Monitoring: Ball prism, Base, Centering plate

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B.2.4 Assembly adhesive and transport case page 67
APPLICATION EXAMPLE FLOODGATE RENOVATION

APPLICATION EXAMPLE MONUMENT MONITORING

APPLICATION EXAMPLE TRACK/RAIL MONITORING
Monitoring: Ball Prism System

Precise - universal - inexpensive

Tachymetric monitoring of buildings, structures, bridges, tunnels, railway tracks etc. with the Bohnenstingl Monitoring System

- Economic monitoring of points by means of automated target detection
- Cost-effective solutions through the use of centering plates
- Very high repetition accuracy due to forced centering

Ball prisms / balls with reflective foil [1]

The ball prism is a precisely manufactured steel ball with a triple prism / reflective foil mounted very precisely in the centre of the ball. Available in two sizes: Outer ball-Ø30 mm and Ø1.5" (38.1 mm), which is also widely used in laser tracker applications. Ball-Ø30 mm is available with prism constant K = 11.3 mm, Ø1.5" additionally with K = -16.9 mm.

The triple prism with its centrally symmetrical point (= visible prism centre) is ideally located in the centre of the steel ball. If the prism is inaccurately aligned with the tachymeter, only the smallest inaccuracies will occur.

Base / nest with integrated magnet [2]

On the cylindrical ball base with cone-shaped upper part, the ball prism comes to rest in a force-centred position and can be aligned in all directions over a 180° range.

The steel ball is kept reliable in the base by an integrated permanent magnet.

The point indicated by the visible prism center is always exactly on the centre axis of the base and has a distance (height offset HO) of 30.8 mm (or 25 mm for stainless steel bases) from its underside.

This ensures the highest accuracy for repeat measurements, far better than the specified measurement accuracy of electro-optical total stations.

Centering plate [3]

For a variety of monitoring tasks it is not necessary to permanently equip each point with a prism. If the observation points are easily accessible, it’s often enough to attach centering plates before doing the zero measurement.

Only during the measurement itself is the ball prism (together with the magnetic base) or the L-bar prism (with the magnetic base) inserted into the centering plate and aligned and force-centered.

Instead of the centering plate, the base can also be attached directly to the object point. This can achieve a further increase in accuracy. However, this is usually far below the measurement accuracy that can be achieved with a tachymeter.

With a centering plate, exact repeat measurements can be carried out at the same point - over many years. Particularly with a large number of points to be checked, it is much cheaper to attach centering plates to the object. Depending on the surface, they are screwed on or glued on (non-destructively).

The ball base with magnet sticks reliably to the stable plates made of galvanised steel or magnetic stainless steel.
The choice is yours

Base / nest: strength of magnetic holding force

Most of our ball bases (which serve as support cones for the ball and at the same time as attachment to the object to be measured) are available with different magnetic holding forces. A weak holding force makes sense if the ball is placed on the base and removed again within a short time.

The use of bases with weak magnets in practice however has shown that although the prism remains reliably attached to the ball base, in certain applications the set direction towards the tachymeter can change when left unsupervised. For example during long-term monitoring on railroad-tracks. When a train drives by, the rail is subjected to strong vibrations. These vibrations are transmitted to the ball base. For this reason we recommend bases with strong magnetic forces, so the ball prism does not change its set alignment towards the total station.

Base / nest: Base diameter

Our bases for the ball prisms with Ø1.5" are available in two diameters. Ø33 mm and Ø40 mm. The diameter describes the circular contact surface of the base in the direction of the object. The diameter itself has no effect on the measurement. Only thing that should be noted is, we offer one universal centring plate for the Ø40 mm bases and three different centring plates for the bases with Ø 33 mm. Please refer to the subchapter „Centering plates“ for the most appropriate centering plate for your application.

Info: The Ø40 mm is based on existing products from the laser scanning industry. We have also developed the Ø33 mm in order to be able to offer a system that saves as much space as possible.

Base / nest: Offsets

A spherical prism mounted on a spherical base results in a certain height (offset) between the prism center and the bottom surface of the base.

For most monitoring points, the offset to the wall is not relevant, since only a change over a certain period of time of the monitored object is what you are looking for. However, if the monitoring points are to have a „round“ offset dimension, you can easily achieve a wall distance of 50 mm with our thread bases, for example. And with further adapters also the distance 100 mm according to AdV version (German norm).

Centering plates: Mounting options

A combination of ball base and ball prism works as a unit theoretically without further accessories. Examples: Either the unit is placed on a smooth magnetic metal surface where it sticks to. Or the ball base can be glued to the object to be monitored using mounting adhesive. The ball can then still be removed. Of course, the base can no longer be removed. To avoid this, we offer so-called centering plates. The inexpensive plates are screwed or glued to the object. The ball base can then be placed on these with an accuracy of tenths of a millimeter by means of forced centering. High-precision repeat measurements are thus guaranteed even over a long period of time.
Ball prism: Diameters of the steel-sphere

We offer two ball diameters. The larger diameter of 1.5” (38.1 mm), is based on reflector balls from laser tracking applications. It makes it possible to accommodate both a glass prism with Ø17.5 mm and a glass prism with Ø25 mm. Thus, the choice results in two different prism constants. The small ball prism with Ø30 mm is somewhat cheaper and takes up less space, but due to the smaller Ø it also only offers space for the small glass prism. Here you are bound to one prism constant.

Ball prism: Galvanized steel or stainless steel

As our ball monitoring system finds more and more applications, the demands change as well. For this reason, in addition to the classic galvanized steel version, we also offer ball prism casings in stainless steel design. These have increased weather resistance and are also magnetic.

General: Accuracies

The diameters of the balls are manufactured with an accuracy of ± 0.05 mm. Other geometries, such as the position of the prism centre to the ball centre, height offsets and centering fits, have an accuracy of ± 0.1 to ± 0.2 mm.

The ball prism monitoring system thus enables highly accurate tachymetric precision measurements.

Please refer to the next section for information on the prism constant.

Ball prisms with test certificate

- Highest accuracy - with tested prism constant

In order to ensure the accuracy of the constant specification, we measure each triple prism individually and install it in the steel ball.

To examine the accuracy of the prism constant and the position of the central reflection point, we have a series of our ball prisms tested by the Karlsruhe Institute of Technology (KIT).

For this purpose, ball prisms are taken from the current series / batch and a unique serial number is engraved into each ball casing. They are then measured by KIT. As a result, a test certificate is issued for each prism with serial number.

Since then, the deviations from the nominal values have been better than ±0.1 mm for 90% of the tested prisms. The maximum deviation was 0.3 mm.

The test certificate refers to the ball prism with the serial number which is engraved on the back of the ball. In addition to the prism constant K, which was determined from several comparison measurements with a high-precision reference prism, the position of the centre of the prism relative to the centre of the sphere is also indicated.

Purchase ball prism with test certificate

Would you like to buy tested ball prisms? Just send us an email:

info@bohnenstingl.de
Ball Prism Ø 30 mm

- Sphere: Ø 30 mm ± 0,05 mm
- Glass prism: Ø 17,5 mm (grinding accuracy: 2")
- Reflective surfaces: silver mirrored on the rear side
- Mounting of the prism in sphere: ± 0,1 mm
- Prism constant K= -11,3 (Leica = +23,1) mm
- Range: Up to more than 500 m (depending on device and weather conditions)
- Weight: 80 g
- On request also available with test certificate

Description Backside Material Order-No. SEK

Ball prism Ø 30 mm, K = -11,3 (Leica = +23,1) mm

- M6 thread galvanized steel 1450 1353
- galvanized steel 1451 1353
- M6 thread stainless steel 1450.S 1518
- polished stainless steel 1451.SP 1628

Protective cap

A protective cap can be clipped onto the ball prisms. Info: s. page 68.

Ball target Ø 30 mm with reflective foil

- For measurements at shorter distances and without automatic target acquisition
- Reflective foil applied in the axis / level of the ball centre
- Prism constant of K = 0 (Leica= +34,4) mm
- Target mark is exactly in center of the ball for highly accurate angle measurement
- Outer Ø reflective foil: 20 mm
- With M6 inner thread at back
- Outer Ø Target for angle measurement: 5 mm
- Inner Ø target for angle measurement: 0.5 mm
- (other designs possible on request)
- Weight: 75 g

Description Material Order-No. SEK

Ball target Ø 30 mm, reflective foil, K = 0 (Leica = +34,4) mm
galvanized steel 1455 858
stainless steel 1455.SP 1133
Ball prism Ø 1.5" (38.1 mm)

- Material of the ball: Galvanized steel or magnetic stainless steel
- Steel sphere-Ø 1.5": ± 0.05 mm
- Grinding accuracy of triple prism: 2”
- Reflective surfaces: Silver mirrored on the rear side
- Mounting of the prism in sphere: ± 0.1 mm
- On request also available with test certificate

Prism constant: K= -16.9 (Leica = +17.5) mm

- With triple prism made of glass Ø 25 mm
- Range: 500 up to over 1000 m (device and weather dependent)
- Weight: 160 g

<table>
<thead>
<tr>
<th>Description</th>
<th>Material</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball prism Ø 1.5&quot;, K = -16.9 (Leica = +17.5) mm</td>
<td>galvanized steel</td>
<td>1445</td>
<td>1595</td>
</tr>
<tr>
<td></td>
<td>stainless steel</td>
<td>1445.S</td>
<td>1760</td>
</tr>
</tbody>
</table>

Prism constant: K= -11.3 (Leica = +23.1) mm

- With triple prism made of glass Ø 17.5 mm
- Range: 300 up to over 500 m (device and weather dependent)
- Weight: 180 g

<table>
<thead>
<tr>
<th>Description</th>
<th>Material</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball prism Ø 1.5&quot;, K = -11.3 (Leica = +23.1) mm</td>
<td>galvanized steel</td>
<td>1453</td>
<td>1595</td>
</tr>
<tr>
<td></td>
<td>stainless steel</td>
<td>1453.S</td>
<td>1760</td>
</tr>
</tbody>
</table>

Protective cap

A protective cap can be clipped onto the 1453 and 1453.S ball prisms. Info: s. page 68.

Ball target Ø 1.5" with reflective foil

- For measurements at shorter distances and without automatic target acquisition
- Reflective foil applied in the axis / level of the ball center
- Prism constant of K = 0 (Leica= +34.4) mm
- Stainless steel casing

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball foil target Ø 1.5&quot;, stainless steel, K = 0 (Leica = +34.4) mm</td>
<td>1447.S</td>
<td>1265</td>
</tr>
</tbody>
</table>
Magnetic Ball Prism Monitoring System

**Thread base for Ø30 mm**
- With magnet and various thread connections [s. page 61]

**Ø30 mm Ball Prism**
- With prism / reflective foil [s. page 56]

**Base for ball prism Ø30 mm**
- Magnetic holding force in three different strengths [s. page 59]

**Centering plate Ø33 mm**
- For adhesive bonding or screwing on [s. page 64]

**Thread base for Ø1.5”**
- With magnet and various thread connections [s. page 61]

**Ø1.5” Ball Prism**
- With two prism constants or reflective foil [s. page 57]

**Base for ball prism Ø1.5”**
- Magnetic holding force in two different strengths [s. page 60]

**Base for ball prism Ø1.5”**
- Magnetic holding force in two different strengths [s. page 60]

**Centering plate Ø40 mm**
- For adhesive bonding or screwing on [s. page 66]
Base with integrated magnet for ball-Ø 30 mm

- Turned part made of hard anodised aluminium with integrated permanent magnet
- For mounting on magnetic surfaces, e.g. railway rails, machines, vehicles and centring plates
- Each base is supplied with a protective cover plate

Protective cover plate

The base can be fitted with a cover plate during the period no measurements are taking place. It is also held magnetically and protects the ball base / nest from dirt and weather influences.

<table>
<thead>
<tr>
<th>Description</th>
<th>magnetic holding force</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Ø 33 mm for ball prism Ø 30 mm, with integrated magnet and protective cover plate</td>
<td>approx. 1.0 / 1.5 kg</td>
<td>1460</td>
<td>269.5</td>
</tr>
<tr>
<td></td>
<td>approx. 6.0 / 3.0 kg</td>
<td>1460.S</td>
<td>352</td>
</tr>
<tr>
<td></td>
<td>approx. 12.0 / 20.0 kg</td>
<td>1460.S2</td>
<td>396</td>
</tr>
</tbody>
</table>

INFO

Due to the very high holding force of the strong magnets of the bases 1460.S and 1460.S2, the use of a „remover“-tool is recommended. Further information can be found on page 62.
**Base with magnet for ball-Ø 1.5” (38.1 mm)**
- Turned part made of hard anodised aluminium with integrated permanent magnet
- For mounting on magnetic surfaces, e.g. railway rails, machines, vehicles and centring plates
- Each base is supplied with a protective cover plate

**Protective cover plate**
The base can be fitted with a cover plate during the period no measurements are taking place. It is also held magnetically and protects the ball base / nest from dirt and weather influences.

<table>
<thead>
<tr>
<th>Description</th>
<th>magnet. force</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Ø 33 mm for ball prism Ø 1.5”, with integrated magnet and protective plate</td>
<td>approx. 2,0 / 3,0 kg</td>
<td>1457.S</td>
<td>352</td>
</tr>
<tr>
<td></td>
<td>approx. 6,0 / 15,0 kg</td>
<td>1457.S2</td>
<td>374</td>
</tr>
<tr>
<td>Base Ø 40 mm for ball prism Ø 1.5”, with integrated magnet and protective plate</td>
<td>approx. 2,0 / 3,0 kg</td>
<td>1458.S</td>
<td>352</td>
</tr>
<tr>
<td></td>
<td>approx. 6,0 / 15,0 kg</td>
<td>1458.S2</td>
<td>374</td>
</tr>
</tbody>
</table>

**INFO**
Due to the very high holding force of the strong magnets of the bases 1460.S and 1460.S2, the use of a „remover“-tool is recommended. Further information can be found on page 62.

**Base without permanent magnet**
Can be used only in horizontally mounted centering plates Ø40 mm.

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Ø 40 mm for ball prism Ø 1.5”, without magnet</td>
<td>1459</td>
<td>231</td>
</tr>
</tbody>
</table>
**Magnetic base with thread connections**

- The distance of the ball center from the base underside to the center of the prism is always exactly 50 ± 0.1 mm (without thread)
- All bases are shipped including cover plate for protection against dirt (s. page 60)
- On request many of the bases are also available with weaker or stronger magnets

### For ball prism Ø 1.5" (38.1 mm)

#### With inner thread

<table>
<thead>
<tr>
<th>Description</th>
<th>thread connection</th>
<th>magn. holding force</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base for ball prism Ø 1.5&quot;, inner thread</td>
<td>1/4&quot;</td>
<td>approx. 3 kg</td>
<td>1466.14</td>
<td>511,5</td>
</tr>
<tr>
<td></td>
<td>M8</td>
<td>approx. 3 kg</td>
<td>1466.08</td>
<td>511,5</td>
</tr>
<tr>
<td></td>
<td>5/8&quot;</td>
<td>approx. 3 kg</td>
<td>1466.58</td>
<td>511,5</td>
</tr>
</tbody>
</table>

#### With outer thread

<table>
<thead>
<tr>
<th>Description</th>
<th>thread connection</th>
<th>magn. holding force</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base for ball prism Ø 1.5&quot;, outer thread</td>
<td>1/4&quot; x 8 mm</td>
<td>approx. 3 kg</td>
<td>1466.14a</td>
<td>544,5</td>
</tr>
<tr>
<td></td>
<td>M8 x 8 mm</td>
<td>approx. 1 kg</td>
<td>1466.08a</td>
<td>440</td>
</tr>
<tr>
<td></td>
<td>5/8&quot; x 11 mm</td>
<td>approx. 3 kg</td>
<td>1466.08a</td>
<td>544,5</td>
</tr>
</tbody>
</table>

### For ball prism Ø 30 mm

#### With inner thread

<table>
<thead>
<tr>
<th>Description</th>
<th>thread connection</th>
<th>magn. holding force</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base for ball prism Ø 30 mm, inner thread</td>
<td>1/4&quot;</td>
<td>approx. 4,5 kg</td>
<td>1465.214</td>
<td>511,5</td>
</tr>
<tr>
<td></td>
<td>M8</td>
<td>approx. 4,5 kg</td>
<td>1465.208</td>
<td>511,5</td>
</tr>
<tr>
<td></td>
<td>5/8&quot;</td>
<td>approx. 4,5 kg</td>
<td>1465.258</td>
<td>511,5</td>
</tr>
</tbody>
</table>

#### With outer thread

<table>
<thead>
<tr>
<th>Description</th>
<th>thread connection</th>
<th>magn. holding force</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base for ball prism Ø 30 mm, outer thread</td>
<td>1/4&quot; x 8 mm</td>
<td>approx. 4,5 kg</td>
<td>1465.214a</td>
<td>544,5</td>
</tr>
<tr>
<td></td>
<td>M8 x 8 mm</td>
<td>approx. 0,5 kg</td>
<td>1465.08a</td>
<td>440</td>
</tr>
<tr>
<td></td>
<td>5/8&quot; x 11 mm</td>
<td>approx. 4,5 kg</td>
<td>1465.208a</td>
<td>544,5</td>
</tr>
</tbody>
</table>

*Prices do not include any taxes*
Extension for thread bases - Wall offset 100 mm

With the following adapters, the ball bases with M8 thread (s. page 61) can be extended to the wall offset of 100 mm (AdV version, German norm).

<table>
<thead>
<tr>
<th>Description</th>
<th>Thread 1st side</th>
<th>Thread 2nd side</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension, Aluminium, Ø 25 x 50 mm</td>
<td>M8 inner thread</td>
<td>M8 inner thread</td>
<td>0372.050</td>
<td>247,5</td>
</tr>
<tr>
<td></td>
<td>M8 outer thread</td>
<td>M8 inner thread</td>
<td>0373.050</td>
<td>258,5</td>
</tr>
<tr>
<td></td>
<td>M8 outer thread</td>
<td>M8 outer thread</td>
<td>0374.050</td>
<td>269,5</td>
</tr>
</tbody>
</table>

NOTE
We can supply the ball base and adapter „glued“ together so that an exclusive use of 100 mm distance is possible.

Center Pin

A centering pin / punch is available for the bases 1457.S2 and 1458.S2. This allows the base to be placed on a point that is already marked on the object (e.g. cross, grain).

- Stainless steel Ø 5 x 100 mm
- Without hardened tip (non-magnetic) or with hardened tip (magnetic)

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centering pin Ø 5 x 100 mm, stainless steel</td>
<td>1458.Z</td>
<td>132</td>
</tr>
<tr>
<td>Centering pin Ø 5 x 100 mm, stainless steel, hardened tip</td>
<td>1458.ZS</td>
<td>198</td>
</tr>
</tbody>
</table>

Remover Tool

Bases with strong magnets (1457.S2, 1458.S2, 1460.S2) cannot easily be pulled off „by hand“ due to their very high magnetic holding force.
It is therefore recommended to use a remover-tool.

- Sturdy, break-proof plastic
- Suitable for all ball bases (not for stainless steel bases)
- With carrying strap
- Dimensions: Ø 45 x 100 mm
- Weight: ca. 120 g

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remover tool with carrying strap</td>
<td>1460.Z</td>
<td>275</td>
</tr>
</tbody>
</table>
Stainless steel base for ball-Ø 1.5" (38.1 mm)

Design and function of the stainless steel ball base corresponds to that of the aluminium ball bases.

With permanent magnet

The integrated permanent magnet allows the ball base to be attached to all magnetic surfaces, e.g. railway rails, machines, vehicles and centering plates. s. page 66.

Special features:
- Casing made of stainless steel (V2A)
- Integrated ring magnet with centric bore Ø 14 mm
- Height-Offset HO of prism center to bottom surface of base: 25 ± 0,1 mm
- Bottom surface-diameter of base: Ø40 ± 0.01 mm
- Fits to centering plate No. 6009 s. page 66
- Ring marking with engraved ball Ø and height offset HO 25 mm
- Each base is shipped with a cover plate

If there is no ball prism on the base, it can be covered with a protective plate made of galvanised sheet steel. This has a Ø of 40 mm, is also held by the base magnet and protects the base from dirt and weather influences (see picture).

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel base Ø 40 mm for ball prisms Ø 1.5&quot;, with magnet (holding force approx. 4.0/5.0 kg), with cover plate</td>
<td>1430</td>
<td>638</td>
</tr>
</tbody>
</table>

PLEASE NOTE
Please also note our special bases made of stainless steel for industrial 3-D measurements s. page 98

Without permanent magnet

For applications where no magnet is needed. This base can of course only be used horizontally.

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel base Ø 40 mm for ball prism Ø 1.5&quot; (38.1 mm), without magnet</td>
<td>1431</td>
<td>517</td>
</tr>
</tbody>
</table>
Centering plate for Ø 33 mm

To use with adhesive

- Galvanized steel plate Ø 40 x 4 mm, magnetic
- To use with assembly adhesive (s. page 67)
- Accuracy of centering fit Ø 33 mm: ± 0,1 mm
- Bore hole Ø 8 mm in center for exact fixation of the plate during gluing

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centering plate to use with adhesive, with centering Ø 33 mm, bore hole 8 mm, galvanized</td>
<td>1461</td>
<td>82,5</td>
</tr>
</tbody>
</table>

To use with adhesive and / or to screw on

- Steel plate Ø 40 x 7 mm
- Accuracy of centering fit Ø 33 mm: ± 0,1 mm

Mounting options:

- To use with assembly adhesive (s. page 67)
- Center bore hole Ø 8 mm for countersunk screws

Galvanized steel (magnetic) or stainless steel (magnetic)

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centering plate Ø 33 mm, countersunk bore 8 mm, galvanized</td>
<td>1464</td>
<td>110</td>
</tr>
<tr>
<td>Centering plate Ø 33 mm, countersunk bore 8 mm, stain. steel</td>
<td>1464.VA</td>
<td>143</td>
</tr>
</tbody>
</table>

TIP
Choose the stainless steel version if you are working under conditions, which require increased weather resistance.
To screw on and / or nail to object

- Steel plate Ø 60 x 4 mm, galvanized, with 4 bore holes Ø 4,5 mm
- For screwing onto a wide variety of surfaces
- Accuracy of centering fit: Ø33 ± 0,1 mm
- Center bore hole Ø 8 mm for exact positioning of the plate when screwing on

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centering plate Ø 33 mm to screw on object, center bore hole Ø 8 mm + 4 x Ø 4,5 mm eccentric bore hole</td>
<td>1463</td>
<td>99</td>
</tr>
</tbody>
</table>

Cover plate for centering plates Ø 33 mm

- To protect the centering plates from dust and weather

The protective plate sticks reliably to the centering plate by means of a permanent magnet mounted in the middle. The curvature ensures that the disc is centred and cannot slip on the plate.

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective cover for centering plates Ø 33 mm, with magnet</td>
<td>1453-50</td>
<td>38,5</td>
</tr>
</tbody>
</table>
Universal centering plate for base Ø 40 mm

To use with adhesive and / or to screw on

- Steel plate Ø 50 x 7 mm, galvanized
- Accuracy of centering fit: Ø40 ± 0,1 mm

Mounting options

- To use with assembly adhesive s. page 67
- Center borehole Ø 8 mm for a countersunk screw
- Eccentric holes Ø 5 mm for 2 to 4 countersunk screws

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centering plate for base Ø 40 mm, to use with adhesive or to screw onto object</td>
<td>6009</td>
<td>121</td>
</tr>
</tbody>
</table>

Protective cover for centering plate 6009

The protective cover plate fits exactly into the centering Ø 40 mm of the centering plate 6009. It sticks reliably to it due to the centrally mounted permanent magnet and protects against dust and weather.

<table>
<thead>
<tr>
<th>Description</th>
<th>Order-No.</th>
<th>SEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective cover for centering plate Ø 40 mm, with magnet</td>
<td>6009.S</td>
<td>38,50</td>
</tr>
</tbody>
</table>