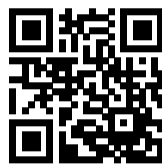


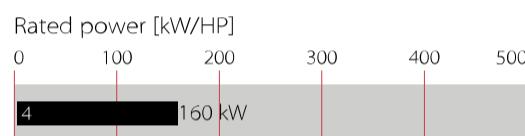
Ecosine 400-480 VAC 50Hz Economy Passive Harmonic Filters



- Economy line of passive harmonic filters for THDi <10%
- Help to comply with EN 61000-3-12, IEEE-519 and other PQ standards
- Support an efficient utilization of electrical system capacity
- Ideal for motor drives with 6-pulse rectifier front-end
- Suitable for diode and thyristor (SCR) rectifiers applications



Performance indicators



Approvals & Compliances



Features and Benefits

FN3416 (50 Hz) models of the Ecosine product family represent the very compact economy line with a THID performance of >10% (with Ldc).

They are ideal for non-linear three-phase equipment with B6 rectifier front-end that do not require the industry leading <5% THID performance provided by Schaffner Ecosine Evo series.

The performance is still sufficient to comply with EN 61000-3-12 or with IEEE-519 for $I_{sc}/I_L < 50$. Schaffner Ecosine filters help to unburden the electrical infrastructure from excess loading and heat caused by current harmonics, and therefore support a better utilization of electric system capacity.

Lower harmonics also reduce the risk of system resonances and potential downtime of sensitive electronic equipment.

FN3416/18 filters upgrade standard motor drives to low-harmonic drives quickly and easily.

Typical Applications

- Three-phase power conversion equipment with front-end six-pulse rectifier (diode or SCR)
- Motor drives, like those used e.g. in pump and fan applications
- Battery chargers, incl. DC fast chargers for e-cars

Technical Specifications

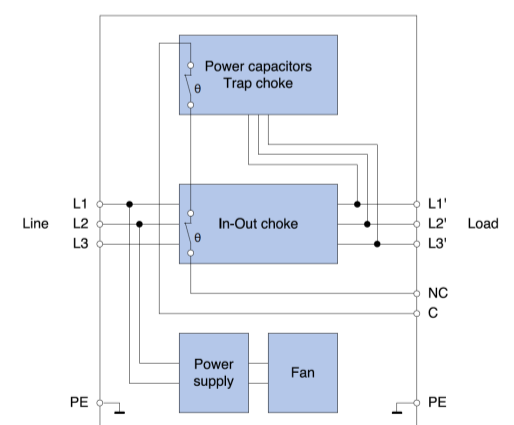
| | |
|--|---|
| Nominal operating voltage | 3x380 to 500 VAC ±10% |
| Overload capability | 1.6x rated current for 1 minute, once per hour |
| Operating frequency | 50Hz ±1 Hz (FN 3416) |
| Total harmonic current distortion THDi* | <10% @ rated power (with DC-Link choke) <15% @ rated power (without DC-Link choke) |
| Total demand distortion TDD | According to IEEE-519 |
| Nominal motor drive input power rating | 4 to 160 kW |
| High potential test voltage | P -> E 2500 VAC (2 sec) |
| Earthing system | TN, TT, IT |
| Efficiency | >98% @ nominal line voltage and power |
| Temperature range (operation and storage) | -25°C to +45°C fully operational +45°C to +70°C derated operation*** -25°C to +70°C transport and storage |
| Cooling | Internal fan cooling, unregulated |
| Protection category | IP 20 |
| Flammability corresponding to | UL 94 V-0 |
| Design corresponding to | UL 508, EN 61558-2-20, CE (LVD2006/95/EC) |
| SCCR** | 100 kA |

* System requirements: THVD <2%, line voltage unbalance <1%
Note: performance specifications in this datasheet refer to six-pulse diode rectifiers. SCR rectifier front-end will produce different results, depending upon the firing angle of the thyristors.

** External UL-rated fuses required.

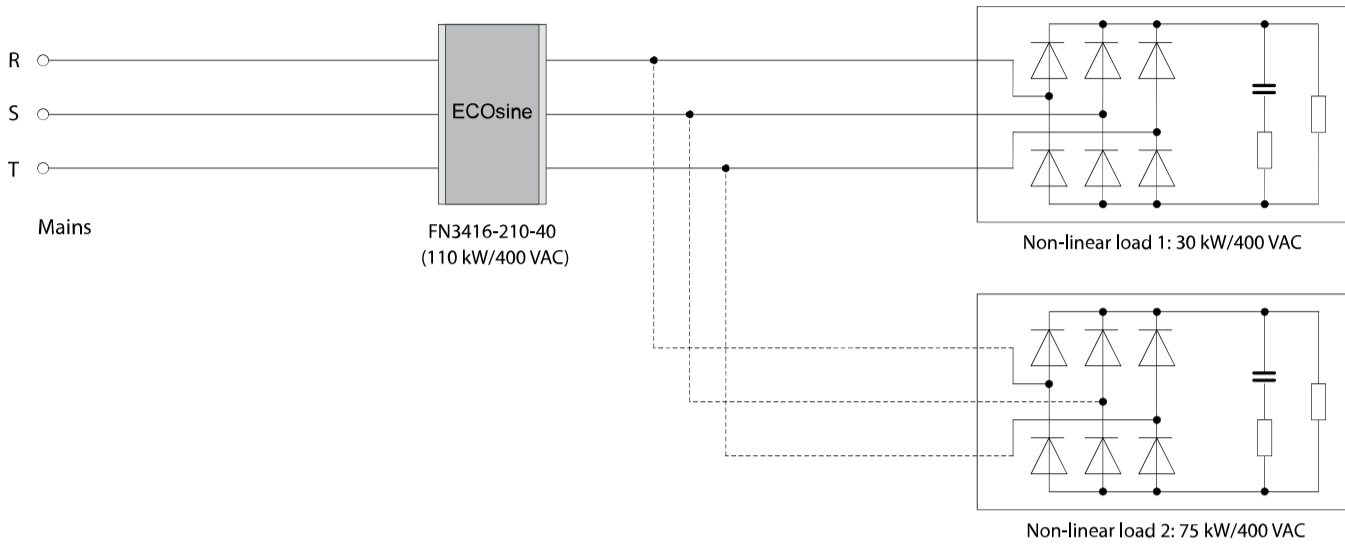
*** Iderated = $I_{nominal} * \sqrt{(70^\circ C - T_{amb}) / 25^\circ C}$

Typical electrical schematic

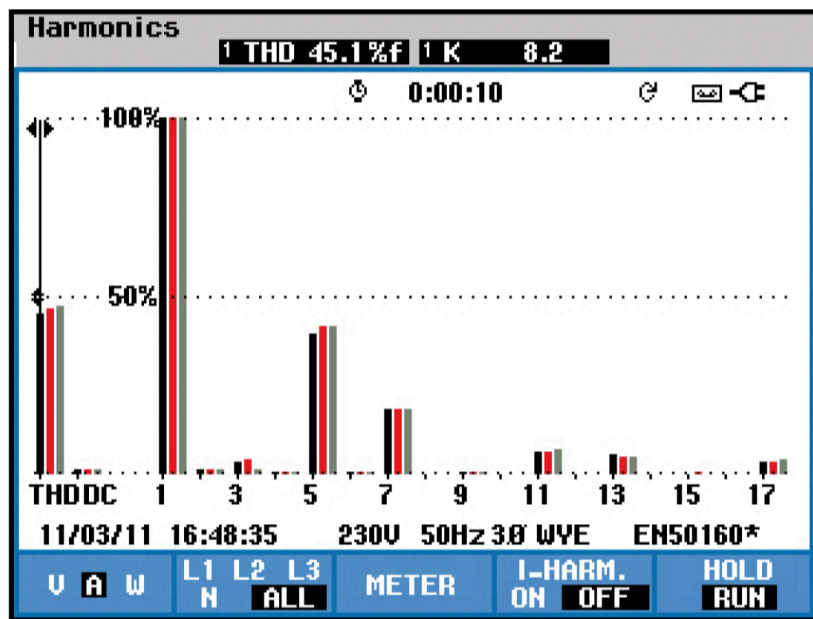


Filter Application

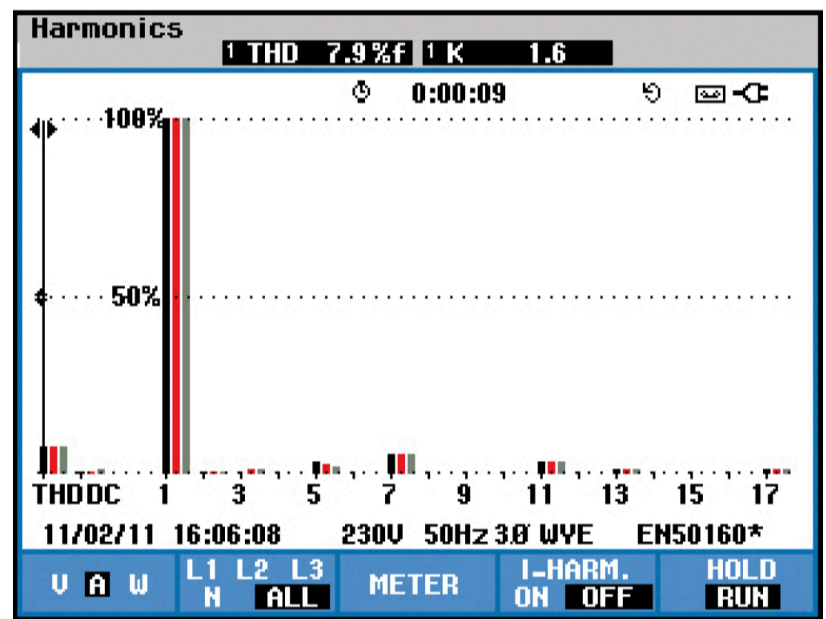
ECOsine filters are best installed directly at the input of 6-pulse rectifiers. It is possible to connect several non-linear loads (e.g. motor drives) in parallel. In this case the rating of the filter must match the sum of the power ratings of drives connected to it. The use of a (built-in) DC-link choke is recommended for best harmonics mitigation performance. If the expected input power exceeds the rating of the largest available filter, and a custom solution is not desired, then two or more filters can be wired in parallel. In this mode of operation, it is recommended to use filters with equal power ratings to ensure proper current sharing.



Typical Filter Performance





Motor drive with Ldc, without harmonic filter



Motor drive with Ldc, with ECOsine FN 3416

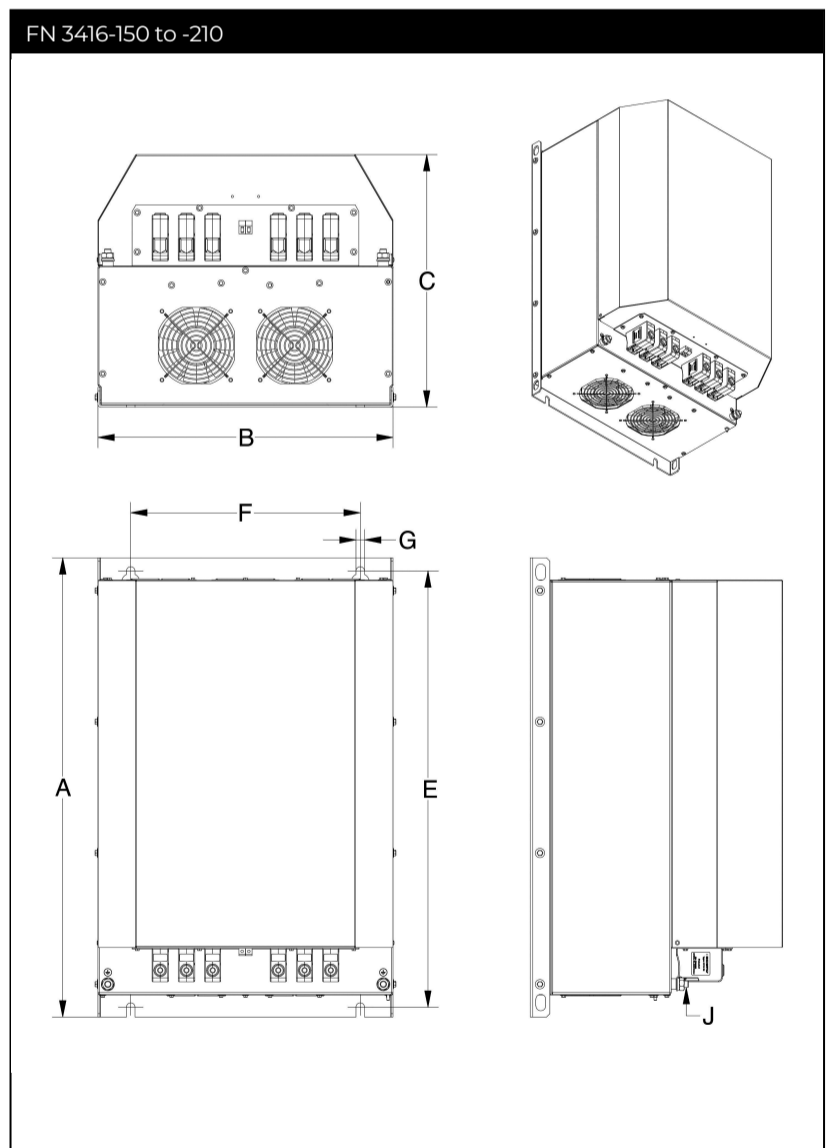
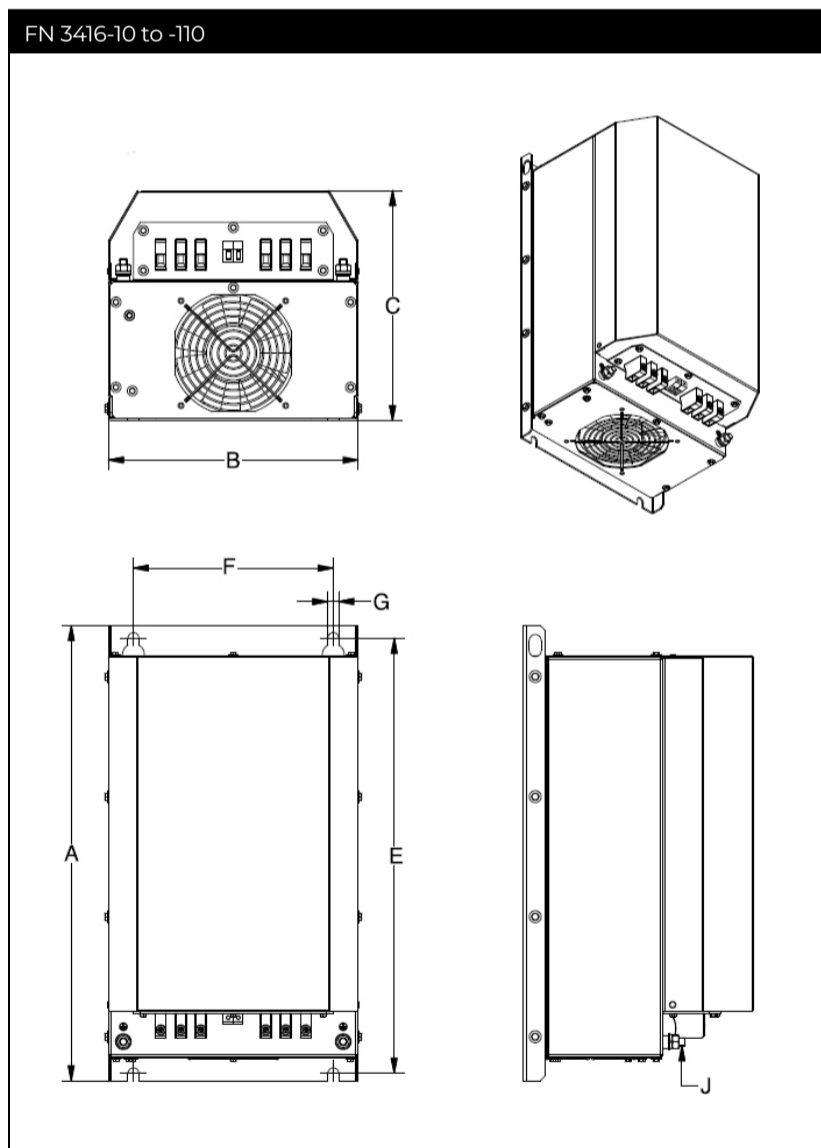
Filter Selection Table

| Filter* | Rated load power @ 400 VAC/50 Hz | Rated load power @ 500 VAC/50 Hz | Power loss** @ 25°C/50 Hz | Input /output connections | | Weight |
|----------------|-------------------------------------|-------------------------------------|------------------------------|---|---|--------|
| | [kW] | [kW] | [W] |  |  | [kg] |
| FN 3416-10-44 | 4 | 5.5 | 63 | -44 | | 10 |
| FN 3416-13-44 | 5.5 | 7.5 | 82 | -44 | | 10 |
| FN 3416-16-44 | 7.5 | 11 | 105 | -44 | | 15 |
| FN 3416-24-33 | 11 | 15 | 153 | -33 | | 20 |
| FN 3416-32-33 | 15 | 18.5 | 294 | -33 | | 22 |
| FN 3416-38-33 | 18.5 | 22 | 256 | -33 | | 25 |
| FN 3416-45-33 | 22 | 30 | 306 | -33 | | 29 |
| FN 3416-60-34 | 30 | 37 | 408 | -34 | | 37 |
| FN 3416-75-34 | 37 | 45 | 410 | -34 | | 43 |
| FN 3416-90-35 | 45 | 55 | 493 | -35 | | 47 |
| FN 3416-110-35 | 55 | 75 | 546 | -35 | | 50 |
| FN 3416-150-40 | 75 | 90 | 784 | -40 | | 86 |
| FN 3416-180-40 | 90 | 110 | 817 | -40 | | 92 |
| FN 3416-210-40 | 110 | 132 | 887 | -40 | | 100 |
| FN 3416-260-99 | 132 | 160 | 947 | | -99 | 125 |
| FN 3416-320-99 | 160 | 200 | 988 | | -99 | 135 |

* Filter to be selected by system voltage and load (motor drive) power. Note: the harmonic filter will reduce RMS input current. Therefore, filter selection by current rating, as it is common for EMC/EMI filters, is not recommended.

** Calculated power loss at rated load power.

Mechanical Data








FN 3416-260 to -320

Dimensions

| FN 3416-... | 10 | 13 | 16 | 24 | 32 | 38 | 45 | 60 | 75 | 90 | 110 | 150 | 180 | 210 | 260 | 320 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| A | 390 | 390 | 390 | 455 | 455 | 455 | 455 | 520 | 520 | 580 | 580 | 700 | 700 | 700 | 700 | 700 |
| B | 185 | 185 | 185 | 250 | 250 | 250 | 280 | 280 | 280 | 280 | 280 | 450 | 450 | 450 | 450 | 450 |
| C | 190 | 190 | 190 | 230 | 230 | 230 | 230 | 248 | 248 | 248 | 248 | 385 | 385 | 385 | 385 | 385 |
| E | 370 | 370 | 370 | 435 | 435 | 435 | 435 | 500 | 500 | 555 | 555 | 665 | 665 | 665 | 665 | 665 |
| F | 140 | 140 | 140 | 200 | 200 | 200 | 200 | 225 | 225 | 225 | 225 | 350 | 350 | 350 | 350 | 350 |
| G | 9 | 9 | 9 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 13 | 13 | 13 | 13 | 13 |
| J | M6 | M6 | M6 | M8 | M8 | M8 | M8 | M8 | M8 | M10 | M10 | M10 | M10 | M10 | M10 | M10 |
| V | | | | | | | | | | | | | | | | 25 |
| W | | | | | | | | | | | | | | | | 6 |
| X | | | | | | | | | | | | | | | | 12.5 |
| Y | | | | | | | | | | | | | | | | 47 |
| Z | | | | | | | | | | | | | | | | 11 |

All dimensions in mm; 1 inch = 25.4 mm

Tolerances according to: ISO 2768-m/EN 22768-m

| Filter connector cross sections | -33 | -34 | -35 | -40 | -44 |
|---------------------------------|---|--|---|---|---|
| |  |  |  |  |  |
| Solid wire | 16 mm ² | 35 mm ² | 50 mm ² | 95 mm ² | 10 mm ² |
| Flex wire | 10 mm ² | 25 mm ² | 50 mm ² | 95 mm ² | 6 mm ² |
| AWG type wire | AWG 6 | AWG 2 | AWG 1/0 | AWG 4/0 | AWG 8 |
| Recommended torque | 1.5–1.8 Nm | 4.0–4.5 Nm | 7–8 Nm | 17–20 Nm | 1.0–1.2 Nm |

Installation

For more detailed information and step by step installation guidelines, please consult the user manual at www.schaffner.com or the installation instructions (delivered with each filter).

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