USER MANUAL

CSP1+ High Accuracy

Mains Powered CT Current Sensor with P1 output

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History of changes

VERSION	DATE	DESCRIPTION
1.0	**06/02/23**	**Initial version**
1.1	**05/07/23**	**Adjustment For Compliance**
1.2	**10/07/23**	**Adjustment For Compliance**
1.2	**17/07/24**	**Adjustment in settings**
1.3	**01/10/24**	**Delta network (3-fase / 3 wire) wiring diagram added**
1.4	**30/06/25**	**Full Revision of Document**

TABLE OF CONTENT

1. Introduction

Thank you for purchasing this CSP1+ current sensor. Xemex has a wide product range of devices. We have introduced a variety of meters and converters. For more information on other products visit our website at Home - Xemex | Smart Energy Communicator or contact our sales department on sales@xemex.eu.

The Xemex CSP1+ module is a directional CT current meter with a SMR5.0 compliant P1 output in a Din rail housing. It measures the current passing through the wires it is clamped over, an approximates active power running trough.

Up to 3 CT current transformers can be connected to the CSP1+ device. These CT clamps can be installed around the power lines without disturbing the installation.

The CSP1+ can be used for both, single phase or poly phase installations. The Xemex CSP1+ module is ideal for P1 based Active Load Balancing applications in EV charging installations, heat pump installations, and others where no DSMR smart meter is available.

1.1. Scope

This manual is applicable to the CSP1+, a 230 V AC powered Current Sensor with P1 output. It describes the specifications, installation, and operation of the product. Please read this document carefully before installation and operating.

1.2. Target group

A qualified person in accordance with specific local standards and safety regulations must be responsible for the installation, operation and maintenance of the CSP1+.

1.3. Intended usage

The CSP1+ is only to be used for measuring the amount of electrical current and shall work within the specified values only. The CSP1+ informs the EV charging point or any other device with a P1 input port via a P1 signal (SMR5.0) about the amount of current going through the grid by measuring the current using CT clamps.

1.4. Used symbols and abbreviations

The following symbols are used in this document and/or are marked on the product:

	Alternating current
	Three-phase alternating current
	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
	Caution, possibility hazard of electric shock.
	Caution

1.5. Abbreviations and acronyms

V AC:	AC-voltage
V DC:	DC-voltage
EV:	Electrical Vehicule
(D)SMR:	(Dutch) Smart Meter Requirements
E-MUCS:	Extended Multi-Utility Companion Specification
TCP:	Transmission Control Protocol
DNS:	Domain Name Device
mDNS:	Multicast Domain Name Device
DHCP:	Dynamic Host Configuration Protocol
TIC:	Télé-Information Client
LED:	Light Emitting Diode
HTTP:	Hypertest Transfer Protocol
API:	Application Programming Interface
JSON:	JavaScript Object Notation
USB:	Universal Serial Bus
UART:	Universal Asynchronous Receiver-Transmitter
UI:	User Interface
TVS:	Transient Voltage Suppressor

1.6. Safety precautions

Always adhere to the following checklist:

1. Only qualified personnel or licensed electricians should install the Xemex CSP1+. The mains voltages of 120 V AC to 600 V AC can be lethal!
2. Follow all applicable local, national electrical and safety codes.
3. Install the CSP1+ device in an electrical enclosure (panel or junction box) or in a limited access electrical room.
4. Verify that circuit voltages and currents are within the proper range for the meter model.
5. Use current transformers (CTs) with built-in transient voltage suppressor (TVS) with a dielectric strength of at least 3.5 kV 50 Hz 1 min and a work voltage of 660V.
   Only use Xemex approved CT clamps from 40mA ... 80A (if CT ratio = 2000(default))
6. Ensure that the CTs are placed behind fuses or circuit breakers.
7. Equipment must be disconnected from the HAZARDOUS LIVE voltages before access.
8. Do not install the CSP1+ where the temperatures can be below –25°C or above 60°C, excessive moisture, dust, salt spray, or other contamination. The device requires an environment no worse than pollution degree 2 (normally only non-conductive pollution; an occasionally temporary conductivity caused by condensation must be expected).
9. Do not drill mounting holes in the device. Click the module on a DIN Rail instead.
10. When the CSP1+ is installed incorrectly, the safety protections may be impaired.

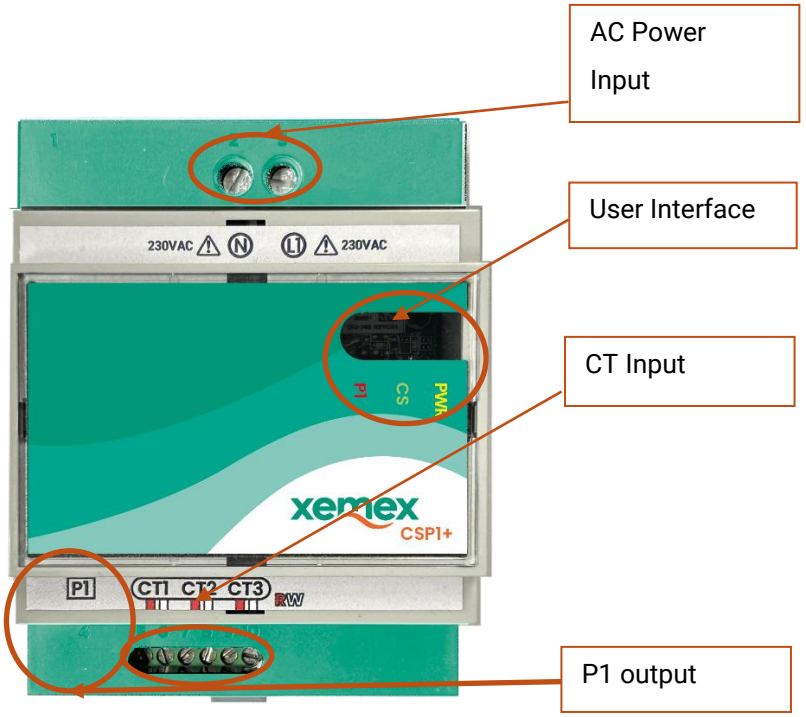
1.7. Certifications

Date	Accreditation Centre	IP Code	Kind
2023-08-09	Kiwa	EN 60529:1991 + A1:2000 + A2:2013 IEC 60529:1989 + A1:1999 + A2:2013	
2023-10-09	Kiwa	EN 55011 EN 55011/A1 EN 55011/A11 EN 55011/A2 EN 55032:2015 + A11:2020 EN 6100-4-11 EN 6100-4-2 EN 6100-4-3 EN 6100-4-4 EN 6100-4-5 EN 6100-4-5/A1 EN 6100-4-6 EN 6100-4-8 EN 61326-1	 Class B Class A + B Class B Class A Class B Class B Class A Class A

2. Technical description

The Xemex CSP1+ device is a Current Transformer current metering device with a P1 output.
It has following interfaces:

- Mains Power input (AC)
- P1 Communication output (according SMR5)
- User Interface
- Current Transformers (CT) input



The CSP1+ measures the RMS current values of the three current transformer values and their respective power direction over a period of 1 second.

At the end of the measurement cycle the new RMS values are sent out as a P1 message.

This process continuously repeats every second.

2.1. Environmental conditions

- Protection class: II
- Overvoltage class: III
- Operating temperature: -25 °C - +60 °C
- Storage temperature: -30 °C - +85 °C
- Relative humidity: < 75 % year's average at 21 °C
  < 95 % less than 30 days/year, at 25 °C
- Pollution Degree: 2
- Altitude: < 2000m
- Application area: Residential, Indoors in suitable meter cabinet

2.2. CT Clamp Input

Use current transformers (CTs) with built-in TVS with a dielectric strength of at least 3.5KV 50Hz 1min and a work voltage of 660V. Do not use current output (ratio) CTs such as 1 amp or 5 amp output CTs: they will destroy the meter. The CT-related information in this manual is based on Xemex recommended clamps. It's recommended to use these CTs, or equivalent CTs sold by Xemex.
Ensure that the CTs are placed behind fuses or circuit breakers.

Connector	Screw terminal connectors for max 3 Current Transformers
Measuring principle	Current measurement by Current transformer
Current range	1A* ... 40A (if CT ratio = 2000)
	*measured currents smaller than 1A will have a larger deviation
CT ratio	2000 (default)
Input impedance	40 Ohm
Current Accuracy	Typically <5 % at 23 °C
Max Cable length	1 meter

CT clamps max range will be halved when used with the CSP1+. This is related to the HW of the device and will make the accuracy (of the halved max range) much more accurate.

2.3. P1 Output

Protocol P1 protocol conform SMR5.0
Max cable length: 3 meter
Connector RJ12 – 6 pin
Pin definition:

Pin #	Signal name	Description	Remark
1	+3.7V	+3.7V power supply	Power supply line
2	Data Request	Data Request	Input
3	Data GND	Data ground	
4	n.c.	Not connected	
5	Data	Data line	Output. Open collector
6	Power GND	Power ground	Power supply line

2.4. P1 Cable Specifications

2.5. LED Interface

2.5.1. PWR - POWER Status LED – Yellow LED

The PWR LED is a yellow LED that will light up from the moment the CSP1+ device gets power.
If after installation, the LED doesn't light up you should check the mains power.

LED status	Explanation
OFF	CSP1+ device is not powered
ON	CSP1+ device is powered

2.5.2. CS – Current Sense status LED – Green LED

The current indicator LED is a green LED that gives an indication of the actual current. This LED starts blinking with a period of 1 second. The LED will be on for 25 ms per cumulated current in ampere.
So, if for example the cumulated current for L1, L2 and L3 is 10A, the LED will be on for 250msec and off for 750msec. If the total current exceeds 40A, the LED will be continuously on.

LED status	Explanation
OFF	No current measured or no CT connected
Blinking (1sec)	Cumulated measured current < 40A. Value determines how long LED is on
ON	Cumulated measured current >= 40A

2.5.3. P1 – P1 port status LED – Red LED

The P1 port indicator LED is a red LED that will light up if the request line on the P1 interface is set to a high state. For this it is necessary that the CSP1+ device is connected to the charge point.

LED status	Explanation
OFF	P1 not connected or request line is low
Blinking	Charge point requests P1 data by toggling the request line
ON	Request line is continuously in high state

Most P1 slave devices keep the request line continuously high. This will result the LED to directly light up after connecting the RJ-cable and stay on.
The charge point will not keep the request line high. After reception of a P1 message, the charge point will put the line low to process the message. This will make the P1 LED blink with the frequency the charge point puts the request line in high state.

2.6. Screw terminals

2.6.1. CT terminals

Pitch:	3.5 mm
Connection Method:	Screw Clamp
Current Rating:	12 A
Voltage Rating:	300 V
Wire Gauge Min:	30 AWG
Wire Gauge Max:	14 AWG

2.6.2. AC terminal

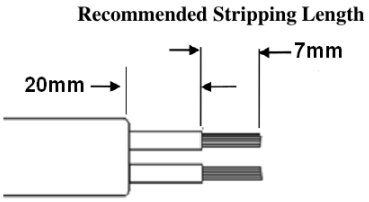
Pitch:	7.62 mm
Connection Method:	Screw
Current Rating:	32 A
Voltage Rating:	500 V
Wire Gauge Min:	24 AWG
Wire Gauge Max:	10 AWG

2.7. AC Wiring requirements

For AC connections, use stranded or solid wires a prescribed according to best practices in the respective country. In this manual solid wires with a section of 2.5mm2 is used.

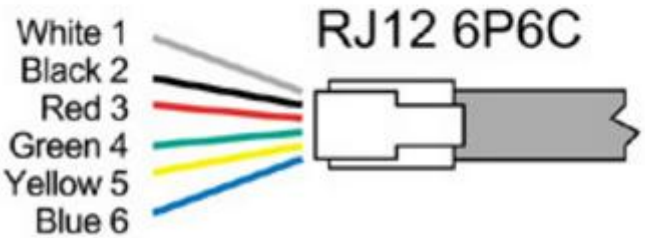
2.8. Wire stripping

Each wire should be stripped bare from one end over the length of 7mm. The secondary insulation (individual insulation over each individual wire may be visible up to 20mm from the end. After those 20mm, the second insulation (around all wires) should be present at all times.



2.9. P1 port properties

Use a 4-wire or 6-wire cable. On one end the cable should be foreseen with a RJ11 of RJ12 connector.



2.9.1. Physical LAYER properties

- Baud rate = 115200
- Line setting = 8N1
  - 8 data bits
  - No parity
  - 1 stop bit

Only a limited set of registers available on the P1 output information is filled in by the CSP1+ device. The other registers are returned with value 0 or empty for compatibility reasons with the message format defined in DSMR4.2 and SMR5.

2.9.2. P1 Telegram Structure

The table below shows the limited set of registers that are filled in:

Value	OBIS reference	Attribute	Class ID	Value Format	Value Unit
Header information	-	-	-	Manufacturer specific	
Version information for P1 output	1-3:0.2.8.255	2 Value	1 Data	S2, tag 9	
Instantaneous current L1 in A resolution	1-0:31.7.0.255	2 Value	3 Register	F3(2,2), tag 18	A
Instantaneous current L2 in A resolution	1-0:51.7.0.255	2 Value	3 Register	F3(2,2), tag 18	A
Instantaneous current L3 in A resolution	1-0:71.7.0.255	2 Value	3 Register	F3(2,2), tag 18	A
Total active power import	1-0:1.7.0.255	2 Value	3 Register	F5(3,3), tag 18	kW
Total active power export	1-0:2.7.0.255	2 Value	3 Register	F5(3,3), tag 18	kW
Active power import L1	1-0:21.7.0.255	2 Value	3 Register	F5(3,3), tag 18	kW
Active power import L2	1-0:41.7.0.255	2 Value	3 Register	F5(3,3), tag 18	kW
Active power import L3	1-0:61.7.0.255	2 Value	3 Register	F5(3,3), tag 18	kW
Active power export L1	1-0:22.7.0.255	2 Value	3 Register	F5(3,3), tag 18	kW
Active power export L2	1-0:42.7.0.255	2 Value	3 Register	F5(3,3), tag 18	kW
Active power export L3	1-0:62.7.0.255	2 Value	3 Register	F5(3,3), tag 18	kW

Datagram is sent by default once each second.(SMR5.0) and ends with a checksum.

2.9.3. Example P1 output telegram

XMX5XMXCQA0000008879

1-3:0.2.8(40)
0-0:1.0.0(000101010000W)
0-0:96.1.1(45303030303030303030303030303030)
1-0:1.8.1(000000.000*kWh)
1-0:2.8.1(000000.000*kWh)
1-0:1.8.2(000000.000*kWh)
1-0:2.8.2(000000.000*kWh)
0-0:96.14.0(0001)
1-0:1.7.0(16.560*kW)
1-0:2.7.0(00.000*kW)
0-0:96.3.10(1)
0-0:96.7.21(00000)
0-0:96.7.9(00000)
1-0:99.97.0(0)(0-0:96.7.19)
1-0:32.32.0(00000)
1-0:52.32.0(00000)
1-0:72.32.0(00000)
1-0:32.36.0(00000)
1-0:52.36.0(00000)
1-0:72.36.0(00000)
0-0:96.13.1(XMX_P1CS_V05)
0-0:96.13.0()
1-0:32.7.0(230.0*V)
1-0:52.7.0(230.0*V)
1-0:72.7.0(230.0*V)
1-0:31.7.0(024.56*A)
1-0:51.7.0(024.56*A)
1-0:71.7.0(024.56*A)
1-0:21.7.0(05.520*kW)
1-0:41.7.0(05.520*kW)
1-0:61.7.0(05.520*kW)
1-0:22.7.0(00.000*kW)
1-0:42.7.0(00.000*kW)
1-0:62.7.0(00.000*kW)
!19D6

3. Installation instructions

3.1. Guidelines for safety and installation

This installation guide must be consulted in all cases when manipulating parts which are marked with the Caution symbol. Risk of serious injuries or death and/or at least product damage!

Caution: never open the secondary circuit of a Current Transformer while current is flowing through the primary circuit!
If the secondary circuit is opened when primary current is flowing, then the voltage will go to a very high value, possibly causing electrical arcing and/or electrical shock to service personnel. Therefore CT's with internal TVS must be used.

Failing to obey the "Guidelines for safety and installation" voids the warranty of the device.
The installation and the operation of this device and any maintenance must be carried out by a qualified person in accordance with specific local standards and safety regulations.

3.2. Mounting

Mount the device in a DIN rail cabinet.

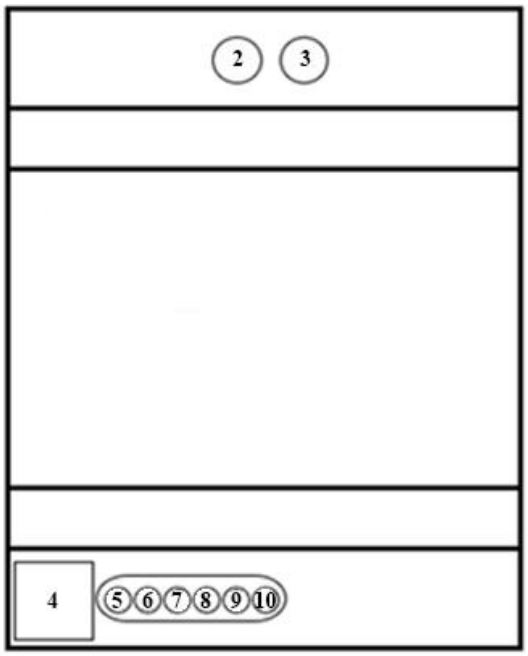
3.3. Install / Wiring procedure

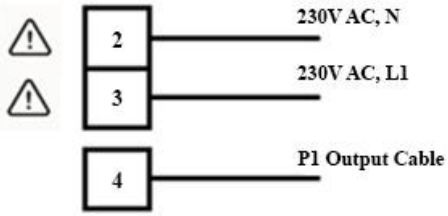
Polarity is important. For single-phase and three-phase star (wye) connections, make sure to connect the Neutral line (N) and the Phase 1 line (L1) to the corresponding terminals. For Delta network connections, please refer to Chapter 4 of this installation manual for specific instructions.

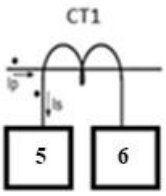
3.3.1. Single Phase

Please follow this installation sequence for single-phase

1. Connect N and L1 to the mains power supply.
2. Connect CT clamp onto CSP1+ device. The arrow of the CT clamp must follow Grid to Load.
3. CT clamp wires need to be attached with the RED wire to 5, and WHITE wire to 6.
4. Connect P1 port.



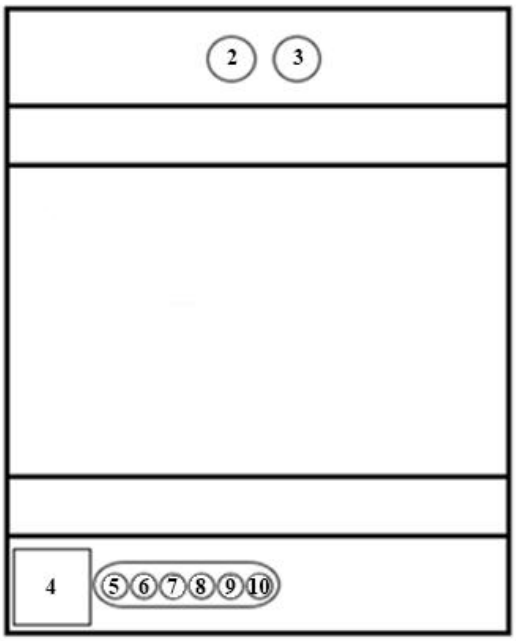




3.3.2. Delta Net

Please follow this installation sequence for Delta (3p /3w) network connection:

1. Connect L2 and L1 to the mains power supply.
2. Connect CT clamps onto L1 and L3 into the CSP1+ device. The arrow of the CT clamp must follow Grid to Load.
3. CT1 needs to be attached with the RED wire to screw terminal 5, and WHITE wire to screw terminal 6, while CT2 wires need to connect with WHITE to screw terminal 7 and RED to port 8.
4. Connect P1 port.



Installation Option1:	Installation Option 2:
Preferred option	Alternative Option
2: L2	2: L2
3: L1	3: L3
4: P1 Output	4: P1 Output
5: CT1 red	5: CT3 red
6: CT1 white	6: CT3 white
7: CT3 white	7: /
8: CT3 red	8: /
9: /	9: CT1 white
10: /	10: CT1 red

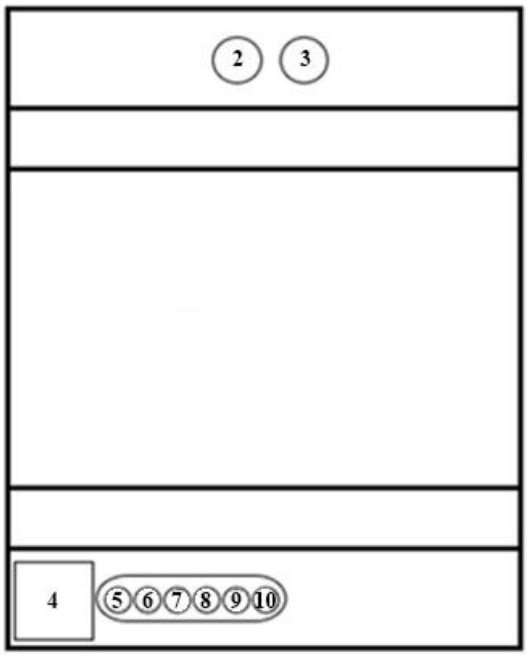
Note:

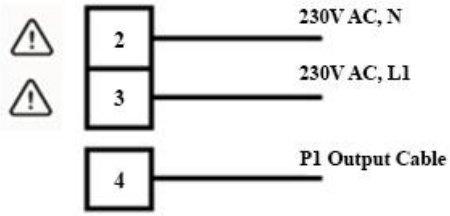
- CT1 means CT clamp over Line 1 with Arrow from Grid to Home Load
- Rotation - Right

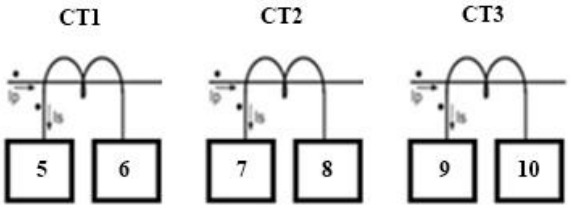
3.3.3. Star Net

Please follow this installation sequence for three-phase star (3p/4w) connection:

1. Connect N and L1 to the mains power supply.
2. Connect CT clamps onto L1 , L2 , L3 into the CSP1+ device. The arrow of the CT clamp must follow Grid to Load. CT1/CT2/CT3 needs to be attached with the RED wire to screw terminal 5/7/9, and the WHITE wire to screw terminal 6/8/10 respectively.
3. Connect P1 port.







3.3.4. Important Wiring Notes

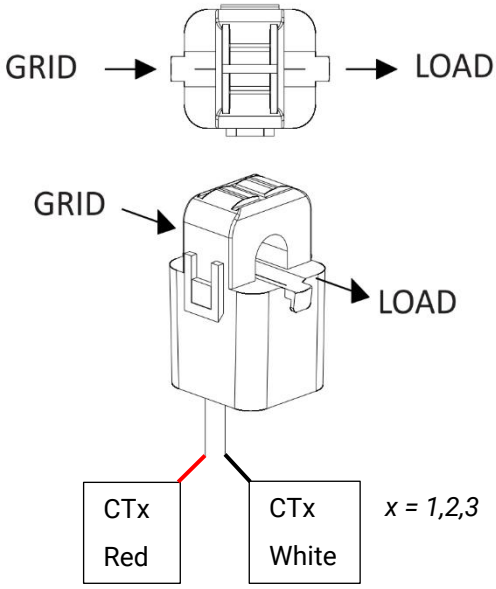
AC connections:

Do not exchange N (terminal 1) with L (terminal 2). The power direction (import versus export) is derived from the AC connection. When the AC connection is reversed the device will not measure the grid currents/power correctly.

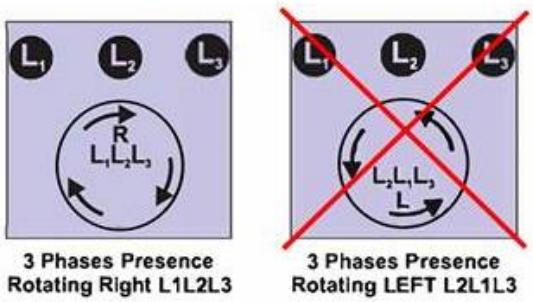
CT Connections:

CT clamps max range will be halved when used with the CSP1+. This is related to the HW of the device and will make the accuracy (of the halved max range) much more accurate.

CT clamps must be installed as follows:



PLEASE NOTE! Keep terminal connections clean. Ensure no dirt, debris, or foreign substances are present between the core of the terminal and the transformer.



The CT connection order is shown for a Right Rotating grid. Always ensure a right rotating

4. Maintenance and Service

There are no serviceable parts inside.

Clean the unit with a slightly damp cloth and mild detergent.

5. Software

The CSP1+ does not require any additional software for installation, configuration, or operation.

All necessary settings, including the CT ratio (default 2000:1), measurement logic, and communication parameters, are preconfigured during production.

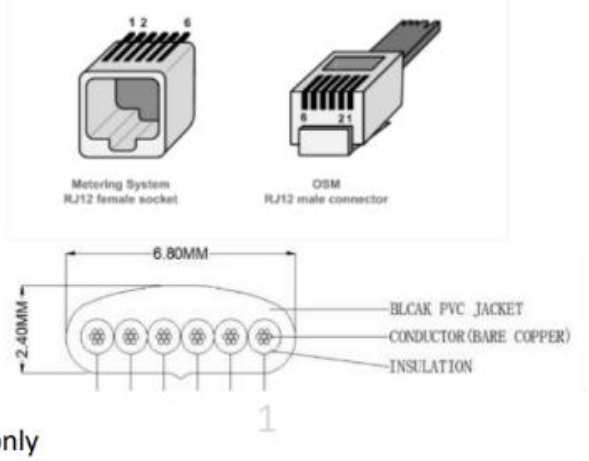
As a result, the device is completely plug-and-play and ready for use once properly installed physically.

6. Accessories

6.1. P1 – USB Cable Connection (optional)

A P1-USB cable is optional.

This cable supports a USB type A connection on one side and a P1 RJ12 connection on the other. It is mainly used to support a connection between a laptop, Energy Management System, or other device and the CSP1+ such that they receive the P1 message.



*Picture above for reference only

Technical Parameters

Connection Type	USB Type A
Cable length	2.5m
Working Voltage	5V

Pin configuration and functions

Number	Color	Description
1	Blue	+5V power supply
2	Yellow	Data Request, connect to +5V
3	Green	Data GND
4	Red	NC
5	Black	Data line
6	White	Power GND

7. Troubleshooting

Issue/fault	Possible Cause	Solution
Incorrect power direction	L and N reversed	See Section 3.3 “Installation”
Export is measured as import (or vice versa)	Arrow points from Load to Grid	Arrow must point from Grid → Load.
Wrong phase or incorrect RMS value	Red/White wires connected incorrectly	Follow correct connection terminals (see section 3.3).
Inaccurate or zero readings	Poor or no current measurement	Check whether clamp is fully around insulated phase wire.
No data available / no communication with charge point	P1 cable not connected or defective	Check P1 connection and slave device behavior.
PWR LED is off	No mains power	Check 230V power supply.
CS LED is off	No CT connected or no current	Check CTs and fuse/circuit breaker. Verify current is above 1A (below that is outside accurate range).
P1 LED is off	Charge point (or P1 reader) does not send request (Request line remains low)	Check the P1 cable and charge point. Measure if communication occurs on the Data Request line (pin 2).

8. Decommissioning and Disposal

The procedure for disconnecting and removing the device is described below.

Guidelines for safety precautions in section 1.6 must be followed without fail.

8.1. Decommissioning / Unwiring procedure

Please follow this sequence for uninstalling a single- or poly-phase system.

1. Disconnect the P1 cable by pressing down the on the latching tab and gently pulling the P1 cable out of the jack.
2. Unscrew the screws on terminals 4 till 9 and remove the CT cables.
3. Unscrew the screws on terminal 1 and 2 and remove the cables.
4. Unmount the device from the dinrail by inserting a flat-tip screwdriver into the DIN release clip and pull down the clip.
5. Swing the device out and upwards to remove the device.

8.2. Disposal

For the disposal of the device observe the local disposal and environmental protection regulations in effect without fail.

Based on the data specified in environmental certificate ISO 14001, the components used in the device are largely separable and can therefore be taken to the relevant disposal or recycling point.

Components	Disposal
Printed circuit boards	Electronic waste: disposal according to local regulations.
Metal parts	Sorted and taken to collective materials disposal point.
Plastic components	Sorted and taken to recycling (regranulation) plant.

9. Technical Support

9.1. Technical Support Contact Information

For any technical issues or inquiries, our dedicated support team is available to assist you. Please use the following contact methods to reach out for assistance:

9.2. Email Support:

For general inquiries, troubleshooting, or technical assistance, please email our support team at: support@xemex.eu Please provide a detailed description of the issue, serial number, along with any relevant screenshots or error messages to expedite the resolution process.

9.3. Phone Support:

If you prefer to speak directly with a technician, you can reach us at:
+32 32 01 95 95
Our phone support is available Monday to Friday within regular business hours. If your request falls outside of business hours, please leave a ticket throughout our support portal.

9.4. Support Portal:

For access to FAQs, troubleshooting guides, and ticket submission, visit our dedicated support portal at: https://xemex-support.freshdesk.com/nl/support/home

9.5. Social Media:

For any non technical related information visit us via our official social media channels:
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