CEN standard-draft
pr EN 12261

CEN standard-draft according to engl version from 06/1998

- Meter Classification
  - Pressure ratings, gas meter sizes, dimensions, temperature ranges
- Metrological performance requirements
  - Type testing, individual meter testing
- Design and material requirements
  - Robustness, resistance to environmental conditions, pressure and temperature tappings
- Meter output
  - Pulse generator, output shaft
- Marking
  - Data plate, direction of flow, working position, other connections

Q_{max}, Qmin, Nominal diameter

Permissible values

Q_{max} (m^3/h)	Rangeability 1:10	1:20	1:30	1:50	Nominal diameters DN A	B	C
	Q_{min} (m^3/h)						
40	4	2	1,3	0,8	25		50
65	6	3	2	1,3		50	
100	10	5	3	2		50	80
160	16	8	5	3	50	80	100
250	25	13	8	5		80	100
400	40	20	13	8	80	100	150
650	65	32	20	13	100	150	
1000	100	50	32	20		150	200
1600	160	80	50	32	150	200	250
2500	250	130	80	50	200	250	300
4000	400	200	130	80	250	300	400
6500	650	320	200	130	300	400	
10000	1000	500	320	200	400	500	
16000	1600	800	500	320	500	600	
25000	2500	1300	800	500	600	750	

A: high speed version, B: preferred diameter, C: low speed version

ELSTER AMCO

Pressure ratings, Connections, Dimensions, Temperature ranges

- recommended, approved pressures
  - 10 -16 - 20 - 25 - 40 - 50 - 100 - 150 - 250 - 420
- Inlet and outlet of the meter
  - Nominal diameter and connection type have got to be the same
- Overall length of the meter
  - preferred 3 DN, shall not be exceeded
  - shorter meters: manufacturer shall be able to provide “make up” pieces
- Temperature ranges
  - Gas and ambient temperatur temperature ranges shall be indicated
  - Gas temperature range at least -10 °C to +40 °C

Type testing I

- **Maximum permissible Errors:**

Flow rate Q	Maximum permissible errors
$Q_{min} \leq Q < Q_t$	± 2 %
$Q_t \leq Q \leq Q_{max}$	± 1 %

- **Transitional flow rate Q_t:**

Rangeability	Q_t
1 : 10	$0.20 \cdot Q_{max}$
1 : 20	$0.20 \cdot Q_{max}$
1 : 30	$0.15 \cdot Q_{max}$
≥ 1 : 50	$0.10 \cdot Q_{max}$

Type testing II

- **Test flow rates in % of Q_{max} :**

Rangeability			
1:10	1:20	1:30	1:50
			2
		3	
	5	5	5
10	10	10	
			15
25	25	25	25
40	40	40	40
70	70	70	70
100	100	100	100

- Measuring at $p_e \leq 4$ bar with gas under atmospheric conditions
- Measuring at $p_e > 4$ bar:
  - with gas in the range of the specified metering condition
  - at least at 2 pressures, i. e. close to the lowest and the highest pressure
  - at maximum pressure > 50 bar a test at 50 bar is deemed acceptable

Type testing III

- **Stability**
  - In the flow rate range from 0.25 Q_{max} to Q_{max} the variation of the error of indication of the meter at each flow rate shall stay within a span of 0.2%
- **Linearity**
- permissible difference between the highest and lowest error of indication

Flow rates 0.25 $Q_{max} \leq Q \leq Q_{max}$		
Size	Pressure	
	≤ 4 bar	> 4 bar
≤ DN 100	1.0 %	0.5 %
> DN 100	1.0 %	0.3 %

- **Pressure loss value**
  - Maximum pressure loss values at Q_{max} with atmospheric air

Nominal diameter	**Dp (Pa)**	**Dp (mbar)**
low speed version	1000	10
preferred diameter	1500	15
high speed version	2500	25

Type testing IV

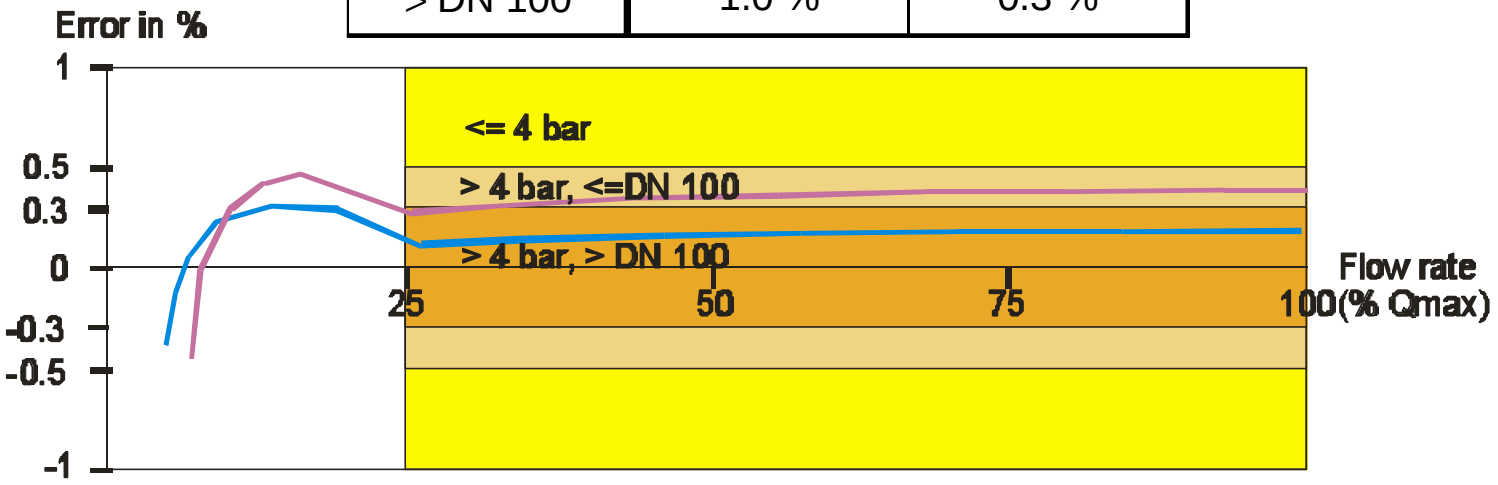
- **Durability**
  - Meters shall retain the accuracy within defined limits over their expected life
    - Difference in error of indication < 1/3 of the maximum permissible error
    - Endurance test corresponding to 1000 hours at Q_{max}
- **Temporary overload**
  - The meter shall run at a flow rate of 1.2 Q_{max} for a time period of 1 hour
    - Error of indication between 0.25 Q_{max} to Q_{max} at each flow rate shall stay within a span of 0.2%
- **Temperature range**
  - Indication of the range over which the meter is designed to perform within the standard performance specification shall be stated
    - Temperature range shall be at least from -10 °C to +40 °C

Individual meter testing I

- **Error of indication**
  - shall be within the maximum permissible errors (±1%, ±2%)
  - $p_e \leq 4$ bar: test carried out with a gas at near atmospheric conditions
  - $p_e > 4$ bar: test carried out with a gas as close as possible to the foreseen working pressure

- **Linearity**

flowrate 0.25 $Q_{max} \leq Q \leq Q_{max}$		
Size	Pressure	
	≤ 4 bar	> 4 bar
≤ DN 100	1.0 %	0.5 %
> DN 100	1.0 %	0.3 %



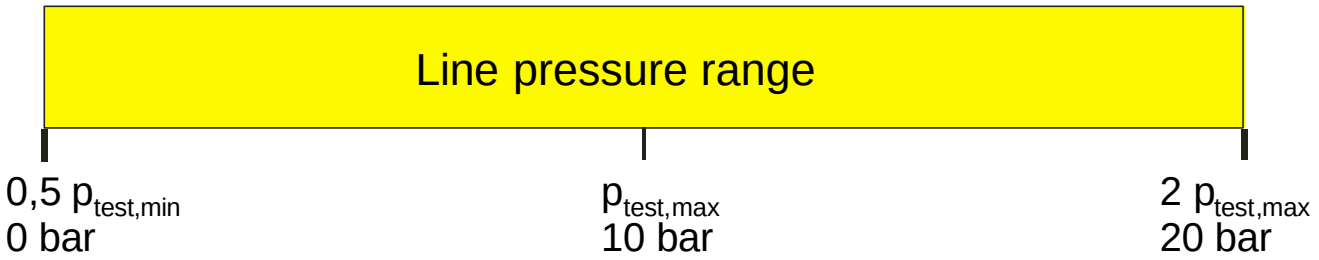
Individual meter testing II

- **Working pressure range**

number of tests	line pressure range
1 at atm. pressure	0 to 4 bar
1 at p_{test}	$0.5 \cdot p_{test}$ to $2.0 \cdot p_{test}$
≥ 2 between $p_{test,min}$ and $p_{test,\ max}$	$0.5 \cdot p_{test,min}$ to $2.0 \cdot p_{test,max}$

Example:

$p_{test,min}$ = atm. pressure, $p_{test,max}$ = 10 bar



Individual meter testing III

- **Adjustment of the meters**
  - after the determination of the errors of indication, turbine meters shall be adjusted so that the weighted mean error (WME) is as close to zero as the adjustment steps and the maximum permissible errors allow
  - The WME shall have a value between -0.4% und +0.4%

- **Calculation of WME**
  - When testing at different pressures the error figures taken into account for the calculation of WME shall be the ones obtained at the pressure closest to the foreseen working pressure

$$WME = \frac{SUM\,(Q_i / Q_{max}) \cdot E_i}{SUM\,(Q_i / Q_{max})}$$

Q_i / Q_{max} is the weighting factor
E_i is the error of indication at the flow rate Q_i
When $Q_i = Q_{max}$, a weighting factor of 0.4 instead of 1 shall be used

Individual meter testing IV

- **Test certificate**
  - shall be issued and shall include the following information:
    - the error of indication figures
    - the name and location of the test facility
    - the method of testing (bell prover, sonic nozzle, other meters)
    - the estimated uncertainty of the method
    - the nature and conditions of the test gas (pressure, temperature, density)
    - the mounting position of the meter during the test
    - adjustment gear wheels, pulse values

Measuring points, Meter output

- **Pressure tappings**
  - the tapping shall be identified as „p_m“
  - circular tappings shall have a bore diameter of not less than 3 mm and not greater than 10 mm
- **Temperature tappings**
  - where thermometer pocket is provided within the meter, this shall be marked distinct with „t_m“
  - if with „t_m“ marked thermometer pocket is provided in the meter this shall be used for the determination of the measuring temperature and the error calculation
- **Meter indication**
  - the indicating device shall operate satisfactorily and shall remain legible for the normal life of the meter under normal conditions and shall be visually inspected
  - if turbine meters are equipped with pulse generators these devices are regarded as an integral part of the gas meter
  - If pulse generators are operated magnetically, provision shall be made to prevent or detect tampering or interference by external magnetic fields

Marking

- **Data plate**
  - the data plate shall include at least the following information:

  - the EC type approval mark and number, if appropriate
  - the manufacturer's trade mark and/or trade name
  - the serial number and the year of manufacture of the turbine meter
  - the maximum design pressure: p_{max} = ... MPa (or bar)
  - the maximum flow rate: Q_{max} = ... m^3/h
  - the minimum flow rate: Q_{min} = m^3/h
  - the working temperature range t = ... - ... °C
  - the working pressure range: p = ... - ... MPa (or bar)
  - the number of this European Standard EN 12261

Spin-Test

- **Mechanical friction not essentially changed**
  - The meter should display no change in accuracy
- **Mechanical friction essentially changed**
  - Accuracy of the meter at low flow rates gets worse
  - Test:
    - Meter in normal working position
    - Rotate the turbine wheel at least 1/20 of the speed at Q_{max}
    - Determine the time from beginning of the movement up to the stop of the measuring wheel
    - Repeat the spin test at least three times and determine the mean average time
    - Compare with typical spin times given by the manufacturer
    - Other methods for the spin test are permissible, provided that the method is specified

Spin Times of Elster Turbine Meters

- **Table values are minimum values**
  - **Spin time longer: Meter operates well**
  - **Spin time shorter: Main bearings have to be checked for wear**

NOMINAL DIAMETER	ROTOR MATERIAL Plastic	ROTOR MATERIAL Aluminium
50 / 2"	-	2' 00"
80 / 3"	1' 30"	2' 00"
100 / 4"	2' 00"	2' 30"
150 / 6"	2' 30"	3' 30"
200 / 8"	-	4' 00"
250 / 10"	-	4' 30"
300 / 12"	-	4' 30"
400 / 16"	-	4' 30"