

OPERATING MANUAL

Conducont LP4 | Conductivity Transmitter with 4-pole graphite electrodes and temperature sensor



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1 Notes on the Document

1.1 Document Features

This manual describes the product's design, functions, and use, and helps you operate the product as intended.

Read the manual carefully before using the product. This will help you avoid potential injury, property damage, and damage to the device.

The operating manual is an integral part of the device and must be kept accessible at all times in the immediate vicinity of the operating site.

The information in this document reflects the knowledge available at the time of printing. Subject to change without notice.

1.2 Terms

NOTE

Information on how to prevent malfunctions, operational failures, and damage to the device or system.



WARNING

Failure to follow these instructions may result in serious or fatal injury.

[04-5]

Reference to a variant >> Product Code section

1.3 Additional Documentation

In addition to this document, you can find additional documentation online.

2 Safety Instructions

2.1 Authorized Personnel

Installation, electrical connection, commissioning, operation, maintenance, disassembly, and disposal of the device must be performed by a qualified and authorized specialist in accordance with the instructions in the operating manual and applicable standards.

This specialist must have read and understood the operating instructions, particularly the safety instructions. The required personal protective equipment must always be worn when working on or with the device.

2.2 Intended Use

The device is an electronic conductivity transmitter for monitoring, controlling, and continuously measuring conductivity and temperature in liquids.

The device's operational safety is guaranteed only when used as intended. Improper or unintended use of this product may result in application-specific hazards, such as a container overflow due to incorrect installation or adjustment. This can result in property damage, personal injury, or environmental damage. Furthermore, this may impair the device's performance.

Improper use, failure to follow the operating instructions and technical regulations, the use of inadequately qualified personnel, unauthorized modifications, and damage to the device exclude the manufacturer's liability for any resulting damages. The manufacturer's warranty is void.

2.3 Operational Safety

The device is designed and tested in accordance with the state of the art to ensure operational safety. It may only be operated when it is in technically sound and safe operating condition. The operator is responsible for ensuring the trouble-free operation of the device. The device may only be used within the permissible operating limits. Any use outside these intended limits may result in significant hazards.

The materials must be checked for compatibility with the application requirements prior to use. An unsuitable material can lead to damage, malfunction, or destruction of the device and the resulting hazards.

The device must not be used as the sole means of preventing hazardous conditions on machines and systems.

For safety and warranty reasons, any modifications beyond the described operating procedures may only be performed by personnel authorized by the manufacturer. Unauthorized modifications or alterations are expressly prohibited. For safety reasons, only accessories specified by the manufacturer may be used.

The device complies with the requirements of all relevant EU directives. This is confirmed by the CE mark affixed to the device. The corresponding EU Declaration of Conformity can be requested or downloaded from the website.

3 Product Description

3.1 Function

The device is an electronic conductivity transmitter for monitoring, controlling, and continuously measuring conductivity and temperature in liquids.

The device is suitable for conductivity measurement applications in virtually all industrial sectors, particularly for fresh water, wastewater, and saltwater. Its slim design allows for use especially in confined installation conditions, such as in small-diameter sounding tubes.

The highly accurate, long-term stable, and robust conductivity measuring cell, the stainless steel housing, and the thick-walled, dimensionally stable support cable with a heavy-duty steel core ensure reliably precise measurements and enable operation even under demanding environmental conditions, such as low temperatures, high shock and vibration loads, or problematic liquids.

A 4-electrode cell is used to measure conductivity, ensuring accurate and reliable temperature-compensated measurements across a wide conductivity range, even in the presence of contaminants.

A built-in platinum temperature sensor with long-term stability is used to measure temperature.

The measured temperature value can be read via the digital interface on the RS485 Modbus-RTU version.

Configuration and operation can be performed via the integrated wired interface.

3.2 Design

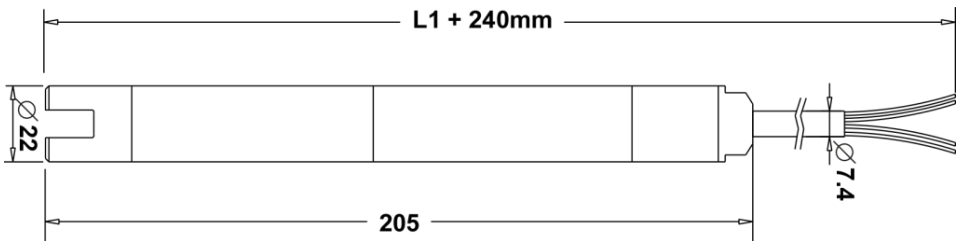


Image3.1 : grf00058_cmp_lp4sl

- 1 Conductivity measurement cell with temperature sensor
- 2 Electronics housing

3 Support cable with steel core

Conductivity measurement cell (1) with integrated platinum temperature sensor.

Fully encapsulated signal processing electronics in the housing tube (2).

Dimensionally stable support cable (3) with steel core and shielding braid.

Laser-etched labeling on the nameplate affixed to the housing tube (2) ensures the device's identifiability throughout its entire service life.

3.3 Nameplate

The nameplate contains the most important data for identifying and using the device.

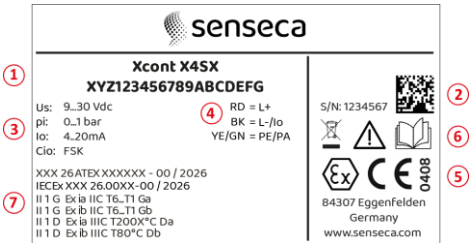


Figure3.2: grf00002_lab001

- 1 Product Code
- 2 Serial Number
- 3 Technical Specifications
- 4 Electrical Connection
- 5 Approvals
- 6 Safety Instructions
- 7 Type of ignition protection

3.4 Product Code

LP4 [01][02][03][04][05][06][07][08][09][10][11][12][13][14][15][80][94/95/98]

	Device	LP4	Conductivity Sensor D22 mm
01	Model	S	Standard
02	Sensor	L	Potentiometric, 4-pin / graphite-epoxy

03	Approval	S	Standard
04	Process Connection	0	without
05	Process Seals	1	FKM/FPM
06	Process Connection	V	CrNi steel
07	Connection housing	0	without
08	Measurement Range (PV)	0	0...50 mS/cm
09	Electronics – Output	V	RS485 Modbus-RTU, 4-wire, overvoltage protection
10	Electronics – Function	3	Temperature -20...+70 °C (-4...+158 °F)
11	Process Temperature	0	-20...+70 °C (-4...+158 °F)
12		0	
13	Measurement accuracy (PV)	4	1% MW / 2 µS/cm
14	Electrical Connection	K	Cable, pre-terminated strands
14		H	Cable, Hydrolog HLF4 assembly
14		0	Cable, unassembled
15	Material of carrier cable	A	PE cable jacket
15		B	Cable jacket: PUR
80	Length L1	/##### #	mm (≤ 300,000 mm)
94	Additional option	+SF	LABS-free, silicone-free / Paint-compatible version
95	Additional option	+ML	Measurement point designation / TAG - laser marking
98	Additional option	+KF	Configuration / Default Setting

Variants are generally identified by the letter Y in the product code.

3.5 Dimensions

Dimensions in mm

[10-4] = Specifications for electronics Function – Conductivity

3.5.1 Electrical Connection – Cables, Stranded Wire Termination – [14-K]

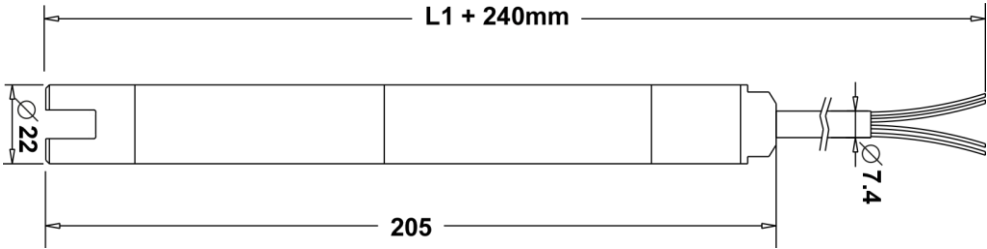


Figure3.3: grf00058_dim_lp4sl_k

3.5.2 Electrical Connection – Cables, Stranded Wire Termination – [14-H]

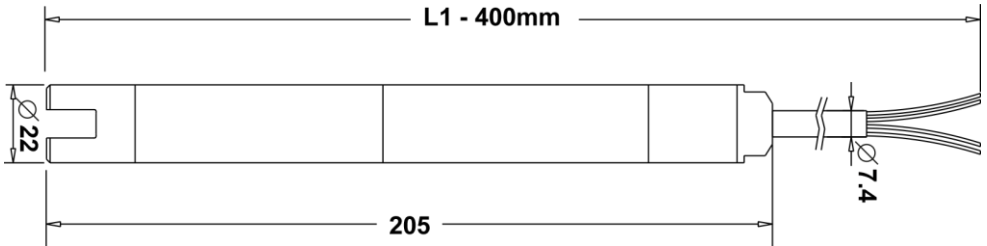


Figure3.4: grf00059_dim_lp4sl_h

3.5.3 Electrical Connection – Cables, Without Termination – [14-0]

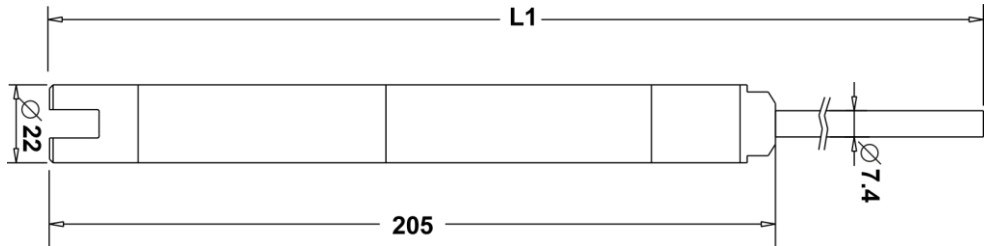


Figure 3.5: grf00060_dim_lp4sl_0

3.6 Packaging, Transport, Storage

The device is protected by packaging designed to withstand normal transport stresses. Transport must be carried out in accordance with the instructions on the shipping packaging. Failure to do so may result in damage to the device.

Upon receipt, the shipment must be inspected immediately for correctness, completeness, and any transport damage. Any transport damage or hidden defects found must be handled accordingly.

The packages must be kept sealed until installation and, unless otherwise specified, stored only under the following conditions:

- Do not store outdoors
- Store in a dry, dust-free location
- Do not expose to corrosive substances
- Protect from direct sunlight
- Avoid mechanical shocks
- Storage and transport temperature: -20...+85 °C
- Relative humidity 20...85 %

3.7 Accessories

A comprehensive range of accessories, optimally tailored to the device, is available for installation and electrical connection.

4 Installation

4.1 Ambient and Process Conditions

Correct operation of the device within the specified technical data can only be guaranteed if the permissible ambient and process conditions at the installation site (see the Technical Data section) are not exceeded. Therefore, before installation, ensure that all parts of the device in contact with the process (e.g., electrodes, process seal, housing, connection cable) are suitable for the prevailing process conditions (e.g., process pressure, process temperature, chemical properties of the media, abrasion, mechanical stresses).

4.2 Installation Location

Install the device in a location free of flow and turbulence, or use a guide tube. The inner diameter of the guide tube should be at least 1 mm larger than the outer diameter of the device.

The device should be installed in a location with a stable temperature whenever possible. Significant fluctuations in process temperature can cause temporary increases in measurement signal deviations.

The cable end must terminate in a dry room or in a suitable junction box.

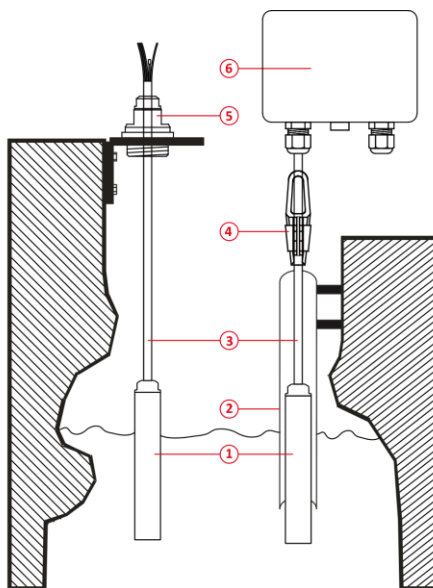


Figure 4.1: grf00005_ins_hp4s

- 1 Conductivity Sensor
- 2 Guide tube
- 3 Support cable (bending radius > 100 mm)
- 4 Tension clamp – see accessories
- 5 Mounting screw – see accessories
- 6 Field housing – see accessories

4.3 Installation Instructions

Do not remove the packaging until immediately before installation, and inspect the device for any damage.

The transport protection cap attached to the measuring cell must not be removed until immediately before installation. The transport protection cap must be removed. The measuring cell must not be damaged.

**WARNING**

Install the device only when the system is depressurized. There is a risk of rapidly escaping measured media or a pressure surge.

**WARNING**

Allow the system to cool sufficiently before installation. There is a risk from escaping, hazardous, and hot measured media.

5 Electrical Connection

5.1 Electronics Output – RS485 Modbus-RTU – [09-V]

5.1.1 Function

The Modbus protocol is a communication protocol based on a master/slave architecture. All devices are connected via two data lines (A+ / B-) and a COMMON line (C/L-).

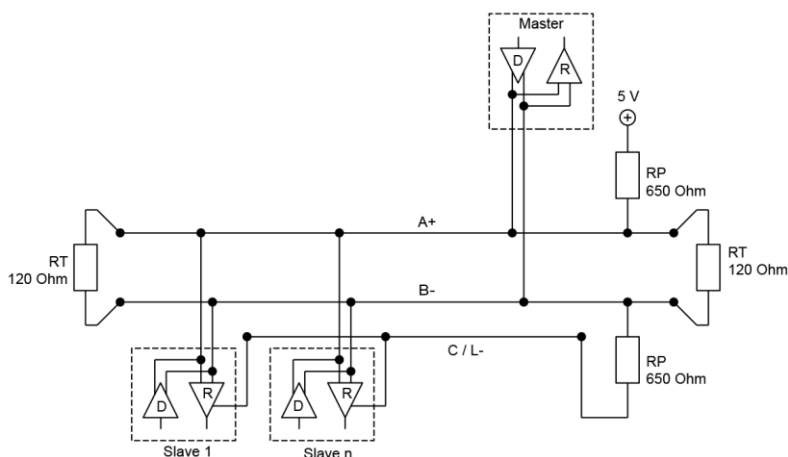


Image5.1 : grf00011_eac_modbus_line_termination

A standard RS485 allows for the connection of 32 slaves in a single segment. The device has a load of only 1/8 of the standard load ($R_{in} \geq 96 \text{ k}\Omega$), meaning that, theoretically, up to 256 of these devices can be operated in a single network segment. However, the number is limited to 247 by the Modbus address space.

The two terminating resistors RT prevent reflections on the data lines. The optimal resistance value depends on the characteristic impedance of the cable used; however, a value of 120 ohms is a common choice.

The polarization network is required to ensure appropriate potentials when none of the devices are transmitting and the A+ and B- lines are therefore undefined (high-impedance). The value of RP depends, for example, on the bus load or the terminating resistors. Recommended values range from 450 ohms to 650 ohms.

The use of a bias network is recommended to maintain a stable network. Typically, the bias resistors are built into the master device or can be enabled as needed.

Arrange the devices in a bus topology (line). Avoid branch lines.

5.1.2 Pin Assignment

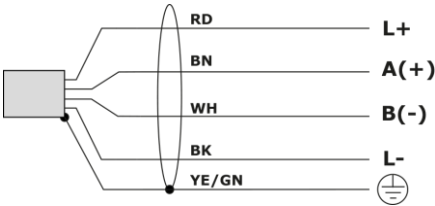


Figure5.2: grf00020_eac_cab_4p_4w_rs485_hp4

5.1.3 Connection Cable

Use a 4-wire cable in accordance with the EIA485 recommendation:

Impedance	135...165 Ω @ 3...20 MHz
Cable capacitance	< 30 pF/m
Cable diameter	> 0.64 mm
Cable cross-section	0.34 mm ² / AWG 22
Loop resistance	< 110 Ω /km
Shielding	Braided shield / shielding foil
Cable length	38,400 baud $\leq$ 1,200 m

Cable colors RD = red / BN = brown / WH = white / BK = black / YE/GN = yellow/green

5.1.4 Connection Instructions

 **WARNING**

Install the device only when it is de-energized.

NOTE

Switch off all connected control devices before commissioning.

Observe the maximum permissible supply voltage U_s at the L+/L- terminals:

- $U_s = 6...35$ Vdc

Ground the device, preferably via the metallic process connection, or alternatively via the cable shield.

Route the cable separately from power-carrying lines; ground the cable shield.

6 Operation

6.1 Electronics Output – RS485 Modbus-RTU – [09-V]

Operation is performed via the wired interface.

Information regarding installation and use of the interface and operating software is not included in this manual.

Parameters

The parameter file and description can be downloaded from the manufacturer's website. Setting ranges and default values are specified for all parameters.

7 Troubleshooting and Fault Resolution

The system operator is responsible for taking appropriate measures to resolve any malfunctions that occur.

In the event of a malfunction, check:

Component / Area	Check	Remedy
Housing	Damage	Replace or return the device
Conductivity measurement cell	Contamination	Clean the device or send it in
	Damage	Replace or return the device
Process seals	Damage	Replace the process seal
		Use a different sealing material if necessary
Pressure-compensating capillary	Contamination	Send the device in for repair
Supply voltage	Operating voltage present	Turn on the operating voltage
		Check or repair the connection terminals
	Operating voltage polarity reversed	Reverse the polarity of the operating voltage
	Operating voltage too low	Adjust or repair
	Operating voltage too high	Send the device in for repair
	Load resistance too high	Increase operating voltage
	Connection cable is damaged	Send the device in for repair

If the malfunction cannot be resolved, please contact the manufacturer.

8 Maintenance

The device is maintenance-free when used as intended.

Deposits that have become firmly attached to the conductivity measuring cell can cause incorrect readings. In this case, clean the conductivity measuring cell regularly. Do not use sharp or hard tools, compressed air, or corrosive chemicals. Device disassembly: See the “Disassembly” section.

8.1 Calibration of the Conductivity Sensor

Calibration determines the cell constant of the conductivity sensor. The cell constant takes into account the geometric dimensions, materials, and design of the conductivity sensor, particularly the aging process of the electrodes. The recommended recalibration interval is 12 months; under difficult measurement conditions (deposits, abrasion, chemical influences), it is 4 to 6 months. The calibration procedure is performed in accordance with separate calibration instructions.

9 Repair

The device is not intended for repair by the user. Repairs may only be performed by the manufacturer.

9.1 Disassembly

Use appropriate protective clothing, e.g., safety goggles and gloves.



WARNING

Allow the device and system to cool sufficiently before disassembly. There is a risk from hot surfaces as well as leaking, hazardous, and hot measured media.



WARNING

Disassemble the device only when it is de-energized.



WARNING

Switch off all connected control units before disassembly.

After disassembly, the diaphragm must be fitted with a protective cap.

9.2 Returns

Returns can only be accepted if the device is accompanied by a decontamination declaration. The declaration is available for download on the website and must be fully completed and affixed to the outside of the packaging in a manner that protects it from the elements and ensures safe transport.

9.3 Disposal

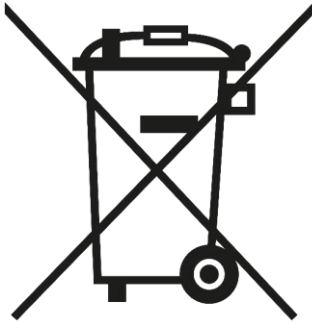


Figure 9.1: sym00001_weee_can

In accordance with EU Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), the product is marked with the symbol shown to minimize the disposal of WEEE as unsorted household waste. These products must not be disposed of as unsorted household waste and can be returned to the manufacturer for disposal. Returns are subject to the manufacturer's general terms and conditions or individually agreed terms.

10 Technical Specifications

Reference Conditions	Ta = +15...+25 °C (+59...+77 °F) / Pa = 860...1060 kPa / r.F. = 45...75 %
	Us = 24 Vdc ±0.1 V / ton = 240 s / vertical, sensor at the bottom
Measurement Deviation	EN/IEC 60770-1: Characteristic curve deviation – Setpoint adjustment
Response time	IEC 60751: Water / 0.4 m/s / temperature step 10 K

10.1 Inputs

10.1.1 Conductivity input

Sensor type	Conductive 4-electrode cell
Measurement range – FSI	0...50 mS/cm
Resolution	≤ 0.1% of measured value (≥ ±0.2 µS/cm)
Calibration curve deviation	≤ ±1% of measured value (≥ ±2 µS/cm)
Temperature compensation	-2 %/K / -20...+70 °C (-4...+158 °F)
Reference temperature	+25 °C
Effect of auxiliary power	≤ ±0.002 %FSI/V
Long-term zero-point drift	≤ ±0.15 %FSI/year

10.1.2 Input Temperature – Pt1000

Sensor Type	Pt1000 resistance – IEC 60751
Measuring range – FSI	-20...+70 °C (-4...+158 °F)
Resolution	≤ ±0.01 K / FSI ≥ 16 bits
Characteristic Curve Deviation	≤ ±0.2 K + 0.005 * [Tp]
Effect of auxiliary power	≤ ±0.002 %FSI/V

Long-term drift	$\leq \pm 0.1 \text{ K/year}$
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10.2 Outputs

10.2.1 Electronic output – RS485 Modbus-RTU – [09-V]

Interface – Cio	
Specifications	RS485, bidirectional / Modbus-RTU / 9600 baud (4800...38400 baud)
Input resistance	112 Ω
Time Response	Conductivity signal: $t_{90} \leq 2 \text{ s}$ ($t_d = 0 \text{ s}$)
	Signal temperature: $t_{90} \leq 60 \text{ s}$ ($t_d = 0 \text{ s}$)
Auxiliary power	
Supply voltage U_s	6...35 Vdc, reverse-polarity protected / residual ripple $\leq 2 \text{ Vpp}$
Input current I_s	$\leq 15 \text{ mA}$ (no load)
Turn-on delay time	$\leq 4 \text{ s}$ ($t_d = 0 \text{ s}$)

10.3 Ambient conditions

Process temperature T_p	-20...+70 °C (-4... +158 °F)
Process pressure	$\leq 5 \text{ bar}$
Ambient temperature T_a	-20...+70 °C (-4... +158 °F)
Protection class	IP68 [$\leq 50 \text{ m}/\leq 5 \text{ bar}$] (EN/IEC 60529)
Climate class	4K4H (EN/IEC 60721-3-4)
Shock resistance	50 g [11 ms] (EN/IEC 60068-2-27)
Vibration resistance	20 g [10...2000 Hz] (EN/IEC 60068-2-6)
EMC	Class B equipment / industrial environment (EN/IEC 61326)

Surge protection	Integrated surge protection (EN/IEC 61000-4-5)
[09-A]/[09-V]	Insulation voltage ≥ 50 Vdc / Rated discharge current 10 kA (8/20 μ s)
Protection class	III
Pollution degree	4
Operating altitude	2,000 m above sea level
MTTF	256.4 years
Weight	0.25 kg + (L1 $\times$ 0.068 kg/m)

10.4 Materials

In contact with the process	Graphite, epoxy
	Steel 1.4404/316L
	FKM/FPM, PE, PUR
Support cable	Breaking force of steel shield: ≥ 920 N
	Bending radius: ≥ 100 mm
	Strand cross-section: 0.22 mm ²
	Resistance: 90 ohms/km

11 Revision

Version	Changes
UMN07.26	Initial release

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