HM-PN11RS Digital submersible transmitter for Level measurement

HM 2501

HM-PN11RS has many advantages:

- Digital electronics.
- Built up with separate measuring probe and electronics house. Probe cable without reference tube. Barometric sensor in house for atmospheric pressure compensation.
- Modular built to suit different needs. Measuring probe with different diameter, different diaphragm material, display option, etc.
- Settings can be done inside electronics housing, via communication or with display (option).
- Built in relays (option) for pump control etc.
- Withstands media up o 125 C continuously (with optional Teflon cable). Very little effect from temperature due to extremely small oil filling volume.
- Tripple output/input: 4-20 mA, MODBUS communication and HART communication (option).
- High accuracy 0,25% (option 0,1%) and low temperature drift (total 0,2% of max range for -10 to +70 degrees C).
- Innovative Autozero function. Just press a button, done.
- Range turndown 30:1. One type fits most applications. Easy setting with span button.
- Well tested and approved for CE (EMC and PED), RoHS, REECH etc.
- Embossed diaphragm (only probe with 31 mm diameter). Insensitive to particles and contact. Easy to clean without deformation.
- Lightning protected as standard. The transmitter can withstand a stroke of lightning close to the supply/signal cables.
- Robust aluminium, IP67, housing protects the electronics and electrical connections from dust and moisture.

HEMOMATIK
www.hemomatik.se
Ordertel 08-771 00 04 Växel 08-771 02 20
Teknisk 08-771 35 80
Länna, S-142 50 SKOGÅS (Stockholm)

Description:

Description HM-PN11 is an upgrade of the successful HM-PN10 level transmitter for applications where pressure connection in the bottom of the vessel is not possi-ble or desirable, for example pump pits. HM-PN11 is designed with an innovative 2-sensor technology. HM-PN11 has a submers-ible measuring probe with two optional diameters 31 or 20 mm. The probe has optional diaphragm material for highest corrosion resistance (20 mm only SS316L). The probe hangs in its cable. The cables standard length is 10 m but can be delivered in length up to max 200 m. The probe cable is connected to the electronic housing where all elec-tronics are placed. Connection of signal/ supply cables are done in the electronic housing. HM-PN11 is equipped with the best possible protection against EMC and lightning strokes.

Function:

HM-PN11 measuring probe measures the liquid level with a piezoresistive abso-lute pressure sensor connected to the diaphragm. This level will then fluctuate with the atmospheric pressure varia-tion. To compensate for this variation there is a barometric sensor, placed in the electronic housing and connected to the surrounding atmosphere. The electronics uses this measurement to compensate the measured liquid level for the atmospheric pressure variations. The benefit of this technique is that the measurement will be more accurate because there is no need for a refer-ence tube in the probe cable. This tube has often caused big faults because of plugging or condensation. The probe cable is also easier to lengthen/shorten for the user. Probe cable in Teflon can be delivered for applications with high-er media temperature, up to +125°C (+257°F). Normal max media tempera-ture is +80°C (+176°F).

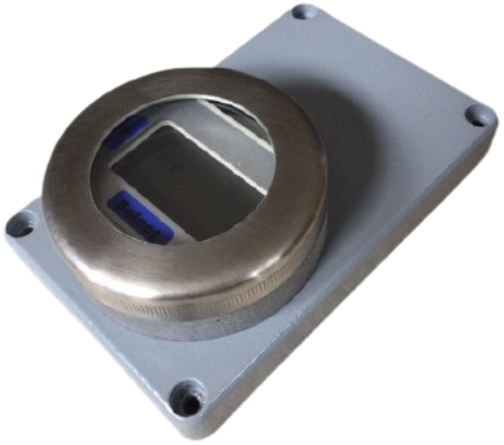
HM-PN11 has microcomputer-based elec-tronics, which communicate with the outside world with 4 to 20 mA signal as well as HART (option) and MODBUS communication. The electronics meas-ure and converts the output signal from the pressure dependent sensor bridge to digital values. Furthermore, the total resistance of the probe sensor bridge is measured and these values are convert-ed to digital temperature values.
The electronics perform compensation for temperature drift of the sensor by means of compensation values en-tered at the factory calibration and at the same time the temperature meas-urement is also calibrated. Compensa-tion for the non-linearity in the sensor is done in the same manner.
Different kinds of transfer functions, such as linear, square root, curves..., can be selected. The electronics per-form the calculation for the selected transfer function and then the digital value is converted to analogue for the 4 to 20 mA current loop. The digital value can also be read via MODBUS and HART (option) communication in optional engineering units, percent-age or current.
HM-PN11 can be configured/ calibrated via buttons inside housing, via the display D10RS (pending) or a PC via MODBUS communication or HART communica-tion (option) and also by means of a Hart hand terminal .

Local switching:

HM-PN11 can as an option be equipped with two potential free optical relays. Switching points can be set from the display or via MODBUS communica-tion from a PC (pending). Use for ex-ample for pump control etc.

Display:

The transmitter can as an option also be equipped with a local display, D10RS. The display can show the sig-nal in optional engineering units, for example mWc or mH2O. Unit and lim-its can be set by customer on the dis-play.
The display can also be used for con-figuring the transmitter.



Autozero function:

HM-PN11 has an innovative solution to elim-inate the problem of zero shift (due to for example mounting orientation, cov-ering, corrosion or mechanical damage of the diaphragm). Place HM-PN11 level probe in correct mounting position with the pressure that shall represent 4 mA on the diaphragm and just press a button or shorten two cables for ten seconds. This action resets the 4 mA
(and also makes the communication to send correct pressure/level in engi-neering units).
Autozero can also be done via commu-nication, both via MODBUS and HART (option) and also from the display.

Span setting function:

HM-PN11 has a simple solution to set the level for span, 20 mA output. Just put the level (pressure) that shall represent 20 mA on the HM-PN11 probe diaphragm and press the span button for ten sec-onds. This action sets 20 mA to repre-sent this level (pressure) (and also makes the communication to send cor-rect pressure/level in engineering units). Span can also be set via communica-tion, both via MODBUS and HART (option) and also from the display.

Approvals:

HM-PN11 is CE approved according to the EU directives for pressure equipment, PED, and EMC. HM-PN11 fulfils al requirements for RoHS, REACH and WEEE directives.

The pressure intermediate oil is a FDA approved silicon oil.

Cable:

Length: Standard 10 m, see text and code table (option up to 200 m).
Cable sheath: PUR (polyurethane), black
Outer diameter: 7,5 mm
Cord: 4, colour coded
Cord size: 0,34 mm2

To consider:

Never place the electronic housing direct on a cold or damp wall, leave a gap.

Always place the electronic housing so that the cable entry for the probe cable is directed downwards.

Use round signal/supply/relay cable and tighten the cable feed through firmly.

Make sure that the electronic housing cover is tight.

Make sure that the reference tube in the box is connected to the surrounding atmosphere.

Don't expose the diaphragm to unnecessary damage (even though its very robust and insensitive). As standard the probe is delivered with a transportation diaphragm protection cover. This can also be used in normal operation if required. For harsh applications a stainless steel protection cover can be supplied.

Don't descend the probe so that it stands on the bottom of the vessel.

Highest media temperature is +80°C (+176°F) or with Teflon cable +125°C (+257°F).

If the media are turbulent or flowing fasten the probe appropriately.

NOTE! Durability of the diaphragm and other parts of the transmitter is dependent of process parameters and media and is the users full responsibility.

Make sure that no free hydrogen can exist in the media, if so try to use gold plated diaphragm.

Check that the cable sheath corrosion resistance is sufficient for the media.

Default settings for relay:

Opto 1:
4 mA and below ON
20 mA and above OFF
Opto 2:
4 mA and below OFF
20 mA and above ON

Relay switching points can be set via MODBUS and from the display (pending).

Lightning protection:

As standard HM-PN11 is equipped with a very efficient lightning protection.
The protection is designed to withstand a lightning stroke close to the connection cables but can not withstand a direct stroke. The protection is designed to meet the demands for Class 1 testing according to IEC61643-1 5 kA (10/350 uS).
This protection is normally enough in most applications.
The lightning protection is built up as a three step protection. The pulse that enters the transmitter is catched by two varistors, three transient protection diodes and a double surge arrester. The lightning protection protects both the 4 -20 mA/supply connection and also the probe cable connection.
The transmitter housing must be appropriately grounded for the protection to fulfil its purpose.

MODBUS Communication:

MODBUS communication can be used for transfer of measured values, for example the level and the media temperature (etc.). Several units can be connected in parallel and addressed to communicate its values (addresses from 1-255). Standard address at delivery is 10.
The communication can also be used for configuration of all HM-PN11 parame-ters direct from a suited control system or from a PC (with appropriate soft-ware).
The MODBUS communication is fully registry based (see the manual for HM-PN11 for more information).
Physical interface for MODBUS is RS485, 4 lines. Supply voltage (11-48 VDC) use the 4-20 mA lines and the communication use two separate lines A and B.
A standard RS485 dongle can be use (but it is optimal to use an optoisolated RS485 dongle).

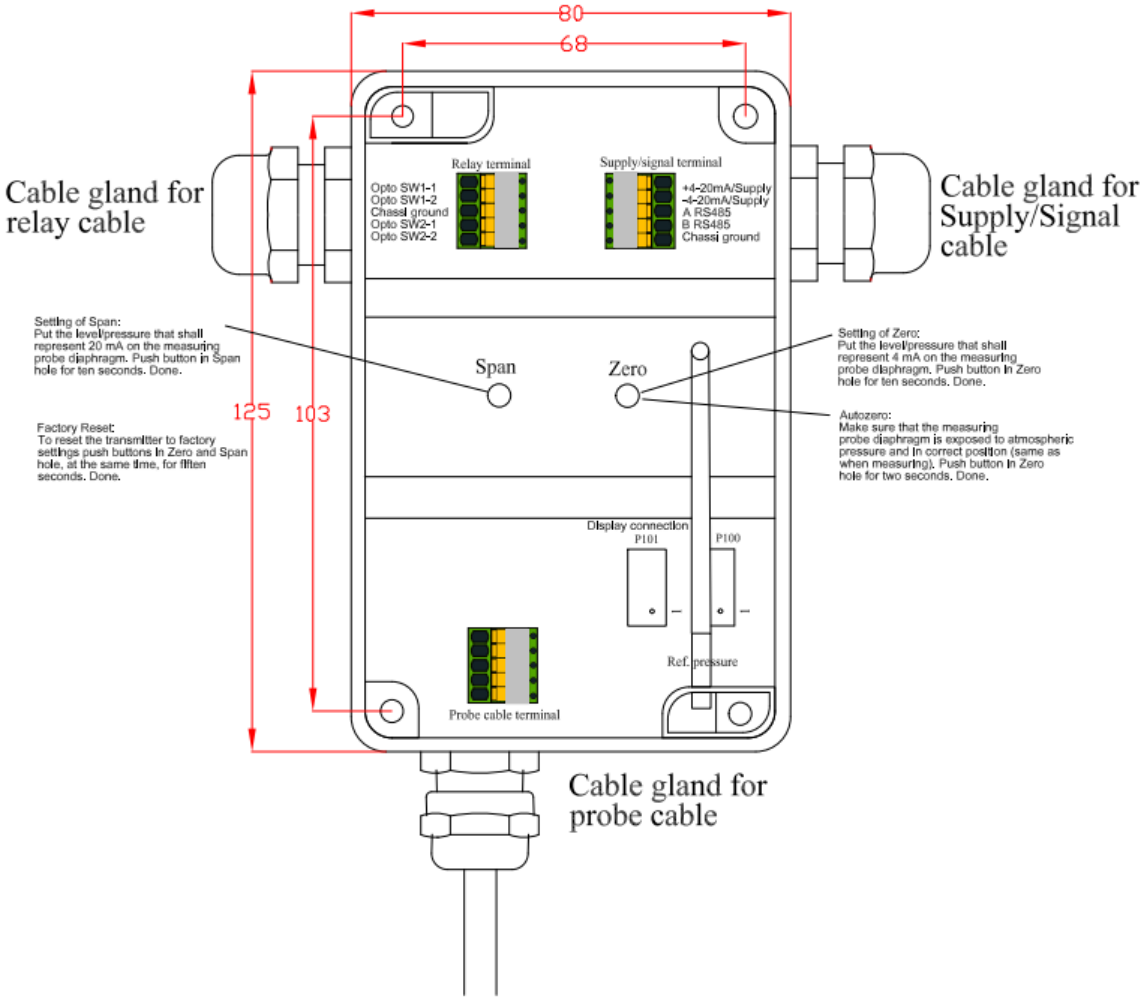
HART Communication:

HM-PN11 can communicate via HART (option), both for signalling values and for configuration.
HART is a standard communication protocol that can be used for signalling of measured values and for full configuration of all HM-PN11 parameters. The HART protocol have three levels of commands, Universal, Common Practice and Transmitter Specific com-mands.
A HART modem must be used.
The physical interface use FSC (Frequency Shift Communication) signalling. This is done by overlaying a 1200 Hz or 2400 Hz full sine wave on the current loop. The 4-20 mA signalling is fully unaffected by this.

PI200PS/PSD:

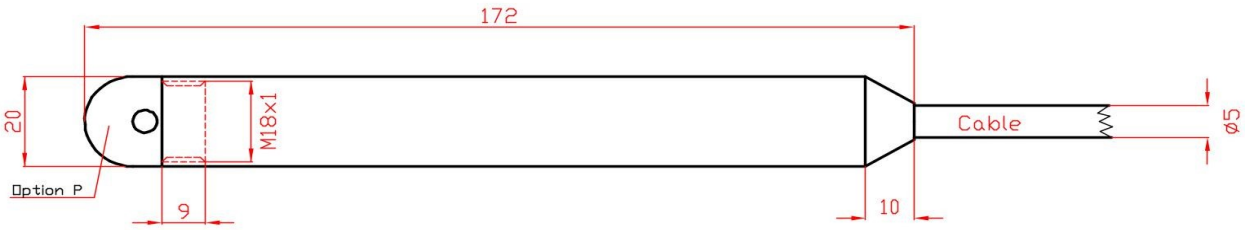
PI200PS is a PC package for configuration of MODBUS Pressure, Differential and Level Transmitters.
This battery powered modem box with mA display can be used with optional MODBUS software.
Included in the package is a PC program, MEP7 Modbus Tool, dedicated for configuration of Pondus Instruments pressure, differential and level transmitters.
To PI200PS a low resistance mA meter easily can be connected to show the mA output signal.
PI200PSD has an inbuilt display to show the transmitters mA output signal (see picture).

Electronics box layout and size:

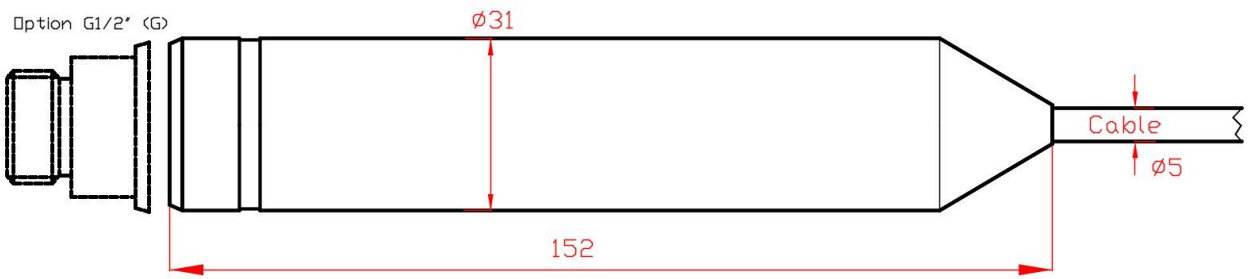


Level probe size:

Level probe type A, AP:



Level probe type B, BG: (preliminary size)



Code table:

HM-PN11abcd-xyz-1234 (NOTE HM-PN11RS have as standard built in Lightning protection) Standard cable length is 10 m.	**Suffix abcd Elevtronics**	**Suffix x Display**	**Suffix yz Probe type**	**Figure 1 Diaphragm material**	**Figure 2 Connection**	**Figure 3 Range**	**Figure 4 Ref. Pressure**	**Comment**
Electronics								
4-20 mA and Modbus	RS							Standard
4-20 mA, Modbus and Hart	RSH							
4-20 mA and Modbus. With relay.	RSR							
4-20 mA, Modbus and Hart. With relay.	RSHR							
Display								
No display		x						Standard
Built in display		D						
Measuring probe type								
Probe type A (diameter 20 mm)			A					Standard
Probe type B (diameter 31 mm)			B					
Probe type A with diaphragm protection SS			AP					
Probe type B with G1/2” thread			BG					
Diaphragm material								
Titanium (only for probe B)				1				
Stainless steel 316L (for probe A, AP, B and BG)				3				Standard for Probe A, AP
Hastelloy C276 (only for probe B, BG)				4				Standard for Probe B, BG
Gold plated (only for probe B, BG)				8				
Connection								
Submersible Probe					0			
Span min-max (range)								
0-3,5 mH2O (4 degrees C)						1		Specify cable length
0-5 mH2O (4 degrees C)						2		Specify cable length
0-10 mH2O (4 degrees C)						3		Specify cable length
0-20 mH2O (4 degrees C)						4		Specify cable length
0-35 mH2O (4 degrees C)						5		Specify cable length
0-70 mH2O (4 degrees C)						6		Specify cable length
0-200 mH2O (4 degrees C)						7		Specify cable length
0-400 mH2O (4 degrees C)						8		Specify cable length
Reference Pressure								
Atmospheric pressure							0	

Ordering example: Level transmitter with 4-20 mA, Modbus and relay. Built in display. Standard probe with diaphragm protection and range 0-20 mH2O will have the code **HM-PN11RSR-DAP-4040, specify cable length or standard 10 m.**

Technical data HM-PN11:

Type:	Electronic level transmitter with digital electronics	**Series resistance dependence:**	Better than +/- 0,1 %
Function:	Submersible level transmitter with separate electronics housing. Piezo-resistive sensor. Barometric sensor in electronic housing for atmosphere compensation.	**Supply voltage dependence:**	Better than +/-0,1 %
Operation range:	From 0% to 100% of range.	**Temperature dependence:**	Better than +/-0,2 % of max range (For -10 C to +70 C) *1
Span:	Adjustable between upper sensor limit and 1/30 of this.	**Long time stability:**	Better than 0,08% per year.
Zero:	Adjustable between –100% and 100% of upper sensor limit.	**Vibration dependence:**	(for Probe)
Overload:		Perpendicular to the diaphragm:	Max 0,3 kPa/G
3,5, 5, and 10 mH2O	Max 30 mH2O	Parallel to the diaphragm:	Max +0,2 kPa/G
20, 35, 70 mH2O	Max 150 mH2O	**Vibration test:**	Test according to IEC770
200 mH2O	Max 600 mH2O	**Repeatability:**	Better than +/- 0,1 % of max range.
400 mH2O	Max 1000 mH2O	**Accuracy:** (including non-linearity, hysteresis, repeatability).	Better than +/-0,25 % of max range. Option 0,1%.
Material : Diaphragm:	See Code table	**Mounting:**	Submersible Probe . Wall mounted electronic box.
Media touched parts:	Stainless steel 316L. PUR cable.	**Electrical connection:**	Spring loaded terminal
Housing:	Casted aluminium	**Encapsulation:**	IP67 house , probe IP68
Ambient temperature:	-20 to +80 degrees C		
Damping:	0,1 to 10 sec. Adjustable via communication.	**Electrical safety:**	According to EN60204-1
Media temperature:	80 C. With Teflon cable 125 C.	**EMC:**	According to EN61326-1-2-3
Output:	4-20 mA. Signal proportional to the pressure. Hart (option) and MOD-BUS communication.	**PED:**	According to 97/23/EC
Supply:	11-55 V DC	**Filling oil:**	AK100, food approved silicon oil (FDA approval).
Series resistance:	R kohm=(Supply-11/20)	**Weigth:**	300-1000 g depending cable length connection.

*1 Depend on probe type and configuration.