

Universal sine wave output filter for motor drives

SCHAFFNER

energy efficiency and reliability



- Smoothing of PWM drive output voltage
- Efficient motor protection
- Increase of motor service life
- Reduction of audible motor noise
- Reduction of parasitic losses
- Improvement of system reliability

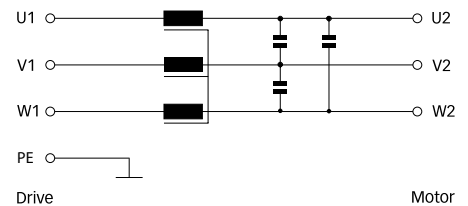
Approvals



Technical specifications

| | |
|--|---|
| Nominal operating voltage: | 3x 400/230VAC ±10% |
| Motor frequency: | 0 to 70Hz |
| Switching frequency: | 4 to 16kHz |
| Rated currents: | 2.5 to 610A @ 40°C |
| Motor cable length: | 400m max. |
| Impedance (uk): | 10% @ nominal voltage, 50Hz & rated current |
| Residual ripple voltage: | <5% |
| High potential test voltage: | P → E 3000VAC for 3 sec P → P 2000VAC for 3 sec |
| Protection category: | IP00 (filters up to 150A according to VBG 4) |
| Overload capability: | 2x rated current at switch on for 30 seconds, 1.5x rated current for 1 minute, once per hour |
| Temperature range (operation and storage): | -25°C to +85°C (25/085/21) |
| Insulation class: | T40/F (155°C) |
| Flammability corresponding to: | UL 94V-2 or better |
| Design corresponding to: | EN 61558-2-20 (VDE 0570-2-20) |

Typical electrical schematic



Features and benefits

- Conversion of the PWM output signal (symmetrical voltage components) of motor drives into a smooth sine wave with low residual ripple.
- Elimination of premature motor damage caused by high dv/dt, overvoltages, motor overheating and eddy current losses.
- Significantly increased service life of electric motors.
- Reduction of the pulse load of motor drive IGBTs and the parasitic losses on long shielded motor cables.
- Cost-effective and space-saving open frame filter design.
- Vacuum impregnation ensures less humming noise and high durability.

Typical applications

- Motor drive applications with long motor cables
- Pumps
- Conveyors
- HVAC applications
- Elevators
- General automation tasks
- Applications with multiple motors in parallel

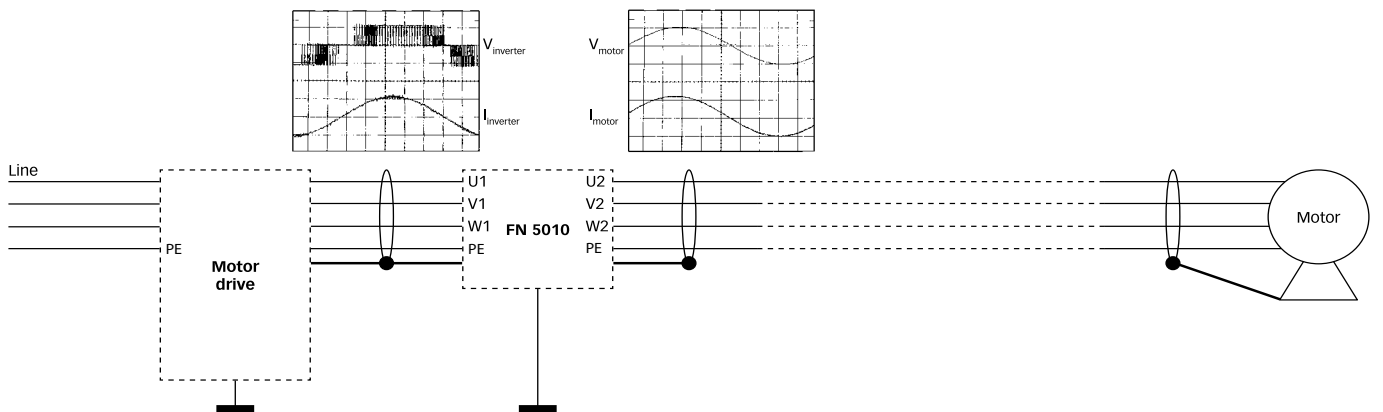
Filter selection table

| Filter | Rated current @ 40°C | Typical motor power rating* | Nominal inductance | Nominal capacitance | Typical power loss** | Input/Output connections | Total | Cu. | Weight Al. |
|----------------|-------------------------|--------------------------------|-----------------------|------------------------|-------------------------|-----------------------------|-------|------|---------------|
| | [A] | [kW] | [mH] | [μF] | [W] | | | | |
| FN 5010-2.5-99 | 2.5 | 1.1 | 22.4 | 1.5 Δ | 50 | -99 | 2.6 | 0.68 | |
| FN 5010-4.5-99 | 4.5 | 2.2 | 11 | 1.5 Δ | 66 | -99 | 3 | 1.1 | |
| FN 5010-8-99 | 8 | 4 | 7.2 | 1.5 Δ | 73 | -99 | 6.6 | 2.2 | |
| FN 5010-10-99 | 10 | 5.5 | 4.2 | 1.5 Δ | 91 | -99 | 6.6 | 2.6 | |
| FN 5010-13-99 | 13 | 7.5 | 4.2 | 1.5 Δ | 124 | -99 | 7.3 | 3.2 | |
| FN 5010-18-99 | 18 | 11 | 3.5 | 1.5 Δ | 144 | -99 | 11.5 | 3.6 | |
| FN 5010-24-99 | 24 | 15 | 2.4 | 1.5 Δ | 191 | -99 | 14 | 5 | |
| FN 5010-32-99 | 32 | 18.5 | 2 | 2 Δ | 273 | -99 | 16 | 6.8 | |
| FN 5010-42-99 | 42 | 22 | 1.58 | 7 Y | 252 | -99 | 22 | 7.4 | |
| FN 5010-48-99 | 48 | 30 | 1.5 | 7 Y | 340 | -99 | 28 | 8.8 | |
| FN 5010-60-99 | 60 | 30 | 1.1 | 4 Δ | 290 | -99 | 35 | 10.9 | |
| FN 5010-75-99 | 75 | 37 | 0.9 | 4 Δ | 340 | -99 | 42 | 11.5 | |
| FN 5010-90-99 | 90 | 45 | 0.8 | 5 Δ | 360 | -99 | 46 | 12.8 | |
| FN 5010-110-99 | 110 | 55 | 0.7 | 5 Δ | 400 | -99 | 58 | 13 | |
| FN 5010-150-99 | 150 | 75 | 0.5 | 7 Δ | 716 | -99 | 75 | 14.8 | |
| FN 5010-180-99 | 180 | 90 | 0.4 | 10 Δ | 820 | -99 | 88 | 1.4 | 10.9 |
| FN 5010-210-99 | 210 | 110 | 0.4 | 10 Δ | 1065 | -99 | 115 | 2.1 | 11.2 |
| FN 5010-270-99 | 270 | 132 | 0.3 | 12 Δ | 1230 | -99 | 150 | 2.1 | 14 |
| FN 5010-325-99 | 325 | 160 | 0.3 | 12 Δ | 1820 | -99 | 194 | 5.2 | 21 |
| FN 5010-410-99 | 410 | 200 | 0.2 | 18 Δ | 1830 | -99 | 206 | 5.2 | 23.8 |
| FN 5010-510-99 | 510 | 315 | 0.17 | 20 Δ | 2255 | -99 | 290 | 6.5 | 32 |
| FN 5010-610-99 | 610 | 355 | 0.14 | 25 Δ | 2520 | -99 | 330 | 7.7 | 37.5 |

* General purpose four-pole (1500r/min) AC induction motor rated 400V/50Hz.

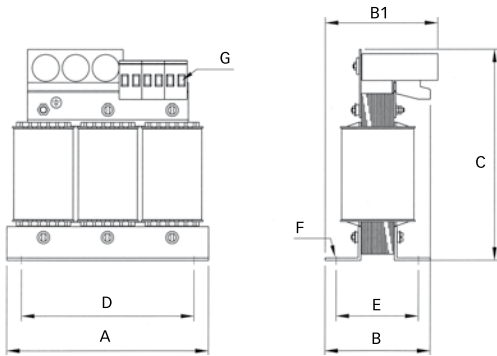
** Exact value depends upon the motor cable type and length, switching frequency, motor frequency and further stray parameters within the system.

Typical block schematic

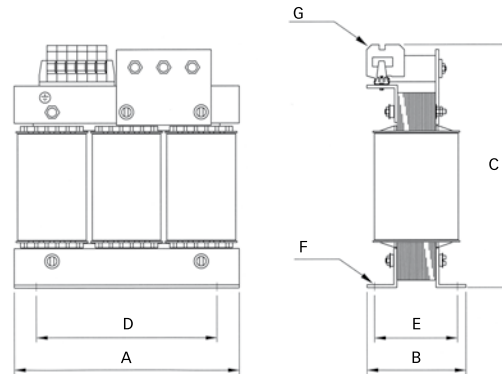


Mechanical data

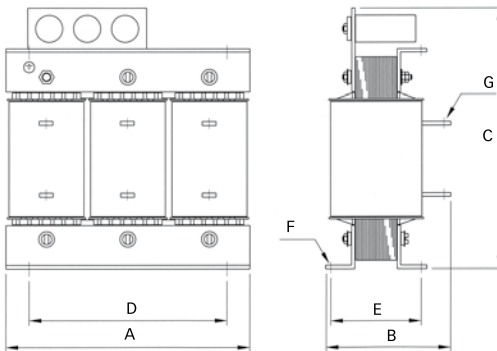
2.5 to 42A types



48 to 150A types



180 to 610A types



Dimensions

| | A | B | B1 | C | D | E | F | G |
|-----------|-----|-----|-----|-----|-----|-----|---------|--------------------|
| 2.5A | 125 | 65 | 110 | 180 | 100 | 45 | 5 x 8 | 2.5mm ² |
| 4.5A | 125 | 75 | 110 | 180 | 100 | 55 | 5 x 8 | 2.5mm ² |
| 8 and 10A | 155 | 95 | 118 | 205 | 130 | 70 | 8 x 12 | 4mm ² |
| 13A | 190 | 100 | 125 | 230 | 170 | 58 | 8 x 12 | 4mm ² |
| 18A | 190 | 120 | 125 | 230 | 170 | 78 | 8 x 12 | 10mm ² |
| 24A | 210 | 125 | 135 | 260 | 175 | 85 | 8 x 12 | 10mm ² |
| 32A | 210 | 135 | 135 | 260 | 175 | 95 | 8 x 12 | 10mm ² |
| 42A | 230 | 170 | 150 | 285 | 180 | 122 | 8 x 12 | 10mm ² |
| 48A | 240 | 210 | <B | 290 | 190 | 125 | 8 x 12 | 16mm ² |
| 60A | 240 | 220 | <B | 290 | 190 | 135 | 8 x 12 | 16mm ² |
| 75A | 300 | 210 | <B | 345 | 240 | 134 | 11 x 15 | 35mm ² |
| 90A | 300 | 215 | <B | 345 | 240 | 139 | 11 x 15 | 35mm ² |
| 110A | 300 | 237 | <B | 345 | 240 | 161 | 11 x 15 | 50mm ² |
| 150A | 420 | 217 | <B | 470 | 370 | 142 | 11 x 15 | 50mm ² |
| 180A | 420 | 235 | <B | 470 | 370 | 157 | 11 x 15 | Ø11 |
| 210A | 420 | 260 | <B | 470 | 370 | 182 | 11 x 15 | Ø11 |
| 270A | 420 | 295 | <B | 470 | 370 | 217 | 11 x 15 | Ø11 |
| 325A | 480 | 310 | <B | 580 | 430 | 238 | 13 x 18 | Ø11 |
| 410A | 480 | 320 | <B | 550 | 430 | 238 | 13 x 18 | Ø11 |
| 510A | 500 | 350 | <B | 580 | 430 | 255 | 13 x 18 | Ø11 |
| 610A | 500 | 370 | <B | 670 | 430 | 268 | 13 x 18 | Ø18 |

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