RVG

Rotary Gas Meters

Applications

- **Media:** natural gas, town gas, propane, inert gases.
  Special versions:
  oxygen up to 10 bar,
  acetylene up to 1.5 bar.
- **Industry:** gas supply, stove manufacturers, chemical industry.
- **Tasks:** measurement, control, automatic regulation.

Operating principle

Elster RVG rotary gas meters are volume measuring instruments for gaseous media and operate according to the displacement principle. They register the gas volume under working conditions. In order to correct the measured value to the standard volume, electronic volume correctors can be used.

With the offtake of gas, a pressure drop between the inlet and outlet of the meter builds up. This causes a torque on the impellers which are connected to each other via high-precision synchronizing wheels. This, in turn, causes the diametrically opposed impellers to rotate. There is no metal-to-metal contact between the impellers and the meter housing. During this process, the measuring chambers formed between the impellers and housing are periodically filled and emptied.

The rotations of the impellers – and hence the number of times the measuring chambers are filled – are reduced by a multistage gear system and in the flange connections transferred to an 8-digit totalizer via a magnetic coupling.

Overview

For many years now, rotary gas meters have proved themselves in volume measurement of gaseous media, especially when high accuracy, a medium-sized measuring range and a compact design are required.

The rotary gas meters of the RVG type represent an ideal complement to the diaphragm gas meters and turbine gas meters which are also supplied by Elster.

The highest quality in design, materials, machining, and finishing together with our experience of decades guarantee high accuracy of measurement durability, and reliability under any operating conditions.

By using rotary gas meters, the operating parameters volume (m^3) and flow rate Q (m^3/h) can exactly be registered when measuring a large variety of gases.

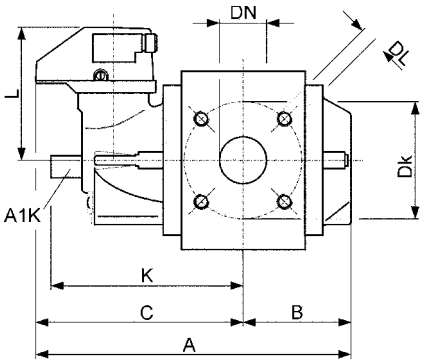
Installation and maintenance

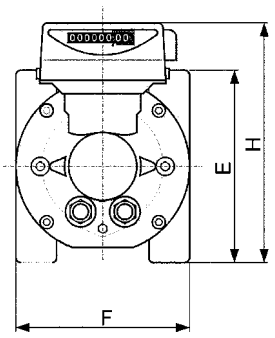
Rotary gas meters should always be mounted free of tension. Due to their measuring principle, they do not require straight inlet and/or outlet pipe sections. When planning the installation, a sufficient wall clearance should be taken into account. The oil level must be checked regularly. If necessary, the oil must be changed. For easy access, the oil reservoirs of the front and the back side are connected, to allow maintenance to be done always from the front. To ensure the safe operation of the rotary gas meters we urgently recommend the use of filters or Elster cone sieves.

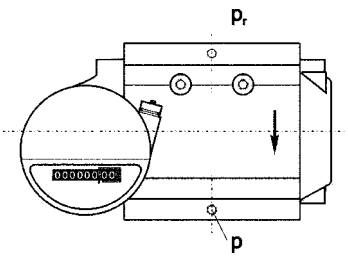
Main features

- **Meter sizes: G10 – G250**
- **For flow rates from 0.5 m^3/h to 400 m^3/h**
- **Rangeabilities of the meters 1:20 – 1:160**
- **Nominal widths DN 25 – DN 100**
- **Pressure ratings PN 16 and ANSI 150**
- **Housing made of spheroidal graphite cast iron (GGG-40) or aluminium**
- **Operating temperature –20°C to + 60°C (Alu) –20°C to + 60°C (GGG-40)**
- **High-temperature resistance up to 4 bar for GGG-40**
- **Pressure offtake connections at the inlet and outlet**
- **Ready for the installation of two thermowells in the inlet (flange connection)**
- **Suitable for out-door installations (IP class 67)**
- **Vertical and horizontal installation**
- **EU and national approvals by PTB**
- **Validity of calibration period (Germany) 16 years**
- **LF-pulser E1 (standard)**
- **Optional: HF-pulser A1K**
- **Optional: double direction index S1D for universal installation and flow direction (flange connection)**

Flow direction: left-hand to right-hand — *vertical top to bottom*







Reading from left or from top

Axis roller index: horizontal

Reading from the front Achse

Dimensions and weights

Dimensions in mm, weight in kg

Size	DN*	DN**	A	B	C	H	Dk*	DL*	E	K	L	F***	Weight
Aluminium													
G16	50	40	335	115	220	222	125	4xM16	180	240	141	171	12
G25	50	40	335	115	220	222	125	4xM16	180	240	141	171	12
G40	50	40	335	115	220	222	125	4xM16	180	240	141	171	12
G65	50	40	335	115	220	222	125	4xM16	180	240	141	171	12
G100	80	–	435	165	272	222	160	8xM16	180	290	141	171	16
G160	80	100	469	189	280	278	160	8xM16	220	298	172	241	33
G250	100	80	529	219	310	278	180	8xM16	220	328	172	241	39

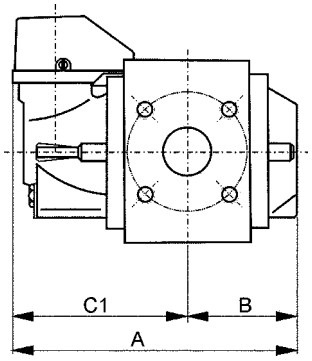
Standard: flange PN16 according to DIN 2633; optional: ANSI B16.5

Dimensions in mm, weight in kg

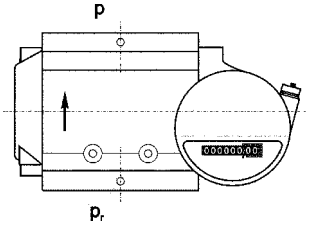
Size	DN*	DN**	A	B	C	H	Dk*	DL*	E	K	L	F***	Weight
GGG40													
G16	50	40	335	115	220	222	125	4xM16	180	240	141	150	23
G25	50	40	335	115	220	222	125	4xM16	180	240	141	150	23
G40	50	40	335	115	220	222	125	4xM16	180	240	141	150	23
G65	50	40	335	115	220	222	125	4xM16	180	240	141	150	23
G100	80	–	435	165	272	222	160	8xM16	180	290	141	240(230)	34
G160	80	100	469	189	280	278	160	8xM16	220	298	172	240	64
G250	100	80	529	219	310	278	180	8xM16	220	328	172	240	72

* Standard ** Special model *** Special dimensions in parentheses.

Flow direction: right-hand to left-hand — *vertikal bottom to top*



	A	B	C1
G16	298	115	183
G25	298	115	183
G40	298	115	183
G65	298	115	183
G100	400	165	235
G160	432	189	243
G250	492	219	273



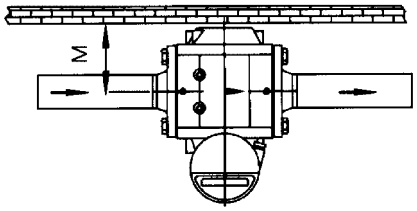
Reading from right or from top

Axis roller index:horizontal

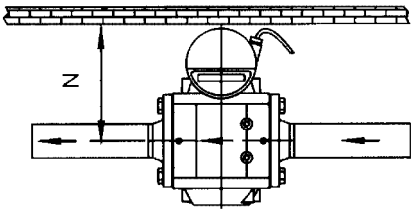
Reading from the front

Adjustment to the flow direction

Back



Back

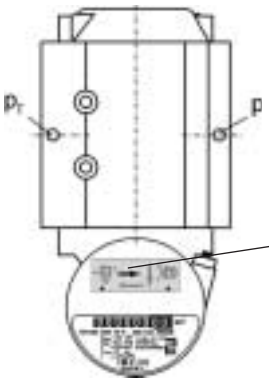


Minimum wall clearance: M or N

	DN	M in mm	N in mm
G16-G65	50	120	185
G100	80	170	235
G160	80	200	245
G250	100	230	275

Dimensions of N in case of inspection glasses on the front and back sides (standard in case of GGG-40 housings, optional in case of aluminium housings)

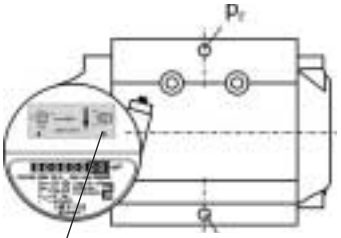
RVG with double direction index S1D



RVG with S1D and IN-S11

Flow direction according to arrow on cover plate, here left → right

Horizontal flow: Reading from top



Upper index covered, lower free
When flow direction bottom → top cover is turned round, upper index is free, lower index covered

p_r-offtake always at inlet
Position of thermowells independent from flow direction

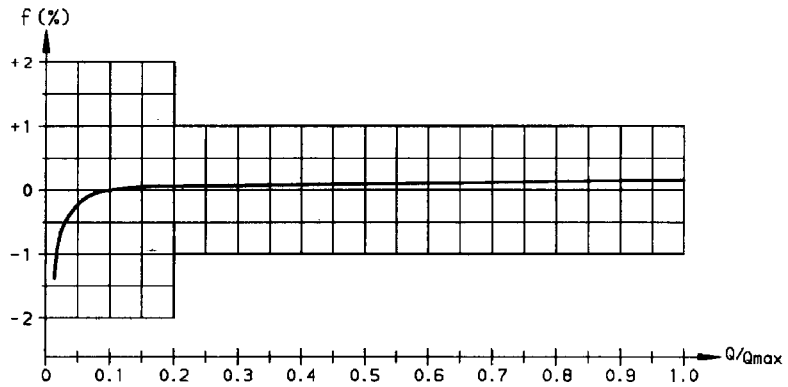
Flow direction according to arrow on cover plate, here top → bottom

Vertical flow: Reading from the front

Measuring ranges: to PTB approval Z 7.130 95.06

Meter Size	Measuring chamber (dm^3)	Start-up flow rate (m^3/h)	Q_{min} (m^3/h) national 1:160	Q_{min} (m^3/h) national 1:100	Q_{min} (m^3/h) national 1:65	Q_{min} (m^3/h) EU-standards 1:20	Q_{max} (m^3/h)	2* NF (imp/m^3)	HF (imp/m^3) (option)
G 16 DN 50	0.56	0.03				1.3	25	10	~14,025
G 25 DN 50	0.56	0.03			0.6	2.0	40	10	~14,025
G 40 DN 50	0.56	0.03		0.6	1.0	3.0	65	10	~14,025
G 65 DN 50	0.56	0.03	0.6	1.0	1.6	5	100	10	~14,025
G 100 DN 80	1.07	0.05	1.0	1.6	2.5	8	160	1	~7,528
G 160 DN 80	2.01	0.1	1.6	2.5	4.0	13	250	1	~3,882
G 250 DN 100	2.54	0.3	2.5	4.0	6.0	20	400	1	~3,178

Error curve with calibration error limits



Subject to identical installation conditions, the reproducibility of the measured values is better than 0.2%.

LF pulser E1 and PCM

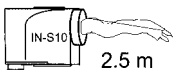
ELSTER rotary meters are commonly equipped with 2 low-frequency (LF) pulse generators and an additional monitoring reed switch (PCM) for detection of line break or interferences caused by magnetic fields. These pulse generators are attachable and can be retrofitted or changed without opening totalizer.

Installation of the pulse generator IN-S1x:

- Both guides of the IN-S1x are inserted into the guiding grooves of the totalizer head.
- Push the unit over the safety clip of the totalizer head until the IN-S1x locks acoustically.

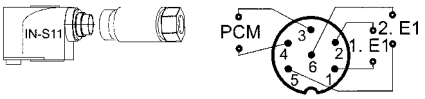
Removal of the pulse generator IN-S1x:

- Lift the lower clip of IN-S1x by means of a screwdriver and, by pulling slightly, remove from the guide of the totalizer head.



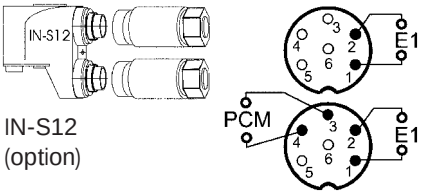
IN-S10
(standard)

IN-S10
wiring colors
1. E1: white-brown
2. E1: green-yellow
PCM: gray-pink
PCM monitoring
against manipulation



IN-S11
(option)

View on soldering side of plug socket including 1 each 6-pin female plug socket PG 9 DIN 45322



IN-S12
(option)

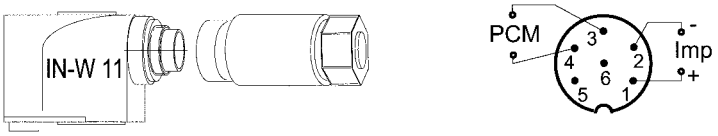
View on soldering side of plug socket including 2 each 6-pin female plug sockets PG 9 DIN 45322

LF-pulser: voltage: U_{max} = 24 V; current: I_{max} = 50 mA; switching capacity: P_{max} = 0.25 W resistor: R_i = 100 Ω ± 20%

The PCM control contact is a special Reed switch. In the control state, this switch is closed with a protection resistor R_i = 100 Ω in series. When an external magnetic field is brought into contact with the IN-S1x pulser (tampering to suppress the pulses originating from the gas flow) the Reed switch is opened. If the switch is permanently monitored (e.g. by ELSTER volume conversion devices), it is possible to recognize the exact time of line break or tampering.

LF pulser IN-W11

As an option, it is possible to fit ELSTER RVGs with the Wiegand sensor module IN-W11 instead of the LF-pulser module IN-S1x. The IN-W11 is a low-frequency pulser with a definite pulse width > 50 ms, which is highly reliable and ensures there is no mechanical wear and tear.

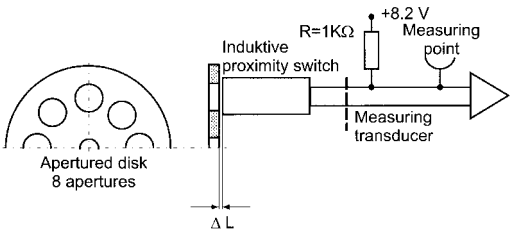


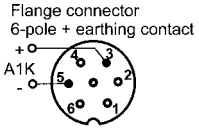
IN-W11: voltage: U_{max} = 24 V; max. power loss P_{max} = 0.6 W or VA; serial resistor: R_i = 100 Ω ± 20%

HF pulser A1K

Design to DIN EN 50227 (Namur) as an option

Nominal voltage:	U_n = 8 V DC	
current consumption:	active area free	I ≥ 2.1 mA
	active area covered	I ≤ 1.2 mA





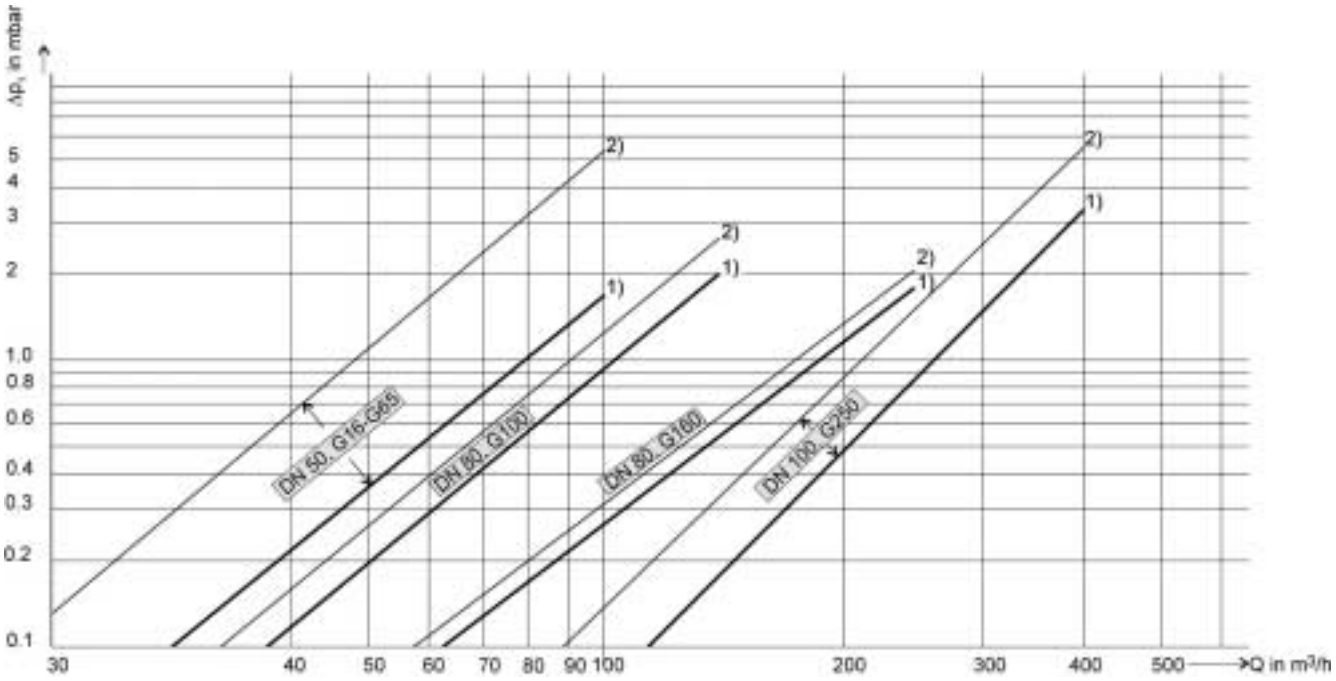
The indicated pin assignments show:

a) the view on the pin contacts of the built-in flange connector

b) the view on the soldered connection ends of the adapter socket

Pressure loss diagram

Reference density ρ_{ng} = 0.83 kg/m³



1) without cone sieve 2) with cone sieve

Example

Example to determine the pressure loss under operating conditions

Given:
- load 400 m³ /h
- type G 250, DN 100
- operating pressure 10 bar
- gas: natural gas or air.

from the diagram:
Δp_1 = 3.35 mbar (natural gas at 1 bar abs.)

$$\rho_b = 0.83 \cdot \frac{11}{1} = 9.13 \frac{kg}{m^3}$$

$\Delta p_b = 3.35 \cdot 9.13 = 30.6$ mbar for natural gas

conversion for any gas (here: air):

$$\Delta p_{air} = 30.6 \cdot \frac{1.29}{0.83} = 4.76 \text{ mbar}$$

Pressure loss under operating conditions:

$$\Delta p_b = \Delta p_1 \cdot \rho_b$$

Density under operating constructions:

$$\rho_b = \rho_n \cdot \frac{p_b}{p_{atm}}$$

Pressure loss for any gas G:

$$\Delta p_G = \Delta p_{ng} \cdot \frac{\rho_G}{\rho_{ng}}$$

Sign	Description	Unit
ρ_b	Density in operating conditions	kg/m³
ρ_n	Density in standard condition	kg/m³
ρ_G	Density of any gas	kg/m³
ρ_{ng}	Density of natural gas	kg/m³
p_{atm}	Absolute atmospheric pressure	bar
p_b	Absolute operating pressure (overpressure)	bar
Δp_G	Pressure loss for natural gas at 1 bar	mbar
Δp_1	Pressure loss for natural gas at operating conditions	mbar
Δp_{ng}	Pressure loss for natural gas	mbar
Δp_G	Pressure loss for any gas	mbar

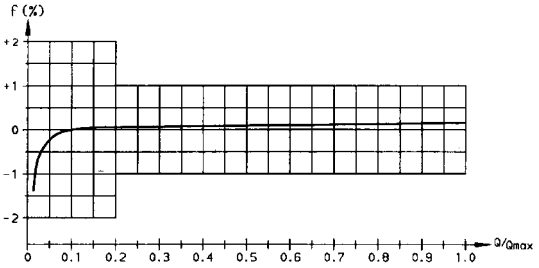
Densities ρ_b in standard condition:

Air	1.29 kg/m³	Methane	0.72 kg/m³
Town gas	0.64 kg/m³	Propane	2.01 kg/m³
Natural gas	0.83 kg/m³	Carbon dioxide	1.98 kg/m³
Nitrogen	1.25 kg/m³	Hydrogen	0.09 kg/m³

RVG

Rotary Gas Meters G10 – G25

Error curve with calibration error limits



Subject to identical installation conditions, the reproducibility of the measured values is better than 0.2%.

Ideal system component

With volume corrector EK210

Most compact cabinet solution with M2R

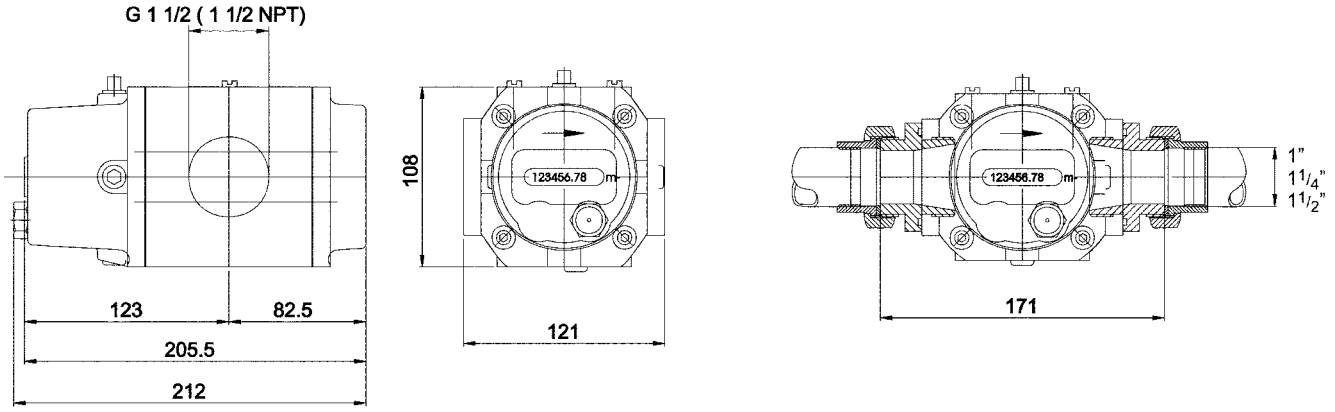
Ultimate system:
RVG + EK210 + MR 25 G6

- Smallest space required
- Highest measuring accuracy
- Highest outlet pressure control

Main features

- **Meter sizes G10 – G25**
- **Flow rates from 0.5 – 40 m³/h**
- **Rangeabilities of the meters 1:20 – 1:80**
- **Nominal widths: DN 25, DN 32, DN 40**
- **Housing thread G 1 ½**
- **Line pressure: maximum 20 bar**
- **Housing made of aluminium**
- **Operating temperature –20°C to + 60°C**
- **Pressure taps at the inlet and outlet**
- **Vertical and horizontal installation**
- **EU and national approvals by PTB**
- **Validity of calibration period (Germany) 16 years**
- **LF-pulser E1**

Dimensions



Technical Data

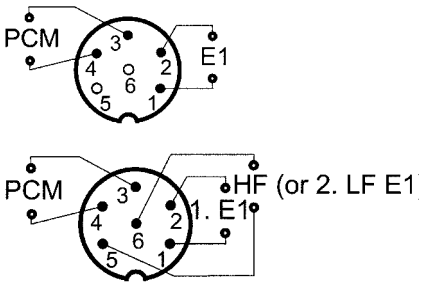
Technology	Meter size	G10	G16	G25
	Q_{min} (m^3/h)	0.5	0.5	0.5
	Q_{max} (m^3/h)	16	25	40
	Rangeability	1:20 to 1:30	1:20 to 1:50	1:20 to 1:80
	Flow range	0.5 – 40 m^3/h		
	Start-up flow rate	0.03 m^3/h (0.5 l/min)		
	Measured quantity	Operating volume V in m^3		
	Accuracy: 0.2 Q_{max} – Q_{max} Q_{min} – 0.2 Q_{max}	 < ± 1% from measured value < ± 2 % from measured value		
	Pipe connection	Pipe thread ISO 228, G 1 1/2 (internal thread), adaptable to pipes DN 25 (1") ; DN 32 (1 1/4") ; DN 40 (1 1/2")		
	Index	8-digit roller index, reading from the front, in 90°-steps turnable (roller index axis horizontal)		
Specification	Mounting	horizontal or vertical		
	Flow direction	left → right; right → left; top → bottom; bottom → top must be specified in the order		
	Line pressure (gauge)	maximum 20 bar		
Weight	(kg)	4.5		
Application	Medium	Natural gas, town gas, propane, inert gases		
	Gas- / ambient temperature	-20°C to +60°C (option: -40°C to +60°C)		
Output	LF–Reed contact E1	Standard: 1 contact, (0.1 m^3 / impulse) + PCM* Option: 2 contacts, (0.1 m^3 / impulse) + PCM*		
	HF–pulser **	Option: 1 HF-pulser according to DIN EN 50227 (Namur) Equipment: 1 HF-pulser + 1 LF-reed contact + PCM*		

* PCM : Supervision contact against tampering
** from 2003 on

LF-pulser E1

Standard:
LF-pulser E1 (Reed-contact)
and PCM supervision contact
against tampering

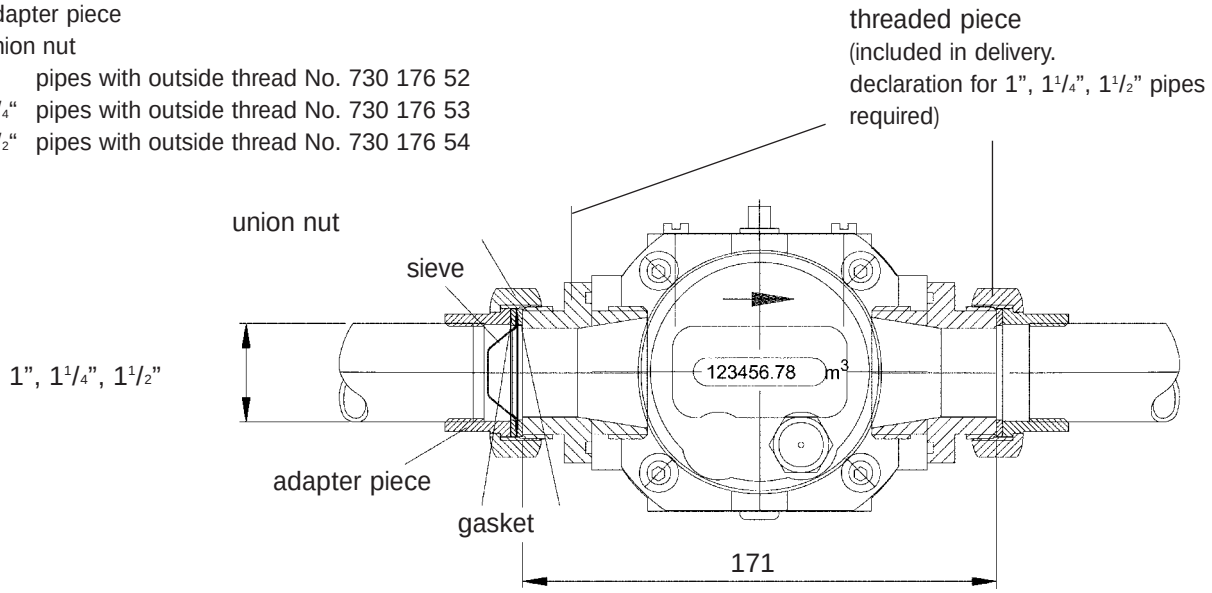
Option:
HF - LF pin assignment



View on soldering side of plug socket

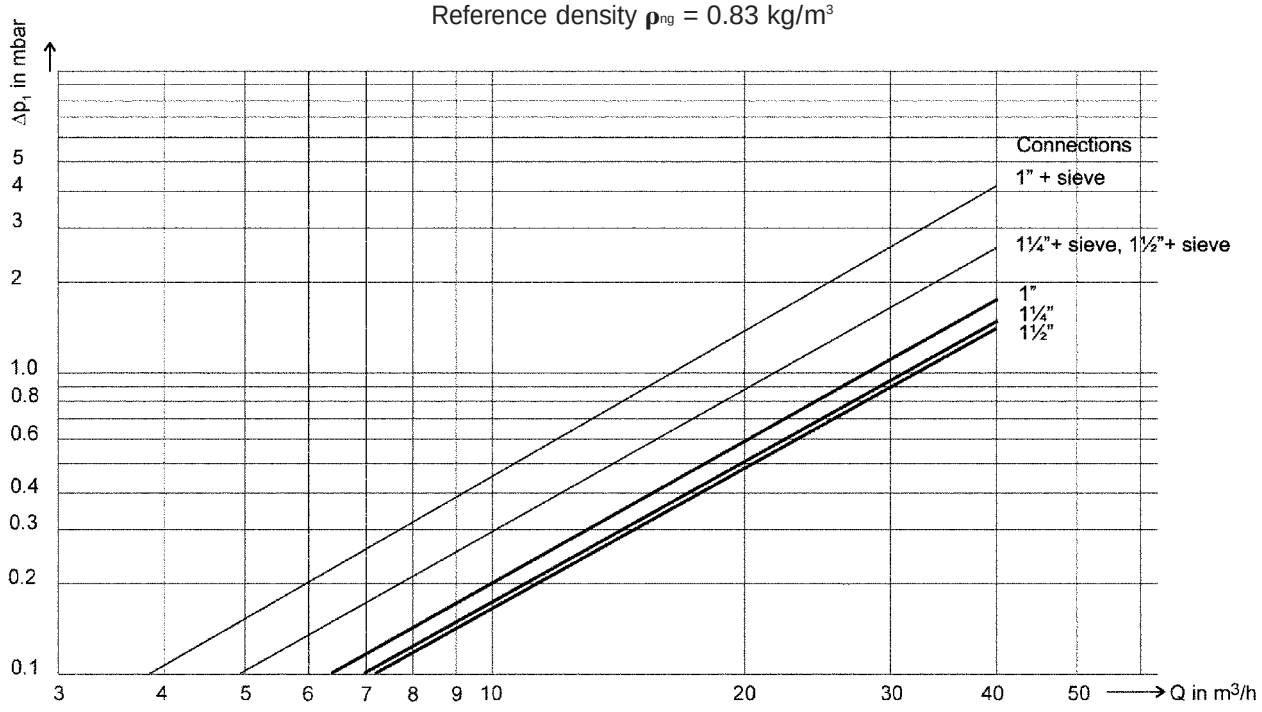
Connecting sets

Optional available are connecting sets consist of:
3 x gasket
1 x sieve
2 x adapter piece
2 x union nut
for 1“ pipes with outside thread No. 730 176 52
for 1¼“ pipes with outside thread No. 730 176 53
for 1½“ pipes with outside thread No. 730 176 54



Pressure loss diagram

Reference density ρ_{ng} = 0.83 kg/m³



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