

Instructions for installation and operation

UniSmart

Communication module for gas meters

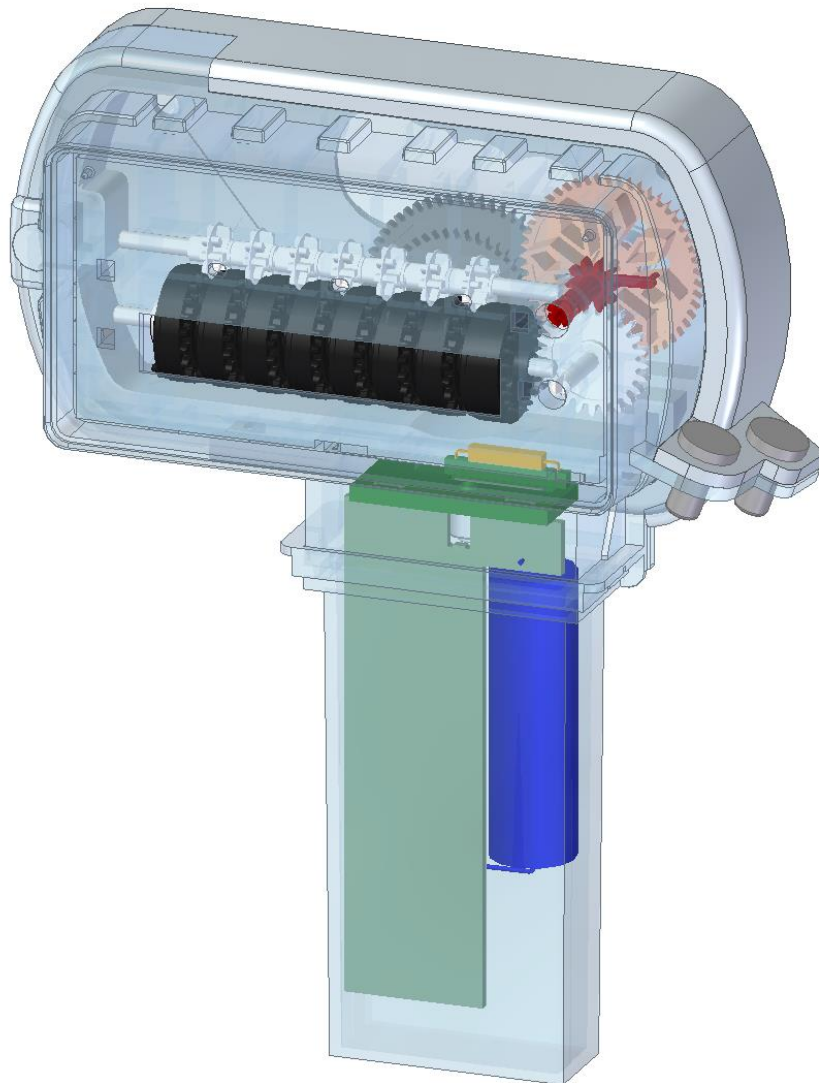


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1. Declaration of conformity

	CE MARKING – DECLARATION OF CONFORMITY
Gas meter with UNISMART is in conformity with: • PN-EN 60079-0/2013 • PN-EN 60079-11/2012 • RED Directive (2014/53/UE) • ATEX Directive (2014/34/UE) • RoHS Directive (2011/65/UE)	

2. Version history

Wersja	Data	Komentarz
1.0	12.11.2015	First version.
1.1	21.12.2015	Second version, changed title, marking of declaration of conformity, temperature range added, label description added, changes in point 12.
1.2	08.09.2016	Third version, label change.
1.3	07.05.2018	Fourth version. Changed picture in points 7 and 8, changed label.
2	06.08.2020	Updated formatting in accordance with the APATOR Product Identification Book

3. Introduction

The main purpose of this document is to provide information for gas meters with UniSmart module users.

4. Purpose

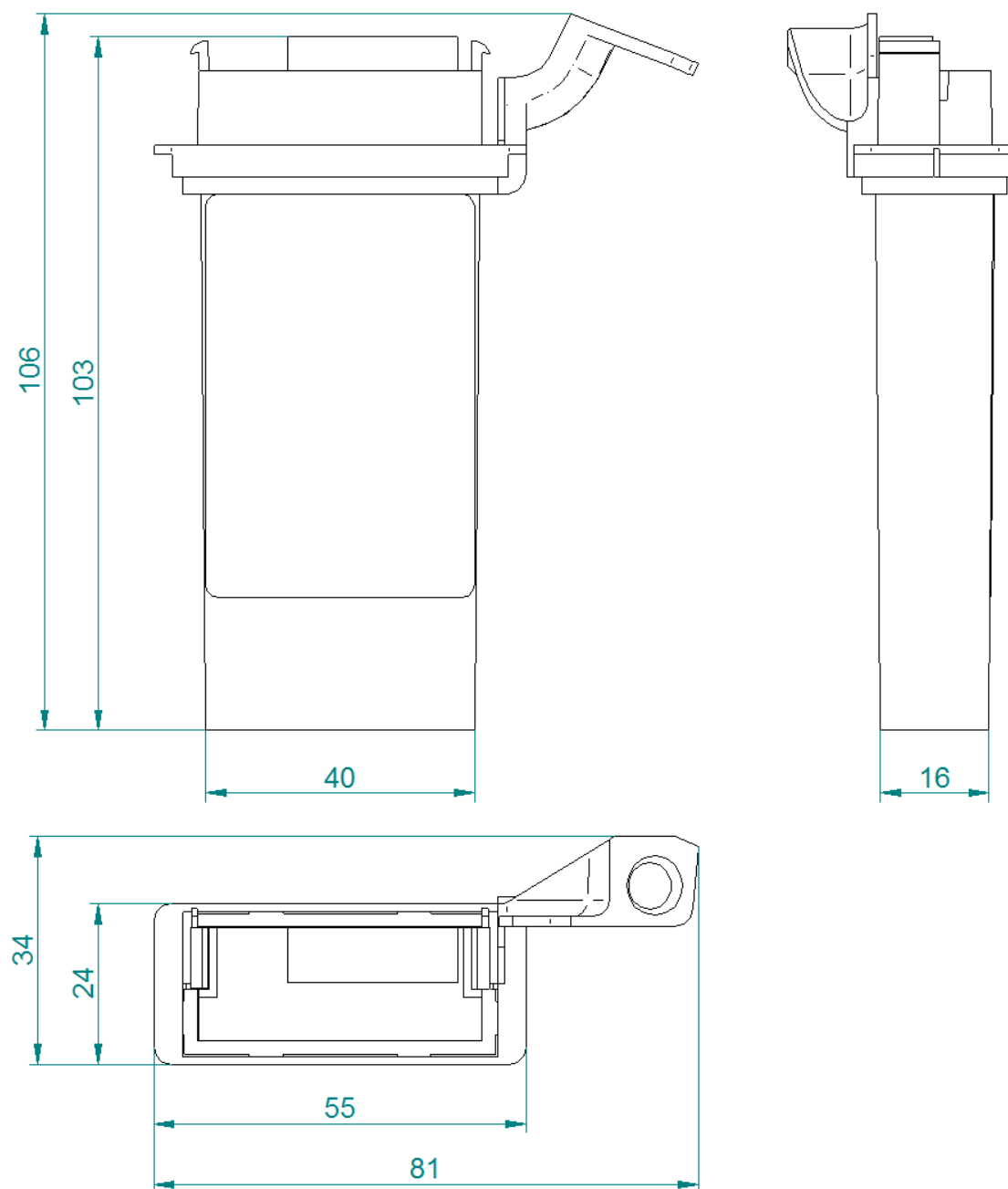
UniSmart is a telemetry module assembled to gas meter mechanical index. Assembled reed switch allows to count impulses from the drums of the mechanical index, which can be converted into the gas usage and send wirelessly by the UniSmart. The usage of open communication protocol in accordance with standards EN 13757-3 provides interoperability with devices of other manufacturers. UniSmarts use AMR – Automatic Meter Reading and fulfilled requirements of current standards in this area. Communication takes places by M-Bus module – wireless.

The gas meters with UniSmart module are indicated for measurement of gas supplied to places where maximum gas consumption does not exceed Q_{max} . The gas meters can be used for measurement of natural gas, artificially produced gas and their mixtures. Gas meters with UniSmart module can be used in II explosion hazard zone, where there is a possibility of explosive atmosphere.

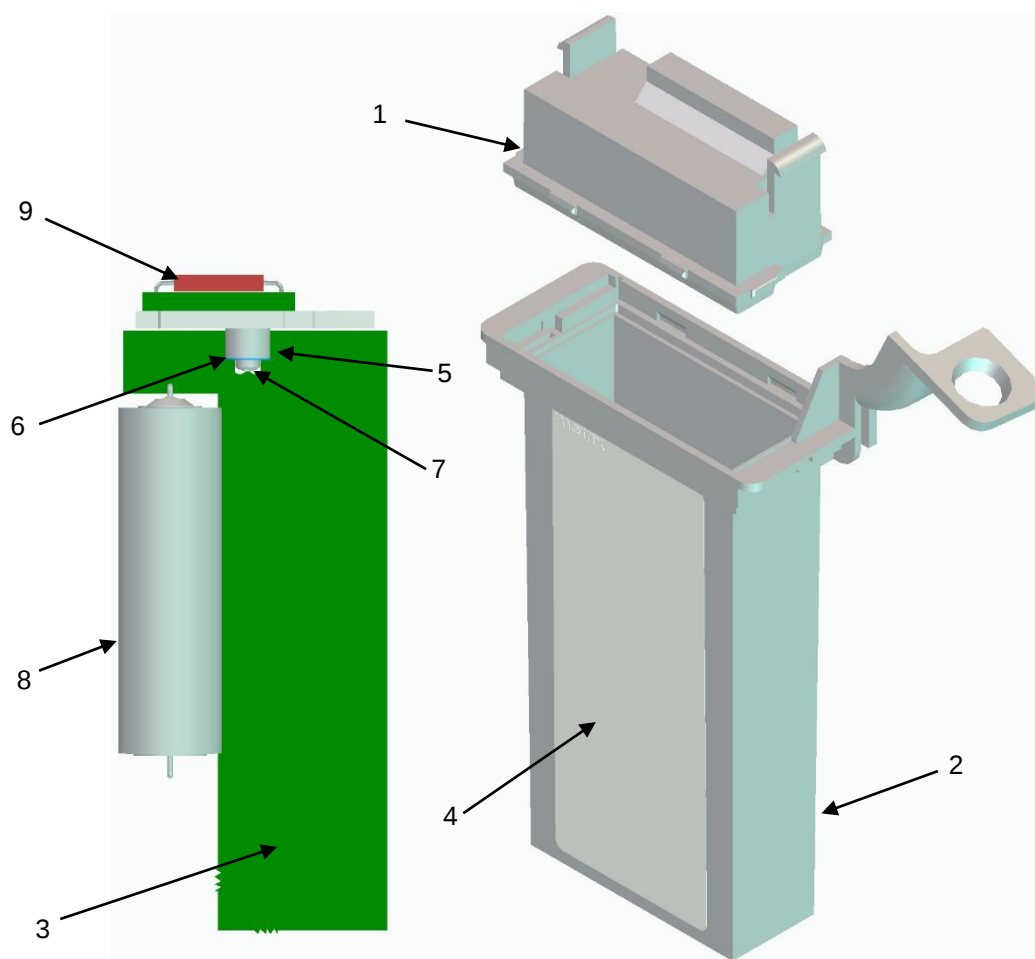
5. Technical data

Supply voltage	3,6 V (lithium battery type AA)
Quiescent current	3,0 μ A
Operating time	>10 years
Minimum storage temperature	-30°C
Maximum storage temperature	+60°C
Ambient temperature range during module work	from -25°C to +55°C
Pulse weight	0,01 m ³
Metrological compatibility	EN1359:1999/A1 (2006)
Fire resistance	EN 1359
Leak tightness level	IP65
ATEX	Zone 2, Ex ic IIA T3 Gc, IP65
Communication	868 Mhz wireless M-BUS compatible with EN13757-3 and OMS
Mechanical environmental class	M1
Electromagnetic environmental class	E1

6. Main dimensions



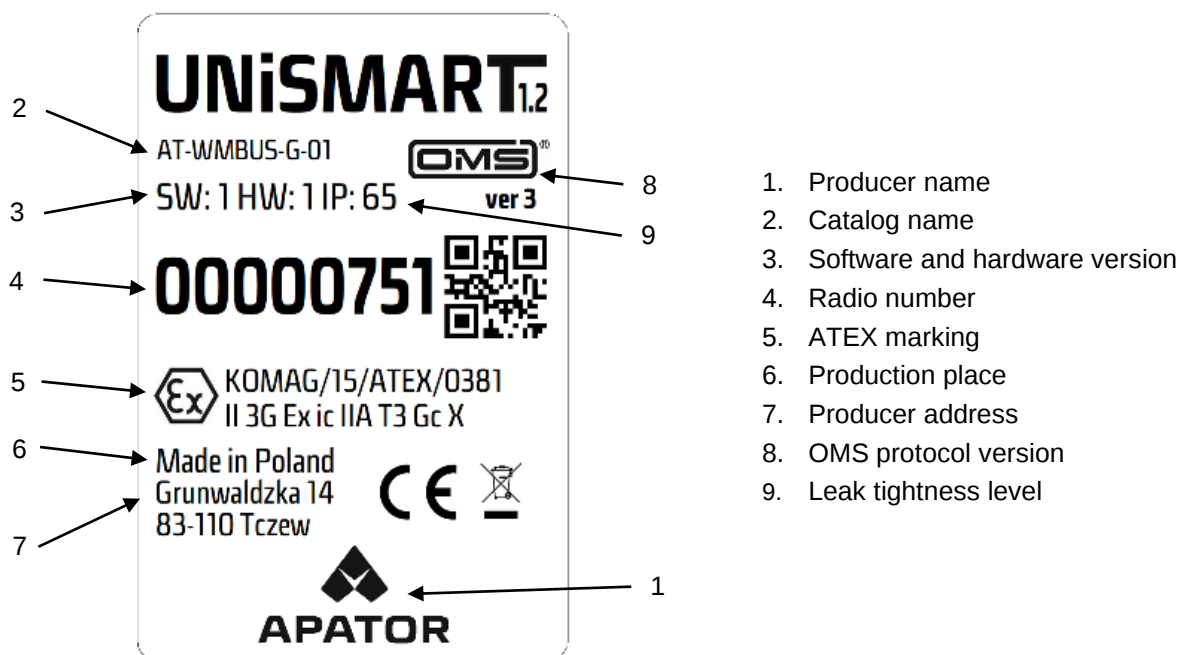
7. Module construction



Module construction (assemblies and parts):

1. UniSmart sensors cover
2. Telemetry module casing
3. Sensors assembly
4. UniSmart label
5. Polyimide spacer sleeve
6. Washer
7. Screw
8. Battery
9. Reed switches

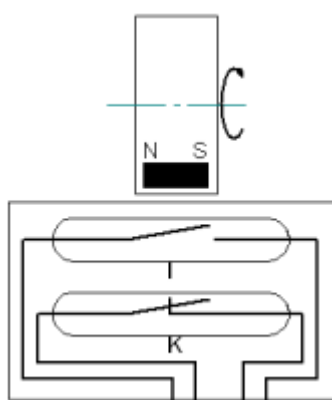
Inside of the casing there is PCB containing reed switches (counting and control), radio with antenna and battery.



8. Principle of operation

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

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



I – Counting reed switch (normally open)

K – Control reed switch (normally close)

9. Radio communication (Wireless M-Bus)

Radio communication is performed by Wireless M-Bus communication protocol compatible with the OMS (Open Metering System) specification according to the standard EN 13757-4. Frequency 868 MHz. Data is encrypted by the AES-128 key according to EN13757-3, 5.10.

Data contained in a frame:

- current consumption
- fabrication number
- battery status
- error flag (standard set of error flags)



10. M-Bus frame content

In the table below there are wM-Bus telegram contents, both encrypted and unencrypted. Version of the OMS standard used in the device is 4.x. AES key used for examples is “..00..”; frame type: SND-NR.

Byte No.	Field Name	Content	Bytes [hex]	Bytes [hex]	Layer
			plain	AES coded	
1	L Field	Length of data (number of following bytes) (67 bytes)		43h	Data Link Layer (DLL)
2	C Field	SND-NR (Send No Reply)		44h	
3	M Field	Manufacturer code = AMX		B8h	
4	M Field	Manufacturer code		05h	
5	A Field	Identification number LSB (BCD)		06h	
6	A Field	Identification number (BCD)		52h	
7	A Field	Identification number (BCD) (= 19005206)		00h	
8	A Field	Identification number MSB (BCD)		19h	
9	A Field	Version (Generation)		A5h	
10	A Field	Device type (Medium = Gas)		03h	
11	CRC 1			23h	
12	CRC 1			F6h	ELL
13	CI Field	Extended Link Layer (short)		8Ch	
14	CC Field	Communication Control		00h	
15	Access No.	ELL-Access Counter of Meter		02h	
16	CI Field	Authentication and Fragmentation layer		90h	Fragmentation

17	AFL	AFL Length (all AFL bytes after AFL)		0Fh	
18	FCL	Fragmentation Control Field (LSB)		00h	
19	FCL	Fragmentation Control Field (MSB)		2Ch	
20	MCL	Message Control Field		25h	
21	MCR	Message Counter (LSB)		03h	
22	MCR	Message Counter		00h	
23	MCR	Message Counter (= 3)		00h	
24	MCR	Message Counter (MSB)		00h	
25	MAC	AES-CMAC (MSB)		B9h	
26	MAC	AES-CMAC		C5h	
27	MAC	AES-CMAC		5Fh	
28	MAC	AES-CMAC		06h	
29	CRC 2			2Bh	DLL
30	CRC 2			8Ch	
31	MAC	AES-CMAC		F3h	AFL
32	MAC	AES-CMAC		61h	
33	MAC	AES-CMAC		75h	
34	MAC	AES-CMAC (LSB)		1Dh	
35	CI Field	7Ah (short header)		7Ah	Transport Layer (TPL)
36	Access No.	Access number of Meter		02h	
37	Status	M-BUS state contents errors and alerts (no errors, no alerts)		00h	
38	Config Field	Configuration Field LSB (2 encrypted blocks)		20h	
39	Config Field	Configuration Field (AES mode 7)		07h	
40	Config Field	Configuration Field MSB		10h	
41	AES-Verify	Decryption verification	2Fh	6Dh	
42	AES-Verify	Decryption verification	2Fh	F3h	
43	DR1	DIF (Variable length)	0Dh	BEh	APL
44	DR1	VIF (Fabrication no) - text representation of gas meter or radio communication module Serial number	78h	07h	
45	DR1	LVAR (14 characters)	0Eh	47h	
46	DR1	Value LSB	31h	C0h	
47	CRC 3			12h	DLL
48	CRC 3			9Eh	
49	DR1	Value	35h	B3h	Application Layer (APL)
50	DR1	Value	36h	BFh	
51	DR1	Value	30h	FBh	
52	DR1	Value	32h	05h	
53	DR1	Value	35h	62h	
54	DR1	Value	30h	7Fh	

55	DR1	Value	30h	D1h	
56	DR1	Value	35h	C6h	
57	DR1	Value	41h	29h	
58	DR1	Value	39h	4Dh	
59	DR1	Value	31h	EEh	
60	DR1	Value ("0919A500520651")	39h	1Bh	
61	DR1	Value MSB	30h	C0h	
62	DR2	DIF (8 digit BCD, current value)	0Ch	25h	
63	DR2	VIF (Volume 0,001 m3)	93h	16h	
64	DR2	VIFE (VIF contains uncorrected unit or value at metering conditions instead of converted unit)	3Ah	B1h	
65	CRC 4			1Ah	DLL
66	CRC 4			91h	
67	DR2	Value LSB	70h	B5h	APL
68	DR2	Value	56h	CCh	
69	DR2	Value (= 12345,67 m3)	34h	81h	
70	DR2	Value MSB	12h	5Fh	
71	DR3	DIF (16 bit integer/binary)	02h	70h	
72	DR3	VIF (Second extension of VIF-codes)	FDh	3Fh	
73	DR3	VIFE (Error flags - binary)	97h	6Fh	
74	DR3	VIFE (Standard conform data content)	1Dh	23h	
75	DR3	Value LSB	00h	E3h	
76	DR3	Value MSB (no errors, no alerts, no alarms)	00h	AEh	
77	CRC 5			43h	DLL
78	CRC 5			65h	

11. Removing the UniSmart module

UniSmart module can be removed from a gas meter at any time without damaging the gas meter index. To unplug the module, seal need to be drilled first. Next remove the seal and tubular rivet.

Break the left and right side of the module using pliers.



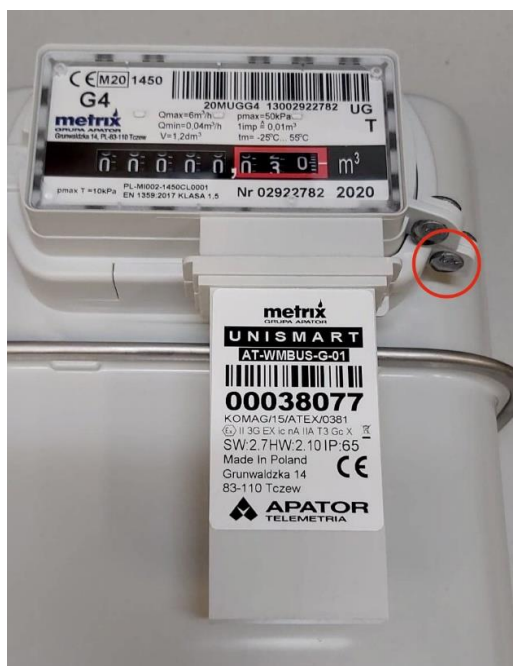


Next insert flat screwdrivers (diameter 3 to 3,5 mm) in both holes to fold back the attachments and pull the module out from the socket.

12. Mounting the UniSmart module



Insert the module into the index socket until the clinches reach their final position (you shall hear a "click")



Sealing:

- insert a hollow rivet into the sealing hole of the Unismart module
- insert the seal into the hole of the hollow rivet and close the seal

13. Exploitation

Gas meter combined with the UniSmart does not need any maintenance or lubrication during its lifetime. Indication errors during exploitation are regulated by law. Periodic check of the gas installation and the gas meter is performed according to the Gasworks procedure.

Lack of replacement and service parts. Battery is inconvertible.

Gas meter is designed to installation in mechanical environment „M1” with low level of shake and vibration according to directive 2004/22/EC.

Gas meter is designed to installation in electromagnetic environment „E1”, according to directive 2004/22/EC.

Product is designed to comply the requirements of ATEX zone 2.

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