Orifice Flow Meter
TM N4

Figure 1 TM N4 orifice flow meter

Application

The TM N4 orifice flow meter is used to measure the flow of transparent liquids in closed piping. Any mounting location, position and flow direction can be selected for the flow meter. The flow meter can also be used for flow monitoring if equipped with limit contacts.

Design and Mode of Operation

The TM N4 orifice flow meter primarily consists of an orifice plate as the sensor and a float as the display element. A differential pressure is produced across the orifice plate which is fitted in the main stream between two flanges in the piping. In a bypass, this differential pressure produces a volume flow in a rota meter. The height of the float indicates the flow rate. The flow is read at the position of the float's widest diameter.

Installation and Start-up

- The measuring regulations for the flow DIN EN ISO 5167 not only include the version of orifice units but also require an installation conforming to standards so that the indicated uncertainty in measurement can be kept. The standard installation must already be considered during the projecting of the pipeline. The orifice unit must be installed in a straight pipeline which is long enough. Bends, valves and the like must be installed in such a distance of the orifice unit that the trouble has faded there. Orifice units with large diameters are highly sensitive to troubles.
- Observe the recommendations with respect to inlet and outlet pipe sections for the orifice plate according to DIN EN ISO 5167 at page 5
- Adjust orifice with the sharp edge (+ marking) to the entry side
- Insert differential pressure sensor with gaskets centrically between the flanges of the pipeline and tighten uniformly.
- Unfasten screw cap (G2), align the indicating part vertically downwards and then tighten screw cap.
- For floats with magnets and contact switches, lead the float along the whole contact to the polarization during the start-up.

Maintenance

Contamination, especially around the bypass orifice, may lead to faults in the measurement. The bypass orifice plate can be dismounted and cleaned without interrupting the main flow if the ball valves are closed first.

Contact Assembly

The bistable contact assembly K18 consists of a contact spring set sealed in a glass tube filled with protective gas. The contact springs are polarized by a fixed magnet such that they exhibit a bistable response.

Retrofitting of contact switches is only possible if the floats used are equipped with magnets.

Two contacts can be selected:

- K18 A: contact closes when the limit is fallen below
- K18 B: contact closes when the limit is exceeded.

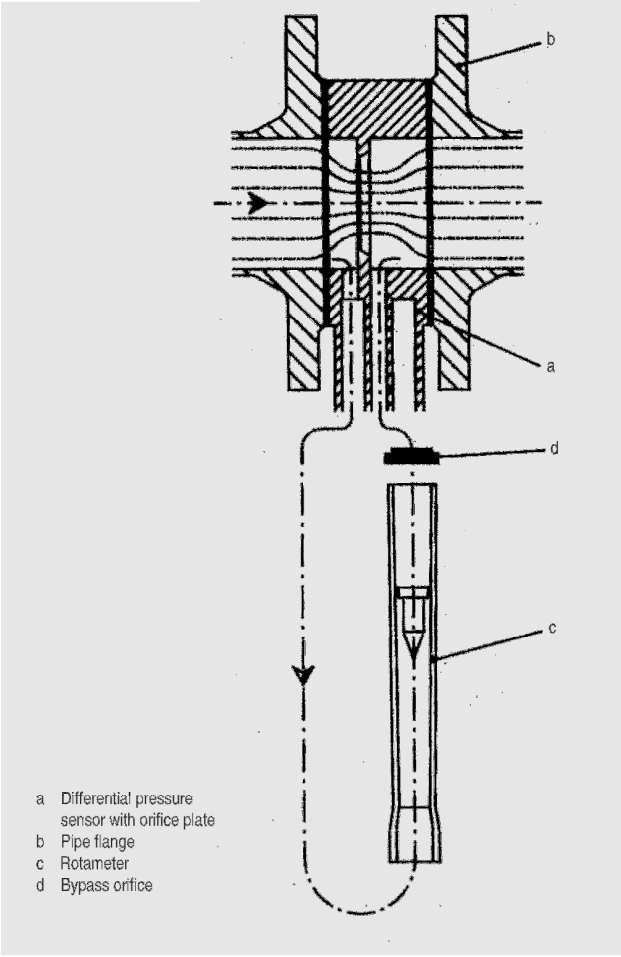

Figure 2 Measuring principle

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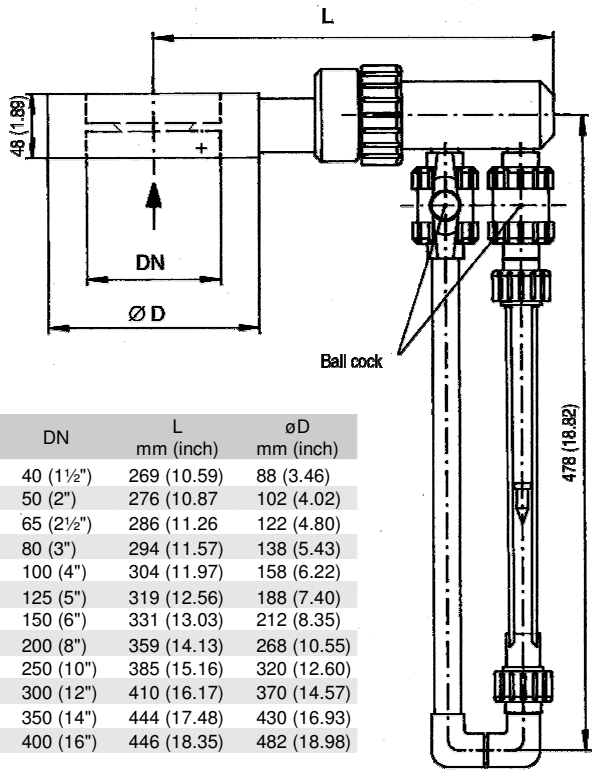
Technical Data TM N4

Measuring principle	Orifice plate as differential pressure sensor with variable area meter in bypass
Input	
Flow	any
Rated operating conditions	
Ambient conditions	
Temperature and pressure limits	
• With water and non-corrosive liquids	≤40 °C (104 °F) 10 bar (145 psi) 50 °C (122 °F) 6.25 bar (94.25 psi) 60 °C (140 °F) 2.5 bar (36.25 psi)
• With corrosive liquids	≤20 °C (68 °F) 10 bar (145 psi) 40 °C (104 °F) 4 bar (58 psi) 60 °C (140 °F) 1 bar (14.5 psi)
Medium conditions	
• Accuracy	±2 % of full scale value
• Measuring range	see table right
- for liquids	1.2 to 1,600 m³/h (5.28 to 7,045 USgpm) A special scale must be provided for liquids with a density other than 1 kg/l (62.43 lbs/cu.ft)
• Dimensions for measured variable	m³/h
Viscosity limits for all measuring ranges	1.0 to 1.3 mPas·s (cp)
Design	
Metering tube connections	ring between DIN-Flanges of nominal pressure rating PN 10/145 psi DN 40/1½“ to DN 400/16“ (DIN 2501)
Inlet and outlet pipe sections	according to DIN EN ISO 5167
Wetted parts materials	
Ring	PVC
Orifice plate	PVC, stainless steel, Mat.-No. 1.4571/316Ti, optional
Flow tube	Polyamid can be used with water up to +50 °C (140 °F), otherwise up to +60 °C (140 °F)or Polysulfon for use up to +60 °C (140 °F)
Ball cocks	PVC
Connection tube	PVC
Float	Stainless steel, Mat.-No. 1.4305/303, optional: stainless steel, Mat.-No. 1.4571/316Ti, PVC
Limits	Polysulfon
Gasket	Perbunan/Neopren
Bypass orifice plate	Stainless steel, Mat.-No. 1.4571/316Ti, optional PVC
Certificates and approvals	
Classification according to PED 97/23/EC	for liquids of fluid group 2; complies with requirements of article 3, paragraph 3 (sound engineering practice SEP)
Contacts	
K18 A	closes when the limit is fallen below
K 18 B	opens when the limit is fallen below
Housing/Plug	PP/PA 6
Contact material	Rhodium
Degree of protection	IP 65
Ambient temperature	-20 to +60 °C (-4 to 140 °F)
Max. switching frequency	5/min
Max. rating K18 A/B	AC 250 V / 0.5 A / 10 VA DC 250 V / 0.5 A / 5 W Rating data apply to resistive loads; a suppressor circuit is required for inductive loads.



DN	L mm (inch)	øD mm (inch)
40 (1½")	269 (10.59)	88 (3.46)
50 (2")	276 (10.87	102 (4.02)
65 (2½")	286 (11.26	122 (4.80)
80 (3")	294 (11.57)	138 (5.43)
100 (4")	304 (11.97)	158 (6.22)
125 (5")	319 (12.56)	188 (7.40)
150 (6")	331 (13.03)	212 (8.35)
200 (8")	359 (14.13)	268 (10.55)
250 (10")	385 (15.16)	320 (12.60)
300 (12")	410 (16.17)	370 (14.57)
350 (14")	444 (17.48)	430 (16.93)
400 (16")	446 (18.35)	482 (18.98)

Figure 3 TM N4, dimensions in mm (inch)

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Note of Application

It must be ensured that the materials selected for the parts of the meter coming into contact with the media are suitable for the used process media.

The device may only be used within the pressure and voltage limits specified on the identification plate.

Before replacing the measuring tubes, check that the device is free of hazardous media and pressures.

The device is primarily designed for steady loads.

The flow meter meets the requirements of Article 3 Paragraph 3 of the PED 97/23/EC. It must only be used for Group 2 liquids.

Measuring Range (Liquids)

Nominal diameter		Measuring range (Input pressure ≥ 0.5 bar (7.25 psi))		Pressure consumption		Diameter ratio	Weight	
DN	(inch)	m3/h	(Usgpm)	Δp mbar	(psi)	ß	kg	(lbs)
		1.2 to 6	(5.28 to 26.4)	335	(4.86)	0.48		
40	(1½)	2 to 10	(8.8 to 44)	275	(3.99)	0.60	1.5	(3.31)
		3.2 to 16	(14.1 to 70)	200	(2.90)	0.73		
		2 to 10	(8.8 to 44)	330	(4.79)	0.49		
50	(2)	3 to 15	(13.2 to 66)	280	(4.06)	0.59	1.6	(3.53)
		5 to 25	(22 to 110)	200	(2.90)	0.73		
		3.2 to 16	(14.1 to 70)	330	(4.79)	0.48		
65	(2½)	6 to 30	(26.4 to 132)	250	(3.63)	0.64	1.8	(3.97)
		8 to 40	(35 to 176)	210	(3.05)	0.72		
		5 to 25	(22 to 110)	330	(4.79	0.49		
80	(3)	10 to 50	(44 to 220)	240	(3.48	0.66	1.9	(4.19)
		13 to 65	(57 to 286)	200	(2.90)	0.74		
		10 to 50	(44 to 220)	300	(4.35)	0.55		
100	(4)	16 to 80	(70 to 352)	235	(3.41)	0.67	2.0	(4.41)
		20 to 100	(88 to 440)	200	(2.90)	0.73		
		13 to 65	(57 to 286)	325	(4.71)	0.50		
125	(5)	24 to120	(106 to 528)	245	(3.55)	0.66	2.3	(5.07)
		32 to 160	(141 to 704)	200	(2.90)	0.74		
		20 to 100	(88 to 440)	315	(4.57)	0.52		
150	(6)	32 to 160	(141 to 704)	245	(3.55)	0.64	2.5	(5.51)
		50 to 250	(220 to 1100)	180	(2.61)	0.76		
		34 to 170	(150 to 749)	320	(4.64)	0.51		
200	(8)	60 to 300	(264 to 1321)	250	(3.63)	0.65	3.1	(6.83)
		80 to 400	(352 to 1761)	200	(2.90)	0.73		
		50 to 250	(320 to 1100)	250	(3.63)	0.50		
250	(10)	80 to 400	(352 to 1321)	270	(3.92)	0.61	3.5	(7.72)
		130 to 650	(572 to 2862)	200	(2.83)	0.74		
		80 to 400	(352 to 1321)	315	(4.57)	0.52		
300	(12)	120 to 600	(528 to 2642)	265	(3.84)	0.62	4.1	(9.04)
		200 to 1000	(881 to 4403)	180	(2.61)	0.76		
		100 to 500	(440 to 2202)	325	(4.71)	0.50		
350	(14)	200 to 1000	(881 to 4403)	235	(3.41)	0.67	5.1	(11.24)
		270 to 1300	(1189 to 5724)	190	(2.76)	0.75		
		140 to 700	(616 to 3082)	320	(4.64)	0.51		
400	(16)	240 to 1200	(1057 to 5284)	250	(3.63)	0.65	5.8	(12.79)
		320 to 1600	(1409 to 7045)	200	(2.90)	0.73		

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