



# EMC COMBILINE

EMC SOLUTIONS  
EN



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# SYSTEM OVERVIEW

## Automation with Drive

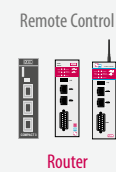
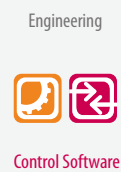
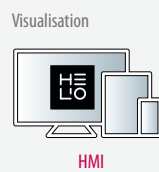
stands for system solutions from automation to mechanical movement. The EMC technology is integrated in the KEB portfolio and belongs to the parts that are often invisible. The practical implementation is integrated in drive controllers or alternatively as modular solution for single or combined axes.

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

## SOFTWARE



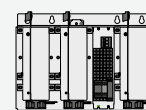
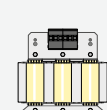
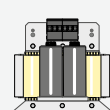
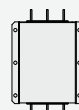
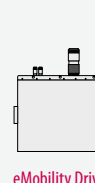
## HMI



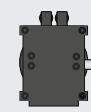
## CONTROL



## DRIVES



## MOTORS



## 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                 |
| $f_{mains}$ | Mains frequency                                                    | H                       | Width from base                        |
| $I_{leak}$  | Leakage current in accordance to EN 60939-1: 2010 (Attachement A9) | $H_1$                   | Width from base - coil design or cable |
| $P_{inv}$   | 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               |
| $f_{max}$   | Maximum motor frequency                                            | Cu                      | Copper portion                         |
| $U_{max}$   | 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>max. leakage current</b> | 0 mA                               |
| <b>Overload</b>             | 150 % - 60 s                       |
| <b>Climate category</b>     | 3K3 (EN 60721-3-3)                 |
| <b>Vibration /schock</b>    | 3M4 (EN 60721-3-3)                 |
| <b>Technical principles</b> | EN 61558-2-20, VDE 0160            |

|                                |                                |
|--------------------------------|--------------------------------|
| <b>Cooling</b>                 | Convection                     |
| <b>Voltage drop</b>            | U <sub>k</sub> = 4 %           |
| <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 or lying horizontally |
| <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.     | $I_N$<br>[A] | $P_V$<br>[W] | $f_{\text{mains}}$<br>[Hz] | $\emptyset$<br>[mm <sup>2</sup> ] | B<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[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    |

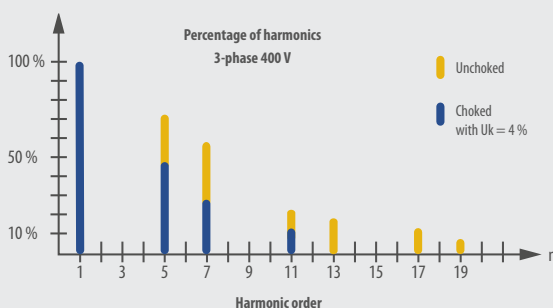
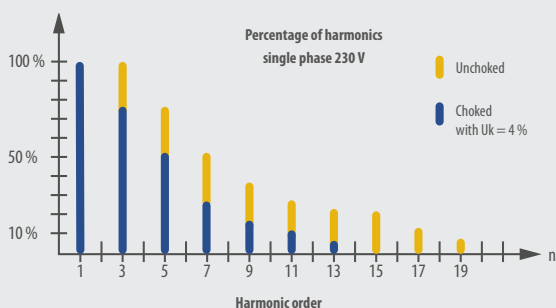
## MAINS CHOKE 3-PHASES 230 VAC ( $U_{\max} = 264 \text{ V}$ ), 50/60 Hz

| Part-No.     | $I_N$<br>[A] | $P_V$<br>[W] | $f_{\text{mains}}$<br>[Hz] | $\emptyset$<br>[mm <sup>2</sup> ] | B<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[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  $U_k = 4 \%$ .

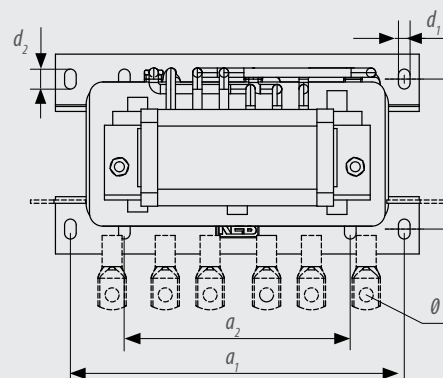
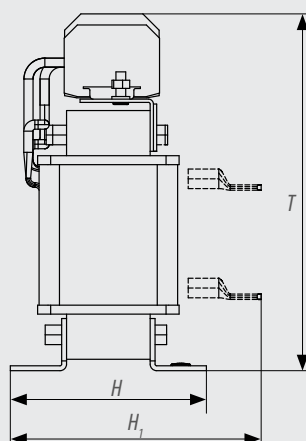
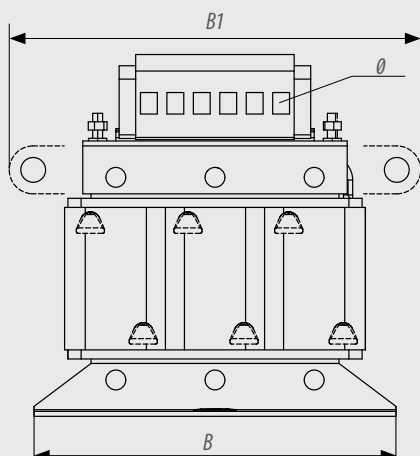


# MAINS CHOKE SERIES Z1

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

| Part-No.     | $I_N$<br>[A] | $P_V$<br>[W] | $f_{\text{mains}}$<br>[Hz] | $\emptyset$<br>[mm <sup>2</sup> ] | B/B1<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[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

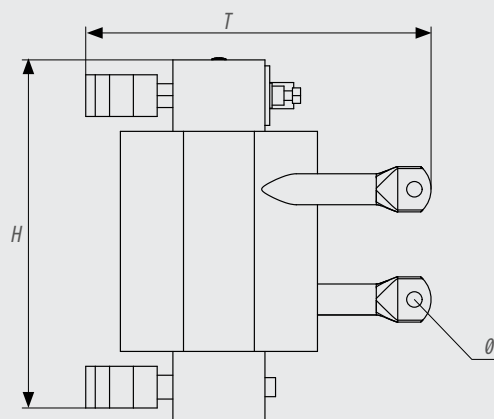
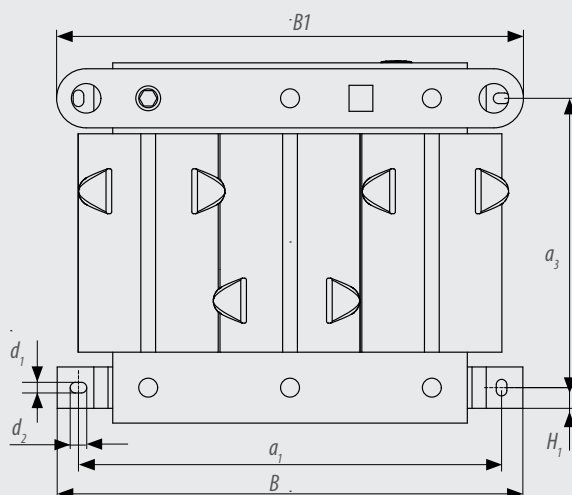


## BACKPLANE MOUNTING

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 CHOKES 3-PHASES 400 VAC ( $U_{\max} = 550 \text{ V}$ ), 50/60 Hz

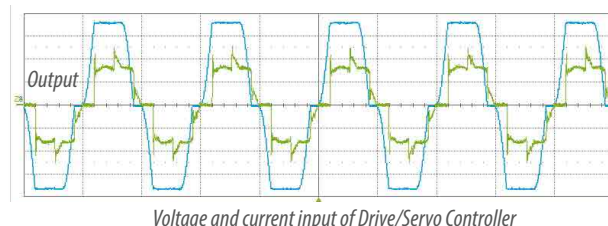
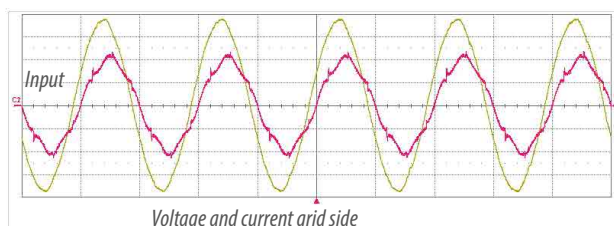
| Part-No.     | $I_N$<br>[A] | $P_V$<br>[W] | $f_{\text{mains}}$<br>[Hz] | $\emptyset$<br>[mm <sup>2</sup> ] | B/B1<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[mm] | weight  |        |
|--------------|--------------|--------------|----------------------------|-----------------------------------|--------------|-----------|---------------|-----------|---------------|---------------|---------------|---------------|---------|--------|
|              |              |              |                            |                                   |              |           |               |           |               |               |               |               | 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:

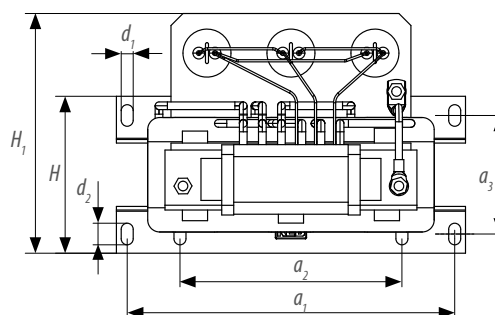
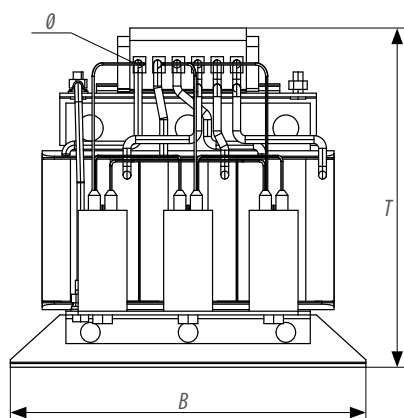
- EN 61000-3-2; up to 16 A
- EN 61000-3-12; 16 A up to 75 A
- EN 61000-3-4
- G5/4 Engineering Recommendation (GB)
- EN 12015 (Standard for lifts Europe)
- IEEE 519 - 1992 (USA)
- AS 2279 (Australia)
- Quality of Electric Energy Supply. Harmonics in Public Supply Network (China)
- COP. supply rules (Hong 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<br>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 ( $U_{max} = 440 \text{ V}$ ), 50 Hz - THDI < 15 % / PWHD < 39 %

| Part-No.     | $I_N$<br>[A] | $P_{inv}$<br>[kW] | $P_v$<br>[W] | $\emptyset$<br>[mm <sup>2</sup> ] | B<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[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 ( $U_{max} = 440 \text{ V}$ ), 50 Hz - THDI < 8 % / PWHD < 15 %

| Part-No.     | $I_N$<br>[A] | $P_{inv}$<br>[kW] | $P_v$<br>[W] | $\emptyset$<br>[mm <sup>2</sup> ] | B<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[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 ( $U_{max} = 528 \text{ V}$ ), 60 Hz - THDI < 8 % / PWHD < 15 %

| Part-No.     | $I_N$<br>[A] | $P_{inv}$<br>[HP] | $P_v$<br>[W] | $\emptyset$ | B<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[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 %

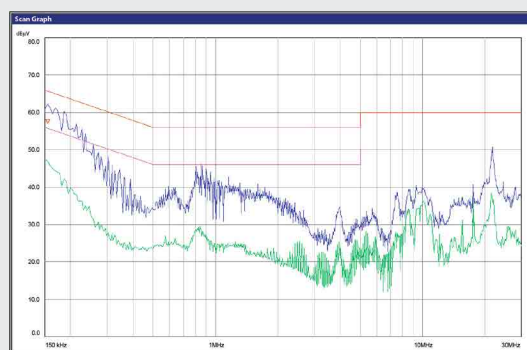
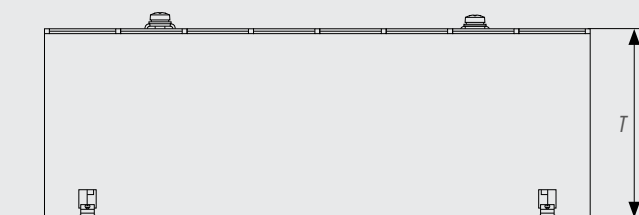
| Part-No.             | $I_N$<br>[A] | $P_V$<br>[W] | $I_{leak}$<br>[mA] | Suppression degree /<br>Motor cable length | $\emptyset$<br>[mm <sup>2</sup> ] | B<br>[mm] | H<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $d_1$<br>[mm] | weight<br>m [kg] |
|----------------------|--------------|--------------|--------------------|--------------------------------------------|-----------------------------------|-----------|-----------|-----------|---------------|---------------|---------------|------------------|
| 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 %

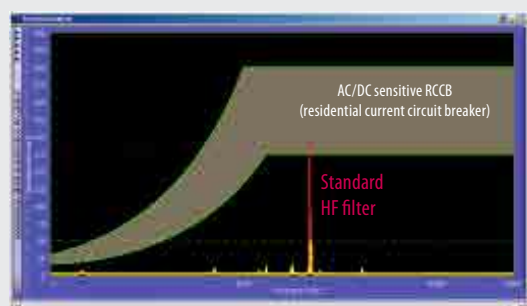
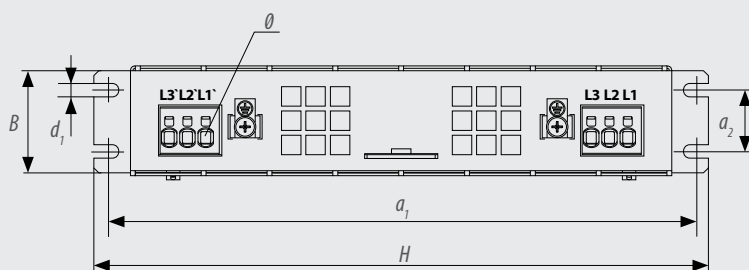
| Part-No.     | $I_N$<br>[A] | $P_V$<br>[W] | $I_{leak}$<br>[mA] | Suppression degree /<br>Motor cable length | $\emptyset$<br>[mm <sup>2</sup> ] | B<br>[mm] | H<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $d_1$<br>[mm] | weight<br>m [kg] |
|--------------|--------------|--------------|--------------------|--------------------------------------------|-----------------------------------|-----------|-----------|-----------|---------------|---------------|---------------|------------------|
| 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 ( $U_{\max} = 528 \text{ V}$ ), 50/60 Hz  $\pm 10 \%$**

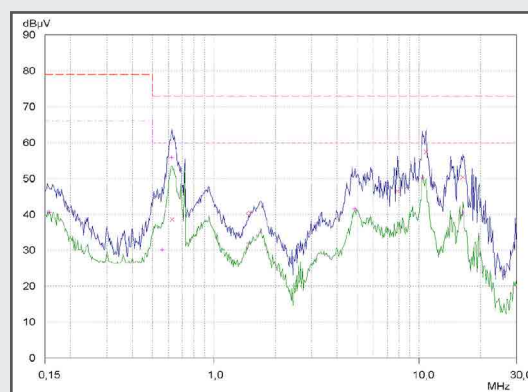
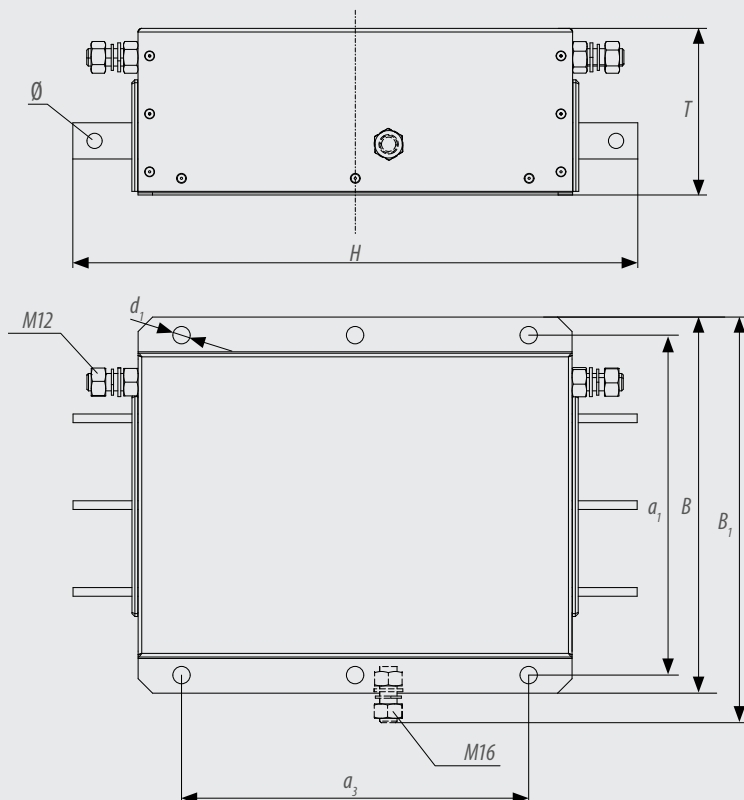
| Part-No.        | $I_N$<br>[A] | $P_V$<br>[W] | $I_{\text{leak}}$<br>[mA] | Suppression degree /<br>Motor cable length | $\emptyset$<br>[mm <sup>2</sup> ] | B<br>[mm] | B1<br>[mm] | H<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | weight<br>m [kg] |
|-----------------|--------------|--------------|---------------------------|--------------------------------------------|-----------------------------------|-----------|------------|-----------|-----------|---------------|---------------|---------------|------------------|
| 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.

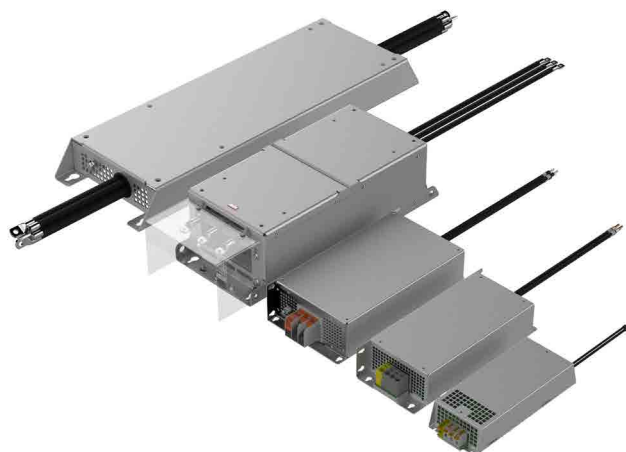
UL and cUL approvals: variants xxE4T60-1001 and 33E6T60-3150



EMC characteristic

## EXCLUSIVELY FOR DRIVE CONTROLLER COMBIVERT F6

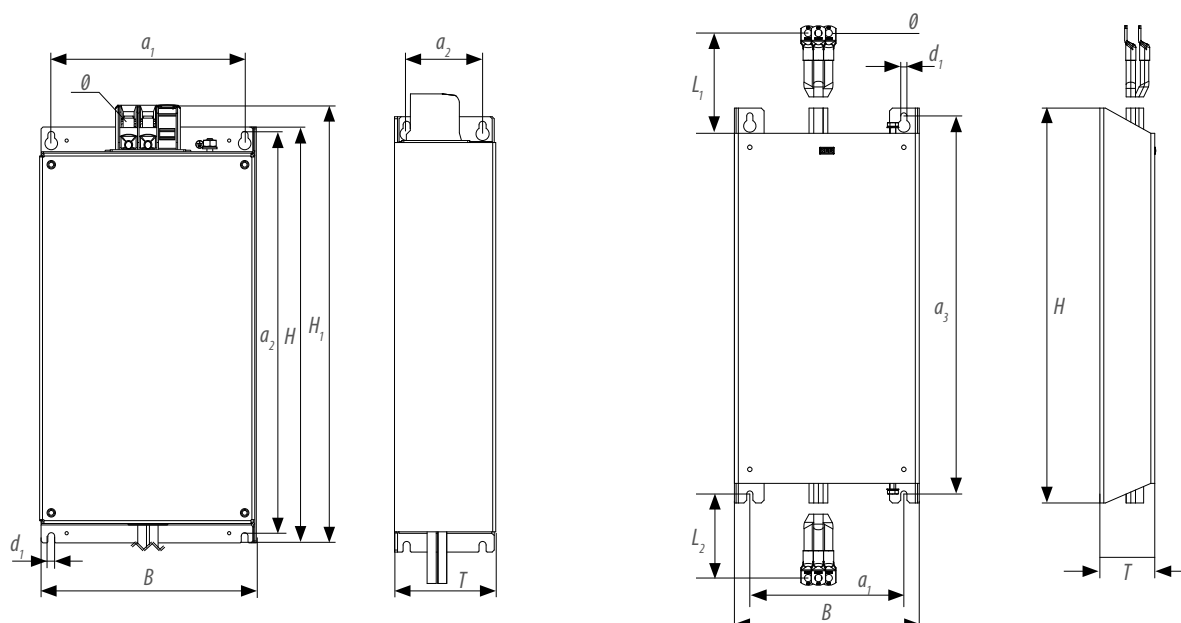
- Large rated voltage range 0 - 550 V
- Rated currents from 21 - 650 A, in nine sizes
- Compact design in book form with small mounting area
- Space-saving through sub-mounting the filter behind the drive:  
No additional space required in the control cabinet
- Ready for connection: Integrated mains 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<br>housing | $I_N$<br>[A] | $P_V$<br>[W] | $I_{leak}$<br>[mA] | Suppression degree /<br>Motor cable length | $\emptyset$<br>[mm <sup>2</sup> ] | B<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $a_3$<br>[mm] | $L_1$<br>[mm] | $L_2$<br>[mm] | $d_1$<br>[mm] | weight<br>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

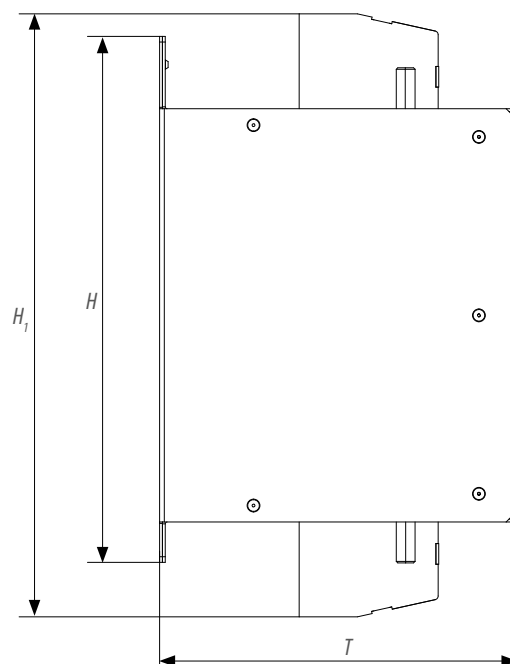
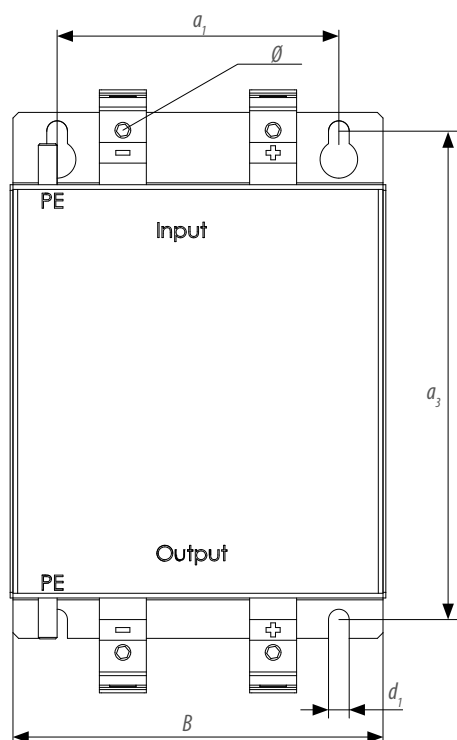
## DC FILTERS

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 in IT-mains



| Part-No.     | $I_N$<br>[A] | $P_V$<br>[W] | $I_{leak}$<br>[mA] | Suppression degree /<br>Motor cable length | $\emptyset$<br>[mm <sup>2</sup> ] | B<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | weight<br>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             |



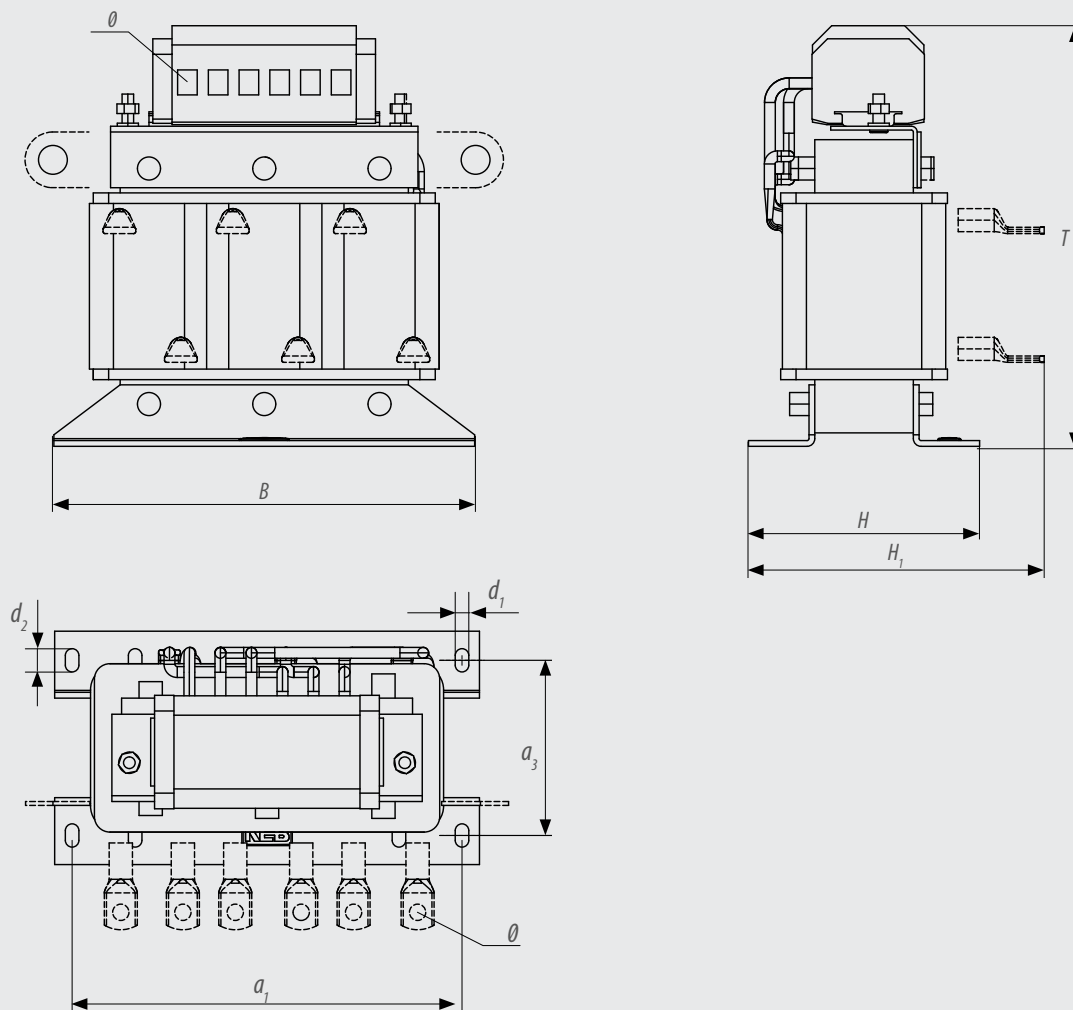
## MOTOR CHOKES

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 ( $> 15$  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.

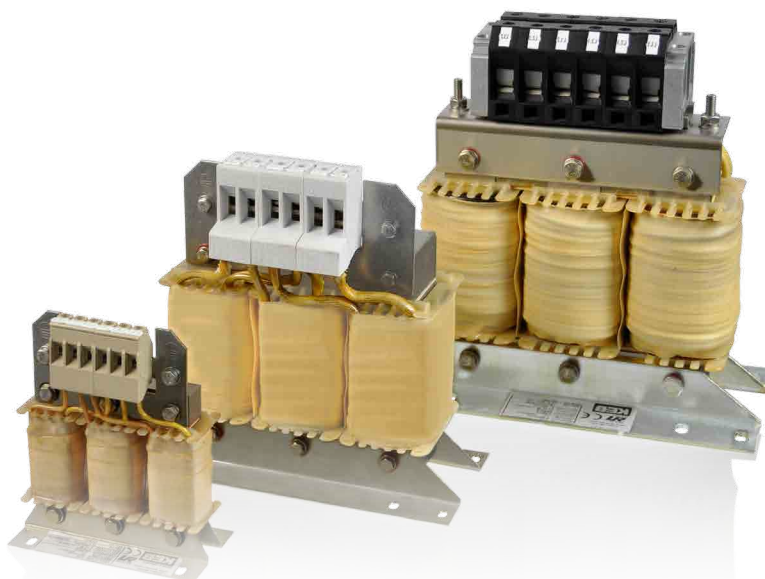


# MOTOR CHOKE SERIES Z1

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

| Part-No.     | $I_N$<br>[A] | L<br>[mH] | $P_V$<br>[W] | $\emptyset$<br>[mm <sup>2</sup> ] | B/B1<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[mm] | weight  |        | $f_s$<br>[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

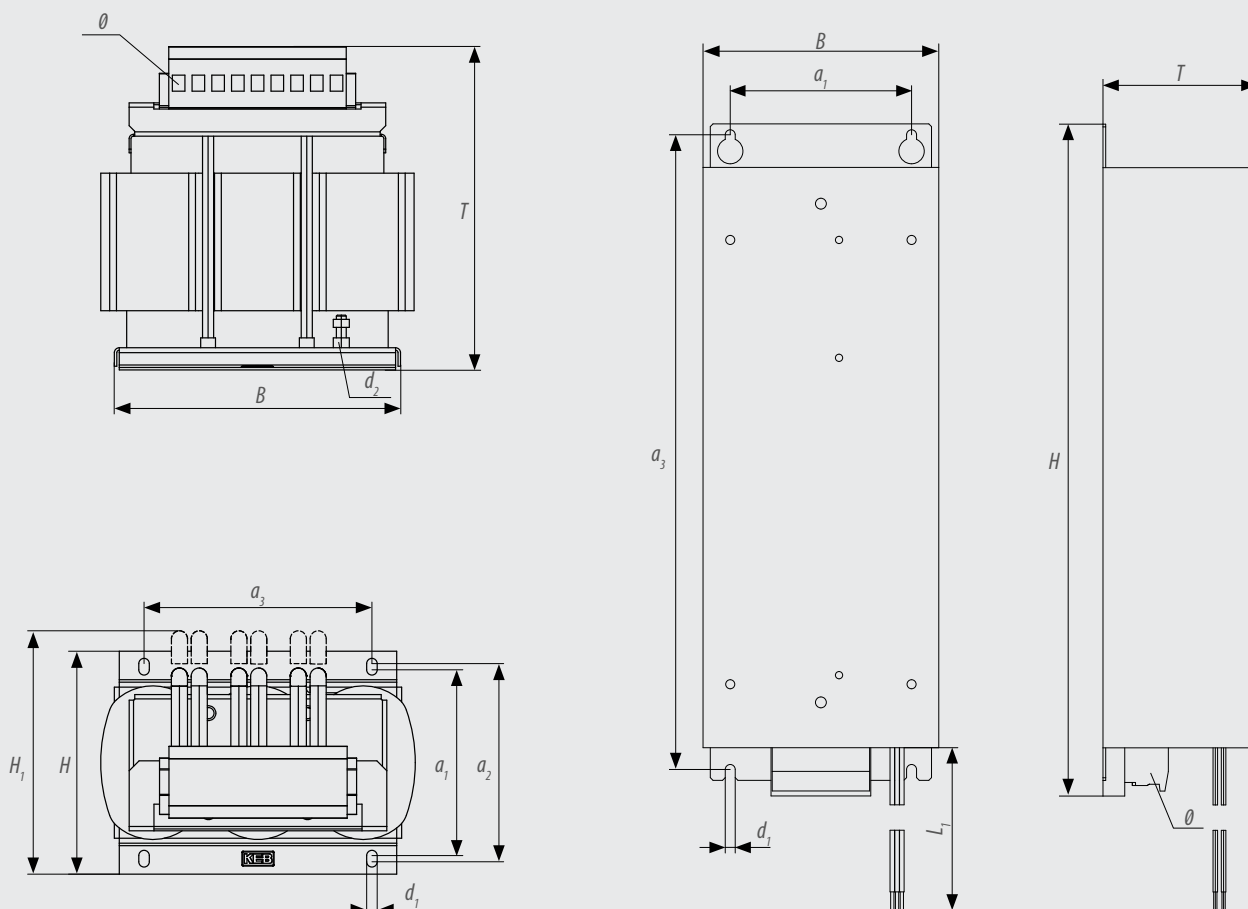


**MOTOR CHOKE 3-PHASES 400 VAC ( $U_{\max} = 550$  V), FREQUENCY RANGE 0 ... 1.600 Hz,  $U_k = 20\%$**

| Part-No.     | $I_N$ | $L$   | $P_v^*$ | $\emptyset$        | $B$  | $H$  | $H_1$ | $T$  | $a_1$ | $a_2$ | $a_3$ | $d_1$ | $d_2$ | weight  |        | $f_s$  |
|--------------|-------|-------|---------|--------------------|------|------|-------|------|-------|-------|-------|-------|-------|---------|--------|--------|
|              | [A]   | [mH]  | [W]     | [mm <sup>2</sup> ] | [mm] | [mm] | [mm]  | [mm] | [mm]  | [mm]  | [mm]  | [mm]  | [mm]  | Cu [kg] | m [kg] | [kHz]  |
| 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



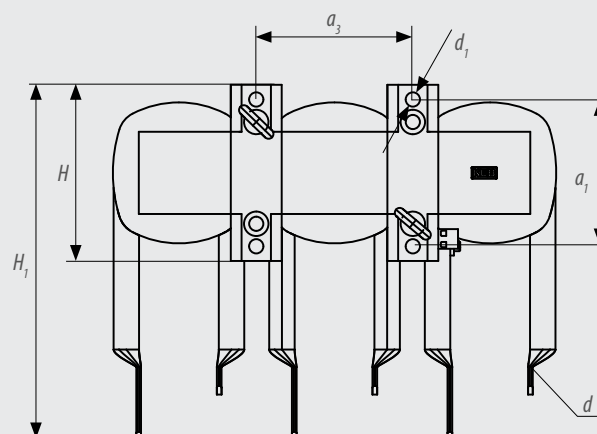
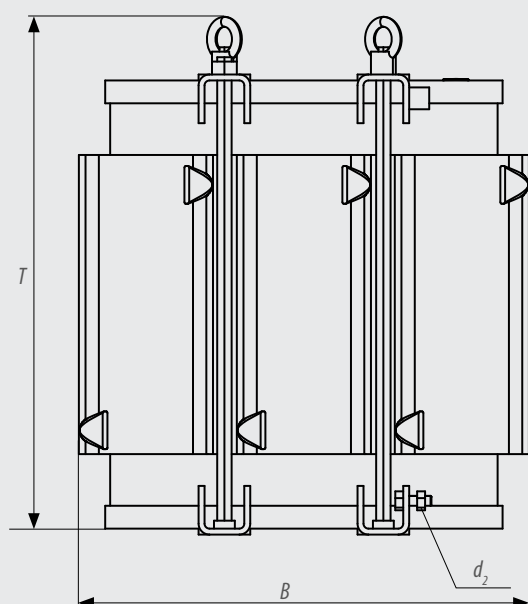
# MOTOR CHOKE SERIES Z2

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

| Part-No.     | $I_N$<br>[A] | $L$<br>[mH] | $P_v^*$<br>[W] | $\emptyset$<br>[mm <sup>2</sup> ] | $B$<br>[mm] | $H$<br>[mm] | $H_1$<br>[mm] | $T$<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $a_3$<br>[mm] | $d$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[mm] | weight |       | $f_s$<br>[kHz] |
|--------------|--------------|-------------|----------------|-----------------------------------|-------------|-------------|---------------|-------------|---------------|---------------|---------------|-------------|---------------|---------------|--------|-------|----------------|
| 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

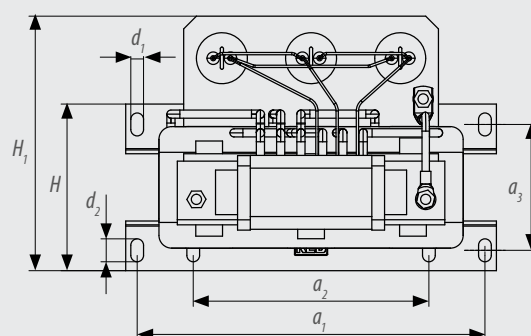
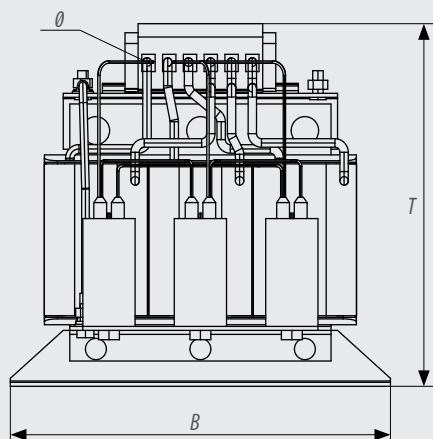


# MOTOR-SIDE SERIES Z1

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

| $P_{\text{inv}}$<br>[kW] | Part-No.     | $I_N$<br>[A] | $I_{\text{max.}}$<br>[A] | $P_V$<br>[W] | $f_s$<br>[kHz] | B<br>[mm] | H<br>[mm] | $H_1$<br>[mm] | T<br>[mm] | $a_1$<br>[mm] | $a_2$<br>[mm] | $a_3$<br>[mm] | $d_1$<br>[mm] | $d_2$<br>[mm] | $\emptyset$<br>[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         | 352       | 139       | 232           | 330       | 328           | 224           | 99            | 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



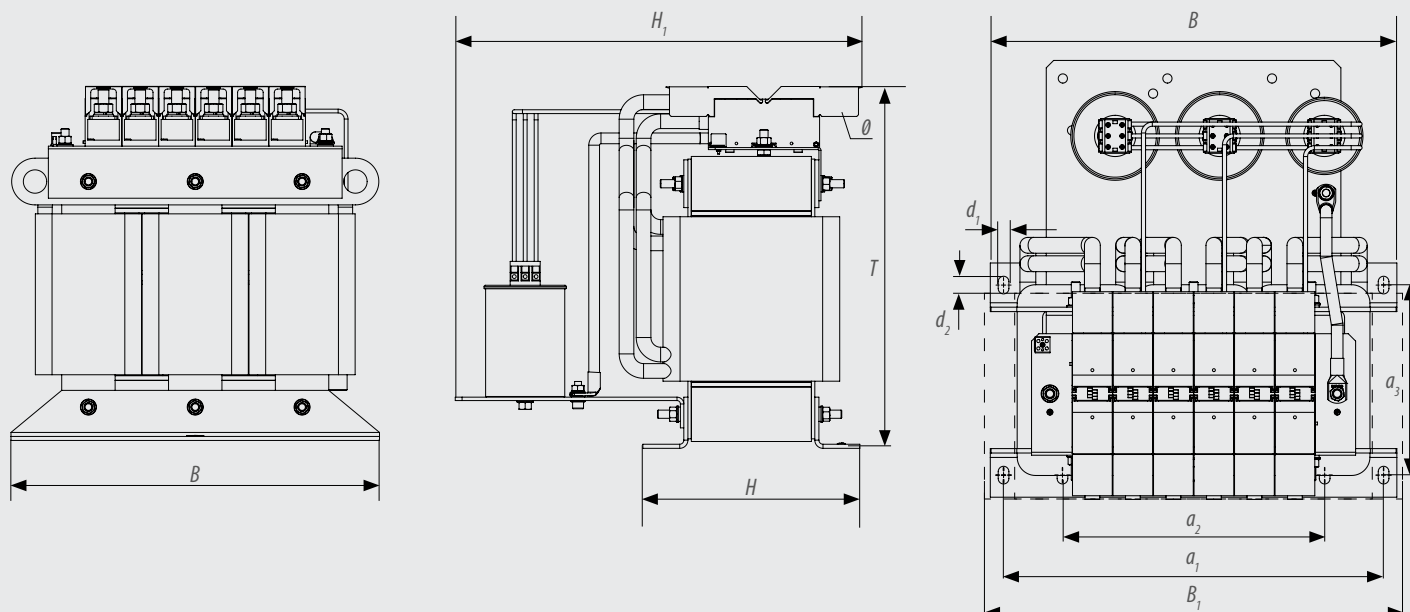
**SINUSOIDAL FILTER 3-PHASES 400 V AC ( $U_{\max} = 500 \text{ V}$ ),  $f_{\max} 100 \text{ Hz}$** 

| $P_{\text{FU}}$<br>[kW] | Part-No.     | $I$ | $I_{\max}$ | $P_v$ | $f_s$  | $B/B_1$ | $H/H_1$ | $T$  | $a_1$ | $a_2$ | $a_3$ | $d_1$ | $d_2$ | $\emptyset$        | Weight  |        | $U_k$ |
|-------------------------|--------------|-----|------------|-------|--------|---------|---------|------|-------|-------|-------|-------|-------|--------------------|---------|--------|-------|
|                         |              | [A] | [A]        | [W]   | [kHz]  | [mm]    | [mm]    | [mm] | [mm]  | [mm]  | [mm]  | [mm]  | [mm]  | [mm <sup>2</sup> ] | 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.

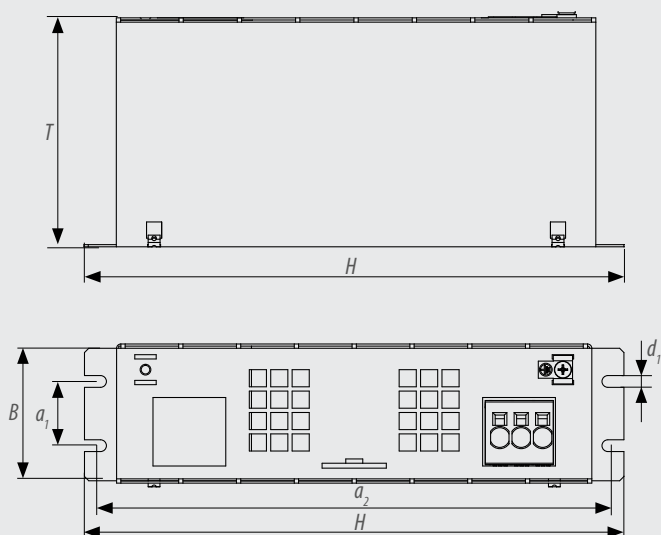


# CAPACITOR ASSEMBLY SERIES Z2

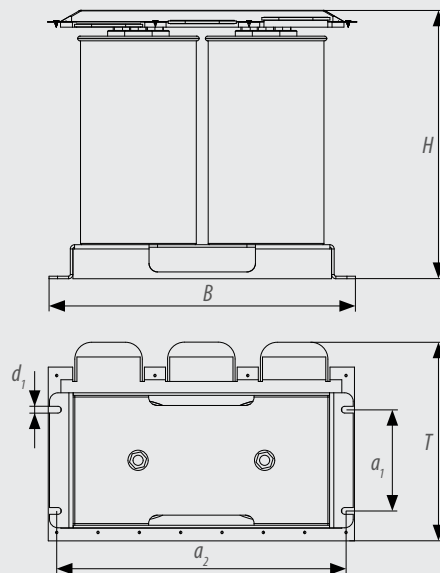
| Part-No      | C<br>[μF] | ill. | H<br>[mm] | B<br>[mm] | T<br>[mm] | a <sub>1</sub><br>[mm] | a <sub>2</sub><br>[mm] | d <sub>1</sub><br>[mm] | m<br>[kg] |
|--------------|-----------|------|-----------|-----------|-----------|------------------------|------------------------|------------------------|-----------|
| 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<br>$I_N$ [A] | material<br>number | 0 ... 600 Hz<br>@ $f_s = 6$ kHz                                         | 0 ... 800 Hz<br>@ $f_s = 8$ kHz     | 0 ... 1000 Hz<br>@ $f_s = 10$ kHz | 0 ... 1200 Hz<br>@ $f_s = 12$ kHz | 0 ... 1600 Hz<br>@ $f_s = 16$ kHz |
| 07   | 2.6                  | 07Z2F04-1003       | -                                                                       | 00Z2G24-0006<br>(00Z2T09-0002)*     | 00Z2G24-0065<br>(00Z2T09-0002)*   | 00Z2G24-0055<br>(00Z2T09-0002)*   | 00Z2G24-0035<br>(00Z2T09-0002)*   |
| 09   | 4.1                  | 09Z2F04-1003       | -                                                                       | 00Z2G24-0016<br>(00Z2T09-0002)*     | 00Z2G24-0007<br>(00Z2T09-0002)*   | 00Z2G24-0065<br>(00Z2T09-0002)*   | 00Z2G24-0055<br>(00Z2T09-0002)*   |
| 10   | 5.8                  | 10Z2F04-1003       | -                                                                       | 00Z2G24-0017<br>(00Z2T09-0002)*     | 00Z2G24-0007<br>(00Z2T09-0002)*   | 00Z2G24-0006<br>(00Z2T09-0002)*   | 00Z2G24-0055<br>(00Z2T09-0002)*   |
| 12   | 9.5                  | 12Z2F04-1003       | -                                                                       | 00Z2G24-0047<br>(00Z2T09-0002)*     | 00Z2G24-0037<br>(00Z2T09-0002)*   | 00Z2G24-0007<br>(00Z2T09-0002)*   | 00Z2G24-0006<br>(00Z2T09-0002)*   |
| 13   | 12                   | 13Z2F04-1003       | -                                                                       | 00Z2G24-0057<br>(00Z2T09-0002)*     | 00Z2G24-0047<br>(00Z2T09-0002)*   | 00Z2G24-0017<br>(00Z2T09-0002)*   | 00Z2G24-0006<br>(00Z2T09-0002)*   |
| 14   | 16.5                 | 14Z2F04-1003       | -                                                                       | 00Z2G24-0051<br>(00Z2T09-3010)*     | 00Z2G24-0057<br>(00Z2T09-0002)*   | 00Z2G24-0047<br>(00Z2T09-0002)*   | 00Z2G24-0016<br>(00Z2T09-0002)*   |
| 15   | 24                   | 15Z2F04-1003       | -                                                                       | 00Z2G24-0061<br>(00Z2T09-3010)*     | 00Z2G24-0051<br>(00Z2T09-3010)*   | 00Z2G24-0057<br>(00Z2T09-0002)*   | 00Z2G24-0017<br>(00Z2T09-0002)*   |
| 16   | 33                   | 16Z2F04-1003       | -                                                                       | 00Z2G24-0061<br>(00Z2T09-3010)*     | 00Z2G24-0061<br>(00Z2T09-3010)*   | 00Z2G24-0051<br>(00Z2T09-2010)*   | 00Z2G24-0037<br>(00Z2T09-0002)*   |
| 17   | 42                   | 17Z2F04-1003       | -                                                                       | 00Z2G24-0001<br>(00Z2T09-2010)*     | 00Z2G24-0061<br>(00Z2T09-3010)*   | 00Z2G24-0051<br>(00Z2T09-3010)*   | 00Z2G24-0047<br>(00Z2T09-0002)*   |
| 18   | 50                   | 18Z2F04-1003       | -                                                                       | 00Z2G24-0001<br>(00Z2T09-2010)*     | 00Z2G24-0001<br>(00Z2T09-2010)*   | 00Z2G24-0061<br>(00Z2T09-3010)*   | 00Z2G24-0057<br>(00Z2T09-0002)*   |
| 19   | 60                   | 19Z2F04-1003       | -                                                                       | 00Z2G24-0011<br>(00Z2T09-2010)*     | 00Z2G24-0001<br>(00Z2T09-2010)*   | 00Z2G24-0061<br>(00Z2T09-3010)*   | 00Z2G24-0051<br>(00Z2T09-3010)*   |
| 20   | 75                   | 20Z2F04-1003       | -                                                                       | 00Z2G24-0021<br>(00Z2T09-1010)*     | 00Z2G24-0001<br>(00Z2T09-1010)*   | 00Z2G24-0001<br>(00Z2T09-1010)*   | 00Z2G24-0051<br>(00Z2T09-4010)*   |
| 21   | 90                   | 21Z2F04-1003       | -                                                                       | 00Z2G24-0031<br>(00Z2T09-1010)*     | 00Z2G24-0011<br>(00Z2T09-1010)*   | 00Z2G24-0001<br>(00Z2T09-1010)*   | 00Z2G24-0051<br>(00Z2T09-4010)*   |
| 22   | 115                  | 22Z2F04-1003       | -                                                                       | 00Z2G24-0002<br>(00Z2T09-1010)*     | 00Z2G24-0021<br>(00Z2T09-1010)*   | 00Z2G24-0011<br>(00Z2T09-1010)*   | 00Z2G24-0061<br>(00Z2T09-4010)*   |
| 23   | 150                  | 23Z2F04-1003       | 00Z2G24-0041<br>(00Z2T09-0025)*                                         | 00Z2G24-0002<br>(00Z2T09-1010)*     | 00Z2G24-0021<br>(00Z2T09-1010)*   | 00Z2G24-0011<br>(00Z2T09-1010)*   | 00Z2G24-0061<br>(00Z2T09-4010)*   |
| 24   | 180                  | 24Z2F04-1003       | 00Z2G24-0042<br>(00Z2T09-0025)*                                         | 00Z2G24-0012<br>(00Z2T09-1025)*     | 00Z2G24-0031<br>(00Z2T09-1025)*   | 00Z2G24-0021<br>(00Z2T09-1010)*   | 00Z2G24-0001<br>(00Z2T09-1010)*   |
| 25   | 210                  | 25Z2F04-1003       | 00Z2G24-0052<br>(00Z2T09-0035)*                                         | 00Z2G24-0022<br>(00Z2T09-1025)*     | 00Z2G24-0012<br>(00Z2T09-1025)*   | 00Z2G24-0021<br>(00Z2T09-1025)*   | 00Z2G24-0001<br>(00Z2T09-1010)*   |
| 26   | 250                  | 26Z2F04-1003       | 00Z2G24-0062<br>(00Z2T09-0035)*                                         | 00Z2G24-0041<br>(00Z2T09-0025)*     | 00Z2G24-0012<br>(00Z2T09-0025)*   | 00Z2G24-0031<br>(00Z2T09-0025)*   | 00Z2G24-0001<br>(00Z2T09-0010)*   |
| 27   | 300                  | 27Z2F04-1003       | 00Z2G24-0062<br>(00Z2T09-0070)*                                         | 00Z2G24-0041<br>(00Z2T09-0070)*     | 00Z2G24-0032<br>(00Z2T09-0035)*   | 00Z2G24-0012<br>(00Z2T09-0025)*   | 00Z2G24-0011<br>(00Z2T09-0010)*   |
| 28   | 370                  | 28Z2F04-1003       | 00Z2G24-0033<br>(00Z2T09-0070)*                                         | 00Z2G24-0052<br>(00Z2T09-0070)*     | 00Z2G24-0032<br>(00Z2T09-0070)*   | 00Z2G24-0022<br>(00Z2T09-0035)*   | 00Z2G24-0021<br>(00Z2T09-0025)*   |
| 29   | 460                  | 29Z2F04-1003       | 00Z2G24-0043<br>(00Z2T09-0095)*                                         | 00Z2G24-0062<br>(00Z2T09-0070)*     | 00Z2G24-0003<br>(00Z2T09-0070)*   | 00Z2G24-0032<br>(00Z2T09-0070)*   | 00Z2G24-0031<br>(00Z2T09-0025)*   |
| 30   | 570                  | 30Z2F04-1003       | 00Z2G24-0014<br>(2 x 00Z2T09-0070)*                                     | 00Z2G24-0062<br>(00Z2T09-0095)*     | 00Z2G24-0004<br>(00Z2T09-0095)*   | 00Z2G24-0003<br>(00Z2T09-0070)*   | 00Z2G24-0002<br>(00Z2T09-0035)*   |
| 31   | 630                  | 31Z2F04-1003       | 00Z2G24-0014<br>(2 x 00Z2T09-0070)*                                     | 00Z2G24-0043<br>(2 x 00Z2T09-0070)* | -                                 | -                                 | -                                 |
| 32   | 710                  | 32Z2F04-1003       | 00Z2G24-0014 +<br>00Z2G24-0041<br>(2 x 00Z2T09-0070<br>+ 00Z2T09-0025)* | 00Z2G24-0043<br>(2 x 00Z2T09-0070)* | -                                 | -                                 | -                                 |
| 33   | 800                  | 33Z2F04-1003       | 00Z2G24-0014 +<br>00Z2G24-0041<br>(2 x 00Z2T09-0070<br>+ 00Z2T09-0025)* | 00Z2G24-0043<br>(2 x 00Z2T09-0070)* | -                                 | -                                 | -                                 |

\* Recommended wire set

# NHF FILTER SUPPRESSION DEGREE C3

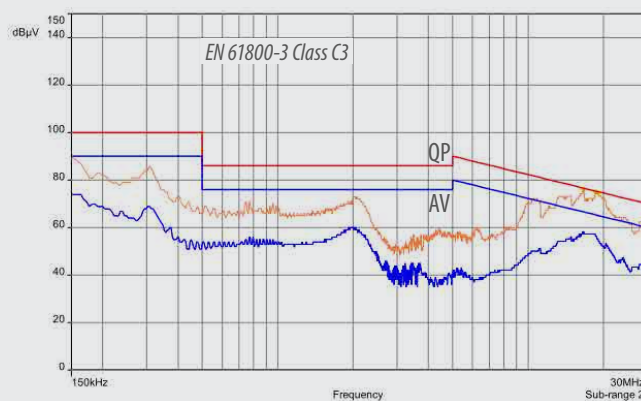
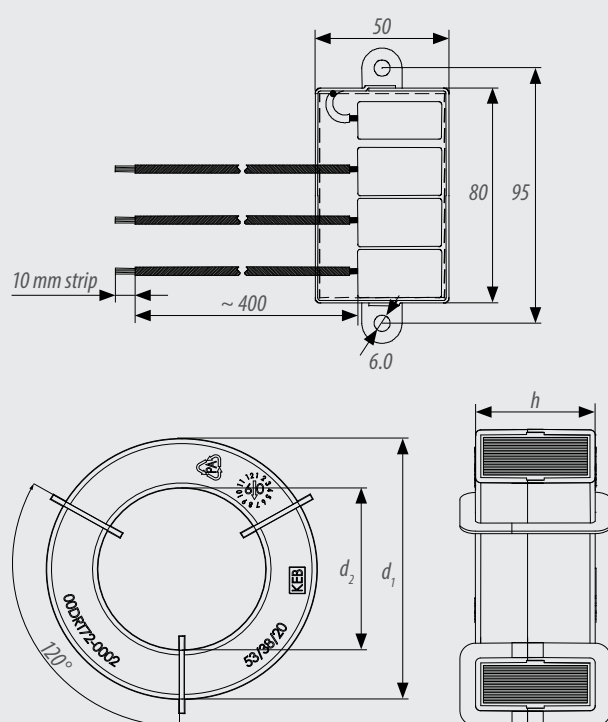
## LOW AND HIGH FREQUENCY FILTER COMBINATION

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

## RECOMMENDED

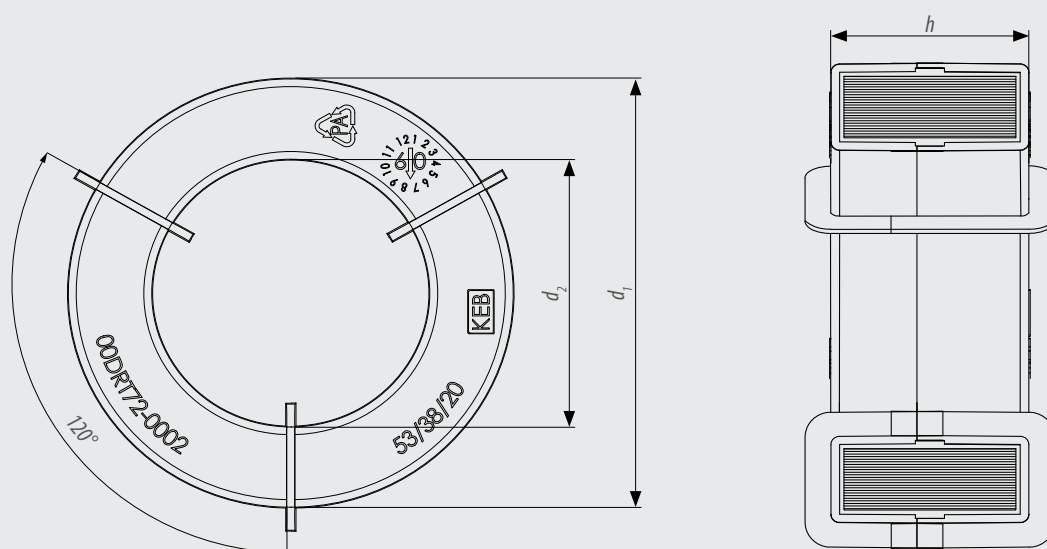
cable set 00E4061-1908



- 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]<br>@ 2 kHz<br>minimum value | *** Can be used up to a current (A) /<br>No. of turns (N) /<br>Cable cross-section ( $\text{mm}^2$ ) | m<br>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.

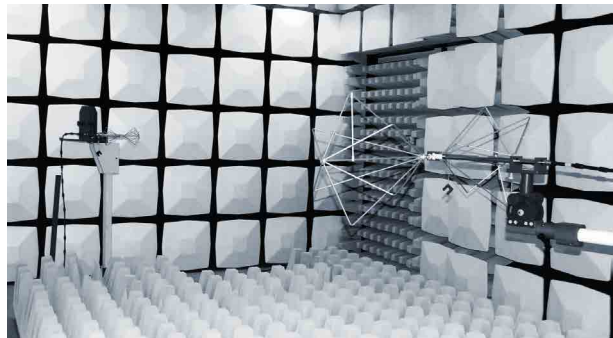
### THE ADVANTAGES

- 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

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KEB'S GLOBAL PARTNER NETWORK





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