Operating manual

Product name: Positioning System Type: H-Portal
Product ID: 1410363
Positioning System Type: H-Portal
Translation (EN) of the original German instructions | R1d

Use
- The operating instructions must be available at the component at all times.
- The operating instructions must be available at the component / device at all times.
- Always use the complete original (or the original translation) of these operating instructions.

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Service
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- http://www.ief.de

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History of Changes

<table>
<thead>
<tr>
<th>Document Code</th>
<th>Date</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAN_EN_1410363_H-Portal_R1a.docx</td>
<td>May 2017</td>
<td>First edition (R1a). English translation of the original German instructions.</td>
</tr>
<tr>
<td>MAN_EN_1410363_H-Portal_R1b.docx</td>
<td>June 2017</td>
<td>Modification dimensions 55 and 65 to 60 mm in Figure 15, page 26.</td>
</tr>
<tr>
<td>MAN_EN_1410363_H-Portal_R1c.docx</td>
<td>May 2019</td>
<td>Modifications as far as some parts list and drawings are concerned (e.g., parts numbers 1800142 and 1311835) and motion sequence X.</td>
</tr>
<tr>
<td>MAN_EN_1410363_H-Portal_R1d.docx</td>
<td>April 2020</td>
<td>Modifications in parts list and drawing no. 1131724</td>
</tr>
</tbody>
</table>

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We are always grateful for suggestions for improvements and information about errors.
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1 Declaration of Incorporation

EC declaration of incorporation in the sense of the EC directive 2006/42/EC (machinery), Annex II B.

The manufacturer:
IEF-Werner GmbH
Wendelhofstraße 6
78120 Furtwangen - Germany

hereby declares that the following products (the incomplete machine/partial machine):

<table>
<thead>
<tr>
<th>Designation</th>
<th>IEF-Werner part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioning System Type: H-Portal</td>
<td>1800142</td>
</tr>
</tbody>
</table>

where possible based on the scope of delivery, corresponds to the following basic requirements of the directive on Machinery (2006/42/EC):
Annex I, item: 1.1.2; 1.1.3; 1.1.5; 1.3.2; 1.3.4; 1.5.1; 1.7.3; 1.7.4;

The incomplete machine also corresponds to the following further directives:

The technical documents were generated according to Annex VII part B and may be electronically submitted to the national authorities upon justified request.

List of some applied harmonised standards:

Commissioning of the incomplete machine delivered by us is not permitted until it has been determined that the overall system into which the incomplete machine is installed meets the basic safety and health protection requirements according to Annex I of the above EC directive 2006/42/EC.

Name and address of the documentation officer: IEF-Werner GmbH

Furtwangen, May 2019

Stefan Deck (managing director)
2 Safety

2.1 Definition of Warning Notes

⚠️ DANGER

Indicates danger.
Non-observance of the safety provisions causes death.

⚠️ WARNING

Indicates potential danger.
Non-observance of the safety provisions may cause death or severe injury.

⚠️ CAUTION

Indicates potential danger.
Non-observance of the safety provisions may cause injury.

NOTICE

Indicates potential danger. Non-observance of the safety provisions may cause property damage.
2.2 General Warning Notes

The positioning system type: H-portal must only be commissioned by specialists who received safety-technical instruction and are able to assess potential dangers. Furthermore, all chapters of these operating instructions must have been read and understood completely.

**DANGER**

Warning of dangerous electrical voltage.
The system must be powered down for all assembly, disassembly or repair work. Non-observance of the safety provisions may cause death.

**WARNING**

Linear modules must only be operated with their protective devices.
The positioning system type: The H-Portal always has to be operated in connection with suitable safety devices (e.g., safety cell, protective room, protective housing, light curtain).

**CAUTION**

Do not remove plugs or clamps when live.
Motor connectors or clamps must not be inserted or disconnected when live. Risk of burning of the contacts and risk of flying sparks.

**CAUTION**

Warning of hot surface.
During operation, the heated drive may cause skin burns when touched. Install a protective device, if possible! Do not touch the marked areas or wait for an adequate cooling time.
2.3 Special Hazard Warnings

In addition, this operating manual contains the following special hazard warnings:

**WARNING**

Warning of shearing off of limbs.
These points of the components pose the danger of shearing off of limbs in operation.

**WARNING**

Warning against being pulled in.
These points of the components pose the danger of pulling in of limbs (fingers/hand) in operation.

**WARNING**

Warning of crushing of limbs.
These points of the components pose the danger of crushing of limbs in operation.

Figure 1  Dangers at the H-Portal
3 Intended Use

The positioning system type: The H-Portal (see Figure 2, bottom) was designed for use in the commercial area. Use of high-quality guides (guide rails and guide carriages) warrants high dynamics and good running behaviour. The guide carriages are equipped with wipers to prevent ingress of coarse dirt into the guide carriage. All drive motors of the positioning system are stationary, i.e. no motors, gears or cables are moved along with them. Use of the system under conditions with increased contamination and abrasive dusts, however, should be avoided because there are no further protective measures like bellows, etc.

Areas of use of the positioning system type: The H-portals include:

- Equipment and mounting systems
- Handling of small parts
- Loading and unloading stations
- etc.

3.1 Reasonably Foreseeable Misuse

The positioning system of the type H-Portal is not to be used for certain applications such as the transport of persons and animals or as a pressing/bending device.

Use of the system without additional measures is also not possible in special fields of application, such as the chemical or food industry or in explosive atmospheres.

In case of doubt, consult the manufacturer.
4 Description of the main assemblies

4.1 Versions of the positioning system type: H-Portal

There are the three following development levels of the positioning system of type: H-Portal:

- X/Y-system
- X/Y/Z-system
- X/Y/Z/W-system

![Diagram of positioning system types]

Figure 3 Versions of the positioning system type: H-Portal

A X/Y-system ( ),
(with basic body module 80/15 and module 115/42)

B X/Y/Z-system ( + )
(with basic body module 60/33 and with ball spline)

C X/Y/Z/W-system turning unit ( + + )
(with second ball spline and angle gear)
4.1.1 Design of the X/Y-system

Figure 4 Main assemblies (design of the X/Y-system)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Basic body of module 80/15</td>
</tr>
<tr>
<td>C</td>
<td>Carriage with deflection roller (2x)</td>
</tr>
<tr>
<td>E</td>
<td>Flange gears</td>
</tr>
<tr>
<td>B</td>
<td>Basic body of module 115/42</td>
</tr>
<tr>
<td>D</td>
<td>Carriage of the module 115/42</td>
</tr>
<tr>
<td>F</td>
<td>Servo motor</td>
</tr>
</tbody>
</table>
4.1.2 Design of the X/Y/Z-system

The cover of the ball spline and cover of the belt are not displayed in this view.

Figure 5  Main assemblies (design of the X/Y/Z-system)

A  Basic body of module 60/33
B  Gear housing spanner
C  Ball spline housing
D  Toothed belt
E  Ball spline belt gear
F  Planetary gear
G  Servo motor
4.1.3 Design of the X/Y/Z/W-system

Figure 6 Main assemblies (design of the X/Y/Z/W-system)

A  Turning unit  B  Ball spline housing
C  Toothed belt  D  Ball spline belt gear
E  Planetary gear  F  Servo motor
G  Belt tensioner
5 Assembly Instructions

5.1 Installation Position

The positioning system type: The H-Portal is primarily intended for the horizontal use, i.e. the X- and Y-axes run in parallel to the floor, the Z-axis runs vertically. If any different installation position is desired, coordination with the manufacturer is desired.

Figure 7  Positioning System Type: H-Portal – horizontal use
5.2 Function description/kinematic relationships

5.2.1 Design of the X/Y-system

The belt in the X/Y-system is placed in an H-shape (see Figure 8, below). The movements in the X- and Y-directions are implemented by a belt. The belt is tensed at the carriage of the Y-axis. The drive takes place at one of the 180° deflections at the X-axis. Either side/deflection may be used, provided that the motors are not placed on the same basic body.

For a run in the X-direction, the two motors must be turned into precisely opposite directions. In the Y-direction, the two motors must be turned synchronously. If one motor is standing, the system moves below 45°.

The movements in X and Y therefore depend on the two motors!

**Figure 8** Arrangement of the toothed belt, as well as turning and movement direction of the motors in the X/Y-system

### Kinematic relationships of the X/Y-system

<table>
<thead>
<tr>
<th>Motor turns</th>
<th>Motor turns motor 1</th>
<th>Motor turns motor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>$M_1 = \frac{X \cdot i_{1.2}}{V_{i.2}}$</td>
<td>$M_2 = \frac{-X \cdot i_{1.2}}{V_{i.2}}$</td>
</tr>
<tr>
<td>Y</td>
<td>$M_1 = \frac{Y \cdot i_{1.2}}{V_{i.2}}$</td>
<td>$M_2 = \frac{Y \cdot i_{1.2}}{V_{i.2}}$</td>
</tr>
<tr>
<td>Total X and Y</td>
<td>$M_1 = \frac{(X+Y) \cdot i_{1.2}}{V_{i.2}}$</td>
<td>$M_2 = \frac{(-X+Y) \cdot i_{1.2}}{V_{i.2}}$</td>
</tr>
</tbody>
</table>

### Movement path

<table>
<thead>
<tr>
<th>Movement path</th>
<th>Movement path X</th>
<th>Movement path Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M_1$</td>
<td>$X = \frac{1}{2} \frac{M_1 \cdot V_{i.2}}{i_{1.2}}$</td>
<td>$Y = \frac{1}{2} \frac{M_1 \cdot V_{i.2}}{i_{1.2}}$</td>
</tr>
<tr>
<td>$M_2$</td>
<td>$X = \frac{1}{2} \frac{-M_2 \cdot V_{i.2}}{i_{1.2}}$</td>
<td>$Y = \frac{1}{2} \frac{M_2 \cdot V_{i.2}}{i_{1.2}}$</td>
</tr>
<tr>
<td>Total $M_1$ and $M_2$</td>
<td>$X = \frac{1}{2} \frac{(M_1-M_2) \cdot V_{i.2}}{i_{1.2}}$</td>
<td>$Y = \frac{1}{2} \frac{(M_1+M_2) \cdot V_{i.2}}{i_{1.2}}$</td>
</tr>
</tbody>
</table>

$V_{i.2}$: Infeed constant = 140 mm  
$i_{1.2}$: Transmission planetary gear (with $i_{1.2} > 1$)

Prefixes may vary depending on motor type and motor attachment version  
$M_1$, $M_2$: X/Y-system motors in turns
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Figure 9  X/Y-system drive in X-direction
- Movement direction belt
- Movement direction carriage
- Rotating direction drive/deflection

Figure 10  X/Y-system drive in Y-direction
- Movement direction belt
- Movement direction carriage
- Rotating direction drive/deflection
5.2.2 Design of the X/Y/Z-system

In the X/Y/Z-system, the belt for the X/Y-movement is placed as in the X/Y-system. The belt for the Z-movement is arranged in the ‘Plus’ (+)-form. The movements and positions in the Z-direction are independent of the X/Y-position!

![Arrangement of the toothed belt X/Y/Z-system](image)

**Figure 11** Arrangement of the toothed belt X/Y/Z-system

### Kinematic relationships of the X/Y/Z-system

<table>
<thead>
<tr>
<th>Motor turns</th>
<th>Motor 1</th>
<th>Motor 2</th>
<th>Motor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>$M_1 = \frac{X \cdot i_{1,2}}{V_{1,2}}$</td>
<td>$M_2 = \frac{-X \cdot i_{1,2}}{V_{1,2}}$</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>$M_1 = \frac{Y \cdot i_{1,2}}{V_{1,2}}$</td>
<td>$M_2 = \frac{Y \cdot i_{1,2}}{V_{1,2}}$</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>-</td>
<td>-</td>
<td>$M_3 = 2 \cdot \frac{Z \cdot i_{3,4}}{V_{3,4}}$</td>
</tr>
<tr>
<td>Total M1 and M2</td>
<td>$M_1 = \frac{(X+Y) \cdot i_{1,2}}{V_{1,2}}$</td>
<td>$M_2 = \frac{(-X+Y) \cdot i_{1,2}}{V_{1,2}}$</td>
<td>$M_3 = 2 \cdot \frac{Z \cdot i_{3,4}}{V_{3,4}}$</td>
</tr>
</tbody>
</table>

### Movement path

<table>
<thead>
<tr>
<th>Movement path</th>
<th>Movement path X</th>
<th>Movement path Y</th>
<th>Movement path Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M_1$</td>
<td>$X = \frac{1}{2} \cdot \frac{M_1 \cdot V_{1,2}}{i_{1,2}}$</td>
<td>$Y = \frac{1}{2} \cdot \frac{M_1 \cdot V_{1,2}}{i_{1,2}}$</td>
<td></td>
</tr>
<tr>
<td>$M_2$</td>
<td>$X = \frac{1}{2} \cdot \frac{-M_2 \cdot V_{1,2}}{i_{1,2}}$</td>
<td>$Y = \frac{1}{2} \cdot \frac{M_2 \cdot V_{1,2}}{i_{1,2}}$</td>
<td></td>
</tr>
<tr>
<td>$M_3$</td>
<td>-</td>
<td>-</td>
<td>$Z = \frac{1}{2} \cdot \frac{M_3 \cdot V_{3,4}}{i_{3,4}}$</td>
</tr>
<tr>
<td>Total M1 and M2</td>
<td>$X = \frac{1}{2} \cdot \frac{(M_1-M_2) \cdot V_{1,2}}{i_{1,2}}$</td>
<td>$Y = \frac{1}{2} \cdot \frac{(M_1+M_2) \cdot V_{1,2}}{i_{1,2}}$</td>
<td>$Z = \frac{1}{2} \cdot \frac{M_3 \cdot V_{3,4}}{i_{3,4}}$</td>
</tr>
</tbody>
</table>

- $V_{1,2}$: Infeed constant = 140 mm
- $V_{3,4}$: Infeed constant = 160 mm
- $i_{1,2}$: Transmission planetary gear (with $i_{1,2} > 1$)
- $i_{3,4}$: Transmission planetary gear (with $i_{3,4} > 1$)

Prefixes may vary depending on motor type and motor attachment version

$M_3$: Motor Z-system in turns
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Figure 12  X/Y/Z-system drive in Z-direction

- Movement direction belt
- Movement direction carriage
- Rotating direction drive/deflection
5.2.3 Design of the X/Y/Z/W-system

In the X/Y/Z/W-system, the belt for the X/Y-movement is placed as in the X/Y-system. The belts for the Z- and W-movements are in the 'Plus' (+)-form.

For a movement in the Z-direction, the motors must be turned into opposite directions. The rotating axis is turned by synchronous turning of the motors 3 and 4.

The movements and positions in the Z-direction are independent of the X/Y-positions. The rotating direction of the turning axis depends on the Y-position, however. As a consequence, adjustment of motors 3 and 4 (see Figure 14, page 25) is required when moving the Y-axis.

![Arrangement of the toothed belt X/Y/Z/W-system](image)

**Kinematic relationships X/Y/Z/W-system**

<table>
<thead>
<tr>
<th>Motor turns</th>
<th>Motor 1</th>
<th>Motor 2</th>
<th>Motor 3</th>
<th>Motor 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>$M_1 = \frac{X - i_{1,2}}{V_{1,2}}$</td>
<td>$M_2 = -\frac{X - i_{1,2}}{V_{1,2}}$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Y</td>
<td>$M_1 = \frac{Y - i_{1,2}}{V_{1,2}}$</td>
<td>$M_2 = \frac{Y - i_{1,2}}{V_{1,2}}$</td>
<td>$M_3 = \frac{Y - i_{3,4}}{V_{3,4}}$</td>
<td>$M_4 = \frac{Y - i_{3,4}}{V_{3,4}}$</td>
</tr>
<tr>
<td>Z</td>
<td>-</td>
<td>-</td>
<td>$M_3 = \frac{Z - i_{3,4}}{V_{3,4}}$</td>
<td>$M_4 = \frac{-Z - i_{3,4}}{V_{3,4}}$</td>
</tr>
<tr>
<td>W [°]</td>
<td>-</td>
<td>-</td>
<td>$M_3 = \frac{W - i_{3,4} \cdot i_{w} \cdot 180 \text{ mm}}{V_{3,4}}$</td>
<td>$M_4 = \frac{W - i_{3,4} \cdot i_{w} \cdot 180 \text{ mm}}{V_{3,4}}$</td>
</tr>
</tbody>
</table>

**Total X, Y, Z, W**

$M_1 = \frac{(X + Y) - i_{1,2}}{V_{1,2}}$

$M_2 = \frac{(-X + Y) - i_{1,2}}{V_{1,2}}$

$M_3 = \frac{(Y + Z) - i_{3,4}}{V_{3,4}} + \frac{1}{360^\circ} \frac{W - i_{3,4} \cdot i_{w} \cdot 180 \text{ mm}}{V_{3,4}}$

$M_4 = \frac{(Y - Z) - i_{3,4}}{V_{3,4}} + \frac{1}{360^\circ} \frac{W - i_{3,4} \cdot i_{w} \cdot 180 \text{ mm}}{V_{3,4}}$

**Movement path**

<table>
<thead>
<tr>
<th>Movement path</th>
<th>Movement path X</th>
<th>Movement path Y</th>
<th>Movement path Z</th>
<th>Turns W</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M_1$</td>
<td>$X = \frac{1}{2} \cdot \frac{M_1 \cdot V_{1,2}}{i_{1,2}}$</td>
<td>$Y = \frac{1}{2} \cdot \frac{M_1 \cdot V_{1,2}}{i_{1,2}}$</td>
<td>-</td>
<td>$W = 360^\circ \frac{1}{2} \cdot \frac{M_2 \cdot V_{1,2}}{i_{1,2}} \cdot 180 \text{ mm}$</td>
</tr>
<tr>
<td>$M_2$</td>
<td>$X = \frac{1}{2} \cdot \frac{-M_2 \cdot V_{1,2}}{i_{1,2}}$</td>
<td>$Y = \frac{1}{2} \cdot \frac{M_2 \cdot V_{1,2}}{i_{1,2}}$</td>
<td>-</td>
<td>$W = 360^\circ \frac{1}{2} \cdot \frac{M_2 \cdot V_{1,2}}{i_{1,2}} \cdot 180 \text{ mm}$</td>
</tr>
<tr>
<td>$M_3$</td>
<td>-</td>
<td>-</td>
<td>$Z = \frac{1}{2} \cdot \frac{M_3 \cdot V_{3,4}}{i_{3,4}}$</td>
<td>$W = 360^\circ \frac{1}{2} \cdot \frac{M_3 \cdot V_{3,4}}{i_{3,4}} \cdot 180 \text{ mm}$</td>
</tr>
<tr>
<td>$M_4$</td>
<td>-</td>
<td>-</td>
<td>$Z = \frac{1}{2} \cdot \frac{-M_4 \cdot V_{3,4}}{i_{3,4}}$</td>
<td>$W = 360^\circ \frac{1}{2} \cdot \frac{M_4 \cdot V_{3,4}}{i_{3,4}} \cdot 180 \text{ mm}$</td>
</tr>
<tr>
<td>Total $M_1$, $M_2$, $M_3$, $M_4$</td>
<td>$X = \frac{1}{2} \cdot \frac{(M_1 - M_2) \cdot V_{1,2}}{i_{1,2}}$</td>
<td>$Y = \frac{1}{2} \cdot \frac{(M_1 + M_2) \cdot V_{1,2}}{i_{1,2}}$</td>
<td>$Z = \frac{1}{2} \cdot \frac{(M_3 - M_4) \cdot V_{3,4}}{i_{3,4}}$</td>
<td>$W = 360^\circ \frac{1}{2} \cdot \frac{(M_1 + M_2) \cdot V_{1,2}}{i_{1,2}} + \frac{1}{360^\circ} \frac{(M_3 + M_4) \cdot V_{3,4} \cdot i_{w} \cdot 180 \text{ mm}}{i_{3,4} \cdot i_{w} \cdot 180 \text{ mm}}$</td>
</tr>
</tbody>
</table>
V₁₂: Infeed constant = 140 mm
V₃₄: Infeed constant = 160 mm
i₁₂: Transmission planetary gear (with i₁₂ > 1)
i₃₄: Transmission planetary gear (with i₃₄ > 1)
i₉₀: Transmission angular planetary gear (with i₉₀ > 1)

Prefixes may vary depending on motor type and motor attachment version
M₃, M₄: Motors for Z/W-system in turns

Figure 14: X/Y/Z/W-system drive in circle direction

- Movement direction belt
- Movement direction carriage
- Rotating direction drive/deflection
5.3 Attachment

5.3.1 Attachment of the positioning system

The positioning system can be tensed at a level with four angles and the matching levelling plate.

Figure 15 Attachment with angle
Positioning System Type: H-Portal

Translation (EN) of the original German instructions | R1d

Figure 16  Attachment with angle (isometric view)

Figure 17  Angle (item no.: 1304064) for attachment of the positioning system type: H-Portal
5.3.2 Installation of Actuators

The actuators (cylinders, pick-up modules, etc.) that are to be installed on an X/Y system can be attached via the drilling pattern on the carriage plate.

The threaded bores M6 make different axis configurations possible on the carriage using an adapter plate.

The recesses Ø12 serve to centre clamping elements with supply option.

![Carriage plate Y-axis (module 115/42) with centring ring (item no.: 1024021)](image)

The actuators (cylinders, pick-up modules, etc.) that are to be installed on an X/Y/Z system can be attached via the drilling pattern on the end plate.

When using accessory units such as rotary tables, special end plates are used and the attachment option of the accessory unit applies.

![End plate Z-axis (module 60/33)](image)
Figure 20  Rotating unit (W-axis)
5.4 Motor attachment versions and gear types

The gear attachment is primarily intended for the flange gear type: PLFE64 or for a belt gear with planetary gear type: PLE80 or PLE60. A secondary angle gear type: WPLFE64 or TK+ 004 MF can be installed as well. The gears can be installed on either side. Both motors by IEF-Werner GmbH and customer-specific motors can be attached to these gears.

Figure 21  Overview motor attachment versions with gear types

A  Belt gear with planetary gear PLE 80 and servo motor
B  Flange gear PLFE 64 and servo motor
C  Belt gear with planetary gear PLE 60 and servo motor
D  Belt gear with planetary gear PLE 60 and servo motor (arranged opposite)
5.5 Accessories

5.5.1 Mechanical stop

Stoppers (as lift limit) are available for all movement directions.

- Module 80/15 → item no.: 1018827
- Module 115/42 → item no.: 1054226
- Module 60/33 → item no.: 1128721

5.5.2 Angle to attach the positioning system

Levelling 120 mm cpl. (angle) → item no.: 1304064 (also see Figure 17, page 27)
5.6 Technical data

5.6.1 Tightening Torques for Screw Connection [Nm]

<table>
<thead>
<tr>
<th>Strength class</th>
<th>M2.5</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M8</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.8</td>
<td>0.5</td>
<td>1.28</td>
<td>2.7</td>
<td>5.5</td>
<td>9.5</td>
<td>23</td>
</tr>
</tbody>
</table>

5.6.2 Technical data Positioning system type: H-Portal

<table>
<thead>
<tr>
<th>Positioning System Type: H-Portal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke X</td>
</tr>
<tr>
<td>Stroke Y</td>
</tr>
<tr>
<td>Stroke Z</td>
</tr>
<tr>
<td>Weight X/Y/Z system (at stroke: 800/600/300)</td>
</tr>
<tr>
<td>Moved mass X/Y/Z system in X/Y/Z direction</td>
</tr>
<tr>
<td>Moved mass X/Y system in X/Y direction</td>
</tr>
<tr>
<td>Weight increase per 100 mm stroke Y-axis</td>
</tr>
<tr>
<td>Weight increase per 100 mm stroke Z-axis</td>
</tr>
<tr>
<td>Recommended handling weight (dependent on stroke, motor and gear)</td>
</tr>
<tr>
<td>Repeating accuracy</td>
</tr>
<tr>
<td>Toothed belt X/Y</td>
</tr>
<tr>
<td>Rope-pull resistance</td>
</tr>
<tr>
<td>Toothed belt Z and ZW</td>
</tr>
<tr>
<td>Rope-pull resistance</td>
</tr>
<tr>
<td>Infeed constant without gear X/Y</td>
</tr>
<tr>
<td>Infeed constant without gear Z</td>
</tr>
<tr>
<td>for gear:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Recommended size servo motors</td>
</tr>
</tbody>
</table>
5.6.3 Type Label

The type label is attached in the following position:

![Figure 22](image-url)  
**Figure 22** Position of the type label

A Type Label

![Figure 23](image-url)  
**Figure 23** Type label (standard design)

A Type designation  
B Infeed / motor turn  
C Serial number  
D Order number
6 Maintenance

**NOTICE**

Any repairs must only be performed by specialist personnel that has read and understood these operating instructions.
Only use genuine spare parts, since IEF-Werner GmbH will not assume any warranty otherwise.

6.1 Lubrication of Guide Carriage

The guide carriages are equipped with long-time lubrication for a running output of 5000 km (Z-axis → 1000 km) in the factory. We recommend regularly relubricating the guide carriage after this.

Relubrication takes place by a manual surge press (IEF-Werner item no.: 1055123) using the lubrication nipples attached to the marked locations. The lubrication nipples [E] and [F] (see Figure 25, page 36) must be lubricated from either side. The other lubrication nipples [A], [B] and [D] (see Figure 24, below) only need to be lubricated on one of the two sides.

Lubricant Dynalub 510 must be used. The lubrication quantity is 3 x 0.4 cm³. Lubrication must take place three times at 0.4 cm³, and the carriage must be moved by approx. 100 mm in between, so that the lubricant spreads.

The grooved ball bearings are service-life lubricated and therefore do not need to be lubricated.

![Figure 24 Lubrication for the X- and Y-axes](imageURL)

A  Lubrication nipples guide carriage X-axis  
B  Lubrication nipples guide carriage Y-axis  
C  Alternative – lubrication from below  
   (lubrication nipples guide carriage X-, Y-axis)
Figure 25  Lubrication for Z-axis

D  Lubrication nipples for nut in groove guide

E  Lubrication nipples guide carriage Y-axis and lower guide carriage Z-axis

F  Lubrication nipples for upper guide carriage Z-axis
# Troubleshooting

<table>
<thead>
<tr>
<th>Interference</th>
<th>Reason</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased running noise</td>
<td>Nominal service life of guide carriage exceeded</td>
<td>Complete exchange of the guide carriages</td>
</tr>
<tr>
<td></td>
<td>Torque load on guide carriage too high, causing play in the guide carriage</td>
<td>Complete exchange of the guide carriages; reduce load if necessary</td>
</tr>
<tr>
<td></td>
<td>Guide carriage worn from strong contamination</td>
<td>Replace all guide carriages, clean guide rails and relubricate</td>
</tr>
<tr>
<td>Guide rails worn</td>
<td></td>
<td>Replace guide rails, replace all guide carriages, check load, protect linear module from strong contamination</td>
</tr>
<tr>
<td>Belt tension too high</td>
<td></td>
<td>Relieve belt a little</td>
</tr>
<tr>
<td>Belt contaminated or run in</td>
<td></td>
<td>Clean belt, replace if necessary</td>
</tr>
<tr>
<td>Sprocket run in</td>
<td></td>
<td>Replace sprocket</td>
</tr>
<tr>
<td>Bearing of the deflector roller defective</td>
<td></td>
<td>Replace deflector roller with bearing</td>
</tr>
<tr>
<td>Motor or gearbox aligned incorrectly</td>
<td></td>
<td>Align motor or gearbox</td>
</tr>
<tr>
<td>Gearbox or counter-bearing of the gearbox sprocket defective</td>
<td></td>
<td>Replace gearbox or counter-bearing</td>
</tr>
</tbody>
</table>

**Linear drive unit does not move**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor connected incorrectly</td>
<td>Check and change connector assignment, if required</td>
</tr>
<tr>
<td>Motor defective</td>
<td>Replace motor</td>
</tr>
<tr>
<td>Plugs loose</td>
<td>Check plug connections</td>
</tr>
<tr>
<td>Motor cable defective</td>
<td>Check motor cable, replace cable, if required.</td>
</tr>
<tr>
<td>Toothed disc slips through</td>
<td>Engage clamp set tightly and secure screws with threadlocker.</td>
</tr>
<tr>
<td>Guide carriage defective (stiffness, block)</td>
<td>Replacement of the guide carriages, if required of the guide rail</td>
</tr>
<tr>
<td>For motor with brake: Brake does not disengage</td>
<td>Apply current to the brake, if the brake still does not open, replace motor</td>
</tr>
<tr>
<td>Error in power electronics or control unit</td>
<td>Check components, replace if necessary</td>
</tr>
<tr>
<td>Interference</td>
<td>Reason</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Position loss/reverse play</td>
<td>Belt tension too low</td>
</tr>
<tr>
<td></td>
<td>Toothed disc slips through</td>
</tr>
<tr>
<td>Linear drive unit moves mechanically against the stop during the reference run</td>
<td>Incorrect direction of rotation</td>
</tr>
<tr>
<td></td>
<td>Broken motor cable</td>
</tr>
</tbody>
</table>
8 Repair

**WARNING**

Warning of dangerous electrical voltage.
The system must be powered down for all assembly, disassembly or repair work. Non-observance of the safety provisions may cause death.

**NOTICE**

Any repairs must only be performed by specialist personnel who have read and understood these original operating instructions. Only use genuine spare parts, since IEF-Werner GmbH will not assume any warranty otherwise.

8.1 Factory-setting of the toothed belt tension

The toothed belt tension is correctly set in the factory before delivery.

Note: Do not remove the threadlocker varnish from the setting screws at the belt lock of the X/Y- and X/Y/Z-systems.

In an X/Y/Z/W-system, the toothed belt for the Z/W-movement is tensed until the clamping sleeves block; therefore, no threadlocker is used.

![Diagram of toothed belt tension Z/W-belt above the end plate, up at the Z-axis](image)

**Figure 26** Toothed belt tension Z/W-belt above the end plate, up at the Z-axis

- A Clamping screw
- B Sleeve
- C Deflection shaft
8.2 Replace toothed belt

8.2.1 Replacing the toothed belt in the X/Y-system

**CAUTION**

The positioning system must be supported in the vertical arrangement so that the carriages or axes do not fall off when releasing the toothed belt.

You may also put the positioning system into a horizontal position (e.g. by disassembly).

---

**Release the damaged toothed belt**

1. Relieve toothed belt (see [A] in Figure 27, page 41) by loosening the two M6-clamping screws [D].
2. Release the belt buckles and toothed segments [C]. Do not release the counter-screw [E] in the middle.
3. Disassemble the lid [B].
4. Pull out the defective toothed belt [A].
5. Check further moving parts for wear and function, replace if necessary.

**Insert new toothed belt**

1. Thread in the toothed belt anew.
2. Re-install the belt buckles and toothed segments [C].
4. Before and during clamping of the toothed belt, ensure that the teeth of the belt interlock with the grooves of the sprockets.
5. Check smooth operation and noise.
6. Re-install the lid [B].
7. Perform reference run and check axis positions; adjust if necessary.
Positioning System Type: H-Portal
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Figure 27  Toothed belt change at the X/Y-system
A  Toothed belt  B  Cover
C  Belt buckles  D  M6-clamping screws
E  Counter-screw

Figure 28  Toothed belt at the X/Y-system
A  Toothed belt
8.2.2 Replacing the toothed belt in the X/Y/Z-system

**CAUTION**

The Z-axis must be supported at vertical attachment or secured by a stopper (article no. 1128721) so that it does not fall off when loosening the toothed belt.

Release the damaged toothed belt

1. Relieve the toothed belt (see A in Figure 29, page 43) by releasing the central M8-clamping screws D, so that the two counter-thread pins E do not become maladjusted.
2. Disassemble the lid.
3. Release the belt buckles C.
4. Pull out defective toothed belt.
5. Check further moving parts for wear and function, replace if necessary.
6. Release housing with deflector rollers B.

Insert new toothed belt

1. Thread in the toothed belt anew. Disassemble the end plates or guide the toothed belt with a flat screwdriver at the height of the end plates.
2. Re-install the housing with deflector rollers B.
3. Install the belt buckles C.
4. Install the lid at the housing with the deflection rollers B.
5. Tension toothed belt.
6. Before and during clamping of the toothed belt, ensure that the teeth of the belt interlock with the grooves of the sprockets.
7. Tighten the M8 clamping screw D to the stop again. The counter-thread pins E specify the clamping path.
8. Check smooth operation and noise.
9. Assemble the lid.
10. Remove the support of the linear unit.
11. Perform reference run and check axis positions; adjust if necessary.
Positioning System Type: H-Portal

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Figure 29  Toothed belt change at the X/Y/Z-system

A  Toothed belt
C  Belt buckle
E  Counter-thread pins

B  Housing with deflection
D  M8-clamping screws

Lid concealed
8.2.3 Replacing the toothed belt in the X/Y/Z/W-system

**CAUTION**

The Z-axis must be supported at vertical attachment or secured by a stopper (article no. 1128721) so that it does not fall off when loosening the toothed belt.

Release the damaged toothed belt

1. Relieve toothed belt (see A in Figure 30, page 45) by loosening the M5-clamping screws D.
2. Disassemble the lid.
3. Release housing with deflector rollers B.
4. Disassemble the end plates C.
5. Release clamp for adjustment rings F and axial safety mechanism G for sprocket.
6. When using a belt gear, relieve the belt gear. For this, loosen the four screws I of the planetary gear. These screws can be reached through the bore of the sprocket.
7. Release the clamping set H in the belt gear (in the clamping set, release the screws and push on the clamping set with a screw if necessary). When using a flange gear, open the clamp ring F at the flange gear.
8. Push both sprockets J and grooved guides K out of the housing. If possible, do not push the sprocket off of the grooved guide.
10. Check further moving parts for wear and function, replace if necessary.

Insert new toothed belt

**NOTICE**

The positions of the support bearings L must not be changed. When the screws N have been opened, adjust the position again. However, this is done by pushing in the X/Y-axis system in the respective end positions, so that the sprocket specifies the position of the grooved guide. When using a flange gear, the position must be adjusted again if it has been removed.

1. Re-insert toothed belt.
2. Push the sprockets J and grooved guides K back into the original position. If possible, do not push the sprocket off of the grooved guide.
3. Restore the clamp for the adjustment rings F and re-install the axial protection G for the sprocket. Observe or check for smooth operation.
4. Retighten the clamping set H in the belt gear. When using a flange gear, close the clamping ring again.
5. Re-tension the toothed belt in the belt gear manually and tighten the planetary gear with the screws I.
6. Install the end plates C.
7. Insert and install the housing with the deflection rolls B.
8. Assemble the lid.
9. Retighten the two clamping screws D to the stop. The sleeves E specify the clamping path.
(10) Before and during clamping of the toothed belt, ensure that the teeth of the belt interlock with the grooves of the sprockets.
(11) Check smooth operation and noise.
(12) Remove the support of the linear unit.
(13) Perform reference run and check axis positions; adjust if necessary.

Figure 30  Toothed belt change at the X/Y/Z/W-system

A  Toothed belt
C  End plates
E  Sleeves
G  Screws for axially securing the sprocket
I  Screws of the planetary gear
K  Grooved shaft guide
M  Screws for clamping the support bearing

B  Housing with deflector rollers
D  M5-clamping screws
F  Adjustment rings
H  Clamping set for sprocket
J  Sprocket
L  Support bearing
8.3 Exchange guide carriages / guide rail

8.3.1 Exchange guide carriages/guide rail of the X-axis

**CAUTION**

The positioning system must be supported in the vertical arrangement so that the carriages or axes do not fall off when releasing the toothed belt.

You may also put the positioning system into a horizontal position (e.g. by disassembly).

Remove defective guide carriage.

1. Relieve toothed belt (see A in Figure 27, page 41) by releasing the two M6-clamping screws D (see Figure 27, page 41).
2. Release the belt buckles and toothed segments C (see Figure 32, page 41). Do not release the counter-thread pins E in the middle.
3. Disassemble the lid B.
4. Pull out the toothed belt.
5. Remove the deflection roller F (see Figure 32, page 48).
6. Remove the deflection housing X-axis G.
7. Disconnect the Y-axis from the carriage of the X-axis by pulling the four pins H and releasing the screws I.
8. Separate the carriage X-axis. For this, loosen the four threaded pins J and then remove the screws K. Mark the arrangement of the carriage parts and do not swap them later.
9. Push the carriage from the guide rails with the guide carriage, release the screws M and remove the guide carriage L.
10. Clean the guide rail and check it for wear or damage; replace it if necessary.
11. Check further moving parts for wear and function, replace if necessary.

Insert new guide carriage.

**NOTICE**

The new guide carriages must only be installed at the adapter plate with the carriage installed.

Manually push the guide carriage against the stop edge at the carriage (see Figure 31, page 47).

1. Push the new guide carriage (see L in Figure 31, page 47) onto the guide rail.
2. The polished surface of the guide carriage L is the reference surface and applied against the carriage. The other surface is exposed (see Figure 31, page 47). The placement does not matter for the guide rail. Push the guide rail against the step of the basic body during installation.
3. When tightening the screws M, push the guide carriages L against the reference side with the entire basic body.
4. Check the guide system for smooth operation.
(5) Re-assemble the carriage. The centring ring \( N \) aligns the position in the X-direction and the two threaded pins \( J \) align the position in the Z-direction. Moderately apply the threaded pins; then tighten the four cylinder-head screws \( K \).

(6) Check the guide system for smooth operation. The deflection rollers for the Y-axis \( O \) (Figure 32, page 48) must turn freely.

(7) Install the deflection housing \( G \) X-axis, then the deflection roller \( F \).

(8) Reinstall the Y-axis on the carriages. The pins \( H \) specify an alignment.

(9) Insert the belt.

(10) Install the belt buckle \( C \).

(11) Tension toothed belt: Evenly tighten the clamping screws \( D \) to the stop. The counter-screw \( J \) specifies the clamping path.

(12) Before and during clamping of the toothed belt, ensure that the teeth of the belt interlock with the grooves of the sprockets.

(13) Check smooth operation and noise development again and remove support from the linear unit.

(14) If the positioning system has been removed from the frame, the attachments of the X-axes must be tightened in the respective end positions of the carriage. Then check for smooth operation and noise development again.

(15) Re-install the cover.

(16) Perform reference run and check axis positions; adjust if necessary.

---

**Figure 31** Reference side of the guide carriages at the X-axis

- J Threaded pins
- L Guide carriage
- N Centring
- Q Notch = Reference side of the basic body
- K Screws
- M Screws
- P Stop of carriage at the deflection housing
- R Reference and stop surface of the guide carriage and guide rail
Figure 32   Exchange guide carriages/guide rail of the X-axis.

A  Toothed belt not illustrated → see A in Figure 27, page 41  
B  Lid  
C  Belt buckle  
D  M6-clamping screws  
E  Counter-screw  
F  Deflection roller X-axis  
G  Deflection housing X-axis  
H  Pins  
I  Screws  
J  Threaded pins  
K  Screws  
L  Guide carriage  
M  Screws  
N  Centring  
O  Deflection roller Y-axis
8.3.2 Exchange of guide carriage Y-axis

**CAUTION**

The positioning system must be supported in the vertical arrangement so that the carriages or axes do not fall off when releasing the toothed belt.

You may also put the positioning system into a horizontal position (e.g. by disassembly).

Remove defective guide carriage.

1. In an X/Y-system: The parts installed on the carriage must be removed. Then relieve the belt (A see Figure 27, page 41), but do not adjust the central counter-thread pin (E see Figure 27, page 41).
2. For an X/Y/Z-system (see Figure 29, page 43), the Z-axis must be removed. For this, relieve the belt (A see Figure 29, page 43), but do not adjust the two count-thread pins (E see Figure 29, page 43). Then remove the covers and the deflection units (B see Figure 29, page 43). After releasing the screws (D), the Z-axis can be disassembled.
3. For an X/Y/Z/W-system (see Figure 30, page 45), the Z-axis must be removed. For this, relieve the belt by releasing the two M5-clamping screws (D see Figure 30, page 45). Then remove the covers and the deflection units (B Figure 30, page 45). After releasing the screws (D), the Z-axis can be disassembled.

4. Pull out the X/Y belt (A) (see Figure 27, page 41), around the Y-axis.
5. Disassemble the cover parts.
6. Pull the four pins (H) (see Figure 33, page 50) then take out the screws (I) for the carriage and the Y-axis.
7. Disassemble one of the two end plates of the Y-axis (G).
8. Push the interim plate (J) with guide carriage (K) from the guide.
9. Clean the guide rail and check it for wear or damage and replace it if necessary.
10. Check further moving parts for wear and function, replace if necessary.

Insert new guide carriage.

1. The ground surface of the guide carriages (K) is the reference surface (see Figure 34, page 51) and applied to the interim plate (J).
2. The placement does not matter for the guide rail. Push the guide rail against the step of the basic body during installation.
3. The lubrication channel is arranged on the inside.
4. When tightening the screws (L), push the guide carriage (K) with the reference side against the step in the interim plate (J).
5. Join the interim plate with the guide carriage on the guide shaft.
6. Check the guide system for smooth operation.
7. Install the end plate (G).
8. Reinstall the Y-axis on the carriage of the X-axis. The four pins (H) specify the position. Then tighten the screws (I) for the carriage.
(8) Check the guide system for smooth operation.

(9) Thread in the X/Y-toothed belt and install the belt buckle with the tooth segment.

(10) Clamp the X/Y-toothed belt: Tighten the two M6 clamping screws evenly to the stop. The central counter-screw specifies the clamping path.

(11) Before and during clamping of the toothed belt, ensure that the teeth of the belt interlock with the grooves of the sprockets.

(12) Install the cover parts.

(13) Re-install the Z-axis if necessary.

(14) Tension the Z-toothed belt if necessary (see section Replace toothed belt, as of page 40)

(15) Perform reference run and check axis positions; adjust if necessary.

---

Figure 33  Exchange guide carriages/guide rail of the Y-axis.

A  Toothed belt not illustrated → see A in Figure 29, page 43 or Figure 30, page 45
B  Housing with deflection
C  Belt buckle X/Y-belt
D  M8 clamping screw Z-belt
E  2x counter-thread pins
F  Screws of the interim plate for the carriage plate
G  End plate
H  Pins
I  Screws
J  Adapter plate
K  Guide carriage

---
Positioning System Type: H-Portal

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Figure 34  Reference side of the guide carriages at the Y-axis

- J  Adapter plate
- L  Screws
- N  Notch = Reference side of the basic body
- K  Guide carriage
- M  Carriage plate
- O  Reference surface of the guide carriage and guide rail
8.3.3 Exchange of the guide carriage Z-axis

**CAUTION**

The positioning system must be supported in the vertical arrangement so that the carriages or axes do not fall off when releasing the toothed belt.
You may also put the positioning system into a horizontal position (e.g. by disassembly).

Remove defective guide carriage.

1. In an X/Y/Z-system: Relieve the Z-toothed belt (see A in Figure 29, page 43) by releasing of the central M8 clamping screws (see D in Figure 29, page 43). Do not release the two counter-thread pins (see E in Figure 29, page 43).
2. Remove the cover parts and end plate Z-axis (see G in Figure 35, page 53).
3. Disassemble the deflection unit B. Then the Z-axis can be disassembled.

4. In an X/Y/Z/W-system: Relieve the Z/W-toothed belt by releasing the two M5 clamping screws (see D in Figure 30, page 45).
5. Remove the cover parts and two end plates of the Z-axis (see G in Figure 35, page 53).
6. Disassemble the deflection unit B. Then the Z-axis can be disassembled. The Z/W-toothed belt does not need to be removed entirely.

7. Loosen the screws H for the guide carriage.
8. Push the guide carriages I from the guide.
9. Clean the guide rail and check it for wear or damage and replace it if necessary.
10. Check further moving parts for wear and function, replace if necessary.
11. Place the guide carriage I on the new guide rail.

**NOTICE**

The guide carriages must only be installed at the adapter plate with the guide rail installed. Observe reference side (see Figure 36, page 53).

1. The ground surface of the guide carriages I is the reference surface (see Figure 36, page 53) and applied to the adapter plate. The placement does not matter for the guide rail. Push the guide rail against the step of the basic body J during installation.
2. The lubrication nipples are placed on the outside (retrofit if necessary).
3. When tightening the screws H, push the guide carriages I against the reference side with the entire basic body J.
4. Check the guide system for smooth operation.
5. Install the Z-axis again on the carriage of the Y-axis.
6. Assemble the deflection unit B.
7. Assemble the end plate G and covers.
(8) Tension the Z-toothed belt until the belt buckles (see C in Figure 33, page 50) are applied to the counter-thread pins (see E in Figure 33, page 50).
Before and during clamping of the toothed belt, ensure that the teeth of the belt interlock with the grooves of the sprockets.
Tighten the two clamping screws to block in an X/Y/Z/W-system.
Before and during clamping of the toothed belt, ensure that the teeth of the belt interlock with the grooves of the sprockets.

(9) Perform reference run and check axis position; adjust if necessary.

Figure 35 Exchange guide carriages/guide rail of the Z-axis.
B  Deflection units  G  End plates
H  Screws of the guide carriage  I  Guide carriage

Figure 36 Reference side of the guide carriages at the Z-axis.
I  Guide carriage  J  Basic body
L  Reference surface of the guide carriage and guide rail
8.4 Exchange of the grooved guide

**CAUTION**

The positioning system must be supported at vertical attachment or secured by a stopper (article no. 1128721) so that the carriage or axes do not fall off when loosening the toothed belt.

You may also put the positioning system into a horizontal position (e.g. by disassembly).

---

Remove the defective grooved guide.

1. Relieve toothed belt (see [A] in Figure 30, page 45) by loosening the two M5-clamping screws.
2. Disassemble the covers.
3. Release housing with deflector rollers [B] (see Figure 37, page 55).
5. When using a belt gear, relieve the belt gear. For this, loosen the four screws [I] of the planetary gear. These screws can be reached through the bore of the sprocket.
6. Release the clamping set [H] in the belt gear (in the clamping set, release the screws and push on the clamping set with a screw if necessary). When using a flange gear, open the clamp ring at the flange gear.
7. Take out the sprocket [J] and grooved guide [K].
8. Disassemble the sprocket [J] from the grooved guide [K].
9. Check further moving parts for wear and function, replace if necessary.

---

Insert new grooved guide.

**NOTICE**

The positions of the support bearings [L] must not be changed. When the screws [N] have been opened, adjust the position again. However, this is done by pushing in the X/Y-axis system in the respective end positions, so that the sprocket specifies the position of the grooved guide. When using a flange gear, the position must be adjusted again if it has been removed.

---

1. Install the sprocket [J] on the grooved guide [K]. If possible, do not push the nut body [M] off of the grooved shafts.
2. Re-insert the sprocket [J] and grooved guide [J]. Observe alignment; the screws of the sprocket are at the rear in the figure.
3. Reinstall the clamp for the adjustment rings [F] and the axial protection [G] for the sprocket. Observe smooth operation.
4. Tighten the clamping set [H] again in the belt gear. When using the flanged gear, restore the clamping ring.
5. Re-tension the toothed belt in the belt gear manually and tighten the planetary gear with the screws [I].
6. Insert housing with deflector rollers [B].
7. Assemble the lid.
8. Tighten the clamping screw [D] to the stop again. The sleeves (see [E] Figure 30, page 45) or counter-thread pins specify the tension path.
(9) Before and during clamping of the toothed belt, ensure that the teeth of the belt interlock with the grooves of the sprockets.

(10) Check smooth operation and noise.

(11) Remove the support of the linear unit if necessary.

(12) Perform reference run and check axis position; adjust if necessary.
## 9 Parts lists and drawings

### 9.1 Positioning System Type: H-Portal, 1800142

<table>
<thead>
<tr>
<th>Z-Pos.</th>
<th>Part number</th>
<th>Designation</th>
<th>E=spare part</th>
<th>V=wear part</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 *) +</td>
<td>20 *) +</td>
<td>Basic body type: Module 80/15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 *) +</td>
<td>30 *) +</td>
<td>Ball rail guide type: 1605-103-31</td>
<td>V</td>
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<tr>
<td>40 *) +</td>
<td>40 *) +</td>
<td>Basic body module 115/42 type: H-Portal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 *) +</td>
<td>50 *) +</td>
<td>Guide rail module 115/42 type: H-Portal</td>
<td></td>
<td></td>
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<tr>
<td>60 *) +</td>
<td>60 *) +</td>
<td>Basic body type: Module 60/33</td>
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<tr>
<td>70 *) +</td>
<td>70 *) +</td>
<td>Basic body with turning axis module 60/33 type: H-Portal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 *) +</td>
<td>80 *) +</td>
<td>Guide rail</td>
<td>V</td>
<td></td>
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<tr>
<td>120</td>
<td>1025262</td>
<td>Housing with damper type: 80/160/15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>1059629</td>
<td>Drive set type: 80/15/50/FLG</td>
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<td>140</td>
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<td>Drive set type: 80/15/50</td>
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<td>Flange type: PLFE 064</td>
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<td>Lid M80/160/15 plastic - colour: black</td>
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<td>180</td>
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<td>Bearing cover plastic - colour black</td>
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<td>190</td>
<td>1023994</td>
<td>Slot nut, M4 flat</td>
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<tr>
<td>200</td>
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<td>Slot nut, M4 short</td>
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<tr>
<td>210</td>
<td>1044440</td>
<td>Plastic clip 10.8 x 5.5 mm</td>
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<td></td>
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<tr>
<td>220</td>
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<td>Plastic clip 10.8 x 5.5 mm</td>
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<td>230</td>
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<td>240</td>
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<td>Plastic clip 10.8 x 5.5 mm</td>
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<td>260</td>
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<td>Carriage with deflection roller cpl.</td>
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<td>270</td>
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<td>280</td>
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<td>1062164</td>
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<td>300</td>
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<td>Dampener green PUR 80 Shore</td>
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<tr>
<td>310</td>
<td>1021376</td>
<td>Toothed belt 49ATL5 with E-wire 0.60 mm</td>
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<tr>
<td>320</td>
<td>1023994</td>
<td>Slot nut, M4 flat</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Z-Pos. | Part number | Designation | E=spare part | V=wear part
--- | --- | --- | --- | ---
330 | 1126636 | Slot nut, M4 short | | |
335 | 735189 | Centring sleeve, type: ZBH-9 | | |
340 | 1044440 | Plastic clip 10.8 x 5.5 mm | | |
350 | 1044440 | Plastic clip 10.8 x 5.5 mm | | |
355 | 626928 | Cylinder pin with inner thread DIN 7979/ISO 8735 - 5x20 | | |
357 | 627735 | Cylinder pin DIN 6325 / ISO 8734 - 6 x 24 - A | | |
370 | 1131724 | Linear unit vertical cpl. | | |
380 | 1052929 | Carriage unit | | |
390 | 1132400 | Turning unit parts cpl. | | |
400 | 1130320 | Ball spline cpl. | | |
410 | 1132453 | Belt gear ball spline i=1:1 | | |
420 | 1093534 | Gear housing spanner cpl. | | |
430 | 1126531 | Deflection roller module 60/33 v cpl. | | |
440 | 1126529 | Bolt v | | |
450 | 1126530 | Sleeve d12 D16 type: Module 60/33 | | |
460 | 1126544 | End plate module 60/33 | | |
470 | 1130346 | Assembly angle type: H-Portal | | |
500 | 732766 | Toothed belt type: 25AT5 E-strand 0.6 | | |
510 | 1126550 | Slot nut M4 | | |
520 | 1126636 | Slot nut, M4 short | | |
530 | 627576 | Threaded pin hexagon socket and conical top ISO 4026 - M5 x 10 - 45H - zinc-plated | | |
570 | 1130332 | Coupling flange gear | | |
575 | 1142536 | Adjustment ring type: GN706.2-42-B20-NI | | |
578 | 1106827 | Groove ball bearing, type: 6204-C-2HRS | V | |
579 | 1013134 | Hexagon screw ISO 4017 - M5 x 10 - 8.8 zinc-pl. | | |
590 | 1018827 | Stopper type: Module 80/160/15 | | |
600 | 1054226 | Stopper type: Module 115/42 | | |
610 | 1128721 | Lift limiter cpl. type: Module 60/33 | | |

* use depending on design

*) Part number by inserted components. Is defined in more detail in the customer-specific parts list.
Figure 38 Exploded drawing 1800142
Figure 39  Section views 1800142

Figure 40  View with turning unit 1800142
Positioning System Type: H-Portal

Translation (EN) of the original German instructions | R1d

Figure 41  Dimensioned drawing 1800142
### 9.2 Carriage with deflection roller cpl. 1311835

<table>
<thead>
<tr>
<th>Z-Pos.</th>
<th>Parts number</th>
<th>Designation</th>
<th>E=spare part</th>
<th>V=wear part</th>
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<td>10</td>
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<td>Housing deflection shaft</td>
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<td>1428422</td>
<td>Deflection washer</td>
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<td>30</td>
<td>1428433</td>
<td>Bearing bolt</td>
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<tr>
<td>40</td>
<td>1428449</td>
<td>Carriage</td>
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<td>Distributor</td>
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<td>Grooved ball bearing 12 x 37 x 12 mm, type: 6301.2RS</td>
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<tr>
<td>90</td>
<td>1028704</td>
<td>T.-lubrication nipples type: D4</td>
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<td>1008664</td>
<td>Centring sleeve, type: ZBH-7</td>
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<td>Cylindrical screw DIN 912 / ISO 4762 - M4 x 10</td>
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<td>57138</td>
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<td>120</td>
<td>626191</td>
<td>Threaded pin, hexagon socket and conical top</td>
<td></td>
<td></td>
</tr>
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<td>ISO 4026 - M6 x 12 - 45H - zinc-plated</td>
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<td>1021053</td>
<td>O-ring - NBR - 70° Shore A type: 3-1.50</td>
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<td>140</td>
<td>626116</td>
<td>Recessed-head screw ISO 10642 - M3 x 10 - 8.8</td>
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<tr>
<td></td>
<td></td>
<td>zinc-pl.</td>
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<td>150</td>
<td>626191</td>
<td>Threaded pin, hexagon socket and conical top</td>
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<td>ISO 4026 - M6 x 12 - 45H - zinc-plated</td>
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<tr>
<td>160</td>
<td>626329</td>
<td>Cylindrical pin ISO 8734 - 5 x 20 - A</td>
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<tr>
<td>170</td>
<td>626181</td>
<td>Threaded pin, hexagon socket and conical top</td>
<td></td>
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<td></td>
<td></td>
<td>ISO 4026 - M5 x 5 - 45H - zinc-plated</td>
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</table>
Figure 42   Exploded view carriage with deflection roller cpl. 1311835
### 9.3 Linear unit, vertical cpl. 1131724

<table>
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<tr>
<th>Z-Pos.</th>
<th>Part number</th>
<th>Designation</th>
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<tr>
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<td>Deflection roller Module 60/33 cpl.</td>
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<tr>
<td>40</td>
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<td>Adapter plate ZOM, type: H-Portal</td>
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<td>50</td>
<td>1126538</td>
<td>Covering, type: Module 60/33</td>
</tr>
<tr>
<td>60</td>
<td>1129512</td>
<td>Cover plate, type: Module 60/33</td>
</tr>
<tr>
<td>70</td>
<td>1129509</td>
<td>Bearing bolt ZOM, type: Module 60/33</td>
</tr>
<tr>
<td>80</td>
<td>1052457</td>
<td>Intermediate plate, type: Module 115/42</td>
</tr>
<tr>
<td>90</td>
<td>1056302</td>
<td>Pressure piece Module 115/42</td>
</tr>
<tr>
<td>100</td>
<td>1059202</td>
<td>Toothed segment steel, type: 80-160/15</td>
</tr>
<tr>
<td>110</td>
<td>1023942</td>
<td>Threaded sleeve, type: 80-160/15</td>
</tr>
<tr>
<td>120</td>
<td>1054232</td>
<td>Lubrication adapter, type: Module 115/42</td>
</tr>
<tr>
<td>130</td>
<td>1054270</td>
<td>Grease pipe</td>
</tr>
<tr>
<td>140</td>
<td>1028704</td>
<td>T.-lubrication nipple DIN 3405, type: D4</td>
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<tr>
<td>150</td>
<td>737231</td>
<td>O-ring - NBR - 70° Shore A, type: 12-1.50</td>
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<tr>
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<td>1031602</td>
<td>O-ring - NBR - 70° Shore A, type: 1.8-1.80</td>
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<td>1126614</td>
<td>Guide carriage, greased, with lubrication nipple, left, type Module 60/33</td>
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<tr>
<td>175</td>
<td>1145153</td>
<td>Guide carriage, greased, with lubrication nipple, right, type Module 60/33</td>
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<td>185</td>
<td>1055020</td>
<td>Guide carriage right, type: SHW27CA1QZSSC1E(GK)B</td>
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<td>190</td>
<td>26481</td>
<td>Dampener green PUR 80 Shore</td>
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<td>210</td>
<td>626175</td>
<td>Fillister head screw ISO 7380 - M4 x 8 - A2-50</td>
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<td>220</td>
<td>626338</td>
<td>Cylindrical pin DIN 6325 / ISO 8734 - 6 x 16 - A</td>
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<tr>
<td>270</td>
<td>626059</td>
<td>Cylindrical screw DIN 912 / ISO 4762 - M5 x 16 - 8.8 zinc-pl.</td>
</tr>
</tbody>
</table>
### Positioning System Type: H-Portal

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<table>
<thead>
<tr>
<th>Z-Pos.</th>
<th>Part number</th>
<th>Designation</th>
<th>E=spare part</th>
<th>V=wear part</th>
</tr>
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<tr>
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<td>Circlip for shaft, type: DIN 471-12x1- spring steel-phosphated</td>
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<tr>
<td>310</td>
<td>1433716</td>
<td>Clamping rail dL 50, L35 M4</td>
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**Figure 43** Exploded view linear unit, vertical cpl. 1131724
### 9.4 Carriage unit module 115/42, 1052929

<table>
<thead>
<tr>
<th>Z-Pos.</th>
<th>Part number</th>
<th>Designation</th>
<th>E=spare part</th>
<th>V=wear part</th>
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<td>Carriage plate</td>
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<td>20</td>
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<td>Intermediate plate</td>
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<tr>
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<td>Toothed segment</td>
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<td>1056302</td>
<td>Pressure piece Module 115/42</td>
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<td>1054232</td>
<td>Lubrication adapter</td>
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<td>O-ring NBR 70 Shore A, type: 12.00-1.50</td>
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<tr>
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<td>T.-lubrication nipple DIN 3405, type: D4</td>
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<tr>
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<td>Cylindrical screw DIN 912 / ISO 4762 - M5 x 16 - 8.8 zinc-pl.</td>
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<td>160</td>
<td>1023942</td>
<td>Threaded sleeve, type 80-160/15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>1056300</td>
<td>Cover sheet, type Module 115/42</td>
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<td></td>
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<tr>
<td>180</td>
<td>1072610</td>
<td>Recessed-head screw DIN 7991 / ISO 10642 - M3 x 8 - A2-50</td>
<td></td>
<td></td>
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</tbody>
</table>
Positioning System Type: H-Portal

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Figure 44 Exploded view carriage unit module 115/42 1052929
### 9.5 Turning unit parts, 1132400

<table>
<thead>
<tr>
<th>Z-Pos.</th>
<th>Parts number</th>
<th>Designation</th>
<th>E=spare part</th>
<th>V=wear part</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1142453</td>
<td>Shaft WPLE40 type: H-Portal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1130350</td>
<td>Sprocket Al 29.0 AT5/36-2 type: H-Portal</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1130348</td>
<td>Adapter WPLE40 type: H-Portal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>1143568</td>
<td>Cover deflection type: H-Portal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>1143576</td>
<td>End plate turning unit type: H-Portal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>1126541</td>
<td>Angle deflection roller type: Module 60/33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>1143569</td>
<td>Deflection shaft type: H-Portal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>1143573</td>
<td>Sleeve d5.5 D10 type: H-Portal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>1143575</td>
<td>Deflection pulley turning unit type: H-Portal</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>1142466</td>
<td>Grooved ball bearing 25 x 42 x 9 mm, type: 619052RS</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>626898</td>
<td>Grooved ball bearing 12 x 32 x 10 mm, type: 6201.2RS</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>627093</td>
<td>Grooved ball bearing 15 x 35 x 11 mm, type: 6202.2RS</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>626061</td>
<td>Cylindrical screw ISO 4762 - M4 x 16 - 8.8 zinc-pl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>626985</td>
<td>Cylindrical screw ISO 4762 - M5 x 35 - 8.8 zinc-pl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>1063449</td>
<td>Cylindrical screw DIN 7984 - M3 x 6 - 8.8 zinc-pl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>626218</td>
<td>Cylindrical screw ISO 4762 - M3 x 50 - 8.8 zinc-pl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>626484</td>
<td>Cylindrical screw ISO 4762 - M4 x 25 - 8.8 zinc-pl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>626890</td>
<td>Circlip for shaft DIN 471-15x1-steel, zinc-plated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>907969</td>
<td>Fillister head screw ISO 7380 - M4 x 6 - A2-50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>1047409</td>
<td>Centring sleeve, stainless steel type: ZBH-5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 45  Exploded view turning unit parts 1132400
## 9.6 Ball spline cpl., 1130320

<table>
<thead>
<tr>
<th>Z-Pos.</th>
<th>Part number</th>
<th>Designation</th>
<th>E=spare part V=wear part</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>1302975</td>
<td>Sprocket cpl.</td>
<td>V</td>
</tr>
<tr>
<td>40</td>
<td>1149578</td>
<td>Housing ball spline type: H-Portal</td>
<td>V</td>
</tr>
<tr>
<td>50</td>
<td>1130310</td>
<td>Bearing holder type: H-Portal</td>
<td>V</td>
</tr>
<tr>
<td>60</td>
<td>1130309</td>
<td>Connection plate type: H-Portal</td>
<td>V</td>
</tr>
<tr>
<td>70</td>
<td>1130312</td>
<td>Flange holder type: H-Portal</td>
<td>V</td>
</tr>
<tr>
<td>90</td>
<td>1142887</td>
<td>Pressure disc type: H-Portal</td>
<td>V</td>
</tr>
<tr>
<td>100</td>
<td>733723</td>
<td>Grooved ball bearing 45 x 58 x 7 mm, type: 61809.2RS</td>
<td>V</td>
</tr>
<tr>
<td>130</td>
<td>1060677</td>
<td>Fillister head screw ISO 7380 - M5 x 10 - A2-50</td>
<td>V</td>
</tr>
<tr>
<td>140</td>
<td>626050</td>
<td>Recessed-head screw ISO 10642 - M6 x 16 - 8.8 zinc-pl.</td>
<td>V</td>
</tr>
<tr>
<td>150</td>
<td>626705</td>
<td>Cylindrical screw ISO 4762 - M3 x 8 - 8.8 zinc-pl.</td>
<td>V</td>
</tr>
<tr>
<td>160</td>
<td>626036</td>
<td>Cylindrical screw ISO 4762 - M6 x 25 - 8.8 zinc-pl.</td>
<td>V</td>
</tr>
<tr>
<td>170</td>
<td>626037</td>
<td>Cylindrical screw ISO 4762 - M6 x 20 - 8.8 zinc-pl.</td>
<td>V</td>
</tr>
<tr>
<td>180</td>
<td>626062</td>
<td>Cylindrical screw ISO 4762 - M4 x 12 - 8.8 zinc-pl.</td>
<td>V</td>
</tr>
<tr>
<td>190</td>
<td>626336</td>
<td>Cylindrical pin ISO 8734 - 6 x 12 - A</td>
<td>V</td>
</tr>
<tr>
<td>200</td>
<td>626400</td>
<td>Disc zinc-plated type: B6.4</td>
<td>V</td>
</tr>
</tbody>
</table>
Positioning System Type: H-Portal

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Figure 46  Exploded view ball spline cpl. 1130320
### 9.7 Belt gear ball spline, 1132453

<table>
<thead>
<tr>
<th>Z-Pos.</th>
<th>Part number</th>
<th>Designation</th>
<th>E=spare part</th>
<th>V=wear part</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1025119</td>
<td>Gear housing for PLE60 type: Module 80/15</td>
<td></td>
<td></td>
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<tr>
<td>20</td>
<td>1054732</td>
<td>Sprocket St 32.0 AT5/42-2 rework</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>28722</td>
<td>Toothed disc St 32.0 AT5/42-2</td>
<td></td>
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</tr>
<tr>
<td>40</td>
<td>1025513</td>
<td>Belt gear lid type: 80/15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>1004001</td>
<td>Insertion lid for gear type: profiLINE 200</td>
<td></td>
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</tr>
<tr>
<td>60</td>
<td>732295</td>
<td>Clamping set type: PSV 2061 14x26</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>732294</td>
<td>Clamping set type: PSV 2061 20x38</td>
<td>E</td>
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</tr>
<tr>
<td>75</td>
<td>908243</td>
<td>Toothed belt (red) type: 25AT5/450 GEN III</td>
<td>V</td>
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</tr>
<tr>
<td>80</td>
<td>626039</td>
<td>Recessed-head screw ISO 10642 - M4 x 8 - 8.8 zinc-pl.</td>
<td></td>
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</tr>
<tr>
<td>90</td>
<td>1050511</td>
<td>Cylindrical screw DIN 7984 - M5 x 8 - 8.8 zinc-pl.</td>
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</tbody>
</table>

Figure 47  Exploded view belt gear ball spline. 1132453
### 9.8 Gear housing spanner cpl., 1093534

<table>
<thead>
<tr>
<th>Z-Pos.</th>
<th>Part number</th>
<th>Designation</th>
<th>E=spare part</th>
<th>V=wear part</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1093528</td>
<td>Gear housing belt spanner module 55 gear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1093533</td>
<td>Clamping block module 55 gear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1093532</td>
<td>Counterpart belt spanner module 55 gear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>1093535</td>
<td>Counterpart belt spanner 2 module 55 gear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>1093530</td>
<td>Belt holder rework type: Module 55, gearbox</td>
<td></td>
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</tr>
<tr>
<td>50</td>
<td>1093524</td>
<td>Gear cover belt type: Module 55</td>
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<tr>
<td>60</td>
<td>626059</td>
<td>Cylindrical screw ISO 4762 - M5 x 16 - 8.8 zinc-pl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>626039</td>
<td>Recessed-head screw ISO 10642 - M4 x 8 - 8.8 zinc-pl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>1004001</td>
<td>Insertion lid for gear type: profiLINE 200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>1093529</td>
<td>Cover belt spanner type: Module 55, gearbox</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>626127</td>
<td>Recessed-head screw ISO 10642 - M4 x 20 - 8.8 zinc-pl.</td>
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</tr>
<tr>
<td>130</td>
<td>626062</td>
<td>Cylindrical screw ISO 4762 - M4 x 12 - 8.8 zinc-pl.</td>
<td></td>
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</tr>
<tr>
<td>140</td>
<td>1047425</td>
<td>Threaded pin, hexagon socket and conical top ISO 4026 - M6 x 22 - 45H - zinc-plated</td>
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<td></td>
</tr>
<tr>
<td>150</td>
<td>626254</td>
<td>Cylindrical screw ISO 4762 - M8 x 30 - 8.8 zinc-pl.</td>
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</tr>
</tbody>
</table>
Positioning System Type: H-Portal

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Figure 48   Exploded view gear housing spanner cpl. 1093534