



## Measurements:

### Allocation of test items and tests

Test item-Nr.	DN	MOP	Type name	Connection ends, both sides	Check of dimensions acc. drawings
1	15	5	FLEXUM DN 15	internal thread Rp 1/2"	passed
2	20	5	FLEXUM DN 20	internal thread Rp 3/4"	passed
3	25	5	FLEXUM DN 25	internal thread Rp 1"	passed

### External leak tightness at receipt

test item	MOP	leakage rate at test pressure $P_T$ (max. 20 cm <sup>3</sup> /h)		test result
		$P_T = 6 \text{ mbar}$	$P_T = 7,5 \text{ bar}$	
1	5 bar	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	passed
2	5 bar	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	passed
3	5 bar	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	passed

Test conditions: Test method DIN EN 331, Pt. 7.2, detection of bubbles, test medium air, test time for each test pressure 10 min, 10 times using of armature, ambient temperature 17,5 °C

Allowed measurement uncertainty:

Leakage rate accuracy  $\pm 1 \text{ cm}^3$ , temperature  $\pm 1^\circ\text{C}$ , time  $\pm 1 \text{ s}$

### Internal leak tightness at receipt

test item	leakage rate at test pressure $P_T$ $P_T = 6 \text{ mbar}$ (max. 20 cm <sup>3</sup> /h)		leakage rate at test pressure $P_T$ $P_T = 7,5 \text{ bar}$		test result
	input side	output side	input side	output side	
1	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	passed
2	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	passed
3	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	passed

Test conditions: test method DIN EN 331, Pt. 7.2, detection of ascending air, test medium air, test time for each test pressure 10 min, armature in shut position, ambient temperature 17,5 °C

Allowed measurement uncertainty:

Leakage rate accuracy  $\pm 1 \text{ cm}^3$ , temperature  $\pm 1^\circ\text{C}$ , time  $\pm 1 \text{ s}$

There were no external or internal leakage or deformations at the test items by applying test pressures.



### **Actuating torque (6.4)**

test item	actuating torque				test result
	at 1. switching cycle at receipt at ambient temperature (max. 21 Nm)	at ambient temperature 20°C (max. 7 Nm)	at low temperature -20°C	At high Temperature +60°C	
1	1,5	1,0	1,7	1,0	passed
2	1,9	1,0	1,6	1,0	passed
3	5,1	2,5	2,8	2,3	passed

Test conditions: test method DIN EN 331, Pt. 7.4, ambient temperature 17,8 °C, 24 h storage after first switching cycle and at low temperature and high temperature, full pressure differential, rotation speed 5 min<sup>-1</sup>

Allowed measurement uncertainty: torque ±1%, temperature ±1°C, time ±1 s, rotation speed ±0,5 min<sup>-1</sup>

The test items fulfilled the requirements to the actuating torque.

### **Rated flow rate (6.3)**

test item	dimension	construction	requested minimum flow rate	measured flow rate	test result
1	DN 15	straight	5,0 m <sup>3</sup> /h	6,5 m <sup>3</sup> /h	passed
2	DN 20	straight	10,0 m <sup>3</sup> /h	13,0 m <sup>3</sup> /h	passed
3	DN 25	straight	16,0 m <sup>3</sup> /h	25,0 m <sup>3</sup> /h	passed

Test conditions: flow rate test rig, test medium: compressed air, inlet pressure 25 mbar, ambient temperature 19,7°C, pressure difference over the test sample 1,0 mbar, flow measurement device type Krohne

Allowed measurement uncertainty: temperature ± 2°C, pressure sensor class 0,1, flow rate ± 0,1%,

The test item fulfilled the requirements to rated flow.





### **Resistance test 7.6.3 / 7.6.4**

test item	nominal diameter	test	time	cracking / blistering / corrosion	tightness	test result
3	DN 25	Humidity test	48 h	no	tight	passed
3	DN 25	salt spray test (NSS)	96 h	no	tight	passed

Test conditions: test temperature Humidity test 40 °C; NSS test 35 °C

Allowed measurement

uncertainty: time  $\pm 1$  h, temperature Humidity test  $\pm 3$  K; NSS test  $\pm 1$  K

The test items fulfill the requirements of the chemical resistance

### **Permanent suitability (6.7)**

test item	quantity of switching cycles	flow rate (m <sup>3</sup> /h)	leakage rate (max. 20 cm <sup>3</sup> /h) internal (6mbar/7,5bar) and external (6mbar/7,5bar) at -20°C				leakage rate (max. 20 cm <sup>3</sup> /h) internal (6mbar/7,5bar) and external (6mbar/7,5bar) at 20°C				leakage rate (max. 20 cm <sup>3</sup> /h) internal (6mbar/7,5bar) and external (6mbar/7,5bar) at 60°C			
1	5000	0,25	0	0	0	0	0	0	0	0	0	0	0	0
			passed				passed				passed			
2	2500	0,50	0	0	0	0	0	0	0	0	0	0	0	0
			passed				passed				passed			
3	2500	0,80	0	0	0	0	0	0	0	0	0	0	0	0
			passed				passed				passed			

Test conditions: test method DIN EN 331, Pt. 7.6, test stand for permanent suitability, ambient temperature 18,1 °C, pressure 5 bar, rotation speed 5 min<sup>-1</sup>, temperature leak tightness -20°C/ 18,1 °C/ 60,1 °C, test of leak tightness with pressure of 6 mbar/7,5 bar, test time for each test pressure 10 min,

Allowed measurement

uncertainty: rotation speed  $\pm 0,5$  min<sup>-1</sup>, flow rate  $\pm 1$  %, Leakage rate  $\pm 5$  cm<sup>3</sup>/h, accuracy 1 cm<sup>3</sup>, torque  $\pm 1\%$  temperature  $\pm 1$  °C

The test items fulfilled the requirements to leak tightness and actuating torque after test of suitability.



### **Torsion- and bending resistance, leak tightness**

test item	torsion stress (MT) and bending stress (MF) (Nm)				actuating torque at (max. 7 Nm) during/after torsion /bending	leakage rate (max. 20 cm <sup>3</sup> /h) internal and external leak tightness at 6 mbar	leakage rate (max. 20 cm <sup>3</sup> /h) internal and external leak tightness at 7,5 bar
	MF <sub>1</sub>	MF <sub>2</sub>	MT <sub>1</sub>	MT <sub>2</sub>			
1	105	53	75	40	1,1 Nm / 1,2 Nm	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h
2	225	113	100	68	1,1 Nm / 1,2 Nm	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h
3	340	170	125	100	2,8 Nm / 2,4 Nm	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

Test conditions: test method DIN EN 331, Pt. 7.5.2, stresses selected in accordance with dimension, test time MT<sub>1</sub>/MF<sub>1</sub> = 10 s, MT<sub>2</sub>/MF<sub>2</sub> = 900 s, test with torsion/bending test rig, ambient temperature 20,4°C, test of leak tightness with pressure of 6 mbar/7,5 bar, test time for each test pressure 10 min

Allowed measurement uncertainty: Leakage rate ±5 cm<sup>3</sup>/h, accuracy 1 cm<sup>3</sup>, temperature ±1 °C, torque ±1%, pressure class 0.1

The test items fulfilled the requirements of torsion and bending resistance.



## Testing and measurement equipment

Kennzeichnung identification	Bezeichnung description	Meßgenauigkeit accuracy of measurement	Id.-nummer identification number	Letzte Kalibrierung Date last calibration	Kalibrierintervall Monate frequency of checks months
MG 0005-1	<b>Uhr-Messschieber</b> <i>sliding caliper</i>	± 0,1 mm	150724007	06.2013	36
MG 0041-1	<b>Stoppuhr</b> <b>1 / 100, 10 h</b> <i>Stop watch</i>	+ 1 s	9050	05.2012	24
MG 0014-2	<b>Stahlmaß 0 – 1000 mm</b> <i>Steel measure</i>	± 1,0 mm	427-56	07.2012	36
G 0011-1	<b>Federwaage</b> 0 – 10 Nm <i>Spring Balance</i>	± 0,3 %	-	03.2014	30
MG 0047-1	<b>Drehmomentaufnehmer</b> 6 – 30 Nm <i>Torque sensor</i>	± 1 %	KB00130	06.2012	24
G 0008-1	<b>Waage KC 120 Mettler Toledo</b> 0 – 120 kg <i>Balance KC 120</i>	± 1 g	S/N1937494	05.2014	18
P 0041-1	<b>Druckmessumformer DPS</b> 0 – 50 mbar <i>Digital manometer</i>	± 0,5 %	04204006ARO	09.2013	12
P 0056-1	<b>Druckmessumformer DPS</b> 0 – 10 bar <i>Pressure transducer</i>	± 0,5 %	SEN-8700-B085	01.2014	18
P 0120-1	<b>Druckmessumformer DPS</b> 0 - 2,5 mbar <i>Pressure transducer</i>	± 0,5 %	5090A068	01.2014	18
M 0013-1	<b>Schwimmerdurchflussmesser</b> <b>1,1 – 11 Nm³/h</b> <i>rotameter</i>	± 1 %	6/242914.001	05.2014	42
M 0066-1	<b>Schwimmerdurchflussmesser</b> <b>3,0 – 30 Nm³/h</b> <i>rotameter</i>	± 1,6 %	9/212870/001	05.2014	42
V 0015-2	<b>Eurotherm Chessell 5180V</b> <i>Eurotherm Chessell 5180V</i>	± 0,02 %	GE40154-001-003 4902 M20	01.2014	18
V 0010-1  mit	<b>Messgerät Almemo 2590-9</b> programmierbar, verschiedene Messbereiche <i>programmable diff. measuring ranges</i>	± 0,02 %	HR2030931	07.2012	48
T 0165-1	<b>Temperaturfühler PT100</b> Thermoelement, PT100 <i>Temperature sensor Thermocouple</i>	KL.B	12-5188	07.2012	48