

DANGER

PLEASE READ CAREFULLY THESE INSTRUCTIONS BEFORE INSTALLING OPERATING OR MAINTAINING THIS EQUIPMENT. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE



- THIS INSTRUCTION MANUAL IS FOR PRODUCTION ENGINEERS AND MAINTENANCE PERSONNEL IN CHARGE OF OPERATION OF THIS PRODUCT. PLEASE MAKE SURE THAT WHEN A BEGINNER USES THIS PRODUCT, RECIEVES INSTRUCTIONS FROM EXPERIENCED PERSONNEL, THE DISTRIBUTOR OR TDG.
- BEFORE INSTALLING, OPERATING OR MANTAINING THIS EQUIPMENT, CAREFULLY READ THIS MANUAL. FAILURE TO FOLLOW THESE INSTRUCTIONS AND SAFETY PRECAUTIONS COULD RESULT IN SERIOUS INJURY, DEATH, OR PROPERTY DAMAGE.
- STORE THIS MANUAL NEAR THE EQUIPMENT FOR FUTURE REFERENCE

INDEPENDENT JAW CHUCK MOUNTING & OPERATING MANUAL

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1. IMPORTANT SAFETY NOTES

1.1 TERMS AND SYMBOLS USED FOR SAFETY MESSAGES

In this manual precautions for handling that are considered especially important are classified and displayed as shown below depending on the damage of risk including the seriousness of the harm that could result. Please read carefully and understand the meanings of these terms and follow the instructions for safe operation.



SAFETY ALERT SYMBOL

The triangle is the safety alert symbol used to alert you to potential safety hazards that could result in injury or death



INDICATES A HAZARDOUS SITUATION WHICH IF NOT AVOIDED WILL MOST LIKELY 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 COULD RESULT IN MINOR OR MODERATE INJURY



INDICATES A HAZARDOUS SITUATION WHICH IF NOT AVOIDED COULD RESULT IN DAMAGE TO THE EQUIPMENT OR SHORTENED WORKLIFE

2. WARRANTY

The warranty period is 2 years after delivery date from factory assuming appropriate use in single-shift operation and respecting the recommended maintenance and lubrication intervals.

Basically all seals, sealing elements, screw connections, bearings, screws and wipers as well as components which get in contact with the work piece are not subject to claim of warranty. Please also observe our general terms and conditions with regard to these warranty conditions.

3. LIABILITY AND HOW TO USE THIS MANUAL

This standard product is suitable for clamping work pieces on lathe machines and other rotating tooling machines. Unintended and improper use of the Manual Chuck may cause danger to life and limb of the operator. The specified maximum technical data must not be exceeded while the Manual Chuck is in operation.

The Manual Chuck should only be used on the basis of its technical data. This also comprises the observance of the conditions of initial operation, assembly, operation as well as conditions of environment and maintenance provided by the manufacturer.

For each individual clamping task, the permitted rotational speed and the necessary clamping force must be determined according to the respective standards that apply and/or the most up-to-date scientific and technological data.

Principles

The Manual Chuck, which has been designed, produced and put on the market complies with the specific safety regulations valid at the time of delivery and initial operation as mentioned below in detail.

Case of application

The Manual Chuck is to be used for the case of application contractually agreed between the producer/deliverer and the user, as well as such cases of application described in the product description which are also in accordance with the appropriate safety regulations.

Improper use of the Manual Chuck can result in:

- Danger to life and limb of the operator.
- Danger to the Manual Chuck and to further assets of either the business operator or a third party.

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Unintended and improper use of the Manual Chuck is for example:

- If workpieces are not clamped properly.
- If safety regulations are disregarded and people are working at the Manual Chuck without additional protective devices e.g. for machining.
- If a Manual Chuck is used for machines or tools for which it is not intended.

Irrespective of whether our chucks are used under rotation or stationary, it is mandatory to wear protective equipment in accordance to EC machine guideline, so that loose parts, discharged in case of the chuck or a component malfunctioning, are absorbed by the protective equipment.

The machine manufacturer must ensure that the wall thickness in the machine's panelling is adequate and must not employ any polycarbonate glass for protective windows, because this may cause a threat to the life and limb of the operator in the case of a fracture in the chuck jaws. Please observe all appropriate safety measures during the transportation and handling of any chucks of considerable weight.

There are countless things that should or cannot be done, and it is impossible to cover all of them in this manual. Therefore do not perform any actions unless they are specifically allowed in this manual.

For further questions related to safety, operation, control, inspection and maintenance please contact our company.

4. PART LIST AND SPARE PARTS

Depending on the acquired chuck, you will find the following parts:

ONE PIECE JAW INDEPENDENT CHUCK

- Chuck with reversible one-piece jaws.
- Operating key for screws.
- Thrust Bearings.
- Mounting screws and Allen key sets.

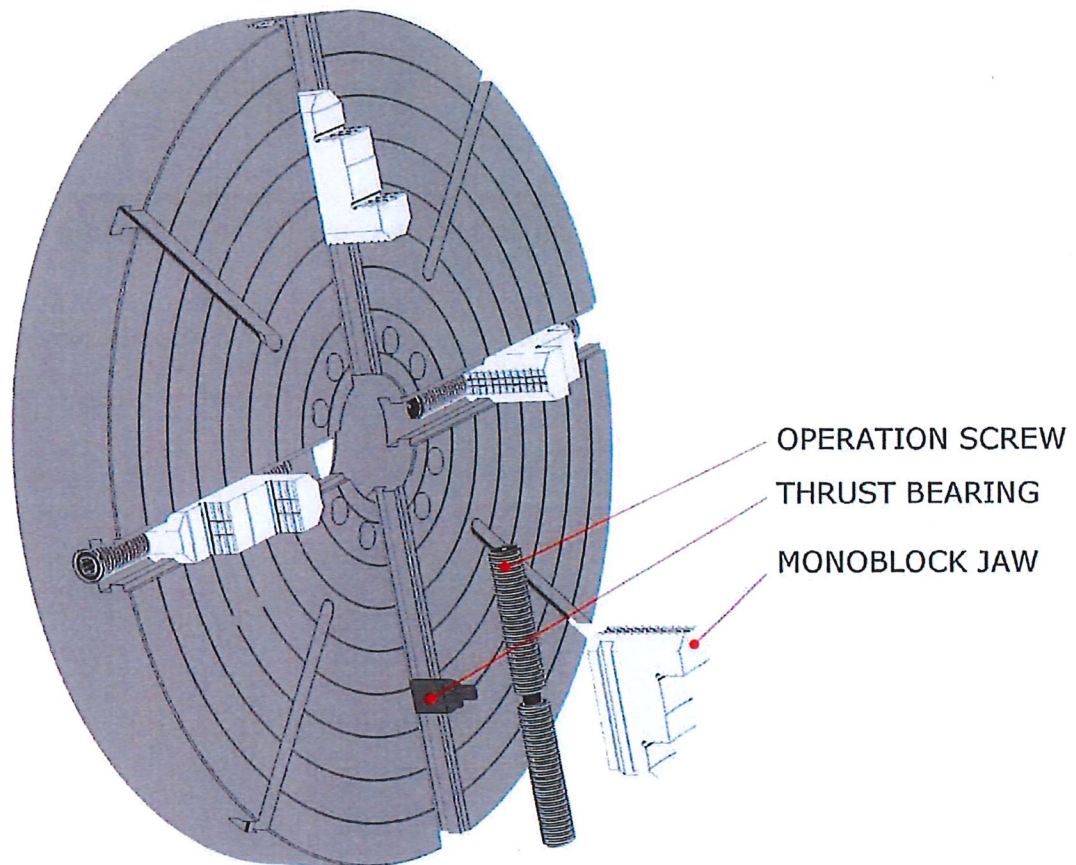


Fig1: One piece jaws chuck parts

TWO PIECE JAW INDEPENDENT CHUCK

- Chuck with reversible hard top jaws.
- Base jaws.
- Thrust Bearings.
- Operating key for screws.
- Mounting screws and Allen key sets

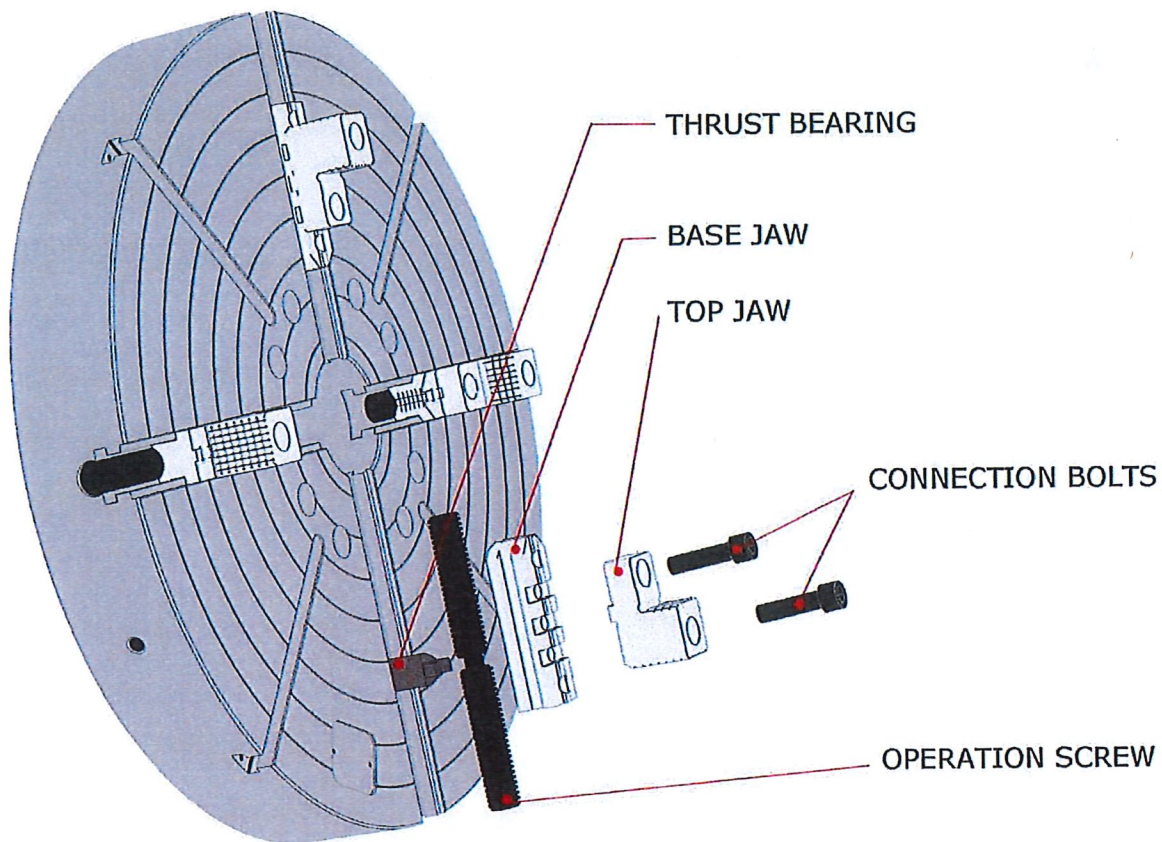


Fig2: Two pieces jaws chuck parts

5. TECHNICAL SPECIFICATIONS

5.1 ALLOWABLE MAX RPM



DO NOT ALLOW THE ROTATIONAL SPEED OF THE CHUCK
EXCEED THE MAXIMUM ALLOWABLE SPEED LIMIT

The following chart shows maximum allowable rotational speeds due to the stress of the material. Please note that maximum revolutions indicated are under optimal machining conditions, with the gravity centre of the piece placed in the centre of the lathe bore.

Ø CHUCK (mm)	Cast Iron	Ductile Iron	Steel	Nodular Cast
160	2149	2865	3820	3125
200	1719	2292	3056	2500
250	1375	1833	2445	2000
315	1091	1455	1940	1587
350	982	1310	1746	1429
400	859	1146	1528	1250
500	688	917	1222	1000
600	573	764	1019	833
630	546	728	970	794
700	491	655	873	714
800	430	573	764	625
900	382	509	679	556
950	362	482	643	526
1000	344	458	611	500
1100	313	417	556	455
1180	291	388	518	424
1200	286	382	509	417
1250	275	367	489	400
1300	264	353	470	385
1320	260	347	463	379
1400	246	327	437	357
1450	237	316	421	345
1500	229	306	407	333
1600	215	286	382	313
1700	202	270	360	294
1800	191	255	340	278
1900	181	241	322	263
2000	172	229	306	250

Chart 1: Allowed maximum rotational speed

5.2 CLAMPING FORCE



DO NOT EXCEED THE TORQUES SHOWN IN THE FOLLOWING CHARTS. A FRAGILE BREAK OF WETHER THE ACTUATION SCREW OR THE JAW SCREW MIGHT CAUSE THE WORK PIECE FLY OUT

DETERMINE THE REQUIRED GRIPPING FORCE FOR PROCESSING (VDI 360) AND CHECK THAT THIS FORCE IS PROVIDED BEFORE MACHINNING. THE GRIPPING FORCE MUST NOT EXCEED THE MAXIMUM STATIC GRIPPING FORCE



DO NOT EXCEED THE TORQUES SHOWN IN THE FOLLOWING CHARTS. OTHERWISE THE ACTUATION SCREWS AND JAWS MIGHT SUFFER EXCESSIVE STRESS AND CONSEQUENTLY THE OPERATION LIFE OF THE CLAMPING DEVICE WILL BE SHORTENED

Ø (mm)	CHUCK	Ø (inch)	CHUCK	MAX TORQUE ON KEY (DaN.m)	TOTAL FORCE (DaN)	CLAMPING
160		6		15	3000	
200		8		15	3000	
250		10		20	4000	
300		12		20	5000	
350		14		28	6500	
400		16		28	6500	
450		18		36	7500	
500		20		36	8000	
600		14		50	14000	
700		28		60	16000	
800		32		60	16000	
900		36		60	16000	
1000		40		70	22000	
1200		48		70	22000	
1400		56		70	22000	
1500		60		70	22000	

Chart 2: Independent jaw Chucks allowed maximum clamping force and actuation torque

5.3 EFFECT OF CENTRIFUGAL FORCE



THE ROTATION SPEED, WHEN THE DYNAMIC GRIPPING FORCE BECOMES APPROXIMATELY 1/3 OF THE MAXIMUM STATIC GRIPPING FORCE IS SET AS THE MAXIMUM ALLOWABLE ROTATIONAL SPEED.

MAKE SURE THE DYNAMIC GRIPPING FORCE IS AT LEAST 1/3 OF THE STATIC GRIPPING FORCE TO AVOID SERIOUS ACCIDENTS.

In the case of the outside diameter gripping, when the chuck is operating, the gripping force decreases due to the centrifugal force.

According to VDI 360:

Centrifugal force:

$$F_{CF} = \sum(m_J \times r_{CM}) \times \left(\frac{\pi \times n}{30} \right)^2$$

where

- m_J is the mass of the jaw components in kg;
- r_{CM} refer to the radii of their centre of mass in m;
- n is the spindle speed in rev/min;

The required total dynamic grip, F_{sp} , is given by:

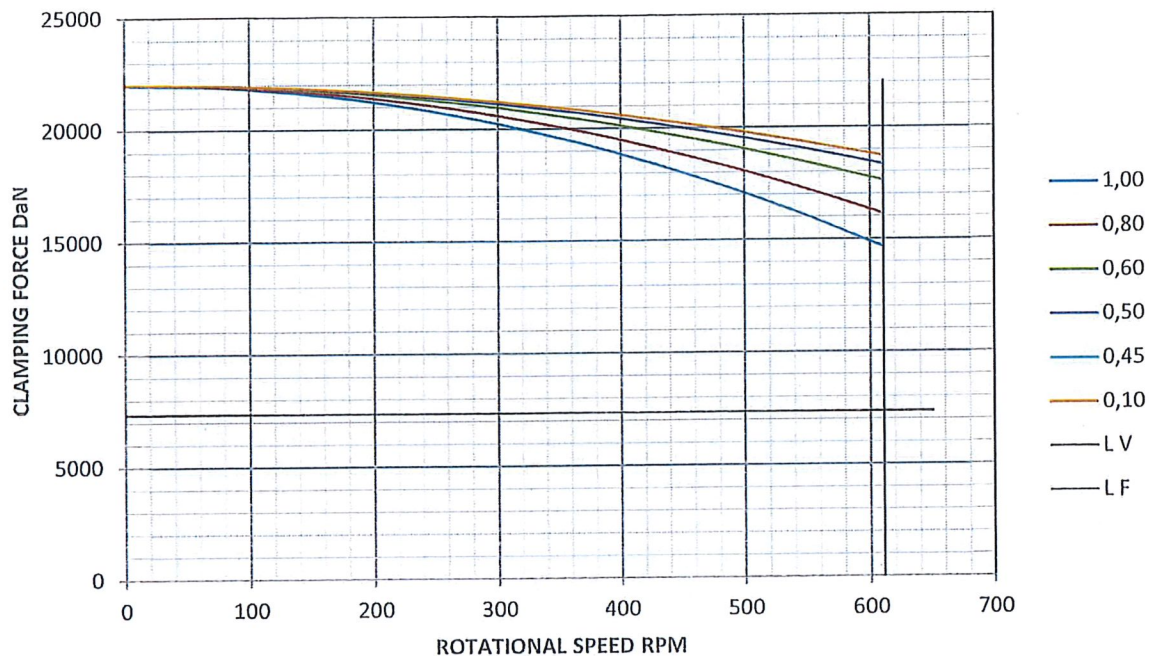
For external grip (jaws moving radially inwards to grip):

$$F_{SP} = F_{spo} - F_{CF}$$

For internal grip (jaws moving radially outwards to grip)

$$F_{SP} = F_{spo} + F_{CF}$$

Case of Application



Ø1000 independent jaw chuck loss of clamping force due to centrifugal force effect

While turning, the chuck loses clamping force due to the centrifugal force effect. The previous graphic shows the behaviour of an Ø1000 chuck operating in different clamping diameters at different rotational speeds.

As can be noticed, the higher the rotational speed & the clamping diameter are, the bigger the loss of clamping force is.

The horizontal and the vertical asymptotes are the allowed clamping force limit and the maximum allowed rotational speed. When the machining is being performed inside those values, we can consider that we are in the controlled release of workpiece.

If the machining is being performed out of those values we are inside the uncontrolled release of workpiece. **DO NOT PERFORM MACHINING OUT OF THE SECURE VALUES.**

In case of doubt regarding effect of the centrifugal force on clamping force, please check the VDI 3106 or contact our company.

Please note that the calculations shown above are only valid for Ø1000 independent chuck with an standard set of base jaws, for other conditions calculations must be reworked.

6. ASSEMBLY AND DISASSEMBLY OF THE CHUCK



PLEASE MAKE SURE THE CHUCK IS PROPERLY ATTACHED TO THE MACHINE SPINDLE BEFORE STARTING MACHINING



PLEASE NOTE THE SAFETY REGULATIONS WHEN HANDLING HEAVY CHUCKS

TDG chucks are built to fit lathe spindles under the following norms:

- DIN 6350 – Recess Mount
- DIN 55026
- DIN 55027
- DIN 55029 Camlock
- ASA B5.9 – FORMS A1, A2, B1, B2

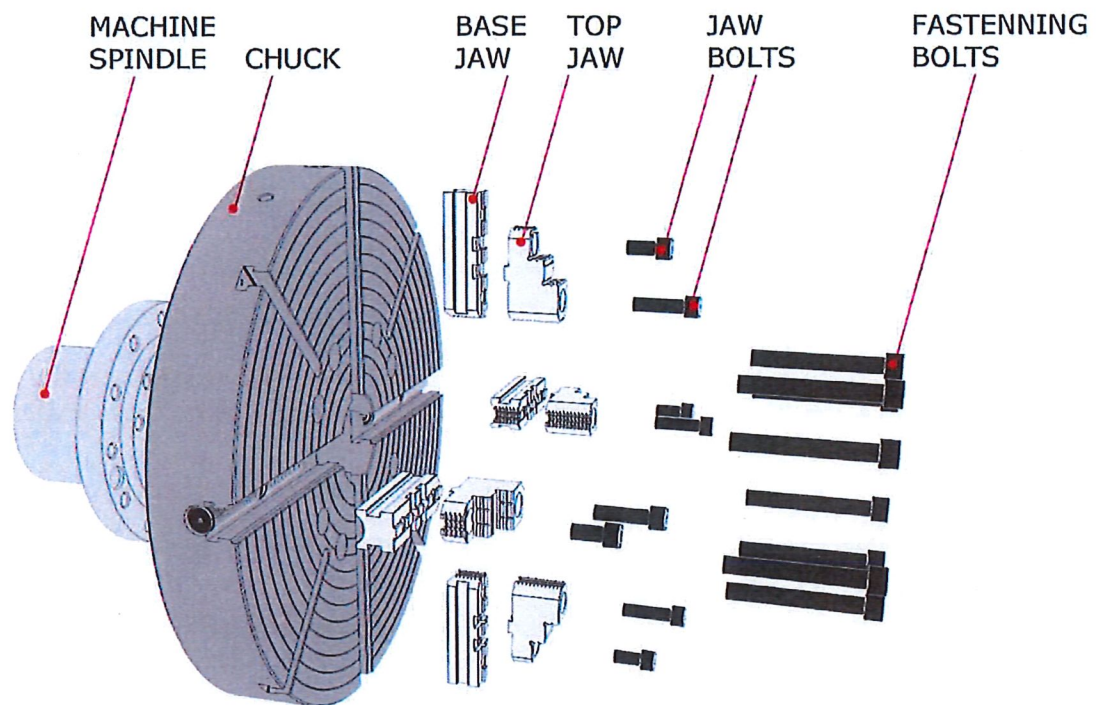


Fig 3: Description of parts

Check the head of the machine spindle or the intermediate flange on true-running. Admissible value: 0,005mm as per DIN 6386 and ISO 3089. The contact face has to be chamfered and clean at the bores. Remove possible damages at the mounting faces of the spindle head. In case of flange spindles, the contact face has to be checked with a straight edge.

For fastening with an intermediate flange please note that the flange needs full contact with the chuck body. The flange must be supported by the whole face.

TDG chucks are supplied with various short taper mountings. For bajonett mounting Type C, for Camlock fastening Type S and with intermediate flanges for short taper shape A. (Should you have any further questions please contact our technical sales department).

Thoroughly clean the centring and the bearing surfaces of both parts and lubricate them with oil before placing the chuck onto the spindle head. When the chuck is slightly pressed, there should be a noticeable play and between the faces there should be a gap of 0.02-0.05 mm. Check the gap by means of a feeler gauge.

Firmly tighten the fastening elements to an even torque in diagonally opposite pairs.

Take front face and external diameter as reference surfaces to tighten the screws.

To assembly the chuck to the machine spindle follow the instructions below.

- Make sure all surfaces in contact are perfectly clean and free of strange particles; otherwise chuck run out might be increased.
- For direct mounting as per Din 55026, place the chuck in the machine spindle and fasten the screws of the bolt circle applying the same torque. Use of a dynamometric key and tighten alternatively and evenly is highly recommended
- For direct mounting as per DIN 55027, place the chuck in the machine spindle, fasten the stud bolts and turn the bajonett.
- For direct mounting as per DIN 55029 (Camlock), place the chuck in the machine spindle and close the camlock.
- With intermediate flange fasten it to the chuck (in case it is not fastened) and place the assembly equally on the machine spindle.

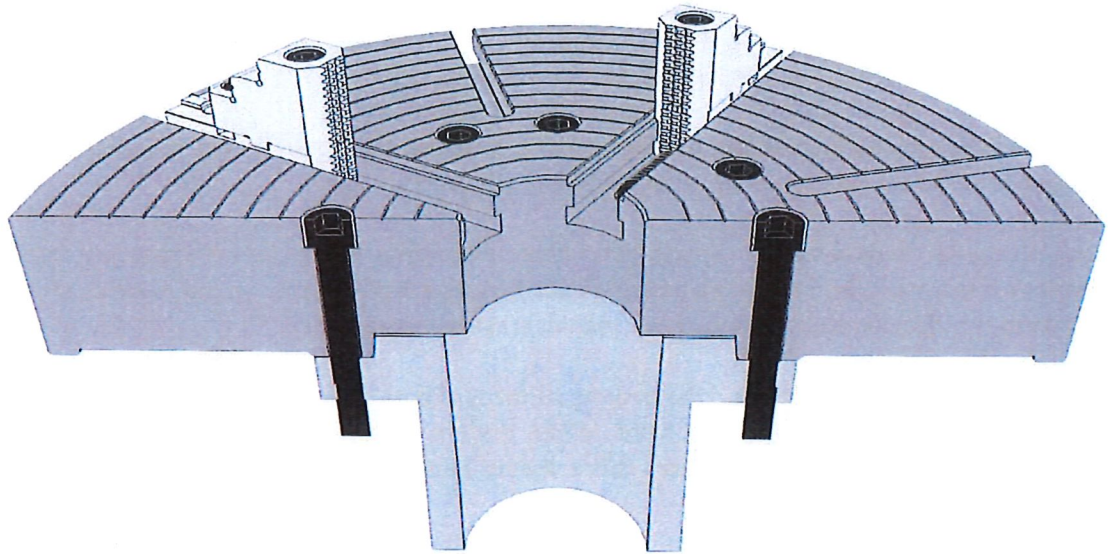


Fig 4: DIN 55026 direct mounting

Follow the instructions in the reverse order to disassembly the chuck

IT IS HIGHLY RECOMMENDED TO KEEP THE JAWS AND THE
ACTUATION SCREWS CLEAN AND PROPERLY LUBRICATED TO
ACHIEVE PROPER FUNCTIONING AND HIGH ACCURACY

This technical drawing shows a cross-section of a mechanical assembly, possibly a valve or a pump. The main component is a housing with a central vertical shaft. The housing has a flange at the top and a base. Inside the housing, there are several components: a central shaft with a threaded section, a valve or piston mechanism with a seal, and a return spring. The drawing is a detailed cross-section showing the internal structure and components.

- Never exceed the max. Admissible torque. Exceeding the max. admissible torque may cause fracture of bolts and hard running of the chuck due to deformations in base jaw. Max admissible torques are shown in the chart below.
- When tightening the fastening screws, never use an extension rod or a hammer.
- Never apply extra force in the event of hardly moving jaws (e.g. with a hummer) Clean the guidance and the jaws.
- Never dismantle ground top jaws from the base jaws. During the grinding operation they are always adjusted to each other and therefore assure a high accuracy. Otherwise the true-running accuracy will reduce!
- Each base and top jaw set is numbered and after maintenance must be placed in the same position.
- After a number of clamping cycles, actuate the chuck several times without a workpiece gripped at full stroke, so that the grease will distribute evenly on the sliding faces inside the chuck. The chuck will achieve its full clamping force again.
- Max. speed and calculation of the required gripping force is valid only for standard stepped hard jaws.

Maximum admissible torque for fastening and replacing screws, Nm:

In case of doubt, use screw quality 12.9 to replace the original screw.

Screw size	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30
Max.admiss. Torque(Nm). Quality 8.8	24,6	48	84	133	206	295	415	567	714	1100	1530
Max. admiss. Torque(Nm). Quality 12.9	42,2	83	144	229	354	492	692	945	1190	1900	2600

Chart 3: Max allowed torques in screws

Please note that the torques shown above are max admissible torques (fluency) , usually 50-60% of the torque or 280 N.m is enough. Applying high torques may cause deformations in base jaws and therefore hard running of the chuck.

Important notes to be observed when using non-standard jaws

- The non-standard jaws should be designed as low and light as possible. The clamping point should be located as closely to the chuck front side as possible.
- If the design of the special jaws requires them to be wider, it is very important to take in to account that the loss of clamping force due to centrifugal effect will be higher, and therefore the maximum allowed rotational speed will decrease.
- Do not use welded jaws.
- The max speed may only be operated in conjunction with max operating force and only with Chucks which are in perfect working conditions.
- At high speeds, the chuck may only be operated under a sufficiently sized protection guard.
- After a crash, the clamping device must be examined for cracks before being put into service again. Damaged parts must be replaced by original **PBA** spare parts.
- The jaw fixing screws must be replaced if they show signs of wear or damage.

8. MAINTENANCE

NOTICE

TO MAINTAIN HIGH ACCURACY, PROPER FUNCTIONING AND TO ENLARGE WORKING LIFE OF THE CHUCK IT IS NECESSARY TO KEEP MAINTENANCE UP TO DATE.



PLEASE NOTE THE SAFETY REGULATIONS WHEN HANDLING HEAVY CHUCKS

In order to keep the chuck working properly and to avoid several problems such as seizure of the moving parts, loss of clamping force and even fracture of the parts is very important to keep the chuck as clean and lubricated as possible.

We recommend at least once or twice per month to thoroughly clean and lubricate the jaws. One example of maintenance could be the expressed below.

- 1- Unscrew the top jaws, clean and lubricate the contact faces with the base jaws. Later when assembling them remember that each single top jaw should be placed over its each single base jaw.

- 2- Extract the base jaw by turning the actuation screw, Take into account that some base jaws are quite heavy, so take the required precautions needed when handling heavy loads. E.g. Use lifting eyes and a crane.

When extracted, thoroughly clean and lubricate the screw guide and the jaw guides. Make sure there are no remaining machining chips after cleaning, otherwise marks and seizures could be made.

- 3- Extract the actuation screw and perform a cleaning and lubrication as performed in the previous step.

Use an air pistol to clean any remaining machining chip in the chuck.

- 4- Assembly the parts again in the same place where they were

previously. We recommend Fuchs Renep 2 or similar lubrication oil.

If the chuck is subject to clamp and unclamp pieces constantly and every day, do not hesitate to clean and lubricate as many times per week as possible.

Please note that we cannot accept any liability for damage caused by not observing these Operating Manual & Maintenance instructions

9. ANNOTATIONS