SIEMENS

SIWAREX R

Mounting units of series CC

Instruction Manual **Revision 08/2009**

SIEMENS

SIWAREX R

Mounting element for load cells of series CC

Instruction Manual

Chapter Overview

Warning and Safety Terms

DANGER

means, that death, severe injury to persons or damage to equipment **will** be caused, if the respective safety measures have not been taken.

WARNING

means, that death or severe injury **can** be caused, if the respective safety measures are not taken.

CAUTION

with a warning triangle means that failure to take the necessary precautions may lead to minor injury.

CAUTION

without a warning triangle means that failure to take the necessary precautions may lead to property damage.

IMPORTANT

Means that failure to observe the appropriate instructions may lead to an undesirable result or condition.

NOTE

means a notice concerning possible advantages of conforming with the recommendation.

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General

Please read this manual before starting work! It contains important notes and data, the observance of which will assure the general safety and functionality of this device. This makes handling of this product much easier for you and produces reliable measuring results.

Intended Utilization

Intended utilization means that this product is only to be utilized within the limitations defined in the technical specifications and purposes of use in this operating manual.
There are no dangers associated with this device when conforming with the safety notes and the intended utilization.
The fail-safe and secure operation of this device depends on proper transportation, storage, installation and assembly as well as on careful operation and commissioning.

Proper operation of this device can only be ensured if the specifications provided in technical data are observed.
Improper handling can cause death, bodily harm and damage to equipment.

Notes on Product Liability

We expressly point out that the nature of the product is described exclusively and conclusively in the sales contract. The contents of this product documentation are not part of an earlier or existing agreement, acceptance or legal relationship nor do they affect these in any way. All obligations of Siemens result from the contract of purchase, which also contains the full and solely valid liability agreement. The conditions for liability for defects defined in the contract of sale are neither extended nor restricted by this document.

Delivery Notes

The respective scope of delivery is listed on the enclosed shipping documents according to the valid contract of sale.
Please observe the instructions printed on the packaging when opening. Check that the delivered goods are complete and undamaged. In particular, compare the order number on the type plate with the order data.

Qualified Personnel

Qualified personnel, in regards to the safety-related information in this manual and the product itself, are persons who are familiar with the installation, assembly, commissioning and operation of this product. They must be authorized and qualified to install, put into operation and maintain devices, systems and circuits in accordance with national safety rules and regulations.

Brand names / Trademarks

SIWAREX ® is a registered trademark of Siemens AG.

The other designations in this manual may be trade marks, which if used by third parties, may infringe upon the rights of the proprietor.

1. General Conditions for Installation and Assembly

1.1 Lift-off Protection

Lift-off protections prevent the top plates being lifted from the load cells or permanently built-in load cells being overloaded by tension in the direction opposite to the measuring direction. Lift-off protections are necessary if there is a danger of the load carrier being lifted or tipped. This is possible with light high containers or with silos that are not affixed for example.
Lift-off protections are integrated in the combination mounting units of series CC. Lift-off protections may have to be constructed when using other mounting units. One suggested solution for a lift-off protection is shown in fig. 1-1. The dimension X indicates the possible lift-off path of the load carrier. The bore ØD must be greater than the pin diameter Ød. The movement of the load carrier may not be obstructed.

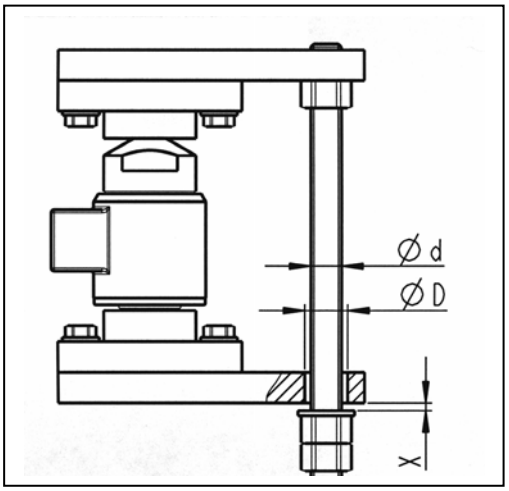


Fig 1-1 Lift-off protection solution suggestion

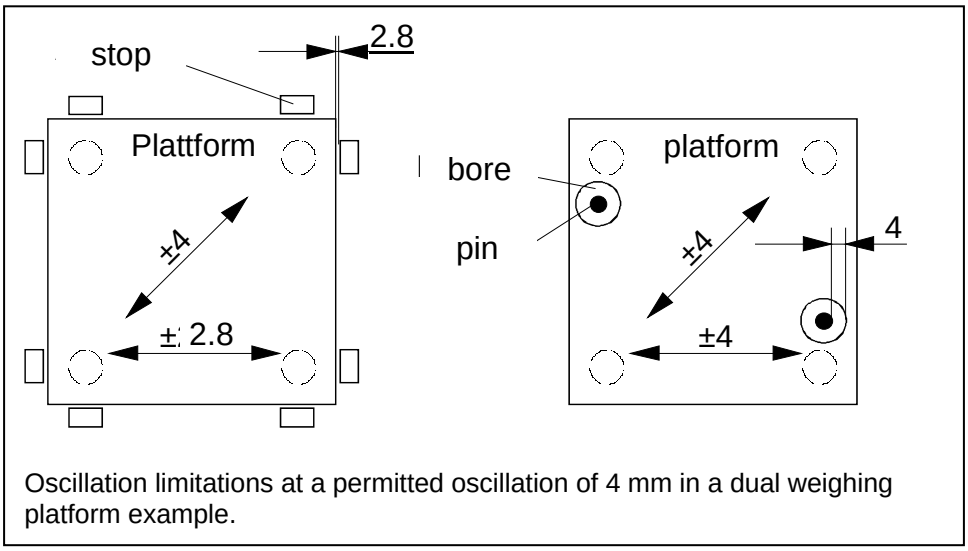
1.2 Overload Protection

Overload protection is to be understood as the protection of load cells against too high a load in direction of measurement. Transverse forces may also occur which exceed the load capacity limit of the load cells.

Overload protection in the direction of measurement
Load cells are usually protected against vertical overloading by placing a stop bolt under the force transmission. The measurement path of the load cell is then limited. The danger of unintentional overloading is not as high in load cells with high rated loads. Possible additional loads can already be taken into account in dimensioning of the load cells.
Another way of protecting load cells from overloading is in over-dimensioning the load cells.

Overload protection from the side
Cross-forces exist because of wind, filling procedures, acceleration or conveyor belt friction for example. If these forces exceed certain values, the load cells must be protected.
The CC cell forms a self-centering pendulum brace together with the force guiding pieces of the pendulum bearing or the combination mounting unit. This transmits the weight force directly into the load cells. The self-aligning bearing and combination mounting units allow lateral movement of the load carrier or a change in its length as a result of thermal expansion up to a certain degree. They generate a restoring force according to the deflection which re-centers the position of the load carrier. This freedom of movement is expressly wished and is necessary for accurate weighing. If the transverse force is so high that it overcomes the restoring force of the pendulum brace up to the deflection limit, appropriate safety precautions must be taken.

These could be oscillation limitations or guidings (see chapter 1.3). Pendulum limits must be designed or set so that the permissible deflection cannot be exceeded on all sides. In Fig. 1-2, this is displayed in two examples.



Oscillation limitations at a permitted oscillation of 4 mm in a dual weighing platform example.

Fig. 1-2 Oscillation limitation example

Pendulum limits are integrated in the combination mounting units of the load cells of series CC.

CAUTION

When using weighing cells with low nominal loads, overload protections are to be used, cross-directional as well, in order to protect the cells from damage.
The use of load cells above the maximum working load or the maximum lateral load can lead to irreparable faults or damage to the load cells or the mounting unit.

1.3 Guidings

Guidings take up transverse forces. They allow no lateral movement of the load carrier. At the same time they may not be tensioned by changes in the distance between contact points (e.g. thermal expansion). Figure 1-3 shows the ideal arrangement of guidings. They are used for example when the weight needs to be determined under the effects of a transverse force.
Guidings must be installed exactly at right angles to the direction of action of the load cells so that no force components are produced in the direction of measurement. Stretching the guidings is best avoided when they are positioned with the same direction of rotation. To fasten a load carrier or a hopper in a static position, three guidings will suffice. With four guidings there is a risk that they are tensioned in relation to each other and induce a weighing error. If four guidings are to be used nevertheless, they must be installed with sufficient clearance.

The guidings should correspond with the principles used in the weighing technology. Round-head bolt guides for up to 1000 kN lateral load are also available upon request.

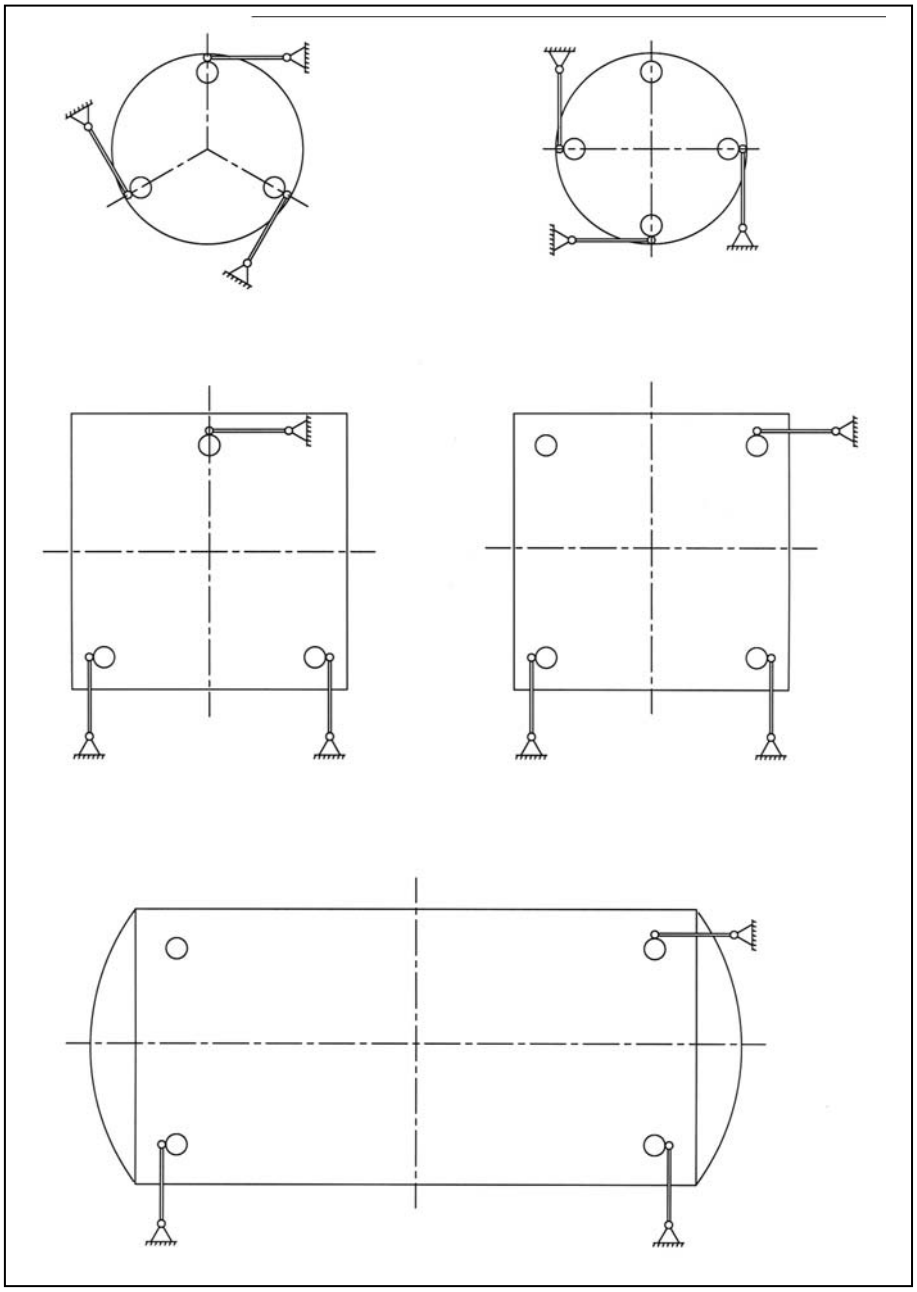


Fig. 1-3 Guiding Positioning

1.4 Load Cell Dummies

Load cells are sensitive sensors. To protect them from damage, they should only be handled as late as possible for installation and transport. During installation and transport, these should be replaced by dummies or phantoms. Dummies can be constructed as follows for example:

1. **A replica of the mounting element using a welded construction.**
   A pipe or any other steel profile can be welded between two plates with the respective hole format for the fastening bolts. The total height corresponds to the installation height of the mounting element. This is the safest and most stable version. Rough assembly work can be performed.

2. **Using a SIWAREX R combination mounting unit.**
   The combination mounting units are supplied as completely assembled units. The units are set approximately to the installation height of the operable unit. Light assembly work can be performed.

1.5 Load Cell Handling

DANGER

Load cells and mounting units are not machine elements that are constructed using standard safety factors. It is therefore absolutely necessary to prepare for the potential danger with respective supports or other means of protection.

CAUTION

To protect against undesirable electrical current, such as static discharge that can occur during welding or which can be caused by lighting for example, the load cells should be bridged with highly flexible grounding cables (e.g. SIWAREX R grounding cable 7MH3 701-1AA1).

SIWAREX R load cells may only be installed and connected by qualified personnel.

Load cells are precision components and are to be handled carefully. Pay special attention during transport and assembly.

CAUTION

Mechanical jolts or dropping could irreparably damage the load cells.
Load cells are not to be carried by their connecting cables.

Loads must be introduced precisely in the direction of measurement of the load cells. Torsion and bending moments, eccentric loading and lateral loads are disturbance forces that lead to incorrect measurements and can cause damage if exceeding the permitted limitations of the load cells and mounting elements.
The mounting components allow enough play in movement that thermal expansion does not lead to lateral loading.

1.6 Welding and Installation Work

As long as installation work is not complete on the scale, the load cells should be replaced with dummies to protect them from jolts or welding current.

CAUTION

If welding is required after installing the load cells, make absolutely sure that the welding current is not routed through the load cells. The ground clamp of the welder is to be securely connected in the direct vicinity of the point to be welded. The load cells must be bridged with a grounding cable. The individual load cells are to be disconnected. The free cable ends should be insulated.

1.7 Mounting

Load cells are never to be overloaded. Slowly put the load carrier on. Especially with load cells having lower rated loads, there is a danger that external forces during installation, e.g. tightening counter nuts, will bend the load cell bodies.

WARNING

Proper tools are to be used for lifting the load carrier. Ensure that the respective safety regulations are followed.

NOTE

Molded brackets or eyebolts should exist on the load carrier for the proper utilization of lifting instruments.

If overload security mechanisms are available, set them up so that the desire load can be taken on safely. They must permit an unrestricted increase in weight up to the set weight.
The gap between the load cell and the overload protection is to be guarded from contamination and icing.
Overload protections must be checked for perfect setting within the scope of regular maintenance.

DANGER

Contaminated, icy or incorrectly set overload protection will create blockages which cause incorrect measurements or can cause injury or damage to the machinery by overloading the scale.

CAUTION

Proper assembly and installation of load cells and mounting elements is to be ensured by checking the assembly dimensions and freedom of movement for example. Incorrect assembly can cause damage to load cells and mounting elements.
Ensure that the cable is not damaged, disconnected or separated.
Wrap and hang the cable in a loop hanging down on vertical cable mounts to divert any moisture away from connections.

1.8 Installation Surfaces

The following conditions are to be met for mounting element installation surfaces:

- The position and slope deviation of the installation surfaces to one-another should correspond with the general tolerances for welded constructions, EN ISO 13920.
- The foundation must be absolutely solid and unable to sink. Level steel plates should be cast in concrete foundations on which the mounting elements are installed.
- The fastening surfaces must be vertical to the direction of measurement and preferably in one plane.

If there are more than three mounting points, then the suspension is normally statically indeterminate. It is inevitable that the load will not be evenly distributed over all load cells on a stiff foundation with stiff load carriers. Two diagonally positioned load cells support the main load. The other cells merely support the load carrier. There are two ways to consider this:

1. By over-dimensioning the load cells
The rated load of the load cells is calculated so that the overall weight can be supported on two load cells using four mounting points for example.
This will also prevent load cell overloading if there is a possibility of the foundation sinking.

2. Mounting point height adjustment
The output signals of all load cells are determined one after the other when they are loaded. In order to achieve similar load on all of them, spacer plates are used to adjust the height. The spacer plates are pushed in between the brackets and the top plate of the mounting element for the best results.
The output signals of the individual load cells correspond with load distribution. The output signals are measured as follows:
Disconnect load cell lines SIG+ and SIG-.

- Supply the load cells with the supply voltage (e.g. 10.2V).
- Measure the output voltage between SIG+ and SIG- on each individual load cell.
- Now put spacer plates under the brackets for the load cell with the lowest value until the output voltages match.

The load cell seat must be horizontal, level over the full-coverage and like the load cell underside, absolutely clean.

The contact surface that introduces the force is to be coated with high-performance grease.

1.9 Dismantling

When dismantling the load cells, the same safety and security measures are to be followed as for the installation and assembly.

- All power supply lines are to be switched off.
- Secure the load carrier from falling.
- User appropriate lifting mechanisms and tools.
- Take all load off of the load cells and carefully remove them without any excessive force (no jolting movements).
- Do not cut the cable if the load cells are to be used again or if being sent in for repair.
- To not step on or pull on the cable for moving the load cells.

1.10 Explosion Protection

The mounting elements of the load cells hold no potential risk of explosion. They are therefore not subject to the EC directive 94/9 EG (ATEX).

2 Self-aligning Bearing

2.1 Technical Description

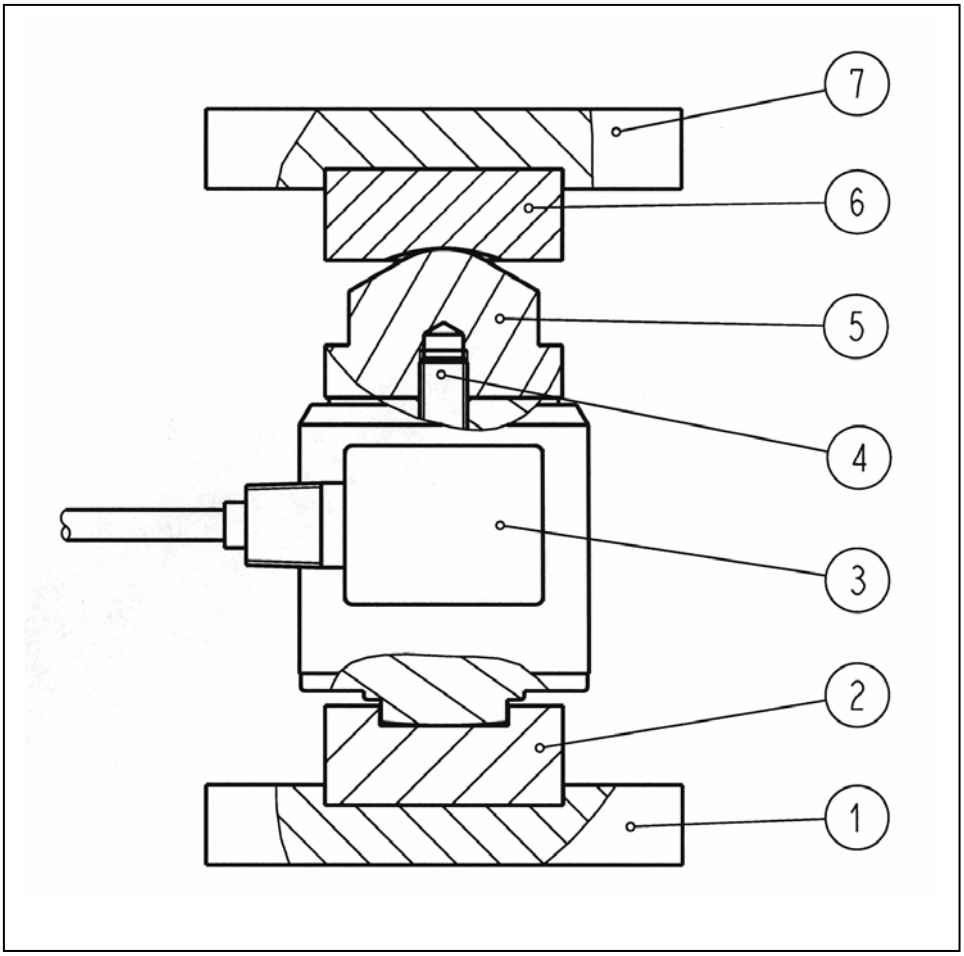
2.1.1 Application Range

The self-aligning bearing serves for direct force transmission into the load cell.
This has a self-centering effect on the load carrier.

2.1.2 Construction

A complete pendulum bearing unit consists of the order units load cell and self-aligning bearing.
The load cell (3) is between the force guiding pieces (2) and (6) the base (1) and top plate (7). Base (1) and top plate (7) are bolted to the foundation or the load carrier. Another force guiding piece (5) is firmly bolted to the load cell (3). These form a self-centering pendulum brace. Lateral deflections of the load carrier are therefore possible and permissible up to a certain degree. The deflection induces a restoring force through the pendulum brace which returns the load carrier to the rest position.

(numbering, see fig. 2-1)



No.	Designation
1	Base plate
2	Force guiding piece base plate
3	Load cell
4	Threaded pin
5	Force guiding piece load cell
6	Force guiding piece top plate
7	Top plate

Fig. 2-1 Structure of self-aligning bearing

2.2 Assembly

The installation conditions differ greatly. The dead weight of the load carrier may be very low or relatively high. It could be a hopper, a platform or a conveyor for example. The following assembly instructions can only be taken as general guidelines.

WARNING

Proper tools are to be used for lifting the load carrier. Ensure that the respective safety regulations are followed.

The load carrier should always be built on dummies to begin with, so that the load cells are protected from damages during assembly. The load carrier may then only be lifted a few millimeters from bracket to bracket to position the self-aligning bearing. The following description of assembly procedures is based on this situation.

Assembly procedure: (numbering see Fig. 2-2)

1. **Load cell preparation:**
   - A data sheet is supplied with every load cell with the calibration values for that load cell. This is found in a supply pocket which is stuck on the packaging. Take the data sheet and store it in a safe place.
   - Unpack the load cell.

2. **Prepare the self-aligning bearing:**
   - Unpack the self-aligning bearing.
     A delivery unit consists of:
     - Two mounting plates
       - base plate (1)
       - top plate (7)
     - force guiding piece base plate (2)
     - force guiding piece load cell (5)
     - force guiding piece top plate (6)
     - threaded pin (4)

3. **Assemble the pendulum brace:**

NOTE

Please follow the guidelines from chapter 1.5 Load Cell Handling when working with load cells.

CAUTION

An incorrect or incomplete assembly can result in damaging load cells, mounting components and the load carrier.

DANGER

A falling load carrier can result in death, severe injury or damage to equipment depending on exposure.

- Bolt the force guiding piece (5) with the threaded pin (4) firmly to the load cell (3).
- Coat the ball surfaces of the force guiding piece (5) and the load cell (3) with ball bearing grease.

4. **Install the pendulum bearing unit:**
   - Loosen the bolted connections of all dummies.
   - Lift the load carrier at the first bracket by 5 mm and remove the dummy.
   - Fix the top plate (7) under the fastening bracket.
   - Fix the base plate (1) to the foundation plate.
   - Insert the force guiding piece for base plate (2) in the base plate (1).
   - Insert the load cell (3) in the force guiding piece for base plate (2).
   - Place the force guiding piece for top plate (6) on the force guiding piece of the load cell (5).
   - Insert the force guiding piece for top plate (6) in the recess in the top plate (7) and hold with a suitable tool.
   - Lower the load carrier slightly making sure that the force guiding piece of the load cell (5) sets down firmly in the pan of the force guiding piece of the top plate (6).
   - Insert the other pendulum bearing units as described.
   - Check whether the load cells are as vertical as possible.

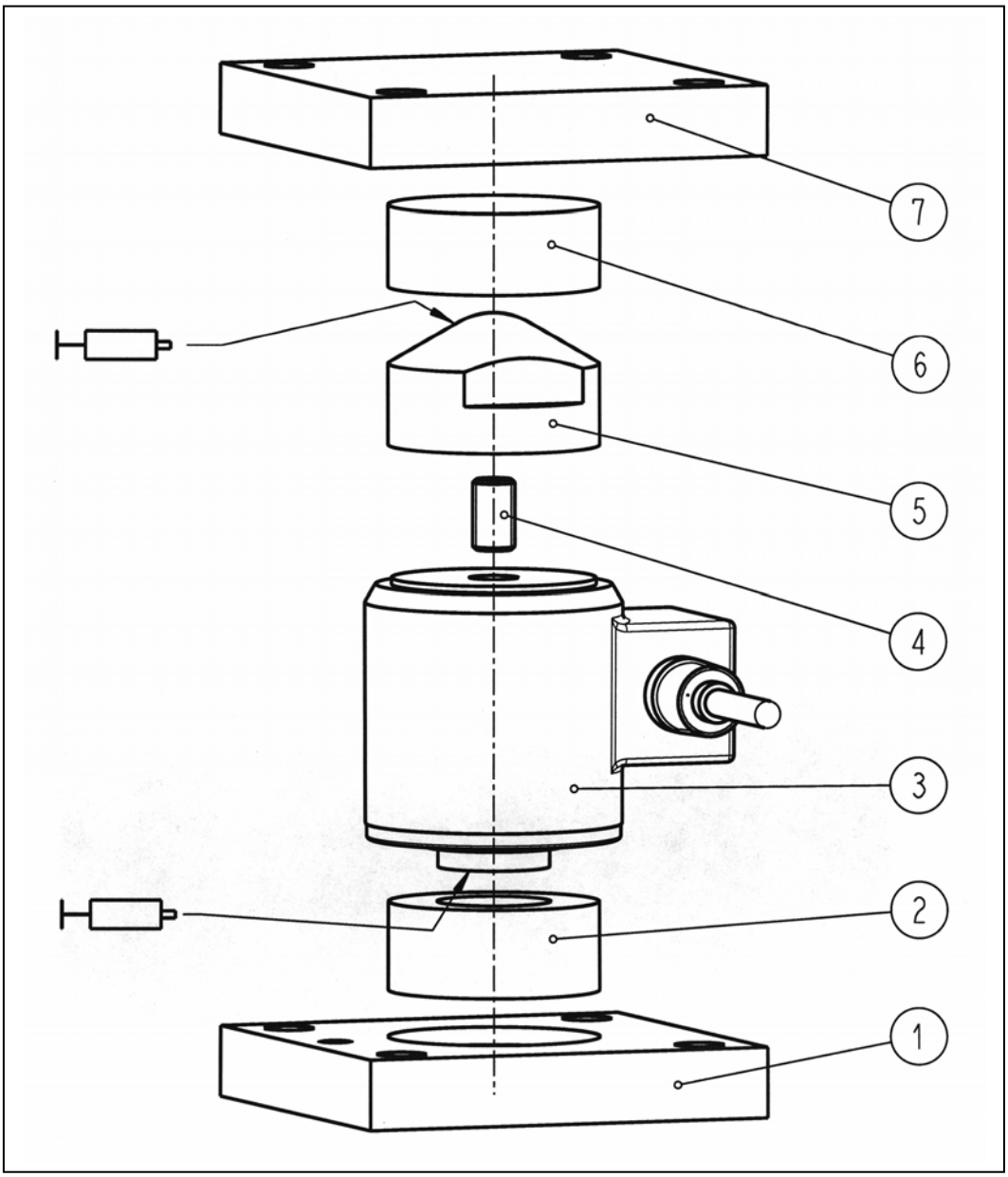


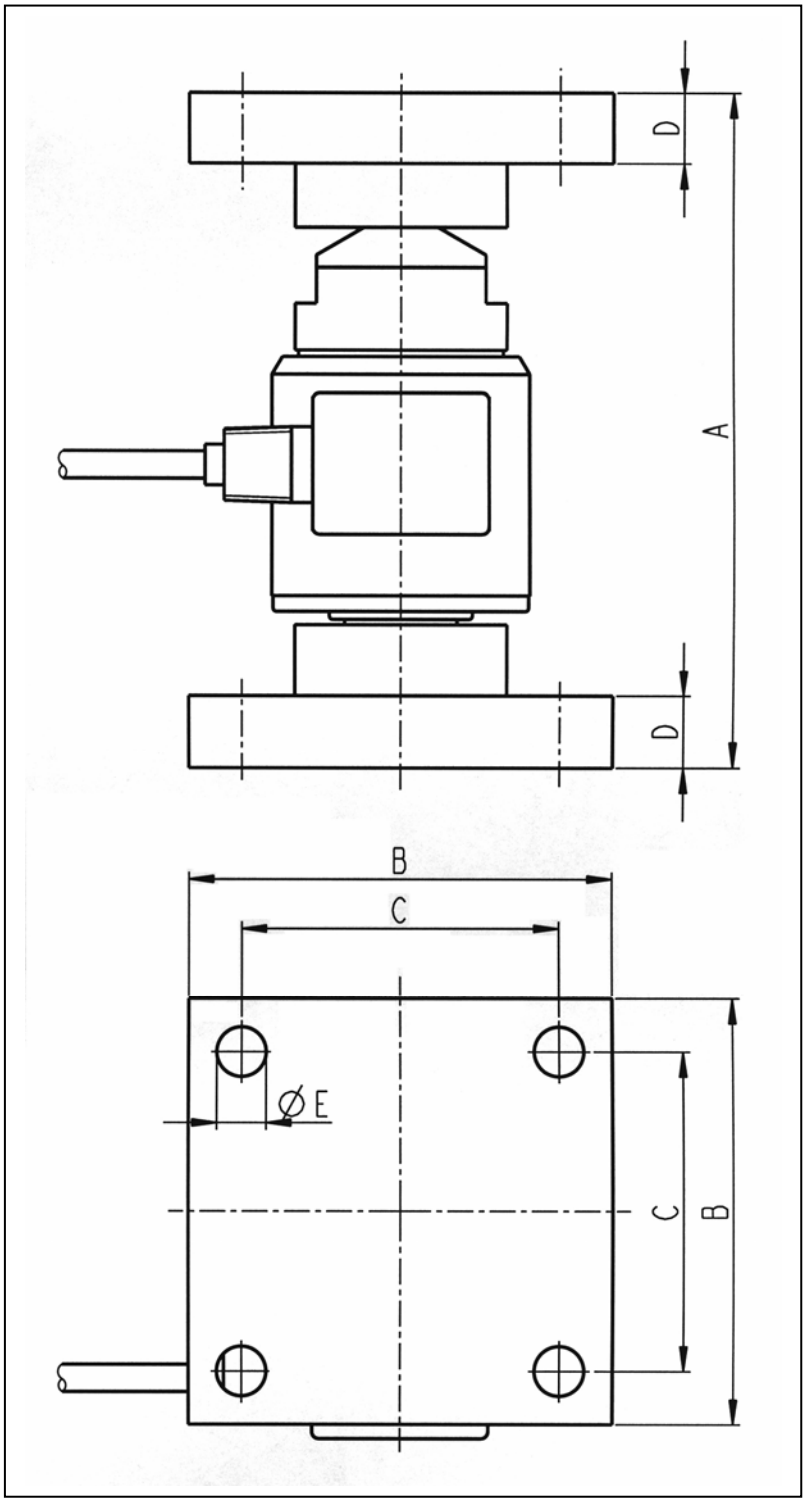
Fig. 2-2 Assembly of the self-aligning bearing

2.3 Technical Data

2.3.1 Function Data

Rated load	**10t ... 100t**
Permitted transverse movement	± 8 mm
Restoring force pro mm deflection	0.5 % of the applied load

2.3.2 Dimensions



Rated load	A	B	C	D	ØE	Notice
10t, 25t	190	120	90	20	14	
40t, 60t	274	160	110	30	18	
40t, 60t	254	200	140	30	26	Assembly dimensions according to self-aligning bearing RN 60t
100t	385	200	150	40	18	

Fig. 2-4 Dimensions of the self-aligning bearing

2.4 Care and Maintenance

The self-aligning bearings must be checked depending on the ambient conditions. In case of heavy contamination by dust, dirt, moisture etc. the maintenance intervals must be chosen accordingly. These are to be kept free of coarse contamination. The ball surfaces of the force guiding pieces must be re-greased if necessary.

2.5 Ordering Data

Self-aligning bearing for load cells with a rated load of	**Order number Self-aligning bearing**	**Notice**
10t, 25t	7MH4 136-5EA11	
40t, 60t	7MH4 136-5LA11	
40t, 60t	7MH4 136-5LA12	Assembly dimensions according to self-aligning bearing RN 60t
100t	7MH4 136-6AA11	

The order numbers above do not include the load cells.

3 Combination Mounting Unit

3.1 Technical Description

3.1.1 Application Range

Combination mounting units are for direct force transmission to the load cells.
These are self-centering on the load carrier.

The combination mounting units have the following features:

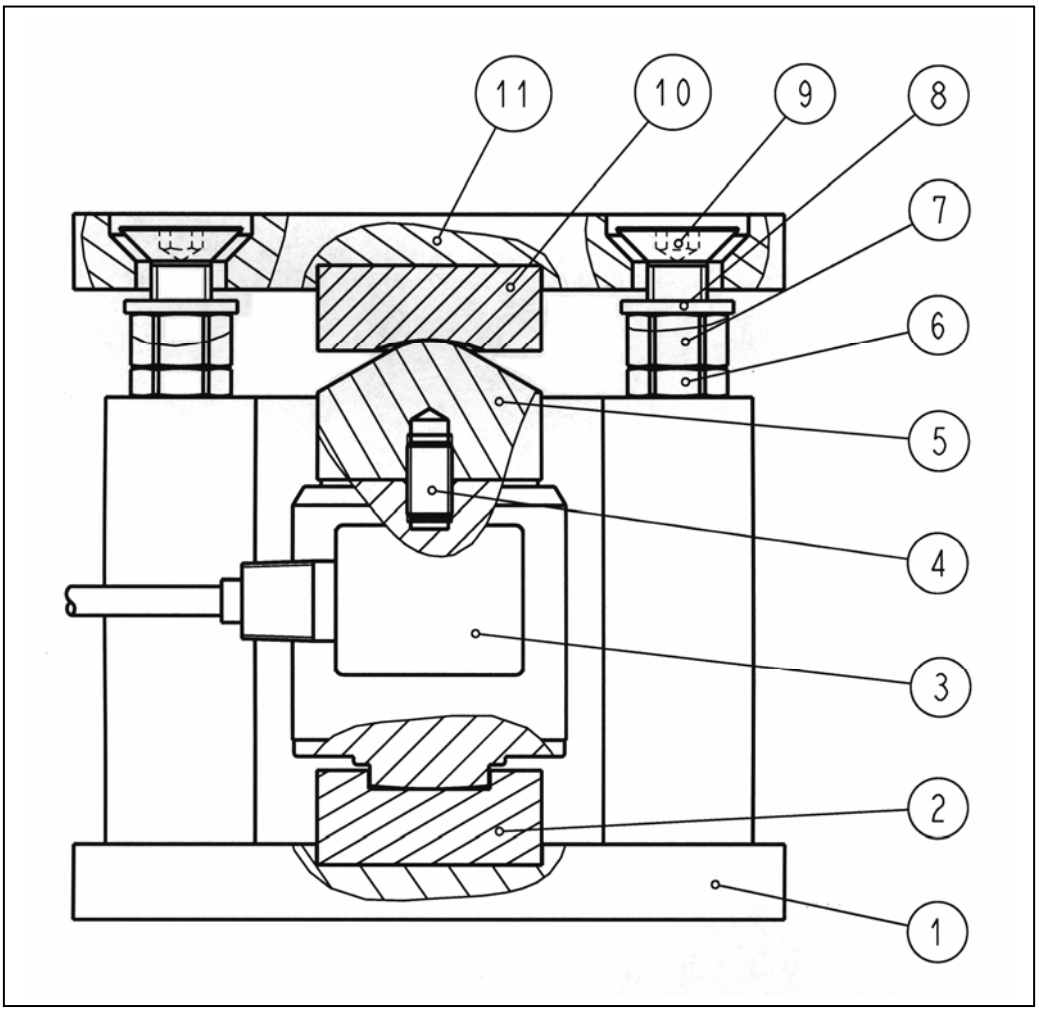
- Integrated oscillation limitation.
- Integrated lift-off protection.
- Integrated overload protection
- Can be used as dummy for light assembly work.
- Slow, controlled lowering of the top plate.
- Can be used as transport locking device by affixing the top plate to protect the load cells.

3.1.2 Construction

The combination mounting unit consists of the base and top plates and two counter-sunk bolts as oscillation limitation and lift-off protection. Combined with the load cell, it is a multifunctional storage unit.

The load cell (3) is between the force guiding pieces (2) and (10) of the base (1) and top plate (11). Base (1) and top plate (11) are bolted to the foundation or the load carrier. Another force guiding piece (5) is firmly bolted to the load cell. They form a self-centering pendulum brace. Lateral deflections of the load carrier are therefore possible and permissible up to a certain degree. The deflection induces a restoring force through the pendulum brace which returns the load carrier to the rest position.
The counter-sunk bolts (9) limit the possible deflection of the top plate (11). Their second function is to prevent the top plate from being lifted.

(Numbering see Fig. 3-1)



No.	Designation
1	Base plate
2	Force guiding piece base plate
3	Load cell
4	Threaded pin
5	Force guiding piece load cell
6	Hexagon nut, low form
7	Hexagon nut
8	Washer
9	Counter-sunk bolt
10	Force guiding piece top plate
11	Top plate

Fig. 3-1 Structure of combination mounting unit

3.2 Assembly

The installation conditions differ greatly. The dead weight of the load carrier may be very low or relatively high. It could be a hopper, a platform or a conveyor for example. The following assembly instructions can only be taken as general guidelines.

WARNING

Proper tools are to be used for lifting the load carrier. Ensure that the respective safety regulations are followed.

The load carrier should always be built on dummies to begin with, so that the load cells are protected from damages during assembly. The load carrier must then only be lifted a few millimeters from bracket to bracket to position the combination mounting unit. The following description of assembly is based on this situation.

Assembly procedure: (numbering see Fig. 3-2)

1. Load cell preparation:

- A data sheet is supplied with every load cell with the calibration values for that load cell. This is found in a supply pocket which is stuck on the packaging. Take the data sheet and store it in a safe place.
- Unpack the load cell.

2. Combination Mounting Unit preparation:

NOTE

The counter-sunk bolts (9) must be used to set the lifting distance of the top plate (11) to approx. 5 mm, see dimension X in fig. 3-4. It is easiest to set the lift-off distance before installing the load cell. The combination mounting unit need not be dismantled to install the load cell.
The combination mounting units are pre-assembled before delivery. Adjust the top plate (11) with the two counter-sunk bolts (9) and the two nuts (6) and (7) to mounting height:

Rated load	**10t, 25t**	**40t, 60t**
Functional installation height	188 mm	273 mm
+ lifting distance	5 mm	5 mm
= installation height	193 mm	278 mm

These preparations and following the handling procedures as described in the following prevent any extra work in adjusting later.
When using the combination mounting units as dummies this 5 mm height allowance must be taken into account or set afterwards.

- Unpack the combination mounting unit.
  Scope of delivery:
  - Combination mounting unit, mounted, (10t, 25t with grounding cable)
  - Set of force guiding pieces (2), (5) and (10)
  - Threaded pin (4)
- Set lifting distance of the top plate (11) as described above.

3. Installing the Combination Mounting Unit:

NOTE

Please follow the guidelines from chapter 1.5 Load Cell Handling when working with load cells.

CAUTION

An incorrect or incomplete assembly can result in damaging load cells, mounting components and the load carrier.

DANGER

A falling load carrier can result in death, severe injury or damage to equipment depending on exposure.

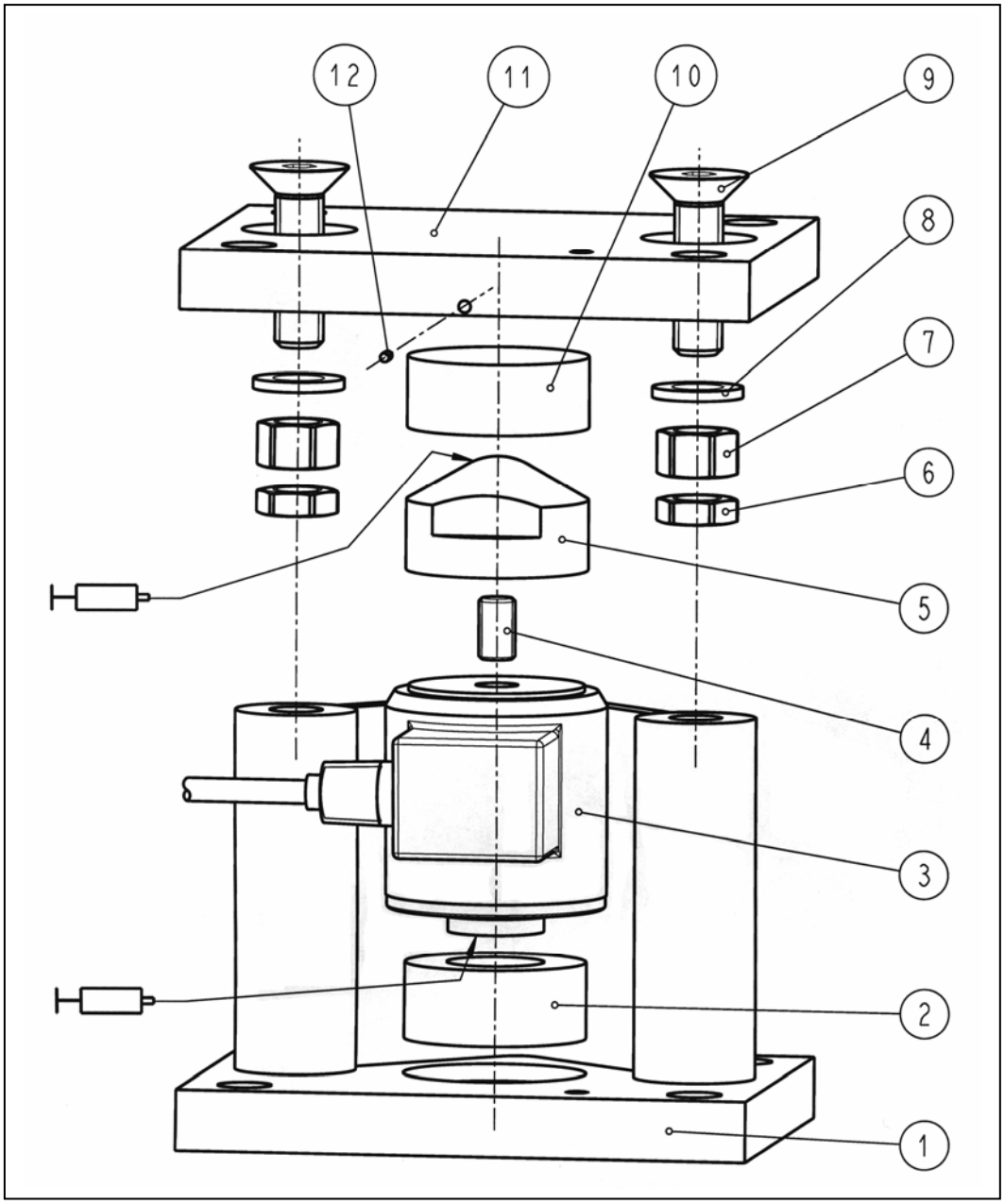


Fig. 3-2 Mounting the combination mounting unit

- Loosen the bolts on the dummies.
- Lift the load carrier from the first bracket and remove the dummy.
- Set the combination mounting unit in place and loosely install the fastening bolts.
- Insert other combination mounting units and push in fastening bolts loosely.
- Tighten the fastening bolts.
- Insert the load cell in the combination mounting unit.
- Loosen the nuts (7) half a turn all the way round until the load carrier is lowered completely onto the load cells.
- Turn nut (7) to nut (6) and tighten.

5. Assembly Inspection:

- The load carrier must be able to swing freely.
- The counter-sunk bolts (9) should be in the center of the bores in the top plate (11) if possible. The top plate therefore has optimal freedom of movement on all sides and no secondary forces can be generated.
- The counter-sunk bolts (9) may not protrude past the top plate (11).

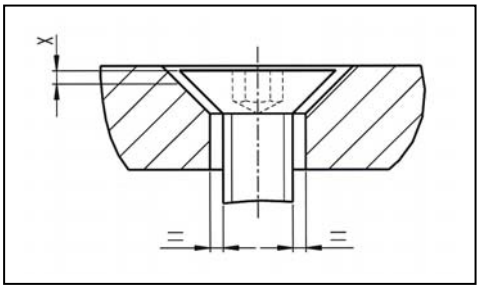


Fig. 3-4 Overload Protection and Oscillation Limitation

DANGER

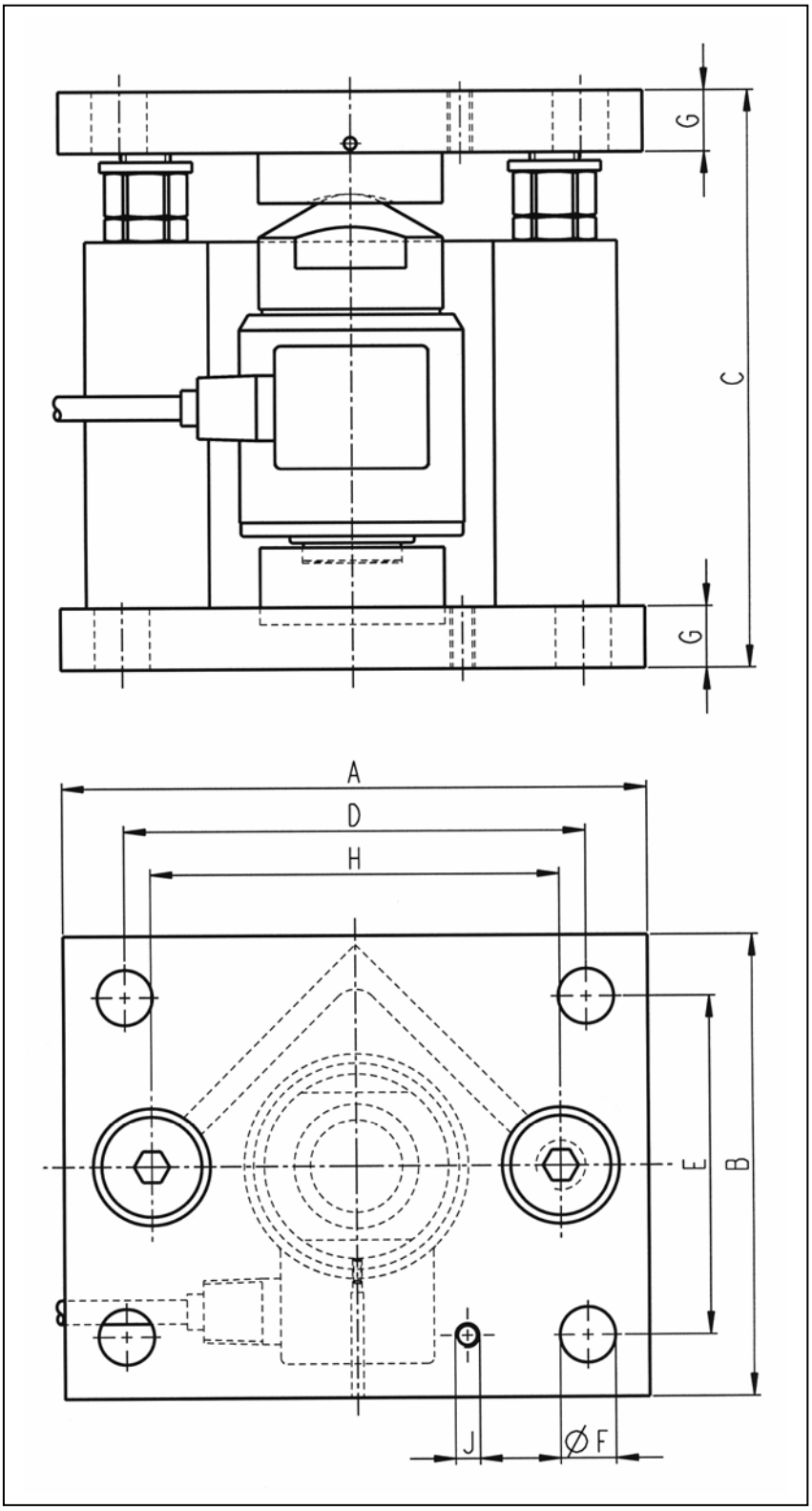
Incorrectly adjusted counter-sunk bolts cause blockages which in turn result in incorrect measurements or can lead to overloading the scale and damage to equipment or injury to persons.

3.3 Technical Data

3.3.1 Function Data

Rated load	**10t, 25t**	**40t, 60t**
Permitted Transverse Movement:	± 4 mm	± 4 mm
Lifting distance of the top plate	4 ... 5 mm	4 ... 5 mm
Max. Transverse Force	10 kN	15 kN
Max. Lifting Force	20 kN	35 Kn
Restoring Force pro mm deflection	0.5 % of the applied load	

3.3.2 Dimensions



Rated load	A	B	C	D	E	ØF	G	H	J
10 t, 25 t	190	150	188	150	110	18	20	133	M10
40 t, 60 t	250	200	273	190	150	22	30	182	M10

Fig. 3-5 Dimensions combination mounting unit

3.4 Care and Maintenance

Combination mounting units are to be inspected depending on the environmental conditions. If there is a high degree of dust, contamination, humidity etc., the maintenance intervals are to be chosen respectively. These are to be kept free of coarse contamination. The ball surfaces of the pressure pieces must be re-greased if necessary.

3.5 Ordering Data

Combination mounting units for load cells with a rated load of	Order number
10t, 25t	7MH4 136-5EC11
40t, 60t	7MH4 136-5LC11

The order numbers above do not include the load cells.

4 Grounding Cable

4.1 Technical Description

4.1.1 Application Range

The grounding cable is used for protecting the load cells from unwanted currents. These currents could be caused by e.g.:

- as equalization currents for missing or faulty, voltage equalization lines,
- a lightning bolt in the vicinity,
- welding or
- static discharge.

The grounding cable is an electrical shunt for the load cell and mounting unit. High welding currents can damage load cells, mounting units or the electronics. Voltage spikes from static discharge can damage the electronics.

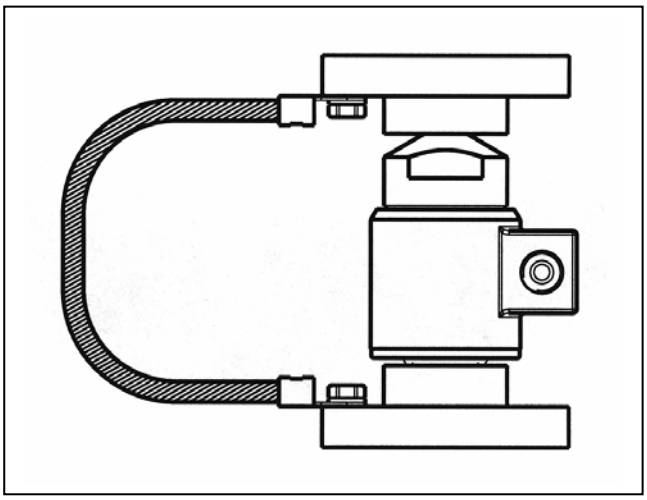


Fig. 4-1 Application example Grounding Cable

4.1.2 Construction

The grounding cable consists of a fine-strand copper wire with a cross-section of 50 mm^2 and two eyelets, Ø 10mm.

4.2 Assembly

A permanent bolt-contact is to be made for fastening the grounding cable, e.g. M10, on the load carrier and the foundation. Female threads M10 are provided in the base plate and top plate for the mounting units of series CC delivered without grounding cable.

4.3 Dimensions

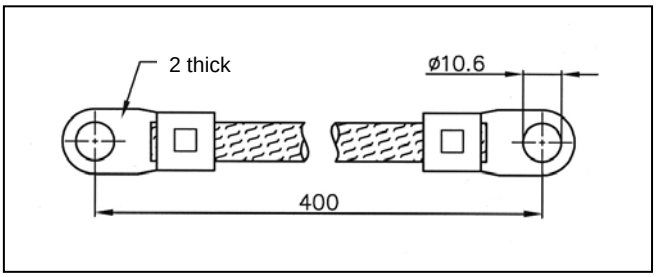


Fig. 5-2 Dimensions grounding cable

4.4 Care and Maintenance

The connections of the cable are to be inspected regularly for corrosion and conductivity.

4.5 Ordering Data

Designation	Order number
Grounding cable	7MH3 701-1AA1