POE.4AT-AC1

53V, 4x 30W, Single Phase Input

PoE Power supply

- AC 100-240V Wide-range input
- PULS Power Supply integrated
- Width only 77mm
- 4x 30W ports (acc. to IEEE 802.3at)
- Data transfer rate up to 1000Mbps
- Temperature range -25°C to +70°C
- Plug & Play installation and DIN rail mounting
- 3 Year warranty

Product Description

The POE.4AT-AC1 is a DIN rail mountable Power over Ethernet (PoE) injector which comes with an integrated PULS Power Supply of the highly reliable DIMENSION product family. It can inject full 30W to each of 4 individual PoE channels (according to IEEE 802.3at) via RJ45 Ethernet ports, so no power sharing is limiting the use of single channels. The device can supply powered devices PD of type1 and type2 (PoE+).

If more channels are needed you might also be interested in the 8 channels version, POE.8AT-AC1 with the same housing size.

Short-form Data

AC Input voltage range	AC 100-240V	Suitable for TN-, TT- and IT- main networks
DC Output voltage range	48 – 56Vdc	Factory setting 53V (For PoE+ the output voltage must be above 50V)
Output power	4x 30W (PoE+)	-25°C to +60°C ambient
	4x 15.4W (PoE)	-25°C to +70°C ambient
Output current limitation per channel	0.63A (PoE+)	-25°C to +60°C ambient
	0.33A (PoE)	-25°C to +70°C ambient
Efficiency	91.6%	At 230Vac
Losses	11.0W	At 230Vac
Temperature range	-25°C to +70°C	
Size (wxhxd)	77x128x117mm	Without DIN rail
Weight	850g / 1.87 lb	

Order Numbers

PoE Power Supply	**POE.4AT-AC1**
Mechanical Accessory	ZM10.WALL Wall/panel mount bracket

Main Approvals

For details and the complete approval list, see chapter 19.

c UL us LISTED

UL 61010-2-201
(planned)

INDEX

TERMINOLOGY AND ABREVIATIONS

PE and ⏚ symbol	PE is the abbreviation for **P**rotective **E**arth and has the same meaning as the symbol ⏚.
Earth, Ground	This document uses the term “earth” which is the same as the U.S. term “ground”.
t.b.d.	To be defined, value or description will follow later.
AC 230V	A figure displayed with the AC or DC before the value represents a nominal voltage with standard tolerances (usually ±15%) included. E.g.: DC 12V describes a 12V battery disregarding whether it is full (13.7V) or flat (10V)
230Vac	A figure with the unit (Vac) at the end is a momentary figure without any additional tolerances included.
50Hz vs. 60Hz	As long as not otherwise stated, AC 100V and AC 230V parameters are valid at 50Hz mains frequency. AC 120V parameters are valid for 60Hz mains frequency.
may	A key word indicate flexibility of choice with no implied preference.
shall	A key word indicate a mandatory requirement.
should	A key word indicate flexibility of choice with a strongly preferred implementation.

1. INTENDED USE

This device is designed for installation in an enclosure and is intended for commercial use, such as in industrial control, process control, monitoring and measurement equipment or the like.

The device is suitable for indoor applications. Outdoor applications are also allowed as long as all requirements specified in this manual (enclosure, controlled environment, condensation, ...) are met.

Do not use this device in equipment, where malfunctioning may cause severe personal injury or threaten human life without additional appropriate safety devices, that are suited for the end-application.

If this device is used in a manner outside of its specification, the protection provided by the device may be impaired.

2. INSTALLATION INSTRUCTIONS

⚠ WARNING **Risk of electrical shock, fire, personal injury or death.**

- Turn power off before working on the device and protect against inadvertent re-powering.
- Do not open, modify or repair the device.
- Use caution to prevent any foreign objects from entering into the housing.
- Do not use in wet locations or in areas where moisture or condensation can be expected.
- Do not touch during power-on, and immediately after power-off. Hot surface may cause burns.

Obey the following installation instructions:

This device may only be installed and put into operation by qualified personnel.

This device does not contain serviceable parts.

If damage or malfunction should occur during installation or operation, immediately turn power off and send unit to the factory for inspection.

Install device in an enclosure providing protection against electrical, mechanical and fire hazards.

Install the device onto a DIN rail according to EN 60715 with the input terminals on the bottom of the device.

Make sure that the wiring is correct by following all local and national codes. Use appropriate copper cables that are designed for a minimum operating temperature of 60°C for ambient temperatures up to +45°C, 75°C for ambient temperatures up to +60°C and 90°C for ambient temperatures up to +70°C. Ensure that all strands of a stranded wire enter the terminal connection. Use ferrules for wires on the input terminals. Unused screw terminals should be securely tightened. Use shielded twisted pair Ethernet cables specified for usage in IEEE 802.3at.

The device is designed for pollution degree 2 areas in controlled environments. No condensation or frost is allowed.

The enclosure of the device provides a degree of protection of IP20. The enclosure does not provide protection against spilled liquids.

The device is designed for overvoltage category III zones. The device is designed as “Class of Protection I” equipment according to IEC 61140. Do not use without a proper PE (Protective Earth) connection.

The device is suitable to be supplied from TN, TT or IT mains networks. The continuous voltage between the input terminal and the PE potential must not exceed 264Vac.

The input can also be powered from batteries or similar DC sources. The continuous voltage between the supply voltage and the PE/ground potential must not exceed 180Vdc.

A disconnecting means shall be provided for the input of the device.

The device is designed for convection cooling and does not require an external fan. Do not obstruct airflow and do not cover ventilation grid!

The device is designed for altitudes up to 2000m (6560ft).

Keep the following minimum installation clearances: 40mm on top, 20mm on the bottom, 5mm left and right side. Increase the 5mm to 15mm in case the adjacent device is a heat source. When the device is permanently loaded with less than 50%, the 5mm can be reduced to zero.

The device is designed, tested and approved for branch circuits up to 20A without additional protection device. If an external fuse is utilized, do not use circuit breakers smaller than 6A B- or C-Characteristic to avoid a nuisance tripping of the circuit breaker.

The maximum surrounding air temperature is +70°C (+158°F). The operational temperature is the same as the ambient or surrounding air temperature and is defined 2cm below the device.

The device is designed to operate in areas between 5% and 95% relative humidity.

Do not plug or unplug the device as long as input voltage is present.

Do not unplug input connectors more often than 20 times in total.

3. AC-INPUT

AC input	nom.	AC 100-240V	Suitable for TN-, TT- and IT mains networks
Allowed voltage L or N to earth	max.	264Vac	Continuous according to IEC 62477-1
Input frequency	nom.	50–60Hz	±6%
Turn-on voltage	typ.	80Vac	Steady-state value, see Fig. 3-1
Shut-down voltage	typ.	70Vac	Steady-state value, see Fig. 3-1
	typ.	55Vac	Dynamic value for maximal 250ms

		AC 100V	AC 120V	AC 230V	
Input current	typ.	1.35A	1.13A	0.63A	At 53V, 4x 30W
Power factor*)	typ.	0.99	0.98	0.90	At 53V, 4x 30W
Turn-on time **)	typ.	763ms	753ms	700ms	
External input protection	See recommendations in chapter 23.1				

*) The power factor is the ratio of the true (or real) power to the apparent power in an AC circuit.
**) Including device detection

Fig. 3-1 **Input voltage range**

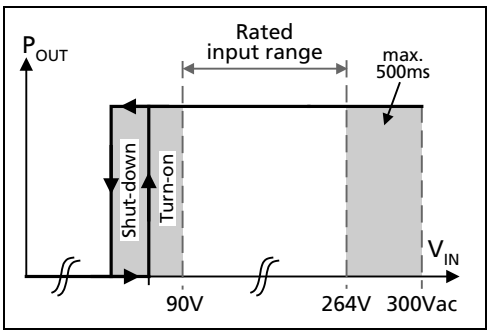


Fig. 3-2 **Input current vs. output power at 53V output voltage**

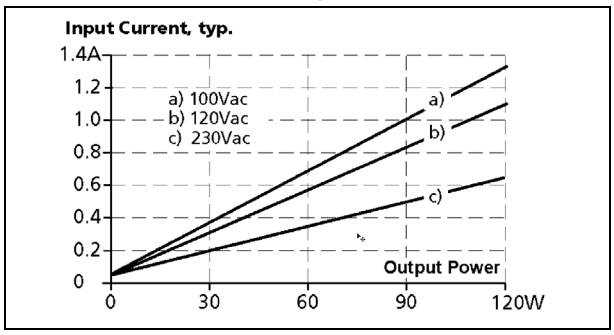
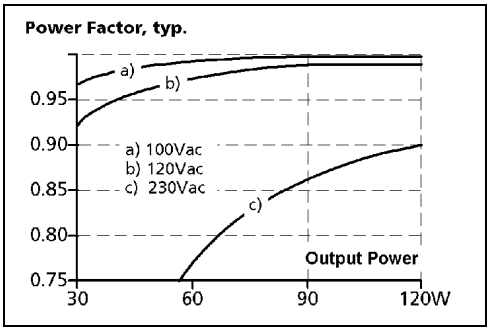


Fig. 3-3 **Power factor vs. output power at 53V output voltage**



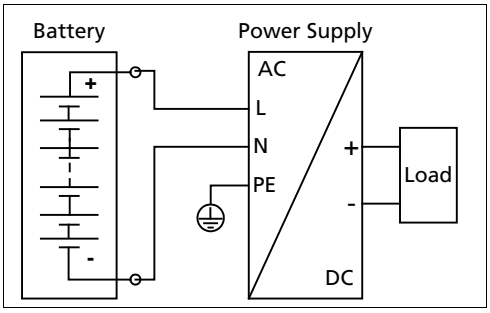
4. DC-INPUT

DC input	nom.	DC 110-150V	±20%
DC input range		88-180Vdc	Continuous operation
DC input current	typ.	1.20A	At 110Vdc
Allowed voltage L/N to Earth	max.	180Vdc	Continuous, according to IEC 62477-1
Turn-on voltage	typ.	80Vdc	Steady state value
Shut-down voltage	typ.	70Vdc	Steady state value
	typ.	55Vdc	Dynamic value for maximal 250ms
External input protection	See recommendations in chapter 23.1		

Instructions for DC use:

a) Use a battery or a similar DC source. A supply from the intermediate DC-bus of a frequency converter is not recommended and can cause a malfunction or damage the unit.
b) Connect +pole to L and –pole to N.
c) Connect the PE terminal to an earth wire or to the machine ground.

Fig. 4-1 **Wiring for DC Input**



5. INPUT INRUSH CURRENT

An active inrush limitation circuit (NTCs, which are bypassed by a relay contact) limits the input inrush current after turn-on of the input voltage.

The charging current into EMI suppression capacitors is disregarded in the first microseconds after switch-on.

		AC 100V	AC 120V	AC 230V	
Inrush current	max.	$11A_{peak}$	$7A_{peak}$	$11A_{peak}$	At 40°C, cold start
	typ.	$9A_{peak}$	$6A_{peak}$	$6A_{peak}$	At 25°C, cold start
	typ.	$9A_{peak}$	$6A_{peak}$	$9A_{peak}$	At 40°C, cold start
Inrush energy	max.	$0.1A^2s$	$0.1A^2s$	$0.4A^2s$	At 40°C, cold start

Fig. 5-1 **Typical turn-on behaviour at nominal load, 120Vac input and 25°C ambient**

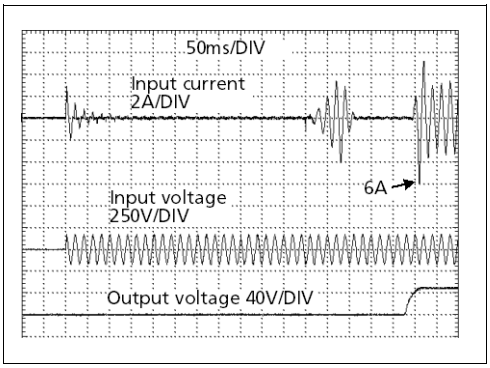
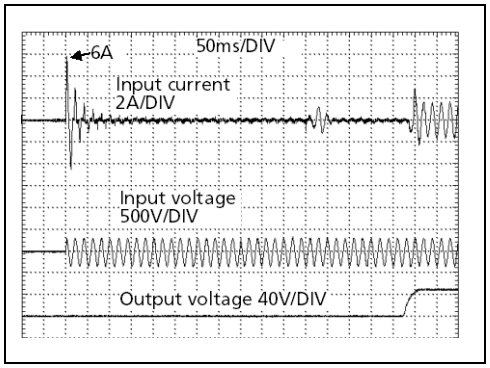


Fig. 5-2 **Typical turn-on behavior at nominal load, 230Vac input and 25°C ambient**



6. OUTPUT

Output voltage	Nom.	53V	
Adjustment range		48-56V	Guaranteed value
	max.	58.0V	This is the maximum output voltage which can occur at the clockwise end position of the potentiometer due to tolerances. It is not a guaranteed value which can be achieved.
Factory settings	typ.	53V	At full load and cold unit
Line regulation	max.	10mV	Between 85 and 264Vac
Load regulation	max.	50mV	Between 0 and 2.3A, static value
Ripple and noise voltage	max.	50mVpp	Bandwidth 20Hz to 20MHz, 50Ohm
RJ45 Output channels		4x 30W (PoE+)	-25°C to +60°C ambient
		4x 15.4W (PoE)	-25°C to +70°C ambient
Output current limitation		0.63A (PoE+)	-25°C to +60°C ambient
		0.33A (PoE)	-25°C to +70°C ambient

7. HOLD-UP TIME

		AC 100V	AC 120V	AC 230V	
Hold-up Time	min.	50ms	50ms	50ms	4x 30W PoE

Fig. 7-1 **Hold-up time vs. input voltage**

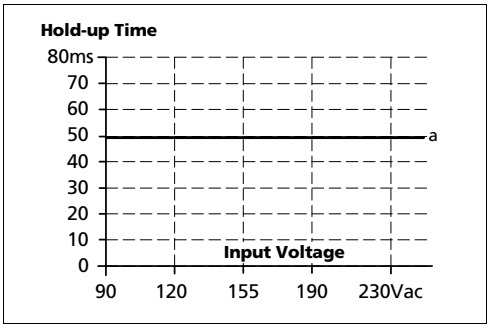
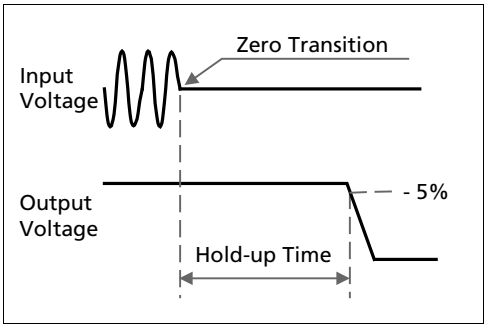


Fig. 7-2 **Shut-down behaviour, definitions**



8. DC-OK RELAY CONTACT

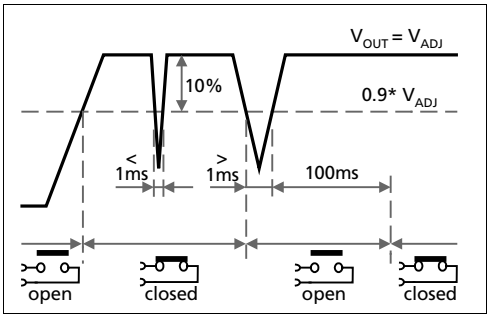
This feature monitors the output voltage on the output terminals of a running power supply.

Contact closes	As soon as the output voltage reaches typ. 90% of the adjusted output voltage level.
Contact opens	As soon as the output voltage dips more than 10% below the adjusted output voltage. Short dips will be extended to a signal length of 100ms. Dips shorter than 1ms will be ignored.
Switching hysteresis	typ. 2V
Contact ratings	Maximal 60Vdc 0.3A, 30Vdc 1A, 30Vac 0.5A, resistive load Minimal permissible load: 1mA at 5Vdc
Isolation voltage	See dielectric strength table in chapter 18.

⚠ WARNING

In order to fulfil the IEEE 802.3at requirements, external equipment and wiring connected to the DC-OK contact need to have a minimum isolation strength of 1500Vac to ground.

Fig. 8-1 **DC-OK relay contact behavior**



9. EFFICIENCY AND POWER LOSSES

		AC 100V	AC 120V	AC 230V	
Efficiency (AC/DC)	typ.	89.8%	90.4%	91.6%	at 4x 30W output
Power losses (AC/DC incl. injection)	typ.	13.6W	12.7W	11.0W	at 4x 30W output

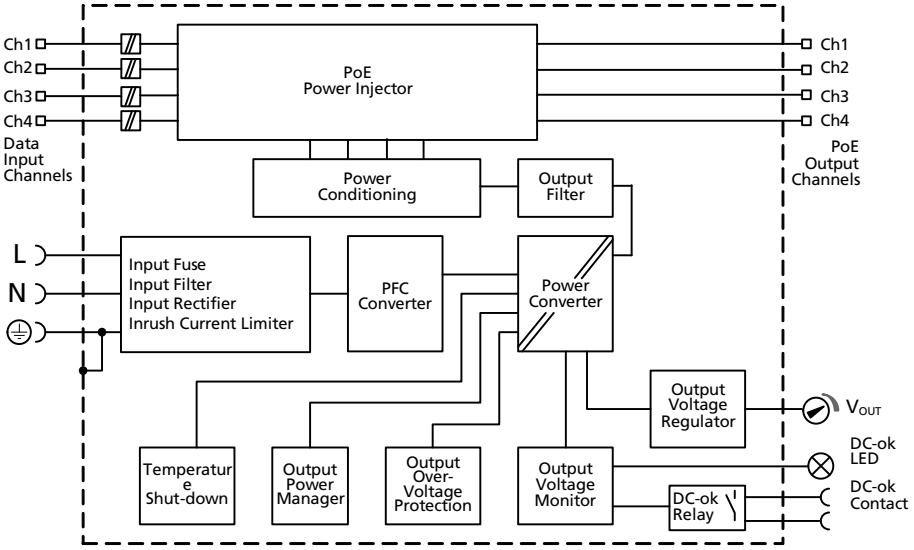
10. LIFETIME EXPECTANCY

The Lifetime expectancy shown in the table indicates the minimum operating hours (service life) and is determined by the lifetime expectancy of the built-in electrolytic capacitors. Lifetime expectancy is specified in operational hours and is calculated according to the capacitor's manufacturer specification. The manufacturer of the electrolytic capacitors only guarantees a maximum life of up to 15 years (131 400h). Any number exceeding this value is a calculated theoretical lifetime which can be used to compare devices.

	AC 100V	AC 120V	AC 230V	
Lifetime expectancy	141 000h	158 000h	188 000h	At 53V, 4x 30W and 40°C
	399 000h	446 000h	531 000h	At 53V, 4x 30W and 25°C

11. FUNCTIONAL DIAGRAM

Fig. 11-1 **Functional diagram**



12. TERMINALS AND WIRING

The terminals are IP20 finger safe constructed and suitable for field- and factory wiring.

	Input	**DC-OK-Signal**
Type	Plug connector with screw terminals	Plug connector with screw terminals
Solid wire	max. 4mm²	max. 1.5mm²
Stranded wire	max. 2.5mm²	max. 1.5mm²
American Wire Gauge	AWG 20-12	AWG 26-14
Max. wire diameter (including ferrules)	2.4mm	1.8mm
Recommended tightening torque	max. 0.5nm, 4.5lb-in	max. 0.8nm, 7lb-in
Wire stripping length	7mm / 0.28inch	6mm / 0.25inch
Screwdriver	3.5mm slotted or cross-head No 2	3.5mm slotted
	Do not unplug the connectors more often than 20 times in total	Do not unplug the connectors more often than 20 times in total

Instructions for wiring:

1) Use appropriate copper cables that are designed for minimum operating temperatures of:
   60°C for ambient up to 45°C, 75°C for ambient up to 60°C and 90°C for ambient up to 70°C minimum.
2) Follow national installation codes and installation regulations!
3) Ensure that all strands of a stranded wire enter the terminal connection!
4) Unused terminal compartments should be securely tightened.
5) Ferrules are allowed and recommended.

13. FRONT SIDE AND USER ELEMENTS

Fig. 13-1
Front side

A	**Power input terminal**	Hot swap connector
B	**Ethernet inputs**	4x RJ45 jacks
C	**Ethernet/PoE outputs**	4x RJ45 jacks
D	**Output voltage potentiometer**	Factory setting 53V
E	**DC-OK LED** (green)	ON when the output voltage is >90% of the adjusted output voltage
F	**DC-OK relay contact**	Hot swap connector

14. EMC

The power supply is suitable for applications in industrial environment as well as in residential, commercial and light industry environments.

EMC Immunity	According to generic standards: EN 61000-6-1 and EN 61000-6-2 and product standard EN 55035			
Electrostatic discharge	EN 61000-4-2	Contact discharge Air discharge	±4kV ±8kV	Criterion B Criterion B
Electrostatic RF field	EN 61000-4-3	80MHz-6GHz	10V/m	Criterion A
Fast transients (Burst)	EN 61000-4-4	AC Input lines Data ports DC-OK line	±2kV ±1kV ±1kV	Criterion B Criterion B Criterion B
Surge voltage on input	EN 61000-4-5	L → N	±1kV	Criterion B
		L; N → PE	±2kV	Criterion B
Surge voltage on data input lines and PoE output lines	EN 61000-4-5	Network lines → shielding 1,2/50us Network lines → shielding 10/700us	±1kV ±1kV	Criterion B Criterion B
Surge voltage on DC OK signal lines	EN 61000-4-5	DC OK signal → PE (common mode)	±1kV	Criterion B
Conducted disturbance	EN 61000-4-6	0.15-80MHz	10V	Criterion A
Power Frequency Magnet Field	EN 61000-4-8	50Hz / 60Hz	30A/m	Criterion A
Mains voltage dips	EN 61000-4-11	0% of 100Vac 40% of 100Vac 70% of 100Vac 0% of 200Vac 40% of 200Vac 70% of 200Vac	0Vac, 20ms 40Vac, 200ms 70Vac, 500ms 0Vac, 20ms 80Vac, 200ms 140Vac, 500ms	Criterion A Criterion C Criterion C Criterion A Criterion A Criterion A
Voltage interruptions	EN 61000-4-11	0% of 200Vac (=0V)	5000ms	Criterion C

Criterions:

A: Before, during and after the test the equipment shall operate as intended, no loss of function and the output voltage must be within +/-5% range and the data rate within 95% and 100% .

B: Before, during and after the test the equipment shall operate as intended, no loss of function or loss of data links shall occur. After the test there shall be no degradation of performance

C: Temporary loss of PoE power function is possible. PoE Power supply may shut-down and restarts by itself. No damage or hazards will occur. The data transmission will be not interrupted.

EMC Emission	According to generic standards: EN 61000-6-3 and EN 61000-6-4 and product standard EN 55032	
Conducted emission input lines	EN 55011, EN 55032, FCC Part 15, CISPR 11, CISPR 32	Class B
Conducted emission on data ports (Input and PoE output lines)	EN 55032	Class B
Radiated emission	EN 55011, EN 55032	Class B
Harmonic input current	EN 61000-3-2	Class A fulfilled

This device complies with FCC Part 15 rules.

Operation is subjected to following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Switching Frequencies

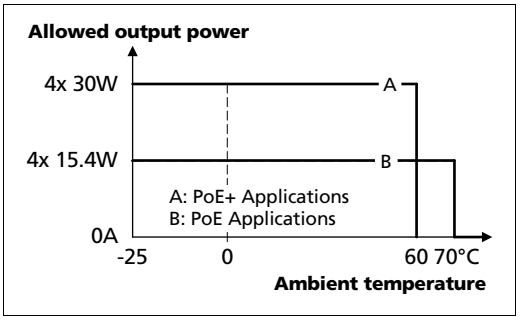
PFC converter	110kHz	Fixed frequency
Main converter	84kHz to 140kHz	Output load dependent
Auxiliary converter	60kHz	Fixed frequency

15. ENVIRONMENT

Operational temperature [1]	-25°C to +60°C (-13°F to 140°F)	PoE+ application (30W per channel)
	-25°C to +70°C (-13°F to 158°F)	PoE application (15.4W per channel)
Storage temperature	-40°C to +85°C (-40°F to 185°F)	For storage and transportation
Humidity	5 to 95% r.h.	According to IEC 60068-2-30 Do not energize while condensation is present
Over-voltage category	III	According to IEC 60664-1 for altitudes up to 2000m
Audible noise	Some audible noise may be emitted from the power supply during no load, overload or short circuit.	

1) Operational temperature is the same as the ambient or surrounding temperature and is defined as the air temperature 2cm below the unit.

Fig. 15-1 **Output power vs. Ambient temp.**



16. PROTECTION FEATURES

Output protection	Electronically protected against overload, no-load and short-circuits. In case of a protection event, audible noise may occur.	
Output over-voltage protection	Typ. 58.5Vdc Max. 60Vdc	In case of an internal power supply defect, a redundant circuit limits the maximum output voltage. The output shuts down and automatically attempts to restart.
Degree of protection	IP 20	EN/IEC 60529
Penetration protection	> 4mm	E.g. screws, small parts
Over-temperature protection	Yes	Output shut-down with automatic restart. The temperature sensor is installed on critical components inside the unit and turns the unit off in safety critical situations (e.g. derating requirements not observed, high ambient temperature, ventilation obstructed, or the mounting orientation derating is not followed). There is no correlation between the operating temperature and turn-off temperature since this is dependent on input voltage, load and installation methods.
Input transient protection	MOV (Metal Oxide Varistor)	For protection values see chapter 14 (EMC).
Internal input fuse	Included	Not user replaceable slow-blow high-braking capacity fuse

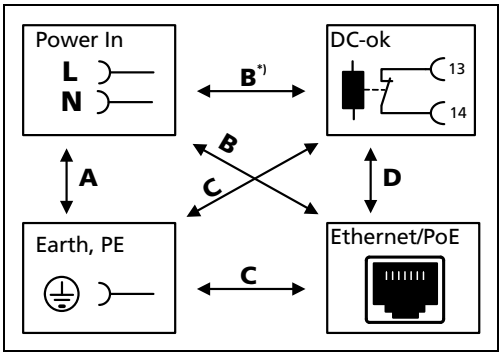
17. SAFETY FEATURES

Input / output separation	Double or reinforced galvanic isolation	
	SELV	IEC 60950-1
	PELV	IEC/EN 60204-1, EN 62477-1, IEC 60364-4-41
Class of protection	I	PE (Protective Earth) connection required
Isolation resistance	> 500MOhm	At delivered condition between input and output, measured with 500Vdc
	> 500MOhm	At delivered condition between input and PE, measured with 500Vdc
	> 500MOhm	At delivered condition between output and PE, measured with 500Vdc
	> 500MOhm	At delivered condition between output and DC-OK contacts, measured with 500Vdc
PE resistance	< 0.1Ohm	Resistance between PE terminal and the housing in the area of the DIN rail mounting bracket.
Touch current (leakage current)	typ. 0.14mA / 0.36mA	At 100Vac, 50Hz, TN-,TT-mains / IT-mains
	typ. 0.20mA / 0.50mA	At 120Vac, 60Hz, TN-,TT-mains / IT-mains
	typ. 0.33mA / 0.86mA	At 230Vac, 50Hz, TN-,TT-mains / IT-mains
	max. 0.18mA / 0.43mA	At 110Vac, 50Hz, TN-,TT-mains / IT-mains
	max. 0.26mA / 0.61mA	At 132Vac, 60Hz, TN-,TT-mains / IT-mains
	max. 0.44mA / 1.05mA	At 264Vac, 50Hz, TN-,TT-mains / IT-mains

18. DIELECTRIC STRENGTH

The output voltage is floating and has no ohmic connection to the ground. Type and factory tests are conducted by the manufacturer. Field tests may be conducted in the field using the appropriate test equipment which applies the voltage with a slow ramp (2s up and 2s down). Connect all input-terminals together as well as all output poles before conducting the test. When testing, set the cut-off current settings to the value in the table below.

Fig. 18-1 **Dielectric strength**



		A	B	C	D
Type test	60s	2500Vac	4000Vac	1500Vac	500Vac
Factory test	5s	2500Vac	2500Vac	1350Vac	500Vac
Field test	5s	2000Vac	2000Vac	1000Vac	500Vac
Cut-off current setting		> 10mA	> 20mA	> 60mA	> 5mA

B*) When testing input to DC-OK ensure that the max. voltage between DC-OK and the Ethernet Ports is not exceeded (column D). We recommend connecting DC-OK pins and all Ethernet leads together when performing the test.

⚠ WARNING

In order to fulfil the IEEE 802.3at requirements, external equipment and wiring connected to the DC OK contact need to have a minimum isolation strength of 1500Vac to ground.

19. APPROVED, FULFILLED OR TESTED STANDARDS

UL 61010 (planned)	c UL us LISTED	UL Certificate UL 61010-2-201 Electrical Equipment for Measurement, Control and Laboratory Use - Particular requirements for control equipment Applicable for US and Canada E-File: E198865
IEC 62368 (planned)	CB Report	CB Scheme Certificate IEC 62368-1 Audio/video, information and communication technology equipment - Safety requirements Output safety level: ES1
IEC 61010 (planned)	CB Report	CB Scheme Certificate IEC 61010-2-201 Electrical Equipment for Measurement, Control and Laboratory Use - Particular requirements for control equipment

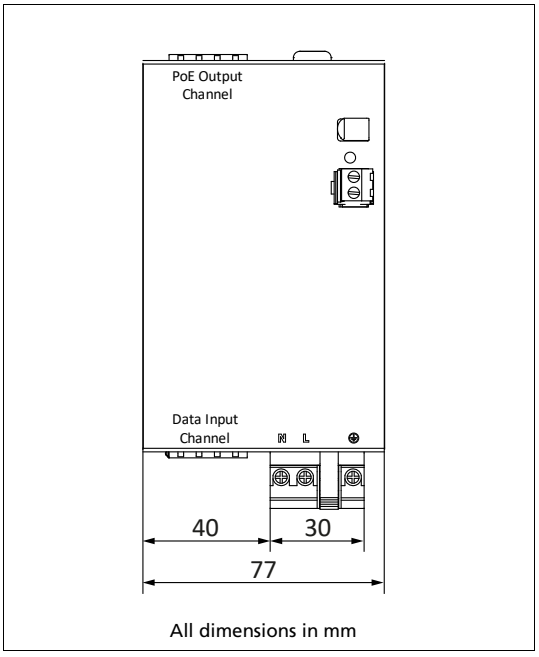
20. REGULATORY PRODUCT COMPLIANCE

EU Declaration of Conformity	CE	The CE mark indicates conformance with the - EMC directive - Low-voltage directive - RoHS directive
WEEE Regulation		Manufacturer's Declaration EU Regulation on Waste Electrical and Electronic Equipment Registered as business to business (B2B) products.
REACH Directive	REACH ✓	Manufacturer's Statement EU-Directive regarding the Registration, Evaluation, Authorization and Restriction of Chemicals

21. PHYSICAL DIMENSION AND WEIGHT

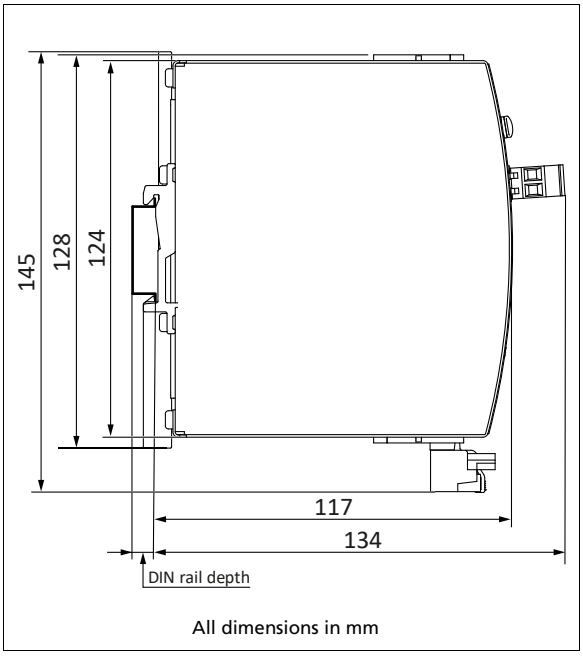
Width	77mm 3,03”
Heigth	128mm 5.06”
Depth	117mm 4.61’’ The DIN rail depth must be added to the unit depth to calculate the total required installation depth.
Weight	850g / 1.87lb
DIN rail	Use 35mm DIN rails according to EN 60715 or EN 50022 with a height of 7.5 or 15mm.
Housing material	Body: Aluminium alloy Cover: Zinc-plated steel
Installation clearances	See chapter 2

Fig. 21-1
Front view



All dimensions in mm

Fig. 21-2
Side view



All dimensions in mm

22. ACCESSORIES

22.1. ZM10.WALL - WALL/PANEL MOUNT BRACKET

This bracket is used to mount the devices on a wall/panel without utilizing a DIN rail. The bracket can be mounted without detaching the DIN rail brackets.

Fig. 22-1 **Isometric view**

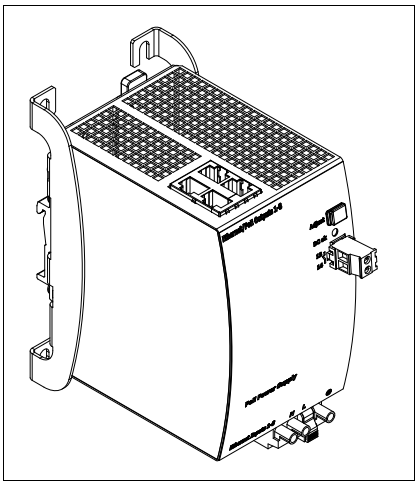


Fig. 22-2 **Isometric view**

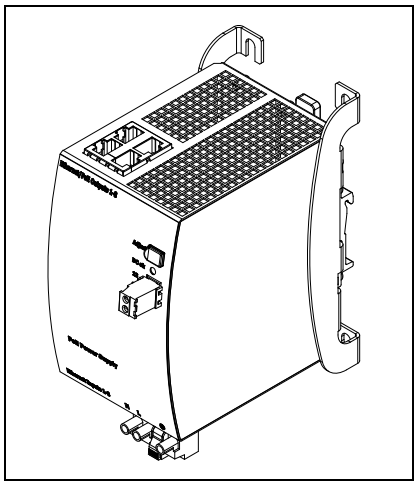


Fig. 22-3 **Isometric view**

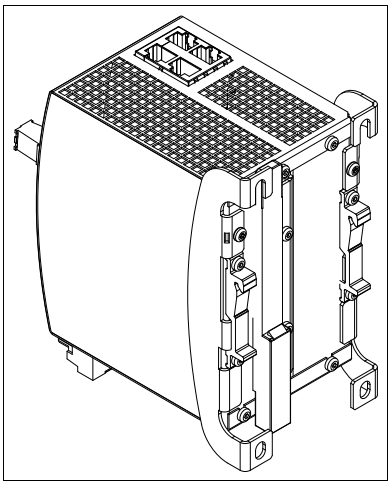


Fig. 22-4 **Wall/panel mounting, front view**

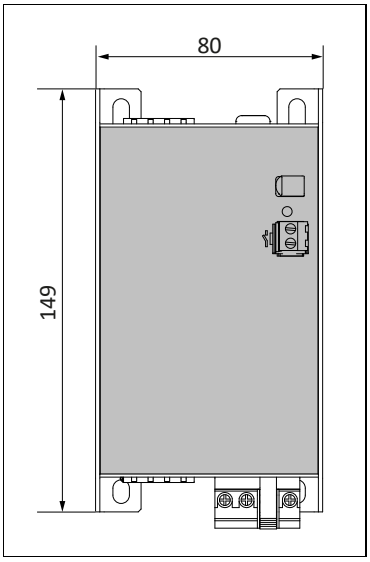


Fig. 22-5 **Hole pattern for wall mounting**

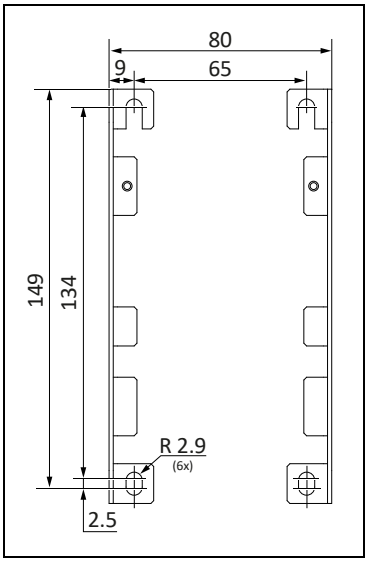
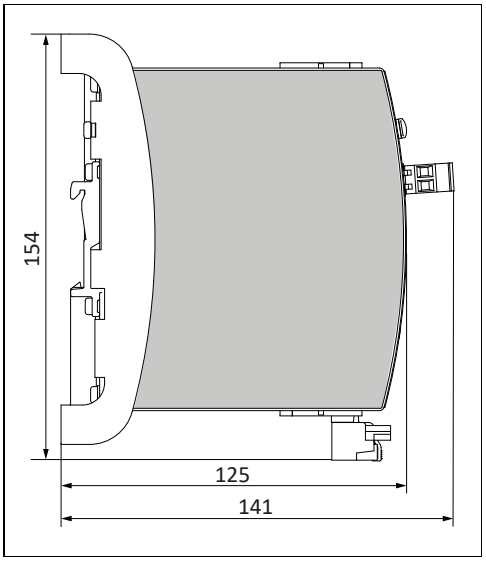


Fig. 22-6 **Wall/panel mounting, side view**



23. APPLICATION NOTES

23.1. EXTERNAL INPUT PROTECTION

The unit is tested and approved for branch circuits up to 20A. An external protection is only required if the supplying branch has an ampacity greater than this. Check also local codes and local requirements. In some countries local regulations might apply.

If an external fuse is necessary or utilized, minimum requirements need to be considered to avoid nuisance tripping of the circuit breaker. A minimum value of 6A B- or C-Characteristic breaker should be used.

23.2. OPERATION ON TWO PHASES

The power supply can also be used on two-phases of a three-phase-system. Such a phase-to-phase connection is allowed as long as the supplying voltage is below 240V$^{+10\%}$.