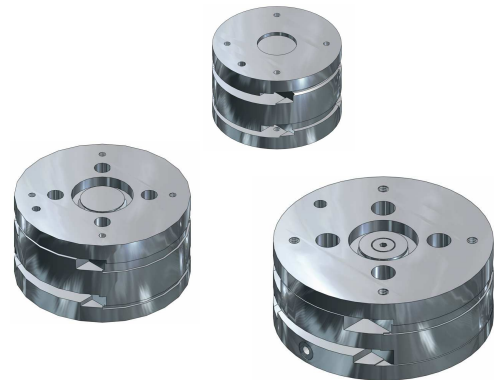


Lateral Alignment Device

KA-65, KA-65-ZV/DV
KA-80, KA-80-ZV/DV
KA-100, KA-100-ZV/DV



Version 2.0 last revision January 2012

Dear customer,

Thank you for the confidence that you have placed in our company by purchasing an IPR alignment device.

Every alignment device is fully assembled in the plant and is subject to an individual test. This includes examining their complete proper functioning and safe working.

These instructions illustrate how the alignment device is set up and operates. In addition, all the main details for assembly, commissioning and maintenance are clearly arranged.

Please carefully read through the contents.

Do directly contact us if any of your questions are not answered in these instructions. We are at the following address.

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Translation of the original assembly instructions

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1. General

1.1. Information on these instructions

These instructions enable the alignment device to be safely and effectively handled. These instructions form part of the machine and should be kept close to it so that the personnel responsible can easily access them.

The personnel involved must have carefully read through these instructions and understood them before beginning any work. Keeping to all the safety and handling pointers in these instructions is the basis on which work is done safely.

Also applying are any local health & safety regulations and the general safety conditions where the machine is used.

Illustrations in these instructions are there to assist in basic understanding; they may deviate somewhat from the actual design.

Also follow the generally valid, statutory and other binding regulations of European and national legislation as well as the accident prevention and environmental protection provisions in force in your country.

1.2. Terms of the guarantee




The terms of the guarantee can be found in the manufacturer's general terms & conditions of business. Please turn to our Customer Service (for contact data see cover) if any matters are not clear.

2. Safety

This section provides an overview on all the important safety aspects for the protecting people and for reliable, no-trouble operations. Further task-related safety instructions are included in the sections on the individual service life phases.

2.1. Symbol explanations

Safety instructions are identified by symbols in these instructions. The safety instructions are introduced by signalling words expressing the degree of hazard involved.

	CAUTION! Points to a possible dangerous situation which - if not avoided - may result in either minor or slight injuries.
	NOTE! Points to a possible dangerous situation which - if not avoided - may result in either material or ecological damage.
	This symbol brings useful tips and recommendations to one's notice as well as information on efficient, no-trouble operations.

2.2. Intended use

The KA force-free compensation device is solely for offsetting position variations of tools when picking up and depositing/lowering. Tolerance can be compensated within the max. displacement of the compensation device. Angle errors cannot be offset.

The compensating function is only to be released when the compensation device is in the horizontal position.

Compensation devices are not ready-to-use machines as envisaged under the EU Machinery Directive. Compensation devices are solely for fitting/attaching to machinery and equipment.



NOTE!

You must use this alignment device exclusively in accordance with the operating conditions and performance specifications established in these instructions.

2.3. Inappropriate use

Any other use or one going beyond that described in the "Intended Use" chapter is deemed to be inappropriate and will void all warranty or guarantee claims.

It is the owner - and not the manufacturer - who accepts liability for damage resulting from this.



NOTE!

The alignment device must not be used in any explosive environment.

2.4. General risks

The alignment device was state-of-the-art manufactured at the time of delivery. Even so, dangers could still proceed from it if the safety information listed here in these instructions is not followed.

- The personnel involved must have carefully read through these instructions and understood them before beginning any work.
- The instructions must always be available for all users where the alignment device is deployed.
- These instructions are also to accompany the alignment device if it is handed over to third parties.
- Do not delve into moving components or handle them during on-going operations.
- Never open protective covers under ongoing operations.
- Only authorized specialist personnel - outside the danger zone - are allowed to carry out any work such as assembly, commissioning, operating, dismantling and maintenance.
- Before any work is begun on the alignment device, the energy supply needs to be disconnected and the line system relieved of pressure. Secure the system against being unintentionally reactivated for the duration of the work.
- Ensure during commissioning that all pneumatic connections are either allocated or firmly closed.

2.5. Owner obligations

Together with the safety instructions in these instructions, the valid safety, accident prevention and environmental protection regulations in force where the machine is used must be adhered to.

As part of his obligation to exercise due care, the owner is to ensure that:

- The alignment device is used as intended
- During the entire period of use of the machine a check is to be made on whether his operating instructions comply with the ongoing status of the standards & codes and, if necessary, he is to adapt them.
- The responsibilities for installation, operation, fault rectification, maintenance and cleaning are clearly settled and laid down.
- All those dealing with the machine have both read these instructions and understood them. In addition, he has to regularly train the personnel involved and inform them as to hazards/risks.

2.6. Requirements placed on the personnel

The variety of tasks described in these instructions place differing requirements on the qualifications of those performing these tasks.

Only appropriate specialist personnel or a duly instructed person under the supervision of specialist personnel are allowed to carry out any work such as assembly, commissioning, operating, dismantling and maintenance.

In view of his technical training, knowledge, experience and knowledge of the relevant standards and regulations, the specialist is in a position to perform the work he has been entrusted with and - on his own - to recognize/avoid any hazards.

3. Specifications

(Please refer to the ongoing catalogue for specifications of the individual alignment devices)

3.1. General basic data

Min. operating pressure: 3.5 bar
 Max. operating pressure: 8 bar
 Temperature range: 5 °C to 80 °C (higher if request ed)
 Drive: Pneumatic
 Material: Casing of high-strength aluminium hard-coated/ partly hardened steel, Operating parts hardened tool-steel

Tolerance particulars
 Thread: +/- 0.1 mm
 Alignment pin drill hole: +/- 0.02 mm

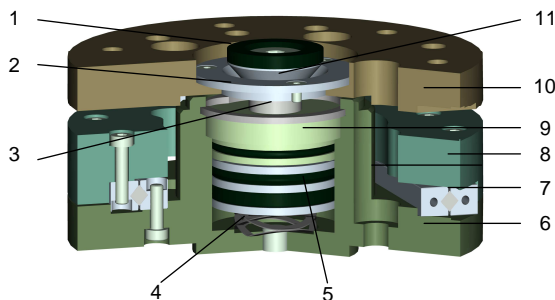
3.2. Operating conditions

The working environment is not to contain any dirt, dust, spray or vapours. The machine is to be used at temperatures between 10 °C and 40 °C.

The maximum (non-condensing) relative air humidity is to be between 10% and 70%.

4. Setup and function

4.1. Overview



1	Adhesion Pad*	7	Guide Rail
2	Cone Inset	8	Middle Part
3	Piston Rod	9	Sealing Part
4	Spring*	10	Tool Side
5	Piston	11	Locking Cone
6	Robot Side		

* Parts only for KA - with offset-locking

4.2. Brief description

The compensation movement is implemented through linear roller guidance based on the compound slider principle. Compensation takes place without reaction force. The fixture can be locked in a central position using a double- action pneumatic cylinder. The compensation can take place twodimensionally in the x-y direction. The adjustment of the alignment device is made by the closing of the ripper with appropriate finger design.

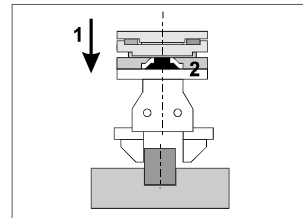
Note: no angular compensation

Lateral Alignment Devices provide a number of benefits:

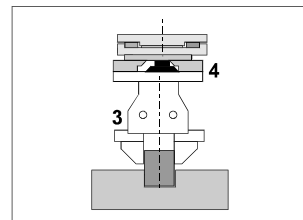
- Specifically designed for short compensation movements
- Tolerance compensation with position offset in x-y direction up to +/- 25mm
- Prevents wedging and jamming when inserting and removing workpieces
- Protects robots and automatic assembly machines against wear
- Combinable with Z-axis compliance device

Description of operation

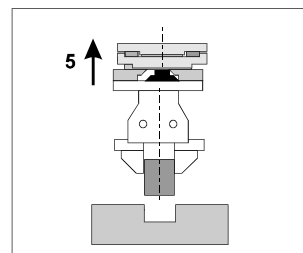
The robot is outside the interference contour and starts the extraction operation (1). The KA is unlocked (2).



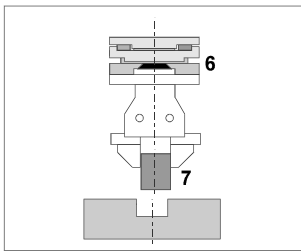
The gripper closes centrally to the part (3). The KA is displaced (4) should the position offset be on hand.



The part is withdrawn (5). The KA remains displaced.

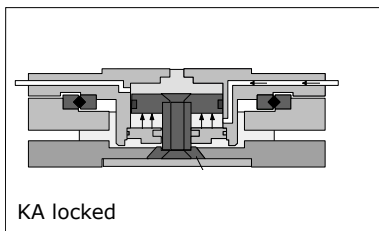
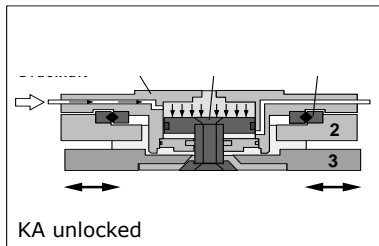


The robot moves out of the interference contour; the KA is locked (6). In so doing, the part is centred on the robot axis (7).



Standard type

The effect of the force-free compensation device of the standard type being locked is for the tool to be centred onto the robot axis



Offset locking (DV)

Special applications may make it necessary for the KA position offset to remain in the event of a displacement - even after the locking.

For this function the force-free compensation device complete with offset locking is provided with 3 different operating states:

Unlocked:

No compressed air is on hand. Piston and cone "float" in the guide. The tool side can be moved.

Locked:

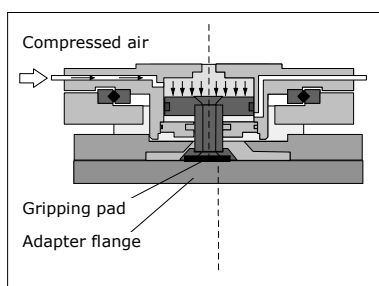
Compressed air is on hand at the "locked" compressed air connection. The tool side is locked in the centred position

Offset locking:

Compressed air is on hand at the "unlocked" compressed air connection. Using a gripper pad, the cone presses onto the adapter flange and the tool side is fixed in its displaced position.

A 5/3 directional control pneumatic valve actuated by others from the robot controller or a separate PLC controls the KA force-free compensation device complete with offset locking.

The KA with offset locking only functions in association with an adapter flange.



KA locked (offset locking)

Compensation - one-dimensional

This option is available for applications for which a compensation movement may only be provided in one direction. This necessitates an enquiry.

Compensation limiter

The force-free compensation device can be supplied with a compensation limiter permitting only smaller-scale displacements as against the standard KA. This necessitates an enquiry.

5. Transport, packing, storage

5.1. Transport

Immediately check on the delivery when received as to completeness and any transportation damage.

Proceed as follows if there are signs of external damage:

- Do not accept the delivery or only under reservation.
- Note down the extent of damage on the transportation documents or on the forwarder's delivery note.
- Initiate the complaint procedure.



Object to any shortcoming as soon as it is discovered. Claims for damages can only be filed within the valid time spans as set aside for complaints.

Transportation temperature $-20\text{ }^{\circ}\text{C}$ to $65\text{ }^{\circ}\text{C}$.

Protect against external impact (jolt, blow, vibration).

5.2. Packing

The packing is to be such as to protect the components up to the assembly stage from transportation damage, corrosion and other kinds of damage. Thus, the packing is to be left intact and only removed just before actual assembly.

Only recyclable materials are used for the packing.

Dispose of packaging materials in accordance with the respectively valid statutory regulations and local requirements.

5.3. Storage

Store packs under the following conditions:

- Do not store outdoors.
- Store at a dry and dust-free location.
- Do not expose to corrosive media.
- Protect from direct sunlight.
- Avoid mechanical shocks.
- Temperature for storage: $15\text{ }^{\circ}\text{C}$ to $35\text{ }^{\circ}\text{C}$
- Relative air humidity: max. 60%.
- In cases of storage exceeding 3 months, regularly check on the general condition of all the parts and packing. If need be, either recondition the conservation protection or renew it.



There may also be information on the packs themselves extending beyond the requirements set out here. They are to be correspondingly kept to.

6. Assembly and commissioning



CAUTION!

Before assembling the alignment device, the energy supply needs to be disconnected and the line system relieved of pressure.

Make a note of the safety instructions and general hazards listed on Page 2.

6.1. Assembly

The assembly drill hole dimensions and the location and size of the pneumatic connections can be taken from the ongoing catalogue.

A fixture flange with the appropriate drilling template and centring shoulder of the right installation size is used to assemble the compensation device at the robot. If the right fixture flange is not in hand, then a flange is to be made or acquired from the manufacturer.

Use the fastening screws to fit the compensation device to the robot. Ensure orientation with the aid of a fitting pin.

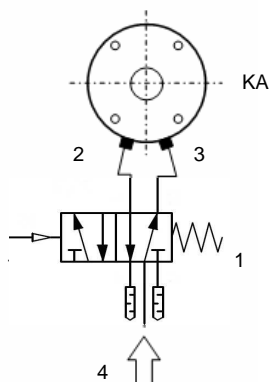
For a sufficiently stable assembly of the tool at the compensation device, the tool fixture flange needs to have an appropriate drilling template and centring shoulder. If not so, then an adapter flange is to be made or acquired from the manufacturer.

Fasten tool with the fastening screws. Ensure orientation with the aid of a fitting pin.

All assembly bolts are to be secured with thread-locking adhesive (e.g. Loctite 243).

6.2. Pneumatic installation

- 5/2 way pneumatic valve (1) - given the KA standard type - to be provided by others (do not use an impulse valve).
- 5/3 way pneumatic valve with centre position vents (1) - given KA with offset locking (option) to be provided by others (do not use an impulse valve).
- Install compressed air hoses with threaded unions at the pneumatic connections KA unlock (2) and KA lock (3).
- Provide compressed air (4) at 5-8 bar.



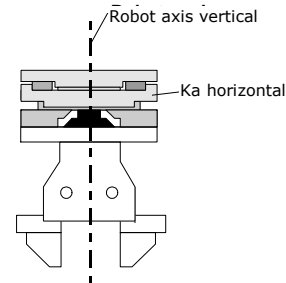
NOTE!

The lower the air pressure the lower the locking force. The catalogue points to the fact that the specified locking force ceases to be available at an air pressure under 6 bar.

6.3. Programming locking and unlocking

Unlocking the KA only in the horizontal position

- Only programme unlocking and locking in the KA horizontal position (for vertical robot axis see Fig.)



Absolute necessity of locking the KA in all the other positions

- The KA compensation function only functions when the KA is horizontal.
- The KA must be locked in all other positions and during the robot's travel.
- Locking the KA when the robot axis is not vertical will damage it.

6.4. Testing the installation

- Check that the screw connections and threaded unions are seated firmly
- Check freedom of movement of the electrical cables and pneumatic hoses for possible interference contours
- Examine the air pressure provided by others for pneumatically actuating the force-free compensation device

6.5. Function test

- Carry out function test of the KA force-free compensation device in all programming phases
- Check on programming-compliant change between locking and unlocking



CAUTION!

Secure the robot equipment from failure of the compressed air provided by others.

The KA compensation function ceases to work given a lack of air pressure. Collisions or other damage might arise.

6.6. Dismantling

1. Switch off robot in a suitable position
2. Turn off the compressed air as provided by customer
3. Remove pneumatic lines from the KA
4. Disassemble tools complete with adapter flange from KA
5. Dismantle KA from adapter flange
6. Dismantle adapter flange from the robot tool pickup flange

7. Malfunctions

Compensation device does not lock/unlock

- Check on supply of air, replace any non-tight lines, if necessary
- Air pressure too low, raise the air pressure
- Check on compensation device and effect repairs, if necessary
- Check the pneumatic valve and replace, if necessary


Compensation movement has ceased

- Clean compensation device and remove foreign matter, if necessary
- Roller guides faulty or contaminated; clean guides and repair, if necessary


Air flows from the compensation device

- Check on compensation device and effect repairs, if necessary

8. Maintenance and Repairs

	NOTE! Make a note of the safety instructions and general hazards listed on Page 2.
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8.1. Cleaning and upkeep

	NOTE! Corrosive cleaning agents could damage the compensation device seals and result in them ageing more rapidly.
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Make a note of the following when cleaning and tending to the compensation device:

- Use protective caps and the like to firmly close all the openings
- Check that all connections are tight
- Use a metal cleaner
- Remove any coarse dirt and keep components such as sensors clean.

8.2. Maintenance

To retain compensation device functions, we recommend carrying out the following maintenance steps at least 2x a year:

- Check the compensation device for any dirt contamination and clean, if necessary
- Check compensation device as to function and effect repairs or have them carried out, if necessary
- Check compensation device for signs of external deformation, damage and wear and repair, if necessary

8.3. Corrective maintenance

The manufacturer provides you with a comprehensive compensation device repair service.

- For assured functioning of the force-free compensation device, the recommendation is to have the rail guides fitted and adjusted at the manufacturers.

Spare parts and a full set of seals can be obtained through the manufacturer.

The following corrective maintenance can be carried out, as an option, at the customer's:

- Changing the set of seals
- Replacing and adjusting the keyways

A description of this work is given in the annex.

9. Dismantling, Decommissioning, Disposal



CAUTION!

Before dismantling the compensation device, the energy supply needs to be disconnected and the line system relieved of pressure.

Make a note of the safety instructions and general hazards listed on Page 2.

9.1. Dismantling

At the end of its useful life, the compensation device must be dismantled and disposed of in an environmentally compatible manner.

Properly clean sub-assemblies and components and disassemble them with consideration given to the prevailing local health & safety and environmental protection provisions.

9.2. Decommissioning

Brief immobilization of the KA only when the robot axis is in the vertical position

You carry out decommissioning in the reverse order to commissioning.

- Any compensation device malfunctioning needs to be corrected before decommissioning
- Compensation device needs to be cleaned
- Manually move the cone into the "locked" position"
- Non-plugged connection openings need to be firmly closed

9.3. Disposal

Pass on disassembled parts for recycling if no arrangements have been made for returning them or disposal:

- Turn metals into scrap.
- Hand in plastic elements for recycling.
- Sort the rest of the components by material properties and dispose of accordingly.

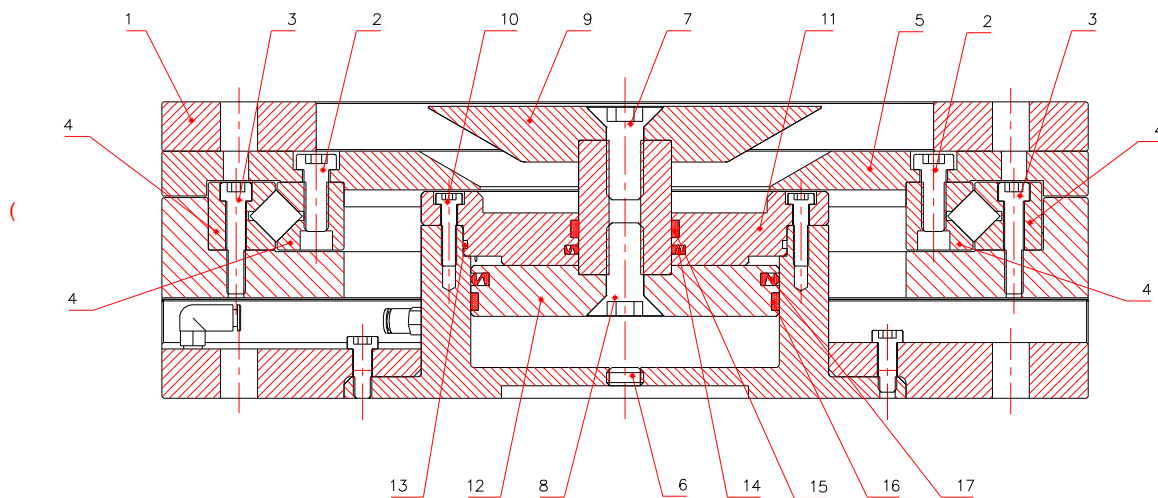
10. Versions

Please refer to the ongoing catalogue for the versions of the individual compensation devices and their part Nos.

- Offset locking (KA-...-ZV/DV)
- Compensation - one-dimensional
- Compensation limiter

The offset locking (DV) results in a reduction of the max. handling weight to half of the standard KA unit.

Repair work (can be implemented as an option at the customer's)

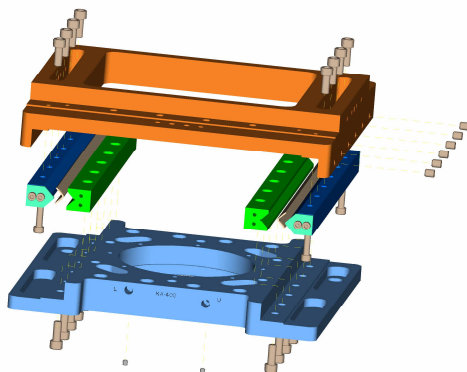


Changing the set of seals

1. Dismantling the adapter plate (Item 1) (remove cheese-head screw).
2. Dismantle rail guides (Item 4); to this end, undo screws Item 2/3.
3. Unscrew threaded pin (Item 6).
4. Unscrew flat head screw (Item 7); to this end apply an opposing force to the screw (Item 8) with hexagonal socket spanner.
5. Remove cone (Item 9).
6. Remove gripper flange (Item 5).
7. Unscrew cheese head screws (Item 10).
8. Remove cylinder sealing section (Item 11).
9. Replace O-ring (Item 13).
10. Change piston rod seal (Item 14) and guide belt (Item 15)
11. Withdraw piston rod (Item 12) from the cylinder.
12. Change guide belt (Item 16) and piston seal (Item 17)
13. Assembly is carried out in the reverse order.

Replacing and adjusting the keyways at the compensation device

To replace the set of guides, the respective assembly drawings of the compensation device in question need to be requested from the manufacturer (if not present).



Setting the robot-side guides

14. Undo robot-sided screws on the side (do not fully unscrew) where the setting screws are located
15. Screw in the threaded pin 2x until the centre part to the robot side is on hand in a smooth running yet zero-play manner
16. Glue in place the screws on the robot side using thread locking adhesive (e.g. Loctite 243) and tighten with torque 2.8 Nm
17. Check guides as zero-play, smooth running

Proceed with setting work on the tool side on the basis of the same setting plan as on the robot side.