

6500W + IMT65W Battery Powered Electromagnetic Water Meter



The 6500W flow tube and the IMT65W transmitter have been specifically designed to work together as a system for district metering of potable water and custody transfer measurement.

- ▶ Battery- or mains powered, with battery backup option
- ▶ Integrated temperature and pressure measurement for leak monitoring
- ▶ MI-001, OIML R49 up to DN600/24", no inlet/outlet runs needed
- ▶ Burial installation possible (IP68)

Equipment should be installed, operated, serviced, and maintained only by qualified personnel.

No responsibility is assumed by Schneider Electric for any consequences arising from the use of this material.

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1.1 The power of independence

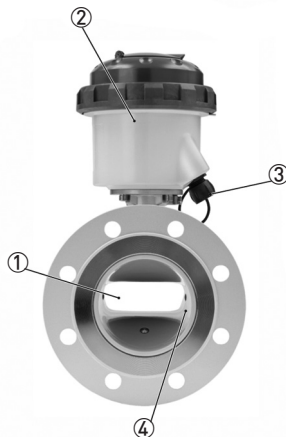
In a world where water is becoming increasingly scarce, accurate flow measurements of a valuable resource like drinking water are essential for efficient water network management, reducing non-revenue water and for billing purposes. The 6500W + IMT65W water meter, with its unique **rectangular tube design** and efficient coil construction, along with flexibility in powering the transmitter form a unique solution for district metering and custody transfer measurement.

Flow profile disturbances are squeezed out by contraction and the mean flow velocity in the rectangular cross section is doubled. The coils provide a strong and homogeneous magnetic field, leading to an improved signal to noise ratio and stable measurements. The result is a very good low flow performance and a drastic reduction of the additional uncertainty for upstream disturbances. The 6500W tube has set a new standard in the market for simplifying installation with **zero inlet and zero outlet sections**. Another benefit of the rectangular bore is a very low power consumption and thus a longer battery lifetime.

The **battery powered** 6500W + IMT65W is ideal for remote locations where **no mains power** is available. For locations where mains power is available, but water companies demand for a battery power back up to ensure continuous measurements, the 6500W + IMT65W can be equipped with an external Multi-Power unit.

The 6500W tube has an **integrated pressure and temperature sensor** making it an all-in-one water meter.

To transfer all data, including counter values, pressure & temperature measurements and meter and status alarms the 6500W + IMT65W can communicate by RS485 using the **Modbus RTU protocol**. The unique low (battery) powered Modbus option can be connected to a GPRS data logger unit for a complete remote solution. When using the **Multi-Power unit**, with the high power Modbus version all available data is transferred at a high frequency.



1. Rectangular bore for DN25 up to DN600
2. Multiple power concept
3. Pulse and Modbus communication
4. Integrated pressure and temperature sensor

Highlights

Accurate and robust performance

- Unique rectangular flow tube design for sizes DN25...600
- Flow profile disturbances squeezed out by contraction
- Large turn down ratio for peak flows during the day and low flows during the night
- Standard in-house wet calibration for every meter

Approvals

- Certifications to OIML R49 and MID Annex III (MI-001) up to DN600
- Range of local custody transfer approvals based on OIML R49
- Drinking water approvals including ACS, DVGW, NSF, UBA and WRAS

Standard IP68 signal transmitter and tube

- IP68 compact and field version for submersion in flooded chambers
- Compact housing with small footprint for installation in electrical cabinets
- Plug & play (IP68) connectors

Simplifies installation, minimises maintenance

- OD inlet, OD outlet for compact installation directly behind an elbow or reducer
- Special coating for immersed or subsoil tube installation
- Standard reference electrode making grounding rings obsolete

Multiple power concept for any location

- Internal lithium batteries for battery lifetime up to 10 years
- AC mains supply and DC power (for green energy e.g. solar or wind power) both with battery backup

Flow, pressure and temperature measurement

- Flow, and optional pressure and temperature measurement integrated in one instrument
- Simple, cost efficient and robust installation

Data communication and transfer

- RS485 Modbus RTU communication for disclosure of a wide range of data
- Special low power Modbus option for battery operation

Industries

- Water distribution network management
- District metering (DMA)
- Revenue metering
- Water abstraction
- Irrigation
- Dewatering

Applications

- Measurement of potable water, raw water and irrigation water
- Monitoring of distribution networks
- Pressure and water quality control with integrated P&T sensor
- Pressure and pumping stations
- District Metering Areas (DMA) for leak detection
- Water consumption and billing
- Checking of water wells or pumps and maintaining water balance

1.2 Options

**Remote or compact signal transmitter**

The 6500W + IMT65W is available in a compact or a remote (field) version. The remote signal transmitter comes with a practical wall holder for easy mounting to a wall of a measurement chamber or electrical cabinet. The functionality of the compact and the remote version is identical.

**Power: Internal battery pack**

On locations where no power is available, the 6500W + IMT65W operates on batteries. The standard IMT65W has an internal battery pack with lithium dual D-cell batteries.

**Multi-Power for mains power with battery backup**

The 6500W + IMT65W can be powered by an external IP68 rated **Multi-Power unit** on locations with a main supply (110 V... 230 V AC), but where battery backup is required. The integrated dual D-cell battery ensures a continuous measurement even if the mains power supply is unreliable.

To save energy, the meter automatically switches to a low power battery backup mode.

The Multi-Power unit comes with a 10...30 V DC power cable for connection to green power supply sources such as wind or solar panels.



Water immersion (IP68)

Both tube and signal transmitter are IP68 rated according to IEC/EN 60529 suitable for immersing underwater during flooding (e.g. in periods of heavy rainfall).

The robust **6500W + IMT65W** flow tube is suitable for long duration immersion in flooded metering pits. The compact and remote version of the IMT65W signal transmitter can be installed in chambers with periodic submersion.

The output cable has plug and play IP68 rated connectors. Immersion in water is possible down to a depth of 10 meter / 33 ft.



Underground installation

With its robust construction the flow sensor can also be buried underground. This can be a major cost saving as it eliminates the need for a measurement chamber. A special protective coating can be ordered optionally. The remote sensor version has an IP68 stainless steel connection box.



Integrated Pressure & Temperature tube

The **6500W + IMT65W** is an all-in-one water meter measuring flow, pressure and temperature with just one instrument.

For this the 6500W tube is equipped with an integrated pressure and temperature sensor. Flow, pressure and temperature values can be read on the display or via Modbus. When critical limits for pressure and temperature are exceeded an alarm can be generated via a status output or Modbus.

The integrated pressure and temperature sensor is available for sizes DN50 to DN200.

1.3 Measuring principle

An electrically conductive fluid flows inside an electrically insulated pipe through a magnetic field. This magnetic field is generated by a current, flowing through a pair of field coils.

Inside of the fluid, a voltage U is generated:

$$U = v * k * B * D$$

in which:

v = mean flow velocity

k = factor correcting for geometry

B = magnetic field strength

D = inner diameter of flowmeter

The signal voltage U is picked off by electrodes and is proportional to the mean flow velocity v and thus the flow rate Q . A signal transmitter is used to amplify the signal voltage, filter it and convert it into signals for totalizing, recording and output processing.

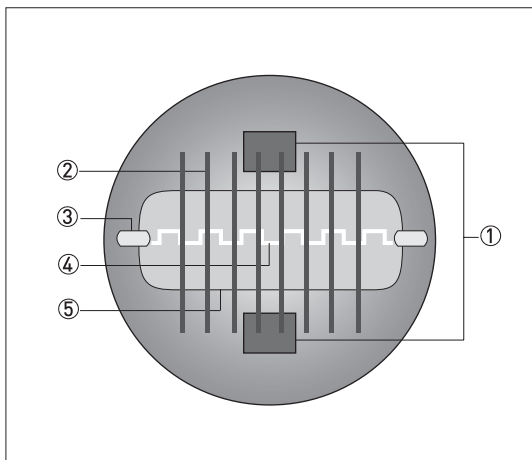


Figure 1-1: Measuring principle

- ① Field coils
- ② Magnetic field
- ③ Electrodes
- ④ Induced voltage (proportional to flow velocity)
- ⑤ Rectangular cross section

Rectangular cross section

The minimal height of the measuring tube decreases the distance between the field coils (1), resulting in a stronger and more homogeneous magnetic field (2). In addition, the mean flow velocity v increases due to the rectangular and reduced cross section. The large electrode spacing (D) and the increased flow velocity results in a higher magnetic signal voltage, also in the presence of a low flow rate.

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website.*

Measuring system

Measuring principle	Faraday's law of induction
Application range	Electrically conductive fluids
Measured value	
Primary measured value	Flow velocity
Secondary measured value	Volume flow
Optional measured value	Pressure and temperature

Design

Features	Unique rectangular flow tube design providing improved flow profile and signal to noise ratio resulting in highest accuracy, low energy consumption and large turndown ratio.
	Rilsan® polymer coated flow tube approved for drinking water
	No internal or moving parts
	Built-in reference electrode
	Optional; built-in P&T sensor (restricted to DN50...200 / 1...8"), refer to <i>Integrated P&T sensor (optional)</i> on page 16.
	Self-providing energy by batteries for up to 10 years
Modular construction	The measurement system consists of a flow tube and a signal transmitter. It is available as a compact and as a remote version.
Compact version	In compact version with IMT65W (C): Model 6500W + IMT65W C
Remote version	In field version with IMT65W (F): Model 6500W + IMT65W F
	Cable length up to 25 m / 70 ft, other lengths on request.
Nominal diameter	DN25...600 / 1...24", Rectangular bore.

Display and user interface	
Display	LCD display, 8 digits.
Operation	2 optical keys to navigate through the menu of the signal transmitter without opening the housing
Display information	Standard:
	Sum counter (default), forward counter, reverse counter or flow rate.
	Flow direction (forward or reverse), counter settings.
	Measured value and measuring unit
	Battery lifetime indicator
Optional:	Operating pressure, operating temperature, empty pipe, self-test, display test, test mode, diameter, meter constant, software version, AMR mode, notification sign, multiplier.
Remote reading	Optional: external GSM / GPRS data logger for pulse or Modbus Please contact Customer Support for more information.

Measurements

Measuring units	Volume
	Default setting: m ³
	Selectable: litre, gallon, imperial gallons, cubic feet, acre inch, acre feet, mega litre, mega imp. gallon.
	Flow rate
	Default setting: m ³ / hr
	Selectable: litre/sec, gallon/min, imperial gallon/min, cubic feet/hour, acre inch/day, acre feet/day, mega litre/day, mega imperial gallon/day.
Measurement interval	Default setting: 15s
Battery power	Selectable: 5s, 10s, 15s, 20s.
Measurement interval Multi-Power	Default setting: 5s
Empty pipe detection	Optional: display shows - EP - in case of empty pipe detection
Low flow cut off	Measurements below this value are neglected
	Default setting: 10 mm/s
	Selectable: 0 mm/s, 5 mm/s, 10 mm/s

Measuring accuracy

Maximum measuring error	DN 25...300 / 1...12"; down to 0.2% of the measured value ± 1 mm/s DN350...600 / 14...24"; down to 0.4% of the measured value ± 1 mm/s
	The maximum measuring error depends on the installation conditions
	For detailed information refer to <i>Measurement accuracy</i> on page 25.
Repeatability	DN 25...300 / 1...12"; $\pm 0.1\%$ ($v > 0.5$ m/s / 1.5 ft/s) DN350...600 / 14...24"; $\pm 0.2\%$ ($v > 0.5$ m/s / 1.5 ft/s)
Calibration / Verification	Standard:
	2 Point calibration by a direct volume comparison
	Optional: for DN25...600 / 1...24"
	Verification to Measurement Instrument Directive (MID) Annex MI-001 Standard: Verification at Ratio (Q3/Q1) = 80 Optional: Verification at Ratio (Q3/Q1) > 80
MID Annex III (MI-001) (Directive 2014/32/EU)	EC-Type examination certificate to MID Annex III (MI-001)
	Diameter: DN25...600 / 1...24"
	Minimum straight inlet flow: 0 DN
	Minimum straight outlet flow: 0 DN
	Forward and reverse (bi-directional) flow
	Orientation: any
	Ratio (Q3/Q1): up to 630
	Liquid temperature range: +0.1...50°C / +32...122°F
	Maximum operating pressure: \leq DN200 / 8": 16 bar / 232 psi, \geq DN250 / 10": 10 bar / 150 psi.
	For detailed information refer to <i>Legal metrology</i> on page 19.
OIML R49	Certificate of conformity to OIML R49 (edition 2006)
	Diameter: DN25...600 / 1...24"
	Accuracy: Class 1 and 2
	Minimum straight inlet flow: 0 DN
	Minimum straight outlet flow: 0 DN
	Forward and reverse (bi-directional) flow
	Orientation: any
	Ratio (Q3/Q1): up to 400
	Liquid temperature range: +0.1...50°C / +32...122°F
	Maximum operating pressure: \leq DN200 / 8": 16 bar / 232 psi, \geq DN250 / 10": 10 bar / 150 psi.
	For detailed information refer to <i>Legal metrology</i> on page 19.

Operating conditions

Temperature	
Process temperature	-5...+70°C / +23...+158°F
Ambient temperature	-25...+65°C / -13...+149°F
	Ambient temperatures below -25°C / -13°F may affect the readability of the display
	It is recommended to protect the signal transmitter from external heat sources such as direct sunlight, because high temperatures reduce the life cycle of all electronic components and the battery.
Storage temperature	-30...+70°C / -22...+158°F
Measurement range	-12...12 m/s / -40...40 ft/s
Starting flow	From 0 m/s / 0 ft/s onwards
Pressure	
Operating pressure	Up to 16 bar (232 psi) for DN25...200 / 1...8" Up to 10 bar (150 psi) for DN250...600 / 10...24"
Vacuum load	0 mbar / 0 psi absolute
Pressure loss	For detailed information refer to <i>Pressure loss</i> on page 30.
Chemical properties	
Physical conditions	Water: drinking water, raw water, irrigation water. For salt water, please contact the factory.
Electrical conductivity	≥ 20 µS/cm

Installation conditions

Installation	Assure that flow tube is always fully filled.
	For detailed information refer to the section Installation in the manual.
Flow direction	Forward and reverse
	Arrow on flow tube indicates forward flow direction
Inlet run	≥ 0 DN
	For detailed information refer to <i>Measurement accuracy</i> on page 25.
Outlet run	≥ 0 DN
	For detailed information refer to <i>Measurement accuracy</i> on page 25.
Dimensions and weights	For detailed information refer to <i>Dimensions and weights</i> on page 27.

Materials

Tube housing	Sheet steel
Measuring tube	DN25...200 / 1...8": metallic alloy
	DN250...600 / 10...24": stainless steel
Flanges	DN25...150 / 1...6": Stainless steel 1.4404 / 316L DN200 / 8" : Stainless steel 1.4301 / 304L DN250...DN600 / 10...24": steel St37-C22 / A105 Optional: DN250...600 / 10...24": Stainless steel
Liner	Rilsan®
Protective coating	On exterior of the meter: flanges, housing, and / or connection box (field version).
	Standard: coating
	Option: subsoil coating
Measuring electrodes	Standard: stainless steel 1.4301 / AISI 304
	Optional: Hastelloy® C
Reference electrode	Standard: stainless steel 1.4301 / AISI 304
	Optional: Hastelloy® C
Grounding rings	Grounding rings can be omitted when the reference electrode is used
Signal transmitter housing	Polycarbonate
Wall holder for remote signal transmitter	Polycarbonate
Connection box	Only for remote versions.
	Stainless steel

Process connections

EN 1092-1	Standard:
	DN25...200 / 1...8" : PN 16
	DN250...600 / 10...24" : PN 10
	Optional:
	DN250...600 / 10...24" : PN16 (DN350...600: 10 bar rated)
ASME B16.5	1...12": 150 lb RF (232 psi / 16 bar rated) 14...24": 150 lb (150 psi / 10 bar rated)
JIS B2220	DN25...300 / 1...12": 10 K DN350...600 / 14"...24": 7,5 K
AS 4087	DN25...600 / 1"...24" : Class 16 on request (DN350...600 / 14"...24": 10 bar rated)
AS 2129	DN25...600 / 1"...24" : Table D, E on request (DN350...600 / 14"...24": 10 bar rated)
For detailed information on nominal flange pressure and nominal diameter refer to <i>Dimensions and weights</i> on page 27.	

Other connections	
Thread	DN25: G1" thread connection
	DN40: G1.5" thread connection
Other	Weld-on, clamp, oval flanges: on request.

Electrical connections

Cable connections	
Cable entries	Compact and field version: IMT65W
	Connection with 1 or 2 snap-on connectors
Output cable	IMT65W compact and field version
	Standard: Pulse- or Modbus output cable
	Optional: Pulse output activated and connection to the data logger - GPRS module. Output cable with 2 plug and play - IP68 rated connectors
Power supply	
Battery	Standard:
	Internal battery pack: Dual D-cell (Lithium, 3.6V, 38 Ah).
Multi-Power Optional:	External IP68 rated AC/DC power supply (110...230V AC \pm 10% - 10..30V DC / 50-60Hz) with battery backup Dual D-cell (Lithium, 3.6V, 38 Ah). Cable length is 1.5 meter / 5 feet
Typical lifetime (default settings)	With 2 internal batteries;
	DN25...200 / 1...8" : up to 10 years DN250...600 / 10...24" : up to 7 years
	For detailed information refer to <i>Battery lifetime</i> on page 31
Notifications	Pre-notification at < 10% of its original capacity
	Final notification at < 1% of its original capacity
Battery replacement	No loss of totalizer data

Tube cable (remote versions only)	
Type	WSC2 standard cable, double shielded.
Length	Standard: 5 meter / 16 feet
	Optional: 10 meter / 33 feet, 25 meter / 82 feet.
	Other cable lengths on request (max. 30 meter)
In- and output	
Pulse output	2 Passive pulse outputs (maximum 3 outputs possible; see status output).
	$f \leq 100$ Hz; $I \leq 10$ mA; $U: 2.7...24$ VDC ($P \leq 100$ mW).
	Volume / pulse is programmable
	Phase shift between pulse A and B (forward and reverse) selectable
	Pulse width is selectable: 5 ms (default), 10 ms, 20 ms, 50 ms, 100 ms, 200 ms.
Status output	2 Passive status outputs (1 status output can be used as a third pulse output)
	$I \leq 10$ mA; $U: 2.7...24$ VDC ($P \leq 100$ mW)
	Function (selectable): pressure limit maximum, pressure limit minimum, temperature limit maximum, temperature limit minimum, self-check, battery pre notification, battery final notification, empty pipe.
Communication	Internal & external batteries: Passive pulses or non-galvanic separated Modbus Multi-Power: Passive pulses or galvanic separated Modbus

Approvals and certificates

CE	
This device fulfils the statutory requirements of the EU directives. The manufacturer certifies successful testing of the product by applying the CE mark.	
	For full information of the EU directives & standards and the approved certifications, please refer to the EU Declaration of Conformity or the manufacturer website.
Custody transfer Not valid for integrated temperature and pressure sensor	Directive: 2014/32/EU MID Annex III (MI-001) type examination certificate
	OIML R49 edition 2006 certificate of conformity
	* Innerstaatliche Bauartzulassung als Kaeltezaehler (For Germany, Switzerland and Austria).
	* NMI M10 Certificate of approval for accuracy class 2.5 (Australia)
	* DN40...100; SANS 1529 (South Africa).
	* Contact Product Support
Other approvals and standards	
Drinking water approvals	ACS, DVGW W270, NSF / ANSI Standard 61, UBA, WRAS.
Protection category according to IEC 60529	Compact and field version in polycarbonate housing: IP68 (NEMA 4X/6P) and IP68 Multi-Power unit" (Test conditions; 1500 hours, 10 meters / 33 feet below surface).
Shock test	IEC 60068-2-27
	30 g for 18 ms
Vibration test	IEC 60068-2-64
	$f = 20...2000$ Hz, rms = 4.5g, t = 30 min.

2.1.1 Integrated P&T sensor (optional)

Design

Features	Optional: integrated pressure and temperature sensor in the 6500W flow tube.
	In combination with: IMT65W (compact and remote) 6500W flow tube DN50...200 / 2...8"

Measurements

Measuring range	Pressure
	-0.5...16 bar / -7.3...232 psi (relative)
	Temperature
	-5...+70°C / +23...158°F
Measuring units	
Pressure	Default setting: bar
	Selectable: mbar, psi
Temperature	Default setting: °C
	Selectable: °F
Measurement interval	Default setting: 15 min.
	Selectable: 1 min., 5 min., 10 min., 15 min. or equal to the measurement flow interval.

Measuring accuracy

Maximum measuring accuracy	Pressure
	± 1% of full scale (0.5 ...16 bar / -7.3...232 psi)
	Temperature
	± 1.5°C for -5°...+70°C / +23...158°F

Materials

Pressure and temperature sensor	316L
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2.1.2 Multi-Power (optional)

Design

Features	The 6500W + IMT65W can be connected to an external Multi-Power unit. The input power for the Multi-Power can be realized by connection to a AC/DC supply source
	Protection class; IP68
	Housing material; polypropylene

Operating range

Input	110...230 V AC \pm 10%, 50-60 Hz, 9.5W
	10...30 V DC, 775-230 mA
Output	4.2 V DC, 5W
Cable (Output)	Combined power and output (Y-cable) with snap-on connector
Power Cable	DC cable (green) and AC cable (grey)
Temperature	
Storage and transport temperature	-30...+70°C / -22...158°F
Maximum operating temperature	-25...+65°C / -13...149°F

Approval

Transport	Certificate under UN38.3 requirements (Transportation Tests for Lithium batteries)
Other approval and standards	
Protection category according to IEC 60529	Multi-Power: IP68 (NEMA 4X/6P) (Test conditions; 1500 hours, 10 meters / 33 feet below surface)
Shock test	IEC 60068-2-27
	30 g for 18 ms
Vibration test	IEC 60068-2-64
	f = 20...20000 Hz, rms = 4.5g, t = 30 min.

2.1.3 Modbus protocol (option)

The Modbus option on the 6500W + IMT65W is available in two versions:

- not isolated (battery powered) - for standard internal battery version
- galvanically isolated (mains powered) - for the Multi-Power version

The 6500W + IMT65W transmitter and Multi-Power with Modbus has a RS485 interface to communicate with an external device (PC or other suitable computer system) using the Modbus protocol. This option allows data exchange between PC or computer and single or multiple devices. The bus configuration consists of one external device as a master and one or more signal transmitters as slaves.

For bus operation, the device address, parity, baud rate, stop bits, data format and transmission delay must be set in the signal transmitter. All devices connected to the bus, must have the same baud rate and settings, but different (unique) addresses.

Please note that changing the baud rate will greatly affect the units battery life time. The baud rate equal to and below 9600 bps are considered energy efficient while baud rates greater than 9600 bps are not.

Do not use a bus termination for the non-isolated standard battery powered version (will effect the lifetime)!

General technical data

Baud rate	1200, 2400, 3600, 4800, 9600 (default), 19200, 38400, 57600 or 115200
Protocol	Modbus RTU (documentation available on the Modbus Organisation website)
Data encoding	All Modbus data fields are encoded according to the IEC 61131-3 standard
Maximum participants on bus	32 per line, master included (may be extended by repeaters)
Coding	NRZ bit coding
Address range	Modbus: 1...247
Transmission procedure	Half duplex, asynchronous
Bus access	Master / slave
Device role	Slave
Cable	Shielded twisted pair for RS 485 applications
Distances	Isolated: Maximum 1.2 km / 3937 ft without repeater (dependent on baud rate and cable specifications) multi-drop
	Non-isolated: Maximum 100 m, without termination (point to point)

For more details refer to the Modbus supplementary manual.

2.2 Legal metrology

2.2.1 OIML R49

The 6500W + IMT65W has a certificate of conformity with the international recommendation OIML R49 (edition 2006). The certificate has been issued by NMI (Dutch board of weight and measures).

The OIML R49 recommendation 2006 concerns water meters intended for the metering of cold potable and hot water. The measuring range of the water meter is determined by Q_3 (nominal flow rate) and R (ratio).

The 6500W + IMT65W meets the requirements for water meters of accuracy class 1 and 2.

- For accuracy class 1, the maximum permissible error for water meters is $\pm 1\%$ for the upper flow rate zone and $\pm 3\%$ for the lower flow rate zones.
- For accuracy class 2, the maximum permissible error for water meters is $\pm 2\%$ for the upper flow rate zone and $\pm 5\%$ for the lower flow rate zones.

According to OIML R49, accuracy class 1 designation shall be applied only to water meters with $Q_3 \geq 100 \text{ m}^3/\text{h}$.

$$Q_1 = Q_3 / R$$

$$Q_2 = Q_1 * 1.6$$

$$Q_3 = Q_1 * R$$

$$Q_4 = Q_3 * 1.25$$



Figure 2-1: ISO flow rates added to figure as comparison towards OIML

X: Flow rate

Y [%]: Maximum measuring error

① $\pm 3\%$ for class 1, $\pm 5\%$ for class 2 devices

② $\pm 1\%$ for class 1, $\pm 2\%$ for class 2 devices

OIML R49 Class 1; certified metrological flow characteristics

DN	Span (R) Q3 / Q1	Flow rate [m ³ /h]			
		Minimum Q1	Transitional Q2	Permanent Q3	Overload Q4
65	250	0.400	0.64	100	125
80	250	0.640	1.02	160	200
100	250	1.00	1.60	250	312.5
125	250	1.60	2.56	400	500
150	250	2.52	4.03	630	787.5
200	160	3.9375	6.30	630	787.5
250	160	6.25	10.00	1000	1250
300	160	10.00	16.00	1600	2000
350	160	15.625	25.00	2500	3125
400	160	25	40.00	4000	5000
450	160	25	40.00	4000	5000
500	160	39.375	63.00	6300	7875
600	100	63	100.80	6300	7875

OIML R49 Class 2; certified metrological flow characteristics

DN	Span (R) Q3 / Q1	Flow rate [m ³ /h]			
		Minimum Q1	Transitional Q2	Permanent Q3	Overload Q4
25	400	0.025	0.040	10	12.5
25	400	0.040	0.064	16	20.0
40	400	0.0625	0.100	25	31.3
40	400	0.100	0.160	40	50.0
50	400	0.100	0.160	40	50.0
50	400	0.1575	0.252	63	78.75
65	400	0.1575	0.25	63	78.75
65	400	0.250	0.40	100	125.0
80	400	0.250	0.40	100	125.0
80	400	0.400	0.64	160	200.0
100	400	0.400	0.64	160	200.0
100	400	0.625	1.00	250	312.5
125	400	0.625	1.00	250	312.5
125	400	1.000	1.60	400	500.0
150	400	1.000	1.60	400	500.0
150	400	1.575	2.52	630	787.5
200	400	1.575	2.52	630	787.5
250	400	2.500	4.00	1000	1250
300	400	4.000	6.40	1600	2000
350	160	15.625	25.0	2500	3125
400	160	25.000	40.0	4000	5000
450	160	25.000	40.0	4000	5000
500	160	39.375	63.00	6300	7875
600	160	63.000	100.80	6300	7875

2.2.2 MID Annex III (MI-001)

All new designs of water meters that are to be used for legal purposes in Europe require certification under the Measurement Instrument Directive (MID) 2014/32/EU Annex III (MI-001). Annex MI-001 of the MID applies to water meters intended for the measurement of volume of clean, cold or heated water in residential, commercial and light industrial use. An EC-type examination certificate is valid in all countries of the European Union.

The 6500W + IMT65W has an EC-type examination certificate and can be verified to the MID Annex III (MI-001) for water meters with diameter DN25...DN600.

The conformity assessment procedure followed for 6500W + IMT65W is Module B (Type Examination) and Module D (Quality Assurance of the Production Process).

The maximum permissible error on volumes delivered between Q2 (transitional) flow rate and Q4 (overload) flow rate is $\pm 2\%$.

The maximum permissible error on volumes delivered between Q1 (minimum) flow rate and Q2 (transitional) flow rate is $\pm 5\%$.

$$Q1 = Q3 / R$$

$$Q2 = Q1 * 1.6$$

$$Q3 = Q1 * R$$

$$Q4 = Q3 * 1.25$$

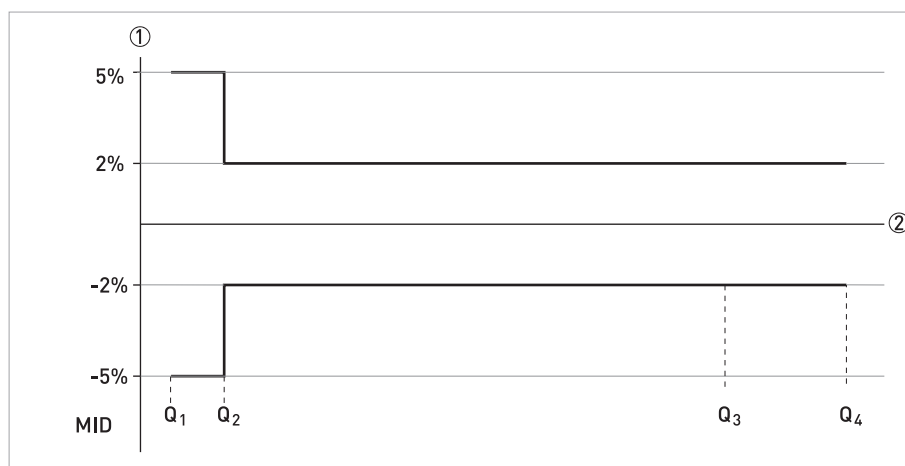


Figure 2-2: ISO flow rates added to figure as comparison towards MID

X: Flow rate

Y [%]: Maximum measuring error

MI-001 certified flow characteristics

DN	Span (R) Q3 / Q1	Flow rate [m ³ /h]			
		Minimum Q1	Transitional Q2	Permanent Q3	Overload Q4
25	640	0.025	0.040	16	20.0
40	640	0.0625	0.100	40	50.0
50	630	0.100	0.160	63	78.75
65	635	0.1575	0.252	100	125.0
80	640	0.25	0.400	160	200.0
100	625	0.40	0.640	250	312.5
125	640	0.625	1.00	400	500.0
150	630	1.00	1.60	630	787.5
200	508	1.575	2.52	630	787.5
250	400	2.50	4.00	1000	1250
300	400	4.00	6.40	1600	2000
350	160	15.625	25.0	2500	3125
400	160	25.00	40.0	4000	5000
450	160	25.00	40.0	4000	5000
500	160	39.375	63.0	6300	7875
600	100	63.00	100.8	6300	7875

2.2.3 Verification to MID Annex III (MI-001) and OIML R49

Verification at other values for R and Q3 or to OIML R49 class 1 is available on request.

Verification to MID Annex III (MI-001)

DN	Span (R)	Flow rate [m ³ /h]		
		Q1	Q2	Q3
25	80	0.050	0.08	4
40	80	0.125	0.20	10
50	80	0.200	0.32	16
65	80	0.313	0.50	25
80	80	0.500	0.80	40
100	80	0.788	1.26	63
125	80	1.250	2.00	100
150	80	2.000	3.20	160
200	80	3.125	5.00	250
250	80	5.000	8.00	400
300	80	7.875	12.60	630
350	80	20.00	32.0	1600
400	80	31.25	50.0	2500
450	80	31.25	50.0	2500
500	80	50.00	80.0	4000
600	80	78.75	126	6300

2.3 Measurement accuracy

Every electromagnetic flowmeter is calibrated by direct volume comparison. The wet calibration validates the performance of the flowmeter under reference conditions against accuracy limits.

The accuracy limits of electromagnetic flowmeters are typically the result of the combined effect of linearity, zero point stability and calibration uncertainty.

Reference conditions

- Medium: water
- Temperature: +5...+35°C / +41...+95°F
- Operating pressure: 0.1...5 barg / 1.5...72.5 psig
- Inlet section: ≥ 53 DN
- Outlet section: ≥ 2 1 DN

Note: the performance of the water meter is defined and documented in an individual water meter calibration certificate.

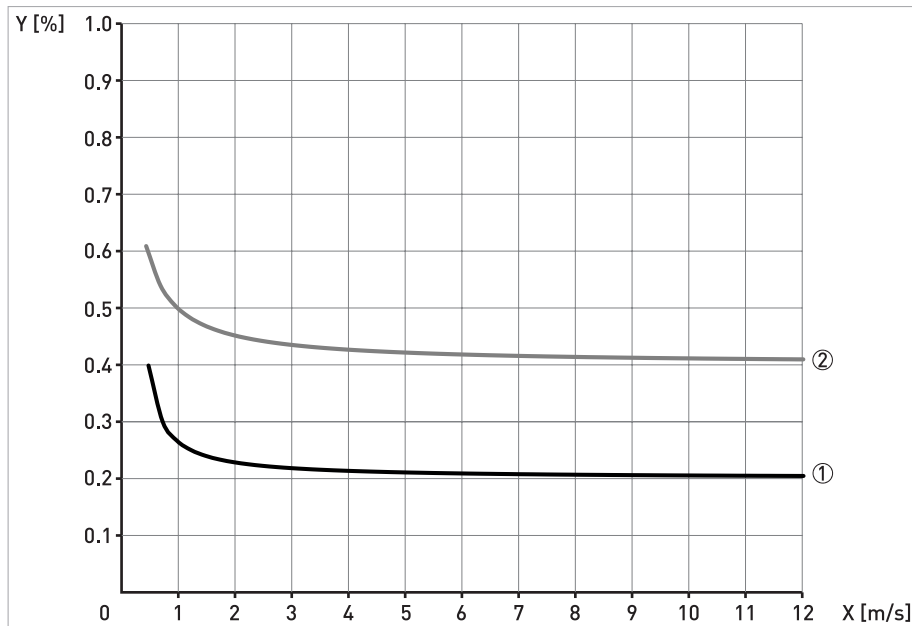


Figure 2-3: Measuring accuracy
X [m/s]: Flow velocity; Y [%]: Maximum measuring error

Accuracy with signal transmitter IMT65W

Size	Accuracy	Curve
DN25...300 / 1...12"	0.2% of the measured value ± 1 mm/s	①
DN350...600 / 14...24"	0.4% of the measured value ± 1 mm/s	②

2.3.1 6500W + IMT65W without straight inlet and outlet sections

Disturbed flow profiles, such as those that occur behind elbows, tee pieces, reducers or valves installed in front of a water meter, affect the measuring performance. Therefore it is usually recommended to fit a straight inlet length in front of and straight outlet length behind a water meter.

As a result of the unique 6500W flow tube design, whereby the mean flow velocity and flow profile are optimized within the rectangular and reduced cross section, the additional uncertainty for upstream disturbances are drastically reduced. Therefore the requirements for straight length and in front of and behind a meter are reduced.

The NMI has performed tests with various flow and swirl disturbers according to ISO 4064 and EN 14154. Based on these results the has received the following certificates:

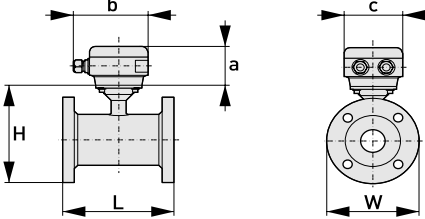
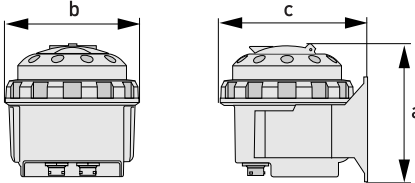
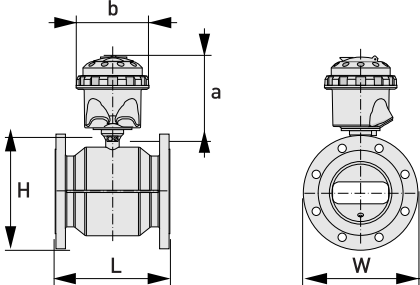
OIML R49 certificate

- Diameter range DN25...600 / 1...24"
- Accuracy class 1 and class 2
- Minimum straight inlet and outlet pipe length of 0 DN
- Bi-directional flow

EC-type certificate according MID Annex III (MI-001)

- Diameter range DN25...600 / 1...24"
- Minimum straight inlet and outlet pipe length of 0 DN
- Bi-directional flow

2.4 Dimensions and weights

Remote flow tube		a = 88 mm / 3.5" b = 139 mm / 5.5" ① c = 106 mm / 4.2" Total height = H + a
Remote signal transmitter in polycarbonate housing (IP68)		a = 171 mm / 6.7" b = 161 mm / 6.3" b = 177 mm / 7"
Compact version in polycarbonate housing (IP68)		a = 159 mm / 6.3" b = 161 mm / 6.3" Total height = H + a

① The value may vary depending on the used cable glands.

- All data given in the following tables are based on standard versions of the flow tube only.
- Especially for smaller nominal sizes of the flow tube, the signal transmitter can be bigger than the tube.
- Note that for other pressure ratings than mentioned, the dimensions may be different.
- For full information on signal transmitter dimensions see relevant documentation.

EN 1092-1

Nominal size DN [mm]	Dimensions [mm]			Approx. weight [kg]
	L	H	W	
25	150	151	115	5
40	150	166	150	6
50	200	186	165	13
65	200	200	185	11
80	200	209	200	17
100	250	237	220	17
125	250	266	250	21
150	300	300	285	29
200	350	361	340	36
250	400	408	395	50
300	500	458	445	60
350	500	510	505	85
400	600	568	565	110
450	600	618	615	125
500	600	671	670	120
600	600	781	780	180

ASME B16.5 / 150 lb

Nominal size [inches]	Dimensions [inches]			Approx. weight [lb]
	L	H	W	
1	5.91	5.83	4.3	18
1½	5.91	6	4.9	21
2	7.87	7.05	5.9	34
3	7.87	8.03	7.5	42
4	9.84	9.49	9.0	56
5	9.84	10.55	10.0	65
6	11.81	11.69	11.0	80
8	13.78	14.25	13.5	100
10	15.75	16.3	16.0	148
12	19.7	18.8	19.0	210
14	27.6	20.7	21	290
16	31.5	22.9	23.5	370
18	31.5	24.7	25	420
20	31.5	27	27.5	500
24	31.5	31.4	32	680

2.5 Pressure loss

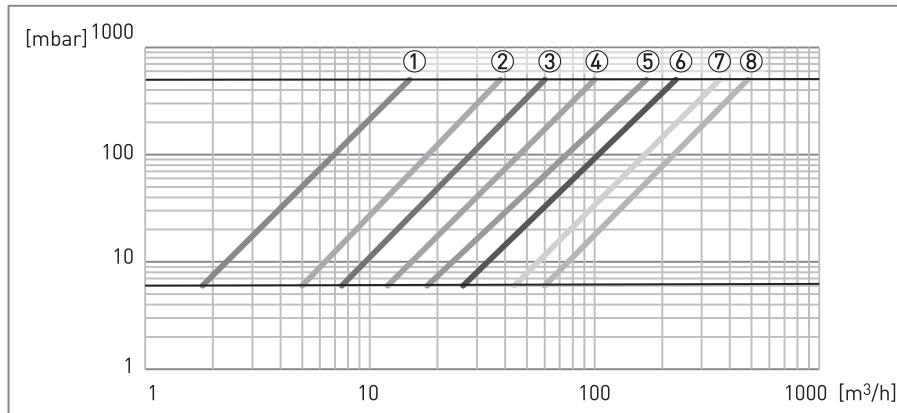


Figure 2-4: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN25...150 / 1...6"

- ① DN25 / 1"
- ② DN40 / 1½"
- ③ DN50 / 2"
- ④ DN65 / 2½"
- ⑤ DN80 / 3"
- ⑥ DN100 / 4"
- ⑦ DN125 / 5"
- ⑧ DN150 / 6"

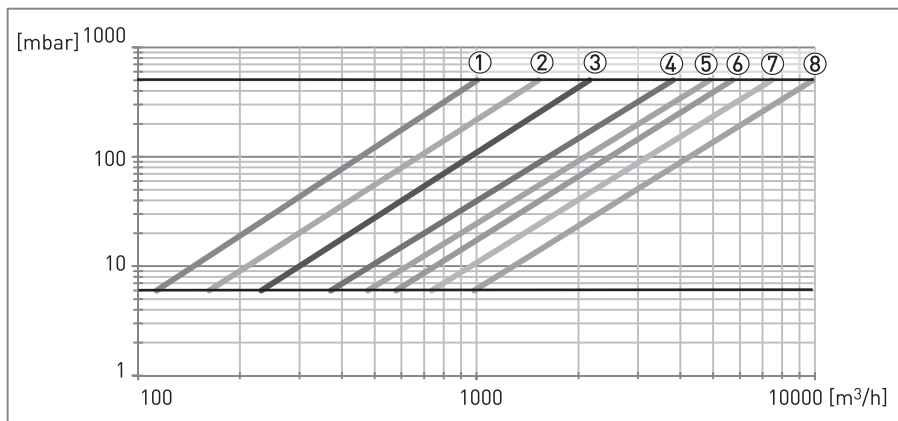


Figure 2-5: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN200...600 / 8...24"

- ① DN200 / 8"
- ② DN250 / 10"
- ③ DN300 / 12"
- ④ DN350 / 14"
- ⑤ DN400 / 16"
- ⑥ DN450 / 18"
- ⑦ DN500 / 20"
- ⑧ DN600 / 24"

2.6 Battery lifetime

The maximum battery lifetime depends on the choice of battery, the diameter and on the measurement interval. Other factors influencing the battery lifetime include the ambient temperature, the pulse output settings, the status output, the pulse width and the Modbus baud rate settings. The graphs show the battery lifetime for the different available battery types and measurement intervals.

Conditions

The maximum battery lifetime is based on default menu and Modbus settings, an ambient temperature of 25°C / 77°F and a flow rate at 2 m/s. The effect of the optional pressure and temperature sensor decreases the battery lifetime by 5% (on average).

Maximum lifetime of batteries for: DN25...200 / 1...8"

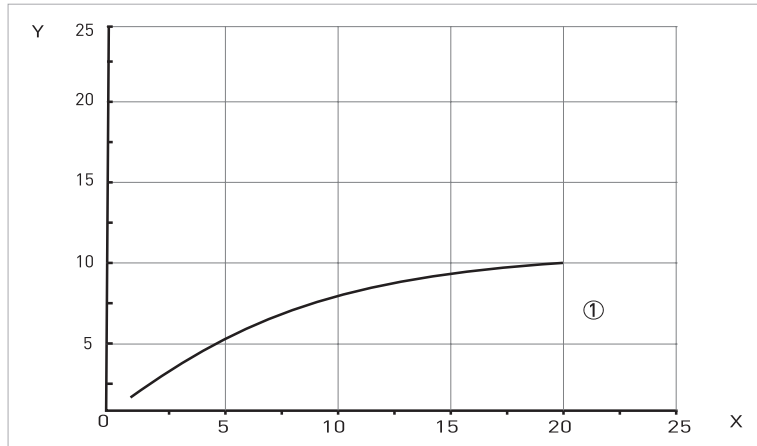


Figure 2-6: X = Measuring interval in seconds, Y = typical lifetime in years

Maximum lifetime of batteries for: DN250...600 / 10...24"

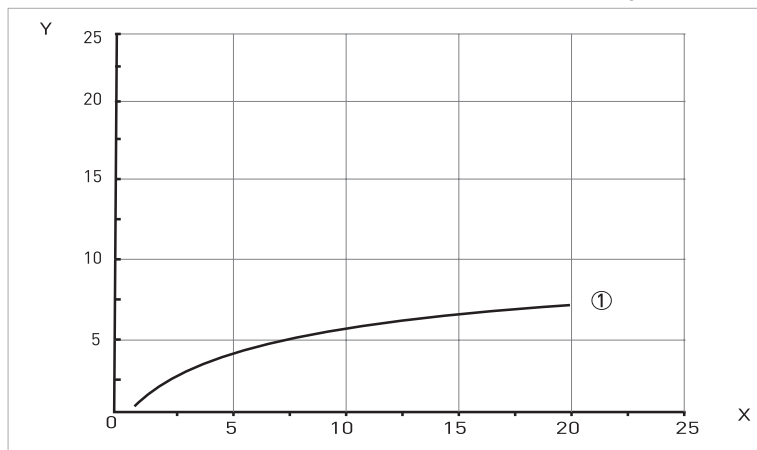


Figure 2-7: X = Measuring interval in seconds, Y = typical lifetime in years

2.7 Connection of the tube cable

The compact version of the 6500W + IMT65W is already internally connected to the tube and has different options to connect pulse, Modbus and/or external supply cables. See the following sections for the different options and available cables.

For the 6500W + IMT65W remote version, a standard cable is delivered with the device. On the tube side the cable is as standard potted at the factory. The tube cable has a IP68 rated RVS snap-on connection to connect the tube with the IP68 field signal transmitter. The cables have the following colour coded leads:

Standard tube cable

Wire colour	Terminal	Function
Brown	1	Reference electrode
White	2	Standard electrode signal
Violet	3	Standard electrode signal
Blue	7	Field current
Green	8	Field current
Yellow	9	No function
Drain wires	Screws	Shielding

The standard WSC2 tube cable (double shielded), includes both electrode and field current leads and has a maximum length of 25 m / 82 ft. (other lengths on request).

Tube cable with integrated P&T option

Wire colour	Contact on connector	Terminal	Function
Brown	H	1	Reference electrode / P&T sensor
White	D	4	P&T sensor
Grey	F	5	P&T sensor
Pink	B	6	P&T sensor
Blue	A	7	Field current
Green	G	8	Field current
White/White	C	2	Standard electrode signal
White/Red	E	3	Standard electrode signal
Drain wires	Housing	Screws	Shielding

Make sure the device functions properly, always use the signal cables included in the delivery

2.8 Connection of the signal cable

2.8.1 IP68 housing (compact version)

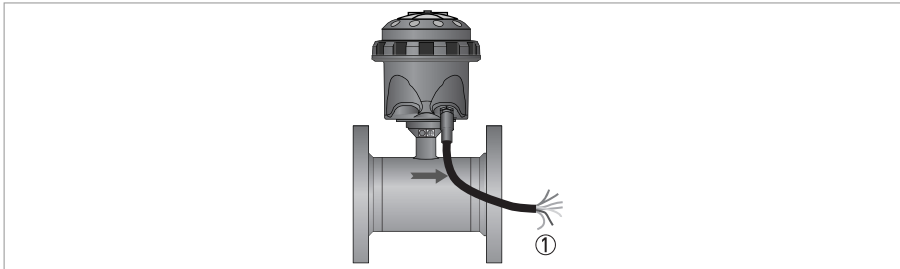


Figure 2-8: Output cable at IP68 compact version

① Color coded leads of the output cable

Pulse output cable

Wire color	Contact on connector	Function
Yellow	A	Status output 1 or threshold for P or T or pulse output C
White	G	Status output 2 or threshold for P or T
Blue	H	Ground
Brown	B	Pulse output A
Green	F	Pulse output B
Pink	C	External battery +
Grey	E	External battery -

Note; with or without shielding

Modbus cable

Note: see the next chapter for the combined power and modbus / pulse cable options.

2.8.2 IP68 housing (remote version)

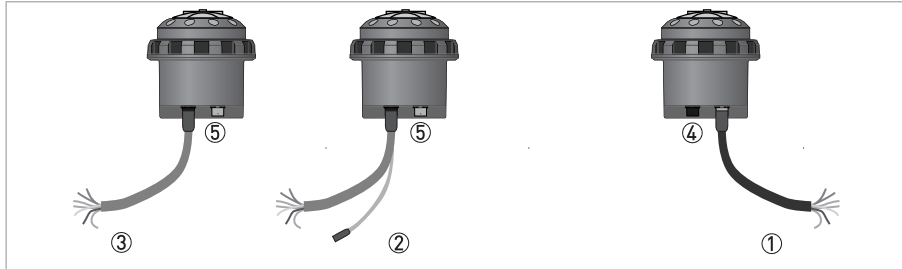


Figure 2-9: Different output cable, IP68 remote version

- ① Color coded leads of tube cable
- ② Y - cable with additional power cable
- ③ I/O cable (pulse, modbus)
- ④ I/O connection
- ⑤ RVS tube cable connection

Tube cable:

For more information; refer to *Connection of the tube cable* on page 32 for the available connection options.

For connection of I/O (modbus, pulse output signals) with or without additional power supply cable connection, several cable connection options are available. The cables have the following color code leads.

Output pulse cable

Wire color	Contact on connector	Function
Yellow	A	Status output 1 or threshold for P or T or pulse output C
White	G	Status output 2 or threshold for P or T
Blue	H	Ground
Brown	B	Pulse output A
Green	F	Pulse output B
Pink	C	External battery +
Grey	E	External battery -

Combined power and pulse output cable (Y-cable)

Wire color	Contact on connector	Function
Yellow	A	Status output 1 or threshold for P or T or pulse output C
White	G	Status output 2 or threshold for P or T
Grey	H	Ground
Brown	B	Pulse output A
Green	F	Pulse output B
Brown	C	External power +3.6V
White	E	External power (Ground)
Shield	D	Shielding

Combined power and Modbus cable (Y-cable)

Wire color	Contact on connector	Function
Shield	C	Shielding
Brown	B	-
White	A	Ground
Green	E	Down link wire A←
Yellow	K	Down link wire B←
Pink	H	Up link wire A→
Grey	J	Up link wire B→
Brown	F	External power +3.6V
White	G	External power (Ground)
Shield	D	Shielding

This cable has two pairs of wires, one for uplink and one for downlink. Both are connected within the connector. When disconnecting the cable on the tube side, the two paired wires will stay connected so there is disconnection of the RS-485.

Because of this connection (switching link wire), it makes no difference where the up- and downlink are connected.

For proper use and installation, it is recommended to follow the advised color coded wire connections in the table above. A 120 Ω line terminator is required when the 6500W + IMT65W signal transmitter is the last device in line and/or is part of the bus connection.

Specific information is described in the supplementary Modbus manual, available on the manufacturer website.

Model	Description
6500W	Schneider Electric™ Model 6500W Magnetic Flow Tube
6501W 651HW 6502W 652HW 6503W 6504W 6505W 6506W 6508W 6510W 6512W 6514W 6516W 6518W 6520W 6524W	Nominal diameter DN 25...1" DN 40...1½" DN 50...2" DN 65...2½" DN 80...3" DN 100...4" DN 125...5" DN 150...6" DN 200...8" DN 250...10" DN 300...12" DN 350...14" DN 400...16" DN 450...18" DN 500...20" DN 600...24"
-0 -2 -3 -A -N	Nominal pressure Gas threaded connection (only 1" and 1.5") PN 10 EN 1092-1 (only 8" – 24": PN 10 EN 1092-1 (only 8" – 24": Max. pressure 10 bar) PN 16 EN 1092-1 150 lb RF ASME B 16.5 10K Conn. Acc. JIS B2220
0	Approval non-Ex
1 C	System design / cable connection Compact with transmitter housing / at transmitter Separate with stainless steel connection box / IP68
0 7 8	Transmitter model Without / modular IMT65W (C)- IP68 IMT65W (F)- IP68
0	Lining Standard (Rilsan)
0	Grounding ring material Without
B C	Electrodes Hastelloy C22 Stainless Steel DIN 1.4301/304
1 C	Construction of Electrodes Fixed Pressure/Temperature Sensor (DN50 to DN200, 2"-8" with SS electrodes)
1	Housing Material Steel
1 2	Protection class / dimension (face-to-face) IP 68 Factory / standard (with stainless steel connection box) IP 68 Factory / standard (compact)
0	Cable Compact - without / separate with WSC 2(V3 only)
0 1 4	Cable length Compact - none / separate - 5 m 15 ft 10 m 30 ft 25 m 75 ft

Model	Description
0 A	Calibration Standard Custody Transfer
0 3 5	Finish Standard Offshore (IP 68 only) Burial coating (IP 68 only)
0	Reserved / Default Reserved field
0	Construction requirements Standard
0	QA / QC requirements Standard
0 2 3	Tagplate Standard 316 / 1.4401 tagplate (120 x 46 mm) 317 / 1.4401 tagplate (67 x 25 mm)
0	Ratio of CT-calibration Standard, R=80
1 3 4	Instruction language German English French
0	Warranty Standard
0 2 3	Flange Material Flange DIN 1.4301 / 304L DIN 1.4404 / 316L
0	Reserved/Default Reserved field

Model	Description
IMT65W	Schneider Electric Model IMT65W Magnetic Flow Transmitter
-2 -8 -U -V	Type IMT65W (C/MP): Compact IMT65W (C): Compact IMT65W (F): Field IMT65W (F/MP): Field
A C H M P	Power supply Prepared for Multi-Power + battery back-up 2 Tadiran cells Prepared for Multi-Power + battery back-up 2 Saft cells Internal / dual battery pack Tadiran cells Internal / prepared for dual battery pack Internal / dual battery pack saft cells
0	Ex version non Ex
F G L F F G	Cable connection IP 68 connector with 5 m 15 ft output cable IP 68 connector with 10 m 30 ft output cable IP 68 connector with 25 m 75 ft output cable IP 68 connector with 5 m 15 ft output cable IP 68 connector with 5 m 15 ft output cable IP 68 connector with 10 m 30 ft output cable
5 6 7	Operating manual Without / English GB Without / French Without / Spanish
0* 1 5	Custody transfer Standard (empty pipe detection standard) Water, OIML R-49 Class 2 Water, MI-001
0* A	Process diagnostics Standard P/T sensor
0	Signal transmitterhousing Standard polycarbonate
1* G H K L Y	Communication Basic IO (2 passive pulse + 2 passive status output - not activated) I/O RS485 Modbus I/O RS485 Modbus External Instruments KGA 42 datalogger-GPRS module KGA-Modbus Flex
0	Reference method Standard
0 2 3	Tag plate (field only) Standard 316/1.4401 tag plate (120 x 46 mm) 316/1.4401 tag plate (67 x 25 mm)
1 2* 3 4	Manuals German English French Spanish

Model	Description
0 A	Power supply wiring Standard, battery Multi-Power

*: Standard

ORDERING INSTRUCTIONS

1. Model Number.
2. Flow Data:
 - a. Maximum, minimum, and normal flow rate.
 - b. Fluid composition and viscosity at operating temperatures.
 - c. Fluid density or relative density (specific gravity).
 - d. Maximum, minimum and normal operating temperatures.
 - e. Maximum, minimum and normal operating pressures.
 - f. Mating pipe schedule.
 - g. Type and location (distance) of upstream disturbance.
3. Calibration Information (analog output only); maximum flow rate 20 mA output.
4. Electric Classification.
5. Optional Selections and Accessories.
6. Customer Tag Data.

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