PPT-P-307i-RS

- hydrostatic level, conductivity and temperature transmitter
- submersible probe, diameter 27 mm
- nominal ranges: from 0...4 mH_2O up to 0...200 mH_2O (level); 5 µS... 200 mS (conductivity); 0... 70°C (temperature)
- output signals: digital RS-485 / Modbus RTU or HART
- stainless steel probe and sensor
- accuracy 0.1 % span
- excellent accuracy and long term stability

The **PPT-P-307i-RS** combined transmitter is designed for continuous measurement of level, conductivity and temperature of mineral water in boreholes. It´s possible to measure water level in a borehole, pool or well by just one transmitter. Level of water, conductivity and water temperatures values are gradually sent to RS 485 bus by communication protocol Modbus RTU or HART, transmitter can handle both protocols simultaneously. For measuring the water level is used the proven semiconductor sensor with stainless steel separating diaphragm. Conductivity measurement is provided by a 4 wire sensor with platinum electrodes on ceramics. This arrangement allows accurate conductivity measurement within very wide limits. Level and conductivity channels are digitally temperature compensated. The temperature channel is fitted with a Pt 1000 sensor.

PREFERRED AREAS OF USE ARE

Water / filtrated sewage
- mineral water resources monitoring
- water resources in general
- environmental technology

TECHNICAL DATA

Measurement ranges														
Level channel														
Level [mH_2O]	0.4	0.6	1	1.6	2.5	4	6	10	16	25	40	60	100	
Permissible overpressure [bar]	0.2	0.2	0.5	0.5	1	1	3	3	6	6	20	20	20	
Conductivity channel														
Conductivity channel ranges	5 µS ... 100 µS				100 µS ... 1 mS					1 mS ... 200 mS				
Temperature channel	0…70°C													
Output signal / Supply														
Output signal RS 485	Digital output (communication RS 485 / HART© protocol) 1D Digital output (communication RS 485 / ModBus RTU protocol) 2D													
Supply	Standard 8 … 36 V_{DC}, option 3,3 V … 5 V													
Performance														
Accuracy	IEC 60770: Level … 0,1 % of span Temperature … 2 °C in compensated range Conductivity … range 5 µS … 100 mS … 2 % … range 100 mS … 200mS … 5% (calculated to span for ranges 5 µS … 100 µS, 100 µS … 1 mS, 1 mS … 200 mS)													
Long term stability - level	≤ ± 0.1 % span / year													
Response time - level	200 msec													
Thermal e ects (O set and Span)														
Level channel	≤ ± 0,2 in compensated range 0 ... 70 °C													
Temperature compensation	Via integrated sensor Pt1000													
Permissible temperatures	medium: 0 ... 70 °C storage: 0 ... 70 °C electronics / enviroment: 0 ... 70 °C													
Electrical protection														
Insulation resistance	> 100 MW													
Short-circuit protection	permanent													
Reverse polarity protection	no damage, but also no function													
Electromagnetic compatibility	emission and immunity according to EN 61326													
Electrical connection														
Cable with sheath material [1]	PVC (0 … 70 °C) grey PUR (0 … 70 °C) black FEP [2] (0 … 70 °C) black others on request													

[1] cable with integrated air tube for atmospheric pressure reference
[2] do not use freely suspended probes with an FEP cable if e ects due to highly charging processes are expected

Materials (media wetted)	
Housing	stainless steel 1.4435 (316L)
Diaphragm	stainless steel 1.4435 (316L)
Seals	VITON
Conductivity sensor	Platinum on ceramics Al_2O_3 96%
Connecting cables (by factory)	cable capacitance: signal line/shield also signal line/signal line: 160 pF/m cable inductance:signal line/shield also signal line/signal line: 1µH/m
Miscellaneous	
Current consumption	< 30 mA
Weight	approx. 350 g (without cable)
Ingress protection	IP 68
CE-conformity	EMC Directive: 2004/108/EC
Baud rate*	HART© 1200 Bd 4800 Bd 19200 Bd 2400 Bd 9600 Bd 38400 Bd
	ModbusRTU 1200 Bd 4800 Bd 19200 Bd 2400 Bd 9600 Bd 38400 Bd

* Unless otherwise specified by the customer, the communication is set as follows after delivery by the manufacturer: 8 dat. bit, 1 stop bit, 9600 Bd, even parity, address 1

Map of Input registers MODBUS (read only, function #4 – Read input registers)

Address	Register	Description	Data type	Example	
0x0000	SerialNr	Serial Number	UInt32	0x0012	123456
0x0001				0xd687	
0x0002	CalDate	Date of last calibration	Date	0x07de	2014
0x0003				0x051b	27.5.
0x0004	PressUpperRange	Upper range of pressure channel	Float, IEEE754	0x4120	10,0
0x0005				0x0000	
0x0006	PressLowerRange	Lower range of pressure channel	Float, IEEE754	0x0000	0,0
0x0007				0x0000	
0x0008	Pressure	Actual pressure	Float, IEEE754	0x3f9e	1,2345
0x0009				0x0419	
0x000A	MaxPress	Maximal Pressure	Float, IEEE754	0x3f00	1,5
0x000B				0x0000	
0x000C	MinPress	Minimal Pressure	Float, IEEE754	0x3f00	0,5
0x000D				0x0000	
0x000E	TempUpperRange	Upper range of temperature channel	Float, IEEE754	0x42a0	80,0
0x000F				0x0000	
0x0010	TempLowerRange	Lower range of temperature channel	Float, IEEE754	0xc1a0	-20,0
0x0011				0x0000	
0x0012	Temperature	Actual temperature	Float, IEEE754	0x41a0	20,0
0x0013				0x0000	
0x0014	MaxTemp	Maximal temperature	Float, IEEE754	0x4270	60,0
0x0015				0x0000	
0x0016	MinTemp	Minimal temperature	Float, IEEE754	0x4170	15,0
0x0017				0x0000	
	MeasStatus	Status: 0x0001 = measurement is finished, regs. 0x0023-0x0026 contain valid measurements.	UInt16		
0x001E		Status: 0x0000 = measurement is pending; regs. 0x0023-0x0026 don´t contain valid measurements			
0x001F	Pressure	Actual pressure (copy of regs. 0x0008-0x0009)	Float, IEEE754		
0x0020					
0x0021	Temperature	Actual temperature (copy of reg. 0x0012-0x0013)	Float, IEEE754		
0x0022					
0x0023	Conductivity	Conductivity value [S/cm]	Float, IEEE754		
0x0024					
0x0025	ConductivityTC	Conductivity value [S/cm] recalculated to reference temperature 25.0 °C	Float, IEEE754		
0x0026					
0x0027	CondCellTemperature	Temperature [°C] of conductivity cell	Float, IEEE754		
0x0028					

Map of Holding registers MODBUS (read and write, function #3 - Read Holding Registers , fce #6 - Write Single Register)					
Address	Register	Description	Data type	Example	
0x0000	PressUnitsCode	Unit of pressure channel	Uint16	0x0006	bar
0x0001	TempUnitsCode	Unit of temperature channel	Uint16	0x0000	°C
0x0002	DeviceAddress	Device address (1…247)	Uint16	0x0001	1
0x0003	Baudrate	Baud rate	Uint16	0x0005	9600
0x0004	Parity	Parity	Uint16	0x0000	PA_none
0x0005 0x0006	Pressure Offset	Value for zeroing the pressure	Float, IEEE754	0x3dcc 0xcccd	0,1
0x0007 0x0008	Temperature Offset	Value for zeroing the temperature	Float, IEEE754	0x3f80 0x0000	1
0x0009	CondOffset-Range1	Conductivity offset range 1 (5 µS…100 µS)	Float, IEEE754	0.0000000	S/cm
0x000B	CondOffset-Range2	Conductivity offset range 2 (100 µS…2 mS)	Float, IEEE754	0.0000000	S/cm
0x000D	CondOffset-Range3	Conductivity offset range 3 (2 mS…200 mS)	Float, IEEE754	0.0000000	S/cm
0x000F	CondUnitsCode	Conductivity channel unit	Unit16	0001	S/cm
0x0010	PressDamping	Pressure damping	Float, IEEE754	0,1	s
0x0012	ClearMinMaxValues	Resetting of maximum and minimum values	Unit16	0x0000	Writing 0x0000 will reset all max. and min. values
0x0013	SetCondMeasRange	Conductivity measuring range setting	Unit16	0x0007 – automatic range switching	
„SetCondMeasRange“ register values		0x0000 - Range1: range 2 mS/cm…200 mS/cm 0x0001 - Range2: range 100 uS/cm…2 mS/cm 0x0002 - Range3: range 5 uS/cm…100 uS/cm 0x0007 – automatic range switching			

Pressure unit enumeration MODBUS													
Code (Unit16)	0x0003	0x0004	0x0005	0x0006	0x0007	0x0008	0x0009	0x000A	0x000B	0x000C	0x000D	0x000E	0x000F
Unit	mmH2O @4*	mmHG @0**	psi	bar	mbar	g/cm^2	kg/cm^2	Pa	kPa	torr	atm	mH2O @4*	MPa
*millimeter of water column (4 °C)													
**millimeter of Hg column (0 °C)													

Temperature unit enumeration MODBUS			
Code (Uint16)	0x0000	0x0001	0x0002
Unit	°C	°K	°F

Baud rate enumeration MODBUS						
Code (Uint16)	0x0002	0x0003	0x0004	0x0005	0x0006	0x0007
Baud rate [Bd]	1200	2400	4800	9600	19200	38400

Conductivity enumeration MODBUS				
Code (Uint16)	0x0001	0x0002	0x0003	0x0004
Unit	S/cm	mS/cm	µS/cm	S/m
Note: 1 S/cm = 100 S/m				

Parity enumeration MODBUS			
Code (Uint16)	0x0000	0x0001	0x0002
Parity	None	Odd	Even

It is necessary to make device reset (Power supply o and on) after changing Address, Baud rate or Parity (command #6).
If reset is not performed, device uses old communication parameters.

When working with registers that are longer than 16 bits, it is necessary to read and write these registers at once, otherwise a response with the error code "Illegal data address" is returned.

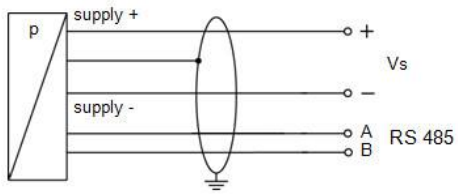
Following commands are implemented in HART protocol:	
Command #0	Read Unique Identifier
Command #1	Read Primary Variable
Command #2	Read Loop Current and Percent of Range
Command #3 Command #3 gives back 4 variables	Read Dynamic Variables and Loop Current - Primary Variable: Pressure [units below pt. 2] - Secondary Variable: PT1000 temperature unit is given by Modbus hold. register #1 (via HART only the primary variable unit can be set) - Tertiary Variable: Conductivity [mS/cm] (Temperature compensated value) - QuaternaryVariable: Conductivity [mS/cm]
Command #6	Write Polling Address
Command #7	Read Polling Address
Command #11	Read Unique Identifier Associated with Tag
Command #12	Read Message
Command #13	Read Tag, Descriptor, Date
Command #14	Read Primary Variable Transducer Information
Command #15	Read Device Information
Command #16	Read Final Assembly number
Command #17	Write Message
Command #18	Write Tag, Descriptor, Date
Command #19	Write Final Assembly Number
Command #34	Write Primary Variable Damping Value
Command #35	Write Primary Variable Range Values
Command #43	Set Primary Variable Zero
Command #44	Write Primary Variable Units
HART protocol is described in the HART standard.	

The following units of measured quantities are implemented in the HART protocol:	
HART pressure units	
Unit	Code (h)
mmH2O@4°C	0xEF
mmHg@0°C	0x05
psi	0x06
bar	0x07
mbar	0x08
g/cm2	0x09
kg/cm2	0x0A
Pa	0x0B
kPa	0x0C
torr	0x0D
atm	0x0E
mH2O@4°C	0xAB
MPa	0xED

HART temperature units	
Unit	Code (h)
Degree °C	0x20
Degree °F	0x21
Degree °K	0x23

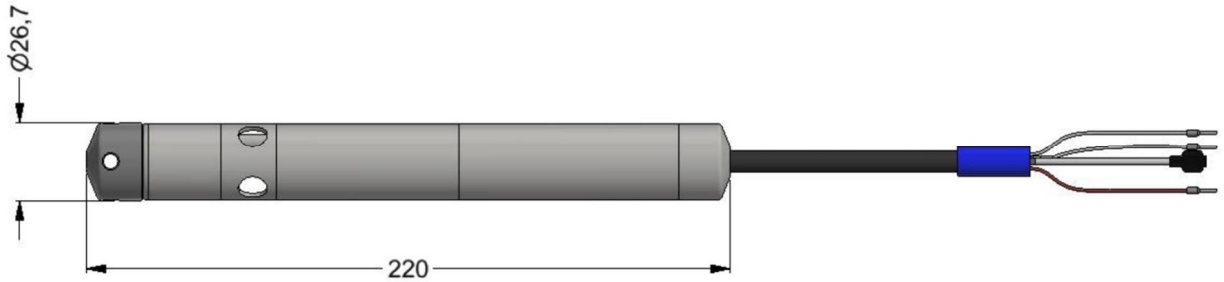
HART conductivity units	
Unit	Code (h)
mS/cm	0x42

ELECTRICAL CONNECTION

Wiring diagram / connector


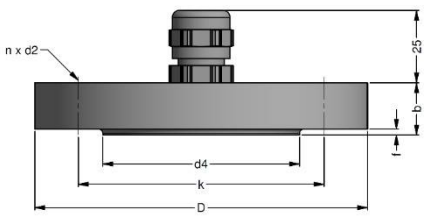
Pin configuration		
Electrical connection		cable colours (DIN 47100)
	Supply + Supply –	wh (white) bn (brown)
	Shield	gn/ye (green / yellow)
Communication protocol	A B	ye (yellow) pk (pink)

DIMENSION DRAWINGS



ACCESSORIES

Mounting flange with cable gland		
Technical data		cable gland M16x1.5 with seal insert (for cable-Ć 4 ... 11 mm)
Suitable for	all probes	
Flange material	stainless steel 1.4404 (316L)	
Material of cable gland	standard: brass, nickel plated on request: stainless steel 1.4305 (303); plastic	
Seal insert	material: TPE (ingress protection IP 68)	
Hole pattern	according to DIN 2507	
Version	Size (in mm)	Weight
DN25 / PN40	D = 115, k = 85, b = 18, n = 4, d= 14	1.4 kg
DN50 / PN40	D = 165, k = 125, b = 20, n = 4, d= 18	3.2 kg
DN80 / PN16	D = 200, k = 160, b = 20, n = 8, d= 18	4.8 kg



Ordering type	Ordering code
DN25 / PN40 with cable gland brass, nickel plated	ZMF2540
DN50 / PN40 with cable gland brass, nickel plated	ZMF5040
DN80 / PN16 with cable gland brass, nickel plated	ZMF8016

Terminal clamp		
Techni cal data		
Suitable for	all probes with cable Ć 5.5 ... 10.5 mm	
Material	standard: steel, zinc plated optionally: stainless steel 1.4301 (304)	
Weight	approx. 160 g	

Ordering type	Ordering code
Terminal clamp, steel, zinc plated	1003440
Terminal clamp, stainless steel 1.4301 (304)	1000278

ORDER CODE

PPT-P-307i-RS-☐☐☐-☐☐☐☐-☐-☐-☐-☐☐-☐-☐-☐-☐☐☐-☐☐☐

Pressure		
in bar		450
in m H_2O		451
[mH_2O]	**[bar]**	
0 … 4	0 … 0,4	4000
0 … 10	0 … 1	1001
0 … 20	0 … 2	2001
0 … 40	0 … 4	4001
0 … 100	0 … 10	1002
0 … 200	0 … 20	2002
Customer		9999
Conductivity		
Automatic range selection (5 µS … 100 µS / 100 µS … 1 mS / 1 mS … 200 mS)		1
Housing material		
Stainless steel 1.4404 (316L)		1
Diaphragm material		
Stainless steel 1.4435 (316 L)		1
Output signal		
Digital output RS 485 (protocol HART)		1D
Digital output RS 485 (protocol MODBUS RTU)		2D
Customer		99
Seals		
Viton (FKM)		1
EPDM		3
Customer		9
Accuracy		
0,1 %		1
Customer		9
Electrical connection		
PVC - cable (grey, Ø 7,4 mm, price for 1 m)[1]		1
PUR - cable (black, Ø 7,4 mm, price for 1 m)[1]		2
FEP - cable with PTFE sheath (black, Ø 7,4 mm, price for 1 m)[1]		3
TPE-U - cable, up to 125 °C (blue, Ø 7.4 mm, price for 1 m)[1]		4
Customer		9
Cable length		
in m		999
Special version		
RS 485 interface, supply 8…36 V DC		14A
RS 485 interface, supply 3,3…5 V DC		143
Customer		999
Additional information for RS485 HART or MODBUS RTU Baud Rate		
1200 Bd		1200
2400 Bd		2400
4800 Bd		4800
9600 Bd (standard)		9600
19200 Bd		19200
38400 Bd		38400
Temperature compensation		
0 … 70 °C (standard)		1
-20 … 80 °C		3
Additional information for "2D" RS 485 / ModBus RTU Parity		
Even (standard)		2
Odd		1
No Parity		0

Accessories for submersible transmitter	
Terminal clamp - zinc plated	1003440
Terminal clamp - Stainless Steel 1.4301	1000278
Mounting screw PG16 - plastic	5002200

1 - shielded cable with integrated ventilation tube for atmospheric pressure reference

Manufacturer reserves the right to change sensor specifications without further notice.