

Operating Instructions

BA 148 e

Disc-Type Tool Turret

0.5.480.220

2007-08-17

The present manual is part of the product.



- The manual should be kept in an easily accessible place during the product's lifetime.
- The manual should be passed on to the next owner /user of the product.
- Make sure that any possible supplement received is duly added to the manual.
-

Manual Translation



Type plate on turret housing

- 1 Classification number (series, size)
- 2 Identification number
- 3 Order number

| | | | | | | |
|--|--|--|----------|--------------|----|---|
|   | <i>Feinmechanik GmbH</i> <i>D - 72555 Metzingen</i> | | Typ | X.X.XXX.X | XX | ① |
| | | | Id.-Nr. | XXX XXX | | ② |
| | | | Com. Nr. | XX-XXX-XX-XX | | ③ |
| | | | | | | |

BA 148 e

| Classification number (series, size) | Identification number |
|---|--|
| 0.5.480.220 | 062 812 064 588 066 332 068 152 |

Tool Turret "DISK-Type"

with electric drive

0.5.480. 220

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1. Design of DISK-Type Tool Turret

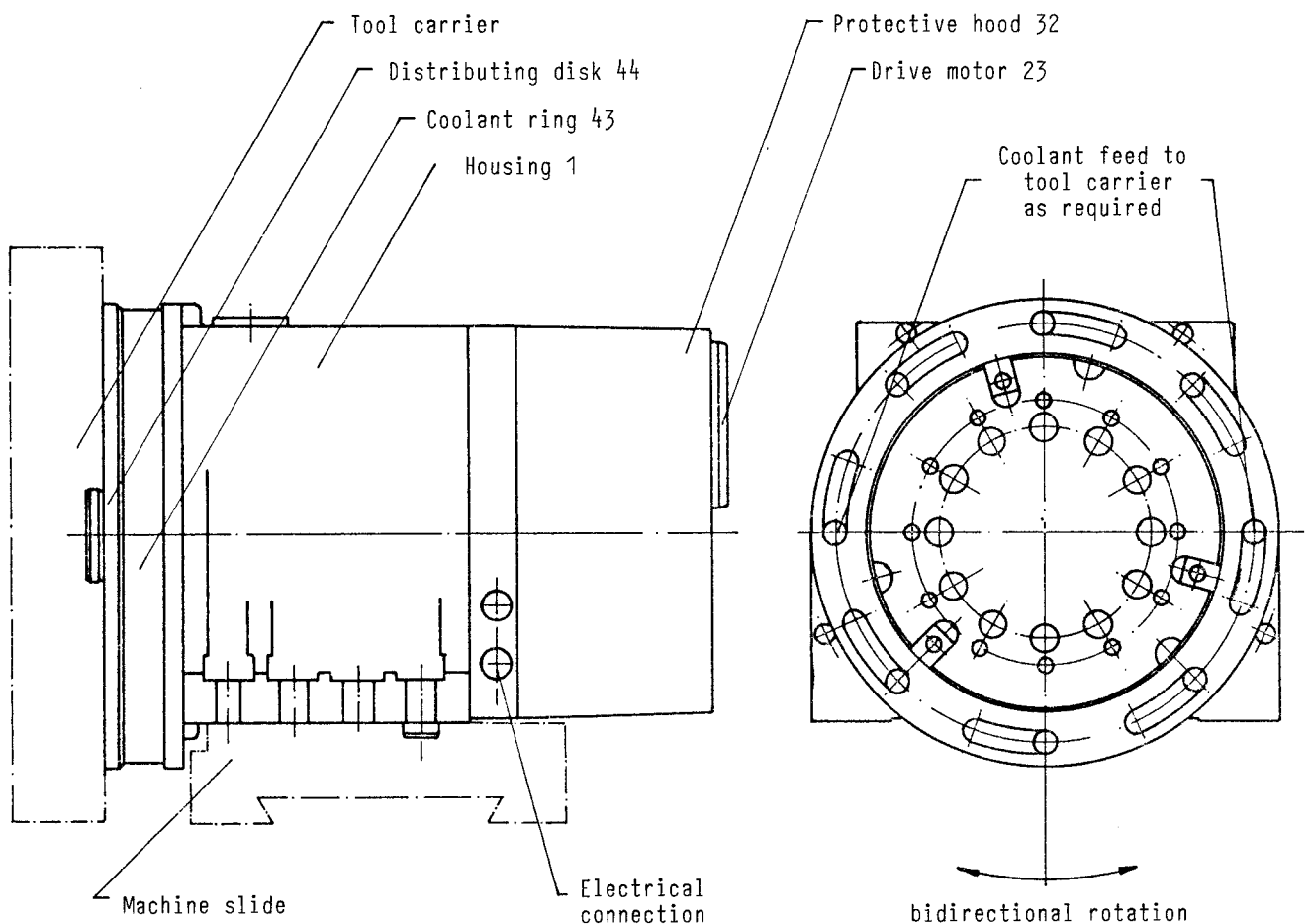
The DISK-type tool turret consists of a housing 1 containing the functional components and fastened as a firm base onto the machine slide. The front of the housing is provided with an indexing, rotating disk 3, on which the actual tool carrier is located and fastened.

By means of the coolant ring 43 and the distributing disk 44 clamped onto disk 3, the coolant is fed to the tool cutting edge via the tool carrier.

The electrical switches and control elements and the drive motor 23 are accommodated on the back of the housing 1 under a protective hood 32.

The coolant connection and the electrical connections can be arranged on the left-hand or right-hand side as required.

FIGURE 1



2. Working Principle of the Components

=====

The motor 23 drives, via a planetary gear and the shaft 7, a radial hub 13 to which the roller 14 is fastened. In the first part of the rotation movement, the roller 14 moves to the right or left against the locking cam of the component 12 and pulls the Hirth spur toothing apart (Fig. 2). Then the radial hub 13 rotates the location disk 3 by contacting bush 10 (Fig. 3). This rotation is synchronously transmitted to the angular encoder 52, which signals the current position. Upon reaching the selected position, the solenoid 55 presses the pre-indexing bolt 25 into the recesses of the damping ring 5. The pre-indexing bolt 25 actuates a proximity detector 56, which gives the signal for motor direction change. The roller 14 runs onto the locking cam (Fig. 2) and presses together the Hirth spur gearing above the plate spring 51. Shortly before it reaches the centre of the cam, the b8 proximity detector 57 is actuated by the cam disk, which signals that the turret is locked. The bolt 29 engages in disk 11. Roller 14 is held. When the solenoid 55 is switched off, the compression spring 58 pushes back the pre-indexing bolt 25 and engaging bolt 29, thus actuating the b7 proximity detector 56.

The signal of the b8 proximity detector 57 can be used to initiate further machine operations. For commencing further indexing movements, the signal of s7 has to be used.

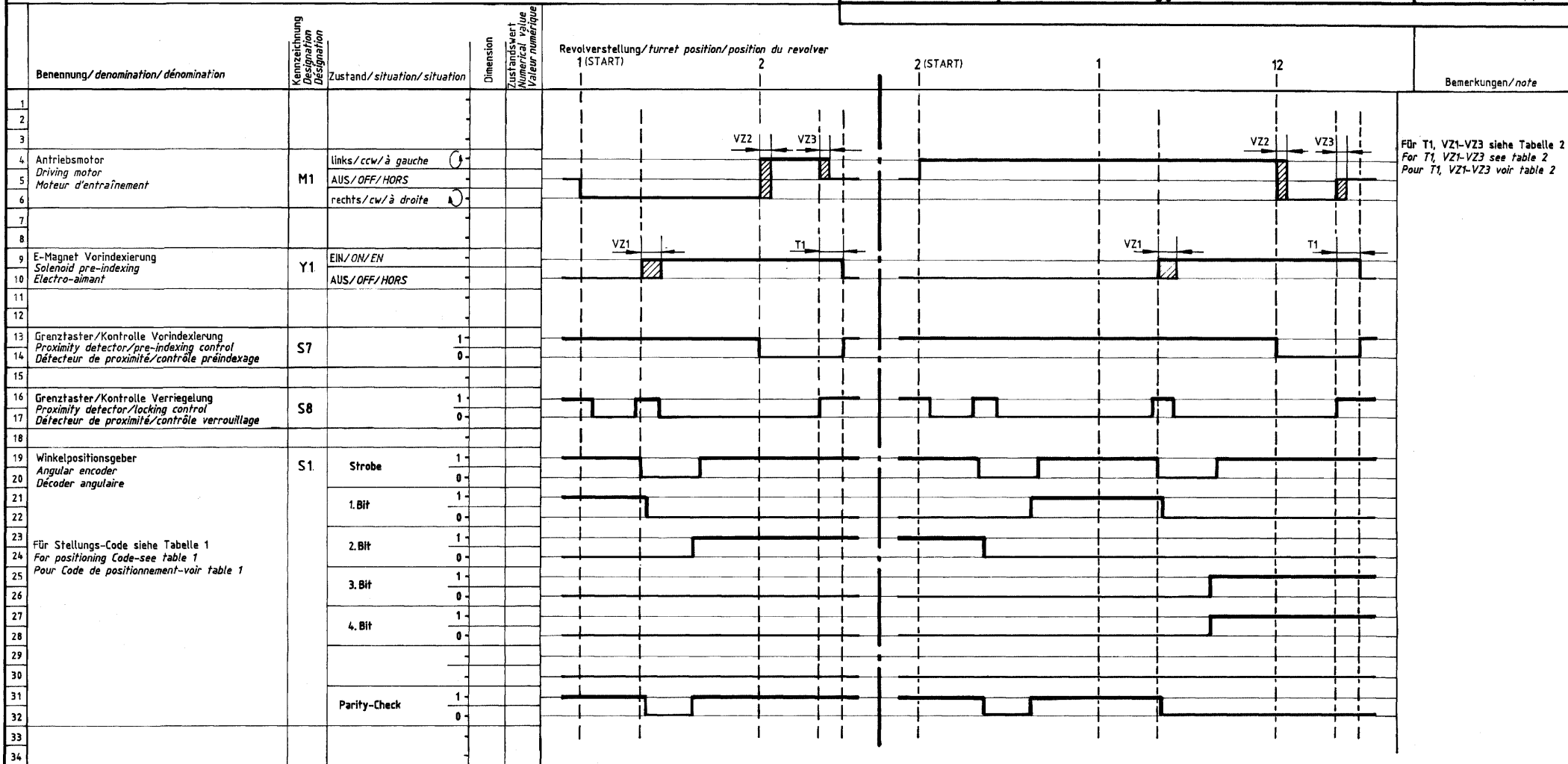


Tabelle 1 / Table 1

| Funktion Function Fonction | Revolver-Schaltstellung Indexing position of turret Position d'indexage du revolver | | | | | | | | | | | |
|----------------------------------|---|---|---|---|---|---|---|---|---|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Strobe | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1.Bit | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 2.Bit | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 3.Bit | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 4.Bit | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| Parity-Check | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |

Tabelle 2 / Table 2

| | | Min. | Max. |
|--|---------|------|------|
| Erforderliche Verzögerungszeit Delay time required Temporisation requise | T1 (ms) | 150 | - |
| Zulässige Verzögerungszeit Adm. delay time Temporisation adm. | VZ1(ms) | - | 60 |
| | VZ2(ms) | - | 60 |
| | VZ3(ms) | - | 40 |

Revolver-
bezeichnung
geändert
05.01.90 Al

SAUTER Feinmechanik GmbH
D-7430 Metzingen
West-Germany

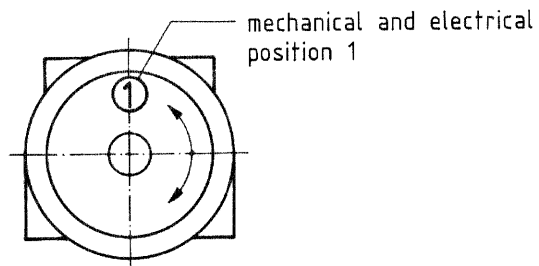
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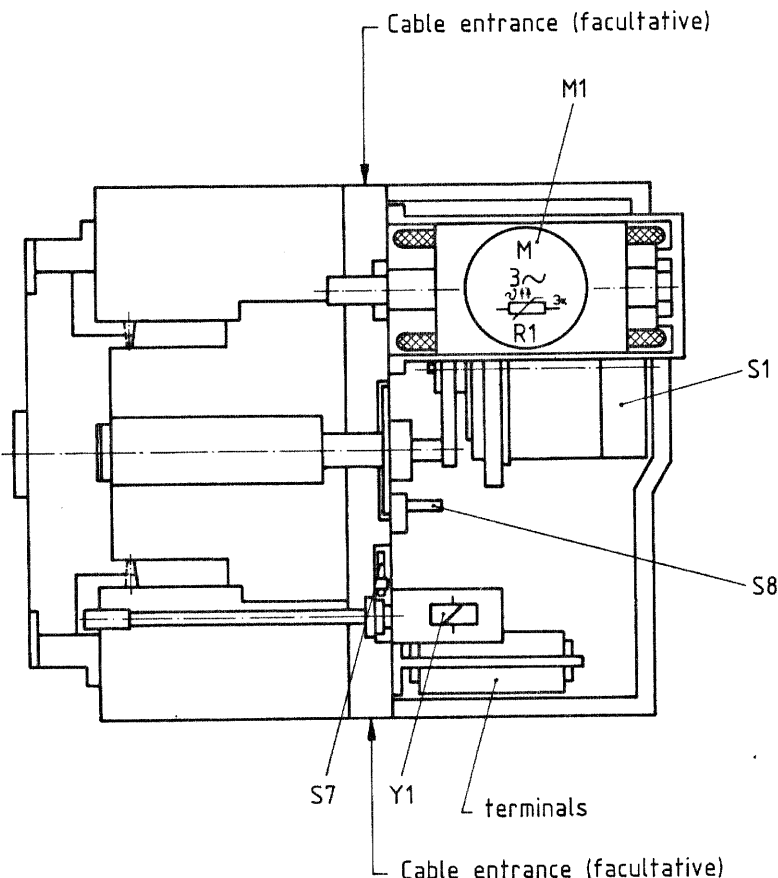
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Ersatz für Ausgabe gleicher Nr. vom 12.05.82 gez.
In exchange for plan of the same N° dated 12.05.82
En échange pour le plan du même N° du 12.05.82



mechanical and electrical
position 1

| Terminal arrangement plan | |
|---------------------------|-------------|
| Size | Drawing No. |
| 25 | SK-612 |
| 32 | SK-612 |
| 40 | SK-612 |
| 20 | SK-612 |



Wiring layout

SAUTER Disk-type tool turret
0.5.4⁷₈..2.. 6/8/10/12 positions

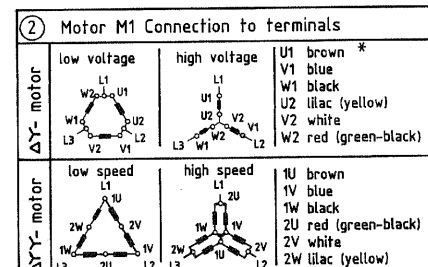
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EP-594 e

| De- sig- nation | Element / Function | Line | terminal No. | Wire- colour/ No. | Type | Supplier |
|-----------------------|---|------------------------|-----------------|-------------------------|---|----------------------|
| S1 | Angular encoder | brown (+) | 12 (+) | 10 | BRGB ⁰ ₂ -W ⁰⁸ _A B-10-EP- -P- L _{K0,5} R SAZ | Balluff Neuhausen |
| | | blue (-) | 11 (-) | 9 | | |
| | | 1. Bit | white | 1 | | |
| | | 2. Bit | yellow | 2 | | |
| | | 3. Bit | green | 3 | | |
| | | 4. Bit | lilac | 4 | | |
| | | Strobe | black | 5 | | |
| | | Parity-Check screen | pink | 6 | | |
| S7 | Proximity-Detector control pre-indexing | brown (+) | 12 (+) | | BES 516-324-E0-K-1 | Balluff Neuhausen |
| | | blue (-) | 11 (-) | | | |
| | | black | 8 | 7 | | |
| S8 | Proximity-Detector control of locking | brown (+) | 12 (+) | | BES 516-324-E0-K-1 | Balluff Neuhausen |
| | | blue (-) | 11 (-) | | | |
| | | black | 10 | 8 | | |
| R1 | Posistor-heat detector | blue | 14 | 11 | PTC thermistor in acc. with German Standard DIN 44081 U \leq 4V DC | Sauter |
| | | blue | 15 | 12 | | |
| M1 | 3-Phase A.C. Motor (release - indexing - locking) | ② | U1 * 2U | 15 | | |
| | | | V1 2V | 16 | | |
| | | | W1 2W | 17 | | |
| | | | U2 1U | | | |
| | | | V2 1V | | | |
| | | | W2 1W | | | |
| | Ground | | | green-yellow | | |
| Y1 | Solenoid pre-indexing | brown (+) | 16 (+) ③ | 13 | 24V DC; 2,8A 50% duty rating | Schütz Memmingen |
| | | blue (-) | 17 (-) ④ | 14 | | |

① for this, protective motor switch (thermistor) is required.
Without thermistor motor protector no guarantee in
case of motor failure.

③ Diode 1N4006 (mounted to terminals)

④ depending on the turret's outfit
⑤ SUPERFLEX-N-number cable (Cable drag chains)
18x0,75mm², Length acc. to order



| Technical Data of: | | S1 | S7 / S8 |
|------------------------|--|--------------|-------------------------|
| Operating voltage: | | 15 - 30 V DC | 10 - 24 V DC $\pm 20\%$ |
| Max. residual ripple: | | 10% | 10% |
| Max. load current: | | 50 mA | 200 mA |
| Nom. sensing distance: | | - | 1 mm |
| Temperature range: | | 0° to +60°C | -20° to +65°C |
| Function: | | - | make contact |
| Type: | | pnv logic | pnv logic |

③ Kabel
geä.
01.09.86 Wi

SAUTER Feinmechanik GmbH
D-7430 Metzingen
West-Germany

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Datum 10.02.86
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5. Coolant Supply

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Each DISK-type tool turret can be connected to the coolant supply via the connection arranged as required on the left-hand or right-hand side of the housing 1.

The coolant is supplied to the tool carrier through the coolant ring 43, which contains the coolant valve 45, and the distributing disk 44.

The distributing disk 44 is rigidly connected with the location disk 3.

The coolant passes to the position selected between coolant valve 45 and distributing disk 44.

The coolant can be fed into the tool carrier either via coolant ring 43 on the connection side or from the opposite side.

By the reniform groove in the distributing disk 44 the coolant supply into the tool carrier can be chosen either positive or negative within the angle α (depending on order) as shown below, measured from the center of the axis. (see Fig. 5)

| Size | 220 | 225 | 232 | 240 |
|-----------------|-----|-----|-----|-----|
| within α | 20° | 22° | 22° | 24° |

6. Mounting the Tool Turret on the Machine

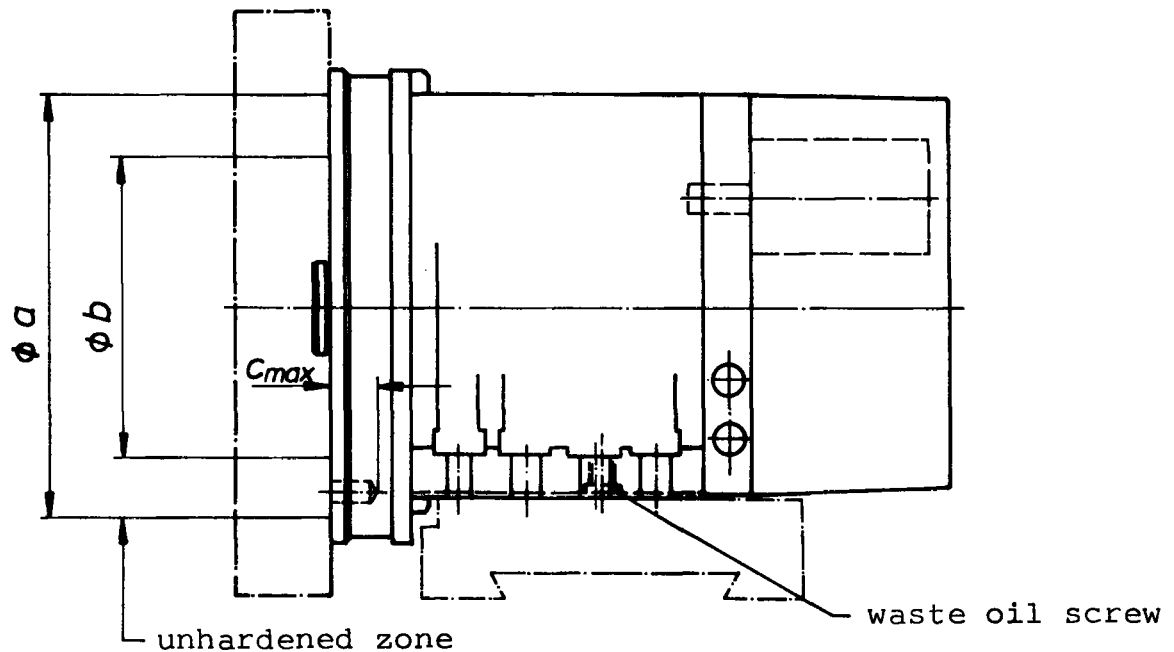
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The mounting surface of the DISK-type tool turret is precisely rectangular to the face of the location disk, thus enabling the turret axis to be aligned with an adjusting plate to the centreline of the rotation axis.

If the tool turret is mounted on the machine without adjusting plate, the tool turret must be locked on the face of the location disk 3 in order to adjust the height. The height of the tool turret must then be adjusted when it is exactly at right angles to the disk.

By means of the bush, which is part of the delivery, the fixation screw, situated diagonally to the working position, can be transformed into point of swivelling. Align the face of the location disk of turret on the machine slide in an exact right angle to the axis of rotation and fasten it with a tightening torque acc. to SK-734.

See wiring diagram EP-... for electrical connection of the tool turret.



| | 20 | 25 | 32 | 40 |
|----------|-----|-----|-----|-----|
| <i>a</i> | 164 | 210 | 268 | 344 |
| <i>b</i> | 130 | 166 | 200 | 200 |
| <i>c</i> | 15 | 20 | 25 | 30 |

7. Maintenance

=====

The SAUTER disk-type tool turret requires very little maintenance. It is lubricated by means of gear lubricant oil.

In the case of reassembly the lubricant oil requires to be renewed. Only gear lubricant oil

HLP ISO VG 46

may be used.

| Size | 20 | 25 | 32 | 40 |
|-------------------------------------|-----|-----|-----|------|
| Required oil quantity cm^3 | 250 | 500 | 750 | 1000 |

8. Removing the Tool Turret from the Machine

=====

In the event of a fault, the tool turret must be removed from the machine before it can be dismantled.

It is best to unscrew the tool carrier first.

After breaking the electrical and coolant connections, the fastening screws can be loosened and the tool turret taken off the machine

9. Replacing Components

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9.1.1. Replacing and Setting Proximity Detectors

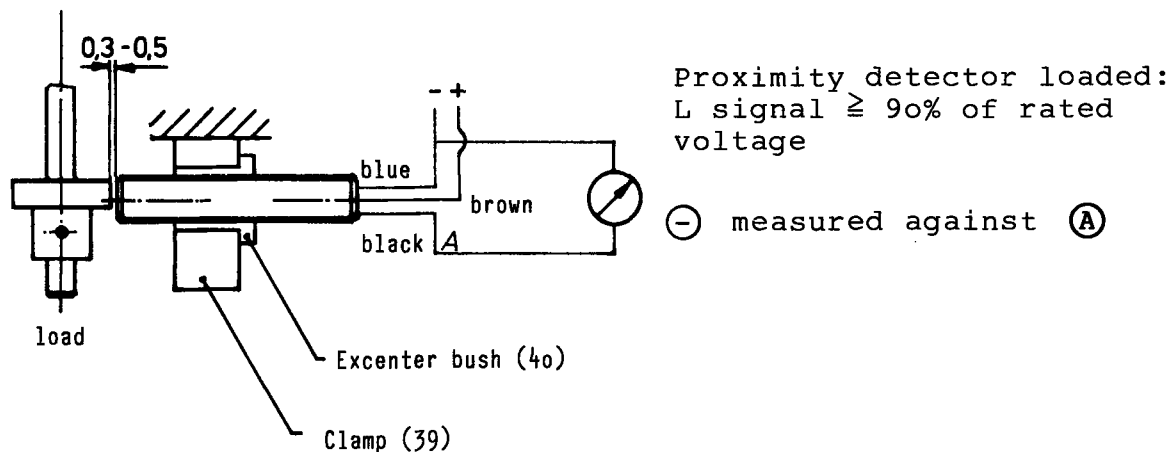
The proximity detector s7 (56) for checking the position of the pre-indexing bolt can, after having released the clamp (39), be retracted from the excenter bush (40) and checked acc. to fig. 6.

For adjustment, the tool turret needs to be put in an intermediate position. To do so, the existing voltage on the motor has to be cut off during turret rotation. Measure dimension "a" of the stroke of the pre-indexing bolt up to damping ring(5) at the core of solenoid (55). Now lock tool turret in defined position.

The position of proximity detector s7 has to be set on the excenter bush (40) in such a way that its signal drops out after an insertion depth of the pre-indexing bolt of $a+2+0,5$ mm. A larger insertion depth may cause the blockade of the motor. The motor is then switched off by the built-in PTC-resistor elements.

The proximity detector s8 (57) for checking the tool turret lock can also be tested as shown in fig. 6 after removal. The cam on cam disk (49) must be below the proximity detector in locked condition. The switching distance should be approx. 0.3 - 0.5 mm during adjustment.

Figure 6



9.1.2. Replacing and Setting Angular Encoder

To replace a defective angular encoder 52, the clamping elements 42 and the toothed belt wheel 60 must be loosened. The encoder can now be pulled out of its mount.

Lock the turret in any position for setting the encoder. Rough setting is carried out by disengaging the toothed belt wheel 70 and turning it until the encoder signals the position assigned to the location disk 3/tool carrier.

To evaluate the position, connect up encoder 52 as per our wiring diagram. Then turn toothed belt wheel 70 until there is voltage between STROBE and MINUS. Now check whether there is voltage between the individual BITS and MINUS. The position can be evaluated using the function table in our wiring diagram. (Voltage between BIT and MINUS means 1; no voltage means 0).

Fine setting is obtained by turning the encoder 52 until STROBE drops out. Precisely mark the angular position by scribe marks on mount and encoder. Turn encoder in opposite direction until STROBE drops out here too. Mark angular position. The angular range now marked is approx. 20° . Turn encoder back about 10° until the mark is in the middle between the two scribe marks on the mount. Tighten clamping elements 42.

9.2. Replacing Three-phase Motor 23

1. Switch off master switch.
2. Unscrew and remove protective cover 32.
3. The motor housing 22 + 23 can be unscrewed by loosening the three screws 61. Disconnect the motor leads from the terminal strip.
4. The rotor can now be removed from the stator.
5. Install the motor in reverse order. (If necessary, replace O-ring 78 when installing.)

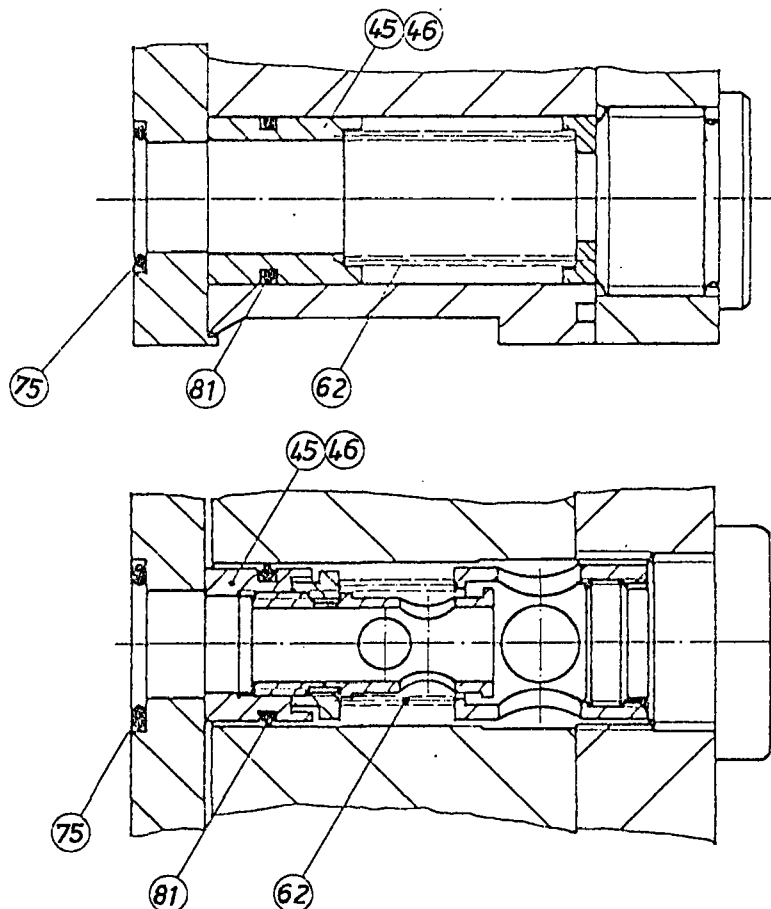
9.3. Replacing the DC-operated Solenoid 55

A defective DC solenoid is replaced after disconnecting the electric cable and unscrewing the four hexagon socket head screws.

9.4. Replacing the Coolant Valve

The coolant is passed by the fixed coolant ring 43 to the distributing disk 44 through the coolant valve 45. Sealing is by axial pressure of the valve 45 against the face of the distributing disk 44.

The event of a fault, the valve can be removed together with the screw plug. The valve can be remounted after a visual check, eventually after having exchanged the synthetic part with O-ring.



10. Dismantling the Tool Turret

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If seals are worn or if there is a fault, the tool turret must be dismantled in order to replace the seals or to trace the fault. To do so, the turret must be removed from the machine as described under 8.

Place the tool turret on the face of location disk 3. After unscrewing protective cover 32 and disconnecting the cable, the D.C.-operated solenoid 55 can be unscrewed. The spring plate 28 can now be removed from the push rod 27 together with spring 58.

Now unscrew the drive motor 23, which covers one of the screws 63 of flange component 2. After loosening the screws 63, the flange component 2 with gear unit, driver unit and encoder can be removed from its snug fit in housing 1. The grub screw of part 30 can now be unscrewed, and the bolt 29 of the engaging device and compression spring 64 can be removed.

Place the tool turret back on the mounting surface of housing 1.

After unscrewing the screws 65 in location disk 3, the disk can be removed together with the pre-indexing ring 5, the setbolts 6 and the distributing disk 44. Indexing bolt 25 can now be pulled out of housing 1 together with the push rod 27. The locking/clamping unit can now be extracted through the back of housing 1. After loosening the screws 66, the external index plate 4 can also be removed.

Remove the clamps 38 and screws 67 to dismantle distributing disk 44.

Dismantle the clamping unit by removing screws 68 from part 18. To remove the arbors 15, the straight pins 69 are pulled out of their holes using an extractor.

The gear is disassembled as follows:

Undo grub screw in toothed belt wheel 70 and pull out said wheel. Unscrew proximity detector mount. Undo grub screw on cam disk 49 and remove this disk. Loosen lock ring 72 and pull out shaft 7. Remove second lock ring 72. The gear can now be removed.

Then wash the parts, replace the seals and fill the tool turret with the specified oil (see sheet 7, section 7.).

Assembly is in the reverse order. First determine the rotational position of part 4 using the indexing pin. The parting line X must be free of grease prior to assembly, and the straight pin must be removed from the parting line after assembly. Tighten screws 65 and 66 with the torque specified in the table below.

| Size | 20 | 25 | 32 + 40 |
|--------------------------------|-------|-------|---------|
| Tightening torque of screws 65 | 41 Nm | 83 Nm | 145 Nm |
| screws 66 | 41 Nm | 83 Nm | 145 Nm |

Pull plug out of location disk 3. Insert suitable bright-drawn material or straight pin through hole. Place test pin on radial hub 13. Unlock and lock tool turret. Measure axial movement of test pin. The dimensional difference shows the lift of plate spring 51. The lift should be at least 0.05 mm. If necessary grind off the disk 94 to obtain the correct lifting height.

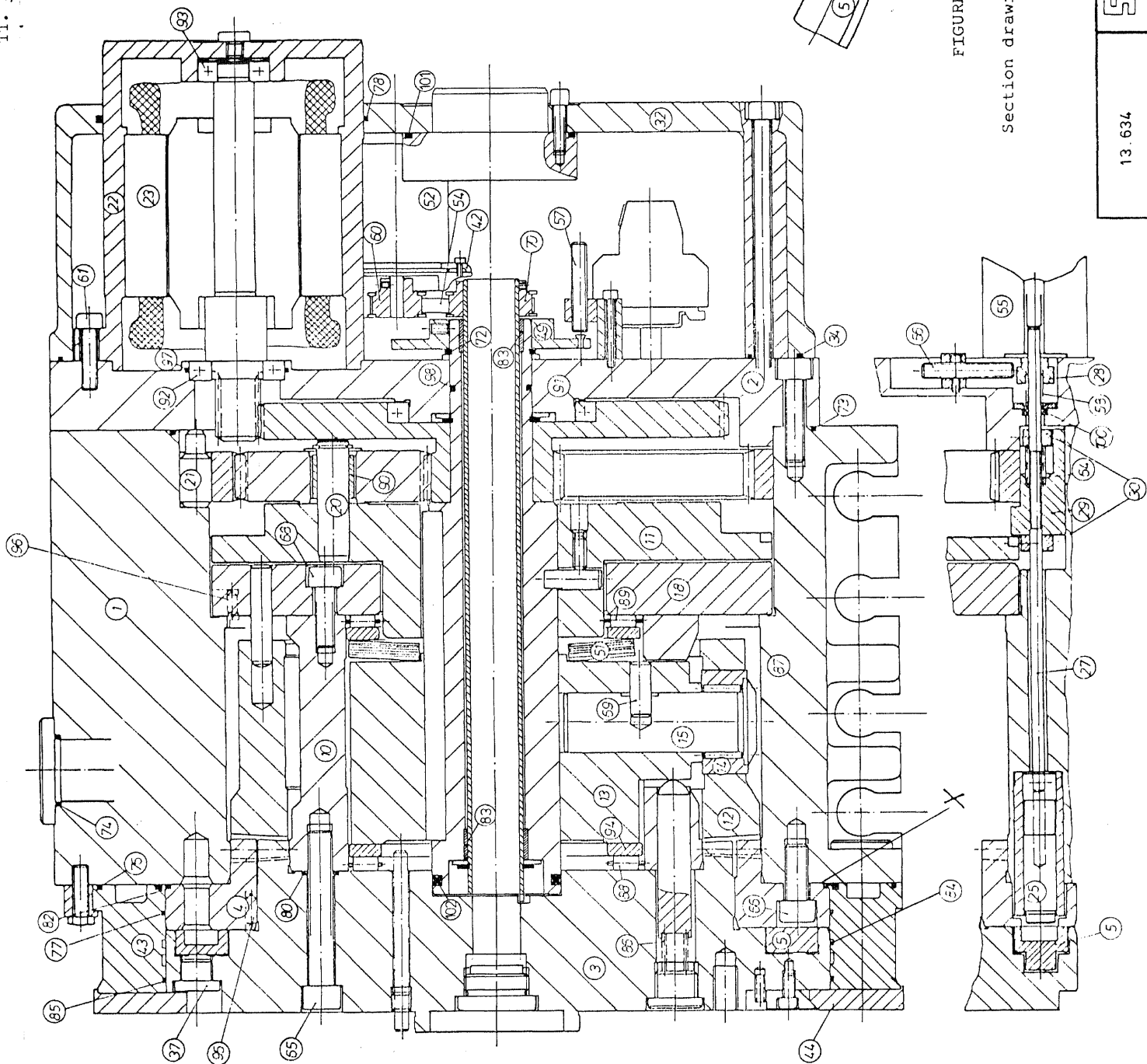


FIGURE 2

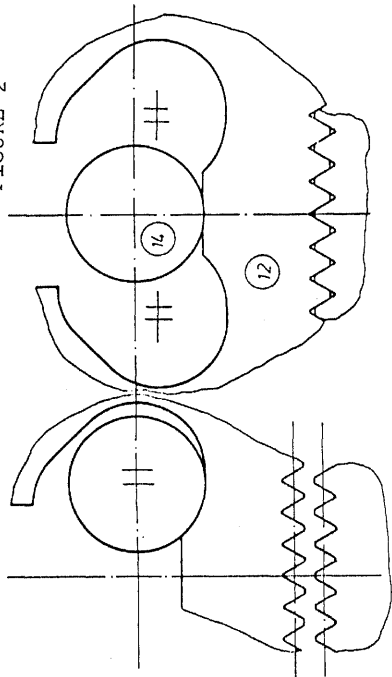


FIGURE 3

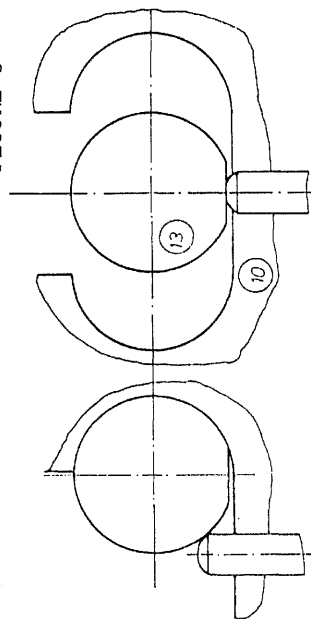


FIGURE 4

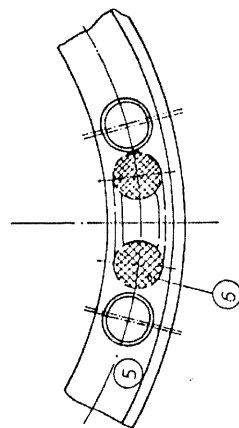
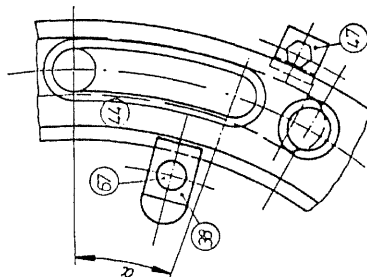


FIGURE 5



Section drawing of coolant valve - see sheet 10

List of Spare Parts

DISK-Type Tool Turret

Type: 0.5.480.220 - From Ident-N°
058 000

| N° | Denomination | Ordering-References | | Qty. | Manufacturer |
|---|--------------------------------------|---|----------|------|--------------|
| | | Designation | Ident-N° | | |
| 6 | Setbolt | 2.4.285.000 | 057 741 | 24 | Sauter |
| 14 | Bearing bush | 2.4.165.014 | 037 998 | 3 | Sauter |
| 20 | Bolt | 2.4.040.002 | 038 272 | 3 | Sauter |
| 21 | Setbolt | 2.4.285.006 | 038 273 | 6 | Sauter |
| x 23 | Three-phase motor | EBM 80/80 ..8p ... V/ .. cy., for gear ratio i = : | | 1 | Sauter |
| 34 | O-ring | OR 245-3 Viton | 061 914 | 1 | |
| 45 | Bush | 2.4.160.007 | 033 424 | 1 | Sauter |
| 46 | Plug | 2.4.036.002 | 038 277 | 1 | Sauter |
| 51 | Plate spring | A 100x51x6 size 3 | 034 575 | 1 | Sauter |
| 52. | Angular encoder f. turret 8 tools | BRGB2-WBB08EP-PRSA2 | 057 325 | 1 | Balluff |
| | ditto f. turret 12 tools | BRGB2-WAB12EP-PRSA2 | 057 327 | 1 | Balluff |
| 54, | POWER GRIP toothed belt | (100) 60 XL 037 010 N° of teeth 30 | 034 586 | 1 | Flender |
| 55 | DC operated solenoid | GHRB 050 L20 D02 24 V DC; 2,8 A; 82 N duty cycle 50 % | 055 150 | 1 | Schultz |
| 56 | Proximity detector | BES 516-324-E0-K1 | 004 157 | 1 | Balluff |
| 57 | Proximity detector | BES 516-324-E0-K1 | 004 157 | 1 | Balluff |
| 58 | Helical compression spring | D-156 | 024 493 | 1 | Gutekunst |
| 62 | ditto | VD-180 N | 062 220 | 1 | Gutekunst |
| 64 | ditto | VD-166 | 037 387 | 1 | Gutekunst |
| 73 | O-ring | OR 188-2 Viton | 058 073 | 1 | |
| 74 | O-ring | OR 30-2 Viton | 058 489 | 1 | |
| x = depending on order | | | | | |
| Parts numbered as per drawing, sheet 13 | | | | | |

In case of order we absolutely need: type of unit and serial n° !

14.635

SAUTER **Feinmechanik GmbH**
D-7430 Metzingen
West-Germany



Sheet 14

List of Spare Parts

DISK-Type Tool Turret

Type: 0.5.480.220 - From Ident-N°
062 800

| N° | Denomination | Ordering-References | | Qty. | Manufacturer |
|---|----------------------------|---------------------------------|----------|------|----------------|
| | | Designation | Ident-N° | | |
| x 75 | O-ring | OR 38-2 Viton | 062 132 | 8-12 | |
| x 75 | O-ring | OR 12-1,5 Viton | 058 493 | 8-12 | |
| 76 | O-ring | OR 236-2 Viton | 061 909 | 1 | |
| 77 | O-ring | OR 200-3 Viton | 058 506 | 1 | |
| 78 | O-ring | OR 94-3 Viton | 058 495 | 1 | |
| 80 | O-ring | OR 9-1,5 Viton | 058 501 | 9 | |
| 81 | O-ring | OR 10,5-1,5 Viton | 059 658 | 2 | |
| 82 | O-ring | OR 192-2 Viton | 058 502 | 1 | |
| 83 | DU bush | MB 1815 DU | 038 663 | 2 | Schmidt |
| 84 | PTFE seal (OMNISEAL) | URS B 200,0-108-10 C | 034 592 | 1 | Elring |
| 85 | "Spaghetti" hose | D 2,41 x 0,31 AWG 11 0,638 m | 036 588 | 1 | Höfert |
| 86 | Helical compression spring | D-227 B | 043 701 | 3 | Gutekunst |
| 87 | Bearing needle | 2 x 9,8 DIN 5402 | 038 401 | 81 | FAG |
| 88 | Axial needle ring | AXK 6085 | 034 579 | 1 | FAG |
| 89 | Axial needle ring | AXK 75100 | 034 578 | 1 | FAG |
| 90 | Needle bush | HK 1015 | 034 577 | 3 | INA |
| 91 | Deep groove ball bearing | 61810 | 034 582 | 1 | FAG |
| x 92 | ditto | 6004 2RS1 DIN 625 | 055 576 | 1 | SKF |
| x 92 | ditto | 6302 2RS1 DIN 625 | 038 428 | 1 | SKF |
| 93 | ditto | 6201 RS DIN 625 | 026 650 | 1 | FAG |
| 97 | O-Ring | OR 42-2 | 001 031 | 1 | Freudenberg |
| 98 | O-Ring | OR 20-2,5 | 000 994 | 1 | Freudenberg |
| 100 | Seal | N 6-9 (6x12x4) | 000 889 | 1 | Simrit |
| 101 | O-Ring | OR 63-2 Viton | 061 089 | 1 | |
| 102 | Quad-Ring | ID 34,59x2,62 | 027 512 | 1 | Busak & Luyken |
| x = depending on order | | | | | |
| Parts numbered as per drawing, sheet 13 | | | | | |

In case of order we absolutely need: type of unit and serial n° !

13. Actions to be taken in the Event of a Collision

=====

A distinction should be made here between

a) Collision during turret swivelling

If the collision impact is very high, e.g. during swivelling into the rotating chuck, the three arbor pins 20 of the planetary gear will break. In severe cases the teeth in the planetary gear will break. Other parts may then also be damaged.

One or several defects of this type will show up in excessive play when the tool carrier is swivelled in the unlocked state. The tool turret no longer locks or is hard to move. Have the damaged parts replaced by our service personnel (see Section 10, sheet 11 for dismantling the DISK-type tool turret).

b) Collision when turret is locked

When the tool turret is overloaded, the force can be high enough for the plate spring 51 to be pressed flat due to the Hirth toothing being lifted out. In a collision with the rotating chuck, individual tool turret components can be displaced into the parting lines. These parts will generally be

the outer index plate 4 to housing 1 and
the housing 1 on the slide

One or more defects are indicated by a displacement of the tool centreline in relation to the rotation axis.

Action: realign the components using straight pins. Tighten screws with torque wrench (see Section 10, sheet 12). Remove these pins from the parting lines again after alignment.

Align the external index plate 4 by unscrewing the collar plugs 37 from location disk 3, loosening screw 66, turning the unlocked tool turret by hand, then undoing the next screw 66 and so forth. When the screws 66 are all unscrewed, the index plate 4 is aligned with the housing by putting a straight pin through an assembly hole, and screws 66 are retightened. The straight pin is pulled out of the index plate 4/housing 1 parting line. The collar plugs 37 are screwed back in.

If the force attacks at an unfavourable angle, the toolholders or their locations in the tool carrier can be distorted or damaged. Their replacement is then necessary.



| Fault | Cause | Rectification |
|--|--|---|
| 1. Turret does not stop in the selected position 2. Tool turret does not lock (proximity detector for positional control is operated, switch combination "locked" b8 is not obtained) | 1. Angular position control limit switch is defective 1. Proximity detector for checking "pre-indexing" is out of adjustment or defective | 1. Check angular position control limit switch and replace it, if necessary. 1. Test proximity detector, re-adjust or replace. (see sheet 10, 10.1.) |

Befestigung der Scheibenrevolver und Werkzeugscheiben

093488

SK-734 d,e,f

Fastening of Disk-type tool turrets and tool disks
Fixation des tourelles revolver DISQUE et des plateaux à outils

| Revolver-Baugröße <i>Size of tool turret</i> Taille de la Tourelle revolver 0.5.4..... | Werkzeug-Scheiben-Befestigung <i>Fastening of tool disks</i> Fixation des plateaux à outils | | Werkzeug-Revolver-Befestigung <i>Fastening of tool turrets</i> Fixation des tourelles revolver | |
|--|---|---|--|---|
| | Befestigungsschrauben <i>Fastening screws</i> Vis de fixation | | Befestigungsschrauben <i>Fastening screws</i> Vis de fixation | |
| | ø / Qualität <i>Dia. / Quality</i> Dia. / Qualité | Anzieh- *) drehmoment [Nm] <i>Tightening torque</i> Couple de serrage | ø / Qualität <i>Dia. / Quality</i> Dia. / Qualité | Anzieh- *) drehmoment [Nm] <i>Tightening torque</i> Couple de serrage |
| ..08 | M5 M6 - 12.9 | 5,5 16 | M6 - 12.9 | 16 |
| ..10 | M6 - 12.9 | 16 | M8 - 12.9 | 39 |
| ..12 | M8 - 12.9 | 39 | M8 - 12.9 | 39 |
| ..16 | M8 - 12.9 | 39 | M10 - 12.9 | 77 |
| ..20 | M10 - 12.9 | 77 | M12 - 12.9 | 135 |
| ..25 | M12 - 12.9 | 135 | M16 - 12.9 | 280 |
| ..32 | M12 - 12.9 | 135 | M20 - 12.9 | 550 |
| ..40 | M12 - 12.9 | 135 | M24 - 12.9 | 950 |

*) Gewinde und Kopfauf­lage­fläche der Schrauben mit **MoS₂** geschmiert.

*) Srew thread and seat engaging surface of screw head lubricated with **MoS₂**

*) Filet de vis et surface d'appui de la tête de vis lubrifiés avec **MoS₂**

Verteiler: MTG, REP, KD

SAUTER

Feinmechanik GmbH
D - 72555 Metzingen
G e r m a n y




Index: _ 2007.01.16

Ersteller: 2007.01.16 tro

Contact

Order information

| | |
|---|--|
|  | Service SAUTER Feinmechanik GmbH Postfach 1551 D-72545 Metzingen Germany |
|  | ++49(0) 7123-926-0 |
|  | ++49(0) 7123-926-193 |
| @ | service@sauter-feinmechanik.com |



IMPORTANT

Please indicate in your orders:

Product data as per nameplate on the housing


1. Classification number (series, size)
2. Identification number
3. Order number

Ordering data as per replacement-parts drawing and table

4. Identification number and quantity of the spare part requested.

Client

5. Company
6. Client's name and phone number.

| | | | | | |
|---|---|-------------|--------------|----|---|
|  | SAUTER Feinmechanik GmbH D - 72555 Metzingen | Typ | X.X.XXX.X | XX | ① |
| | Made in Germany | Id.-Nr. | XXX XXX | | ② |
| | | Com. Nr. | XX-XXX-XX-XX | | ③ |
| | | | | | |