amorphous VITROVAC 6025 Z

Tape-wound cores for Mag Amp Chokes

The Magnetic Amplifier (Mag Amp) regulation principle offers a low cost, efficient and, owing to the simple design, highly reliable solution for secondary output regulation in switched-mode power supplies with multiple outputs.

The heart of a Mag Amp-choke is a toroidal core made from a softmagnetic alloy with a highly square hysteresis loop and low magnetic reversal losses. For this reason, amorphous Co-based alloys such as VITROVAC® 6025 Z have been accepted world-wide for this application.

The most popular and particularly economic magnetic amplifiers are those with a performance range from approx. 20 to above 150 W per output, for currents up to 30 A or above. The Mag Amp principle is well established in power supplies of personal computers and server applications.

Recently, our core range for MagAmp Chokes has been complemented by a newly developed nanocrystalline core series of VITROPERM® 500 Z. Please contact us for further informations.

Core informations:

Our Mag Amp Cores are preferably supplied in plastic protective cases, adding silicone rubber (Fix 022). This finish is suitable for direct winding and offers good mechanical protection for the core, and thus the best magnetic properties. The resins used for the plastic cases are according to UL94V-0 or UL94V-1. Epoxy coated (Fix 350) core designs aswell as many other core sizes are available on request.

Material data of VITROVAC 6025 Z :

	typical values
Saturation flux density (25 °C), B_s	0.58 T
Bipolar flux density swing (25 °C)	1.15 T
Bipolar flux density swing (90 °C)	1.0 T
Squareness, B_r / B_s (100 kHz), typ.	> 96 %
Saturation magnetostriction (25 °C)	< 0.2 × 10^{-6}
Curie temperature, T_c	240 °C
Continuous upper operation temperature	90 °C

VITROVAC 6025 Z cores for Mag Amps, standard sizes:

core dimensions	finished dimensions (limiting values) O.D. mm	I.D. mm	H mm	core cross-section A_{Fe} cm²	mean core path length l_{Fe} cm	core mass m_{Fe} g	total flux [1] (25°C) ϕ_{ss} µWb	total flux [1] (90°C) $\phi_{ss,\,90°C}$ µWb	eff. winding area A_{Cu} cm²	mean copper path length l_{Cu} cm	heat trans. Res. R_{th} K/W	part number T6000...
10 × 8 × 4	11.6	6.5	5.1	0.032	2.83	0.7	3.7	3.2	0.082	2.01	56	**6-E4010-W534**
10.1×6.9×4.5	11.6	5.5	6.0	0.058	2.67	1.2	6.7	5.8	0.059	2.24	57	**6-E4010-W663**
10.7×8.2×4.5	14.0	6.6	6.2	0.045	2.97	1.0	5.2	4.5	0.085	2.45	47	**6-E4010-W728**
12.8×9.5×3.2	14.7	7.9	4.8	0.042	3.50	1.1	4.8	4.2	0.121	2.23	44	**6-E4012-W464**
12 × 8 × 4.5	14.0	6.6	6.2	0.072	3.14	1.7	8.1	7.0	0.085	2.45	47	**6-E4012-W547**
12.5 × 10 × 5	14.0	8.5	6.8	0.050	3.53	1.4	5.8	5.0	0.140	2.56	42	**6-E4012-W535**
14 × 8 × 4.5	15.5	6.5	5.7	0.108	3.46	2.9	12.4	10.8	0.082	2.53	44	**6-E4014-W481**
15 × 10 × 4.5	17.1	7.9	6.5	0.090	3.93	2.7	10.4	9.0	0.121	2.84	37	**6-E4015-W813**
15 × 10 × 6	17.9	8.2	8.2	0.124	3.93	3.7	14.3	12.4	0.131	3.20	34	**6-E4015-W856**
16 × 10 × 6	17.9	8.2	8.2	0.144	4.08	4.5	16.6	14.4	0.131	3.20	34	**6-E4016-W536**
17.5×12.5×6	19.1	10.9	8.1	0.120	4.71	4.4	13.8	12.0	0.231	3.30	30	**6-E4017-W537**
19.2×12.7×6	20.6	11.4	7.4	0.161	5.01	6.2	18.5	16.1	0.253	3.30	28	**4-E4019-W666**[2]
19 × 15 × 5	21.2	13.0	7.3	0.080	5.34	3.3	9.2	8.0	0.329	3.17	27	**6-E4019-W539**
19 × 15 × 10	21.2	13.0	12.3	0.160	5.34	6.6	18.4	16.0	0.329	4.25	24	**6-E4019-W540**
20 × 12.5× 8	22.6	10.3	10.2	0.240	5.10	9.4	27.6	24.0	0.206	4.05	26	**6-E4020-W538**
25 × 20 × 10	27.7	17.1	12.9	0.200	7.10	10.9	23.0	20.0	0.568	4.98	18	**6-E4025-W542**
25 × 16 × 10	27.9	13.6	12.5	0.360	6.44	17.9	41.4	36.0	0.360	5.00	19	**6-E4025-W541**
30 × 20 × 10	32.8	17.6	12.5	0.400	7.85	24.2	46.0	40.0	0.602	5.40	16	**6-E4030-W543**

[1] $\Phi_{ss} = 2 \times B_s \times A_{Fe}$ [2] epoxy coated

VITROPERM 500 Z

Nanocrystalline Tape-Wound Cores for Magnetic Amplifier Chokes

VITROPERM® 500 Z - a new class of Fe-based nanocrystalline soft magnetic material developed specially for use in Saturable Reactors and Magnetic Amplifiers is another innovative development by VACUUMSCHMELZE GmbH & Co. KG.

This newly developed material complements the already existing amorphous material - Co-based high-squareness VITROVAC® 6025 Z. This is presently being widely used in Magnetic Amplifier Chokes (MagAmps) for secondary output voltage regulation in various kinds of SMPS with multiple outputs.

Making use of the specific material properties of nanocrystalline VITROPERM 500 Z enables reliable MagAmp circuits with good performance in smallest component sizes at significantly reduced costs. Thus, the MagAmp Regulation principle becomes even more attractive in future projects.

VITROPERM combines excellent soft magnetic properties with a very high saturation induction of 1.2 Tesla making this nanocrystalline material all the more interesting where volume and cost matter most. Furthermore, the thermal stability of the nanocrystalline structure is superior to amorphous materials thereby allowing continuous operating temperatures of up to 120°C and more. With these unbeatable properties, our new square-loop VITROPERM 500 Z with its very high remanence ratio (low ΔB_{rs}, high squareness) is the ideal choice for engineers to design MagAmp circuits which are highly reliable and cost-effective.

Core informations:

Our MagAmp cores of VITROPERM 500 Z are preferrably supplied in plastic protection boxes, adding silicone rubber (Fix 022).
Our plastic boxes are suitable for direct winding (even with thick copper wires) and offer optimum mechanical protection for the nanocrystalline core material. This guarantees best magnetic properties. All materials are according UL94V-1/0 (UL-file no. E41871).

Material data VITROPERM 500 Z (typical values):

Saturation flux density (25 °C), B_s	1.2 T
Bipolar flux density swing (25 °C)	2.35 T
Bipolar flux density swing (90 °C)	2.15 T
Squareness, B_r / B_s	> 94 %
Saturation magnetostriction (25 °C)	< 0.5 × 10^{-6}
Curie temperature, T_c	600 °C
Continuous upper operation temperature	120 °C

Core type series of nanocrystalline VITROPERM 500 Z MagAmp cores

core dimensions $d_{a,Core}$ x $d_{i,Core}$ x h_{Core}	finished dimensions (limiting values) O.D. mm	I.D. mm	H mm	core cross-section A_{Fe} cm²	mean core path length l_{Fe} cm	core mass m_{Fe} g	total flux [1] 25°C ϕ_{ss} µWb	total flux [1] 90°C $\phi_{ss, 90°C}$ µWb	core area [2] product $W_a \times A_{Fe}$ cm^4	eff. Cu-winding area A_{Cu} cm²	mean Cu-path length l_{Cu} cm	heat transfer Resistance R_{th} K/W	part number, order code T6000...
10×7×4.5	11.7	5.5	6.1	0.054	2.67	1.1	12.7	11.9	0.013	0.059	2.27	57	6-L2010-**W759**
11×8×4.5	14.1	6.6	6.3	0.054	2.98	1.2	12.7	11.9	0.018	0.085	2.53	46	6-L2011-**W760**
12×8×4.5	14.1	6.6	6.3	0.072	3.14	1.7	16.9	15.8	0.025	0.085	2.53	46	6-L2012-**W761**
12.5×10×4.5	14.1	8.5	6.8	0.045	3.53	1.2	10.6	9.9	0.026	0.140	2.59	42	6-L2012-**W762**
12.8×9.5×3.2	14.7	7.9	4.8	0.042	3.50	1.1	9.9	9.3	0.021	0.121	2.26	44	6-L2012-**W803**
16×10×6	18.0	8.0	8.1	0.144	4.08	4.3	33.8	31.7	0.072	0.124	3.25	34	6-L2016-**W763**
16.5×12.5×6	19.1	10.9	8.1	0.096	4.56	3.2	22.6	21.1	0.090	0.231	3.30	30	6-L2016-**W764**
17.5×12.5×6	19.1	10.9	8.1	0.120	4.71	4.2	28.8	26.4	0.112	0.231	3.30	30	6-L2017-**W765**
19×15.2×4.5	21.2	12.9	7.2	0.068	5.37	2.7	16.1	15.0	0.089	0.323	3.28	27	6-L2019-**W766**
19×15.2×10	21.2	13.0	12.3	0.152	5.37	6.0	35.7	33.4	0.202	0.329	4.30	24	6-L2019-**W815**
20×15×8	22.6	10.3	10.2	0.160	5.50	6.5	37.6	35.2	0.133	0.206	4.08	26	6-L2020-**W767**
20×12.5×8	22.6	10.3	10.2	0.240	5.11	9.0	56.4	52.8	0.200	0.206	4.08	26	6-L2020-**W768**

[1] $\Phi_{ss} = 2 \times B_s \times A_{Fe}$

[2] $W_a \times A_{Fe}$: core area product in cm^4, W_a is the available winding area of the case

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