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**<http://www.siemens.de/pr/index.htm>**

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# Ferrites and Accessories



Siemens Matsushita Components

Ferrites and inductive components in modern office communications

## The little things that do so much

In the multimedia age, ferrites and inductive components often play a key role. In the switch-mode power supplies of PCs ETD cores ensure interference-free transmission of power. Ring and E cores in energy-saving lamps provide pleasant lighting. Interface transformers in ISDN systems satisfy the high demands of CCITT standards. And ultra-flat planar transformers supply units and installations with the necessary power.



For application-specific products and inductive components design you can count on the support of our I.F.C. KNOW-HOW CENTER, right from the initial engineering phase.

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## Selector Guide

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### RM cores

Core type	Standards	Mounting dimensions (mm) of assembly set Base area × H <sup>1)</sup>	Individual parts of assembly set	Part number	Page
RM 3		7,62 <sup>2</sup> × 7,5	Core Coil former	B65817 B65818	<a href="#">186</a> <a href="#">187</a>
RM 4	IEC 431 DIN 41980 DIN 41981	10,16 <sup>2</sup> × 10,8	Core Coil former Insulating washers Clamp Adjusting screws	B65803 B65804 B65804 B65806 B65539	<a href="#">189</a> <a href="#">191</a> <a href="#">192</a> <a href="#">192</a> <a href="#">193</a>
RM 4 LP		10,5 <sup>2</sup> × 8,1  14 × 17,5 × 8,1	Core Coil former Clamp Insulating washers SMD coil former/Clamp	B65803 B65804 B65804 B65804 B65804	<a href="#">197</a> <a href="#">198</a> <a href="#">199</a> <a href="#">199</a> <a href="#">200</a>
RM 5	IEC 431 DIN 41980	12,7 <sup>2</sup> × 10,8  16,5 × 19 × 10,6	Core Coil former Clamp Insulating washers SMD coil former Clamp Adjusting screws	B65805 B65806 B65806 B65806 B65822 B65806 B65539/ B65806	<a href="#">202</a> <a href="#">204</a> <a href="#">205</a> <a href="#">205</a> <a href="#">206</a> <a href="#">206</a> <a href="#">208</a>
RM 5 LP		20 × 16 × 8	Core SMD coil former Clamp	B65805 B65822 B65804	<a href="#">213</a> <a href="#">214</a> <a href="#">214</a>
RM 6	IEC 431 DIN 41980 DIN 41981	15,24 <sup>2</sup> × 12,8  19,5 × 25 × 12,8 19,6 × 22,2 × 13	Core Coil former Clamp/Insulating washers Coil former for SMPS transf. Coil former for power appl. SMD coil former Clamp Adjusting screws	B65807 B65808 B65808 B65808 B65808 B65821 B65808 B65659	<a href="#">216</a> <a href="#">218</a> <a href="#">221</a> <a href="#">219</a> <a href="#">220</a> <a href="#">222</a> <a href="#">222</a> <a href="#">224</a>
RM 6 LP		23 × 20 × 9,5	Core SMD coil former Clamp	B65807 B65821 B65808	<a href="#">229</a> <a href="#">230</a> <a href="#">230</a>
RM 6-R	IEC 431		Core	B65809	<a href="#">231</a>

1) Height above mounting plane

## Selector Guide

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Core type	Standards	Mounting dimensions (mm) of assembly set Base area × H <sup>1</sup> )	Individual parts of assembly set	Part number	Page
RM 7	IEC 431	17,78 <sup>2</sup> × 13,8	Core Coil former Clamp/Insulating washers Adjusting screws	B65819 B65820 B65820 B65659	<a href="#">233</a> <a href="#">235</a> <a href="#">236</a> <a href="#">237</a>
RM 7 LP			Core	B65819	<a href="#">240</a>
RM 8	IEC 431 DIN 41981	20,32 <sup>2</sup> × 16,8 26 × 30 × 16,8	Core Core for chokes Coil former Coil former for SMPS transf. Coil former for power appl. Clamp/Insulating washers Adjusting screws	B65811 B65811 B65812 B65812 B65812 B65812 B65812	<a href="#">242</a> <a href="#">244</a> <a href="#">245</a> <a href="#">246</a> <a href="#">247</a> <a href="#">248</a> <a href="#">249</a>
RM 8 LP			Core	B65811	<a href="#">253</a>
RM 10	IEC 431 DIN 41980 DIN 41981	25,42 × 19 31 × 40 × 19	Core Core for chokes Coil former Coil former for power appl. Coil former for chokes Clamp/Insulating washers Adjusting screws	B65813 B65813 B65814 B65814 B65814 B65814 B65679	<a href="#">255</a> <a href="#">257</a> <a href="#">258</a> <a href="#">259</a> <a href="#">260</a> <a href="#">261</a> <a href="#">262</a>
RM 10 LP			Core	B65813	<a href="#">264</a>
RM 12	IEC 431	30,48 <sup>2</sup> × 24,9 32 × 45,7 × 24,9	Core Core for chokes Coil former Coil former for power appl. Coil former for chokes Clamp/Insulating washers	B65815 B65815 B65816 B65816 B65816 B65816	<a href="#">266</a> <a href="#">268</a> <a href="#">269</a> <a href="#">270</a> <a href="#">271</a> <a href="#">272</a>
RM 12 LP			Core	B65815	<a href="#">273</a>
RM 14	IEC 431	35,56 <sup>2</sup> × 30,5 44 × 29 × 30,5	Core Core for chokes Coil former Coil former for power appl. Clamp/Insulating washers	B65887 B65887 B65888 B65888 B65888	<a href="#">275</a> <a href="#">277</a> <a href="#">278</a> <a href="#">279</a> <a href="#">280</a>
RM 14 LP			Core	B65887	<a href="#">281</a>
Adjusting tools (see individual data sheets)				B63399, B6580*	

1) Height above mounting plane

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### PM cores

Core type	Standards	Mounting dimensions (mm) of assembly set Base area × H 1)	Individual parts of assembly set	Part number	Page
PM 50/39	IEC 1247 DIN 41990	65 × 52 × 45	Core Coil former Mounting assembly	B65646 B65647 B65647	<a href="#">285</a> <a href="#">286</a> <a href="#">287</a>
PM 62/49	IEC 1247 DIN 41990	76 × 64 × 55	Core Coil former Mounting assembly	B65684 B65685 B65685	<a href="#">288</a> <a href="#">289</a> <a href="#">290</a>
PM 74/59	IEC 1247 DIN 41990	85,5 × 75 × 65	Core Coil former Mounting assembly	B65686 B65687 B65687	<a href="#">291</a> <a href="#">292</a> <a href="#">293</a>
PM 87/70	IEC 1247 DIN 41990	101 × 87 × 72	Core Coil former Mounting assembly	B65713 B65714 B65714	<a href="#">294</a> <a href="#">295</a> <a href="#">296</a>
PM 114/93	IEC 1247 DIN 41990	114 × 92 × 93	Core Coil former	B65733 B65734	<a href="#">297</a> <a href="#">298</a>

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1) Height above mounting plane

## Selector Guide

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### P cores (pot cores)

Core type	Standards	Mounting dimensions (mm) of assembly set Base area × H <sup>1)</sup>	Individual parts of assembly set	Part number	Page
P 3,3 × 2,6			Core	B65491	<a href="#">300</a>
P 4,6 × 4,1		5,5 × 5 × 5,1 6,8 × 5 × 5,1	Core Coil former Terminal carrier Adjusting screws	B65495 B65496 B65496 B65496	<a href="#">302</a> <a href="#">303</a> <a href="#">304</a> <a href="#">305</a>
P 5,8 × 3,3			Core	B65501	<a href="#">308</a>
P 7 × 4		7,5 × 7,5 × 7,1	Core Coil former Mounting assembly Adjusting screws	B65511 B65512 B65512 B65512	<a href="#">310</a> <a href="#">311</a> <a href="#">312</a> <a href="#">313</a>
P 9 × 5	IEC 133 DIN 41293 DIN 41294	12,5 × 12,5 × 7,3 9,9 × 9,9 × 8,3 (4 solder terminals) 9,9 × 12,3 × 8,3 (6 solder terminals) 12,2 × 17 × 6,0	Core Pinned coil former/Clamp Coil former/Insulating washer  SMD coil former Mounting assembly Adjusting screws	B65517 B65518 B65522  B65524 B65518 B65518	<a href="#">319</a> <a href="#">320</a> <a href="#">321</a>  <a href="#">322</a> <a href="#">323</a> <a href="#">324</a>
P 11 × 7	IEC 133 DIN 41293 DIN 41294	15 × 15 × 8,3 12,3 × 12,3 × 9,5 (4 solder terminals) 12,3 × 14,6 × 9,5 (8 solder terminals)	Core Pinned coil former/Clamp Coil former/Insulating washer Mounting assembly  Adjusting screws	B65531 B65532 B65532 B65535  B65539	<a href="#">331</a> <a href="#">332</a> <a href="#">333</a> <a href="#">334</a>  <a href="#">335</a>
P 14 × 8	IEC 133 DIN 41294	17,5 × 17,5 × 9,9 16,8 × 15 × 11,3 (4 solder terminals) 16,8 × 19,6 × 11,3 (6 solder terminals)	Core Pinned coil former/Clamp Coil former/Insulating washers  Mounting assembly Adjusting screws	B65541 B65542 B65542  B65545 B65549	<a href="#">342</a> <a href="#">343</a> <a href="#">344</a>  <a href="#">345</a> <a href="#">346</a>

1) Height above mounting plane

## Selector Guide

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Core type	Standards	Mounting dimensions (mm) of assembly set Base area × H 1)	Individual parts of assembly set	Part number	Page
P 18 × 11	IEC 133 DIN 41294	22 × 22 × 11,9 19,9 × 20,7 × 13,5	Core Pinned coil former/Clamp Coil former/Insulating washers Mounting assembly Adjusting screws	B65651 B65652 B65652 B65655 B65659	<a href="#">352</a> <a href="#">353</a> <a href="#">354</a> <a href="#">355</a> <a href="#">356</a>
P 22 × 13	IEC 133 DIN 41293 DIN 41294	24,5 × 26 × 16,6	Core Coil former/Insulating washers Mounting assembly Adjusting screws	B65661 B65662 B65665 B65669	<a href="#">363</a> <a href="#">364</a> <a href="#">365</a> <a href="#">366</a>
P 26 × 16	IEC 133 DIN 41293 DIN 41294	27,8 × 28,5 × 19	Core Coil former/Insulating washers Mounting assembly Adjusting screws	B65671 B65672 B65675 B65679	<a href="#">371</a> <a href="#">373</a> <a href="#">374</a> <a href="#">375</a>
P 30 × 19	IEC 133 DIN 41293 DIN 41294	32,5 × 33,5 × 22,8	Core Coil former/Insulating washers Mounting assembly Adjusting screws	B65701 B65702 B65705 B65679	<a href="#">380</a> <a href="#">381</a> <a href="#">382</a> <a href="#">383</a>
P 36 × 22	IEC 133 DIN 41293 DIN 41294	40 × 41,8 × 27,5	Core Coil former/Insulating washer Mounting assembly Adjusting screws	B65611 B65612 B65615 B65679	<a href="#">387</a> <a href="#">388</a> <a href="#">389</a> <a href="#">390</a>
P 41 × 25		39 × 55 × 28,1	Core Coil former Mounting assembly Adjusting elements	B65621 B65622 B65623 B65579	<a href="#">393</a> <a href="#">394</a> <a href="#">395</a> <a href="#">396</a>
Adjusting tools (see individual data sheets)				B63399	

1) Height above mounting plane

## Selector Guide

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### P core halves (P cores for proximity switches)

Core type (Ø × height)	Suitable for standard size per DIN EN 50 008	Material	Individual parts of assembly set	Part number	Page
5,6 × 3,7	M 8 × 1	N22, M33	Core	B65931	<a href="#">400</a>
7,35 × 3,6		N22, M33	Core	B65933	<a href="#">401</a>
			Coil former	B65512	<a href="#">401</a>
8,4 × 4,3	M 12 × 1	M33	Core	B65924-B	<a href="#">402</a>
8,6 × 3,3	M 12 × 1	N22, M33	Core	B65924-A	<a href="#">403</a>
9 × 2,8	M 12 × 1	N22, M33	Core	B65935-J	<a href="#">404</a>
			Coil former	B65936	<a href="#">404</a>
9,4 × 4,6	M 12 × 1	N22, M33	Core	B65935-A	<a href="#">405</a>
			Coil former	B65522	<a href="#">405</a>
14 × 5,3	M 18 × 1	N22, M33	Core	B65926	<a href="#">406</a>
14,4 × 7,5	M 18 × 1	N22	Core	B65937	<a href="#">407</a>
			Coil former	B65542	<a href="#">407</a>
25 × 8,9	M 30 × 1,5	N22	Core	B65939	<a href="#">408</a>
			Coil former	B65940	<a href="#">408</a>
30,5 × 10,2	M 40 × 1,5	N22	Core	B65941	<a href="#">409</a>
			Coil former	B65942	<a href="#">409</a>
35 × 10,8		N22	Core	B65947	<a href="#">410</a>
47 × 14,9		N22	Core	B65943	<a href="#">411</a>
			Coil former	B65944	<a href="#">411</a>
68 × 14,5		N22	Core	B65928	<a href="#">412</a>
			Coil former	B65946	<a href="#">412</a>
70 × 14,5		N22	Core	B65945	<a href="#">413</a>
			Coil former	B65946	<a href="#">413</a>
150 × 30		N27	Core	B65949	<a href="#">414</a>

## Selector Guide

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### EP, ER, ETD, EC cores

Core type	Standards	Mounting dimensions (mm) of assembly set L × W × H <sup>1)</sup>	Individual parts of assembly set	Part number	Page
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### EP cores

EP 7	IEC 1596	7,5 × 10 × 10 13 × 9,2 × 8,8	Core Coil former/Cap yoke SMD coil former	B65839 B65840 B65840	<a href="#">416</a> <a href="#">417</a> <a href="#">418</a>
EP 10	IEC 1596	12 × 14,2 × 12,5	Core Coil former Mounting assembly	B65841 B65842 B65842	<a href="#">419</a> <a href="#">420</a> <a href="#">421</a>
EP 13	IEC 1596	15 × 16 × 13,7 15 × 16 × 13,7 19,5 × 13 × 12,5	Core Coil former Coil former for high-voltage applications Mounting assembly SMD coil former	B65843 B65844 B65844 B65844 B65844	<a href="#">422</a> <a href="#">423</a> <a href="#">424</a> <a href="#">425</a> <a href="#">426</a>
EP 17	IEC 1596	20 × 21,6 × 16,2	Core Coil former Mounting assembly	B65845 B65846 B65846	<a href="#">427</a> <a href="#">428</a> <a href="#">429</a>
EP 20	IEC 1596	23 × 27,5 × 20,5	Core Coil former Mounting assembly	B65847 B65848 B65848	<a href="#">430</a> <a href="#">431</a> <a href="#">432</a>

### ER cores

ER 9,5		12 × 10 × 5,7	Core SMD coil former	B65523 B65527	<a href="#">440</a> <a href="#">441</a>
ER 11		12,8 × 11,7 × 6	Core SMD coil former Yoke	B65525 B65526 B65526	<a href="#">442</a> <a href="#">443</a> <a href="#">443</a>
ER 35			Core	B66350	<a href="#">444</a>
ER 42		33 × 46 × 55	Core Coil former Case	B66347 B66348 B66348	<a href="#">445</a> <a href="#">446</a> <a href="#">447</a>
ER 46			Core	B66377	<a href="#">448</a>
ER 49			Core	B66391	<a href="#">449</a>
ER 54			Core	B66357	<a href="#">450</a>

1) Height above mounting plane

## Selector Guide

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Core type	Standards	Mounting dimensions (mm) of assembly set L × W × H <sup>1</sup> )	Individual parts of assembly set	Part number	Page
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### ETD cores

ETD 29	IEC 1185	35,5 × 35,5 × 25,5 24 × 35,5 × 41,2	Core Coil former (horizontal) Coil former (vertical) Yoke	B66358 B66359 B66359 B66359	<a href="#">452</a> <a href="#">454</a> <a href="#">455</a> <a href="#">454</a>
ETD 34	IEC 1185 CECC 25301-001	43 × 40 × 35 27,5 × 40 × 46	Core Coil former (horizontal) Coil former (vertical) Yoke	B66361 B66362 B66362 B66362	<a href="#">456</a> <a href="#">458</a> <a href="#">459</a> <a href="#">458</a>
ETD 39	IEC 1185 CECC 25301-002	48 × 45 × 38	Core Coil former/Yoke	B66363 B66364	<a href="#">460</a> <a href="#">462</a>
ETD 44	IEC 1185 CECC 25301-003	53 × 50 × 41	Core Coil former/Yoke	B66365 B66366	<a href="#">463</a> <a href="#">465</a>
ETD 49	IEC 1185 CECC 25301-004	58 × 55 × 43,5	Core Coil former/Yoke	B66367 B66368	<a href="#">466</a> <a href="#">468</a>
ETD 54	IEC 1185	62 × 62 × 47	Core Coil former/Yoke	B66395 B66396	<a href="#">469</a> <a href="#">471</a>
ETD 59	IEC 1185	67 × 71 × 50	Core Coil former/Yoke	B66397 B66398	<a href="#">472</a> <a href="#">474</a>

### EC cores

EC 35	IEC 647	47 × 36 × 28	Core Coil former (solder tags) Coil former (solder pins)	B66337 B66272 B66272	<a href="#">476</a> <a href="#">477</a> <a href="#">478</a>
EC 41	IEC 647	52,5 × 47,5 × 42 47,5 × 42 × 44	Core Coil former (horizontal) Coil former (vertical) Mounting assembly	B66339 B66274 B66274 B66274	<a href="#">479</a> <a href="#">480</a> <a href="#">480</a> <a href="#">480</a>
EC 52	IEC 647	61 × 57,5 × 43,5 54 × 52,5 × 53	Core Coil former (horizontal) Coil former (vertical) Mounting assembly	B66341 B66276 B66276 B66276	<a href="#">482</a> <a href="#">483</a> <a href="#">483</a> <a href="#">483</a>
EC 70	IEC 647	82 × 81 × 48,5 72 × 57,5 × 75	Core Coil former (horizontal) Coil former (vertical) Mounting assembly	B66343 B66278 B66278 B66278	<a href="#">485</a> <a href="#">486</a> <a href="#">486</a> <a href="#">486</a>

1) Height above mounting plane

## Selector Guide

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### DE, EFD, E cores

Core type <sup>1)</sup>	Standards	Mounting dimensions (mm) of assembly set L × W × H <sup>2)</sup>	Individual parts of assembly set	Part number	Page
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#### DE cores

DE 28			Core	B66399	<a href="#">488</a>
DE 35			Core	B66409	<a href="#">489</a>

#### EFD cores

EFD 10		19 × 12 × 5,5	Core SMD coil former	B66411 B66412	<a href="#">491</a> <a href="#">492</a>
EPF 12			Core	B66427	<a href="#">493</a>
EFD 15		19,3 × 17 × 8	Core Coil former Yoke	B66413 B66414 B66414	<a href="#">494</a> <a href="#">495</a> <a href="#">495</a>
		21 × 16 × 8	SMD coil former Cover plate	B66414 B66414	<a href="#">496</a> <a href="#">496</a>
EFD 20		24,3 × 22 × 10	Core Coil former/Yoke	B66417 B66418	<a href="#">497</a> <a href="#">498</a>
EFD 25		29,3 × 27,3 × 12,5	Core Coil former/Yoke	B66421 B66422	<a href="#">499</a> <a href="#">500</a>
EFD 30		34,4 × 32,5 × 12,5	Core Coil former/Yoke	B66423 B66424	<a href="#">501</a> <a href="#">502</a>

#### E cores

E 6,3/2		8,5 × 8 × 5,7 9 × 8 × 5,7	Core SMD coil former SMD coil former/Cover cap	B66300 B66296 B66301	<a href="#">504</a> <a href="#">505</a> <a href="#">506</a>
E 8,8/2	IEC 1246	10 × 12,5 × 5,5	Core SMD coil former/Cover cap	B66302 B66302	<a href="#">507</a> <a href="#">508</a>
E 13/7/4 (EF 12,6)	DIN 41 985 IEC 1246	15 × 17 × 12 10 × 15 × 17 13,5 × 19,5 × 9,3	Core Coil former (horizontal) Coil former (vertical) SMD coil former Cover plate Yoke	B66305 B66202 B66202 B66306 B66414 B66202	<a href="#">509</a> <a href="#">510</a> <a href="#">510</a> <a href="#">512</a> <a href="#">512</a> <a href="#">510</a>

1) The E core designations have been brought into line with IEC; the previous designations are given in parentheses.

2) Height above mounting plane

## Selector Guide

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Core type <sup>1)</sup>	Standards	Mounting dimensions (mm) of assembly set L × W × H <sup>2)</sup>	Individual parts of assembly set	Part number	Page
E 16/8/5 (EF 16)	DIN 41 985 IEC 1246	18 × 20 × 14 11 × 18 × 20	Core Coil former (horizontal) Coil former (vertical) Yoke	B66307 B66308 B66308 B66308	<a href="#">513</a> <a href="#">514</a> <a href="#">514</a> <a href="#">514</a>
E 16/6/5			Core	B66393	<a href="#">516</a>
E 19/8/5 E 187 <sup>3)</sup>			Core	B66379	<a href="#">517</a>
E 20/10/6 (EF 20)	DIN 41 985 IEC 1246	22 × 22 × 17 15 × 22 × 24 24 × 21,5 × 14 15 × 22 × 24	Core Coil former (horizontal) Coil former (vertical) Coil former (right-angle pins) Coil former for luminaires Yoke	B66311 B66206 B66206 B66206 B66206 B66206	<a href="#">518</a> <a href="#">519</a> <a href="#">519</a> <a href="#">520</a> <a href="#">521</a> <a href="#">520</a>
E 21/9/5		22 × 20 × 20	Core Coil former	B66314 B66314	<a href="#">522</a> <a href="#">523</a>
E 25/13/7 (EF 25)	DIN 41 985 IEC 1246	28 × 28 × 21 18 × 28 × 29 19 × 26 × 30	Core Coil former (horizontal) Coil former (vertical) Coil former for SMPS Yoke	B66317 B66208 B66208 B66208 B66208	<a href="#">524</a> <a href="#">525</a> <a href="#">525</a> <a href="#">527</a> <a href="#">525/527</a>
E 25,4/10/7 E2425 <sup>3)</sup>			Core	B66315	<a href="#">528</a>
E 28/13/11			Core	B66403	<a href="#">529</a>
ED 29/14/11			Core	B66407	<a href="#">530</a>
E 30/15/17	DIN 41 295	36 × 36 × 12 19 × 36 × 36	Core Coil former (horizontal) Coil former (vertical) Yoke	B66319 B66232 B66232 B66232	<a href="#">531</a> <a href="#">532</a> <a href="#">532</a> <a href="#">532</a>
E 32/16/9 (EF 32)	DIN 41 985 IEC 1246	35 × 37 × 24	Core Coil former Yoke	B66229 B66230 B66230	<a href="#">534</a> <a href="#">535</a> <a href="#">535</a>
E 32/16/11			Core	B66233	<a href="#">536</a>

<sup>1)</sup> The E core designations have been brought into line with IEC; the previous designations are given in parentheses.

<sup>2)</sup> Height above mounting plane

<sup>3)</sup> US designation (size based on U.S. lam. size E cores)

## Selector Guide

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Core type <sup>1)</sup>	Standards	Mounting dimensions (mm) of assembly set $L \times W \times H^2)$	Individual parts of assembly set	Part number	Page
E 34/14/9 E 375 <sup>3)</sup>			Core	B66370	<a href="#">537</a>
E 36/18/11		39 × 38 × 31	Core Coil former	B66389 B66390	<a href="#">538</a> <a href="#">539</a>
E 40/16/12 E 21 <sup>3)</sup>			Core	B66381	<a href="#">540</a>
E 42/21/15	DIN 41 295 IEC 1246	42,5 × 43 × 33	Core Coil former	B66325 B66242	<a href="#">541</a> <a href="#">542</a>
E 42/21/20	DIN 41 295 IEC 1246	38 × 46 × 52	Core Coil former Case	B66329 B66243 B66243	<a href="#">543</a> <a href="#">544</a> <a href="#">545</a>
E 47/20/16 E 625 <sup>3)</sup>			Core	B66383	<a href="#">546</a>
E 55/28/21	DIN 41 295 IEC 1246	56 × 57 × 46	Core Coil former	B66335 B66252	<a href="#">547</a> <a href="#">548</a>
E 55/28/25			Core	B66344	<a href="#">549</a>
E 56/24/19 E 75 <sup>3)</sup>			Core	B66385	<a href="#">550</a>
E 65/32/27	DIN 41 295 IEC 1246	58 × 59 × 54	Core Coil former	B66387 B66388	<a href="#">551</a> <a href="#">552</a>
E 70/33/32		73 × 60 × 59	Core Coil former	B66371 B66372	<a href="#">553</a> <a href="#">554</a>
E 80/38/20			Core	B66375	<a href="#">555</a>

1) The E core designations have been brought into line with IEC; the previous designations are given in parentheses.

2) Height above mounting plane

3) US designation (size based on U.S. lam. size E cores)

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### U and UI cores

Core type	Standards	Individual parts of assembly set	Part number	Page
U 11/9/6		Core	B67366	<a href="#">558</a>
U 15/11/6		Core Coil former	B67350 B67350	<a href="#">559</a> <a href="#">559</a>
U 17/12/7		Core	B67364	<a href="#">560</a>
U 20/16/7	DIN 41 296 (Dimensions)	Core Coil former	B67348 B67348	<a href="#">561</a> <a href="#">561</a>
U 21/17/12		Core	B67318	<a href="#">562</a>
U 25/20/13		Core Coil former	B67352 B67352	<a href="#">563</a> <a href="#">563</a>
U 26/22/16		Core	B67355	<a href="#">564</a>
U 30/26/26		Core	B67362	<a href="#">565</a>
U 93/76/16		Cores	B67345	<a href="#">566</a>
UI 93/104/16				
U 93/76/20		Cores	B67345	<a href="#">567</a>
UI 93/104/20				
U 93/76/30		Cores	B67345	<a href="#">568</a>
UI 93/104/30				
UU 93/152/30		Coil former	B67345	<a href="#">569</a>
UR 29/18/16		Core	B67354	<a href="#">570</a>
UR 35/31/13		Core	B67359	<a href="#">571</a>
UR 38/32/13		Core	B67313	<a href="#">572</a>
UR 39/35/15		Core	B67317	<a href="#">573</a>
UR 42/34/16		Core	B67368	<a href="#">574</a>
UR 42/36/15		Core	B67320	<a href="#">575</a>
UR 42,7/33/14		Core	B67322	<a href="#">576</a>
UR 46/37/15		Core	B67314	<a href="#">577</a>

### Ring cores/Double-aperture cores

Core type	Standards	Individual parts of assembly set	Part number	Page
Ring cores R 2,5 ... R 200	R2,5; R4; R6,3; R10 based on IEC 525	Core	B64290	<a href="#">583</a>
Double-aperture cores Core height 2,5 ... 14,5 mm	6,2; 8,3 and 14,5: DIN 41279, shape G	Core	B62152	<a href="#">589</a>

### FPC film

Material	Part number	Page
C 350	B68450	<a href="#">592</a>

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(In numerical order)

Part number	Page	Type
B62152	<a href="#">589</a>	Double-aperture cores
B63399	<a href="#">193</a> , <a href="#">208</a> , <a href="#">224</a> , <a href="#">237</a> , <a href="#">249</a> , <a href="#">262</a> , <a href="#">305</a> , <a href="#">313</a> , <a href="#">324</a> , <a href="#">335</a> , <a href="#">346</a> , <a href="#">357</a> , <a href="#">367</a> , <a href="#">375</a> , <a href="#">383</a> , <a href="#">390</a> , <a href="#">396</a>	Adjusting screwdriver plus handle for RM and P cores
B64290	<a href="#">583</a>	Ring cores
B65491	<a href="#">300</a>	P 3,3 × 2,6 core
B65495	<a href="#">302</a>	P 4,6 × 4,1 core
B65496	<a href="#">303</a>	P 4,6 × 4,1 coil former, terminal carrier, adjusting screw
B65501	<a href="#">308</a>	P 5,8 × 3,3 core
B65511	<a href="#">310</a>	P 7 × 4 core
B65512	<a href="#">311</a> , <a href="#">401</a>	P 7 × 4 clf., mounting assembly, adj., P core half P 7,35 × 3,6 clf.
B65517	<a href="#">319</a>	P 9 × 5 core
B65518	<a href="#">320</a> , <a href="#">323</a>	P 9 × 5 coil former, clamp, mounting assembly, adj.
B65522	<a href="#">321</a> , <a href="#">405</a>	P 9 × 5 clf., insulating washer, P core half 9,4 × 4,6 clf.
B65523	<a href="#">440</a>	ER 9,5 core
B65524	<a href="#">322</a>	P 9 × 5 coil former (SMD)
B65525	<a href="#">442</a>	ER 11 core
B65526	<a href="#">443</a>	ER 11 coil former (SMD)
B65527	<a href="#">441</a>	ER 9,5 coil former (SMD)
B65531	<a href="#">331</a>	P 11 × 7 core
B65532	<a href="#">332</a>	P 11 × 7 coil former, clamp, insulating washer
B65535	<a href="#">334</a>	P 11 × 7 mounting assembly
B65539	<a href="#">193</a> , <a href="#">208</a> , <a href="#">335</a>	Adjusting screw for RM 4, RM 5, P 11 × 7
B65541	<a href="#">342</a>	P 14 × 8 core
B65542	<a href="#">343</a> , <a href="#">407</a>	P 14 × 8 clf., clamp, ins., P core half 14,4 × 7,5 clf.
B65545	<a href="#">345</a>	P 14 × 8 mounting assembly
B65549	<a href="#">346</a>	P 14 × 8 adjusting screw
B65579	<a href="#">396</a>	P 41 × 25 adjusting screw
B65611	<a href="#">387</a>	P 36 × 22 core
B65612	<a href="#">388</a>	P 36 × 22 coil former, insulating washer
B65615	<a href="#">389</a>	P 36 × 22 mounting assembly
B65621	<a href="#">393</a>	P 41 × 25 core
B65622	<a href="#">394</a>	P 41 × 25 coil former
B65623	<a href="#">395</a>	P 41 × 25 mounting assembly

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

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Part number	Page	Type
B65646	<a href="#">285</a>	PM 50/39 core
B65647	<a href="#">286</a>	PM 50/39 coil former, mounting assembly
B65651	<a href="#">352</a>	P 18 × 11 core
B65652	<a href="#">354</a>	P 18 × 11 coil former, clamp, insulating washer
B65655	<a href="#">356</a>	P 18 × 11 mounting assembly
B65659	<a href="#">224, 237, 357</a>	Adjusting screw for RM 6, RM 7, P 18 × 11
B65661	<a href="#">363</a>	P 22 × 13 core
B65662	<a href="#">365</a>	P 22 × 13 coil former, insulating washer
B65665	<a href="#">366</a>	P 22 × 13 mounting assembly
B65669	<a href="#">367</a>	P 22 × 13 adjusting screw
B65671	<a href="#">371</a>	P 26 × 16 core
B65672	<a href="#">373</a>	P 26 × 16 coil former, insulating washer
B65675	<a href="#">374</a>	P 26 × 16 mounting assembly
B65679	<a href="#">262, 375, 383, 390</a>	Adjusting screw for RM 10, P 26 × 16, P 30 × 19, P 36 × 22
B65684	<a href="#">288</a>	PM 62/49 core
B65685	<a href="#">289</a>	PM 62/49 coil former, mounting assembly
B65686	<a href="#">291</a>	PM 74/59 core
B65687	<a href="#">292</a>	PM 74/59 coil former, mounting assembly
B65701	<a href="#">380</a>	P 30 × 19 core
B65702	<a href="#">381</a>	P 30 × 19 coil former, insulating washer
B65705	<a href="#">382</a>	P 30 × 19 mounting assembly
B65713	<a href="#">294</a>	PM 87/70 core
B65714	<a href="#">295</a>	PM 87/70 coil former, mounting assembly
B65733	<a href="#">297</a>	PM 114/93 core
B65734	<a href="#">298</a>	PM 114/93 coil former
B65803	<a href="#">189</a>	RM 4 core
B65804	<a href="#">191</a>	RM 4 coil former, clamp, insulating washer
B65805	<a href="#">202</a>	RM 5 core
B65806	<a href="#">192</a> <a href="#">204</a>	RM 4 clamp, centering pin RM 5 coil former, clamp, centering pin
B65807	<a href="#">216</a>	RM 6 core
B65808	<a href="#">218</a> <a href="#">237</a>	RM 6 coil former, clamp, insulating washer, centering pin RM 7 centering pin
B65809	<a href="#">231</a>	R 6 core
B65811	<a href="#">242</a>	RM 8 core
B65812	<a href="#">245</a>	RM 8 coil former, clamp, insulating washer, adjusting screw

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

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B65813	<a href="#">255</a>	RM 10 core
B65814	<a href="#">258</a>	RM 10 coil former, clamp, insulating washer
B65815	<a href="#">266</a>	RM 12 core
B65816	<a href="#">271</a>	RM 12 coil former, clamp, insulating washer
B65817	<a href="#">186</a>	RM 3 core
B65818	<a href="#">187</a>	RM 3 coil former
B65819	<a href="#">233</a>	RM 7 core
B65820	<a href="#">235</a>	RM 7 coil former, clamp, insulating washer
B65821	<a href="#">222</a>	RM 6 coil former (SMD)
B65822	<a href="#">206</a>	RM 5 coil former (SMD)
B65839	<a href="#">416</a>	EP 7 core
B65840	<a href="#">417</a>	EP 7 coil former
B65841	<a href="#">419</a>	EP 10 core
B65842	<a href="#">420</a>	EP 10 coil former, mounting assembly
B65843	<a href="#">422</a>	EP 13 core
B65844	<a href="#">423</a>	EP 13 coil former, mounting assembly
B65845	<a href="#">427</a>	EP 17 core
B65846	<a href="#">428</a>	EP 17 coil former, mounting assembly
B65847	<a href="#">430</a>	EP 20 core
B65848	<a href="#">431</a>	EP 20 coil former, mounting assembly
B65887	<a href="#">275</a>	RM 14 core
B65888	<a href="#">278</a>	RM 14 coil former, clamp, insulating washer
B65924	<a href="#">402</a> , <a href="#">403</a>	P core halves P 8,4 × 4,3, P 8,6 × 3,3
B65926	<a href="#">406</a>	P core half 14 × 5,3
B65928	<a href="#">412</a>	P core half 68 × 14,5
B65931	<a href="#">400</a>	P core half 5,6 × 3,7
B65933	<a href="#">401</a>	P core half 7,35 × 3,6
B65935	<a href="#">404</a> , <a href="#">405</a>	P core half 9 × 2,8, 9,4 × 4,6
B65936	<a href="#">404</a>	P core half 9 × 2,8 coil former
B65937	<a href="#">407</a>	P core half 14,4 × 7,5
B65939	<a href="#">408</a>	P core half 25 × 8,9
B65940	<a href="#">408</a>	P core half 25 × 8,9 coil former
B65941	<a href="#">409</a>	P core half 30,5 × 10,2
B65942	<a href="#">409</a>	P core half 30,5 × 10,2 coil former
B65943	<a href="#">411</a>	P core half 47 × 14,9
B65944	<a href="#">411</a>	P core half 47 × 14,9 coil former

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

## Index of Part Numbers

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Part number	Page	Type
B665945	<a href="#">413</a>	P core half $70 \times 14,5$
B665946	<a href="#">412</a> , <a href="#">413</a>	P core half $68 \times 14,5$ clf., P core half $70 \times 14,5$ clf.
B665947	<a href="#">410</a>	P core half $35 \times 10,8$
B665949	<a href="#">414</a>	P core half $150 \times 30$
B66202	<a href="#">510</a>	E 13/7/4 coil former, yoke
B66206	<a href="#">519</a>	E 20/10/6 coil former, yoke
B66208	<a href="#">525</a>	E 25/13/7 coil former, yoke
B66229	<a href="#">534</a>	E 32/16/9 core
B66230	<a href="#">535</a>	E 32/16/9 coil former, yoke
B66232	<a href="#">532</a>	E 30/15/7 coil former, yoke
B66233	<a href="#">536</a>	E 32/16/11 core
B66242	<a href="#">542</a>	E 42/21/15 coil former
B66243	<a href="#">544</a> , <a href="#">545</a>	E 42/21/20 coil former, case
B66252	<a href="#">548</a>	E 55/28/21 coil former
B66272	<a href="#">477</a>	EC 35 coil former
B66274	<a href="#">480</a>	EC 41 coil former, mounting assembly
B66276	<a href="#">483</a>	EC 52 coil former, mounting assembly
B66278	<a href="#">486</a>	EC 70 coil former, mounting assembly
B66296	<a href="#">505</a>	E 6,3 coil former (SMD)
B66300	<a href="#">504</a>	E 6,3 core
B66301	<a href="#">505</a>	E 6,3 coil former (SMD), cover cap
B66302	<a href="#">507</a>	E 8,8 core, coil former (SMD)
B66305	<a href="#">509</a>	E 13/7/4 core
B66306	<a href="#">512</a>	E 13/7/4 coil former (SMD)
B66307	<a href="#">513</a>	E 16/8/5 core
B66308	<a href="#">514</a>	E 16/8/5 coil former, yoke
B66311	<a href="#">518</a>	E 20/10/6 core
B66314	<a href="#">522</a>	E 21/9/5 core, coil former
B66315	<a href="#">528</a>	E 25,4/10/7 core
B66317	<a href="#">524</a>	E 25/13/7 core
B66319	<a href="#">531</a>	E 30/15/7 core
B66325	<a href="#">541</a>	E 42/21/15 core
B66329	<a href="#">543</a>	E 42/21/20 core
B66335	<a href="#">547</a>	E 55/28/21 core
B66337	<a href="#">476</a>	EC 35 core
B66339	<a href="#">479</a>	EC 41 core

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

## Index of Part Numbers

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Part number	Page	Type
B66341	<a href="#">482</a>	EC 52 core
B66343	<a href="#">485</a>	EC 70 core
B66344	<a href="#">549</a>	E 55/28/25 core
B66347	<a href="#">445</a>	ER 42 core
B66348	<a href="#">446</a>	ER 42 coil former, case
B66350	<a href="#">444</a>	ER 35 core
B66357	<a href="#">450</a>	ER 54 core
B66358	<a href="#">452</a>	ETD 29 core
B66359	<a href="#">454</a>	ETD 29 coil former, yoke
B66361	<a href="#">456</a>	ETD 34 core
B66362	<a href="#">458</a>	ETD 34 coil former, yoke
B66363	<a href="#">460</a>	ETD 39 core
B66364	<a href="#">462</a>	ETD 39 coil former, yoke
B66365	<a href="#">463</a>	ETD 44 core
B66366	<a href="#">465</a>	ETD 44 coil former, yoke
B66367	<a href="#">466</a>	ETD 49 core
B66368	<a href="#">468</a>	ETD 49 coil former, yoke
B66370	<a href="#">537</a>	E 34/14/9 core
B66371	<a href="#">553</a>	E 70/33/32 core
B66372	<a href="#">554</a>	E 70/33/32 coil former
B66375	<a href="#">555</a>	E 80/38/20 core
B66377	<a href="#">448</a>	ER 46 core
B66379	<a href="#">517</a>	E 19/8/5 core
B66381	<a href="#">540</a>	E 40/16/12 core
B66383	<a href="#">546</a>	E 47/20/16 core
B66385	<a href="#">550</a>	E 56/24/19 core
B66387	<a href="#">551</a>	E 65/32/27 core
B66388	<a href="#">552</a>	E 65/32/27 coil former
B66389	<a href="#">538</a>	E 36/18/11 core
B66390	<a href="#">539</a>	E 36/18/11 coil former
B66391	<a href="#">449</a>	ER 49 core
B66393	<a href="#">516</a>	E 16/6/5 core
B66395	<a href="#">469</a>	ETD 54 core
B66396	<a href="#">471</a>	ETD 54 coil former, yoke
B66397	<a href="#">472</a>	ETD 59 core
B66398	<a href="#">474</a>	ETD 59 coil former, yoke

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

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Part number	Page	Type
B66399	<a href="#">488</a>	DE 28 core
B66403	<a href="#">529</a>	E 28/13/11 core
B66407	<a href="#">530</a>	ED 29/14/11 core
B66409	<a href="#">489</a>	DE 35 core
B66411	<a href="#">491</a>	EFD 10 core
B66412	<a href="#">492</a>	EFD 10 coil former
B66413	<a href="#">494</a>	EFD 15 core
B66414	<a href="#">495</a> , <a href="#">512</a>	EFD 15 coil former, yoke, cover plate
B66417	<a href="#">497</a>	EFD 20 core
B66418	<a href="#">498</a>	EFD 20 coil former, yoke
B66421	<a href="#">499</a>	EFD 25 core
B66422	<a href="#">500</a>	EFD 25 coil former, yoke
B66423	<a href="#">501</a>	EFD 30 core
B66424	<a href="#">502</a>	EFD 30 coil former, yoke
B66427	<a href="#">493</a>	EPF 12 core
B67313	<a href="#">572</a>	UR 38/32/13 core
B67314	<a href="#">577</a>	UR 46/37/15 core
B67317	<a href="#">573</a>	UR 39/35/15 core
B67318	<a href="#">562</a>	U 21/17/12 core
B67320	<a href="#">575</a>	UR 42/36/15 core
B67322	<a href="#">576</a>	UR 42,7/33/14 core
B67345	<a href="#">566</a>	U 93/76/16, I 93/28/16, U 93/76/20, I 93/28/20, U 93/76/30, I 93/28/30 cores, coil former for UU 93/152/30
B67348	<a href="#">561</a>	U 20/16/7 core, coil former
B67350	<a href="#">559</a>	U 15/11/6 core, coil former
B67352	<a href="#">563</a>	U 25/20/13 core, coil former
B67354	<a href="#">570</a>	UR 29/18/16 core
B67355	<a href="#">564</a>	U 26/22/16 core
B67359	<a href="#">571</a>	UR 35/31/13 core
B67362	<a href="#">565</a>	U 30/26/26 core
B67364	<a href="#">560</a>	U 17/12/7 core
B67366	<a href="#">558</a>	U 11/9/6 core
B67368	<a href="#">558</a>	UR 42/34/16
B68450	<a href="#">592</a>	FPC film

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clf. = coil former, ins. = insulating washer, adj. = adjusting screw

## SIFERRIT® Materials

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Based on IEC 401, the data specified here are typical data for the material in question, which have been determined principally on the basis of ring cores.

The purpose of such characteristic material data is to provide the user with improved means for comparing different materials.

There is no direct relationship between characteristic material data and the data measured using other core shapes and/or core sizes made of the same material. In the absence of further agreements with the manufacturer, only those specifications given for the core shape and/or core size in question are binding.

# SIFERRIT Materials

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## 1 Application survey

Usage	Frequency range	Material	Specific application	Type	
High Q inductors in resonant circuits and filters	up to 0,1 MHz	N 48	Filters in telephony, MW IF filters	Gapped P and RM cores, adjusting cores	
	0,2 – 1,6 MHz	M 33			
	1,5 – 12 MHz	K 1			
	6 – 30 MHz	K 12	VHF filters		
	up to 100 MHz	U 17			
Line attenuation	up to 2 MHz	M 13	Balun transformers	Ring cores, double- aperture cores	
		K 10			
		M 11			
Broadband transformers (e.g. antenna transformers for MW, SW, VHF, TV) ISDN transformers, digital data transformers, current-compensated interference suppression chokes	up to 3 MHz	T 46	ISDN transformers Impedance and matching transformers	Ring cores	
		T 42			
		T 38		RM, P, ER, EP, ring cores	
		T 44	Current-compensated chokes		
		T 37			
		T 35	RM, P, ring, DE		
		T 65			
	up to 5 MHz	N 30	Current-compensated chokes	Ring cores, double- aperture cores	
		N 26			
		M 33	Radio-frequency transform- ers		
		K 1			
		K 12			
Sensors, ID systems	up to 400 MHz	U 17	Inductive proximity switches	P core halves	
		N 22			
		M 33			
	FPC				

Usage	Frequency range	Material	Specific application	Type
Power transformers, chokes	1 to 100 kHz	N 27	Transformers for flyback converters	E, EC, ETD, U, RM, PM
		N 41	Chokes	Pot cores, RM
		N 61	Pulse power transformers	Small ring cores, E cores
	up to 200 kHz	N 53	Diode splitting transformers	E, U, UR
		N 62		E, U, UR, ETD, ER
		N 67	High-voltage transformers	
		N 72	Electronic lamp ballast devices	E, ETD
	up to 500 kHz	N 87	Transformers for forward and push-pull converters	ETD, EFD, RM, ER
	0,3 – 1 MHz	N 49	Transformers for DC/DC converters, particularly resonance converters	EFD, ER,
	0,5 – 1 MHz	N 59		RM (low profile)

# SIFERRIT Materials

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## 2 Material properties

Preferred application			Resonant circuit inductors				
Material			U 17 <sup>1)</sup>	K 12 <sup>1)</sup>	K 1	M 33 <sup>2)</sup>	N 48
Base material			NiZn	NiZn	NiZn	MnZn	MnZn
Color code (adjuster)			gray	yellow	violet	white	—
	Symbol	Unit					
Initial permeability ( $T = 25^\circ\text{C}$ )	$\mu_i$		10 $\pm 30\%$	26 $\pm 25\%$	80 $\pm 25\%$	750 $\pm 25\%$	2300 $\pm 25\%$
Meas. field strength	$H$	A/m	10000	2000	5000	2000	1200 <sup>3)</sup>
Flux density (near saturation) ( $f = 10\text{ kHz}$ )	$B_S$ (25 °C) $B_S$ (100 °C)	mT mT	180 170	230 210	310 280	400 310	400 <sup>3)</sup> 290 <sup>3)</sup>
Coercive field strength ( $f = 10\text{ kHz}$ )	$H_c$ (25 °C) $H_c$ (100 °C)	A/m A/m	1900 1800	450 410	380 350	80 65	19 13
Optimum frequency range	$f_{\min}$ $f_{\max}$	MHz MHz	10 220	3 40	1,5 12	0,2 1,0	0,001 0,1
Relative loss factor at $f_{\min}$	$\tan \delta/\mu_i$	10 <sup>-6</sup> 10 <sup>-6</sup>	< 100 < 1700	< 150 < 600	< 40 < 120	< 12 < 20	< 0,5 < 2,5
Hysteresis material constant	$\eta_B$	10 <sup>-6</sup> /mT	< 27	< 45	< 36	< 1,8	< 0,4
Curie temperature	$T_C$	°C	> 550	> 450	> 400	> 200	> 150
Relative temperature coefficient at 25 ... 55 °C at 5 ... 20 °C	$\alpha_F$	10 <sup>-6</sup> /K	25 ... 50 45 ... 20	3 ... 14 12 ... 0	2 ... 8 7 ... 1	0,5 ... 2,6 —	0,4 ... 1,0 1,0 ... 0,4
Mean value of $\alpha_F$ at 25 ... 55 °C		10 <sup>-6</sup> /K	37	9	4	1,6	0,7
Density (typical values)		kg/m <sup>3</sup>	4400	4600	4650	4500	4700
Disaccommodation factor at 25 °C	$DF$	10 <sup>-6</sup>	—	—	20	8	2
Resistivity	$\rho$	Ωm	10 <sup>5</sup>	10 <sup>5</sup>	10 <sup>5</sup>	5	3
Core shapes			P, Double aperture	P, Ring	RM, P, Ring, P core half	RM, P, Ring, Double aperture, P core half	RM, P
Other material properties (graphs) see page			<a href="#">44</a>	<a href="#">46</a>	<a href="#">48</a>	<a href="#">50</a>	<a href="#">52</a>

1) Perminvar ferrite: irreversible variations in quality and permeability may occur in case of strong fields in the core (> 1500 A/m). In the case of shape-related dimensions, these dimensions may be exceeded by up to 5%.

2) For threaded cores  $\mu_i = 600 \pm 20\%$

3) Measured at  $f = 40\text{ kHz}$

**Material properties (continued)**

Preferred application			Inductors for line attenuation			Special type
Material			M 11	K 10	M 13	N 22
Base material			NiZn	NiZn	NiZn	MnZn
Color code (adjuster)			brown	—	—	red
	Symbol	Unit				
Initial permeability ( $T = 25^\circ\text{C}$ )	$\mu_i$		250 $\pm 25\%$	600 $\pm 25\%$	2300 $\pm 25\%$	2300 $\pm 25\%$
Meas. field strength	$H$	A/m	2400	2000	1200	1200
Flux density (near saturation) ( $f = 10\text{ kHz}$ )	$B_S$ ( $25^\circ\text{C}$ ) $B_S$ ( $100^\circ\text{C}$ )	mT mT	310 230	290 210	280 135	370 260
Coercive field strength ( $f = 10\text{ kHz}$ )	$H_c$ ( $25^\circ\text{C}$ ) $H_c$ ( $100^\circ\text{C}$ )	A/m A/m	90 70	60 45	12 8	18 14
Optimum frequency range	$f_{\min}$ $f_{\max}$	MHz MHz	0,4 2	0,1 1	0,001 0,1	0,001 0,2
Relative loss factor at $f_{\min}$	$\tan \delta/\mu_i$	$10^{-6}$	< 25	< 15	< 5	< 2
at $f_{\max}$		$10^{-6}$	< 50	< 60	< 20	< 20
Hysteresis material constant	$\eta_B$	$10^{-6}/\text{mT}$	< 3,6	< 1,8	< 4	< 1,4
Curie temperature	$T_C$	°C	> 170	> 150	> 105	> 145
Relative temperature coefficient at $25 \dots 55^\circ\text{C}$	$\alpha_F$	$10^{-6}/\text{K}$	— —	— —	3,0 ... 5,0 5,0 ... 7,5	— —
at $5 \dots 20^\circ\text{C}$						
Mean value of $\alpha_F$ at $25 \dots 55^\circ\text{C}$		$10^{-6}/\text{K}$	14	8	3,7	0,9
Density (typical values)		kg/m <sup>3</sup>	4600	4700	5200	4700
Disaccommodation factor at $25^\circ\text{C}$	$DF$	$10^{-6}$	—	—	—	4
Resistivity	$\rho$	Ωm	$10^5$	$10^5$	$10^5$	1
Core shapes			Double aperture	Ring, Double aperture	Ring, Double aperture	Ring, P core half, Double aperture
Other material properties (graphs) see page			<a href="#">54</a>	<a href="#">55</a>	<a href="#">56</a>	<a href="#">57</a>

# SIFERRIT Materials

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## Material properties (continued)

Preferred application			Broadband transformers				
Material			N 26	N 30	T 65	T 35	T 37
Base material			MnZn	MnZn	MnZn	MnZn	MnZn
	Symbol	Unit					
Initial permeability ( $T = 25^\circ\text{C}$ )	$\mu_i$		2300 $\pm 25\%$	4300 $\pm 25\%$	5300 $\pm 30\%$	6000 $\pm 25\%$	6500 $\pm 25\%$
Meas. field strength	$H$	A/m	1200	1200	1200	1200	1200
Flux density (near saturation) ( $f = 10\text{ kHz}$ )	$B_S$ ( $25^\circ\text{C}$ ) $B_S$ ( $100^\circ\text{C}$ )	mT mT	390 260	380 240	460 320	390 270	380 240
Coercive field strength ( $f = 10\text{ kHz}$ )	$H_c$ ( $25^\circ\text{C}$ ) $H_c$ ( $100^\circ\text{C}$ )	A/m A/m	15 12	12 8	12 11	12 9	9 8
Optimum frequency range	$f_{\min}$ $f_{\max}$	MHz MHz	— —	— —	— —	— —	— —
Relative loss factor at $f_{\min}$	$\tan \delta / \mu_i$	$10^{-6}$	< 5	—	—	—	—
loss factor at $f_{\max}$		$10^{-6}$	$f = 100\text{ kHz}$	—	—	—	—
Hysteresis material constant	$\eta_B$	$10^{-6}/\text{mT}$	< 1,5	< 1,1	< 1,1	< 1,1	< 1,1
Curie temperature	$T_C$	$^\circ\text{C}$	> 150	> 130	> 160	> 130	> 130
Relative temperature coefficient at $25 \dots 55^\circ\text{C}$ at $5 \dots 20^\circ\text{C}$	$\alpha_F$	$10^{-6}/\text{K}$	0 ... 1,5 0 ... 2	— —	— —	— —	— —
Mean value of $\alpha_F$ at $25 \dots 55^\circ\text{C}$		$10^{-6}/\text{K}$	0,5	0,6	-0,5	0,8	-0,3
Density (typical values)		$\text{kg}/\text{m}^3$	4700	4800	4930	4900	4900
Disaccommodation factor at $25^\circ\text{C}$	$DF$	$10^{-6}$	—	—	—	—	—
Resistivity	$\rho$	$\Omega\text{m}$	2	0,5	0,30	0,2	0,2
Core shapes				RM, P, EP	RM, P, EP, E, Ring, Double aperture	RM, P, ER, Ring	RM, P, EP, Ring Ring DE
Other material properties (graphs) see page			58	60	62	64	66

**Material properties (continued)**

Preferred application			Broadband transformers			
Material			T 44	T 38	T 42 <sup>4)</sup>	T 46 <sup>5)4)</sup>
Base material			MnZn	MnZn	MnZn	MnZn
	Symbol	Unit				
Initial permeability ( $T = 25^\circ\text{C}$ )	$\mu_i$		8000 $\pm 30\%$	10000 $\pm 30\%$	12000 $\pm 30\%$	15000 $\pm 30\%$
Meas. field strength	$H$	A/m	1200	1200	1200	1200
Flux density (near saturation) ( $f = 10\text{ kHz}$ )	$B_S$ ( $25^\circ\text{C}$ ) $B_S$ ( $100^\circ\text{C}$ )	mT mT	400 280	380 240	400 250	400 240
Coercive field strength ( $f = 10\text{ kHz}$ )	$H_c$ ( $25^\circ\text{C}$ ) $H_c$ ( $100^\circ\text{C}$ )	A/m A/m	10 6	9 6	7 6	7 6
Optimum frequency range	$f_{\min}$ $f_{\max}$	MHz MHz	— —	— —	— —	— —
Relative loss factor at $f_{\min}$	$\tan \delta / \mu_i$	$10^{-6}$	—	—	—	—
at $f_{\max}$		$10^{-6}$	—	—	—	—
Hysteresis material constant	$\eta_B$	$10^{-6}/\text{mT}$	< 1,1	< 1,4	< 1,4	< 2,0
Curie temperature	$T_C$	$^\circ\text{C}$	> 130	> 130	> 130	> 130
Relative temperature coefficient at $25 \dots 55^\circ\text{C}$	$\alpha_F$	$10^{-6}/\text{K}$	—	—	—	—
at $5 \dots 20^\circ\text{C}$			—	—	—	—
Mean value of $\alpha_F$ at $25 \dots 55^\circ\text{C}$		$10^{-6}/\text{K}$	0,2	- 0,4	- 0,3	- 0,6
Density (typical values)		$\text{kg}/\text{m}^3$	4900	4900	4950	5000
Disaccommodation factor at $25^\circ\text{C}$	$DF$	$10^{-6}$	—	—	—	—
Resistivity	$\rho$	$\Omega\text{m}$	0,25	0,1	0,1	0,01
Core shapes			Ring, DE	RM, P, EP, ER, E, Ring	RM, EP, Ring	Ring
Other material properties (graphs) see page			<a href="#">68</a>	<a href="#">70</a>	<a href="#">72</a>	<a href="#">74</a>

4) Material values defined on the basis of small ring cores ( $\leq R10$ )

5) Preliminary data

# SIFERRIT Materials

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## Material properties (continued)

Preferred application			Power transformers				
Material			N 59	N 49	N 53	N 62	N 27
Base material			MnZn	MnZn	MnZn	MnZn	MnZn
	Symbol	Unit					
Initial permeability ( $T = 25^\circ\text{C}$ )	$\mu$		850 $\pm 25\%$	1300 $\pm 25\%$	1700 $\pm 25\%$	1900 $\pm 25\%$	2000 $\pm 25\%$
Flux density ( $H = 1200 \text{ A/m}$ , $f = 10 \text{ kHz}$ )	$B_S(25^\circ\text{C})$ $B_S(100^\circ\text{C})$	mT mT	460 370	460 370	490 420	500 410	500 410
Coercive field strength ( $f = 10 \text{ kHz}$ )	$H_c(25^\circ\text{C})$ $H_c(100^\circ\text{C})$	A/m A/m	60 50	55 45	26 16	18 11	23 19
Optimum frequency range	$f_{\min}$ $f_{\max}$	kHz kHz	500 1500	300 1000	— 200	— 200	— 150
Hysteresis material constant	$\eta_B$	$10^{-6}/\text{mT}$	—	—	—	—	< 1,5
Curie temperature	$T_C$	°C	> 240	> 240	> 240	> 240	> 220
Mean value of $\alpha_F$ at 20 ... 55 °C		$10^{-6}/\text{K}$	—	—	—	—	3
Density (typical values)		kg/m³	4750	4750	4800	4800	4750
Relative core losses	$P_V$						
25 kHz, 200 mT, 100 °C							
			mW/g mW/cm³		20 100	16 80	32 155
100 kHz, 200 mT, 100 °C							
			mW/g mW/cm³		125 625	105 525	190 920
300 kHz, 100 mT, 100 °C							
			mW/g mW/cm³	120 600	135 670		
500 kHz, 50 mT, 100 °C			mW/g mW/cm³	39 180	24 120		
1 MHz, 50 mT, 100 °C			mW/g mW/cm³	110 510	115 560		
Resistivity	$\rho$	Ωm	26	11	6	4	3
Core shapes				EFD	RM, Ring, EFD, ER	E, U	ETD, E, U
Other material properties (graphs) see page			<a href="#">76</a>	<a href="#">79</a>	<a href="#">82</a>	<a href="#">85</a>	<a href="#">88</a>

## Material properties (continued)

Preferred application			Power transformers					
Material			N 67	N 87	N 72	N 41	N 61	
Base material			MnZn	MnZn	MnZn	MnZn	MnZn	
	Symbol	Unit						
Initial permeability ( $T = 25^\circ\text{C}$ )	$\mu_i$		2100 $\pm 25\%$	2200 $\pm 25\%$	2500 $\pm 25\%$	2800 $\pm 25\%$	3000 $\pm 25\%$	
Flux density ( $H = 1200 \text{ A/m}$ , $f = 10 \text{ kHz}$ )	$B_S(25^\circ\text{C})$ $B_S(100^\circ\text{C})$	mT mT	480 380	480 380	480 370	490 390	490 390	
Coercive field strength ( $f = 10 \text{ kHz}$ )	$H_c(25^\circ\text{C})$ $H_c(100^\circ\text{C})$	A/m	20 14	16 9	15 11	22 20	17 18	
Optimum frequency range	$f_{\min}$ $f_{\max}$	kHz kHz	— 300	— 500	— 300	— 150	— 150	
Hysteresis material constant	$\eta_B$	$10^{-6}/\text{mT}$	< 1,4	< 1,4	—	< 1,4	—	
Curie temperature	$T_C$	°C	> 220	> 210	> 210	> 220	> 220	
Mean value of $\alpha_F$ at 20 ... 55 °C		$10^{-6}/\text{K}$	4	4	—	4	—	
Density (typical values)		kg/m³	4800	4800	4800	4800	4850	
Relative core losses	$P_V$							
25 kHz, 200 mT, 100 °C		mW/g mW/cm³	17 80		16 80	35 180	32 165	
100 kHz, 200 mT, 100 °C		mW/g mW/cm³	105 525	80 385	110 540	280 1400	220 1100	
300 kHz, 100 mT, 100 °C		mW/g mW/cm³	115 560	85 410				
500 kHz, 50 mT, 100 °C		mW/g mW/cm³						
1 MHz, 50 mT, 100 °C		mW/g mW/cm³						
Resistivity	$\rho$	Ωm	6	8	12	2	2	
Core shapes				RM, P, EP, ETD, ER, EFD, E, U, Ring	RM, P, PM, ETD, EFD, E, ER	E, EFD	RM, P	Ring, $\leq R12,5$ E, $\leq E14$
Other material properties (graphs) see page				<a href="#">91</a>	<a href="#">94</a>	<a href="#">97</a>	<a href="#">100</a>	<a href="#">103</a>

# SIFERRIT Materials

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## Material properties (continued)

Preferred application		Injection-molded parts	Die-pressed parts	Film
Material	Ferrite Polymer Composite (FPC)			
Base material			C302	C303
	Symbol	Unit		
Initial permeability $f = 1 \text{ MHz}$	$\mu_i$		$17 \pm 20 \%$	$24 \pm 20 \%$
Flux density (near saturation) $H = 25 \text{ kA/m}$ $f = 10 \text{ kHz}$	$B_s (25^\circ\text{C})$	mT	330	350
Remanent induction $H = 25 \text{ kA/m}$ $f = 10 \text{ kHz}$	$B_r (25^\circ\text{C})$	mT	15	26
Coercive field strength $H = 25 \text{ kA/m}$ $f = 10 \text{ kHz}$	$H_c (25^\circ\text{C})$	A/m	770	640
Relative loss factor $f = 100 \text{ kHz}$ $f = 10 \text{ MHz}$ $f = 1 \text{ GHz}$	$\tan\delta/\mu_i$		0,0010 0,0030	0,0002 0,0050
Hysteresis material constant	$\eta_B$	$10^{-3}/\text{mT}$	< 0,25	< 0,6
Temperature coefficient	$\alpha = \Delta\mu/\mu\Delta T$	1/K	< 0,0002	< 0,0005
Density		kg/m <sup>3</sup>	3500	3600
Resistivity $f = 1 \text{ kHz}$ $f = 10 \text{ kHz}$ $f = 10 \text{ MHz}$	$\rho$	$\Omega\text{m}$	21 13	300 50
Relative permittivity $f = 1 \text{ kHz}$ $f = 10 \text{ kHz}$ $f = 10 \text{ MHz}$	$\epsilon_r$		280 100	900 300
Maximum operating temperature	$T_{\max}$	°C	180	120
Dielectric strength		kV/mm	—	—
Tensile strength <sup>6)</sup>	$\sigma_z$	N/mm <sup>2</sup>	—	0,5
Tearing resistance <sup>6)</sup>		%	—	25
Compressibility <sup>6)</sup>	$\kappa$	N/mm <sup>2</sup>	—	70
Other material properties (graphs) see page			—	<a href="#">106</a>

6) T = 23 °C and 50 % relative humidity

### 3 Measuring conditions

The following measuring conditions, which correspond largely to IEC 51 (CO) 282 (revision IEC 401), apply for the material properties given in the table:

Properties (valid only for ring cores of sizes R 10 to R 36)	Measuring conditions				
	Frequency kHz	Field strength (material-dependent) kA/m	Max. flux density mT	Temper- ature °C	
Initial permeability $\mu_i$		$\leq 10$		$\leq 0,25$	25
Flux density near to saturation	$B$	mT	$\leq 10$	$\geq 1,2$	25; 100
Coercive field strength $H_{cB}$	A/m kA/m	$\leq 10$	$\geq 1,2$	near saturation	25; 100
Relative loss factor	$\tan \delta/\mu_i$	—		$\leq 0,25$	25
Hysteresis material constant $\eta_B$		$T^{-1}$	10 ( $\mu_i \geq 500$ ) 100 ( $\mu_i < 500$ )	$B_1$ 1,5 0,3	$B_2$ 3,0 1,2
Curie temperature $T_c$	$^{\circ}\text{C}$	$\leq 10$		$\leq 0,25$	
Relative temperature coefficient $\alpha_F$	$10^{-6}/\text{K}$	$\leq 10$		$\leq 0,25$	5 ... 20 25 ... 55
Density		$\text{kg}/\text{m}^3$			25
Disaccommodation factor $DF$	$10^{-6}$	$\leq 10$		$\leq 0,25$	25; 60 <sup>1)</sup>
Resistivity $\rho$	$\Omega\text{m}$			—	25

The following properties are given only for materials for power applications:

Power loss	$P_V$	$\text{mW}/\text{cm}^3$ $\text{mW/g}$	25 100 300 500 1000		200 200 100 50 50	100
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1) Higher temperature than specified by IEC (40°C)

# SIFERRIT Materials

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## 4 Specific material data

### Magnetic Design Tool

The MDT provides digital data of hysteresis loop  $B(H)$ , initial permeability versus temperature  $\mu_i(T)$ , complex permeability versus frequency  $\mu'(f), \mu''(f)$ , power losses versus frequency, flux density and temperature  $P_V(f, B, T)$  and amplitude permeability versus flux density  $\mu_a(B)$ . This tool is part of the CD-ROM "Data Book Library 1996" (ordering no. B465-P6578-X-X-7600).

### DC magnetic bias

$H_-$  = DC field strength [A/m]

$$H_- = \frac{I_- \cdot N}{l_e}$$

$I_-$  = Direct current [A]

$N$  = Number of turns

$l_e$  = Effective magnetic path length [m]

### Explanation of the graphs

The curves of  $\mu_{rev} = f(H_-)$  allow an approximate calculation of the variation in reversible permeability ( $\mu_{rev}$ ) and  $A_L$  value caused by magnetic bias. These curves are of particular interest for cores for transformers and chokes, since magnetic bias should be avoided if possible with inductors requiring high stability (filter inductors etc.). In the case of geometrically similar cores (i.e. in particular the same  $A_{min}/A_e$  ratio) the effective permeability of the core in question in conjunction with the given curves suffices to determine the reversible permeability to a close approximation.

For determining the variations of reversible permeability with magnetic bias DC field strength  $H_-$ , the effective permeability  $\mu_e$  for the desired  $A_L$  value is taken from the data sheets for the individual cores. If the curve  $\mu_{rev} = f(H_-)$  for the actual effective permeability is not shown, this can be obtained by interpolation from the two curves shown. The associated DC field strength  $H_-$  can be calculated from the above equation with the effective magnetic path length  $l_e$  similarly obtained from the individual data sheets.

#### Example for small-signal transformers

P 26 x 16, B65671

SIFERRIT material N26

$A_L$  = 1000 nH

$\mu_e$  = 319

$l_e$  = 37,2 mm

The decrease in permeability caused by magnetic bias begins at a DC field strength of about 300 A/m (P 26 x 16) or about 1000 A/m (E 42/15).

This corresponds to an ampere-turns value of

$$I_- \cdot N = H_- \cdot l_e = 300 \cdot 37,2 \cdot 10^{-3} = 11,2 \text{ [A} \cdot \text{turn]} \text{ (for P 26 x 16)}$$

$$I_- \cdot N = H_- \cdot l_e = 1000 \cdot 97 \cdot 10^{-3} = 97 \text{ [A} \cdot \text{turn]} \text{ (for E 42/15)}$$

#### Example for power transformers

E 42/15 (B66325-G500-X127)

combined with B66325-G-X127)

Air gap dimension  $g$  (0,5 ± 0,05) mm

$\mu_e$  = 190

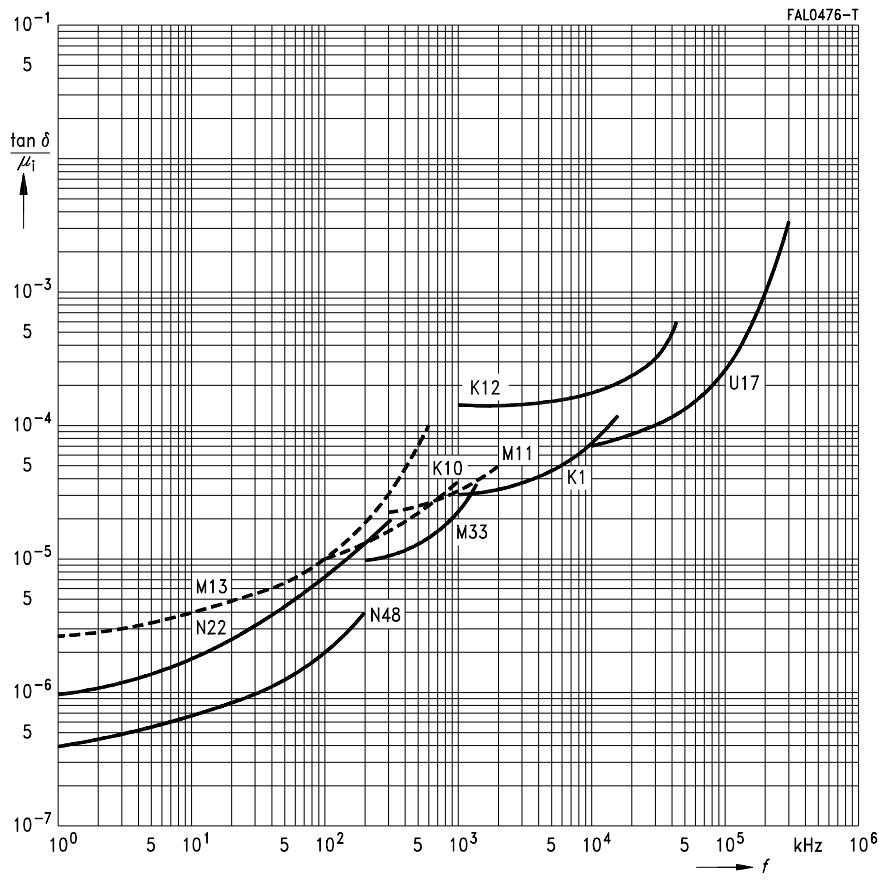
$l_e$  = 97 mm

**SIFERRIT Materials**  
**Inductors for Resonant Circuits and Line Attenuation**

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*Relative loss factor versus frequency*

(measured with ring cores, measuring flux density  $\hat{B} \leq 0,25$  mT)

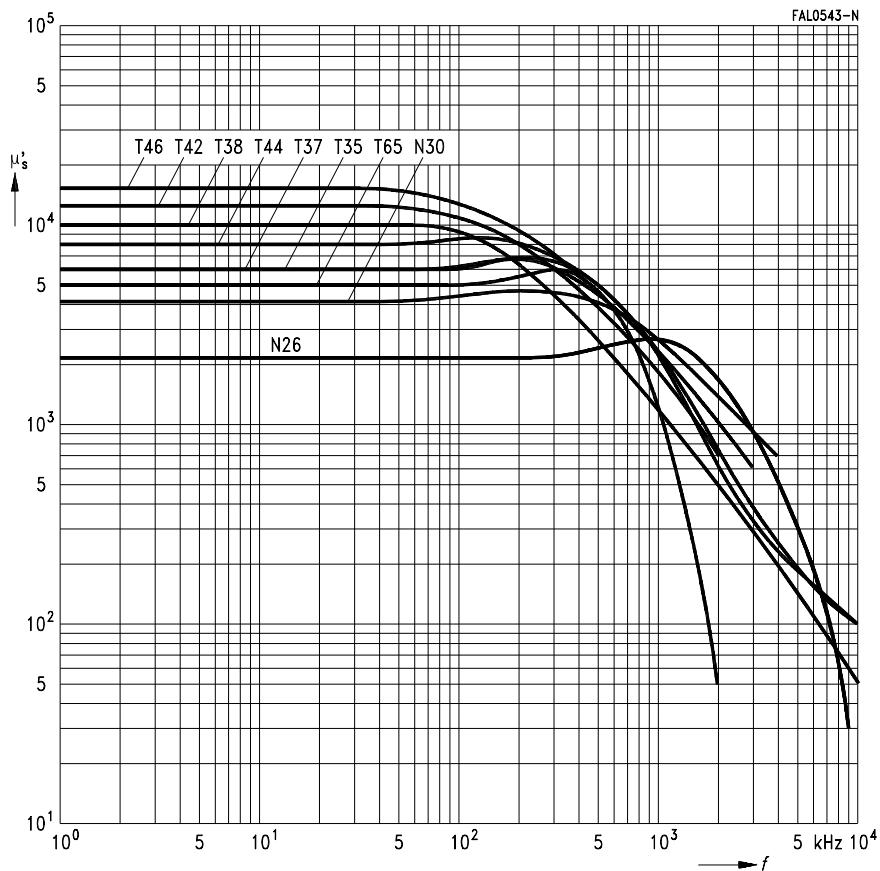


— — — Line attenuation

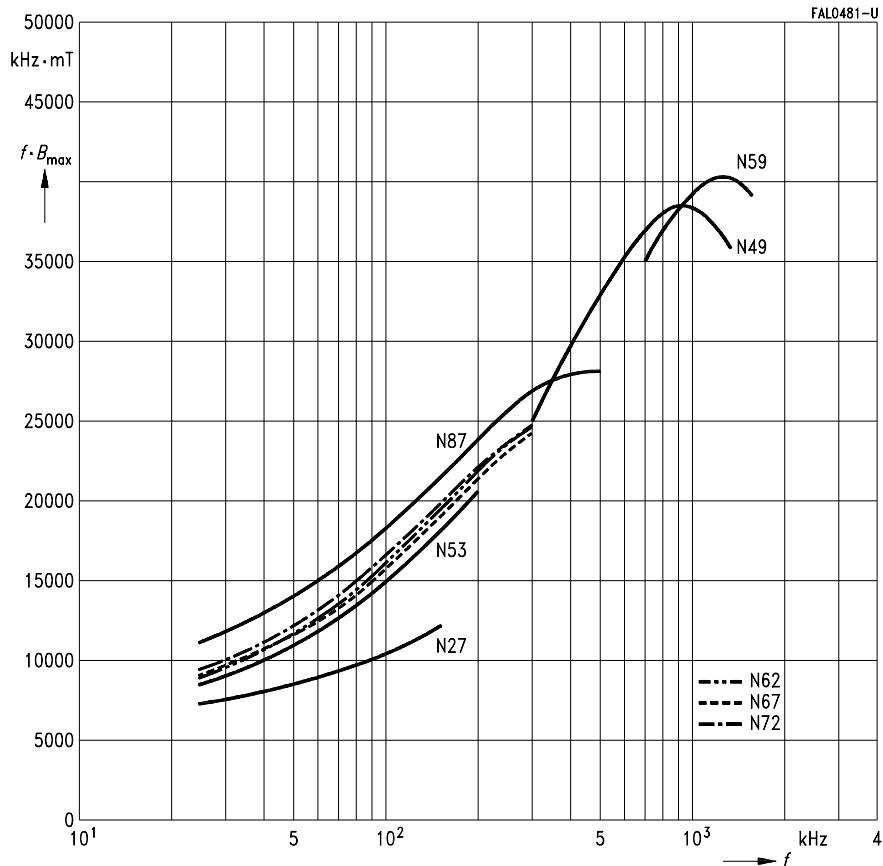
— Resonant circuit

# SIFERRIT Materials Broadband Transformers

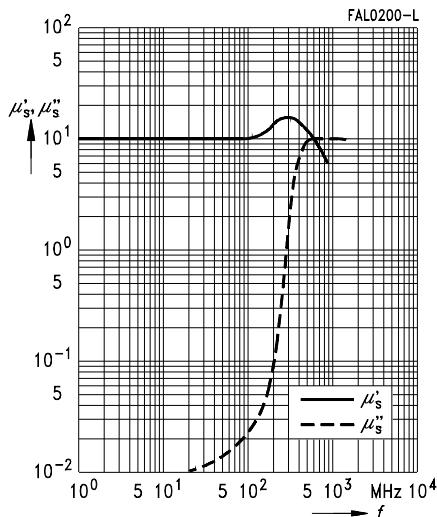
*Relative inductance component versus frequency*  
(measured with ring cores, measuring flux density  $\hat{B} \leq 0,25$  mT)



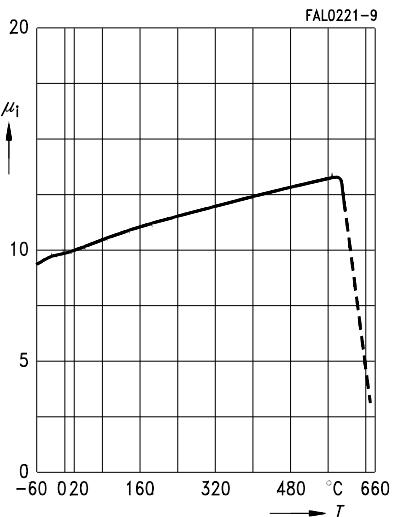
*Performance factor versus frequency*  
(measured with ring cores R29, T = 100 °C, P<sub>V</sub> = 300 kW/cm<sup>3</sup>)



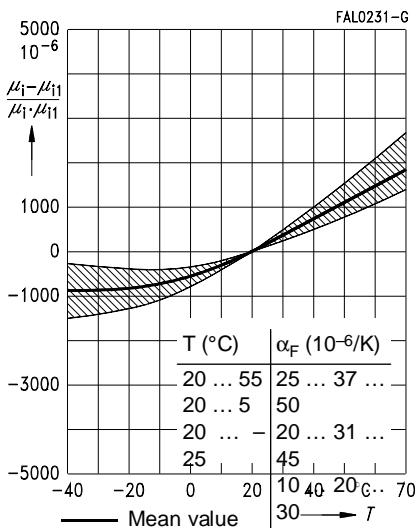
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



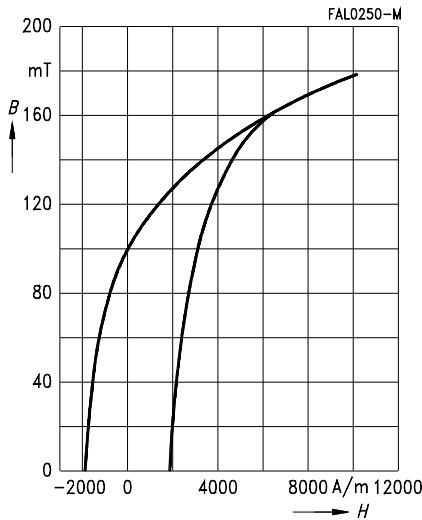
Initial permeability  $\mu_i$   
versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



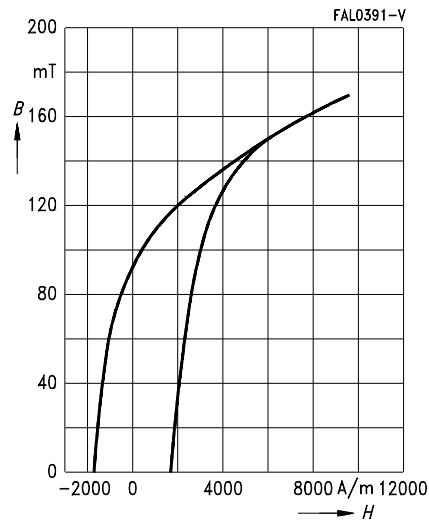
Permeability factor versus temperature  
(measured with P and RM cores,  
 $\hat{B} \leq 0,25$  mT),  $\mu_i \approx 10$



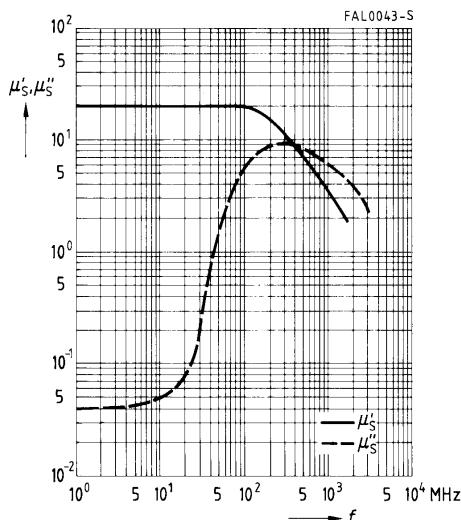
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



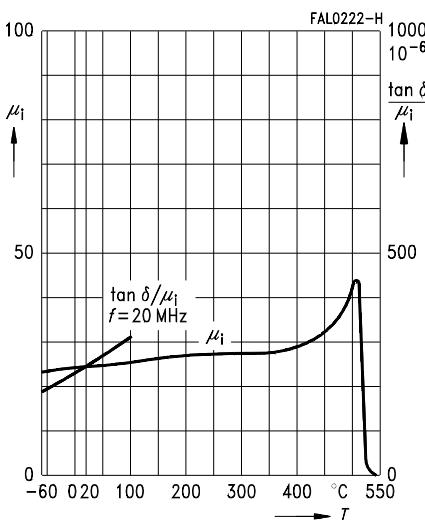
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



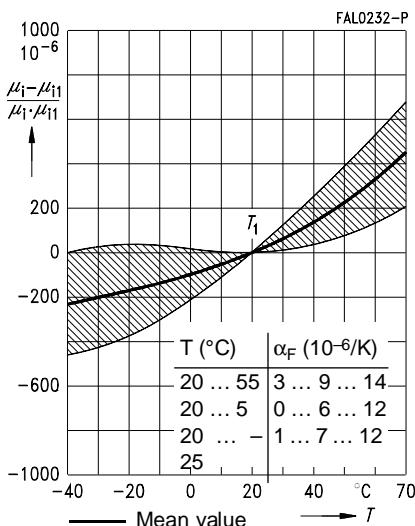
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



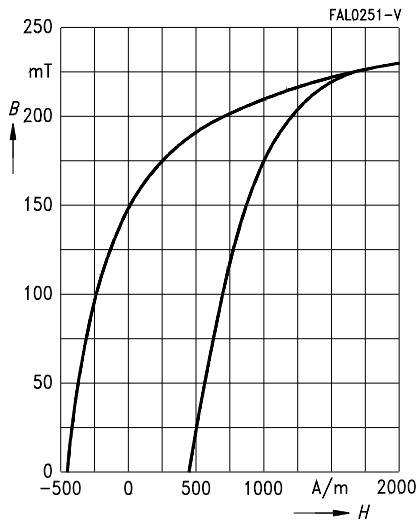
Initial permeability  $\mu_i$  and relative loss factor  
 $\tan \delta / \mu_i$  versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



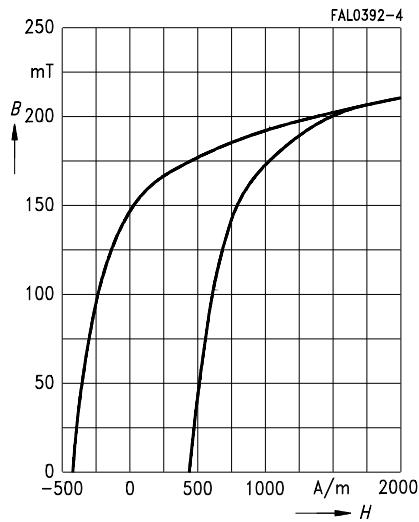
Permeability factor versus temperature  
(measured with P and RM cores,  
 $\hat{B} \leq 0,25$  mT),  $\mu_i \approx 26$



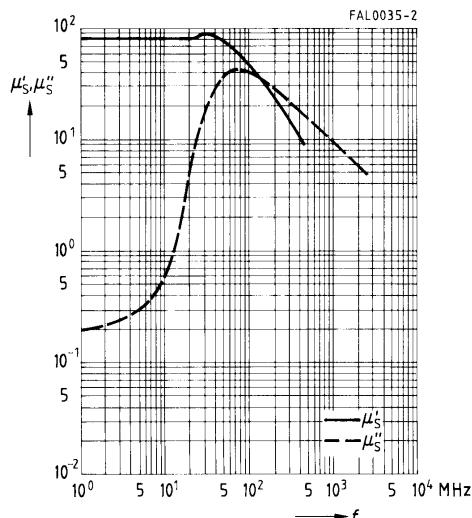
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



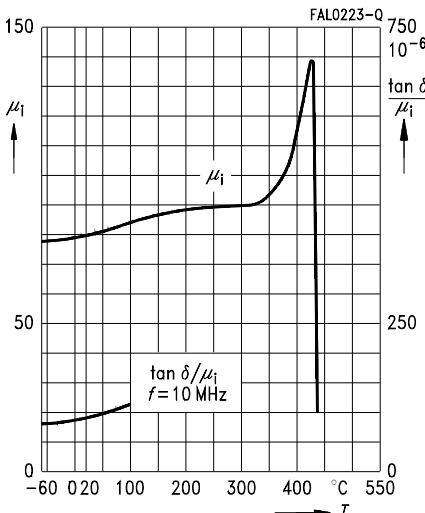
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



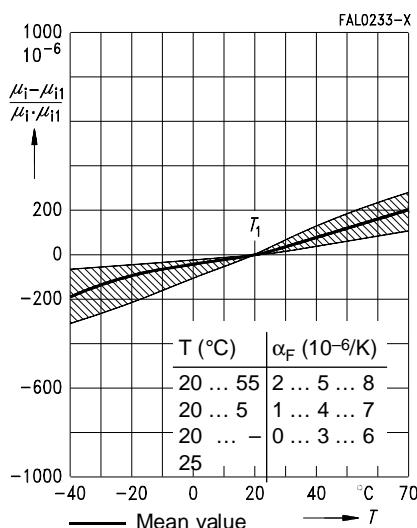
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



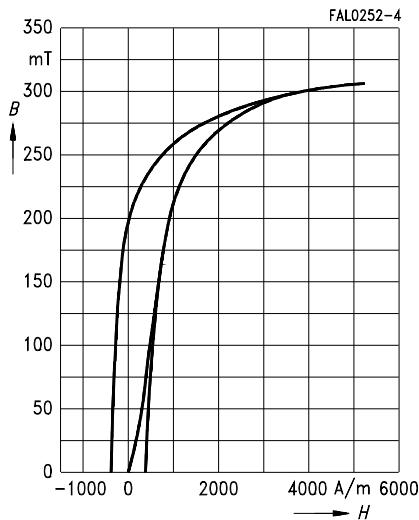
Initial permeability  $\mu_i$  and relative loss factor  
 $\tan \delta / \mu_i$  versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



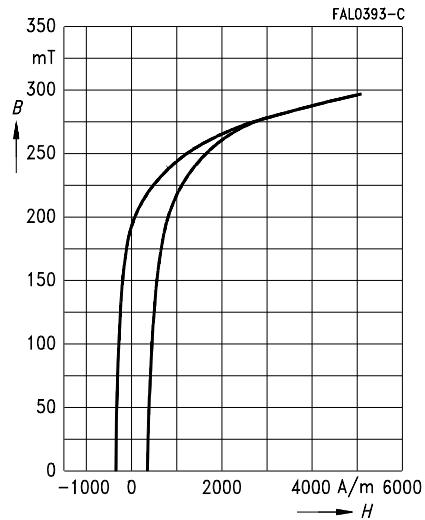
Permeability factor versus temperature  
(measured with P and RM cores,  
 $\hat{B} \leq 0,25$  mT),  $\mu_i \approx 80$



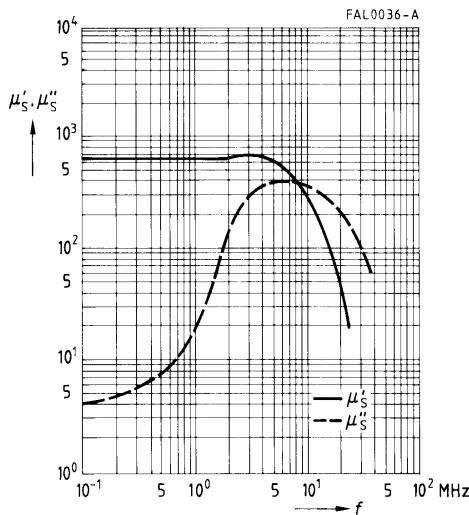
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



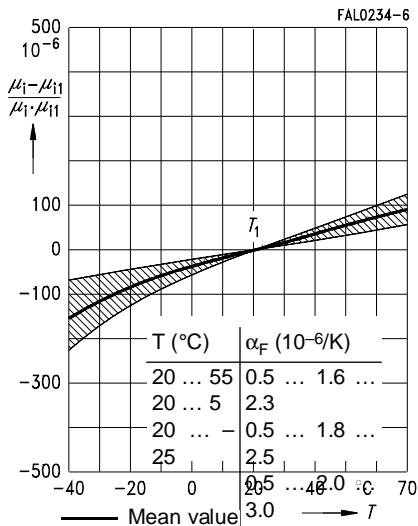
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



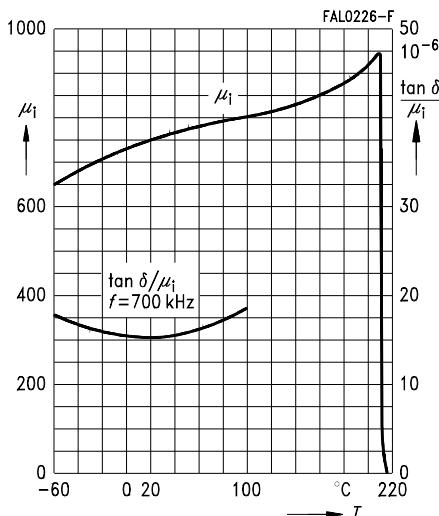
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



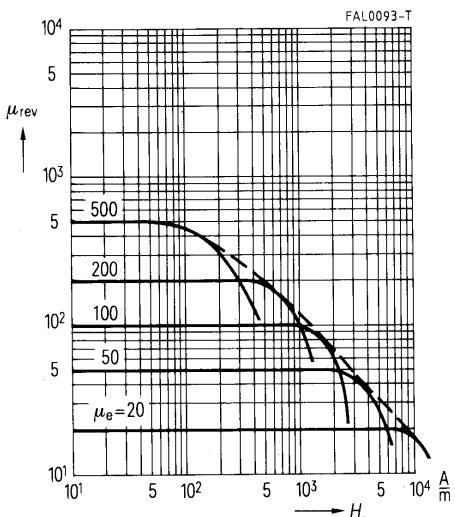
Permeability factor versus temperature  
(measured with P and RM cores,  
 $\hat{B} \leq 0,25$  mT),  $\mu_i \approx 750$



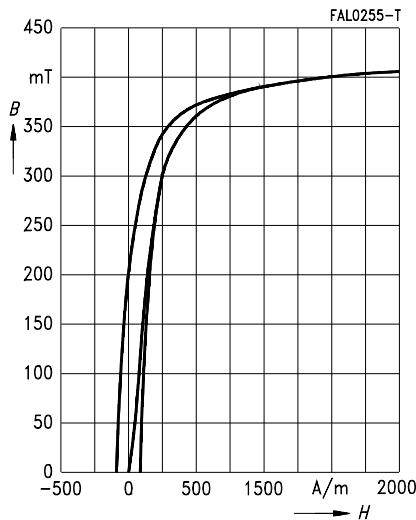
Initial permeability  $\mu_i$  and relative loss factor  
 $\tan \delta / \mu_i$  versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



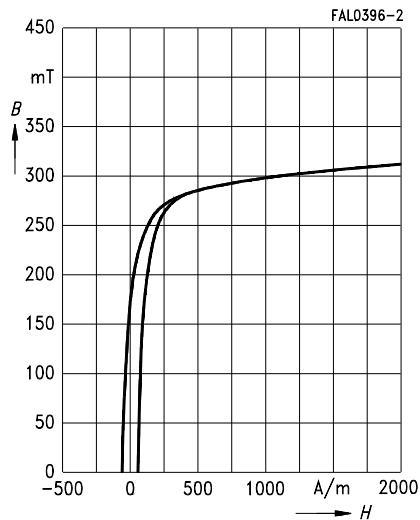
DC magnetic bias of P and RM cores  
(typical values)  
( $\hat{B} \leq 0,25$  mT,  $f = 10$  kHz,  $T = 25$  °C)



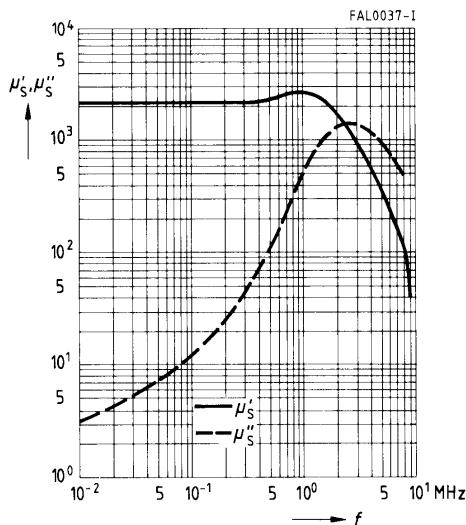
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



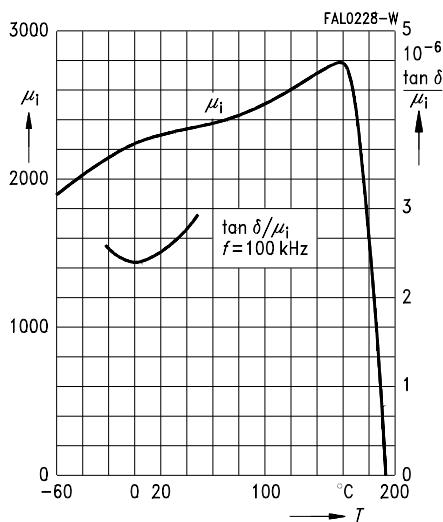
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



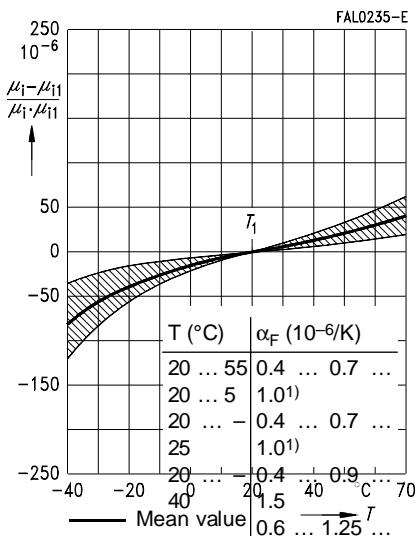
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



Initial permeability  $\mu_i$  and relative loss factor  
 $\tan \delta / \mu_i$  versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



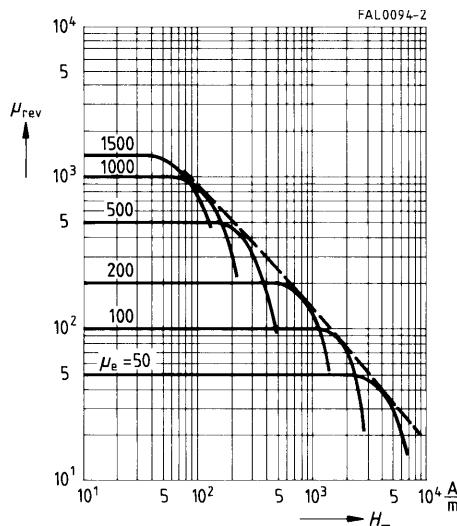
Permeability factor versus temperature  
(measured with P and RM cores,  
 $\hat{B} \leq 0,25$  mT),  $\mu_i \approx 2300$



1) With P cores  $\geq P22 \times 13$  and RM cores  $\geq RM\ 8$  the  $\alpha_F$  value may deviate by up to  $1,2 \cdot 10^{-6}/K$ .

## DC magnetic bias of P and RM cores

(typical values)

 $(\hat{B} \leq 0,25 \text{ mT}, f = 10 \text{ kHz}, T = 25^\circ\text{C})$ 

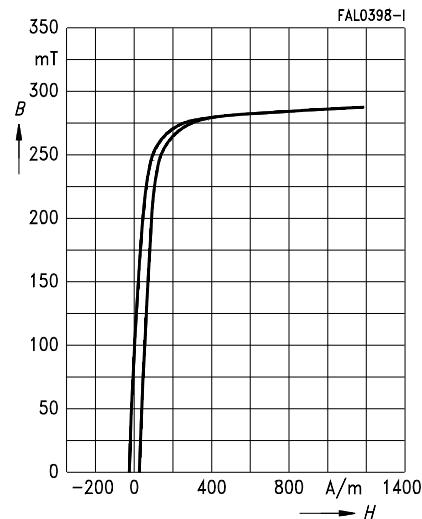
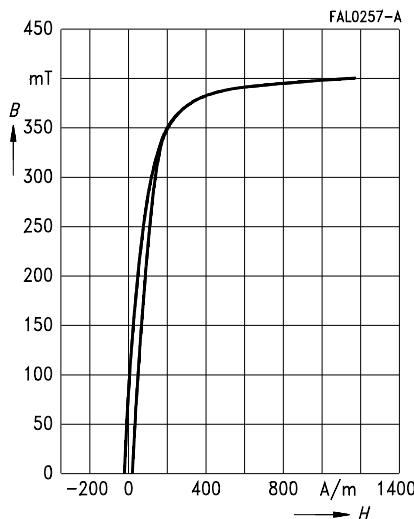
## Dynamic magnetization curves

(typical values)

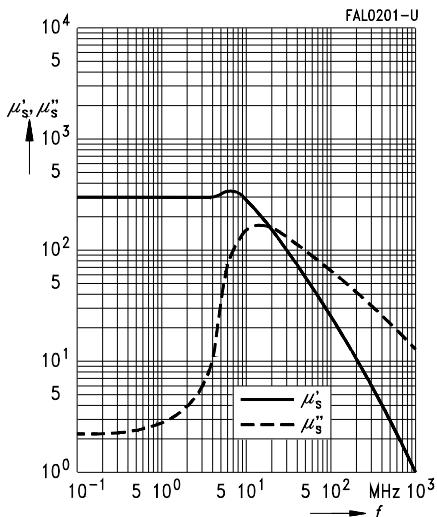
 $(f = 40 \text{ kHz}, T = 25^\circ\text{C})$ 

## Dynamic magnetization curves

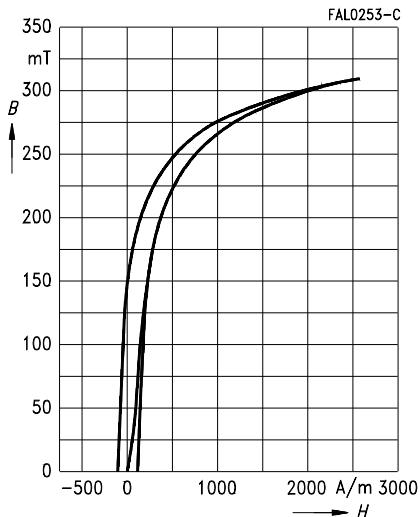
(typical values)

 $(f = 40 \text{ kHz}, T = 100^\circ\text{C})$ 

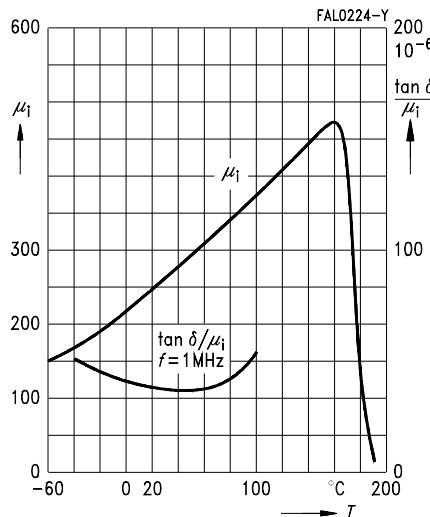
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



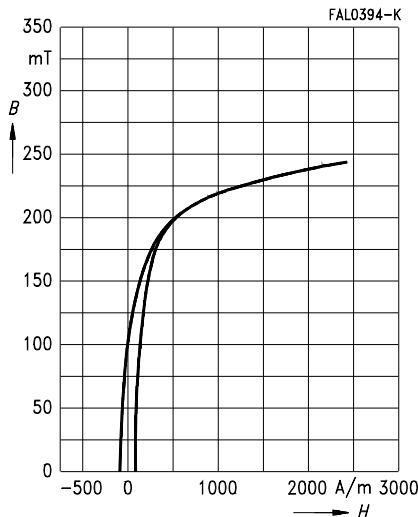
Dynamic magnetization curves  
(typical values)  
( $f = 10$  kHz,  $T = 25$  °C)



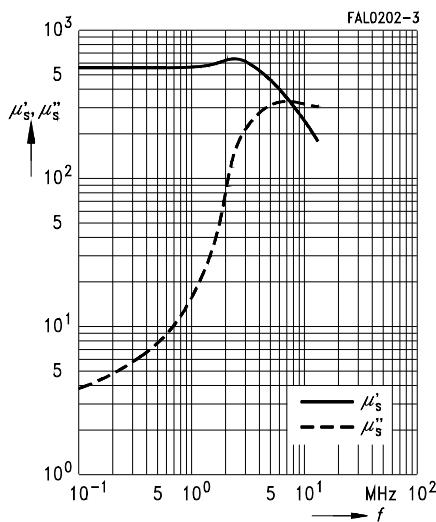
Initial permeability  $\mu_i$  and relative loss factor  
 $\tan \delta / \mu_i$  versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



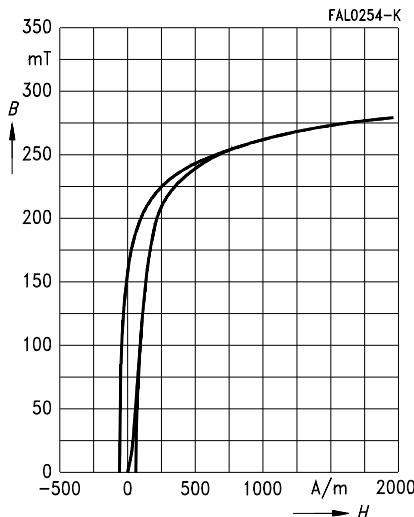
Dynamic magnetization curves  
(typical values)  
( $f = 10$  kHz,  $T = 100$  °C)



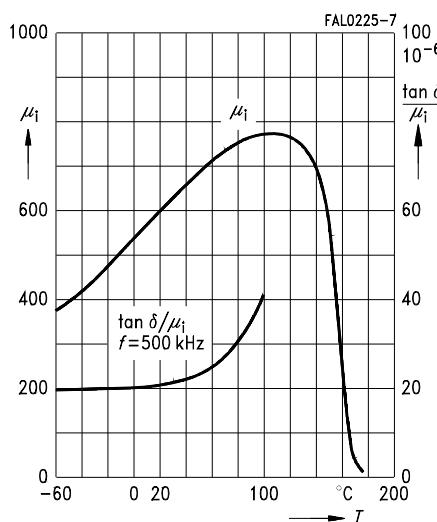
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



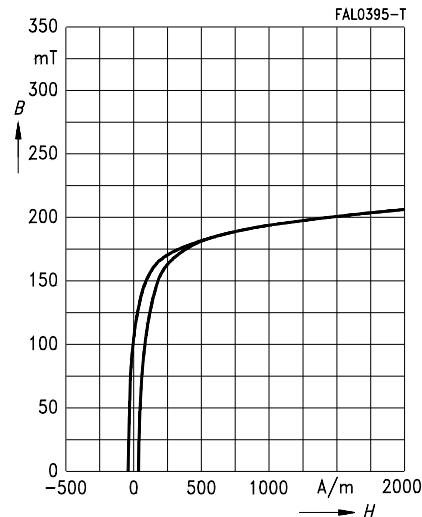
Dynamic magnetization curves  
(typical values)  
( $f = 10$  kHz,  $T = 25$  °C)



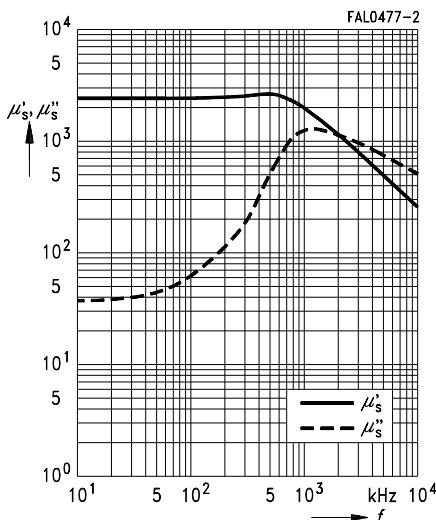
Initial permeability  $\mu_i$  and relative loss factor  
 $\tan \delta / \mu_i$  versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



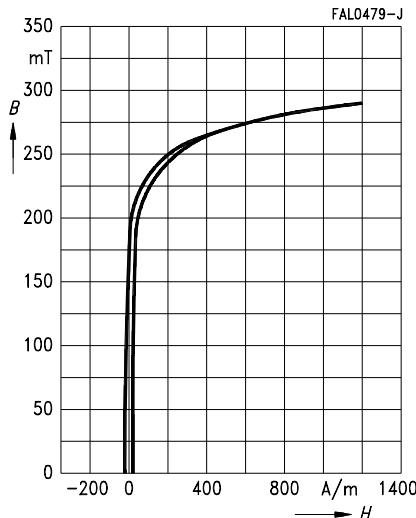
Dynamic magnetization curves  
(typical values)  
( $f = 10$  kHz,  $T = 100$  °C)



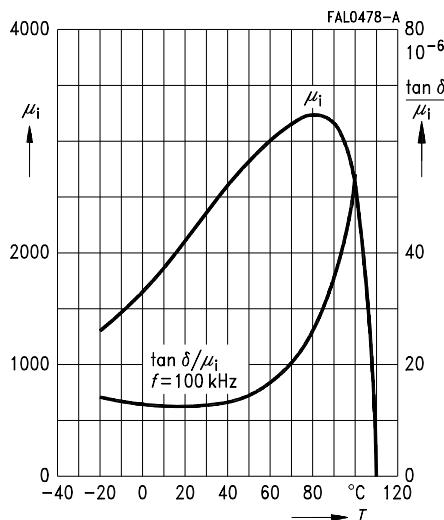
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



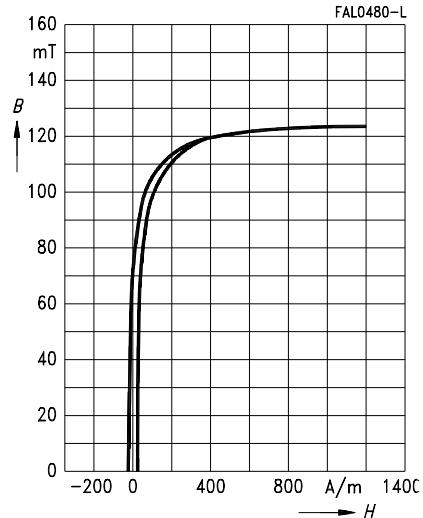
Dynamic magnetization curves  
(typical values)  
( $f = 10$  kHz,  $T = 25$  °C)



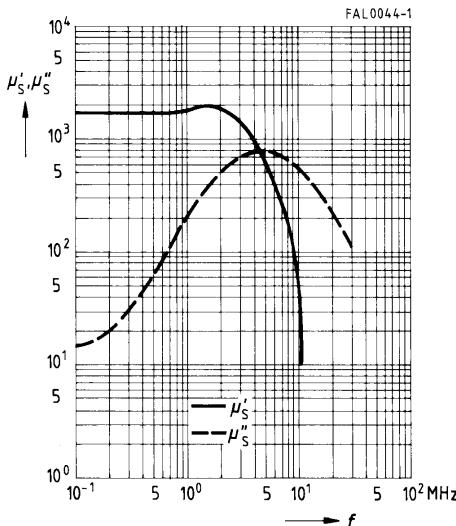
Initial permeability  $\mu_i$  and relative loss factor  
 $\tan \delta / \mu_i$  versus temperature  
(measured with R25 ring cores,  $\hat{B} \leq 0,25$  mT)



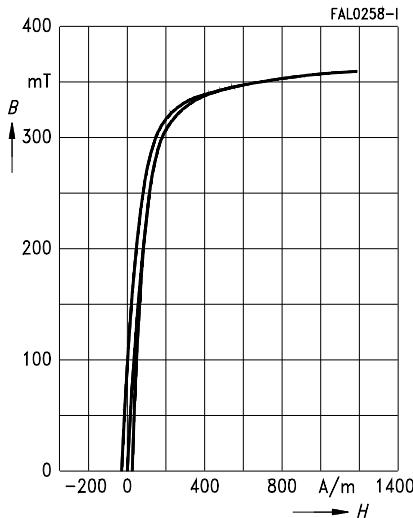
Dynamic magnetization curves  
(typical values)  
( $f = 10$  kHz,  $T = 100$  °C)



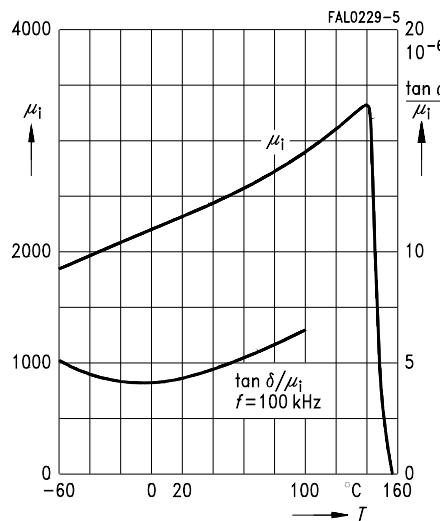
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



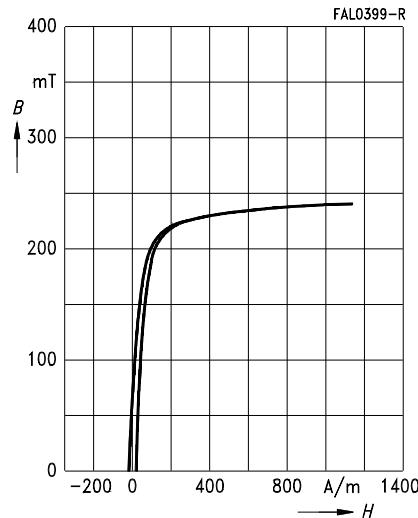
Dynamic magnetization curves  
(typical values)  
( $f = 10$  kHz,  $T = 25$  °C)



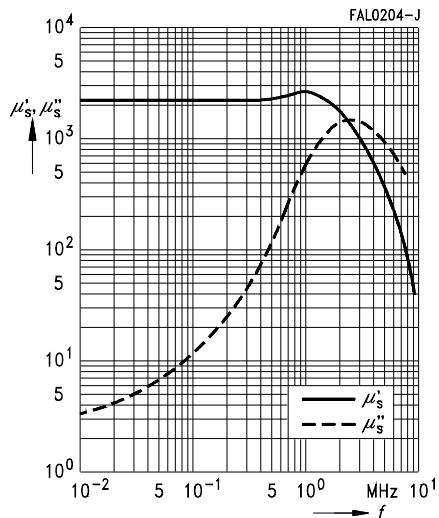
Initial permeability  $\mu_i$  and relative loss factor  
 $\tan \delta / \mu_i$  versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



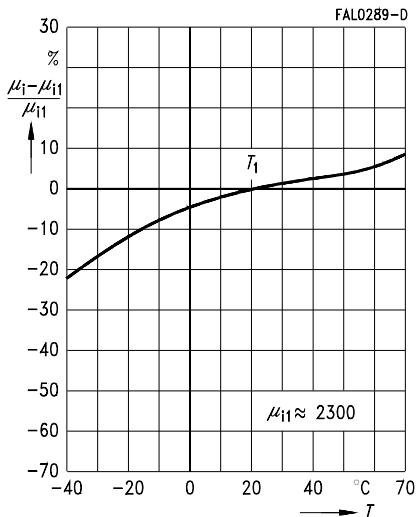
Dynamic magnetization curves  
(typical values)  
( $f = 10$  kHz,  $T = 100$  °C)



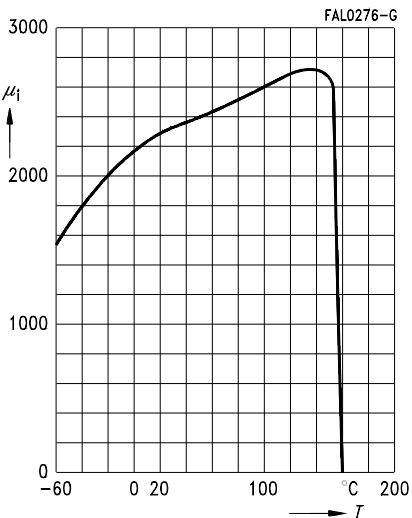
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



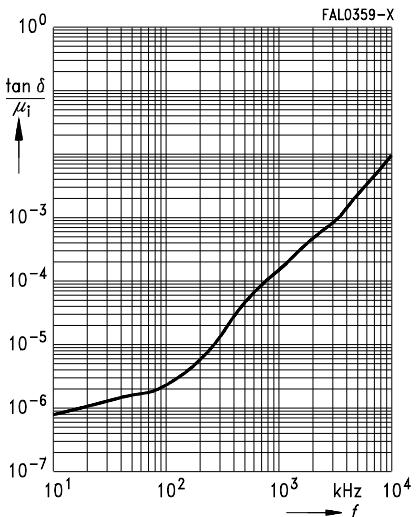
Variation of initial permeability  
with temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



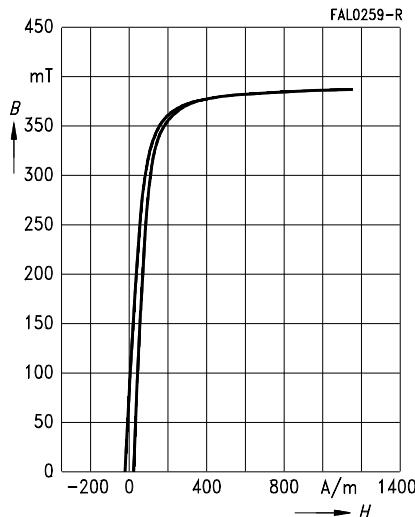
Initial permeability  $\mu_i$   
versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



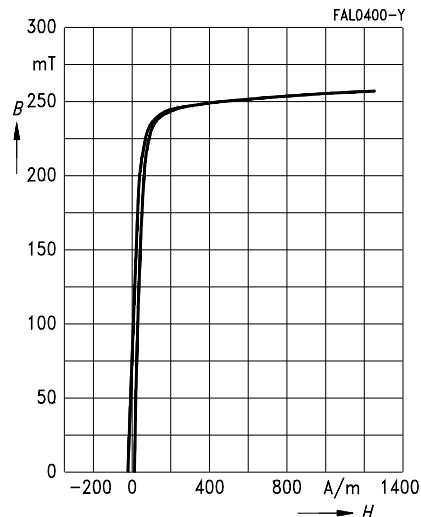
Relative loss factor  
versus frequency  
(measured with R14 ring cores,  $\hat{B} \leq 0,25$  mT)



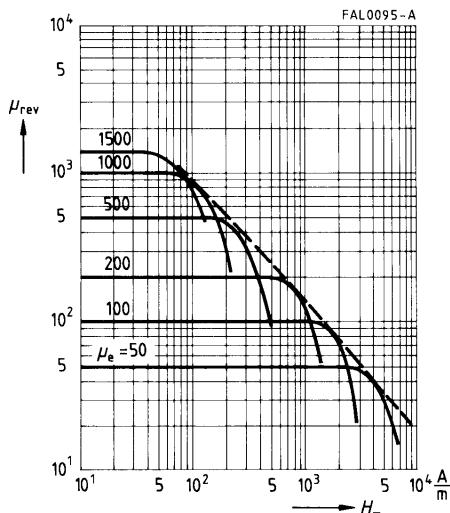
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



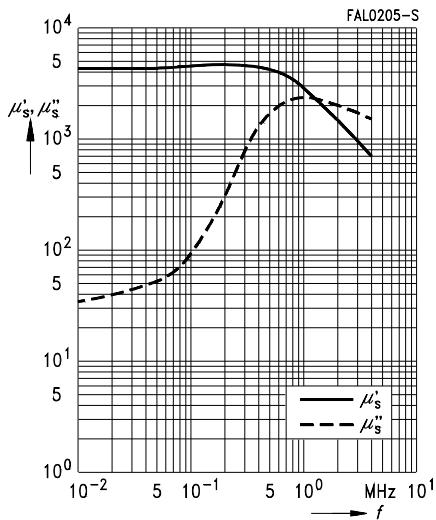
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



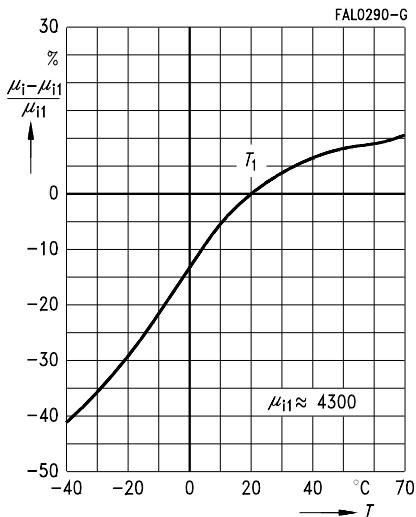
DC magnetic bias of P and RM cores  
(typical values)  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



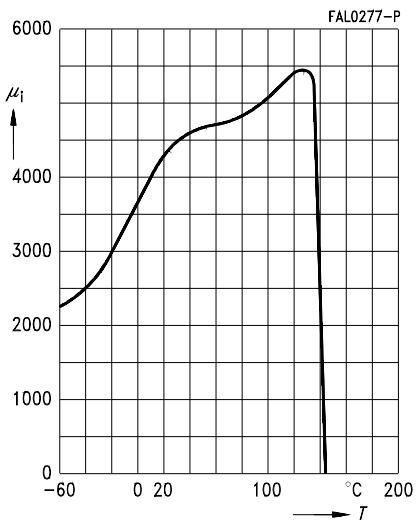
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



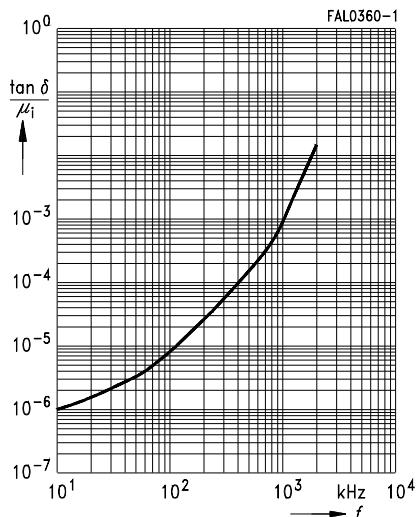
Variation of initial permeability  
with temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



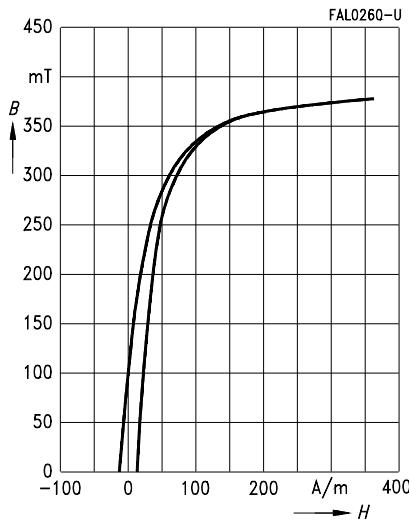
Initial permeability  $\mu_i$   
versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



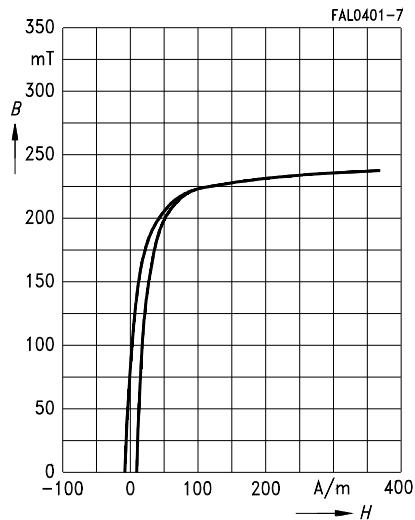
Relative loss factor  
versus frequency  
(measured with R20 ring cores,  $\hat{B} \leq 0,25$  mT)



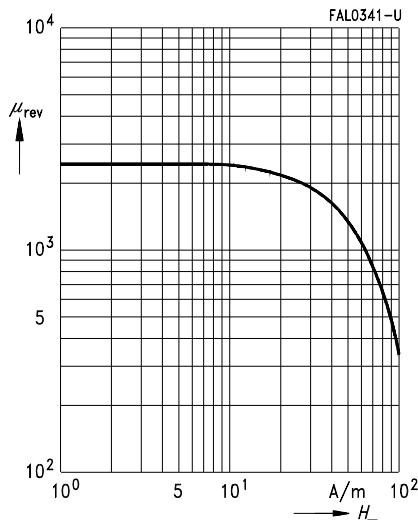
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



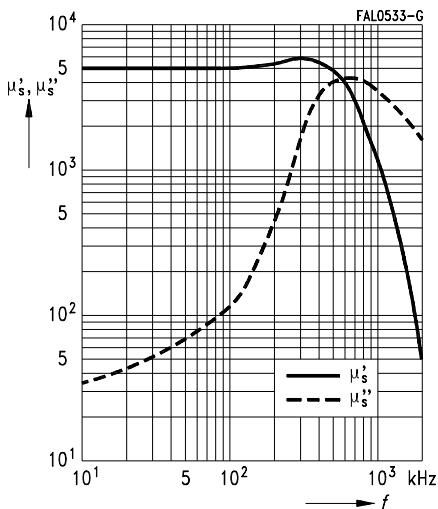
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



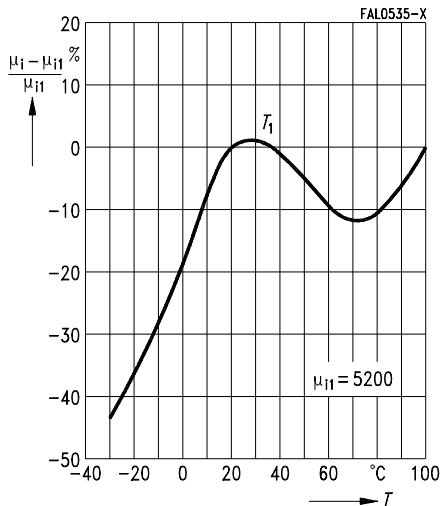
DC magnetic bias of RM cores  
(typical values)  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



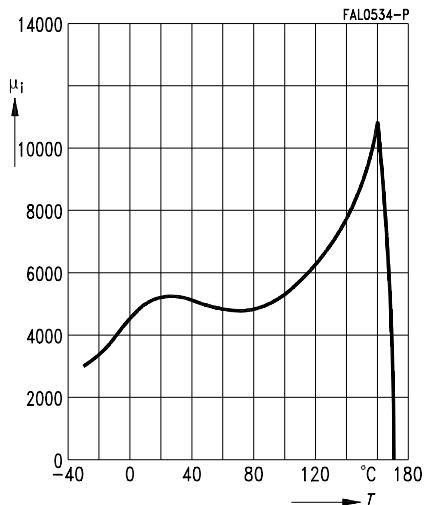
Complex permeability  
versus frequency  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



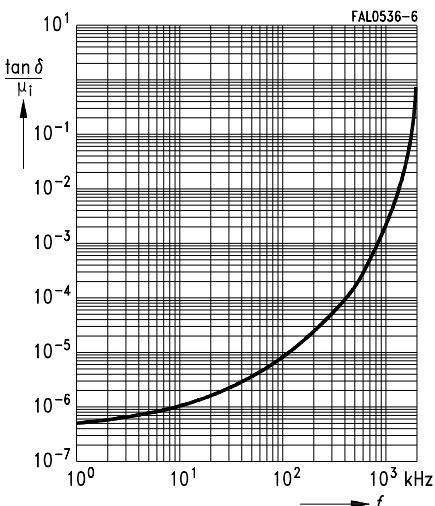
Variation of initial permeability  
with temperature  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



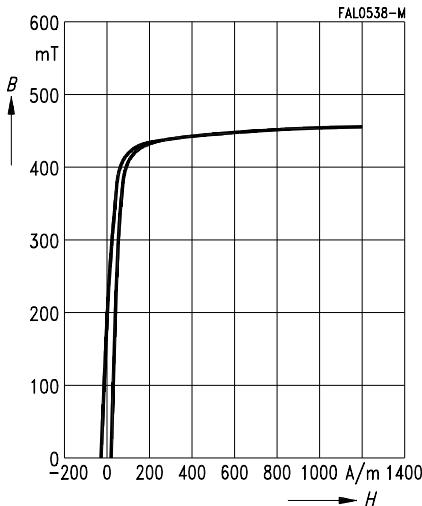
Initial permeability  $\mu_i$   
versus temperature  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



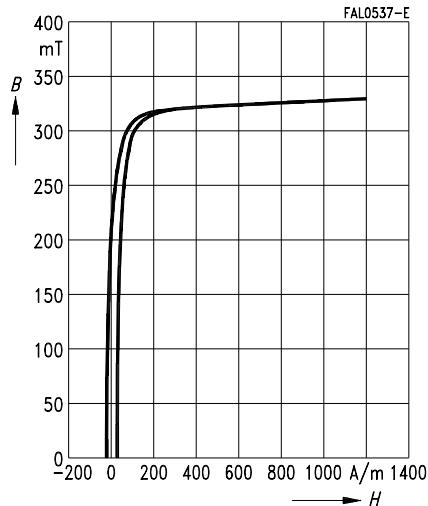
Relative loss factor  
versus frequency  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



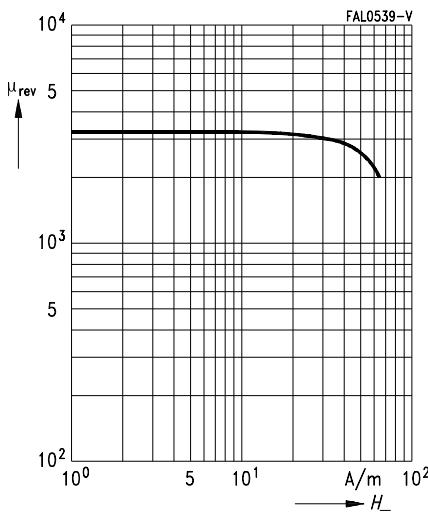
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



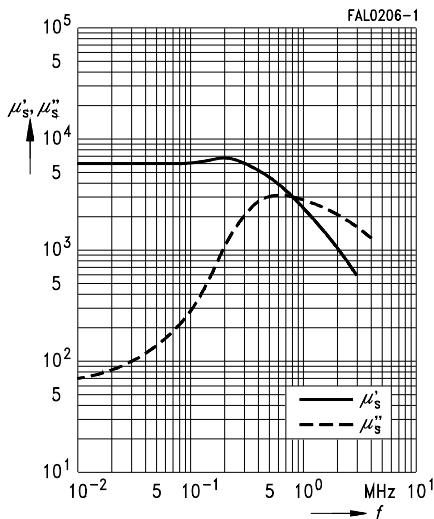
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



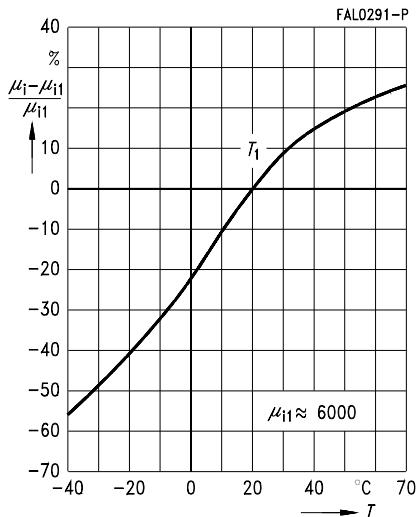
DC magnetic bias of RM cores  
(typical values)  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



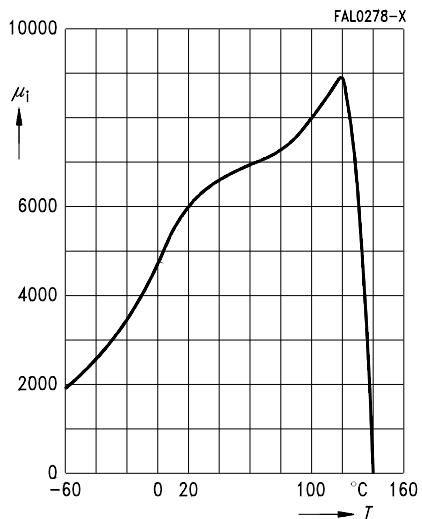
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



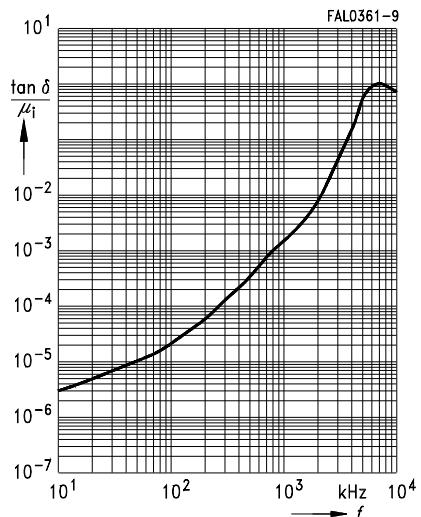
Variation of initial permeability  
with temperature  
(measured with R16 ring cores,  $\hat{B} \leq 0,25$  mT)



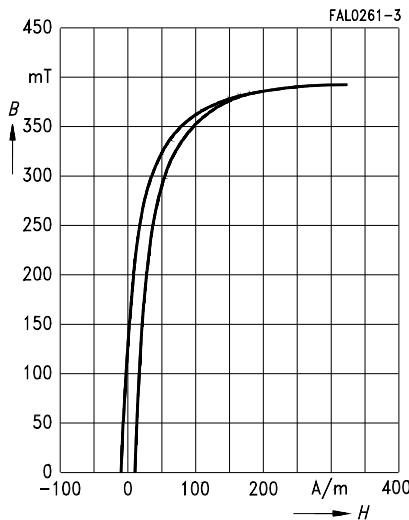
Initial permeability  $\mu_i$   
versus temperature  
(measured with R16 ring cores,  $\hat{B} \leq 0,25$  mT)



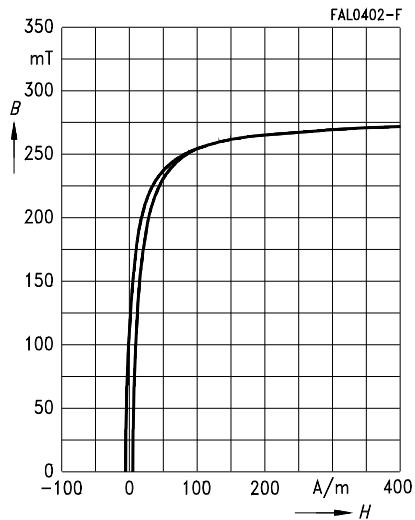
Relative loss factor  
versus frequency  
(measured with R16 ring cores,  $\hat{B} \leq 0,25$  mT)



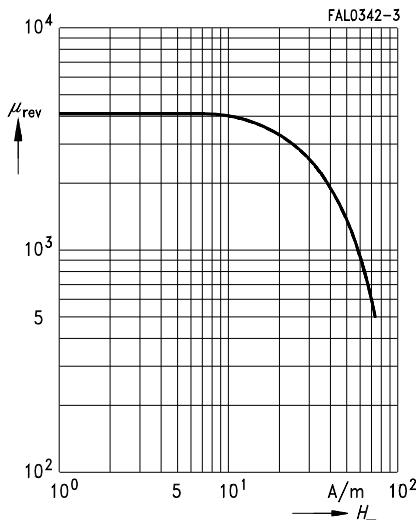
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



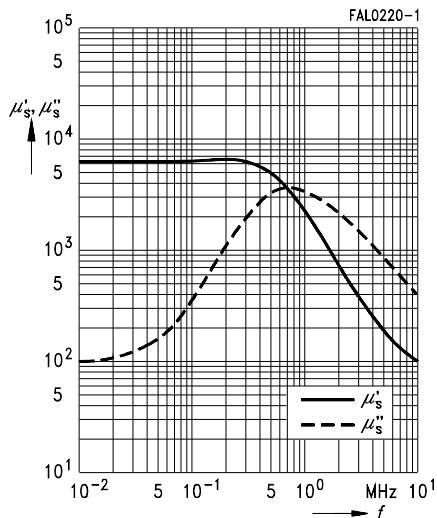
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



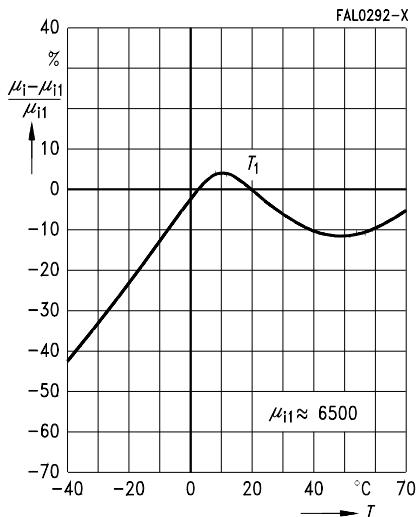
DC magnetic bias of RM cores  
(typical values)  
( $\hat{B} \leq 0.25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



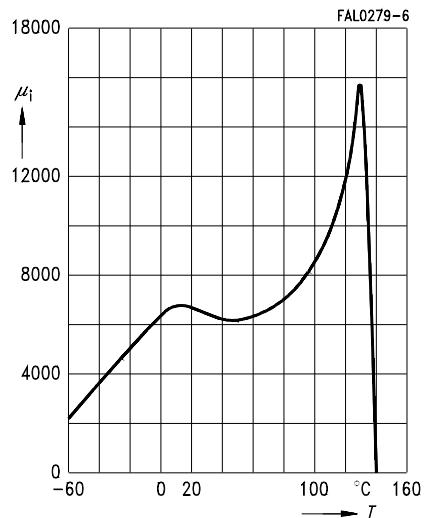
Complex permeability  
versus frequency  
(measured with R16 ring cores,  $\hat{B} \leq 0,25$  mT)



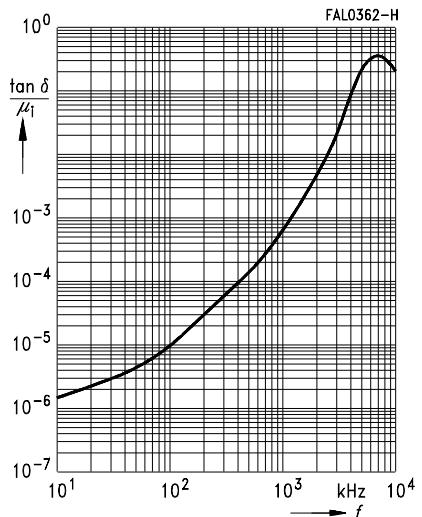
Variation of initial permeability  
with temperature  
(measured with R22 ring cores,  $\hat{B} \leq 0,25$  mT)



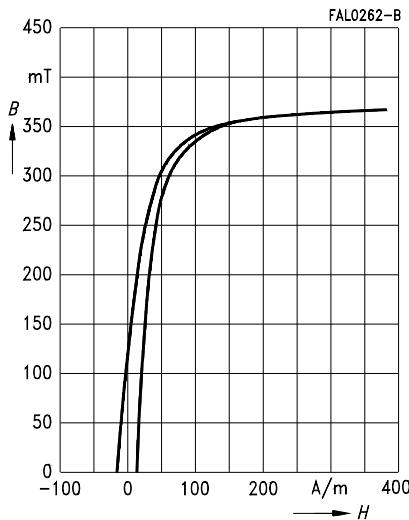
Initial permeability  $\mu_i$   
versus temperature  
(measured with R22 ring cores,  $\hat{B} \leq 0,25$  mT)



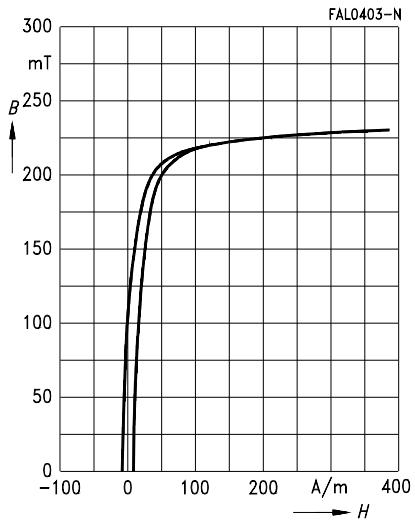
Relative loss factor  
versus frequency  
(measured with R16 ring cores,  $\hat{B} \leq 0,25$  mT)



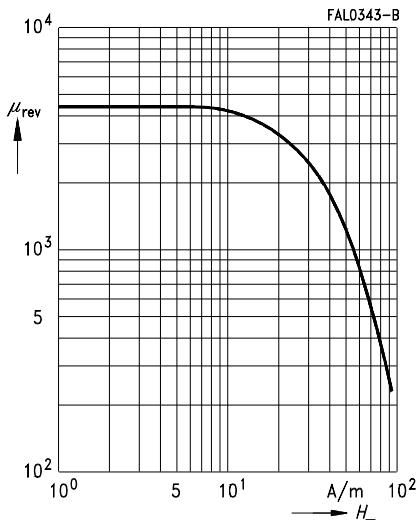
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



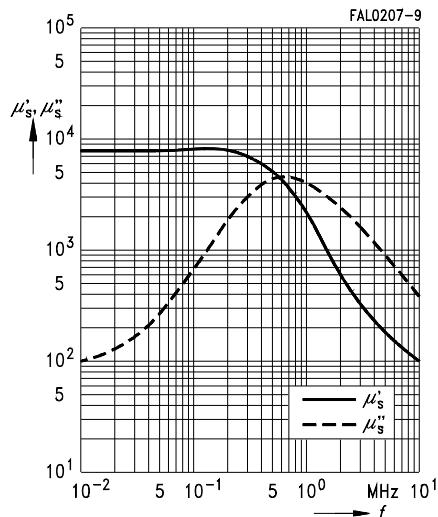
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



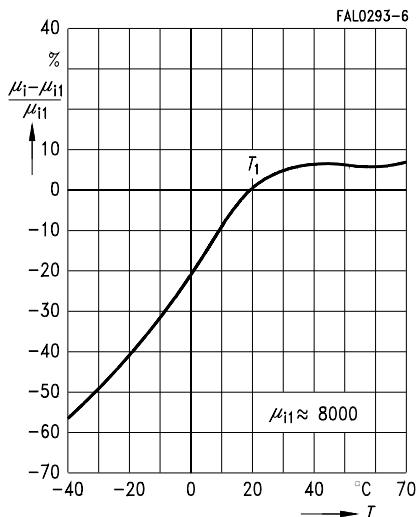
DC magnetic bias of RM cores  
(typical values)  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



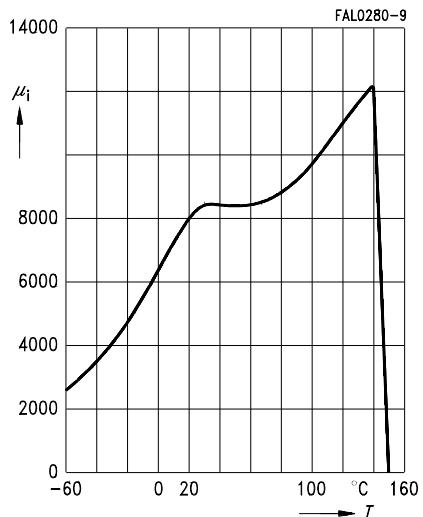
Complex permeability  
versus frequency  
(measured with R17 ring cores,  $\hat{B} \leq 0,25$  mT)



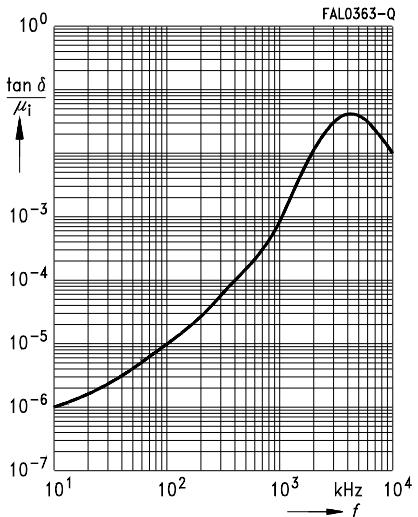
Variation of initial permeability  
with temperature  
(measured with R17 ring cores,  $\hat{B} \leq 0,25$  mT)



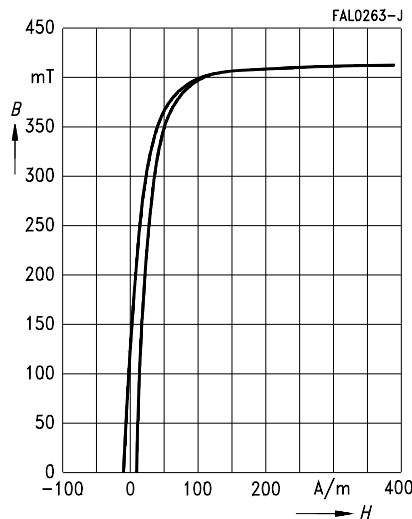
Initial permeability  $\mu_i$   
versus temperature  
(measured with R17 ring cores,  $\hat{B} \leq 0,25$  mT)



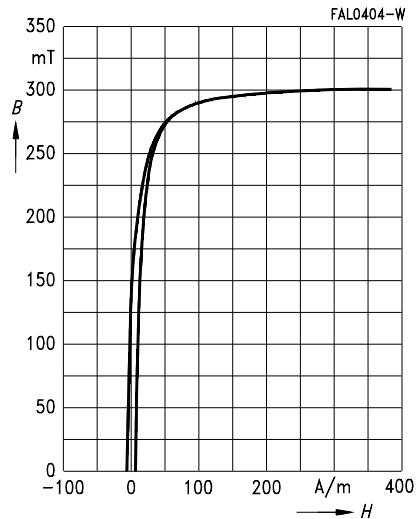
Relative loss factor  
versus frequency  
(measured with R17 ring cores,  $\hat{B} \leq 0,25$  mT)



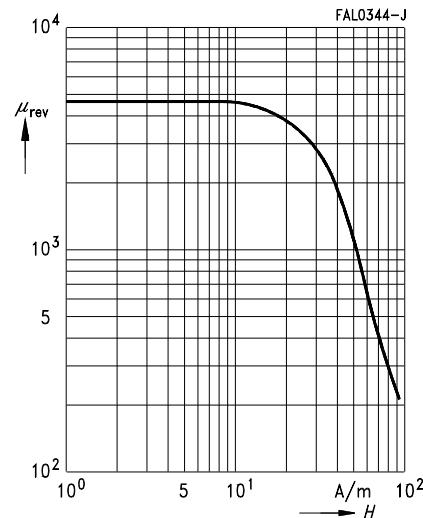
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



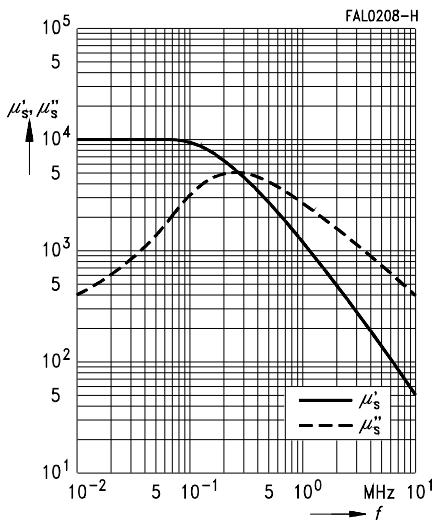
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



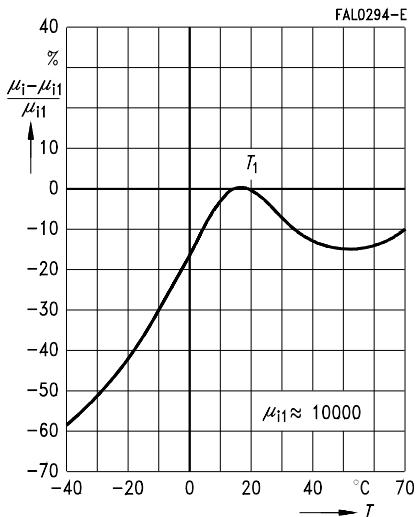
DC magnetic bias of RM cores  
(typical values)  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



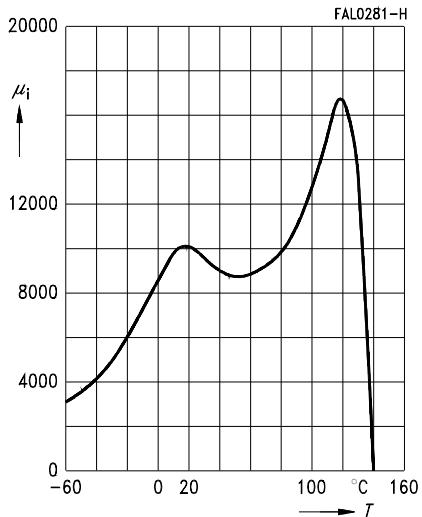
Complex permeability  
versus frequency  
(measured with R14 ring cores,  $\hat{B} \leq 0,25$  mT)



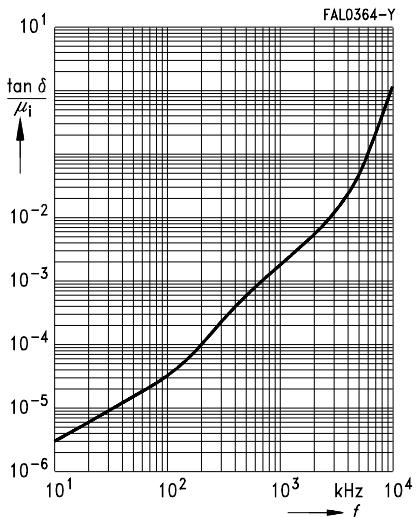
Variation of initial permeability  
with temperature  
(measured with R16 ring cores,  $\hat{B} \leq 0,25$  mT)



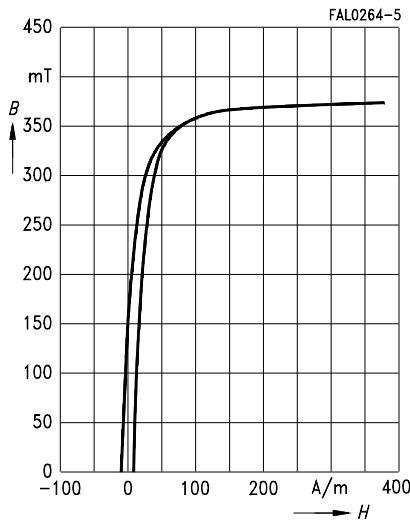
Initial permeability  $\mu_i$   
versus temperature  
(measured with R16 ring cores,  $\hat{B} \leq 0,25$  mT)



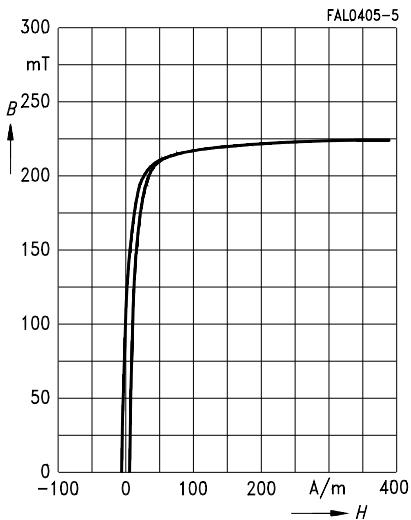
Relative loss factor  
versus frequency  
(measured with R14 ring cores,  $\hat{B} \leq 0,25$  mT)



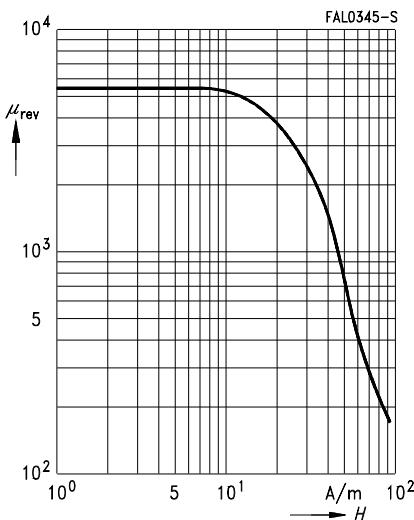
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



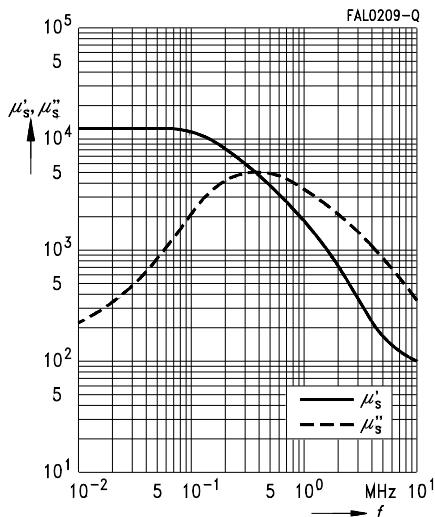
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



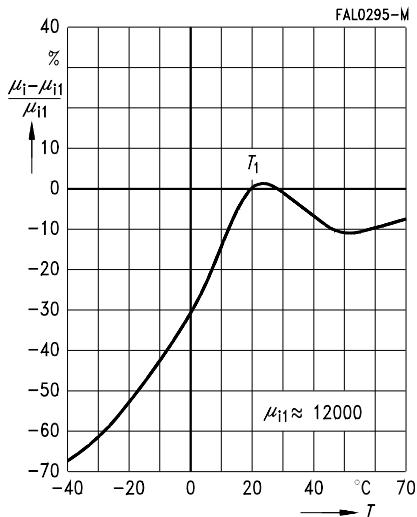
DC magnetic bias of RM cores  
(typical values)  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



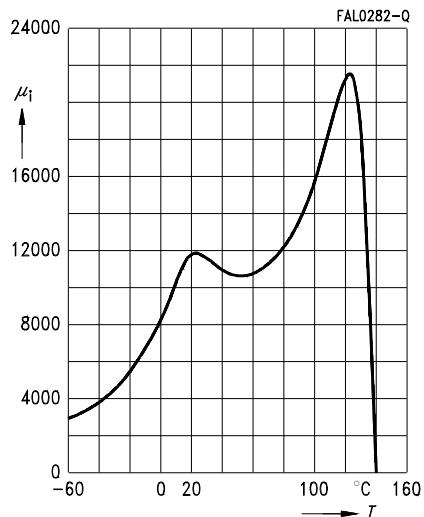
Complex permeability  
versus frequency  
(measured with R9,5 ring cores,  $\hat{B} \leq 0,25$  mT)



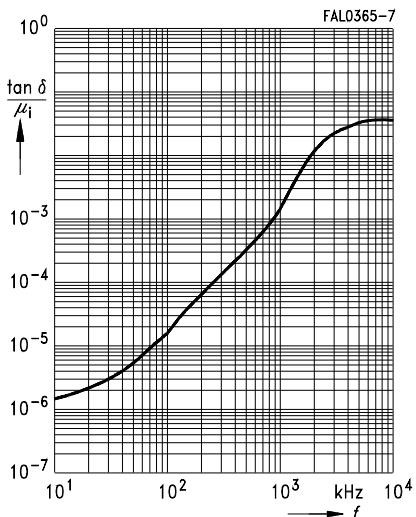
Variation of initial permeability  
with temperature  
(measured with R9,5 ring cores,  $\hat{B} \leq 0,25$  mT)



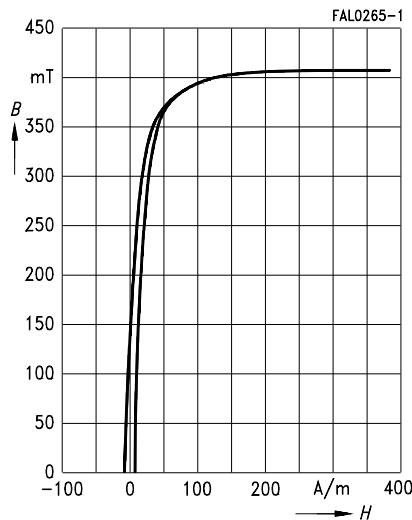
Initial permeability  $\mu_i$   
versus temperature  
(measured with R9,5 ring cores,  $\hat{B} \leq 0,25$  mT)



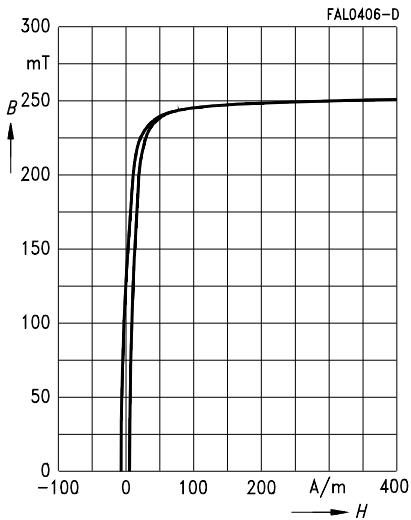
Relative loss factor  
versus frequency  
(measured with R9,5 ring cores,  $\hat{B} \leq 0,25$  mT)



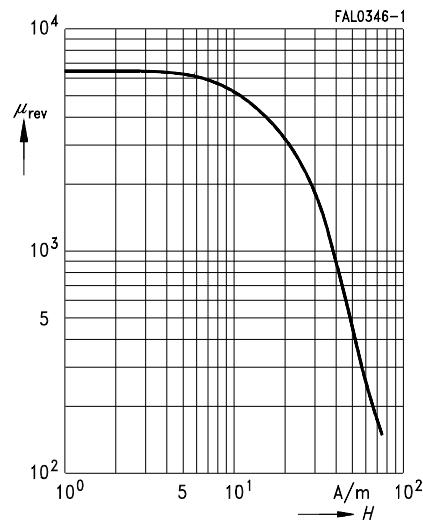
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



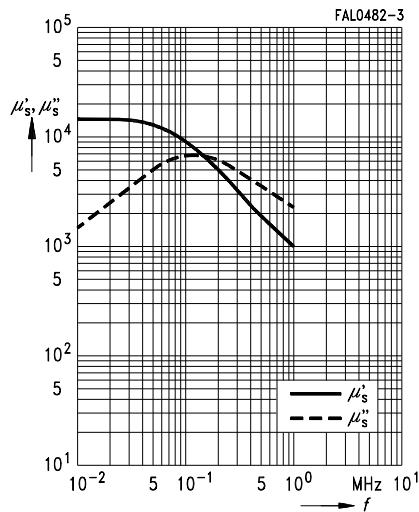
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



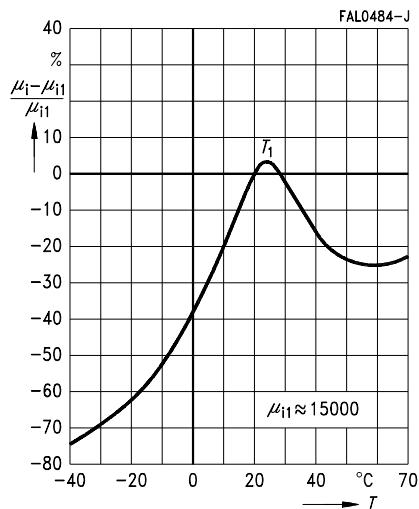
DC magnetic bias of RM cores  
(typical values)  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



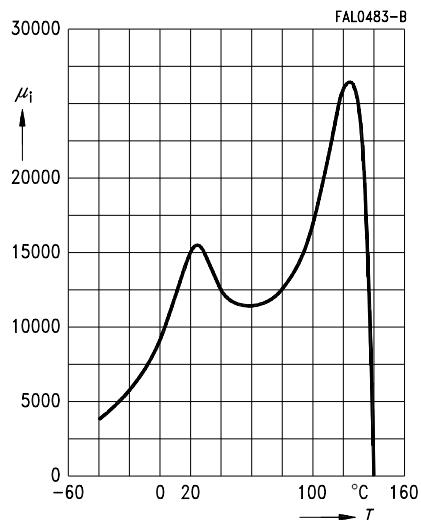
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



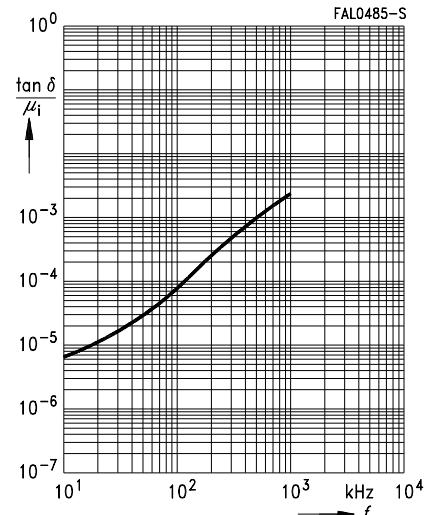
Variation of initial permeability  
with temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



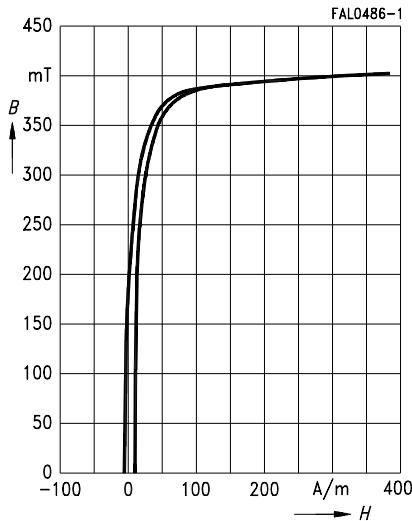
Initial permeability  $\mu_i$   
versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



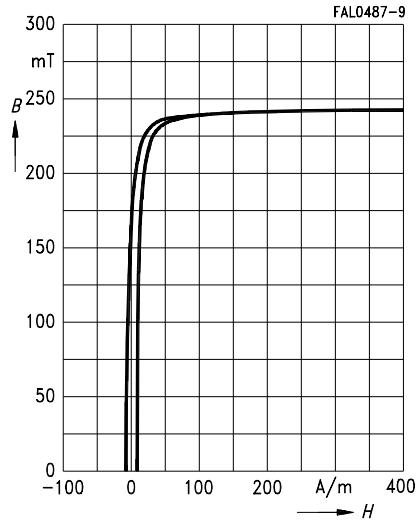
Relative loss factor  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



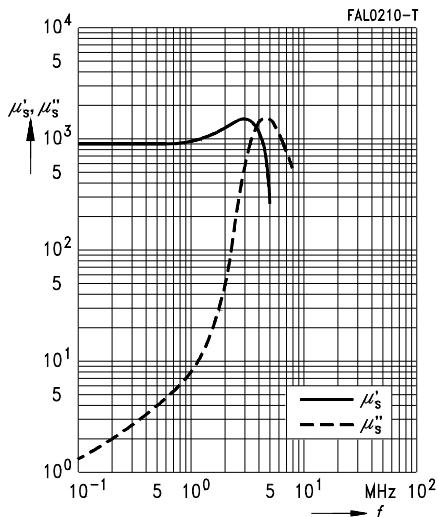
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



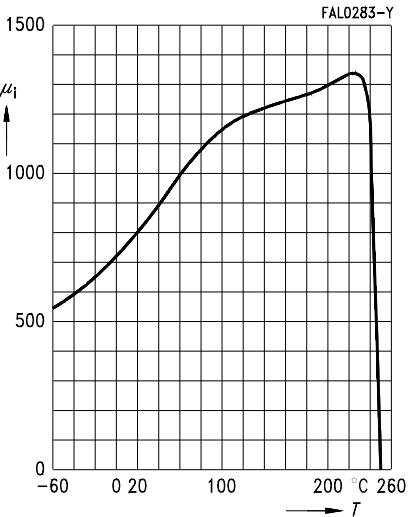
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



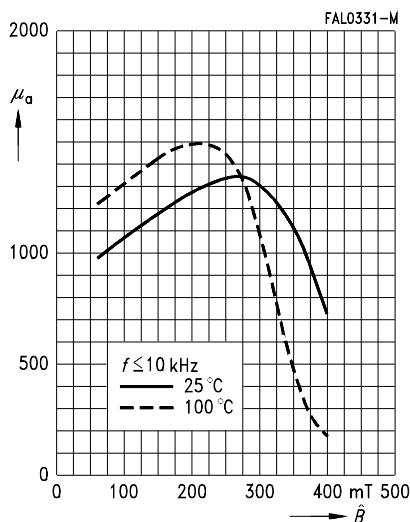
Complex permeability  
versus frequency  
(measured with R25 ring cores,  $\hat{B} \leq 0,25$  mT)



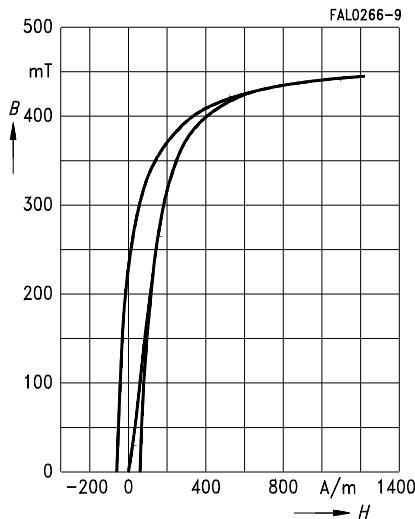
Initial permeability  $\mu_i$   
versus temperature  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



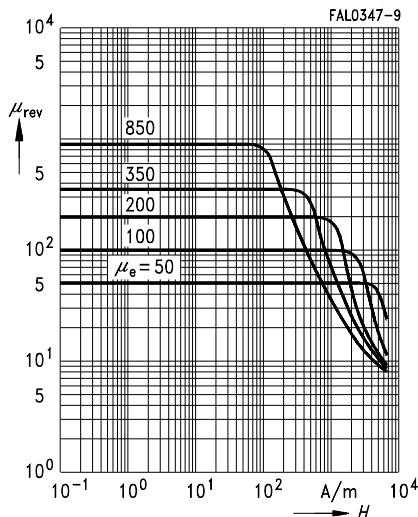
Amplitude permeability  
versus AC field flux density  
(measured with ungapped E cores)



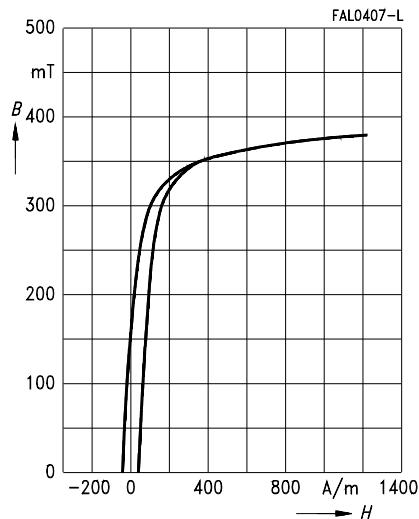
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



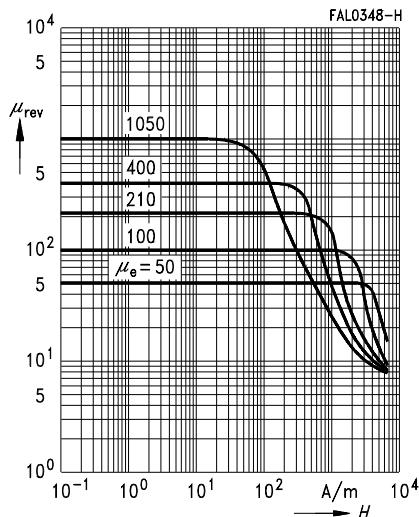
DC magnetic bias  
of P, RM, PM and E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



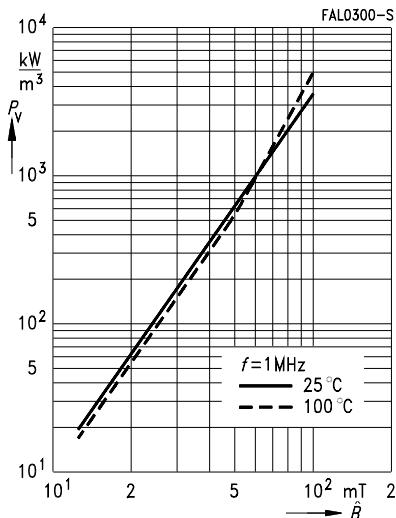
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



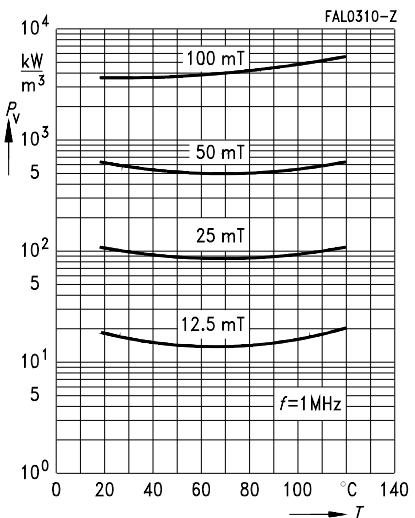
DC magnetic bias  
of P, RM, PM and E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



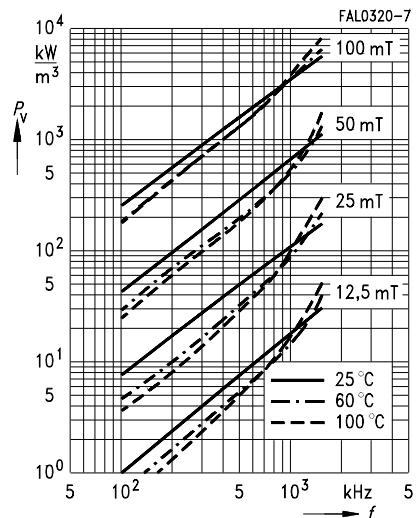
Relative core losses  
versus AC field flux density  
(measured with R29 ring cores)



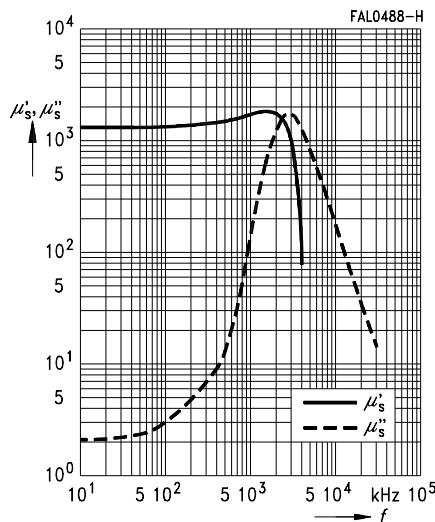
Relative core losses  
versus temperature  
(measured with R29 ring cores)



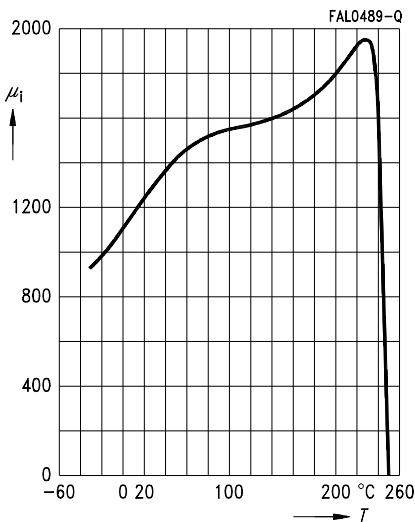
Relative core losses  
versus frequency  
(measured with R29 ring cores)



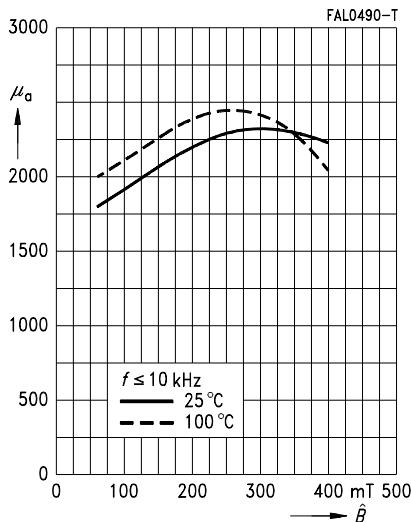
Complex permeability  
versus frequency  
(measured with R17 ring cores,  $\hat{B} \leq 0,25$  mT)



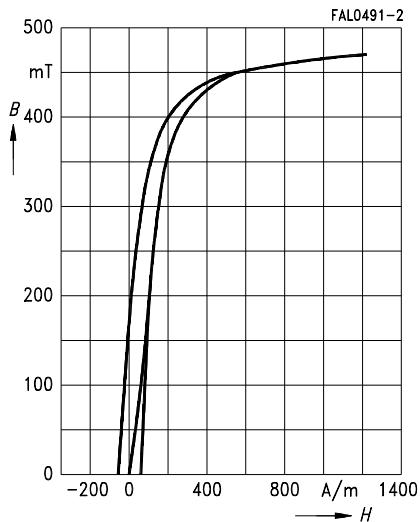
Initial permeability  $\mu_i$   
versus temperature  
(measured with R17 ring cores,  $\hat{B} \leq 0,25$  mT)



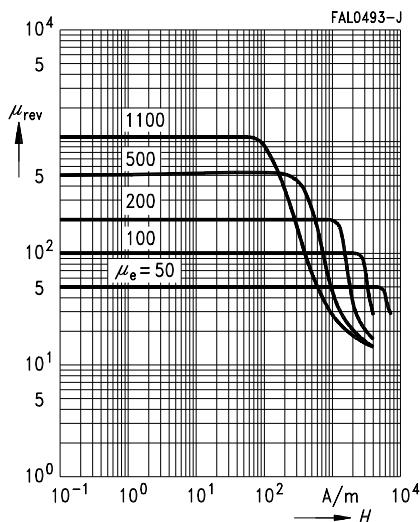
Amplitude permeability  
versus AC field flux density  
(measured with ungapped E cores)



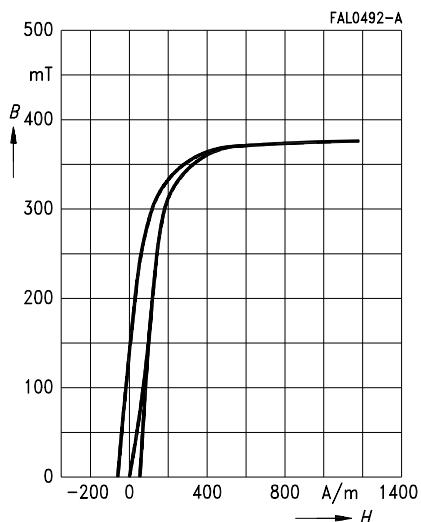
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



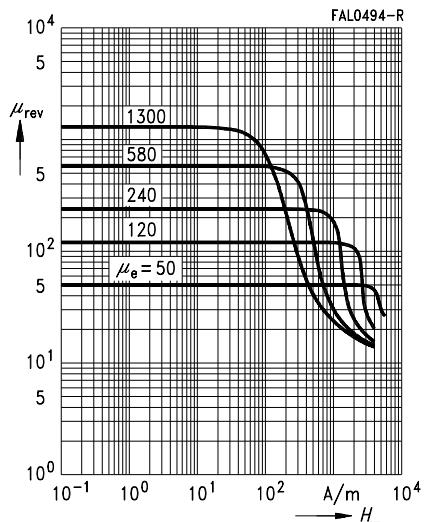
DC magnetic bias  
of P, RM, PM and E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



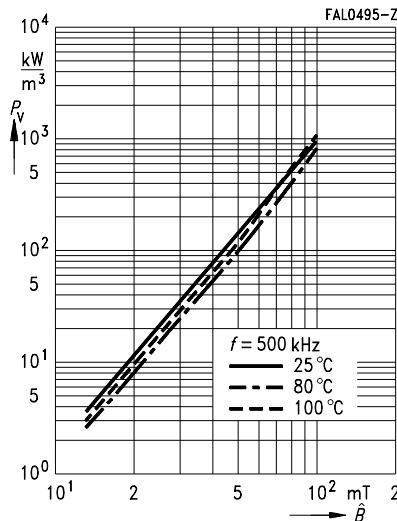
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



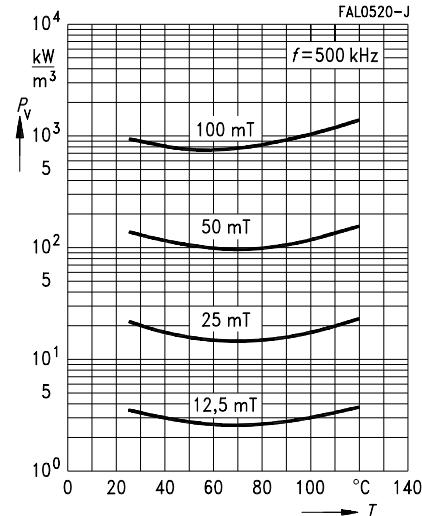
DC magnetic bias  
of P, RM, PM and E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



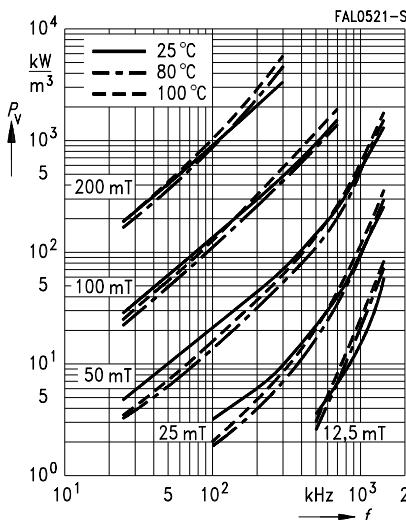
Relative core losses  
versus AC field flux density  
(measured with R17 ring cores)



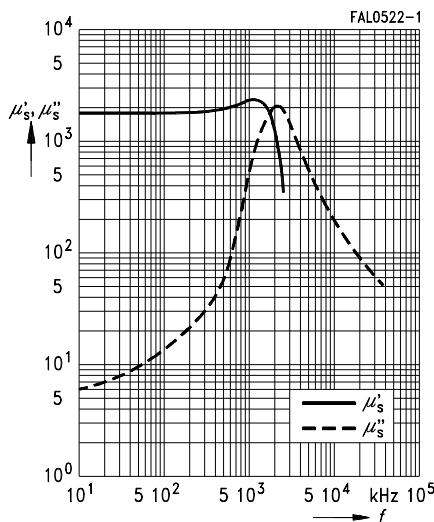
Relative core losses  
versus temperature  
(measured with R17 ring cores)



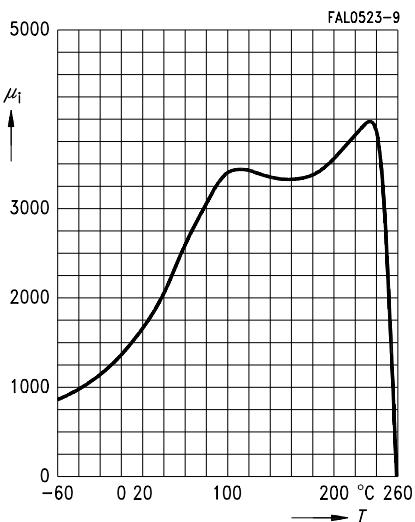
Relative core losses  
versus frequency  
(measured with R17 ring cores)



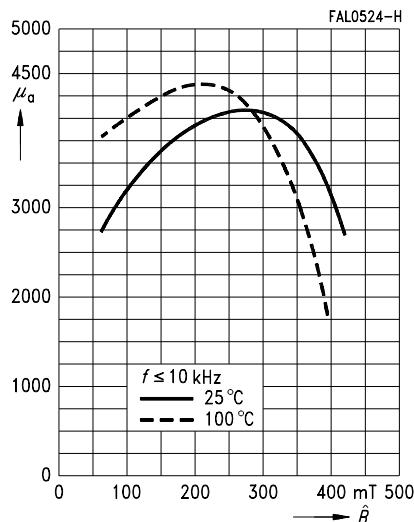
Complex permeability  
versus frequency  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



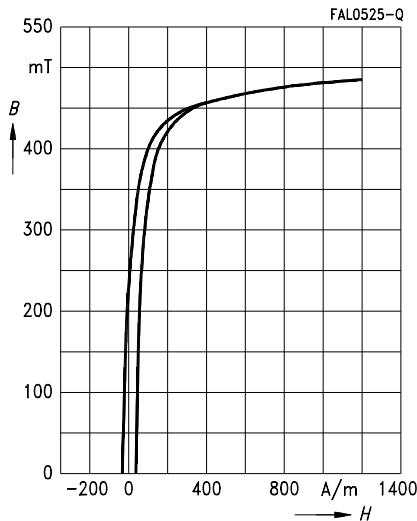
Initial permeability  $\mu_i$   
versus temperature  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



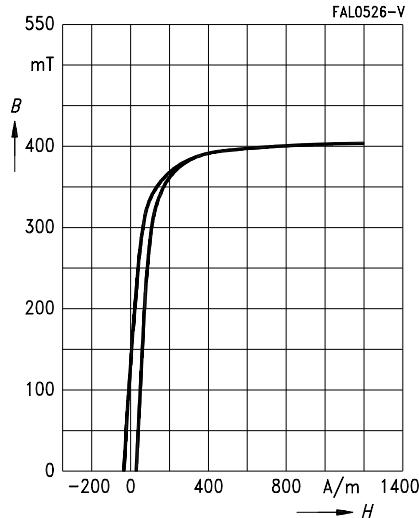
Amplitude permeability  
versus AC field flux density  
(measured with ungapped E and U cores)



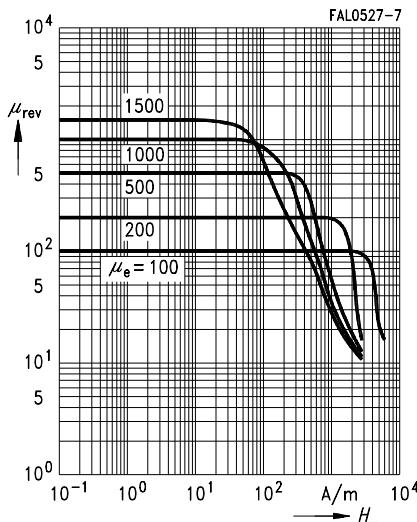
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



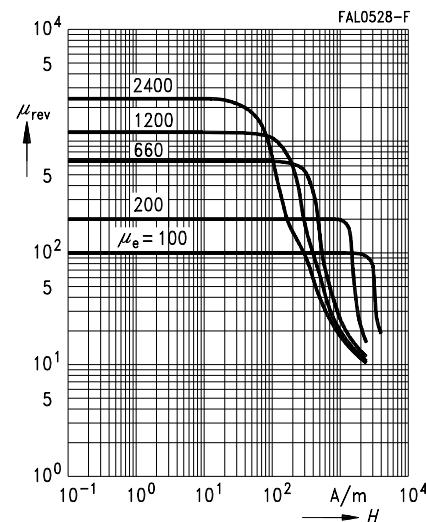
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



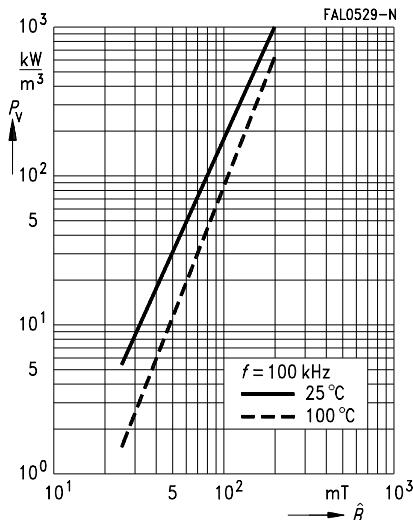
DC magnetic bias  
of P, RM, PM, E and U cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



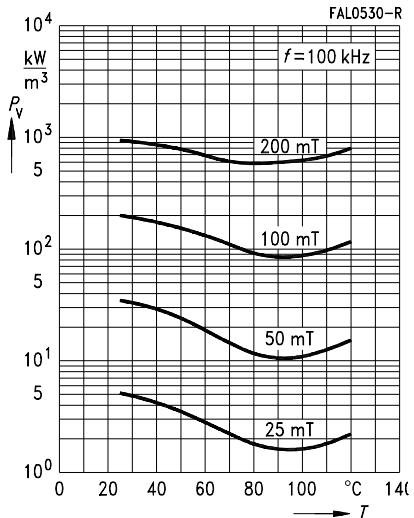
DC magnetic bias  
of P, RM, PM, E and U cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



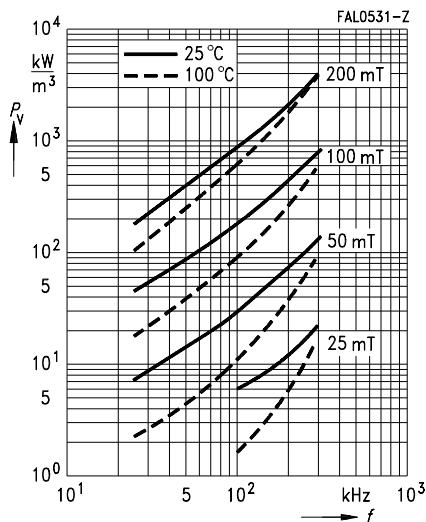
Relative core losses  
versus AC field flux density  
(measured with R17 ring cores)



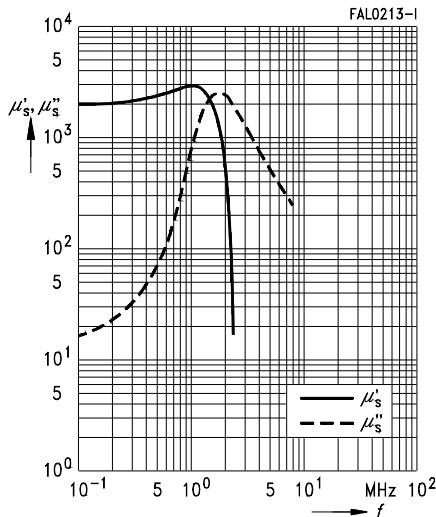
Relative core losses  
versus temperature  
(measured with R17 ring cores)



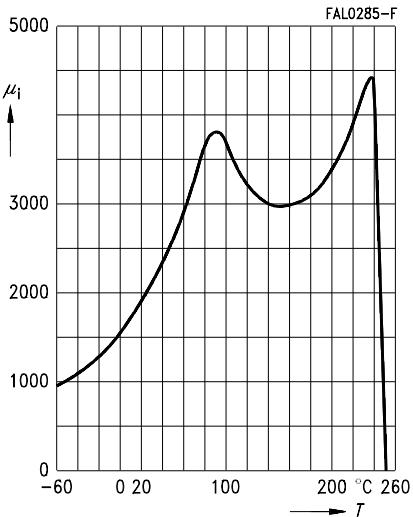
Relative core losses  
versus frequency  
(measured with R17 ring cores)



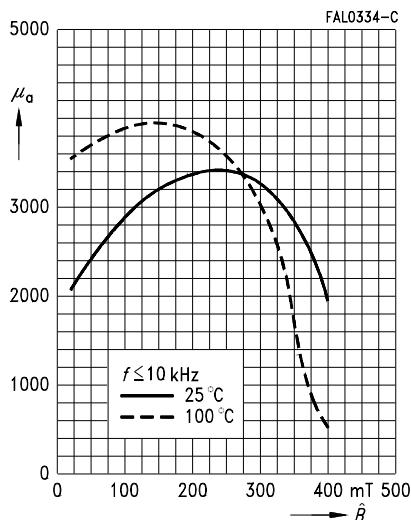
Complex permeability  
versus frequency  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



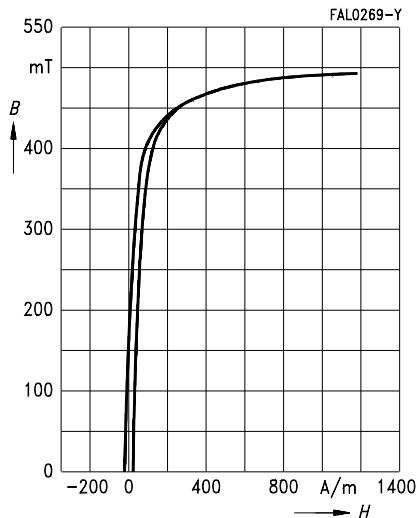
Initial permeability  $\mu_i$   
versus temperature  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



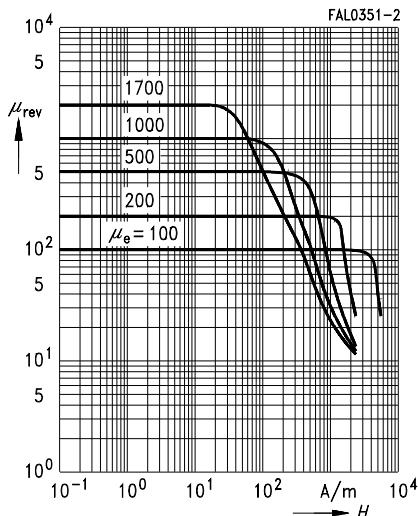
Amplitude permeability  
versus AC field flux density  
(measured with ungapped U cores)



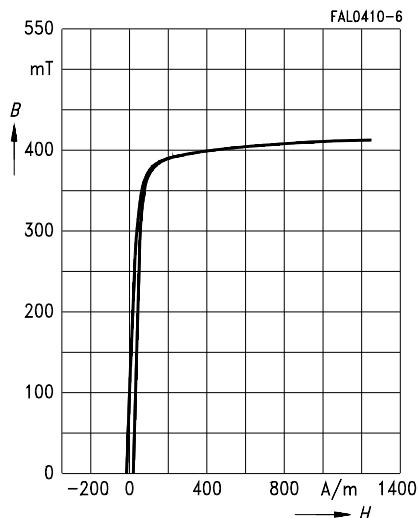
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



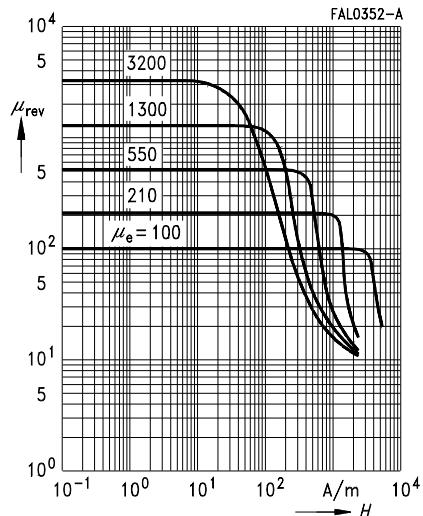
DC magnetic bias  
of E, ETD and U cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



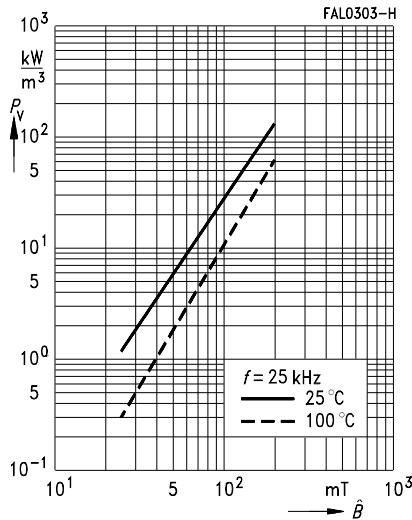
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



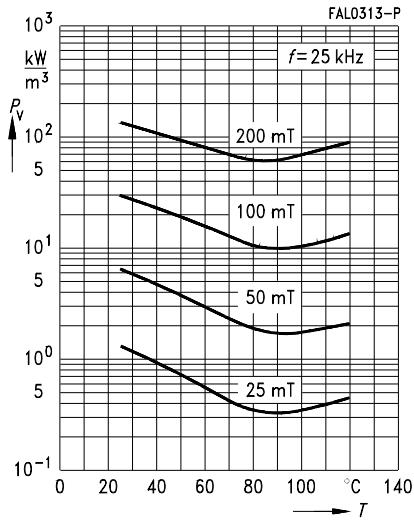
DC magnetic bias  
of E, ETD and U cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



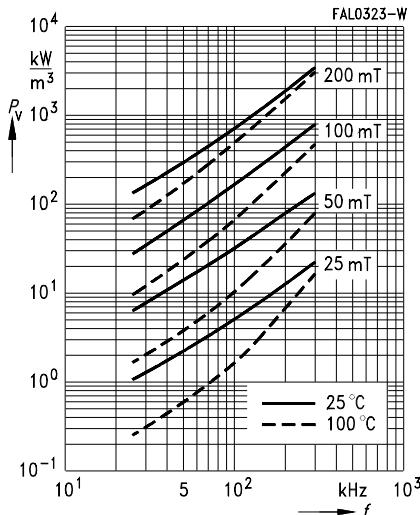
Relative core losses  
versus AC field flux density  
(measured with R29 ring cores)



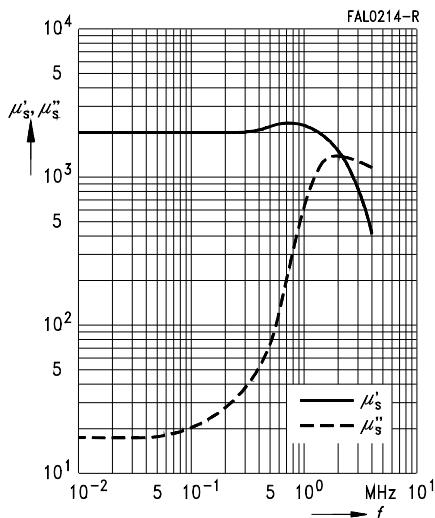
Relative core losses  
versus temperature  
(measured with R29 ring cores)



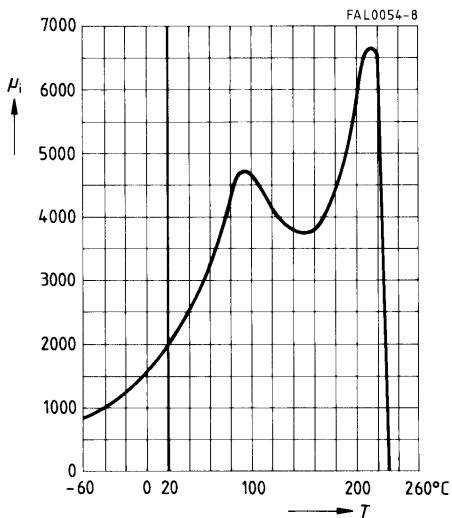
Relative core losses  
versus frequency  
(measured with R29 ring cores)



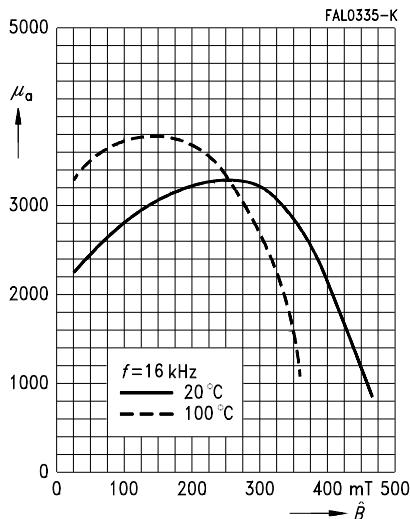
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



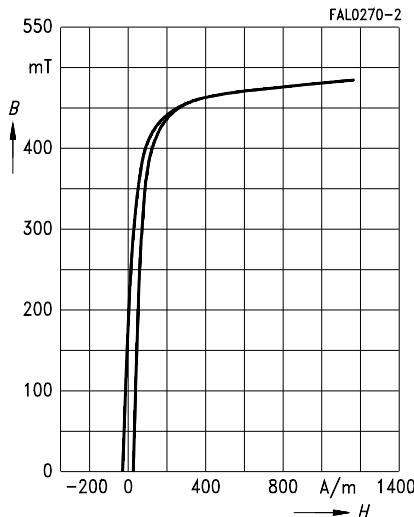
Initial permeability  $\mu_i$   
versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



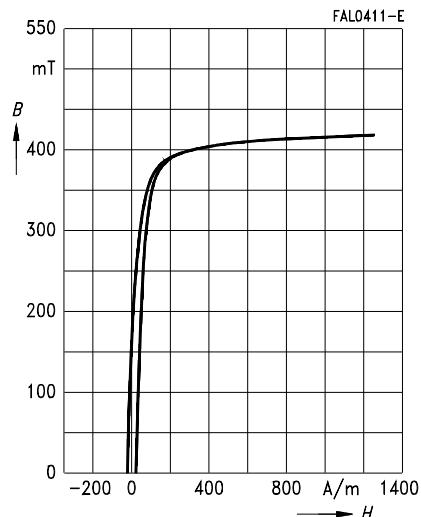
Amplitude permeability versus AC field  
flux density  
(measured with ungapped E cores)



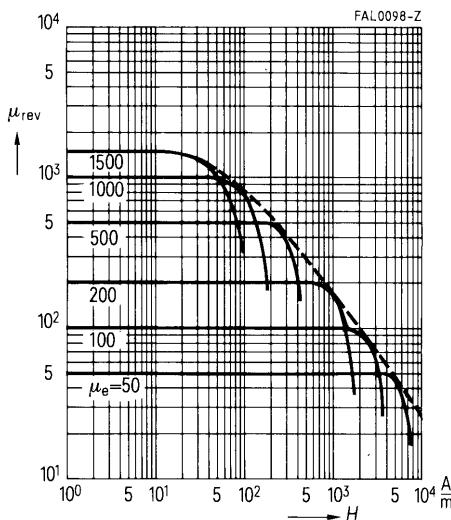
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



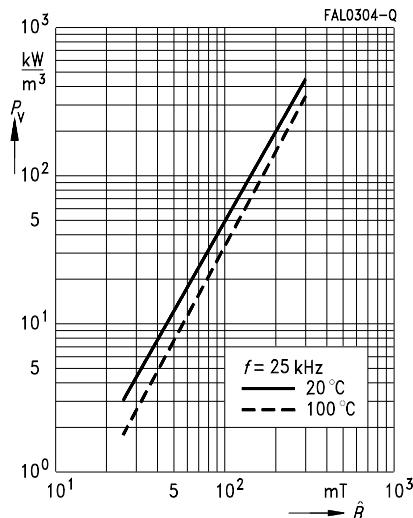
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



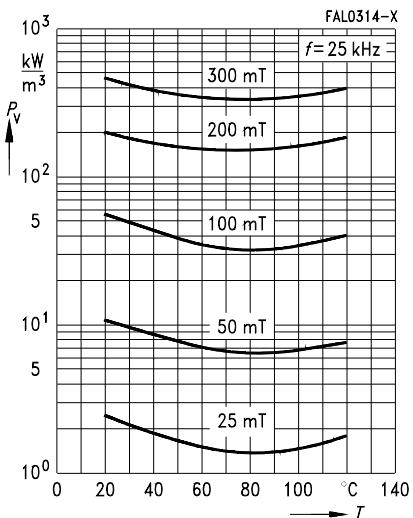
DC magnetic bias  
of P, PM and E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



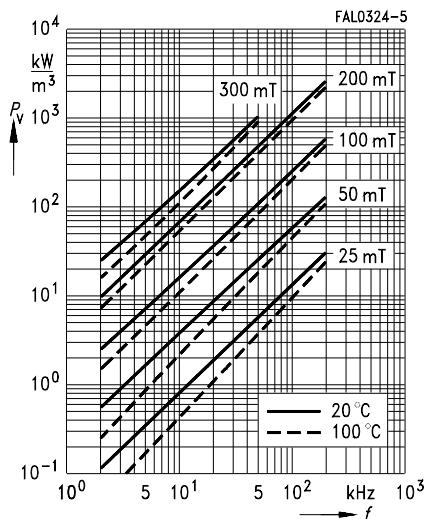
Relative core losses versus AC field flux density  
(measured with R16 ring cores)



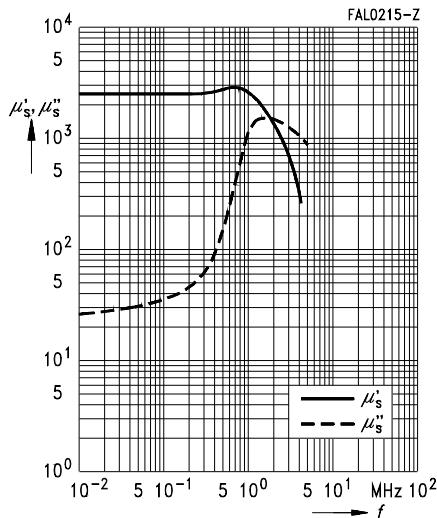
Relative core losses versus temperature  
(measured with R16 ring cores)



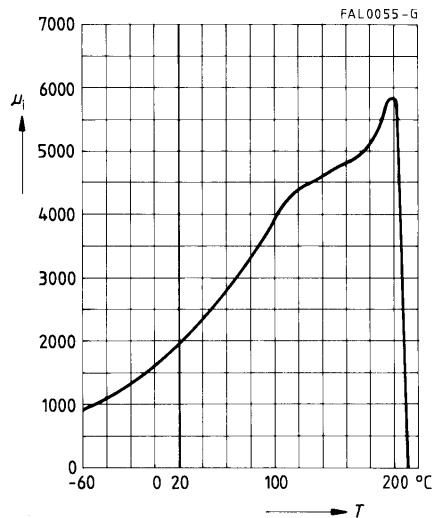
Relative core losses versus frequency  
(measured with R16 ring cores)



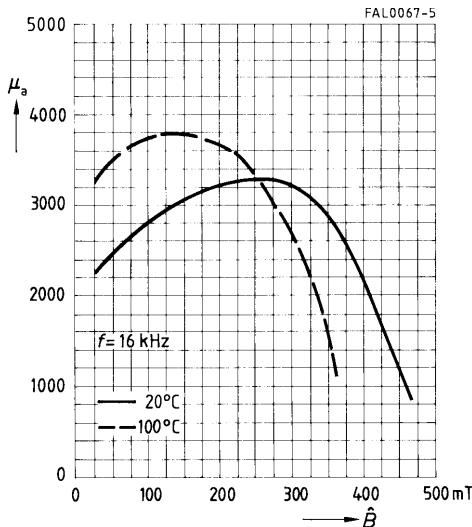
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



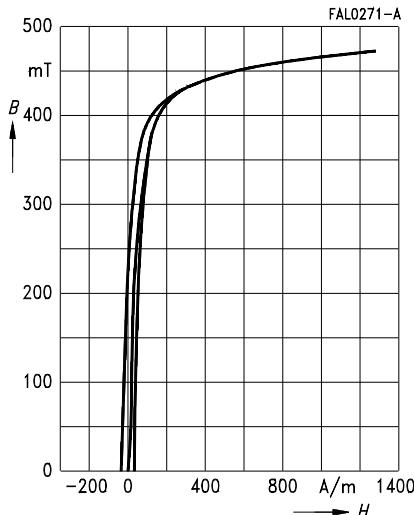
Initial permeability  $\mu_i$   
versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



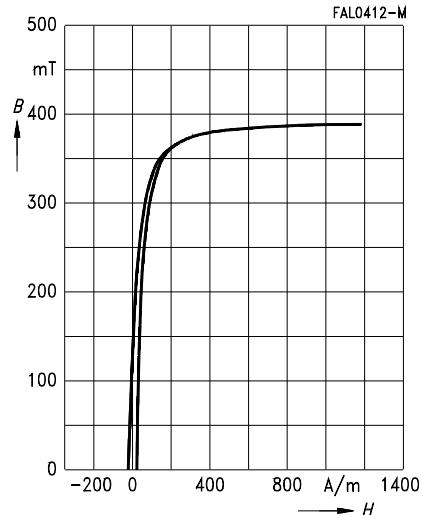
Amplitude permeability versus AC field  
flux density  
(measured with ungapped E cores)



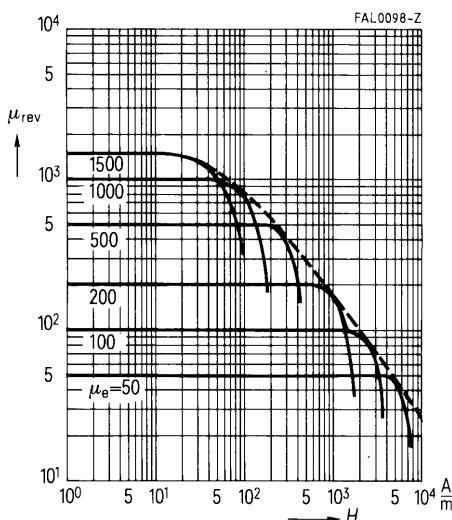
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



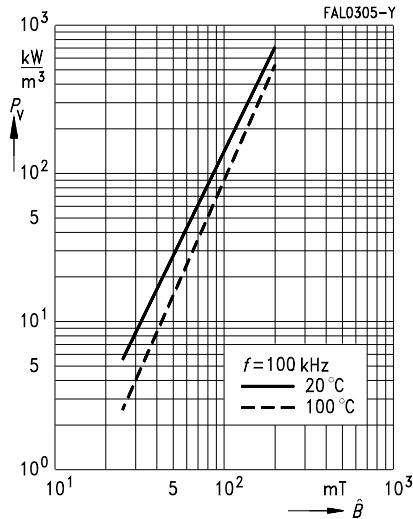
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



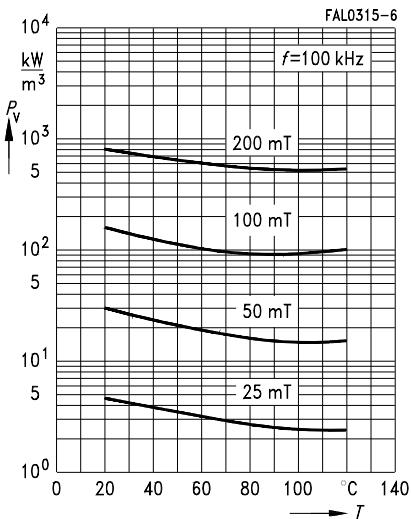
DC magnetic bias  
of P, RM, PM and E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



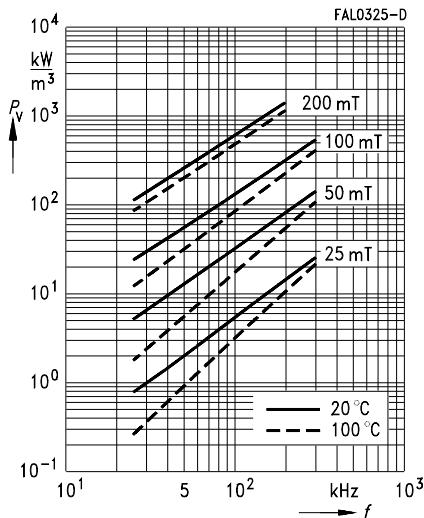
Relative core losses versus AC field flux density  
(measured with R16 ring cores)



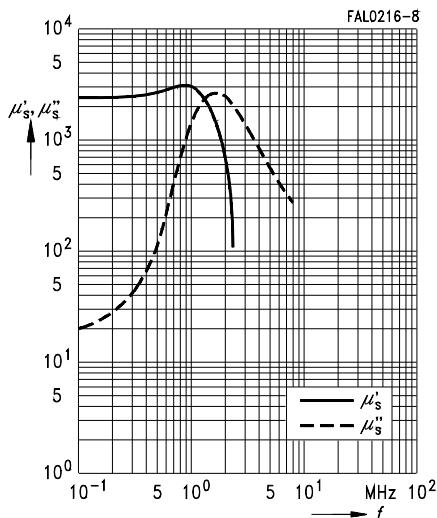
Relative core losses versus temperature  
(measured with R16 ring cores)



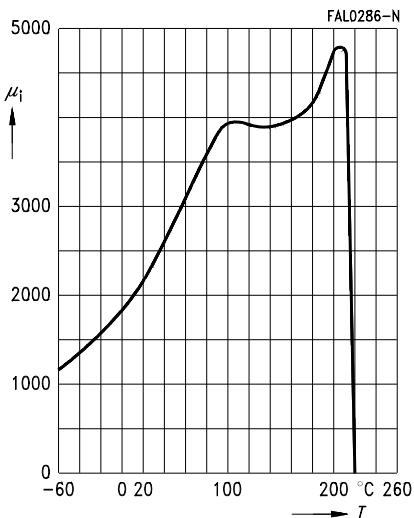
Relative core losses versus frequency  
(measured with R16 ring cores)



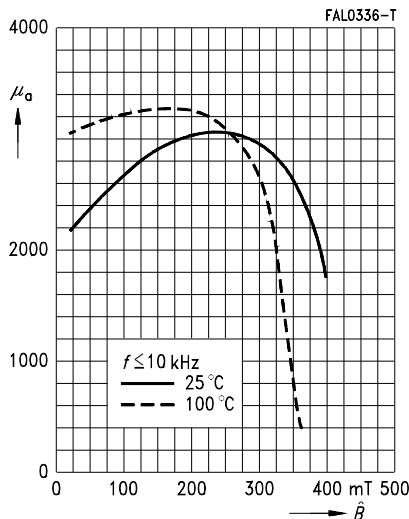
Complex permeability  
versus frequency  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



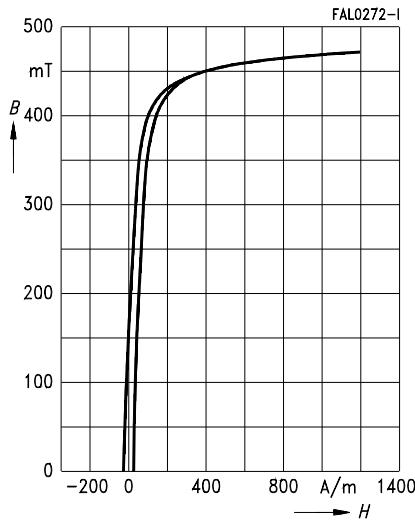
Initial permeability  $\mu_i$   
versus temperature  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



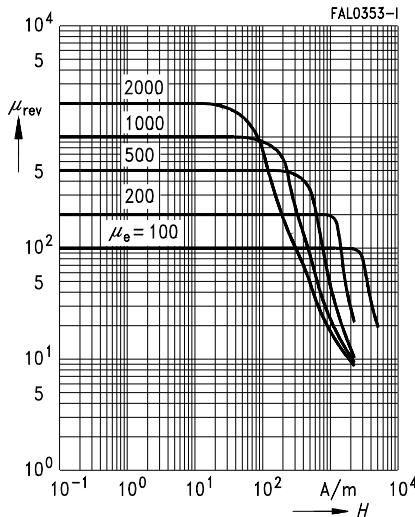
Amplitude permeability versus AC field  
flux density  
(measured with ungapped E cores)



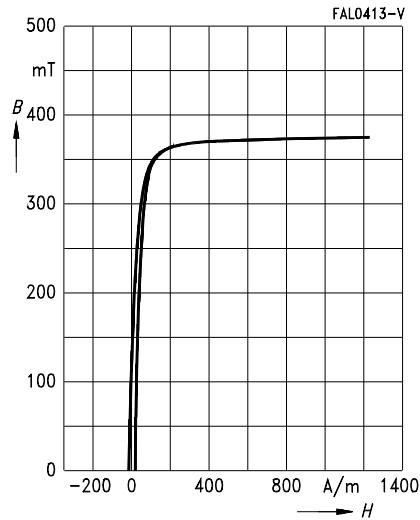
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



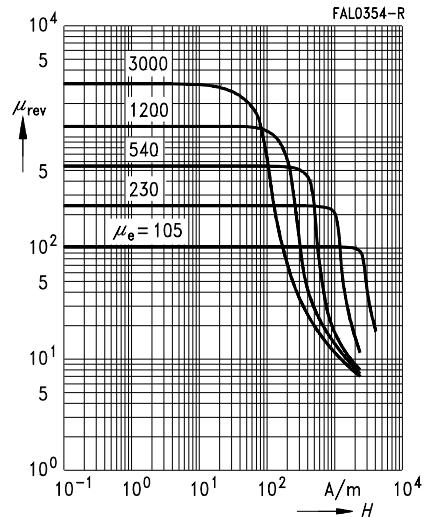
DC magnetic bias  
of P, RM, PM and E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



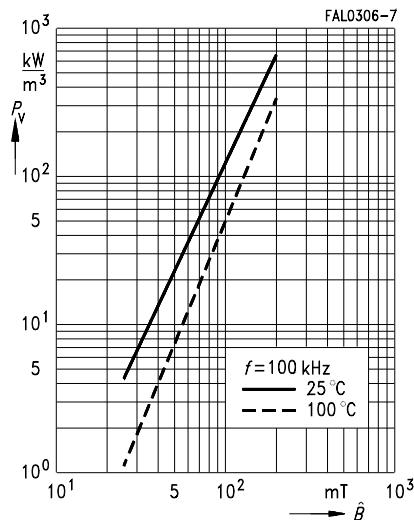
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



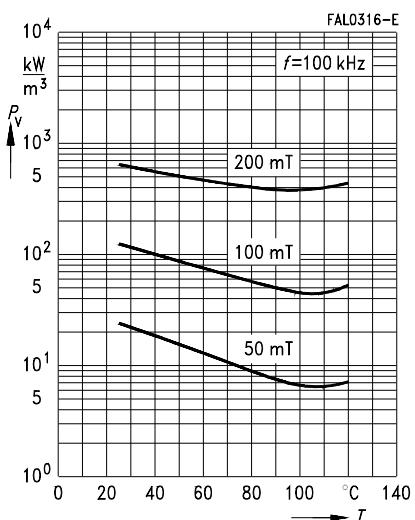
DC magnetic bias  
of P, RM, PM and E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



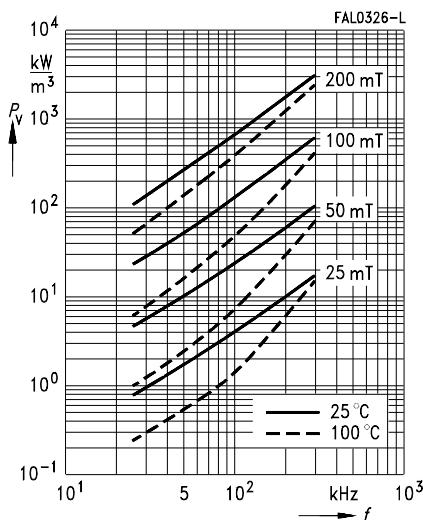
Relative core losses  
versus AC field flux density  
(measured with R29 ring cores)



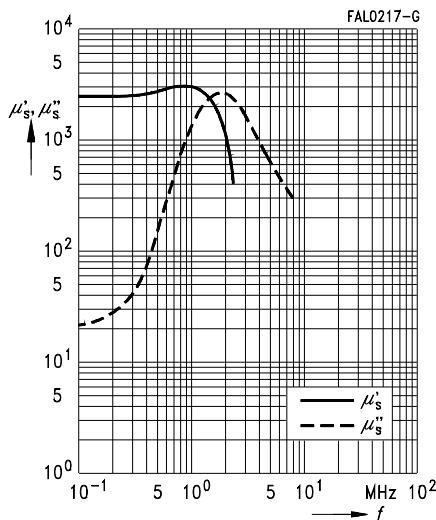
Relative core losses  
versus temperature  
(measured with R29 ring cores)



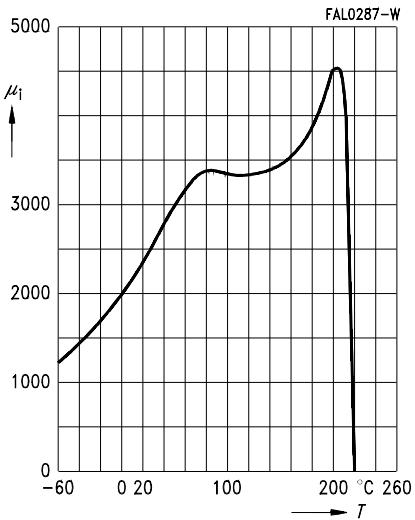
Relative core losses  
versus frequency  
(measured with R29 ring cores)



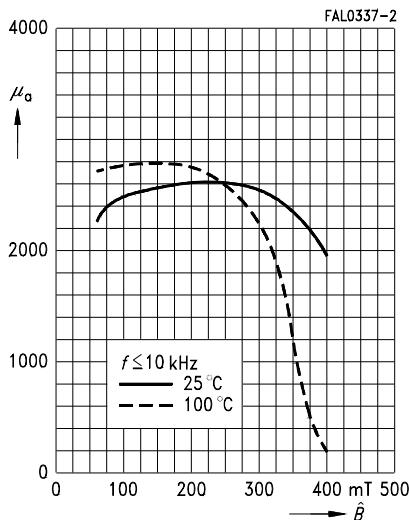
Complex permeability  
versus frequency  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



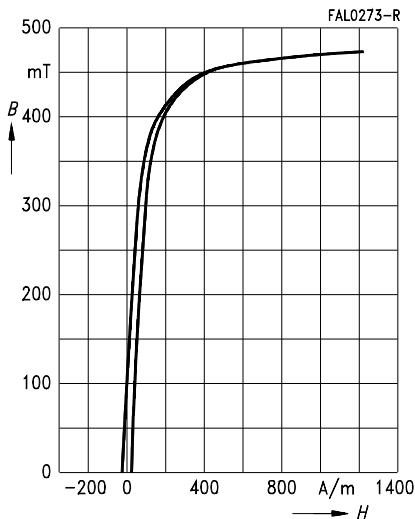
Initial permeability  $\mu_i$   
versus temperature  
(measured with R29 ring cores,  $\hat{B} \leq 0,25$  mT)



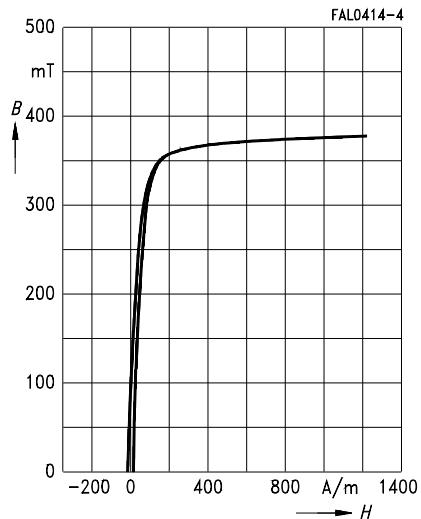
Amplitude permeability versus AC field  
flux density  
(measured with ungapped U cores)



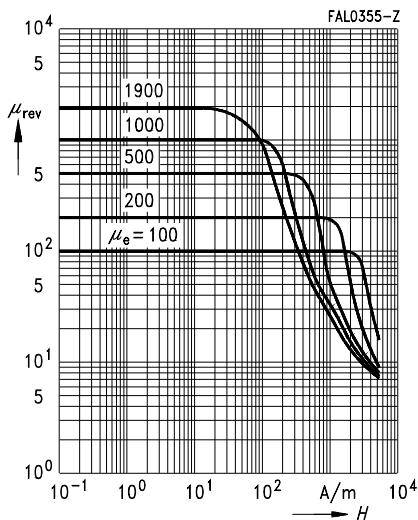
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



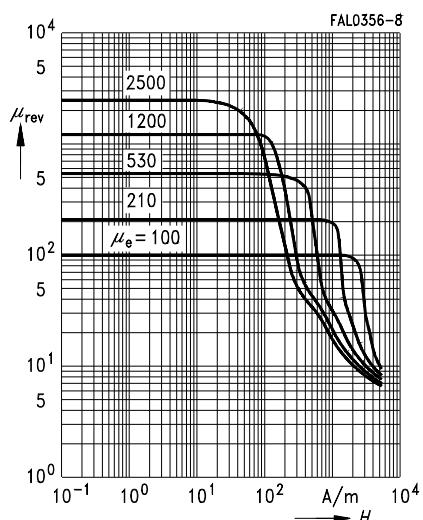
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



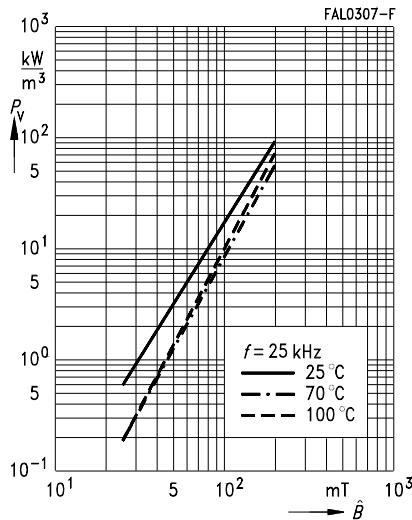
DC magnetic bias of E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



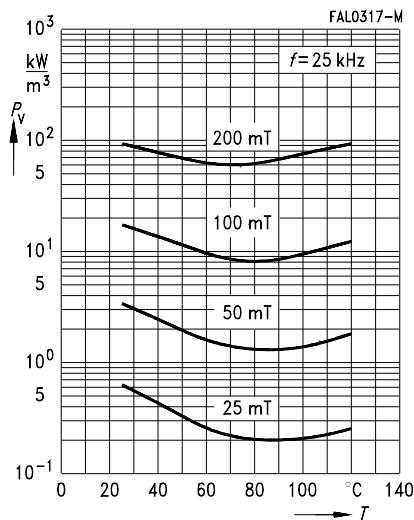
DC magnetic bias of E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



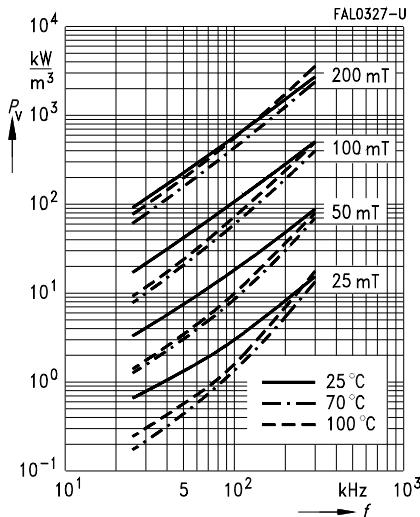
Relative core losses versus AC field flux density  
(measured with R29 ring cores)



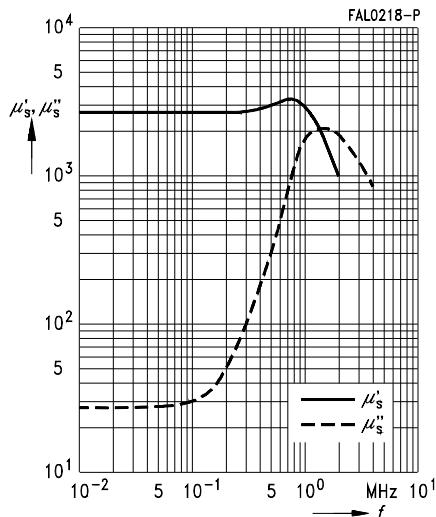
Relative core losses versus temperature  
(measured with R29 ring cores)



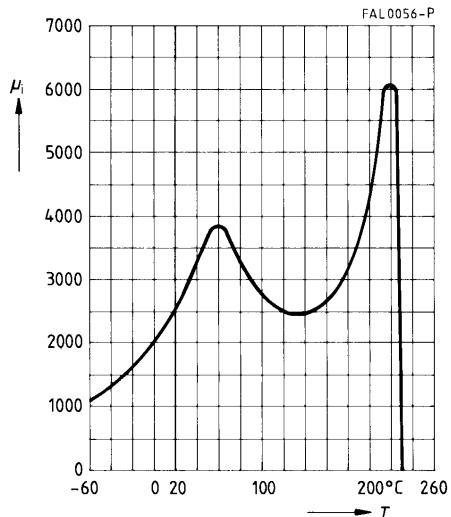
Relative core losses versus frequency  
(measured with R29 ring cores)



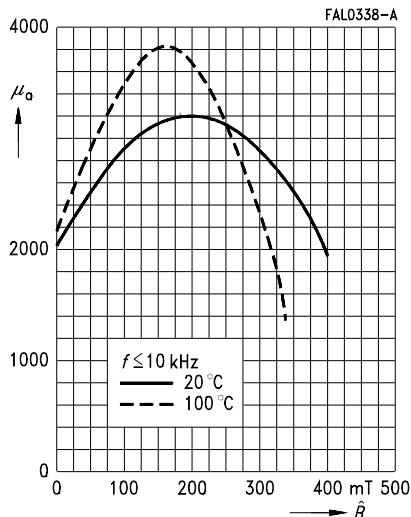
Complex permeability  
versus frequency  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



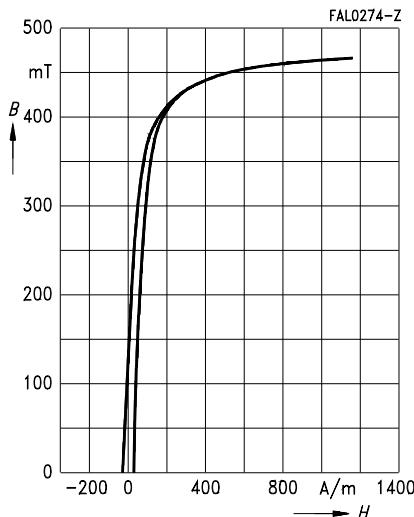
Initial permeability  $\mu_i$   
versus temperature  
(measured with R10 ring cores,  $\hat{B} \leq 0,25$  mT)



Amplitude permeability  
versus AC field flux density  
(measured with ungapped E cores)



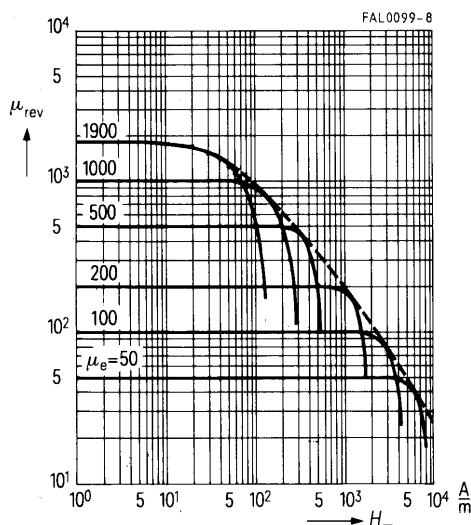
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



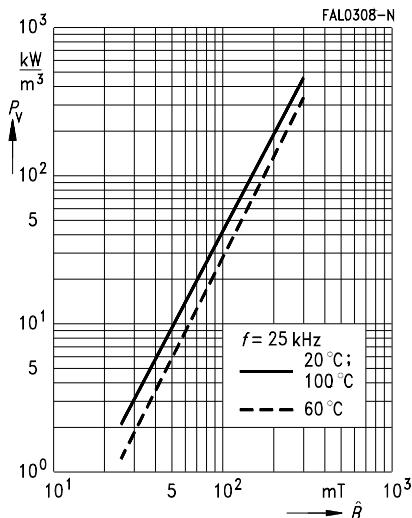
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



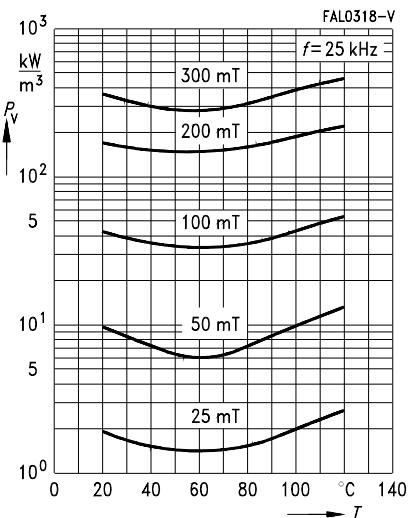
DC magnetic bias  
of P and RM cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



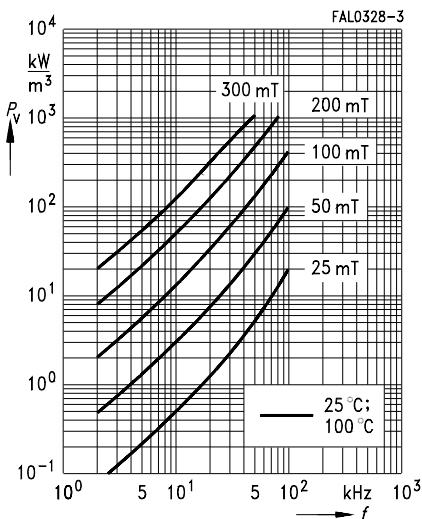
Relative core losses  
versus AC field flux density  
(measured with R16 ring cores)



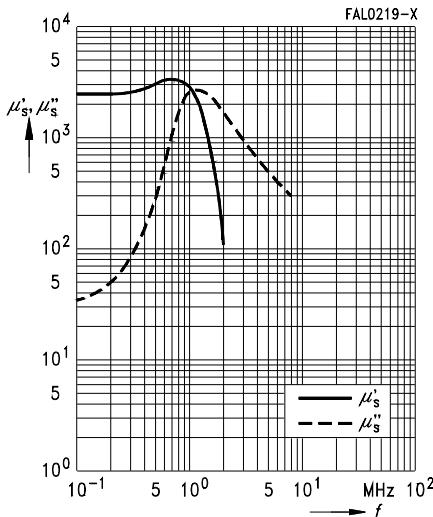
Relative core losses  
versus temperature  
(measured with R16 ring cores)



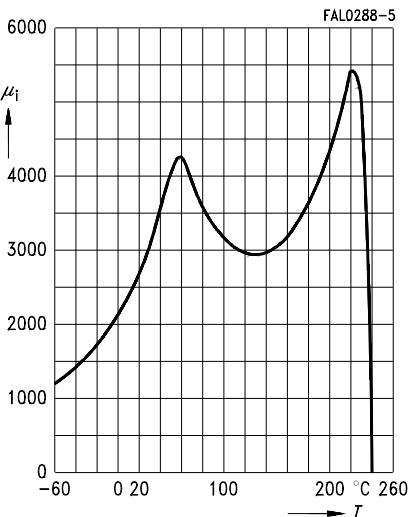
Relative core losses  
versus frequency  
(measured with R16 ring cores)



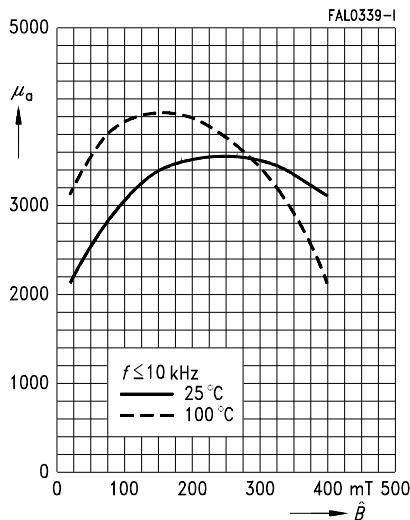
Complex permeability  
versus frequency  
(measured with R34 ring cores,  $\hat{B} \leq 0,25$  mT)



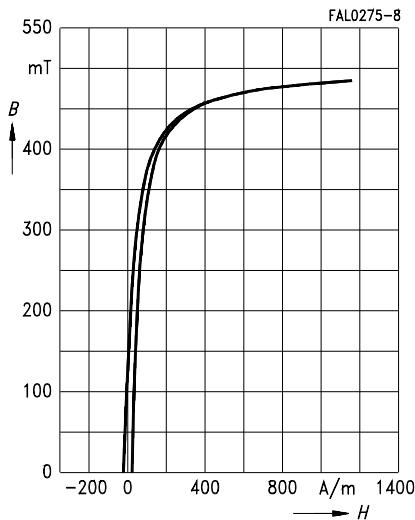
Initial permeability  $\mu_i$   
versus temperature  
(measured with R34 ring cores,  $\hat{B} \leq 0,25$  mT)



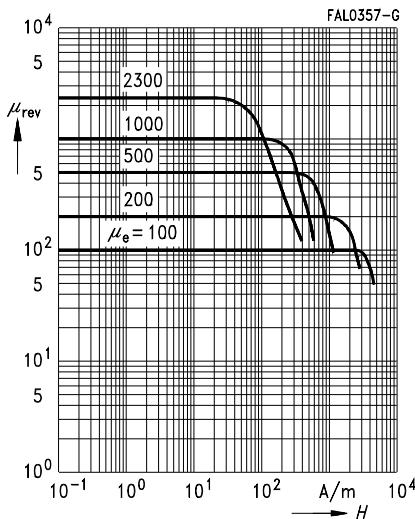
Amplitude permeability  
versus AC field flux density  
(measured with ungapped E cores)



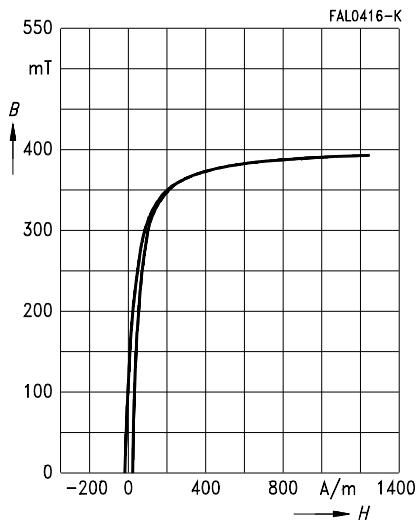
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



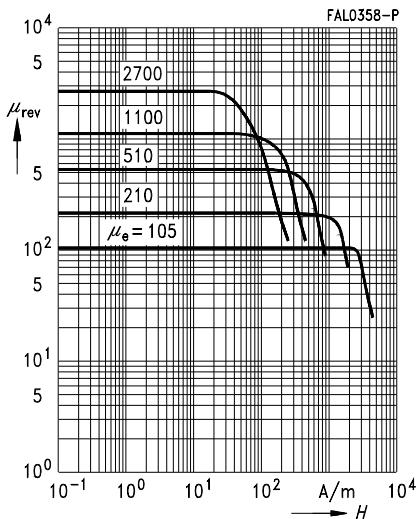
DC magnetic bias  
of E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 25^\circ\text{C}$ )



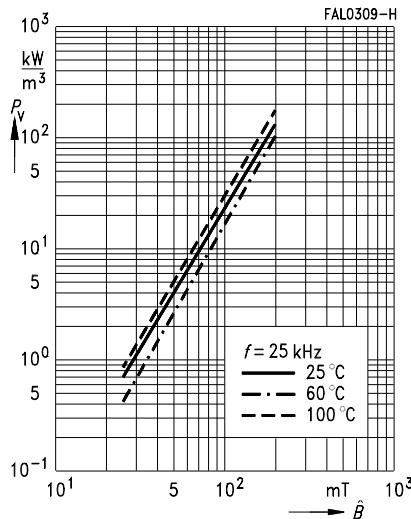
Dynamic magnetization curves  
(typical values)  
( $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



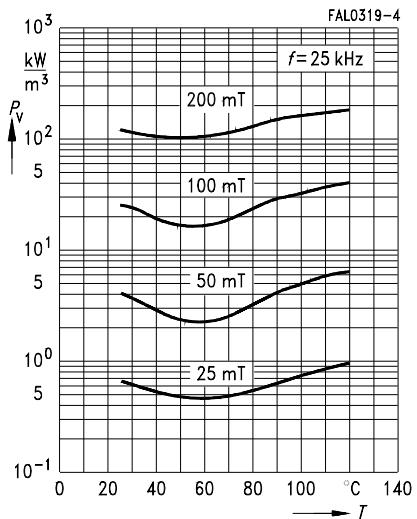
DC magnetic bias  
of E cores  
( $\hat{B} \leq 0,25 \text{ mT}$ ,  $f = 10 \text{ kHz}$ ,  $T = 100^\circ\text{C}$ )



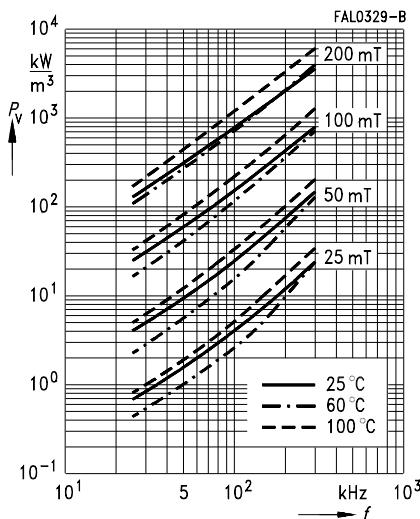
Relative core losses  
versus AC field flux density  
(measured with R34 ring cores)



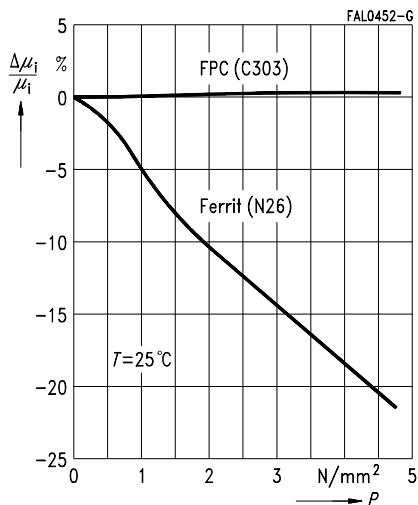
Relative core losses  
versus temperature  
(measured with R34 ring cores)



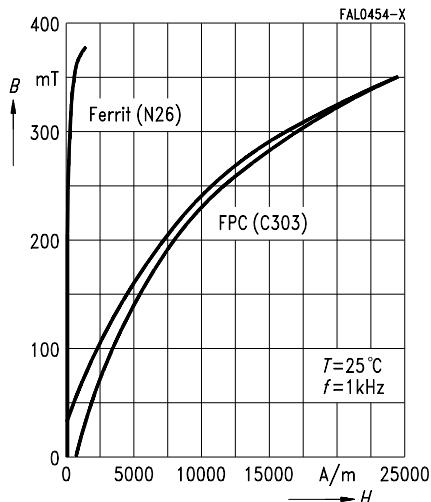
Relative core losses  
versus frequency  
(measured with R34 ring cores)



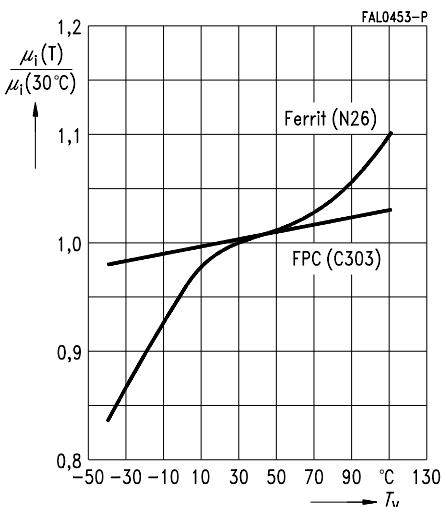
Permeability drop versus pressure  
(measured with R7/4 ring cores)



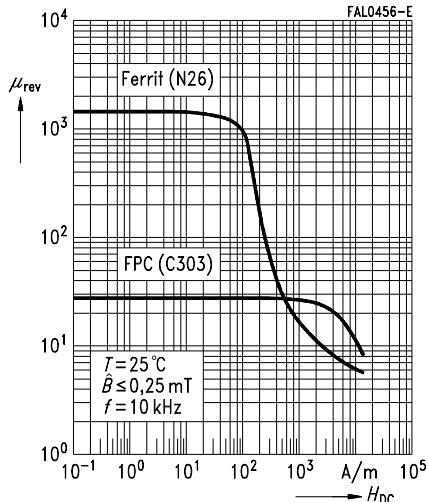
Dynamic magnetization curves  
(measured with R7/4 ring cores)



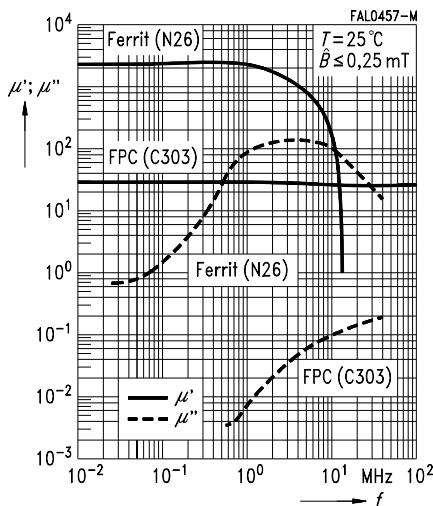
Permeability versus temperature  
(measured with R7/4 ring cores)



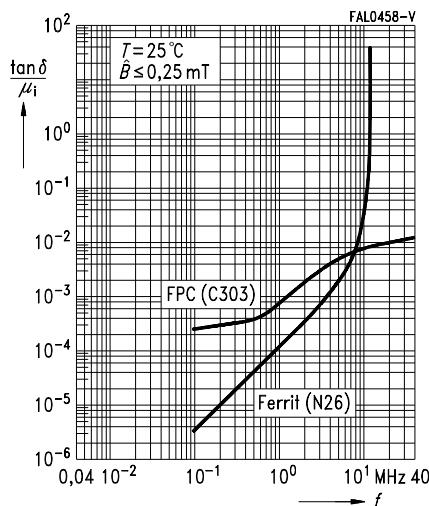
DC magnetic bias  
(measured with R7/4 ring cores)



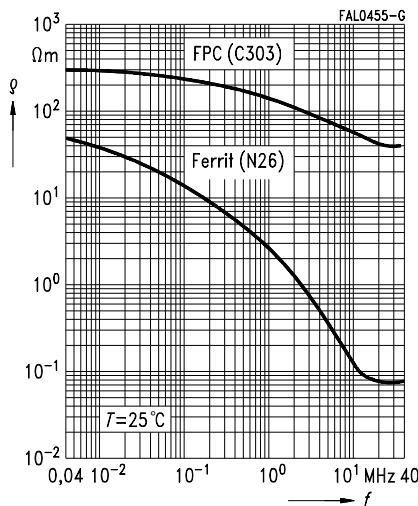
Complex permeability versus frequency  
(measured with R7/4 ring cores)



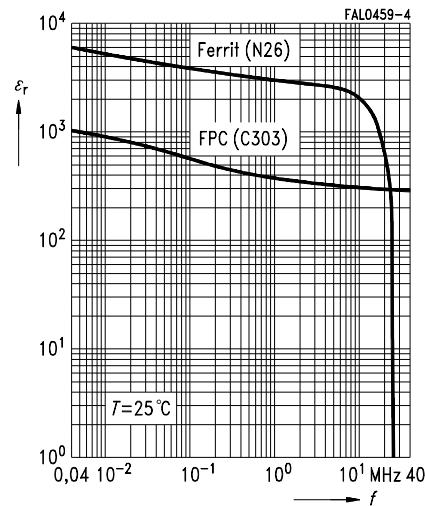
Relative loss factor versus frequency  
(measured with R7/4 ring cores)



Resistivity versus frequency  
(measured with R7/4 ring cores)



Dielectric constant versus frequency  
(measured with R7/4 ring cores)



## SIFERRIT Materials

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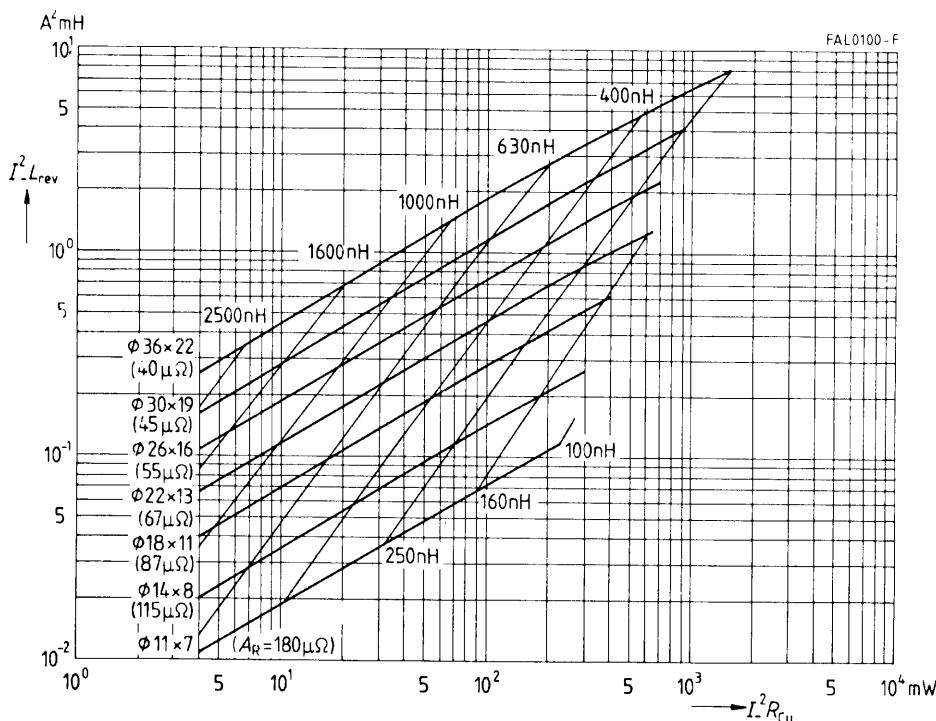
*Optimum value of biased P cores, SIFERRIT materials N48 and N26  
(small-signal applications)*

The maximum value of the inductance  $L_{rev}$  (inductance corresponding to the reversible permeability) or the minimum value of the DC resistance  $R_{Cu}$ , which can be obtained at a defined magnetic bias current  $I$ , can be determined from the following diagram for P cores made of SIFERRIT N48 and N26.

Example: At  $I = 0,1$  A,  $L_{rev}$  shall be  $> 10$  mH and  $R_{Cu} < 1 \Omega$ .

Required: The smallest possible P core

Solution: All core sizes contained in a rectangle limited at the bottom by the horizontal  $I^2 \cdot L_{rev} = 0,1 \text{ A}^2 \text{ mH}$  and at the right by the vertical  $I^2 \cdot R_{Cu} = 0,01 \text{ W}$  are possibilities. Accordingly, the smallest possible core size is 22 mm diameter  $\times$  13 mm with  $A_L = 1000 \text{ nH}$ ,  $R_{Cu}$  approx.  $0,86 \Omega$ ,  $L_{rev}$  approx.  $10,6 \text{ mH}$  and  $N = (R_{Cu}/A_R)^{1/2}$  approx. 114, one-section coil former.



*Optimum value of biased EC and E cores, SIFERRIT material N27  
(power applications)*

The relationship between magnetic biasing capability  $(I^2 L)_{\max}$ , copper loss  $I^2 R$ , effective permeability  $\mu_e$  (effect of air gap) and overtemperature  $\Delta T$  between 30 and 50 K is shown in the nomograms below for two different core series. Core losses due to ripple have not been taken into consideration. Type, size, and air gap can be chosen with the help of these nomograms.

Example:

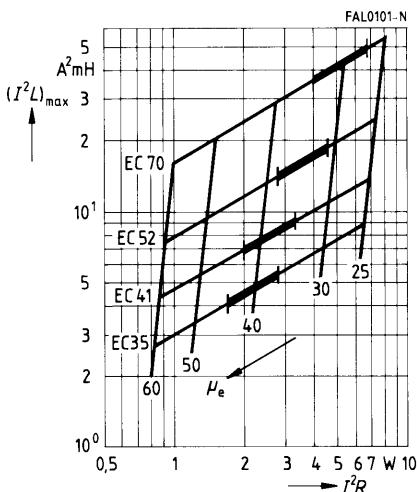
Given:  $(I^2 L)_{\max} = 8 \text{ A}^2\text{mH}$  and  $\Delta T$  approx. 40 K

Required: Ferrite core and  $\mu_e$

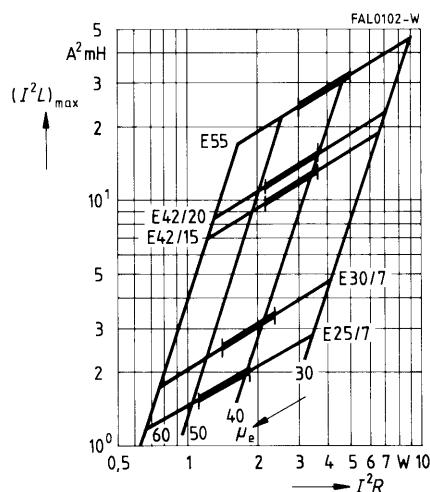
Solution: An effective permeability  $\mu_e$  of approximately 38 can be obtained from the nomogram for EC cores on the rising straight line of the EC41 core in the height of the ordinate 8  $\text{A}^2\text{mH}$  and in the middle of the plotted temperature range between 30 and 50 K.

Magnetic biasing capability  $(I^2 L)_{\max}$ , copper loss  $I^2 R$ , effective permeability  $\mu_e$  and overtemperature  $\Delta T$  of E and EC cores made of SIFERRIT N27.

EC cores



E cores



 Operating range 30 ... 50 K  
 50K Overtemperature  $\Delta T$  due to copper losses  
 30



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# General Definitions

## 1 Hysteresis

The special feature of ferromagnetic and ferrimagnetic materials is that spontaneous magnetization sets in below a material-specific temperature (Curie point). The elementary atomic magnets are then aligned in parallel within macroscopic regions. These so-called Weiss' domains are normally oriented so that no magnetic effect is perceptible. But it is different when a ferromagnetic body is placed in a magnetic field and the flux density  $B$  as a function of the magnetic field strength  $H$  is measured with the aid of a test coil. Proceeding from  $H = 0$  and  $B = 0$ , the so-called initial magnetization curve is first obtained. At low levels of field strength, those domains that are favorably oriented to the magnetic field grow at the expense of those that are not. This produces what are called wall displacements. At higher field strength, whole domains overturn magnetically – this is the steepest part of the curve – and finally the magnetic moments are moved out of the preferred states given by the crystal lattice into the direction of the field until saturation is obtained, i.e. until all elementary magnets in the material are in the direction of the field. If  $H$  is now reduced again, the  $B$  curve is completely different. The relationship shown in the hysteresis loop (Fig. 1) is obtained.

### 1.1 Hysteresis loop

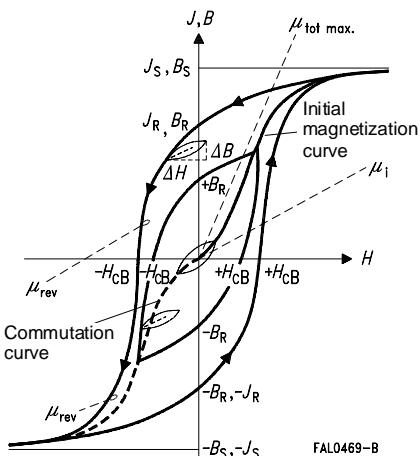


Fig. 1  
Magnetization curve  
(schematic)

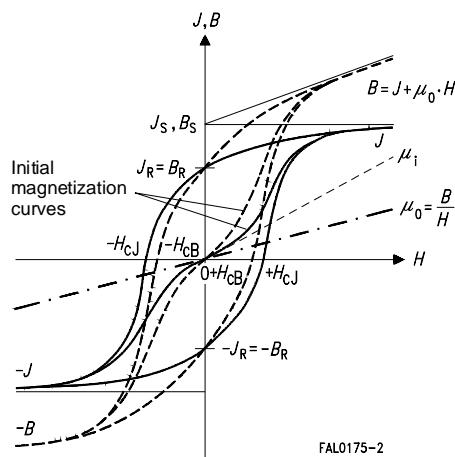


Fig. 2  
Hysteresis loops for different  
excitations and materials

Magnetic field strength

$$H = \frac{I \cdot N}{l} = \frac{\text{ampere} \cdot \text{turns}}{\text{length in m}}$$

$$\left[ \frac{\text{A}}{\text{m}} \right]$$

Magnetic flux density

$$B = \frac{\phi}{A} = \frac{\text{magnetic flux}}{\text{permeated area}}$$

$$\left[ \frac{\text{Vs}}{\text{m}^2} \right] = [\text{T}(\text{Tesla})]$$

## General Definitions

---

Polarization  $J$

$$J = B - \mu_0 H$$

$$\mu_0 \cdot H \ll J \Rightarrow B \approx J$$

General relationship between  $B$  and  $H$ :

$$B = \mu_0 \cdot \mu_r(H) \cdot H$$

$\mu_0$  = magnetic field constant

$$\mu_0 = 1,257 \cdot 10^{-6} \left[ \frac{\text{Vs}}{\text{Am}} \right]$$

$\mu_r$  = relative permeability

In a vacuum,  $\mu_r = 1$ ; in ferromagnetic or ferrimagnetic materials the relation  $B(H)$  becomes nonlinear and the slope of the hysteresis loop  $\mu_r \gg 1$ .

### 1.2 Basic parameters of the hysteresis loop

#### 1.2.1 Initial magnetization curve

The initial magnetization curve describes the relationship  $B = \mu_r \mu_0 H$  for the first magnetization following a complete demagnetization. By joining the end points of all "sub-loops", from  $H = 0$  to  $H = H_{\max}$ , (as shown in Figure 1), we obtain the so-called commutation curve (also termed normal or mean magnetization curve), which, for magnetically soft ferrite materials, coincides with the initial magnetization curve.

#### 1.2.2 Saturation magnetization $B_S$

The saturation magnetization  $B_S$  is defined as the maximum flux density attainable in a material (i.e. for a very high field strength) at a given temperature; above this value  $B_S$ , it is not possible to further increase  $B(H)$  by further increasing  $H$ .

Technically,  $B_S$  is defined as the flux density at a field strength of  $H = 1200 \text{ A/m}$ . As is confirmed in the actual magnetization curves in the chapter on "Materials", the  $B(H)$  characteristic above 1200 A/m remains roughly constant (applies to all ferrites with high initial permeability, i.e. where  $\mu \geq 100$ ).

#### 1.2.3 Remanent flux density $B_R(H)$

The remanent flux density (residual magnetization density) is a measure of the degree of residual magnetization in the ferrite after traversing a hysteresis loop. If the magnetic field  $H$  is subsequently reduced to zero, the ferrite still has a material-specific flux density  $B_R \neq 0$  (see Fig. 1: intersection with the ordinate  $H = 0$ ).

#### 1.2.4 Coercive field strength $H_C$

The flux density  $B$  can be reduced to zero again by applying a specific opposing field  $-H_C$  (see Fig. 1: intersection with the abscissa  $B = 0$ ).

The demagnetized state can be restored at any time by:

- traversing the hysteresis loop at a high frequency and simultaneously reducing the field strength  $H$  to  $H = 0$ .
- by exceeding the Curie temperature  $T_C$ .

## 2 Permeability

Different relative permeabilities  $\mu$  are defined on the basis of the hysteresis loop for the various electromagnetic applications.

### 2.1 Initial permeability $\mu_i$

$$\mu_i = \frac{1}{\mu_0} \cdot \frac{\Delta B}{\Delta H} \quad (H \rightarrow 0)$$

The initial permeability  $\mu_i$  defines the relative permeability at very low excitation levels and constitutes the most important means of comparison for soft magnetic materials. According to DIN IEC 401,  $\mu_i$  is defined using closed magnetic circuits (e.g. a closed ring-shaped cylindrical coil) for  $f \leq 10 \text{ kHz}$ ,  $B < 0,25 \text{ mT}$ ,  $T = 25^\circ\text{C}$ .

### 2.2 Effective permeability $\mu_e$

Most core shapes in use today do not have closed magnetic paths (Only ring, double E or double-aperture cores have closed magnetic circuits.), rather the circuit consists of regions where  $\mu_i \neq 1$  (ferrite material) and  $\mu_i = 1$  (air gap). Fig. 3 shows the shape of the hysteresis loop of a circuit of this type.

In practice, an effective permeability  $\mu_e$  is defined for cores with air gaps.

$$\mu_e = \frac{1}{\mu_0 N^2} \sum \frac{I}{A}$$

$$\sum \frac{I}{A} = \text{form factor}$$

$L$  = inductance  
 $N$  = number of turns

It should be noted, for example, that the loss factor  $\tan \delta$  and the temperature coefficient for gapped cores reduce in the ratio  $\mu_e/\mu_i$  compared to ungapped cores.

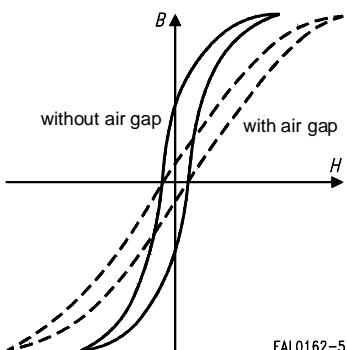


Fig. 3  
Comparison of hysteresis loops for a core with and without an air gap

## General Definitions

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The following approximation applies for an air gap  $s \ll l_e$ :

$$\mu_e = \frac{\mu_i}{1 + \frac{s}{l_e} \cdot \mu_i}$$

$s$  = width of air gap

$l_e$  = effective magnetic path length

For more precise calculation methods, see for example E.C. Snelling, "Soft ferrites", 2nd edition.

### 2.3 Apparent permeability $\mu_{app}$

$$\mu_{app} = \frac{L}{L_0} = \frac{\text{inductance with core}}{\text{inductance without core}}$$

The definition of  $\mu_{app}$  is particularly important for specification of the permeability for coils with tubular, cylindrical and threaded cores, since an unambiguous relationship between initial permeability  $\mu_i$  and effective permeability  $\mu_e$  is not possible on account of the high leakage inductances. The design of the winding and the spatial correlation between coil and core have a considerable influence on  $\mu_{app}$ . A precise specification of  $\mu_{app}$  requires a precise specification of the measuring coil arrangement.

### 2.4 Complex permeability $\bar{\mu}$

To enable a better comparison of ferrite materials and their frequency characteristics at very low field strengths (in order to take into consideration the phase displacement between voltage and current), it is useful to introduce  $\mu$  as a complex operator, i.e. a complex permeability  $\bar{\mu}$ , according to the following relationship:

$$\bar{\mu} = \mu_s' - j \cdot \mu_s''$$

where, in terms of a series equivalent circuit, (see Fig. 5)

$\mu_s'$  is the relative real (inductance) component of  $\bar{\mu}$

and  $\mu''$  is the relative imaginary (loss) component of  $\bar{\mu}$ .

Using the complex permeability  $\bar{\mu}$ , the (complex) impedance of the coil can be calculated:

$$Z = j \omega \bar{\mu} L_0$$

where  $L_0$  represents the inductance of a core of permeability  $\mu_r = 1$ , but with unchanged flux distribution.

(cf. also section 4.1: information on  $\tan \delta$ )

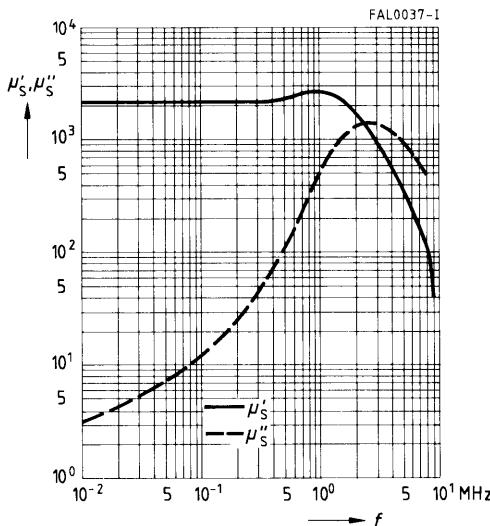


Fig. 4

Complex permeability versus frequency

(measured with R10 ring cores, N 48 material, measuring flux density  $B \leq 0,25$  mT)

Fig. 4 shows the characteristic shape of the curves of  $\mu_s'$  and  $\mu_s''$  as functions of the frequency, using N 48 material as an example. The real component  $\mu_s'$  is constant at low frequencies, attains a maximum at higher frequencies and then drops in approximately inverse proportion to  $f$ . At the same time,  $\mu''$  rises steeply from a very small value at low frequencies to attain a distinct maximum and, past this, also drops as the frequency is further increased.

The region in which  $\mu'$  decreases sharply and where the  $\mu''$  maximum occurs is termed the cut-off frequency  $f_{\text{cutoff}}$ . This is inversely proportional to the initial permeability of the material (Snoek's law).

## 2.5 Reversible permeability $\mu_{\text{rev}}$

$$\mu_{\text{rev}} = \frac{1}{\mu_0} \cdot \lim_{\Delta H \rightarrow 0} \left( \frac{\Delta B}{\Delta H} \right)_{H_{\perp}} \quad (\text{Permeability with superimposed DC field } H_{\perp})$$

In order to measure the reversible permeability  $\mu_{\text{rev}}$ , a small measuring alternating field is superimposed on a DC field. In this case  $\mu_{\text{rev}}$  is heavily dependent on  $H_{\perp}$ , the core geometry and the temperature.

Important application areas for DC field-superimposed, i.e. magnetically biased coils are broadband transformer systems (feeding currents with signal superimposition) and power engineering (shifting the operating point) and the area known as "nonlinear chokes" (cf. chapter on RM cores). For the magnetic bias curves as a function of the excitation  $H_{\perp}$  see the chapter on "SIFERRIT materials".

## General Definitions

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### 2.6 Amplitude permeability $\mu_a$

$$\mu_a = \frac{\hat{B}}{\mu_0 \hat{H}} \quad (\text{Permeability at high excitation})$$

$\hat{B}$  = peak value of flux density

$\hat{H}$  = peak value of field strength

For frequencies well below cut-off frequency,  $\mu_a$  is not frequency-dependent but there is a strong dependence on temperature. The amplitude permeability is an important definition quantity for power ferrites. It is defined for specific core types by means of an  $A_{L1}$  value for  $f \leq 10$  kHz,  $B = 0,320$  mT (or 200 mT),  $T = 100$  °C (see also introduction to the various core types, e.g. page [184](#)).

$$A_{L1} = \frac{\mu_0 \cdot \mu_a}{\sum \frac{l}{A}}$$

### 3 Magnetic core shape characteristics

Permeabilities and also other magnetic parameters are generally defined as material-specific quantities. For a particular core shape, however, the magnetic data are influenced to a significant extent by the geometry. Thus, the inductance of a slim-line ring core coil is defined as:

$$L = \mu_r \cdot \mu_0 \cdot N^2 \cdot \frac{A}{l}$$

Due to their geometry, soft magnetic ferrite cores in the field of such a coil change the flux parameters in such a way that it is necessary to specify a series of effective core shape parameters in each data sheet. The following are defined:

$l_e$  effective magnetic length

$A_e$  effective magnetic cross section

$A_{min}$  min. magnetic cross section of the core  
(required to calculate the max. flux density)

$V_e = A_e \cdot l_e$  effective magnetic volume

With the aid of these parameters, the calculation for ferrite cores with complicated shapes can be reduced to the considerably more simple problem of an imaginary ring core with the same magnetic properties. The basis for this is provided by the methods of calculation according to IEC 205, 205A and 205B, which allow the following factors  $\Sigma l/A$  and  $A_L$  to be calculated:

### **3.1 Form factor**

$$\sum \frac{I}{A} = \frac{I_e}{A_e}$$

The inductance  $L$  can then be calculated as follows:

$$L = \frac{\mu_e \cdot \mu_0 \cdot N^2}{\sum \frac{I}{A}}$$

where  $\mu_e$  denotes the effective permeability or another permeability  $\mu_{rev}$  or  $\mu_a$  (or  $\mu_i$  for cores with a closed magnetic path) adapted for the  $B/H$  range in question.

### **3.2 Inductance factor, $A_L$ value**

$$A_L = \frac{L}{N^2} = \frac{\mu_e \cdot \mu_0}{\sum \frac{I}{A}}$$

$A_L$  is the inductance referred to number of turns = 1. Therefore, for a defined number of turns  $N$ :

$$L = A_L \cdot N^2$$

### **3.3 Tolerance code letters**

The tolerances of the  $A_L$  are coded by the letters in the third block of the ordering code in conformity with IEC 62.

Code letter	Tolerance of $A_L$ value	Code letter	Tolerance of $A_L$ value
A	$\pm 3\%$	M	$\pm 20\%$
G	$\pm 2\%$	Q	$+ 30/- 10\%$
J	$\pm 5\%$	R	$+ 30/- 20\%$
E	$\pm 7\%$	U	$+ 80/- 0\%$
K	$\pm 10\%$	X	filling letter
L	$\pm 15\%$	Y	$+ 40/- 30\%$

The tolerance values available are given in the individual data sheets.

## General Definitions

### 4 Definition quantities in the small-signal area

#### 4.1 Loss factor $\tan \delta$

Losses in the small-signal area are specified by the loss factor  $\tan \delta$ .

Based on the impedance  $Z$  (cf. also section 2.4), the loss factor of the core in conjunction with the complex permeability  $\bar{\mu}$  is defined as

$$\tan \delta_s = \frac{\mu_s''}{\mu_s'} = \frac{R_s}{\omega L_s} \quad \text{and} \quad \tan \delta_p = \frac{\mu_p''}{\mu_p'} = \frac{\omega \cdot L_p}{R_p}$$

where  $R_s$  and  $R_p$  denote the series and parallel resistance and  $L_s$  and  $L_p$  the series and parallel inductance respectively.

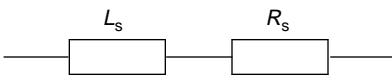


Fig. 5

Lossless series inductance  $L_s$  with loss resistance  $R_s$  resulting from the core losses.

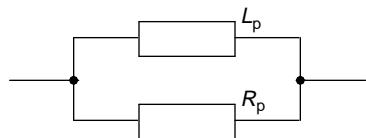


Fig. 6

Lossless parallel inductance  $L_p$  with loss resistance  $R_p$  resulting from the core losses.

From the relationships between series and parallel circuits we obtain:

$$\mu'_p = \mu'_s \cdot (1 + (\tan \delta)^2)$$

$$\mu''_p = \mu''_s \cdot \left(1 + \left(\frac{1}{\tan \delta}\right)^2\right)$$

#### 4.2 Relative loss factor $\tan \delta/\mu_i$

In gapped cores the material loss factor  $\tan \delta$  is reduced by the factor  $\mu_e/\mu_i$ . This results in the relative loss factor  $\tan \delta_e$  (cf. also section 2.2):

$$\tan \delta_e = \frac{\tan \delta}{\mu_i} \cdot \mu_e$$

The table of material properties lists the relative loss factor  $\tan \delta/\mu_i$ . This is determined in accordance with IEC 401 at  $f = 10$  kHz,  $B = 0,25$  mT,  $T = 25$  °C.

#### 4.3 Quality factor Q

The ratio of reactance to total resistance of an induction coil is known as the quality factor  $Q$ .

$$Q = \frac{\omega L}{R_L} = \frac{\text{reactance}}{\text{total resistance}}$$

The total quality factor  $Q$  is the reciprocal of the total loss factor  $\tan \delta$  of the coil; it is dependent on the frequency, inductance, temperature, winding wire and permeability of the core.

#### 4.4 Optimum frequency range

The optimum frequency range is specified primarily in the case of ferrites for broadband transformers and filters. The curves for  $\tan \delta/\mu_i$  versus  $f$  in the chapter on "SIFERRIT Materials" provide a quick reference for the selection of inductors with a high  $Q$  factor.

##### Upper frequency limit $f_{\max}$

The upper frequency limit is the frequency at which the loss factor curve has not yet begun to rise too steeply. This is approximately the case when the  $Q$  factor of the ring core is about 50 or when  $\tan \delta$  is about 0,02. The  $Q$  factor below the frequency limit or for gapped cores is much higher.

##### Lower frequency limit $f_{\min}$

The lower frequency limit is the frequency at which it is advisable to select the material with the next higher permeability for reasons of the lower loss factor.

#### 4.5 Hysteresis loss resistance $R_h$ and hysteresis material constant $\eta_B$

In transformers, in particular, the user cannot always be content with very low saturation. The user requires details of the losses which occur at higher saturation, e.g. where the hysteresis loop begins to open.

Since this hysteresis loss resistance  $R_h$  can rise sharply in different flux density ranges and at different frequencies, it is measured in accordance with IEC 401 for  $\mu_i$  values greater than 500 at  $B = 1,5$  and 3 mT ( $\Delta B = 1,5$  mT), a frequency of 10 kHz and a temperature of 25 °C (for  $\mu_i < 500$ :  $f = 100$  kHz). The hysteresis loss factor  $\tan \delta_h$  can then be calculated from this.

$$\tan \delta_h = \frac{\Delta R_h}{\omega \cdot L}$$

For the hysteresis material constant  $\eta_B$  we obtain:

$$\eta_B = \frac{\Delta \tan \delta_h}{\mu_e \cdot \Delta \hat{B}} = \frac{\Delta R_h}{\omega \cdot L \cdot \mu_e \cdot \Delta \hat{B}}$$

The hysteresis material constant,  $\eta_B$ , characterizes the material-specific hysteresis losses, it can be determined independently of the air gap.

## General Definitions

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The hysteresis loss factor of an inductor can be reduced, at a constant flux density, by means of an (additional) air gap

$$\Delta \tan \delta_h = \frac{\Delta R_h}{\omega \cdot L} = \eta \cdot \Delta \hat{B} \cdot \mu_e$$

For further details see IEC 367-1 and 125.

### 5 Definition quantities in the power sector

While in the small-signal sector ( $H \leq H_{cmax}$ ), i.e. in filter and broadband applications, the hysteresis loop is generally traversed only in lancet form (Fig. 2), for power applications the hysteresis loop is driven partly into saturation. The defining quantities are then

$\mu_{rev}$  reversible permeability in the case of superimposition with a DC signal  
(operating point for power transformers)

$\mu_a$  amplitude permeability and  
 $P_V$  core losses.

#### 5.1 Core losses $P_V$

The losses of a ferrite core or core set  $P_V$  is proportional to the area of the hysteresis loop in question. It consists of three components:

$$P_V = P_{V, \text{hysteresis}} + P_{V, \text{eddycurrent}} + P_{V, \text{residual}}$$

Owing to the high specific resistance of ferrite materials, the eddy current losses in the frequency range common today (1 kHz - 2 MHz) may be practically disregarded except in the case of core shapes having a large cross-sectional area. In principle the following applies:

$$P_V = U \cdot I \cdot \cos \varphi$$

where  $U$  is the applied voltage,  $I$  the resulting current and  $\varphi$  the phase displacement between  $U$  and  $I$ .

The power loss  $P_V$  is a function of the temperature  $T$ , the frequency  $f$ , the flux density  $B$  and is of course dependent on ferrite material and core shape.

The temperature dependence can generally be approximated by means of a third-order polynomial, while

$$P_V(f) \sim f^{(1+x)} \quad 0 \leq x \leq 1$$

applies for the frequency dependence and

$$P_V(B) \sim B^{(2+y)} \quad 0 \leq y \leq 1$$

for the flux density dependence. The coefficients  $x$  and  $y$  are dependent on core shape and material, and there is a mutual dependence between the coefficients of the definition quantity (e.g.  $T$ ) and the relevant parameter set (e.g.  $f$ ,  $B$ ).

In the case of cores which are suitable for power applications, the total core losses  $P_V$  are given explicitly for a specific frequency  $f$ , flux density  $B$  and temperature  $T$  in the relevant data sheets.

When determining the total power loss for an inductive component, the winding losses must also be taken into consideration in addition to the core-specific losses.

$$P_{V\text{ tot}} = P_{V\text{ core}} + P_{V\text{ winding}}$$

where, in addition to insulation conditions in the given frequency range, skin effect and proximity effect must also be taken into consideration for the winding.

## **5.2 Performance factor ( $f \cdot B_{\max}$ )**

The performance factor ( $f \cdot B_{\max}$ ) is a measure of the maximum power which a ferrite can transform, whereby it is generally assumed that the loss does not exceed 300 mW/cm<sup>3</sup>. Heat dissipation values of this order are usually assumed when designing small and medium-sized transformers. Increasing the performance factor will either enable an increase of the power that can be transformed by a core of identical design, or a reduction in component size if the transformed power is not increased.

If the performance factors of different power transformer materials are plotted as a function of frequency, only slight differences are observed at low frequencies (< 300 kHz), but these differences become more pronounced with increasing frequency. This diagram can be used to determine the optimum material for a given frequency range.

## **6 Influence of temperature**

### **6.1 $\mu(T)$ curve, Curie temperature $T_C$**

The initial permeability  $\mu_i$  as a function of  $T$  is given for all materials (see chapter on SIFERRIT materials). Important parameters for a  $\mu(T)$  curve are the position of the secondary permeability maximum (SPM) and the Curie temperature. Minimum losses occur at the SPM temperature.

Above the Curie temperature  $T_C$  ferrite materials lose their ferrimagnetic properties, i.e.  $\mu_i$  drops to  $\mu_i = 1$ . This means that the parallel alignment of the elementary magnets (spontaneous magnetization) is destroyed by increasing thermal activation. This phenomenon is reversible, i.e. when the temperature is reduced below  $T_C$  again, the ferrimagnetic properties are restored.

### **6.2 Temperature coefficient of permeability $\alpha$**

By definition the temperature coefficient  $\alpha$  represents a straight line of average gradient between the reference temperatures  $T_1$  and  $T_2$ . If the  $\mu(T)$  curve is approximately linear in this temperature range, this is a good approximation; in the case of heavily pronounced maxima, as occur particularly with highly permeable broadband ferrites, however, this is less true. The following applies:

$$\alpha = \frac{\mu_{i2} - \mu_{i1}}{\mu_{i1}} \cdot \frac{1}{T_2 - T_1}$$

$\mu_{i1}$  = initial permeability  $\mu_i$  at  $T_1 = 25^\circ\text{C}$

$\mu_{i2}$  = the initial permeability  $\mu_i$  associated with the temperature  $T_2$

## General Definitions

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### 6.3 Relative temperature coefficient $\alpha_F$

$$\alpha_F = \frac{\alpha}{\mu_i} = \frac{\mu_i - \mu_{i1}}{\mu_i \cdot \mu_{i1}} \cdot \frac{1}{T - T_1}$$

In a magnetic circuit with an air gap and the effective permeability  $\mu_e$  the temperature coefficient is reduced by the factor  $\mu_e/\mu_i$  (cf. also section 2.4).

### 6.4 Permeability factor

The first factor in the equation for determining the relative temperature coefficient  $\frac{\mu_i - \mu_{i1}}{\mu_i \cdot \mu_{i1}}$  is known as the permeability factor.

In the case of SIFERRIT materials for resonant circuits, the temperature dependence of the permeability factor can be seen from the relevant diagram.

### 6.5 Effective temperature coefficient $\alpha_e$

$$\alpha_e = \frac{\mu_e}{\mu_i} \cdot \alpha$$

In the case of the ferrite materials for filter applications, the  $\alpha/\mu_i$  values for the ranges 25 ... 55°C and 5 .... 20°C are given in table of material properties.

The effective permeability  $\mu_e$  is required in order to calculate  $\alpha_e$ ; therefore this is given for each core in the individual data sheets.

### 6.6 Relationship between the change in inductance and the permeability factor

The relative change in inductance between two temperature points can be calculated as follows:

$$\frac{\Delta L}{L} [\%] = \frac{\alpha}{\mu_i} \left[ \frac{10^{-6}}{K} \right] \cdot (T - T_1) [K] \cdot \mu_e \cdot 100 \quad \begin{matrix} \mu_i \text{ at temperature } T \\ \mu_{i1} \text{ at temperature } T_1 \end{matrix}$$

$$\frac{\Delta L}{L} [\%] = \frac{\mu_i - \mu_{i1}}{\mu_i \cdot \mu_{i1}} \mu_e \cdot 100$$

### 6.7 Temperature dependence of saturation magnetization

The saturation magnetization  $B_S$  drops with temperature and at  $T_C$  has fallen to  $B_S = 0$  mT. The drop for  $B_S(25^\circ\text{C})$  and  $B_S(100^\circ\text{C})$ , i.e. the main area of application for the ferrites, can be taken from the table of material properties.

### 6.8 Temperature dependence of saturation-dependent permeability (amplitude permeability)

It can be seen from the  $\mu_a(B)$  curves for the different materials that  $\mu_a$  exhibits a more pronounced maximum with increasing temperature and drops off sooner on account of decreasing saturation.

## **7 Disaccommodation**

Ferrimagnetic states of equilibrium can be influenced by mechanical, thermal or magnetic changes (shocks). Generally, an increase in permeability occurs when a greater mobility of individual magnetic domains is attained through the external application of energy. This state is not temporally stable and returns logarithmically with time to the original state.

### **7.1 Disaccommodation coefficient *d***

$$d = \frac{\mu_{i1} - \mu_{i2}}{\mu_{i1} \cdot (\lg t_2 - \lg t_1)}$$

where  $\mu_{i1}$  = permeability at time  $t_1$

$\mu_{i2}$  = permeability at time  $t_2$  and  $t_2 > t_1$

### **7.2 Disaccommodation factor *DF***

$$DF = \frac{d}{\mu_{i1}}$$

Accordingly, a change in inductance can be calculated with the aid of *DF*:

$$\frac{L_1 - L_2}{L_1} = DF \cdot \mu_e \cdot \log \frac{t_2}{t_1}$$

### 8 General mechanical, thermal, electrical and magnetic properties of ferrites

#### 8.1 Mechanical stability

If one wishes to describe the mechanical properties or stability of a ferrite core, the best method is to consider the general properties of ceramic bodies.

As is the case with any ceramic, the ferrite core is brittle and sensitive to any shock, bending or tensile load. Therefore its resistance to temperature change (e.g. in an ultrasonic bath) is restricted, as is shown by the following diagrammatic analysis of a thermal shock test.

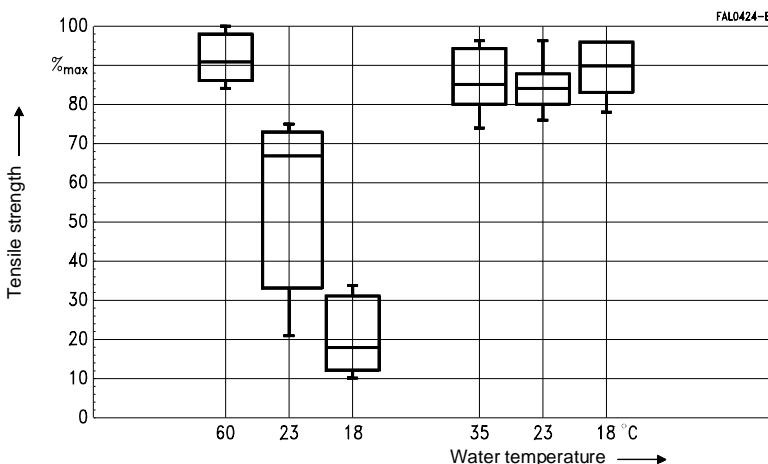


Fig. 7

Tensile strength distribution for ferrite core, resistance to temperature change  
box diagram: the respective maximum and minimum values for the tensile strength (vertical lines) at each bath temperature can be seen, 50% of the values for the tensile strength lie within the box, with 25 % above and 25 % below in each case. The horizontal line in the box gives the median.

As can be seen from the illustration, the tensile strength of the cores under test falls to about 10 to 15 % of the initial maximum value in the first test cycle ( $60\text{ }^{\circ}\text{C} \rightarrow 23\text{ }^{\circ}\text{C} \rightarrow 18\text{ }^{\circ}\text{C}$ ). The reason for this behavior lies in the stresses produced in the core as a result of the high cooling rate (medium: water). These stresses are relieved through the formation of cracks in the core material. The tensile strength of the core is thus dramatically reduced. These events are represented in the following relation:

$$\sigma_T = \alpha \cdot \Delta T \frac{E_0}{1 + 2\pi Ni^2}$$

$\sigma_T$	Actual effective stress
$\alpha$	Coefficient of thermal expansion ( $7 - 12 \cdot 10^{-6}$ 1/K)
$E_0$	Modulus of elasticity
$N$	Number of temperature changes
$l$	Crack length

In order to quantify the brittleness of a ferrite core, a fracture mechanism quantity must first be found which is also a material property. This quantity is the fracture toughness. It is the quantity which indicates the order of stress magnitude in the core at which a subcritical fracture growth becomes unstable. This relationship is represented in the following

$$K_1 \geq K_{1C} \quad \text{with} \quad K_1 = \sigma/\sqrt{Y} \quad \text{and} \quad K_{1C} = \sqrt{G_C E}$$

$K_1$	Stress intensity factor
$K_{1C}$	Fracture toughness
$Y$	Factor for fracture/sample geometry
$G_C$	Critical fracture area energy
$E$	E modulus

The  $K_{1C}$  value – determined by indentation testing – can be regarded as the desired measure of the brittleness of a material. A typical value for fracture toughness can be obtained from the table below.

Tensile strength	approx. 30 MPa/mm <sup>2</sup>
Compressive strength	approx. 800 MPa/mm <sup>2</sup>
Vickers hardness HV <sub>15</sub>	approx. 600 MPa/mm <sup>2</sup>
Modulus of elasticity	approx. 150000 N/mm <sup>2</sup>
Fracture toughness K <sub>1c</sub>	approx. 0,8 ... 1,1 MPam <sup>1/2</sup>
Thermal conductivity	approx. 4 ... 7 · 10 <sup>-3</sup> J/mm·s·K
Coefficient of linear expansion	approx. 7 ... 10 · 10 <sup>-6</sup> 1/K
Specific heat	approx. 0,7 J/g·K

Stresses in the core affect not only the mechanical properties but also the magnetic properties. It is apparent that the initial permeability is dependent on the stress state of the core. With

$$\mu_i \sim \frac{1}{\sigma_T}$$

it can be shown that the higher the stresses are in the core, the lower is the value for the initial permeability. Embedding the ferrite cores (e.g. in plastic) can induce these stresses. A permeability reduction of up to 50% and more can be observed, depending on the material. In this case, the embedding medium should have the greatest possible elasticity.

## General Definitions

### 8.2 Resistance to radiation

SIFERRIT materials can be exposed to the following radiation without significant variation ( $\Delta L/L \leq 1\%$  for ungapped cores):

gamma quanta:  $10^9$  rad

quick neutrons:  $2 \cdot 10^{20}$  neutrons/m<sup>2</sup>

thermal neutrons:  $2 \cdot 10^{22}$  neutrons/m<sup>2</sup>

### 8.3 Resistivity $\rho$ , dielectric constant $\epsilon$

At room temperature, ferrites have a resistivity in the range  $1 \Omega\text{m}$  to  $10^5 \Omega\text{m}$ ; this value is usually higher at the grain boundaries than in the grain interior. The temperature dependence of the core resistivity corresponds to that of a semiconductor:

$$\rho \sim e^{\frac{E_a}{k \cdot T}}$$

$E_a$  Activation energy (0,1 ... 0,5 eV)

$k$  Boltzmann constant

T Absolute temperature [K]

Thus the resistivity at 100 °C is one order of magnitude less than at 25 °C, which is significant, particularly in power applications, for the magnitude of the eddy-current losses.

Similarly, the resistivity decreases with increasing frequency.

Example: Material N 48

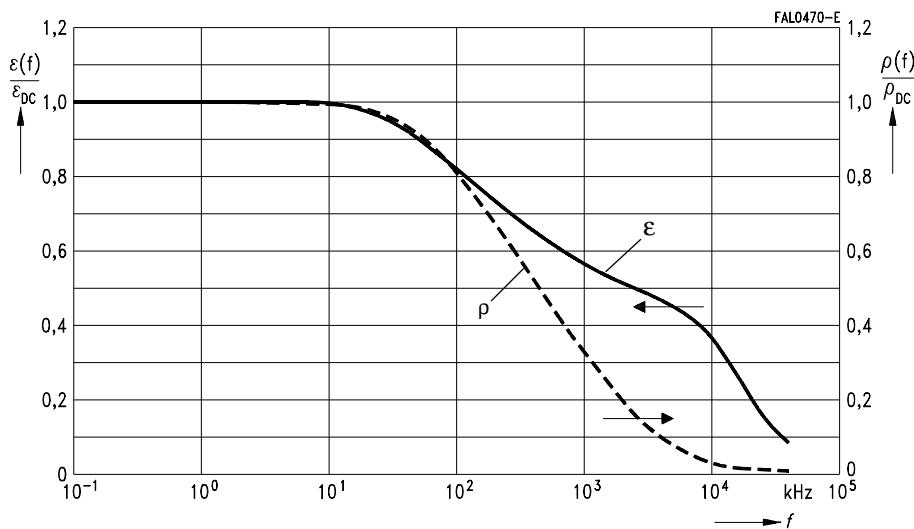


Fig. 8  
Resistivity and dielectric constant versus frequency

The different resistivity values for grain interior and grain boundary result in high (apparent) dielectric constants  $\epsilon$  at low frequencies. The dielectric constant  $\epsilon$  for all ferrites falls to values around 10 ... 20 at very high frequencies. NiZn ferrites already reach this value range at frequencies around 100 kHz.

SIFFERIT material	Resistivity (approx.) $\Omega \text{m}$	Dielectric constant $\epsilon$ at (approximate values)				
		10 kHz	100 kHz	1 MHz	100 MHz	300 MHz
K1 (NiZn)	$10^5$	30	15	12	11	11
N 48 (MnZn)	1	$140 \cdot 10^3$	$50 \cdot 10^3$	$30 \cdot 10^3$		

## 8.4 Magnetostriction

Linear magnetostriction is defined as the relative change in length of a magnetic core under the influence of a magnetic field. The greatest relative variation in length  $\lambda = \Delta l/l$  occurs at saturation magnetization. The values of the saturation magnetostriction ( $\lambda_s$ ) of our ferrite materials are given in the following table (negative values denote contraction).

SIFFERIT material	K 12	K 1	N 48
$\lambda_s$ in $10^{-6}$	-21	-18	-1,5

Magnetostrictive effects are of significance principally when a coil is operated in the frequency range < 20 kHz and then undesired audible frequency effects (distortion etc.) occur.

## 9 Coil characteristics

### Resistance factor $A_R$

The resistance factor  $A_R$ , or  $A_R$  value, is the DC resistance  $R_{Cu}$  per unit turn, analogous to the  $A_L$  value.

$$A_R = \frac{R_{Cu}}{N^2}$$

When the  $A_R$  value and number of turns  $N$  are given, the DC resistance can be calculated from  $R_{Cu} = A_R N^2$ .

From the winding data etc. the  $A_R$  value can be calculated as follows:

$$A_R = \frac{\rho \cdot I_N}{f_{Cu} \cdot A_N}$$

where  $\rho$  = resistivity (for copper:  $17,2 \mu\Omega \text{ mm}$ ),  $I_N$  = average length of turn in mm,  $A_N$  = cross section of winding in  $\text{mm}^2$ ,  $f_{Cu}$  = copper space factor. If these units are used in the equation, the  $A_R$  value is obtained in  $\mu\Omega = 10^{-6} \Omega$ .

For coil formers,  $A_R$  values are given in addition to  $A_N$  and  $I_N$ . They are based on a copper space factor of  $f_{Cu} = 0,5$ . This permits the  $A_R$  value to be calculated for any space factor  $f_C$ :

$$A_{R(f_{Cu})} = A_{R(0,5)} \cdot \frac{0,5}{f_{Cu}}$$



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- **MKPs in stacked-film technology:** 382 types, 160 to 1000 V, 1.5 nF to 1 µF
- **Interference suppression:** 140 types with a wide choice of ratings for different applications
  - X2 capacitors with small dimensions or for maximum security against active flammability (Safe-X) and Y2 capacitors for suppressing commonmode interference

**SCS – dependable, fast and competent**



## Application Notes

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### 1 Gapped and ungapped ferrite cores

Even with the best grinding methods known today, a certain degree of roughness on ground surfaces cannot be avoided, so that the usual term "without air gap" or "ungapped" does not imply no air gap at all. The  $A_L$  values quoted allow for a certain amount of roughness of the ground faces. The tolerance of the  $A_L$  value for ungapped cores is  $-20$  to  $+30$  % or  $-30$  to  $+40$  %. Closer tolerances are not available for several reasons. The spread in the  $A_L$  values of ungapped cores practically equal the spread in ring core permeability ( $\pm 20$  % ...  $\pm 30$  %), and the  $A_L$  value largely depends on the grinding quality of the matching surfaces.

The following are normally defined:

precision-ground/lapped cores	$s_{\text{resid}} \sim 1 \mu\text{m}$
normally ground cores	$s_{\text{resid}} \sim 10 \mu\text{m}$
gapped cores	$s \geq 0,01 \text{ mm}$

The residual air gap  $s_{\text{resid}}$  here is the total of the residual air gaps at the leg or centerpost contact surfaces.

With increasing material permeability the influence of the inevitable residual air gap grows larger. The spreads in the  $A_L$  value may also be increased by the mode of core assembly. Effects of mounting and gluing can result in a reduction of the  $A_L$  value.

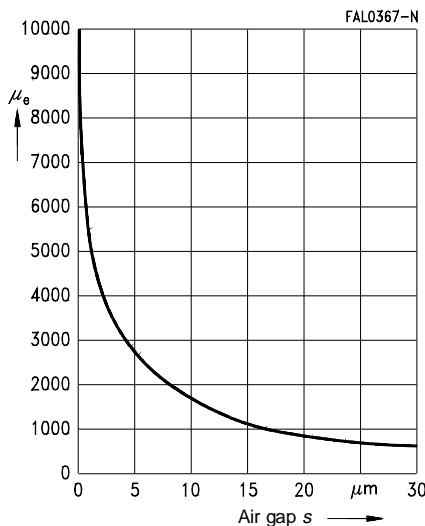
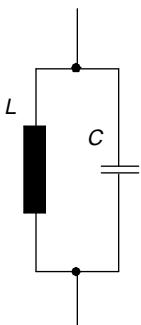


Fig. 9

Relationship between permeability  $\mu_e$  and air gap  $s$  for an RM 4/T 38 ferrite core

## 2 Cores for filter applications

### 2.1 Gapped cores for filter/resonant circuits



Basic requirements:

- low  $\tan \delta$
- close tolerance for  $A_L$  value
- close tolerance for temperature coefficient
- low disaccommodation factor  $DF$
- wide adjustment range

Gapped cores are therefore always used in high quality circuits (for materials see application survey, page [30](#)).

In the case of small air gaps (max. 0.2 mm) the air gap can be ground into only one core half. In this case the half with the ground air gap bears the stamp. The other half is blank.

The air gap enables the losses in the small-signal area and the temperature coefficient to be reduced by a factor of  $\mu_e/\mu_i$  in the small-signal area. More important, however, is that close  $A_L$  value tolerances can be achieved.

The rated  $A_L$  values for cores with ground air gap can be obtained from the individual data sheets. The data for the individual cores also include the effective permeability  $\mu_e$  used to approximately determine the effective loss factor  $\tan \delta_e$  and the temperature coefficient of the effective permeability  $\alpha_e$  from the ring core characteristics (see table of material properties).

It should be noted at this point that in cores with a larger air gap the stray field in the immediate vicinity of the air gap can cause additional eddy current losses in the copper winding. If the coil quality must meet stringent requirements, it is therefore advisable to wind several layers of polystyrene or nylon tape instead of wire in the part of the winding that is in the proximity of the air gap; with a 3-section coil former this would be the part of the center section near the air gap.

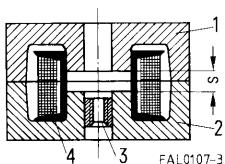


Fig. 10

Schematic drawing showing the construction of a P or RM core set with a total air gap  $s$ , comprising 2 core halves (1 and 2), threaded part (3) and padded winding (4)

## 2.2 P and RM cores with threaded sleeves

P and RM cores are supplied with a glued-in threaded sleeve. S+M Components uses automatic machines featuring high reliability in dosing of the adhesive and in positioning the threaded sleeve in the core.

The tight fit of the threaded sleeve is regularly checked – including a humid atmosphere of 40 °C/93 % r.h. (in accordance with IEC 68-2-3) over 4 days – and also by periodic tests over 3 weeks. The usual bonding strengths of 20 N for Ø 2 mm holes (e.g. for P 11 × 7, RM 5) and 30 N for Ø 3 mm holes (e.g. for P 14 × 11, RM 6) are greatly exceeded, reaching an average of > 100 N. The threaded sleeve is continuously checked for proper centering. Overall, the controlled automated procedure guarantees higher reliability than manual gluing with its unavoidable inadequacies. Owing to the porosity of the ferrite, tension of the ferrite structure due to hardened adhesive that has penetrated cannot always be avoided. Hence, the relative temperature coefficient  $\alpha_F$  may be increased by approximately  $0,2 \cdot 10^{-6}/K$ .

## 2.3 Inductance adjustment

Inductance adjustment curves are included in the individual data sheets for P and RM cores. These represent typical values. The indicated percentage change in inductance is referred to  $L$  (inductance without adjusting screw). For adjustment the air gap is bridged with a cylindrical or threaded core. Consequently, only gapped cores permit adjustment.

The combinations of gapped cores and adjusting screws recommended in the data sheets ensure a sufficient range of adjustment at stable adjustment conditions.

Suitable plastic adjusting tools are also listed in the data sheets.

## 2.4 Typical calculation of a resonant circuit inductor

The following example serves to illustrate the dependencies to be considered when designing a resonant circuit inductor:

A SIFERRIT pot core inductor is required with an inductance of  $L = 640 \mu H$  and a minimum quality factor  $Q = 400$  ( $\tan \delta_L = 1/Q = 2,5 \cdot 10^{-3}$ ) for a frequency of 500 kHz. The temperature coefficient  $\alpha_e$  of this inductor should be  $100 \cdot 10^{-6}/K$  in the temperature range + 5 to + 55 °C.

### a) Choice of material

According to the table of material properties and the  $\tan \delta/\mu_i$  curves (see chapter "SIFERRIT materials") the material M 33, for example, can be used for 500 kHz.

### b) Choice of $A_L$ value

The Q and temperature coefficient requirements demand a gapped pot core. The relative temperature coefficient  $\alpha_F$  of SIFERRIT M 33 according to the table of material properties is on average about  $1,6 \cdot 10^{-6}/K$ . Since the required  $\alpha_e$  value of the gapped P core should be about  $100 \cdot 10^{-6}/K$ , the effective permeability is

$$\alpha_F = \frac{\alpha_e}{\mu_e} \quad \Rightarrow \quad \mu_e = \frac{\alpha_e}{\alpha_F} = 100 \cdot 10^{-6}/K \cdot \frac{1}{1,6 \cdot 10^{-6}/K} = 62,5$$

With pot core P 18 × 11 (B65651):  $\mu_e = 47,9$  for  $A_L = 100 \text{ nH}$ .

With pot core P 22 × 13 (B65661):  $\mu_e = 39,8$  for  $A_L = 100 \text{ nH}$ .

### c) Choice of winding material

RF litz wire 20×0,05 with single natural silk covering is particularly suitable for frequencies around 500 kHz. The overall diameter of the wire including insulation of 0,367 mm and the average resistivity of 0,444 Ω/m are obtained from the litz-wire table (refer to pertinent standard). It is recommended that the actual overall diameter always be measured, and this value used for the calculation.

### d) Number of turns and type of core

For an  $A_L$  value of 100 nH and an inductance of 640 μH the equation  $N = (L/A_L)^{1/2}$  yields 80 turns. The nomogram for coil formers on [page 154](#) shows that for a wire with an external diameter of 0,367 mm the two-section former for core type P 18 × 11 80 can easily take 80 turns. This type can therefore be used with a two-section former.

### e) Length of wire and DC resistance

The length of an average turn  $l_N$  on the above former is 35,6 mm. The length of litz wire necessary for the coil is therefore  $80 \cdot 35,6 \text{ mm} = 2848 \text{ mm}$  plus say  $2 \cdot 10 \text{ cm}$  for the connections, giving a total length of 3,04 m. The average resistivity of this wire is 0,444 Ω/m; the total DC resistance  $R_{Cu}$  is thus  $3,04 \text{ m} \cdot 0,444 \Omega/\text{m} \approx 1,35 \Omega$ . It should be noted that the length of an average turn  $l_N$  given in the individual data sheets always refers to the fully wound former. If the former is not fully wound, the length of an average turn must be corrected according to the extent of the winding.

### f) Quality test

The mathematical calculation of the total loss, i.e. the losses of the core and windings is very laborious and only approximate. At the specified frequency of 500 kHz considerable dielectric and eddy-current losses occur. The quality is therefore checked on a sample coil wound as specified above, in this case the value being about 550 as shown in the Q factor characteristics for P 18 × 11 in the data sheet.

### g) Checking the temperature coefficient

The core P 18 × 11 with  $A_L = 100 \text{ nH}$  has an effective permeability  $\mu_e = 47,9$ . SIFERRIT M 33 has a relative temperature coefficient  $\alpha_F \approx 1,6 \cdot 10^{-6}/\text{K}$ ; therefore the following temperature coefficient can be calculated

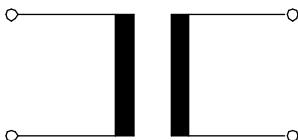
$$\alpha_e = \mu_e \cdot \alpha_F = 47,9 \cdot 1,6 \cdot 10^{-6}/\text{K} = 76,6 \cdot 10^{-6}/\text{K}$$

Actual measurement yielded  $90 \cdot 10^{-6}/\text{K}$ .

It should be pointed out that with pot cores the temperature coefficient of the unwound coil has almost no influence since the flux density lies primarily in the core.

For effective permeabilities  $\mu_e < 80$ , however, due to the influence of the winding an additional temperature coefficient of approx.  $(10 \dots 30) \cdot 10^{-6}/\text{K}$  must be included in the calculation.

### 3 Cores for broadband transformers



General requirements:

- high  $A_L$  values ( $\triangleq$  high effective permeability) to restrict number of turns
- good broadband properties, i.e. high impedance up to highest possible frequencies
- low total harmonic distortion ( $\triangleq$  low hysteresis material constant  $\eta_B$ )
- low sensitivity to superimposed DC currents ( $\triangleq$  highest possible values for  $T_C$  and  $B_S$ )
- low  $\tan \delta$  for high-frequency applications

#### 3.1 Precision-ground, ungapped cores for broadband transformers

For fields of application such as matching transformers in digital transmission networks, pulse signal transformers or current-compensated chokes, either cores which form a closed magnetic circuit (ring, double E or double-aperture cores) or paired core sets without air gap are used. In order to achieve the highest possible effective permeability here, these cores are precision ground with residual air gaps  $s \sim 1 \mu\text{m}$ . By selecting the low-profile core types, the  $A_L$  value can be further increased, and the number of turns reduced.

For this reason, RM and pot cores made of materials N 30, T 35, T 37, T 38 and T 42 are especially suitable for these applications. For high-frequency applications, N 26, M 33, K 1, K 12 and U 17 are suitable.

#### 3.2 Fundamentals for broadband transformers in the range 10 kHz to over 1 GHz – an example

Broadband transformers are constructed primarily using closed core shapes, i.e. ring cores and double-aperture cores. Divided core designs such as P/RM cores or small E/ER cores, which allow more simple winding, are particularly suitable for transformers up to approximately 200 MHz.

The bandwidth  $\Delta f = f_{\text{oG}} - f_{\text{uG}}$  ( $f_{\text{oG}}$  = upper cut-off frequency,  $f_{\text{uG}}$  = lower cut-off frequency) is considered the most important transformer characteristic.

Cut-off frequency: Frequency at which the voltage at the transformer drops to 70,7 % ( $\triangleq$  fall of 3 dB)

The following holds true for circuit quality  $Q > 10$  (typical value):

$$\Delta f = \frac{f_r}{R_i} \cdot \sqrt{\frac{L_H}{C_0}}$$

$f_r$  = Resonance frequency

$R_i$  = Internal resistance of generator (normally,  $R_i \ll$  loss resistance of ferrite)

$L_H$  = Main inductance

$C_0$  = Winding capacitance

Transmission loss curve

$$\alpha = \ln \frac{U}{U_r}$$

$U_r$  = voltage at  $f_r$

$\alpha$  = attenuation when matched with line impedance (e.g. 50  $\Omega$ )

Example: 1 : 1 transformer based on E6,3/T38 with 2  $\times$  10 turns

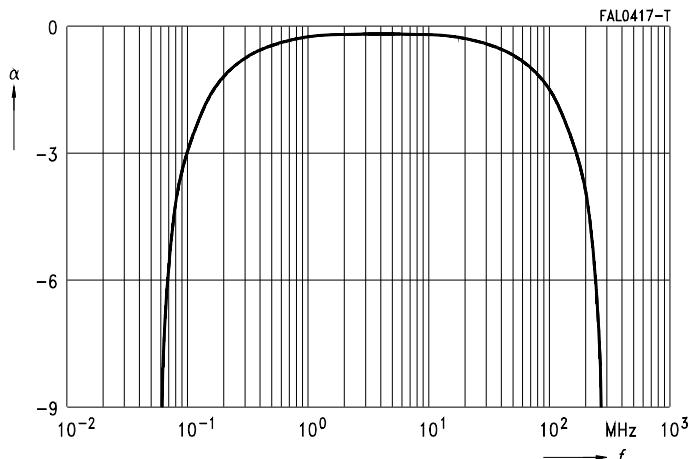


Fig. 11

Transmission loss curve for transformer E6,3/T38 with 2  $\times$  10 turns (parallel)

#### 4 Cores for inductive sensors

The proximity switch, widely used in automation engineering, is based on the damping of a high-frequency LC oscillator by the approach of a metal. The oscillator inductor consists of a cylindrical coil and a ferrite core half whose open side forms what is known as the active area. The function of the ferrite core consists in spatially aligning the magnetic field so as to restrict the interaction area.

The oscillator design must take into account that the inductor forms a magnetically open circuit. The inductance and quality are decisively dependent on the coil design, unlike in the case of closed circuits. The initial permeability plays a subordinate role here, as is shown by the following example:

Core:	P9 $\times$ 5 (B65517-D ...)
Coil:	100 turns, 0,08 CuL
Current:	1 mA
Frequency:	100 kHz

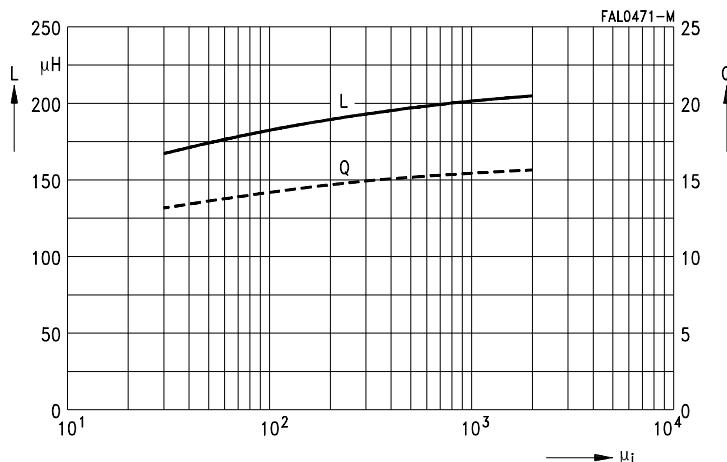


Fig. 12

Inductance and quality versus initial permeability

$P9,3 \times 2,7, N = 100, f = 100 \text{ kHz}, I = 1 \text{ mA}$

Decisive for this application is the attainment of as high a Q as possible, with the lowest possible dependence on temperature at the oscillator frequency. When the distance between the damping lug and the active area changes, the oscillator Q should however change as strongly as possible.

If the relative change in Q  $\Delta Q/Q$  exceeds a predefined threshold, e.g. 10 %, a switching operation is initiated at the so-called operating distance. Attainment of the target values depends on appropriate coil dimensioning and can generally only be performed empirically.

## 5 Cores for power applications

### 5.1 Core shapes and materials

The enormously increased diversity of application in power electronics has led to a considerable expansion not only in the spectrum of core shapes but also in the range of materials.

To satisfy the demands of higher-frequency applications, the EFD cores have been developed in sizes EFD10, 15, 20, 25 and EFD30. These are characterized by an extremely flat design, optimized cross-sectional distribution and optimized winding shielding.

For many standard applications up to 100 kHz, materials N27 and N41 can be used. For the range up to 200 kHz, materials N62, N67 and N72 are suitable. N87 continues the series up to 500 kHz, while N49 and N59 cover the range from 300 kHz to 1 MHz e.g. for DC/DC (resonance) converters.

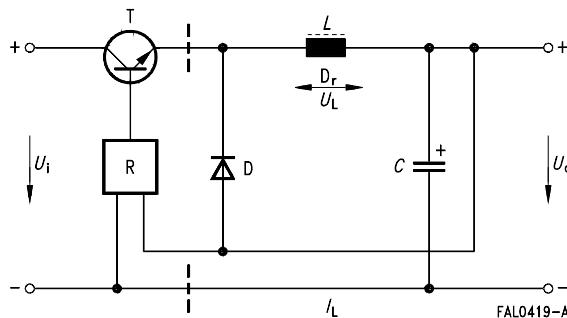
For detailed information on core shapes see the individual data sheets, for general information on materials see the chapter on SIFERRIT materials.

## Application Notes

## 5.2 Correlation: Applications – core shape/material

### 5.2.1 Step-down converters

### *Typical circuit diagram (Fig. 13)*



### *Advantages*

- only one choke required
  - high efficiency
  - low radio interference

## *Disadvantages*

- only one output voltage
  - restricted short-circuit withstand capability (no line isolation)

## *Application areas*

- providing a constant output voltage, isolated from input voltage
  - regulation in a forward converter
  - regulated voltage inversion
  - sinusoidal line current draw

### *Core/material requirements*

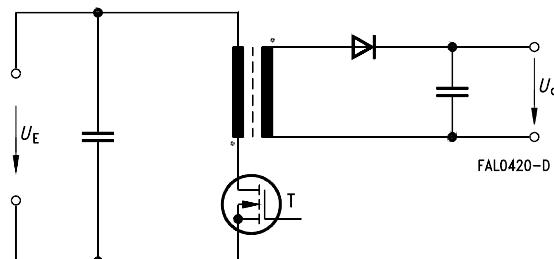
- Standard requirements regarding losses and saturation

### *S+M recommendations for core shape/material*

- E/ETD/U cores made of material N27,  
RM cores made of material N41 (specially suitable for nonlinear chokes)

### 5.2.2 Single-ended flyback converter

*Typical circuit diagram (Fig. 14)*



#### Advantages

- simple circuit variant (low cost)
- low component requirement
- only one inductive component
- low leakage losses
- several easily regulatable output voltages

#### Disadvantages

- close coupling of primary and secondary sides
- high eddy current losses in the air gap area
- large transformer core with air gap restricts possible applications
- average radio interference
- exacting requirements on the components

#### Application areas

- low and medium powers up to max. 200 W with wide output voltage range
- maximum operating frequency approx. 100 kHz

#### Core/material requirements

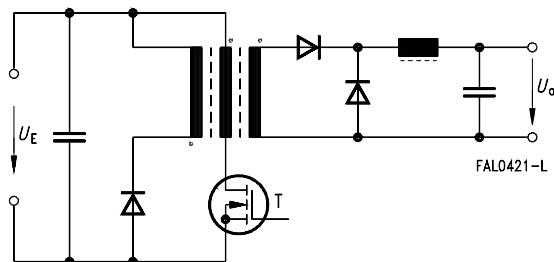
- low power losses at high temperature
- very high saturation with low dependence on temperature
- gapped cores (recently also with  $A_L$  value guarantee)

#### S+M recommendations for core shape/material

- E/U cores in
  - N27 (standard)
  - N62 (low losses, high saturation)

## 5.2.3 Single-ended forward converter

Typical circuit diagram (Fig. 15)



### Advantages

- higher power range than flyback converter
- lower demands on circuit components
- high efficiency

### Disadvantages

- 2 inductive components
- large choke
- demagnetization winding
- high radio interference suppression complexity
- increased component requirement, particularly with several regulated output voltages

### Application areas

- medium and high powers (up to 500 W) especially in the area of low output voltages
- PWM (pulse width) modulation up to approx. 500 kHz

### Core/material requirements

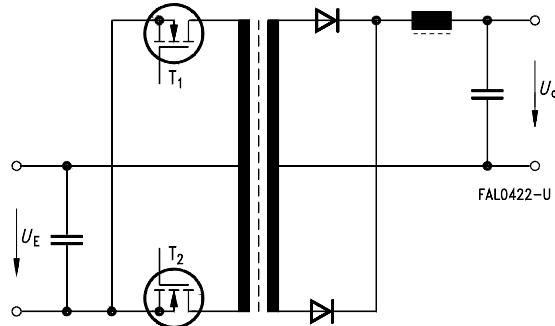
- low losses at high temperatures and at high frequencies (low eddy-current losses)
- generally, ungapped cores

### S+M recommendations for core shape/material

- E/ETD, small EFD cores, RM/PM cores made of  
N27, N41 (up to 100 kHz)  
N62, N67, N72 (up to 300 kHz)  
N87 (up to 500 kHz)  
N49, N59 (500 kHz to 1 MHz)

### 5.2.4 Push-pull converter

*Typical circuit diagram (Fig. 16)*



#### *Advantages*

- powers up to the kW range
- small choke
- high efficiency
- low radio interference suppression complexity

#### *Disadvantages*

- 2 inductive components
- complex winding
- high component requirement, particularly with several regulated output voltages

#### *Application areas*

- high powers (>>100 W), also at high output voltages
- PWM (pulse width) modulation up to 500 kHz

#### *Core/material requirements*

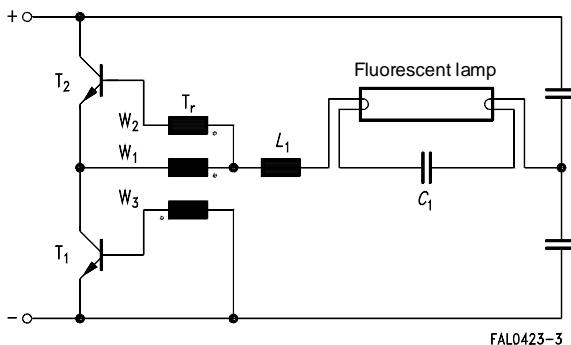
- low losses at high temperatures
- low eddy-current losses since application areas is up to 500 kHz and above
- generally, ungapped cores

#### *S+M recommendations for core shape/material*

- large E/ETD, RM/PM cores made of N27, N67, N87 (with large core cross sections ( $A_e \geq 250 \text{ mm}^2$ ), on account of eddy-current losses N87 must be used even where  $f < 100 \text{ kHz}$ )

### 5.2.5 Electronic lamp ballast device

*Typical circuit diagram (Fig. 17)*



#### *Advantages*

- considerably reduced size compared to 50 Hz line solution
- significantly higher efficiency than line voltage regulator

#### *Disadvantages*

- high component requirement

#### *Application areas*

- control unit for fluorescent lamps

#### *Core/material requirements*

- low losses in the range 50 – 80 °C
- pulse power requirements
- gapped and ungapped E cores
- ring cores with defined pulse characteristic

#### *S+M recommendations for core shape/material*

- E/ETD/EFD cores made of N62, N72 for  $L_1$

### 5.3 Selection of switch-mode power supply transformer cores

The previous section (Correlation: Applications – core shape/material) provides a guide for the rough selection of core shape and material.

The following procedure should be followed when selecting the actual core size and material:

- 1) Definition of requirements
  - range of power capacities  $P_{\text{trans}}$
  - specification of the SMPS type
  - specification of pulse frequency and maximum temperature rise
  - specification of the maximum volume
- 2) Selection of “possible” core shapes/materials on the basis of the “Power capacity” tables starting on [page 142](#).

These tables associate core shape/material combinations (and the volume  $V$ ) with the power capacity of the different converter types at a “typical” frequency  $f_{\text{typ}}$  and a “cut-off frequency”  $f_{\text{cutoff}}$ .

The typical frequency specified here is a frequency for which specific applications are known, or which serves as the base frequency for the power loss guarantee values.

The cut-off frequency is selected such that the advantages of other materials predominate above this frequency and that it is therefore advisable to switch to a different material which is better optimized for this range.

As a rule, the application-specific operating conditions are found neither at the “typical” frequency nor at the cut-off frequency. The intermediate values for  $P_{\text{trans}}$  ( $f$ ) can be estimated approximately using the following formula:

$$P_{\text{trans}}(f) \sim P_{\text{trans}}(f_0) \cdot \sqrt{\frac{f}{f_0}} \quad f_0 = f_{\text{typ}}, f_{\text{cutoff}}$$

### 3) Final selection of core shape/material

The core shapes/materials selected as possibilities under 2) must now be compared with the relevant data sheets for the specific core types and the material data (typical curves), taking the following points into consideration:

- volume
- accessories (power coil former)
- $A_L$  values of ungapped core
- $A_L$  values/air gap specifications
- temperature minimum for losses, Curie temperature  $T_C$ , saturation magnetization  $B_S$ , magnetic bias characteristic, amplitude permeability characteristic

Core shape/material combinations which are not contained in the individual data sheets can be requested from S + M Components.

## Application Notes

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### 5.4 Selection tables: Power capacities

					Power capacities					
					Push-pull converter		Single-ended converter		Flyback converter	
					C = 1 <sup>1)</sup>		C = 0,71 <sup>1)</sup>		C = 0,62 <sup>1)</sup>	
Core shapes	Material	Version (LP=Low profile)	f <sub>typ</sub> kHz	f <sub>cutoff</sub> kHz	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W
RM4	N41	Normal	25	150	5	13	3	9	3	8
	N67		100	300	21	33	15	23	13	20
	N87		100	500	24	57	17	40	15	35
	N49		500	1000	23	31	17	22	14	19
	N59		750	1500	37	49	26	35	23	30
	N41	LP	25	150	4	12	3	8	2	7
	N67		100	300	19	29	13	21	12	18
	N87		100	500	21	50	15	36	13	31
	N49		500	1000	22	27	16	19	14	17
	N59		750	1500	35	43	25	31	22	27
RM5	N41	Normal	25	150	9	21	6	15	5	13
	N67		100	300	34	52	24	37	21	33
	N87		100	500	47	90	33	64	29	56
	N49		500	1000	38	49	27	35	24	31
	N59		750	1500	60	78	43	55	37	48
	N41	LP	25	150	7	50	5	35	4	31
	N67		100	300	32	85	23	61	20	53
	N87		100	500	37	47	26	33	23	29
	N49		500	1000	36	74	26	52	22	46
	N59		750	1500	57	36	40	25	35	22
RM6	N41	Normal	25	150	16	89	12	63	10	55
	N67		100	300	55	153	39	109	34	95
	N87		100	500	76	83	54	59	47	52
	N49		500	1000	62	132	44	94	38	82
	N59		750	1500	98	37	69	26	61	23
	N41	LP	25	150	15	92	10	66	9	57
	N67		100	300	57	159	41	113	35	99
	N87		100	500	77	87	55	62	48	54
	N49		500	1000	64	137	46	98	40	85
	N59		750	1500	102	37	72	26	63	23

1) Numerical data are stated in accordance with the publication "Effect of the magnetic material on the shape and dimensions of transformers and chokes in switched-mode power supplies", G. Roespel, Siemens AG München, J. of Magn. and Magn. Materials 9 (1978) 145-49

					Power capacities					
Core shapes	Material	Version (LP=Low profile)			Push-pull converter		Single-ended converter		Flyback converter	
			$f_{typ}$	$f_{cutoff}$	$P_{trans}(f_{typ})$	$P_{trans}(f_{cutoff})$	$P_{trans}(f_{typ})$	$P_{trans}(f_{cutoff})$	$P_{trans}(f_{typ})$	$P_{trans}(f_{cutoff})$
			C = 1 <sup>1)</sup>	C = 1 <sup>1)</sup>	C = 0,71 <sup>1)</sup>	C = 0,71 <sup>1)</sup>	C = 0,62 <sup>1)</sup>	C = 0,62 <sup>1)</sup>	C = 0,62 <sup>1)</sup>	C = 0,62 <sup>1)</sup>
RM7	N41	Normal	25	150	23	50	16	35	14	31
	N67		100	300	77	124	55	88	48	77
	N87		100	500	106	213	75	152	66	132
	N49		500	1000	86	116	61	83	53	72
	N59		750	1500	137	184	97	131	85	114
	N41	LP	25	150	32	78	22	56	20	49
	N67		100	300	122	194	87	138	76	120
	N87		100	500	166	335	118	238	103	208
	N49		500	1000	136	182	97	130	85	113
	N59		750	1500	216	289	154	206	134	179
RM8	N41	Normal	25	150	33	71	23	51	20	44
	N67		100	300	111	177	78	126	69	110
	N87		100	500	153	305	108	216	95	189
	N49		500	1000	124	166	88	118	77	103
	N59		750	1500	196	263	139	187	122	163
	N41	LP	25	150	53	116	38	82	33	72
	N67		100	300	179	287	127	204	111	178
	N87		100	500	248	495	176	352	154	307
	N49		500	1000	201	270	143	192	125	167
	N59		750	1500	319	428	226	304	198	265
RM10	N41	Normal	25	150	59	129	42	91	37	80
	N67		100	300	200	320	142	227	124	198
	N87		100	500	275	551	196	391	171	342
	N49		500	1000	223	300	159	213	139	186
	N59		750	1500	354	476	252	338	220	295
	N41	LP	25	150	90	194	64	137	56	120
	N67		100	300	304	481	216	341	188	298
	N87		100	500	419	828	298	588	260	514
	N49		500	1000	340	451	241	320	211	280
	N59		750	1500	540	716	383	508	334	444

1) Numerical data are stated in accordance with the publication "Effect of the magnetic material on the shape and dimensions of transformers and chokes in switched-mode power supplies", G. Roespel, Siemens AG München, J. of Magn. and Magn. Materials 9 (1978) 145-49

## Application Notes

					Power capacities					
Core shapes	Material	Version (LP=Low profile)			Push-pull converter		Single-ended converter		Flyback converter	
			$f_{typ}$	$f_{cutoff}$	$P_{trans}(f_{typ})$	$P_{trans}(f_{cutoff})$	$P_{trans}(f_{typ})$	$P_{trans}(f_{cutoff})$	$P_{trans}(f_{typ})$	$P_{trans}(f_{cutoff})$
			C = 1 <sup>1)</sup>	C = 0,71 <sup>1)</sup>	C = 0,71 <sup>1)</sup>	C = 0,62 <sup>1)</sup>				
RM12	N41	Normal	25	150	126	275	90	195	78	171
	N67	LP	100	300	424	683	301	485	263	424
	N87		100	500	585	1178	415	836	363	730
	N49		500	1000	475	642	337	456	294	398
	N59		750	1500	753	1018	535	723	467	631
	N41		25	150	179	390	127	277	111	242
	N67		100	300	600	969	426	688	372	601
	N87		100	500	829	1671	588	1186	514	1036
	N49		500	1000	672	910	477	646	417	564
	N59		750	1500	1067	1444	757	1025	661	895
RM14	N41	Normal	25	150	210	459	149	326	130	285
	N67	LP	100	300	705	1140	500	810	437	707
	N87		100	500	973	1965	691	1395	603	1218
	N49		500	1000	789	1071	560	760	489	664
	N59		750	1500	1252	1698	889	1206	776	1053
	N41		25	150	287	629	204	446	178	390
	N67		100	300	963	1561	683	1108	597	968
	N87		100	500	1329	2691	943	1910	824	1668
	N49		500	1000	1078	1466	766	1041	668	909
	N59		750	1500	1710	2325	1214	1651	1060	1442
<b>PM cores</b>										
PM50/39	N27	Normal	25	150	359	785	255	557	222	487
	N87	100	500	1557	3148	1106	2235	965	1952	
PM62/49	N27	Normal	25	150	599	1305	425	927	371	809
	N87	100	500	2600	5235	1846	3717	1612	3245	
PM74/59	N27	Normal	25	150	989	2207	702	1567	613	1369
	N87	100	500	4295	8853	3050	6286	2663	5489	
PM87/70	N27	Normal	25	150	1363	2970	967	2108	845	1841
	N87	100	500	5915	11910	4200	8456	3667	7384	
PM114/93	N27	Normal	25	150	2468	5378	1752	3819	1530	3335
	N87	100	500	10715	21571	7607	15316	6643	13374	

1) Numerical data are stated in accordance with the publication "Effect of the magnetic material on the shape and dimensions of transformers and chokes in switched-mode power supplies", G. Roespel, Siemens AG München, J. of Magn. and Magn. Materials 9 (1978) 145-49

					Power capacities					
					Push-pull converter		Single-ended converter		Flyback converter	
					C = 1 <sup>1)</sup>		C = 0,71 <sup>1)</sup>		C = 0,62 <sup>1)</sup>	
Core shapes	Material	Version (LP=Low profile)	f <sub>typ</sub> kHz	f <sub>cutoff</sub> kHz	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W
<b>EC cores</b>										
EC35	N27	Normal	25	150	145	317	103	225	90	197
EC41	N27	Normal	25	150	216	471	154	335	134	292
EC52	N27	Normal	25	150	388	846	275	600	241	524
EC70	N27	Normal	25	150	859	1871	610	1329	532	1160
<b>E cores</b>										
E20/10/6	N27	Normal	25	150	26	59	19	42	16	37
	N67		100	300	86	138	61	98	53	86
	N62		25	300	32	140	23	100	20	87
	N87		100	500	118	238	84	169	73	148
E25/13/7	N27	Normal	25	150	49	107	35	76	30	66
	N67		100	300	154	249	110	177	96	154
	N62		25	300	71	429	50	304	44	266
	N87		100	500	213	252	151	179	132	156
E30/15/7	N27	Normal	25	150	95	490	68	348	59	304
	N67		100	300	300	208	213	148	186	129
	N62		25	300	122	484	87	344	76	300
	N87		100	500	415	835	294	593	257	517
E32/16/9	N27	Normal	25	150	117	1024	83	727	73	635
	N67		100	300	368	594	261	422	228	368
	N62		25	300	177	255	126	181	110	158
	N87		100	500	508	602	361	427	315	373
E40/16/12	N27	Normal	25	150	165	853	117	606	103	529
	N67		100	300	520	362	369	257	323	224
	N62		25	300	288	842	205	598	179	522
	N87		100	500	718	1451	510	1030	445	900
E42/21/15	N27	Normal	25	150	200	1028	142	730	124	638
	N67		100	300	629	1015	447	721	390	629
	N62		25	300	349	436	248	310	216	270
	N87		100	500	869	1028	617	730	539	638

1) Numerical data are stated in accordance with the publication "Effect of the magnetic material on the shape and dimensions of transformers and chokes in switched-mode power supplies", G. Roespel, Siemens AG München, J. of Magn. and Magn. Materials 9 (1978) 145-49

## Application Notes

					Power capacities					
					Push-pull converter		Single-ended converter		Flyback converter	
					C = 1 <sup>1)</sup>		C = 0,71 <sup>1)</sup>		C = 0,62 <sup>1)</sup>	
Core shapes	Material	Version (LP=Low profile)	f <sub>typ</sub> kHz	f <sub>cutoff</sub> kHz	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W
E42/21/20	N27	Normal	25	150	270	1388	192	985	167	861
	N67		100	300	850	589	603	418	527	365
	N62		25	300	471	1370	335	973	292	849
	N87		100	500	1173	2361	833	1676	727	1464
E47/20/16	N27	Normal	25	150	288	2521	205	1790	179	1563
	N67		100	300	907	1463	644	1039	563	907
	N62		25	300	503	629	357	446	312	390
	N87		100	500	1252	1482	889	1053	777	919
E55/28/21	N27	Normal	25	150	492	1072	349	760	305	665
	N67		100	300	1548	2495	1099	1770	959	1547
	N62		25	300	858	2528	609	1795	532	1568
	N87		100	500	2136	4300	1516	3050	1324	2670
ETD cores										
ETD29	N59	Normal	750	1500	530	722	376	512	329	447
	N49		500	1000	334	455	237	323	207	282
	N62		25	300	150	491	107	349	93	304
	N27		25	150	95	208	67	148	59	129
	N67		100	300	298	485	212	344	185	300
	N87		100	500	412	835	292	593	255	518
ETD34	N59	Normal	750	1500	833	1130	591	802	516	701
	N49		500	1000	525	712	373	506	325	442
	N62		25	300	238	769	169	546	147	477
	N27		25	150	149	326	106	231	92	202
	N67		100	300	469	759	333	539	291	470
	N87		100	500	647	1308	459	928	401	811
ETD39	N59	Normal	750	1500	1249	1689	887	1199	775	1047
	N49		500	1000	788	1065	559	756	488	660
	N62		25	300	387	1149	275	816	240	712
	N27		25	150	224	487	159	346	139	302
	N67		100	300	703	1134	499	805	436	703
	N87		100	500	971	1954	689	1387	602	1212

1) Numerical data are stated in accordance with the publication "Effect of the magnetic material on the shape and dimensions of transformers and chokes in switched-mode power supplies", G. Roespel, Siemens AG München, J. of Magn. and Magn. Materials 9 (1978) 145-49

					Power capacities					
Core shapes	Material	Version (LP=Low profile)			Push-pull converter		Single-ended converter		Flyback converter	
			$f_{typ}$	$f_{cutoff}$	$P_{trans}(f_{typ})$	$P_{trans}(f_{cutoff})$	$P_{trans}(f_{typ})$	$P_{trans}(f_{cutoff})$	$P_{trans}(f_{typ})$	$P_{trans}(f_{cutoff})$
			C = 1 <sup>1)</sup>	C = 0,71 <sup>1)</sup>	C = 0,71 <sup>1)</sup>	C = 0,62 <sup>1)</sup>				
ETD44	N59	Normal	750 kHz	1500 kHz	2078	2821	1475	2003	1288	1749
	N49		500	1000	1310	1779	930	1263	812	1103
	N62		25	300	649	1919	460	1363	402	1190
	N27		25	150	372	814	264	578	231	505
	N67		100	300	1169	1894	830	1345	725	1174
	N87		100	500	1614	3264	1146	2318	1001	2024
ETD49	N62	Normal	25	300	1005	2959	714	2101	623	1835
	N27		25	150	576	1255	409	891	357	778
	N67		100	300	1813	2921	1287	2074	1124	1811
	N87		100	500	2502	5033	1776	3574	1551	3121
ETD54	N62	Normal	25	300	1509	4442	1072	3154	936	2754
	N27		25	150	865	1884	614	1337	536	1168
	N67		100	300	2722	4384	1932	3113	1687	2718
	N87		100	500	3756	7555	2667	5364	2329	4684
ETD59	N62	Normal	25	300	2533	7460	1799	5297	1571	4625
	N27		25	150	1452	3164	1031	2246	900	1961
	N67		100	300	4568	7362	3243	5227	2832	4565
	N87		100	500	6305	12688	4476	9009	3909	7867
<b>EFD cores</b>										
EFD10/5/3	N59	Normal	750	1500	23	36	16	26	14	22
	N49		500	1000	14	20	10	14	9	12
	N87		100	500	12	31	8	22	7	19
EFD15/8/5	N59	Normal	750	1500	63	96	45	68	39	60
	N49		500	1000	40	52	28	37	25	32
	N87		100	500	42	96	30	68	26	60
EFD20/10/7	N59	Normal	750	1500	150	236	107	167	93	146
	N49		500	1000	95	137	67	97	59	85
	N67		100	300	85	128	60	91	53	80
	N87		100	500	117	204	83	145	72	126

1) Numerical data are stated in accordance with the publication "Effect of the magnetic material on the shape and dimensions of transformers and chokes in switched-mode power supplies", G. Roespel, Siemens AG München, J. of Magn. and Magn. Materials 9 (1978) 145-49

## Application Notes

					Power capacities					
					Push-pull converter		Single-ended converter		Flyback converter	
					C = 1 <sup>1)</sup>		C = 0,71 <sup>1)</sup>		C = 0,62 <sup>1)</sup>	
Core shapes	Material	Version (LP=Low profile)	f <sub>typ</sub> kHz	f <sub>cutoff</sub> kHz	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W	P <sub>trans</sub> (f <sub>typ</sub> ) W	P <sub>trans</sub> (f <sub>cutoff</sub> ) W
EFD25/13/9	N59	Normal	750	1500	311	417	221	296	193	258
	N49		500	1000	196	263	139	187	122	163
	N67		100	300	175	280	124	199	109	173
	N87		100	500	242	482	172	342	150	299
EFD30/15/9	N59	Normal	750	1500	401	343	285	244	249	213
	N49		500	1000	253	544	180	386	157	337
	N67		100	300	226	365	160	259	140	227
	N87		100	500	312	630	221	447	193	390
<b>U cores</b>										
U15/11/6	N27	Normal	25	150	31	81	22	58	20	50
U17/12/7	N27	Normal	25	150	37	97	26	69	23	60
U20/16/7	N27	Normal	25	150	74	161	52	114	46	100
U25/20/13	N27	Normal	25	150	198	432	141	306	123	268
UU93/152/30	N27	Normal	25	150	2527	5508	1794	3910	1567	3415

1) Numerical data are stated in accordance with the publication "Effect of the magnetic material on the shape and dimensions of transformers and chokes in switched-mode power supplies", G. Roespel, Siemens AG München, J. of Magn. and Magn. Materials 9 (1978) 145-49

The material-specific values on which the table calculations (for the “power capacities”) are based should be taken from the following table. The overtemperature  $\Delta T_{\text{here}}$  is the sum of the temperature rises resulting from core and winding losses.

	$\Delta T_{\text{max}}$ K	$f_{\text{typ}}$ kHz	$f_{\text{cutoff}}$ kHz
N59	30	750	1500
N49	20	500	1000
N62	40	25	150
N27	30	25	100
N67	40	100	300
N87	50	100	500
N72	40	25	150
N41	30	25	100

The following conditions were also applied:

- The application area for flyback converters was restricted to  $f < 150$  kHz.
- The power specifications for N49/N59 should be read as applicable to DC/DC (quasi) resonance converters (single-ended forward operation).
- The maximum flux densities were defined as follows:  
 For flyback converters:  $\Delta B \leq 200$  mT ( $\Delta B \leq 50$  mT for materials N49, N59)  
 For push-pull converters:  $\Delta B \leq 400$  mT.

The typical value specified in the tables for the power capacity at a “typical”  $f_{\text{typ}}$  and a cut-off frequency  $f_{\text{cutoff}}$  are based on the assumption that the temperature rise and the losses in core and winding are evenly distributed. Generally, the following relationship with the thermal resistance  $R_{\text{th}}$  applies, and is listed specifically for core types below.

$$P_{V, \text{tot}} = \frac{\Delta T}{R_{\text{th}}}$$

### 5.5 Thermal resistance for the main power transformer core shapes:

Core shapes	$R_{th}$ (K/W)	Core shapes	$R_{th}$ (K/W)	Core shapes	$R_{th}$ (K/W)
E 20/6	50	ETD 29	28	PM 50/39	15
E 25	40	ETD 34	20	PM 62/49	12
E 30/7	23	ETD 39	16	PM 74/59	9,5
E 32	22	ETD 44	11	PM 87/70	8
E 40	20	ETD 49	8	PM 114/93	6
E 42/15	19	ETD 54	6	U 11	46
E 42/20	15	ETD 59	4	U 15	35
E 47	13	ER 42	12	U 17	30
E 55/21	11	ER 49	9	U 20	24
E 55/25	8	ER 54	11	U 21	22
E 65/27	6	RM 4	120	U 25	15
EC 35	18	RM 5	100	U 26	13
EC 41	15	RM 6	80	U 30	4
EC 52	11	RM 7	68	U 93/20	1,7
EC 70	7	RM 8	57	U 93/30	1,2
EFD 10	120	RM 10	40	UI 93	5
EFD 15	75	RM 12	25	UU 93	4
EFD 20	45	RM 14	18		
EFD 25	30				
EFD 30	25				

The thermal resistances specified should be regarded as typical values based on a measurement in which the influence of the winding was minimized as far as possible. Free convection of heat at room temperature without cooling facilities was employed. The thermal resistance of a particular coil design can only be determined by measurements on the transformer, e.g. through the temperature-rise curve with DC magnetization.

# Processing Notes

## 1 Processing notes for the manufacture of wound products for small-signal and power applications

### 1.1 Winding design

For the most common core types the maximum number of turns for the individual coil formers can be seen from the following nomograms. Common wires and litz wires are specified in the pertinent standards (DIN 46 447 part 1, DIN 46 435 part 2 and DIN 46 436 part 2).

As can be seen from Fig. 18, as high a winding level as possible should be employed because at low  $\mu_e$  values in particular a low winding level ( $h/H$  ratio) can cause an  $A_L$  drop of up to 10% compared to the maximum value with full winding. (By IEC definition, the  $A_L$  values are always related to fully wound 100-turn coils.)

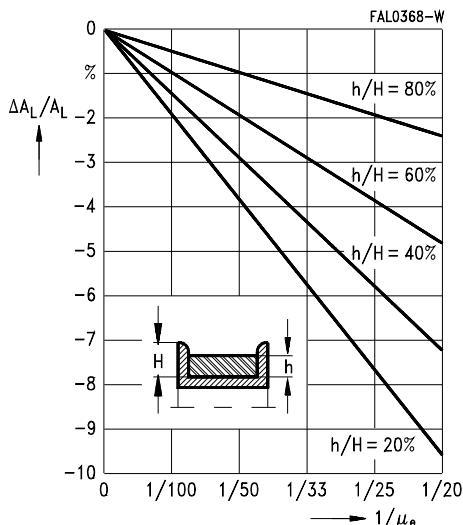


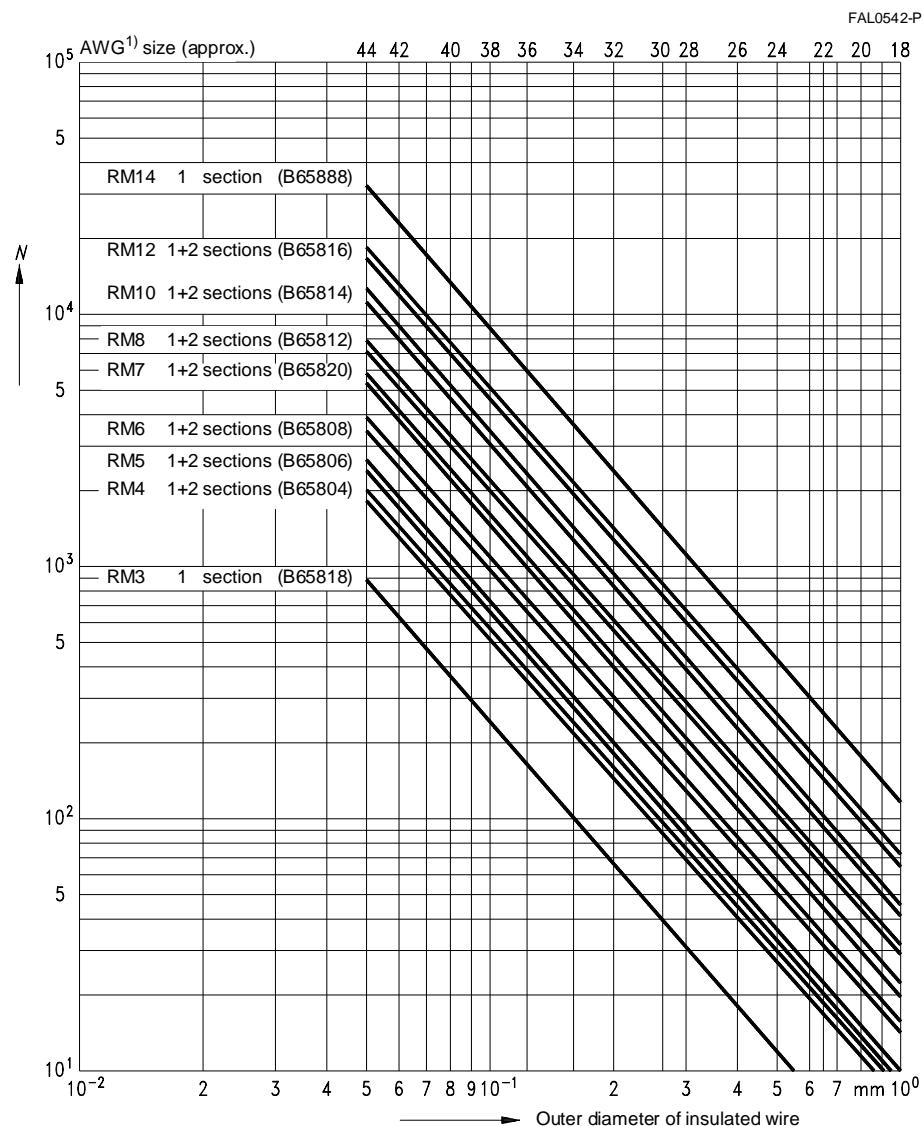
Fig. 18  
Percentage change in  $A_L$  value versus relative winding height  $h/H$

## Processing Notes

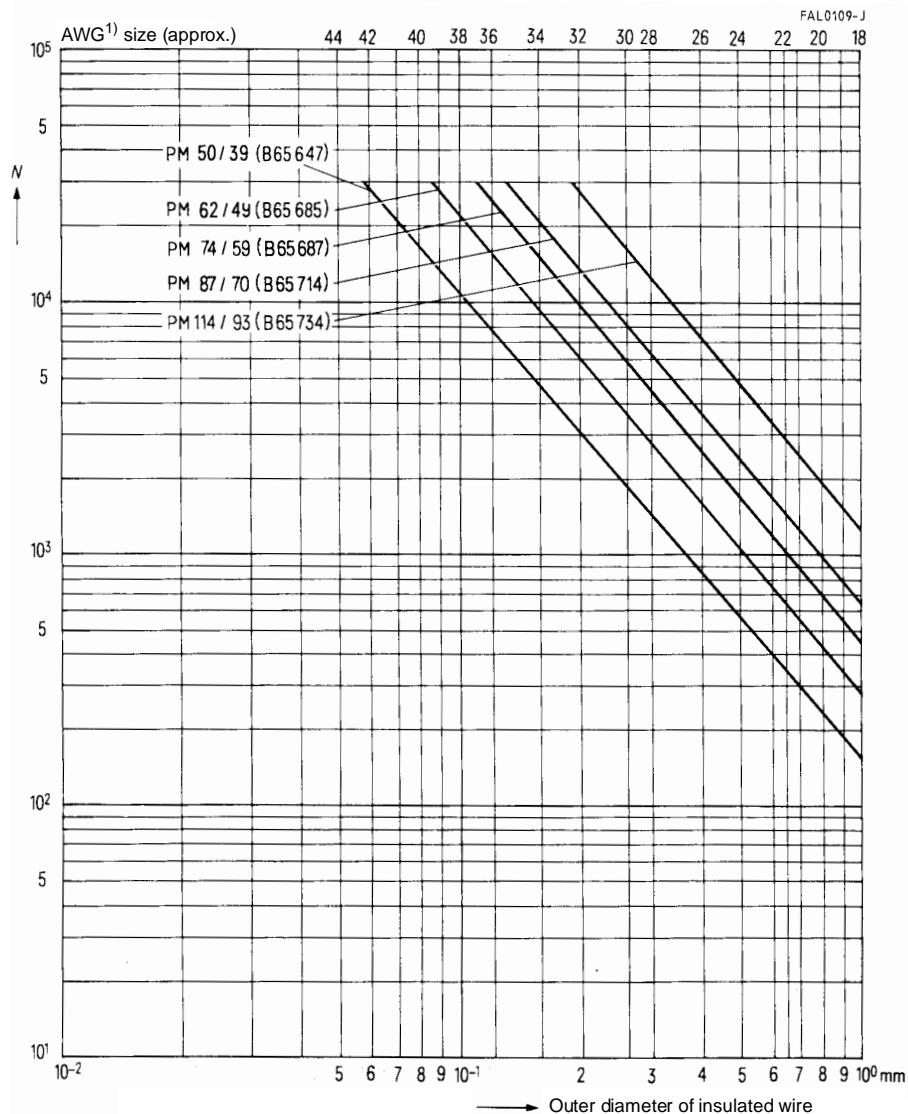
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### RM cores

Maximum number of turns  $N$  for coil formers



1) American Wire Gauge (AWG)

**PM cores**Maximum number of turns  $N$  for coil formers

1) American Wire Gauge (AWG)

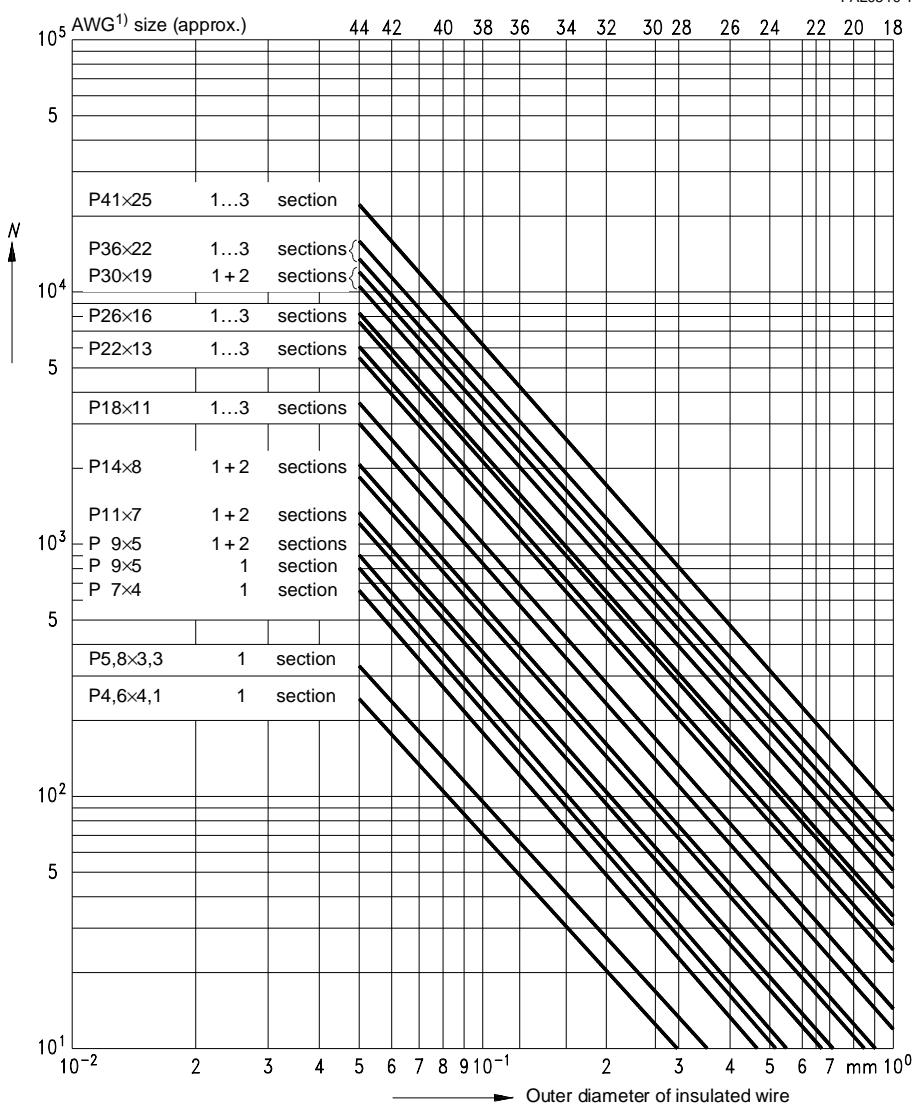
## Processing Notes

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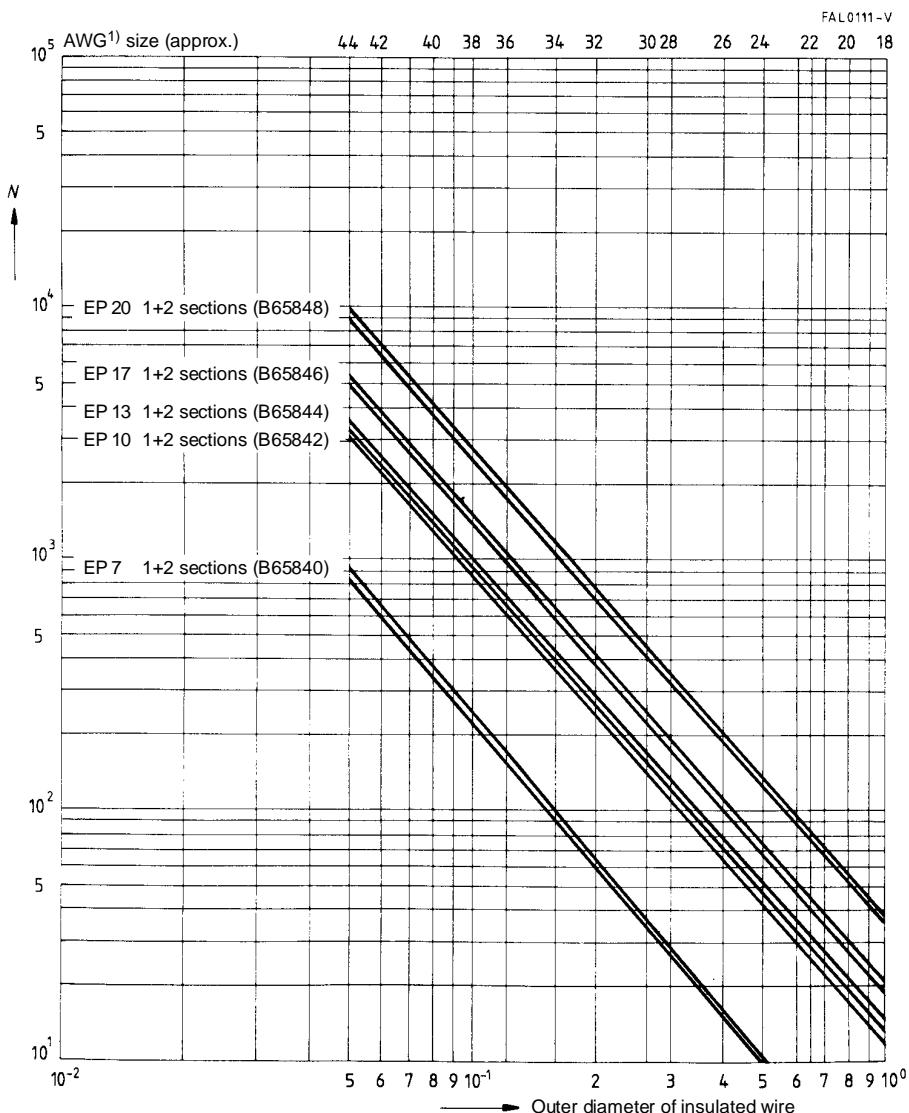
*P* cores

Maximum number of turns *N* for coil formers

FAL0540-Y



1) American Wire Gauge (AWG)

*EP cores*Maximum number of turns  $N$  for coil formers

1) American Wire Gauge (AWG)

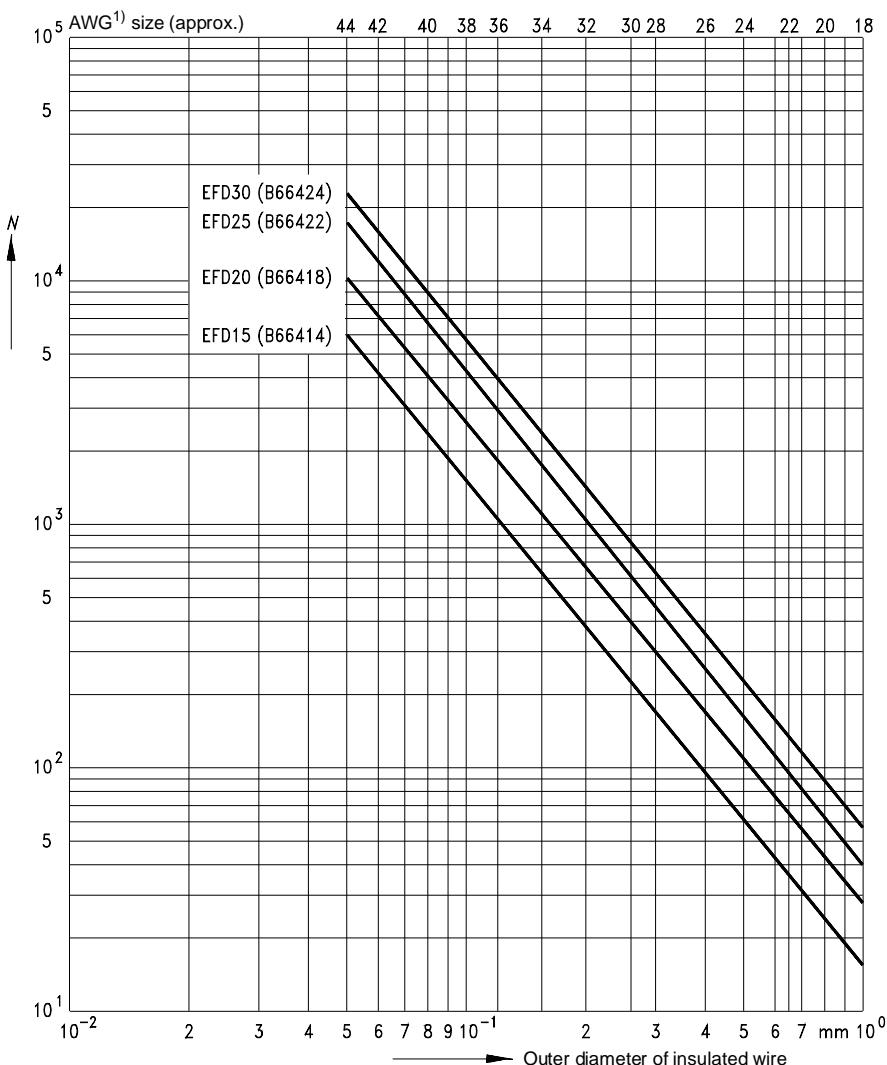
## Processing Notes

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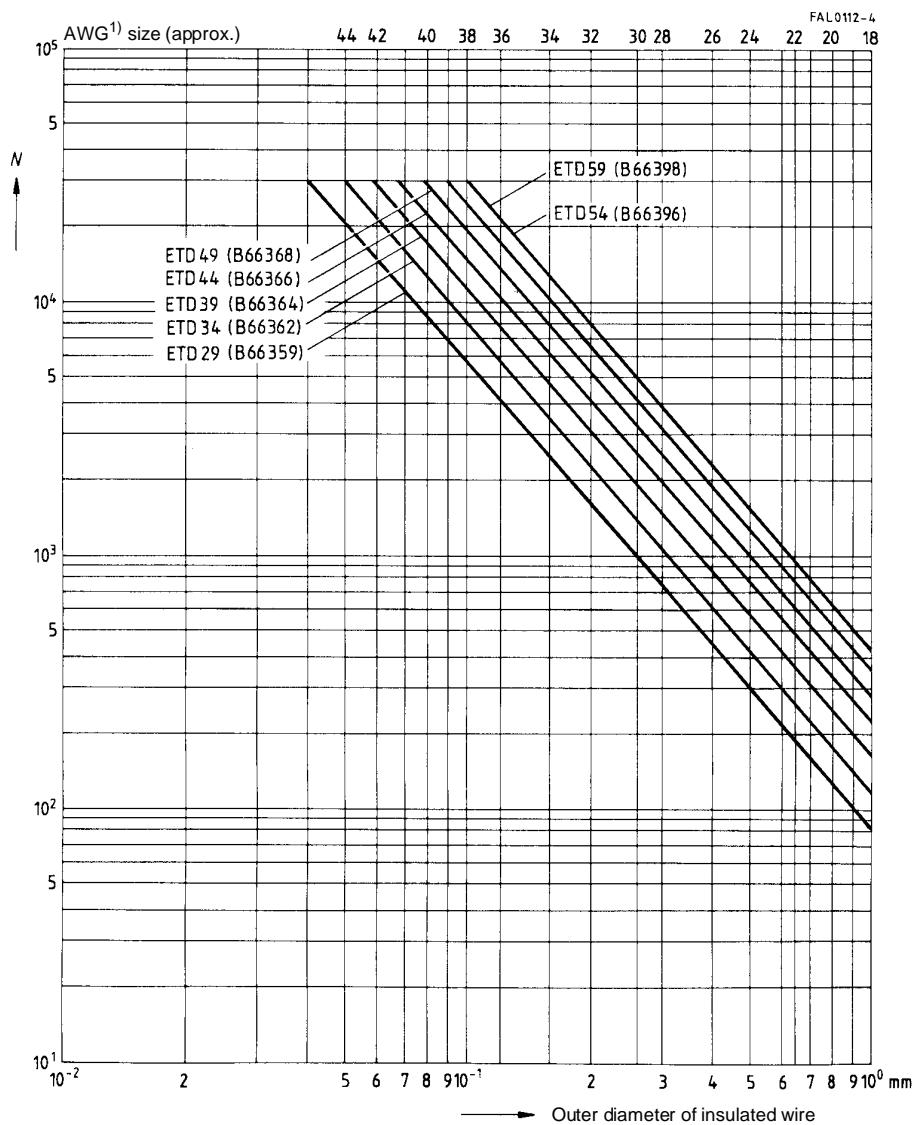
### EFD cores

Maximum number of turns  $N$  for coil formers

FAL0427-1



1) American Wire Gauge (AWG)

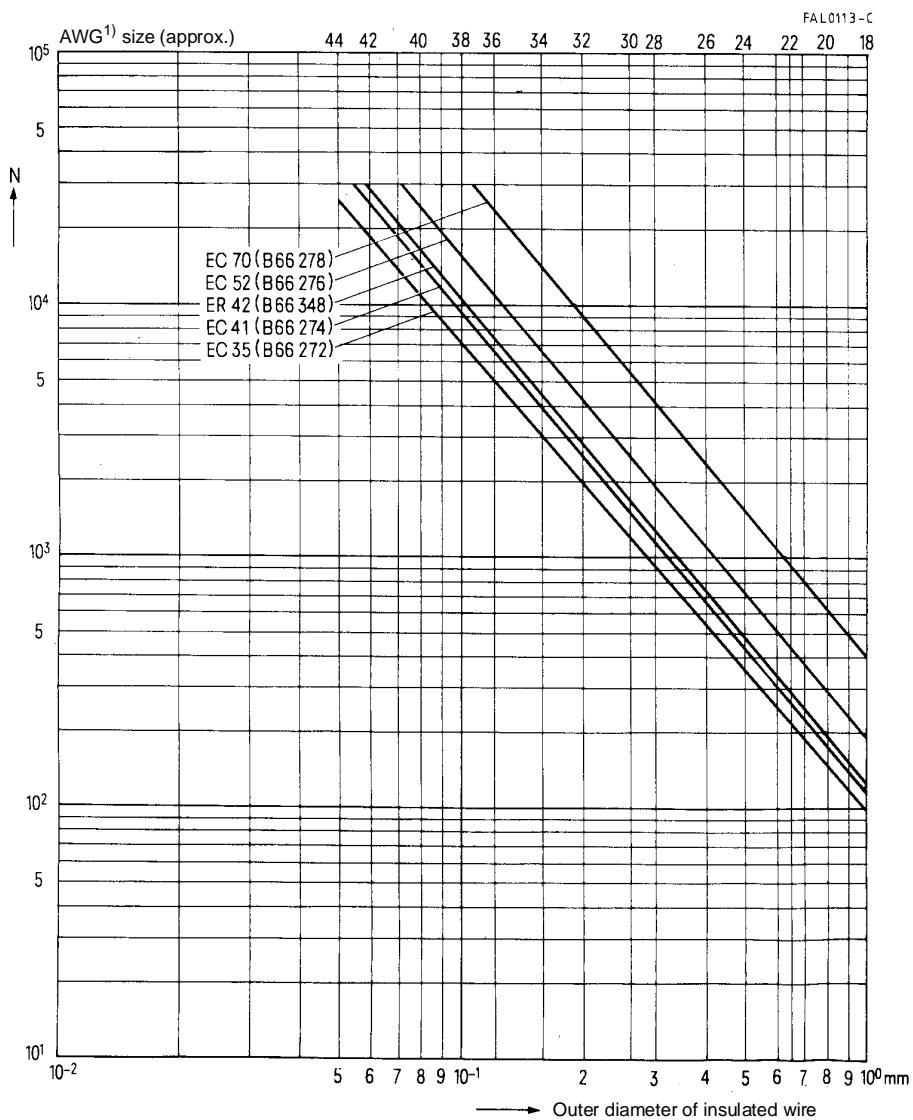
*ETD cores*Maximum number of turns  $N$  for coil formers

1) American Wire Gauge (AWG)

## Processing Notes

### EC and ER cores

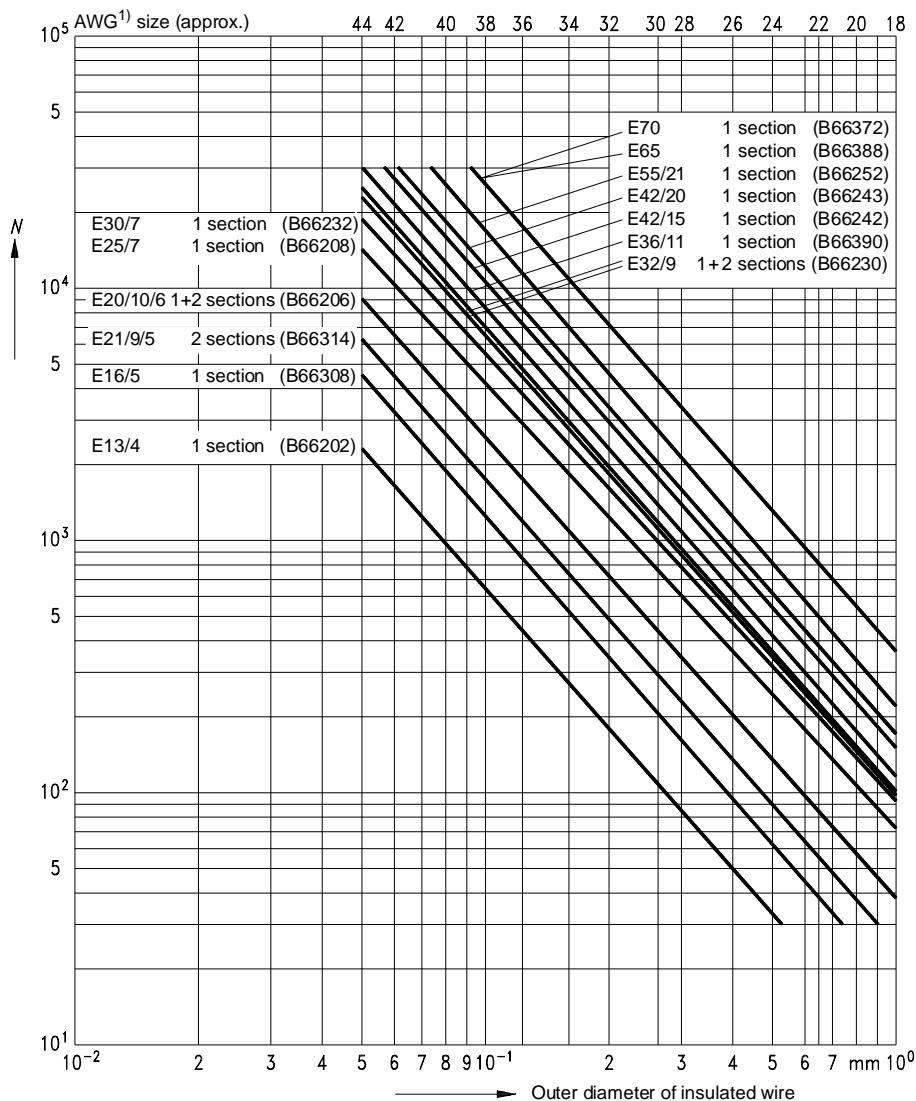
Maximum number of turns  $N$  for coil formers



1) American Wire Gauge (AWG)

*E cores*Maximum number of turns  $N$  for coil formers

FAL0541-7



1) American Wire Gauge (AWG)

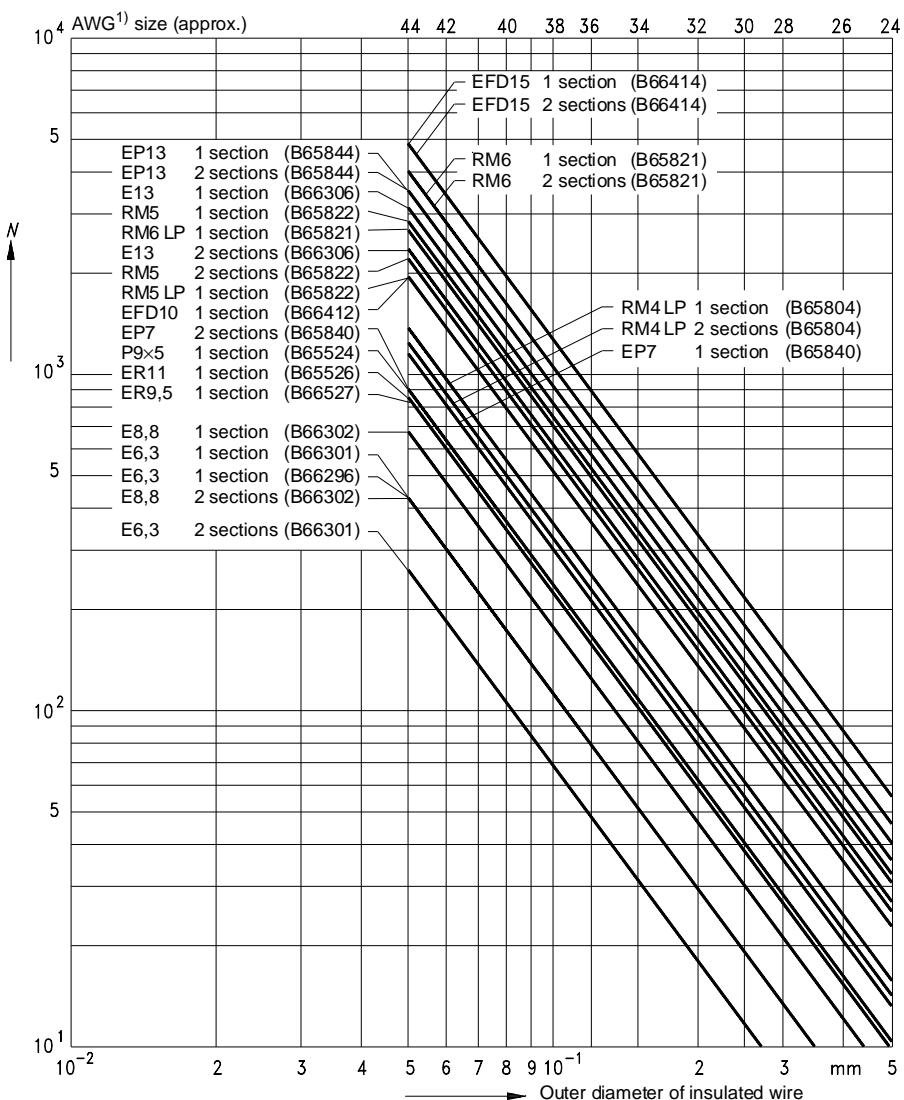
## Processing Notes

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### SMD types

Maximum number of turns  $N$  for coil formers

FAL0532-8



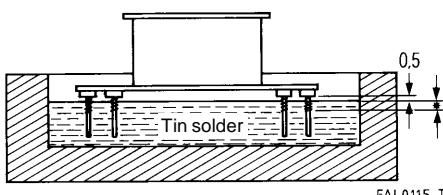
1) American Wire Gauge (AWG)

## 1.2 Soldering/Inductor assembly

The winding wires are preferably connected to the pins by dip soldering. Note the following when soldering:

- Prior to every dip soldering process the oxide film must be removed from the surface of the solder bath.
- 2 to 3 turns of the wire are dipped into the solder bath; the coil former must not be allowed to come too close to the solder or remain there for too long (see diagram).
- The following are typical values:

Bath temperature: 400 °C, soldering time: 1 s

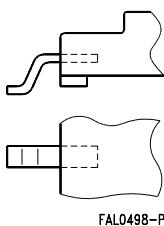


For inductor assembly, it is advisable to clamp the cores with the associated relevant mounting assemblies for the coil formers and cores. In this way it is possible to avoid the effects of external mechanical stress.

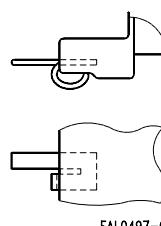
## 1.3 Terminal geometry

If thick wires need to be used in order to meet the electrical requirements, then either a greater manufacturing effort (with longer production times and increased production costs) will be necessary, or a terminal geometry suitable for use with thick wires will have to be selected. Two different SMD terminal geometries are available from S+M: gullwings and J terminals.

Gullwing terminals



J terminals



With gullwing terminals the wire is wound direct on the terminal, which is then soldered on the circuit board. With J terminals the wire is wound on a separate pin, and the J terminal is soldered to the circuit board.

So gullwings are suitable for applications with thin wire (up to approx. 0,18 mm in diameter), and J terminals for use with thick wire (upwards from 0,18 mm in diameter). These figures for wire diameter are only intended as guidelines. Depending on wire diameter, the winding arrangement, the pinning and electrical requirements, one has to decide from case to case which solution is best for the particular application.

## Processing Notes

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### 1.4 Gluing

The mating surfaces must be free of dust, grease and fibers. From the numerous adhesives available, epoxy resins with appropriate hardeners have proved particularly suitable. The following adhesives can be recommended:

- a) for cores:
  - 100 g Araldite AY 103
  - 16 g hardener HY 956
  - Pot life 1 hour max.
  - Curing 3 hours at 60 °C
  - Thermal stability of the glued joint 60 °C  
(for a short period 90 °C)
- b) for cores:
  - 100 g Araldite AY 103
  - 7 g hardener HY 992
  - Pot life approx. 8 hours
  - Curing 3 hours at 100 °C
  - Thermal stability of the glued joint 90 °C  
(for a short period 120 °C)
- c) for cores:
  - 100 g Araldite AY 103
  - 40 g hardener HY 991
  - Pot life 1 hour
  - Curing 60 minutes at 80 °C
  - Thermal stability of the glued joint 80 °C
- d) for cores:
  - 100 g Araldite AY 105
  - 50 g hardener HY 991
  - Pot life approx. 1 hour
  - Curing 45 minutes at 80 °C
  - Thermal stability of the glued joint 100 °C
- e) for coil formers:
  - 100 g adhesive A
  - 200 cm<sup>3</sup> filler Aerosil 200
  - Curing same as a)
- f) for external gluing:
  - Single-component adhesive AV 118
  - Open pot life
  - Curing 10 minutes 180 °C,  
20 minutes 160 °C,  
45 minutes 140 °C
  - Thermal stability of the glued joint 120 °C

(Manufacturer of adhesives a) – f): Ciba Geigy)

### 1.5 Adhesive application and core mating

A quantity of adhesive appropriate to the area in question is applied to the cleaned surface of the core's side walls. The centerpost must remain free of adhesive. The two core halves without coil former are then placed on a mandrel and rotated against each other two or three times to spread the adhesive. A slight ring of adhesive exuding around the edges indicates that sufficient adhesive has been applied.

On porous, low-permeability SIFERRIT materials (U and K) the adhesive should be applied and spread twice.

The next step should follow immediately since the adhesive film easily attracts dust and absorbs moisture. Therefore, the core pair with adhesive already applied is opened for a short time and the wound coil is inserted without touching the mating surfaces.

The wound coil is then fixed into position. This can be done by using resilient spacers which must be inserted before applying the adhesive. Appropriate spacers are available on request.

The coil former can also be fixed by gluing, e.g. using adhesive e), but only at one spot on the core bottom to avoid any mechanical stress caused by the difference in thermal expansion of core and coil former.

Adhesive f) is suitable for external gluing, which implies only four dots of adhesive at the joints on both sides of the openings. Because of the somewhat lower torsional strength, it should be noted that this kind of gluing should only be used with mounted cores.

### 1.6 Holding jigs

The core assembly is cured under pressure in a centering jig. The core center hole – where present – is used for centering, and two to eight coils can be held in one jig with a pressure spring. Spacers will ensure that the pressure is only exerted on the side walls of the core.

Single jigs facilitate the coil inductance measurement, which has proved useful for checking cores with small air gaps before the adhesive has hardened. Small inductance corrections can be made by slightly turning the core halves relative to each other.

### 1.7 Final adjustment

(possible only with adjustable cores)

With all assembled ferrite cores, a magnetic activation takes place as a result of mounting influences such as clamping, gluing and soldering, i.e. a disaccommodation process commences. Therefore the final adjustment for high-precision inductors should take place no earlier than one day after assembly; preferably, one week should first elapse.



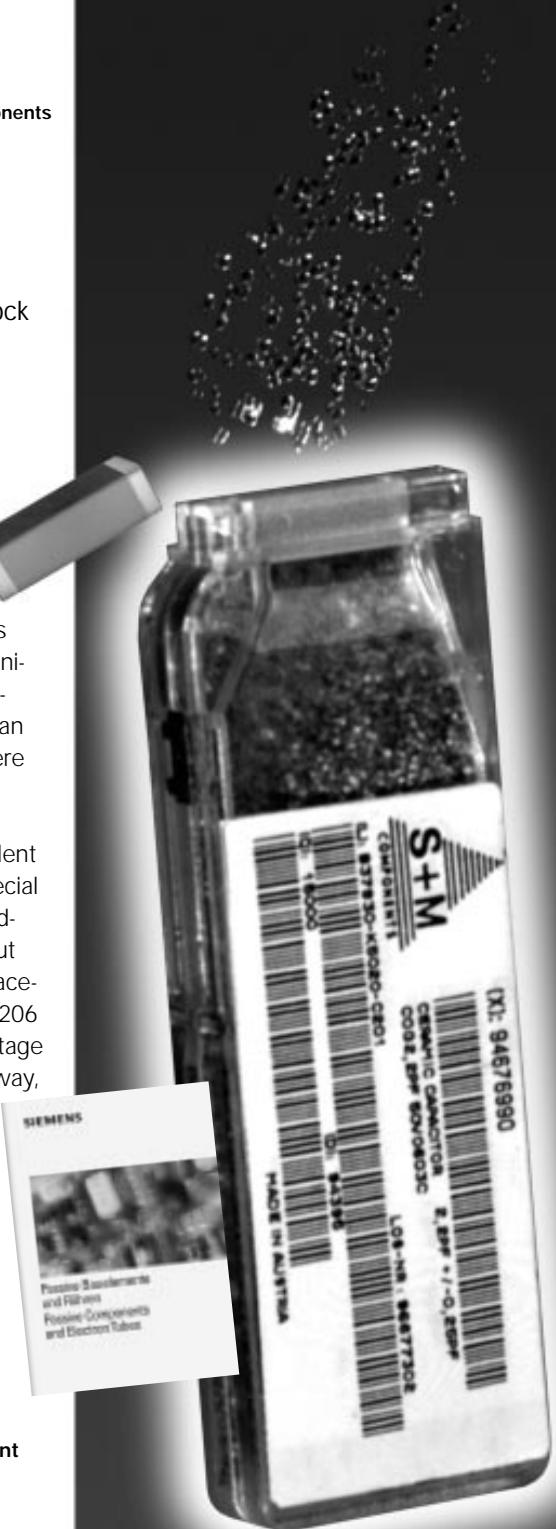
Siemens Matsushita Components

Ceramic chip capacitors from stock

## Small in size, big in performance

Our selection of capacitors ranges from standard sizes down to a miniature highlight in 0402 style. Measuring only 1 x 0.5 x 0.5 mm, it's an ideal solution for applications where space is tight, like in handies and cardiac pacemakers. At the same time all our chips can boast excellent soldering characteristics, with special terminal variants for conductive adhesion. And we also thought about the right packing for automatic placement. You get all sizes down to 1206 in bulk case for example, plus voltage ratings from 16 to 500 V. By the way, our leaded models have CECC approval of course, in fact they were certified more than ten years ago.

More in the new short form catalog!



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## Packing

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### Survey of packing modes

#### Ferrites

	Type	Packing	Para.	Page
RM cores	RM 3 to RM 10 RM 12, RM 14	Blister tapes Standard trays	3.2 2.2.1	<a href="#">170</a> <a href="#">168</a>
PM cores	PM50/39 to PM114/93	Standard trays	2.2.1	<a href="#">168</a>
P cores	all P cores P 9 × 5 to P 22 × 13	Standard trays Blister tapes on request	2.2.1 3.2	<a href="#">168</a> <a href="#">170</a>
P core halves	5,6 × 3,7 to 150 × 30	Standard trays	2.2.1	<a href="#">168</a>
EP cores	EP 7 to EP 20	Standard trays Blister tapes on request	2.2.1 3.2	<a href="#">168</a> <a href="#">170</a>
E cores	E 6,3 and E 8,8 Core length 12,6 ... 36 mm Core length > 36 mm	Bags Block packs Standard trays	2.3.1 2.2.2 2.2.1	<a href="#">169</a> <a href="#">168</a> <a href="#">168</a>
EC cores ER cores ETD cores EFD cores		Standard trays	2.2.1	<a href="#">168</a>
U and I cores	U15, U17, U25, U26, UR42 others	Block packs Standard trays	2.2.2 2.2.1	<a href="#">168</a> <a href="#">168</a>
Ring cores	Packing depends on size and version (coated/uncoated)	Standard trays Boxes Bags	2.2.1 2.3.2 2.3.1	<a href="#">168</a> <a href="#">169</a> <a href="#">169</a>
Double-aperture cores		Bags	2.3.1	<a href="#">169</a>

#### Accessories

Coil formers with pins	Polystyrene boards	2.2.3	<a href="#">169</a>
Coil formers without pins	Boxes Bags	2.3.2 2.3.1	<a href="#">169</a> <a href="#">169</a>
Mounting assemblies	Boxes Bags	2.3.2 2.3.1	<a href="#">169</a> <a href="#">169</a>
Clamps	Bags (individual clamps)	2.3.1	<a href="#">169</a>
Insulating washers	Bags (individual washers)	2.3.1	<a href="#">169</a>

## 1 General information

Our product packaging modes ensure maximum protection against damage during transportation. Moreover, our packing materials are selected with environmental considerations in mind. They are marked with the appropriate recycling symbols.

Because of the large variety of types and sizes, we use five basic kinds of packing, which are described in points 2 and 3 below:

- blister tape
- tray
- container
- reel
- magazine

The packing units are based on the following system:

### 1.1 Packing unit (PU)

Usually, a packing unit is a collection of a number of basic packages. The size of the packing unit is stated for the particular components in their data sheets. When ordering, please state complete packing units if possible. We reserve the right to round the ordered quantity accordingly.

### 1.2 Dispatch unit

A number of packing units are combined to form a dispatch unit. Standard dispatch units for large quantities are a Europallet or pallet carton. For small quantities, folding corrugated cardboard boxes are used in standard sizes. In the case of small quantities a dispatch unit may also include packages with other components.

### 1.3 Bar-code standard label

On the product packing label (standard label) we include bar-code information in addition to plain text. In addition to benefits relating to the internal flow of goods, this provides above all a more rapid and error-free means of identification checking for the customer.

The bar code used is Code 39 (medium density). Two different versions of the label are available.

- a) Example of a label with vendor code number (L), quantity (Q) and date code (D) in bar code



The date code (D) indicates the quality assurance release date, which enables the respective production batch to be traced back to the respective production stage.

- b) Example of a label with customer code number (P), quantity (Q) and date code (D) in bar code



In this case the vendor code number is imprinted at bottom left in plain text.

## 2 Modes of packing

### 2.1 Blister tape

Blister packing was specially devised for handling by automatic systems but has also proved to be very good for conventional handling, especially where small quantities are concerned. See point 3.2 for a detailed description and a list of the core types that can be supplied in this type of packing.

### 2.2 Tray (pallet)

#### 2.2.1 Standard tray

The polystyrene tray (basic package) is the standard packing for most types of core. The area of 200 mm × 300 mm corresponds to the module dimensions of DIN 55 510 and is based on the area of the 800 mm × 1200 mm Europallet. Depending on the overall height of the trays and the numbers contained, several trays will be stacked to form a packing unit and provided with a corrugated cardboard cover. For the protection of the cores the entire stack is also shrink-wrapped in polyethylene film.

Each core is enclosed in a separate compartment. When P cores and similar types are packed in sets, the halves of the core pairs are packed so that their pole faces are opposite one another. As a rule their association is identified by markings in the polystyrene (recessed webs, thinner webs). In the case of P3,3 × 2,6 and P4,6 × 4,1 cores the halves of a set are not located in a single tray but in different trays of a packing unit.

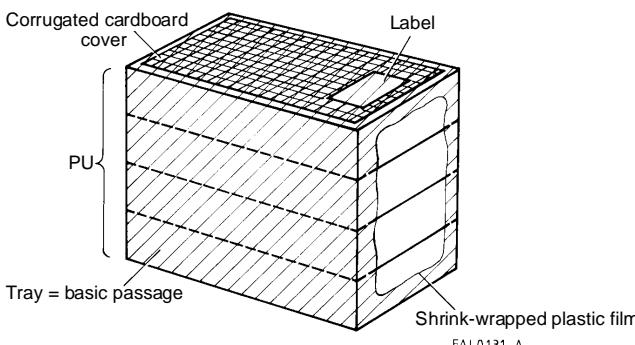
#### 2.2.2 Block packing

For E and U core we prefer block packing in trays with the dimensions 200 mm × 300 mm. The symmetry, position, length and spacing of the blocks are always the same. The height of the tray is dependent on the size of the core. For the makeup of a packing unit see point 2.2.1.

Block packing can be supplied in boxes of corrugated cardboard (special packing unit!) on request.

Block packing permits highly rationalized handling and is designed for automatic processing.

#### *Packing unit for standard or block packing*



### **2.2.3 Board for coil formers with pins**

For coil formers with pins, a polystyrene board is generally used. The coil formers are inserted in the board with the pins downwards. A number of stacked boards (packing unit) are enclosed in a jacket of cardboard, or packed in a folding box, and in some cases are shrink-wrapped in plastic.

## **2.3 Container**

### **2.3.1 Bag**

Small ferrite parts are packed in flat polyethylene bags. The number per bag depends on the volume of the parts. Generally four bags in a corrugated cardboard box form a packing unit.

Small accessories (clamps, mounting assemblies, and also pinless and SMD coil formers) are also packed in this way. The size of the bag depends on the volume of the parts (packing unit).

### **2.3.2 Box**

Coated ring cores of medium size are packed in cardboard boxes with cardboard or polyethylene foam inlays. The number per box depends on the volume of the cores.

Accessories (large mounting assemblies, coil formers etc.) are packed in boxes of cardboard or corrugated cardboard.

## **3 Delivery modes for automatic processing**

### **3.1 General information on inductor production**

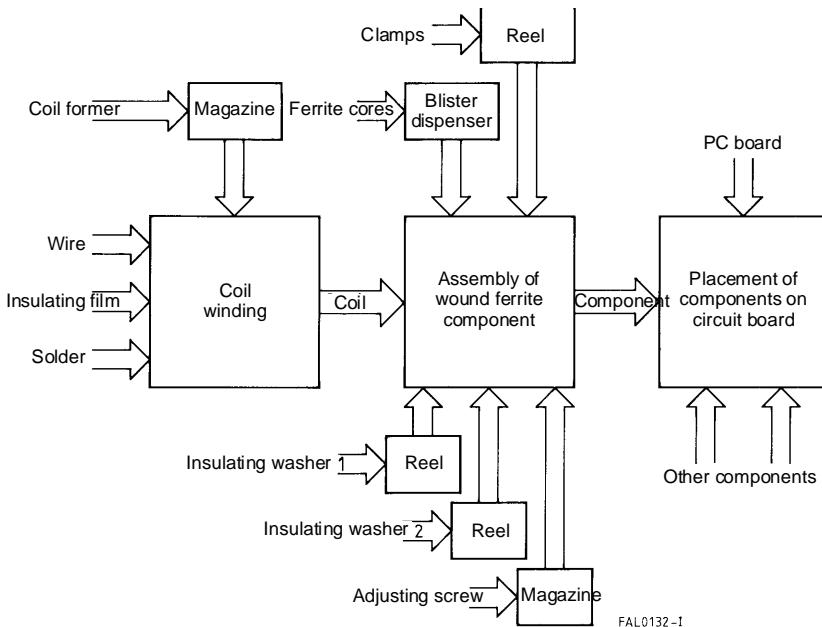
The inductor parts described in the following can be handled by automatic manufacturing systems. In addition to automatic winding machines - which can be combined with wrapping, fluxing and soldering stations - flexible, high-performance automatic assembly lines are available. Design and packing of the individual parts (ferrite cores, coil formers, clamps, insulating washers and adjusting screws) have been optimized for automatic processing and permit easy feeding to the various stations of production lines.

We supply RM cores up to RM10 (P and EP cores on request) blister-taped in dispenser boxes. By inserting a plate-shaped resilient insulating washer between core and coil former, gluing can be dispensed with.

We also provide consulting services with examples of implementations to customers planning to introduce automatic production lines.

# Packing

## Production sequence



### 3.2 Cores in blister tape

The cores are packed in sets ready for assembly, i.e. a stamped core with the base upwards and an unstamped core (possibly with a threaded sleeve) with the pole face upwards. The blister tapes have a hole at one end for orientation purposes (see also illustration). The tapes are sealed with a paper cover. Looking at a tape with the hole on the left and the paper cover on top, then after removing the paper cover the stamped cores will be in the upper row and the unstamped cores of the sets in the lower row.

Several blister tapes are combined in a box with a perforated tear-off cover (dispenser pack) to form a packing unit. The tapes are packed so that the orientation hole appears in the dispenser opening. The box is shrink-wrapped in polyethylene film.

The following table lists the core types which are available in blister tape:

Type	Dimensions of blister tape $l \times b \times d$ mm	Spacing mm	Spacing upper/ lower row mm	Dimensions of dispenser pack $l \times b \times h$ mm	Sets/ tape	Tapes/ box	Sets/ box	Approx. net weight g
<b>RM cores <sup>1)</sup></b>								
RM 3 <sup>2)</sup>	340 × 60 × 4,4	17,0	10,65	347 × 63 × 46	40	10	400	220
RM 4	340 × 60 × 6,6	17,0	27,5	349 × 63 × 203	20	30	600	1000
RM 4 LP	340 × 60 × 5,0	17,0	27,5	349 × 63 × 203	20	40	800	
RM 5	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	1550
RM 5 LP <sup>3)</sup>	340 × 60 × 5,0	17,0	27,5	349 × 63 × 203	20	40	800	
RM 6	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	2550
RM 6 LP <sup>3)</sup>	340 × 60 × 5,7	17,0	27,5	349 × 63 × 203	20	35	700	
R 6	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	2550
RM 7	295 × 82 × 9,4	29,5	38,5	301 × 85 × 240	10	25	250	1925
RM 7 LP <sup>3)</sup>	295 × 82 × 5,9	29,5	38,5	301 × 85 × 240	10	40	400	
RM 8	295 × 82 × 11,8	29,5	38,5	301 × 85 × 240	10	20	200	2600
RM 8 LP <sup>3)</sup>	295 × 82 × 7,9	29,5	38,5	301 × 85 × 240	10	30	300	
RM10	295 × 82 × 11,8	29,5	38,5	301 × 85 × 240	10	20	200	4600
RM10 LP <sup>3)</sup>	295 × 82 × 9,4	29,5	38,5	301 × 85 × 240	10	25	250	
<b>EP cores <sup>4)</sup></b>								
EP 7	340 × 60 × 5,0	17,0	27,5	349 × 63 × 203	20	40	800	1260
EP 10	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	1375
EP 13	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	2550
EP 17	295 × 82 × 11,8	29,5	38,5	301 × 85 × 240	10	20	200	2220
EP 20	295 × 82 × 11,8	29,5	38,5	301 × 85 × 240	10	20	200	5640
<b>P cores <sup>4)</sup></b>								
P 9 × 5	340 × 60 × 4,0	17,0	27,5	349 × 63 × 203	20	50	1000	800
P 11 × 7	340 × 60 × 4,0	17,0	27,5	349 × 63 × 203	20	50	1000	1700
P 14 × 8	295 × 82 × 5,9	29,5	38,5	301 × 85 × 240	10	40	400	1280
P 18 × 11	295 × 82 × 9,4	29,5	38,5	301 × 85 × 240	10	25	250	1500
P 22 × 13	295 × 82 × 9,4	29,5	38,5	301 × 85 × 240	10	25	250	3250

For ordering codes refer to the individual data sheets.

Dimensions are nominal; tolerances given in design drawings.

1) Blister packing is standard

2) Box without tear-off cover

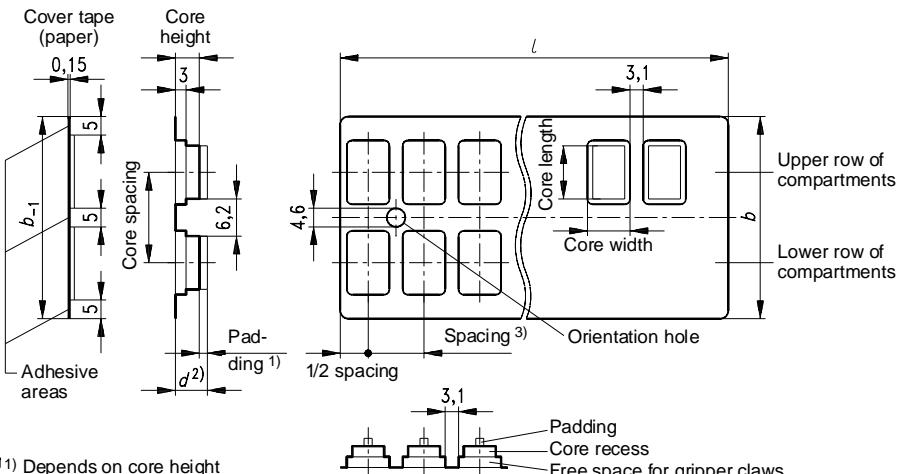
3) Blister packing for RM 5 LP to RM 10 LP in preparation

4) Polystyrene tray is standard (blister packing on request)

# Packing

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## Blister tapes



<sup>1)</sup> Depends on core height

<sup>2)</sup> Thickness incl. cover tape

<sup>3)</sup> For RM3: 2 sets per spacing

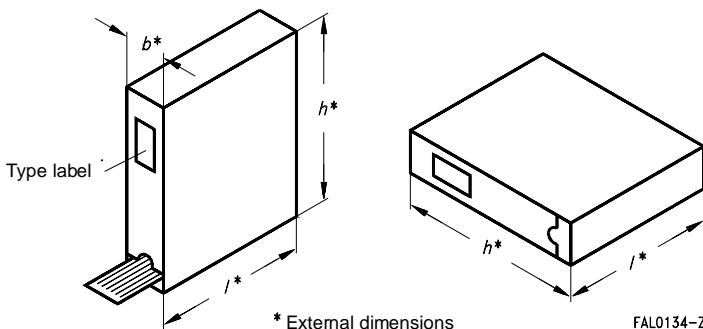
FAL0472-V

The blister compartments always comprise the following function spaces: a free space for the gripper claws, the recess in which the core rests and the padding.

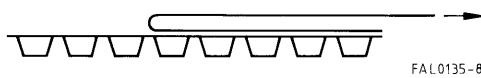
The free space enables the cores to be removed by mechanical grippers. On the reverse side of the blister, these free spaces lead to a regular grid arrangement with a spacing of 6,2 mm and 3,1 mm. The blisters should be guided and stopped at these intervals. A hanging arrangement is to be preferred, because this avoids problems arising in case the blister height or padding thickness varies.

The core recess centers the core in the blister compartment.

The padding serves as protection during transport and as spacing to achieve correct filling of the dispenser pack. The shape and position of the padding may vary, depending on the production method used. All padding dimensions given must therefore be considered to be subject to change at any time.

**Dispenser pack**

To open a blister tape manually, peel back the paper cover tape smoothly but not too quickly, along the axis of the tape as shown in the following illustration.



When opening a blister tape automatically, it is advisable not to completely remove the paper cover. Rather, the cover paper should be divided up by means of 4 longitudinal cuts so that the mating surfaces remain on the blister (cf. blister tape illustration). The paper strips produced above the two rows of compartments can then be easily lifted. This avoids malfunctions resulting from fluctuations in the adhesive properties of the paper sealing tape.

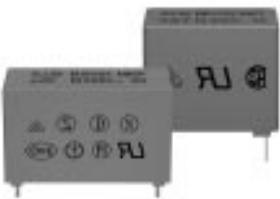


Siemens Matsushita Components

EMI suppression capacitors

## Play it safe

Whether video recorder, television, refrigerator or toaster – our EMI suppression capacitors do a grand job in every possible kind of entertainment and consumer electronics appliance. They've also proven their worth in switch-mode power supplies for PCs. No wonder, because the advantages of film technology are there to be seen: low cost, no risk of failure through damp, and optimum self-



healing capability. The result – less destruction of equipment and ensuing fires. Plus the line is safeguarded against surges. In this way our capacitors satisfy strict user's need for safety, and the EMC standards too of course.

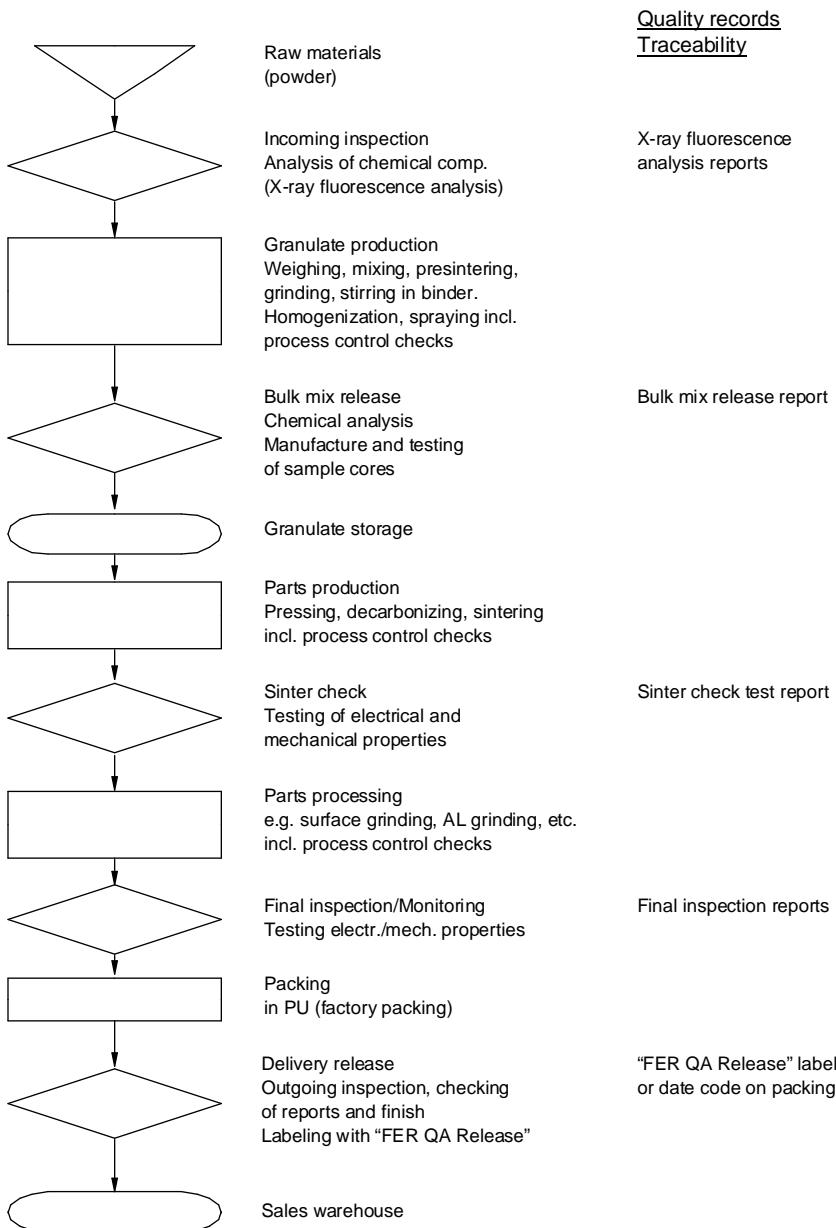


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## Quality Considerations

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### 1 Production sequence and quality assurance during ferrite manufacture (schematic)



# Quality Considerations

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## 2 General information

### 2.1 Ferrites quality objectives

Quality plays a central role in the competition for the better and more favorable product. As a guiding principle for the continual improvement of product and service quality, the Ferrites Division has set quality objectives which are regularly updated and successively extended to all products. These serve as target criteria for new developments and are similarly required of current products.

To realize the objectives for existing products, projects involving teams of staff from all areas are working on product and process improvements without regard to departmental boundaries.

### 2.2 Total Quality Management and Siemens *top* campaign

The aim of Total Quality Management (TQM) and the Siemens *top* campaign is to gear the entire organization to optimally satisfying customer requirements.

Following the principle of “quality from the very start”, everyone in our company is involved in realizing this objective. Systematic planning, careful selection of our suppliers and mastery of the development and production processes are the most important guarantors for maintaining a high quality level.

Internal measures to promote quality, such as training courses, quality group work, working committees and Q audits, strengthen the sense of responsibility of every employee and help to recognize and avoid errors.

Modern quality instruments such as FMEA<sup>1)</sup> and SPC<sup>2)</sup> supplement and support our quality assurance and enhancement measures.

## 3 Ferrites quality assurance system

The documented QA system of the Ferrites Division forms the basis for all quality assurance activities. At all locations the Ferrites QA systems satisfy the international QA standard ISO 9000, as witnessed by certificates from the DQS (Deutsche Gesellschaft zur Zertifizierung von Qualitäts-sicherungssystemen) or the AFAQ (Association Française pour l'Assurance de la Qualité).

### 3.1 Quality assurance for incoming goods

To ensure the quality of raw materials and bought-in parts, the ferrite plants of S+M Components work only with suppliers who can establish proof of both a high quality product and an effective quality assurance system.

Where it is necessary for process control – as in the case of the iron oxide for example – the plants perform their own incoming inspections.

### 3.2 Quality assurance in production

The production processes are monitored and controlled by constant examination of the process parameters and (intermediate) products. These inspections are included in the company-wide statistical process control (SPC).

At the conclusion of each major production stage a release inspection (“quality control gate”) is performed to establish proof of the quality.

1) FMEA Failure Mode and Effects Analyses

2) SPC Statistical Process Control

### **3.3 Traceability**

By recording the lot or batch numbers on the documentation accompanying the process, complete traceability is maintained in the production sequence.

After delivery, traceability to the internal release inspections ("quality control gates") is ensured by the date code which is printed on the label ([see page 167](#)).

### **4 Delivery quality**

The quality level of the products released for delivery is constantly monitored, recorded and evaluated. These data for ferrite cores are available on request.

### **5 Classification of defects, AQL values**

A product is considered defective if it does not comply with the specifications given in the data sheets or in the agreed technical purchase specification.

Use of the sampling plan according to IEC 410/DIN ISO 2859 (previously DIN 40 080, contents identical to MIL STD 105 D) is recommended where incoming inspections are carried out by the user.

#### **5.1 Electrical properties**

The measuring conditions can be found in the chapter "General – Definitions". The product data and relevant tolerance limits are defined in the respective data sheets. The material data given in the chapter "SIFERRIT materials" are to be understood as typical values.

Measuring conditions deviating from the data book require agreement between the customer and the S+M Ferrites plant.

#### **5.2 Dimensions**

The dimensioned drawings in the individual data sheets are definitive for the dimensions.

#### **5.3 Finish**

Assessment of the finish of ferrite cores is performed in accordance with S+M finish specifications. These are based on IEC 421 and have been introduced by S+M Components as a proposed standard. Detailed drawings, which are available on request, specify the maximum permissible limit values for damage which can never be totally excluded with ceramic components. Assessment of the solderability of terminal pins for coil formers and clamps is carried out in accordance with IEC 68 2-20, test Ta, method 1 (aging 3).

#### **5.4 AQL values**

Within the framework of our quality goals, we are gradually tightening the AQL values which are intended for use in the customer's incoming goods inspection, currently the value AQL 0,25 is applicable.



Siemens Matsushita Components

Big performance ex SCS stock

# 2,000 PTC thermistors in one go

A hot tip in PTCs for overload protection: our maximum order level of 2,000 pieces. And with more than 50 different models, we've got a lot more to offer too. Operating voltages from 12 to 550 V, rated currents up to 2.5 A, maximum switching currents of 15 A, plus a broad selection of leaded versions and SMDs.



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# Standards and Specifications

---

## 1 General information

Ferrite parts from S+M Components are manufactured in accordance with IEC and DIN specifications. The relevant standards are quoted in the selector guide and in the individual data sheets.

It would take up too much space here to enumerate all standards dealing with ferrites. In the supplement to DIN 41 280 (Soft Magnetic Ferrite Cores: Material Properties) all relevant DIN, CECC and IEC standards are listed. This supplement is regularly updated.

The EU's standardization system currently being set up is exclusively restricted to the harmonization of international standards. A binding CE identification mark is envisaged for components having a safety implication.

The following standards should be mentioned because of their general significance:

IEC 68	Basic environmental testing procedures
IEC 85	Thermal evaluation and classification of electrical insulation
IEC 367-1	Cores for inductors and transformers for telecommunications Part 1. Measuring methods
IEC 401 (1993)	Information on ferrite materials appearing in manufacturers' catalogs of transformer and inductor cores
IEC 410 and DIN ISO 2859	Sampling plans and procedures for inspection by attributes
DIN 40 040	Application categories and reliability
DIN EN 50 008	Industrial low-voltage switchgear Inductive proximity switches, type A, for DC voltage, 3 or 4 terminals
UL 94	Tests for flammability of plastic materials for parts in devices and appliances
DIN ISO 9000 to DIN ISO 9004	Quality management and quality assurance standards

## 2 Quality assessment

The DIN and IEC standards mainly specify dimensions, designations and magnetic characteristics, whereas the European system of quality assessment CECC and the harmonized DIN-CECC standards additionally define methods of measurement and quality levels.

Since 1982 the IEC has been establishing the so-called IEC Q-system, which will have worldwide applicability. German DIN IEC standards are being harmonized with this quality system.

CECC and IEC-Q standards have a similar structure: they are subdivided into generic specifications (GS), sectional specifications (SS) and blank detail specifications (BDS). The numbering system of QC is analogous to that of CECC.

The detail specifications of CECC and IEC do not fully correspond to each other.

A quality assessment system of "Capability Approval" for the production of ferrite parts is being established.

## **Standards and Specifications**

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### **2.1 DIN-CECC system**

GS	DIN 45 970 Part1 (CECC 25 000)	Inductor and transformer cores for telecommunications
SS/BDS	DIN 45 970 Part 11 (CECC 25 100)	Magnetic oxide cores for inductor applications
SS/BDS	DIN 45 970 Part 12 (CECC 25 200)	Magnetic oxide cores for linear transformers
SS/BDS	DIN 45 970 Part 13 (CECC 25 300)	Magnetic oxide cores for power applications
SS	DIN 45 970 Part 14 (CECC 25 400)	Adjusters used with magnetic oxide cores for use in inductors and tuned transformers
BDS	DIN 45 970 Part 141 (CECC 25 401)	Adjusters used with magnetic oxide (ferrite) cores for use in inductors and tuned transformers
GS	CECC 26 000	Custom-built transformers and inductor cores

### **2.2 DIN-IEC system**

GS	DIN IEC 723 Part 1 QC 250 000 (IEC 723-1)	Inductor and transformer cores for telecommunications
SS	DIN IEC 723 Part 2 QC 250 100 (IEC 723-2)	Magnetic oxide cores for inductor applications
BDS	DIN IEC 723 Part 2-1 QC 250 101 (IEC 723-2-1)	Magnetic oxide cores for broadband transformer applications; quality assessment level A
SS	DIN IEC 723 Part 3 QC 250 200 (IEC 723-3)	Magnetic oxide cores for broadband transformers
BDS	DIN IEC 723 Part 3-1 QC 250 201 (IEC 723-3-1)	Magnetic oxide cores for broadband transformer applications; quality assessment level A
SS	DIN IEC 723 Part 4 QC 250 300 (IEC 723-4)	Magnetic oxide cores for transformers and chokes for power applications
BDS	DIN IEC 723 Part 4-1 QC 250 301 (IEC 723-4-1)	Magnetic oxide cores for transformers and chokes for power applications; quality assessment level A
SS	DIN IEC 723 Part 5 QC 250 400 (IEC 723-5)	Ferrite adjusters for adjustable inductors and transformers
BDS	DIN IEC 723 Part 5-1 QC 250 401 (IEC 723-5-1)	Ferrite adjusters for adjustable inductors and transformers; quality assessment level A

## 2.3 Detail specifications

DIN 45 970 (CECC) contains the following detail specifications for P and RM cores, material classes J4, J5 and M1 (DIN 41 280).

Part 114	P 9 × 5	J 4	Part 121	RM 5	M 1
Part 115	P 11 × 7	J 4	Part 122	RM 6	M 1
Part 116	P 14 × 8	J 4	Part 123	RM 8	M 1
Part 117	P 18 × 11	J 4	Part 124	RM 5	M 1 } without
Part 118	P 22 × 13	J 4	Part 125	RM 6	M 1 } center
Part 119	P 26 × 16	J 4	Part 126	RM 8	M 1 } hole
Part 1110	P 30 × 19	J 4			
Part 1111	P 36 × 22	J 4			
Part 1112	RM 5	J 5			
Part 1113	RM 6	J 5			
Part 1114	RM 8	J 5			
Part 1115	P 11 × 7	J 5			
Part 1116	P 14 × 8	J 5			
Part 1117	P 18 × 11	J 5			
Part 1118	P 22 × 13	J 5			
Part 1119	P 26 × 16	J 5			

The material properties of J4 and J5 can be implemented with N48 and those of M1 with materials N30 and T35.

Further specifications that are relevant for S+M Components products are the French UTE standards:

UTE 83313-001	CECC 25301-001	ETD 34	8P
UTE 83313-002	CECC 25301-002	ETD 39	8P
UTE 83313-003	CECC 25301-003	ETD 44	8P
UTE 83313-004	CECC 25301-004	ETD 49	8P

Class 8P can be implemented with N27.

## 3 IEC standards

The IEC standardization has been concluded for:

IEC 1246 (1994)	E cores
IEC 647 (1979)	EC cores
IEC 1596 (1995)	EP 7 - 30
IEC 1185 (1995)	ETD 19 - 59
IEC 133 (1985)	P cores
IEC 1247 (1995)	PM cores
IEC 431 (1983)	RM 4 to RM 10
	RM 12, RM 14 (amendment 1, 1995)

Please refer to the latest CO publications.



Siemens Matsushita Components

A whole lot of ring core chokes

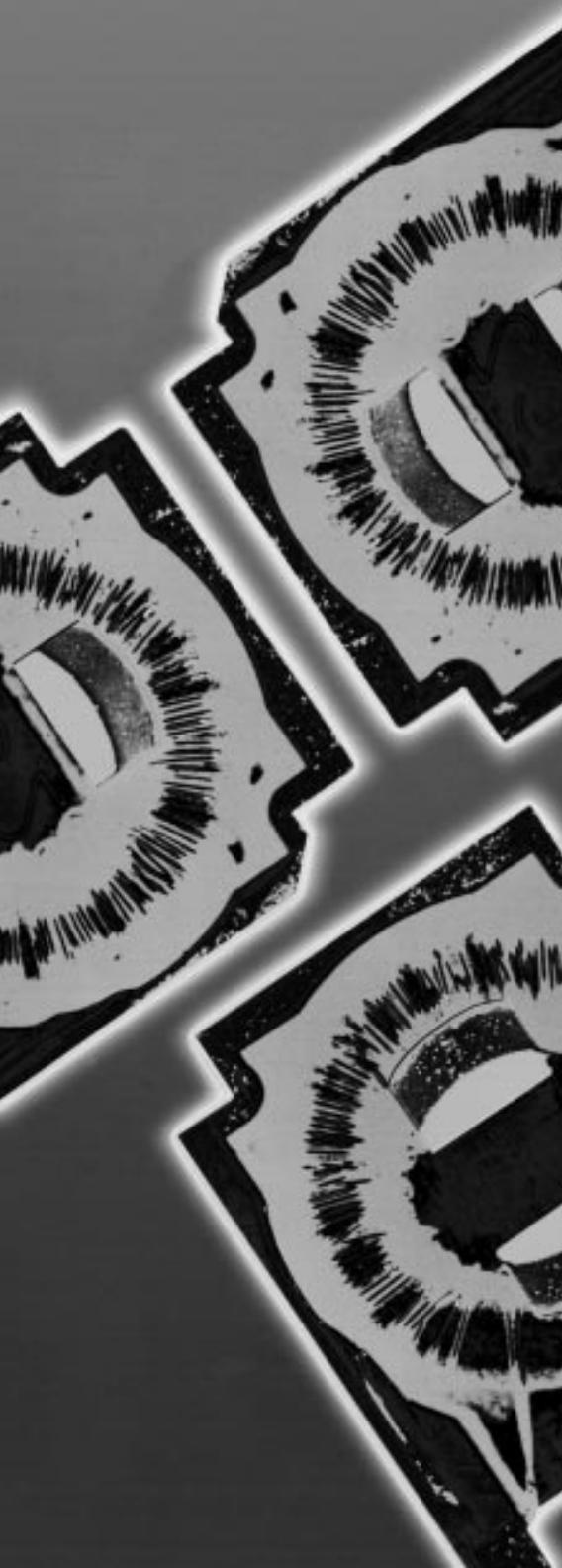
## Chokes to your choice

You urgently need particular ring core chokes? That's no problem, we have 200,000 pieces in stock and deliver reliably through SCS. Our automated production guarantees



the best of reliability too. It turns out chokes in different versions: flat and upright, with current rated from 0.4 to 16 A. UL and VDE approved, and complying with the latest EMC standards of course.

**SCS – dependable, fast and competent**



# RM Cores

## General Information

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### 1 General information

The demand for coil formers with integrated pins for efficient winding gave rise to the development of compact RM (Rectangular Modular) cores. Furthermore, this design allows high PCB packing densities. RM coil formers and accessories are suited to automatic processing.

During assembly, RM cores are held in place by clamps which engage in recesses in the core base. The holding forces defined for our further developed RM clamps mean that in the majority of applications the glue bonding usually employed previously (cf. chapter on "Processing notes", page 162) is no longer required. The various clamping forces defined, which have been verified by S+M Components through measurements, are specified in the individual data sheets.

The core dimensions are matched to standard PCB grids. RM6 means, for example, that the core with coil former fills a square basic area  $6 \times 6$  modules (1 module  $\approx 2,54$  mm) =  $15,24 \times 15,24$  mm<sup>2</sup>. The mainly used core sizes RM4 through RM14 are specified in IEC 431 and in DIN 41980, the coil formers in DIN 41981.

### 2 Applications

- Originally RM cores from Siemens (today S+M Components) were essentially designed for two major applications, i.e.
  - very low-loss, highly stable filter inductors and other resonance determining inductors (materials N48, M33 and K1) and
  - low-distortion broadband transmission at low signal modulation (materials T38, T35, N30, N26).
- Even today there is still a high demand for RM cores suited to these applications.
- RM cores are increasingly required for power applications. For this purpose our core series made of materials N67, N87 and N49 (ungapped) is particularly well suited. Matching coil formers with larger pin spacings are available. RM cores without center hole (higher  $A_L$  value and greater power capacity) are used for transformer applications.
- Our product range also includes low-profile RM cores, whose significantly reduced overall height makes them suitable for small-signal, interface and matching transformers and also for transformer and energy storage chokes in DC/DC converters with a high pulse rate (materials N87 and N49). The low-profile types are particularly suited for applications where the winding is printed onto the PCB and the core is fitted to the board from either side.
- In addition to conventional accessories, SMD coil formers are available for RM4 Low Profile, RM5, RM6 and RM6 Low Profile (refer also to the brochure "SMD Transformers, Ferrites and Accessories for SMD Inductors").
- RM cores with waisted centerpost (RM8 through RM14) are suitable for nonlinear chokes in switch-mode power supplies. For RM10 and RM12 we supply matching coil formers.  
The representation of the  $A_L$  value versus the ampere-turns should be considered typical. Other curves can be achieved on request by adapting the geometry.
- RM cores with or without center hole can be supplied in any material on request.
- For power applications, particularly for compact energy storage chokes, we supply the RM12 and RM14 cores with optimized, strengthened base thickness.

# **RM Cores**

## **General Information**

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### **3      $A_{L1}$ value**

For core types produced from a power material, the minimum  $A_{L1}$  value is specified. The  $A_{L1}$  value is defined at a flux density of  $\dot{B} = 320$  mT and a temperature of 100 °C. The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{\min}$ .

### **4      Marking of RM core sets**

The material and the  $A_L$  value are always stamped on RM cores > RM3, the material and "o. L." (= without air gap) are stamped onto ungapped cores. Only one core half of the two comprising a set carries the marking. With cores having an unsymmetrical air gap (the total air gap is ground into one half) the ground half carries the marking, with cores including a glued-in threaded sleeve the half without sleeve is marked.

### **5      Coil formers made from the new material Bakelite blue**

The subject of environmental protection has always been taken very seriously in our company. In this respect the new material for RM coil formers satisfies the requirements better than previously used synthetic materials.

Bakelite blue ensures enhanced environmental compatibility for the coil formers since these are now

- formaldehyde-free
- halogen-free
- without free phenols
- UL94-V0 listed.

Moreover, they offer the following advantages:

- improved insulation between winding wires and ferrite core by means of an insulation web
- no outgassing impairing solderability
- dimensional thermostability better than defined in IEC 68-2-20, allowing successful processing at solder bath temperatures up to 500 °C of winding wires which are difficult to solder (W180).

### **6      Clamping instead of glue bonding**

Investigation of further rationalization in the automatic processing of RM cores has led to the result that a complete assembly step – glue bonding of the core halves – can be omitted.

The following benefits result for the user:

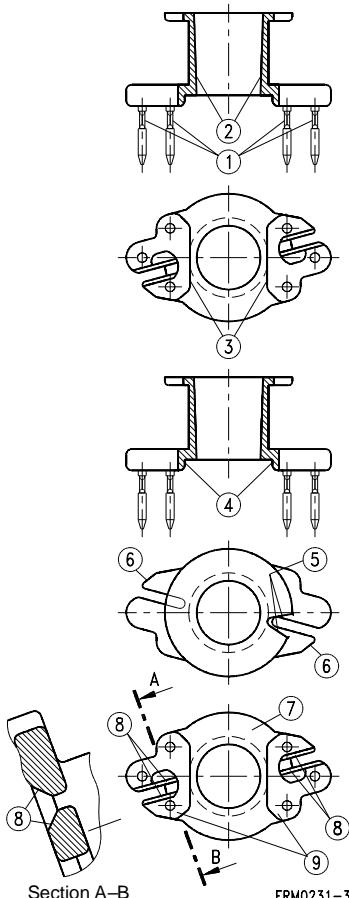
- shorter assembly times
- no investment costs for gluing machines
- shorter idle times during coil assembly
- no cost for glue

For this reason, S+M Components has developed a stainless steel clamp for RM cores that guarantees a defined clamping force. We are the sole supplier of this type of clamp, which is available with or without ground terminal. The core is provided with a nose to prevent the clamp from slipping off.

## 7 Coil formers for automatic processing

Automated manufacture is gaining more and more importance for the low-cost production of inductive components. The prerequisites are high-performance winding and assembly machines on the one hand, and suitable accessories on the other.

The new S+M Components RM coil formers were developed to meet this demand. These coil formers are not only matched to the versatile concepts of automation, but also offer advantages for manual winding. The essential improvements of the version optimized for automatic processing will be described in the following, taking the example of an RM6 coil former. The consistent utilization of these benefits will in most cases bring about a reduction of production costs for inductors and transformers.



- ① Pins squared in the start-of-winding area  
Secure restraint of the ends of the winding even with 2 to 3 winding corners; the winding process is considerably accelerated
- ② Internal diameter slightly conical and highly accurate  
Easy and fast slipping-on and snug fit on the winding tools
- ③ Shortened wire guidance slots  
Substantially higher flange breaking strength
- ④ Almost parallel flanges with minimum radii at the winding cylinder to the flange  
Correct winding layers, more turns, neat and rapid winding
- ⑤ V-shaped slot in the pinless flange  
Automatic loading and unloading of winding machine possible. Substantially more accurate fixing and arrangement of the coil formers
- ⑥ Lengthened wire catching nose  
Leads all wires safely into the wire guidance slots, even at high winding speed
- ⑦ Pinless flange without marking  
Substantially more accurate arrangement of the coil formers for winding and wrapping
- ⑧ Slot outlet stepped in height  
Owing to the transfer of the wire crossing to the level of the slot, short circuit is prevented when soldering the ends of the winding to the pins
- ⑨ Insulation web  
Improved insulation between the winding wires and the ferrite core

- Without center hole for transformer applications

**Magnetic characteristics (per set)**

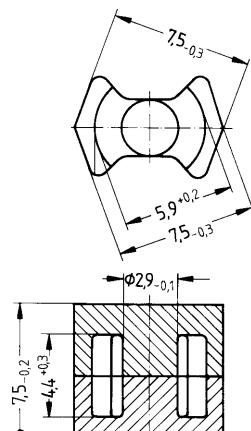
$$\Sigma l/A = 1,8 \text{ mm}^{-1}$$

$$l_e = 15,1 \text{ mm}$$

$$A_e = 8,4 \text{ mm}^2$$

$$A_{min} = 6,4 \text{ mm}^2$$

$$V_e = 128 \text{ mm}^3$$

**Approx. weight** 0,55 g/set**Ungapped**

Material	A <sub>L</sub> value nH	$\mu_e$	Ordering code J- without center hole	PU Sets
N30	1600 + 40/- 30%	2290	B65817-J-Y30	400
T38	3000 + 40/- 30%	4300	B65817-J-Y38	

## Coil former

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85)

H ≈ max. operating temperature 180 °C), color code blue

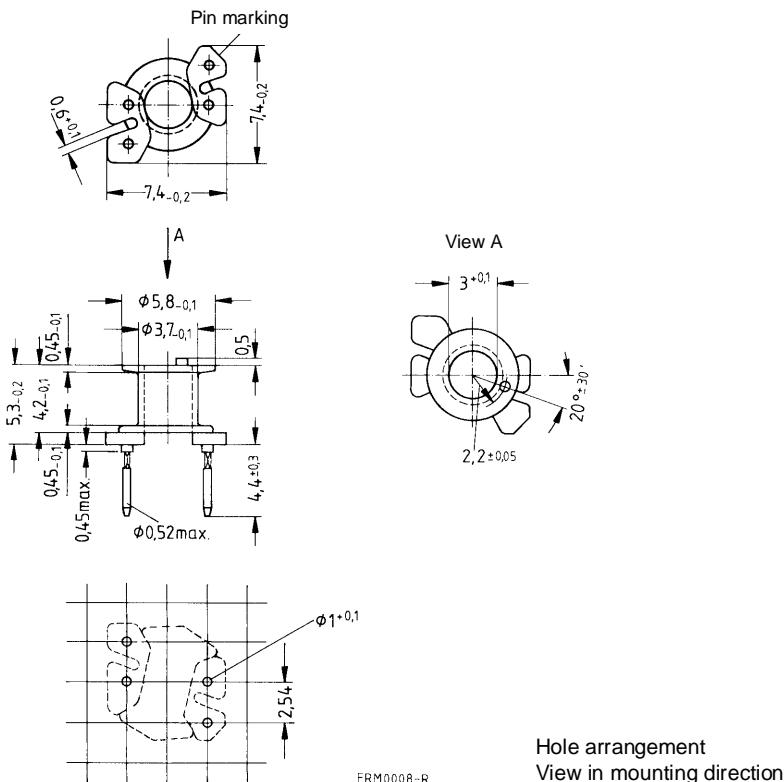
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: see page 152

Pins squared in the start-of-winding area

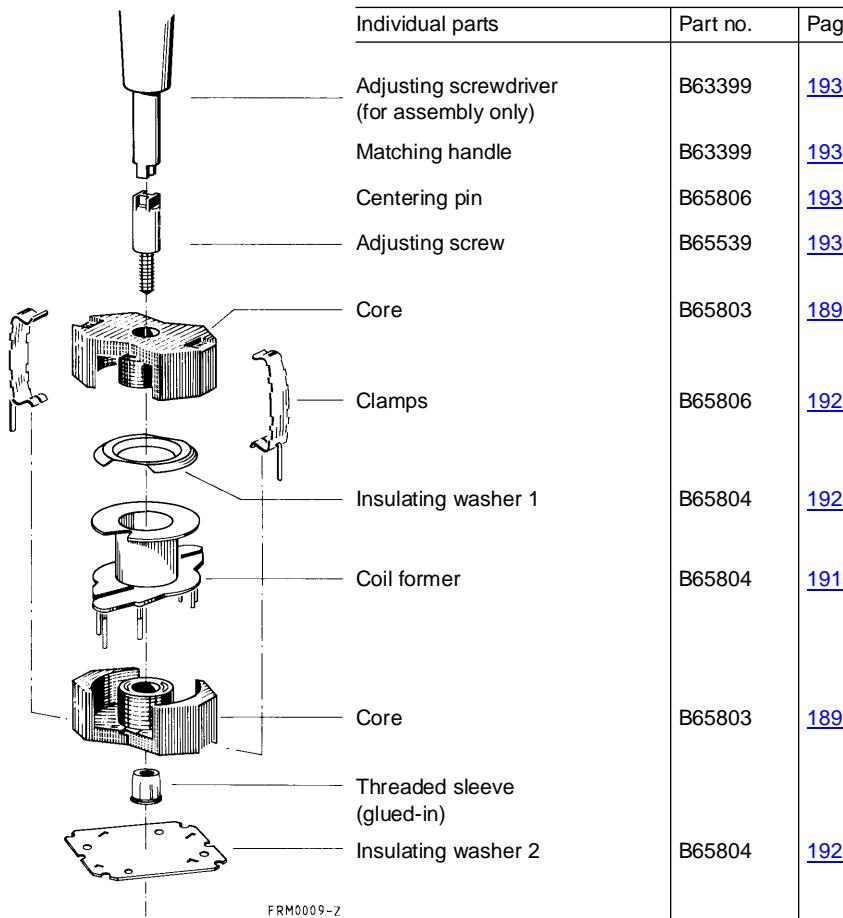
Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	3,2	14,7	147	4	B65818-K1004-D1	500



## RM 4

### Core and Accessories

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Example of an assembly set

**Also available:**

RM 4 low profile:

Core	B65803-P	<a href="#">197</a>
Coil former	B65804	<a href="#">198</a>
SMD coil former	B65804	<a href="#">200</a>
Clamp	B65804	<a href="#">199</a>
Insulating washer 1 + 2	B65804	<a href="#">199</a>

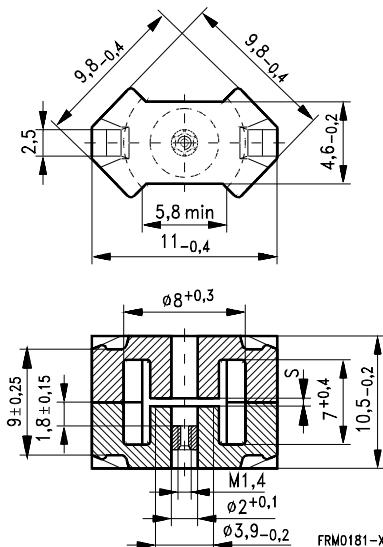
- In accordance with IEC 431 and DIN 41 980
- Core without center hole  
for transformer applications

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma I/A$	1,9	1,7	$\text{mm}^{-1}$
$I_e$	21	22	mm
$A_e$	11	13	$\text{mm}^2$
$A_{\min}$	—	11,3	$\text{mm}^2$
$V_e$	232	286	$\text{mm}^3$

**Approx. weight (per set)**

$m$	1,45	1,65	g

**Gapped**

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code -N with threaded sleeve	PU Sets
K1	16 ± 3 %	1,0	24,2	B65803-N16-A1	600
	25 ± 3 %	0,40	37,8	B65803-N25-A1	
M33	40 ± 3 %	0,36	60,4	B65803-N40-A33	
	63 ± 3 %	0,18	95	B65803-N63-A33	
N48	63 ± 3 %	0,16	95	B65803-N63-A48	
	100 ± 3 %	0,10	151	B65803-N100-A48	
	160 ± 3 %	0,60	242	B65803-N160-A48	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code -A with center hole -J w/o center hole	PU Sets
N26	800 + 30/- 20 %	1210			B65803-A-R26	600
N30	1900 + 30/- 20 %	2570			B65803-J-R30	
T35	2800 + 40/- 30 %	3790			B65803-J-Y35	
T38	3700 + 40/- 30 %	5000			B65803-J-Y38	
N49	750 + 30/- 20 %	1010	450	0,04 (50 mT, 500 kHz, 100 °C)	B65803-J-R49	
N67	1000 + 30/- 20 %	1480	650	0,25 (200 mT, 100 kHz, 100 °C)	B65803-J-R67	
N87	1100 + 30/- 20 %	1480	650	0,20 (200 mT, 100 kHz, 100 °C)	B65803-J-R87	

**Coil former**

Standard: to IEC 431 and DIN 41981

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

H  $\triangleq$  max. operating temperature 180 °C), color code blue

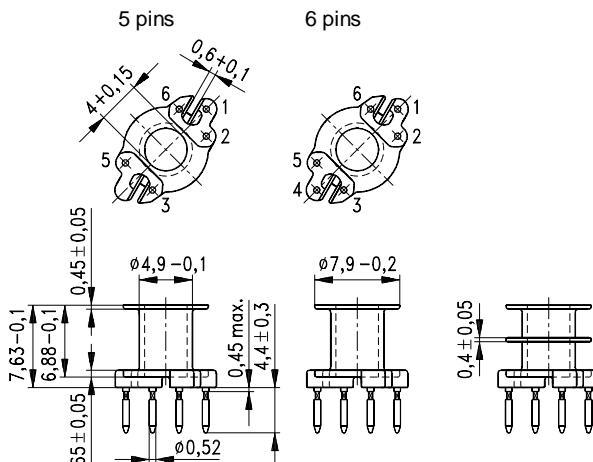
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

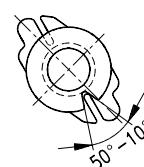
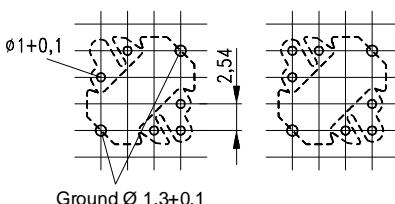
Winding: [see page 152](#)

Pins squared in the start-of-winding area

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	7,7	20	89	5	B65804-K1005-D1	1000
				6	B65804-K1006-D1	
2	7,3	20	94	5	B65804-K1005-D2	
				6	B65804-K1006-D2	



Hole arrangement  
View in mounting direction



### Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,335 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Also available as strip clamp on reels

### Insulating washer 1 between core and coil former

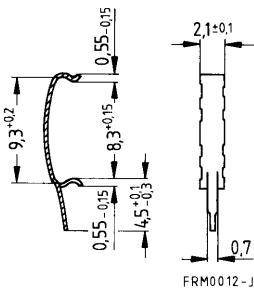
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,06 mm thick

### Insulating washer 2 for double-clad PCBs

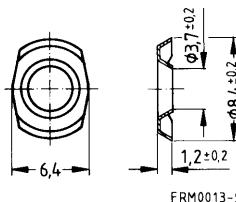
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65806-A2203	1000
Insulating washer 1 (reel packing, PU = 1 reel)	B65804-A5000	2500
Insulating washer 2 (bulk)	B65804-C2005	2500

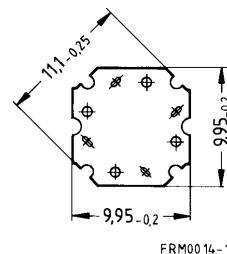
### Clamp



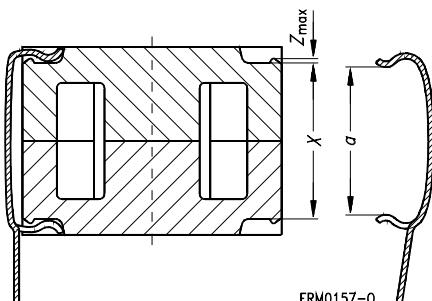
### Insulating washer 1



### Insulating washer 2



### RM clamping forces



$F_{\min}$ : Extension of clamp from  $a$  to  $a_2 = X_{\min}$   
 $F_{\max}$ : Extension of clamp from  $a$  to  $a_1 = X_{\max}$

Clamp opening $a$ (mm)	8,3 + 0,15
Core nose $Z_{\max}$ (mm)	0,15
Height of core pair $X$ (mm)	$X_{\min}$ $X_{\max}$
Clamping force $F$ (N)	$F_{\min}$ $F_{\max}$

**Adjusting screw**

● Tube core with thread and core brake made of GFR polyterephthalate

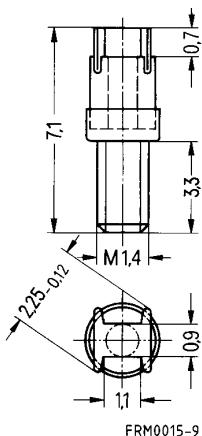
Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

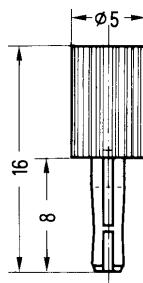
**Centering pin** as assembly aid for RM core centering

Core RM 4		<b>Adjusting screw</b>			Min. adjusting range %	Ordering code	PU Pcs
Material	A <sub>L</sub> value nH	Tube core Ø × length mm	Material	Color code			
K 1	16	1,81 × 2,0	Si 1	black	20	B65539-C1003-X101	500
	25	1,81 × 2,0	K 1	yellow	21	B65539-C1003-X1	
M 33	40	1,81 × 2,0	Si 1	black	17	B65539-C1003-X101	
	63	1,81 × 2,0	K 1	yellow	21	B65539-C1003-X1	
N 48	63	1,81 × 2,0	Si 1	black	12	B65539-C1003-X101	
	100	1,81 × 2,0	K 1	yellow	17	B65539-C1003-X1	
	160	1,81 × 2,7	N 22	red	12	B65539-C1002-X22	
<b>Adjusting screwdriver</b>					B63399-B4		10
<b>Handle</b>					B63399-B5		10
<b>Centering pin</b>					B65806-A2008		500

**Adjusting screw**



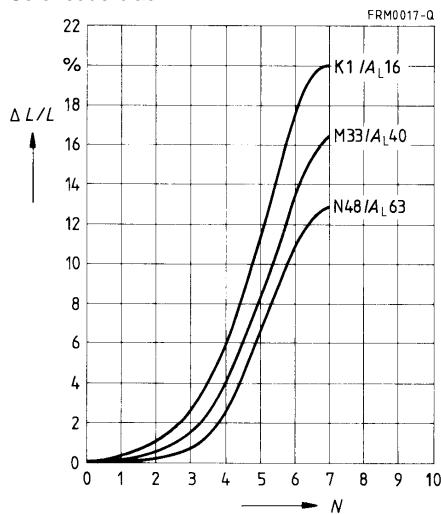
**Centering pin**



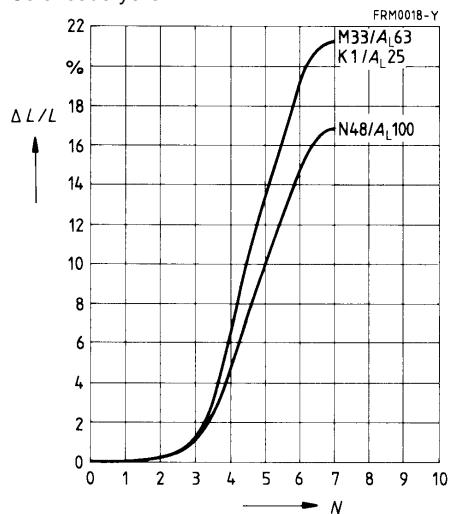
**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 1 turn engaged.

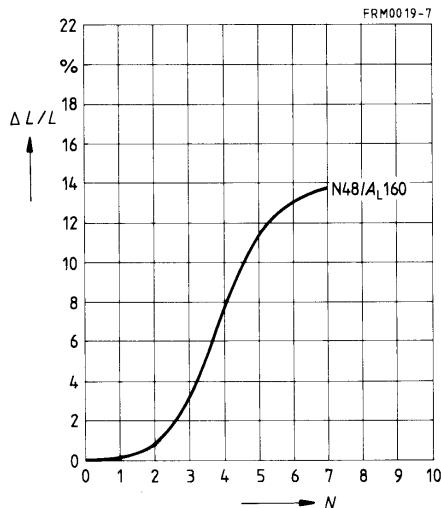
Adjusting screw B65539-C1003-X101  
Color code black



Adjusting screw B65539-C1003-X1  
Color code yellow

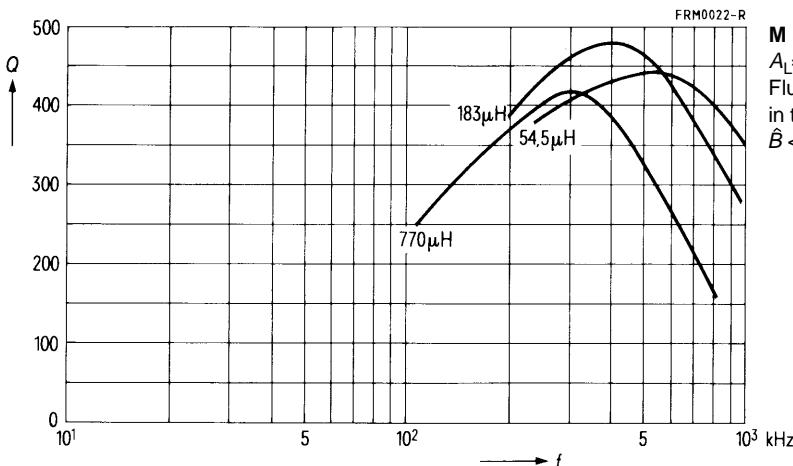
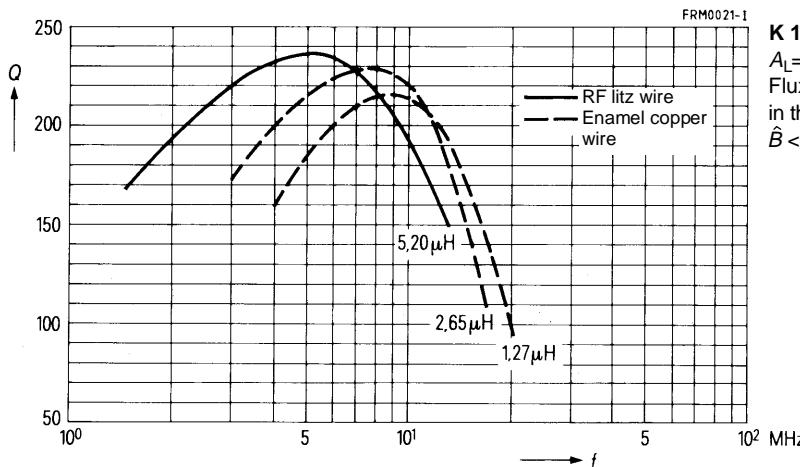
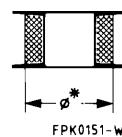


Adjusting screw B65539-C1002-X22  
Color code red



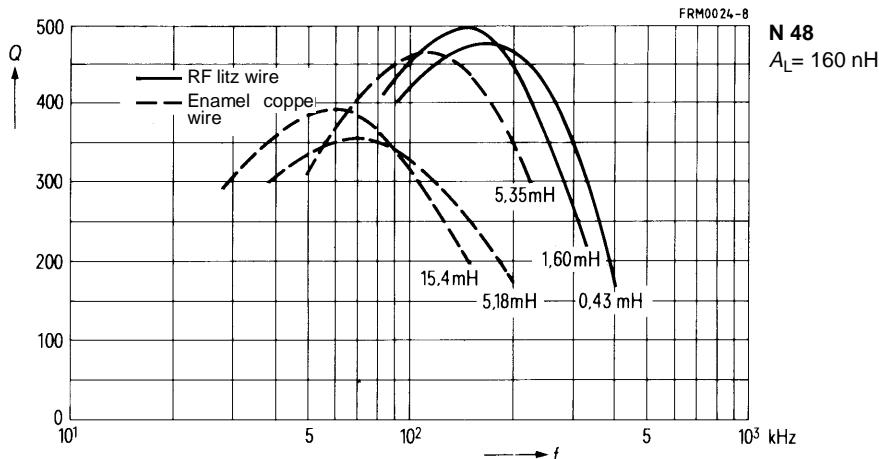
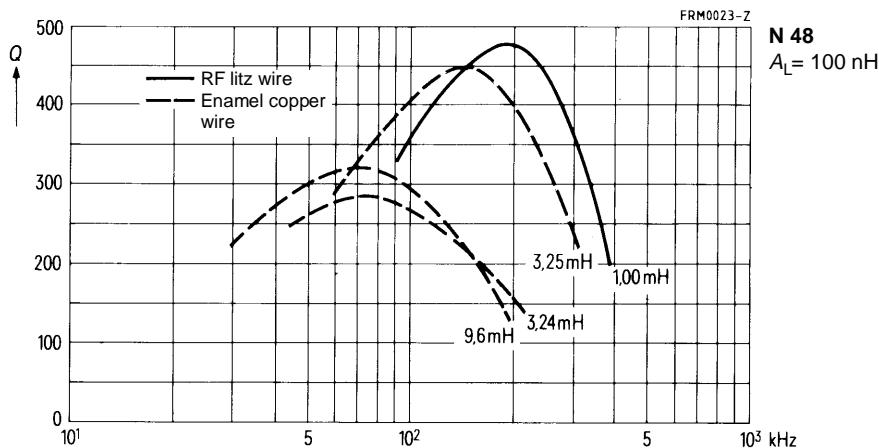
**Q factor characteristics (typical values)**

Material	$A_L$ value	$L$ $\mu\text{H}$	Turns	Wire; RF litz wire	Sections	$\emptyset^*$ mm
K 1	25 nH	5,20	14	45 × 0,04 CuLS	1	6,6
		2,65	10	0,5 CuL	1	6,6
		1,27	7	0,6 CuL	1	6,4
M 33	63 nH	770	100	20 × 0,04 CuL	1	—
		183	52	45 × 0,04 CuL	1	—
		54,5	29	90 × 0,04 CuL	1	—



**Q factor characteristics (typical values)**Flux density in the core  $B < 1 \text{ mT}$ 

Material	$L$ (mH) for		Turns	Wire; RF litz wire	Sections
	$A_L = 100 \text{ nH}$	$A_L = 160 \text{ nH}$			
N 48	—	0,43	52	45 × 0,04 CuLS	1
	1,00	1,60	100	20 × 0,04 CuLS	1
	3,24	5,18	180	0,18 CuL	1
	9,60	15,40	310	0,14 CuL	1
	3,25	5,35	183	10 × 0,05 CuL	1



- For compact transformers with high inductance
- Without center hole

**Magnetic characteristics (per set)**

$$\Sigma l/A = 1,2 \text{ mm}^{-1}$$

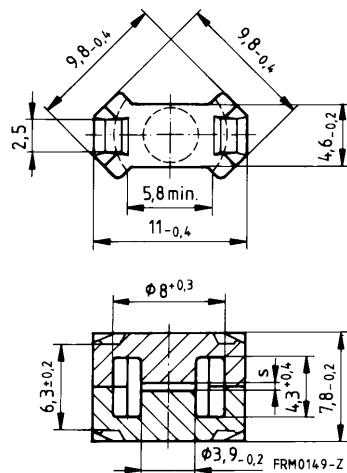
$$l_e = 17,3 \text{ mm}$$

$$A_e = 14,5 \text{ mm}^2$$

$$A_{min} = 11,3 \text{ mm}^2$$

$$V_e = 251 \text{ mm}^3$$

**Approx. weight** 1,2 g/set



**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code	PU Sets
N67	$160 \pm 5 \%$	0,05	153	B65803-P160-J67	800

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code	PU Sets
T38	$5000 + 40/-30 \%$	4770			B65803-P-Y38	800
N49	$860 + 30/-20 \%$	820	630	0,03 (50 mT, 500 kHz, 100 °C)	B65803-P-R49	
N67	$1200 + 30/-20 \%$	1136	950	0,15 (200 mT, 100 kHz, 100 °C)	B65803-P-R67	

**Coil former**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

H  $\triangleq$  max. operating temperature 180 °C), color code blue

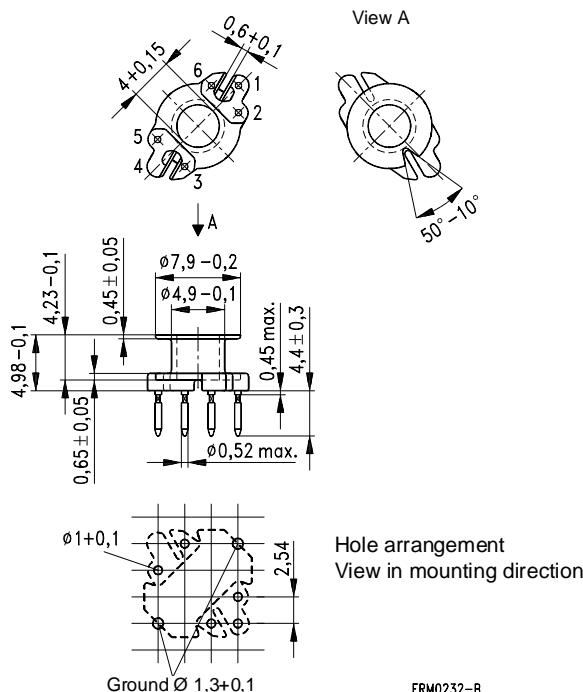
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 160](#) (as SMD coil former)

Pins squared in the start-of-winding area

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	4,7	20,1	147	6	B65804-R1006-D1	1000



### Clamp

- With and without ground terminal, made of stainless spring steel (tinned), 0,3 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Clamping force 40 N per pair of clamps (typical value)
- Also available as strip clamp on reels on request

### Insulating washer 1 between core and coil former

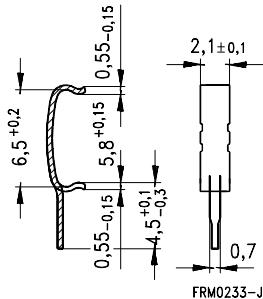
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,06 mm thick

### Insulating washer 2 for double-clad PCBs

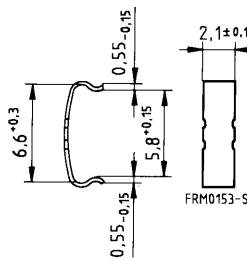
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp with ground terminal (ordering code per piece, 2 are required)	B65804-P2203	1600
Clamp without ground terminal (ordering code per piece, 2 are required)	B65804-P2204	1600
Insulating washer 1 (reel packing, PU = 1 reel)	B65804-A5000	2500
Insulating washer 2 (bulk)	B65804-C2005	2500

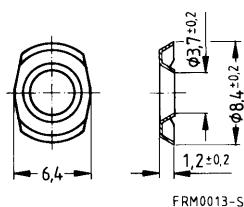
#### Clamp with ground terminal



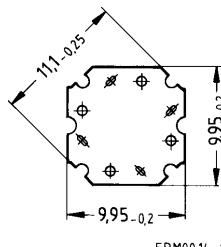
#### Clamp without ground terminal



#### Insulating washer 1



#### Insulating washer 2



### SMD coil former with J terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

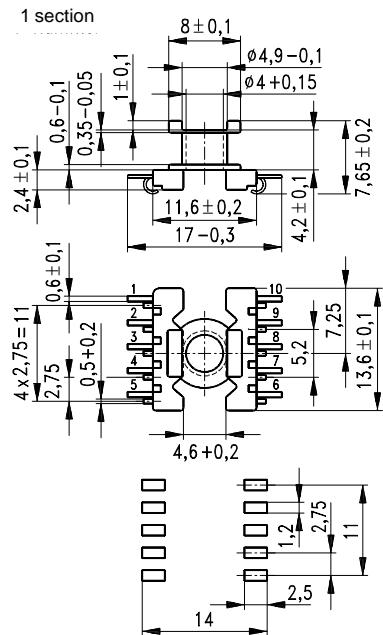
Winding: [see page 160](#)

### Clamp

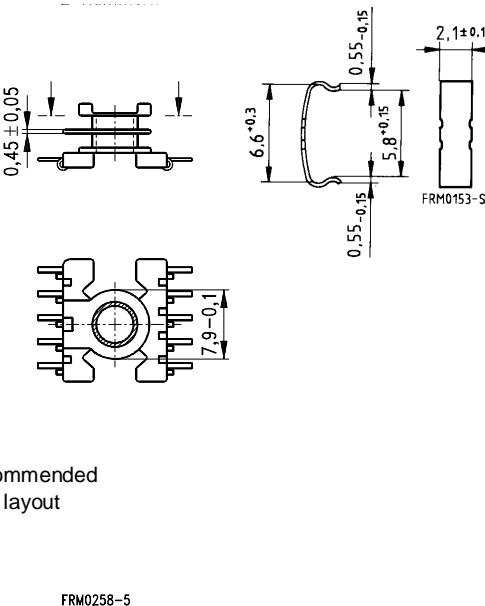
- Without ground terminal, made of stainless spring steel, 0,3 mm thick
- Also available as strip clamp (each carton containing 2 reels), also on a reel on request

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Termi- nals <sup>1)</sup>	Ordering code	PU Pcs
1	5,0	20,1	138	10	B65804-B6010-T1	800
2	4,4	20,1	157	10	B65804-B6010-T2	
Clamp	(ordering code per piece, 2 are required)			B65804-P2204		1600

### Coil former



### 2 sections



### Clamp

1) 6 and 8 terminals on request

## RM 5 Core and Accessories

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">208</a>
Matching handle	B63399	<a href="#">208</a>
Centering pin	B65806	<a href="#">208</a>
Adjusting screw	B65539 B65806	<a href="#">208</a>
Core	B65805	<a href="#">202</a>
Clamps	B65806	<a href="#">205</a>
Insulating washer 1	B65806	<a href="#">205</a>
Coil former	B65806	<a href="#">204</a>
Core	B65805	<a href="#">202</a>
Threaded sleeve (glued-in)		
Insulating washer 2	B65806	<a href="#">205</a>

FRM0005-2

Example of an assembly set

<b>Also available:</b>	SMD coil former	B65822	<a href="#">206, 207</a>
	RM 5 low profile:		
	Core	B65805-P	<a href="#">213</a>
	SMD coil former	B65822	<a href="#">214</a>
	Clamp	B65804	<a href="#">214</a>

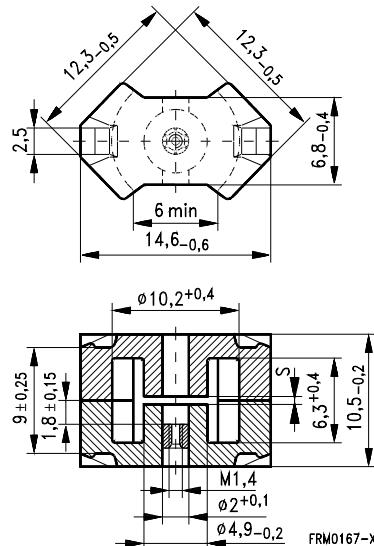
- In accordance with IEC 431 and DIN 41 980
- Core without center hole  
for transformer applications

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma I/A$	1,0	0,93	$\text{mm}^{-1}$
$I_e$	20,8	22,1	mm
$A_e$	20,8	23,8	$\text{mm}^2$
$A_{\min}$	15	18	$\text{mm}^2$
$V_e$	430	526	$\text{mm}^3$

**Approx. weight (per set)**

$m$	2,9	3,0	g



**Gapped**

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code -N with threaded sleeve	PU Sets
K1	25 ± 3 %	1,0	19,9	B65805-N25-A1	500
	40 ± 3 %	0,40	31,8	B65805-N40-A1	
M33	20 ± 3 %	1,2	15,9	B65805-N20-A33	
	63 ± 3 %	0,4	50,2	B65805-N63-A33	
	100 ± 3 %	0,2	79,6	B65805-N100-A33	
N48	125 ± 2 %	0,16	100	B65805-N125-G48	
	160 ± 3 %	0,12	128	B65805-N160-A48	
	200 ± 3 %	0,09	159	B65805-N200-A48	
	250 ± 3 %	0,06	200	B65805-N250-A48	
	315 ± 3 %	0,03	255	B65805-N315-A48	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code -C with center hole -J w/o center hole	PU Sets
K1	100 + 30/- 20 %	80			B65805-C-R1	500
N26	1800 + 30/- 20 %	1430			B65805-C-R26	
N30	3500 + 30/- 20 %	2590			B65805-J-R30	
T35	5200 + 30/- 20 %	3850			B65805-J-R35	
T38	6700 + 40/- 30 %	4960			B65805-J-Y38	
T42	9600 + 40/- 30 %	7090			B65805-J-Y42	
N49	1300 + 30/- 20 %	960	810	0,06 (50 mT, 500 kHz, 100 °C)	B65805-J-R49	
N67	1800 + 30/- 20 %	1330	1200	0,40 (200 mT, 100 kHz, 100 °C)	B65805-J-R67	
N87	2000 + 30/- 20 %	1470	1200	0,32 (200 mT, 100 kHz, 100 °C)	B65805-J-R87	
N41	2600 + 30/- 20 %	1920	1200	0,10 (200 mT, 100 kHz, 100 °C)	B65805-J-R41	

**Coil former**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

H  $\triangleq$  max. operating temperature 180 °C), color code blue

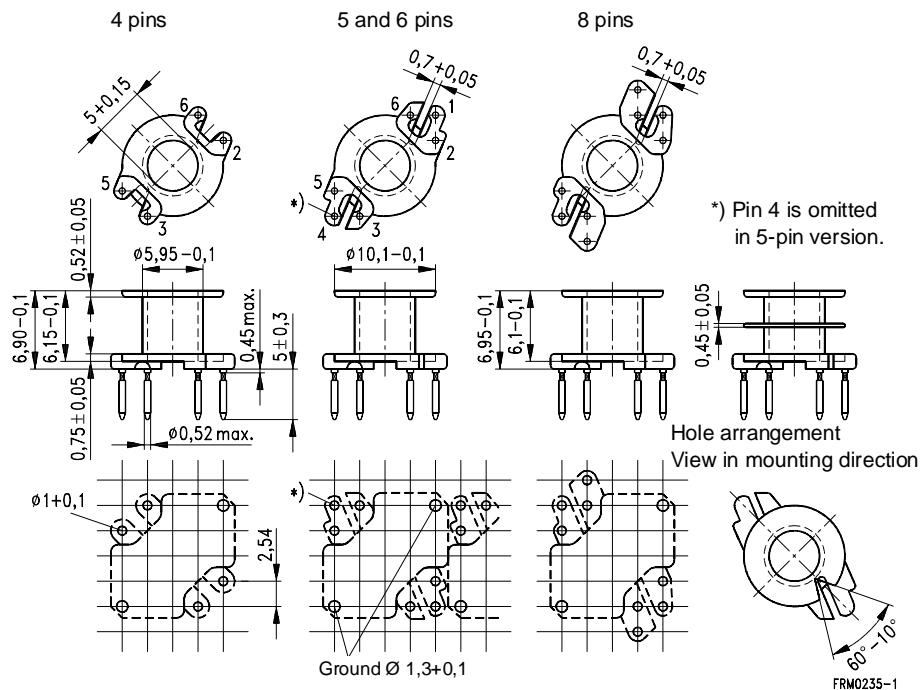
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

Pins squared in the start-of-winding area; also available in stick magazines

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	9,5	25	90	4	B65806-K1004-D1	500
				5	B65806-K1005-D1	
				6	B65806-K1006-D1	
				8	B65806-K1008-D1	
2	8,7	25	94	4	B65806-K1004-D2	
				5	B65806-K1005-D2	
				6	B65806-K1006-D2	
1 or 2	with 4 special solder terminals for litz wire on request					



**Clamp**

- With ground terminal, made of stainless spring steel (tinned), 0,335 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Also available as strip clamp on reels

**Insulating washer 1** between core and coil former

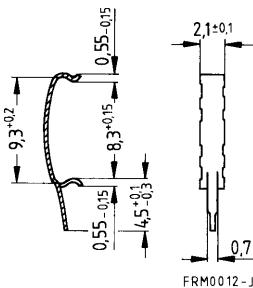
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to 85: E  $\leq$  120 °C), 0,06 mm thick

**Insulating washer 2** for double-clad PCBs

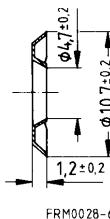
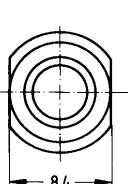
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65806-A2203	1000
Insulating washer 1 (reel packing, PU = 1 reel)	B65806-A5000	2500
Insulating washer 2 (bulk)	B65806-D2005	2500

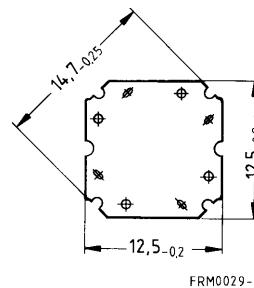
**Clamp**



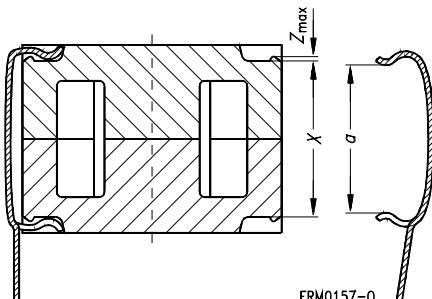
**Insulating washer 1**



**Insulating washer 2**



**RM clamping forces for RM 5**



$F_{\min}$ : Extension of clamp from  $a$  to  $a_2 = X_{\min}$   
 $F_{\max}$ : Extension of clamp from  $a$  to  $a_1 = X_{\max}$

Clamp opening $a$ (mm)	8,3 + 0,15
Core nose $Z_{\max}$ (mm)	0,15
Height of core pair $X$ (mm)	$X_{\min}$ $X_{\max}$
Clamping force $F$ (N)	$F_{\min}$ $F_{\max}$

### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

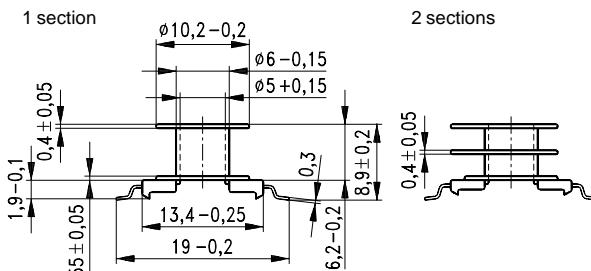
Winding: [see page 160](#)

### Clamp

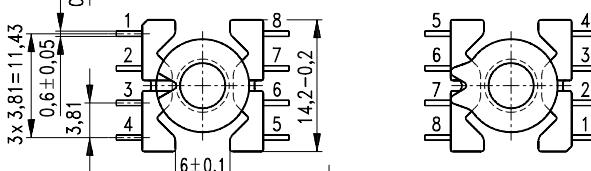
- Without ground terminal, made of stainless spring steel, 0,3 mm thick
- Also available as strip clamp (each carton containing 2 reels), also on a reel on request

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	11,1	25	77	8	B65822-F1008-T1	500
2	10,2	25	85	8	B65822-F1008-T2	
Clamp	(ordering code per piece, 2 are required)			B65806-J2204		1000

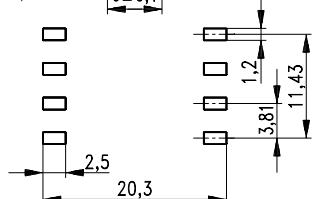
### Coil former



2 sections

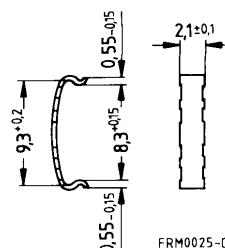


Recommended  
PCB layout



FRM0254-7

### Clamp



FRM0025-G

**SMD coil former with J terminals**

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

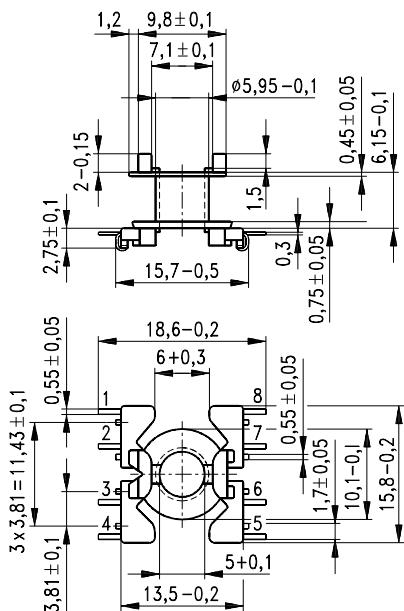
Winding: [see page 160](#)

**Clamp**

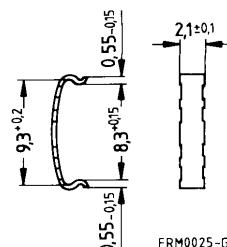
- Without ground terminal, made of stainless spring steel, 0,3 mm thick
- Also available as strip clamp (each carton containing 2 reels)
- Also available on a reel on request

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	11,1	25	73	8	B65822-J1008-T1	500
Clamp	(ordering code per piece, 2 are required)				B65806-J2204	1000

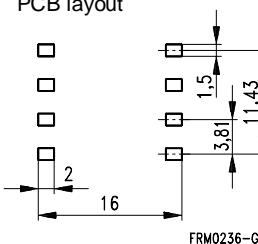
**Coil former**



**Clamp**



Recommended  
PCB layout



**Adjusting screw**

- Tube core with thread and core brake made of GFR polyterephthalate
- Also available in magazines

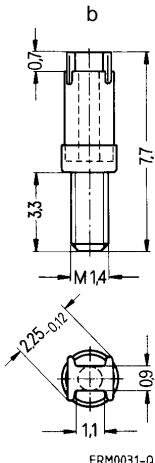
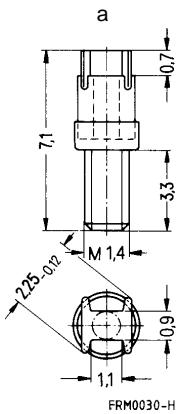
Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

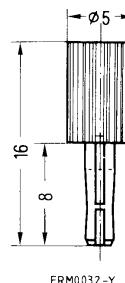
**Centering pin** as assembly aid for RM core centering

Core RM 5		Adjusting screw				Min. adjusting range %	Ordering code	PU Pcs
Material	A <sub>L</sub> value nH	Fig.	Tube core Ø × length mm	Material	Color code			
K 1	25	a	1,81 × 2,0	Si 1	black	13	B65539-C1003-X101	500
	40	a	1,81 × 2,0	K 1	yellow	16	B65539-C1003-X1	
M 33	63	a	1,81 × 2,7	Si 1	white	11	B65539-C1002-X101	
	100	a	1,81 × 2,0	K 1	yellow	14	B65539-C1003-X1	
N 48	125	a	1,81 × 2,0	K 1	yellow	13	B65539-C1003-X1	
	160	a	1,81 × 2,7	N 22	red	15	B65539-C1002-X22	
	200					11		
	250	b	1,81 × 3,4	N 22	green	13	B65806-C3001-X22	
	315	b	1,90 × 3,4	N 22	blue	9		
	315	b	1,90 × 3,4	N 22	blue	12	B65806-A3002-X22	
<b>Adjusting screwdriver</b>							B63399-B4	10
<b>Handle</b>							B63399-B5	10
<b>Centering pin</b>							B65806-A2008	10

**Adjusting screws**



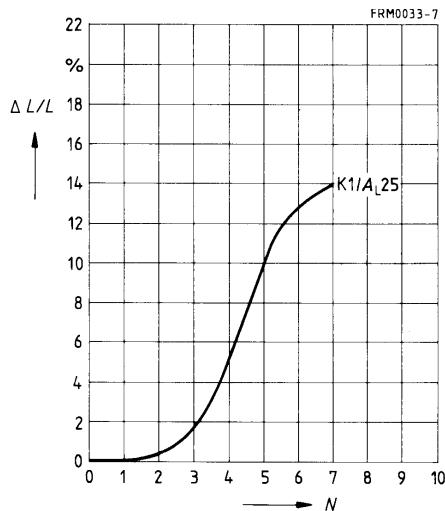
**Centering pin**



**Inductance adjustment curves (nominal values)**Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.0  $\leq$  at least 1 turn engaged.

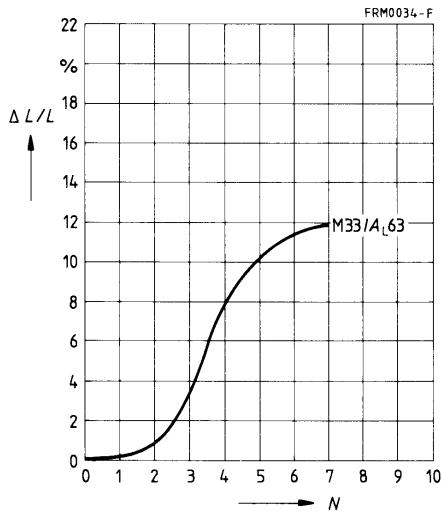
Adjusting screw B65539-C1003-X101

Color code black



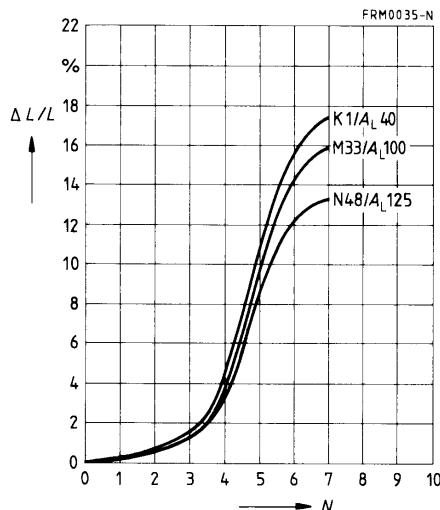
Adjusting screw B65539-C1002-X101

Color code white



Adjusting screw B65539-C1003-X1

Color code yellow

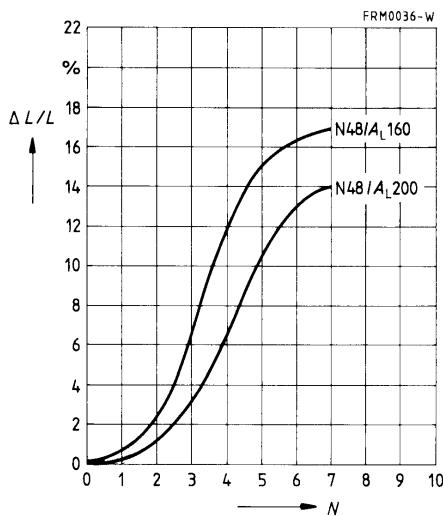


**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 1 turn engaged.

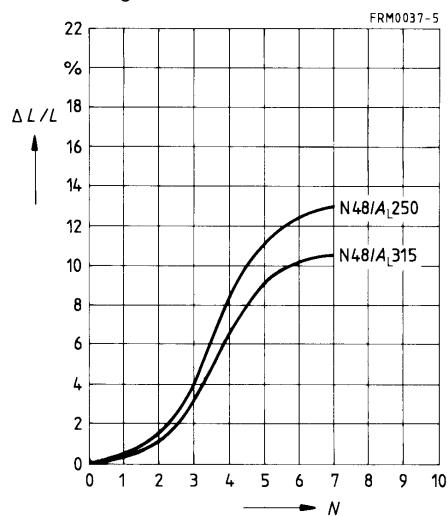
Adjusting screw B65539-C1002-X22

Color code red



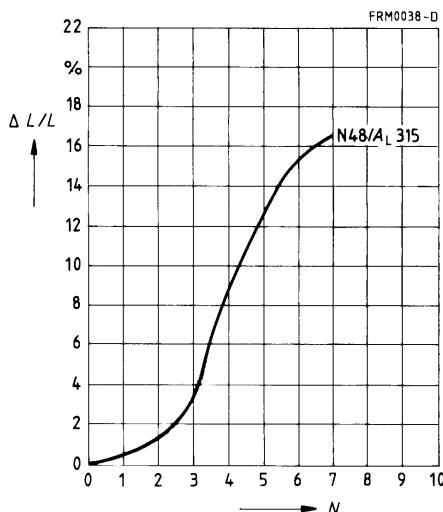
Adjusting screw B65806-C3001-X22

Color code green



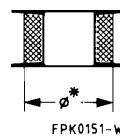
Adjusting screw B65806-A3002-X22

Color code blue

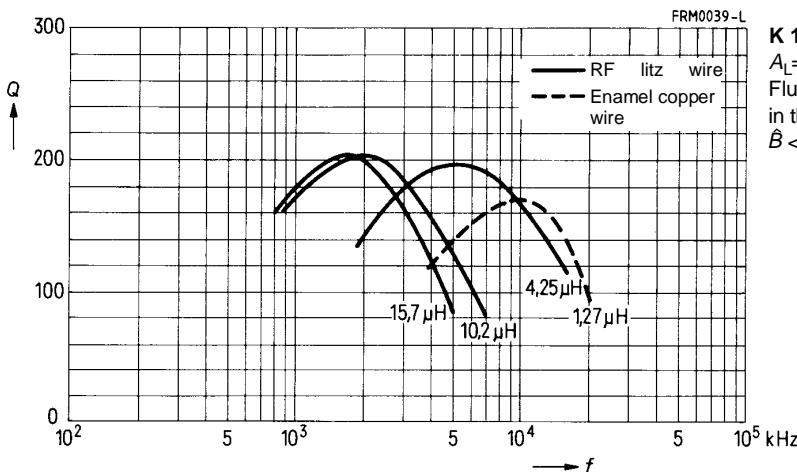


**Q factor characteristics (typical values)**

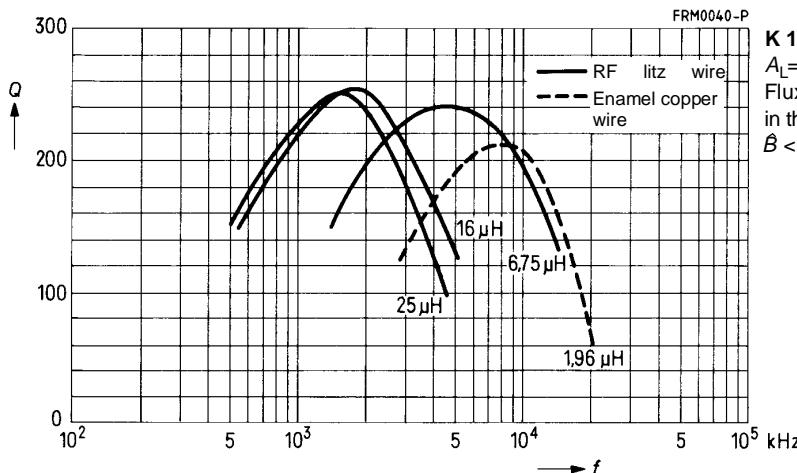
Material	$L$ ( $\mu\text{H}$ ) for		Turns	Wire; RF litz wire	Sections	$\emptyset^*$ mm
	$A_L = 25 \text{ nH}$	$A_L = 40 \text{ nH}$				
K 1	1,27	1,96	7	0,6 CuL	1	8,5
	4,25	6,75	13	30 x 0,04 CuLS	1	9,0
	15,7	25	25	30 x 0,04 CuLS	1	8,4
	10,2	16	20	40 x 0,04 CuLS	1	8,2



\* Pad of polystyrene tape up to diameter  $\emptyset$



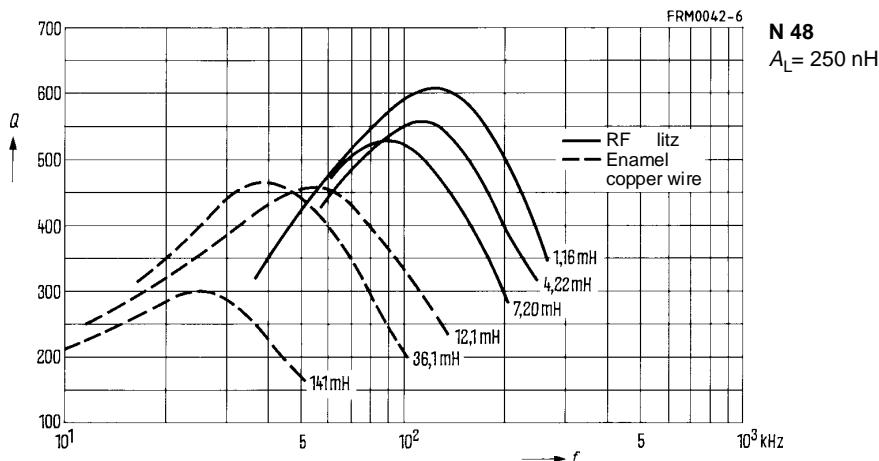
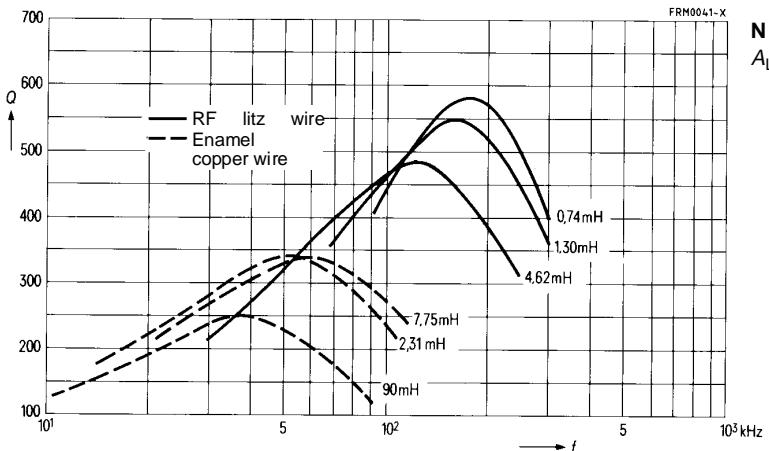
**K 1**  
 $A_L = 25 \text{ nH}$   
Flux density  
in the core  
 $B < 0,5 \text{ mT}$



**K 1**  
 $A_L = 40 \text{ nH}$   
Flux density  
in the core  
 $B < 0,6 \text{ mT}$

**Q factor characteristics (typical values)**Flux density in the core  $\hat{B} < 1 \text{ mT}$ 

Material	$L$ (mH) for $A_L = 100 \text{ nH}$		Turns	Wire; RF litz wire	Sections
	$A_L = 100 \text{ nH}$	$A_L = 160 \text{ nH}$			
N 48	90	141	750	0,1 CuL	1
	23,1	36,1	380	0,14 CuL	1
	7,75	12,1	220	0,18 CuL	1
	4,62	7,20	170	10 × 0,05 CuLS	1
	—	4,22	130	20 × 0,04 CuLS	1
	1,30	—	90	30 × 0,04 CuLS	1
	0,74	1,16	68	45 × 0,04 CuLS	1



- For compact transformers
- Without center hole

**Magnetic characteristics (per set)**

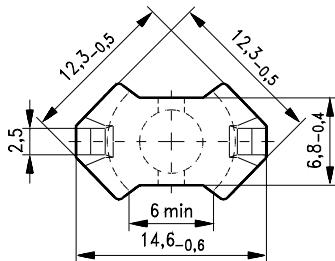
$$\Sigma I/A = 0,71 \text{ mm}^{-1}$$

$$l_e = 17,5 \text{ mm}$$

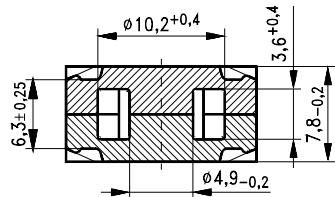
$$A_e = 24,5 \text{ mm}^2$$

$$A_{min} = 18 \text{ mm}^2$$

$$V_e = 430 \text{ mm}^3$$



**Approx. weight** 2,6 g/set



FRM0168-6

**Ungapped**

Mate- rial	$A_L$ value nH	$\mu_e$	$A_{L1}$	$P_V$ W/set	Ordering code	PU Sets
N30	$4100 + 30/-20\%$	2320			B65805-P-R30	500
T38	$7700 + 40/-30\%$	4360			B65805-P-Y38	
N49	$1700 + 30/-20\%$	960	80	0,09 (50 mT, 500 kHz, 100 °C)	B65805-P-R49	
N67	$2400 + 30/-20\%$	1360	1430	0,33 (200 mT, 100 kHz, 100 °C)	B65805-P-R67	
N87	$2400 + 30/-20\%$	1360	2590	0,26 (200 mT, 100 kHz, 100 °C)	B65805-P-R87	

#### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85)

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s.

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B; 350 °C, 3.5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C. 1 s

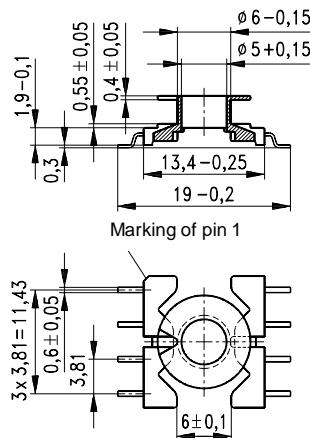
Winding: see page 160

## Clamp

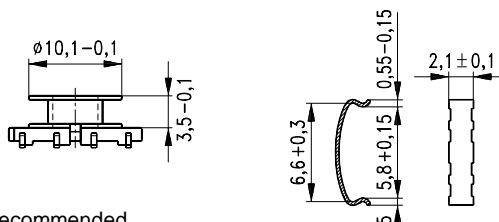
- Without ground terminal, made of stainless spring steel, 0,3 mm thick
  - Also available as strip clamp (each carton containing 2 reels)
  - Also available on a reel on request

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	5,1	25	169	8	B65822-A6008-T1	500
Clamp	(ordering code per piece, 2 are required)				B65804-P2204	1000

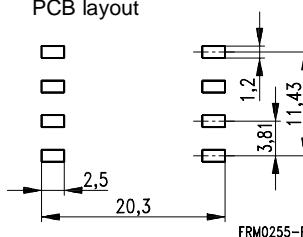
## Coil former



## Clamp



## Recommended PCB layout



## RM 6

### Core and Accessories

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Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">224</a>
Matching handle	B63399	<a href="#">224</a>
Centering pin	B65808	<a href="#">224</a>
Adjusting screw	B65659	<a href="#">224</a>
Core	B65807	<a href="#">216</a>
Clamps	B65808	<a href="#">221</a>
Insulating washer 1	B65808	<a href="#">221</a>
Coil former	B65808	<a href="#">218</a>
Core	B65807	<a href="#">216</a>
Threaded sleeve (glued-in)		
Insulating washer 2	B65808	<a href="#">221</a>
FRM 0048-K		

Example of an assembly set

<b>Also available:</b>	Coil former for SMPS transf.	B65808	<a href="#">219</a>
	Coil former for power applications	B65808	<a href="#">220</a>
	SMD coil former	B65821	<a href="#">222, 223</a>
	RM 6 low profile: Core	B65807-P	<a href="#">229</a>
	SMD coil former	B65821	<a href="#">230</a>
	Clamp	B65808	<a href="#">230</a>

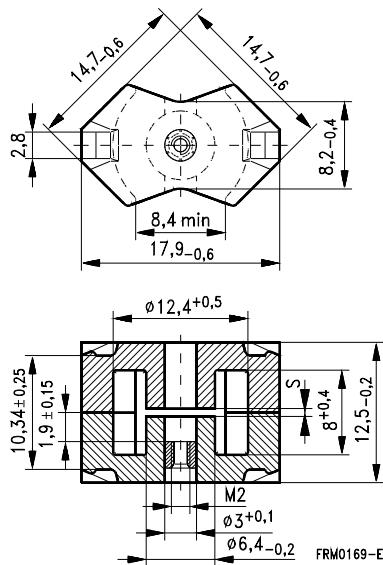
- In accordance with IEC 431 and DIN 41 980
- Core without center hole  
for transformer applications

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma I/A$	0,86	0,78	$\text{mm}^{-1}$
$I_e$	26,9	28,6	mm
$A_e$	31,3	36,6	$\text{mm}^2$
$A_{\min}$	—	31	$\text{mm}^2$
$V_e$	840	1050	$\text{mm}^3$

**Approx. weight (per set)**

$m$	4,9	5,3	g



**Gapped**

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code -N with threaded sleeve -C with center hole	PU Sets
K1	$40 \pm 3 \%$	0,80	27,4	B65807-N40-A1	500
M33	$63 \pm 3 \%$	0,60	43,2	B65807-N63-A33	
	$100 \pm 3 \%$	0,38	68,5	B65807-N100-A33	
N48	$160 \pm 2 \%$	0,22	110	B65807-N160-G48	500
	$200 \pm 3 \%$	0,17	137	B65807-N200-A48	
	$250 \pm 3 \%$	0,12	171	B65807-N250-A48	
	$315 \pm 3 \%$	0,08	216	B65807-N315-A48	
	$400 \pm 3 \%$	0,05	274	B65807-N400-A48	
N26	$1000 \pm 3 \%$	0,006	685	B65807-C1000-K26	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code -C with center hole -J w/o center hole	PU Sets
K1	120 + 30/- 20 %	82			B65807-C-R1	500
N26	2200 + 30/- 20 %	1500			B65807-C-R26	
N30	4300 + 30/- 20 %	2670			B65807-J-R30	
T35	6200 + 30/- 20 %	3850			B65807-J-R35	
T38	8600 + 40/- 30 %	5340			B65807-J-Y38	
T42	12300 + 40/- 30 %	7630			B65807-J-Y42	
N49	1700 + 30/- 20 %	1060	960	0,15 (50 mT, 500 kHz, 100 °C)	B65807-J-R49	
N67	2400 + 30/- 20 %	1490	1450	0,64 (200 mT, 100 kHz, 100 °C)	B65807-J-R67	
N87	2400 + 30/- 20 %	1490	1450	0,51 (200 mT, 100 kHz, 100 °C)	B65807-J-R87	
N41	3100 + 30/- 20 %	1920	1450	0,16 (200 mT, 25 kHz, 100 °C)	B65807-J-R41	

**Coil former**

Standard: to IEC 431 and DIN 41981

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

H  $\triangleq$  max. operating temperature 180 °C), color code blue

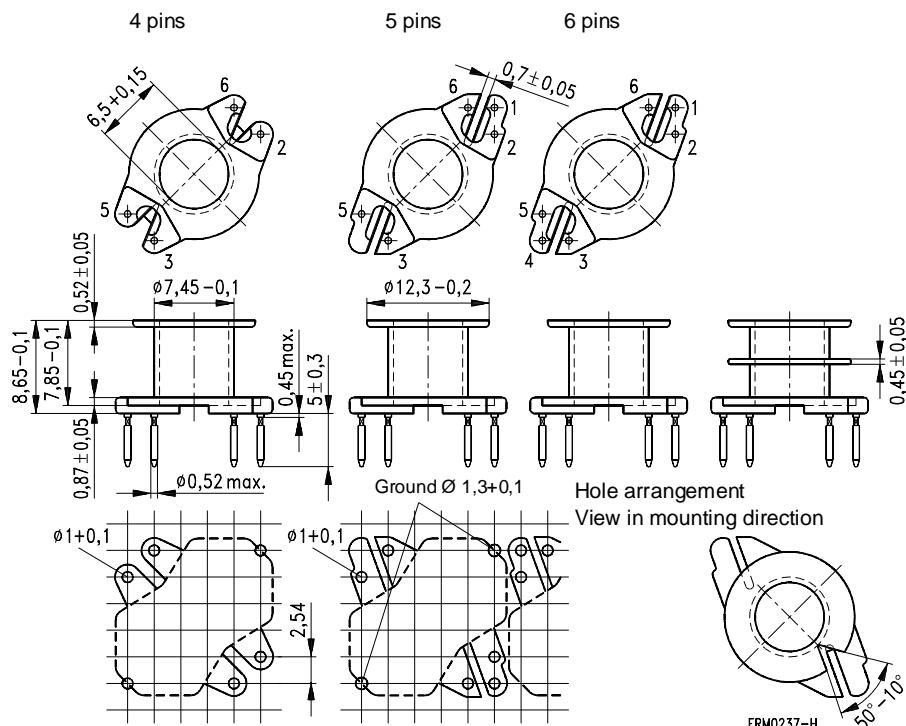
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

Pins squared in the start-of-winding area; also available in stick magazines

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	15	30	69	4	B65808-K1004-D1	500
				5	B65808-K1005-D1	
				6	B65808-K1006-D1	
2	14	30	73	4	B65808-K1004-D2	500
				6	B65808-K1006-D2	
1 or 2	with 4 special solder terminals for litz wire on request					



## Coil former for SMPS transformers with line isolation

The creepage distances and clearances are designed such that the coil former is suitable for use in SMPS transformers with line isolation.

- Closed center flange with external wire guide
  - Pins squared in the start-of-winding area
  - Optimized for use with automatic winding machines

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85)

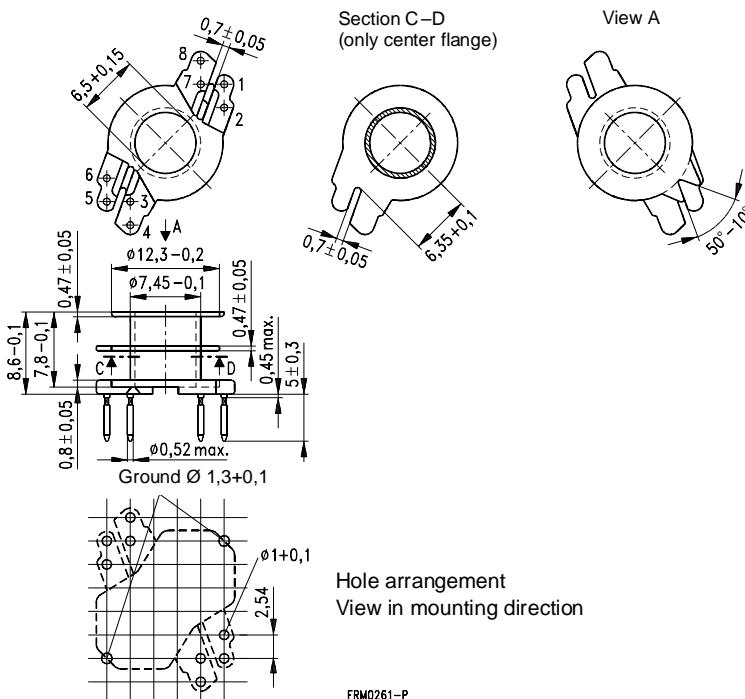
F ≈ max. operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B; 350 °C, 3,5 s

Winding: see page 152

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
2	14	30	73	8	B65808-X1108-D2	500



**Coil former for power applications**

Optimized for automatic winding

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

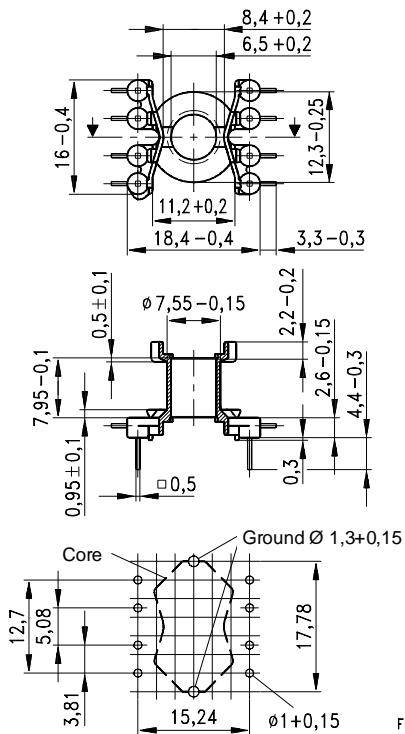
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

For matching clamp and insulating washer 1 [see page 221](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	15	30	69	8	B65808-E1508-T1	500



FRM0220-M

### Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,435 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Also available as strip clamp on reels

### Insulating washer 1 between core and coil former

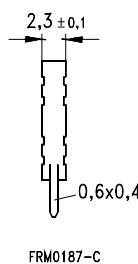
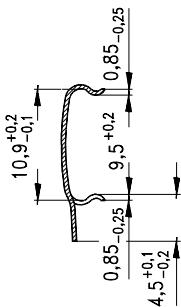
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,06 mm thick

### Insulating washer 2 for double-clad PCBs

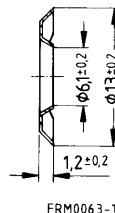
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65808-A2203	1000
Insulating washer 1 (reel packing, PU = 1 reel)	B65808-A5000	2500
Insulating washer 2 (bulk)	B65808-C2005	2500

### Clamp

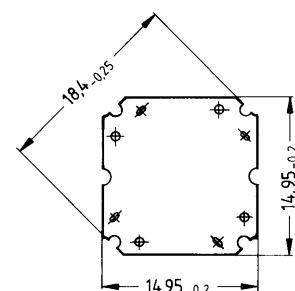


### Insulating washer 1



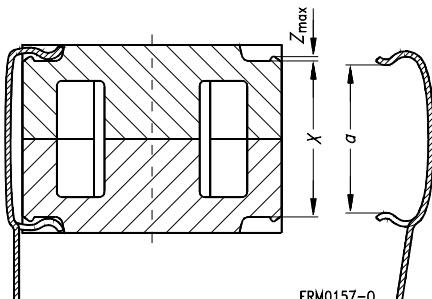
FRM0063-T

### Insulating washer 2



FRM0065-A

### RM clamping forces



$F_{\min}$ : Extension of clamp from  $a$  to  $a_2 = X_{\min}$   
 $F_{\max}$ : Extension of clamp from  $a$  to  $a_1 = X_{\max}$

Clamp opening $a$ (mm)	9,5 + 0,2
Core nose $Z_{\max}$ (mm)	0,22
Height of core pair $X$ (mm)	$X_{\min}$ $X_{\max}$
Clamping force $F$ (N)	$F_{\min}$ $F_{\max}$

### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

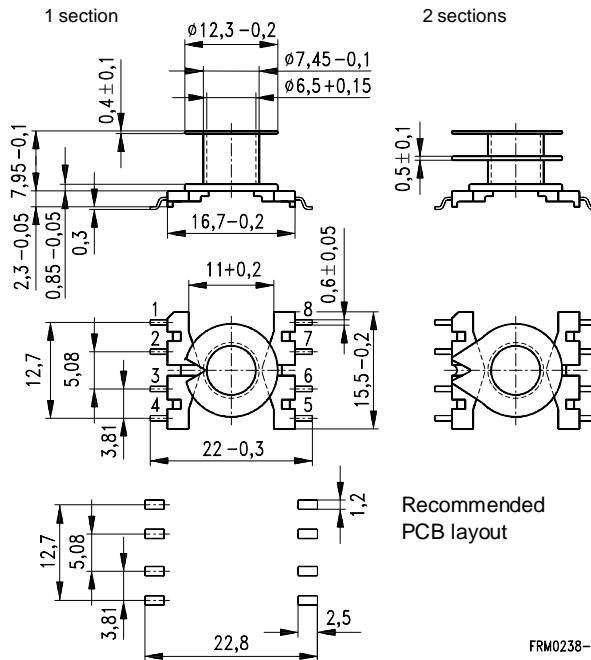
Winding: [see page 160](#)

### Clamp

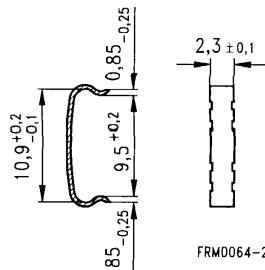
- Without ground terminal, made of stainless spring steel, 0,3 mm thick
- Also available as strip clamp (each carton containing 2 reels)
- Also available on a reel on request

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	16,2	31	66	8	B65821-C1008-T1	500
2	15,2	31	69	8	B65821-C1008-T2	
Clamp	(ordering code per piece, 2 are required)			B65808-J2204		1000

### Coil former



### Clamp



FRM0064-2

Recommended  
PCB layout

FRM0238-Q

### SMD coil former with J terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

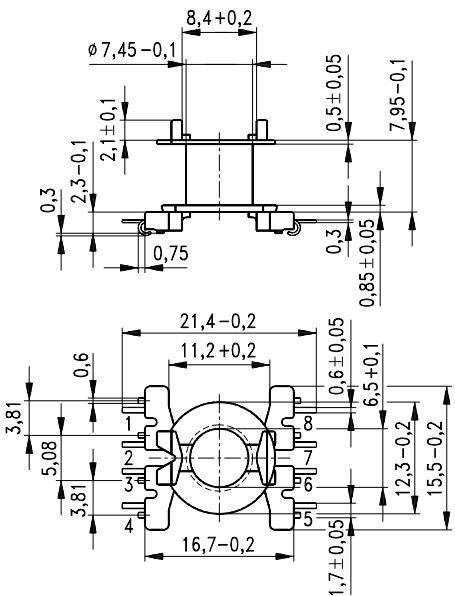
Winding: [see page 160](#)

### Clamp

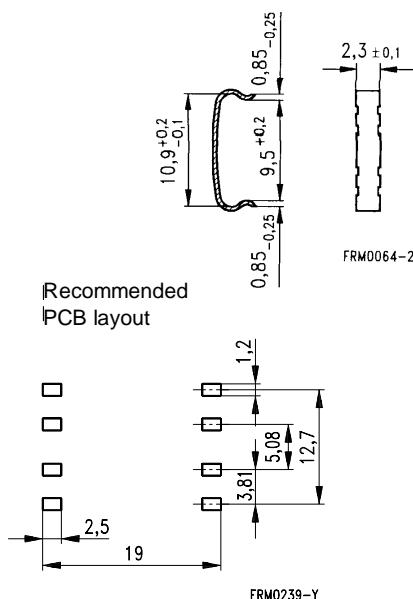
- Without ground terminal, made of stainless spring steel, 0,3 mm thick
- Also available as strip clamp (each carton containing 2 reels)
- Also available on a reel on request

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	16,2	31	66	8	B65821-J1008-T1	500
Clamp	(ordering code per piece, 2 are required)				B65808-J2204	1000

### Coil former



### Clamp



Recommended  
PCB layout

FRM0239-Y

**Adjusting screw**

● Tube core with thread and core brake made of GFR polyterephthalate

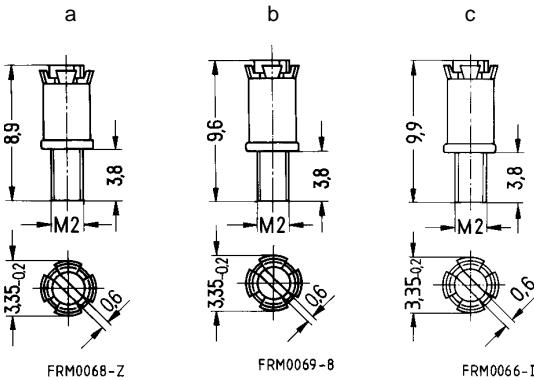
Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

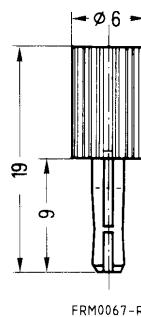
**Centering pin** as assembly aid for RM core centering

Core RM 6		Adjusting screw			Min. adjusting range %	Ordering code	PU Pcs
Material	A <sub>L</sub> value nH	Fig.	Tube core Ø × length mm	Material	Color code		
K 1	40	a	2,62 × 3,7	Si 1	white	15	B65659-F1-X101
M 33	63	a	2,62 × 3,7	Si 1	white	17	B65659-F1-X101
	100	c	2,82 × 4,4	Si 1	brown	16	B65659-F4-X101
N 48	160	a	2,62 × 3,7	K 1	green	17	B65659-F1-X1
	200	a	2,62 × 3,7	N 22	red	16 11	B65659-F1-X23
	250						
	315	b	2,75 × 4,4	N 22	black	13	B65659-F3-X23
	400	c	2,82 × 4,4	N 22	yellow	11	B65659-F4-X23
<b>Adjusting screwdriver</b>						B63399-B4	10
<b>Handle</b>						B63399-B5	10
<b>Centering pin</b>						B65808-A2008	500

**Adjusting screws**



**Centering pin**

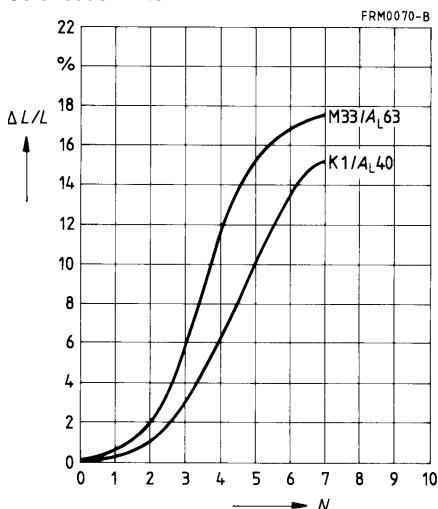


**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 1 turn engaged.

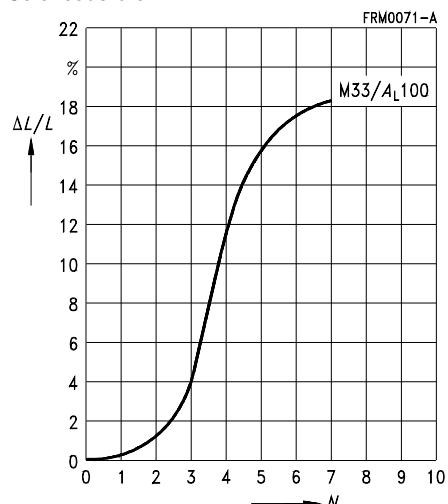
Adjusting screw B65659-F1-X101

Color code white



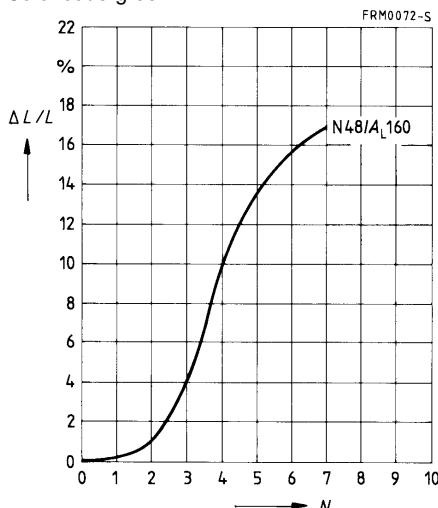
Adjusting screw B65659-F4-X101

Color code brown



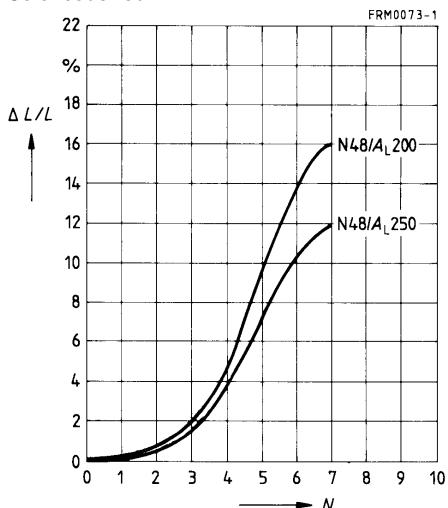
Adjusting screw B65659-F1-X1

Color code green



Adjusting screw B65659-F1-X23

Color code red

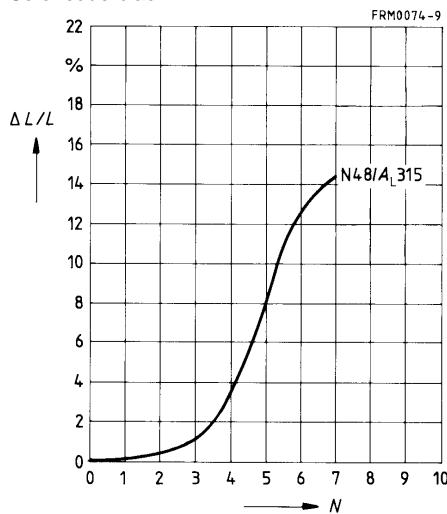


**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 1 turn engaged.

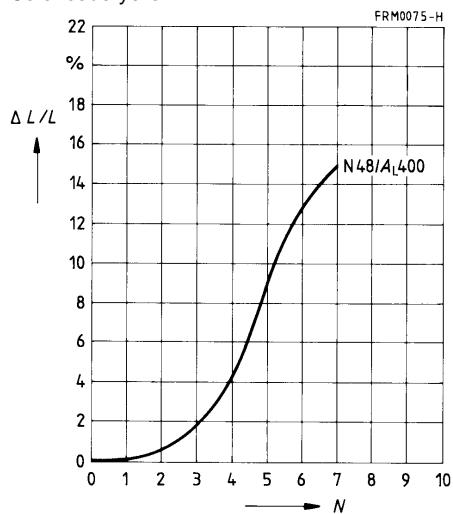
Adjusting screw B65659-F3-X23

Color code black



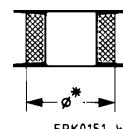
Adjusting screw B65659-F4-X23

Color code yellow

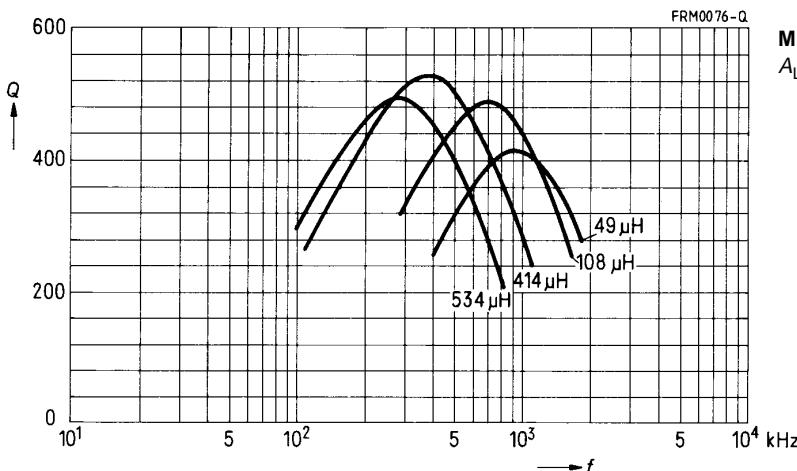


**Q factor characteristics (typical values)**Flux density in the core  $\hat{B} < 2 \text{ mT}$ 

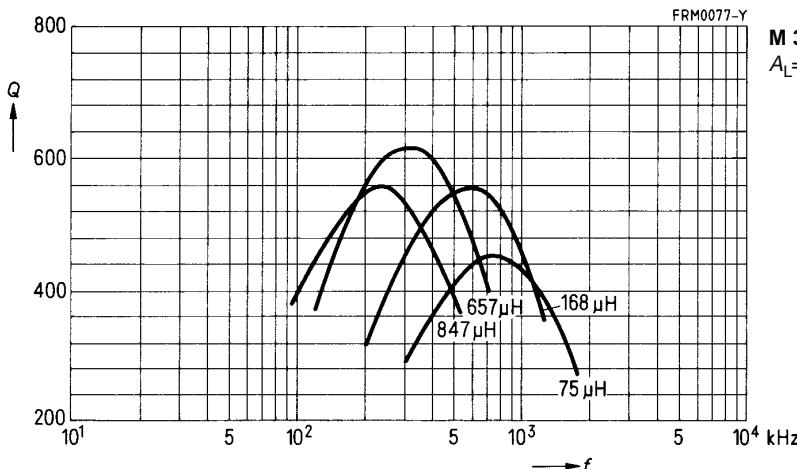
Material	$L (\mu\text{H})$ for $A_L = 63 \text{ nH}$	$A_L = 100 \text{ nH}$	Turns	RF litz wire	Sections	$\emptyset^*$ mm
M 33	534	847	92	45 x 0,04 CuLS	1	—
	414	657	81	45 x 0,04 CuLS	2	—
	108	168	41	45 x 0,04 CuLS	2	9,8
	49	75	27	45 x 0,04 CuLS	2	10,6



\* Pad of  
polystyrene  
tape up to  
diameter  $\emptyset$



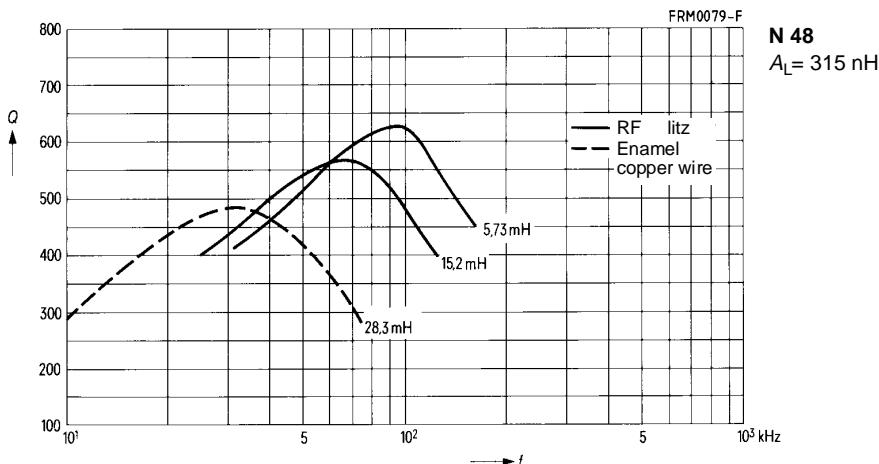
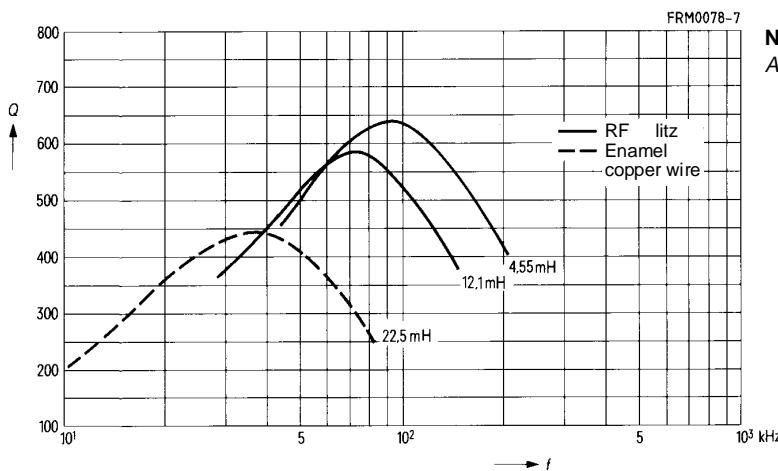
M 33  
 $A_L = 63 \text{ nH}$



M 33  
 $A_L = 100 \text{ nH}$

**Q factor characteristics (typical values)**Flux density in the core  $\hat{B} < 2 \text{ mT}$ 

Material	$L$ (mH) for $A_L = 250 \text{ nH}$	$L$ (mH) for $A_L = 315 \text{ nH}$	Turns	Wire; RF litz wire	Sections
N 48	22,5	28,3	300	0,20 CuL	1
	12,1	15,2	220	6 × 0,07 CuLS	1
	4,55	5,73	135	20 × 0,05 CuLS	1



- For compact transformers
- Without center hole

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,58 \text{ mm}^{-1}$$

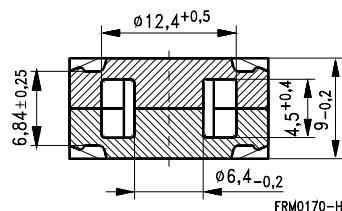
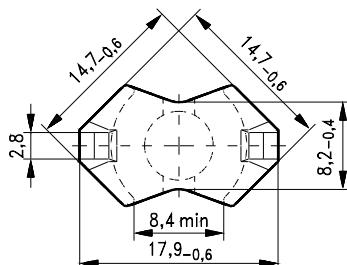
$$l_e = 21,8 \text{ mm}$$

$$A_e = 37,5 \text{ mm}^2$$

$$A_{min} = 31,2 \text{ mm}^2$$

$$V_e = 820 \text{ mm}^3$$

**Approx. weight** 4,0 g/set



**Ungapped**

Mate- rial	$A_L$ value nH	$\mu_e$	$A_{L1min}$	$P_V$ W/set	Ordering code	PU Sets
N30	5200 + 30/- 20 %	2390			B65807-P-R30	500
T38	10500 + 40/- 30 %	4830			B65807-P-Y38	
N49	2200 + 30/- 20 %	1020	1500	0,14 (50 mT, 500 kHz, 100 °C)	B65807-P-R49	
N67	3000 + 30/- 20 %	1380	1950	0,50 (200 mT, 100 kHz, 100 °C)	B65807-P-R67	
N87	3000 + 30/- 20 %	1380	1950	0,40 (200 mT, 100 kHz, 100 °C)	B65807-P-R87	

### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

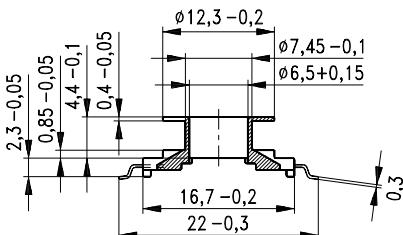
Winding: [see page 160](#)

### Clamp

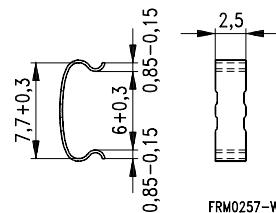
- Without ground terminal, made of stainless spring steel, 0,3 mm thick
- Also available as strip clamp (each carton containing 2 reels)
- Also available on a reel on request

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	7,6	31	66	8	B65821-A6008-T1	500
Clamp	(ordering code per piece, 2 are required)				B65808-P2204	1000

### Coil former

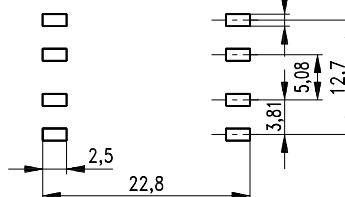
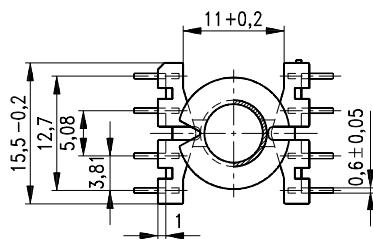


### Clamp



FRM0257-W

### Recommended PCB layout



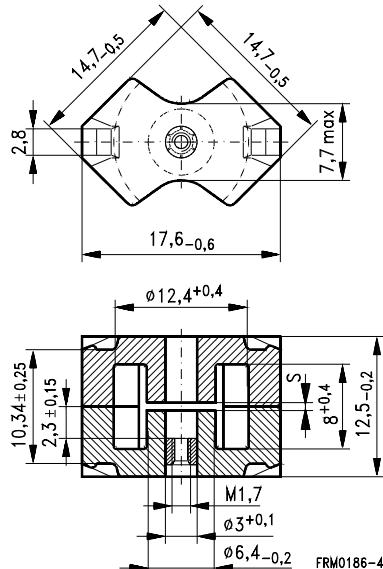
FRM0256-N

- In accordance with IEC 431

**Magnetic characteristics (per set)**

$\Sigma l/A = 0,8 \text{ mm}^{-1}$   
 $l_e = 25,6 \text{ mm}$   
 $A_e = 32 \text{ mm}^2$   
 $V_e = 820 \text{ mm}^3$

**Approx. weight** 5,1 g/set



**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code -F with threaded sleeve	PU Sets
N48	$160 \pm 2 \%$	0,20	102	B65809-F160-A48	500
	$200 \pm 3 \%$	0,16	127	B65809-F200-A48	
	$315 \pm 3 \%$	0,08	201	B65809-F315-A48	
	$400 \pm 3 \%$	0,05	255	B65809-F400-A48	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	Ordering code -A with center hole	PU Sets
N30	$4300 + 30/-20 \%$	2740	B65809-A-R30	500
T35	$6000 + 30/-20 \%$	3820	B65809-A-R35	
T38	$8600 + 40/-30 \%$	5470	B65809-A-Y38	

## RM 7 Core and Accessories

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">237</a>
Matching handle	B63399	<a href="#">237</a>
Centering pin	B65808	<a href="#">237</a>
Adjusting screw	B65659	<a href="#">237</a>
Core	B65819	<a href="#">233</a>
Clamps	B65820	<a href="#">236</a>
Insulating washer 1	B65820	<a href="#">236</a>
Coil former	B65820	<a href="#">235</a>
Core	B65819	<a href="#">233</a>
Threaded sleeve (glued-in)		
Insulating washer 2	B65820	<a href="#">236</a>
FRM 0048-K		

Example of an assembly set

Also available: RM 7 low profile core B65819-P [240](#)

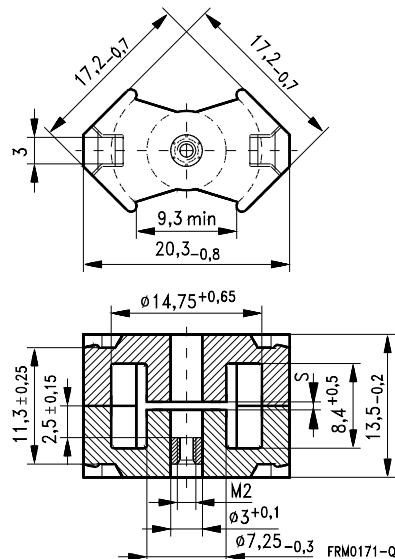
- In accordance with IEC 431
- Core without center hole  
for transformer applications

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma I/A$	0,74	0,7	$\text{mm}^{-1}$
$I_e$	29,8	30,4	mm
$A_e$	40	43	$\text{mm}^2$
$A_{\min}$	—	39	$\text{mm}^2$
$V_e$	1200	1340	$\text{mm}^3$

**Approx. weight (per set)**

$m$	6,5	7,2	g

**Gapped**

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code -N with threaded sleeve -J without center hole	PU Sets
N48	$250 \pm 3 \%$	0,16	147	B65819-N250-A48	250
	$315 \pm 3 \%$	0,12	186	B65819-N315-A48	
N41	$160 \pm 5 \%$	0,30	89	B65819-J160-J41	
	$250 \pm 5 \%$	0,18	39	B65819-J250-J41	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code -A with center hole -J w/o center hole	PU Sets
N30	5000 + 30/- 20 %	2780			B65819-J-R30	250
T35	7000 + 30/- 20 %	3900			B65819-J-R35	
T38	10000 +40/- 30 %	5570			B65819-J-Y38	
N49	1900 + 30/- 20 %	1070	1070	0,22 (50 mT, 500 kHz, 100 °C)	B65819-J-R49	
N67	2700 + 30/- 20 %	1510	1600	0,96 (200 mT, 100 kHz, 100 °C)	B65819-J-R67	
N87	2700 + 30/- 20 %	1510	1600	0,77 (200 mT, 100 kHz, 100 °C)	B65819-J-R87	

**Coil former**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

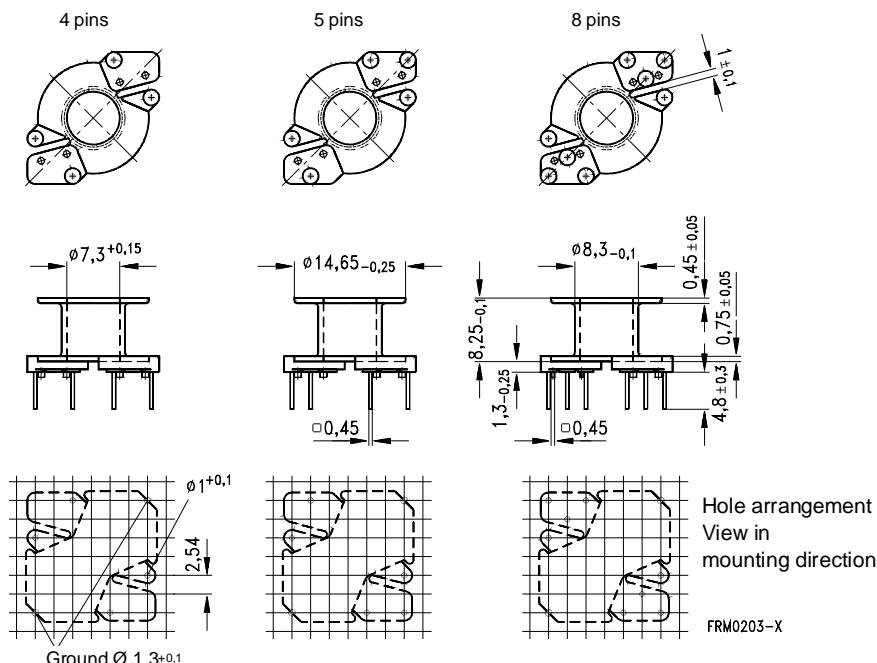
H  $\triangleq$  max. operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	21,4	35,6	56	4	on request	250
	21,4	35,6	56	5	on request	
	21,4	35,6	56	8	B65820-B1008-D1	
2	with 4 or 8 pins on request					



**Clamp**

- With ground terminal, made of stainless spring steel (tinned), 0,4 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

**Insulating washer 1** between core and coil former

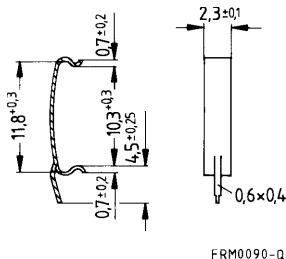
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,06 mm thick

**Insulating washer 2** for double-clad PCBs

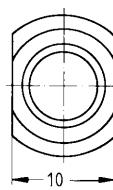
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65820-B2001	500
Insulating washer 1 (reel packing, PU = 1 reel)	B65820-A5000	2000
Insulating washer 2 (bulk)	B65820-C2005	2000

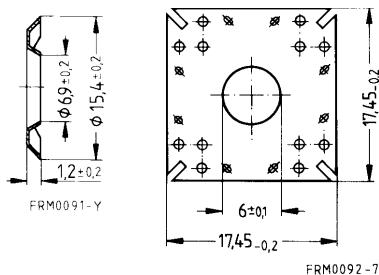
**Clamp**



**Insulating washer 1**



**Insulating washer 2**



**Adjusting screw**

● Tube core with thread and core brake made of GFR polyterephthalate

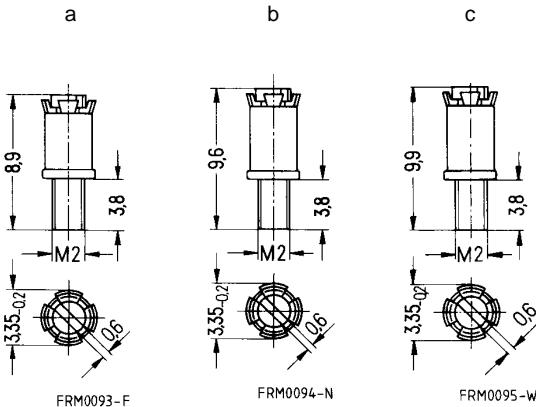
Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

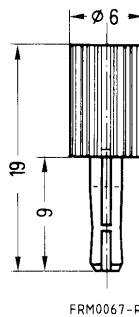
**Centering pin** as assembly aid for RM core centering

Core RM 7		Adjusting screw			Min. adjusting range %	Ordering code	PU Pcs
Material	$A_L$ value nH	Fig.	Tube core Ø × length mm	Material			
M33	63	a	2,60 × 3,7	Si 1	white	16	B65659-F1-X101
	100	c	2,82 × 4,4	Si 1	brown	17	B65659-F4-X101
M48	250	a	2,60 × 3,7	N 22	red	12	B65659-F1-X23
	315	b	2,75 × 4,4	N 22	black	16	B65659-F3-X23
<b>Adjusting screwdriver</b>					B63399-B4		10
<b>Handle</b>					B63399-B5		10
<b>Centering pin</b>					B65808-A2008		500

**Adjusting screws**



**Centering pin**

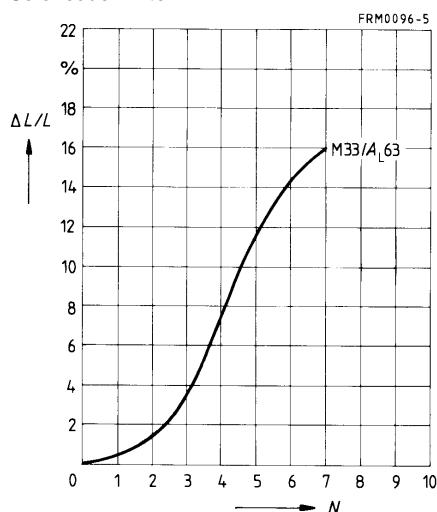


**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 2 turns engaged.

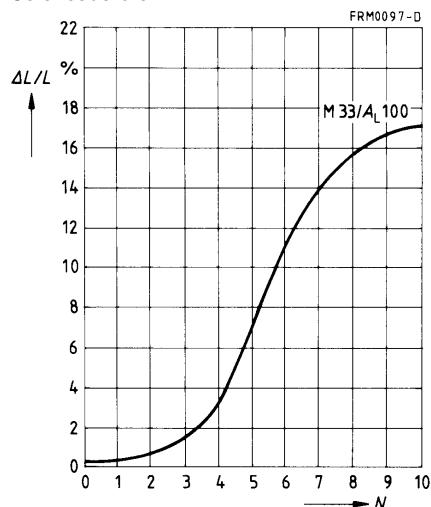
Adjusting screw B65659-F1-X101

Color code white



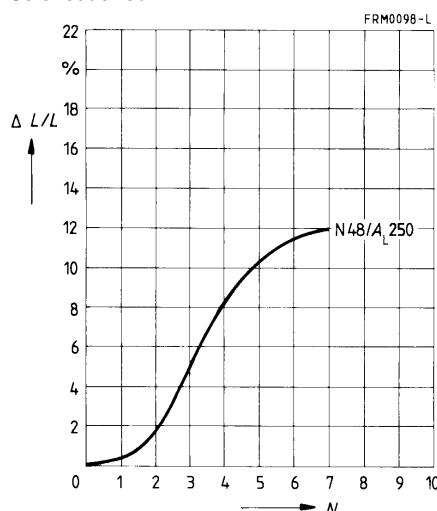
Adjusting screw B65659-F4-X101

Color code brown



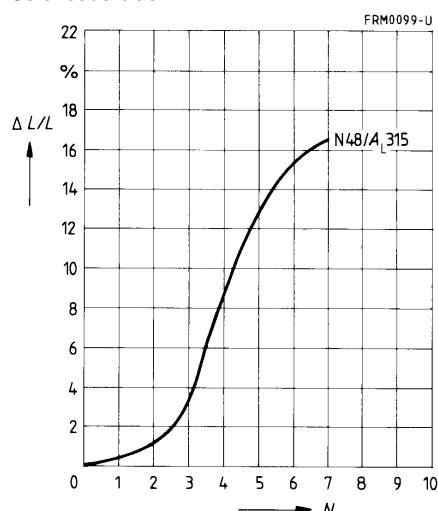
Adjusting screw B65659-F1-X23

Color code red



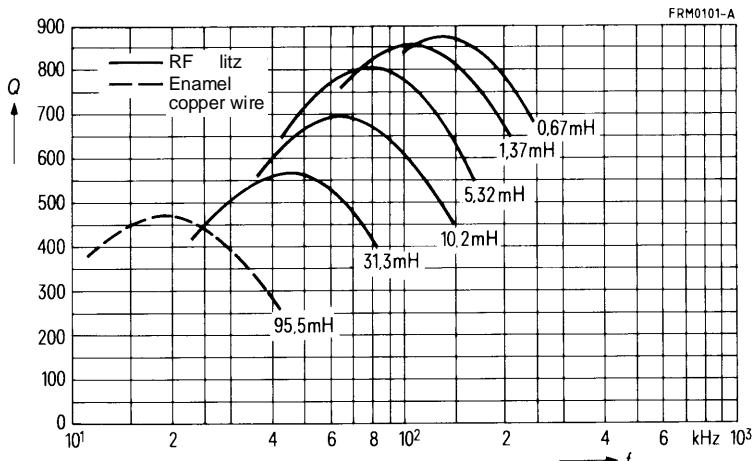
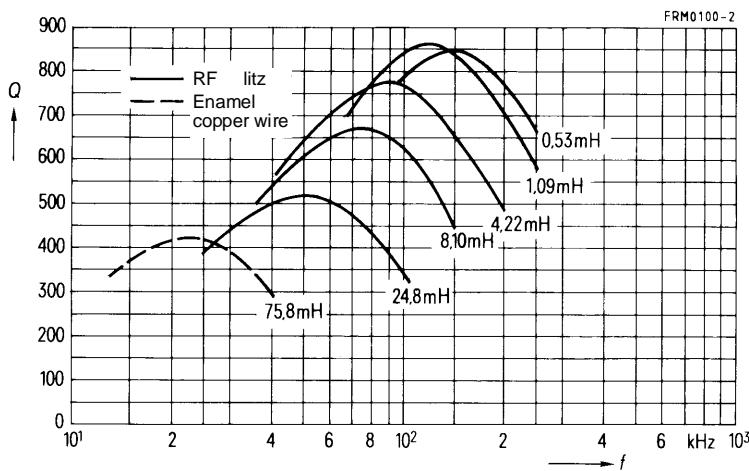
Adjusting screw B65659-F3-X23

Color code black



**Q factor characteristics (typical values)**Flux density in the core  $\hat{B} < 1 \text{ mT}$ 

Mater- ial	$L$ (mH) for		Turns	Wire; RF litz wire	Sec- tions
	$A_L = 250 \text{ nH}$	$A_L = 315 \text{ nH}$			
N 48	75,80	95,50	550	0,18 CuL	1
	24,80	31,30	315	6 × 0,07 CuLS	1
	8,10	10,20	180	20 × 0,05 CuLS	1
	4,22	5,32	130	45 × 0,04 CuLS	1
	1,09	1,37	66	90 × 0,04 CuLS	1
	0,53	0,67	46	120 × 0,04 CuLS	1



- For compact transformers
- Without center hole

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,52 \text{ mm}^{-1}$$

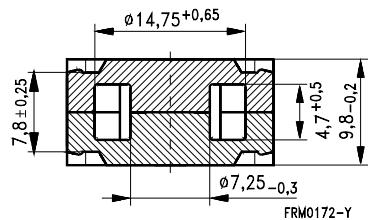
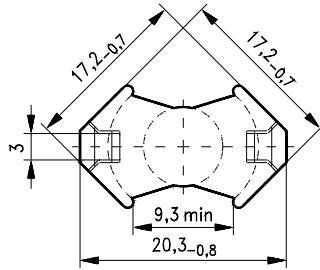
$$I_e = 23,5 \text{ mm}$$

$$A_e = 45,3 \text{ mm}^2$$

$$A_{min} = 39,6 \text{ mm}^2$$

$$V_e = 1060 \text{ mm}^3$$

**Approx. weight** 5,7 g/set



**Ungapped**

Mate- rial	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N30	5600 + 30/- 20 %	2310			B65819-P-R30	250
T38	11500 + 40/- 30 %	4740			B65819-P-Y38	
N49	2400 + 30/- 20 %	990	1700	0,21 (50 mT, 500 kHz, 100 °C)	B65819-P-R49	
N67	3300 + 30/- 20 %	1360	2200	0,71 (200 mT, 100 kHz, 100 °C)	B65819-P-R67	
N87	3300 + 30/- 20 %	1360	2200	0,57 (200 mT, 100 kHz, 100 °C)	B65819-P-R87	

## RM 8

### Core and Accessories

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Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">249</a>
Matching handle	B63399	<a href="#">249</a>
Adjusting screw	B65812	<a href="#">249</a>
Core	B65811	<a href="#">242</a>
Clamps	B65812	<a href="#">248</a>
Insulating washer 1	B65812	<a href="#">248</a>
Coil former	B65812	<a href="#">245</a>
Core	B65811	<a href="#">242</a>
Threaded sleeve (glued-in)		
Insulating washer 2	B65812	<a href="#">248</a>

Example of an assembly set

FRM0051-5

<b>Also available:</b>	Core for nonlinear chokes	B65811-H	<a href="#">244</a>
	Coil former for SMPS transformers	B65812	<a href="#">246</a>
	Coil former for power applications	B65812	<a href="#">247</a>
	RM 8 low-profile core	B65811-P	<a href="#">253</a>

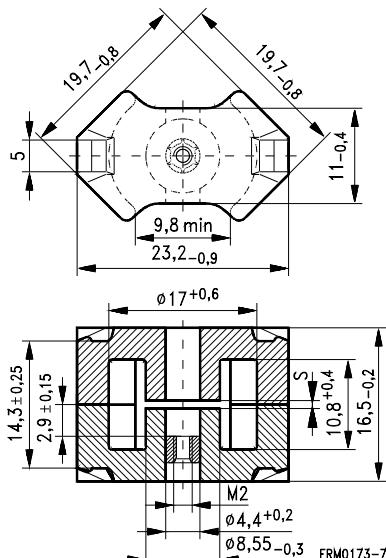
- In accordance with IEC 431
- Cores without center hole  
for transformer applications
- For nonlinear chokes see B65811-H

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma l/A$	0,67	0,59	$\text{mm}^{-1}$
$I_e$	35,1	38	mm
$A_e$	52	64	$\text{mm}^2$
$A_{\min}$	—	55	$\text{mm}^2$
$V_e$	1840	2430	$\text{mm}^3$

**Approx. weight (per set)**

$m$	10,7	12	g



**Gapped**

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code -F with threaded sleeve -J without center hole	PU Sets
M33	$100 \pm 3\%$	0,7	53	B65811-F100-A33	200
N48	$250 \pm 3\%$	0,23	133	B65811-F250-A48	
	$315 \pm 3\%$	0,17	168	B65811-F315-A48	
	$400 \pm 3\%$	0,14	213	B65811-F400-A48	
	$630 \pm 5\%$	0,10	336	B65811-F630-J48	
N41	$250 \pm 5\%$	0,24	117	B65811-J250-J41	
	$1600 \pm 10\%$	0,04	752	B65811-J1600-K41	

**Ungapped**

Mate- rial	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code -D with center hole -J w/o center hole	PU Sets
N26	2900 + 30/- 20 %	1550			B65811-D-R26	200
N30	5700 + 30/- 20 %	2680			B65811-J-R30	
T35	8400 + 30/- 20 %	3940			B65811-J-R35	
T38	12500 + 40/- 30 %	5870			B65811-J-Y38	
N49	2200 + 30/- 20 %	1040	1270	0,37 (50 mT, 500 kHz, 100 °C)	B65811-J-R49	
N67	3300 + 30/- 20 %	1560	1900	1,50 (200 mT, 100 kHz, 100 °C)	B65811-J-R67	
N87	3300 + 30/- 20 %	1560	1900	1,20 (200 mT, 100 kHz, 100 °C)	B65811-J-R87	
N41	4100 + 30/- 20 %	1930	1900	0,36 (200 mT, 25 kHz, 100 °C)	B65811-J-R41	

- Suitable for nonlinear chokes in switch-mode power supplies, particularly for forward converters and buck converters

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,59 \text{ mm}^{-1}$$

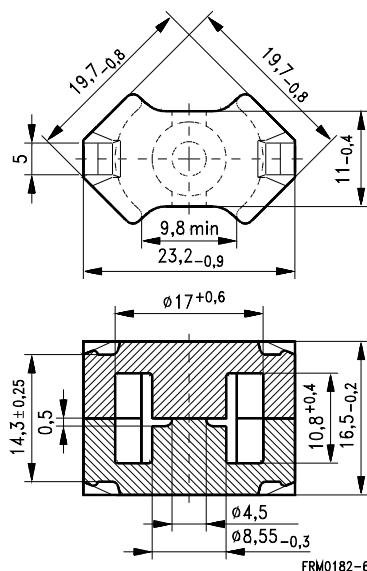
$$l_e = 38 \text{ mm}$$

$$A_e = 64 \text{ mm}^2$$

$$A_{\min} = 55 \text{ mm}^2$$

$$V_e = 2430 \text{ mm}^3$$

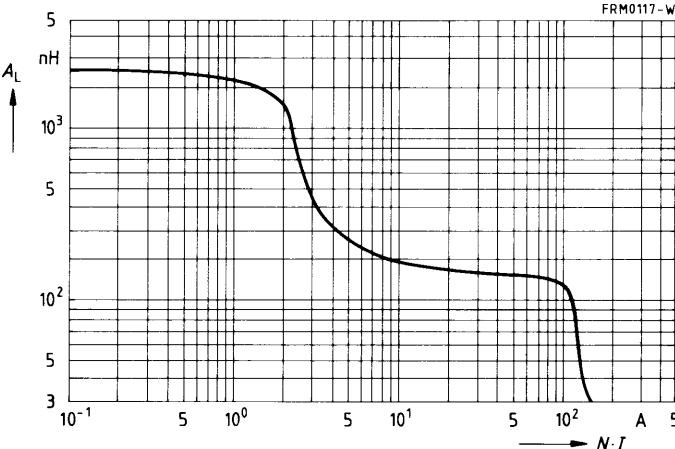
**Approx. weight** 12 g/set



Material	$A_L$ value nH	Ordering code	PU Sets
N41	$2500 \pm 30 \%$	B65811-H2500-X41	200

**$A_L$  value versus ampere-turns  $N \cdot I$ , typical curve**

(Measuring flux density  $\hat{B} \leq 1 \text{ mT}$ , measuring frequency  $f = 10 \text{ kHz}$ )



**Coil former**

Standard: to IEC 431 and DIN 41 981

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

H  $\triangleq$  max. operating temperature 180 °C), color code blue

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

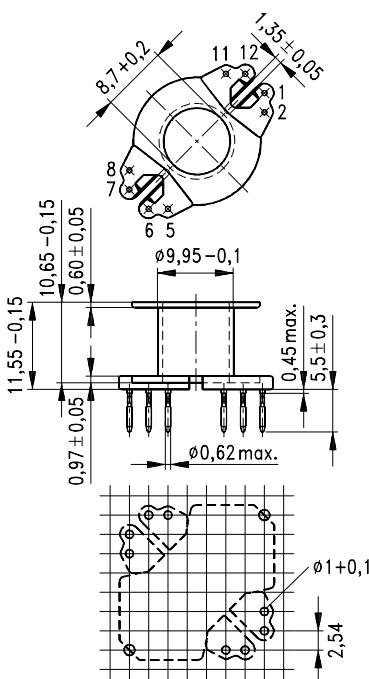
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

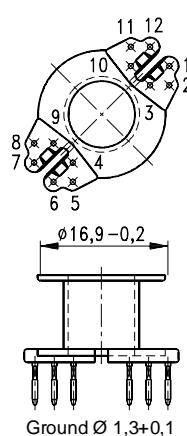
Pins squared in the start-of-winding area

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	30	42	47	5	B65812-K1005-D1	200
				8	B65812-K1008-D1	
				12	B65812-K1012-D1	
2	28,4	42	50	5	B65812-K1005-D2	
				8	B65812-K1008-D2	
				12	B65812-K1012-D2	

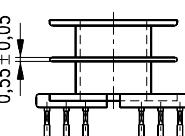
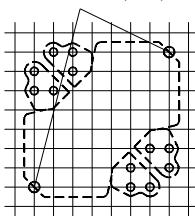
5 and 8 pins\*)



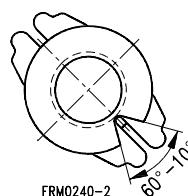
12 pins



\*) Pins 6, 7 and 12 are omitted in the 5-pin version



Hole arrangement  
View in mounting direction



**Coil former for SMPS transformers with line isolation**

The creepage distances and clearances are designed such that the coil former is suitable for use in SMPS transformers with line isolation.

- Closed center flange with external wire guide
- Pins squared in the start-of-winding area
- Optimized for use with automatic winding machines

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

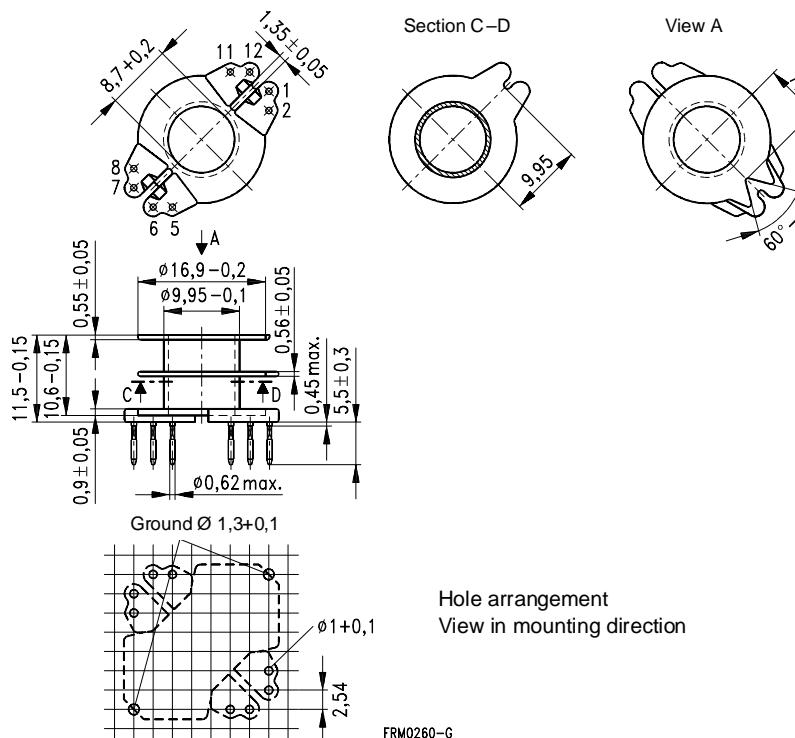
F  $\triangleq$  max. operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
2	28,4	42	50	8	B65812-X1108-D2	200



**Coil former for power applications**

Optimized for automatic winding

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

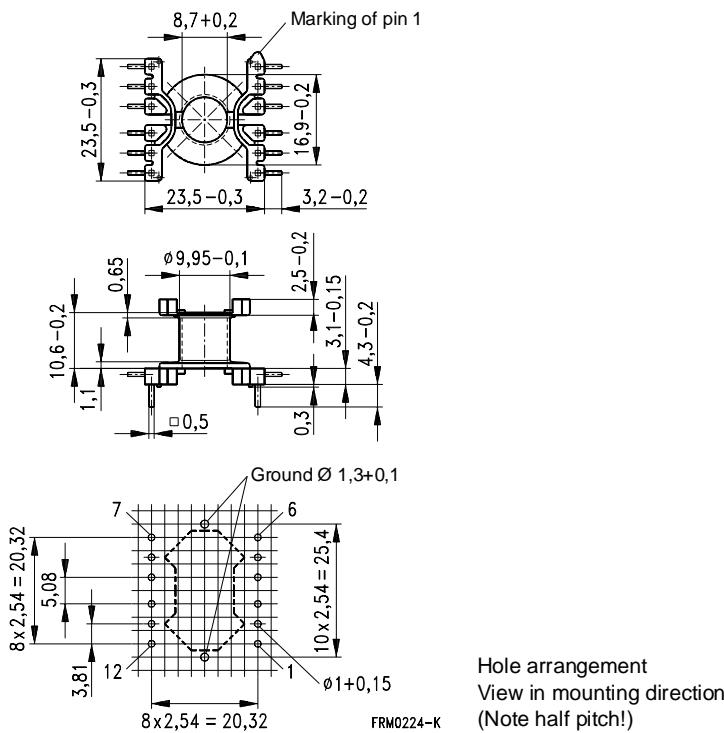
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

For matching clamp and insulating washer 1 [see page 248](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	30	42	47	12	B65812-C1512-T1	200



### Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,4 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Also available as strip clamp on reels

### Insulating washer 1 between core and coil former

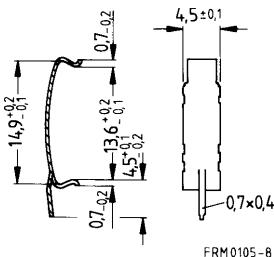
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,06 mm thick

### Insulating washer 2 for double-clad PCBs

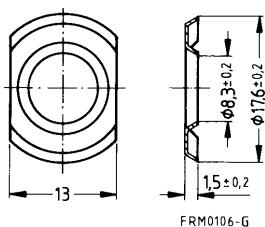
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65812-A2203	400
Insulating washer 1 (reel packing, PU = 1 reel)	B65812-A5000	1200
Insulating washer 2 (bulk)	B65812-C2005	1200

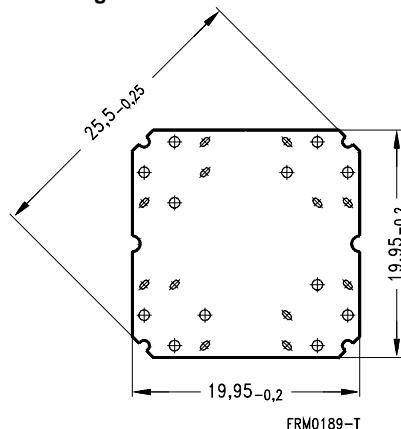
### Clamp



**Insulating washer 1**



**Insulating washer 2**



**Adjusting screw**

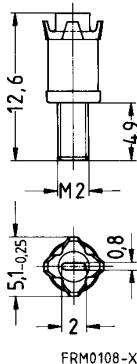
● Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

Core RM 8		Adjusting screw			Min. adjusting range %	Ordering code	PU Pcs
Mate- rial	A <sub>L</sub> value nH	Tube core Ø × length mm	Mate- rial	Color code			
M 33	100	3,85 × 5,0	Si 1	yellow	16	B65812-B3003-X101	200
N 48	250	4,18 × 5,0	Si 1	white	12	B65812-B3001-X101	
	315	3,85 × 5,0	N 22	gray	13	B65812-B3003-X22	
	400	4,18 × 4,0	N 22	brown	17	B65812-B3002-X22	
	500 630	4,18 × 5,0	N 22	black	13 9	B65812-B3001-X22	
<b>Adjusting screwdriver</b>					B63399-B1		10
<b>Handle</b>					B63399-B5		10

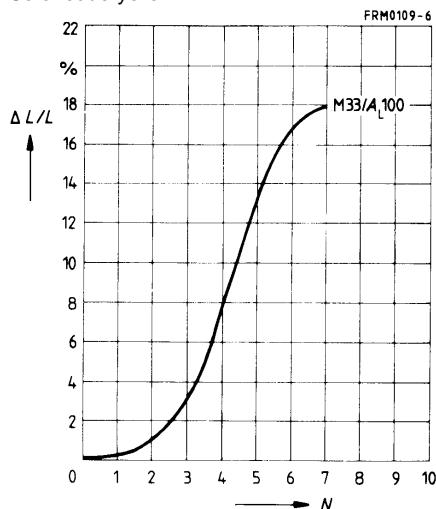
**Adjusting screw**



**Inductance adjustment curves (nominal values)**Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.0  $\leq$  at least 2 turns engaged.

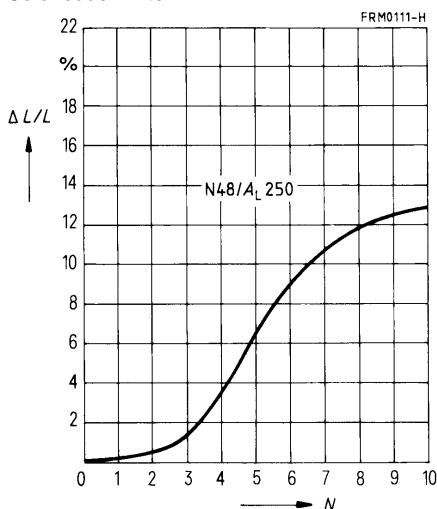
Adjusting screw B65812-B3003-X101

Color code yellow



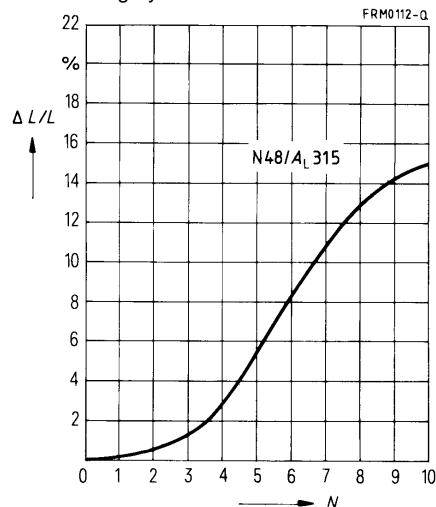
Adjusting screw B65812-B3001-X101

Color code white



Adjusting screw B65812-B3003-X22

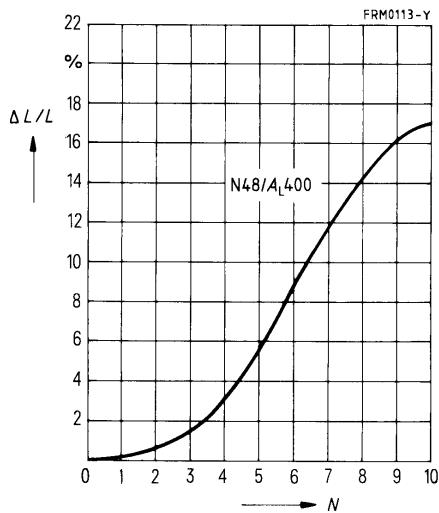
Color code gray



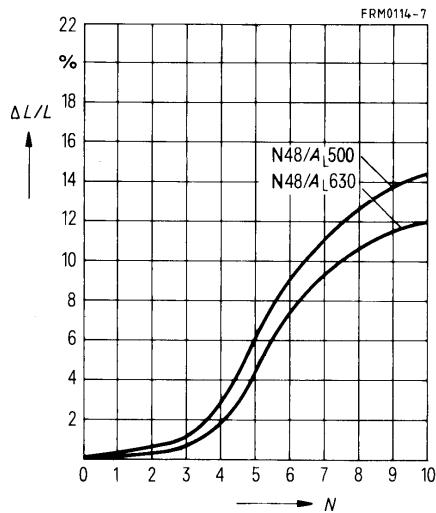
**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 2 turns engaged.

Adjusting screw B65812-B3002-X22  
Color code brown

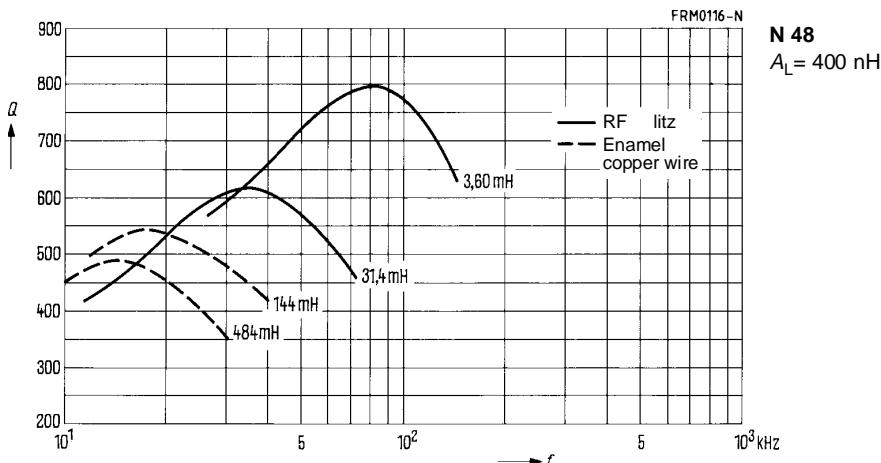
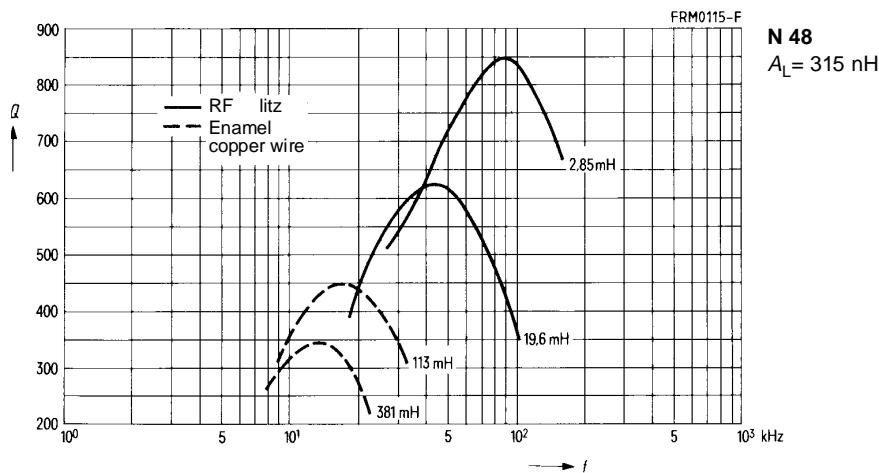


Adjusting screw B65812-B3001-X22  
Color code black



**Q factor characteristics (typical values)**Flux density in the core  $\hat{B} < 2 \text{ mT}$ 

Material	$L$ (mH) for $A_L = 315 \text{ nH}$	$L$ (mH) for $A_L = 400 \text{ nH}$	Turns	Wire; RF litz wire	Sections
N 48	381	484	1100	0,15 CuL	1
	113	144	600	0,2 CuL	1
	19,6	31,4	280	20 × 0,05 CuLS	1
	2,85	3,6	95	60 × 0,05 CuLS	1



- For compact transformers
- Without center hole

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,44 \text{ mm}^{-1}$$

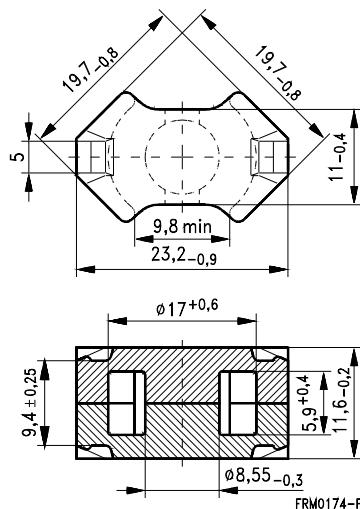
$$l_e = 28,7 \text{ mm}$$

$$A_e = 64,9 \text{ mm}^2$$

$$A_{min} = 55,4 \text{ mm}^2$$

$$V_e = 1860 \text{ mm}^3$$

**Approx. weight** 9,2 g/set



**Ungapped**

Mate- rial	$A_L$ value nH	$\mu_e$	$A_{L1min}$	$P_V$ W/set	Ordering code	PU Sets
N30	6800 + 30/- 20 %	2390			B65811-P-R30	500
T38	15000 + 40/- 30 %	5270			B65811-P-Y38	
N49	2900 + 30/- 20 %	1020	2000	0,33 (50 mT, 500 kHz, 100 °C)	B65811-P-R49	
N67	4100 + 30/- 20 %	1440	2550	1,15 (200 mT, 100 kHz, 100 °C)	B65811-P-R67	
N87	4100 + 30/- 20 %	1440	2550	0,92 (200 mT, 100 kHz, 100 °C)	B65811-P-R87	

## RM 10 Core and Accessories

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">262</a>
Matching handle	B63399	<a href="#">262</a>
Adjusting screw	B65679	<a href="#">262</a>
Core	B65813	<a href="#">255</a>
Clamps	B65814	<a href="#">261</a>
Insulating washer 1	B65814	<a href="#">261</a>
Coil former	B65814	<a href="#">258</a>
Core	B65813	<a href="#">255</a>
Threaded sleeve (glued-in)		
Insulating washer 2	B65814	<a href="#">261</a>
FRM0053-L		

Example of an assembly set

**Also available:**

Coil former for power applications	B65814	<a href="#">259</a>
Core and coil former for nonlinear chokes	B65813-H	<a href="#">257</a>
	B65814	<a href="#">260</a>
RM 10 low-profile core	B65813-P	<a href="#">264</a>

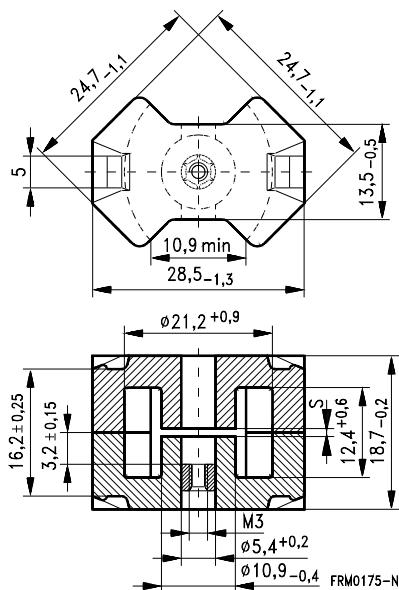
- In accordance with IEC 431 and DIN 41 980
- Cores without center hole  
for transformer applications
- For nonlinear chokes see B65813-H

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma I/A$	0,5	0,45	$\text{mm}^{-1}$
$I_e$	42	44	mm
$A_e$	83	98	$\text{mm}^2$
$A_{\min}$	—	90	$\text{mm}^2$
$V_e$	3470	4310	$\text{mm}^3$

**Approx. weight (per set)**

$m$	20,7	22	g



**Gapped**

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code -N with threaded sleeve -J without center hole	PU Sets
N48	$400 \pm 3\%$	0,21	160	B65813-N400-A48	200
	$630 \pm 3\%$	0,13	250	B65813-N630-A48	
N41	$250 \pm 3\%$	0,44	90	B65813-J250-A41	
	$630 \pm 5\%$	0,13	226	B65813-J630-J41	
	$1600 \pm 10\%$	0,04	573	B65813-J1600-K41	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code -J w/o center hole	PU Sets
N30	7600 + 30/- 20 %	2720			B65813-J-R30	200
T35	11000 + 30/- 20 %	3940			B65813-J-R35	
T38	16000 + 40/- 30 %	5730			B65813-J-Y38	
N49	2900 + 30/- 20 %	1040	1680	0,75 (50 mT, 500 kHz, 100 °C)	B65813-J-R49	
N67	4200 + 30/- 20 %	1500	2550	2,75 (200 mT, 100 kHz, 100 °C)	B65813-J-R67	
N87	4200 + 30/- 20 %	1500	2550	2,30 (200 mT, 100 kHz, 100 °C)	B65813-J-R87	
N41	5500 + 30/- 20 %	1960	2550	0,80 (200 mT, 25 kHz, 100 °C)	B65813-J-R41	

- Suitable for nonlinear chokes in switch-mode power supplies, particularly for forward converters and buck converters

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,45 \text{ mm}^{-1}$$

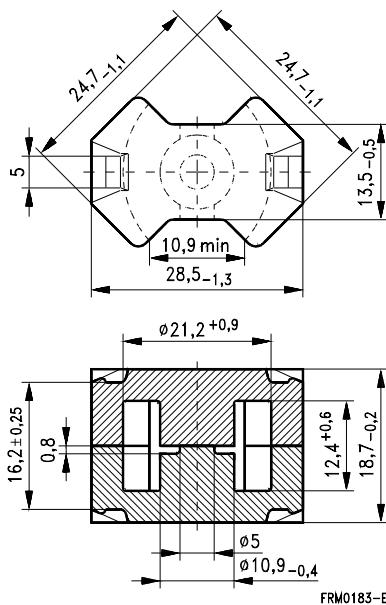
$$l_e = 44 \text{ mm}$$

$$A_e = 98 \text{ mm}^2$$

$$A_{\min} = 90 \text{ mm}^2$$

$$V_e = 4310 \text{ mm}^3$$

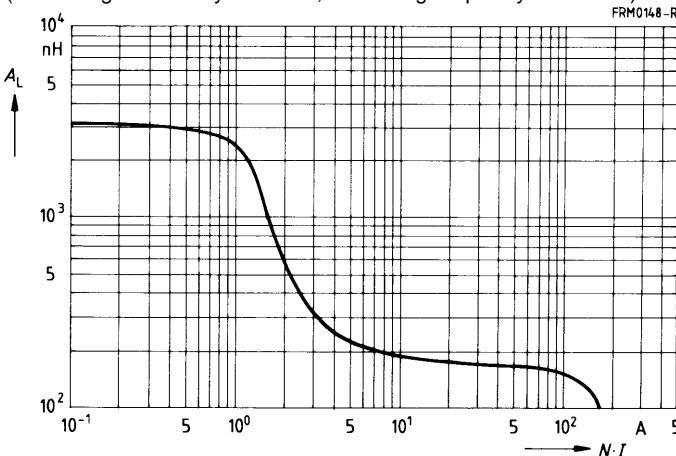
**Approx. weight** 22 g/set



Material	$A_L$ value nH	Ordering code	PU Sets
N41	$3200 \pm 30 \%$	B65813-H3200-X41	200

**$A_L$  value versus ampere-turns  $N \cdot I/\text{dc}$ , typical curve**

(Measuring flux density  $\hat{B} \leq 1 \text{ mT}$ , measuring frequency  $f = 10 \text{ kHz}$ )



**Coil former**

Standard: to IEC 431 and DIN 41 981

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

H  $\triangleq$  max. operating temperature 180 °C), color code blue

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

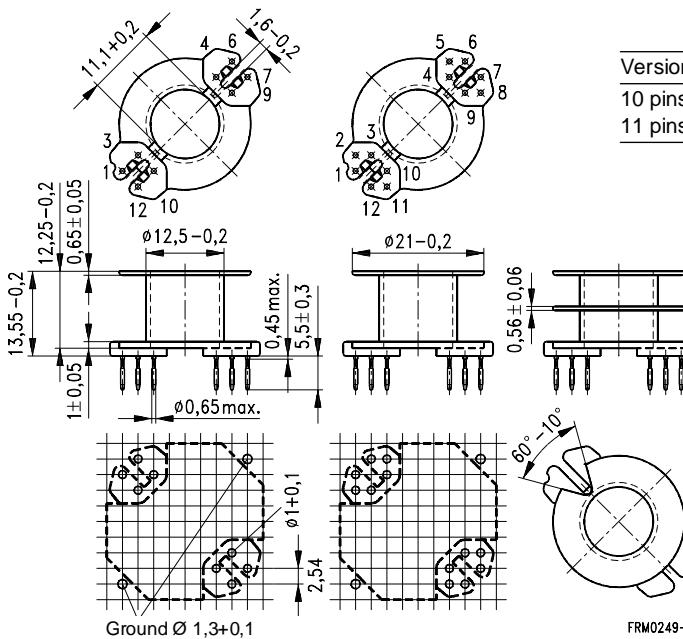
Pins squared in the start-of-winding area

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	41,5	52	43	8	B65814-K1008-D1	200
				10	B65814-K1010-D1	
				11	B65814-K1011-D1	
				12	B65814-K1012-D1	
2	39	52	46	8	on request	
				10	on request	
				11	on request	
				12	B65814-K1012-D2	

8 pins\*)

10, 11 and 12 pins

Version	Pins omitted
10 pins	2, 11
11 pins	9



Hole arrangement  
View in  
mounting direction

FRM0249-6

**Coil former for power applications**

Optimized for automatic winding

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

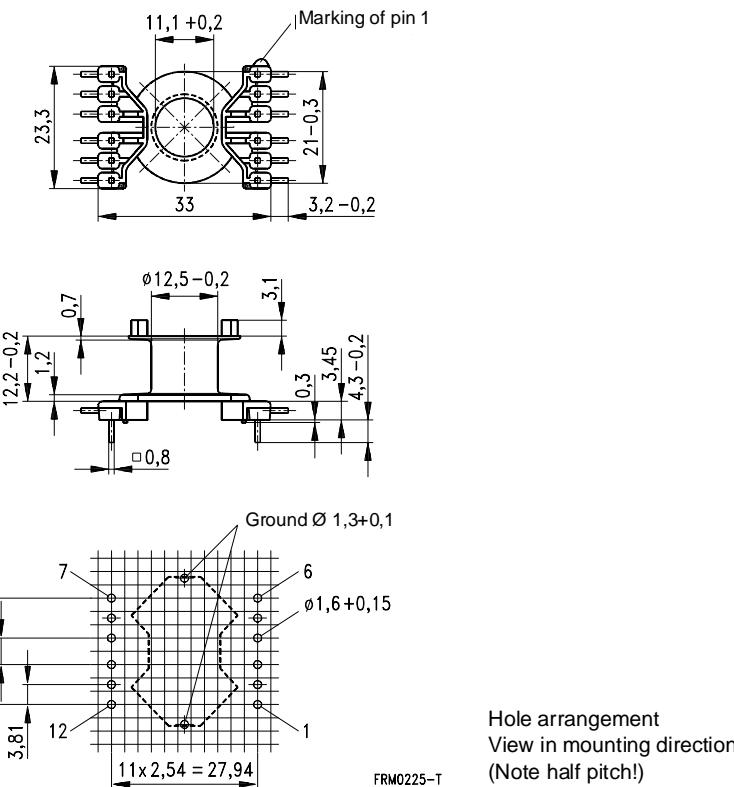
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

For matching clamp [see page 261](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	41,5	52	43	12	B65814-C1512-T1	200



**Coil former for nonlinear chokes**

- Suitable for wire gauges  $\varnothing$  0,8 ... 1,5 mm
- The winding wires can be fixed in the coil former to be able to use the standard grid.

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

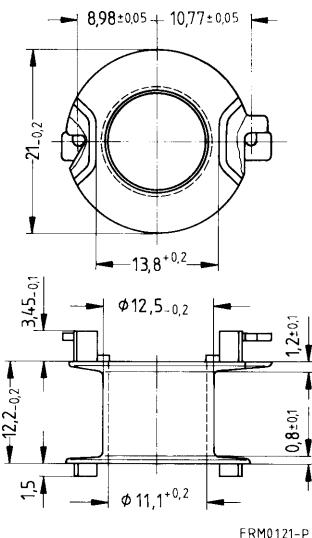
F  $\leq$  max. operating temperature 155 °C), color code black

Resistance to soldering heat: to IEC 68-2-20, test Tb, method1B: 350 °C, 3,5 s

Winding: [see page 152](#)

For matching clamp [see page 261](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
1	41,5	52	43	B65814-J1000-T1	200



### Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,45 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Also available as strip clamp on reels

### Insulating washer 1 between core and coil former

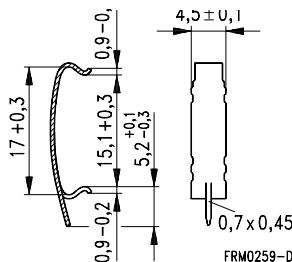
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,06 mm thick

### Insulating washer 2 for double-clad PCBs

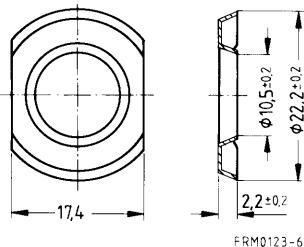
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65814-A2203	400
Insulating washer 1 (reel packing, PU = 1 reel)	B65814-B5000	1200
Insulating washer 2 (bulk)	B65814-B2005	800

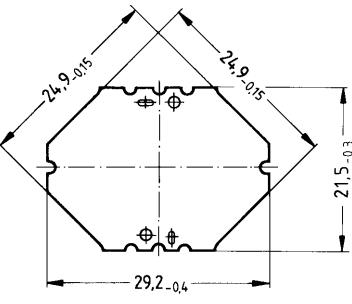
### Clamp



### Insulating washer 1



### Insulating washer 2



**Adjusting screw**

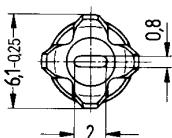
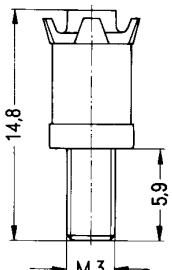
● Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

Core RM 10		Adjusting screw			Min. adjusting range %	Ordering code	PU Pcs
Material	A <sub>L</sub> value nH	Tube core Ø × length mm	Material	Color code			
N 48	315	4,55 × 6,3	N 22	red	13	B65679-E3-X22	200
	400	4,98 × 6,3	N 22	black	10	B65679-E2-X22	
	630	5,15 × 6,3	N 22	white	18	B65679-E1-X22	
<b>Adjusting screwdriver</b>					B63399-B1		10
<b>Handle</b>					B63399-B5		10

**Adjusting screw**



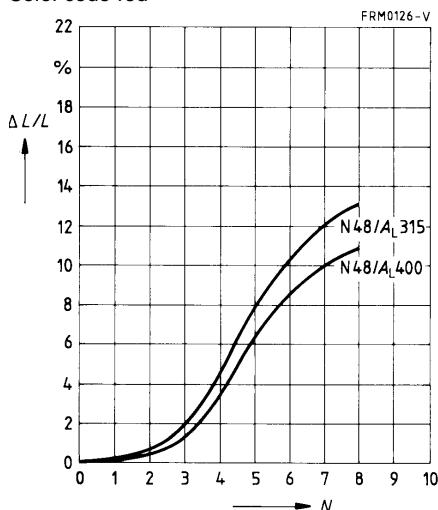
FRM0125-M

**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 2 turns engaged.

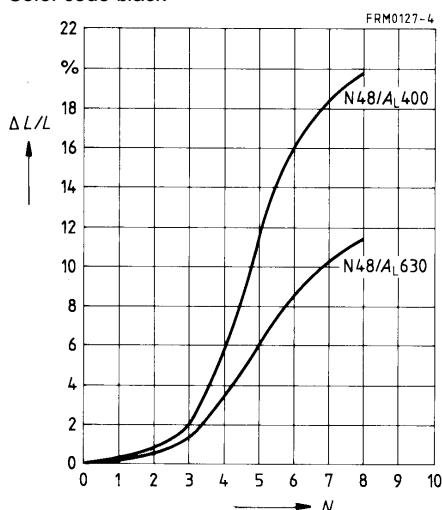
Adjusting screw B65679-E3-X22

Color code red



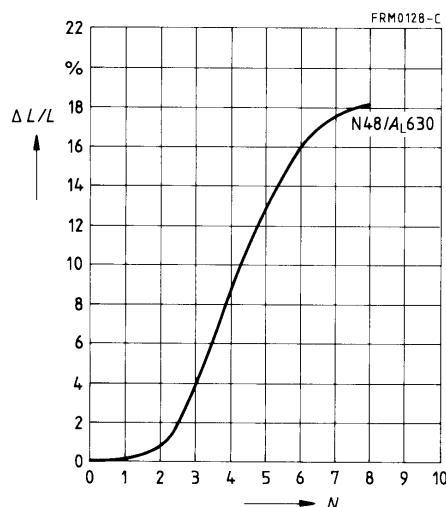
Adjusting screw B65679-E2-X22

Color code black



Adjusting screw B65679-E1-X22

Color code white



- For compact transformers
- Without center hole

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,34 \text{ mm}^{-1}$$

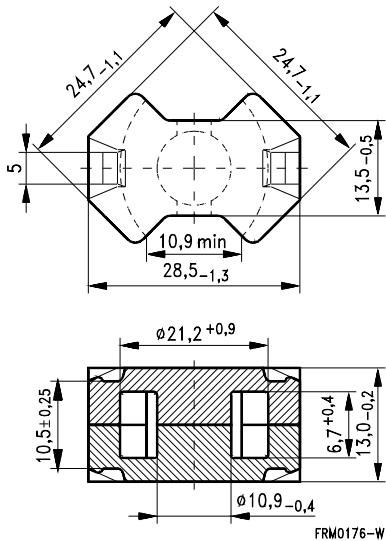
$$I_e = 33,9 \text{ mm}$$

$$A_e = 99,1 \text{ mm}^2$$

$$A_{min} = 93,3 \text{ mm}^2$$

$$V_e = 3360 \text{ mm}^3$$

**Approx. weight** 17,2 g/set



**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$	$P_V$ W/set	Ordering code	PU Sets
N30	$9100 + 30/- 20 \%$	2470			B65813-P-R30	200
T38	$19500 + 40/- 30 \%$	5290			B65813-P-Y38	
N49	$3700 + 30/- 20 \%$	1000	2600	0,62 (50 mT, 500 kHz, 100 °C)	B65813-P-R49	
N67	$5200 + 30/- 20 \%$	1410	3300	2,15 (200 mT, 100 kHz, 100 °C)	B65813-P-R67	
N87	$5200 + 30/- 20 \%$	1410	3300	1,72 (200 mT, 100 kHz, 100 °C)	B65813-P-R87	

## RM 12 Core and Accessories

Individual parts	Part no.	Page
Core	B65815	<a href="#">266</a>
Clamps	B65816	<a href="#">272</a>
Insulating washer 1	B65816	<a href="#">272</a>
Coil former	B65816	<a href="#">269</a>
Core	B65815	<a href="#">266</a>
Insulating washer 2	B65816	<a href="#">272</a>

FRM0129-K

Example of an assembly set

**Also available:**

Coil former for power applications	B65816	<a href="#">270</a>
Core for nonlinear chokes	B65815-H	<a href="#">268</a>
Coil former for nonlinear chokes	B65816	<a href="#">271</a>
RM 12 low-profile core	B65815-P	<a href="#">273</a>

- In accordance with IEC 431
- Optimized core cross section and increased thickness of base for power applications
- Without center hole
- For nonlinear chokes see B65815-H

**Magnetic characteristics (per set)**

$$\Sigma/A = 0,39 \text{ mm}^{-1}$$

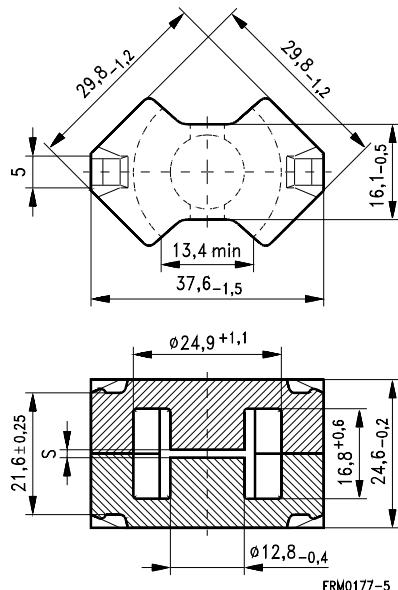
$$l_e = 57 \text{ mm}$$

$$A_e = 146 \text{ mm}^2$$

$$A_{\min} = 125 \text{ mm}^2$$

$$V_e = 8340 \text{ mm}^3$$

**Approx. weight** 45 g/set

**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code -E without center hole	PU Sets
N41	$160 \pm 3 \%$	1,30	50	B65815-E160-A41	100
	$250 \pm 3 \%$	0,70	78	B65815-E250-A41	
	$400 \pm 3 \%$	0,35	124	B65815-E400-J41	
	$1000 \pm 5 \%$	0,12	310	B65815-E1000-J41	

**Ungapped**

Mate- rial	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code -E w/o center hole	PU Sets
N30	8400 + 30/- 20 %	2610			B65815-E-R30	100
T35	12800 + 30/- 20 %	3970			B65815-E-R35	
N49	3500 + 30/- 20 %	1090	1930	1,41 (50 mT, 500 kHz, 100 °C)	B65815-E-R49	
N67	5300 + 30/- 20 %	1640	2900	5,50 (200 mT, 100 kHz, 100 °C)	B65815-E-R67	
N87	5300 + 30/- 20 %	1640	2900	4,50 (200 mT, 100 kHz, 100 °C)	B65815-E-R87	
N41	6000 + 30/- 20 %	1860	2900	1,40 (200 mT, 25 kHz, 100 °C)	B65815-E-R41	

- Suitable for nonlinear chokes in switch-mode power supplies, particularly for forward converters and buck converters

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,39 \text{ mm}^{-1}$$

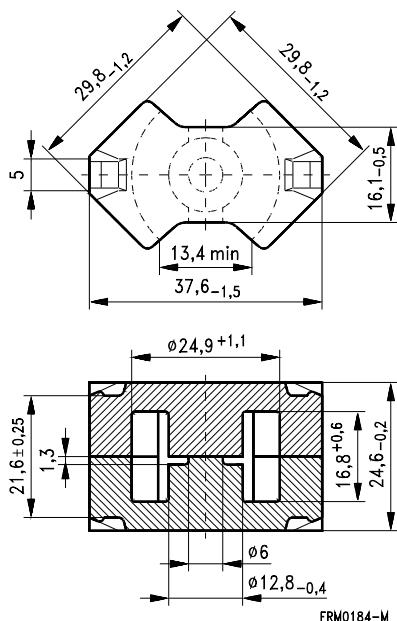
$$l_e = 57 \text{ mm}$$

$$A_e = 146 \text{ mm}^2$$

$$A_{\min} = 90 \text{ mm}^2$$

$$V_e = 8340 \text{ mm}^3$$

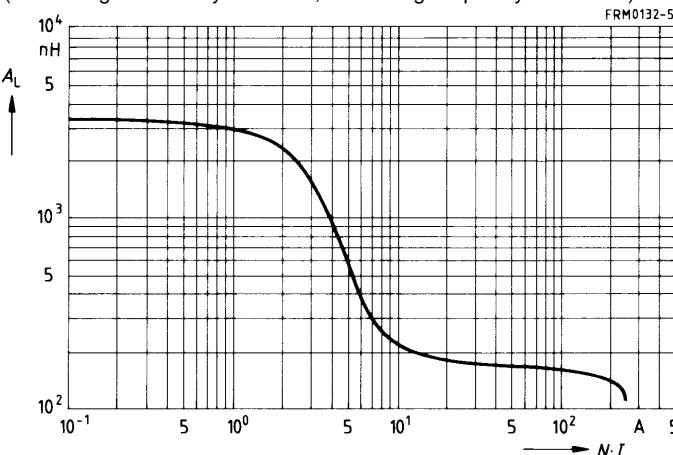
**Approx. weight** 44 g/set



Material	$A_L$ value nH	Ordering code	PU Sets
N41	$3700 \pm 30 \%$	B65815-H3700-X41	100

**$A_L$  value versus ampere-turns  $N \cdot I$ , typical curve**

(Measuring flux density  $\hat{B} \leq 1 \text{ mT}$ , measuring frequency  $f = 10 \text{ kHz}$ )



**Coil former**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

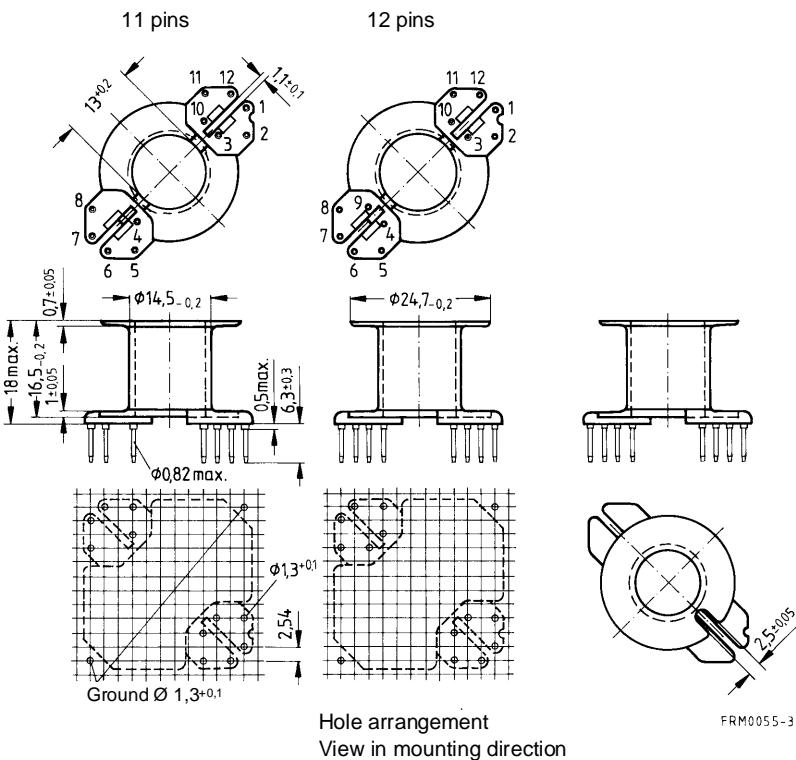
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

Round pins

For matching clamp and insulating washers [see page 272](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	73	61	28,7	11 12	B65816-A1011-D1 B65816-A1012-D1	100
2	with 12 pins on request					



**Coil former for power applications**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

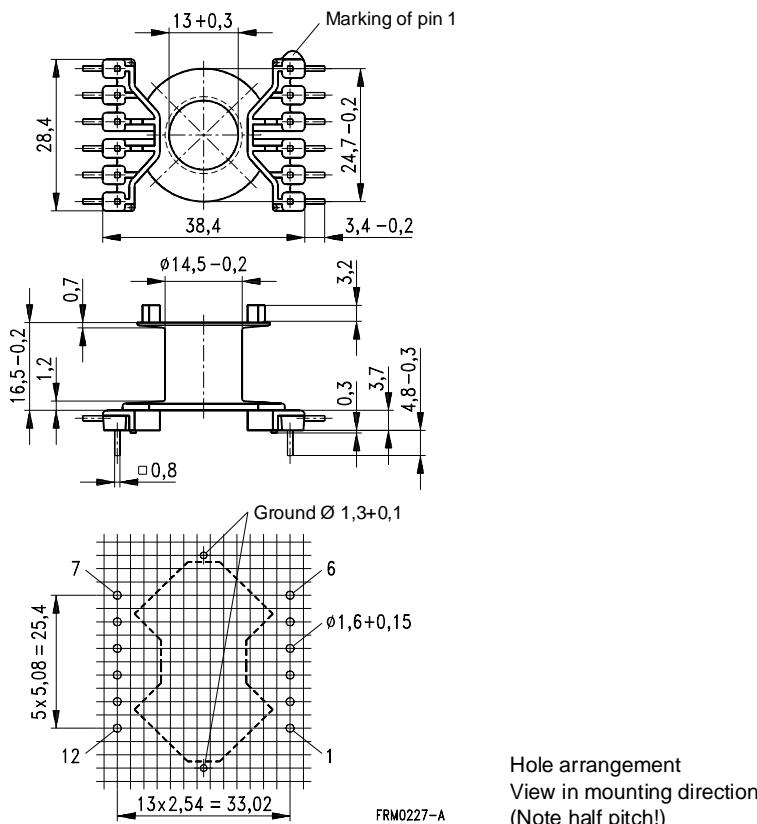
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

For matching clamp [see page 272](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	72	61	28,7	12	B65816-C1512-T1	100



**Coil former for nonlinear chokes**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

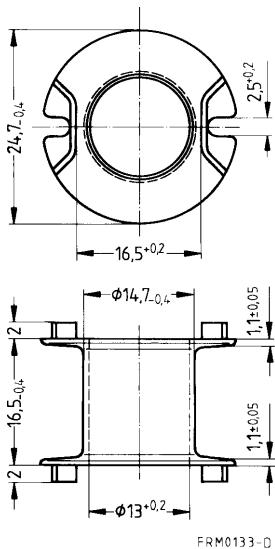
F  $\triangleq$  max. operating temperature 155 °C), color code black

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#), suitable for wire gauges to Ø 2 mm

For matching clamp [see page 272](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
1	70,5	31,4	15,3	B65816-J1000-T1	100



FRM0133-D

## Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,45 mm thick
  - Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

**Insulating washer 1** between core and coil former

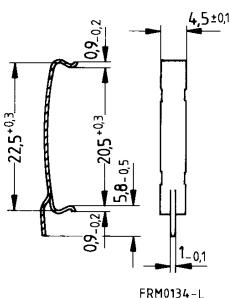
- For tolerance compensation and for insulation
  - Made of polycarbonate (UL 94 V-0, insulation class to IEC 85:  $E \leq 120^\circ\text{C}$ ), 0,1 mm thick

### **Insulating washer 2 for double-clad PCBs**

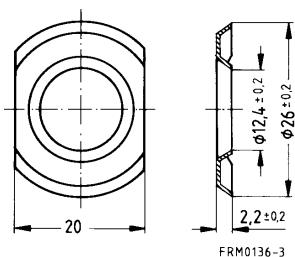
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0.3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65816-A2002	200
Insulating washer 1 (reel packing, PU = 1 reel)	B65816-B5000	800
Insulating washer 2 (bulk)	B65816-D2005	400

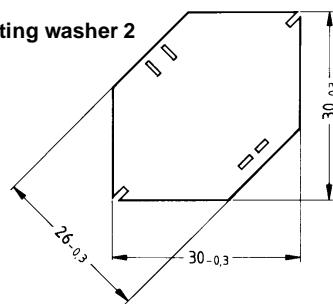
## Clamp



## **Insulating washer 1**



## **Insulating washer 2**



- For compact transformers
- Without center hole

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,28 \text{ mm}^{-1}$$

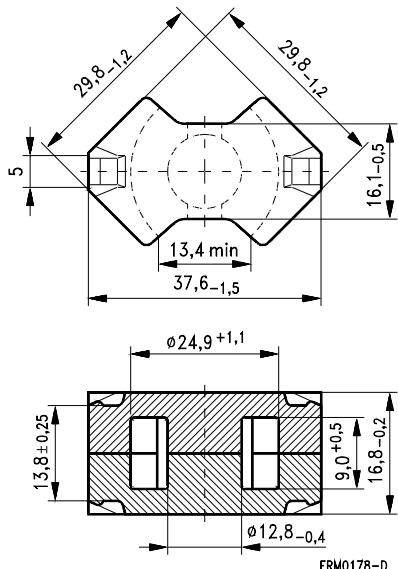
$$I_e = 42 \text{ mm}$$

$$A_e = 147,5 \text{ mm}^2$$

$$A_{min} = 124,7 \text{ mm}^2$$

$$V_e = 6195 \text{ mm}^3$$

**Approx. weight** 33,6 g/set



**Ungapped**

Mate- rial	$A_L$ value nH	$\mu_e$	$A_{L1min}$	$P_V$ W/set	Ordering code	PU Sets
N30	$10500 + 30/- 20 \%$	2370			B65815-P-R30	100
N49	$4500 + 30/- 20 \%$	1010	3100	1,21 (50 mT, 500 kHz, 100 °C)	B65815-P-R49	
N67	$6300 + 30/- 20 \%$	1420	4000	4,20 (200 mT, 100 kHz, 100 °C)	B65815-P-R67	
N87	$6300 + 30/- 20 \%$	1420	4000	3,36 (200 mT, 100 kHz, 100 °C)	B65815-P-R87	

## RM 14 Core and Accessories

Individual parts	Part no.	Page
Core	B65887	<a href="#">275</a>
Clamps	B65888	<a href="#">280</a>
Insulating washer 1	B65888	<a href="#">280</a>
Coil former	B65888	<a href="#">278</a>
Core	B65887	<a href="#">275</a>
Insulating washer 2	B65888	<a href="#">280</a>

FRM0129-K

Example of an assembly set

**Also available:**

Coil former for power applications	B65888	<a href="#">279</a>
Core for nonlinear chokes	B65887-H	<a href="#">277</a>
RM 14 low-profile core	B65887-P	<a href="#">281</a>

- In accordance with IEC 431
- Optimized core cross section and increased thickness of base for power applications
- Without center hole
- For nonlinear chokes see B65887-H

**Magnetic characteristics (per set)**

$$\Sigma/A = 0,35 \text{ mm}^{-1}$$

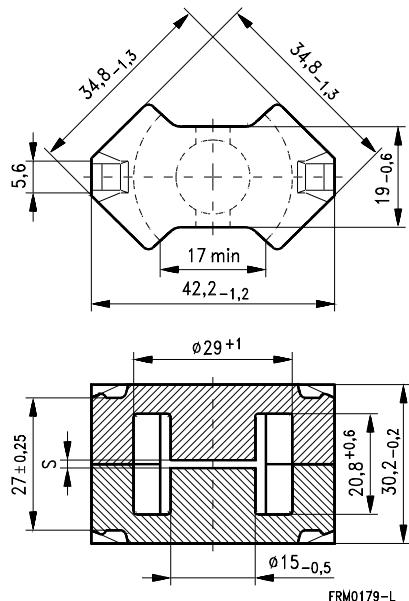
$$l_e = 70 \text{ mm}$$

$$A_e = 200 \text{ mm}^2$$

$$A_{\min} = 170 \text{ mm}^2$$

$$V_e = 14\,000 \text{ mm}^3$$

**Approx. weight** 74 g/set

**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code -E without center hole	PU Sets
N41	$160 \pm 3 \%$	1,90	45	B65887-E160-A41	60
	$250 \pm 3 \%$	1,00	70	B65887-E250-A41	
	$400 \pm 3 \%$	0,50	111	B65887-E400-A41	
	$1000 \pm 5 \%$	0,15	278	B65887-E1000-J41	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code -E w/o center hole	PU Sets
N30	9500 + 30/- 20 %	2650			B65887-E-R30	60
N49	3700 + 30/- 20 % <sup>1)</sup>	1030 <sup>1)</sup>	2150 <sup>1)</sup>	2,37 <sup>1)</sup> (50 mT, 500 kHz, 100 °C)	B65887-E-R49	
N67	6000 + 30/- 20 %	1670	3250	9,00 (200 mT, 100 kHz, 100 °C)	B65887-E-R67	
N87	6000 + 30/- 20 %	1670	3250	7,40 (200 mT, 100 kHz, 100 °C)	B65887-E-R87	
N41	6800 + 30/- 20 %	1890	3250	2,20 (200 mT, 25 kHz, 100 °C)	B65887-E-R41	

---

<sup>1)</sup> Preliminary data

- Suitable for nonlinear chokes in switch-mode power supplies, particularly for forward converters and buck converters

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,35 \text{ mm}^{-1}$$

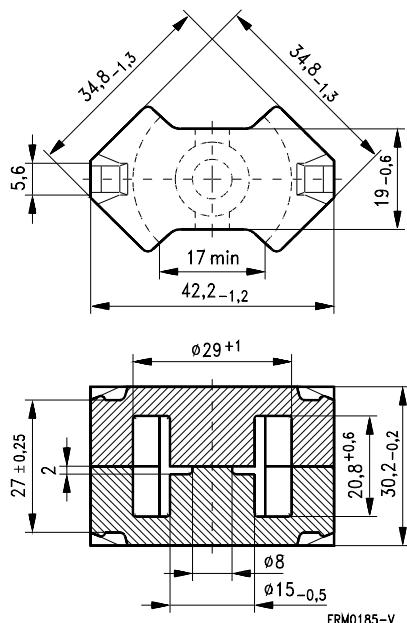
$$l_e = 70 \text{ mm}$$

$$A_e = 200 \text{ mm}^2$$

$$A_{\min} = 170 \text{ mm}^2$$

$$V_e = 14000 \text{ mm}^3$$

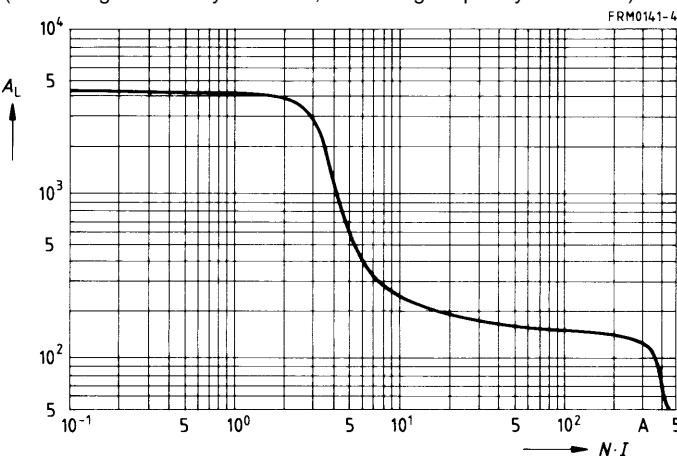
**Approx. weight** 74 g/set



Material	$A_L$ value nH	Ordering code	PU Sets
N41	$4300 \pm 30 \%$	B65887-H4300-X41	60

**$A_L$  value versus ampere-turns  $N \cdot I$ , typical curve**

(Measuring flux density  $\hat{B} \leq 1 \text{ mT}$ , measuring frequency  $f = 10 \text{ kHz}$ )



## Coil former

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85)

F ≈ max. operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

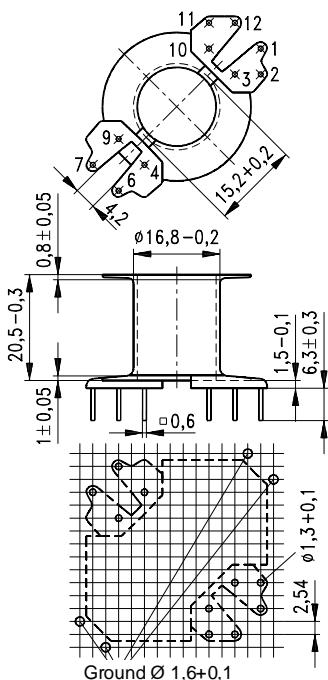
Winding: see page 152

### Square pins

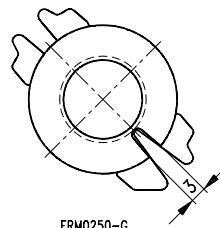
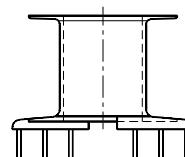
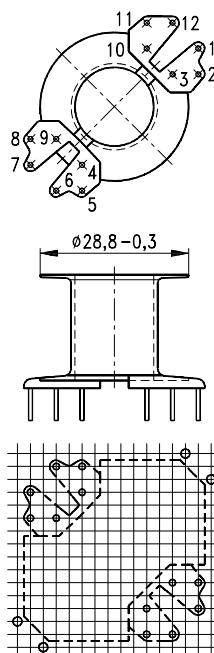
For matching clamp and insulating washers see page 280

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	107	71,5	23	10 12	B65888-C1010-D1 B65888-C1012-D1	60

10 pins



12 pins



## Hole arrangement View in mounting direction

**Coil former for power applications**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

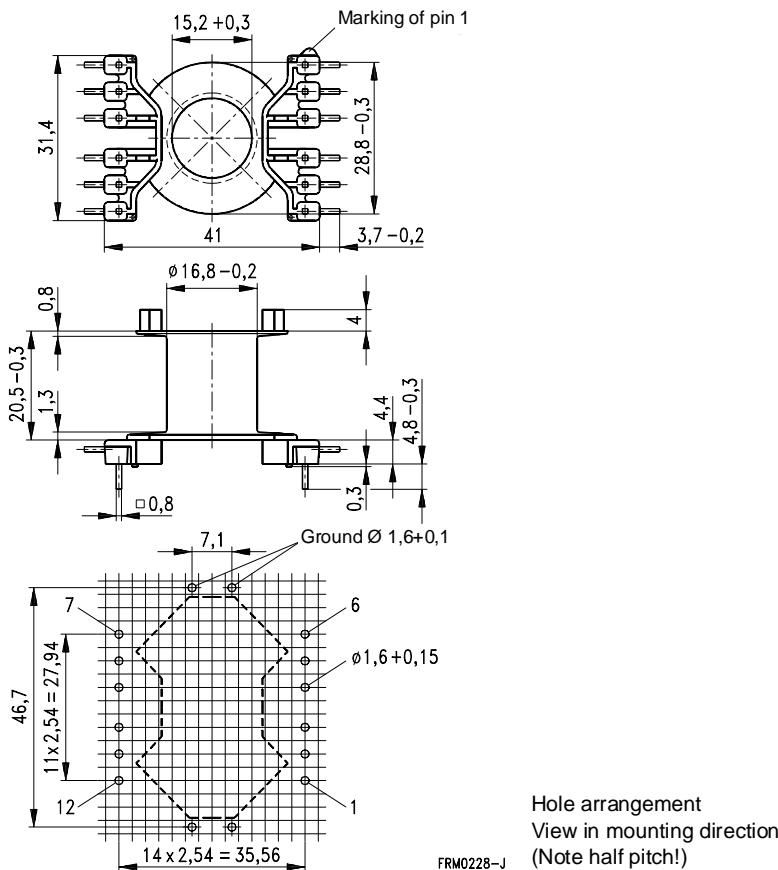
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 152](#)

For matching clamp [see page 280](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	106	71,5	23	12	B65888-C1512-T1	60



**Clamp**

- With ground terminal, made of stainless spring steel (tinned), 0,5 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

**Insulating washer 1** between core and coil former

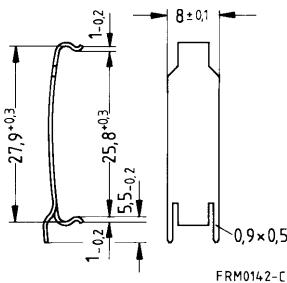
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,1 mm thick

**Insulating washer 2** for double-clad PCBs

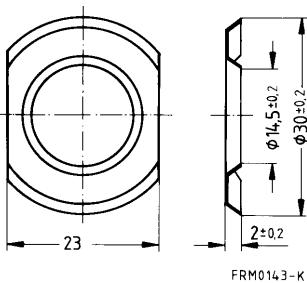
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65888-A2002	120
Insulating washer 1 (reel packing, PU = 1 reel)	B65888-B5000	800
Insulating washer 2 (bulk)	B65888-B2005	240

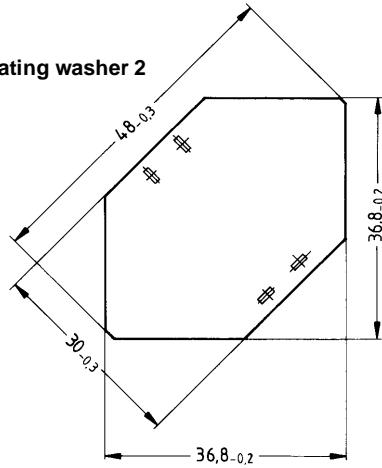
**Clamp**



**Insulating washer 1**



**Insulating washer 2**



- For compact transformers
- Without center hole

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,25 \text{ mm}^{-1}$$

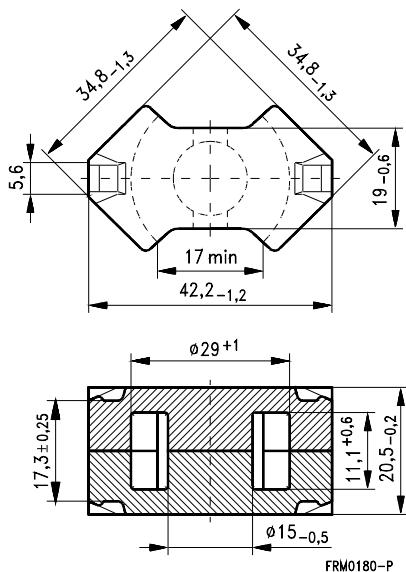
$$l_e = 50,9 \text{ mm}$$

$$A_e = 201 \text{ mm}^2$$

$$A_{min} = 170 \text{ mm}^2$$

$$V_e = 10\,230 \text{ mm}^3$$

**Approx. weight** 55 g/set



FRM0180-P

**Ungapped**

Mate- rial	$A_L$ value nH	$\mu_e$	$A_{L1min}$	$P_V$ W/set	Ordering code	PU Sets
N30	$11\,500 + 30/-20 \%$		2320		B65887-P-R30	60
N49	$5\,100 + 30/-20 \%$	3500	1020	2,0 (50 mT, 500 kHz, 100 °C)	B65887-P-R49	
N67	$7\,100 + 30/-20 \%$	4500	1430	6,9 (200 mT, 100 kHz, 100 °C)	B65887-P-R67	
N87	$7\,100 + 30/-20 \%$	4500	1430	5,5 (200 mT, 100 kHz, 100 °C)	B65887-P-R87	

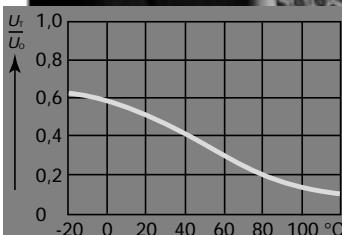


Siemens Matsushita Components

NTC thermistor chips for  
temperature compensation

## Keep cool

No matter what the temperature, that's the promise behind our NTC chips in 0805 and 1206 sizes, available direct from SCS stock. These chips do valuable service in handies, ensuring clear contrast in the display and optimum reception in the crystal oscillator, besides proper charging of the battery. In hybrid and SMT circuits, NTC chips cover a temperature range of -55 °C through +125 °C.



SCS – dependable, fast and competent



## PM Cores

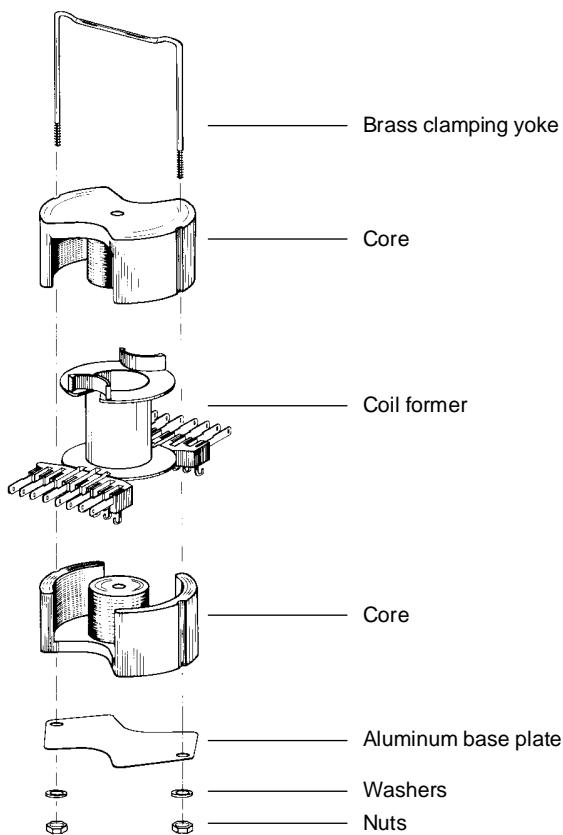
### General Information

PM cores are particularly suitable for use in transformers handling high powers in the frequency range up to 300 kHz. For numerous design tasks in telecommunications and industrial electronics (e.g. power pulse transformers in radar transmitters, antenna matching networks, machine control systems, thyristor firing transformers, energy storage chokes in switch-mode power supply equipment and others), the pot core shape offers various advantages: wide flux area for high power at a minimum number of turns, thus causing only low magnetic leakage and stray capacitance, as well as good shielding owing to the closed form, precisely ground air gaps, straightforward assembly and economic mounting.

A family of large pot cores, briefly designated PM cores (for Pot core Module), is presented in the following.

Due to the weight of these pot cores, particularly in the case of the large cores 87/70 and 114/93, mounting on PC boards may not always be possible. In these cases, the coil former should be mounted with its terminals upwards.

#### Example of an assembly set:



FPM0002-6

## **PM Cores**

### **General Information**

---

#### **1      $A_{L1}$ value**

For each core type, the minimum  $A_{L1}$  value is specified. The  $A_{L1}$  value is defined at a flux density of  $\hat{B} = 320$  mT and a temperature of 100 °C (exception: material N49:  $\hat{B} = 200$  mT). The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{\min}$ .

#### **2      Core losses**

For each core type, the maximum dissipation loss is specified in W/set with the relevant measurement parameters. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{\min}$ .

- In accordance with IEC 1247
- Particularly suitable for power transformers and energy storage chokes

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,227 \text{ mm}^{-1}$$

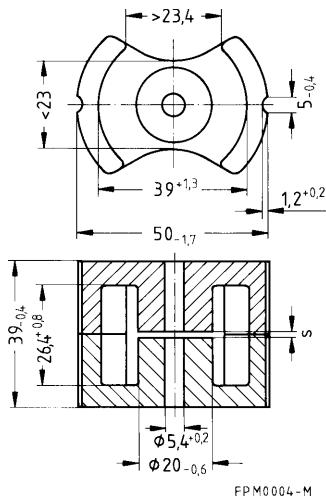
$$l_e = 84 \text{ mm}$$

$$A_e = 370 \text{ mm}^2$$

$$A_{min} = 280 \text{ mm}^2$$

$$V_e = 31\,000 \text{ mm}^3$$

**Approx. weight** 140 g/set



**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code	PU Sets
N27	$250 \pm 3\%$	2,00	45	B65646-A250-A27	30
	$630 \pm 3\%$	0,63	114	B65646-A630-A27	
	$1600 \pm 5\%$	0,20	289	B65646-A1600-J27	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N27	$7400 + 30/-20\%$	1330	5000	4,2 (200 mT, 25 kHz, 100 °C)	B65646-A-R27	30
N87	$7400 + 30/-20\%$	1330	5000	15,5 (200 mT, 100 kHz, 100 °C)	B65646-A-R87	

**Coil former**

Standard: DIN 41 990

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

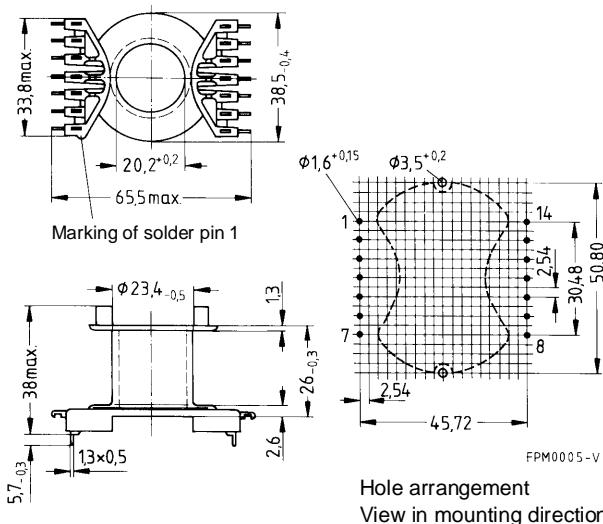
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 153](#)

Also available without solder pins

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Solder pins	Ordering code	PU Pcs
1	154	96,8	21,6	14	B65647-B1014-T1	30
1	154	96,8	21,6	—	B65647-A1000-T1	



### **Mounting assembly**

- For chassis mounting<sup>1)</sup> or printed circuit boards
- The set comprises a yoke and a base plate
- Fixing nuts M3 and washers are supplied

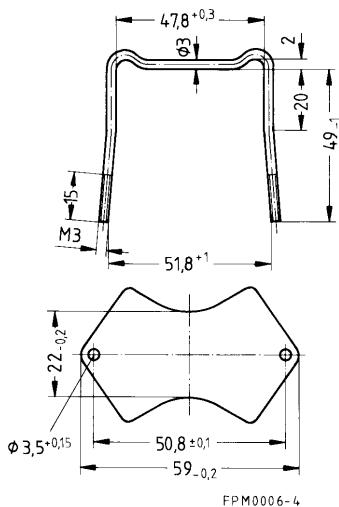
### **Yoke**

- Material: Brass clamping yoke ( $\varnothing$  3 mm) with thread

### **Base plate**

- Material: Aluminum (0,6 mm)

	Ordering code	PU Pcs
Complete mounting assembly including nuts and washers	B65647-A2000	30



1) On a chassis the coil former must be mounted with its solder pins upward.

- In accordance with IEC 1247
- Particularly suitable for power transformers and energy storage chokes

**Magnetic characteristics (per set)**

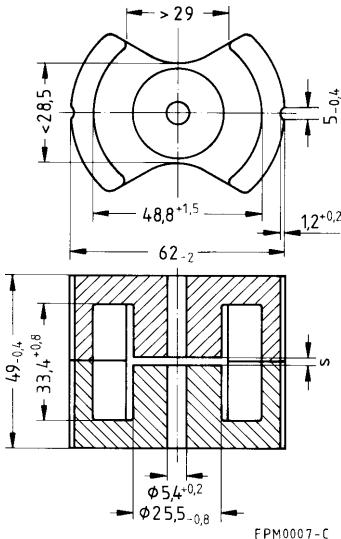
$$\Sigma I/A = 0,191 \text{ mm}^{-1}$$

$$l_e = 109 \text{ mm}$$

$$A_e = 570 \text{ mm}^2$$

$$A_{min} = 470 \text{ mm}^2$$

$$V_e = 62\,000 \text{ mm}^3$$

**Approx. weight** 280 g/set

**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code	PU Sets
N27	$315 \pm 3\%$	2,60	48	B65684-A315-A27	20
	$630 \pm 3\%$	1,10	95	B65684-A630-A27	
	$1600 \pm 5\%$	0,34	242	B65684-A1600-J27	
	$4000 \pm 15\%$	0,10	605	B65684-A4000-L27	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N27	$9200 + 30/- 20\%$	1400	5950	8,4 (200 mT, 25 kHz, 100 °C)	B65684-A-R27	20
N87	$9200 + 30/- 20\%$	1400	5950	5,8 (200 mT, 100 kHz, 100 °C)	B65684-A-R87	

**Coil former**

Standard: DIN 41 990

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

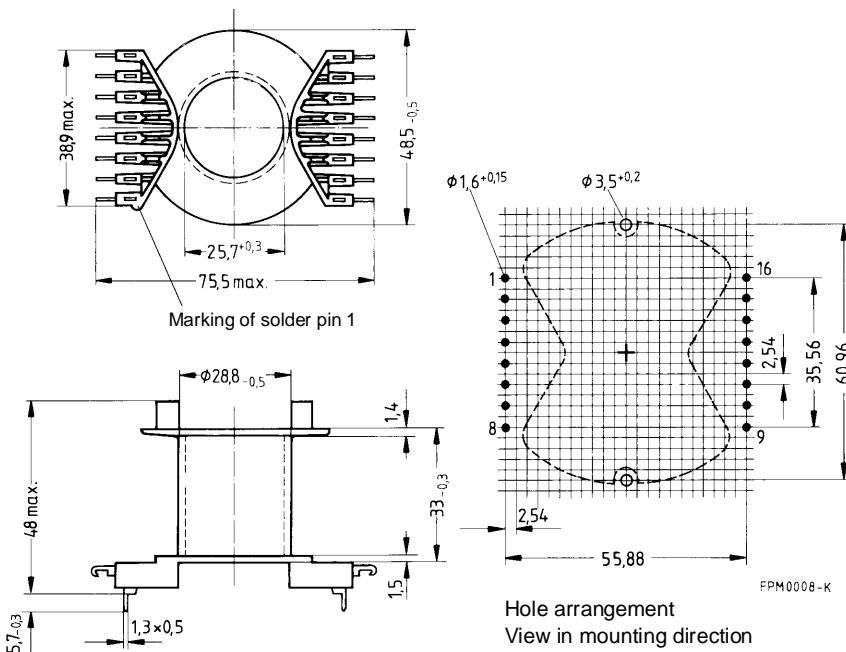
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 153](#)

Pins squared in the start-of-winding area

Also available without solder pins

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Solder pins	Ordering code	PU Pcs
1	270	120	15,4	16	B65685-B1016-T1	20
1	270	120	15,4	—	B65685-A1000-T1	



### **Mounting assembly**

- For chassis mounting<sup>1)</sup> or printed circuit boards
- The set comprises a yoke and a base plate
- Fixing nuts M3 and washers are supplied

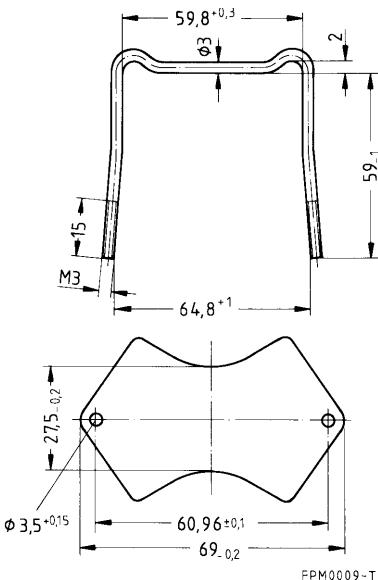
### **Yoke**

- Material: Brass clamping yoke ( $\varnothing$  3 mm) with thread

### **Base plate**

- Material: Aluminum (0,6 mm)

	Ordering code	PU Pcs
Complete mounting assembly including nuts and washers	B65685-A2000	20



1) On a chassis the coil former must be mounted with its solder pins upward.

- In accordance with IEC 1247
- Particularly suitable for power transformers and energy storage chokes

### Magnetic characteristics (per set)

$$\Sigma l/A = 0,162 \text{ mm}^{-1}$$

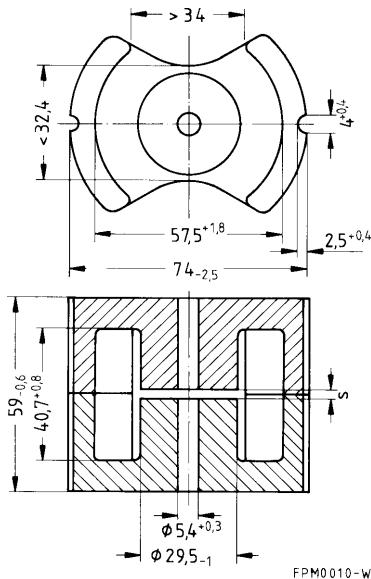
$$l_e = 128 \text{ mm}$$

$$A_e = 790 \text{ mm}^2$$

$$A_{\min} = 630 \text{ mm}^2$$

$$V_e = 101\,000 \text{ mm}^3$$

**Approx. weight** 460 g/set



### Gapped

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code	PU Sets
N27	$315 \pm 3\%$	3,80	41	B65686-A315-A27	10
	$630 \pm 3\%$	1,50	81	B65686-A630-A27	
	$2500 \pm 5\%$	0,26	322	B65686-A2500-J27	
	$4000 \pm 15\%$	0,14	516	B65686-A4000-L27	

### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N27	$10000 + 30/-20\%$	1290	7000	7,5 (150 mT, 25 kHz, 100 °C)	B65686-A-R27	10
N87	$10000 + 30/-20\%$	1290	7000	9,6 (100 mT, 100 kHz, 100 °C)	B65686-A-R87	

**Coil former**

Standard: DIN 41 990

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

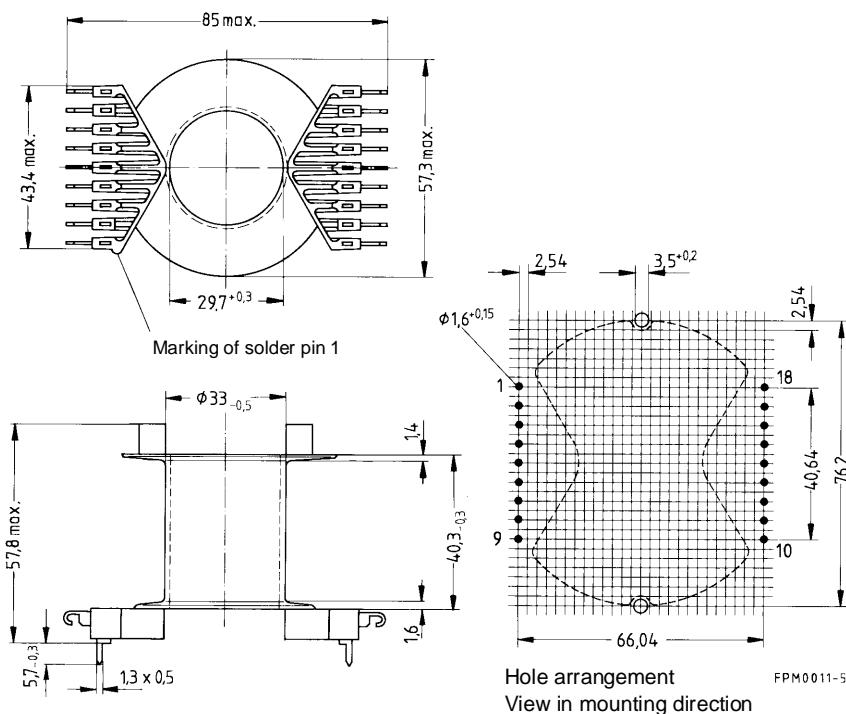
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 153](#)

Also available without solder pins

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value μΩ	Solder pins	Ordering code	PU Pcs
1	442	140	10,9	18	B65687-A1018-T1	10
1	442	140	10,9	—	B65687-A1000-T1	



### **Mounting assembly**

- For chassis mounting<sup>1)</sup> or printed circuit boards
- The set comprises a yoke and a base plate
- Fixing nuts M3 and washers are supplied

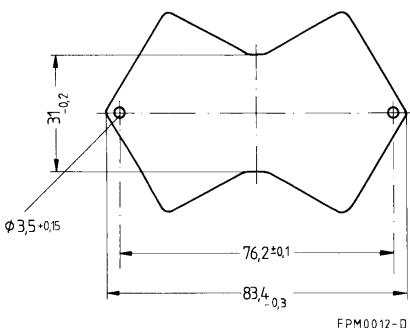
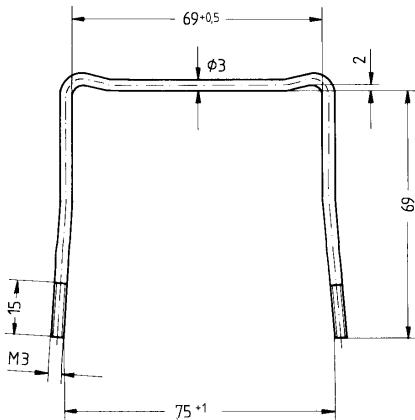
### **Yoke**

- Material: Brass clamping yoke ( $\varnothing$  3 mm) with thread

### **Base plate**

- Material: Aluminum (0,6 mm)

	Ordering code	PU Pcs
Complete mounting assembly including nuts and washers	B65687-A2000	10



1) On a chassis the coil former must be mounted with its solder pins upward.

- In accordance with IEC 1247
- For power transformers  
    > 1 kW (20 kHz) and energy storage chokes

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,161 \text{ mm}^{-1}$$

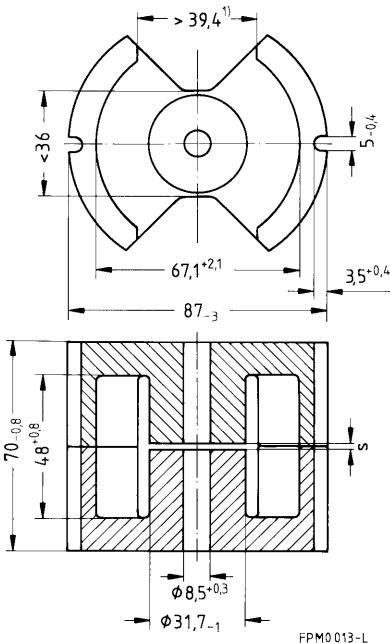
$$l_e = 146 \text{ mm}$$

$$A_e = 910 \text{ mm}^2$$

$$A_{\min} = 700 \text{ mm}^2$$

$$V_e = 133\,000 \text{ mm}^3$$

**Approx. weight** 770 g/set



FPM0 013-L

**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code	PU Sets
N27	400 ± 3 %	3,50	51	B65713-A400-A27	4
	1000 ± 3 %	1,10	128	B65713-A1000-A27	
	2500 ± 5 %	0,34	320	B65713-A2500-J27	
	5000 ± 15 %	0,14	640	B65713-A5000-L27	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N27	12000 + 30/- 20 %	1530	7050	12,4 (150 mT, 25 kHz, 100 °C)	B65713-A-R27	4

### Coil former

Standard: DIN 41 990

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85)

F ≈ max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

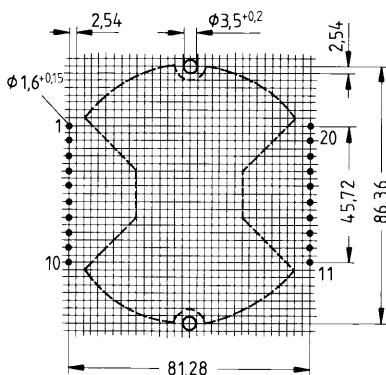
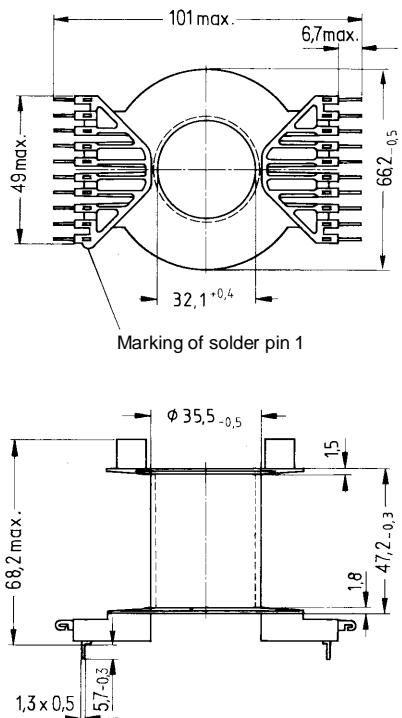
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3.5 s

Winding: see page 153

Pins squared in the start-of-winding area

Also available without solder pins

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Solder pins	Ordering code	PU Pcs
1	657	158	8,27	20	B65714-K1020-T1	8
1	657	158	8,27	—	B65714-J1000-T1	



### Hole arrangement View in mounting direction

**Mounting assembly**

- For chassis mounting<sup>1)</sup> or printed circuit boards
- The set comprises a yoke and a base plate
- Fixing nuts M3 and washers are supplied

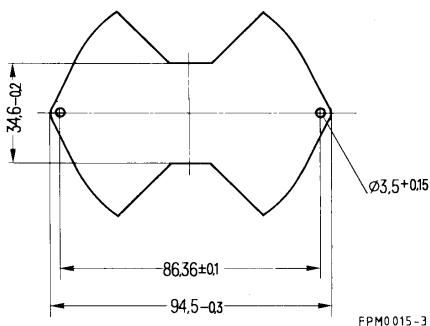
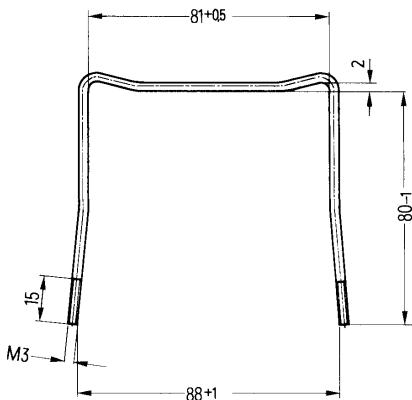
**Yoke**

- Material: Brass clamping yoke ( $\varnothing$  3 mm) with thread

**Base plate**

- Material: Aluminum (0,6 mm)

	Ordering code	PU Pcs
Complete mounting assembly including nuts and washers	B65714-A2000	8



1) On a chassis the coil former must be mounted with its solder pins upward.

- In accordance with IEC 1247
- For power transformers  
    > 1 kW (20 kHz) and energy storage chokes

**Magnetic characteristics (per set)**

$$\Sigma/A = 0,116 \text{ mm}^{-1}$$

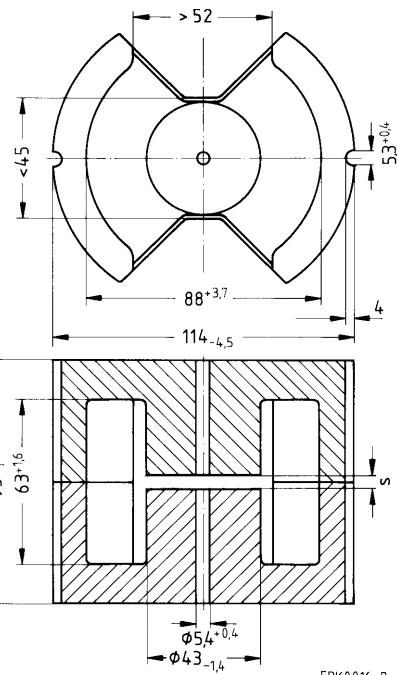
$$l_e = 200 \text{ mm}$$

$$A_e = 1720 \text{ mm}^2$$

$$A_{\min} = 1380 \text{ mm}^2$$

$$V_e = 344\,000 \text{ mm}^3$$

**Approx. weight** 1940 g/set

**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code	PU Sets
N27	$630 \pm 3\%$	3,80	58	B65733-A630-A27	2
	$2500 \pm 5\%$	0,70	231	B65733-A2500-J27	
	$6300 \pm 15\%$	0,22	581	B65733-A6300-L27	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N27	$16000 + 30/-20\%$	1480	9750	14,0 (100 mT, 25 kHz, 100 °C)	B65733-A-R27	2

**Coil former without solder pins**

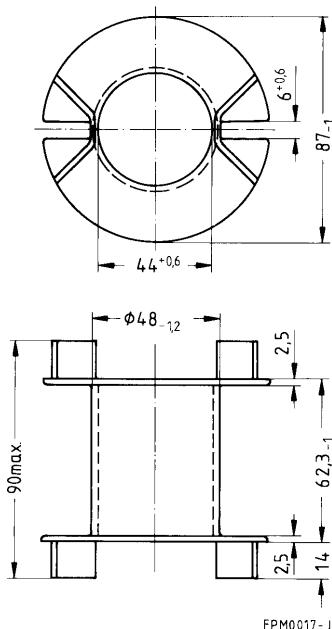
Standard: DIN 41 990

Material: Polyphenylene sulphide (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code brown

Winding: [see page 153](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
1	1070	210	6,75	B65734-B1000-T1	2



# P Cores (Pot Cores)

## General Information

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### 1 General information

P cores (Pot cores) are available in a wide range of sizes from S+M Components; 8 types in our product line comply with IEC 133 and DIN 41293. We offer a choice of different SIFERRIT materials, which permits the cores to be used for a large variety of applications to over 100 MHz. Since the wound coil is completely enclosed by the ferrite core, P cores feature low magnetic leakage. They can be easily and precisely adjusted to the most manifold inductor requirements.

We naturally also supply the appropriate accessories for each core version. Most of the cores are available with threaded sleeves and screws for precision inductance adjustment. Adjustment curves are given for this purpose. These relate to the particular recommended combination of screw core/core material  $A_L$  value and must be understood as typical values. Notes on gluing the core halves may be found on page [162](#).

### 2 Applications

The cores are suitable for:

- High-quality resonant circuit inductors (filters) with high inductance stability (materials N48, M33, K1, K12, U17)
- Low-distortion broadband small-signal transformers in materials T38 and N30 with high  $A_L$  value
- Power applications. Here, pot cores without center hole made of material N67 are used as standard. As a result of their larger effective magnetic cross-sectional area, these types are characterized by a higher  $A_L$  value, better flux density distribution and, consequently, a reduced power loss.

Your attention is drawn particularly to the following developments:

- The pot cores P5,8x3,3 through P30x19 have broadened side slots to protect the wires.
- For core sizes P9x5, P11x7, P14x8 and P18x11, pinned coil formers for automatic assembly are available.
- In addition to conventional accessories, an SMD coil former is available for core type P9x5.

### 3 Marking

The material and the  $A_L$  value are always stamped on P cores with a diameter > 5,8 mm, the material and "o, L." (=without air gap) are stamped on ungapped cores. Only one core half of the two comprising a set carries the marking. With cores having an unsymmetrical air gap (the total air gap is ground into one half) the ground half carries the marking, with cores including a glued-in threaded sleeve the half without sleeve is marked.

### 4 $A_{L1}$ value

For each core type produced from power materials, the minimum  $A_{L1}$  value is specified. The  $A_{L1}$  value is defined at a flux density of  $\hat{B} = 320$  mT and a temperature of 100 °C (exception: material N49:  $\hat{B} = 200$  mT). The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{\min}$ .

### 5 Power loss

For each core type with power materials the maximum power loss is specified in W/set. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{\min}$ .

**Magnetic characteristics (per set)**

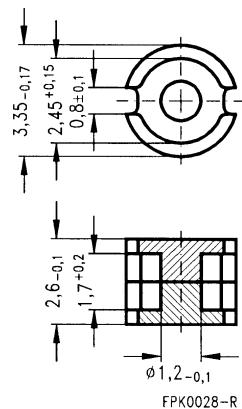
$$\Sigma l/A = 3,72 \text{ mm}^{-1}$$

$$l_e = 5,1 \text{ mm}$$

$$A_e = 1,37 \text{ mm}^2$$

$$V_e = 7 \text{ mm}^3$$

**Approx. weight** 0,06 g/set



FPK0028-R

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	Ordering code	PU Sets
K1	25 + 40/- 30 %	75	B65491-C-Y1	500
N30	500 + 40/- 30 %	1480	B65491-C-Y30	

**Winding data**

Usable winding cross section $A_N$ without coil former mm <sup>2</sup>	Average length of turn $A_N$ mm	$A_R$ value $\mu\Omega$
0,65	5,8	310

**P 4,6 × 4,1**  
**Core and Accessories**

---

**Adjustable miniature assembly set for printed circuit boards and surface mounting**

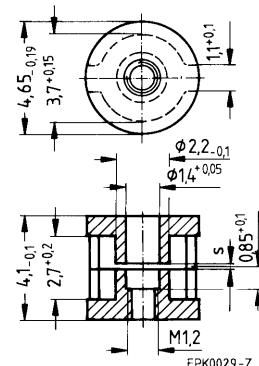
Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">305</a>
Matching handle	B63399	<a href="#">305</a>
Adjusting screw	B65496	<a href="#">305</a>
Core	B65495	<a href="#">302</a>
Coil former	B65496	<a href="#">303</a>
Core with internal thread	B65495	<a href="#">302</a>
Terminal carrier for PCB through-hole assembly	B65496	<a href="#">304</a>

FPK0017-B

Example of an assembly set

**Miniature pot cores  
for adjustable miniature inductors**

- One of the two cores is equipped with an internal thread for the adjusting screw
- The unit can be fixed to the terminal carrier by glue
- Space requirements of the inductor 5 × 5,1 mm (without terminals)



**Magnetic characteristics (per set)**

$$\Sigma I/A = 2,6 \text{ mm}^{-1}$$

$$l_e = 7,6 \text{ mm}$$

$$A_e = 2,8 \text{ mm}^2$$

$$V_e = 21,3 \text{ mm}^3$$

**Approx. weight** 0,17 g/set

**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code -K with thread	PU Sets
K1	$16 \pm 3 \%$	0,20	33	B65495-K16-A1	500
M33	$40 \pm 5 \%$	0,07	83	B65495-K40-J33	
N48	$63 \pm 5 \%$	0,04	130	B65495-K63-J48	

**Ungapped**

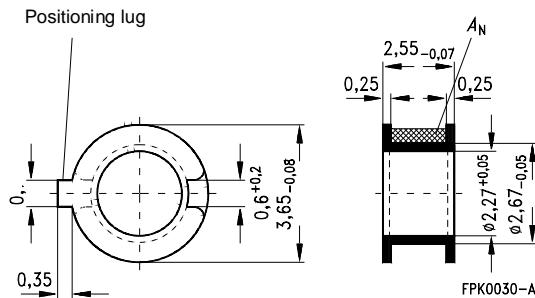
Material	$A_L$ value nH	$\mu_e$	Ordering code -B with center hole -W without center hole	PU Sets
M33	$200 + 40/-30 \%$	414	B65495-B-Y33	500
N30	$800 + 40/-30 \%$	1660	B65495-B-Y30	
T65	$1800 + 40/-30 \%$	1850	B65495-W-Y65	

**Coil former with positioning lug**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
F  $\triangleq$  max. operating temperature 155 °C), color code black

Winding: [see page 154](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
1	0,8	9,5	400	B65496-B1000-T1	500

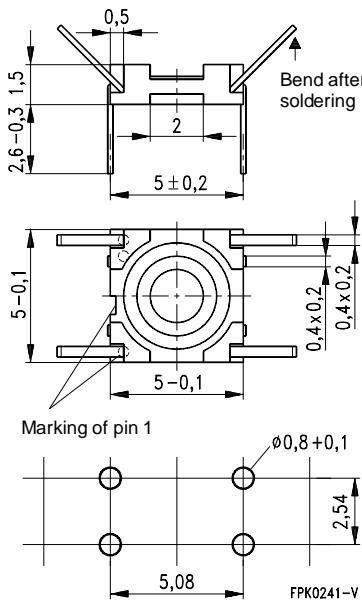


**Terminal carrier**

Material: GFR polyether ketone (UL 94 V-0, insulation class to IEC 85:  
 F  $\triangleq$  max. operating temperature 155 °C), color code natural  
 Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s  
 Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

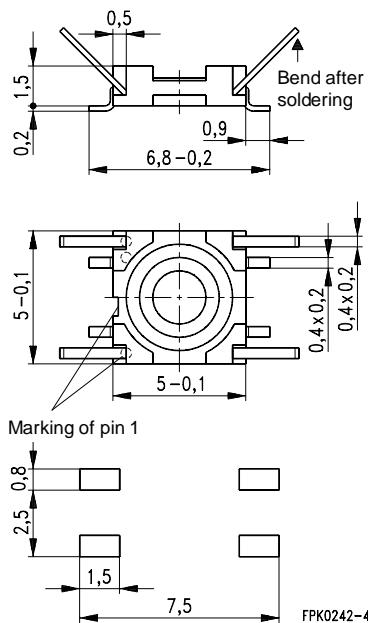
Terminal carrier	Ordering code	PU Pcs
With 4 solder terminals for PCB through-hole assembly	B65496-B2002	500
With 4 solder terminals for SMT	B65496-B2003	500

**For PCB through-hole assembly**



Hole arrangement  
 View in mounting direction

**For SMT**



Recommended PCB layout

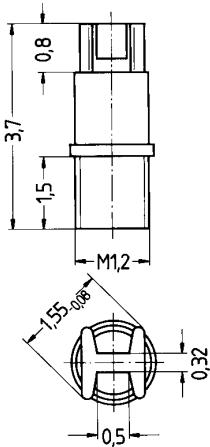
**Adjusting screw**

● Tube core with thread and core brake made of polyacetal

Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

Adjusting screw			Min. adjusting range %	Ordering code	PU
Tube core Ø × length mm	Matе- riаl	Color code			Pcs
1,25 × 1,2	K 1	blue	10	B65496-A3001-X1	1000
<b>Adjusting screwdriver</b>				B63399-A1007	10
<b>Handle</b>				B63399-B5	10

**Adjusting screw**

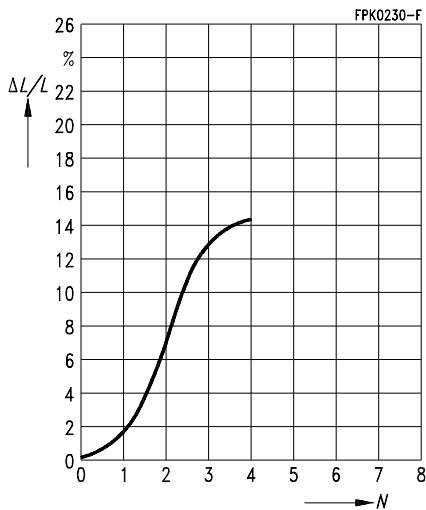
FPK0033-S

**Inductance adjustment curves** (nominal values)

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least  $1/2$  to 1 turn engaged.

Adjusting screw B65496-A3001-X1

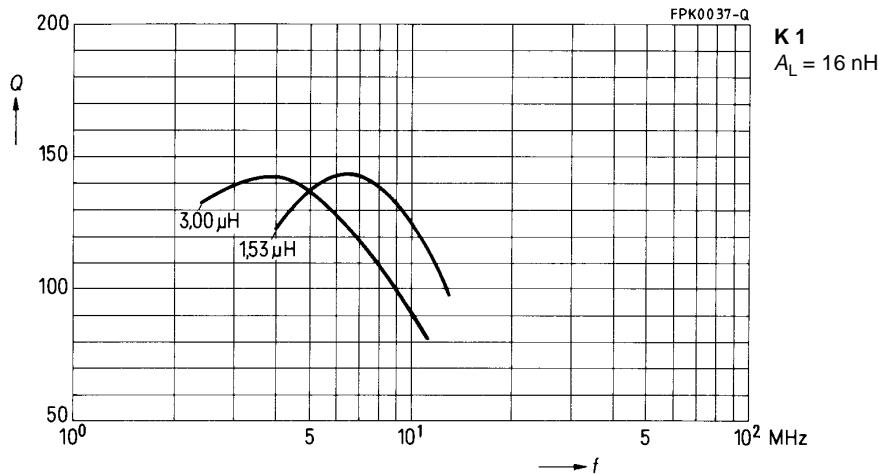
Color code blue



**Q factor characteristics** (typical values)

Flux density in the core  $\hat{B} < 1 \text{ mT}$

Material	$A_L$ (nH)	$L$ ( $\mu\text{H}$ )	Turns	RF litz wire
K 1	16	1,53	9	$32 \times 0,025 \text{ CuLS}$
		3,00	13	$15 \times 0,040 \text{ CuLS}$



**Magnetic characteristics (per set)**

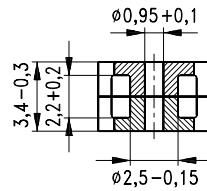
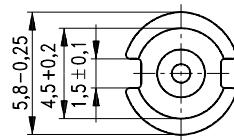
$$\Sigma l/A = 1,68 \text{ mm}^{-1}$$

$$l_e = 7,9 \text{ mm}$$

$$A_e = 4,7 \text{ mm}^2$$

$$V_e = 37 \text{ mm}^3$$

**Approx. weight** 0,2 g/set



FPK0232-W

**Ungapped<sup>1)</sup>**

Material	$A_L$ value nH	$\mu_e$	Ordering code	PU Sets
K1	60 + 40/- 30 %	80	B65501-D-Y1	2000
M33	350 + 30/- 20 %	470	B65501-D-R33	
N26	800 + 40/- 30 %	1070	B65501-D-Y26	

1) Gapped pot cores on request

**P 7 × 4**  
**Core and Accessories**

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">313</a>
Matching handle	B63399	<a href="#">313</a>
Adjusting screw	B65512	<a href="#">313</a>
Yoke	B65512	<a href="#">312</a>
Core	B65511	<a href="#">310</a>
Coil former	B65512	<a href="#">311</a>
Core	B65511	<a href="#">310</a>
Terminal carrier with thread	B65812	<a href="#">312</a>

FPK0018-J

Example of an assembly set  
for printed circuit boards

**Magnetic characteristics (per set)**

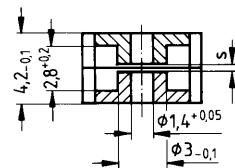
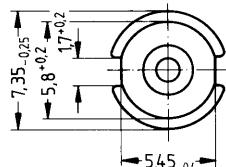
$$\Sigma l/A = 1,43 \text{ mm}^{-1}$$

$$l_e = 10 \text{ mm}$$

$$A_e = 7 \text{ mm}^2$$

$$V_e = 70 \text{ mm}^3$$

**Approx. weight** 0,5 g/set



FPK0040-A

**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code -A with center hole	PU Sets
U17 <sup>1)</sup>	$8 \pm 3 \%$	0,80	9,1	B65511-A8-A17	2000
K1	$25 \pm 3 \%$	0,32	28,5	B65511-A25-A1	
M33	$63 \pm 3 \%$	0,13	72,0	B65511-A63-A33	
N48	$100 \pm 3 \%$	0,10	114,0	B65511-A100-A48	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	Ordering code -A with center hole	PU Sets
N26	$1000 + 40/-30 \%$	1140	B65511-A-Y26	2000
N30	$2000 + 40/-30 \%$	2280	B65511-A-Y30	

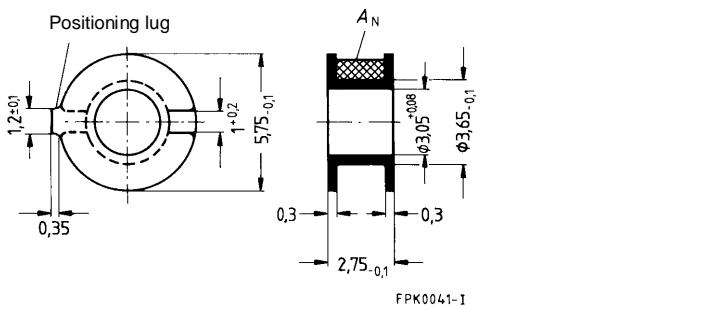
1) The dimensions may be up to approx. 10 % larger.

**Coil former with positioning lug**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
F  $\triangleq$  max. operating temperature 155 °C), color code black

Winding: [see page 154](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
1	2,2	14,6	240	B65512-C-T1	500



### Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

### Coil former for nonlinear chokes

- With thread for the adjusting screw

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

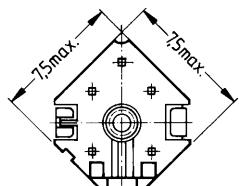
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

### Yoke

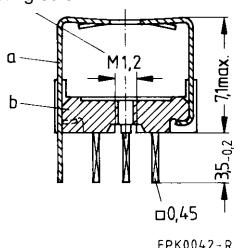
Material: Spring yoke, made of tinned nickel silver (0,2 mm), with ground terminal

Complete mounting assembly (5 solder terminals)

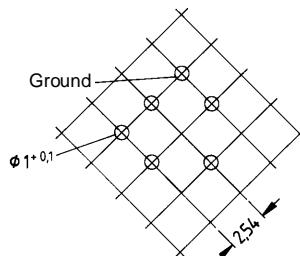
Ordering code: B65512-C2001, PU = 500 sets



Thread for  
adjusting screw



FPK0042-R



FPK0043-Z

a) Yoke

b) Terminal carrier with 5 solder terminals

**Adjusting screw**

● Tube core with thread and core brake made of GFR polyterephthalate

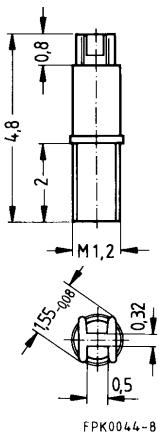
Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

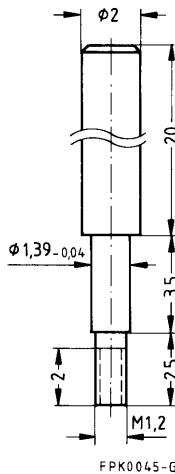
**Centering pin** e. g. made of brass (for design proposal see figure below)

Core P 7 × 4		Adjusting screw			Min. adjusting range %	Ordering code	PU Pcs
Material	A <sub>L</sub> value nH	Tube core Ø × length mm	Material	Color code			
U 17	8	1,25 × 1,8	U 17	white	14	B65512-A3001-X17	2000
K 1	25	1,25 × 1,8	U 17	white	12	B65512-A3001-X17	
M 33	63	1,25 × 1,8	U 17	white	8	B65512-A3001-X17	
	63	1,25 × 1,8	K 1	yellow	15	B65512-A3001-X1	
N 48	100	1,25 × 1,8	K 1	yellow	12	B65512-A3001-X1	
<b>Adjusting screwdriver</b>					B63399-A1007		10
<b>Handle</b>					B63399-B5		10

**Adjusting screw**



**Centering pin**



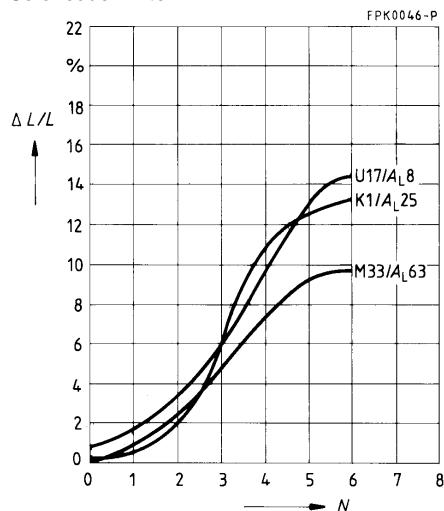
**Inductance adjustment curves** (nominal values)

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.

0  $\leq$  screw completely engaged.

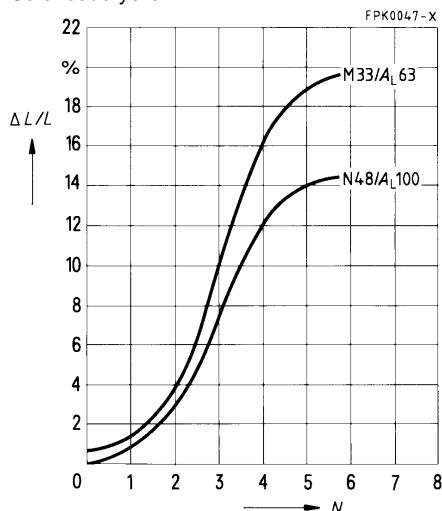
Adjusting screw B65512-A3001-X17

Color code white



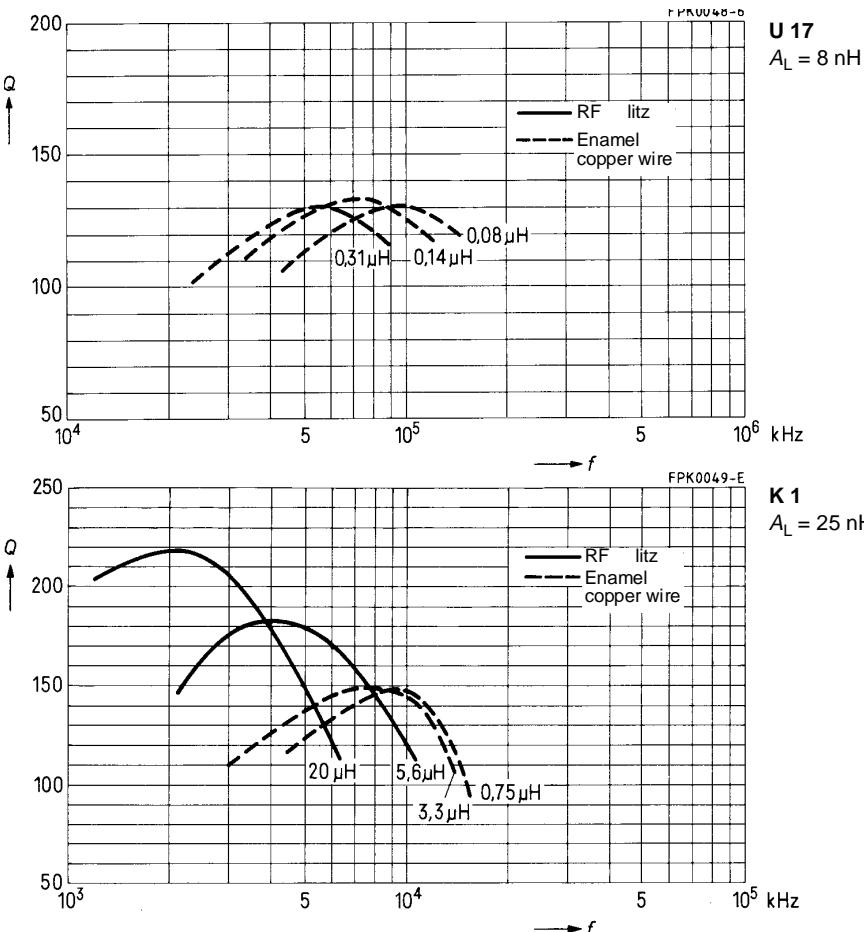
Adjusting screw B65512-A3001-X1

Color code yellow



**Q factor characteristics (typical values)**Flux density in the core  $\hat{B} < 2 \text{ mT}$ 

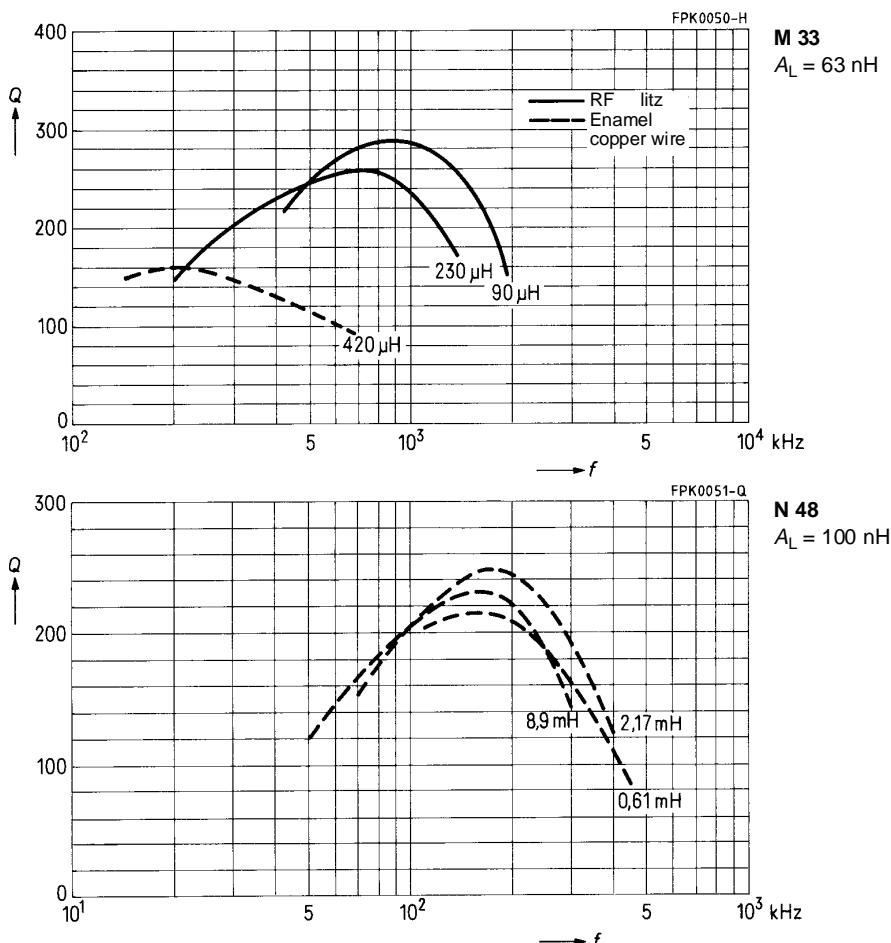
Material	$A_L$ value	$L$	Turns	Wire; RF litz wire	No. layers
U 17	8 nH	0,31 $\mu\text{H}$	6	0,25 CuL	1
		0,14 $\mu\text{H}$	4	0,30 CuL	1
		0,08 $\mu\text{H}$	3	0,30 CuL	1
K 1	25 nH	20 $\mu\text{H}$	28	15 × 0,04 CuLS	4
		5,6 $\mu\text{H}$	15	12 × 0,04 CuLS	2
		3,3 $\mu\text{H}$	11	0,3 CuL	2
		0,75 $\mu\text{H}$	5	0,4 CuL	1



**Q factor characteristics** (typical values)

Flux density in the core  $\hat{B} < 2 \text{ mT}$

Material	$A_L$ value	$L$	Turns	Wire; RF litz wire
M 33	63 nH	420 $\mu\text{H}$	80	0,14 CuL
		230 $\mu\text{H}$	60	3 × 0,07 CuLS
		90 $\mu\text{H}$	37	12 × 0,04 CuLS
N 48	100 nH	8,90 $\mu\text{H}$	300	0,07 CuL
		2,17 $\mu\text{H}$	150	0,10 CuL
		0,61 $\mu\text{H}$	80	0,15 CuL



**P 9×5**  
**Core and Accessories**

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">324</a>
Matching handle	B63399	<a href="#">324</a>
Adjusting screw	B65518	<a href="#">324</a>
Yoke	B65818	<a href="#">323</a>
Core	B65817	<a href="#">319</a>
Coil former	B65522	<a href="#">321</a>
Insulating washer 1	B65522	<a href="#">321</a>
Core	B65517	<a href="#">319</a>
Terminal carrier with thread	B65518	<a href="#">323</a>
FPK0019-S		
Example of an assembly set for printed circuit boards		
<b>Also available:</b>	SMD coil former	B65524 <a href="#">322</a>

**P 9×5**  
**Core and Accessories**

Individual parts	Part no.	Page
Pot core	B65517	<a href="#">319</a>
2 clamps	B65518	<a href="#">320</a>
Insulating washer	B65522	<a href="#">321</a>
Pinned coil former	B65518	<a href="#">320</a>
Pot core	B65517	<a href="#">319</a>

Example of an assembly set

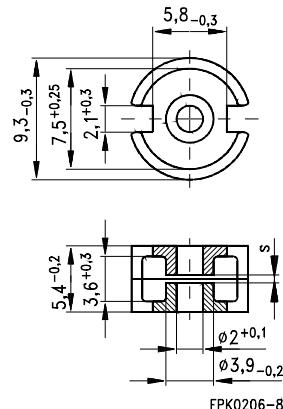
- In accordance with IEC 133 and DIN 41 293

#### Magnetic characteristics (per set)

	with center hole	without center hole	
$\Sigma I/A$	1,25	1,13	$\text{mm}^{-1}$
$I_e$	12,2	13,4	mm
$A_e$	9,8	11,9	$\text{mm}^2$
$A_{\min}$	—	9,3	$\text{mm}^2$
$V_e$	120	159	$\text{mm}^3$

#### Approx. weight (per set)

$m$	0,8	1,0	g



#### Gapped

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code <sup>2)</sup> -D with center hole -T with threaded sleeve	PU Sets
U17 <sup>1)</sup>	10 ± 3 %	1,20	10,0	B65517-D10-A17	1000
K12	16 ± 3 %	0,80	15,9	B65517-+16-A12	
K1	25 ± 3 %	0,45	24,9	B65517-+25-A1	
	40 ± 3 %	0,26	39,8	B65517-+40-A1	
M33	40 ± 3 %	0,37	39,8	B65517-T40-A33	
	63 ± 3 %	0,20	63,0	B65517-D63-A33	
N48	100 ± 3 %	0,10	100,0	B65517-+100-A48	
	160 ± 3 %	0,06	159,0	B65517-+160-A48	
	200 ± 3 %	0,04	200,0	B65517-D200-A48	
N26	250 ± 10 %	0,03	249,0	B65517-D250-K26	

#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code -D with center hole -W without center hole	PU Sets
K1	95 + 30/- 20 %	95			B65517-D-R1	1000
N26	1300 + 30/- 20 %	1190			B65517-D-R26	
N30	2500 + 30/- 20 %	2490			B65517-D-R30	
T38	5500 + 40/- 30 %	4945			B65517-W-Y38	

1) The dimensions may be up to approx. 10 % larger.

2) Replace the + by the code letter "D" or "T" for the required version.

### Coil former with solder pins

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code blue

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 154](#)

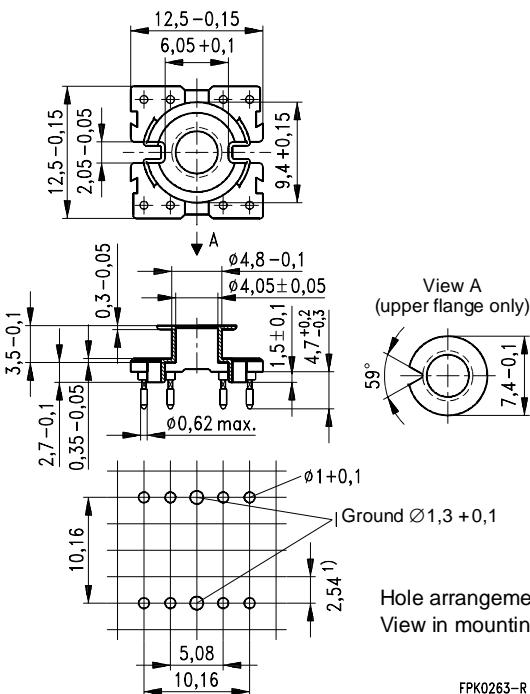
Pins squared in the start-of-winding area

### Clamp

Material: Stainless spring steel (0,25 mm), with ground terminal

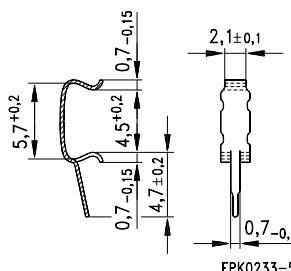
Coil former	Ordering code				PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Pcs
1	3,4	19,2	183	8	B65518-J1008-D1
Clamp (ordering code per piece, 2 are required)	B65518-A2010				1000

### Coil former



1) 2,5 mm also permissible

### Clamp



**Coil former**

Standard: to IEC 133 and DIN 41 294

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

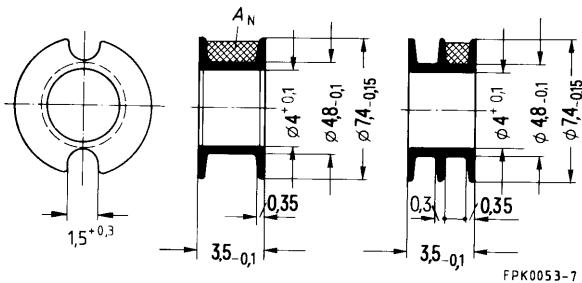
Winding: [see page 154](#)

**Insulating washer 1** between core and coil former

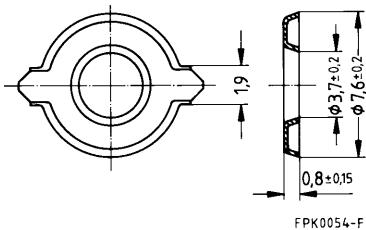
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120°C), 0,04 mm thick

Coil former				Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$I_N$ mm	$A_R$ value $\mu\Omega$		Pcs
1	3,6	19,2	183	B65522-B-T1	500
2	3,2	19,2	206	B65522-B-T2	
Insulating washer 1 (reel packing, PU = 1 reel)			B65522-A5000	3500	

**Coil former**



**Insulating washer 1**



### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

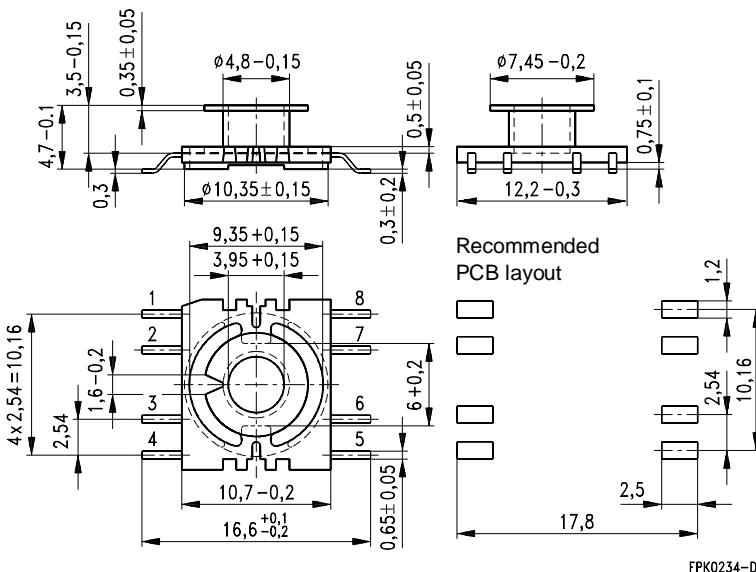
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Winding: [see page 160](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	3,4	19,2	194	4	B65524-C1004-T1	1000
	3,4	19,2	194	8	B65524-C1008-T1	



In the 4-terminal version terminals 2, 3, 6 and 7 are omitted.

### Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

#### Terminal carrier

- With thread for the adjusting screw (to be combined with core version "D")

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

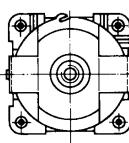
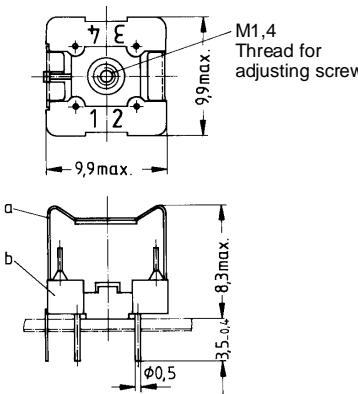
#### Yoke

Material: Spring yoke, made of tinned nickel silver (0,25 mm), with ground terminal

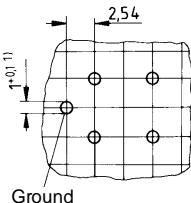
Complete mounting assembly  
(4 solder terminals)  
Ordering code: B65518-D2001, PU = 500 sets

Complete mounting assembly  
(6 solder terminals)  
Ordering code: B65518-D2002, PU = 500 sets

4 solder terminals

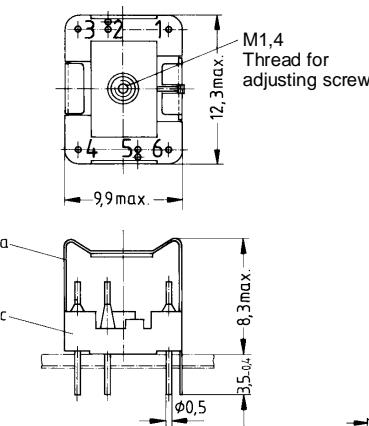


FPK0055-N

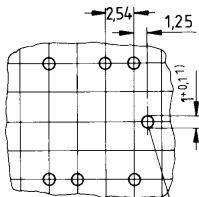


FPK0057-5

6 solder terminals



FPK0056-W



FPK0057-7

1) 1,3 hole also permissible

a) Yoke

b) Terminal carrier with 4 solder terminals

c) Terminal carrier with 6 solder terminals

**Adjusting screw**

● Tube core with thread and core brake made of GFR polyterephthalate

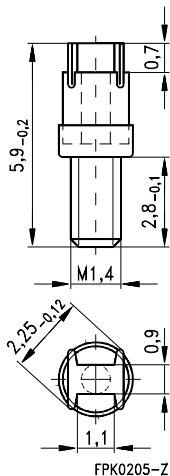
Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

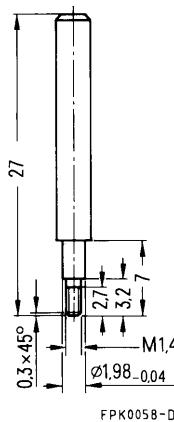
**Centering pin** e.g. made of brass (for design proposal see figure below)

Core P 9 × 5	Adjusting screw			Min. adjusting range %	Ordering code	PU Pcs
	A <sub>L</sub> value nH	Tube core Ø × length mm	Material			
U 17	10	1,81 × 2,0	Si 1	brown	6	B65518-C3000-X101
K 12	16	1,81 × 2,0	Si 1	brown	15	
K 1	25	1,81 × 2,0	Si 1	brown	17	
	40	1,81 × 2,0	K 1	blue	16	
M 33	40	1,81 × 2,0	Si 1	brown	16	
	63	1,81 × 2,0	K 1	blue	22	
N 48	100	1,81 × 2,0	K 1	blue	15	
	160	1,81 × 2,0	N 22	green	11	
	200	1,81 × 2,0			8	
<b>Adjusting screwdriver</b>					B63399-B4	10
<b>Handle</b>					B63399-B5	10

**Adjusting screw**



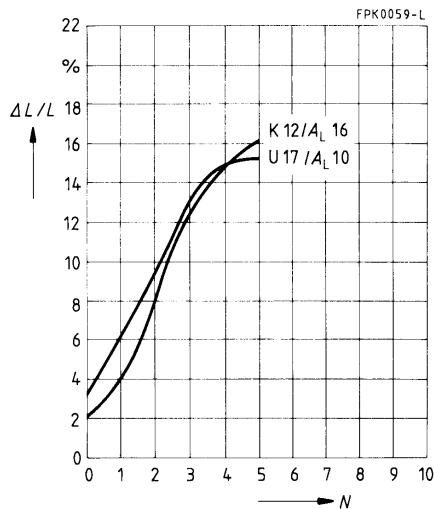
**Centering pin**



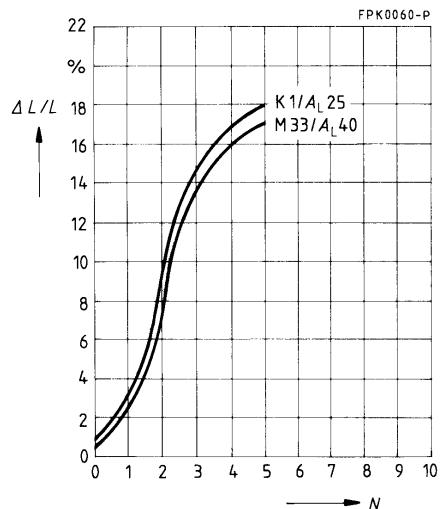
### Inductance adjustment curves (nominal values)

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 1 turn engaged.

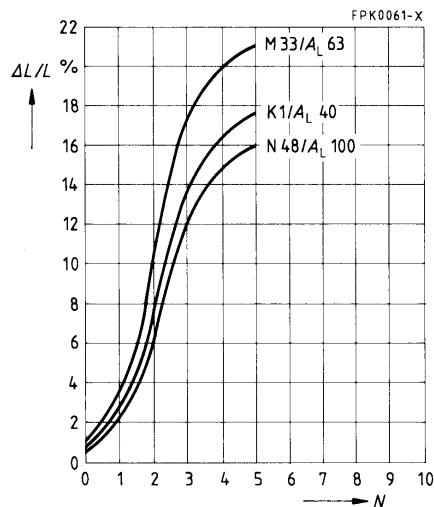
Adjusting screw B65518-C3000-X101  
Color code brown



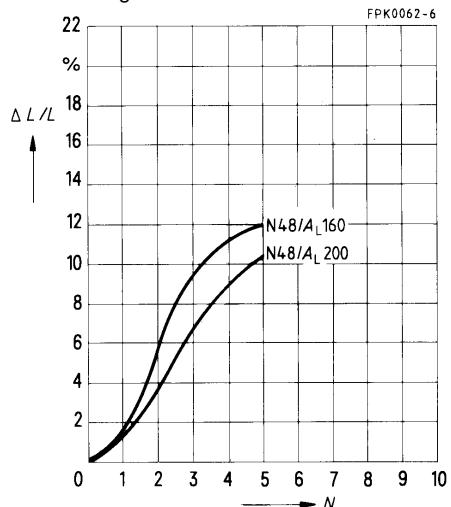
Adjusting screw B65518-C3000-X101  
Color code brown



Adjusting screw B65518-C3000-X1  
Color code blue



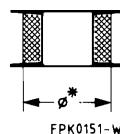
Adjusting screw B65518-C3000-X22  
Color code green



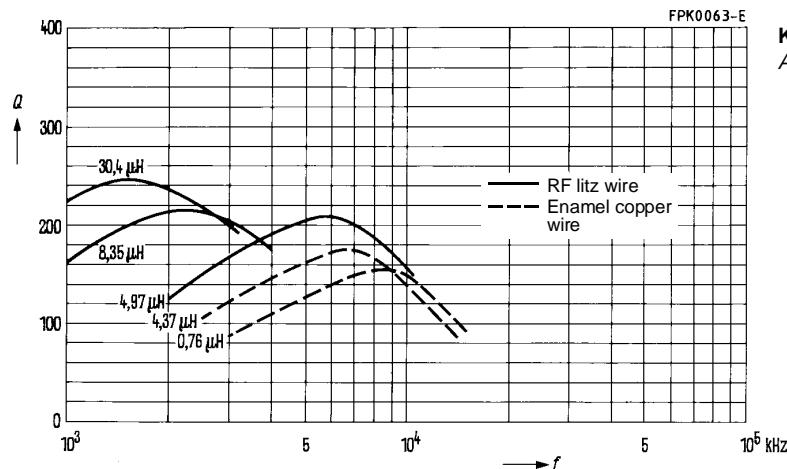
**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 0,6 \text{ mT}$

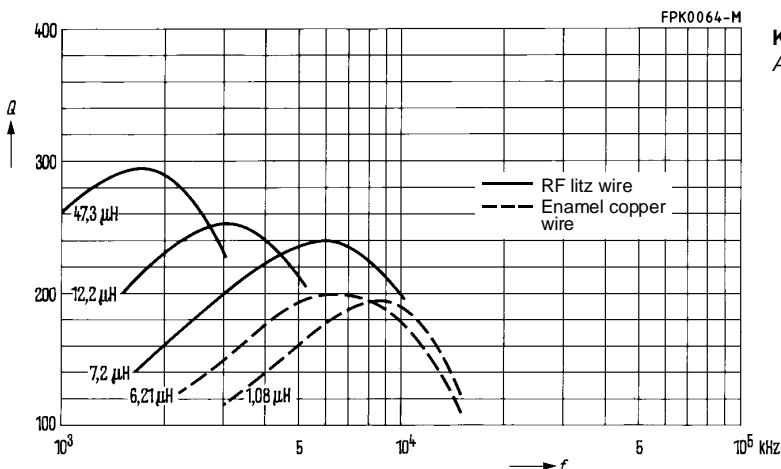
Material	$L (\mu\text{H})$ for $A_L = 25 \text{ nH}$		Turns	Wire; RF litz wire	Sections	$\emptyset^*$ mm
	$A_L = 25 \text{ nH}$	$A_L = 40 \text{ nH}$				
K 1	4,37	6,21	12	0,20 CuL	1	6,7
	0,76	1,08	5	0,50 CuL	1	6,0
	30,40	47,3	35	1 × 20 × 0,04 CuLS	1	—
	8,35	12,2	18	1 × 20 × 0,04 CuLS	1	—
	4,97	7,2	13	1 × 12 × 0,04 CuLS	1	6,7



\* Pad of polystyrene  
tape up to  
diameter  $\emptyset$



**K 1**  
 $A_L = 25 \text{ nH}$

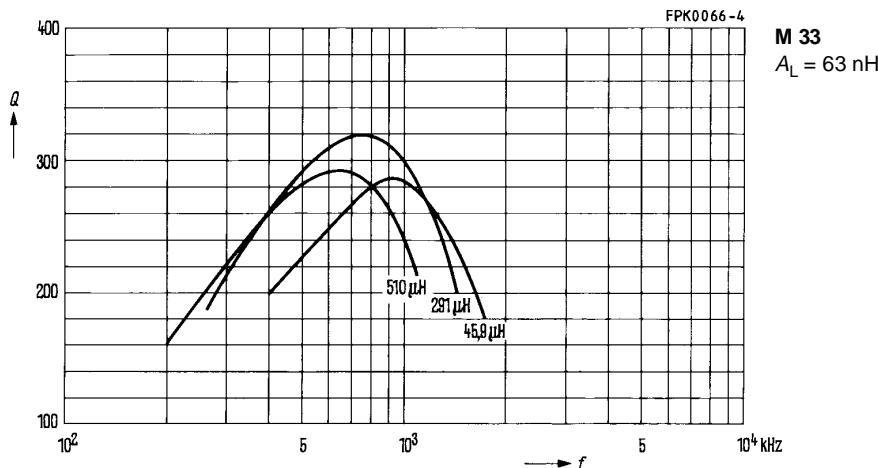
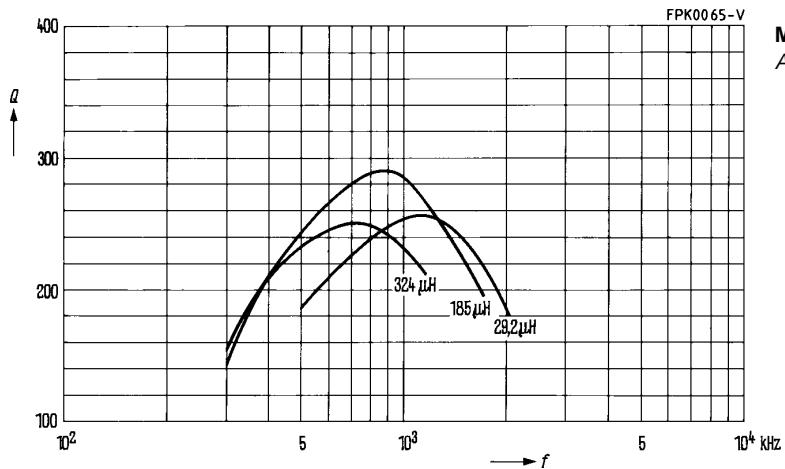


**K 1**  
 $A_L = 40 \text{ nH}$

**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 2 \text{ mT}$

Material	$L (\mu\text{H})$ for		Turns	RF litz wire	Sections
	$A_L = 40 \text{ nH}$	$A_L = 63 \text{ nH}$			
M 33	324	510	90	1 × 5 × 0,05 CuLS	1
	185	291	68	1 × 12 × 0,04 CuLS	1
	29,2	45,9	27	1 × 30 × 0,04 CuLS	1

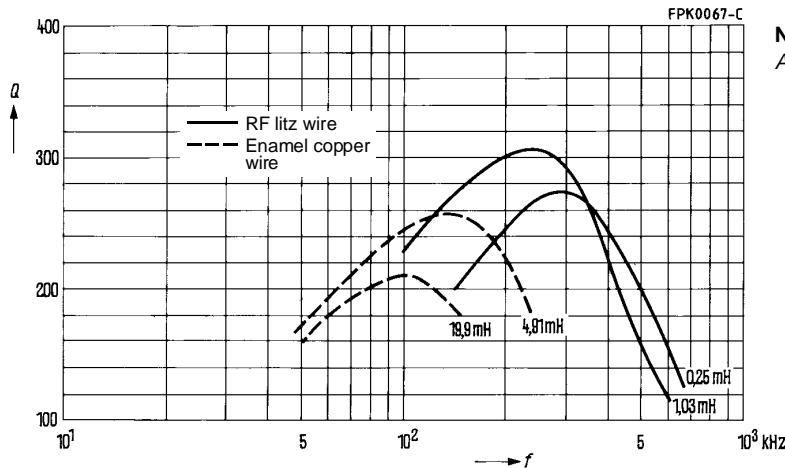


**Q factor characteristics (typical values)**

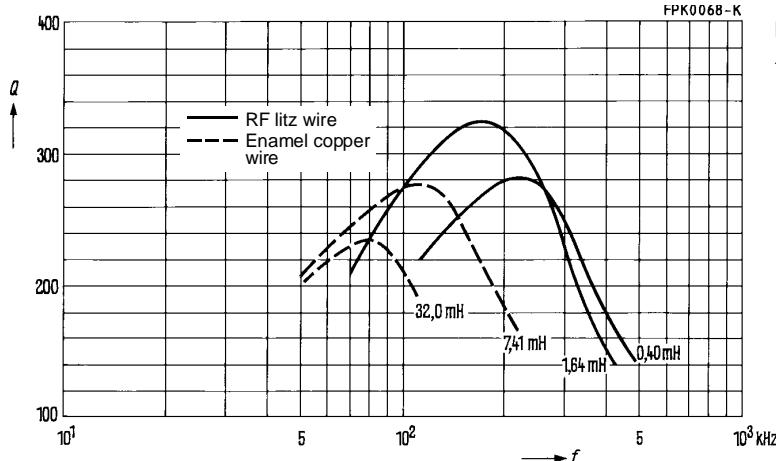
Flux density in the core  $\hat{B} < 3 \text{ mT}$

Material	$L (\mu\text{H})$ for		Turns	RF litz wire	Sections
	$A_L = 100 \text{ nH}$	$A_L = 160 \text{ nH}$			
N 48	19,9	32,0	450	0,07 CuL	1
	4,91	7,41	250	0,1 CuL	1
	1,03	1,64	100	1 × 12 × 0,04 CuL	1
	0,25	0,40	50	1 × 15 × 0,04 CuLS	1

FPK0067-C  
N 48  
 $A_L = 100 \text{ nH}$



FPK0068-K  
N 48  
 $A_L = 160 \text{ nH}$



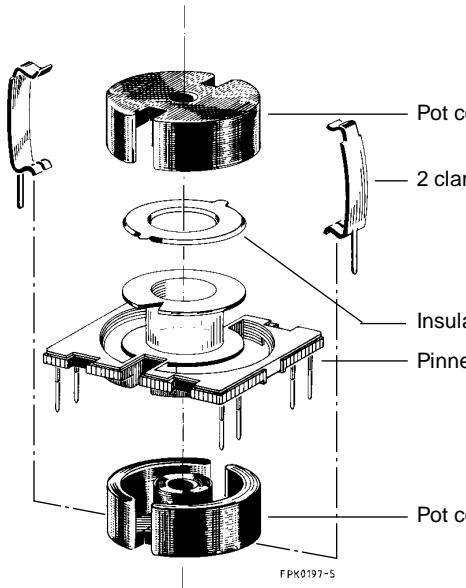
**P 11 × 7**  
**Core and Accessories**

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">335</a>
Matching handle	B63399	<a href="#">335</a>
Adjusting screw	B65539	<a href="#">335</a>
Yoke	B65535	<a href="#">334</a>
Core	B65531	<a href="#">331</a>
Coil former	B65532	<a href="#">333</a>
Insulating washer 1	B65532	<a href="#">333</a>
Core	B65531	<a href="#">331</a>
Terminal carrier with thread	B65535	<a href="#">334</a>

FPK0020-V

Example of an assembly set  
for printed circuit boards

Individual parts	Part no.	Page
Pot core	B65531	<a href="#">331</a>
2 clamps	B65532	<a href="#">332</a>
Insulating washer	B65532	<a href="#">333</a>
Pinned coil former	B65532	<a href="#">332</a>
Pot core	B65531	<a href="#">331</a>

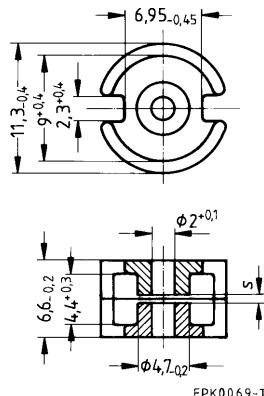


Example of an assembly set

● In accordance with IEC 133 and DIN 41 293

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma I/A$	1,0	0,92	$\text{mm}^{-1}$
$I_e$	15,9	16,30	mm
$A_e$	15,9	17,70	$\text{mm}^2$
$A_{\min}$	—	14,90	$\text{mm}^2$
$V_e$	252,0	289,00	$\text{mm}^3$



**Approx. weight (per set)**

$m$	1,7	1,8	g

**Gapped**

Mate-rial	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code <sup>1)</sup> -D with center hole -T with threaded sleeve	PU Sets
K12	16 ± 3 %	0,70	13,0	B65531-D16-A12	1000
K1	25 ± 3 %	1,00	19,1	B65531-D25-A1	
	40 ± 3 %	0,41	31,8	B65531-+40-A1	
M33	40 ± 3 %	0,64	31,8	B65531-D40-A33	
	63 ± 3 %	0,38	50,0	B65531-D63-A33	
N48	100 ± 3 %	0,20	80,0	B65531-D100-A48	
	160 ± 3 %	0,10	127,0	B65531-+160-A48	
	250 ± 3 %	0,06	199,0	B65531-+250-A48	
N26	400 ± 10 %	0,03	318,0	B65531-D400-K26	

**Ungapped**

Mate-rial	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
M33	780 + 30/- 20 %	620			B65531-D-R33	100
N26	1800 + 30/- 20 %	1430			B65531-D-R26	
N30	3500 + 30/- 20 %	2560			B65531-W-R30	
T38	7000 + 40/- 30 %	5120			B65531-W-Y38	
N67	2000 + 30/- 20 %	1460	1250	0,15 (200 mT, 100 kHz, 100 °C)	B65531-W-R67	

1) Replace the + by the code letter "D" or "T" for the required version.

**Coil former with solder pins**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:  
F  $\triangleq$  max. operating temperature 155 °C), color code blue

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 154](#)

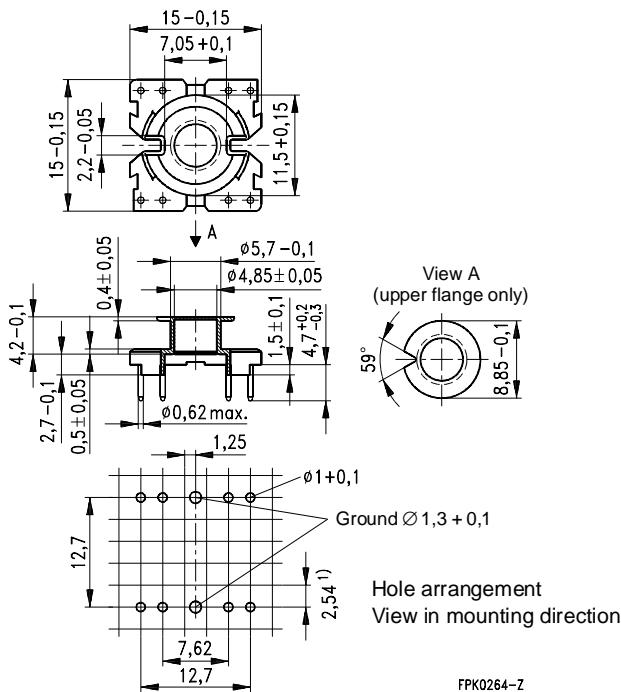
Pins squared in the start-of-winding area

**Clamp**

Material: Stainless spring steel (0,30 mm), with ground terminal

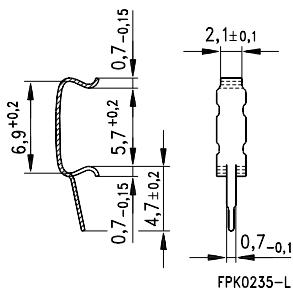
Coil former	Ordering code				PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Pcs
1	4,2	22	180	8	B65532-J1008-D1
Clamp (ordering code per piece, 2 are required)	B65532-A2010				1000

**Coil former**



1) 2,5 mm also permissible

**Clamp**



### Coil former

Standard: to IEC 133 and DIN 41 294

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

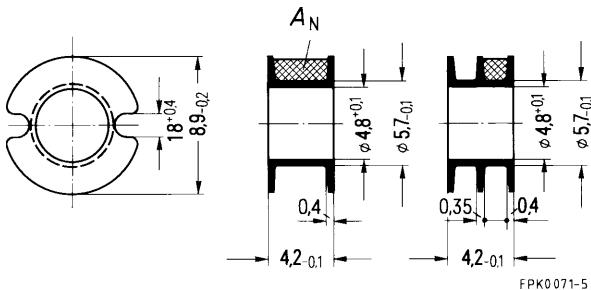
Winding: [see page 154](#)

### Insulating washer 1 between core and coil former

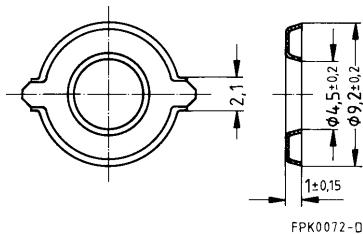
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120°C), 0,04 mm thick

Coil former				Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$		
1	4,2	22	180	B65532-B-T1	500
2	3,8	22	200	B65532-B-T2	
Insulating washer 1 (reel packing, PU = 1 reel)				B65532-A5000	3000

### Coil former



### Insulating washer 1



### Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

#### Terminal carrier

- With thread for the adjusting screw (to be combined with core version "D")

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

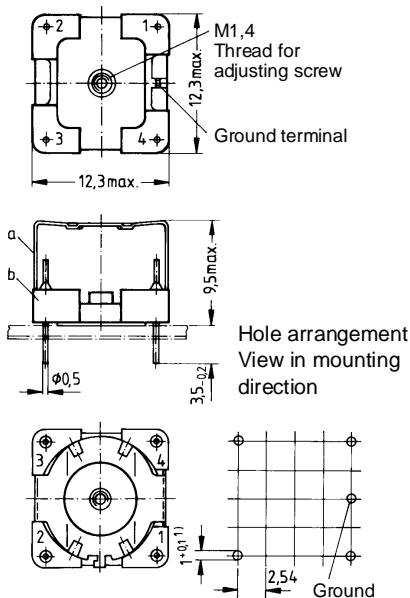
#### Yoke

Material: Spring yoke, made of tinned nickel silver (0,25 mm), with ground terminal

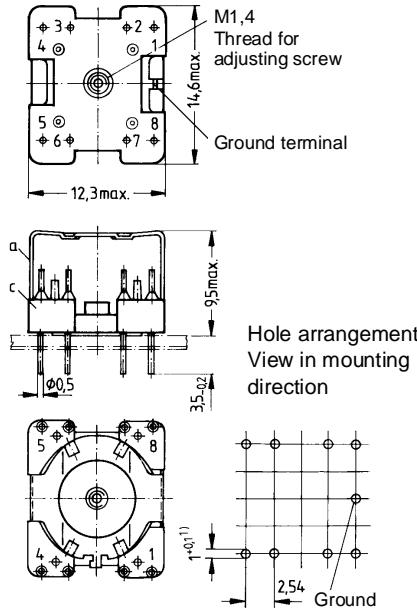
Complete mounting assembly  
(4 solder terminals)  
Ordering code: B65535-B2, PU = 500 sets

Complete mounting assembly  
(6 solder terminals)  
Ordering code: B65535-B3, PU = 500 sets

4 solder terminals



8 solder terminals



1) 1,3 hole also permissible

a) Yoke

b) Terminal carrier with 4 solder terminals

c) Terminal carrier with 8 solder terminals

FPK0073-L

**Adjusting screw**

● Tube core with thread and core brake made of GFR polyterephthalate

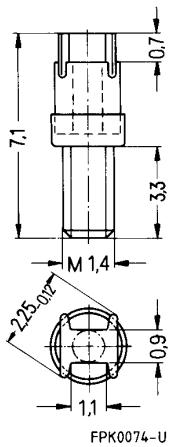
Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

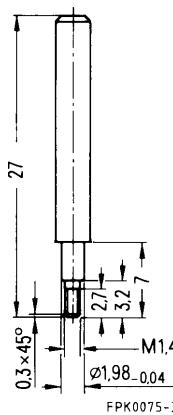
**Centering pin** e.g. made of brass (for design proposal see figure below)

Core P 11 × 7 Material	$A_L$ value nH	Adjusting screw			Min. adjusting range %	Ordering code	PU Pcs		
		Tube core $\varnothing \times$ length mm	Material	Color code					
K 12	16	1,81 × 2,0	Si 1	black	13	B65539-C1003-X101	1000		
K 1	25	1,81 × 2,0	K 1	yellow	30	B65539-C1003-X1			
	40				12				
M 33	40 63	1,81 × 2,0	Si 1	black	17 11	B65539-C1003-X101			
N 48	100	1,81 × 2,0	K 1	yellow	17	B65539-C1003-X1			
	160 250	1,81 × 2,7			16 8	B65539-C1002-X22			
<b>Adjusting screwdriver</b>						B63399-B4	10		
<b>Handle</b>						B63399-B5	10		

**Adjusting screw**



**Centering pin**

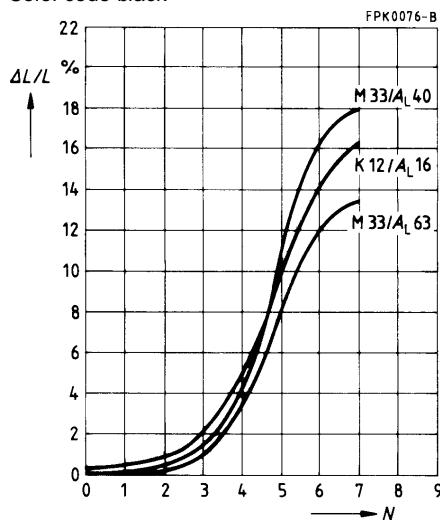


**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 1 turn engaged.

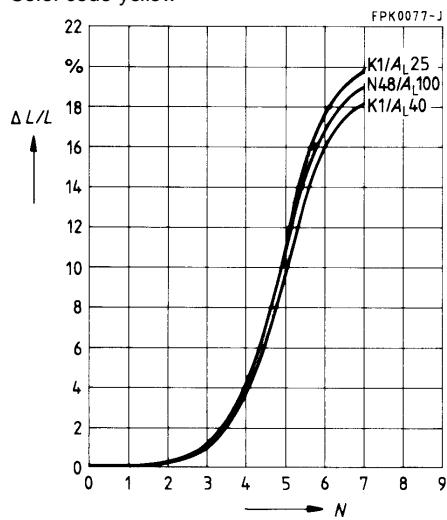
Adjusting screw B65539-C1003-X101

Color code black



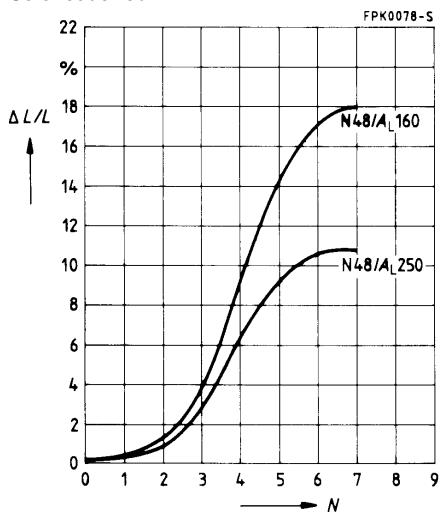
Adjusting screw B65539-C1003-X1

Color code yellow



Adjusting screw B65539-C1002-X22

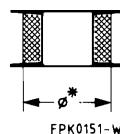
Color code red



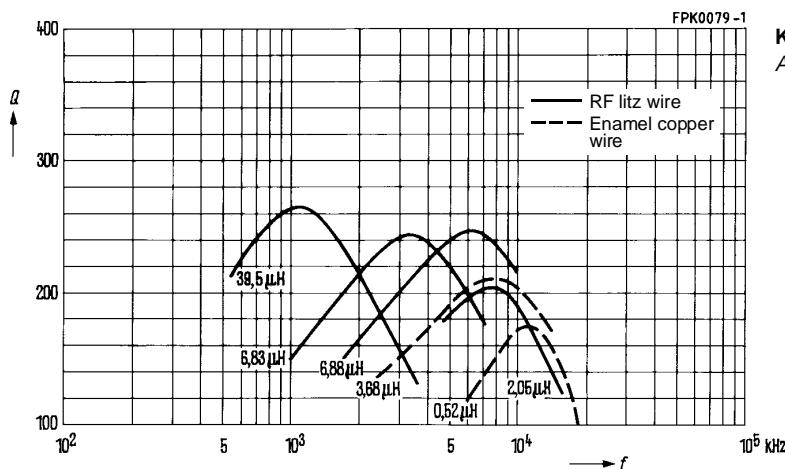
**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 0,6 \text{ mT}$

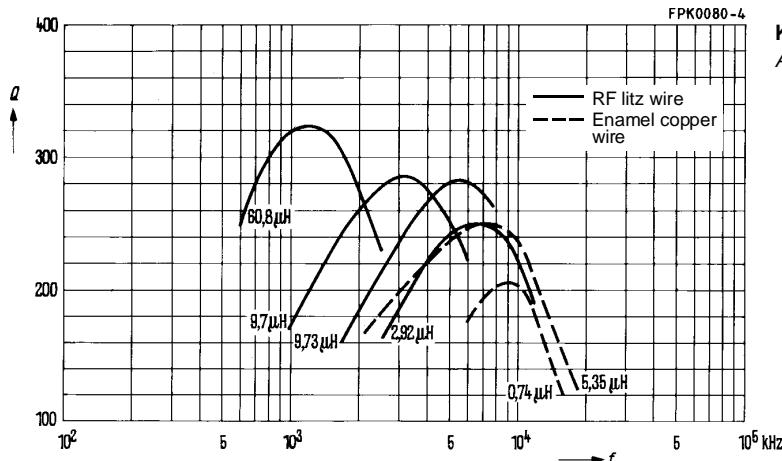
Material	$L (\mu\text{H})$ for $A_L = 25 \text{ nH}$		Turns	Wire; RF litz wire	Sections	$\emptyset^*$ mm
	$A_L = 25 \text{ nH}$	$A_L = 40 \text{ nH}$				
K 1	3,68	5,35	11	0,25 CuL	1	8,1
	0,52	0,74	4	0,70 CuL	1	7,2
	39,50	60,80	40	1 × 30 × 0,04 CuLS	1	—
	6,88	9,73	15	1 × 12 × 0,04 CuLS	1	8,4
	6,83	9,70	15	1 × 30 × 0,04 CuLS	1	6,9
	2,05	2,92	8	1 × 30 × 0,04 CuLS	1	8,1



\* Pad of polystyrene  
tape up to  
diameter  $\emptyset$



**K 1**  
 $A_L = 25 \text{ nH}$

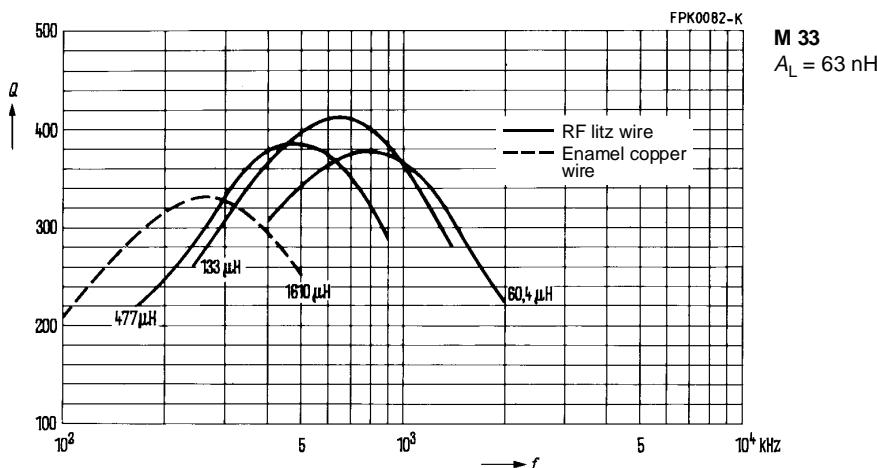
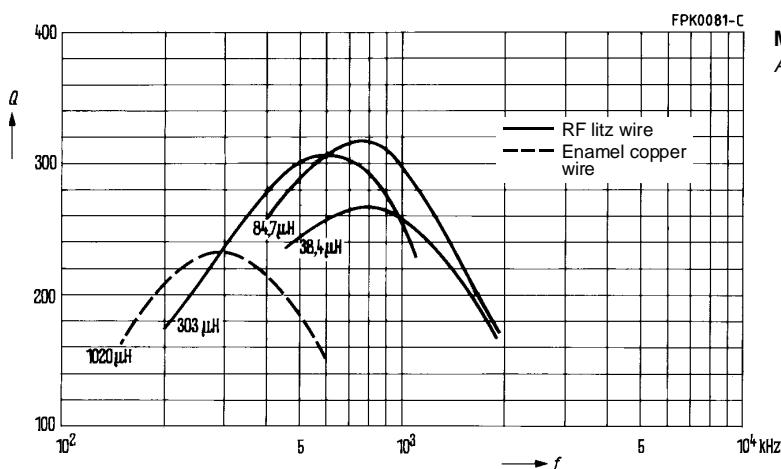


**K 1**  
 $A_L = 40 \text{ nH}$

**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 2 \text{ mT}$

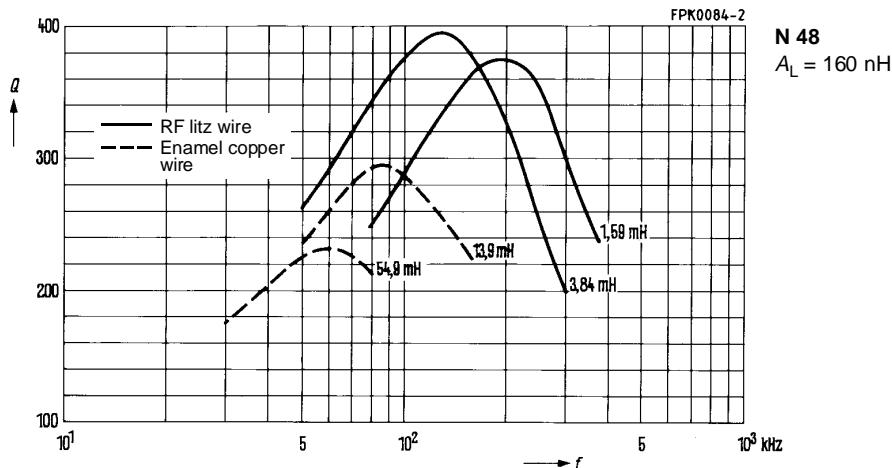
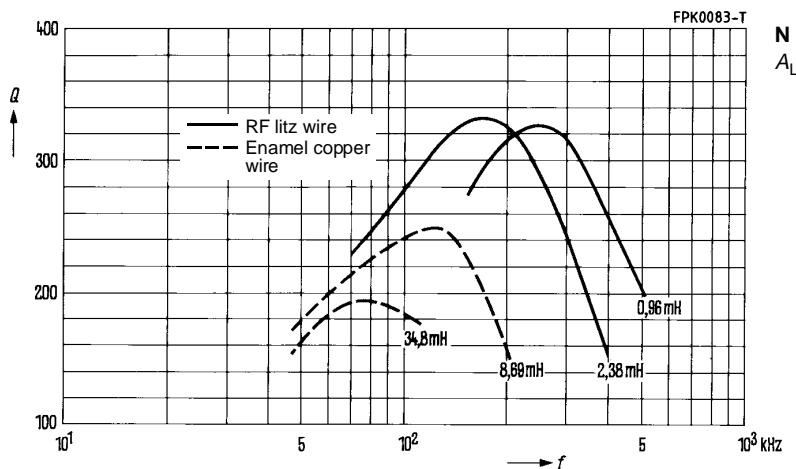
Material	$L (\mu\text{H})$ for		Turns	RF litz wire	Sections
	$A_L = 40 \text{ nH}$	$A_L = 63 \text{ nH}$			
M 33	1020,0	1610,0	160	1 × 12 × 0,04 CuL	1
	303,0	477,0	87	1 × 15 × 0,04 CuLS	1
	84,7	133,0	46	1 × 30 × 0,04 CuLS	1
	38,4	60,4	31	1 × 45 × 0,04 CuLS	1



**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 3 \text{ mT}$

Material	$L (\mu\text{H})$ for		Turns	RF litz wire	Sections
	$A_L = 100 \text{ nH}$	$A_L = 160 \text{ nH}$			
N 48	34,80	54,90	600	0,07 CuL	1
	8,69	13,90	300	0,10 CuL	1
	2,38	3,84	160	1 × 12 × 0,04 CuLS	1
	0,96	1,59	100	1 × 12 × 0,04 CuLS	1



## P 14 × 8 Core and Accessories

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">346</a>
Matching handle	B63399	<a href="#">346</a>
Adjusting screw	B65549	<a href="#">346</a>
Yoke	B65545	<a href="#">345</a>
Core	B65541	<a href="#">342</a>
Coil former	B65542	<a href="#">344</a>
Insulating washer 1	B65542	<a href="#">344</a>
Core	B65541	<a href="#">342</a>
Threaded sleeve (glued-in)		
Insulating washer 2	B65542	<a href="#">344</a>
Terminal carrier	B65545	<a href="#">345</a>
FPK0006-V		

Example of an assembly set  
for printed circuit boards

**Also available:**

Assembly sets for chassis mounting on request

Individual parts	Part no.	Page
Pot core	B65541	<a href="#">342</a>
2 clamps	B65542	<a href="#">343</a>
Insulating washer	B65542	<a href="#">344</a>
Pinned coil former	B65542	<a href="#">343</a>
Pot core	B65541	<a href="#">342</a>

Example of an assembly set

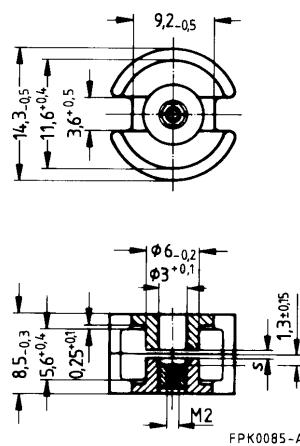
● In accordance with IEC 133

#### Magnetic characteristics (per set)

	with center hole	without center hole	
$\Sigma I/A$	0,8	0,73	$\text{mm}^{-1}$
$I_e$	20	21	mm
$A_e$	25	28,7	$\text{mm}^2$
$A_{\min}$	20	23,6	$\text{mm}^2$
$V_e$	500	603	$\text{mm}^3$

#### Approx. weight (per set)

$m$	3,2	3,5	g



#### Gapped

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code -T with threaded sleeve	PU Sets
K1	$40 \pm 3 \%$	1,00	25,4	B65541-T40-A1	500
M33	$40 \pm 3 \%$	0,90	25,4	B65541-T40-A33	
	$100 \pm 3 \%$	0,30	64,0	B65541-T100-A33	
N48	$160 \pm 2 \%$	0,16	102,0	B65541-T160-G48	
	$250 \pm 3 \%$	0,10	159,0	B65541-T250-A48	
	$315 \pm 3 \%$	0,08	201,0	B65541-T315-A48	
	$400 \pm 10 \%$	0,05	255,0	B65541-T400-A48	

#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	$140 + 30/-20 \%$	89			B65541-D-R1	500
M33	$970 + 30/-20 \%$	617			B65541-D-R33	
N26	$2300 + 30/-20 \%$	1460			B65541-D-R26	
N30	$4600 + 30/-20 \%$	2670			B65541-W-R30	
T38	$9800 + 40/-30 \%$	5690			B65541-W-Y38	
N67	$2800 + 30/-20 \%$	1630	1550	0,33 (200 mT, 100 kHz, 100 °C)	B65541-W-R67	
N41	$2800 + 30/-20 \%$	1780	1400	0,08 (200 mT, 100 kHz, 100 °C)	B65541-D-R41	

### Coil former with solder pins

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code blue

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 154](#)

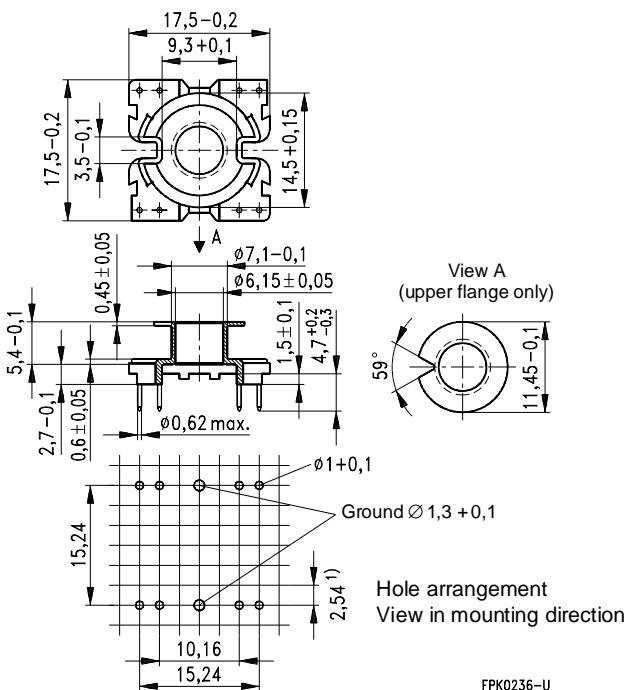
Pins squared in the start-of-winding area

### Clamp

Material: Stainless spring steel (0,35 mm), with ground terminal

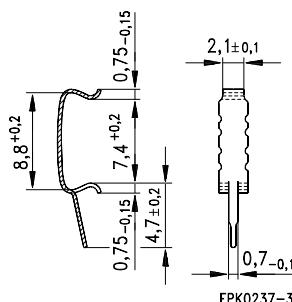
Coil former	Ordering code				PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Pcs
1	8,4	28	115	8	B65542-J1008-D1
Clamp (ordering code per piece, 2 are required)					B65542-A2010
					1000

### Coil former



1) 2,5 mm also permissible

### Clamp



### Coil former

Standard: to IEC 133 and DIN 41 294

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Winding: [see page 154](#)

### Insulating washer 1 between core and coil former

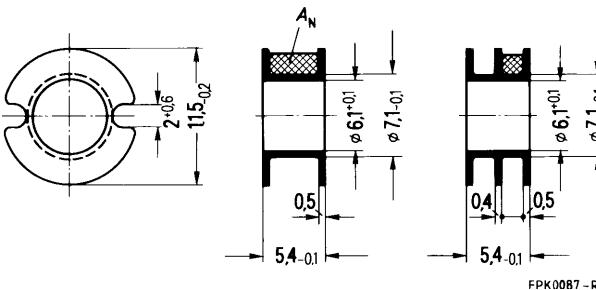
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,04 mm thick

### Insulating washer 2 between core and terminal carrier

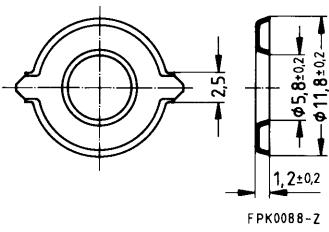
- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,08 mm thick

Coil former				Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$		
1	8,4	28	115	B65542-B-T1	500
2	7,6	28	127	B65542-B-T2	
Insulating washer 1 (reel packing, PU = 1 reel)			B65542-A5000		2500
Insulating washer 2 (bulk)			B65542-A5002		500

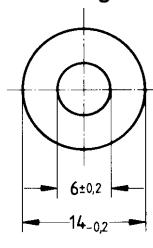
### Coil former



### Insulating washer 1



### Insulating washer 2



### Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

#### Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

#### Yoke

Material: Spring yoke, made of tinned nickel silver (0,25 mm), with ground terminal

Complete mounting assembly

(4 solder terminals)

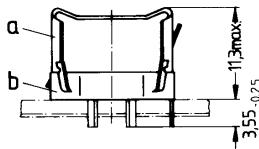
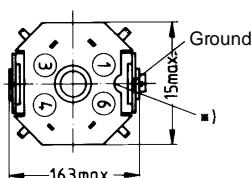
Ordering code: B65545-B9 PU = 500 sets

Complete mounting assembly

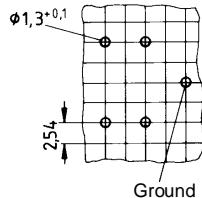
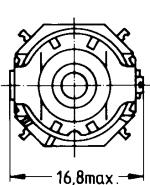
(6 solder terminals)

Ordering code: B65545-B10, PU = 500 sets

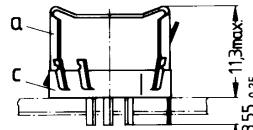
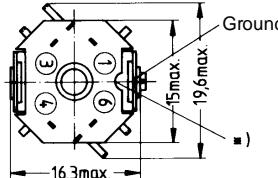
4 solder terminals



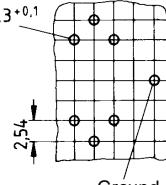
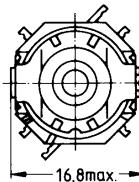
Hole arrangement  
View in mounting  
direction



6 solder terminals



Hole arrangement  
View in mounting  
direction



FPK0090-8

\*) This recess must be on the side of the grounding pin to ensure that the yoke locks in position.

a) Yoke

b) Terminal carrier with 4 solder terminals

c) Terminal carrier with 6 solder terminals

### Adjusting screw

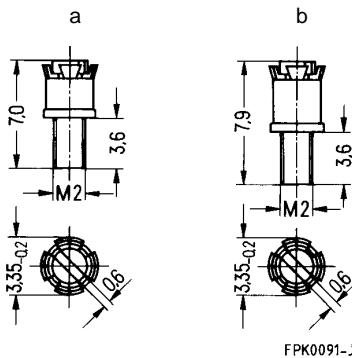
● Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

Core P 14 × 8		Adjusting screw			Min. adjusting range %	Ordering code	PU Pcs				
Material	A <sub>L</sub> value nH	Fig.	Ø × length mm	Material	Color code						
K 12	20	a	2,6 × 2,0	Si 1	green	10	B65549-E3-X101				
K 1	40	a	2,6 × 2,0	Si 1	green	10	B65549-E3-X101				
M 33	40	a	2,6 × 2,0	Si 1	green	15	B65549-E3-X101				
	100	a	2,6 × 2,0	N 22	white	12	B65549-E3-X23				
N 48	160	b	2,76 × 2,9	N 22	black	20	B65549-E4-X23				
	250					12					
	315					11					
	400					6					
<b>Adjusting screwdriver</b>						B63399-B4	10				
<b>Handle</b>						B63399-B5	10				

### Adjusting screw

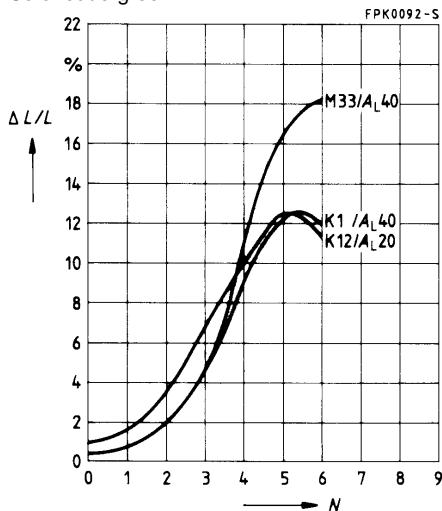


**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 1 turn engaged.

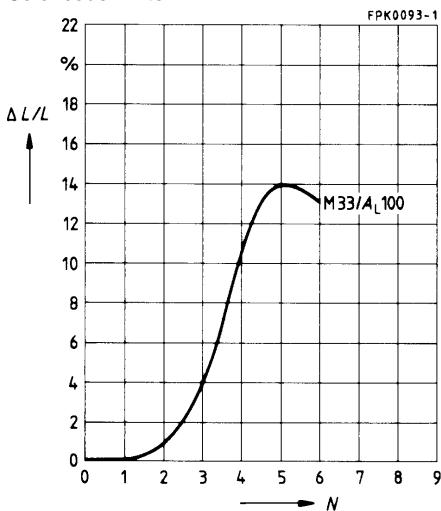
Adjusting screw B65549-E3-X101

Color code green



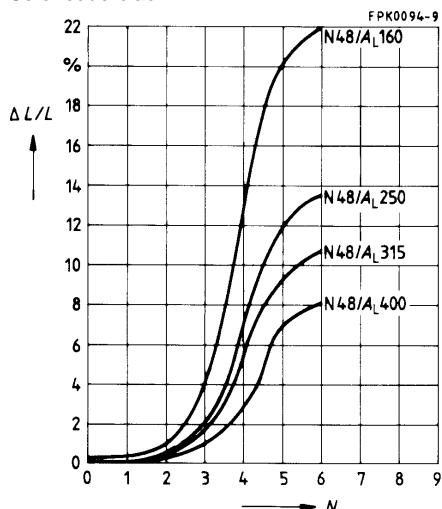
Adjusting screw B65549-E3-X23

Color code white



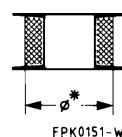
Adjusting screw B65549-E4-X23

Color code black



**Q factor characteristics (typical values)**

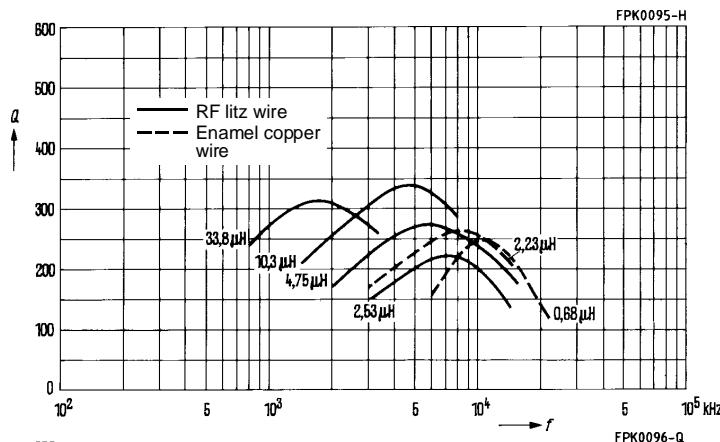
Material $A_L$ value	$L$ ( $\mu\text{H}$ )	Turns	Wire; RF litz wire	Sec- tions	$\emptyset^*$ mm
K 1 $A_L = 40 \text{ nH}$	2,23	7	0,55 CuL	1	10,1
	0,68	4	1,0 CuL	1	9,2
	33,8	30	1 × 20 × 0,04 CuLS	1	9,5
	10,3	15	1 × 20 × 0,04 CuLS	1	10,8
	4,75	10	1 × 20 × 0,04 CuLS	1	10,8
	2,53	7	1 × 20 × 0,04 CuLS	1	10,8
M 33 $A_L = 100 \text{ nH}$	1000	100	1 × 15 × 0,04 CuLS	1	—
	325	57	1 × 30 × 0,05 CuLS	1	—
	250	50	1 × 30 × 0,05 CuLS	1	—
	193	22 + 22	1 × 45 × 0,04 CuLS	2	—
	90	15 + 15	1 × 45 × 0,04 CuLS	2	—



\* Pad of polystyrene  
tape up to  
diameter  $\emptyset$

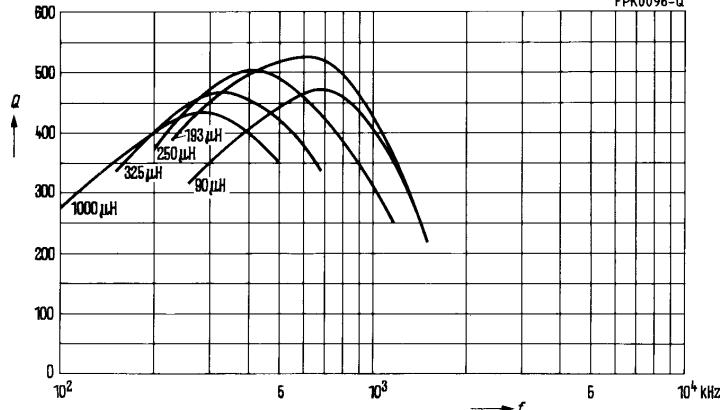
**K 1**  
 $A_L = 40 \text{ nH}$

Flux density  
in the core  
 $\hat{B} < 0,6 \text{ mT}$



**M 33**  
 $A_L = 100 \text{ nH}$

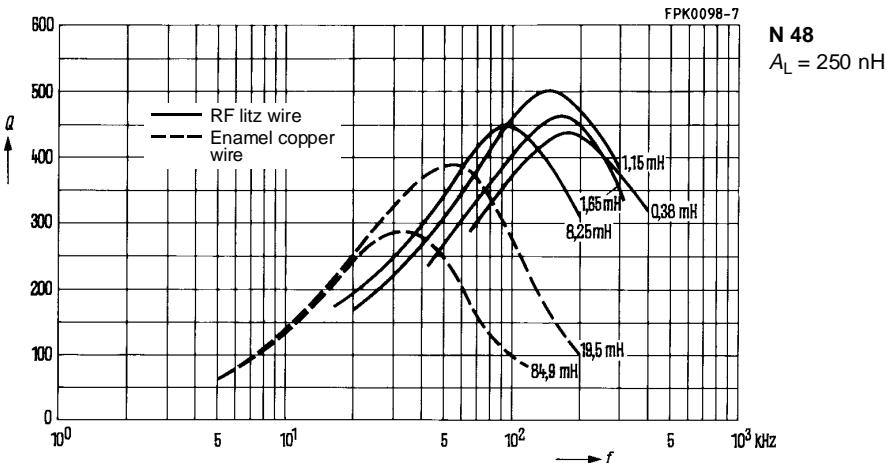
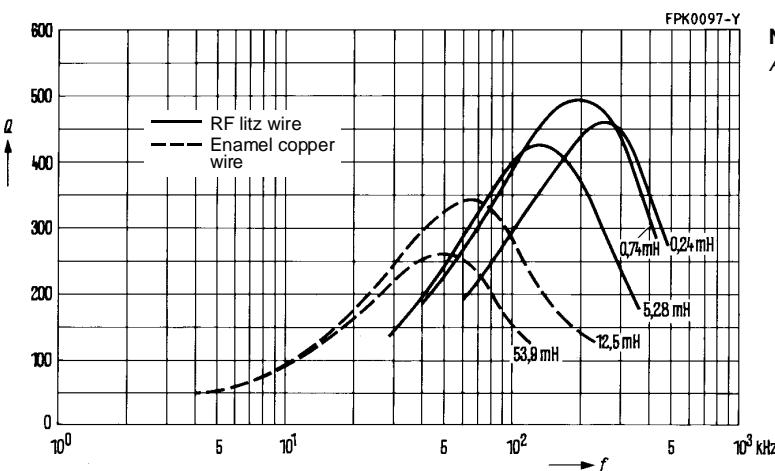
Flux density  
in the core  
 $\hat{B} < 2 \text{ mT}$



**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 2 \text{ mT}$

Material	$L$ (mH) for $A_L = 160 \text{ nH}$	$L$ (mH) for $A_L = 250 \text{ nH}$	Turns	Wire; RF litz wire	Sections
N 48	53,90	84,90	580	0,10 CuL	1
	12,50	19,50	280	0,15 CuL	1
	5,28	8,25	182	1 × 12 × 0,04 CuLS	1
	—	1,65	81	1 × 20 × 0,04 CuLS	2
	0,74	1,15	68	1 × 20 × 0,05 CuLS	2
	0,24	0,38	39	1 × 30 × 0,05 CuLS	2



**P 18 × 11**  
**Core and Accessories**

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">356</a>
Matching handle	B63399	<a href="#">356</a>
Adjusting screw	B65659	<a href="#">356</a>
Yoke	B65655	<a href="#">355</a>
Core	B65651	<a href="#">352</a>
Coil former	B65652	<a href="#">354</a>
Insulating washer 1	B65652	<a href="#">354</a>
Core	B65651	<a href="#">352</a>
Threaded sleeve (glued-in)		
Insulating washer 2	B65652	<a href="#">354</a>
Terminal carrier	B65655	<a href="#">355</a>

FPK0021-4

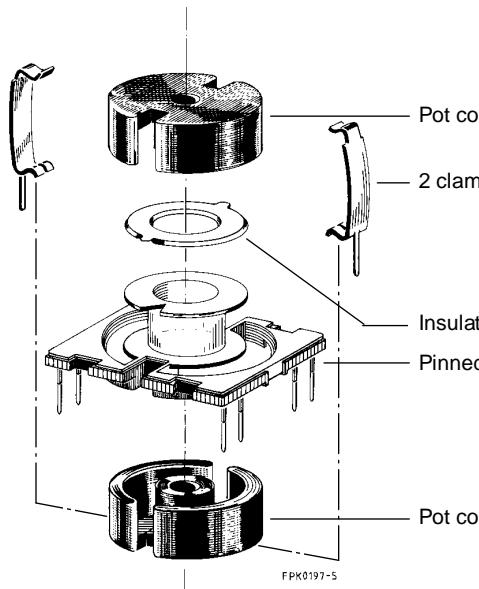
Example of an assembly set  
for printed circuit boards

**Also available:**

Assembly sets for chassis mounting on request

**P 18×11**  
**Core and Accessories**

Individual parts	Part no.	Page
Pot core	B65651	<a href="#">352</a>
2 clamps	B65652	<a href="#">353</a>
Insulating washer	B65652	<a href="#">354</a>
Pinned coil former	B65652	<a href="#">353</a>
Pot core	B65651	<a href="#">352</a>



Example of an assembly set

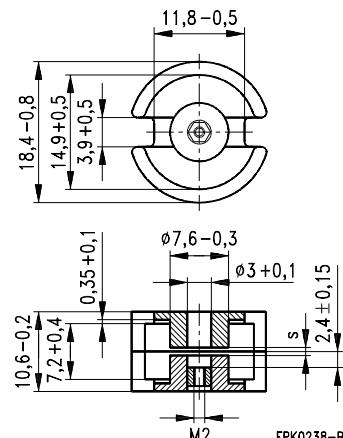
● In accordance with IEC 133

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma I/A$	0,6	0,57	$\text{mm}^{-1}$
$I_e$	25,9	26,6	mm
$A_e$	43	46,7	$\text{mm}^2$
$A_{\min}$	—	33,9	$\text{mm}^2$
$V_e$	1120	1240	$\text{mm}^3$

**Approx. weight (per set)**

$m$	6,0	6,6	g



**Gapped**

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code -D with center hole -T w. threaded sleeve	PU Sets
K1	40 ± 3 %	1,60	19,2	B65651-T40-A1	500
	63 ± 3 %	0,90	30,2	B65651-T63-A1	
M33	100 ± 3 %	0,60	47,9	B65651-T100-A33	
N48	160 ± 2 %	0,32	77,0	B65651-T160-G48	500
	250 ± 3 %	0,20	120,0	B65651-T250-A48	
	315 ± 3 %	0,15	151,0	B65651-T315-A48	
	400 ± 3 %	0,10	192,0	B65651-T400-A48	
	500 ± 3 %	0,07	240,0	B65651-T500-A48	
N26	630 ± 10 %	0,05	302,0	B65651-D630-K26	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	180 + 30/- 20 %	86			B65651-D-R1	500
N26	2900 + 30/- 20 %	1380			B65651-D-R26	
N30	5900 + 30/- 20 %	2680			B65651-W-R30	
T38	12600 + 40/- 30 %	5710			B65651-W-Y38	
N67	3600 + 30/- 20 %	1630	2000	0,51 (200 mT, 100 kHz, 100 °C)	B65651-W-R67	

### Coil former with solder pins

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code blue

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 154](#)

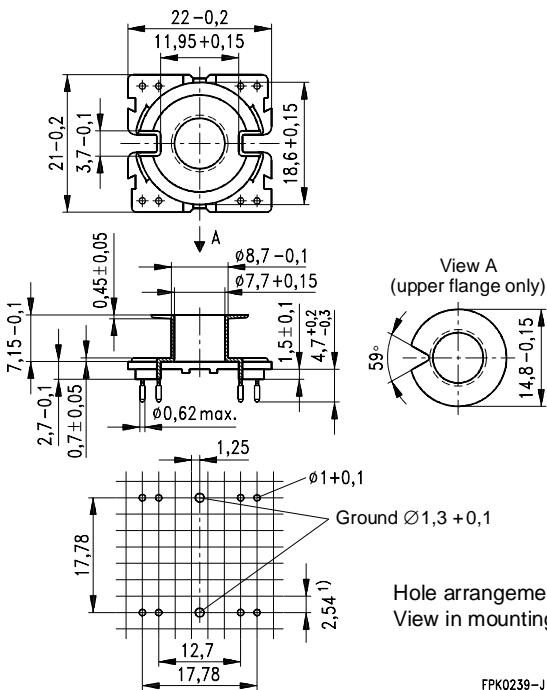
Pins squared in the start-of-winding area

### Clamp

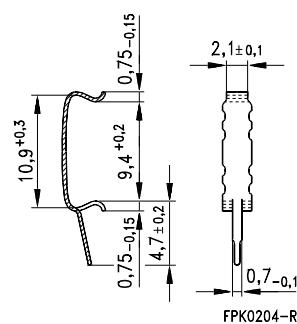
Material: Stainless spring steel (0,35 mm), with ground terminal

Coil former	Ordering code				PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Pcs
1	16	35,6	87	8	B65652-J1008-D1
Clamp (ordering code per piece, 2 are required)	B65652-A2010				2000

### Coil former



### Clamp



1) 2,5 mm also permissible

### Coil former

Standard: to IEC 133 and DIN 41 294  
 Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \leq$  max. operating temperature 155 °C), color code black  
 Winding: [see page 154](#)

### Insulating washer 1 between core and coil former

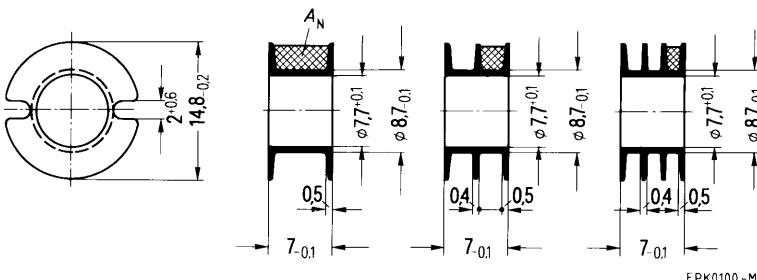
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,04 mm thick

### Insulating washer 2 between core and terminal carrier

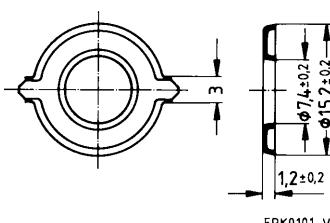
- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,08 mm thick

Coil former				Bestellnummer	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$		Pcs
1	16	35,6	87	B65652-B-T1	500
2	13	35,6	94	B65652-B-T2	
3	12	35,6	101	B65652-B-T3	
Insulating washer 1 (reel packing, PU = 1 reel)				B65652-A5000	2000
Insulating washer 2 (bulk)				B65652-A5002	500

### Coil former

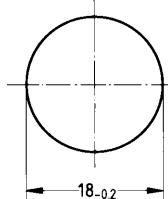


### Insulating washer 1



FPK0101-V

### Insulating washer 2



FPK0102-4

### Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

#### Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \leq \text{max. operating temperature } 155^{\circ}\text{C}$ ), color code gray

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3):  $235^{\circ}\text{C}, 2\text{ s}$

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B:  $350^{\circ}\text{C}, 3.5\text{ s}$

#### Yoke

Material: Spring yoke, made of tinned nickel silver (0,3 mm), with ground terminal

Complete mounting assembly

(4 solder terminals)

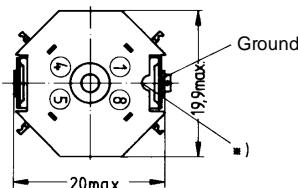
Ordering code: B65655-B9 PU = 500 sets

Complete mounting assembly

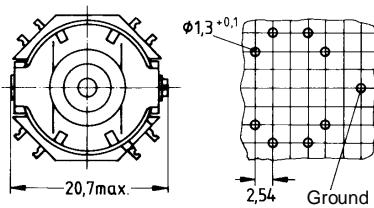
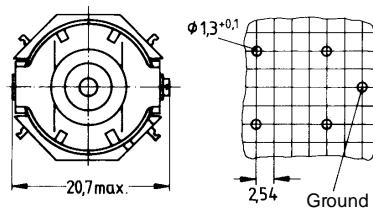
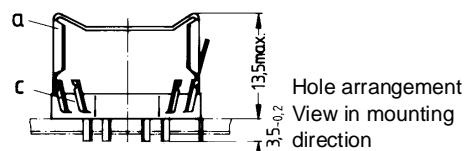
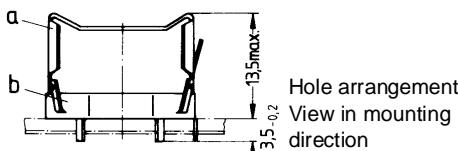
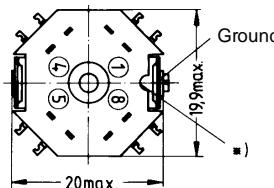
(8 solder terminals)

Ordering code: B65655-B10, PU = 500 sets

4 solder terminals



8 solder terminals



FPK0103-C

\*) This recess must be on the side of the grounding pin to ensure that the yoke locks in position.

a) Yoke

b) Terminal carrier with 4 solder terminals

c) Terminal carrier with 8 solder terminals

### Adjusting screw

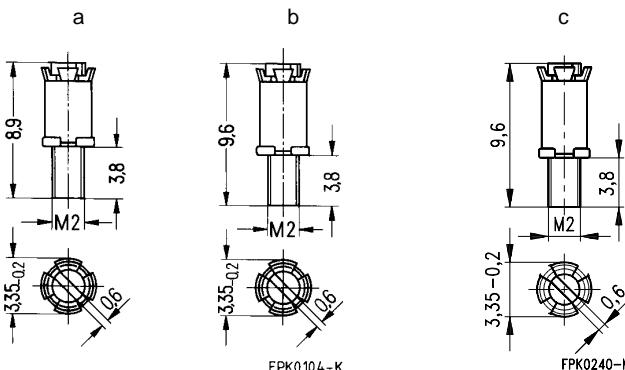
● Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

Core P 18 × 11		Adjusting screw			Min. adjusting range %	Ordering code	PU
Material	A <sub>L</sub> value nH	Tube core Fig.	Ø × length mm	Material	Color code		
K 1	40	a	2,62 × 3,6	Si 1	white	13	B65659-F1-X101
	63	c	2,82 × 4,4	Si 1	brown	11	B65659-F4-X101
	63	a	2,62 × 3,6	K 1	green	17	B65659-F1-X1
M 33	63	a	2,62 × 3,6	Si 1	white	16	B65659-F1-X101
	100					10	
	100	c	2,82 × 4,4	Si 1	brown	17	B65659-F4-X101
	160	a	2,62 × 3,6	Si 1	white	6	B65659-F1-X101
N 48	160	a	2,62 × 3,6	Si 1	white	7	B65659-F1-X101
	160	c	2,82 × 4,4	Si 1	brown	12	B65659-F4-X101
	250	a	2,62 × 3,6	K 1	green	10	B65659-F1-X1
	315	b	2,75 × 4,4	N 22	black	16	B65659-F3-X23
	400					12	
	400	c	2,82 × 4,4	N 22	yellow	16	B65659-F4-X23
<b>Adjusting screwdriver</b>						B63399-B4	10
<b>Handle</b>						B63399-B5	10

### Adjusting screw

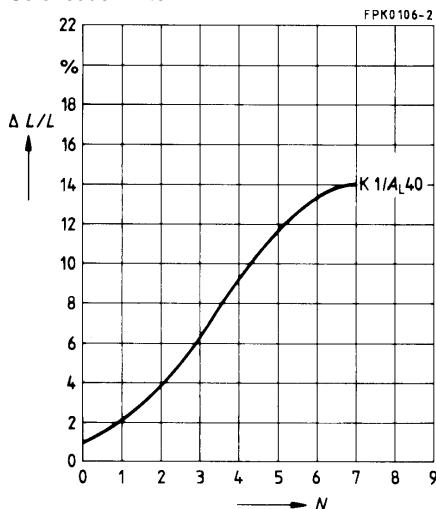


**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 1 turn engaged.

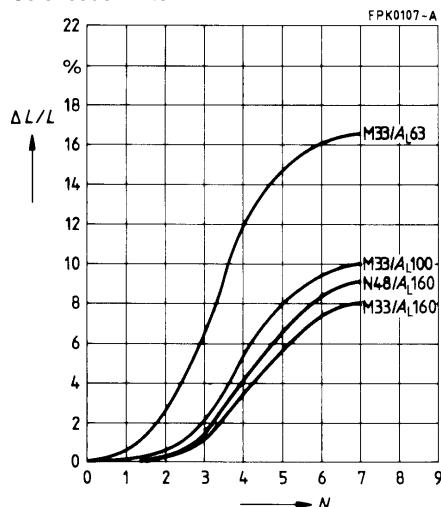
Adjusting screw B65659-F1-X101

Color code white



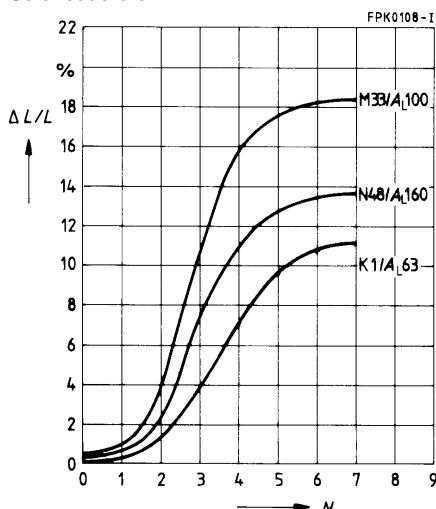
Adjusting screw B65659-F1-X101

Color code white



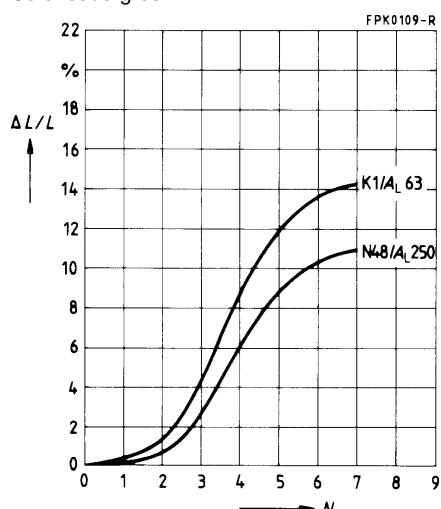
Adjusting screw B65659-F4-X101

Color code brown



Adjusting screw B65659-F1-X1

Color code green

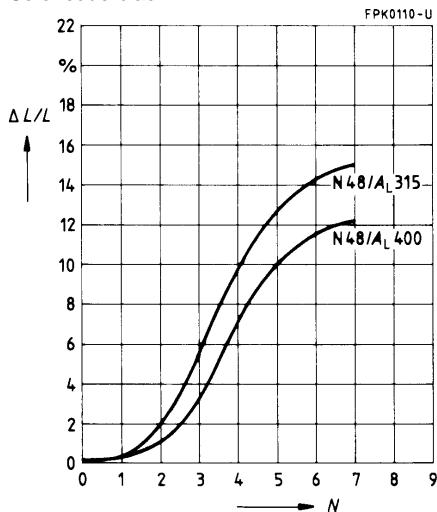


**Inductance adjustment curves** (nominal values)

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 1 turn engaged.

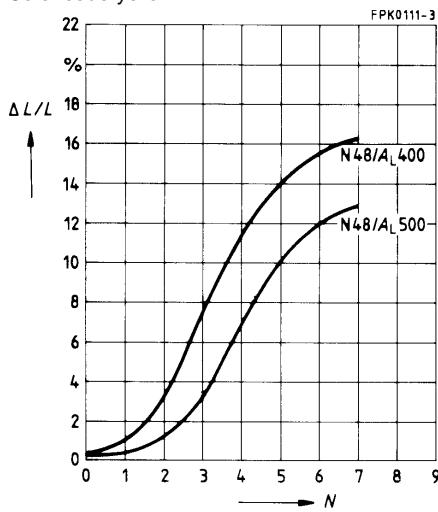
Adjusting screw B65659-F3-X23

Color code black



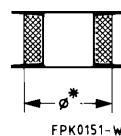
Adjusting screw B65659-F4-X23

Color code yellow



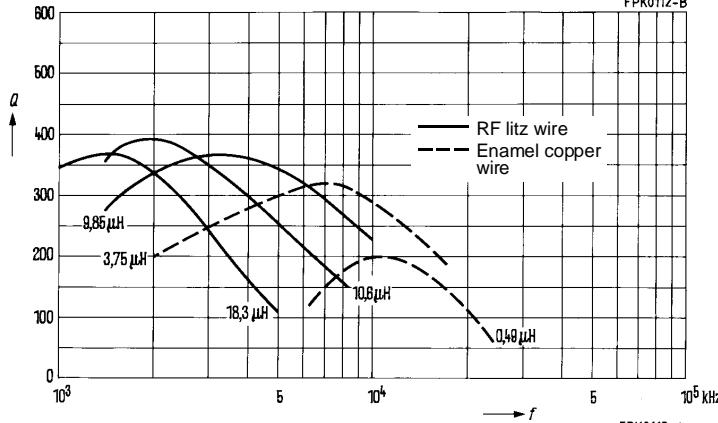
**Q factor characteristics (typical values)**

Material $A_L$ value	$L$ ( $\mu\text{H}$ )	Turns	Wire; RF litz wire	Sect-	$\emptyset^*$ mm
K 1 $A_L = 40 \text{ nH}$	3,75	9	0,6 CuL	1	13,0
	0,49	3	1,0 CuL	1	12,2
	18,3	20	3 × 30 × 0,04 CuLS	1	12,8
	10,6	5+5+5	3 × 30 × 0,04 CuLS	3	12,8
	9,85	15	1 × 45 × 0,04 CuLS	1	13,5
M 33 $A_L = 63 \text{ nH}$	1415	150	1 × 30 × 0,04 CuLS	1	—
	630	100	1 × 45 × 0,04 CuLS	1	—
	403	40+40	1 × 45 × 0,04 CuLS	2	—
	198	25+6+25	1 × 45 × 0,04 CuLS	3	11,7
	72,8	15+4+15	1 × 45 × 0,04 CuLS	3	10,8
	49,4	12+4+12	1 × 45 × 0,04 CuLS	3	10,8



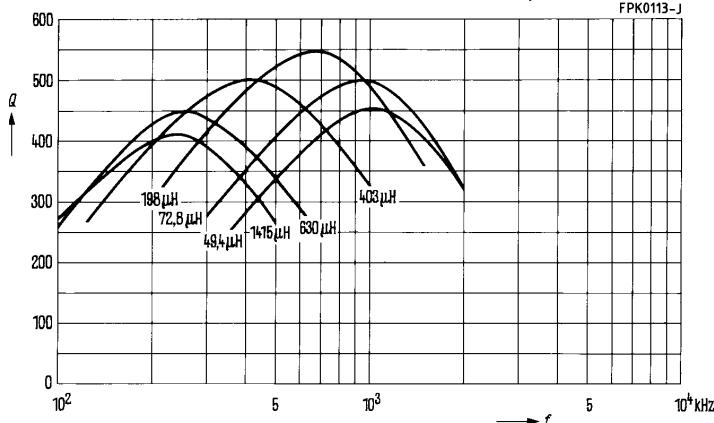
\* Pad of polystyrene  
tape up to  
diameter  $\emptyset$

FPK0112-B



**K 1**  
 $A_L = 40 \text{ nH}$

Flux density  
in the core  
 $\hat{B} < 1,6 \text{ mT}$

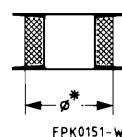


**M 33**  
 $A_L = 63 \text{ nH}$

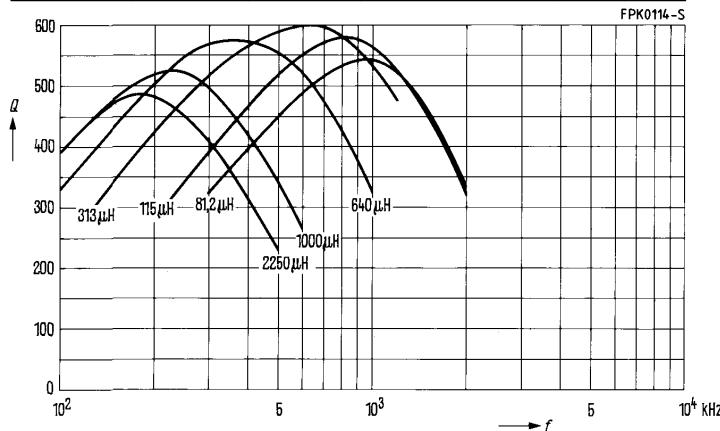
Flux density  
in the core  
 $\hat{B} < 2 \text{ mT}$

**Q factor characteristics (typical values)**

Material $A_L$ value	$L$	Turns	Wire; RF litz wire	Sec- tions	$\emptyset^*$ mm
M 33 $A_L = 100 \text{ nH}$	2250 $\mu\text{H}$	150	1 × 30 × 0,04 CuLS	1	—
	1000 $\mu\text{H}$	100	1 × 45 × 0,04 CuLS	1	—
	640 $\mu\text{H}$	40+40	1 × 45 × 0,04 CuLS	2	—
	313 $\mu\text{H}$	25+6+25	1 × 45 × 0,04 CuLS	3	11,7
	115 $\mu\text{H}$	15+4+15	1 × 45 × 0,04 CuLS	3	10,8
	81,2 $\mu\text{H}$	12+4+12	1 × 45 × 0,04 CuLS	3	10,8
N 48 $A_L = 160 \text{ nH}$	504 mH	1790	0,07 CuL	1	—
	31,9 mH	450	1,15 CuL	1	—
	3,0 mH	138	1 × 20 × 0,05 CuLS	1	—
	1,19 mH	8	1 × 45 × 0,04 CuLS	1	—
	0,53 mH	58	1 × 45 × 0,05 CuLS	1	—

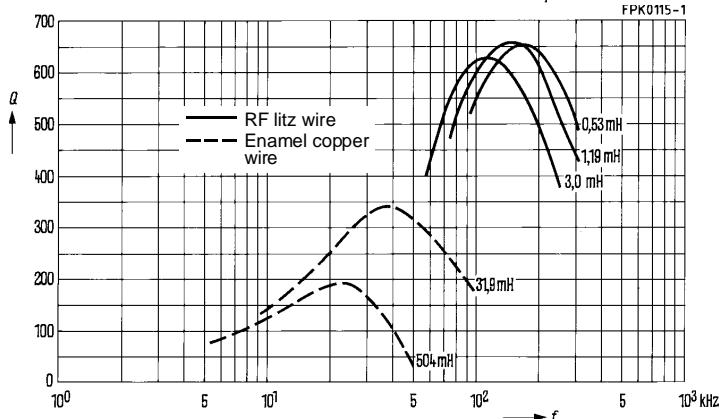


\* Pad of polystyrene  
tape up to  
diameter  $\emptyset$



**M 33**  
 $A_L = 100 \text{ nH}$

Flux density  
in the core  
 $\hat{B} < 1,6 \text{ mT}$



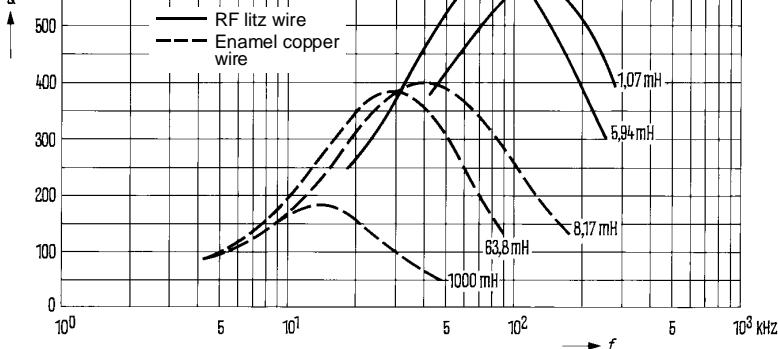
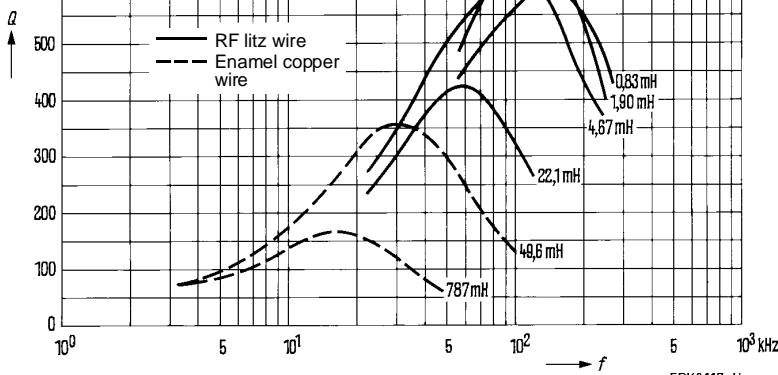
**N 48**  
 $A_L = 160 \text{ nH}$

Flux density  
in the core  
 $\hat{B} < 1,5 \text{ mT}$

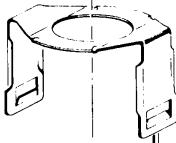
**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 1,5 \text{ mT}$

Material	$L$ (mH) for		Turns	Wire; RF litz wire	Sections
	$A_L = 250 \text{ nH}$	$A_L = 315 \text{ nH}$			
N 48	787	1000	1790	0,07 CuL	1
	49,6	63,8	450	0,15 CuL	1
	22,1	—	301	1 × 20 × 0,04 CuLS	1
	—	8,17	161	0,25 CuL	1
	4,67	5,94	138	1 × 20 × 0,05 CuLS	1
	1,90	—	87	1 × 45 × 0,04 CuLS	1
	0,83	1,07	58	1 × 45 × 0,05 CuLS	1



**P 22 × 13**  
**Core and Accessories**

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">366</a>
Matching handle	B63399	<a href="#">366</a>
Adjusting screw	B65669	<a href="#">366</a>
 Yoke	B65665	<a href="#">365</a>
 Core	B65661	<a href="#">363</a>
 Spulenkörper	B65662	<a href="#">364</a>
 Insulating washer 1	B65662	<a href="#">364</a>
 Core	B65661	<a href="#">363</a>
 Threaded sleeve (glued-in)		
 Insulating washer 2	B65662	<a href="#">364</a>
 Terminal carrier	B65665	<a href="#">365</a>

FPK0022-C

Example of an assembly set  
for printed circuit boards

**Also available:**

Assembly sets for chassis mounting on request

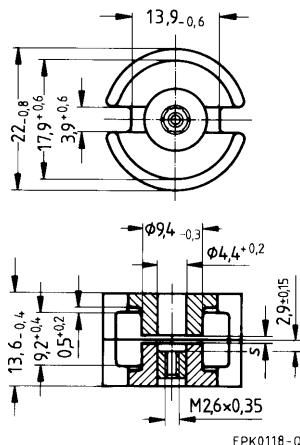
● In accordance with IEC 133 and DIN 41 293

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma I/A$	0,5	0,46	$\text{mm}^{-1}$
$I_e$	31,6	33,2	mm
$A_e$	63	72,6	$\text{mm}^2$
$A_{\min}$	—	58,1	$\text{mm}^2$
$V_e$	2000	2410	$\text{mm}^3$

**Approx. weight (per set)**

$m$	13	14	g



FPK0118-Q

**Gapped**

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code -D with center hole -T w. threaded sleeve	PU Sets
K1	$63 \pm 3\%$	1,30	25,0	B65661-T63-A1	400
M33	$100 \pm 3\%$	0,90	39,8	B65661-T100-A33	
N48	$160 \pm 2\%$	0,50	64,0	B65661-T160-G48	
	$250 \pm 2\%$	0,26	100,0	B65661-T250-G48	
	$315 \pm 3\%$	0,22	125,0	B65661-T315-A48	
	$400 \pm 3\%$	0,16	159,0	B65661-T400-A48	
	$500 \pm 3\%$	0,14	199,0	B65661-T500-A48	
	$630 \pm 3\%$	0,10	250,0	B65661-T630-A48	
N26	$1250 \pm 10\%$	0,05	498,0	B65661-D1250-K26	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	$220 + 30/-20\%$	86			B65661-D-R1	400
N26	$3800 + 30/-20\%$	1510			B65661-D-R26	
N30	$8300 + 30/-20\%$	2780			B65661-W-R30	
T38	$16000 + 40/-30\%$	6370			B65661-W-Y38	
N67	$4400 + 30/-20\%$	1600	2500	1,21 (200 mT, 100 kHz, 100 °C)	B65661-W-R67	

### Coil former

Standard: to IEC 133 and DIN 41 294

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Winding: [see page 154](#)

### Insulating washer 1 between core and coil former

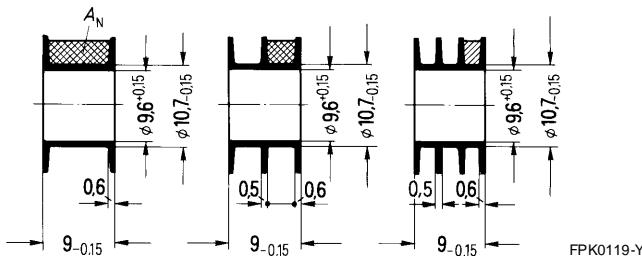
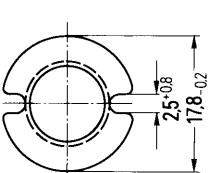
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,06 mm thick

### Insulating washer 2 between core and terminal carrier

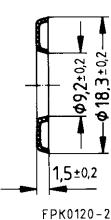
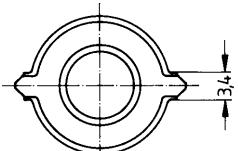
- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,08 mm thick

Coil former				Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$		
1	23,4	44	67	B65662-B-T1	400
2	22,0	44	69	B65662-B-T2	
3	20,0	44	76	B65662-B-T3	
Insulating washer 1 (reel packing, PU = 1 reel)				B65662-A5000	1400
Insulating washer 2 (bulk)				B65662-A5002	400

### Coil former

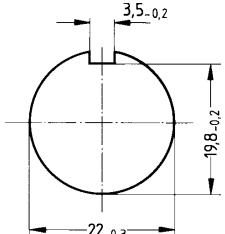


### Insulating washer 1



FPK0120-2

### Insulating washer 2



FPK0121-A

### Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

#### Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \leq$  max. operating temperature 155 °C), color code gray

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

#### Yoke

Material: Spring yoke, made of tinned nickel silver (0,4 mm), with ground terminal

Complete mounting assembly

(4 solder terminals)

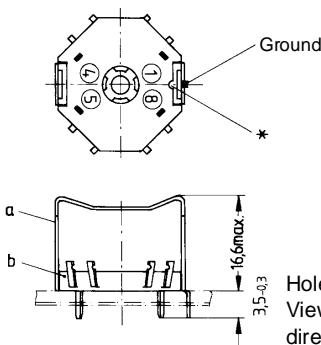
Ordering code: B65665-C5 PU = 400 sets

Complete mounting assembly

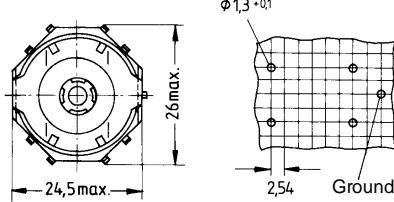
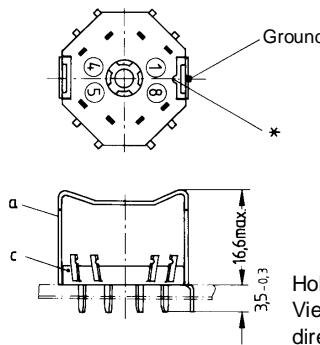
(8 solder terminals)

Ordering code: B65665-C4, PU = 400 sets

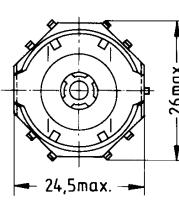
4 solder terminals



8 solder terminals



FPK0122-I



FPK0123-R

\*) This recess must be on the side of the grounding pin to ensure that the yoke locks in position.

- a) Yoke
- b) Terminal carrier with 4 solder terminals
- c) Terminal carrier with 8 solder terminals

**Adjusting screw**

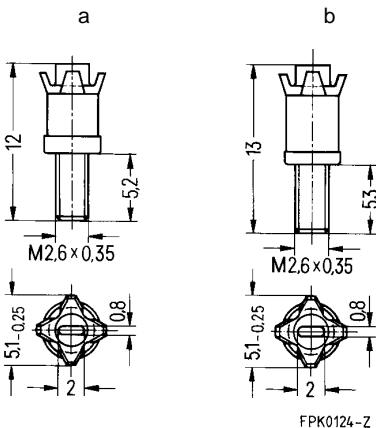
● Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

Core P 22 × 13		Adjusting screw			Min. adjusting range %	Ordering code	PU			
Material	A <sub>L</sub> value nH	Fig.	Tube core Ø × length mm	Material	Color code					
K1	63	a	3,5 × 4,3	K 1	blue	17	B65669-D9-X1	400		
M33	160	a	3,5 × 4,3	K 1	blue	11	B65669-D9-X1			
N48	250	a	4,1 × 3,6	N 22	yellow	18	B65669-D11-X22			
	315					13				
400	400	a	4,1 × 4,3	N 22	red	12	B65669-D7-X22			
	500	b	4,18 × 5,0	N 22	white	12	B65669-E6-X22			
	630					10				
<b>Adjusting screwdriver</b>					B63399-B4		10			
<b>Handle</b>					B63399-B5		10			

**Adjusting screw**



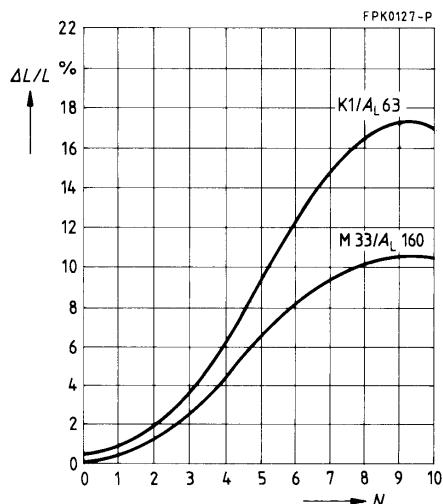
FPK0124-Z

**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 2 turns engaged.

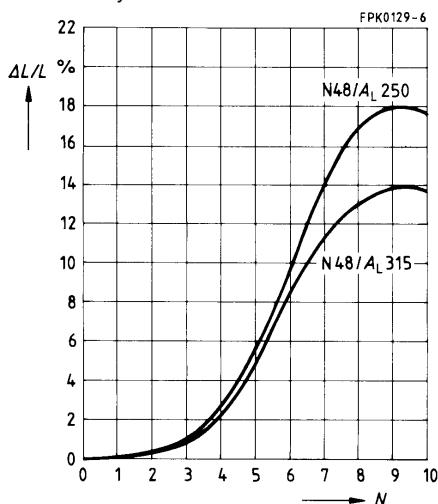
Adjusting screw B65669-D9-X1

Color code blue



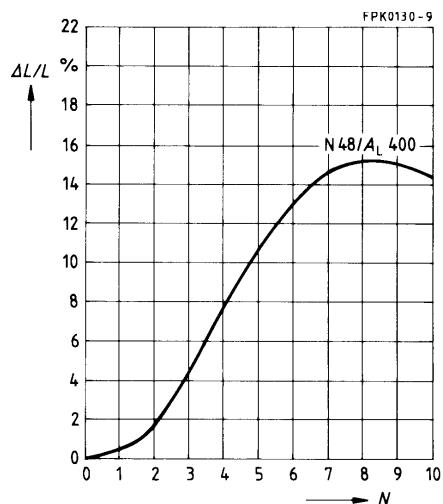
Adjusting screw B65669-D11-X22

Color code yellow



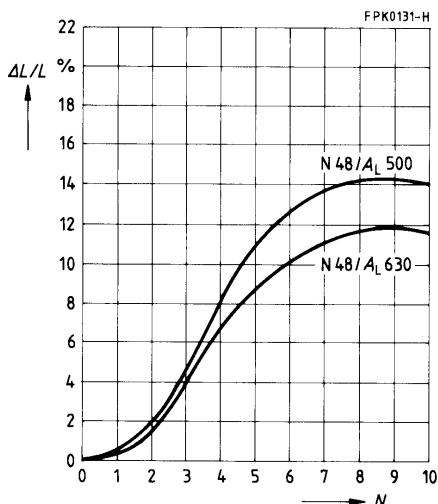
Adjusting screw B65669-D7-X22

Color code red



Adjusting screw B65669-E6-X22

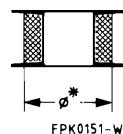
Color code white



**Q factor characteristics (typical values)**

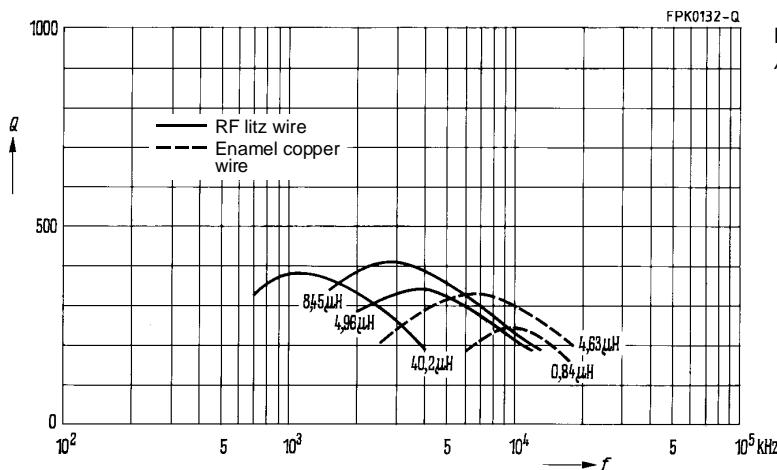
Flux density in the core  $\hat{B} < 0,6 \text{ mT}$

Material	$L (\mu\text{H})$ for $A_L = 40 \text{ nH}$		Turns	Wire; RF litz wire	Sections	$\emptyset^*$ mm
	$A_L = 40 \text{ nH}$	$A_L = 63 \text{ nH}$				
K 1	4,63	6,74	10	0,7 CuL	1	16,1
	0,84	1,17	4	1,0 CuL	1	15,5
	40,20	58,0	10+10+10	1 × 45 × 0,04 CuLS	3	16,8
	8,45	11,7	13	3 × 30 × 0,04 CuLS	1	16,5
	4,96	7,0	10	3 × 30 × 0,04 CuLS	1	16,5

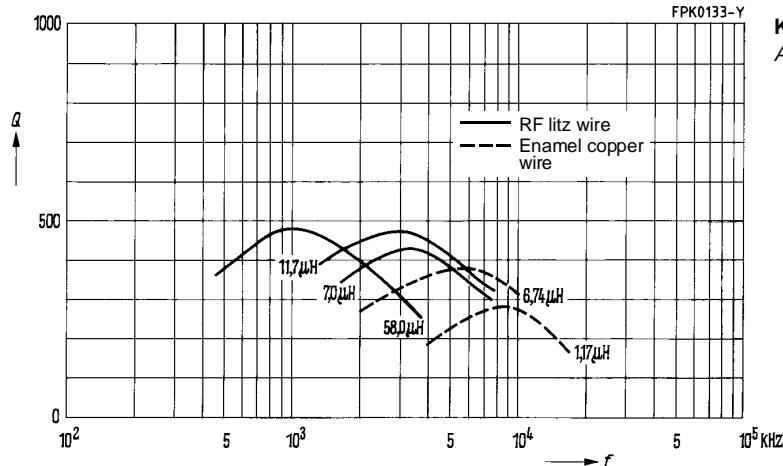


\* Pad of polystyrene  
tape up to  
diameter  $\emptyset$

**K 1**  
 $A_L = 40 \text{ nH}$



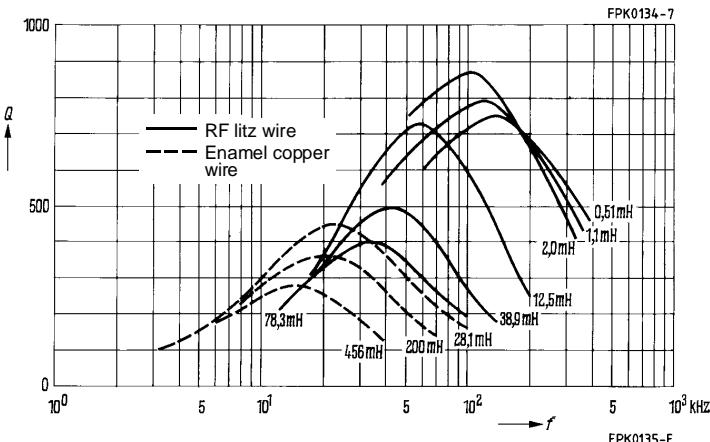
**K 1**  
 $A_L = 63 \text{ nH}$



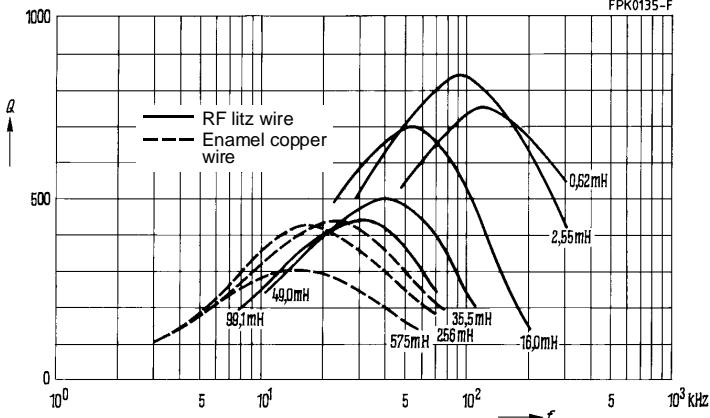
**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 1,5 \text{ mT}$

Mate- rial	<i>L</i> (mH) for		Turns	Wire; RF litz wire	Sec- tions
	$A_L = 315 \text{ nH}$	$A_L = 400 \text{ nH}$			
N 48	456	575	1200	0,12 CuL	1
	200	256	800	0,15 CuL	1
	28,1	35,5	300	0,27 CuL	1
	78,3	99,1	500	1 × 12 × 0,04 CuLS	1
	38,9	49,0	350	1 × 15 × 0,04 CuLS	1
	12,5	16,0	200	1 × 20 × 0,05 CuLS	1
	2,0	2,55	80	3 × 20 × 0,05 CuLS	2
	1,1	—	59	3 × 20 × 0,05 CuLS	3
	0,51	—	40	3 × 20 × 0,05 CuLS	2
	—	0,62	40	3 × 30 × 0,05 CuLS	2



**N 48**  
 $A_L = 315 \text{ nH}$



**N 48**  
 $A_L = 400 \text{ nH}$

**P 26 × 16**  
**Core and Accessories**

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">375</a>
Matching handle	B63399	<a href="#">375</a>
Adjusting screw	B65679	<a href="#">375</a>
Yoke	B65675	<a href="#">374</a>
Core	B65671	<a href="#">371</a>
Coil former	B65672	<a href="#">373</a>
Insulating washer 1	B65672	<a href="#">373</a>
Core	B65671	<a href="#">371</a>
Threaded sleeve (glued-in)		
Insulating washer 2	B65672	<a href="#">373</a>
Terminal carrier	B65675	<a href="#">374</a>

FPK0023-K

Example of an assembly set  
for printed circuit boards

**Also available:**

Assembly sets for chassis mounting on request

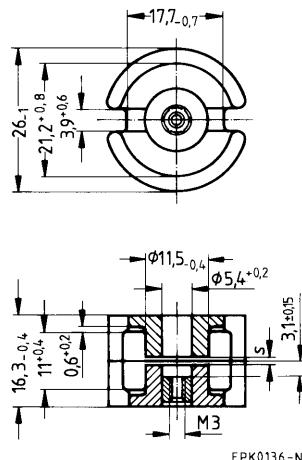
- In accordance with IEC 133 and DIN 41 293

**Magnetic characteristics (per set)**

	with center hole	without center hole	
$\Sigma I/A$	0,4	0,37	$\text{mm}^{-1}$
$I_e$	37,2	40	mm
$A_e$	93	108	$\text{mm}^2$
$A_{\min}$	76,5	87	$\text{mm}^2$
$V_e$	3 460	4 320	$\text{mm}^3$

**Approx. weight (per set)**

$m$	21	23	g



**Gapped**

Mate-rial	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code -D with center hole -T with threaded sleeve	PU Sets
K1	63 ± 3 %	2,28	20,2	B65671-T63-A1	200
	100 ± 3 %	0,90	31,9	B65671-T100-A1	
M33	100 ± 3 %	1,52	31,9	B65671-T100-A33	
	160 ± 3 %	0,78	51,0	B65671-T160-A33	
N48	160 ± 2 %	0,80	51,0	B65671-T160-G48	
	250 ± 2 %	0,40	80,0	B65671-T250-G48	
	315 ± 2 %	0,34	100,0	B65671-T315-G48	
	400 ± 3 %	0,24	127,0	B65671-T400-A48	
	630 ± 3 %	0,15	201,0	B65671-T630-A48	
	800 ± 3 %	0,11	255,0	B65671-T800-A48	
N26	1000 ± 5 %	0,10	319,0	B65671-D1000-J26	
	1600 ± 10 %	0,05	510,0	B65671-D1600-K26	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1min}$ nH	$P_V$ W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	270 + 30/- 20 %	86			B65671-D-R1	200
N26	4900 + 30/- 20 %	1560			B65671-D-R26	
N30	9700 + 30/- 20 %	2860			B65671-W-R30	
T38	22000 + 40/- 30 %	6480			B65671-W-Y38	
N67	5500 + 30/- 20 %	1620	3050	2,12 (200 mT, 100 kHz, 100 °C)	B65671-W-R67	
N41	6300 + 30/- 20 %	2000	2850	0,57 (200 mT, 25 kHz, 100 °C)	B65671-D-R41	

### Coil former

Standard: to IEC 133 and DIN 41 294

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Winding: [see page 154](#)

### Insulating washer 1 between core and coil former

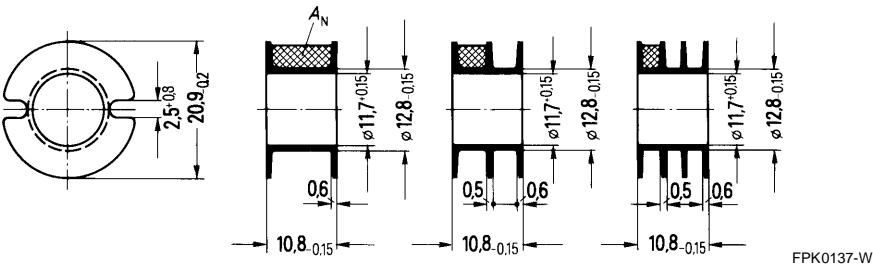
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,06 mm thick

### Insulating washer 2 between core and terminal carrier

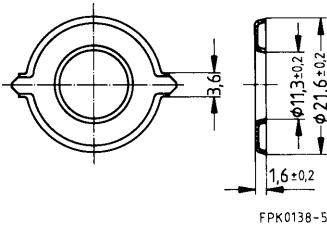
- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120 °C), 0,08 mm thick

Coil former				Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$		Pcs
1	32,0	52	55	B65672-B-T1	200
2	30,0	52	59	B65672-B-T2	
3	28,8	52	61	B65672-B-T3	
Insulating washer 1 (reel packing, PU = 1 reel)				B65672-B5000	1000
Insulating washer 2 (bulk)				B65672-A5002	200

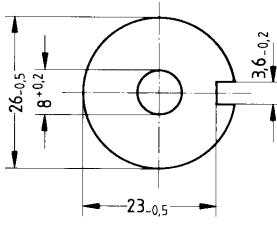
### Coil former



### Insulating washer 1



### Insulating washer 2



### Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

#### Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \leq$  max. operating temperature 155 °C), color code gray

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

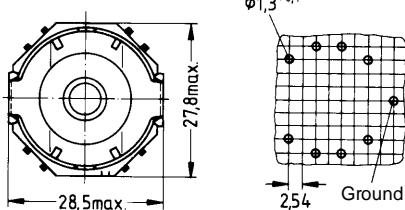
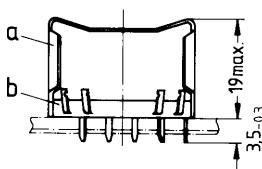
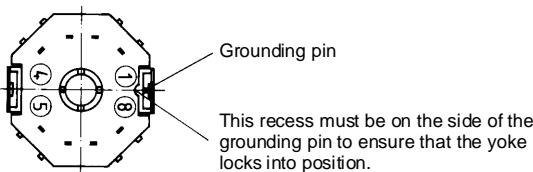
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

#### Yoke

Material: Spring yoke, made of tinned nickel silver (0,4 mm), with ground terminal

Complete mounting assembly (8 solder terminals)

Ordering code: B65675-B5, PU = 200 sets



FPK0140-G

a) Yoke

b) Terminal carrier with 8 solder terminals

**Adjusting screw**

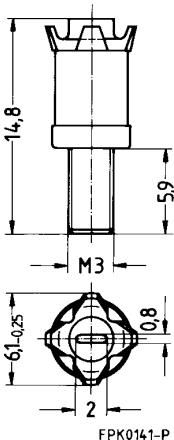
● Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

Core P 26 × 16		Adjusting screw			Min. ad- justing range %	Ordering code	PU Pcs				
Material	A <sub>L</sub> value nH	Tube core Ø × length mm	Material	Color code							
K 1	63	4,98 × 6,3	Si 1	yellow	24	B65679-E2-X101	200				
	100	4,98 × 6,3	Si 1	yellow	13	B65679-E2-X101					
M 33	100	4,98 × 6,3	Si 1	yellow	25	B65679-E2-X101					
	160	4,98 × 6,3	Si 1	yellow	17	B65679-E2-X101					
N 48	160	4,98 × 6,3	Si 1	yellow	20	B65679-E2-X101					
	250	4,55 × 6,3	N 22	red	16	B65679-E3-X22					
					13						
	315	4,98 × 6,3	N 22	black	23	B65679-E2-X22					
					18						
	400	5,15 × 6,3	N 22	white	16	B65679-E1-X22					
					14						
<b>Adjusting screw</b>						B63399-B1	10				
<b>Handle</b>						B63399-B5	10				

**Adjusting screw**<sup>1)</sup>



1) Due to the limited distance between adjusting screw and internal borehole, the entire assembly must be accurately centered.

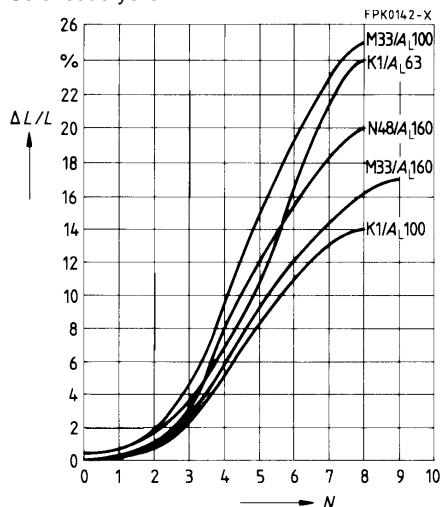
**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.

0  $\leq$  at least 2 turns engaged

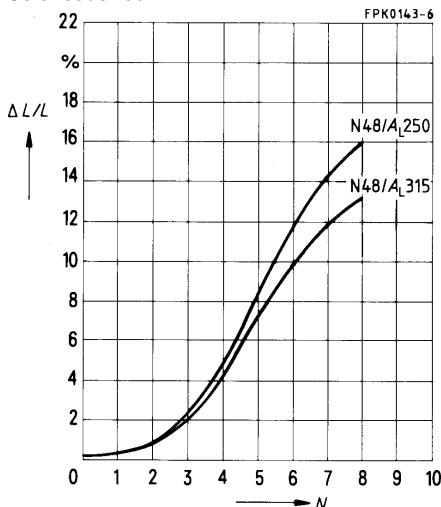
Adjusting screw B65679-E2-X101

Color code yellow



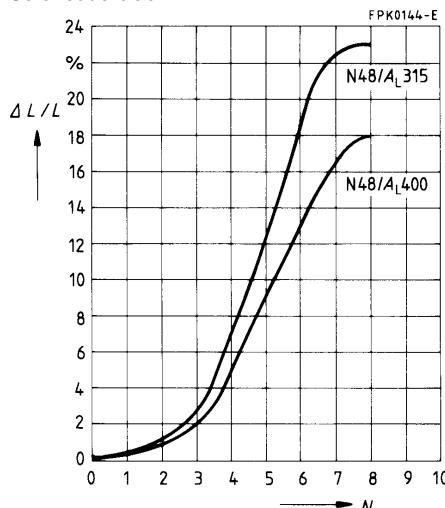
Adjusting screw B65679-E3-X22

Color code red



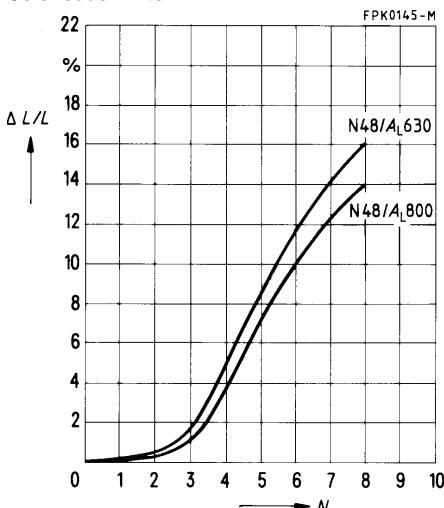
Adjusting screw B65679-E2-X22

Color code black



Adjusting screw B65679-E1-X22

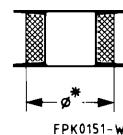
Color code white



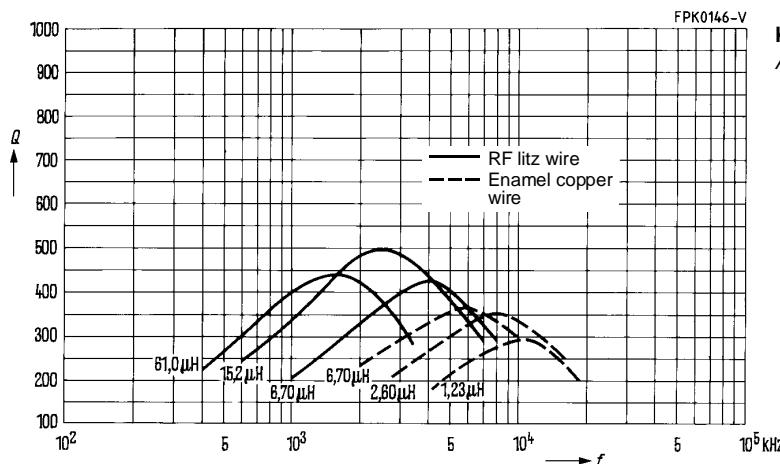
**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 0,6 \text{ mT}$

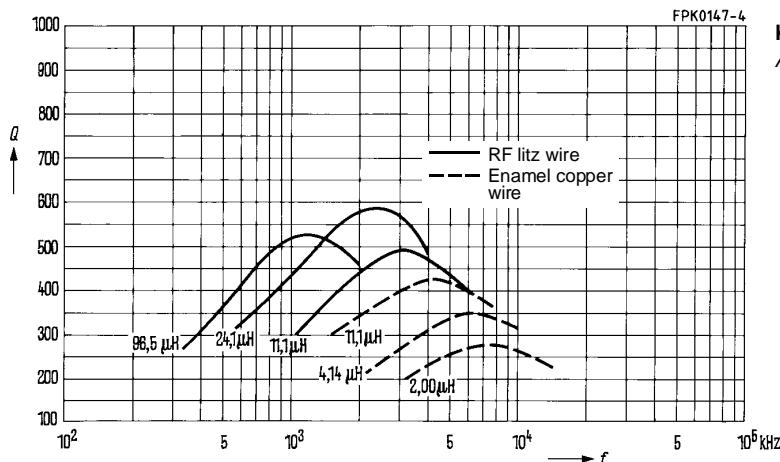
Material	$L (\mu\text{H})$ for		Turns	Wire; RF litz wire	Sections	$\emptyset^*$ mm
	$A_L = 63 \text{ nH}$	$A_L = 100 \text{ nH}$				
K 1	6,70	11,10	10	0,7 CuL	1	18,0
	2,60	4,14	6	1,0 CuL	1	17,5
	1,23	2,0	4	1,0 CuL	1	17,5
	61,0	96,5	10+10+10	1 × 45 × 0,04 CuLS	3	18,5
	15,2	24,1	15	3 × 30 × 0,04 CuLS	1	18,0
	6,7	11,1	3+4+3	3 × 30 × 0,04 CuLS	3	18,0



\* Pad of polystyrene  
tape up to  
diameter  $\emptyset$



**K 1**  
 $A_L = 63 \text{ nH}$

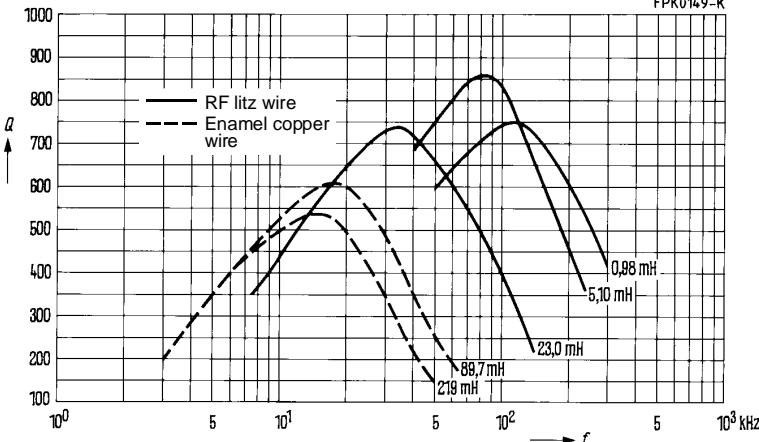
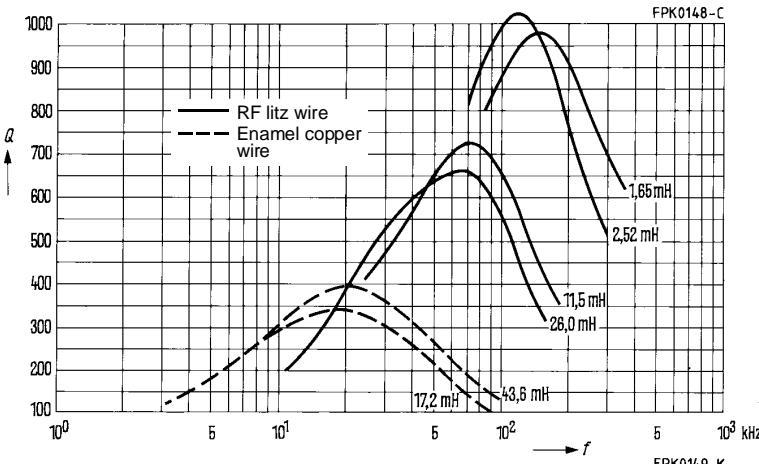


**K 1**  
 $A_L = 100 \text{ nH}$

**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 1,5 \text{ mT}$

Mate- rial	$L$ (mH) for		Turns	RF litz wire	Sec- tions
	$A_L = 315 \text{ nH}$	$A_L = 630 \text{ nH}$			
N 48	—	219	600	0,20 CuL	1
	43,6	89,7	385	0,27 CuL	1
	17,2	—	235	0,35 CuL	1
	26,0	—	290	1 × 20 × 0,05 CuLS	1
	11,5	23,0	193	1 × 30 × 0,05 CuLS	1
	2,52	5,10	90	3 × 30 × 0,04 CuLS	2
	1,65	—	78	3 × 20 × 0,05 CuLS	3
	—	0,98	39	3 × 20 × 0,07 CuLS	3



**P 30 × 19**  
**Core and Accessories**

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">383</a>
Matching handle	B63399	<a href="#">383</a>
Adjusting screw	B65679	<a href="#">383</a>
Yoke	B65705	<a href="#">382</a>
Core	B65701	<a href="#">380</a>
Coil former	B65702	<a href="#">381</a>
Insulating washer 1	B65702	<a href="#">381</a>
Core	B65701	<a href="#">380</a>
Threaded sleeve (glued-in)		
Insulating washer 2	B65702	<a href="#">381</a>
Terminal carrier	B65705	<a href="#">382</a>

FPK0024-T

Example of an assembly set  
for printed circuit boards

**Also available:**

Assembly sets for chassis mounting on request

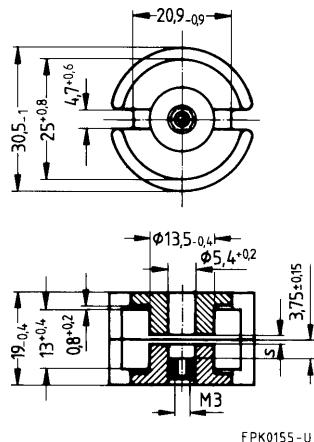
- In accordance with IEC 133 and DIN 41 293

### Magnetic characteristics (per set)

	with center hole	without center hole	
$\Sigma l/A$	0,33	0,32	$\text{mm}^{-1}$
$I_e$	45	46	mm
$A_e$	136	145	$\text{mm}^2$
$A_{\min}$	—	117	$\text{mm}^2$
$V_e$	6100	6670	$\text{mm}^3$

### Approx. weight (per set)

$m$	36	37	g



FPK0155-U

### Gapped

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code -D with center hole -T w. threaded sleeve	PU Sets
N48	250 ± 2 %	0,72	66	B65701-T250-G48	160
	400 ± 2 %	0,40	105	B65701-T400-A48	
	630 ± 3 %	0,22	166	B65701-T630-A48	
	1000 ± 3 %	0,12	263	B65701-T1000-A48	
N26	1250 ± 5 %	0,10	328	B65701-D1250-J26	
	2000 ± 10 %	0,05	525	B65701-D2000-K26	

### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
N26	6200 + 30/- 20 %	1630			B65701-D-R26	160
N30	11500 + 30/- 20 %	2930			B65701-W-R30	
T38	28000 + 40/- 30 %	7130			B65701-W-Y38	
N67	6400 + 30/- 20 %	1610	3550	3,24 (200 mT, 100 kHz, 100 °C)	B65701-W-R67	

### Coil former

Standard: to IEC 133 and DIN 41 294

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Winding: [see page 154](#)

### Insulating washer 1 between core and coil former

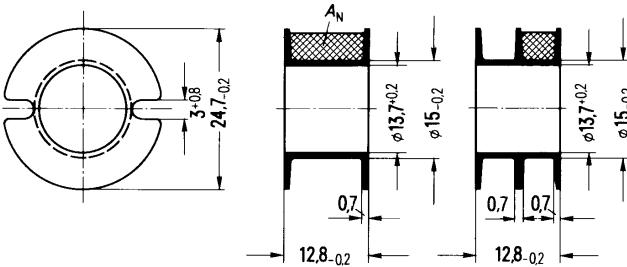
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120°C), 0,06 mm thick

### Insulating washer 2 between core and terminal carrier

- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120°C), 0,08 mm thick

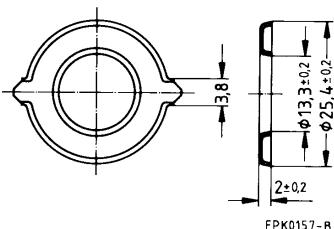
Coil former				Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$		Pcs
1	48	60	46	B65702-B-T1	160
2	45	60	49	B65702-B-T2	
Insulating washer 1 (reel packing, PU = 1 reel)			B65702-A5000		800
Insulating washer 2 (bulk)			B65702-A5002		160

### Coil former



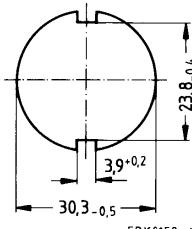
FPK0156-3

### Insulating washer 1



FPK0157-B

### Insulating washer 2



FPK0158-J

### Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

#### Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \leq$  max. operating temperature 155 °C), color code gray

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

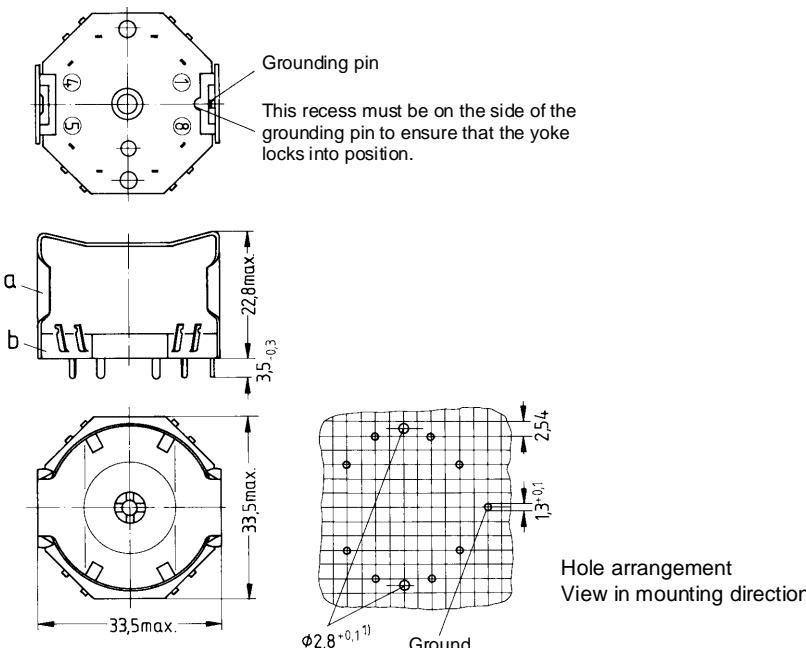
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

#### Yoke

Material: Spring yoke, made of tinned nickel silver (0,5 mm), with ground terminal

Complete mounting assembly (8 solder terminals)

Ordering code: B65705-B3, PU = 160 sets



FPK0159-S

- 1) The 2,8 mm hole is only necessary for additional fixing with M 2,5 screw.
- a) Yoke
- b) Terminal carrier with 8 solder terminals

**Adjusting screw**

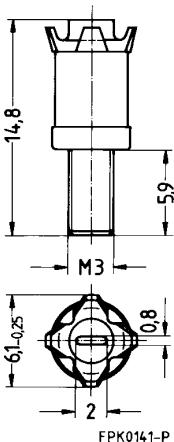
● Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

Core P 30 × 19		Adjusting screw			Min. ad- justing range %	Ordering code	PU Pcs
Mate- rial	A <sub>L</sub> value nH	Tube core Ø × length mm	Mate- rial	Color code			
N 48	250	4,55 × 6,3	N 22	red	16	B65679-E3-X22	160
	400 630	4,98 × 6,3	N 22	black	18	B65679-E2-X22	
					11		
	630 1000	5,15 × 6,3	N 22	white	18 10	B65679-E1-X22	
<b>Adjusting screwdriver</b>					B63399-B1		10
<b>Handle</b>					B63399-B5		10

**Adjusting screw**<sup>1)</sup>



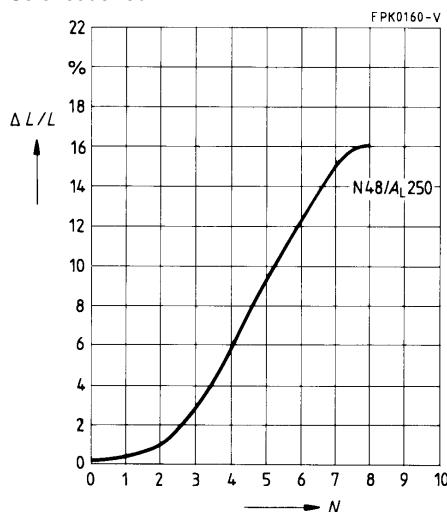
1) Due to the limited distance between adjusting screw and internal borehole, the entire assembly must be accurately centered.

**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 2 turns engaged.

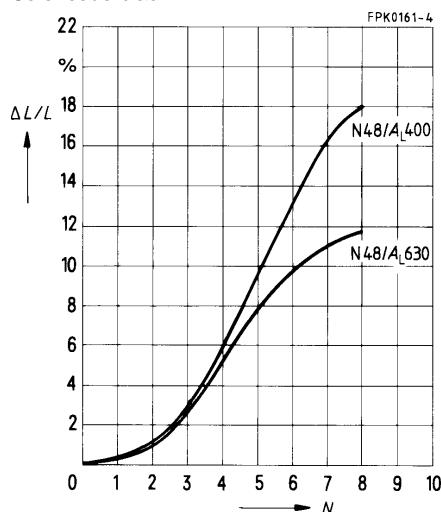
Adjusting screw B65679-E3-X22

Color code red



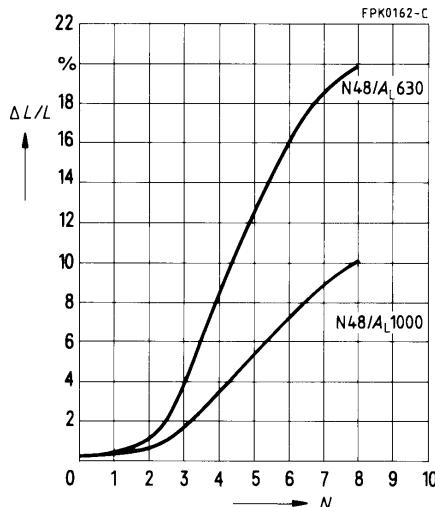
Adjusting screw B65679-E2-X22

Color code black



Adjusting screw B65679-E1-X22

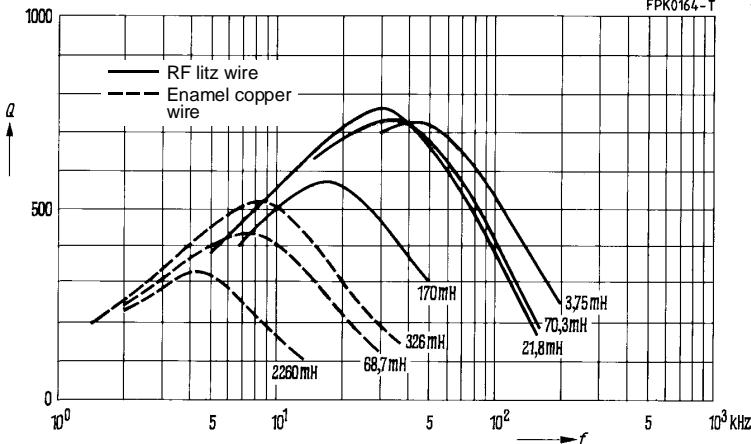
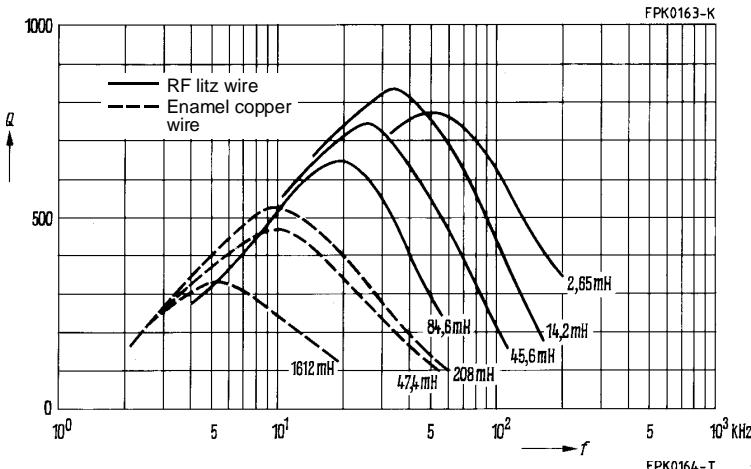
Color code white



**Q factor characteristics (typical values)**

Flux density in the core  $\hat{B} < 1,5 \text{ mT}$

Mate- rial	$L$ (mH) for $A_L = 630 \text{ nH}$		Turns	Wire; RF litz wire	Sec- tions
	$A_L = 630 \text{ nH}$	$A_L = 1000 \text{ nH}$			
N 48	1612	2260	1600	0,15 CuL	1
	208	326	570	0,25 CuL	1
	47,4	68,7	350	0,40 CuL	1
	—	170	420	$1 \times 12 \times 0,04$ CuLS	1
	84,6	—	420	$1 \times 20 \times 0,05$ CuLS	1
	45,6	70,3	270	$1 \times 30 \times 0,05$ CuLS	1
	14,2	21,8	150	$3 \times 20 \times 0,05$ CuLS	1
	2,65	3,75	65	$3 \times 20 \times 0,07$ CuLS	2



**P 36 × 22**  
**Core and Accessories**

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">390</a>
Matching handle	B63399	<a href="#">390</a>
Adjusting screw	B65679	<a href="#">390</a>
Yoke	B65615	<a href="#">389</a>
Core	B65611	<a href="#">387</a>
Coil former	B65612	<a href="#">388</a>
Insulating washer 1	B65612	<a href="#">388</a>
Core	B65611	<a href="#">387</a>
Threaded sleeve (glued-in)		
Terminal carrier	B65615	<a href="#">389</a>

FPK0025-2

Example of an assembly set for printed circuit boards

**Also available:**

Assembly sets for chassis mounting on request

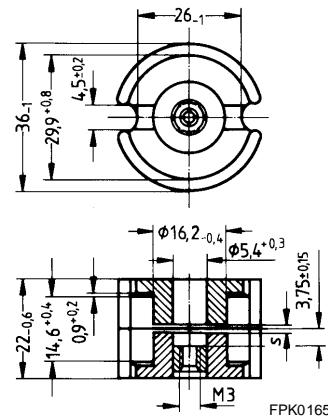
- In accordance with IEC 133 and DIN 41 293

#### Magnetic characteristics (per set)

	with center hole	without center hole	
$\Sigma I/A$	0,26	0,25	$\text{mm}^{-1}$
$I_e$	52	53,5	mm
$A_e$	202	213	$\text{mm}^2$
$A_{\min}$	—	173	$\text{mm}^2$
$V_e$	10 600	11 400	$\text{mm}^3$

#### Approx. weight (per set)

$m$	57	59,5	g



#### Gapped

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code -L with center hole -N with threaded sleeve	PU Sets
N48	250 ± 2 %	1,20	52	B65611-N250-G48	50
	400 ± 2 %	0,62	83	B65611-N400-G48	
	630 ± 3 %	0,35	130	B65611-N630-A48	
	1000 ± 3 %	0,22	207	B65611-N1000-A48	
N26	2500 ± 10 %	0,05	518	B65611-L2500-K26	

#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code -L with center hole -W w/o center hole	PU Sets
N26	7600 + 30/- 20 %	1570			B65611-L-R26	50
N30	15200 + 30/- 20 %	3020			B65611-W-R30	
N67	8000 + 30/- 20 %	1590	4500	5,47 (200 mT, 100 kHz, 100 °C)	B65611-W-R67	

**Coil former**

Standard: to IEC 133 and DIN 41 294

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

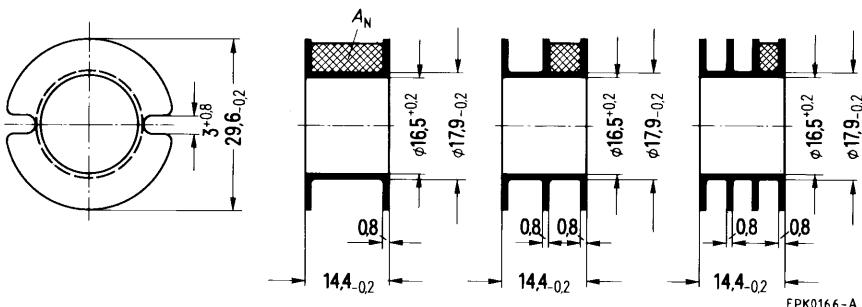
Winding: [see page 154](#)

**Insulating washer 1** between core and coil former

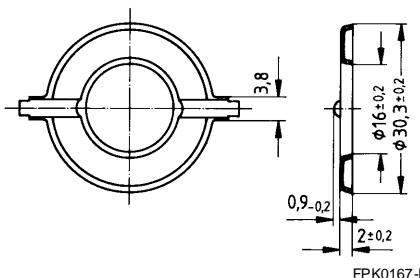
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E  $\leq$  120°C), 0,06 mm thick

Coil former				Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$		
1	63	73	39	B65612-B-T1	50
2	59	73	42	B65612-B-T2	
3	55	73	44	B65612-B-T3	
Insulating washer 1 (reel packing, PU = 1 reel)				B65612-A5000	500

**Coil former**



**Insulating washer 1**



### Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke

#### Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \leq$  max. operating temperature 155 °C), color code gray

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

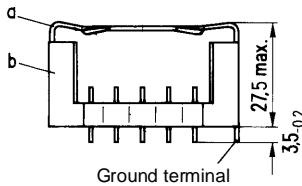
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

#### Yoke

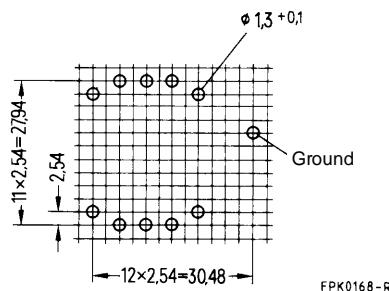
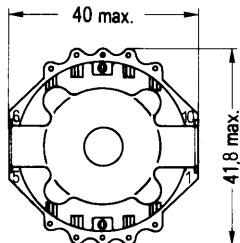
Material: Spring yoke, made of nickel silver (0,5 mm), with ground terminal

Complete mounting assembly (10 solder terminals)

Ordering code: B65615-B1, PU = 50 sets



Hole arrangement  
View in mounting direction



a) Yoke

b) Terminal carrier with 10 solder terminals

**Adjusting screw**

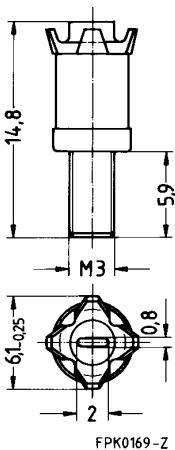
● Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)

Plastic **handle** for adjusting screwdriver (not shown)

Core P 36 × 22		Adjusting screw			Min. ad- justing range %	Ordering code	PU Pcs
Material	A <sub>L</sub> value nH	Tube core Ø × length mm	Material	Color code			
N 48	250	4,98 × 6,3	Si 1	yellow	10	B65679-E2-X101	50
	250 400	4,55 × 6,3	N 22	red	15 8	B65679-E3-X22	
	400 630	4,98 × 6,3	N 22	black	15 10	B65679-E2-X22	
	630 800	5,15 × 6,3	N 22	white	14 10	B65679-E1-X22	
	900				8		
	1000				7		
	1250				6		
<b>Adjusting screwdriver</b>					B63399-B1		10
<b>Handle</b>					B63399-B5		10

**Adjusting screw**<sup>1)</sup>



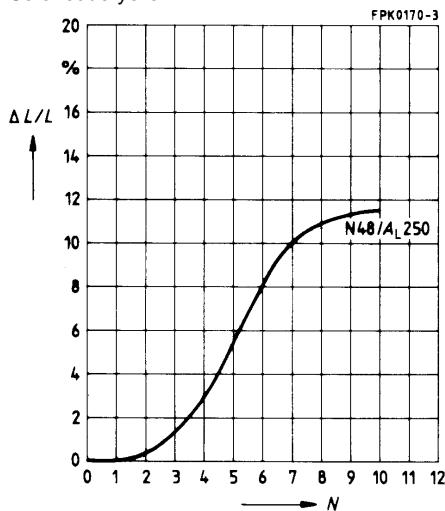
1) Due to the limited distance between adjusting screw and internal borehole, the entire assembly must be accurately centered.

**Inductance adjustment curves (nominal values)**

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.  
0  $\leq$  at least 2 turns engaged.

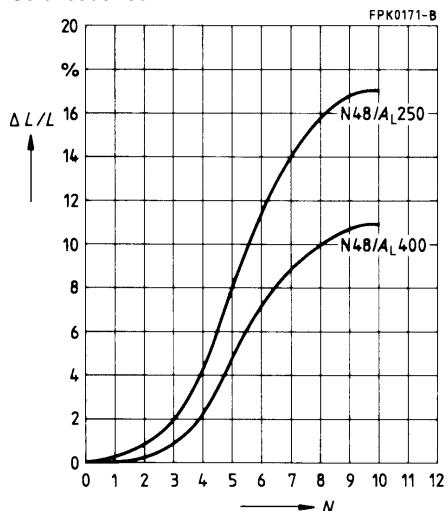
Adjusting screw B65679-E2-X101

Color code yellow



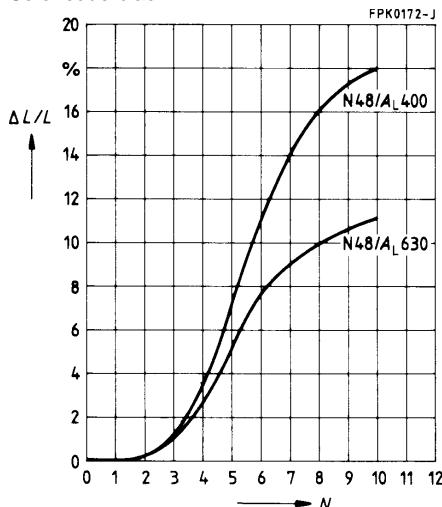
Adjusting screw B65679-E3-X22

Color code red



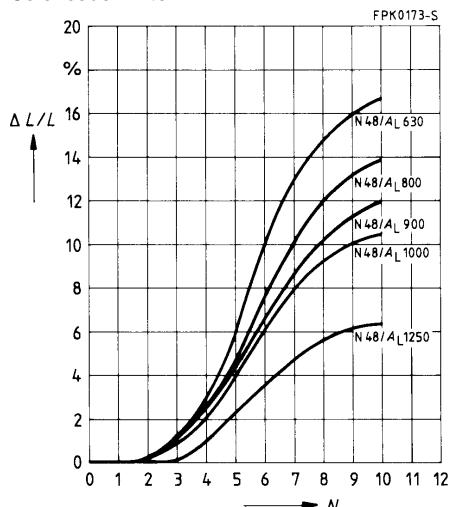
Adjusting screw B65679-E2-X22

Color code black



Adjusting screw B65679-E1-X22

Color code white



**P 41 × 25**  
**Core and Accessories**

---

**Assembly set for chassis mounting**

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	<a href="#">396</a>
Matching handle	B63399	<a href="#">396</a>
Adjusting screw	B65579	<a href="#">396</a>
Yoke	B65623	<a href="#">395</a>
Core	B65621	<a href="#">393</a>
Coil former	B65622	<a href="#">394</a>
Core	B65621	<a href="#">393</a>
Threaded sleeve	B65579	<a href="#">396</a>
Base plate with 2 tubular rivets	B65623	<a href="#">395</a>

FPK0026-

Example of an assembly set

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,257 \text{ mm}^{-1}$$

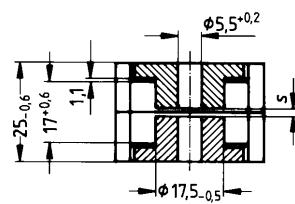
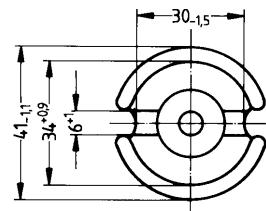
$$l_e = 62,1 \text{ mm}$$

$$A_e = 242 \text{ mm}^2$$

$$A_{\min} = 200 \text{ mm}^2$$

$$V_e = 15\,000 \text{ mm}^3$$

**Approx. weight** 82 g/set



FPK0174-1

**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code -J with center hole	PU Sets
N48	250 ± 3 %	1,35	51	B65621-J250-A48	50
	630 ± 3 %	0,43	129	B65621-J630-A48	
	1250 ± 3 %	0,18	256	B65621-J1250-A48	
N26	3150 ± 10 %	0,05	642	B65621-J3150-K26	

**Ungapped**

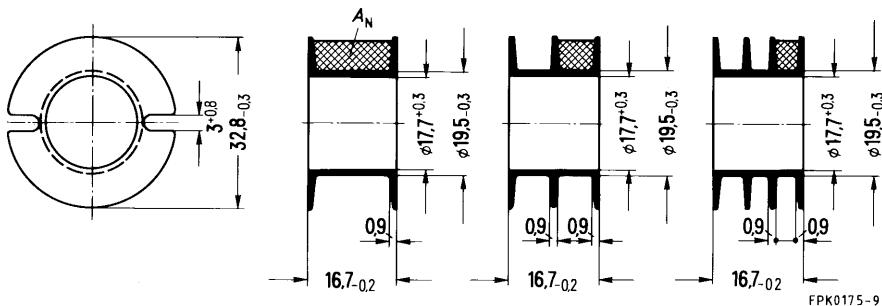
Material	$A_L$ value nH	$\mu_e$	Ordering code -J with center hole	PU Sets
N26	8400 + 30/- 20 %	1720	B65621-J-R26	50

**Coil former**

Material: GFR polycarbonate (UL 94 V-0, insulation class to IEC 85:  
E  $\leq$  max. operating temperature 120 °C)

Winding: [see page 154](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
1	80	81	33	B65622-A-M1	50
2	80	81	35	B65622-A-M2	
3	75	81	37	B65622-A-M3	



**Mounting assembly for chassis mounting**

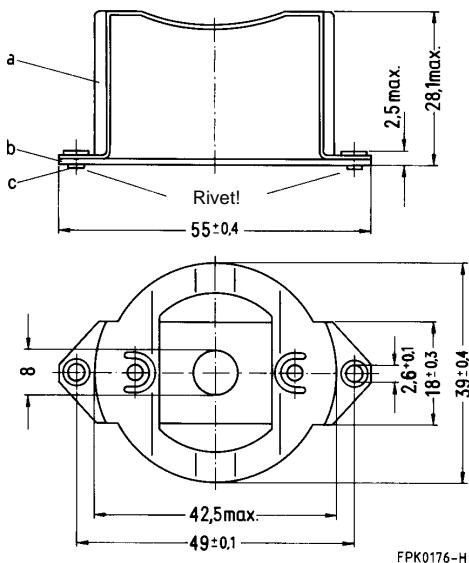
- The set comprises a yoke and a metal base plate
- Fixing by screws or rivets

**Yoke**

Material: Spring yoke, made of nickel silver (0,5 mm)

Complete mounting assembly (with tubular rivets)

Ordering code: B65623-A1, PU = 50 sets



- a) Yoke  
b) Base plate  
c) Tubular rivets

### Adjusting screw

- Tube core with thread made of GFR polyterephthalate

### Threaded sleeve

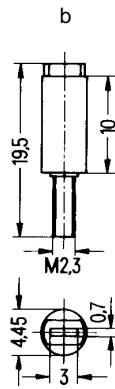
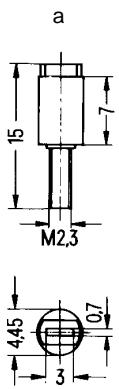
- Made of GFR polyterephthalate
- The slotted shank serves as core brake

Plastic **adjusting screwdriver** (not shown)

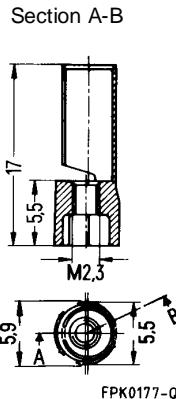
Plastic **handle** for adjusting screwdriver (not shown)

Core P 41 × 25		Adjusting screw				Min. adjusting range %	Ordering code	PU
Material	A <sub>L</sub> value nH	Tube core Fig.	Ø × length mm	Material	Color code			
N 48	250	a	4,44 × 7	N 22	red	14	B65579-B1-X23	50
	400	b	4,44 × 10	N 22	red	12	B65579-B3-X23	
	630					5		
	1250					2		
<b>Threaded sleeve</b>							B65579-K1	50
<b>Adjusting screwdriver</b>							B63399-B4	10
<b>Handle</b>							B63399-B5	10

### Adjusting screw



### Threaded sleeve



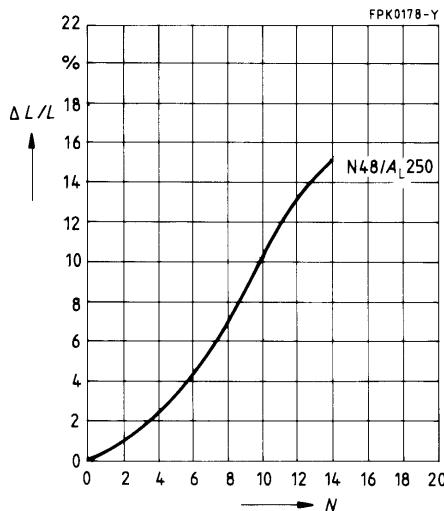
**Inductance adjustment curves** (nominal values)

Relative inductance change  $\Delta L/L$  versus turns  $N$  of adjusting screw.

Immersion depth 3 mm. 0  $\leq$  at least 2 turns engaged.

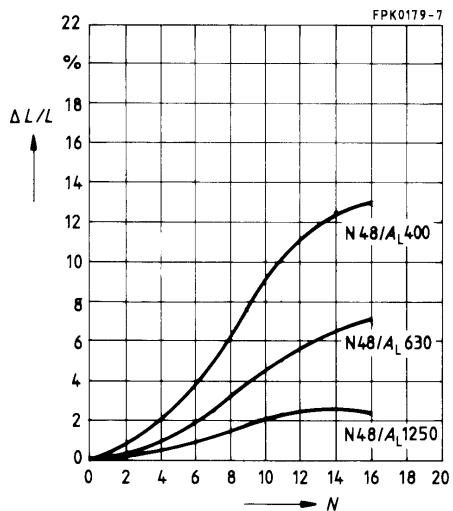
Adjusting screw B65579-B1-X23

Color code red



Adjusting screw B65579-B3-X23

Color code red





Siemens Matsushita Components

SMDs from stock

# Focus on surface mounting

SCS also offers you an extensive range of components for surface mounting. For example you can have HF chokes SIMID 01 through SIMID 04, dataline chokes, thermistor chips for temperature compensation, tantalum chips in sizes A, B, C and D plus inductive ferrite components and resistors.



Ask for our new  
SMD product  
survey!

**SCS – dependable, fast and competent**



## P Core Halves (P Cores for Proximity Switches)

### General Information

---

Inductive proximity switches can be used as noncontacting motion detectors and output indicators. Possible applications:

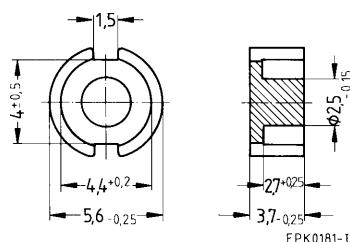
- Detection of the final position on conveyor belts
- Counters at rotating parts
- Contactless detection of pointer position of pointer-type measuring and control instruments

The advantages of proximity switches are bounceless switching, no mechanical wear, insensitivity to contamination and detection of metallic parts only.

We supply P cores with diameters ranging from 5,6 to 150 mm for inductive proximity switches. Their dimensions are matched to standardized switches. Maximum operating distances can thus be achieved for the individual P core sizes. The SIFERRIT material N22 is particularly suitable for the frequency range from 0,1 to 0,8 MHz. The material M33 is additionally available for higher frequencies (core types with 5,6 to 14,0 mm diameter).

Thermoplastic coil formers can be supplied for most of the core types. This material permits an operating temperature range of – 60 to + 120 °C. Consequently, temperatures of up to + 120 °C are also permissible during encapsulation.

- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size as per DIN EN 50 008: M 8×1



Material	Approx. weight g	Ordering code	PU Pcs
N22	0,15	B65931-C-X22	1000
M33	0,15	B65931-C-X33	

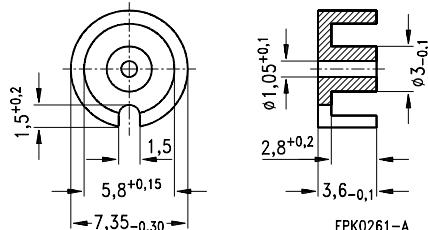
For these cores we recommend formerless winding, e.g. by using an enamel-insulated wire with thermoplastic coating.

#### Data for winding without coil former

$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$
approx. 2,08	9,7	160

### Core

- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz

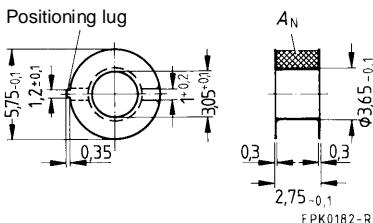


Material	Approx. weight g	Ordering code	PU Pcs
N22	0,3	B65933-A-X22	1000
M33	0,3	B65933-A-X33	

### Coil former with positioning lug

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \triangleq$  max. operating temperature 155 °C); color code black

$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
2,2	14,6	240	B65512-C-T1	500

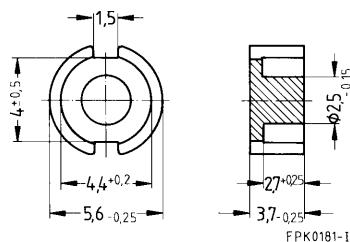


# P Core Half 8,4 × 4,3 Core

B65924-B

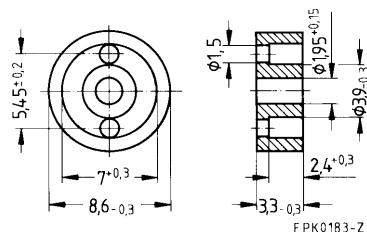
## Core

- For inductive proximity switches
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size as per DIN EN 50 008: M 12 × 1



Material	Approx. weight g	Ordering code	PU Pcs
M33	0,5	B65924-B-X33	1000

- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size as per DIN EN 50 008: M 12 × 1



Material	Approx. weight g	Ordering code	PU Pcs
N22	0,5	B65924-A-X22	2000
M33	0,5	B65924-A-X33	

# P Core Half 9 × 2,8

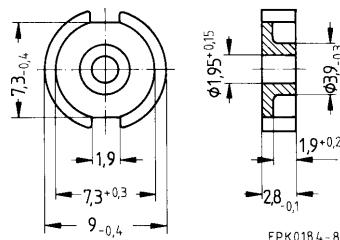
## Core and Accessories

B65935

B65936

### Core

- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size as per DIN EN 50 008: M 12 × 1

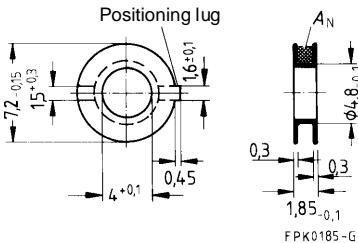


Material	Approx. weight g	Ordering code	PU Pcs
N22	0,6	B65935-J-X22	2000
M33	0,6	B65935-J-X33	

### Coil former with positioning lug

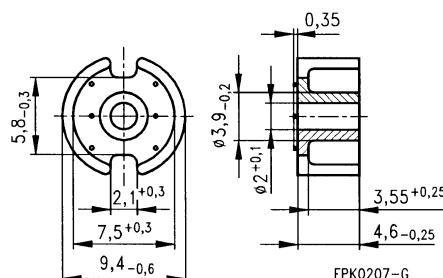
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \triangleq$  max. operating temperature 155 °C); color code black

$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
2,2	18,6	470	B65936-A-T1	1000



### Core

- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size as per DIN EN 50 008: M 12 × 1
- With pimples on the end surfaces (pimple height = 0,35 mm)

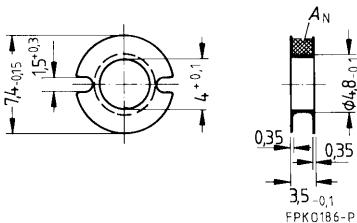


Material	Approx. weight g	Ordering code	PU Pcs
N22	0,6	B65935-A-X22	1000
M33	0,6	B65935-A-X33	

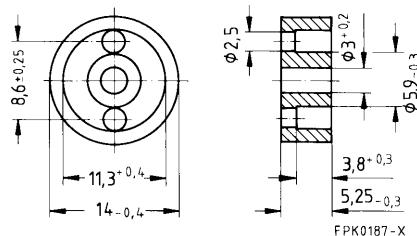
### Coil former

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \triangleq$  max. operating temperature 155 °C); color code black

$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
2,8	18,5	220	B65522-B-T1	500



- For inductive proximity switches
- Material N22 for the frequency range from about 70 to 700 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size as per DIN EN 50 008: M 18 × 1



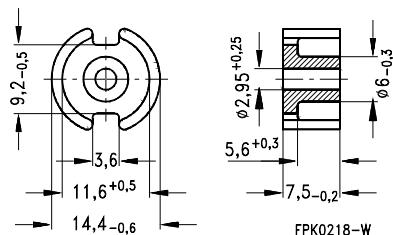
Material	Approx. weight g	Ordering code	PU Pcs
N22	1,8	B65926-A-X22	1000
M33	1,8	B65926-A-X33	

# P Core Half 14,4 × 7,5 Core and Accessories

B65937  
B65542

## Core

- For inductive proximity switches
- Material N22 for the frequency range from about 70 to 700 kHz
- Suitable for standard size as per DIN EN 50 008: M 18 × 1

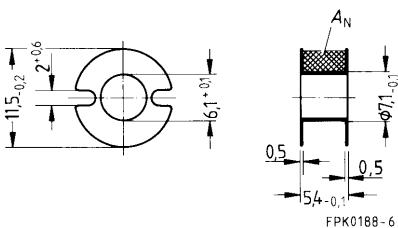


Material	Approx. weight g	Ordering code	PU Pcs
N22	2,5	B65937-A-X22	1000

## Coil former

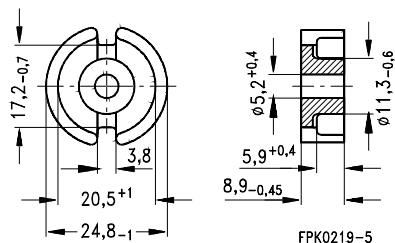
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \leq$  max. operating temperature 155 °C); color code black

$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
8,4	28	115	B65542-B-T1	500



**Core**

- For inductive proximity switches
- Material N22 for the frequency range from about 60 to 600 kHz
- Suitable for standard size as per DIN EN 50 008: M 30 × 1,5

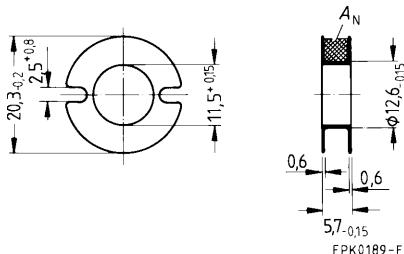


Material	Approx. weight g	Ordering code	PU Pcs
N22	9	B65939-A-X22	400

**Coil former**

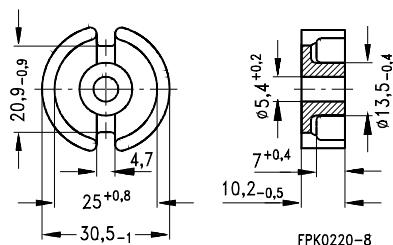
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F  $\triangleq$  max. operating temperature 155 °C); color code black

$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
16,7	51	105	B65940-B-T1	400



**Core**

- For inductive proximity switches
- Material N22 for the frequency range from about 50 to 500 kHz
- Suitable for standard size as per DIN EN 50 008: M 40 × 1,5

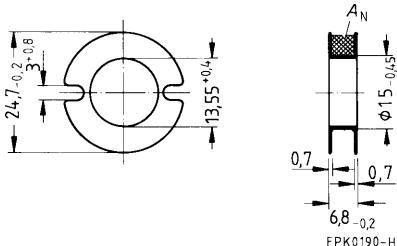


Material	Approx. weight g	Ordering code	PU Pcs
N22	18	B65941-A-X22	200

**Coil former**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \triangleq$  max. operating temperature 155 °C); color code black

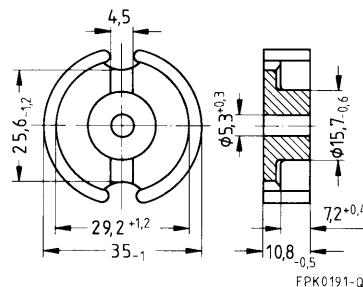
$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
24,4	62	87	B65942-B-T1	200



**P Core Half 35 × 10,8  
Core**

**B65947**

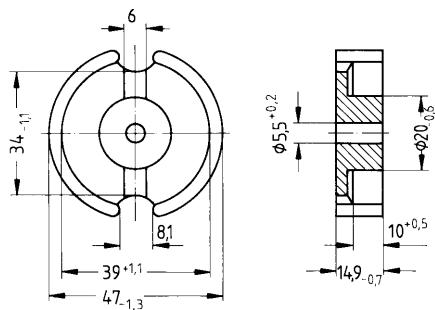
- For inductive proximity switches
- Material N22 for the frequency range from about 40 to 400 kHz



Material	Approx. weight g	Ordering code	PU Pcs
N22	28	B65947-A-X22	100

**Core**

- For inductive proximity switches
- Material N22 for the frequency range from about 30 to 300 kHz

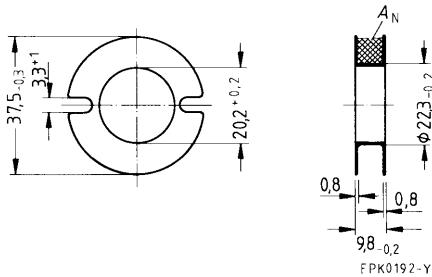


Material	Approx. weight g	Ordering code	PU Pcs
N22	62	B65943-A-X22	50

**Coil former**

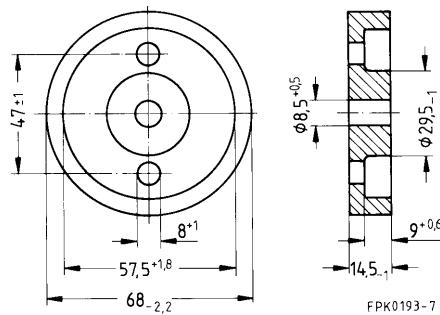
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \triangleq$  max. operating temperature 155 °C); color code black

$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
62	95	52,5	B65944-B-T1	50



### Core

- For inductive proximity switches
- Material N22 for the frequency range from about 20 to 200 kHz

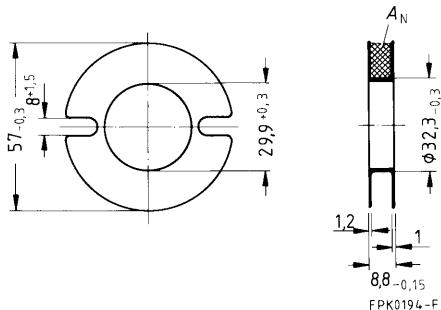


Material	Approx. weight g	Ordering code	PU Pcs
N22	130	B65928-A-X22	40

### Coil former

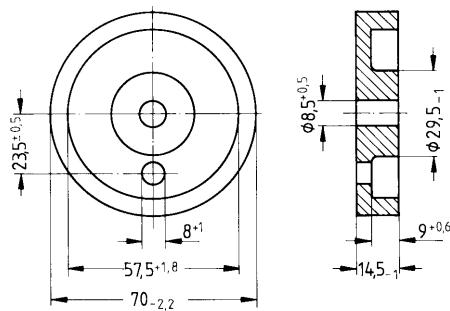
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \triangleq$  max. operating temperature 155 °C); color code black

$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
77	140	62	B65946-B-T1	40



### Core

- For inductive proximity switches
- Material N22 for the frequency range from about 20 to 200 kHz

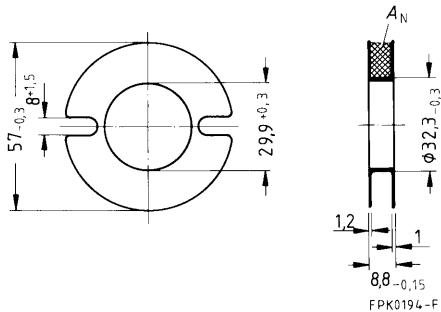


Material	Approx. weight g	Ordering code	PU Pcs
N22	130	B65945-A-X22	40

### Coil former

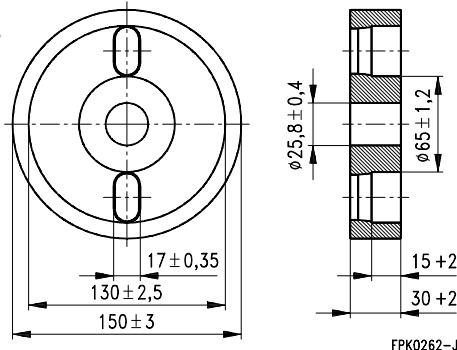
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 $F \triangleq$  max. operating temperature 155 °C); color code black

$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Ordering code	PU Pcs
77	140	62	B65946-B-T1	40



**High-volume pot core**

- Unground core for inductive proximity switches with wide operating distances
- Application examples:
  - Rotary transformers for non-contact power and information transmission
  - Inductive power transmission (non-contact charging of electric cars)
- Options:
  - a) Ground version for transformers up to 30 kW
  - b) Core height up to 45 mm for transformers up to 100 kW



FPK0262-J

**Magnetic characteristics** for option a)

(per set)

$$\Sigma l/A = 0,044 \text{ mm}^{-1}$$

$$l_e = 160 \text{ mm}$$

$$A_e = 3580 \text{ mm}^2$$

$$A_{\min} = 2800 \text{ mm}^2$$

$$V_e = 566\,000 \text{ mm}^3$$

Material	Approx. weight g	Ordering code	PU Pcs
N27	1700	B65949-A-X27	2

## EP Cores

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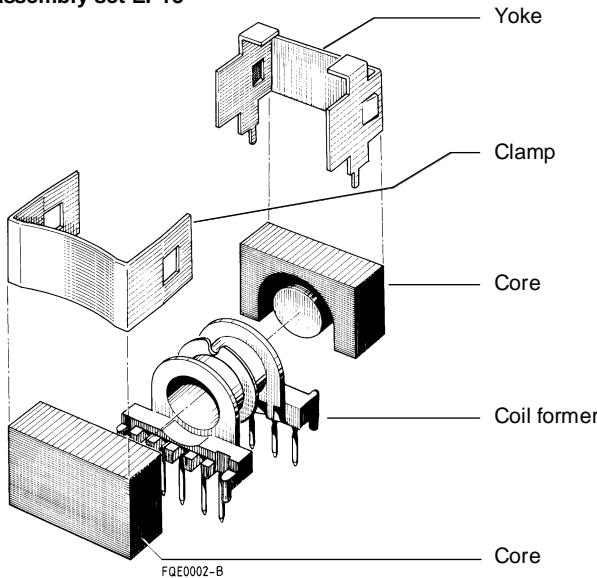
### General information

EP cores are typically used for transformer applications. Their cubic shape provides an excellent volume ratio to total space used and permits high PCB packing densities. The compact design and the high-permeability materials used (N30, T35, T38 and T42, all ungapped versions) ensure low magnetic leakage and excellent properties for broadband small-signal transmission. The large-volume types (EP20 and EP17 made of T38) are recommended for low frequencies, while the smaller types (EP7 made of N30) are more suitable for the high-frequency range.

EP cores are increasingly being used for power applications. Here we recommend the series EP7 through EP20 made of N67 for operation up to about 300 kHz.

Matching pinned coil formers suitable for automatic processing and shielding accessories (yoke, clamp or cap yoke) complete the product line.

### Example of an assembly set EP13



### 1 $A_{L1}$ value

The minimum  $A_{L1}$  value is specified for core types produced from a power material. The  $A_{L1}$  value is defined at a flux density of  $\hat{B} = 320$  mT and a temperature of 100 °C (exceptions: material N49:  $\hat{B} = 200$  mT). The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage, referred to the minimum cross-sectional area  $A_{\min}$ .

### 2 Core losses

The maximum dissipation loss for each core type employing power materials is specified in W/set together with the measurement parameters. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{\min}$ .

- In accordance with IEC 1596
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets

**Magnetic characteristics (per set)**

$$\Sigma/A = 1,52 \text{ mm}^{-1}$$

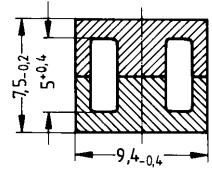
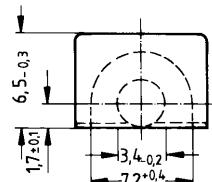
$$l_e = 15,7 \text{ mm}$$

$$A_e = 10,3 \text{ mm}^2$$

$$A_{\min} = 8,5 \text{ mm}^2$$

$$V_e = 162 \text{ mm}^3$$

**Approx. weight** 1,4 g/set

**Gapped**

Material	$A_L$ value nH	s approx. mm	$\mu_e$	Ordering code	PU Sets
N30	$250 \pm 5 \%$	0,05	300	B65839-A250-J30	2000
N67	$100 \pm 5 \%$	0,12	120	B65839-A100-J67	
N87	$140 \pm 5 \%$	0,08	170	B65839-A140-J87	

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N30	$2000 + 30/-20 \%$	2420			B65839-A-R30	2000
T38	$5200 + 40/-30 \%$	6290			B65839-A-Y38	
T42	$5800 + 40/-30 \%$	7000			B65839-A-Y42	
N67	$1100 + 30/-20 \%$	1330	750	0,11 (200 mT, 100 kHz, 100 °C)	B65839-A-R67	

**Coil former**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:  
F  $\triangleq$  max. operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 155](#)

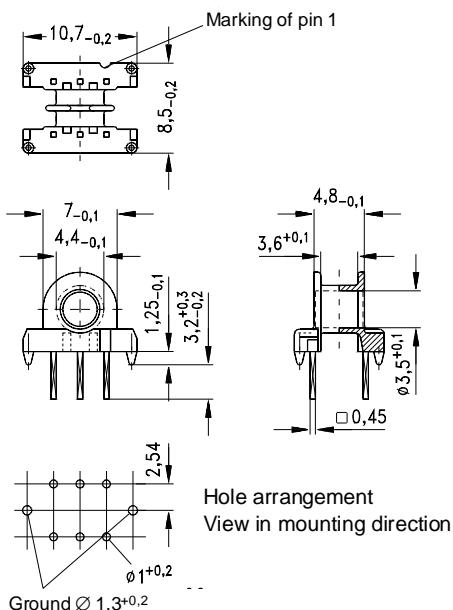
Squared pins

**Cap yoke**

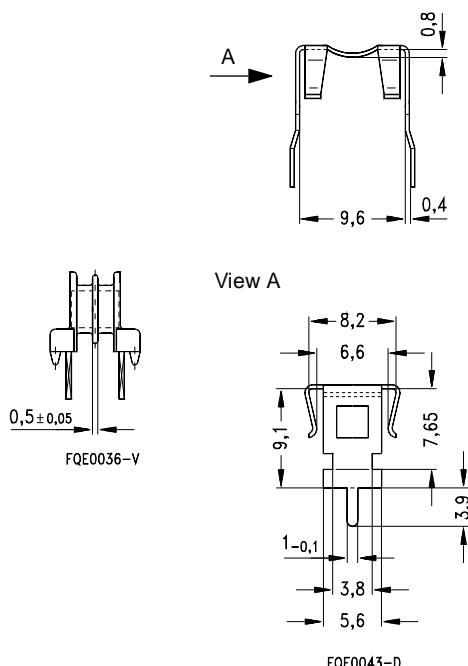
Material: With ground terminal, made of stainless spring steel (tinned), 0,25 mm thick

Coil former					Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals		
1	3,7	17,9	166	6	B65840-B1006-D1	2000
2	3,2	17,9	192	6	B65840-B1006-D2	
Cover				B65840-C2000		5000

**Coil former**



**Cap yoke**



**SMD coil former with gullwing terminals**

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

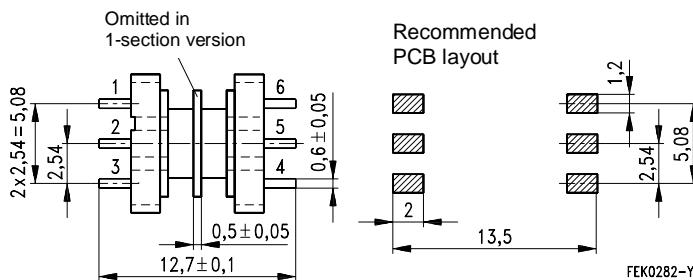
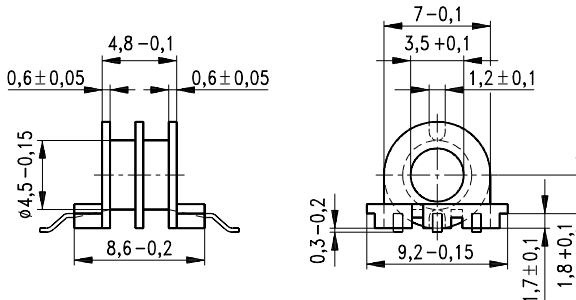
F  $\triangleq$  max. operating temperature 155 °C), color code black

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

Winding: [see page 160](#)

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	4,0	17,9	154	6	B65840-N1106-T1	2000
2	3,6	17,9	171	6	B65840-N1106-T2	



- In accordance with IEC 1596
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets

**Magnetic characteristics (per set)**

$$\Sigma/A = 1,7 \text{ mm}^{-1}$$

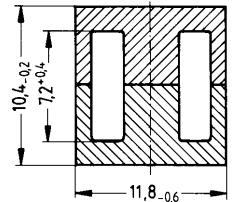
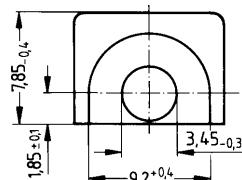
$$l_e = 19,2 \text{ mm}$$

$$A_e = 11,3 \text{ mm}^2$$

$$A_{\min} = 8,5 \text{ mm}^2$$

$$V_e = 217 \text{ mm}^3$$

**Approx. weight** 2,8 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N30	2000 + 30/- 20 %	2700			B65841-A-R30	1000
T35	3200 + 30/- 20 %	4330			B65841-A-R35	
T38	4800 + 40/- 30 %	6490			B65841-A-Y38	
T42	6000 + 40/- 30 %	8000			B65841-A-Y42	
N67	1100 + 30/- 20 %	1480	650	0,18 (200 mT, 100 kHz, 100 °C)	B65841-A-R67	

**Coil former**

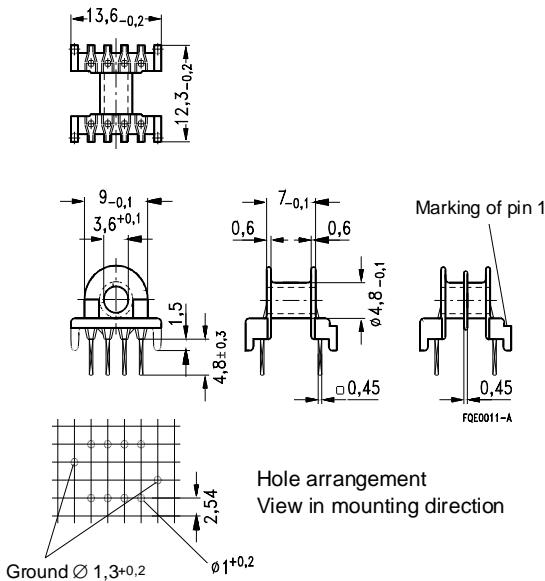
Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:  
 $F \leq$  max. operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s  
 Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 155](#)

Squared pins

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	11,4	21,5	65	8	B65842-C1008-D1	1000
2	10,0	21,5	74	8	B65842-C1008-D2	



**Mounting assembly**

The set comprises a yoke and a clamp

**Yoke**

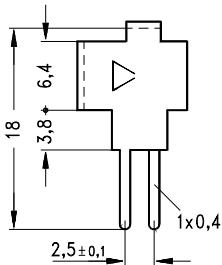
Material: Made of nickel silver (0,4 mm) with ground terminal (tinned)

**Clamp**

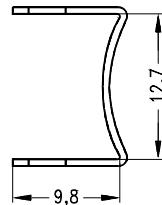
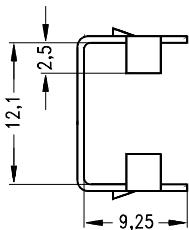
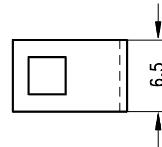
Material: Spring clamp, made of nickel silver (0,3 mm)

	Ordering code	PU Pcs
Complete mounting assembly	B65842-A2000	1000

**Yoke**



**Clamp**



- In accordance with IEC 1596
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets

**Magnetic characteristics (per set)**

$$\Sigma/A = 1,24 \text{ mm}^{-1}$$

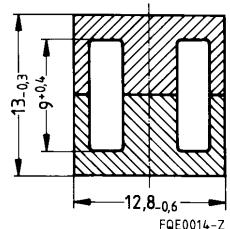
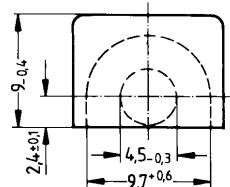
$$l_e = 24,2 \text{ mm}$$

$$A_e = 19,5 \text{ mm}^2$$

$$A_{\min} = 14,9 \text{ mm}^2$$

$$V_e = 472 \text{ mm}^3$$

**Approx. weight** 4,5 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N30	2800 + 30/- 20 %	2760			B65843-A-R30	500
T35	4400 + 30/- 20 %	4340			B65843-A-R35	
T38	7000 + 40/- 30 %	6910			B65843-A-Y38	
T42	8500 + 40/- 30 %	8300			B65843-A-Y42	
N67	1600 + 30/- 20 %	1580	900	0,40 (200 mT, 100 kHz, 100 °C)	B65843-A-R67	

**Coil former**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code green

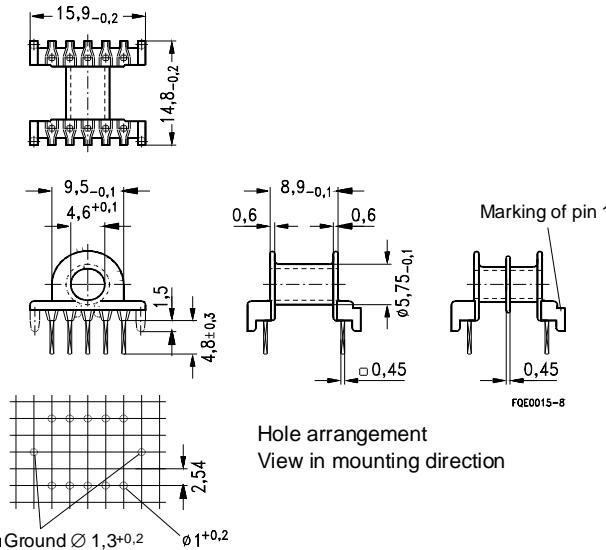
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 155](#)

Squared pins

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	13,8	23,8	59,4	10	B65844-C1010-D1	500
2	13,0	23,8	63,2	10	B65844-C1010-D2	



**Coil former with closed center flange for high-voltage applications**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F  $\leq$  max. operating temperature 155 °C), color code green

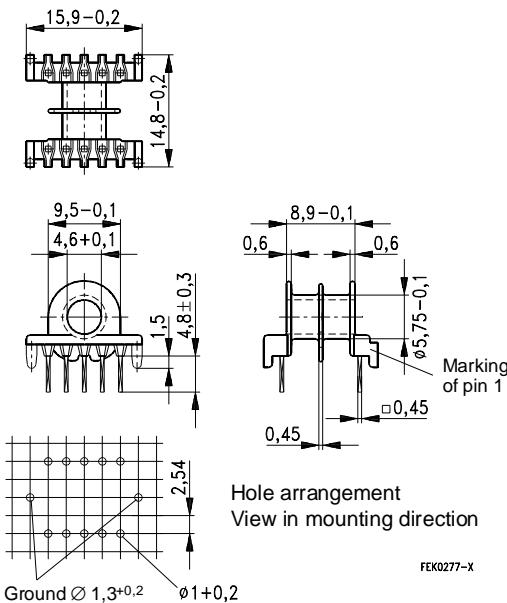
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 155](#)

Squared pins

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
2	13,0	23,8	63,2	10	B65844-L1010-D2	500



**Mounting assembly**

The set comprises a yoke and a clamp

**Yoke**

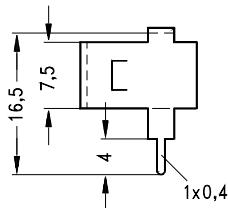
Material: Made of nickel silver (0,4 mm) with ground terminal (tinned)

**Clamp**

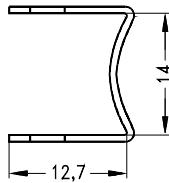
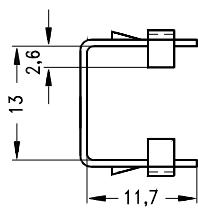
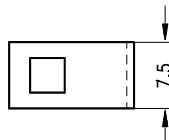
Material: Spring clamp, made of nickel silver (0,3 mm)

	Ordering code	PU Pcs
Complete mounting assembly	B65844-A2000	500

**Yoke**



**Clamp**



### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

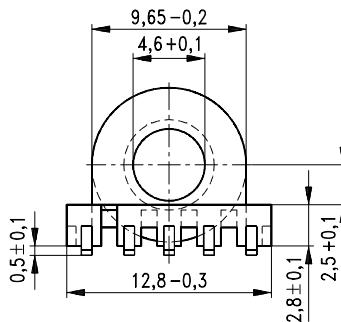
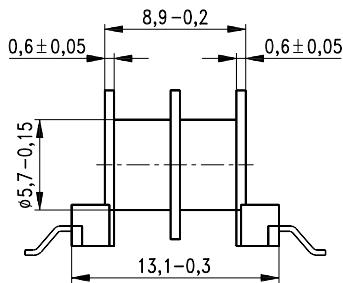
F  $\triangleq$  max. operating temperature 155 °C), color code natural or black

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

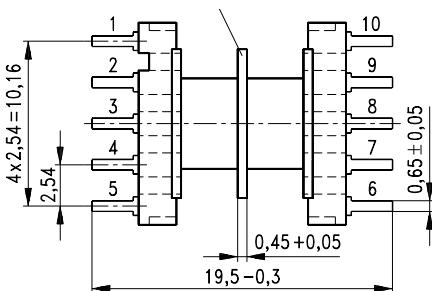
permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

Winding: [see page 160](#)

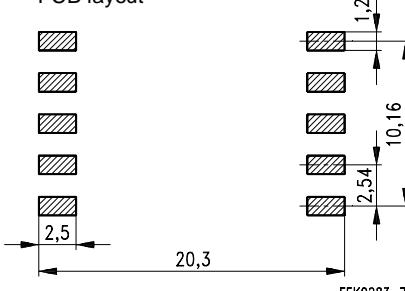
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	14,0	23,8	59,4	10	B65844-N1110-T1	500
2	13,2	23,8	63,2	10	B65844-N1110-T2	



Omitted in  
1-section version



Recommended  
PCB layout



- In accordance with IEC 1596
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets

**Magnetic characteristics (per set)**

$$\Sigma/A = 0,84 \text{ mm}^{-1}$$

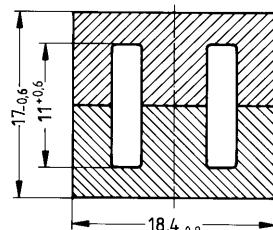
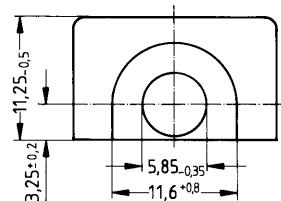
$$l_e = 28,5 \text{ mm}$$

$$A_e = 33,9 \text{ mm}^2$$

$$A_{\min} = 25,5 \text{ mm}^2$$

$$V_e = 966 \text{ mm}^3$$

**Approx. weight** 12 g/set



FQE0017-P

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N30	4300 + 30/- 20 %	2870			B65845-J-R30	200
T35	6900 + 30/- 20 %	4610			B65845-J-R35	
T38	10800 + 40/- 30 %	7220			B65845-J-Y38	
T42	13000 + 40/- 30 %	8700			B65845-J-Y42	
N67	2400 + 30/- 20 %	1600	1350	0,68 (200 mT, 100 kHz, 100 °C)	B65845-J-R67	

**Coil former**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:  
 $F \leq$  max. operating temperature 155 °C), color code green

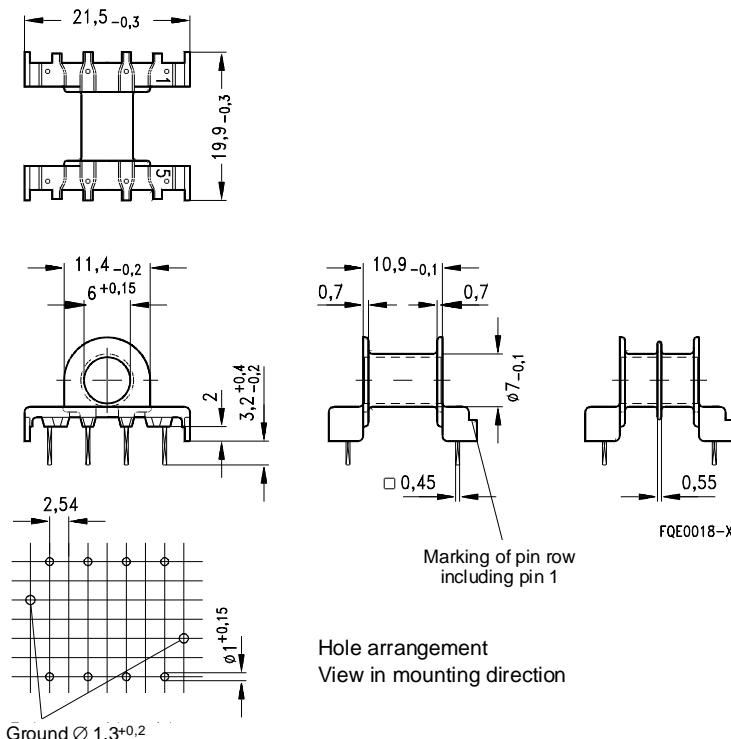
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 155](#)

Squared pins

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	18,8	28,8	52,7	8	B65846-L1008-D1	200
2	17,7	28,8	55,9	8	B65846-L1008-D2	



**Mounting assembly**

The set comprises a yoke and a clamp

**Yoke**

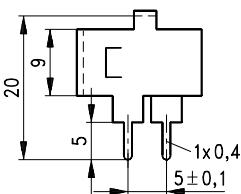
Material: Made of nickel silver (0,4 mm) with ground terminal (tinned)

**Clamp**

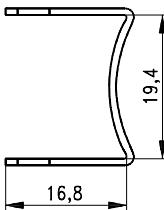
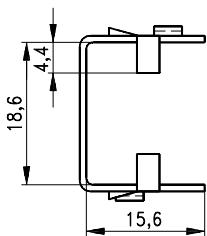
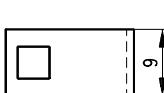
Material: Spring clamp, made of nickel silver (0,3 mm)

	Ordering code	PU Pcs
Complete mounting assembly	B65846-J2000	200

**Yoke**



**Clamp**



FEK0278-G

- In accordance with IEC 1596
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets

**Magnetic characteristics (per set)**

$$\Sigma/A = 0,51 \text{ mm}^{-1}$$

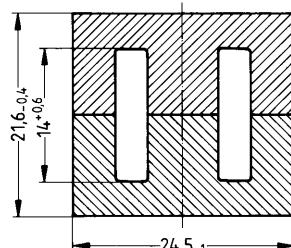
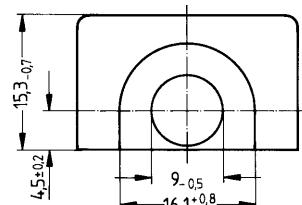
$$l_e = 40 \text{ mm}$$

$$A_e = 78 \text{ mm}^2$$

$$A_{\min} = 60 \text{ mm}^2$$

$$V_e = 3120 \text{ mm}^3$$

**Approx. weight** 27,5 g/set



FQE0021-H

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Sets
N30	6700 + 30/- 20 %	2720			B65847-A-R30	200
T38	18700 + 40/- 30 %	7590			B65847-A-Y38	
N67	4000 + 30/- 20 %	1630	2200	2,32 (200 mT, 100 kHz, 100 °C)	B65847-A-R67	

**Coil former**

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:  
 $F \leq$  max. operating temperature 155 °C), color code green

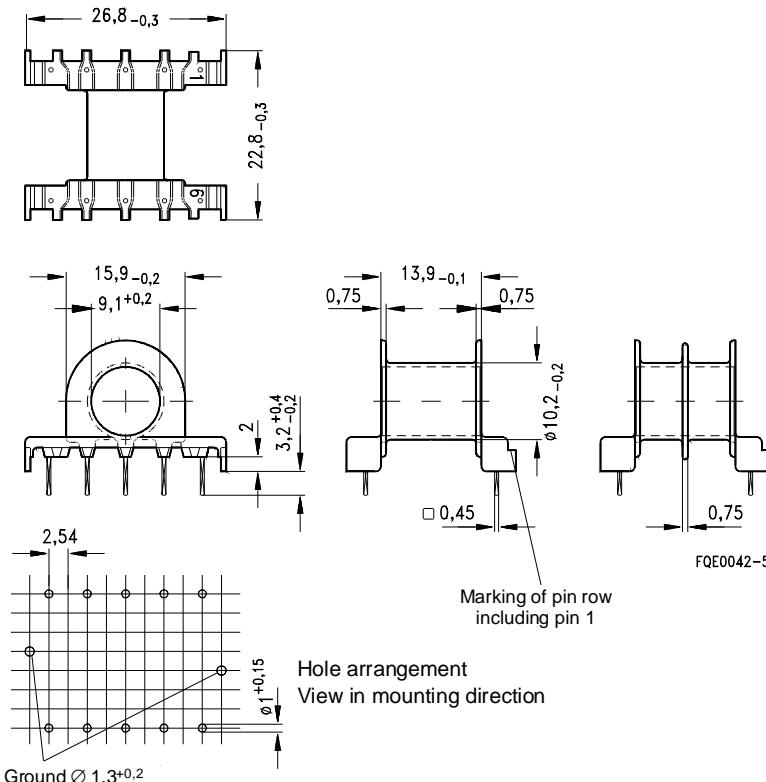
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 155](#)

Squared pins

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	33,8	38,9	39,6	10	B65848-D1010-D1	200
2	31,8	38,9	42,1	10	B65848-D1010-D2	



**Mounting assembly**

The set comprises a yoke and a clamp

**Yoke**

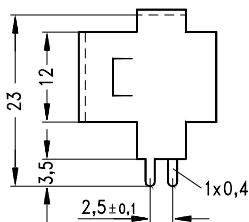
Material: Made of nickel silver (0,4 mm) with ground terminal (tinned)

**Clamp**

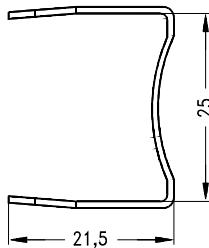
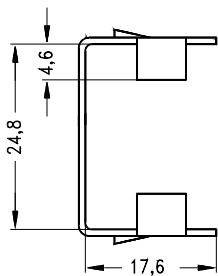
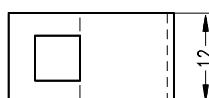
Material: Spring clamp, made of nickel silver (0,4 mm)

	Ordering code	PU Pcs
Complete mounting assembly	B65848-A2000	200

**Yoke**



**Clamp**



FQE0024-P

# E Cores

## General Information

---

### 1 Core shapes and materials

The preferred materials for manufacture of E cores are the SIFERRIT materials N27, N67, N87, N49 and N30. N27 is recommended for power applications in the frequency range up to about 100 kHz, N67 for the frequency range from about 100 to 300 kHz and N87 for the frequency range up to 500 kHz; EFD cores made of N49 are particularly suitable for frequencies  $f > 500$  kHz. These materials feature a high saturation flux density and low power loss.

Material N30 is particularly suitable for broadband small-signal applications and also for interference suppression chokes.

The E core spectrum contained in this data book comprises five basic core shapes, which can be used not only for transformers but also for chokes with a power capacity of up to 10 kW.

#### a) Types with round center leg

We offer the following types:

- ER cores
- ETD cores in accordance with IEC 1185 (Economic Transformer Design)
- EC cores in accordance with IEC 647

E cores with round center leg offer the advantage of easy winding, particularly when thick winding wires are used, compact mounting dimensions and wide openings on each side. ETD cores have the additional benefit of an almost constant cross section along the magnetic path. A wide variety of optimized accessories is available. ER cores in sizes 9,5 and 11/5 are particularly suitable for designing transformers with low overall height and high inductance. They come in material T38 for broadband applications plus in N87 and N49 for power transformers for frequencies up to and over 500 kHz. SMD coil formers are available as accessory.

#### b) Double E cores

The DE cores are a type of E core with a closed magnetic path. Paired with the magnetic advantages of a ring core, automatic winding can be performed thanks to the accessories specially designed for automatic production. Material T37 can thus be used for the significantly more cost-effective production of current-compensated chokes.

#### c) Types with rectangular center leg

- EFD cores (Economic Flat Transformer Design); EPF core

EFD cores have an optimized cross section and enable the design of very flat and compacts transformers, even for high-frequency applications.

- E cores in accordance with DIN 41295 or DIN 41985

The conventional E cores with rectangular center leg are available in a wide variety of sizes.

# E Cores

## General Information

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### 2 Ordering, marking, delivery

E cores are supplied in pieces (except ER 9,5 and ER 11: in sets), with each packing unit (PU) exclusively containing cores with or without shortened center leg (air gap dimension „g“).

Gapped EFD cores are supplied with toleranced  $A_L$  value as specified in the data sheets. All other E cores are available with toleranced  $A_L$  value on request.

There are two possibilities of air gap distribution, either symmetrical (each core of a set has the same air gap size) or unsymmetrical (a gapped core is combined with an ungapped core).

E and U cores are marked using the same system. Hence, the following description applies to both core shapes.

- **E6,3 and E8,8 cores are not marked.**
- With **ER 9,5** and **ER 11** cores (packed in sets) only one core half carries the marking. Ungapped cores are stamped with the material and "o. L." (= without air gap). Gapped cores are stamped with the material and the  $A_L$  value. In case of unsymmetrical air gap distribution the gapped core half carries the marking.
- **E cores with short legs (up to E 16/6) and small U cores (up to U 17)** are stamped with rolls on the back (figure 1).

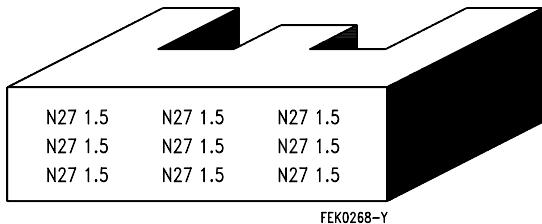


Figure 1  
Roll stamping on back

#### Gapped cores:

with toleranced air gap: material and size of air gap, e.g.: N27 1,2

with toleranced  $A_L$  value:

symmetrical version: material,  $A_L$  value and code for  $A_L$  value tolerance,

e.g.: N27 30 A

unsymmetrical version: material and size of air gap, e.g.: N27 1,2

Ungapped cores are only marked with the material, e.g. N27.

- **E 16/8 cores and larger** as well as **U 20 and larger** are marked by a ink-jet printer on the outside of the legs (figure 2).

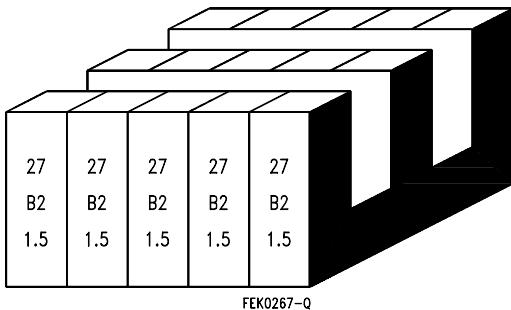


Figure 2  
Marking by ink-jet printer

Gapped cores :

with toleranced air gap: material, date code and size of air gap,  
e.g.: 27 B2 1,5

with toleranced  $A_L$  value:

symmetrical version: material, date code,  $A_L$  value and code for  $A_L$  value tolerance, e.g.: 27 B2 30 A

unsymmetrical version: material, date code and size of air gap,  
e.g.: 27 B2 1,5

Ungapped cores are marked with material and date code, e.g.: 27 B2.

Depending on their height and width, there is not enough space on all cores for complete marking, meaning that simplification is necessary. So only the material and the date code will be stated. This ensures that there is space for at least one complete marking (two characters per line) on the core. To avoid confusion of names like N27 and N72, the beginning of the material designation coincides with the position of the letter in the date code.

Example:  
↓  
727272

2B2B2B  
means N27 (not N72)

# E Cores

## General Information

---

### Date code:

Date coding is based on a two-week period (see tables, counting by calendar weeks CW).

In the following year lines 1 and 2 will be swapped (material and date code). The position of letters and digits will not be swapped.

### Coding of two-week production periods

CW	Code	CW	Code	CW	Code
1 and 2	A	19 and 20	J	37 and 38	S
3 and 4	B	21 and 22	K	39 and 40	T
5 and 6	C	23 and 24	L	41 and 42	U
7 and 8	D	25 and 26	M	43 and 44	V
9 and 10	E	27 and 28	N	45 and 46	W
11 and 12	F	29 and 30	O	47 and 48	X
13 and 14	G	31 and 32	P	49 and 50	Y
15 and 16	H	33 and 34	Q	51 and 52	Z
17 and 18	I	35 and 36	R	53	@

### Coding of week day

	Day	Code		Day	Code
CW <sub>n</sub>	Monday	1	CW <sub>n+1</sub>	Monday	6
	Tuesday	2		Tuesday	7
	Wednesday	3		Wednesday	8
	Thursday	4		Thursday	9
	Friday	5		Friday	0
	Saturday	5		Saturday	0
	Sunday	+		Sunday	-

The black ink is insoluble in water, but it will dissolve in fluids based on ketones. It will also dissolve if left for a long time in an ultrasonic bath. Different colored markings are not feasible.

### 3 Ungapped cores

Even with the best grinding methods available today, a certain degree of roughness (approx. 6 µm) cannot be avoided on the ground surface in the case of „ungapped“ cores.

The  $A_L$  value tolerance for ER, EC, ETD and E cores is + 30/– 20 %. The small E cores E6,3 and E8,8, however, have a tolerance of + 40/– 30 %.

#### **4      Cores with toleranced air gap**

The following tolerances for dimension „g“ apply to all E cores:

Dimension g mm	Tolerance mm
$0,10 \text{ mm} \leq g < 0,5$	$\pm 0,02$
$g \geq 0,5$	$\pm 0,05$

As is the case with ungapped cores, a certain degree of roughness cannot be avoided on the ground surfaces of the outer legs (see point 3).

#### **5      Cores with toleranced $A_L$ value**

The tolerance of the  $A_L$  value depends on the magnitude of the  $A_L$  value and the core shape. Tolerance figures are therefore given only on a core-type-specific basis.

#### **6      Calculation systems**

Calculation systems a) and b) apply to the  $A_L$  value under the following measuring conditions:

Measuring flux density  $\hat{B} \leq 0,25 \text{ mT}$ , measuring frequency  $f = 10 \text{ kHz}$ ,  
measuring temperature  $T = 23 \pm 3 \text{ }^\circ\text{C}$ , measuring coil:  $N = 100$  turns, fully wound

##### *a) Air gap and $A_L$ value*

The typical  $A_L$  value tabulated in the individual data sheets refers to a core set comprising a gapped core with dimension „g“ and an ungapped core with „g“ approx. 0.

By inserting the core-specific constants  $K1$  and  $K2$ , a nominal  $A_L$  value can be calculated for the materials N27, N67 and N87 within the relevant quoted air-gap validity range:

$$s = \left( \frac{A_L}{K1} \right)^{\frac{1}{K2}} \quad s = [\text{mm}] \\ A_L = [\text{nH}]$$

Production variations with regard to  $\mu_i$  and grinding quality should be taken into account additionally.

##### *b) DC magnetic bias $I_{DC}$*

By using the core-shape-related factors  $K3$  and  $K4$ , nominal values can be determined for the DC magnetic biasing characteristic of E, ETD, EC and EFD cores made of materials N67, N27 and N87 at temperature  $23 \text{ }^\circ\text{C}$  and  $100 \text{ }^\circ\text{C}$ .

The direct current  $I_{DC}$  at which the  $A_L$  value drops by 10 % compared to the  $A_L$  value without magnetic biasing ( $I_{DC} = 0 \text{ A}$ ) is determined for a coil with 100 turns.

Calculation of  $I_{DC}$  at  $T = 23 \text{ }^\circ\text{C}$ :

The factors  $K3$  and  $K4$  for  $T = 23 \text{ }^\circ\text{C}$  and the  $A_L$  value without magnetic biasing are inserted into the equation for the calculation.

# E Cores

## General Information

---

Calculation of  $I_{DC}$  at  $T = 100^\circ\text{C}$ :

The factors  $K3$  and  $K4$  for  $T = 100^\circ\text{C}$  are inserted into the equation for the calculation. The value for  $T = 23^\circ\text{C}$  without magnetic biasing should be used here as the  $A_L$  value.

$$I_{DC} = \left( \frac{0,9 \cdot A_L}{K3} \right)^{\frac{1}{K4}} \quad I_{DC} = [\text{A}]$$
$$A_L = [\text{nH}] \quad (\text{without magnetic biasing})$$

### 7 Magnetic characteristics

The set characteristics  $\Sigma/A$ ,  $I_e$ ,  $A_e$ ,  $A_{min}$  and  $V_e$  required for the calculation of field strength, flux density and hysteresis losses have been determined in accordance with IEC 205 (1966) ( $A_{min}$  = minimum cross section relative to the nominal dimensions).

### 8 Core losses

The maximum power loss for each core type is specified in W/set together with the measurement parameters. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{min}$ .

### 9 $A_{L1}$ value

The minimum  $A_{L1}$  value is specified for each core type. The  $A_{L1}$  value is defined at a flux density of  $B = 320\text{ mT}$  and a temperature of  $100^\circ\text{C}$ . The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{min}$ .

### 10 Accessories

The coil formers for all ETD, EFD, EC and ER cores and most of the E cores are designed so that they can be wound fully automatically.

With the ETD cores and most E cores, each core half and its mounting assembly can be fitted to the coil former from the same side, thus permitting simple fully automatic assembly.

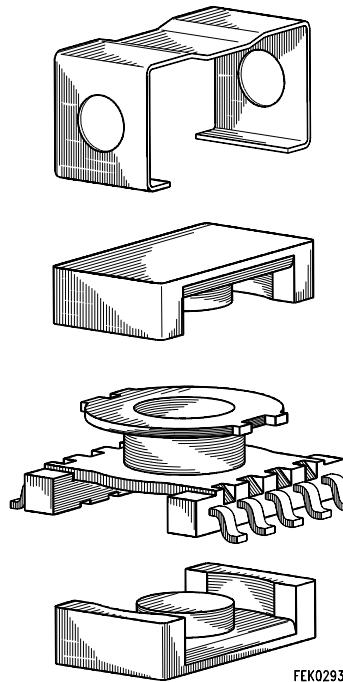
EC coil formers, cores and their mounting assemblies are fixed by means of screws.

If coil formers are used for cores with a rectangular cross section (E cores), the indication of the winding height represents only a theoretical value. The use of thicker wires or litz wires results in a gradual rounding of the winding from layer to layer. In such cases the planned winding design should be verified by means of a winding test.

## ER Cores

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Example of an assembly set ER 11/5



FEK0293

- For transformers featuring high inductance and low overall height
- ER9,5 cores are supplied as sets

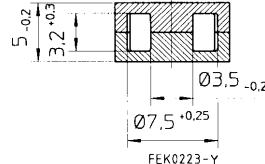
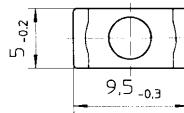
**Magnetic characteristics (per set)**

$$\Sigma I/A = 1,58 \text{ mm}^{-1}$$

$$l_e = 13,3 \text{ mm}$$

$$A_e = 8,41 \text{ mm}^2$$

$$V_e = 120 \text{ mm}^3$$

**Approx. weight** 0,6 g/set**Ungapped**

Material	$A_L$ value nH	$\mu_e$	Ordering code	PU Sets
T38	4500 + 40/-30 %	5680	B65523-J-Y38	1000
N87	800 + 30/-20 %	1000	B65523-J-R87	

**SMD coil former with gullwing terminals**

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

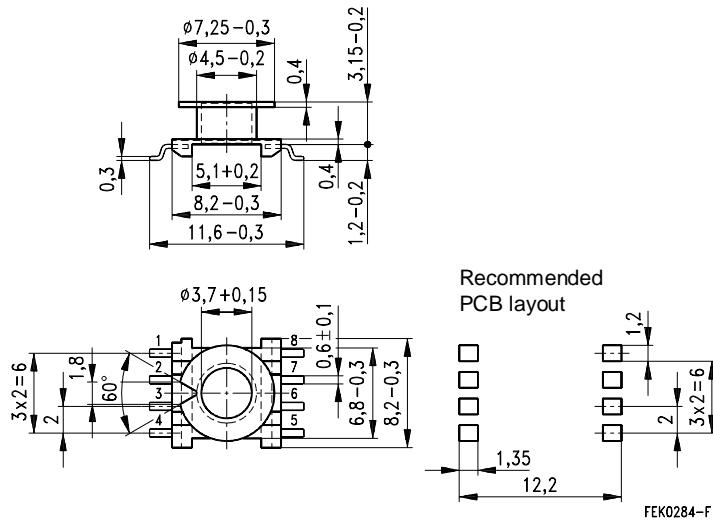
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

Winding: [see page 160](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	3,23	18,4	196	8	B65527-A1008-T1	1000



- For transformers featuring high inductance and low overall height
- ER11/5 cores are supplied as sets

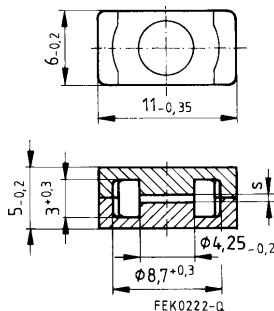
**Magnetic characteristics (per set)**

$$\Sigma I/A = 1,1 \text{ mm}^{-1}$$

$$l_e = 14 \text{ mm}$$

$$A_e = 12,7 \text{ mm}^2$$

$$V_e = 178 \text{ mm}^3$$

**Approx. weight** 0,85 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	Ordering code	PU Sets
T38	6400 + 40/- 30 %	5600	B65525-J-Y38	1000
N49	800 + 30/- 20 %	715	B65525-J-R49	
N87	1200 + 30/- 20 %	1050	B65525-J-R87	

**Gapped**

Material	$A_L$ value nH	$s$ approx. mm	$\mu_e$	Ordering code	PU Sets
N67	$160 \pm 3 \%$	0,08	140	B65525-J160-A87	1000

### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

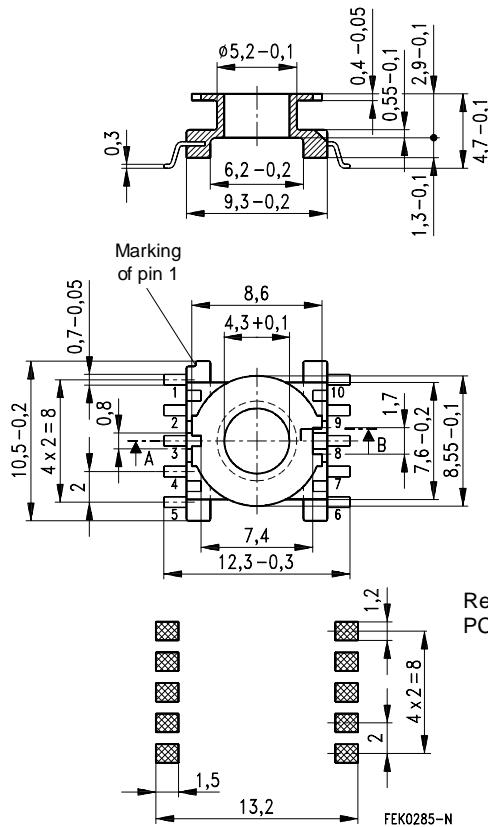
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coilformer: 400 °C, 1 s

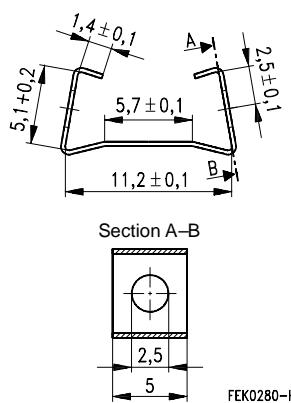
Winding: [see page 160](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	3,3	21,6	225	10	B65526-B1010-T1	1000
Yoke					B65526-A2000	1000

### Coil former



### Yoke



- Round center leg particularly suitable for use of thick winding wires or tapes
- For compact winding design with low leakage inductance
- ER cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,81 \text{ mm}^{-1}$$

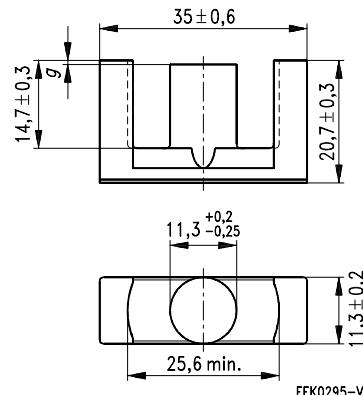
$$l_e = 89,6 \text{ mm}$$

$$A_e = 111 \text{ mm}^2$$

$$A_{\min} = 101 \text{ mm}^2$$

$$V_e = 9930 \text{ mm}^3$$

**Approx. weight** 52 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2500 + 30/-20 %	1610	1930	1,95 (200 mT, 25 kHz, 100 °C)	B66350-G-X127	250

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,50 ± 0,05	275	177	B66350-G500-X127	250
	1,00 ± 0,05	170	109	B66350-G1000-X127	
	1,50 ± 0,05	125	80	B66350-G1500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	169	- 0,706	275	- 0,847	256	- 0,865

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,50 \text{ mm}$   
 $K3, K4: 90 \text{ nH} < A_L < 600 \text{ nH}$

- Round center leg particularly suitable for use of thick winding wires or tapes
- For compact winding design with low leakage inductance
- ER cores are supplied as pieces

**Magnetic characteristics (per set)**

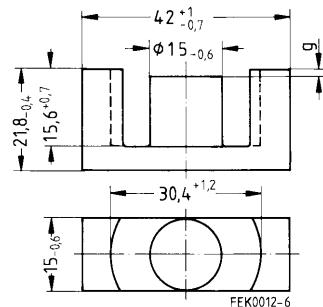
$$\Sigma/A = 0,58 \text{ mm}^{-1}$$

$$l_e = 99 \text{ mm}$$

$$A_e = 170 \text{ mm}^2$$

$$A_{\min} = 170 \text{ mm}^2$$

$$V_e = 16\,800 \text{ mm}^3$$



**Approx. weight** 84 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	3200 + 30/-20 %	1480	2700	3,10 (200 mT, 25 kHz, 100 °C)	B66347-G-X127	200
N67	3500 + 30/-20 %	1620	2700	10,50 (200 mT, 100 kHz, 100 °C)	B66347-G-X127	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	1,00 ± 0,05	257	119	B66347-G1000-X127	200
	1,50 ± 0,05	190	88	B66347-G1500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	257	- 0,741	415	- 0,847	387	- 0,865
N67	257	- 0,741	396	- 0,820	390	- 0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 3,00 \text{ mm}$   
 $K3, K4: 110 \text{ nH} < A_L < 1100 \text{ nH}$

**Coil former**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

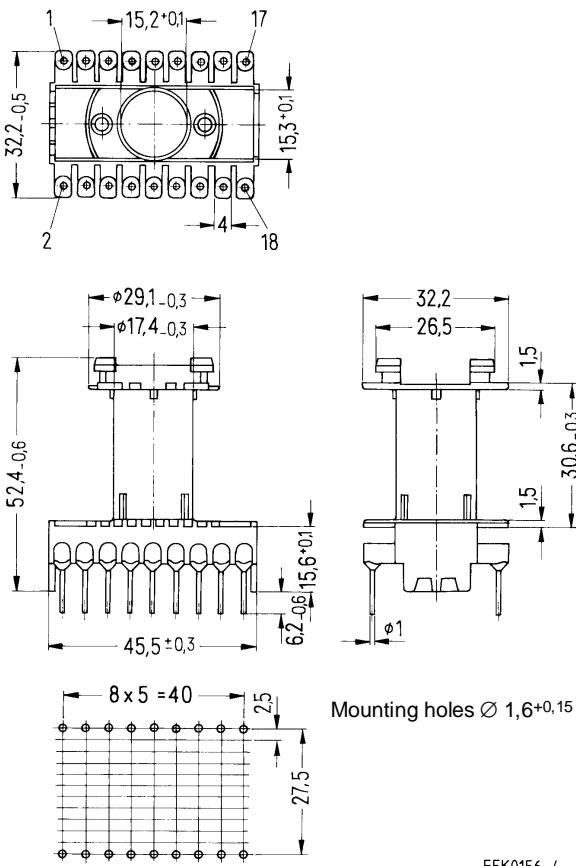
F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 158](#)

Coil former					Ordering code	PU Pcs
Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		
1	127	68,5	18,6	18	B66348-A1018-T1	100
Case <a href="#">see page 447</a>					B66348-A2001-T	100



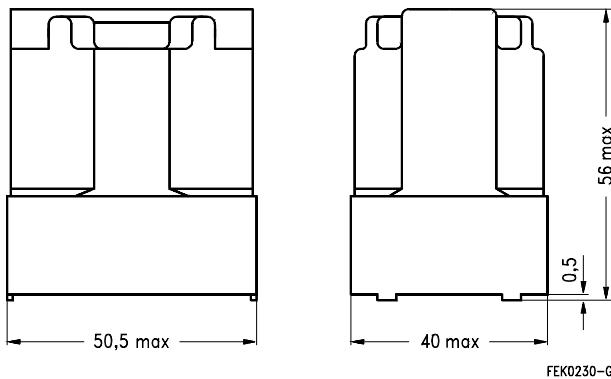
**Case**

- Used to protect the transformer against external influences, and for stamping

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code blue

	Ordering code	PU Pcs
Case	B66348-A2001-T	100



- Round center leg particularly suitable for use of thick winding wires or tapes
- For compact winding design with low leakage inductance
- ER cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,34 \text{ mm}^{-1}$$

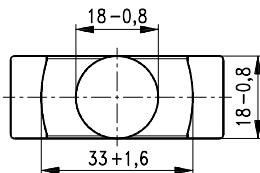
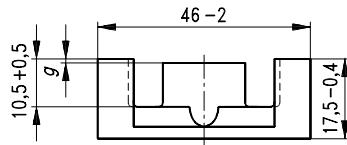
$$l_e = 79 \text{ mm}$$

$$A_e = 233 \text{ mm}^2$$

$$A_{\min} = 226 \text{ mm}^2$$

$$V_e = 18\,400 \text{ mm}^3$$

**Approx. weight** 98 g/set



FEK0297-C

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	5700 + 30/-20 %	1550	4630	3,62 (200 mT, 25 kHz, 100 °C)	B66377-G-X127	180

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,50 ± 0,05	608	164	B66377-G500-X127	180
	1,00 ± 0,05	343	93	B66377-G1000-X127	
	1,50 ± 0,05	245	66	B66377-G1500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	343	- 0,826	589	- 0,847	546	- 0,865

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 1,00 \text{ mm}$   
 $K3, K4: 190 \text{ nH} < A_L < 1850 \text{ nH}$

- Round center leg particularly suitable for use of thick winding wires or tapes
- For compact winding design with low leakage inductance
- ER cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma/A = 0,49 \text{ mm}^{-1}$$

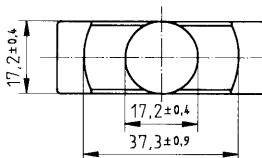
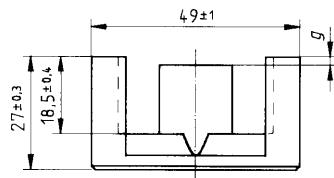
$$l_e = 118 \text{ mm}$$

$$A_e = 243 \text{ mm}^2$$

$$A_{\min} = 225 \text{ mm}^2$$

$$V_e = 28\,700 \text{ mm}^3$$

**Approx. weight** 146 g/set



FEK0160-W

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	3500 + 30/-20 %	1350	3240	5,38 (200 mT, 25 kHz, 100 °C)	B66391-G-X127	120

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	342	- 0,750	578	- 0,847	540	- 0,865

Validity range:       $K1, K2$ : 0,10 mm <  $s$  < 3,50 mm  
 $K3, K4$ : 130 nH <  $A_L$  < 1300 nH

- Round center leg particularly suitable for use of thick winding wires or tapes
- For compact winding design with low leakage inductance
- ER cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma I/A = 0,35 \text{ mm}^{-1}$$

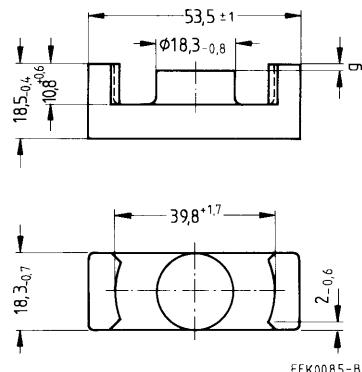
$$l_e = 90 \text{ mm}$$

$$A_e = 256 \text{ mm}^2$$

$$A_{\min} = 252 \text{ mm}^2$$

$$V_e = 23\,000 \text{ mm}^3$$

**Approx. weight** 119 g/set



FEK0085-B

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	5600 + 30/- 20 %	1560	4480	4,40 (200 mT, 25 kHz, 100 °C)	B66357-G-X127	100
N67	5750 + 30/- 20 %	1600	4480	14,90 (200 mT, 100 kHz, 100 °C)	B66357-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,50 ± 0,05	620	173	B66357-G500-X127	100
	1,00 ± 0,05	360	100	B66357-G1000-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

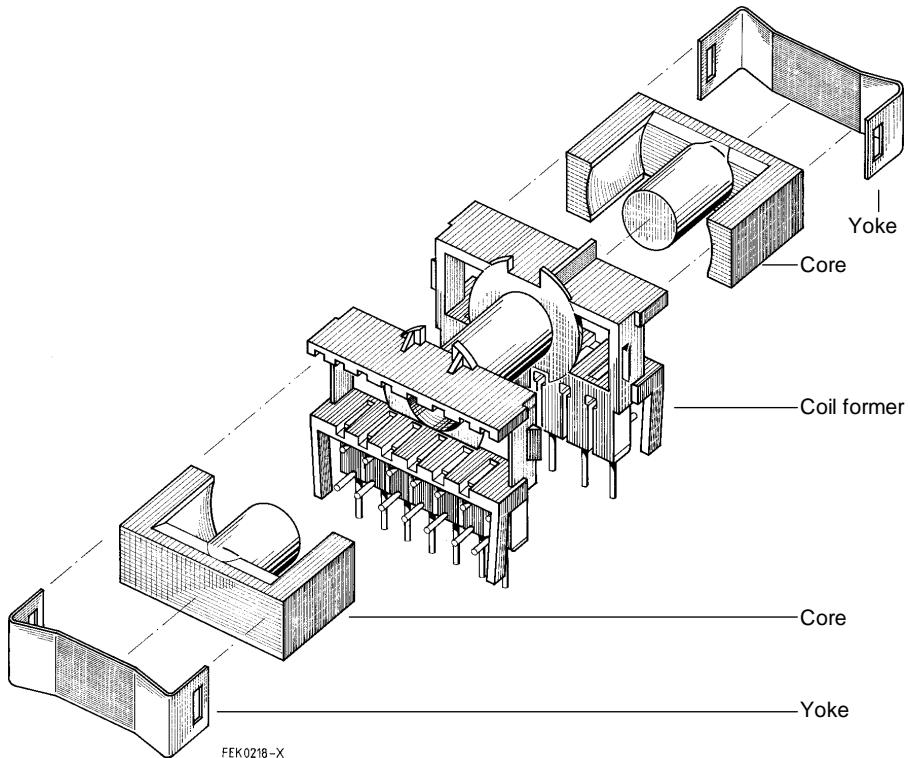
Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	360	- 0,786	635	- 0,847	590	- 0,865
N67	360	- 0,786	608	- 0,820	594	- 0,881

Validity range:  $K1, K2: 0,15 \text{ mm} < s < 3,50 \text{ mm}$   
 $K3, K4: 180 \text{ nH} < A_L < 1800 \text{ nH}$

## ETD Cores

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Example of an assembly set (ETD 34)



- In accordance with IEC 1185
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces

#### Magnetic characteristics (per set)

$$\Sigma l/A = 0,93 \text{ mm}^{-1}$$

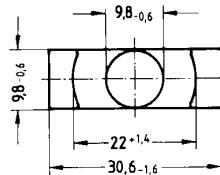
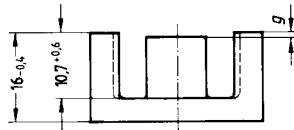
$$l_e = 70,4 \text{ mm}$$

$$A_e = 76 \text{ mm}^2$$

$$A_{\min} = 71 \text{ mm}^2$$

$$V_e = 5350 \text{ mm}^3$$

**Approx. weight** 28 g/set



FEK0044-8

#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2000 + 30/- 20 %	1470	1700	1,04 (200 mT, 25 kHz, 100 °C)	B66358-G-X127	200
N67	2100 + 30/- 20 %	1530	1700	3,50 (200 mT, 100 kHz, 100 °C)	B66358-G-X167	
N87	2200 + 30/- 20 %	1610	1700	2,80 (200 mT, 100 kHz, 100 °C)	B66358-G-X187	

#### Gapped

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27, N67	0,10 ± 0,02	621	457	B66358-G100-X1**	200
	0,20 ± 0,02	383	281	B66358-G200-X1**	
	0,50 ± 0,05	201	148	B66358-G500-X1**	
	1,00 ± 0,05	124	91	B66358-G1000-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	124	– 0,7	195	– 0,847	181	– 0,865
N67	124	– 0,7	188	– 0,820	181	– 0,881
N87	124	– 0,7	192	– 0,796	176	– 0,873

Validity range:       $K1, K2$ : 0,10 mm <  $s$  < 2,00 mm  
                          $K3, K4$ : 70 nH <  $A_L$  < 680 nH

**Coil former (magnetic axis horizontal)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

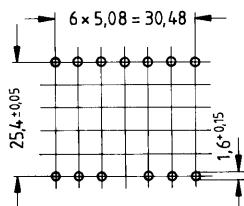
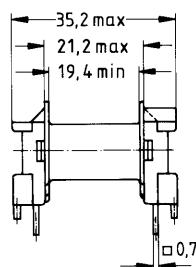
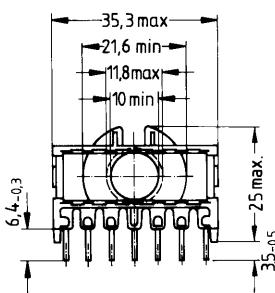
Winding: [see page 157](#)

Squared pins

**Yoke**

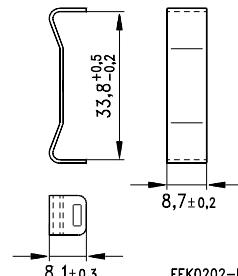
Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	97	52,8	18,7	13	B66359-B1013-T1	100
Yoke (ordering code per piece, 2 are required)					B66359-A2000	200

**Coil former**

Hole arrangement  
View in mounting direction

FEK0046-Q

**Yoke**

**Coil former (magnetic axis vertical)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 157](#)

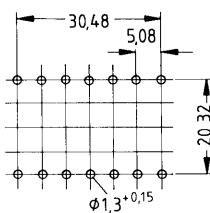
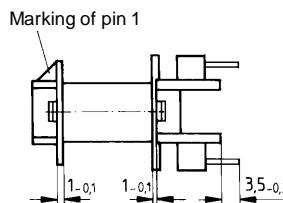
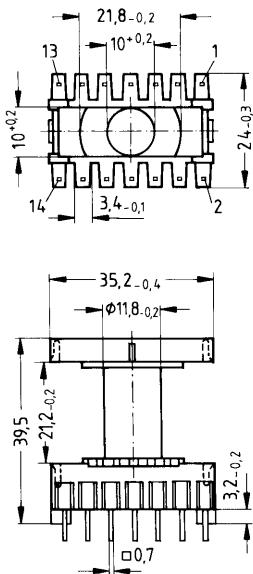
Squared pins

**Yoke**

Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		
1	97	52,8	18,7	14	B66359-J1014-T1	100
Yoke (ordering code per piece, 2 are required)					B66359-A2000	200

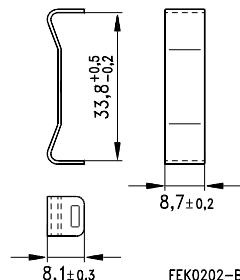
**Coil former**



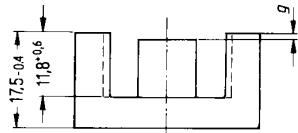
Hole arrangement  
View in mounting direction

FEK039-8

**Yoke**



- In accordance with IEC 1185
- Quality assurance per UTE 83313-001/CECC 25 301-001 (material N27)
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces



#### Magnetic characteristics (per set)

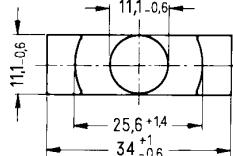
$$\Sigma/A = 0,81 \text{ mm}^{-1}$$

$$l_e = 78,6 \text{ mm}$$

$$A_e = 97,1 \text{ mm}^2$$

$$A_{\min} = 91,6 \text{ mm}^2$$

$$V_e = 7630 \text{ mm}^3$$



FEK0048-F

**Approx. weight** 40 g/set

#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2400 + 30/- 20 %	1540	1940	1,48 (200 mT, 25 kHz, 100 °C)	B66361-G-X127	200
N67	2450 + 30/- 20 %	1580	1940	5,00 (200 mT, 100 kHz, 100 °C)	B66361-G-X167	
N87	2600 + 30/- 20 %	1670	1940	4,00 (200 mT, 100 kHz, 100 °C)	B66361-G-X187	

#### Gapped

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	$0,10 \pm 0,02$	790	508	B66361-G100-X127	200
N67	$0,20 \pm 0,02$	482	310	B66361-G200-X1**	
	$0,50 \pm 0,05$	251	161	B66361-G500-X1**	
	$1,00 \pm 0,05$	153	98	B66361-G1000-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	153	– 0,713	245	– 0,847	227	– 0,865
N67	153	– 0,713	236	– 0,820	229	– 0,881
N87	153	– 0,713	240	– 0,796	222	– 0,873

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,50 \text{ mm}$

$K3, K4: 80 \text{ nH} < A_L < 780 \text{ nH}$

**Coil former (magnetic axis horizontal)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

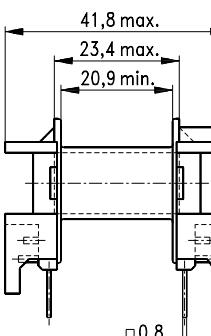
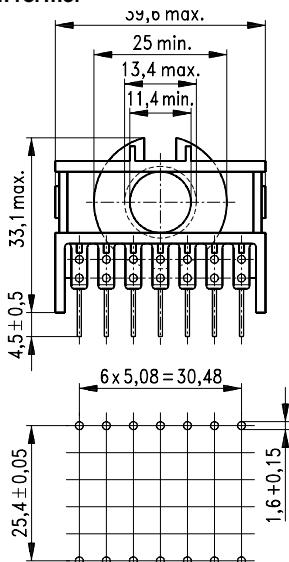
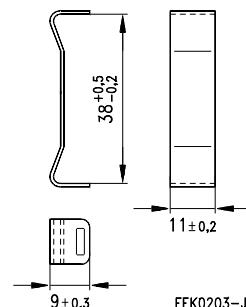
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 157](#)**Yoke**

Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	122	60,5	17	14	B66362-B1014-T1	100
Yoke (ordering code per piece, 2 are required)					B66362-A2000	200

**Coil former****Yoke**

Hole arrangement  
View in mounting direction

**Coil former (magnetic axis vertical)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

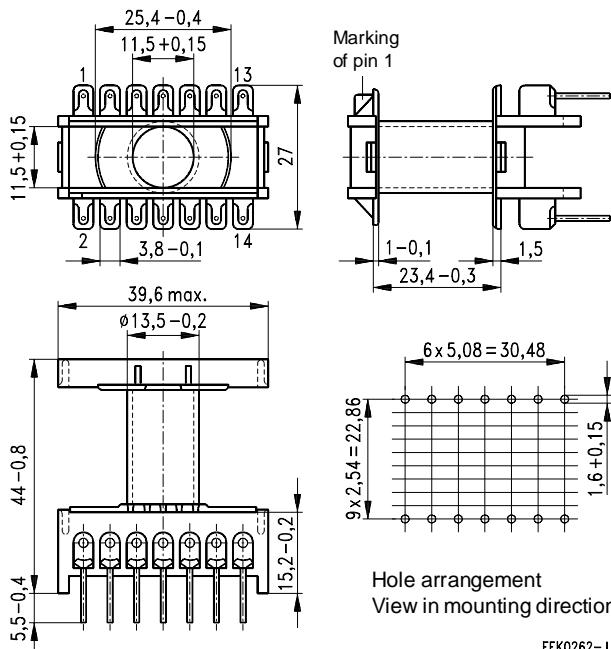
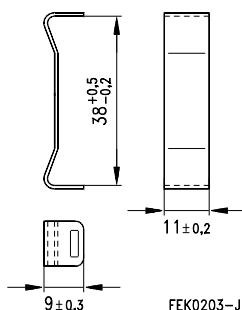
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

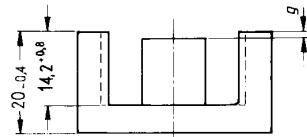
Winding: [see page 157](#)**Yoke**

Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	122	60,5	17	14	B66362-L1014-T1	100
Yoke (ordering code per piece, 2 are required)					B66362-A2000	200

**Coil former****Yoke**

- In accordance with IEC 1185
- Quality assurance per UTE 83313-002/CECC 25 301-002 (material N27)
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces



#### Magnetic characteristics (per set)

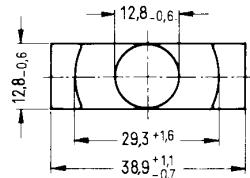
$$\Sigma/A = 0,74 \text{ mm}^{-1}$$

$$l_e = 92,2 \text{ mm}$$

$$A_e = 125 \text{ mm}^2$$

$$A_{\min} = 123 \text{ mm}^2$$

$$V_e = 11\,500 \text{ mm}^3$$



Approx. weight 60 g/set

FEK0053-8

#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2550 + 30/- 20 %	1500	2140	2,22 (200 mT, 25 kHz, 100 °C)	B66363-G-X127	200
N67	2600 + 30/- 20 %	1540	2140	7,50 (200 mT, 100 kHz, 100 °C)	B66363-G-X167	
N87	2700 + 30/- 20 %	1600	2140	6,00 (200 mT, 100 kHz, 100 °C)	B66363-G-X187	

#### Gapped

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	$0,10 \pm 0,02$	1062	622	B66363-G100-X127	200
N67	$0,20 \pm 0,02$	639	374	B66363-G200-X1**	
	$0,50 \pm 0,05$	326	191	B66363-G500-X1**	
	$1,00 \pm 0,05$	196	115	B66363-G1000-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	196	– 0,734	308	– 0,847	287	– 0,865
N67	196	– 0,734	295	– 0,820	289	– 0,881
N87	196	– 0,734	300	– 0,796	280	– 0,873

Validity range:       $K1, K2$ : 0,10 mm <  $s$  < 3,00 mm  
                          $K3, K4$ : 90 nH <  $A_L$  < 850 nH

### Coil former

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
F  $\triangle$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

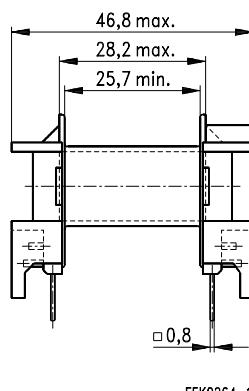
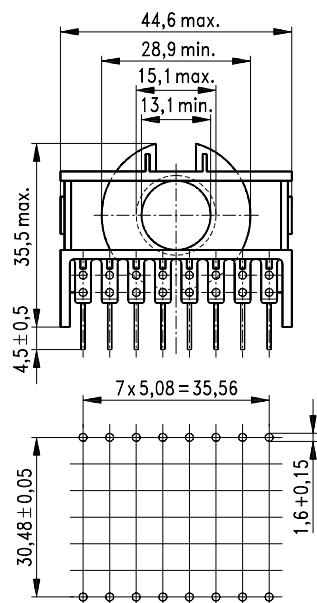
Winding: [see page 157](#)

### Yoke

Material: Stainless spring steel (0,4 mm)

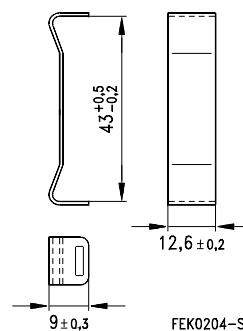
Coil former					Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	178	69	13,3	16	B66364-B1016-T1	100
Yoke (ordering code per piece, 2 are required)					B66364-A2000	200

### Coil former



Hole arrangement  
View in mounting direction

### Yoke



- In accordance with IEC 1185
- Quality assurance per UTE 83313-003/CECC 25 301-003 (material N27)
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces

#### Magnetic characteristics (per set)

$$\Sigma/A = 0,6 \text{ mm}^{-1}$$

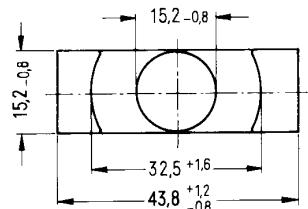
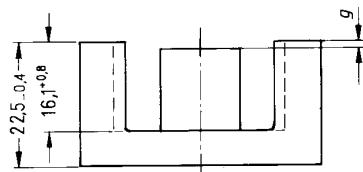
$$l_e = 103 \text{ mm}$$

$$A_e = 173 \text{ mm}^2$$

$$A_{\min} = 172 \text{ mm}^2$$

$$V_e = 17\,800 \text{ mm}^3$$

**Approx. weight** 94 g/set



FEK0057-6

#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	3300 + 30/- 20 %	1560	2640	3,48 (200 mT, 25 kHz, 100 °C)	B66365-G-X127	100
N67	3350 + 30/- 20 %	1600	2640	11,80 (200 mT, 100 kHz, 100 °C)	B66365-G-X167	
N87	3500 + 30/- 20 %	1650	2640	9,40 (200 mT, 100 kHz, 100 °C)	B66365-G-X187	

#### Gapped

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	$0,20 \pm 0,02$	862	407	B66365-G200-X1**	100
N67	$0,50 \pm 0,05$	438	207	B66365-G500-X1**	
	$1,00 \pm 0,05$	262	124	B66365-G1000-X1**	
	$1,50 \pm 0,05$	194	92	B66365-G1500-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	262	– 0,74	420	– 0,847	391	– 0,865
N67	262	– 0,74	420	– 0,820	395	– 0,881
N87	262	– 0,74	420	– 0,796	382	– 0,873

Validity range:       $K1, K2$ : 0,10 mm <  $s$  < 3,50 mm  
 $K3, K4$ : 110 nH <  $A_L$  < 1060 nH

### Coil former

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
F  $\triangle$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

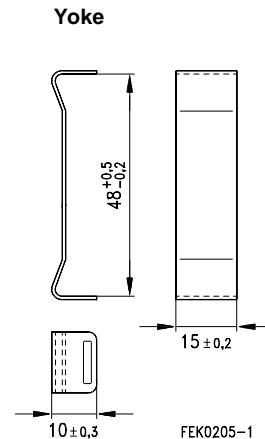
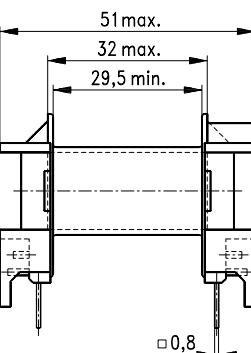
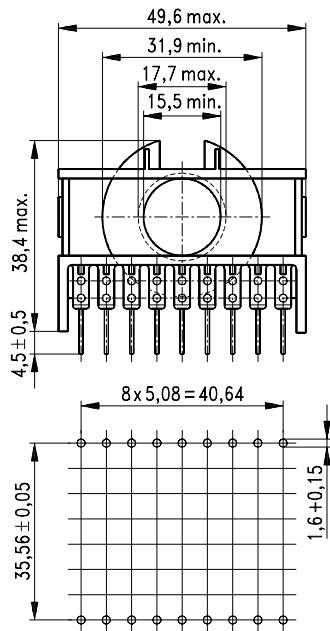
Winding: [see page 157](#)

### Yoke

Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	210	77,7	12,7	18	B66366-B1018-T1	50
Yoke (ordering code per piece, 2 are required)					B66366-A2000	200

### Coil former



FEKO265-9

FEKO205-1

Hole arrangement  
View in mounting direction

- In accordance with IEC 1185
- Quality assurance per UTE 83313-004/CECC 25 301-004 (material N27)
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces

### Magnetic characteristics (per set)

$$\Sigma/A = 0,54 \text{ mm}^{-1}$$

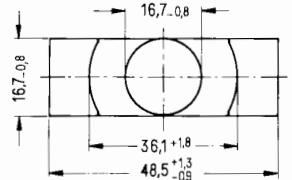
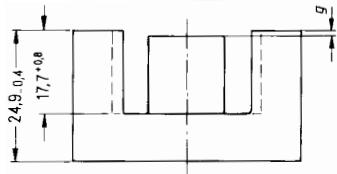
$$l_e = 114 \text{ mm}$$

$$A_e = 211 \text{ mm}^2$$

$$A_{\min} = 209 \text{ mm}^2$$

$$V_e = 24\,100 \text{ mm}^3$$

**Approx. weight** 124 g/set



FEK0061-Y

### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	3700 + 30/- 20 %	1590	2910	4,59 (200 mT, 25 kHz, 100 °C)	B66367-G-X127	100
N67	3700 + 30/- 20 %	1590	2910	15,50 (200 mT, 100 kHz, 100 °C)	B66367-G-X167	
N87	3800 + 30/- 20 %	1630	2910	12,40 (200 mT, 100 kHz, 100 °C)	B66367-G-X187	

### Gapped

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	0,20 ± 0,02	1035	444	B66367-G200-X1**	100
N67	0,50 ± 0,05	525	225	B66367-G500-X1**	
	1,00 ± 0,05	314	135	B66367-G1000-X1**	
	2,00 ± 0,05	188	81	B66367-G2000-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	314	– 0,741	504	– 0,847	470	– 0,865
N67	314	– 0,741	480	– 0,820	476	– 0,881
N87	314	– 0,741	485	– 0,796	460	– 0,873

Validity range:       $K1, K2$ : 0,10 mm <  $s$  < 3,50 mm  
                          $K3, K4$ : 120 nH <  $A_L$  < 1160 nH

### Coil former

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
 F  $\triangle$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

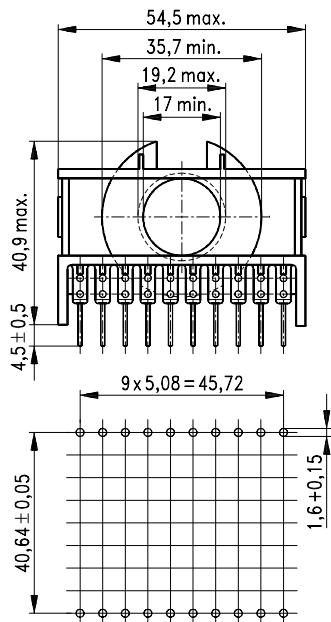
Winding: [see page 157](#)

### Yoke

Material: Stainless spring steel (0,4 mm)

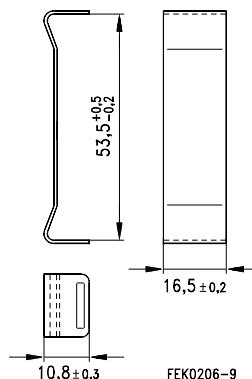
Coil former					Ordering code	PU
Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	269,4	86	11	20	B66368-B1020-T1	50
Yoke (ordering code per piece, 2 are required)					B66368-A2000	100

### Coil former



Hole arrangement  
 View in mounting direction

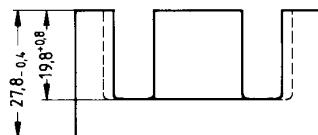
### Yoke



FEK0266-H

FEK0206-9

- In accordance with IEC 1185
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces



#### Magnetic characteristics (per set)

$$\Sigma l/A = 0,45 \text{ mm}^{-1}$$

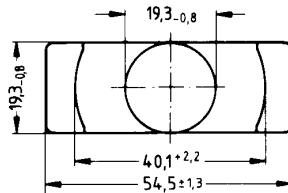
$$l_e = 127 \text{ mm}$$

$$A_e = 280 \text{ mm}^2$$

$$A_{\min} = 280 \text{ mm}^2$$

$$V_e = 35\,600 \text{ mm}^3$$

**Approx. weight** 180 g/set



FEK0065-W

#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	4200 + 30/- 20 %	1510	3470	6,66 (200 mT, 25 kHz, 100 °C)	B66395-G-X127	75
N67	4400 + 30/- 20 %	1570	3470	22,50 (200 mT, 100 kHz, 100 °C)	B66395-G-X167	
N87	4450 + 30/- 20 %	1600	3470	18,00 (200 mT, 100 kHz, 100 °C)	B66395-G-X187	

#### Gapped

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	0,20 ± 0,02	1377	496	B66395-G200-X1**	75
N67	1,00 ± 0,05	393	141	B66395-G1000-X1**	
	1,50 ± 0,05	287	103	B66395-G1500-X1**	
	2,00 ± 0,05	229	82	B66395-G2000-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	393	– 0,779	658	– 0,847	615	– 0,865
N67	393	– 0,779	624	– 0,820	623	– 0,881
N87	393	– 0,779	630	– 0,796	603	– 0,873

Validity range:       $K1, K2$ : 0,10 mm <  $s$  < 3,50 mm  
                          $K3, K4$ : 140 nH <  $A_L$  < 1390 nH

### Coil former

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
F  $\triangle$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

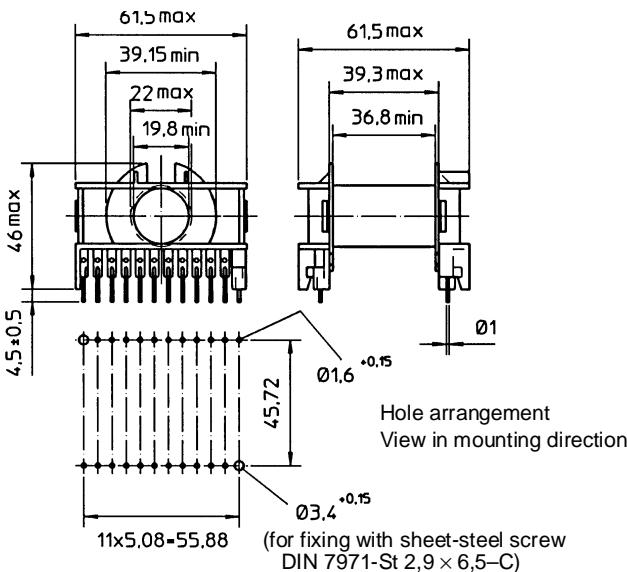
Winding: [see page 157](#)

### Yoke

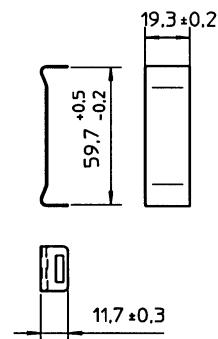
Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	315,6	96	10,5	22	B66396-A1022-T1	75
Yoke (ordering code per piece, 2 are required)					B66396-A2000	75

### Coil former



### Yoke



FEK0200-U

- In accordance with IEC 1185
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,38 \text{ mm}^{-1}$$

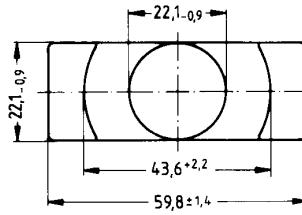
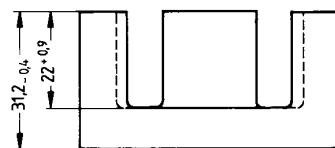
$$l_e = 139 \text{ mm}$$

$$A_e = 368 \text{ mm}^2$$

$$A_{\min} = 368 \text{ mm}^2$$

$$V_e = 51\,200 \text{ mm}^3$$

**Approx. weight** 260 g/set



FEK0066-5

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	5000 + 30/- 20 %	1500	4170	9,62 (200 mT, 25 kHz, 100 °C)	B66397-G-X127	40
N67	5200 + 30/- 20 %	1570	4170	32,50 (200 mT, 100 kHz, 100 °C)	B66397-G-X167	
N87	5300 + 30/- 20 %	1590	4170	26,00 (200 mT, 100 kHz, 100 °C)	B66397-G-X187	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	0,20 ± 0,02	1588	476	B66397-G200-X1**	40
N67	1,00 ± 0,05	508	152	B66397-G1000-X1**	
	1,50 ± 0,05	381	114	B66397-G1500-X1**	
	2,00 ± 0,05	311	93	B66397-G2000-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	508	– 0,708	853	– 0,847	799	– 0,865
N67	508	– 0,708	808	– 0,820	811	– 0,881
N87	508	– 0,708	812	– 0,796	783	– 0,873

Validity range:       $K1, K2$ : 0,10 mm <  $s$  < 3,50 mm  
                          $K3, K4$ : 170 nH <  $A_L$  < 1660 nH

### Coil former

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:  
F  $\triangle$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

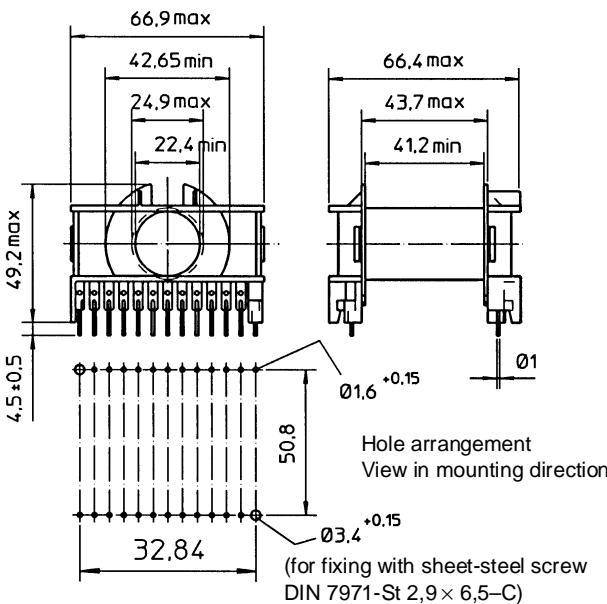
Winding: [see page 157](#)

### Yoke

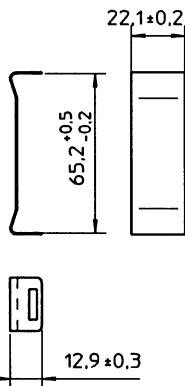
Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	365,6	106,1	10,0	24	B66398-A1024-T1	40
Yoke (ordering code per piece, 2 are required)					B66398-A2000	40

### Coil former



### Yoke

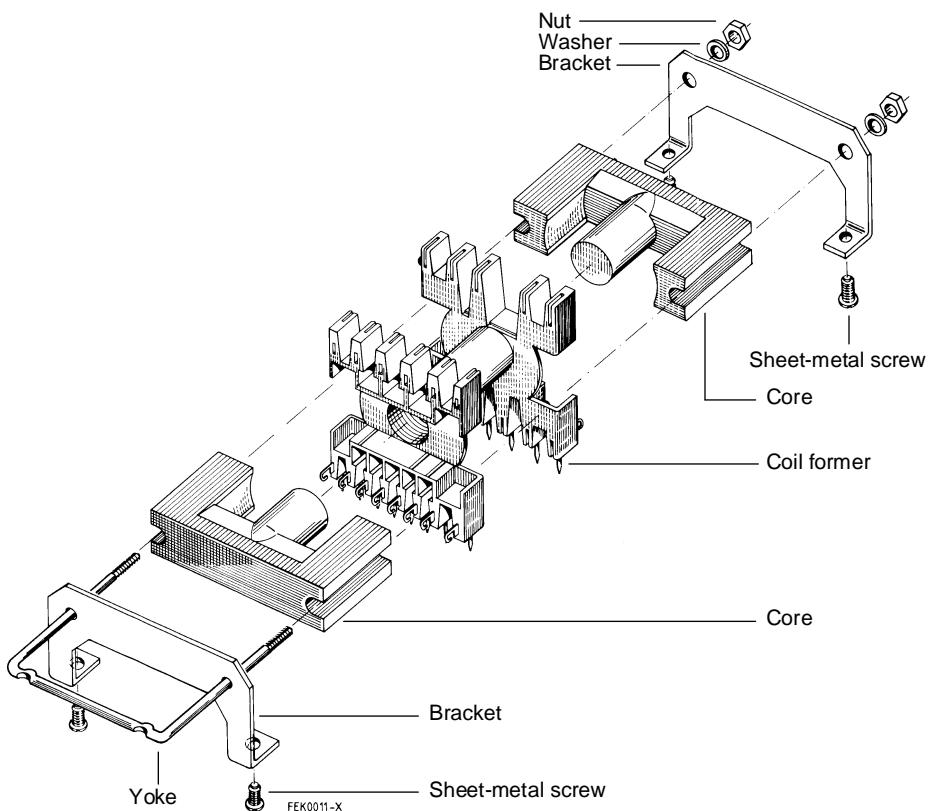


FEK0201-3

## EC Cores

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### Example of an assembly set



- In accordance with IEC 647
- Compact E core with large winding window
- Round center leg particularly suitable for use of thick winding wires
- EC cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,92 \text{ mm}^{-1}$$

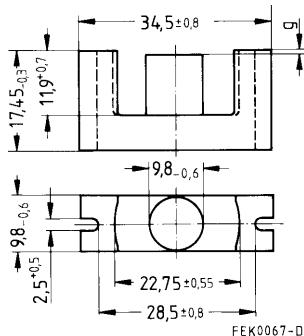
$$l_e = 77,4 \text{ mm}$$

$$A_e = 84,3 \text{ mm}^2$$

$$A_{\min} = 71 \text{ mm}^2$$

$$V_e = 6530 \text{ mm}^3$$

**Approx. weight** 36 g/set



**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2100 + 30/- 20 %	1530	1710	1,10 (200 mT, 25 kHz, 100 °C)	B66337-G-X127	200

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,10 ± 0,02	651	475	B66337-G100-X127	200
	0,25 ± 0,02	336	245	B66337-G250-X127	
	0,50 ± 0,05	203	148	B66337-G500-X127	
	1,00 ± 0,05	123	90	B66337-G1000-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	123	-0,724	214	-0,847	198	-0,865

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,50 \text{ mm}$   
 $K3, K4: 70 \text{ nH} < A_L < 680 \text{ nH}$

**Coil former with solder tags**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

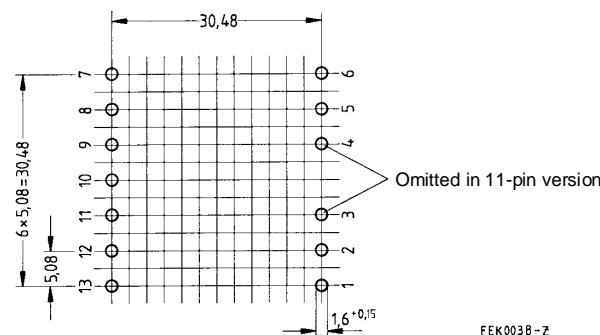
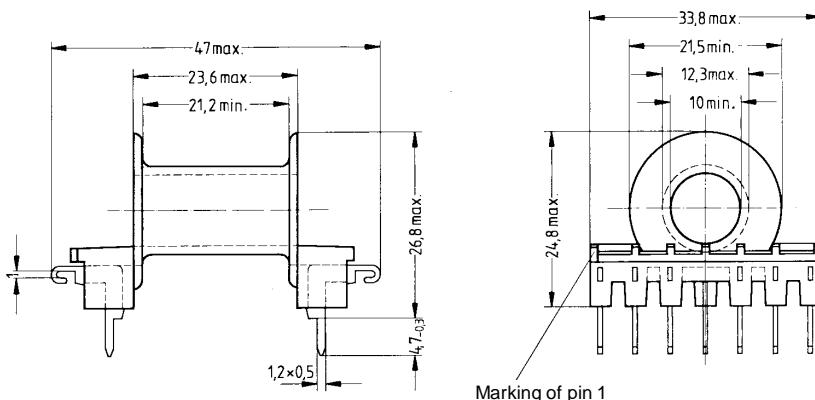
Solder tags hot-tin dipped

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 158](#)

Also available without solder terminals

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	97	53	18,8	11 13	B66272-C1001-T1 B66272-C1002-T1	100



Hole arrangement

View in mounting direction

**Coil former with solder pins**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

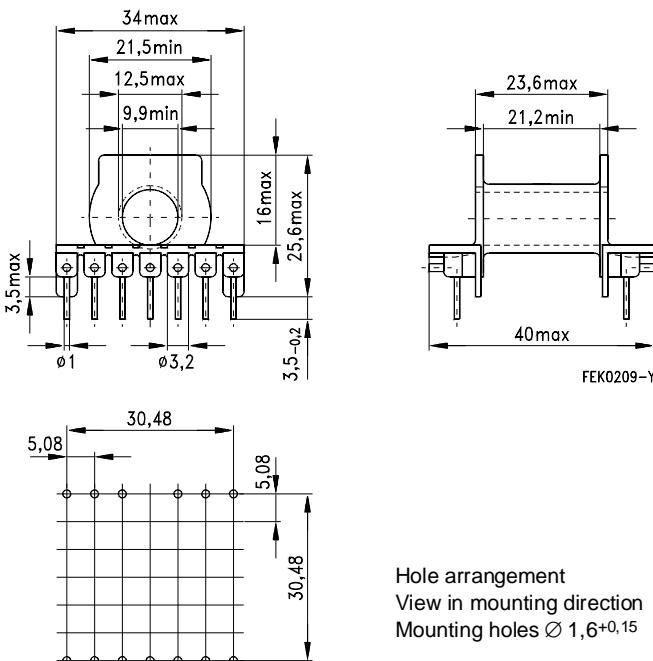
F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 158](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	97	53	18,8	13	B66272-J1013-T1	100



- In accordance with IEC 647
- Compact E core with large winding window
- Round center leg particularly suitable for use of thick winding wires
- EC cores are supplied as pieces

**Magnetic characteristics (per set)**

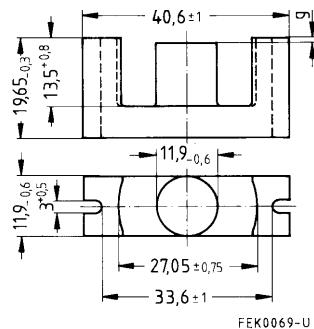
$$\Sigma/A = 0,74 \text{ mm}^{-1}$$

$$l_e = 89,3 \text{ mm}$$

$$A_e = 121 \text{ mm}^2$$

$$A_{\min} = 106 \text{ mm}^2$$

$$V_e = 10\,800 \text{ mm}^3$$

**Approx. weight** 52 g/set**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2700 + 30/- 20 %	1580	2130	1,80 (200 mT, 25 kHz, 100 °C)	B66339-G-X127	200

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,25 ± 0,02	470	275	B66339-G250-X127	200
	0,50 ± 0,05	281	165	B66339-G500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	168	- 0,742	300	- 0,847	279	- 0,865

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,50 \text{ mm}$   
 $K3, K4: 90 \text{ nH} < A_L < 850 \text{ nH}$

**Coil former (magnetic axis horizontal or vertical)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Solder tags hot-tin dipped

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 158](#)

Also available without solder terminals

**Mounting assemblies**

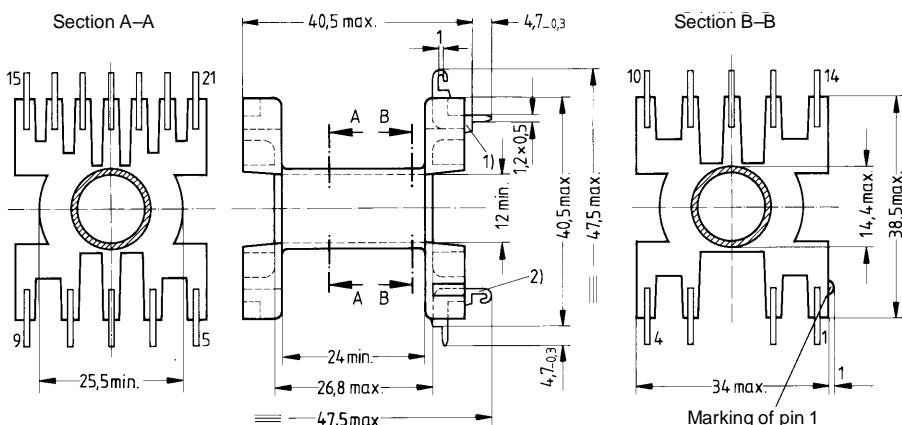
For vertical version: consisting of bracket and yoke

For horizontal version: consisting of yoke and metal strip

Max. torque for screwing the mounting assembly onto the PC board: 0,6 Nm per thread.

Coil former						Ordering code	PU Pcs
Version	Sections	$A_N$ mm <sup>2</sup>	$I_N$ mm	$A_R$ value $\mu\Omega$	Termi-nals		
Horizontal	1	134	62	15,9	9	B66274-B1001-T1	100
					12	B66274-B1002-T1	
Vertical	1	134	62	15,9	12	B66274-B1012-T1	
Mounting assembly (horizont.) complete with screws and nuts				B66274-B2001			
Mounting assembly (vertical) complete with screws and nuts				B66274-B2002			

**Coil former**

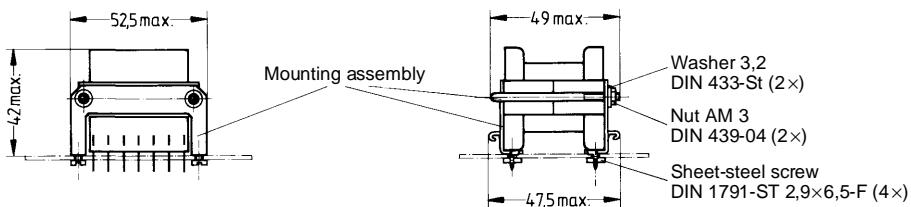


1) Position of solder tag in vertical version

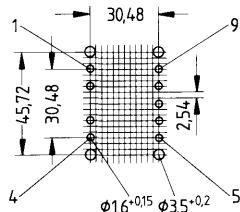
2) Position of solder tag in horizontal version

FEK0071-6

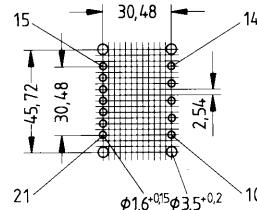
**Horizontal version:** core assembled with accessories



9 terminals



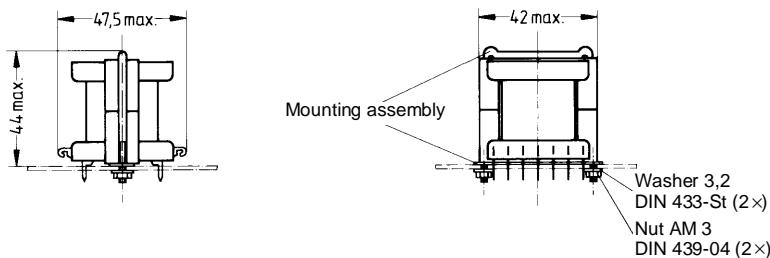
12 terminals



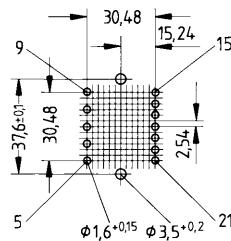
Hole arrangement  
View in mounting  
direction

FEK0072-E

**Vertical version:** core assembled with accessories



12 terminals



Hole arrangement  
View in mounting  
direction

FEK0073-M

- In accordance with IEC 647
- Compact E core with large winding window
- Round center leg particularly suitable for use of thick winding wires
- EC cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma/A = 0,58 \text{ mm}^{-1}$$

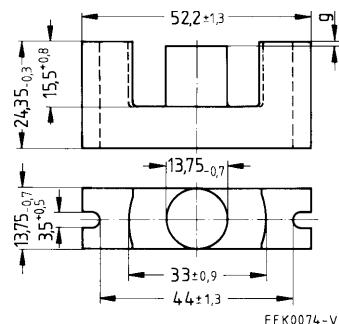
$$l_e = 105 \text{ mm}$$

$$A_e = 180 \text{ mm}^2$$

$$A_{\min} = 141 \text{ mm}^2$$

$$V_e = 18900 \text{ mm}^3$$

**Approx. weight** 110 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	3400 + 30/- 20 %	1570	2700	2,40 (200 mT, 25 kHz, 100 °C)	B66341-G-X127	100

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	$0,25 \pm 0,02$	621	288	B66341-G250-X127	100
	$1,50 \pm 0,05$	165	77	B66341-G1500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	223	- 0,739	435	- 0,847	406	- 0,865

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 3,00 \text{ mm}$   
 $K3, K4: 110 \text{ nH} < A_L < 1050 \text{ nH}$

**Coil former (magnetic axis horizontal or vertical)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Solder tags hot-tin dipped

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 158](#)

Also available without solder terminals

**Mounting assemblies**

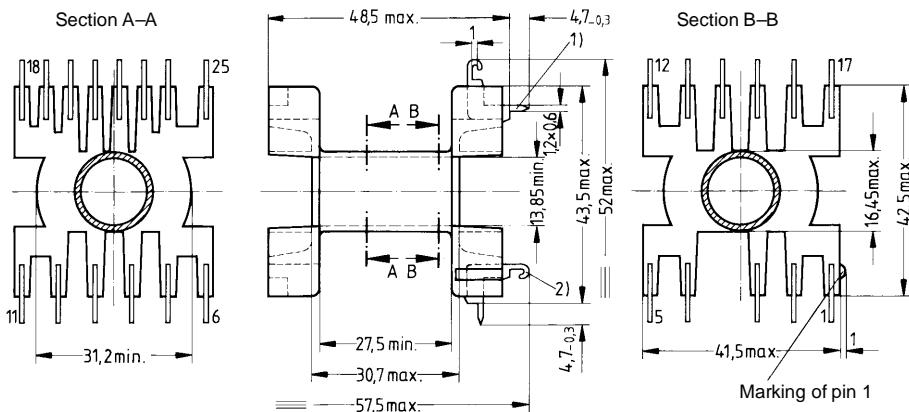
For vertical version: consisting of bracket and yoke

For horizontal version: consisting of yoke and metal strip

Max. torque for screwing the mounting assembly onto the PC board: 0,8 Nm per thread.

Coil former						Ordering code	PU Pcs
Version	Sections	$A_N$ mm <sup>2</sup>	$I_N$ mm	$A_R$ value $\mu\Omega$	Termi-nals		
Horizontal	1	212	74	12	11	B66276-B1001-T1	50
					14	B66276-B1002-T1	
Vertical	1	212	74	12	11	B66276-B1011-T1	
Mounting assembly (horizont.) complete with screws and nuts						B66276-B2001	50
Mounting assembly (vertical) complete with screws and nuts						B66276-B2002	

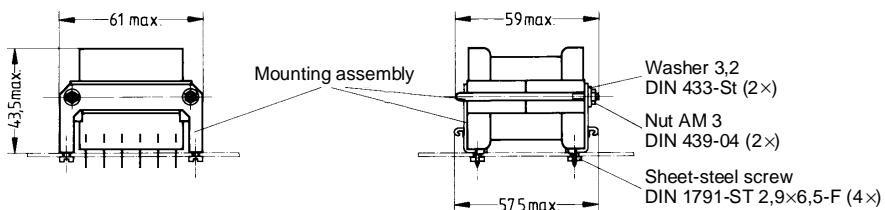
**Coil former**



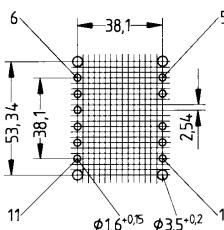
1) Position of solder tag in vertical version  
 2) Position of solder tag in horizontal version

FEK0076-C

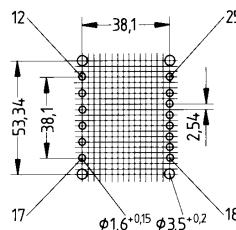
**Horizontal version:** core assembled with accessories



11 terminals



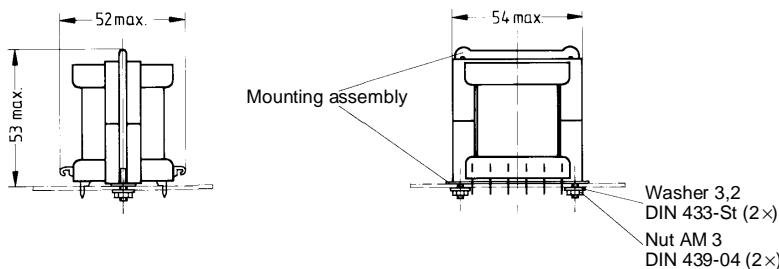
14 terminals



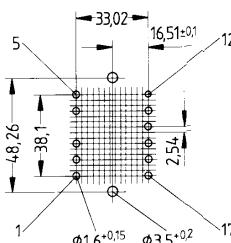
Hole arrangement  
View in mounting  
direction

FEK0077-K

**Vertical version:** core assembled with accessories



11 terminals



Hole arrangement  
View in mounting  
direction

FEK0078-T

- Nach IEC 647
- Kompakter E-Kern mit großem Wickelfenster
- Runder Mittelsteg vorteilhaft bei Verwendung dicker Drähte
- EC-Kerne werden stückweise geliefert

#### Magnetische Formkenngrößen (pro Satz)

$$\Sigma/A = 0,52 \text{ mm}^{-1}$$

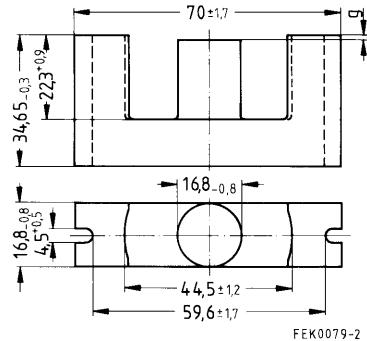
$$l_e = 144 \text{ mm}$$

$$A_e = 279 \text{ mm}^2$$

$$A_{\min} = 211 \text{ mm}^2$$

$$V_e = 40\,200 \text{ mm}^3$$

**Satzgewicht** ca. 252 g



#### ohne Luftspalt

Werkstoff	$A_L$ -Wert nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/Satz	Bestellnummer	VE Stück
N27	3900 + 30/- 20 %	1600	3050	4,80 (200 mT, 25 kHz, 100 °C)	B66343-G-X127	60

#### mit Luftspalt

Werkstoff	$g$ mm	$A_L$ -Wert ca. nH	$\mu_e$	Bestellnummer	VE Stück
N27	$0,50 \pm 0,05$	529	217	B66343-G500-X127	60
	$1,00 \pm 0,05$	320	131	B66343-G1000-X127	

Der  $A_L$ -Wert in der Tabelle gilt für einen Kernsatz, bestehend aus einem Kern ohne Luftspalt (Maß  $g = 0$ ) und einem Kern mit Luftspalt (Maß  $g > 0$ ).

#### Berechnungsfaktoren (Formeln [siehe Seite 437](#))

Werkstoff	Zusammenhang Luftspalt – $A_L$ -Wert		Berechnung der „Sättigungsstromstärke“			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	320	– 0,725	644	– 0,847	603	– 0,865

Gültigkeitsbereich:  $K1, K2: 0,10 \text{ mm} < s < 3,50 \text{ mm}$   
 $K3, K4: 120 \text{ nH} < A_L < 1200 \text{ nH}$

**Spulenkörper (liegend und stehend)**

Material: Polyterephthalat GV (UL 94 V-0, Isolierstoffklasse nach IEC 85:

F  $\triangleq$  max. Betriebstemperatur 155 °C), Kennfarbe schwarz

Lötbarkeit: nach IEC 68-2-20, Prüfung Ta, Methode 1 (Alterung 3): 235 °C, 2 s

Lötsen feuerverzinkt

Lötwärmebeständigkeit: nach IEC 68-2-20, Prüfung Tb, Methode 1B: 350 °C, 3,5 s

Bewicklung: [siehe Seite 158](#)

Auch ohne Lötanschlüsse lieferbar

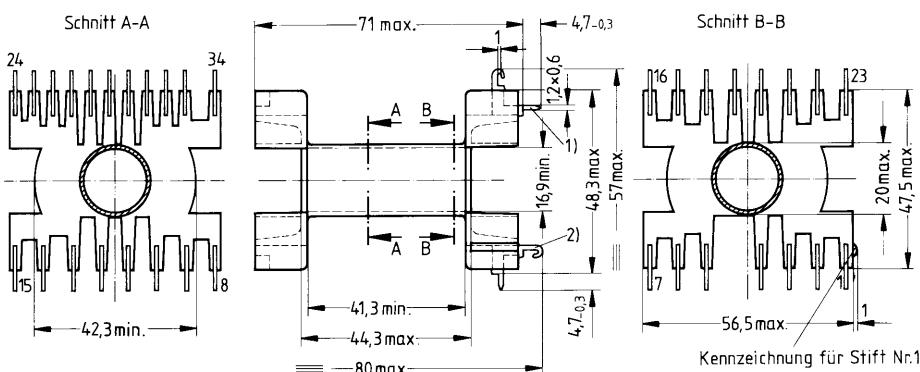
**Halterungen**

Für stehende Ausführung: bestehend aus Winkel und Bügel

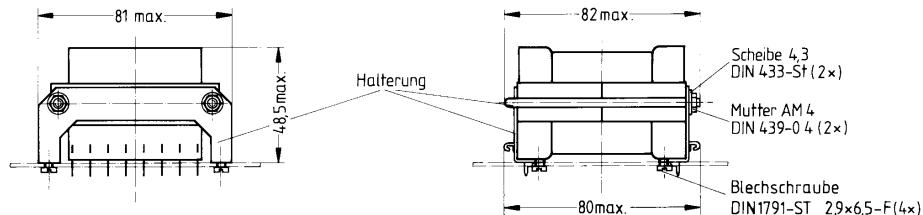
Für liegende Ausführung: bestehend aus Bügel und Band

Max. Drehmoment bei Verschraubung der Halterung auf der Platine: 1,2 Nm je Gewinde.

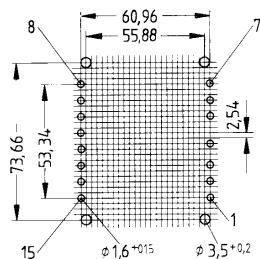
Spulenkörper						Bestellnummer	VE Stück				
Aus- führung	Kam- mern	$A_N$ mm <sup>2</sup>	$I_N$ mm	$A_R$ -Wert $\mu\Omega$	An- schlüsse						
liegend	1	469	97	7,1	15	B66278-B1001-T1	20				
					19	B66278-B1002-T1					
stehend	1	469	97	7,1	15	B66278-B1011-T1	20				
					19	B66278-B1012-T1					
Halterung (liegend) komplett mit Schrauben und Muttern						B66278-B2001	20				
Halterung (stehend) komplett mit Schrauben und Muttern						B66278-B2002					

**Spulenkörper**

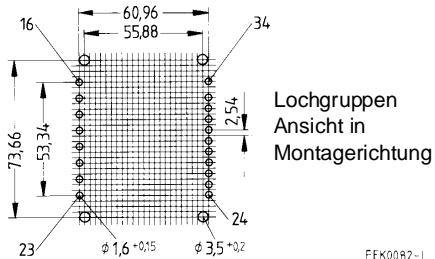
1) Einbau der Lötsche bei stehender Ausführung  
2) Einbau der Lötsche bei liegender Ausführung

**Liegende Ausführung: Kerne mit Zubehör montiert**

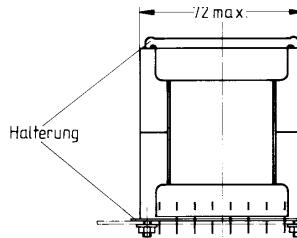
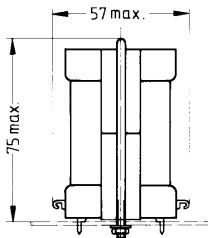
15 Anschlüsse



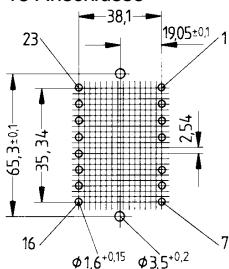
19 Anschlüsse



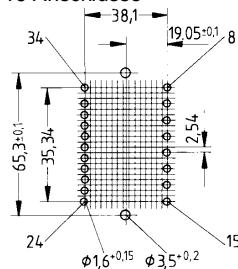
FEK0082-L

**Stehende Ausführung: Kerne mit Zubehör montiert**

15 Anschlüsse



19 Anschlüsse

Lochgruppen  
Ansicht in  
Montagerichtung

FEK0083-U

- Closed E core shape (no gap)
- For broadband transformers and current-compensated chokes

**Magnetic characteristics (per piece)**

$$\Sigma l/A = 2,59 \text{ mm}^{-1}$$

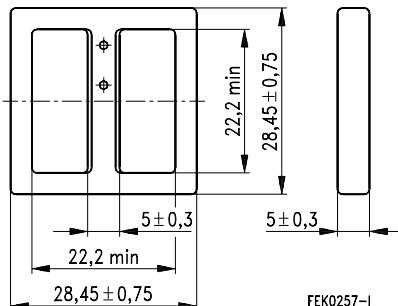
$$l_e = 70 \text{ mm}$$

$$A_e = 27 \text{ mm}^2$$

$$A_{\min} = 27 \text{ mm}^2$$

$$V_e = 1890 \text{ mm}^3$$

**Approx. weight** 15 g/piece



FEK0257-I

Material	$A_L$ value nH	Ordering code	PU Pcs
T37	$3200 \pm 20 \%$	B66399-A2-M37	880

- Closed E core design guarantees material-specific properties
- For broadband transformers and current-compensated chokes

**Magnetic characteristics (per piece)**

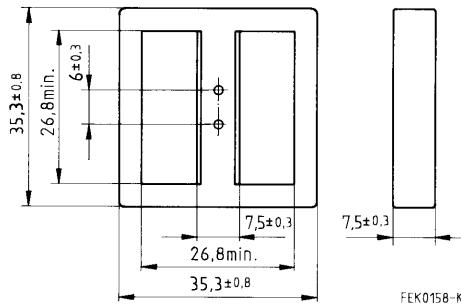
$$\Sigma l/A = 1,46 \text{ mm}^{-1}$$

$$l_e = 85 \text{ mm}$$

$$A_e = 58 \text{ mm}^2$$

$$A_{\min} = 58 \text{ mm}^2$$

$$V_e = 4970 \text{ mm}^3$$

**Approx. weight** 26 g/piece

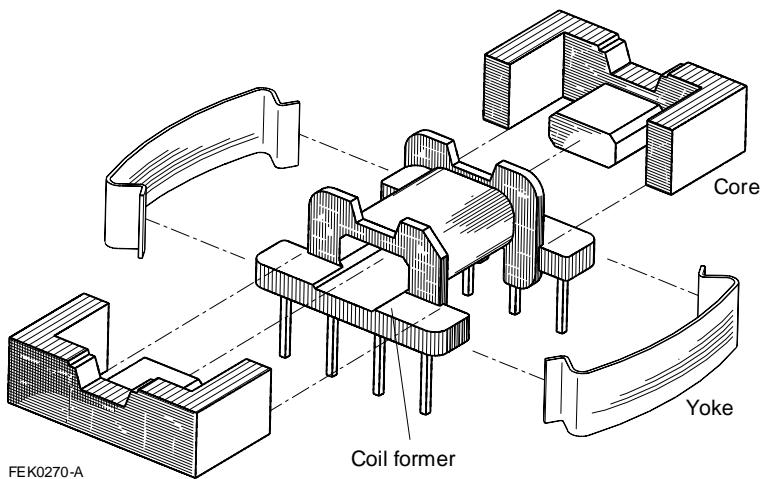
FEK0158-K

Material	$A_L$ value nH	Ordering code	PU Pcs
T37	$5400 + 40/-30\%$	B66409-A1-X37	390

## EFD Cores

---

Example of an assembly set



- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma l/A = 3,21 \text{ mm}^{-1}$$

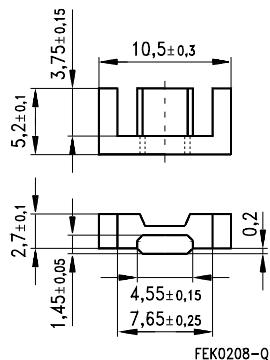
$$l_e = 23,1 \text{ mm}$$

$$A_e = 7,2 \text{ mm}^2$$

$$A_{\min} = 6,5 \text{ mm}^2$$

$$V_e = 166 \text{ mm}^3$$

**Approx. weight** 0,8 g/set



FEK0208-Q

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N59	260 + 30/- 20 %	660	200	0,037 (50 mT, 500 kHz, 100 °C)	B66411-G-X159	2000
N49	370 + 30/- 20 %	940	100	0,032 (50 mT, 500 kHz, 100 °C)	B66411-G-X149	
N87	450 + 30/- 20 %	1150	390	0,09 (200 mT, 100 kHz, 100 °C)	B66411-G-X187	

**SMD coil former with gullwing terminals**

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

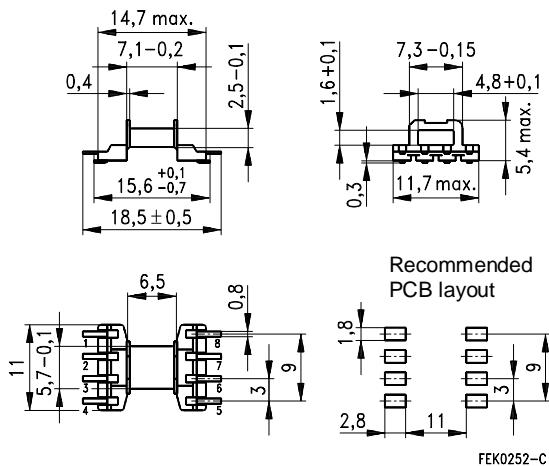
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

Winding: [see page 160](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	4,6	19,6	147	8	B66412-A6008-T1	1500



- E core with flattened, lower center leg for especially flat transformer design
- Optimized cross section of legs
- For DC/DC converters
- EPF cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma l/A = 1,5 \text{ mm}^{-1}$$

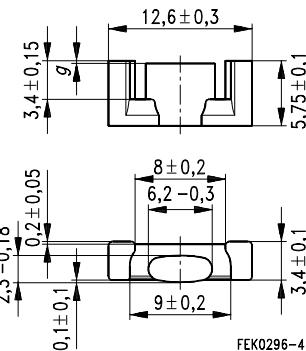
$$l_e = 21,5 \text{ mm}$$

$$A_e = 14,5 \text{ mm}^2$$

$$A_{\min} = 12,6 \text{ mm}^2$$

$$V_e = 310 \text{ mm}^3$$

**Approx. weight** 1,5 g/set



**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N87	850 + 30/- 20 %	1010	670	0,20 (200 mT, 100 kHz, 100 °C)	B66427-G-X187	3600

**Gapped**

Material	$A_L$ value nH	$\mu_e$	$g$ approx. mm	Ordering code	PU Pcs
N87	100 ± 15 %	119	0,15	B66427-U100-L187	3600
	70 ± 10 %	83	0,25	B66427-U70-K187	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N87	26,1	- 0,720	47	- 0,796	39	- 0,873

Validity range:       $K1, K2: 0,10 \text{ mm} < s < 1,00 \text{ mm}$   
 $K3, K4: 50 \text{ nH} < A_L < 410 \text{ nH}$

- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma I/A = 2,27 \text{ mm}^{-1}$$

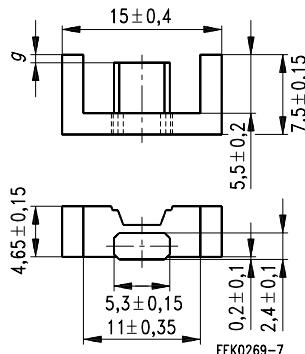
$$l_e = 34 \text{ mm}$$

$$A_e = 15 \text{ mm}^2$$

$$A_{\min} = 12,2 \text{ mm}^2$$

$$V_e = 510 \text{ mm}^3$$

**Approx. weight** 2,8 g/set



**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N49	600 + 30/- 20 %	1080	330	0,11 (50 mT, 500 kHz, 100 °C)	B66413-G-X149	1920
N87	780 + 30/- 20 %	1400	560	0,28 (200 mT, 100 kHz, 100 °C)	B66413-G-X187	

**Gapped**

Material	$A_L$ value nH	$\mu_e$	$g$ approx. mm	Ordering code	PU Pcs
N87	100 ± 10 %	180	0,17	B66413-U100-K187	1920
	160 ± 15 %	288	0,08	B66413-U160-L187	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N87	29,7	- 0,676	44,2	- 0,796	33,2	- 0,873

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 1,00 \text{ mm}$   
 $K3, K4: 30 \text{ nH} < A_L < 280 \text{ nH}$

### Coil former

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max.operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 156](#)

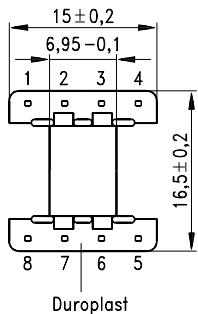
Squared pins

### Yoke

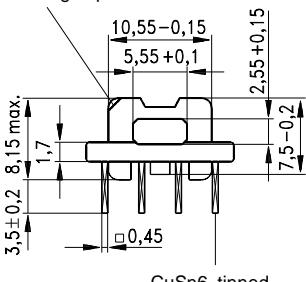
- Material: Stainless spring steel (0,25 mm)

Coil former					Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		
1	15,8	29	63,1	8	B66414-B1008-D1	960
Yoke (ordering code per piece, 2 are required)					B66414-B2000	1920

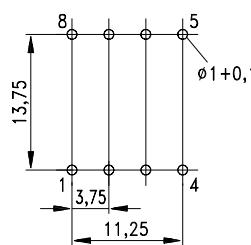
### Coil former



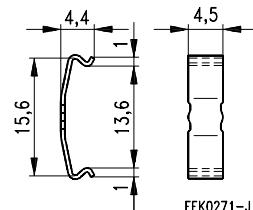
Marking of pin 1



### Mounting holes



### Yoke



FEK0216-G

### SMD coil former with J terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

Winding: [see page 160](#)

### Yoke

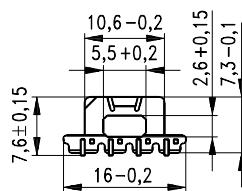
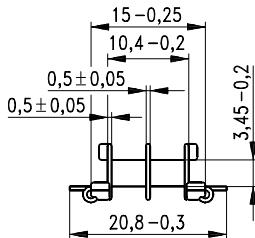
- Material: Stainless spring steel (0,25 mm)

### Cover plate

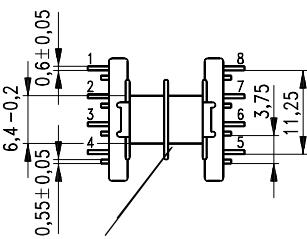
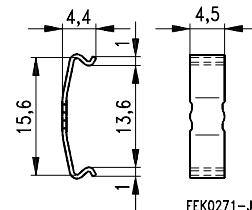
- For marking and improved processing on assembly machines
- See under coil former for material and resistance to soldering heat

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	20,4	36	60	8	B66414-A6008-T1	960
2	19,5	36	64	8	B66414-A6008-T2	
Yoke (ordering code per piece, 2 are required)				B66414-B2000		1920
Cover plate				B66414-A7000		960

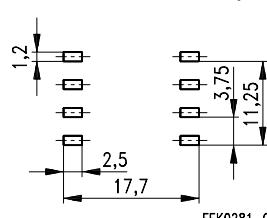
### Coil former



### Yoke

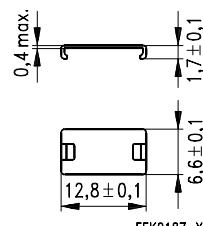


Recommended PCB layout



Center flange omitted for one-section version

### Cover plate



- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces

#### Magnetic characteristics (per set)

$$\Sigma/A = 1,52 \text{ mm}^{-1}$$

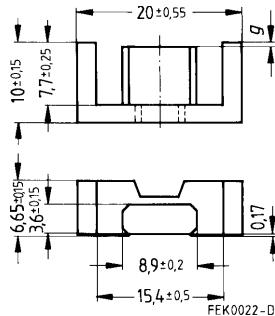
$$l_e = 47 \text{ mm}$$

$$A_e = 31 \text{ mm}^2$$

$$A_{\min} = 31 \text{ mm}^2$$

$$V_e = 1460 \text{ mm}^3$$

**Approx. weight** 7,2 g/set



#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N49	910 + 30/- 20 %	1100	750	0,29 (50 mT, 500 kHz, 100 °C)	B66417-G-X149	1260
N87	1200 + 30/- 20 %	1440	660	1,05 (200 mT, 100 kHz, 100 °C)	B66417-G-X187	

#### Gapped

Material	$A_L$ value nH	$\mu_e$	$g$ approx. mm	Ordering code	PU Pcs
N87	100 ± 10 %	120	0,49	B66417-U100-K187	1260
	160 ± 10 %	193	0,25	B66417-U160-L187	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

#### Calculation factors ( [see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N87	61,1	- 0,699	85,4	- 0,796	75,7	- 0,873

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 1,40 \text{ mm}$   
 $K3, K4: 50 \text{ nH} < A_L < 410 \text{ nH}$

### Coil former

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max.operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 156](#)

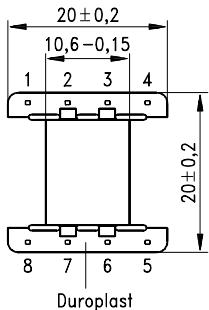
Squared pins

### Yoke

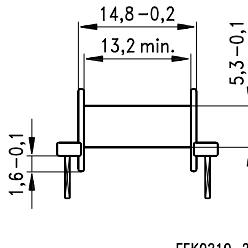
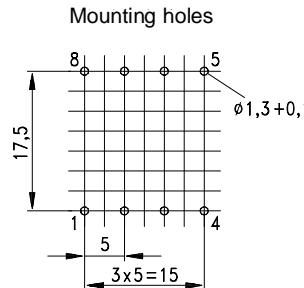
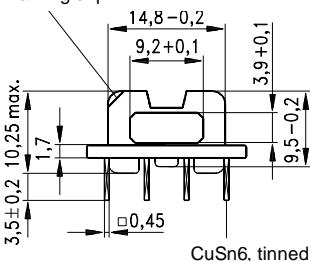
- Material: Stainless spring steel (0,3 mm)

Coil former					Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		
1	28,1	40,2	49,2	8	B66418-B1008-D1	630
Yoke (ordering code per piece, 2 are required)					B66418-B2000	1260

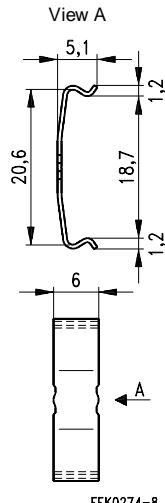
### Coil former



Marking of pin 1



### Yoke



FEK0274-8

- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces

#### Magnetic characteristics (per set)

$$\Sigma I/A = 0,98 \text{ mm}^{-1}$$

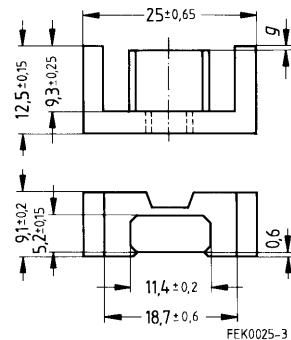
$$l_e = 57 \text{ mm}$$

$$A_e = 58 \text{ mm}^2$$

$$A_{\min} = 57 \text{ mm}^2$$

$$V_e = 3310 \text{ mm}^3$$

**Approx. weight** 16,6 g/set



#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N67	2000 + 30/- 20 %	1560	1280	2,10 (200 mT, 100 kHz, 100 °C)	B66421-G-X167	650
N87	2000 + 30/- 20 %	1560	1280	1,80 (200 mT, 100 kHz, 100 °C)	B66421-G-X187	

#### Gapped

Material	$A_L$ value nH	$\mu_e$	$g$ approx. mm	Ordering code ** = 67 (N67) = 87 (N87)	PU Pcs
N67,	160 ± 10 %	125	0,55	B66421-U160-K1**	650
N87	250 ± 10 %	195	0,30	B66421-U250-K1**	
	315 ± 10 %	246	0,22	B66421-U315-K1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

#### Calculation factors (see page 437 for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N67	103	- 0,734	150	- 0,820	142	- 0,881
N87	103	- 0,734	154	- 0,796	138	- 0,873

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 1,40 \text{ mm}$   
 $K3, K4: 50 \text{ nH} < A_L < 410 \text{ nH}$

### Coil former

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max.operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 156](#)

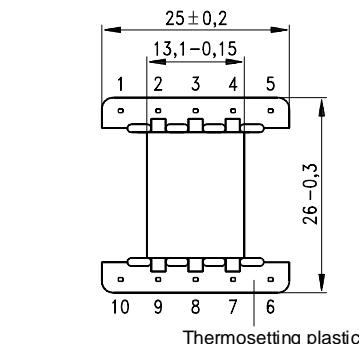
Squared pins

### Yoke

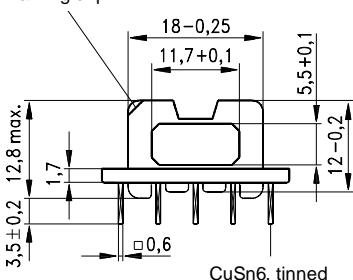
- Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		
1	40,7	50	42,3	10	B66422-B1010-D1	325
Yoke (ordering code per piece, 2 are required)					B66422-B2000	650

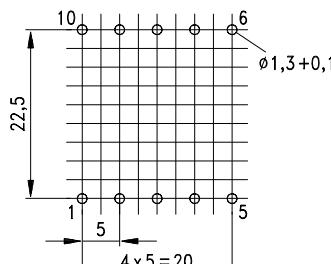
### Coil former



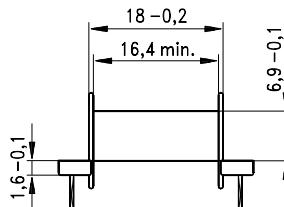
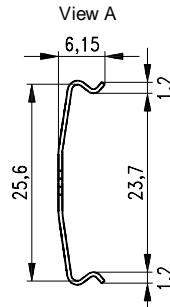
Marking of pin 1



### Mounting holes



### Yoke



- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces

#### Magnetic characteristics (per set)

$$\Sigma l/A = 0,99 \text{ mm}^{-1}$$

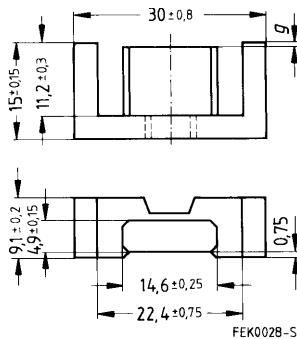
$$l_e = 68 \text{ mm}$$

$$A_e = 69 \text{ mm}^2$$

$$A_{\min} = 69 \text{ mm}^2$$

$$V_e = 4690 \text{ mm}^3$$

Approx. weight 24 g/set



#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N67	2050 + 30/- 20 %	1610	1280	3,00 (200 mT, 100 kHz, 100 °C)	B66423-G-X167	250
N87	2050 + 30/- 20 %	1610	1280	2,60 (200 mT, 100 kHz, 100 °C)	B66423-G-X187	

#### Gapped

Material	$A_L$ value nH	$\mu_e$	$g$ approx. mm	Ordering code ** = 67 (N67) = 87 (N87)	PU Pcs
N67,	160 ± 10 %	125	0,71	B66423-U160-K1**	250
N87	250 ± 10 %	196	0,38	B66423-U250-K1**	
	315 ± 10 %	246	0,27	B66423-U315-K1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

#### Calculation factors (see page 437 for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N67	125	- 0,712	172	- 0,820	166	- 0,881
N87	125	- 0,712	176	- 0,796	161	- 0,873

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,00 \text{ mm}$   
 $K3, K4: 70 \text{ nH} < A_L < 630 \text{ nH}$

### Coil former

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85:  
 F  $\leq$  max. operating temperature 155 °C), color code green

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 156](#)

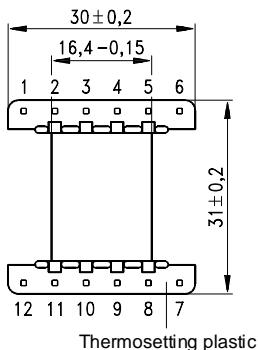
Square pins

### Yoke

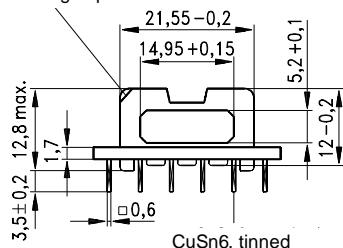
- Material: Stainless spring steel (0,45 mm)

Coil former					Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		
1	52,3	56,7	37,3	12	B66424-B1012-D1	125
Yoke (ordering code per piece, 2 are required)					B66424-B2000	250

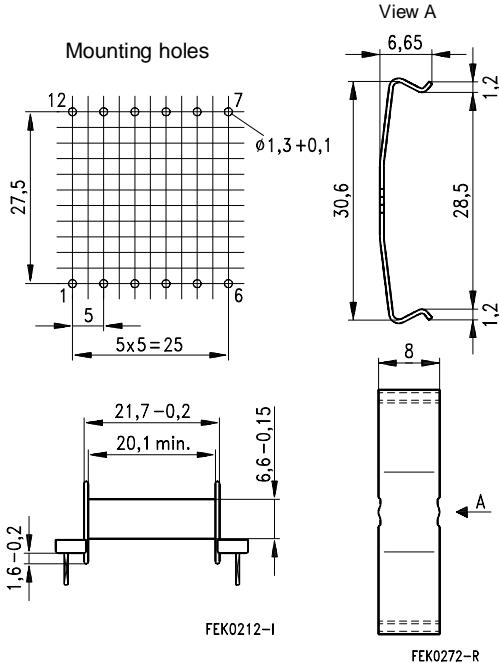
### Coil former



### Marking of pin 1



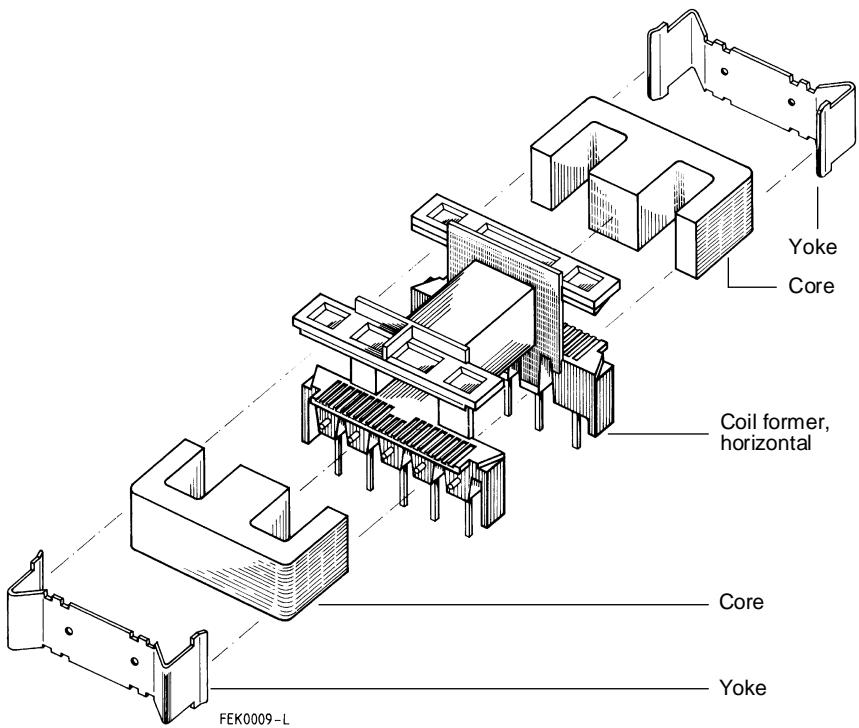
### Yoke



## E Cores

---

Example of an assembly set using a coil former with horizontal magnetic axis (E 20/6)



- For miniature transformers, e.g. DC/DC converters for surface mounting
- Available with SMD coil former
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma l/A = 3,7 \text{ mm}^{-1}$$

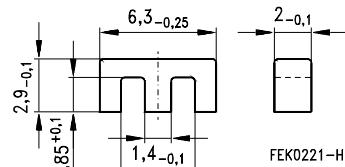
$$l_e = 12,2 \text{ mm}$$

$$A_e = 3,3 \text{ mm}^2$$

$$A_{\min} = 2,6 \text{ mm}^2$$

$$V_e = 40,3 \text{ mm}^3$$

**Approx. weight** 0,12 g/set



FEK0221-H

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ mH	Ordering code	PU Pcs
T38	1700 + 40/- 30 %	4990	—	B66300-G-X138	10000
N67	380 + 30/- 20 %	1120	300	B66300-G-X167	

The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

Winding: [see page 160](#)

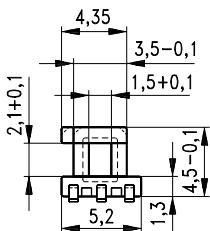
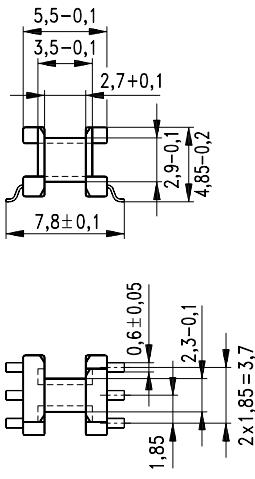
### Plastic cover cap

Used to protect the transformer against external influences, for stamping and for improved processing on assembly machines

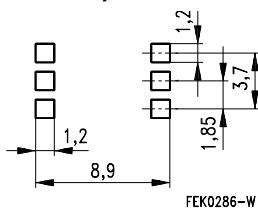
Material: see coil former, color code white

Coil former					Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals		
1	0,9	12,8	489	6	B66296-B1006-T1	5000
Plastic cover cap					B66301-C2000	5000

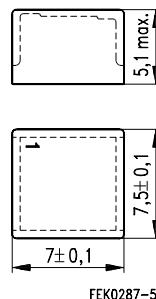
### Coil former



Recommended  
PCB layout



### Plastic cover cap



FEK0287-5

### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

Winding: [see page 160](#)

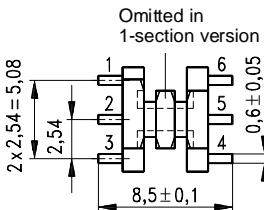
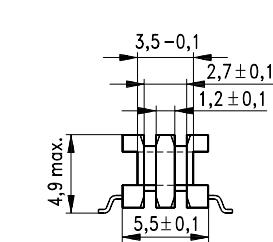
### Plastic cover cap

Used to protect the transformer against external influences, for stamping and for improved processing on assembly machines

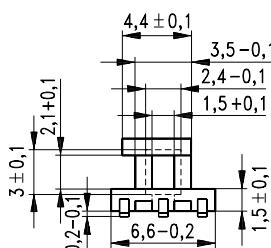
Material: see coil former, color code white

Coil former					Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals		Pcs
1	1,62	12,8	272	4	B66301-B1004-T1	5000
				6	B66301-B1006-T1	
2	0,9	12,8	490	4	B66301-B1004-T2	
				6	B66301-B1006-T2	
Plastic cover cap					B66301-C2000	5000

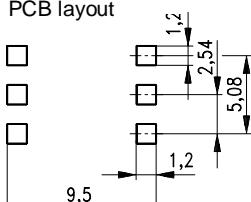
### Coil former



Terminals 2 and 5 are omitted in 4-terminal version

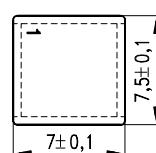
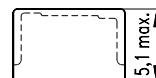


Recommended  
PCB layout



FEK0288-D

### Plastic cover cap



FEK0287-5

- In accordance with IEC 1246
- For miniature transformers, e.g. DC/DC converters for surface mounting
- Available with SMD coil former
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma/A = 3,1 \text{ mm}^{-1}$$

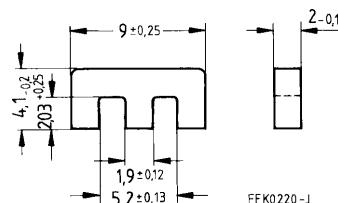
$$I_e = 15,5 \text{ mm}$$

$$A_e = 5 \text{ mm}^2$$

$$A_{\min} = 3,6 \text{ mm}^2$$

$$V_e = 78 \text{ mm}^3$$

**Approx. weight** 0,50 g/set



FEK0220-J

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	1000 + 30/- 20 %	2460			B66302-G-X130	5000
T38	2100 + 40/- 30 %	5170			B66302-G-X138	
N67	550 + 30/- 20 %	1350	400	0,04 (200 mT, 100 kHz, 100 °C)	B66302-G-X167	

The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

Winding: [see page 160](#)

### Plastic cover cap

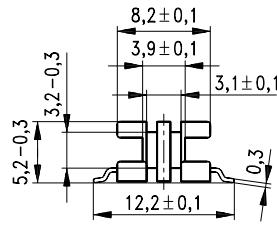
Used to protect the transformer against external influences, for stamping and for improved processing on assembly machines

Material: GFR polyamide (UL 94 V-0, insulation class to IEC 85:

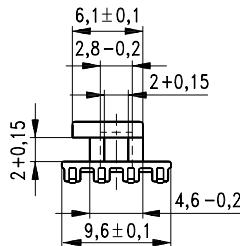
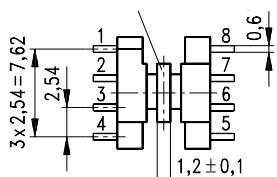
F  $\leq$  max. operating temperature 155 °C), color code white

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	2,7	14,9	190	8	B66302-D1008-T1	2500
2	1,7	14,9	302	8	B66302-D1008-T2	
Plastic cover cap						B66302-A2000

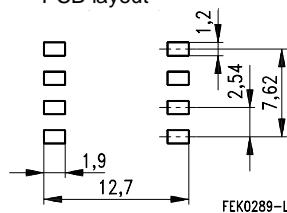
### Coil former



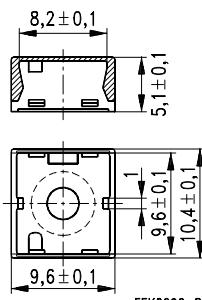
Omitted in  
1-section version



Recommended  
PCB layout



### Plastic cover cap



FEK0290-P

- In accordance with IEC 1246
- For miniature transformers
- Available with SMD coil former
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma/A = 2,39 \text{ mm}^{-1}$$

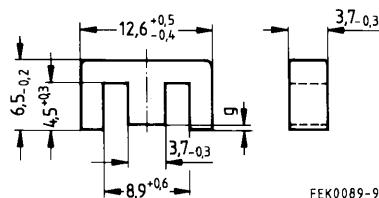
$$l_e = 29,6 \text{ mm}$$

$$A_e = 12,4 \text{ mm}^2$$

$$A_{\min} = 12,2 \text{ mm}^2$$

$$V_e = 367 \text{ mm}^3$$

**Approx. weight** 2 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	1000 + 30/-20 %	1900			B66305-G-X130	3450
N27	800 + 30/-20 %	1510	530	0,40 (200 mT, 100 kHz, 100 °C)	B66305-G-X127	
N67	830 + 30/-20 %	1570	530	0,25 (200 mT, 100 kHz, 100 °C)	B66305-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,04 ± 0,01	250	454	B66305-G40-X127	3450

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	28,4	- 0,676	36,5	- 0,847	33,2	- 0,865
N67	28,4	- 0,676	36,0	- 0,820	32,9	- 0,881

Validity range:  $K1, K2: 0,03 \text{ mm} < s < 1,00 \text{ mm}$   
 $K3, K4: 30 \text{ nH} < A_L < 260 \text{ nH}$

**Coil former (magnetic axis horizontal or vertical)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 159](#)

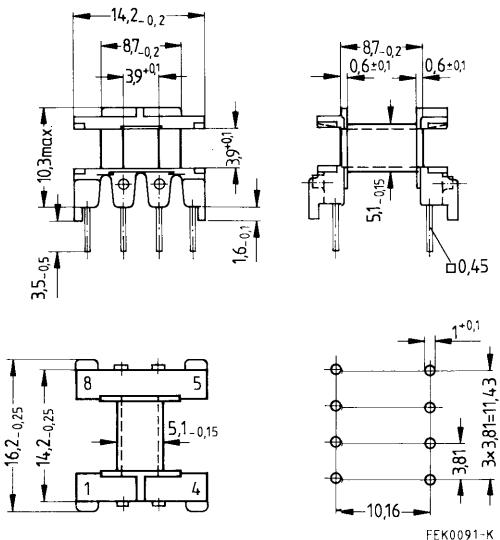
Squared pins

**Yoke**

Material: Stainless spring steel (0,2 mm)

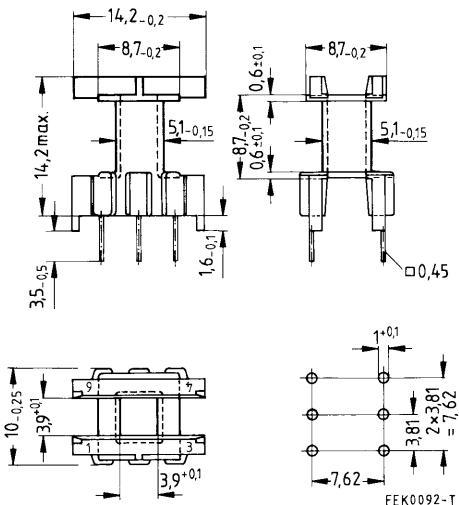
Coil former						Ordering code	PU
Figure	Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	1	11,6	27,2	80,6	8	B66202-A1108-T1	1725
2	1	11,6	27,2	80,6	6	B66202-J1106-T1	
Yoke (ordering code per piece, 2 are required)						B66202-A2010	3450

**Figure 1, horizontal version**



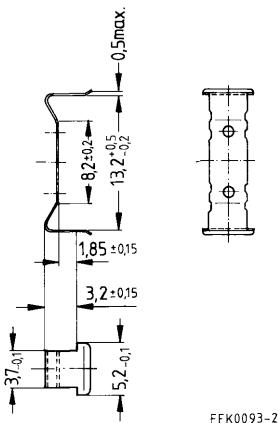
Hole arrangement  
View in mounting direction

**Figure 2, vertical version**



Hole arrangement  
View in mounting direction

### **Yoke**



### SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

permissible soldering temperature for wire-wrap connection on coil former: 400 °C, 1 s

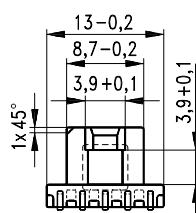
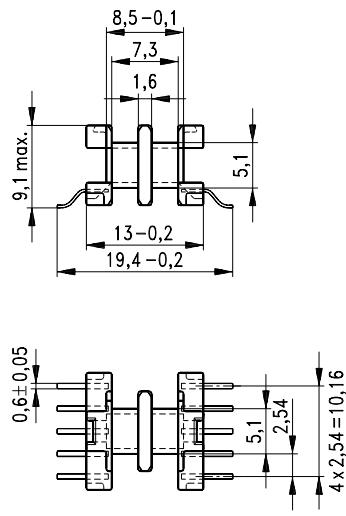
Winding: [see page 160](#)

### Cover plate

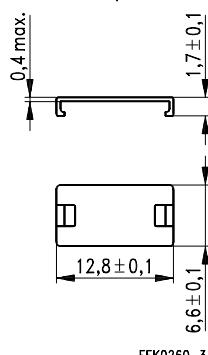
- For stamping and for improved processing on assembly machines
- See under coil former for material and resistance to soldering heat

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Terminals	Ordering code	PU Pcs
1	13,0	27	71	10	B66306-C1010-T1	1725
2	10,2	27	91	10		
Cover plate		B66414-A7000		960		

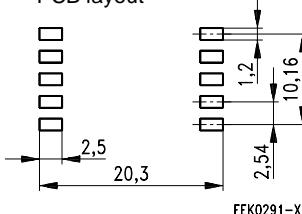
### Coil former



### Cover plate



Recommended  
PCB layout



FEK0260-3

FEK0291-X

- In accordance with IEC 1246
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

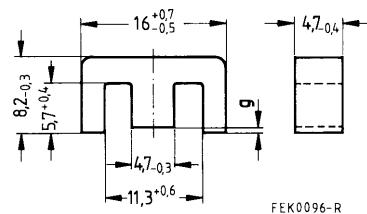
$$\Sigma/A = 1,87 \text{ mm}^{-1}$$

$$l_e = 37,6 \text{ mm}$$

$$A_e = 20,1 \text{ mm}^2$$

$$A_{\min} = 19,4 \text{ mm}^2$$

$$V_e = 756 \text{ mm}^3$$



**Approx. weight** 3,6 g/set

**Ungapped**

Material	$A_L$ -Wert nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	1400 + 30/-20 %	2080			B66307-G-X130	2000
N27	950 + 30/-20 %	1410	670	0,14 (200 mT, 25 kHz, 100 °C)	B66307-G-X127	
N67	990 + 30/-20 %	1470	670	0,45 (200 mT, 100 kHz, 100 °C)	B66307-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	$0,06 \pm 0,01$	303	450	B66307-G60-X127	2000
	$0,10 \pm 0,02$	212	315	B66307-G100-X127	
	$0,50 \pm 0,05$	69	102	B66307-G500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	42,2	-0,701	57,0	-0,847	52,1	-0,865
N67	42,2	-0,701	55,9	-0,820	51,8	-0,881

Validity range:  $K1, K2: 0,05 \text{ mm} < s < 1,50 \text{ mm}$   
 $K3, K4: 30 \text{ nH} < A_L < 330 \text{ nH}$

**Coil former (magnetic axis horizontal or vertical)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 159](#)

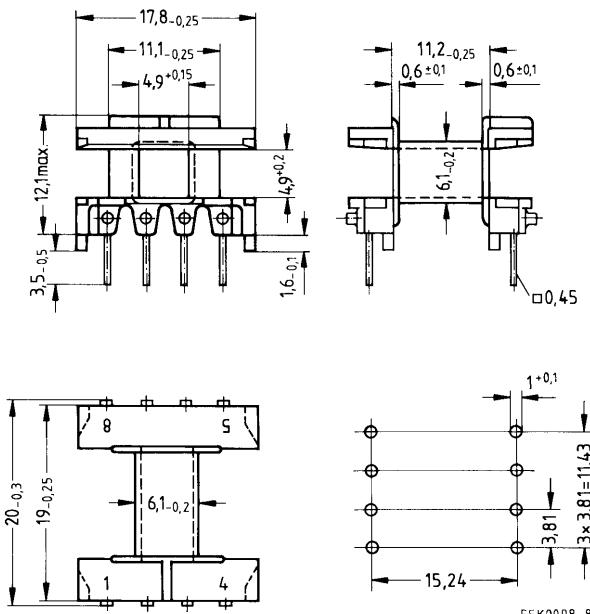
Squared pins

**Yoke**

Material: Stainless spring steel (0,2 mm)

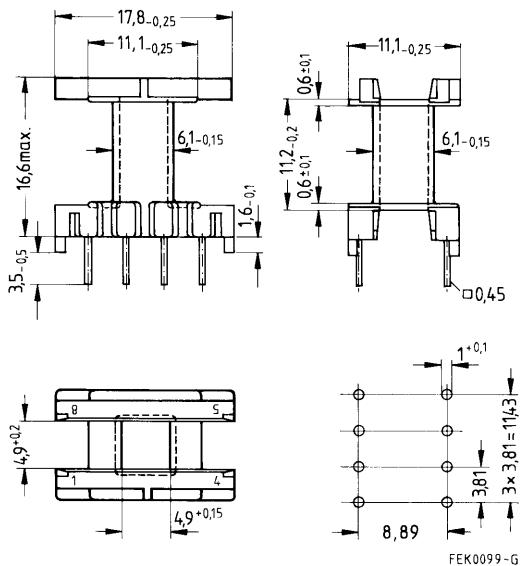
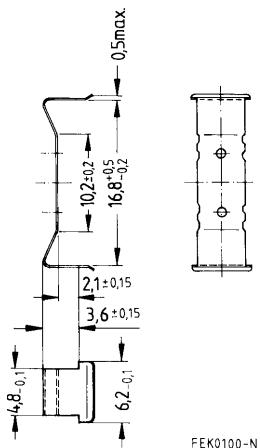
Coil former						Ordering code	PU Pcs
Figure	Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		
1	1	22,3	34	52,4	8	B66308-A1108-T1	1000
2	1	22,3	34	52,4	8	B66308-J1108-T1	
Yoke (ordering code per piece, 2 are required)				B66308-A2010			2000

**Figure 1, horizontal version**



Hole arrangement  
View in mounting direction

Figure 2, vertical version

**Yoke**

- Shortened leg compared with E 16/8/5
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

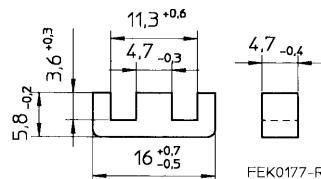
$$\Sigma/A = 1,49 \text{ mm}^{-1}$$

$$l_e = 28,6 \text{ mm}$$

$$A_e = 19,2 \text{ mm}^2$$

$$A_{\min} = 17,6 \text{ mm}^2$$

$$V_e = 549 \text{ mm}^3$$



**Approx. weight** 3 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	1100 + 30/-20 %	1300	850	0,10 (200 mT, 25 kHz, 100 °C)	B66393-G-X127	2000

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	42,0	- 0,764	56,7	- 0,847	51,7	- 0,865

Validity range:  $K1, K2: 0,05 \text{ mm} < s < 1,50 \text{ mm}$   
 $K3, K4: 40 \text{ nH} < A_L < 430 \text{ nH}$

- Size based on US lam. size E cores  
US designation E 187
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma l/A = 1,76 \text{ mm}^{-1}$$

$$l_e = 39,6 \text{ mm}$$

$$A_e = 22,5 \text{ mm}^2$$

$$A_{\min} = 22,1 \text{ mm}^2$$

$$V_e = 891 \text{ mm}^3$$

**Approx. weight** 4,4 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	1700 + 30/-20 %	2380			B66379-G-X130	1785
N27	1050 + 30/-20 %	1470	720	0,18 (200 mT, 25 kHz, 100°C)	B66379-G-X127	
N67	1100 + 30/-20 %	1540	720	0,55 (200 mT, 100 kHz, 100°C)	B66379-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	$0,25 \pm 0,02$	122	170	B66379-G250-X127	1785

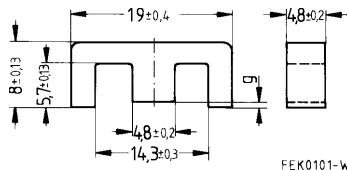
The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	46,4	- 0,697	63,3	- 0,847	57,9	- 0,865
N67	46,4	- 0,697	61,9	- 0,820	57,6	- 0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,00 \text{ mm}$

$K3, K4: 40 \text{ nH} < A_L < 350 \text{ nH}$



- In accordance with IEC 1246
- Cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma/A = 1,44 \text{ mm}^{-1}$$

$$l_e = 46,3 \text{ mm}$$

$$A_e = 32,1 \text{ mm}^2$$

$$A_{\min} = 31,9 \text{ mm}^2$$

$$V_e = 1490 \text{ mm}^3$$

**Approx. weight** 7,3 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	2150 + 30/- 20 %	2460			B66311-G-X130	1470
N27	1300 + 30/- 20 %	1490	1090	0,27 (200 mT, 25 kHz, 100 °C)	B66311-G-X127	
N67	1350 + 30/- 20 %	1540	1090	0,92 (200 mT, 100 kHz, 100 °C)	B66311-G-X167	

**Gapped**

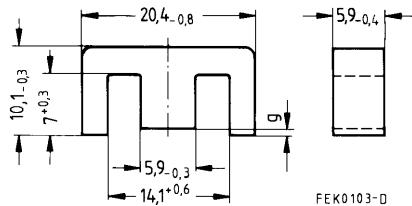
Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	0,09 ± 0,01	329	415	B66311-G90-X1**	1470
N67	0,17 ± 0,02	227	259	B66311-G170-X1**	
	0,25 ± 0,02	171	195	B66311-G250-X1**	
	0,50 ± 0,05	103	118	B66311-G500-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	62,2	- 0,692	88,1	- 0,847	80,9	- 0,865
N67	62,2	- 0,692	85,9	- 0,820	80,9	- 0,881

Validity range:  $K1, K2: 0,05 \text{ mm} < s < 1,50 \text{ mm}$   
 $K3, K4: 50 \text{ nH} < A_L < 430 \text{ nH}$



**Coil former (magnetic axis horizontal or vertical)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

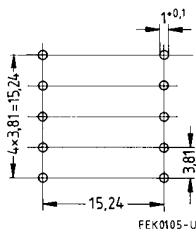
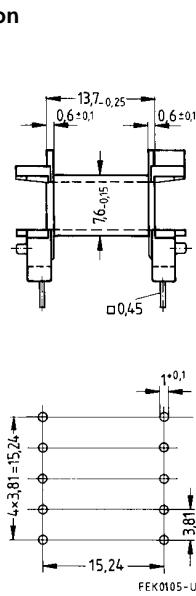
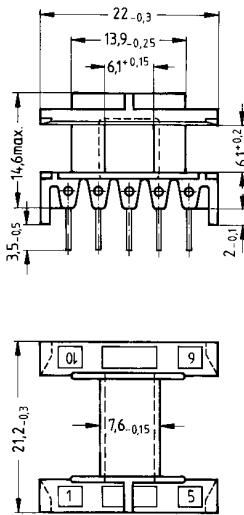
Winding: [see page 159](#)

Squared pins

For matching yoke see next page

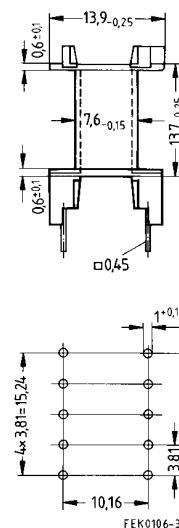
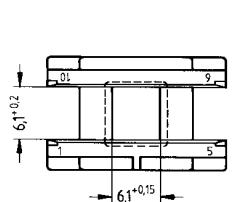
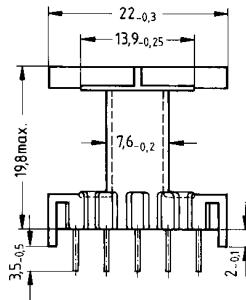
Figure	Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	1	34	41,2	42	10	B66206-A1110-T1	735
2	1	34	41,2	42	10	B66206-J1110-T1	

**Figure 1, horizontal version**



Hole arrangement  
View in mounting  
direction

**Figure 2, vertical version**



Hole arrangement  
View in mounting  
direction

**Coil former (with right-angle pins)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

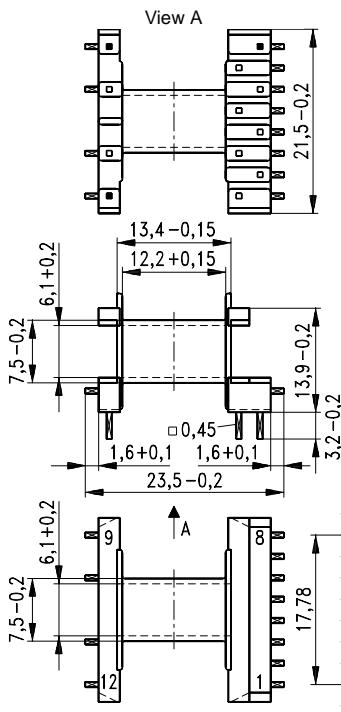
Winding: [see page 159](#)

Squared pins

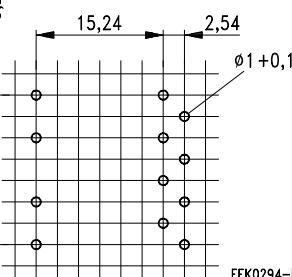
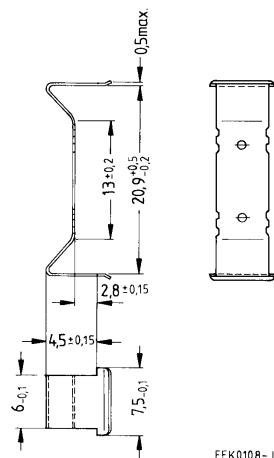
**Yoke**

Material: Stainless spring steel (0,2 mm)

Coil former					Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	34	41,2	42	12	B66206-C1012-T1	1470
1	34	41,2	42	14	on request	
Yoke (ordering code per piece, 2 are required)					B66206-A2010	1470

**Coil former**

Hole arrangement  
View in  
mounting direction

**Yoke**

FEK0108-J

**Coil former for luminaires**

- To be used without clamps

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

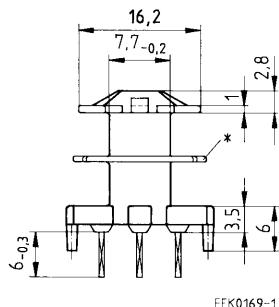
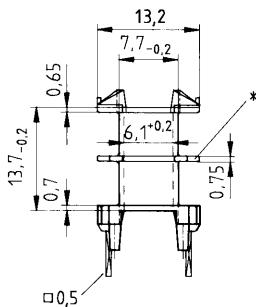
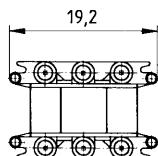
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

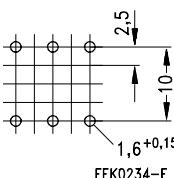
Winding: [see page 159](#)

Squared pins

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	32,7	42,3	44,5	6	B66206-J1106-T1	735
2	30,7	42,3	34,4	6	B66206-J1106-T2	



Hole arrangement  
View in mounting direction



\* Omitted for one-section version. Where nothing is specified the tolerances are  $\pm 0,1$  mm.

- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma I/A = 2,01 \text{ mm}^{-1}$$

$$l_e = 43,4 \text{ mm}$$

$$A_e = 21,6 \text{ mm}^2$$

$$A_{\min} = 20,2 \text{ mm}^2$$

$$V_e = 937 \text{ mm}^3$$

**Approx. weight** 4,8 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	$1500 + 30 - 20 \%$	2390			B66314-G-X130	1785
N27	$900 + 30 - 20 \%$	1440	630	0,18 (200 mT, 25 kHz, 100 °C)	B66314-G-X127	

**Gapped**

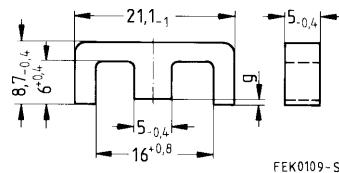
Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	$0,20 \pm 0,02$	142	226	B66314-G200-X127	1785
	$0,50 \pm 0,05$	76	121	B66314-G500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	47,4	- 0,682	59,9	- 0,847	54,9	- 0,865

Validity range:       $K1, K2$ :  $0,05 \text{ mm} < s < 1,50 \text{ mm}$   
 $K3, K4$ :  $30 \text{ nH} < A_L < 310 \text{ nH}$



**Coil former (magnetic axis horizontal)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

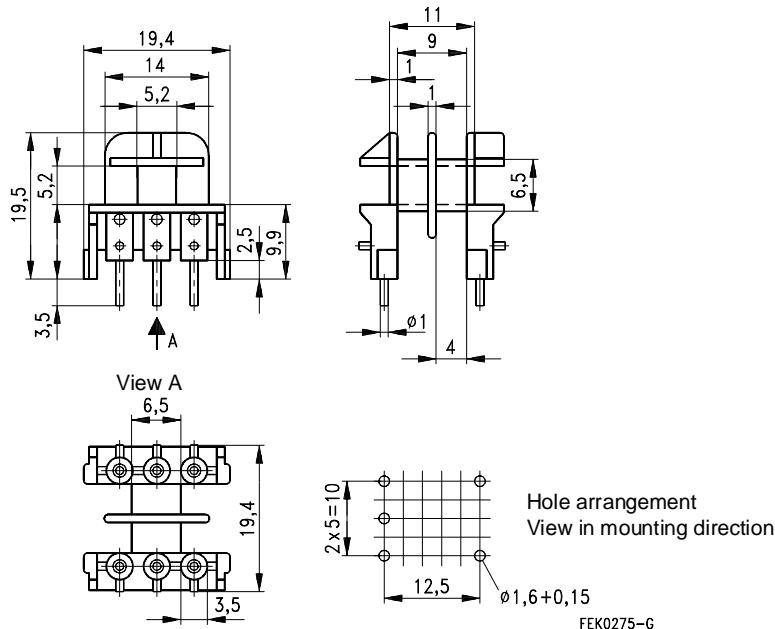
F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 159](#)

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
2	30	41	47	5	B66314-Z1005-T2	1785



- In accordance with IEC 1246
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

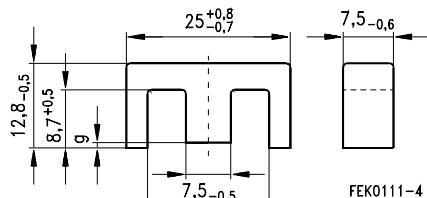
$$\Sigma/A = 1,1 \text{ mm}^{-1}$$

$$l_e = 57,5 \text{ mm}$$

$$A_e = 52,5 \text{ mm}^2$$

$$A_{\min} = 51,5 \text{ mm}^2$$

$$V_e = 3020 \text{ mm}^3$$



**Approx. weight** 16 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	2900 + 30/-20 %	2530			B66317-G-X130	850
N27	1750 + 30/-20 %	1520	1440	0,59 (200 mT, 25 kHz, 100 °C)	B66317-G-X127	
N67	1800 + 30/-20 %	1570	1440	2,00 (200 mT, 100 kHz, 100 °C)	B66317-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	0,10 ± 0,02	489	425	B66317-G100-X1**	850
N67	0,16 ± 0,02	347	302	B66317-G160-X1**	
	0,25 ± 0,02	250	218	B66317-G250-X1**	
	0,50 ± 0,05	151	131	B66317-G500-X1**	
	1,00 ± 0,05	91	79	B66317-G1000-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	90	-0,731	139	-0,847	129	-0,865
N67	90	-0,731	135	-0,820	129	-0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,00 \text{ mm}$   
 $K3, K4: 60 \text{ nH} < A_L < 570 \text{ nH}$

**Coil former (magnetic axis horizontal or vertical)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

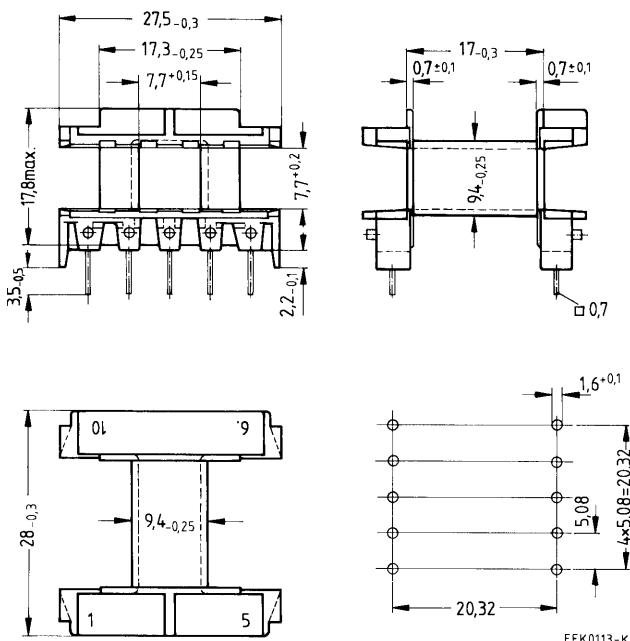
Winding: [see page 159](#)

Squared pins

Material: Stainless spring steel (0,25 mm)

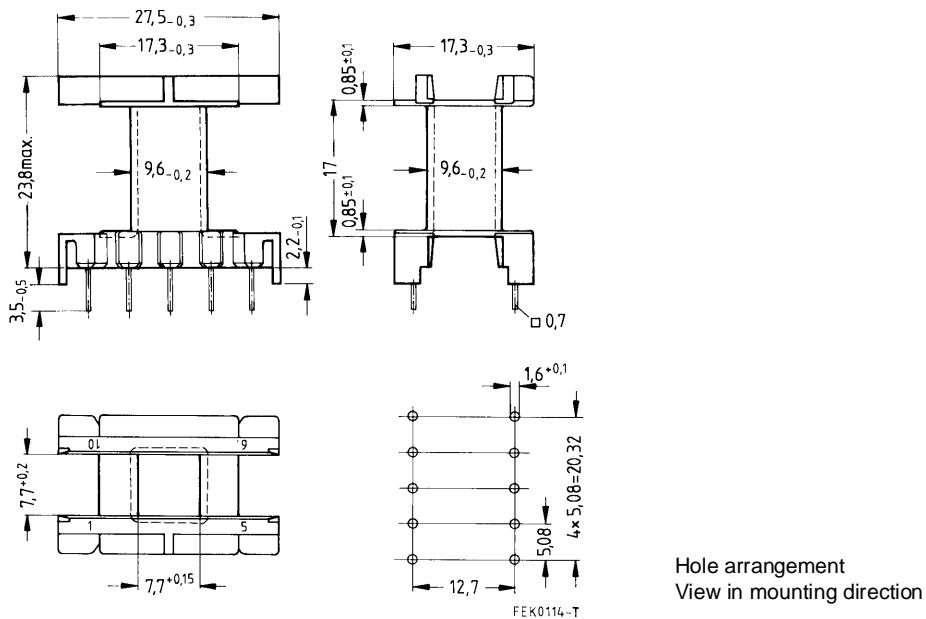
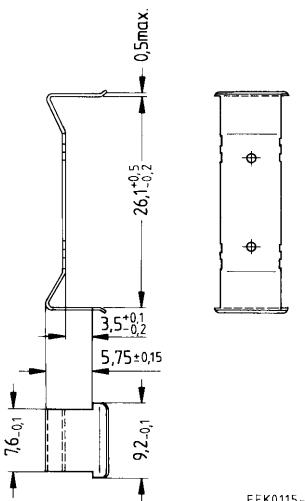
Coil former						Ordering code	PU
Figure	Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	1	61	50	28	10	B66208-A1110-T1	450
2	1	61	50	28	10	B66208-J1110-T1	
Yoke (ordering code per piece, 2 are required)						B66208-A2010	900

**Figure 1, horizontal version**



Hole arrangement  
View in  
mounting direction

Figure 2, vertical version

**Yoke**

**Coil former for SMPS transformers with line isolation**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 159](#)

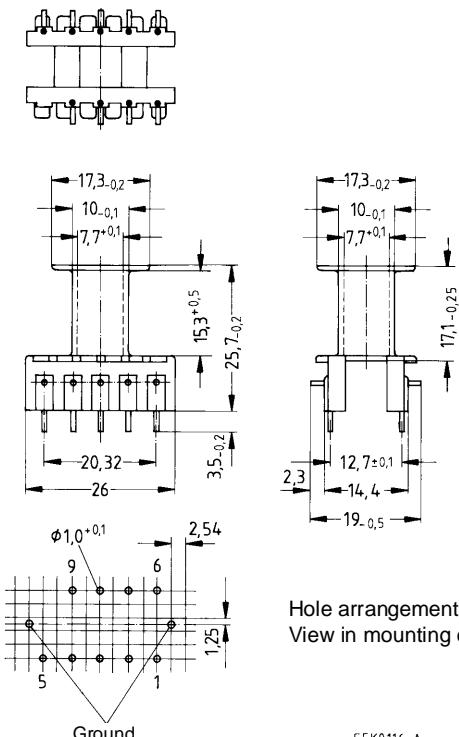
Squared pins

**Yoke**

Material: Nickel silver (0,3 mm) with ground terminal

Coil former					Ordering code	PU
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		Pcs
1	56	52	32	9	B66208-J1009-T1	450
Yoke (ordering code per piece, 2 piece required)					B66208-A2003	450

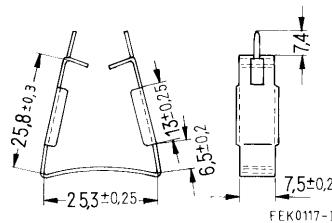
**Coil former**



Hole arrangement  
View in mounting direction

FEK0116-A

**Yoke**



- Size based on US lam. size E cores  
US designation E2425
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma/A = 1,27 \text{ mm}^{-1}$$

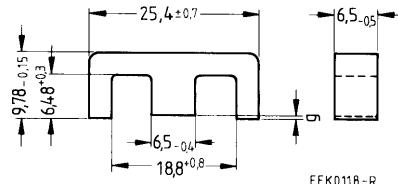
$$l_e = 49,2 \text{ mm}$$

$$A_e = 38,8 \text{ mm}^2$$

$$A_{\min} = 38,4 \text{ mm}^2$$

$$V_e = 1910 \text{ mm}^3$$

**Approx. weight** 9,6 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	2700 + 30/-20 %	2720			B66315-G-X130	950
N27	1500 + 30/-20 %	1510	1240	0,36 (200 mT, 25 kHz, 100 °C)	B66315-G-X127	
N67	1600 + 30/-20 %	1610	1240	1,20 (200 mT, 100 kHz, 100 °C)	B66315-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,25 ± 0,02	199	200	B66315-G250-X127	950
	0,50 ± 0,05	122	123	B66315-G500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	75	- 0,707	106	- 0,847	97	- 0,865
N67	75	- 0,707	103	- 0,820	97	- 0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,00 \text{ mm}$   
 $K3, K4: 50 \text{ nH} < A_L < 500 \text{ nH}$

- For compact SMPS transformers,  
e.g. in video recorders
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,71 \text{ mm}^{-1}$$

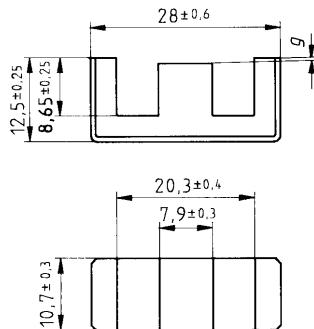
$$l_e = 59,1 \text{ mm}$$

$$A_e = 83 \text{ mm}^2$$

$$A_{\min} = 82,4 \text{ mm}^2$$

$$V_e = 4910 \text{ mm}^3$$

**Approx. weight** 25 g/set



FEK0168-S

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N67	3100 + 30/-20 %	1750	2210	3,20 (200 mT, 100 kHz, 100 °C)	B66403-G-X167	660

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N67	0,50 ± 0,05	237	134	B66403-G500-X167	660
	0,70 ± 0,05	185	105	B66403-G700-X167	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors (see page 437 for formulas)**

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N67	143	- 0,731	220	- 0,820	203	- 0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,00 \text{ mm}$   
 $K3, K4: 90 \text{ nH} < A_L < 890 \text{ nH}$

- E core with flat, rounded center leg
- Compact winding design with low leakage inductance
- ED cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,84 \text{ mm}^{-1}$$

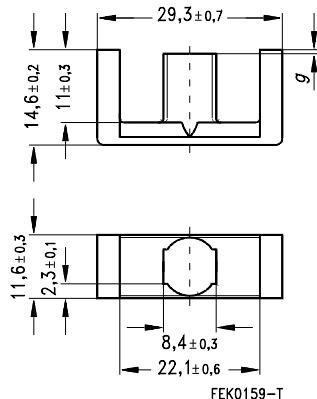
$$l_e = 69,5 \text{ mm}$$

$$A_e = 83 \text{ mm}^2$$

$$A_{\min} = 82,1 \text{ mm}^2$$

$$V_e = 5770 \text{ mm}^3$$

**Approx. weight** 29 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2200 + 30/- 20 %	1460	1880	1,10 (200 mT, 25 kHz, 100 °C)	B66407-G-X127	585

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	K1 (23 °C)	K2 (23 °C)	K3 (23 °C)	K4 (23 °C)	K3 (100 °C)	K4 (100 °C)
N27	138	- 0,731	214	- 0,847	198	- 0,865

Validity range:       $K1, K2: 0,10 \text{ mm} < s < 2,00 \text{ mm}$   
 $K3, K4: 80 \text{ nH} < A_L < 750 \text{ nH}$

- In accordance with DIN 41 295
- E cores are supplied as pieces

#### Magnetic characteristics (per set)

$$\Sigma/A = 1,12 \text{ mm}^{-1}$$

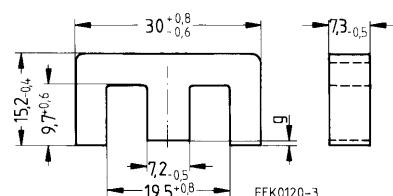
$$l_e = 67 \text{ mm}$$

$$A_e = 60 \text{ mm}^2$$

$$A_{\min} = 49 \text{ mm}^2$$

$$V_e = 4000 \text{ mm}^3$$

**Approx. weight** 22 g/set



#### Ungapped

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	3100 + 30/-20 %	2760			B66319-G-X130	850
N27	1700 + 30/-20 %	1510	1410	0,81 (200 mT, 25 kHz, 100°C)	B66319-G-X127	
N67	1850 + 30/-20 %	1640	1410	2,75 (200 mT, 100 kHz, 100°C)	B66319-G-X167	

#### Gapped

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	0,10 ± 0,02	460	410	B66319-G100-X1**	850
N67	0,18 ± 0,02	300	265	B66319-G180-X1**	
	0,34 ± 0,02	195	175	B66319-G340-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

#### Calculation factors (see page 437 for formulas)

Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	90	-0,708	156	-0,847	144	-0,865
N67	90	-0,708	150	-0,820	144	-0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,00 \text{ mm}$   
 $K3, K4: 560 \text{ nH} < A_L < 60 \text{ nH}$

**Coil former (magnetic axis horizontal or vertical)**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5s

Winding: [see page 159](#)

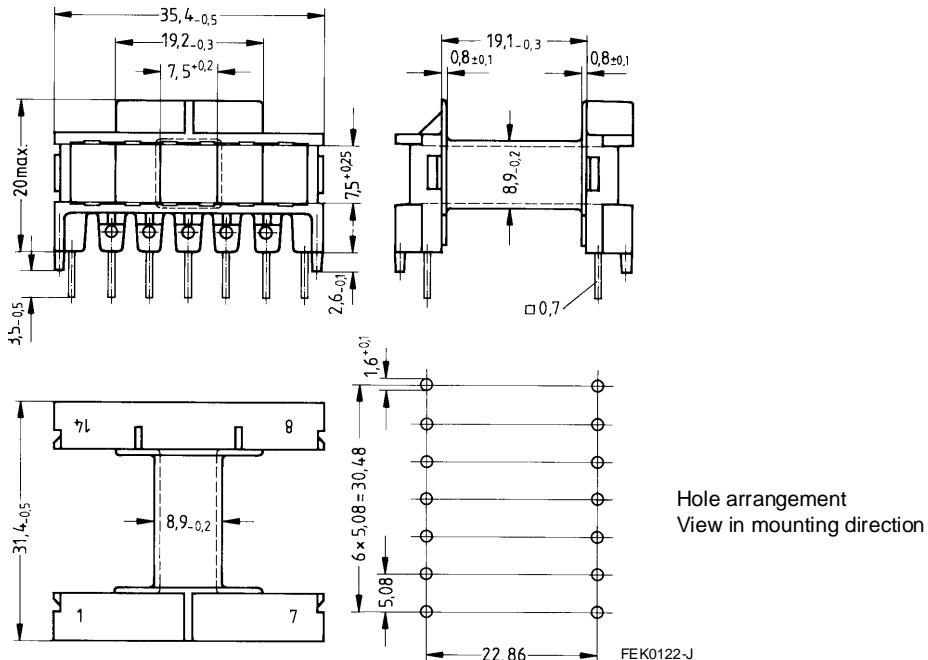
Squared pins

**Yoke**

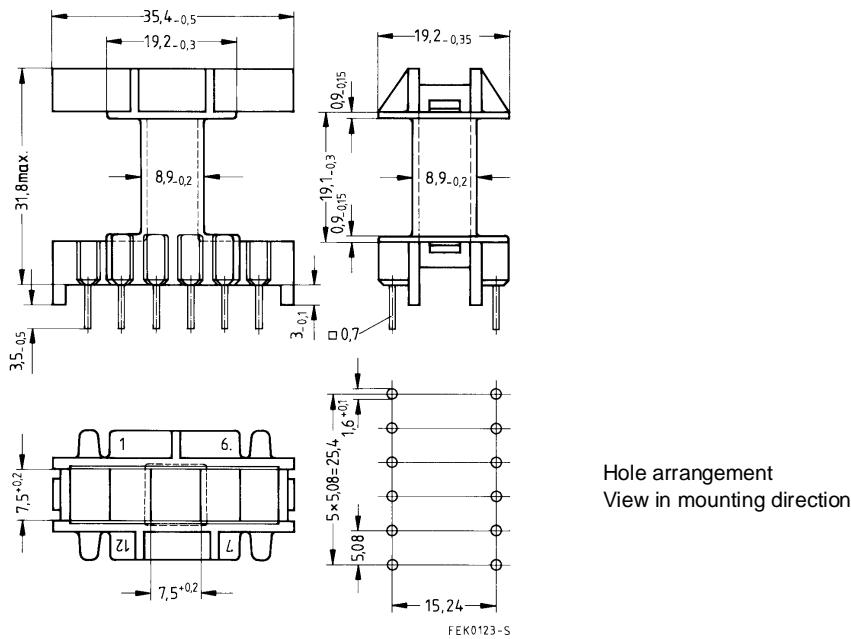
Material: Stainless spring steel (0,4 mm)

Coil former						Ordering code	PU Pcs
Figure	Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		
1	1	90	56	21	14	B66232-A1114-T1	425
2	1	90	56	21	12	B66232-J1112-T1	
Yoke (ordering code per piece, 2 are required)						B66232-A2010	425

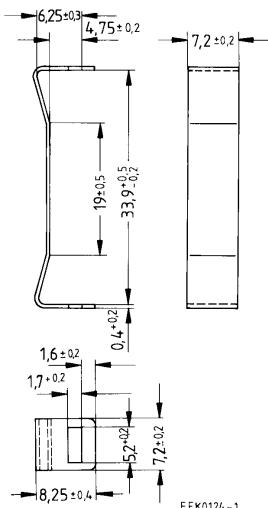
**Figure 1, horizontal version**



**Figure 2, vertical version**



### Yoke



- In accordance with IEC 1246
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma/A = 0,89 \text{ mm}^{-1}$$

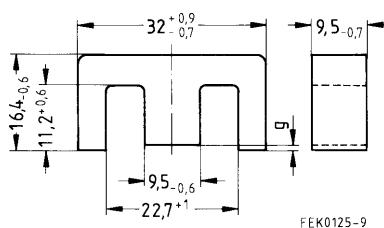
$$l_e = 74 \text{ mm}$$

$$A_e = 83 \text{ mm}^2$$

$$A_{\min} = 81,4 \text{ mm}^2$$

$$V_e = 6140 \text{ mm}^3$$

**Approx. weight** 30 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N30	$3800 + 30/-20\%$	2690			B66229-G-X130	480
N27	$2100 + 30/-20\%$	1480	1770	1,10 (200 mT, 25 kHz, 100 °C)	B66229-G-X127	
N67	$2250 + 30/-20\%$	1590	1770	3,75 (200 mT, 100 kHz, 100 °C)	B66229-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27,	$0,50 \pm 0,05$	244	172	B66229-G500-X1**	480
N67	$1,00 \pm 0,05$	145	103	B66229-G1000-X1**	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	145	- 0,748	212	- 0,847	196	- 0,865
N67	145	- 0,748	204	- 0,820	197	- 0,881

Validity range:       $K1, K2: 0,10 \text{ mm} < s < 2,50 \text{ mm}$   
 $K3, K4: 70 \text{ nH} < A_L < 710 \text{ nH}$

**Coil former**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

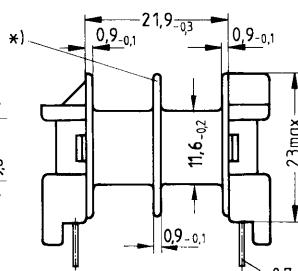
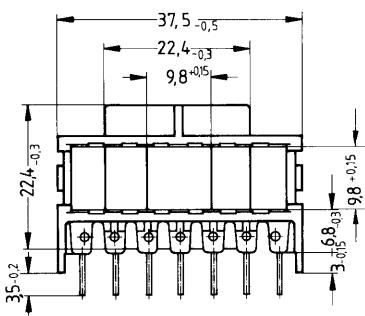
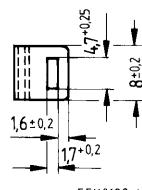
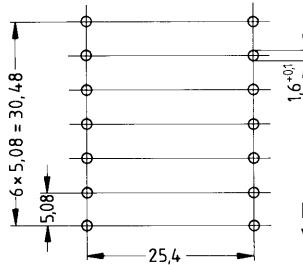
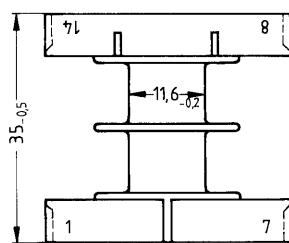
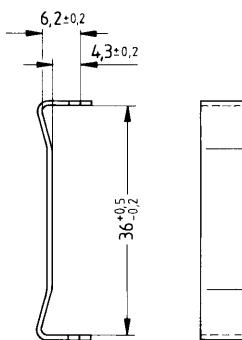
Winding: [see page 159](#)

Squared pins

**Yoke**

Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU Pcs
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins		
1	108,50	64,4	20,42	14	B66230-A1114-T1	240
2	103,64	64,4	21,38	14	B66230-A1114-T2	
Yoke (ordering code per piece, 2 are required)			B66230-A2010			480

**Coil former****Yoke**Hole arrangement  
View in mounting direction

\*) Center flange omitted in one-section version

FEK0127-Q

- E cores are supplied as pieces

**Magnetic characteristics (per set)**

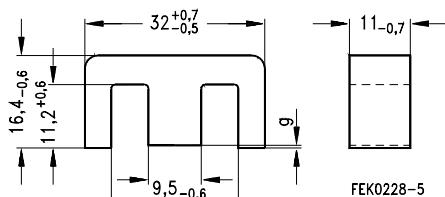
$$\Sigma l/A = 0,76 \text{ mm}^{-1}$$

$$l_e = 74 \text{ mm}$$

$$A_e = 97 \text{ mm}^2$$

$$A_{\min} = 95 \text{ mm}^2$$

$$V_e = 7187 \text{ mm}^3$$



**Approx. weight** 37 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N67	2800 + 30/-20 %	1690	2050	4,65 (200 mT, 100 kHz, 100 °C)	B66233-G-X167	420

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N67	165	- 0,711	239	- 0,820	231	- 0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,50 \text{ mm}$

$K3, K4: 90 \text{ nH} < A_L < 800 \text{ nH}$

- Size based on US lam. size E cores  
US designation E375
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

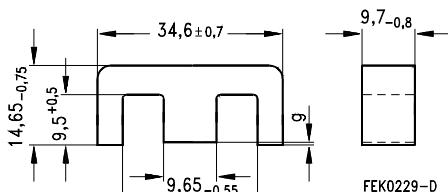
$$\Sigma l/A = 0,82 \text{ mm}^{-1}$$

$$l_e = 69,6 \text{ mm}$$

$$A_e = 84,8 \text{ mm}^2$$

$$A_{\min} = 83,2 \text{ mm}^2$$

$$V_e = 5\,900 \text{ mm}^3$$



**Approx. weight** 30 g/set

**Ungapped**

Mate- rial	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2300 + 30/-20 %	1498	1929	1,10 (200 mT, 25 kHz, 100 °C)	B66370-G-X127	480

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	146	- 0,719	219	- 0,847	202	- 0,865

Validity range:       $K1, K2$ :  $0,10 \text{ mm} < s < 2,50 \text{ mm}$   
 $K3, K4$ :  $80 \text{ nH} < A_L < 770 \text{ nH}$

- E cores are supplied as pieces

**Magnetic characteristics (per set)**

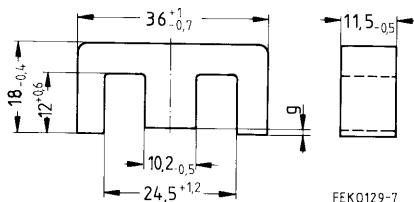
$$\Sigma/A = 0,68 \text{ mm}^{-1}$$

$$l_e = 81 \text{ mm}$$

$$A_e = 120 \text{ mm}^2$$

$$A_{\min} = 112 \text{ mm}^2$$

$$V_e = 9670 \text{ mm}^3$$



**Approx. weight** 50 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2900 + 30/-20 %	1550	2330	1,85 (200 mT, 25 kHz, 100 °C)	B66389-G-X127	420
N67	3000 + 30/-20 %	1600	2330	6,25 (200 mT, 100 kHz, 100 °C)	B66389-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	1,00 ± 0,05	183	96	B66389-G1000-X127	420

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	182	- 0,749	302	- 0,847	280	- 0,865
N67	182	- 0,749	290	- 0,820	282	- 0,881

Validity range:       $K1, K2: 0,10 \text{ mm} < s < 2,50 \text{ mm}$   
 $K3, K4: 100 \text{ nH} < A_L < 930 \text{ nH}$

**Coil former**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\triangleq$  max. operating temperature 155 °C), color code black

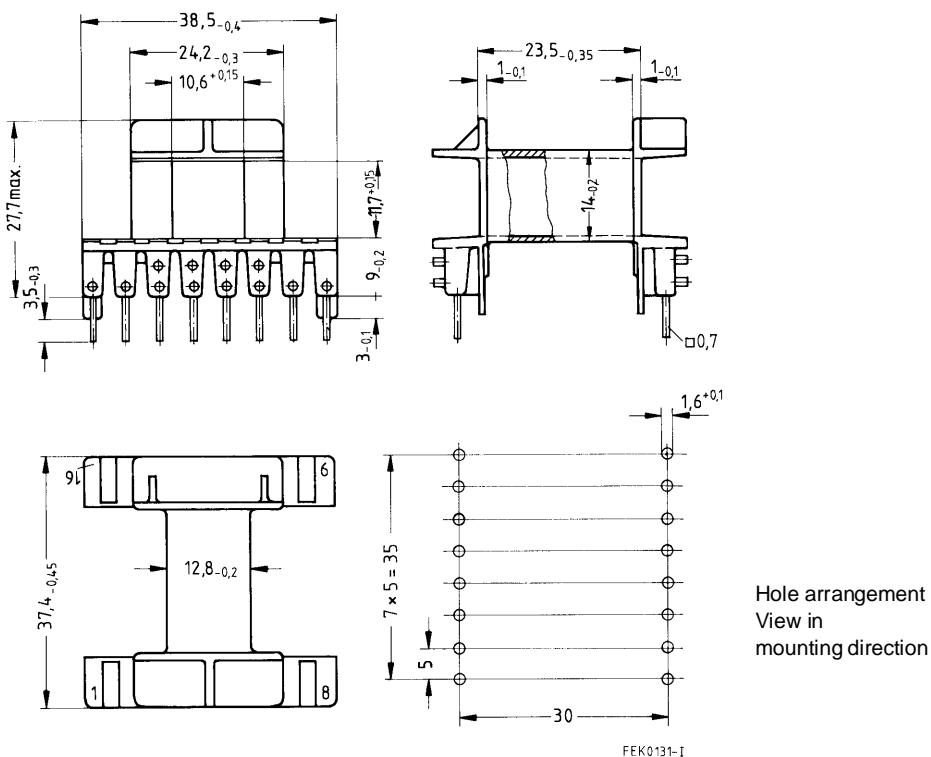
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 159](#)

Squared pins

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	122,55	76,4	21,45	16	B66390-A1016-T1	210



Hole arrangement  
View in  
mounting direction

- Size based on US lam. size E cores  
US designation E 21
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$$\Sigma/A = 0,52 \text{ mm}^{-1}$$

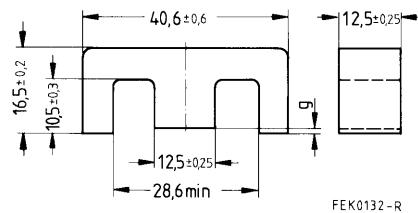
$$l_e = 77 \text{ mm}$$

$$A_e = 149 \text{ mm}^2$$

$$A_{\min} = 143 \text{ mm}^2$$

$$V_e = 11\,500 \text{ mm}^3$$

**Approx. weight** 58 g/set



**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	3800 + 30/-20 %	1560	3050	2,15 (200 mT, 25 kHz, 100 °C)	B66381-G-X127	200
N67	4000 + 30/-20 %	1640	3050	7,25 (200 mT, 100 kHz, 100 °C)	B66381-G-X167	
N72	4600 + 30/-20 %	1900	3150	1,12 (200 mT, 25 kHz, 100 °C)	B66381-G-X172	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,50 ± 0,05	411	166	B66381-G500-X127	200

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	239	- 0,782	378	- 0,847	351	- 0,865
N67	239	- 0,782	364	- 0,820	352	- 0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,50 \text{ mm}$   
 $K3, K4: 130 \text{ nH} < A_L < 1200 \text{ nH}$

- In accordance with IEC 1246
- Cores are supplied as pieces

**Magnetic characteristics (per set)**

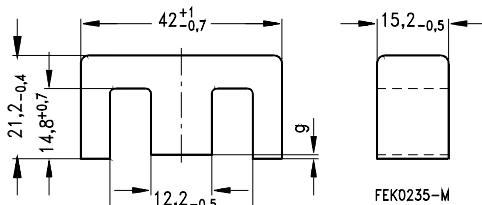
$$\Sigma/A = 0,54 \text{ mm}^{-1}$$

$$l_e = 97 \text{ mm}$$

$$A_e = 178 \text{ mm}^2$$

$$A_{\min} = 175 \text{ mm}^2$$

$$V_e = 17300 \text{ mm}^3$$



**Approx. weight** 88 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	3500 + 30/- 20 %	1510	2900	3,30 (200 mT, 25 kHz, 100°C)	B66325-G-X127	200
N67	3800 + 30/- 20 %	1640	2900	11,00 (200 mT, 100 kHz, 100°C)	B66325-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,10 ± 0,02	1497	647	B66325-G100-X127	200
	0,25 ± 0,02	759	328	B66325-G250-X127	
	0,50 ± 0,05	454	196	B66325-G500-X127	
	0,64 ± 0,05	378	164	B66325-G640-X127	
	1,00 ± 0,05	272	118	B66325-G1000-X127	
	1,50 ± 0,05	201	87	B66325-G1500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

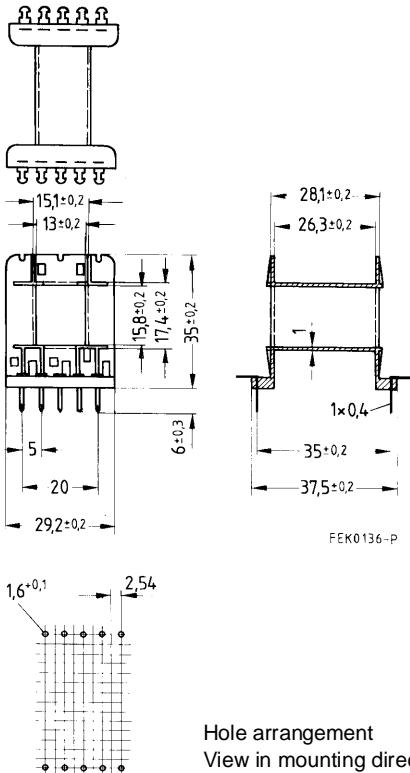
Material	Relationship between air gap - $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	272	- 0,741	436	- 0,847	406	- 0,865
N67	272	- 0,741	417	- 0,820	410	- 0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 2,50 \text{ mm}$   
 $K3, K4: 1210 \text{ nH} < A_L < 130 \text{ nH}$

**Coil former**

Material: GFR 6-polyamide (UL 94 HB, insulation class to IEC 85:  
F  $\triangle$  max. operating temperature 155 °C), color code natural  
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s  
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s  
Winding: [see page 159](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	177	87	17	10	B66242-J1000-R1	100



- In accordance with IEC 1246
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

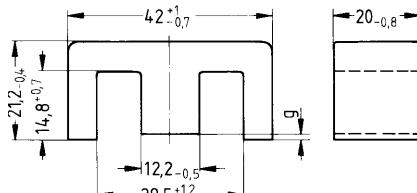
$$\Sigma/A = 0,41 \text{ mm}^{-1}$$

$$l_e = 97 \text{ mm}$$

$$A_e = 234 \text{ mm}^2$$

$$A_{\min} = 229 \text{ mm}^2$$

$$V_e = 22\,700 \text{ mm}^3$$



FEK0137-X

**Approx. weight** 116 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	$4750 + 30/-20 \%$	1560	3800	4,40 (200 mT, 25 kHz, 100 °C)	B66329-G-X127	120
N67	$5100 + 30/-20 \%$	1680	3800	14,50 (200 mT, 100 kHz, 100 °C)	B66329-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	$0,25 \pm 0,02$	1029	338	B66329-G250-X127	120
	$0,50 \pm 0,05$	603	198	B66329-G500-X127	
	$1,00 \pm 0,05$	354	116	B66329-G1000-X127	
	$1,50 \pm 0,05$	259	85	B66329-G1500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	354	-0,770	574	-0,847	534	-0,865
N67	354	-0,770	548	-0,820	538	-0,881

Validity range:       $K1, K2: 0,10 \text{ mm} < s < 3,00 \text{ mm}$   
 $K3, K4: 160 \text{ nH} < A_L < 1500 \text{ nH}$

**Coil former**

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

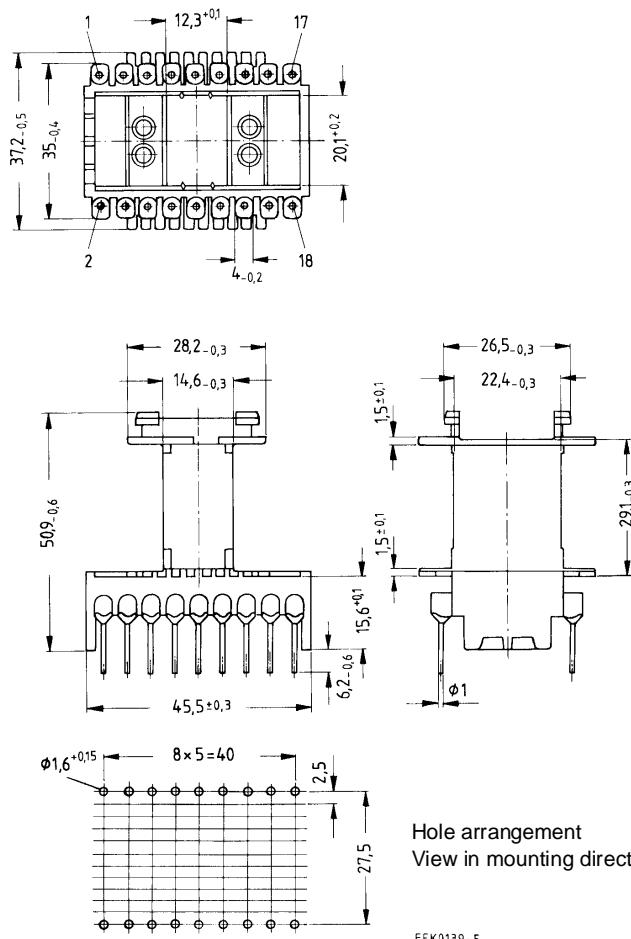
F  $\triangleq$  max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: [see page 159](#)

Sections	$A_N$ mm $^2$	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	172	100	20	18	B66243-A1018-T1	120



Hole arrangement  
View in mounting direction

FEK0139-E

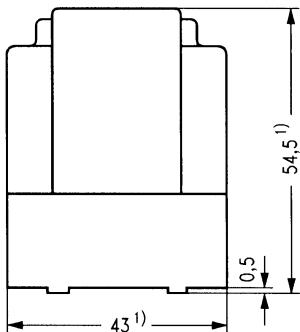
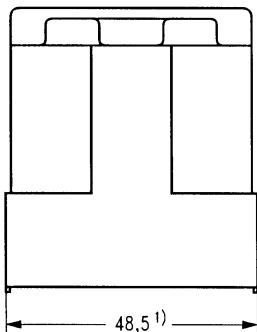
**Case**

- Used to protect the transformer against external influences, and for stamping

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85:

F  $\leq$  max. operating temperature 155 °C), color code blue

	Ordering code	PU Pcs
Case	B66243-A2001-T	120



FEK0236-V

1) Maximum dimension

- Size based on US lam. size E cores
- US designation E 625
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

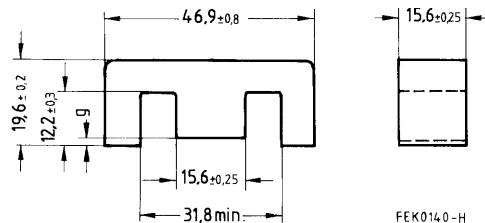
$$\Sigma/A = 0,38 \text{ mm}^{-1}$$

$$l_e = 89 \text{ mm}$$

$$A_e = 233 \text{ mm}^2$$

$$A_{\min} = 226 \text{ mm}^2$$

$$V_e = 20\,700 \text{ mm}^3$$



**Approx. weight** 106 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	5100 + 30/-20 %	1550	4120	3,95 (200 mT, 25 kHz, 100 °C)	B66383-G-X127	200
N67	5400 + 30/-20 %	1640	4120	13,30 (200 mT, 100 kHz, 100 °C)	B66383-G-X167	

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	364	- 0,773	579	- 0,847	538	- 0,865
N67	364	- 0,773	554	- 0,820	542	- 0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 3,00 \text{ mm}$   
 $K3, K4: 170 \text{ nH} < A_L < 1640 \text{ nH}$

- In accordance with IEC 1246
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

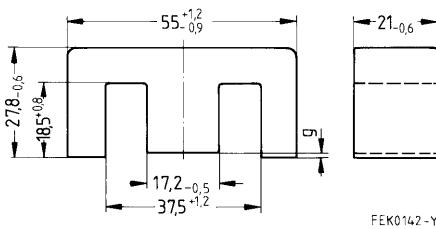
$$\Sigma/A = 0,35 \text{ mm}^{-1}$$

$$l_e = 124 \text{ mm}$$

$$A_e = 354 \text{ mm}^2$$

$$A_{\min} = 351 \text{ mm}^2$$

$$V_e = 43\,900 \text{ mm}^3$$



FEK0142-Y

**Approx. weight** 215 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	5800 + 30/-20 %	1610	4500	8,00 (200 mT, 25 kHz, 100°C)	B66335-G-X127	100
N67	6400 + 30/-20 %	1780	4500	4,30 (100 mT, 100 kHz, 100°C)	B66335-G-X167	
N87	6400 + 30/-20 %	1780	4500	21,50 (200 mT, 100 kHz, 100°C)	B66335-G-X187	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	$0,50 \pm 0,05$	843	234	B66335-G500-X127	100
	$1,00 \pm 0,05$	496	138	B66335-G1000-X127	
	$1,50 \pm 0,05$	364	101	B66335-G1500-X127	
	$2,00 \pm 0,05$	292	81	B66335-G2000-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

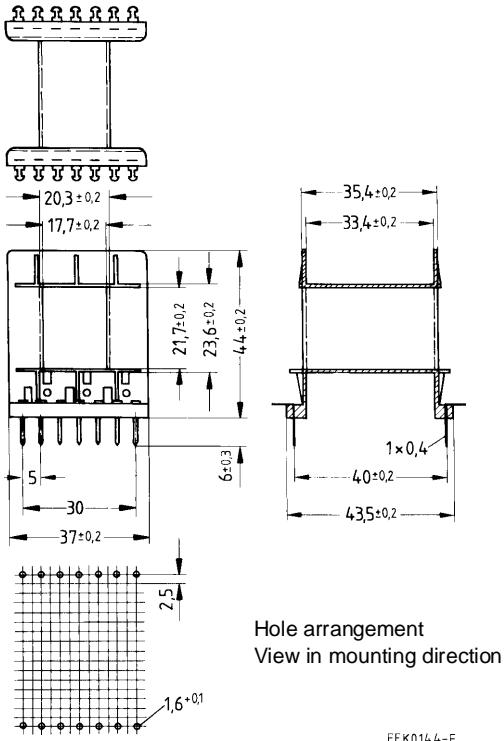
Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	496	-0,764	836	-0,847	781	-0,865

Validity range:  $K1, K2: 0,15 \text{ mm} < s < 3,50 \text{ mm}$   
 $K3, K4: 180 \text{ nH} < A_L < 1799 \text{ nH}$

### Coil former

Material: GFR 6-polyamide (UL 94 HB, insulation class to IEC 85:  
F  $\triangle$  max. operating temperature 155 °C), color code natural  
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s  
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5s  
Winding: [see page 159](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	280	113	14	14	B66252-B-M1	50



- E cores are supplied as pieces

**Magnetic characteristics (per set)**

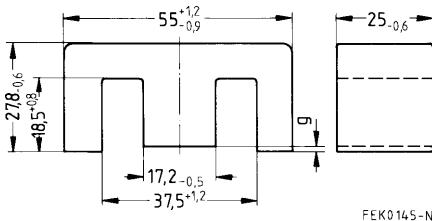
$$\Sigma l/A = 0,3 \text{ mm}^{-1}$$

$$l_e = 124 \text{ mm}$$

$$A_e = 420 \text{ mm}^2$$

$$A_{\min} = 420 \text{ mm}^2$$

$$V_e = 52\,100 \text{ mm}^3$$



**Approx. weight** 256 g

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	6800 + 30/-20 %	1600	5340	9,50 (200 mT, 25 kHz, 100 °C)	B66344-G-X127	100

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	2,50 ± 0,05	295	70	B66344-G2500-X127	100

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	596	- 0,769	992	- 0,847	927	- 0,865

Validity range:       $K1, K2: 0,15 \text{ mm} < s < 3,50 \text{ mm}$   
 $K3, K4: 220 \text{ nH} < A_L < 2130 \text{ nH}$

- Size based on US lam. size E cores  
US designation E 75
- E cores are supplied as pieces

**Magnetic characteristics (per set)**

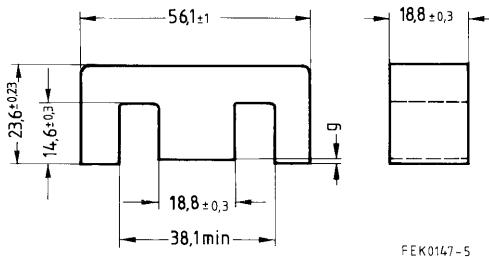
$$\Sigma l/A = 0,31 \text{ mm}^{-1}$$

$$l_e = 107 \text{ mm}$$

$$A_e = 340 \text{ mm}^2$$

$$A_{\min} = 327 \text{ mm}^2$$

$$V_e = 36\,400 \text{ mm}^3$$



**Approx. weight** 184 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	6300 + 30/-20 %	1570	5000	6,80 (200 mT, 25 kHz, 100 °C)	B66385-G-X127	100
N67	6700 + 30/-20 %	1670	5000	23,00 (200 mT, 100 kHz, 100 °C)	B66385-G-X167	

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	500	- 0,784	821	- 0,847	765	- 0,865
N67	500	- 0,784	783	- 0,820	773	- 0,881

Validity range:  $K1, K2: 0,10 \text{ mm} < s < 3,00 \text{ mm}$   
 $K3, K4: 200 \text{ nH} < A_L < 2000 \text{ nH}$

- In accordance with IEC 1246
- Cores are supplied as pieces

**Magnetic characteristics (per set)**

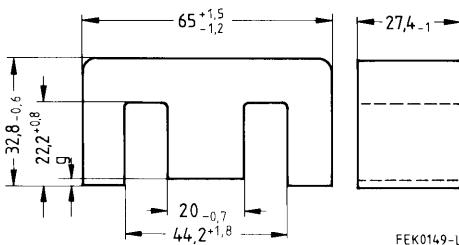
$$\Sigma/A = 0,27 \text{ mm}^{-1}$$

$$l_e = 147 \text{ mm}$$

$$A_e = 535 \text{ mm}^2$$

$$A_{\min} = 529 \text{ mm}^2$$

$$V_e = 78\,600 \text{ mm}^3$$



**Approx. weight** 394 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	7200 + 30/-20 %	1570	5730	14,60 (200 mT, 25 kHz, 100 °C)	B66387-G-X127	30
N67	7900 + 30/-20 %	1700	5730	7,90 (100 mT, 100 kHz, 100 °C)	B66387-G-X167	

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,50 ± 0,05	1214	265	B66387-G500-X127	30
	1,00 ± 0,05	716	156	B66387-G1000-X127	
	1,50 ± 0,05	526	115	B66387-G1500-X127	

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

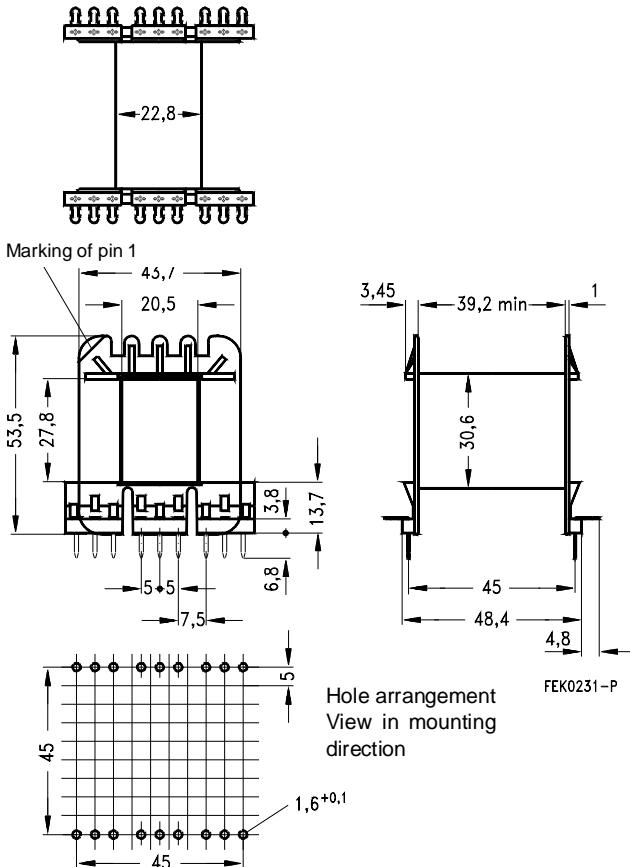
Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	716	- 0,762	1231	- 0,847	1154	- 0,865

Validity range:  $K1, K2$ : 0,20 mm <  $s$  < 5,00 mm  
 $K3, K4$ : 230 nH <  $A_L$  < 2290 nH

**Coil former**

Material: GFR 6-polyamide (UL 94 HB, insulation class to IEC 85:  
 F  $\triangleq$  max. operating temperature 155 °C), color code natural  
 Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s  
 Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5s  
 Winding: [see page 159](#)

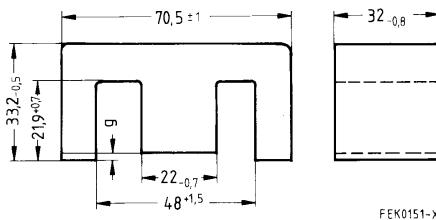
Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	415	151	12,5	18	B66388-A1018-T1	15



- E cores are supplied as pieces

**Magnetic characteristics (per set)**

$\Sigma A = 0,22 \text{ mm}^{-1}$   
 $l_e = 149 \text{ mm}$   
 $A_e = 683 \text{ mm}^2$   
 $A_{\min} = 676 \text{ mm}^2$   
 $V_e = 102\,000 \text{ mm}^3$



FEK0151-X

**Approx. weight** 514 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	8850 + 30/-20 %	1530	7200	19,00 (200 mT, 25 kHz, 100 °C)	B66371-G-X127	30

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	1,50 ± 0,05	655	113	B66371-G1500-X127	30

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

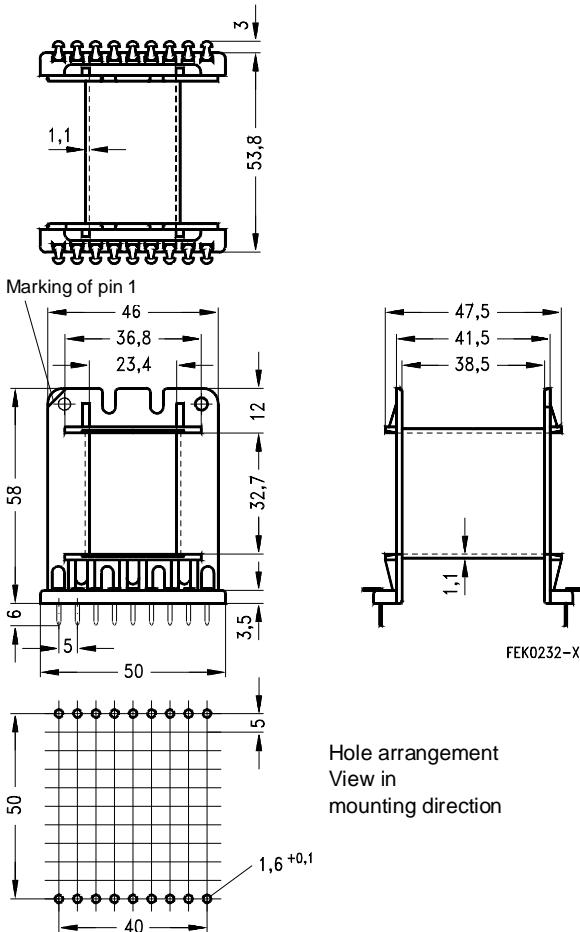
Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	903	- 0,789	1568	- 0,847	1470	- 0,865

Validity range:       $K1, K2: 0,20 \text{ mm} < s < 5,00 \text{ mm}$   
 $K3, K4: 290 \text{ nH} < A_L < 2880 \text{ nH}$

**Coil former**

Material: GFR 6-polyamide (UL 94 HB, insulation class to IEC 85:  
 F  $\triangle$  max. operating temperature 155 °C), color code natural  
 Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s  
 Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5s  
 Winding: [see page 159](#)

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ value $\mu\Omega$	Pins	Ordering code	PU Pcs
1	445	164	123	18	B66372-A1018-T1	30



- E cores are supplied as pieces

**Magnetic characteristics (per set)**

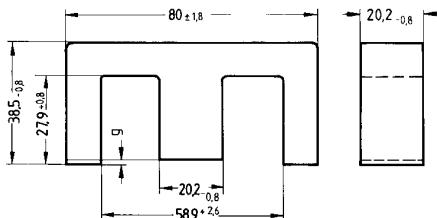
$$\Sigma l/A = 0,47 \text{ mm}^{-1}$$

$$l_e = 184 \text{ mm}$$

$$A_e = 390 \text{ mm}^2$$

$$A_{\min} = 388 \text{ mm}^2$$

$$V_e = 71\,800 \text{ mm}^3$$



FEK0153-E

**Approx. weight** 358 g/set

**Ungapped**

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	4150 + 30/-20 %	1550	3340	13,30 (200 mT, 25 kHz, 100 °C)	B66375-G-X127	40

**Gapped**

Material	$g$ mm	$A_L$ value approx. nH	$\mu_e$	Ordering code	PU Pcs
N27	0,50 ± 0,05	882	329	B66375-G500-X127	40

The  $A_L$  value in the table applies to a core set comprising one ungapped core (dimension  $g = 0$ ) and one gapped core (dimension  $g > 0$ ).

**Calculation factors** ([see page 437](#) for formulas)

Material	Relationship between air gap – $A_L$ value		Calculation of saturation current			
	$K1$ (23 °C)	$K2$ (23 °C)	$K3$ (23 °C)	$K4$ (23 °C)	$K3$ (100 °C)	$K4$ (100 °C)
N27	539	- 0,710	867	- 0,847	816	- 0,865

Validity range:       $K1, K2$ : 0,20 mm <  $s$  < 5,00 mm  
 $K3, K4$ : 140 nH <  $A_L$  < 1330 nH



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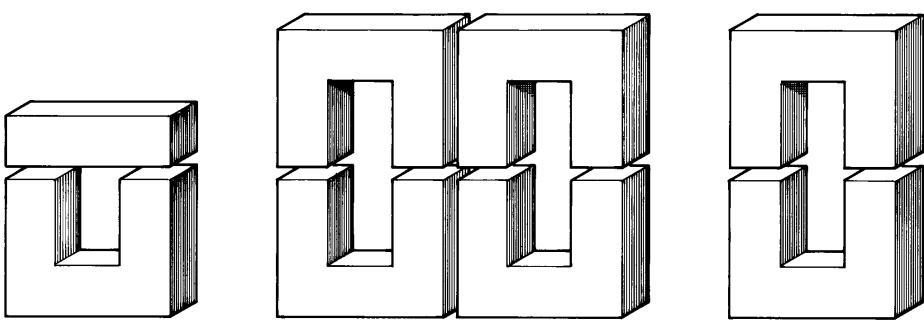
building-block system, different attenuation characteristics and packages, various kinds of leads and current ratings from 1 through 20 A.



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# U and UI Cores

## General Information



FUS0001-3

### 1 Core shapes and materials

U and I cores are made of SIFERRIT materials N27, N62, N67 and now new, of N53. Owing to their high saturation flux density, high Curie temperature and low dissipation losses, they are suitable for power, pulse and high-voltage transformers (in particular line deflection transformers and diode splitting transformers in TV sets, energy storage chokes, ignition transformers etc.). Typical core shapes are U cores with rectangular centerposts and UR cores with one round and one rectangular centerpost. UU and UI cores of rectangular cross section are preferred for power ratings > 1 kW, since they can be combined in various ways (see illustration above) to produce transformers in the kilowatt range.

### 2 Ordering, marking and delivery

U and I cores are supplied as pieces, not as sets. Please note the size of the packing units.

For marking see E cores, [page 434](#).

U cores with one shortened leg ( $\triangleq$  air gap) are available only on request.

### 3 Test results for $A_L$ and $A_{L1}$ values and core losses $P_V$

The corresponding test results are tabulated separately for each core shape.

#### a) $A_L$ value (see also [page 117](#))

The  $A_L$  value is measured with a fully wound 100-turn coil at a flux density of  $\hat{B} = 0,25$  mT and a frequency of  $f = 10$  kHz. The temperature of the core is equal to room temperature.

#### b) $A_{L1}$ value

The  $A_{L1}$  value is measured with a flux density of  $\hat{B} = 320$  mT at 100 °C. The measuring frequency here is less than 25 kHz. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{\min}$  of the core.

#### c) Power loss $P_V$

The dissipation loss is specified in W/set. The data are maximum values under the specified measuring conditions. For material N67, the provisional limiting values at 200 mT/100 kHz/100 °C are also specified. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area  $A_{\min}$  of the core.

**Core (with rectangular cross section)**

**Magnetic characteristics (per set)**

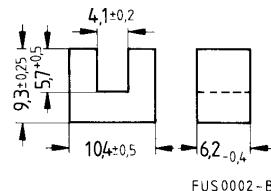
$$\Sigma/A = 2,11 \text{ mm}^{-1}$$

$$l_e = 41,5 \text{ mm}$$

$$A_e = 19,7 \text{ mm}^2$$

$$A_{\min} = 19,7 \text{ mm}^2$$

$$V_e = 820 \text{ mm}^3$$



**Approx. weight** 4,2 g/set

U cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	800 + 30/- 20 %	1340	600	0,10 (200 mT, 16 kHz, 100 °C)	B67366-A1-X27	1000

**Core (with rectangular cross section)**

**Magnetic characteristics (per set)**

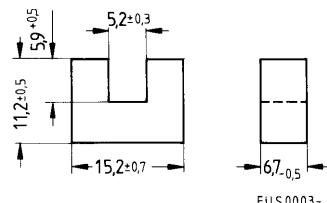
$$\Sigma I/A = 1,5 \text{ mm}^{-1}$$

$$l_e = 48 \text{ mm}$$

$$A_e = 32 \text{ mm}^2$$

$$A_{\min} = 32 \text{ mm}^2$$

$$V_e = 1540 \text{ mm}^3$$



**Approx. weight** 8,6 g/set

U cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	1200 + 30/- 20 %	1430	840	0,19 (200 mT, 16 kHz, 100 °C)	B67350-A1-X27	1360

**Coil former with squared pins**

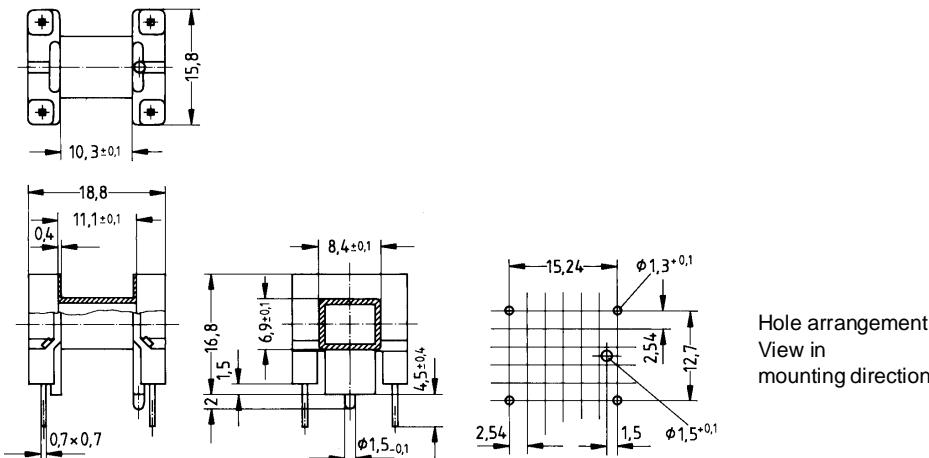
Material: GFR 6-polyamide (UL 94 V-0, insulation class to IEC 85:

E  $\leq$  max. operating temperature 120 °C), color code natural

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ $\mu\Omega$	Pins	Ordering code	PU Pcs
1	37	45	42	4	B67350-A1004-T1	1360



Hole arrangement  
View in  
mounting direction

**Core (with rectangular cross section)****Magnetic characteristics (per set)**

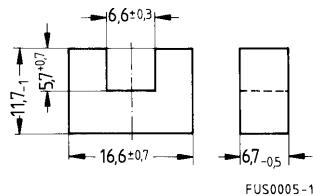
$$\Sigma I/A = 1,66 \text{ mm}^{-1}$$

$$l_e = 53 \text{ mm}$$

$$A_e = 32 \text{ mm}^2$$

$$A_{\min} = 32 \text{ mm}^2$$

$$V_e = 1700 \text{ mm}^3$$



**Approx. weight** 9,6 g/set

U cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	1300 + 30/- 20 %	1510	760	0,21 (200 mT, 16 kHz, 100 °C)	B67364-G-X27	1360

**Core (with rectangular cross section)**  
 Dimensions in accordance with DIN 41296

**Magnetic characteristics (per set)**

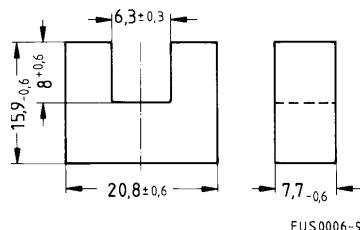
$$\Sigma l/A = 1,24 \text{ mm}^{-1}$$

$$l_e = 68 \text{ mm}$$

$$A_e = 55 \text{ mm}^2$$

$$A_{\min} = 55 \text{ mm}^2$$

$$V_e = 3740 \text{ mm}^3$$



**Approx. weight** 18 g/set

U cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	1600 + 30/-20 %	1570	1020	0,42 (200 mT, 16 kHz, 100 °C)	B67348-A1-X27	500

**Coil former with squared pins**

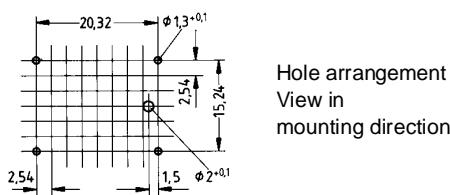
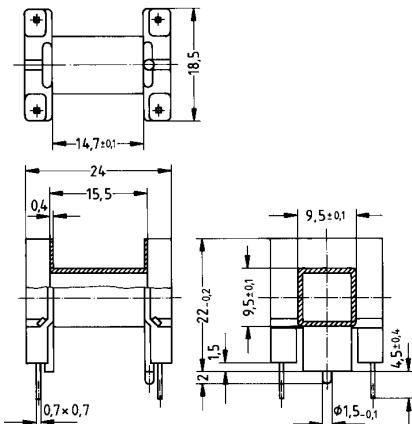
Material: GFR 6-polyamide (UL 94 V-0, insulation class to IEC 85:

$E \leq$  max. operating temperature 120 °C), color code natural

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ $\mu\Omega$	Pins	Ordering code	PU Pcs
1	70	60	30	4	B67348-A1004-T1	500



**Core (with rectangular cross section)**

**Magnetic characteristics (per set)**

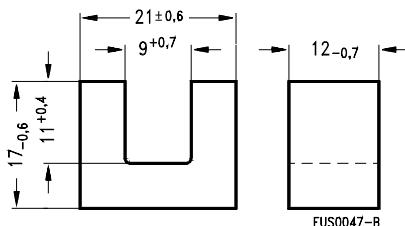
$$\Sigma I/A = 1,22 \text{ mm}^{-1}$$

$$l_e = 81 \text{ mm}$$

$$A_e = 66,5 \text{ mm}^2$$

$$A_{\min} = 64,1 \text{ mm}^2$$

$$V_e = 5\,390 \text{ mm}^3$$



**Approx. weight** 27 g/set

U cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N62	1600 + 30/- 20 %	1550	1290	0,54 (200 mT, 25 kHz, 100 °C)	B67318-G-X162	528
N27	1650 + 30/- 20 %	1600	1030	0,59 (200 mT, 16 kHz, 100 °C)	B67318-G-X127	

**Core (with rectangular cross section)**

**Magnetic characteristics (per set)**

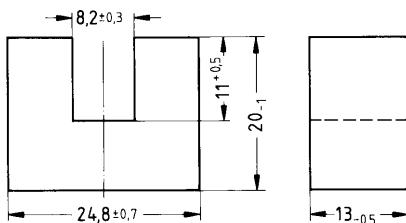
$$\Sigma/A = 0,82 \text{ mm}^{-1}$$

$$l_e = 86 \text{ mm}$$

$$A_e = 105 \text{ mm}^2$$

$$A_{\min} = 105 \text{ mm}^2$$

$$V_e = 9030 \text{ mm}^3$$



**Approx. weight** 46 g/set

FUS0008-Q

U cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2500 + 30/- 20 %	1630	1540	1,00 (200 mT, 16 kHz, 100 °C)	B67352-A1-X27	500

**Coil former with squared pins**

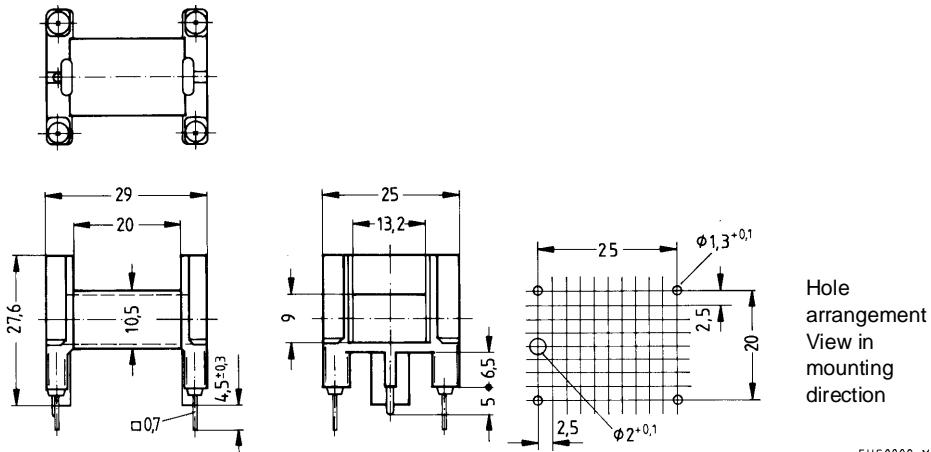
Material: GFR 6-polyamide (UL 94 V-0, insulation class to IEC 85:

E  $\leq$  max. operating temperature 120 °C), color code natural

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ $\mu\Omega$	Pins	Ordering code	PU Pcs
1	138	67	17	4	B67352-A1004-T1	500



FUS0009-Y

**Core (with rectangular cross section)****Magnetic characteristics (per set)**

$$\Sigma l/A = 0,75 \text{ mm}^{-1}$$

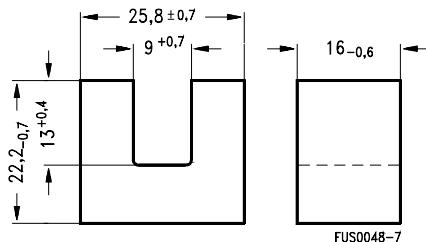
$$l_e = 98 \text{ mm}$$

$$A_e = 131 \text{ mm}^2$$

$$A_{\min} = 129 \text{ mm}^2$$

$$V_e = 12800 \text{ mm}^3$$

**Approx. weight** 65 g/set



FUS0048-7

U cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	2500 + 30/- 20 %	1480	1680	1,40 (200 mT, 16 kHz, 100 °C)	B67355-A1-X27	320

**Core (with rectangular cross section)****Magnetic characteristics (per set)**

$$\Sigma/A = 0,45 \text{ mm}^{-1}$$

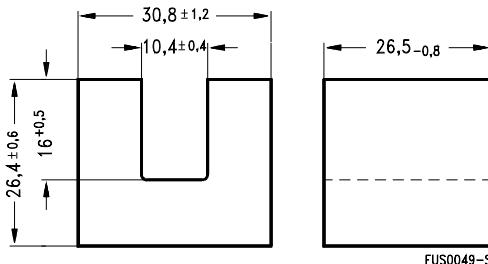
$$l_e = 118 \text{ mm}$$

$$A_e = 265 \text{ mm}^2$$

$$A_{\min} = 265 \text{ mm}^2$$

$$V_e = 31\,300 \text{ mm}^3$$

**Approx. weight** 146 g/set



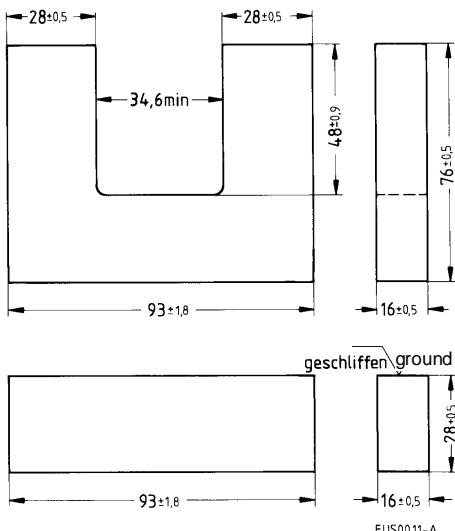
U cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N27	4400 + 30/- 20 %	1560	2830	3,00 (200 mT, 16 kHz, 100 °C)	B67362-A1-X27	96

For power transformers  
 > 1 kW (20 kHz)

**Magnetic characteristics (per set)**

	UU 93/152/16	UI 93/104/16	
$\Sigma I/A$	0,79	0,58	$\text{mm}^{-1}$
$I_e$	354	258	mm
$A_e$	448	448	$\text{mm}^2$
$A_{\min}$	448	448	$\text{mm}^2$
$V_e$	159 000	116 000	$\text{mm}^3$
$m$	800	600	g/set



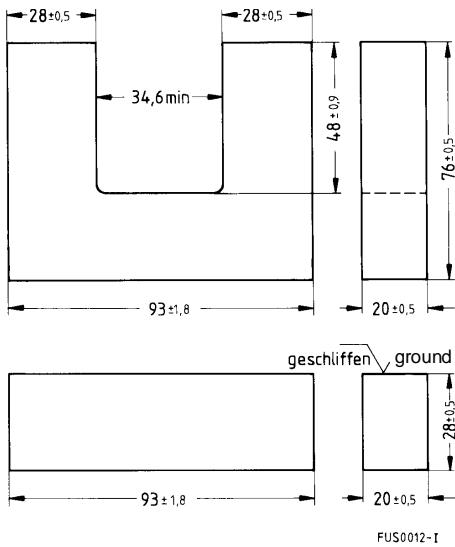
U and I cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
Combination UU 93/152/16						
N27	2900 + 30/- 20 %	1820	1990	16,20 (200 mT, 16 kHz, 100 °C)	B67345-B3-X27	20
Combination UI 93/104/16						
N27	3800 + 30/- 20 %	1740	2740	12,00 (200 mT, 16 kHz, 100 °C)	B67345-B3-X27 (U) B67345-B4-X27 (I)	20 30

For power transformers  
 > 1 kW (20 kHz)

**Magnetic characteristics (per set)**

	UU 93/152/20	UI 93/104/20	
$\Sigma I/A$	0,63	0,46	$\text{mm}^{-1}$
$I_e$	354	258	mm
$A_e$	560	560	$\text{mm}^2$
$A_{\min}$	560	560	$\text{mm}^2$
$V_e$	198 000	144 000	$\text{mm}^3$
$m$	1 000	750	g/set



FUS0012-I

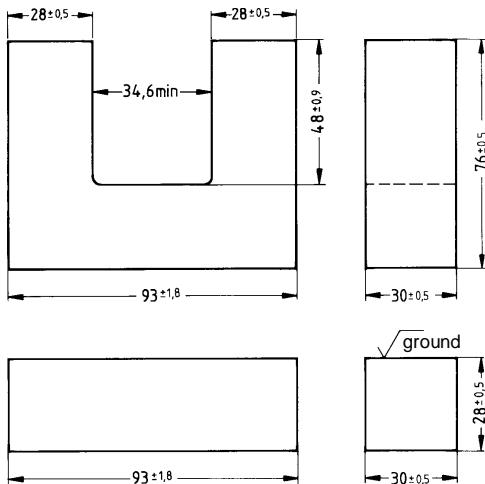
U and I cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
Combination UU 93/152/20						
N27	3600 + 30/- 20 %	1800	2490	20,00 (200 mT, 16 kHz, 100 °C)	B67345-B10-X27	10
Combination UI 93/104/20						
N27	4900 + 30/- 20 %	1790	3420	15,00 (200 mT, 16 kHz, 100 °C)	B67345-B10-X27 (U) B67345-B11-X27 (I)	10 20

For power transformers  
 > 1 kW (20 kHz)

**Magnetic characteristics (per set)**

	UU 93/152/30	UI 93/104/30	
$\Sigma I/A$	0,42	0,31	$\text{mm}^{-1}$
$I_e$	354	258	mm
$A_e$	840	840	$\text{mm}^2$
$A_{\min}$	840	840	$\text{mm}^2$
$V_e$	297 000	217 000	$\text{mm}^3$
$m$	1 500	1 100	g/set



FUS0013-R

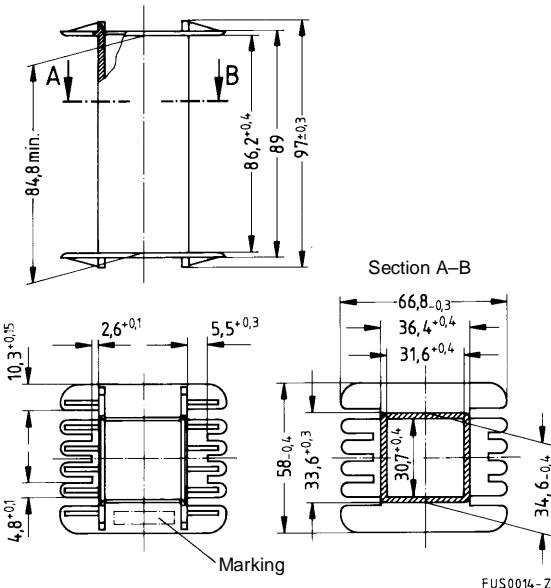
U and I cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
Combination UU 93/152/30						
N27	5400 + 30/- 20 %	1800	3740	30,00 (200 mT, 16 kHz, 100 °C)	B67345-B1-X27	4
Combination UI 93/104/30						
N27	7400 + 30/- 20 %	1850	5130	22,00 (200 mT, 16 kHz, 100 °C)	B67345-B1-X27 (U) B67345-B2-X27 (I)	4 8

**Coil former**

Material: GFR 6-polyamide (UL 94 V-0, insulation class to IEC 85:  
 $E \leq$  max. operating temperature 120 °C), color code natural

Sections	$A_N$ mm <sup>2</sup>	$l_N$ mm	$A_R$ $\mu\Omega$	Ordering code	PU Pcs
1	1052	195	6,4	B67345-A1000-T1	8



**Magnetic characteristics (per set)**

$$\Sigma l/A = 1,01 \text{ mm}^{-1}$$

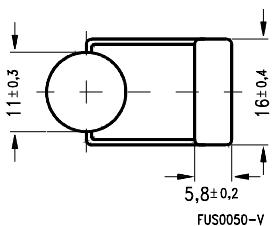
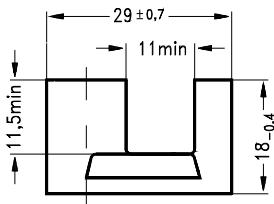
$$l_e = 95 \text{ mm}$$

$$A_e = 94 \text{ mm}^2$$

$$A_{\min} = 94 \text{ mm}^2$$

$$V_e = 8930 \text{ mm}^3$$

**Approx. weight** 44 g/set



UR cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N53	1750 + 30/- 20 %	1400	1250	7,50 (200 mT, 100 kHz, 100 °C)	B67354-A1-X53	250
N27	2000 + 30/- 20 %	1600	1250	0,95 (200 mT, 16 kHz, 100 °C)	B67354-A1-X27	
N67	2100 + 30/- 20 %	1680	1250	5,50 (200 mT, 100 kHz, 100 °C)	B67354-A1-X67	

**Magnetic characteristics (per set)**

$$\Sigma l/A = 1,15 \text{ mm}^{-1}$$

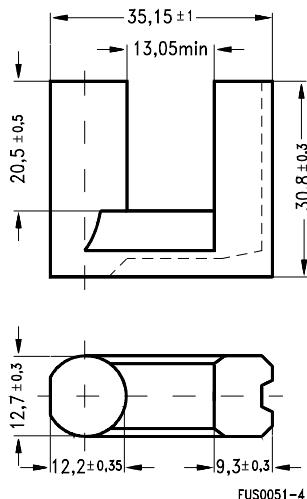
$$l_e = 142 \text{ mm}$$

$$A_e = 120 \text{ mm}^2$$

$$A_{\min} = 112 \text{ mm}^2$$

$$V_e = 17600 \text{ mm}^3$$

**Approx. weight** 86 g/set



UR cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N53	1550 + 30/- 20 %	1490	1150	14,70 (200 mT, 100 kHz, 100 °C)	B67359-G-X153	63
N62	1750 + 30/- 20 %	1670	1310	1,90 (200 mT, 25 kHz, 100 °C)	B67359-G-X162	
N67	1950 + 30/- 20 %	1870	1150	10,80 (200 mT, 100 kHz, 100 °C)	B67359-G-X167	

**Magnetic characteristics (per set)**

$$\Sigma l/A = 1,08 \text{ mm}^{-1}$$

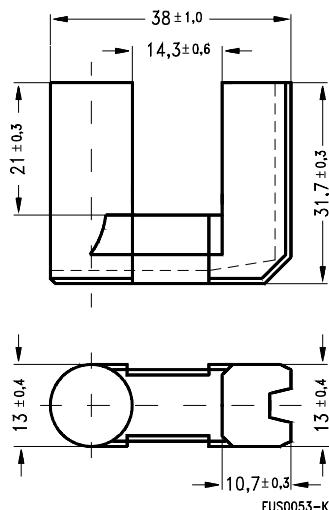
$$l_e = 148 \text{ mm}$$

$$A_e = 137 \text{ mm}^2$$

$$A_{\min} = 133 \text{ mm}^2$$

$$V_e = 20\,300 \text{ mm}^3$$

**Approx. weight** 97,5 g/set



UR cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N53	1650 + 30/- 20 %	1420	1280	16,60 (200 mT, 100 kHz, 100 °C)	B67313-G-X153	84
N62	1850 + 30/- 20 %	1590	1460	2,15 (200 mT, 25 kHz, 100 °C)	B67313-G-X162	
N67	2000 + 30/- 20 %	1720	1280	12,20 (200 mT, 100 kHz, 100 °C)	B67313-G-X167	

**Magnetic characteristics (per set)**

$$\Sigma l/A = 1,09 \text{ mm}^{-1}$$

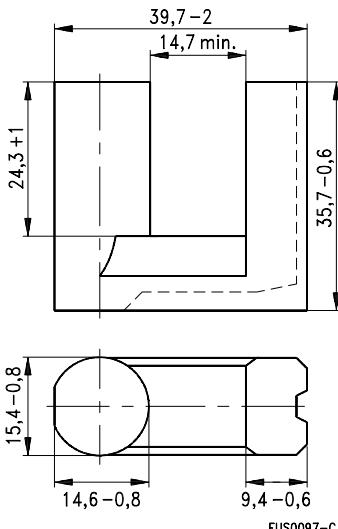
$$l_e = 163 \text{ mm}$$

$$A_e = 150 \text{ mm}^2$$

$$A_{\min} = 133 \text{ mm}^2$$

$$V_e = 24\,500 \text{ mm}^3$$

**Approx. weight** 125 g/set



FUS0097-C

UR cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N53	1700 + 30/- 20 %	1550	1210	21,30 (200 mT, 100 kHz, 100 °C)	B67317-G-X153	189
N62	1850 + 30/- 20 %	1680	1370	2,75 (200 mT, 25 kHz, 100 °C)	B67317-G-X162	
N67	2050 + 30/- 20 %	1870	1210	15,60 (200 mT, 100 kHz, 100 °C)	B67317-G-X167	

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,98 \text{ mm}^{-1}$$

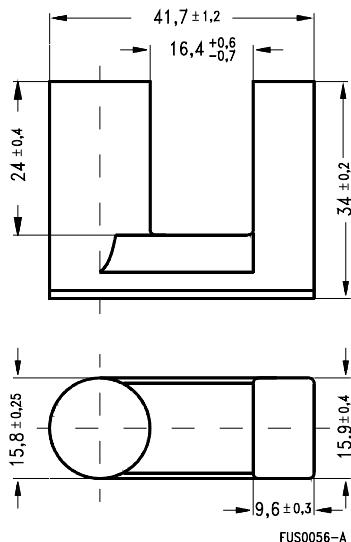
$$l_e = 163 \text{ mm}$$

$$A_e = 166 \text{ mm}^2$$

$$A_{\min} = 153 \text{ mm}^2$$

$$V_e = 27\,100 \text{ mm}^3$$

**Approx. weight** 140 g/set



UR cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N53	1950 + 30/- 20 %	1520	1410	23,80 (200 mT, 100 kHz, 100 °C)	B67368-G-X153	136
N62	2150 + 30/- 20 %	1680	1600	3,10 (200 mT, 25 kHz, 100 °C)	B67368-G-X162	
N67	2350 + 30/- 20 %	1830	1410	17,50 (200 mT, 100 kHz, 100 °C)	B67368-G-X167	

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,94 \text{ mm}^{-1}$$

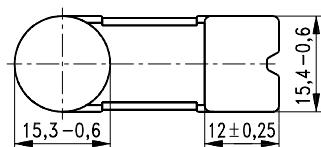
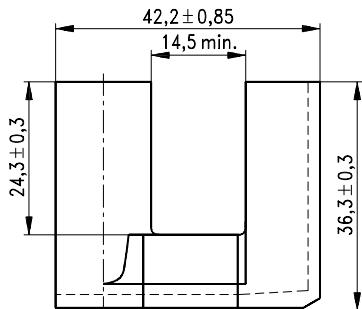
$$l_e = 168 \text{ mm}$$

$$A_e = 179 \text{ mm}^2$$

$$A_{\min} = 177 \text{ mm}^2$$

$$V_e = 30100 \text{ mm}^3$$

**Approx. weight** 144 g/set



UR cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N53	1980 + 30/- 20 %	1480	1410	24,50 (200 mT, 100 kHz, 100 °C)	B67320-G-X153	180
N67	2250 + 30/- 20 %	1680	1410	18,0 (200 mT, 100 kHz, 100 °C)	B67320-G-X167	
N87	2300 + 30/- 20 %	1720	1410	14,5 (200 mT, 100 kHz, 100 °C)	B67320-G-X187	

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,94 \text{ mm}^{-1}$$

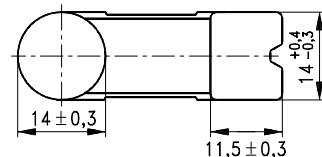
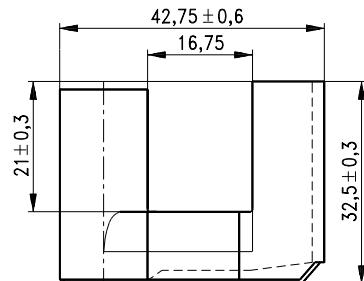
$$l_e = 157 \text{ mm}$$

$$A_e = 159 \text{ mm}^2$$

$$A_{\min} = 154 \text{ mm}^2$$

$$V_e = 24\,850 \text{ mm}^3$$

**Approx. weight** 127 g/set



FUS0110-8

UR cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N53	1850 + 30/- 20 %	1480	1380	21,6 (200 mT, 100 kHz, 100 °C)	B67322-G-X153	152
N87	2300 + 30/- 20 %	1810	1380	15,0 (200 mT, 100 kHz, 100 °C)	B67322-G-X187	

**Magnetic characteristics (per set)**

$$\Sigma l/A = 0,98 \text{ mm}^{-1}$$

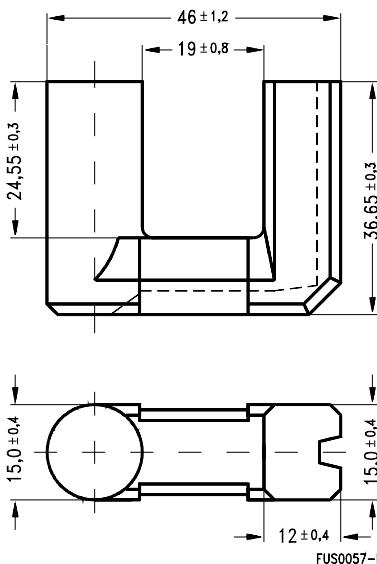
$$l_e = 176 \text{ mm}$$

$$A_e = 180 \text{ mm}^2$$

$$A_{\min} = 177 \text{ mm}^2$$

$$V_e = 31\,700 \text{ mm}^3$$

**Approx. weight** 145,5 g



UR cores are supplied as pieces. The  $A_L$  value in the table applies to a core set comprising two ungapped cores.

Material	$A_L$ value nH	$\mu_e$	$A_{L1\min}$ nH	$P_V$ W/set	Ordering code	PU Pcs
N53	1900 + 30/- 20 %	1480	1420	24,80 (200 mT, 100 kHz, 100 °C)	B67314-G-X153	120
N62	2050 + 30/- 20 %	1590	1610	3,30 (200 mT, 25 kHz, 100 °C)	B67314-G-X162	
N67	2300 + 30/- 20 %	1790	1420	18,20 (200 mT, 100 kHz, 100 °C)	B67314-G-X167	



Siemens Matsushita Components

Quality without compromises

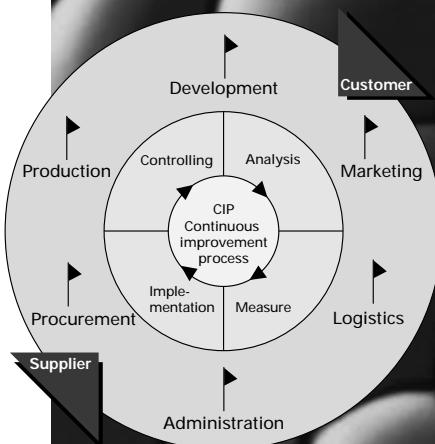
## top with TQM

We're not satisfied until you are. So our quality demands are quite tough. And they don't start in production, they span the whole field from development to despatch. To watch over it all we implemented Total Quality Management, a system aimed at continuous improvement – in everything. That includes true-to-schedule delivery and service readiness, ISO 9000 for all plants, modern QA, commitment to the environment in manufacturing, materials and packing plus constant training of employees. All embedded in *top*, the worldwide quality campaign of the Siemens organization.



More about "top with TQM" in this brochure!

Components



SCS – dependable, fast and competent

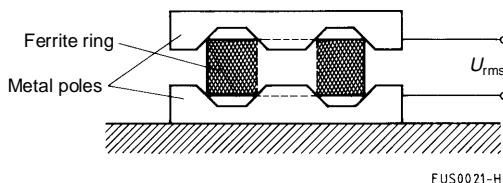
## Ring Cores

### General Information

- Our product line includes a wide range of ring cores with finely graded diameters ranging from 2,5 to 200 mm (see overview of available types). Other core heights can be supplied on request. All cores are available in the usual materials.

Ring cores are available in different coating versions, thus offering the appropriate solution for every application. The coating not only offers protection for the edges but also provides an insulation function.

The following test setup is used to test the dielectric strength of the insulating coating: A copper ring is pressed to the top edge of the ring. It touches the ferrite ring at the edges (see diagram). The test duration is 2 seconds; the test voltages specified in the table are minimum values:



Core size	$U_{\text{rms}}$
R 4 thru R 10	1,0 kV
R 12,5 thru R 20	1,5 kV
> R 20	2,0 kV

For cores with high permeability, increased spread of the  $A_L$  values of several percent must be expected due to the polyamide coating (K version). This effect can be avoided by using an epoxy resin coating (L version).

For small ring cores, we have introduced a parylene coating (Galxyl) which features a low coating thickness and high dielectric strength.

- Ring cores are used primarily for pulse and broadband transformers, baluns and chokes. Owing to the magnetically closed circuit, high flux densities can be achieved at small volume. Magnetic leakage is negligible.
- Ring cores are also increasingly used for power applications. Here, the typical values for amplitude permeability and power loss, as summarized in the section on SIFERRIT materials (Page [29](#)), are applicable to the special power materials.
- In the list of preferred types, the  $A_{L1\min}$  value (measurement conditions 320 mT, 100 °C, 10 kHz) is also specified for power applications, in addition to a limiting value for power loss under the relevant measurement conditions. This provides a guarantee of the minimum amplitude permeability.
- Characteristic data for cores not included among the preferred types are available on request.

#### Versions

Version	Ordering code
● Uncoated	B64290-A...
● Coated with polyamide; thickness of coating approx. 0,2 to 0,4 mm	B64290-K...
● Coated with parylene; thickness of coating approx. 10 to 15 µm, standard coating for small cores ( $\leq R4$ )	B64290-P...
● Coated with epoxy resin; thickness of coating approx. 0,15 to 0,3 mm, coating for large cores, on request	B64290-L...

## Ring Cores

### General Information

#### *Application: Ring cores to suppress line interference*

With the ever-increasing use of electrical and electronic equipment, it becomes increasingly important to be able to ensure that all facilities will operate simultaneously in the context of electromagnetic compatibility (EMC) without interfering with each others' respective functions. The EMC legislation which came into force at the beginning of 1996 applies to all electrical and electronic products marketed in the EU, both new and existing ones. So the latter may have to be modified so that they are neither susceptible to electromagnetic interference, nor emit spurious radiation. Ferrite cores are ideally suited for this purpose since they are able to suppress interference over a wide frequency range.

At frequencies above 1 MHz, ferrite rings slipped over a conductor lead to an increase in the impedance of this conductor. The real component of this impedance absorbs the interference energy.

A ferrite material's suitability for suppressing interference within a specific frequency spectrum depends on its magnetic properties, which vary with frequency. Before the right material can be selected, the impedance  $|Z|$  must be known as a function of frequency.

The curve of impedance as a function frequency is characterized by the sharp increase in loss at resonance frequency.

#### Measurement results:

The measurements shown here were made at room temperature ( $23 \pm 3^\circ\text{C}$ ) using an HP 4191A RF impedance analyzer with a flux density of  $B \leq 1 \text{ mT}$ .

The maximum of the impedance curve shifts to lower frequencies as the number of turns increases; this is due to the capacitive effect of the turns (figure 1, using R25/15 as an example).

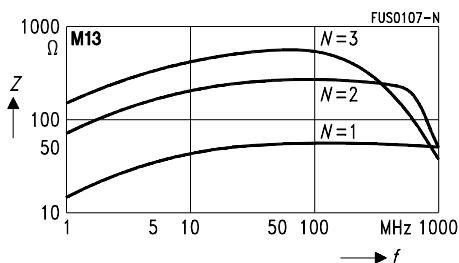


Figure 1

For direct comparison of the typical suppression characteristics of different ferrite materials, the impedance curves were normalized using the equation  $|Z|_n = |Z| / N^2 \times \Sigma (I_e / A_e)$ ; the geometry factor was calculated on the basis of the core dimensions (figure 2).

These normalized impedance curves are guide values, mostly measured using ring core R 10 with a number of turns  $N = 1$  (wire diameter 0.7 mm); they may vary slightly, depending on the geometry.

Ring Cores  
General Information

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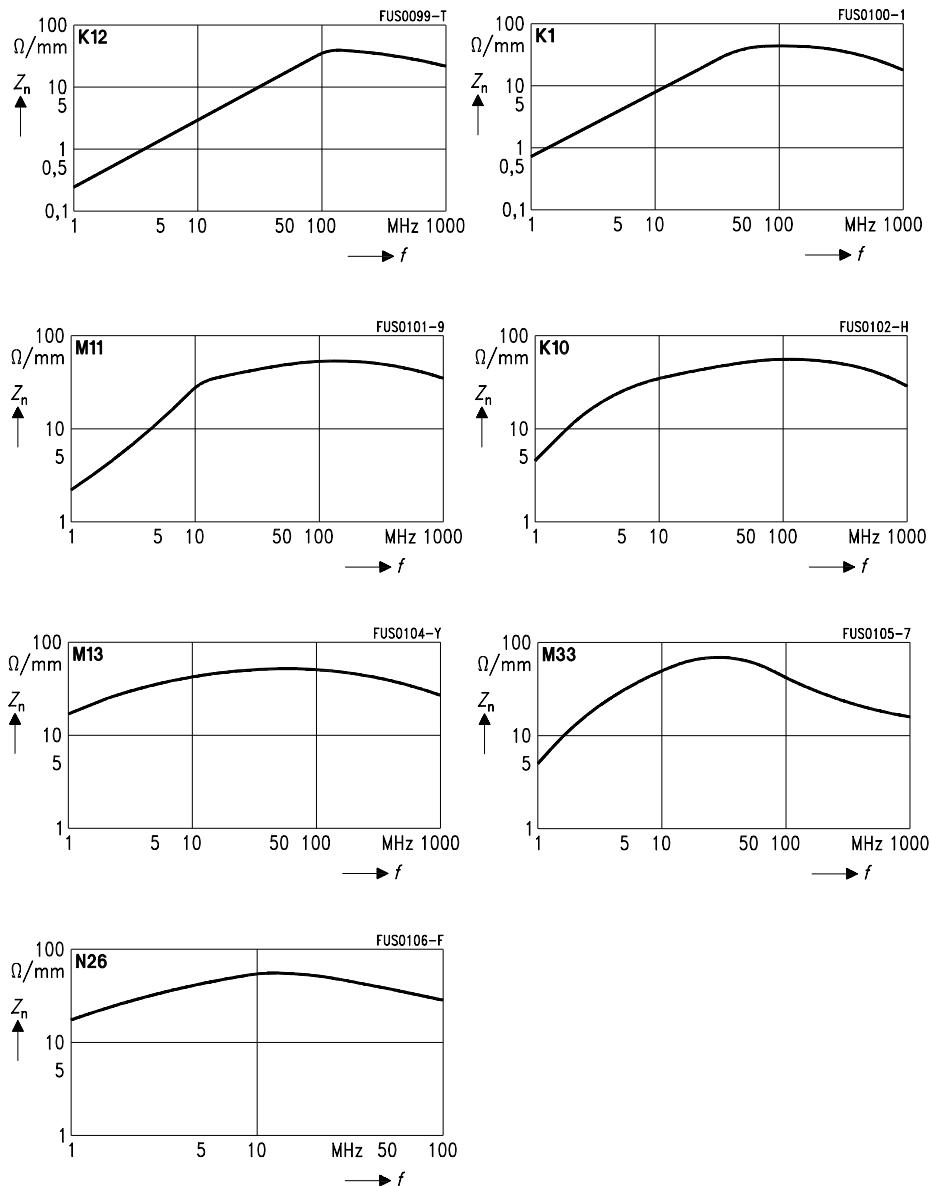


Figure 2

## Ring Cores

### General Information

Ring cores are also available in split versions, which can easily be clipped onto cables. The residual air gap inevitable in the reassembled ferrite ring affects its impedance characteristic only slightly in the upper frequency range (figure 3, using R25/15 as an example).

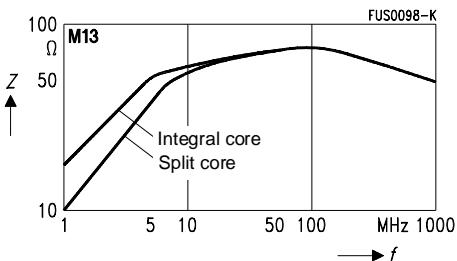


Figure 3

The residual air gap has a positive effect on performance with dc biasing because magnetic saturation is not reached until higher signal levels (figure 4, using R25/15 as an example).

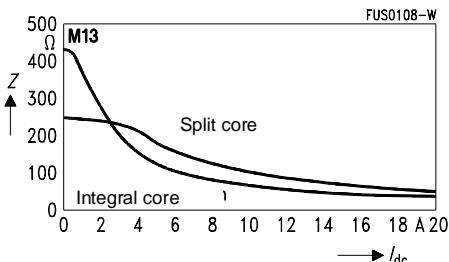
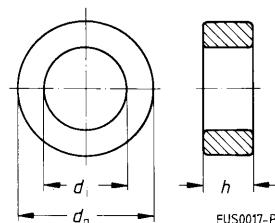


Figure 4



## Overview of available types

Type	Dimensions			Magnetic characteristics				Approx. weight g
	$d_a^{(1)}$ mm	$d_i^{(1)}$ mm	$h^{(1)}$ mm	$\Sigma l/A$ mm <sup>-1</sup>	$l_e$ mm	$A_e$ mm <sup>2</sup>	$V_e$ mm <sup>3</sup>	
R 2,5	2,5 ± 0,12	1,5 ± 0,1	1,0 ± 0,1	12,30	6,02	0,49	3,0	0,02
R 3,0	3,05 ± 0,2	1,27 ± 0,2	1,27 ± 0,2	5,65	5,99	1,06	6,4	0,04
R 3,9	3,94 ± 0,12	2,24 ± 0,12	1,3 ± 0,12	8,56	9,21	1,08	9,9	0,05
R 3,9/2	3,94 ± 0,12	2,24 ± 0,12	2,0 ± 0,12	5,56	9,21	1,66	15,3	0,07
R 4,0	4,0 ± 0,12 (4,5 max)	2,4 ± 0,12 (1,9 min)	1,6 ± 0,1 (2,1 max)	7,69	9,63	1,25	12,0	0,06
R 5,8	5,84 ± 0,12 (6,36 max)	3,05 ± 0,12 (2,53 min)	1,52 ± 0,12 (2,05 max)	6,36	13,03	2,05	26,7	0,1
R 5,8/3	5,84 ± 0,12 (6,36 max)	3,05 ± 0,12 (2,53 min)	3,0 ± 0,12 (3,55 max)	3,22	13,03	4,04	52,6	0,3
R 6,3	6,3 ± 0,15 (7,25 max)	3,8 ± 0,12 (2,85 min)	2,5 ± 0,12 (3,4 max)	4,97	15,21	3,06	46,5	0,2
R 9,5/2	9,53 ± 0,19 (10,5 max)	4,75 ± 0,12 (3,8 min)	2,0 ± 0,1 (2,9 max)	4,51	20,72	4,59	95,1	0,5
R 9,5	9,53 ± 0,19 (10,5 max)	4,75 ± 0,12 (3,8 min)	3,17 ± 0,15 (4,1 max)	2,85	20,72	7,28	151	0,8
R 10	10,0 ± 0,2 (11,0 max)	6,0 ± 0,15 (5,05 min)	4,0 ± 0,15 (4,95 max)	3,07	24,07	7,83	188	0,9
R 12,5	12,5 ± 0,3 (13,6 max)	7,5 ± 0,2 (6,5 min)	5,0 ± 0,15 (5,95 max)	2,46	30,09	12,23	368	1,8
R 13,3	13,3 ± 0,3 (14,4 max)	8,3 ± 0,3 (7,2 min)	5,0 ± 0,15 (5,95 max)	2,67	32,70	12,27	401	1,8
R 14	14,0 ± 0,3 (15,1 max)	9,0 ± 0,25 (7,95 min)	5,0 ± 0,2 (6,0 max)	2,84	34,98	12,30	430	2,0
R 15	15,0 ± 0,5 (16,3 max)	10,4 ± 0,4 (9,2 min)	5,3 ± 0,3 (6,4 max)	3,24	39,02	12,05	470	2,4

1) Values in parentheses apply to coated cores, ring cores made of NiZn ferrite may exceed the specified dimensions by up to 5 %

Type	Dimensions			Magnetic characteristics				Approx. weight g
	$d_a^{(1)}$ mm	$d_i^{(1)}$ mm	$h^{(1)}$ mm	$\Sigma I/A$ $\text{mm}^{-1}$	$I_e$ mm	$A_e$ $\text{mm}^2$	$V_e$ $\text{mm}^3$	
R 16	$16,0 \pm 0,4$ (17,2 max)	$9,6 \pm 0,3$ (8,5 min)	$6,3 \pm 0,2$ (7,3 max)	1,95	38,52	19,73	760	3,7
R 17	$17,0 \pm 0,4$ (18,2 max)	$10,7 \pm 0,3$ (9,6 min)	$6,8 \pm 0,2$ (7,8 max)	2,00	42,0	21,04	884	4,4
R 20/7	$20,0 \pm 0,4$ (21,2 max)	$10,0 \pm 0,25$ (8,7 min)	$7,0 \pm 0,4$ (8,2 max)	1,30	43,55	33,63	1465	7,6
R 22	$22,1 \pm 0,4$ (23,3 max)	$13,7 \pm 0,3$ (12,6 min)	$6,35 \pm 0,3$ (7,4 max)	2,07	54,15	26,17	1417	6,8
R23/8	$22,6 \pm 0,4$ (23,8 max)	$14,7 \pm 0,2$ (13,7 min)	$7,6 \pm 0,2$ (8,6 max)	1,92	56,82	29,56	1680	8,1
R23/9	$22,6 \pm 0,4$ (23,8 max)	$14,7 \pm 0,2$ (13,7 min)	$9,2 \pm 0,2$ (10,2 max)	1,59	56,82	35,78	2033	9,8
R 25/10	$25,3 \pm 0,7$ (26,8 max)	$14,8 \pm 0,5$ (13,5 min)	$10,0 \pm 0,2$ (11,0 max)	1,17	60,07	51,26	3079	16
R 25/15	$25,3 \pm 0,7$ (26,8 max)	$14,8 \pm 0,5$ (13,5 min)	$15,0 \pm 0,4$ (16,2 max)	0,78	60,07	76,89	4619	24
R 25/20	$25,3 \pm 0,7$ (26,8 max)	$14,8 \pm 0,5$ (13,5 min)	$20,0 \pm 0,5$ (21,3 max)	0,59	60,07	102,5	6157	33
R 29	$29,5 \pm 0,7$ (31,0 max)	$19,0 \pm 0,5$ (17,7 min)	$14,9 \pm 0,4$ (16,1 max)	0,96	73,78	76,98	5680	27
R 30	$30,5 \pm 1,0$ (32,3 max)	$20,0 \pm 0,6$ (18,2 min)	$12,5 \pm 0,4$ (13,7 max)	1,19	77,02	64,66	4980	25
R 34/10	$34,0 \pm 0,7$ (35,5 max)	$20,5 \pm 0,5$ (19,2 min)	$10,0 \pm 0,3$ (11,1 max)	1,24	82,06	66,08	5423	27
R 34/12,5	$34,0 \pm 0,7$ (35,5 max)	$20,5 \pm 0,5$ (19,2 min)	$12,5 \pm 0,3$ (13,6 max)	0,99	82,06	82,60	6778	33
R 36	$36,0 \pm 0,7$ (37,5 max)	$23,0 \pm 0,5$ (21,7 min)	$15,0 \pm 0,4$ (16,2 max)	0,94	89,65	95,89	8597	43
R 40	$40,0 \pm 1,0$ (41,8 max)	$24,0 \pm 0,7$ (22,5 min)	$16,0 \pm 0,4$ (17,2 max)	0,77	96,29	125,3	12070	61
R 42	$41,8 \pm 1,0$ (43,6 max)	$26,2 \pm 0,6$ (24,8 min)	$12,5 \pm 0,3$ (13,6 max)	1,08	103,0	95,75	9862	48
R 50	$50,0 \pm 1,0$ (51,8 max)	$30,0 \pm 0,7$ (28,5 min)	$20,0 \pm 0,5$ (21,3 max)	0,62	120,4	195,7	23560	118
R 58	$58,3 \pm 1,0$ (60,1 max)	$40,8 \pm 0,8$ (39,2 min)	$17,6 \pm 0,4$ (18,8 max)	1,00	152,4	152,4	23230	115

1) Values in parentheses apply to coated cores, ring cores made of NiZn ferrite may exceed the specified dimensions by up to 5 %

Type	Dimensions			Magnetic characteristics				Approx. weight g
	$d_a^{(1)}$ mm	$d_i^{(1)}$ mm	$h^{(1)}$ mm	$\Sigma I/A$ $\text{mm}^{-1}$	$I_e$ mm	$A_e$ $\text{mm}^2$	$V_e$ $\text{mm}^3$	
R 100	102,0 ± 2,0 (104,8 max)	65,8 ± 1,3 (63,7 min)	15,0 ± 0,5 (16,3 max)	0,96	255,3	267,2	68220	330
R 140	140,0 ± 3,0 (143,8 max)	103,0 ± 2,0 (100,2 min)	25,0 ± 1,0 (26,8 max)	0,82	375,8	458,9	172440	860
R 200	202,0 ± 4,0 (206,8 max)	153,0 ± 3,0 (149,2 min)	25,0 ± 1,0 (26,8 max)	0,90	550,5	608,6	335030	1600

1) Values in parentheses apply to coated cores, ring cores made of NiZn ferrite may exceed the specified dimensions by up to 5 %

**Preferred types<sup>1)</sup>**

Type	Material	$A_L$ value nH (1mT, 10 kHz, 25°C)	$A_{L1min}$ nH (320 mT, N49: 200 mT, 10 kHz, 100 °C)	Power loss per core (measurement conditions)	Ordering code	PU Pcs
R 2,5	N 30 T 38 T 38	440 ± 25% 1020 ± 30% 1020 +30/-40%			-P35-X830 -A35-X38 -P35-X38	40000
R 4	K 1 M 33 N 30 T 38 T 38 T46	13 ± 25% 123 ± 25% 700 ± 25% 1630 ± 30% 1630 +30/-40% 2450 +30/-30%			-A36-X1 -A36-X33 -K36-X830 -A36-X38 -P36-X38 -A36-X46	16000
R 6,3	K 1 M 33 N 49 <sup>2)</sup>  N 30 N 30 T38 T38	20 ± 25% 190 ± 25% 330 ± 25%  1090 ± 25% 1090 ± 25% 2530 ± 30% 2530 +30/-40%	250	< 6 mW (50 mT/500 kHz/100°C)	-A37-X1 -K37-X33 -K37-X49  -A37-X830 -K37-X830 -A37-X38 -K37-X38	4000
R 9,5 / 2	T46	4180 ± 30%			-A681-X46	
R 10	K1 M33 N49 <sup>2)</sup>  N30 N30 T38	33 ± 25% 308 ± 25% 530 ± 25%  1760 ± 25% 1760 ± 25% 4090 +30/-40%	410	< 23 mW (50 mT/500 kHz/100°C)	-A38-X1 -K38-X33 -K38-X49  -A38-X830 -K38-X830 -K38-X38	1000 3000 3000  1000 3000 3000
R 12,5	N 49 <sup>2)</sup>  N27  N 67  N30 N30 T 35 T 35	660 ± 25%  1020 ± 25%  1070 ± 25%  2200 ± 25% 2200 ± 25% 3060 ± 25% 3060 +25/-30%	510  460  460  -	< 45 mW (50 mT/500 kHz/100°C)  < 70 mW (200 mT/25 kHz/100°C)  < 280 mW (200 mT/100 kHz/100°C)	-K44-X49  -K44-X27  -K44-X67  -A44-X830 -K44-X830 -A44-X35 -K44-X35	1500  1500  1500  500 1500 500 1500

1) The preferred core types are available at short notice. Other cores on request.

2) Preliminary data

Type	Material	$A_L$ value nH (1mT, 10 kHz, 25°C)	$A_{L1min}$ nH (320 mT, N49: 200 mT, 10 kHz, 100 °C)	Power loss per core (measurement conditions)	Ordering code	PU Pcs
R 16	N 49 <sup>1)</sup>	840 ± 25%	640	< 95 mW (50 mT/500 kHz/100°C)	-K45-X49	2000
	N27	1290 ± 25%	580	< 140 mW (200 mT/25 kHz/100°C)	-K45-X27	2000
	N67	1350 ± 25%	580	< 500 mW (200 mT/100 kHz/100°C)	-K45-X67	2000
	N30	2770 ± 25%			-K45-X830	2000
	T35	3870 ± 25%			-A45-X35	1000
	T35	3870 +25/-30%			-K45-X35	2000
	T38	6440 ± 30%			-A45-X38	1000
	T38	6440 +30/-40%			-K45-X38	2000
R 20/7	N 27	1930 ± 25%	870	< 280 mW (200 mT/25 kHz/100°C)	-K632-X27	1000
	N 67	2030 ± 25%	870	< 1,2 W (200 mT/100 kHz/100°C)	-K632-X67	1000
	N 30	4160 ± 25%			-A632-X830	500
	N 30	4160 ± 25%			-K632-X830	1000
	T 35	5000 ± 25%			-A632-X35	500
	T 35	5000 +25/-30%			-K632-X35	1000
	T 38	8500 +30/-40%			-K632-X38	1000
	N 27	1210 ± 25%	550	< 250 mW (200 mT/25 kHz/100°C)	-K638-X27	300
R 22	N30	2610 ± 25%			-K638-X830	300
	T 35	3200 ± 25%			-A638-X35	500
	T 35	3200 +25/-30%			-K638-X35	300
	N 27	2150 ± 25%	970	< 580 mW (200 mT/25 kHz/100°C)	-K618-X27	500
R 25/10	N 67	2260 ± 25%	970	< 2,4 W (200 mT/100 kHz/100°C)	-K618-X67	500
	N 30	4620 ± 25%			-A618-X830	400
	N 30	4620 ± 25%			-K618-X830	500
	T 35	5400 ± 25%			-A618-X35	400
	T 35	5400 +25/-30%			-K618-X35	500
R 34/10	N 30	4360 ± 25%			-K58-X830	225
R 34/12,5	N 30	5460 ± 25%			-K48-X830	225

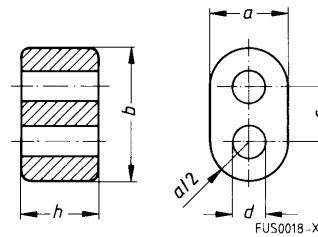
1) Preliminary data

Type	Material	$A_L$ value nH (1mT, 10 kHz, 25°C)	$A_{L1min}$ nH (320 mT, N49: 200 mT, 10 kHz,100 °C)	Power loss per core (measurement conditions)	Ordering code	PU
					B64290-	Pcs
R 36	N 27	2670 ± 25%	1200	< 1,6 W (200 mT/25 kHz/100°C)	-K674-X27	200
	N 67	2810 ± 25%	1200	< 5,9 W (200 mT/100 kHz/100°C)	-K674-X67	
	N 30	5750 ± 25%			-A674-X830	
	N 30	5750 ± 25%			-K674-X830	
R 40	N 30	7000 ± 25%			-A659-X830	80
	N 30	7000 ± 25%			-K659-X830	
R 42	N 30	5000 ± 25%			-A22-X830	192
	N 30	5000 ± 25%			-K22-X830	
R 50	N 30	8700 ± 25%			-A82-X830	64
	N 30	8700 ± 25%			-L82-X830	
R 58	N 30	5400 ± 25%			-K40-X830	90
R 100	N 30	5500 ± 25%			-A84-X830	24
R 140	N 30	6200 ± 25%			-A705-X830	4
R 200	N 30	5500 ± 30%			-A711-X830	2

**Primarily used for broadband  
transformers up to high frequencies**

#### Application examples

- SIFERRIT material N30 for low frequencies and for pulse applications
- SIFERRIT material K1 for matching transformers and baluns up to about 250 MHz in antenna feeders or in input circuits of VHF and TV receivers
- SIFERRIT material U17 for the same applications up to 500 MHz



Dimensions <sup>1)</sup>					Magnetic characteristics				Weight
$h$ (mm)	$b$ (mm)	$a$ (mm)	$c$ (mm)	$d$ (mm)	$\Sigma I/A$ <sup>3)</sup> $mm^{-1}$	$I_e$ <sup>3)</sup> $mm$	$A_e$ <sup>3)</sup> $mm^2$	$V_e$ <sup>3)</sup> $mm^3$	g
14,5 – 1,0	14,50 – 1,0	8,5 – 0,5	$5,85 \pm 0,25$	$3,4 + 0,80$	0,310	15,3	49,7	760	4,0
8,3 – 0,6	14,50 – 1,0	8,5 – 0,5	$5,85 \pm 0,25$	$3,4 + 0,60$	0,540	15,3	28,4	435	2,5
6,2 – 0,5	7,25 – 0,5	4,2 – 0,4	$2,90 \pm 0,15$	$1,7 + 0,30$	0,745	7,6	10,2	78	0,4
2,5 – 0,3	3,60 – 0,3	2,1 – 0,3	$1,45 \pm 0,10$	$0,8 + 0,15$	1,780	3,7	2,1	7,8	0,1

#### Overview of available types

Core height $h$ (mm)	Material	$A_L$ value <sup>3)</sup> nH (Tol. $\pm 30\%$ )	Ordering code <sup>4)</sup>	PU Pcs
14,5 – 1,0 <sup>2)</sup>	U17 K1	40 330	B62152-A1-X17 B62152-A1-X1	200
8,3 – 0,6 <sup>2)</sup>	U17 K1 N30	24 190 10000	B62152-A4-X17 B62152-A4-X1 B62152-A4-X30	400
6,2 – 0,5 <sup>2)</sup>	U17 K1 N30	17 140 7300	B62152-A7-X17 B62152-A7-X1 B62152-A7-X30	2000
2,5 – 0,3	U17 K1 N30	7 60 3000	B62152-A8-X17 B62152-A8-X1 B62152-A8-X30	20000

1) Cores made of NiZn ferrite may exceed the specified dimensions by up to 5 %.

2) In accordance with DIN 41279, shape G.

3) Magnetic characteristics and  $A_L$  value are based on winding of center leg.

4) Double-aperture cores are available with parylene coating on request. In this case the thickness of the coating is approx. 10 to 15  $\mu m$ . Ordering code for coated version: B62152-P...



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# We set your ideas in motion

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**Basic features**

- Composite material of polymer and ferrite
- Minor influence of temperature
- High dc magnetic bias capability
- Suitable for a wide frequency range
- High electrical resistance

**Technical benefits**

- High mechanical stability
- Excellent dimensional stability
- Manufacturing technique: injection molding (C302)  
→ production of any core shape possible
- Distributed air gap → low winding losses

**Application examples**

- Inductive proximity switches
- Identification systems, e.g. immobilizer in automobiles
- Non-contact power transmission
- Resonance inductors for DC/DC converters

Core shapes on request

**Physical properties**

Material	Symbol	Unit	C302	C303
Initial permeability; $f = 1 \text{ MHz}$	$\mu_i$		$17 \pm 20 \%$	$24 \pm 20 \%$
Flux density (near saturation) $H = 25 \text{ kA/m}; f = 10 \text{ kHz}$	$B_s (25^\circ\text{C})$	mT	330	350
Remanent flux density $H = 25 \text{ kA/m}; f = 10 \text{ kHz}$	$B_r (25^\circ\text{C})$	mT	15	26
Coercive field strength $H = 25 \text{ kA/m}; f = 10 \text{ kHz}$	$H_c (25^\circ\text{C})$	A/m	770	640
Relative loss factor $f = 100 \text{ kHz}$ $f = 10 \text{ MHz}$	$\tan\delta/\mu_i$		0,0010 0,0030	0,0002 0,0050
Hysteresis material constant	$\eta_B$	$10^{-3}/\text{mT}$	< 0,25	< 0,6
Temperature coefficient	$\alpha = \Delta\mu/\mu\Delta T$	1/K	< 0,0002	< 0,0005
Density		$\text{kg}/\text{m}^3$	3500	3600
Resistivity $f = 10 \text{ kHz}$ $f = 10 \text{ MHz}$	$\rho$	$\Omega\text{m}$	21 13	300 50
Dielectric constant $f = 10 \text{ kHz}$ $f = 10 \text{ MHz}$	$\epsilon_r$		280 100	900 300
Max. operating temperature	$T_{\max}$	°C	180	120

### **Basic features**

- FPC is a composite material of polymer and ferrite
- FPC film is a thin, mechanically flexible film

### **Technical benefits**

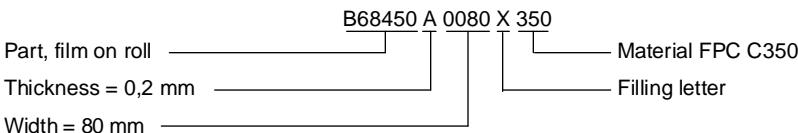
- Stable magnetic characteristics
- Low weight: FPC film is 40% lower in density than ferrite
- High mechanical strength
- Shaping as required: customer-specific solutions possible
- Economy: easy transport and storage,  
simple, rationalized processing, low mounting volume

### **Application examples**

- Electromagnetic shielding
- Flexible coils
- Field focusing, in particular for flat coils:  
“coil on chip” technology

### **Ordering**

The film is 80 mm wide and 0,2 mm thick. Supply in packing units of 1 meter.



**Physical properties** (material values defined on 0,2 mm thick film)

Material	Symbol	Unit	C350
Initial permeability <sup>1)</sup> f = 1 MHz	$\mu_i$		9 ± 20 %
Flux density (near saturation) <sup>1)</sup> H = 25 kA/m f = 10 kHz	$B_s$	mT	255
Remanent flux density <sup>1)</sup> H = 25 kA/m f = 10 kHz	$B_r$	mT	9
Coercive field strength <sup>1)</sup> H = 25 kA/m f = 10 kHz	$H_c$	A/m	600
Relative loss factor <sup>1)</sup> f = 10 MHz f = 1 GHz	$\tan\delta/\mu_i$		< 0,005 < 0,400
Hysteresis material constant	$\eta_B$	10 <sup>-3</sup> /mT	< 2
Temperature coefficient <sup>1)</sup>	$\alpha=\Delta\mu/\mu\Delta T$	1/K	< 5 · 10 <sup>-5</sup>
Density		kg/m <sup>3</sup>	2930
Resistivity <sup>1)</sup> f = 1 kHz f = 10 MHz	$\rho$	Ωm	500 100
Dielectric constant <sup>1)</sup> f = 1 kHz f = 10 MHz	$\epsilon_r$		700 21
Dielectric strength		kV/mm	1
Max. operating temperature	$T_{max}$	°C	120
Tensile strength <sup>2)</sup>	$\sigma_z$	N/mm <sup>2</sup>	0,5
Tearing resistance <sup>2)</sup>		%	25
Compressibility <sup>2)</sup>	$\kappa$	N/mm <sup>2</sup>	70

1) T = 25 °C in accordance with IEC 51 (CO) 282

2) T = 23 °C and 50 % r.h.

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Now order even more

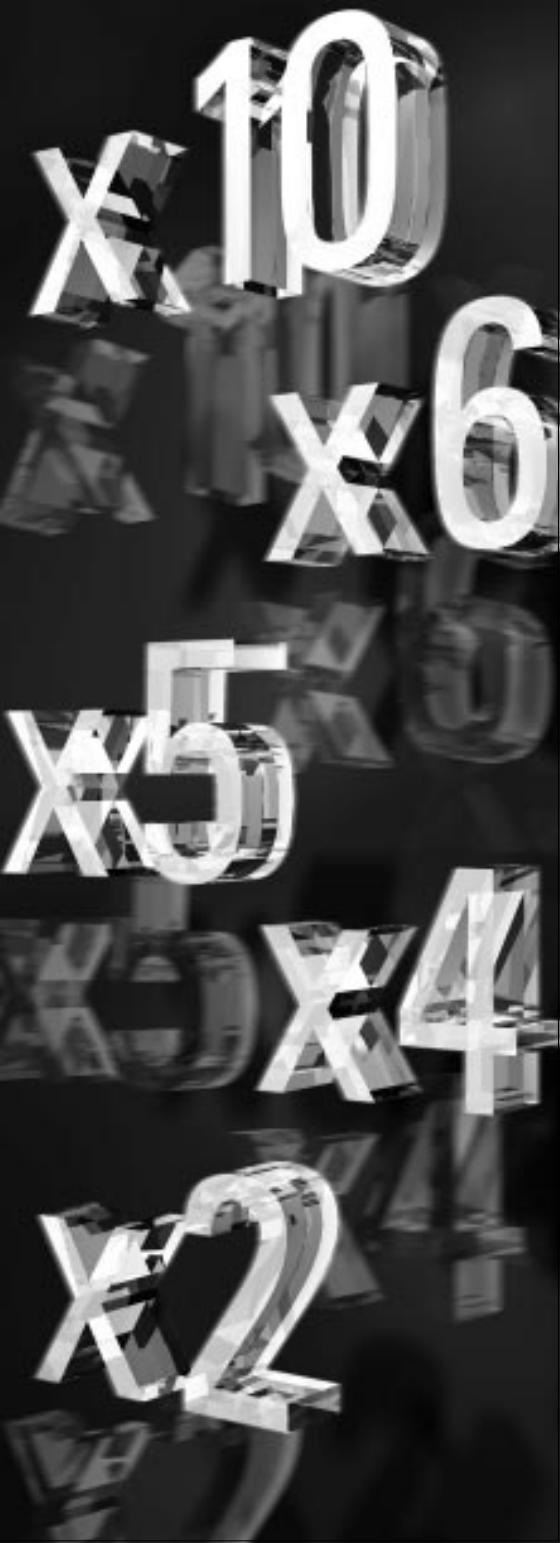
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## Symbols and Terms

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Symbol	Meaning	Unit
$A$	Cross section of coil	mm <sup>2</sup>
$A_e$	Effective magnetic cross section	mm <sup>2</sup>
$A_L$	Inductance factor; $A_L = L/N^2$	nH
$A_{L1}$	Minimum inductance at defined high saturation ( $\leq \mu_a$ )	nH
$A_{\min}$	Minimum core cross section	mm <sup>2</sup>
$A_N$	Winding cross section	mm <sup>2</sup>
$A_R$	Resistance factor; $A_R = R_{Cu}/N^2$	$\mu\Omega = 10^{-6} \Omega$
$B$	RMS value of magnetic flux density	Vs/m <sup>2</sup> , mT
$\Delta B$	Flux density deviation	Vs/m <sup>2</sup> , mT
$\hat{B}$	Peak value of magnetic flux density	Vs/m <sup>2</sup> , mT
$\Delta \hat{B}$	Peak value of flux density deviation	Vs/m <sup>2</sup> , mT
$B_{-}$	DC magnetic flux density	Vs/m <sup>2</sup> , mT
$B_R$	Remanent flux density	Vs/m <sup>2</sup> , mT
$B_S$	Saturation magnetization	Vs/m <sup>2</sup> , mT
$C_0$	Winding capacitance	F = As/V
$DF$	Relative disaccommodation coefficient $DF = d/\mu_i$	
$d$	Disaccommodation coefficient	
$E_a$	Activation energy	J
$f$	Frequency	s <sup>-1</sup> , Hz
$f_{\text{cutoff}}$	Cut-off frequency	s <sup>-1</sup> , Hz
$f_{\max}$	Upper frequency limit	s <sup>-1</sup> , Hz
$f_{\min}$	Lower frequency limit	s <sup>-1</sup> , Hz
$f_r$	Resonance frequency	s <sup>-1</sup> , Hz
$f_{Cu}$	Copper space factor	
$g$	Air gap	mm
$H$	RMS value of magnetic field strength	A/m
$\hat{H}$	Peak value of magnetic field strength	A/m
$H_{-}$	DC field strength	A/m
$H_c$	Coercive field strength	A/m
$h$	Hysteresis coefficient of material	$10^{-6} \text{ cm/A}$
$h/\mu_i^2$	Relative hysteresis coefficient	$10^{-6} \text{ cm/A}$
$I$	RMS value of current	A
$I_{\text{--}}$	Direct current	A
$\hat{I}$	Peak value of current	A
$J$	Polarization	Vs/m <sup>2</sup>
$k$	Boltzmann constant	J/K
$L$	Inductance	$H = Vs/A$
$\Delta L/L$	Relative inductance change	
$L_0$	Inductance of coil without core	H
$L_H$	Main inductance	H
$L_p$	Parallel inductance	H

## Symbols and Terms

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Symbol	Meaning	Unit
$L_{\text{rev}}$	Reversible inductance	H
$L_s$	Series inductance	H
$l_e$	Effective magnetic path length	mm
$l_N$	Average length of turn	mm
$N$	Number of turns	
$P_{\text{Cu}}$	Copper (winding) losses	W
$P_{\text{trans}}$	Transferrable power	W
$P_V$	Relative core losses	mW/g
$Q$	Quality factor ( $Q = \omega L/R_s = 1/\tan \delta_L$ )	
$R$	Resistance	$\Omega$
$R_{\text{Cu}}$	Copper (winding) resistance ( $f = 0$ )	$\Omega$
$R_h$	Hysteresis loss resistance of a core	$\Omega$
$\Delta R_h$	$R_h$ change	$\Omega$
$R_i$	Internal resistance	$\Omega$
$R_p$	Parallel loss resistance of a core	$\Omega$
$R_s$	Series loss resistance of a core	$\Omega$
$R_{\text{th}}$	Thermal resistance	K/W
$R_V$	Effective loss resistance of a core	$\Omega$
$s$	Total air gap	mm
$T$	Temperature	$^{\circ}\text{C}$
$\Delta T$	Temperature difference	K
$T_c$	Curie temperature	$^{\circ}\text{C}$
$t$	Time	s
$t_v$	Pulse duty factor	
$\tan \delta$	Loss factor	
$\tan \delta_L$	Loss factor of coil	
$\tan \delta_r$	(Residual) loss factor at $H \rightarrow 0$	
$\tan \delta_e$	Relative loss factor	
$\tan \delta_h$	Hysteresis loss factor	
$\tan \delta/\mu_i$	Relative loss factor of material at $H \rightarrow 0$	
$U$	RMS value of voltage	V
$\mathcal{O}$	Peak value of voltage	V
$V_e$	Effective magnetic volume	$\text{mm}^3$
$Z$	Complex impedance	$\Omega$
$\alpha$	Temperature coefficient ( $TK$ )	1/K
$\alpha_F$	Relative temperature coefficient of material	1/K
$\alpha_e$	Temperature coefficient of effective permeability	1/K
$\epsilon_r$	Relative dielectric constant	
$\Phi$	Magnetic flux	Vs
$\eta$	Efficiency of a transformer	
$\eta_B$	Hysteresis material constant	$\text{mT}^{-1}$

## Symbols and Terms

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Symbol	Meaning	Unit
$\eta_i$	Hysteresis core constant	$A^{-1}H^{-1/2}$
$\lambda_s$	Magnetostriiction at saturation magnetization	
$\bar{\mu}$	Relative complex permeability	
$\mu_o$	Magnetic field constant	$Vs/Am$
$\mu_a$	Relative amplitude permeability	
$\mu_{app}$	Relative apparent permeability	
$\mu_e$	Relative effective permeability	for parallel components
$\mu_i$	Relative initial permeability	
$\mu'_p$	Relative real (inductive) component of $\bar{\mu}$	
$\mu''_p$	Relative imaginary (loss) component of $\bar{\mu}$	
$\mu_r$	Relative permeability	for series components
$\mu_{rev}$	Relative reversible permeability	
$\mu'_s$	Relative real (inductive) component of $\bar{\mu}$	
$\mu''_s$	Relative imaginary (loss) component of $\bar{\mu}$	
$\mu_{tot}$	Relative total permeability derived from the static magnetization curve	
$\rho$	Resistivity	$\Omega m^{-1}$
$\Sigma I/A$	Magnetic form factor	$mm^{-1}$
$\tau_{Cu}$	DC time constant $\tau_{Cu} = L/R_{Cu} = A_L/A_R$	s
$\omega$	Angular frequency; $\omega = 2 \pi f$	$s^{-1}$

The commas used in numerical values denote decimal points.

All dimensions are given in mm.

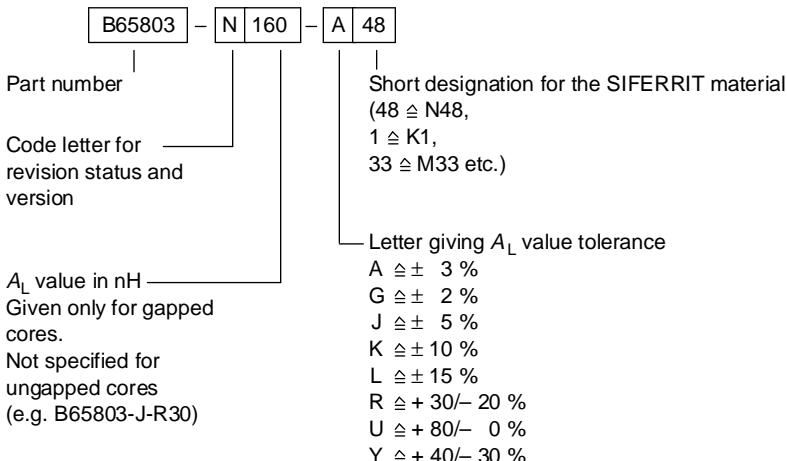
## Symbols and Terms

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### Ordering code structure

*RM and P core sets*

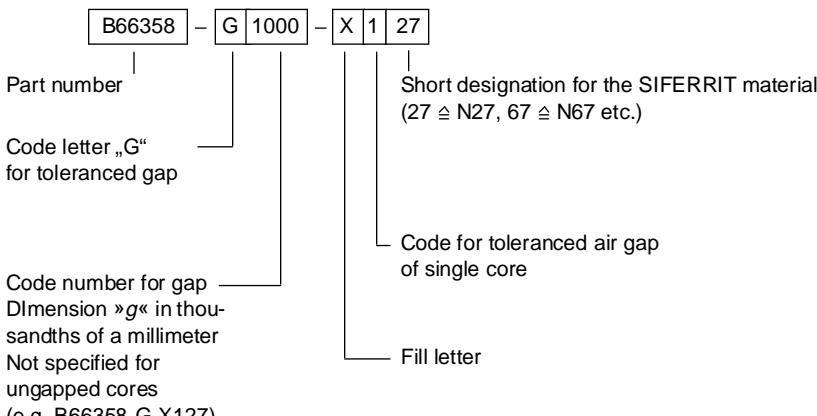
(Example here RM 4)



### E cores (ETD, EFD, EC, ER, E)

E cores are supplied as pieces; each packing unit contains only cores either with or without shortened center leg (gap dimension »g«). The typical value given in the tables for the  $A_L$  value applies to a core set consisting of one core with a shortened center leg and one core without a shortened center leg (dimension »g« approx. 0). E cores with a toleranced  $A_L$  value are available on request. We then prefer a symmetrical air gap distribution.

Ordering example (here ETD 29)



## Symbols and Terms

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### Versions (code letters) of RM and P cores

Type	with center hole (without threaded sleeve)	with center hole (with threaded sleeve)	without center hole	with tapered center post	low- profile version
RM 3	—	—	J	—	P
RM 4	A	N	J	—	P
RM 5	C	N	J	—	P
RM 6	C	N	J	—	P
RM 6-R	A	F	—	—	—
RM 7	A	N	J	—	P
RM 8	D	F	J	H	P
RM 10	—	N	J	H	P
RM 12	—	—	E	H	P
RM 14	—	—	E	H	P

Type	with center hole (without threaded sleeve)	with center hole (with threaded sleeve)	without center hole
P 3,3 × 2,6	—	—	C
P 4,6 × 4,1	B	K (with thread)	W
P 5,8 × 3,3	D	—	—
P 7 × 4	A	—	—
P 9 × 5	D	T	—
P 11 × 7	D	T	W
P 14 × 8	D	T	W
P 18 × 11	D	T	W
P 22 × 13	D	T	W
P 26 × 16	D	T	W
P 30 × 19	D	T	W
P 36 × 22	L	N	W
P 41 × 25	J	—	—