

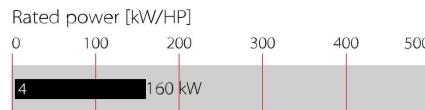
# ECOsine® Compact Economy Line of Passive Harmonic Filters



- Economy line of passive harmonic filters for THID <10 %
- Help to comply with EN61000-3-12, IEEE-519 and other PQ standards
- Support an efficient utilization of electrical system capacity
- Ideal for motor drives with 6-pulse rectifier frontend
- Suitable for diode and thyristor (SCR) rectifiers applications



### Performance indicators



### Approvals

### ROHS

### Features and benefits

FS 33906 (50 Hz) models of the ECOsine product family represent the very compact "economy line" with a THID performance of  $\leq 10\%$  (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 FN 3410/12 filters. The performance is still sufficient to comply with EN61000-3-12 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. FS 33906 filters upgrade standard motor drives to "low-harmonic drives" quickly and easily.

### Technical specifications

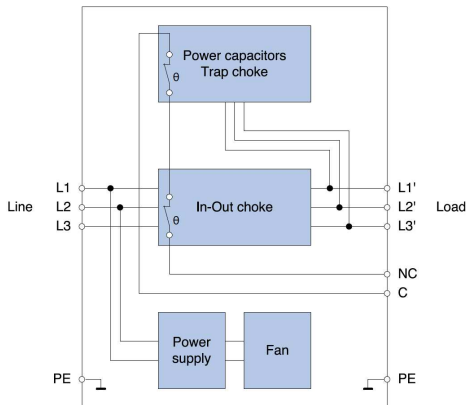
<b>Nominal operating voltage</b>	3x 380 to 500 VAC $\pm 10\%$
<b>Total harmonic current distortion THID*</b>	<10 % @ rated power (with DC-Link choke) <15 % @ rated power (without DC-Link choke)
<b>Total demand distortion TDD</b>	According to IEEE-519
<b>Nominal motor drive input power rating</b>	4 to 160 kW
<b>Efficiency</b>	>98 % @ nominal line voltage and power
<b>High potential test voltage</b>	P -> E 2500 VAC (2 sec)
<b>Protection category</b>	IP 20
<b>Cooling</b>	Internal fan cooling, unregulated
<b>Overload capability</b>	1.6x rated current for 1 minute, once per hour
<b>Ambient temperature range</b>	-25 °C to +45 °C fully operational -25 °C to +70 °C transport and storage +45 °C to +55 °C derated operation**
<b>Flammability corresponding to</b>	UL 94 V-2 or better
<b>Design corresponding to</b>	UL508, EN61558-2-20, CE (LVD2006 / 95 / EC)
<b>MTBF @ 45°C/500 V (Mil-HB-217F)</b>	200 000 hours
<b>SCCR***</b>	100 kA
<b>Earthing System</b>	TN, TT, IT

\* 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.  
 \*\* Iderated = Inominal \*  $\sqrt{(70\text{ °C}-T_{amb}) / 25\text{ °C}}$   
 \*\*\* External UL-rated fuses required.

### Typical applications

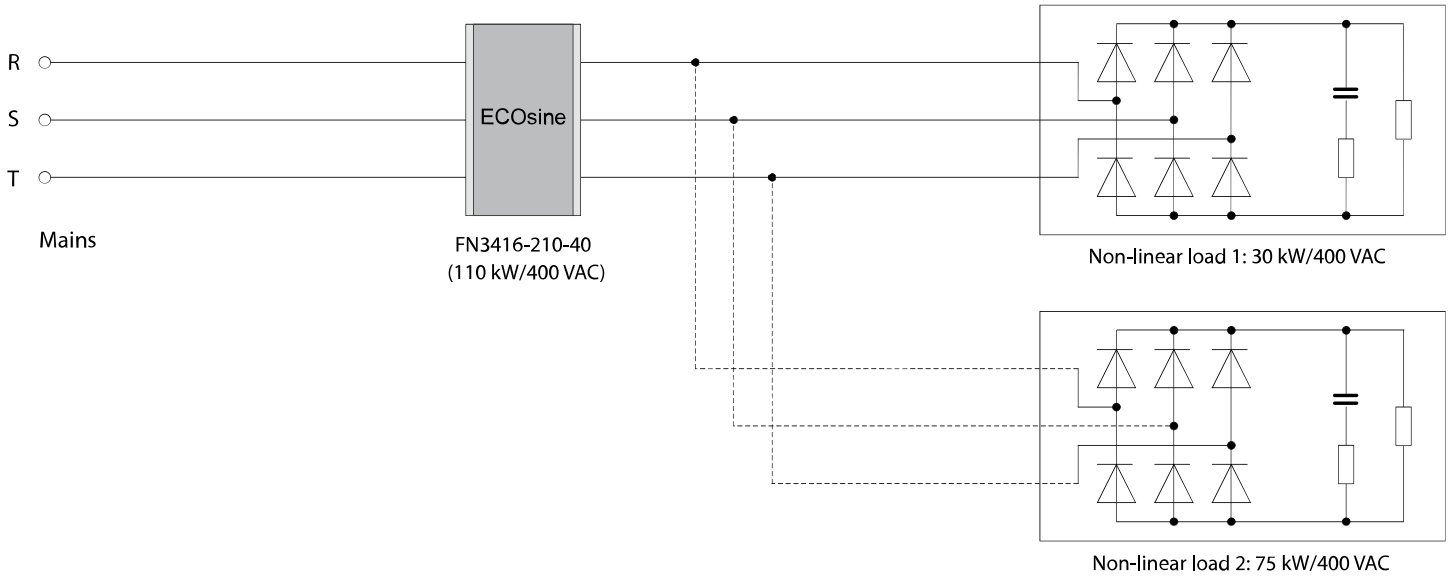
- Three-phase power conversion equipment with front-end six-pulse rectifier (diode or SCR)
- Motor drives, like those used e.g. in pump and fan applications
- Battery chargers, incl. DC fast chargers for e-cars

### Typical electrical schematic

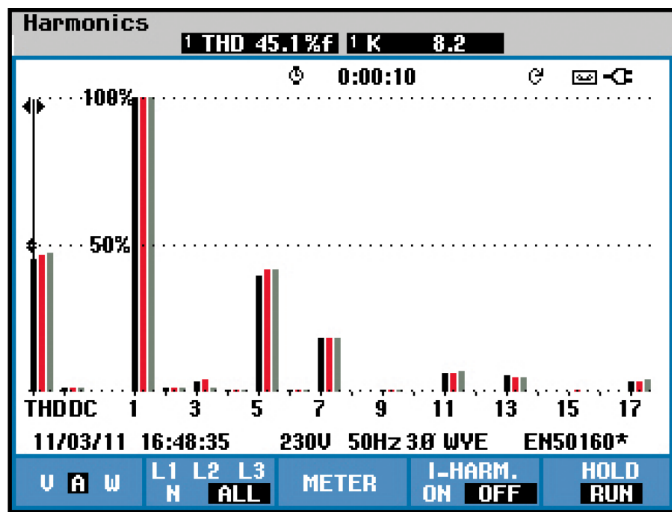


### Filter application

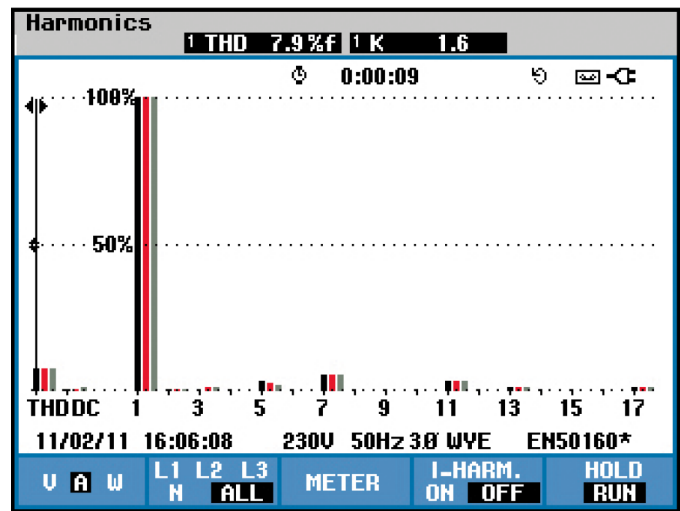
ECOsine® filters are best installed directly at the input of 6-pulse rectifiers. It is possible to connect several non-linear loads (e.g. motor drives) in parallel. In this case the rating of the filter must match the sum of the power ratings of drives connected to it. The use of a (built-in) DC-link 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  $L_{DC}$  without harmonic filter



Motor drive with  $L_{DC}$  with ECOsine FS 33906

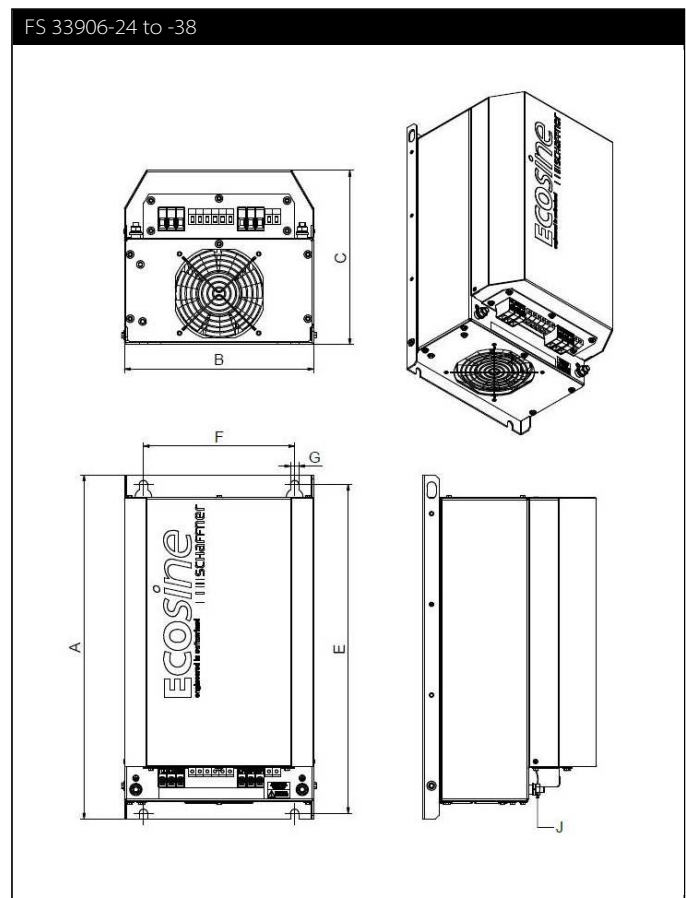
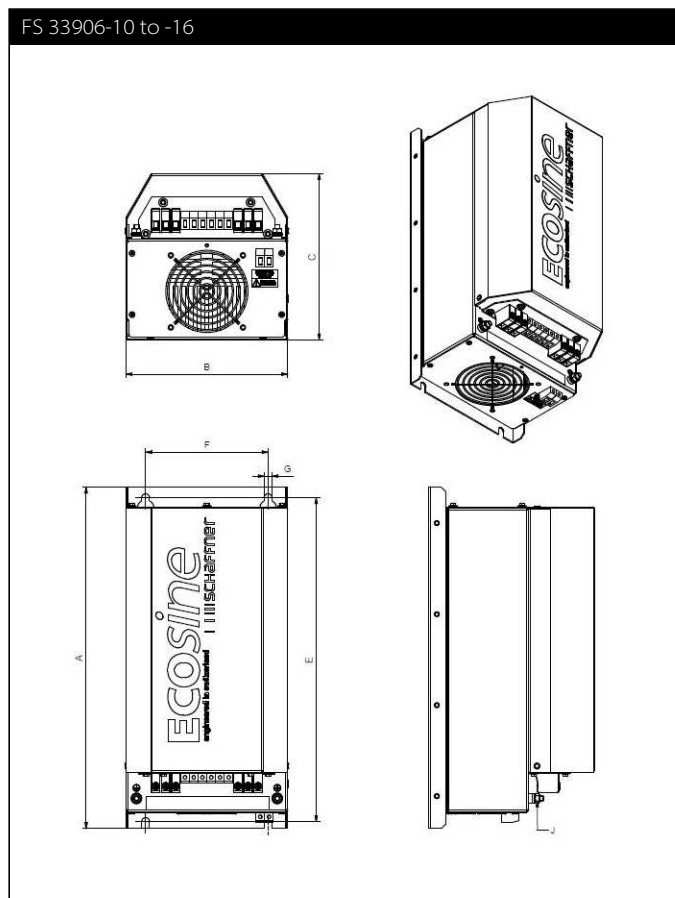
## Filter selection table

Filter*	Rated load power	Rated load power	Power loss**	Input /output	Weight [kg]
	@ 400 VAC/50 Hz [kW]	@ 500 VAC/50 Hz [kW]	@ 25°C/50 Hz [W]	connections	
FS 33906-10-44	4	5.5	63	-44	10
FS 33906-13-44	5.5	7.5	82	-44	10
FS 33906-16-44	7.5	11	105	-44	15
FS 33906-24-33	11	15	153	-33	20
FS 33906-32-33	15	18.5	294	-33	22
FS 33906-38-33	18.5	22	256	-33	25
FS 33906-45-33	22	30	306	-33	29
FS 33906-60-34	30	37	408	-34	37
FS 33906-75-34	37	45	410	-34	43
FS 33906-90-35	45	55	493	-35	47
FS 33906-110-35	55	75	546	-35	50
FS 33906-150-40	75	90	784	-40	86
FS 33906-180-40	90	110	817	-40	92
FS 33906-210-40	110	132	887	-40	100
FS 33906-260-99	132	160	947	-99	125
FS 33906-320-99	160	200	988	-99	135

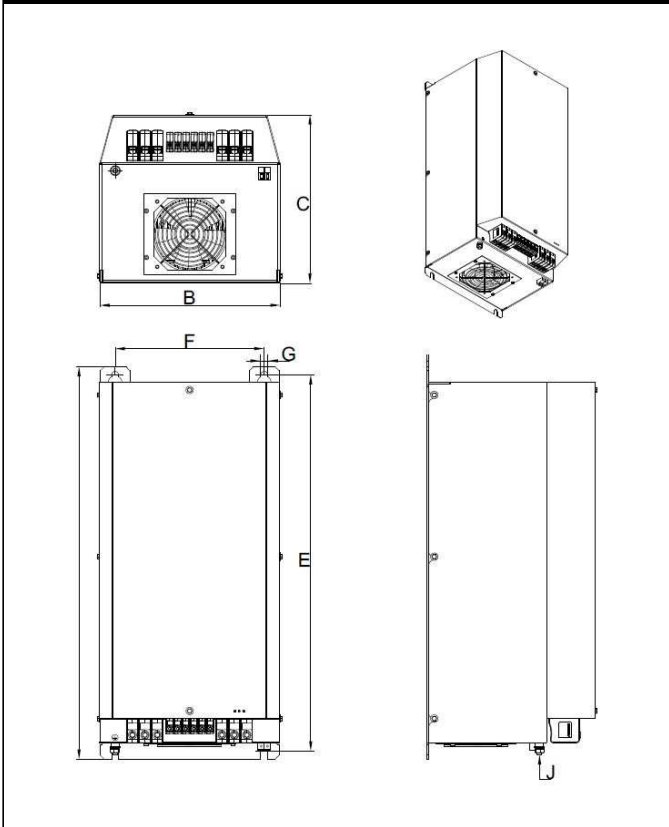
\* Filter to be selected by system voltage and load (motor drive) power. Note: the harmonic filter will reduce RMS input current. Therefore, filter selection by current rating, as it is common for EMC/EMI filters, is not recommended.

\*\* Calculated power loss at rated load power.

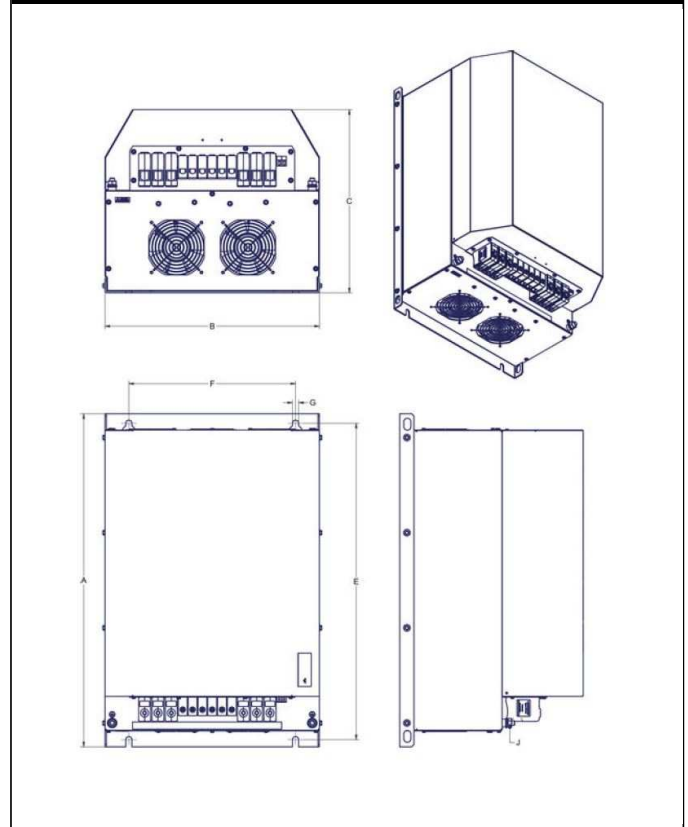
## Mechanical Data



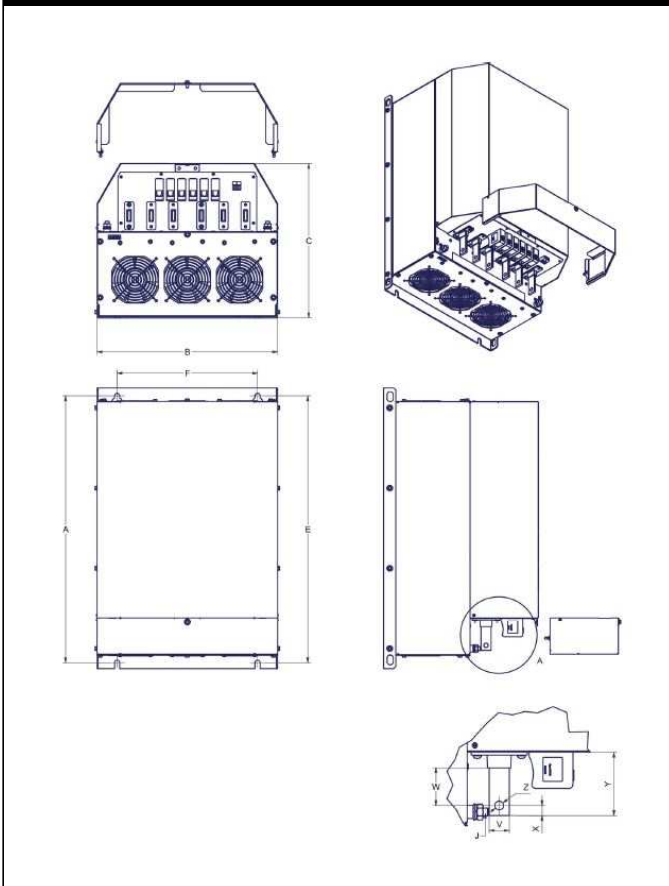
FS 33906-45 to -110



FS 33906-150 to -210



FS 33906-260 to -320



## Dimensions

FS 33906-...	10	13	16	24	32	38	45	60	75	90	110	150	180	210	260	320
<b>A</b>	390	390	390	455	455	455	455	520	520	580	580	700	700	700	700	700
<b>B</b>	185	185	185	250	250	250	280	280	280	280	280	450	450	450	450	450
<b>C</b>	190	190	190	230	230	230	230	248	248	248	248	385	385	385	385	385
<b>E</b>	370	370	370	435	435	435	435	500	500	555	555	665	665	665	665	665
<b>F</b>	140	140	140	200	200	200	200	225	225	225	225	350	350	350	350	350
<b>G</b>	9	9	9	11	11	11	11	11	11	11	11	13	13	13	13	13
<b>J</b>	M6	M6	M6	M8	M8	M8	M8	M8	M8	M10	M10	M10	M10	M10	M10	M10
<b>V</b>															25	25
<b>W</b>															6	6
<b>X</b>															12.5	12.5
<b>Y</b>															47	47
<b>Z</b>															11	11

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

## Trap terminals jumper connectors A1, B1, C1, A2, B2, C2

	AWG	Wire [mm <sup>2</sup> ]	Torque [Nm]
<b>FS 33906-10-44</b>	16	1.5	0.7~0.8
<b>FS 33906-13-44</b>	16	1.5	0.7~0.8
<b>FS 33906-16-44</b>	16	1.5	0.7~0.8
<b>FS 33906-24-33</b>	16	1.5	0.7~0.8
<b>FS 33906-32-33</b>	16	1.5	0.7~0.8
<b>FS 33906-38-33</b>	16	1.5	0.7~0.8
<b>FS 33906-45-33</b>	14	2	1.5~1.8
<b>FS 33906-60-34</b>	10	6	1.5~1.8
<b>FS 33906-75-34</b>	10	6	1.5~1.8
<b>FS 33906-90-35</b>	10	6	1.5~1.8
<b>FS 33906-110-35</b>	10	6	1.5~1.8
<b>FS 33906-150-40</b>	6	16	4~4.5
<b>FS 33906-180-40</b>	6	16	4~4.5
<b>FS 33906-210-40</b>	6	16	4~4.5
<b>FS 33906-260-99</b>	2	35	7~8
<b>FS 33906-320-99</b>	1/0	50	17~20

Please see the brochure "Basics in EMC and Power Quality" on our website [www.schaffner.com/downloads](http://www.schaffner.com/downloads) to find more details on filter connectors.

## Installation

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



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