

Hydrostatic Level Measurement *waterpilot FMX 160*

**The cost-effective and reliable cable probe.
Standard unit for the measurement of water levels
in wells and clarification plants**



Cable probe
Waterpilot FMX 160

Features at a Glance

- *Standard probe for water and wastewater plant construction*

The reliable and cost-effective Waterpilot FMX 160 fulfils the requirements of process plant construction due to increased electrical and mechanical stability of the probe

- potted electronics unit with 4...20 mA signal output with integrated overvoltage protection,
- durable conical cable sealing fitted on the probe tube and with a moisture barrier in the pressure compensation line
- stainless steel wetted parts with Viton gasket
- Measuring cell can easily be replaced

- *Complete sensor programme*

The Waterpilot supplements a complete and uniform sensor programme to provide the application-specific solution at all times. The Deltapilot S, the hydrostatic probe from Endress+Hauser, is used instead of the Waterpilot if

- the solids content of wastewater is high
- corrosive industrial waste is mixed with wastewater or
- highly accurate measurement is required.

- CE mark

Application

The Waterpilot FMX 160 hydrostatic pressure sensor is used for measuring levels of water or wastewater.

The nine measuring ranges from 0.2 bar up to 10 bar and 2 m (10 ft) water gauge up to 100 m (300 ft) water gauge enable the Waterpilot to cover all standard applications as well as those for deep wells, water towers and clarification plants.

Accessories:
Cable hold for no-slip mounting with connecting box and housing with G 1½ thread connection



Complete Measuring Point Peripherals

Mounting is by either a cable holder including connecting box or a housing with a G 1½ thread.

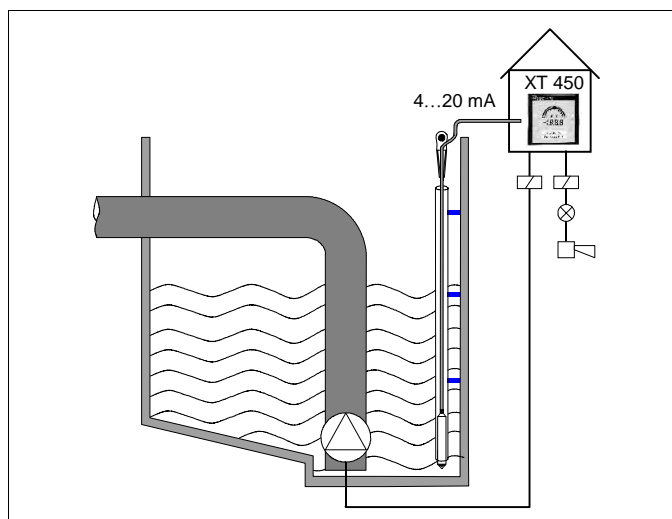
Whether transmitter power supply units (with display) or limit relays, plotters or ... Endress+Hauser offers the complete range of measuring point peripherals for the Waterpilot.

Endress+Hauser

Nothing beats know-how



Operating Principle



Practical example.
A Waterpilot FMX 160
(inside a guide tube)
and a Contactor
XT 450 for supplying
power and pump
alternating control

The Complete Measuring System

The measuring point consists of one Waterpilot FMX 160 and one transmitter power supply unit with a voltage between 10.5 V...24 V (not Ex) or 12...30 V.

Design

The core of the Waterpilot hydrostatic pressure sensor is a silicon resistive measuring cell mounted in a stainless steel probe tube. The stainless steel diaphragm is protected by a fine mesh metal grid and a protective cover.

Function

The hydrostatic pressure of the column of liquid acts on the stainless steel diaphragm and is transmitted within the measuring cell which is filled with silicone oil. The pressure deflects a silicon diaphragm with a thin film strain gauge. A resistance bridge supplies the electrical signal which is converted into a pressure proportional 4...20 mA signal by the evaluating electronics.

Variations in pressure on the surface of the liquid are compensated for by an air tube passing through the connecting cable to the far side of the silicon diaphragm.

Nine preset ranges cover all measurements from 0.2 bar up to 10 bar and 2 m (10 ft) water gauge up to 100 m (300 ft) water gauge. Other ranges are factory set.

Note

Endress+Hauser recommends the Deltapilot S hydrostatic pressure sensor for applications with chemical wastewater, wastewater containing solids or for applications requiring high accuracy and small measuring ranges. The Deltapilot S is especially designed for such applications with its corrosion-resistant sensor diaphragm in Hastelloy C.

Customised Operation

- Typical conditions found at wells and clarification plants are atmospheric interference or overvoltages, e.g. lightning discharge. The integral overvoltage protection prevents short transient voltage peaks damaging the electronics unit. Further protection is achieved with a separate HAW overvoltage unit.
- Also typical are the rugged weather conditions affecting the cable probe. All electronic modules are potted and a moisture barrier reduces condensation build-up in the pressure compensation line to ensure increased long-term stability of measurement.
- The metal diaphragm of the Waterpilot has double protection with a plastic protective cover as well as a metal grid to ensure error-free operation without maintenance for all typical applications.
- The cable gland in the probe tube is sealed with a conical gasket to give a durable self-adjusting seal which is completely tight fitting.

Other Features

The 4...20 mA two-wire system allows the measuring signal to be transmitted over large distances.

Additional filters at the input of the electronics protect the measuring signal from electromagnetic interference (RFI protection 10 V/m).

The connecting cable is coated with PE insulating layer to prevent wear. It is also reinforced by steel webbing for use as a supporting cable.

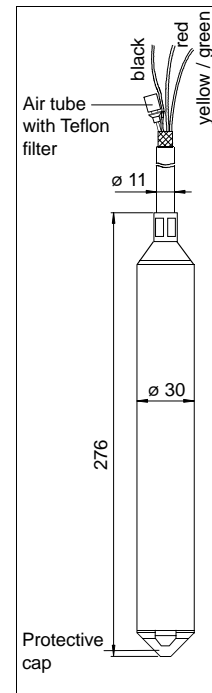
Mounting

Installation Point

The cable probe should be mounted where there is no flow or turbulence. If this is not possible, then a guide tube should be used at least R 1½ or internal diameter greater than 50 mm in order to prevent sideways movement of the probe leading to measuring errors.

Important:

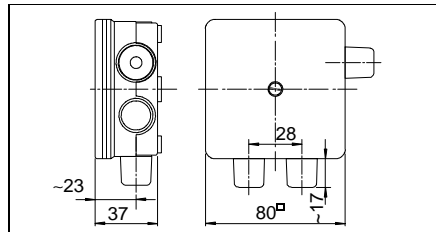
- Insert the cable probe slowly into the liquid.
- Cable probe should not hit any side walls.
- Connecting box should be mounted outside the shaft or the connecting cable should lead directly to the control panel.



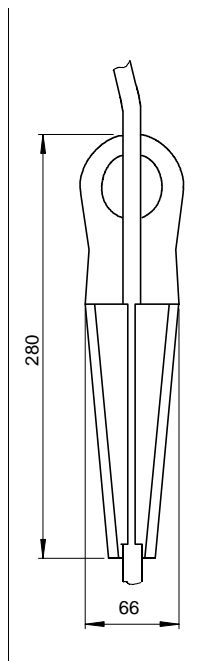
Dimensions
cable probe
1 mm = 0.039 in
1 in = 25.4 mm

Accessories

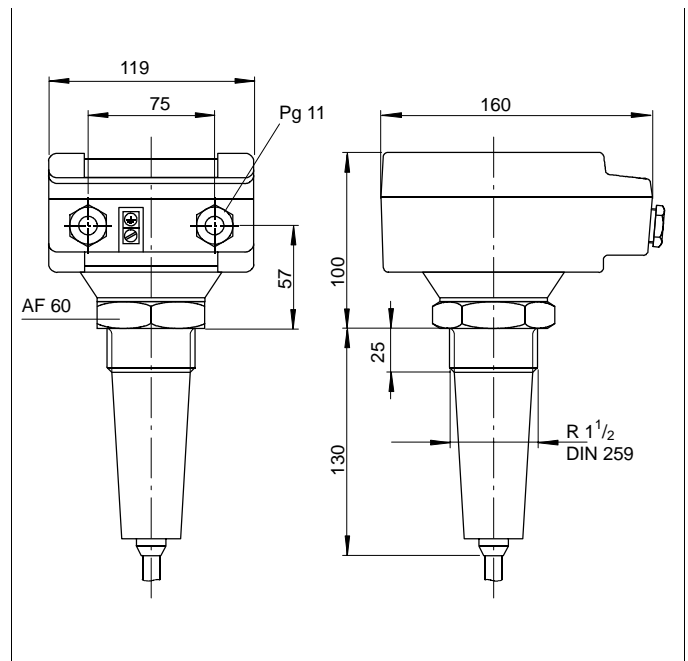
1 mm = 0.039 in
1 in = 25.4 mm



Accessory:
Dimensions of the
connecting box IP 54
(Code C for
"mechanical
connection")



Accessory:
Galvanised cable holder
(Code C for
"mechanical
connection")



Accessory:
Dimensions of the housing: Alu housing IP 55
with pressure compensation, G 1½ in PBTB
(Code A for "mechanical connection")

Technical Data

* ft means ft water gauge
m means m water gauge
** Other measuring ranges available

1 m = 3.28 ft
1 ft = 0.305 m

Measuring Range

Measuring cells with a silicon resistive sensor

Measuring range**	0.2 bar	0.4 bar	0.6 bar	1.0 bar	1.6 bar	2.5 bar	4 bar	6 bar	10 bar
	2 m*	4 m*	6 m*	10 m*	16 m*	25 m*	40 m*	60 m*	100 m*
	10 ft*	20 ft*	30 ft*	50 ft*	75 ft*	100 ft*	200 ft*	300 ft*	
Overload in bar	1.6	1.6	2.4	4.0	6.4	10.0	16.0	24.0	40

Material, Wetted Parts

Sensor tube: 1.4571 (BS 316 L)
stainless steel
Diaphragm: 1.4401 stainless steel (filling liquid in measuring cell: silicon fluid)
Gasket: Viton
Cable: PE insulation (polyethylene), can be shortened
Protective cover: perfluoralkoxy-copolymerisate (PFA)

Materials, Mounting Accessories

Cable holder: galvanized steel with pressed clamps
Housing: aluminium, G 1 1/2 in polybutyleneterephthalate (PBTP)
Connecting box: Duroplast

Weight

Cable probe: approx. 0.5 kg (1.1 lbs) (without cable)
Housing with cable: approx. 2.1 kg (without cable)
Cable holder incl. connecting box: approx. 0.5 kg
Cable: approx. 0.1 kg/m (0.0671 lbs/ft)

Operating Conditions

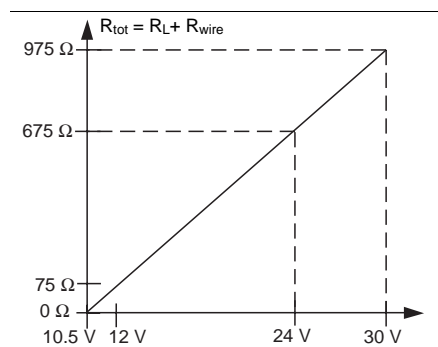
Process temperature: 0...50°C
Storage temperature: -20...80°C
Protection (DIN 40 050):
Cable probe IP 68,
Housing IP 55, Connecting box IP 54

Electromagnetic Compatibility

Interference immunity to EN 50082-2 and industrial standard NAMUR (field strength 10 V/m)
Interference emission to EN 50081-1

Note

The connecting wires of the supporting cable are connected to the power supply and the potential compensation wire. Important: The end of the cable must be in a dry area so that condensation in the weather protected pressure compensation tube can be prevented. The aluminium housing with IP 55 or the connecting box with IP 54 fulfil this requirement.



Transmission Mode

- Signal output: 4...20 mA, two-wire

Attenuation: 1.5 ms (adjusting time for 63% of end value)
Linear characteristic curve: determined by the fixed point method conf. to DIN 16 068 (horizontal calibration position)

- Accuracy, effects of variables

Measuring uncertainty: 0.5% FS (sum of linearity, hysteresis (0.1% FS) and reproducibility (0.1% FS))
Long-term stability:
for zero point 0.5%/a FS

Effects of process temperature:
0.4%/10 K FS in the range 0...50°C (32...122°F) for zero point or sensitivity, value doubled for 0.2 bar and 2 m water gauge measuring range

Power Supply

- 10.5...24 V (not Ex)
- 12...30 V

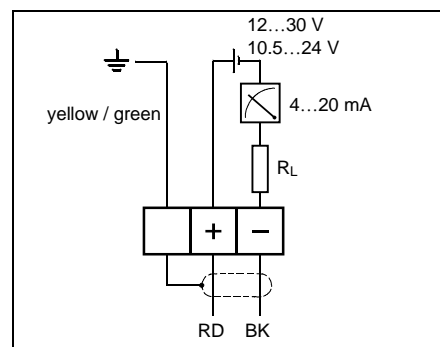
Effect of terminal voltage: insignificant in permissible range
Residual ripple of auxiliary power: insignificant for $U_{PP} < 100$ mV
Effects of load resistance: insignificant in permissible range (0...800 Ω)

CE Mark

By attaching the CE-mark, Endress+Hauser confirms that the Waterpilot has been successfully tested and fulfils all legal requirements of the relevant EC directives.

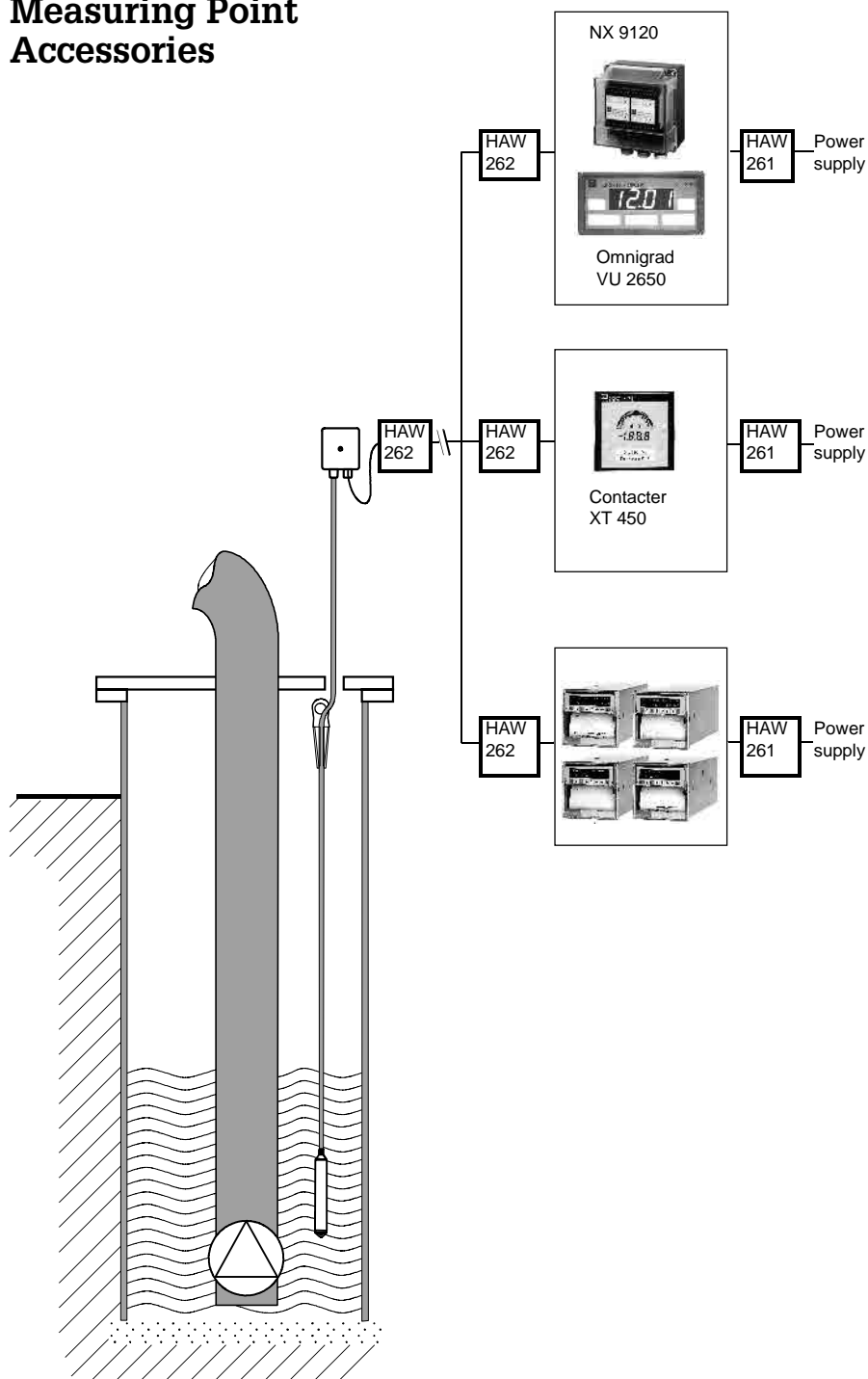
Technical Data, Cable

The wear-resistant cable is bound with steel webbing insulated with a PE layer and can be shortened, with two-wire electrical cabling (diameter 0.2 mm² Cu) and a tube for pressure compensation. Standard lengths 10 m and 20 m, please state other lengths if required. Minimum radius of bending: 200 mm. The cable may be used in depths up to 200 m (654 feet) without tension bearing units.



Electrical Connection

Complete Measuring Point Accessories



Deep well measurement
using the Waterpilot
FMX 160
Surge arrester HAW 262
(on power side,
HAW 261)

External Overvoltage Protection for Increased Safety

The HAW 262 overvoltage protector provides additional and improved protection against atmospheric interference. The HAW 261 is used especially on the mains supply side. A protective housing is available for mounting in the field.

Separate overvoltage
protection with the HAW

Transmitter Power Supply Units with or without Display

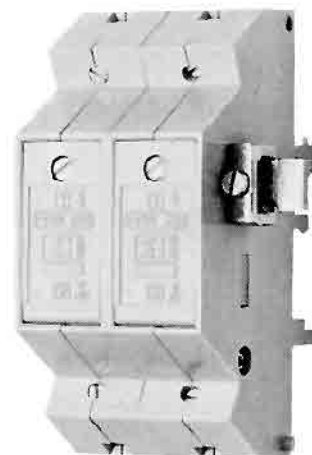
Power supply unit NX 9120 in Minipac format to power the Waterpilot or Omnigrad VU 2650 power supply unit with digital display in control panel housing.

Limit Contactor/Control Unit

The Contactor XT 450 serves as a 2-/4-fold limit transmitter or can be operated as a 2 or 3 point controller (e.g. alternating pump control). It supplies power to the Waterpilot and has a digital and analogue display of the measured value.

Extensive Range of Plotters

Displaying and documenting measured data from the Waterpilot is carried out by printers or registration units from Endress+Hauser. The wide range of registration units corresponds in function and housing to existing instrumentation.



Waterpilot FMX 160

Certificate

R For non-hazardous areas, 12...30 V_{DC}
S For non-hazardous areas, 10.5...24 V_{DC}
H EEx ib IIC T4

Mechanical Connection

D Cable probe with no mechanical connection
A Thread G 1 1/2 A PBTB/Al-housing, IP 55
C Mounting clamp, gal./connecting box IP 54, Pg 11
Y Special version on request

Probe Tube Material

A 1.4571
Y Special material on request

Measuring Range and Measuring Cell (Silicon Resistive)

02	0...0.2 bar,	8A	0...2 m water gauge	80	0...10 ft water gauge
04	0...0.4 bar,	8B	0...4 m water gauge	81	0...20 ft water gauge
06	0...0.6 bar,	8C	0...6 m water gauge	82	0...30 ft water gauge
10	0...1.0 bar,	8D	0...10 m water gauge	83	0...50 ft water gauge
16	0...1.6 bar,	8E	0...16 m water gauge	84	0...75 ft water gauge
25	0...2.5 bar,	8F	0...25 m water gauge	85	0...100 ft water gauge
40	0...4.0 bar,	8G	0...40 m water gauge	86	0...200 ft water gauge
60	0...6.0 bar,	8H	0...60 m water gauge	87	0...300 ft water gauge
11	0...10.0 bar,	8K	0...100 m water gauge		
70	adjusted to ...bar (>0.2 bar)	8L	adjusted to ...m water gauge (>2 m water gauge)	88	adjusted to ...ft water gauge (>10 ft water gauge)
99	Special version on request				

Sealing of the Measuring Cell

A Viton-sealing
Y Special version on request

Suspension Cable

B 10 m PE-cable (can be shortened)
C 20 m PE-cable (can be shortened)
A m length of probe selectable (1-100m)
E 30 ft PE-cable (can be shortened)
F 60 ft PE-cable (can be shortened)
Y Special on request

Preferred types with shorter delivery
FMX 160-R D A 04 A B
FMX 160-R D A 10 A C

FMX 160

Ordering Code

m Carrying Cable

Supplementary Documentation

☐ Deltapilot S
Hydrostatic pressure sensor with reliable watertight measuring cell
System Information SI 026F/00/e

☐ Deltapilot S
Technical Information TI 257F/00/en


☐ Power supply unit NX 9120
Technical Information TI 001/11/e

☐ Contactor XT 450
Technical Information TI 137C/07/e

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