LENZ
*Fluid Power Specialist*

# Pressure gauge scale ranges
# Scale spacing and scale numbering per EN 837

The design of the scale depends on scale range, nominal size (NS, diameter of case) and accuracy class of a pressure gauge.

European norm EN 837-1 and EN 837-3 provide information about the design of dials with concentric scales. In addition to the scales which are in accordance with EN 837, of course all other scale ranges, double and multiple scales, as well as colored scales, etc., which are customary abroad, are also available.

**Scale ranges**
The preferred unit of pressure is bar.

**Pressure ranges in bar**

| | | | | |
|---|---|---|---|---|
| 0 ... 0.6 | 0 ... 1 | 0 ... 1.6 | 0 ... 2.5 | 0 ... 4 |
| 0 ... 6 | 0 ... 10 | 0 ... 16 | 0 ... 25 | 0 ... 40 |
| 0 ... 60 | 0 ... 100 | 0 ... 160 | 0 ... 250 | 0 ... 400 |
| 0 ... 600 | 0 ... 1000 | 0 ... 1600 | | |

**Pressure ranges in mbar**

| | | |
|---|---|---|
| 0 ... 1 | 0 ... 10 | 0 ... 100 |
| 0 ... 1.6 | 0 ... 16 | 0 ... 160 |
| 0 ... 2.5 | 0 ... 25 | 0 ... 250 |
| 0 ... 4 | 0 ... 40 | 0 ... 400 |
| 0 ... 6 | 0 ... 60 | 0 ... 600 |

**Vacuum ranges in bar**
Vacuum gauges have anti-clockwise pointer travel with increasing vacuum.

-0.6 ... 0 -1 ... 0

**Vacuum ranges in mbar**

| | | |
|---|---|---|
| -1 ... 0 | -10 ... 0 | -100 ... 0 |
| -1.6 ... 0 | -16 ... 0 | -160 ... 0 |
| -2.5 ... 0 | -25 ... 0 | -250 ... 0 |
| -4 ... 0 | -40 ... 0 | -400 ... 0 |
| -6 ... 0 | -60 ... 0 | -600 ... 0 |

**Combined pressure and vacuum ranges in bar**

-1 ... +0.6 -1 ... +1.5 -1 ... +3 -1 ... +5 -1 ... +9
-1 ... +15-1 ... +24

as well as corresponding combined pressure and vacuum ranges in mbar.

**Nominal sizes**
Nominal sizes (NS) of gauges are as follows: 40, 50, 63, 80, 100, 160 and 250

**Accuracy classes**
The accuracy class stating the limits of permissible error is expressed as a percentage of the span. The following accuracy classes are defined: 0.1, 0.25, 0.6, 1, 1.6, 2.5 and 4.

For gauges with a pointer stop the accuracy class will cover from 10% to 100% of the scale range.
For gauges with a free zero the accuracy class will cover from 0% to 100% of the scale range.

**Assignment of accuracy classes to nominal sizes**

| Nominal Size | Accuracy class 0.1 | 0.25 | 0.6 | 1 | 1.6 | 2.5 | 4 |
|---|---|---|---|---|---|---|---|
| 40 and 50 | | | | | x | x | x |
| 63 | | | | x | x | x | x |
| 80 | | | | x | x | x | |
| 100 | | | | x | x | x | |
| 160 | | x | x | x | x | | |
| 250 | x | x | x | x | x | | |

The total errors of indication at reference temperature 20°C of the gauge shall not exceed the values given in the following table.

| Accuracy class | Limits of permissible error (percentage of span) |
|---|---|
| 0.1 | ± 0.1 % |
| 0.25 | ± 0.25 % |
| 0.6 | ± 0.6 % |
| 1 | ± 1 % |
| 1.6 | ± 1.6 % |
| 2.5 | ± 2.5 % |
| 4± | 4 % |

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**Scale interval**
The minimum number of minor scale divisions for each accuracy class and nominal size of gauge are shown in the following table:

| Scale (pressure range) | Nominal Size (NS) | Minimum number of minor scale divisions Accuracy classes 0.1 | 0.25 | 0.6 | 1 | 1.6 | 2.5 | 4 |
|---|---|---|---|---|---|---|---|---|
| 0 to 100 | 40 | | | | | 20 | 20 | 20 |
| | 50 | | | | | 20 | 20 | 20 |
| | 63 | | | | 20 | 20 | 20 | 20 |
| | 80 | | | | 50 | 50 | 50 | 50 |
| | 100 | | | 100 | 50 | 50 | | |
| | 160 | | 200 | 100 | 50 | 50 | | |
| | 250 | 500 | 200 | 100 | 50 | 50 | | |
| 0 to 160 | 40 | | | | | 32 | 32 | 32 |
| | 50 | | | | | 32 | 32 | 32 |
| | 63 | | | | 32 | 32 | 32 | 32 |
| | 80 | | | | 32 | 32 | 32 | 32 |
| | 100 | | | 80 | 32 | 32 | | |
| | 160 | | 160 | 80 | 32 | 32 | | |
| | 250 | 320 | 320 | 80 | 32 | 32 | | |
| 0 to 250 | 40 | | | | | 25 | 25 | 25 |
| | 50 | | | | | 25 | 25 | 25 |
| | 63 | | | | 25 | 25 | 25 | 25 |
| | 80 | | | | 50 | 50 | 50 | 50 |
| | 100 | | | 125 | 50 | 50 | | |
| | 160 | | 125 | 125 | 50 | 50 | | |
| | 250 | 500 | 250 | 125 | 50 | 50 | | |

| Scale (pressure range) | Nominal Size (NS) | Minimum number of minor scale divisions Accuracy classes 0.1 | 0.25 | 0.6 | 1 | 1.6 | 2.5 | 4 |
|---|---|---|---|---|---|---|---|---|
| 0 to 400 | 40 | | | | | 20 | 20 | 20 |
| | 50 | | | | | 20 | 20 | 20 |
| | 63 | | | | 20 | 20 | 20 | 20 |
| | 80 | | | | 40 | 40 | 40 | 40 |
| | 100 | | | 80 | 40 | 40 | | |
| | 160 | | 200 | 200 | 40 | 40 | | |
| | 250 | 400 | 200 | 200 | 40 | 40 | | |
| 0 to 600 | 40 | | | | | 30 | 30 | 30 |
| | 50 | | | | | 30 | 30 | 30 |
| | 63 | | | | 30 | 30 | 30 | 30 |
| | 80 | | | | 60 | 60 | 60 | 60 |
| | 100 | | | 120 | 60 | 60 | | |
| | 160 | | 120 | 120 | 60 | 60 | | |
| | 250 | 300 | 300 | 120 | 60 | 60 | | |

Scale spacing: ≥ 1 mm.
Thickness of the scale marks: ≤ 1/5 of the scale spacing.

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# Examples of scale spacings and scale numberings

Example 1: accuracy classes from 1 to 4

| Nominal Size (NS) | Scale (pressure range) | Scale spacing and scale numbering | | | | | | | Scale interval | Number of minor divisions |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| 63 | 0 ... 1 | 0 | 0.2 | 0.4 | 0.6 | 0.8 | 1 | | 0.05 | |
| | 0 ... 10 | 0 | 2 | 4 | 6 | 8 | 10 | | 0.5 | |
| | 0 ... 100 | 0 | 20 | 40 | 60 | 80 | 100 | | 5 | 20 |
| | 0 ... 1000 | 0 | 200 | 400 | 600 | 800 | 1000 | | 50 | |
| | -1 ... 0 | -1 | - 0.8 | -0.6 | -0.4 | -0.2 | 0 | | 0.05 | |
| | -1 ... 0 ... +9 | -1 | 0 1 2 3 4 5 6 7 8 9 | | | | | | 0.5 | |
| 80 | | | | | | | | | | |
| 100 | | | | | | | | | | |
| 160 | 0 ... 2.5 | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | | 0.05 | |
| 250 | 0 ... 25 | 0 | 5 | 10 | 15 | 20 | 25 | | 0.5 | |
| | 0 ... 250 | 0 | 50 | 100 | 150 | 200 | 250 | | 5 | |
| | 0 ... 2500 | 0 | 500 | 1000 | 1500 | 2000 | 2500 | | 50 | 50 |
| | -1 ... 0 ... +1.5 | -1 | -0.5 | 0 | 0.5 | 1 | 1.5 | | 0.05 | |
| | -1 ... 0 ... +24 | -1 0 | 5 | 10 | 15 | 20 | 24 | | 0.5 | |
| 80 | | | | | | | | | | |
| 100 | | | | | | | | | | |
| 160 | 0 ... 0.6 | 0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.01 | |
| 250 | 0 ... 6 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 0.1 | |
| | 0 ... 60 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 1 | 60 |
| | 0 ... 600 | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 10 | |
| | -0.6 ... 0 | -0.6 | -0.5 | -0.4 | -0.3 | -0.2 | -0.1 | 0 | 0.01 | |
| | -1 ... 0 ... +5 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 0.1 | |

Example 2: accuracy class 0.6

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 160 | | | | | | | | | |
| 250 | 0 ... 4 | 0 | 0.5 | 1 | 3 | 3.5 | 4 | 0.02 | |
| | 0 ... 40 | 0 | 5 | 10 | 30 | 35 | 40 | 0.2 | |
| | 0 ... 400 | 0 | 50 | 100 | 300 | 350 | 400 | 2 | 200 |
| | 0 ... 4000 | 0 | 500 | 1000 | 3000 | 3500 | 4000 | 20 | |
| | -1 ... 0 ... +3 | -1 | -0.5 | 0 | 2 | 2.5 | 3 | 0.02 | |

Example 3: accuracy class 0.25

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 250 | | | | | | | | | |
| | 0 ... 1.6 | 0 | 0.1 | 0.2 | 1.3 | 1.4 | 1.5 | 1.6 | 0.005 |
| | 0 ... 16 | 0 | 1 | 2 | 13 | 14 | 15 | 16 | 0.05 |
| | 0 ...160 | 0 | 10 | 20 | 130 | 140 | 150 | 160 | 0.5 | 320 |
| | 0 ... 1600 | 0 | 100 | 200 | 1300 | 1400 | 1500 | 1600 | 5 |
| | -1 ... 0 ... +0.6 | -1 | -0.9 | -0.8 | 0.3 | 0.4 | 0.5 | 0.6 | 0.005 |
| | -1 ... 0 ... +15 | -1 | 0 | 1 | 12 | 13 | 14 | 15 | 0.05 |