

HILTI

OneStep rock anchor

Operating instructions

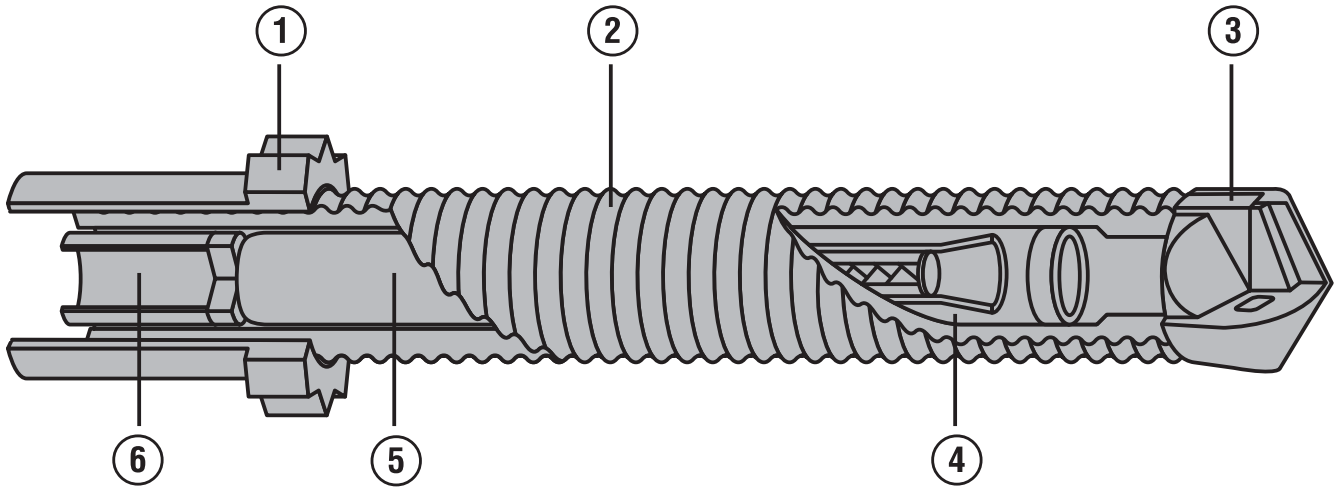
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Appendix

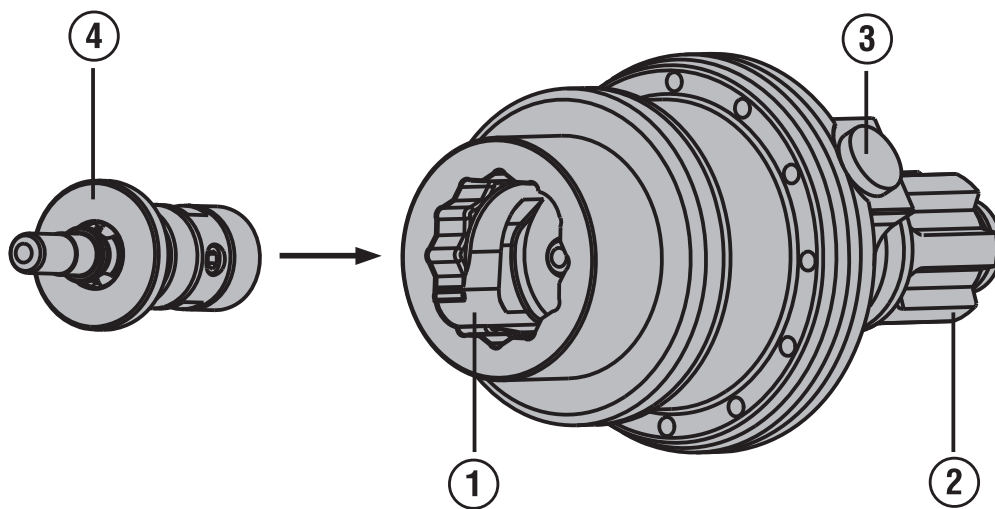
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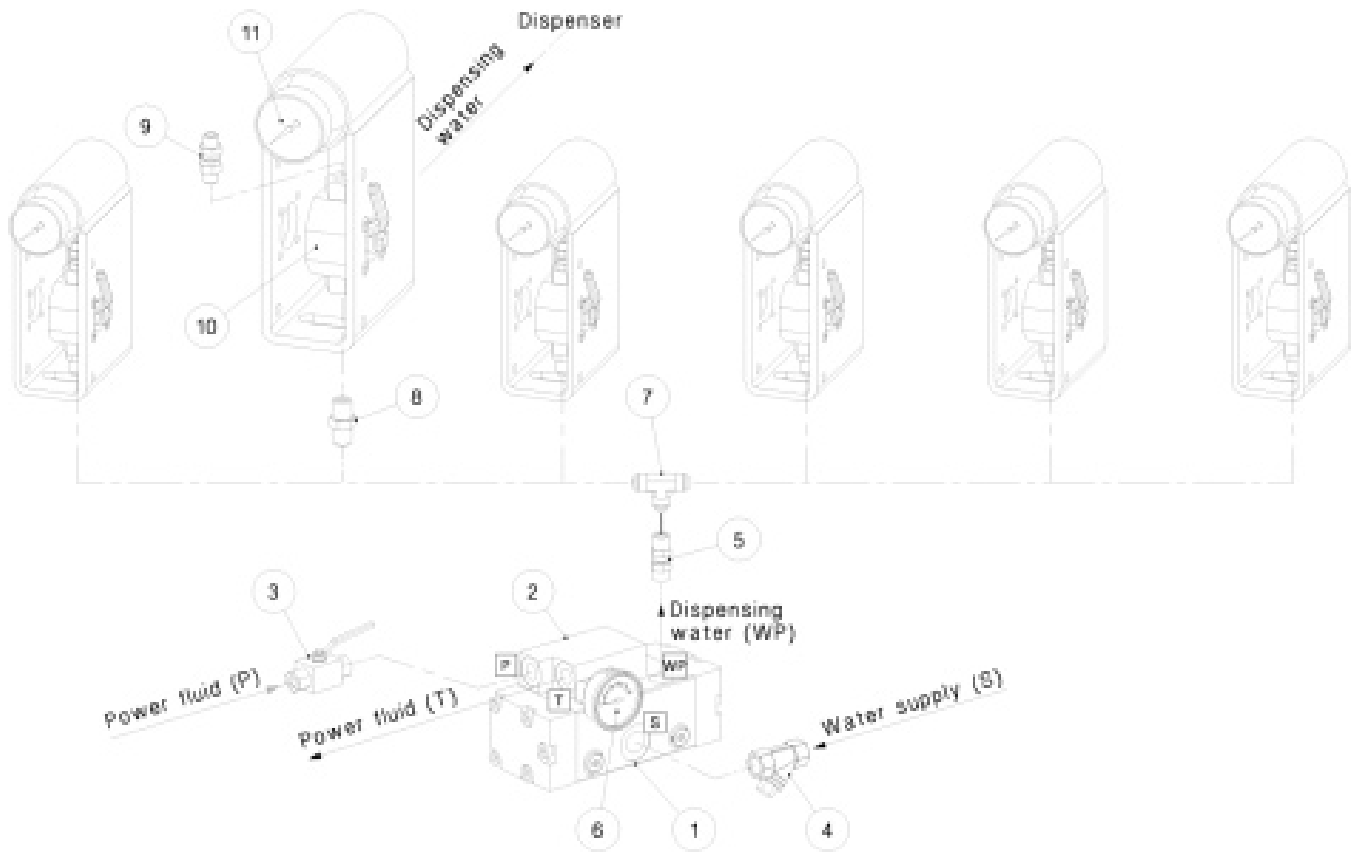
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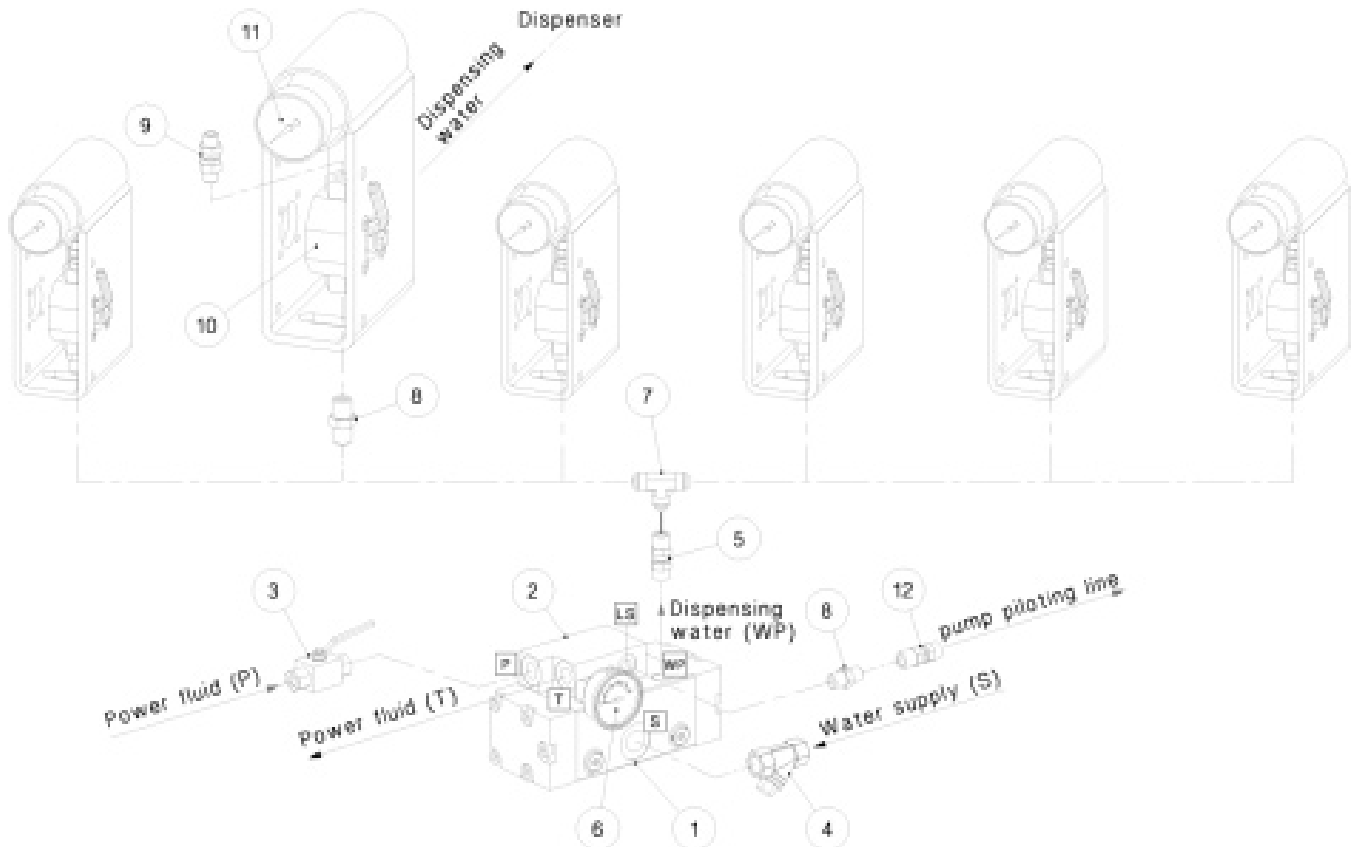
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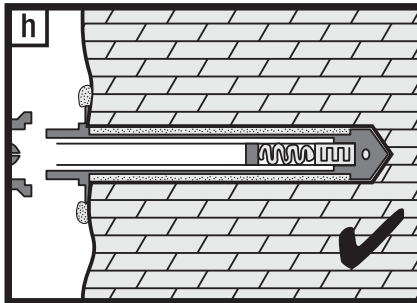
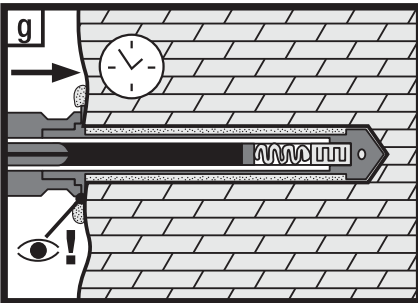
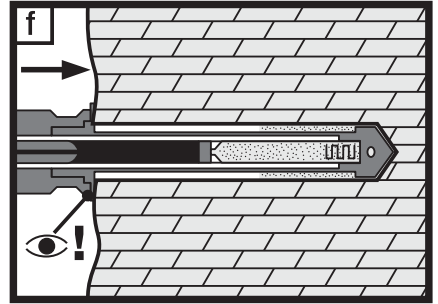
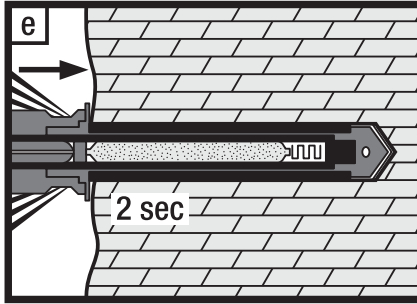
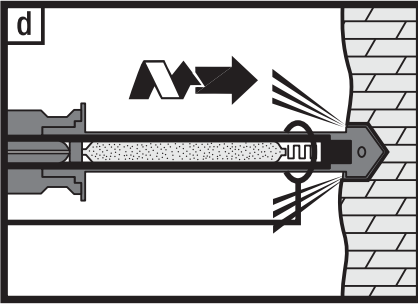
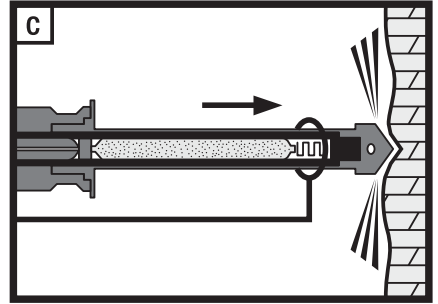
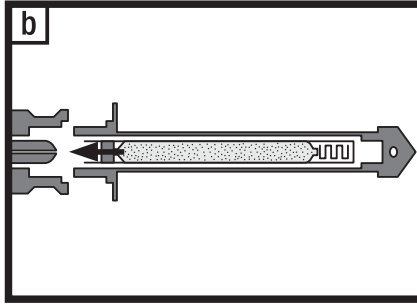
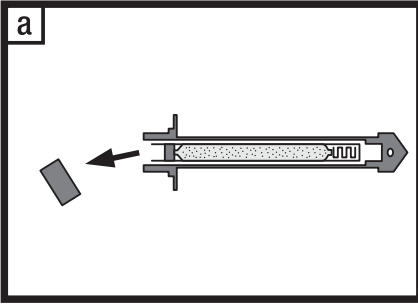
System overview – schematic view (Non-Load Sensing)



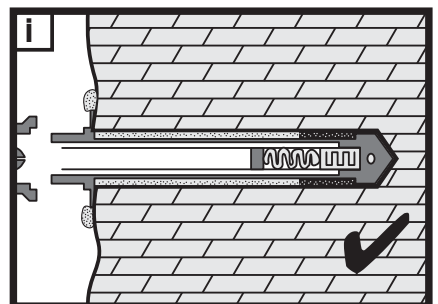
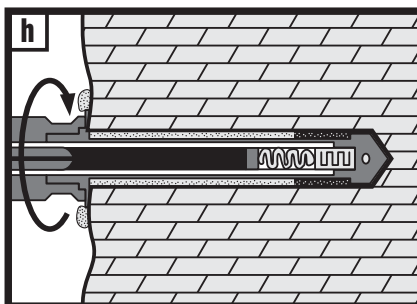
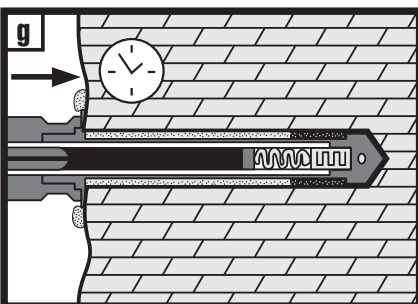
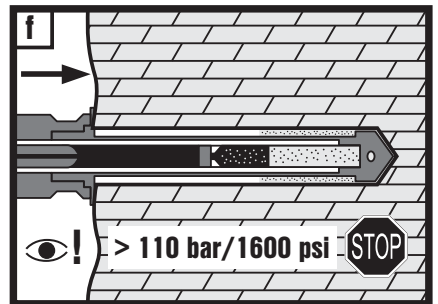
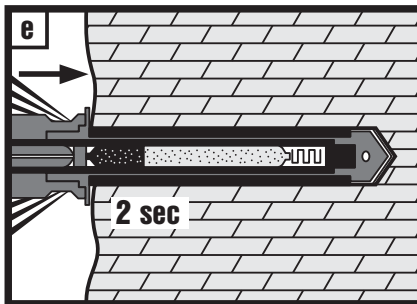
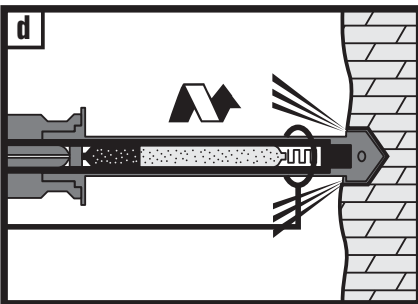
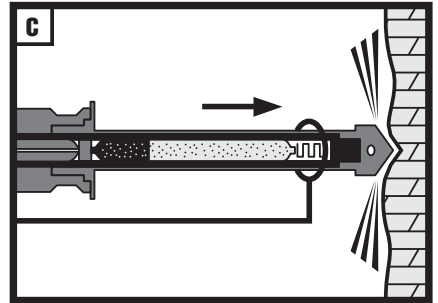
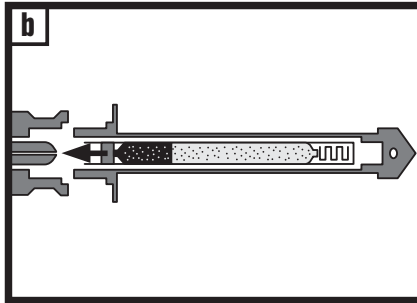
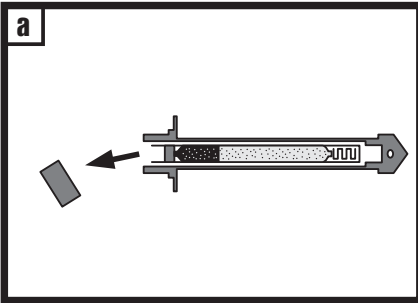
System overview – schematic view (Load Sensing)



4



5



OneStep rock anchor

It is essential that the operating instructions are read before initiation of the system.

Always keep these operating instructions with the OneStep system.

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1. General Information

1.1 Safety notices and their meaning

-CAUTION-

This word draws attention to a potentially dangerous situation that could lead to minor personal injury or damage to the equipment or other property.

-NOTE-

This word draws attention to instructions and other useful information.

1.2 Pictograms

Warning signs



General warning



Warning: avoid hand injuries



Warning! Falling objects

Obligation signs



Wear eye protection



Wear a hard hat



Wear ear protection



Wear protective gloves



Wear safety boots

Approvals of the HOS rock anchor



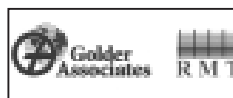
MSHA



DMT



Bezirksregierung Arnsberg



RMT

1.3 Other information

In these operating instructions, the designation “the system” always refers to the OneStep rock anchor system.

1 These numbers refer to the corresponding illustrations. The illustrations can be found on the fold-out cover-pages. Keep these pages open while studying the operating instructions.

(#1) These numbers refer to the corresponding valves shown in the flow diagram on illustration **3** on the cover-page.

2. Description

2.1 Components

The Hilti OneStep rock anchor system consists of 3 main components which are necessary for drilling the anchor and injecting the mortar contained within the anchor:

1. OneStep rock anchor (HOS) 1

- ① 12-pointed nut (Single piece nut with standard anchor, two piece nut with pretension anchor)
- ② Anchor-tube (HOS-W: steel; HOS-C: fiber)
- ③ Drill-head
- ④ Flushing-water channel
- ⑤ Mortar
- ⑥ Centre ring

2. Dispenser 2

- ① 12-pointed chuck
- ② Connection end (hydraulic-motor); according to appendix 8 different designs are available
- ③ Water connection (dispensing water)
- ④ Inner component

3. Multi Rig Intensifier Unit 3

- ① Pump
- ② Manifold
- ③ Ball valve - ON/OFF switch pump
- ④ Filter
- ⑤ Non return valve 5 bar
- ⑥ Pressure gauge (system-pressure water)
- ⑦ Water-distribution T-fitting
- ⑧ Blind / Orifice
- ⑨ Non return valve 0.2 bar
- ⑩ Control valve / Dispensing lever
- ⑪ Pressure gauge (Dispensing-pressure control)

2.2 Use of the product as directed

-CAUTION-

In addition to the safety rules listed in the individual sections of these operating instructions, the following points must be strictly observed at all times.

The system is designed for drilling with the Hilti OneStep rock anchor and for injecting the contained mortar.

When assembling and using the dispensing unit the national standards are to be followed, the minimum requirements are as defined in DIN EN ISO 4413.

It is permissible to use in environments where there is a risk of explosion. The appliance complies with the provisions and requirements of 94/9/EC (ATEX) for: **Group I** category M2 → Mining and explosive atmospheres (firedamp)



Changes or modifications to the system are not permissible. To avoid the risk of injury, use only genuine Hilti accessories and ancillary equipment. Observe the information printed in the operating instructions concerning operation, care and maintenance.

The system and its ancillary equipment may present hazards when used incorrectly by untrained personnel or not as directed.

3. Technical Data and required media

Technical specification of the rock anchor HOS-W

Tubular shaft diameter	38.5 mm (1½ inch)
Lengths	120–250 cm (47¼ – 98⅝ inch) (see appendix 1)
Ultimate load	≥ 320 kN
Yield strength	≥ 270 kN
Elongation at break	≥ 10 %
Chemical mortar	2-component polyester mortar
Drilling method	Clockwise rotating, wet
Pretensioning method (only for HOS-W type T)	Anticlockwise rotating
Drill head	Roof-shaped cutting edge
Diameter at cutting edge	40.5 mm

Technical specification of the rock anchor HOS-C

Tubular shaft diameter	38.0 mm (1½ inch)
Lengths	120–250 cm (47¼ – 98⅝ inch) (see appendix 1)

Ultimate load	≥ 200 kN
Shear load	≥ 50 kN
Nut pull-off	≥ 100 kN
Chemical mortar	2-component polyester mortar
Drilling head	Roof-shaped cutting edge
Diameter at cutting edge	40.5 mm

Dispenser

Connection ends	Different types of connection ends available → appendix 8
Weight	depending on type and length → appendix 8
Length	depending on type and length → appendix 8
Speed of rotation	max. 1000 r.p.m.
Torque transfer	max. 800 Nm
Contact pressure during drilling	max. 20 kN (HOS-W) ; max. 10 kN (HOS-C)

Pump data

Weight	16.5 kg
Dimensions	250 mm × 150 mm × 165 mm

Pump connections

• Power supply (P, T)	1/2" BSPP female
• Water supply (S)	3/4" BSPP female
• Water outlet (HP)	3/8" BSPP female

Media specifications

Power fluid medium		
• Viscosity	10 to 200 cSt	
• Temperature	< 70 °C	
• Filtration ratio	< 25 µm	
• Pressure (in P-line)	140 to 200 bar*	(2030 to 2860 PSI)*
• Flow rate	max. 45 L/min	(max. 12 US-gal/min)

Cooling capacity	2 kW
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Dispensing water

• Temperature	< 40 °C	
• Filtration ratio	< 80 µm	
• Pressure inlet	5 to 25 bar	(75 to 360 PSI)
• Pressure outlet	120 bar	(1740 PSI)
• Flow rate	max. 30 L/min	(max. 8 US-gal/min)

Flushing water (Measured at the drill motor)

• Pressure	15 to 25 bar	(215 to 360 PSI)
• Flow rate	> 30 L/min	(> 8 US-gal/min)
• Filtration ratio	< 200 µm	
• Temperature	< 40 °C	

Hoses (min. requirements)	Nom. Pressure	Nom. Diameter
Power Supply (P, T)	250 bar 3600 PSI	12 mm ½"
Water supply (S)	250 bar 3600 PSI	16 mm ¾"
Water outlet (HP) to Distributor (#7)	250 bar 3600 PSI	10 mm ¾"
Distributor (#7) to control valve (#10)	250 bar 3600 PSI	8 mm 9/16"
Fittings (min. requirements)	Nominal pressure > 250 bar / 3600 PSI	

Parts (#1) – (#11)

Use only genuine Hilti parts as given in **3** and in appendix 7.

* The given minimum values are valid if the pressure in the tank-line is less than 5 bar / 70 PSI. If the pressure in the tank line exceeds 5 bar / 70 PSI the minimum pressure in the P-line has to be increased until 120 bar / 1740PSI dispensing water pressure can be ensured for the entire dispensing process. This must only be done by authorized personnel.

4. Safety rules – general

4.1 Proper arrangement and organization of the workplace

- Wear non-slip boots and always work from a secure stance.
- Wear Personal Protective Equipment (PPE) while working.
- Do not wear loose clothing, loose long hair and jewellery, which could become caught up in moving parts.
- Avoid unfavourable body positions.
- Ensure that the workplace is well lit.
- Ensure that the workplace is well ventilated.
- Objects which could cause injury should be removed from the working area.
- Keep other persons outside the area affected while you are working.
- Take care of your tools. You will work more efficiently and more safely if tools are clean and sharp.

4.2 Handling and using the appliance with due care and attention



-CAUTION-

- The hoses are pressurized. Check the hoses at the beginning of every shift and ensure that all hoses are well positioned to avoid damage as a result of surrounding influences.
- Don't touch or hold rotating parts.
- The system is heavy. There is a risk of pinching parts of the body. Wear a hard hat, protective gloves and safety boots.
- The system emits noise. Excessive noise may damage the hearing. Wear ear protection.
- Drilling may cause hazardous splintering of the material. Splintering material may injure parts of the body and the eyes. Wear eye protection and a hard hat.
- Operate the system only as directed and only when it is in faultless condition.

- Never leave the system unsupervised.
 - Use only the genuine Hilti accessories or spare parts listed in the operating instructions. The use of other equipment may present a risk of injury.
 - Do not overload the system. The system operates more efficiently and more safely within its given performance range.
 - Ensure that the parameters of the machine where you want to install the system on can match the technical requirements of the OneStep system (see chapter 3).
- NOTE-**
When assembling and using the system the national standards are to be followed, the minimum requirements are as defined in DIN EN ISO 4413.
- CAUTION-**
When connecting the pump and the dispenser, national standards are to be followed, the minimum requirements are as defined in DIN EN ISO 4413.
- The pressure-outlet of the dispensing water is limited to 120 bar at the pump. Do not change this setting.
- Follow the instructions concerning care and maintenance.

4.3 Requirements to be met by users

- Specified maximum operating-pressure:
 - max. power fluid pressure in feed-line to the Hilti system: 200 bar / 2900 PSI
- NOTE-**
In case the machine power fluid pressure is higher than 200 bar / 2900 PSI, a pressure reducing valve must be added in front of the Hilti system.
- The system is intended for professional use.
 - The system may only be installed, operated, serviced and repaired by authorized and trained personnel. These personnel must be informed of any special hazards that may be encountered.
 - Always concentrate on the job you are doing. Proceed carefully and do not use the system if your full attention is not on the job.
 - Always follow country specific regulations, processes and safety standards.

4.4 Personal protective equipment

- The user and persons in the immediate vicinity must wear suitable eye protection, a hard hat, ear protection, protective gloves and safety boots when the system is in use (in accordance with the safety regulations of the mine).



5. Installation

It is essential that safety rules printed in these operating instructions are read and observed.



Ensure that the parameters of the machine where you want to install the system on can match the technical requirements of the OneStep system (see chapter 3).

-NOTE-

When assembling and using the system the national standards are to be followed, the minimum requirements are as defined in DIN EN ISO 4413.

The length of the hoses has to be fitted to the required working radius. All possible movements have to be covered to avoid tearing off the hoses.

All equipment must be clean, undamaged and fully functional when installed.

-CAUTION-

When connecting the pump and the dispenser, national standards are to be followed, the minimum requirements are as defined in DIN EN ISO 4413.

The pressure-outlet of the dispensing water is limited to 120 bar at the pump. Do not change this setting.

Ensure that the required power fluid medium with adequate pressure and flow rate (see chapter 3) is available at the pump at any time you want to dispense OneStep anchors.

5.1 Preparation for use 3

5.1.1 Fitting the Multi Rig Intensifier Unit (MRIU)

-NOTE-

The flow diagrams shown in appendix 7 are to be known as schematic diagrams. The implementation of the Intensifier Unit into the complete hydraulic system has to be defined on the basis of the already existing flow diagram of the machine.

1. Mount the pump assembly (#1 - #6) in a well protected, easily accessible and visible location. Use four M8 screws for the assembly and add bolt adhesive (Loctite or similar). The pump should be mounted on a sufficiently horizontal surface to enable proper working of leakage detecting bores (see chapter 6.1.5).
2. Connect the power-fluid feed-line to the ball valve (#3). The ball valve is already pre-assembled to the P-port.

Connect the power-fluid tank-line to the T-port at the manifold (#2).

Connect the water supply line to the filter (#4). The filter is already pre-assembled to the S-port.

Connect the dispensing water line to the WP-port at the pump (#1)

3. Use adequate hoses (see chapter 3) with steel reinforcement and steel fittings.

-NOTE-

The power-fluid tank line pressure must not exceed 5 bar!

4. Mount the control valves (#10) in a well protected and easily accessible location where the operator can use them easily and ergonomically convenient.
5. Connect the WP-port at the pump (#1) and the T-fitting (#7) with a 3/4" hose.
6. Connect the T-fitting (#7) and as many control valves as required with a 9/16" hose.
7. Ensure that all fittings are tight.

-NOTE-

The maximum number of six anchors dispensed in parallel must not be exceeded.

8. The pump can be switched ON and OFF at the ball valve (#3). The pump can be immediately used after the power fluid has been switched ON.
9. Bleed the power-fluid circuit in accordance with the manufacturers guidelines.
10. Vent the dispensing water circuit. Turn all dispensing levers at the control valves (#10) into dispensing position (ON) until the dispensing water escapes continuously and smoothly.

-CAUTION-

Water can exit the dispenser at pressure. Keep out of the way.

10. Ensure that the required media are available at the pump with adequate pressure and flow rates (see chapter 3) at any time you want to dispense OneStep anchors.

5.1.2 Fitting the dispenser

1. Check the seals at the connection end of the dispenser (if worn, change seals according to existing connection end as shown in appendix 8).
2. Grease the connection end.
3. Fit the dispenser, connection end first, into the drilling motor.
4. Secure the dispenser in the drill-motor with the mount-

- ing-accessories intended for the existent drill-motor.
- Connect the dispensing-water hose to the dispenser.
 - Secure the housing to prevent rotation as shown in appendix 4 and appendix 5 (Caution: No rigid connection to the motor or motor carriage).
 - Use stainless cylinder-head bolts M8 with adequate length to fix the anti-twist device. Ensure that all screws of the dispenser are set and mounted with the specified torque (see appendix 8) after mounting the anti twist device.

5.1.3 HOS Feed Control (optional)

Description

The HOS Feed Control is an option to support the HOS drilling process. It controls the feed rate of the drill rig as a function of flushing water pressure. Therefore, the feed rate is automatically kept at an optimum without the need for the operator to adjust it. The HOS Feed Control System is particularly suitable for drilling strata with cohesive layers. Hydraulic circuit and part list is located in appendix 9. The standard system can be used with flushing water pressures up to $p = 22 \text{ bars} / 320 \text{ PSI}$.

Installation

During assembly and operation of the HOS Feed Control System all local regulations on hydraulic systems are to be considered. The DIN EN ISO 4413 is always to be taken into account as a minimum requirement.

- Switch off the machine and block the flushing water line.
- Release the pressure on all hydraulic and water lines.
- Find a suitable position for the feed control valve close to the HOS anchor. Ask for support from your Hilti Technical Support.

- Assemble the HOS Feed Control System in accordance to hydraulic circuit and part list in appendix 9.

Adjustment

The HOS Feed Control system has to be adjusted to the local flushing water conditions. This guarantees a drilling performance at its best.

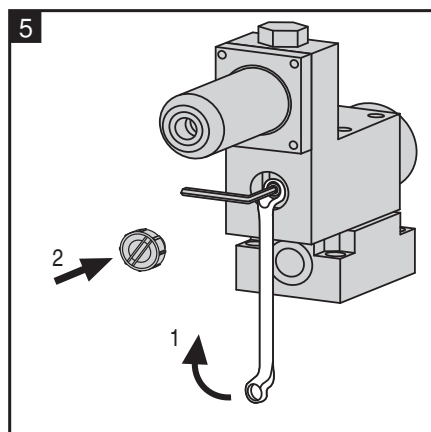
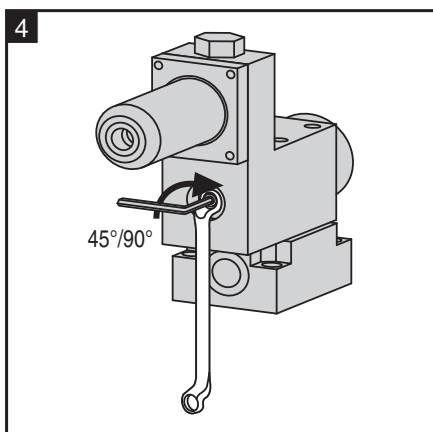
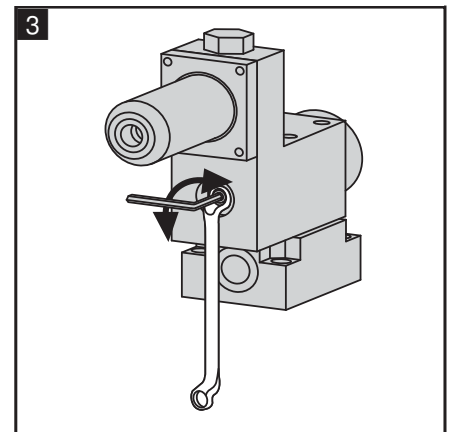
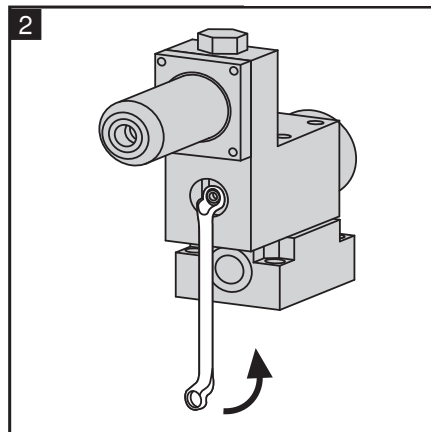
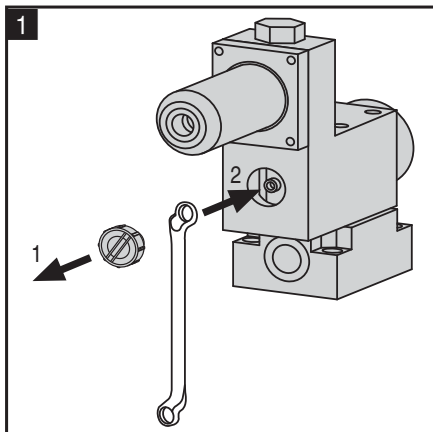
- Block the ball valve in the flushing water line (the valve actuation now has maximum static pressure).
- Remove protective cap from valve [1.1].
- Release locking screw of valve [1.2 + 2].
- Switch on flushing water supply.
- Vent system air at valve actuation (water cylinder).
- Adjust the drill rig feed rate as follows:

Step 1: Switch on feed

Step 2: In case the drill rig moves, reduced feed by turning valve adjustment screw clockwise until carriage just stops [3].

Step 3: In case the drill rig does not move, increase feed by turning valve adjustment screw anti clockwise until drill rig just moves [3]. With a maximum flushing water pressure between 20 and 22 bars / 290 and 320 PSI you may skip step 4. The adjustment is already done here.

Step 4: With a maximum flushing water pressure below 20 bars / 290 PSI and water pressure fluctuations of $\Delta p < 2 \text{ bars} / 29 \text{ PSI}$ turn adjustment screw [4] clockwise 45° . With water pressure fluctuations of $\Delta p > 2 \text{ bars} / 29 \text{ PSI}$ turn adjustment screw [4] clockwise 90° . Tighten locking screw of valve carefully [5.1]. Replace protective cap [5.2]. Open ball valve in flushing water line.



6. Before Use

6.1 Before each usage

6.1.1 General overview

- Inner component **2**: Check the contact surface of the sealing plate for signs of wear (good seal with the rock anchor). Change sealing plate, if it is worn or broken (see chapter 8.2). Ensure the inner component is properly fixed in the dispenser.
- Check 12-pointed chuck for signs of excessive wear.
- Ensure that the required media are available with adequate pressure and flow-rate (see chapter 3).
- Ensure that all used adapters and extensions are in good and operative condition.

6.1.2 Setting the system

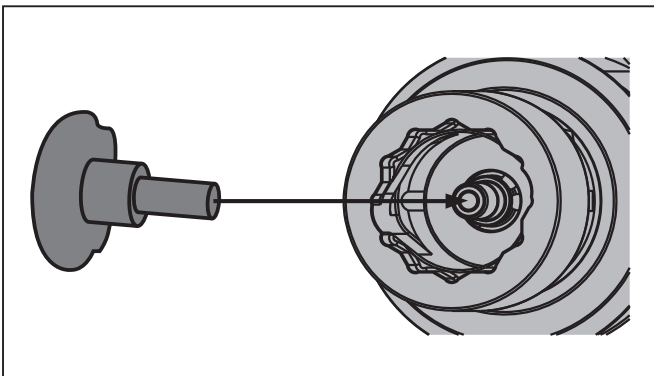
-CAUTION-

Water can exit the dispenser at pressure. **Keep out of the way.**

1. Ensure that all hoses and valves are mounted properly and connected correctly and all fittings are tight.
2. Bleed the system (waterside)
 - Turn all dispensing levers at the Control Valves (#10) into dispensing position (ON). Wait until the water escapes smoothly and continuously out of the dispenser.
 - Measure at every dispenser the time until 1.5 liters have been drained
 - 15-18 sec. → o.k.
 - if dispensing time differs from 15-18 sec. → troubleshooting chapter 9.

6.1.3 Checking for leakage and gauge functionality

- Close the injection water outlet on all dispensers firmly with an M8 screw (e.g. starknob according to appendix 6).



- Set the system under pressure by turning the dispensing levers at all Control Valves (#10) into dispensing position (ON) and leave the lever in that position.
- Ensure that all fittings and hoses do not leak.
- Observe the gauge that shows the water-pressure in the dispensing-water line **3** (#11) for proper function after leakage test. When operating the dispensing lever (#10) the pressure must increase immediately to ~110 bar / 1600 PSI.

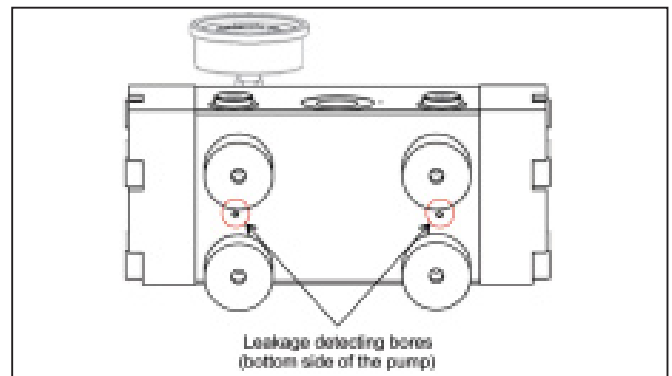
- Ensure at the pressure gauge (#6) that the system pressure is 120 bar.
- Return the dispensing-lever to the drilling position (OFF).
- Observe the gauge (#11) that shows the pressure in the dispensing water line and ensure the pressure is completely released before starting to remove the screw.

6.1.4 Checking HOS Feed Control (if used)

The HOS Feed Control Valve should be adjusted to the flushing water pressure as needed, but at least once per day. If there are problems see the troubleshooting chapter 9.3.

6.1.5 Observation of pump leakage detector

The leakage detecting bore is located on the bottom surface of the pump-housing at the zone which separate oil- and water-chambers from each other.



-CAUTION-

If the draining from leakage detectors exceeds rate of 10 drops per minute, the pump must be replaced and sent to Hilti. Refer to chapter 8.4.

6.2 Periodical checks

If the system is in constant use, these checks should be carried as frequently as mine conditions require, but at least once per week. If the system has been idle for a long period of time they should be made before the next usage.

6.2.1 Dirt trap (filter) (#4)

- Check the mesh
 - Clean the mesh, if silted/blocked.
 - Change the dirt trap (filter), if worn.

6.2.2 Assembly

- Ensure the anti-twist device is secure.
- Ensure the dispenser is securely connected with the drill motor.

7. Operation

It is essential that the safety rules printed in these operating instructions are read and observed. Ensure that the expiry date of the anchor you want to set is not exceeded.

-NOTE-

Use only anchors that are in a proper condition (anchor tube, drill bit and 12-pointed nut) as delivered by Hilti. Ensure that the anchors didn't become damaged during storage or transportation in the mine.

7.1 Operation HOS-W ISL and HOS-C 4 (pictures a-e)

-NOTE-

Ensure that the pump is switched on at the Ball Valve (#3) and ensure that the required media (see chapter 3) are available with adequate pressure and flow-rate at any time you want to install OneStep anchors.

7.1.1 Drilling HOS-W ISL and HOS-C

-NOTE-

Before drilling: Ensure that the Dispensing Lever at the Control Valve (#10) was turned into the drilling position (OFF). There must be no water escaping at the dispensing water nozzle at the inner component of the dispenser during drilling.

1. Remove the protective cap from the 12-pointed nut of the rock anchor.
2. Ensure that the flushing-water holes at dispenser and anchor (at 12-pointed-nut and drill bit) are open. Clean holes and dispenser chuck from debris, if necessary.
3. Insert the 12-pointed-nut of the rock anchor into the 12-pointed chuck of the dispenser, until the seal at the nut-bottom gets in contact with the sealing plate of the inner component.
4. Use the anchor guide (or similar equipment) on the drilling carriage to stabilize the rock anchor whilst drilling.
5. Ensure that the anchor rotates freely in the anchor guide.
6. Drilling direction: clockwise
7. Use an extension (see appendix 2) in case of uneven strata to ensure that the anchor can be drilled to its complete depth.
8. Brace the drill rig to the strata. Bring the drill bit of the rock anchor in contact with the rock and press it to the strata (from now on do not remove the thrust until the complete setting procedure has been finished).

-NOTE-

9. Do not use excessive drill thrust that bends/breaks the anchor.
10. Start flushing water.
11. Start drilling.
12. Where required remove the anchor guide in accordance with manufacturer's guidelines and local work and safety procedures.

13. Drill anchor to its complete depth.
14. In order to prevent strong friction stop drilling and applying thrust immediately once anchor reaches its complete depth.
15. Continue flushing for approx. 2 seconds after drilling has been finished.

7.1.2 Dispensing (Standard HOS) 4 (pictures f-h)

1. Ensure that the rock anchor is still properly engaged in the dispenser chuck.
2. Ensure that the anchor is firmly pushed against the strata.
3. Turn the Dispensing Lever at the Control Valve (#10) into dispensing position (ON).
4. Keep the lever in the dispensing position (ON) until the resin escapes from the drilled hole. If no mortar escapes, end the injection operation when maximum injection pressure ~110 bar / 1600 PSI is shown at the gauge in the dispensing-water line (#11).
5. Maintain thrust until the resin has set. The length of the waiting time depends on the surrounding temperature and the flushing-water temperature, but lasts at least 15 sec.
6. Push the Dispensing Lever (#10) of the control valve back into drilling position (OFF) and wait until the pressure in the dispensing water line is released.
7. Retract the drilling motor to its original position.
8. Assure that the dispenser is free of debris every time before inserting a new anchor.

-NOTE-

Observe also the safety precautions listed in the MSDS material safety data sheet (see also training documents).

7.2 Operation Pretension HOS

-NOTE-

Ensure that the pump is switched on at the Ball Valve (#3) and ensure that the required media (see chapter 3) are available with adequate pressure and flow-rate at any time you want to install OneStep anchors.

7.2.1 Drilling (Pretension HOS) 5 (pictures a-e)

-NOTE-

Before drilling: Ensure that the Dispensing Lever at the Control Valve (#10) was turned into the drilling position (OFF). There must be no water escaping at the dispensing water nozzle at the inner component of the dispenser during drilling.

1. Remove the protective cap from the 12-pointed nut of the rock anchor.
2. Ensure flushing-water holes at dispenser and anchor (at 12-pointed-nut and drill bit) are open. Clean holes and dispenser chuck from debris, if necessary.
3. Insert the 12-pointed-nut of the rock anchor into the 12-pointed chuck of the dispenser, until the seal at the nut-bottom gets in contact with the sealing plate of the inner component.

4. Use the anchor guide (or similar equipment) on the drilling carriage to stabilize the rock anchor whilst drilling.
5. Ensure the anchor rotates freely in the anchor guide.
6. Drilling direction: clockwise
7. Use an extension (see appendix 2) in case of uneven strata to ensure the anchor can be drilled to its complete depth.
8. Brace the drilling carriage to the strata. Bring the drill bit of the rock anchor in contact with the rock and press it to the strata (from now on do not remove the thrust until the complete setting procedure has been finished).

-NOTE-

9. Do not use excessive drill thrust that bends the anchor.
10. Start flushing water.
11. Start drilling.
12. Where required remove the anchor guide in accordance with manufacturer's guidelines and local work and safety procedures.
13. Drill anchor to its complete depth.
14. In order to prevent strong friction stop drilling and applying thrust immediately once anchor reaches its complete depth.
15. Continue flushing for approx. 2 seconds after drilling has been finished.

7.2.2 Dispensing and tensioning (Pretension HOS) (pictures f-i)

1. Ensure that the rock anchor is still properly engaged in the dispenser chuck.
2. Ensure that the anchor is firmly pushed against the strata.
3. Turn the Dispensing Lever at the Control Valve (#10) into dispensing position (ON).
4. Continue dispensing until the maximum pressure of ~110 bar / 1600 PSI is shown on the gauge in the water line (#11).
5. Push the Dispensing Lever (#10) of the control valve back into drilling position (OFF) and wait until the pressure in the dispensing water line is released.
6. Maintain thrust until the fast resin has set. The length of the waiting time depends on the surrounding temperature and the flushing-water temperature. Wait 5 to 10 seconds before tensioning the rock anchor.
7. Rotate the drill motor anti-clockwise to tension the anchor.

-NOTE-

For consistent pretension in the rock anchor, check the torque level of the drill motor regularly.

-NOTE-

Observe also the safety precautions listed in the MSDS material safety data sheet (see also training documents).

7.3 Consequences of improper setting

-NOTE-

If one of the following cases occurs during injection or setting of the resin the full load capacity of the anchor cannot be ensured:

- Power failure (dispensing incomplete)
- Drill-rig thrust removed (potential move of the anchor in the underground and hence potential damage of chemical bond)
- Rotation of the anchor (potential damage of chemical bond)
- Interruption of dispensing (dispensing incomplete)

-CAUTION-



If the anchor is not properly installed or damaged in any way:

- Ensure that the anchor can not cause any damage or harm. If required, remove and dispose the anchor.
- If required set a new anchor.



Do not under any circumstances put any part of your body between the dispenser and a bolt that has not been or is suspected of not being dispensed.

8. Maintenance

-NOTE-

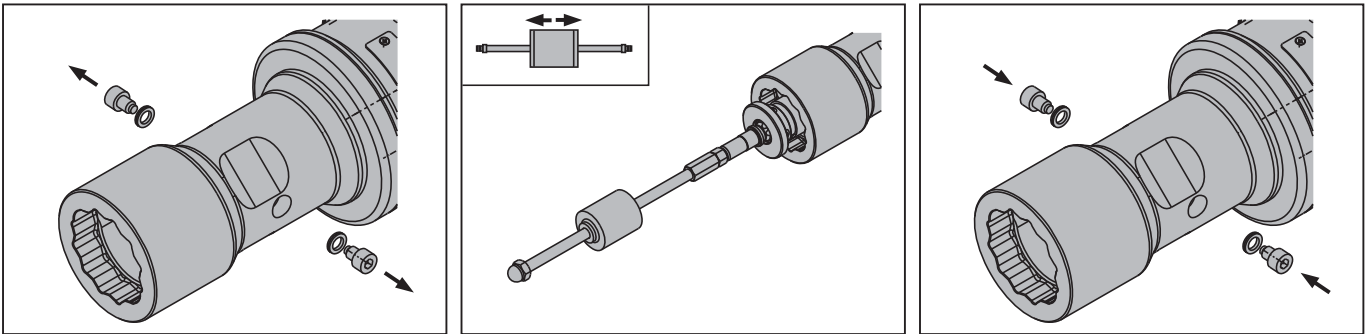
The following described activities are to be done in case of need.

The required spare parts and repair tools are listed in appendix 6 and concerning to the type of dispenser in appendix 8.

en

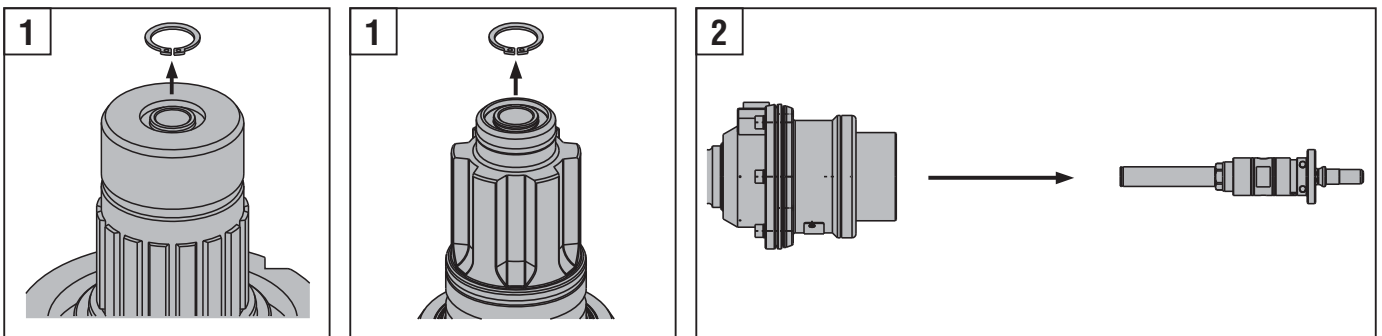
8.1 Replacement of the inner component

8.1.2 Dispenser Type B (short inner component)



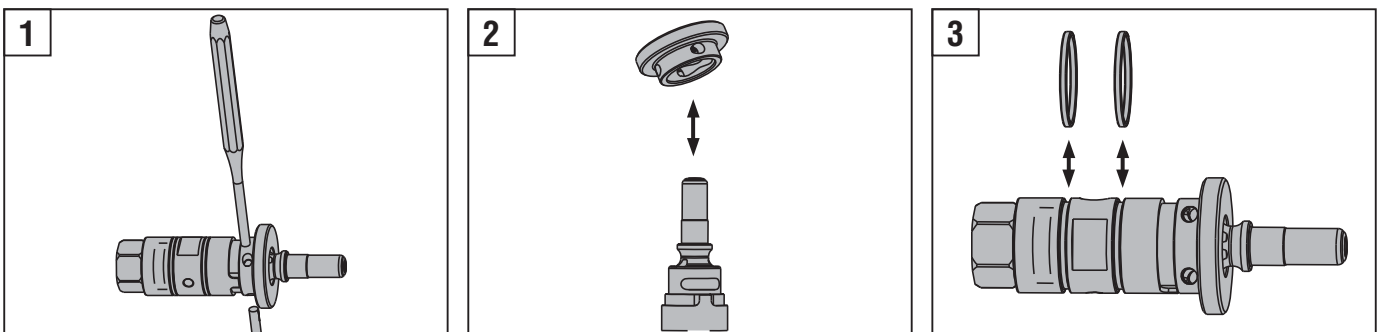
- Release the cylinder cap screws and retaining-washers with an Allen key (6 mm)
- Screw the extractor into the inner component.
- Pull out the inner component.
- Insert and position a new, lightly greased inner component.
- Secure the inner component with new cap screws and Nord-Lock® washers.

8.1.3 Dispenser Type B (long inner component)



- Screw the extractor into the inner component.
- Release the circlip (fig 1)
- Pull out the inner component (fig 2)
- Insert and position a new, lightly greased inner component.
- Secure the inner component with a circlip.

8.2 Maintenance of the inner component



- Use a hammer and pin punch to drive out both slotted pins (fig 1).
- Remove worn sealing plate / fit new sealing plate (fig 2).

- Drive in slotted pins to secure sealing plate.
- Fit new O-rings (fig 3).
- Ensure the flushing-water holes are open.
- Check the non-return valves for smoothness of operation. Do this by pressing the base of the housing of the non-return valve with a pin or rod.

8.3 Replacement of the seals at the connection end

The seals at the drilling-motor interface differ between the various types of connection ends. The different work steps, seal-types and tools are shown in appendix 8 according to the existing type of dispenser.

8.4 Maintenance of the pump

In general, the pump is maintenance free. Only the leakage detector has to be observed (refer chapter 6.1.5). If the draining from leakage detectors exceeds the rate of 10 drops per minute, the pump must be replaced and sent to Hilti.

In this case

1. Shut off the machine power supply.
2. Shut off the ball valve (#3) in the power-fluid line of the pump.
3. Open one of the dispensing valves on the machine to de-pressurize the water lines.
4. Replace the pump by changing hydraulic hoses and fittings according to national standards, the minimum requirements are defined in EN ISO 443.

9. Troubleshooting

9.1 Troubleshooting HOS rock anchor (all types) and dispensing system

Problem: No dispensing / bolt encapsulation incomplete (no resin show at the mouth of bore)

- Turn the Dispensing Lever at the Control Valve (#10) into dispensing position (ON) and observe the Pressure Gauges (#6) (P_6 ; system-pressure) and (#11) (P_{11} ; dispensing pressure)

$P_6 \sim 0$ bar / pump not working

- no water-supply
 - No/insufficient dispensing-water supply?
 - Water-hoses blocked/squeezed?
 - Filter (#4) blocked?
 - Pump-sealings worn? → Check leakage detector (see 6.1.5)
- no power fluid supply
 - Power fluid hoses installed at the correct port?
 - No/insufficient power fluid supply?
 - Ball valve (#3) blocked/shut?
 - Pump-sealings worn? → Check leakage detector (see 6.1.5)
- Leakage in power fluid supply / water supply?
- Pump broken or blocked?

$0 < P_6 < 120$ bar

- Insufficient power fluid supply (flow rate/pressure) → see chapter 3
- Bolter overloaded?
- Diameter of power-supply hoses (P-line) too small?
- Pressure setting at pump misaligned?

$P_6 \sim 120$ bar and $P_{11} \sim 110$ bar at the end of dispensing process

- Resin completely dispensed
 - Broken ground?
 - Cavities in the strata?

$P_6 \sim 120$ bar and $P_{11} \sim 110$ bar immediately after operating the Control Valve / Dispensing Lever (#10)

- Blockage behind P_{11}
 - Flushing holes at drill-bit blocked?
 - Water-hose blocked/squeezed?
 - Dispensing-water nozzle at inner-component of dispenser blocked?
 - Check-valve in inner-component of dispenser blocked?

$P_6 \sim 120$ bar and $P_{11} \sim 110$ bar suddenly during dispensing (dispensing time shorter than usual)

- dispensing process interrupted
 - Resin cured too quickly? Storage-, flushing water- or underground-temperature too high?
 - Annular gap blocked?
 - Hoses blocked/squeezed?
 - Orifice (#8) broken/worn?

$P_6 \sim 120$ bar and $P_{11} \sim 0$ bar after operating the Control Valve / Dispensing Lever (#10)

- Pressure Gauge (#11) faulty or
- Blockage between Pressure Gauge (#6) and Pressure Gauge (#11)
 - Water-hose blocked/squeezed?
 - Control Valve (#10) blocked or faulty?
 - Orifice (#8) blocked?

$P_6 \sim 120$ bar and $P_{11} < 110$ bar after standard dispensing time (depends on anchor-length)

- Anchor not pressed to the strata? → Draining water between Dispenser and HOS anchor?
- Leakage in the system/dispenser?
- Air in system?
- Control Valve (#10) blocked or faulty?
- Center-ring at anchor broken?
- Orifice (#8) blocked?
- Fittings not tight?

 $P_6 > 120$ bar

- Call Hilti personnel or trained personnel to readjust pressure limit to 120bar.

9.2 Trouble shooting pretension HOS**Problem: During drilling the nut runs out of the dispenser**

Is the direction of rotation correct?

- Correct rotation direction controls

Problem: During tensioning the nut doesn't run out of the dispenser

Is the direction of rotation correct?

- Correct rotation direction controls

Problem: Anchor doesn't rotate during drilling

Pretension nut run forwards on the anchor?

- Screw the nut back in position

9.3 Trouble shooting Option HOS Feed Control System

With installation and operation of the HOS Feed Control System the local regulations are to be taken into account. The guideline DIN EN ISO 4413 is always to be considered as a minimum requirement.

Problem: Clogging of bolt = no function of HOS Feed Control Systems

Air in valve actuation (water line)

- Vent air at actuation and repeat valve adjustment according chapter 5.1.4

No or not sufficient flushing water to bolt

- Ref. chapter 9.1 Trouble shooting HOS bolt

Valve adjustment screw out of adjustment

- Repeat valve adjustment according chapter 5.1.4

Water leakage out of protective cap

- Replacement of FC valve

Problem: Carriage feed too slow

Pressure of flushing water above selected control pressure range

- Repeat valve adjustment according chapter 5.1.4

Problem with hydraulic power supply

- Check hydraulic power supply by qualified staff

Valve damaged

- Replacement of FC valve

Problem: No carriage feed

Pressure of flushing water above selected control pressure range

→ Repeat valve adjustment according chapter 5.1.4

Hydraulic hoses or system components not properly connected

→ Check hydraulic system by qualified staff

Efficient power supply or problem with hydraulic power supply

→ Check hydraulic system by qualified staff

Valve damaged

→ Replacement of FC valve

Problem: No retraction of carriage

Check valve inside FC valve blocked

→ Replacement of FC valve

→ Repeat valve adjustment according chapter 5.1.4

10. Storage and transportation

See the actual Material Safety Data Sheet concerning storage and transportation.

11. Accessories, spare parts & repair tools

- | | | | |
|--|-----------------------------|----------------|--------------|
| • Coupling nut | → appendix 2 | • Feed control | → appendix 9 |
| • Extensions | → appendix 2 | | |
| • Drill- and setting-adapters | → appendix 3 | | |
| • Spare parts hydraulic circuit | → appendix 7 | | |
| • Spare parts & repair tools dispenser | → appendix 6 and appendix 8 | | |

12. Disposal

See the actual Material Safety Data Sheet concerning disposal.

-CAUTION-

Improper disposal of the equipment may have serious consequences: The burning of plastic components generates toxic fumes which may present a health hazard.



Most of the materials from which Hilti tools or appliances are manufactured can be recycled. The materials must be correctly separated before they can be recycled. In many countries, Hilti has already made arrangements for taking back old tools and appliances for recycling. Ask Hilti customer service or your Hilti representative for further information.

13. Manufacturer's warranty – tools

Hilti warrants that the tool supplied is free of defects in material and workmanship. This warranty is valid so long as the tool is operated and handled correctly, cleaned and serviced properly and in accordance with the Hilti Operating Instructions, and the technical system is maintained. This means that only original Hilti consumables, components and spare parts may be used.

This warranty provides the free-of-charge repair or replacement of defective parts only over the entire lifespan of the tool. Parts requiring repair or replacement as a result of normal wear and tear are not covered by this warranty.

Additional claims are excluded, unless stringent national rules prohibit such exclusion. In particular, Hilti is

not obligated for direct, indirect, incidental or consequential damages, losses or expenses in connection with, or by reason of, the use of, or inability to use the tool for any purpose. Implied warranties of merchantability or fitness for a particular purpose are specifically excluded.

For repair or replacement, send tool or related parts immediately upon discovery of the defect to the address of the local Hilti marketing organization provided.

This constitutes Hilti's entire obligation with regard to warranty and supersedes all prior or contemporaneous comments and oral or written agreements concerning warranties.

14. Declaration of conformity (original)

Designation:	Dispenser
Type:	HOS I-T xx / HOS I-N xx
Year of design:	2003-2009

We declare, on our sole responsibility, that the in appendix 8 named dispenser comply with the following directives and standards: 94/9/EC, 2006/42/EC, EN 12100, EN 13463-1.

Designation:	Multi Rig Intensifier Unit
Year of design:	2011

We declare on our sole responsibility, that the in appendix 7 named preassembled Pump assemblies and Dispensing assemblies comply with the following directives and standards: DIN EN ISO 4413, 2006/42/EC.

**Hilti Corporation, Feldkircherstrasse 100,
FL-9494 Schaan**

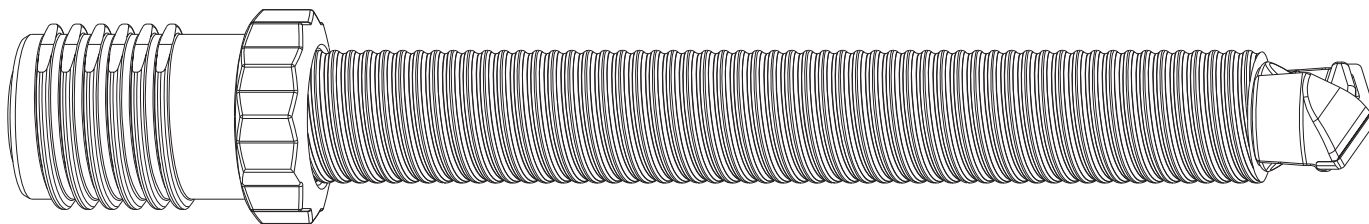


Helmut Haas
Head of Quality Management Natural Resources
Energy & Industry
03/2013



Lars Taenzer
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03/2013

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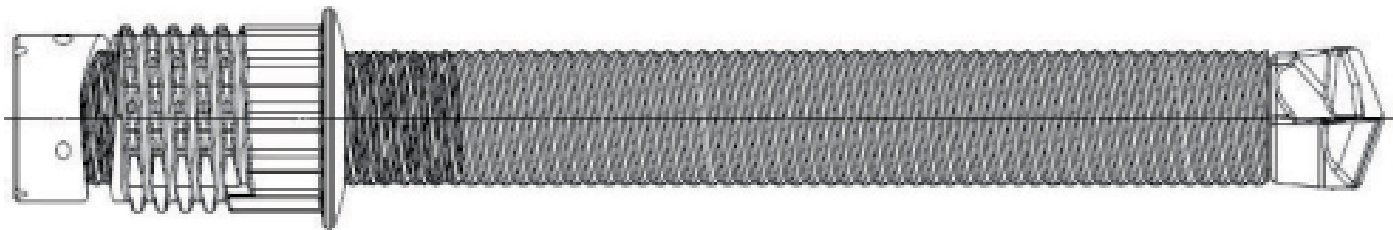
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Name (steel-drill bit)	Total length		Color code in nut	Item number
	[mm]	[inch]		
HOS-W 120 /320 N3 30	1245	49"	no color	211876
HOS-W 150 /320 N3 30	1545	61"	red	211877
HOS-W 180 /320 N3 30	1845	72.6"	blue	211878
HOS-W 210 /320 N3 30	2145	84.5"	orange	211879
HOS-W 250 /320 N3 30	2565	101"	white	211880

Name (carbide-drill bit)	Total length		Color code in nut	Item number
	[mm]	[inch]		
HOS-W 120 /320 N4 30	1245	49"	no color	211875
HOS-W 150 /320 N4 30	1545	61"	red	236496
HOS-W 180 /320 N4 30	1845	72.6"	blue	236497
HOS-W 210 /320 N4 30	2145	84.5"	orange	236498
HOS-W 250 /320 N4 30	2565	101"	white	283042

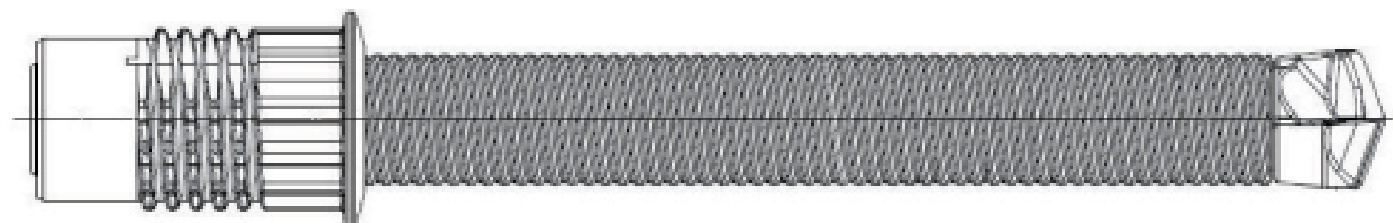
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HOS-W 120 /320 N3 15	1245	49"	no color	421196
HOS-W 150 /320 N3 15	1545	61"	red	421197
HOS-W 180 /320 N3 15	1845	72.6"	blue	421198
HOS-W 210 /320 N3 15	2145	84.5"	orange	421199
HOS-W 250 /320 N3 15	2565	101"	white	421200

Name (carbide-drill bit)	Total length		Color code in nut	Item number
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HOS-W 120 /320 N4 15	1245	49"	no color	421201
HOS-W 150 /320 N4 15	1545	61"	red	421202
HOS-W 180 /320 N4 15	1845	72.6"	blue	421203
HOS-W 210 /320 N4 15	2145	84.5"	orange	421204
HOS-W 250 /320 N4 15	2565	101"	white	421205



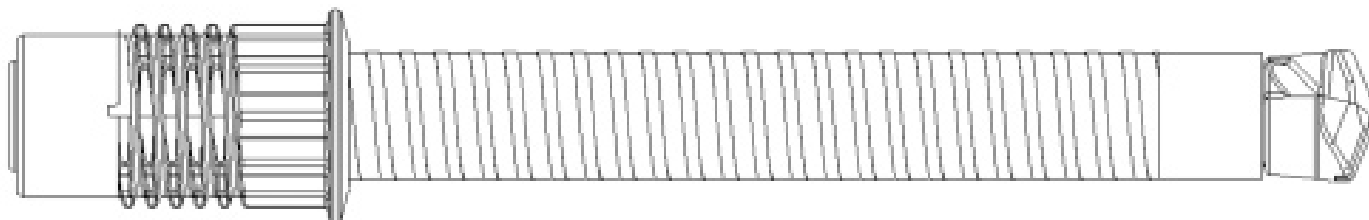
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HOS-W 120 /320 T3 15	1245	49"	no color	421186
HOS-W 150 /320 T3 15	1545	61"	red	421187
HOS-W 180 /320 T3 15	1845	72.6"	blue	421188
HOS-W 210 /320 T3 15	2145	84.5"	orange	421189
HOS-W 250 /320 T3 15	2565	101"	white	421190

Name (carbide-drill bit)	Total length		Color code in nut	Item number
	[mm]	[inch]		
HOS-W 120 /320 T4 15	1245	49"	no color	421191
HOS-W 150 /320 T4 15	1545	61"	red	421192
HOS-W 180 /320 T4 15	1845	72.6"	blue	421193
HOS-W 210 /320 T4 15	2145	84.5"	orange	421194
HOS-W 250 /320 T4 15	2565	101"	white	421195



Name (steel-drill bit)	Total length		Color code in nut	Item number
	[mm]	[inch]		
HOS-W 120 /320 N3 15	1245	49"	no color	437901
HOS-W 150 /320 N3 15	1545	61"	red	437902
HOS-W 180 /320 N3 15	1845	72.6"	blue	437904
HOS-W 210 /320 N3 15	2145	84.5"	orange	437905
HOS-W 250 /320 N3 15	2565	101"	white	438906

Name (carbide-drill bit)	Total length		Color code in nut	Item number
	[mm]	[inch]		
HOS-W 120 /320 N4 15	1245	49"	no color	437908
HOS-W 150 /320 N4 15	1545	61"	red	437910
HOS-W 180 /320 N4 15	1845	72.6"	blue	437911
HOS-W 210 /320 N4 15	2145	84.5"	orange	437912
HOS-W 250 /320 N4 15	2565	101"	white	437913



1

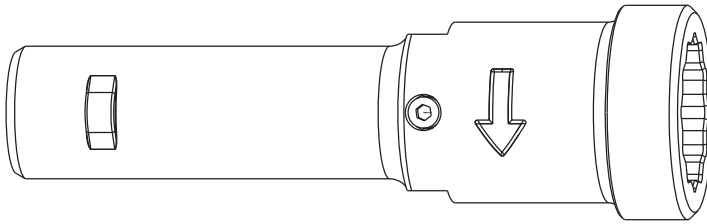
Name (steel-drill bit)	Total length		Color code in nut	Item number
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HOS-C 120/200 N3 15	1245	49"	blue	2060279
HOS-C 150/200 N3 15	1545	61"	orange	2060310
HOS-C 180/200 N3 15	1845	72.6"	red	2060311
HOS-C 210/200 N3 15	2145	84.5"	green	2060312
HOS-C 250/200 N3 15	2565	101"	yellow	2060313

Name (carbide-drill bit)	Total length		Color code in nut	Item number
	[mm]	[inch]		
HOS-C 120/200 N3 15 ASC	1245	49"	blue	2060314
HOS-C 150/200 N3 15 ASC	1545	61"	orange	2060315
HOS-C 180/200 N3 15 ASC	1845	72.6"	red	2060316
HOS-C 210/200 N3 15 ASC	2145	84.5"	green	2060317
HOS-C 250/200 N3 15 ASC	2565	101"	yellow	2060318

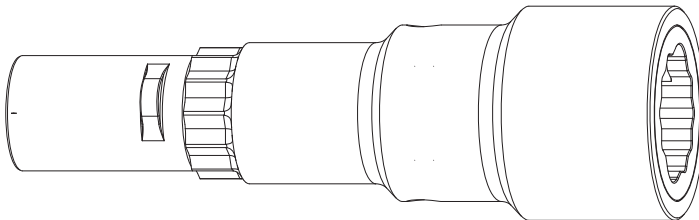
Name (steel-drill bit)	Total length		Color code in nut	Item number
	[mm]	[inch]		
HOS-C 120/200 N4 15	1245	49"	blue	2060082
HOS-C 150/200 N4 15	1545	61"	orange	2060083
HOS-C 180/200 N4 15	1845	72.6"	red	2060084
HOS-C 210/200 N4 15	2145	84.5"	green	2060085
HOS-C 250/200 N4 15	2565	101"	yellow	2060086
HOS-C 250/200 N4 30 STD*	2565	101"	yellow	2060322

* Exception: for dispenser N

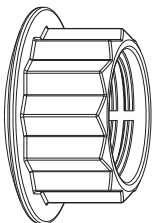
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HOS-C 120/200 N4 15 ASC	1245	49"	blue	2060087
HOS-C 150/200 N4 15 ASC	1545	61"	orange	2060088
HOS-C 180/200 N4 15 ASC	1845	72.6"	red	2060089
HOS-C 210/200 N4 15 ASC	2145	84.5"	green	2060320
HOS-C 250/200 N4 15 ASC	2565	101"	yellow	2060321

Appendix 2**Extension****for dispenser N**

Available tube lengths (without shaft) [mm]	[inch]	Item number
200	7.8	248318
300	11.8	287588
600	23.6	287589

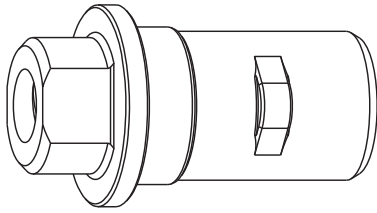
2**Appendix 2****Extension****for dispenser T**

Available tube lengths (without shaft) [mm]	[inch]	Item number
200	7.8	428618
300	11.8	428619
600	23.6	428620

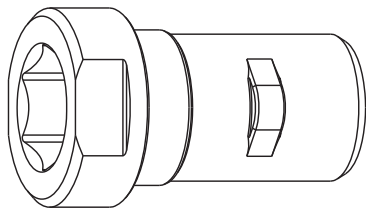
Appendix 2**Coupling nut HOS-W 320****for all nut types**

	Item number
	284132

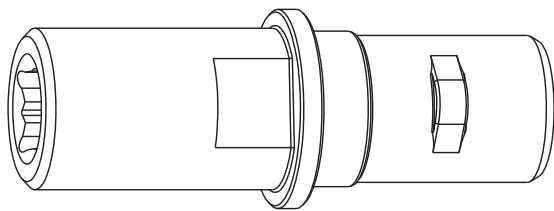
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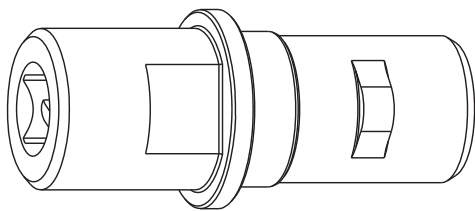
	Item number
Drill-adapter B 25 rht assy	274648



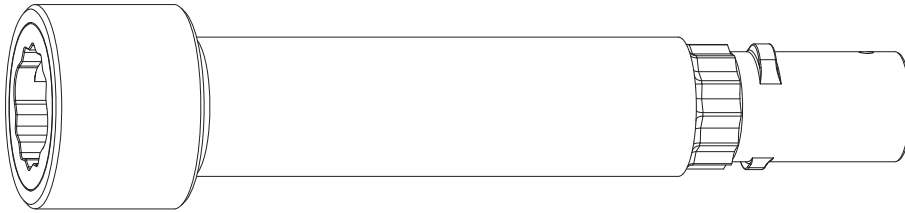
	Item number
Setting-adapter SW 41 assy	274649



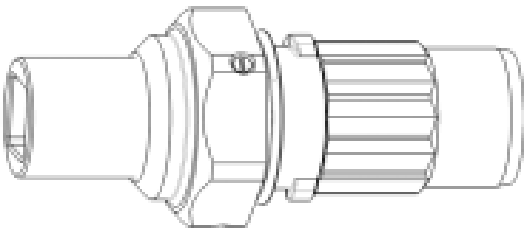
	Item number
Drill- and setting-adapter 1 1/8" assy	365875



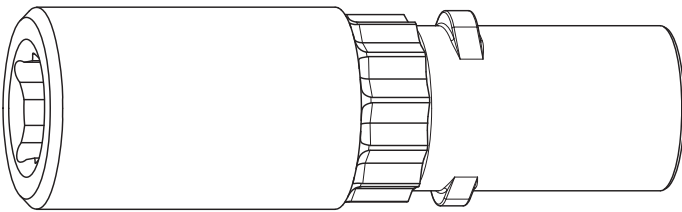
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Drill- and setting-adapter Hydro-AUS assy	274650



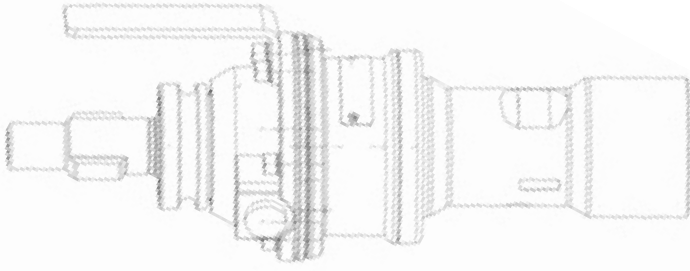
	Item number
Socket wrench	428539



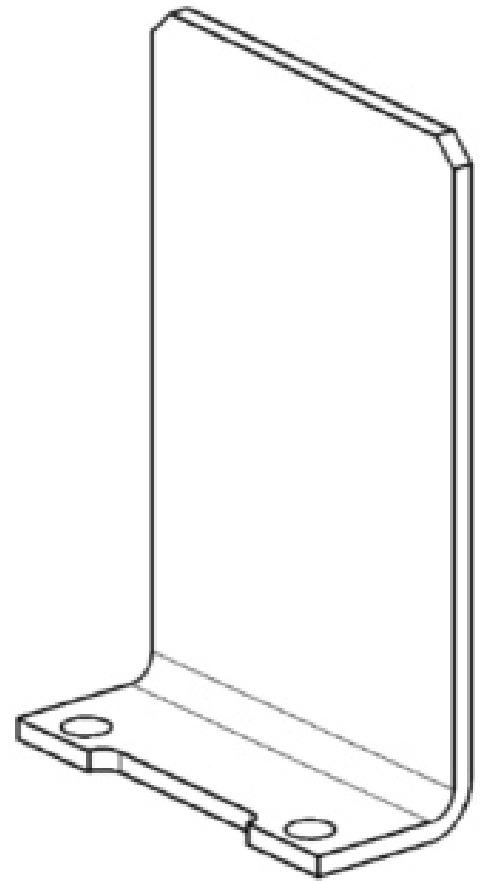
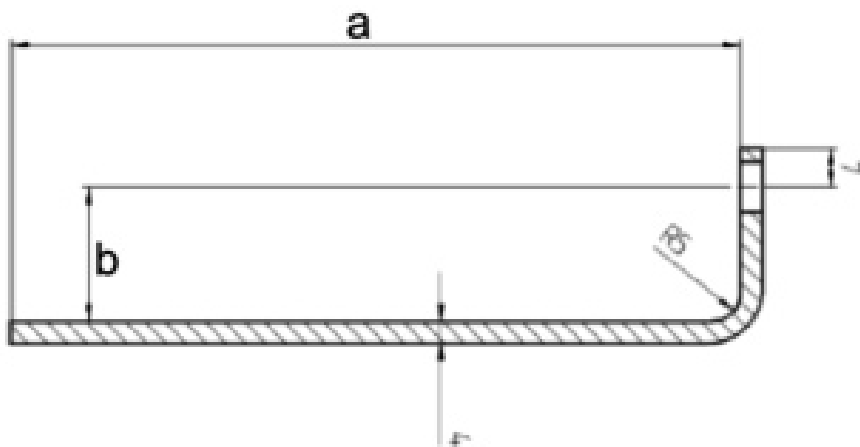
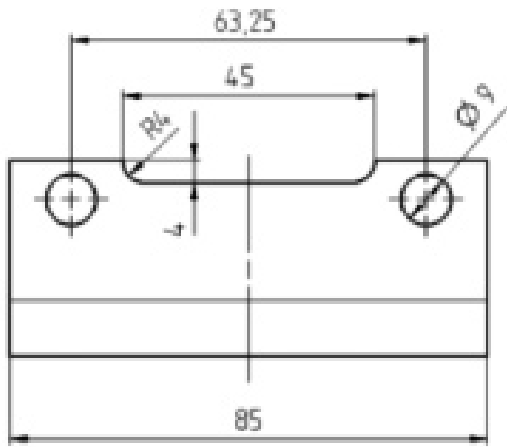
	Item number
Adapter T 25	2053605



	Item number
Adapter T 1 1/8"	428541



4



4

Adapt dimensions **a**, **b** to motor-geometry

Appendix 5

Spare part- and tool-box

Information

The spare part- and tool-box is intended to store the most important spare parts and tools together. Spare parts for the hydraulic system, plus special tools, seals and wear parts needed for the maintenance of the dispensers are shown in the corresponding appendices. The tools named on this page are generally needed for maintaining the hydraulic system and the dispensers.

5

Article	Item number
Spare part box HOS (empty)	241291
Allen wrench PB 4 mm	209436
Allen wrench PB 2 mm	404019
Screw driver PB 135 (3)	404021
Flat wrench 10*13	404020
Star knob 40/M8	209435
LOCTITE 243	3994
Pin punc	209437
Extractor RSH	17744
Operating Instruction HOS	2043530

Appendix 6

System overview

6

		Part-name Part-number in illustrations	Pump 1	Manifold 2	Ball valve 3	Filter 4	Pressure gauge (System-pressure water) 6	Additional information
Item-#	Item-nomination							
2018105	Pump assy	HOS MRI	x	x	x	x	x	Pump unit (1,2) incl. Pressure gauge (6) preassembled with valves (3,4) and all necessary fittings to connect the parts.
2029874	Pump	HOS MRI	x	x			x	Pump unit (1,2) incl. Pressure gauge (6) as spare to replace worn pump in Pump assy (# 2018105).
2018200	Filter element	HOS MRI JIC						Filter mesh to replace worn mesh in Filter (4).

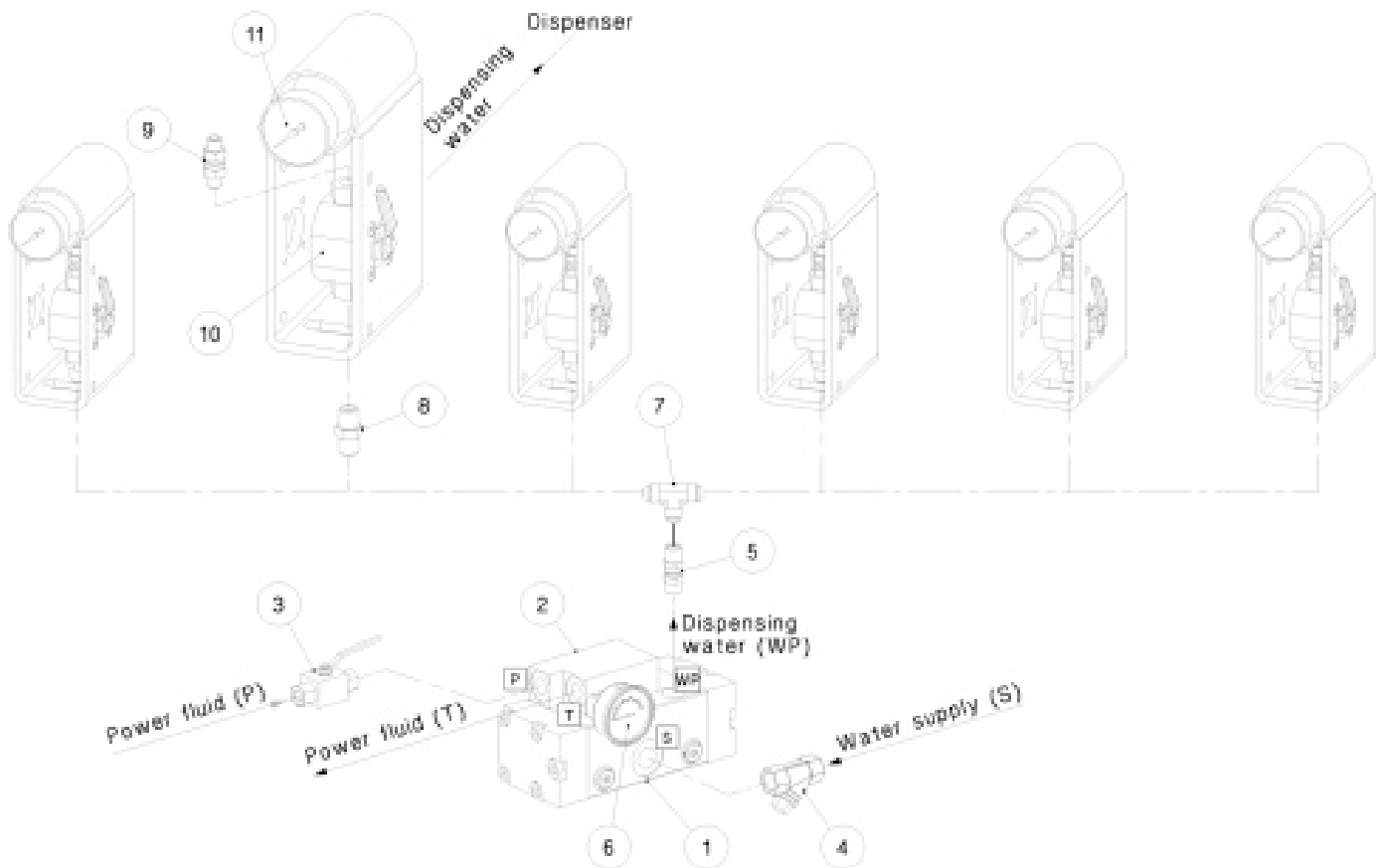
		Part-name Part-number in illustrations	Orifice 8	Non return valve 0,2 bar 9	Control valve / dispensing lever 10	Pressure gauge (Dispensing pressure control) 11	Additional information
Item-#	Item-nomination						
2018106	Dispenser assy		x	x	x	x	Ball cock assy (# 2018107) and pressure gauge (11) preassembled in a steel housing (see also picture next side).
2018107	Ball cock assy	HOS 1/4"	x	x	x		Control valve (10), Orifice (8) and Non return valve (9) preassembled with all necessary fittings as spare part to replace worn Ball cock assy in Dispenser assy (item - # 2018106).
2018108	Manometer	0-160				x	Spare part to replace Pressure gauge in Dispenser assy (# 2018106)

		Part-name Part-number in illustrations	Water distribution T-fitting 7	Additional information
Item-#	Item-nomination			
2018109	Hydraulic fitting	JIC	x	Includes T-fittings and elbow fittings to distribute the dispensing water from the pump to the Dispenser assies. For required hose sizes see chapter 3

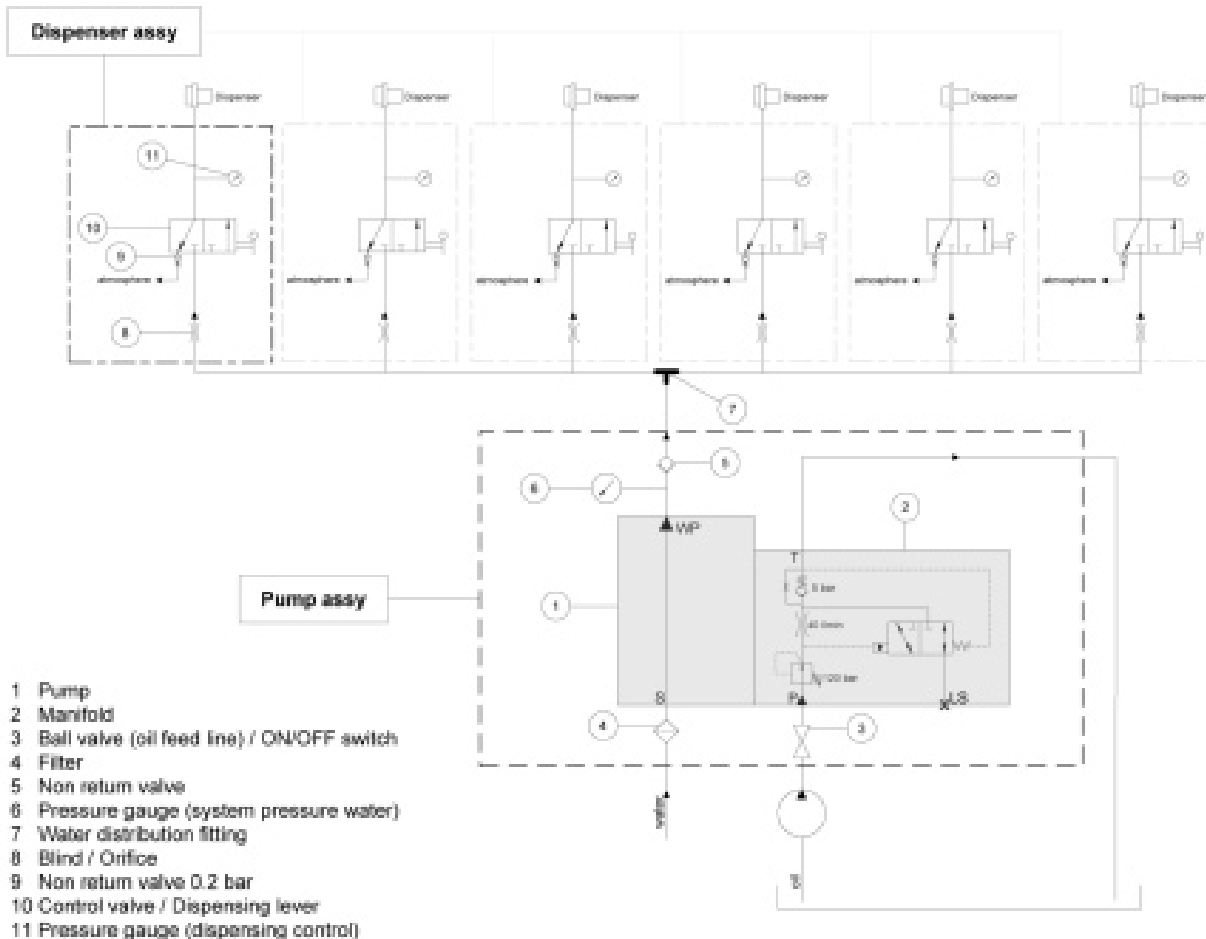
Appendix 7 Non-Load Sensing

System overview – exploded view (Non-Load Sensing)

7

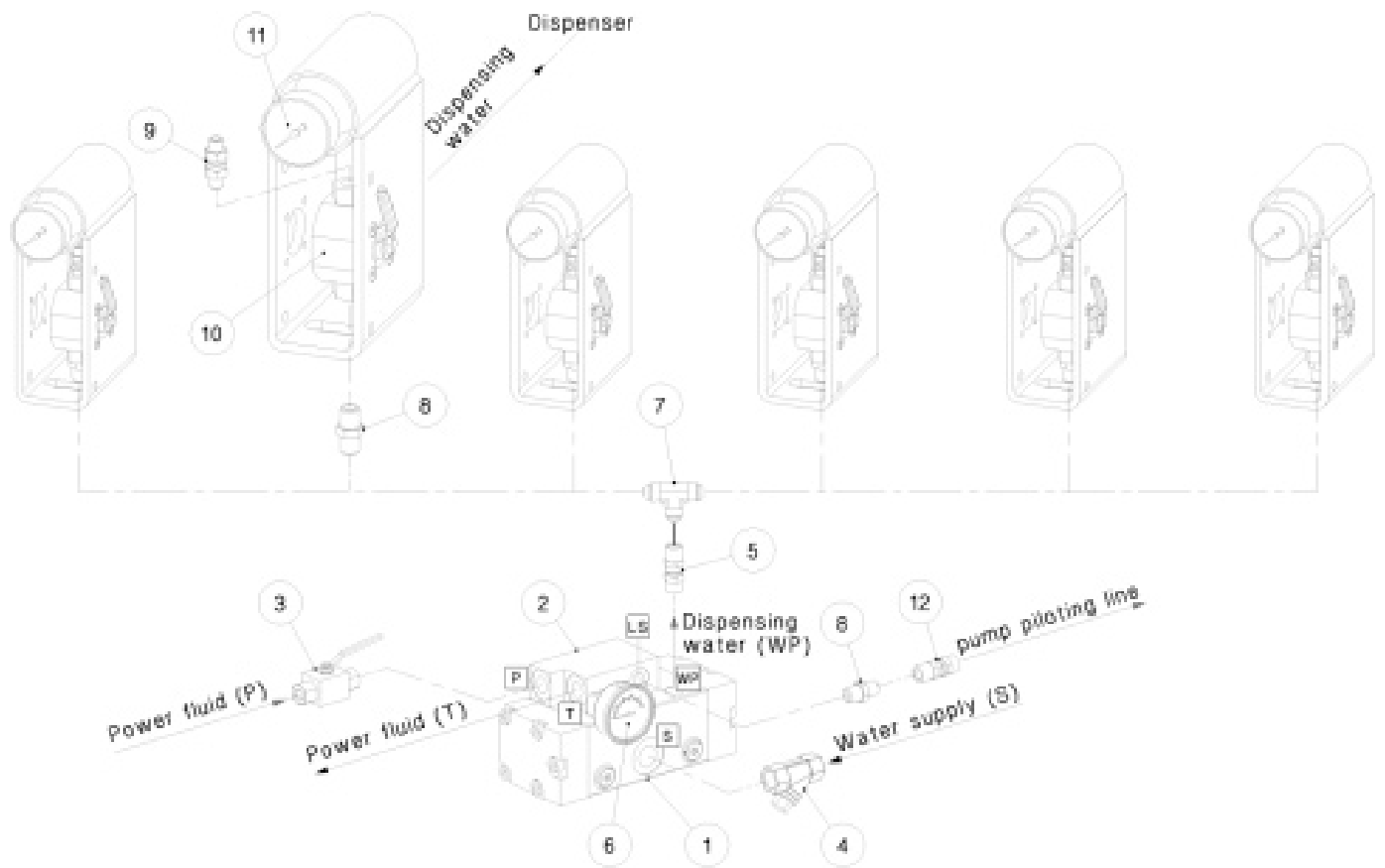


System overview – schematic view (Non-Load Sensing)



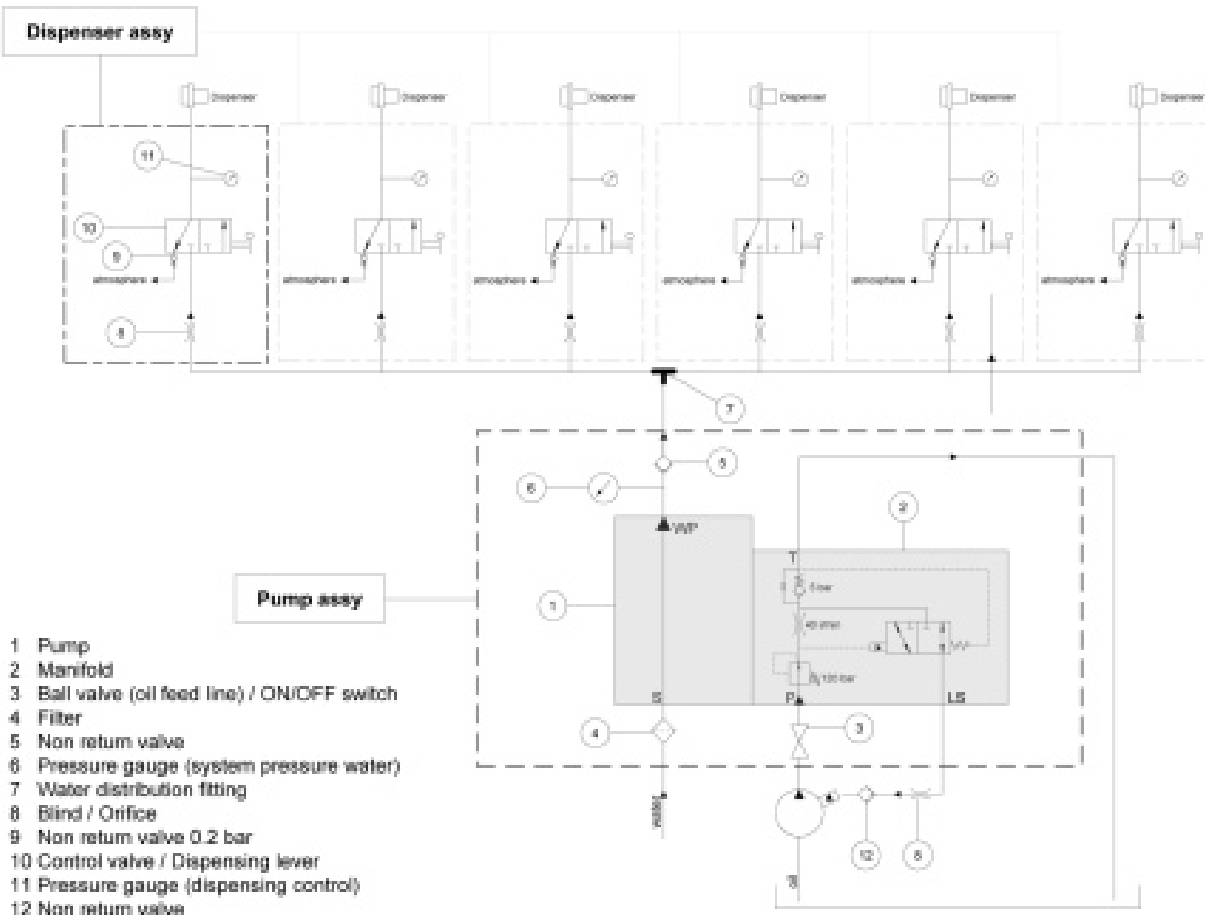
Appendix 7 Load Sensing

System overview – exploded view (Load Sensing)



7

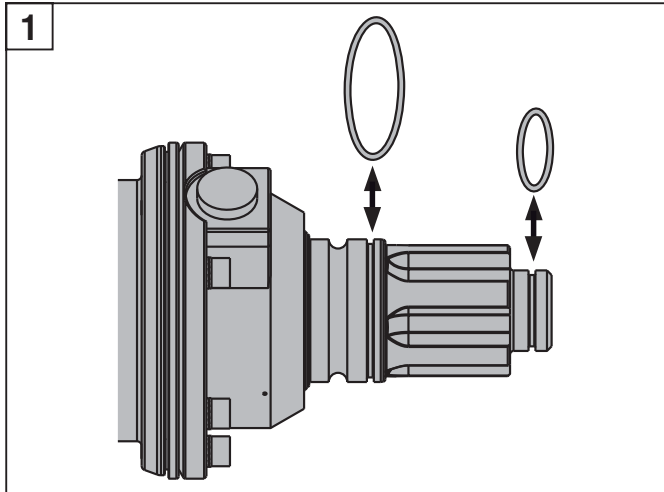
System overview – schematic view (Load Sensing)



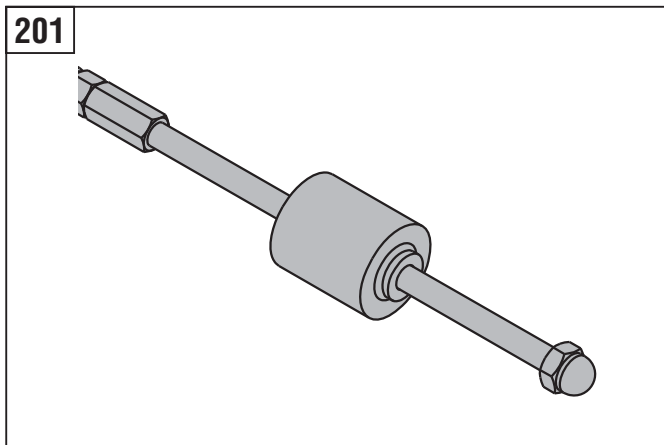
Maintenance of the shaft

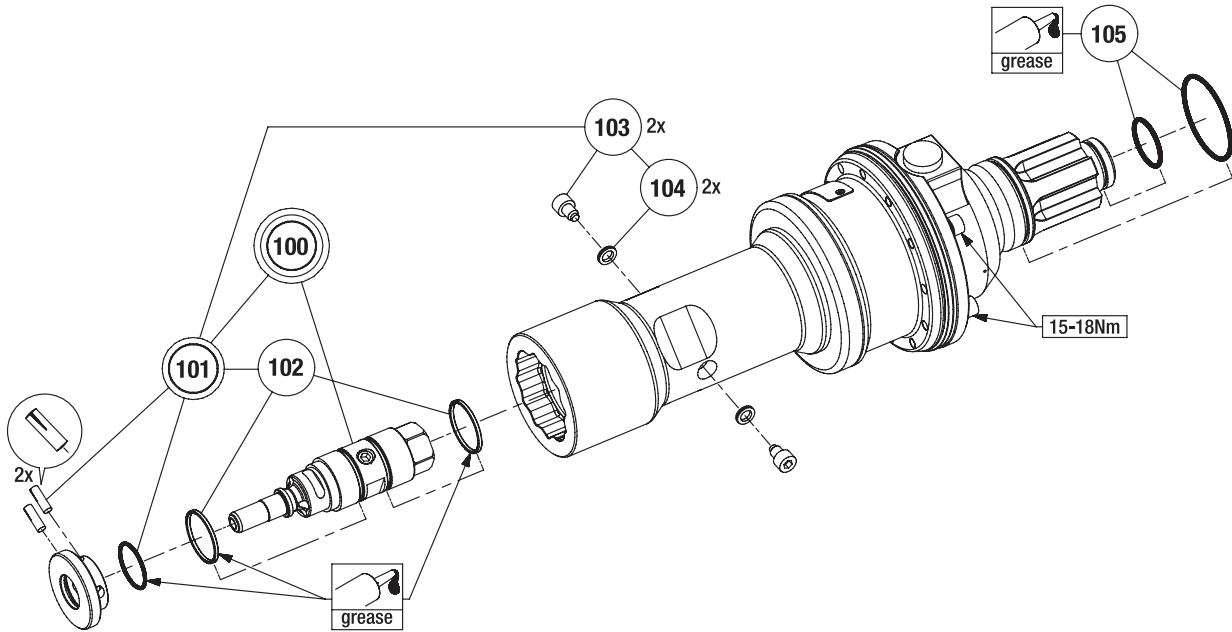
- Remove the dispenser from the drill motor
- Remove the worn O-rings / fit new O-rings (#105)
- Grease the connection end slightly before reassembly

8/1



#	Tools	Item number
201	Extractor assy	17719





Name	Length without shaft		Weight		Item number
	[mm]	[inch]	[kg]	[lb]	
Dispenser HOS I-N A5	286	11 ¹⁷ / ₆₄	14.7	32.5	362227
Dispenser HOS I-N A2	336	13 ⁷ / ₃₂	16.4	36.2	287569
Dispenser HOS I-N A3	386	15 ¹³ / ₆₄	18.0	39.7	287570

#	Spare parts	Item number
100	Inner component HOS I-N sht Assy	274440
101	Stop Kit	287592
102	O-Ring HOS-I-N	274442
103	Hex sht hd cap screw	287597
104	Retaining washer NL 8	238578
105	O-ring Hydro Kit	238577

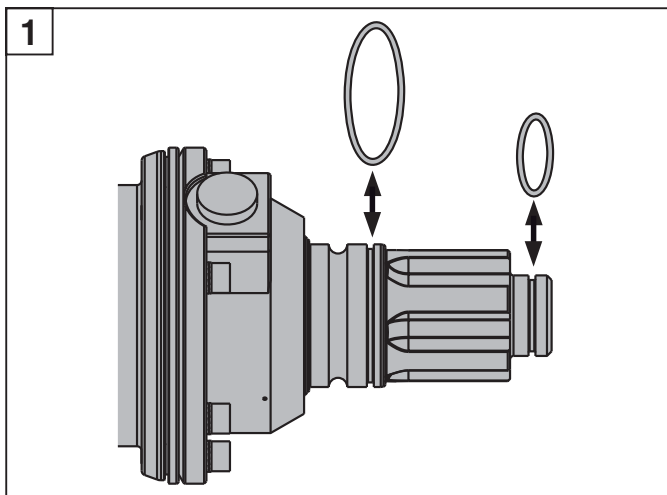
Name	Length without shaft		Weight		Item number
	[mm]	[inch]	[kg]	[lb]	
Dispenser HOS I-T A 391	286	11 ¹⁷ / ₆₄	14.7	32.5	428536
Dispenser HOS I-T A 441	336	13 ⁷ / ₃₂	16.4	36.2	428537
Dispenser HOS I-T A 491	386	15 ¹³ / ₆₄	18.0	39.7	428538

#	Spare parts	Item number
100	Inner component HOS I-TR sht Assy	435830
101	Stop Kit HOS I-T	435832
102	O-Ring HOS-I-N	274442
103	Hex sht hd cap screw	287597
104	Retaining washer NL 8	238578
105	O-ring Hydro Kit	238577

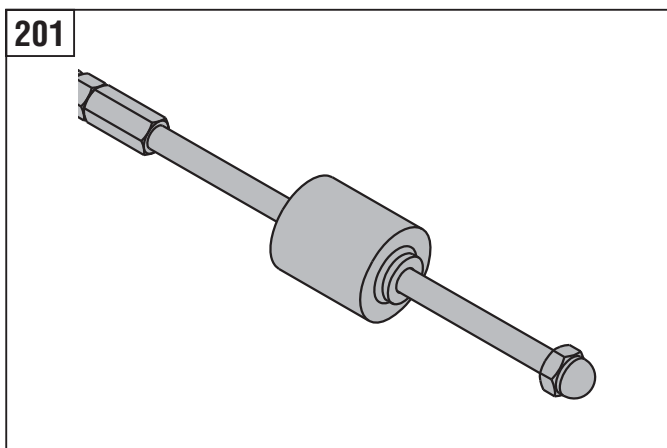
Maintenance of the shaft

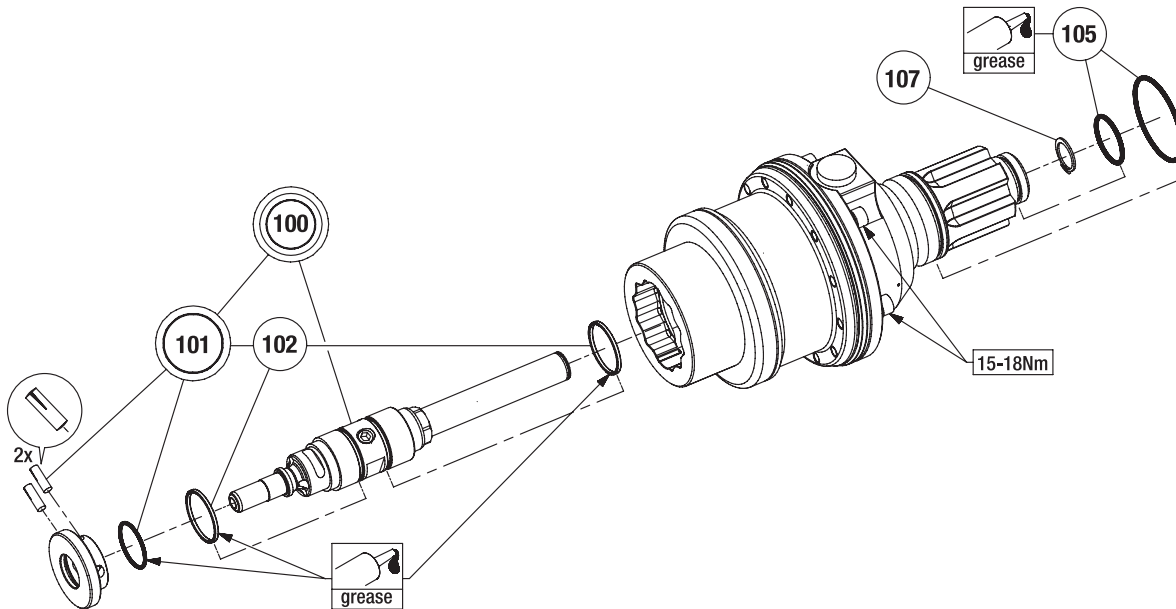
- Remove the dispenser from the drill motor
- Remove the worn O-rings / fit new O-rings (#105)
- Grease the connection end slightly before reassembly

8/2



#	Tools	Item number
201	Extractor assy	17719





Name	Length without shaft		Weight		Item number
	[mm]	[inch]	[kg]	[lb]	
Dispenser HOS I-N A1	176	6 ¹⁵ / ₁₆	11.1	24.4	287572

#	Spare parts	Item number
100	Inner component Hydro 160 assy	238521
101	Stop Hydro 160 kit	238582
102	O-ring HOS-I-N	274442
105	O-ring Hydro Kit	238577
107	circlip A20 stnls	238576

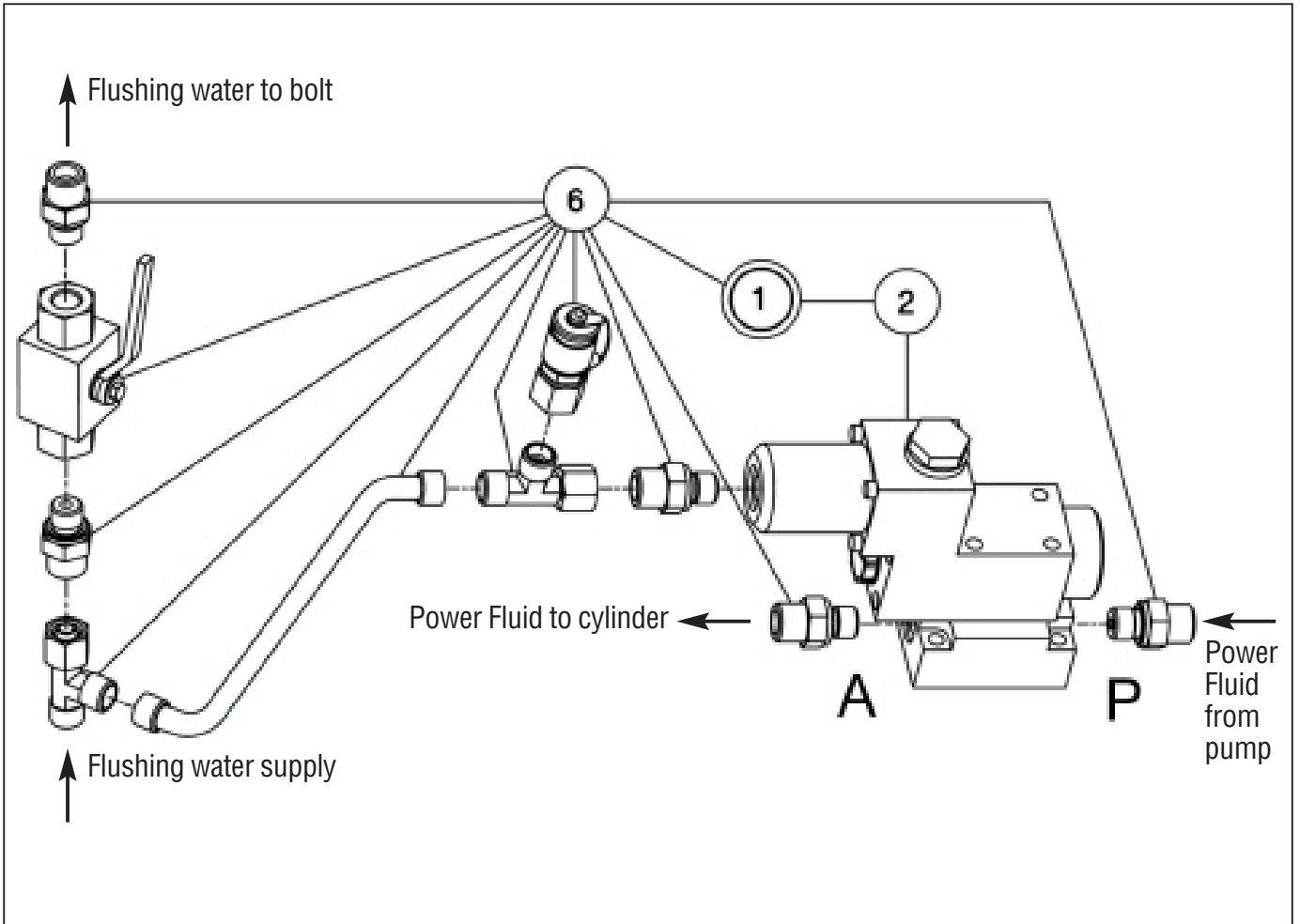
Name	Length without shaft		Weight		Item number
	[mm]	[inch]	[kg]	[lb]	
Dispenser HOS I-T A 281	176	6 ¹⁵ / ₁₆	11.1	24.4	428535

#	Spare parts	Item number
100	Inner component Hydro 160-TR assy	435836
101	Stop Kit Hydro 160-T kit	435838
102	O-ring HOS-I-N	274442
105	O-ring Hydro Kit	238577
107	circlip A20 stnls	238576

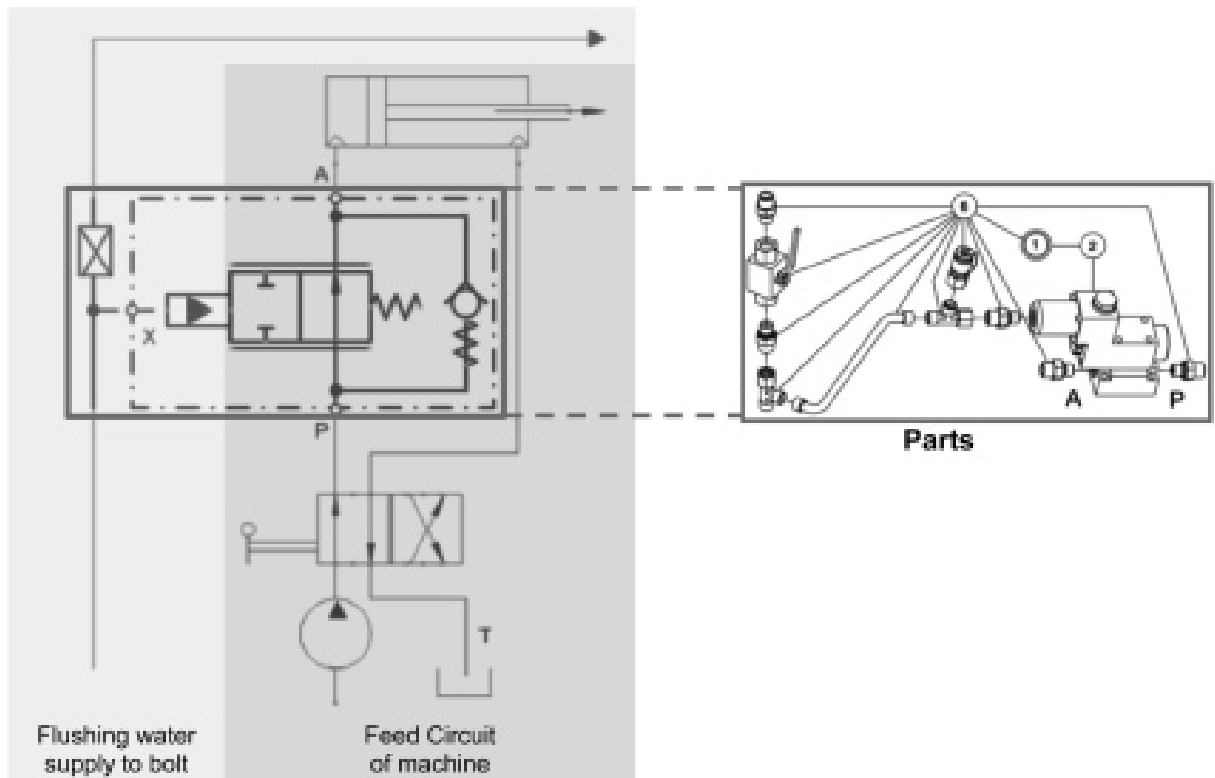
Appendix 9

Feed Control

Pos	Description	Item number
1.1	HOS FC Unit JC	423049
1.2	HOS FC Unit BSPP	423055
1.3	HOS FC Unit DN	423057
2	HOS FC Valve Assembly	423050
6.1	HOS FC Hose Assembly JIC	423054
6.2	HOS FC Hose Assembly BSPP	423056
6.3	HOS FC Hose Assembly DIN	423058



FeedControl System (Option) – Flow Diagram





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