



POWER QUALITY MANAGEMENT LIMITED

## Operating and Installation Instructions (rev.2)

Firmware V02.05.xx / V02.06.xx

## ECOsine™ Active Harmonic Filters



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Valid from firmware version:

From V02.05.12 / V02.06.23

(firmware version see parameter P010)

Meaning of firmware version number:

V **XX**.xx.xx – hardware release, downwards incompatible

V xx.**XX**.xx – function version

V xx.xx.**XX** – small compatible changes

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## 1. General safety instructions

### 1.1. Intended use

The ECOsine™ Active harmonic filter is used for active compensation of reactive power and harmonic content and for load balancing.

Please ensure that no compensation systems, **which are not detuned**, are connected to the same grid. Otherwise interactions between ECOsine™ Active and the compensation systems could occur.



**DANGER**

#### **Dangerous voltage**

**Risk of death due to short circuits and electric shock if the active filter is opened while connected to the ac mains or for up to 5 minutes after being disconnected from the ac mains**

⇒ All interventions involving opening the device cover or removing or installing the connection cable may only be performed by qualified personnel.

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**WARNING**

#### **High-frequency interferences**

**In a residential environment high-frequency interferences could occur, which necessitate interference suppression**

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### 1.2. Personnel qualification

Installation of the ECOsine™ Active filter, inspections for proper operation, and certain troubleshooting measures may only be performed by qualified personnel. All other measures may be performed by people who have read these instructions.

## 2. Introduction

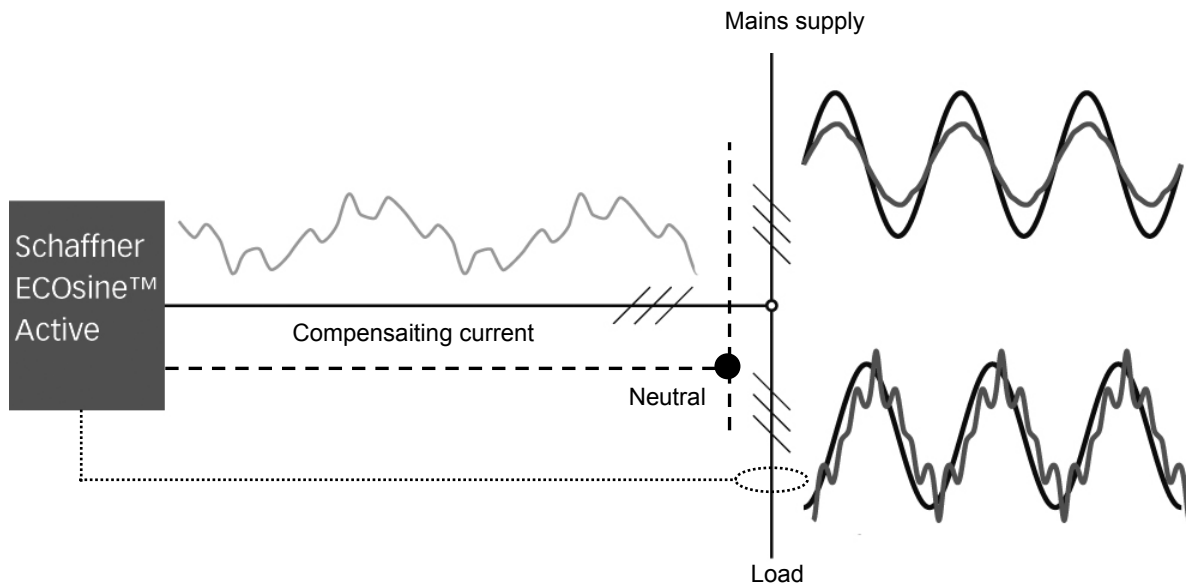
### 2.1. Functions of the active filter

The ECOsine™ Active filter enables:

- Reduction of the current THD
- Reduction of the harmonic current content
- Compensation of reactive power and an improvement of the power factor  $\cos \varphi$
- Display of mains current and voltage
- Load balancing

### 2.2. Principle of operation

The ac mains current, which is drawn by a non-linear load, is measured by ECOsine™ Active either directly or indirectly via external current transformers. The harmonic content and reactive power components are detected and processed in a digital control structure. The active filter continually generates a compensating current that offsets the harmonic content and reactive current in the load, so the ac mains only has to provide the minimum fundamental in phase current.







**Fig. 1: Principle of operation of the ECOsine™ Active filter**

The active filter instantly adapts to all changes in the load and the systems harmonic content spectrum, in order to be able to optimally respond at any time.

### 2.3. About these instructions

The following symbols, terms and designations are used in these operating and installation instructions:

**Table 1: Use of symbols, terms, and designations**

	Description
<b>NOTICE</b>	<b>Notice</b> Follow these instructions to avoid damages to the unit.
 <b>CAUTION</b>	<b>Caution</b> Follow these instructions to avoid damages to the unit or injuries of personnel.
 <b>WARNING</b>	<b>Warning</b> Follow these instructions to avoid situations which may cause severe or deadly injuries.
 <b>DANGER</b>	<b>Danger</b> Follow these instructions to avoid situations which cause severe or deadly injuries.
 <b>DANGER</b>	<b>Dangerous Voltage</b> Follow these instructions to avoid situations which cause severe or deadly injuries due to dangerous electrical voltage.
<b>Note</b> Note text	<b>Note</b> Please observe these notes.
⇒  1.  2.	<b>Operation steps</b> Complete the operation described (multiple steps are numbered, arrow indicates a single step).

### 3. Installation and electrical connection

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**DANGER**

#### **Dangerous voltage**

**Risk of death due to short circuits and electric shock if grounding is missing or by contact with liquids.**

- ⇒ Make absolutely sure that the filter is grounded.
  - ⇒ Do not set up the filter near liquids.
  - ⇒ Do not expose the filter to excessive humidity.
  - ⇒ Remove or open the covers/doors only if the power is switched off.
- 

#### **NOTICE**

#### **Insufficient ventilation**

**Insufficient ventilation or inadequate heat dissipation can cause overheating and damage the unit.**

- ⇒ Do not cover the ventilation grilles.
  - ⇒ If installed in a switch cabinet, make sure that the thermal energy is removed (see Technical Data in chapter 7).
-

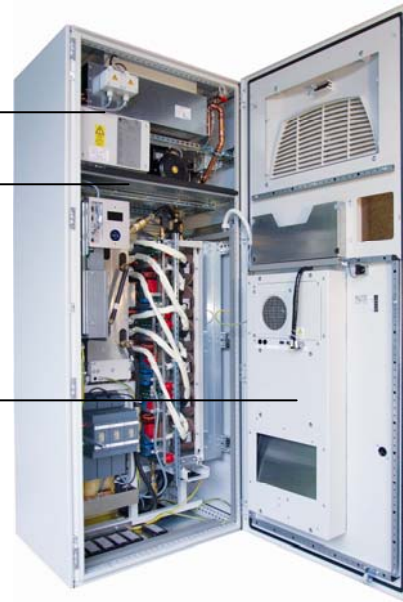
### 3.1. Cooling circuit (ECOsine™ Active -200/250/300-xxx-x)

Please observe the following installation instructions:

**Integrated cooling circuit with heat exchanger SK3300.007**  
 (see chapter 3.1.1)

**Collecting tray with drain**  
 (see chapter 3.1.2)

**Interior air cooling SK330x.140**  
 (see chapter 3.1.3)



**Fig. 2: Cooling equipment ECOsine™ Active -200/250/300-xxx-x**

#### 3.1.1. Integrated cooling circuit with heat exchanger SK3300.007

ECOsine™ Active -200/250/300-xxx-x devices are equipped with an integrated, maintenance-free closed-loop cooling-system.

The coolant-pressure in off-state (device de-energized) has to be in the following range and can be monitored using the built-in manometer. The pressure is monitored by the control unit. The filter will not start working, if the pressure is too low. **Please verify that the pressure is in the correct range before you start up the unit for the first time.**

**Table 2: Inflated pressure cooling circuit**

Pressure	Value
Nominal value	1.7 ... 2.5bar (in de-energized state)



Fig. 3: Manometer of cooling circuit

### 3.1.2. Water collection tray with drain

In order to protect the IP54 space below a water collection tray is integrated in the cabinet. **Under normal conditions no liquid or condensate should accumulate** in this tray.

In case of water entering the upper part of the enclosure it will be collected in the tray and drain through a drain-tube installed in the rear of the tray.



Fig. 4: Drain-tube of water tray

### Install the drain

The drain has to be connected to a gully or a suitable tank outside the cabinet.



**Fig. 5: Drain duct**

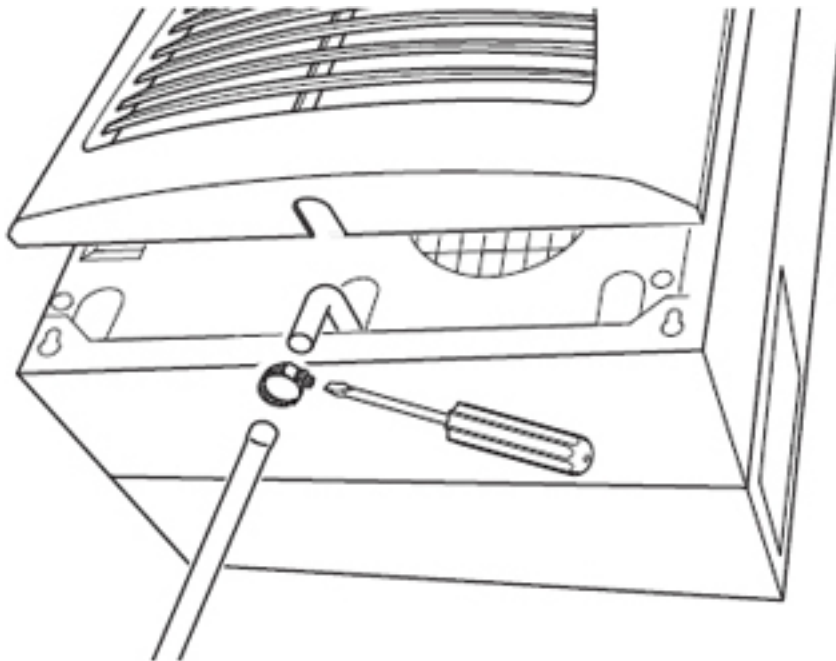
### 3.1.3. Interior air cooling system SK330x.140

The cooling-unit mounted in the door is an active cooling-system, which will produce condensate in high-humidity operating-conditions. Normally, this condensate evaporates such that no water escapes.

### Install condensate drain only if necessary

The evaporation system can evaporate up to **2.4l condensate/day**. If the amount of condensate exceeds this maximum value, condensate will escape at the emergency outlet of the cooler outside the cabinet. (Located at the bottom)

One possible reason for condensate to escape is insufficient sealing of the cable-entry in the bottom of the unit. **Please ensure that the cable-entry area in the bottom of the cabinet is well sealed.**



**Fig. 6: Condensate drain connector of the interior cooler**

### Seal the cable entry

All cabinet entries – especially the cable entry area at the bottom of the cabinet – have to be sealed in order to prevent entry of humidity.

### 3.2. Dimensional drawings ECOsine™ Active -030/050-480-3

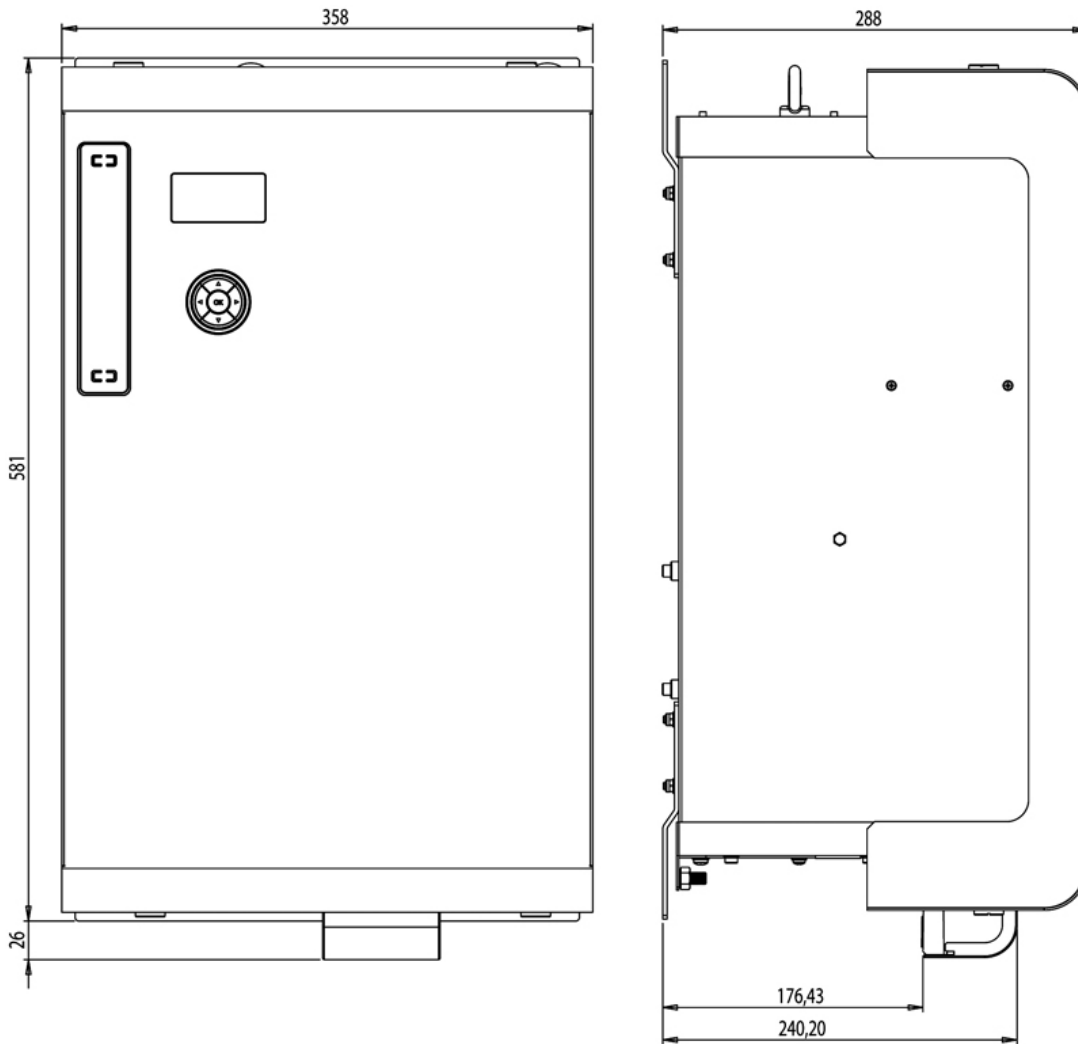


Fig. 7: Dimensional drawings ECOsine™ Active -030/050-480-3

Table 3: Minimal installation clearances ECOsine™ Active -030/050-480-3

Side	Required minimum installation clearances
Top (air outlet)	300mm
Bottom (air inlet)	300mm
Left/right side	50mm

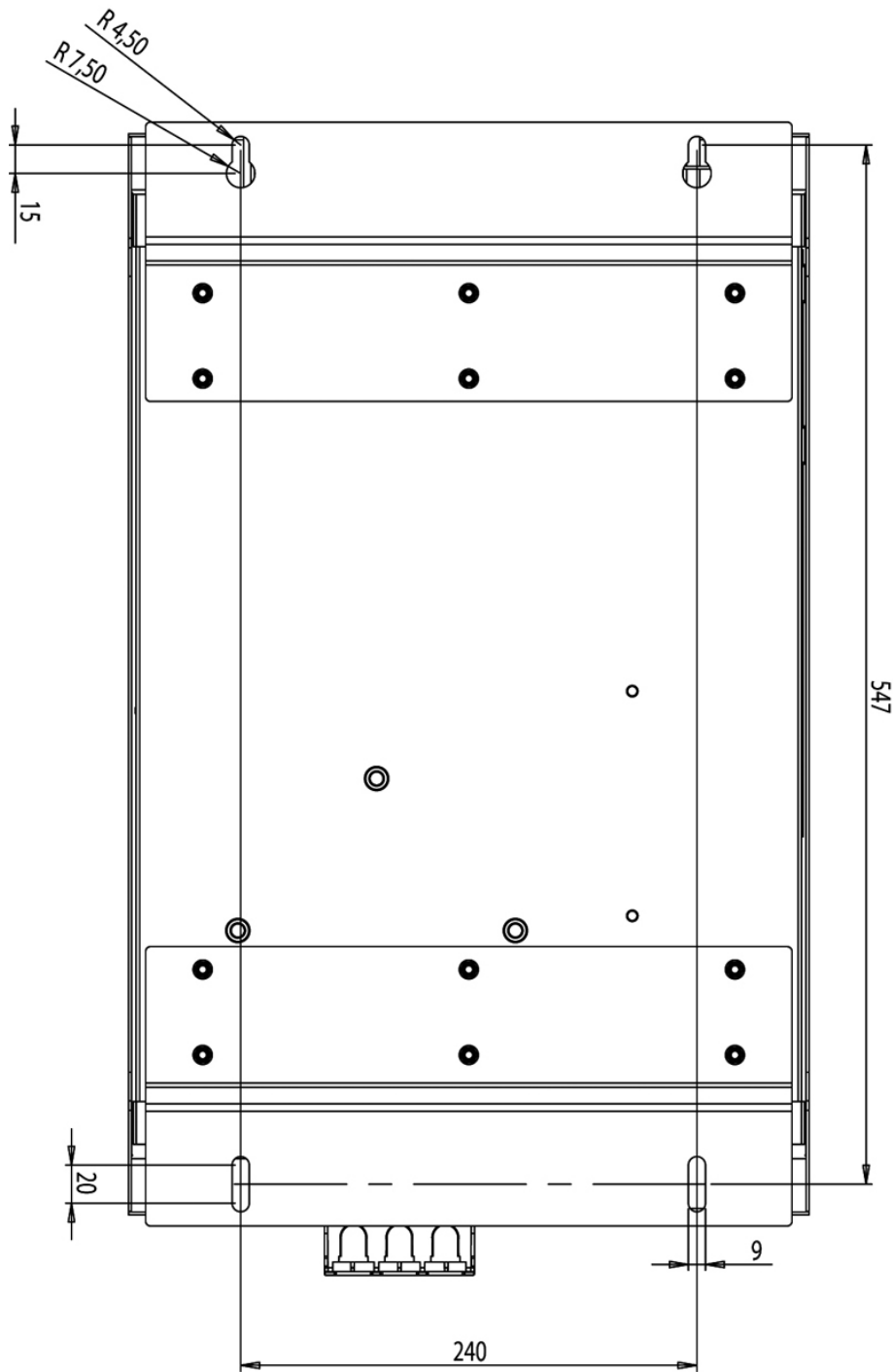


Fig. 8: Drilling template ECOsine™ Active -030/050-480-3

### 3.3. Dimensional drawings ECOsine™ Active -030/060-400-4

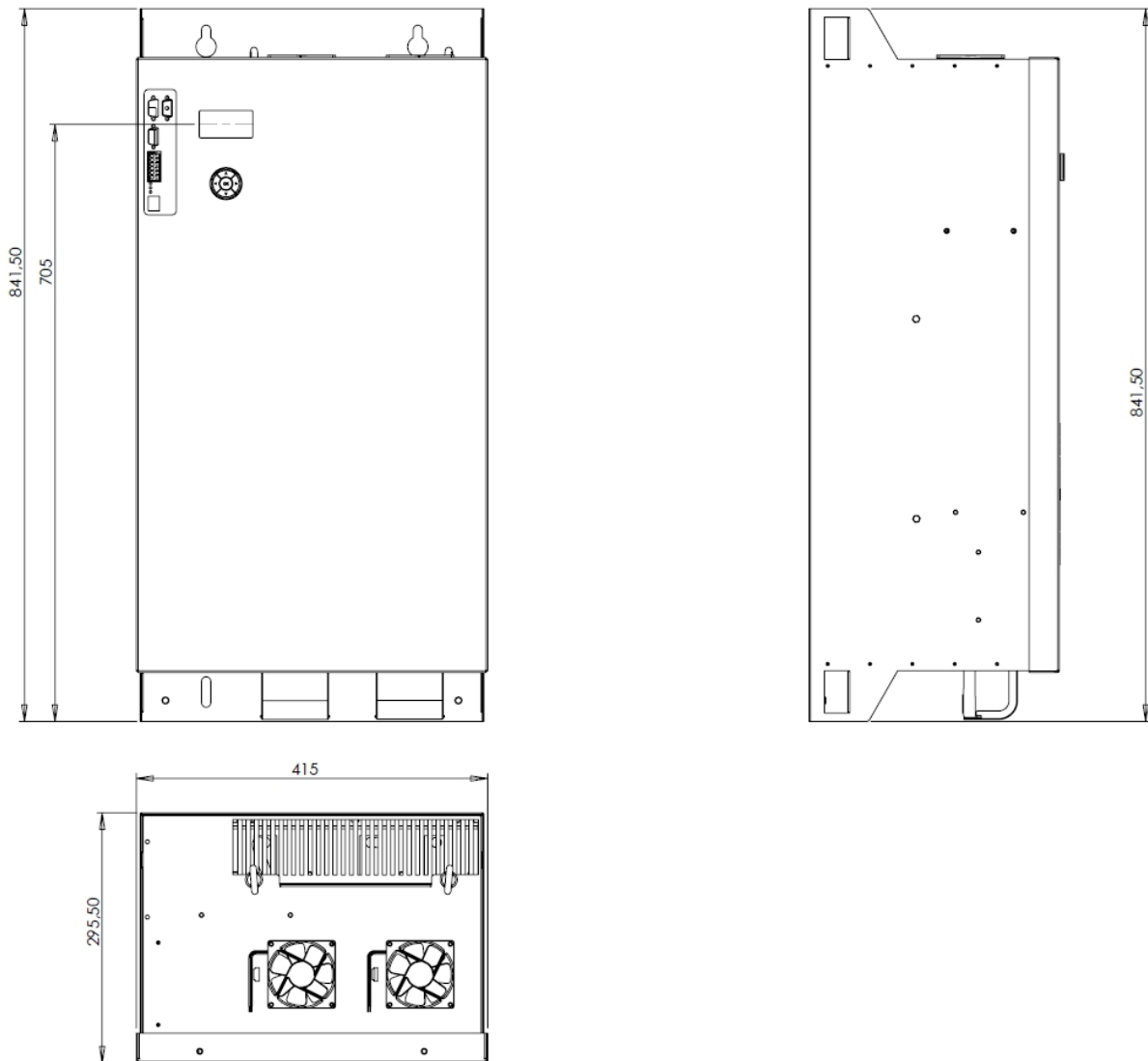


Fig. 9: Dimensional drawings ECOsine™ Active -030/060-400-4

Table 4: Minimal installation clearances ECOsine™ Active -030/060-400-4

Side	Required minimum installation clearances
Top (air outlet)	300mm
Bottom (air inlet)	300mm
Left/right side	Side-by-side mounting without any clearance

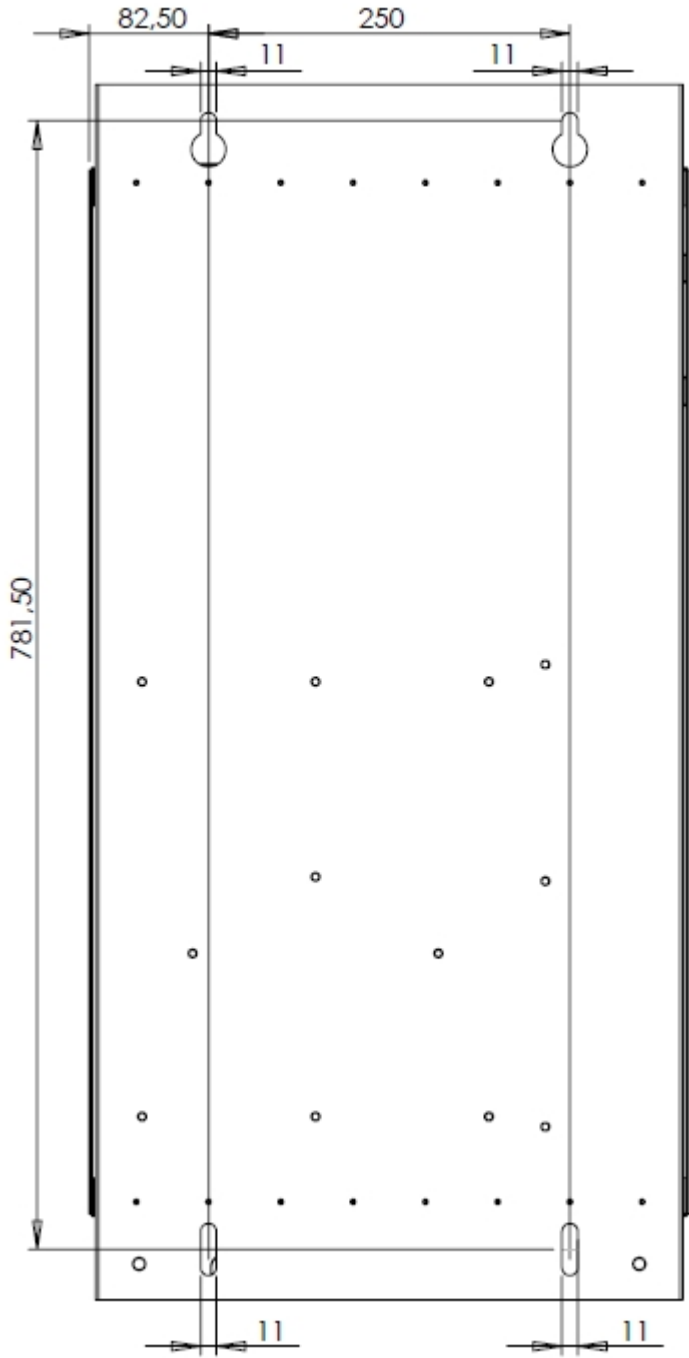


Fig. 10: Drilling template ECOsine™ Active -030/060-400-4

### 3.4. Dimensional drawings ECOsine™ Active -100/120-xxx-x

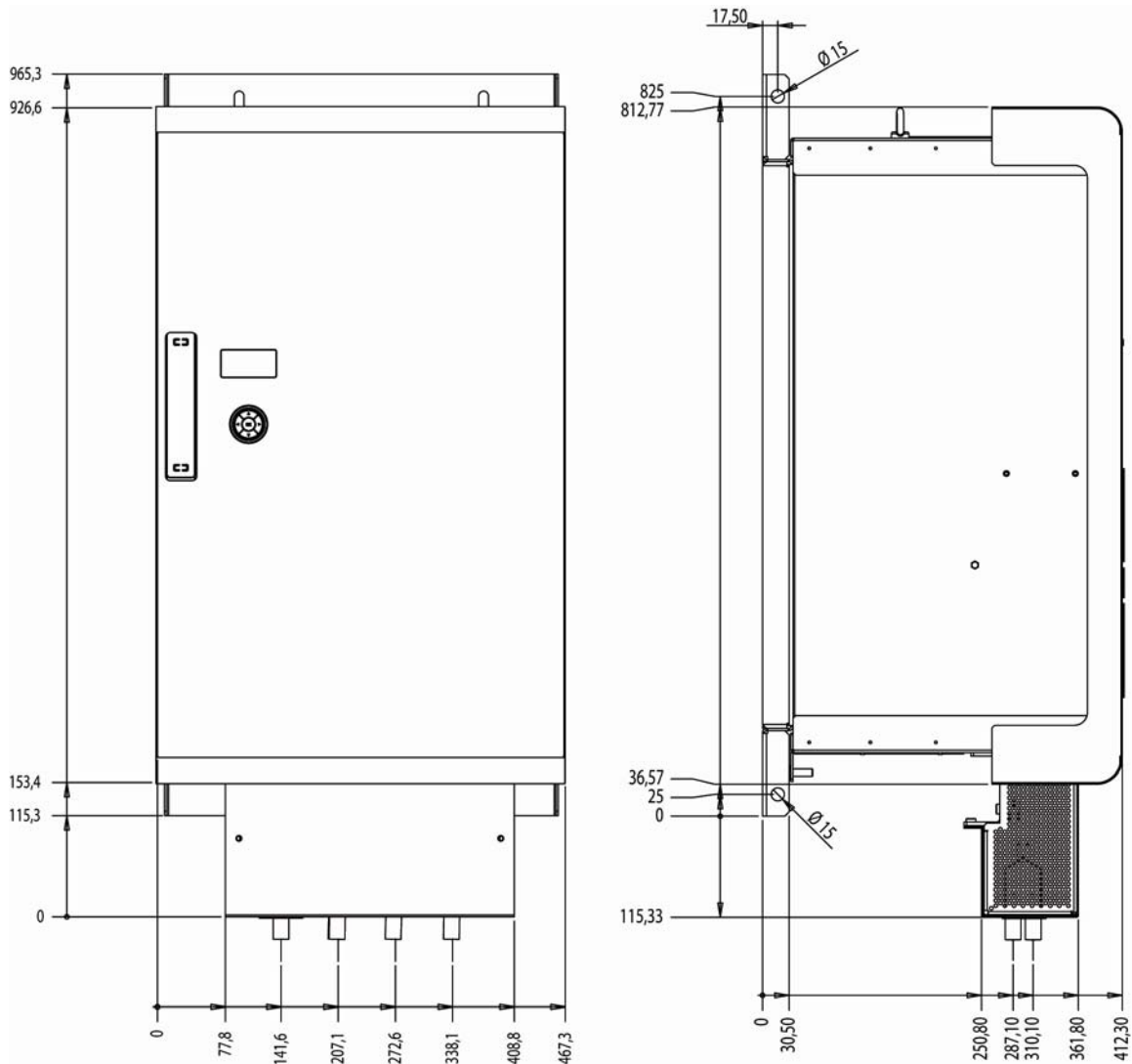


Fig. 11: Dimensional drawings ECOsine™ Active -100/120-480-3

Table 5: Installation clearances ECOsine™ Active -100/120-480-3

Side	Recommended minimum installation distance
Top (air outlet)	300mm
Bottom (air inlet)	300mm
Left/right side	50mm

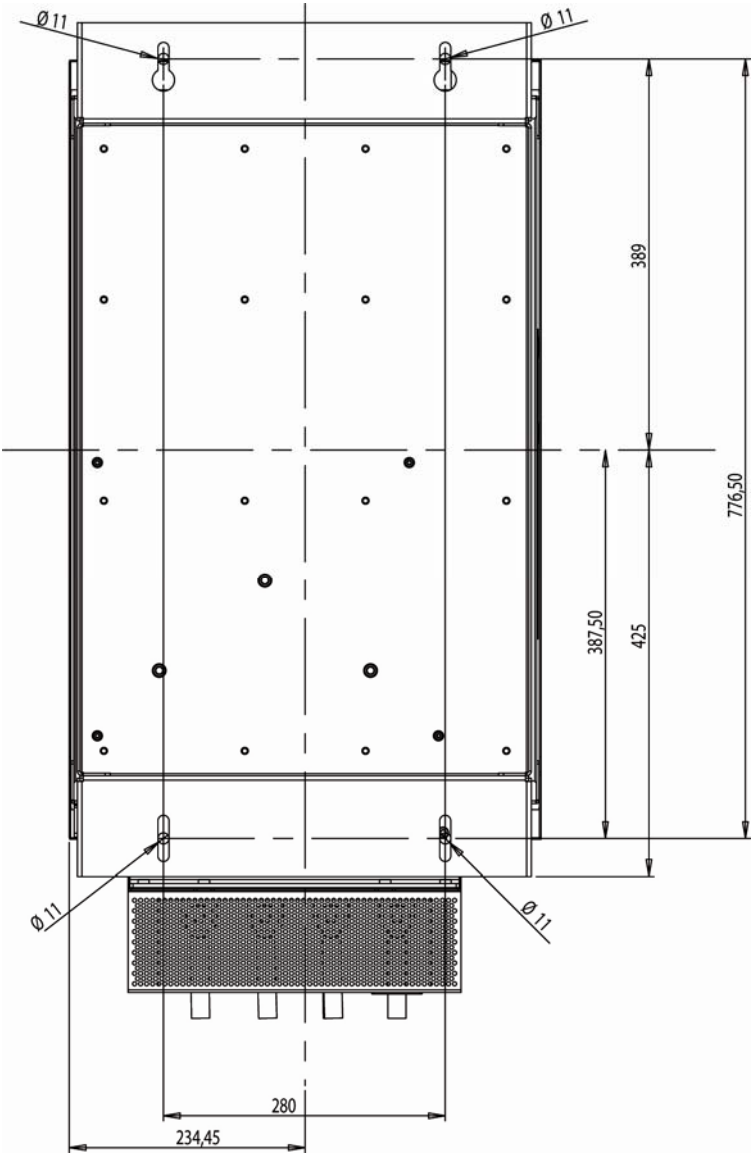


Fig. 12: Drilling template ECOsine™ Active -100/120-480-3

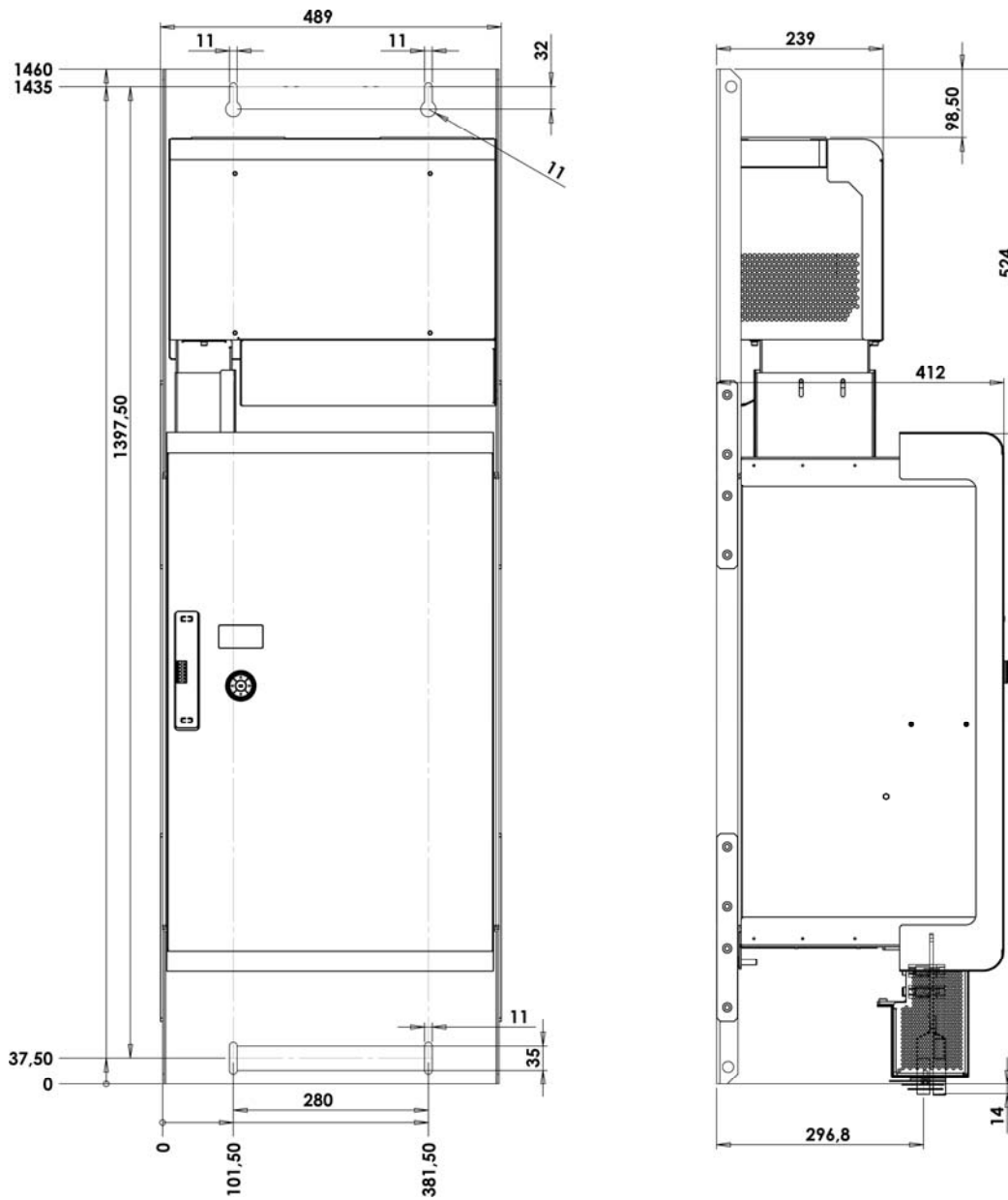


Fig. 13: Dimensional drawings ECOSine™ Active -100/120-400-4

Table 6: Installation clearance ECOSine™ Active -100/120-400-4

Side	Required minimum installation clearance
Top (air outlet)	300mm
Bottom (air inlet)	300mm
Left/right (air inlet or choke)	100mm on each side

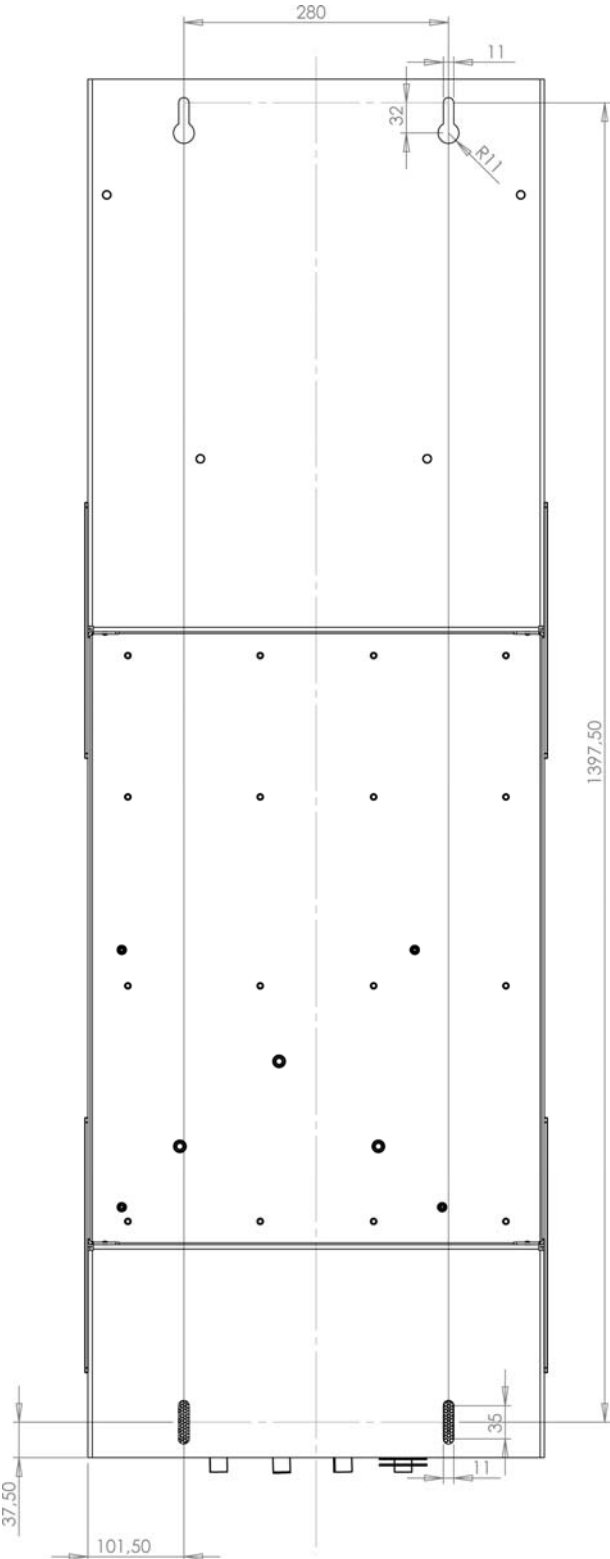


Fig. 14: Drilling template ECOsine™ Active -100/120-400-4

### 3.5. Dimensional drawings ECOsine™ Active -200/250/300-xxx-x

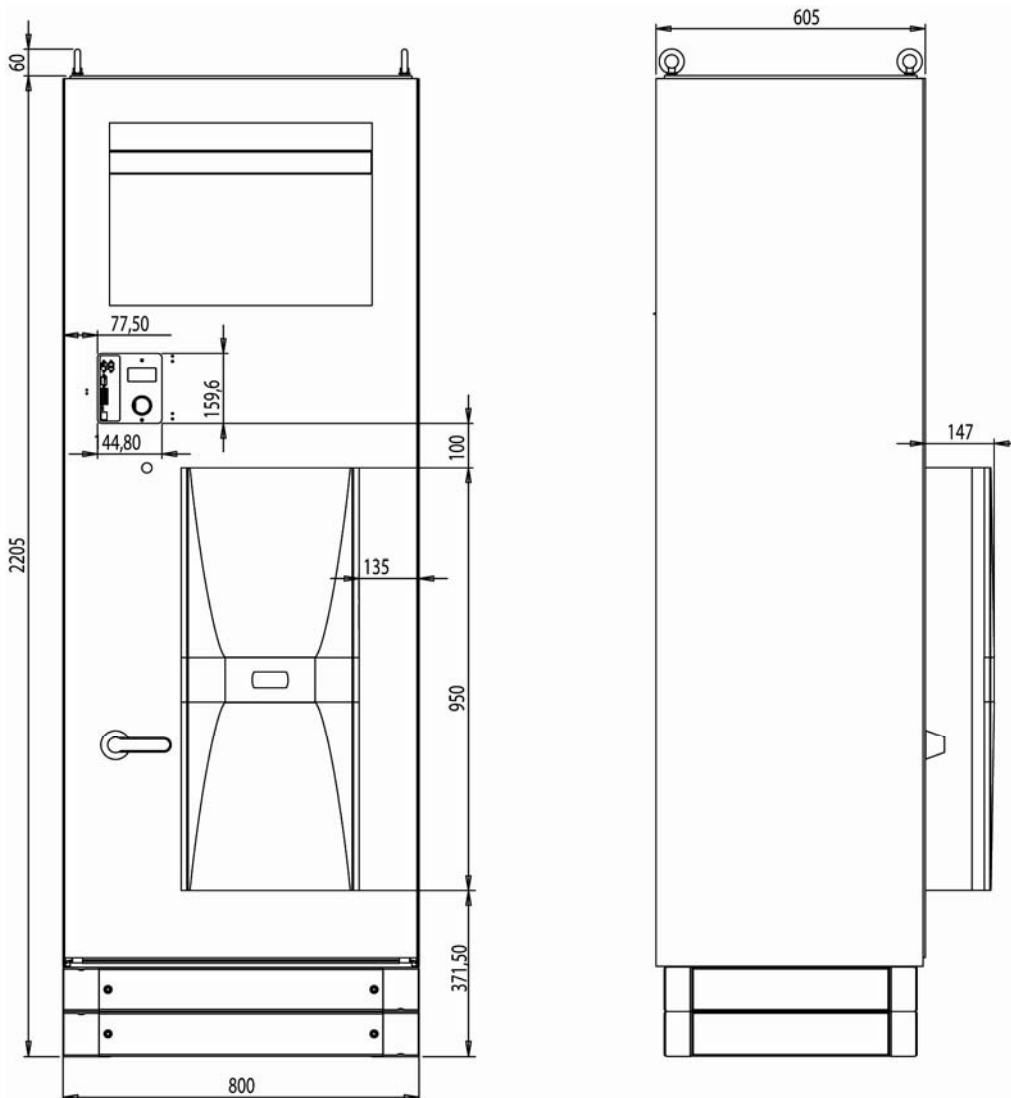


Fig. 15: Dimensional drawings ECOsine™ Active -200/250/300-xxx-x (with socket 200mm)

Table 7: Installation clearance ECOsine™ Active -200/250/300-xxx-x

Side	Required minimum installation clearance
Top (air outlet)	300mm
front (air inlet)	900mm (to open the door)
Left/right side	Side-by-side mounting without any clearance

### 3.6. Position of the connecting terminals

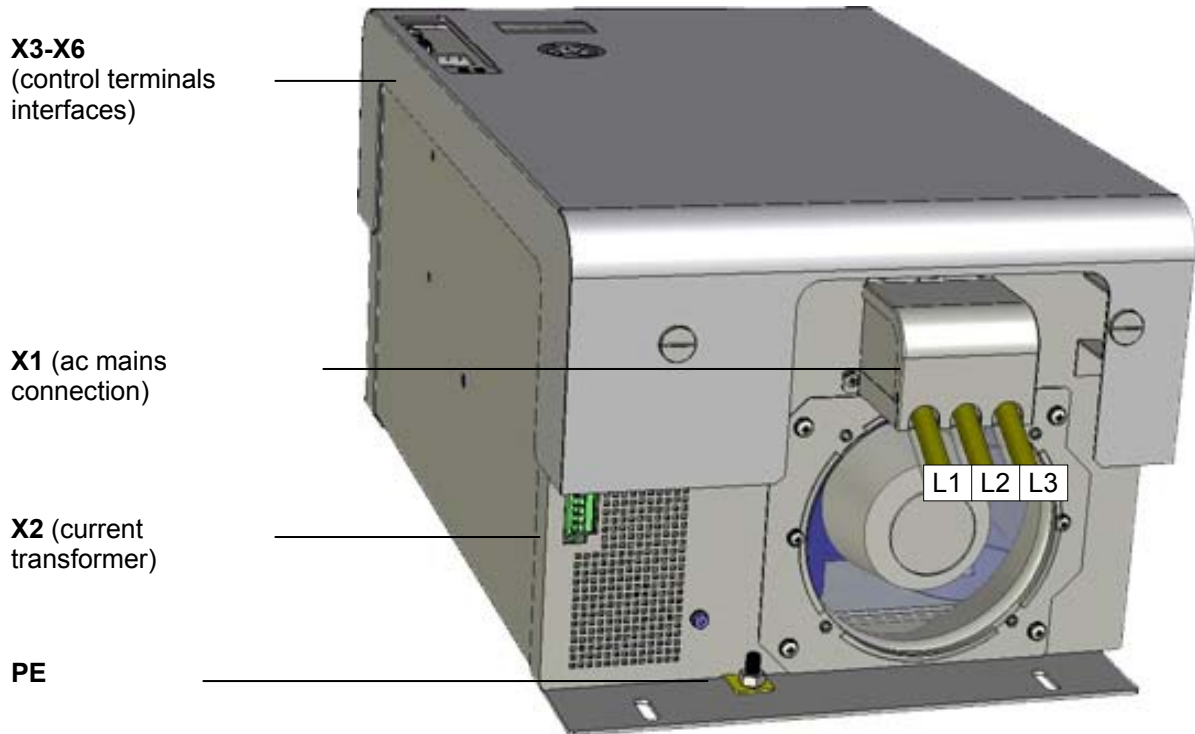


Fig. 16: Position of the electrical connecting terminals ECOsine™ Active -030/050-480-3

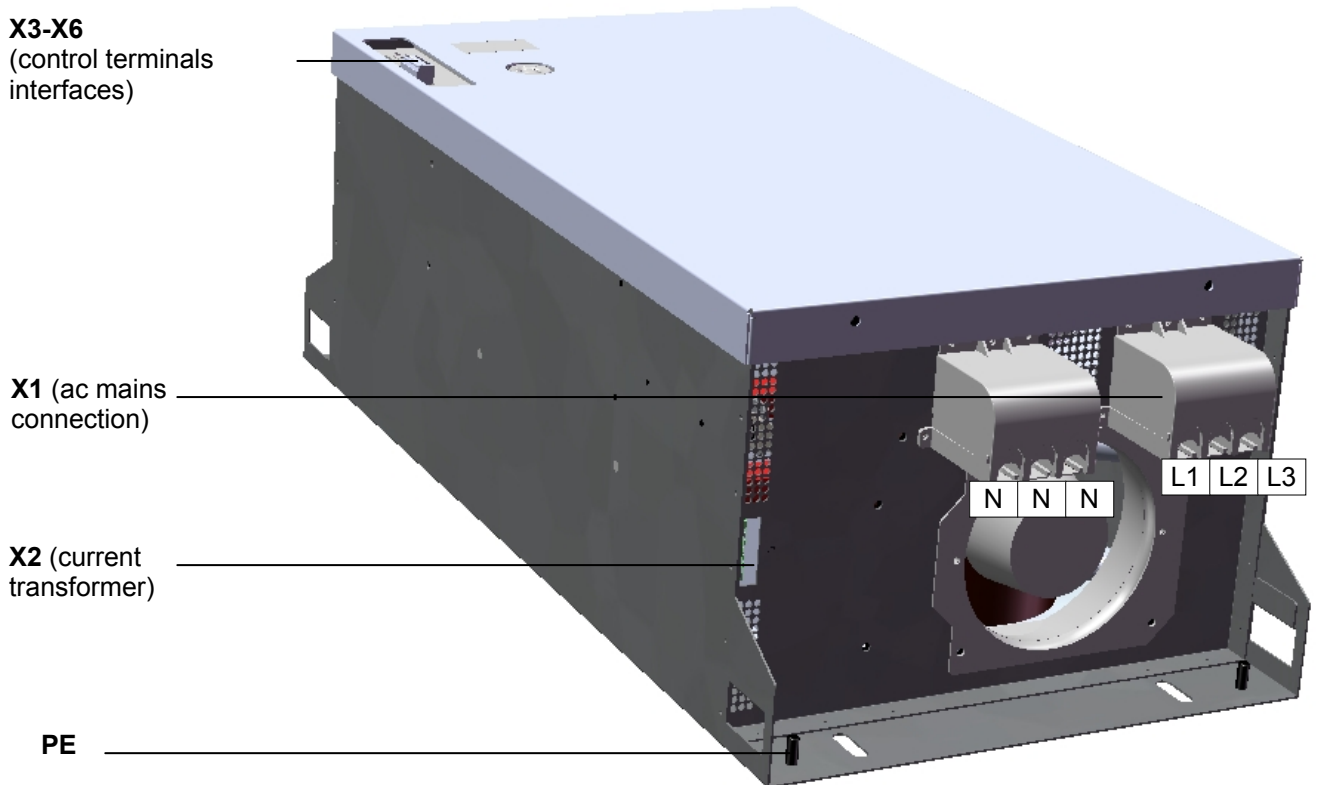


Fig. 17: Position of the electrical connecting terminals ECOsine™ Active -030/060-400-4

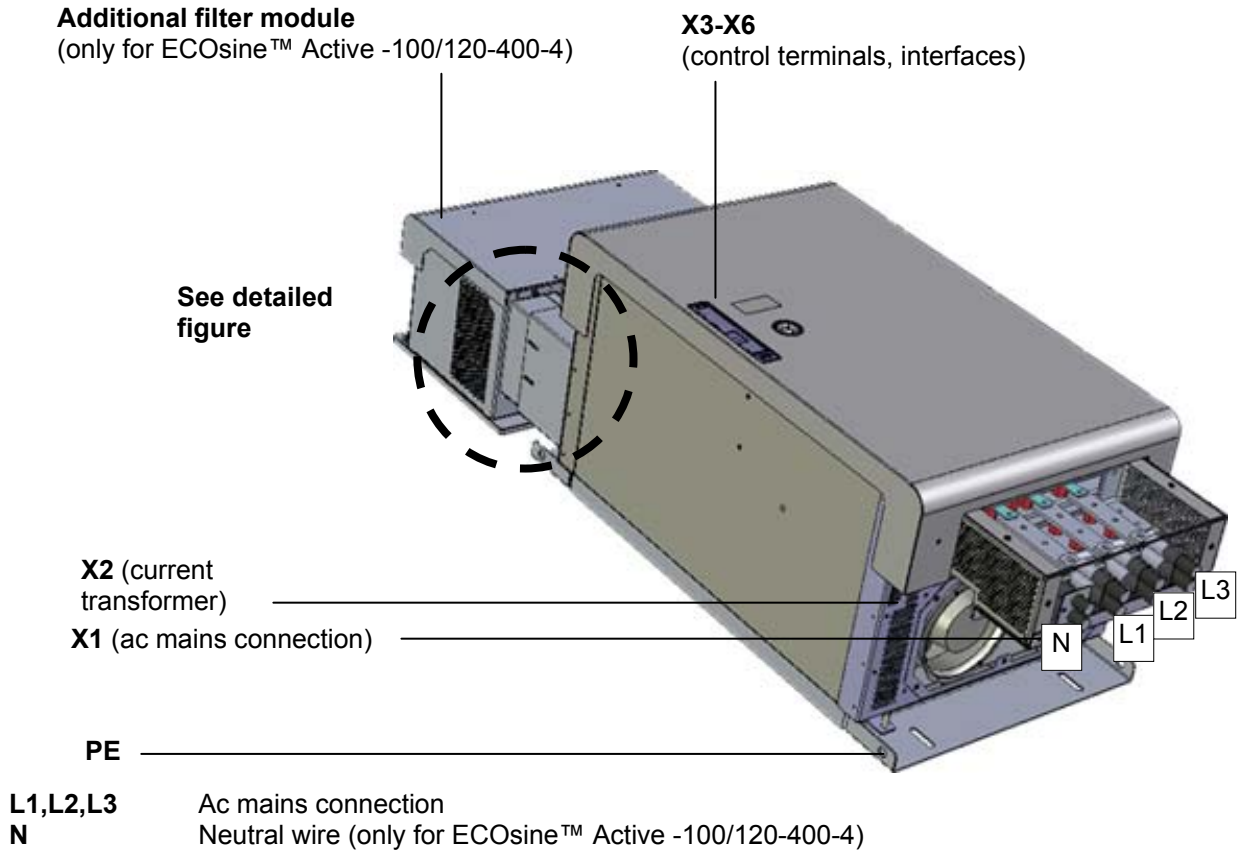
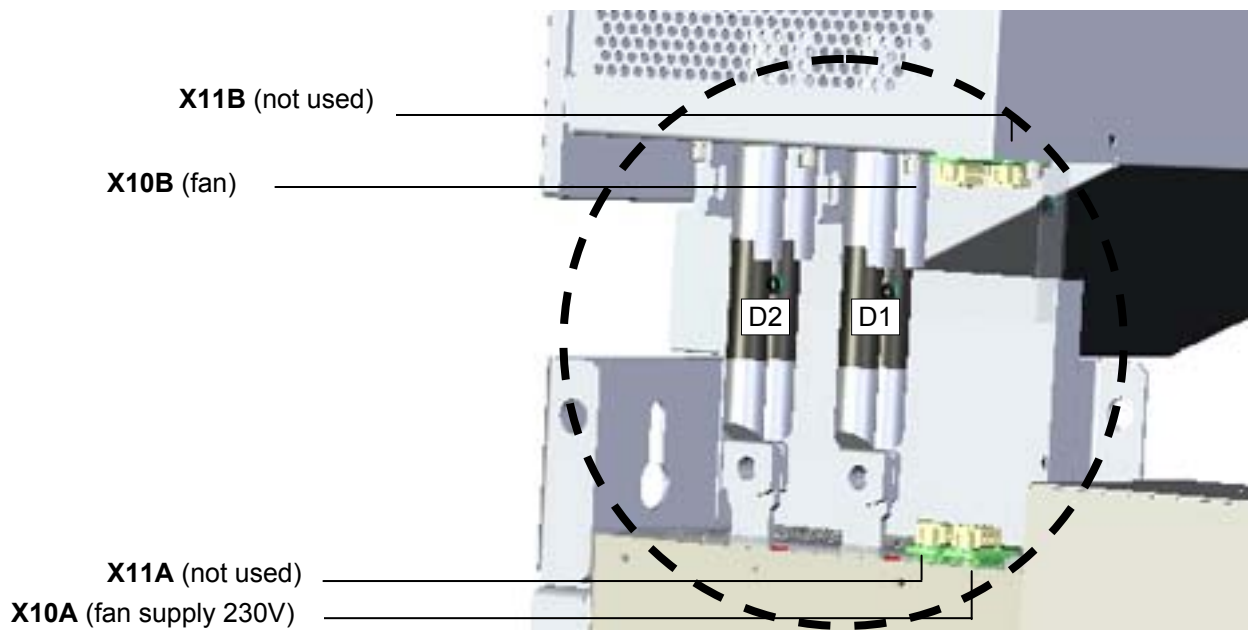
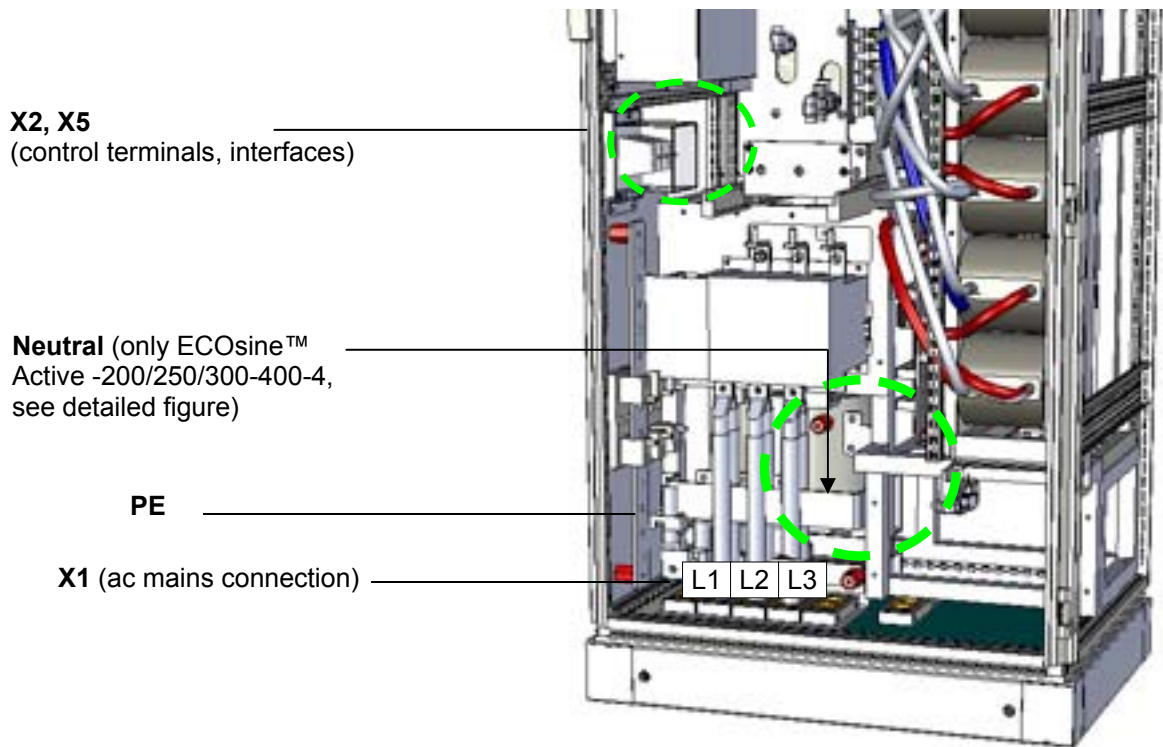


Fig. 18: Position of the electrical connecting terminals ECOsine™ Active -100/120-xxx-x



The following connections have to be installed:  
**D1 - D1 / D2 - D2 / X10A - X10B**

Fig. 19: connecting of additional filter module (only for ECOsine™ Active -100/120-400-4)



All cabinet entries – especially the cable entry area at the bottom of the cabinet – have to be sealed in order to prevent entry of humidity

Fig. 20: Position of the electrical connecting terminals ECOsine™ Active -200/250/300-xxx-x

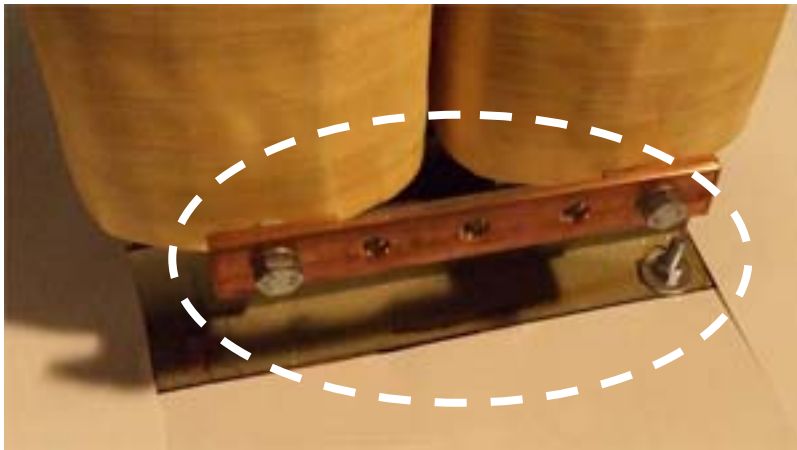


Fig. 21: connecting bar neutral wire ECOsine™ Active -200/250/300-xxx-4

### 3.7. External fuse protection

ECOsine™ Active must always be protected on the mains side of the filter with suitable fuses or circuit breakers. Depending on operation mode, alternation of load and harmonic spectrum of ECOsine™ Active output current, fuses will be stressed very different.

**Table 8: recommended external ac mains protection**

Device	External fuse (cable protection fuses, e.g. type gL/gG)
ECOsine™ Active -030-480-3	50A
ECOsine™ Active -050-480-3	80A
ECOsine™ Active -060-400-4	100A
ECOsine™ Active -100-xxx-x	160A
ECOsine™ Active -120-xxx-x	200A
ECOsine™ Active -200/250/300-xxx-x	400A

### 3.8. External fuse protection for UL conformity

To ensure UL conformity, one of the following types of fuses must be used:

**Table 9: Fuse types required for UL conformity**

Device	External fuse	Designation
ECOsine™ Active -030-480-3	50A	Littelfuse JLLS50 or Bussmann-Cooper JJS-50
ECOsine™ Active -050-480-3	80A	Littelfuse JLLS80 or Bussmann-Cooper JJS-80
ECOsine™ Active -100-480-3	150A	Littelfuse JLLS150 or Bussmann-Cooper JJS-150
ECOsine™ Active -120-480-3 (UL pending)	150A	Littelfuse JLLS150 or Bussmann-Cooper JJS-150
ECOsine™ ACTIVE - 200/250/300-480-3 (UL pending)	400A (internal)	Already integrated in device (Littelfuse JLLS400 or Bussmann-Cooper JJS-400)

### 3.9. Connection of ac mains (X1)

Ground the active filter via the earth bolt (PE).

Observe the following ac mains connection cross sections and the tightening torque:

**Table 10: connection cross sections and tightening torque mains connection**

Device	Min. value cable cross section	Max. value cable cross section	Connecting bolt	Tightening torque
ECOsine™ Active - 030/050-480-3	1 x 25mm <sup>2</sup> per phase and PE	2 x 35mm <sup>2</sup> or 1 x 50mm <sup>2</sup> per phase and PE	M6 (in future M8)	M6: 3.5Nm (31.0 lbs.-in.)  M8: 9.5Nm (84.0 lbs.-in.)
ECOsine™ Active - 030/060-400-4	1 x 25mm <sup>2</sup> per phase and PE  1 x 50mm <sup>2</sup> (N)	1 x 50mm <sup>2</sup> per phase and PE  3 x 50mm <sup>2</sup> (N) or 1x 95mm <sup>2</sup>	M8	9.5Nm (84.0 lbs.-in.)
ECOsine™ Active - 100/120-xxx-x	1 x 35mm <sup>2</sup> per phase and PE  2 x 50mm <sup>2</sup> oder 1 x 95mm <sup>2</sup> (N)	2 x 50mm <sup>2</sup> or 1 x 95mm <sup>2</sup> per phase and PE  2 x 120mm <sup>2</sup> (N)	M10	19Nm (168.0lbs.-in.)
ECOsine™ Active - 200/250/300-xxx-x	1 x 185mm <sup>2</sup> per phase and PE  2 x 240mm <sup>2</sup> (N)	2 x 120mm <sup>2</sup> or 1 x 240mm <sup>2</sup> per phase and PE  2 x 240m <sup>2</sup> (N)	M12	33Nm (292.0lbs.-in.)

Use the correct cable cross sections in consideration of cable type and type of cable mounting.

To ensure UL conformity use UL listed cable (90°C, AWG4 or larger) and suitable UL listed wire-lugs.

### 3.10. Connection of the external current transformers (X2)



**DANGER**

**Dangerous voltage**

**Risk of death due to short circuits and electric shock if the current transformers are connected incorrectly.**

- ⇒ **Before** installing the current transformers on the primary conductor, short circuit them on the secondary side with separable short-circuit jumpers (not in the scope of delivery).
- ⇒ Keep the current transformers short circuited until the ECOsine™ Active devices are connected with these connecting terminals and continuity

through the ECOsine™ Active sense-loop has been verified.

- ⇒ **Before** disconnecting the current transformers from the ECOsine™ Active, short-circuit them with the separable short-circuit plugs provided.

### 3.10.1. Current transformer specification

Please observe the following instructions:

- **Three** external current transformers must be connected for correct ECOsine™ Active operation.
- For parallel operation of more than one ECOsine™ Active the current transformers must be installed **on the load side** of the filter. For stand alone operation of one ECOsine™ Active the transformers can be installed on the mains **or** load side of the filter.
- Separate transformer circuits are mandatory for proper operation of ECOsine™ Active.
- Dedicated current transformers must be used. Current transformer secondary circuits must not be looped through additional sense-loads.
- A current transformer terminal-block with separable short-circuit plugs must be installed between the external current transformers and the X2 connecting terminal on ECOsine™ Active. This is necessary in order to be able to short-circuit the current transformers before disconnecting the X2 terminal on the ECOsine™ Active during any kind of service work.

**Table 11: Current transformer specification**

Characteristic	Value
Rated secondary current	5A
Rated primary current	The primary current has to be selected for the <b>peak</b> rms current (example: starting current 1800A → use current transformer 2000A : 5A)
Accuracy class	1.0 (or better)
Output power	at least 2.5VA (1 ECOsine™ Active ) at least 5.0VA (2 ECOsine™ Active in parallel operation) at least 7.5VA (3 ECOsine™ Active in parallel operation) at least 10.0VA (4 ECOsine™ Active in parallel operation) at least 12.5VA (5 ECOsine™ Active in parallel operation)

### 3.10.2. Current transformer specification for UL conformity

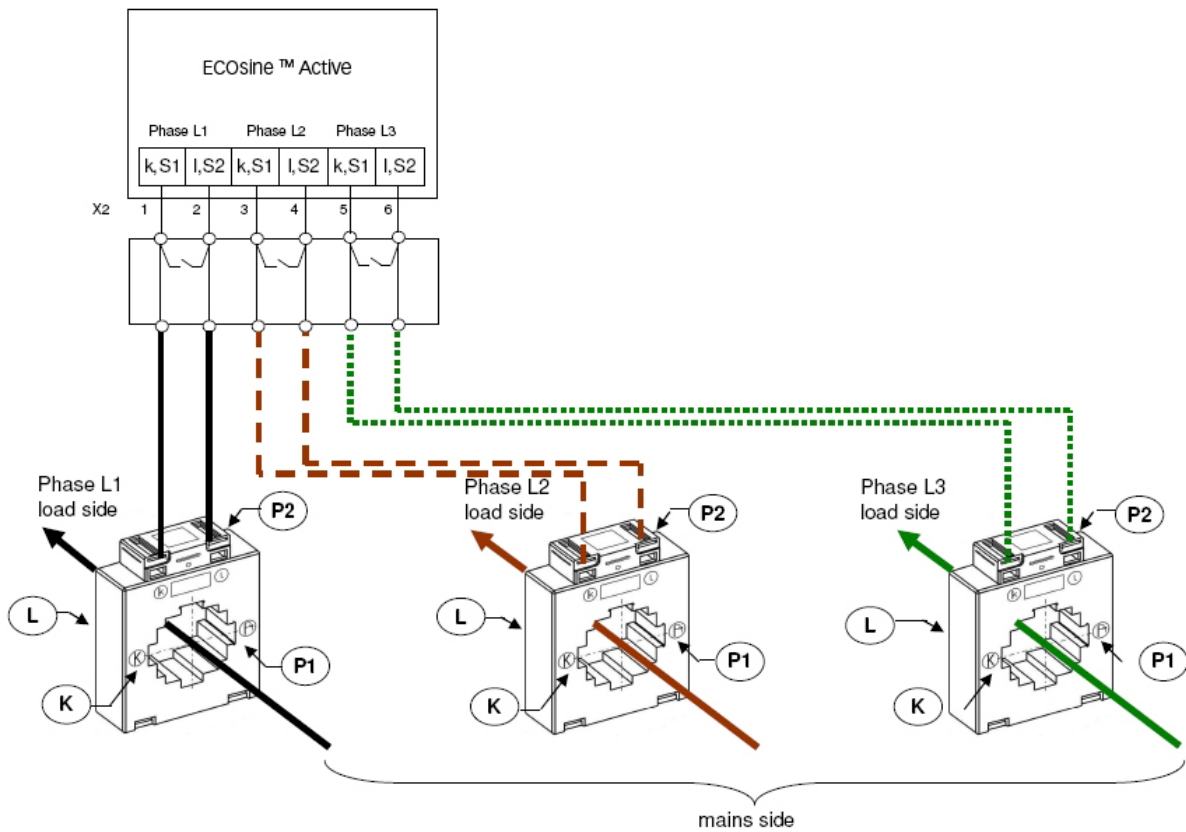
To ensure UL conformity, UL-compliant external current transformers must be used.

**Table 12: Example of a current transformer with UL conformity**

Manufacturer	Current transformer type
Flex Core	FCL-series

### 3.10.3. Current transformer connection for operation of one ECOSine™ Active

To ensure that currents are correctly detected **observe the specified direction of the current flow from the transformers and the correct phase assignment.**



**Fig. 22: Transformer wiring for operation of one ECOSine™ Active**

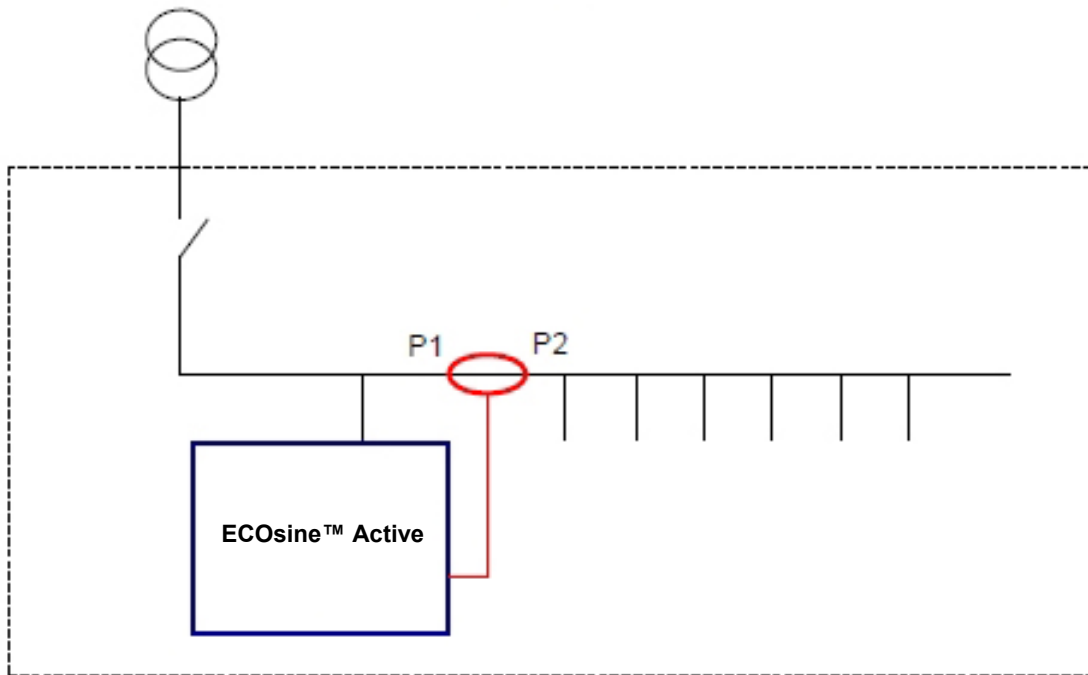


Fig. 23: CT installation on load side for operation of one ECOsine™ Active

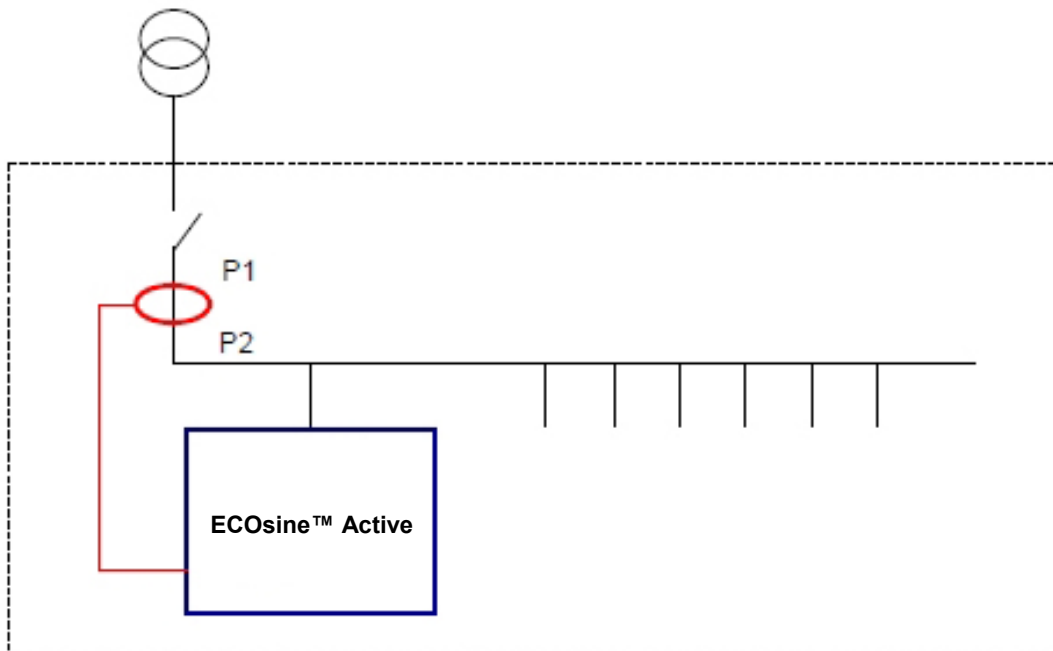


Fig. 24: CT installation on mains side for operation of one ECOsine™ Active

### 3.10.4. Current transformer connection for parallel operation

The available compensation current can be increased through parallel operation of several ECOSine™ Active units. In doing so, the current signal from the external current transformers is looped through all the ECOSine™ Active units in accordance with the following schematic. **The current transformers must be installed on load side (between the mains connection of the filter and the mains connection of the load to be compensated).**

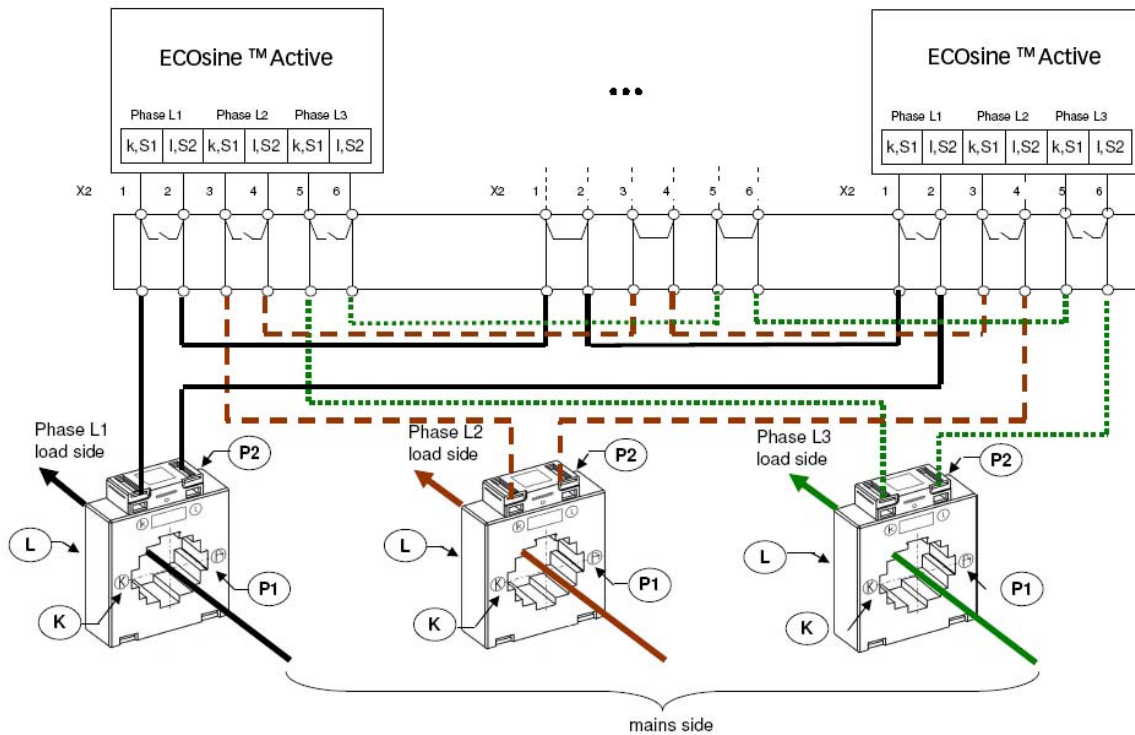


Fig. 25: Current transformer wiring for parallel operation of up to five ECOSine™ Actives

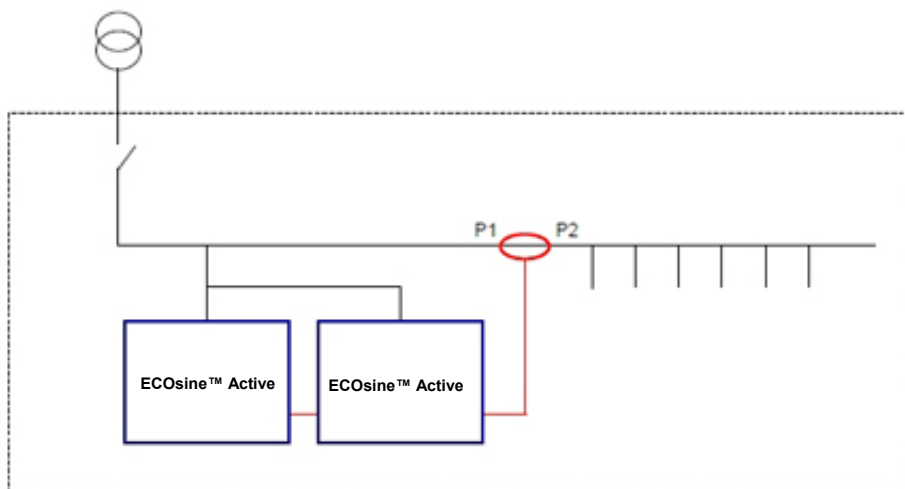


Fig. 26: CT installation on load side for parallel operation of ECOSine™ Active

**Note**

A maximum of five ECOSine™ Active may be operated on **one** current transformer set due to the maximum power output of the external current transformers. Additional current transformers must be installed if more than five devices are to be operated in parallel.

For parallel operation of more than one ECOSine™ Active the current transformers must be installed on **load side** of the filter.

**P320** has to be set to the sum of the entire rated compensation currents connected in parallel (see chapter 4.4).

**3.10.5. Current transformer terminals on the active filter (X2)**

**Table 13: X2 terminal – connection terminals for external current transformers**

X2 terminal	Designation	Comment
1	k, S1	Phase L1 current transformer
2	l, S2	Phase L1 current transformer
3	k, S1	Phase L2 current transformer
4	l, S2	Phase L2 current transformer
5	k, S1	Phase L3 current transformer
6	l, S2	Phase L3 current transformer

**Table 14: cable cross section external current transformers**

Device	Requested cable cross section
ECOSine™ Active -30/50/60/100/120-xxx-x	X2: 2.5mm <sup>2</sup>
ECOSine™ Active -200/250/300-xxx-x	X2: 4.0 ... 6.0mm <sup>2</sup>

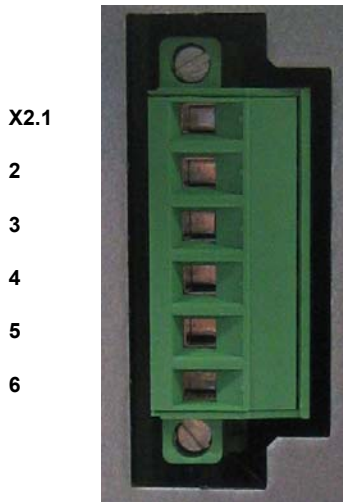
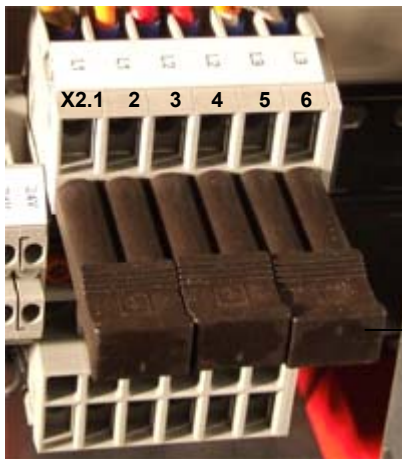


Fig. 27: X2 terminal – external current transformers (ECOsine™ Active -30/50/60/100/120-xxx-x)



Separable short-circuit  
jumpers

Fig. 28: X2 terminal – external current transformers (ECOsine™ Active -200/250/300-xxx-x)

#### External current transformer block necessary

A current transformer terminal block with separable short-circuit plugs must be installed between the external current transformers and the X2 connecting terminal. This is required to short-circuit the current transformers secondaries before disconnecting the X2 terminal from the ECOsine™ Active unit during service work.



**DANGER**

#### Risk of Electric Shock Due to Loose Cables

If inadequately secured live cables may be accidentally disconnected, potentially causing current transformer failure and/or severe electric shock.

⇒ Connector X2 must be secured with the two bolts provided, to prevent inadvertent disconnection.

### 3.11. Connection of the external interfaces

#### 3.11.1. Overview

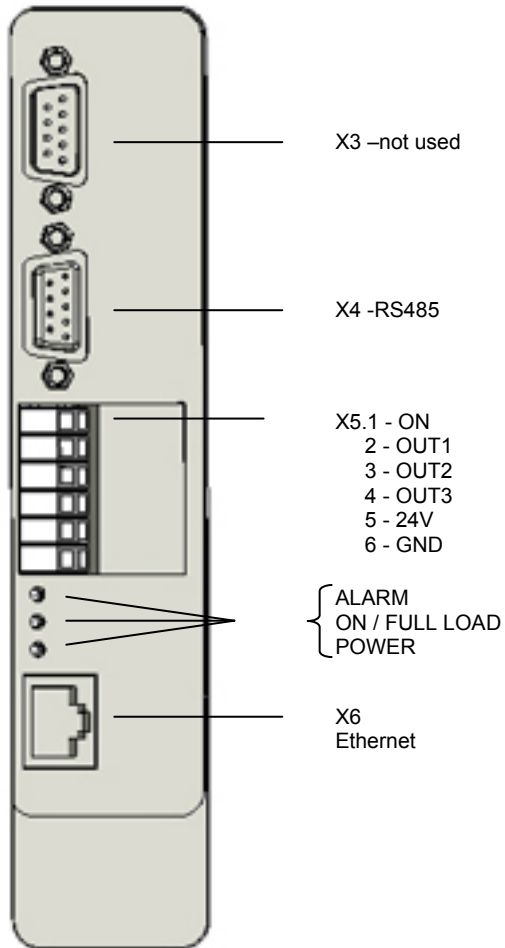


Fig. 29: Position of the control terminals

#### 3.11.2. RS485 (X4) serial service interface

This terminal is used to connect to a PC with the AHF Viewer operating program, details see chapter 6.2.

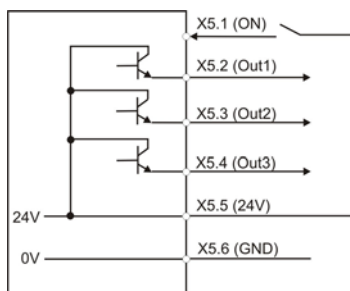
### 3.11.3. Digital inputs and outputs (X5)

ECOSine™ Active has 1 digital input and 3 digital outputs. The function of these inputs and outputs is as follows:

**Table 15: Assignment of the digital inputs and outputs**

X5 terminal	Designation	Comments
1	ON	<b>Digital input</b> 0V (not connected): ECOSine™ Active OFF 24V DC (from X5.5): ECOSine™ Active ON  <b>Input only active, when “P202 = terminal strip”, otherwise ECOSine™ Active is switched on and off by P202</b>
2	OUT1	<b>Digital output</b> (24V, max. 20mA) Low = fault/alarm (“ALARM”) High (24V DC) = normal operation  <b>This is valid for “P201 = low active” (factory setting). Polarity can be adjusted by P201.</b>
3	OUT2	<b>Digital output</b> (24V, max. 20mA) Low = device not in operation High (24V DC) = device in operation (“ON”)
4	OUT3	<b>Digital output</b> (24V, max. 20mA) Low = device not full loaded High (24V DC) = full load (“FULL LOAD”)
5	24 V	Max. 20mA Only to supply the X5.1 digital input, no connection of external loads permitted.
6	GND	Ground 0V (reference potential for digital outputs)

The digital inputs/outputs are short circuit-proof and electrically isolated from the control electronics.



**Fig. 30: Functional connection of digital input/outputs**

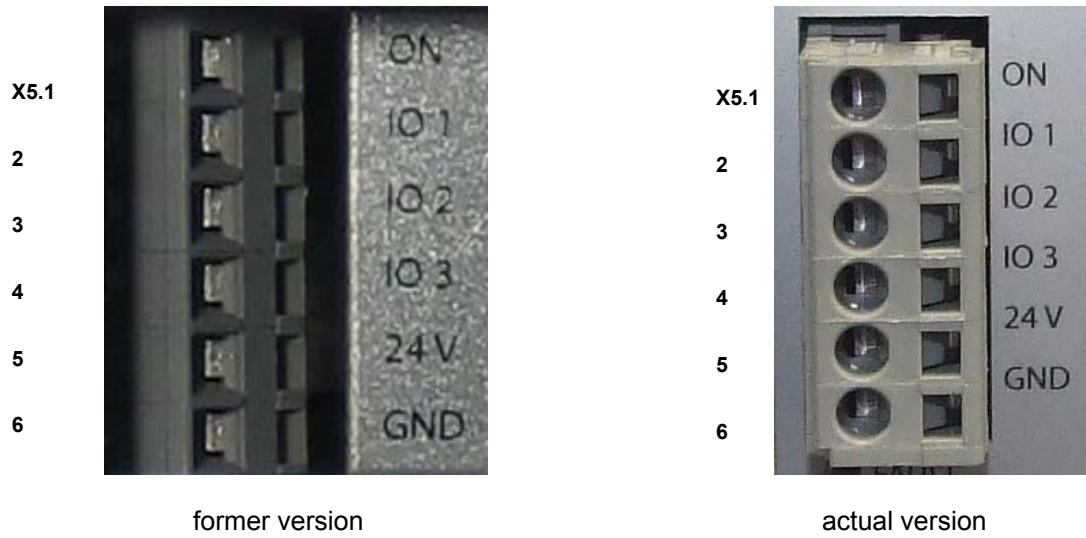


Fig. 31: X5 terminal – digital in- and outputs (ECOsine™ Active -30/50/60/100/120-xxx-x)

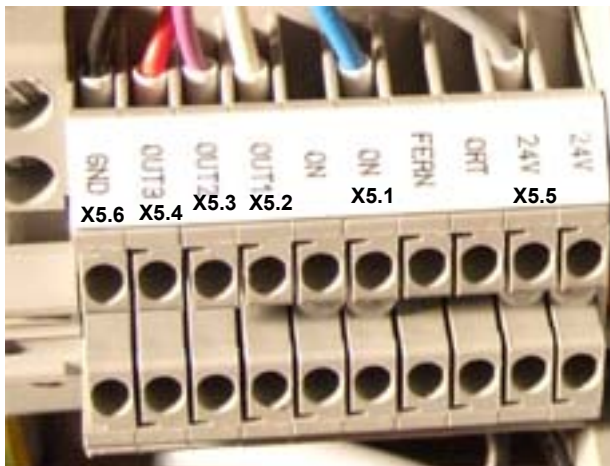


Fig. 32: X5a terminal – digital in- and outputs (ECOsine™ Active -200/250/300-xxx-x)

For ECOsine™ Active -200/250/300-xxx-x an ON-OFF switch is integrated in the cabinet door. The switch connects terminal X5.1 to X5.5



Fig. 33: Integrated switch ON – OFF (ECOsine™ Active -200/250/300-xxx-x)

#### 3.11.4. Ethernet (X6)

This interface is used to connect to a PC with the AHF Viewer operating program or to connect ECOsine™ Active to a LAN network system, details see chapter 6.2.

#### 3.11.5. Meaning of status LED

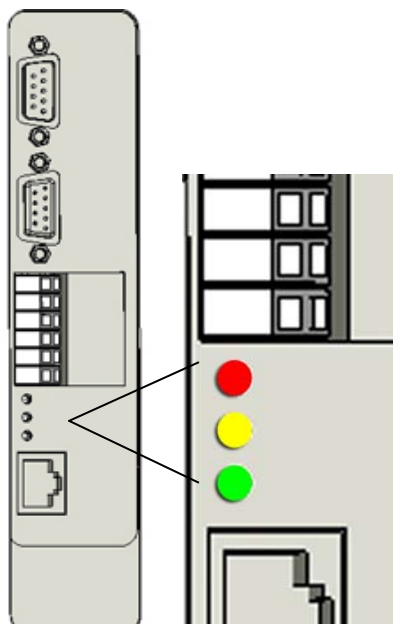





Fig. 34: Meaning of status LED

-  RED  
**Alarm, Unit OFF**  
Corresponds to output X5.2
-  YELLOW  
**ON:** Unit in normal operation (LED remains on)  
Corresponds to output X5.3
- FULL LOAD:** Unit at current limit (LED flashes)  
Corresponds to output X5.4
-  GREEN  
**POWER:** Unit ready, mains voltage is applied  
(LED remains on)  
**STANDBY:** Unit automatic standby (LED flashes)

Continual operation at the load limit is possible; the device reduces the compensation current to the rated value. Operation at the load limit results in a reduction of current and voltage quality at mains connection point. The compensation current may need to be increased (use of additional ECOsine™ Active devices) to attain the desired ac mains quality.

## 4. Commissioning

The ECOsine™ Active harmonic filter is commissioned via the integrated display and keypad.

### 4.1. Integrated display and keypad

The parameter menu is navigated via the integrated keypad:

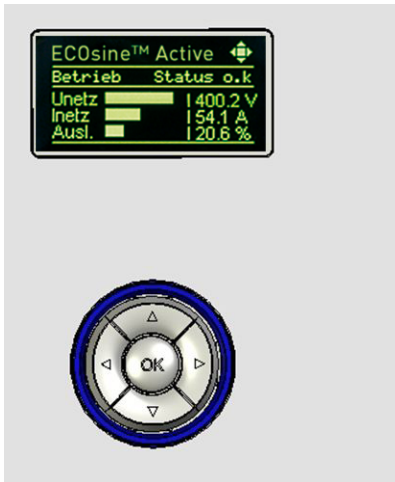


Fig. 35: Display and keypad

The keys have the following functions:

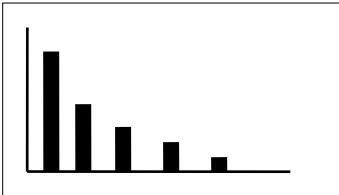
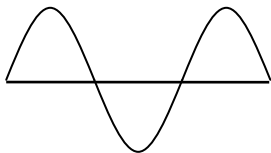
Table 16: Key functions

Key	Function
▶	Go down one menu level
◀	<ul style="list-style-type: none"> <li>▪ Back to the higher menu level, exit menu or</li> <li>▪ Scroll inside information screen</li> </ul>
▲	<ul style="list-style-type: none"> <li>▪ Go up one line or</li> <li>▪ Change information screen</li> </ul>
▼	<ul style="list-style-type: none"> <li>▪ Go down one line</li> <li>▪ Change information screen</li> </ul>
OK	Change parameter, apply value.

### 4.2. Information screen

Starting from basic screen some information windows in level 0 are available. Level 1 can be reached by pressing ▶ from each information screen.

**Table 17: Information screen**

Level 0	Notes
<p><b>ECOsine™ Active xxx</b>                      status                      Uline            xxxV                      I_line            xxxA                      Output            xx%</p>	<p>Basic screen with status information, line values and device output                      Scrolling to next/previous screen with ▼ or ▲.</p>
<p><b>Information</b>                      FWVers            Vxx.xx.xx                      FPVers            V_xx                      LTCVers            V_xx                      roating            right/left                      ...                      MAC                xx.xx.xx.xx                      ...</p>	<p>Information about firmware versions, direction of rotating, MAC address and other internal status information in case of service                      Scrolling from the lines inside the screen by ◀.</p>
<p><b>Harmonics</b></p> 	<p>Harmonics spectrum and THDI of line current phase L1.</p>
<p><b>Mains current</b></p> 	<p>Waveform of mains current phase L1.</p>
<p><b>State</b>                      Pxxx changed                      Full load                      ...</p>	<p>Eventlog of the last events since power on, like changing of parameters, full load (Note: The detailed eventlog is available with software AHF Viewer, see chapter 6).</p>

### 4.3. Parameter menu structure

**Table 18: ECOsine™ Active menu structure**

Level 1	Level 2	Level 3
<b>Main menu</b>	<b>0 device specs</b>	
0 device specs	002 rated current	
1 measurements	003 overload current	
2...5 commissioning	...	
6 fault messages		
	<b>1 measurements</b>	
	100 mains frequency	
	101 THDI L1	
	...	
	<b>2 ... 5 commissioning</b>	<b>2 basic setup</b>
	2 basic setup	200 language
	3 current transformer	201 polarity ALARM X5
	4 operating mode	...
	5 experts	
		<b>3 current transformer</b>
		300 transformer placement
		301 transformer ratio
		...
		<b>4 operating mode</b>
		400 reactive power
		401 power factor
		...
	<b>6 fault messages</b>	
	021 failure cause	

For commissioning, you must check several values in menu 1 and set the parameters in menus 2, 3, and 4. The shown menu structure is an example; all available parameters are explained in Chapter 5.

#### 4.4. Commissioning procedure

1. Make sure that the electrical connection (see chapter 3) has been correctly established. The following prerequisites must be met:
  - Proper external fuses are installed (see chapter 3.7 and 3.8).
  - Mains phases L1, L2, and L3 are connected (see chapter 3.9).
  - External current transformers for all 3 mains phases have been connected, installation position, current direction and phase assignment have been verified (see chapter 3.7).
  - Disconnect the short circuit jumpers of the external currents transformers.

##### Only at ECOsine™ Active -200/250/300-xxx-x:

- Check the coolant pressure (see chapter 3.1.1)
  - Check the seal of the cable entry (see chapter 3.1.3)
  - Disconnect the short circuit jumpers at terminal X2 (see chapter 3.10.5)
  - Drain is connected to a suitable tank or gully (see chapter 3.1.2)
2. Switch ECOsine™ Active control off:
    - Terminal X5.1 = 0V (disconnect the connection of X5.5 to X5.1)
  3. Turn on the mains power. Check whether the DC bus circuit is correctly pre-charged and the mains voltage and frequency have been correctly identified. (Note: a short load current flows into the dc-link.)
    - P100 = 50Hz (60Hz) - mains frequency
    - P110, P111, P112 = approx. 400 ... 480V - mains voltages
    - P103 = approx. 560 ... 650V - DC-Bus voltage
  4. Set factory settings
    - P210 = set factory settings
  5. Parameterize ECOsine™ Active in accordance with your application (see chapter 5 for detailed parameter meanings):
    - P300: Position of the external current transformers (mains side, load side)
    - P310: Transforming ratio of the external current transformers
    - P320: Sum of the rated compensation currents of all ECOsine™ Actives connected to **one** current transformer set (maximum of 5 devices permitted)

6. Check, if the indicated power values make sense. In an environment with symmetric load the values should all be positive and of equal magnitude.

- P105 = + ... kW? – power L1
- P106 = + ... kW? – power L2
- P107 = + ... kW? – power L3
- P105 ≈ P106 ≈ P107? Are all values positive?

Otherwise double-check the wiring of the external current sensors and the parameter settings.

7. Check that the compensation is deactivated (done by setting of factory settings in point 4):

- P400: Reactive power compensation = 0%
- P410: Harmonic current compensation = OFF
- P405: load balancing = OFF

8. Switch ECOsine™ Active control on:

- Terminal X5.1 = 24V (establish the connection from X5.5 to X5.1) **or**
- P202 = „direct ON“

9. Check whether the DC-Bus voltage is properly regulated:

- P103 = approx. 750 ... 820V (depends on device type)

10. Activate the desired type of compensation:

- P400: Reactive power compensation = 0 ... 100%
- P410: Harmonic current compensation = ON

11. If necessary adapt standby threshold (P406) and degrees of compensation (P411 ff).

12. Using a suitable measuring instrument, check for the correct compensation on the mains side.

## 5. Parameter list

All measured values and parameters to be set are identified with a parameter number. The parameters are sorted into groups. The parameter number corresponds to the menu group number in the display.

**Table 19: Overview of the parameter groups**

Parameter group	Meaning	Comments
P0xx	Device data	<b>Read only</b> Display of device data (rated current, overload current, ...)
P1xx	Measured values	<b>Read only</b> Display of measured values (mains voltages, load currents, mains currents, filter currents, intermediate circuit voltages, ...)
P2xx	Basic settings	<b>Commissioning parameter</b> (settings for language, date, ...)
P3xx	Current transformer	<b>Commissioning parameter</b> (settings for current transformer position, transforming ratio, parallel operation of ECOsine™ Active, ...)
P4xx	Type of compensation	<b>Commissioning parameter</b> (activation of reactive power compensation, harmonic current compensation, ...)
P6xx	Alarms	<b>Read only</b> Display of error messages

### 5.1. Parameter groups P0xx, P1xx (read only)

The following parameters display the device data and measured values. Instantaneous values are not shown in the display, as the representation of time-related curves is only useful in AHF Viewer.

**Table 20: Parameters P0xx to P1xx**

No.	Designation	Unit	Meaning
002	rated current	A	RMS value rated current
003	Overload current	A	Maximum overload current – peak value
008	MAC address		MAC Address of control unit example: 08:00:70:22:44:11
009	S/N control board		Serial no. of control unit
010	Firmware version		Version of the device firmware
011	Version LT controller		Version of power section firmware
012	Status LT controller		Version of power board controller
013	Faildcode LT controller		Internal failure code of power board controller
014	Hardware version		Version of hardware
015	Version of device code		Version of device code
016	CT offset L1	mA	CT offset L1 (secondary site)
017	CT offset L2	mA	CT offset L2 (secondary site)
018	CT offset L3	mA	CT offset L3 (secondary site)
020	Status		Current device status
021	Failure cause		Actual failure cause
030	Operating hours	h	Operating hours
100	Mains frequency	Hz	Measured mains frequency
101	THDI	%	Total harmonic distortion mains current L1
102	Power factor		Displacement power factor mains side L1
103	dc bus voltage	V	DC-Bus voltage
104	Usage	%	Device usage, based on the rated current
105	Power L1	kW	RMS value of active power L1
106	Power L2	kW	RMS value of active power L2
107	Power L3	kW	RMS value of active power L3

108	Reactive current device	A	Reactive device current - rms
109	Rotating field		Direction of rotating field
110	U12	V	Mains voltage U12 – rms
111	U23	V	Mains voltage U23 – rms
112	U31	V	Mains voltage U31 – rms
113	U1	V	Phase voltage U1 – instantaneous value
114	U2	V	Phase voltage U2 – instantaneous value
115	U3	V	Phase voltage U3 – instantaneous value
116	U12	V	Linked voltage U12 – instantaneous value
117	U23	V	Linked voltage U23 – instantaneous value
118	U31	V	Linked voltage U31 – instantaneous value
120	$I_{\text{mains rms L1}}$	A	Mains current L1 – rms
121	$I_{\text{mains rms L2}}$	A	Mains current L2 – rms
122	$I_{\text{mains rms L3}}$	A	Mains current L3 – rms
123	$I_{\text{mains L1}}$	A	Mains current L1 – instantaneous value
124	$I_{\text{mains L2}}$	A	Mains current L2 – instantaneous value
125	$I_{\text{mains L3}}$	A	Mains current L3 – instantaneous value
126	$I_{\text{mains N}}$	A	Mains current Neutral – instantaneous value
131	$I_{\text{load rms L2}}$	A	Load current L2– rms
132	$I_{\text{load rms L3}}$	A	Load current L3 – rms
133	$I_{\text{load L1}}$	A	Load current L1 – instantaneous value
134	$I_{\text{load L2}}$	A	Load current L2 – instantaneous value
135	$I_{\text{load L3}}$	A	Load current L3 – instantaneous value
136	$I_{\text{load N}}$	A	Load current Neutral – instantaneous value
140	$I_{\text{ECOsine™ Active rms L1}}$	A	Compensating current L1 – rms
141	$I_{\text{ECOsine™ Active rms L2}}$	A	Compensating current L2 – rms

142	$I_{\text{ECOsine}^{\text{TM}} \text{ Active rms L3}}$	A	Compensating current L3 – rms
143	$I_{\text{ECOsine}^{\text{TM}} \text{ Active L1}}$	A	Compensating current L1 – instantaneous value
144	$I_{\text{ECOsine}^{\text{TM}} \text{ Active L2}}$	A	Compensating current L2 – instantaneous value
145	$I_{\text{ECOsine}^{\text{TM}} \text{ Active L3}}$	A	Compensating current L3 – instantaneous value
146	$I_{\text{ECOsine}^{\text{TM}} \text{ Active N}}$	A	Comp.current Neutral – instantaneous value
147	$I_{\text{mains rms N}}$	A	Mains current Neutral – rms
148	$I_{\text{load rms N}}$	A	Load current Neutral – rms
149	$I_{\text{ECOsine}^{\text{TM}} \text{ Active rms N}}$	A	Compensating current Neutral – rms
180	Modultemp	°C	IGBT-Modultemperature
181	internal temperature	°C	temperature inside active filter
182	fan 3 speed	rpm	speed of fan 3
183	fan 4 speed	rpm	speed of fan 4
198	Switch on slope		Switch on slope 0->1 (for AHF Viewer switch-on-trigger)
199	Switch off slope		Switch off slope 0->1 (for AHF Viewer switch-off-trigger)

### 5.1.1. Parameter groups P2xx, P3xx and P4xx (commissioning parameters)

**Table 21: Parameters P2xx to P410 (basic commissioning)**

Parameter no.	Designation	Factory setting	Meaning
200	Language	German	Language shown on display
201	Polarity ALARM output	Low active	Polarity of Output OUT1 (X5.2) ALARM <ul style="list-style-type: none"> <li>▪ Low active</li> <li>▪ High active</li> </ul>
202	Switch on	Terminal strip	How to switch on ECOsine™ Active <ul style="list-style-type: none"> <li>▪ Terminal strip</li> <li>▪ Direct ON</li> <li>▪ Direct OFF</li> </ul>
210	Set standard values	No action	Set the standard factory settings

220	Date		Actual date and time (please set during 1st start up)  <b>From version V02.06.xx</b>
230	MB node address	1	Modbus node address (1... 255)  <b>From version V02.06.xx</b>
231	MB baudrate	38400	Modbus baudrate (2400 ... 115200)  <b>From version V02.06.xx</b>
232	MB parity	NO	Modbus parity <ul style="list-style-type: none"> <li>▪ NO</li> <li>▪ ODD</li> <li>▪ EVEN</li> </ul> <b>From version V02.06.xx</b>
233	MB Stopbits	1	No. of stop bits <ul style="list-style-type: none"> <li>▪ 0,1,2</li> </ul> (if P233 = 2 then automatically P232 is set to Parity = NO)
240	IP Address	192.168.1.2	IP address <ul style="list-style-type: none"> <li>▪ fix IP address if P241 DHCP = OFF</li> <li>▪ automatic allocation if P241 DHCP = ON</li> </ul> <b>From version V02.06.xx</b>
241	DHCP	ON	Allocation of IP address by DHCP server <ul style="list-style-type: none"> <li>▪ OFF (in that case please set the following parameters:  P240 IP address P242 subnet mask P243 default gateway)</li> <li>▪ ON (in that case the parameters P240, P241 and P242 are allocated automatically by DHCP server)</li> </ul> <b>From version V02.06.xx</b>

242	Subnet mask	255.255.255.0	<p>Subnet mask</p> <ul style="list-style-type: none"> <li>▪ fix subnet mask if P241 DHCP = OFF</li> <li>▪ automatic allocation if P241 DHCP = EIN</li> </ul> <p><b>From version V02.06.xx</b></p>
243	Default gateway	192.168.1.50	<p>Default gateway</p> <ul style="list-style-type: none"> <li>▪ fix address if P241 DHCP = OFF</li> <li>▪ automatic allocation if P241 DHCP = ON</li> </ul> <p><b>From version V02.06.xx</b></p>
300	Current transformer placement	Load side	<p>Placement of the external current transformers</p> <ul style="list-style-type: none"> <li>▪ Load side</li> <li>▪ Mains side</li> </ul>
310	Current transformer ratio	500:5 (A)	<p>Transforming ratio of the external current transformers</p> <p>50:5 up to 50000:5</p>
320	Parallel current	xxA (rated current)	<p>Sum of the rated compensation currents of all ECosine™ Active connected in parallel to one set of current transformers</p>
400	Reactive power compensation	0%	<p>Degree of the reactive power compensation</p> <ul style="list-style-type: none"> <li>▪ 0% ... 100%</li> </ul>
401	Setpoint displacement power factor	0.0	<p>Set point of displacement power factor</p> <ul style="list-style-type: none"> <li>▪ 0.0 ... 1.0</li> </ul> <p>As minimum the reactive current set in P400 is compensated</p> <p><b>From version V02.06.xx</b></p>
405	Load balancing	OFF	<p>Activation or deactivation of load balancing between phases</p> <ul style="list-style-type: none"> <li>▪ ON</li> <li>▪ OFF</li> </ul> <p><b>From version V02.06.xx</b></p>

406	Standby threshold	0%	Automatic standby of ECOsine™ Active, when requested compensating current (rms) is lower than threshold in P406. The hysteresis is 2% of rated current.  0% = no automatic standby
410	Harmonic current compensation	OFF	Activation or deactivation of the harmonic current compensation <ul style="list-style-type: none"><li>▪ ON</li><li>▪ OFF</li></ul>

## 5.2. Adjusting degree of compensation

**Table 22: Parameters P411 to P434 (adjust degree of compensation)**

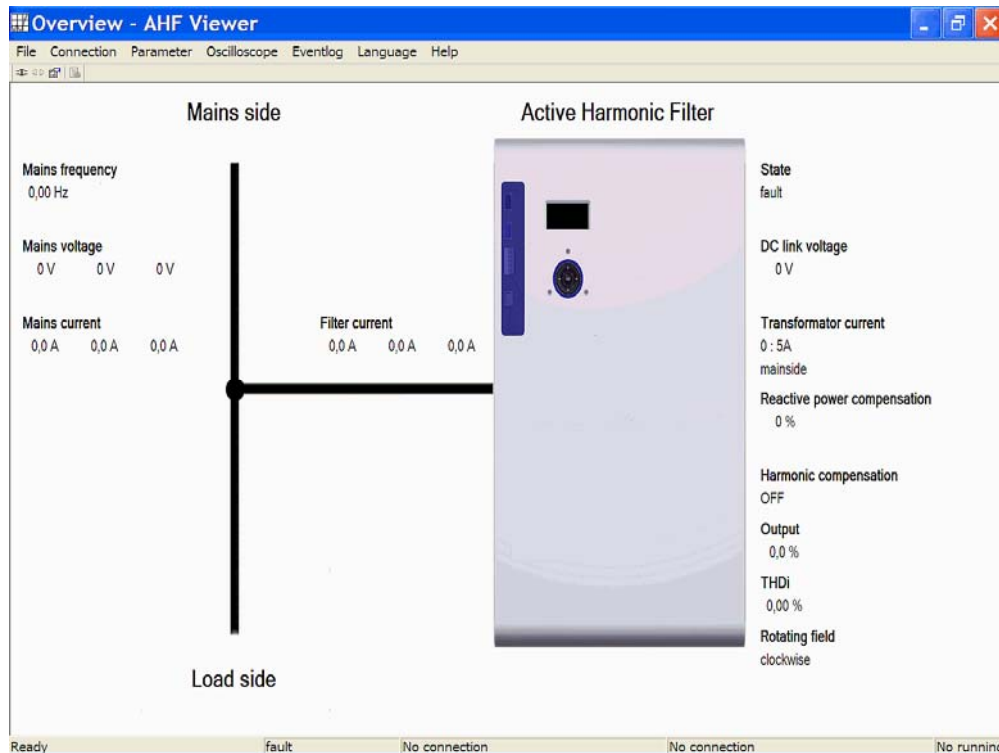
Parameter no.	Designation	Factory setting	Meaning
411	3 <sup>rd</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
412	5 <sup>th</sup> harmonic: degree of compensation	80%	Adjustable degree of compensation 0% ... 100%
413	7 <sup>th</sup> harmonic: degree of compensation	80%	Adjustable degree of compensation 0% ... 100%
414	9 <sup>th</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
415	11 <sup>th</sup> harmonic: degree of compensation	50%	Adjustable degree of compensation 0% ... 100%
416	13 <sup>th</sup> harmonic: degree of compensation	40%	Adjustable degree of compensation 0% ... 100%
417	15 <sup>th</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
418	17 <sup>th</sup> harmonic: degree of compensation	30%	Adjustable degree of compensation 0% ... 100%
419	19 <sup>th</sup> harmonic: degree of compensation	20%	Adjustable degree of compensation 0% ... 100%
420	21 <sup>st</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
421	23 <sup>rd</sup> harmonic: degree of compensation	15%	Adjustable degree of compensation 0% ... 100%
422	25 <sup>th</sup> harmonic: degree of compensation	15%	Adjustable degree of compensation 0% ... 100%
423	27 <sup>th</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
424	29 <sup>th</sup> harmonic: degree of compensation	10%	Adjustable degree of compensation 0% ... 100%
425	31 <sup>st</sup> harmonic: degree of compensation	10%	Adjustable degree of compensation 0% ... 100%

426	33 <sup>rd</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
427	35 <sup>th</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
428	37 <sup>th</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
429	39 <sup>th</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
430	41 <sup>st</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
431	43 <sup>rd</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
432	45 <sup>th</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
433	47 <sup>th</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%
434	49 <sup>th</sup> harmonic: degree of compensation	0%	Adjustable degree of compensation 0% ... 100%

## 6. AHF Viewer PC operating program

The AHF Viewer PC operating program supports ECOsine™ Active commissioning and enables further diagnosis. Details see AHF Viewer online help.

A firmware update of the active filter can be done by using AHF Viewer (only with RS485.)



**Fig. 36: AHF Viewer basic screen**

### 6.1. Hardware prerequisites

AHF Viewer was developed for use with Windows XP. The hardware required to run Windows XP is also sufficient for AHF Viewer.

**Table 23: AHF Viewer prerequisites**

Feature	Level
Operating system	Windows XP, Windows Vista (from AHF Viewer V02.01.x.x, see readme.txt before installation)

### 6.2. Connecting to the PC


The connection is established via the RS485 ECOsine™ Active interface (terminal X4) or connection via Ethernet (terminal X6).

PC connection with RS485 requires a suitable interface converter.

**Table 24: Interface converter specifications RS485**

Designation	
Galvanic isolation	with
Terminating resistance	activated (on last bus participant)
Echo mode	off

**Table 25: Recommended galvanic isolation interface converter USB – RS485**

Designation	Manufacturer	Illustration
USB-485-Mini/OP	www.cti-lean.com	

The connection to ECOsine™ Active uses an interface converter with potential separation via a 2-wire line.

**Table 26: Pin assignment of connecting cable (interface converter – ECOsine™ Active)**

Terminal Interface converter	Terminal X4 ECOsine™ Active	Meaning
A	X4.9	Signal A
B	X4.5	Signal B
	X4.1	Ground (not connected to interface converter)
	X4.2	5V (not connected to interface converter)

For proper operation of RS485 Bus a **termination resistor 120Ω** is recommended especially if long cables or a bus structure with more than one unit is used.

The interfaces are configured by the following parameters, see chapter 5.

**Table 27: Parameters for interface setting**

RS485 (X4)	Ethernet (X6)
Parameter 230 - 233	Parameter 240 - 243

## 7. Technical Data

### 7.1. General technical data

**Table 28: General technical data ECosine™ Active filters**

Characteristic	Value	Comment
altitude	Up to 1000m without derating of compensating current  From 1000 up to 4000m internal derating 1%/100m	Attention!  If the device is used in altitudes >2000m, the transient voltages (1.2µs/50µs) must not exceed the following values :  3000m: max. 3.51kV  4000m: max. 3.10kV  ECosine™ Active is designed according to over voltage class III (EN50178)
Installation	upright	The device has to be installed in upright position.
Current transformer	50:5 up to 50000:5	Adjustable in 1A steps
Parallel operation	Parallel operation of up to 5 units on <b>one</b> current transformer set	For parallel operation of more than 5 units use an additional set of current transformers
EMC	EN 61000-6-4 EN 61000-6-2 EN 61800-3 (C2)	

**Table 29: ECOsine™ Active -030-xxx-3/4 technical data**

	<b>Value</b>
Rated compensation current (continuous operation at the load limit possible)	30A (phase) 90A (neutral, only ECOsine™ Active -030-400-4)
Overload capability	75A (peak value) for 10 ms
Modulation frequency	16kHz
Cooling type	Fan cooled
Ambient temperature	0 - 40°C, up to 55°C with derating (2%/K)
Power dissipation	max. 900W (ECOsine™ Active -030-480-3) max. 950W (ECOsine™ Active -030-400-4)
Cooling air demand (at full load)	ca. 350m <sup>3</sup> /h (ECOsine™ Active -030-480-3) ca. 400m <sup>3</sup> /h (ECOsine™ Active -030-400-4)
Mains frequency	47 to 63Hz
Mains voltage	<u>ECOsine™ Active -030-480-3</u> 380V (AC) ± 15% ... 480V (AC) ± 10% <u>ECOsine™ Active -030-400-4</u> 380V ± 15% ... 415V (AC) ± 10%
Phase connection	3 phases + PE (ECOsine™ Active -030-480-3) 3 phases + N + PE (ECOsine™ Active -030-400-4)
Protection class	IP20
Dimensions (W x H x D)	360 x 590 x 290mm (ECOsine™ Active -030-480-3) 415 x 840 x 300mm (ECOsine™ Active -030-400-4)
Weight	47kg (ECOsine™ Active -030-480-3) 70kg (ECOsine™ Active -030-400-4)
Approval	CE, UL (only 3-wire devices)

**Table 30: ECOsine™ Active -050-480-3 technical data**

	<b>Value</b>
Rated compensation current (continuous operation at the load limit possible)	50A
Overload capability	125A (peak value) for 10ms
Modulation frequency	16kHz
Cooling type	Fan cooled
Ambient temperature	0 - 40°C, up to 55°C with derating (2%/K)
Power dissipation	Max. 1300W
Cooling air demand (at full load)	ca. 550m <sup>3</sup> /h
Mains frequency	47 to 63Hz
Mains voltage	380V (AC) ± 15% ... 480V (AC) ± 10%
Phase connection	3 phases + PE
Protection class	IP20
Dimensions (W x H x D)	360 x 590 x 290mm
Weight	47kg
Approval	CE, UL

**Table 31: ECOsine™ Active -060-400-4 technical data**

	<b>Value</b>
Rated compensation current (continuous operation at the load limit possible)	60A (phase) 180A (neutral)
Overload capability	150A (peak value) for 10ms
Modulation frequency	16kHz
Cooling type	Fan cooled
Ambient temperature	0 - 30°C, up to 55°C with derating (2%/K)
Power dissipation	max. 1800W
Cooling air demand (at full load)	ca. 600m <sup>3</sup> /h
Mains frequency	47 to 63Hz
Mains voltage	380V (AC) ± 15% ... 415V (AC) ± 10%
Phase connection	3 phases + N + PE
Protection class	IP20
Dimensions (W x H x D)	415 x 840 x 300 mm
Weight	70kg
Approval	CE

**Table 32: ECOsine™ Active -100-xxx-3/4 technical data**

	<b>Value</b>
Rated compensation current (continuous operation at the load limit possible)	100A (phase) 300A (neutral, only ECOsine™ Active -100-400-4)
Overload capability	250A (peak value phase current) for 10ms
Modulation frequency	16kHz
Cooling type	Fan cooled
Ambient temperature	0 - 40°C, up to 55°C with derating (2%/K)
Power dissipation	max. 2500W (ECOsine™ Active -100-480-3) max. 3000W (ECOsine™ Active -100-400-4)
Cooling air demand (at full load)	ca. 1400m <sup>3</sup> /h (ECOsine™ Active -100-480-3) ca. 1700m <sup>3</sup> /h (ECOsine™ Active -100-400-4)
Mains frequency	47 to 63Hz
Mains voltage	<u>ECOsine™ Active -100-480-3</u> 380V (AC) ± 15% ... 480V (AC) ± 10% <u>ECOsine™ Active -100-400-4</u> 380V ± 15% ... 415V (AC) ± 10%
Phase connection	3 phases + PE (ECOsine™ Active -100-480-3) 3 phases + N + PE (ECOsine™ Active -100-400-4)
Protection class	IP20
Dimensions (W x H x D)	468 x 970 x 412mm (ECOsine™ Active -100-480-3) 468 x 1460 x 412mm (ECOsine™ Active 100-400-4)
Weight	105kg (ECOsine™ Active -100-480-3) 145kg (ECOsine™ Active -100-400-4)
Approval	CE, UL (only 3-wire devices)

**Table 33: ECOsine™ Active -120-xxx-3/4 technical data**

	<b>Value</b>
Rated compensation current (continuous operation at the load limit possible)	120A (phase) 300A (neutral, only ECOsine™ Active -120-400-4)
Overload capability	250A (peak value phase current) for 10 ms
Modulation frequency	16kHz
Cooling type	Fan cooled
Ambient temperature	0 - 30°C, up to 40°C with derating (1.2%/K), up to 55°C with derating (2%/K)
Power dissipation	max. 2200W (ECOsine™ Active -120-480-3) max. 3000W (ECOsine™ Active -120-400-4)
Cooling air demand (at full load)	ca. 1400m <sup>3</sup> /h (ECOsine™ Active -120-480-3) ca. 1700m <sup>3</sup> /h (ECOsine™ Active -120-400-4)
Mains frequency	47 to 63Hz
Mains voltage	<u>ECOsine™ Active -120-480-3</u> 380V (AC) ± 15% ... 480V (AC) ± 10% <u>ECOsine™ Active -120-400-4</u> 380V ± 15% ... 415V (AC) ± 10%
Phase connection	3 phases + PE (ECOsine™ Active -120-480-3) 3 phases + N + PE (ECOsine™ Active -120-400-4)
Protection class	IP20
Dimensions (W x H x D)	468 x 970 x 412mm (ECOsine™ Active -120-480-3) 468 x 1460 x 412mm (ECOsine™ Active -120-400-4)
Weight	105kg (ECOsine™ Active -120-480-3) 145kg (ECOsine™ Active -120-400-4)
Approval	CE

**Table 34: ECOsine™ Active -200-xxx-3/4 technical data**

	<b>Value</b>
Rated compensation current (continuous operation at the load limit possible)	200A (phase) 600A (neutral, only ECOsine™ Active -200-400-4)
Overload capability	500A (peak value phase current) for 10ms
Modulation frequency	16kHz
Cooling type	Fan cooled
Ambient temperature	0 - 40°C, up to 55°C with derating (2%/K)
Power dissipation	max. 5000W (ECOsine™ Active -200-480-3) max. 5500W (ECOsine™ Active -200-400-4)
Cooling air demand (at full load)	ca. 2600m <sup>3</sup> /h (ECOsine™ Active -200-480-3) ca. 2800m <sup>3</sup> /h (ECOsine™ Active -200-400-4)
Mains frequency	47 to 63Hz
Mains voltage (Other voltages on request)	<u>ECOsine™ Active -200-480-3</u>  <b>50Hz:</b> 380V (AC) ± 15% ... 415V (AC) ± 10% <b>60Hz:</b> 480V (AC) ± 10%  <u>ECOsine™ Active -200-400-4</u>  <b>50Hz:</b> 380V ± 15% ... 415V (AC) ± 10%
Phase connection	3 phases + PE (ECOsine™ Active -200-480-3) 3 phases + N + PE (ECOsine™ Active -200-400-4)
Protection class	IP54
Dimensions (W x H x D)	800 x 2000 x 600mm Height plus socket (200mm standard) Depth including heat exchanger 760mm
Weight	415kg (ECOsine™ Active -200-480-3) 495kg (ECOsine™ Active -200-400-4)
Approval	CE, UL (pending)

**Table 35: ECOsine™ Active -250-xxx-3/4 technical data**

	<b>Value</b>
Rated compensation current (continuous operation at the load limit possible)	250A (phase) 750A (neutral, only ECOsine™ Active -250-400-4)
Overload capability	625A (peak value phase current) for 10 ms
Modulation frequency	16kHz
Cooling type	Fan cooled
Ambient temperature	0 - 40°C, up to 55°C with derating (2%/K)
Power dissipation	max. 6000W (ECOsine™ Active 250-480-3) max. 6500W (ECOsine™ Active 250-400-4)
Cooling air demand (at full load)	ca. 3100m <sup>3</sup> /h (ECOsine™ Active 250-480-3) ca. 3300m <sup>3</sup> /h (ECOsine™ Active 250-400-4)
Mains frequency	47 to 63Hz
Mains voltage (Other voltages on request)	<u>ECOsine™ Active -250-480-3</u> <b>50Hz:</b> 380V (AC) ± 15% ... 415V (AC) ± 10% <b>60Hz:</b> 480 V (AC) ± 10% <u>ECOsine™ Active -250-400-4</u> <b>50Hz:</b> 380V ± 15% ... 415V (AC) ± 10%
Phase connection	3 phases + PE (ECOsine™ Active -250-480-3) 3 phases + N + PE (ECOsine™ Active -250-400-4)
Protection class	IP54
Dimensions (W x H x D)	800 x 2000 x 600mm Height plus socket (200mm standard) Depth including heat exchanger 760mm
Weight	415kg (ECOsine™ Active E -250-480-3) 495kg (ECOsine™ Active -250-400-4)
Approval	CE, UL (only 3-wire devices)

**Table 36: ECOsine™ Active -300-xxx-3/4 technical data**

	<b>Value</b>
Rated compensation current (continuous operation at the load limit possible)	300A (phase) 750A (neutral, only ECOsine™ Active -300-400-4)
Overload capability	750A (peak value phase current) for 10 ms
Modulation frequency	16kHz
Cooling type	Fan cooled
Ambient temperature	0 - 40°C, up to 55°C with derating (2%/K)
Power dissipation	max. 7500W (ECOsine™ Active 300-480-3) max. 8500W (ECOsine™ Active 300-400-4)
Cooling air demand (at full load)	ca. 3400m <sup>3</sup> /h (ECOsine™ Active 300-480-3) ca. 3600m <sup>3</sup> /h (ECOsine™ Active 300-400-4)
Mains frequency	47 to 63Hz
Mains voltage (Other voltages on request)	<u>ECOsine™ Active -300-480-3</u> <b>50Hz:</b> 380V (AC) ± 15% ... 415V (AC) ± 10% <b>60Hz:</b> 480V (AC) ± 10% <u>ECOsine™ Active -300-400-4</u> <b>50Hz:</b> 380V ± 15% ... 415V (AC) ± 10%
Phase connection	3 phases + PE (ECOsine™ Active -300-480-3) 3 phases + N + PE (ECOsine™ Active -300-400-4)
Protection class	IP54
Dimensions (W x H x D)	800 x 2000 x 600mm Height plus socket (200mm standard) Depth including heat exchanger 760mm
Weight	415kg (ECOsine™ Active -300-480-3) 495kg (ECOsine™ Active -300-400-4)
Approval	CE, UL (only 3-wire devices)



POWER QUALITY MANAGEMENT LTD  
PO BOX 76  
BLAKENEY  
GLOUCESTERSHIRE  
GL15 4WU  
Tel: 01594 510670  
Fax: 01594 5161700  
[info@pqmanagement.co.uk](mailto:info@pqmanagement.co.uk)  
[www.bluewaveuk.com](http://www.bluewaveuk.com)