



# EMC COMBILINE

EMC SOLUTIONS

EN



**CONTENTS**

**PAGE**

Introduction	Electromagnetic compatibility (EMC)	4
Mains	Mains chokes. Series Z1	7
	Harmonic filters. Series Z1	10
	Central HF filters. Series E6	12
	HF filters. Series E4/E6	14
	Submounted filters. series E6 for Drive Controller COMBIVERT F6	15
	HF DC-filter	16
Motor	Motor chokes	17
	Sinusoidal filters	21
Combinations	Choke EMC Filter combination C3 Level	26
	Highly efficient cores	27
EMC services		28
Service		30

# SYSTEM OVERVIEW

## Automation with Drive

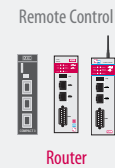
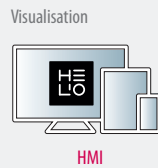
stands for system solutions from automation to mechanical movement. The EMC technology is integrated in the KEB portfolio and belongs to the parts that are often invisible. The practical implementation is integrated in drive controllers or alternatively as modular solution for single or combined axes.

In addition to compliance with valid standards, EMC technology has one goal: maximum operational safety of machines and systems.

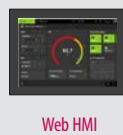
## SOFTWARE



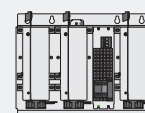
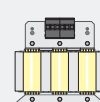
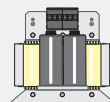
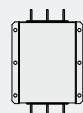
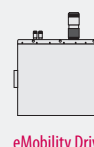
## HMI



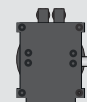
## CONTROL



## DRIVES



## MOTORS



# COMBILINE

## ELECTROMAGNETIC COMPATIBILITY (EMC)

plays an important role in the operating safety of machines and equipment. Manufacturers and operators are required to implement the installed systems so as to achieve electrical compliance with the limits (for emissions) and requirements (for fault-free operations) set out in the standards and regulations.

To this end, the following standards must be applied as per the order below:

**Product standard:** This standard applies to an exactly defined application area that generally meets the special requirements of a product family.

Example: The so-called "power drives systems" (PDS) (Drive Controller and motor viewed in terms of a drive) belong to the product family standards EN 61800-x (-x). EN 61800-3 is the EMC standard.

**Basic technical standard:** This standard sets out the requirements for a specific environment.

Example: The EN 61000-6-x series applies to machine builders; it sets out the general EMC requirements for use either in a public low-voltage grid or an industrial grid.

EN 61000-6 -3 and -4      Emissions

EN 61000-6 -1 and -2      Immunity

**Basic standard:** This standard describes the measurement methods and instruments for the testing process itself. It provides information on limits or minimum requirements without relating the same to a subsequent place of use. That is done by the basic technical standard, basis for the EN 61000-4-x standards series.

KEB develops, produces and supplies a comprehensive range of interference suppression components for the mains- and motor-related optimisation of operating conditions. With the help of a mobile EMC on-site service, our measurements and advisory services can assist you in selecting the proper components and their application. Calibrated measurement instruments and the relevant software can be used to prepare documents that verify compliance with EMC requirements.

## NOMENCLATURE

Electrical		Mechanical	
$I_N$	Nominal current	$\emptyset$	Wire size
$P_V$	Power loss „calculated“	B	Total length from base
$f_{\text{mains}}$	Mains frequency	H	Width from base
$I_{\text{leak}}$	Leakage current in accordance to EN 60939-1: 2010 (Attachement A9)	$H_1$	Width from base - coil design or cable
$P_{\text{inv}}$	Rated capacity of the drive controller [kW] or [HP]	T	Height from base - clamps
L	Inductance	$a_1 a_2 a_3 a_4$	Distance fastening holes
$f_s$	Switching frequency of the Drive Controller	$d_1 d_2$	Diameter fastening holes
$f_{\text{max}}$	Maximum motor frequency	Cu	Copper portion
$U_{\text{max}}$	Maximum operating voltage	m	Total weight
Uk	Voltage drop over the choke/filter at rated frequency and current		
THDi	Total Harmonic Distortion of the current		
PWHD	Partial Weighted Harmonic Distortion of the current		

The operation of variable-speed drives with intermediate voltage circuits puts stress on the mains and motor, which can be optimised with the following additional measures (depending on the place of use and type of application):

## MAINS

- **Mains chokes** reduce harmonics and in-rush current to the mains and increase the service life of components inside the devices.
- **Harmonics filters** reduce the harmonics resulting in sinusoidal current consumption without the voltage losses that occur with mains chokes.
- **HF EMC filters** for high-frequency interference suppression of single and multiple axis systems available in following versions:
  - AC and DC standard filters
  - AC and DC filters with reduced leakage current
  - AC filters compatible with IT networks
  - AC choke and EMC filter combination

## MOTOR

- **Output chokes** for application areas up to 100 Hz and in customer-specific solutions up to 2.000 Hz
- **Sinusoidal filters** create sinusoidal motor voltages and reduce motor losses.  
Available for maximum output frequencies in the range 100 Hz to 1.600 Hz.
- **Sinusoidal EMC filters** as a combination of sinusoidal filters with EMC level reduce symmetrical and asymmetrical interference and support compliance with statutory limits for installations without shielded motor cables (on request). More detailed description can be taken from the catalogue with the reference 0000000-51Z1.



# COMBILINE MAINS-SIDE

## MAINS CHOKES

optimise the current harmonics to the mains power supply which result from the pulse-shaped charging of uncontrolled rectifiers and reduce the effective input current. This decrease in stress has the direct effect of significantly increasing the service life of the DC link voltage capacitors in the Drive Controller and servo drives and reducing the stress on the input rectifier.

Chokes for single-phase or three-phase units are universally designed for a frequency range of 45 - 65 Hz. Nominal inductance is determined by the 4 % short circuit voltage at nominal current and frequency. In the area of the chokes, a sufficiently large installation space must be considered due to increased heat emission and a strong magnetic stray field.

### GENERAL TECHNICAL DATA

<b>Protection class</b>	IP20 (version 1). IP00 (version 2)	<b>Cooling</b>	Convection
<b>max. leakage current</b>	0 mA	<b>Voltage drop</b>	U <sub>k</sub> = 4 %
<b>Overload</b>	150 % - 60 s	<b>Temperature</b>	Storage -25 ... 70° C Operation -10 ... 45° C
<b>Climate category</b>	3K3 (EN 60721-3-3)	<b>Environment (IEC 664-1)</b>	Pollution level 2
<b>Vibration /schock</b>	3M4 (EN 60721-3-3)	<b>Installation position</b>	Standing or lying horizontally
<b>Technical principles</b>	EN 61558-2-20. VDE 0160	<b>Approvals</b>	UR and cUR



### USER BENEFITS

- Relieves the load on supply cables and transformers
- Protects the input rectifier of the Drive Controller from “weak” supply networks
- Increases electrolytic capacitor life by limiting input current ripples

## MAINS CHOKE 1-PHASE 230 VAC ( $U_{max} = 264 \text{ V}$ ), 50/60 Hz

Part-No.	$I_N$ [A]	$P_V$ [W]	$f_{mains}$ [Hz]	$\emptyset$ [mm <sup>2</sup> ]	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	weight	
													Cu [kg]	m [kg]
05Z1B02-1000	6	9	45 - 65	4	60	47	53	80	44	36	3.6	7	0.1	0.5
07Z1B02-1000	10	9	45 - 65	4	85	59.5	65	89	64	46.5	4.8	9	0.3	1.4
09Z1B02-1000	16	15	45 - 65	4	85	60	65	89	64	50	4.8	9	0.3	1.5
10Z1B02-1000	20	15	45 - 65	16	85	60	65	89	64	50	4.8	9	0.3	1.5
12Z1B02-1000	25	18	45 - 65	16	85	60	65	89	64	50	4.8	9	0.4	2.6

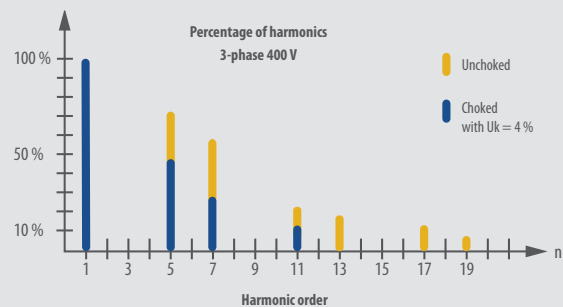
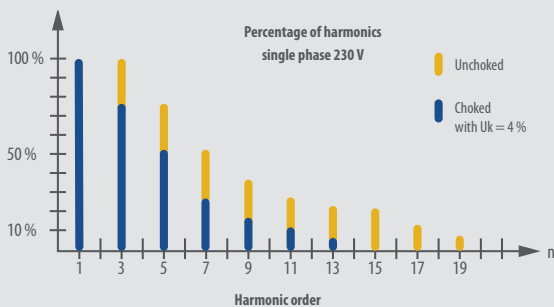
## MAINS CHOKE 3-PHASES 230 VAC ( $U_{max} = 264 \text{ V}$ ), 50/60 Hz

Part-No.	$I_N$ [A]	$P_V$ [W]	$f_{mains}$ [Hz]	$\emptyset$ [mm <sup>2</sup> ]	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	weight	
														Cu [kg]	m [kg]
05Z1B03-1000	2.4	15	45 - 65	4	100	54	54	120	80	-	39	4.8	8	0.1	0.8
07Z1B03-1000	4.2	20	45 - 65	4	100	54	54	120	80	-	39	4.8	8	0.2	0.9
09Z1B03-1000	7.4	26	45 - 65	4	100	54	54	122	80	-	39	4.8	8	0.4	1.1
10Z1B03-1000	10.5	28	45 - 65	4	100	63	63	122	80	-	47	4.8	8	0.5	1.5
12Z1B03-1000	17.3	52	45 - 65	4	148	67	67	145	136	-	47	4.8	8	0.7	2.0
13Z1B03-1000	25.2	55	45 - 65	16	148	77	77	145	136	90	58	4.8	8	0.8	3.7
14Z1B03-1000	34.7	59	45 - 65	16	148	77	77	145	136	90	58	4.8	8	1.1	5
15Z1B03-1000	50.4	88	45 - 65	16	178	90	90	175	166	113	69	4.8	8	1.8	5.8
16Z1B03-1000	69.5	110	45 - 65	M8	219	100	130	160	201	136	70	7	12	2.8	7.4
17Z1B03-1000	88.2	125	45 - 65	M8	219	110	140	170	201	136	80	7	12	3.3	9.6
18Z1B03-1000	105	136	45 - 65	M8	219	120	150	170	201	136	90	7	12	4.2	12.1
19Z1B03-1000	121	170	45 - 65	M8	243	115	155	180	225	156	85	7	12	4	12.2
20Z1B03-1000	152.3	185	45 - 65	M8	243	126	165	180	225	156	96	7	12	4.5	15
21Z1B03-1000	189	200	45 - 65	M10	267	133	173	202	249	176	82	7	12	7.1	21.6

Fig. page 8

For nomenclature, see page 4

Reduction of current harmonics on the power supply by using a mains choke with  $U_k = 4\%$ .

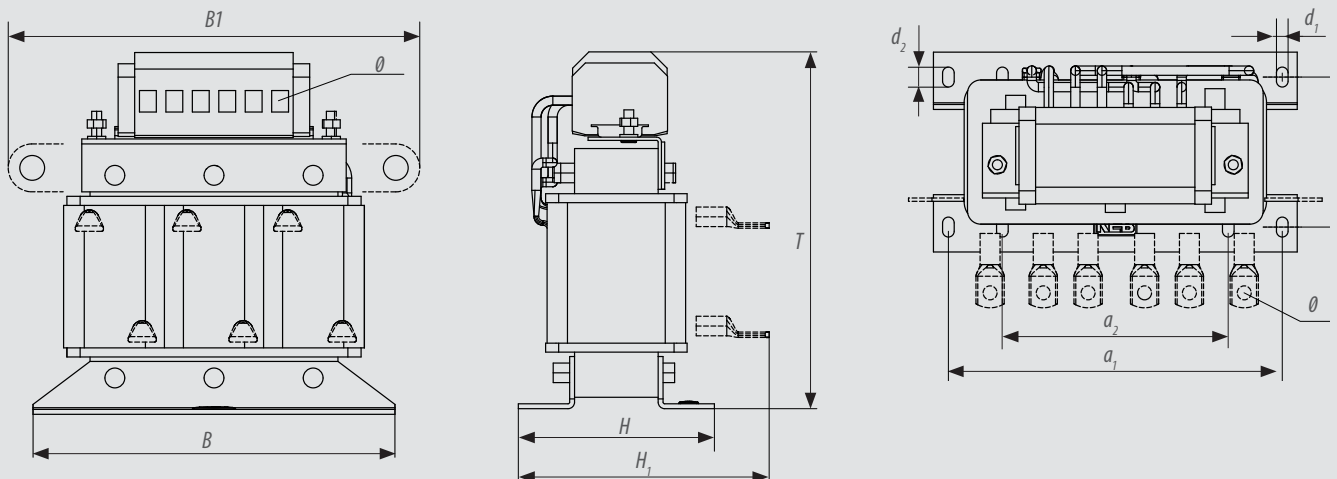


# MAINS CHOKE SERIES Z1

## MAINS CHOKE 3-PHASES 400 VAC ( $U_{max} = 550 V$ ), 50/60 Hz

Part-No.	$I_N$ [A]	$P_V$ [W]	$f_{mains}$ [Hz]	$\emptyset$ [mm <sup>2</sup> ]	B/B1 [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	weight	
														Cu [kg]	m [kg]
05Z1B04-1000	1.4	10	45-65	4	100 / -	55	55	121	80	-	40	4.8	8	0.2	0.8
07Z1B04-1000	2.7	19	45-65	4	100 / -	55	55	121	80	-	40	4.8	8	0.3	0.9
09Z1B04-1000	4.3	23	45-65	4	100 / -	55	55	121	80	-	40	4.8	8	0.4	1.1
10Z1B04-1000	6.1	24	45-65	4	100 / -	64	64	121	80	-	47	4.8	8	0.5	1.5
12Z1B04-1000	10	37	45-65	4	148 / -	68	68	145	136	90	48	4.8	8	0.8	2.1
13Z1B04-1000	12.6	48	45-65	4	148 / -	78	78	145	136	90	59	4.8	8	0.7	2.6
14Z1B04-1000	17.3	69	45-65	4	148 / -	77	77	145	136	90	58	4.8	8	0.9	2.8
15Z1B04-1000	25.2	86	45-65	16	178 / -	73	87	180	166	113	55	4.8	8	1.8	4.4
16Z1B04-1000	34.7	99	45-65	16	178 / -	88	100	178	166	113	68	4.8	8	2	5.9
17Z1B04-1000	44.1	123	45-65	16	219 / -	101	115	215	201	136	73	7	12	2.8	8.4
18Z1B04-1000	52.5	126	45-65	35	219 / -	111	120	220	201	136	81	7	12	3.2	10
19Z1B04-1000	63	142	45-65	35	219 / -	121	135	220	201	136	91	7	12	3.7	12
20Z1B04-1000	79	168	45-65	35	219 / -	121	150	220	201	136	91	7	12	3.8	12
21Z1B04-1000	95	194	45-65	M8	267 / -	109	155	207	249	176	82	7	12	6.3	15.6
22Z1B04-1000	121	210	45-65	M8	291 / -	129	185	215	273	185	97	10	18	6.5	19.3
23Z1B04-1000	158	240	45-65	M8	291 / -	129	200	215	273	185	97	10	18	8.5	22
24Z1B04-1000	189	310	45-65	M10	316 / -	153	225	235	292	200	113	10	16	8	24.8
25Z1B04-1000	221	328	45-65	M10	316 / -	153	222	234	292	200	113	10	16	6.2	25
26Z1B04-1000	263	400	45-65	M10	352 / -	145	210	266	328	224	105	10	16	10	31.6
27Z1B04-1000	315	440	45-65	M10	352 / -	145	230	265	328	224	106	10	16	9	34
28Z1B04-1000	390	559	45-65	M10	388/380	150	245	295	364	248	112	10	16	11.7	41.5
29Z1B04-1000	485	620	45-65	M12	412/395	155	250	315	388	264	116	10	16	13	49.3
30Z1B04-1000	600	650	45-65	M12	412/395	174	270	315	388	264	132	10	16	13	57.7
31Z1B04-1000	660	767	45-65	M12	480/495	172	255	367	450	316	123	12	20	16.5	66
32Z1B04-1000	750	802	45-65	M12	480/495	172	265	475	450	316	123	12	20	19.5	80.5
33Z1B04-1000	840	872	45-65	M12	480/495	172	280	475	450	316	123	12	20	24	86

For nomenclature, see page 4



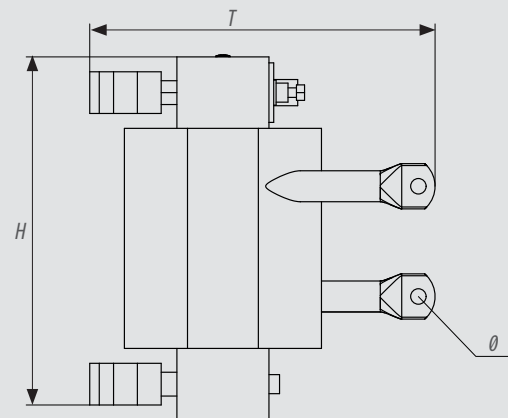
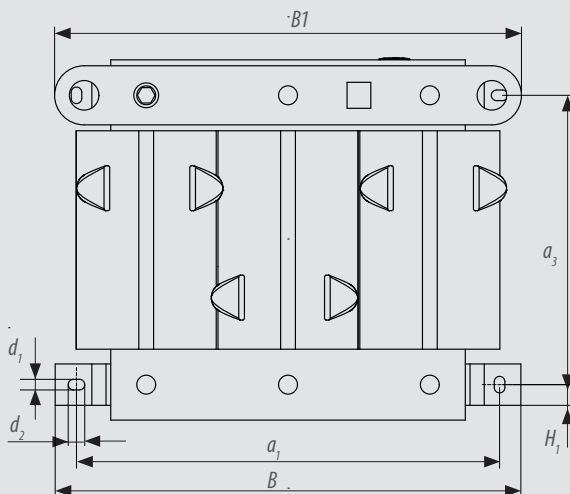


## BACKPLANE MOUNTING

The backplane mounting mains choke type is a range extension of the standard mains choke with the reference xxZ1B04-1000 and are designed to work together with the KEB sub-mounted EMC filters type xxE6T60-1150 as they can be placed directly above the drive controller-filter combination and allows a compact electric cabinet design. With the already prepared EMC filter wires (Re. page 15), these chokes are ready to be connected without additional cable work.

### MAINS CHOKE 3-PHASES 400 VAC ( $U_{max} = 550$ V), 50/60 Hz

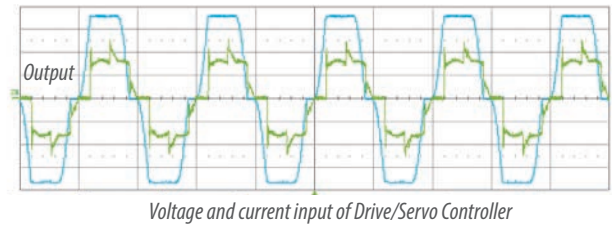
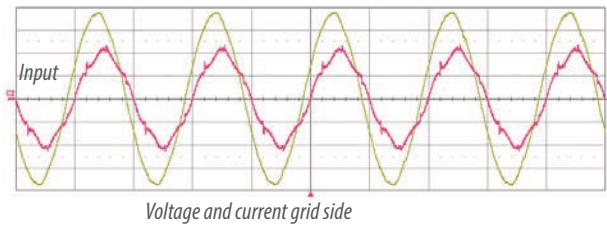
Part-No.	$I_N$ [A]	$P_V$ [W]	$f_{mains}$ [Hz]	$\emptyset$ [mm <sup>2</sup> ]	B/B1 [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	weight	
													Cu [kg]	m [kg]
25Z1B04-1007	221	328	45 - 65	M10	290 / -	226	22	210	258	182	9	14	6.2	25
26Z1B04-1007	263	400	45 - 65	M10	330 / -	256	25	245	298	206	9	14	10	31.6
27Z1B04-1007	315	440	45 - 65	M10	330 / -	256	25	250	298	206	9	14	9	34
28Z1B04-1007	390	559	45 - 65	M12	380/380	286	28	255	322	230	9	14	11.7	41.5
29Z1B04-1007	485	620	45 - 65	M12	395/395	305	30	290	358	245	9	14	13	49.3
30Z1B04-1007	600	650	45 - 65	M12	395/395	305	30	290	358	245	9	14	13	57.7



# HARMONIC FILTER

The new KEB solution to reduce mains harmonics: The filters, like a mains choke, can be easily included in the electrical switching system already in the planning phase. They enable compliance with many international standards such as:

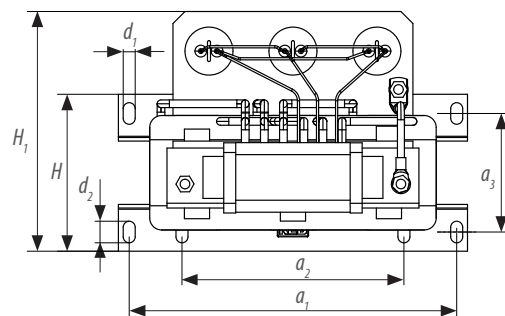
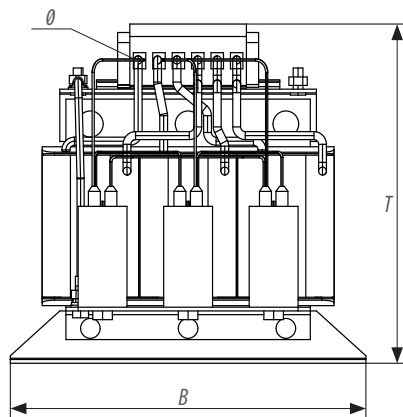
- EN 61000-3-2; up to 16 A
- EN 61000-3-12; 16 A up to 75 A
- EN 61000-3-4
- G5/4 Engineering Recommendation (GB)
- EN 12015 (Standard for lifts Europe)
- IEEE 519 - 1992 (USA)
- AS 2279 (Australia)
- Quality of Electric Energy Supply. Harmonics in Public Supply Network (China)
- COP. supply rules (Hong Kong)



## GENERAL TECHNICAL DATA

<b>Protection rating</b>	IP20, open types
<b>Max. leakage current</b>	0 mA (with option HF filter $\leq 7$ mA)
<b>Overload</b>	150 % - 60 s
<b>Climate category</b>	3K3 (EN 60721-3-3)
<b>Vibration / shock</b>	Germanischer Lloyd. EN 50155
<b>Technical principles</b>	EN 61558-2-20. VDE 0160

<b>Cooling</b>	Convection
<b>Efficiency factor</b>	> 98 %
<b>Temperature</b>	Storage -25 ... 70° C Operation -10 ... 45° C
<b>Environment (IEC 664-1)</b>	Pollution level 2
<b>Installation position</b>	Standing / lying with capacitor positioned below choke
<b>480 V class</b>	UL-. cUL- approval



A new innovative internal structure results in mains-friendly energy consumption with excellent application characteristics. In short, the COMBILINE harmonic filter is universally suited for all types of consumers with B6 inputs.

## THE BENEFITS ARE

- Compact design
- No tendency to oscillate with dynamic load cycles
- Lower voltage loss as compared to mains chokes
- Allows multiple parallel consumers per unit
- Optimised configuration for generators in isolated operations
- Protection for drives in "soft" and "overshooting" mains
- Increased service life for DC link capacitors
- In the case of plant modernisation/expansion no further compensation systems necessary

## HARMONIC FILTER 3-PHASES 400 VAC ( $U_{max} = 440$ V), 50 Hz - THDI < 15 % / PWHD < 39 %

Part-No.	$I_N$ [A]	$P_{inv}$ [kW]	$P_V$ [W]	$\emptyset$ [mm <sup>2</sup> ]	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	weight	
														Cu [kg]	m [kg]
07Z1C04-1001	2.4	0.75	40	4	148	69	134	163	136	90	51	4.8	8	0.7	2.6
10Z1C04-1001	6.1	2.2	65	4	178	75	128	168	166	113	56	4.8	8	1.6	4.8
12Z1C04-1001	10	4	90	4	175	90	145	220	168	113	75	4.8	10	2.2	6.8
13Z1C04-1001	12.6	5.5	105	4	219	102	155	233	202	136	73	7	12	3.5	8.7
14Z1C04-1001	17.3	7.5	135	4	243	105	185	260	225	145	75	7	12	4.2	11.5
15Z1C04-1001	25.2	11	165	16	267	109	174	280	249	176	78	7	12	5.8	16.3
16Z1C04-1001	34.7	15	210	16	291	130	205	275	275	185	97	10	18	7.6	22.6
17Z1C04-1001	44.1	18.5	255	16	291	140	215	280	275	185	110	10	18	9.3	27
18Z1C04-1001	52.5	22	295	35	316	152	256	300	292	200	112	10	16	11.2	33
19Z1C04-1001	63	30	360	35	316	163	260	297	292	200	124	10	16	12.7	38.7

## HARMONIC FILTER 3-PHASES 400 VAC ( $U_{max} = 440$ V), 50 Hz - THDI < 8 % / PWHD < 15 %

Part-No.	$I_N$ [A]	$P_{inv}$ [kW]	$P_V$ [W]	$\emptyset$ [mm <sup>2</sup> ]	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	weight	
														Cu [kg]	m [kg]
09Z1C04-1000	4.3	1.5	60	4	178	90	142	170	166	113	71	4.8	8	1.4	5.8
12Z1C04-1000	10	4	110	4	219	121	170	233	201	136	91	7	12	3.4	11.5
13Z1C04-1000	12.6	5.5	130	16	243	115	195	230	225	144	86	7	12	4.2	13.4
14Z1C04-1000	17.3	7.5	180	16	291	118	192	256	273	185	86	10	18	6.6	18.3
15Z1C04-1000	25.2	11	190	16	291	140	214	257	273	185	106	10	18	9	25.5
16Z1C04-1000	34.7	15	260	16	352	145	240	324	328	224	106	10	16	15	38.5
17Z1C04-1000	44.1	18.5	270	35	352	170	261	324	328	224	131	10	16	15	47.1
18Z1C04-1000	52.5	22	285	35	352	185	260	337	328	224	147	10	16	15	54.6
19Z1C04-1000	63	30	420	35	352	193	355	326	328	224	155	10	16	22	63
20Z1C04-1000	79	37	430	50	388	183	296	360	364	248	144	10	16	23.5	72.6
21Z1C04-1000	95	45	520	50	412	193	320	405	388	264	153	10	16	29.5	96
22Z1C04-1000	121	55	590	50	412	214	378	404	388	264	175	10	16	36	107.7
23Z1C04-1000	158	75	785	95	480	245	416	475	450	316	193	12	20	42.2	162
24Z1C04-1000	189	90	950	95	552	241	515	522	516	356	184	14.5	24	50.8	182.5
25Z1C04-1000	221	110	1145	150	552	275	550	520	525	360	215	14.5	24	60.4	244
26Z1C04-1000	263	132	1360	150	552	294	567	545	516	356	236	14.5	24	63.4	241.5
27Z1C04-1000	315	160	1480	240	552	315	635	550	515	355	255	14.5	24	72.9	294
28Z1C04-1000	390	200	1650	2x150	651	264	530	629	620	460	214	14.5	24	98.2	353
29Z1C04-1000	485	250	1800	2x240	660	350	633	620	620	460	288	14.5	24	126.4	513

## HARMONIC FILTER 3-PHASES 480 V-CLASS ( $U_{max} = 528$ V), 60 Hz - THDI < 8 % / PWHD < 15 %

Part-No.	$I_N$ [A]	$P_{inv}$ [HP]	$P_V$ [W]	$\emptyset$	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	weight	
														Cu [kg]	m [kg]
19Z1C05-1000	46	40	750	M8	352	169	175	325	328	224	128	10	16	16	44.5
20Z1C05-1000	57	50	900	M8	352	185	220	325	328	224	147	10	16	15	55
21Z1C05-1000	69	60	1100	M8	352	193	230	326	328	224	155	10	16	15	64
22Z1C05-1000	90	75	1500	M8	480	200	240	400	468	344	151	10	16	21	93
23Z1C05-1000	115	100	1900	M10	492	202	250	450	468	344	164	10	16	25	106
24Z1C05-1000	150	125	2400	M10	645	248	310	520	626	466	188	14	24	26	165
25Z1C05-1000	190	150	2300	M10	662	248	310	525	626	466	190	14	24	40	180
27Z1C05-1000	220	200	3100	M10	662	278	315	515	626	356	218	14	24	40	230
28Z1C05-1000	300	250	3500	M12	662	298	360	525	626	466	240	14	24	53	258
29Z1C05-1000	360	300	4200	M16	662	318	380	535	626	466	258	14	24	55	280
30Z1C05-1000	410	350	4400	M16	645	330	400	520	626	466	258	14	24	58	285

For nomenclature, see page 4

## CENTRAL HF FILTER SERIES E6

The E6 high-frequency (HF) filter can be used as a central switch cabinet filter, collection filter and for the suppression of individual devices.

- Large rated voltage range 0 - 550 V
- Rated currents from 12 - 330 A, in eight sizes
- Compact design in book form with small footprint
- High saturation resistance. Shielded motor cable lengths up to 100 m and 300 m
- An especially wide damping area due to newly developed filter components
- The filters are designed for low leakage current in operation with frequency converters. With the same applications, the leakage current will be reduced to as low as 1/10 as compared to standard filters
- Operation at AC/DC sensitive RCDs with small triggering level 30/300 mA for people and fire protection
- High short overload capacity
- UL and cUL approvals: variants xxE6T60-3x00

### THREE-WIRE INPUT HF FILTERS

- for connecting three-phase consumers

### FOUR-WIRE HF FILTERS

- for connecting single and three-phase consumers (three-phase plus neutral wire)

Calculation of total length:

$$\text{total length} = \sum_{l=1}^n \text{motor cable length} * \sqrt{n[\text{number of motor cables}]}$$



## THREE-WIRE HF-FILTER 3-PHASES 400/480 VAC ( $U_{max} = 550 V$ ), 50/60 Hz $\pm 10\%$

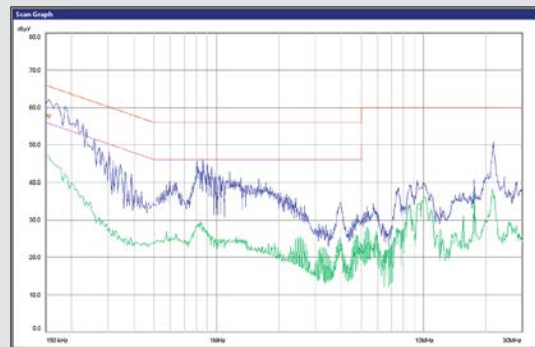
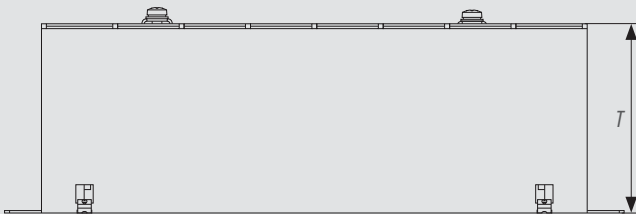
Part-No.	$I_N$ [A]	$P_V$ [W]	$I_{leak}$ [mA]	Suppression degree / Motor cable length	$\emptyset$ [mm <sup>2</sup> ]	B [mm]	H [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$d_1$ [mm]	weight m [kg]
12E6T60-3000/3050(*)	12	8	<3	C1/50 m, C2/100 m	6	45	252	77	237	25	5.5	0.9
14E6T60-3000/3050(*)	22	14	<3	C1/50 m, C2/100 m	6	55	252	92	237	25	5.5	1.3
16E6T60-3000/3050(*)	43	18	<3	C1/50 m, C2/100 m	16	65	252	106	237	30	5.5	1.8
18E6T60-3000/3050(*)	65	27	<3	C1/50 m, C2/100 m	25	130	240	142	220	100	9	3.9
20E6T60-3100	82	110	<3	C1/500m	50	160	400	142	380	130	9	8.4
20E6T60-3000/3050(*)	100	54	<3	C1/50 m, C2/100 m	50	160	240	142	220	130	9	5
22E6T60-3000	150	80	<3	C1/50 m, C2/100 m	95	200	321	190	260	150	11	9
22E6T60-3100	150	160	<3	C1/500 m	95	200	501	190	440	150	11	15.1
24E6T60-3001	200	100	<3	C1/50 m, C2/100 m	M10	200	280	190	260	150	11	8.5
24E6T60-3100	200	180	<3	C1/500 m	95	200	501	190	440	150	11	15.5
27E6T60-3000	330	160	<3	C2/100 m	M10	250	370	194	320	200	11	22.5

## FOUR-WIRE HF-FILTER 3-PHASES 400/480 VAC ( $U_{max} = 550 V$ ), 50/60 Hz $\pm 10\%$

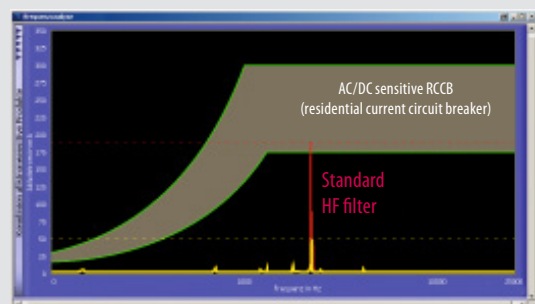
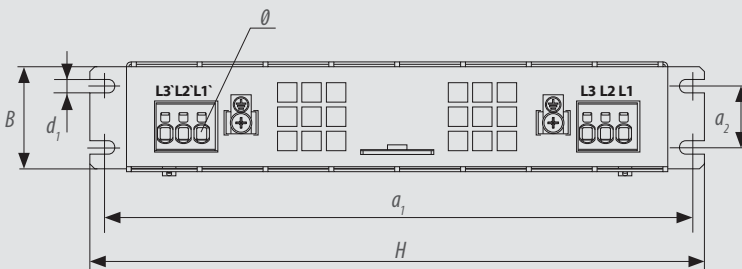
Part-No.	$I_N$ [A]	$P_V$ [W]	$I_{leak}$ [mA]	Suppression degree / Motor cable length	$\emptyset$ [mm <sup>2</sup> ]	B [mm]	H [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$d_1$ [mm]	weight m [kg]
14E6T60-4100	22	20	<3	C2/300 m	6	60	275	150	258	106	6.5	2.1
16E6T60-4100	43	22	<3	C2/300 m	10	70	330	160	288	106	6.5	3.2
18E6T60-4100	65	50	<3	C2/300 m	16	80	385	200	335	170	6.5	4.7
20E6T60-4100	100	80	<3	C2/300 m	25	91	458	240	395	200	6.5	6.7
22E6T60-4100	150	100	<3	C2/300 m	50	120	466	240	395	200	6.5	9.7

For nomenclature, see page 4

(\*) For IT networks



EMC characteristic



Comparison leakage currents

# CENTRAL HF FILTER SERIES E4/E6

THREE-WIRE HF-FILTER 3-PHASES 400/480 VAC ( $U_{max} = 528 V$ ), 50/60 Hz  $\pm 10 \%$

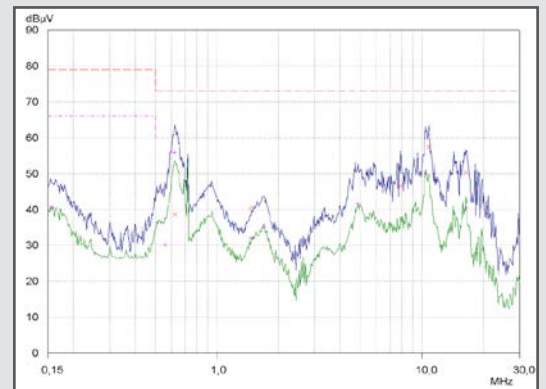
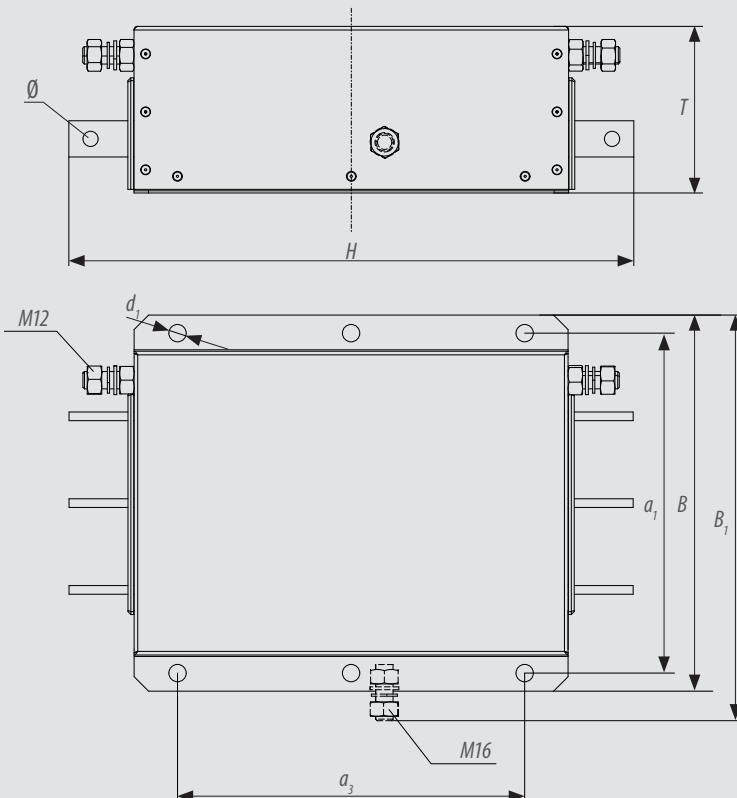
Part-No.	$I_N$ [A]	$P_V$ [W]	$I_{leak}$ [mA]	Suppression degree / Motor cable length	$\varnothing$ [mm <sup>2</sup> ]	B [mm]	B1 [mm]	H [mm]	T [mm]	$a_1$ [mm]	$a_3$ [mm]	$d_1$ [mm]	weight m [kg]
26E4T60-1001	300	50	60	C2/30 m	M10	260	-	385	115	235	240	12	16
26E4T60-1051(*)	300	50	60	C2/30 m	M10	260	-	385	115	235	240	12	16
28E4T60-1001	410	50	60	C2/30 m	M10	260	-	385	115	235	240	12	18.5
28E4T60-1051(*)	410	50	60	C2/30 m	M10	260	-	385	115	235	240	12	18.5
30E4T60-1001	650	50	60	C2/30 m	M10	390	-	390	135	235	240	12	21.5
30E4T60-1051(*)	650	50	60	C2/30 m	M10	390	-	390	135	235	240	12	21.5
33E6T60-3150(*)	840	90	60	C2/30 m	M12	280	311	458	185	255	290	12	33.5

(\*) For TN, TT and IT networks

In insulated grids, insulation resistance is continuously monitored against ground. During this monitoring process, the discharge resistors used in the filters falsify this measurement and they must be suppressed during normal operations.

This function is fulfilled internally by the space-saving IT-HF filters and, in addition to the appropriate attenuation, they also offer the characteristic of low leakage currents.

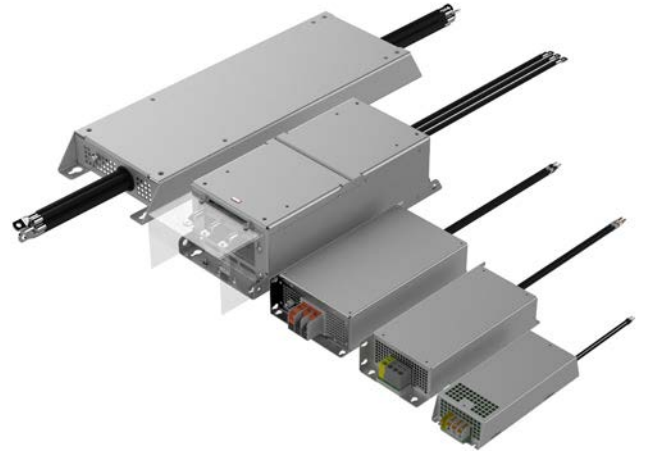
UL and cUL approvals: variants xxE4T60-1001 and 33E6T60-3150



EMC characteristic

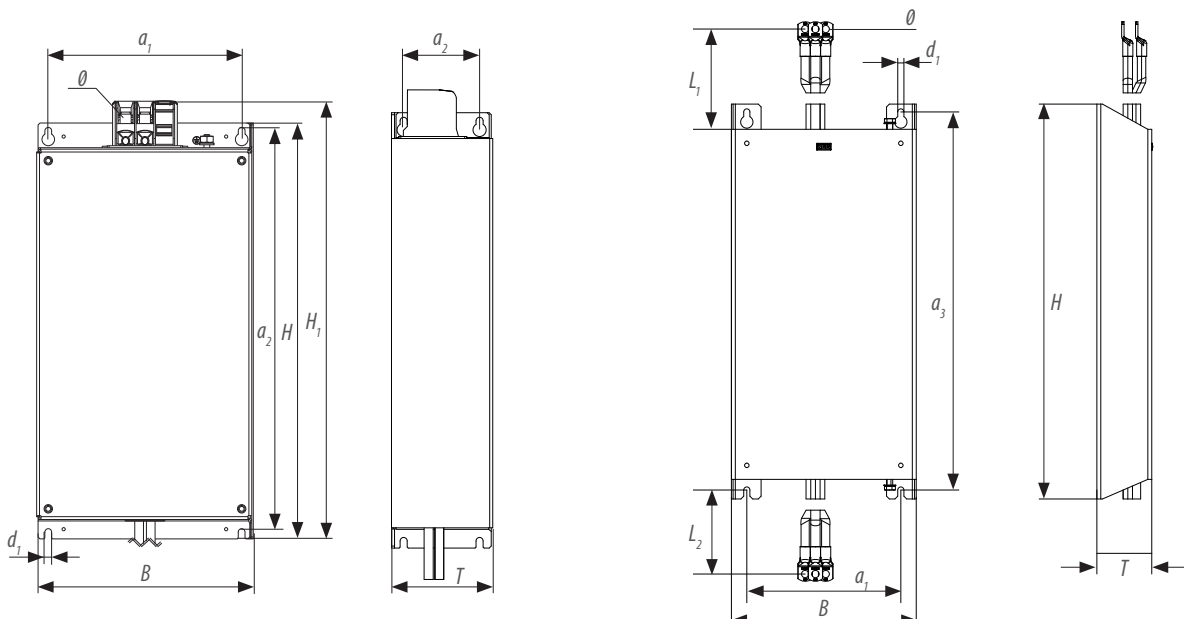
## EXCLUSIVELY FOR DRIVE CONTROLLER COMBIVERT F6

- Large rated voltage range 0 - 550 V
- Rated currents from 21 - 650 A, in nine sizes
- Compact design in book form with small mounting area
- Space-saving through sub-mounting the filter behind the drive: No additional space required in the control cabinet
- Ready for connection: Integrated mains choke for drive controller with the sizes 4 and 6
- High saturation resistance. Shielded motor cable lengths up to 100 m
- An especially wide damping area due to newly developed filter components
- The filters are designed for low leakage current in operation with Drive Controllers. With the same applications the leakage current will be reduced to as low as 1/10 as compared to standard filters.
- Operation on all-current sensitive FI circuit breakers with low tripping threshold of 30/300 mA for personal and fire protection
- High short overload capacity, Compatible with IT utility networks
- Approvals: UL and cUL



Part-No.	F6 housing	$I_N$ [A]	$P_V$ [W]	$I_{leak}$ [mA]	Suppression degree / Motor cable length	$\emptyset$ [mm <sup>2</sup> ]	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$L_1$ [mm]	$L_2$ [mm]	$d_1$ [mm]	weight m [kg]
14E6T60-1050	2	21	22	2.1	C1/50m C2/100m	6	130	325	341	65	100	-	314	-	265	5.5	2
16E6T60-1050	2	43	31	2.1	C1/50m C2/100m	16	130	325	341	65	100	-	314	-	265	5.5	2.5
18E6T60-1050	3	59	40	2.1	C1/50m C2/100m	35	170	405	-	85	125	50	390	-	400	7	5.5
20E6T60-1050	3	82	82	2.1	C1/50m C2/100m	35	170	405	-	85	125	50	390	-	400	7	6.5
22E6T60-1050	4	126	109	2.1	C1/50m C2/100m	50	224	430	452.5	100	200	75	415	-	600	7	10.5
22E6T60-5150*	4/6	126	230	8.5	C1/50m C2/50m	M8	269	630	-	180	200	-	600	70	600	9	36.5
23E6T60-5150*	6	158	265	8.5	C1/50m C2/50m	M8	269	630	-	180	200	-	600	70	600	9	39
24E6T60-5150*	6	189	325	8.5	C1/50m C2/50m	M8	269	630	-	180	200	-	600	70	600	9	47
27E6T60-1150	7	330	50	60	C1/50m C2/50m	M10	330	695	-	98	275	-	675	490	450	11	28.2
28E6T60-1150	7/8	410	50	60	C1/50m C2/50m	M12	330	984	-	98	275	-	950	500	500	13.4	38.2
30E6T60-1150	8	600	50	60	C1/50m C2/50m	M12	330	984	-	98	275	-	950	500	500	13.4	40.5

\* - with integrated mains choke with  $U_k=4\%$   
 - Separate cover available. Part number: 60E6V80-0001 (Cover not UL/cUL)



# HF DC-FILTER

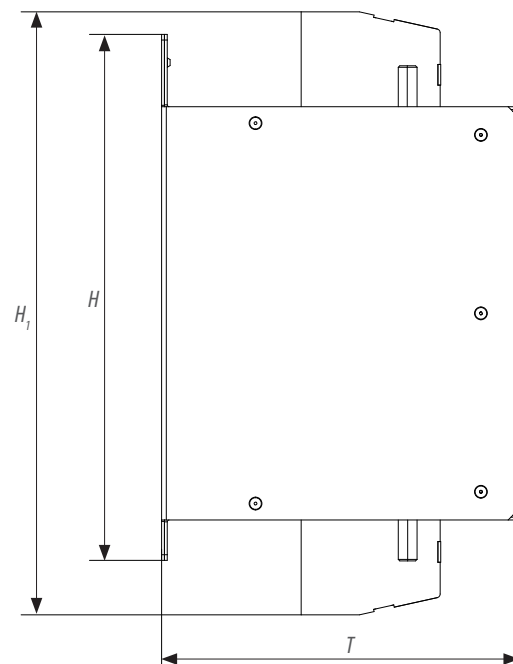
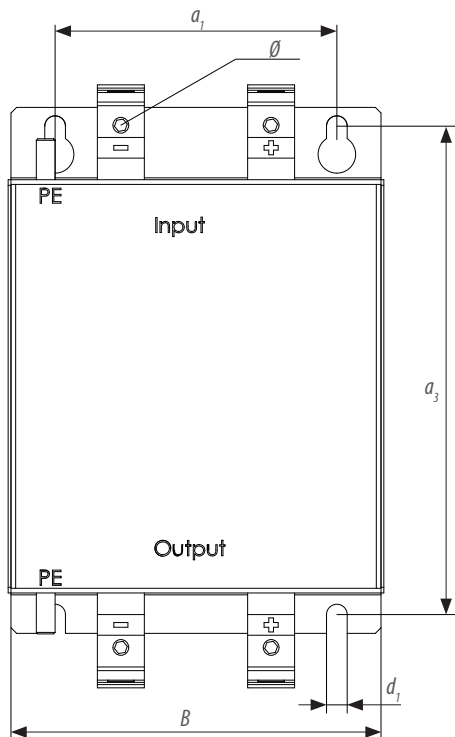
## DC FILTERS

The DC high-frequency (HF) filters are designed to suppress interference from individual devices. This allows larger DC supply networks to be set up, as well as cross-machine DC supply networks. Individual interference suppression allows motors with longer cable lengths to be operated without disturbing the DC supply network.

- Large rated voltage range 150 - 850 V
- Rated currents from 65 - 650 A
- Compact design
- High saturation resistance. Shielded motor cable lengths up to 100 m
- An especially wide damping area due to newly developed filter components
- High short overload capacity
- Also usable an IT-mains



Part-No.	$I_N$ [A]	$P_V$ [W]	$I_{leak}$ [mA]	Suppression degree / Motor cable length	$\varnothing$ [mm <sup>2</sup> ]	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_3$ [mm]	$d_1$ [mm]	weight m [kg]
18E6T60-7B00	65	27	3	C1/50m C2/100m	25	130	240	-	142	100	220	9	3.6
20E6T60-7B00	100	40	3	C1/50m C2/100m	50	160	240	-	145	130	220	9	4.3
24E6T60-7B00	200	70	3	C1/50m C2/100m	95	200	280	321	190	150	260	11	8
28E5T60-7A00	410	50	60	C2/30m	M10	260	300	390	115	235	240	12	17.9
30E5T60-7A00	650	50	60	C2/30m	M10	260	300	390	135	235	240	12	21.2





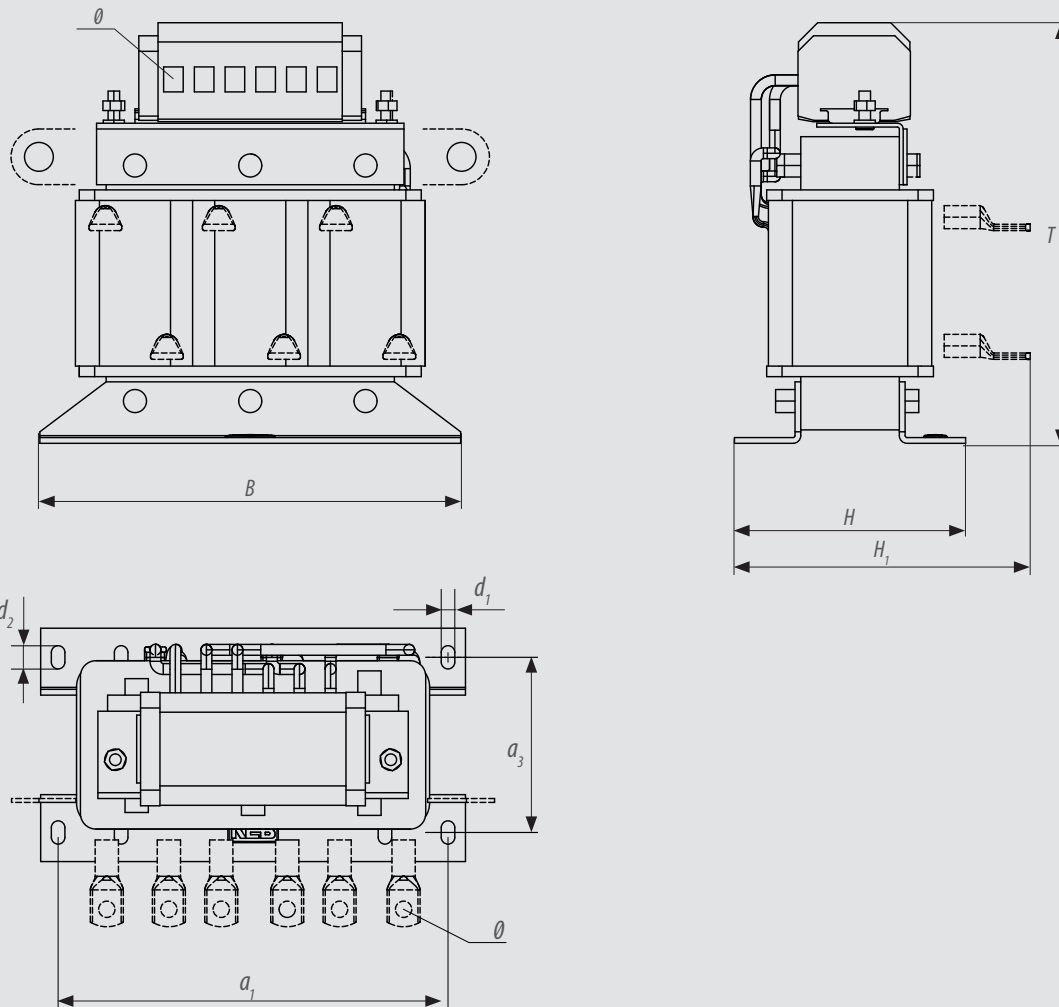
## MOTOR CHOKES

present a cost-effective option for reducing the voltage rise rate  $dV/dt$  in order to avoid the premature ageing of the coil insulation in AC motors.

- Increase total inductance at output
- Reduce current ripples
- Reduce the rise rate of the edges ( $dV/dt$ ) of the IGBTs
- Increase the service life of motor coils
- Reduce the peak value of the current and reduce the stress on IGBTs in drive controller
- Are suitable for applications with long motor cables ( $> 15\text{ m}$ )
- Approvals series Z2 UR and cUR or UL and cUL

The basic series is designed for applications with output frequencies of up to 100 Hz.

Additional versions are available for frequency ranges up to 1.600 Hz as customer-specific designs.

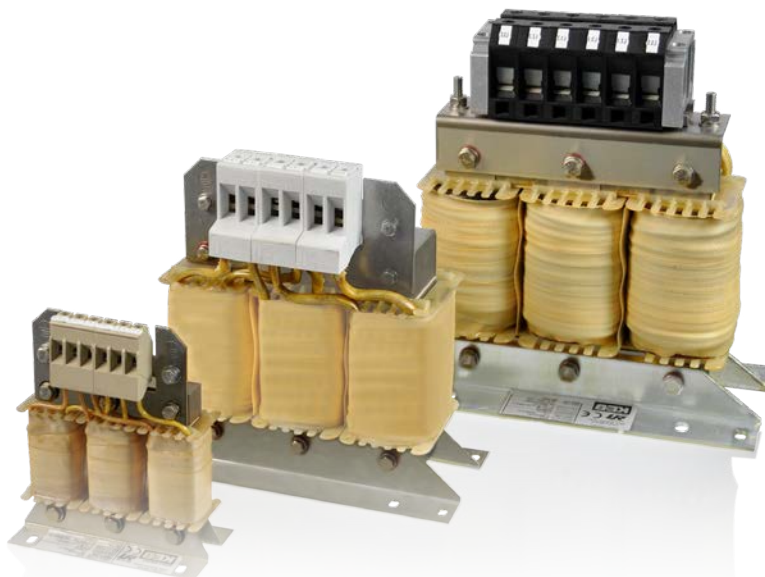


# MOTOR CHOKE SERIES Z1

MOTOR CHOKE 3-PHASES 400 VAC ( $U_{max} = 550$  V), FREQUENCY RANGE 0 ... 100 Hz

Part-No.	$I_N$ [A]	L [mH]	$P_V$ [W]	$\emptyset$ [mm <sup>2</sup> ]	B/B1 [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	weight		$f_s$ [kHz]
														Cu [kg]	m [kg]	
05Z1F04-1010	1.3	11.3	8	4	100	55	H	121	80		40	4.8	8	0.2	0.8	2
07Z1F04-1010	2.6	5.6	15	4	100	55	H	121	80		40	4.8	8	0.2	1.0	2
09Z1F04-1010	4.1	3.18	15	4	100	53	H	121	80		37	4.8	8	0.4	1.1	2
10Z1F04-1010	5.8	2.06	17	4	100	63	H	121	80		47	4.8	8	0.4	1.4	2
12Z1F04-1010	9.5	1.26	24	4	148	68	H	145	136	90	47	4.8	8	0.5	1.8	2
13Z1F04-1010	12	1	31	4	148	78	H	145	136	90	59	4.8	8	0.5	2.5	2
14Z1F04-1010	16.5	0.72	37	4	148	78	H	145	136	90	59	4.8	8	0.6	2.8	2
15Z1F04-1010	24	0.5	47	10	178	72	H	178	166	113	53	4.8	8	1.3	3.9	2
16Z1F04-1010	33	0.36	54	10	178	100	H	180	166	113	68	4.8	8	1.5	5.9	2
17Z1F04-1010	42	0.28	65	16	219	100	105	215	201	136	70	7	12	1.9	6.6	2
18Z1F04-1010	50	0.24	65	35	219	110	110	220	201	136	81	7	12	2.4	8.5	2
19Z1F04-1010	60	0.2	67	35	219	121	130	225	201	136	91	7	12	2.6	10.1	2
20Z1F04-1010	75	0.16	79	35	243	115	130	243	225	156	85	7	12	3.6	12	2
21Z1F04-1010	90	0.13	105	M8 (35)	267	109	155	207	249	176	78	7	12	3.6	15.6	2
22Z1F04-1010	115	0.1	137	M8 (50)	291	129	185	215	273	185	97	10	18	3.6	15.5	2
23Z1F04-1010	150	0.08	170	M8 (70)	291	130	183	216	273	185	97	10	18	5.1	17	2
24Z1F04-1010	180	0.07	210	M10(70)	316	153	225	233	292	200	113	10	16	5.2	24	2
25Z1F04-1010	210	0.06	270	M10(70)	316	153	196	234	292	200	113	10	16	5.8	23.4	2
26Z1F04-1010	250	0.05	380	M10(120)	352	145	230	270	328	224	105	10	16	8.2	29.8	2
27Z1F04-1010	300	0.04	420	M10(150)	352	147	235	272	328	224	110	10	16	12.0	35.5	2
28Z1F04-1010	370	0.03	450	M10(150)	388/380	151	245	300	364	248	112	10	16	10.3	40	2
29Z1F04-1010	460	0.03	550	M12(185)	412/395	155	245	325	388	264	116	10	16	11.0	48.2	2
30Z1F04-1010	570	0,02	650	M12(185)	412/395	167	257	325	388	264	128	10	16	11,5	52	2

For nomenclature, see page 4

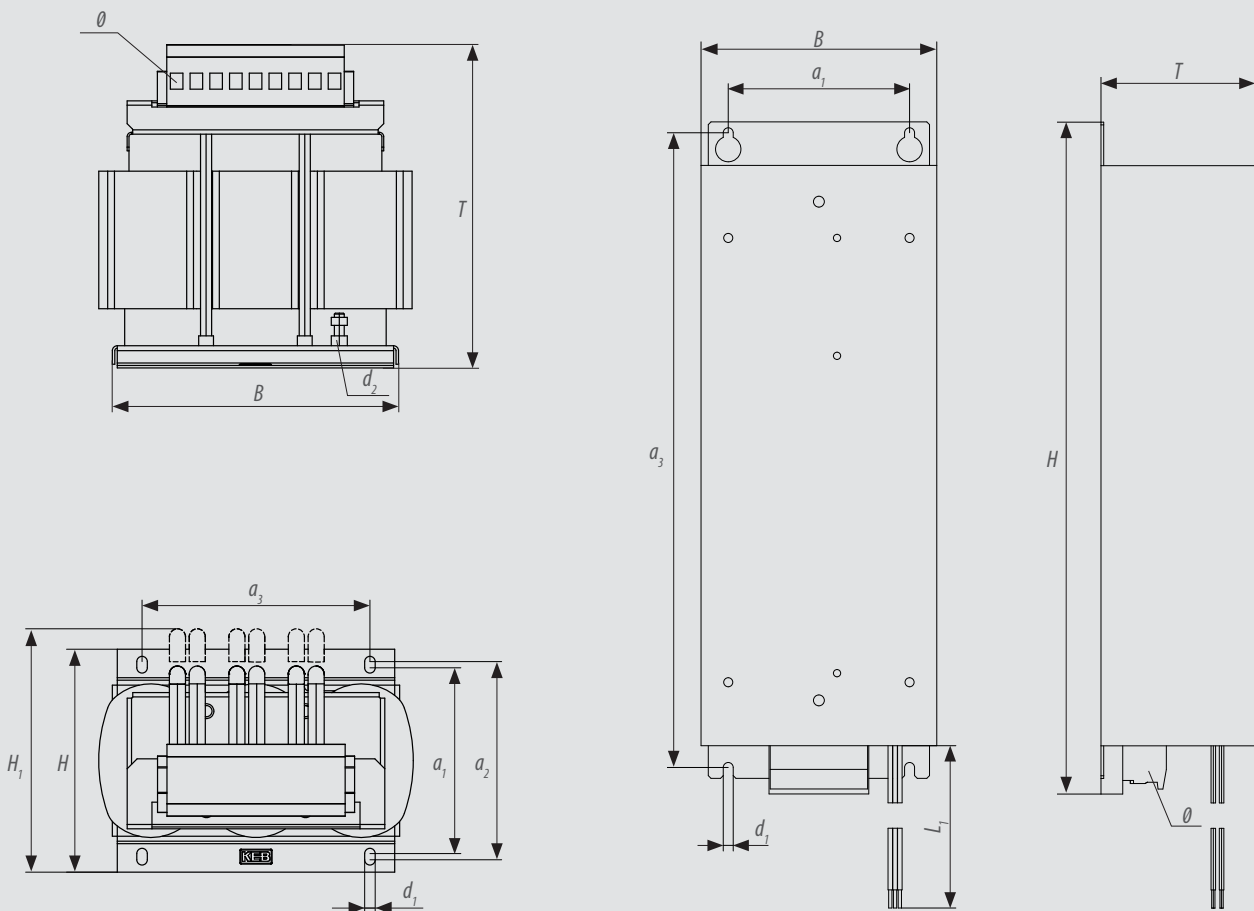


**MOTOR CHOKE 3-PHASES 400 VAC ( $U_{max} = 550$  V), FREQUENCY RANGE 0 ... 1.600 Hz,  $U_k = 20\%$**

Part-No.	$I_N$ [A]	L [mH]	$P_V^*$ [W]	$\emptyset$ [mm <sup>2</sup> ]	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	weight		$f_s$ [kHz]
														Cu [kg]	m [kg]	
07Z2F04-1003	2.6	3.5	18	6	130	371	200	85	100	-	350	5.5	-	-	3.5	5 - 16
09Z2F04-1003	4.1	2.2	32	6										-	3.9	5 - 16
10Z2F04-1003	5.8	1.5	48	6										-	4.1	5 - 16
12Z2F04-1003	9.5	0.967	99	6										-	4.7	5 - 16
13Z2F04-1003	12	0.766	35	10	168	160	160	280	135	145	120	7	6.5	0.9	5.2	5 - 16
14Z2F04-1003	16.5	0.557	44	10	168	160	160	280	135	145	120	7	6.5	1	5.5	5 - 16
15Z2F04-1003	24	0.383	66	10	168	160	160	310	135	145	120	7	6.5	1.8	6.6	5 - 16
16Z2F04-1003	33	0.278	102	10	168	160	160	315	135	145	120	7	6.5	2.1	7.0	5 - 16
17Z2F04-1003	42	0.219	115	16	232	180	180	255	150	160	184	8.5	8.5	2	10.0	5 - 16
18Z2F04-1003	50	0.184	92	16	245	180	180	260	150	160	184	8.5	8.5	3.5	11.2	5 - 16
19Z2F04-1003	60	0.153	124	35	250	180	190	270	150	160	184	8.5	8.5	3.5	11.7	5 - 16

The output and switching frequency should be in a ratio of at least 1:10.

(\*)  $P_V$  at an output frequency of 800 Hz  
For nomenclature, see page 4



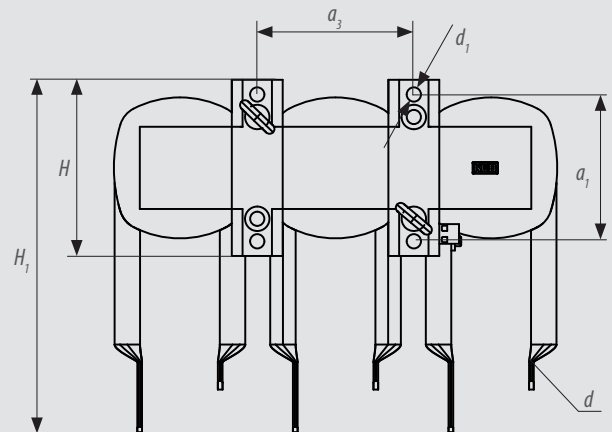
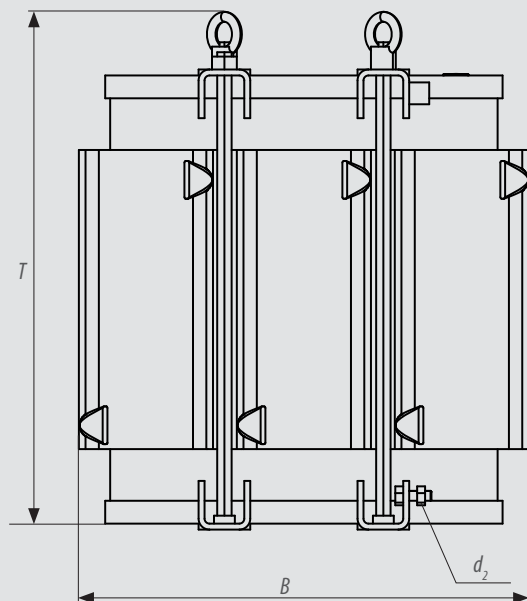
# MOTOR CHOKE SERIES Z2

**MOTOR CHOKE 3-PHASES 400 VAC ( $U_{max} = 550$  V), FREQUENCY RANGE 0 ... 1.600 Hz,  $U_k = 20\%$**

Part-No.	$I_N$ [A]	L [mH]	$P_v^*$ [W]	$\emptyset$ [mm <sup>2</sup> ]	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	d [mm]	$d_1$ [mm]	$d_2$ [mm]	weight		$f_s$ [kHz]
															Cu [kg]	m [kg]	
20Z2F04-1003	75	0.123	152	25	313	180	205	275	150	160	244	M10	M8	M8	4.1	15.0	5 - 16
21Z2F04-1003	90	0.102	147	35	335	180	220	275	150	160	244	M10	M8	M8	5.8	17.3	5 - 16
22Z2F04-1003	115	0.080	224	35	335	180	240	265	150	160	244	M10	M8	M8	6.2	17.0	5 - 16
23Z2F04-1003	150	0.082	264	50	370	170	250	405	144	-	120	M10	15	M10	11.5	32.0	5 - 16
24Z2F04-1003	180	0.068	390	70	365	170	270	415	144	-	120	M10	15	M10	11.5	32.8	5 - 16
25Z2F04-1003	210	0.058	430	70	350	170	270	425	144	-	120	M10	15	M10	11	35.0	5 - 16
26Z2F04-1003	250	0.049	492	95	370	170	300	435	140	-	120	M12	15	M10	16.5	41.0	5 - 16
27Z2F04-1003	300	0.041	515	95	465	180	300	440	150	-	160	M12	15	M10	17.5	45.0	5 - 8
28Z2F04-1003	370	0.033	515	120	450	180	325	465	150	-	160	M12	15	M10	17.5	58.5	5 - 8
29Z2F04-1003	460	0.027	777	150	460	180	330	480	150	-	160	M12	15	M10	21	62.0	5 - 8
30Z2F04-1003	570	0.021	963	240	465	180	350	500	150	-	160	M12	15	M10	29	72.0	5 - 8
31Z2F04-1003	630	0.019	945	240	500	360	430	325	150	325	150	M12	M12	M10	27	97.0	5 - 8
32Z2F04-1003	710	0.017	953	300	500	360	430	325	150	325	150	M12	M12	M10	32	109.0	5 - 8
33Z2F04-1003	800	0.015	949	300	500	400	455	350	150	350	150	M12	M12	M10	40	135.0	5 - 8

(\*)  $P_v$  at an output frequency of 800 Hz, from 23Z2 at a frequency of 600 Hz  
For nomenclature, see page 4

The output and switching frequency should be in a ratio of at least 1:10.



## SINUSOIDAL FILTERS

are low-pass filters that filter out the switching frequency from the PWM (pulse width modulation) - output signal of the drive controller. Sinusoidal voltage with a small ripple occurs at the output, which results in a sinusoidal motor current. This is why the use of sinusoidal filters at the output is not associated with the supplementary losses in the motor's stator and rotor which otherwise occur with drive controller operations.

### KEB SINUSOIDAL FILTERS

- Reduce supplementary losses in the motor during direct drive controller operations. This is a particular requirement for older motors that are not designed for drive controller operations, as well as used specialty motors and medium-frequency motors
- Reduce discharge currents driven by pulse frequency in the case of long cable lengths. The sinusoidal output voltages between the phases and the significant  $dV/dt$  reduction in the voltages phase to ground reduce the capacitive currents. Sinusoidal filters are recommended for up to 500 m motor cable lengths, depending on the type of drive. Lengths exceeding 500 m require an additional EMC level
- Increase the service life of motor insulation. High  $dV/dt$  at the output of the drive controller puts stress on the motor coils. Combined with long cable lengths, it is possible that the high rise of voltage ( $dV/dt$ ) and non-adjusted impedances of drive controller, motor cable and motor result in overstressing. Their peaks may increase to double the value of the DC link voltage (approx. 1.600 V). The sinusoidal filter reduces the PWM signal of the drive controller to sinusoidal sizes, preventing overstressing and a smaller rise of voltage at the motor coil
- Reduce bearing currents in the motor. The filter reduces the high-frequency portions in the output voltage of the drive controller, which in turn reduces the high-frequency portions of the voltage at the motor so as to result in a reduction of bearing currents
- Reduce motor noise, which is lessened due to the sinusoidal voltage between the phases
- Reduce high-frequency transient emissions and improve the entire EMC load on the equipment
- Improve motor efficiency

### AVAILABLE SOLUTIONS

- Sinusoidal filter xxZ1G04-1000 to 50/100 Hz with output frequency range up
- Sinusoidal filter xxZ1G04-1001 to 200 Hz with output frequency range up
- Sinusoidal filter with output frequency range up to 1.600 Hz consisting of motor choke, capacitor module and cable set

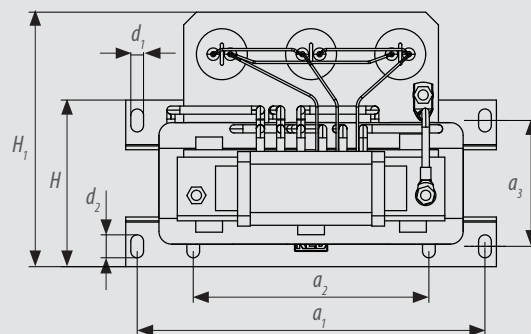
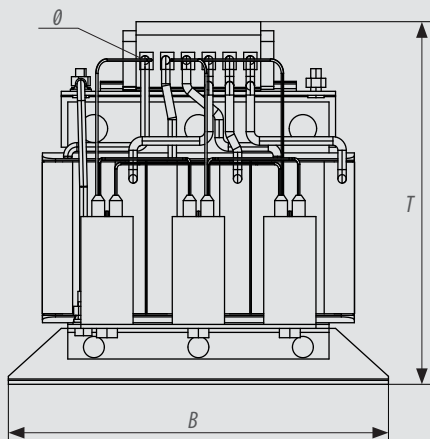


# MOTOR-SIDE SERIES Z1

SINUSFILTER 3-PHASES 400 VAC ( $U_{max} = 500$  V), FREQUENCY RANGE 0 ... 200 Hz,  $U_k = 14\%$

$P_{inv}$ [kW]	Part-No.	$I_N$ [A]	$I_{max.}$ [A]	$P_V$ [W]	$f_s$ [kHz]	B [mm]	H [mm]	$H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	$\emptyset$ [mm <sup>2</sup> ]	weight	
																Cu [kg]	m [kg]
0.37	05Z1G04-1001	1.3	2.3	7.5	4 - 16	100	110	-	118	80	-	95	4.8	8	4	0.2	0.75
0.75	07Z1G04-1001	2.6	4.7	10	4 - 16	100	125	-	135	80	-	110	4.8	8	4	0.5	1.6
1.5	09Z1G04-1001	4.1	7.4	20	4 - 16	148	69	132	160	136	90	49	4.8	8	4	0.8	2.2
2.2	10Z1G04-1001	5.8	10.4	35	4 - 16	148	79	122	143	136	90	58	4.8	8	4	1	3.2
4	12Z1G04-1001	9.5	17	42	4 - 16	178	75	140	195	166	113	55	4.8	8	4	1.8	4.3
5.5	13Z1G04-1001	12	21.6	48	4 - 16	178	89	142	174	166	113	69	4.8	8	4	2.1	6.5
7.5	14Z1G04-1001	16.5	29.7	60	4 - 16	219	101	145	202	201	136	71	7	12	16	2.7	7.6
11	15Z1G04-1001	24	36	80	4 - 16	243	107	188	245	225	156	75	7	12	16	3.8	11.5
15	16Z1G04-1001	33	49.5	120	4 - 16	291	119	190	260	273	185	91	10	18	16	4.2	15
18.5	17Z1G04-1001	42	63	150	4 - 16	291	131	200	279	273	185	99	10	18	35	6.3	20.2
22	18Z1G04-1001	50	75	160	4 - 16	291	130	200	275	273	185	99	10	18	35	6.7	25
30	19Z1G04-1001	60	90	165	4 - 16	316	167	235	300	292	200	128	10	16	35	10	34.3
37	20Z1G04-1001	75	112	170	4 - 16	352	145	224	342	328	224	106	10	16	35	11	37
45	21Z1G04-1001	90	135	180	4 - 16	352	174	250	380	328	224	135	10	16	50	12	43
55	22Z1G04-1001	115	172	186	4 - 16	388	268	277	425	364	248	149	10	16	95	20	66.5
75	23Z1G04-1001	150	225	190	4 - 16	388	217	300	440	364	248	155	10	16	95	22.1	87
90	24Z1G04-1001	180	270	193	4 - 16	412	219	409	434	388	264	179	10	16	M12 (185)	33	92.3

For nomenclature, see page 4



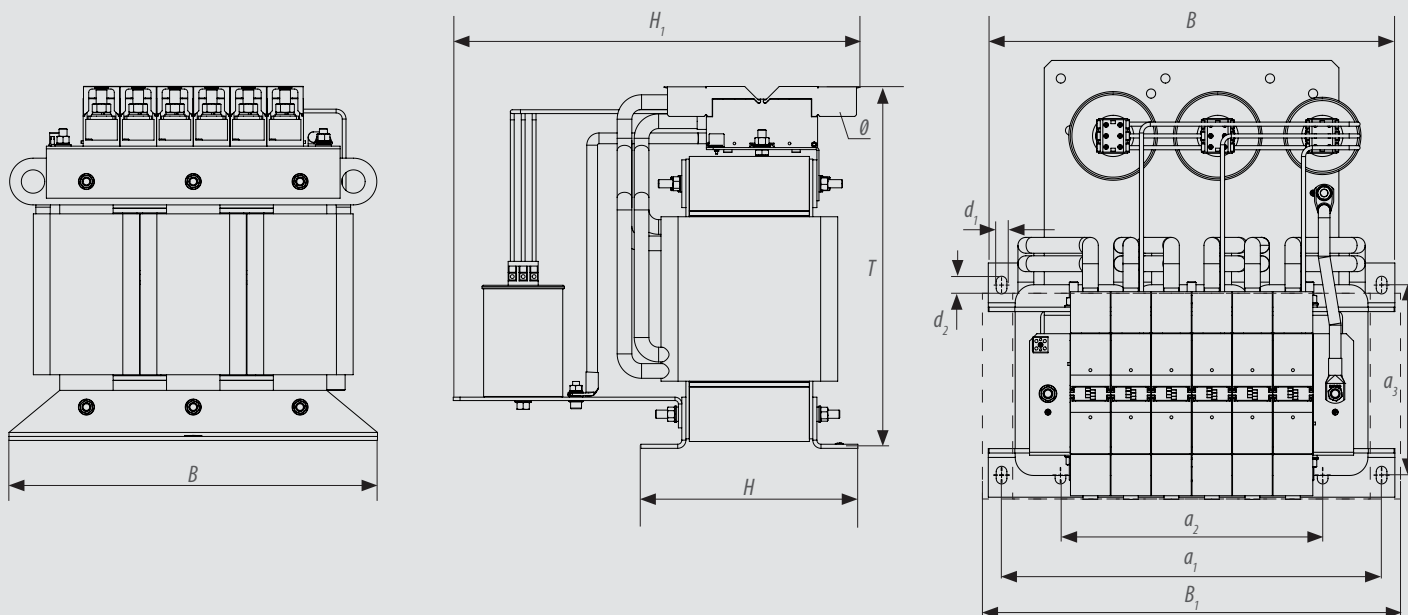
**SINUSOIDAL FILTER 3-PHASES 400 V AC ( $U_{max} = 500 V$ ),  $f_{max} 100 Hz$**

$P_{FU}$ [kW]	Part-No.	I [A]	$I_{max}$ [A]	$P_V$ [W]	$f_s$ [kHz]	B/ $B_1$ [mm]	H/ $H_1$ [mm]	T [mm]	$a_1$ [mm]	$a_2$ [mm]	$a_3$ [mm]	$d_1$ [mm]	$d_2$ [mm]	$\emptyset$ [mm <sup>2</sup> ]	Weight		Uk %
															Cu [kg]	m [kg]	
110	25Z1G04-1000	210	263	335	4 - 16	480/495	203/357	477	450	316	153	12	18	M12 (185)	36	120,5	8
132	26Z1G04-1000	250	313	480	4 - 16	480/495	218/372	475	450	316	168	12	18	M12 (185)	42	129	8
160	27Z1G04-1000	300	375	503	4 - 16	480/495	248/402	478	450	316	198	12	18	M12 (185)	47	156	8
200	28Z1G04-1000	370	463	600	2 - 16	552/--	298/572	526	516	356	237	14,5	24	M16 (300)	83	272	12
250	29Z1G04-1000	460	575	630	2 - 16	555/--	318/596	530	516	356	258	14,5	24	M16 (300)	80	275	12
315	30Z1G04-1000	570	712	950	2 - 16	280/750	287/521	630	620	460	227	14,5	24	2xM16 (300)	115	355	12

For nomenclature, see page 4

**PLEASE NOTE**

The sinusoidal filters have been designed for permissible switching and output frequency areas - values that deviate from this range will cause damage to the filters.

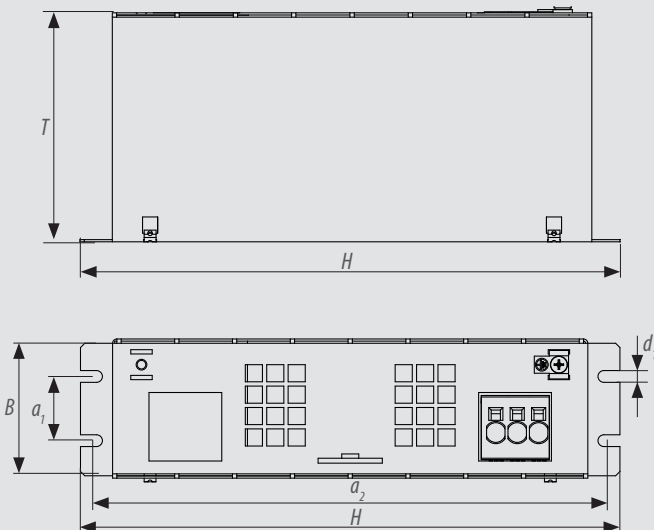


# CAPACITOR ASSEMBLY SERIES Z2

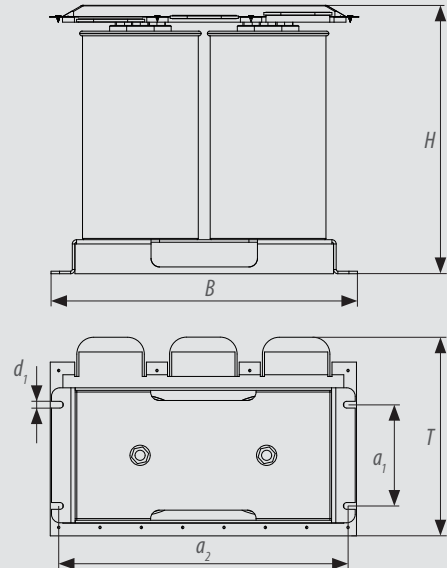
Part-No	C [μF]	ill.	H [mm]	B [mm]	T [mm]	a <sub>1</sub> [mm]	a <sub>2</sub> [mm]	d <sub>1</sub> [mm]	m [kg]
00Z2G24-0005	0.0226	1	252	65	106	30	237	5.5	1.6
00Z2G24-0015	0.05	1	252	65	106	30	237	5.5	1.6
00Z2G24-0025	0.073	1	252	65	106	30	237	5.5	1.6
00Z2G24-0035	0.11	1	252	65	106	30	237	5.5	1.6
00Z2G24-0045	0.157	1	252	65	106	30	237	5.5	1.6
00Z2G24-0055	0.227	1	252	65	106	30	237	5.5	1.6
00Z2G24-0065	0.33	1	252	65	106	30	237	5.5	1.6
00Z2G24-0006	0.49	1	252	65	106	30	237	5.5	1.6
00Z2G24-0016	0.67	1	252	65	106	30	237	5.5	1.6
00Z2G24-0007	0.82	1	252	65	106	30	237	5.5	1.6
00Z2G24-0017	1	1	252	65	106	30	237	5.5	1.6
00Z2G24-0027	1.15	1	252	65	106	30	237	5.5	1.6
00Z2G24-0037	1.33	1	252	65	106	30	237	5.5	1.6
00Z2G24-0047	1.67	1	252	65	106	30	237	5.5	1.6
00Z2G24-0057	2	1	252	65	106	30	237	5.5	1.6
00Z2G24-0001	8	2	315	360	160	120	340	8	4
00Z2G24-0011	10	2	315	360	160	120	340	8	4.5
00Z2G24-0021	12	2	315	360	160	120	340	8	4.5
00Z2G24-0031	15	2	315	360	160	120	340	8	4.5
00Z2G24-0041	33	2	315	360	160	120	340	8	5
00Z2G24-0051	3.6	2	315	360	160	120	340	8	2
00Z2G24-0061	4.7	2	315	360	160	120	340	8	2
00Z2G24-0002	18	2	315	360	370	120	340	8	8
00Z2G24-0012	20	2	315	360	370	120	340	8	8
00Z2G24-0022	25	2	315	360	370	120	340	8	8
00Z2G24-0032	30	2	315	360	370	120	340	8	8
00Z2G24-0042	41	2	315	360	370	120	340	8	10
00Z2G24-0052	45	2	315	360	370	120	340	8	10
00Z2G24-0062	66	2	315	360	370	120	340	8	11.5
00Z2G24-0003	38	2	315	360	370	270	340	8	12
00Z2G24-0013	45	2	315	360	370	270	340	8	12
00Z2G24-0023	76	2	315	360	370	270	340	8	15.5
00Z2G24-0033	78	2	315	360	370	270	340	8	15.5
00Z2G24-0043	99	2	315	360	370	270	340	8	17.5
00Z2G24-0004	52	2	315	360	370	270	340	8	16
00Z2G24-0014	132	2	315	360	370	270	340	8	26.5

For nomenclature, see page 4

ill. 1



ill. 2





# COMPOSITION OF THE SINUSOIDAL FILTER SERIES Z2



Size	MOTOR CHOKE		CAPACITOR ASSEMBLY AND CABLE SET				
	Current $I_N$ [A]	material number	0 ... 600 Hz @ $f_s = 6$ kHz	0 ... 800 Hz @ $f_s = 8$ kHz	0 ... 1000 Hz @ $f_s = 10$ kHz	0 ... 1200 Hz @ $f_s = 12$ kHz	0 ... 1600 Hz @ $f_s = 16$ kHz
07	2.6	07Z2F04-1003	-	00Z2G24-0006 (00Z2T09-0002)*	00Z2G24-0065 (00Z2T09-0002)*	00Z2G24-0055 (00Z2T09-0002)*	00Z2G24-0035 (00Z2T09-0002)*
09	4.1	09Z2F04-1003	-	00Z2G24-0016 (00Z2T09-0002)*	00Z2G24-0007 (00Z2T09-0002)*	00Z2G24-0065 (00Z2T09-0002)*	00Z2G24-0055 (00Z2T09-0002)*
10	5.8	10Z2F04-1003	-	00Z2G24-0017 (00Z2T09-0002)*	00Z2G24-0007 (00Z2T09-0002)*	00Z2G24-0006 (00Z2T09-0002)*	00Z2G24-0055 (00Z2T09-0002)*
12	9.5	12Z2F04-1003	-	00Z2G24-0047 (00Z2T09-0002)*	00Z2G24-0037 (00Z2T09-0002)*	00Z2G24-0007 (00Z2T09-0002)*	00Z2G24-0006 (00Z2T09-0002)*
13	12	13Z2F04-1003	-	00Z2G24-0057 (00Z2T09-0002)*	00Z2G24-0047 (00Z2T09-0002)*	00Z2G24-0017 (00Z2T09-0002)*	00Z2G24-0006 (00Z2T09-0002)*
14	16.5	14Z2F04-1003	-	00Z2G24-0051 (00Z2T09-3010)*	00Z2G24-0057 (00Z2T09-0002)*	00Z2G24-0047 (00Z2T09-0002)*	00Z2G24-0016 (00Z2T09-0002)*
15	24	15Z2F04-1003	-	00Z2G24-0061 (00Z2T09-3010)*	00Z2G24-0051 (00Z2T09-3010)*	00Z2G24-0057 (00Z2T09-0002)*	00Z2G24-0017 (00Z2T09-0002)*
16	33	16Z2F04-1003	-	00Z2G24-0061 (00Z2T09-3010)*	00Z2G24-0061 (00Z2T09-3010)*	00Z2G24-0051 (00Z2T09-2010)*	00Z2G24-0037 (00Z2T09-0002)*
17	42	17Z2F04-1003	-	00Z2G24-0001 (00Z2T09-2010)*	00Z2G24-0061 (00Z2T09-3010)*	00Z2G24-0051 (00Z2T09-3010)*	00Z2G24-0047 (00Z2T09-0002)*
18	50	18Z2F04-1003	-	00Z2G24-0001 (00Z2T09-2010)*	00Z2G24-0001 (00Z2T09-2010)*	00Z2G24-0061 (00Z2T09-3010)*	00Z2G24-0057 (00Z2T09-0002)*
19	60	19Z2F04-1003	-	00Z2G24-0011 (00Z2T09-2010)*	00Z2G24-0001 (00Z2T09-2010)*	00Z2G24-0061 (00Z2T09-3010)*	00Z2G24-0051 (00Z2T09-3010)*
20	75	20Z2F04-1003	-	00Z2G24-0021 (00Z2T09-1010)*	00Z2G24-0001 (00Z2T09-1010)*	00Z2G24-0001 (00Z2T09-1010)*	00Z2G24-0051 (00Z2T09-4010)*
21	90	21Z2F04-1003	-	00Z2G24-0031 (00Z2T09-1010)*	00Z2G24-0011 (00Z2T09-1010)*	00Z2G24-0001 (00Z2T09-1010)*	00Z2G24-0051 (00Z2T09-4010)*
22	115	22Z2F04-1003	-	00Z2G24-0002 (00Z2T09-1010)*	00Z2G24-0021 (00Z2T09-1010)*	00Z2G24-0011 (00Z2T09-1010)*	00Z2G24-0061 (00Z2T09-4010)*
23	150	23Z2F04-1003	00Z2G24-0041 (00Z2T09-0025)*	00Z2G24-0002 (00Z2T09-1010)*	00Z2G24-0021 (00Z2T09-1010)*	00Z2G24-0011 (00Z2T09-1010)*	00Z2G24-0061 (00Z2T09-4010)*
24	180	24Z2F04-1003	00Z2G24-0042 (00Z2T09-0025)*	00Z2G24-0012 (00Z2T09-1025)*	00Z2G24-0031 (00Z2T09-1025)*	00Z2G24-0021 (00Z2T09-1010)*	00Z2G24-0001 (00Z2T09-1010)*
25	210	25Z2F04-1003	00Z2G24-0052 (00Z2T09-0035)*	00Z2G24-0022 (00Z2T09-1025)*	00Z2G24-0012 (00Z2T09-1025)*	00Z2G24-0021 (00Z2T09-1025)*	00Z2G24-0001 (00Z2T09-1010)*
26	250	26Z2F04-1003	00Z2G24-0062 (00Z2T09-0035)*	00Z2G24-0041 (00Z2T09-0025)*	00Z2G24-0012 (00Z2T09-0025)*	00Z2G24-0031 (00Z2T09-0025)*	00Z2G24-0001 (00Z2T09-0010)*
27	300	27Z2F04-1003	00Z2G24-0062 (00Z2T09-0070)*	00Z2G24-0041 (00Z2T09-0070)*	00Z2G24-0032 (00Z2T09-0035)*	00Z2G24-0012 (00Z2T09-0025)*	00Z2G24-0011 (00Z2T09-0010)*
28	370	28Z2F04-1003	00Z2G24-0033 (00Z2T09-0070)*	00Z2G24-0052 (00Z2T09-0070)*	00Z2G24-0032 (00Z2T09-0070)*	00Z2G24-0022 (00Z2T09-0035)*	00Z2G24-0021 (00Z2T09-0025)*
29	460	29Z2F04-1003	00Z2G24-0043 (00Z2T09-0095)*	00Z2G24-0062 (00Z2T09-0070)*	00Z2G24-0003 (00Z2T09-0070)*	00Z2G24-0032 (00Z2T09-0070)*	00Z2G24-0031 (00Z2T09-0025)*
30	570	30Z2F04-1003	00Z2G24-0014 (2 x 00Z2T09-0070)*	00Z2G24-0062 (00Z2T09-0095)*	00Z2G24-0004 (00Z2T09-0095)*	00Z2G24-0003 (00Z2T09-0070)*	00Z2G24-0002 (00Z2T09-0035)*
31	630	31Z2F04-1003	00Z2G24-0014 (2 x 00Z2T09-0070)*	00Z2G24-0043 (2 x 00Z2T09-0070)*	-	-	-
32	710	32Z2F04-1003	00Z2G24-0014 + 00Z2G24-0041 (2 x 00Z2T09-0070 + 00Z2T09-0025)*	00Z2G24-0043 (2 x 00Z2T09-0070)*	-	-	-
33	800	33Z2F04-1003	00Z2G24-0014 + 00Z2G24-0041 (2 x 00Z2T09-0070 + 00Z2T09-0025)*	00Z2G24-0043 (2 x 00Z2T09-0070)*	-	-	-

\* Recommended wire set

# NHF FILTER SUPPRESSION DEGREE C3

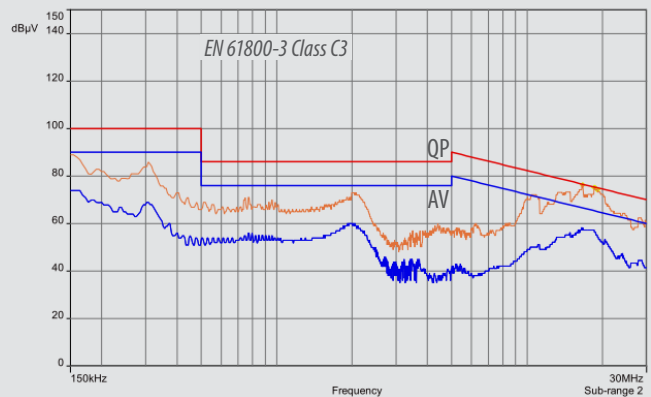
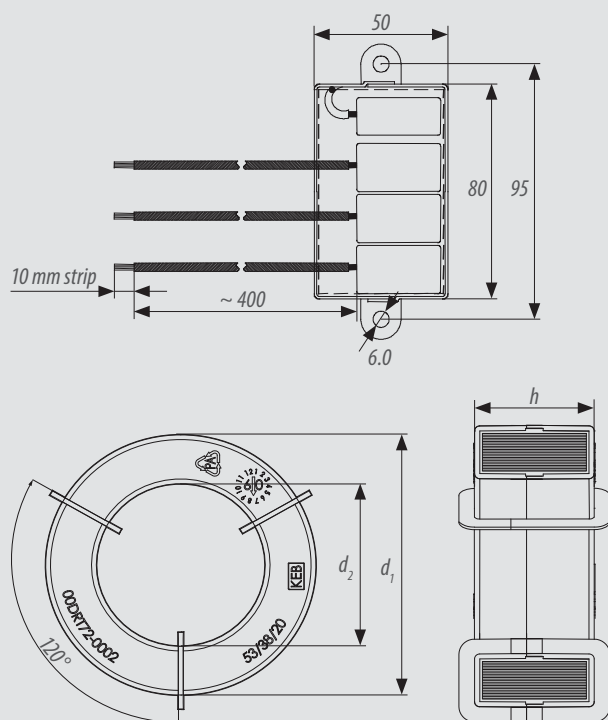
## LOW AND HIGH FREQUENCY FILTER COMBINATION

- Compact and flexible design
- Reduces the harmonic current harmonics generated by the drive controller on the supply network
- Reduces the conducted interference to a value after 61800-3 C3
- Available for motor powers from 37 kW to 315 kW

Unit size	Rated motor power [kW]	Cable cross-section [mm <sup>2</sup> ]	Mains choke	Capacitor assembly	"High Performance" Ring core		Ring core size [mm]
					L1	L2	
20	37	35	20Z1B04-1000	00E4061-1908	L1	L2	d1/d2/h
21	45	50	21Z1B04-1000				
22	50		22Z1B04-1000				
23	75		23Z1B04-1000				
24	90	95	24Z1B04-1000				
25	110		25Z1B04-1000				
26	132	120	26Z1B04-1000				
27	160	150	27Z1B04-1000				
28	200	2x95	28Z1B04-1000				
29	250	2x120	29Z1B04-1000				
30	315	2x150	30Z1B04-1000				
					0090363-4000		57/33/25
					0090366-6000		85/55/35
					0090366-7000		110/74/35
					0090366-8000		142/95/37
					0090366-9000		174/117/38

## RECOMMENDED

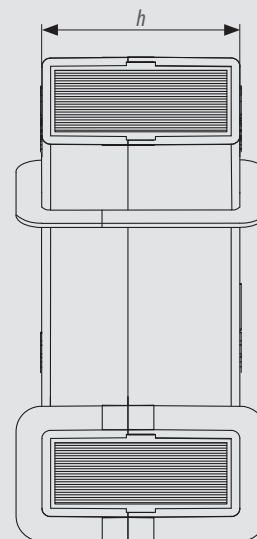
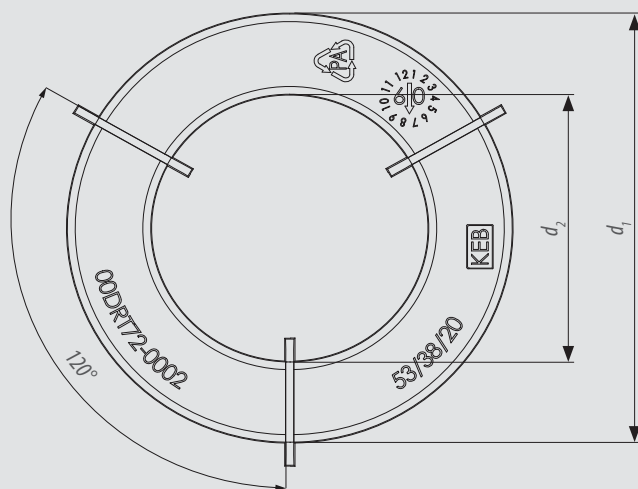
cable set 00E4061-1908



- Reduction of the  $dV/dt$ 's on the motor cables
- Reduction of bearing currents
- Improved EMC by smoothing the interference on the motor cables
- Effect can be increased by the number of turns on a core or the number of cores used



Part-No.	Dimensions [mm]			AI [ $\mu$ H] @ 2 kHz minimum value	*** Can be used up to a current (A) / No. of turns (N) / Cable cross-section ( $\text{mm}^2$ )	m kg
	$d_1$	$d_2$	h			
0090 363-2000	39	20	18	69.4	9.5 A/N = 3/1.5 $\text{mm}^2$	0.062
0090 363-4000	57	34	25	59.3	16.5 A/N = 2/2.5 $\text{mm}^2$	0.2
0090 363-5000	70	45	30	68.5	33 A/N = 2/6 $\text{mm}^2$	0.22
0090 366-6000	85	55	35	77.1	60 A/N = 2/16 $\text{mm}^2$	0.44
0090 366-7000	110	74	35	76.3	150 A/N = 1/95 $\text{mm}^2$	0.78
0090 366-8000	142	95	37	65.0	300 A/N = 1/150 $\text{mm}^2$	1.20
0090 366-9000	174	117	38	51.0	>300 A/N = 1/>185 $\text{mm}^2$	1.80



## ADVISORY AND TESTING COMBILINE

### KEB PROVIDES SECURITY

DRIVES. EMC ADVISORY AND EMC FILTERS WITH DELIVERIES FROM ONE SOURCE.

### EC DIRECTIVE 2004/108/EC

The directive requires every machine manufacturer to design the installation of electrical systems in compliance with EMC legislation. In many cases, this means that individual CE-labelled components must be inspected for their interaction in the equipment or machine. For this purpose, KEB offers a service that includes advisory services and the testing of electrical equipment. Our extensive experience in the development and application of drive controllers in a variety of different industrial areas, combined with modern mobile measurement devices, are the ideal prerequisites for rapid on-site assistance.

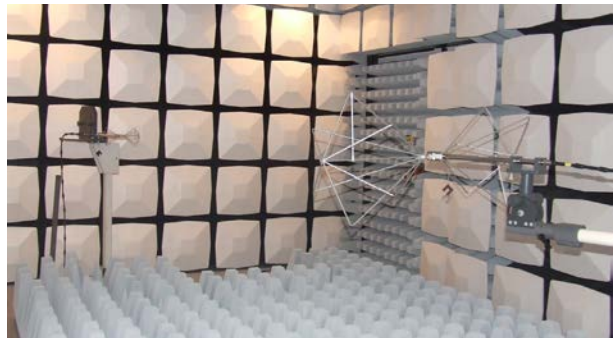
### THE ADVANTAGES

- No expensive investments into measurement devices, buildings, installations and staff
- No training for complex standards
- Standards-appropriate on-site measurements
- Extensive measurement protocol
- Support already provided during development phase
- Advisory services for practical wiring
- Benefit from long-standing KEB experience
- Cost-effective



## 1. IN-HOUSE ABSORBER BUILDING

- Transient emissions / interference pursuant to EN 61800-3;  
Physical dimensions 3 m test section 2.000 x 2.000 mm quiet zone  
Test object weight up to 1 tonne
- For connected loads to 60 kVA 230/400/480/690 V



## 2. INSTALLATION ADVISORY SERVICES

for optimising electrical switching systems



## 3. EMC MEASUREMENTS

on location: conducted measurement and determination of transient emissions



# KEB SERVICE

## PERFORMANCE AND COMPETENCE

### AFTER-SALES CUSTOMER SUPPORT

- start-up support
- EMC service
- mains analysis
- insulation, heat or vibration measurements
- conversion of old product series

### MAINTENANCE AND REPAIRS

- rush or standard service

### COMPONENT AND SPACE PART SUPPLY

- used and new parts for the exchange

### PREVENTIVE MAINTENANCE

- forming and cleaning, inspection, functional analysis

### CUSTOMER SPECIFIC SERVICE

- individual service support
- system optimisation



## KEB WORLDWIDE

**Austria** | KEB Automation GmbH

Ritzstraße 8 4614 Marchtrenk Austria  
 Phone: +43 7243 53586-0 Fax: +43 7243 53586-21  
 E-Mail: info@keb.at Web: keb-automation.com

**Benelux** | KEB Automation KG

Boulevard Paepsem 20 – Paepsemiaan 20 1070 Anderlecht Belgium  
 Phone: +32 2 447 8580  
 E-Mail: info.benelux@keb.de Web: keb-automation.com

**Czech Republic** | KEB Automation GmbH

Videnska 188/119d 61900 Brno Czech Republic  
 Phone: +420 544 212 008  
 E-Mail: info@keb.cz Web: keb-automation.com

**France** | Société Française KEB SASU

Z.I. de la Croix St. Nicolas 14, rue Gustave Eiffel  
 94510 La Queue en Brie France  
 Phone: +33 149620101 Fax: +33 145767495  
 E-Mail: info@keb.fr Web: keb-automation.com

**Germany** | **Geared Motors**

KEB Antriebstechnik GmbH  
 Wildbacher Straße 5 08289 Schneeberg Germany  
 Phone: +49 3772 67-0 Fax +49 3772 67-281  
 E-Mail: info@keb-drive.de Web: keb-automation.com

**Italy** | KEB Italia S.r.l. Unipersonale

Via Newton, 2 20019 Settimo Milanese (Milano) Italy  
 Phone: +39 02 3353531 Fax: +39 02 33500790  
 E-Mail: info@keb.it Web: https://blog.keb.it

**Japan** | KEB Japan Ltd.

711-103 Fukudayama, Fukuda,  
 Shinjo-shi Yamagata 996-0053 Japan  
 Phone: +81 233 292800 Fax: +81 233 292802  
 E-Mail: info@keb.jp Web: keb.jp

**P. R. China** | KEB Power Transmission Technology (Shanghai) Co. Ltd.

No. 435 QianPu Road Chedun Town Songjiang District  
 201611 Shanghai P. R. China  
 Phone: +86 21 37746688 Fax: +86 21 37746600  
 E-Mail: info@keb.cn Web: keb.cn

**Poland** | KEB Automation KG

Phone: +48 604 077 727  
 E-Mail: roman.trinczek@keb.de Web: keb-automation.com

**Republic of Korea** | KEB Automation KG

Deoksan-Besttel 1132 ho Sangnam-ro 37  
 Seongsan-gu Changwon-si Gyeongsangnam-do Republic of Korea  
 Phone: +82 55 601 5505 Fax: +82 55 601 5506  
 E-Mail: vb.korea@keb.de Web: keb-automation.com

**Spain** | KEB Automation KG

c / Mitjer, Nave 8 - Pol. Ind. LA MASIA  
 08798 Sant Cugat Sesgarrigues (Barcelona) Spain  
 Phone: +34 93 8970268  
 E-Mail: vb.espana@keb.de Web: keb-automation.com

**Switzerland** | KEB Automation AG

Barzloostrasse 1 8330 Pfaeffikon/ZH Switzerland  
 Phone: +41 43 2886060  
 E-Mail: info@keb.ch Web: keb-automation.com

**United Kingdom** | KEB (UK) Ltd.

5 Morris Close Park Farm Industrial Estate  
 Wellingborough, Northants, NN8 6XF United Kingdom  
 Phone: +44 1933 402220 Fax: +44 1933 400724  
 E-Mail: info@keb.co.uk Web: keb-automation.com

**United States** | KEB America, Inc.

5100 Valley Industrial Blvd. South  
 Shakopee, MN 55379 United States  
 Phone: +1 952 2241400 Fax: +1 952 2241499  
 E-Mail: info@kebameric.com Web: kebameric.com



## KEB PARTNERS WORLDWIDE

... [www.keb.de/contact/contact-worldwide](http://www.keb.de/contact/contact-worldwide)



**Automation with Drive**

**keb-automation.com**

KEB Automation KG Suedstrasse 38 32683 Barntrup Germany Tel. +49 5263 401-0 E-Mail: info@keb.de

© KEB 0000000-51LIN 07.2024 Subject to technical alterations!