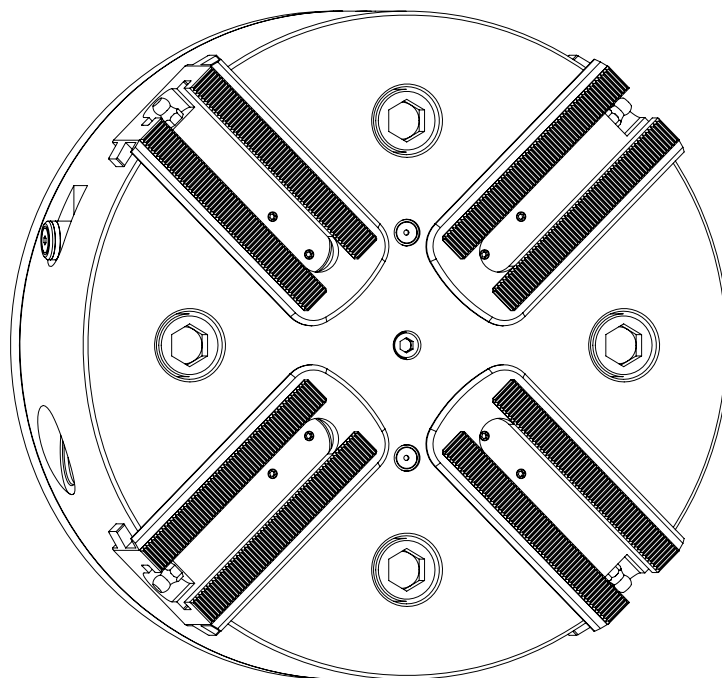




Operating Manual

InoFlex® VD016 - VD120

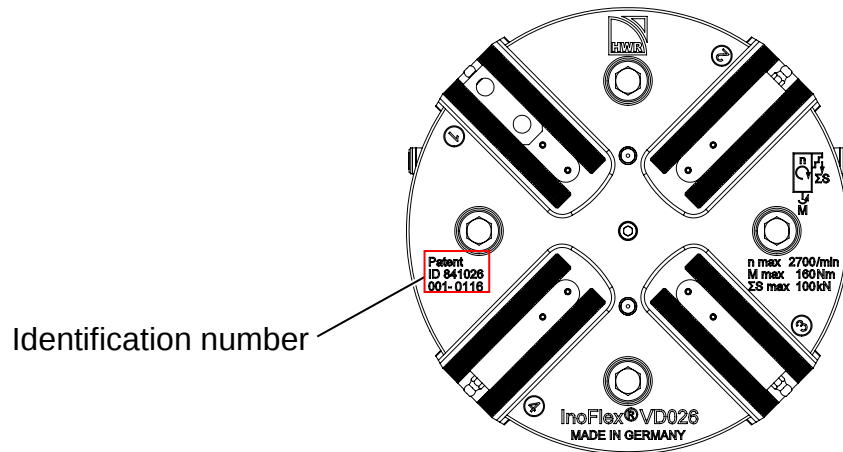
Compensating 4-jaw Manual Chuck



Translation of the Original Operating Manual (German)
Keep for future reference!

Version: 19.12.2017
Edition: G

The following figure shows the chuck with the embossed data.



NOTICE

Please have ready the identification number if you have any questions for the HWR Spanntechnik GmbH. Errors and omissions in the documentation are excepted. Please inform the HWR Spanntechnik GmbH of any errors in the documentation.

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The copyright of this document is retained by HWR Spanntechnik GmbH.

This documentation is designated only for the operating company and its personnel. It contains instructions and information that may not be fully or partially reproduced, distributed nor be transmitted by technical data methods nor be utilized for the purpose of unauthorized competition.

Copyright violations are subject to prosecution under the law.

This operating manual gives you detailed information about the installation, operation and maintenance of the InoFlex® chuck. It includes safety instructions which ensure the safe use of the InoFlex® chuck. You will also find information in this documentation about the scope of delivery and troubleshooting.

With this manual we want to help you get the maximum benefit from your InoFlex® chuck.

The InoFlex® chuck will last long and can be used effectively provided that it is used in an appropriate way and serviced well. The documentation received with the chuck will assist you.

Always keep this operating manual and the other documentation (e.g. manufacturer's documentation) handy and in the immediate vicinity of the machine on which the chuck is used. Make sure to always follow all the information, notices and instructions contained therein. This will prevent accidents caused by incorrect operation, preserve the manufacturer's warranty and always provide you with a fully functioning chuck.

The manufacturer continuously strives to improve his products. He also reserves the right to make any changes and improvements he considers to be necessary. However, this does not include any obligation for retrofitting InoFlex® chucks previously delivered.

**DANGER**

Before commissioning the InoFlex® chuck you must have read and understood the operating instructions and safety rules contained therein.

Employees must be instructed in the operation, installation and use of the InoFlex® chuck in accordance with these operating instructions.

If questions remain unanswered after familiarization and reading the operating instructions, please contact the manufacturer.

We wish you and your colleagues much success in using the InoFlex® chuck.

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1 SAFETY

General information

The operating manual for your InoFlex® chuck contains important instructions for installation, operation, maintenance and troubleshooting. This information will help to ensure the safe operation of your InoFlex® chuck.

All of the required safety instructions and provisions on liability for working with the InoFlex® chuck are included in this chapter. In addition, you will also find instructions here on the intended use of the tool.



WARNING

Read this operating manual carefully and pay particular attention to this chapter before working with the InoFlex® chuck.

1.1 SCOPE OF THE DOCUMENTATION

In addition to the safety instructions the operating manual includes:

- A general product description
- Information on installing the InoFlex® chuck
- Instructions on the use and operation of the InoFlex® chuck
- Maintenance and service instructions
- Troubleshooting instructions
- Technical data

The technical documentation also includes the following records:

- An integrated spare parts list
- A declaration of incorporation

1.2 MANUFACTURER'S INSTRUCTIONS

1.2.1 CUSTOMER SERVICE

The manufacturer's contact details are printed on the back of the title page. Please contact the chuck manufacturer immediately in case any questions or problems arise.

NOTICE

Please have the identification number (ID No.) ready if you have any questions for HWR Spanntechnik GmbH.

1.2.2 WARRANTY AND LIABILITY

As a basic principle, our »general sales terms and delivery conditions« do apply. These are made available to the operating company no later than at conclusion of the contract. Warranty and liability claims for personal injury and property damage are excluded if they can be attributed to one or more of the following causes.

- Inappropriate use of the InoFlex® chuck.
- Improper installation, commissioning, operation and maintenance of the InoFlex® chuck.
- Operating the InoFlex® chuck with defective machine safety devices or safety and protective devices that are incorrectly attached or not functioning properly.
- Failure to observe the instructions in the documentation regarding
 - storage
 - installation
 - operation (e.g. correct clamping of the workpiece, observe the max. speed)
 - maintenance and service
 - troubleshooting of the InoFlex® chuck
- Unauthorized modifications to the chuck or to the machine on which the chuck is mounted
- Inadequate monitoring of parts subject to wear
- Improper repairs
- Catastrophes caused by external influence or force majeure.

DANGER

No modifications, additions, or conversions to the InoFlex® chuck are allowed without permission of the manufacturer. All conversion measures require a written confirmation from the manufacturer.

WARNING

Use only original spare and expendable parts. It cannot be guaranteed that externally procured parts are constructed to meet the required tolerance and safety standards.

NOTICE

The manufacturer only provides a full guarantee for the spare parts ordered from him.

1.2.3 NOTICE ON THE USE OF DOCUMENTATION

Always keep this operating manual and other documents for the InoFlex® chuck in the immediate vicinity of the control unit of the machine in which the chuck is used.

Read this operating manual and make sure to follow the safety instructions before initial use of the tool.

A symbol is used to mark points in the manual which are particularly important.

NOTICE

The training of personnel by the manufacturer is only considered to be a provision of limited information. It does not exempt the user from reading the manual.

1.2.4 EXPLANATION OF THE PICTOGRAMS

The following symbols are used at all key points in this operating manual. Follow these instructions carefully and proceed with caution in these situations.

Identification of the safety instructions:



indicates a hazardous situation which, if not avoided, will result in death or serious injury



indicates a hazardous situation which, if not avoided, could result in death or serious injury



indicates a hazardous situation which, if not avoided, will result in minor or moderate injury



is used to address practices not related to physical injury



indicate specific safety-related instructions or procedures (title may be altered)

1.3 INTENDED USE

1.3.1 THE SOLE INTENDED USE

The InoFlex® chuck VD016 - VD120 is solely intended for the clamping of components for mechanical machining in machine tools (see also Chapter "7" Technical Data).

Any other use is considered improper. The manufacturer is not liable for damages resulting from improper use.

1.3.2 OBSERVE THE INSTRUCTIONS AND RULES

Intended use also includes:

- Following all the instructions in the documentation as well as the manufacturer-supplied documentation (if applicable)
- Compliance with the manufacturer's prescribed service and maintenance conditions and intervals

1.3.3 OBSERVE THE ACCIDENT PREVENTION REGULATIONS

Observe the applicable accident prevention regulations and other generally recognized regulations related to safety.

1.4 WARNING ABOUT FAULTY OPERATION AND MISUSE

The functioning of your InoFlex® chuck has been tested at the factory. However, there are risks associated with faulty operation or misuse, e.g.:

- Risk to life and health of operators, third persons and animals in the vicinity of the machine tool in which the chuck is used
- Risk to the machine tool, the chuck and other property of the operating company
- Risk of losing efficient operation of the machine tool, in which the chuck is installed.

1.5 INSTRUCTIONS FOR SAFE OPERATION



DANGER

Real safety means that you are familiar with all safety instructions. This applies to the type and location of the risk and in particular the protective measures that must be taken. Always remain vigilant and aware of the risk (s) involved.

Malfunctions must be investigated immediately. The operating personnel should consult experts if necessary. Operation may only be resumed if the safety of the InoFlex® chuck and machine tool is absolutely certain.

Operation of the InoFlex® chuck may only be started after the operator has satisfied himself that all maintenance has been performed (as described in this manual).

Should it be determined during operation that pending maintenance was not performed then use must be stopped immediately.

Make sure to observe the permissible room temperature for operation of the InoFlex® chuck machine tool (if specified, see manual of the machine tool).

1.6 OBLIGATIONS

1.6.1 OBLIGATION OF THE OPERATING COMPANY

The operator agrees to only allow those persons to work with the InoFlex® chuck, who

- are familiar with the basic regulations on safety and accident prevention and who have been instructed in the operation of the InoFlex® chuck
- have read and understood the operating manual, the chapter on safety and the warning instructions and who have confirmed this with their signature

The operator is responsible for the selection of the operating personnel. He must pay particular attention to the suitability of the personnel selected for operating a machine tool with the InoFlex® chuck.

The operator always supplies his operating and maintenance personnel with the entire product documentation.

The operator periodically checks the operating and maintenance personnel with respect to safety conscientious work behavior.

The operating company of a machine tool with the InoFlex® chuck must abide by and observe the following rules and regulations:

- The functional limits and safety regulations listed in the technical operating manuals.



DANGER

The operating company is ultimately responsible for safety. This responsibility cannot be delegated.

1.6.2 REQUIREMENTS FOR OPERATING / MAINTENANCE PERSONNEL

The operator agrees:

- To only allow trained personnel (specialized in metal) and CNC lathe operators to work with the InoFlex® chuck
- To clearly define the responsibilities of personnel charged with installation, commissioning, operation, maintenance and repair
- To only allow personnel being trained to work with the InoFlex® chuck under the supervision of an experienced professional (specializing in metal) or a CNC lathe operator.

All persons who are assigned to operate the InoFlex® chuck agree:

- To always ensure the safety of third parties, the InoFlex® chuck and the machine tool
- To read the operating manual, the chapter on safety and the warning instructions and to confirm with their signature that they have understood them
- To observe the basic regulations concerning work safety and accident prevention
- To only use the InoFlex® chuck if they are familiar with the function of the chuck itself and the function of the machine tool and have full control over the corresponding safety and emergency equipment

The operating personnel must be completely focused when working with the machine tool and the InoFlex® chuck.



DANGER

These are matters which concern your own safety and the safety of colleagues and bystanders in the vicinity of the machine!

1.7 ACCIDENT PREVENTION REGULATIONS

1.7.1 GENERAL INFORMATION

Check the operational safety of the InoFlex® chuck each day prior to startup! In addition to the instructions in the documentation, please observe the general, local safety and accident prevention regulations as well.

Faults which occur and impair safety must be eliminated immediately. Damaged parts must be replaced immediately. The machine with the InoFlex® chuck may not be operated until the fault is eliminated.

1.7.2 PROTECTION MEASURES TAKEN BY THE OPERATING COMPANY

Workplace ergonomics

The workstations for the operating personnel must be designed according to ergonomic guidelines. Clear access (prevention of tripping hazards), adequate lighting, etc. (accident prevention regulations, operator workstation safety) must be ensured by the operating company.

Personal protective measures

Personal protective equipment must be worn according to company guidelines and regulations of the employers' liability insurance association (work clothes, anti-slip safety shoes, hair net, etc.).

Machine access

Make sure that unauthorized persons cannot access the work area. This can be accomplished with automatic closing doors which can only be opened with a key or other similar safeguards.

1.7.3 INSTALLATION AND COMMISSIONING

Check to make sure that the chuck is properly inserted and attached in the machine tool.

Before starting the InoFlex® chuck the commissioning personnel must make sure that the InoFlex® chuck is in perfect working condition by conduction mandatory inspections and a trial run!

1.7.4 SAFETY WHEN NOT IN USE

Secure the machine tool with the InoFlex® chuck when it is not in use against operation by unauthorized persons (e.g. with a padlock on the main switch of the machine tool).

Make sure that children are unable to access the InoFlex® chuck and the machine tool.

1.7.5 MAINTENANCE AND REPAIR

Maintenance periods

Perform all required maintenance on time.

Cleaning agents

All surfaces that come into contact with the product must be cleaned with cleaning agents that comply with applicable hygienic or sanitary standards.

Inspection work

The clamping and the rotating parts must be inspected before each use to ensure that they are in perfect working condition. Damaged parts must be replaced immediately with fault-free parts.

Examine the function of all components after completion of maintenance and repair work.

Disposal

Make sure to properly handle and dispose of substances and materials that are used, especially greases and solvents.

2 TECHNICAL DESCRIPTION

2.1 GENERAL INFORMATION

The InoFlex® chuck VD016 - VD120 is intended solely for the clamping of components for mechanical machining in lathes (see also Chapter "7" Technical Data).

The chuck is to be used solely in accordance with VDI [Association of German Engineers] 3106, the user manual of the machine tool and this manual.

NOTICE

The chuck is lubricated at the factory before it is shipped.

2.2 OVERVIEW OF THE InoFlex® CHUCK

2.2.1 SET-UP

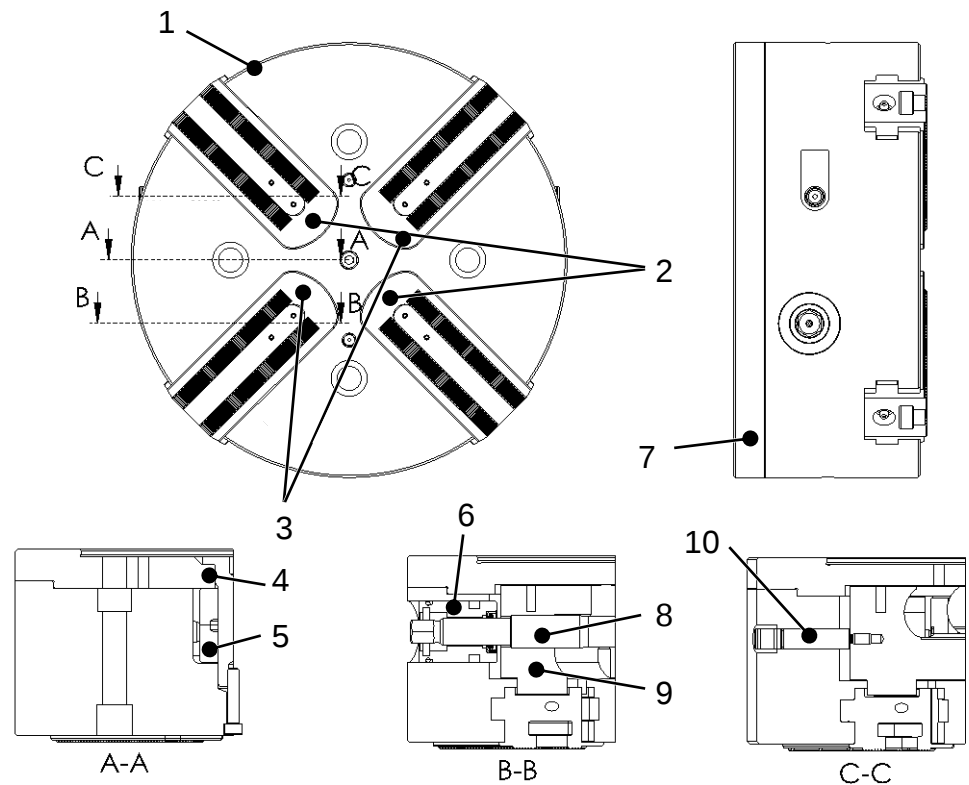


Abb. 2-1: Set-up of the InoFlex® chuck

- | | |
|------------------|---|
| 1. Upper housing | 6. Seal assembly |
| 2. Base jaw 1/3 | 7. Lower housing |
| 3. Base jaw 2/4 | 8. Spindle |
| 4. Pivot bolt | 9. Parallel slider 2 |
| 5. Clamping bone | 10. Stroke control
(not applicable from VD063) |

2.2.2 DESCRIPTION OF FUNCTIONS

After a trained specialist (specializing in metal) or CNC lathe operator installs the manual chuck in the machine tool, the same person clamps the workpiece to be machined in the chuck.

The concentric and compensating 4-jaw manual chuck allows clamping of round, cubic and geometrically irregular parts and is also suitable for workpieces which are susceptible to deformation.

The drive of the compensating clamping 4-jaw chuck moves the base jaws (1/3) and (2/4) on two parallel axes / paths toward and away from each other. Compensation is made possible by connecting the diametrical slides with levers or via a sliding gate-type gear.

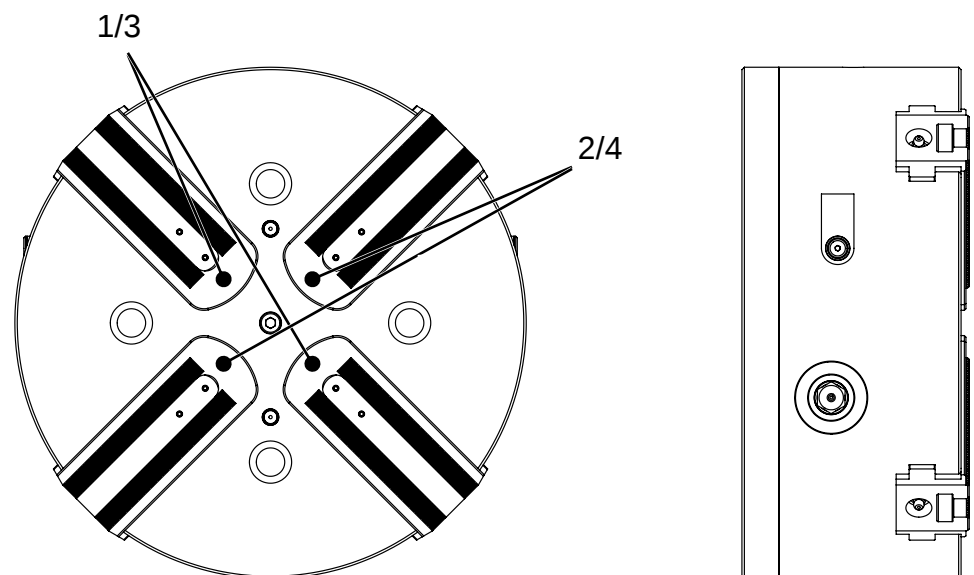


Fig. 2-2: How the InoFlex® chuck works

3 TRANSPORT UND INSTALLATION

3.1 GENERAL INFORMATION

Work in a relaxed and careful manner when installing the chuck. Avoid stress and hectic, as this may lead to working mistakes or even accidents.

Keep all transport routes and the installation area free from interfering objects during the entire work period.

During the installation process observe the operating manual of the machine tool on which the manual chuck is being mounted.



WARNING

Also make sure to comply with the regulations and policies of the operating company regarding personal protective equipment (PPE).

3.2 TRANSPORT

3.2.1 TRANSPORT TOOLS

After delivery, the safely packaged chuck can be transported with the following tools depending on its weight:

- Crane
- Forklift truck or pallet truck

3.2.2 INSTRUCTIONS ON THE PACKAGING

Adhere to the notes and instructions (if any) affixed to the packaging.

3.2.3 SAFETY PRECAUTIONS FOR TRANSPORT

Transport of heavy chucks may only be conducted by specially qualified personnel, if need be with auxiliary tools.



DANGER

During transport, there is a risk that the component may tilt, swing or fall. This can result in equipment damage or serious bodily injury.

The following measures must be taken to prevent equipment damage and life-threatening injuries:

- The chuck may only be lifted on the designated attachment point.
- Please observe the center of gravity and the attachment position of the chuck during pick-up, hanging and transport.
- Load-carrying and lifting equipment must comply with the accident prevention regulations.
- When selecting the load-carrying and lifting equipment make sure to consider the weight of the chuck and if necessary the length of the load arm (e.g. crane boom).
- Make sure to cordon off the transport routes used for the transport of floating loads and mark these routes to keep people off.



DANGER

At no time are people allowed to stay under a floating load. Risk of accident!

3.2.4 CHUCK TRANSPORT WITH EYEBOLT

The eyebolt (DIN 580) supplied at delivery must be used for transportation starting with chuck size VD026.



CAUTION

The permissible load is marked on the eyebolt.

Step 1

Prior to transport, screw the eyebolt into the main body of the chuck (see the figure below). Attach the hoist.

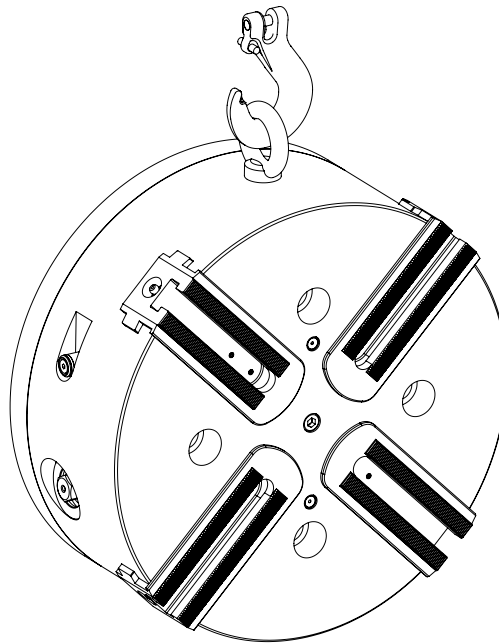


Fig. 3-1: Transport with eyebolt

Step 2

Observe the safety precautions described in section 3.2.3 during transport.



WARNING

Do not remove the hoist and the eyebolt until the chuck is installed properly in the machine tool.

3.2.5 INSPECTIONS AFTER TRANSPORT / RECEIVING THE CHUCK

Immediately check the condition of the InoFlex® chuck after receiving it (transport damage).

Inform the shipping company and the manufacturer of the chuck (HWR Spanntechnik GmbH) if any damage has been found. The address and telephone number you will find on the inside of the front cover.



WARNING

Damage caused during transportation of the chuck must be repaired completely and properly before commissioning.

3.3 INSTALLATION



WARNING

Installation of the InoFlex® chuck may only be carried out by personnel who are trained and instructed in the operation of the machine tool.

3.3.1 SPACE REQUIREMENT

The free space required to install the InoFlex® chuck corresponds with the space requirements of the operator of the machine tool (see corresponding manual of the machine tool).

3.3.2 MEASURES PRIOR TO INSTALLATION

NOTICE

The chuck can be mounted directly on the machine spindle of the machine tool or on an intermediate flange.

- Step 1** Clean the mounting surfaces of the machine spindle, and if using an intermediate flange, also clean its center mount and bearing surface. No dirt or chips are allowed on any of these surfaces. If an intermediate flange is used it must rest completely against the machine spindle. Also make sure that all holes are deburred and clean.
- Step 2** Use a dial gauge to check the bearing surfaces (machine spindle and if applicable intermediate flange) of the chuck for concentricity and axial run-out.

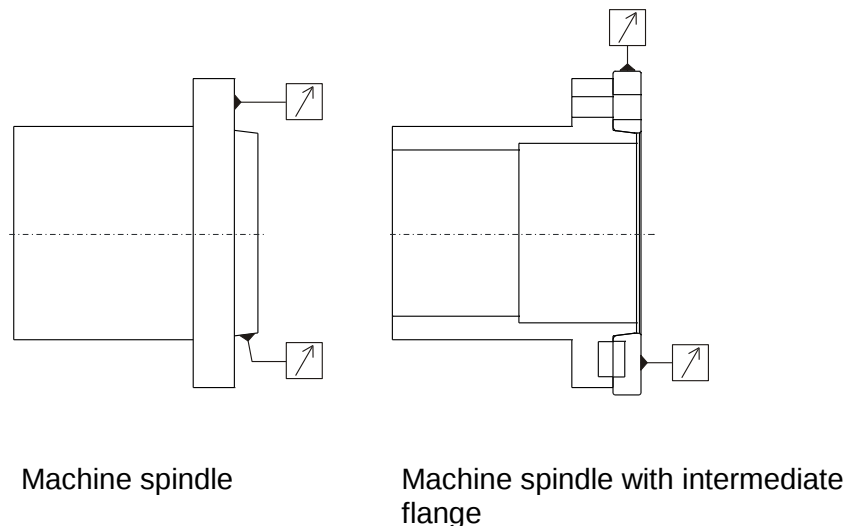


Fig. 3-2: Checking the concentricity and axial run-out

Depending on the size of the chuck the following tolerances must be maintained:

VD	016-021	025-031	040-120
Concentricity tolerance [mm]	0.02	0.03	0.05
Axial run-out tolerance [mm]	0.02	0.03	0.05

Table 3-1: Concentricity / axial run-out tolerance

3.3.3 INSTALLATION OF THE CHUCK

NOTICE

The chuck can be mounted directly on the machine spindle of the machine tool or on an intermediate flange.

- Step 1** Check to make sure that measures required prior to installation (see Section 3.3.2) are carried out.
- Step 2** With the help of the hoist carefully and slowly move the clean chuck (from VD026 hanging on the eyebolt) opposite the intermediate flange and/or the machine spindle.
- Step 3** Slide the chuck onto the intermediate flange or the machine spindle. Make sure that the through-holes for mounting the chuck are aligned with the threaded holes of the flange and the spindle.
- Step 4** Screw in the mounting screws (1) supplied at delivery - preferably of strength class 12.9 - and tighten gently (crosswise).

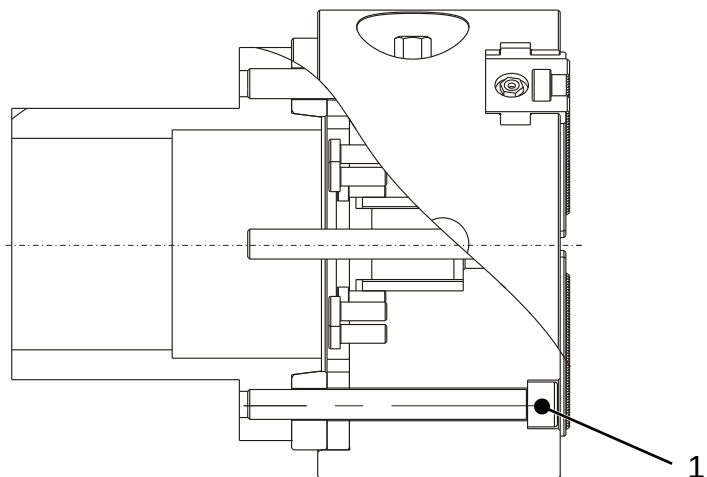


Fig. 3-3: Installing the mounting screws

- Step 5** Remove the hoist and the eyebolt (if used).
- Step 6** Check the concentricity and the axial run-out of the chuck according to Table 3-1. Align the chuck by lightly striking its outer diameter with a hammer if necessary.
- Step 7** Tighten the mounting screws (1) with a torque wrench (crosswise).

NOTICE

Please observe the maximum tightening torques for mounting screws (see Table 7-7).



WARNING

The body of the chuck must not be distorted.

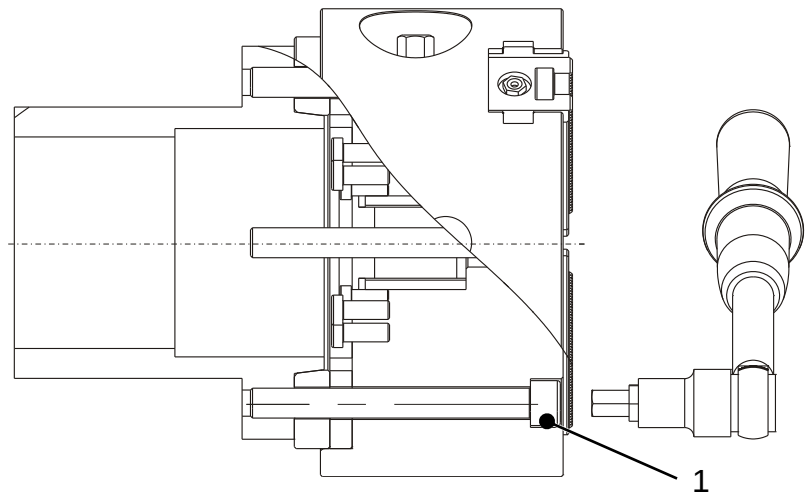


Fig. 3-4: Tighten the mounting screws with the correct torque

Step 8 Recheck the concentricity and axial roll-out of the chuck.

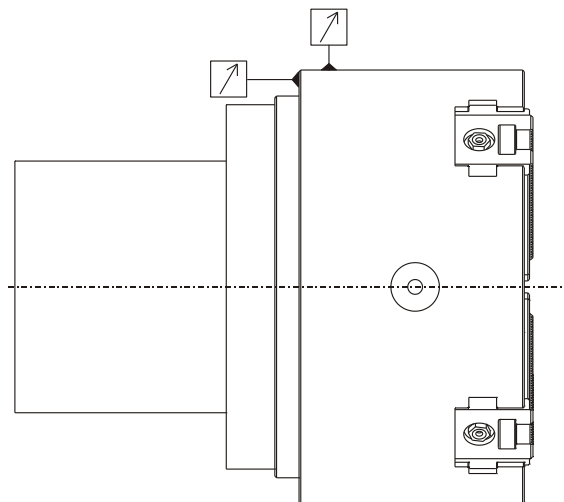


Fig. 3-5: Chuck mounted on the intermediate flange

3.4 INSERTION OF THE CLAMPING JAWS

3.4.1 GENERAL INFORMATION

Top jaws or gripper jaws can be used depending on the workpiece being processed.

NOTICE

The manufacturer recommends the use of original clamping jaws from HWR Spanntechnik GmbH. The manufacturer does not guarantee performance of externally procured parts.



WARNING

Consult with the chuck manufacturer HWR Spanntechnik GmbH before you use clamping jaws from a different manufacturer. You also need to carry out a calculation in accordance with VDI 3106 to determine the maximum permissible speed and required clamping force.

3.4.2 INSTALLATION OF TOP / GRIPPER JAWS

- Step 1** Insert the sliding block (1) into the chuck with the bevelled end towards the center.
- Step 2** Put the clamping jaw onto the serration (2) and screw-in two cylinder screws (3) each of strength class 12.9.



WARNING

Make sure the serration is free from any dirt. Allocate the clamping jaw-number to the corresponding base jaw number. Ensure sufficient screw-in depth (min. 1.25 x thread diameter)

- Step 3** First tighten the screw (3) at the non-bevelled end of the sliding block with a torque wrench and afterwards the screw (3) at the bevelled end.

NOTICE

Please observe the maximum tightening torques for mounting screws (see Table 7-7).

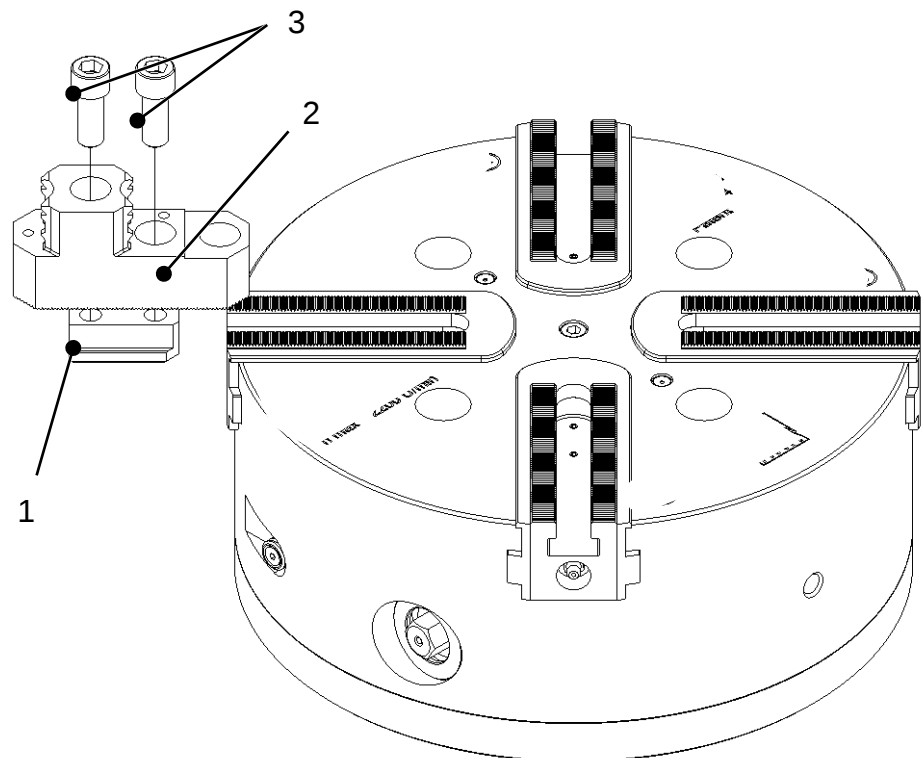


Fig. 3-6: Installation of jaws

3.5 FUNCTION CHECK

The function of the chuck must be checked after installation and before commissioning. Pay particular attention to the clamping force at this time:

- Carry out a calculation of the permissible speed according to the VDI 3106 guideline.
- Measure the clamping force with a suitable clamping force meter on 2 jaws (1/2 total clamping force).

4 OPERATION

4.1 GENERAL INFORMATION

In this chapter you will find information on how to operate the InoFlex® chuck.

NOTICE

Also make sure to comply with the regulations and policies of the operating company (e.g. regarding personal protective equipment (PPE)).



WARNING

In addition, observe the operating instructions of the machine tool in which the chuck is installed.

4.2 PREPARATIONS

- Step 1** Check to make sure that the chuck is properly installed on the machine tool.
- Step 2** Make sure that a functional test was carried out (see chapter 3.5).

4.3 CLAMPING THE WORKPIECE



WARNING

Max. clamping diameter = chuck diameter



WARNING

Make sure the machine tool is in proper working condition before turning on the machine and before operation of the chuck.



DANGER

*If the max. speed of the lathe is higher than the max. permissible speed of the chuck then a speed restrictor must be installed in the machine.
Excessive operating speed of the chuck and therefore excessive centrifugal force must never be allowed. Otherwise there is a risk that the workpiece is not clamped properly.*

Step 1

Clamp the workpiece with a torque wrench and by turning the spindle (1).

NOTICE

Pay attention to the maximum tightening torque of the spindle (1) (see marking on the upper housing and table 7-5).

Step 2

Check both stroke controls (2) to make sure the workpiece is clamped securely (see chapter 4.3.1 for chuck size up to VD050 and chapter 4.3.2 for chuck size from VD063)



DANGER

An unsafely clamped workpiece increases the risk of accidents by falling off.

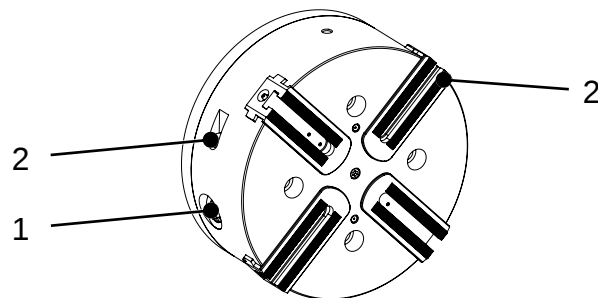
Step 3

Pull off the wrench after clamping the workpiece.



DANGER

According to EN 1550 the spindle of the machine tool may not start until the torque wrench is removed from the chuck.



Step 4 After correct clamping of the workpiece start operating the machine according to the operating manual of the machine tool. Do not exceed the permissible speed.

4.3.1 STROKE CONTROL VD016 – VD050

When the workpiece is clamped the stroke control has to be in the green sector as shown in Fig. 4-3. This eliminates the possibility that the base jaw abuts before the workpiece is clamped safely.

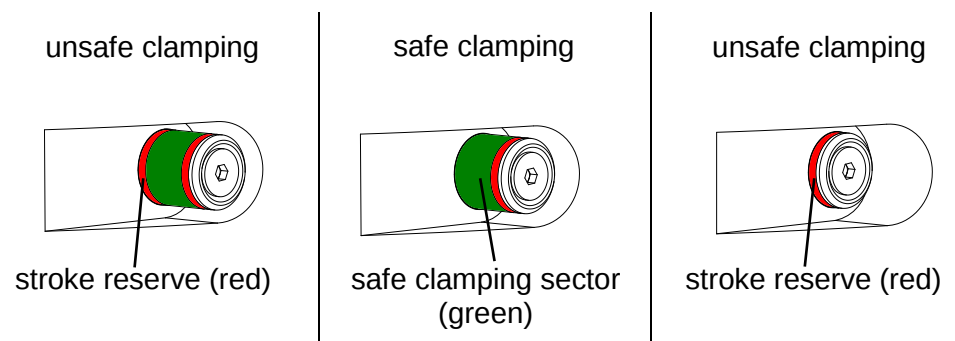


Fig. 4-3: Stroke control VD016 – VD050

4.3.2 STROKE CONTROL VD063 – VD120

When the workpiece is clamped the rear edge of the base jaw has to be between the inner and outer area as shown in Fig. 4-4 This eliminates the possibility that the base jaw abuts before the workpiece is securely clamped.

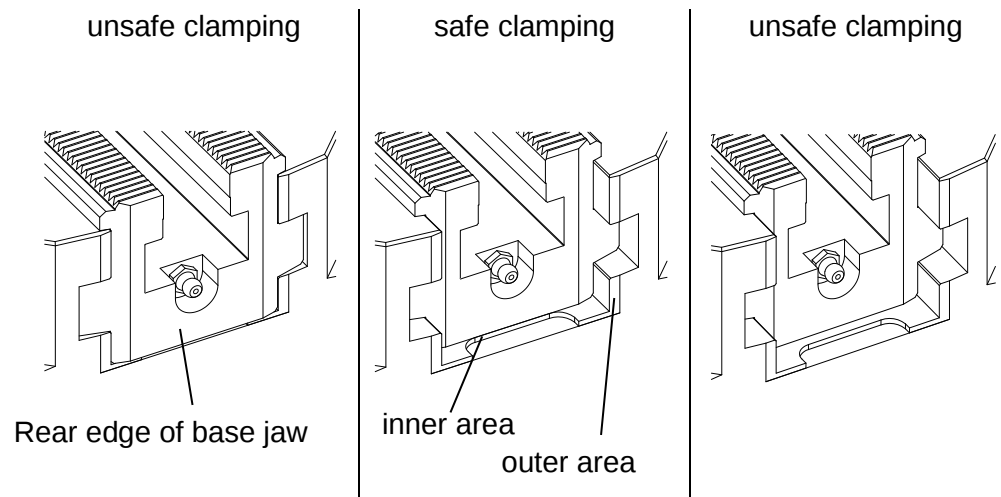


Fig. 4-4: Stroke control VD063 – VD120

4.4 REGULAR TASKS DURING OPERATION

- Carry out visual inspections for contamination on a regular basis. If necessary stop operation and clean the chuck / machine (see Chapter 5 "Maintenance").
- In addition, observe the operating manual of the machine tool.

5 MAINTENANCE

5.1 GENERAL INFORMATION

Regular maintenance and service intervals must be maintained in order to ensure trouble-free operation of the InoFlex® chuck and the machine tool. This includes a test of functions and a visual inspection for damage and wear.



WARNING

In addition, observe the operating instructions of the machine tool in which the chuck is installed.

Keep ready the required materials for cleaning the chuck.

5.2 MAINTENANCE

5.2.1 MAINTENANCE PERIODS

Perform all required maintenance on time.

5.2.2 INSPECTION WORK

The load bearing and the moving parts must be checked before each use to ensure they are in perfect working condition. Damaged parts must be replaced immediately by fault-free parts.



WARNING

Repair and replacement work on the InoFlex® chuck may only be carried out by personnel who are trained and instructed in the operation of the machine tool.

Examine the function of all safety devices on the machine after completion of maintenance and repair work. Protective cladding and protective covers must be installed correctly.

5.2.3 LUBRICANT

Use only the special lubricating grease OKS 265 from HWR Spanntechnik GmbH (or other grease accepted by HWR).

5.2.4 SAFETY INSTRUCTIONS

Switch-off the machine tool and secure the machine against restarting (see operating manual of the machine tool) prior to conducting maintenance and service work.

5.2.5 MAINTENANCE SCHEDULE

Prior to each use of the chuck
Visual inspection of condition and function
Table 5-1: Maintenance work prior to each use

During ongoing operation
Regular visual inspection for contamination
Table 5-2: Maintenance work during ongoing operation

After each use of the machine
Manual cleaning
Table 5-3: Maintenance work after each use

	every 8 operating hrs	every 40 operating hrs	every 1200 / 800* operating hrs
Lubricate each grease nipple (s. Chapt. 5.2.6)	for normal operation		
Check the clamping force with a suitable clamping force meter: measure on 2 jaws (1/2 total clamping force)		X	
Remove the chuck and clean it (s. Chapt. 5.3)			X *) for heavy-duty operation
Table 5-4: Maintenance work according to operating hours			



The chuck must be provided with sufficient grease. Otherwise clamping force will be lost. Risk of accident!

5.2.6 LUBRICATION

NOTICE

*The chuck is lubricated at the factory before it is shipped. To maintain the required clamping force the chuck **MUST** be re-greased with a metered amount of grease. For lubrication intervals see Table 5-4.*



WARNING

Use only the special lubricating grease OKS 265 from HWR Spanntechnik GmbH (or other grease accepted by HWR).

Depending on the operating hours of the chuck lubricate the six grease nipples (1) with the grease.



DANGER

Too little/too much grease causes a loss of clamping force and increases the risk of accidents.

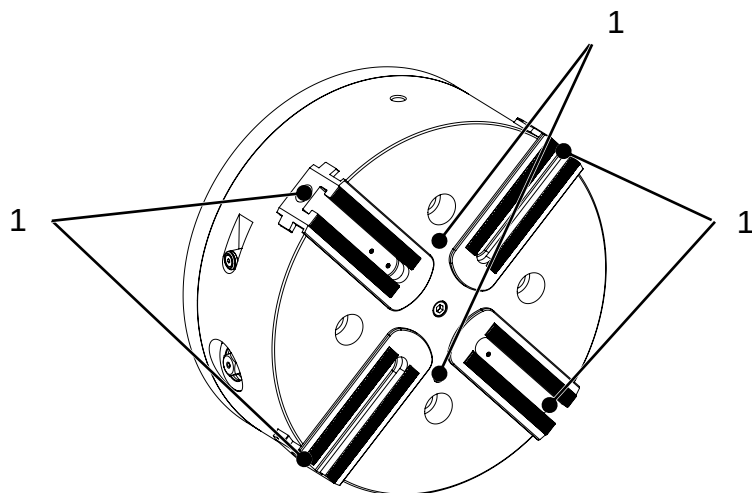


Fig. 5-1: Grease nipples

5.3 DISASSEMBLY / CLEANING / RE-ASSEMBLY OF THE CHUCK

5.3.1 DISASSEMBLY / CLEANING / RE-ASSEMBLY OF THE CHUCK VD016 - VD040

To ensure proper clamping force, the chuck must be disassembled at regular intervals, cleaned and greased again.

NOTICE

Disassembly and cleaning intervals see Table 5-4.

Disassembly and cleaning

- Step 1** Loosen and remove the screws (2) and the cylinder pins (1).
- Step 2** Loosen and remove the screw (7).
- Step 3** Pull-out the pivot bolt (3).
- Step 4** Remove the bottom housing (4).
- Step 5** Remove the cylinder pins (15).
- Step 6** Remove the seal kit (9), shaft seal (8) and O-ring (10) together as one unit.
Check the condition and function of the shaft seal (8). (If necessary, replace the shaft seal before reinstalling the chuck.)
- Step 7** Remove the stroke control (11) and O-ring (12) as a unit.
The coloured rings (red, green, red) must be removed by loosening the screw (14) and the washer (13), underneath there is a hexagonal bolt SW10.
- Step 8** Lift out the entire parallel slide unit (16) by gently lifting and tilting it.



WARNING

Consult the manufacturer first regarding an appliance starting with size VD040.

- Step 9** Remove the base jaws (5) and (6).
- Step 10** Clean all the chuck's components. Use a cold cleaner if necessary.
- Step 11** Check all the components. Damaged parts must be replaced. Contact the manufacturer if you have any questions.

Re-assembly

- Step 1** Re-assemble the chuck in the reverse order to the procedure that was used for disassembly.

5.3.2 DISASSEMBLY / CLEANING / RE-ASSEMBLY OF THE CHUCK VD050

To ensure the clamping force, the chuck must be disassembled at regular intervals, cleaned and greased again.

NOTICE

Disassembly and cleaning intervals see Table 5-4.

- Step 1** Loosen and remove the screw (14).
- Step 2** Put the chuck with the upper housing face down on a suitable underlay so that the base jaws (12 and 13) are free.
- Step 3** Loosen and remove the screws (1 and 2) and the cylinder pins (3).
- Step 4** Pull-out the pivot bolt (4).
- Step 5** Remove the bottom housing (7).
- Step 6** Loosen and remove the screws (5) and the mounting link (6).
- Step 7** Remove seal kit (10), O-ring (9 and 11) together as one unit. Check the condition and function of the O-rings (9 and 11). (If necessary, replace the O-rings before re-assembling the chuck.)
- Step 8** Remove the travel control (15) and O-ring (16) as one unit. The coloured rings (red, green, red) must be removed by loosening the screw (18) and the washer (17), underneath there is a hexagonal bolt SW10.
- Step 9** Lift out the entire parallel slide unit (8) upwards by gently lifting and tilting it.



WARNING

Make sure to consult the manufacturer regarding an appliance.

- Step 10** Remove the base jaws (12 and 13).
- Step 11** Clean all the chucks' components. Use cold cleaner if necessary.
- Step 12** Check all the components. Damaged parts must be replaced. Contact the manufacturer if you have any questions.

Re-assembly

- Step 1** Re-assemble the chuck in the reverse order to the procedure that was used for disassembly.



WARNING

For re-assembling the travel control (15) Loctite 243 has to be used

- Step 2** Lubricate the chuck on the six grease nipples (see chapter 5.2.6).
- Step 3** Check the clamping force with a suitable clamping force meter: measure on 2 jaws (1/2 total clamping force)



WARNING

The initial clamping force measured after greasing may lie below the specified values.

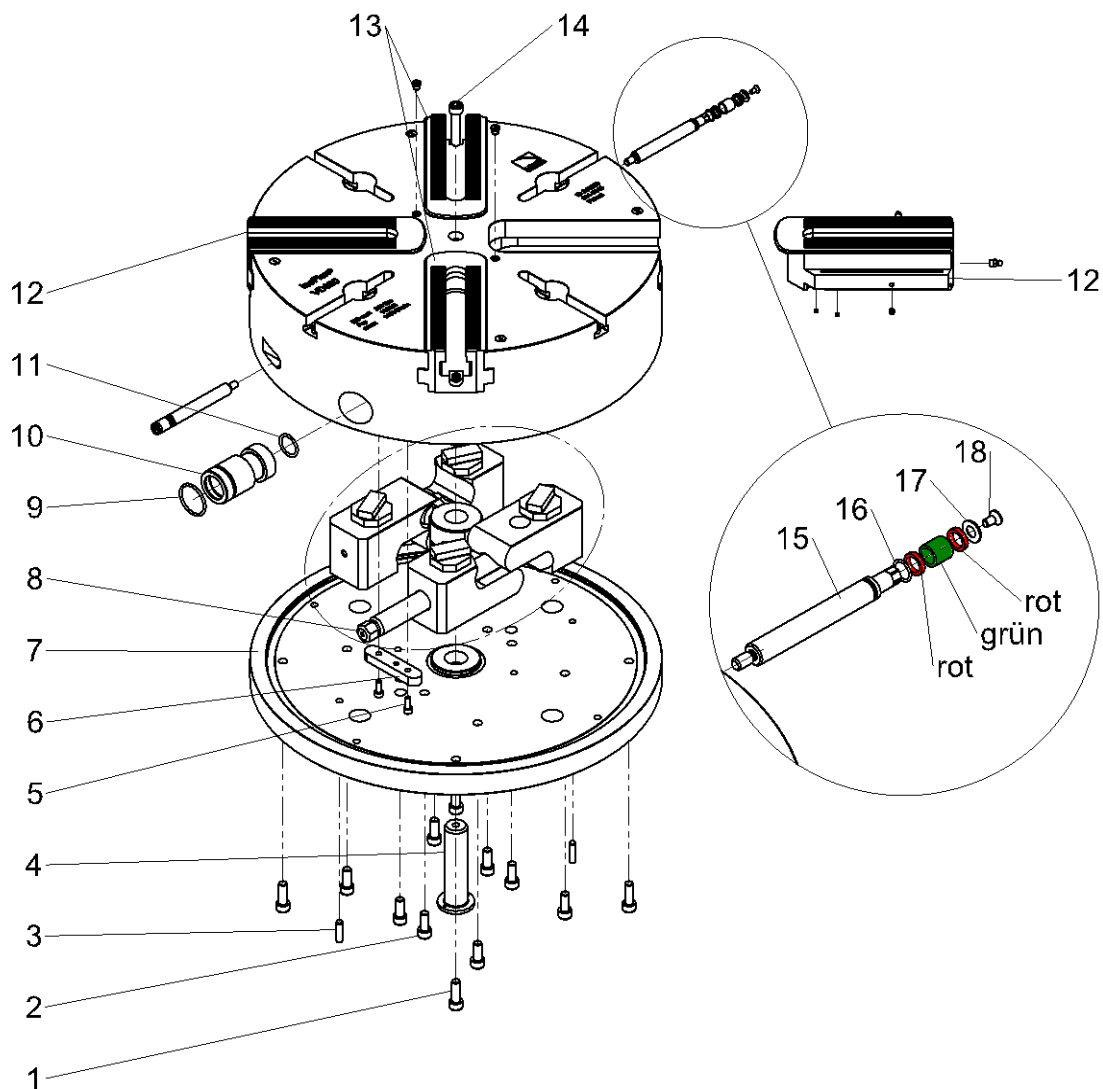


Fig. 5-3: Disassembly / re-assembly of the chuck (VD050)

5.3.3 DISASSEMBLY / CLEANING / RE-ASSEMBLY OF THE CHUCK VD063

To ensure the clamping force, the chuck must be disassembled at regular intervals, cleaned and greased again.

NOTICE

Disassembly and cleaning intervals see Table 5-4.

- Step 1** Loosen and remove the threaded insert (14), the threaded pin (12) and the screw (13).
- Step 2** Put the chuck with the upper housing face down on a suitable underlay so that the base jaws (10 and 11) are free.
- Step 3** Loosen and remove the screw (1)
- Step 4** Pull-out the pivot bolt (2).
- Step 5** Remove the bottom housing (3).
- Step 6** Loosen and remove the screws (5) and the mounting link (6)
- Step 7** Remove the seal kit (8), shaft seal (9) and O-ring (7) together as one unit.
Check the condition and function of the shaft seal (9). (If necessary, replace it before re-assembling the chuck.)
- Step 8** Lift out the entire parallel slide unit (4) upwards by gently lifting and tilting it.



WARNING

Make sure to consult the manufacturer regarding an appliance.

- Step 9** Remove the base jaws (10 and 11).
- Step 10** Clean all the chucks' components. Use a degreaser if necessary.
- Step 11** Check all the components. Damaged parts must be replaced. Contact the manufacturer in case you are uncertain.

Re-assembly

- Step 1** Re-assemble the chuck in the reverse order to the procedure that was used for disassembly.
- Step 2** Lubricate the chuck on the six grease nipples (see chapter 5.2.6).

Step 3 Check the clamping force with a suitable clamping force meter: measure on 2 jaws (1/2 total clamping force)



WARNING

The initial clamping force measured after greasing may lie below the specified values.

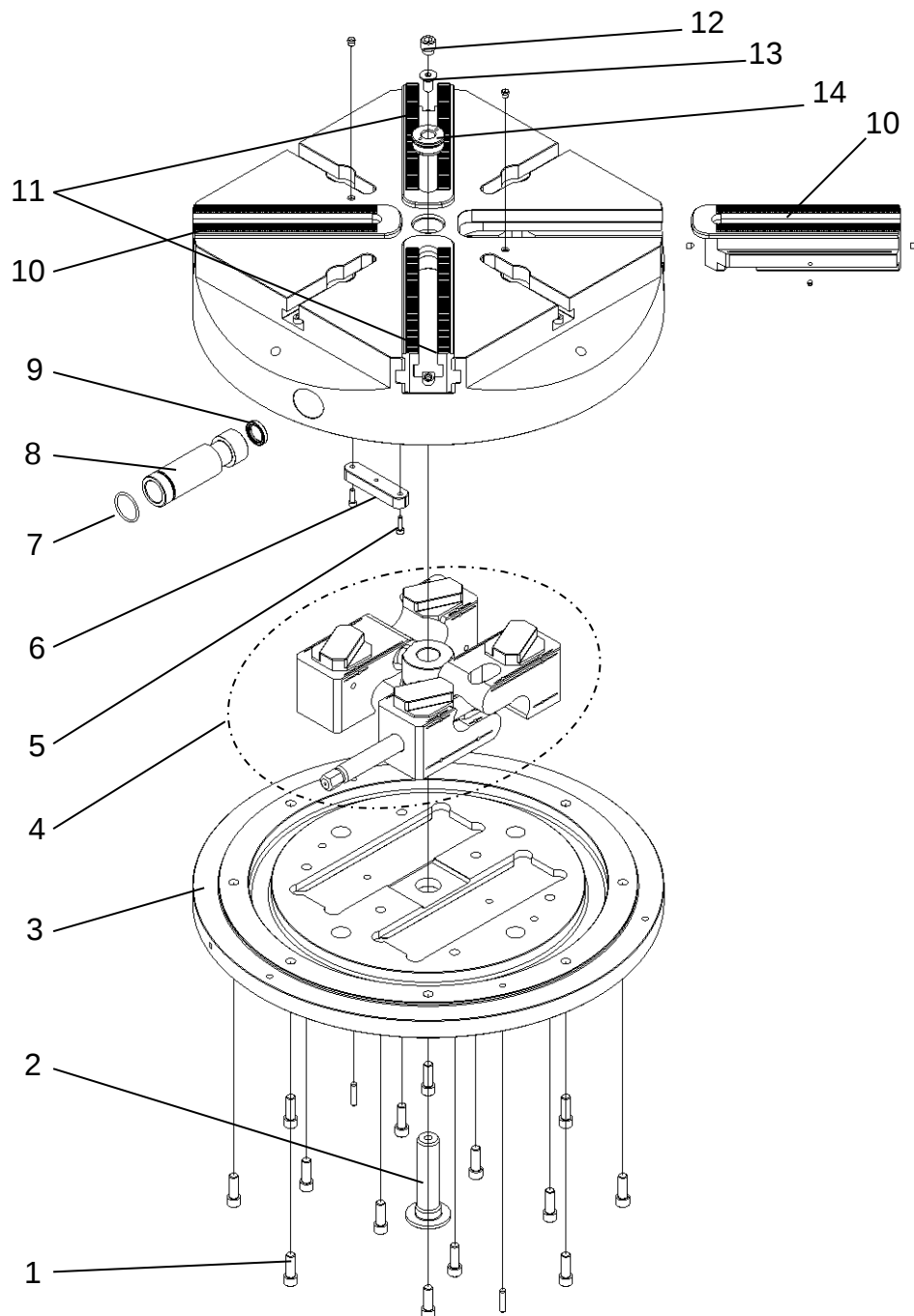


Fig. 5-3: Disassembly / Re-assembly of the chuck (VD063)

5.3.4 DISASSEMBLY / CLEANING / RE-ASSEMBLY OF THE CHUCK VD080

To ensure the clamping force, the chuck must be disassembled at regular intervals, cleaned and greased again.

NOTICE

Disassembly and cleaning intervals see Table 5-4.

- Step 1** Loosen and remove the threaded insert (13), the threaded pin (11) and the screw (12).
- Step 2** Put the chuck with the upper housing face down on a suitable underlay so that the base jaws (9 and 10) are free.
- Step 3** Loosen and remove the screws (1)
- Step 4** Pull-out the pivot bolt (2).
- Step 5** Remove the bottom housing (3).
- Step 6** Remove the mounting link (5)
- Step 7** Remove the seal kit (8) and O-ring (6 and 7) together as one unit.
Check the condition and function of the O-rings (5 and 7). (If necessary, replace them before re-assembling the chuck.)
- Step 8** Lift out the entire parallel slide unit (4) upwards by gently lifting and tilting it.



WARNING

Make sure to consult the manufacturer regarding an appliance.

- Step 9** Remove the base jaws (9 and 10).
- Step 10** Clean all the chucks' components. Use cold cleaner if necessary.
- Step 11** Check all the components. Damaged parts must be replaced. Contact the manufacturer in case you are uncertain.

Re-assembly

- Step 1** Re-assemble the chuck in the reverse order to the disassembly procedure.
- Step 2** Lubricate the chuck on the six grease nipples (see chapter 5.2.6).

Step 3 Check the clamping force with a suitable clamping force meter: measure on 2 jaws (1/2 total clamping force)

⚠ WARNING *The initial clamping force measured after greasing may lie below the specified values.*

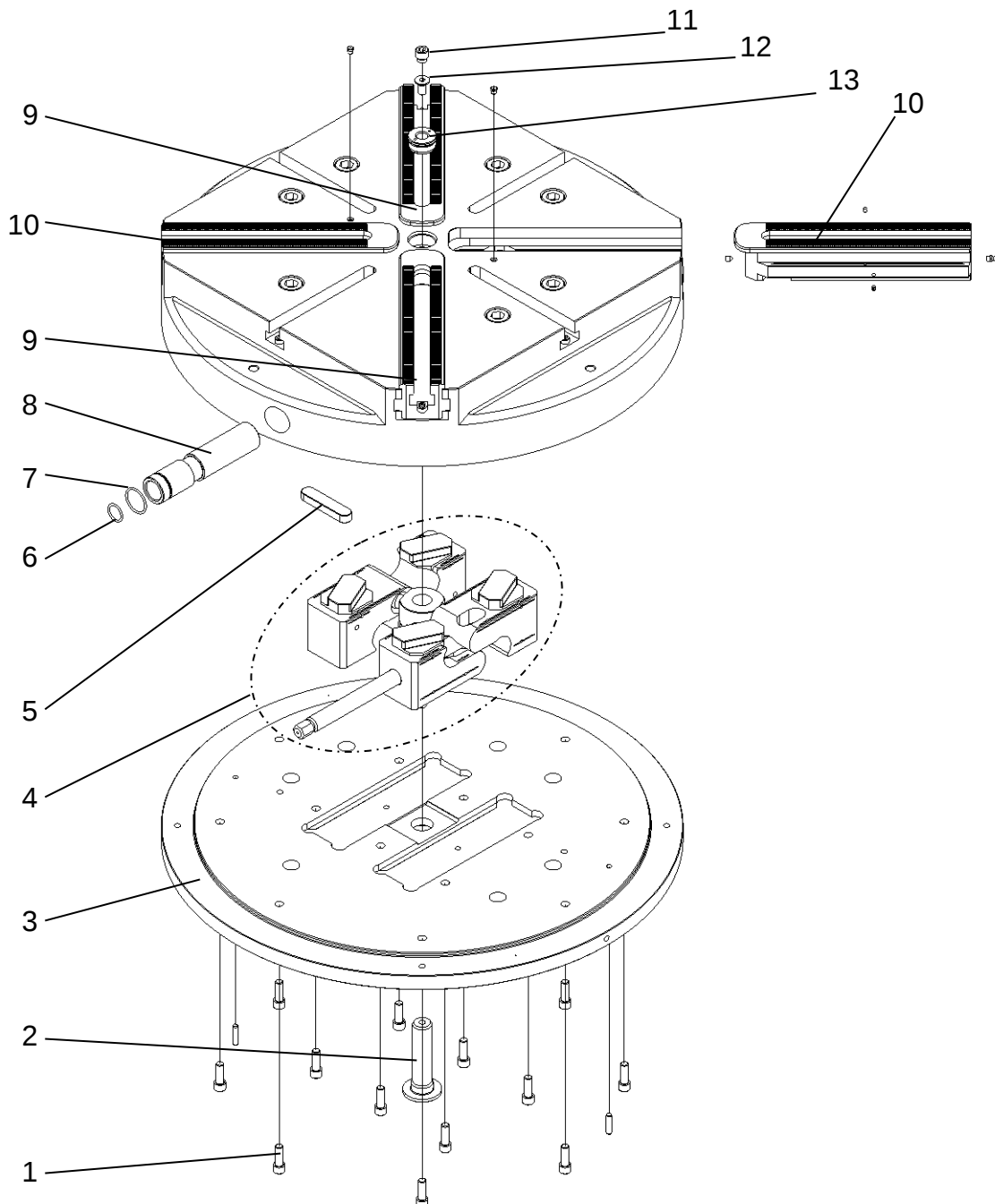


Fig. 5-4: Disassembly / Re-assembly of the chuck (VD080)

5.3.5 DISASSEMBLY / CLEANING / RE-ASSEMBLY OF THE CHUCK VD100 / VD120

To ensure the clamping force, the chuck must be disassembled at regular intervals, cleaned and greased again.

NOTICE

Disassembly and cleaning intervals see Table 5-4.

- Step 1** Loosen and remove the threaded pin (13), the threaded insert (14) and the screw (15).
- Step 2** Put the chuck with the upper housing face down on a suitable underlay so that the base jaws (11 and 12) are free.
- Step 3** Loosen and remove the screws (2) and cylinder pins (4)
- Step 4** Pull-out the pivot bolt (1).
- Step 5** Remove the bottom housing (3).
- Step 6** Remove the mounting links (6)
- Step 7** Remove the seal kit (8) and O-rings (7 and 9) together as one unit.
Check the condition and function of the O-rings. (If necessary, replace them before re-assembling the chuck.)
- Step 8** Remove the spindle extension (10)
- Step 9** Lift out the entire parallel slide unit (5) upwards by gently lifting and tilting it.



WARNING

Make sure to consult the manufacturer regarding an appliance.

- Step 10** Remove the base jaws (11 and 12).
- Step 11** Clean all the chucks' components. Use a degreaser if necessary.
- Step 12** Check all the components. Damaged parts must be replaced. Contact the manufacturer in case you are uncertain.

Re-assembly

- Step 1** Re-assemble the chuck in the reverse order to the procedure that was used for disassembly.
- Step 2** Lubricate the chuck on the six grease nipples (see chapter 5.2.6).

Step 3 Check the clamping force with a suitable clamping force meter: measure on 2 jaws (1/2 total clamping force)

! WARNING *The initial clamping force measured after greasing may lie below the specified values.*

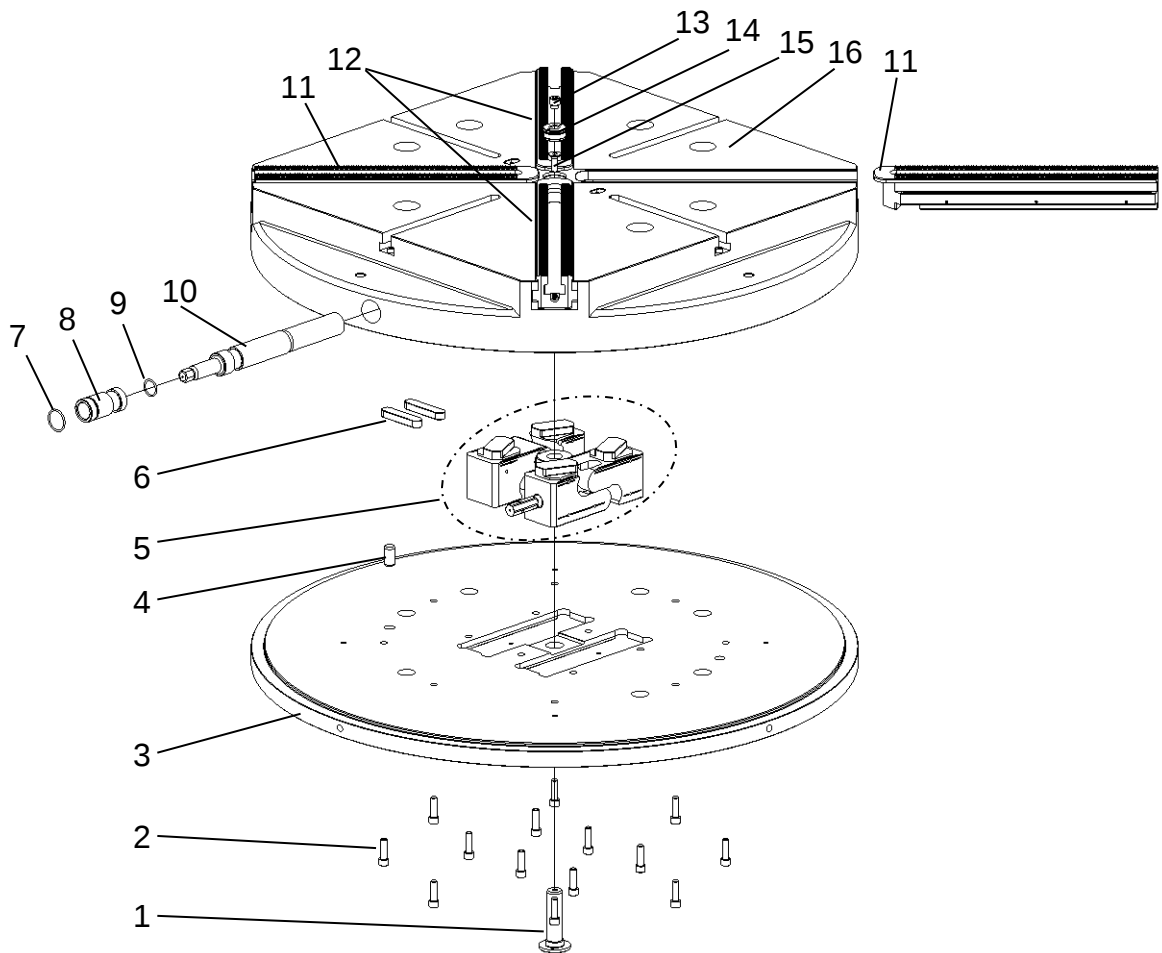


Fig. 5-4: Disassembly / Re-assembly of the chuck (VD100 – VD120)

5.4 WORK AFTER PROLONGED STANDSTILL

The technical maintenance personnel must carry out the following jobs prior to each start after an extended period of standstill:

After a long period of standstill
Visual inspection of the condition and function of the chuck
Cleaning of the chuck
Table 5-5: After a long period of standstill

5.5 DISPOSAL

Have a trained expert dismantle and break down the chuck into its individual components.

Properly handle and dispose of substances and materials used in accordance with the national laws, especially greases and solvents.

6 FAULTS

6.1 GENERAL INFORMATION

This chapter describes the course of action in the event of a fault.

6.2 IF FAULTS OCCUR

Step 1 Switch-off the machine tool and secure the machine against re-starting (see manual of the machine tool) prior to troubleshooting.

Step 2 Eliminate the fault.



WARNING

Repair and replacement work on the InoFlex® chuck may only be carried out by personnel who are also trained and instructed in the operation of the machine tool. Before restarting the chuck or the machine the person responsible for the machine must ensure that:

- *Repair work is completed*
- *The chuck is securely installed in the machine tool*
- *The overall machine is in safe working condition*

Also observe the safety instructions in Chapter 1 of this manual and the manual of the machine tool regarding repairs.

Step 3 Resume operation of the machine tool.



WARNING

Please observe Chapter 4 of this manual and also the manual of the machine tool when restarting the chuck and the machine.

6.3 POSSIBLE CAUSES OF ERRORS AND TROUBLESHOOTING

Error	Cause	Troubleshooting
Only three jaws about on the workpiece	First gripping pair of jaws impede the compensation	When inserting the workpiece watch its contour so that it does not cant
Jaw (s) is (are) stuck in the guide track	Base jaw deformed, contact surfaces and top jaw not plane soiled or damaged	Check top jaw, clean and replace if necessary.
	Base jaw deformed, tightening torque of the mounting screws too high	Comply with the prescribed tightening torque.
	Base jaw deformed	Follow the sequence of tightening sliding block screws (s. 3.4.2)
	Original jaw (s) not used	Use original jaws.
Concentricity error	Jaws not properly turned or milled	Turn or mill top jaws again.
	Jaw inserted in the wrong guide track	Insert the jaw into the guide track with the appropriate identification.
	Base jaws soiled or damaged	Clean or replace the base jaws.
	Mounting screws for the top jaws are too short, too long or overstretched	Check screw depth, replace screws, and observe torque.
	Projection of the top jaws too large	Change the top jaws or clamping method.
	Chuck damaged or worn	Send the chuck for inspection to the manufacturer (HWR Spanntechnik GmbH).
Loss of clamping force	Short jaw stroke with large number of identical workpieces Inadequate lubrication film	Actuate the full stroke of the chuck repeatedly without workpiece for buildup of the lubrication film and to reach full clamping force.
	Insufficient lubrication Lubricant	Lubricate the chuck. Check lubricant and replace if necessary.
	Soiled chuck	Dismantle, clean and lubricate the chuck.
	Impaired function of the chuck	Check all components, replace damaged parts with original parts, send chuck to the manufacturer (HWR clamping GmbH) for inspection and repair.
Table 6-1: Causes of error and troubleshooting		

6.3 POSSIBLE CAUSES OF ERRORS AND TROUBLESHOOTING - CONTINUED

Error	Cause	Troubleshooting
Strong vibration of the machine spindle	Imbalance from the workpiece or top jaws	Change / rework top jaws or add weight to the body of the chuck.
	Imbalance on: • machine spindle • drive • chuck flange	Check the concentricity of various components in stages. Align, balance or replace components.
	Imbalance caused by collision	Send the chuck for inspection and repair to the manufacturer (HWR Spanntechnik GmbH).
Table 6-1: Causes of error and troubleshooting [continued]		

7 TECHNICAL DATA

7.1 GENERAL INFORMATION

All important technical data for the InoFlex® manual chuck is included in this chapter. The data is listed in tables and structured according to individual sizes.

7.2 GENERAL PRODUCT DATA

Operating period	12 hrs/day
Service life	25,000 operating hrs
Clampable workpieces	Commercial steels, cast metals and non-ferrous metals
Table 7-1: General product data	

7.3 OPERATING MATERIALS

Lubricating grease	HWR Special lubricating grease OKS 265 (or other grease accepted by HWR)
Table 7-2: Operating materials	

NOTICE

The special lubricating grease OKS 265 (or other grease accepted by HWR) can only be obtained from HWR Spanntechnik GmbH.

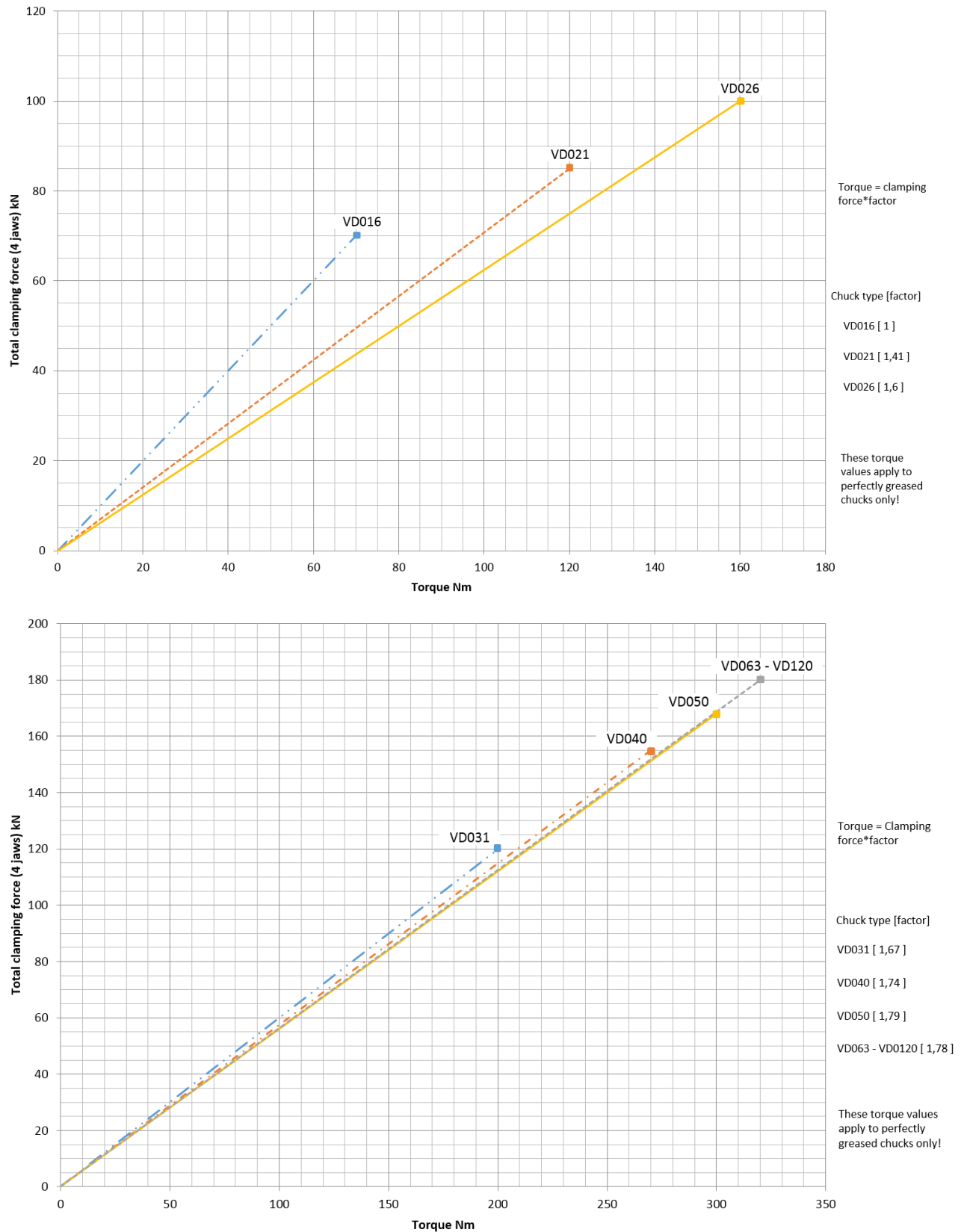
7.4 AMBIENT CONDITIONS

Factory	For temperature range see the operating manual of the tools
Storage	No temperature restrictions
Relative humidity	5-85 %
Installation location of the machine tool	Level, firm ground adequately ventilated
Table 7-3: Ambient conditions	

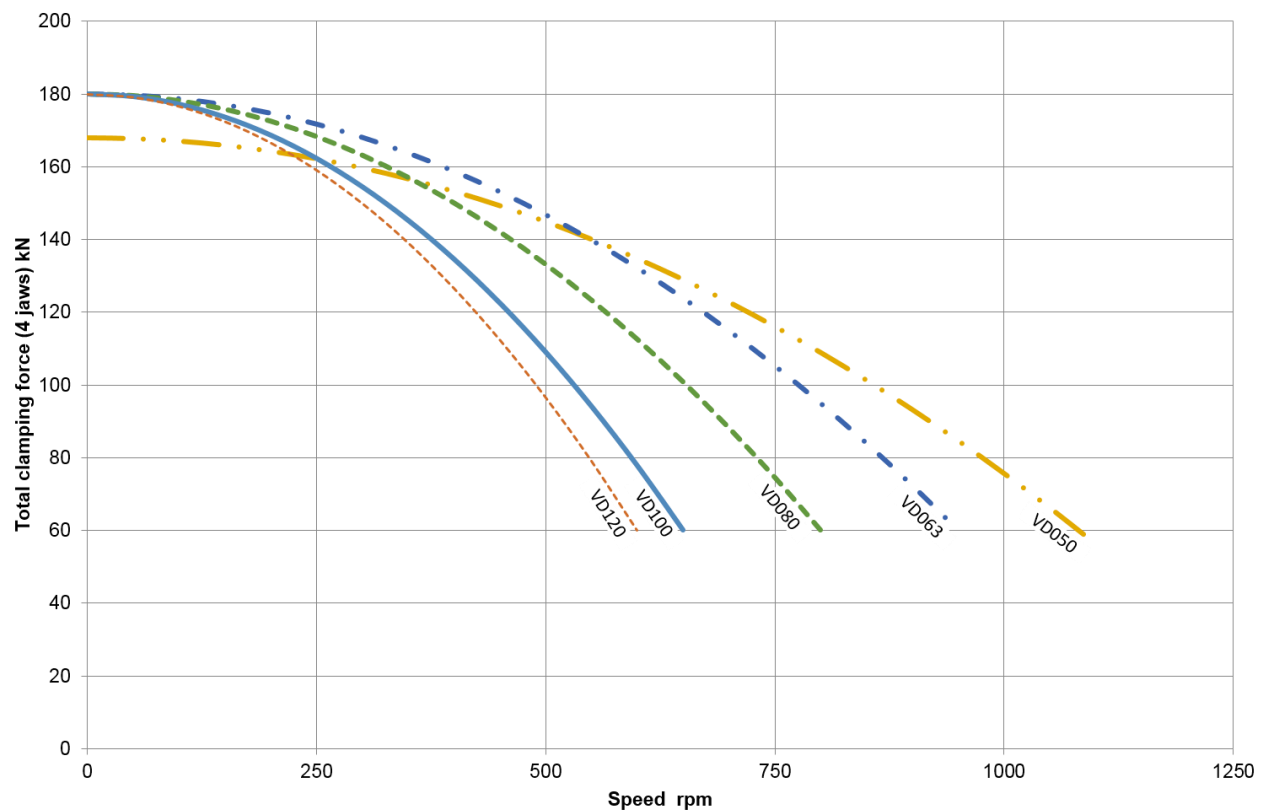
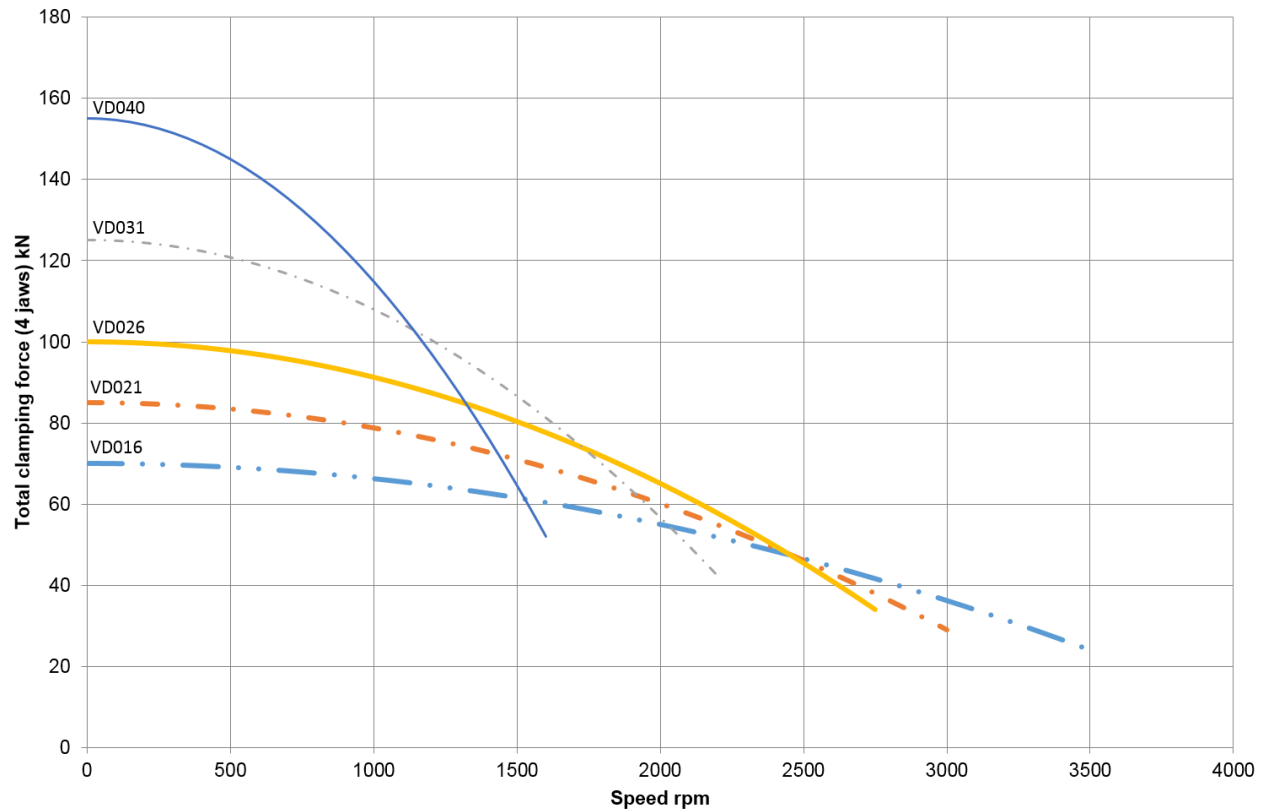
7.5 OTHER DOCUMENTS

Spare parts list
Declaration of incorporation
Table 7-4: Other documents

7.6 CLAMPING FORCE / TORQUE DIAGRAMS



7.7 CLAMPING FORCE/SPEED DIAGRAMS



7 Technical Data

7.8 TECHNICAL DATA

Type		VD016	VD021	VD026	VD031	VD040	VD050	VD063	VD080	VD100	VD120
Ident-No.		841016	841021	841026	841031	841040	841050	841063	841080	841100	841100
Diameter	mm	165	210	255	315	400	500	630	800	990	1150
Radial jaw stroke per jaw	mm	4,3	5,2	5,2	6,1	6,9	8,7	11,3	11,3	11,3	11,3
Compensation per jaw	mm	2,5	3,5	3,5	4	4,5	6,1	8,7	8,7	9,3	9,3
max. tightening torque	Nm	70	120	160	200	270	300	320	320	320	320
max. clamping force	kN	70	85	100	125	155	168	180	180	180	180
max. speed *	1/min	3500	3000	2700	2200	1500	1100	950	800	650	600
Weight (without jaws)	kg	12	22	39	75	127	226	340	545	720	1100
Moment of interia	kg·m²	0,04	0,12	0,32	0,97	2,63	7,39	16,9	24,5	84,5	176,4
max. workpiece weight **	kg	150	180	210	260	320	400	500	600	600	600
T-nut	--	GP05	GP07	GP11	GP11	GP13	GP21	GP21	GP21	GP21	GP21
Standard jaws	--	Please see our chuck data sheets which you will find in our clamping jaw finder under http://www.hwr.de/en/products/chuck-jaws/#c270									
Table 7-5: Technical Data											

* Balance quality acc. to DIN ISO 1940-1: G 6,3 (ungreased)

** for exceeding workpiece weights a support on the chuckbody has to be utilised



Max. clamping diameter = chuck diameter

7.9 MOUNTING DIMENSIONS

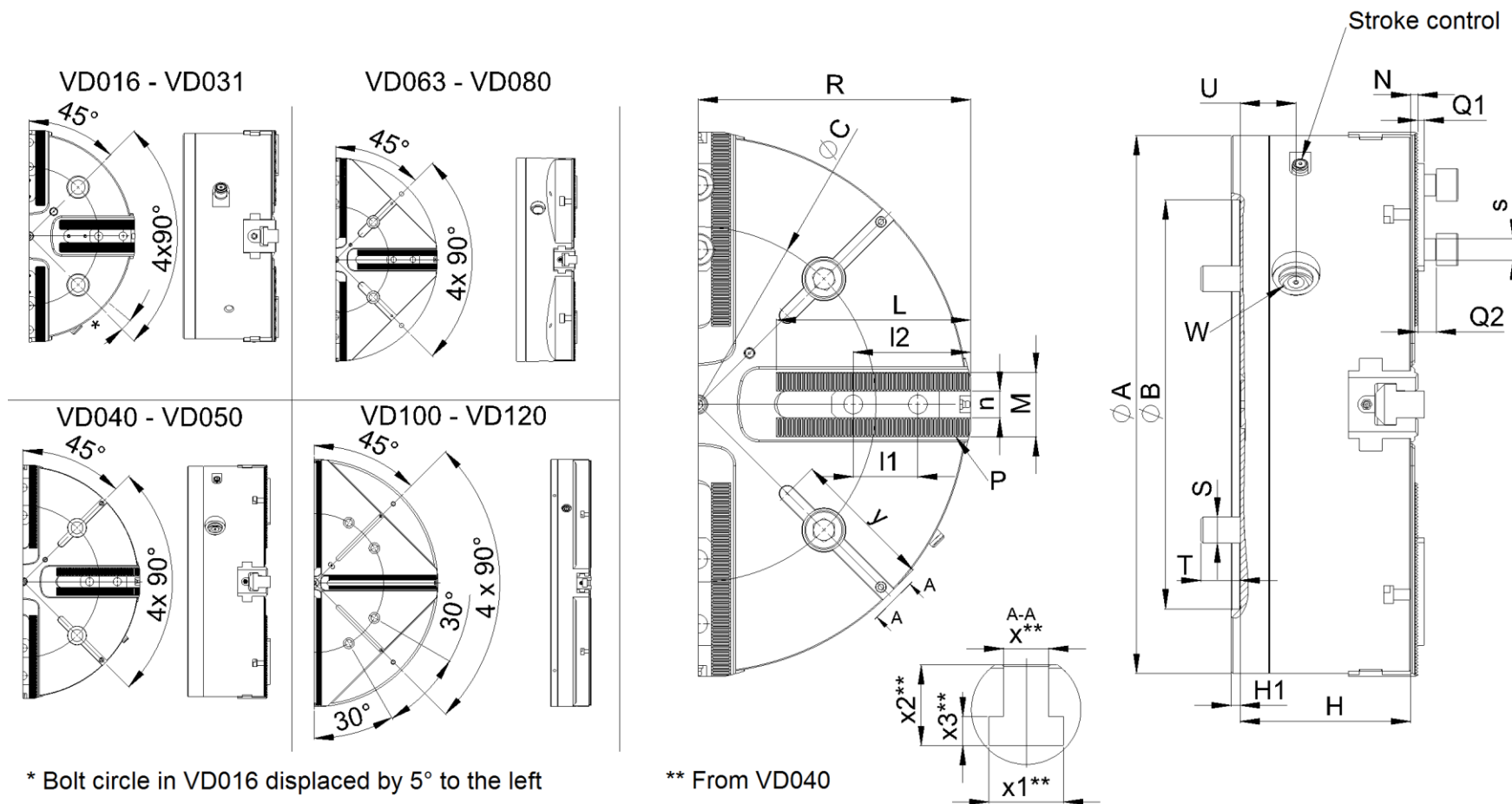


Fig. 7-1: Mounting dimensions VD016-VD100 [Subject to technical change]

7.10 MOUNTING DIMENSIONS

Type			VD016	VD021	VD026	VD031	VD040	VD050	VD063	VD080	VD100	VD120
	A	mm	165	210	255	315	400	500	630	800	990	1150
	B H6	mm	140	170	220	220	300	380	380	520	720	720
	C	mm	104,8	133,4	171,4	171,4	235	330,2	330,2	463,6	647,6	647,6
	H	mm	76	85	105	130	136,5	158,5	163,5	163,5	169,5	169,5
	H1	mm	5	5	5	5	5	8	8	8	8	8
	L	mm	60	78	93	111	141	180	246	315	420	498
	M	mm	31	35,5	40	40	50	60	60	60	60	60
	N	mm	5	5	5	5	6,5	6,5	10,5	10,5	10,5	10,3
Serration	P	mm	1,5x60°	1,5x60°	1,5x60°	1,5x60°	1,5x60°	3x60°	3x60°	3x60°	3x60°	3x60°
	Q1	mm	2,5	3	3	3	3,5	6	6	6	6	6
	Q2	mm	10,5	11,5	11,5	11,5	11,5	16,4	16,4	16,4	16,4	17,4
Chuck open	R	mm	84,8	107,9	130,7	161,1	201,9	252,8	319,3	404,3	504,3	574,3
	S		M10x80, 4x	M12x90, 4x	M16x110, 4x	M16x130, 4x	M20x110, 4x	M24x140, 4x	M24x130, 4x	M24x180, 4x	M30x120, 4x	M30x180, 4x
	T	mm	16	17,6	21,6	22,6	30	36	34,4	41,5	41,5	41,5
	U	mm	28	32	37	50	53	52	59	59	65	65
Wrench size	W	AF	12	12	17	17	21	21	21	21	21	21
	I1	mm	18	20	30	30	30	60	60	60	60	60
min. / max.	I2	mm	25 / 52	28 / 68	41 / 60	41 / 97	43 / 233	70 / 150	80 / 228	80 / 295	80 / 395	80 / 476
	n H8	mm	10	12	16	16	21	25	25	25	25	25

Table 7-6: Mounting dimensions

7.10 MOUNTING DIMENSIONS - CONTINUED

Type		VD016	VD021	VD026	VD031	VD040	VD050	VD063	VD080	VD100	VD120
s		M8x25	M10x25	M12x30	M12x30	M16x35	M20x55	M20x55	M20x55	M20x55	M20x55
x H12	mm	--	--	--	--	14	14	22	22	22	22
x1	mm	--	--	--	--	23	23	40	40	40	40
x2	mm	--	--	--	--	25	25	38	38	38	38
x3	mm	--	--	--	--	9	9	16	16	16	16
y	mm	--	--	--	--	118	133	200	285	245	290
Table 7-6: Mounting dimensions [continued]											

7.11 MAXIMUM TIGHTENING TORQUE FOR MOUNTING SCREWS

Strength class	Standard	Thread								
		M5	M6	M8	M10	M12	M14	M16	M20	M24
		max. tightening torque [Nm]								
12.9	ISO 4762 (DIN 912)	10	16	30	50	70	105	150	220	450
10.9	ISO 4762 (DIN 912)	8	12	25	42	58	88	125	180	350
Table 7-7: Maximum tightening torque for mounting screws										

8 SPARE PARTS

8.1 GENERAL INFORMATION

Replacement parts may be required for the maintenance and repair of the InoFlex® chuck.

This chapter informs you about what information you should have available when ordering replacement parts from the manufacturer HWR Spanntechnik GmbH.

8.2 BASIC INFORMATION REQUIRED FOR ORDERING SPARE PARTS

- Size: e. g. InoFlex® VD031
- Identification number (ID No.)
- Name of the spare part
- Order quantity

8.3 SPARE PARTS ORDER VIA E-MAIL



WARNING

Please observe the minimum information requirements (see section 8.2 "Basic information about ordering spare parts").

We recommend the following procedure when ordering a replacement part:

- Step 1** Look for the desired part in figure 8-1 / 8-2 / 8-3 / 8-4 / 8-5.
- Step 2** Enter the minimum required order information in the e-mail (see Section 8.2).
- Step 3** Send the order to HWR Spanntechnik GmbH using your company address.

NOTICE

The e-mail address can be found on the inside of the front cover of this operating manual.

8.4 SPARE PARTS ORDER BY FAX



WARNING

Please observe the minimum information requirements (see Chapt. 8.2 "Basic information about ordering spare parts").

We recommend the following procedure when ordering a replacement part:

Step 1 Look for the desired part in figure 8-1 / 8-2 / 8-3 / 8-4 / 8-5.

Step 2 Copy the figure and if possible the corresponding Table.



WARNING

Make sure to place the original sheet back into the documentation to ensure the integrity of your data.

Step 3 Clearly indicate the desired replacement part (s) in the figure and in the parts list.
Also enter the desired quantity if it should deviate from number already indicated.

Step 4 Fax this page (s) to HWR Spanntechnik GmbH stating your company address.

NOTICE

The fax number can be found on the inside of the front cover of this operating manual.

8.5

8.5.1

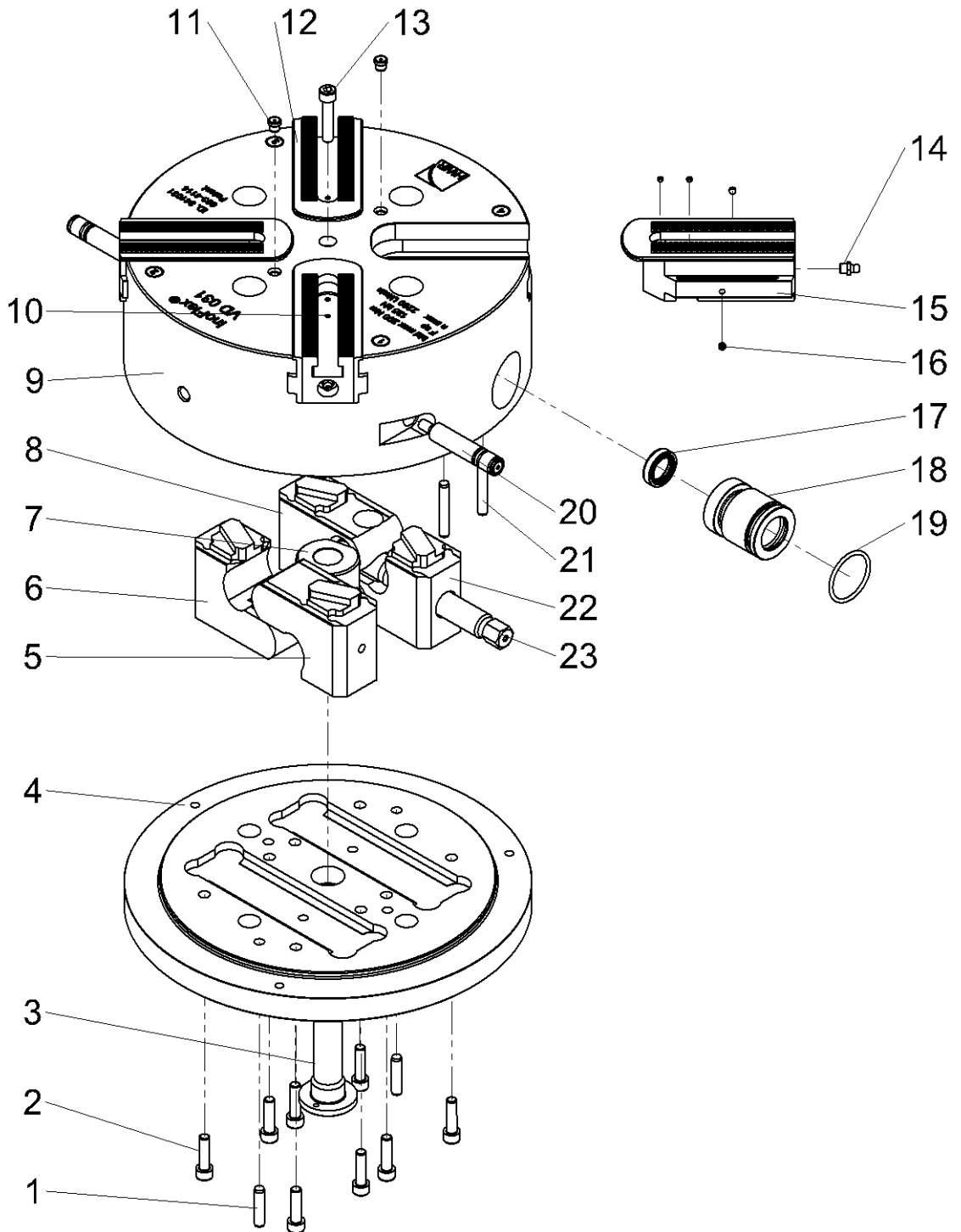


Fig. 8-1: Spare parts (VD016 - VD040)

Pos.	Name	Quantity
1	Cylinder pin	2
2	Screw M8	8
3	Pivot bolt	1
4	Bottom housing	1
5	Parallel slider 3	1
6	Parallel slider 4	1
7	Clamping bone	2
8	Parallel slider 1	1
9	Upper housing	1
10	Plug	8
11	Grease nipple-D8	2
12	Base jaw 1/3	2
13	Screw M8	1
14	Grease nipple, M10x1	4
15	Base jaw 2/4	2
16	Plug	8
17	Shaft sealing ring	1
18	Seal kit	1
19	O-ring	1
20	Stroke control complete	2
21	Cylinder pin	2
22	Parallel slider 2	1
23	Spindle	1
Table 8-1: Spare parts list (VD016 - VD040)		

8.5.2 SPARE PARTS LIST VD050

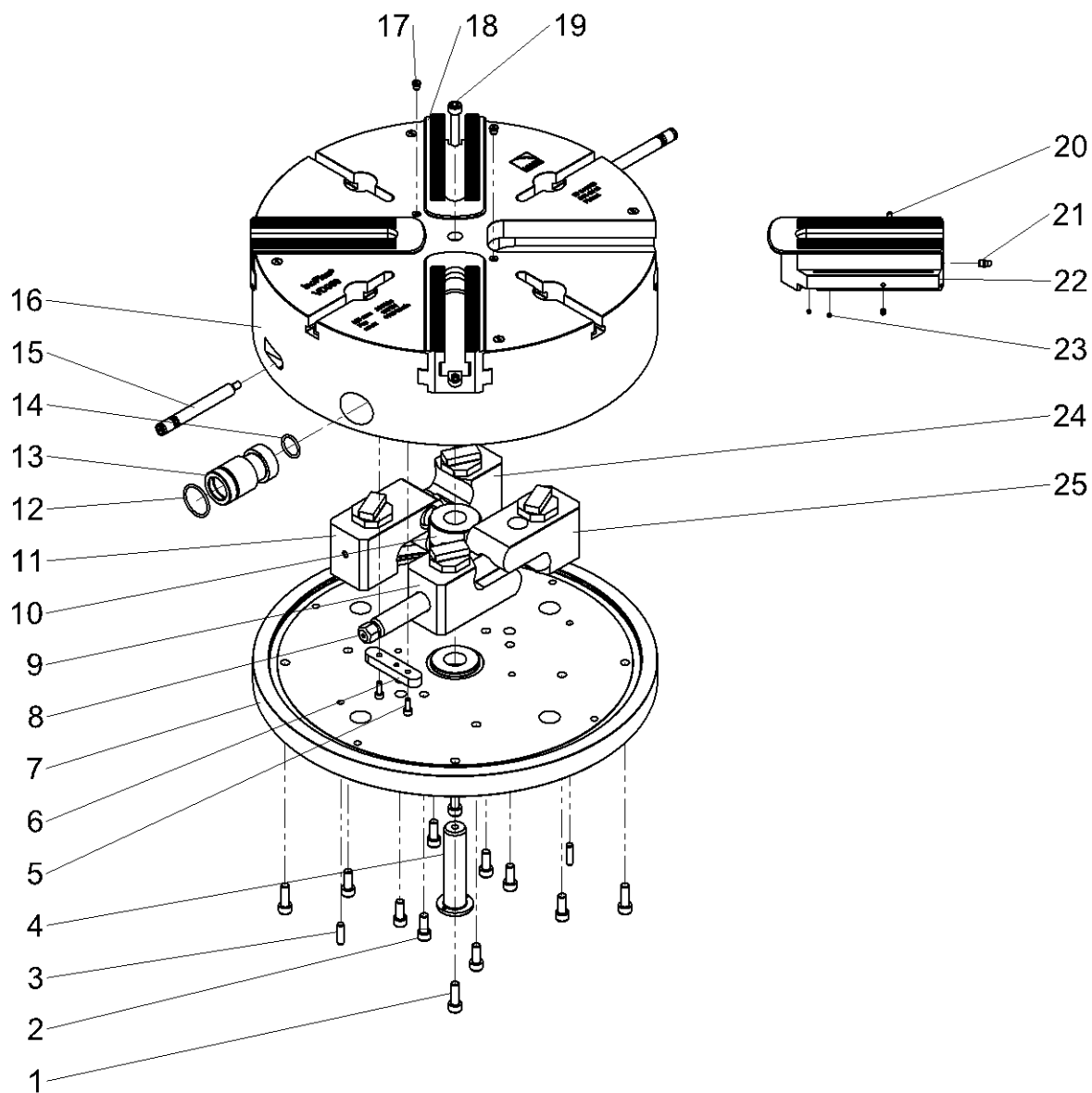


Fig. 8-2: Spare parts (VD050)

Pos.	Name	Quantity
1	Screw M10	4
2	Screw M10	8
3	Cylinder pin	2
4	Pivot pin	1
5	Screw M6	2
6	Connecting link	1
7	Bottom housing	1
8	Spindle	1
9	Parallel slider 2	1
10	Clamping bone	2
11	Parallel slider 3	1
12	O-Ring	1
13	Seal kit	1
14	O-Ring	1
15	Stroke control complete	2
16	Upper housing	1
17	SGrease nipple-D8	2
18	Base jaw 2/4	2
19	Screw M10	1
20	Plug	8
21	Grease nipple, M8x1	4
22	Base jaw 1/3	2
23	Plug	8
24	Parallel slider 4	1
25	Parallel slider 1	1
Table 8-2: Spare parts list (VD050)		

8.5.3 SPARE PARTS LIST VD063

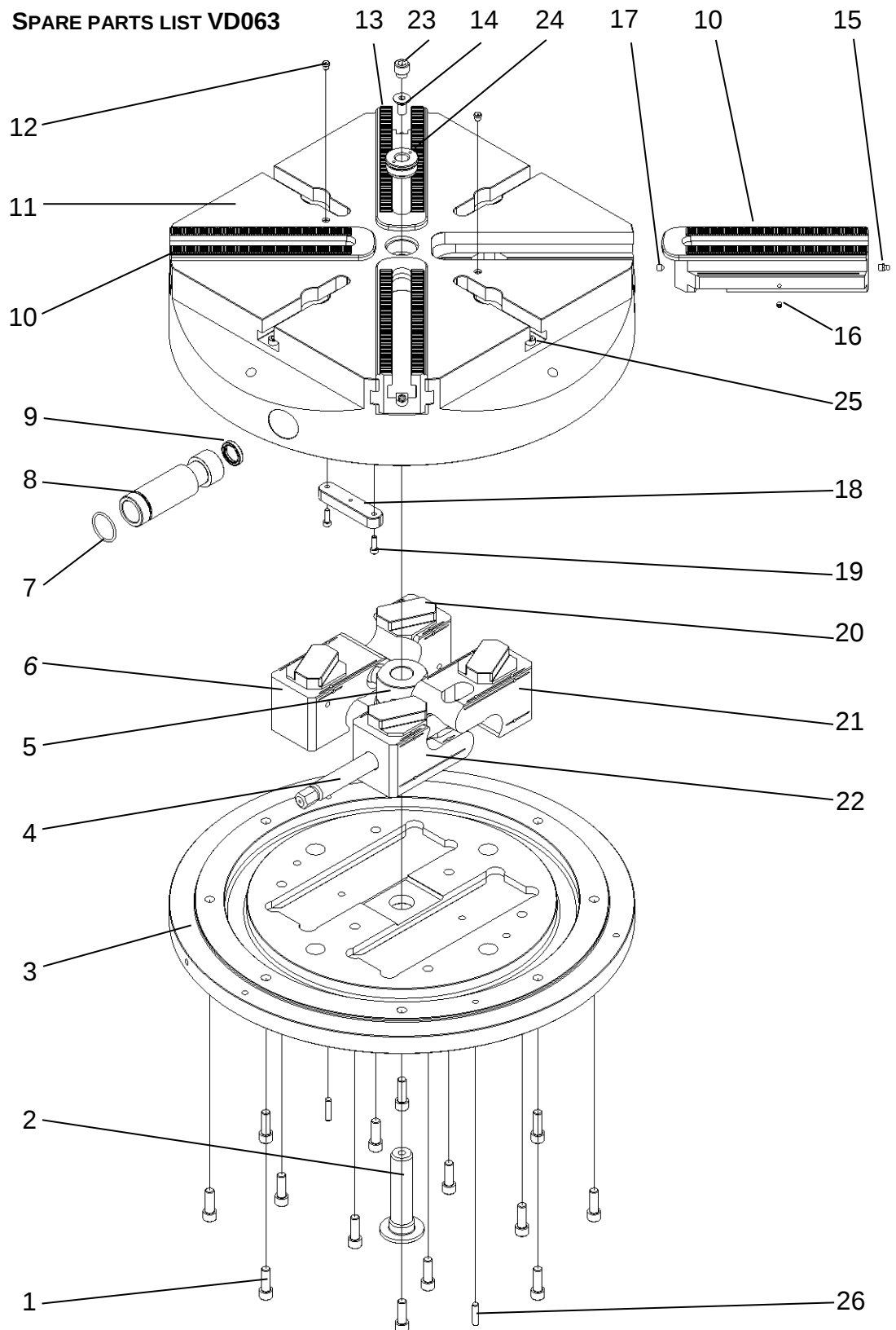


Fig. 8-3: Spare parts (VD063)

Pos.	Name	Quantity
1	Screw M12	15
2	Pivot bolt	1
3	Lower housing	1
4	Spindle	1
5	Clamping bone	2
6	Parallel slider 3	1
7	O-ring	1
8	Seal assembly	1
9	O-ring	1
10	Base jaw 1/3	2
11	Upper housing	1
12	Grease nipple-D8	2
13	Base jaw 2/4	2
14	Screw M12	1
15	Grease nipple	4
16	Plugs	16
17	Plugs	2
18	Connecting link	1
19	Screw M6	2
20	Parallel slider 4	1
21	Parallel slider 1	1
22	Parallel slider 2	1
23	Threaded pin	1
24	Threaded insert	1
25	Screw M8	4
26	Cylinder pin	2
Table 8-3: Spare parts list (VD063)		

8.5.4 SPARE PARTS LIST VD080

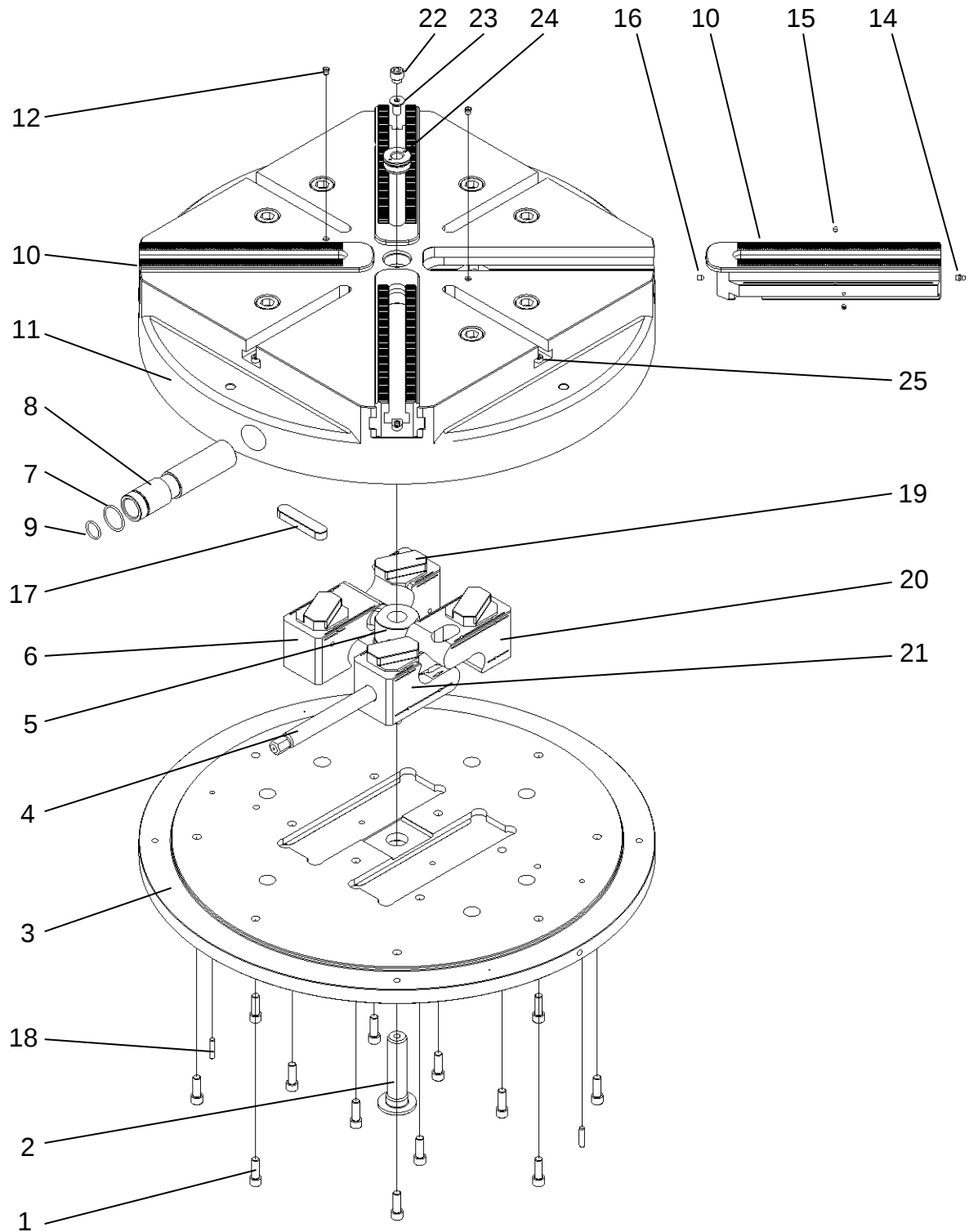


Fig. 8-4: Spare parts (VD080)

Pos.	Name	Quantity
1	Screw M12	14
2	Pivot bolt	1
3	Bottom housing	1
4	Spindle	1
5	Clamping bone	2
6	Parallel slider 3	1
7	O-ring	1
8	Seal kit	1
9	O-ring	1
10	Base jaw 1/3	2
11	Upper housing	1
12	Grease nipple-D8	6
13	Base jaw 2/4	2
14	Grease nipple	4
15	Plug	8
16	Plug	4
17	Connecting link	1
18	Aligning pin	2
19	Parallel slider 4	1
20	Parallel slider 1	1
21	Parallel slider 2	1
22	Threaded pin	1
23	Flat head screw	1
24	Threaded pin	1
25	Screw M8	4
Tabele 8-4: Spare Part List (VD080)		

8.5.5 SPARE PARTS LIST VD100-VD120

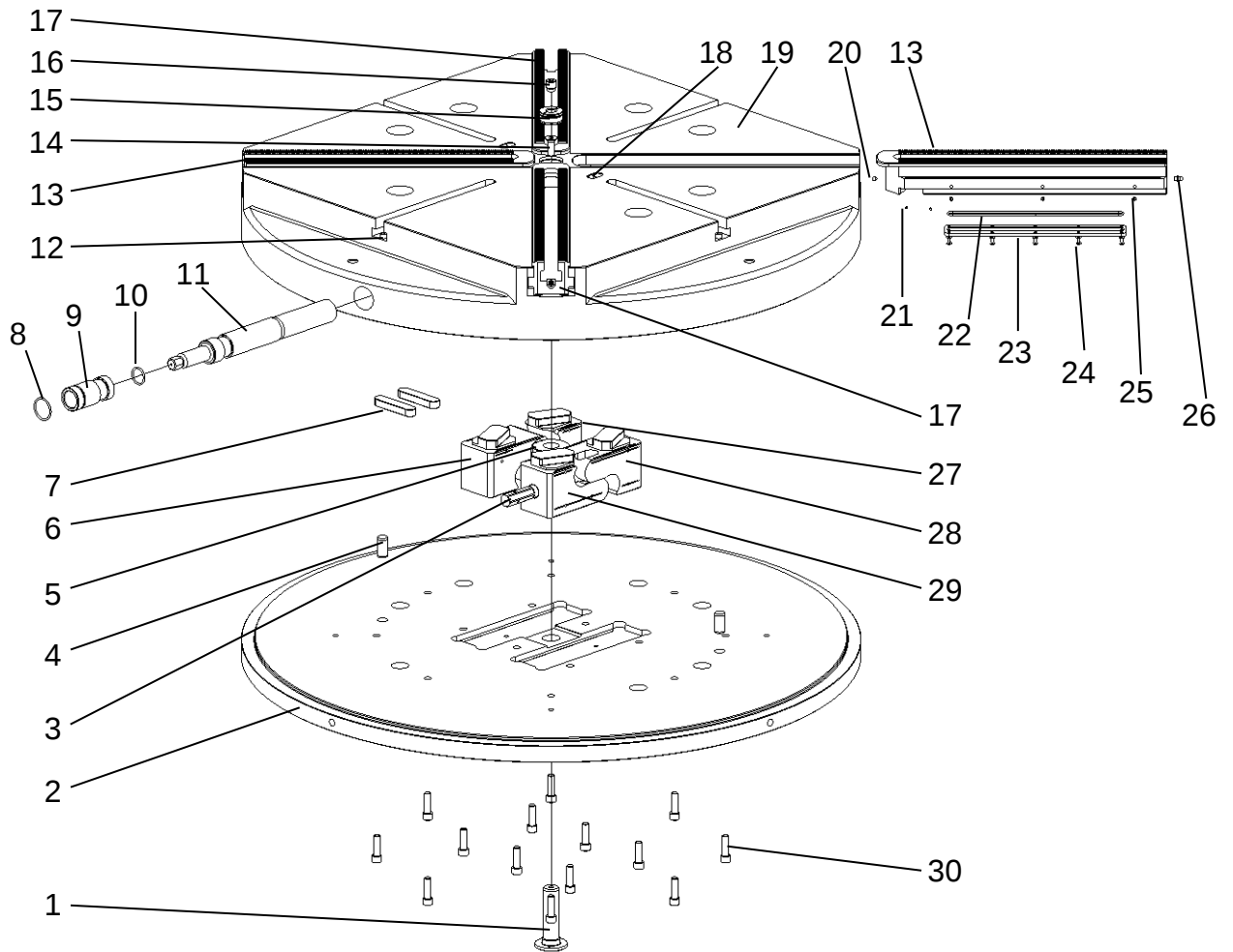


Fig. 8-5: Spare parts (VD100-VD120)

Pos.	Name	Quantity
1	Pivot bolt	1
2	Lower housing	1
3	Spindle	1
4	Cylinder pin	2
5	Clamping bone	2
6	Parallel slider 3	1
7	Connecting link	2
8	O-Ring	1
9	Seal kit	1
10	O-ring	1
11	Spindle extension	1
12	Cylinder head screw	4
13	Base jaw 2/4	2
14	Flat head screw	1
15	Threaded insert	1
16	Threaded pin	1
17	Base jaw 1/3	2
18	Grease nipple	2
19	Upper housing	1
20	Plug	4
21	Plug	8
22	O-Ring	4
23	Top cover	4
24	Flat head screw	24 *
25	Plug	16 **
26	Grease nipple	4
27	Parallel slider 4	1
28	Parallel slider 1	1
29	Parallel slider 2	1
30	Cylinder head screw	14
Table 8-5: Spare parts list (VD100-VD120)		

*) Quantity VD120: 40

**) Quantity VD120: 24