Kirchner und Tochter
Durchflussmesstechnik seit 1951

Installation and Operating Instructions

Differential-Pressure Flow Meter
DDM-DS11
DDM-DS11-MS1
DDM-DS11-MS2

A. Kirchner & Tochter GmbH Dieselstraße 17 · D-47228 Duisburg
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Version 3.3

Contents

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1 Foreword

These Installation and Operating Instructions are applicable to devices of Series DDM-DS11. Please follow all instructions and information given for installation, operation, inspection and maintenance. The Instructions form a component part of the device and should be kept in an appropriate place accessible to the personnel in the vicinity of the location. Where various plant components are operated together, the operating instructions pertaining to the other devices should also be observed.

2 Safety

2.1 Symbol and meaning


Safety notice

This symbol is placed against all directions/information relating to occupational health and safety in these Installation and Operating Instructions and draws attention to danger to life and limb. Such notices should be strictly observed.

2.2 General safety directions and exemption from liability

This document contains basic instructions for the installation, operation, inspection and maintenance of the variable area flow meter. Non-observance of these directions can lead to hazardous situations for man and beast and also to damage to property, for which Kirchner und Tochter disclaims all liability.

The operator is required to rule out potentially hazardous situations through voltage and released media energy.

2.3 Intended use

The DDM-DS11 differential-pressure flow meters are designed for measuring and monitoring the flow of liquids and gases. They may be installed in the pipeline only between flanges or using threaded pipe connections. Straight, unimpeded lengths of pipe runs must be a minimum of 6 x DN upstream of the location and a minimum of 4 x DN downstream of the location. The required version of the DDM-DS11 device should be selected on the basis of the nominal diameter and nominal pressure at the location as well as the type of medium. The indicator part can be equipped with one or two microswitches. The limit values stated in section 10 - Technical data - should not be exceeded.

2.4 Information for Operator and operating personnel

Authorized installation, operating, inspection and maintenance personnel should be suitably qualified for the jobs assigned to them and should receive appropriate training and instruction. All persons charged with assembly, mounting, operation, inspection and maintenance duties must have read and understood the operating instructions. Gaskets in contact with the fluid product must be replaced after all maintenance and repair work.

2.5 Regulations and guidelines

In addition to the directions given in these Installation and Operating Instructions, observe the regulations, guidelines and standards, such as DIN EN and for specific applications, the codes of practice issued by DVGW (gas and water) and VdS (underwriters) or the equivalent national codes and applicable national accident prevention regulations.

2.6 Notice as required by the hazardous materials directive

In accordance with the law concerning handling of waste (critical waste) and the hazardous materials directive (general duty to protect), we would point out that all flow meters returned to Kirchner und Tochter for repair are required to be free from any and all hazardous substances (alkaline solutions, acids, solvents etc.).

Make sure that devices are thoroughly rinsed out to neutralize hazardous substances.

3 Transport and storage

Always use the original packing for transport, handling and storage. Protect the device against rough handling, coarse impact, jolts etc.

4 Installation

4.1 Preparatory work prior to installation

Provide the pipe ends at the installation point with the external pipe thread or flanges respectively (Type series DN) appropriate to the device. Make sure the installation space at the installation point is in keeping with the dimensions given in the dimensional drawing and the table in the Technical Data chapter

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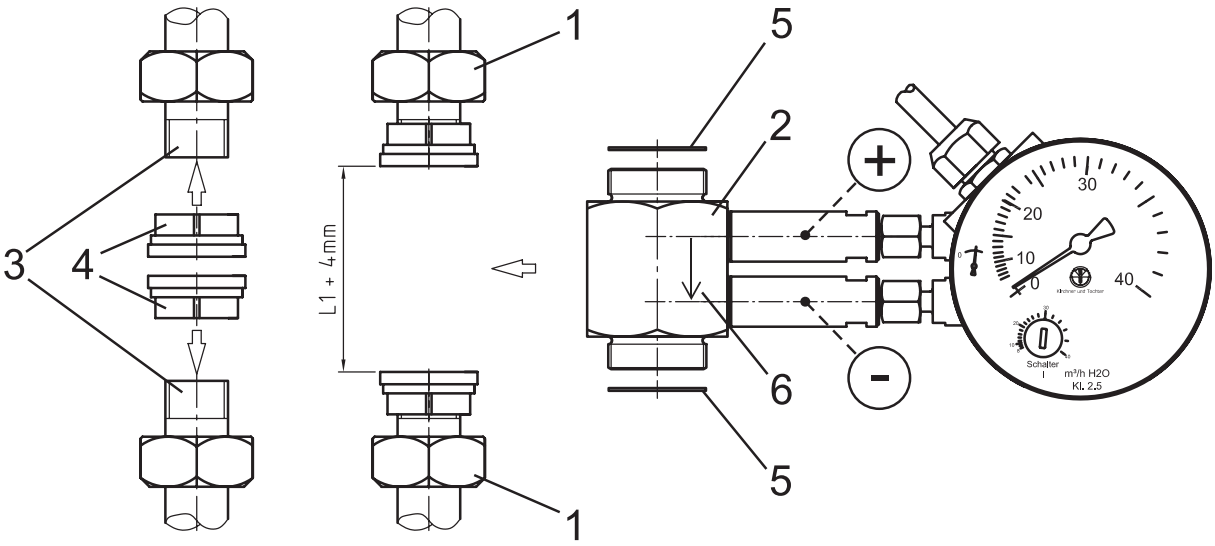
4.2 DDM-DS11 with screw connections

The measuring device is screwed into the pipeline between two inserts that are supplied with the device. The straight, unimpeded inlet and outlet runs should be a minimum of 6 x DN upstream and a minimum of 4 x DN downstream of the location. Between the inserts, leave a gap of L1 + 4 mm for the gaskets. The dimensions of L1 can be found in section 10.6.

- Cut appropriate threads on the pipe ends (3) (in accordance with the order). Make sure that the ends of the pipe are in alignment.
- Unscrew the union nuts (1) from the DDM-DS11 and slide these on to the pipe ends, with the thread facing towards the device (2).
- Screw the insert (4) to the pipe ends using suitable packing material.
- Position the DDM-DS11 together with the two gaskets (5) between the pipe ends and tighten the union nuts.

Inaccurate measurements are possible due to incorrect installation position. Observe the flow direction during installation (see arrow on the device (6)

- Pay attention to the direction of flow (see arrow (6) on the device).



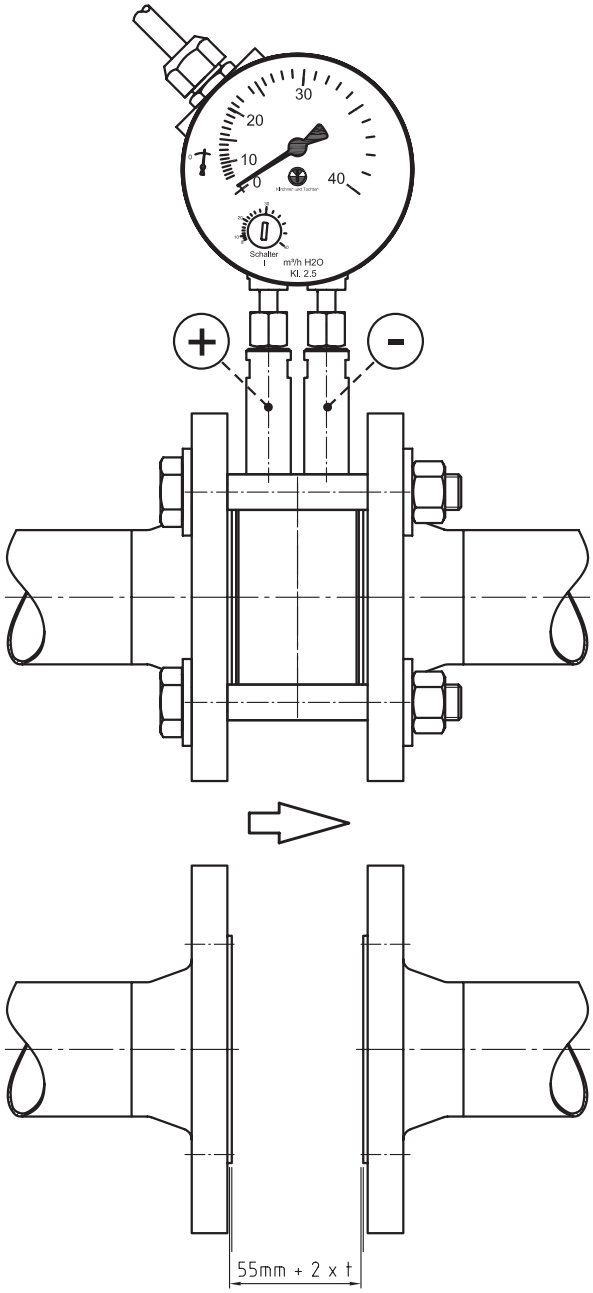
1. Union nut
2. DDM
3. Pipe ends (customer side)
4. Inserts
5. Gaskets
6. Arrow for installation direction

4.3 DDM-DS11 mounted between flanges

The flow meter is mounted between flanges to DIN EN 1092-1 (Type 11 or Type 13). The straight, unimpeded pipe run should be a minimum of 6 x DN upstream and a minimum of 4 x DN downstream of the location. The distance between the flanges should be 55 mm for the ring plus twice the thickness of the gaskets to be used. Make sure that the flanges are in aligment and the sealing faces are parallel to each other. Check that the flanges at the location agree with the details given in the order (standard and pressure rating).

- The distance between the flanges should be 55 mm* + 2 x t (thickness of gaskets used).
- Fit half of the screw connections to the interflange connection.
- Mount the orifice, together with the gaskets fitted on both sides between the two prepared flanges.
- Assemble the remaining screw connections.
- When tightening the screws, make sure that orifice and gaskets are concentric and in alignment with the pipeline.
- Fasten all screw connections uniformly in diagonally opposed sequence.

*(Standard length)
Length can vary order related. Please compare with your order!



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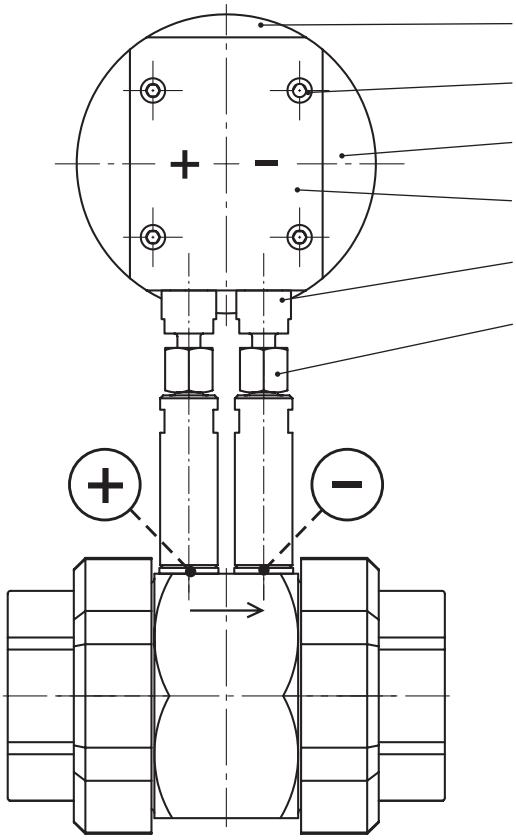
4.4 Modification

The devices are delivered in ready assembled condition to customer specifications (for a customer-specific installation situation). However, a field modification for different installation situations is easily possible and requires little effort. All that needs to be borne in mind is that the „+“ and „–“ connections should not be mixed up. Markings are located:

- on the adapter plate (sticker) and
- on the orifice plates (stamped numbers and an arrow in the direction of flow)



2 x sealing plug G1/4
4 x socket head screws M4
indicator
adapter plate
2 x screw connection G1/4
2 x cutting ring fitting

Only connections of same polarity may be joined together:

„+“ to „+“
„–“ to „–“

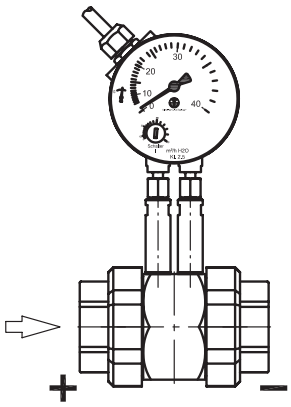
Note:

1. If „+“ is connected to „–“, the pointer in the gauge will turn anti-clockwise.
2. If the gauge is mounted correctly but the orifice is not mounted correctly in the pipeline (flow from „–“ to „+“ counter to the direction of the arrow), the measured values will include substantial errors.

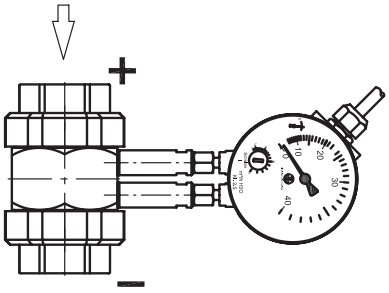
The modification procedure is independent of the connection method (screwed pipe connections or mounting between flanges).

4.4.1 Turning the gauge

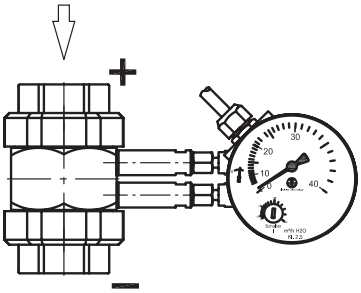
The following example shows the procedure for changing the position of a gauge that has been mounted for the „left to right“ direction of flow to the „top to bottom“ direction of flow:



Original installation situation



Step 1: Mounting the device in the vertical pipe run



Step 2: Turning the gauge 90° counter-clockwise

To turn the gauge (Step 2), remove the 4 Allen screws from the back of the gauge (see figure in section 4.3). The gauge can then be turned in steps of 90°. When refastening the Allen screws, make sure the O-rings are seated correctly between adapter plate and the back of the gauge.

Note: Turning the gauge (by detaching the Allen screws) will not cause polarity reversal!

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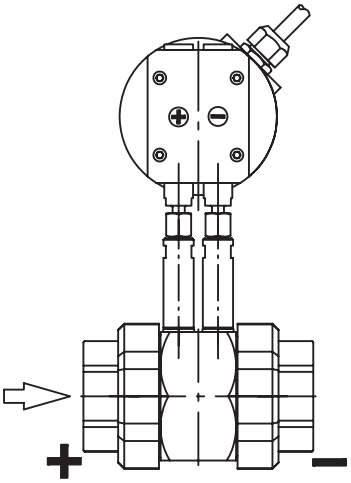
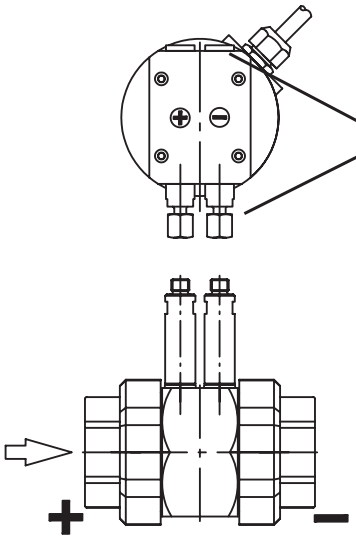
4.4.2 Turning the gauge round

To turn the gauge so that it faces in the opposite direction, proceed as follows:

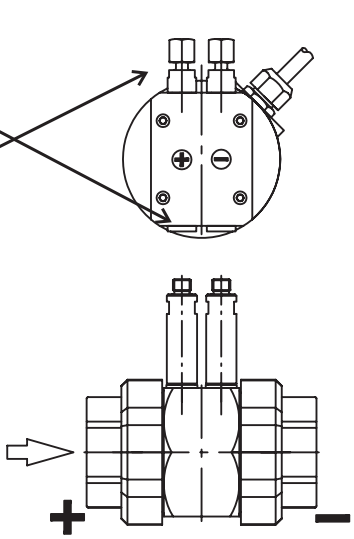
Note: be aware of „+“ and „–“ signs!!! Incorrect polarity will cause the pointer in the gauge to move counter-clockwise



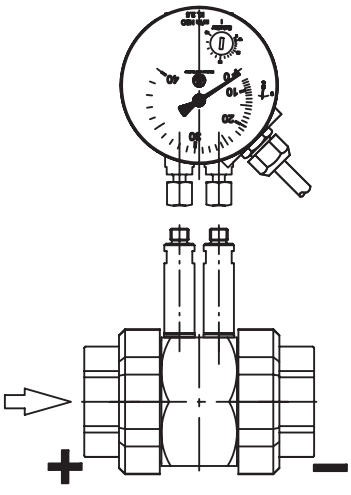
Original installation situation.



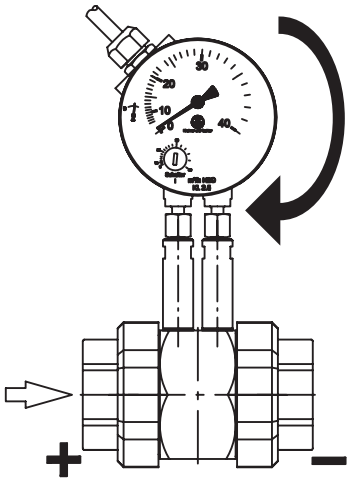
Step 1: Detach the taper bush type pipe union



Step 2: Swap over sealing plugs and screw fittings

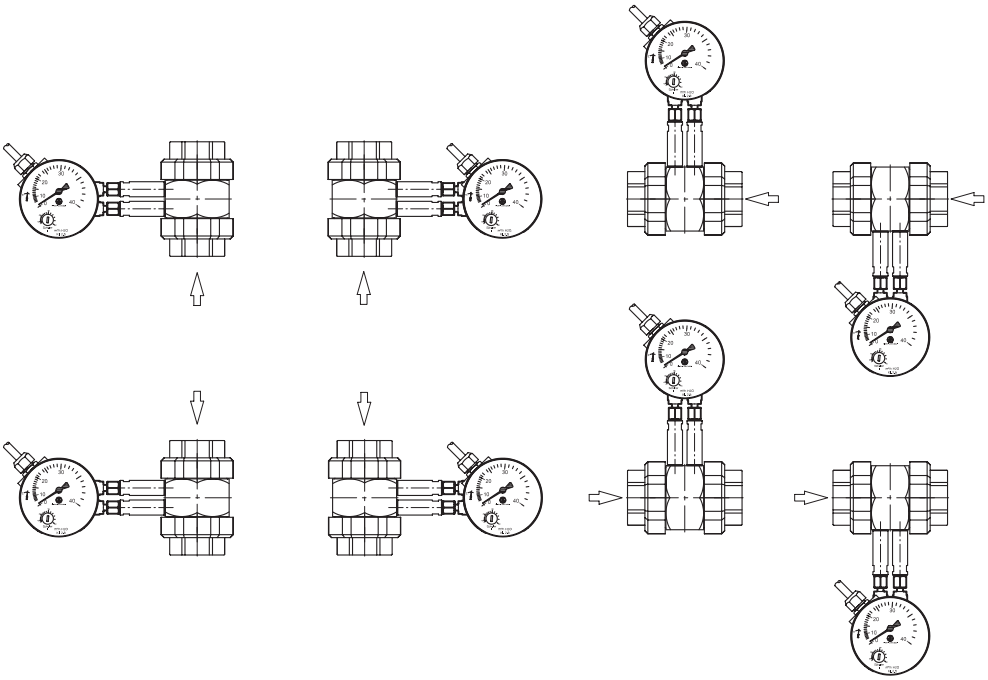


Step 3: Connect the gauge to the orifice plate. Observe polarity: „+“ to „+“ and „–“ to „–“!



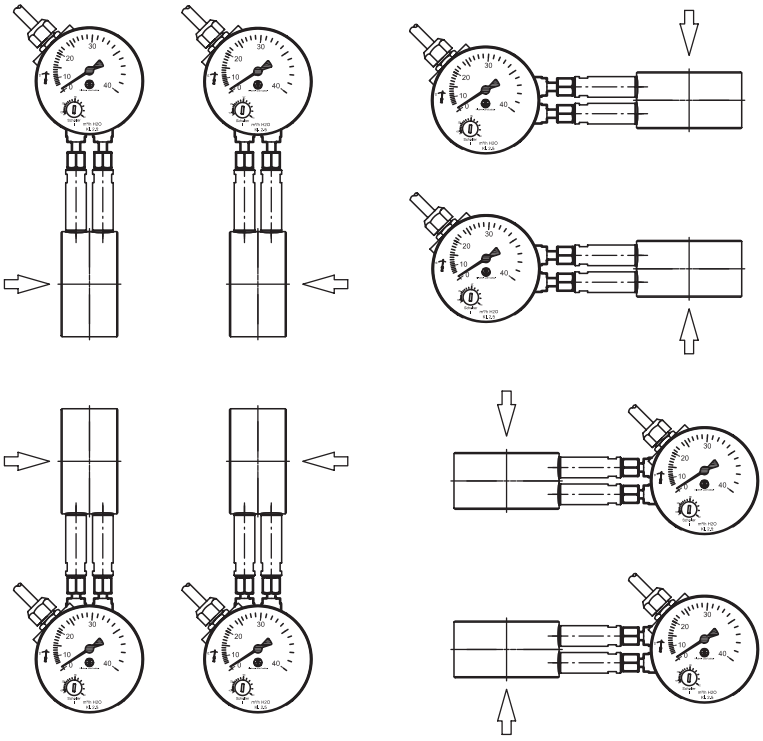
Step 4: Turn the gauge through 180° (see section 4.3.1)

4.4.3 Installation variant DDM-DS11 with screw connections



Direction of flow symbolized by the arrow.

4.4.4 Installation variant DDM-DS11 mounted between flanges



Direction of flow symbolized by the arrow.

4.4.5 Seawater-resistant DDM-DS11

If seawater is used as medium, a high chamical resitance is needed.

Orifice (1) ring (2) and the connecting parts (3) aswell as the adapter plate (4), the diaphragm and the diaphragm casing (5) of the differential pressure gauge are in this case made of seawater resistant red bronze (CuSn7ZnPb). Screw connections (6) and cutting rings are made of stainless steel (1.4571/1.4404).

If the device is installed outside of closed systems, a canopy is recommended.

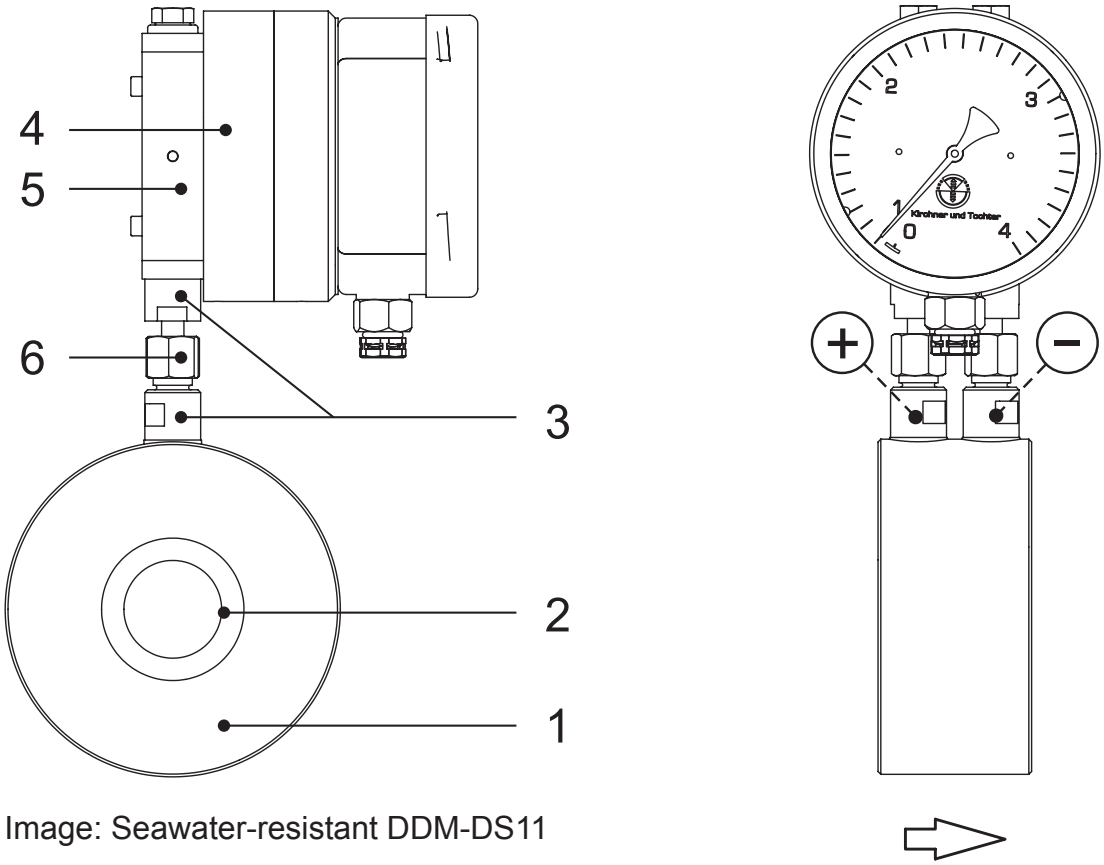


Image: Seawater-resistant DDM-DS11

5 Start-up

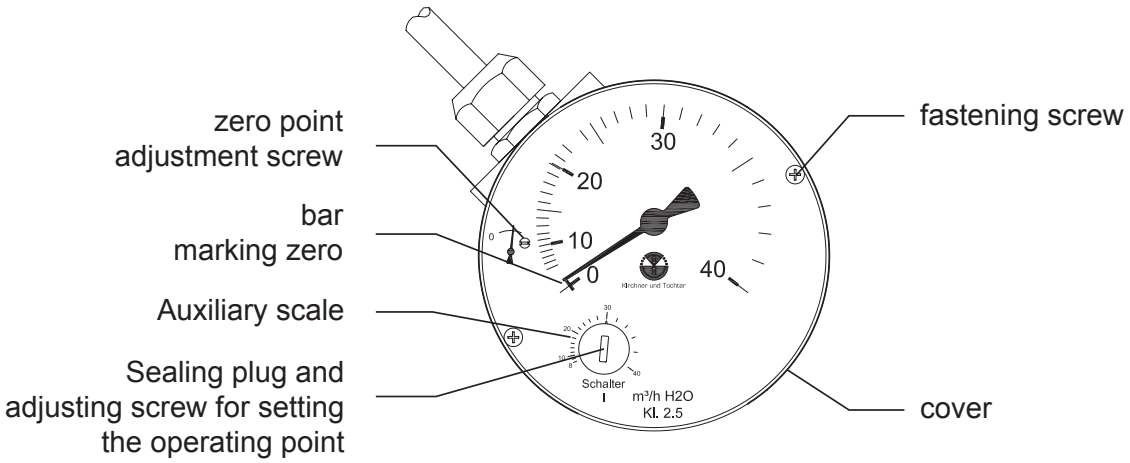
The device must be properly installed before it is started up. Carry out the following before initial start-up:

- Pressurize the measuring line
- Test the leak-tightness of all components of the measuring orifice

6 Note on change of operating data on gas service

On devices for gas service, gauge readings are only correct when the operating conditions at the measuring point (density, operating pressure and operating temperature) are the same as the values marked on the scale.

7 Indicator part DS11



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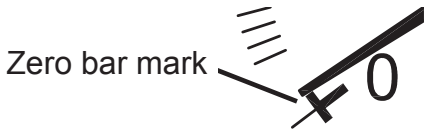
7.1 Zero correction

Should the pointer in the gauge not be located in the area of the zero bar when flow is „off“, the indicator will need to be readjusted as follows:



- Depressurize the measuring cell.
- Undo the two fastening screws on the cover and remove cover.
- Use the zero correction screw to set the measured-value pointer to the scale zero.
- Refit the cover.

7.2 Setting the operating point of limit switches MS1 and MS2

The DS11 indicator can be equipped with up to two contacts.

MS1 single-gap changeover contact

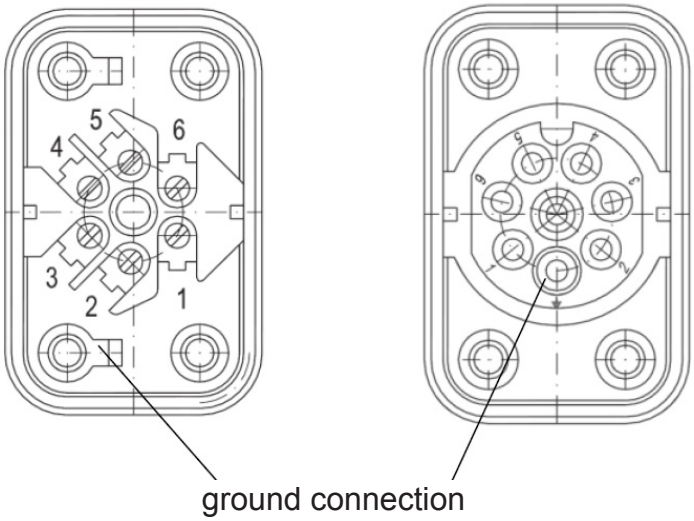
MS2 double-gap changeover contact

To set the operating point, proceed as follows:

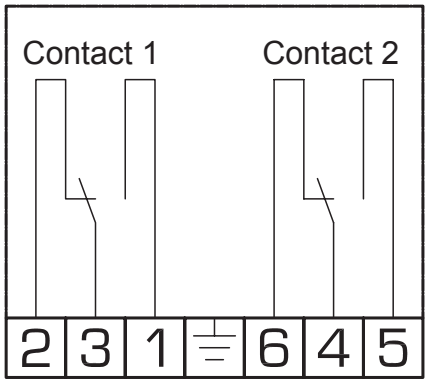
- Detach the sealing plug above the contact adjusting screw in the cover. The contact adjusting screw is now freely accessible to adjust the operating point.
- The auxiliary scale enables adjustment of the operating point over 270° with a setting accuracy of +/- 5 %.
- Check the set operating point by way of the volumetric flow rate of your plant.
- Screw the sealing plug back in again.

7.3 Electrical connection of limit switches MS1 and MS2

Depending on the version, terminal assignment is either via a numbered cable or a cable junction box as shown in the illustration.



Terminal assignment



8 Service

All devices with defects or deficiencies should be sent directly to our repair department. In the service area of the Kirchner und Tochter homepage (www.kt-flow.de) you will find the declaration of decontamination as download and more information about returns.
To avoid risks to our employees and the environment, we can only process devices, for which we get a declaration of decontamination certifying that they are safe due to legal regulations. For questions, please contact our sales department, Tel. +49 2065-96090.

9 Disposal

Please help to protect our environment and dispose workpieces in conformity with current regulations resp. continue using them.

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10 Technical data

Measuring principle	differential pressure measurement on the orifice
Perm. ambient temperature	-10 ... +70 °C
Perm. medium temperature*	standard -10 ... +70 °C max. 130 °C (insulated line) optionally HT-Type above 130 °C
Display unit	mechanical differential pressure measuring unit
In-between flange (DN)	for PN 10/PN 16 flanges acc. to DIN EN 1092-1 shape A & B
Pipe union (Rp)	two-part pipe fitting insert with cylindrical internal thread acc. to DIN EN 10226-1 (ISO 7-1)
External thread (Ga)	cyl. external thread acc. to DIN EN ISO 228
Internal thread (Gi)	cyl. internal thread acc. to DIN EN ISO 228

*) medium must not freeze

10.1 Technical data of microswitches

Switch output	1 or 2 microswitches, 1-channel change-over switch	
Adjustment of switching points	external adjustment by standard value scales	
Smallest adjustable value	approx. 5 % of full scale range	
Switching hysteresis	approx. 2,5 %	
Load data/switches	AC U~ max. = 250 V AC I max. = 5 A P max. = 10 W	DC U~ max. = 30 V DC I max. = 0,4 A P max. = 10 W
Electrical connection	prewired numbered cable 2,5 m, optionally terminal box	

10.2 Technical data of the gauge

Measuring principle	Differential pressure at the orifice
Perm. ambient temperature	-10 ... +70° C
Perm. medium temperature*	-10 ... +70° C
Protection class	IP54 acc. to DIN EN 60529
Measuring accuracy	± 2,5 % FS

*) medium must not freeze

Low Voltage Directive
The DS11 gauge meets the protection requirements of the low-voltage directive 72/23/EEC and its amendment 93/68/EWG.

10.3 Materials

DDM-DS11 DN	
Ring	S355, optionally 1.4571
Corrosion protection	epoxy paint, kiln-dried, traffic blue (RAL 5017), satin finished
Corrosion class	C2
Orifice	1.4571
DDM-DS11 Rp, Gi, Ga	
Pipe union (Rp)	malleable cast iron, zinc plated
Orifice and ring	brass
Gaskets	NBR
Connection between orifice and indicator	
Straight screw-in fitting ¼“	nickel-plated brass or stainless steel
Screw fitting G ¼“ dia. Ø 8	nickel-plated brass or stainless steel
Cutting ring, union nuts	zinc plated steel or stainless steel
Steel sealing	zinc plated steel with NBR gasket
Indicator DS11	
Pressure chamber	aluminium GkAlSi12 (Cu) with HART-COAT surface protection
Measuring diaphragm	NBR
Dial cover	polycarbonate

other materials on request

10.4 Differential pressures and pressure resistance

Differential pressure for liquids	250 mbar[1)]
Differential pressure for gases	200 mbar[1)]
Pressure loss for liquids	appr. 30 ... 60 % from the differential pressure[2)]
Pressure loss for gases	appr. 30 ... 60 % from the differential pressure[2)]
Pressure resistance	PN 16

1) others on request

2) in case of enquiry it should be gathered from the quotation

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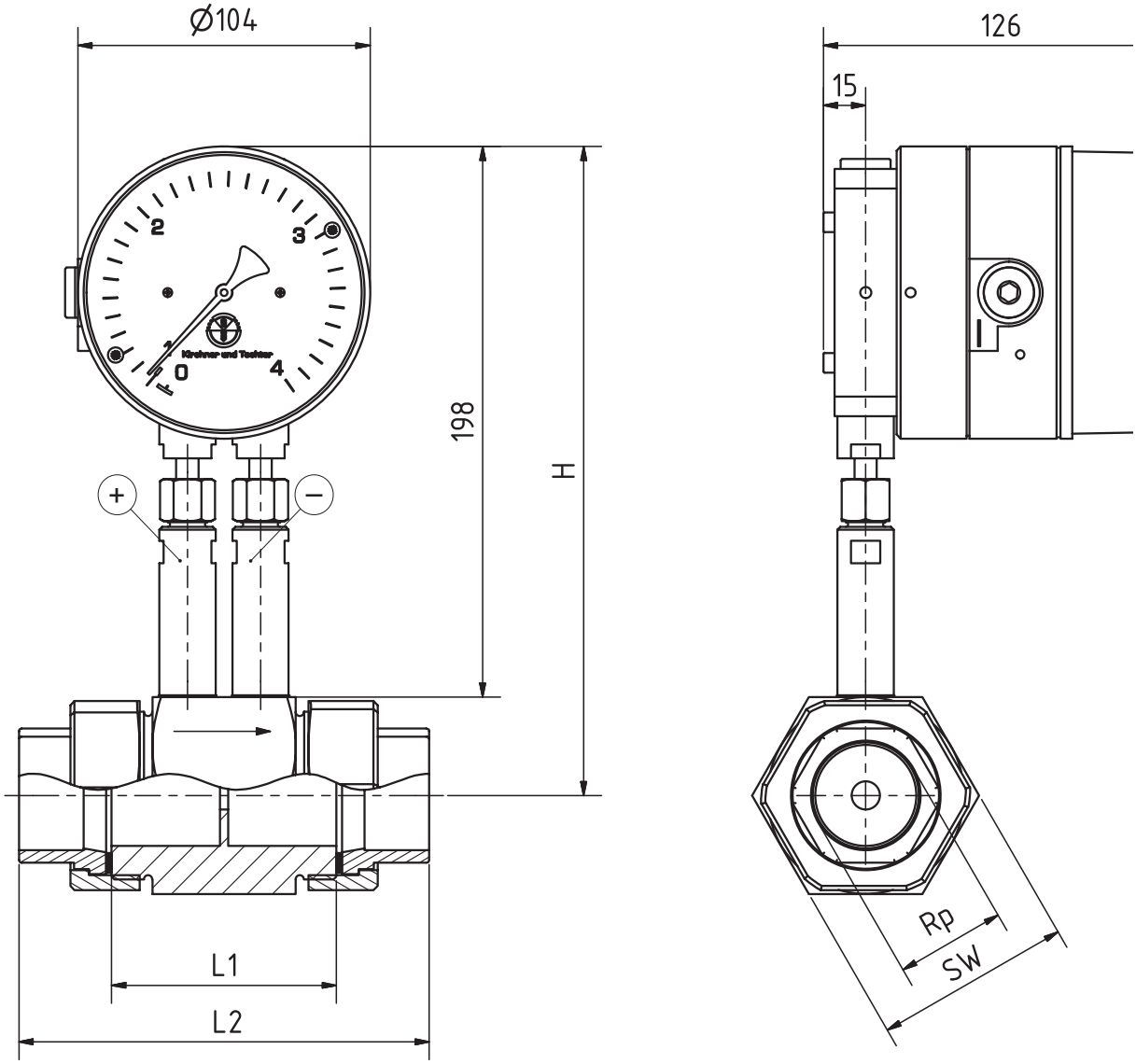
10.5 Type series

DDM-DS11	Measuring orifice with indicator DS11
DDM-DS11 DN	Measuring orifice for in-between flange assembly
DDM-DS11 Rp	Measuring orifice for pipe union connection
DDM-DS11 Gi	Measuring orifice for internal screwed connection
DDM-DS11 Ga	Measuring orifice for external screwed connection
DDM-DS11-...-MS1	with one microswitches
DDM-DS11-...-MS2	with two microswitches

10.6 Dimensions for DDM-DS11 for screwed connections



Rp*)	L_1	L_2	SW	H
¼	80	124	41	218
⅜	80	128	46	221
½	80	128	46	221
¾	80	128	50	223
1	80	136	60	228
1 ¼	80	146	70	233
1 ½	80	149	70	233
2	90	164	85	240

*) inside diameter is made as specified by the pipe inner diameter

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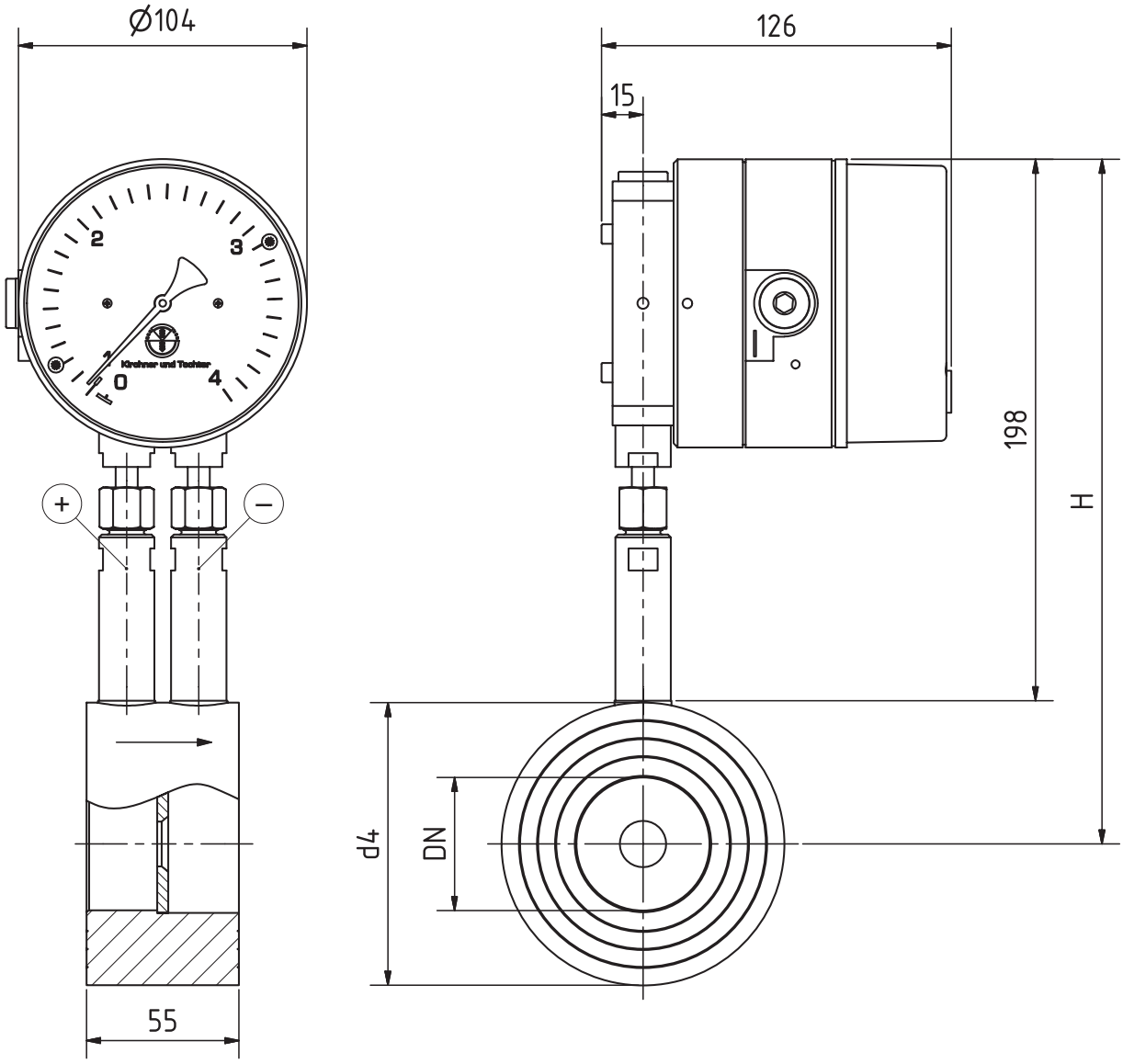
10.7 Dimensions for DDM-DS11 for in-between flange assembly



DN*)	d_4	H
50	102	249
65	122	259
80	138	267
100	158	277
125	188	292
150	212	304
200	268	332

*) Inside diameter made after details provided of inside pipe diameter.

10.8 Measuring ranges

10.8.1 Flow rates for water

Connection with screw connections

RP	Min. measuring range [m³/h] H_2O			Max. measuring range [m³/h] H_2O		
¼	0,05	-	0,3	0,2	-	1,2
⅜	0,05	-	0,4	0,4	-	2,3
½	0,1	-	0,7	0,75	-	4,5
¾	0,2	-	1,3	1,4	-	8,5
1	0,35	-	2	2,25	-	13,5
1 ¼	0,6	-	3,5	4,0	-	24
1 ½	0,85	-	5	5,35	-	32
2	1,25	-	7,5	8,65	-	52

Other measuring ranges on request

Connection for mounting between flanges

DN	Min. measuring range [m³/h] H_2O			Max. measuring range [m³/h] H_2O		
50	1,2	-	7	8,7	-	52
65	2	-	12	13	-	78
80	3	-	18	19,7	-	118
100	4,7	-	28	30,7	-	184
125	7,3	-	44	48	-	288
150	10,7	-	64	68,8	-	413
200	18,8	-	113	122,5	-	735

Other measuring ranges on request

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10.8.2 Flow rates for air

Connection with screw connections

RP	Min. measuring range [m³/h] air[1)]			Max. measuring range [m³/h] air[1)]		
¼	0,5	-	3	1,3	-	8
⅜	0,8	-	5	2,3	-	14
½	1	-	6	3,5	-	21
¾	1,3	-	8	7,5	-	45
1	2	-	12	9	-	54
1 ¼	4	-	24	18	-	108
1 ½	5,8	-	35	25	-	150
2	8,3	-	50	45	-	270

[1)] at STP 0° C and 1013 mbar

Other measuring ranges on request

Connection for mounting between flanges

DN	Min. measuring range [m³/h] air[1)]			Max. measuring range [m³/h] air[1)]		
50	9	-	54	45	-	270
65	13,5	-	81	83	-	500
80	20	-	120	125	-	750
100	35	-	210	142	-	850
125	60	-	360	292	-	1750
150	75	-	450	433	-	2600
200	125	-	750	667	-	4000

[1)] at STP 0° C and 1013 mbar

Other measuring ranges on request

Notes

The devices from **Kirchner und Tochter** have been tested in compliance with applicable EC/EU CE-regulations of the European Community.

The respective declaration of conformity is available on request. Subject to change without notice. The current valid version of our documents can be found at www.kt-flow.de.

The **Kirchner und Tochter** QM-System is certified in accordance with DIN EN ISO 9001:2015. The quality is systematically adapted to the continuously increasing demands.

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