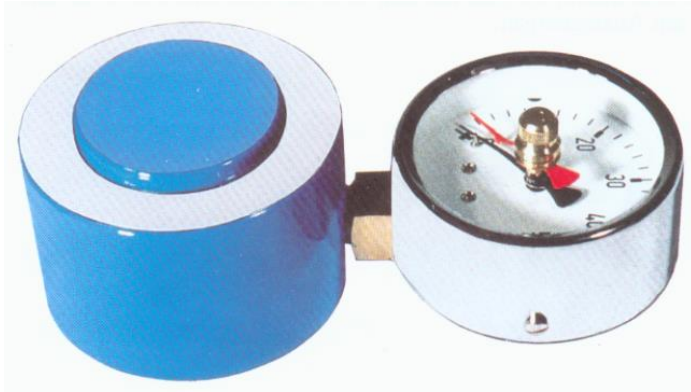


FORCE MEASURING SYSTEMS

hydraulic and hydraulic-electric precision load cell *)



General Description

a) Applications

Mechanical engineering: measuring static or dynamic loads on production machinery and equipment such as machine tools (1), rolling mill stands, paper calendering rolls (2), hobbing machines (3), hydraulic presses and press brakes (4), tensile testing machines (5), car brake testing stands, torque meters.

Civil engineering: measuring pressures exerted by heavy structures such as bridges, bunkers, dams, etc.

Mining: measuring the roof load acting on pit props (6).

Weighing systems: Weighing of tanks, bins, hoppers for totalising weight, controlling process and batching operations, monitoring minimum and maximum levels, etc. (7) and (8). Weighbridges for road and rail vehicles (9).

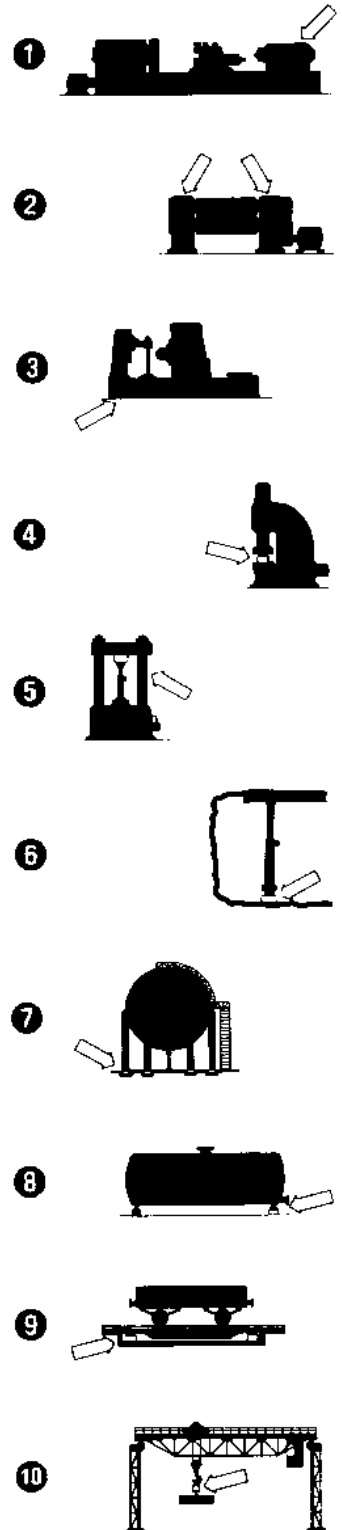
For further details, see leaflet WEIGHING SYSTEMS:

Tension load cells are used for measuring cable tension in lifting and hauling equipment or as crane weight indicators (10).

For further details, see leaflet WEIGHING SYSTEMS.

*) Low-price standard load cells giving accuracies of between 1% and 1,6% are available, but in fewer models.

Further details are given in leaflet D 38.



b) Design

Hydraulic load cells consist essentially of a cylindrical or ring-type capsule with piston and a specially developed oil- and acid-resistant diaphragm which hermetically seals the fluid system. On loading the piston, the pressure generated in the fluid is transmitted via the diaphragm to the indicator gauge. The stroke of the piston does not exceed 1 mm.

Indicators have scales calibrated in N, kN oder MN and are normally available in diameters of 63 mm, 100 mm or 160 mm.

Hydraulic load cells, owing to their simple and robust design, are insensitive to shock and vibration and yet provide high-accuracy readings; they can be used in ambient temperatures ranging from -20°C to +50°C. Higher temperature resistance is offered, on request.

c) Remote Indication

Capillary tubing of between 2 and 15 m length can be used to transmit the load cell output to the indicator or recorder. This 4 mm dia. tubing is available in copper or steel, provided with stainless steel covering, if necessary.

d) Electrical Contact Units

Indicators and certain types of recorders can be provided with electrical contact units designed to give visual or audible signals whenever the actual load exceeds or falls below a pre-set value.

For type selection, see leaflet EK 01.

e) Pressure Transmitter

The load cells can also be equipped with a pressure transmitter and digital indicator.

f) Hydraulic Line Coupling (Reg. Design)

Capillaries of greater length can be provided with a self-sealing coupling at any point between load cell and indicator (recorder) to facilitate the installation on machinery.

Further details are given in the Operating Instructions.

g) Accuracy

Indicator readings normally are accurate to $\pm 1\%$ of full scale or, in special cases, to $\pm 0,6\%$, always provided the load to be measured is acting centrally and normal to the piston face. To ensure this, the cell must be mounted in perfectly horizontal position and parallel to the upper and lower compression faces. The load must act on the full piston face and the piston must not be subjected to side loads or shear forces.

Additional instruments cause the accuracy to decrease. Detailed information is given on request.

h) Overload Capacity / Overload Protection / Shock Load Damping

To determine the correct measuring range and to prevent overloading, multiply the maximum service load by 1.2 if the load is static, or by 1.5 if the load is dynamic, and choose the next higher standard range. Normally, pressure gauges can be loaded to full scale. If desired, we supply pressure gauges that can be subjected to **short-cycle** overloads equal to 1.2 times the full scale.

A dual snubber can be incorporated to dampen out shock loads in both directions.

For further details, see leaflet MZ 02-01.

i) Other Features

Pressure gauges are also available in outdoor design; they can be arranged in any position or can be fitted with a maximum pointer and any special scale or scale graduation. This publication covers our normal range of load cells. If other designs are required, please give detailed information on proposed application, location (outdoors?), service pressure, desired or permissible size, etc.-If load cell is to be installed on a machine, send drawing or detail drawing of the machine.

The load cells described herein are not suitable for measuring shock loads on high-speed presses.

This application requires the use of electrical output load cells with peak-load storage.

k) Special-Purpose Load Cells

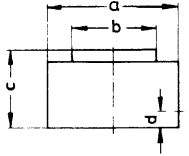
Clamping force sensors; see leaflet D 30.

l) Operating Instructions

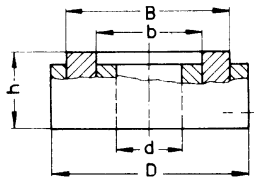
See leaflet BA-D 11.

Typical Designs

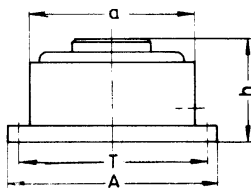
Load Cell



1. cylindrical type

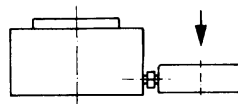


2. ring type

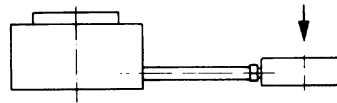


3. special type for weighing systems

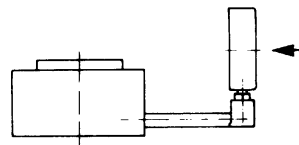
Gauge Connection



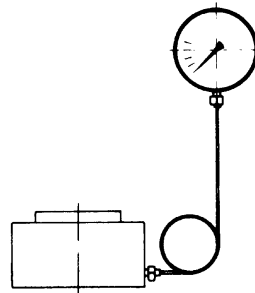
1. rigid



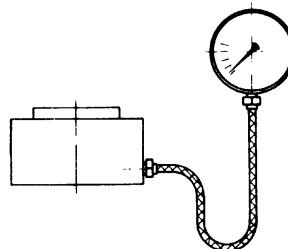
2. rigid, extended



3. rigid, with angular extension



4. cooper or steel capillary tubing as hydraulic line



5. high-pressure hose as hydraulic line

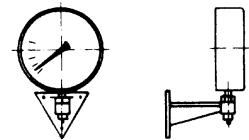
Gauge Type



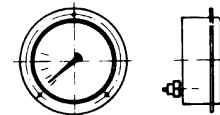
1. circular gauge, Ø100 mm, Ø160 mm, as standard



2. circular gauge for surface-mounting, Ø100 mm, Ø160 mm,



3. circular gauge with wall bracket



4. circular gauge for flush-mounting, with front ring A, Ø100, Ø160 mm

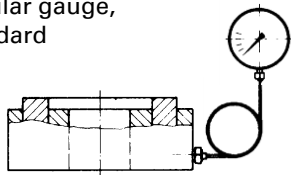


5. circular gauge for flush-mounting, with rear rim and front ring B, Ø100, Ø160 mm

How to order:

Example: Type 5.2.4.7

- 5 = load cell system
- 2 = ring-type load cell
- 4 = capillary tubing
- 1 = circular gauge, standard



In addition, please specify:

Example: Size of gauge = Ø 160 mm

- a) self-sealing coupling, if desired
- b) size of gauge
- c) if gauge (item 1-5) shall be of corrosion-resistant standard type, Ø 100 u. Ø 160
- d) if gauge indicator ist o be fitted with electrical contacts or other devices

Range of Types

Cylindrical Load Cells

Type	Range limit		Scale- graduation 1)	Dimensions in mm for load cell				Net- weight kg 2)
	kN / MN	kp / Mp		a	b	c	d	
N / 0,6	0 – 0,6 kN	0 – 60 kp	0,01 kN	65	30	65	22	2,6
N / 1,0	0 – 1,0 kN	0 – 100kp	0,02 kN	65	30	65	22	2,6
N / 1,6	0 – 1,6 kN	0 – 160 kp	0,05 kN	65	30	65	22	2,6
N / 2,5	0 – 2,5 kN	0 – 250 kp	0,05 kN	65	30	65	22	2,6
N / 4,0	0 – 4,0 kN	0 – 400 kp	0,10 kN	65	30	65	22	2,6
N / 6,0	0 – 6,0 kN	0 – 600 kp	0,10 kN	100	50	75	23	5,5
N / 10,0	0 – 10 kN	0 – 1,0 Mp	0,20 kN	100	50	75	23	5,5
N / 16,0	0 – 16 kN	0 – 1,6 Mp	0,50 kN	100	50	75	23	5,5
N / 25,0	0 – 25 kN	0 – 2,5 Mp	0,50 kN	100	50	75	23	5,5
N / 40,0	0 – 40 kN	0 – 4,0 Mp	1,00 kN	100	50	75	23	5,5
N / 60	0 – 60 kN	0 – 6,0 Mp	1,00 kN	160	100	100	28	16,0
N / 100	0 – 100 kN	0 – 10 Mp	2,00 kN	160	100	100	28	16,0
N / 160	0 – 160 kN	0 – 16 Mp	5,00 kN	160	100	100	28	16,0
N / 250	0 – 250 kN	0 – 25 Mp	5,00 kN	160	100	100	28	16,0
N / 400	0 – 400 kN	0 – 40 Mp	10,00 kN	160	100	100	28	16,0
N / 600	0 – 600 kN	0 – 60 Mp	10,00 kN	160	100	100	28	16,0
N / 1000	0 – 1,0 MN	0 – 100 Mp	0,02 MN	200	140	110	30	27,0
N / 1600	0 – 1,6 MN	0 – 160 Mp	0,05 MN	240	170	120	30	40,0
N / 2500	0 – 2,5 MN	0 – 250 Mp	0,05 MN	290	210	130	30	62,0
N / 4000	0 – 4,0 MN	0 – 400 MP	0,10 MN	350	270	130	30	90,0
N / 6000	0 – 6,0 MN	0 – 600 MP	0,10 MN	370	270	130	35	102,0
N / 10000	0 – 10 MN	0 – 1000 Mp	0,20 MN	470	350	165	55	210,0

- 1) Finely subdivided scale or 160 mm dia. precision gauge optional.
- 2) Net weight for load cells with indicator gauge 100 mm dia.

Ring-type Load Cells

These types are made to customer's specification. Dimension D shall be at least $d + 120$ mm and the depth between 70 and 75 mm, if possible. In special cases where lack of space forbids the use of a cell size conforming to the above diameter/depth ratio, please state the required load range and the space available for installation.

Dimensions of Circular Gauges

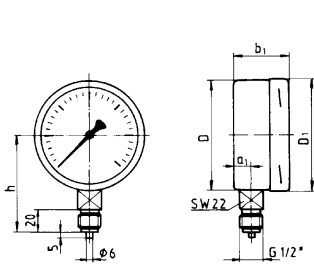


Fig. 101

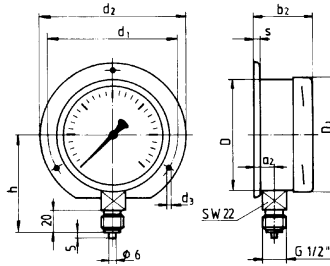


Fig. 102

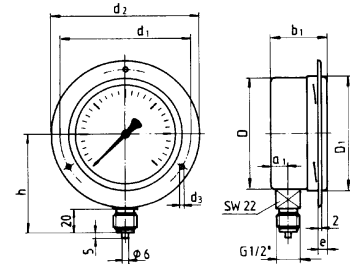


Fig. 103

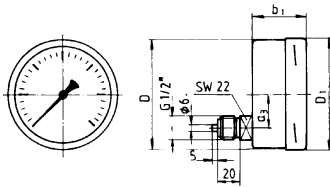


Fig. 104

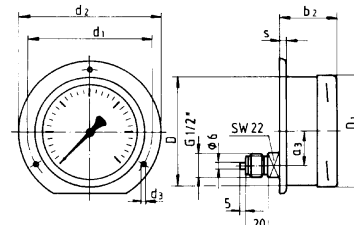


Fig. 105

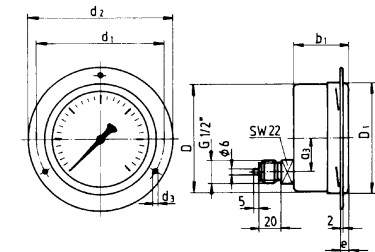


Fig. 106

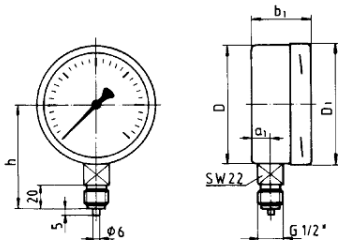


Fig. 107

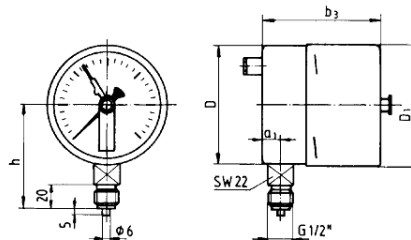


Fig. 108

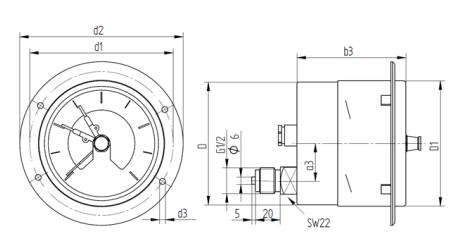


Fig. 109

Nom. Size D in mm	Dimensions in mm														
						b ₃									
	a ₁	a ₂	a ₃	b ₁	b ₂	Single-Contact	Double-Contact	D	D ₁	d ₁	d ₂	d ₃	e	h	s
100	15,5	19	30	49,5	53	87	87	99	101	116	132	4,8	5,5	87	6
160	15,5	19	30	49,5	53	87	87	159	161	178	196	5,8	7	118	6

Fig. 101 = standard gauge to DIN 16 064, Style A, with bottom connection

Fig. 102 = same as Fig. 101, with back rim for surface-mounting, to DIN 16 064, style B

Fig. 103 = same as Fig. 101, with front ring for flush-mounting, to DIN 16 280, style A

Fig. 104 = with eccentric rear connection

Fig. 105 = same as Fig. 104, with back rim for surface-mounting, to DIN 16 064, style B

Fig. 106 = same as Fig. 104, with front ring for flush-mounting, to DIN 16 280, style A

Fig. 107 = stainless steel gauge, with bottom connection

Fig. 108 = contact-making gauge (Fig. 101 with contacts, rear cable inlet)

Fig. 109 = contact-making gauge (Fig. 107 with contacts)