

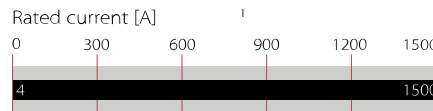
# 3-phase Line Reactor for Motor Drive & Power Quality Applications



- Provision of 4% impedance
- Reduction of mains harmonics
- Reduction of commutation notches
- Protection of motor drive electronics
- Limitation of inrush currents
- Improvement of true power factor



### Performance indicators



### Approvals



UL 508C up to 400 A. For use with AC or DC drives (power conversion equipment) only

### Features and benefits

- Ensure reliability, performance and a long service life of electrical consumers
- Reduction of mains harmonics and commutation notches
- Help to meet international power quality standards such as IEEE-519 or EN 61000-3-2
- Protection of motor drive electronics and dc link capacitors against mains transients
- Reduction of inrush and peak currents
- Reduction of conducted LF emission
- Improvement of conducted LF immunity
- Prevention from nuisance tripping caused by power line voltage spikes
- Improvement of true power factor

### Technical specifications

|  |  |
|--|--|
| <b>Maximum continuous operating voltage</b>      | 3 x 500/288 VAC  |
| <b>Design corresponding to</b>                   | EN 61558-2-20 (VDE 0570-2-20), UL 508C, CSA C22.2 NO.14  |
| <b>Impedance</b>                                 | 4% @ 400 VAC, 50 Hz & rated current  |
| <b>Typical harmonics reduction</b>               | See table on next page   |
| <b>High potential test voltage</b>               | P → E 3000 VAC for 3 sec<br>P → P 3000 VAC for 3 sec   |
| <b>Insulation class</b>                          | T40/N (200°C) for ≤400 A types<br>T40/F (155°C) for ≥500 A types<br>T40/H (180°C) for 1500 A types |
| <b>Protection category</b>                       | IP 00 (KL types according to VBG 4)  |
| <b>Rated currents</b>                            | 4 to 1500 A @ 40°C   |
| <b>Overload capability</b>                       | 2 x rated current at switch on for 30 seconds<br>1.5 x rated current for 1 minute, once per hour   |
| <b>Flammability corresponding to</b>             | UL 94 V-2 or better  |
| <b>Temperature range (operation and storage)</b> | -25°C to +100°C (25/100/21)  |
| <b>MTBF @ 40°C/400 V (Mil-HB-217F)</b>           | >500,000 hours   |

### Typical applications

- Motor drives and various adjustable speed drive systems, such as:
- Elevators
- Robots
- Machinery
- Process automation equipment

### Typical electrical schematic



## Reactor selection table

| Reactor        | Rated current<br>@ 40°C<br>[A] | Typical drive<br>power rating*<br>[kW] | Nominal<br>inductance<br>[mH] | Typical<br>power loss**<br>[W] | Input/Output<br>connections |    | Weight<br>Total<br>[kg] | Earthing bolt |
|----------------|--------------------------------|--|-------------------------------|--------------------------------|-----------------------------|----|-------------------------|---------------|
|                |                                |  |                               |                                |                             |    |                         |               |
| RWK 212-4-KL   | 4                              | 1.5                                    | 7.3                           | 23                             | KL                          |    | 2.1                     | AMP 6,3 x 0,8 |
| RWK 212-7-KL   | 7                              | 3                                      | 4.2                           | 36                             | KL                          |    | 2.5                     | M4            |
| RWK 212-11-KL  | 11                             | 4                                      | 2.6                           | 37                             | KL                          |    | 2.5                     | M4            |
| RWK 212-16-KL  | 16                             | 7.5                                    | 1.8                           | 59                             | KL                          |    | 3.9                     | M5            |
| RWK 212-21-KL  | 21                             | 11                                     | 1.4                           | 66                             | KL                          |    | 5.4                     | M5            |
| RWK 212-29-KL  | 29                             | 15                                     | 1                             | 69                             | KL                          |    | 5.4                     | M5            |
| RWK 212-35-KL  | 35                             | 18.5                                   | 0.84                          | 70                             | KL                          |    | 5.9                     | M5            |
| RWK 212-46-KL  | 46                             | 22                                     | 0.64                          | 99                             | KL                          |    | 11                      | M6            |
| RWK 212-60-KL  | 60                             | 30                                     | 0.49                          | 138                            | KL                          |    | 15                      | M6            |
| RWK 212-75-KL  | 75                             | 37                                     | 0.39                          | 133                            | KL                          |    | 15                      | M6            |
| RWK 212-95-KL  | 95                             | 45                                     | 0.3                           | 166                            | KL                          |    | 22                      | M8            |
| RWK 212-124-KS | 124                            | 55                                     | 0.23                          | 172                            |                             | KS | 25                      | M8            |
| RWK 212-156-KS | 156                            | 75                                     | 0.19                          | 249                            |                             | KS | 25                      | M8            |
| RWK 212-182-KS | 182                            | 90                                     | 0.16                          | 245                            |                             | KS | 32                      | M10           |
| RWK 212-230-KS | 230                            | 110/132                                | 0.13                          | 301                            |                             | KS | 35                      | M10           |
| RWK 212-280-KS | 280                            | 160                                    | 0.1                           | 335                            |                             | KS | 41                      | M10           |
| RWK 212-330-KS | 330                            | 160                                    | 0.09                          | 386                            |                             | KS | 56                      | M10           |
| RWK 212-400-S  | 400                            | 200                                    | 0.073                         | 692                            |                             | S  | 57                      | M10           |
| RWK 212-500-S  | 500                            | 250                                    | 0.058                         | 761                            |                             | S  | 67                      | M10           |
| RWK 212-600-S  | 600                            | 315                                    | 0.049                         | 825                            |                             | S  | 76                      | M10           |
| RWK 212-680-S  | 680                            | 355                                    | 0.043                         | 876                            |                             | S  | 80                      | M10           |
| RWK 212-790-S  | 790                            | 400                                    | 0.037                         | 956                            |                             | S  | 90                      | M10           |
| RWK 212-910-S  | 910                            | 450                                    | 0.032                         | 1022                           |                             | S  | 107                     | M10           |
| RWK 212-1100-S | 1100                           | 630                                    | 0.026                         | 1036                           |                             | S  | 135                     | M10           |
| RWK 212-1310-S | 1310                           | 725                                    | 0.023                         | 1050                           |                             | S  | 100                     | M10           |
| RWK 212-1500-S | 1500                           | 830                                    | 0.020                         | 1000                           |                             | S  | 225                     | M10           |

Customized line reactors with different electrical and mechanical specifications are available on request.

\* Calculated at rated current, 400 VAC and  $\cos \phi=0.8$ . The exact value depends upon the efficiency of the drive, the motor and the entire application.

\*\* Power loss at 25°C/50 Hz, considering a typical harmonic spectrum of a motor drive with B6U rectifier bridge.

## Harmonics reduction

Line reactors are a cost-effective way for the limitation of mains harmonics. The harmonics reduction capability is related to the reactor impedance. A higher impedance translates directly into lower harmonic currents, but of course also into a larger component with a higher voltage drop – and vice versa.

4% impedance reactors like RWK 212 provide an excellent cost/benefit ratio and are particularly beneficiary in the most diverse motor drive applications.

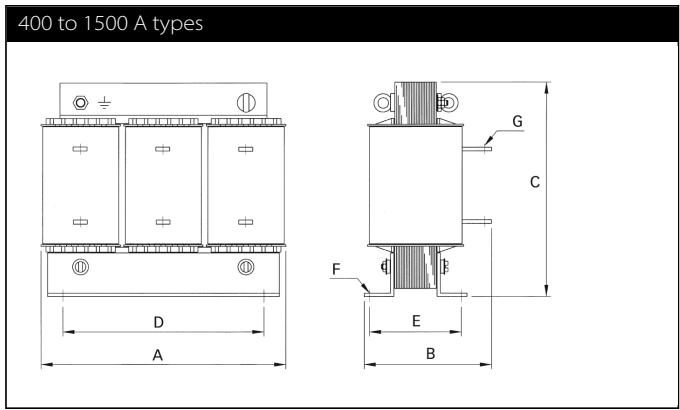
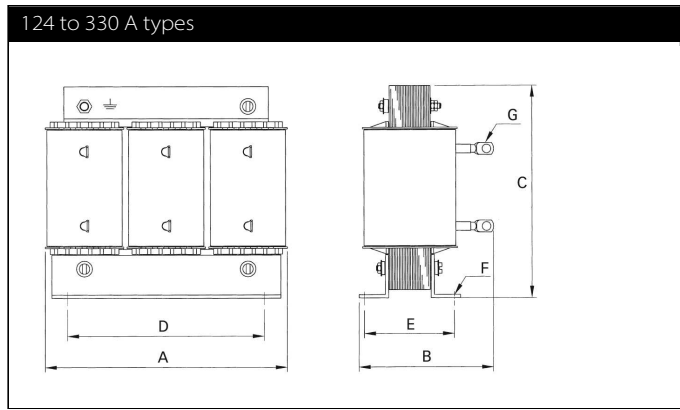
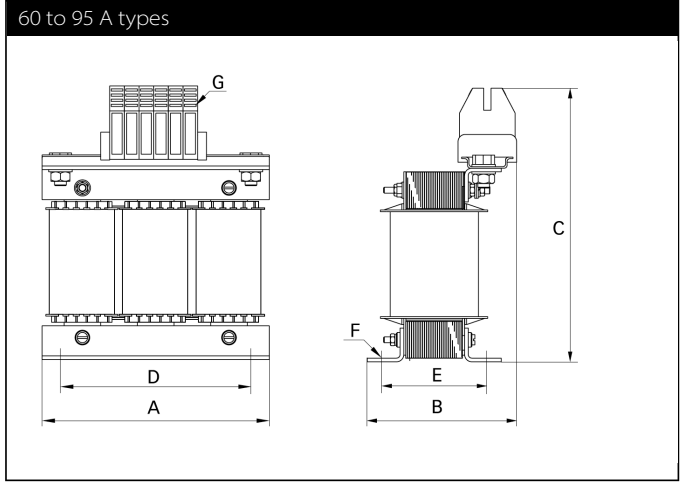
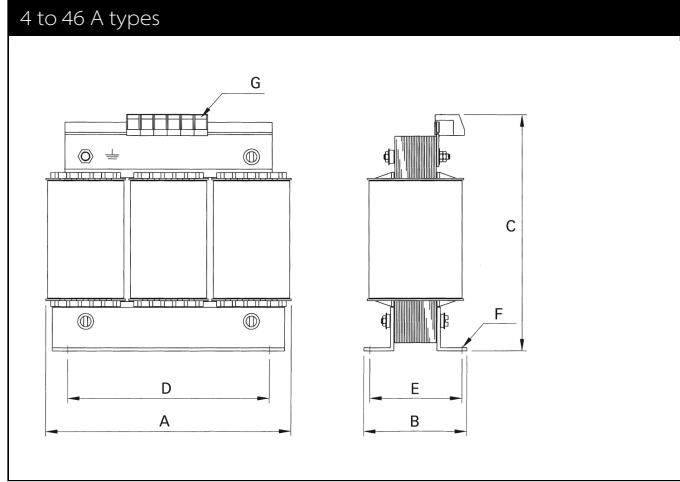
The table below shows various reactor impedance values and their calculated effect in terms of harmonics reduction.

## Harmonic number/Input impedance (uk) vs. remaining harmonics [%]

|       | 0.5%  | 1%   | 2%   | 3%    | 4%    | 5%    | 6%    | 7%    | 8%    | 9%    | 10%   |
|-------|-------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 5th   | 80    | 60   | 46   | 40    | 34    | 32    | 30    | 28    | 26    | 24    | 23    |
| 7th   | 60    | 37   | 22   | 16    | 13    | 12    | 11    | 10    | 9     | 8.3   | 7.5   |
| 11th  | 18    | 12   | 9    | 7.3   | 6.3   | 5.8   | 5.2   | 5     | 4.3   | 4.2   | 4     |
| 13th  | 10    | 7.5  | 5.8  | 4.9   | 4.2   | 3.9   | 3.6   | 3.3   | 3.15  | 3     | 2.8   |
| 17th  | 7.3   | 5.2  | 3.6  | 3     | 2.4   | 2.2   | 2.1   | 0.9   | 0.7   | 0.5   | 0.4   |
| 19th  | 6     | 4.2  | 2.8  | 2.2   | 2     | 0.8   | 0.7   | 0.4   | 0.3   | 0.25  | 0.2   |
| %THID | 102.5 | 72.2 | 52.3 | 44.13 | 37.31 | 34.96 | 32.65 | 30.35 | 28.04 | 25.92 | 24.68 |

Reading example: a 4% impedance reactor typically reduces the THID to ~37% of the fundamental.

**Mechanical data**



## Dimensions

|                      | A   | B        | C        | D   | E    | F       | G                   |
|----------------------|-----|----------|----------|-----|------|---------|---------------------|
| <b>4 A</b>           | 100 | max. 70  | max. 115 | 56  | 43   | 4.8 x 9 | 2.5 mm <sup>2</sup> |
| <b>7 and 11 A</b>    | 125 | max. 80  | max. 130 | 100 | 55   | 5 x 8   | 2.5 mm <sup>2</sup> |
| <b>16 A</b>          | 155 | max. 80  | max. 155 | 130 | 56.5 | 8 x 12  | 4 mm <sup>2</sup>   |
| <b>21 A</b>          | 155 | max. 95  | max. 155 | 130 | 70.5 | 8 x 12  | 4 mm <sup>2</sup>   |
| <b>29 A</b>          | 155 | max. 95  | max. 155 | 130 | 71.5 | 8 x 12  | 4 mm <sup>2</sup>   |
| <b>35 A</b>          | 155 | max. 105 | max. 170 | 130 | 70   | 8 x 12  | 10 mm <sup>2</sup>  |
| <b>46 A</b>          | 190 | max. 120 | max. 195 | 170 | 77.5 | 8 x 12  | 10 mm <sup>2</sup>  |
| <b>60 A</b>          | 210 | max. 155 | max. 240 | 175 | 97   | 8 x 12  | 16 mm <sup>2</sup>  |
| <b>75 A</b>          | 210 | max. 160 | max. 249 | 175 | 97   | 8 x 12  | 35 mm <sup>2</sup>  |
| <b>95 A</b>          | 230 | max. 185 | max. 275 | 180 | 122  | 8 x 12  | 35 mm <sup>2</sup>  |
| <b>124 and 156 A</b> | 240 | max. 210 | max. 210 | 190 | 129  | 11 x 15 | Ø10                 |
| <b>182 A</b>         | 265 | max. 210 | max. 230 | 215 | 114  | 11 x 15 | Ø10                 |
| <b>230 A</b>         | 300 | 210      | 270      | 240 | 131  | 11 x 15 | Ø12                 |
| <b>280 A</b>         | 300 | 218      | 270      | 240 | 139  | 11 x 15 | Ø12                 |
| <b>330 A</b>         | 300 | 255      | 270      | 240 | 166  | 11 x 15 | Ø12                 |
| <b>400 A</b>         | 420 | 205      | 390      | 370 | 133  | 11 x 15 | Ø11                 |
| <b>500 A</b>         | 420 | 215      | 390      | 370 | 140  | 11 x 15 | Ø14                 |
| <b>600 A</b>         | 420 | 225      | 390      | 370 | 149  | 11 x 15 | Ø14                 |
| <b>680 A</b>         | 420 | 225      | 390      | 370 | 150  | 11 x 15 | Ø14                 |
| <b>790 A</b>         | 420 | 240      | 390      | 370 | 162  | 11 x 15 | Ø18                 |
| <b>910 A</b>         | 420 | 255      | 390      | 370 | 177  | 11 x 15 | 2 x Ø11             |
| <b>1100 A</b>        | 420 | 290      | 390      | 370 | 200  | 11 x 15 | 2 x Ø11             |
| <b>1310 A</b>        | 420 | 255      | 490      | 370 | 172  | 11 x 15 | 2 x Ø14             |
| <b>1500 A</b>        | 551 | 400      | 613      | 490 | 266  | 13 x 18 | 4 x Ø13             |

All dimensions in mm; 1 inch = 25.4 mm  
Tolerances according: ISO 2768-m/EN 22768-m

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