

# ECOsine® high power passive harmonic filter modules for system integration



- ▮ Modular and highly compact filter concept
- ▮ Cost-effective open panel design for cabinet integration
- ▮ Optimized for motor drives with DC-link chokes
- ▮ Helps to comply with international power quality standards
- ▮ Supports an efficient utilization of electrical system capacity
- ▮ Filters for thyristor (SCR) rectifiers



## Approvals



## Typical application

Schaffner ECOsine® filters can be applied to virtually any kind of power electronics with front-end six thyristor rectifiers, where harmonic current distortion needs to be reduced to defined limits. The high power filter modules are particularly suitable when no room for packaged filters is available. The Schaffner solution can conveniently be incorporated into cabinets, which allow the filter components to be wired along with the overall electrical wiring job and to be cooled by jointly utilizing the overall cooling concept.

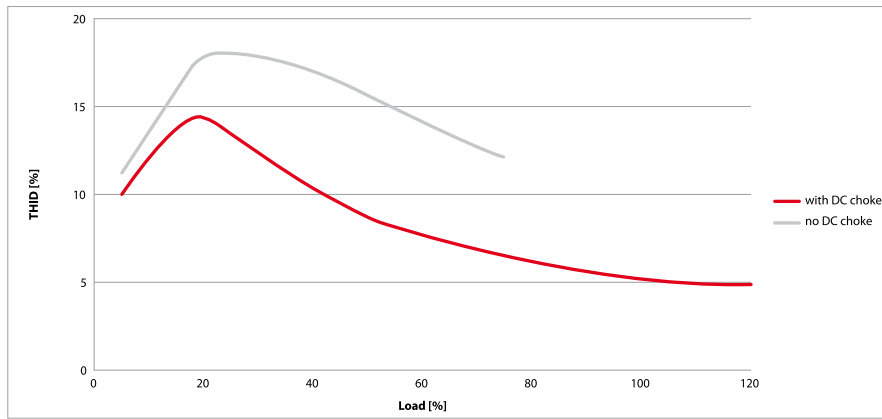
Typical applications include higher power AC and DC motor drives with either six thyristor used e.g. in HVAC, water/wastewater, oil & gas, or mission critical factory automation equipment. In addition, ECOsine® filters can help to reduce thermal and electrical overload caused by harmonic currents in installations involving UPS, high power rectifiers and other non-linear three-phase power supplies.

## Technical specifications

<b>Nominal operating voltage</b>	3x 380 to 500 VAC
<b>Operating frequency</b>	50 Hz +/- 1 Hz
<b>Total harmonic current distortion THID*</b>	~ 5 % @ rated power with Ldc < 15% @ de-rated power without Ldc
<b>Total demand distortion TDD</b>	According to IEEE-519, table 10-3
<b>Nominal motor drive input power rating</b>	200 to 400 kW
<b>Efficiency</b>	≥ 99% @ nominal line voltage and power
<b>Voltage tolerance range</b>	3x 342 to 550 VAC
<b>High potential test voltage</b>	P → E 2500VAC (2 sec)
<b>Protection category</b>	IP00
<b>Cooling</b>	Forced air, to be provided by the installer/integrator
<b>Overload capability</b>	1.6x rated current for 1 minute, once per hour
<b>Ambient temperature range</b>	-25°C to +40°C fully operational -25°C to +85°C transport and storage +40°C to +60°C de-rated operation**
<b>Flammability corresponding to</b>	UL 94V-2 or better
<b>Design corresponding to</b>	UL 508c, EN61558-2-20, CE (LVD 2006/95/EC)
<b>SCCR***</b>	100 kA
<b>Earthing System</b>	TN, TT, IT

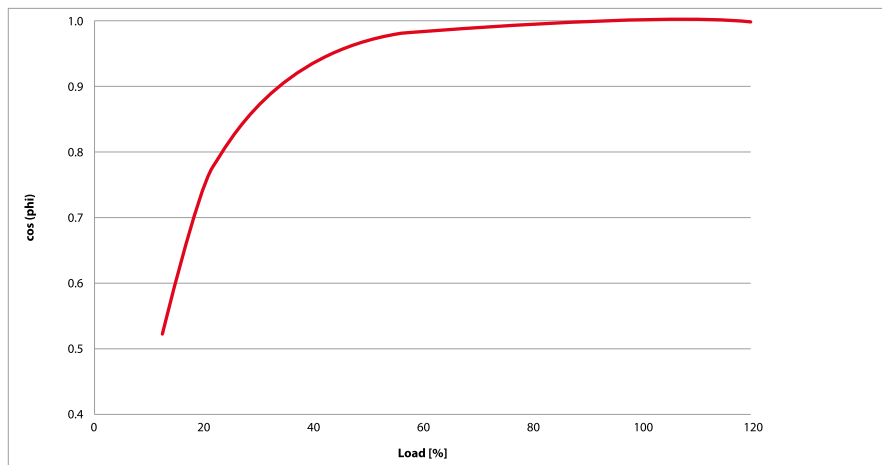
\* System requirements: THVD <2%, line voltage unbalance <1%  
 Note: SCR rectifier front-end will produce different results, depending upon the firing angle of the thyristors  
 \*\* Iderated = Inominal \* √((85°C-Tamb)/45°C)  
 \*\*\* External UL-rated fuses required

### Performance characteristics



### THID - Total harmonic current distortion

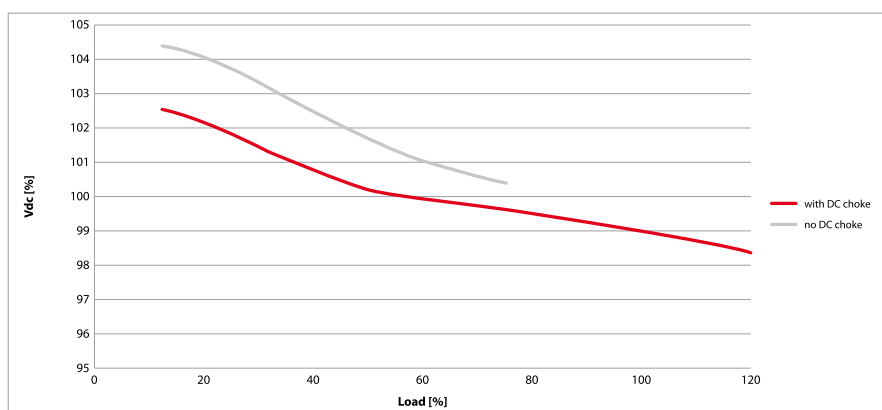
ECOsine® high power passive harmonic filter performance is optimized for rectifiers/motor drives with a dc-link choke. In such applications, a THID of roughly 5% can be expected. The use of a dc-link choke is highly recommended. In a system without  $L_{dc}$ , the filter module has to be derated to max. 70% of its nominal power rating. In such applications, a THID of 10...15% can be expected.



### Displacement power factor

At full load, ECOsine® filters yield unity power factor. At lower load levels, the capacitive current into the power capacitors of the trap circuit cause a leading displacement power factor. This is the case with all types of passive filters with large capacitors. However, compared to traditional filters the useful range of Schaffner ECOsine® is much extended (cos phi >0.9 from 35 to 100% of rated load).

ECOsine® filters allow for trap disconnect at light load to avoid low DPF situations if required. This feature can be provided by the installer using a capacitor contactor of suitable size for the trap circuit.



### DC-link voltage

ECOsine® harmonic filters have a very low impact on the dc-link voltage of the motor drive. The voltage variation as function of the load is represented in the performance diagram beside. Tolerances are kept narrow in order to ensure that motor drives do not suffer from noise tripping because of under- or over-voltage conditions.

## Filter selection table (50 Hz)

Filter	Rated load power* @ 400 VAC/50Hz [kW]	Rated load power* @ 500 VAC/50Hz [kW]	Typ. power loss @ rated load [W]	Weight choke module [kg]	Weight total [kg]
FN 3411-380-99-O	200	250	1040	120	140
FN 3411-470-99-O	250	315	1370	135	157
FN 3411-580-99-O	315	355	1540	160	187
FN 3411-650-99-O	355	400	1550	215	247
FN 3411-710-99-O	400	450	1680	250	285

\* Power rating for motor drives with dc-link chokes. If no  $L_{dc}$  is available, load power of the filter has to be de-rated to 70% of the specified value above  
In this case, the THID will be between 10-15%

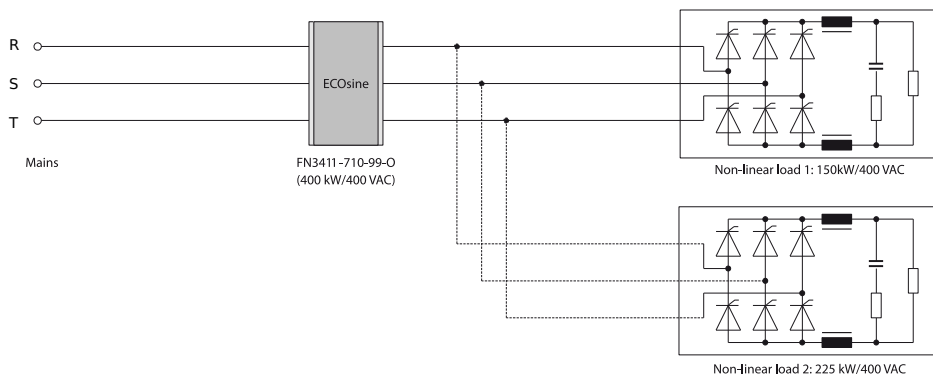
## Scope of delivery

Filter	Power [kW]	Freq. [Hz]	Rectifier	Chokes module	Capacitor modules		Installation manual
					Modules	Caps	
FN 3411-380-99-O	200	50	SCR	1	2	5	√
FN 3411-470-99-O	250	50	SCR	1	2	6	√
FN 3411-580-99-O	315	50	SCR	1	2	8	√
FN 3411-650-99-O	355	50	SCR	1	3	9	√
FN 3411-710-99-O	400	50	SCR	1	3	10	√

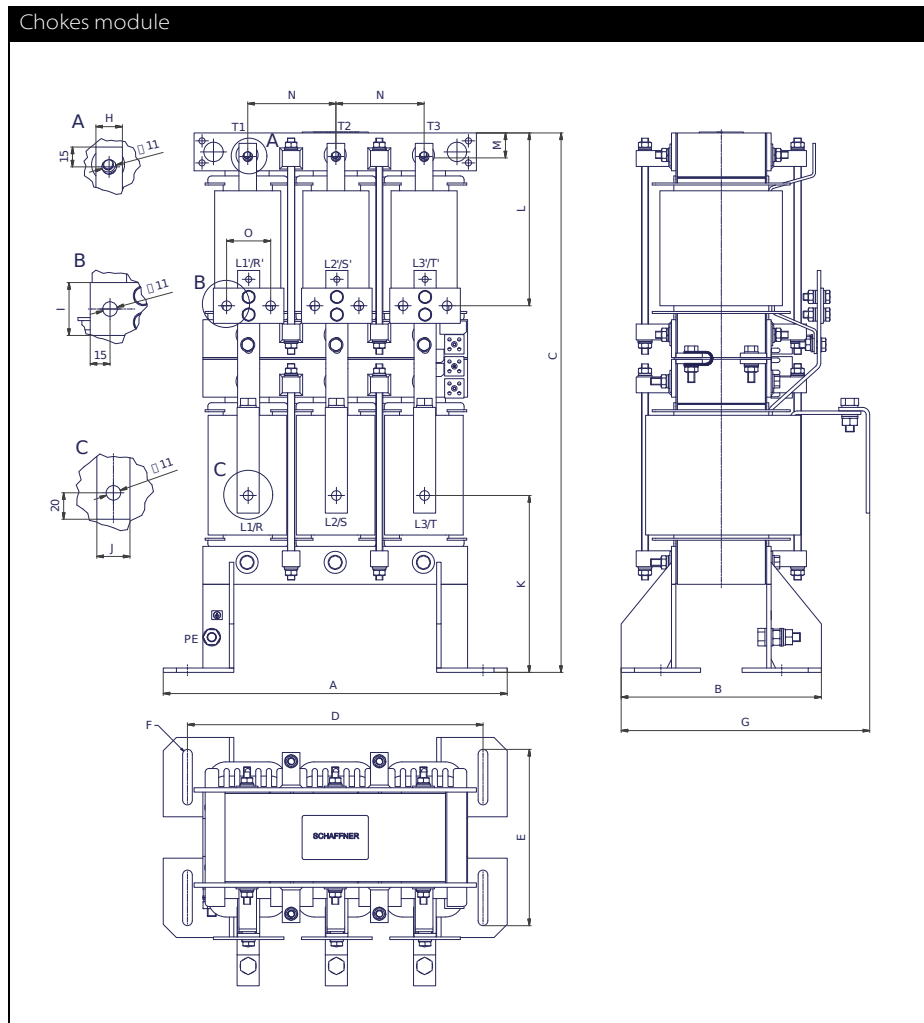
**Remark:** wiring material, cabinet/enclosure and fan(s) are not included in the scope of delivery.

## Application

ECOsine® filters are best installed directly at the input of 6 thyristor (SCR). 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 loads connected to it.



## Mechanical data



## Dimensions of chokes module

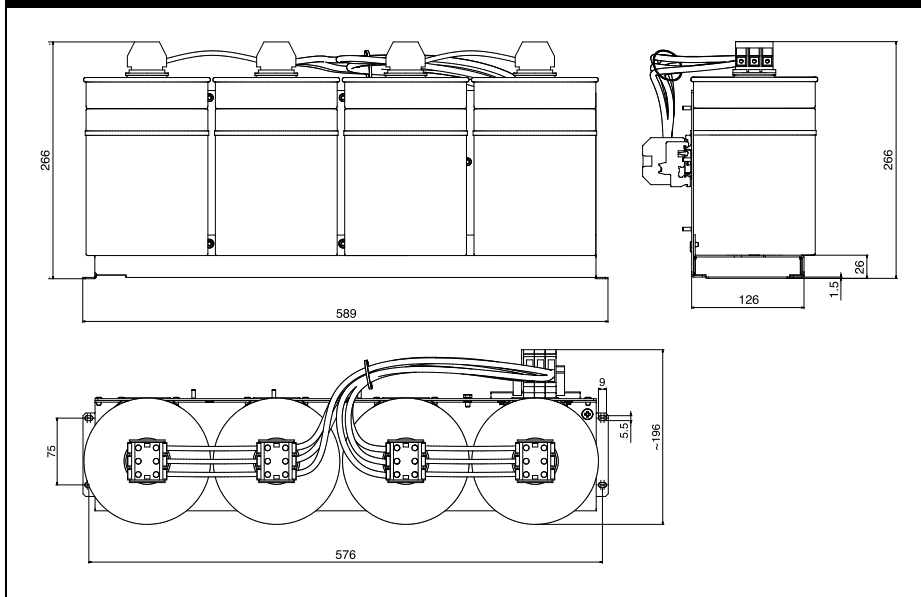
	200 kW	250 kW	315 kW	355 kW	400 kW
<b>A</b>	390 ±1	390 ±1	390 ±1	590 ±1	590 ±1
<b>B</b>	227 ±2	212 ±2	227 ±2	248 ±2	268 ±2
<b>C</b>	<620	<725	<725	<750	<750
<b>D</b>	335 ±1	335 ±1	335 ±1	535 ±1	535 ±1
<b>E</b>	175	175	175	200	200
<b>F</b>	M10 +1	M10 +1	M10 +1	M10 +1	M10 +1
<b>G</b>	<300	<300	<300	<300	<300
<b>H</b>	20	20	20	20	20
<b>I</b>	40	40	40	40	40
<b>J</b>	25	25	25	25	30
<b>K</b>	200 ±5	240 ±5	240 ±5	290 ±5	290 ±5
<b>L</b>	195 ±5	240 ±5	240 ±5	200 ±5	210 ±5
<b>M</b>	25 ±3	35 ±3	35 ±3	35 ±3	35 ±3
<b>N</b>	100	120	120	140	140
<b>O</b>	50	50	50	70	80
<b>Weight</b>	~ 120kg	~ 135kg	~ 160kg	~ 215kg	~ 250kg

All dimensions in mm; 1 inch = 25.4mm

PE bolt M10

Tolerances according to: ISO 2768-m (EN 22768-m)

## Capacitor modules



## Filters 50 Hz

	H
FN 3411-380-99-O	< 145
FN 3411-470-99-O	< 145
FN 3411-580-99-O	< 145
FN 3411-650-99-O	< 160
FN 3411-710-99-O	< 160

## Installation

Detailed installation and wiring instructions as well as cooling requirements can be found in the Installation Manual available from every Schaffner sales point or from [www.myecosine.com](http://www.myecosine.com)

## Important

Forced cooling is required for the thermal management of the magnetic components. Needed fan(s) are not in the scope of delivery. Cooling devices have to be properly selected and installed by the systems integrator. Please consult the Schaffner installation manual for cooling requirement details

Please visit [www.schaffner.com](http://www.schaffner.com) to find more details on filter connectors



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