

Ecosine high power passive harmonic filter modules



- Compact filter for quick installation and easy commissioning

- Cost-effective enclosed passive harmonic filter

- 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 filter cabinets 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 compact filter cabinets can be easily commissioned and quickly installed into existing designs without requiring an in-depth system analysis or highly trained specialists.

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

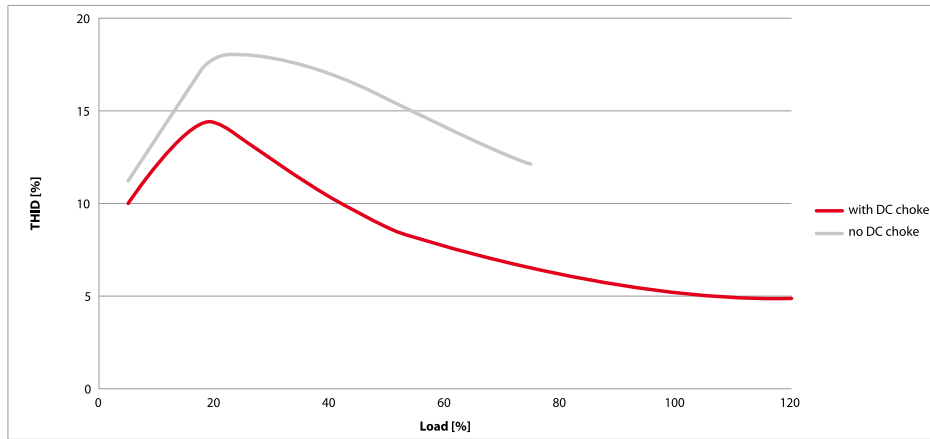
Nominal operating voltage	3x 380 to 480 VAC
Operating frequency	60 Hz +/-1 Hz
Total harmonic current distortion THID*	~5% @ rated power with Ldc <15% @ de-rated power without Ldc
Total demand distortion TDD	According to IEEE-519
Voltage tolerance range	3x 342 to 528 VAC
Nominal motor drive input power rating	300 to 500 HP
Efficiency	≥ 99% @ nominal line voltage and power
High potential test voltage	P -> E 2500 VAC (2 sec)
Protection category	IP 23 for -E2 type filters IP 54 for -E5 type filters
Cooling	Forced air
Overload capability	1.6x rated current for 1 minute, once per hour
Ambient temperature range	-25°C to +40°C fully operational +40°C to +55°C de-rated operation** -25°C to +80°C transport and storage
Flammability according to	UL 94V-2 or better
Design corresponding to	UL 508c, EN 61558-2-20, CE (LVD 2006/95/EC)
SCCR***	100 kA
Earthing System	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

** I_{derated} = I_{nominal} * √((T_{max}-T_{amb})/(T_{max}-T_{nominal})) = I_{nom} * √((55°C-T_{amb})/15°C)

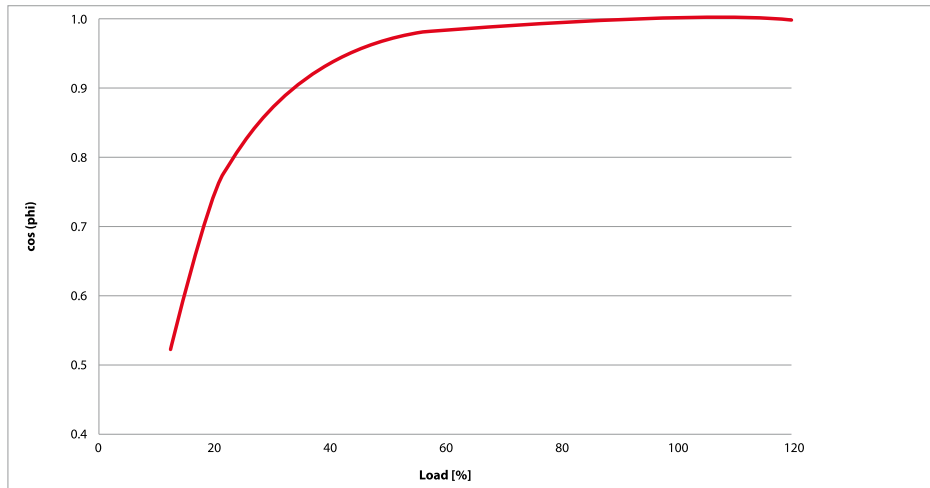
*** External UL-rated fuses required

Performance characteristics



THID – Total harmonic current distortion

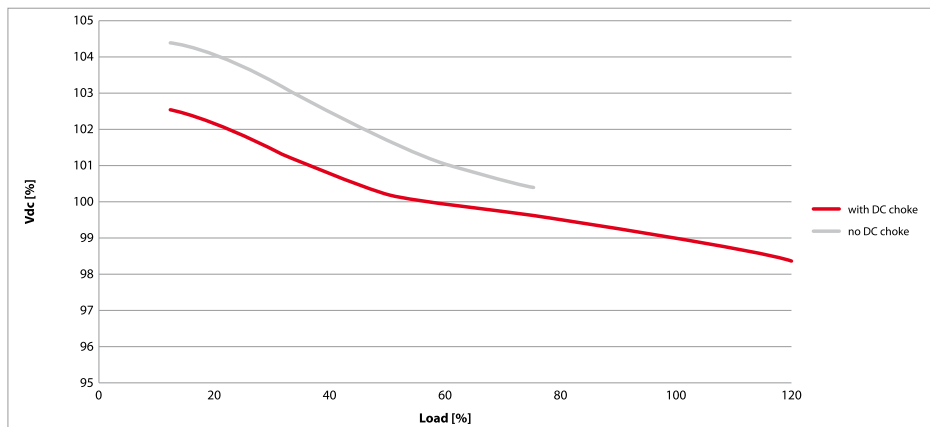
ECOsine high power passive harmonic filter performance is optimized for rectifiers/motor drives with a dc-link choke. In such applications, a THID of roughly 5% can be expected. The use of a dc-link choke is highly recommended. In a system without L_{dc} , the filter module has to be derated to max. 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 (-E2)

Filter	Rated load power* @ 460 VAC/60 Hz [HP]	Min. required L _{DC} [mH]	Min. required L _{AC} [mH]	Typ. power loss @ rated load [W]	Weight choke module [kg]	Weight total [kg]
FN 3413-380-99-E2	300	0.202	0.074	1090	120	235
FN 3413-440-99-E2	350	0.173	0.081	1400	135	262
FN 3413-490-99-E2	400	0.151	0.058	1480	150	274
FN 3413-540-99-E2	450	0.134	0.052	1500	195	341
FN 3413-590-99-E2	500	0.121	0.048	1520	235	383

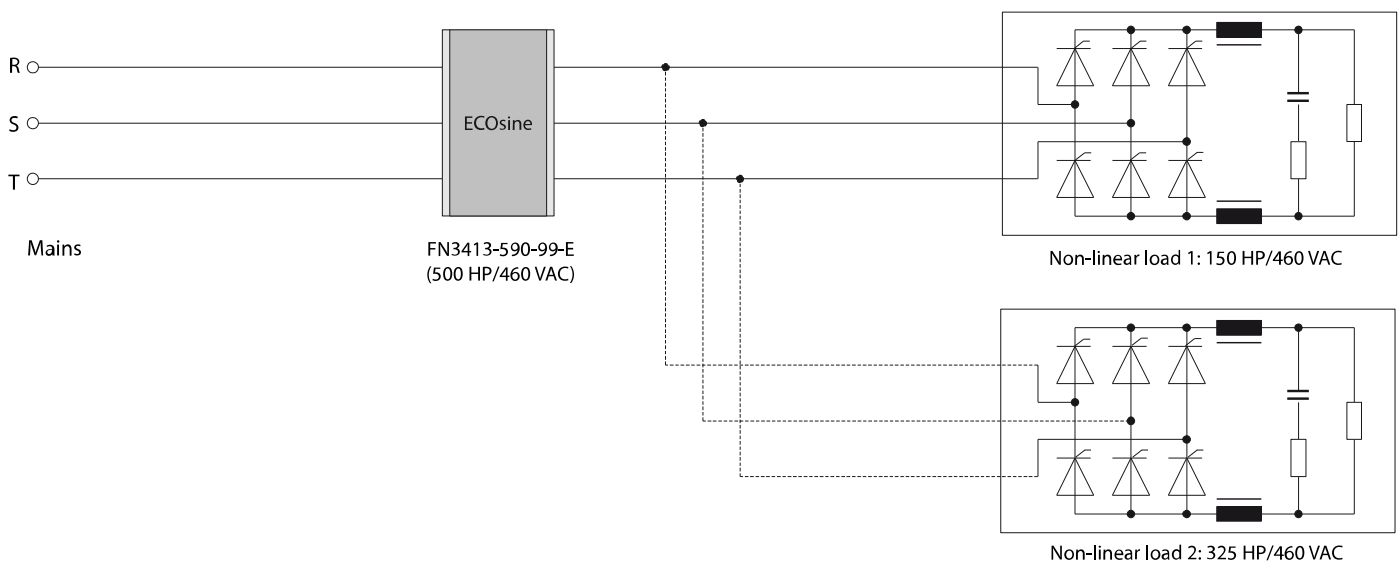
Filter selection table (-E5)

Filter	Rated load power* @ 460 VAC/60 Hz [HP]	Min. required L _{DC} [mH]	Min. required L _{AC} [mH]	Typ. power loss @ rated load [W]	Weight choke module [kg]	Weight total [kg]
FN 3413-380-99-E5	300	0.202	0.074	1090	120	238
FN 3413-440-99-E5	350	0.173	0.081	1400	135	265
FN 3413-490-99-E5	400	0.151	0.058	1480	150	277
FN 3413-540-99-E5	450	0.134	0.052	1500	195	344
FN 3413-590-99-E5	500	0.121	0.048	1520	235	386

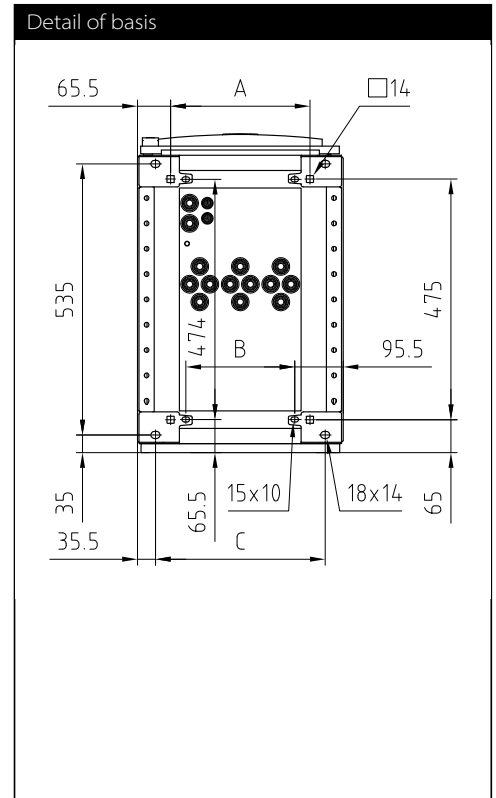
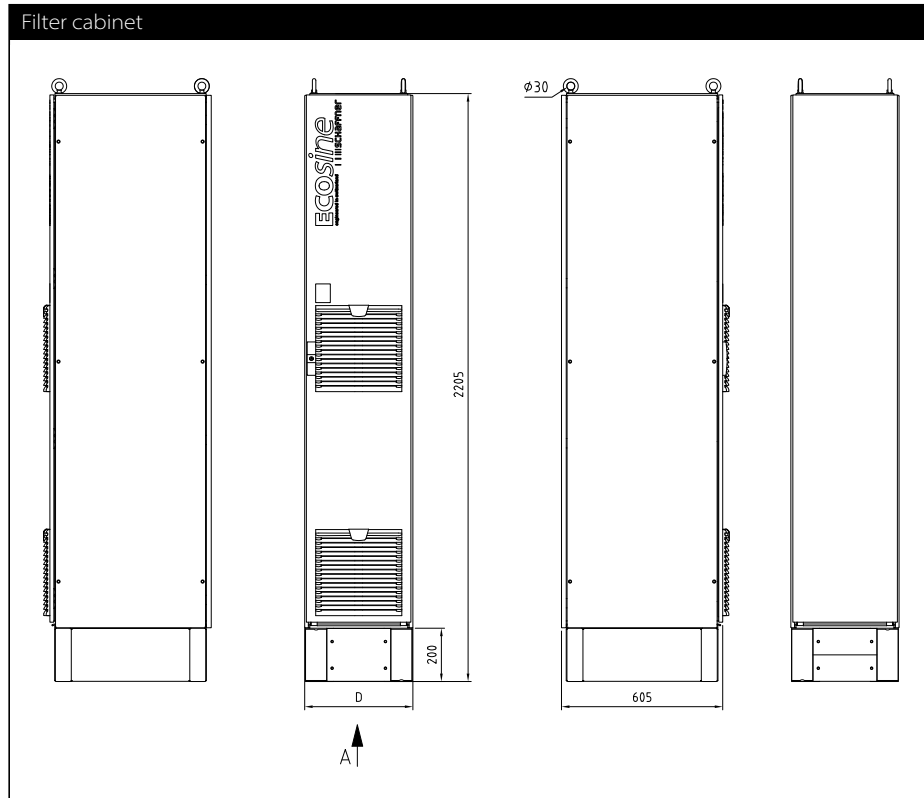
* Power rating for motor drives with dc-link chokes or ac line chokes, the minimum required LDC and LAC are specified in the table. If the minimum required LDC or LAC are not available, load power of the filter has to be de-rated to 70% of the specified value above. In this case, the THID will be between 10-15%.

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 filter cabinets

Filter cabinet (IP 23)	A	B	C	D
FN 3413-380-99-E2	275	215	335	406
FN 3413-440-99-E2	275	215	335	406
FN 3413-490-99-E2	275	215	335	406
FN 3413-540-99-E2	475	415	535	606
FN 3413-590-99-E2	475	415	535	606

Filter cabinet (IP 54)	A	B	C	D
FN 3413-380-99-E5	275	215	335	406
FN 3413-440-99-E5	275	215	335	406
FN 3413-490-99-E5	275	215	335	406
FN 3413-540-99-E5	475	415	535	606
FN 3413-590-99-E5	475	415	535	606

All dimensions in mm; 1 inch = 25.4 mm

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



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