DIEHL
Metering

HYDRUS BULK
Ultrasonic Water Meter 174

User guide

Table of contents

1 PRODUCT DESCRIPTION

1.1 GENERAL APPLICATION

HYDRUS BULK is a static water meter suitable for all applications in the water industry and designed for maintenance-free long-term operation under almost all environmental and operating conditions. HYDRUS meters are tamper-protected, waterproof and UV-resistant and can be installed in any position and without calming sections. They are characterized by their outstanding long-term accuracy and functional reliability.

HYDRUS BULK meters conform to UL 327B and FM 1044 for fire service applications. They are intended to be installed in private-fire-service connections to public water mains supplying water to water-based fire-suppression systems in accordance with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," or the requirements of the Authority Having Jurisdiction.

1.2 FUNCTIONAL PRINCIPLE

The measuring principle is based on the transit time difference of ultrasonic signals with and against the flow. Two pairs of wetted transducers form diagonally arranged signal paths, one horizontal and one vertical. In this way, the mean flow velocity is reliably measured even with a disturbed flow profile. The open flow tube design without reflectors is insensitive to flushed-in foreign particles and sedimentation.

1.3 PERFORMANCE DATA

HYDRUS BULK meets or exceeds the AWWA C-715 accuracy requirements for type I and type II meters.

Measuring range

Size	inch	2"	3"	4"	6"	8"
Operating flow range (Accuracy ±1.5%)	gpm	2.5 - 250	7.5 - 500	10 - 1000	20 - 1900	40 - 2.800
Low flow range (Accuracy ±5%)	gpm	0.2 - 2.5	0.35 - 7.5	0.65 - 10	1.37 - 20	2.75 - 40
Starting flow	gpm	0.141	0.317	0.484	0.660	0.969
Save maximum operating capacity (SMOC) at normal operation	gpm	250	500	1000	1900	2800
Save maximum operating capacity (SMOC) at fire service	gpm	250	400	1000	1600	2800
Pressure loss at SMOC normal operation	psi	2.8	5.5	2.1	4.8	2.8
Pressure loss at SMOC fire service	psi	2.8	3.5	2.1	3.4	2.8

Typical accuracy curve 4"
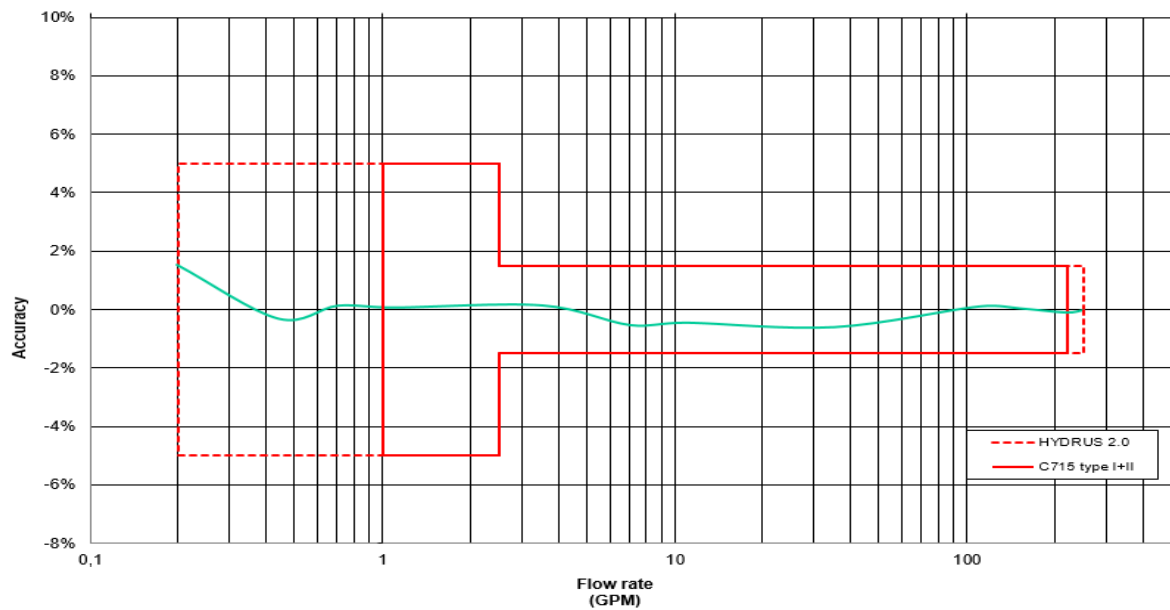

Pressure loss graph
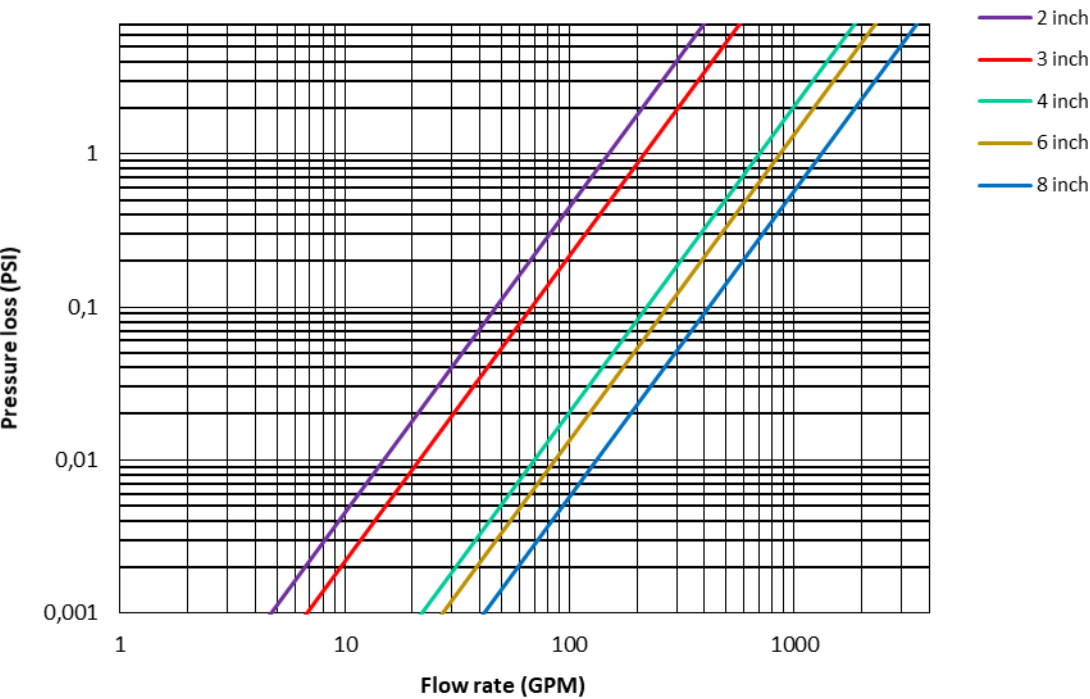
1.4 TECHNICAL DATA

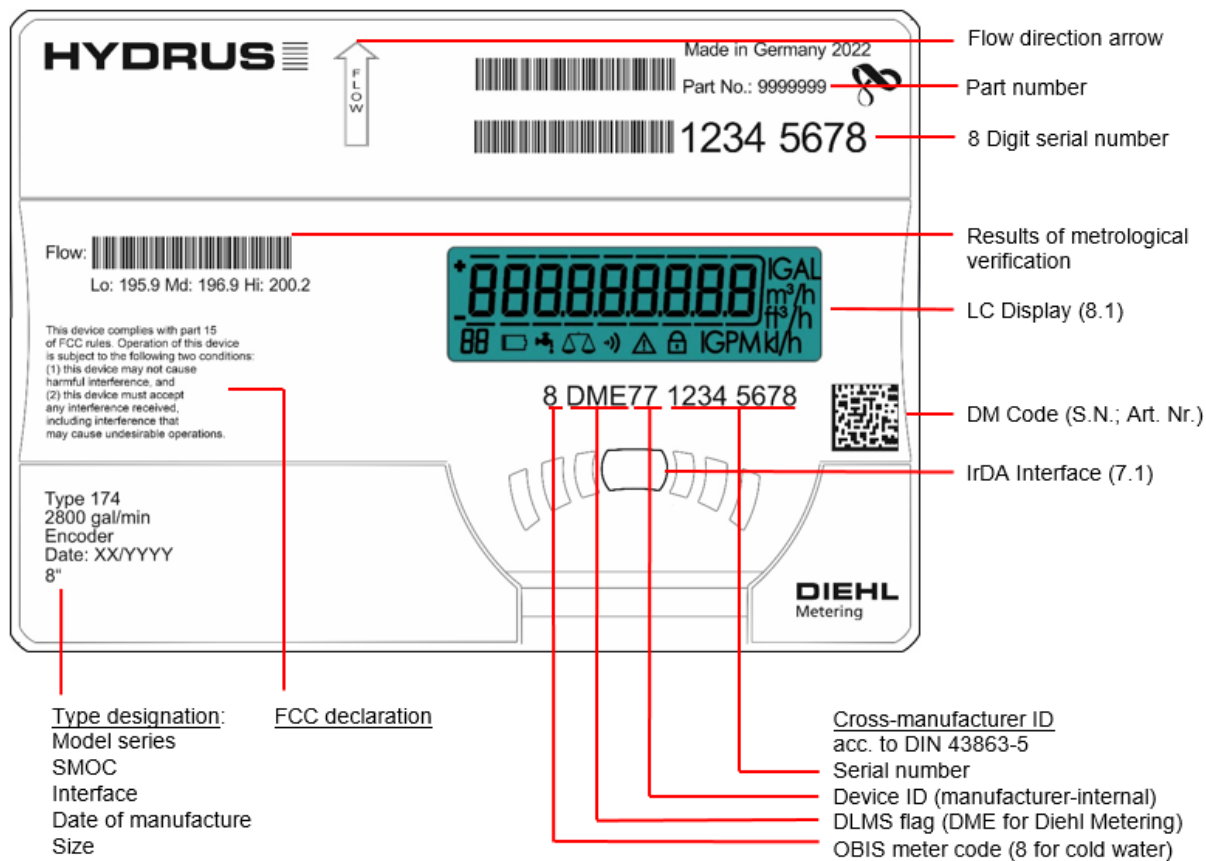|	
Electromagnetic environmental class (OIML D11)	E2 (industrial)
Mechanical environmental class	M2 (high level of vibration and shock)
Environmental classification (OIML R49)	class O (outdoor installation)
Calming sections (upstream / downstream)	U0 / D0 (None)
Degree of Protection	IP 68
Maximum admissable pressure	175 psi*
Medium temperature	33 ... 122°F
Ambient temperature	14 ... 131 °F
Storage temperature	14 ... 158 °F (<95°F max. 4 weeks)
Ultrasonic Measurement	every second
Measurement water temperature	every 16 seconds
Display value update	every 2 seconds
LCD display	9-digit
Communication interfaces	Optical, DM encoder interface
Battery lifetime	up to 20 years

*Flanges according to ANSI B16.1 Class 125

1.5 DIMENSIONS
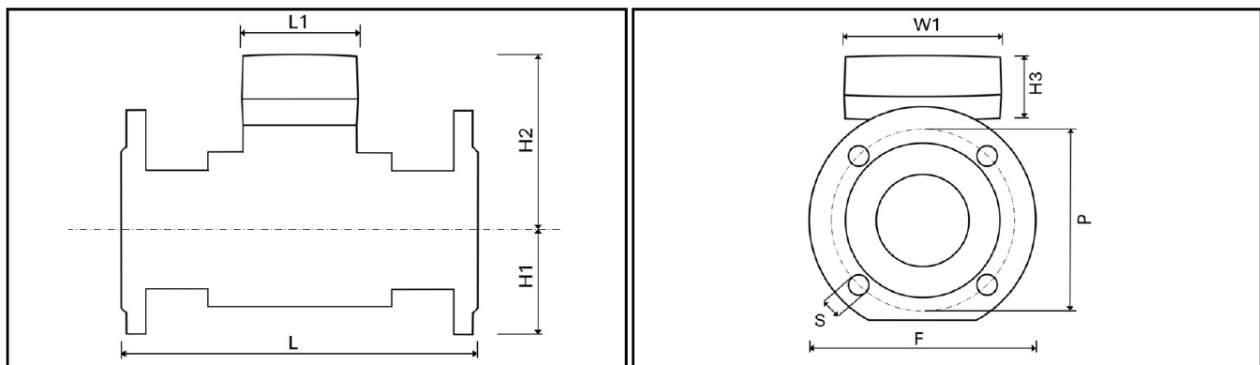
Size			2"	3"	4"	6"	8"
Lay length	L	inch	10"	12"	14"	18"	20"
Height to pipe axis	H1	inch	5.6	6.5	7	7.3	8.4
Height above pipe axis	H2	inch	2.7	3.5	4.3	5.3	6.3
Register length	L1	inch	3.9	3.9	3.9	3.9	3.9
Register width	W1	inch	5.5	5.5	5.5	5.5	5.5
Register height	H3	inch	2.4	2.4	2.4	2.4	2.4
Flange diameter	F	inch	6.25*	7.5	9	11	13.5
Pitch circle diameter	P	inch	4.5	6	7.5	9.5	11.75
Number of screw holes		pcs	2	4	8	8	8
Screw hole diameter	S	inch	3/4	3/4	3/4	7/8	7/8
Net weight		lbs.	22	36	64	64	132

*horizontal (2" has oval flanges)

2 REGISTER

2.1 TYPE PLATE

Flow direction arrow

Part number

8 Digit serial number

Results of metrological verification

LC Display (8.1)

DM Code (S.N.; Art. Nr.)

IrDA Interface (7.1)

Type designation:
Model series
SMOC
Interface
Date of manufacture
Size

FCC declaration

Cross-manufacturer ID
acc. to DIN 43863-5
Serial number
Device ID (manufacturer-internal)
DLMS flag (DME for Diehl Metering)
OBIS meter code (8 for cold water)

2.2 DISPLAY

The data generated by the meter can be viewed in various display loops with system information (e.g. flow rate, volume, date, due date, medium temperature). The loops are numbered from 01 to 09.

The optical button located on the front panel enables scrolling these individual display loops.

To save battery lifetime, the display switches automatically to power save mode after 4 minutes of inactivity. The display is awakened again by pressing the optical button.

After awakening, the display shows first a screen check (i.e. all symbols in the display are briefly switched on and off) and then the total volume. This remains for at least 10 seconds on the display (also when the optical button is pressed). Afterwards the display loop can be switched with the help of the optical button.
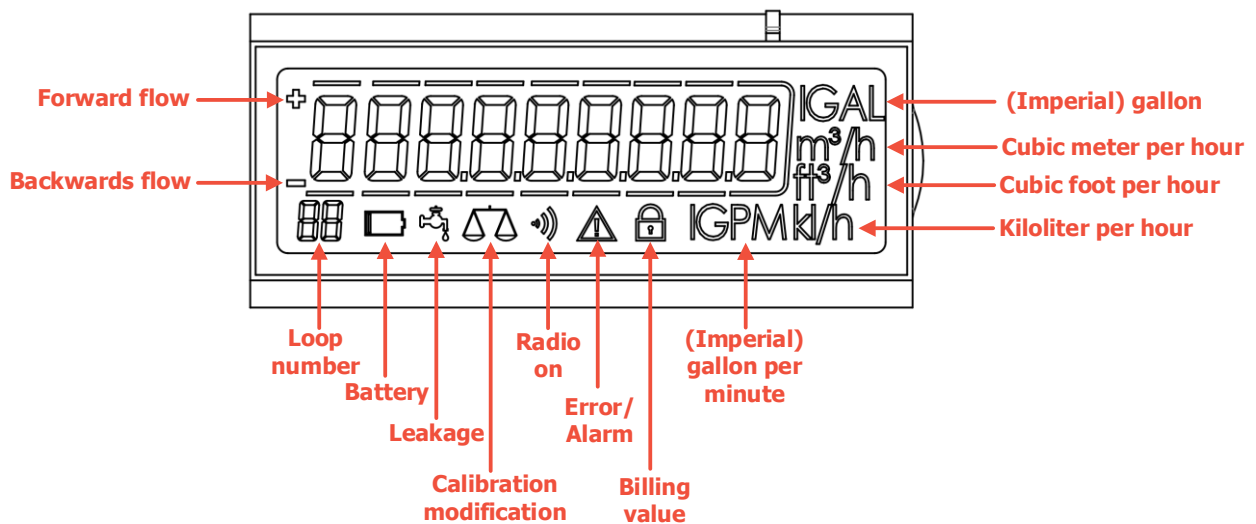
The meter is factory pre-configured with one of the following loops:

Maximum loop
Display test
Total volume
Battery lifetime
Firmware version / Checksum
Current flow
Errors / Alarms
High resolution total volume
Due date / Due date volume
Reverse volume

Medium loop
Display test
Total volume
Battery lifetime
Firmware version / Checksum
Current flow
Errors / Alarms

Minimum loop
Display test
Total volume
Battery lifetime
Firmware version / Checksum

In the following, you can see the comprehensive factory settings for the loops

(Loop number in brackets)

- Display test (88)
- Current total volume (01)
- Battery lifetime (02)
- Software version alternating with the checked sum of the software (03)
- Current flow rate (m³/h) (04)
- Error messages (05)
- Total volume high resolution (07)
- Total volume of the due date function alternating with the modification of the due date (08)
- Current reverse volume (09)

„loop" =
display off

●

„open lid"
(change from
dark to bright)

Display test

Display test: all on	2 s	Display test: all off
88		

2 s

Calibrated value
01

Battery lifetime
02

Minimum loop

Firmware

Firmware version	5s	Firmware checksum
	5s	

03

Medium loop

Current flow
04

Maximum loop

Errors / Alarms

Current error	5s	Continuous error	5s	Historical error

-5 s

05

High resolution volume
07

Due date

Due date	5s	Due date volume
	5s	

08

Backflow
09

Explanation

Brightness shift
on optical
button

Automatical
shift

2.3 ERROR MESSAGES DETAILS

Error messages (optical notification on LC-display in case of error).

3 categories of error:

E - Current errors

A - Continuous errors - if the error is, e.g. present for the default value one hour (configurable) – then the hold time of the continuous error is by default 3 days (configurable)

H - Historical errors - if the error is e.g. present for the default value one hour (configurable) – then the hold time of the continuous error is by default 15 months (configurable).

Checksum error	Event is triggered if base parameter in Flash or RAM is corrupted	E01 / A01 / H01
Hardware temperature	Event is triggered if temperature sensor cable is cut	E02 / A02 / H02
Hardware flow	Event is triggered if flow measuring error occurs	E04 / A04 / H04
Leakage detection	Event is triggered if the continuous consumption over a period of one day (configurable) is higher than a configurable threshold	E05 / A05 / H05
Back flow volume	Event is triggered if the reverse volume is higher than the configurable threshold	E06 / A06 / H06
Air in pipe	Event is triggered if air is detected in the pipe	E07 / A07 / H07
Low battery	Event is triggered if calculated battery life is less than 400 days	E09 / A09 / H09
Undersized meter	Event is triggered if flow is higher than a configurable threshold	E11 / A11 / H11
No consumption	Event is triggered if volume is lower than a configurable threshold for a configurable period of time	E12 / A12 / H12
High medium temperature	Event is triggered if medium temperature is higher than the threshold, which is related to the temperature class	E13 / A13 / H13
Freezing risk	Event is triggered if medium temperature is lower than 3°C	E14 / A14 / H14
Fallback mode	Event is triggered if a significant deviation of the measurement in the two measuring paths occurs	E17 / A17 / H17
Metrological log access	Event is triggered if the metrological log has been accessed	E18 / A18 / H18
Measurement interference	Event is triggered if the measurement is disturbed by influences of cavitation, air water mixture or electromagnetic interference	E22 / A22 / H22
System reset	Event is triggered if the system processor has been reset	E98
Any application error	Event is triggered if the bidirectional communication (M-Bus or optical Interface) has been corrupted	E99 / A99 / A00
Too much communication	Event is triggered if the communication through the optical interface exceeds the threshold	E00 / A00 / H00

The simultaneous appearance of the "Hardware Temperature" Alarm A2 and the "Hardware Flow" Alarm A4 is an indication for tamper activities.

Error and alarm messages can also occur simultaneously,
e.g. E11 - A05 means short-term overload and arising leakage at the same time.

2.4 DATA PRIVACY

The HYDRUS 2.0 BULK saves 512 consumption values within an interval of one hour up to one month. This data can be read locally and accessed only by using the IZAR@MOBILE 2. As a second logging, a small amount of 32 consumption values can be stored and some selected data can be sent by radio. The HYDRUS 2.0 BULK has a minimal sending interval of about 14 seconds and uses the OMS Generation 3 or 4, Profile B security level. Both, the radio protocol and the optical interface are encrypted by default.

3 PRECAUTIONS OF USE

3.1 TRANSPORT

Caution: Meter must be protected against impact and vibration.

Caution: We recommend using only the original packaging for shipment. If shipped in other than the original packaging the factory warranty expires.

3.2 STORAGE

- Meter should be stored in a dry place and protected from frost.

4 INSTALLATION

4.1 LIABILITY

This manual is intended for trained personnel and does not contain any basic working steps.

For the installation, the requirements of the ISO 4064 standard, the OIML R49 recommendation as well as all applicable federal, state and local rules, regulations and codes must be followed.

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⚠ If the installation is not carried out in accordance with good workmanship practices, and if the above-mentioned procedures are not followed, the warranty shall be null and void.

⚠ Protect the meter against any kind of external contamination.

⚠ The legally valid set of rules for drinking water installations must be considered!

⚠ Ensure a sufficient distance between the meter and possible sources of electromagnetic interferences (switches, electric motors, fluorescent lamps, etc.).

⚠ The security seals on the meter must not be broken! A broken seal will immediately lead to an expiration of the factory warranty and verification/conformity.
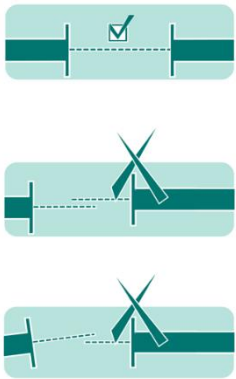

Adhesive seal on body neck / calculator housing

Upper security clip (2x)

Lower security clip
2"– 4" (2x)
6"– 8" (10x)

Adhesive seal on lower / upper calculator housing shell (2x)

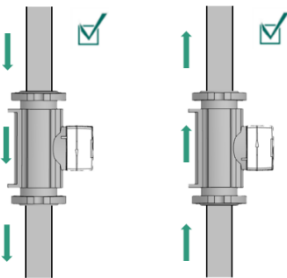Press-fit screw covers (4x)
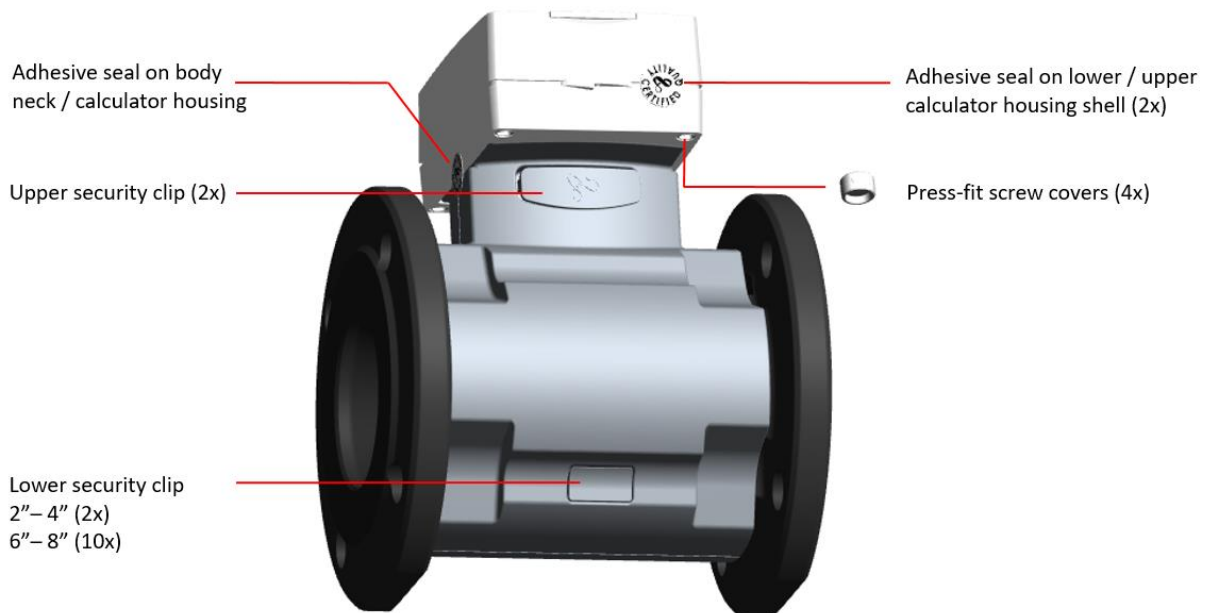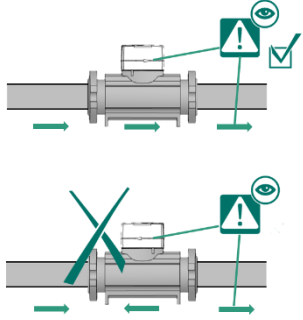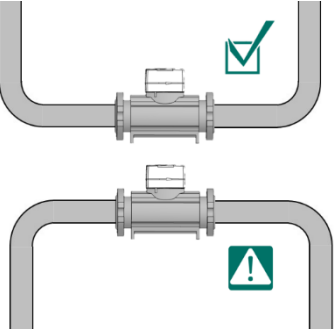
4.2 INSTALLATION PRECAUTIONS
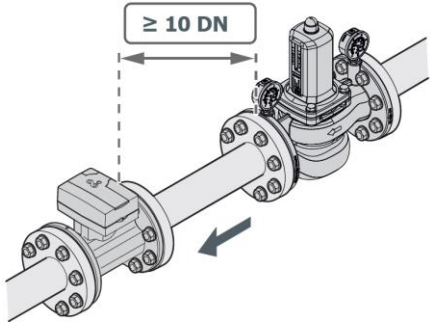
4.2.1 CLEANING THE PIPES

Caution: Clean the pipes thoroughly before installing HYDRUS 2.0 BULK

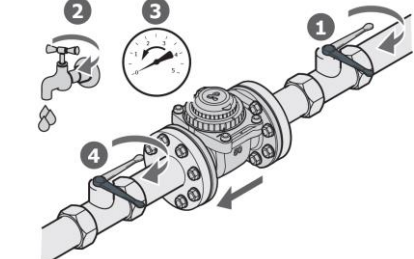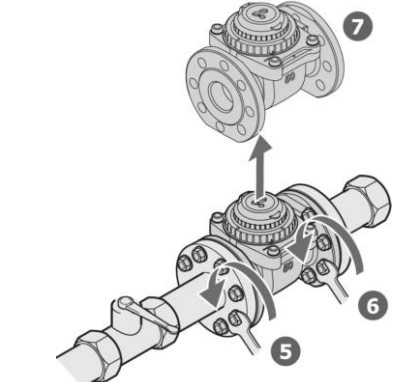### 4.2.2 PIPES ALIGNEMENT

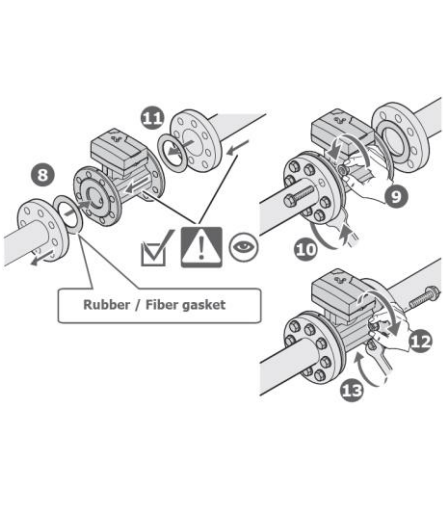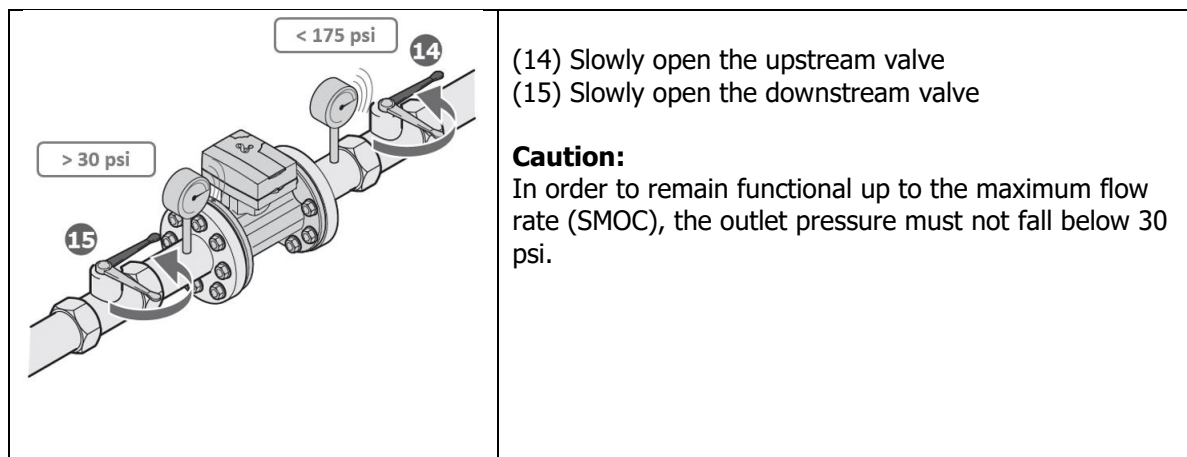|	
	Caution: The pipes must be perfectly aligned in order to minimize the mechanical stresses on the meter body. Make sure that the pipes support the weight of the meter.

4.2.3 INSTALLATION POSITION

	Installation in horizontal and vertical position.
	Caution: Check that the direction of the water flow matches the direction of the arrow located on the casing.
	If possible, install HYDRUS 2.0 BULK at a low-lying point in a pipeline to prevent the formation of air bubbles. The installation location must not be the highest point in the system. The pipe must be completely filled and back-pressured. No straight length required before or after the meter (U0/D0).

13

There must be no air bubbles in the measuring section. A distance of 10 pipe diameters must be maintained from devices that can generate cavitation.

4.2.4 ASSEMBLING/INITIAL OPERATION

(1) Close the valve upstream the meter.
(2) Open a tapping downstream the meter.
(3) Check that the line pressure has completely dissipated.
(4) Close the valve downstream the meter.

(5) Loosen and remove the screws on the outlet-side flange
(6) Loosen and remove the screws on the inlet-side flange
(7) Lift the meter out of the pipework.

Rubber / Fiber gasket

Caution: Used seals on site must be new, suitable for the intended application and comply with local guidelines and regulations.

(8) Remove the old flange gaskets, clean the sealing surfaces and fit the new inlet gasket.
(9) Fasten the screw connections on the inlet by hand.
(10) Tighten them with a suitable tool.
(11) Position the gasket on outlet flange.
(12) Fasten the screw connections on the outlet by hand.
(13) Tighten them with a suitable tool.

	(14) Slowly open the upstream valve (15) Slowly open the downstream valve **Caution:** In order to remain functional up to the maximum flow rate (SMOC), the outlet pressure must not fall below 30 psi.

1   REGULATIONS

1.1   SANITARY CONFORMITY

HYDRUS BULK meets the food-grade requirements relating to materials in contact with water.
It is NSF61 / NSF 372 listed.

1.2   RECYCLING

This product is subject to special collection and disposal. It should be deposited at an appropriate facility to enable recovery and recycling. For further details about recycling this product, please contact your Diehl Metering agency.

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