

GENERAL INFORMATION

An integral part of apparatuses and systems is a process-specific, selectable measuring technology. For this, NORMAG offers the possibility to use the measuring engineering of the current suppliers via appropriate adapters and holders. Our experts will gladly assist you with the appropriate selection.

In addition, NORMAG offers measurement engineering specifically for devices and systems made of borosilicate glass 3.3 and other highly corrosion-resistant materials, usually in close cooperation with renowned suppliers of measurement engineering. Specific advantages such as transparency and corrosion resistance as well as specific requirements such as the lowest possible weights are taken into account.



Illustration 1: Example of measurement and control technology of NORMAG

The standard available devices with the corresponding options are described on the following pages. Special designs that are available upon request are mentioned in the respective product descriptions.

Based on the external measuring devices described below, NORMAG also introduces standard and process-specific automation solutions, examples of which are controller units such as the "Control Unit Pro +" shown in Figure 1. Our experts will be pleased to prepare a concept suitable for your application.

THERMOMETER

Resistance thermometers with Pt100 sensors and bimetallic thermometers for local display are the most commonly used measuring instruments in process engineering to measure temperatures in liquids and gases. The resistance thermometers MTT are Pt100 measuring elements with accuracy class A in 3-wire technology with a stainless steel sleeve and with connection head form B, which are inserted in a protective sleeve made of borosilicate glass. The tip of the glass sleeve is filled with a pharmaco-conforming thermal paste to improve the heat transfer to the measuring element and thus the response times. The measuring inserts are screwed to the glass protection sleeve via a GL screw connection and can therefore be easily exchanged or calibrated without having to loosen the glass flange connection.

In the standard version no measuring transducer is installed, the measuring range is suitable for -50/200 ° C or 0/200 ° C (MTI).

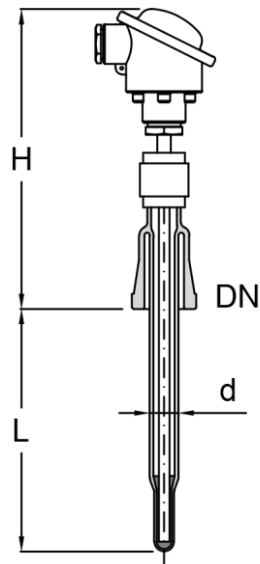
Many options are possible according to your application:

- Version with integrated measuring transducer
- Version with local display and / or measured value transmission (Pt 100 or 4...20 mA)
- Version with adapted measuring range
- Version with redundant Pt100
- Version in various special lengths and flange nominal widths and shapes
- The resistance thermometers are optionally applicable for ATEX areas and approved as ATEX standard for Ex protection class II 2G Ex ia IIC T4 / T6.
- On request, numerous other process and customer-specific versions can be supplied.

In the typical applications in vessels or columns, the mechanical limits of the temperature sensor, in particular with regard to fluidic forces, have to be observed.

RESISTANCE THERMOMETER, STRAIGHT

Straight resistance thermometers with Pt100 sensors are the standard for most applications. They are used on vessel and end caps, column sections, return flow dividers and pipe components and are therefore available with glass protection sleeves in various lengths and with different connection nominal widths. Special lengths and nominal widths are possible.



Resistance thermometer
MTT...-P

Description:

Description:	Item no.	Example
Resistance thermometer DN 25	MTT DN/L-P	MTT 25/0100-P
Resistance thermometer DN 25, ATEX-version	MTT DN/L-P-EX	MTT 25/0100-P-EX
Resistance thermometer DN 25, w. pressure transmitter 4...20 mA	MTT DN/L-P-O1	MTT 25/0100-P-O1
Resistance thermometer DN 25, w. pressure transmitter HART	MTT DN/L-P-O2	MTT 25/0100-P-O2
Resistance thermometer DN 25, with double Pt100	MTT DN/L-P-O3	MTT 25/0100-P-O3
Resistance thermometer DN 25, 4-wire	MTT DN/L-P-O4	MTT 25/0100-P-O4
Resistance thermometer DN 25, with local display	MTT DN/L-P-O5	MTT 25/0100-P-O5
Resistance thermometer DN 25, with calibration certificate	MTT DN/L-P-O.-Z4	MTT 25/0100-P-O1-Z4

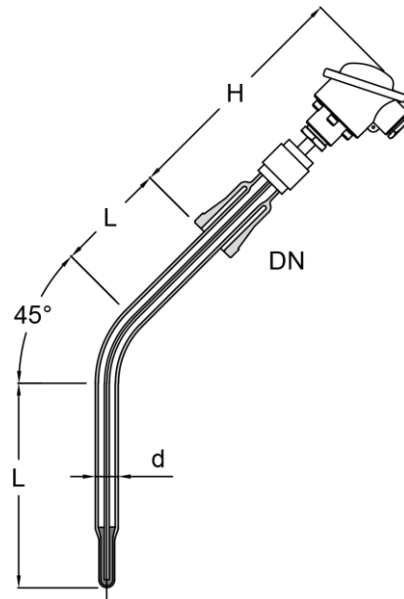
Spare parts

Glass protection sleeve for thermometer DN 25	MT...-P-SP01	MT25/0100-P-SP01
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DN	L [mm]	H [mm]	d [mm]	Bestell-Nr.
25	100	197	19	MTT 25/0100-P
25	150	197	19	MTT 25/0150-P
25	200	197	19	MTT 25/0200-P
25	300	197	19	MTT 25/0300-P
40	200	212	22	MTT 40/0200-P
40	300	212	22	MTT 40/0300-P
40	500	212	28	MTT 40/0500-P

RESISTANCE THERMOMETER, ANGLED

Angled resistance thermometers are commonly used on the 45 ° nozzle of spherical vessels. The mineral-insulated measuring element inside the glass protective sleeve is bendable. The stainless steel protective tube here, deviating from the straight version, is only present in the area of the screw joint. The tip of the glass sleeve is filled with thermal compound to improve the heat transfer to the measuring element. On request, the angled resistance thermometers can also be supplied in other lengths and in customized versions. Common options are listed below.



Resistance thermometer, angled
MTT45/...-P

Description:

Description:	Item no.	Example
Resistance thermometer, angled	MTT 45/DN/L-P	MTT 45/25/0160-P
Resistance thermometer, angled, ATEX-version	MTT 45/DN/L-P-EX	MTT 45/25/0160-P-EX
Resistance thermometer, angled, with transmitter 4...20 mA	MTT 45/DN/L-P-O1	MTT 45/25/0160-P-O1
Resistance thermometer, angled, with transmitter HART	MTT 45/DN/L-P-O2	MTT 45/25/0160-P-O2
Resistance thermometer, angled, with double Pt100	MTT 45/DN/L-P-O3	MTT 45/25/0160-P-O3
Resistance thermometer, angled, 4-wire	MTT 45/DN/L-P-O4	MTT 45/25/0160-P-O4
Resistance thermometer, angled, with local display	MTT 45/DN/L-P-O5	MTT 45/25/0160-P-O5
Resistance thermometer, angled, with calibration certificate	MTT 45/DN/L-P-O.-Z4	MTT 45/25/0160-P-O1-Z4

Spare parts

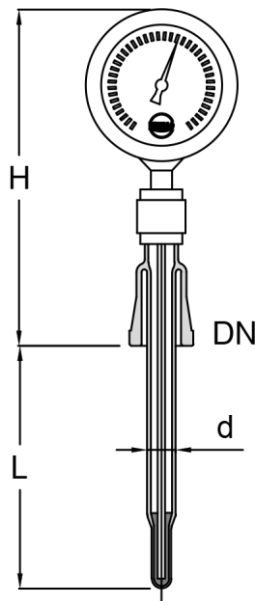
Glass protection sleeve for thermometer DN 25	MT45/DN/L-P-SP01	MT45/25/0160-P-SP01
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DN	L [mm]	L1 [mm]	H [mm]	d [mm]	for sph. vessels [l]	Bestell-Nr.
25	160	120	212	19	10	MTT 45/25/0160-P
25	210	130	212	19	20	MTT 45/25/0210-P
25	300	157	212	19	50	MTT 45/25/0300-P
50	375	140	212	28	100	MTT 45/50/0375-P
50	475	170	212	28	200	MTT 45/50/0475-P

THERMOMETER WITH LOCAL DISPLAY

Thermometers with local display can be supplied in straight and angled form. As a standard, the straight version is offered as a bimetallic thermometer and described below. The structure is analogous to the type MTT, here too, the tip of the glass sleeve is filled with thermal compound to improve the heat transfer to the measuring element and the thermometer is fixed to the glass protective tube via a GL-screw. As standard, a measuring head with 100 mm diameter and display range 0-200 °C is used, the display position is vertical to the connection flange of the measurement.

On request, the local resistance thermometers can also be supplied in other lengths or angled shape in customized versions. Common options are listed below.



Bimetallic thermometer, straight
MTI...-P

Description:

Bimetallic thermometer DN 25, local
 Bimetallic thermometer DN 25, local, with limit switch
 Bimetallic thermometer DN 25, local, with limit switch, ATEX
 Bimetallic thermometer DN 25, local, with calibration certificate

Item no.

MTI DN/L-P
 MTI DN/L-P-O6
 MTI DN/L-P-O6-EX
 MTI DN/L-P-Z4

Example

MTI 25/0100-P
 MTI 25/0100-P-O6
 MTI 25/0100-P-O6-EX
 MTI 25/0100-P-Z4

Spare Parts

Glassschutzhülse für Thermometer DN 25

MT DN/L-P-SP01 MT 25/0100-P-SP01

DN	L [mm]	H [mm]	d [mm]	Bestell-Nr.
25	100	220	19	MTI 25/0100-P
25	150	220	19	MTI 25/0150-P
25	200	220	19	MTI 25/0200-P
25	300	220	19	MTI 25/0150-P
40	200	235	22	MTI 40/0200-P
40	300	235	22	MTI 40/0300-P
40	500	235	28	MTI 40/0500-P

PRESSURE MEASUREMENT

The pressure gauges MPI and pressure transmitters MPT consist of a diaphragm seal with product-contacting laser-welded and flush-mounted tantalum diaphragm and a pressure gauge with bourdon tube in a stainless steel housing.

The pressure gauge and the pressure transmitter are of a special, very easy to build form, and thus suitable without brackets for glass apparatus manufacturing.

Pressure measuring device:

Measuring range MPI and MPT	-1 to +1,5 bar
Temperature range	-10 to +140 °C
Protection class	IP65
output signal	4...20 mA, 2-wire
Cable connection	angle plug M12

Diaphragm seal:

Material in contact with product	tantalum
system filling	Silicone-free synthetic oil FD1 with FDA approval
Accuracy class according to DIN EN 837-1	1,0
Ex-Protection class	II 2G Ex ib IIC T6
sealing surface	DIN EN 1092-1 PN 10 Form B2

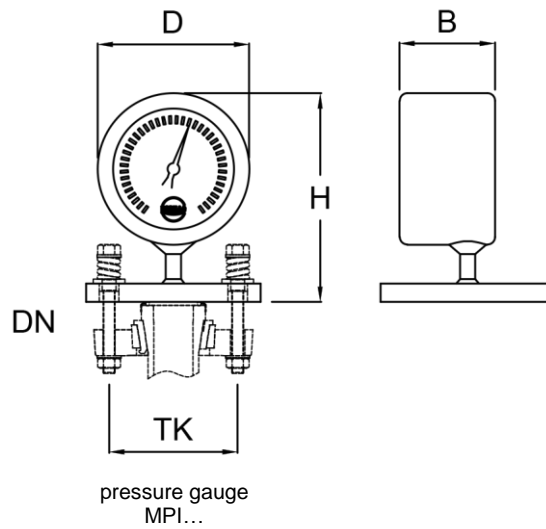
Table 1: Technical data Pressure transducer MPI and MPT

On request, the pressure gauges can also be supplied with other measuring ranges and in customized versions. The pressure measuring devices can be connected to the glass flange with a connection CAPE ... -P and a ring seal CGR ... -P.

Description:

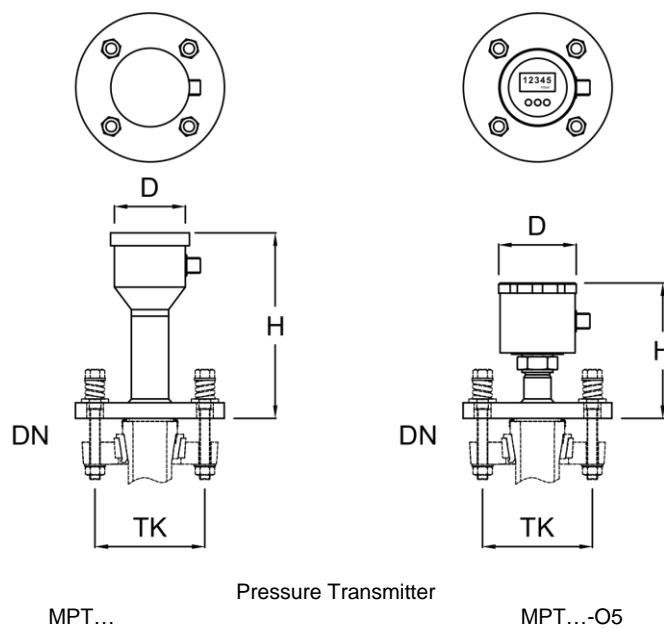
Description:	Item no.	Example
Pressure gauge DN 25, local	MPI DN	MPI 25
Pressure gauge DN 25, local, with limit switch	MPI DN-O6	MPI 25-O6
Pressure gauge DN 25, local, with limit switch, ATEX	MPI DN-O6-EX	MPI 25-O6-EX
Pressure gauge DN 25, local, with calibration certificate	MPI DN-Z2	MPI 25-Z2
Pressure transducer DN 25, 4...20 mA	MPT DN	MPT 25/A40
Pressure transducer DN 25, 4...20 mA, ATEX	MPT DN-EX	MPT 25/A40- EX
Pressure transducer DN 25, 4...20 mA, with local display	MPT DN-O5	MPT 25/A40-O5
Pressure transducer DN 25, 4...20 mA, with calibration certificate	MPT DN-Z4	MPT 25/A40-Z4

PRESSURE GAUGE



DN	H [mm]	D [mm]	B [mm]	TK, nxM [mm]	Item no.
25	146	100	63	85, 4xØ14	MPI 25

PRESSURE TRANSMITTER



DN	H [mm]	D [mm]	TK, nxM [mm]	measuring range bar abs.	Item on.
25	130	70	85, 4xØ14	0/1,6	MPT 25/A16
25	130	70	85, 4xØ14	0/4	MPT 25/A40
25	110	60	85, 4xØ14	0/1,6	MPT 25/A16-O5
25	110	60	85, 4xØ14	0/4	MPT 25/A40-O5

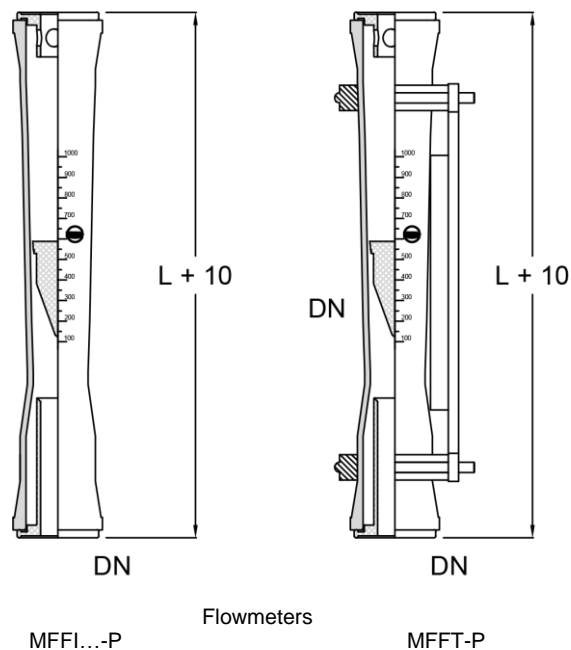
FLOWMETERS

In addition to the flow meters of renowned measurement suppliers, NORMAG offers a transparent flow meter based on the rotary flow meter principle. The rotameter should be installed vertically with the flow direction upwards, the calming distance before and after the measurement should be at least 5 times the diameter. The floating body traps limit the measuring range, but at the same time allow the measuring to run empty. In contact with the product, borosilicate glass 3.3 and PTFE are used.

The flowmeters can be used for the standard pressure range according to Chapter 10, but deviating from that, the permissible operating temperatures are -50 / + 130 °C.

For flowmeters with sensing element, the type TURCK series WIM, output signal: 4 ... 20 mA, 2-wire, explosion protection class: ATEX II 2G EX ia IIC T6, is used for measurement value transmission. The measuring accuracy corresponds to class 1.6.

According to this principle, volumetric flows of liquids and gases can be measured in a measuring range ratio of 10: 1. The scaling is based on air at 1.013 bar or water at ambient conditions. Deviating media and conditions (density, viscosity, temperature, pressure, nominal diameter) must be specified in advance for the design.



Description:
Flowmeter DN 25, local

Item no.
MFFI...-P

Example
MFFI 25/0100-P

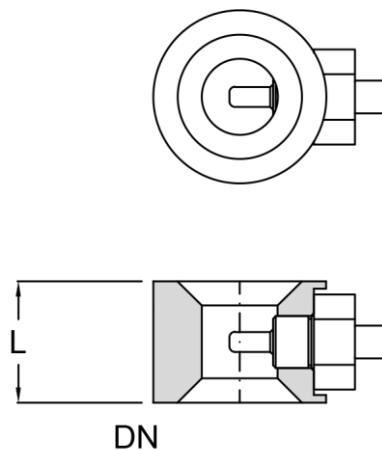
DN	L [mm]	measuring range [l/h]	Item no. local	Item no. 4...20 mA
25	400	6,3-63	MFFI 25/0063-P	-
25	400	10-100	MFFI 25/0100-P	-
40	400	60-630	MFFI 40/0630-P	MFFT 40/0630-P
40	400	100-1000	MFFI 40/1000-P	MFFT 40/1000-P
50	400	170-1700	MFFI 50/1700-P	MFFT 50/1700-P
50	400	320-3200	MFFI 50/3200-P	MFFT 50/3200-P
80	400	400-4000	MFFI 80/4000-P	MFFT 80/4000-P

FLOW SWITCH

As a compact and space-saving limit contact for flow measurements, NORMAG offers a flange-mounted, corrosion-resistant flow limit contact, which can be used for both minimum and maximum contact. A typical application is corrosion-resistant scrubber and cooling circuits in which a minimum flow must be ensured.

Flow switch:	
Measuring range	see table
Temperature range	-10 to +70 °C
Protection class	IP65
output signal	digital
Cable connection	2 m cable connection (4x0,25 mm ²)
Ex-Protection class	II (1) GD Ex ia IIC
Material in contact with product	PTFE
sealing surface	DIN EN 1092-11)
evaluation instrument	MFSG-SZA (230 V)

1) The flow switch can be connected to the glass flange system with a connection CAPE...-P-L0040 and a ring seal CGR...-P.



Flow switch
MFSG...

Description:

Flow switch DN 25

Item no.

MFSG...

Example

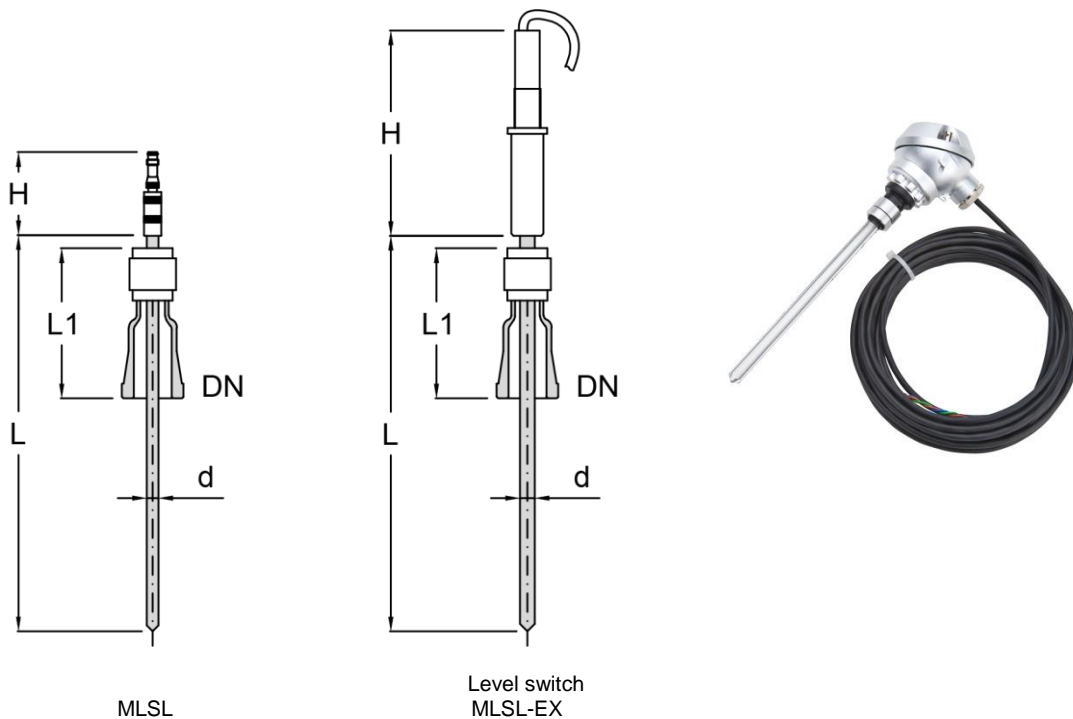
MFSG 25

DN	L [mm]	L1 [mm]	V _{max}		Item no.
			[l/h water]	[l/h oil]	
25	40	12	17 – 1.200	35 – 1.800	MFSG 25
40	40	20	45 – 3.200	90 – 4.500	MFSG 40
50	40	25	70 – 5.000	140 – 7.100	MFSG 50
80	40	40	180 – 12.700	350 – 18.000	MFSG 80

LEVEL SWITCH

As a compact and space-saving limit contact for fill levels, NORMAG offers a flange or GL thread mountable level switch, which can be used for both minimum and maximum contact. A typical application is corrosion-resistant level monitoring in front of pumps or in column sumps in which a minimum fill level or fill level range must be ensured.

Level switch:	
Measuring range	up to 500 mm, longer versions on request
Temperature range	-50/200 °C
Protection class	IP67
Supply voltage	24 VDC
Output signal	PNP, 100 mA
Cable connection (non-Ex)	plug, S8 3-pole
Cable connection (Ex)	cable, 10 m, 5-pole, M18
Ex-Protection class (optional)	II (1) GD Ex ia IIC
Material in contact with product	borosilicate glass 3.3, quartz glass, PTFE



Description:

Level switch DN 25
 Level switch DN 25, ex-proof

Item no.	Example
MSL...-P	MSL 25/0300-P
MSL...-P-EX	MSL 25/0300-P-EX

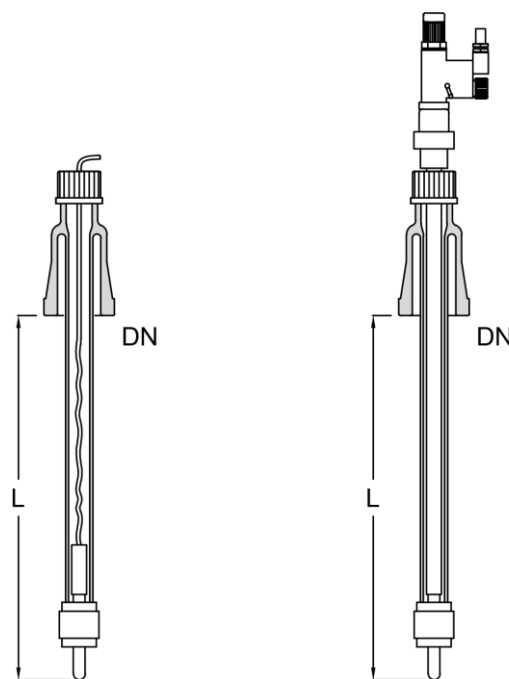
DN	L [mm]	L1 [mm]	H [mm]	d [mm]	Item no.
15	300	90	60	8	MSL 15/0300-P
25	300	90	60	8	MSL 25/0300-P
25	300	110	145	8	MSL 15/0300-P-EX
25	300	110	145	8	MSL 25/0300-P-EX

PH MEASUREMENT

As a special advantage for a pH measurement, NORMAG offers enamelled pH probes from **PFAUDLER**, which can be used over the entire temperature range and cannot dry out, i.e. can remain at the measuring position after the respective measurement. As a result, the measurement is very robust, as well as time and space-saving. If there are no corresponding requirements for the customer and process-specific application, then classic pH measurements with a glass membrane can be used.

In principle, the pH probe is mounted to the desired measuring position via a PTFE screw connection to a glass protective tube in the process chamber. The evaluation of the pH measurement can be carried out via battery (9 V / 1,000 operating hours) or an evaluation unit with power supply. The temperature is also recorded in parallel to the pH measurement.

In the typical applications in vessels or columns, the mechanical limits of the pH measurement with protective tube, in particular with regard to flow-related forces, have to be observed.



pH measurement
MpHT / MpHV ..., System „Standard“ MpHT..., System "PFAUDLER"

Description:

- pH measurement DN 25, 4...20 mA
- pH measurement DN 25, 9V
- pH measurement DN 25, 4...20 mA, **PFAUDLER**-enamel probe
- pH measurement DN 25, 4...20 mA, evaluation unit
- pH measurement DN 25, 4...20 mA, evaluation unit, ATEX

Item no.	Example
MpHT...-P	MpHV 25/0700-P
MpHV...-P	MpHV 25/0700-P
MpHT...-P-O7	MpH 25/0700-P-O7
MpHT...-P-O8	MpH 25/0700-P-O8
MpHT...-P-O8-EX	MpH 25/0700-P-O8-EX

DN	L [mm]	H [mm]	d [mm]	Item no. 9V	Item no. 4...20 mA
25	200	197	19	MpHV 25/0200-P	MpHT 25/0200-P
40	400	197	19	MpHV 40/0400-P	MpHT 40/0400-P
40	550	197	19	MpHV 40/0550-P	MpHT 40/0550-P
40	700	197	19	MpHV 40/0700-P	MpHT 40/0700-P

OPTIONS INSTRUMENTATION

For measuring instruments, the following options can be chosen in addition to the standard components. Each option chosen must be entered at the end of the item number. Several options can be chosen, and as far as possible, they are presented in alphabetical order. In the following table you will find examples of item numbering, which include additional options.

Description:	Item no.	Example
Resistance thermometer DN 25	MTT DN/L-P	MTT 25/0100-P
Resistance thermometer DN 25, ATEX-version	MTT DN/L-P-EX	MTT 25/0100-P-EX
Resistance thermometer DN 25, w. pressure transmitter 4...20 mA	MTT DN/L-P-O1	MTT 25/0100-P-O1
Resistance thermometer DN 25, w. pressure transmitter HART	MTT DN/L-P-O2	MTT 25/0100-P-O2
Resistance thermometer DN 25, with double Pt100	MTT DN/L-P-O3	MTT 25/0100-P-O3
Resistance thermometer DN 25, 4-wire	MTT DN/L-P-O4	MTT 25/0100-P-O4
Resistance thermometer DN 25, with local display	MTT DN/L-P-O5	MTT 25/0100-P-O5
Resistance thermometer DN 25, with calibration certificate	MTT DN/L-P-O.-Z4	MTT 25/0100-P-O1-Z4

You can choose from the following options:

OPTION C – COATING/GLASS TYPE

The standard components used are those made of borosilicate glass 3.3 without a coating. The following alternative options are possible:

- C1 = coating, non-conductive
- C2 = coating, non-conductive, for higher temperatures and chemical resistance
- C3 = coating, conductive
- C4 = amber glass
- C5 = quartz glass

OPTION F – FLANGE TYPE

The standard components used are made of borosilicate glass 3.3 with the flange type F4 (PF system).

The following flange connectors for glass structural components are also generally available:

- F1 = KF flanges, type KF../1
- F2 = KF flanges, type KF../2
- F3 = KF flanges, type KF../3
- F4 = PF flanges, type PF
- F5 = Tube connection 16 mm
- F6 = Tube connection 26 mm
- F7 = GL-thread GL 18
- F8 = GL-thread GL 25
- F9 = NS 29/32
- F10 = NS 45/40

All other combinations of the flange types F1 to F4 can be selected as options. We will be glad to check whether the other types of flange can be used with the selected component.

OPTION M – MATERIAL/PTFE DESIGN

M1 = PTFE conductive

M2 = PTFE conductive with earthing lug

OPTION O – SPECIAL OPTIONS

The following special options are offered for certain structural components.

O1: transmitter 4... 20 mA

O2: transmitter HART

O3: Double pt100

O4: 4-wire

O5: 4...20 mA, with local display

O6: Local measurement with limit contact

O7: measuring probe system **PFAUDLER**

O8: Evaluation unit for measurement or contact

O10: Dimensions according to former design

EX: ATEX design

OPTION SP – REPLACEMENT PARTS

The spare parts are indicated individually for the respective items.

OPTION TAG – LABELLING

Standard labelling of glass structural components is carried out using the standard item number or special identification number, however without an individual TAG number.

TAG numbering is available for the purposes of individual numbering. To do this, enter the option TAG and provide us with the desired TAG number.

TAG = with TAG numbering

OPTION Z – CERTIFICATES

Standard deliveries do not come with certificates.

The following certificates can optionally be delivered with your order.

Z1 = FDA material certificate¹⁾

Z2 = Material certificate 2.1

Z3 = Certificate for Technical Guidelines on Air Quality Control (TA-Luft)

Z4 = calibration certificate

Z5 = Material certificate 3.1 (for stainless steel parts)

1) FDA material certificates can be delivered for product-side structural components containing PTFE.