FORKARDT

3 QLC, 3 QLK
3 QLC-KS, 3 QLK-KS

POWER CHUCKS

ENGLISH

OPERATING INSTRUCTIONS

FORKARDT

Contents

FORKARDT

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1.1 Introductory Note:

Please read carefully the safety instructions and operating manual before using the type 3 QLC, 3 QLK, 3 QLC – KS and 3 QLK - KS three jaw power chucks!
Failure to follow safety and operating instructions may result in injury to the operator or damage to the machine.
Only those persons more than 18 years of age who have read the safety instructions and operating manual should use, fit, and maintain the power - operated chucks type 3 QLC, 3 QLK, 3 QLC - KS and 3QLK - KS.

1.2 Field of Application and Authorized Use:

The Type 3QLC, 3QLK, 3QLC - KS und 3QLK - KS three jaw power chucks, called power chuck hereafter, is actuated by a rotating cylinder. The axial actuating force exerted by the cylinder must be matched to the power chuck.
The power-operated chucks type 3 QLC, 3 QLK, 3 QLC - KS and 3QLK - KS may only be employed ***for authorized purposes*.**
The authorized use for the power chucks is the gripping of work pieces on:

Lathes and other (rotating)

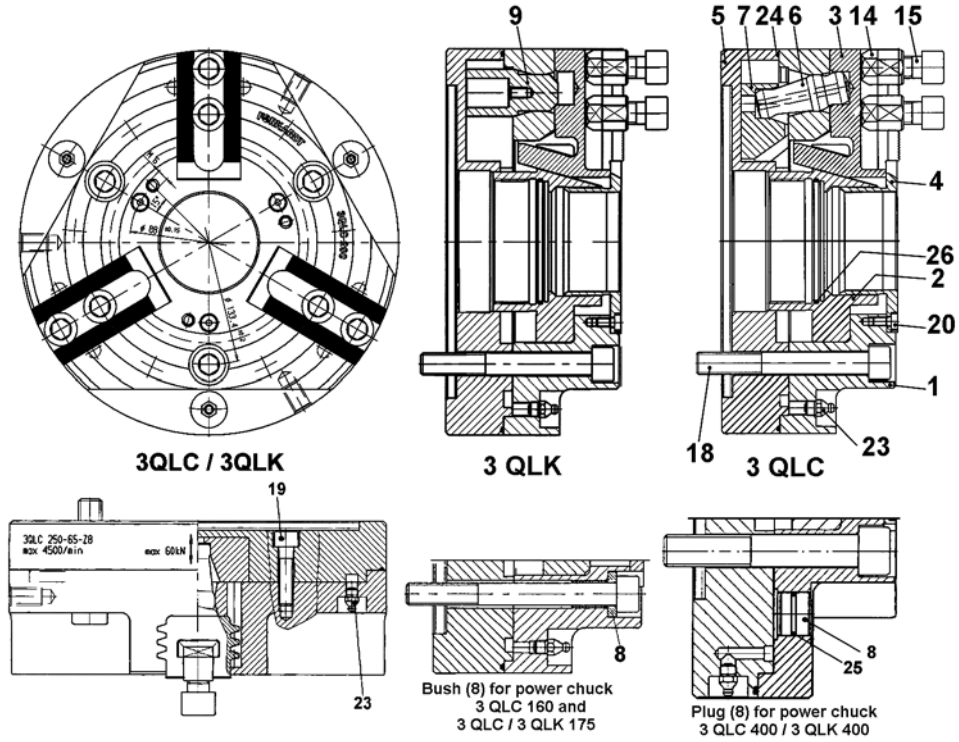
machine tools.

Do ***not*** exceed the maximum axial actuating force, the maximum gripping force or the maximum spindle speed. The permissible spindle speed or the gripping force necessary for any particular machining operations has to be determined in accordance with the relevant technical guidelines and regulations (e.g. VDI 3106 issued by the Association of German Engineers).
Authorized use also implies observance of the manufacturer's instructions concerning commissioning, fitting operation and maintenance. FORKARDT accepts no liability for improper use of the power chuck.

qlk 01a

1.3 Components of the Power Chuck:

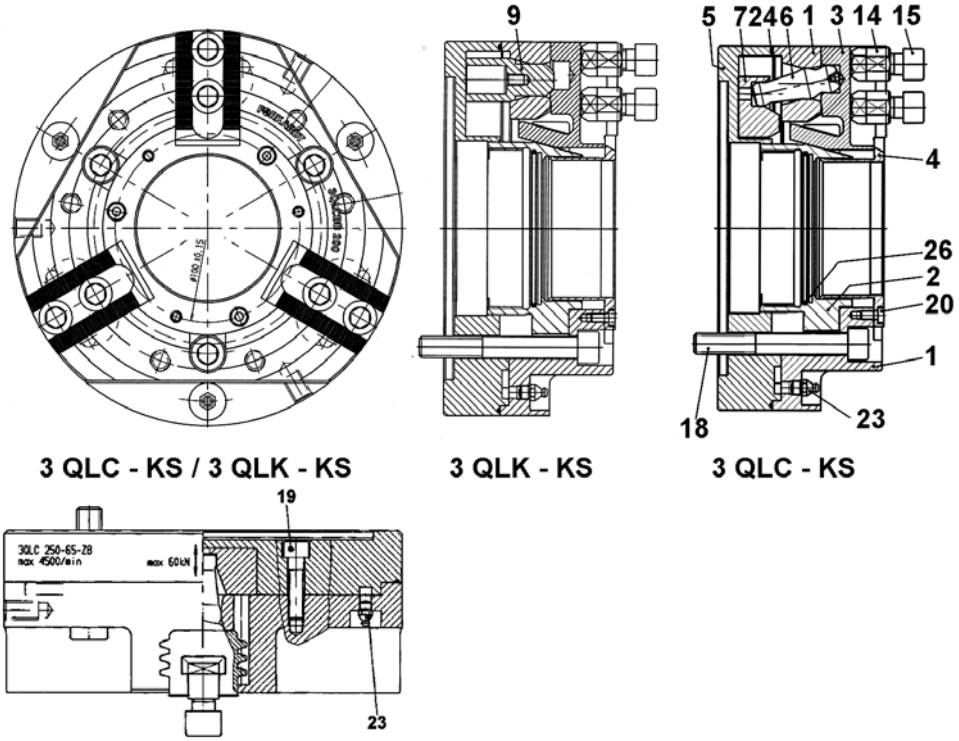
1.3.1 Power Chuck 3 QLC / 3 QLK:



qlk 02

Part No.	Designation
1	Chuck body
2	Chuck piston
3	Master jaw
4	Protective bush
5	Chuck cover
6	Lever
7	Counterbalance weight
8	Bush / Plug
9	Jaw clamping device
14	T - nut
15	Socket head screw
17	
18	Socket head screw
19	Socket head screw
20	Socket head screw
21	
22	
23	Conical grease nipple
24	O - Ring
25	O - Ring
26	O - Ring
27	
28	

1.3.2 Power Chuck 3 QLC - KS / 3 QLK - KS:

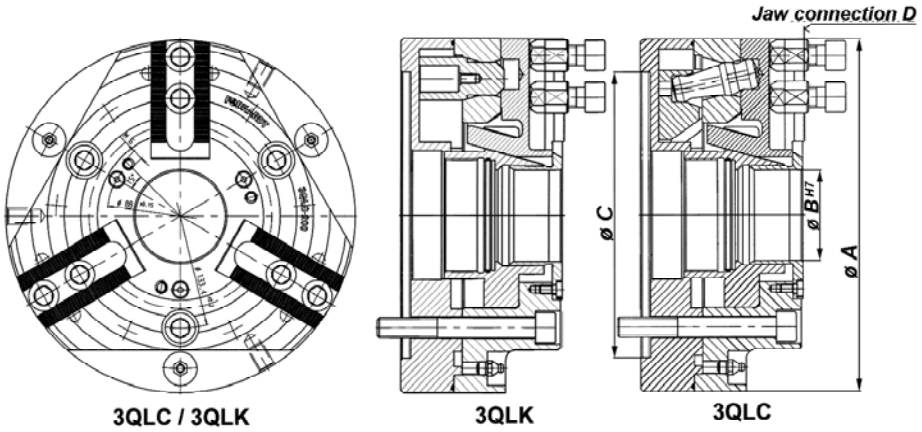


qlk 03

Part No.	Designation
1	Chuck body
2	Chuck piston
3	Master jaw
4	Protective bush
5	Chuck cover
6	Lever
7	Counterbalance weight
8	Bush / Plug
9	Jaw clamping device
14	T - nut
15	Socket head screw
17	
18	Socket head screw
19	Socket head screw
20	Socket head screw
21	
22	
23	Conical grease nipple
24	O - Ring
25	
26	O - Ring
27	

1.4 Important Data at a Glance:

1.4.1 Power Chuck Type 3QLC / 3QLK:

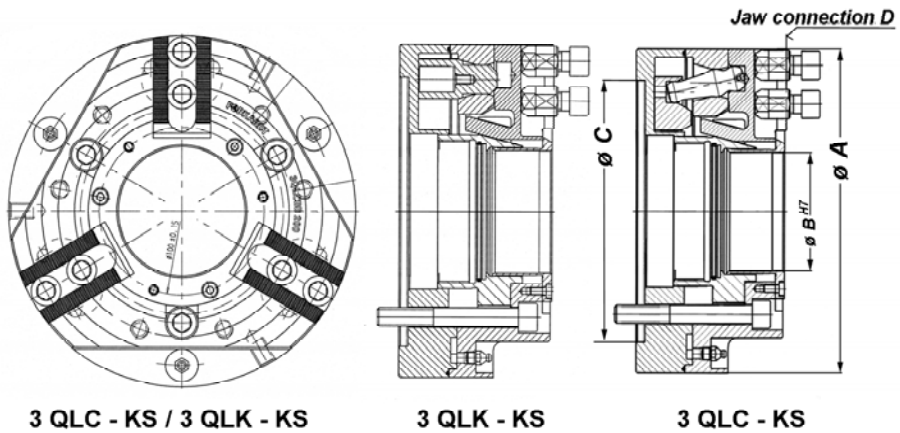


qlk04

Chuck type 3 QLC ➡		160 - 38	175 - 42	200 - 54	250 - 72	315 - 88		400 - 126		
Chuck diameter	ø A	162	175	210	257	320		400		
Bore diameter	ø B H7	38	42	54	72	88		126		
Spindle mounting style	ø C	140	140	170	220	220	300	300		380
Jaw mounting	D	S11	S11	S11	S12	S12		S12	MS12	S23
Ident. No.		168 116	165 566	167 983	165 568	165 569	165 570			
Serration Z11								172008	172020	172010
Serration Z15								172009	172021	172011
Max. actuating force Fmax	daN	2500	2500	4000	6000	6000		6000		9000
Max. gripping force Fsp max	daN	5000	6000	10000	15000	16000		14000		23000
Max. spindle speed n max	min^{-1}	8000	7000	6300	4700	4000		3200		
Polar moment of inertia J	kgm^2	0.038	0.055	0.095	0.2	0.65		2.1		
Flywheel effect GD^2	kpm^2	0.152	0.220	0.380	0.80	2.60		8.40		
Weight G	kg	11.8	13.5	16	26	38		90		

Chuck type 3 QLK ➡		110 - 26	140 - 35	160 - 38	175 - 42	200 - 54	250 - 72	315 - 88		400 - 126		
Chuck diameter	ø A	110	140	162	175	210	257	320		400		
Bore diameter	ø B H7	26	35	38	42	54	72	88		126		
Spindle mounting style	ø C	100	120	140	140	170	220	220	300	300		380
Jaw mounting	D	S8	S9	S11	S11	S11	S12	S12		S12	MS12	S23
Ident. No.		168 894	168 895	168 896	168 897	168 898	168 899	168 900	168 901			
Serration Z11										172044	172056	172046
Serration Z15										172045	172057	172047
Max. actuating force Fmax	daN	2000	2500	2500	2500	4000	6000	6000		6000		9000
Max. gripping force Fsp max	daN	4000	5500	5000	6000	10000	15000	16000		14000		23000
Max. spindle speed n max	min^{-1}	8000	7500	6300	5500	5000	4000	3500		2500		
Polar moment of inertia J	kgm^2	0.0075	0.02	0.038	0.055	0.095	0.2	0.65		2.1		
Flywheel effect GD2	kpm^2	0.030	0.08	0.152	0.220	0.380	0.80	2.60		8.40		
Weight G	kg	5	8.5	11.8	13.5	18	26	38		90		

1.4.2 Power Chuck Type 3QLC - KS / 3QLK - KS:



qlk 05

Chuck type	➡	3QLC - KS 200 - 77	3QLK - KS 200 - 77	3QLC - KS 250 - 101	3QLK - KS 250 - 101	3QLC - KS 315 - 135	3QLK - KS 315 - 135	3QLC - KS 400 - 168	3QLK - KS 400 - 168
Chuck diameter	ø A	210		257		320		400	
Bore diameter	ø B H7	77		101		135		168	
Spindle mounting style	ø C	170		220		300		380	
Jaw mounting	D	S11		S11		S12		S12	
Ident. No.		168 478	168 575	168 479	168 576	168 480	168 577	168 481	168 578
Max. actuating force Fmax	daN	2500		4000		6000		6000	
Max. gripping force Fsp max	daN	6000		10000		15000		16000	
Max. spindle speed n max	rpm.	6300	5000	5000	4200	4000	3000	3200	2800
Polar moment of inertia J	kgm²	0,076		0,18		0,40		1,04	
Flywheel effect GD²	kpm²	0,304		0,72		1,60		4,16	
Weight G	kg	16		26		37		63	

1.5 Chuck Constants:

1.5.1 Power Chuck Type 3QLC / 3QLK:

Chuck type ➡	3QLK 110	3QLK 140	3QLC 160	3QLK 160	3QLC 175	3QLK 175	3QLC 200	3QLK 200	3QLC 250	3QLK 250	3QLC 315	3QLK 315	3QLC 400	3QLK 400
C 1	350	458	507		589		808		916		1186		1309	
C 2	170	212	227		248		322		398		497		553	
C 3	0,03	0,05	0,07		0,08		0,11		0,2		0,35		1,0	
C 4	-	-	0,00008	-	0,00013	-	0,00019	-	0,00032	-	0,0006	-	0,0015	-

1.5.2 Power Chuck Type 3QLC - KS / 3QLK - KS:

Chuck type ➡	3QLC-KS 200	3QLK-KS 200	3QLC-KS 250	3QLK-KS 250	3QLC-KS 315	3QLK-KS 315	3QLC-KS 400	3QLK-KS 400
C 1	589		808		916		1186	
C 2	248		322		398		497	
C 3	0,1		0,15		0,28		0,5	
C 4	0,00017	-	0,00025	-	0,00044	-	0,00085	-

The chuck constants consider the chuck - specific characteristics. They serve for calculating the clamping force at standstill (n = 0) and at operational speed and for the centrifugal force influence at the jaws. See section 6.4.

1.6 Chuck Designation:

1.6.1 Power Chuck Type 3QLC / 3QLK:

3	QLC	250	72	Z8	S 12	165 568
Number of jaws	Chuck designation	Chuck size (outer dia.)	Chuck bore	Mounting style	Jaw mounting	Ident. No.

1.6.2 Power Chuck Type 3QLC - KS / 3QLK - KS:

3	QLC - KS	250	101	Z8	S 11	168 479
Number of jaws	Chuck designation	Chuck size (outer dia.)	Chuck bore	Mounting style	Jaw mounting	Ident. No.

1.7 Tightening Torques for the Chuck Mounting Bolts:

1.7.1 Power Chuck Type 3QLC / 3QLK:

Bolts to DIN 912		Grade 10.9						Manufactured to DIN 267
Thread		M 4	M 6	M 8	M 10	M 12	M 16	M 20
Tightening torque	Nm	4,4	15	36	72	125	290	560
Max. bolt load	N	5800	13200	24300	38700	56500	110000	171000

Grade 8.8 Manufactured to DIN 267		Bolts to DIN 7984		Bolts to DIN 912
Thread		M 5	M 6	M 4
Tightening torque	Nm	5	8,5	3,0
Max. bolt load	N	4850	6700	3900

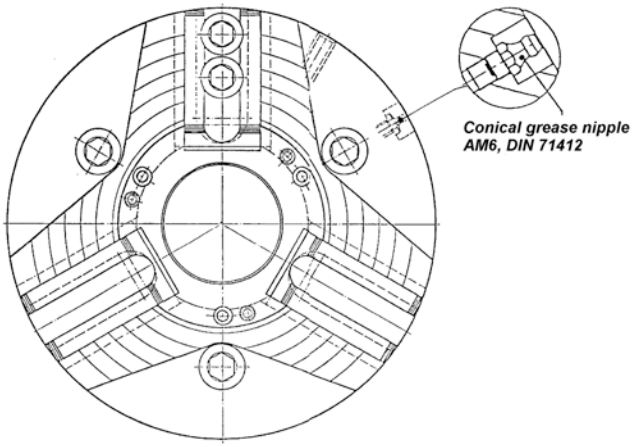
1.7.2 Power Chuck Type 3QLC - KS / 3QLK - KS:

Bolts to DIN 912		Grade 10.9			Manufactured to DIN 267	
Thread		M 10	M 12	M 16	M 20	M 24
Tightening torque	Nm	72	125	290	560	820
Max. bolt load	N	38700	56500	110000	171000	208000

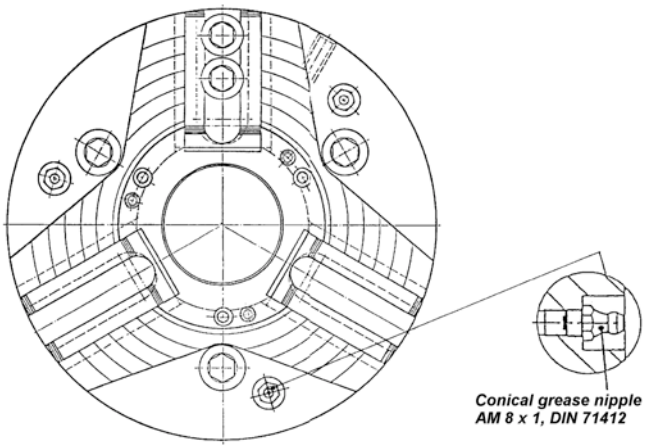
Bolts to DIN 7984	Grade 8.8	Manufactured to DIN 267	
Thread		M 5	M 6
Tightening torque	Nm	5	8,5
Max. bolt load	N	4850	6700

The chuck mounting bolts must be tightened with the torque valves indicated in the tabulation!

1.8 Lubricating Point Drawing:

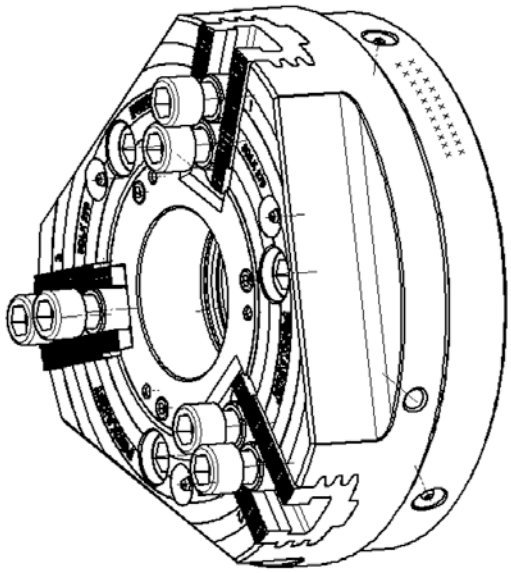


qlk06
The conical grease nipples AM6, DIN 71112 are located on the outside diameter of the chuck cover of power-operated chucks type 3QLK 110 and 3QLK 140.

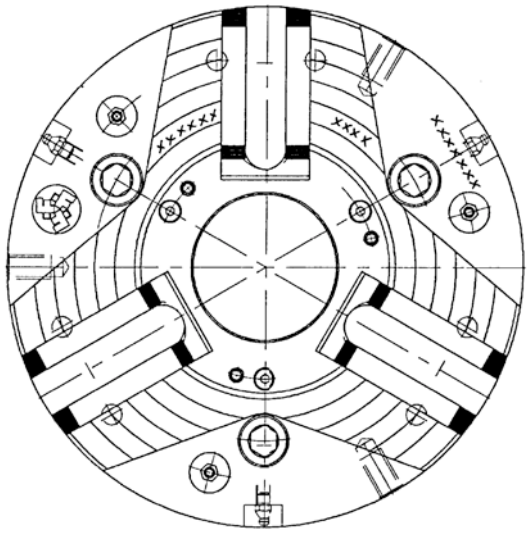


qlk07
The conical grease nipples AM6 or AM8 x 1, DIN 71412 are located on the front side of the chuck body of power-operated chucks type 3QLK/3QLC 160 to 3QLK/3QLC 400 and 3QLCKS/3QLKKS 200 to 3QLCKS/3QLKKS 400.

1.9 Information Quoted on Power Chuck:



qlk08
On outer diameter of power chuck:
Fmax, n max and max. actuating force.



qlk09
On front face of power chuck:
Type of power chuck, Serial No., Ident. No., FORKARDT emblem.

2.0 Safety Instructions:

2.1 General:

This instruction manual contains the information required for the correct use of the Type 3 QLC, 3 QLK, 3 QLC - KS und 3 QLK - KS power chucks. It is directed at technically qualified personnel who have been appropriately trained.
Knowledge and the precise following of the safety information and warnings contained in this manual are preconditions for the safe handling, operation and maintenance of the devices described. Only qualified persons in the sense of section 2.2 have the necessary technical expertise to correctly interpret and take notice of safety notes and warnings given in this manual.

CAUTION ! ***It should be noted that no liability will be assumed for damage resulting from failure to heed the instructions contained in this manual!***

2.2 Qualified Personnel:

Interfering with the power chucks by unqualified persons or failure to follow the safety warnings given in this manual can lead to serious injury or material damage for which FORKARDT takes no responsibility. Only correspondingly qualified personnel may therefore be allowed to work with these power chucks. Qualified personnel within the meaning of the safety instructions given in this manual are persons who

- have been instructed in the handling of chucking work holding equipment and who are familiar with the contents of this manual referring to the handling of the power chuck**.**
- are installation and / or service personnel who have undergone training enabling them to repair / install chucks and work holding equipment and power chucks**.**

2.3 Warning Symbols:

The following signs are here both for the personal safety of the Operator and to prevent damage to either the product described or equipment connected to it. Safety instructions and warnings are included to avert danger to the lives and the health of Operators or maintenance personnel, or to avoid material damage.

2.3.1 Danger Symbol:

This symbol marks all safety instructions in these operating instructions which concern danger to life and limb. Always adhere strictly to the instructions marked with this symbol and take particular care in such situations.

The generally applicable safety and accident prevention regulations must also be observed.

2.3.2 CAUTION ! - Warning:

This symbol is found at all parts of this manual where particular notice should be taken in order that the guidelines, regulations, instructions and correct work procedures are obeyed and hence damage or destruction of the product can be prevented.

2.4 General Safety Instructions:

Hazards may arise where the use and handling of power chucks do not conform to industrial safety requirements. The type 3 QLC, 3 QLK, 3 QLC - KS und 3 QLK - KS power chucks are built to up - to - date technical and safety standards. Despite this, danger can arise from these power chucks in the event of inappropriate use by untrained personnel or use for unauthorized purposes. The work piece is an important factor in the interaction ***between lathe, power chuck and work piece*** and can result in some danger. This danger has to be assessed by the user.

* ***Only those persons more than 18 years of age who have read the safety instructions and operating manual should use, fit and maintain the power chucks. These persons must have received special instructions on the implied dangers.***
* ***These operating instructions must be read prior to fitting and using the power chucks and have to be followed exactly!***
* ***Avoid any mode of operation detrimental to the safety of the power chucks.***
* ***Operators should ensure that no unauthorized persons work use the power chucks.***
* ***The operator should report anything affecting the safety of the power chuck to the supervisor.***
* ***For authorized use see Section 1.2!***
* ***Do not make unauthorized modifications to the power chuck since such steps could affect its safety.***
* ***Only use the power chuck when it is in good condition.***
* ***Failure to keep the workplace clean may create dangerous operating conditions.***
* ***Do maintenance work (e.g. lubrication, servicing) on the chuck only when it is at standstill (n = 0).***
* ***Release pressure in the actuating cylinder before servicing or inspecting the power chuck.***
* ***Use only units and spare parts produced by FORKARDT. Use of unauthorized spare parts invalidates FORKARDT'S warranty.***
* ***Before working with the power chuck, be sure to fit all guards properly.***
* ***Open guard doors only after the power chuck has stopped.***
  Note instruction plate!
* ***Follow all local safety and accident prevention regulations when operating the power chucks.***

3.1 Instructions:

These operating instructions, which have been compiled on the basis of German standard DIN V 8418, must be read, understood and observed by the relevant operating personnel. These operating instructions draw attention to matters of particular significance for the operation of the Type 3 QLC, 3 QLK, 3 QLC – KS and 3 QLK - KS power chucks. Malfunctions in the power chucks can be avoided and trouble - free operation ensured only if the operating personnel are familiar with the contents of these operating instructions.

* We must point out that we accept no liability for any damage and / or breakdowns resulting from the failure to observe these operating instructions.
* If, nevertheless, difficulties are encountered at any time, please contact our customer service department, which will gladly assist you.
  For customer service department, see section 10.3!
* These operating instructions refer only to the power - operated chucks type 3 QLC, 3 QLK, 3 QLC - KS and 3 QLK - KS.
* The illustrations and data in these operating instructions are subject to technical changes that are necessary for improvement of the power - operated chucks type 3 QLC, 3QLK, 3 QLC - KS and 3 QLK - KS!

3.2 Copyright:

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72766 Reutlingen-Mittelstadt
GERMANY

Telephone: (0211) 2506 - 0

Telefax: (0211) 2506 - 221

S:

Made in Germany

4.1 Packing, State of Assembly:

The type of packing is determined partly by the weight of the chuck and the method of transport. The power chucks are packed dust - tight in either oiled paper or transparent film.

Power chucks up to 315 mm diameter:

- are packed in collapsible cardboard boxes with suitable supporting inserts

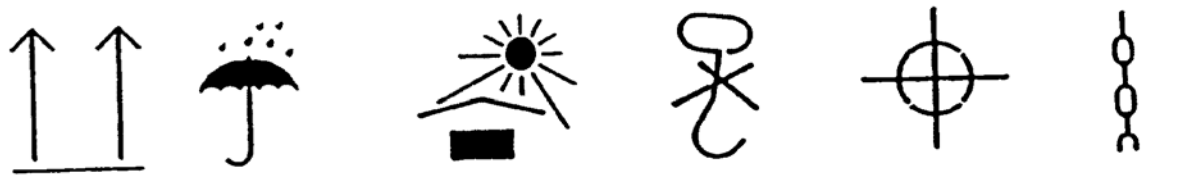
Power chucks from 400 mm diameter onwards:

- are packed in wooden boxes with appropriate stuffing, (e.g. chips),

with inclusion of accessories like top jaws and mounting keys.
Power chucks are supplied fully assembled,

- but with the mounting flange or adapter flange separate.

Attention has to be paid to the symbols (to German standard DIN 55402 part 1) displayed on the packing, e.g.:



Up | Protect from moisture | Protect from heat | No hand hooks | Centre of gravity | Sling here

ZKS 06

4.2 Care, Storage, Contents of Consignment:

Care must be taken during transport to avoid damage due to knocks or jolts or careless loading or unloading.

Shipping supports appropriate to the duration of the journey have to be provided.

If the power chuck is not fitted immediately on delivery, it must be stored on a pallet in a protected location. During storage, the parts have to be covered properly to protect them from dust and moisture.

All bare metal parts of the power chuck are coated before delivery with a corrosion inhibitor (e.g. Molykote Metalprotector Plus).

On receipt, check the contents of the consignment against the delivery note.

Any damage incurred in transit and / or any missing parts must be reported immediately by telephone and in writing!

5.1 General Description:

5.1.1 Power Chuck Type 3 QLC:

3 QLC power chucks are wedge hook chucks with a large through hole, centrifugal force compensation and integral lubricant reserve. They are universal chucks for practically all turning operations:

- for heavy - duty machining of disc and bar-shaped parts
- for delicate finish - machining or easily deformable workpieces.

The new series of 3 QLC power chucks is a logical further development (e.g. NHF) following the best FORKARDT tradition. It combines proven structural elements with new ideas. 3 QLC chucks are developed using computer-aided design methods and manufactured from high-grade steel using the latest production technologies (developed and manufactured in accordance with ISO 9001. Power-operated chuck sizes of 160, 175, 200, 250, 315 and 400mm diameter (in the individual case, deviations from the outside diameter are possible). The following are the major features of the Type 3 QLC power chuck:

- Innovative master jaw profile for maximum stability.
- High accuracy, ground master jaw profile for minimal lubricant loss.
- Significantly improved load absorption through multi " V " master jaw profile
- Integrated lubricant reserve with improved channels to wear surfaces.
- Permanently engaged wedge - hook mechanism for maximum gripping force and accuracy.
- Centrifugal force compensation system for maximum operating r.p.m..
- Large bore hole for bar / chucking applications.
- Optimized materials selection with all load bearing parts hardened and ground.

qlk10

- Simplified installation through piston locking mechanisms which do not protrude into the spindle bore hole.
- Cylinder over - extension constrained from within the chuck.
- Master jaw / top engagement to European and International standards.
- ISO 9001 design and manufacture.
- Type 3 QLC power chucks can be combined with suitable accessories - accessories include: hydraulic actuating cylinders, hard or soft jaws to suit application, draw bar or draw tube for connecting power chuck and actuating cylinder - to provide a modern and efficient chucking system.

The wedge hook mechanism, backlash-free under load (patented both in Germany and abroad), guarantees the highest chucking precision, irrespective of function or production-related differences in size of the individual parts. Balancing weights behind the master jaws reduce the centrifugal force of the mounted jaw assembly and allow the 3 QLC chucks to be used with both high and delicately reduced gripping force in all spindle speed ranges. The lubricant reserve in the sealed chuck body supplies the force-transmitting sliding surfaces with lubricant at each chucking stroke and ensures constant gripping forces even after prolonged periods of operation without maintenance (patented in Germany and abroad).
The newly developed jaw profile (patent pending) offers an optimum guide length for internal and external chucking, reduces load and wear, prevents the ingress of cooling lubricant and the loss of lubricating grease due to centrifugal force. The manufacture of all chuck components to the highest FORKARDT quality guarantees a long service life and reliable function (production control using the latest test facilities, quality assurance to ISO 9000 ff.).

5.1.2 Power Chuck Type 3 QLK:

The design features correspond to those of the 3 QLC series, however, the 3 QLK series has no centrifugal balance. Instead of the centrifugal weights and lever, appropriate jaw clamping devices are provided. Power-operated chuck sizes of 110, 140, 160, 175, 200, 250, 315 and 400mm diameter.

5.1.3 Power Chuck Type 3 QLC - KS:

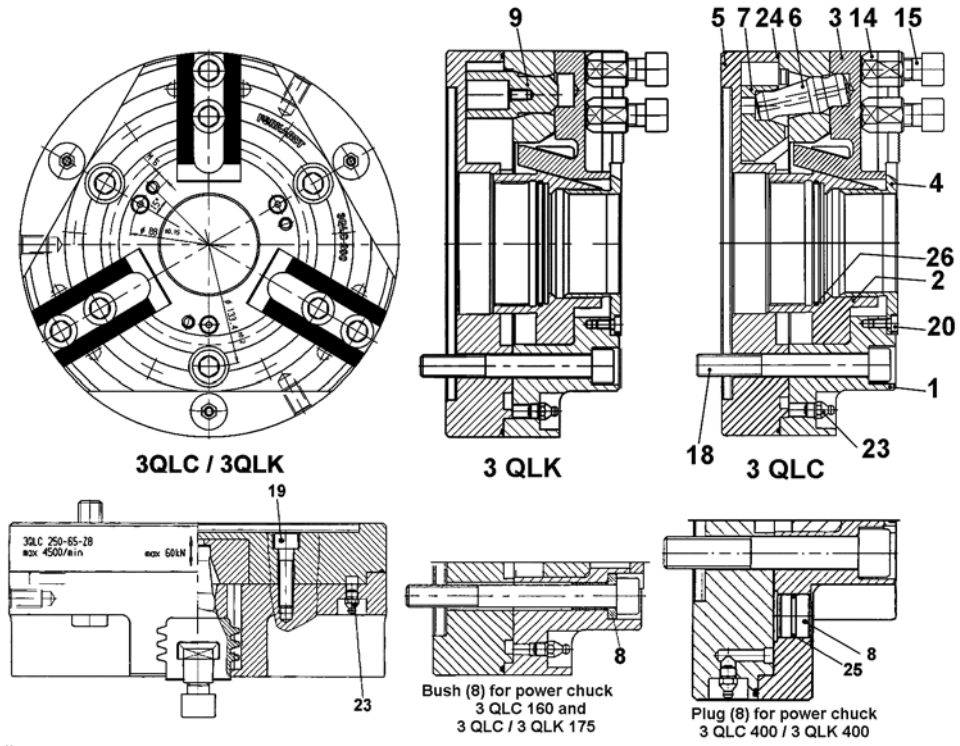
The design features correspond to those of the 3 QLC series, however, the 3 QLC - KS series has an enlarged bore for inserting and chucking large workpiece diameters. Power-operated chuck sizes of 200, 250, 315 and 400mm diameter.

5.1.4 Power Chuck Type 3 QLK - KS:

The design features correspond to the those of the 3 QLC - KS series, however, the 3 QLK - KS series has no centrifugal balance. Instead of the centrifugal weights and levers, appropriate jaw clamping devices are provided. Power-operated chuck sizes of 200, 250, 315 and 400mm diameter.

5.2 Design of the Power Chucks:

5.2.1 Power Chuck 3 QLC / 3 QLK:



qlk 11

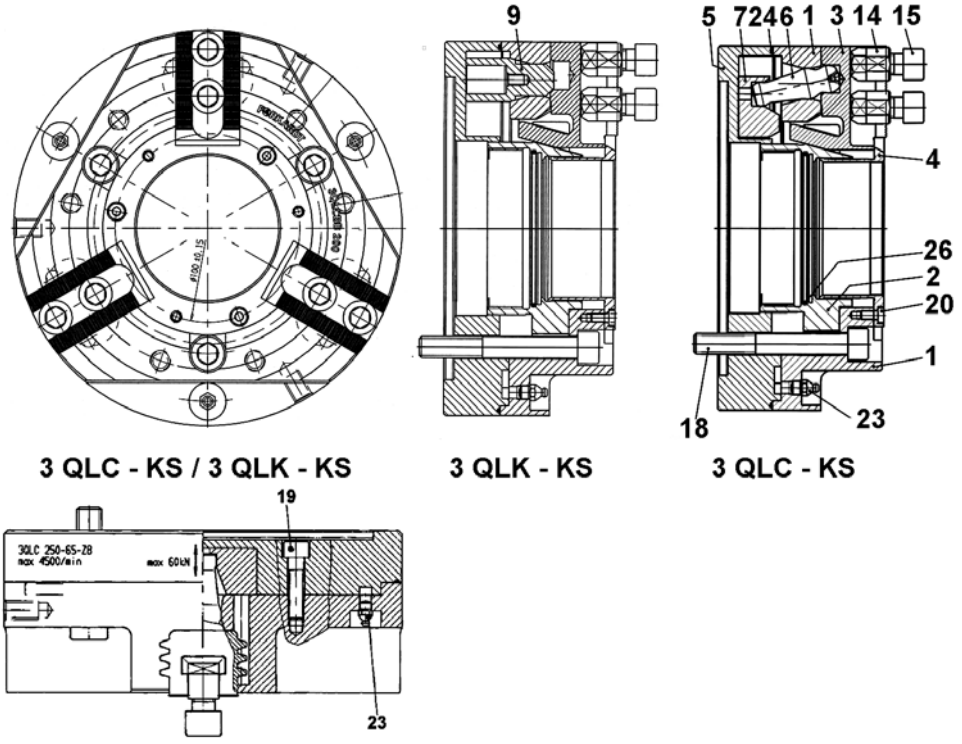
Part No.	Designation
1	Chuck body
2	Chuck piston
3	Master jaw
4	Protective bush
5	Chuck cover
6	Lever
7	Counterbalance weight
8	Bush / Plug
9	Jaw clamping device
14	T - nut
15	Socket head screw
17	
18	Socket head screw
19	Socket head screw
20	Socket head screw
21	
22	
23	Conical grease nipple
24	O - Ring
25	O - Ring
26	O - Ring
27	

The power-operated chuck type 3 QLC / 3 QLK consists of the main components:

- Single-piece chuck body (1) with conical grease nipples (23) on the front side (with power-operated chucks type 3 QLK 110 and 3 QLK140, the grease nipples are located on the circumference of the chuck cover).
- The chuck cover (5), as standard with plain mounting recess. The gap between the chuck body and the cover is hermetically sealed with an O - ring (24).
- The chuck piston (2) with the three wedge hooks, fastening thread for the draw tube, centered and sealed via a O - ring (26).
- The three master jaws (3) with the wedge hooks and as standard with serrations.
- Centrifugal weights (7) and levers (6) for power transmission (with power-operated chucks type 3 QLC)
- Jaw clamping device (8, only for power-operated chucks type 3 QLK),
- and the protective bush (4), which prevents dirt and chips entering the guides of the master jaws or chuck piston.

On the one side, the chuck cover (5) is attached to the chuck body by socket head screws (19) and, at the same time, provides the connection to the nose of the machine spindle via an adapter flange with central mounting bore. The protective bush (4) is attached to the chuck body by three socket head screws (20). With the power-operated chucks type 3 QLC, the levers (6) are guided in the bore of the chuck body and are supported on the right side in the bore of the base jaw (3) and on the left side in the bore of the centrifugal weight (7). With the power-operated chucks type 3 QLK, instead of the lever and centrifugal weights, appropriate jaw clamping devices (9) are provided, which are guided in the bore of the chuck body and are supported on the left side in the chuck cover. The jaw clamping devices (9) prevent the base jaws from being hurled out if the wedge hook is fractured by force.

5.2.2 Power Chuck 3 QLC - KS / 3 QLK - KS:



qlk12

Part No.	Designation
1	Chuck body
2	Chuck piston
3	Master jaw
4	Protective bush
5	Chuck cover
6	Lever
7	Counterbalance weight
8	Bush / Plug
9	Jaw clamping device
14	T - nut
15	Socket head screw
17	
18	Socket head screw
19	Socket head screw
20	Socket head screw
21	
22	
23	Conical grease nipple
24	O - Ring
25	
26	O - Ring

The main components of the Type 3 QLC - KS / 3 QLK - KS power chuck are:

- The one-piece chuck body (1), with conical grease nipples (23) at the front side of the chuck body
- The chuck cover (5), as standard with plain mounting recess The gap between the chuck body and the cover is hermetically sealed with an O - ring (24).
- The chuck piston (2) with the three wedge hooks, fastening thread for the draw tube, centered and sealed via a O - ring (26).
- The three master jaws (3) with the wedge hooks and as standard with serrations.
- Centrifugal weights (7) and levers (6) for power transmission (with power-operated chucks type 3 QLC - KS)
- Jaw clamping device (8, only for power-operated chucks type 3 QLK - KS)
- and the protective bush (4), which prevents dirt and chips entering the guides of the master jaws or chuck piston.

On the one side, the chuck cover (5) is attached to the chuck body by socket head screws (19) and, at the same time, provides the connection to the nose of the machine spindle via an adapter flange with central mounting bore. The protective bush (4) is attached to the chuck body by three socket head screws (20). With the power-operated chucks type 3 QLC - KS, the levers (6) are guided in the bore of the chuck body and are supported on the right side in the bore of the base jaw (3) and on the left side in the bore of the centrifugal weight (7). With the power-operated chucks type 3 QLK - KS, instead of the lever and centrifugal weights, appropriate jaw clamping devices (9) are provided, which are guided in the bore of the chuck body and are supported on the left side in the chuck cover.

The jaw clamping devices (9) prevent the base jaws from being hurled out if the wedge hook is fractured by force.

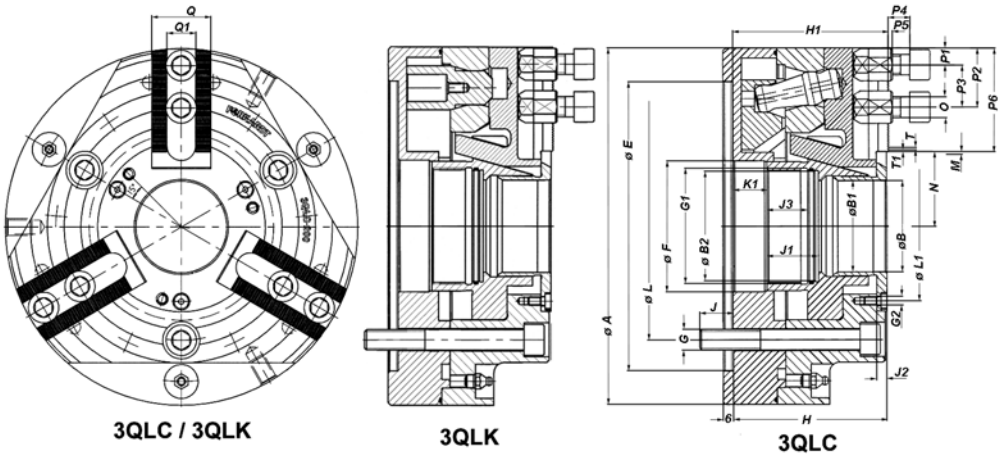
5.3 Principle Dimensions of the Power Chucks:

5.3.1 Power Chuck Type 3 QLC:

Number of jaws	Chuck designation	Chuck size(outer dia)	Chuck bore	Mounting style	Jaw mounting	Ident. No.

1.6.2 Power Chuck Type 3QLC - KS / 3QLK - KS:

3	QLC - KS	250	101	Z8	S 11	168 479
Numberof jaws	Chuck designation	Chuck size(outer dia.)	Chuck bore	Mounting tyle	Jaw ounting	Ident. No.



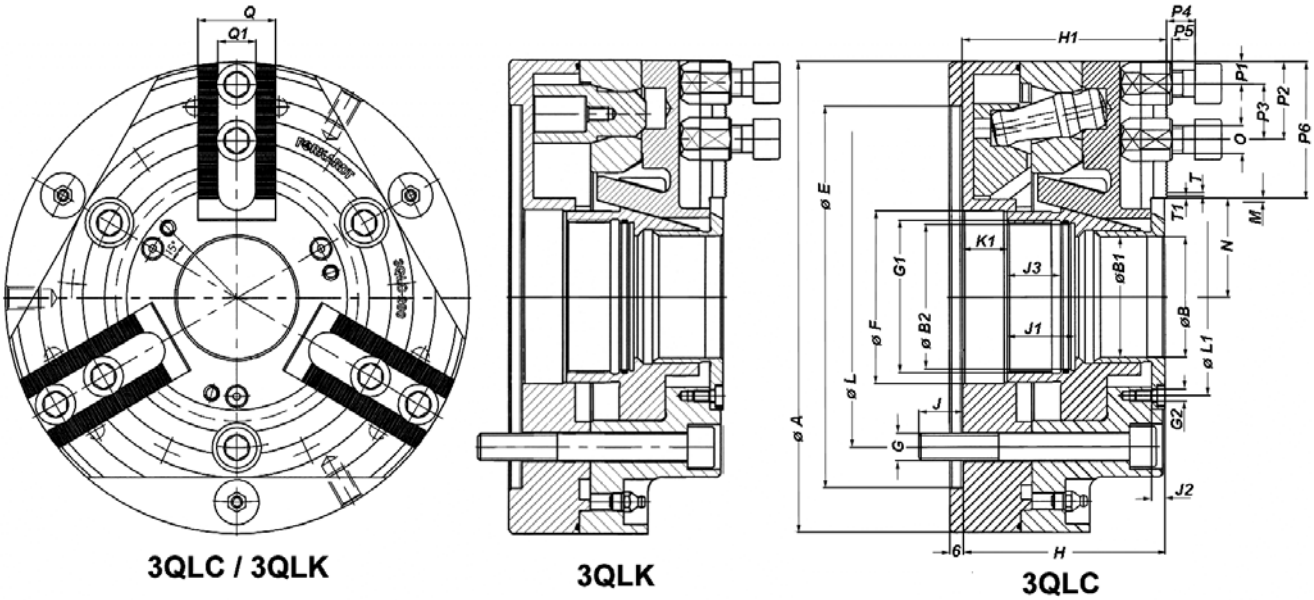
qlk 13

Chuck type 3 QLC	➡	160 - 38	175 - 42	200 - 54	250 - 72	315 - 88		400 - 126	
Chuck diameter	ø A	162	175	210	257	320		400	
Bore diameter	ø B H7	38	42	54	72	88		126	
Spindle mounting style	ø C	140	140	170	220	220	300	300	380
Jaw mounting	D	S11	S11	S11	S12	S12		S23 1)	
Ident. No		168 116	165 566	167 983	165 568	165 569	165 570	165 808	165 813
Protective bush diameter	B1+0,1	38	42	54	72	88		126	
Draw tube recess	B2 H7	42	50	65	77	93		134	
Mounting recess	E H6	140	140	170	220	220	300	300	380
Piston diameter	F	53	62	76	90	110		150	
Socket head screw	G	M 10	M 10 x 95	M 12 x 95	M 16 x 75	M 16 x 100	M 20 x 80	M 20 x 130	M 24 x 110
Draw tube thread	G1	M 45x2	M 55x2	M 68x2	M 82x2	M 100x2		M 140x2	
Puller bores of protective bush	G2	M 4	M 5	M 5	M 6	M 6		M 6	
Chuck body width	H	90	90	90	98	98		128	
Chuck width 2)	H1	92	92	92	100	100		130	
Thread length	J	19	18	20	21	21	25	25	30
Piston length	J1	30	30,6	30,6	33,6	33,6		49	
Thread depth (puller bores G2)	J2	5	6	6	6	6		8	
Piston thread length	J3	23,4	24	24	24	24		36	
Piston stroke	K	17	18,5	20	20	20		30	
Distance max.	K1	17	18,5	20	20	20		30	
Pitch circle diameter	L ±0,1	104,8	104,8	133,4	171,4	171,4	235	235	330,2
Pitch circle diameter	L1 ±0,15	88	88	88	110	130		173	
Jaw movement	M	4,5	5	5,3	5,4	5,4		8	
Jaw position	Nmin Nmax	28,1 32,6	29,9 34,9	38,6 43,9	48,1 53,5	55,1 60,5		77 85	
Jaw bolts	O	M 12	M 12 x 30	M 12 x 30	M 16 x 35	M 16 x 35		M20 x 40	
Distance jaw bolt	P1min P1max	7 23	7 27	7 33	10 36	10 61		15 70	
Distance jaw bolt	**P2min** **P2max**	26 42	26 46	26 52	35 62	35 87		46 101	
Min. spacing	P3	19	19	19	25	25		31	
Min. spacing	P4	10	10	10	10	10		15	
Spacing T-nut / serration	P5	2,5	2,5	2,5	2,5	2,5		3,5	
Mounting serration length	P6	48,4	52,6	61	75	99,5		115	
Jaw width	Q	35	35	35	45	45		60	
Slot width	Q1	17	17	17	21	21		25,5	
Pitch of the mounting serration	T	1/16" x 90°	1/16" x 90°	1/16" x 90°	1/16" x 90°	1/16" x 90°		3/32"x90°	
Distance	T1	1,5	1,5	1,5	1,5	1,5		2,5	
T - nut		FN 231	FN 231	FN 231	FN 232	FN 232		FN 233	

1) Also available with jaw mounting S12, on request

2) Dimension H1 applies only to serrations to DIN 6353

5.3.2 Power Chuck Type 3 QLK:



qlk 14

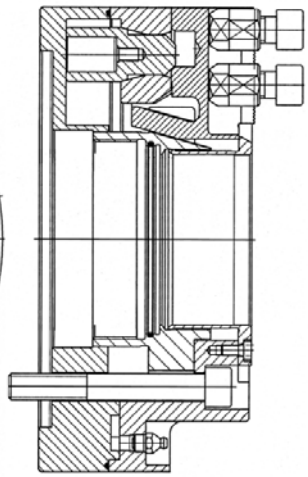
Chuck type 3 QLK	➡	110 - 26	140 - 35	160 - 38	175 - 42	200 - 54	250 - 72	315 - 88		400 - 126	
Chuck diameter	ø A	110	140	162	175	210	257	320		400	
Bore diameter	ø B H7	26	35	38	42	54	72	88		126	
Spindle mounting style	ø C	100	120	140	140	170	220	220	300	300	380
Jaw mounting	D	S8	S9	S11	S11	S11	S12	S12		S23 1)	
Ident. No		168 894	168 895	168 896	168 897	168 898	168 899	168 900	168 901	168 902	168 903
Protective bush diameter	B1+0,1	26	35	38	42	54	72	88		126	
Draw tube recess	B2 H7	32	39	42	50	65	77	93		134	
Mounting recess	E H6	100	120	140	140	170	220	220	300	300	380
Piston diameter	F	47	50	53	62	76	90	110		150	
Socket head screw	G	M10 x 80	M10 x 90	M10 x 95	M10 x 95	M12 x 95	M16 x 75	M16x100	M20 x 80	M20x130	M24x110
Draw tube thread	G1	M36 x 1,5	M42 x 1,5	M45 x 2	M55 x 2	M 68 x 2	M 82 x 2	M 100 x 2		M 140 x 2	
Puller bores of protective bush	G2	M 4	M 4	M 4	M 5	M 5	M 6	M 6		M 6	
Chuck body width	H	80	86	90	90	90	98	98		128	
Chuck width 2)	H1	82	88	92	92	92	100	100		130	
Screws thread length	J	13	18	19	18	20	21	21	25	25	30
Piston length	J1	26,5	30,6	30	30,6	30,6	33,6	33,6		49	
Thread depth (puller bores G2)	J2	5	5	5	6	6	6	6		8	
Piston thread length	J3	19	23	23,4	24	24	24	24		36	
Piston stroke	K	12	13	17	18,5	20	20	20		30	
Distance max.	K1	13	13	17	18,5	20	20	20		30	
Pitch circle diameter	L ±0,2	82,6	104,8	104,8	104,8	133,4	171,4	171,4	235	235	330,2
Pitch circle diameter	L1 ±0,2	58,5	74	88	88	88	110	130		173	
Jaw movement	M	3,2	3	4,5	5	5,3	5,4	5,4		8	
Jaw position	Nmin	25,8	25	28,1	29,9	38,6	48,1	55,1		77	
	Nmax	29,0	28	32,6	34,9	43,9	53,5	60,5		85	
Jaw bolts	O	M8 x 22	M10 x 25	M12 x 30	M12 x 30	M12 x 30	M16 x 35	M16 x 35		M20 x 40	
Distance jaw bolt	P1min	5,5	8	7	7	7	10	10		15	
	P1max	20	14	23	27	33	36	61		70	
Distance jaw bolt	P2min	19	24,5	26	26	26	35	35		46	
	P2max	33,5	30,5	42	46	52	62	87		101	
Min. spacing	P3	14	18	19	19	19	25	25		31	
Min. spacing	P4	8,5	9,5	10	10	10	10	10		15	
Spacing T-nut / serration	P5	2	2,5	2,5	2,5	2,5	2,5	2,5		3,5	
Mounting serration length	P6	32,5	42	48,4	52,6	61	75	99,5		115	
Jaw width	Q	25	30	35	35	35	45	45		60	
Slot width	Q1	10	12	17	17	17	21	21		25,5	
Pitch of the mounting serration	T	1/16"x90⁰	1/16"x90⁰	1/16"x90⁰	1/16"x90⁰	1/16"x90⁰	1/16"x90⁰	1/16"x90⁰		3/32"x90⁰	
Distance	T1	1,5	1,5	1,5	1,5	1,5	1,5	1,5		2,5	
T - nut		168894008	168752008	FN 231	FN 231	FN 231	FN 232	FN 232		FN 233	

1) Also available with jaw mounting S12, on request

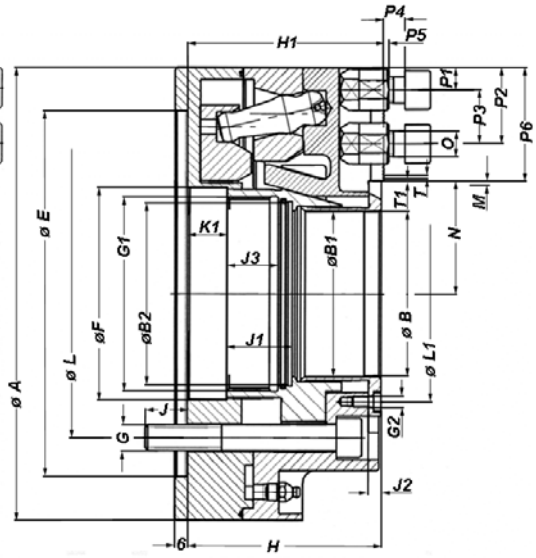
2) Dimension H1 applies only to serrations to DIN 6353

5.3.3 Power Chuck Type 3 QLC - KS / 3QLK - KS:

3 QLC - KS / 3 QLK - KS



3 QLK - KS



3 QLC - KS

qlk 15

Chuck type	➡	3QLC-KS 200 - 77	3QLK-KS 200 - 77	3QLC-KS 250 - 101	3QLK-KS 250 - 101	3QLC-KS 315 - 135	3QLK-KS 315 - 135	3QLC-KS 400 - 168	3QLK-KS 400 - 168
Chuck diameter	ø A	210		257		320		400	
Bore diameter	ø B H7	77		101		135		168	
Spindle mounting style	ø C	170		220		300		380	
Jaw mounting	D	S11		S11		S12		S12	
Ident. No.		168 478	168 575	168 479	168 576	168 480	168 577	168 481	168 578
Protective bush diameter	B1 +0,1	77		101		135		168	
Draw tube recess	B2 H7	85		112		140		173	
Mounting recess	E H6	170		220		300		380	
Piston diameter	F	97		123		154		191	
Piston diameter	G	M 12 x 90		M 16 x 95		M 20 x 90		M 24 x 80	
Draw tube thread	G1	M 90 x 2		M 115 x 2		M 145 x 2		M 180 x 2	
Puller bores of protective bush	G2	M 5		M 5		M 6		M 6	
Chuck body width	H	90		90		98		98	
Chuck width 2)	H1	92		92		100		100	
Screws thread length	J	20		22		20		30	
Piston length	J1	30,6		36,6		33,6		33,6	
Thread depth (puller bores G2)	J2	6		6		6		6	
Piston thread length	J3	24		24		24		24	
Piston stroke	K	18,5		20		20		20	
Distance max.	K1	18,5		20		20		20	
Pitch circle diameter	L ±0,2	133,4		171,4		235		330,2	
Pitch circle diameter	L1 ±0,2	100		129		173		210	
Jaw movement	M	5		5,3		5,3		5,3	
Jaw movement	Nmin Nmax	47,5 52,5		62,2 67,5		79,7 85		95,2 100,5	
Jaw bolts	O	M 12 x 30		M 12 x 30		M 16 x 35		M 16 x 35	
Distance jaw bolt	P1min P1max	8 24		8 33		12 36		12 61	
Distance jaw bolt	P2min P2max	27 43		27 52		37 61		37 86	
Min. spacing	P3	19		19		25		25	
Min. spacing	P4	10		10		10		10	
Spacing T-nut / serration	P5	2,5		2,5		2,5		2,5	
Mounting serration length	P6	52,5		61		75		99,5	
Jaw width	Q	35		35		45		45	
Slot width	Q1	17		17		21		21	
Pitch of the mounting serration	T	1/16" x 90⁰		1/16" x 90⁰		1/16" x 90⁰		1/16" x 90⁰	
Distance	T1	1,5		1,5		1,5		1,5	
Distance		FN 231		FN 231		FN 232		FN 232	

2) Dimension H1 applies only to serrations to DIN 6353

5.4 Mode of Operation:

5.4.1 General:

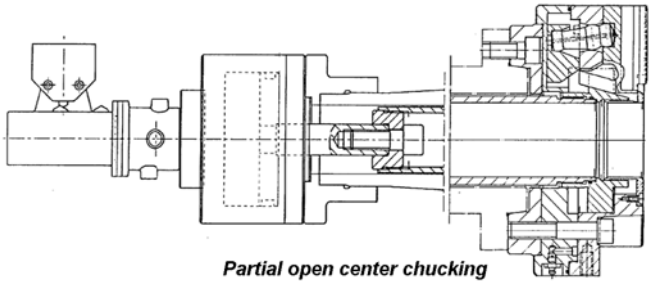
The power chuck is actuated by a standard hydraulic cylinder with stroke monitor, either utilizing the machine hydraulics or a separately supplied hydraulic power pack.

Depending on the work-piece to be machined either

a type OKRJ...

closed center hydraulic cylinder for partial open center chucking

or



Partial open center chucking

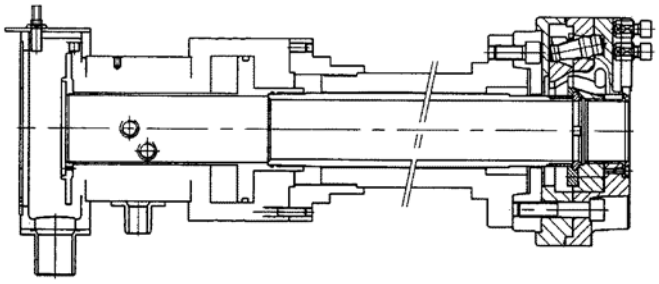
qlk 16

a type OKHJ....

open center hydraulic cylinder for open center chucking

has to be employed.

In a few cases, pneumatic cylinders Type PZRAJ or PZHAMJ are used.



Open center chucking

qlk 17

The power chuck attached to the spindle nose of a lathe is actuated by a rotating hydraulic cylinder; its function is to generate a gripping force to hold the workpiece to be machined from the axial force generated by the actuating cylinder.

The pressure at the actuating cylinder must be set so that the maximum actuating force of the power chuck is not exceeded.

The power chuck is actuated by an axial movement of the cylinder piston - transmitted by a draw tube (partly open center or open center chucking) - to the chuck piston of the chuck and is transmitted by the surfaces of the wedge hook mechanism in the chuck piston to the correspondingly shaped wedge guides in the master jaws which engage during the gripping process. The corresponding radial gripping force - required to hold the work piece during machining - is built up on the work piece via the top jaws. It is important here that the oil pressure at the actuating cylinder for generating the gripping force is matched to the maximum permissible actuating force of the power chuck used and that this force is not exceeded.
A tensile force on the chuck piston causes the jaws to move inwards (external chucking of the work piece), compressive force on the chuck piston causes the jaws to move outwards (internal chucking of hollow work pieces). The 3 QL... chucks are equally suitable for both directions of chucking. The gripping stroke is monitored by limit switches mounted radially on the actuating cylinder. If the top jaws of the power chuck are set to a given gripping diameter, the jaw mounting bolts must be backed off with two turns of the Allen key (to DIN 911) and the top jaw moved with the T-nuts and bolts to the corresponding gripping diameter.

If the top jaws are changed from external to internal chucking,

CAUTION ! ***Note change of direction of the jaw movement,***

or the top jaws are changed from e.g. hard top jaws type HB or roughing jaws to soft top jaws Type WBL for dressing, the jaw mounting bolts must be backed off with two turns of the Allen key and the top jaw removed from the master jaw completely together with the T-nuts.

CAUTION ! ***Remove chips and dirt from the bore of the chuck and the top jaws before removing the top jaws from the master jaws!***

CAUTION !

If machining of the chucked work piece is interrupted for several hours, e.g. overnight, the power chuck must be actuated again before starting to machine the work piece.

5.4.2 Centrifugal Force Compensation:

Each master jaw is linked to a balancing weight via a connecting lever. As the chuck rotates, the centrifugal force of the balancing weight effectively compensates the centrifugal force of the master jaws and top jaws which could otherwise result in a significant loss of gripping force. This simple, sturdy and direct-acting balancing system ensures on the one hand the high gripping force of the 3 QLC and 3 QLC - KS chucks over the full spindle speed range or alternatively permits the chucks to be operated with reduced gripping force even at the highest polishing speeds.

5.4.3 Integral Lubricant Reserve:

The movement of the centrifugal force balancing weights in the rear of the chuck is used to pump lubricant to all the sliding surfaces at each chucking stroke. The excess lubricant which is displaced inwards is returned under centrifugal force to the lubricant tank (via the centrifugal force balancing weights) as the chuck rotates and is then available for lubrication again at the next chucking stroke. When necessary, the lubricant tank can be topped up via easily accessible high-pressure grease nipples.
The lubricant passages are designed as open grooves in the individual parts. In contrast to conventional chuck designs, 3 QLC.. / 3 QLK.. chucks have no narrow, angled lubrication bores which can hinder the flow of lubricant or become clogged. chucks have no narrow, angled lubrication bores which can hinder the flow of lubricant or become clogged. 3 QLC.. / 3 QLK.. chucks.

5.4.4 Sealing:

3 QL.... chucks are effectively sealed to prevent loss of lubricant due to centrifugal force and to avoid functional faults caused by the ingress of cooling lubricant, dirt and chips. The gap between chuck body and cover is hermetically sealed with an O-ring. All movement gaps are designed with tight fits and hardened wiper edges. The one-piece chuck piston is designed with an integral puller / thrust thread and O-ring seal. This prevents dirt and cooling lubricant entering the spindle and eliminates the risk of corrosion as well as simplifying mounting and dismounting of the power chuck.

5.5  Safety Instructions:

A chucking pressure monitor must be provided to ensure that a minimum chucking pressure is available.

The pressure monitor must be set and then locked to prevent any further adjustment so that the machine can only be started when the chucking pressure exceeds an adequate minimum value.

The pressure at the actuating cylinder must be set so that the maximum actuating force of the power chuck is not exceeded.

The test regulations of the industrial safety authority demands that not only a pressure monitor but also a stroke monitor is provided for the actuating cylinder. The stroke monitor must ensure that the spindle and feed drives cannot be started or are automatically stopped if the power chuck is opened or the actuating cylinder reaches the end of its stroke.

The lathe spindle must be prevented from starting when the power chuck is either fully open or fully closed as the lathe will be stopped by the safety limit switches when the chuck is in its limit positions.

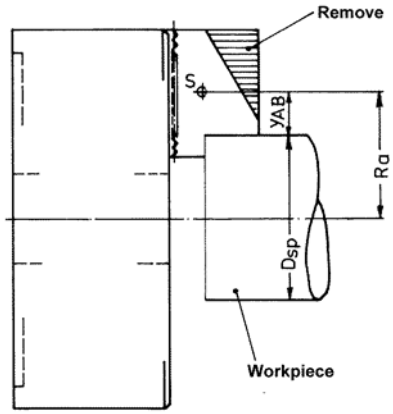
The machine spindle must not start until the chucking pressure in the actuating cylinder has been built up and the power chuck has gripped within its permissible working range.

In the event of failure of the hydraulic power supply, a signal must be triggered to stop the spindle and the workpiece must remain securely gripped until the spindle has come to a standstill.

5.6 Chuck Jaws:

5.6.1 General:

The power chuck is the connecting element between lathe and the work piece to be turned. The power produced by the lathe is transmitted to the spindle nose by the power chuck and to the transfer point between power chuck and work piece by the positive driving of the closed chuck jaws. Chuck jaws are radially moving elements of the power chuck which grip the work-piece during machining. The chuck jaws consist of the master jaws - the connecting link to the power-providing part of the power chuck - and the top jaw which is positively attached (by serrations or cross ten on) to the master jaw and can thus be exactly positioned. The chuck jaws have to be changed to suit the type of machining or the differences in size and shape of the work pieces.



qlk 18

5.7 Type Designation of the Top Jaws:

5.7.1 Power Chuck Type 3 QLC / 3 QLK:

Chuck type ⇒	3 QLC/3QLK	110	140	160	175	200	250	315	400
Hard top jaw	HB	HB 08	HB 09	HB11 / 65 HB11 / 70	HB11 / 65 HB11 / 70	HB11 HB11 / 110	HB12	HB12	HB23 / 18
Soft top jaw	WBL	WBL08	WBL09	WBL11 / 70	WBL11 / 70	WBL11 / 80	WBL12 / 110	WBL12 / 110	WBL23 / 140
Soft monoblock jaw	WBLKL	-	-	WBLKL11	-	WBLKL11	WBLKL12	WBLKL12	WBLKL12
Roughing jaw	KBNKLA	-	-	KBNKLA11	-	KBNKLA11	KBNKLA12	KBNKLA12	KBNKLA12/23
Roughing jaw	KBNKLI	-	-	KBNKLI 11	-	KBNKLI 11	KBNKLI 12	KBNKLI 12	KBNKLI12 / 23

5.7.2 Power Chuck Type 3 QLC - KS / 3 QLK - KS:

Chuck type ⇒	3 QLC-KS/3QLK-KS	200	250	315	400
Hard top jaw	HB	HB 11	HB 11	HB 12	HB 12
Soft top jaw	WBL	WBL 11 / 80	WBL 11 / 80	WBL 12 / 110	WBL 12 / 110
Roughing jaw	KBNKLA	KBNKLA 11	KBNKLA 11	KBNKLA 12	KBNKLA 12
Roughing jaw	KBNKLI	KBNKLI 11	KBNKLI 11	KBNKLI 12	KBNKLI 12

5.7.3 Hard Top Jaw HB:

Hard top jaws Type HB are hardened jaws with serrated gripping surfaces to increase the friction between chuck jaw and work pieces and are ground out under gripping pressure in the power chuck. They are used to grip rough or returned work pieces with medium cutting rate.

qlk 19

Determine the necessary gripping force Fsp!

5.7.4 Soft Top Jaws WBL:

Soft top jaws Type WBL are unhardened brick-shaped block jaws which are used for precise gripping of already machined work pieces
- whose surfaces must not be damaged
- with low cutting rate

These top jaws are turned out under gripping pressure according to the work piece form.

qlk 20

Determine the necessary gripping force Fsp!

5.7.5 Roughing Jaws KBNKLA / KLI:

This type of jaw is assembled on the chuck with the T-sliding block jaw holder system NSTK.

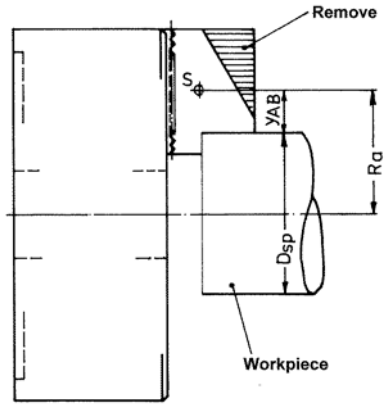
Determine the necessary gripping force Fsp!

kbnkla

kbnkli

5.7.6 Safety Instructions for Top Jaws:

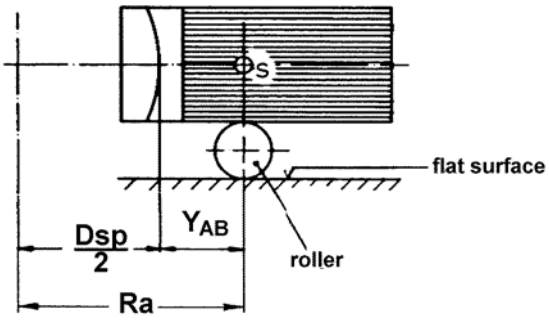
- ***With self-manufactured top jaws, ensure proper pitch of the serrations. Check that no hardening distortion has taken place.***
- ***Do not damage the serrations of the top jaws. Bolt only top jaws with undamaged serrations to the master jaws.***
- ***Recalculate the strength of self-manufactured top jaws using the gripping force. For details, see section 6.3!***
- ***When working at high speeds, reduce as far as possible the weight of soft top jaws and self-manufactured top jaws - but not at the cost of strength.***



qlk 22

- ***In addition to the normal gripping force calculation, the strength of special top jaws must be recalculated in combination with the corresponding power chuck!***
- ***If the calculation and the measurement of the dynamic gripping force for the permissible speed produces a value lower than the maximum speed of the power chuck, the special top jaws must be marked with the permissible speed and the designation of the power chuck!***
- ***Reduce the weight of soft top jaws and self-manufactured top jaws as far as possible!***
- ***Calculate the weight and position of the center of gravity of soft top jaws and self-manufactured top jaws when ready for operation.***
- ***Check whether the useful working gripping force of the power chuck is sufficient for the intended machining. See also calculation example in Section 6.4.***
- ***Set the speed limiting device on the lathe to the permissible speed determined for the special top jaws, as otherwise the centrifugal forces occurring at the jaws at higher speeds will reduce the gripping force to such an extent that the workpieces will no longer be securely held!***

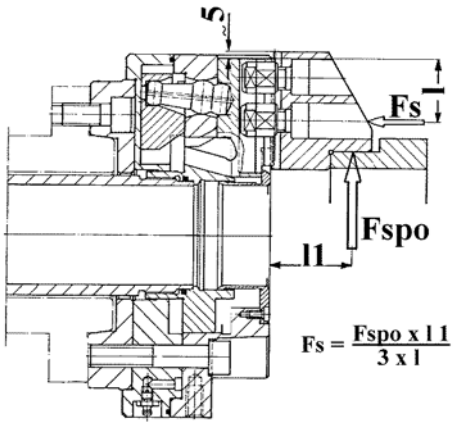
Determination of the center of gravity



qlk 23

- ***When inserting the workpieces into the power chuck, one top jaw must always be placed at the bottom so that jamming of the workpiece between two top jaws is avoided. The risk of jamming of workpieces is particularly high with sharply serrated top jaws, with large gripping diameters, narrow top jaws which do not grip fully around the workpiece and with large opening travels of the power chuck.***

- ***When the work piece is inserted, the travel of the top jaws should be 3 mm or less. Design top jaws in such a way that the jaw travel required to reach the gripping position is not more than 3 mm!***
- ***Check the strength of the jaw mounting bolts. Recalculate the tensile strength (static and dynamic). Use only good quality bolts of grade 10.9 to DIN 267!***
- ***Use only ORIGINAL FORKARDT T-stones and mounting bolts for attaching top jaws, observing the prescribed grade!***
- ***For internal chucking, arrange the mounting bolts as far as possible to the outside; for external clamping, arrange the mounting bolts as far as possible to the inside!***
- ***With self-manufactured top jaws, ensure proper pitch of the serrations and check that no hardening distortion has taken place.***

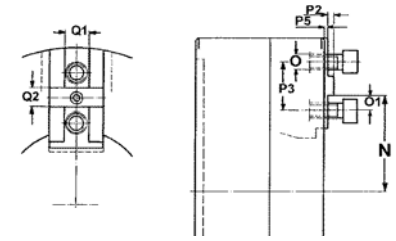


qlk 24

5.7.7 Tightening Torques of the Jaw Mounting Bolts:

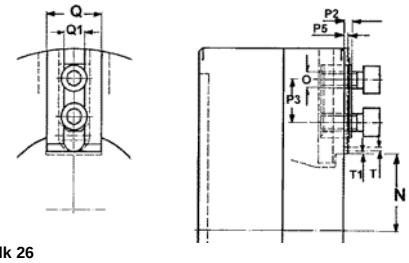
	Bolts to DIN 912		Grade 10.9			Manufactured to DIN 267		
	Thread		M 8	M 10	M 12	M 16	M 20	
	Tightening torque	Nm	16	51	87	215	420	
	Max. bolt load	N	27300	43400	63000	119000	186000	

5.7.8 Alternative Jaw Mounting Systems:



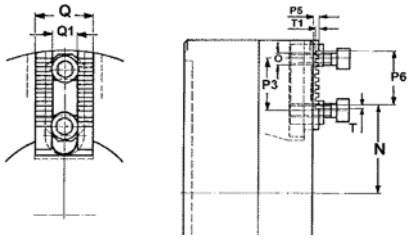
qlk 25

Cross - tenon KDIN



qlk 26

Metric serrations MSK



qlk 27

ACME trapezoid serration

Power-operated chuck variants available on request!

5.8 Technical Safety Requirements for Power Operated Workholding Equipment:

The technical requirements for the operation of power - operated workholding equipment are defined in safety regulations as well as in the DIN (German Standard Institute), VDE (Association of German Electrical Engineers) and VDI (Association of German Engineers) guidelines. The individual safety requirements have to be satisfied by appropriate measures, as shown in the adjacent table.
We have developed items of equipment for both hydraulic and pneumatic control of all our power chucking equipment that satisfy the above mentioned requirements and guidelines.
The way in which these items of equipment interact is shown in the table.

See also publication 601.01.3E.

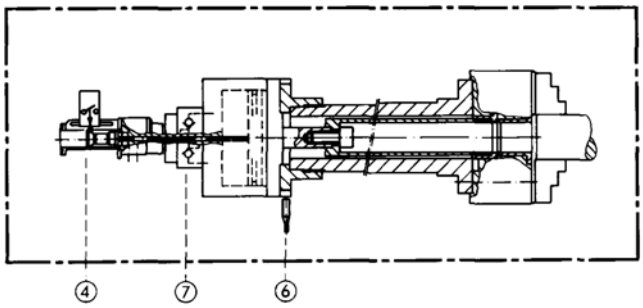
o- - - Mechancal solution

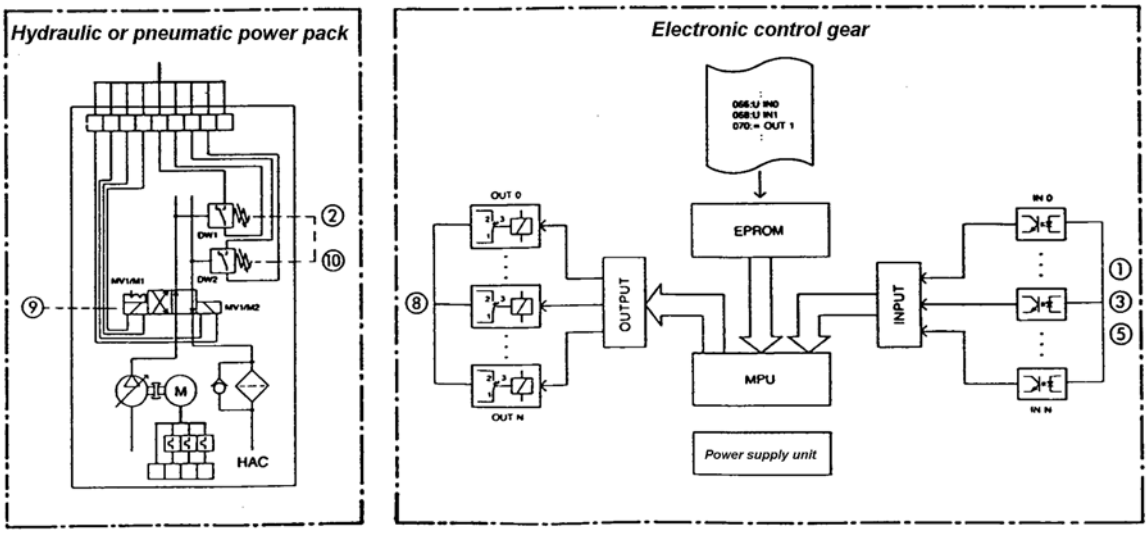
o—— Electrical solution

Safety requirement :	Satisfied by:	48748
The machine spindle may only start when the full chucking pressure has built up in the actuating cylinder.	Pressure switch in the pressure lines	—— ❶ - - - ❷
		—— ❸
The machine spindle may only start when gripping has taken place within the permissible range of jaw movement.	Monitoring of actuating cylinder stroke by electric limit switches	- - ❹ —— ❺
The grip can only be released when the machine spindle has stopped.	Machine spindle rotation monitor	- - - ❻
In the event of failure of the hydraulic power supply the workpiece has to remain gripped until the spindle comes to rest.	Pilot operated check valves in actuating cylinder	- - - ❼ —— ❽
Electric power failure and subsequent restoration of the power supply must not result in any change of the control gear status.	Impulse actuated directional valve with detents in end positions	- - - ❾ - - - ❿
In the event of failure of the hydraulic power supply a signal for the automatic or manual stopping of the spindle has to be given.	Pressure switch in pressure lines	

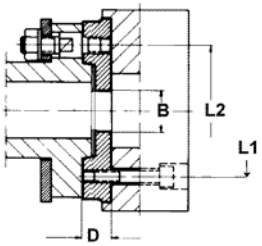
qlk 28

5.9 Accessories:



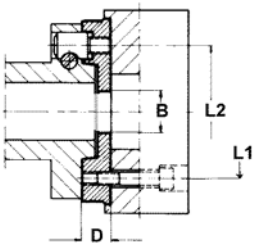


5.9.1 Mounting Flanges, Adapter Flanges, Adapter Plates:



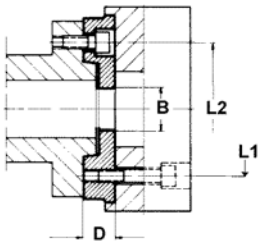
qlk 29

Mounting flange J



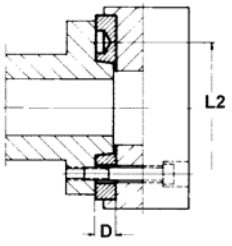
qlk 30

Mounting flange D



qlk 31

Adapter flange ZWF



qlk32

Adapter plate ZWS

Flanges with bayonet plate attachment for mounting on spindle noses to DIN 55022, DIN 55027, ISO 702 / III											J	Flanges with camlock attachment for mounting on spindle noses to DIN 55029, ISO 702 / II, ASA B 5.9 D1									D
Chuck type	Spindle nose	Flange type	Ident. No.	Dimensions				Studs and collar nuts				Flange type	Ident. No.	Dimensions				Camlock studs			
QL..	Size			B	D	L1	L2	FN	Ident. No.	Qty.				B	D	L1	L2	FN	Ident. No.	Qty.	
110	4	FF100–J4	74085	45	18	82,6	85	322	70505	3		FF100-D4	on request	45	28	82,6	82,6	286	70511	3	
140	5	FF120-J5	on request	50	24	104,8	104,8	322	70505	4		FF120-D5	on request	50	30	104,8	104,8	287	70512	6	
160	5	FF140-J5	74086	50	24	104,8	104,8	322	70505	4		FF140-D5	74119	50	30	104,8	104,8	287	70512	6	
175	5	FF140-J5	74086	50	24	104,8	104,8	322	70505	4		FF140-D5	74119	50	30	104,8	104,8	287	70512	6	
200	6	FF170-J6	74090	65	28	133,4	133,4	322	70506	4		FF170-D6	74123	65	35	133,4	133,4	288	70513	6	
250	8	FF220-J8	74097	80	32	171,4	171,4	322	70507	4		FF220-D8	74130	80	40	171,4	171,4	289	70514	6	

Flanges with bayonet plate attachment for mounting on spindle noses to DIN 55022, DIN 55027, ISO 702 / III								J			Flanges with camlock attachment for mounting on spindle noses to DIN 55029, ISO 702 / II, ASA B 5.9 D1								D
Chuck type	Spindle nose	Flansch type	Ident. No.	Dimensions				Stehbolzen und Bundmuttern			Flange type	Ident. No.	Dimensions				Camlock studs		
QL..	Size			B	D	L1	L2	FN	Ident. No.	Qty.			B	D	L1	L2	FN	Ident. No.	Qty.
	8	FF220-J8	74097	80	32	171,4	171,4	322	70507	4	FF220-D8	74130	80	40	171,4	171,4	289	70514	6
315																			
	11	FF300-J11	74104	90	35	235	235	322	70508	6	FF300-D11	74137	90	45	235	235	289	70515	6
	11	FF300-J11	74104	90	35	235	235	322	70508	6	FF300-D11	74137	90	45	235	235	290	70515	6
400																			
	15	FF380-J15	74108	120	42	330,2	330,2	324	70517	6	FF380-D15	74141	120	50	330,2	330,2	291	70516	6

Order code example: 1 mounting flange type FF 170 - J6, Ident. No. 74090, 1 set of studs with collar nuts size 6, Ident. No. 70506

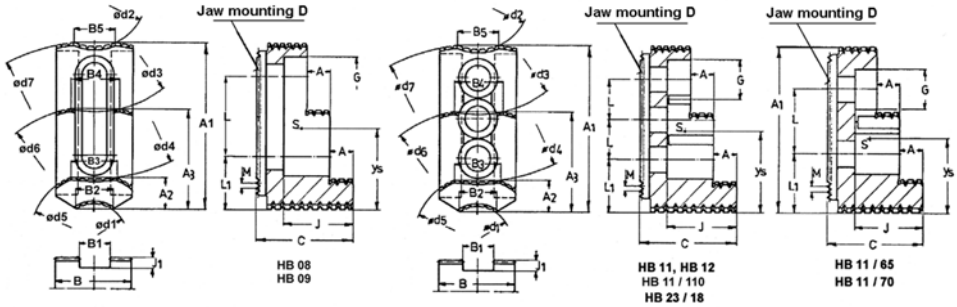
Adapter flanges including mounting bolts for spindle noses to DIN 55021 A/B, DIN 55026 A/B, ISO 702/I A1/A2, ASA B5.9 A1/A2								ZWF	Adapter plates for spindle noses to DIN 55021 A, DIN 55026 A, ISO 702/I A2, ASA B 5.9 A2						ZWS
Chuck type	Spindle nose	Flange type	Ident. No.	Dimensions				Mounting bolts	Chuck type	Spindle nose	Flange type	Ident. No.	Dimensions		
QL..	Size			B	D	L1	L2	DIN 912 10.9	QL..	Size			D	L2	L ①
110	3	ZWF100-K3	on request	35	18	70,6	82,6	3 x M10 x 20	110	4	ZWS100-K4	on request	12	82,6	10
140	4	ZWF120-K4	on request	50	20	82,6	104,8	3 x M10 x 20	140	5	ZWS120-K5	on request	14	104,8	15
160	4	ZWF140-K4	74053 ■	50	20	85	104,8	3 x M10 x 20	160	5	ZWS140-K5	74035	14	104,8	15
	4	ZWF140-K4	74053 ■	50	18	104,8	85								
175								3 x M10 x 20	175	5	ZWS140-K5	74035	14	104,8	15
	4	ZWF140-K4	44757 ●	50	18	104,8	82,6								
200	5	ZWF170-K5	74056	60	24	133,4	104,8	4 x M10 x 25	200	6	ZWS170-K6	74036	15	133,4	15
250	6	ZWF220-K6	74060	80	28	171,4	133,4	4 x M12 x 30	250	8	ZWS220-K8	74038	17	171,4	15
	6	ZWF220-K6	74060	80	28	171,4	133,4	4 x M12 x 30		8	ZWS220-K8	74038	17	171,4	15
315									315						
	8	ZWF300-K8	74065	90	32	235	171,4	4 x M16 x 35			ZWS300-K11	74040	19	235	20
	8	ZWF300-K8	74065	90	32	235	171,4	4 x M16 x 35		11	ZWS300-K11	74040	19	235	20
400									400						
	11	ZWF380-K11	74068	120	35	330,2	235	6 x M20 x 40		15	ZWS380-K15	74042	21	330,2	20

■ DIN 55021 Pitch circle diameter 85 mm; ● DIN 55026 Pitch circle diameter 82,6 mm

① The length of the chuck mounting bolts must be increased by the amount "L" when using these adapter plates!

Order code example: 1 adapter flange ZWF 140 - K4, Ident. No. 44757; 1 adapter plate ZWS - K5, Ident. No. 74035

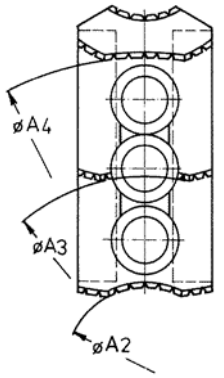
5.9.2 Hard Top Jaws HB:



qlk 33

Hard top jaws HB — **Dimensions HB**

Jaw	Nominal size				Ident.	Main dimensions																							Weight
type	A	B	C	D	No.:	A1	A2	A3	B1	B2	B3	B4	B5	G	J	J1	L	L1	M	ød1	ød2	ød3	ød4	ød5	ød6	ød7	ys	kg / jaw
HB 08	5,5	26	31	S08	168904	47	19,1	32,6	10	7,6	20	20	11	13,5	21,2	4	24,4	12,3	1/16"x90°	29	46	76	102	60	86	113	22	0,130
HB 09	6,5	32	39	S09	168905	57,5	23	40,3	12	8,4	24,4	24,4	12	16,5	26,5	4	25,4	14,9	1/16"x90°	36	57	94	128	73	106,5	139	25,4	0,230
HB 11 / 65	10	35	44	S11	38762/14	64,7	18,2	40,2	17	5	25	25	25	19	33	4	19	28	1/16"x90°	36	64	108	152	78	121,5	167	27,5	0,385
HB 11 / 70	10	35	44	S11	159895	70	40	62,87	17	5	28	26,5	26,5	19	33	4	19	37	1/16"x90°	10	76	121	-	93	137	-	29,6	0,51
HB 11	12	40	49	S11	71961	72,6	21,3	47,4	17	5	30	30,2	20,4	19	37	4	19	18	1/16"x90°	32	58	109	160	80	130	178	32,5	0,47
HB 11 / 110	12	40	49	S11	71416	80,8	23,3	52	17	5	30	30	20	19	37	4	19	26,2	1/16"x90°	28	60	118	174	80	135	190	34	0,56
HB 12	14	50	58	S12	71915	103,5	21,4	62,5	21	22	36	35,6	25,4	25	45	4	25	33,5	1/16"x90°	80	87	169	250	125	205	285	42,5	1,12
HB 23 / 18	18	60	75	S23	45702	139,7	37,2	88,6	25,5	40	39,4	41,3	28,6	31	57	5	31	53	3/32"x90°	80	195	298	400	149	250	350	56,5	2,52



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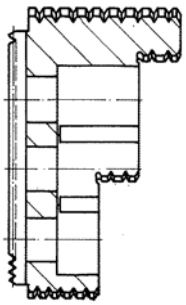

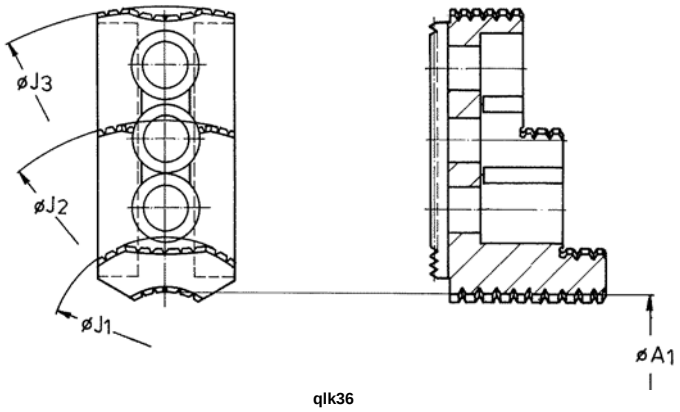

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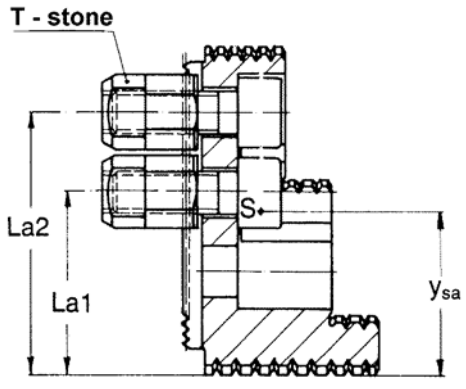
Chuck Type	Top jaw	Ident. No.	O. D. clamping				I. D. clamping			
			A1	A2	A3	A4	J1	J2	J3	J4
3QLC/K 160	HB11/65	D38762014000	22-56	47-81	92-125	135-170	65-97	108-141	153-187	172-206
3QLC/K 200	HB11	D1071961000	32-122	38-126	89-188	140-230	80-168	130-219	179-268	180-270
3QLC/K 250	HB12	D1071915000	24-120	49-155	131-238	212-361	75-165	147-246	255-326	253-313
3QLC/K 315	HB12	D1071915000	28-182	64-217	146-300	227-381	80-226	155-308	234-388	268-423
3QLC/K 400	HB12	D1071915000	90-256	109-291	191-373	273-455	120-300	199-381	279-462	314-497
3QLC/K 400	HB23/18	D4570200000	41-208	89-262	193-365	294-467	115-281	213-322	312-484	369-541

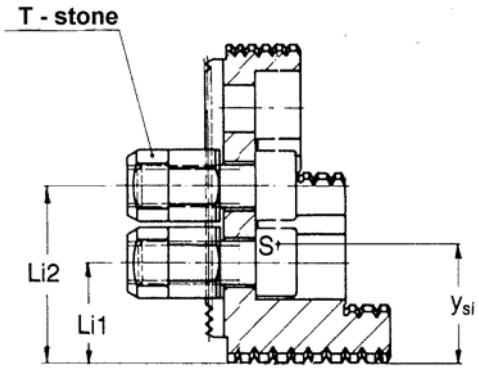
Chuck Type	Top jaw	Ident. No.	O. D. clamping				I. D. clamping			
			A1	A2	A3	A4	J1	J2	J3	J4
3QLC/K-KS 200	HB11/65	D38762014000	65-114	89-128	135-173	179-218	106-145	151-189	196-235	216-255
3QLC/K-KS 250	HB11	D1071961000	75-171	80-175	131-226	183-278	121-216	172-268	221-317	223-319
3QLC/K-KS 315	HB12	D1071915000	76-183	111-218	193-301	275-283	122-227	201-309	281-389	316-424
3QLC/K-KS 400	HB12	D1071915000	107-254	142-300	224-382	306-464	141-308	232-390	312-471	347-506

Chuck Type	Top jaw	Ident. No.	O. D. clamping				I. D. clamping			
			A1	A2	A3	A4	J1	J2	J3	J4
2QLC-LS 160	HB11/65	D38762014000	24-55	49-80	94-125	138-170	67-97	110-141	155-186	174-206
2QLC-LS 200	HB11	D1071961000	20-124	26-128	77-179	128-231	70-169	118-221	166-270	167-272
2QLC-LS 250	HB12	D1071915000	20-123	37-158	119-240	200-322	68-168	140-248	218-329	241-363
2QLC-LS 315	HB12	D1071915000	32-183	68-218	150-300	231-382	83-227	159-308	238-389	272-423
3QLC-LS 160	HB11/65	D38762014000	24-55	49-80	94-125	138-170	67-97	110-141	155-186	174-206
3QLC-LS 200	HB11	D1071961000	20-124	26-128	99-179	129-231	70-169	118-221	166-270	168-272
3QLC-LS 250	HB12	D1071915000	20-123	37-158	119-240	200-322	74-168	140-248	218-329	241-363
3QLC-LS 315	HB12	D1071915000	32-183	68-218	150-300	231-382	83-227	159-308	238-389	272-423



qlk 37

Center of gravity - external T - stones



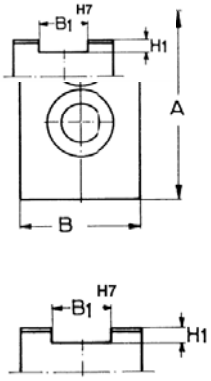
qlk 38

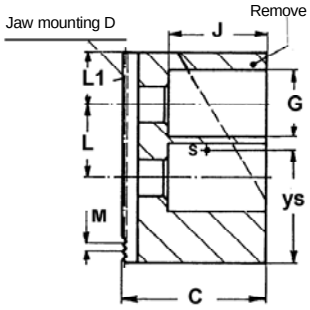
Center of gravity - internal T - stones

Jaw type	Ident. No.	corresponding T - nut	corresponding bolts	La_1	La_2	y_{sa}	Li_1	Li_2	y_{si}	Total weight kg/Jaw complete
HB 08	**168904**	**168908**	**M 8x25**	**23.2**	**36.7**	**23.6**	**12.3**	**25.8**	**20.5**	**0.195**
HB 09	**168905**	**168909**	**M 10x30**	**28.5**	**45**	**29.7**	**14.9**	**31.4**	**23.7**	**0.345**
HB 11 / 65	**38762/14**	**153400**	**M 12x30**	**28**	**47**	**29.5**	**28**	**47**	**29.5**	**0.540**
HB 11 / 70	**159895**	**153400**	**M 12x30**	**37**	**56**	**29.7**	**37**	**56**	**29.7**	**0.665**
HB 11	**71961**	**FN 231**	**M 12x30**	**37**	**56**	**36**	**18**	**37**	**32**	**0.625**
HB 11 / 110	**71416**	**FN 231**	**M 12x30**	**45.2**	**64.2**	**37**	**26.2**	**45.2**	**34.5**	**0.710**
HB 12	**71915**	**FN 232**	**M 16x35**	**58.5**	**83.5**	**48.5**	**33.5**	**58.5**	**42.5**	**1.416**
HB 23 / 18	**45702**	**FN 233**	**M 20x40**	**84**	**115**	**60**	**53**	**84**	**55**	**3.004**

5.9.3 Soft top jaws type WBL:

qlk 39 Soft top jaw WBL





Dimensions WBL **qlk 40**

Chuck type QLC/QLK	max. swing dia-meter	Jaw type	Nominal sizes A	B	C	D	Ident. No.	Main dimensions B1	G	H1	J	L	L1	M	Corres-ponding T-nut	Corres-Ponding bolt	ys	Weight Kg / pc. Without T-nut
110	150	WBL 08	47	25	22.5	S08	168906	10	15	4	12	14	6.5	1/16“x90^0	168894008	M8x22	21.5	0.145
140	190	WBL 09	60	30	25	S09	168907	12	18	4	14.5	20	8	1/16“x90^0	168752008	M10x25	26.5	0.250
160	235	WBL11/70	70	40	40	S11	49302	17	20	4	28	22	15	1/16“x90^0	153791	M12x30	31.5	0.675
175	235	WBL11/70	70	40	40	S11	49302	17	20	4	28	22	15	1/16“x90^0	153791	M12x30	31.5	0.675
200	270	WBL11/80	80	40	40	S11	49303	17	20	4	28	22	25	1/16“x90^0	FN 231	M12x30	35	0.890
250	345	WBL12/110	110	50	50	S11	49304	21	26	4	37	28	30	1/16“x90^0	FN 232	M16x35	51	1.70
315	406	WBL12/110	110	50	50	S12	49304	21	26	4	37	28	30	1/16“x90^0	FN 232	M16x35	51	1.70
400	525	WBL23/140	140	60	60	S23	49306	25.5	33	5	42	35	30	3/32“x90^0	FN 233	M20x40	58	3.12

5.9.4 Soft top jaws type WBLKL:

Chuck type QLC/QLK	Jaw type	Nominal sizes A	B	C	D	Ident. No.	B1	B2	C1	J	Weight / jaw kg
160	WBLKL11	60	40	50	S11	175384	17	23.5	32	12	0.9
200	WBLKL11	80	40	50	S11	175239	17	23.5	32	12	1.2
250	WBLKL12	110	50	70	S12	174913	21	29.5	40	18	2.9
315	WBLKL12	110	50	70	S12	174913	21	29.5	40	18	2.9
400	WBLKL12	110	50	70	S12	174913	21	29.5	40	18	2.9
400	WBLKL23	140	60	80	S23	175241	25.5	37	50	20	5.2

5.9.5 Roughing jaws type KBNKLA for O. D.:

kbnkla

Roughing jaws type KBNKLA with hard chucking claws SKA Ident. – No.. Clamping range und max. swing diameter

For chuck type ▼	174957	174958	174959	174960	174961	174962	175213	175214	175378	175379	175380
3 QLC / QLK 160	-	-	-	-	-	-	-	-	30.5 - 76.5/186	61-105/186	80-126/186
3 QLC / QLK 200	44-88/232	88-134/232	125-170/232	-	-	-	-	-	-	-	-
3 QLC / QLK 250	-	-	-	63-141/338	131-210/338	197-277/338	-	-	-	-	-
3 QLC / QLK 315	-	-	-	89-202/399	193-307/399	225-339/399	-	-	-	-	-
3 QLC / QLK 400	-	-	-	121-268/464	225-373/464	251-404/464	101-292/533	224-414/533	-	-	-

5.9.6 Roughing Jaws type KBNKLI for I. D.:

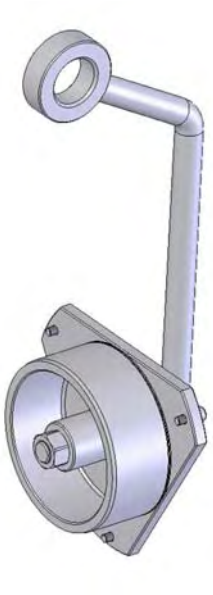
kbnkli

Roughing Jaws type KBNKLI with hard chucking claws SKI Ident. No., Clamping range und max. swing diameter

For Chuck type ▼	175215	175216	175217	175218	175219	175220	175221	175222	175223
3 QLC / QLK 160	-	-	-	-	-	-	-	-	-
3 QLC / QLK 200	165-210/232	121-166/232	86-130/232	-	-	-	-	-	-
3 QLC / QLK 250	-	-	-	259-373/338	161-241/338	96-175/338	-	-	-
3 QLC / QLK 315	-	-	-	259-373/399	-	123-236/399	154-203/399	-	-
3 QLC / QLK 400	-	-	-	291-439/464	-	155-303/464	186-334/464	294-486/533	172-363/533

For Chuck type ▼	175381	175382	176596
3 QLC / QLK 160	125-169/186	97-141/186	76-120/186
3 QLC / QLK 200	-	-	-
3 QLC / QLK 250	-	-	-
3 QLC / QLK 315	-	-	-
3 QLC / QLK 400	-	-	-

5.9.7 Mounting Hooks for Power Chucks type 3 QLC / 3 QLK:



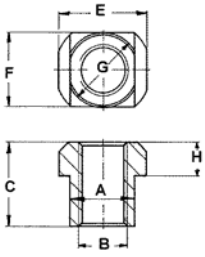
With the help of the mounting hook (sizes 3QLC 250 and above), the power chucks can be assembled and disassembled easily and accident-free. The device is equipped with a rotary bushing, which is screwed together with the chuck. Thus, the chuck can easily be pulled on and off the thread of the draw tube.

Example of Order: 1 Mounting hook for chuck type 3QLC … Ident. No.: ….

5.9.8 T-Nuts:

qlk 47

T - Nut nach FN

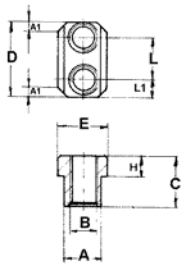


qlk 48

Dimensions

qlk 49

T - Nut NSTU



qlk 50

Dimensions

T - nut	Nominal dimensions			Ident.	Main dimensions				For jaw size	corresponding socket	Weight
type	**A**	**B**	**C**	**No.**	**E**	**F**	**G**	**H**		head screw DIN 912	kg / nut
FN 231	17	M 12	23	71376/000	22,5	19	19	9	HB11, HB11/110, WBL11/80	M 12 x 30	0,038
FN 232	21	M 16	27	71378/000	28,5	23,5	23,5	11	HB12, WBL12	M 16 x 35	0,064
FN 233	25,5	M 20	29	71380/000	36	27,5	27,5	11	HB23/140, WBL23	M 20 x 40	0,097

T - nut	Nominal dimensions				Ident.	Main dimensions					For jaw size	corresponding socket	Weight
type	**A**	**B**	**C**	**D**	**No.**	**E**	**L**	**L1**	**A1**	**H**		head screw DIN 912	kg / nut
NSTU	10	M8	19	25	168908	15	13,5	5,5	4,5x45^0	5,5	HB 08	M8 x 25	0,035
NSTU	12	M10	19,5	33	168909	19	16,5	8	7x45^0	8	HB 09	M10 x 30	0,060
NSTU	10	M8	18	26	168894008	15	14	5,5	4,5x45^0	5,5	WBL 08	M8 x 22	0,038
NSTU	12	M10	18,5	36	168752008	17,5	20	8	6x45^0	7	WBL 09	M10 x 25	0,065
NSTU	17	M12	23	34	153400	22,5	19	7,5	4x45^0	9	HB11/65, HB11/70	M12 x 30	0,119
NSTU	17	M12	23	37	153791	22,5	22	7,5	4x45^0	9	WBL11/70	M12 x 30	0,119

5.9.9 Adjustment Plates for Power Chucks:

qlk 51

With power - operated chucks, the conventional link between the master jaws and the top jaws is the saw - tooth - serrations.
In order to guarantee a perfect function of this link, and to avoid losses in chucking accuracy, and time - consuming work in interchanging jaws, the saw - tooth - serrations must be kept in good condition.
Flash - edged or damaged serrations, dirt accumulation or wear and tear impair the mounting and the seating of the top jaws.

The employment of adjustment plates achieves saving on setting times as well as on the jaws.
It is to be noted that the adjustment plate contains the corresponding serrations of the jaws.
Supply of the adjustment plates is undertaken in a wooden storage case.

Type	Construction
ARP 16	with 1/16" serrations both sides
Ident. No.: 75331	
ARP 32	with 3/32" serrations both sides
Ident. No.: 75333	
ARP 1632	with 1/16" and 3/32" serrations each side
Ident. No.: 75332	

By means of simple adjustment of the mounting serrations through the employment of grinding paste, the serrations can be at all times reworked.
This brief and simple rework on the available chuck jaws increase their repetitive circular form accuracy and prolongs the working life.

5.10 Hydraulic Actuating Cylinder:

qlk 52

qlk 53

6.1 General:

The chuck transmits the spindle torque to the work piece by means of the frictional grip of the jaws (master jaws and top jaws). The force applying the jaws to the work piece is called the gripping force. The gripping force is affected, directly or indirectly, by various factors:

* The variation in the coefficient of friction between work piece and gripping jaw.
* The ratio between gripping diameter and diameter being machined.
* The magnitude of the cutting force applied by the tool.
* The overhang of the gripping jaws at the gripping point.
* The reduction in the gripping force due to the centrifugal force acting on the jaws in the case of external chucking.

Rotating work holding equipment is subject to centrifugal forces that increase with the square of the speed of rotation. The centrifugal force opposes the gripping force in the case of external chucking and increases it in the case of internal chucking. The residual dynamic gripping force at high spindle speeds depends on the static gripping force, the mass of the chuck jaws and the radius of their center of gravity

6.2 Gripping Force:

The max. static gripping force F_{spmax} quoted in the table in section 1.4.1 or 1.4.2 is only achieved under favorable conditions. These are:

- A well maintained power chuck.
- Optimum lubrication of all sliding surfaces.
- Application of maximum actuating force.
- Short overhang of top jaws.
- Spindle static n = 0 (or low spindle speed).

The static gripping force is measured with a static gripping force meter, e.g. SKM 1200 / 1500, see publication 930.10.02E. The figure given in Section 1.4.1 or 1.4.2, page 5 for Fspmax can be used for stress calculations, e.g. for the design of special jaws.

6.2.1 Dynamic Gripping Force Fsp:

The dynamic gripping force ***Fsp*** is the total force (daN) supplied ***by all*** of the jaws under dynamic conditions and represents the minimum value of the available gripping force under normal operating conditions. Implied are:

- well maintained condition and
- adequate lubrication of all sliding surfaces

of the power chuck.

In really good condition, power chucks will exceed the calculated value of Fsp. The static gripping force is a function of the chuck design data, but does not solely determine the gripping force under dynamic conditions. The gripping jaws appreciably effect the performances of a chuck. They have to be selected to suit the specific application.

The gripping jaws effect the dynamic gripping force and hence the maximum permissible spindle speed. The centrifugal force of the jaws of power chucks can have such a significant effect on the gripping force that this effect has to be taken into consideration at higher spindle speeds. The centrifugal force generated by the master jaws and top jaws which reduces the gripping force of the chuck is countered in Type 3 QLC / 3 QLC - KS power chucks by counterbalancing weights and levers so that the gripping force acting on the work piece remains practically constant.

The gripping force to be applied at standstill, Fspo, must be correspondingly high so that the gripping force required for cutting is still available at the selected spindle speed. The effect of the counterbalancing weights actuated by the levers is taken into consideration for Type 3 QLC / 3 QLC - KS power chucks by the chuck constant C_4.

The dynamic gripping force and the actual loss of gripping force ### Fsp for the Type 3 QLC power chuck can be calculated from the following formulae: For the calculation of the operational gripping power and actually occurring gripping power loss ΔFsp, the following calculation formula applies to the power-operated chucks type 3 QLC and 3 QLC - KS, as well as 3 QLK and 3 QLK - KS (however without formula ❶):

$$\mathbf{Fsp = Fspo \pm \Delta Fsp \pm C4 \times n^2} \qquad ❶$$

whereby the available static gripping force Fspo (gripping force at spindle speed n = 0) is:

$$\mathbf{Fspo} = \frac{C1}{C2 + a} \times \mathbf{Fax} \qquad ❷$$

and the loss of gripping force ### Fsp due to the jaws:

$$\mathbf{\Delta Fsp = \pm 0{,}0008 \times (C_3 + Ma) \times n^2} \qquad ❸$$

+ for internal chucking
- for external chucking

and the influence of the lever-actuated counterbalancing weights:

$$\mathbf{\pm C4 \times n^2} \qquad ❹$$

- for internal chucking
+ for external chucking

The dynamic gripping force Fsp is thus:

A: Power – operated chucks type 3 QLK and 3 QLK - KS

$$\mathbf{Fsp} = \frac{C1}{C2 + a} \times \mathbf{Fax \pm 0{,}0008 \times (C_3 + Ma) \times n^2} \qquad ❺a$$

B: Power – operated chucks type 3 QLC and 3 QLC - KS

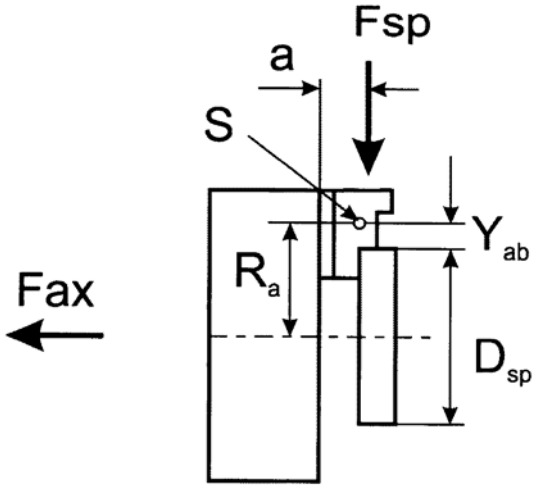
$$\mathbf{Fsp} = \frac{C1}{C2 + a} \times \mathbf{Fax \pm 0{,}0008 \times (C_3 + Ma) \times n^2 \pm C4 \times n^2} \qquad ❺b$$

The total centrifugal moment can be calculated as:

$$\mathbf{Ma} = \frac{\left(\frac{Dsp}{2} \pm Y_{AB}\right) x\ G\ x\ i}{1000} \qquad ❻$$

where:

Fsp = Dynamic gripping force [daN], the total dynamic gripping force applied by the jaws
C1, C2, C3, C4 = Chuck constants
Fax = Maximum actuating force [daN]
n = Spindle speed [rpm]
Ma = Total centrifugal moment of the jaws [kgm]
Dsp = Gripping diameter [mm]
Y_{AB} = Distance of center of gravity of top jaw from gripping diameter [mm]
a = Jaw overhang [mm]
i = Number of jaws
G = Mass of each jaw [kg]
Ra = Distance of centre of gravity of jaw from center of chuck [mm]

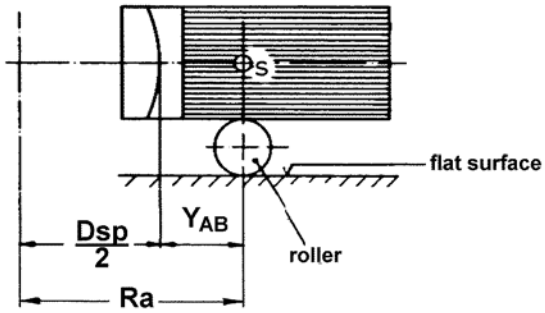


qlk 54

For each application it is necessary to check that the available dynamic gripping force is adequate.
In the case of gripping jaws made from soft top jaws Type WBL or other special jaws, the actual centrifugal moment has to be determined from the weight (***by weighing)*** and ***the distance from the center of gravity Ra*** from the center of the chuck, see adjacent drawing.

See Figure qlk 55 ➡

Determination of the center of gravity



qlk 55

The weight of soft gripping jaws for high spindle speeds must be reduced as much as possible and the overhang of the jaws should be kept short.

The weight and position of the center of gravity of the finished jaws have to be determined, whereupon it must be checked that the residual dynamic gripping force of the power chuck is adequate for the intended machining operation, see formula 5 page 30!

If the calculated dynamic gripping force Fsp proves to be inadequate for the machining operation, then the spindle speed (see formula 8, page 30) or the weight of top jaws (see formula 7, page 30) must be reduced.

The permissible spindle speed for the power chuck equipped with appropriate jaws or the variation of gripping force with speed has to be calculated for each application.

6.3 Safety Instructions:

* ***Check that the gripping force of the chuck is adequate for the machining operation under the chosen operating conditions.***
* ***Maintain the chuck properly to attain the calculated values of the gripping force (the actual gripping force can be higher in the case of a freshly lubricated chuck).***
* ***Use light top jaws at high spindle speeds.***
* ***During rotation of the power chuck, use a dynamic gripping force meter, e.g. FORSAVE D, to determine the dynamic gripping force.***
* ***Determine the loss of gripping force under dynamic conditions at every changeover to ensure that the gripping force is adequate for the desired operation.***
* ***If the gripping force falls below the specified value, lubricate the power chuck. See also Section 9.2!***
* ***Operating machinery at high spindle speeds requires use of adequate interlocked guards for protection. Do not open guards during machine operation!***

6.4 Specimen Calculations:

Example 1:

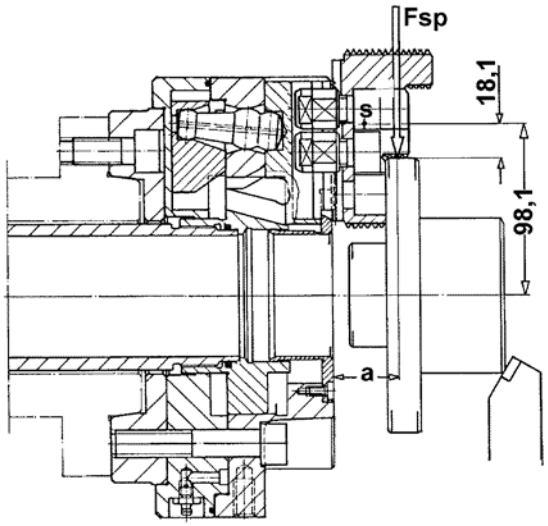
Type of power chuck		: 3 QLC 250
Max. actuating force	Fax	: 6000 daN
Jaws		: HB 12
Gripping diameter	Dsp	: 160 mm
Spindle speed	n	: 3500 rpm
Chuck constant	C 1	: 916
Chuck constant	C 2	: 398
Chuck constant	C 3	: 0,20
Chuck constant	C 4	: 0,00032
Jaw overhang	a	: 39 mm
Number of jaws	i	: 3

The static gripping force (n = 0) and the dynamic gripping force (n = 3500 rpm) has to be found.

Dsp = 160mm

Y_{AB} = 18,1mm

Jaw weight G = 1,42 kg / jaw



qlk 56

Radius of the center of gravity Ra:

$$Ra = \frac{Dsp}{2} + Y_{AB} = \frac{160}{2} + 18{,}1 = 98{,}1\text{mm}$$

Total moment Ma of jaws about center of chuck:

$$Ma = \frac{Ra \times G \times i}{1000} = \frac{98{,}1 \times 1{,}42 \times 3}{1000} = 0{,}418\ \text{kgm}$$

Static gripping force (n = 0):

$$Fspo = \frac{C1}{C2 + a} \times Fax$$

$$Fspo = \frac{916}{398 + 39} \times 6000 = 12576\text{daN}$$

Dynamic gripping force (n = 3500 rpm) :

$$Fsp = Fspo - 0{,}0008\ (c3 + Ma) \times n^2 + c4 \times n^2$$

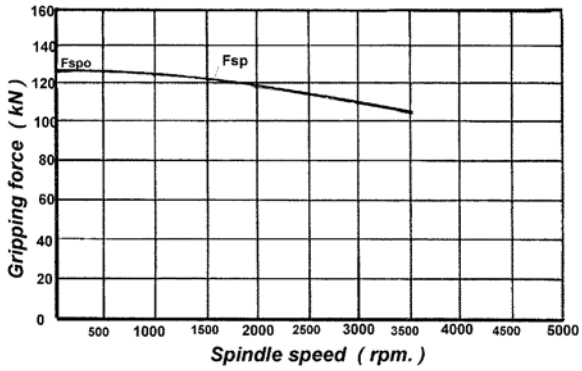
$$Fsp = 12576 - 0{,}0008\ (0.20+0{,}418) \times 3500^2 + 0{,}00032 \times 3500^2$$

$$Fsp = 12576 - 6056 + 3920$$

$$Fsp = 10440\ \text{daN}$$

Example: Material 42 CrMo 4V

la = 60mm Dsp = 160mm v = 250m / min
a = 10mm µsp = 0,35 nz = 2650 rpm
s = 0,63 Sz = 2 Fspz = 2000 daN
dz = 30mm Ks = 1919 N / mm²



qlk 57

Example 2:

Type of power chuck		: 3 QLC 250
Max. actuating force	Fax	: 6000 daN
Required gripping force	Fspz	
at operating spindle speed		: 4900 daN
Jaws		: Special jaw assembly
Gripping diameter	Dsp	: 170 mm
Spindle speed	n	: 3800 min^{-1}
Chuck constant	C 1	: 916
Chuck constant	C 2	: 398
Chuck constant	C 3	: 0,208
Chuck constant	C 4	: 0,00032
Jaw overhang	a	: 78 mm
Number of jaws	i	: 3

Weight G of special jaw = 3,2 kg / jaw
Center of gravity Rs from center of chuck: 110 mm

Total moment Ma of jaws about center of chuck:

$$Ma = \frac{Rs \; x \; G \; x \; i}{1000}$$

$$Ma = \frac{110 \; x \; 3{,}2 \; x \; 3}{1000} = 1{,}056 \text{ kgm}$$

Static gripping force (n = 0):

$$Fspo = \frac{C1}{C2 + a} \; x \; Fax$$

$$Fspo = \frac{916}{398 + 78} \; x \; 6000 = 11546 \text{daN}$$

Dynamic gripping force (n = 3800 rpm):

$$Fsp = Fspo - 0{,}0008 \; (c3 + Ma) \; x \; n^2 + c4 \; x \; n^2$$

$$Fsp = 11546 - 0{,}0008 x (0{,}2 + 1{,}056) x 3800^2 + 0{,}00032 \; x \; 3800^2$$

$$Fsp = 11546 - 14509 + 4621$$

$$Fsp = 1658 \text{ daN}$$

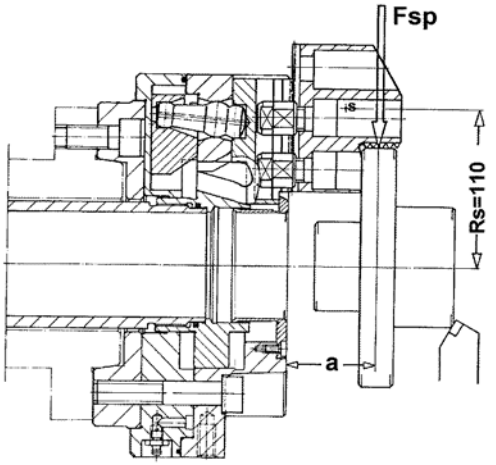
Calculation of permissible values:

$$Ma_{zul} = \frac{Fspo - Fspz + c4 \; x \; n^2}{0{,}0008 \; x \; n^2} \qquad (7)$$

$$Ma_{zul} = \frac{11546 - 4900 + 4621}{0{,}0008 \; x \; 3800^2}$$

$$Ma_{zul} = 0{,}975 \text{ kgm}$$

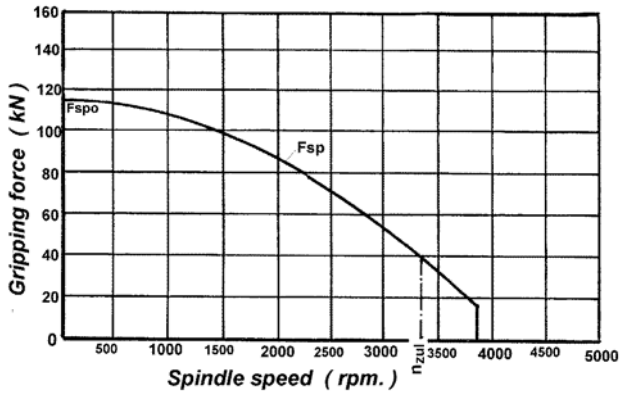
As the permissible moment Ma_{zul} of the special jaw assembly is exceeded, the maximum permissible spindle speed must be calculated from the formula below.



qlk 58

Example: Material 42 CrMo 4V

la = 60mm Dsp = 160mm v = 250m / min
a = 2mm μsp = 0,35 nz = 3800 rpm
s = 0,25 Sz = 2 Fspz = 4900 daN
dz = 30mm Ks = 2249 N / mm²



qlk 59

$$n_{zul} = \sqrt{\frac{Fspo - Fspz + c4 \; x \; n^2}{0{,}0008 \; x \; Mc}} \qquad (8)$$

$$Mc = Ma + C_3 \qquad (9)$$

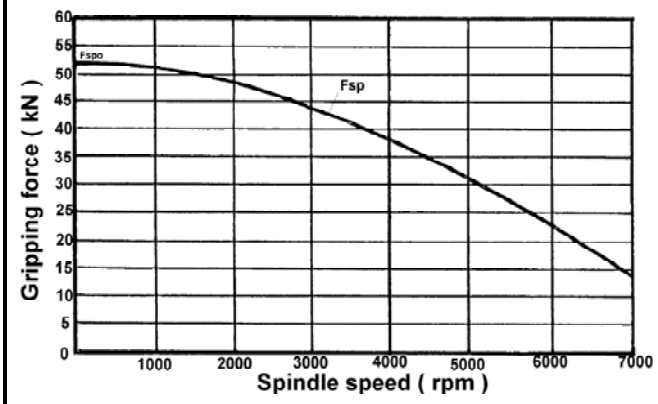
$$Mc = 1{,}056 + 0{,}20 = 1{,}256 \text{ kgm}$$

$$n_{zul} = \sqrt{\frac{11546 - 4900 + 4621}{0{,}0008 \; x \; 1{,}256}}$$

$$n_{zul} = 3348 \text{ rpm}$$

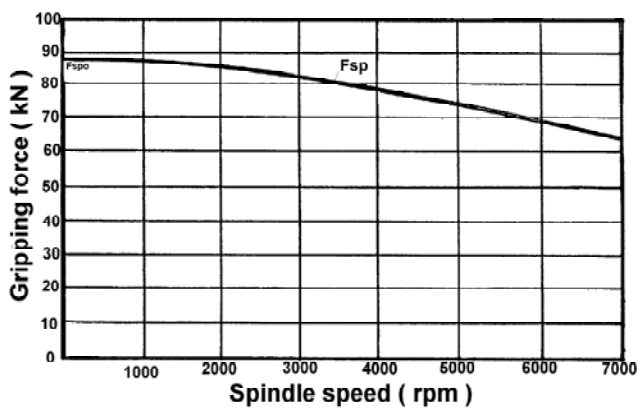
The working speed must be reduced to 3348 rpm in order to obtain sufficient gripping power during machining operations!

6.5 Gripping Force Curve:



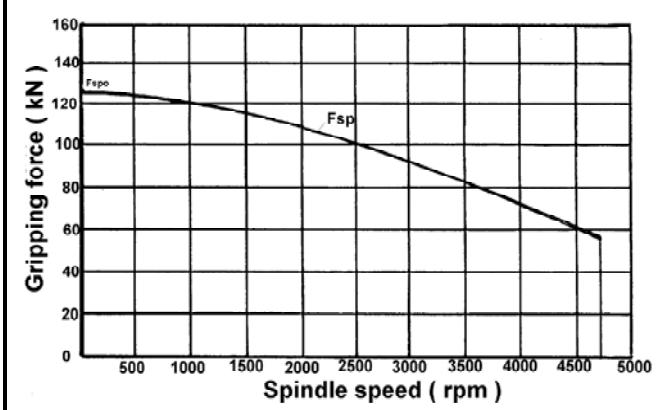
QLC 49

Type 3 QLC 160 power chuck
with top jaws HB 11 / 70 and A4 step = 150mm



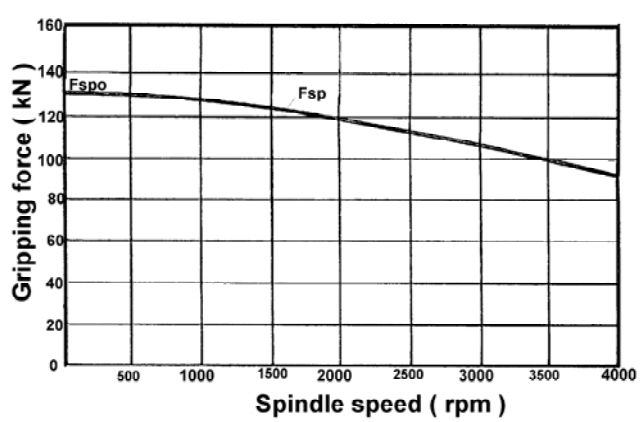
QLC 50

Type 3 QLC 200 power chuck
with top jaws HB 11and A4 step = 231mm



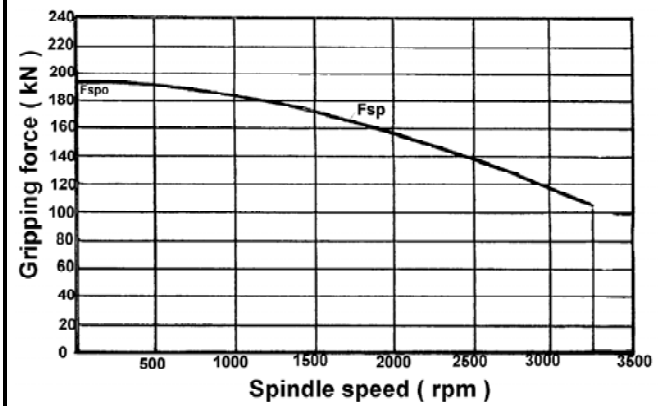
QLC 51

Type 3 QLC 250 power chuck
with top jaws HB 12 and A4 step = 308mm



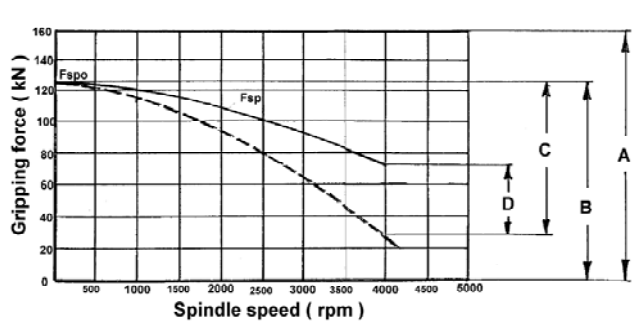
QLC 52

Type 3 QLC 315 power chuck
with top jaws HB 12 and A4 step = 371mm



QLC 53

Type 3 QLC 400 power chuck
with top jaws HB 23 / 18 and A4 step = 456mm



A = Max. gripping force
B = Static gripping force
C = Loss of gripping force
D = Centrifugal force compensation

QLC 54

Gripping force curve
Type 3 QLC 250 power chuck

The adjacent graphs relate to the following conditions: gripping with the A4 step of the hard top jaws, jaws flush with outer diameter of chuck, application of max. gripping diameter and external chucking.

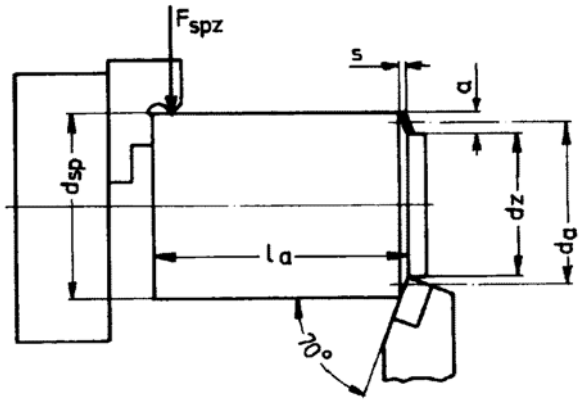
6.6 Determination of the Gripping Force Fspz Required for a Specific Application:

The gripping force required for each application has to be determined. If this gripping force cannot be provided by the chuck with the factors of safety given by the guidelines of the German Association of Engineers VDI 3106, then the permissible spindle speed or the permissible chip cross- section has to be determined.

Herewith an example:

A solid steel workpiece (i.e. without bore) has to be machined. The gripping diameter dsp=60mm, the turning diameter dz =60mm and the cut requires a tangential cutting force Fs=1200daN at a spindle speed of 2760rpm. Soft jaws turned to the gripping diameter are used to avoid damaging the workpiece. This gives a gripping coefficient of µsp=0,1.

A safety factor Sz is allowed for the cutting data. The reduction in gripping force ΔFsp amounts to 2000 daN.



qlk 72

For this example therefore: when taking into account the reduction in gripping force ΔFsp, the minimum static gripping force required is:

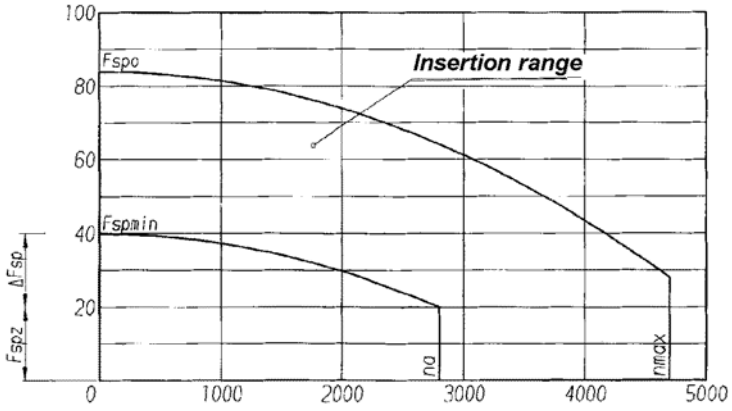
Fsp min=Fspz+ ΔFsp ***=2000+2000=4000daN.***

The " feed thrust Fv " and the " passive force Fp " components do not enter into this formula.They are taken into account in the safety factor Sz.The main variable affecting the gripping force is the tangential cutting force Fs, which can be determined from the chip cross - section and the specific cutting force:

Fs = a x s x ks

The gripping force necessary for the machining operation is given by:

$$Fspz = \frac{Fs \times dz}{\mu sp \times dsp} = \frac{a \times s \times ks \times dz}{\mu sp \times dsp} \quad 1)$$

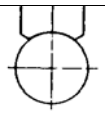
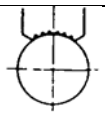
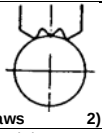


qlk 73

Where:

la = Overhang of workpiece
a = Depth of cut
s = Feed
Ks = Specific cutting force
dz = Machining diameter
dsp = Gripping diameter
µsp = Gripping coefficient
Fs = Tangential cutting force
(i.e. primary cutting force)

The cutting forces increase as the cutting tool becomes dull. An additional factor of safety Sz=2 is recommended to allow for all uncertainties in the machining process.

Gripping coefficient µsp				
Type of jaws	Workpiece material	Finish of gripped workpiece surface ▼▼▼	▼▼, ▼	~
 Finishing jaws	Steel	0,1	0,15	- 1)
	Al	0,1	0,14	-
	Brass	0,09	0,14	-
	Cast iron	0,08	0,12	-
 Block pattern jaws 2)	Steel	0,12	0,20	0,32
	Al	0,11	0,19	0,30
	Brass	0,11	0,18	0,27
	Cast iron	0,10	0,16	0,26
 Roughing jaws 2)	Steel	0,25	0,35	0,50
	Al	0,24	0,33	0,48
	Brass	0,23	0,32	0,45
	Cast iron	0,20	0,28	0,40

1) Avoid, smooth jaws are only suitable for gripping machined surfaces.
2) Identations will be produced on the workpiece. Their depth depends on the gripping force.

The gripping force must be increased to allow for the tilting effect caused by the overhang la.
The tilting force need not be taken into account if the work piece is supported by a tailstock or if the work piece does not project beyond the jaws by more than 0,5 x dsp.
The gripping force Fspz required can be found approximately from the formula:

$$Fspz = Sz \times \frac{a \times s \times Ks \times dz}{\mu sp \times dsp} \times (1 + 4 \times \frac{la}{dsp})$$

Tilting factor:

$$(1 + 4 \times \frac{la}{dsp})$$

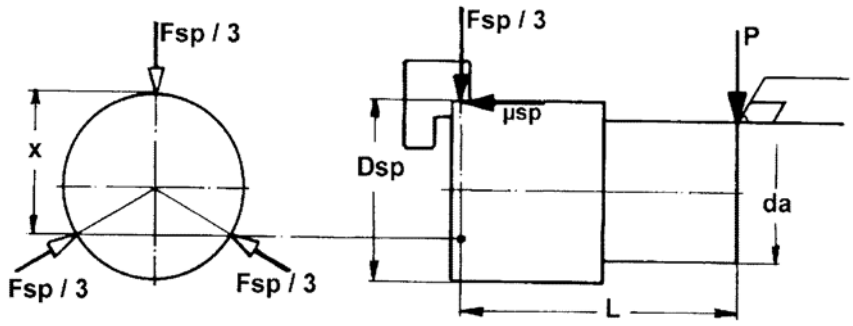
This equation cannot be applied to stepped workpieces whose gripping diameter is appreciably smaller than the machining diameter.

1) The „feed thrust Fv" and „passive thrust Fp" components are not entered into this formula. They are taken into account with the safety factor, Sz.

Specific cutting force Ks (N / mm²)at feed s and tool cutting edge angle of 70⁰ (source: König and Essel)

Material No.	Material	Tensile strenght	at v=	Feed s (mm)					
		N / mm²	m/min	0,16	0,25	0,40	0,63	1,00	1,60
1.0401	C15G	373	100	2482	2189	1918	1687	1481	1298
1.0501	C35G	490	100	2577	2237	1927	1668	1441	1241
1.0532	St50-2	559	100	2561	2248	1959	1716	1499	1307
1.0632	St70-2	824	100	2877	2492	2142	1851	1595	1371
1.0711	9S20	373	100	1609	1553	1497	1444	1393	1342
1.1181	Ck35V	622	100	2574	2266	1982	1741	1527	1335
1.1191	Ck45V	765	100	2524	2253	1999	1781	1584	1405
1.1221	Ck60V	873	100	2548	2296	2058	1851	1662	1490
1.3505	100Cr6G	624	100	2904	2558	2239	1968	1726	1510
1.4113	X6CrMo17G	505	100	2378	2107	1854	1638	1445	1272
1.4305	X12CrNiS18.8	638	350	2596	2192	1835	1545	1296	1085
1.5752	14NiCr14BF	658	100	2249	2012	1790	1598	1424	1266
1.5919	15CrNi6	510	100	2271	2051	1842	1661	1494	1342
1.5920	18CrNi8G	578	100	2360	2095	1847	1636	1446	1276
1.7131	16MnCr5G	510	100	2641	2244	1891	1603	1354	1141
1.7147	20MnCr5G	568	100	2452	2174	1915	1694	1495	1317
1.7225	42CrMo4V	1138	100	2428	2249	2075	1919	1773	1635
1.8515	31CrMo12V	1060	100	2678	2419	2173	1960	1764	1585
1.8519	31CrMoV9V	931	100	2507	2265	2036	1836	1653	1485
3.1354	AlCuMg2	15Hv10	200	953	849	752	668	593	525
--	G-AlMg4SiMn	260	200	829	729	636	558	--	--
3.3561.01	G-AlMg5	75HV10	200	886	797	713	641	574	514
0.6020	GG-20	178HB	200	1687	1444	1227	1047	892	757
0.6030	GG-30	206HB	100	1919	1595	1313	1088	899	740
0.7050	GGG 50	194HB	200	1840	1606	1392	1213	1053	913

6.7 Permissible Overhang Length:



qlk 77

Where:

X = 0,75 Dsp

Fsp = Total gripping force
= Σ jaw forces

Simple safety against the work piece flying out of the chuck from the cutting force component P is ensured when the friction force μsp x Fsp / 3 and P are in equilibrium.

1) P x L = μsp x Fsp / 3 x X = 0,25 x Fsp x Dsp x μsp

The gripping force required to prevent tilting out of the chuck: $Fsp_1 = P \times \frac{4 \times L}{Dsp \times \mu sp}$

$Imax = Fsp \times \frac{Dsp \times \mu sp}{4 \times L}$

The gripping force required for driving: $Fsp_2 = P \times \frac{da}{Dsp \times \mu sp}$

The gripping force required: $Fsp = S \times \frac{P}{\mu sp} \times \frac{(da + 4 \times L)}{Dsp}$

S = Safety factor

Permissible overhang length with given gripping force: $L = 0{,}25 \times (Dsp \times \frac{Fsp \times \mu sp}{P \times S} - da)$

7.1 Work to be Carried out Before Mounting of the Chuck:

7.1.1 Checking the Spindle Nose for Mounting of the Adapter Flange:

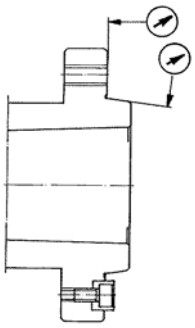
The mounting surfaces on the spindle nose have to be checked with a dial gauge to ensure that high accuracy in respect of radial run-out of the power chuck is achieved.

Radial run-out of register: max. 0.005 mm.

Axial run-out of locating face: max. 0.005 mm.

The flatness of the face has to be checked with a straight-edge.

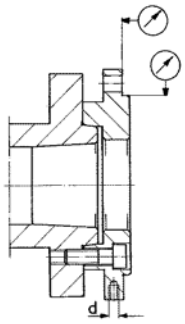
The surface of the face has to be clean and the holes in it must be deburred.



qlk 78

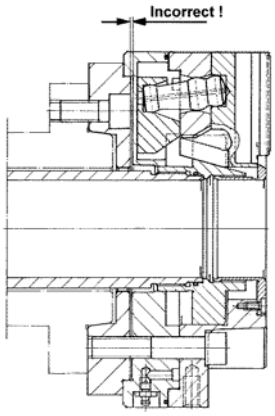
7.1.2 Checking of the Fitted Mounting Flange:

- The power chuck has a central register. An appropriate mounting flange (see also Section 5.8.1) is attached to the spindle nose of the lathe for direct mounting of the power chuck on the machine spindle with short taper to DIN, ISO and ASA standards.
- If the adapter flange is manufactured by the user, it must be finish-turned on the machine spindle and balanced before the power chuck is mounted.



qlk 79

- Remove dirt or chips from machine spindle. Clean the centering collar and locating face of the adapter flange.
- After fitting of the mounting flange, the radial and axial run-out must be checked as described in Section 7.1.1!
- Check the flatness of the face with a straightedge.
- The tapped holes for the mounting bolts must be countersunk, so that the thread is not stripped.
- The mounting surface for the power chuck must not be concave or convex.
- ***The flange must be in contact over the whole surface!***



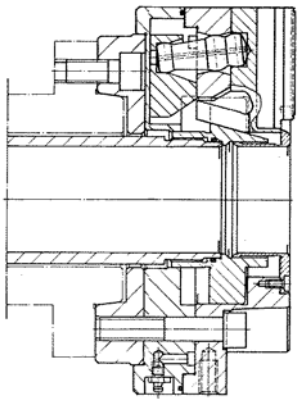
qlk 80

CAUTION !

Do not allow the outer rim of the power chuck to rest on the mounting flange!

- Threaded bores must be drilled in the mounting flange for attachment of balancing weights which, depending on the size of the power chuck to be mounted, should be between M8 and M16 with a thread depth of max. 2d.
- The outer diameter of the mounting flange must be relieved so that it is approx. 1mm less than the register diameter for the power chuck.

See Figure qlk 81 ➡



Correct!

qlk 81

7.1.3 Fitting and Alignment of the Draw Tube:

The actuating cylinder and the power chuck are connected by a draw tube in the case of partial open center chucking with an open center chuck, for example for bar work. Particular attention has to be paid to the following points when fitting a draw tube:

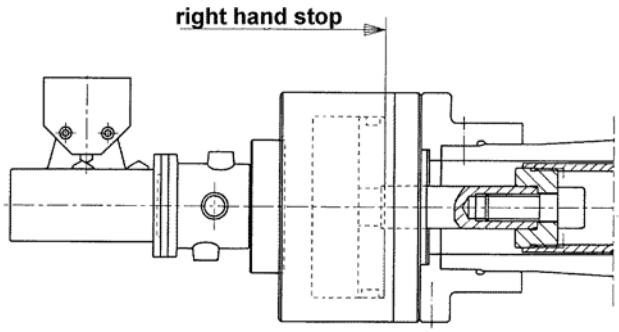
- The draw tube dimensions have to be adequate for the loads imposed.
- Manufacture the draw tube from a material with a tensile strength of at least 45kp / mm^2, e.g. St 35 BK.
- The draw tube must be turned all over to avoid imbalance.
- The draw tube has to be ***balanced dynamically*** in two planes, so that the residual imbalance in each plane is not equivalent to more than a mass of ***5g*** at the outer diameter.

CAUTION !

Make sure that the draw tube is in alignment! The draw tube is in alignment when both threads are concentric!

Skew threads are not permissible!

The extreme r.h. position of the chuck piston of the chuck must always be determined by the actuating cylinder and not by the power chuck itself. The piston of the actuating cylinder therefore has to be moved into the extreme r.h. position before mounting the power chuck!



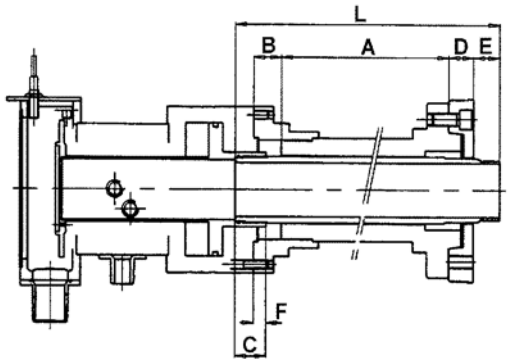
qlk 82

A : Draw tube for open center chucking

Screw the draw tube into the thread of the actuating cylinder.

The length of the draw tube has to be arranged so that the setting dimension " E " is obtained in the position shown.

Secure the draw tube in the piston rod of the actuating cylinder with *Loctite 242.* Dimension „ E " is the measured distance between the contact surface of the power chuck and the back edge of the register diameter in the chuck piston (chuck piston of the power chuck in the right - hand position).



Draw tube length L = A + B + C + D +E - F

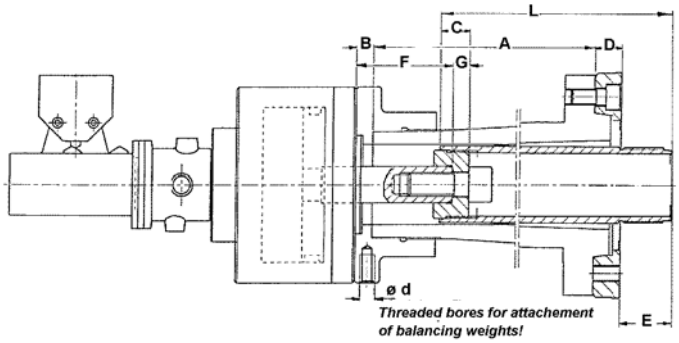
qlk 83

B : Draw tube for partial open center chucking

Bolt an adapter with mounting recess to the end of the actuating cylinder piston rod and screw the draw tube into the thread of the adaptor.

The length of the draw tube has to be arranged so that the setting dimension " E " is obtained in the position shown.

Secure the draw tube on the adapter by means of *Loctite 290!*



Draw tube length L = A + B + C + D + E - (F + G)

qlk 84

Chuck type ➡	3QLK110	3QLK140	3QLC/3QLK160	3QLC/3QLK 175	3QLC/3QLK 200	3QLC/3QLK 250	3QLC/3QLK 315	3QLC/3QLK 400
Setting dimensions „ E " + 0,2 mm	39,5	43,6	47	49,1	50,6	53,6	53,6	79

Chuck type ➡	3QLCKS/3QLKKS 200 - 54	3QLCKS/3QLKKS 250 - 72	3QLCKS/3QLKKS 315 - 88	3QLCKS/3QLKKS 400 - 126
Setting dimensions „ E " + 0,2 mm	49,1	50,6	53,6	53,6

7.1.4 Balancing of Rotating Parts:

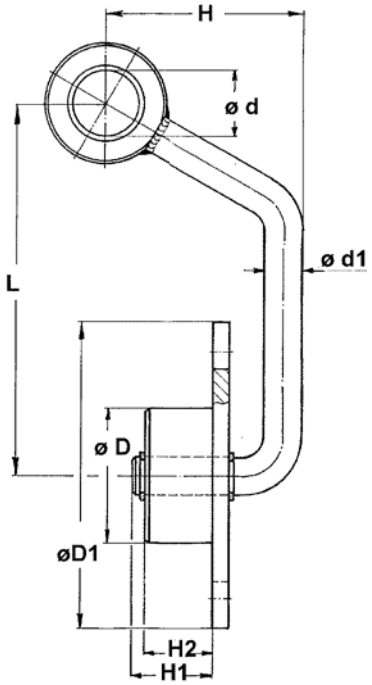
The high spindle speeds necessitate accurate balancing of the rotating parts. An imbalance in the chuck body will cause free centrifugal forces when the spindle rotates; these centrifigal forces can cause vibrations which have a negative effect on the product quality.
Since the centrifugal forces per unit of weight increase with the square of the spindle speed, the demands on the precision of balancing increase with increasing speed of the parts. For this reason, the lathe spindle, the actuating cylinder, the power chuck, the cylinder flange, the chuck mounting flange or adapter plate and the draw tube must be balanced.

The power chuck is balanced dynamically, whereby any imbalance is corrected by screwing balancing weights into the chuck body and the balance quality Q = 2.5 in accordance with VDI 2060 is observed.

Cylinder flanges or chuck mounting flanges which FORKARDT will supply and the draw tube are also balanced.

The actuating cylinder is therefore balanced dynamically in two planes, whereby any imbalance is corrected by screwing balancing weights into the cover and the cylinder body of the actuating cylinder and the balance quality Q =2.5 in accordance with VDI 2060 is observed.

7.2 Mounting of the Power Chuck:



qlk 85

Remove any chips from the machine spindle before mounting the power chuck. Clean the register and locating faces of the adapter flange!

CAUTION !

If a mobile hoist which can be moved in all directions is available for mounting the power chuck, observe the following points: The working load of the hoist must be at least the weight of the power chuck!
For weights of the power chucks, see Section 1.4.1 or 1.4.2, page 5 and page 6.

Mounting of the power-operated chuck on the machine spindle takes place with the mounting hook from chuck size 3QLC 250 / 3QLK 250 and 3QLC - KS250 / 3QLK – KS 250 (separate order).

The mounting hook has a rotating body. The socket head screws are slipped through the milled holes of the mounting body and screwed in the T - nuts of the master jaws. This securely fastens the power chuck axially.

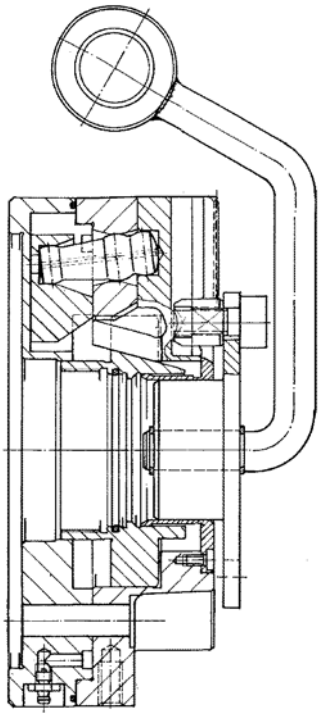
With the help of the mounting hook, power chucks (sizes 3 QLC 250 and above), with the draw tube mounted on the chuck piston, can easily be screwed in the thread of the cylinder piston or mounted on the lathe.

Use the mounting hook to mount the power chuck on the hoist and level it with the spindle.
No mounting hook is supplied for power chucks 3 QLK110, 3 QLK 140 and 3 QLC / 3 QLK 160 to 3QLC / 3 QLK 200 because of their relatively low weight. These power chucks can be levelled with the spindle by hand and screwed on the thread of the draw tube.

However, in case the machine's chucking equipment is frequently changed, the draw tube should be screwed into the thread of the 3 QLC / 3 QLK chuck piston, and Loctite 290 should be used to secure it against loosening.

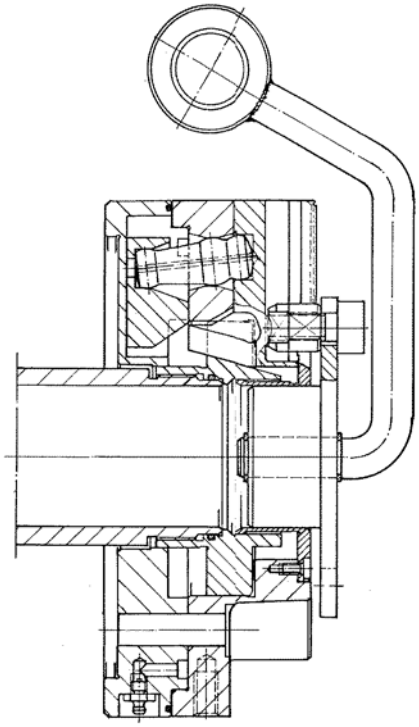
When screwing the draw tube in the chuck piston, take care not to damage the O -ring!

Mounting procedure:



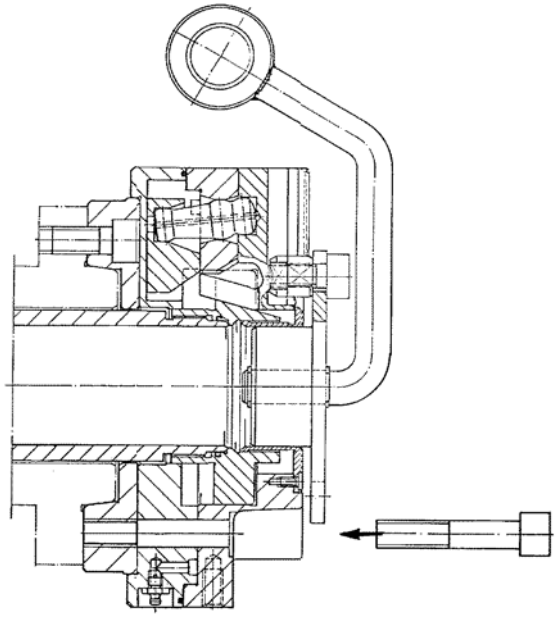
qlk 86

Slip the socket head screws through the milled holes in the mounting body and screw them into the T - nuts of the master jaws. Tighten the screws slightly and pull the chuck against the mounting body.



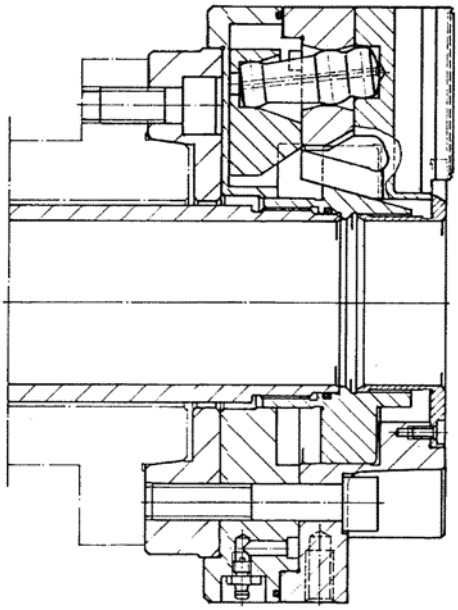
qlk 87

Screw the draw tube into the thread of the chuck piston. Secure the draw tube with ***Loctite 290!*** When screwing the draw tube in the chuck piston, take care not to damage the O - ring!



qlk 88

Securely screw the chuck piston with fitted draw in the thread of the cylinder piston. Push the mounting recess of the power chuck on the mounting spigot of the chuck flange. When doing this, make sure the mounting bolts are at the correct angle to the threaded bore holes in the chuck flange. Unscrew the screws of the T - nuts. Take the T - nuts out of the master jaws and pull the mounting hook out of the bore of the power chuck. Tightly screw the power chuck on the chuck flange with the socket head screws.



qlk 89

Before finally tightening the socket head screws in a clockwise direction, align the power chuck so that after completing mounting, the run-out at the test surfaces of the power chuck does not exceed *0.01 mm*.

Observe the tightening torques of the chuck mounting bolts, see table below.

Bolts to DIN 912		Grade 10.9					Manufactured to DIN 267		
Thread		M 4	M 6	M 8	M 10	M 12	M 16	M 20	M 24
Tightening torque	Nm	4,4	15	36	72	125	290	560	820
Max. bolt load	N	5800	13200	24300	38700	56500	110000	171000	208000

After mounting the complete power chuck system, check for imbalance and compensate any remaining imbalance by screwing in corresponding threaded studs to DIN 914

- ***on the cylinder side into thread d of the cylinder flange, see also Figure qlc 84, page 39 and***
- ***on the chuck side into the mounting flange, see also Figure qlc 79*, page 38.**

The thread on the cylinder body of the actuating cylinder or on the body of the power chuck must not be used for this purpose as the exact dynamic balancing of the actuating cylinder or power chuck will be lost.

Check the proper mounting using a dial gauge on the test faces of the power chuck.

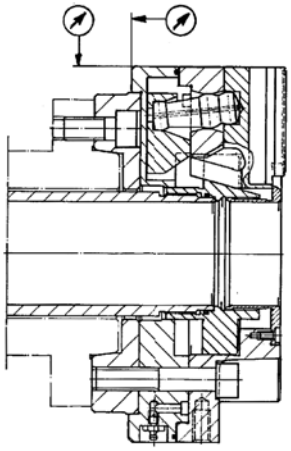
Radial run-out : max. 0,01 mm (guide value)

Axial run-out : max. 0,01 mm (guide value)

See Figure qlk 90 ➡

The chuck body may be distorted if the chuck without gripping jaws does not operate freely.

In that case, remove the chuck from the spindle of the machine and check the flatness of the chuck mounting flange and the diameter of the taper register!



qlk 90

7.3 Mounting of the Top Jaws:

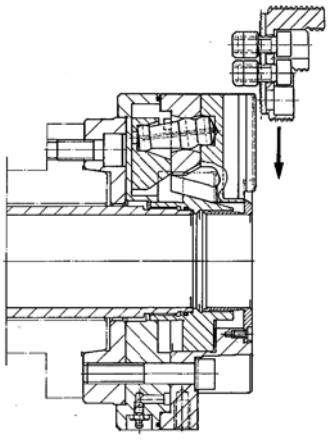
The top jaws are mounted axially on the master jaws using T-stones and the corresponding cheese-head screws. The jaws are positioned radially via the serrations on master jaws and top jaws. The following points must be noted:

Do not use damaged T-stones! The locating surfaces of the T-stones must not be damaged in any way.

When mounting the top jaws on the master jaws, observe the marks 1, 2 or 3 on the master jaws or corresponding guides in the chuck body! Bolt top jaw 1 on the master jaw 1 and so on!

Do not damage the serrations and bolt the top jaws onto the master jaws only with the serrations in good condition.

In order to ensure the proper function of the serrations, the teeth must be in good condition in order to avoid any loss of gripping precision.



qlk 91

Top jaws with serrations can be reconditioned by simple dressing using grinding paste on a dressing plate. See also section 5.8.8, page 29.

Dressing plate, see also publication 990.01.1E.

7.4 Preparations for Use of the Power Chuck:

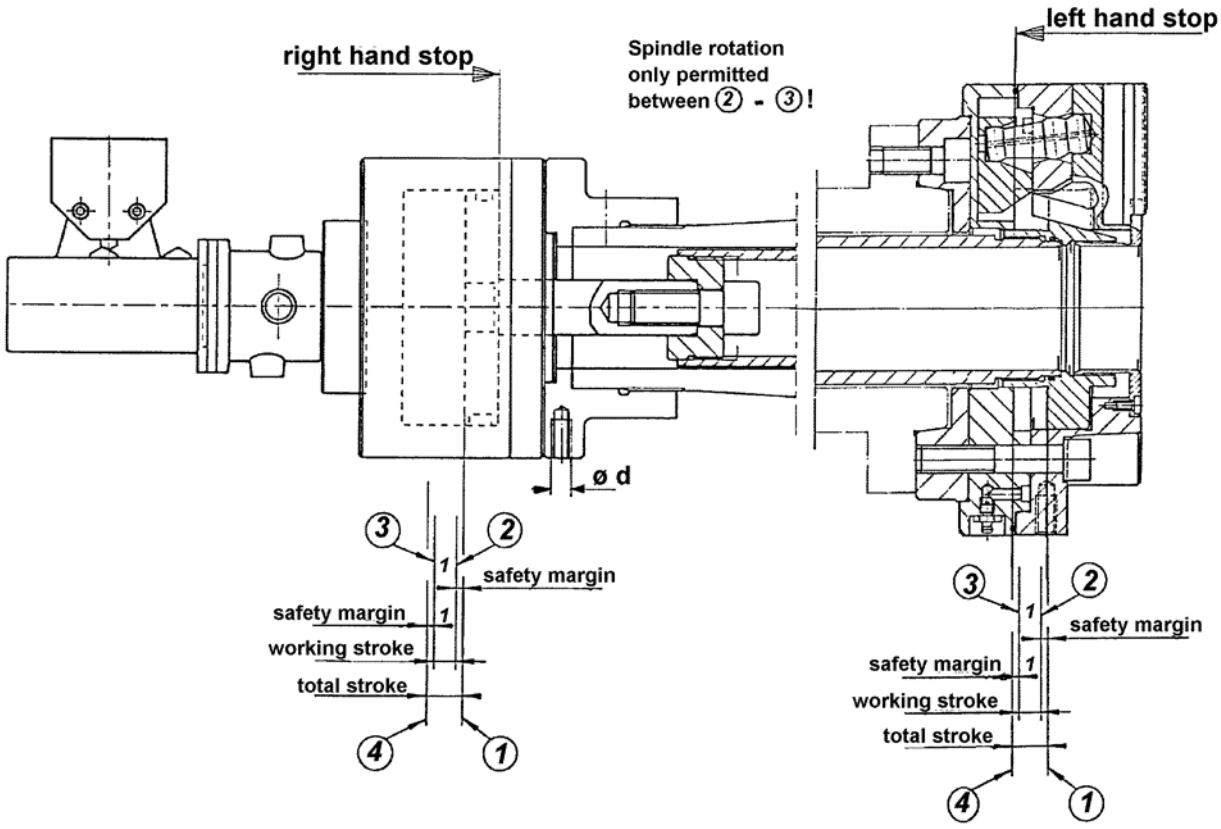
After the chuck has been mounted but before it is used, the following steps must be taken to ensure trouble-free operation:

- Clean everything from the machine that does not belong to it, such as tools for mounting the chuck.
- Grease the power chuck at the grease nipples (AM6 or AM 8 x 1, DIN 71412) on the front side of the chuck body; 5 strokes of the grease gun are sufficient.
- Thoroughly remove any excess grease which may be pressed out of the jaw guides.
- Carry out a no-load operating cycle (without workpiece) of the chuck to distribute the grease.
- Check all visible screws and bolts for tightness.
- Check the movement of the jaws.

7.5 Safety Instructions:

Safety regulations specify that not only a ***pressure monitor*** but also a ***stroke monitor*** is provided for the actuating cylinder. The stroke monitor must ensure that spindle and feed drives cannot be started, or are necessarily stopped, if the power chuck has been opened or the actuating cylinder has reached the end of ist stroke.

- ***Use limit switches to VDE 0113 / 12 with mechanically operated positive-acting NC contacts to monitor the actuating cylinder stroke.***
- ***If other control elements, e.g. proximity limit switches, are used instead of the safety limit switches, the same degree of safety must be assured.***
- ***Use a s a f e t y m a r g i n of one (1) mm. in each direction when setting the limit switch actuators to the permissible stroke. Stroke of the chuck piston of the power chuck see Section 1.4.1 or 1.4.2, page 5.***



qlk 92 P

Do not allow the machine spindle to start when the power chuck is completely open or completely closed - this will make the safety limit switches stop the lathe in the extreme positions!

- ***Check the proper function of the electric stroke monitor on the actuating cylinder! The limit switches must be reliably tripped before the corresponding end positions are reached!***
- ***Test the entire control system! Check the operation of the associated equipment (e.g. the pressure reducing valve with integral pressure monitor)!***
- ***Make sure that the guards and their interlocks are safe! The purpose of the inter-locks is that the machine spindle is stopped in the event of pressure failure!***

8.1 Instructions:

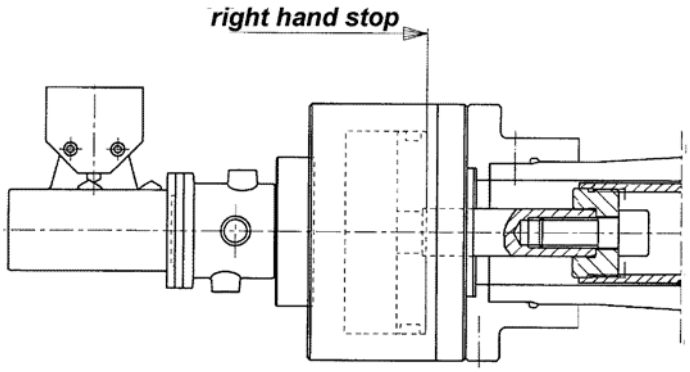
The initial period of use has a marked effect on the satisfactory performance of the power chuck. The mounting of the power chuck should be checked at this stage.

- Mount the top jaws centrically and then connect to the master jaws with the T-nuts. Tighten the jaw mounting bolts to the torques specified in the table in section 5.7.7 on page 22.
- When mounting the master jaws, observe the marks 1, 2, 3 on the chuck body (guides) and on the master jaws!

CAUTION ! ***Fit master jaw 1 in the corresponding guide 1, etc. of the power chuck!***

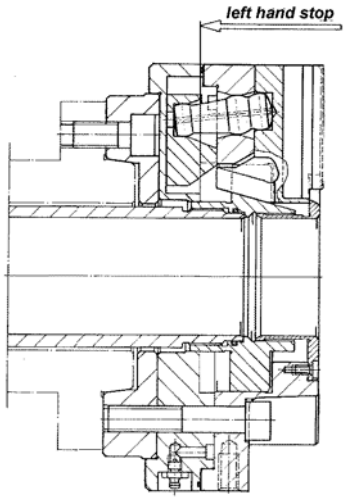
Do not overload the power chuck! Set the pressure at the actuating cylinder so that the maximum permissible actuating force specified in section 1.4.1 or 1.4.2, page 5 is not exceeded!

- The power chuck must open and close at approx. 1/10 of the permissible actuating force!
- Binding of the power chuck may be the result of strained master jaws or top jaws. Unbolt the top jaws and inspect the serrations and T-nuts.
- If the power chuck binds without top jaws, the chuck body may be strained. Check the flatness of the chuck mounting flange!
- Check the jaw movement and chuck piston stroke! Jaw movement and chuck piston stroke, see section 1.4.1 or 1.4.2, page 5.
- Check the jaw movement and chuck piston stroke! Jaw movement and chuck piston stroke, see section 1.4.1 or 1.4.2, page 5!



qlk 93

The stop of the cylinder piston is on the ***right***, always in the actuating cylinder - not in the power chuck.



qlk 94

The extent of movement of the chuck piston towards the ***left*** must be limited by the chuck body or its mounting flange.

8.2 Operation:

Insert and grip the work piece in the power chuck. Start the machine and wait for the machine program to enable the spindle rotation.

Do not start the machine spindle until the actuating cylinder has built up sufficient pressure and the work piece has been gripped within the permissible working range!

Machine work pieces at high spindle speeds only under the protection of an adequately dimensioned safety guard.

Make sure to fit safety devices and close safety guard!

- ***The safety guard must be locked as long as the machine spindle is running and should only be opened when the spindle has come to an absolute standstill!***
- ***Operation of the power chuck must always comply with the local safety and accident prevention regulations! Reference is expressly made to the specific accident prevention regulations of the local industrial safety authority.***
- ***Listen for any abnormal noises whilst the chuck is running!***
- ***Check sample workpieces!***

The precision of the power chuck is illustrated during repeated chucking of a workpiece and by its running precision when the workpiece was machined in several consecutive chuckings. If the center of the gripping cross-section deviates from the lathe centerline beyond the specified tolerance, this will result in faulty workpieces and consequently to scrap!

8.3 Unauthorised Use:

CAUTION !

In the event of system imbalance at the actuating cylinder or power chuck, eliminate the imbalance immediately!

8.4 Safety Instructions:

- ***The operating gripping force must be measured with the power chuck rotating using a dynamic gripping force measuring device, e.g. FORSAVE D. See also Section 6.3.***
- ***Measure the dynamic gripping force after every tool change and ensure that the gripping force is sufficient for the intended machining operation. See also Section 6.2.***
- ***In the event of a loss of chucking power, stop the machining operation and the machine spindle immediately.***
- ***In order to maintain the gripping force over long production runs, operate the chuck periodically under no-load (without a workpiece). A uniform gripping force of the chuck is assured only if the lubrication films are maintained and the grease is distributed to the loaded parts.***
- ***Release the workpiece from the chuck only after stopping the machine spindle!***
- ***Do not leave the workpiece in the chuck overnight as the chuck releases the workpiece after the power chucking system has been switched off!***

8.5 Procedure in the Event of Malfunctions:

Irrespective of the instructions given below, the power chuck must always be operated in accordance with the local safety and accident prevention regulations!

We recommend that a lockable switch be fitted which prevents an inadvertent starting of the machine spindle during repairs or in the event of a malfunction. The following table lists the symtoms, causes and the measures to be taken into the event of any malfunctions of the power chuck. We can no guarantee for the exhaustiveness of this list due to wide range of influencing factors (level of knowledge of the operating personnel, etc.).

Symptom	Cause	Remedial Action
Severe vibration of the machine	Out-of-balance forces due to the mounting flange or cylinder flange and possibly the chuck or the actuating cylinder due to incorrect mounting	Check run-out on the reference surfaces of the power chuck Correct imbalance on power chuck or actuating cylinder immediately Rebalance mounting flange or cylinder flange, if necessary Readjust spindle bearings
Inadequate gripping force	Soiling Inadequate lubrication	Clean power chuck Check lubrication. If lubrication is not sufficient, dismantle, clean and lubricate the power chuck.

Symptom	Cause	Remedial Action
Full jmovement of the jaws is not attained	Master jaws incorrectly mounted or reversed draw tube of wrong length	Check, replace if necessary check setting dimension „ E ”
No gripping force	Master jaws strained	Inspect locating faces Possibly use of jaws from a different manufacturer
Top jaw cannot be adjusted	Serrations of master jaw soiled	Clean Possibly difference in pitch with self-manufactured top jaws
Concentricity error with ground soft top jaws too large	Master jaws reversed, possibly also top jaws	Check and correct, if necessary

8.6 Restarting after a Malfunction:

See Section 8.1 and Section 8.2.

8.7 Before Prolonged Disuse:

- ***Move the piston of the actuating cylinder to the r i g h t !***
- ***Remove the workpiece from the power chuck!***
- ***Clean and grease the power chuck!***
- ***Coat bright metal parts with a corrosion inhibitor. Observe the safety instructions of the corrosion inhibitor manufacturer!***

Do not clean the power chuck with compressed air because chips and coolant may get in the eyes!
Accident hazard!

8.8 After Prolonged Disuse:

- ***Clean corrosion inhibitor from the chuck parts.***
- ***Lubricate the power chuck. Remove any excess grease which emerges!***
- ***Operate the chuck without gripping a workpiece to distribute the lubricating grease!***
- ***At standstill of the machine spindle, check the static gripping force Fspo with a static gripping force meter, e.g. SKM 1200 / 1500!***
- ***Grip a workpiece.***
- ***Otherwise proceed as described in Section 7.4 and Section 8.2!***

9.1 Servicing:

9.1.1 Instructions:

Observe the ***"Safety Instructions"*** in Section 2 when carrying out checks, maintenance and service work on the power chuck.

- ***Malfunctions resulting from inadequate or improper maintenance, reconditioning or servicing can be very costly and give rise to long downtimes.***
- ***Careful lubrication is essential for trouble-free operation of the power chuck.***
- ***The operational reliability and a long service life of the power chuck depend i.a. on proper servicing and maintenance.***

As operating conditions vary, it is not possible to specify in advance how often servicing, inspection for wear or reconditioning are necessary. This must be determined on the basis of the loading conditions and degree of contamination encountered.

Hours of operation / Frequency	Type of check / servicing instructions
After 24 hours of operation; when new or after reconditioning	Lubricate the power chuck Check tightness of screws and bolts
Weekly	Lubricate the master jaws, chuck piston
Weekly	Check the Fspo with a gripping force measuring device, e.g. SKM 1200 / 1500
Monthly	Check wedge hook of the chuck piston and the master jaws for wear.

9.1.2 Maintenance, Servicing:

Always stop the machine spindle and secure the lathe against inadvertent starting (with a lockable local switch) before starting maintenance, inspection or other work.

Move the piston of the actuating cylinder to the extreme r i g h t - h a n d position!

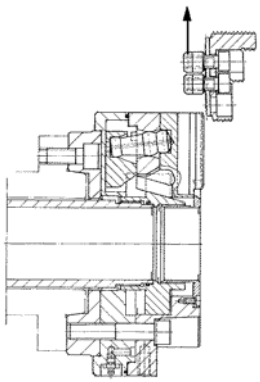
Depressurize hydraulic lines of the hydraulic actuating cylinder!

Put up a WARNING signs!

Check the maintenance condition with a static gripping force measuring device, e.g. SKM 1200 / 1500!

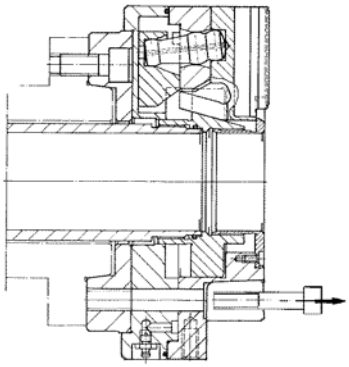
If the static gripping force Fspo of the chuck specified in Section 1.4 and 6.2.1 is no longer achieved even with good lubrication, the power chuck must be removed from the machine spindle and then dismantled, cleaned and greased again!

9.2 Removing Power Chuck from the Machine Spindle:



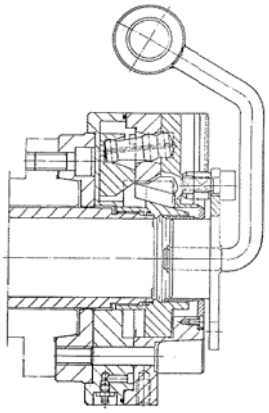
qlk 95

Move the piston of the actuating cylinder to the extreme ***r i g h t - h a n d position***, depressurize the hydraulic lines of the hydraulic actuating cylinder! Unscrew the pressure hoses. Loosen the jaw mounting bolts (two turns are sufficient) and remove the top jaws with the T-stones out of the master jaws.



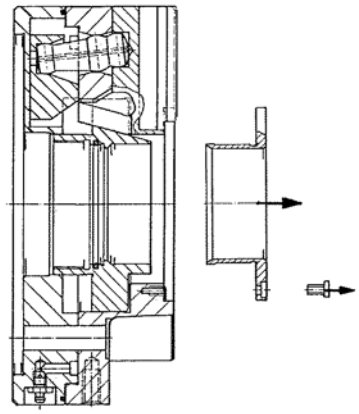
qlk 96

Release chuck mounting bolts (18).



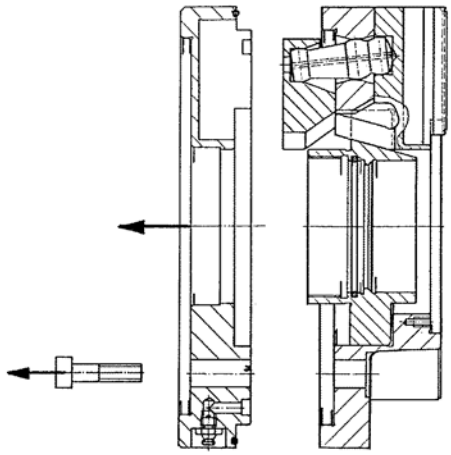
qlk 97

Push the mounting hook in the bore of the power chuck. Slip socket head screws through the milled holes in the mounting body and screw them in the T - stones of the master jaws. Slightly tighten the screws and pull the power chuck against the mounting body. Unscrew the power chuck with the draw tube from the thread of the cylinder piston. Pull the power chuck from the mounting spigot of the chuck flange. Unscrew the draw tube from the chuck piston and deposit the chuck on a palette or work bench.



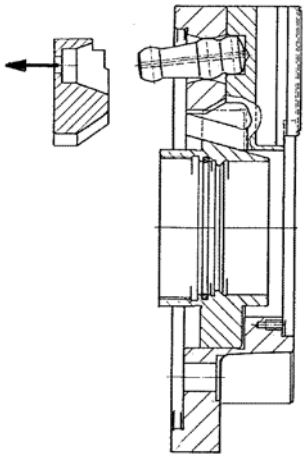
qlk 98

Loosen the mounting bolts (20) and pull the protective bush (4) out of the chuck body (1) and chuck piston (2) to the front by screwing socket head screws into the puller bores.



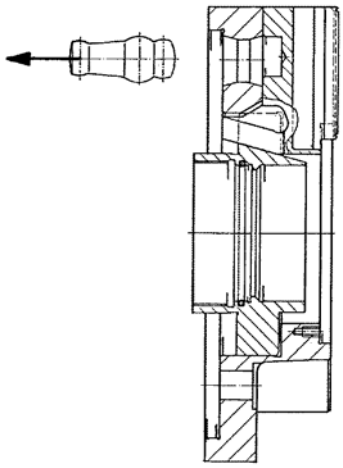
qlk 99

Loosen the mounting bolts (19) and pull the chuck cover (5) out of the chuck body (1) by screwing socket head screws into the puller bores.



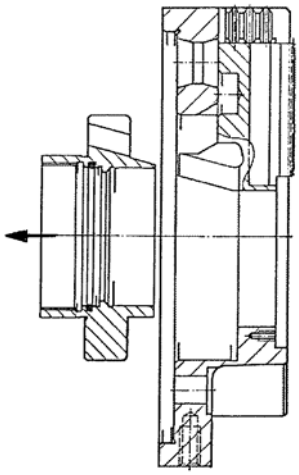
qlk 100

Pull balancing weights (7) from levers (6).



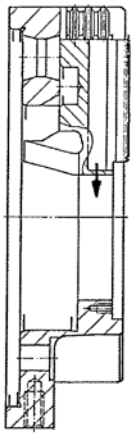
qlk 101

Remove levers (6) from chuck body (1).



qlk 102

Pull the chuck piston (2) out of the chuck body (1).

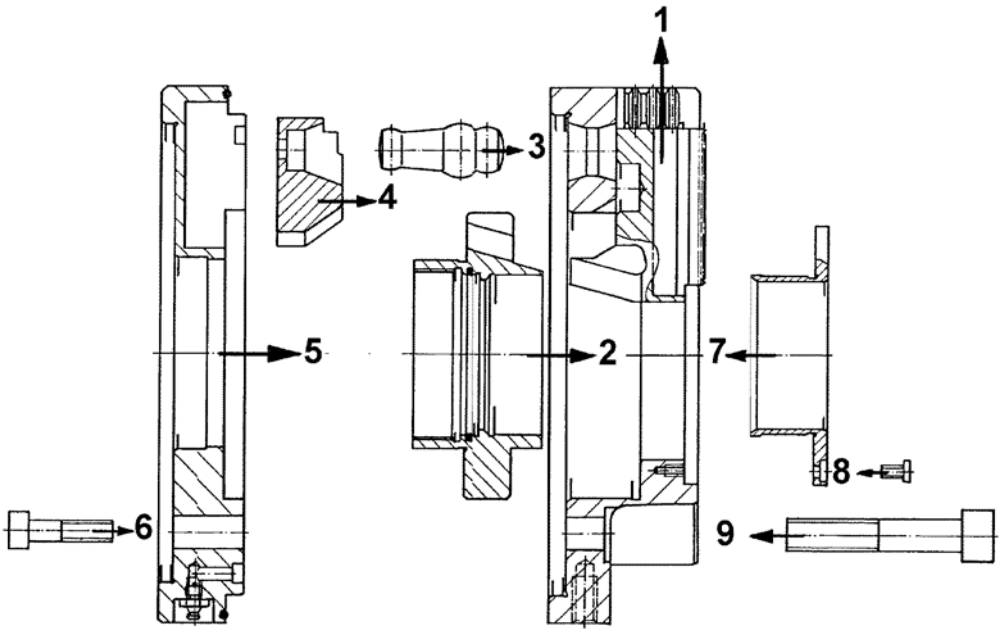


qlk 103

Pull the master jaws (3) out of the chuck body (1) to the inside.

Inspect all parts for damage, wash out and clean. Replace any defective parts. Grease chuck piston, master jaws, chuck body (at the guides of the chuck piston and the master jaws), balancing weights, levers and guides in the chuck cover (for the balancing weights) with lubricating grease, e.g. PF 5 or PF 6!

Inspect all O - rings for damage and wear, replace any defective parts. Coat all the seals with grease and carefully install in their corresponding components. When screwing the draw tube in the chuck piston, take care not to damage the O - ring.



qlk 104

Install the individual parts in the chuck body in the sequence indicated.

CAUTION ! ***When installing the master jaws, observe the marks on the master jaws. Install master jaw 1 into guide 1 of the power chuck, etc.***

CAUTION ! ***Install chuck piston with wedge hook guide 1 in master jaw 1.***

- Install the power chuck on the machine spindle as described in Sections 7.1 and 7.2.
- Tighten the mounting bolts to the torque specified in Section 1.7 on page 6.
- Put the chuck into operation as described in Section 7.4 and Section 8.2.

9.3 Safety Instructions:

- ***The high spindle speeds customary on modern lathes subject the power chuck to high loads. When tools collide with the chuck, e.g. due to faults in the machine program, the chuck can be damaged.***
- ***After a collision, stop the machine spindle immediately and inspect the chuck for damage.***
- ***Remove the chuck from the spindle and do not continue to work with the chuck.***
- ***In addition to visible damage (e.g. to the top jaws, T-stones and mounting bolts), damage may occur which is not immediately apparent, such as hair cracks in the chuck body and in the master jaws.***
- ***In such cases, the affected parts of the chuck must be checked for cracks using a suitable non-destructive testing method in order to rule out any danger. Replace all damaged parts!***
- ***Suitable test methods are:***
  - ***ñ Dye penetrant test***
  - ***ñ Magnaflux test.***

Replace any damaged top jaw mounting bolts only with bolts of the same quality and dimensions! Quality and dimensions, see the table below

	Bolts to DIN 912		**Grade 10.9**			**Manufactured to DIN 267**	
	Thread		M 8	M 10	M 12	M 16	M 20
	Tightening torque	Nm	16	51	87	215	420
	Max. bolt load	N	27300	43400	63000	119000	186000

The jaw mounting bolts must be tightened with the torque value indicated in the tabulation!

9.4 Lubrication:

Foreign matter penetrates into practically every power chuck during machining; scale and foundry dust increase the friction between moving parts and coolant washes away the lubricants. 3 QLC.. / 3 QLK.. chucks are effectively sealed to prevent loss of lubricant and to avoid functional faults caused by the ingress of cooling lubricant, dirt and chips. The gap between chuck body and cover is hermetically sealed with an O-ring. All movement gaps are designed with tight fits and hardened wiper edges. For this reason, the power chuck must be cleaned and lubricated at regular intervals to achieve consistent gripping forces, accuracy and long life.

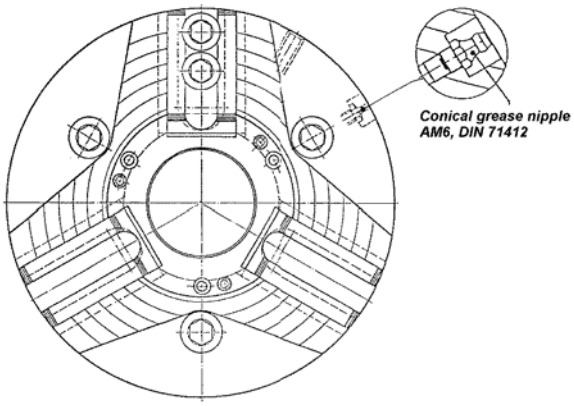
CAUTION ! ***Careful lubrication is essential for trouble-free operation of the power chuck!***

Lubrication and all work necessary for the lubrication must be carried out only with the machine spindle at a standstill!

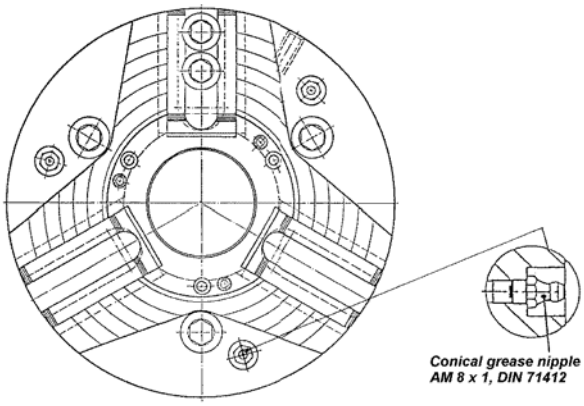
CAUTION ! ***Soiled or poorly lubricated power chucks have a considerably reduced gripping force!***

The power chuck must be relubricated when the static gripping force Fspo with the machine spindle at a standstill no longer achieves the values in the table in Section 1.4.1 or 1.4.2 on page 5!

CAUTION ! ***Measure the gripping force with the machine spindle at a standstill using a static gripping force measuring device, e.g. SKM 1200 / 1500, at regular intervals!***



qlk 105
The conical grease nipples AM6, DIN 71112 are located on the outside diameter of the backplate of power-operated chucks type 3QLK 110 and 3QLK 140.



qlk 106
The conical grease nipples AM6, DIN 71412 are located on the front side of the chuck body of power-operated chucks type 3QLK / 3QLC 160 to 3QLK / 3QLC 400 and 3QLC – KS / 3QLK - KS 200 to 3QLC – KS / 3QLK - KS 400.

- Lubricate the power chuck. 5 strokes of the grease gun are sufficient. For details of the grease gun, see publication 990.01.5E.
- We recommend the following lubricants:
  - PF 5 for all the other parts of the power chuck
  - PF 6 for the wedge hooks of the master jaws, the chuck piston and the piston guide.
- Store lubricants only in clean, closed containers under dry and cool conditions!

9.5 Reconditioning:

9.5.1 Instructions:

For the first repair we recommend that you call upon the manufacturer's personnel. Your maintenance personnel then has an opportunity to receive intensive training. Reconditioning or repair by the user requires personnel with considerable experience. It is essential that work is carried out carefully, as it concerns a unit that effects safety. Spare parts should be ordered in accordance with the spare parts lists in Section 10.2 on page 54 to page 57, if you carry out repairs yourself.

The lathe must be stopped and prevented from inadvertent starting before any maintenance of reconditioning work is carried out on the chuck.

Remove the top jaws from the master jaws!

Extend the piston of the actuating cylinder to the extreme r i g h t - h a n d position!

Move the actuating cylinder piston to the extreme right hand position! Release the pressure in the hydraulic pipes and hoses leading to the actuating cylinder!

Put up a WARNING signs!

- Only maintenance work coming within the scope of servicing or entailing the replacement of parts subject to wear is described here.
- If, for particular reasons, you carry out the replacement of parts yourself, you should keep spare and wear parts supplied by the manufacturer in stock.
- If screws or bolts are rendered unserviceable during dismantling, they have to be replaced by screws and bolts of the same grade and type! See following tables.

a) Tightening torques for the chuck mounting bolts (Type 3QLC / 3QLK power chucks):

Bolts to DIN 912		Grade 10.9						Manufactured to DIN 267
Thread		M 4	M 6	M 8	M 10	M 12	M 16	M 20
Tightening torque	Nm	4,4	15	36	72	125	290	560
Max. bolt load	N	5800	13200	24300	38700	56500	110000	171000

Grade 8.8 Manufactured to DIN 267		Bolts to DIN 7984		Bolts to DIN 912
Thread		M 5	M 6	M 4
Tightening torque	Nm	5	8,5	3,0
Max. bolt load	N	4850	6700	3900

b) Tightening torques for the chuck mounting bolts(Type 3QLC – KS / 3QLK – KS power chucks):

Bolts to DIN 912		Grade 10.9			Manufactured to DIN 267	
Thread		M 10	M 12	M 16	M 20	M 24
Tightening torque	Nm	72	125	290	560	820
Max. bolt load	N	38700	56500	110000	171000	208000

Bolts to DIN 7984	Grade 8.8	Manufactured to DIN 267	
Thread		M 5	M 6
Tightening torque	Nm	5	8,5
Max. bolt load	N	4850	6700

The chuck mounting bolts must be tightened with the torque values indicated in the tabulation!

c) Tightening toeques for the jaw mounting bolts:

	Bolts to DIN 912		Grade 10.9		Manufactured to DIN 267			
	Thread		M 8	M 10	M 12	M 16	M 20	
	Tightening torque	Nm	16	51	87	215	420	
	Max. bolt load	N	27300	43400	63000	119000	186000	

The jaw mounting bolts must be tightened with the torque values indicated in the tabulation!

9.5.2 Replacement of Parts:

As described under Section 9.2!

Mounting, as described under Section 7.2!

Putting into operation, as described in Section 7.4 and Section 8.2!

Observe Safety Instructions!

10.1 Spare Parts:

Prior consultation regarding the spare parts to be kept on site is important for keeping the chuck in running order. Please use the spare parts list when ordering spare parts.

For safety reasons, use only ORIGINAL - FORKARDT spare parts!

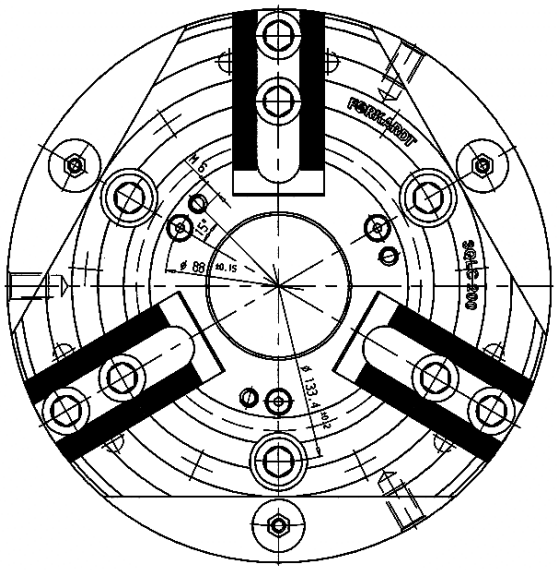
The use of parts from other sources on our products relieves us from our obligations regarding product liability, in so far as any damage can be attributed directly or indirectly to the use of such parts.

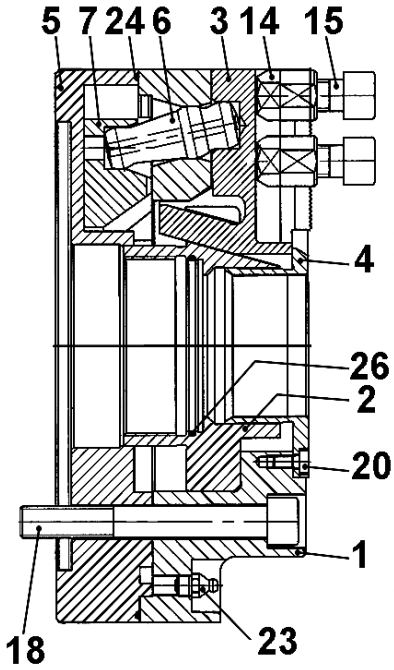
Our warranty only extends to ORIGINAL spare parts supplied by us.

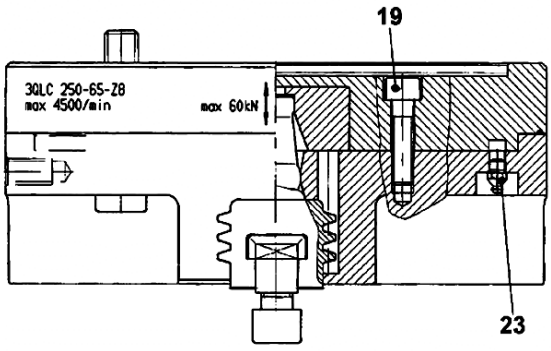
Please note that special specifications frequently exist for parts manufactured or bought out by us and that we always supply spare parts that meet the latest technical standards.

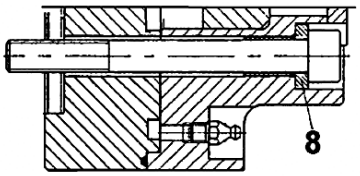
10.2 Spare Parts Lists:

10.2.1 Spare Parts Lists Type 3 QLC Power Chucks:

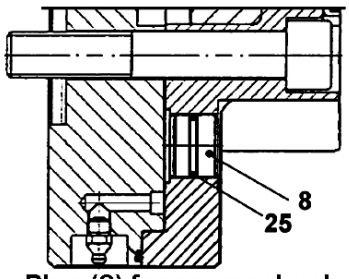








Bush (8) for power chuck
3 QLC 160 and 3 QLC 175



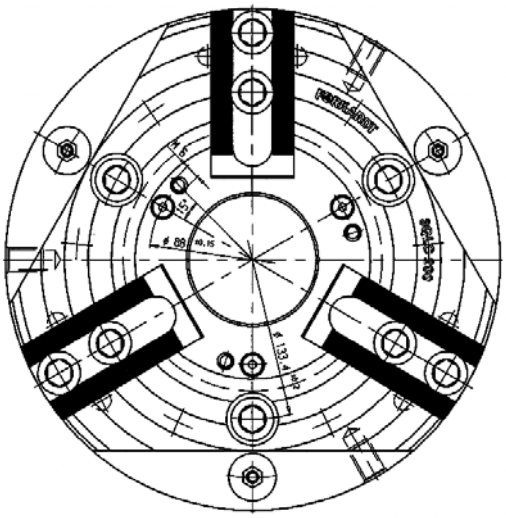
Plug (8) for power chuck
3 QLC 400

qlk 107

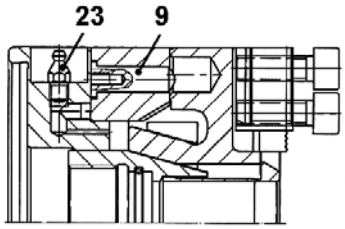
No. off	Description	Part	Chuck Type 3 QLC							
		No.	160 – 38	175 – 42	200 - 54	250 - 72	315 – 88		400 - 126	
Ident. No.		⇒	**168116**	**165566**	**167983**	**165568**	**165569**	**165570**	**165808**	**165813**
1	Chuck body	1	168025001	165566001	165567001	165568001	165569001		165808001	
1	Chuck piston	2	168025002	165566002	165567002	165568002	165569002		165808002	
3	Master jaw	3	168116003	165566003	165567003	165568003	165569003		165808003	
1	Protective bush	4	168025004	165566004	165567004	165568004	165569004		165808004	

No. off	Description	Part	Chuck Type 3 QLC							
		No.	**160 – 38**	**175 – 42**	**200 - 54**	**250 - 72**	**315 – 88**		**400 - 126**	
Ident. No.		⇒	**168116**	**165566**	**167983**	**165568**	**165569**	**165570**	**165808**	**165813**
1	Chuck cover	5	168025005	165566005	165567005	165568005	165569005	165570005	165808005	165813005
3	Lever	6	165566010	165566010	156122010	165568010	156584010		44343010	
3	Balancing weight	7	168025009	165566009	167983009	165568009	165569009		165808009	
3	Bush / Plug	8	165566011	165566011	-	-	-		165808008	
		9								
6	Nutenstein	14	FN 231	FN 231	FN 231	FN 232	FN 232		FN 233	
6	Socket head screw DIN 912 10.9	15	M12 x 30	M12 x 30	M12 x 30	M16 x 35	M16 x 35		M20 x 40	
	Socket head screw DIN 912 10.9	18	3xM10x95	3xM10x95	3xM12x95	3xM16x75	3xM16x100	3xM20x80	3xM20x130	3xM24x110
	Socket head screw DIN 912 10.9	19	6xM8x35	6xM10x35	6xM10x35	6xM10x40	12xM10x40		6xM16x50	
	Socket head screw DIN 79842 8.8	20	3xM4x10	3xM5x10	3xM5x10	3xM6x10	3xM6x10		6xM6x16	
3	Conical grease nipple DIN 71412	23	AM6	AM6	AM8 x 1	AM8 x 1	AM8 x 1		AM8 x 1	
1	O - Ring	24	153 x 2	165 x 2	194 x 2	240 x 2	300 x 3		390 x 3	
		25							20 x 3	
1	O - Ring	26	42 x 2	50 x 2	65 x 2	76 x 3	92 x 3		134 x 3	
1	Mounting hook		-	-	-	165880	165881		165882	
3	Hard top jaw		HB11 / 65	HB11 / 65	HB11	HB12	HB12		HB23 / 18	
	T - nut		6xFN231	6xFN231	6xFN231	6xFN232	6xFN232		6xFN233	
3	Hard top jaw		HB11 / 70	HB11 / 70	HB11 / 110	-	-		-	
	T - nut		6xFN231	6xFN231	6xFN231	-	-		-	
3	Soft top jaw		WBL11/70	WBL11/70	WBL11/80	WBL12/110	WBL12/110		WBL23/140	
	T - nut		3x153791	3x153791	6xFN231	6xFN232	6xFN232		6xFN233	
on request										

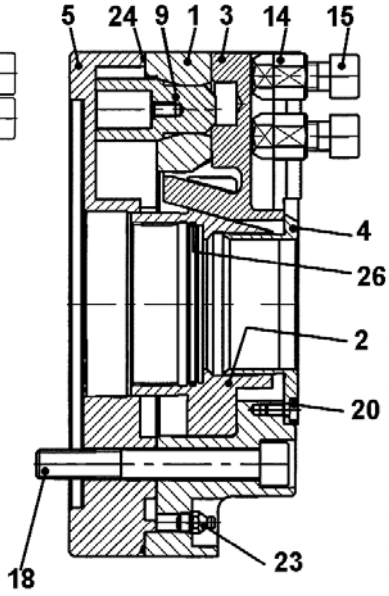
10.2.2 Spare Parts Lists Type 3 QLK Power chucks:



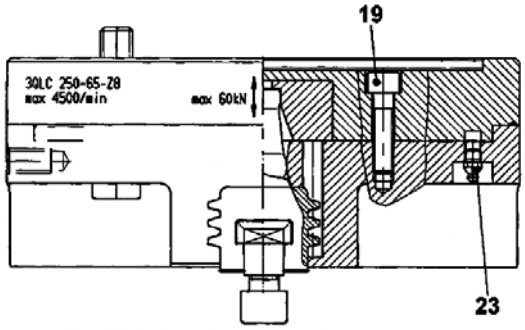
3QLK

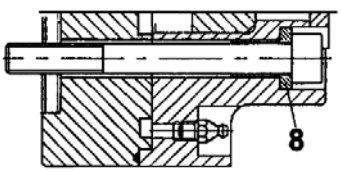


3QLK 110 and
3QLK 140

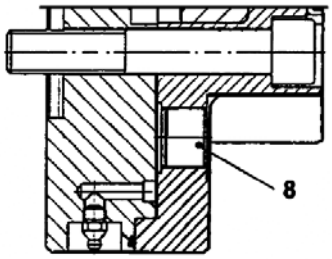


from 3QLK 160





Bush (8) for power chuck
3 QLK 175

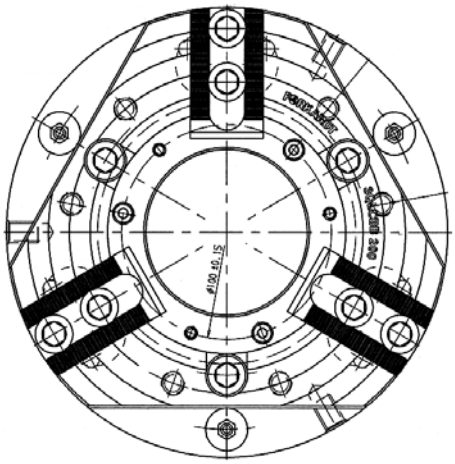


Plug (8) for power chuck
3 QLK 400

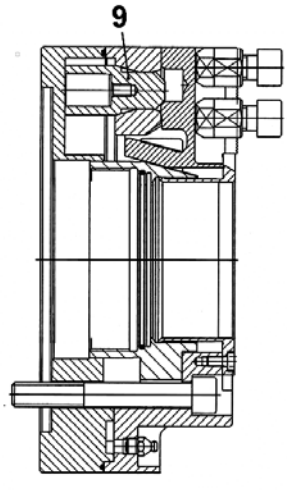
qlk 108

No. off	Description	Part	Chuck Type 3 QLK									
		No.	110-26	140-35	160-38	175-42	200-54	250-72	315 - 88		400 - 126	
Ident. No. ⇒			168894	168895	168896	168897	168898	168899	168900	168901	168902	168903
1	Chuck body	1	168894001	168752001	168025001	165566001	165567001	165568001	165569001		165808001	
1	Chuck piston	2	168894002	168752002	168025002	165566002	165567002	165568002	165569002		165808002	
3	Master jaw	3	168894003	168752003	168166003	165566003	165567003	165568003	165569003		165808003	
1	Protective bush	4	168894004	168752004	168025004	165566004	165567004	165568004	165569004		165808004	
1	Chuck cover	5	168894005	168752005	168025005	165566005	165567005	165568005	165569005	165570005	165808005	165813005
		6										
3	Bush / Plug	8	-	-	165566011	165566011	-	-	-		165808008	
3	Jaw clamping device	9	168894007	168752007	168730009	168538001	168521001	168539001	168539001		168736009	
6	T - nut	14	168894008	168752008	FN 231	FN 231	FN 231	FN 232	FN 232		FN 233	
6	Socket head screw DIN 912 10.9	15	M8 x 22	M10 x 25	M12x30	M12 x 30	M12 x 30	M16 x 35	M16 x 35		M20 x 40	
3	Socket head screw DIN 912 10.9	18	M10x80	M10x90	M10x95	M10x95	M12x95	M16x75	M16x100	M20x80	M20x130	M24x110
	Socket head screw DIN 912 10.9	19	3xM8x20	3xM10x25	6xM8x35	6xM10x35	6xM10x35	6xM10x40	12xM10x40		6xM16x50	
	Socket head screw DIN 79842 8.8	20	3xM4x25	3xM4x25	3xM4x10	3xM5x10	3xM5x10	3xM6x10	3xM6x10		6xM6x16	
3	Conical grease nipple DIN 71412	23	AM6	AM6	AM6	AM6	AM8 x 1	AM8 x 1	AM8 x 1		AM8 x 1	
1	O -Ring DIN 3771	24	-	-	153 x 2	165 x 2	194 x 2	240 x 2	300 x 3		390 x 3	
1	O -Ring DIN 3771	25	-	-	-	-	-	-	-		20 x 3	
1	O -Ring DIN 3771	26	32 x 2	39 x 2	42 x 2	50 x 2	65 x 2	76 x 3	92 x 3		134 x 3	
1	Mounting hook		-	-	-	-	-	165880	165881		165882	
3	Hard top jaw		HB 08	HB 09	HB11/65	HB11/65	HB11	HB12	HB12		HB23	
	T - nut		3xNSTU10	3xNSTU12	6xFN231	6xFN231	6xFN231	6xFN232	6xFN232		6xFN233	
3	Hard top jaw		-	-	HB11/70	HB11/70	-	-	-		-	
	T - nut		-	-	6xFN231	6xFN231	-	-	-		-	
3	Soft top jaw		WBL 08	WBL 09	WBL11/70	WBL11/70	WBL11/80	WBL12/110	WBL12/110		WBL23/140	
	T - nut		168894008	168752008	3x153791	3x153791	6xFN231	6xFN232	6xFN232		6xFN233	
on request												

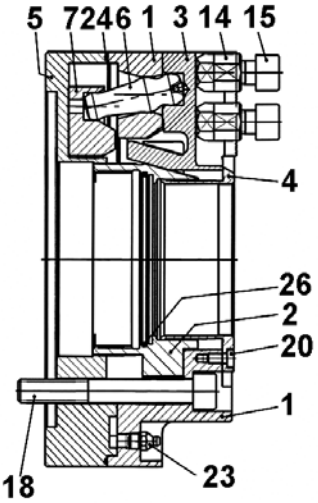
10.2.3 Spare Parts Lists Type 3 QLC - KS / 3 QLK – KS Power Chucks:



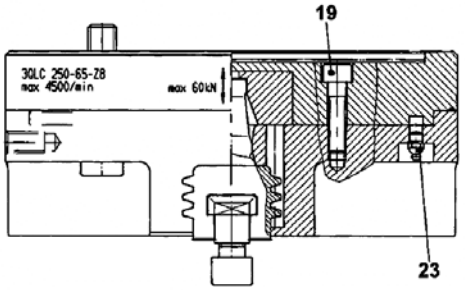
3 QLC - KS / 3 QLK - KS



3 QLK - KS



3 QLC - KS



qlk 109

No. off	Description	Part	Chuck Type 3 QLC - KS / 3 QLK - KS							
		No.	3QLC – KS 200	3QLK – KS 200	3QLC – KS 250	3QLK – KS 250	3QLC – KS 315	3QLK – KS 315	3QLC – KS 400	3QLK – KS 400
Ident. No.		⇒	168478	168575	168479	168576	168480	168577	168481	168578
1	Chuck body	1	168478001		168479001		168480001		168481001	
1	Chuck piston	2	168478002		168479002		168480002		168481002	
3	Master jaw	3	165566003				165568003		165569003	
1	Protective bush	4	168478004		168479004		168480004		168481004	
1	Chuck cover	5	168478005		168479005		168480005		168481005	
3	Lever	6	165566010	-	156122010	-	165568010	-	156584010	-
3	Balancing weight	7	165566009	-	167983009	-	165568009	-	165569009	-
1	Bush / Plug	8	-		-					
3	Jaw clamping device	9	-	168538001	-	168521001	-	168539001	-	168539001
6	T - nut	14	FN 231		FN 232		FN 232		FN 232	
6	Socket head screw DIN 912 10.9	15	M12x30		M12x30		M16x35		M16x35	
3	Socket head screw DIN 912 10.9	18	M12x90		M16x95		M20x90		M24x80	
6	Socket head screw DIN 912 10.9	19	M10x35		M10x35		M10x40		M16x40	
	Socket head screw DIN7984 8.8	20	3xM5x10		6xM5x10		6xM6x10		6xM6x10	
3	Conical grease nipple DIN 71412	23	AM8 x 1		AM8 x 1		AM8 x 1		AM8 x 1	
1	O – Ring DIN 3771	24	200 x 2		240 x 2		304 x 2		390 x 3	
1	O – Ring DIN 3771	26	85 x 2		110 x 2		138 x 3		174 x 3	
1	Mounting hook		-		168580		168581		168582	
3 •	Hard top jaw		HB 11		HB 11		HB 12		HB 12	
6 •	T - nut		FN 231		FN 231		FN 232		FN 232	
			-		-		-		-	
			-		-		-		-	
3 •	Soft top jaw		WBL11 / 80		WBL 11 / 80		WBL 12 / 110		WBL 12 / 110	
6 •	T - nut		FN 231		FN 231		FN 232		FN 232	
• on request										

The following data should be specified when ordering spare parts:

- **Number off**
- **Description**
- **Spare parts list number**
- **Identification number**
- **Product**
- **Serial number**

It is absolutely essential to specify the data marked with an • when ordering spare parts!

10.3 Address for Spare Parts and Service:

FORKARDT

2155 Traversefield Dr

Traverse City, MI 49686

Telephone: 800-544-3828
Email: sales@forkardt.us
Website: www.forkardt.com

11.1 Tools and Accessories:

The following tools and accessories are supplied with the chuck to facilitate maintenance work :

DIN 911 hexagon key for socket head screws								
Chuck type 3 QLC.. / 3 QLK.. ➡	110	140	160	175	200	250	315	400
Key - A / F	3	3	3	3	3	4	14 I 17	17 I 19
Key - A / F	6	8	6	8	8	8	8	14
Key - A / F	8	-	8	10	10	14	4	8
Key - A / F	-	-	10	-	-	-	-	5

Lubricating grease PF 5 and PF 6, grease gun, see tabulation below! Degreasing agent, corrosion inhibitor etc. have to be supplied by you, but can also be ordered from us.

Designation	Type	Ident. No.	Content of can
Special grease	PF 5	101400 / 084	1,0 kg
Special grease	PF 6	101400 / 088	1,0 kg
Lever action grease gun	HH 1	101400 / 121	

11.2 List of Associated Publications:

Accessories for manual and power chucks		**990.01.05E**
Gripping force meter	**SKM 1200 / 1500**	**300224.50.01E**
Gripping force meter	**FORSAVE D**	**620.01.06E**
Hydraulic open center cylinder	**OKHJ**	**440.10.01E**
Hydraulic closed center cylinder	**OKRJ**	**427.10.01E**
Pneumatic cylinder	**PZR**	**423.01.01E**
Control gear for power chucking equipment		**601.10.5E**
T-sliding block jaw holder system	**NSTK**	**724.10.01E**
Jaws for manual and power chucks		**700.10.01D**

DECLARATION OF INCORPORATION

According to EC Machinery Directive EC Directive 2006/42/EC

The manufacturer

FORKARDT GmbH
Lachenhauweg 12
72766 Reutlingen-Mittelstadt

herewith declares the following incomplete machines with the designations:

Type designation: **Three Jaw Power Chucks**

Type: **3 QLC / 3 QLK**
3 QLC – KS / 3 QLK - KS

- **The general health and safety requirements according to Appendix I of the aforementioned directive have been referred to and observed.**
- **The special technical documents according to Appendix VII B have been prepared.**
- **The aforementioned special technical documents will be submitted to the responsible authority as required.**
- **Commissioning is forbidden until it has been verified that the machine in which the aforementioned machines are to be incorporated comply with the specifications of the machinery directive.**
- **Responsible for the documentation:**

  Oskar Weinert

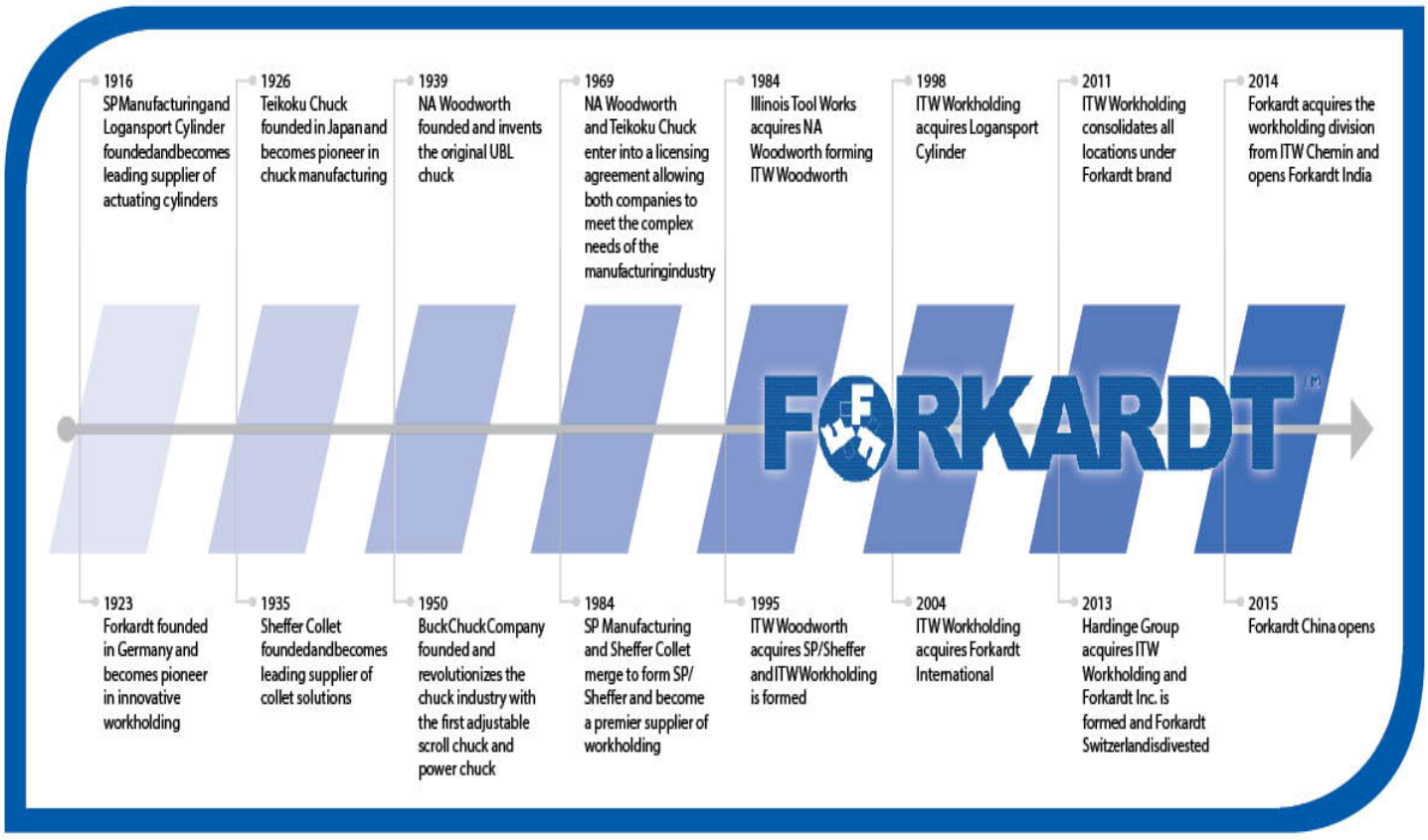
Date/Manufacturer's signature: **05.10.11**

Place: **Erkrath**

.....
(Head of Design Mr Weinert)

Declaration of incorporation number: 3 QLC.E

OUR HISTORY



Innovative Technology by FORKARDT

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