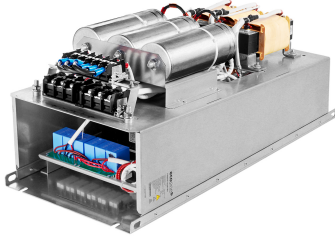


# Ecosine evo, 50 Hz Passive Harmonic Filters



- The industry standard for 6-pulse rectifier and motor drives
- Filters for diode rectifier without DC-link choke and thyristor rectifier
- Best-in-class partial load performance
- Most compact design
- Plug and play, ready to use



## Approvals



(depending on filter configuration)

UL pending for 250 kW types

## Features and benefits

Schaffner ecosine harmonic filters represent an economical solution to the challenge of load-applied harmonics mitigation in three-phase power systems. With a plug-and-play approach and more compact dimensions than comparable products, they can be quickly installed and easily commissioned. They increase the reliability and service life of electric installations, help utilize electric system capacity better, and are the key to meet Power Quality standards such as IEEE 519. Ecosine filters reshape your distorted current back to the desired sinusoidal waveform. Schaffner ecosine filters can be applied to virtually any kind of power electronics with front-end six-pulse rectifiers, 3-phase diode or thyristor bridges, where harmonic current distortion needs to be reduced to defined limits.

## Typical applications

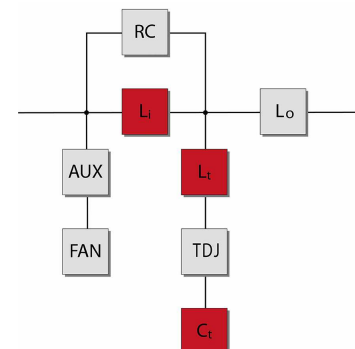
- Equipment with front-end six-pulse rectifier
- Motor drives
- Factory automation equipment
- Water/wastewater treatment facilities
- Fan and pump applications
- HVAC installations
- Mission-critical processes
- DC fast chargers

## Technical specifications

<b>Nominal operating voltage</b>	3 x 380 VAC to 415 VAC ±10%
<b>Operating frequency</b>	50 Hz ±1 Hz
<b>Nominal motor drive input power rating</b>	1.1 to 250 kW
<b>Total harmonic current distortion THID*</b>	≤5% at rated power
<b>Efficiency</b>	>98% for rated voltage and power
<b>High potential test voltage</b>	P → E 2160 VAC (1 s)
<b>Protection category</b>	IP 00, IP 20
<b>Cooling</b>	Internal fan cooling or external cooling**
<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 +45°C to +70°C derated operation*** -25°C to +85°C transport and storage
<b>Flammability corresponding to</b>	UL 94 V-2
<b>Design corresponding to</b>	Filter: UL 61800-5-1, EN 61800-5-1 Chokes: EN 61558-2-20 or EN 60076-6
<b>MTBF @ 45°C/415 V (Mil-HB-217F)</b>	>200,000 hours
<b>SCCR****</b>	100 kA
<b>Earthing System</b>	TN, TT, IT
<b>Overvoltage category</b>	OV III (IEC 60664-1 / UL 61800-5-1)

\* System requirements: THVD <2%, line voltage unbalance <1%  
 Note: performance specifications in this brochure refer to six-pulse diode rectifiers. SCR rectifier front-ends will produce different results, dependent upon the firing angle of the thyristors. THID ~5% at rated power for filter <6 kW  
 \*\* Please check the inlet air flow required for cooling table on page 6 of this document.  
 \*\*\*  $I_{derated} = I_{nominal} \cdot \sqrt{\frac{(T_{max} - T_{amb})}{(T_{max} - T_{nominal})}} = I_{nom} \cdot \sqrt{\frac{(70^\circ\text{C} - T_{amb})}{25^\circ\text{C}}}$   
 \*\*\*\* External UL-rated fuses required. Please consult the user manual.

## Typical electrical schematic



## Filter selection table – IP 00 enclosure

Filter	Rated load power @ 400 V/50 Hz [kW]	Motor drive input current [Arms]**	Rated filter input current [Arms]	Weight [kg]	Typical losses [W]****	Terminal	Frame size
FN 3440-1-110-E0_____*	1.1	3	1.63	6.6	61	110	A
FN 3440-2-110-E0_____*	2.2	5.5	3.26	9.6	87	110	A
FN 3440-4-112-E0_____*	4	10	5.93	13.2	135	112	B
FN 3440-6-112-E0_____*	5.5	13	8.17	16.9	183	112	C
FN 3440-8-112-E0_____*	7.5	16	11.1	20.9	256	112	C
FN 3440-11-113-E0_____	11	24	16.3	28.2	287	113	D
FN 3440-15-113-E0_____	15	32	22.2	32.0	359	113	D
FN 3440-19-113-E0_____	19	38	28.2	33.3	343	113	D
FN 3440-22-115-E0_____	22	45	32.5	47.5	460	115	E
FN 3440-30-115-E0_____	30	60	44.4	49.3	570	115	E
FN 3440-37-115-E0_____	37	75	54.8	59.8	581	115	E
FN 3440-45-115-E0_____	45	90	66.7	66.8	783	115	E
FN 3440-55-115-E0_____	55	110	81.6	69.3	858	115	E
FN 3440-75-116-E0_____	75	150	111	117.6	1036	116	G
FN 3440-90-116-E0_____	90	180	134	138.6	1166	116	G
FN 3440-110-118-E0_____	110	210	164	157.9	1365	118	H
FN 3440-132-118-E0_____**	132	260	197	176.3	1392	118	H
FN 3440-160-118-E0_____**	160	320	240	201.8	1462	118	H
FN 3440-200-118-E0_____**	200	400	300	249.7	1644	118	H
<b>New</b>							
FN 3440-250-199-E0XSSXX	250	530	376	324	1746	119	J

\* Filter rating which does not require forced cooling or fan module

\*\* Filter rating which does not require RC damping module for rectifiers with EMI filter

\*\*\* Motor drive input current without harmonic filter

\*\*\*\* Typical losses @ 45°C, 400 V, 50 Hz and rated load power

## Filter power terminals

Terminal designation*	Screw thread	Flex wire AWG	Flex wire [mm <sup>2</sup> ]	Screw torque value [Nm]	Max width** cable lug [mm]	Frame size
110	M3	14-22	0.4-2.5	0.5	7	A
112	M4	10-22	0.4-6	1.2	10	B, C
113	M6	6-18	0.75-16	3	15	D
115	M8	1/0-8	10-50	8	15	E, F
116	M8	3/0-8	10-95	8	17	G
118	M10	3/0-500 kcmil	95-240	10	35	H
119	M16	350-750 kcmil	95-240	10	35	J

\* Recommended connector type: wire or cable lug for 110 to 113, only cable lug for 115 to 118

\*\* To fulfill creepage/clearance acc. UL 61800-5-1 without additional protection (insulation). Creepage/clearance can vary depending on applicable standard and must be reviewed by customer. Creepage/clearance may be reduced when additional protection (insulation) is provided.

## Filter signal and earth terminals

Terminal type	Screw thread	Screw torque value [Nm]	Frame size
Signal	M3*	0.5	All
Earth (PE)	M5	2.2	A
Earth (PE)	M6	4	B, C
Earth (PE)	M8	9	D, E
Earth (PE)	M10	17	F, G, H
Earth (PE)	M12	25	J

\* Max width cable lug = 7 mm

## Filter selection table - IP 20 enclosure

Filter	Rated load power @ 400 V/50 Hz [kW]	Motor drive input current [Arms]**	Rated filter input current [Arms]	Weight [kg]	Typical losses [W]****	Terminal	Frame size
FN 3440-1-110-E2_*****	1.1	3	1.63	8	61	110	A
FN 3440-2-110-E2_*****	2.2	5.5	3.26	11	87	110	A
FN 3440-4-112-E2_*****	4	10	5.93	15	135	112	B
FN 3440-6-112-E2_*****	5.5	13	8.17	19	183	112	C
FN 3440-8-112-E2_*****	7.5	16	11.1	23	256	112	C
FN 3440-11-113-E2_****	11	24	16.3	32	287	113	D
FN 3440-15-113-E2_****	15	32	22.2	36	359	113	D
FN 3440-19-113-E2_****	19	38	28.2	37	343	113	D
FN 3440-22-115-E2_****	22	45	32.5	53	460	115	E
FN 3440-30-115-E2_****	30	60	44.4	55	570	115	E
FN 3440-37-115-E2_****	37	75	54.8	66	581	115	E
FN 3440-45-115-E2_****	45	90	66.7	73	783	115	E
FN 3440-55-115-E2_****	55	110	81.6	75	858	115	E
FN 3440-75-116-E2_****	75	150	111	126	1036	116	G
FN 3440-90-116-E2_****	90	180	134	147	1166	116	G
FN 3440-110-118-E2_****	110	210	164	175	1365	118	H
FN 3440-132-118-E2_******	132	260	197	194	1392	118	H
FN 3440-160-118-E2_******	160	320	240	219	1462	118	H
FN 3440-200-118-E2_******	200	400	300	267	1644	118	H
<b>New</b>							
FN 3440-250-119-E2FASXX	250	530	376	350	1746	119	J

\* Filter rating which does not require forced cooling or fan module

\*\* Filter rating which does not require RC damping module for rectifiers with EMI filter

\*\*\* Motor drive input current without harmonic filter

\*\*\*\* Typical losses @ 45°C, 400 V, 50 Hz and rated load power

## Filter power terminals

Terminal designation*	Screw thread	Flex wire AWG	Flex wire [mm <sup>2</sup> ]	Screw torque value [Nm]	Max width** cable lug [mm]	Frame size
110	M3	14-22	0.4-2.5	0.5	7	A
112	M4	10-22	0.4-6	1.2	10	B, C
113	M6	6-18	0.75-16	3	15	D
115	M8	1/0-8	10-50	8	15	E, F
116	M8	3/0-8	10-95	8	17	G
118	M10	3/0-500 kcmil	95-240	10	35	H
119	M16	350-750 kcmil	95-240	10	35	J

\* Recommended connector type: wire or cable lug for 110 to 113, only cable lug for 115 to 118

\*\* To fulfill creepage/clearance acc. UL 61800-5-1 without additional protection (insulation). Creepage/clearance can vary depending on applicable standard and must be reviewed by customer. Creepage/clearance may be reduced when additional protection (insulation) is provided.

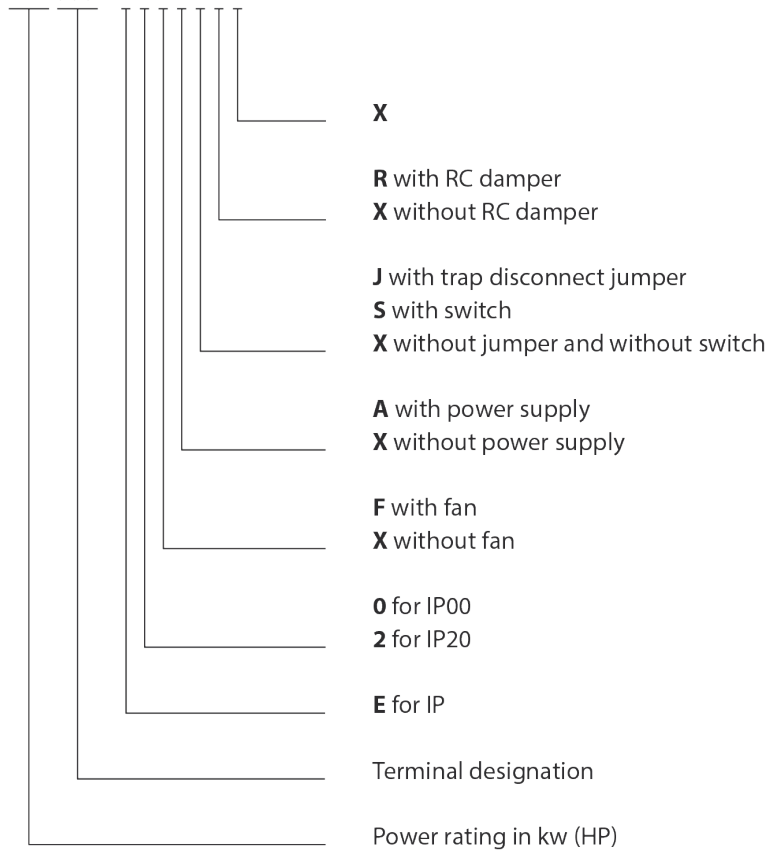
## Filter signal and earth terminals

Terminal type	Screw thread	Screw torque value [Nm]	Frame size
Signal	M3*	0.5	All
Earth (PE)	M5	2.2	A
Earth (PE)	M6	4	B, C
Earth (PE)	M8	9	D, E
Earth (PE)	M10	17	F, G, H
Earth (PE)	M12	25	J

\* Max width cable lug = 7 mm

Product selector

FN 34nn-xxx-yyy-

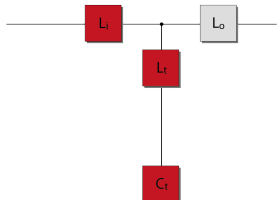


**Table 1: Filter configurations if external air flow is available for cooling**

(Filters do **not** contain fan and do **not** contain aux. power supply)

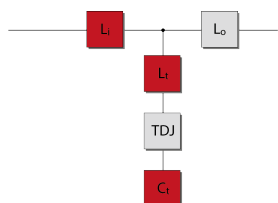
**E0XXXXX**

- For rectifiers without DC-link choke



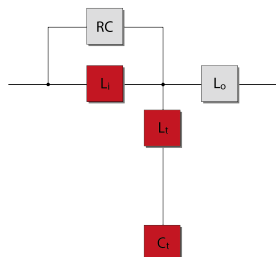
**E0XXJXX**

- For rectifiers without DC-link choke  
- Filters contain trap disconnect jumper



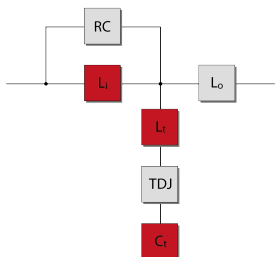
**E0XXXRX**

- For rectifiers without DC-link choke and with EMI filter  
- Filters contain RC damper module



**E0XXJRX**

- For rectifiers without DC-link choke and with EMI filter  
- Contain RC damper module and trap disconnect jumper



### Table 2: Filter configurations with embedded ventilation

(Filters contain fan and aux. power supply)

<p><b>E0FAXXX and E2FAXXX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke</li> <li>- Filters contain fan, aux. power supply</li> </ul>	<p><b>E0FAJXX and E2FAJXX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke</li> <li>- Filters contain fan, aux. power supply and trap disconnect jumper</li> </ul>	<p><b>E0FAXRX and E2FAXRX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke and with EMI filter</li> <li>- Filters contain fan, aux. power supply and RC damper module</li> </ul>	<p><b>E0FAJRX and E2FAJRX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke and with EMI filter</li> <li>- Filters contain fan, aux. power supply, RC damper module and trap disconnect jumper</li> </ul>

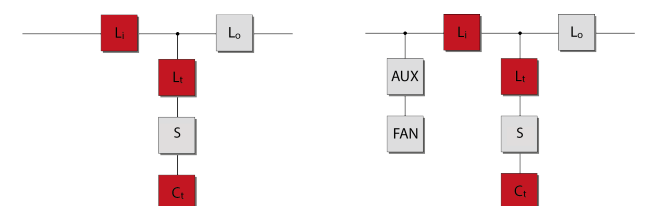
### Table 3: Filter configurations if external aux. power supply for the fan is available

(Filters contain fan but do not contain aux. power supply, user should provide aux. power supply to the fan)

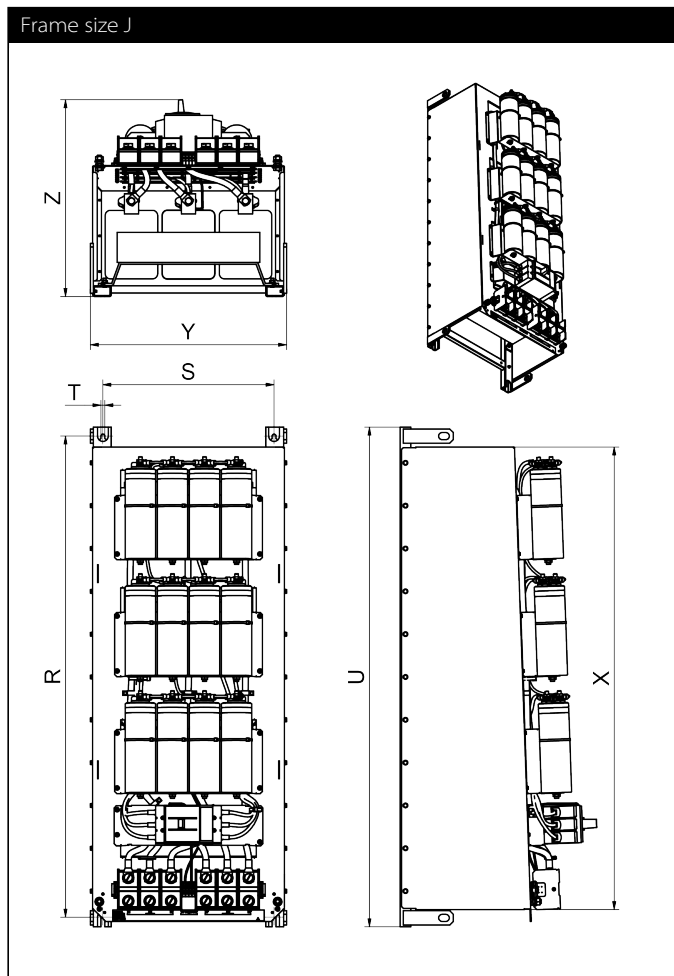
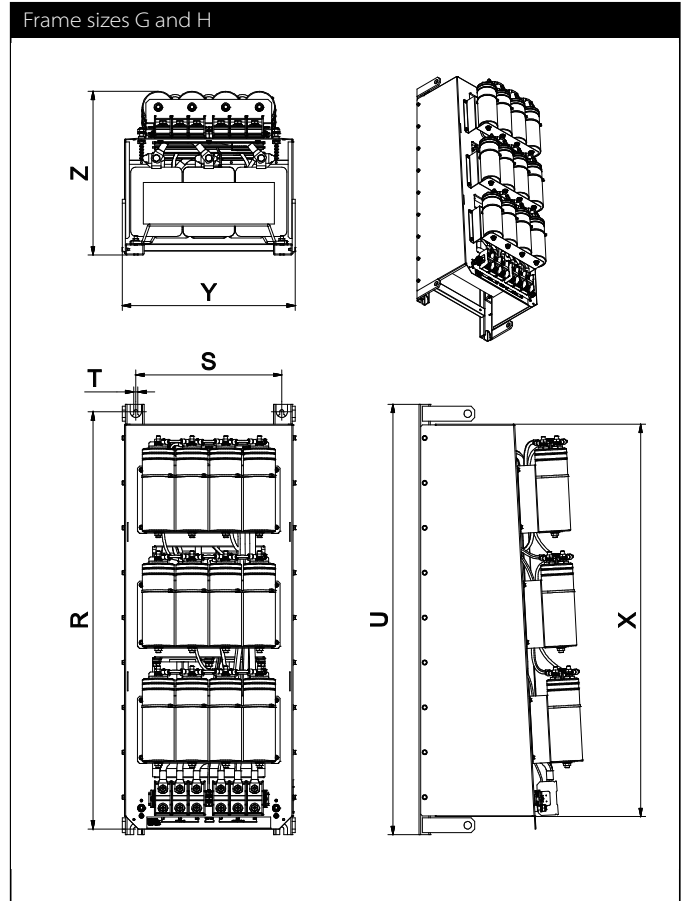
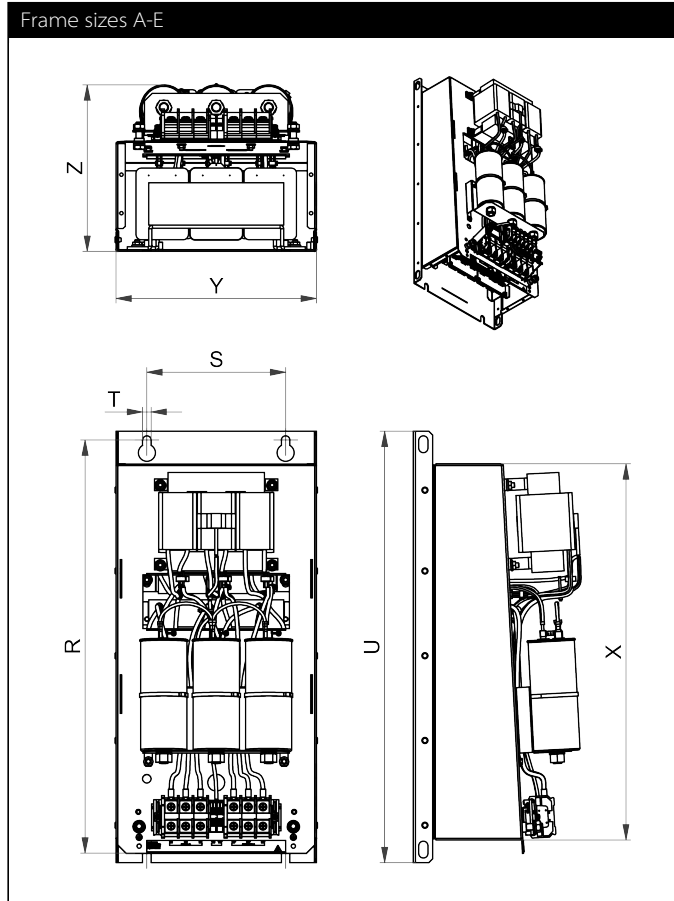
<p><b>E0FXXXX and E2FXXXX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke</li> <li>- Filters contain fan</li> </ul>	<p><b>E0FXJXX and E2FXJXX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke</li> <li>- Filters contain fan and trap disconnect jumper</li> </ul>	<p><b>E0FXRX and E2FXRX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke and with EMI filter</li> <li>- Filters contain fan and RC damper module</li> </ul>	<p><b>E0FXJRX and E2FXJRX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke and with EMI filter</li> <li>- Contain fan, RC damper module and trap disconnect jumper</li> </ul>

### Table 4: 250 kW Filter configuration

<p><b>E0XXSXX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke</li> <li>- Filters contain circuit breaker</li> </ul>	<p><b>E2FASXX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke</li> <li>- Filters contain fan aux. power supply and circuit breaker</li> </ul>
---	---



### Mechanical data of IP 00 enclosure



## Dimensions

Frame	Drill pattern [mm]			Base [mm]			Volume [mm] V
	R	S	T	U	X	Y	
<b>A</b>	340	120	7	360	302	160	185
<b>B</b>	405	120	7	425	370	180	206
<b>C</b>	460	150	7	483	430	210	221
<b>D</b>	540	180	11	560	491	260	252
<b>E</b>	680	220	11	705	635	290	319
<b>F</b>	730	250	11	752	684	340	343
<b>G</b>	920	280	11	960	863	353	386
<b>H</b>	115	390	11	1150	1053	462	456
<b>J</b>	1348	480	11	1400	1300	550	555

## Inlet air flow required for cooling

Frame size	Min air volume* [m <sup>3</sup> /h]
<b>A, B, C</b>	0
<b>D</b>	128
<b>E</b>	204
<b>G</b>	408
<b>H</b>	612
<b>J</b>	816

\* External air flow required for filter configurations without embedded ventilation





## Dimensions

Frame	Drill pattern [mm]			Base [mm]			Volume [mm] V
	R	S	T	U	X	Y	
<b>A</b>	340	120	7	360	302	160	185
<b>B</b>	405	120	7	425	370	180	206
<b>C</b>	460	150	7	483	430	210	221
<b>D</b>	540	180	11	560	491	260	252
<b>E</b>	680	220	11	705	635	290	319
<b>F</b>	730	250	11	752	684	340	343
<b>G</b>	920	280	11	960	863	353	386
<b>H</b>	115	390	11	1150	1053	462	456
<b>J</b>	1348	480	11	1400	1300	550	555

## Inlet air flow required for cooling

Frame size	Min air volume* [m <sup>3</sup> /h]
<b>A, B, C</b>	0
<b>D</b>	128
<b>E</b>	204
<b>G</b>	408
<b>H</b>	612
<b>J</b>	816

\* External air flow required for filter configurations without embedded ventilation



## Headquarters, global innovation and development

### Switzerland

#### Schaffner Group

Industrie Nord  
Nordstrasse 11e  
4542 Luterbach  
T +41 32 681 66 26  
[info@schaffner.com](mailto:info@schaffner.com)



## Sales and application centers

### China

#### Schaffner EMC Ltd. Shanghai

T20-3 C, No 565 Chuangye Road,  
Pudong district  
201201 Shanghai  
T +86 21 3813 9500  
[cschina@schaffner.com](mailto:cschina@schaffner.com)  
[www.schaffner.com.cn](http://www.schaffner.com.cn)

### Finland

#### Schaffner Oy

Sauvonrinne 19 H  
08500 Lohja  
T +358 10 567 2855  
[finlandsales@schaffner.com](mailto:finlandsales@schaffner.com)

### France

#### Schaffner EMC S.A.S.

16-20 Rue Louis Rameau  
95875 Bezons  
T +33 1 34 34 30 60  
F +33 1 39 47 02 28  
[francesales@schaffner.com](mailto:francesales@schaffner.com)

### Germany

#### Schaffner Deutschland GmbH

Schoemperlenstrasse 12B  
76185 Karlsruhe  
T +49 721 56910  
F +49 721 569110  
[germanysales@schaffner.com](mailto:germanysales@schaffner.com)

### India

#### Schaffner India Pvt. Ltd

REGUS WORLD TRADE CENTRE  
WTC, 22nd Floor Unit No 2238, Brigade  
Gateway Campus, 26/1, Dr. Rajkumar Road  
Malleshwaram (W)  
560055 Bangalore  
T +91 80 67935355  
[indiasales@schaffner.com](mailto:indiasales@schaffner.com)

### Italy

#### Schaffner EMC S.r.l.

Via Ticino, 30  
20900 Monza (MB)  
T +39 039 21 41 070  
[italysales@schaffner.com](mailto:italysales@schaffner.com)

### Japan

#### Schaffner EMC K.K.

Taiju-Seimei Sangenjaya Bldg.  
1-32-12, Kamiuma, Setagaya-ku  
154-0011 Tokyo  
T +81 3 5712 3650  
F +81 3 5712 3651  
[japansales@schaffner.com](mailto:japansales@schaffner.com)  
[www.schaffner.jp](http://www.schaffner.jp)

### Singapore

#### Schaffner EMC Pte Ltd.

#05-09, Kg Ubi Ind. Estate  
408705 Singapore  
T +65 6377 3283  
F +65 6377 3281  
[singaporesales@schaffner.com](mailto:singaporesales@schaffner.com)

### Spain

#### Schaffner EMC España

Calle Caléndula 93, Miniparc III, Edificio E  
El Soto de Moraleja, Alcobendas  
28109 Madrid  
T +34 917 912 900  
F +34 917 912 901  
[spainsales@schaffner.com](mailto:spainsales@schaffner.com)

### Sweden

#### Schaffner EMC AB

Östermalmstorg 1  
114 42 Stockholm  
T +46 8 5050 2425  
[swedensales@schaffner.com](mailto:swedensales@schaffner.com)  
[www.schaffner.com](http://www.schaffner.com)

### Switzerland

#### Schaffner EMV AG

Industrie Nord  
Nordstrasse 11e  
4542 Luterbach  
T +41 32 681 66 26  
[switzerlandsales@schaffner.com](mailto:switzerlandsales@schaffner.com)

### Taiwan R.O.C.

#### Schaffner EMV Ltd.

20 Floor-2, No 97, Section 1, XinTai 5th Road  
22175 XiZhi District New Taipei City 22175  
T +886 2 2697 5500  
F +886 2 2697 5533  
[taiwansales@schaffner.com](mailto:taiwansales@schaffner.com)  
[www.schaffner.com.tw](http://www.schaffner.com.tw)

### Thailand

#### Schaffner EMC Co. Ltd.

Northern Region Industrial Estate  
67 Moo 4 Tambon Ban Klang  
Amphur Muangng P.O. Box 14  
51000 Lamphun  
T +66 53 58 11 04  
F +66 53 58 10 19  
[thailandsales@schaffner.com](mailto:thailandsales@schaffner.com)

### United Kingdom

#### Schaffner Ltd.

5 Ashville Way, Molly Millars Lane  
Wokingham  
RG41 2PL Berkshire  
T +44 118 9770070  
F +44 118 9792969  
[uksales@schaffner.com](mailto:uksales@schaffner.com)

### USA

#### Schaffner EMC Inc.

52 Mayfield Avenue  
Edison, New Jersey  
T +1 732 225 9533  
F +1 732 225 4789  
[usasales@schaffner.com](mailto:usasales@schaffner.com)  
[www.schaffnerusa.com](http://www.schaffnerusa.com)

#### Schaffner North America

6722 Thirlane Road  
24019 Roanoke, Virginia  
T +1 276 228 7943  
F +1 276 228 7953

#### Schaffner North America

823 Fairview Road  
24382 Wytheville, Virginia  
T +1 276 228 7943  
F +1 276 228 7258

To find your local partner within Schaffner's global network: [www.schaffner.com](http://www.schaffner.com)

© 2018 Schaffner Group

The content of this document has been carefully checked and understood. However, neither Schaffner nor its subsidiaries assume any liability whatsoever for any errors or inaccuracies of this document and the consequences thereof. Published specifications are subject to change without notice. Product suitability for any area of application must ultimately be determined by the customer. In all cases, products must never be operated outside their published specifications. Schaffner does not guarantee the availability of all published products. This disclaimer shall be governed by substantive Swiss law and resulting disputes shall be settled by the courts at the place of business of Schaffner Holding AG. Latest publications and a complete disclaimer can be downloaded from the Schaffner website. All trademarks recognized.