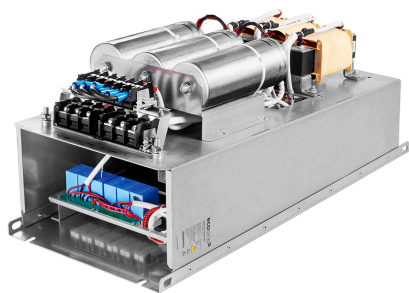
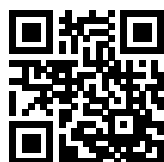


# Ecosine evo, 400 VAC 50 Hz Full Performance Passive Harmonic Filters



- 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 & Compliances



(depending on filter configuration)

## 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 THDi*</b>	≤5% at rated power
<b>Efficiency</b>	>98% for rated voltage and power
<b>Overload capability</b>	1.6x rated current for 1 minute, once per hour
<b>SCCR**</b>	100 kA
<b>High potential test voltage</b>	P → E 2160 VAC (1 s)
<b>Overvoltage category</b>	OV III (IEC 60664-1 / UL 61800-5-1)
<b>Earthing System</b>	TN, TT, IT
<b>Protection category</b>	IP 00, IP 20
<b>Cooling</b>	Internal fan cooling or external cooling***
<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>Design corresponding to</b>	Filter: UL 61800-5-1, EN 61800-5-1 Chokes: EN 61558-2-20 or EN 60076-6
<b>Flammability corresponding to</b>	UL 94 V-2
<b>MTBF @ 45°C/400 V (Mil-HB-217F)</b>	>200,000 hours

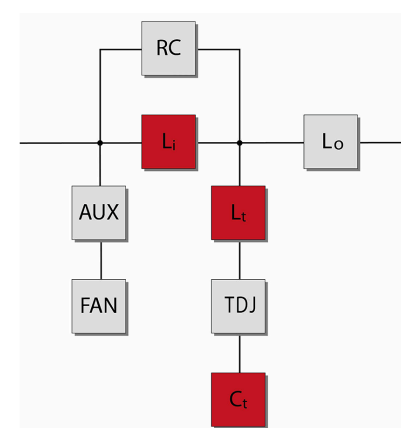
\* System requirements: THDv <2%, line voltage unbalance <1%  
Note: performance specifications in this brochure refer to six-pulse diode rectifiers. SCR rectifier front-ends will produce different results, dependent upon the firing angle of the thyristors.  
THDi ~5% at rated power for filter <6 kW/HP

\*\* External UL-rated fuses required. Please consult the user manual.

\*\*\* Please check the inlet air flow required for cooling table further in this document and the user manual.

\*\*\*\* Derated =  $Inominal \cdot \left( \frac{T_{max} - T_{amb}}{T_{max} - T_{nominal}} \right) = Inominal \cdot \left( \frac{70^{\circ}C - T_{amb}}{25^{\circ}C} \right)$

## Typical electrical schematic



(all configurable optional functionalities shown)

## 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	3.0	1.63	7	61	110	A
FN 3440-2-110-E0_*****	2.2	5.5	3.26	10	87	110	A
FN 3440-4-112-E0_*****	4.0	10	5.93	13	135	112	B
FN 3440-6-112-E0_*****	5.5	13	8.17	17	183	112	C
FN 3440-8-112-E0_*****	7.5	16	11.1	21	256	112	C
FN 3440-11-113-E0_****	11	24	16.3	28	287	113	D
FN 3440-15-113-E0_****	15	32	22.2	32	359	113	D
FN 3440-19-113-E0_****	19	38	28.2	33	343	113	D
FN 3440-22-115-E0_****	22	45	32.5	48	460	115	E
FN 3440-30-115-E0_****	30	60	44.4	49	570	115	E
FN 3440-37-115-E0_****	37	75	54.8	60	581	115	E
FN 3440-45-115-E0_****	45	90	66.7	67	783	115	E
FN 3440-55-115-E0_****	55	110	81.6	69	858	115	E
FN 3440-75-116-E0_****	75	150	111	118	1036	116	G
FN 3440-90-116-E0_****	90	180	134	139	1166	116	G
FN 3440-110-118-E0_****	110	210	164	158	1365	118	H
FN 3440-132-118-E0_******	132	260	197	176	1392	118	H
FN 3440-160-118-E0_******	160	320	240	202	1462	118	H
FN 3440-200-118-E0_******	200	400	300	210	1644	118	H
FN 3440-250-119-E0XXSXX	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	185-400	10	48	J

\* Recommended connector type: wire or cable lug for 110 to 113, only cable lug for 115 to 119

\*\* 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	3.0	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_*****	4.0	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	227	1644	118	H
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	185-400	10	48	J

\* Recommended connector type: wire or cable lug for 110 to 113, only cable lug for 115 to 119

\*\* 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.

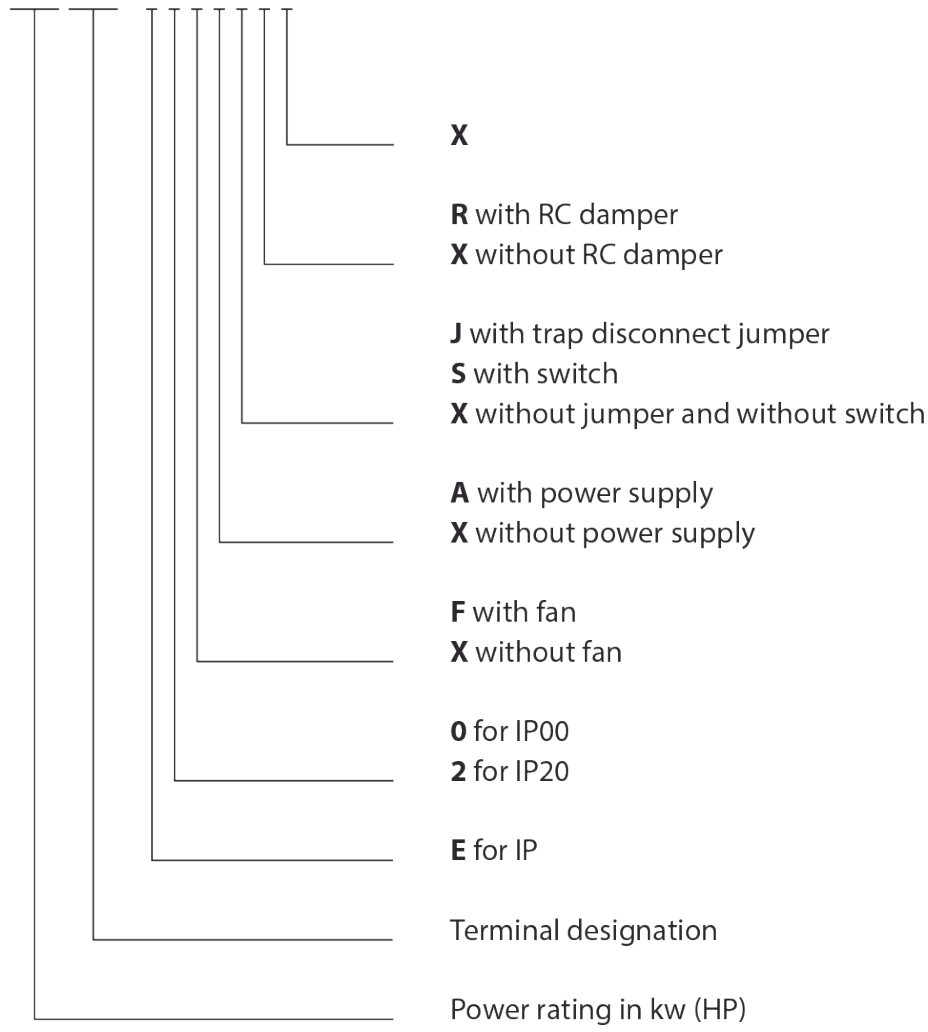
## Filter Signal And Earth Terminals

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-

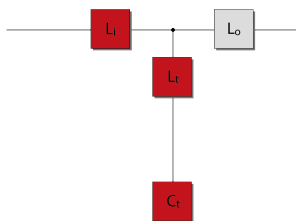


**Table 1: Filter Configurations If External Air Flow Is Available For Cooling**

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

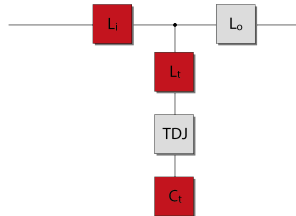
**E0XXXXX**

- For rectifiers without DC-link choke



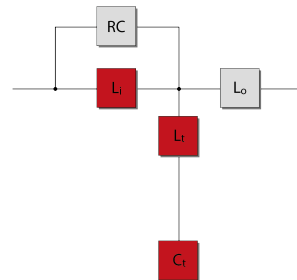
**E0XXJXX**

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



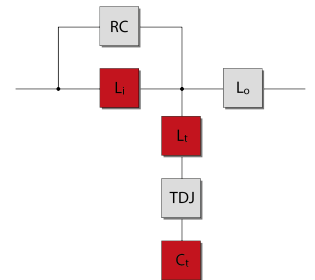
**E0XXXRX**

- 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>

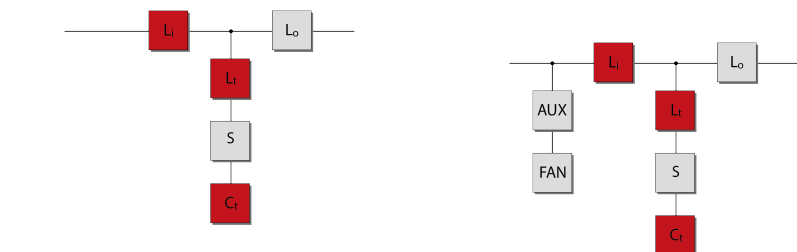
### Table 3: Filter Configurations If External Aux. Power Supply For The Fan Is Available

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

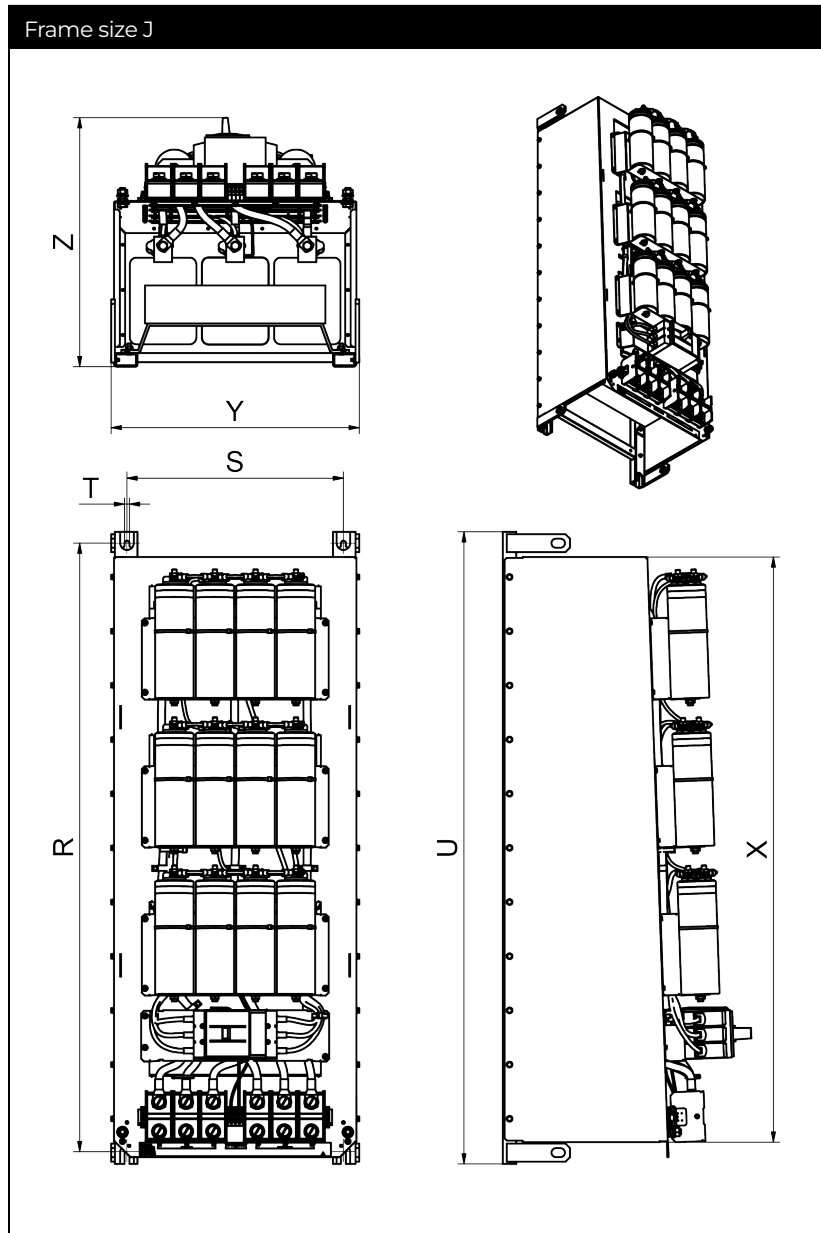
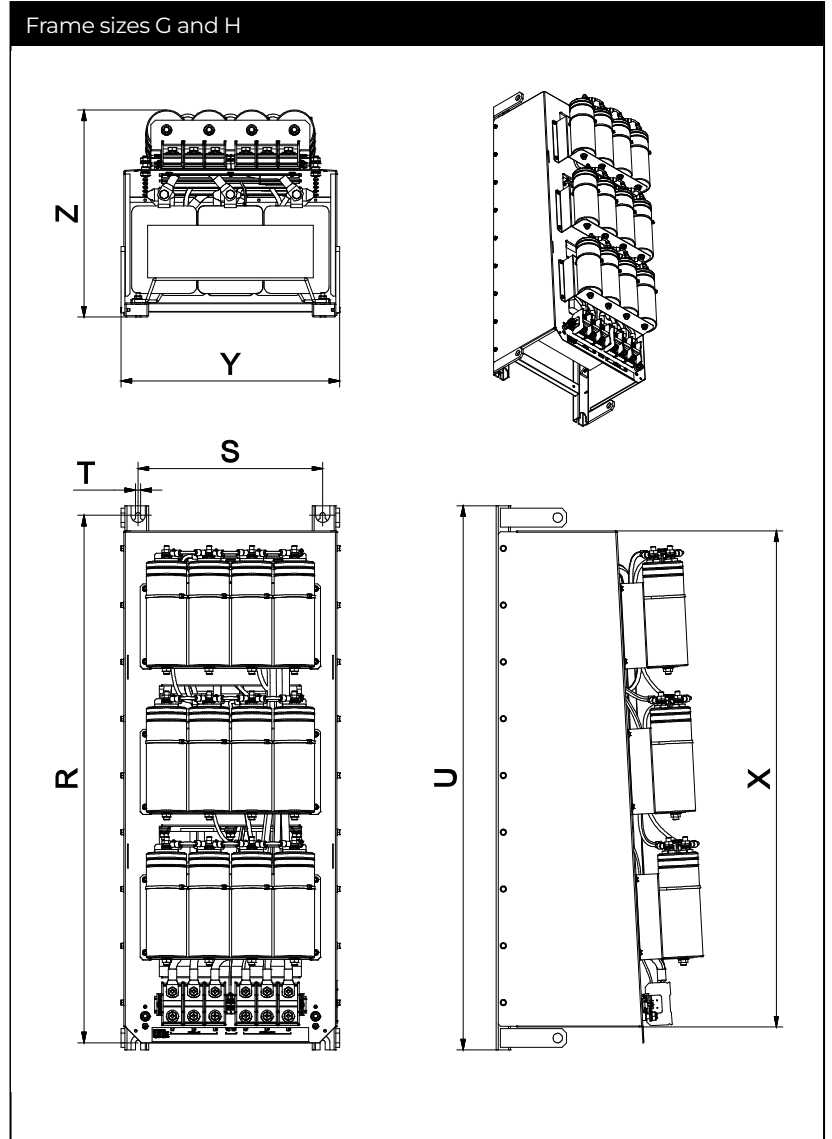
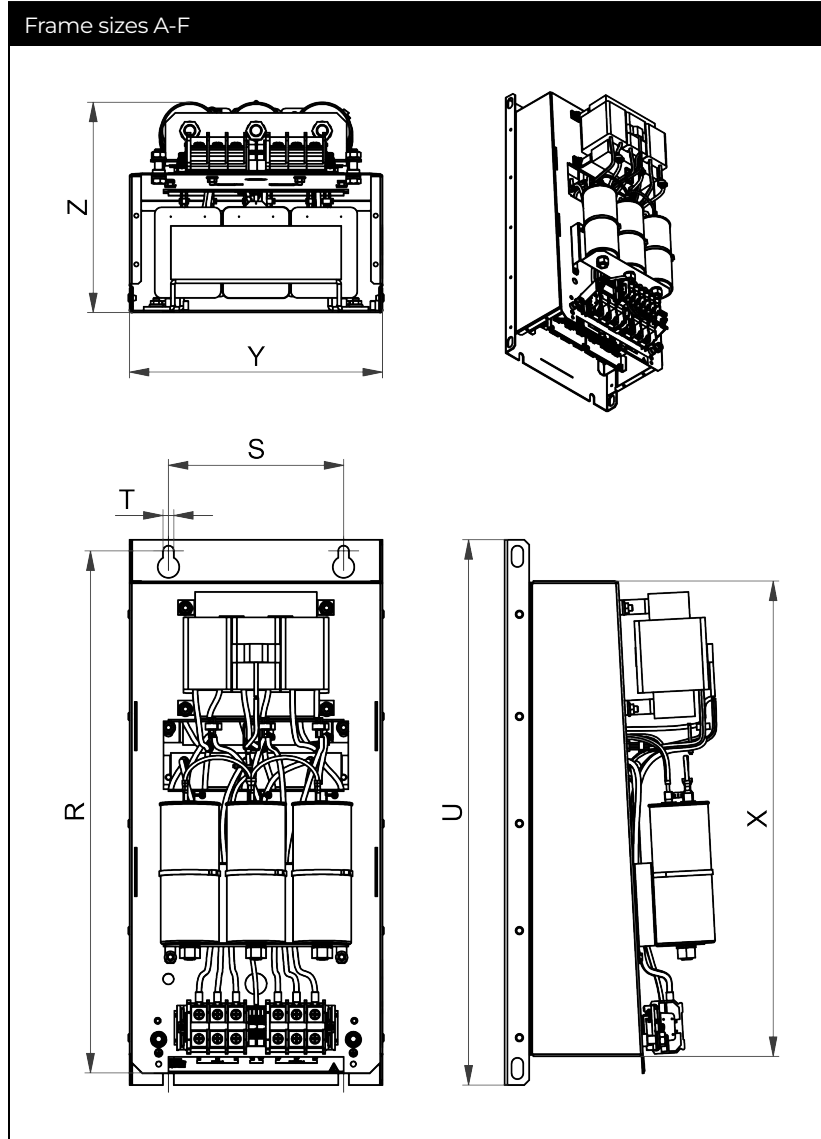
<p><b>E0FXXXX and E2FXXXX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke</li> <li>- Filters contain fan</li> </ul>	<p><b>E0FXJXX and E2FXJXX</b></p> <ul style="list-style-type: none"> <li>- For rectifiers without DC-link choke</li> <li>- Filters contain fan and trap disconnect jumper</li> </ul>	<p><b>E0FXXRX and E2FXXRX</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>E0XSXXX</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>
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### Mechanical Data Of IP 00 Enclosure



## Dimensions

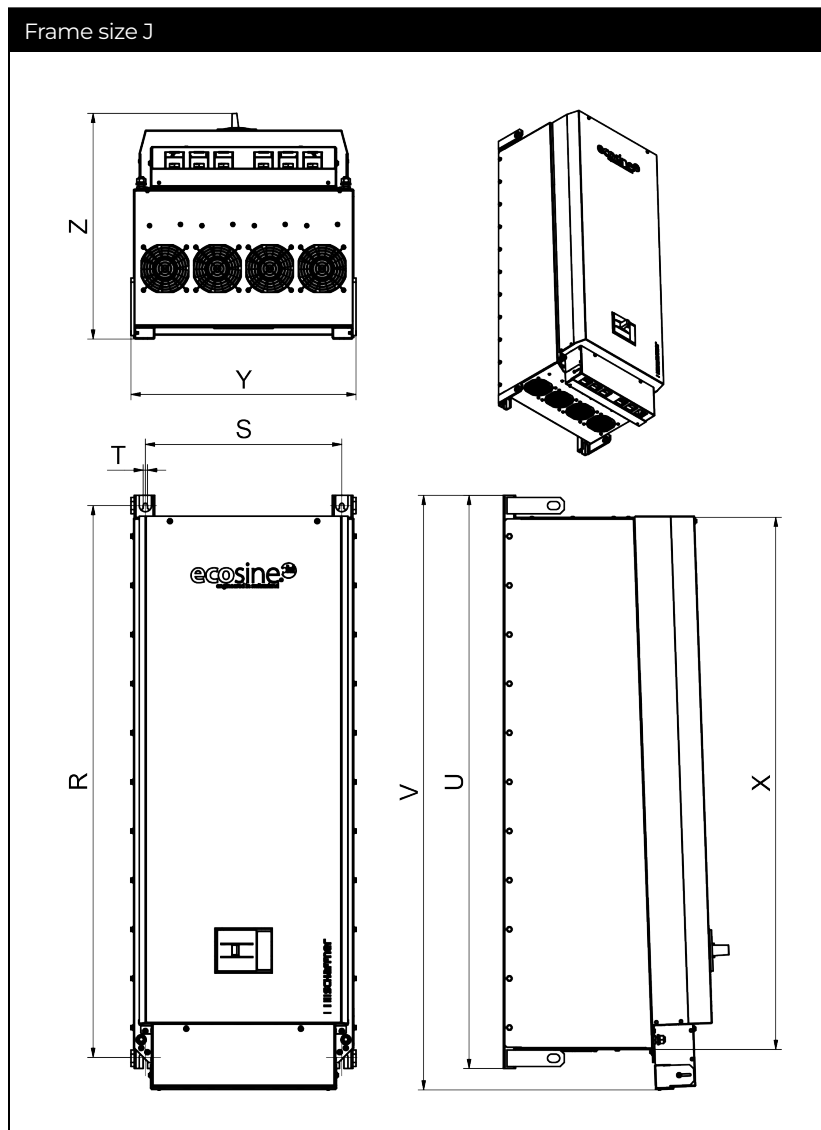
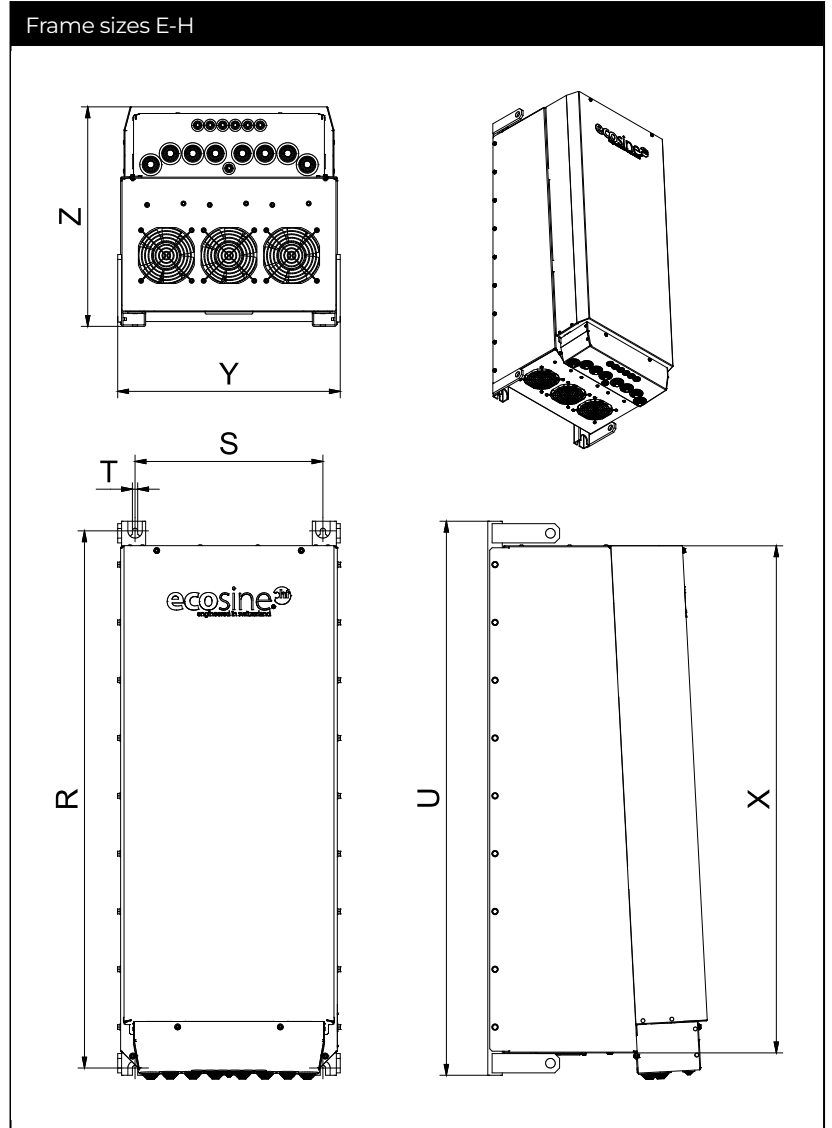
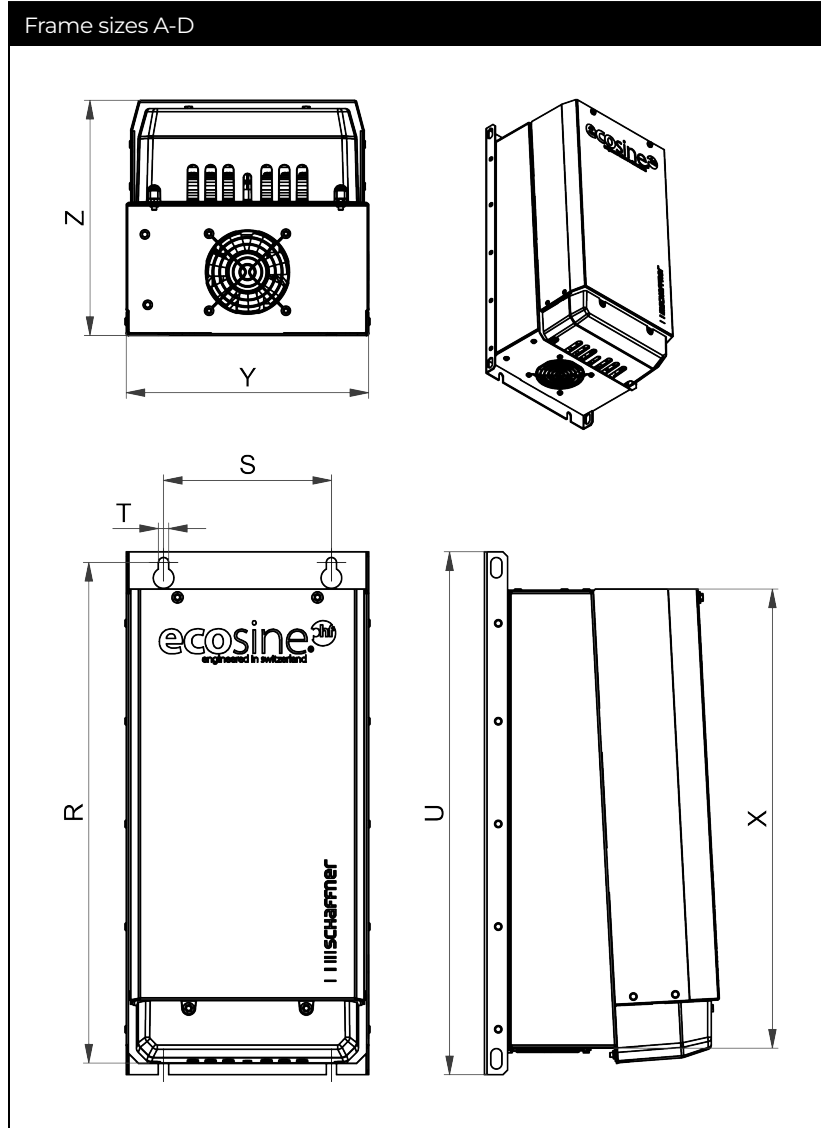
Frame	Drill pattern			Base			Volume
	R	S	T	U	X	Y	Z
	[mm]			[mm]			[mm]
<b>A</b>	340	120	7	360	302	160	185
<b>B</b>	405	120	7	425	370	180	206
<b>C</b>	460	150	7	483	430	210	221
<b>D</b>	540	180	11	560	491	260	252
<b>E</b>	680	220	11	705	635	290	319
<b>F</b>	730	250	11	752	684	340	343
<b>G</b>	920	280	11	960	863	353	396
<b>H</b>	1115	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* [m3/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

### Mechanical Data Of IP 20 Enclosure





## Dimensions

Frame	Drill pattern [mm]		Base [mm]			Volume [mm]		
	R	S	T	U	X	Y	Z	V
<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	396	
<b>H</b>	1115	390	11	1150	1053	462	456	
<b>J</b>	1348	480	11	1400	1300	550	555	1455

## 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