FERROVAC GMBH

ULTRA HIGH VACUUM TECHNOLOGY

MD16/MD40/MDG40
Linear Rotary Feedthroughs

Instruction Manual

Version 1.1

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Warranty

Ferrovac GmbH warrants this product to be free of defects in material and workmanship for a period of 12 months from the date of shipment.

In case of proof of any defective parts in the product, we will at our option, either repair the product or replace it.

Warranty Limitations

The warranty for this product does not apply to defects resulting from the following:

- non-observance of operational- and safety instructions
- natural wear of components
- modifications to our products without our written consent
- misuse of any product or part of the product

This warranty stands in place of all other warranties, implied or expressed, including any warranty of merchantability implied or fitness for a particular use. The remedies provided herein are buyer's sole and exclusive remedies.

Neither the company Ferrovac GmbH nor any of its employees shall be liable for any direct, indirect, incidental, consequential or special damages arising out of the use of its products, even if the company Ferrovac GmbH has been advised in advance of the possibility of such damages. Such excluded damages shall include but are not limited to: Costs of removal and installation, losses sustained as the result of injury to any person, or damage to property.

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Content

Terms and Symbols

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A triangle with explanation mark indicates a passage in the manual with information that is crucial for the operator. READ THESE PARAGRAPHS CAREFULLY or the product might be damaged by misuse.

CAUTION! The CAUTION heading in a manual explains hazardous situations that could damage the product. Such damage may invalidate warranty.

Normal Use

The product described in this manual must always be used:

- With original accessories supplied by Ferrovac which are explicitly specified for the use with the product described in this publication.
- In an indoor research laboratory environment.
- By personnel qualified for operation of delicate scientific equipment.
- In accordance with this and all related manuals.

CAREFULLY READ THE SAFETY INFORMATION AND ALL RELEVANT MANUALS BEFORE USING THE PRODUCT AND ANY RELATED INSTRUMENTATION!

1. Introduction

This type of magnetically driven manipulator can be used as a small transfer arm for short and intermediate distances. For example: It is perfectly suitable for sample transfer from a load lock into the main chamber. Single shaft linear/rotary feedthroughs can serve for carrying a movable sample storage platform or a stack of receptacles. If used with a port aligner and one of our key adapters, they may also be used to tighten a screw or engage a sample locking mechanism at a specific position. Dual shaft linear/rotary feedthroughs can be equipped with one of our pincer grips. The fine adjustable magnetic coupling allows a precise control of their opening and closing by turning a knurled screw.

2. Unpacking and Inspection

Linear/rotary feedthroughs are shipped clean and ready to use in UHV. Prepare a sufficiently clean workspace and wear surgical gloves when unpacking and inspecting the device. Check for any visible damage of the package, manipulator and accessories. Compare the contents of the package with the delivery note. Any damage or missing items must be reported to Ferrovac **within 48 hours after delivery.**

CAUTION!

- **Always** use powder-free examination gloves during unpacking to avoid contamination.
- **Please** ensure enough working space for unpacking and inspection.
- **Please** clean the working table/surface and cover it with Aluminium foil or household foil.
- **Never** hit the knife edge.
- **Never** expose the feedthrough to physical shocks (**brittle magnets!!!**).
- **Never** bend the tube nor the shaft.

3. Overview

An illustrated overview with a few examples of linear/rotary feedthroughs is given:

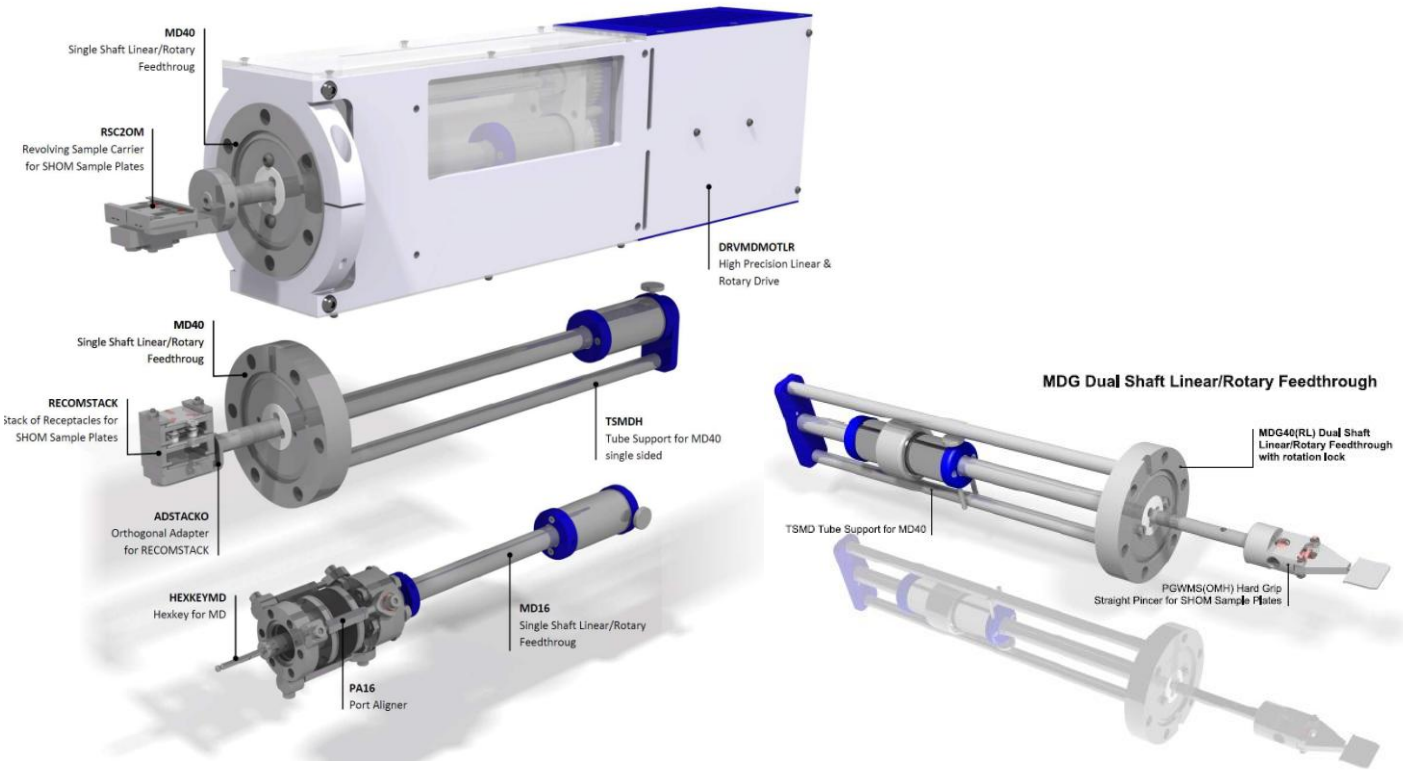

Fig 1 ***Left hand side, top down:*** *MD40 with revolving sample carrier and high precision drive, MD40 with stack of receptacles and tube support, MD16 with port aligner and hexkey.* ***Right hand side:*** *MDG40 with pincer grip and tube support with rotation lock.*

3.1 Nomenclature

The main parts of the dual/single shaft linear/rotary feedthrough are named as follows:

CAUTION!

- **Always** use the linear/rotary feedthrough for its purpose (not as a lever, screwdriver, etc.).
- **Never** expose the linear/rotary feedthrough to physical shocks (**brittle magnets!!!**).
- **Never** bend the tube nor the shaft.
- **Never** pull the outer magnet off the tube (maximal force is 30N!).
- **Never** overthighten the magnetic coupling in respect to the tube (maximal torque is 0.5Nm!).

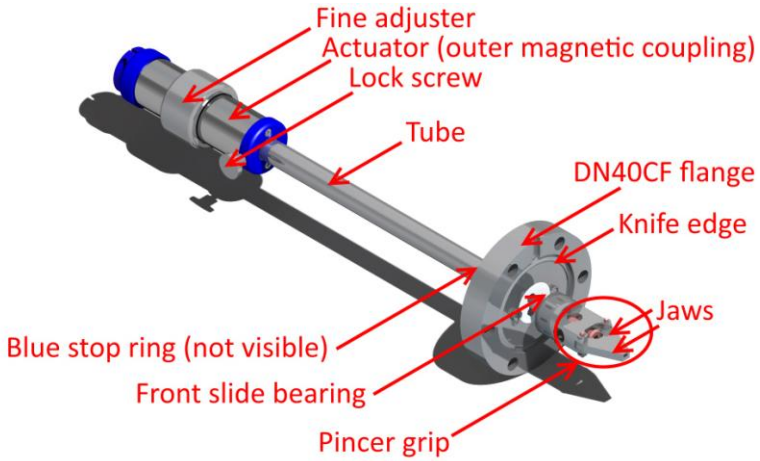

Fig 2 *MDG40 nomenclature. The models MD16/MD40 are not equipped with pincer grips or fine adjusters.*

3.2 Handling

Contrary to customary products, the motion of the shaft is not affected by the difference between atmospheric pressure and ultra high vacuum. Therefore, the shafts of the linear/rotary feedthroughs can be guided by the operator in a smooth and controlled way.

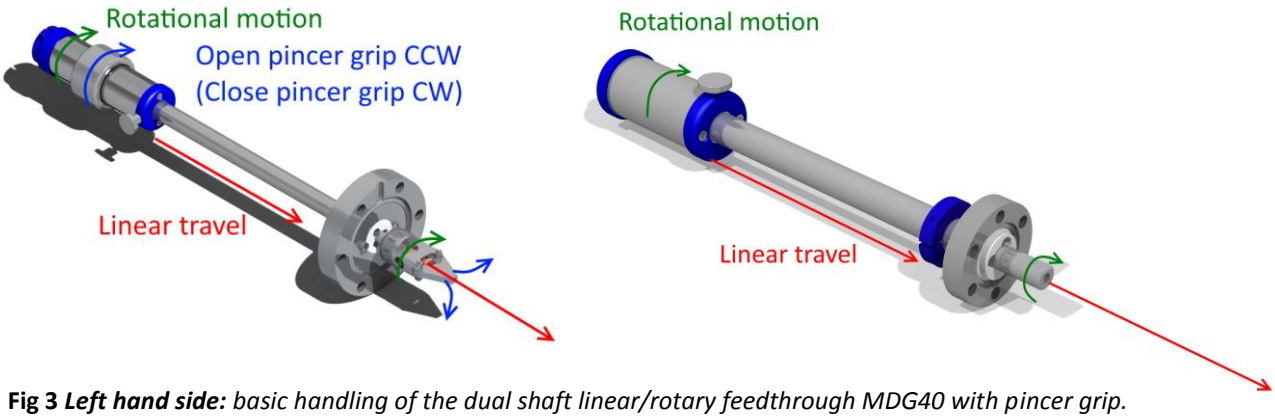

Fig 3 ***Left hand side:*** *basic handling of the dual shaft linear/rotary feedthrough MDG40 with pincer grip.* ***Right hand side:*** *basic handling of the single shaft linear/rotary feedthrough MD16. The same handling applies to the model MD40.*

4. Setup and Installation

4.1 Mounting

In delicate situations, the mounting procedure exposes the feedthrough to the risk of being damaged. Please follow the warning notes and the illustrated instruction.

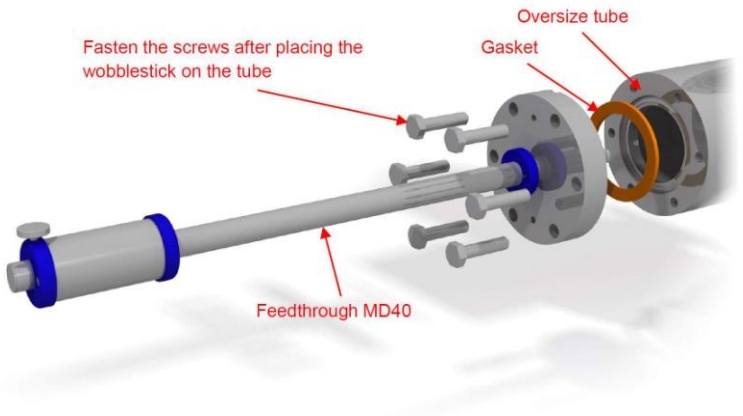

Fig 4 Mounting arrangement, screws used: M6x20 hex-headed or cylindrical-hex (Allen)

CAUTION!

- **Always** use powder-free examination gloves during mounting to avoid contamination.
- **Never** expose the linear/rotary feedthrough to physical shocks (**brittle magnets!!!**).
- **Never** bend the tube nor the shaft.
- **Never** hit the knife edge.

4.3 Tube support

Especially linear/rotary feedthroughs with longer travel ranges require special care to be taken to protect the tube unit from accidental bending.

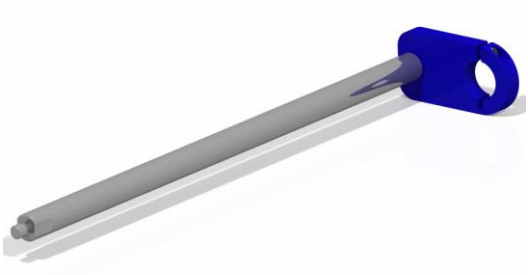

Fig 5 Single sided tube support TSMDH

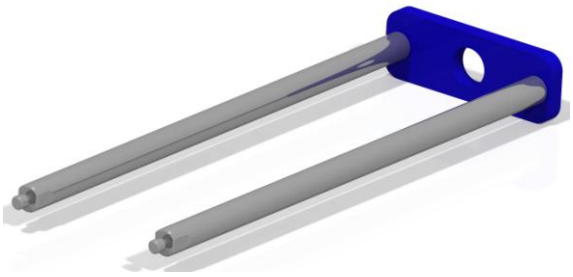

Fig 6 Tube support TSMD

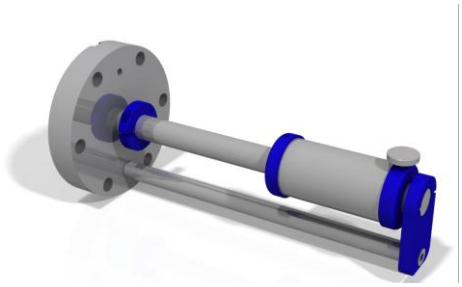

Fig 7 Feedthrough with single sided tube support MD40(Y0)-TSMDH

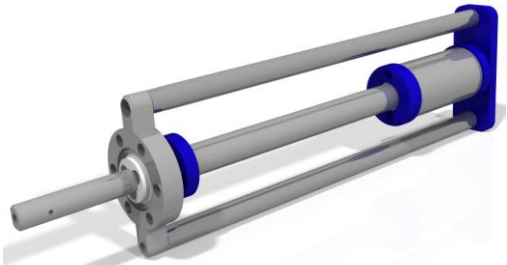

Fig 8 Feedthrough with tube support MD16(TS)-TSMD

4.4 Bakeout

All UHV manipulators including the MD16/MD40/MDG40 are bakeable up to 150°C. Do **not** remove the magnetic coupling for the bakeout procedure. In order to minimize evolution of residual gas, it is helpful to move the coupling back and forth during cooldown of the UHV system after bakeout.

CAUTION! **Never** remove the magnetic coupling for the bakeout procedure. Make sure the temperature **never** exceeds **150°C**!

5. Accessories

5.1 Forks and hex accessories

5.1.1 Straight fork for block style holders FRKBS

This simple sample exchange fork can be used in combination with all MD16/40 magnetically driven feedthroughs to manipulate block style sample holders SHBS or SHBS(5).

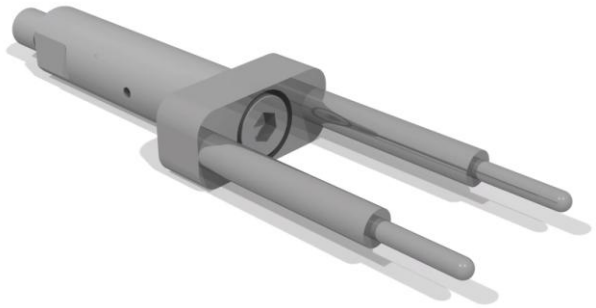

Fig 8 FRKBS

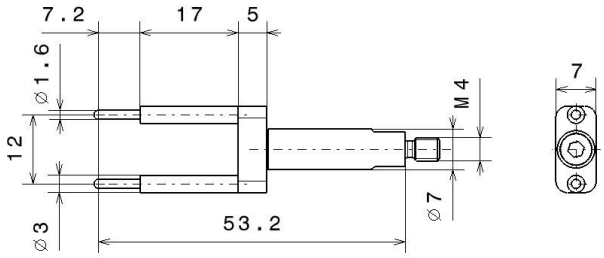

Fig 9 Dimensions FRKBS

5.1.2 Short fork for block style holders FRKBSDM

A short version of the straight fork for block style holders. The FRKBS without D=7mm shaft.

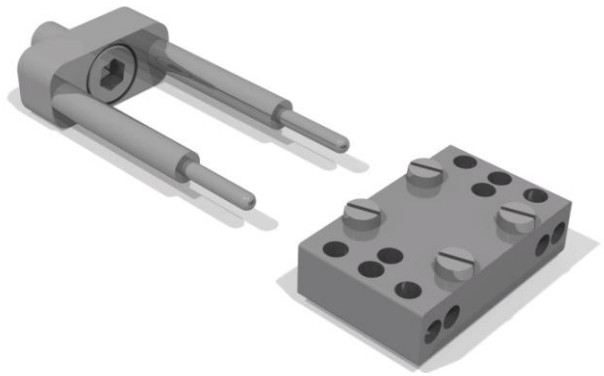

Fig 10 FRKBSDM

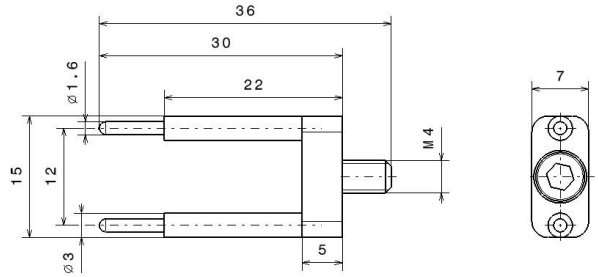

Fig 11 Dimensions FRKBSDM

5.1.3 Hex key

This key can be used in combination with MD40/16 feedthroughs for tightening/loosening in-vacuum hexagonal socket screws. Available in both, metric and imperial type hex keys. Please specify key type and size upon ordering.

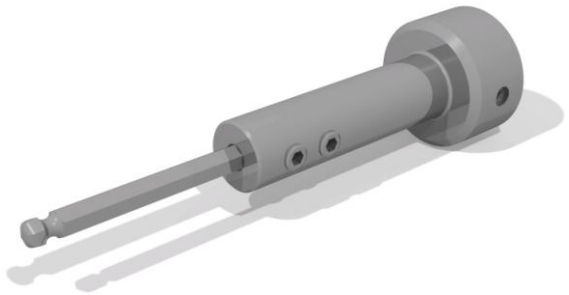

Fig 12 HEXKEY

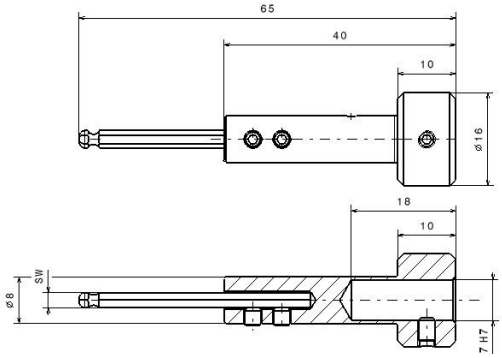

Fig 13 Dimensions HEXKEY

5.1.4 Hex nut

Turns you feedthroug into an allen wrench. Used in combination with MD40/16 feedthrougs for tightening/loosening in-vacuum hexagonal head screws. Available in both, metric and imperial sizes. Please specify nut type and size upon ordering.

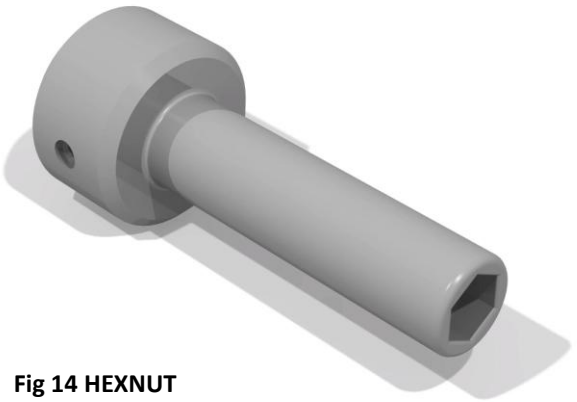

Fig 14 HEXNUT

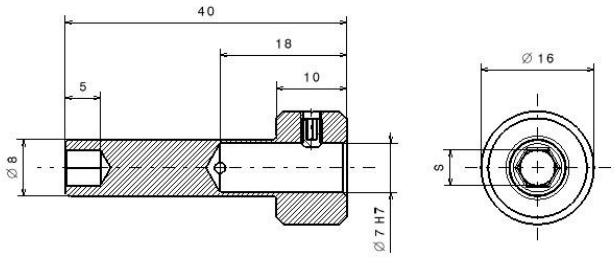

Fig 15 Dimensions HEXNUT

5.2 High torque magnet MKSHT

The MKSHT is a longer actuator for MD16/MD40 feedthroughs. A high torque of 1Nm (140 in.oz) optimizes torsional applications like using the manipulator as a screwdriver.

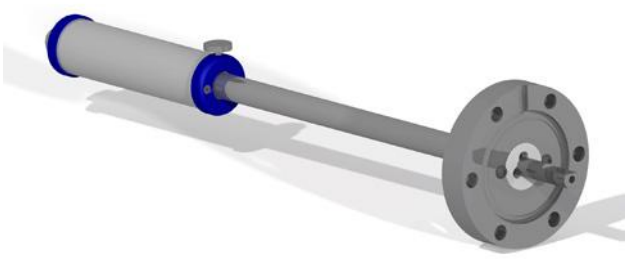

Fig 16 MD40HT: Linear/Rotary feedthrough with MKSHT

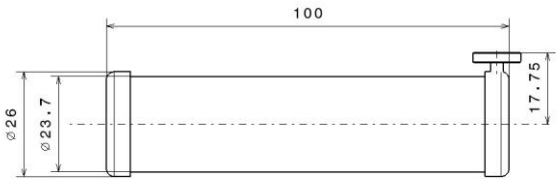

Fig 17 Dimensions MKSHT

For more accessories and motorization options visit our website: www.ferrovac.com

6 Problem solving

Please follow the warning notes for this whole section:

CAUTION!

- **Always** use powder-free examination gloves to avoid contamination.
- **Please** ensure enough working space for inspection.
- **Please** clean the working table/surface and cover it with Aluminium foil or household foil.
- **Never** hit the knife edge nor the bellows.
- **Never** expose the feedthrough to physical shocks (**brittle magnets!!!**).
- **Never** bend the tube nor the shaft.

6.1 Aligning the magnets

WARNING: If you decide to reposition the outer magnetic coupling yourself, Ferrovac GmbH can not take any responsibility for damage caused to or by the feedthrough or by your related actions.

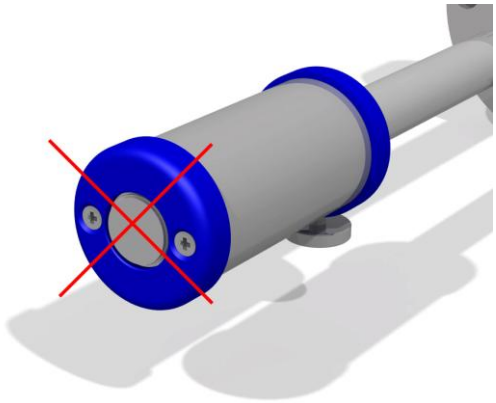

Fig 26 Wrong alignment

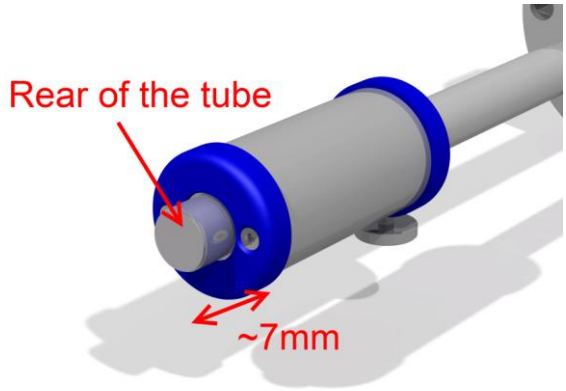

Fig 27 Correct alignment

If the specified linear force of 30N is exceeded during use of a feedthrough (outer magnets in respect to the inner magnets), the magnets are displaced in respect to each other. Each inner and outer magnet assembly is built with several rows of counterwise poled magnets. When both halves are in their proper place, the rear of the tube stands out approximately 7mm.

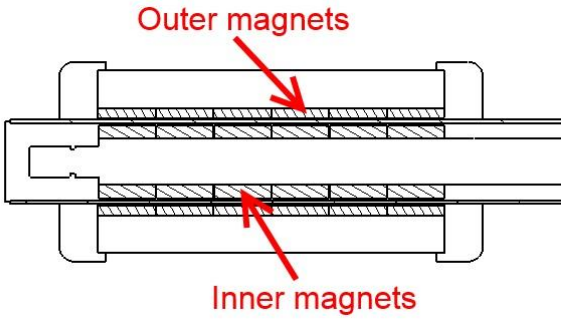

Fig 28 Inner/Outer magnets

Repositioning the magnet assemblies:

- Pull the outer magnetic coupling off the tube.
- With a gloved hand, hold the shaft of the feedthrough firmly.
- With the other hand, start pushing the outer magnetic coupling onto the tube. Every time a row of outer magnets is pushed over an inner one, a strong 'click' can be felt when they lock.
- While moving linearly, the magnets will want to rotate 1/8th of a full turn for every row of magnets (due to the eight-fold symmetry of the magnets), which can be felt. So it is beneficial to push linearly and simultaneously turn a little.

Repositioning the magnet assemblies* without venting:

- Put one thumb on the end of the tube and two fingers around the actuator.
- Pull back until the outer magnet coupling is positioned as shown in figure 27.
- Should the magnet assembly move too far off the back of the tube:
    - Find something rigid inside your chamber to press against.

Be very careful when pushing against this rigid part!

6.2 Factory overhaul

The slide bearings are the only parts of the feedthrough that wear out. A great many bakeout periods can lead to slight deformation of the slide bearings. This can result in reduced motion smoothness and probably higher outgassing rates. We offer an allover factory overhaul for inner and outer bearings and readjustement of any style of pincer grips. Please have a look on our website for more information or contact us directly.

6.3 Declaration of decontamination

In case of returning the feedthrough to Ferrovac GmbH, it is necessary to complete a declaration of contamination and send it to us. Please contact us beforehand. An RMA will be issued and mailed to you.

6.4 Download

This manual can be downloaded from our website. It can be found in the specifications of each listed linear/rotary feedthrough.