

# Gas meters

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# Smart Gas Metering



# iSMART2

The UG iSMART2 series meters are the 2nd generation of smart gas meters of Apator Metrix, being the base for many smart gas meters project in Europe and beyond. The design uses proven and durable diaphragm measuring principle with low power, solid state Hall effect sensors for volumetric measurement. The volumetric measurement principle is highly convenient for changing composition of gases in the networks. The iSMART2 electronic index can be integrated with each meter within our product portfolio to add proven measurement with smart functionalities like shut-off valve, communication and Graphical User Interface. The device uses microkernel-based, real-time operating system ensuring flexibility and security in rising IoT world.

## KEY FEATURES

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- High tech, state of the art design with high quality components
- Proven and reliable diaphragm gas meter with high accuracy multipoint calibration throughout the flow range
- For use with fuel gases of the 1st, 2nd & 3rd families according to EN 437:2003+A1:2009, hydrogen g-meter in the roadmap
- Compliance with EN 1359:2017, EN 16314:2013, 2004/22/EC (MID), 2014/108/EC (EMC), 2014/53/EU (RED), WELMEC 7.2
- Volume conversion with real NTC temperature measurement in the gas stream
- ATEX (EN 60079) approved (Zone 2 3G Ex ic IIA T3 Gc)
- IP65 ingress protection rating (EN 60529)
- Optional full-bore shut-off ball valve with zero pressure drop, Class 1 acc. EN16314:2013 (G1.6 up to G6), SIL2 according to IEC 61508
- Optical port located on front of index (EN 1107 and EN 62056-21 compliant)
- Low power, solid state Hall Effect sensors (patented)
- Calculated 26 years battery lifetime (dependent on profile). Lithium Thyonyl-Chloride cells.
- Communication W-MBus 868 MHz (OMS4), NB-IoT (DLMS/COSEM)
- Real time clock accuracy:  $\pm 0.5$  s/day
- Resistance to high ambient temperature  $T@0.1\text{bar}$  according to EN1359
- Index measuring resolution 00000.0000 m<sup>3</sup>
- Cable through with gold plated pins, glass-ceramic, high temperature resistant, helium leakage tested
- OTA Firmware Update
- Security mode 7 profile B, microcontroller supports 128/256-bit AES key encryption hardware accelerator
- External magnetic field detection, reverse flow detection, mechanical interference, low battery
- LCD display 128x64 px dot-matrix, backlight



# uniSMART2

## Communication module for gas meter

**uniSMART2** is a communication module, pre-mounted & configured on new gas meters or as a retrofit module for already installed gas meters of Apator Metrix. The robust Unismart2 has smart solid-state sensors for volumetric measurement of values of the mechanical index of the diaphragm gas meter. The sensors detect possible return flow and secure against “false pulses”. Index values and events as tampering and overflows are logged and communicated following 868 MHz Wireless M-Bus (cooperates with devices working in OMS standard), T-mode, security mode 7, profile B in the M-Bus telegram. A lifetime of battery mounts up to 20 years, communicating every 5 minutes. Communication is compliant with German BSI specifications.

For retrofit modules on installed gas meters, Apator has developed a special tool for easy and fast installation.

### KEY FEATURES

- **Versatility** – suitable to be connected to any type of meter equipped with an anti tamper Apator Metrix S.A. index, produced after 2005.
- **Easy to install and setup** – connected as a standard pulse transmitter in the meter installed in the network and configured wirelessly.
- **Interoperability** – the usage of open communication protocol in accordance with standards EN 13757-3 and EN 13757-4 provides interoperability with devices of other manufacturers and the ability to communicate within a single system AMR. Reading is carried out by radio. The product is compatible with other existing technical specifications in the EU countries, such as OMS.
- **Flexibility** – can be used in walk-by or stationary systems. Apator Metrix also offers software for these systems operating on readily available equipment (e.g. android based smartphones).

## SMART FEATURES

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- An open, widely communication protocol used wireless M-Bus based on European Standard, EN 13757-3 and EN 13757-4.
- Modes:
  - T1 (transmission frame with readings)
  - T2 (parameterisation module)
  - service mode
- Count the number of pulses
  - 1 pulse means 1 rotation of the last drum with the least significant digit of mechanical index
  - an algorithm of elimination errors caused for example by vibration of drum in mechanical index
- Recalculation of pulses per volume (m<sup>3</sup>)
- Register of flows (60 - daily, 120 - monthly)
- The alarm log
  - interference by an external magnetic field
  - exceeding the maximum flow ( $Q_{max}$ )
  - no pulses
- Firmware upgrade through RF communication channel
- Estimated time of battery discharge
- Power 1x AA lithium battery
- Operation time without replacing the battery (up to 10 years)
- Parametrisation
  - initial state
  - time (date, time)
  - definition of flow precision
  - definition of broadcast schedule the reading frame
  - definition of the contents of a sent frame
- Optional parameters sent in a radio frame
  - volume of the last billing period
  - battery status
  - gas meter type
  - spacing of connector pipes
  - manufacturer
  - year of production
  - installation number
- Data Encryption AES-128 in accordance with OMS and EN 13757-3:
  - OMS specification (with dynamic initialisation vector)



Aluminium case 110      000      100 / 110 / 130 mm



152.4 mm (6")      160 mm      220 mm      250 mm



000      130 mm      152.4 mm (6")      220 mm      250 mm



000      130 mm      220 mm      250 mm



000 / 152.4 / 250 / 280 / 300



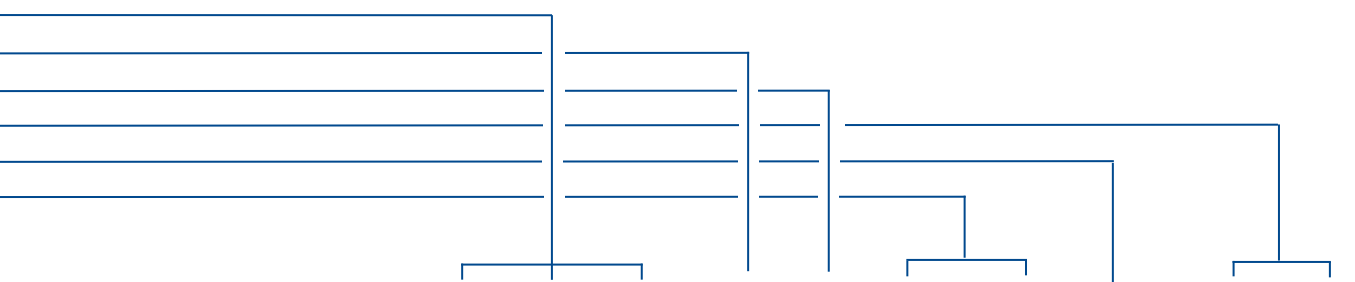
280 / 335 / 400 mm



vertical: 000 / 335 / 430 / 500 / 510 / 640  
horizontal: 570 / 680 / 720



# Residential, commercial and industrial gas meters



Type		UG G1.6	UG G2.5	UG G4	UG G4	2UG G6	UG G10	UG G16	UG G25	UG G40	UG G65	
Maximum flow rate	m <sup>3</sup> /h	2.5	4	6	6	10	16	25	40	65	100	
Minimum flow rate	m <sup>3</sup> /h	0.016	0.016 / 0.025	0.016 / 0.025 / 0.04	0.04	0.06	0.1	0.16	0.25	0.4	0.65	
Nominal flow rate	m <sup>3</sup> /h	1.6	2.5	4	4	6	10	16	25	40	65	
Cyclic volume	dm <sup>3</sup>	1.2	1.2	1.2	2.2	2.2	5.6	5.6	11.2	16.8	22.4	
Max working pressure	bar	0.5 / 2*	0.5 / 2*	0.5 / 2*	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Index max indication	m <sup>3</sup> /h	99999.999					999999.99					
Starting flow rate	dm <sup>3</sup> /h	3	5	5	5	8	13	13	20	32	32	
Fireproof up to 650 °C according to EN 1359	bar	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	

Thread

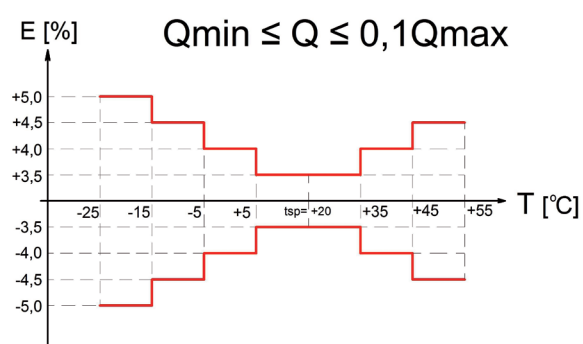
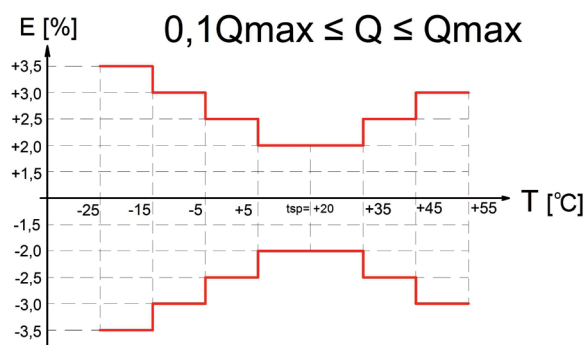
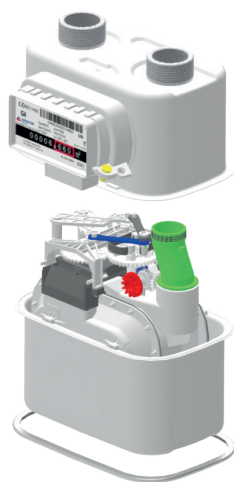
Threaded connections may be manufactured acc. to any international norm (ISO; ANSI; British Standard etc.....)

\*1 Aluminium case



## MECHANICAL TEMPERATURE COMPENSATION

Gas meters UG G1.6 up to UG G4 can be equipped with mechanical temperature compensation (bimetal).



Gas is a substance subject to thermal expansion, which means that depending on temperature, it increases or decreases its volume. Consequently, what changes is the measuring accuracy of a gas meter with relation to its energy content. In other words when gas with some energy content, volume and temperature is already in pipes and is heated, then the index unit is to show a bigger consumption after flow, whereas when gas is cooled, the gas meter will indicate a lower consumption.

It is a very important issue as a temperature change of 3°C corresponds to a volume change of approximately 1%. Such considerable temperature changes are likely to occur especially to meters placed on the outside of a building. Consequently the meter works at various temperatures depending on the season. A gas meter with temperature compensation provides a solution to this problem as it uses and undergoes thermal expansion as well.

A temperature compensation mechanism installed in the measuring unit is adjusted in such a way so that it changes the cyclic volume of the measuring unit exactly like gas undergoing expansion due to temperature changes. Elements responsible for compensation installed in the meter allow a radial shift of the diaphragm, which results in moving the curve of typical error up or down in relation to the zero line.

Thus the gas meter converts the measured value of gas volume into its value at fiducial temperature – irrespective of measuring temperature.

## UG SERIES V=1.2 dm<sup>3</sup>

UG 1.2 dm<sup>3</sup> series gas meters are designed for measurement of gas supplied to apartments where consumption of gas does not exceed 6 m<sup>3</sup>/h of air density of 1.2 kg/m<sup>3</sup>.

THE GAS METERS CAN BE USED FOR MEASUREMENT OF:

- Natural gas
- City gas
- Propane-butane gas
- Hydrogen 100%

Gas meter is equipped with pulse magnet as standard.

Pulse transmitter can be added at any time (1 imp = 0.01 m<sup>3</sup>).



### TECHNICAL DATA

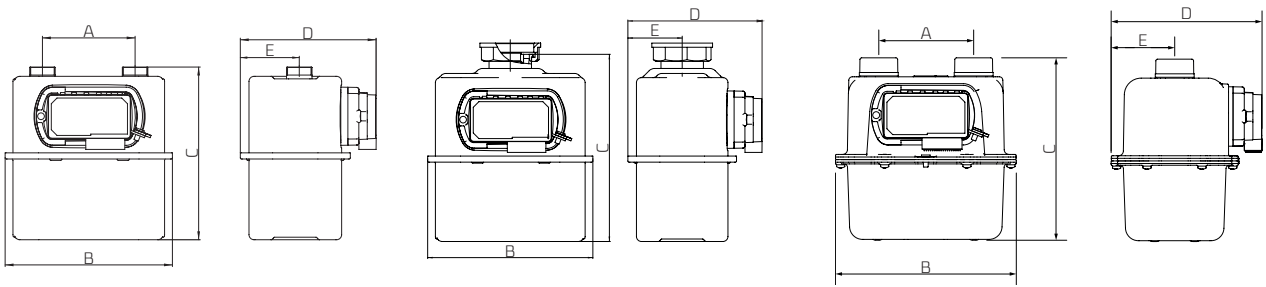
		UG G1.6	UG G2.5	UG G4
Maximum flow rate	m <sup>3</sup> /h	2.5	4	6
Minimum flow rate	m <sup>3</sup> /h	0.016	0.016 / 0.025	0.016 / 0.025 / 0.040
Nominal flow rate	m <sup>3</sup> /h	1.6	2.5	4
Cyclic volume	dm <sup>3</sup>	1.2	1.2	1.2
Max working pressure	bar	0.5 / 2*	0.5 / 2*	0.5 / 2*
Index max indication	m <sup>3</sup> /h	99999.999	99999.999	99999.999
Starting flow rate	dm <sup>3</sup> /h	3	5	5
Fireproof up to 650 °C according to EN 1359	bar	0.1	0.1	0.1

\*) Aluminium case

### ADDITIONAL INFORMATION ON GAS METERS WITH MECHANICAL TEMPERATURE COMPENSATION

	UG T
Cyclic volume	1.15 (1.2) dm <sup>3</sup>
Allowable indication errors limits during initial verification:	
- Q <sub>min</sub> to 0.1 Q <sub>max</sub>	± 3.5%
- 0.1 Q <sub>max</sub> to Q <sub>max</sub>	± 2.0%
Temperature range	-25 ÷ 55°C
UG T - TC correction range:	
- standard	-10 ÷ 40°C
- optional	-25 ÷ 40°C

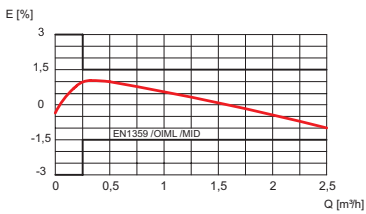
## DIMENSIONS



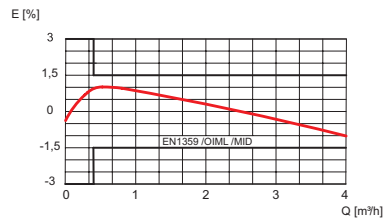
A [mm]	B [mm]		C [mm]		D [mm]		E [mm]		Weight [kg]
	Steel	Alu	Steel	Alu	Steel	Alu	Steel	Alu	
000	200	–	226	–	163	–	66	–	~1.7
100	200	210	212 to 224	210	163	175	66	74	~1.7
110	200	210	208 to 228	210	163	175	66 or 70	74	~1.7
130	200	–	212 to 228	–	163	–	66	–	~1.7
152.4	235	–	262	–	177	–	72	–	~3
160	235	–	241	–	177	–	77	–	~3
220	283	–	223	–	177	–	72	–	~2.9
250	326	–	223	–	177	–	72	–	~3.2

## CURVES OF TYPICAL ERROR AND PRESSURE LOSS

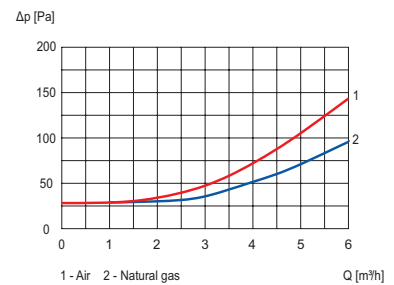
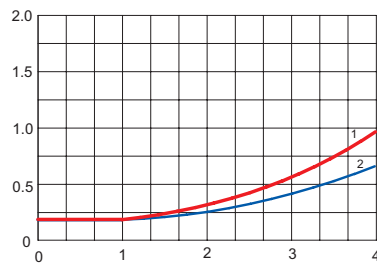
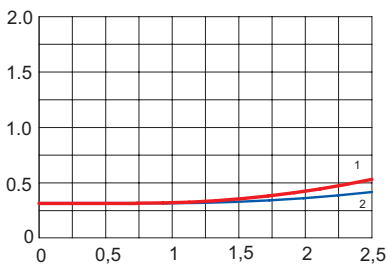
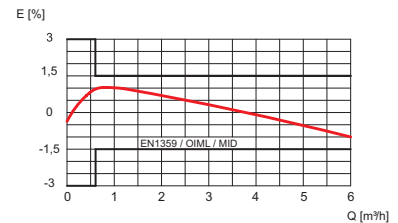
UG G1.6



UG G2.5



UG G4



## UG SERIES V=2.2 dm<sup>3</sup>

UG 2.2 dm<sup>3</sup> series gas meters are designed for measurement of gas supplied to apartments where consumption of gas does not exceed 10 m<sup>3</sup>/h of air density of 1.2 kg/m<sup>3</sup>.

### THE GAS METERS CAN BE USED FOR MEASUREMENT OF:

- Natural gas
- City gas
- Propane-butane gas
- Hydrogen 100%



Gas meter is equipped with pulse magnet as standard.

Pulse transmitter can be added at any time (1 imp = 0.01 m<sup>3</sup>).

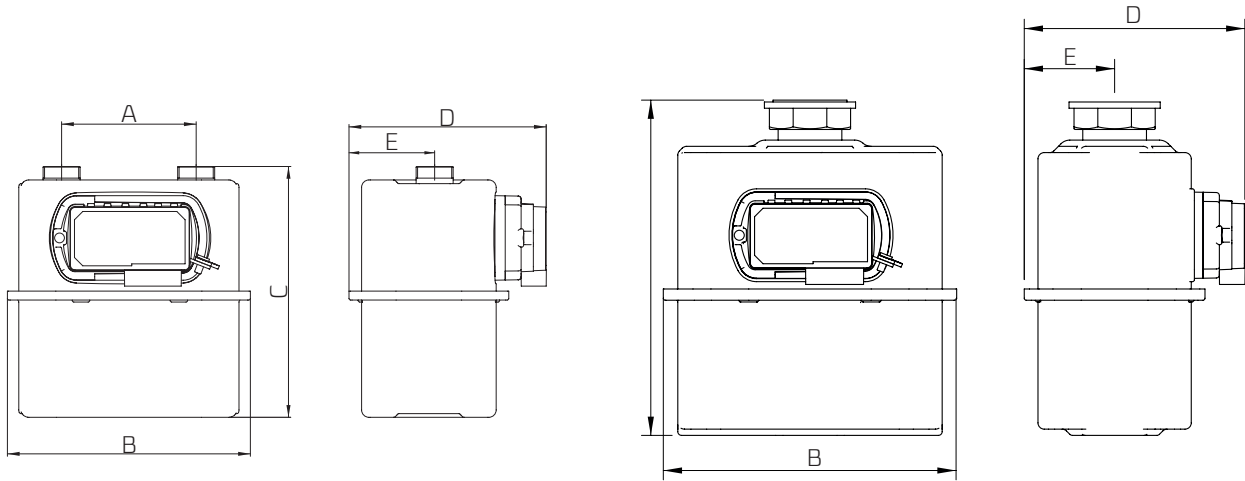
### TECHNICAL DATA

		UG G4	ZUG G6
Maximum flow rate	m <sup>3</sup> /h	6	10
Minimum flow rate	m <sup>3</sup> /h	0.040	0.060
Nominal flow rate	m <sup>3</sup> /h	4	6
Cyclic volume	dm <sup>3</sup>	2.2	2.2
Max working pressure	bar	0.5	0.5
Index max indication	m <sup>3</sup> /h	99999.999	99999.999
Starting flow rate	dm <sup>3</sup> /h	5	5
Fireproof up to 650 °C according to EN 1359	bar	0.1	0.1

### ADDITIONAL INFORMATION ON GAS METERS WITH MECHANICAL TEMPERATURE COMPENSATION

	UG T
Cyclic volume	1.9 dm <sup>3</sup>
Allowable indication errors limits during initial verification:	
- Q <sub>min</sub> to 0.1 Q <sub>max</sub>	± 3.5%
- 0.1max to Q <sub>max</sub>	± 2.0%
Temperature range	-25 ÷ 55°C
UG T - TC correction range:	
- standard	-10 ÷ 40°C
- optional	-25 ÷ 40°C

**DIMENSIONS**

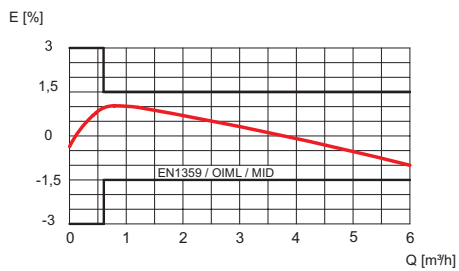


A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	Weight [kg]
	Steel	Steel	Steel	Steel	
000	235	254	177	72	~ 3
130	235	241	177	72	~ 3
152.4	235	262	177	72	~ 3
160	235	241	177	77	~ 3
220	283	223 or 236*	177	72	~ 2.9
250	326	223	177	72	~ 3.2

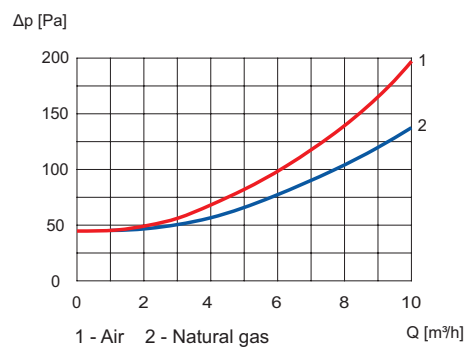
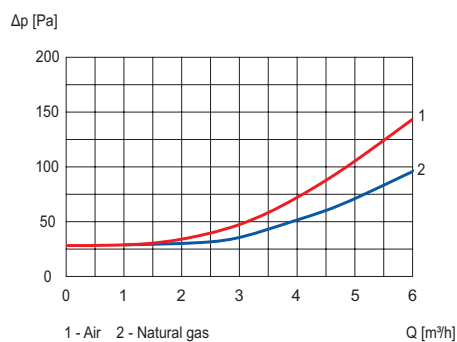
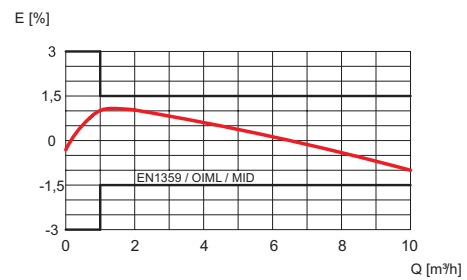
\*) 2UG2,2 version with connection pipes 3/4" (Dutch standard)

**CURVES OF TYPICAL ERROR AND PRESSURE LOSS**

UG G4



2UG G6



## UG SERIES V=5.6 dm<sup>3</sup>

UG 5.6 dm<sup>3</sup> series gas meters are designed for measurement of gas supplied to commercial consumers where maximum consumption of gas does not exceed 25 m<sup>3</sup>/h of air density of 1.2 kg/m<sup>3</sup>.

THE GAS METERS CAN BE USED FOR MEASUREMENT OF:

- Natural gas
- City gas
- Propane-butane gas
- Hydrogen 100%

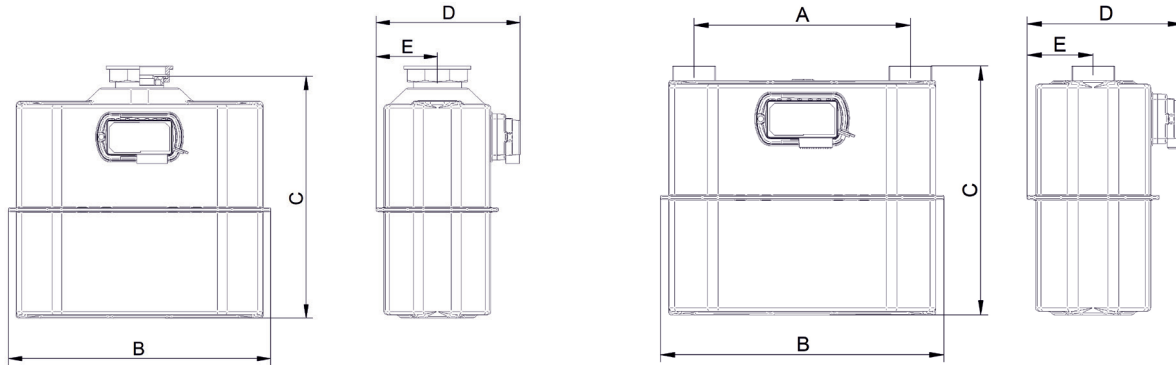


Gas meter is equipped with pulse magnet as standard.  
Pulse transmitter can be added at any time (1 imp = 0.1 m<sup>3</sup>).

### TECHNICAL DATA

		UG G10	UG G16
Maximum flow rate	m <sup>3</sup> /h	16	25
Minimum flow rate	m <sup>3</sup> /h	0.1	0.16
Nominal flow rate	m <sup>3</sup> /h	10	16
Cyclic volume	dm <sup>3</sup>	5.6	5.6
Max working pressure	bar	0.5	0.5
Index max indication	m <sup>3</sup> /h	999999.99	999999.99
Starting flow rate	dm <sup>3</sup> /h	13	13

### DIMENSIONS

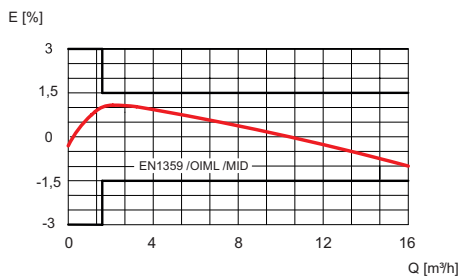


A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	Weight [kg]
	Steel	Steel	Steel	Steel	
000	393	360	216	92	~7
152.4	393	359	216	92	~6.8
250	393	354	216	92	~6.8
280	393	345	216	92	~6.8
300	393	345 or 365*	216	92	~6.8

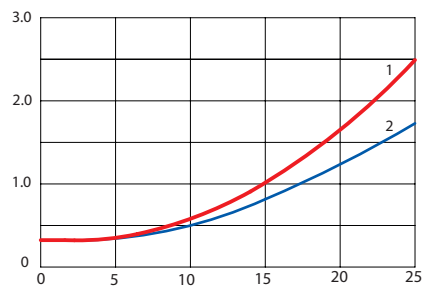
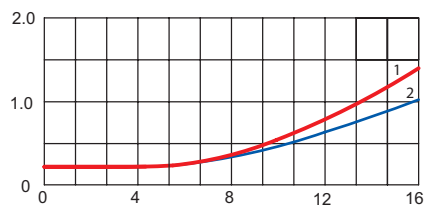
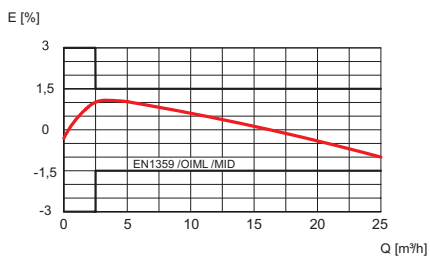
\*) Meter version with connection pipes G2" BS

CURVES OF TYPICAL ERROR AND PRESSURE LOSS

UG G10



UG G16



UG SERIES

## UG G25 V=11.2 dm<sup>3</sup>

UG 11.2 dm<sup>3</sup> gas meter is designed for measurement of gas supplied to commercial consumers where maximum consumption of gas does not exceed 40 m<sup>3</sup>/h of air density of 1.2 kg/m<sup>3</sup>.

THE GAS METERS CAN BE USED FOR MEASUREMENT OF:

- Natural gas
- City gas
- Propane-butane gas
- Hydrogen 100%

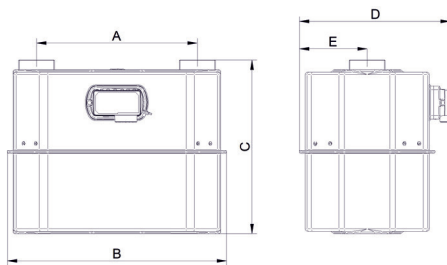


Gas meter is equipped with pulse magnet as standard.  
Pulse transmitter can be added at any time (1 imp = 0.1 m<sup>3</sup>).

### TECHNICAL DATA

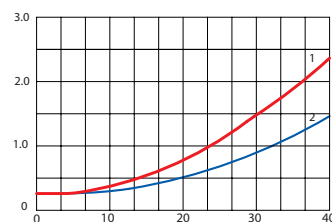
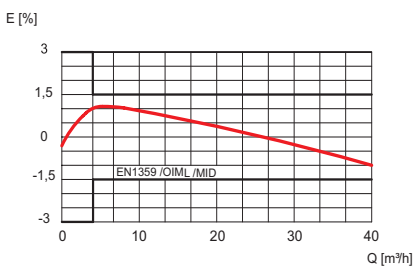
		UG G25
Maximum flow rate	m <sup>3</sup> /h	40
Minimum flow rate	m <sup>3</sup> /h	0.25
Nominal flow rate	m <sup>3</sup> /h	25
Cyclic volume	dm <sup>3</sup>	11.2
Max working pressure	bar	0.5
Index max indication	m <sup>3</sup> /h	999999.99
Starting flow rate	dm <sup>3</sup> /h	20
Fireproof up to 650 °C according to EN 1359	bar	0.1

### DIMENSIONS



A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	Weight [kg]
	Steel	Steel	Steel	Steel	
280	456	361 or 380*	313	141	~ 13.6
335	456	361	313	141	~ 13.6
400	456	420	313	141	~ 13.6

\*) Meter version with connection pipes G2" BS



## UG G40 V=16.8 dm<sup>3</sup>

UG 16.8 dm<sup>3</sup> series gas meters are designed for measurement of gas supplied to commercial consumers where maximum consumption of gas does not exceed 65 m<sup>3</sup>/h of air density of 1.2 kg/m<sup>3</sup>.

THE GAS METERS CAN BE USED FOR MEASUREMENT OF:

- Natural gas
- City gas
- Propane-butane gas
- Hydrogen 100%

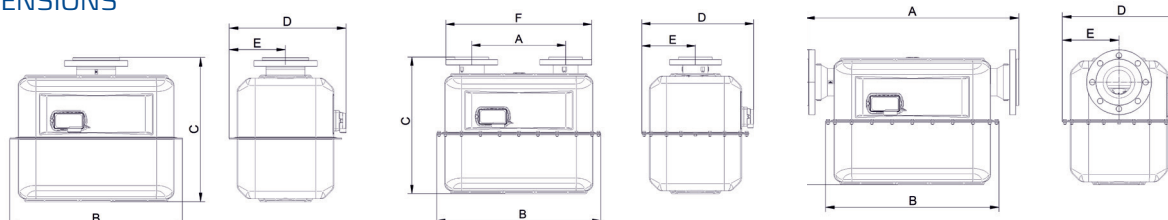
Gas meter is equipped with pulse magnet as standard.  
Pulse transmitter can be added at any time (1 imp = 0.1 m<sup>3</sup>).



### TECHNICAL DATA

		UG G40
Maximum flow rate	m <sup>3</sup> /h	65
Minimum flow rate	m <sup>3</sup> /h	0.4
Nominal flow rate	m <sup>3</sup> /h	40
Cyclic volume	dm <sup>3</sup>	16.8
Max working pressure	bar	0.5
Index max indication	m <sup>3</sup> /h	999999.99
Starting flow rate	dm <sup>3</sup> /h	32
Fireproof up to 650 °C according to EN 1359	bar	0.1

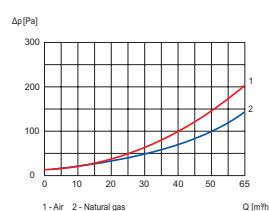
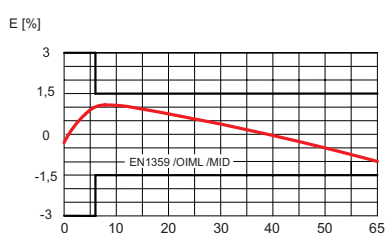
### DIMENSIONS



Boss position	A [mm]	B [mm]		C [mm]		D [mm]		E [mm]	F [mm]	Weight [kg]
		Steel	Steel	Steel	Steel	Steel	Steel			
Vertical	000	586	490	398	191	-	~ 31			
	335*	586	490	398	191	-	~ 27			
	335	586	490	398	186	520	~ 33			
	510	735	488	398	186	709	~ 35			
Horizontal	570	586	446	398	186	346	~33			
	720	586	456	398	186	346	~38			

\*) version without flanges

### CURVES OF TYPICAL ERROR AND PRESSURE LOSS



## UG G65 V=22.4 dm<sup>3</sup>

UG 22.4 dm<sup>3</sup> gas meter is designed for measurement of gas supplied to commercial consumers where maximum consumption of gas does not exceed 100 m<sup>3</sup>/h of air density of 1.2 kg/m<sup>3</sup>.

THE GAS METERS CAN BE USED FOR MEASUREMENT OF:

- Natural gas
- City gas
- Propane-butane gas
- Hydrogen 100%

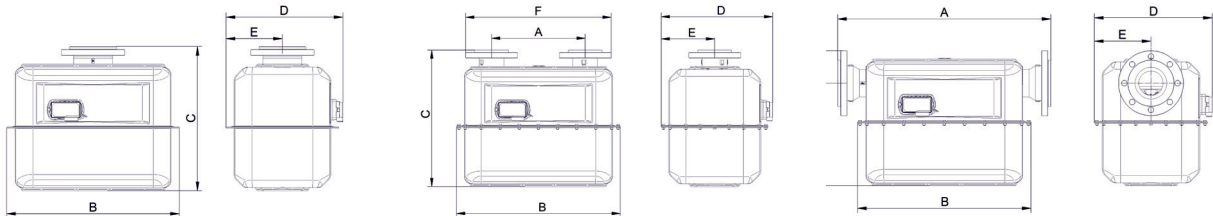


Gas meter is equipped with pulse magnet as standard.  
Pulse transmitter can be added at any time (1 imp = 0.1 m<sup>3</sup>).

### TECHNICAL DATA

		UG G65
Maximum flow rate	m <sup>3</sup> /h	100
Minimum flow rate	m <sup>3</sup> /h	0.65
Nominal flow rate	m <sup>3</sup> /h	65
Cyclic volume	dm <sup>3</sup>	22.4
Max working pressure	bar	0.5
Index max indication	m <sup>3</sup> /h	999999.99
Starting flow rate	dm <sup>3</sup> /h	32
Fireproof up to 650 °C according to EN 1359	bar	0.1

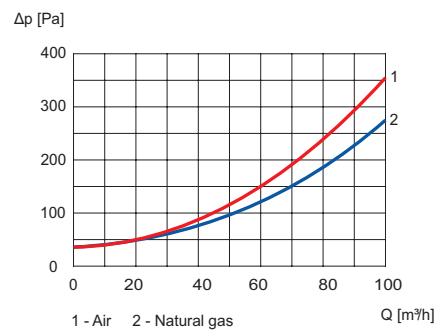
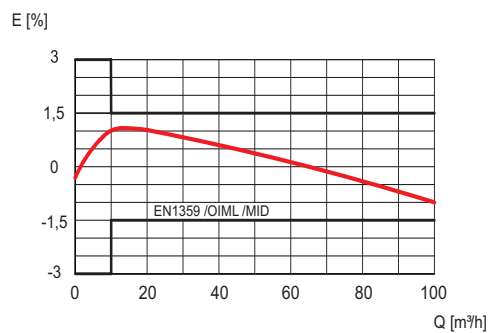
### DIMENSIONS

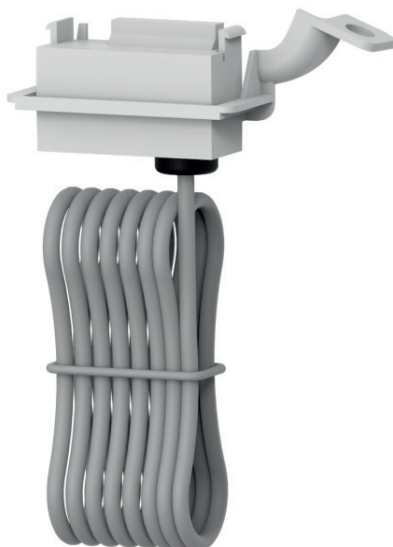


Boss position	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	Weight [kg]
		Steel	Steel	Steel	Steel	Steel	
Vertical	000	586	490	398	191	-	~ 35
	335*	586	490	398	191	-	~ 27
	430	586	587	398	186	630	~ 35
	500	735	488	398	186	699	~ 35
	640	586	488	398	186	840	~ 38
Horizontal	680	586	446	398	186	346	~ 35
	720	586	456	398	186	346	~ 38

\*) version without flanges

## CURVES OF TYPICAL ERROR AND PRESSURE LOSS UG G65





# NI-3

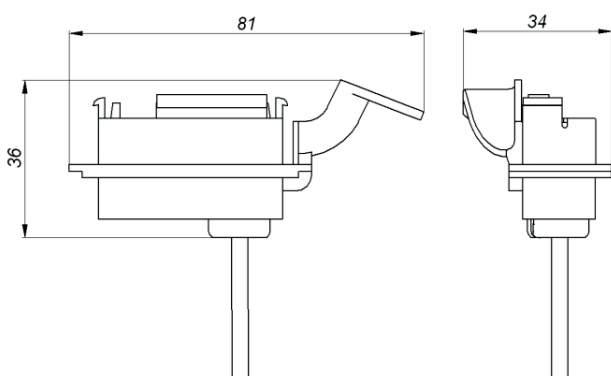
## Pulse transmitter

Pulse transmitter Ni-3 is a contact reed (magnetic) low frequency transmitter designated for generating and transmitting electrical pulses to register the volume and flow of gas in electrical circuits. It is designed to operate with Apator Metrix gas meters.

### TECHNICAL DATA

		NI - 3
Power supply	V	$U_{i, \max} = 24$
Current	mA	$I_{i, \max} = 100$
Switching power	W	max 0,6
Max resistance	$\Omega$	$R_i = 0,75$
Max inductance	H	$L_i \approx 0$
Max conductivity	S	$C_i \approx 0$
Connecting cable length	m	2 m (on special order up to 10 m)
Operating temperature	$^{\circ}\text{C}$	from $-25^{\circ}\text{C}$ to $+50^{\circ}\text{C}$

### DIMENSIONS



## CONSTRUCTION

The pulse transmitter consists of the following parts:

- Housing
- Low frequency sensors set

## HOUSING

Made of plastic. It contains clinches that allow fastening the transmitter inside the socket of the index. There is a set of sensors inside the housing.

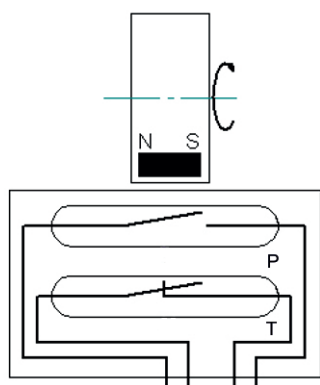
## LOW FREQUENCY SENSORS SET

Consists of the housing with built-in reed switches: pulse counting and tamper reeds. They are covered with a hermetic mass and connected by a 4-wired cable.

## OPERATING PRINCIPLES

There is a magnet in a rotating drum which causes close of a pulse counting reed switch. For this reason electric pulses are rising, and their number is equal to number of the drum rotations.

A tamper reed switch detects attempts to block counting system with strong magnet.



- P – Pulse counting reed switch**  
(normally open)
- T – Tamper reed switch**  
(normally closed)



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