MECON

FLOW-CONTROL-SYSTEMS

Orifice plate flowmeter
F O Turbo-Lux 3

Fig 1 Orifice plate flowmeter Turbo-Lux 3

Application

The orifice plate flowmeter Turbo-Lux 3 is used to measure the volume of transparent fluids in closed pipeline systems. Any mounting position and direction of flow is possible. The main field of application is the utilisation in stationary water extinguishing systems. The flowmeter complies with the requirements of the " Verband der Schadensversicherer e.V. (VdS)" "Association of damage insurers".

Mode of operation and design

The orifice plate flowmeter Turbo-Lux 3 consists of a differential pressure sensor (fig. 2, 1) for stationary installation as well as a portable bypass meter to measure the auxiliary flow (fig. 2, 2). The differential pressure sensor complies essentially with DIN EN ISO 5167 as well as the VDI guidelines 2040. The bypass meter contains a conical glass tube (fig. 2, 3) with a float (fig. 2, 4). The water flows vertically upwards through the glass tube which is equipped with a bypass orifice at the top (fig. 2, 5). A filter (fig. 2, 6) at the inlet side prevents the ingression of foreign particles to a large extent. Inlet and outlet ports for the flow to be measured in the bypass are arranged concentrically to ensure simple assembly and combination with the stationary differential pressure sensor.

Installation of the differential pressure sensor

A straight pipe section to achieve non turbulence with a length in relation to the diametral pitch in accordance with DIN EN ISO 5167 must be provided both upstream and downstream from the differential pressure sensor (see page 4). In the case of installation in sprinkler systems, we refer to the VdS CEA guideline for sprinkler systems 4001, in which 10 x D is prescribed upstream of the pressure sensor and 5 x D downstream of the sensor. The installation can be conducted in the direction required by the user - horizontal up to vertical (fig. 4). However, ensure that the flow direction corresponds to the direction of flow indicated by the arrow on the instrument and that the differential pressure sampling tube (fig. 2, 7) is installed in a horizontal position. Adequate free space must be provided for the mounting of the bypass meter. The concentric installation between the flanges of the pipeline is essential to guarantee the adherence to the measuring tolerance. The central offset may not exceed 0.5 mm. A centring assembly (fig. 3) can be supplied for all dimensions of differential pressure sensor to aid centring in installation between flanges.

Mounting the bypass meter

The bypass meter can be used for all specified nominal diameters. The pipeline must be drained before the screw caps are loosened (fig. 2, 10) in order to prevent the leakage of fluid. The bypass meter is connected and screwed into place using the union nut (fig. 2, 9). It must always be mounted in a truly vertical position to allow the float (fig. 2, 4) to move freely in the measuring tube (fig. 2, 3). Any contaminants which have passed through the filter must be removed. Tighten union nut and the screw cap manually, if possible. The screw threads must run smoothly - e.g. by lubricating with grease. The pipeline must be filled with water slowly to prevent water hammer.

Measurement

Read the exact value as soon as a consistent flow has been attained, i.e. when the float has reached a stable position. Read the value at the greatest diameter of the float. The pipeline must always be filled.
When the bypass meter is commissioned or set into operation, bubbles of air will initially accumulate at the top part, which must be removed. For this purpose, the union nut (fig. 2, 9) must be somewhat loosened during operation and the device must be rotated by 360°, so that the air bubbles can escape. Then tighten the union nut once again.

Reading the measured value

The flow rate is printed in m³/min for the main values (100/ 90/ 80/ 70/ 60/ 50/ 40/ 20 %) on the scale for each nominal diameter. The scale division in brackets is also listed to assist the determination of intermediate values.
An extended table in which a flow value is assigned to each line can be found on page 3.

Maintenance

If the filter is blocked by deposits (fig. 2, 6) the flowmeter must be returned to the manufacturer to be cleaned and tested.
Ensure that the O-ring (fig. 2, 8) and the M 30 x 1,5 thread of the orifice plate are lubricated with grease.

Operating note

The operator of these measuring units is responsible for the suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. In particular, it must be ensured that the materials selected for the parts of the measuring unit coming into contact with the medium are suitable for the process media to be used. The unit may only be used within the pressure and voltage limits specified in the operating instructions. Before replacing the measuring tubes, check that the unit is free from hazardous media and pressures. The instrument complies with the requirements according to Article 3 Paragraph 3 of the guideline relating to pressure instruments 97/23/EU. The most hazardous permissible media are the fluids defined in Group 2.

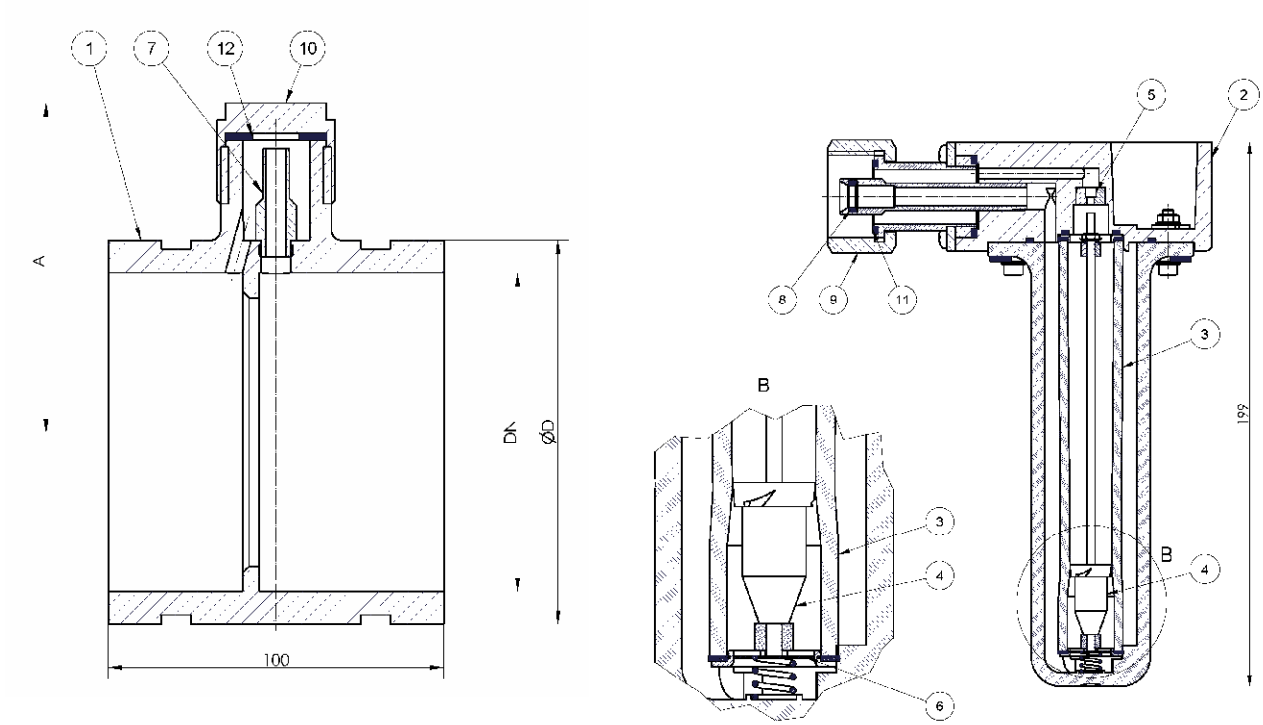

Fig.2 Turbo-Lux 3, Position drawing and dimensions in mm (inch)

1	Differential pressure sensor
2	Bypass meter
3	Measuring glass tube
4	Float
5	Bypass orifice
6	Filter
7	Differential pressure sampling tube
8	O-ring
9	Screw cap
10	Union nut
11	O-ring
12	Gasket

Connections	Intermediate flange connection		
	Dimensions		Weight
	A±0.5	øD ±0.5	
DN	mm	mm	kg
50 PN 10/16	-	-	-
80 PN 10/16	130	138	1,3
100 PN 10/16	140	158	1,6
150 PN 10/16	165	212	2,1
200 PN 10/16	190	268	3,0
indicating part	-	-	0,7

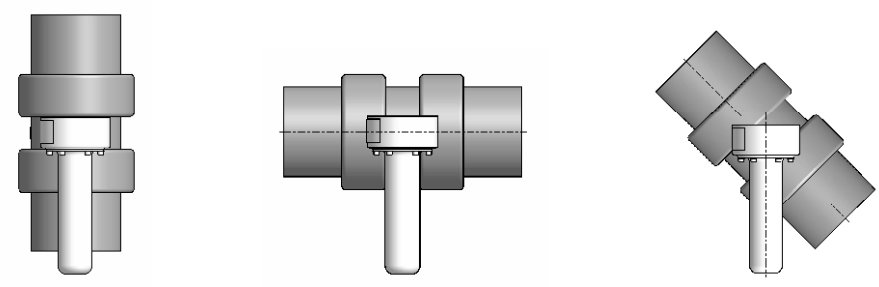

Fig.4 Examples of installation

Flow table for the bypass meter Turbo-Lux 3

Flowrate - Water Orifice for intermediate flange model										
Anzeige	DN 50		DN 80		DN 100		DN 150		DN 200	
in %	m³/min	l/min	m³/min	l/min	m³/min	l/min	m³/min	l/min	m³/min	l/min
100	0,80	800	2,10	2100	3,60	3600	7,20	7200	14,40	14400
98	0,78	784	2,06	2058	3,53	3528	7,06	7056	14,11	14112
96	0,77	768	2,02	2016	3,46	3456	6,91	6912	13,82	13824
94	0,75	752	1,97	1974	3,38	3384	6,77	6768	13,54	13536
92	0,74	736	1,93	1932	3,31	3312	6,62	6624	13,25	13248
90	0,72	720	1,89	1890	3,24	3240	6,48	6480	12,96	12960
88	0,70	704	1,85	1848	3,17	3168	6,34	6336	12,67	12672
86	0,69	688	1,81	1806	3,10	3096	6,19	6192	12,38	12384
84	0,67	672	1,76	1764	3,02	3024	6,05	6048	12,10	12096
82	0,66	656	1,72	1722	2,95	2952	5,90	5904	11,81	11808
80	0,64	640	1,68	1680	2,88	2880	5,76	5760	11,52	11520
78	0,62	624	1,64	1638	2,81	2808	5,62	5616	11,23	11232
76	0,61	608	1,60	1596	2,74	2736	5,47	5472	10,94	10944
74	0,59	592	1,55	1554	2,66	2664	5,33	5328	10,66	10656
72	0,58	576	1,51	1512	2,59	2592	5,18	5184	10,37	10368
70	0,56	560	1,47	1470	2,52	2520	5,04	5040	10,08	10080
68	0,54	544	1,43	1428	2,45	2448	4,90	4896	9,79	9792
66	0,53	528	1,39	1386	2,38	2376	4,75	4752	9,50	9504
64	0,51	512	1,34	1344	2,30	2304	4,61	4608	9,22	9216
62	0,50	496	1,30	1302	2,23	2232	4,46	4464	8,93	8928
60	0,48	480	1,26	1260	2,16	2160	4,32	4320	8,64	8640
58	0,46	464	1,22	1218	2,09	2088	4,18	4176	8,35	8352
56	0,45	448	1,18	1176	2,02	2016	4,03	4032	8,06	8064
54	0,43	432	1,13	1134	1,94	1944	3,89	3888	7,78	7776
52	0,42	416	1,09	1092	1,87	1872	3,74	3744	7,49	7488
50	0,40	400	1,05	1050	1,80	1800	3,60	3600	7,20	7200
48	0,38	384	1,01	1008	1,73	1728	3,46	3456	6,91	6912
46	0,37	368	0,97	966	1,66	1656	3,31	3312	6,62	6624
44	0,35	352	0,92	924	1,58	1584	3,17	3168	6,34	6336
42	0,34	336	0,88	882	1,51	1512	3,02	3024	6,05	6048
40	0,32	320	0,84	840	1,44	1440	2,88	2880	5,76	5760
35	0,28	280	0,74	735	1,26	1260	2,52	2520	5,04	5040
30	0,24	240	0,63	630	1,08	1080	2,16	2160	4,32	4320
25	0,20	200	0,53	525	0,90	900	1,80	1800	3,60	3600
20	0,16	160	0,42	420	0,72	720	1,44	1440	2,88	2880

Pressure loss particulars

Flow	Δp mbar (psi)
20	13.6 (0.19)
50	85.0 (1.23)
100	340.0 (4.93)

Orifice plate flowmeter
F O Turbo-Lux 2

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Technical Data Turbo-Lux 3

Application field	see page 1
Mode of operation and design	see page 1
Measuring principle	Orifice plate as differential pressure sensor with bypass meter
Inlet	
Nominal diameters	DN 50 PN 10/16 DN 80 PN 10/16 DN 100 PN 10/16 DN 150 PN 10/16 DN 200 PN 10
Nominal pressure	PN 16
Pressure limit	max. 16 bar
Measuring accuracy:	± 2.5% final value ± 5% starting value
Operational conditions	
Temperature limits	max. 50 °C
Constructive design	
Materials (fig. 2)	
- Differential pressure sensor (1)	stainless steel
-Differential pressure sampling tube (7)	M.-No. 2.0380 (Ms58)
- Float (4)	Stainless steel
- Bypass orifice (5)	Stainless steel
- Filter (6)	Stainless steel
- Gasket (11/12)	Perbunan
Certificates and approvals	
Classification in accordance with guideline for pressure instruments 97/23/EU	For liquids of fluid group 2; complies with requirements of article 3, paragraph 3 (sound engineering practice SEP)
Vds certification number	G4060003

Ordering data

F O Turbo-Lux 23
Orifice plate flowmeter

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Orifice plate for installation between flange	
without	0
DN 50 (Qv: 0.16 - 0.8 m³/min.)	1
DN 80 (Qv: 0.42 - 2.1 m³/min.)	2
DN 100 (Qv: 0.72 - 3.6 m³/min.)	3
DN 150 (Qv: 1.44 - 7.2 m³/min.)	4
DN 200 (Qv: 2.88 - 14.4 m³/min.)	5
Bypass meter FO Turbo-Lux 3	
without	A
for orifice plate to be installed in groove connection	B
Replacement union cap	
without union cap	0
with union cap including gasket	1
Calibration certificate	
without calibration certificate	0
with calibration certificate	1

Inlet and outlet

Minimum values for straight pipelines without disturbance in diverse pipeline diameters D in accordance with DIN EN ISO 5167

Aperture ratio m	0.01	0.04	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.36	0.42	0.49	0.56
Ratio of diameters ß	0.10	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75
Fixtures upstream of the dosing unit	Straight pipeline lengths at the Inlet required												
Elbow or T-piece	10 (6)	10 (6)	10 (6)	10 (6)	12 (6)	14 (7)	14 (7)	14 (7)	16 (8)	18 (9)	22 (11)	28 (14)	36 (18)
Two or more elbows													
at the same level	14 (7)	14 (7)	14 (7)	16 (8)	16 (8)	18 (9)	18 (9)	20 (10)	22 (11)	26 (13)	32 (16)	36 (18)	42 (21)
at different levels	34 (17)	34 (17)	34 (17)	34 (17)	36 (18)	36 (18)	38 (19)	40 (20)	44 (22)	48 (24)	54 (27)	62 (31)	70 (35)
Reducer (from 2 D to D covering a length from 1.5 D to 3 D)	5	5	5	5	5	5	5	6 (5)	8 (5)	9 (5)	11 (6)	14 (7)	22 (11)
Diffusor (from 0.5 D to D a length from 1 D to 2 D)	16 (8)	16 (8)	16 (8)	16 (8)	16 (8)	16 (8)	17 (9)	16 (9)	20 (10)	22 (11)	25 (13)	30 (15)	38 (19)
Valve, completely opened	18 (9)	18 (9)	18 (9)	18 (9)	18 (9)	20 (10)	20 (10)	20 (11)	24 (12)	26 (13)	28 (14)	32 (16)	36 (18)
Gate valve completely opened	12 (6)	12 (6)	12 (6)	12 (6)	12 (6)	12 (6)	12 (6)	12 (6)	14 (7)	14 (7)	16 (8)	20 (10)	24 (12)
For all listed	Straight pipelines at outlet required												
Armatures	4 (2)	4 (2)	4 (2)	5 (2.5)	5 (2.5)	6 (3)	6 (3)	6 (3)	6 (3)	7 (3.5)	7 (3.5)	7 (3.5)	8 (4)
Errors due to wrong installation	Straight pipelines in the inlet (for all diameters ß) required												
abrupt symetrical reduction in diameter with a diametral ratio >= 0.5	30 (15)												
Thermometer pocket													
<= 0.03 D	5 (3)												
0.03 D to 0.13 D	20 (10)												
Non bracketed values:	apply to orifices; tubes and Venturi tubes; length of pipe at the outlet measured from the end of the diffusor												
Bracketed values:	apply to orifices; tubes and Venturi tubes; in these cases an additional uncertainty of von ±0.5% should be added arithmetically to the relative uncertainty according to DIN EN ISO 5167, September 1995.												

The specifications for T-pieces refer to T-pieces at the inlet where the flow is divided in two and metering is conducted in a partial flow. A swirl develops downstream from the T-pieces that merge the two flows; therefore a longer inlet pipeline is required.