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1 Introduction

The question "What is hydraulics?" can be answered as follows for the technical department.

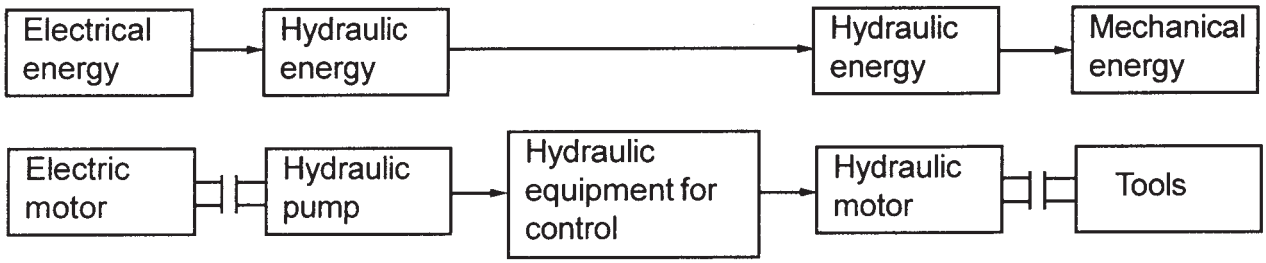
Hydraulics can be understood to mean the transmission and control of forces and movements by means of liquid matters.

Hydraulic systems and hydraulic units are quite common in technical applications. They are applied for instance, in:

- Machine tool manufacture
- Press manufacture
- Plant manufacturing
- Vehicle manufacturing
- Aircraft construction
- Ship building

The benefits of the hydraulic system lie in the generation and transmission of stronger forces in the application of smaller structural elements and in good closed and open-loop control. The switching units can also be well remote-controlled (mostly electrically). Running from the standstill state under maximum load is possible with hydraulic-cylinder and hydraulic motor The fast reversal of direction can be realized through the respective switching units. Pressure, force, torque and the speed of the working elements are infinitely variable. The hydraulic units have a high service life due to self-lubrication.

Energy conversion in hydraulic installations



There are also disadvantages alongside these benefits. The disadvantages are largely in the transmission medium, on the pressurized liquid itself.

There are risks of accident in the high pressure of the hydraulic pressurized liquid. Care shall therefore be taken that all connections are tightened and leak-proof.

In other words, the hydraulic system has special benefits and focal points - as those specified above. Good solutions can be realized for production-technical problems in connection with the electrical technology, mechanics and the pneumatic system.

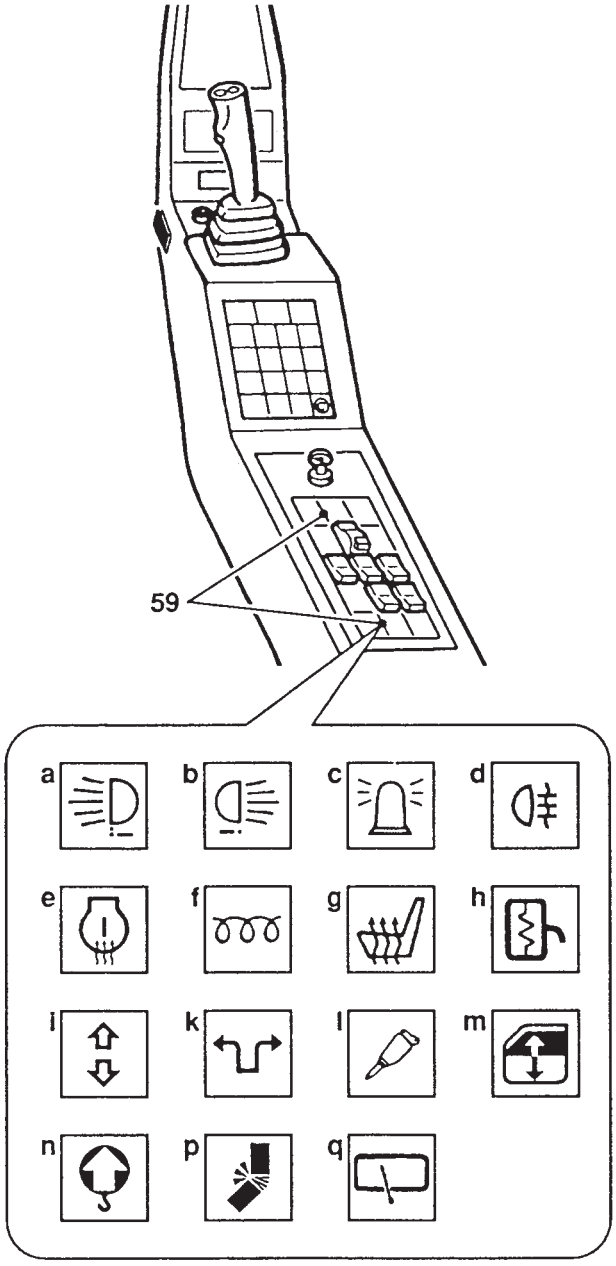
Pre-requisites to be met by the user of the hydraulic system:

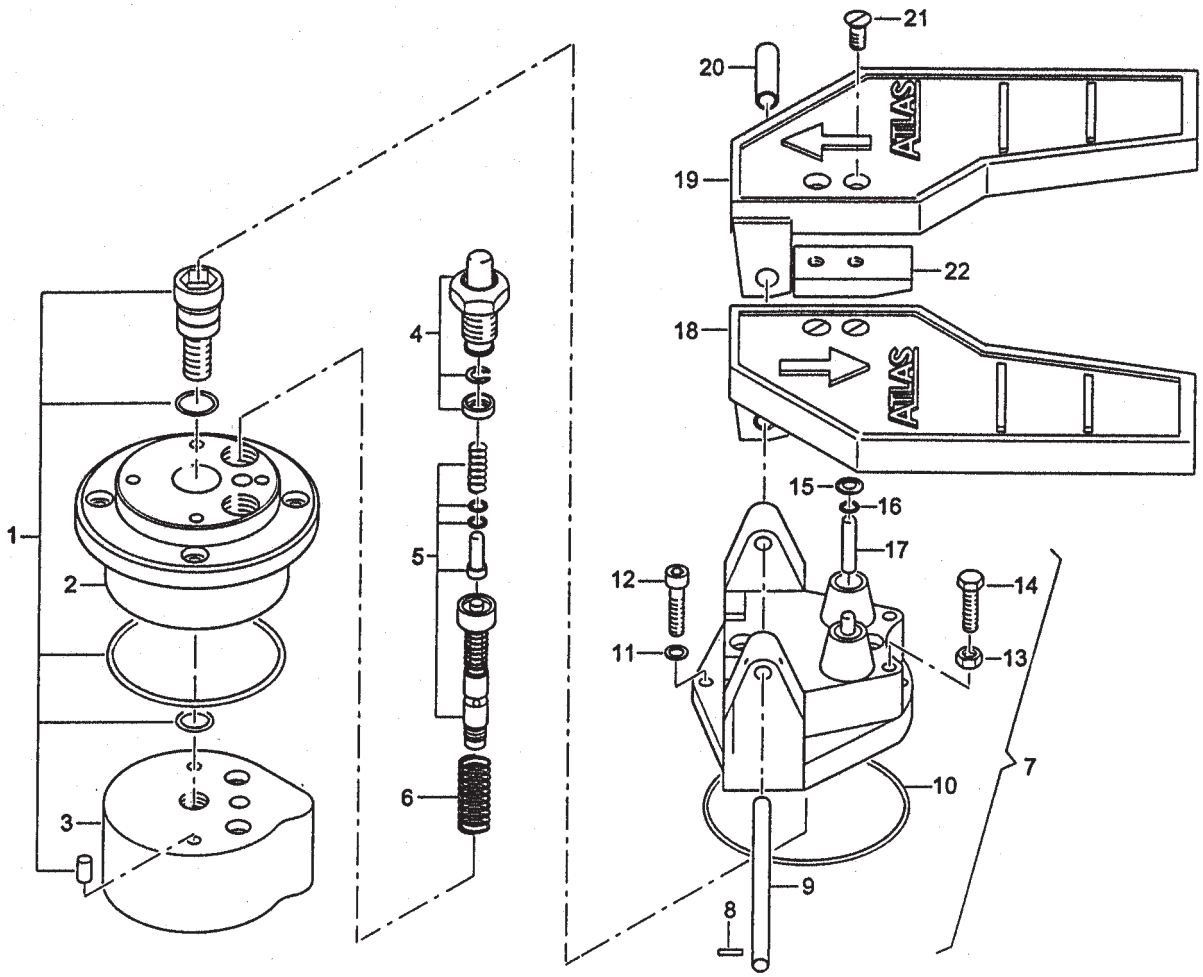
Knowledge of the physical fundamental principles of hydrostatics and hydrodynamics
Knowledge of the units and physical magnitudes of hydraulics
Knowledge of hydraulic components and their interaction in hydrosystems.

4 Special equipments ♦

Available functions (59)
in switch block on right

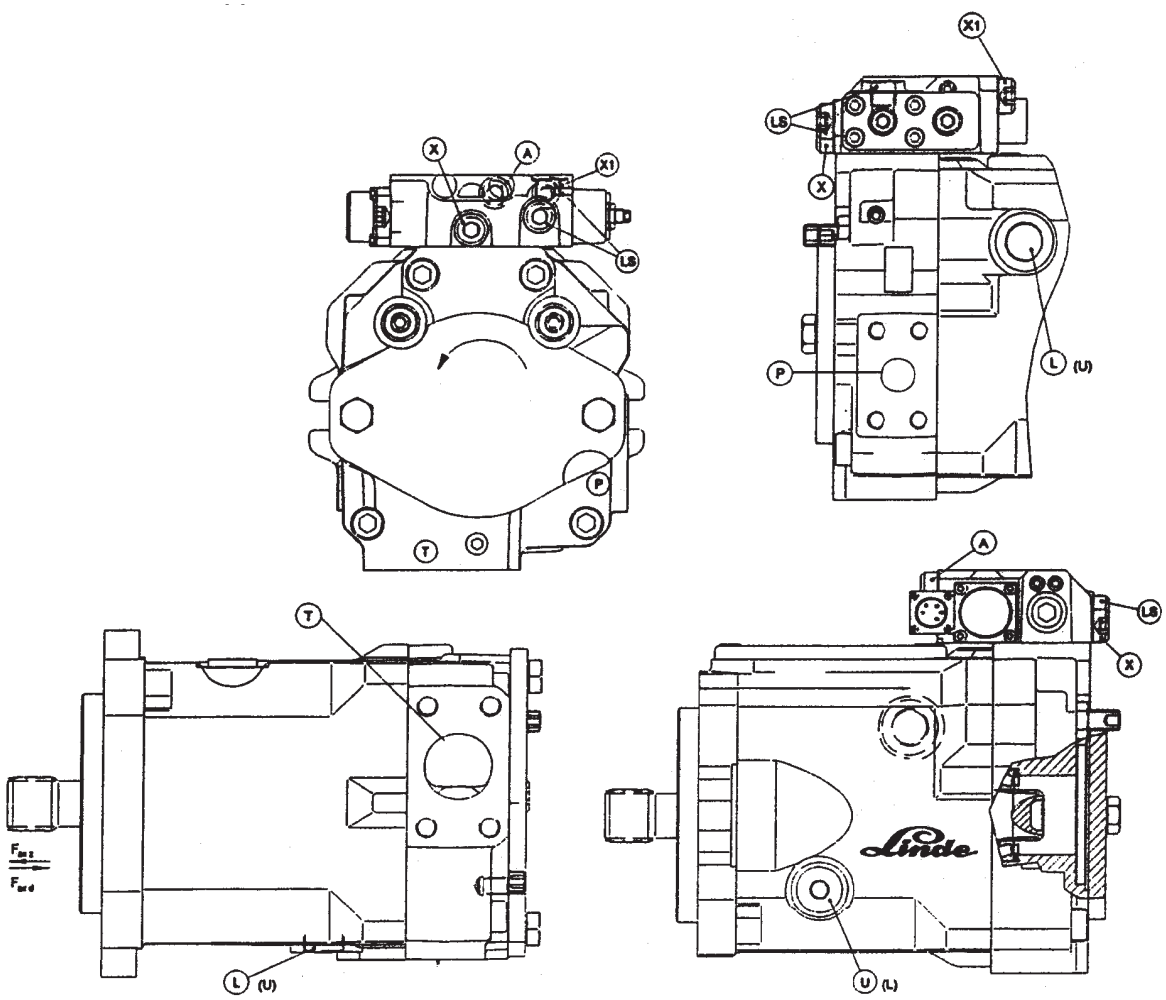
- **a** Headlight on roof, front (orange)
- **b** Headlight on roof, rear (orange)
- **c** Rotary beacon (yellow)
- **d** Rear fog light (green)
- **e** Fuel preheating (yellow)
- **f** Hydraulic oil heating (green)
- **g** Seat heating (yellow)
- **h** Mirror heating (yellow)
- **i** Cab lift up / down (green)
  Vario cab up / down (green)
- **k** Vario cab forward / back (red)
- **l** Hydraulic hammer (blue)
- **m** Electric window lift (green)
- **n** Overload warning device (yellow)
- **p** Reverse safety function (red)
- **q** Rear window wiper (green)





1 Repairing set
2 Upper part
3 Lower part
4 Repairing set
5 Valve case
6 Spring set
7 Repairing set
18 Pedal L
19 Pedal R
20 Bush
21 Counters screw A3C
22 Plate

5.4 Connection and gage port diagram



EXPLANATIONS

	Nominal ratings (cm³)	105	135
P	Discharge port SAE	1“	1“
T	Suction port SAE	2“	2“
L U	Drain (filling vent) ports Port enabling case to be filled with oil	M22x1.5	M22x1.5

A Gage port, control pressure M14 x 1.5

LS Load-sensing port 2x M1 4 x 1 .5

X Gage port, actuating pressure M14 x 1.5

X1 Control pressure port for foroperation operation emergency operation (max. 30 bar) M 14 x 1.5

Solenoid switching operations
M d.c. proportional solenoid 12/24 V, according to specification

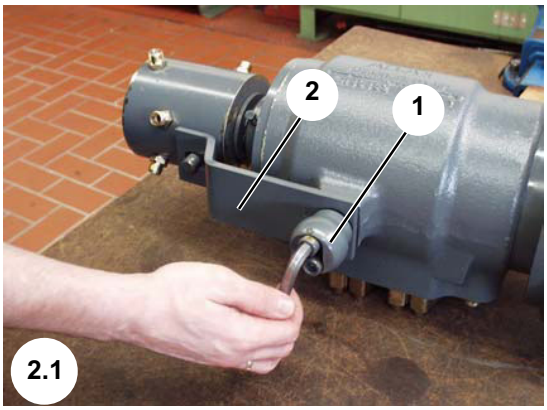
Oil type (see technical data sheet)

Permissible casing inner pressure 1,5 bar. Casing to be filled with oil and bled before start of operation observe mounting instructions !

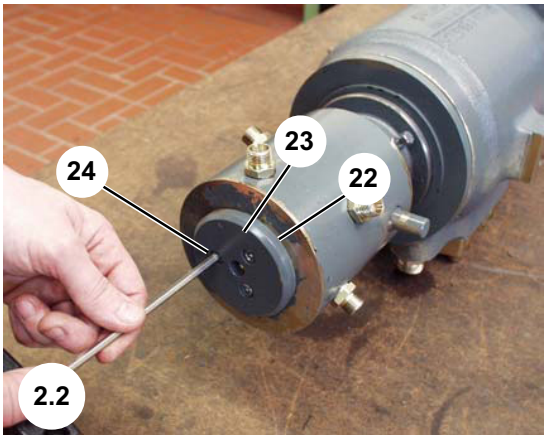
For other specifications, see technical data sheets.

For applications involving radial shaft loadings please contact LFH.

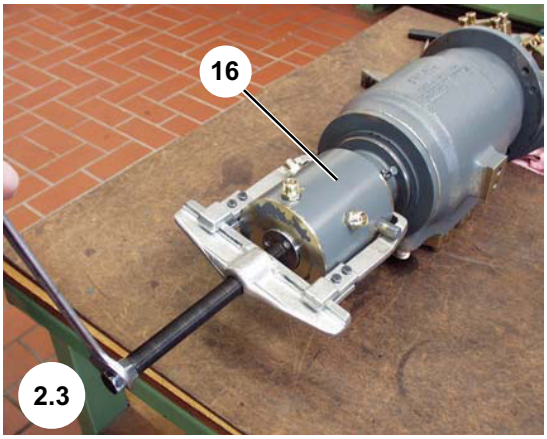
13.2 Maintenance of the rotary connection



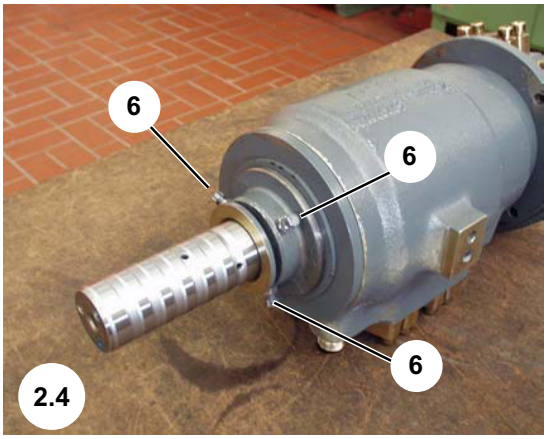
Screw off the spherical head (1) and remove the lokking device (2).



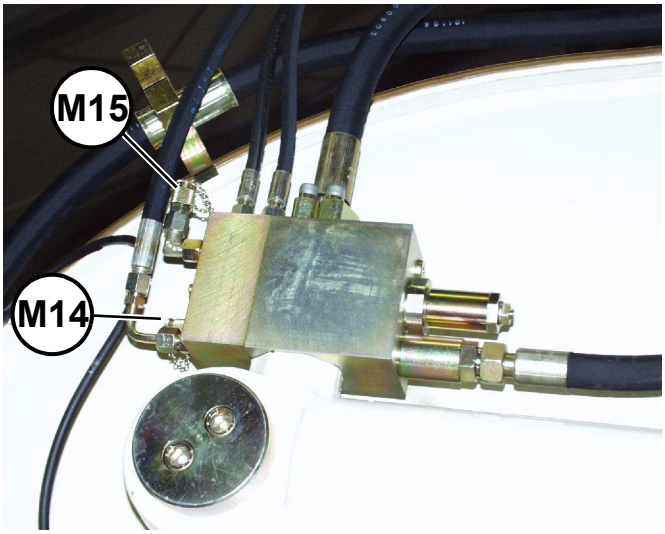
Remove the cap screws (24) and the flange (23) with the stop disc (22).

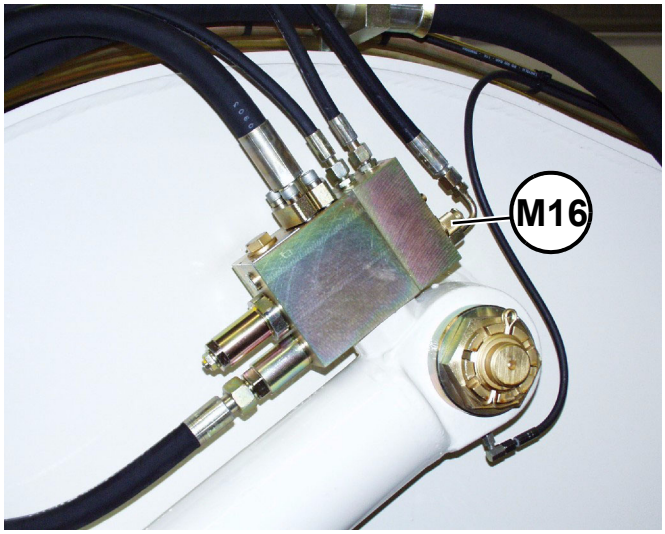


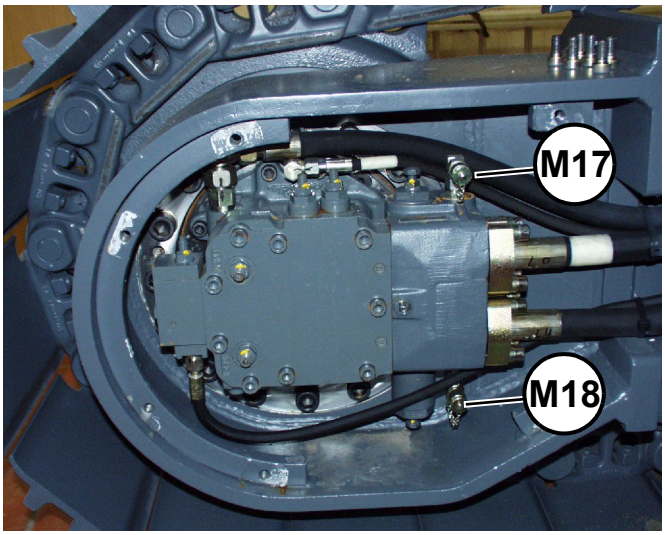
Pull off the outer part (16).

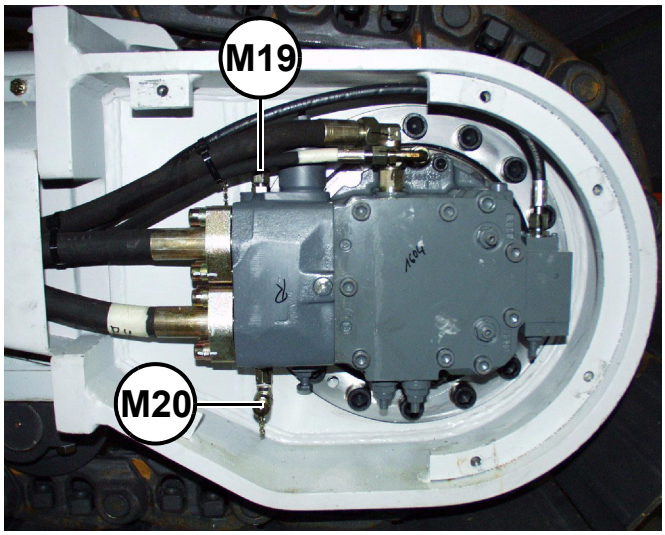


Screw out the securing screws (6).

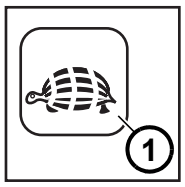






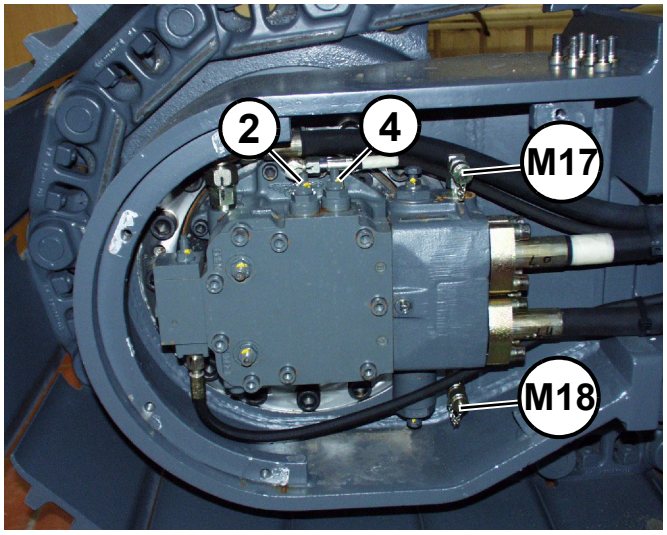


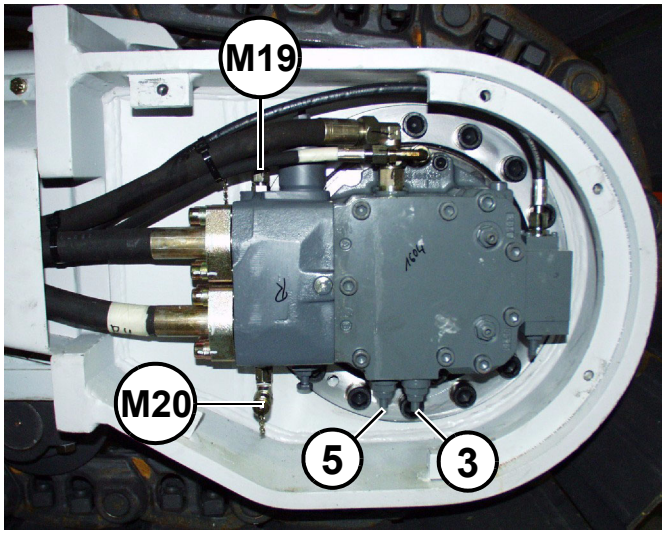
M14 Valve A static pressure
M15 Pilot pressure lowering
M16 Valve B static pressure
M17 Secondary pressure forward travel, left
M18 Secondary pressure reverse travel, left
M19 Secondary pressure forward travel, right
M20 Secondary pressure reverse travel, right



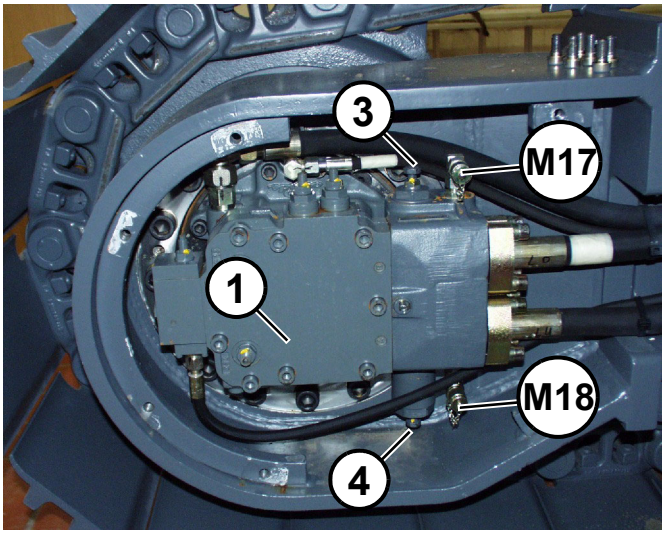
WARNING

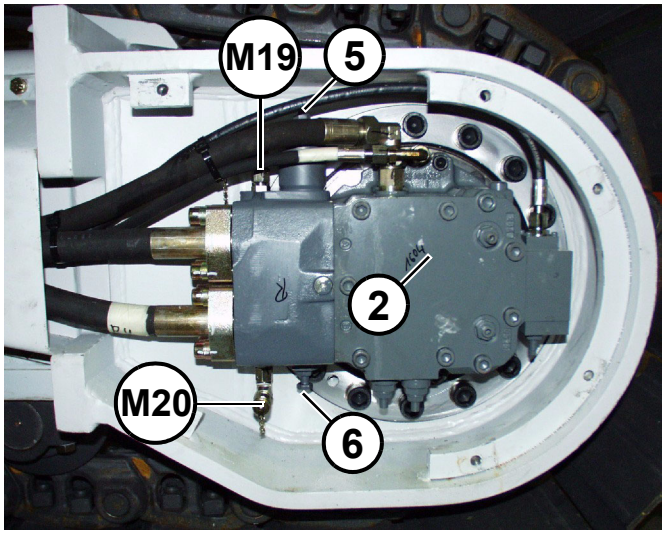
Ensure that the selector switch is shifted to position crawler speed I ("higher speed"), the symbol (1) "turtle" in the display panel should not light up, otherwise the disc break can be destroyed.





6. The pressure of secondary valve is displayed at the measuring union "secondary pressure forward travel, left" (M17), "secondary pressure reverse travel, left" (M18), "secondary pressure forward travel, right" (M19) or "secondary pressure reverse travel, right" (M20). Check each crawler track **separately** by operating the control handle.
7. The adjustment for the corresponding secondary valve is carried out by screwing in/out the respective adjusting screws for "forward travel" (2) or (3), and/or "reverse travel" (4) or (5), located on both inner back sides of the crawler unit.
8. Switch off the engine, ignition key in position "**0**" (the ignition is switched off).
9. Remove the pressure gauges from measuring union "secondary pressure forward travel, left" (M17), "secondary pressure reverse travel, left" (M18), "secondary pressure forward travel, right" (M19) and "secondary pressure reverse travel, right" (M20).
10. Release the drive units, see section 4.16.2 on page 59.





11. Set the reverse travel movement of the crawler track raised to its maximum stage using the control lever.
12. Screw out the adjusting screw (3) and/or (5), until the pressure at the measuring union "secondary pressure reverse travel, left" (M18) and/or "secondary pressure reverse travel, right" (M20) stops dropping.
13. Screw in the adjusting screw (3) and/or (5), until the pressure at measuring union "secondary pressure reverse travel, left" (M18) and/or "secondary pressure reverse travel, right" (M20) rises approx. 1 bar.

NOTE

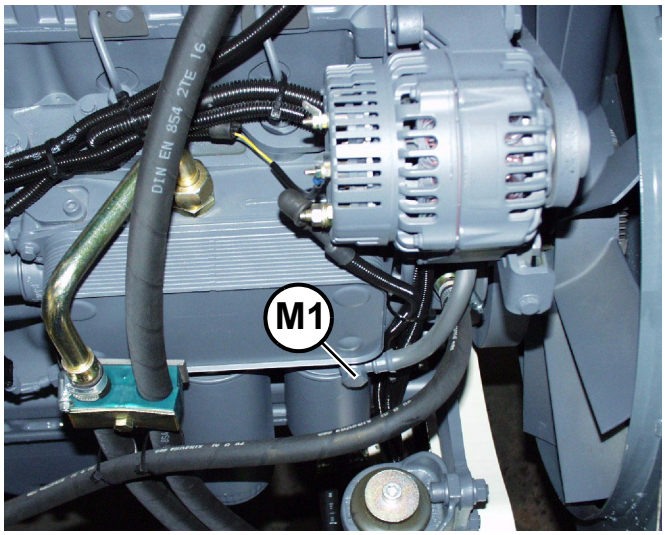
Ensure that no one is remaining within the travel gear area of the excavator.

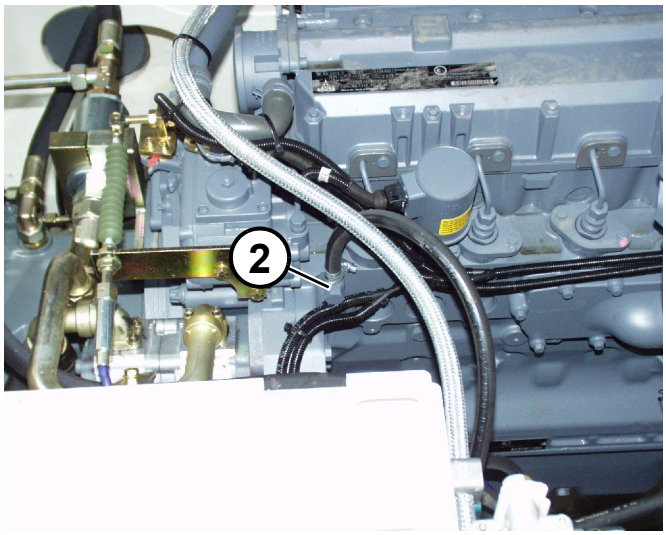
14. Lower the excavator.
15. Switch off the engine, ignition key in position "**0**" (the ignition is switched off).
16. Remove the pressure gauges from the measuring union "secondary pressure forward travel, left" (M17) and "secondary pressure reverse travel, left" (M18), and/or "secondary pressure forward travel, right" (M19) and "secondary pressure reverse travel, right" (M20).

4.3 Fuel admission pressure

NOTE

Replace the fuel filter before checking the fuel admission pressure.





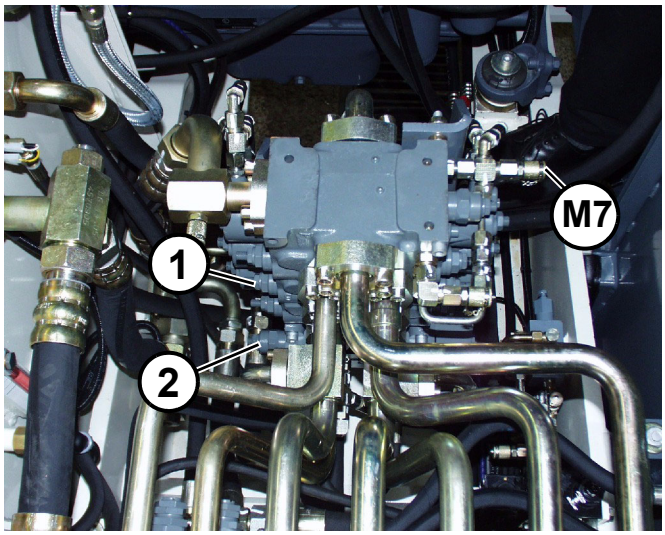
1. Remove the hollow screw (1) from measuring union "fuel admission pressure" (M1).
2. Screw in a suitable adapter, and connect the pressure gauge.
3. Start the engine.
4. Move the engine speed control lever to the maximum speed position (to its stop).
5. The fuel admission pressure on measuring union "fuel admission pressure" (M1) should read between 5 bar and 5.5 bar.

NOTE

Check the pressure-holding valve (2), in case fuel admission pressure is insufficient.

6. Switch off the engine.
7. Remove the adapter and the pressure gauge.
8. Close measuring union "fuel admission pressure" (M1) with the hollow screw (1).

4.12.1 Raising pressure P

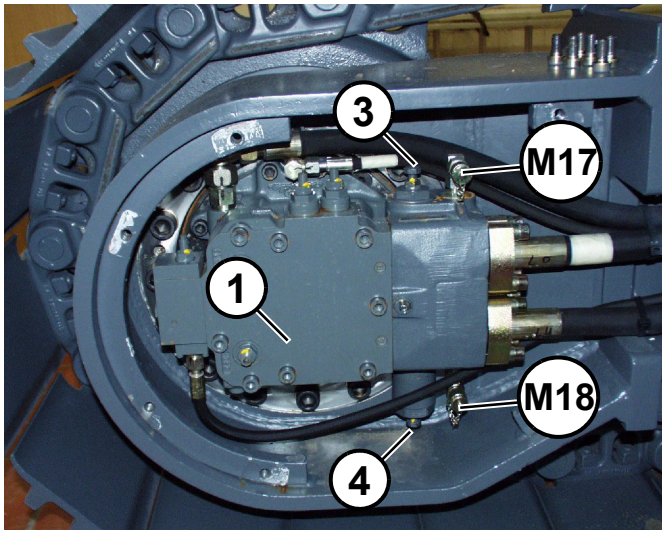


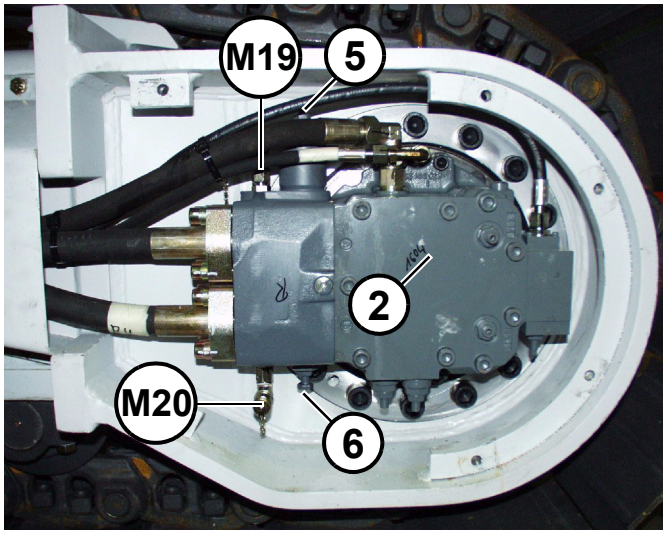
1. Connect a pressure gauge to measuring union "pump" (M7).
2. Start the engine.
3. Set the engine speed to approx. 1700 rpm.
4. Move "jib folding out" function to its stop position and hold in place. The pressure of the "jib folding out" is displayed at measuring union "pump" (M7).
5. Tighten the adjusting screw (1) for the secondary valves "jib folding out" by approx. one turn. The pressure at measuring union "pump" (M7) is now limited by the pressure cut-off device while the "jib folding out" function is active.

WARNING

The pressure displayed at measuring union "pump" (M7) should not exceed 460 bar during the following adjustments.

6. Move "jib folding out" function to its stop position and hold it. The pressure of the pressure cut-off device is displayed at measuring union "pump" (M7).
7. Tighten the adjusting screw (2) for the pressure cut-off device to set the pressure at measuring union "pump" (M7) 20 bar above the maximum secondary pressure setting.
8. Repeat steps 6 to 8 as necessary.





WARNING

Ensure that no one is remaining within the crawler track area and other rotating parts of the excavator, before carrying out the following adjustment procedure.

WARNING

Make sure only to move the crawler track raised.

5. Start the engine.
6. Move the engine speed adjusting lever to the maximum speed position (to its stop).
7. Shift selector switch to crawler speed **II** ("slow speed").
8. Set the maximum forward travel speed of the crawler track using the control lever.
9. Screw out the adjusting screws (3) and (4), and/or (5) and (6) for the dynamic pressure at the corresponding drive unit (1) or (2), until the pressure at the measuring union "secondary pressure forward travel, left" (M17) and/or "secondary pressure forward travel, right" (M19) stops dropping.
10. Screw in the adjusting screw (4) and/or (6), until the pressure at measuring union "secondary pressure forward travel, left" (M17) and/or "secondary pressure forward travel, right" (M19) rises approx. 1 bar.

2 Bolt pre-loadings and tightening torques

To ensure reliable connections, always comply with the prescribed tightening torques when installing bolts.

Refer to the stated pre-loading P_v and tightening torque M_a values for adjusting the torque wrench.

The following table states the standard pre-loading P_v and tightening torque M_a values according to thread sizes.

The stated values apply unless a different value is stated on the assembly drawing.

Standard metric thread (DIN 13 Page 34)

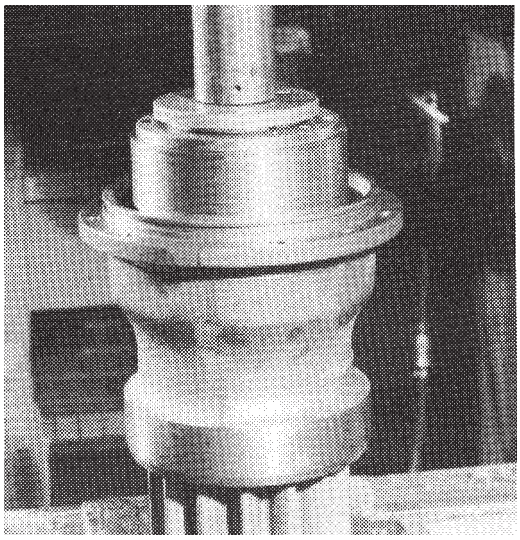
Threads P_v and M_a of the quality grades

	8.8 (8G)				10.9 (10K)				12.9 (12K)			
	P_v		M_a		P_v		M_a		P_v		M_a	
	kN*	(kp)	Nm**	(kpm)	kN	(kp)	Mm	(kpm)	kN	(kp)	Nm	(kpm)
M 5	6,2	(635)	5,9	(0,6)	8,8	(895)	7,9	(0,8)	10,5	(1070)	9,8	(1,0)
M 6	8,8	(WO)	9,8	(1.0)	12,4	(126Q)	13,8	(1.4)	14,8	(1510)	16,7	(1,7)
M 8	16,2	(1650)	24,6	(2,5)	22,8	(2320)	34,4	(3,5)	24,3	(2790)	40,2	(4,1)
M 10	25,7	(2620)	48,1	M.9)	36,2	(3690)	67,8	(6,9)	43,5	(4430)	81.5	(8,3)
M 12	37,6	(3830)	84,4	(8,6)	53,0	(5400)	118	(12,0)	63,4	(6450)	142	(14,5)
M 14	51,6	(5250)	133	(13.5)	72,6	(7400)	187	(19,0)	87,0	(8850)	226	(23,0)
M 16	71,7	(7300)	206	(21.0)	100,1	(10200)	290	(29,5)	121,0	(12300)	348	(35,5)
M 18	86,3	(8800)	285	(29,0)	122,0	(12 400)	398	(40,5)	145,0	(14800)	476	(48,5)
M 20	112,0	(11400)	402	(41,0)	157,0	(16000)	570	(58,0)	187,5	(19200)	677	(69,0)
M 22	138,5	(14 100)	540	(55,0)	195,5	(19900)	765	(78,0)	234,5	(23900)	914	(93,0)
M 24	161,0	(16400)	697	(71,0)	226,0	(23000)	980	(100,0)	271,0	(27603)	1180	(120,0)

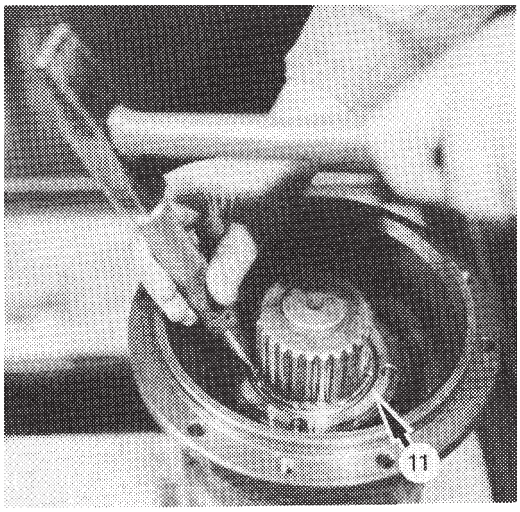
Standard metric thread (DIN 13 Page 34)

M 8x1	17,8	(1810)	26,5	(2,7)	25,0	(2550)	37,3	(3,8)	30,0	(3060)	44,2	(4,5)
M 10x1	27,8	(2830)	47,1	(4,8)	39,1	(3980)	68.8	(7,0)	46,8	(4770)	81,5	(8,3)
M 12x1,5	40,0	(4070)	88,4	(9,0)	56,0	(5700)	123	(12,5)	67,2	(6850)	147	(15,0)
M 14x1,5	57,5	(5850)	147	(15,0)	81,0	(8250)	206	(21,0)	97,3	(9900)	246	(25,0)
M 16x1,5	77,5 101,1	(7900)	221	(22,5)	109,0	(11 100)	309	(31,5)	130.5	(13300)	373	(38,0)
M 18x1,5		(10300)	319	(32,5)	142,0	(14500)	451	(46,0)	171,0	(17400)	540	(55,0)
M 20x1,5	127,6	(13000)	451	(46.0)	179,5	(18300)	628	(64.0)	216,0	(22000)	755	(77,0)
M 22x1,5	158,0 179,0	(16 100)	599	(61.0)	222,0	(22600) (25 700)	845	(86,0)	266,0	(27 100)	1030	(105,0)
M 24x2		(18300)	765	(78,0)	253,0		1080	(110,0)	303,5	(30900)	1275	(130,0)
M 27x2	233,5	(23800)	1130	115,0)	329,0	(33500)	1570	(160,0)	395,0	(40200)	1915	(195,0)

*kN = Kilo-Newton **Nm = Newton-Meter

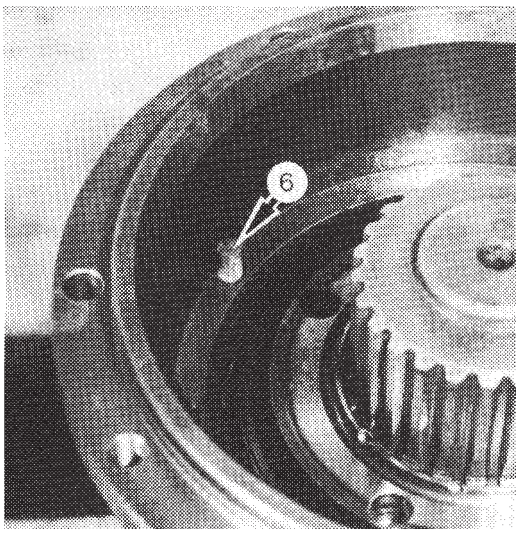


…using a sleeve as an aid.



Caulk bearing race (11) a

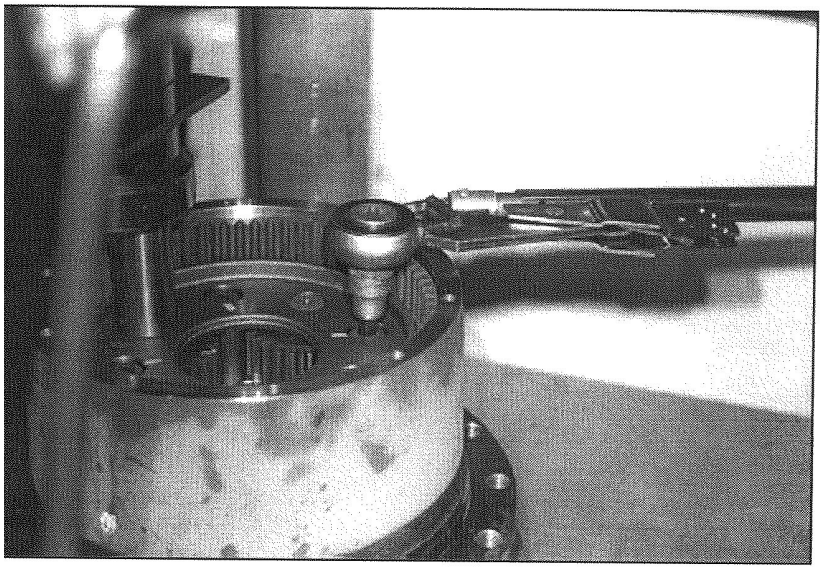
t five points on the circumference with a centre punch.



Always clean the round bar magnet (6).

Install the planet stages and brake assembly as described above.

-RIMONTAGGIO / *REASSEMBLING*-

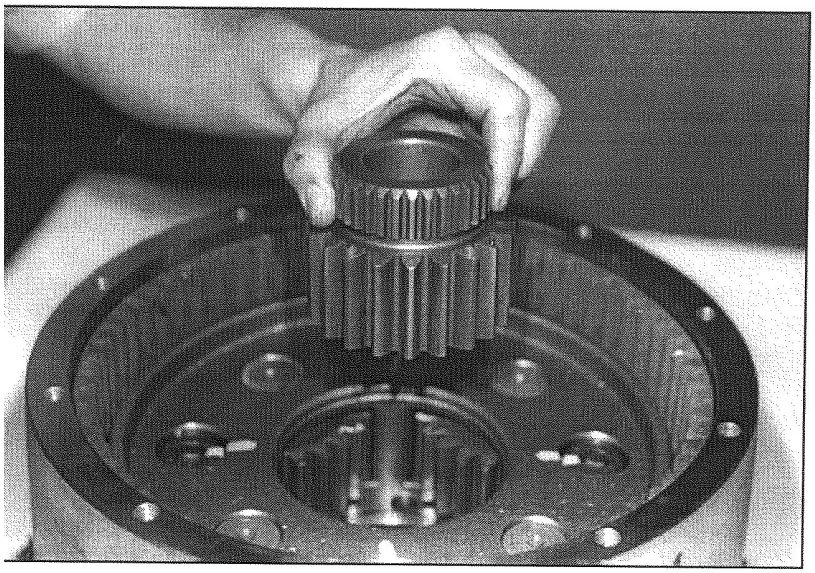


FASE 39

Serrare le 4 viti TCEI M20x100 (pos.12), classe di resistenza 10.9 con una chiave dinamometrica alla coppia di 58,5 daNm.

STEP 39

Tighten the 4 socket head screws M20x100 (pos.12), grade 10.9, by a torque wrench at a torque of 58,5 daNm.

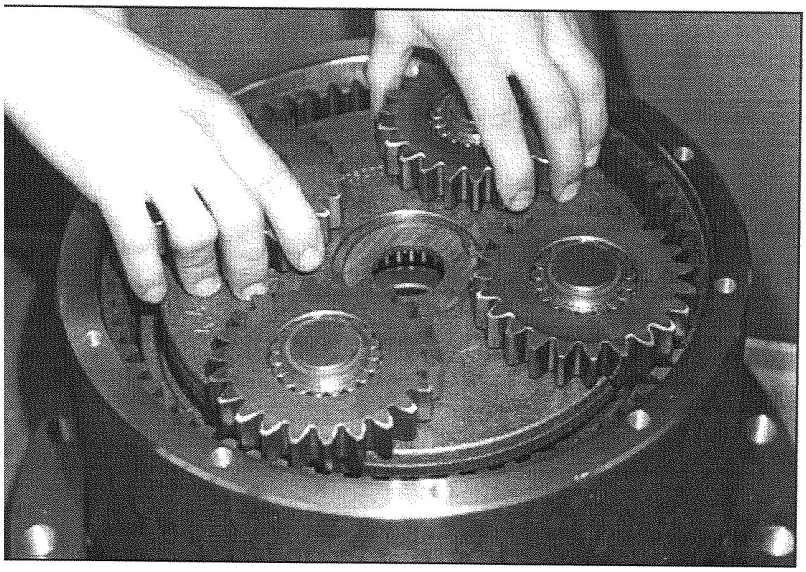


FASE 40

Inserire il solare di 3°riduzione (pos.11).

STEP 40

Insert the 3rd stage sun gear (pos.11).



FASE 41

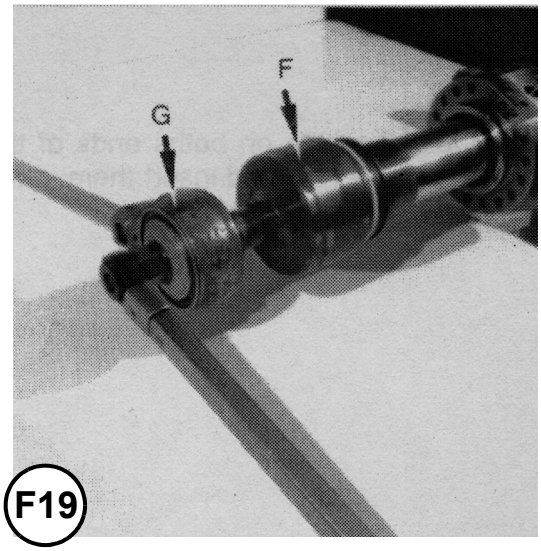
Montare la 2° riduzione (pos.10).

STEP 41

Assemble the 2nd reduction assembly (pos.10).

21. Figure F19:
    Oil thread of the piston rod.

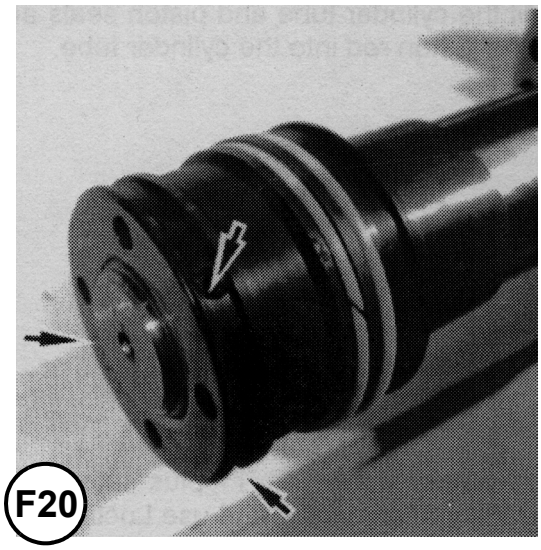
22. Figure F19:
    Screw on
    piston with a special socket wrench (F) and
    tighten it fully.
    Tightening torque 1000Nm.
    Use torque multiplier (G).



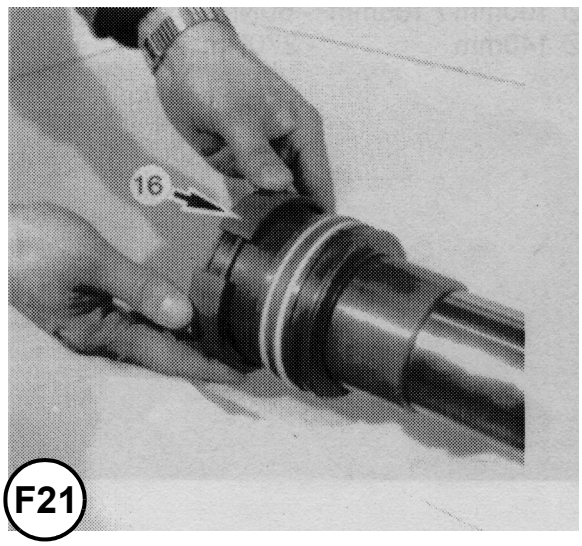
F19

23. Figure F20:
    Tighten the 3 safety screws;
    always comply with the following
    tightening torques:

M 8	22 Nm
M 16	120 Nm


F20

24. Figure F21:
    Insert the guide bush (16).



F21