INSTALLATION AND OPERATING MANUAL

EN

Network power quality varmeter

COSYS P

socomec
Innovative Power Solutions

EN CONTENTS

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1. ABOUT THIS DOCUMENT

The Power Quality Controller (PQC) is a device that controls the power factor and other parameters of the supply power quality. Throughout this document, it will simply be referred to as COSYS P.
The latest version of these instructions can be found on our website: www.socomec.com.

1.1. Purpose

These instructions are for people who install, connect, commission and use the COSYS P. Before using the device, please read these instructions carefully. Any work must be carried out in accordance with these instructions.

1.2. Retaining this manual

These instructions contain important information to use the COSYS P safely, correctly and cost-effectively. It should be considered an integral part of the device and should be kept in a safe place for ongoing reference.

1.3. Symbols used in these instructions

The specific instructions in this manual are marked by symbols and bordered from the rest of the text.

Warning symbols

To avoid any risk of accidents, serious injury or death as well as property damage, please always follow the instructions below. Warning symbols include the following keywords: DANGER, WARNING, CAUTION or IMPORTANT, accompanied by a yellow symbol on the left side, as shown here:

WARNING!

Type of risk!
Description of the risk involved and potential consequences – Measures to be taken to avoid any danger.

Description of the risk involved and potential consequences.

Measures to be taken to avoid any danger.

Symbols and keywords classify the extent of the danger:

Symbol	Keyword	Meaning
	DANGER	Indicates a danger with a high level of risk that, if not avoided, can result in death or serious bodily injury.
	WARNING	Indicates a danger with a medium level of risk that, if not avoided, can result in death or serious bodily injury.
	CAUTION	Indicates a low-risk danger that, if not avoided, can result in minor or moderate bodily injury.
	CAUTION	Failure to comply with this symbol can result in damage to property.

Notes

These notes complement the main text and provide additional information on the correct functioning of COSYS P. They are marked with a white symbol on a blue background on the left side, as shown below:

Note

Example of a note

Note: example of a note

1.4. Reference documents

To find out more about COSYS P, please refer to:

- "Notes on COSYS P applications"
- "Modbus specifications"
- "Application note"
- "Notes on REST applications"

2. SECURITY

2.1. Intended use

In the intended scope (See section "3. Technical specifications" page 12), the COSYS P is intended to control the power factor "cos φ" by switching the reactive power. Any use of the device that does not comply with the use must be expressly approved by the manufacturer.

2.2. Risks specific to this device

The COSYS P was made using state-of-the-art technology. However, this does not rule out any potential risk.

Failure to comply with safety instructions can result in death, serious injury or significant property damage to equipment and other property.

Risk of electrocution

The COSYS P operates under mains voltage. Any contact with live parts at the device's terminals or connecting cables can result in serious injury or death.

- Only qualified service technicians who have familiarised themselves and learnt the contents of these instructions are authorised to carry out the installation, commissioning and decommissioning of the COSYS P.
- When installing or maintaining the COSYS P, ensure that the device is OFF.
- Lock and label insulated electrical circuits to avoid inadvertently re-powering them.
- Make sure that no terminals are under voltage!
- All nearby live parts should be covered to avoid accidental contact.
- The current transformer circuit must be short-circuited before being interrupted.
- The installation must be carried out exclusively with approved cables.
- The COSYS P should never be used at speeds greater than the maximum specification. Overloading the unit can result in irreparable damage, the risk of fire or electrical accidents. Do not exceed the load values of the various connections.
- Never open the COSYS P unit.
- While the COSYS P is in use, never touch the USB port.

Risk of burns

The terminals of the device can become hot during operation.

After using the COSYS P, allow the device and its terminals to cool before touching the connections.

2.3. Information management

Staff qualifications

Anyone working with COSYS P must be qualified in the following:

installation, commissioning, troubleshooting (fitting):
Electrician

Use, troubleshooting (incorrect configuration):
persons who have read and familiarised themselves with the operating instructions.

Troubleshooting (device malfunctions):
Contact your Socomec sales agency

User responsibility

Users are obliged to comply with the regulations of the accident insurance agency covering electrical installations, and conform with the local regulations in force.

The security of the system in which the COSYS P is integrated is the responsibility of the system's installers and users.

For safety reasons and to ensure compliance with product approval requirements (CE marking), the user is not allowed to modify the COSYS P in any way.

The user must ensure that all operators are familiar with these instructions and that they comply with them at all times.

2.4. Notice of non-liability

The warranty does not cover damage caused by non-compliance with these instructions. We cannot be held responsible for such damages!

Incorrect use of the device or failure to comply with safety instructions will invalidate any warranty claim and we do not accept responsibility for any injury or damage that results from it!

2.5. Applicable standards

The device must be installed and commissioned at an industrial site in strict compliance with the following standards:

IEC 61508-1:2011-02; IEC 60364

It is also imperative to comply with all laws, regulations and safety guidelines (IEC, EN, VDE, NF C 15-100 and any other applicable installation standards) relevant to this product and to the protection of persons and property.

2.6. Repairs

Should a repair be required, the customer or user should contact the manufacturer of COSYS P at:
SOCOMEC, 1 rue de Westhouse, 67235 BENFELD, FRANCE.
www.socomec.com

3. TECHNICAL SPECIFICATIONS

Power:

POWER SUPPLY VOLTAGE	85-267 V AC (absolute limits), frequency 45-65 Hz or 100-377 V DC (absolute limits).
POWER CONSUMPTION	maximum 5 VA.
OVER-CURRENT PROTECTION	External, max. 2 A (timer) specified.

Inputs:

VOLTAGE PATH MEASUREMENT INPUTS	80 V AC – max. 760 V AC (phase-phase, absolute limits), adapted to 115-690 V AC networks, electrically connected via high resistances; option of medium voltage measurements with a x/100 V transformer. In usage zones set out in UL / CSA standards (COSYS P xxx480x-xx versions): Networks with rated voltages of 115-600 V AC. Detection of power outages after the length of a half-wave.
CURRENT PATH MEASUREMENT INPUTS	x/5 A AC or x/1 A AC (current of auxiliary transformer ≥ 15 mA), electrically insulated, max. consumption of 1 VA per transformer connection, continuous overload power up to 6 A AC, max. transient overload 10 A AC for 10 seconds
DIGITAL INPUTS	Up to five digital inputs 5-24 V DC inputs, also usable as digital inputs up to 5 x 24 V DC, 100 mA outputs, electrically linked with each other and with the temperature input
TEMPERATURE INPUTS	1 x PT-100 or PT-1000 RTD, 4-wire or 2-wire configuration, automatic detection of sensor type Type of thermistor 2 x NTC TDK/Epcos-B57861S0502F040, measurement range -50°C to +200°C, electrically linked with digital outputs
SELECTABLE PROFILE (T)	Pulse S0 according to DIN 43864

Interfaces:

MODBUS RTU INTERFACE	Necessary final resistance of 120 Ω at the end of the system bus		
ETHERNET INTERFACE (MODBUS TCP, WEB SERVER)		100 Mbits/s 100 BASE-T Ethernet standard	
INTERNAL BUS			RS-485, surge impedance 120 Ω,

Outputs:

CATEGORY	12-OUTPUT RELAY	6-OUTPUT RELAY
OUTPUT RELAY (OUTPUTS FOR RACK SWITCHES)	NO contact with shared pole P; AC - 14,250 V AC, 3 A maximum or DC - 13 30 V DC, 3 A maximum, mechanical life 2 × 107 cycles, AC electric life - 14 to 3 A: 1 × 10^5 cycles, AC - 14 at 0.5 A: 2 × 10^6 cycles	
	Shared power conductor P to max. 10 A output relays; Note: ACT-14/DC-13 usage class according to IEC 60947-5-1; for all COSYS P models in the UL/CSA usage zones: 3 A 250 V AC cos φ=1 at 85°C, 3 A 30 V DC L/R=0ms at 85°C	
ALARM CONTACT	NO dry contact, AC-14 250 V AC, 3 A max. or DC-13 30 V DC, 3 A max., mechanical life 2 × 107 cycles, electric life AC-14 to 3 A 1.5 × 105 cycles, AC-14 to 0.5 A 2 × 106 cycles. Note: ACT-14/DC-13 usage class according to IEC 60947-5-1, in usage zones set out in UL / CSA standards: 3 A 250 V AC cos φ=1 at 85°C, 3 A 30 V DC L/R = 0 ms at 85°C	
DIGITAL OUTPUTS	Up to 5 digital outputs 24 V DC, 100 mA, electrically linked with each other and with the temperature input. Can also be used as digital inputs up to 5 × 5-24 V DC. Note: This internal interconnection generates a minimum current of almost 1 µA at the outputs. This can generate a faint glow in relays with low-power LEDs, for example.	

Connections via plug-in screw terminals

AUX POWER CIRCUIT TO THE DEVICE, INSULATION VALUE	Max. conductor cross-section 2.5 mm², min. 0.2 mm²	
	250 V AC min. , 70°C	500 V AC, 70°C
PE EARTHING TERMINAL	6.3 mm female sliding connector; driver section at least equal to the section of the largest AUX phase conductor, voltage measurement connectors, output relays and alarm connections; Yellow/Green jacket colour	
VOLTAGE MEASUREMENT INPUTS L1, L2, L3, N	Max. conductor cross-section 2.5 mm², min. 0.2 mm² Insulation value; Example 1: for 230 V AC, select at least 250 V AC, 70°C; Example 2: for 690 V AC, select at least 750 V AC, 70°C	
CURRENT MEASUREMENT INPUTS L1, L2, L3, TERMINALS S1 AND S2 IN EACH CASE	Conductor cross-section max. 2.5 mm², min. 0.2 mm² Insulation value: min. 250 V AC, 70°C	
OUTPUT RELAY (OUTPUTS FOR RACK SWITCHES)	Max. conductor cross-section 2.5 mm², min. 0.2 mm²	
	250 V relay Insulation: 250 V AC min. , 70°C	440 V relay Insulation: 500 V AC min. , 70°C
ALARM CONTACT	Max. conductor cross-section 2.5 mm², min. 0.2 mm² Insulation: min. 250 V AC, 70°C	
USB FOR UPDATES (SERVICE ENGINEER INTERFACE)	Micro-A and Micro-B USB ports	
DIGITAL INPUTS AND OUTPUTS	Max. conductor cross-section 1.5 mm², min. 0.14 mm² Insulation: 50 V DC, 70°C	
TEMPERATURE INPUTS	Max. conductor cross-section 1.5 mm², min. 0.14 mm² Insulation: 50 V DC, 70°C	
MODBUS RTU INTERFACE	Max. conductor cross-section 1.5 mm², min. 0.14 mm² Insulation: 50 V DC, 70°C	
ETHERNET INTERFACE	Ethernet cable cat. 5 according to TIA-568A/B, S/FTP shielding, RJ45 plug	
INTERNAL BUS	Max. conductor cross-section 1.5 mm², min. 0.14 mm² Insulation: 50 V DC, 70°C	
INPUT FOR SELECTABLE PROFILE	Max. conductor cross-section 1.5 mm², min. 0.14 mm² Insulation: 50 V DC, 70°C	

Note: 0.14 mm² = AWG 26; 0.2 mm² ≈ AWG 25;
1.4 mm² ≈ AWG 16; 2.5 mm² = AWG 14

Design data:

DIMENSIONS (W x H x D)	Enclosure 144 mm × 144 mm × 70 mm Enclosure 144 mm × 165 mm × 70 mm, including connectors
MOUNTING	Front panel encased in a 138 mm x 138 mm recess according to IEC 61554, held in place by four tabs in the corners of the enclosure Max. screw tightening torque 0.4 Nm
WEIGHT	Approx. 770 g without packaging
DEGREE OF PROTECTION (IP)	Face of the device when mounted in cabinet IP40, when mounted in cabinet with upgrade kit (ref. no. 20-50015) IP54; rear of the device and terminals IP20; all according to the standard EN 60529 Pollution level 2 according to the standard EN 61010-1:2011-07.
ELECTRICS	Cabinet protection, cat. I, according to EN 61140 Service voltage up to 760 V AC max., absolute value at voltage measurement inputs. TNV1 circuits, some of which are linked to each other: digital inputs and outputs, optional temperature inputs, optional Modbus interface.
HOUSING DESIGN	Inflammability UL 94 V-0 according to housing manufacturer IK06 shock-resistant according to EN 61010-1:2011-07, 8.2.2
LIFETIME	15 years at an ambient temperature of +25°C
EMC	EMC according to EN 61326-1 EN 61000-4-2, immune to electrostatic discharge: air 8 kV and contact 6 kV with horizontal and vertical coupling EN 61000-4-3, at radiated electromagnetic fields (EMS) 80 MHz - 1 GHz, horizontal and vertical, level 10 V/m = radiation in industrial environments, Class A Hardware version V1.0: EN 55022A EMI 30 MHz - 1 GHz - industrial environments, Class A As a Class A device, this model can cause radio interference in residential areas. If necessary, users may be asked to take corrective action at their own expense. From the V1.2 hardware version: EN 55022A EMI 30 MHz - 1 GHz - offices and residential areas, Class B EN 61000-4-6, Immunity to conducted disturbances, level 10 V RMS, 150 kHz - 80 MHz1 COSYS P xxxxxxx-3x: EN 55022A EMI 30 MHz - 1 GHz - offices and residential areas, Class B EN 61000-4-4, immunity to electrical fast transient bursts, 1 kV capacitive coupling, 2 kV injection into power cable and voltage measurement inputs EN 61000-4-5 shock-wave immunity, 6 kV injection into power cable and voltage measuring inputs

(1) Standard immunity testing for radio frequency fields according to EN 61000-4-6 (EMC immunity) requires amplitude modulation to a modulation frequency of 1 kHz.
However, this frequency is within the measuring range of the controller in its intended use (20th harmonic of 50 Hz = 1 kHz). The measurement circuit should therefore clearly meet the standard test. For this reason, the immunity test at RF fields can only be achieved with amplitude modulation.

Ambient conditions:

TEMPERATURE RANGE	from -25°C to +65°C, without condensation
INSTALLATION ALTITUDE	Maximum height above sea level 2,000 m

Measurement system:

ACCURACY	Voltage and current measurement ±1% to 50/60 Hz and ambient temperature of 25°C
AVERAGE FUNCTION	More than 1 second, updated every 100 ms
HARMONICS	Measured via Lx-N All even and odd harmonics up to the 19th

4. DEVICE DESCRIPTION

4.1. Function

COSYS P is a reactive energy compensation relay. It continuously calculates the reactive and active power components of the network using current measurements (current transformer) and voltage measurements (voltage measurement connection). If the reactive power value exceeds certain thresholds, determined by the COSYS P controller during calibration or as otherwise defined, switch controls are transmitted to the controller's outputs. If the inductive reactive power is greater than the preset value during the controller configuration (cos phi target), after an adjustable timeout, one or more COSYS P control contacts are closed. COSYS P switches racks as needed to restore the targeted power factor. If the inductive reactive power component of the loads drops again, the racks are powered off. COSYS P offers a variety of options to customise control settings to suit the application. The clarity of the on-screen display ensures the effective monitoring of reactive power compensation. 'Cyclical mode' is a useful feature to extend the life of the installation, as it guarantees consistent use between all racks.

Regeneration

The COSYS P incorporates a four-quadrant control function.
If the active power is returned to the supply network, for example by combined heat and power systems, the COSYS P continues to correct the reactive power obtained from the supply network. When this generation occurs, the active power P is shown with the minus sign in front. Regeneration mode is also indicated by an onscreen symbol.

4.2. Device versions

The COSYS P comes in several versions:

- COSYS P 6 outputs
- COSYS P 12 outputs
- COSYS P 6 outputs Modbus RTU
- COSYS P 12 outputs Modbus RTU
- COSYS P 6 outputs Modbus TCP
- COSYS P 12 outputs Modbus TCP

Temperature and input/output modules are also available as an option.

4.3. User interface

The device is operated using the following keys under the display:

BUTTON					
ACTION	COSYS P overview	Select	Select	Open submenu	Info display

Note: the keys have different functions depending on the menu. Please see the relevant section for the specific function.

SYMBOL	BUTTON	FUNCTION
	Exit	Go back a level in the system tree.
	Up	Increase the value of a unit's selected setting. Move the selected item up.
	Down	Decrease the value of a unit's selected setting. Move the selected item down.
	Back / enter	Jump a level in the system tree (e.g. to select a specific setting). Select and confirm a specific setting (e.g. by applying a value).
	Information	Help text

You have a choice of three languages on the COSYS P. To access the language selection screen, go to Main menu > Settings > Service > Initial start (see section "5.3.2. Using COSYS P for the first time" page 32):

- German
- English
- French

4.4. Password protection

COSYS P uses a password to prevent unauthorised access to sensitive menu commands.

Protected menu commands:

- Main menu > Settings
  Security level 1, password: last four digits of the serial number (see label on COSYS P or section "6.4. About COSYS P" page 77).
- Main menu > Settings > Service > Reset switching cycles
- Main menu > Settings > Service > Maintenance
- Security level 2, password: 3725

The user is prompted to enter the password whenever they select a protected menu.

Use ▲ and ▼ to select the numbers; press OK to confirm your selection. After confirming the 4th digit, you can access all the protected menus for one hour.

5. INSTALLATION

The installation of the COSYS P is done in three stages:

- Mount at the desired location (see section "5.1.1. Before installation" page 20)
- Electrical connections (see section "5.2.1. Electrical installation steps" page 25 and "5.2.2. Completing the electrical installation" page 26)
- Commissioning (see section "5.3.1. Before commissioning" page 31)

Always follow these steps in the order given.

5.1. Mount at the desired location

5.1.1. Before installation

1. Make sure everything is complete (see section "5.1.2. Equipment" page 20).
2. Inspect the device and check for any damage.
   If there is any visual damage, for safety reasons, **do not** use the device.
   If in doubt, contact SOCOMEC AFTER-SALES SERVICE.
3. Make sure the location chosen for the COSYS P is suitable (*see section "5.1.3. Suitable location" page 21*).

5.1.2. Equipment

The COSYS P (and its accessories) include:

- 1 COSYS P device
- 4 or more connectors (depending on the device model) protected from polarity inversions and delivered non-assembled
- 1 set of instructions

5.1.3. Suitable location

The installation location of the COSYS P must meet the following conditions (see also section "2.1. Intended use" page 9):

- Never install the COSYS P in areas where there is a risk of a gas explosion or exposure to dust.
- Do not expose the COSYS P to direct sunlight or high temperatures and do not install it in the immediate vicinity of heat-generating devices.
- Install the COSYS P in a well ventilated area. Do not cover the rear or side walls of the unit.
- Do not expose the COSYS P to rain, water, moist environments or high humidity levels.
- Protect the COSYS P from vibrations and physical damage.

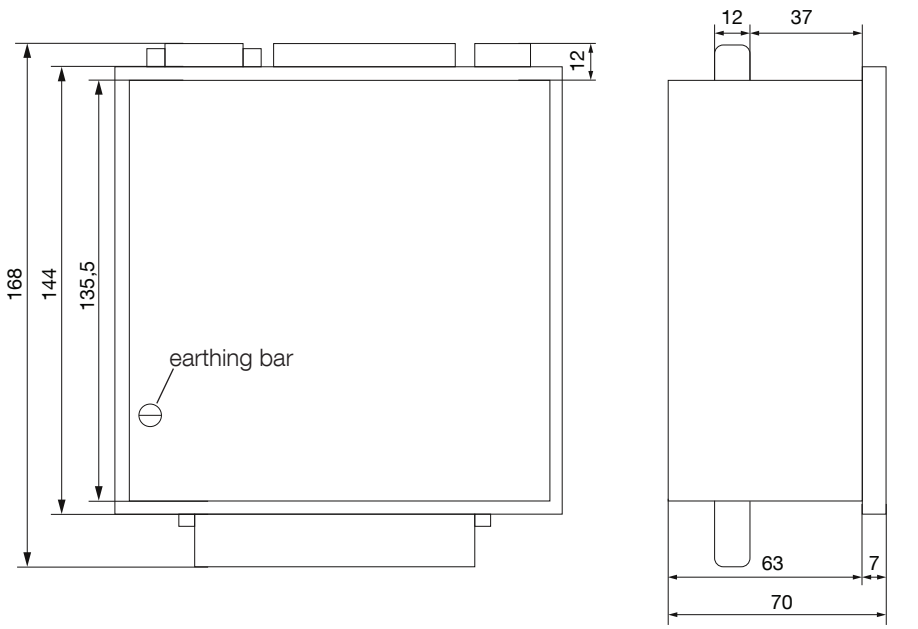
The device must be installed vertically outside the cabinet or control cabinet so the operator can access the controls and displays.

Version 3.0: This is a Class A product. In offices and residential areas, it can cause harmful interference to radio signals. In this case it may be necessary to take proper precautions during the installation.

Seen from the rear, the COSYS P is a built-in device with an IP20 degree of protection. Always provide protection against accidental contact with live parts and install the controller in a suitable enclosure to prevent the ingress of dust and liquids (e.g. control panel or distribution panel).

5.1.4. Mounting the device

Dimensions in mm



DANGER! The rear of the COSYS P to be enclosed in the cabinet or control cabinet has an IP20 degree of protection. Always provide protection against accidental contact with live parts and install the controller in a suitable enclosure to prevent the ingress of dust and liquids (e.g. control panel or distribution panel).

DANGER! Do not install the COSYS P in a hazardous area (ATEX, for example) as its switching can generate sparks. Never install the controller in areas at risk of gas and/or dust explosion.

The COSYS P is designed to be encased at the front of the control cabinet in a 138 mm x 138 mm recess in accordance with IEC 61554.

It is held in place by four tabs in the corners.

Fitting:

Preparation: Pivot the tabs at the four corners of the controller flat behind the front panel by turning the fastening screws (accessible from the front) anticlockwise.

Insert the bottom metal panel of the COSYS P into the control cabinet recess (after inserting the IP54 seal into the groove behind the COSYS P front panel, if applicable).

Gently push the front panel of the COSYS P against the outer part of the control cabinet and tighten the four fastening screws by turning them clockwise at a maximum torque of 0.4 Nm. The retaining tabs swivel outward and can be pressed against the inside wall of the cabinet until they are well fastened.

DANGER! To avoid accidents, follow these guidelines:
- Install the COSYS P in accordance with its intended use before connecting it to the mains.
- All connectors provided with the controller must be plugged in.

Take these precautions to significantly reduce the risk of fatal accidents.

DANGER! To avoid the COSYS P overheating, proceed as follows:
- Install the COSYS P in a well ventilated area, making sure its side and rear walls are not covered.
- It should not be near heat sources.
- Do not expose the COSYS P to direct sunlight.

By complying with these safety instructions you can significantly reduce the risk of damage to equipment and property and the risk of endangering people's lives.

IMPORTANT SAFETY NOTICE!

To avoid accidents, follow these guidelines:

When the SOCOMEC recessed controller is mounted on the front of a control cabinet, its four fixing screws could conduct electricity and become a safety hazard in the event of any wiring fault next to the controller. If a wire carrying a dangerous voltage becomes loose, it may come into contact with one of the four fixing screws. Do not allow the head of the screw, which can be touched from the outside of the cabinet, to become live. In rare cases, it can be fatal.

At the installation site of the SOCOMEC recessed controller (e.g. control panel, cabinet), all wires and cables must be securely fastened or bundled behind cable glands to prevent contact between a wire and a fixing screw on the controller. This contact could feed electricity to the screw and make it dangerous.

Compliance with these safety guidelines significantly reduces the risk

of damaging the equipment and property and endangering lives.

5.2. Electrical installation

5.2.1. Electrical installation steps

WARNING!
Risk of electrocution!

Any contact with live parts at the device's terminals or connecting cables can result in serious injury or death.

- Only qualified persons who have read and familiarised themselves with the contents of these instructions are authorised to install, commission, modify or upgrade the COSYS P.
- When installing or connecting the COSYS P, ensure that the device is OFF.
- Lock insulated electrical circuits to avoid inadvertently re-powering them.
- Make sure no terminals are under voltage.
- All nearby live parts should be covered to avoid accidental contact.

CAUTION!
Risk of burns!

The terminals of the device can become hot during operation, which can cause burning if touched.

- After using the COSYS P, allow the device and its terminals to cool sufficiently before touching the connections.

The COSYS P is connected as shown in the diagrams of "5.2.9.1. Connection diagrams for all COSYS P models" page 30 and as specified in section "5.2.3. Specifications for electrical connections" page 27:

1. Connect the earth (see "5.2.4. Grounding" page 27).
2. Install an external fuse disconnecting device on the power cable of the COSYS P (see "5.2.5. Power supply" page 28).
3. Connect the voltage measurement cable (see "5.2.6. Measuring the voltage" page 28).
4. Connect the current measurement cable (see "5.2.7. Measuring the current" page 29).
5. Connect the output relays (see "5.2.8. Output relay (control output)" page 30).
6. If necessary, connect the alarm relay to send alarm signals (see "5.2.9. Alarm function" page 30).

5.2.2. Completing the electrical installation

WARNING!
Risk of electrocution!

If there is a wiring defect in the vicinity of the COSYS P, the four fastening screws risk becoming live, posing a safety hazard. Any contact with live parts at the device's terminals or connecting cables can result in serious injury or death.

Secure all cables (control panel, cabinet, etc.) around the COSYS P.

At the COSYS P installation site (e.g. control cabinet, enclosure), check that all wires and cables are securely secured or bundled to prevent contact between a wire and a screw attachment of the device.

5.2.3. Specifications for electrical connections

- For the connection, use only full-core conductors or approved multi-strand cables with an adequate diameter and compatible with high voltage.
- If using flexible multi-strand cables to connect the COSYS P, crimp the ends of "short" insulated tips by 6 mm in length.
- Use appropriate fixings and other attachments to relieve any strain on electrical wires and cables connected to the COSYS P.
- Wires and cables connected to the COSYS P should not be equipped with additional connectors.
- All connectors provided with the COSYS P must be plugged in, even if they are not intended for use, and attached to the device with the screws provided, if applicable.

5.2.4. Grounding

There is an earthing lug at the back of the enclosure for the PE connection. It is marked with the earth symbol according to EN 60617-2, as shown here.
The PE earth conductor's cross-section must be at least equal to that of the largest AUX phase conductor, the voltage measurement connectors, relay outputs and alarm connections. The colour of the sheath is yellow/green. Earth connections for the power circuits of the network must have at least the same current transport capacity as the circuits.
If the earthing lug breaks, do not turn on the COSYS P. The device must be repaired or replaced.

Note: the COSYS P should only be used if it is connected to the earth conductor.

5.2.5. Power supply

External isolator

An external disconnecting device, such as an isolator or circuit breaker, must be installed on the COSYS P power cable. It must be in close proximity to the device and be able to isolate all cables connected to the AUX ports on the COSYS P. This disconnecting device should not disconnect the earth conductor.

Fuses

The device's AUX power circuits must be protected by one or two fuses, i.e.:

- Timer 2 A, 250 V AC

This kind of fuse is required on the phase line if the power comes from a **phase–neutral** connection, but with a **phase–phase** connection, two fuses must be installed.

For more information, see the diagrams in section "5.2.10. Connection diagrams for all COSYS P models" page 30.

5.2.6. Measuring the voltage

The voltage measurement inputs are electrically connected with high resistances. See 3 “Caractéristiques Techniques” for measuring ranges. DC voltages cannot be measured.

The voltage inputs on the COSYS P are designed for 100-690 V AC networks.

Average voltages can be measured using an x/100 V transformer.

There is no need for external over-current protection in the voltage measuring circuits since they are protected by a safety impedance. In this case, a short-circuit protected cable (double insulated strand) must be used to connect the voltage measurement inputs.

5.2.7. Measuring the current

The COSYS P is designed to be connected to an external current transformer x / 5 A insulated from the power supply. Pay special attention to the permissible measuring range. For more details, see section "3. Technical specifications" page 12.

WARNING!
Risk of electrocution!

Turning off the circuits of the current transformer may result in arcing, with the risk of electric shock, burns or eye damage. Red-hot metal particles can also occur, which is not only a health hazard, but can cause a fire.

The fastening screws on the connectors must be securely tightened to ensure that the connectors are properly maintained.

Auxiliary connections on power transformers must be short-circuited before cutting off power to the COSYS P circuits or unplugging the connector!

Note: if there is an earth terminal on the secondary side of the current transformer, it must be connected to a grounding conductor! In general, it is advisable to earth the current transformer circuit.

Note: in networks with rated voltage of 1000 V and higher, the circuits of the current transformers must be connected to the earth. The controller may suffer damage if networks with rated voltage of 1000 V or higher are not connected to the earth. Automatic connection recognition is not possible with three-phase measuring.

5.2.8. Output relay (control output)

Depending on the type of device used, the COSYS P is equipped with 6 or 12 output relays (control outputs). Relays or switches are usually connected to it to turn the capacitor racks on and off.

Q1–Q12 output relays (**Q1–Q6** on 6-relay COSYS P models) get their control voltage from a shared **P** power supply. For the load values of the output relays and the shared **P** power supply, please see the connection diagram or the specifications (see section "3. Technical specifications" page 12).

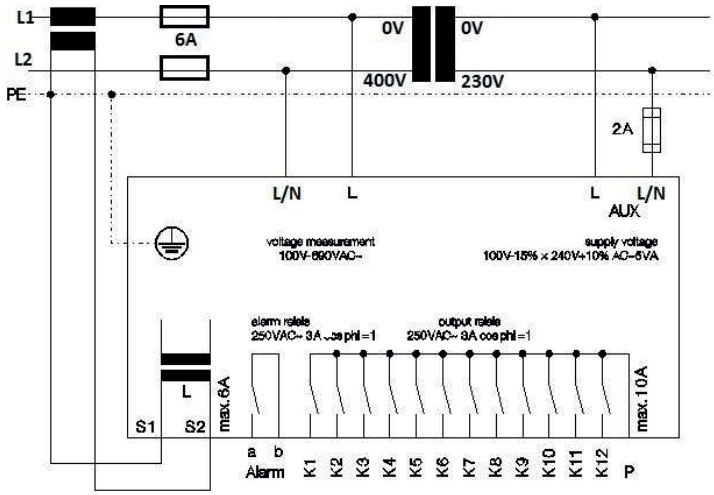
If not all the available output relays are to be used, it is advisable to connect the output cables starting with output 1, without skipping outputs.

5.2.9. Alarm function

The COSYS P has a dry contact to transmit alarms externally, with alarm terminals a and b provided for this purpose, as indicated in . Pay close attention to the load value of the contact (see section "3. Technical specifications" page 12).

5.2.10. Connection diagrams for all COSYS P models

Model diagram for COSYS P



5.3. Commissioning (initial start-up)

5.3.1. Before commissioning

WARNING!
Risk of electrocution!

Any contact with live parts at the device's terminals or connecting cables can result in serious injury or death.

It is important to check that the COSYS P is installed and connected appropriate to its intended use before connecting it to the mains.

Cover the terminals of the device!

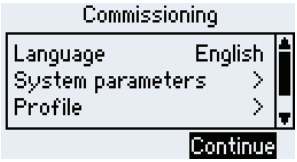
CAUTION!
Risk to equipment!

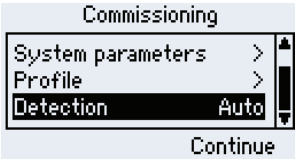
If the COSYS P terminals are not properly connected or the wrong voltages or signals are applied, this can damage the device or even the entire installation.

Check that the connections have been made correctly before powering the device.

1. Check that the COSYS P is properly installed and connected as described in section "5.1. Mount at the desired location" page 20 and "5.2. Electrical installation" page 25 and that the connectors provided with the device are all plugged in.
2. Make sure the device is connected to the earth.
3. Ensure that all terminals on the device are protected from the risk of accidental contact, with a closed door or an appropriate covering, for example.
4. Turn the device on.
5. Go to initial start-up (See section "5.3.2. Using COSYS P for the first time" page 32)

5.3.2. Using COSYS P for the first time





BUTTON		▲	▼	OK	i
ACTION	Main menu	Language selection ger – eng– fr	Language selection ger – eng– fr	Confirm the language and go back to selecting settings	–

When the device is switched on, the COSYS P homescreen appears, showing information about the installed firmware. The initial Start dialogue window appears automatically. Here you can make the basic operating settings of the device and select the start-up mode.

Note: if the COSYS P does not start up, turn off the power and check the wiring.

The following settings must be selected or confirmed:

Language English (default), German, French

Network settings

Transformer voltage ratio

Range from 1 to 300, transformer ratio: $\frac{Vprimary}{Vsecondary}$

Transformer current ratio

Range from 1 to 7,000, transformer ratio: $\frac{Iprimary}{Isecondary}$

Example: current transformer $\frac{500A}{5A}$

Transformer ratio: $k = \frac{Iprimary}{Isecondary} = \frac{500A}{5A} = 100$

Profile Control profile for the COSYS P to operate on after a successful start-up.

By default, the COSYS P is set to the factor cos φ target = 0.96 ind. See section"6.3.3. Control settings" page 54.

Communication If applicable: communication interface settings (Modbus RTU / Modbus TCP / internal Bus). For more information, see "6.3.5. Communication (optional)" page 69.

Identification Automatic/manual connection and identification of racks (see "5.3.3. Automatic rack connection and identification" page 34 and "5.3.4. Manual rack connection and identification" page 35).

Note: to show voltage and current readings (as well as derived power values) correctly, you need to enter the voltage and current transformer ratios.

Whichever initial start mode is selected, all configuration data is stored in a non-volatile memory. In the event of a power outage (planned or not), this data is not lost. When power is restored, the COSYS P automatically starts up and initiates the control process after the boot up phase.

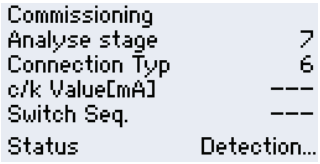
5.3.3. Automatic rack connection and identification

To start the automatic capacitor rack connection and identification process, select the **Auto** option from the **Detection** menu, then confirm with **Continue**.

The COSYS P switches the individual output relays one after the other and identifies not only the phase-out angle, but also the assigned output. Each output is switched several times until the COSYS P can check the measured values.

This is shown in the following screenshots:

Capacitive power rack being identified; identification of the completed connection resulting in a Type 4 connection.



Once the COSYS P has successfully completed the rack connection and identification process, the user must confirm the result by pressing OK. The COSYS P then switches to automatic mode and shows the **COSYS P summary screen**. If, at this time, there is a practical need to control the reactive power, the COSYS P turns the racks on or off, as required.

If the COSYS P rack connection and identification procedure fails, or if the user presses the Esc key to quit, a message appears on the screen. The initial start-up procedure can then be restarted.

5.3.4. Manual rack connection and identification

To start the manual capacitor rack connection and identification process, select the **Man** option from the **Detection** menu, then confirm with **Continue**.

In manual start-up mode, the following settings must be determined and entered manually:

In manual start-up mode, the following settings must be determined and entered manually:

Type of connection See "5.3.4.1. Type of connection" page 36

c/k value See "5.3.4.2. Calculating c/k" page 37

Switching sequence Define the switching sequence according to the relative values of individual racks in relation to each other:

1:1:1:1:1…	1:1:2:4:4…	1:2:3:4:4…
1:1:2:2:2…	1:1:2:4:8…	1:2:3:6:6…
1:1:2:2:4…	1:2:2:2:2…	1:2:4:4:4…
1:1:2:3:3…	1:2:3:3:3…	1:2:4:8:8…

Number of C racks Indicates the number of control outputs used.

Confirm your entries by pressing **Continue**. The COSYS P then goes into auto mode and shows the **COSYS P summary screen**. If, at this time, there is a practical need to control the reactive power, the COSYS P starts to turn OFF the capacitor racks that are ON, as needed.

Note: manual start-up mode disables the capacitive power identification function when the COSYS P is in use.

5.3.4.1. Type of connection

The phase shift angle of the current and voltage follows the type of connection. This is shown in the table below:

TYPE OF CONNECTION	CONNECTION TO VOLTAGE ROUTE		
	L/N – L	L/N – L	L/N – L
0	L1 – N	L2 – N	L3 – N
1	L1 – L3	L2 – L1	L3 – L2
2	N – L3	N – L1	N – L2
3	L2 – L3	L3 – L1	L1 – L2
4	L2 – N	L3 – N	L1 – N
5	L2 – L1	L3 – L2	L1 – L3
6	N – L1	N – L2	N – L3
7	L3 – L1	L1 – L2	L2 – L3
8	L3 – N	L1 – N	L2 – N
9	L3 – L2	L1 – L3	L2 – L1
10	N – L2	N – L3	N – L1
11	L1 – L2	L2 – L3	L3 – L1
CURRENT TRANSFORMER IN:	↑ **L1**	↑ **L2**	↑ **L3**

Example: The current transformer is installed on phase L1, while the voltage is measured between phase L2 and L1. So this is a Type 5 connection.

5.3.4.2. Calculating c/k

For the system to work, you need to determine the c/k value (feedback current). This value is 65% of the rated current of the smallest rack and must be detected by measuring the current of the COSYS P.

The following formula calculates the c/k value:

$$IA = 0.65 \cdot \frac{Qsmallest\ rack}{V \cdot \sqrt{3} \cdot k} \cdot 1{,}000 \approx 0.375 \cdot \frac{Qsmallest\ rack}{V \cdot k} \cdot 1{,}000\,[mA]$$

AI - Feedback current TBD in mA

Qsmallest rack = capacitive power of the smallest rack in var (not the total capacitive power of the system)

V = Mains voltage in volts on the primary side of the voltage transformer

k = transformer ratio (primary side / secondary side)

For a network of 400 / 50 Hz, refer to the value of the c/k setting in the table below:

c/k setting for a 400 V 50 Hz AC network ~															
Current		Rack power (not total power) of the PF compensation system in kvar													
	k	2.5	5	6.25	7.5	10	12.5	15	20	25	30	40	50	60	100
30/5	6	400	800	980	1200	1600									
40/5	8	300	600	740	900	1200	1500								
50/5	10	240	480	590	720	960	1200	1440							
60/5	12	200	400	490	600	800	1000	1200	1600						
75/5	15	160	320	390	480	640	800	960	1280	1600	1920				
100/5	20	120	240	300	360	480	600	720	960	1200	1440	1920			
150/5	30	80	160	200	240	320	400	480	640	800	960	1280	1600	1920	
200/5	40	60	120	150	180	240	300	360	480	600	720	960	1200	1440	
250/5	50	50	100	120	140	190	240	290	380	480	580	770	960	1150	1920
300/5	60	40	80	100	120	160	200	240	320	400	480	640	800	960	1600
400/5	80	30	60	80	90	120	150	180	240	300	360	480	600	720	1200
500/5	100	20	50	60	70	100	120	140	190	240	290	380	480	580	960
600/5	120		40	50	60	80	100	120	160	200	240	320	400	480	800
750/5	150		30	40	50	60	80	100	130	160	190	260	320	380	640
1000/5	200		20	30	40	50	60	70	100	120	140	190	240	290	480
1500/5	300			20	20	30	40	50	60	80	100	130	160	190	320
2000/5	400					20	30	40	50	60	70	100	120	140	240
2500/5	500						20	30	40	50	60	80	100	120	190
3000/5	600							20	30	40	50	60	80	100	160
4000/5	800								20	30	40	50	60	70	120
5000/5	1000									20	30	40	50	60	100
6000/5	1200										20	30	40	50	80
7000/5	1400											20	30	40	70

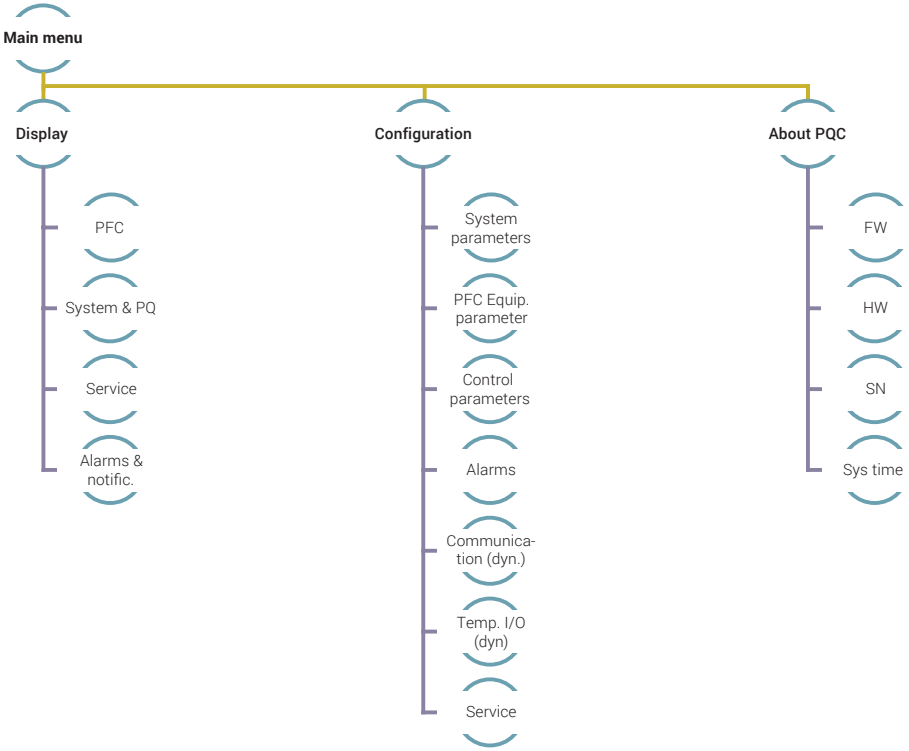
WARNING! The c/k value should always be >20, to ensure the correct calculation of reactive power per rack.

6. THE MENU

6.1. Main menu

The measurements and settings provided by COSYS P can be shown in the Main menu and edited, if necessary.

The Main menu includes three main groups: **Display, Settings** and **About COSYS P**.



6.2. Display

Main menu > Display

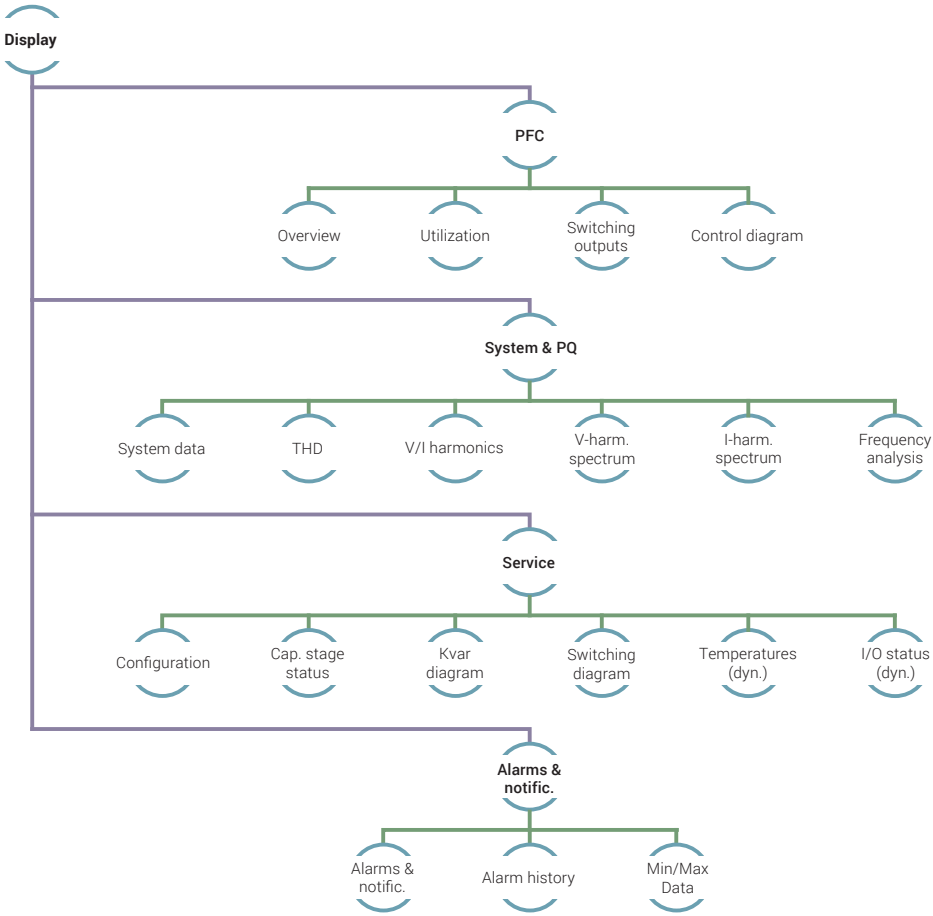
The display menu shows all the measurements and settings related to power factor correction. The main display menu includes the following commands:

COSYS P overview COSYS P measurements related to power factor control

Supply network and power quality Supply network and power quality settings

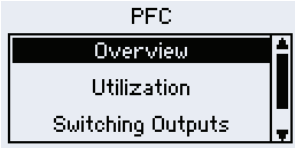
Service Status display

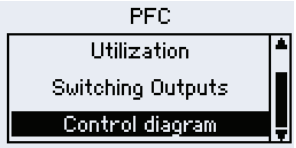
Alarms and messages Show real-time alarms and alarm log


Display
PFC
Overview
Utilization
Switching outputs
Control diagram
System & PQ
System data
THD
V/I harmonics
V-harm. spectrum
I-harm. spectrum
Frequency analysis
Service
Configuration
Cap. stage status
Kvar diagram
Switching diagram
Temperatures (dyn.)
I/O status (dyn.)
Alarms & notific.
Alarms & notific.
Alarm history
Min/Max Data

6.2.1. COSYS P overview

Main menu > Display > COSYS P overview

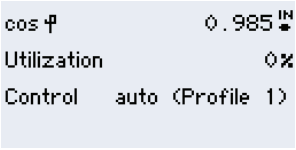


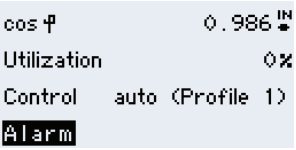


Shows all the measurements and settings related to power factor control.

6.2.1.1. Overview

Main menu > Display > COSYS P overview > Overview





cos φ Shows the real-time value of cos φ

Capacity use To ratio of real-time switching capacity to total available capacity, expressed as a percentage (0% = no capacitors switched, 100% = all capacitors switched).

Control Automatic/manual and active control profile

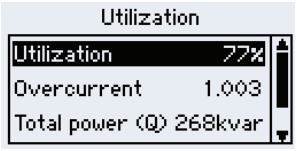
Alarm Flashes in case of an alarm.

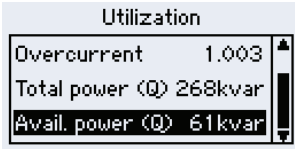
Regeneration Flashes when active power is injected into the distribution network.

Note: if the alarm flashes, press ⓘ to show the list of alarms and active messages.

6.2.1.2. Capacity use

Main menu > Display > COSYS P overview > Capacity use





Percentage: capacity used / capacity available. The ratio of real-time switching capacity to total available capacity, expressed as a percentage.

Over-current This is the theoretically determined ratio between the value of the real-time effective current and the fundamental current in the capacitor Irms / I50 Hz, 60 Hz. The filtering factor p of the reactive energy compensation system is also taken into account in the calculation.

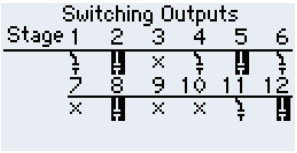
Total Q power Sum of all reactive powers of racks that are ON.

Q power available Reactive power still available to control.

6.2.1.3. Command outputs

Main menu > Display > COSYS P overview > Command outputs

The summary screen shows the real-time statuses of all racks.



Racks 3,4,5,6,10 and 11: Active racks turned OFF

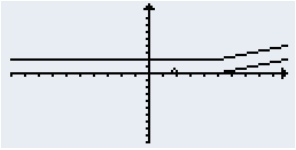
Racks 1,2,7,8,9 and 12. : active racks that are ON

A capacitor rack that is permanently ON is indicated with an "F" (fixed).

6.2.1.4. Control diagram

Main menu > Display > Compensation > Control diagram

The control diagram shows the selected control curve (active control profile) and indicates the realtime operating point.



Scale: A division of the scale on the y-axis corresponds to 2/3 x the capacitive value of the lowest rack.

BUTTON					
ACTION	Back to main menu	Zoom +	Zoom -	–	Other info

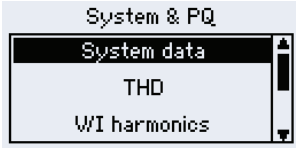
Zoom + Zoom in on the control diagram

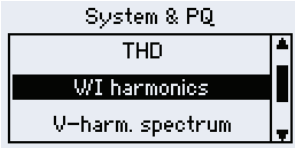
Zoom - Zoom out on the control diagram

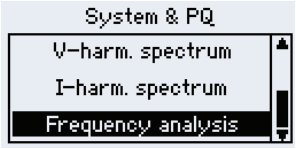
More info The following data is shown in a separate window: cos factor φtarget, Limit L, parallel displacement SP and zoom factor.

6.2.2. System and power supply quality

Main menu > Display > System and power supply quality

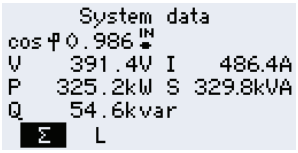






6.2.2.1. Network variables

Main menu > Display > System and power supply quality > Network variables



cos φ Real-time power factor cos φ

VΔ /V Phase-phase voltage VΔ / Phase-neutral voltage V

P Real-time active power

Q Real-time reactive power
(if the reactive power is capacitive, it is shown with a minus sign)

I Real-time current value

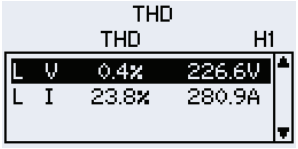
S Real-time apparent power

∑ Sum of all phases (L1 to L3)

6.2.2.2. THD

Main menu > Display > System and power supply quality > THD

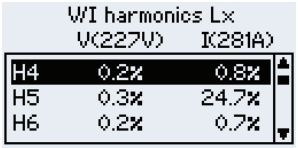
THDv and THDi and their amplitudes expressed as a percentage of the fundamental H1



6.2.2.3. Harmonics V/I

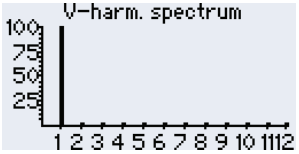
Main menu > Display > System and power supply quality > > Harmonics V/I

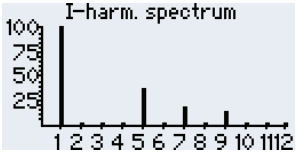
Values as a percentage of the current and voltage harmonics, in conjunction with the fundamental current and voltage values.



6.2.2.4. Harmonic spectrum V, Harmonic spectrum I

Main menu > Display > System and power supply quality > Harmonic spectrum V, Harmonic spectrum I





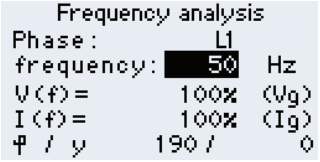
Graphic representation of the harmonic spectrum up to row 19

The fundamental at 50/60 Hz represents 100%. A division of the scale on the y-axis corresponds to 5%.

BUTTON					
ACTION	Back to Display menu	Zoom +	Zoom -	Toggle between H1–12 and H13–19	Other info

6.2.2.5. Frequency analysis

Main menu > Display > System and power supply quality > Frequency analysis



Phase Measurement of Lx [1 ≤ X ≤ 3]

Frequency 10 Hz to 2,500 Hz in increments of 10 Hz

V(f) Voltage amplitude at the selected frequency as a percentage of the fundamental voltage V1 (f = 50/60 Hz)

I(f) Current amplitude at the selected frequency as a percentage of the fundamental voltage I1 (f = 50/60 Hz)

Angle φ Angle between V(f) and I(f) in degrees

Angle γ Angle between V1 (fundamental) and I(f) in degrees

BUTTON					
ACTION	Status info	Frequency +10 Hz	Frequency -10 Hz	Phase selection	–

6.2.3. Service

Main menu > Display > Service

6.2.3.1. Configuration

Main menu > Display > Service > Configuration

Control status Manual or auto mode

Switching sequence List of detected racks.

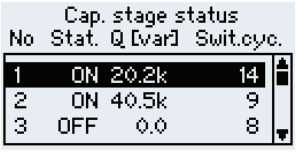
Available racks Number of racks detected

c/k value [mA] Feedback current is determined from the lowest rack detected

Type of connection Type of connection for. See the table in section 5.3.4 “Connexion et identification manuelles des gradins”

6.2.3.2. Rack status

Main menu > Display > Service > Rack status



N° Number of racks [1 to 12]

Status ON / OFF / [x second(s)]
ON: manual actuation of a rack OFF: manual disabling of a rack [x second(s)]: time until you can turn ON the capacitor rack again (discharge time)

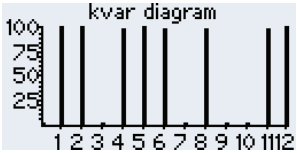
Q[var] Reactive power of the rack in var (reactive power of three-phased rack).

Switching cycles Number of rack switching cycles

6.2.3.3. Kvar diagram

Main menu > Display > Service > Kvar diagram

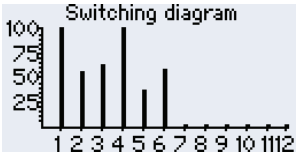
This diagram shows the real-time reactive power of capacitor racks as a percentage. After the device starts, this graph shows all racks detected at 100%. Reactive power decreases over time and capacitor wear.



6.2.3.4. Switching diagram

Main menu > Display > Service > Switching diagram

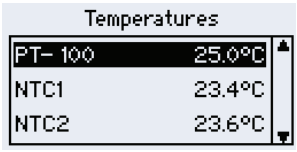
This diagram shows the switching cycle counters for all racks in the form of a table. 100% on the y-axis is the set max. number of switching cycles recorded.



6.2.3.5. Temperatures (optional I/O extension for temperature sensor)

Main menu > Display > Service > Temperatures

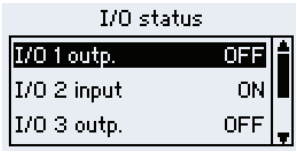
The display screen shows the temperature of the activated probes PT 100/1000, NTC1 and NTC2.



6.2.3.6. Temperatures (optional I/O extension for temperature sensor)

Main menu > Display > Service > I/O status

I/O extension inputs and outputs for existing temperature sensor and status indication for each of them.



6.2.4. Alarm notification

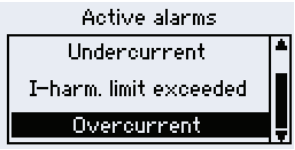
Main menu > Display > Alarm notification.

Real-time alarm status and min./max log.

6.2.4.1. Alarm notification

Main menu > Display > Alerts and messages > Alert notification.

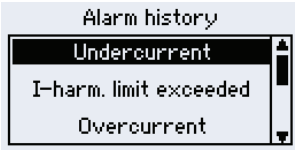
List of all alarms currently active. Select one of them then press OK to show information including real-time alarms.
The thresholds for multiple alarms can be set in the Settings menu (see section "6.3.4. Alarms" page 64). All alarms are listed in the section "9. Troubleshooting" page 85.



Note: you can also get to the **Alarms and messages** menu from the options under **Display > COSYS P overview > Overview** after pressing .

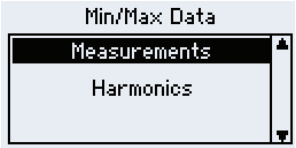
6.2.4.2. Alert log

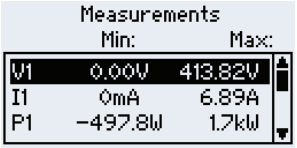
Main menu > Display > Alerts and messages > Alarm log.



The alarm memory function shows the 10 most recent alarms in chronological order. Select a line and press to show the alarm status. Min./max. data.

Main menu > Display > Alarms et messages > Data > Min./max.





The min./max. memory function lists the minimum and maximum values of the following measurements:

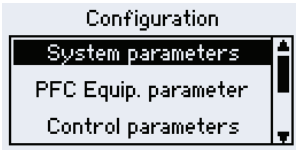
- Measurement data by phase:
  - Voltage
  - Current
  - Power (active, reactive and apparent)
  - Grid frequency
  - Over-current
- Harmonics:
  - Voltage harmonics
  - Current harmonics
- Temperatures: (available only with the optional I/O temperature sensor extension)
  - PT
  - NTC1
  - NTC2

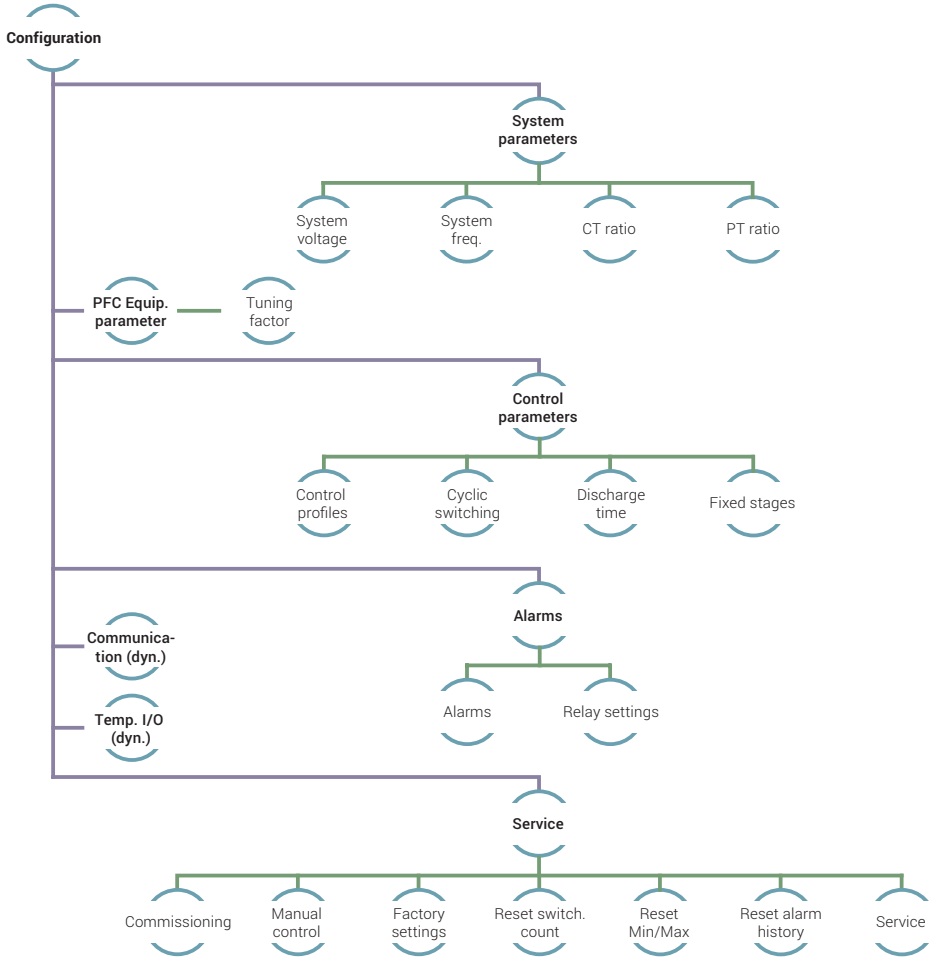
Note: press ⓘ to show how long the minimum and maximum values have appeared on the screen.

6.3. Configuration

In the Settings menu you can edit and configure all the settings related to the operation of the reactive energy compensation system, based on the specific characteristics of the customer's installation.

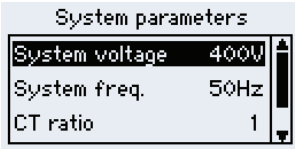
Main menu > Configuration

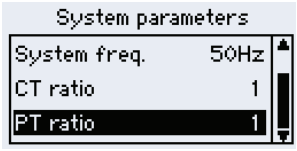




6.3.1. Network settings

Main menu > Settings > Network settings





Setting specific network settings to control:

Rated network voltage Control range: 60 V – 60 kV

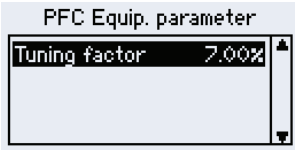
Network rated frequency 50 Hz, 60 Hz, Auto
Auto mode: The COSYS P automatically determines the network frequency. In the case of networks with strong harmonic voltage distortions or pulses (switching), you may need to manually adjust the network rated frequency as appropriate.

Voltage transformer range from 1 to 300, transformer ratio = $\frac{Vprimary}{Vsecondary}$

Current transformer range from 1 to 7,000, transformer ratio = $\frac{Iprimary}{Isecondary}$
e.g. for a 500 A / 5 A current transformer
transformer ratio K = $\frac{Iprimary}{Isecondary} = \frac{500\,A}{5\,A} = 100$

6.3.2. Equipment settings PFC

Main menu > Settings > Equipment settings PFC

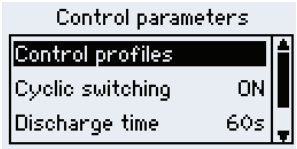


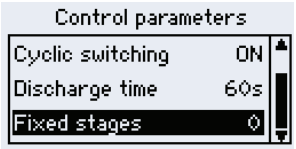
Specific settings for the reactive energy compensation system:

Filtering factor Filters the reactive energy compensation system (A must be set to calculate the exact over-current. If the system is not filtered, enter 0%.

6.3.3. Control settings

Main menu > Settings > Control settings





Specific settings for the COSYS P control function:

Control profiles Profile; selectable profile
Profile: 5 control profiles, see "6.3.3.1. Control profiles" page 54.
Selectable profile: auto switching of profiles to V,U,P thresholds by phase or total P, digital input, see "6.3.3.3. Automatic switching of control profiles (selectable profile)" page 63.

Cyclical mode ON / OFF (ON by default). Cyclical mode switches all racks of the same power to the same frequency.

Discharge time Discharge time Rack discharge time of 5 to 900 s (increments of 1 s). The discharge time should be as long as the longest discharge time recorded for the capacitors used.

Fixed racks Racks always under voltage, not controlled by the COSYS P.

6.3.3.1. Control profiles

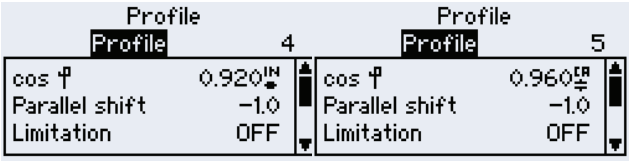
Main menu > Settings > Control settings > Control profiles

Profile See "6.3.3.2. Editable regulatory profiles" page 55.

Selectable profile See "6.3.3.3. Automatic switching of control profiles (selectable profile)" page 63.

6.3.3.2. Editable regulatory profiles

Main menu > Settings > Control settings > Control profiles > Profile



Choose from five profiles, which you can select and modify individually. The device comes with the following default configuration:

PROFILE	1	2	3	4	5
COS φ TARGET	0.96 ind	1.0	1.0	0.96 ind	0.96 cap
PARALLEL DISPLACEMENT	-1.0	0.0	+1.0	-1.0	-1.0
LIMIT	+1.0	off	off	off	off
RESPONSE TIME	45 s	45 s	45 s	45 s	45 s
PHASE	L1	L1	L1	L1	L1

Note: automatic switching of profiles on V,U,P thresholds by phase or total P.

Typical uses for controller profiles

Profile 1	Describes the ideal control curve for all consumer networks where an inductive cos φ factor is required.
Profile 2	Suitable for consumer networks where an average cos φ factor = 1 must be obtained.
Profile 3	Suitable for consumer networks where an average cos φ factor is close to 1 or over-compensation must be avoided.
Profile 4	Suitable for consumer networks like those described under Profile 1, but which have their own production installations (e.g. a CHP cogeneration unit) with ongoing or frequent power supply (regeneration) from the mains.
Profile 5	Suitable for generating networks, such as hydroelectric power plants or wind turbines, where a cos φ factor is required.

Note: the "Notes on COSYS P applications" contain more detailed information.

Control profile settings

BUTTON		▲	▼	OK	i
ACTION	Select profile (enter Yes/ No)	Select setting	Select setting	Select setting Go back to select settings	–

Control profile settings

BUTTON					
ACTION	Select profile (login Yes/No)	Increase value +	Decrease in value -	Go back to select settings	–

cos φ target factor 0.90 capacitive to 0.80 inductive (increments of 0.01)

Parallel displacement -2.0 to +4.0 (in increments of 0.5)

Limit -2.0 to +2.0 (in increments of 0.5), ON or with SP option (parallel displacement) (mirror image of the characteristic curve on the y-axis in the regeneration quadrants). The "Notes on COSYS P applications" contain more information.

Response time 5 to 500 seconds (in increments of 1 second).

Phase L1

Active Activates the control profile (only one profile can be activated).

Setting the cos φ target factor

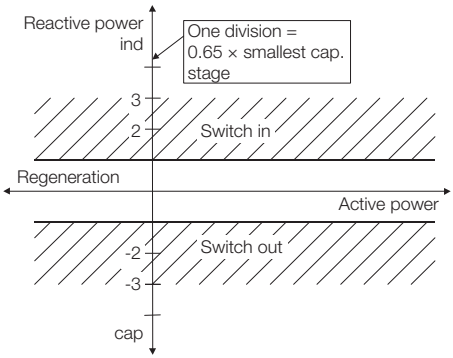
The target value for the cos φ factor can be set from 0.80 inductive to 0.90 capacitive in increments of 0.01. For how to proceed, see the following diagrams:

Control features

cos φtarget = 1

Limit = 0

Parallel displacement - 0



If the system is operating in the band shown, no switching is activated.

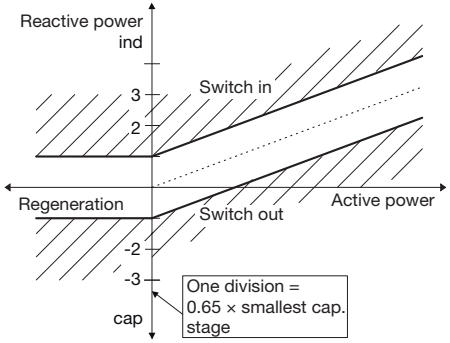
Control features

cos φtarget = 0.92 ind

Limit ind = 0

Parallel displacement - 0

If the system works outside this bandwidth, the COSYS P will attempt to return to the bandwidth with as few switching cycles as possible.



The diagram above shows how the COSYS P acts during regeneration (mains supply). The "elbow" in the band (characteristic line) is not reflected in the regeneration quadrants. Instead, the band extends laterally from the point where it intersects the reactive power axis (Y-axis).

By moving the band into the capacitive range (see parallel displacement section below), inductive reactive power during regeneration can be virtually avoided. When a capacitive cos φ target factor is defined, the control band is a true reflection from the consumption side to the regeneration side (see the 3rd diagram in subsection "Limit").

Parallel displacement

This setting determines a parallel displacement of the bandwidth as shown above. The plus sign indicates a shift in the inductive direction and the minus sign in the capacitive direction.

Values -2 to +4 can be set in increments of 0.5. The following two examples illustrate the effects of these displacements:

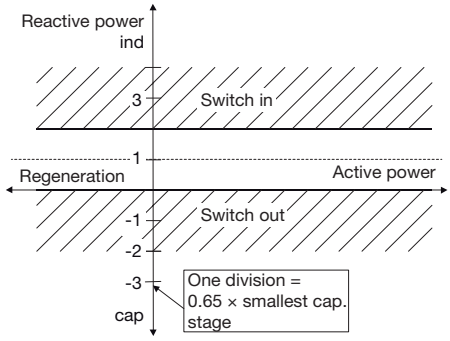
Control features

cos φtarget = 1

Limit = 0

Parallel displacement = +1.0 (inductive value)

The defined cos φ target factor therefore represents the upper limit of the control bandwidth. This avoids over-compensation.

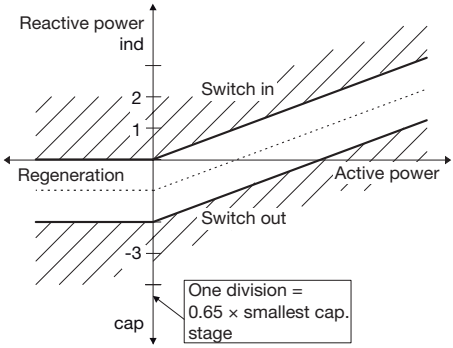


Control features

cos φtarget = 0.92 ind

Limit = OFF

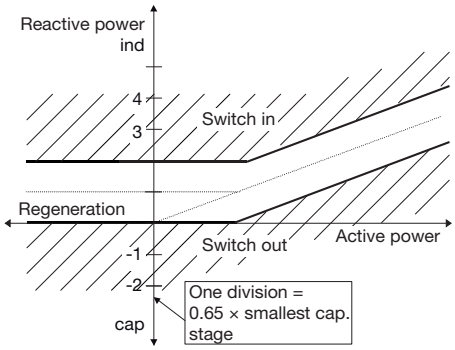
Parallel displacement = -1.0 (capacitive value)



In this case, the cos φ target factor represents the lower limit (more inductive) of the control bandwidth. During regeneration, the lower limit (more inductive) represents a cos φ target factor of 1. This means that there is no inductive reactive power when power is supplied.

Limit

This setting opens up new options that were previously impossible due to conflicting requirements.



The range of system limits can be set between -2 and +2 in increments of 0.5 and can be disabled. Setting the limit to 1 and the cos φ target factor to 1.00 has exactly the same effect as the parallel displacement described above. If the cos φ target factor is not set to 1, the control curve shows a characteristic breakage, as shown in the example above.
The limit is an absolute limit not to be crossed by the reactive power.

Control features

cos φtarget = 0.92 ind

Limit = +1.0

Parallel displacement - 0.0

This setting has the following effects:

The defined γ target power factor is usually reached within the upper power range.

Over-compensations (capacitive, usually disruptive) are avoided in the lower power range.

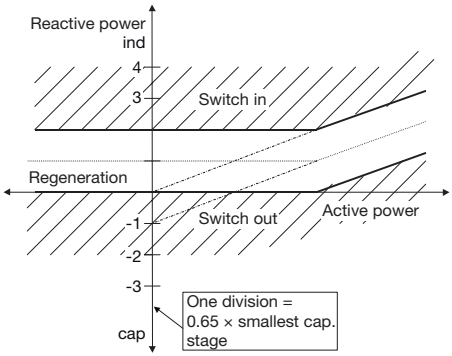
The following diagram illustrates an effective combination of "parallel displacement" and "limit":

Control features

cos φtarget = 0.92 ind

Limit = +1.0

Parallel displacement = -1.0 (capacitive value)

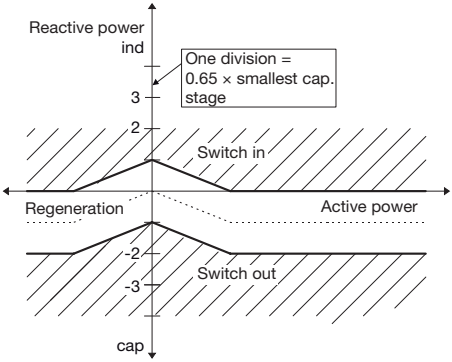


This example shows what happens next

In the "higher" power range, the parameter cos φtarget factor is defined as the lower limit value (more inductive).

Over-compensations are avoided in the lower power range.

For the sake of completeness, the following figure shows the characteristics of the control bandwidth set for a capacitive cos φtarget.
In this case, the control range does not extend laterally on the reactive power axis in the regeneration quadrants, but is a mirror image going from consumption to regeneration.



Control features

cos φtarget= 0.95 cap

Limit = -1.0

Parallel displacement - 0

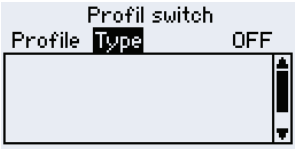
Response time

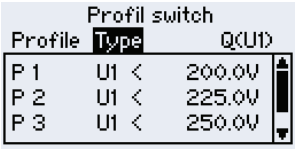
The response time, i.e. the time between one switching action and the next for the same capacitor rack, can be set between 5 and 500 seconds in increments of 5 seconds. Before triggering a rack or turning it OFF, the COSYS P waits until this response time has elapsed before switching. If other racks need to be activated, the response time is shortened depending on the number of racks involved (for example, 2 racks = response time ÷ 2 or 3 racks = response time ÷ 3).

To minimise the wear on the contacts, set the response time to less than 45 seconds in exceptional cases only. The discharge time, which ensures that the capacitors are fully discharged before powering on, takes precedence over the response time.

6.3.3.3. Automatic switching of control profiles (selectable profile)

Main menu > Settings > Control settings > Control profiles > Selectable profile





Stop auto switching of profiles Automatic switching of Q(V) profiles

BUTTON				OK	i
ACTION	Setting	-	Selectable profile settings	Switching type (Q(V1) etc.)	–

The auto switching function automatically modifies the regulatory profiles of the COSYS P. This allows you to set up a 5-point Q (V) or Q (P) control curve (see Notes on the COSYS P application).

The following settings can be used to initiate switching:

- Voltage (L–N) and (L–L)
- Active power
- Digital temp. inputs I/O optional

6.3.4. Alarms

Main menu > Settings > Alarms

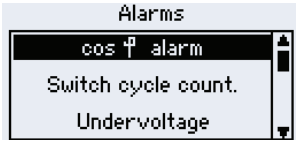
Alarms See "6.3.4.1. Alarms" page 64

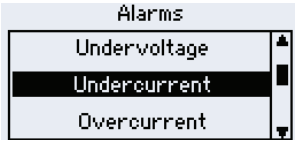
Relay function This option can reverse the way the alarm relay works:

NO mode: Closes the contact if there is an active alarm.

NF mode: Opens the contact if there is an active alarm.

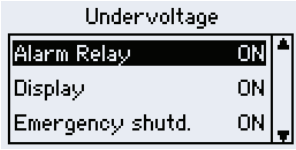
6.3.4.1. Alarms





BUTTON		▲	▼	OK	i
ACTION	Configure the COSYS P	Select alarm threshold	Select alarm threshold	Edit alarm threshold	–

Manage alarms



When an alarm state is detected, the COSYS P can signal or manage alarms in a number of way. Each type of alarm can have different settings.

- Transmission via alarm relay

  If the alarm relay function is assigned to an alarm, the alarm relay built into the COSYS P switches when the alarm goes off (connections: alarms a, b) and stays in that state as long as the alarm is activated.

- On-screen alarm warning

  If the alarm display function is assigned to an alarm, a pop-up window appears on the COSYS P display. Press OK to validate the message, regardless of the alarm state.

- Emergency mode of the reactive energy compensation system
  If a critical alarm is triggered (due to e.g. an over-current issue), the COSYS P can initiate emergency mode to protect the reactive energy compensation system. This action interrupts the automatic control function and disables (OFF) all control outputs. The automatic control function remains disabled for the duration of the alarm plus an additional 240 seconds. After that, the COSYS P automatically initiates control of the system to reach the cos φtarget factor again.

- Alarm signal via the I/O temperature output

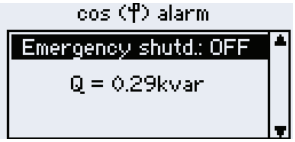
  If the COSYS P is equipped with an optional temperature I/O, the alarms can also be connected to separate outputs. Assigned outputs remain powered for the duration of the alarm (NO mode only).

- Alarm signal via Modbus interface

  If the COSYS P includes the Modbus communication interface (RTU or TCP), all existing alarms stored in the registry can be read. For more information, see Modbus Specifications

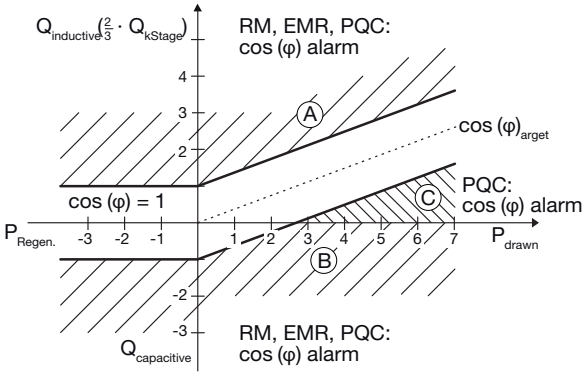
Note: details of alarms settings can be found in the following sections.
All alarms are listed in the section "9. Troubleshooting" page 85.

6.3.4.2. cos alarm φ



Alarm control bandwidth: the COSYS P triggers the alarm cos φ in the following states:

- The measured cos φ factor is more inductive than the control bandwidth and all the capacitors are ON. As a result, the COSYS P can no longer use its capacities to make the cos φ factor more capacitive (see A).
- The measured cos φ factor is more capacitive than the control bandwidth and all the capacitors are OFF. As a result, the COSYS P can no longer turn OFF its capacities to make the cos φ factor more inductive (see B and C).

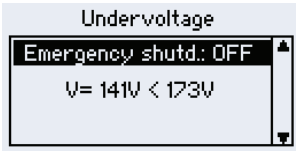


When the control bandwidth alarm is disabled (OFF), you can remove the cos φ factor alarm in range C. This range is not critical in most applications, as the cos φ factor is less than the cos φ target factor.

6.3.4.3. Switching cycles counter

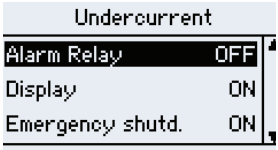
Alert threshold 10 k to 500 k (increments of: 1 k), default value = 80 k

6.3.4.4. Under voltage



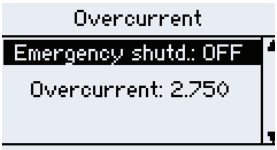
Alert threshold Cannot be changed. The alarm goes off when the measured voltage drops below 10% of the expected mains voltage set.

6.3.4.5. Under-current



Alert threshold Cannot be changed. The alarm goes off when the measured secondary current drops below 10 mA.

6.3.4.6. Over-current



Over-current is the theoretically determined ratio between the value of the real-time actual current and the fundamental current in the capacitor (Irms / I50 Hz, 60 Hz). As such, it indicates the ratio of harmonic currents in relation to the base current.

The filtering factor p of the reactive energy compensation system is also taken into account in the theoretical calculation.

The over-current in the capacitor can only be calculated correctly if the exact filtering factor of the system is entered. If the system is not equipped with an anti-harmonic inductance, enter 0%.

Alert threshold 1 to 2.00 (in increments of 0.01)

6.3.4.7. Zero charge detection (dud)

Alarm detection of a rack's reactive power drop relative to its calibration value. If the measured reactive power falls below the limit, the rack is excluded from the power factor control process.

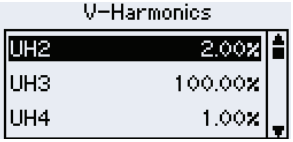
Setting range: "OFF" at 95% (OFF: no power factor compensation process, the rack's reactive power is not monitored.)

WARNING! When the COSYS P is manually calibrated, the alarm is automatically deactivated, as is the alarm threshold (OFF).

6.3.4.8. THDi

Alert threshold 5% at 500%
(in increments of 1%)

6.3.4.9. Harmonics V



Alert threshold 0% at 100% (in increments of 0.01%)

6.3.4.10. Harmonics I

Alert threshold 0% at 100% (in increments of 0.01%)

6.3.4.11. Microcuts (voltage dips)

The voltage break alarm is designed to protect capacitors and their switches from power outages short enough to cause the capacitor switches to open and close immediately.

Alert threshold 50% to 93% (in increments of 1%)

Microcut (voltage dip) in % (100% being the rated power voltage value): This is the mean quadratic value of the voltage at which the voltage interruption detection function must react.

Presets: The alarm goes off if the voltage drops below 85% of the rated voltage.

Microcut (voltage dip) 85%

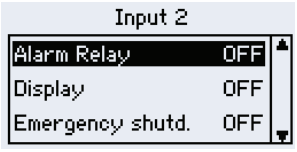
6.3.4.12. Temperature PT-100 / 1000 / NTC1 / NTC2

(optional I/O extension for temperature sensor)

Alert threshold –50 at 200°C (in increments of 1%)

6.3.4.13. Inputs I/O 1 – I/O 5

(optional I/O extension for temperature sensor)



When activated, the temperature sensor and I/O probe extension input allows COSYS P to process logical signals.

Example: Interrupting the control function if logical signal 1 is received. The possibilities are extremely diverse.

6.3.5. Communication (optional)

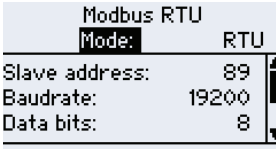
Main menu > Settings > Communication (dyn.)l

The COSYS P has several optional means of communication. This menu depends on the communication option of the COSYS P and, if applicable, the type of option.

6.3.5.1. Modbus RTU

Modbus RTU connection

You can make the following settings in the Modbus interface configuration menu:



Bus address COSYS P is accessible at the defined bus address

Transmission rate 1,200, 2,400, 4,800, 9,600, 19,200, 38,400, 57,600, 115,200

Data bits 5 to 8

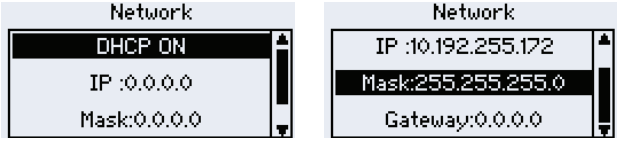
Stop bits 1 or 2

Parity even, odd or none

Note: for more details, see Modbus Specifications

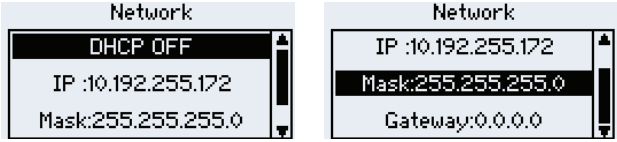
6.3.5.2. Modbus TCP (IoT)

DHCP ON



To use the COSYS P in DHCP mode, select the DHCP ON option. The data displayed in this menu (IP, mask, gateway) indicates the network settings assigned by the server, which means that the services available (Modbus TCP, web server) are accessible on the network.

DHCP OFF



To use the Ethernet interface with a manual network configuration, make the following settings in the COSYS P:

- IP address
- Subnet mask
- Gateway (optional)

Once these settings are defined, the available services (Modbus TCP, web server) are accessible on the network.

The COSYS P is accessible via the Modbus TCP/IP protocol and port 502 at the defined IP address.

Note: the web server is only fully operational with the following browsers:
- Mozilla Firefox version 60.0.1 or later
- Google Chrome version 66.0.3359.181 or later.

The COSYS P allows a maximum of 2 simultaneous connections.

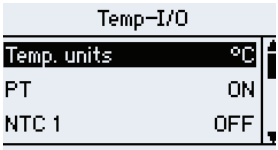
Note: for more information on the optional Ethernet interface, see the "Notes on COSYS P applications".

6.3.6. Temperature I/O (optional)

The following diagram shows the typical circuits of passive digital inputs and outputs, as well as temperature reading inputs:

Temperature measurement inputs

Temperature measurement inputs can be configured on the COSYS P: **Main menu > Settings > Temp. I/O (dyn.)**.



Possible temperature units:

- C (degrees Celsius)
- K (Kelvin)
- F (degrees Fahrenheit)

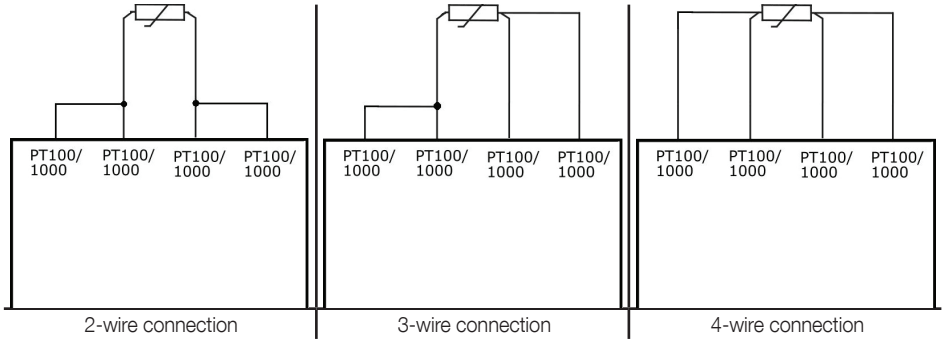
The temperature sensors actually used are configured as active/inactive.

Temperatures measured by active sensors connected to the inputs are shown in the Temperatures menu of the COSYS P.

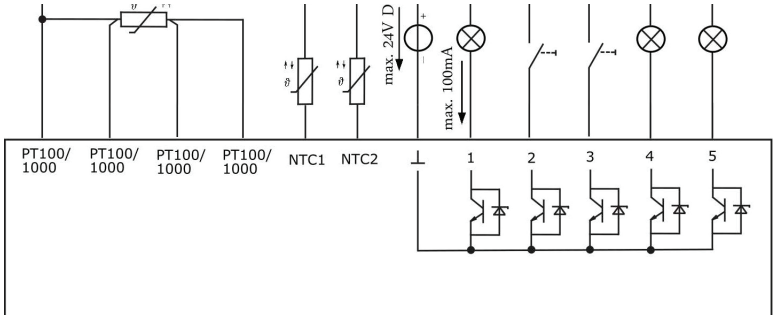
See section "6.2.3.5. Temperatures (optional I/O extension for temperature sensor)" page 49.

If all temperature measurement inputs are to be controlled, you can set the alarm thresholds in the Alarms menu of the COSYS P (see section "6.3.4. Alarms" page 64). A fixed switching hysteresis is set at 1.5 K.

The connections of the temperature measurement input PT-100 / 1000 are supported:



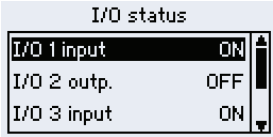
One or two probes with NTC 2 thermistor wires (ref. no. 29-20094, 7 m cable) can be connected as shown below:



Passive digital inputs and outputs

Terminals 1 to 5 can be configured to accommodate any specific application as inputs or outputs of the COSYS P: **Main menu > Settings > Temp. I/O (dyn.)**. If the configured inputs or outputs are used as alarms, their routing can be set in the Alarms menu (see section "6.3.4. Alarms" page 64).

Real-time statuses of inputs and outputs are shown in the **I/O status** menu (see section "6.2.3.6. Temperatures (optional I/O extension for temperature sensor)" page 49).



An input can be used to switch between regulation profiles 1 and 2. To configure this in the COSYS P, proceed as follows: **Main menu > Settings > Temp. I/O (dyn.)**. When this option is enabled, profile switching is done via this input only (after which profiles cannot be switched from the COSYS P menu or the optional Modbus RTU interface) and only between registered regulation profiles 1 (input 1: low level) and 2 (input 1: high level).

Digital inputs can be used for electrical signals from 5 V DC to 24 V DC max.

It is possible to use digital outputs (open collectors) for an external voltage of up to 24 V DC and at a maximum current of 100 mA.

6.3.7. Service

Main menu > Settings > Service (password protected)

6.3.7.1. Start-up

Main menu > Settings > Service > Start-up

See section "5.3.2. Using COSYS P for the first time" page 32.

6.3.7.2. Manual control

Main menu > Settings > Service > Manual settings

CAUTION!
Risk to equipment!

Manually activating a rack can result in over-compensation of the system. This can also cause other problems, such as a surge induced by resonance phenomena in the supply network and/or damage to the racks and other network-related loads.

The supply network must be monitored to detect any resonance and surge conditions when manually switching racks.

This menu shows the number of racks (1 to 12), the status of each rack (ON / OFF), its reactive power (determined automatically or manually) and its switching cycles.

N° Number of racks [1 to 12]

Status ON / OFF / [x second(s)]
ON: manual actuation of a rack OFF: manual disabling of a rack
[x seconds]: time until you can turn ON the capacitor rack again (discharge time)

Q(var) Real-time reactive power of the rack in var (the three-phased reactive rack power).

Switching cycles Number of rack switching cycles

A rack turns OFF immediately. Before the rack can be turned on again, you need to wait until the capacitor discharge time has elapsed. The discharge time count is shown in the Status column. You cannot turn the rack on until this time has elapsed. If any attempt is made to turn on the rack before the countdown ends, a 'not possible' message is shown. (The rack is not automatically switched on once the discharge time has elapsed.)

Press ⓘ to show the real-life values of cos φ, P and Q.

6.3.7.3. Source configuration

Main menu > Settings > Service > Factory settings

Restores the COSYS P default settings (without impacting the switching cycle counter).

6.3.7.4. Removing switching cycles

Main menu > Settings > Service > Remove switching cycles

Reset the switching cycle counters of all racks (individually, service password required); see section "4.4. Password protection" page 19.

Note: a switching cycle counter should only be reset after the relevant switch is replaced.

6.3.7.5. Min./max. reset

Main menu > Settings > Service > Min./max. reset

Reset all min./max values.

6.3.7.6. Reset alarm log

Main menu > Settings > Service > Reset alarm log

Reset all alarms recorded so far.

6.3.7.7. Maintenance

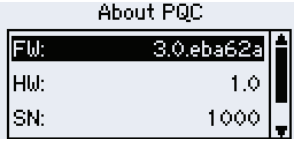
Main menu > Settings > Service > Maintenance

Optional service functions

Update temp. I/O	Software update mode for Temp.
I/O Temp. I/O CLI	for SOCOMEC Service
IoT update	Software update mode for IoT
IoT CLI	for SOCOMEC Service
Update internal Bus	Software update mode for internal Bus

6.4. About COSYS P

Main menu > About COSYS P



This option shows the device's data:

FW	Firmware version number
HW	Hardware version number
SN	Serial number
System time	Operating hours

6.5. Factory settings

MENU	PARAMETER	SETTING
Network settings (see "6.3.1. Network settings" page 53)		
Network settings	Nominal voltage	400 V
	Nominal frequency	Automatic
	Transformer report (I)	1
	Transformer report (V)	1
System settings (see "6.3.2. Equipment settings PFC" page 53)		
Network settings	Filtering factor	7%
Control settings (see "6.3.3. Control settings" page 54)		
Control settings	Cyclic mode	ON
	Discharge time	60 s
	Fixed racks	0
Control profile settings 1	cos φ	0.96 ind
	Parallel displacement	-1
	Limit	1
	Response time	45 s
	Phase	L1
	Active	ON
Control profile settings 2	cos φ	1.0
	Parallel displacement	0
	Limit	OFF
	Response time	45 s
	Phase	L1
	Active	OFF
Control profile settings 3	cos φ	1
	Parallel displacement	+1
	Limit	OFF
	Response time	45 s
	Phase	L1
	Active	OFF

MENU	PARAMETER	SETTING
Control profile settings 4	cos φ	0.92 ind
	Parallel displacement	-1
	Limit	OFF
	Response time	45 s
	Phase	L1
	Active	OFF
Control profile settings 5	cos φ	0.96 cap
	Parallel displacement	-1
	Limit	OFF
	Response time	45 s
	Phase	L1
	Active	OFF
Alerts (see "6.3.4. Alarms" page 64)		
Alarms	Relay function	NO (normally open)
Alert cos φ	Bandwidth control alarm	OFF
	Alarm relay	ON
	Display	ON
	Emergency off	OFF
Switching cycles counter	Alert threshold	80 k
	Alarm relay	ON
	Display	ON
	Emergency off	OFF
Under voltage	Alarm relay	ON
	Display	ON
	Emergency off	ON
Under-current	Alarm relay	OFF
	Display	ON
	Emergency off	ON
Over-current	Alert threshold	1.20
	Alarm relay	ON
	Display	ON
	Emergency off	ON

MENU	PARAMETER	SETTING	
Zero-load recognition	Alert threshold	80%	
	Alarm relay	ON	
	Display	ON	
	Emergency off	OFF	
THDi	Alert threshold	50%	
	Alarm relay	OFF	
	Display	OFF	
	Emergency off	OFF	
Harmonics V	Alert threshold	Components 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	Alert threshold % 2 100 1 6 100 5 0.5 100 0.5 3.5 100 3 0.43 100 0.41 2 100 1.76
	Alarm relay	OFF	
	Display	ON	
	Emergency off	OFF	
Harmonics I	Alert threshold	All 100% (IH2 – IH19)	
	Alarm relay	OFF	
	Display	OFF	
	Emergency off	OFF	

MENU	PARAMETER	SETTING
Voltage interruption	Alert threshold	85%
	Alarm relay	ON
	Display	ON
	Emergency off	ON
Communication (see "6.3.5. Communication (optional)" page 69)		
Modbus RTU	Slave address	0
	Baud rate	19200
	Data bits	8
	Parity	none
	Stop bits	1
Modbus TCP	DHCP	OFF
	IP	0.0.0.0
	Subnetwork	0.0.0.0
	Gateway	0.0.0.0
Internal bus	Internal bus address	0
Temp. I/O (see "6.3.6. Temperature I/O (optional)" page 72)		
Temp. I/O	Temperature units	°C
	PT	OFF
	NTC1	OFF
	NTC2	OFF
	I/O 1	Input
	I/O 2	Input
	I/O 3	Input
	I/O 4	Input
	I/O 5	Input

6.6. Service interface

The COSYS P has a service interface in the form of a Micro USB port. This port is used for maintenance tasks such as firmware updates.

Note: only trained SOCOMEC service technicians are authorised to use this interface.

For more information on firmware updates, contact the SOCOMEC after-sales team.

7. GENERAL CONDITIONS OF USE

Before using COSYS P, always take the following precautions:

- The device should always be used in a closed control cabinet.
- All voltages applied to the device should never exceed the limits indicated in the specifications.
- Ambient temperatures should be included in the range indicated in the specifications.

8. CLEANING AND MAINTENANCE

8.1. Safety during cleaning and maintenance

WARNING!
Risk of electrocution!

The COSYS P uses dangerous voltages. Any contact with live parts inside the COSYS P or at the device's terminals or connecting cables can result in serious injury or death.

- Do not open the COSYS P housing.
- During any cleaning and maintenance work, turn off the power supply to the COSYS P and isolate the connecting cables.
- Lock insulated electrical circuits to avoid inadvertently re-powering them.
- Make sure all connections are OFF.
- All live components in the immediate vicinity must be covered.

8.2. Cleaning

The COSYS P should only be cleaned with a dry cloth. Do not under any circumstances use aggressive or abrasive solvents or cleaning products.

8.3. Maintenance

None of the COSYS P components requires maintenance.

9. TROUBLESHOOTING

If an alarm is triggered while the COSYS P is in use, refer to the table below to identify and remedy faults.

ALARM SIGNAL	FAULT	POSSIBLE CAUSE	WHAT TO DO
	The COSYS P is not working; nothing shown on the front of the device	Lack of current or incorrect voltage	Check that the device is properly connected and that the circuit fuse is not blown.
Can't reach the cos φ φαχτορ	The COSYS P generates a cos φ alarm, but the value of the real-time cos φ factor (closer than 1) is better than the target value. Value is more capacitive than the regulation bandwidth but still inductive	See 6.3.4.2 “Alarme Cos φ” for control bandwidth alarm settings.	See 6.3.4.2 “Alarme Cos φ” for control bandwidth alarm settings.
Voltage > Set limit	The COSYS P is showing that the voltage is lower than the fixed alarm threshold, although there is a voltage on the screen.	The Alarm threshold is not suitable for the rated network voltage. The default setting is recommended for 400 V networks. The alarm goes off when the network voltage is less than 85% of the rated voltage.	Set the correct alarm threshold for the rated network voltage (see 6.3.1 “Paramètres réseau”)
Current < Set limit	The screen does not display a current value (0 A)	Interrupted circuit or short circuit in the current transformer cable.	Use an ammeter to measure the current in this path (Imin * 0.015 A). Danger: see 5.2.7 “Mesure du courant”
		The current in the current path is too low.	(Imin * 0.015 A) Install a smaller current transformer.
		Faulty current transformer.	Check the current transformer.

ALARM SIGNAL	FAULT	POSSIBLE CAUSE	WHAT TO DO
Voltage < set limit + current < set limit	COSYS P indicates the lack of voltage and current, but the device is connected and current is present.	Voltage keeps crossing zero.	Edit network voltage settings –> Switch from Auto mode to a suitable network frequency (50 Hz or 60 Hz).
Over-current > Set limit	Harmonic voltage level of the circuit is too high	The alarm goes off when the Irms/I50 Hz, 60 Hz ratio exceeds the fixed alarm threshold.	
Switching cycles > Set limit	A certain number of switching cycles of one or more switches are over the set max. value		Replace the switches involved and remove the switching cycles entered.
Harmonic V > Set limit	Harmonic voltage level of the circuit is too high		
Zero load detected	The COSYS P detected one or more racks with a reduced rated power.	The capacitor rack(s) lost their capacity.	Replace the capacitor(s)
		Due to an unstable network, the COSYS P mistakenly detected a loss of capacity.	Turn off the zero-load detection feature.
Voltage dip	The COSYS P detected one or more racks with a reduced rated power.	The capacitor rack(s) lost their capacity.	Replace the capacitor(s)
		Due to an unstable network, the COSYS P mistakenly detected a loss of capacity.	Turn off the zero-load detection feature.
Undetected connection Undetected racks		Microcut (voltage dip) The alarm goes off if a voltage dip causes the actual voltage to drop below the set half-wave time limit	

ALARM SIGNAL	FAULT	POSSIBLE CAUSE	WHAT TO DO
Undetected connection Undetected racks	The following message is displayed during automatic calibration: Alarm detected No cap. rack	Fault in the circuit controller (switches not working).	Check the circuit controller using the connection diagram and check the fuse.
		Missing or defective rack capacitor fuses	Check if the capacitors are powered after switching.
		Current transformer installed in the wrong place.	Check if the current transformer is installed in accordance with the wiring diagram.
		Strong fluctuations in reactive power.	Wait for the power supply to stabilise; set the c/k value and the connection type manually
	Despite the inductive load, no rack is activated when the COSYS P is in auto mode.	When programming the COSYS P, c/k, the response time or discharge time was set too high.	Check the COSYS P settings and correct it if necessary.
		In automatic mode, the c/k response current is not been correctly identified.	Check the controller's circuit against the connection diagram and repeat the configuration.
		Another current measuring device (e.g. an ammeter) is connected in parallel with the current path.	All measuring devices in the current path must be systematically connected in series.
	In auto mode, a rack is continuously switched.	The COSYS P was programmed with a c/k value that was too low.	Correct the c/k (see table).
		High load fluctuations; the response time was set too low.	Increase the response time.

ALARM SIGNAL	FAULT	POSSIBLE CAUSE	WHAT TO DO
	The cos φ factor shown is less than the cos φ target factor despite the COSYS P powering all the racks.	Incorrectly entered connection type.	Re-select the type of connection.
		Fault in the controller circuit.	Check that the capacitor switches are ON.
		Error in the capacitor circuit.	Check the fuses and capacitor switches and contacts and measure the load currents using a clamp test, if necessary.
		Strong fluctuations in reactive power.	Reactive power still missing from the menus.
		Faulty calibration.	Repeat the calibration procedure.
	The COSYS P does not turn all racks OFF in low load conditions or when the installations are shut down.	Excessive c/k	Adjust the c/k against the table.
		The COSYS P is in manual mode.	Turn off manual mode.
		Incorrect control profile selected.	Adjust the control profile according to the needs of the system.
	The LCD screen's backlight briefly lights up and then turns off, while the screen is blank or shows only the start-up logo – the device restarts several times.	Power voltage of the device too low.	Check the supply voltage of the COSYS P. Is there excessive contact resistance in the supply circuit?
	The charge states are displayed but the capacitors' switches are not activated.	The controller circuit is not connected properly or there is no control voltage.	Check the circuit controller using the connection diagram and check the fuse.
		Switches not connected to neutral.	

Note: other error messages are listed under "Notes on COSYS P applications".

10. DECOMMISSIONING AND REMOVAL, STORAGE AND DISPOSAL

10.1. Decommissioning the COSYS

WARNING!
Risk of electrocution!

Any contact with live parts at the device's terminals or connecting cables can result in serious injury or death.

Only duly qualified persons who have familiarised themselves and learnt the contents of these instructions are authorised to carry out the installation, commissioning and decommissioning of the COSYS P.

Disconnect the COSYS P from the mains before decommissioning.

Insulated electrical circuits must be locked in order to prevent them from being turned on inadvertently.

Make sure no terminals are under voltage.

Nearby live components should be covered to avoid accidental contact.

CAUTION!
Risk of burns!

The terminals of the device can become hot during operation, which can cause burning if touched.

After using the COSYS P, allow the device and its terminals to cool sufficiently before touching the connections.

CAUTION!
Risk to equipment!

Any contact between the ends of unplugged cables can result in short circuits and overloads in the installation conductors, which could damage the equipment.

- Every unplugged cable must be insulated individually and measures must be taken to avoid accidental contact with live parts or electrical conductors.

1. The current transformers must be short-circuited.
2. Unplug all COSYS P cables.
3. Individually insulate all unplugged cables and take steps to avoid accidental contact with live parts or conductive elements.

10.2. Removing the COSYS P

The COSYS P is held in place by four tabs on the back of the front wall of the cabinet. Remove the fastening screws to release them.

1. Use a screwdriver to unscrew the four screws anticlockwise. This will release the tabs and rotate them so they move to the front panel of the COSYS P.
2. Remove the COSYS P from the front of the cabinet.

10.3. Storage

The COSYS P should be stored in a clean, dry place away from dust.

The storage temperature must be between -20°C and +80°C.

10.4. Disposal

All electronic devices must be disposed of in accordance with environmental protection regulations.

CAUTION!
Risk to equipment!

Non-conforming disposal can be harmful to the environment.

- The device must be disposed of in accordance with the respective legal provisions in force.

WARNING!
Risk to equipment!

In the European Union, electrical waste and electronic components are subject to the WEEE Directive (waste electrical and electronic equipment). These components should never be disposed of as normal household or industrial waste. In other countries, always respect the equivalent local regulations on disposing of waste electrical and electronic equipment. This waste must be delivered to specialised collection centres.

The device can also be returned to Socomec, or handed to one of the company's local representatives for its eco-mindful disposal. Otherwise, it can be handed to a company specialising in recycling electronic devices.

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