operation manual

systec SYS MMF

SYS-MMF

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1 Description

1.1 Introduction

The SYS-MMF is a low-cost, simple to use multivariable transmitter for mass flow measurement using the differential pressure method. In addition to the differential pressure, the transmitter internally measures the static pressure P1 and has a PT100 3-wire input to compensate for the fluid temperature. The SYS-MTF type has only one differential pressure sensor and one temperature input (no pabs sensor). It can be used for saturated steam, for example, or if the pressure in the pipeline can be assumed to be constant.

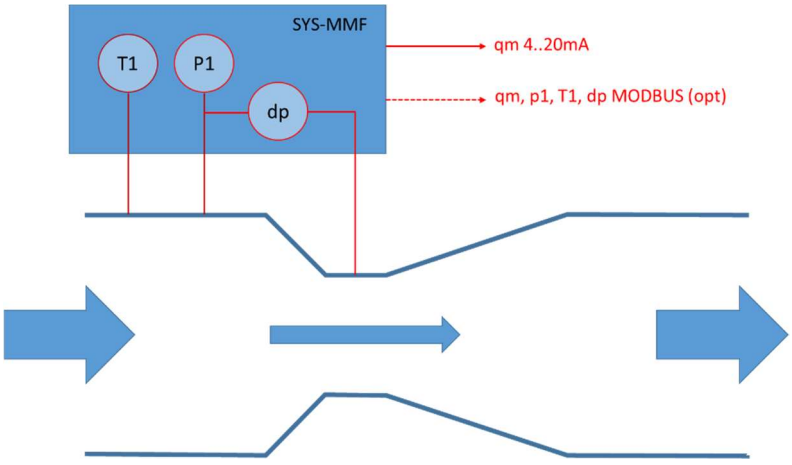
The SYS-MMF can be completely setup very quickly and easily by means of a simple parameterization using the three front keys. Complex parameterization software is not required for this.

The SYS-MMF is a 2-wire 4..20mA transmitter (HART-capable) as standard. An additional Modbus interface is available as an option.

The SYS-MMF can be used for gases, saturated and superheated steam and for water.

1.2 Measuring principle

The SYS-MMF compensates the influence of pressure and temperature on flow measurements working with the differential pressure principle. From the measured static pressure and temperature, the SYS-MMF calculates the standard volume flow (gases) or the mass flow (steam) and transmits this measured variable directly as a 4..20mA signal.



The SYS-MMF can be used with all common primary elements such as orifices, venturis and nozzles.

The use in combination with the deltaflow pitot tube is particularly advantageous: A PT100 element can be integrated into the deltaflow and the transmitter can be mounted directly on the sensor. This completely eliminates the need for complex piping and cabling and the complete mass flow meter is installed via only one stud to the pipe.

1.3 highlights

- By measuring temperature, absolute pressure and differential pressure using the compact sensors and the microcontroller-based flow computer, the SYS-MMF offers a compact and cost-effective solution for a large number of different flow measurement applications.
- SYS-MMF uses integrated pressure and temperature sensors to compensate for the effects of changes in pressure and temperature on the density of the fluid.
- The mass flow or standard volume flow value is output directly as a 4..20mA value (2-wire). Pressure, temperature and differential pressure are shown on the display and can be transmitted via HART. With the optional MODBUS interface, all values can also be read out digitally.
- In combination with the deltaflow pitot tube, the result is a particularly compact mass meter to be installed that is highly insensitive to dirt and condensate.
- SYS-MMF in combination with the deltaflow works practically maintenance-free and can be used for large flow, temperature and pressure ranges .

1.4 Applications

Typical areas of application are steam, air, gases, water, liquids and exhaust gases in a wide pressure and temperature range.

2 interpretation

The design and calculation of the parameters is very easy with the deltacalc Excel design table. You receive this design file with the transmitter. If you order the SYS-MMF together with a deltaflow, you will automatically receive the design and parameter file with the delivery.

The deltacalc-Excel design for individual calcualtions file can be donwload from the systec webpage.

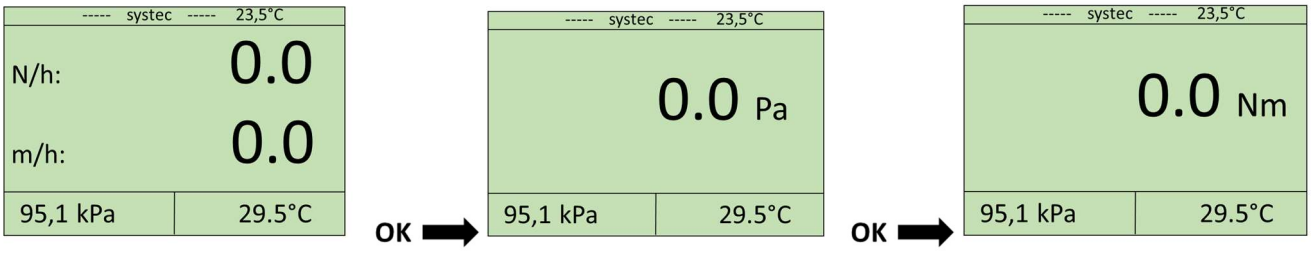
Entering three extra parameters is sufficient for parameterizing the Massflow function.

1. Flow measuring span (maximum measuring range of your application, e.g. 15,000 Nm³/h or 300 kg/h)
2. Flow coefficient (non-dimensional characteristic, is automatically calculated from the design data in deltacalc Excel)
3. KEPS to compensate for the expansion number of the primary element

Beside these "extra-parameters" SYS-MMF has a number of standard Parameters such as Damping or zero offset calibration.

3 Power indicator

After the SYS-MMF is supplied with power (11-30VDC, 3.8..22.5mA), the device shows the standard operating display. The operating display can be changed with the OK button. If desired, you may setup the disply in the meun to "rolling" which leads to an automatic rolling display without pressing the OK-key.



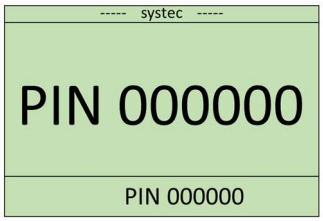
Flow rate display Differential pressure display Totalizer display

Depending on the medium selected, the units for flow rate and totalizer change. For gases, the values Nm³/h and Nm³ or m³/h and m³ are displayed (the unit is selected via the flow coefficient). For water and liquids m³/h and m³ or kg/h and kg, for steam kg/h and kg.

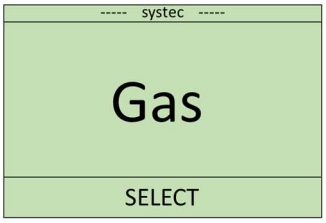
parameterization

To access the parameterization menu, press and hold the OK button (5 seconds)

The standard PIN is 00000, confirm the PIN with OK

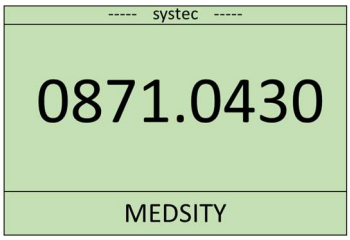


In the next step select the medium

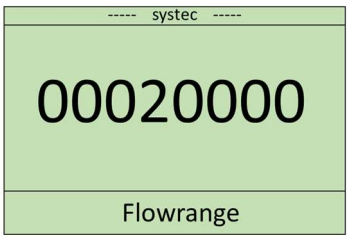


Select your medium with the ^ key and confirm the selection with OK. You can choose between Gas (gases), Water (water), Liquid (general liquids), Sat_steam (saturated steam) and Suph_steam (superheated steam).

When selecting Liquid (a liquid other than water), you must enter the operating density of the liquid in kg/m³ in the next step: The density at the design point applies.

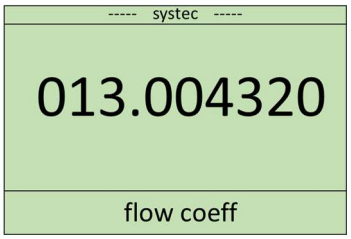


In the next menu item, the end value of the measuring range is entered (design measuring range.



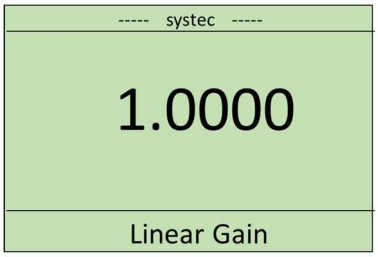
The unit depends on the selected medium:
Gas: Nm³/h
Steam/saturated steam: kg/h
Water/Liquid: m³/h

The next menu item is the entry of the calibration factor (flow coefficient). The flow coefficient is calculated from the design data of your primary element and the measuring cell used. The flow coefficient of your application will be calculated by systec Controls, or you can simply calculate the coefficient online at www.systec-controls.de/flowcoeff

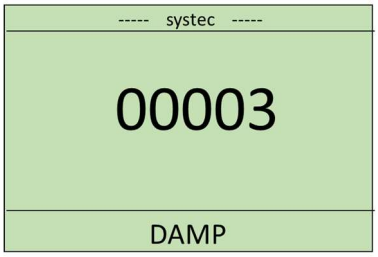


Entering the KEPS factor is used to compensate for the expansion number of the primary element. If there is no influence or if the expansion number is assumed to be constant, the default value is 1.0000

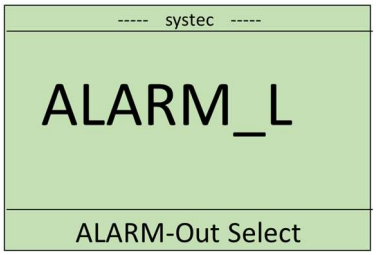
The following menu item "Linear Gain" enables a linear flow rate correction from 80% (0.80000) to 120% (1.20000). You can use this to set your flow measurement to the correct value, for example after a calibration. The flow value calculated by the SYS-MMF is multiplied by this constant.



This is followed by the input of a damping in seconds / moving average)

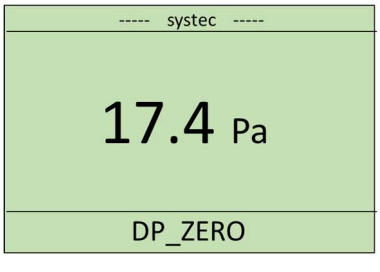


In the next menu item you can select the alarm (fault) current for the output.



If ALARM_L (low) is selected, the transmitter supplies an error current of <=3.6mA. When selecting ALARM_H (high) >=21.6 mA

In the DP_ZERO menu you can zero the displayed differential pressure (position correction).



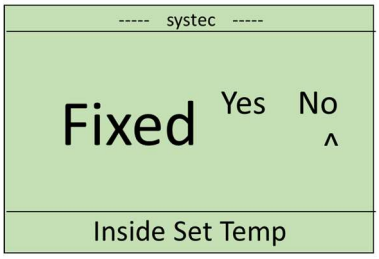
OK ➡

ATTENTION: Only carry out the zero point adjustment if you are sure that exactly the same pressure is present at both process connections of the transmitter (eg at the three-way block - process shut off and bypass open). An adjustment under flow or pending differential pressure leads to measurement errors!

To adjust, press the < button for 5 seconds, then use the ^ button to select "Yes" and then confirm with the OK button. The adjustment takes about 3 seconds. After that the dp display should show 0.0Pa.

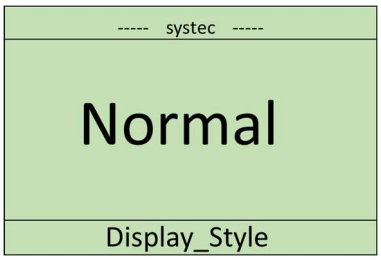
ATTENTION: The zero point adjustment is necessary after installation of the measurement and commissioning of the line. To increase the measurement accuracy, a check or readjustment of the zero point is recommended every 6 months.

In the "Fixed Temp" menu item, you have the option of selecting a fixed medium temperature if you do not want to measure the temperature.

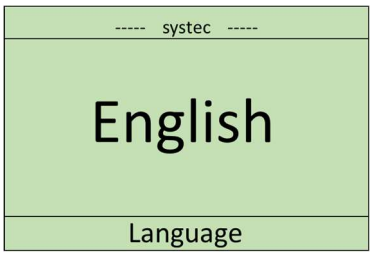


If you select "Yes" with the ^ key and confirm with OK, you must enter a constant medium temperature in the next item.

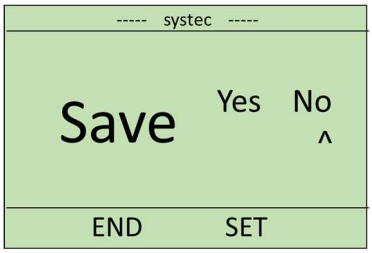
In the "Display Style" menu, you can set whether the status display scrolls or advances manually.



In the Language menu , select the language. You can choose between "German / English / Chinese)



In the last menu save or discard your settings:



To save and exit, use the ^ key to select "Yes" and confirm with OK. This takes you back to the operating display.

4 wiring

The standard variant has a hard-capable two-wire 4..20mA connection (11-30VDC supply) and an input for the PT100 3-wire element.
The Modbus variant requires a separate voltage connection (approx. 40mA, 11-30VDC) and, in addition to the 4..20mA output, also has the RS485 two-wire Modbus connection.

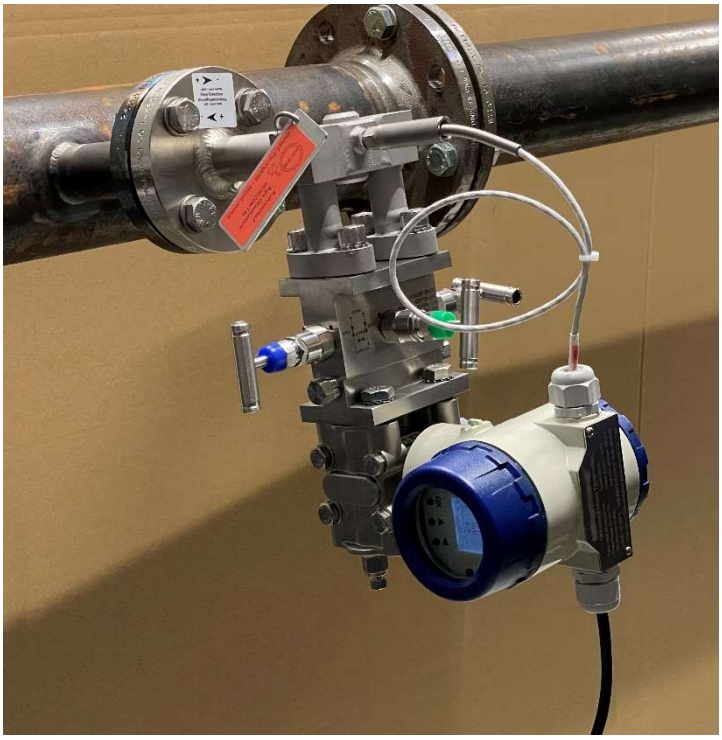
5 process connection

The flange connection on the transmitter corresponds to the flange pattern according to DIN EN 61518. 7/16 UNF screws of a suitable length must be used as mounting screws. The transmitter can be flanged on both sides, ¼"NPT locking bolts for the back of the flange are included in the delivery.

Attention: Please always use a suitable lubricant when screwing on the measuring cell flange and the locking bolts, especially with NPT screw connections, there is a risk of cold welding with stainless steel!

The use of an intermediate flanged 3- or 5-way valve block is recommended for compact installation on dynamic pressure probes. If necessary, a zero point adjustment or dismantling of the transmitter is possible without interrupting the process.

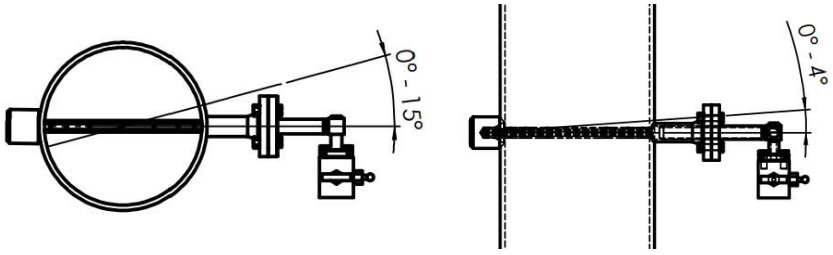
The orientation of the transmitter should follow the recommendations of the primary element manufacturer and observe the instructions in DIN 19216.



deltaflow DF25 for with integrated PT100, condensate trap, three-way block and SYS-MMF in a horizontal DN100 steam line

When using dynamic pressure probes, particular attention should be paid to:

STEAM: When used in steam lines, a condensate trap must protect the transmitter from overheating, so the transmitter is usually located below the tapping point.



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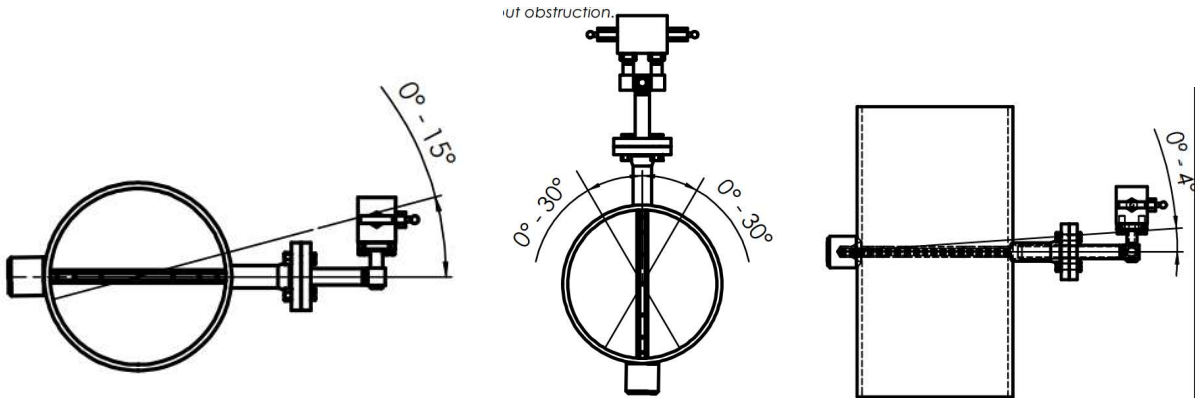
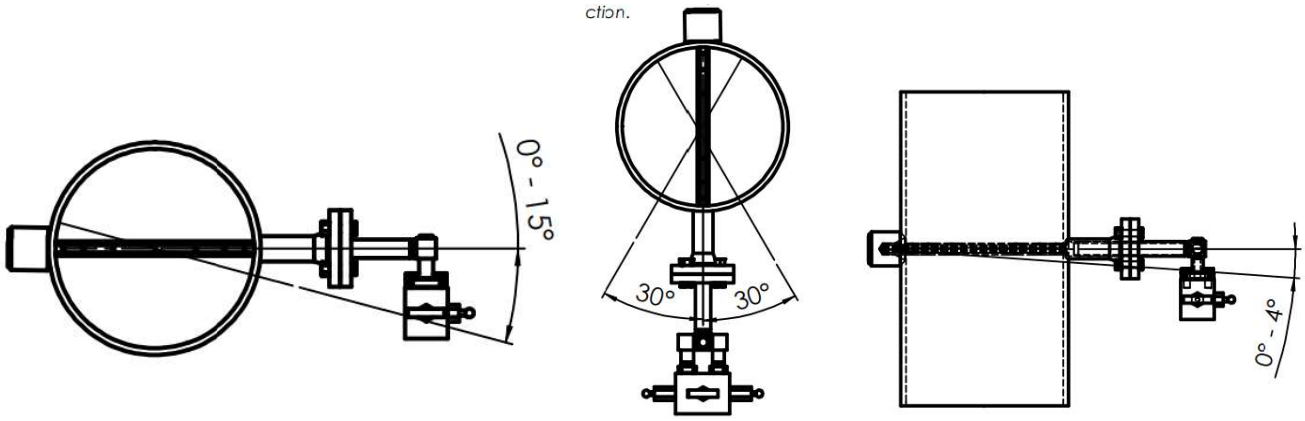
Gases: When used in gas lines, attention must be paid to drainage, condensates and liquids should not accumulate in the impulse lines. The transmitter is therefore usually located above the tapping point.



Liquids: In the case of liquid lines, ensure that the impulse lines are vented so that no gas rumbling collects in front of the measuring cell. The transmitter is therefore usually located under the tapping point.



6 Maintenance / Recalibration

The SYS MMF transmitter is maintenance-free.

A recalibration interval of 2 years (additional uncertainty dp/pabs 0.05% os, T 0.2K) or 5 years (additional uncertainty dp/pabs 0.1% os, T 0.5K) is recommended.

The zero point should be checked or readjusted every 6 months. In the case of particularly high accuracy requirements in the partial load range or in the case of strong temperature fluctuations of the measuring cell, possibly more often.

7 order codes

SYS_MMF Multivariable Transmitter					
	Range	Language	Front	Options	Notes
SYS-MMF	-	-	-	-	Multivariable Mass Flow Transmitter, dp, pabs and T
SYS-MTF					Multivariable Mass Flow Tranmitter, dp and T (no pabs)
	BB				dp apsn 10mbar, pabs span 20bar, PT100 3ltr, PN160
	BD				dp span 60mbar, pabs span 20bar, PT100 3ltr, PN160
	DE				dp span 400mbar, pabs span 100bar, PT100 3ltr, PN160
	EDN				dp span 2500mbar, pabs span 250bar, PT100 3ltr, PN250
	BBG				dp span 10mbar, pabs span 20bar, PT100 3ltr, goldplated
	BDG				dp span 60mbar, pabs span 20bar, PT100 3ltr, goldplated
	DEG				dp span 400mbar, pabs span 100bar, PT100 3ltr, goldplated
	EDNG				dp span 2500mbar, pabs span 250bar, PT100 3ltr, goldplated
		02			Deutsch / English / Chinesisch
			0		systec Front
				HT	4..20mA / Hart
				RS	Modbus (additional)
				10P	10 point calibration
					Standard types, 1-5 Weeks
					Othe rtypes 4-8 Weeks

8 Technical specifications

8.1 dp measurement

Type *BB*: 0..10mbar
Type *BD*: 0..60mbar
Type *DE*: 0..400mbar
Type *DN*: 0..2500mbar

The permitted single port pressure (one-sided pressure load) must not exceed 1.5 x the measuring range of the absolute pressure cell.

8.2 pabs measurement

Types BB/BD/BBG/BDG: 0..20 bar abs, double overload protection
Types DE/DEG: 0..100 bar abs, 1.5-fold overload protection
Types EDN/EDNG: 0..250bar abs, 1.5x overload protection

8.3 Temperature measurement (compensated measuring ranges)

Measuring range gases: -40..500°C
Measuring range liquids/water: -40..250°C
Measuring range superheated steam: 100-800°C
Measuring range saturated steam: 99-372°C

8.4 Ambient conditions transmitter

Ambient temperatures: -20..75°C, non-condensing

8.5 Degree of protection

IP67

9 CE Declaration of Conformity

10 Contact

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