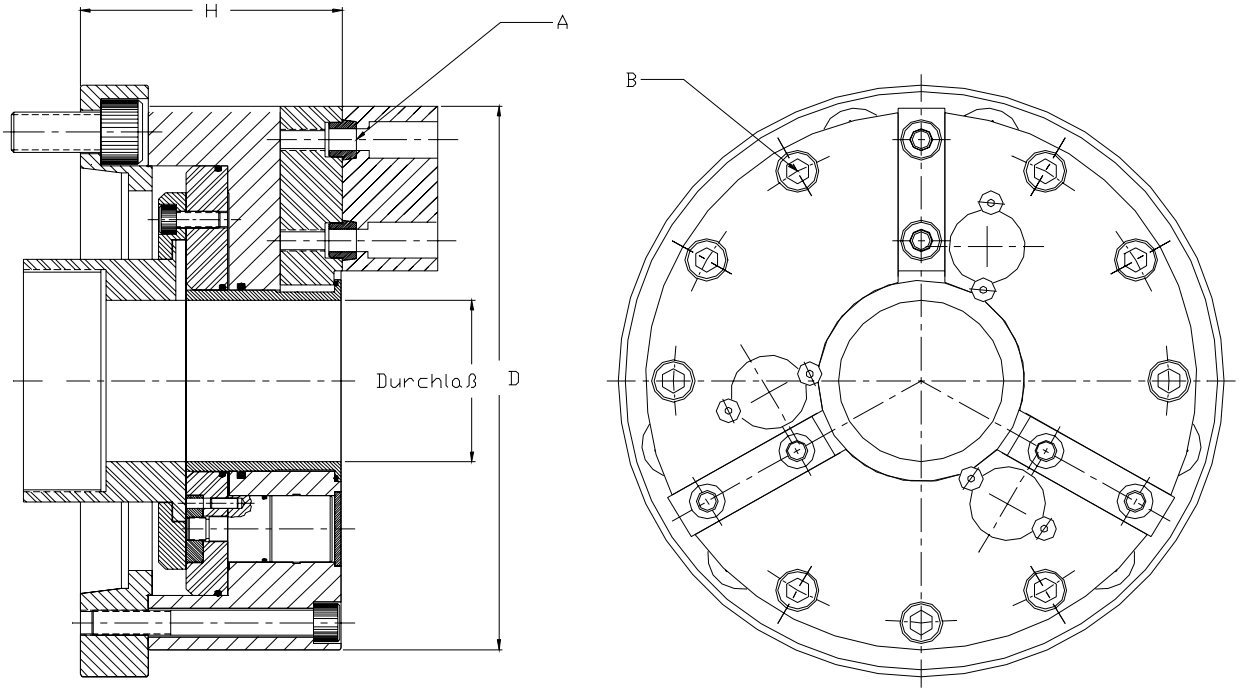
Power precision chucks PPC Operating manual



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1. Introduction

Thank you very much for the purchase of a MicroCentric precision chuck. We wish you a good success on your work with it. Please read the operation manual carefully before you start the work with this product. The consideration of this manual will help you to avoid accidents, breakdowns and damages.

Clamping systems are the most important components of tool machines, when you have to produce high precision parts with high accuracy and concentricity. Our products have several advantages and are in usage for different application, e.g. turning, grinding and milling.

Please call our sales- and service engineers if you would like to get additional information.

2. General

2.1 Features of power precision chucks

MicroCentric power precision chucks are designed according to the actual stand of technique and correspond to the requirements of modern clamping systems:

- Accuracy < 3 µm
- Sizes from 110 to 300 mm
- Clamping force up to 7.440 daN
- Through bore for bar working
- Useable for inside and outside clamping
- Quick change top jaw system
- Special chucks (e.g. 2 or 6-jaw versions)

Please read and pay attention to the following security notices very carefully:

1. All applications of the precision chuck must be according to this operating manual.
2. Do not touch the chuck while it is rotating.
3. While closing the jop jaws please pay attention, that there are no objects between the top jaws and the workpiece.
4. The spindle adapter must be manufactured in the right way. During mounting the chuck onto the machine, spindle nose, spindle adapter and the chuck must be clean. Further all mounting bolts have to tighten strong enough.
5. Periodically you should verify, that all mounting bolts on the chuck resp. the spindle adapter are still fixed.
6. Please never exceed the maximum drawtube force.
7. On automatically loaded machines there should be a control, if the chuck will get into the right position while clamping the workpiece. One possibility is to check the axial movement of the drawtube on the cylinder.
8. Please let us know first and immediately in every cases, when the chuck works abnormally or it has no function. Our well educated service engineers will support you well and solve your problems.
9. On the usage of our clamping systems the valid instructions and laws to avoid accidents must be observed.

3. System description

3.1 Chuck assembly

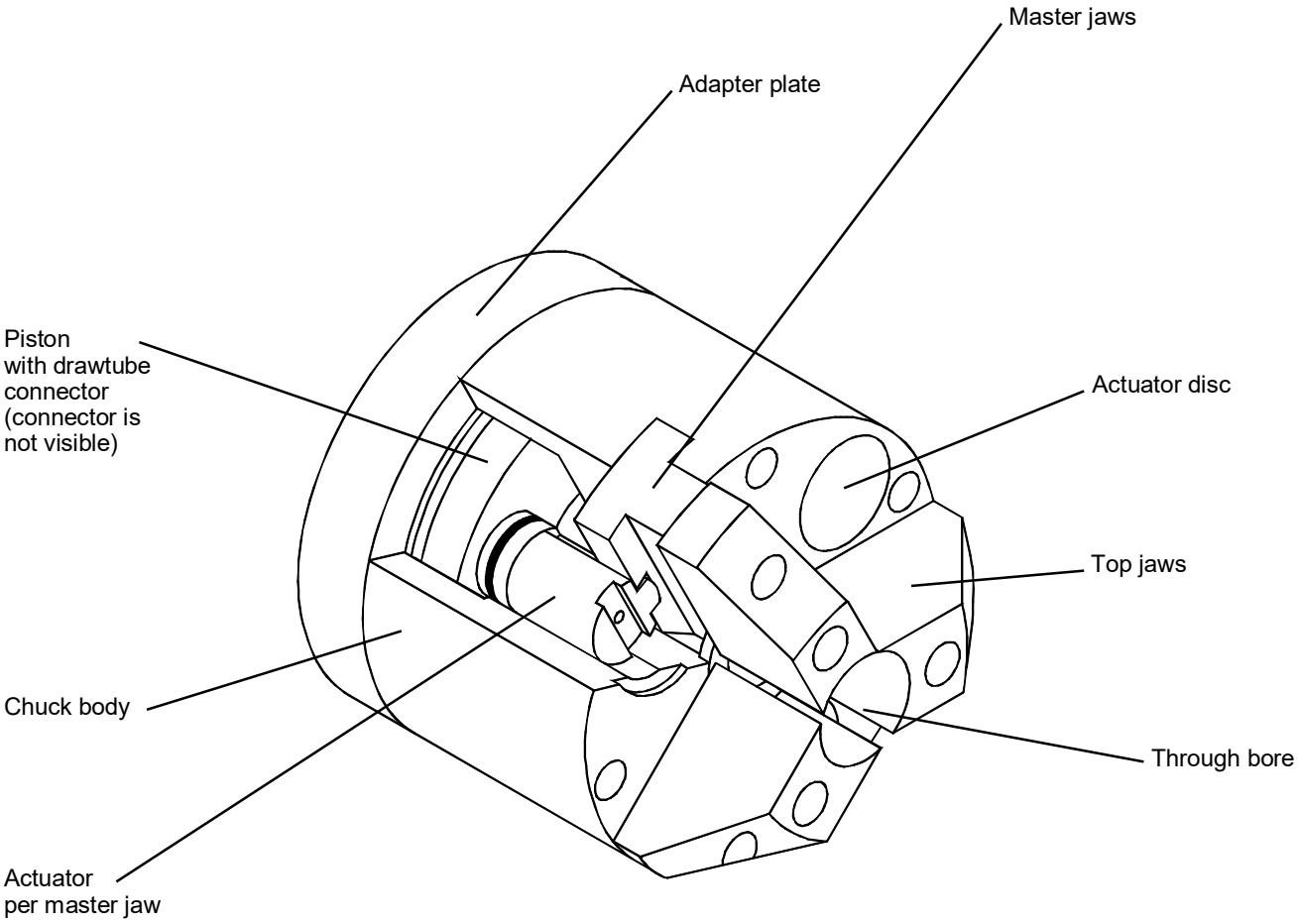


Fig. 1.1

3.2 Function principle

The piston makes a forward movement through drawtube force. On the piston are actuators fixed. These actuators have an oblique plain milled in, which engage in slots of the master jaws. Through that the axial movement of the piston is transferred to a radial movement of the jaws. The chuck opens on the outside clamping through that motion. The chuck closes through a backward movement of the piston.

On the inside clamping the function will be done reverse.

3.3 Rotating applications

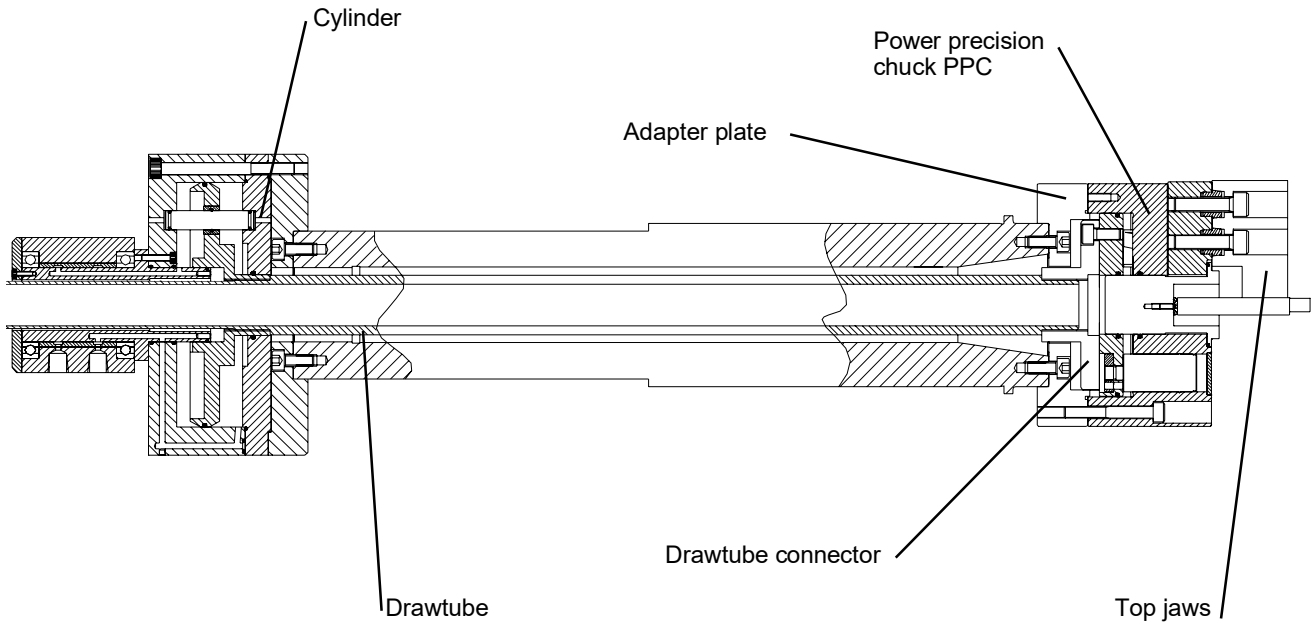


Fig. 1.2

3.4 Mounting of chucks

Attention:
All bolts must be fixed with the in Appendix A listed torque.

1. For the installation of MicroCentric chucks a suitable spindle adapter is required. When you manufacture the spindle adapter by yourself, please take the necessary dimensions out of the DIN-ISO-norms resp. our data sheets. The spindle adapter should get a suitable recess with enough clearance to the pilot diameter of the chuck. The lateral runout may not exceed 2,5 µm. Through the clearance between the recess and the pilot diameter it is possible to adjust a radial runout. The spindle adapter must have a through bore for the drawtube. Please bring in 6 holes and threads into the spindle adapter for mounting the chuck onto the adapter plate.

2. Make sure that mounting surfaces of chuck, adapter plate and spindle nose are free from nicks or pollution. Please tighten all mounting bolts alternately and equally. It is recommended to use bolts with solidity class 12.9.

3. First fix the spindle adapter onto the machine spindle with handforce. Adjust the adapter by taking out a radial runout. Tighten the mounting screws equally.

4.A. Chucks (only small sizes) with not turnable drawtube connectors:
Bring the drawtube into the front position. Mount the drawtube connector with the chuck onto the drawtube and tighten them together. Hereby make certain, that the chuck is always supported well enough. Move the drawtube with low force into the rear position. Mount the chuck onto the spindle adapter, adjust it at the outside diameter radially and tighten the screws over cross equally.

4.B. Chucks with turnable drawtube connectors:
Bring the drawtube into the rear position by actuating the cylinder. Mount the chuck onto the spindle adapter, adjust it at the outside diameter radially and tighten the screws over cross equally. Move the drawtube with low force into the front position. Mount the drawtube connector onto the drawtube and tighten it.

5. Now the chuck should work with low drawtube force of the cylinder.

4. Top jaws

4.1 Design of top jaws

To achieve utmost accuracy as well as the best possible holding capability, the following should be considered when designing top jaws:

1. Workpieces must have a good finished diameter with a good roundness for precise holding.

2. Use a clamping force as low as possible, especially on thin walled workpieces. Please think about, that each dimension and shape-deviations of workpieces influence the clamping situation.

3. Grip the workpiece as close to the face of the chuck as possible.

4. Clamping surfaces of top jaws and workpieces must be absolutely clean and free of burrs.

5. For external grip applications lighten the top jaws as much as possible to minimize the effects of centrifugal force. It is important to reduce the weight at the largest radius. Refer to Figure 2.1.

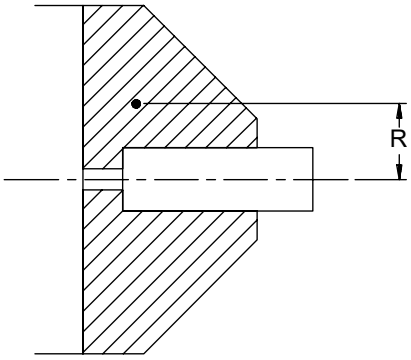


Fig. 2.1

6. In the area of axial location the workpiece must have a correct manufactured angle to the clamping diameter (see Fig. 2.2). The edge of the clamping diameter in the top jaws should get a little groove.

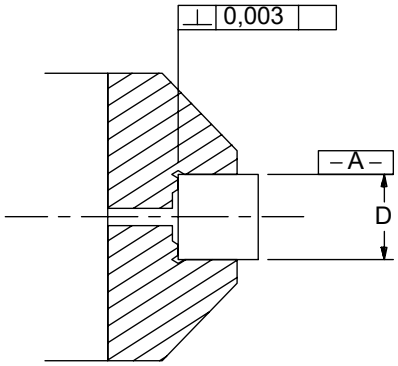


Fig. 2.2

7. Workpieces with no shoulder support must be held on a length twice their diameter. Refer to figure 2.2.

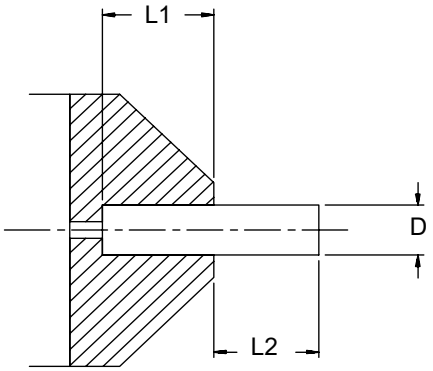


Fig. 2.3

8. Long workpieces should not extend from the top jaws more than 1,5 times (L2) the length being gripped (L1). Otherwise we recommend to use a tailstock. Please see Fig. 2.3.

9. For outside clamping situations the finished diameter of top jaws should be machined equal to or little greater than the largest workpiece diameter in your lot, when you require a very high accuracy (one-line contact occurs). For higher clamping forces the top jaws should be machined a little smaller than your workpiece diameter, so that you will get a two-line clamping situation. Please see Fig. 2.4 und 2.5.

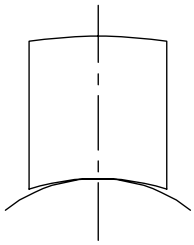


Fig. 2.4

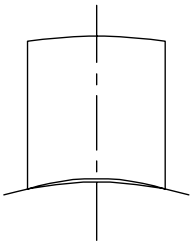


Fig. 2.5

10. For inside clamping situations the finished diameter of top jaws should be machined equal or a little smaller than the largest workpiece diameter in your lot, when you require a very high accuracy (one-line contact occurs). For higher clamping forces the top jaws should be machined a little greater than your workpiece diameter, so that you will get a two-line clamping situation. Please see Fig. 2.6 und 2.7.

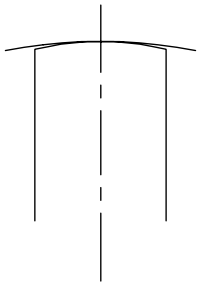


Fig. 2.6

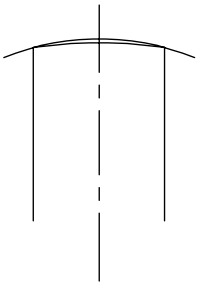
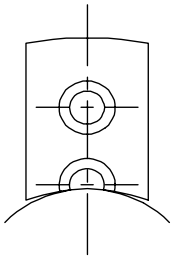


Fig. 2.7

11. The clamping diameter is exactly equal to the workpiece diameter, when you clamp the workpieces in the area of the mounting holes. Otherwise you will get a two-line clamping situation with a loss of accuracy. (see Fig. 2.8).



Fig, 2.8

12. Top jaws must be machined on the chuck under load during their preparation and at actual air pressure to be used in production. So you will get the best accuracy.

4.2 Machining of top jaws

1. Top jaws should sit strong enough in the pins on the master jaws. First fix the top jaws with handforce and clamp the loading pin resp. loading ring several times. When you are sure, that the top jaws are sitting in the right position, tighten the screws under load equally.

   In opposite to the above mentioned, mount and tighten QC top jaws onto the master jaws directly without clamping. Please see also 4.3.

2. For the machining of top jaws it is necessary to load the jaws in the same direction as they are used in production. The top jaws must be machined under load during their preparation and at actual air pressure to be used in production.

3. Determine in which position of jaw stroke the top jaws should be machined. With a small jaw stroke it is easier to get a high accuracy. If you will load the workpieces automatically you should machine the top jaws with an opening stroke of 0,5 mm at least.

4. Open the chuck fully and insert a suitable loading pin resp. loading ring (Refer figure 2.9 to 2.12).

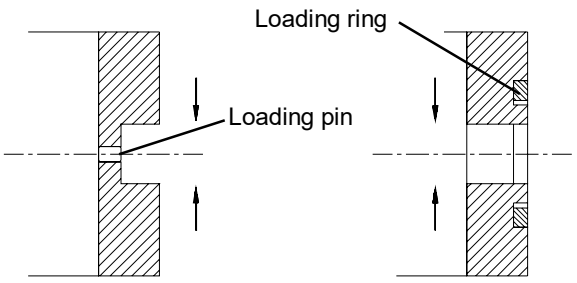


Fig. 2.9

Fig. 2.10

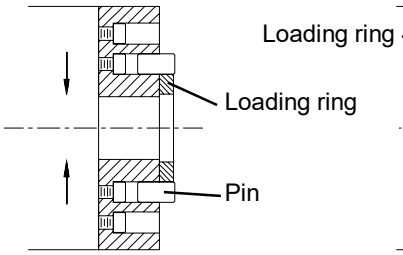


Fig. 2.11

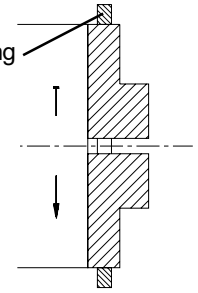


Fig. 2.12

4.1 Figure 2.9 illustrates the loading in a step bore for outside clamping. A loading pin will be clamped in the small diameter to machine the greater one. For the re-machining loading pins with different diameters are useful.

4.2 Figure 2.10 shows an other method for the machining of top jaws for outside clamping. A loading ring is used for through bores. For the re-machining loading rings with different diameters are useful.

4.3 Figure 2.11 shows a version with pins, which are mounted in the screw bores of the top jaws. With these pins a loading ring is clamped. This method can be used for through bores as well, but this method should be used only exceptionally.

4.4 In Figure 2.12 you see a sample for an inside clamping. A loading ring is fixed on the outside diameter of top jaws. For the re-machining loading rings with different inside diameters are useful.

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5. Close the chuck and machine the clamping diameter into the top jaws.

6. After finishing the clamping diameter open the chuck and remove the loading pin resp. loading ring.

7. Load workpiece and close the chuck. Verify without spindle rotation, if the workpiece is clamped without a possibility of distortion.

8. Start spindle rotation and stop it. Verify, if the workpiece is still clamped in the right position without distortion.

9. Start the production of your workpieces.

Additional notices:

Top jaws can be machined on a simultaneous chuck (jaw turning fixture). To achieve the best repeatability top jaws must be finish machined under load during their preparation on the chuck.

After changeover of top jaws the clamping diameter should be reworked.

When a chuck is changed completely with the clamping set, after remounting of chucks the radial and lateral runout must be adjusted carefully. It is useful to adjust the chuck with a master workpiece.

4.3 QC (quick change) top jaws

1. On QC top jaws it is necessary for a good changeover accuracy, that you mount the top jaws always in the same sequence with a constant torque.

2. Mount top jaws in the sequence no. 1, no. 2 and no. 3 onto the chuck and tighten them with handforce. It is recommended to use bolts with solidity class 12.9.

3. Tighten the top jaws with the in appendix A listed torque equally. Hereby fasten first the inner screw of each top jaw and second the outer screw.

5. Chuck care and maintenance

5.1 General notices

The lifetime of your MicroCentric chuck can be increased significant through careful and periodical care. The following notices should help you certainly:

1. Lubricate the chuck at regular intervals as determined by actual operating conditions. We recommend a lubrication interval each shift on automatically loading machines. The absolute minimum for lubrication is once a week. You should never exceed this lubrication interval.

2. Do never exceed the maximum drawtube force. The chuck could be damaged. As a general rule: The closest repeatability is attained at low to middle clamping forces. Please adjust the clamping force in all applications so low as possible.

3. Disassemble the chuck at regular intervals, as determined by actual operating conditions, at least once a year but possibly as often as every few months, for cleaning, replacement of O-Rings, and to determine effectiveness of lubrication schedule.

4. Protect the chuck when the system is not on your machine. Please clean it and protect the system against dust and humidity (corrosion). Think always, that the chuck should work in the µm-area.

5.2 Lubrication

To lubricate the chuck, each chuck has 3 grease nipples at the front side or the outside diameter. Squeeze several times (2-3 strokes) with the grease gun, while you open and close the chuck.

Caution: Press not to much oil / grease in the chuck!

5.3 Chuck disassembly

Caution: These chucks are precision tools. All components are manufactured for a proper fit to other parts. It is necessary, that all parts are reassembled at the same position where they are removed first.

1. Remove the drawtube connector from the piston. Make note of the letter stamped on the face of the piston. It must align with jaw slot no. 1 when reassembling.

2. Loose mounting screws of the centre housing and remove the centre housing (this bushing is pressed in).

3. For the disassembly of the piston remove the actuator discs from the front side of the chuck. Then move the piston with a nylon plug to the chucks rear side, alternately tap each actuator until the assembly is free. When the actuators are no longer in the grooves of the master jaws, it is possible to remove the piston.

   Attention: Do not disassemble the 3 actuators from the piston, as they are positioned and pinned in place.

4. Remove master jaws.

5. Clean all parts with mineral spirits or a stoddard solvent and blow dry with light air pressure.

6. Check all disassembled parts very carefully, if parts are worn out or if they have damages.

5.4 Chuck assembly

1. All sliding surfaces should be liberally coated with lubricating oil.

2. Slide master jaws into their respective T-slots, note numbers engraved on jaws and T-slots.

3. Insert the piston - actuator assembly, aligning the letter stamped on the face of piston with jaw slot no. 1. Slide piston forward.

4. Engage actuators into slot in master jaws. Slide piston completely forward. On this motion the master jaws are moving to the outside .

5. Press the centre housing into the chuck body. Mount and tighten the screws of the centre housing.

6. Mount the drawtube connector onto the piston.

Attention: Chucks in need of repair should be returned to our address for skilled fitting to restore original performance and accuracy.

6. Trouble shooting guide

	Problems	**Possible Causes**
1.	Not enough jaw force	A,B,C,D
2.	The jaws move to slowly	A,B,C,D
3.	Not enough jaw force at high spindle speed	A,B,C,E,F,H
4.	Excessive vibration	G
5.	Excessive body runout	I
6.	Chuck does not repeat	B,C,D,E,F
7.	Chuck jaws do not have full travel	B,C,D,E

Possible causes and solutions:

A. Drawtube force on the cylinder is too low. Change air or oil pressure on the cylinder, if necessary see the operation manual of the cylinder.

B. Poor lubrication. It may be necessary to disassemble the chuck for a thorough cleaning and lubrication, particularly if the chuck has not been lubricated at frequent regular intervals.

C. Improper assembly of chuck. If the chuck has been dismounted recently, make sure that all parts of the chuck have been cleaned carefully and installed correctly.

D. Master jaw binding in chuck body. Remove top jaws. If binding action is no longer present examine for foreign material trapped between master jaw and top jaw. If binding action is still present after removing top jaws, disassemble chuck and examine for galled sliding surfaces. Consult us for repair information.

E. Poor preparation or design of top jaws. Top Jaws must be machined under load and actual pressure to be used during operation. Reduce top jaw weight as much as possible to minimize the effects of centrifugal force. Please see our proposal in this manual.

F. The top jaws are not tight enough. Tighten equally.

G. Unequal weight distribution. Counterbalance as required.

H. Reduce of jaw force through too high centrifugal force. On spindle speeds over 2.500 r.p.m it is necessary to pay attention to the centrifugal force. Reduce the jaw weight, increase the drawtube force or reduce the spindle speed if possible.

I. Improper system mounting. Please check the spindle adapter and the spindle nose for damages and pollution. Verify if the mounting bolts are not too long. Tighten the mounting bolts equally and alternately.

Appendix A: Torque for mounting bolts

Bolt size	Torque at bolts 8.8	Torque at bolts 12.9
M 5	6,0 Nm	10,4 Nm
M 6	10,4 Nm	17,9 Nm
M 8	25,3 Nm	43,6 Nm
M 10	51,0 Nm	88,0 Nm
M 12	87,0 Nm	150,0 Nm
M 14	139,0 Nm	239,0 Nm

Notices