Original instructions

BG00307459 A.001.1 2014-04-03

Boom DB 120 Maintenance and repair instructions

SANDVIK

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1 GENERAL

1.1 General

These instructions describe the structure, operating principle, and adjustment procedures for the DB 120 boom.

Following the maintenance instructions increases the operating life, reliability, and safety of the boom significantly.

Sandvik is always willing to give advice and help with anymaintenance--related problems.

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2 SAFETY

2.1 Safety

⚠ WARNING	
	**Never repair a boom or boom components or cylinders by welding (Special materials are used in booms that cannot be welded using normal methods). A repair-welded boom will break, and when it falls or tips over, it can cause personal damage.**

Pressurized hydraulic hoses must not be touched by hand. The hoses may have unnoticeable needle holes that let out high-pressure oil sprays that may penetrate the skin.

Beware of moving machine parts. Do the service and repair work only with the rig stopped. Make also sure that the rig cannot be accidentally started during maintenance or repair work.

Do not go under an unsupported rig. Do not disconnect hydraulic hoses or valves unless you are certain that the system has no static load. Remove all static load always before starting repair work by a mechanical support or by driving a cylinder to its extreme position.

Operating, service and adjustment procedures must be carried out only by personnel with specialized operation and service training. Read and ensure that you understand the operating, maintenance, and safety instructions before using or servicing the rig.

NOTICE

OBSERVE ABSOLUTE CLEANLINESS WHEN DISMANTLING AND REASSEMBLING HYDRAULIC EQUIPMENT. Whenever a cylinder has been removed, the hydraulic circuit must be vented and flushed. This is to prevent dirt and air in the cylinder from causing malfunctions.

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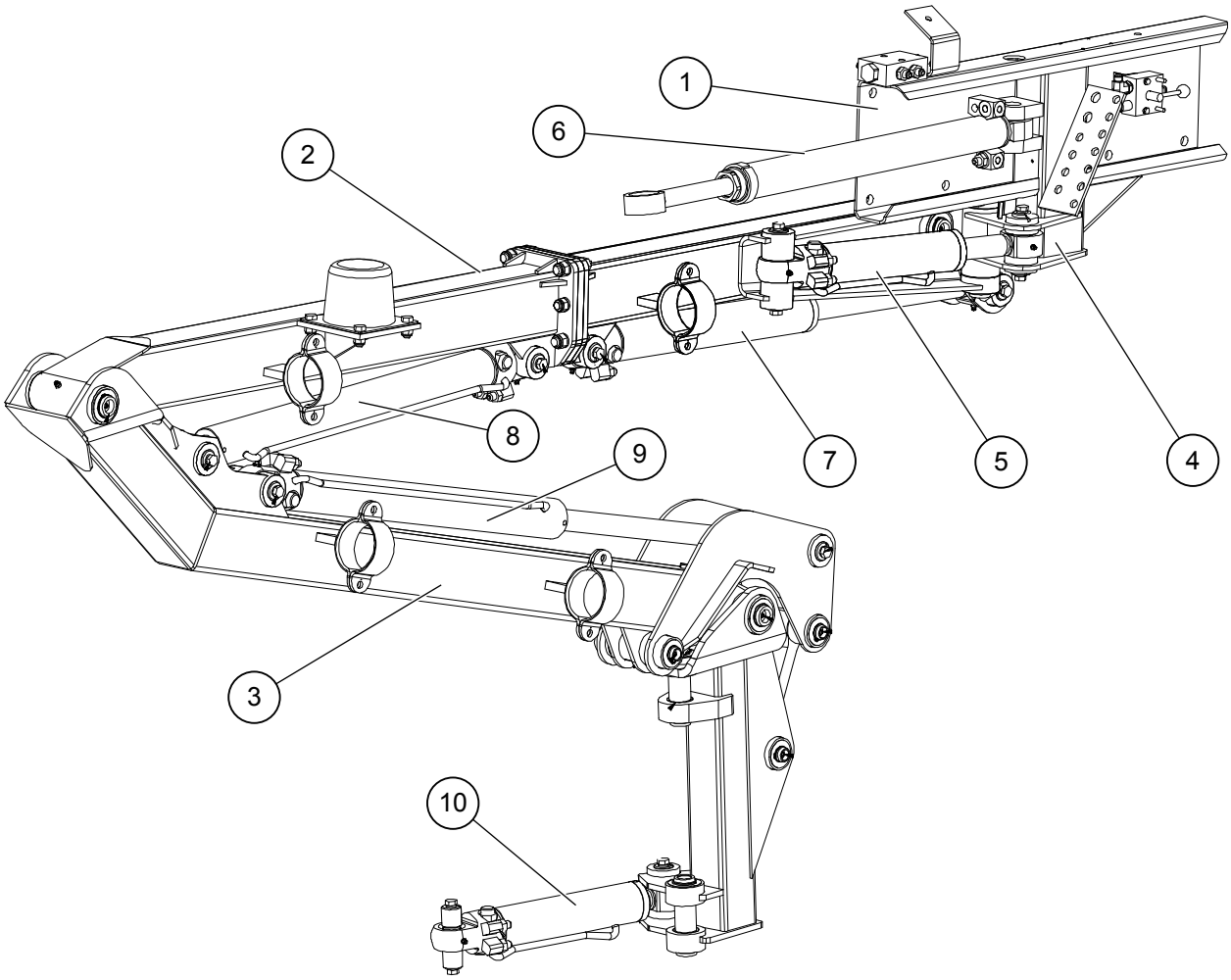
3 MAIN COMPONENTS OF DB 120 BOOM

3.1 Main components of DB 120 Boom



1	*Cradle*	*2*	*Boom head*
3	*Base boom*	*4*	*Cross*
5	*Feed swing cylinder*	*6*	*Feed extension cylinder*
7	*Feed tilt cylinder*	*8*	*Boom knee cylinder*
9	*Boom lift cylinder*	*10*	*Boom swing cylinder*

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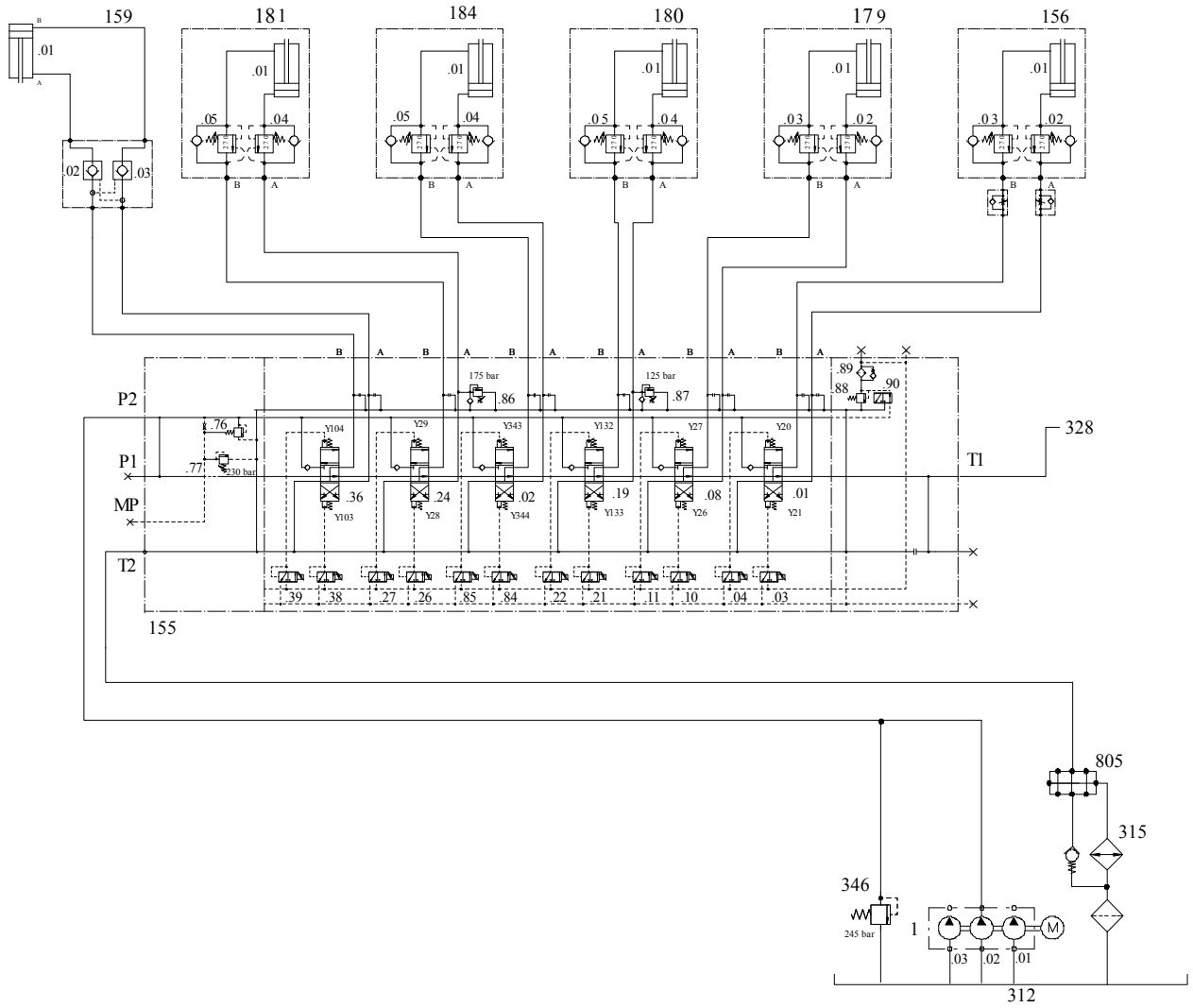
4 BOOM HYDRAULICS

4.1 Hydraulic components, DC120

1	*Gear pump; output used for the dust collector and boom (1.02)*	*2*	*Overcentre valves for the cylinders (10 pcs) (181.05, 181.04, 184.05, 184.04, 180.05, 180.04, 179.03, 179.02, 156.03, 156.02)*
3	*Boom control valve, to control the boom and feed movements (155)*	*4*	*Regulating valves for the boom movement speed (6 pcs), to adjust the boom and feed movement speed (155.36, 155.24, 155.02, 155.19, 155.08, 155.01)*
5	*Feed extension cylinder lock valve (159.02, 159.03)*	*6*	*Feed transfer control valve spool, 15 L/min (155.36)*
7	*Boom lift control valve spool, 15 L/min (155.24)*	*8*	*Knee cylinder control valve spool, 15 L/min (155.02)*
9	*Feed swing control valve spool, 15 L/min (155.19)*	*10*	*Feed tilt control valve spool, 15 L/min (155.08)*
11	*Boom swing control valve spool, 15 L/min (155.01)*	*12*	*Boom swing cylinder (156)*
13	*Feed tilt cylinder (184)*	*14*	*Feed swing cylinder (181)*
15	*Boom knee cylinder (180)*	*16*	*Boom lift cylinder (179)*
17	*Feed extension cylinder (159)*	*18*	*Pilot control valve for the pressure--relief valve (19), max. 240 bar (adjustable) (155.77)*
19	*Pressure--relief valve (non--adjustable) (155.76)*	*20*	*One--way restrictor (2 pcs) (156 A, B)*
21	*Dust collector system (328)*	*22*	*Pressure--relief valve (155.86, 155.87, 346)*

4.2 Hydraulic diagram, DC120



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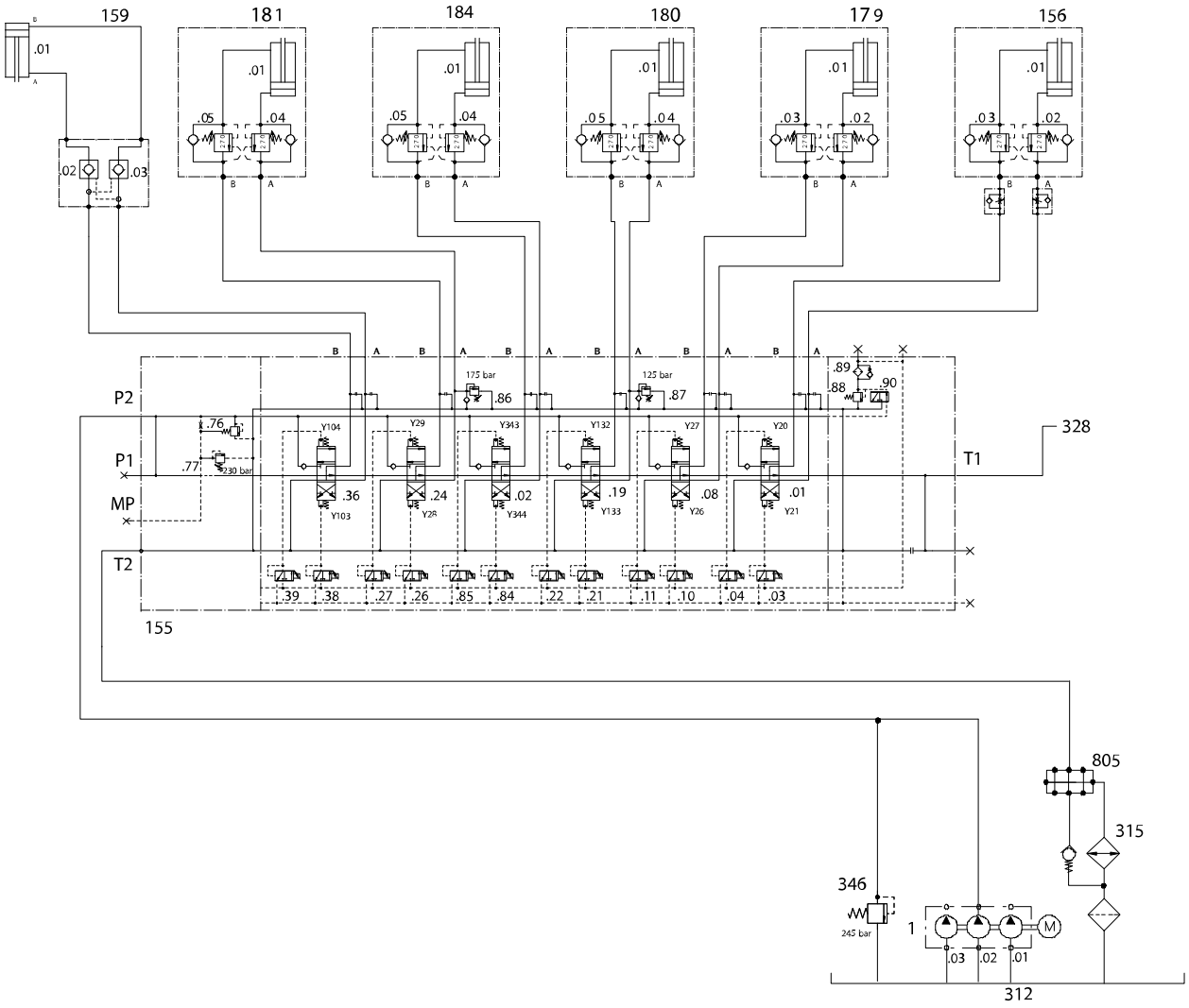
4.3 Hydraulic components, DC121R/DC122R

1	*Gear pump; output used for the dust collector and boom (1.02)*	*2*	*Overcentre valves for the cylinders (10 pcs) (181.05, 181.04, 184.05, 184.04, 180.05, 180.04, 179.03, 179.02, 156.03, 156.02)*
3	*Boom control valve, to control the boom and feed movements (155)*	*4*	*Feed extension cylinder lock valve (159.02, 159.03)*
5	*Feed transfer control valve spool, 12 L/min (155.36)*	*6*	*Boom lift control valve spool, 12 L/min (155.24)*
7	*Knee cylinder control valve spool, 12 L/min (155.19)*	*8*	*Feed swing control valve spool, 12 L/min (155.08)*
9	*Feed tilt control valve spool, 12 L/min (155.02)*	*10*	*Boom swing control valve spool, 12 L/min (155.01)*
11	*Boom swing cylinder (156)*	*12*	*Feed tilt cylinder (184)*
13	*Feed swing cylinder (179)*	*14*	*Boom knee cylinder (180)*
15	*Boom lift cylinder (181)*	*16*	*Feed extension cylinder (159)*
17	*Pilot control valve for the pressure--relief valve (155.79), max. 240 bar (adjustable) (155.77)*	*18*	*Pressure--relief valve (non--adjustable) (155.79)*
19	*One--way restrictor (2 pcs) (156 A, B)*	*20*	*Pilot control circuit pressure--reducing valve (non--adjustable) (155.90)*
21	*Pilot control circuit pressure--relief valve (non--adjustable) (155.88)*	*22*	*Pilot control valve (12 pcs) (155.39, 155.38, 155.27, 155.26, 155.85, 155.84, 155.22, 155.21, 155.11, 155.10, 155.04, 155.03)*
23	*Dust collector system (328)*	*24*	*Pressure--relief valve (155.86, 155.87, 346)*

4.4 Hydraulic diagram, DC121R/DC122R



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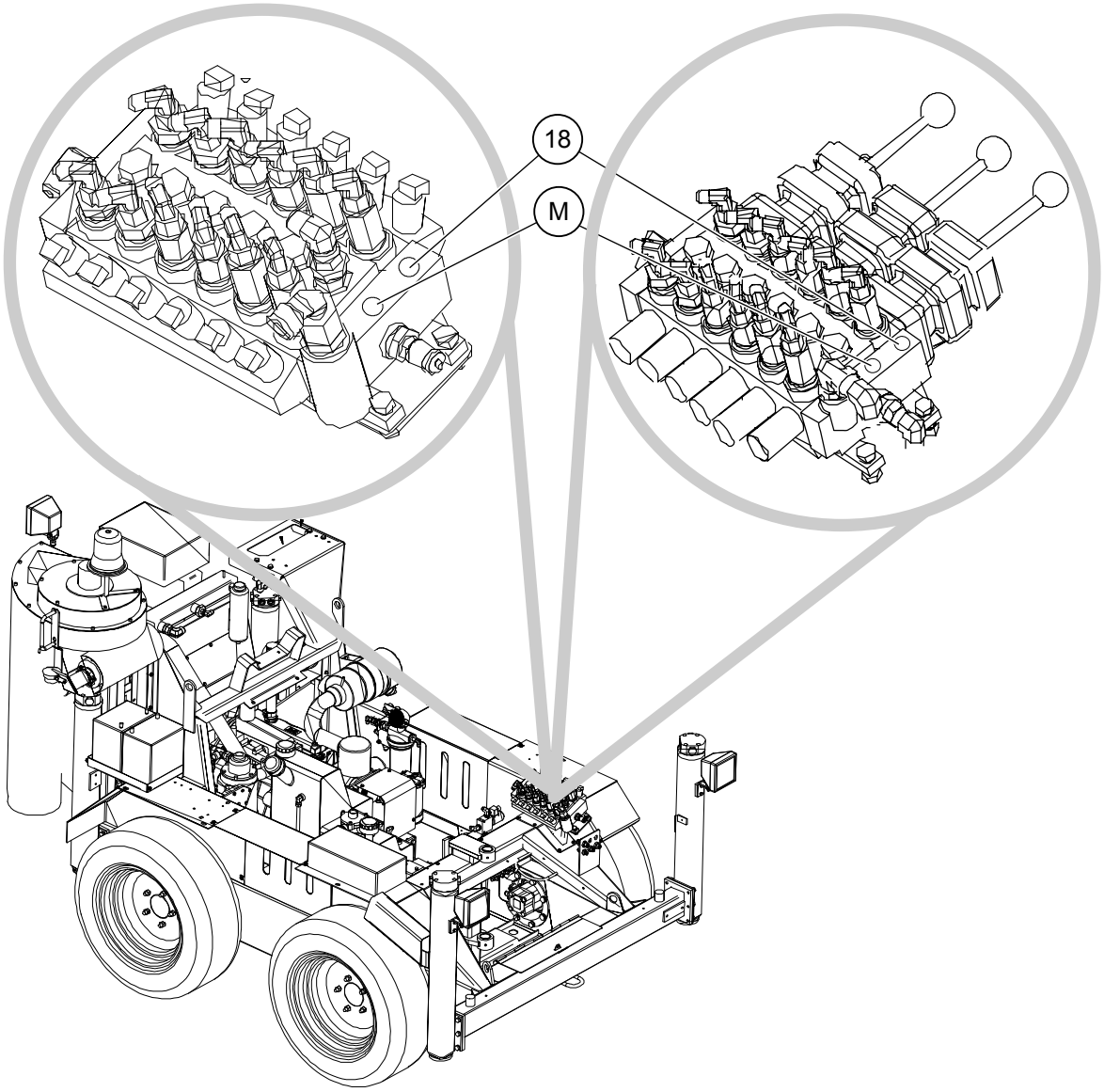
4.5 Adjusting the boom pressure-relief valve



On the left DC121R/CD122R, on the right DC120

1. Connect a pressure gauge to the measurement point (M).
2. Turn the pressure-relief valve's (18) adjusting screw fully open and then close it two turns.
3. Start the diesel engine and let it idle.
4. Run the feed extension to the extreme position and keep running it against the limiter.
5. Adjust the pressure to 240 bar.
6. Read the pressure from the gauge.
7. Tighten the lock screw.

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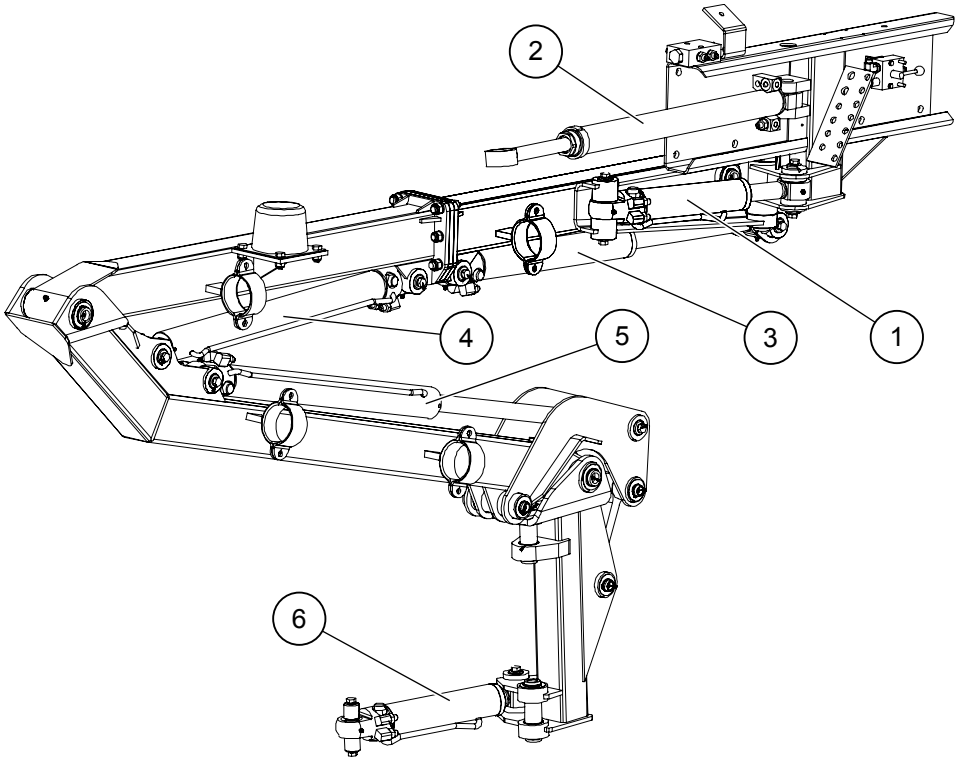
5 REPLACING A CYLINDER

5.1 Replacing a cylinder

1. Before removing a cylinder, support the section of the boom the cylinder operates so that the section cannot move.
2. Move the cylinder with the hydraulics to find the position at which the cylinder pins are not under a loaded.
3. Open the overcentre valves so that the cylinder becomes unloaded.
4. Disconnect the hydraulic hoses and plug, then mark the connectors.
5. Support the cylinder and remove the pins.

When removing the cylinder, ensure that all appropriate boom sections are supported.



1	*Feed swing cylinder*	*2*	*Feed extension cylinder*
3	*Feed tilt cylinder*	*4*	*Boom knee cylinder*
5	*Boom lift cylinder*	*6*	*Boom swing cylinder*

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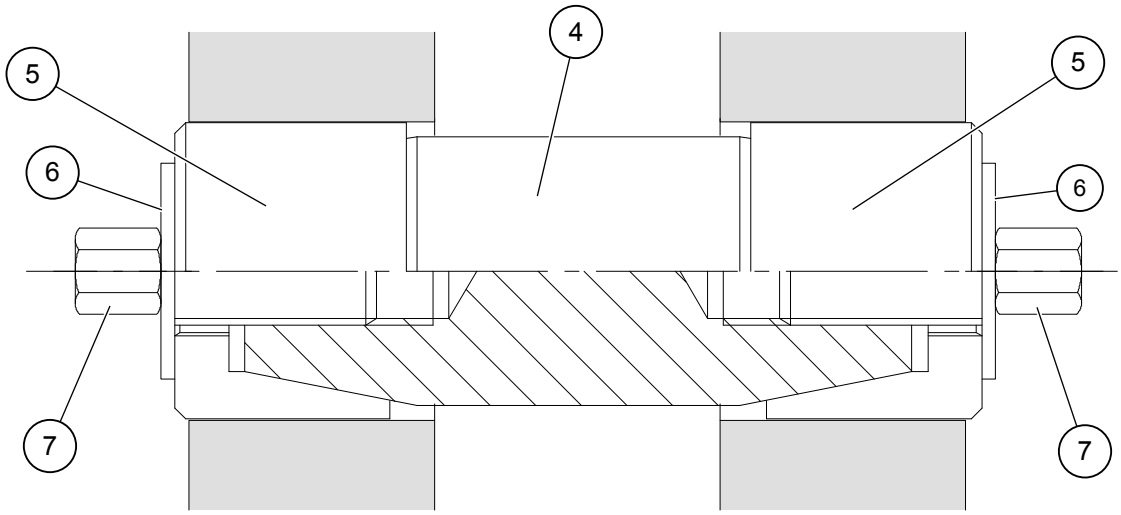
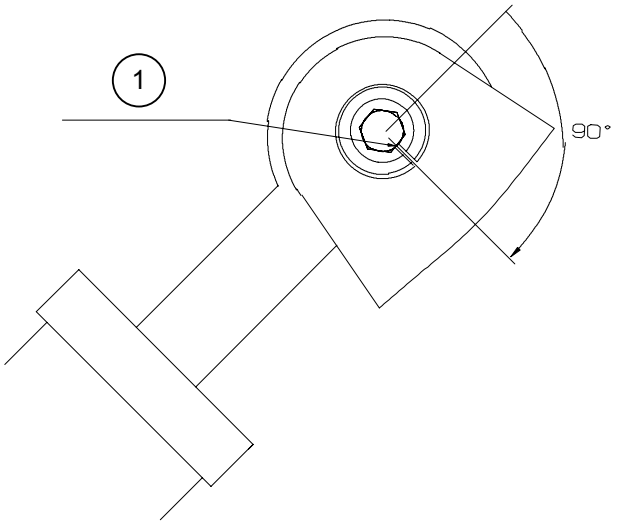
6 CYLINDER MOUNTING PINS

6.1 Cylinder mounting pins

The cylinder pins are tightenable tapered pins that are tightened with zero clearance to the cylinder eyes.



1. Check the tightening torque. The correct tightening torque is 60 Nm.
2. Check the position of each pin's expansion slot (**1**).
   It should be perpendicular to the cylinder movement and, if possible, point down when in transport position.



6.2 Removing the pin

1. Remove the screws (7) and washers (6).
2. Remove the bushings (5) by using a M16 screw as an extractor.
3. Pull the pin (4) out.

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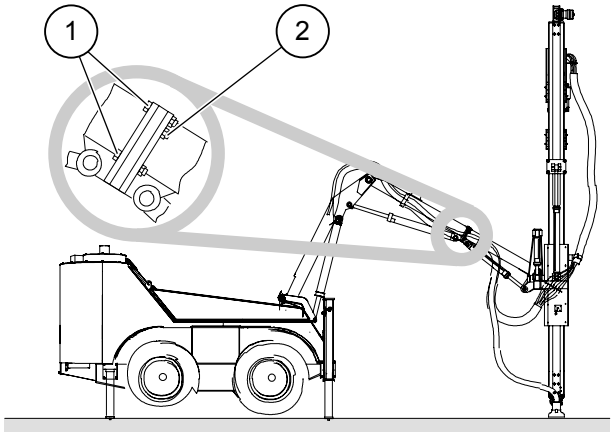
7 TURNING THE BOOM HEAD TO HORIZONTAL DRILLING POSITION

7.1 Turning the boom head to horizontal drilling position

1. Remove the rod and run the rock drill to the lower end of the feed. Run the feed extension cylinder to the minimum length.
2. Run the boom out, turn the feed to horizontal orientation, and support the tip of the feed against the ground.

Do not open the other two flange nuts (part 2 in the figure below), as otherwise the boom head will fall and possibly cause injury.

3. Open the four bolts (1) at the corners of the flanges at the middle of the boom head.
4. Tilt the feed left (swing).
5. Run the rock drill upward carefully just below the middle section of the feed.
6. Take hold of the lower end of the feed and lift it so that the boom head turns 90º. Tighten the flange bolts.



1 Open these.
2 Do not open these.

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8 MAINTENANCE

8.1 Maintenance

Each shift:

• Lubricate all boom grease nipples

- cylinders

- joints

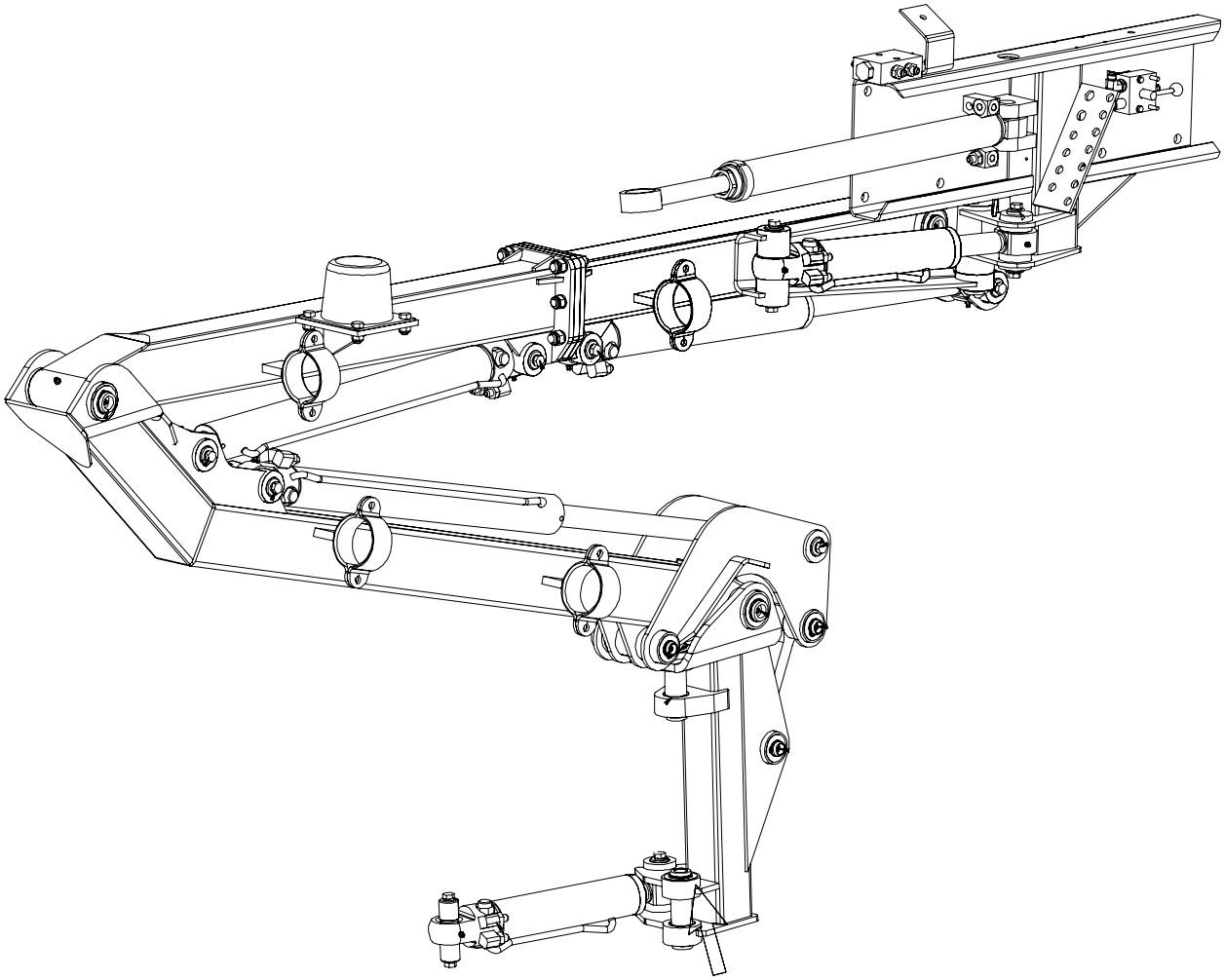
• Check the condition of the boom visually

- welds

Weekly:

• Wash the boom.

• Tighten all bolts and nuts



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Original instructions

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Hydraulic cylinders

⚠ WARNING	
	**IGNORING INSTRUCTIONS HAZARD!** **To avoid death or injury you MUST read, understand and follow operator's and maintenance manuals before installing, inspecting, operating, servicing, testing, cleaning, transporting, storing, dismantling or disposing of the product or a part or accessory of the product. Keep this publication for future reference.**

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1 INTRODUCTION

1.1 The Purpose of these instructions

This manual contains supplementary information for operation, maintenance and repair of a component.

Before operating, or performing maintenance or repair procedures for the component or system described in this manual, read and understand the information in operator´s and maintenance manuals supplied with the machine. Pay special attention to the safety information in chapter "2 Safety and environmental instructions" of those manuals.

1.1.1 Validity of the manuals

This manual, and especially the safety information, is valid only if no unauthorized changes to the product are made.

Continuing improvement and advancement of product design might have caused changes to your product which are not included in this publication. Note also that if a third party has made changes to the product after delivery from the manufacturer, this publication does not include information on these changes or their influences on the product.

Whenever a question arises regarding your product, or this manual, please consult your local Sandvik representative for the latest available information.

1.2 General

The main structural differences between hydraulic cylinders are:

- single and double acting
- cylinder bore
- cylinder stroke
- overcenter valve equipment

Stroke can be limited with a spacer mounted either to the piston side or the piston rod side. Correct type of spacer can be found in the spare parts list.

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2 SAFETY AND ENVIRONMENTAL INSTRUCTIONS

2.1 Safety

Installation, adjustment and repair work can only be carried out by a person who has the necessary qualifications and knows the equipment.

Before starting the rig, make sure that nobody is working close to, or under the rig.

Never disconnect any hydraulic hoses or valves before you make sure that there is no static load in the system.

Acquaint yourself with the service and user instructions before starting to work on a cylinder. Learn to know all the components that you will be working on.

Follow the installation instructions issued by Sandvik.

Use all necessary safety devices and make sure that they are in good condition.

Note! ***Proper use and service guarantees longer life of the hydraulic cylinder.***

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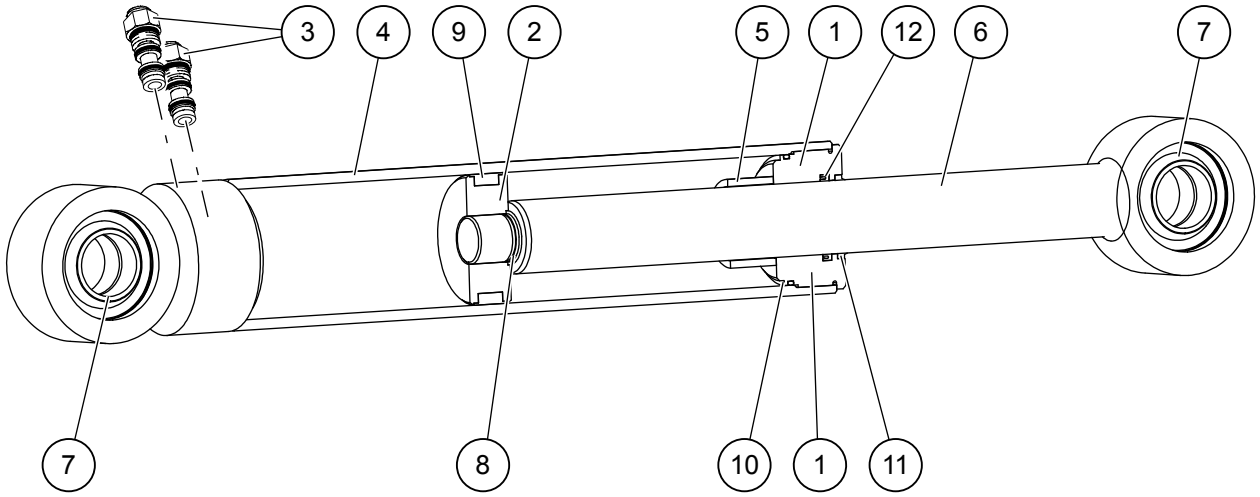
3 CYLINDER MAIN COMPONENTS

3.1 Main components



1	*Front cover*	*2*	*Piston*
3	*Overcenter valves*	*4*	*Cylinder tube*
5	*Spacer (not in all cylinders)*	*6*	*Piston rod*
7	*Bearing / bushing*	*8*	*O-ring*
9	*Piston seals*	*10*	*O-ring*
11	*Wiper*	*12*	*Seal*

3.2 Overcenter valves

⚠ WARNING

HIGH-PRESSURE FLUID HAZARD!

High-pressure fluid remaining in hydraulic lines could cause death or severe injury.

Never carry out maintenance or repair work on a pressurized system. Relieve pressure before opening fittings, plugs or hydraulic valve cartridges. Always make sure the parts are not pressurized. Use a bleeder screw to relieve the pressure behind the valves or cartridges, or wait until the rig is depressurized before removing the components.

Protect your eyes by wearing safety goggles.

Most hydraulic cylinders are equipped with overcenter valves (also known as crossover valves). They are either built in the hydraulic cylinder or connected to the hydraulic circuit via hydraulic hoses.

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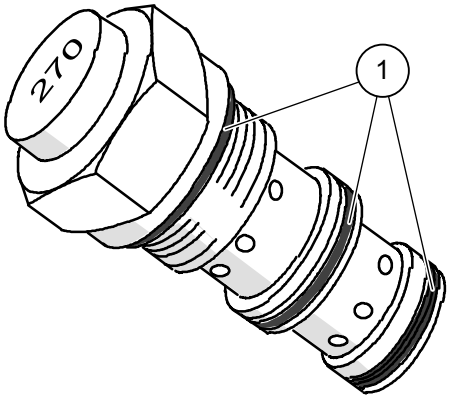

Most of the overcenter valves are one-piece components and thus cannot be readjusted. Sets of the seal rings (1) are provided as spare parts.

The set value of the valve is stamped on the face of the valve.

The tasks of an overcenter valve are:

- If a hose connected to the hydraulic cylinder breaks, the overcenter valve acts as a safety valve and prevents the cylinder from moving.
- During drilling, the overcenter valve prevents oil flow from the cylinder to the tank. The boom maintains accurately the position to which it was moved to by using the boom control valves.
- When the boom is moved, the overcenter valve does not allow oil flow from the return side until the pressure on the pressured side rises high enough. Boom movements are smoother and more accurate and the boom own weight cannot accelerate the speed of movement.
- If an external force raises the pressure in the cylinder higher than the set value of the overcenter valve, the valve opens and lets oil out of the cylinder. This enables the boom to yield under external force and mechanical damage to the boom can be avoided.

NOTICE

The set values of the overcenter valves for various purposes are different. Therefore you must not replace an overcenter valve with one from another cylinder. The set value of the valve is stamped on the face of the valve.

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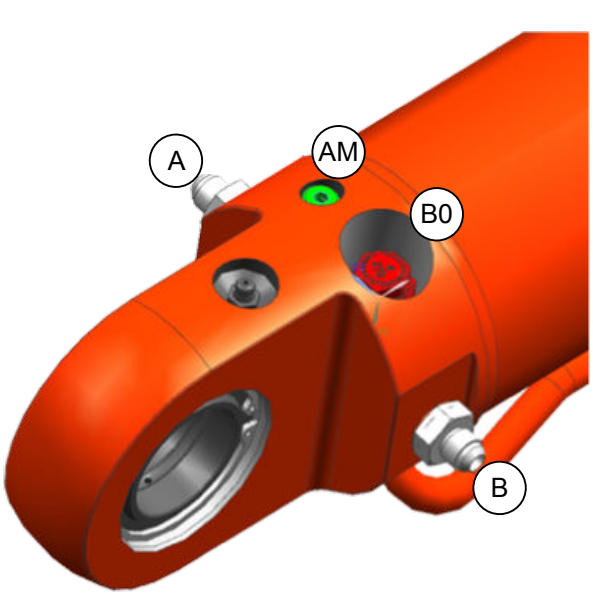
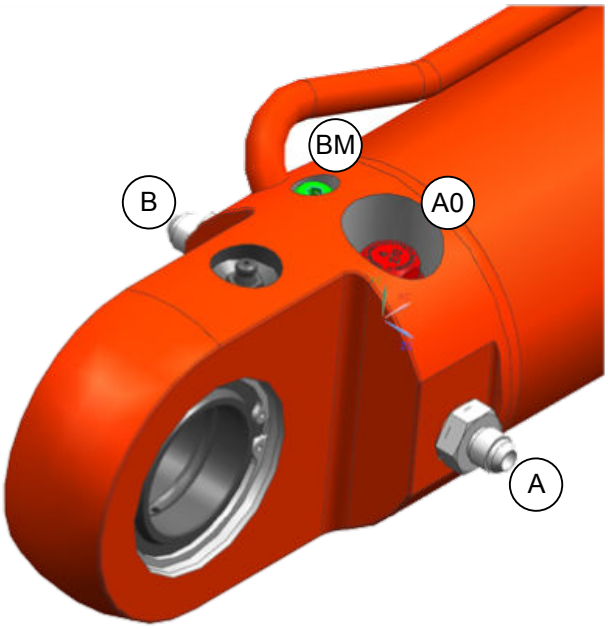
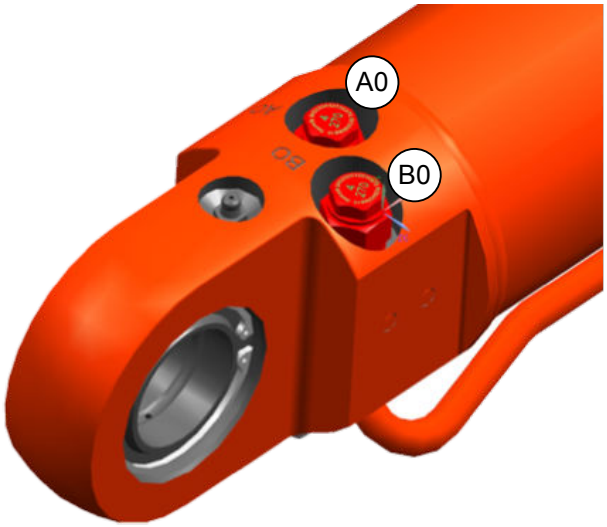
Before removing cylinders make sure the structure is mechanically supported.

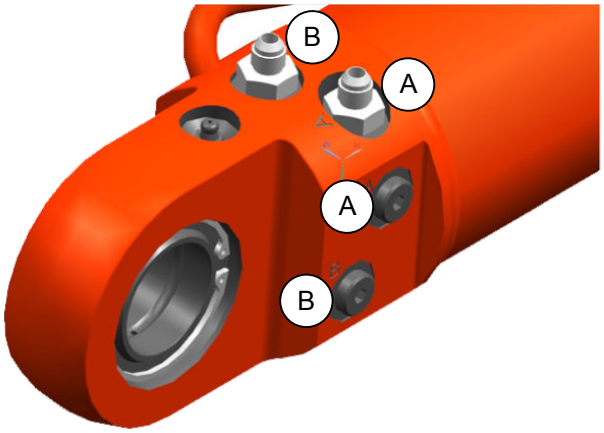
Before removing overcenter valves release the pressure by opening corresponding plug (eg. AM and BM) slowly with care! Locations of the plugs and valves depend on cylinder types.





In some cylinders there are no pressure releasing plugs. There may be plugs for alternative fitting position. They are stamped (A) and (B).





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4 CYLINDER MAINTENANCE AND REPAIR

4.1 Disassembly

Before starting to remove the cylinder, make sure that the boom is properly supported and cylinder is without static load. Disconnect the hydraulic hoses from the cylinder, and plug hoses and adapters.

Support and secure the cylinder so that it cannot fall down. Depending on the cylinder pin type, either remove the circlip or locking plate. Hit the pin out or detach expansion pin according to instructions in section "Instruction for positioning and tightening expansion pins".

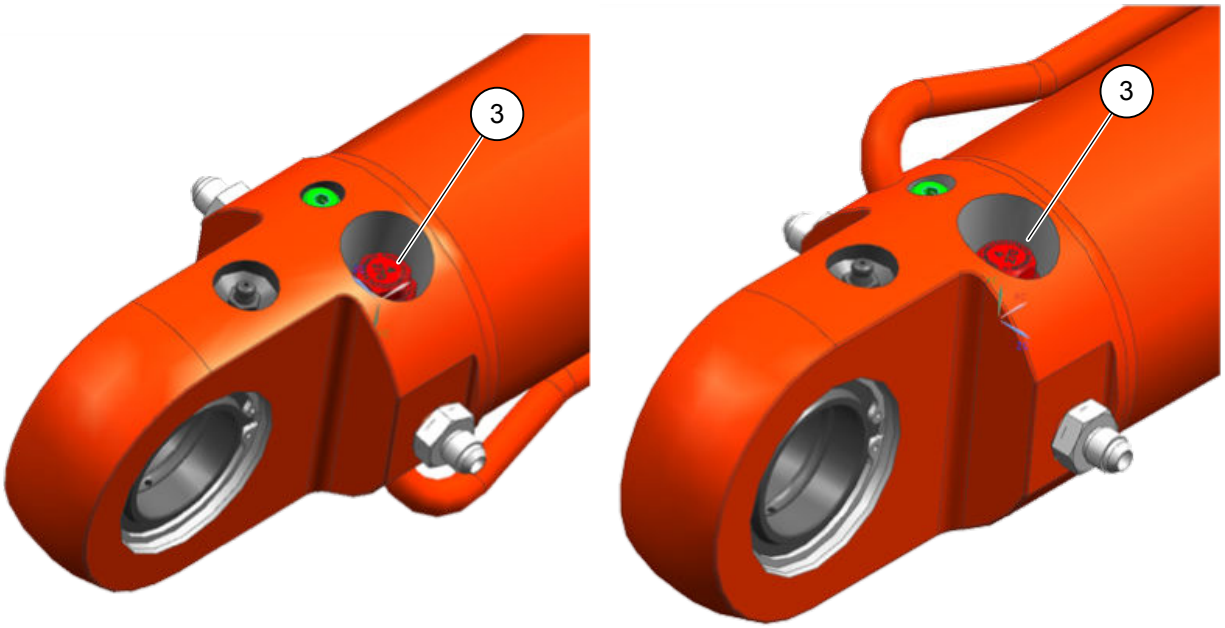
Wash the cylinder externally and mount it securely before starting to disassemble it.

See also cylinder manufacturer instructions.

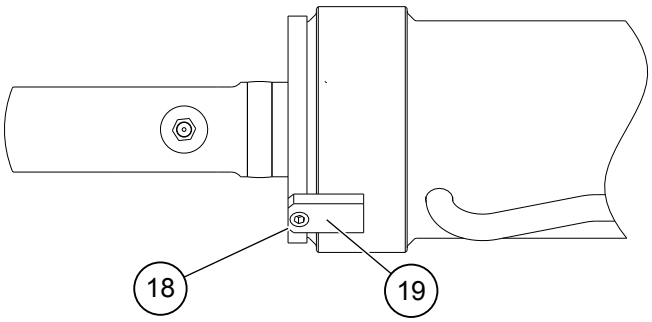
4.1.1 Cylinder

If there is hydraulic pressure available, connect the hoses to the cylinder and drive the piston rod out as far as it comes. Make sure that there is no remainig pressure in the hydraulic cylinder and disconnect the hoses and remove the overcenter valves (3).

Be aware of oil spilling.



Open the clamp screw (18) from the bracket (19).



Open the cover with a special tool. Pull out the piston rod; support it properly in order to get it out smoothly.

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4.1.2 Piston

Undo the lock nut / locking screws (if equipped). Remove the piston (2) together with the seals from the piston rod (6) with suitable tools. Slide the spacer (5) and cylinder cover (1) carefully away from the piston rod (6) and remove all the seals and the wiper. Replace them if necessary. Unscrew the overcenter valves (3) from the cylinder tube (4) and visually check their condition. Wash all components.

4.1.3 Inspection

Replace all seals and wipers. Check all sliding surfaces. If scratches (big enough to feel with a fingernail) are found, the components need to be replaced because the sealing ability of the surfaces is no longer good. Also check the piston rod for straightness. If the rod is distorted, check that it is not caused by an incorrect spacer. Check the condition of the bearings / bushings (7) and replace them if there are any sings of wear.

4.1.4 Replacing of bearing bushings

If the cylinder has already been removed from the rig, support the cylinder well, remove circlips and press the old bearings / bushings out using a suitable drift.

The new bearing / bushings are easier to install if they are cooled in a freezer and the cylinder eye is warmed with a torch.

4.2 Assembling the standard SMC cylinder

See the cylinder structure from the parts manual. There are many different kind of cylinders. See also cylinder manufacturer instructions.

You always need a new seal kit when assembling the cylinder!

Note! ***In the seal kit there may be extra seals that you do not need in your cylinder.***

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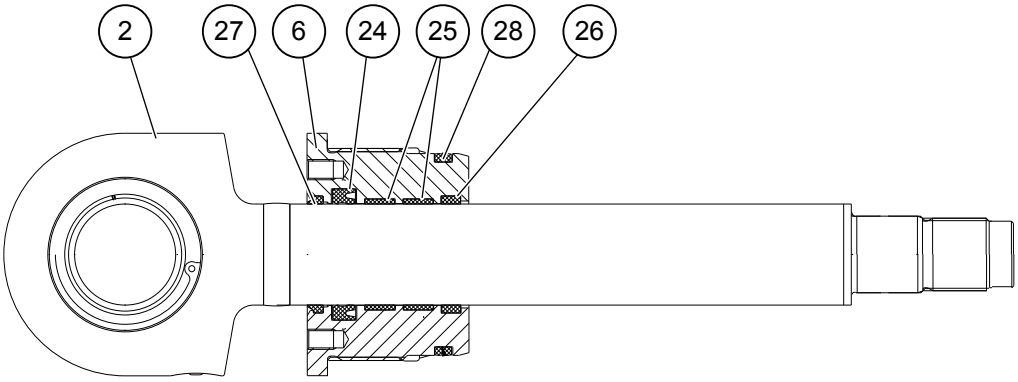
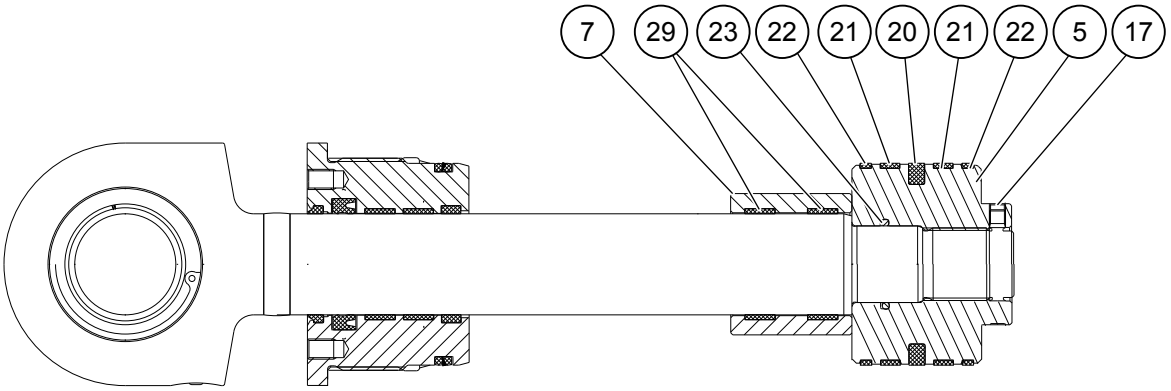
1. Grease the seal grooves of the front cover (6) and install the seal (28), dirt ring (26) and guide rings (25).



2. Install the wiper (27), and rod seal (24); note the direction of the seal; lip towards the piston (5).
3. Install the front cover (6) to the piston rod (2).
4. Install the guide rings (29) to the spacer (7). Note! Short cylinders are not equipped with spacers.



5. Install the spacer (7) to the piston rod (2).

NOTICE

If the stroke of the cylinder is limited with a spacer and it is left out, the cylinder can be damaged in use. Check that you install the correct type spacer.

6. Grease the seal grooves of the piston (5) and install the piston seal (20), guide rings (21), dirt rings (22) and O-ring (23).

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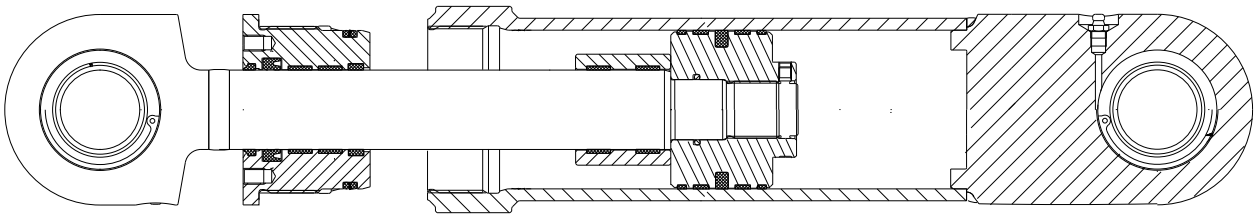
7. Install the piston to the piston rod. Tighten the piston, see tightening torque from the table.
   Maximum tightening torques for the piston and front cover

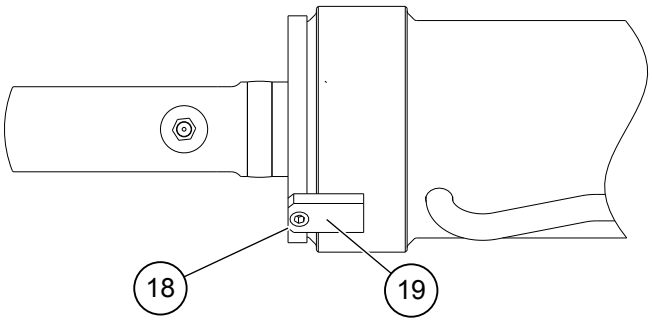
Threads [mm]	Max torques [Nm]
20	30
30	40
40	50
45	60
50	70
60	100
65	120
75	150
80	180
85	200

8. To lock the piston, drill the hole of 6 mm diameter 3.5 mm deep to the piston rod and install the clamp screw (17); secure with glue.
9. Lubricate the cylinder bore and the piston seals.
10. Push the piston assembly into the cylinder. Be careful not to damage the piston seals.



11. Screw the front cover in and tighten with a special tool. See tightening torque in the table.

12. To lock the front cover, drill the hole of 7 mm diameter 3 mm deep to the front cover trough the hole in the bracket (19) and install the clamp screw (18); secure with glue.



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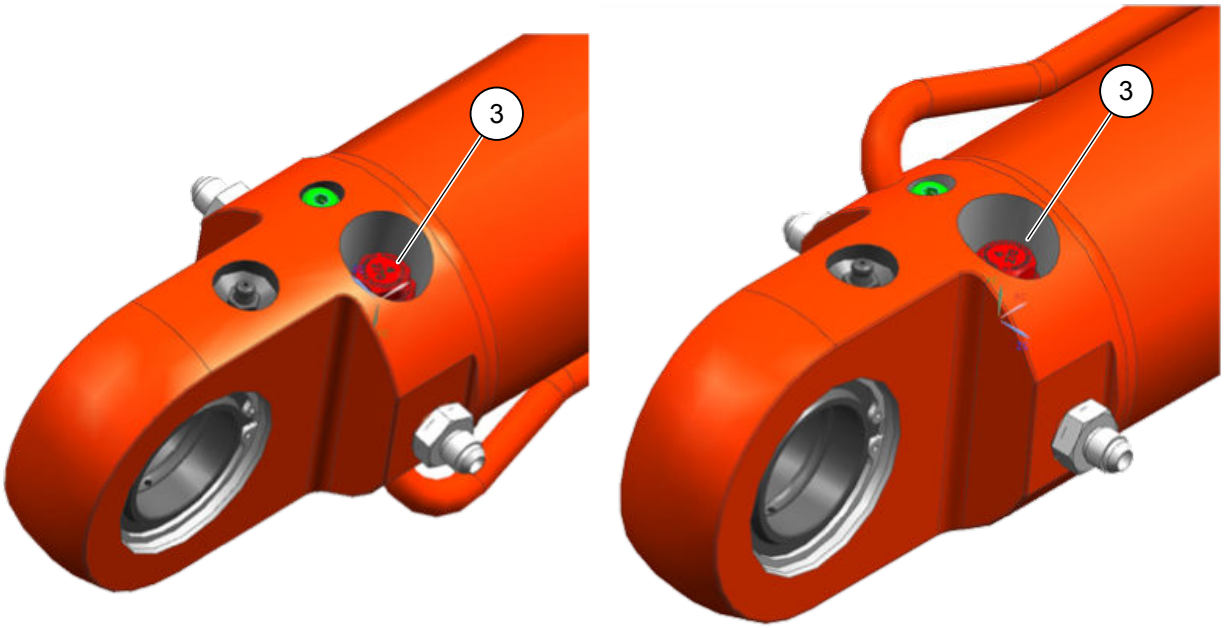
13. Install the overcenter valves (3).



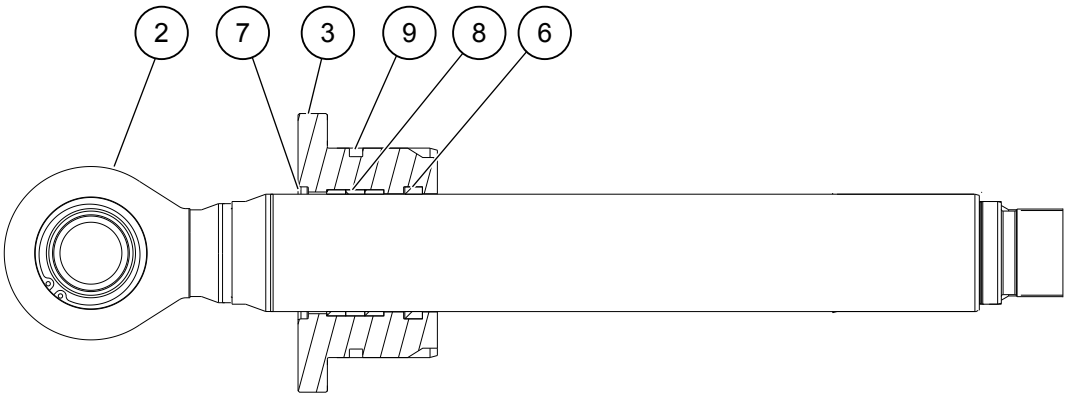
4.3 Assembling the other types of cylinders

See the cylinder structure from the parts manual. There are many different kind of cylinders. See also cylinder manufacturer instructions.

You always need a new seal kit when assembling the cylinder!

Note! ***In the seal kit there may be extra seals that you do not need in your cylinder.***

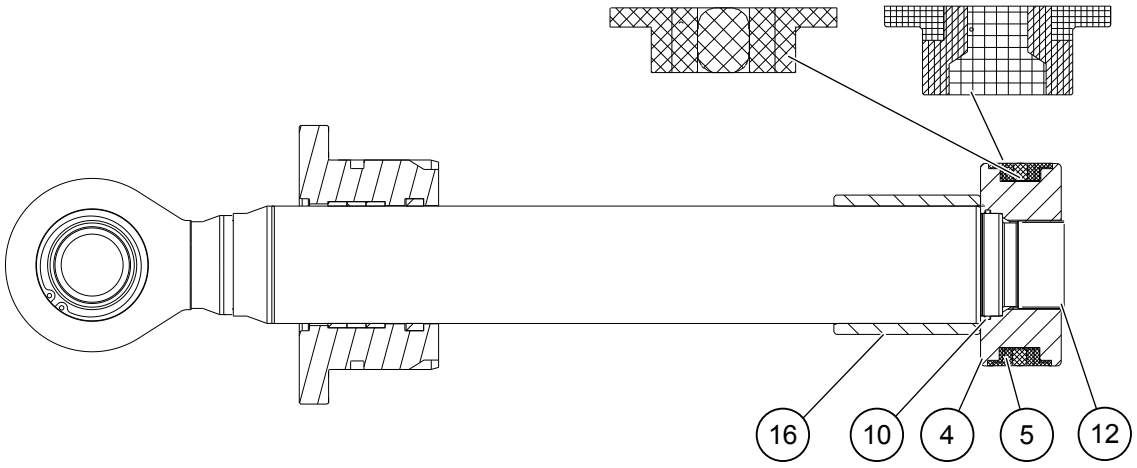
1. Grease the seal grooves of the front cover (3) and install the guide rings (8) and o-ring (9).



2. Install the wiper (7), and U-seal (6), note the direction of the seal; lip towards piston (4).
3. Install the front cover (3) to the piston rod (2).

4. Install the guide rings to the spacer (16). Note! Some spacers are not equipped with guide rings.

Note! ***Short cylinders are not equipped with spacers.***



5. Install the spacer (16) to the piston rod (2).

NOTICE

If the stroke of the cylinder is limited with a spacer and it is left out, the cylinder can be damaged in use. Check that you install the correct type spacer.

6. Grease the seal grooves of the piston (4) and install the piston seal (5) and O-ring (10).
7. Install the piston to the piston rod. Tighten the piston / piston nut, see tightening torque from the table.
   Maximum tightening torques for the piston and front cover

Threads [mm]	Max torques [Nm]
20	30
30	40
40	50
45	60
50	70
60	100
65	120
75	150
80	180
85	200

8. To lock the piston, install the clamp screw (12), Note! There are different ways to clamp the piston / piston nut.
9. Lubricate the cylinder bore and the piston seals.

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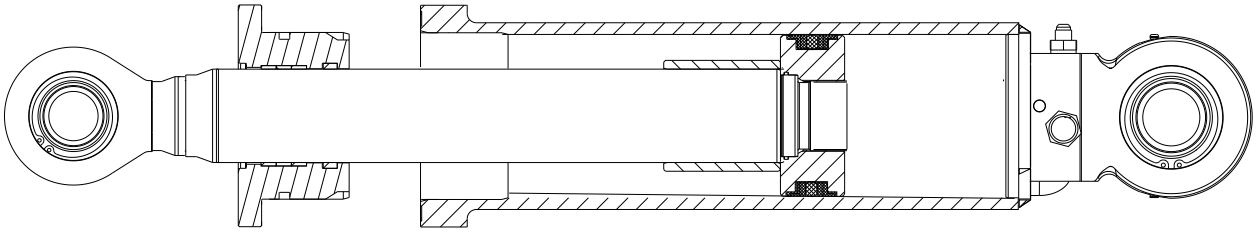
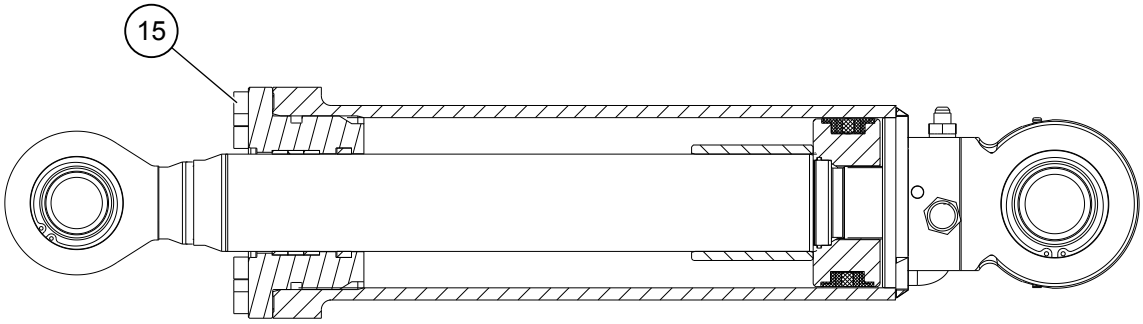
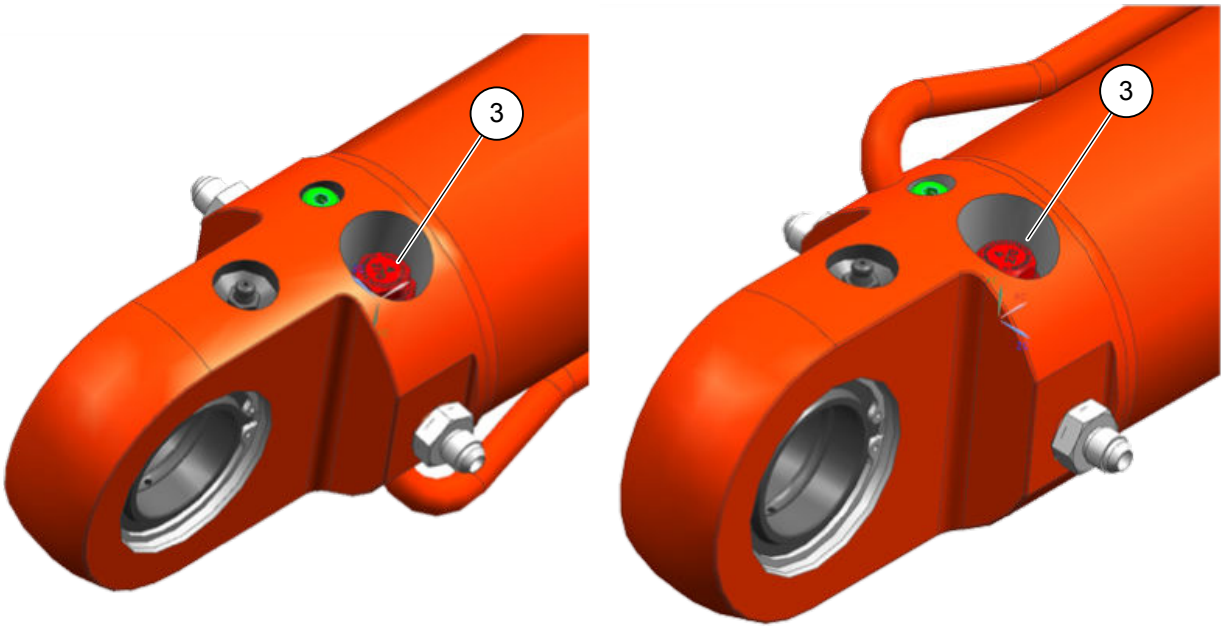
10. Push the piston assembly into the cylinder. Be careful not to damage the piston seals.



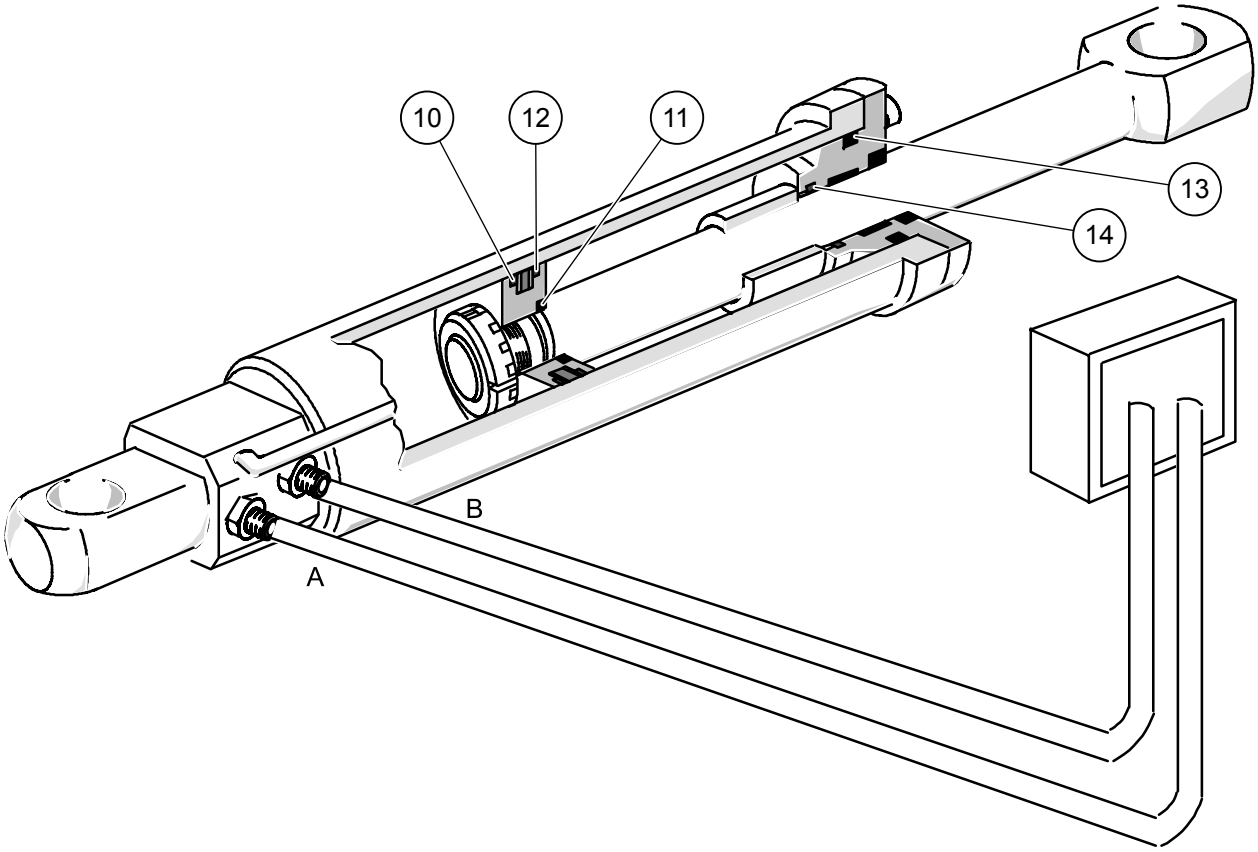
11. Fasten the front cover with the the screws (15) and tighten them.



12. Install the overcenter valves (3).



4.4 Testing of cylinder



Testing of cylinder

4.4.1 Line A, inspection

Run the piston rod completely out. Disconnect line A, and pressurize line B. Check line A for leaking oil. If oil leaks out, one of the seals (10, 11 or 12) or overcenter valve is faulty.

4.4.2 Line B, inspection

Run the piston rod completely in. Disconnect line B, and pressurize line A. Check line B for leaking. If oil leaks out, one of the seals (10, 11 or 12) or the overcenter valve is faulty. If oil comes out between the cylinder cover and cylinder tube, the O-ring (13) is faulty. If oil comes out between the cylinder cover and piston rod, the O-ring (14) is faulty.

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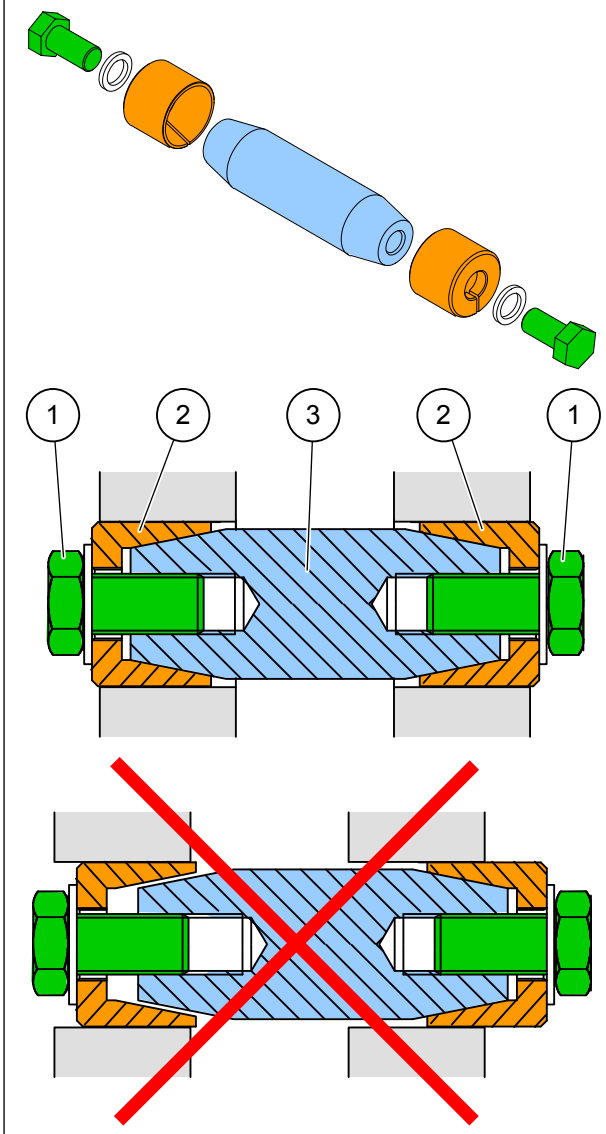
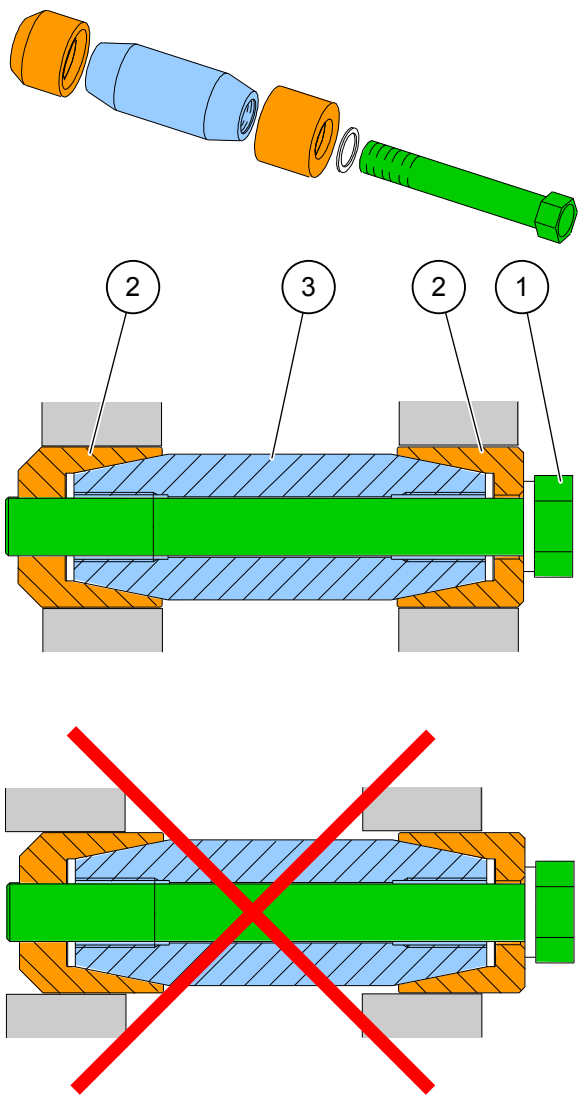
4.5 Instruction for positioning and tightening expansion pins

Two-screw expansion pin	One-screw expansion pin
	

1. Place the pin (3) in the middle of the joint.
2. Place the conical bushings (2) on both ends of the pin.
3. Thread the tightening screw(s) (1) in place.
4. Tighten the tightening screw(s).
   - One-screw pin: Tighten the tightening screw to the correct torque. Observe at the same time that the pin remains in the middle of the joint.
   - Two-screw pin: Thread the screws alternately until they are at the correct torque. Do not torque the screws one at a time, as this can cause the pin to move and the other end of the pin can remain without proper support. When tightening, check that the pin remains in the middle of the joint.

     The correct tightening torques are: M16: 150 Nm, M20: 290 Nm.

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