Husqvarna

GB

Workshop manual

DXR 145

HUSQVARNA CONSTRUCTION PRODUCTS

Husqvarna part no.
114 28 07-26 Rev.A

Table of contents

1.1 Purpose of the manual

The Workshop Manual is intended to describe the most important workshop procedures that can come into question on the demolition robot DXR145. Some very simple and self-evident repairs have been omitted.

The manual should be carefully read and understood by service personnel before using and servicing the equipment, especially the instructions concerning safety. Keep the manual with the equipment at all times and review the operating and safety instructions periodically. Service personnel must have sufficient knowledge to competently perform the service tasks.

Outline

This workshop manual starts with the introductory sections Safety (important safety guidelines), Component Location (illustrating the basic design of the machine) and Functional description (illustrating the basic functionality of the machine).

The manual continues to describe in detail through the different chapters how work on the basic modules should be carried out in the sections for Function Test, Service & Maintenance, Fault Messages, Fault Tracing and Repair Procedures. There are also sections with instructions for Firmware Download and how to Adjust the Frequency.

The last chapters refer to the Electric and the Hydraulic Drawings, Technical Specifications and Tools recommendations.

Many of the service steps include maneuvering the hydraulic system when positioning the machine. This means that as a mechanic, you will have to carefully read the operator's manual and make yourself familiar with the remote controlled maneuvering system.

Layout

The pictures are mostly enough to guide the mechanic through the various procedures. The text on the right hand column has further references and explanations for the repair work as well as various warnings involved.

The general principle is that the mounting procedure is the dismantling procedure in reverse.

Contents

The manual is divided into numbered chapters with chapter headings in capital letters at the top of each page. The list of contents also has page references to the start of each chapter.

2.1 Spare Parts Catalogue

For information about spare parts please refer to the EPC (Electronic Parts Catalogue) and **Husqvarna Support Site**: https://portal.husqvarnacp.com/int/

2.2 Operators Manual

Please refer to the web site: https://portal.husqvarnacp.com/int/ for the latest Operators Manual.

2.3 Accessories

The DXR demolition robots can be equipped with accessory kits.

Please refer to the Operators Manual or the web site: https://portal.husqvarnacp.com/int/ for additional information.

2.4 Service Bulletins

Please see the **Husqvarna Support Site**:https://portal.husqvarnacp.com/int/, to ensure that you have the latest information.

3.1 Preparations and Safety

3.1.1 Preparation and Safety

Objective Use the manual to identify the correct service/repair procedure.

Personal safety Whenever you perform a task you must use the personal protective clothing and equipment that is appropriate for the task and which conforms to your local safety regulations and policies.

Among other items, this may include:

– Work clothing - such as coveralls and steel-capped footwear

– Eye protection - such as safety glasses and face masks

– Ear protection - such as earmuffs and earplugs

– Hand protection - such as rubber gloves and barrier cream

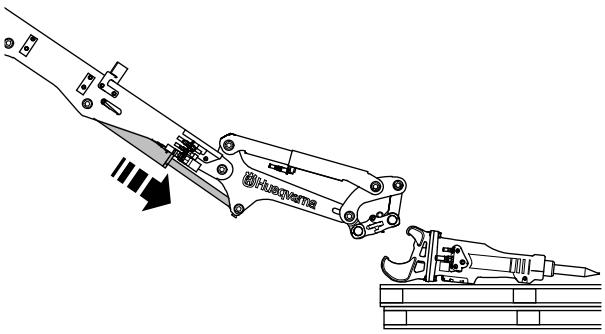
– Respiratory equipment - such as face masks and valved respirators

Safety check Make sure that you understand and observe all legislative and personal safety procedures when carrying out the tasks.

Chemical substances When performing service tasks involving the use of chemical substances (such as hydraulic fluids or retainer compounds), please refer to the instructions from the manufacturer.

3.1.2 Fitting on a Tool

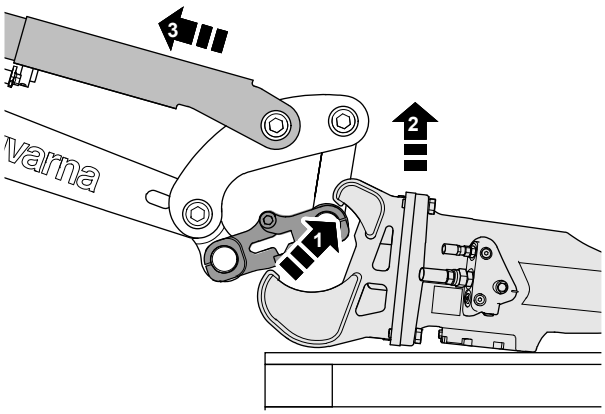
Remove



1. **Coupling Tool Hitch to an Adapter Plate**

   For some service work a tool should be fitted, especially when tipping the machine, refer to Section 3.3.3.1 “*Positioning and Securing the Machine*”, page 6 for DXR145, .

2. Fully extend the Stick-Cylinder and position the Tool Hitch.



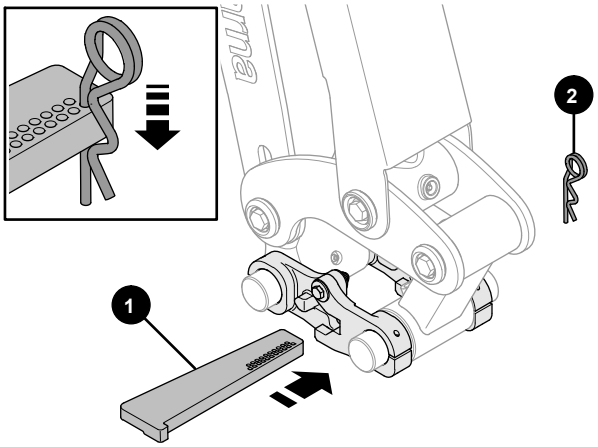
3. Remove the lock wedge (1): unlock the cotter pin and slide out the wedge.

4. Place the tool with the Adapter Plate aligned with the Tool Hitch.

5. **Coupling procedure** Carefully fit the Tool Hitch shaft in the upper grooves of the Adapter Plate, both sides must engage evenly (1).

6. Fully engage the Tool Hitch in the tool. Lift the tool upwards slightly (2). Extend (raise) the boom extension.

7. Fully retract the tool (3). As the tool is tilted upwards, the lower Tool Hitch shaft will automatically engage in the corresponding grooves of the adapter plate.



8. **Lock the Tool Hitch in a widened position**. Slide in the wedge (1). Lock it with the cotter pin (2).

3.2 Symbols

READ THE OPERATOR´S MANUAL

– Familiarise yourself with the machine. Read the operator's manual, especially the sections involving manoeuvring with the remote control system.

– The operator's manual contains much information concerning basic service and maintenance, which is important in order to keep the machine safe and reliable.

WARNING

– This symbol indicates that hazardous safety risks to persons must be avoided.

CAUTION

This symbol indicates when risk of machine damage should be avoided.

HIGH VOLTAGE

– Risk of electric shock. Service work on the machine should be performed with the power cable disconnected.

RISK OF FIRE

– The machine contains flammable liquids and components.

– Ensure that there is a fire-extinguisher on site at the workplace.

HEAVY WEIGHT

– Lifting or movement of heavy objects may be required. Take proper precautions to prevent accidents.

SECURE WORK PIECE

– Secure parts carried by the hydraulic system, especially when standing or reaching in under machine parts. A faulty machine may loose hydraulic pressure and sink or tip!

– Use jack stands, lifting straps from a traverse or a forklift of sufficient capability.

– **Once secured – never rotate turret; otherwise the weight balance is compromised!**

HIGH PRESSURE HAZARDOUS OIL

This machine has a complex hydraulic system. Most service points therefore involve a risk of exposure to hydraulic oil, often with high pressure.

– Protect eyes, hands and skin from hydraulic oil.

– Take proper precautions to carefully reduce pressure and collect spills.

AVIOD POLLUTING THE HYDRAULIC SYSTEM

– Dust particles must never reach inside the hydraulic system!
– Before service, clean the concerned area thoroughly.
– Pay extra attention before exposing the interior of any hydraulic pats.
  Wipe clean with a solvent and use compressed air to remove any dust or debries.
– Always plug openings to reduce spill and exposure to dust.

3.3 General warnings

3.3.1 High Pressure

This machine has a complex hydraulic system. Most service points therefore involve a risk of exposure to hydraulic oil, often with high pressure.

Pipe and hose couplings can remain pressurized despite the motor being switched off and the power cable disconnected. It must always be assumed that hydraulic hoses are pressurized and they must be opened with great care. Relieve the pressure on the arm system by resting it on the ground and turn off the electric motor before undoing the hoses.

– Undo the air filter so that the overpressure in the reservoir is discharged.
– Wait until pressure has decreased via internal leakage.
– When maintaining the track unit, discharge the pressure in the accumulator.

Never try to stop hydraulic oil leaking from a broken hose by hand. Finely dispersed hydraulic oil at high pressure can permeate under the skin and cause very severe injuries.

– Protect eyes, hands and skin from hydraulic oil.
– Take proper precautions to carefully reduce pressure and collect spills.

3.3.2 Cleaning

HIGH VOLTAGE!

Turn off the machine and disconnect the power supply cable.

Make sure it´s not possible to reconnect the cable by misstake during the prodecure.

WARNING!

Minimize the risk of slipping.

The area surrounding the machine must be clean.

WARNING!

Use suitable personal protective equipment

– Always use protective glasses to protect your eyes.
– Dirt and harmful substances can be released from the machine when using high pressure equipment.
– Never aim a high pressure jet towards the skin! High pressure jetting using water or air can permeate into the skin and cause serious injury.

Cleaning Method

The cleaning method varies depending on the type of contaminants and how soiled the machine is. A mild degreasing agent can be used. Avoid skin contact. Remember this when using high-pressure washing:

– High-pressure washing with the wrong nozzle or too high pressure can damage electrical components, electrical cables and hydraulic hoses.
– The high pressure jet can damage seals and lead to water and dirt permeating into the machine, resulting in serious damage.
– Stickers can be washed away.
– The surface finish can be damaged.

CAUTION!

High-pressure washing and compressed air should be used with extreme caution. Incorrect use can damage the machine.

Several components require special consideration when cleaning:

Component	Precaution
Hydraulic Oil Tank	Place a plastic bag over the air filter and seal it with an elastic to avoid water entering the tank.
Cooler	Let the cooler cool down before cleaning. Use compressed air to clean the air fins. If necessary, use high-pressure washing and a degreasing agent.
	Incorrect use of high-pressure washing or compressed air can distort the cooler's fins and thereby impair the cooling capacity.
	– Max. pressure: 100 Bar. – Spray directly towards the cooler, in parallel with the fins. – Keep a distance of about 40 cm between the cooler and the nozzle.
Electric Components	Clean the Electric Motor, electric cabinet, terminals and other electrical components with a cloth or with compressed air.
	Blow clean internally using compressed air.
	Wipe the remote control with a damp cloth.
	Never spray water on electric components.
	Never use high-pressure washing.

After washing

– Lubricate all the lubrication points on the machine.
– Use compressed air to dry electrical terminals.
– Be careful when the machine is started after washing. If any components have been damaged due to moisture, the machine's movements can be defective.

3.3.3 Positioning of the machine

3.3.3.1 Positioning and Securing the Machine

To position the machine in a safe way before start of maintenance and troubleshooting is important to prevent accidents.

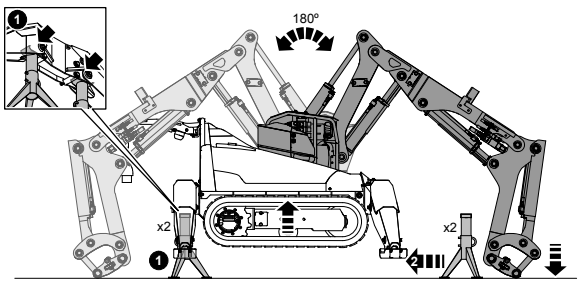
Always take precautions to reduce the risk of heavy pieces collapsing or tipping due to lack of hydraulic pressure.

Make sure that the machine is positioned in such a way that the machine cannot tip and that the Boom-Stick is mechanically locked or forming a stable self-carrying structure.

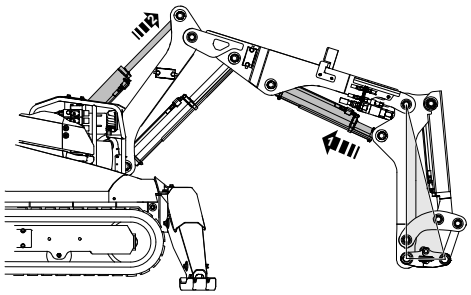
Use jack stands for securing the machine and to stop hydraulic parts to sink due to reduced pressure.

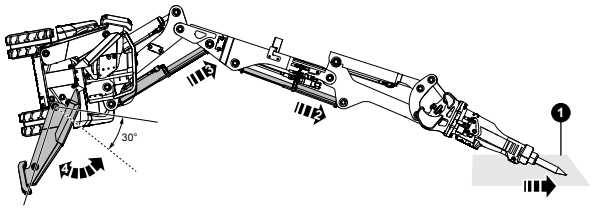
Take precautions when maneuvre the machine on the side for work and access of the frame interior.

Remove



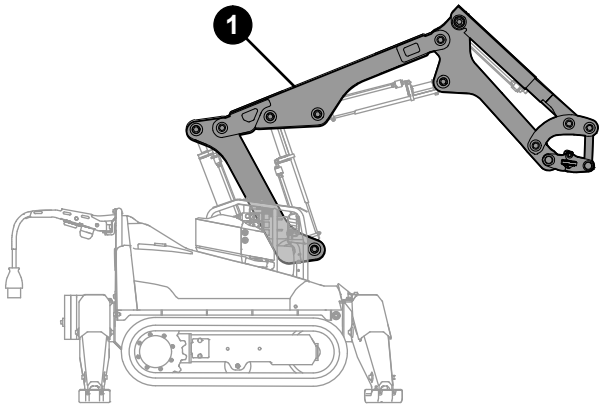
1. **Positioning and securing the machine on stands:**
2. Lower all the Outriggers and raise the machine as much as possible with the Outriggers.
3. Use the Boom-Stick to fully press up the front or rear end and insert jack stands under each fixing point for the Outrigger (1).
4. Turn the Boom-Stick 180° and press up the other end of the machine and insert jack stands under each Outrigger fixing point (2).
5. Lower the machine until the weight is supported by the jack stands and the Boom-Stick is resting on the ground.
6. Turn off the machine and disconnect the power supply cable.





7. **Positioning and securing the Boom and Boom-Stick:**
8. Operate the Boom-Stick so that the Stick-Cylinder is fully retracted (1).
9. Positioning the arm so that the Boom-Cylinder is fully extended (2).
10. The complete Boom should be resting on the ground at the Tool Hitch and form a stable triangle with the stick joint.
11. Use straps to increase the stability of the arm.
12. Turn off the machine and disconnect the power supply cable.
13. **Positioning the machine on the side:**
14. Lower the Outriggers approximately 30° in the tipping direction.
15. Fit a tool on the Tool Hitch to get some extra weight at the Boom-Stick and make the tipping more secure.
16. Rotate the boom 90° and retract the boom and the extension with the tool slightly above the ground.
17. Place a board on the ground underneath the tool to be able to slide the tool against the ground (1).
18. Slowly extend the arm with the tool just above ground (2).
19. Stop extending the arm when the machine reaches the tipping point and the tool rests on the board.
20. Slowly extend the arm with the board sliding on the ground until the cylinder is fully extended (3).
21. Slowly press down the 30° angled Outriggers until fully lowered (4).
22. Turn off the machine and disconnect the power supply cable.
23. To raise the machine again, extend the boom cylinder approximately 30 cm, lift the outriggers (4) and slowly fully retract the boom.

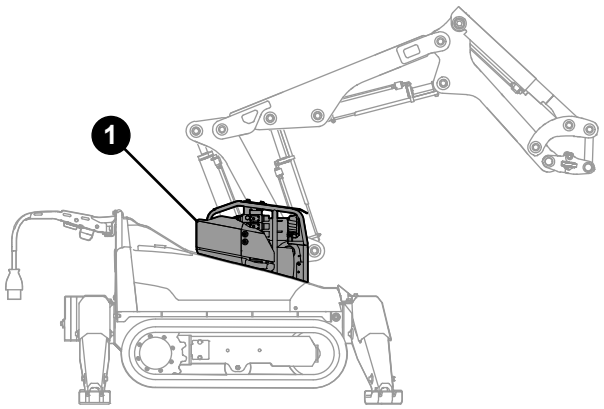
4.1 Boom-stick



1. Boom-Stick

4.2 Turret

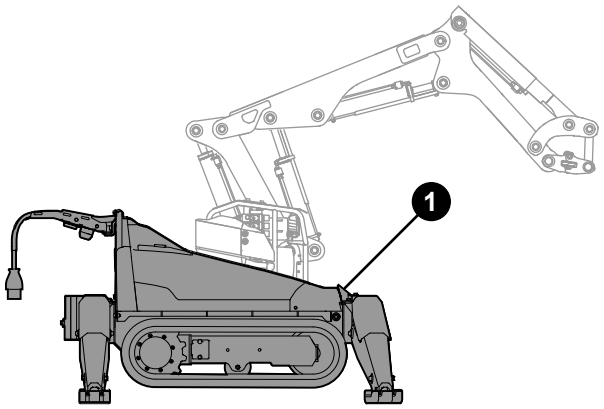
The turret is mounted on the undercarriage as a pivoting platform for the boom-stick. It consists of hydraulic and electronic components related to the boom-stick.



1. Turret

4.3 Carriage

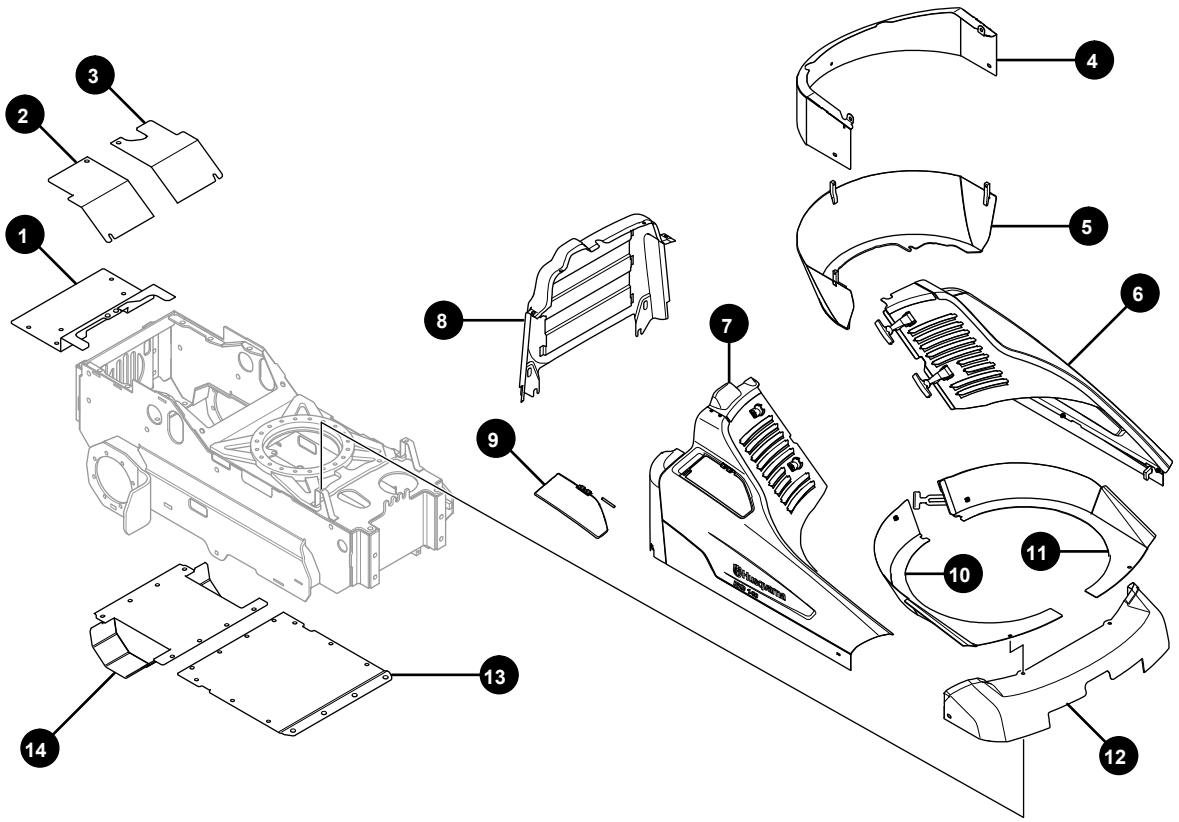
The carriage comprises the chassis frame with traction system and outriggers for stability. The carriage chassis and covered body are housing most of the system components such as the Electrical Motor (M1), Hydraulic Pump, Hydraulic Oil Tank etc.



1. Carriage

4.4 Covers

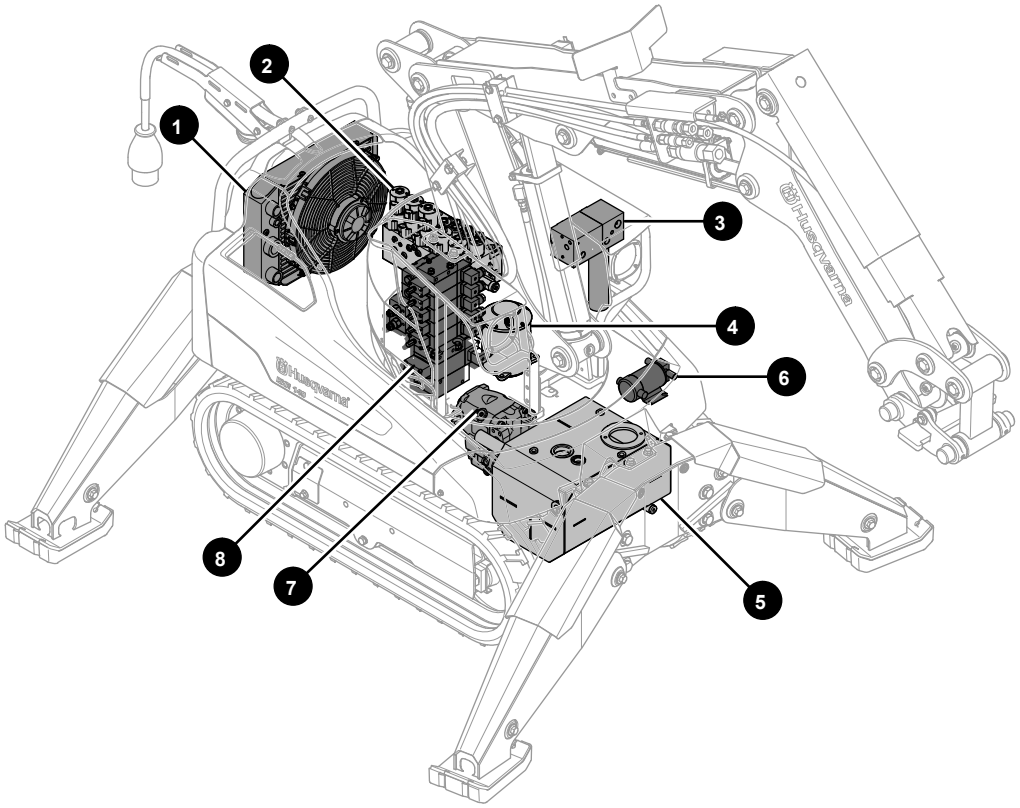
The interior of the carriage and turret are protected by covers and plates.



1. Outer Motor Cover
2. Inner Dual Motor Cover Right
3. Inner Dual Motor Cover Left
4. Upper Turret Cover
5. Lower Turret Cover
6. Side Cover Left
7. Side Cover Right
8. Rear Cover
9. Control Panel Lid
10. Rear Inner Cover Right
11. Rear Inner Cover Left
12. Front Cover
13. Bottom Center Plate
14. Bottom Plate Rear

4.5 Hydraulic Systems

4.5.1 Hydraulic System



1. Cooling System
2. Valve Block Chassis
3. Grease Pump
4. Swivel (XS)
5. Hydraulic Oil Tank
6. Filling Pump (M3)
7. Hydraulic Pump
8. Valve Block Arm System

4.5.2 Cooling System

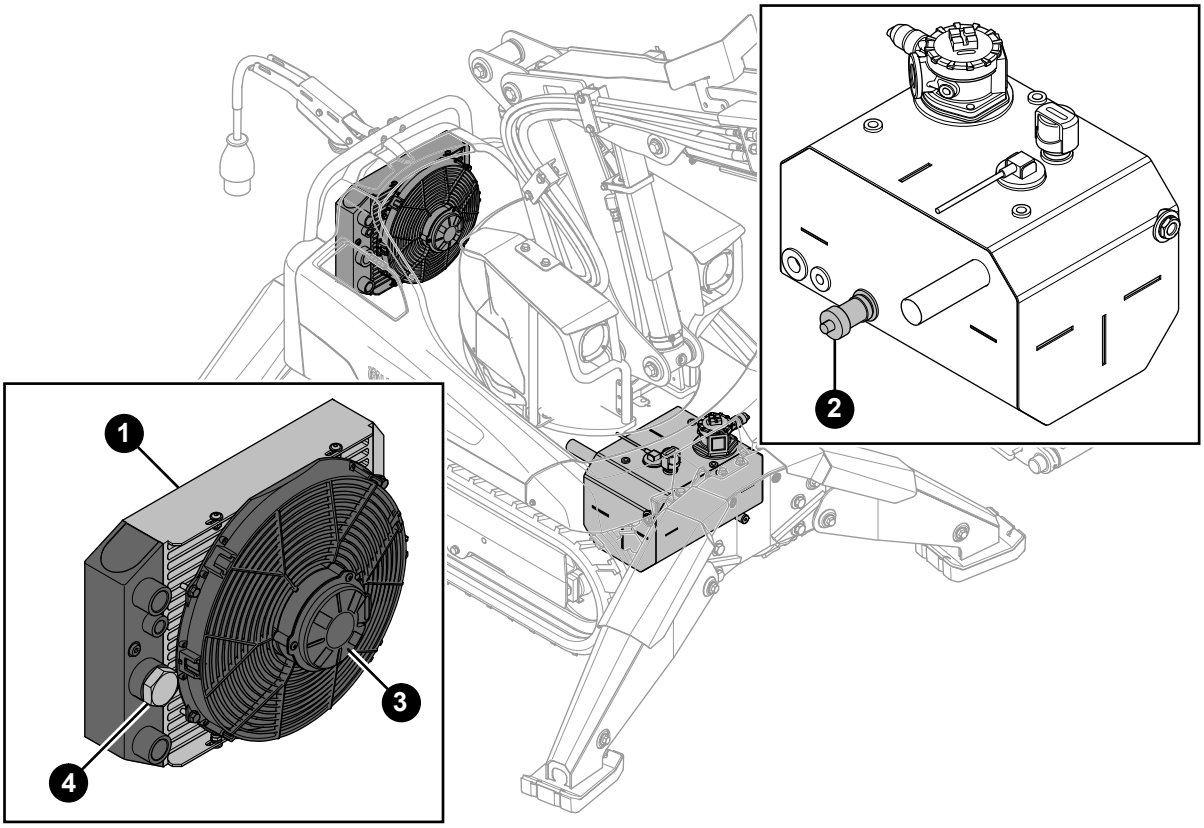


Figure 4.5.2-1. Cooling System

1. Cooler
2. Temperature Sensor Hydraulic Oil (T4)
3. Cooling Fan
4. Cooler Thermostat

4.6 Electrical System

4.6.1 Electrical Cabinet

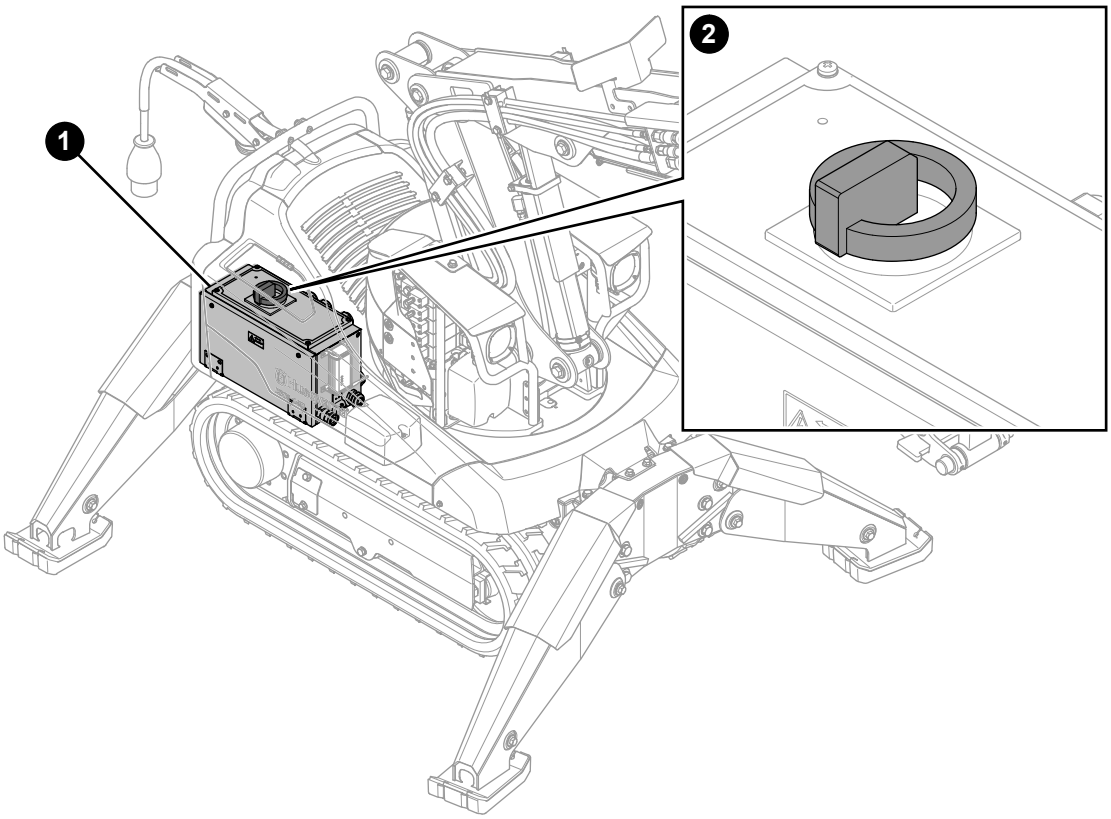


Figure 4.6.1-1. Electrical Cabinet

1. Electrical Cabinet
2. On/Off Switch Main Power (Q1)

4.6.2 Radio & Control Modules

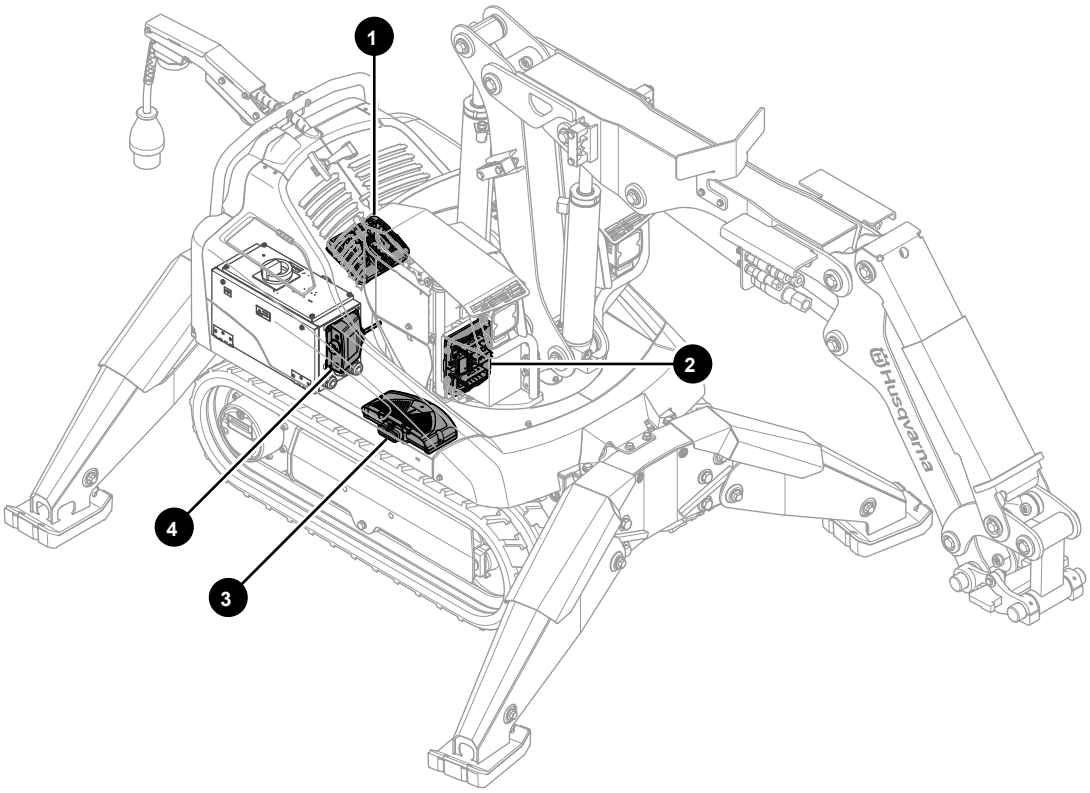


Figure 4.6.2-1. Radio & Controller Modules

1. Slave Control Module Body body (KE2)
2. Slave Control Module Body tower (KE3)
3. Master Control Module (KE1)
4. Radio Control Module (KE5)

4.6.3 Swivel

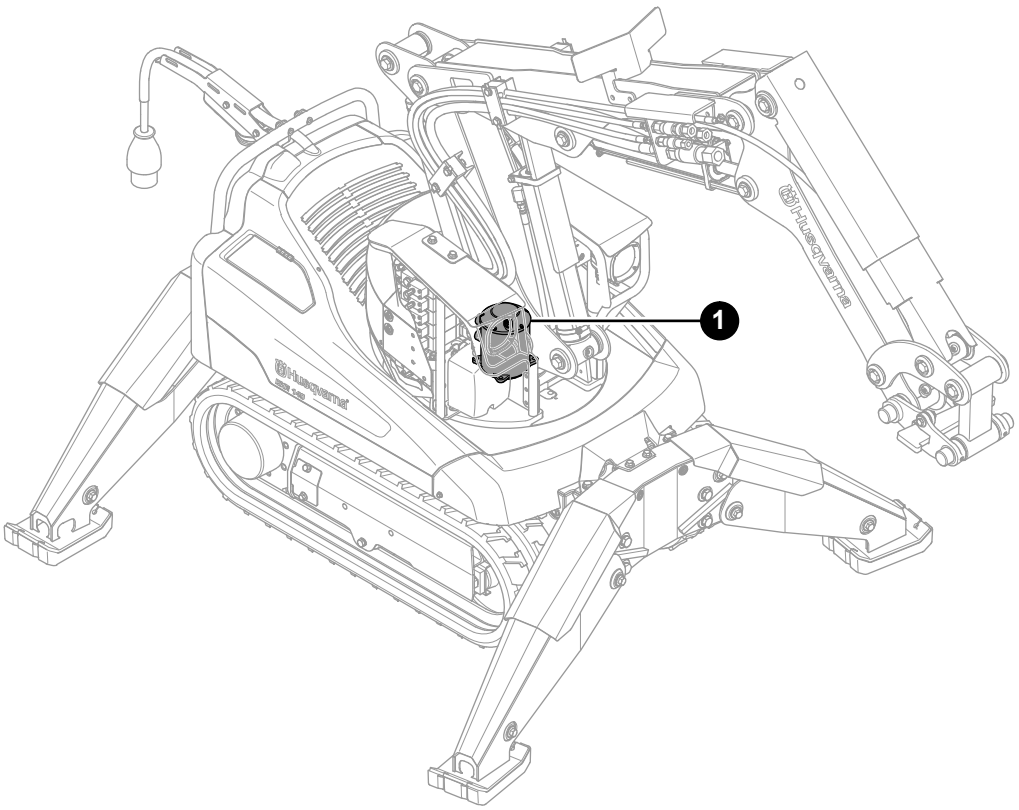


Figure 4.6.3-1. Swivel

1. Swivel (XS)

4.7 Slewing System

4.7.1 Slewing System

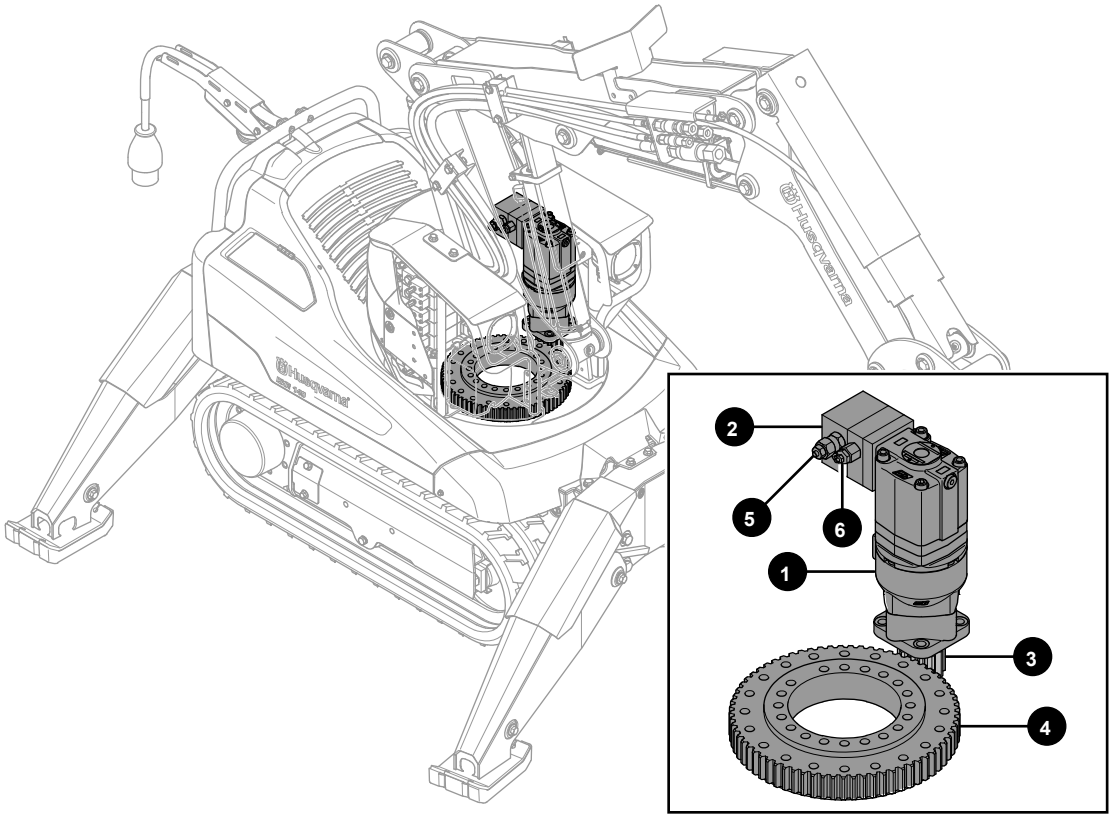


Figure 4.7.1-1. Slewing System

1. Slew Motor
2. Valve Block
3. Slew Motor Sprocket
4. Slewing Ring
5. Counterbalance Valve
6. Pressure Relief Valve

4.8 Outriggers

4.8.1 Outriggers

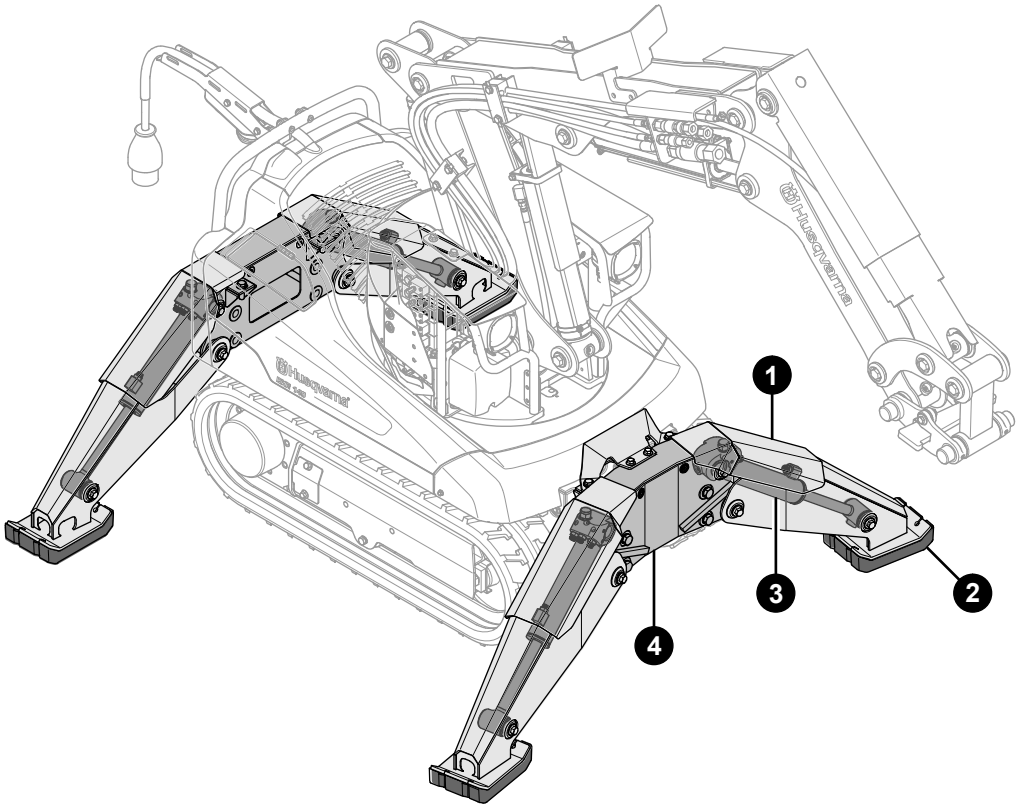


Figure 4.8.1-1. Outriggers

1. Outrigger
2. Outrigger Foot with Rubber/Steel Pad
3. Outrigger Cylinder
4. Outrigger Bracket

4.9 Traction System

4.9.1 Traction System

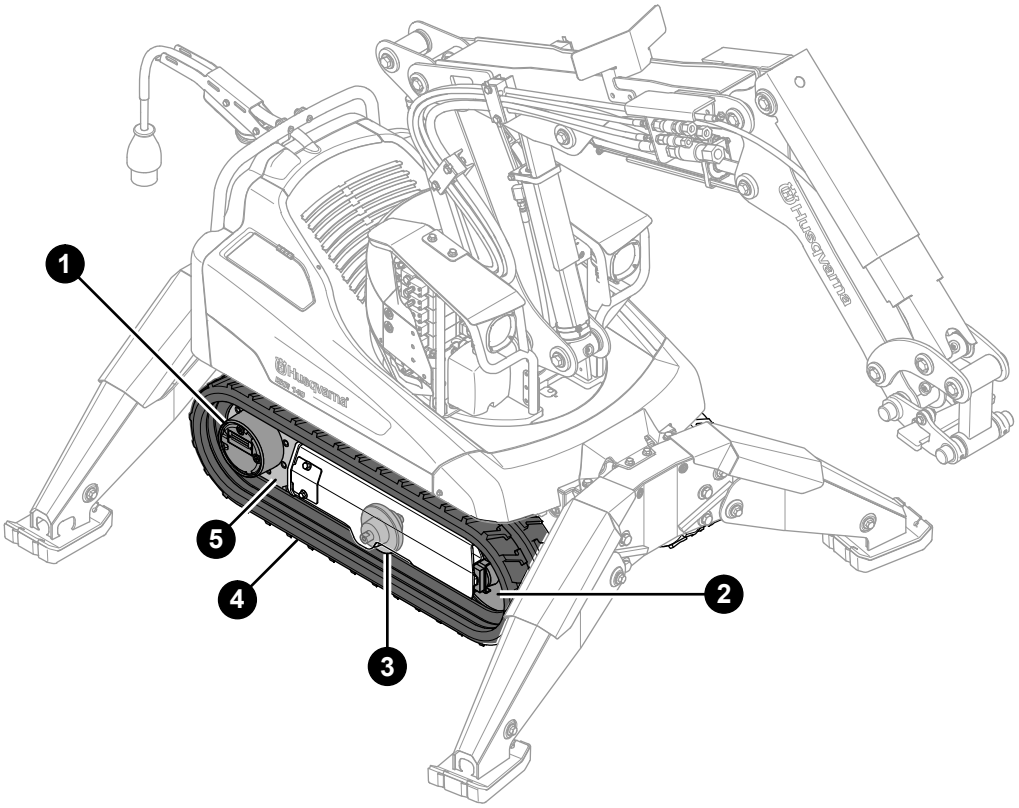


Figure 4.9.1-1. Traction System

1. Hydraulic Drive Motor
2. Tensioning Wheel
3. Support Wheel
4. Rubber/Steel Track
5. Drive Gearwheel

5.1 Boom

5.1.1 Boom

The boom system is divided into three parts in order to provide extensive movement, long reach and compactness. The expanding shafts minimize the risk of play in the joints.

Always work as close to the work object as possible to make optimum use of the power to the arm system and cylinders. Run cylinder 1 and cylinder 2 in parallel to modify the machine's reach without moving the machine.

The two-piece foldable/expendable **boom** with **stick** is referred to as the Boom-Stick and is fixed to the turret. The "mechanical arm" consists of the **boom**, **boom extension**, **stick**, **joints**, **cylinders** and **tool hitch** with optional **tool**.

The Boom-Stick is mounted with expandable axles to eliminate wear. When the fasteners are tightened, the slitted sleeves are pushed down over the tapered ends of the axle, expanding parallel to lock the expander system in the pivot.

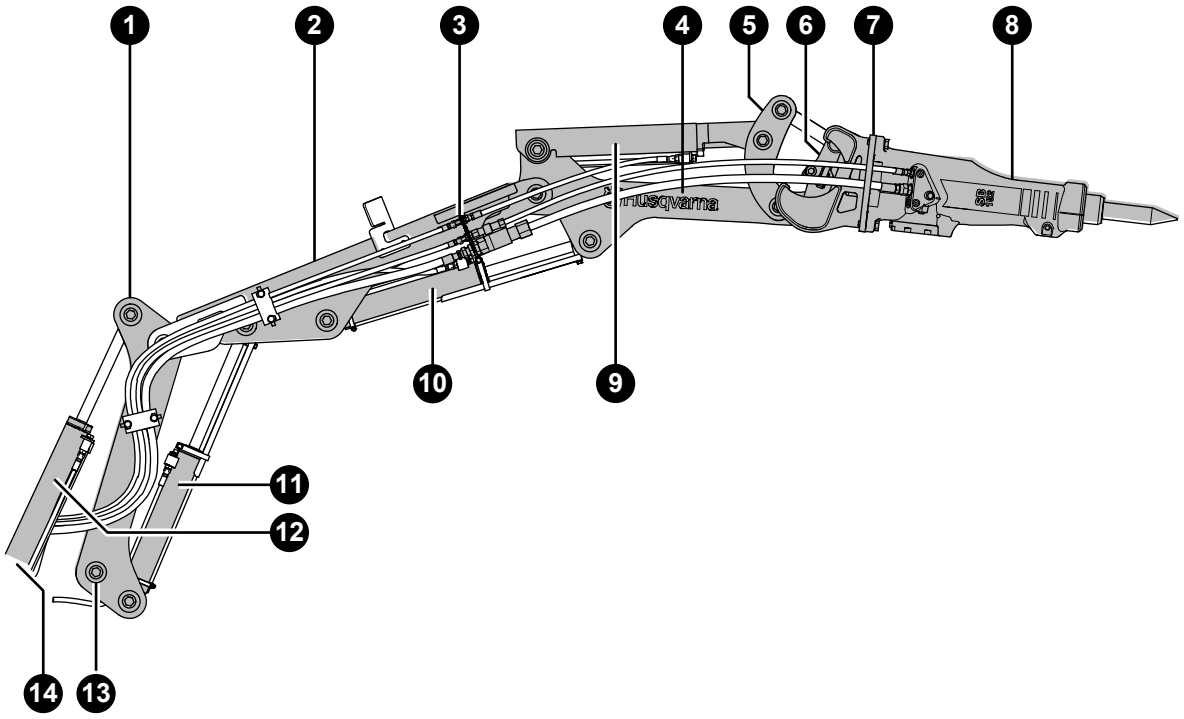


Figure 5.1.1-1. Boom-stick

1. Boom
2. Boom Extension
3. Bulkhead, Hydraulic Couplings and Bracket
4. Stick
5. Tool Lever
6. Tool Hitch
7. Adapter Plate
8. Tool
9. Tool-Cylinder covered with the Shield (cyl. 4)
10. Stick-Cylinder (cyl. 3)
11. Boom Extension-Cylinder (cyl. 2)
12. Boom-Cylinder
13. Boom Joint, with expander system, integrated in the Base Plate
14. Boom-Cylinder attachment to the Turret Base Plate (cyl. 1)

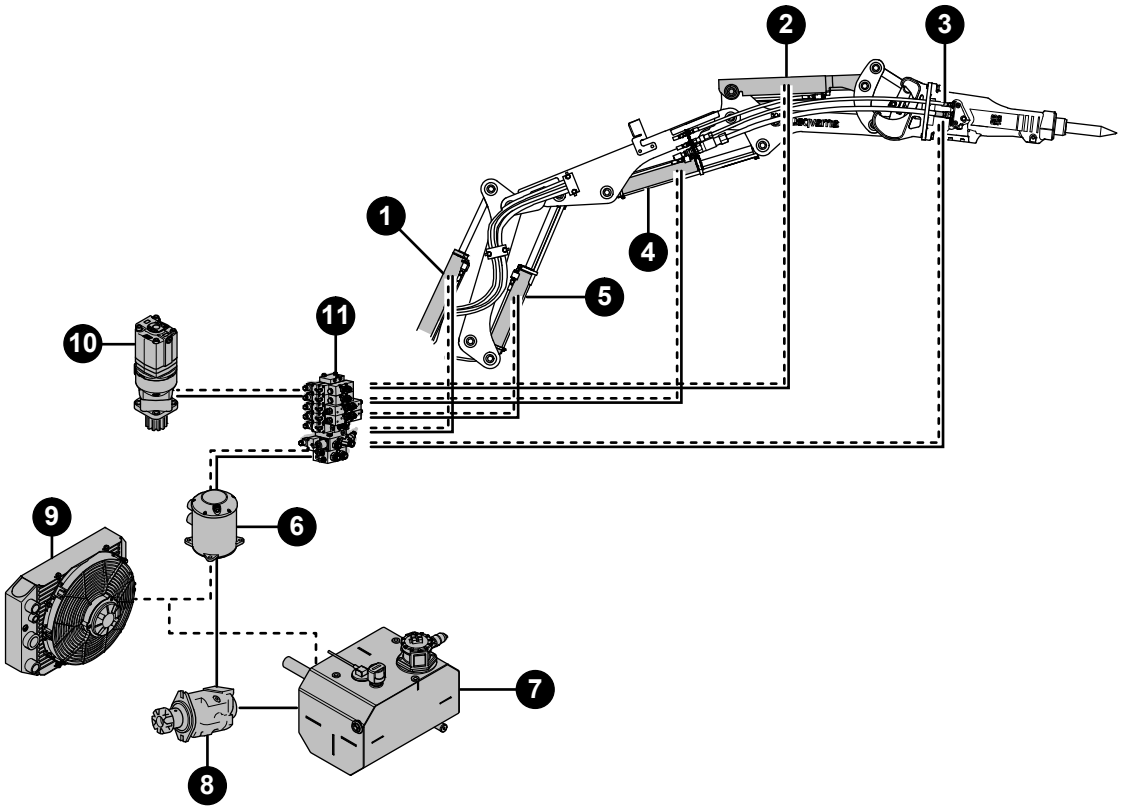


Figure 5.1.1-2. Boom-stick Hydraulics

1. The Boom-Cylinder is connected to cylinder 1 on Valve Block Arm System
2. The Tool-Cylinder is connected to cylinder 4 on Valve Block Arm System
3. Tool Hydraulics
4. The Stick-Cylinder is connected to cylinder 3 on Valve Block Arm System
5. The Boom Extension-Cylinder is connected to cylinder 2 on Valve Block Arm System
6. Hydraulic Line Swivel through Pivoting Center
7. Hydraulic Oil Tank and Hydraulic Oil Filter
8. Hydraulic Pump (powered by the main Electric Motor
9. Hydraulic Oil Cooler (return flow)
10. Slew Motor (fixed to the Turret with a sprocket in the Slewing Gear Ring (fixed to the carriage frame))
11. Valve Block Arm System

(Filled line: pressure, dotted line: return flow.)

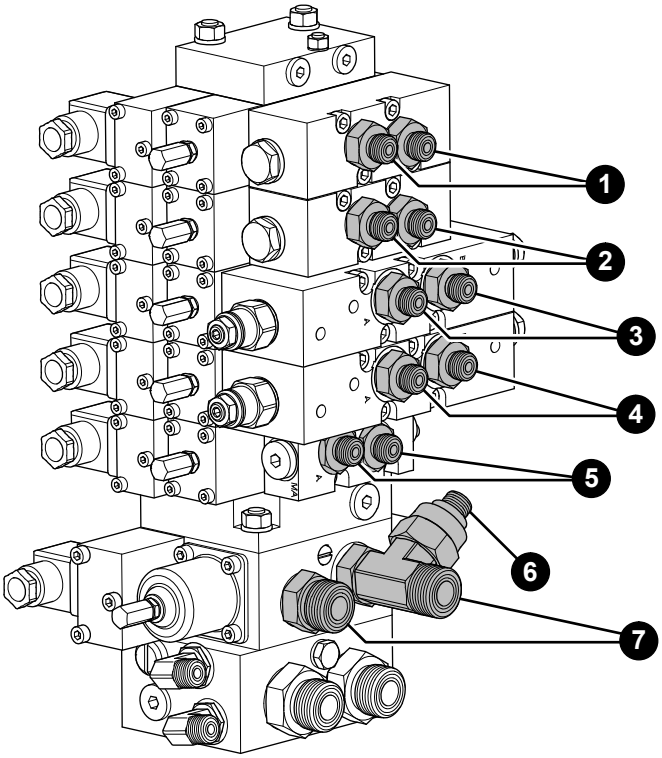


Figure 5.1.1-3. Valve Block Arm System (Boom-stick hydraulic system)

1. Tool (cyl. 4) A+/B-
2. Stick (cyl. 3) A+/B-
3. Extension (cyl. 2) A+/B-
4. Boom (cyl. 1) A+/B-
5. Rotation A+/B-
6. Grease Pump +
7. Tool A+/B-

Refer to Section 5.2.3.1 “*Valve Block Arm System*”, page 23 for more information.

Boom pressure The maximum boom pressure 200 bar can be decreased to 150 bar in 5 bar intervals.

5.2 Hydraulic System

5.2.1 Hydraulic System

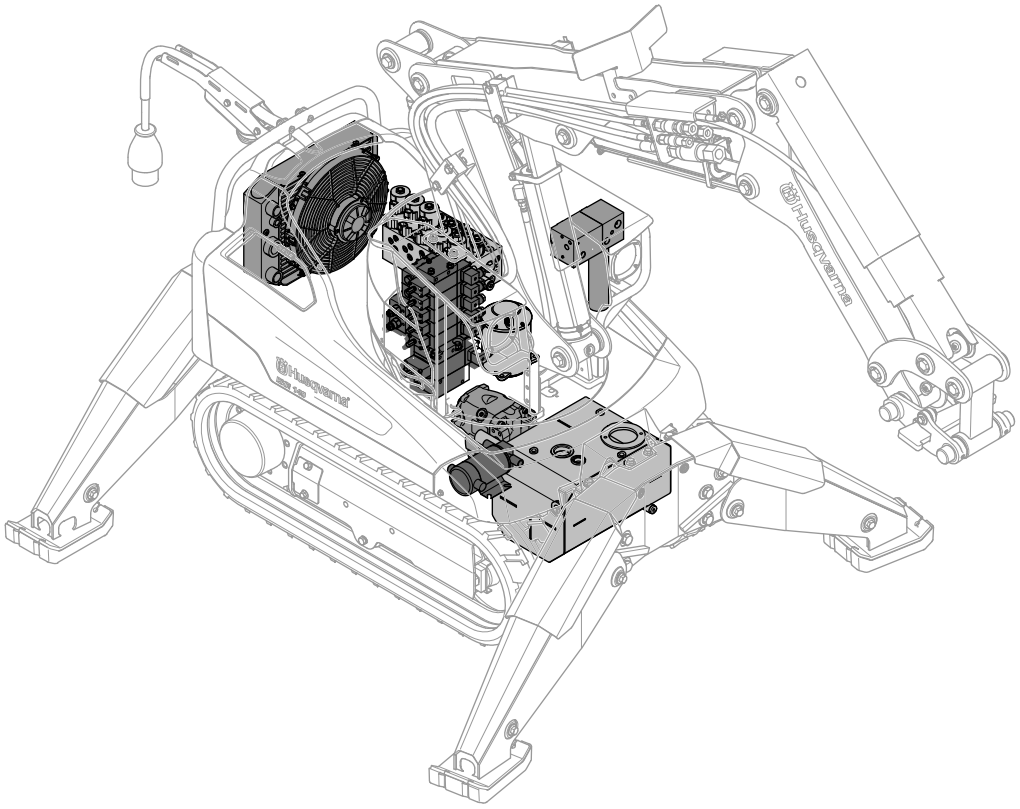


Figure 5.2.1-1. Hydraulic System

The hydraulic system operates the machine's functions by means of hydraulic pressure and flow. The system consists of the Hydraulic Pump, Hydraulic Oil Tank, Cooler, Hydraulic Drive Motor, hydraulic cylinders, filters and valves of various kinds. Hoses or pipes connect the components with each other.

The hydraulic oil flow/pressure is induced by the Hydraulic Pump and is distributed to the Valve Block Chassis, which in conjunction with the Valve Block Arm System, control various actuators.

The pressure control valve control the hydraulic system's pressure. Pressure control valves limit or reduce the pressure to the value required. Volume control valves affect the hydraulic oil's flow and thereby the speed of the functions. Direction control valves direct the hydraulic oil to the machine's different functions.

Table 1. Main Pressure (bar)

	DXR145
Standard pressure	200
Increased main pressure*	250
Track tensioning and outriggers up	130
Hydraulic hammer	160 (18,5 kW)

* Increased main pressure is used only for the outriggers down and when operating some tools.

If several functions are used at the same time the pressure will be set to the lowest value.

5.2.2 Load Sensing System

The hydraulic flow and pressure is controlled by the load sensing pump. The pump responds to the flow and pressure requirements of the system detected by the two compensators whenever the control valve is altered. The **hydraulic pump** will automatically build up flow to compensate for the load difference. It remains in high pressure standby until the load is overcome or the valve spool is returned to neutral. It will produce only enough flow to make up for internal leakage.

A pressure drop can be felt by the operator in the effort required to move the valve spool control lever but the compensator will always adjust the pump flow so that there is exactly a 20 Bar pressure drop across the spool allowing the operator better control.

The pump provides only the oil required at 20 Bar above the system working pressure creating a very efficient hydraulic system.

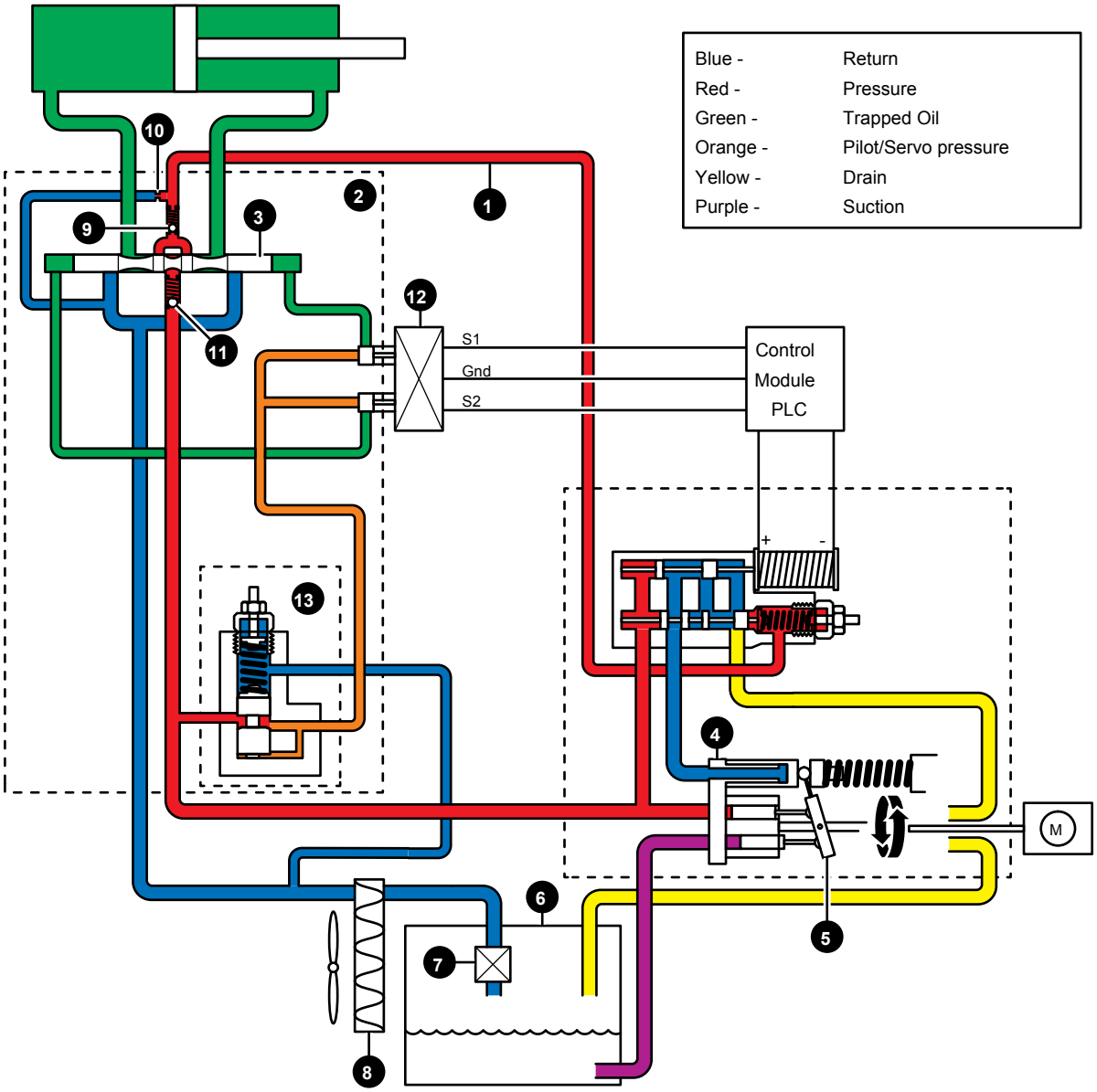


Figure 5.2.2-1. Load Sensing (LS) Hydraulic Circuit

1. LS signal Line
2. Control Valve
3. Spool, A: Extend, B: Retract
4. Hydraulic Pump
5. Swashplate
6. Hydraulic Oil Tank
7. Hydraulic Oil Filter
8. Cooler
9. Non-return Valve
10. Restrictor
11. Non-return Valve
12. Pressure control Solenoid
13. Pressure reducing Valve

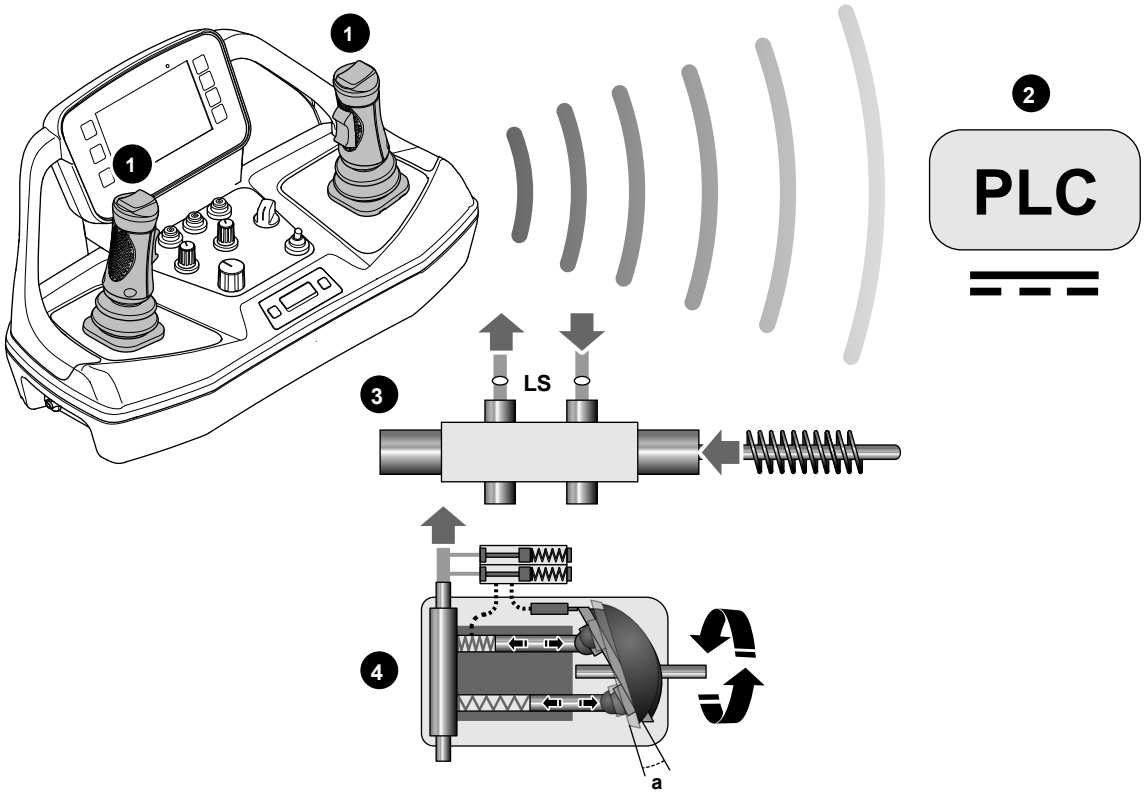


Figure 5.2.2-2. LS Flow-chart

1. The Joystick signal is transmitted via the Radio Controller Module to the PLC
2. The solenoid is activated and the current will correspond to the Joystick angle
3. The load balance is altered by the spool movement
4. The Pressure Flow Compensator (LS) detects any imbalance and the swashplate angle (a) in the Hydraulic Pump will adapt the pump piston stroke to achieve the ideal hydraulic flow

5.2.3 Valve Block Arm System/Rear

5.2.3.1 Valve Block Arm System

The Valve Block Arm System is mounted to the turret right hand side.

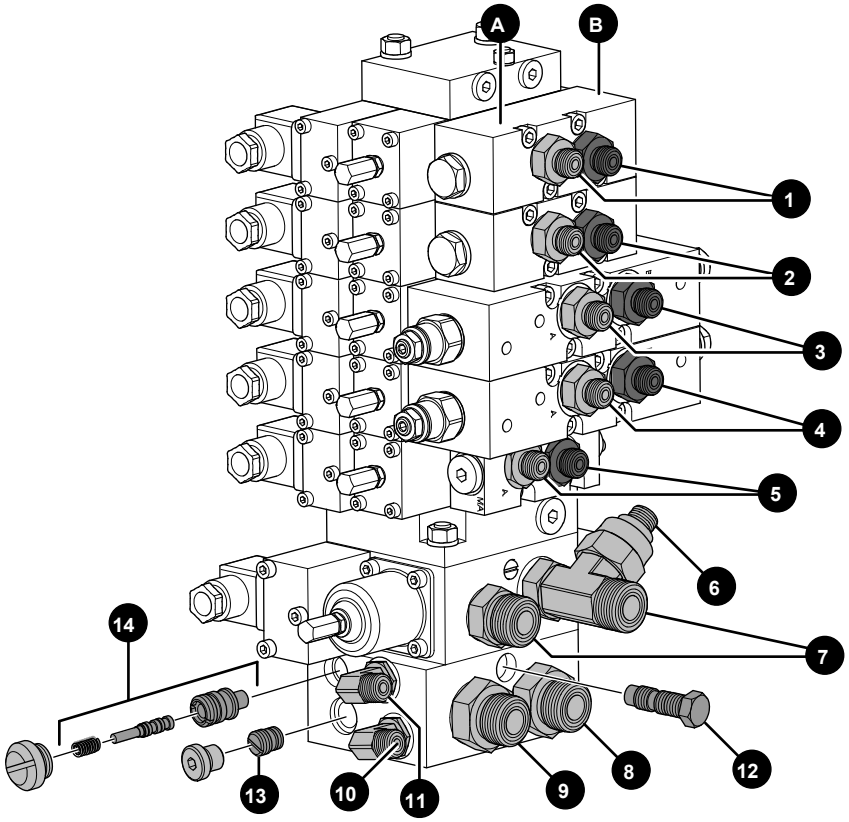


Figure 5.2.3.1-1. Valve Block Arm System

Table 2. Boom-stick

		Wire id	Hydraulic Valve	A. Acctuator/Valve (+)	B. Acctuator/Valve (-)
1.	Tool (cyl. 4)	W25	QV11	+	-
2.	Stick (cyl. 3)	W24	QV10	+	-
3.	Extension (cyl. 2)	W23	QV9	+	-
4.	Boom (cyl. 1)	W22	QV8	+	-
5.	Rotation	W21	QV22	+ Clockwise rotation	- Counterclockwise rotation
6	to Grease Pump	W30	QV6	+	
7.	Tool	W20	QV13	T tool	P tool (and Grease Pump)

Table 3. Connection Block

8.	P: Pressure inlet, connects to Swivel
9.	R: Return outlet, connects to Swivel
10.	LS: Load sensing signal, connects to Swivel
11.	Pressure Sensor
12.	LS-load dampener
13.	Internal filter
14.	Pilot pressure reducer valve (20bar)

The Valve Block Arm System controls various actuators according to these principles:

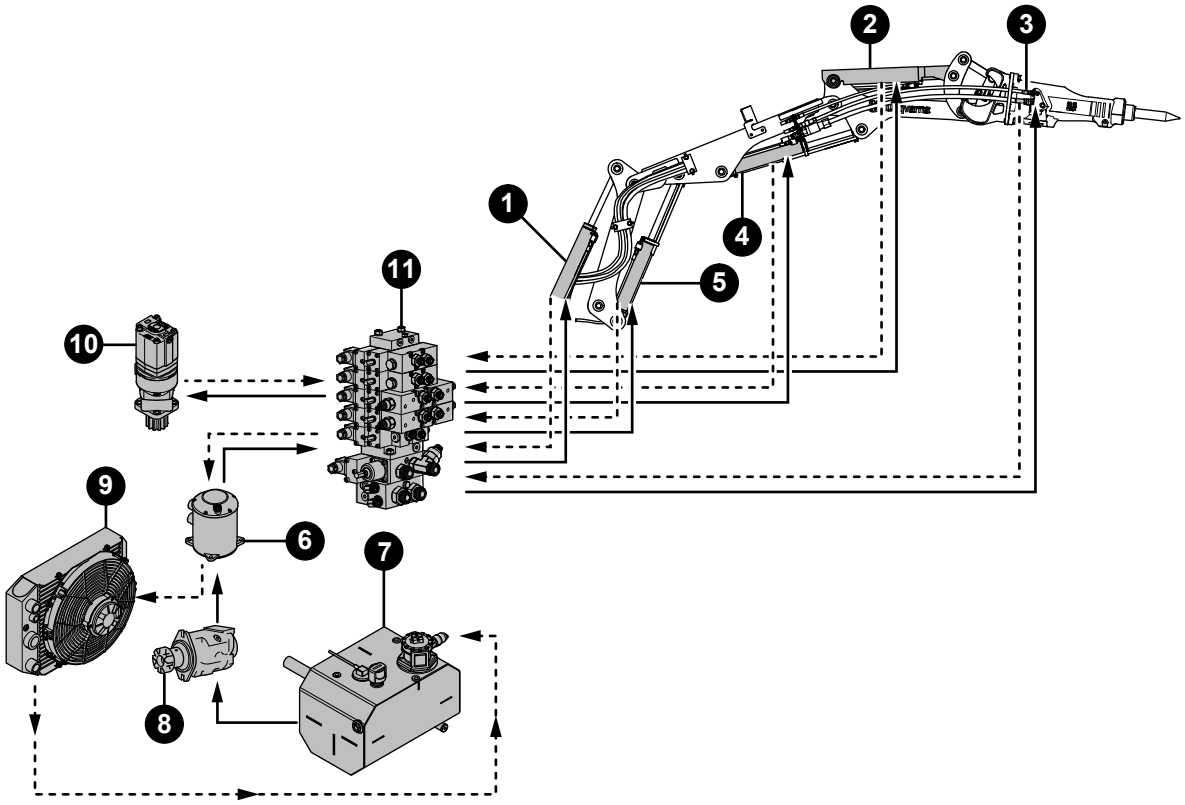


Figure 5.2.3.1-2. Boom-stick

1. Boom-Cylinder
2. Tool-Cylinder
3. Tool Hydraulics
4. Stick-Cylinder
5. Boom Extension-Cylinder
6. Hydraulic Line Swivel through Pivoting Center
7. Hydraulic Oil Tank and Filter
8. Hydraulic Pump (powered by the main electric motor)
9. Hydraulic Oil Cooler (return flow)
10. Slew Motor (fixed to turret with sprocket in slewing gear ring (fixed to the carriage frame)
11. Valve Block Arm System

(Filled line: pressure, dotted line: return flow)

5.2.4 Valve Block Chassis/Front

5.2.4.1 Valve Block Chassis

The hydraulic oil flow/pressure is induced by the Hydraulic Pump and distributed to the**Valve Block Chassis**, which together with the Valve Block Arm System, control the various actuators.

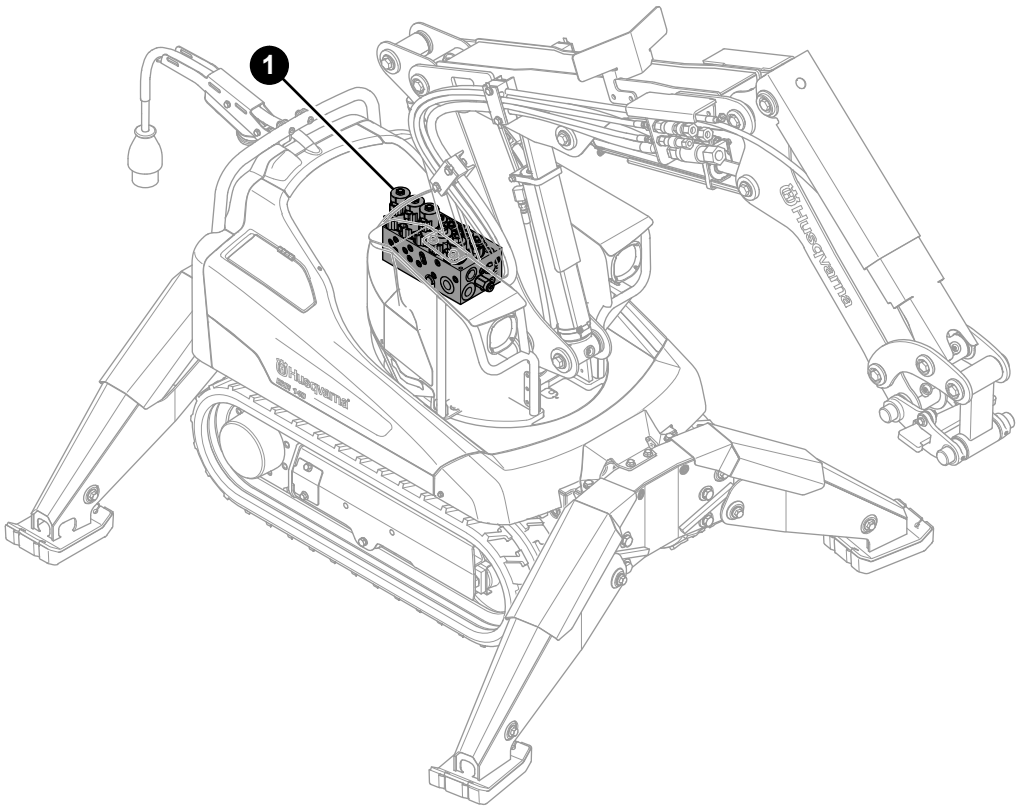


Figure 5.2.4.1-1. Valve Block Chassis

The**Valve Block Chassis** is mounted on the left side shelf.

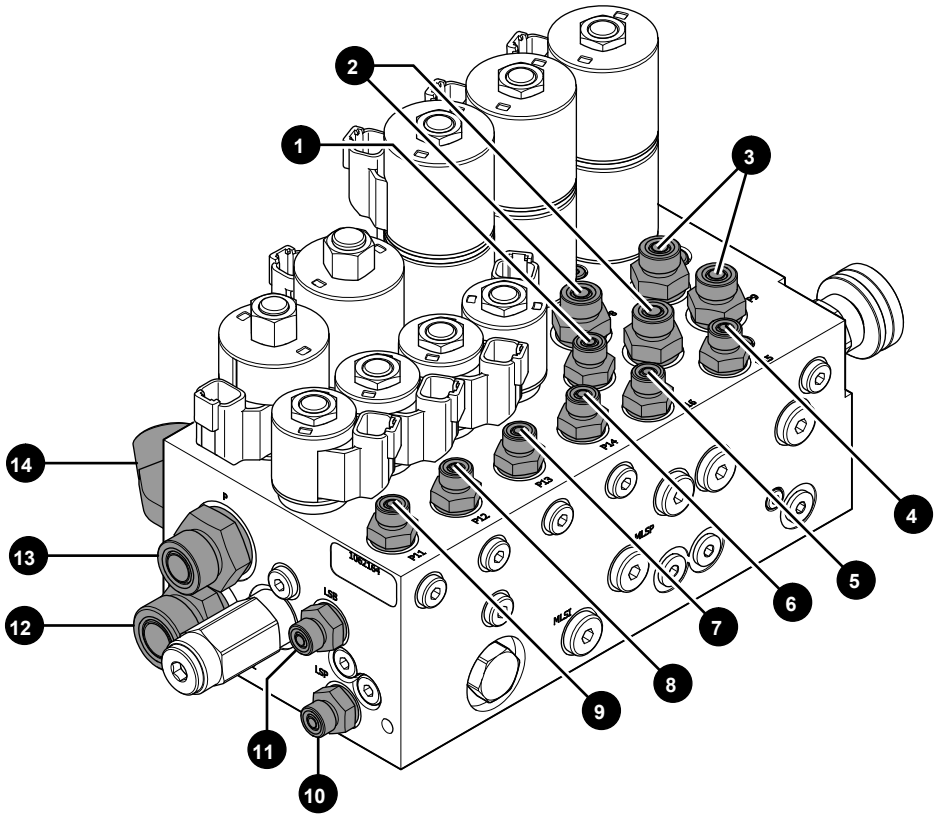


Figure 5.2.4.1-2. Hydraulic Couplings

Table 4. Hydraulic Couplings

	Function	Valve block port	From Actuator(s) port	To Actuator(s) port
1.	Automatic Track Tension System	P17		+
2.	Track Drive Motor, Left	P7		B
		P8		A
3.	Track Drive Motor, Right	P9		A
		P10		B
4.	Outrigger cylinders, Front	P15		-
5.	Outrigger cylinders, Rear	P16		-
6.	Outrigger cylinders, Rear/Right	P14		+
7.	Outrigger cylinders, Rear/Left	P13		+
8.	Outrigger cylinders, Front/Right	P12		+
9.	Outrigger cylinders, Front/Left	P11		+
10.	Load-sensing Signal	LSP		Pump
11.	Load-sensing Signal	LSB	Valve block arm system via swivel LS	
12.	System return	T2	Valve block arm system via swivel T	
13.	System pressure	P	Pump	
14.	System return	T1		Cooler

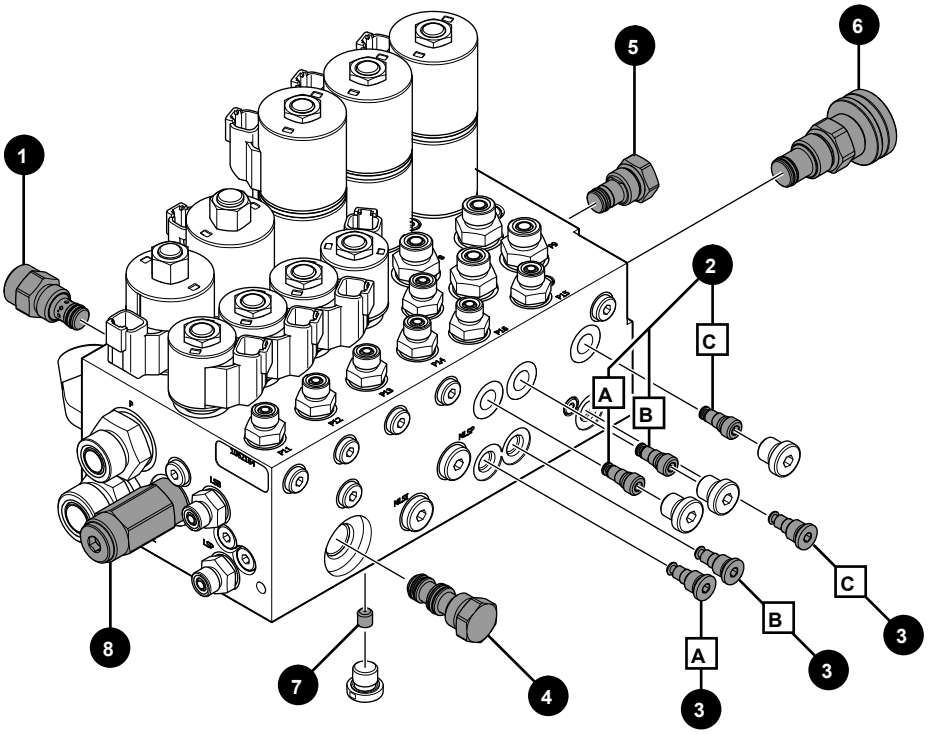


Figure 5.2.4.1-3. Internal valves

	Name	A	B	C
1.	Flow regulating, pressure-compensated, valve (Load-sensing Signal)			
2.	Shuttle valve (Load-sensing Signal)	Outriggers	Track Drive Motor Left	Track Drive Motor Right
3.	Check Valve (Load-sensing Signal)	Outriggers	Track Drive Motor Left	Track Drive Motor Right
4.	Load shuttle check Valve (Load-sensing Signal)			
5.	Check valve (Track Tension)			
6.	Release valve (Track Tension)			
7.	Restrictor (Load-sensing Signal)			
8.	Pressure relief valve (system saftey valve, 280 bar)			

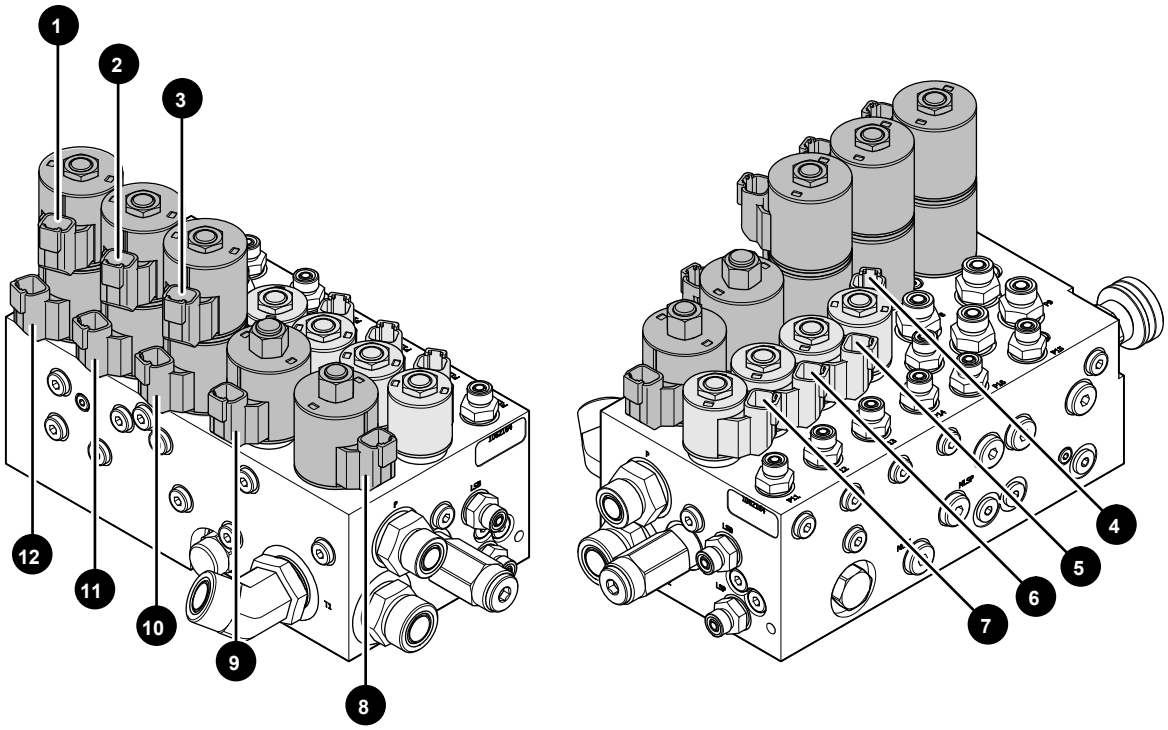


Figure 5.2.4.1-4. Electrical Connections

Table 5. Electrical Connections

	Function	Wire id	Connector
1.	Track Belt Right Forward	W213.1/W213.2	QV16 (Hyd.Valve)
2.	Track Belt Left Forward	W214.1/W214.2	QV18 (Hyd.Valve)
3.	Outrigger Up	W215.3/W215.4	QV21 (Hyd.Valve)
4.	Outrigger Left Front	W224.1/W224.2	QV4 (Hyd.Valve)
5.	Outrigger Right Front	W223.1/W223.2	QV3 (Hyd.Valve)
6.	Outrigger Left Back	W222.1/W222.2	QV2 (Hyd.Valve)
7.	Outrigger Right Back	W221.1/W221.2	QV1 (Hyd.Valve)
8.	Circulation Valve	W140.1/W140.2	QV7 (Hyd.Valve)
9.	Pressure Control	W130.1/W130.2	QV5 (Hyd.Valve)
10.	Outrigger Down	W215.1/W215.2	QV20 (Hyd.Valve)
11.	Track Belt Left Backward	W214.3/W214.4	QV19 (Hyd.Valve)
12.	Track Belt Right Backward	W213.3/W213.4	QV17 (Hyd.Valve)

5.2.5 Cooling System

The main function of the cooling system is to cool the hydraulic oil.

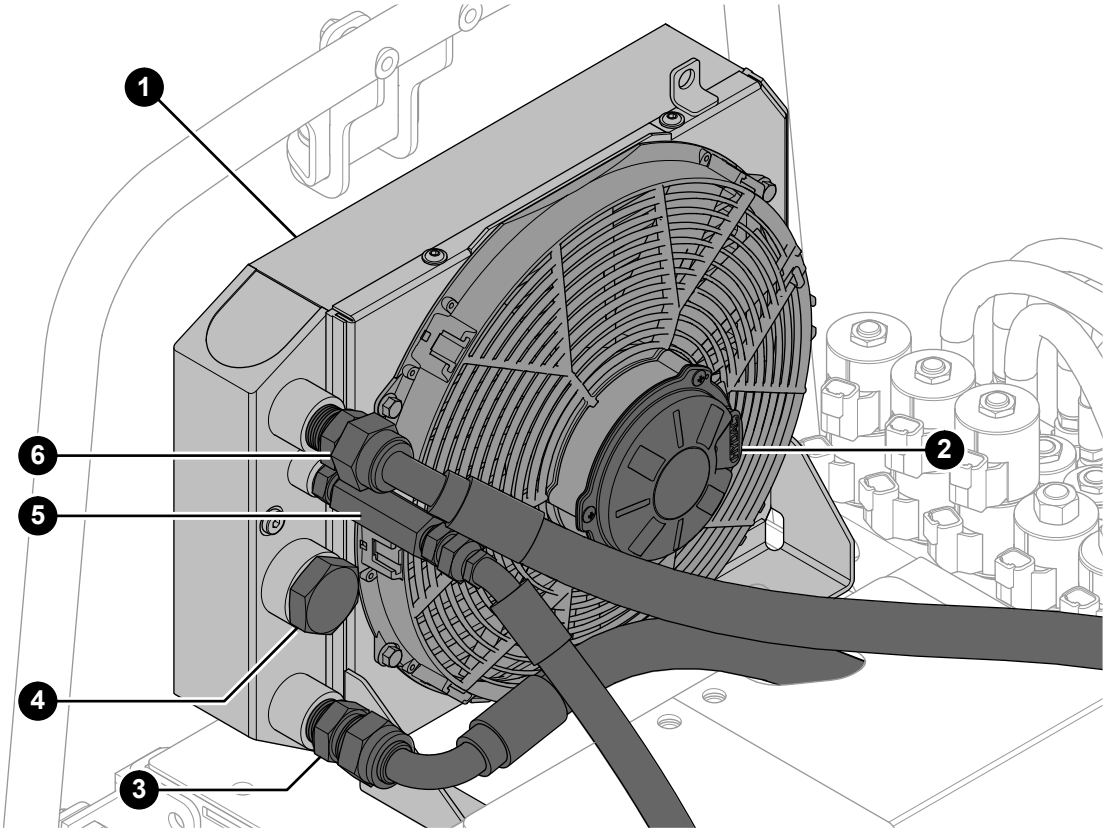


Figure 5.2.5-1. Cooling System

1. Cooler
2. 24VDC Cooling Fan 3000RPM
3. Return flow
4. Cooler Thermostat
5. Check valve from Filling Pump
6. To Hydraulic Oil Tank

The Integrated Temperature Bypass Valve leaves the bypass channel open so that a part of the oil bypasses the cooling element. When the oil temperature reaches the required value, the IBT closes the bypass channel and the oil is cooled down avoiding a too low temperature of the oil at cold starts. The IBT closes at 45°C and opens at 2 bar.

5.2.6 Hydraulic Pump

5.2.6.1 Hydraulic pump

The hydraulic axial piston pump is of the variable displacement type and produces a flow of 0-52 l/min (0-14 gal/min).

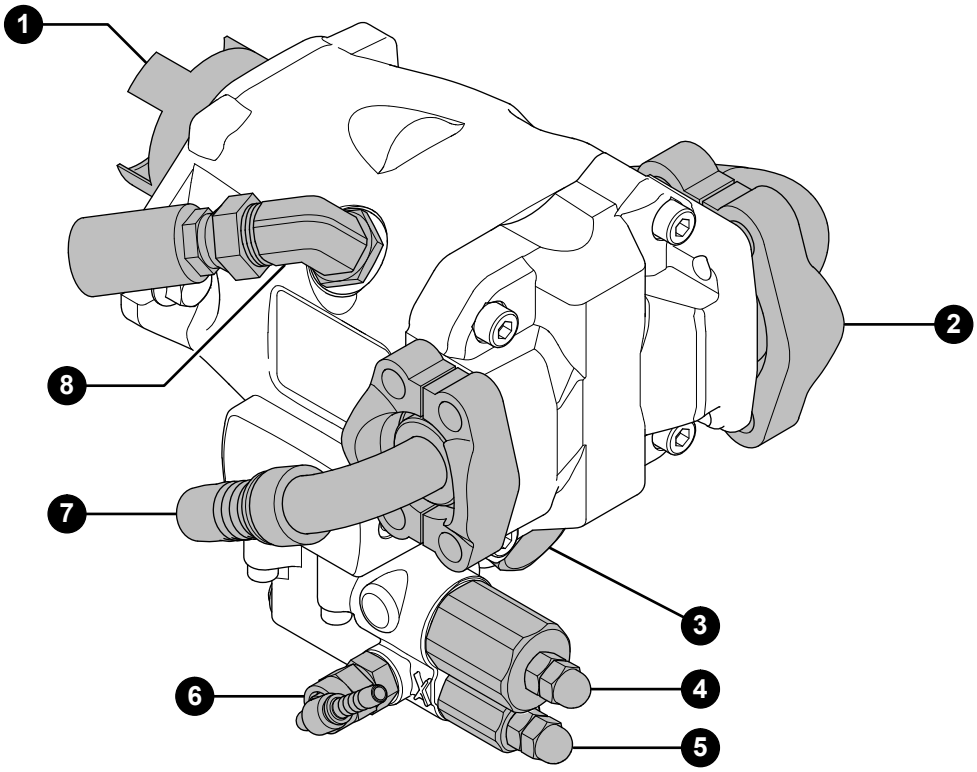


Figure 5.2.6.1-1. Hydraulic Pump

1. Claw coupling (to motor axis)
2. From Hydraulic Oil Tank (feed hose)
3. Max displacement plug (2 plugs available - 50 & 60 Hz), limits the max flow to 52 l/min
4. Max pressure compensator - 270 bar
5. Pressure Flow Compensator (LS) - 20 bar
6. Load sensing connecting from Valve blocks
7. Pressure hose to Valve Block Chassis and arm system
8. Case drain flow to Hydraulic Oil Tank

5.2.7 Hydraulic Oil Tank

The Hydraulic Oil Tank is a container that receives oil from the cooler and supplies oil to the pump. Depending on the operating condition of the hydraulic actuators, the level can vary grately. With all cylinders fully retracted, the Remote Control display shows 100%.

The Hydraulic Oil Tank cleans, cools and vents the oil. Two flows reaches the tank, the regular return flow which goes through the cooler via the return filter into the tank, and also the "Drain" (slew motor & grease pump) that reaches the tank but is not cleaned and goes directly into the tank.

The Hydraulic Oil Tank return filter cleans the oil provided the return pressure is ≤3 bar, this to spare filter. At ≥3 bar the cleaning process fails.

There is a **Pressure Guard Oil Filter (5)** mounted in the tank providing the operator with a reminder that the filter is becoming clogged, this is done at ≥2 bar.

The **Air Filter (1)** ensures that the tank vents the hydraulic oil and that air may enter the tank due to level differences. This must be done otherwise the tank may get damage since the volume of oil is constantly changing.

AVOID POLLUTING THE HYDRALIC SYSTEM!

Keep all openings and the interior of the Hydraulic Oil Pump clean and avoid getting water into the tank.

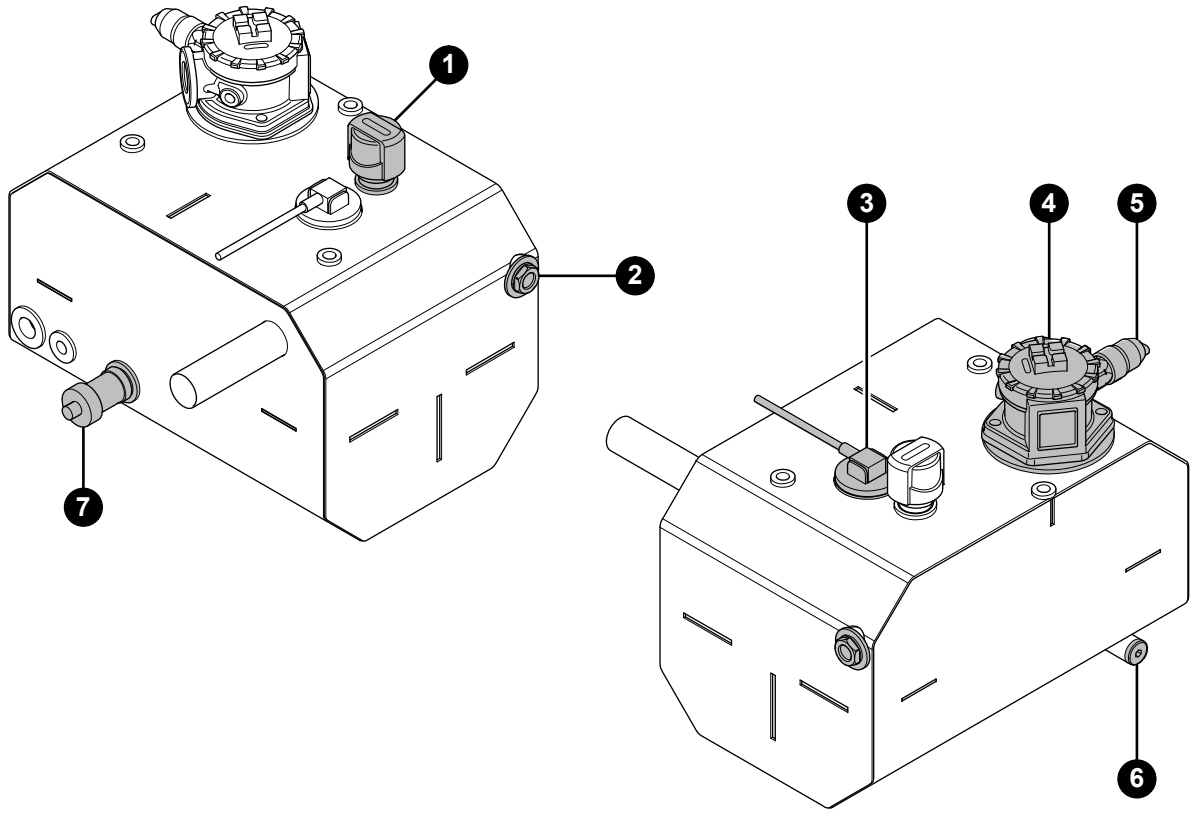


Figure 5.2.7-1. Hydraulic Oil Tank

1. Air Filter (air valve)
2. Sight eye – rough level check*
3. Oil Level Sensor (B3)
4. Lid for Hydraulic Oil Filter
5. Pressure Guard Oil Filter (B5)
6. Drain plug
7. Temperature Sensor Hydraulic Oil (B2)

*When the oil is visible in the sight eye it indicates max volume/100%.

Refer to chapter Specification for values.

5.2.8 Grease Pump

The Grease Pump provides a steady flow of grease to the attached chisel/breaker tool. The Grease Pump is mounted on the left work-light frame. The breaker mode will automatically enable the Grease Pump using the L-valve.

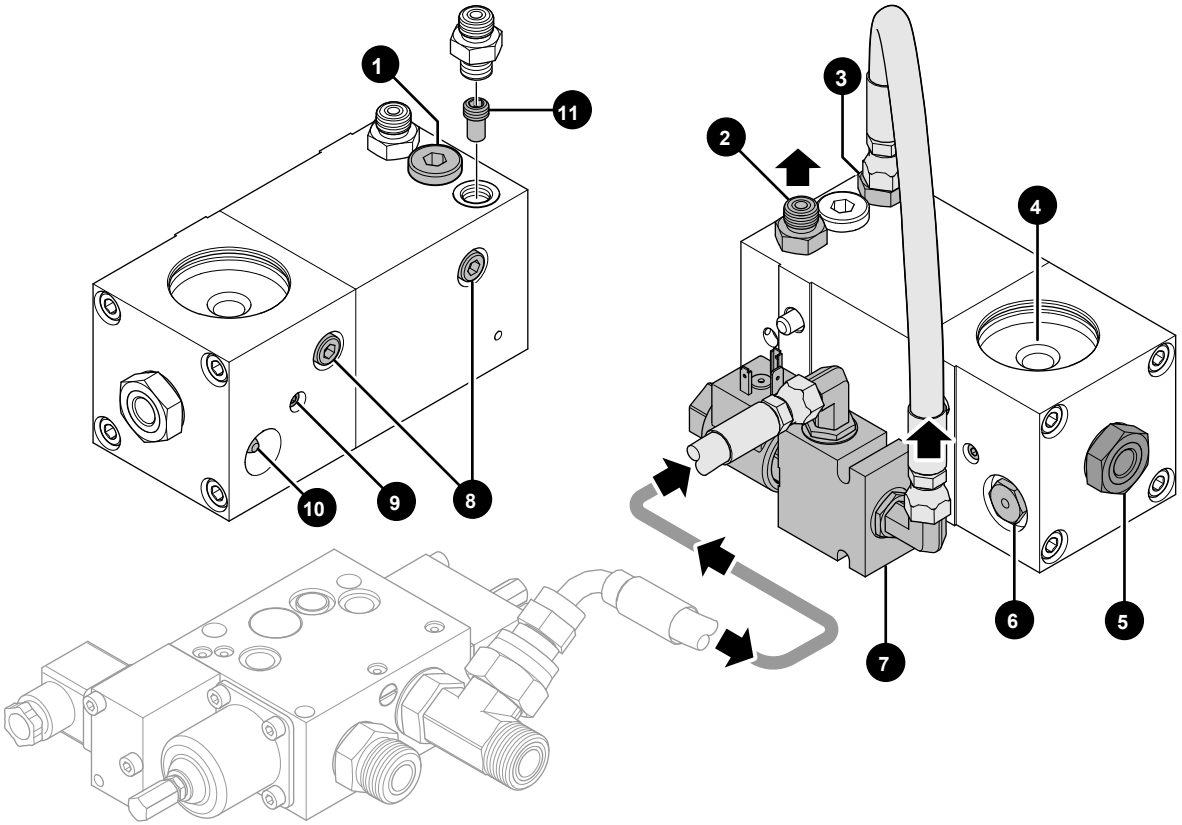


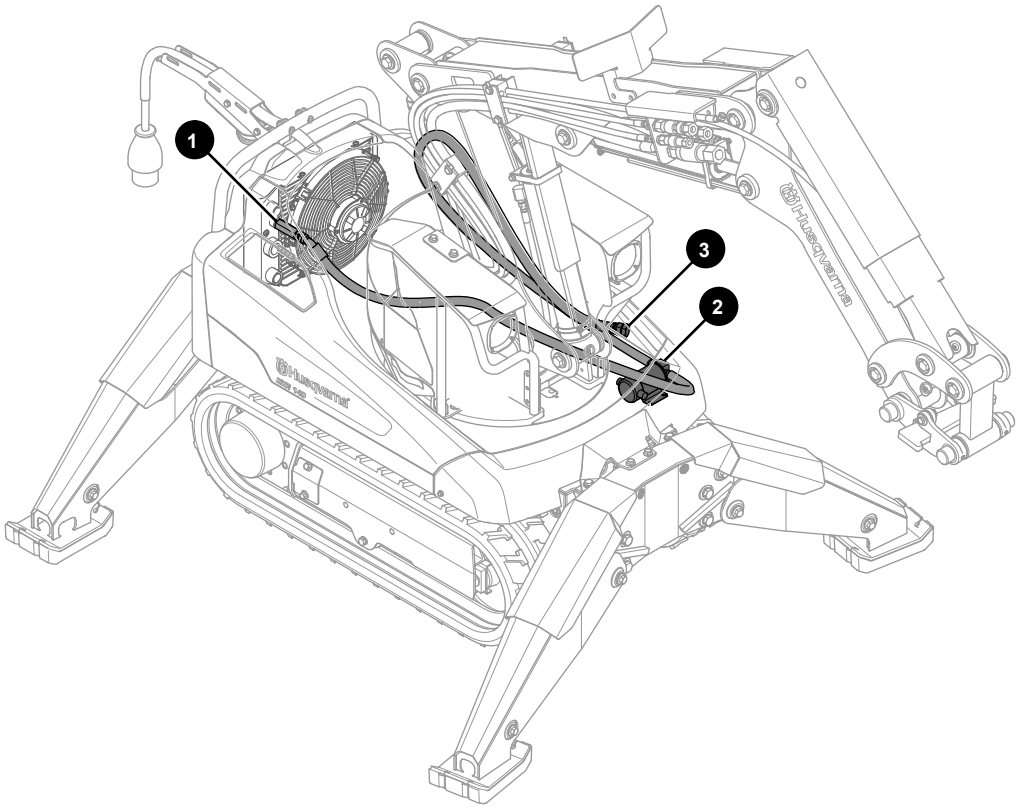
Figure 5.2.8-1. Grease Pump from below

1. The Flow ajustment screw can be rotaded 6 turns in total. Clockwise, the flow to the pump is cut-off, less grease to the hammer. Counterclockwise, the flow to the pump is increased, more grease to the hammer. The factory setting for the Flow adjustment screw is in the middle/3 turns.
2. Hydraulic return flow
3. Hydraulic oil pressure and Oil strainer
4. Tube attachment for tool grease
5. Pump element - Grease outlet
6. Pressure relief valve 120 bar
7. 24 VDC On/Off Grease pump L-valve.
8. Grease pump Allen key fasteners
9. Air release with Allen screw
10. Nipple for manual lubrication and Grease pump chamber
11. Oil strainer (filter)

The **Grease Pump L-valve** supplies the Grease Pump with fluid. The valve only opens then the tool is activated or via "Adjustable mode" when "tool with grease" has been chosen.

Refer to chapter Specifications for values.

5.2.9 Filling Pump



1. Check Valve
2. Filling Pump
3. Fill Hose

Use the hydraulic oil **Filling Pump** to refill the hydraulic oil. Check the oil level on the remote control display under "SERVICE" and the tab "OIL REFILL". Hold the selection key down to refill the hydraulic oil. The **Filling Pump** shuts off automatically when the tank is full. About 16 litres of new oil is required to replace the hydraulic oil of the tank.

Check the sticker next to the **Filling Pump** for the quality of the hydraulic oil that the machine is originally supplied with.

CAUTION!

The machine can be damaged if different types of hydraulic oil are mixed.

The **Filling Pump** is activated by a low-voltage circuit.

5.3 Electrical System

5.3.1 Power Distribution

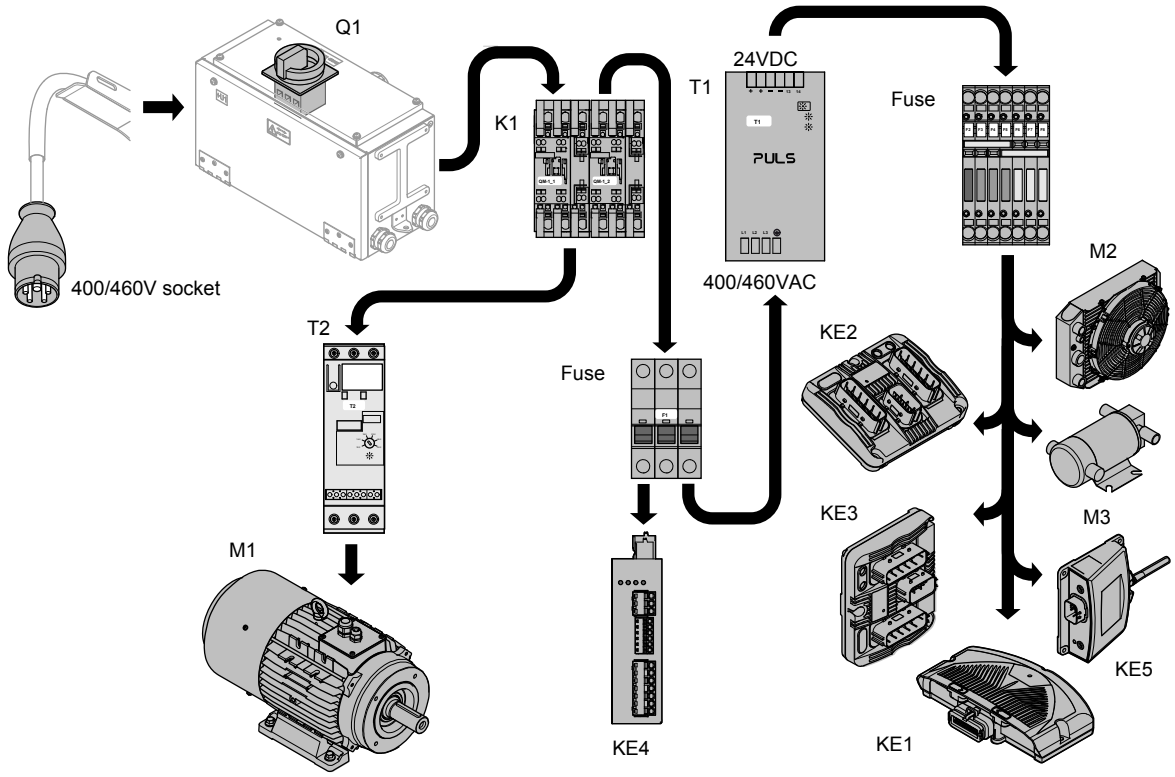


Figure 5.3.1-1. Power Distribution

Table 6. Component Description

Component ID	Description
Q1	On/Off Switch Main Power
K1	Reversing Contactor
T2	Soft Start
M1	Electrical Motor
KE4	Power Meter
T1	24VDC Power Supply
KE1	Master Control Module
KE2/3	Slave Control Module Body
KE5	Radio Control Module
M3	Filling Pump
M2	Cooling Fan

5.3.2 Electrical System

5.3.2.1 Electrical System

General The electrical system consists of a high-voltage circuit and a low-voltage circuit.

High-voltage circuit The high-voltage circuit is used as a power source for both the **Electrical Motor** and the low-voltage circuit. An automatic phase rotation change-over switch secures the correct rotation direction of the **Electrical Motor**.

Power supply The power supply from the main must be sufficiently powerful and constant to ensure that the **Electrical Motor** functions without problems.

CAUTION!

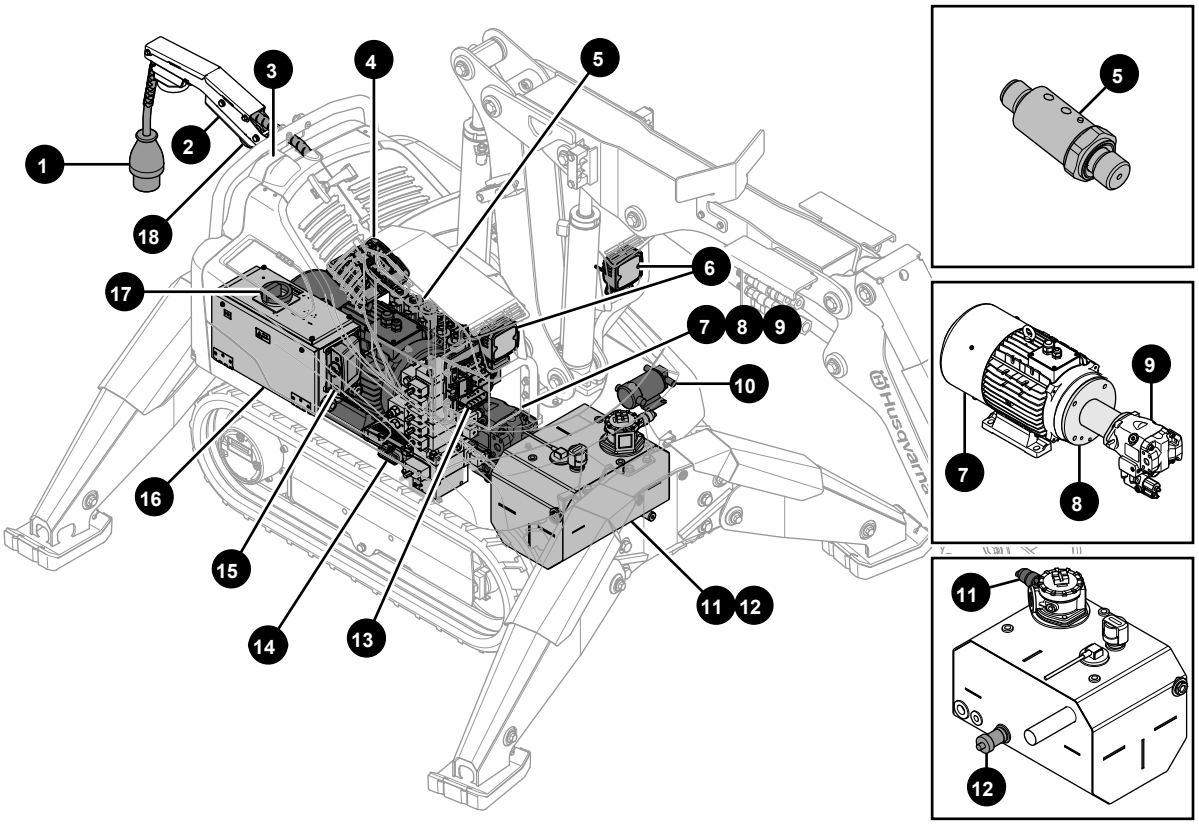
Too high or too low voltage causes the Electrical Motor's power consumption, and so also its temperature, to increase until the motor's safety circuit trips.

5 FUNCTIONAL DESCRIPTION

Fuses The fuses in the distribution box protect the electrical system in case of overload or breakdown. The power outlet must have the correct fuses with regard to the **Electrical Motor**, the length of the power cable and the area of the power cable's conductor. The table "Guide values for mains connection" shows which fuse is required for the **Electrical Motor**. The machine is equipped with Softstart and can be started with most types of fuses. If a fuse keeps blowing, there is a fault in the electrical system or in the machine that is connected to it. Before restarting the machine the source of the fault must be removed.

Power cable The machine is connected to the mains with a 3-phase power cable. It is very important that the cable that is used is correctly dimensioned, i.e. that it has the correct cross sectional area in relation to the length of the conductor in order to counteract drops in voltage. Guide values for the cable's size are found in the table "Guide values for mains connection".

Low-voltage circuit The high-voltage current is reduced to low-voltage in an AC/DC module. It is used to supply power to the control system and functions such as work lighting and refilling pump.

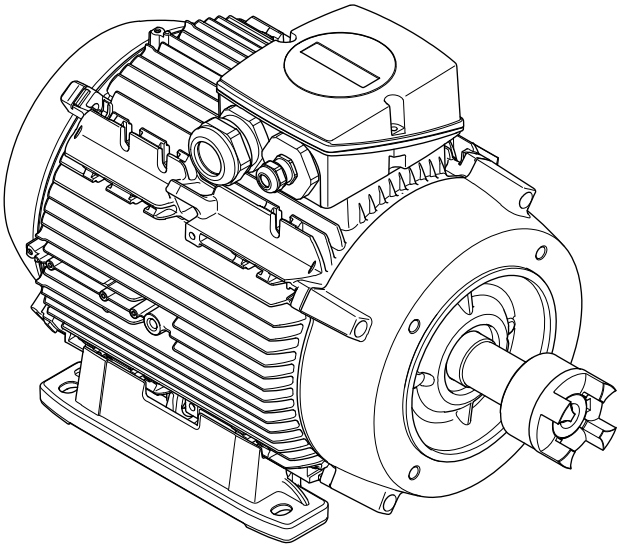


1. Power Cable
2. Antenna
3. Emergency Stop - Rear (S2)
4. Slave Control Module Body (KE2)
5. Pressure Sensor (B1)
6. Working Lights (E1, E2)
7. Electrical Motor (M1)
8. Intermediate Piece (Bellhouse)
9. Hydraulic Pump
10. Filling Pump (M3)
11. Pressure Guard Oil Filter (B3)
12. Temperature Sensor Hydraulic Oil (B2)
13. Slave Control Module Tower (KE3)
14. Master Control Module (KE1)
15. Radio Control Module (KE5)
16. Electrical Cabinet
17. On/Off Switch Main Power (Q1)
18. LED - Warning Light Back (E3)

Main Electrical Motor The Electrical Motor runs at constant speed. It is the power source for the **hydraulic axial piston pump**. The motor and pump shafts inter-connect by a claw coupling.

5.3.2.2 Electrical Motor

Specification

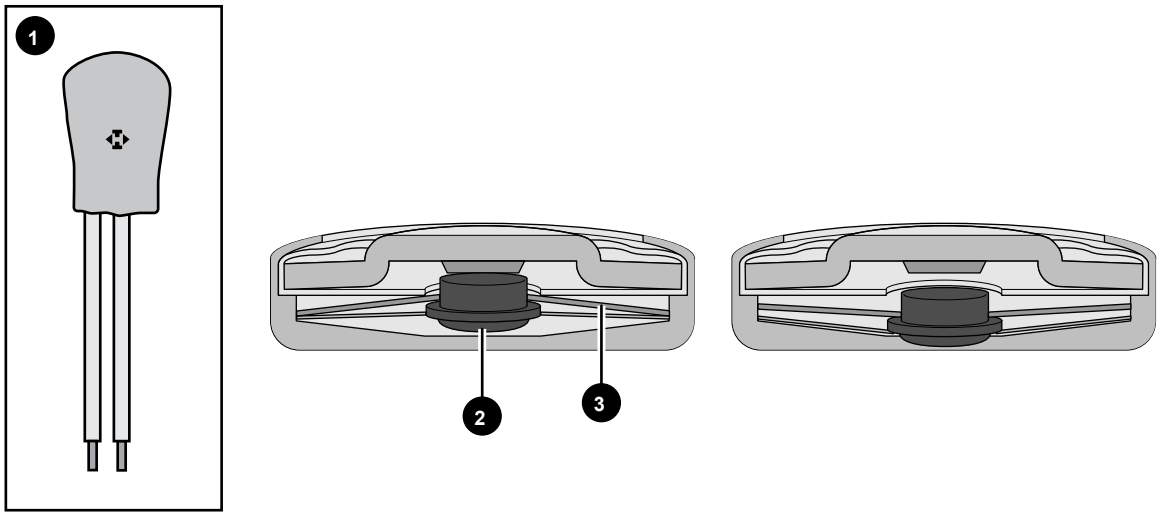


The electrical motor for the DXR145 is a 2-pole motor with fixed (or internal) delta connection. It works with a voltage of 400/460V AC.

It rotates at approx. 3000RPM at 50Hz and at approx. 3500RPM at 60Hz.

Thermal protection

Temperature sensors (1) are integrated in the stator winding in order to monitor the temperature and protect the stator winding from overheating.



It is an NC type and normally opens at 150°C, reset temp. is approx. 35°C lower (~115°C).

The **temperature sensor** has an **integrated switch (2)** that is controlled by the **bimetal disc (3)** that opens the circuit when it gets to hot. When the temperature has decreased, the sensor switch will be automatically reset.

5.3.2.3 How to test the electrical motor

WARNING!

Carefully read the instrument's operators manual before usage.

Re-calibrate the test leads.

HIGH VOLTAGE!

Tests are only to be performed by a qualified electrician!

HIGH VOLTAGE!

Tests are only to be performed when the motor is at standstill and de-energized.

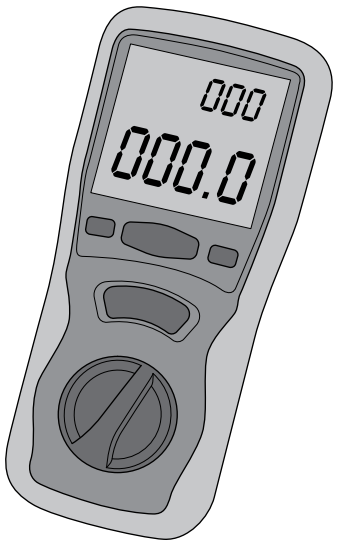
Turn off the machine and disconnect the power supply cable.

Make sure that it is not possible to reconnect the cable by mistake during the repair procedure.

HIGH VOLTAGE!

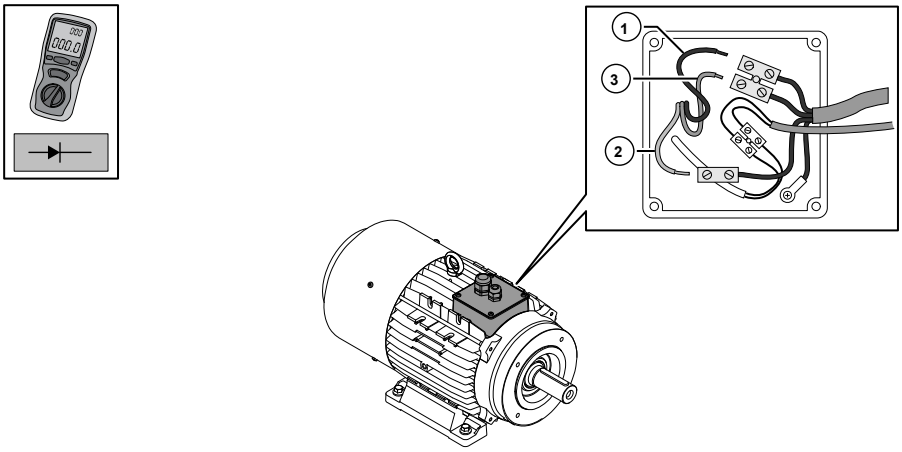
Defective insulation can cause arcing at high voltages.

The motor works with a voltage of 400/460V AC. Even if measurements with a multimeter shows that the motor winding insulation is OK, it is still possible there are faults in these.



To ensure there are no faults in the winding insulation, use an insulation tester. The insulation is normally measured at 1000V over 3-seconds. Make sure that the connected test cables and test probes are designed for 1000V or more.

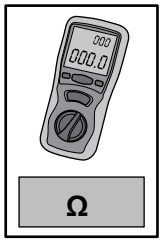
1.

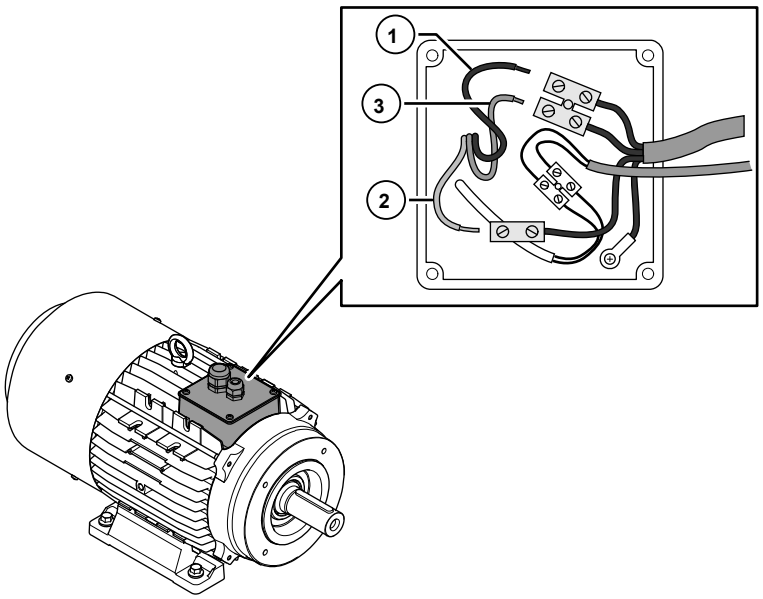


Short-circuit testing.

- Info: Test shows whether the motor have shorted windings (U-V-W) to ground (motor material).
- Tools: Multimeter.
- Procedure: Set the multimeter in position diode test. Connect the multimeter between the different windings 1-2-3 (U-V-W) and ground (motor material), and measure one at the time. A shorted motor gives a closed circuit between the ground cable/chassis of the motor and one of the phases. If no fault is indicated, the test must be extended to step 2-3.

2.

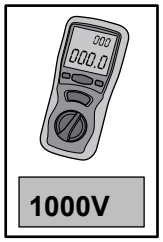


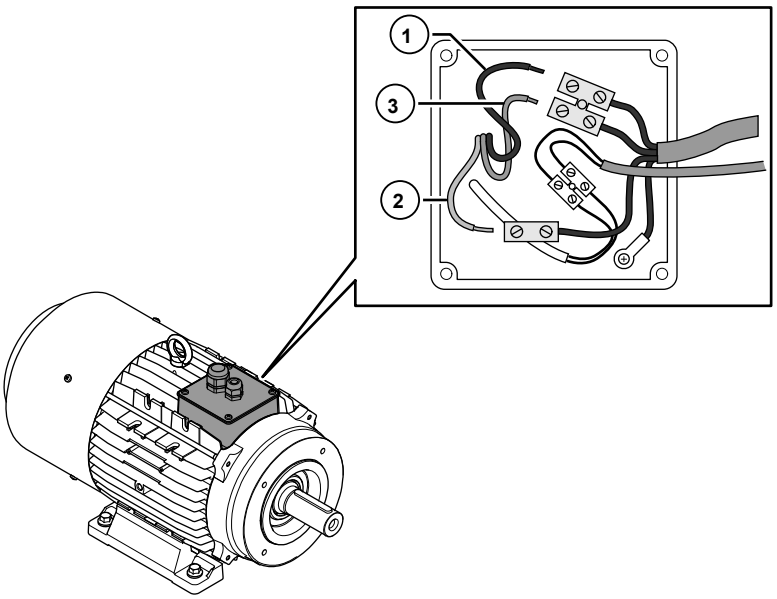


Phase-to-phase winding resistance: U-V, U-W, V-W (where U-V-W are the three phases).

- Info: Test shows whether the motor has shorted winding turns, i.e. ensure that the motor is well balanced. The check is carried out with resistance measurement in Ω (Ohm). Resistance value can be influenced by temperature (room temperature is preferred).
- Tools: The instrument can be a multimeter or ohmmeter (low resistance).
- Nominal resistance value DXR145: 0.348Ω with a tolerance of ± 5% = 0.3306<->0.3654Ω.
- Procedure:
  - Disconnect the supply wires from the terminal box inside the motor.
  - Measure across all of the phases, ± 8% tolerance for unbalancing between 1-2 (U-V), 2-3 (V-W) and 1-3 (U-W).
  - Make a thurough investigation if the resistance value is ± 0.150Ω from nominal.

3.





Insulation testing/Winding insulation resistance:

- Info: The insulation test is a test which indicates where there is inadequate insulation between the motor's windings and ground (Winding integrity & Insulation quality).

  Insulation measurement takes place in the same way as the first check above, "short-circuit testing", between the ground (motor material) and phases 1-2-3 (U-V-W). The insulation tester should be set to 1000V, the tester measures resistance during the test. The test must show maximum resistance for the result to be approved. Poor insulation between ground and the phases results in reduced resistance.
- Tools: Insulation tester.
- Procedure:
  - Establish a good suitable ground connection on the motor to ensure a reliable connection.

    Make the test as instructed in the Insulation tester.
  - Test result: Values should be symmetrical between all motor leads.

    Faulty winding insulation: Low Ω resistance (0Ω): Motor should be serviced/replaced.

    Winding insulation OK: The high Ω resistance should be OL.

Table 7. Cables DXR145

Electric motor			**Soft start (T2)**	
Cable color	Terminal marking		Cable marking	Pin
Black	U	->	1	T1
Green/White	V	->	2	T2
Red	W	->	3	T3

5.3.3 Swivel

The Swivel allows the hydraulic lines and an electric cable to pass between the turret and undercarriage. The Swivel assembly is attached to the turret centre and comprises a female part that freely rotate over the male pivot centre. The male unit is fixed via a rotary stop mounted in the chassis.

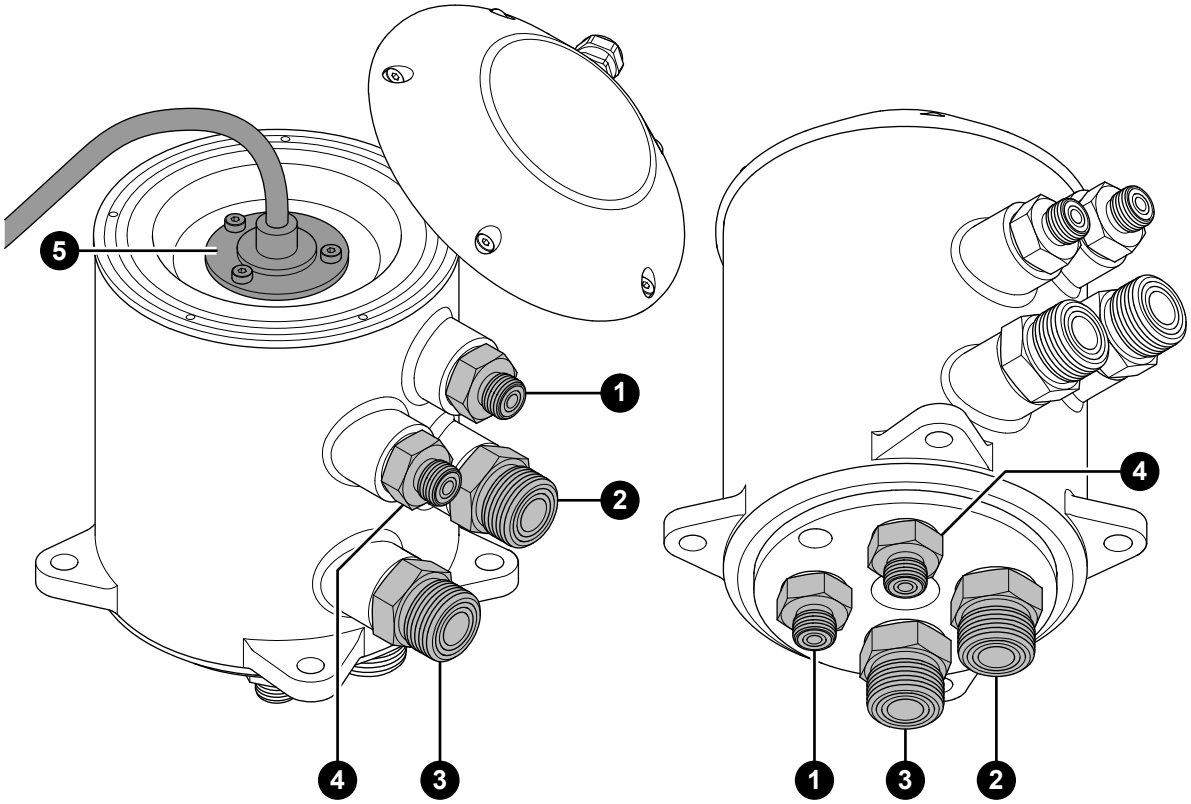
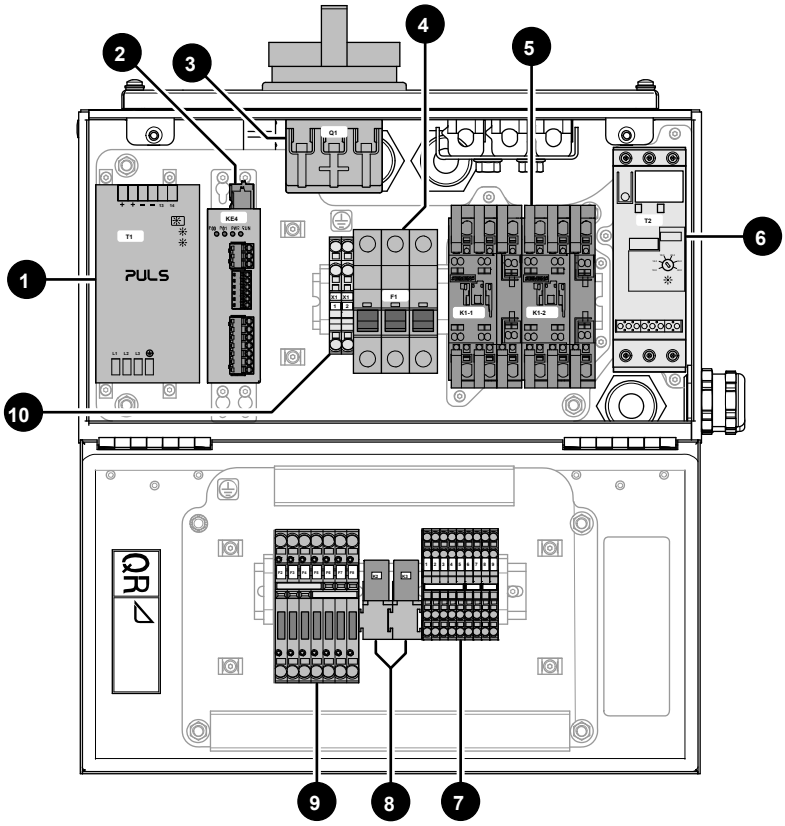


Figure 5.3.3-1. Hydraulic ports

1. Drain: From the Slew Motor and Grease Pump
2. Pressure: From the Hydraulic Pump (P) to the Valve Block Arm System (connection block)
3. Return: From the Valve Block Arm System to the Valve Block Chassis (T)
4. Pressure Flow Compensator (LS) signal: From the Valve Block Chassis to the Valve Block Arm System
5. The main function of the Electric Swivel is to provide a freely rotating electrical connection between the turret and undercarriage.

5.3.4 Electrical Cabinet

5.3.4.1 Electrical Cabinet



1. 24VDC Power Supply **(T1)**, 20A from power mains 3×400V~ (380V~ - 480V~ (50/60Hz)).
2. Power Meter **(KE4)** ((10V~ - 500V~ (50/60Hz)) Max current 60A. Compensates for phase sequence faults caused by e.g. extension cables. Reads and displays (R/C) live values for voltage, current and frequency. Programmable by DIP switches.
3. On/Off Switch Main Power **(Q1)**.
4. Automatic fuse - Transfomer & Power Meter **(F1)**. A blown fuse will halt the 24VDC Power Supply and Power Meter.
5. Reversing Contactor **(K1)** main motor. The Power Meter (10V~ - 500V~ (50/60Hz)) determines which one of the two contactors (K1_1 or K1_2) to be activated when starting the motor.
6. Soft Start 3 Phase 30A **(T2)** (200V~ - 480V~ (50/60Hz)).
7. Terminal blocks **(X2)**.
8. Relay Cooling fan **(K2)** Relay Filling pump **(K3)**.
9. Fuse rack.
10. Ground Terminal Block **(X1)** (ground connection).

Table 8. Fuses

Fuse	Amp	Voltage	Description of protected components
F1	4 A	400/460VAC	T1: Transformer 400/460 VAC => 24 VDC
F1	4 A	400 VAC	KE4: Power Meter
F2	15 A	24 VDC	M2: Cooling Fan
F3	5 A	24 VDC	M3: Filling Pump
F4	10 A	24 VDC	KE1: Master Control Module
F5	10 A	24 VDC	KE2: Slave Control Module Body
F6	10 A	24 VDC	KE3: Slave Control Module Tower
F7	1 A	24 VDC	KE4: Power Meter
F8	3 A	24 VDC	KE5: Radio Control Module

Table 9. K-relay

Relay	Circuit	Function	Relay stage (off mode)	Description
K2	Rail-mounted relay 30A 24VDC - Cooling Fan	On/off switch	Normally open (NO)	(K2) is a normally open relay (NO). A 24VDC signal is taken from the body plc slave KE2/X2 when starting the machine, which activates the K2 coil, which in turn closes the relay circuit and activates the cooling fan.
K3	Rail-mounted relay 30A 24VDC - Filling Pump	On/off switch	Normally open (NO)	(K3) is a normally open relay (NO). A 24VDC signal is taken from the body plc slave KE2/X2 when starting the machine, which activates the K2 coil.. The 24VDC signal energizes the coil in the relay and will close the relay circuit and then 24VDC from fuse F3 will pass through the relay to the .
KE4	Power Meter			

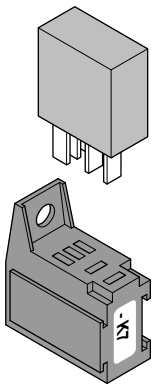


Figure 5.3.4.1-2. K2/K3

5.3.4.2 Soft Starter (T2)

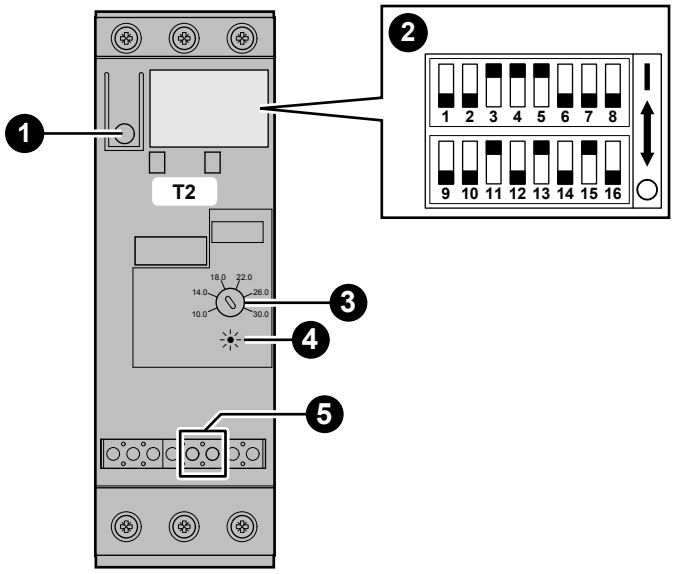


Figure 5.3.4.2-1. Soft Starter (T2)

1. Reset/Test Button
2. Dip Switches (Soft Start settings)
3. Dial (11kW = 25A, 15kW = 30A.)
4. LED Diode
5. N.O. Fault Contact #97 87

Table 10. Soft Starter LED Description

Number of Flashes	Description
1	Overload
2	Over-temperature
3	Phase Reversal
4	Phase Loss/Open Load
5	Phase Imbalance
6	Shorted SCR
7	Test

Electronic Motor Overload Protection

The motor overload protection is accomplished electronically with the use of current transformers on each of the three phases. The controller's overload protection is programmable. The overload trip class selection consists of either OFF, 10, 15, or 20. The trip current is selected by adjusting the **dial (3)** to the motor full load current rating. 11kW = 25A, 15kW = 30A.

To adjust the overload trip current, turn the **dial (3)** until the desired current is aligned with the pointer. Trip rating is 120% of the dial setting.

Auto Overload Reset

Set the **Dip Switch (2)** no. 13 to Auto position (on/up). The relay resets automatically when the motor thermal model drops below 75% of motor thermal capacity.

Test: Push and hold the **Reset/Test button (1)** for 5 seconds to manually trip. The **LED diode (4)** will indicate a test state and the **N.O. Fault Contact (5)** changes state. Push the **Reset/Test button** again to revert the device to operating mode.

All other faults: Reset by cycling the control power.

Over-temperature

The temperature is monitored by means of internal thermistors. When the power poles maximum rated temperature is reached, the microcomputer switches off the soft starter, a temp. fault is indicated via **LED**, and the 97/98 fault contact closes.

Phase Reversal

When enabled via a **DIP switch**, 3-phase input power will be verified before starting. If input power phasing is detected to be incorrect, the start will be aborted and a fault indicated.

Phase Loss/Open Load

The soft starter will not attempt a start if there is a single-phase condition on the line. This protects from motor burnout during single-phase starting.

Phase Imbalance

The soft starter monitors for imbalance between phase currents. To prevent motor damage, it will trip if the difference between the minimum phase current and the maximum phase current exceeds 65% for 3 s, and a fault will be indicated.

Shorted SCR

Prior to every start and during starting, it will check for shorts and unit load connections to the motor. If there is a shorted SCR in the soft starter and/or open load, the start will be aborted and a shorted SCR or open load fault will be indicated. This prevents damage from phase imbalance.

Push to Test

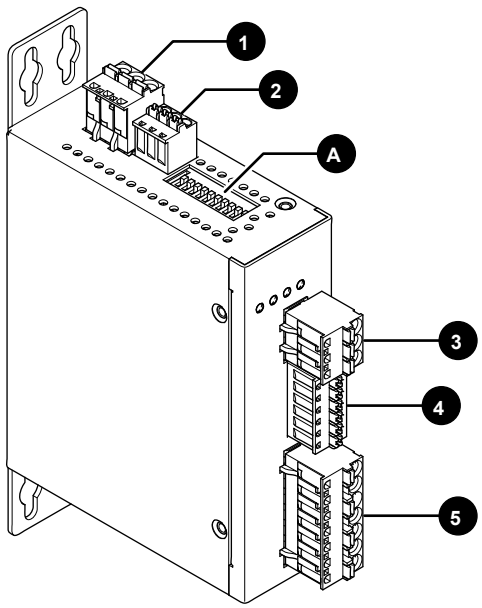
The soft starter with control wiring can be tested for fault conditions by using the Push to Test function. Hold down the **Reset/Test button** for 7 s to activate the fault Aux (97, 98) and shut down the soft starter. To clear, either push the **Reset/Test button** or cycle control power to the device.

Table 11. SMC-3 Troubleshooting Guide

Problem	Possible Cause	Solution
Pre-start Motor fails to start	LED Off	Check control power connections and power source to the SMC-3.
	LED On	Check Isolation Contactor for proper closure.
		Check presence of Line Power.
	LED Flashing 1 - Overload	Reset Overload.
	2 - Over-temperature	Trio on Over Temperature. Allow time for unit to cool. Check duty cycle against Selection Guide information.
	3 - Phase Reversal	Check for proper phase rotation of line power.
	4 - Phase Loss/Open Load	Check Line and Load connections to SMC-3, contactors and motor. confirm that 3:phase is present.
	5 - Phase Imbalance	Check line current present in each phase. (Unit will trip if imbalance is >50%.)
	6 - Shorted SCR	Perform continuity check across the power poles (L 1-T1, L2-T2, L3-T3). Remove Line and Load connections before taking measurements. Measurements should exceed 1 Ok for Qood power pole.
Motor attempts to start but aborts before Up-to-Speed	LED Off	Check control power connections and power source to the SMC-3.
	LED On	Check Isolation Contactor for proper closure.
		Check presence of Line Power.
	LED Flashing 1 - Overload	Reset Overload.
	2 - Over-temperature	Trio on Over Temperature. Allow time for unit to cool. Check duty cycle against Selection Guide information.
	4 - Phase Loss/Open Load	Check Line and Load connections to SMC-3, contactors and motor. confirm that 3:phase is present.
	5 - Phase Imbalance	Check line current present in each phase. (Unit will trip if imbalance is >50%.)
	6 - Shorted SCR	Perform continuity check across the power poles (L 1-T1, L2-T2, L3-T3). Remove Line and Load connections before taking measurements. Measurements should exceed 1 Ok for Qood power pole.

Problem	Possible Cause	Solution
Motor stops inadvertently and fails to start	LED Off	Check control power connections and power source to the SMC-3.
	LED On	Check Isolation Contactor for proper closure.
		Check presence of Line Power.
	LED Flashing 1 - Overload	Reset Overload.
	2 - Over-temperature	Trio on Over Temperature. Allow time for unit to cool. Check duty cycle against Selection Guide information.
	4 - Phase Loss/Open Load	Check Line and Load connections to SMC-3, contactors and motor. confirm that 3:phase is present.
	5 - Phase Imbalance	Check line current present in each phase. (Unit will trip if imbalance is >50%.)

5.3.4.3 Power Meter (KE4)



1. DC power input
2. CAN open
3. Relay output (x3)
4. Current sensor/Transducer input (x3)
5. Measurement voltage input

A, Dip-switches, use for settings:

Table 12. Dip settings

Dip no:	1	2	3	4	5	6	7	8	9	10
ON				X		X	X			X
OFF	X	X	X		X			X	X	

Power Meter

The Power Meter responds to the incoming phase sequence supplied to the machine, it automatically pre-determines which one of the two contactors KE1_1 or KE1_2 that should be used upon starting the electric engine. This feature enables constant motor rotation regardless of the incoming phase sequence.

The Power Meter continuously reads the voltage (V), current (A) and frequency (Hz) the machine is exposed to. All values are presented in the Remote Control under Machine Status.

This Power Meter protects the machine from under-/over-voltage by generating an error message at pre-set minimum and maximum values:

Table 13. Voltage

Too low		Too high	
50 Hz 400 V	Voltage > 360 V	50 Hz 400 V	Voltage < 430 V
60 Hz 480 V	Voltage > 440 V	60 Hz 480 V	Voltage < 510 V

Table 14. Data

Power input	+12 ~ 48 V DC
Power consumption	2 W
Measurement voltage	10 ~ 500 V
Measurement current/Max. current	60 A
Measurement frequency	50/60 Hz
Communication	CANopen
Functional temperature	-20 ~ +70°C

5.3.4.4 24 VCD Power Supply (T1)

Diagnostics are easy due to the dry DC-ok contact, a green DC-ok LED and red overload LED.

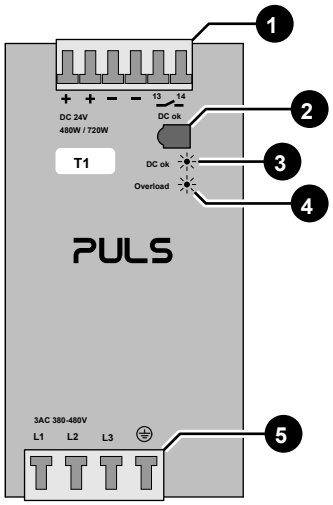


Figure 5.3.4.4-1. 24 VCD Power Supply (T1)

1. Output Terminals
2. Output voltage potentiometer
3. DC - ok lamp (green)
4. Overload lamp (red)
5. Input Terminals

DC-OK RELAY CONTACT:

This feature monitors the output voltage, which is produced by the power supply itself. The DC-ok lamp and DC-ok contact function are synchronized.

Table 15. DC-OK RELAY CONTACT

Contact closes	As soon as the output voltage reaches the adjusted output voltage.
Contact opens	As soon as the output voltage dips more than 10% below the adjusted output voltage. Short dips will be extended to a signal length of 250ms. Dips shorter than 1ms will be ignored.
Contact re-closes	As soon as the output voltage exceeds 90% of the adjusted voltage.

NOTE!

The DC-ok feature requires that the output voltage reaches the nominal (=adjusted) level after turn-on in order to function according to specification. If this level cannot be achieved, the overload lamp will be on and the DC-ok contact will be open. The overload signal will only shut off as soon as the adjusted voltage is reached.

Table 16. 24VDC power supply LED Description

	Overload lamp (red)	DC- ok lamp (green)	DC- ok relay contact
Normal mode	OFF	ON	Closed
Bonus Power mode	OFF	ON	Closed
Overload (V-out < 90%)	ON	OFF	Open

	Overload lamp (red)	DC- ok lamp (green)	DC- ok relay contact
Short-circuit (V-out = ca 0V)	ON	OFF	Open
Over-temperature	ON	OFF	Open
No input power	OFF	OFF	Open

5.3.5 Radio & Control Modules

5.3.5.1 Radio Receiver Module KE5

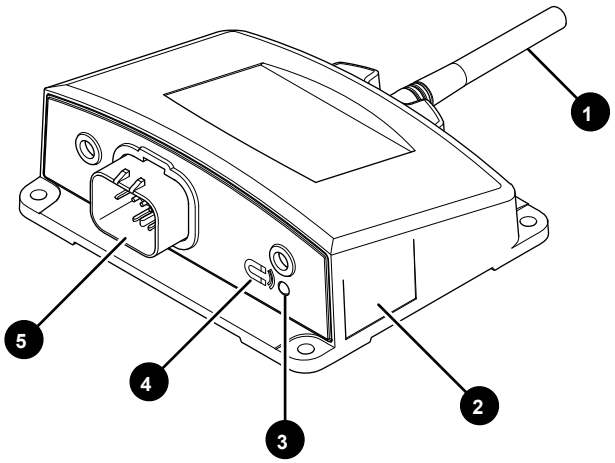


Figure 5.3.5.1-1. Radio Receiver Module KE5

1. External antenna
2. Product label
3. Status LED
4. Magnet symbol (for pairing)
5. Amp-seal connector

Pair the receiver with the remote control via the information center on the remote control. Refer to: Operator's manual Remote Control.

Operate the receiver via remote control or cable control. Use the cable control as back-up.

Table 17. Receiver specifications

Item	Technical data
Supply Voltage	12/24 VDC
Functional Temperature	-25°C - +70°C
Current consumption	<200 mA
Range	<100 m (open ground)
Fuse	External fuse 10 A
Connector type	Amp-seal 14 pin
Digital inputs	Vin Manual, LOOP_IN
Radio frequency bands	2,4 GHz
CAN bus	CAN open and Safety CAN

Table 18. LED indications

Status LED	Indicating
OFF	No power supply
RED continuous	Major error
RED fast flashing	Minor error
RED slow flashing	Power supplied - no applications
ORANGE continuous	Refuse link with transmitter
ORANGE fast flashing	Paring pending

Status LED	Indicating
ORANDE slow flashing	Paring
GREEN continuous	Power supplied - No link to transmitter and no CAN communication
GREEN fast flashing	Linked with transmitter
GREEN slow flashing	Power supplied - No link to transmitter CAN in functional mode
GREEN + ORANGE alternating	Linked over BLE to diagnostic tool

Table 19. Pin-out

Pin	Signal	Description
1	Vin remote	Power supply 12/24 VDC (use external fuse 10 A)
2	LOOP IN	Safety classified loop input 9-36 VDC. Closed when transmitter is switched on and radio link established. Max. load 6 A. Requires common ground as for Pin 1.
3	+CAB	Supply voltage for transmitter tether control. Connects to Pin 2 on the transmitter side.
4	GND	Ground for transmitter tether control. Connects to Pin 3 on the transmitter side.
5	LOOP OUT	Safety classified loop output. Closed when transmitter is switched on and radio link established. Max. load 6 A. Requires common ground as for Pin 1.
6	GND	Ground
7	CAN1_H	Can-open/Safety CAN
8	CABCAN_H	Serial communication for tether control. Connects to Pin 4 on the transmitter side.
9	CABCAN_L	Serial communication for tether control. Connects to Pin 5 on the transmitter side.
10	Vin Manual	Input for enabling manual override, typically from levers on the hydraulic valve block. When this input goes high, Pin 12 & 14 goes high and the safety loop is closed (Pin 2 & 5).
11	CAN1_L	Can-open/Safety CAN
12	ACT_MOV	High when analog functions (e.g. joysticks, potentiometers) on the transmitter are activated. Max. load 2 A.
13	GND	Ground
14	STOP_OUT	High when transmitter is switched on and radio link established. Max. load 2 A.

5.3.5.2 Safety PLC Master KE1

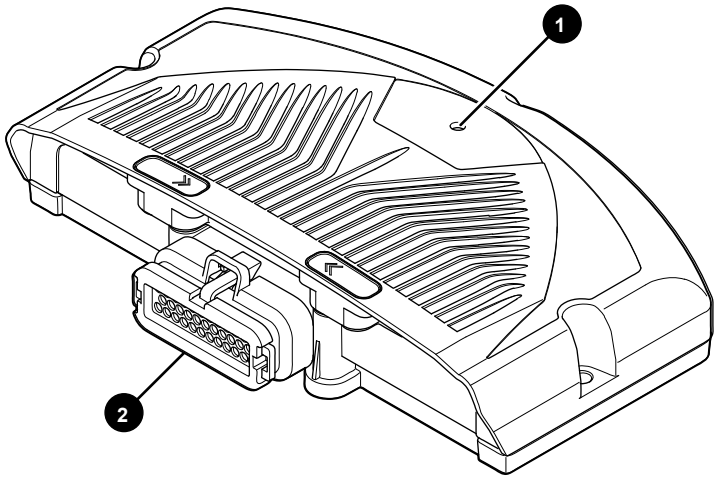


Figure 5.3.5.2-1. Safety PLC Master KE1 EPEC SC52

1. LED indicator
2. Connector

Table 20. Technical data

Supply voltage	12/24 VDC
Functional temperature	-40°C - +85°C
Diagnostics	Signal LED (green/red/blue)

Analog input protection

Diagnostics

Analog inputs are protected against over current. It is automatically included when the MultiTool configures the pins to current mode (mA). In case of over current the input is changed to voltage mode.

– Three color **LED indicator** (green/red/blue)
– Internal temperature measurement for PCB and processor area
– Monitoring of supply voltage pins
– HW watchdog
– Firmware error log
– Network monitoring
– CAN diagnostics

Table 21. Green, blue and red LED indicate different operating conditions according to the following table:

State	Green LED	Red LED	Blue LED	Implemented by	Explanation
Power off	-	-	-	-	No supply voltage
Power on and no SW running	-	ON	-	HW	Supply voltage is on, software is not running.
Power on and SW at init phase with no errors	ON	-	-	Boot/Firmware	Boot/Firmware is at init phase.
No application	5 Hz	-	-	Firmware	Firmware is running, no PLCopen application
Application stopped	ON	-	-	Firmware	Application is stopped. Depending on the application I/O configuration, firmware might diagnose this as an error situation, which leads to the red LED to turn ON.
Fatal error	-	ON	-	Boot/Firmware /HW	Control unit boot-up failed or a critical error while running.

State	Green LED	Red LED	Blue LED	Implemented by	Explanation
Update	Blinks alternately with red LED	Blinks alternately with green LED	-	Boot	After firmware update boot-up, during the installation phase, red and green LEDs are flashed alternately.
Update Successful	ON	-	ON	Boot	After new firmware is successfully installed, green and blue LEDs are set ON. Reboot is required.
Erasing	ON	ON	-	Boot	During new firmware installation, LED is yellow when downloaded firmware is being erased
Application init	ON	-	-	Application	LED is continuously on also during the initialization: starting from power on until the application is running and the I/O / CAN initializations are done.
ApplicationOk + No Safe Operational	-	-	2 Hz	Application	Application is running and the system is OK and in safe state (safety switches are open - no voltage is provided to outputs)
ApplicationOk + Safe Operational	2 Hz	-	-	Application	Application is running and the system is OK and in safe operational state (safety switches are closed)
Application Error (system not OK)	-	2 Hz	-	Application	Application error. The system is not OK.
Application custom control	Application specific	Application specific	Application specific	Application	Application can override code template's LED control by application specific implementation

5.3.5.3 Main Body PLC Slave KE2/Tower PLC Slave KE3

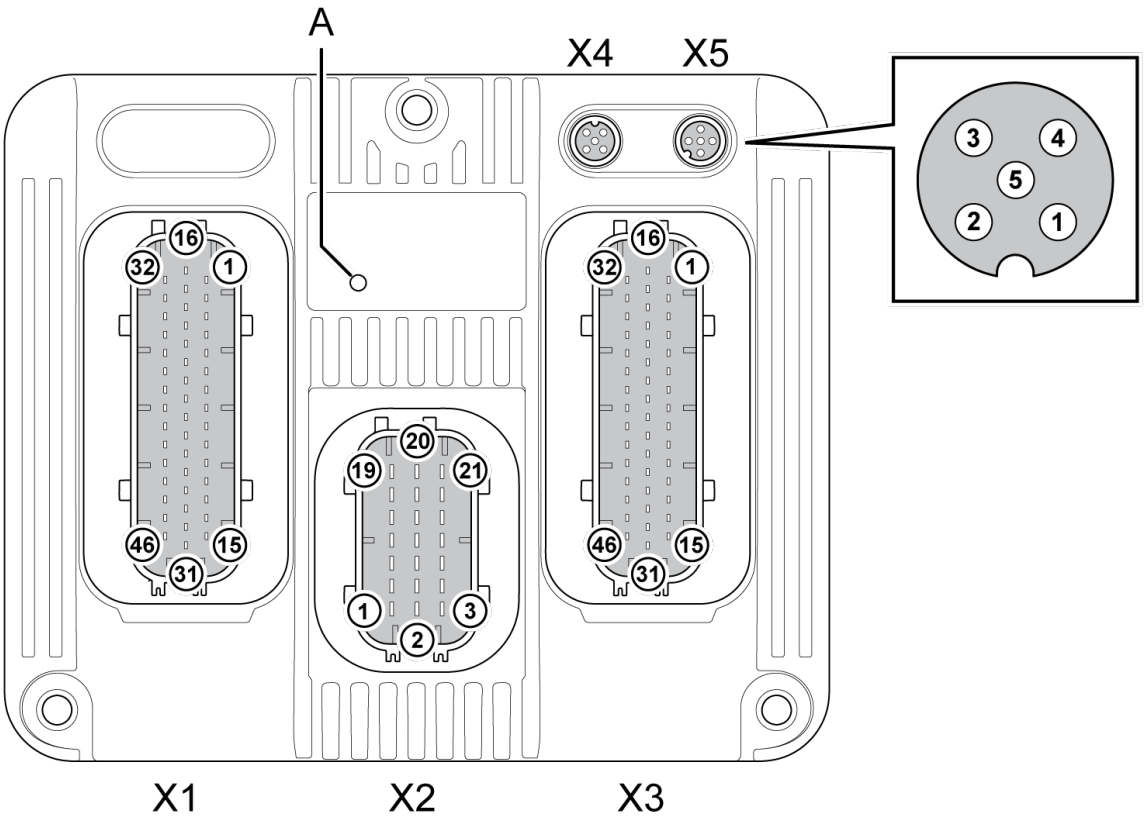


Figure 5.3.5.3-1. PLC Slave KE2/KE3 EPEC GL84

A. LED indicator

The Main Body PLC Slave (KE2) manages the functions in the body/chassis.

The Tower PLC Slave (KE3) manages the communication for the functions in/on the turret.

Table 22. Technical data

Processor	32 bit CPU
	200 MHz
Supply voltage	12/24 VDC
Functional temperature	-40°C - +85°C
Diagnostics	Signal LED (green/red/blue)
	Supply voltage
	Unit temperature
	REF voltage monitoring
	Internal voltage monitoring

A green, blue or red LED (A) indicate different functional conditions:

Table 23. Functional conditions

State	Green LED	Blue LED	Red LED	Implemented by	Explanation
Power OFF	-	-	-	-	No supply voltage
Power ON and no SW running	-	-	ON	HW	Supply voltage is on, software is not running
Power ON and SW at init phase with no errors	ON	-	-	Boot/Firmware	Boot/Firmware is in init phase
Pre-functional state	200 ms ON, 200 ms OFF	-	-	Firmware	CAN-open slave pre-functional state
Functional state	ON	-	-	Firmware	CAN-open slave functional state
Stopped state	200 ms ON, 200 ms OFF	-	-	Firmware	CAN-open stopped state
Fatal error	-	-	ON	Boot/Firmware/HW	Control unit boot-up failed or a critical error while running
Update	Blinks alternately with Red LED	-	Blinks alternately with Green LED	Boot	After firmware update boot-up, during the installation phase, red and green LEDs are flashed alternately.
Update complete	-	ON	-	Boot	Firmware update is complete and re-boot is required.

5.4 Slewing System

5.4.1 Slewing System

The slewing system converts axial movement into rotary torque, allowing the rotation of greater loads with more accuracy, while also enabling geared torque amplification. The slewing drive does this by meshing the grooves of a horizontal screw with the teeth of a gear placed perpendicular to the screw. The gear rotates as the screw turns, and the screw's axial movement force is then transmitted to the radial gear as magnified output torque.

The **Slew Motor** is fixed to the Turret with a **sprocket** in the **Slewing Gear Ring** which is fixed to the carriage frame.

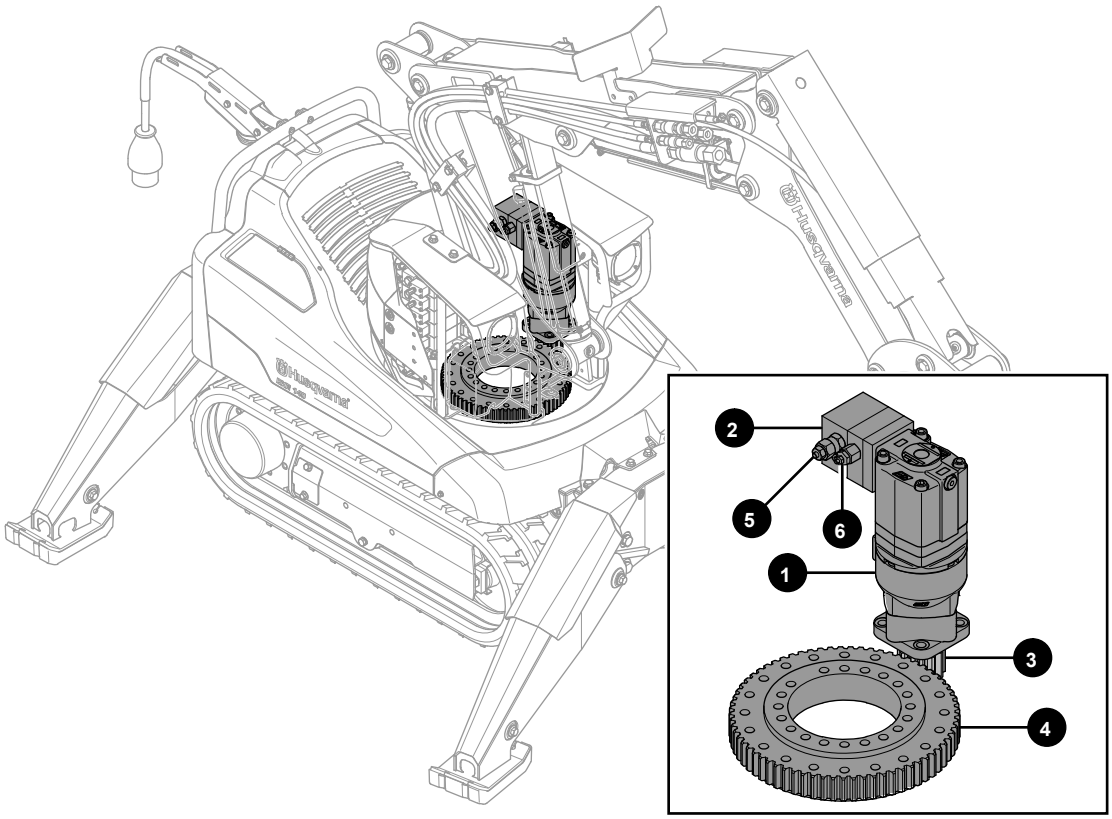


Figure 5.4.1-1. Slewing System

1. Slew Motor
2. Valve Block
3. Slew Motor Sprocket
4. Slewing Ring
5. Counterbalance Valve
6. Pressure Relief Valve

5.4.2 Slewing Ring

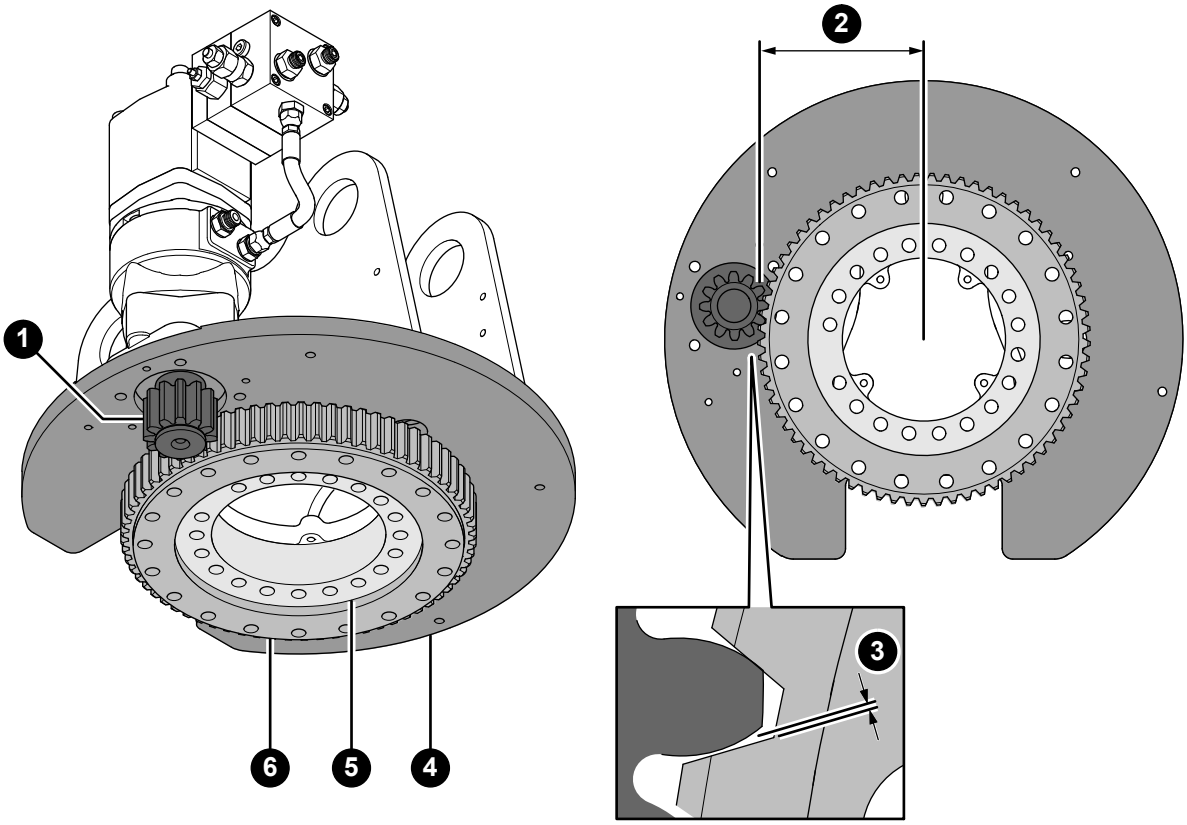


Figure 5.4.2-1. Slewing ring

1. Slew Motor sprocket
2. Minimum Slewing Ring radius (three gears with light green marking)
3. Gear backlash=0.2mm*
4. Turret base plate with attachment for Slew Motor with sprocket
5. Slewing Ring bearings with turret fasteners
6. Slewing Gear Ring with fasteners (attached to carriage)

*Incorrect gear backlash affects the precision when turning the turret. Refer to Section 10.6.4.1 “*Adjust Gear Backlash*”, page 164 on how to adjust the backlash.

5.4.3 Slewing Motor

The **Slew Motor** is a rotary motor with an integrated parking brake. The motor carries a valve block containing both load-holding valves (holding back load during rotation) and shock valves (safety valve against pressure shocks).

The motor also has a separate drain that goes directly to the hydraulic tank. As the motor does not use gear oil the hydraulic oil will act lubricant for the internal moving parts. This lubricating oil will be transported away via the drain.

The **Slew Motor** is fixed to the Turret with a **sprocket** in the **Slewing Gear Ring** which is fixed to the carriage frame.

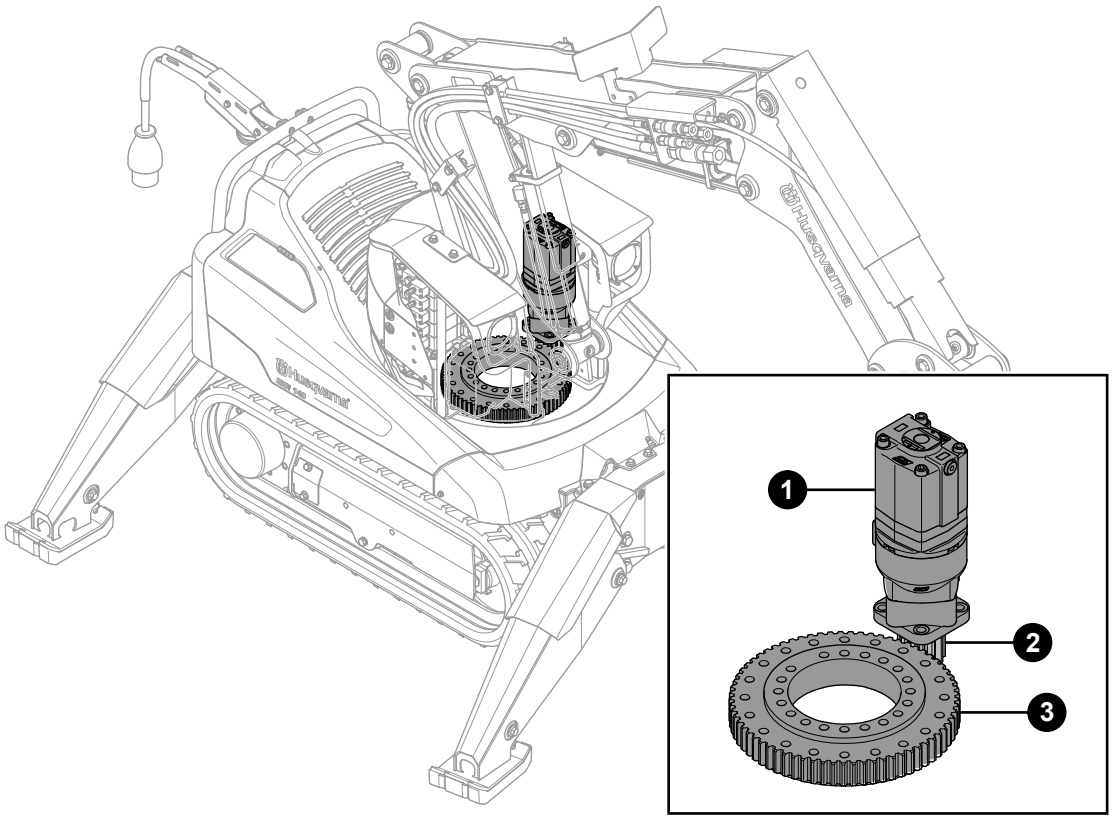


Figure 5.4.3-1. Slew Motor

1. Slew Motor
2. Slew Motor Sprocket
3. Slewing Ring

5.5 Outriggers

5.5.1 Outriggers

The main function of the Outriggers is to give the machine stability. Always use the Outriggers when working on/with the machine.

Increased main pressure (250 bar) is used when the Outriggers are pushed down. 130 bar is used to raise the Outriggers. The track tension system will be re-charged with 130 bar everytime the Outriggers are raised.

The Outriggers located in each corner of the machine are controlled independently via the Remote Control to supply maximum stability. All four Outriggers have the same design comprising attachment to the undercarriage, joints, cylinders and hydraulic lines.

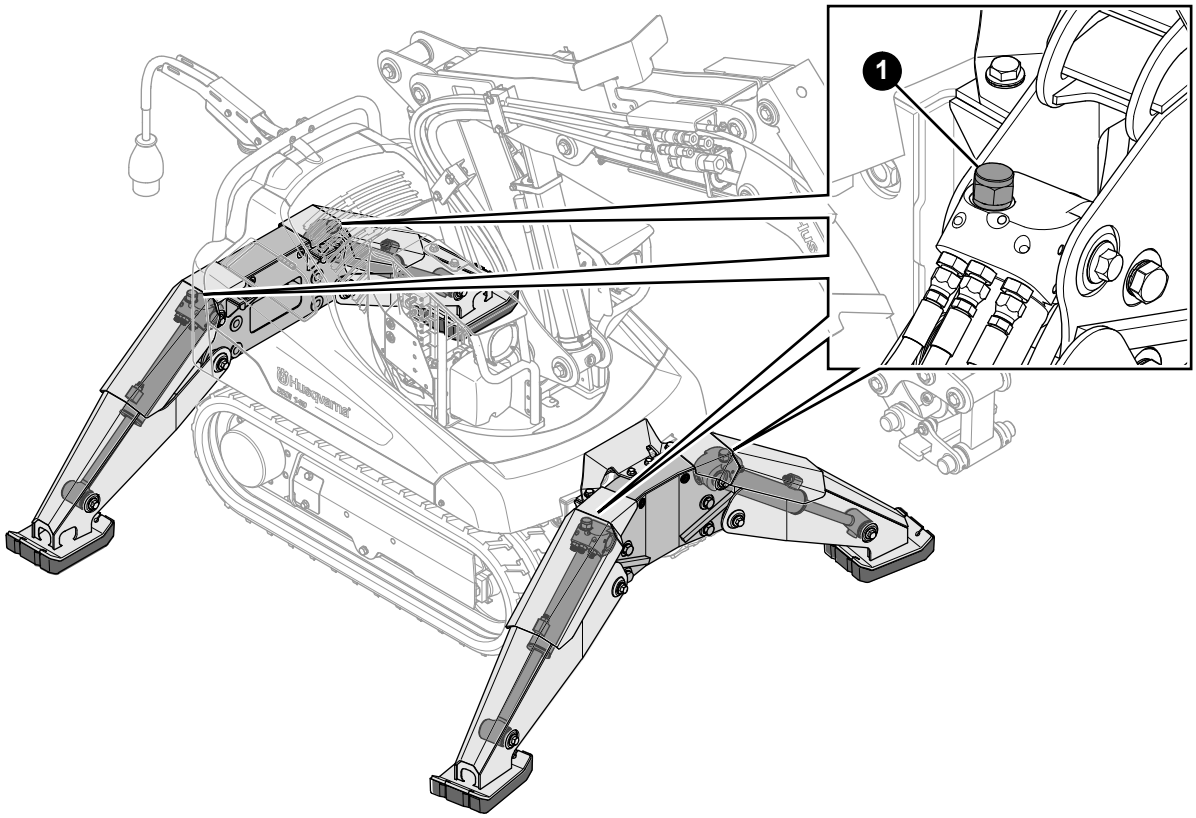


Figure 5.5.1-1. Outrigger Cylinder Safety Valve

1. The Outrigger Cylinder Safety Valve prevents the cylinder from losing pressure due to hose failure.

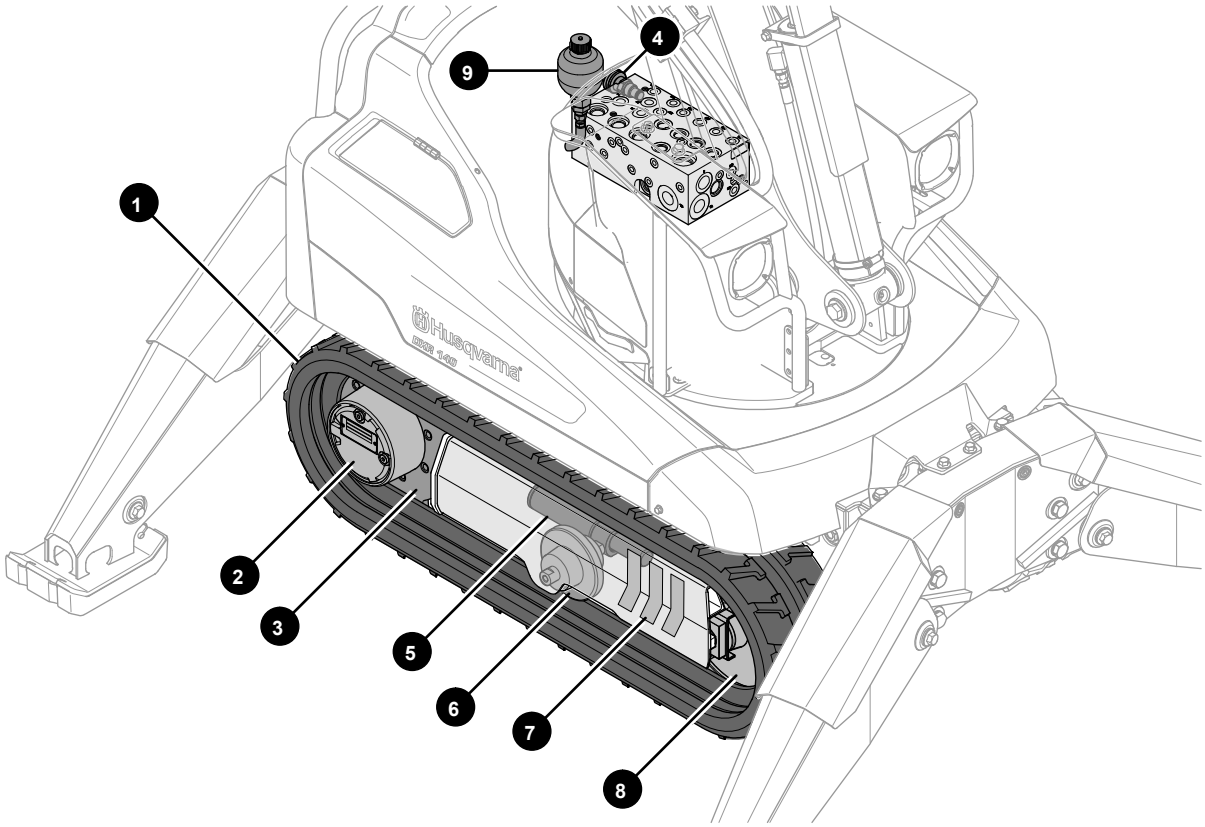
5.6 Traction System

The traction units are located on each side of the undercarriage. They each have an independent **Hydraulic Drive Motor** for short distance driving and positioning of the machine. The **Hydraulic Drive Motor** is supplied with oil from a proportional controlled valve. The **Hydraulic Drive Motor** is fitted with both static and dynamic braking.

The traction units can be controlled in pairs but also individually via the joysticks.

The **Rubber/Steel Track**s are tensioned by a hydraulic belt tensioning system loaded up with 130 bar pressure via the four Outrigger Cylinders.

The **system accumulator** acts as damping springs of the tracks, the accumulator is preloaded with a certain gas pressure. The accumulator consists of 50% hydraulic oil and 50% nitrogen. To evacuate the integrated boost pressure open the manual bleeding valve - the oil is led back to the tank.



1. Rubber/Steel Track
2. Hydraulic Drive Motor
3. Sprocket
4. Tensioning Release Valve
5. Tensioning Cylinder
6. Track Roller
7. Forward Direction Indication
8. Rubber Track Tension Idler (pushed forward by the Tensioning Cylinder or manual screw)
9. System Accumulator

5.7 Remote Control

5.7.1 HMI Factory Settings Menu

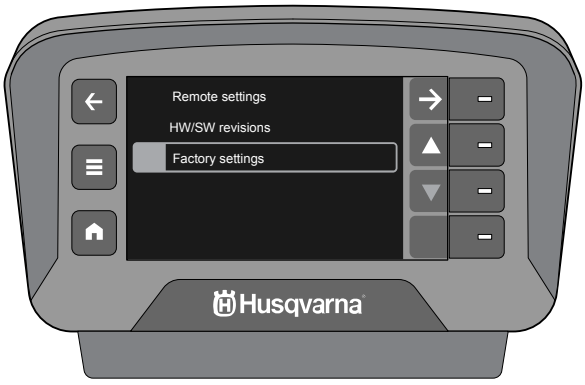
5.7.1.1 HMI Factory Settings Menu

General information

All hydraulic features have preprogrammed default values found in the machine's control modules and its software.

The cylindrical functions parameters affect the driving feel of the machine and can, and should be further adjusted/trimmed by factory or service personnel when needed.

1.1 HMI Factory Settings Menu



Select "System" in the Remote Control display and then select "Factory settings".

Enter the 6 digit service pin code 134213 for the "Factory settings" menu.

1.2 Calibrate in service mode

The following factory settings can be calibrated and adjusted. Adjusting the factory setting values will affect the maximum plus and minus values in the "Calibrate hydraulics" values in the "Controls" menu used by the operator.

Table 24. Settings for hydraulic functions

Automatic (pressure and valves calibration)	Oil flow
Manual (tools)	Reset all to default

Table 25. Automatic calibration and Manual settings

Automatic	Pressure and valves	Calibration of hydraulic system pressure & functions min current value
	Pressure	Calibration of hydraulic system pressure
Manual settings is used to obtain optimal driving experience and functions, It is also used to synchronize left and right track		
Manual	Parallel, C1-C2	Settings for parallel movement at high/low speed
	Cylinder 1-5	Settings for min/max current & RAMP
	Track Left/Right	Synchronize left and right track
	Rotation	Settings for min/max current & RAMP
	Outriggers	
	Tool	
	Extra 1-2	

Table 26. Oil Flow, Adjusts the parameters for the tool oil flow

Oil Flow	Calibration of the tool oil flow

1.3 Reset all to default

Restore all the hydraulic parameters and basic values in the control modules by erasing the factory and operator settings.

Select "Reset all to default"

– This will delete all calibrated settings if you select the tick-mark and confirm

After reset you need to perform the different calibration steps under the "Calibrate in service mode" menu.

1. Automatic adjustment (Pressure and Valves)

2. Oil Flow calibration

3. Manual Trim/Adjust:

– Rubber tracks (synchronize left and right track)
– Hydraulic functions Parallel Movement (C1 and C2)
– Boom cylinders (only if required).

5.7.1.2 Set the voltage and frequency in the Remote Control

Set the voltage (400/460VAC) in the Remote Control to ensure that the software knows which warning levels to apply.

Set the voltage

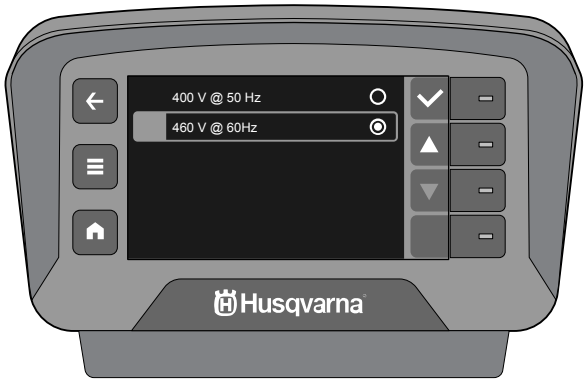
1. Select "System" in the Remote Control display.

2. Select "Factory settings".

3. Enter the service pin code: 134213.

4. Select "Set voltage" in the factory menu.

5. Select "400 V @ 50Hz" or "460 V @ 60Hz".



5.7.1.3 Automatic Adjustment

Function:

The automatic adjustment function adjusts all of the machine's minimum currents for the hydraulic functions and calibrates the machine's hydraulic pressure. It does not include the track synchronization (needs to be done separately) or the flow calibration for the Tool.

Two levels are available:

– Pressure and Valves (calibrate pressures and adjust minimum currents)
– Pressure (only calibrate pressures)

Table 27. Automatic adjustment Pressure

18%	50 bar - arm
27%	100 bar - arm
36%	150 bar - arm
45%	200 bar - arm
54%	250 bar - arm
63%	130 bar - chassis
72%	180 bar - chassi
81%	200 bar - chassis
90%	250 bar - chassis

Perform Automatic adjustment:

– 1. Heat the machine's hydraulic oil to about 40-50°C. Cold oil can easily result in oscillation which causes Auto Adjust to fail. Heat up the oil as a possible solution. (Drive the caterpillar in the air or lift the outriggers up/down.)
– 2. Heat the regulators in the control modules. Run each hydraulic function approx. 10s.

  NOTE: In order to maintain optimal regulation of the regulators during the calibration phase, the machine should not be switched off between the heating phase and the Automatic adjustment/calibration itself.
– 3. Lower all the outriggers.
– 4. Disconnect the hydraulic tool (hammer/crusher/grappler).
– 5. Move and position the right joystick in the maximum forward position until the automatic adjustment/calibration process shows "complete".

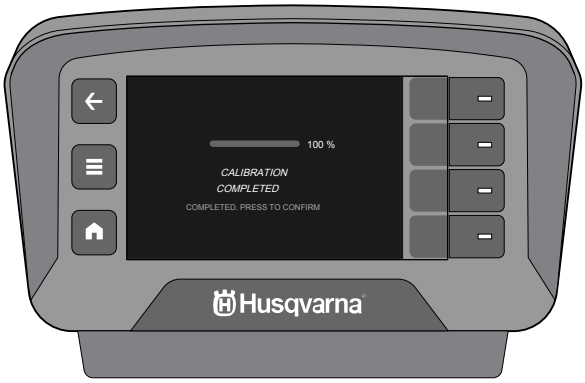


Table 28. Error messages during procedure

Error Message	Possible cause	Remedy
Calibration aborted.	Joystick not fully positioned in maximum forward position during the entire calibration process.	Redo the calibration procedure.
Calibration failed.	Cold oil, and or cold controller module regulators. Defect proportional pressure regulator.	Heat up the oil, and or controller module regulators and redo the calibration procedure. Inspect the proportional pressure regulator.

5.7.1.4 Oil Flow Calibration

Calibrate the tool oil flow through its valve section to ensure correct and optimized flow for the different standard tools and Custom tool 1-3. The calibration is carried out in three flow level steps (min, mid & max), adjust the displayed current values to obtain the correct flow at the flow meter.

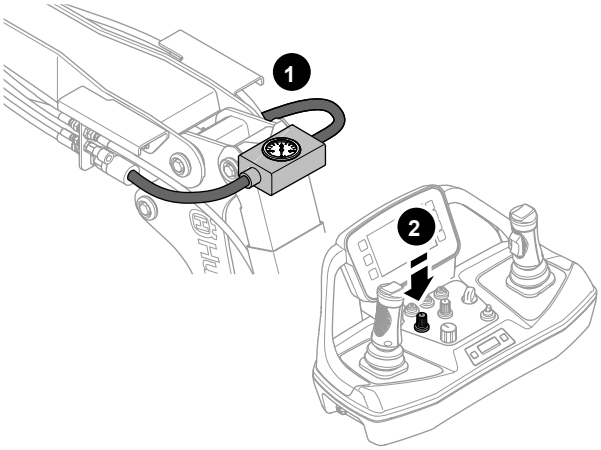
Recommended tool: flow meter

Go to the "System & Factory settings" menu, "Calibrate in service mode", "Oil flow."

Mid & max level calibration

Function:

The "Oil flow" identifies which current value is needed to achieve the upper flow levels.



Procedure:

- 1. Connect the flow meter to the tool hydraulic quick couplings
- 2. Set the tool speed potentiometer to maximum position (full clockwise)
- 3. Select "Oil flow" in the menu

Table 29. Tuning table

Step	Flow directions	Flow	Activate flow: Left joystick button
1	Select B>A	45 l/min	Right
2	Select A>B	45 l/min	Left
3	Select B>A	15 l/min	Right
4	Select A>B	15 l/min	Left

- 4. Select flow directions according to Table

- 5. Start the machine

- 6. Carry out the "Oil flow" calibration

- Activate the machine: left button (1) on the right joystick and in direct connection, continuously activate the, for (B>A) Right button and for (A>B) Left button (2) on the left joystick until the calibration step is completed.

- Select + or - until the value (l/min) shown in the Tuning table below is shown on the flow meter

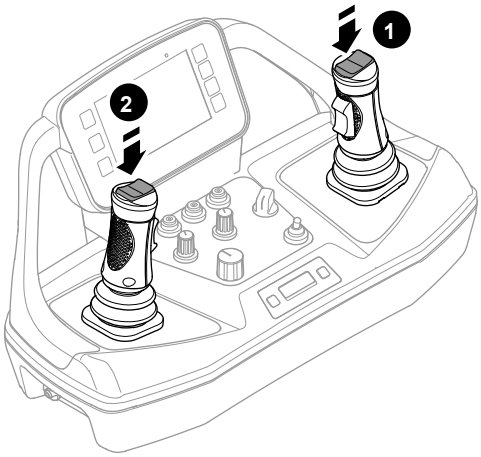


Figure 5.7.1.4-4. Activate the machine and tool

Min level calibration

Go to the "Factory settings" menu, "Calibrate in service mode", "manual, Tool."

Function:

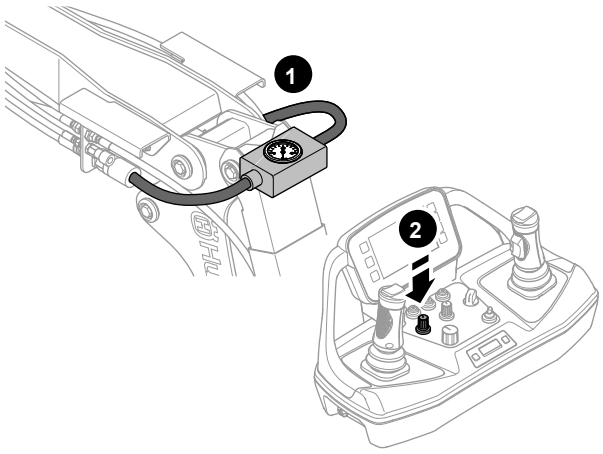
This calibration step identifies which current value is required to achieve 2 l/min (lowest flow).

Maximum current value does not need to be adjusted.

Procedure:

- 1. Connect the flow meter to the tool hydraulic quick couplings.

–



- 2. Set the tool speed potentiometer to minimum position (full counter clockwise)
- 3. Select Tool Current (Min) in the "Manual" menu

–

4. Carry out the lowest flow calibration

- Activate the machine: left button (1) on the right joystick and in direct connection, continuously activate the right/left button (2) on the left joystick until the calibration step is completed

Select + or - until approx 2 l/m is shown on the flow meter

- For B>A press Right button on joystick
- For A>B press Left button on joystick

To complete the calibration in both flow directions repeat the step above twice.

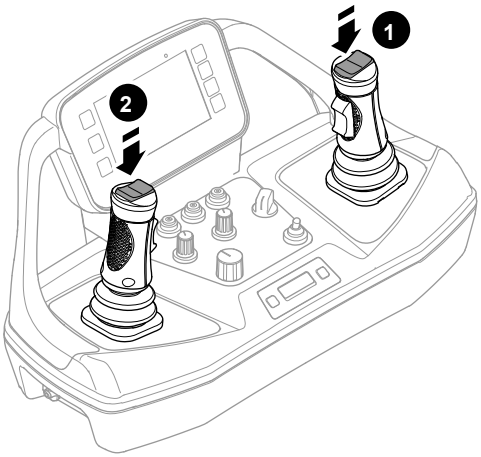


Figure 5.7.1.4-7. Activate the machine and tool

- 5. Select "Back" on the left side of the menu to return to main menu.

5.7.1.5 Individual trimming - C1-C5/Rotation/Outriggers/Extra 1&2

Maximum currents: These generally do not need to be changed. (However, this does not apply to maximum currents of the tracks and rotation which may be required to change). The goal is to find maximum speed at a maximum joystick stroke.

Minimum current: The goal is to find the optimum/desirable (minimum) current value (fixed value) required to achieve a hydraulic movement with as little joystick movement as possible.

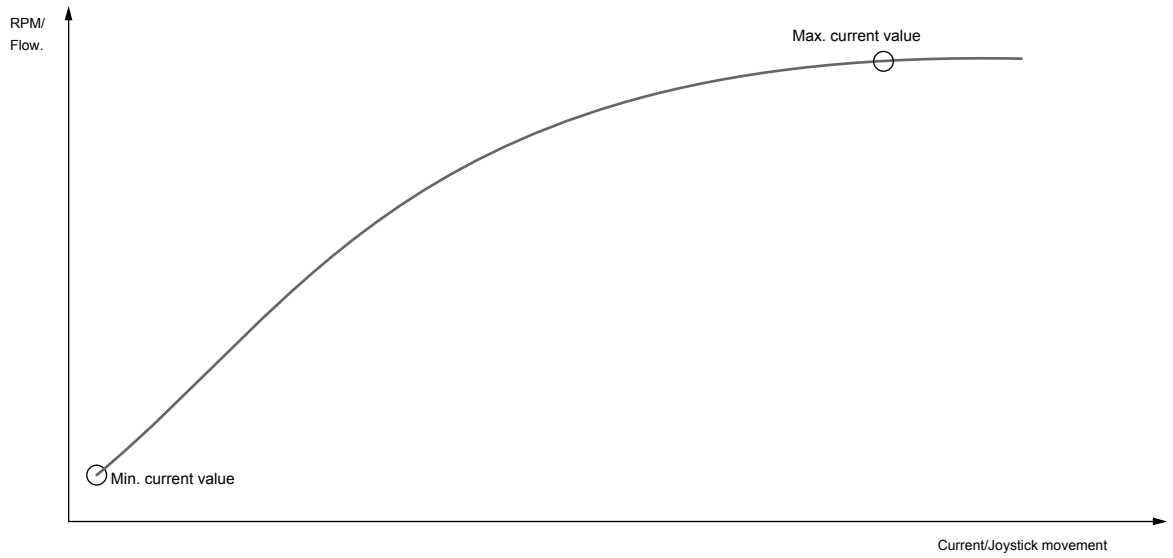
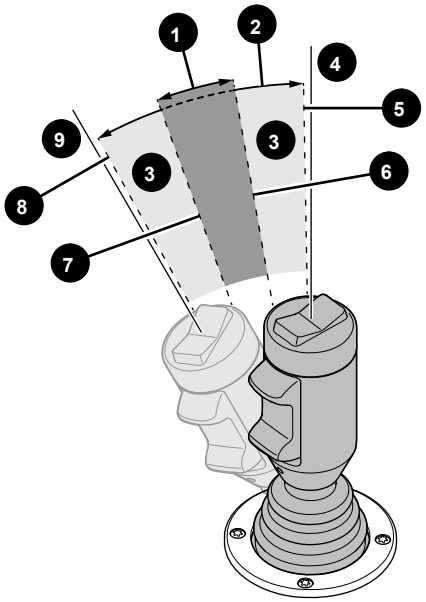
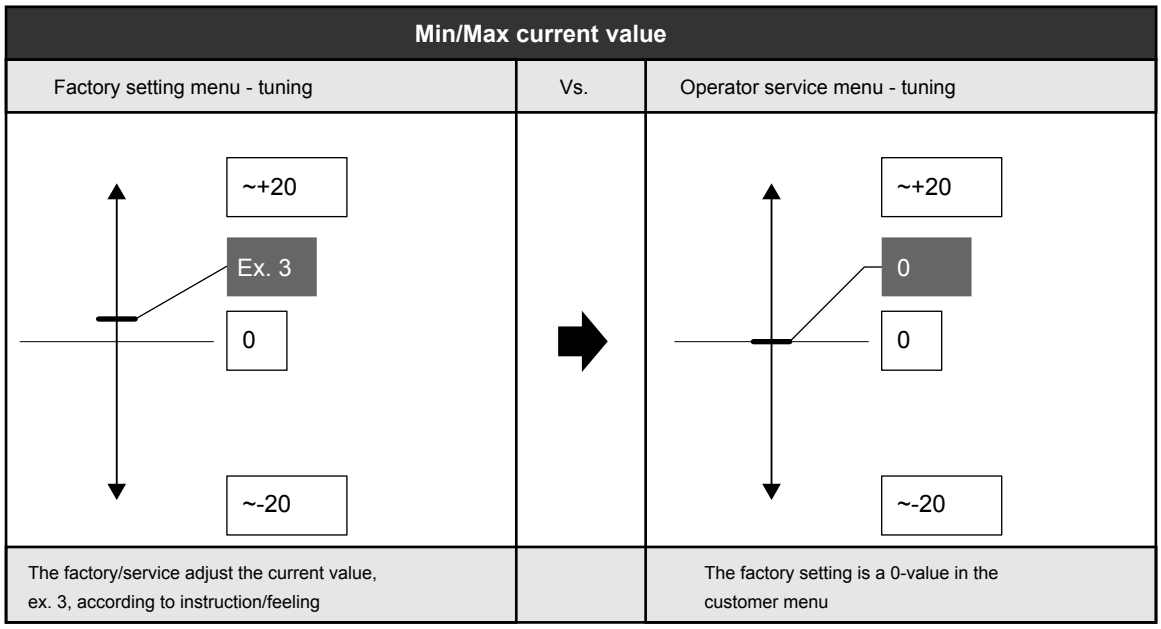


Table 30. Common faults when adjusting:

Trimming action	Machine symptom	Trimming solution
A too high minimum value	Valve opens rapidly → Jerky start, this might mean that it is not possible to employ a function gently	Lower the value until the function react with as little joystick stroke as possible
A too low minimum value	Increased joystick deadband → delayed start of the function at the beginning of the joystick stroke	Increase the value until the function react with as little joystick stroke as possible
A too high maximum value	Valve maximum opening position is achieved more rapidly → impair the resolution of the joystick movement	Lower the value right until a decrease in maximum speed is noted
A too low maximum value	Valve does not open entirely → function cannot be run at maximum speed	Increase the value right until function no longer increases in speed



1. Poor resolution of joystick due to low active area
2. Good resolution on joystick thanks to large active area
3. Deadband
4. Joystick neutral position
5. Correct minimum current. Can sneak off but starts early on joystick movement
6. Incorrect minimum current. Too low value causes a delayed start of the movement
7. Incorrect maximum current. Too high value means that maximum speed is reached too early, before reaching the end position
8. Correct max current. Maximum speed when the joystick is in its end position
9. Joystick end position.



Regardless of whether the maximum/minimum values for the current remains according to the machine's preprogrammed default values or have been adjusted by factory/service personnel the value will always appear as a 0/default value in the service menu available to the operator.

Trim possibilities and procedure:

1. Default value: Is preprogrammed in the machine software
2. Factory setting: Factory & service personnel have the possibility to change the pre-set standard values.
   - All settings made in the customer settings will be erased if trimming is carried out in the factory settings
3. Operator setting: The operator has the option to adjust the machine's "operator values" on the basis of a scale where the default value is displayed as a 0-value.

5.7.1.6 Ramp up/down

The ramp adjusts the acceleration/deceleration of the drive.

– A high up-value means slow acceleration.
– A low up-value means quick acceleration.
– A high down-value means slow braking.
– A low down-value means quick braking.

5.7.1.7 Parallel Movement (C1/C2)

Function:

The parallel movement works as a synchronization between C1 and C2. It must first be done after adjustetment of C1 & C2 individually (if necessary).

Procedure:

Adjust parallel motion in both in & out under "Low / High Speed"

– Arm rising -> Reduce the value until the arm moves in parallel
– Arm sinking -> Increase the value until the arm moves in parallel

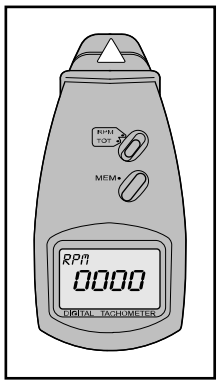
5.7.1.8 Tracks (forward and backwards)

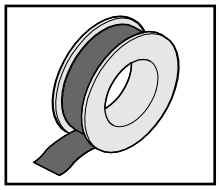
Function:

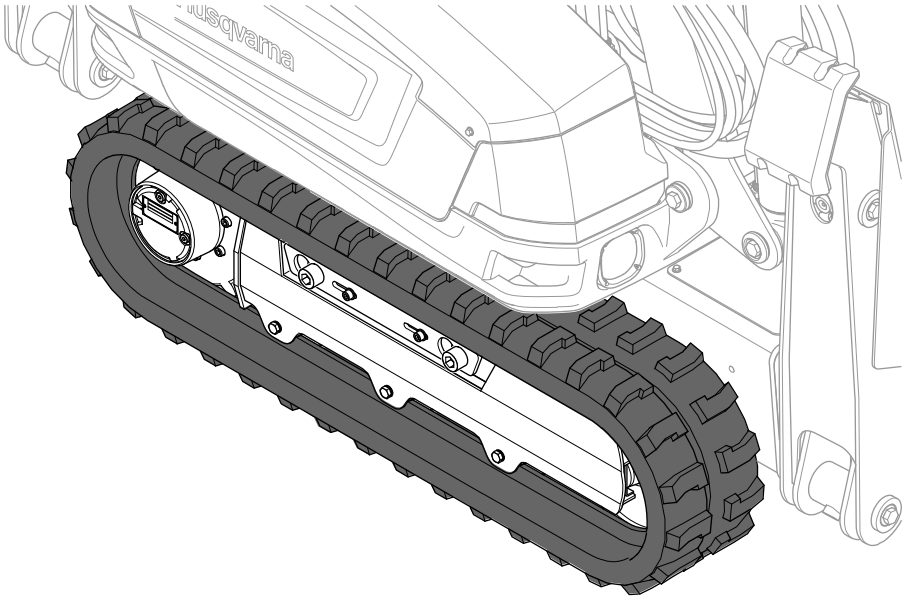
Max & min currents are adjusted to synchronize the tracks.

Recommended tool:

Optic/Tachometer







Max. current: (each track trimmed individually)

– 1. Lower the outriggers and apply the relevant measure equipment.
– 2. Apply maximum joystick stroke (max. rotation speed)
– 3. Increase the pre-installed current value until the maximum rotation speed is reached and no longer increases. Thereafter, the current value must be reduced until the track speed decreases - note the measured speed
– 4. Repeat step 2-3 on the second drive motor.
– 5. Lower the machine and check that the machine is moving straight at different speeds - left and right tracks are synchronized.

Min. current: (each track trimmed individually)

– 1. Lower the outriggers and apply the relevant measure equipment.
– 2. Set the slow motion potentiometer to min. (full counter clockwise).
– 3. Apply ~ 50% joystick stroke for the chosen track.
– 4. Adjust the preset current value until the track just moves, if the track rotates without adjusting the steering value, lower the value until the track rotates at the minimum speed.
– 5. Lower the machine and check that the machine moves straight at different speeds - left and right tracks are synchronized.

5.7.1.9 Rotation

Parameter to trim: Max & min currents

– Max. current: Adjust the current value so that it takes about 5s to rotate 180°. Tower rotation 180° CW & CCW (withdrawn arm without tool, moving start) 5 ± 0.5 s
– Min. current: Included in Auto Adjust

5.7.1.10 Boom pressure

Function:

The boom pressure limits the hydraulic pressure to cylinders on the arm system to between 150-200 bar which will lower the strength of the boom.

5.8 Sensors

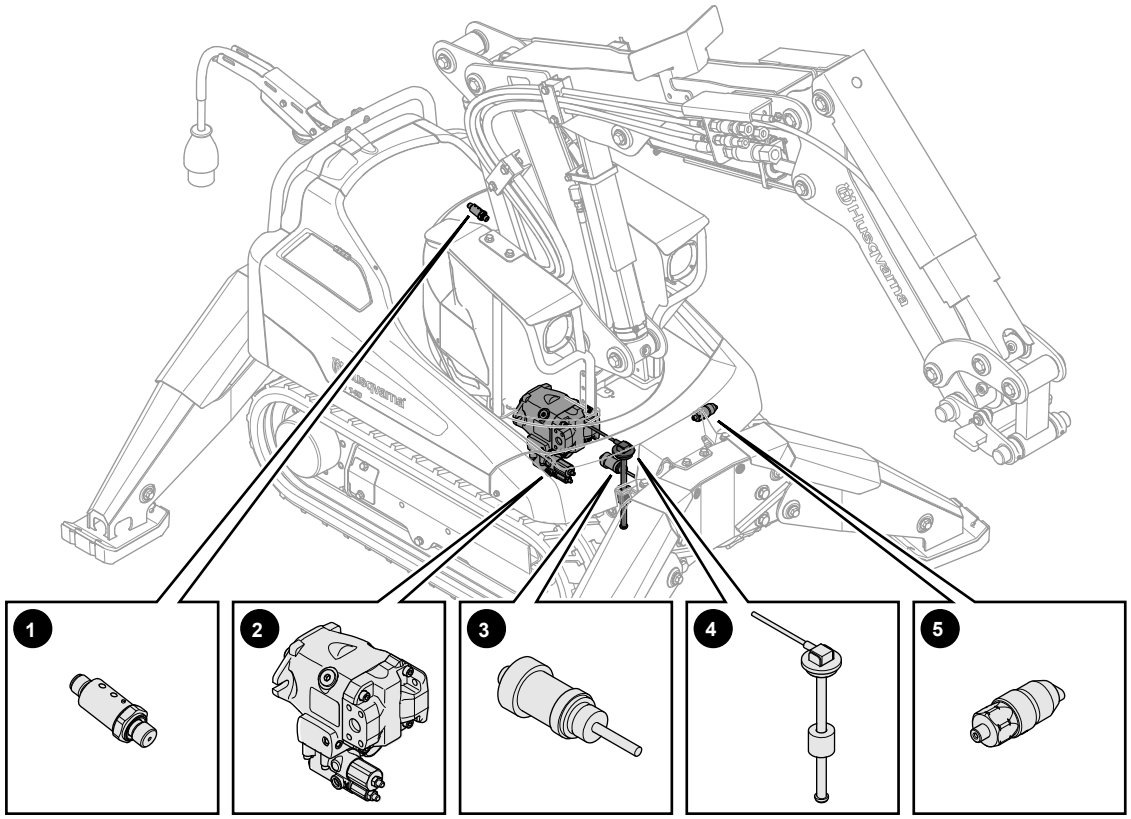


Figure 5.8-1. Hydraulic Sensors

1. Pressure Sensor (B1)
2. Pressure Flow Compensator (LS)
3. Temperature Sensor Hydraulic Oil (B2)
4. Oil Level Sensor (B3)
5. Pressure Guard Oil Filter (B5)

The **Pressure Sensor (1)** measures all the hydraulic pressure, 4-20mA 0-300 bar, in the machine on the pressure side (P). The sensor works as an input signal to the control module, and a pressure steering function against the pressure control valve as well as a trigger for some warning messages.

The Hydraulic Pump responds to imbalance detected by the **Pressure Flow Compensator (LS) (2)** whenever the control valve is altered. The LS pressure, 20 +/-1 bar, can manually be adjusted. The level of maximum pressure and increased load is PLC-controlled.

The LS pressure should be 20 ± 1 bar at rest.

The **Temperature Sensor Hydraulic Oil (3)** in the hydraulic tank has a measuring range of -50°C to +200°C (4-20mA). The machine's control module takes in the input from the sensor and then protects the machine's vital parts from cold and overheating. <-5°C, the machine enters a “limp mode” (only 50% of speed to cylinders etc. and no tool functionality) until the oil has warmed up. > 90°C, the machine enters a "limp mode" (only 50% of speed to cylinders etc. and no tool functionality) until the oil has cooled down to <80°C - the system is automatically reset.

The **Oil Level Sensor (4)** (0-190 Ω) indicates when the machine needs to be filled with hydraulic oil, checks what level is the min/max vs. Ω. The sensor also detects the maximum allowed oil level during the filling phase - the control module automatically turns off the filling pump when the maximum allowed oil level is reached.

The 5V **Pressure Guard Oil Filter (5)** is a N/O (normally open) sensor that indicates when the hydraulic return filter needs to be replaced - this occurs when the return pressure is ≥2 bar.

6.1 Function Test

Brake Functions

WARNING!

Be aware of risks.

Make sure no one is within the machine's risk area during test of the machine.

Check the drive brake's function by operating the machine on a slope.

– Release the Joysticks
  - The machine should then be braked and remain stationary.

Check the slew brake's function by rotating the extended Boom-Stick on a slope.

– Release the Joysticks
  - The Boom-Stick should then be braked and stop gently.

Cooler

Clean the Cooler when necessary. Overheating has a negative effect of the machine's components.

Cylinders

Checking the cylinder barrels and piston rods should be done with the cylinders extended to the end position. Replace damaged components immediately.

– Check that the cylinder barrels are not dented or cracked.
– Check the rod wipers for damage or leakage. Replace if necessary.
– Check that the piston rods are undamaged and straight. A damaged piston rod causes contamination of the hydraulic system, resulting in mechanical damage.

Tool Attachment

WARNING!

A worn or damaged safety component must be replaced.

The Tool Hitch cotter and pin are important safety components. A worn or damaged cotter must be replaced with an original spare part, manufacturing your own cotter is not permitted.

– Check that the Tool Hitch is complete and that all parts are intact and correctly mounted.

Track Tensioning

– The Rubber/Steel Tracks are tensioned automatically when the Outriggers are lifted.
– Rubber/Steel Tracks may be tensioned by means of a terminal SERVICE menu command.
– If demolition debris or suchlike enters into the tracks during operation, the Tensioning Accumulator maintains flexible tensioning preventing breakdowns and stoppages.

Checking Track Tension:

The slack of Rubber/Steel Tracks should not exceed 10—15mm.

– Operate the Outriggers up and down
  - Wait 15 minutes and check.

The tracks can become slack due to one of the track tensioning function's check valves being blocked or broken.

Cleaning the Check Valves

WARNING!

Be aware of risks.

Make sure no one is within the machine's risk area during test of the machine.

The check valves can be cleaned by discharging the pressure in the Tensioning Accumulator and thus loosening the tension of the tracks.

– Pull out the Tensioning Release Valve knob and rotate it 90° to lock it in an opened position.
– Operate the Outriggers up and down.
– Hydraulic oil is then pumped around, cleaning the check valve.

– Rotate and release the valve back into position.
– Operate the Outriggers up and down to tension the Rubber/Steel Track.

Breaker Lubrication

WARNING!

Be aware of risks.

Make sure no one is within the machine's risk area during test of the machine.

Check that grease is reaching the Breaker by dismantling the grease hose at the Breaker.

– Start the machine and activate the Breaker function.
– Exercise great caution during the inspection to ensure that nobody is injured.

Tools

Check that the tool can be used in such a way that neither the operator nor people in the vicinity are exposed to unnecessary risks.

READ THE OPERATORS MANUAL!

Read Operators Manual for other checks.

7.1 Before and After Document

7.1.1 Securing the Machine

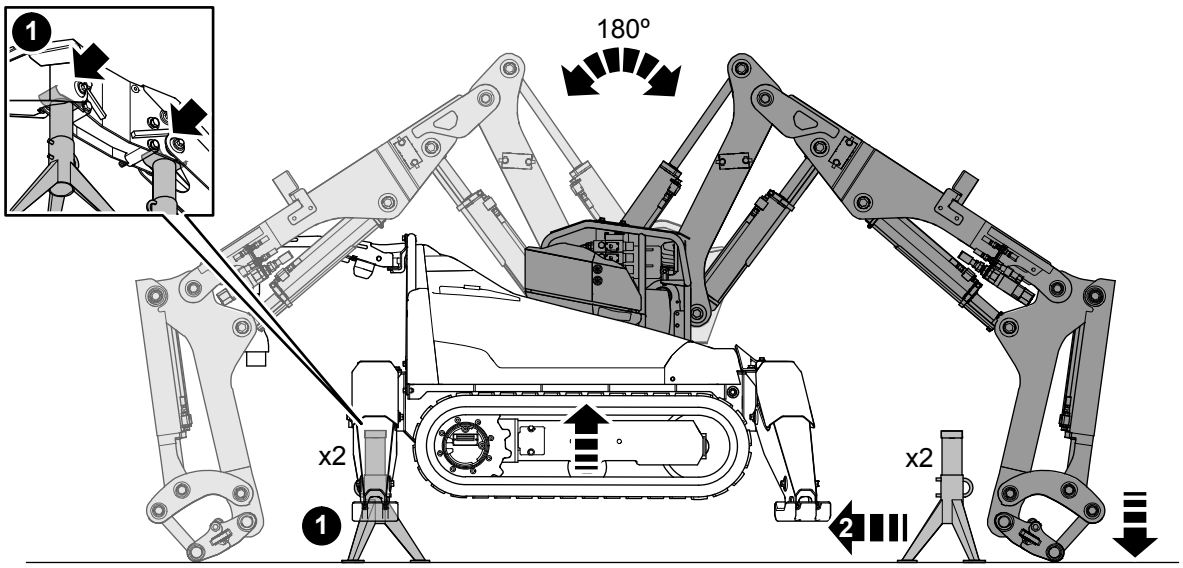
7.1.1.1 Positioning and Securing the Machine

WARNING!

Always take precautions to reduce the risk of accidents.

To prevent accidents it is important to position the machine in a safe way.

To prevent accidents it is important to position the machine in a safe way before start of maintenance and troubleshooting. Always take precautions to reduce the risk of heavy pieces collapsing or tipping due to lack of hydraulic pressure. Make sure the machine is positioned in such a way that the machine cannot tip and that the Boom-Stick is mechanically locked or forming a stable self-carrying structure. Use jack stands for securing the machine and to stop hydraulic parts to sink due to reduced pressure. Take precautions when maneuvering the machine on the side for work and access of the frame interior.



Positioning and securing the machine on stands:

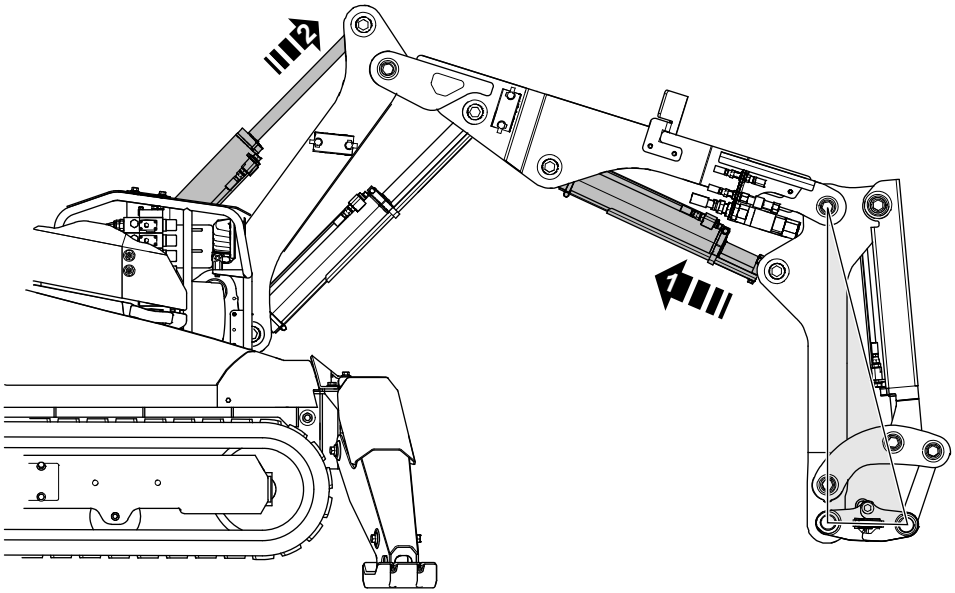
Lower all the Outriggers and raise the machine as much as possible with the Outriggers.

Use the Boom-Stick to fully press up the front or rear end and insert the jack stands (1) under each fixing point for the Outrigger.

Turn the Boom-Stick 180° and press up the other end of the machine and insert the jack stands (2) under each Outrigger fixing point.

Lower the machine until the weight is supported by the jack stands and the Boom-Stick is resting on the ground.

Turn off the machine and disconnect the power supply cable.



Positioning and securing the Boom and Boom-Stick:

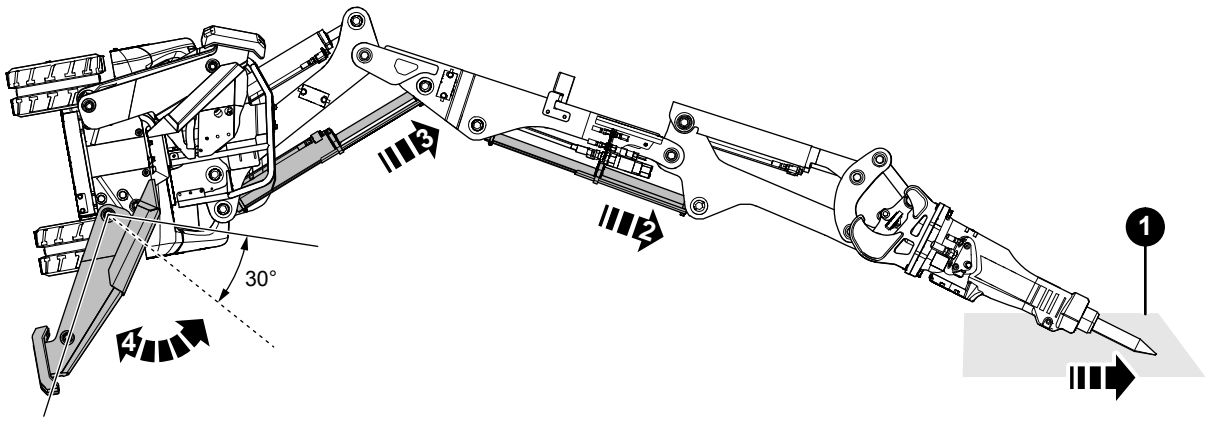
Operate the Boom-Stick so that the Stick-Cylinder is fully retracted (1).

Position the arm so that the Boom-Cylinder is fully extended (2).

The complete Boom should be resting on the ground at the Tool Hitch and form a stable triangle with the stick joint.

Use straps to increase the stability of the arm.

Turn off the machine and disconnect the power supply cable.



Positioning the machine on the side:

Always tip the machine to the left side otherwise the hydraulic oil may enter the Air Filter.

Lower the Outriggers (4) approximately 30° in the tipping direction.

Fit a tool on the Tool Hitch to get extra weight at the Boom-Stick and make the tipping more secure.

Rotate the boom 90° and retract the boom and the extension with the tool slightly above the ground.

Place a board (1) on the ground underneath the tool to be able to slide the tool against the ground.

Slowly extend the Stick-Cylinder (2) with the tool just above ground.

Stop extending the arm when the machine reaches the tipping point and the tool rests on the board.

Slowly extend the Boom Extension-Cylinder (3) with the board sliding on the ground until the cylinder is fully extended.

Slowly press down the 30° angled Outriggers (4) until fully lowered.

Turn off the machine and disconnect the power supply cable.

To raise the machine again, initiate the raising by extending the Boom-Cylinder approximate 30cm, lift the outriggers (4) and slowly fully retract the boom.

7.1.2 Hydraulic Couplings

Preparations before start

Secure the machine before start of work. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71.

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149.

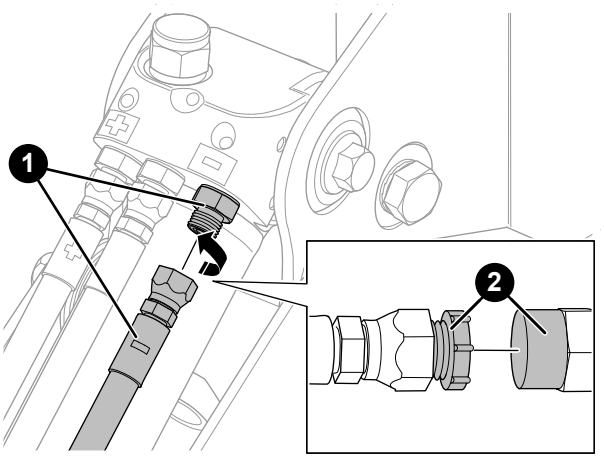
AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

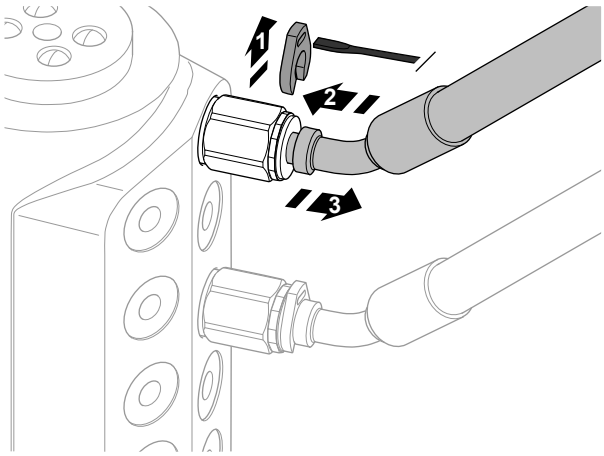
NOTE!

Do not twist the hoses

Remove

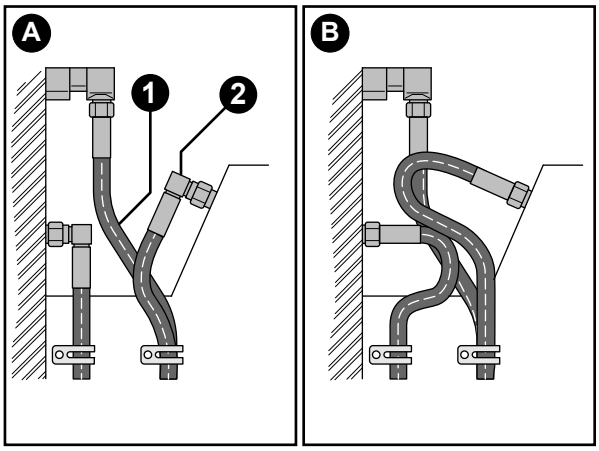


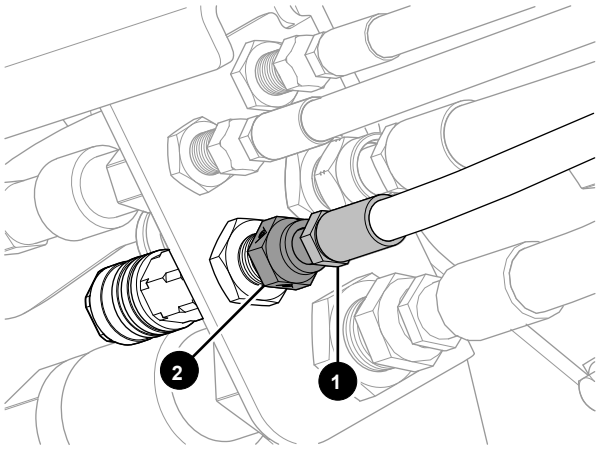
1. **To remove threaded couplings:**
2. Mark the lines and hoses (1) for your own reference and gently loosen the couplings.
3. Keep the area clean and reduce spill by plugging the openings with a plastic hat or a nylon plug (2).
   – If maintaining operability is desired, a metal PO-plug should be used instead.
4. When installing the threaded coupling, check that the O-ring is in correct position and not damaged.



5. **To remove quick couplings:**
6. Remove the red WEO-clip (1).
7. Release the coupling by pressing it in (2) and then pull it out (3).
8. **To remove hydraulic hoses:**
9. Mark or document how the hoses are connected to ensure proper remounting.
10. Check that the hoses are in good condition and mounted without kinks and any contact with sharp edges.
    – Replace worn or damaged hoses.

Install





1. To install, do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211.

   When installing the threaded coupling, check that the O-ring is in correct position and not damaged.

   The hoses have a longitudinal marking (1) to avoid a twisted mounting.

   – A 7% twist of the hose will reduce the lifecycle of the hose by 90%.

   Always install the hoses with as few and smooth bends as possible by using 45° and 90° couplings (2) and with a correct length to minimize wear and damage.

   An install with correct length, using angled couplings and avoided twisted hoses will get an clean and perspicuous installation (A) in the machine.

2. Hold (1) still with a spanner and tighten (2) with a torque wrench when installing hydraulic hoses to awoid twisting.

7.1.3 Connectors

Preparations before start

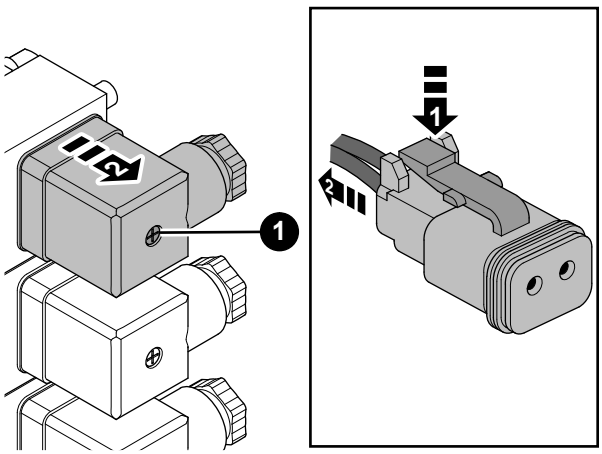
HIGH VOLTAGE!

Turn off the machine and disconnect the power supply cable.

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the connectors before disconnecting.

Remove



1. Mark each cable contact for easier reassembling.
2. Remove the securing point of the connector:
   – Loosen the center screw (1).
   – Press down the tab lock (1).
3. Gently remove the connector from the electrical part or electrical harness (2).

Install

1. Install of Connectors.

   Install the connector and if mounted with a screw, install the center screw.

7.2 Service Schedule

7.2.1 Service - First 8 Hours

After the first 8 hours, the following maintenance should be carried out.

Table 31. First 8 Hours Service

Service	Content
Re-tighten mountings Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211	Fasteners Outrigger Cylinders
	Fasteners Boom system and Tool Hitch

7.2.2 Service - First 50 Hours

After the first 50 hours, the following maintenance should be carried out.

Table 32. First 50 Hours Service

Service	Content
Lubricate Refer to: Section 7.4 “*Lubrication, Grease Nipples*”, page 81	Cylinders and shafts in Boom-Stick and Tool Hitch
	Outrigger Cylinders and shafts
	Slewing Ring: Grease Nipple and Slewing Gear Ring teeth
Change	Gearbox Drive Motor Oil, see procedure: Section 7.8 “*Drain and Refill Gearbox Drive Motor*”, page 87
Visual check of Mountings (Re-tighten when neccesary). Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211	Bolts and fasteners
	Electrical Motor
	Hydraulic Cooler and Cooling Fan
	Slew Motor
	Slewing Ring
	Electrical cabinet rubber dampner
	Controller modules
Re-tighten mountings Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211	Fasteners Outrigger Cylinders
	Fasteners Boom system and Tool Hitch
	Drive Motor sprocket
	Outrigger bracket
	Electrical Cabinet (High voltage component: mounting plates and screw connections) – On/Off Switch Main Power (Q1) – 24VDC Power Supply (T1) – Reversing Contactor (K1) – Soft Start (T2)
Level check	Hydraulic oil. Refer to: Section 5.2.7 “*Hydraulic Oil Tank*”, page 30
	Breaker lubrication
Visual check of Wear and Damage	Hydraulic cylinder: Barrel, rod, and rod wiper
	Hydraulic hoses
	Power cable, connectors and sockets
	Rubber/steel components: Outrigger foot and track
	Slewing system
	Safety decals
	Joystick and Remote Control

Check of Leakage	Cylinders
	Visible hoses
	Valve blocks
	Cooler
	Slew and Drive Motor
Firmware update Refer to: Section 11.1 “*Software update/upload*”, page 180	Controller modules and Remote Control
Function Check	Machine operates via Radio signal (≥10m)
	Machine operates via CAN extension cable
	Hydraulic cylinders, slew and drive motor/s (smoothness)
	Emergency stop machine
	Machine stop Remote Control
	Track tension and Drive Motors
	Warning & work light
	Horn
	Filling Pump
	Grease Pump (breaker/tool)
Function Check Hydraulic system	Hydraulic Pump – Check for unusual sounds
	Idle pressure 5-10 bar
	LS/standby pressure 20+/- 1 bar
	Boom system 200 bar +/- 2 bar
	Outriggers down/up 250/130 bar +/- 3 bar

7.2.3 Service - 250 Hours

After 250 hours, the following maintenance should be carried out.

Table 33. 250 Hours Service

Service	Content
Change	Hydraulic Oil Filter. Refer to: Section 10.5.4.2 “*Hydraulic Oil Filter*”, page 150
	Hydraulic Air Filter. Refer to: Section 10.5.4.1 “*Air Filter*”, page 149
Lubricate Refer to: Section 7.4 “*Lubrication, Grease Nipples*”, page 81	Cylinders and shafts in Boom-Stick and Tool Hitch
	Outrigger Cylinders and shafts
	Slewing Ring: Grease Nipple and Slewing Gear Ring teeth
Visual check of Cracks: – Welded seams – Holes or sharp corners	Carrige chassis
	Outrigger Cylinders and shafts
	Boom-Stick
	Cylinders and shafts in Boom-Stick and Tool Hitch

Visual check of Mountings (Re-tighten when neccesary). Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211	Bolts and fasteners
	Power unit (motor, fan, fan housing)
	Slew Motor
	Slewing Ring
	Electrical cabinet rubber dampner
	Controller modules
	Electrical Cabinet (High voltage component: mounting plates and screw connections) – On/Off Switch Main Power (Q1) – 24VDC Power Supply (T1) – Reversing Contactor (K1) – Soft Start (T2)
Re-tighten mountings Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211	Fasteners Outrigger Cylinders
	Fasteners Boom system and Tool Hitch
Level check	Hydraulic oil. Refer to: Section 5.2.7 “*Hydraulic Oil Tank*”, page 30
	Breaker lubrication
	Gearbox drive motor oil. Refer to: Section 7.8 “*Drain and Refill Gearbox Drive Motor*”, page 87
Visual check of Wear and Damage	Hydraulic cylinder: Barrel, rod, and rod wiper
	Hydraulic hoses
	Power cable, connectors and sockets
	Rubber/steel components: Outrigger foot and track
	Slewing system
	Shaft bushings and shims
	Safety decals
	Joystick and Remote Control
Check of Leakage	Cylinders
	Visible hoses
	Valve blocks
	Cooler
	Slew and Drive Motor
Firmware update Refer to: Section 11.1 “*Software update/upload*”, page 180	Controller modules and Remote Control
Function Check	Machine operates via Radio signal (≥10m)
	Machine operates via CAN extension cable
	Hydraulic cylinders, slew and drive motor/s (smoothness)
	Emergency stop machine
	Machine stop Remote Control
	Track tension and Drive Motors
	Warning & work light
	Horn
	Filling Pump
	Grease Pump (breaker/tool)
Function Check Hydraulic system	Hydraulic Pump – Check for unusual sounds
	Idle pressure 5-10 bar
	LS/standby pressure 20+/- 1 bar
	Boom system 200 bar +/- 2 bar
	Outriggers down/up 250/130 bar +/- 3 bar

7.2.4 Service - 500 Hours

After 500 hours, the following maintenance should be carried out.

Table 34. 500 Hours Service

Service	Content
Change	Hydraulic Oil. Refer to: Section 7.5.2 “*Drain and Refill Hydraulic Oil*”, page 82
	Hydraulic Oil Filter. Refer to: Section 10.5.4.2 “*Hydraulic Oil Filter*”, page 150
	Hydraulic Air Filter. Refer to: Section 10.5.4.1 “*Air Filter*”, page 149
Lubricate Refer to: Section 7.4 “*Lubrication, Grease Nipples*”, page 81	Cylinders and shafts in Boom-Stick and Tool Hitch
	Outrigger Cylinders and shafts
	Slewing Ring: Grease Nipple and Slewing Gear Ring teeth
Visual check of Cracks: – Welded seams – Holes or sharp corners	Carrige chassis
	Outrigger Cylinders and shafts
	Boom-Stick
	Cylinders and shafts in Boom-Stick and Tool Hitch
Visual check of Mountings (Re-tighten when neccesary). Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211	Bolts and fasteners
	Power unit (motor, fan, fan housing)
	Slew Motor
	Slewing Ring
	Electrical cabinet rubber dampner
	Controller modules
	Electrical Cabinet (High voltage component: mounting plates and screw connections) – On/Off Switch Main Power (Q1) – 24VDC Power Supply (T1) – Reversing Contactor (K1) – Soft Start (T2)
Re-tighten mountings Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211	Fasteners Outrigger Cylinders
	Fasteners Boom system and Tool Hitch
Level check	Breaker lubrication
	Gearbox drive motor oil. Refer to: Section 7.8 “*Drain and Refill Gearbox Drive Motor*”, page 87
Visual check of Wear and Damage	Hydraulic cylinder: Barrel, rod, and rod wiper
	Hydraulic hoses
	Power cable, connectors and sockets
	Rubber/steel components: Outrigger foot and track
	Slewing system
	Shaft bushings and shims
	Safety decals
	Joystick and Remote Control
Check of Leakage	Cylinders
	Visible hoses
	Valve blocks
	Cooler
	Slew and Drive Motor
Firmware update Refer to: Section 11.1 “*Software update/upload*”, page 180	Controller modules and Remote Control

Function Check	Machine operates via Radio signal (≥10m)
	Machine operates via CAN extension cable
	Hydraulic cylinders, slew and drive motor/s (smoothness)
	Emergency stop machine
	Machine stop Remote Control
	Track tension and Drive Motors
	Warning & work light
	Horn
	Filling Pump
	Grease Pump (breaker/tool)
Function Check Hydraulic system	Hydraulic Pump – Check for unusual sounds
	Idle pressure 5-10 bar
	LS/standby pressure 20+/- 1 bar
	Boom system 200 bar +/- 2 bar
	Outriggers down/up 250/130 bar +/- 3 bar

7.2.5 Service - 1000 Hours

After 1000 hours, the following maintenance should be carried out.

Table 35. 1000 Hours Service

Service	Content
Change	Hydraulic Oil. Refer to: Section 7.5.2 “*Drain and Refill Hydraulic Oil*”, page 82
	Hydraulic Oil Filter. Refer to: Section 10.5.4.2 “*Hydraulic Oil Filter*”, page 150
	Hydraulic Air Filter. Refer to: Section 10.5.4.1 “*Air Filter*”, page 149
	Gearbox drive motor oil. Refer to: Section 7.8 “*Drain and Refill Gearbox Drive Motor*”, page 87
Lubricate Refer to: Section 7.4 “*Lubrication, Grease Nipples*”, page 81	Cylinders and shafts in Boom-Stick and Tool Hitch
	Outrigger Cylinders and shafts
	Slewing Ring: Grease Nipple and Slewing Gear Ring teeth
Visual check of Cracks: – Welded seams – Holes or sharp corners	Carrige chassis
	Outrigger Cylinders and shafts
	Boom-Stick
	Cylinders and shafts in Boom-Stick and Tool Hitch
Visual check of Mountings (Re-tighten when neccesary). Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211	Bolts and fasteners
	Power unit (motor, fan, fan housing)
	Slew Motor
	Slewing Ring
	Electrical cabinet rubber dampner
	Controller modules
	Electrical Cabinet (High voltage component: mounting plates and screw connections) – On/Off Switch Main Power (Q1) – 24VDC Power Supply (T1) – Reversing Contactor (K1) – Soft Start (T2)
Re-tighten mountings Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211	Fasteners Outrigger Cylinders
	Fasteners Boom system and Tool Hitch
Level check	Breaker lubrication

Visual check of Wear and Damage	Hydraulic cylinder: Barrel, rod, and rod wiper
	Hydraulic hoses
	Power cable, connectors and sockets
	Rubber/steel components: Outrigger foot and track
	Slewing system
	Shaft bushings and shims
	Safety decals
	Joystick and Remote Control
Check of Leakage	Cylinders
	Visible hoses
	Valve blocks
	Cooler
	Slew and Drive Motor
Firmware update Refer to: Section 11.1 “*Software update/upload*”, page 180	Controller modules and Remote Control
Function Check	Machine operates via Radio signal (≥10m)
	Machine operates via CAN extension cable
	Hydraulic cylinders, slew and drive motor/s (smoothness)
	Emergency stop machine
	Machine stop Remote Control
	Track tension and Drive Motors
	Warning & work light
	Horn
	Filling Pump
	Grease Pump (breaker/tool)
Function Check Hydraulic system	Hydraulic Pump – Check for unusual sounds
	Idle pressure 5-10 bar
	LS/standby pressure 20+/- 1 bar
	Boom system 200 bar +/- 2 bar
	Outriggers down/up 250/130 bar +/- 3 bar
Clean, Oil strainer	Grease Pump (breaker/tool)

7.3 Hydraulic Final Check

Finalization

Make sure all the parts are correctly mounted and all the connectors correctly connected.

– Use the correct torque when mounting parts. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211
– Make sure the power cable, all the connectors and the sockets are correctly installed before connecting and starting the electrical system.

Hydraulic System

If the hydraulic system has been drained during service or maintenance a refill is needed. Refer to: Section 7.5.2 “*Drain and Refill Hydraulic Oil*”, page 82

Function Check

WARNING!

Be aware of risks.

Make sure no one is within the machine's risk area during test of the machine.

Make a Function Test before start of use. Refer to: Section 6.1 “*Function Test*”, page 69

7.4 Lubrication, Grease Nipples

Lubrication of joints and shafts of the machine is one important part of the daily and weekly service to maintain a good functionallity. All lubrication points shall be lubricated every time the procedure is done.

Swing joints must be kept lubricated so that any dirt, moisture or water that have entered is pressed out, and to reduce wear on shafts and bearings.

It is a must to lubricate the machines lubrication points every time the machine has been washed.

Always position the machine in a safe way before start of maintenance to prevent accidents. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

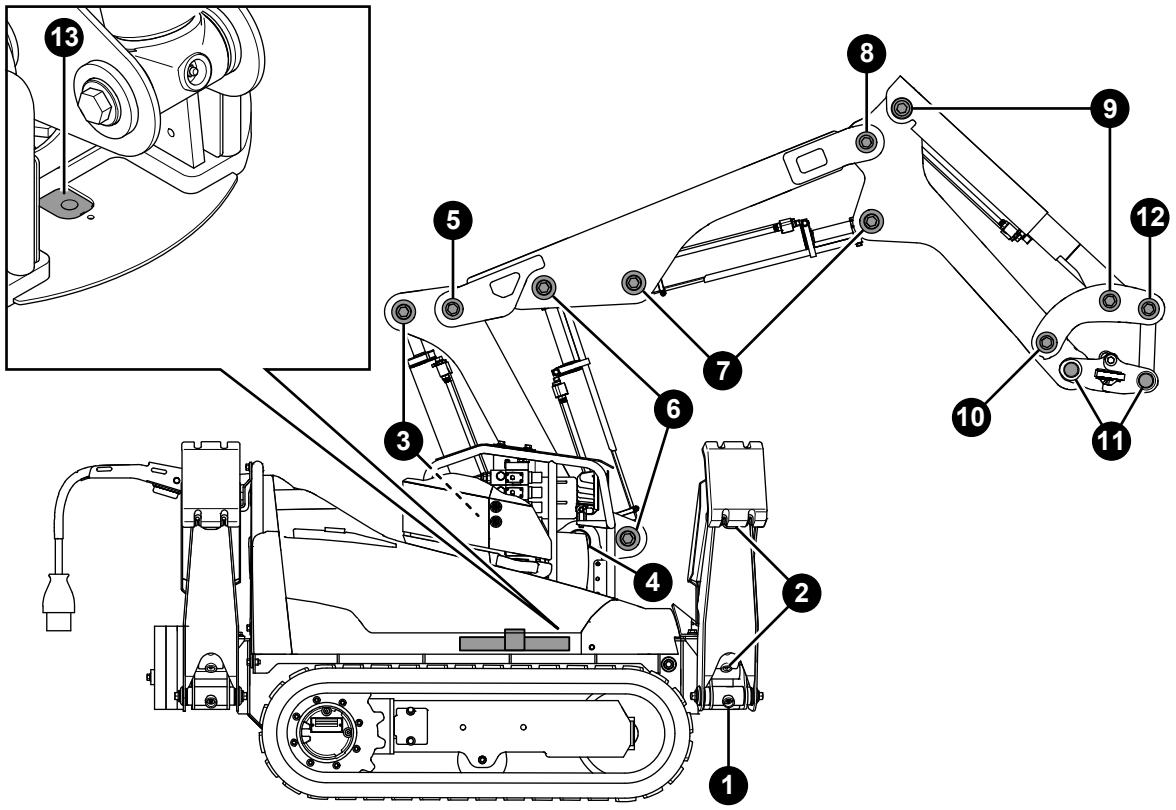


Figure 7.4-1. Lubrication Points

1. Outrigger Joints
2. Outrigger Cylinder Shafts
3. Boom Cylinder Shaft
4. Boom Joints
5. Boom Extension Joint
6. Boom Extension Cylinder Shafts
7. Boom-Stick Cylinder Shafts
8. Boom-Stick Joint
9. Tool Cylinder Shafts
10. Lever Joint
11. Tool Joints
12. Link Joint
13. Slewing Bearings and Gears*

Clean all 29 nipples before greasing and replace broken or worn parts.

Outrigger and Boom System:

Pump 3 to 5 times until grease penetrates through the shims area when lubricating. Always use lubrication grease according to the specification. Refer to: Section 15.1 “*Technical Data*”, page 209

Slew System:

Distribute the grease evenly to the gears by applying grease, rotate the turret 180° and apply grease again. Repeat the procedure to lubricate the slewing bearings and teeth throughout a 360° circle.

*One of the two slewing ring grease nipples is accessible under a service lid. Rotate the turret slowly to find it at 180° distance.

7.5 Drain and Refill Hydraulic Oil

7.5.1 Level check Hydraulic Oil

CAUTION!

Position the machine on a horizontal surface.

Clean the component before opening for checks or filling. Always prevent dirt from entering the system.

Refill the hydraulic oil if the level is low, refer to Section 15.2 “*Guide Values and Specifications*”, page 209.

– Retract all Boom-Stick cylinders and fully fold the Outriggers.
– Check the oil level in the HMI display.
– Refill if the hydraulic oil level is less than 100%.
– Refer to the refill section in Section 7.5.2 “*Drain and Refill Hydraulic Oil*”, page 82.

7.5.2 Drain and Refill Hydraulic Oil

Preparations before start

Retract all the cylinders for the Boom-Stick and Outrigger. Position the Boom-Stick rotated to the side so the front of the machine is easily accessible. Turn off the machine.

HIGH PRESSURE FLUID!

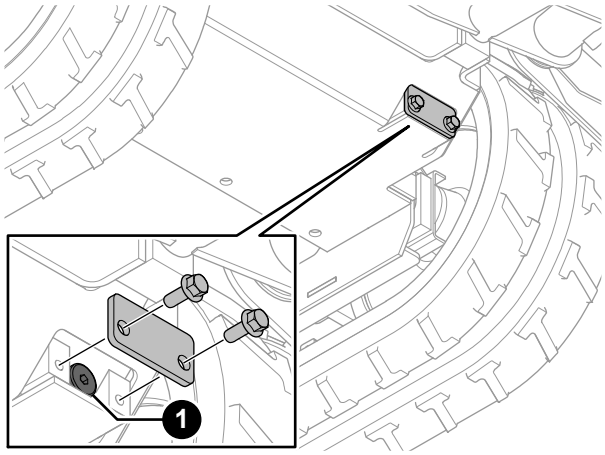
Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings.

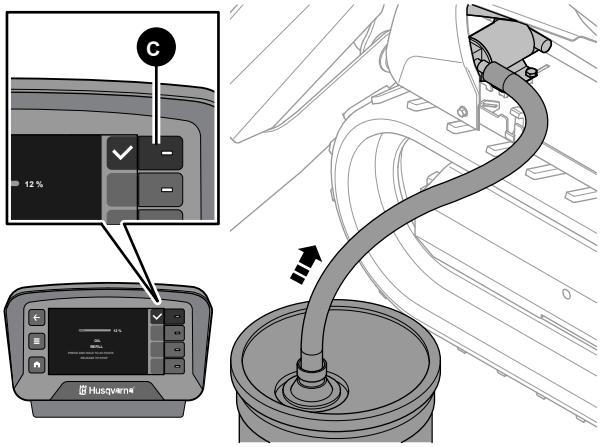
Drain



1. Remove the cover plate for the drain plug.
2. Place a container capable of 25 liters straight below the drain tap.
3. Remove the drain plug (1) and drain the Hydraulic Oil Tank.
4. Install the drain plug.

   Install the cover plate for the drain plug.

Refill



1. Remove the Side Cover Left.
2. Replacing the hydraulic oil of the tank requires approximately 16 liters of new oil.

   Place the container of the new hydraulic oil below the fill pump hose.

   CAUTION!

   The machine can be damaged if different types of hydraulic oil are mixed.

   Check which quality the hydraulic system contains before refilling or changing.

   Clean the suction hose of the Filling Pump .

   Remove the PO plug from the end of the fill hose and put it deep inside the container of the new hydraulic oil.
3. With the Electrical Motor switched off:
   - Press the menu button on the Remote Control.
   - Select "Oil refill" in the "Function" menu on the display.
   - Read the hydraulic oil level on the display.
   - Press and hold the button (C) to fill the hydraulic oil.
4. The Filling Pump will switch off automatically when the level is 100%.
5. – Remove the suction hose from the the container of the new hydraulic oil.
   - Install the plug of the suction hose.
6. Install the Side Cover Left.

7.6 Complete change/flush of Hydraulic Oil

Preparations before start

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings.

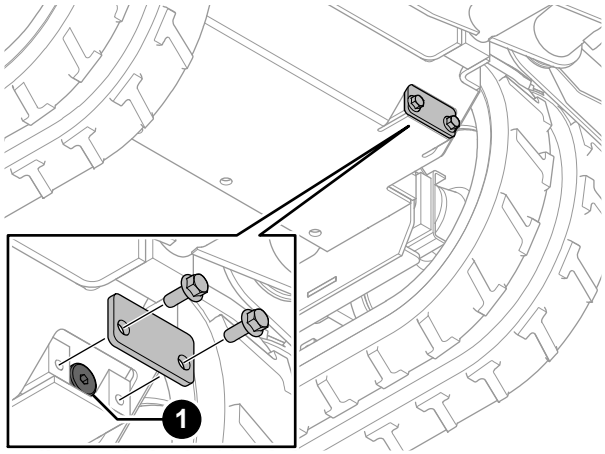
HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

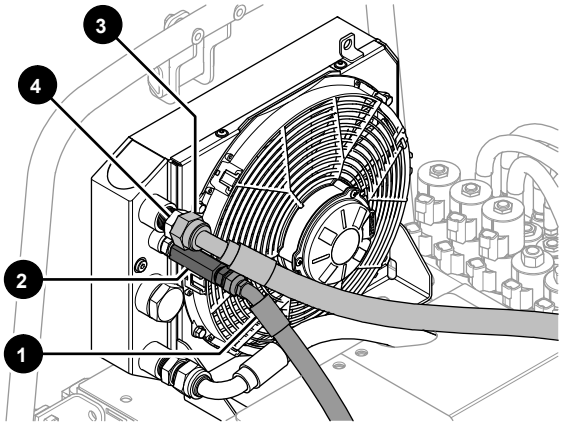
Run the machine until the hydraulic oil reaches the functional temperature of 40-50 °C.

Drain

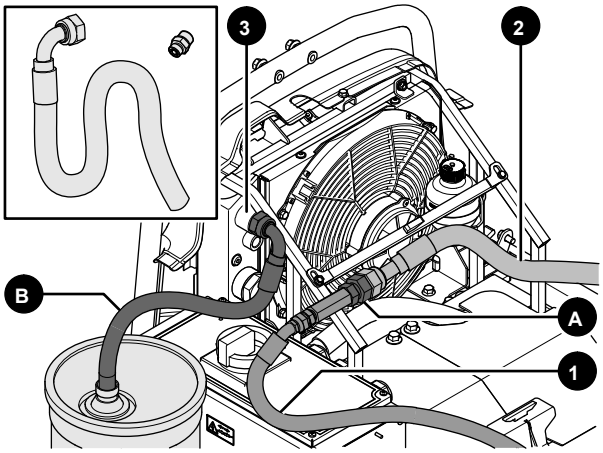


1. Position the turret rotated at 90°.
2. Retract all the cylinders for the Boom-Stick and Outriggers.
3. Remove the cover plate for the drain plug.
4. Place a container capable of 25 litres straight below the drain tap.
5. Remove the drain plug (1) and drain the Hydraulic Oil Tank.
6. Replace the Air Filter, refer to Section 10.5.4.1 “*Air Filter*”, page 149 and the Hydraulic Oil Filter, refer to Section 10.5.4.2 “*Hydraulic Oil Filter*”, page 150.
7. Fit and tighten the drain plug (1).

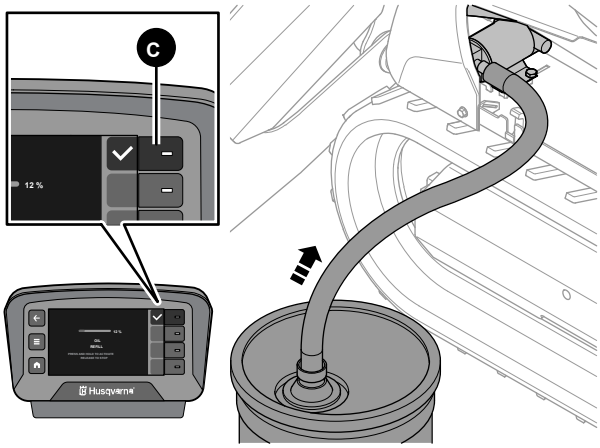
Connect service hoses and fill with new oil



1. Remove the fill hose (1) from the check valve (2).
2. Remove the return hose (3) from the cooler exit (4).



3. Connect the fill hose (1) and return hose (2) with adapter A.
4. Connect the drain hose (B) on the cooler exit (3) and place the other end of the the hose to a container capable of 30 liters.

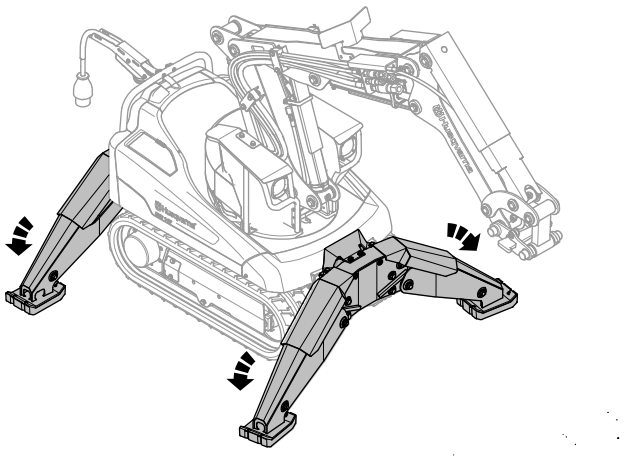


5. Place the container of the new hydraulic oil below the fill pump hose.

> **CAUTION!**
> The machine can be damaged if different types of hydraulic oil are mixed.
>
> Check which quality the hydraulic system contains before refilling or changing.

6. Remove the PO plug from the end of the fill hose and put it deep inside the container of the new hydraulic oil.
7. Switch the machine ON.
8. – Press the menu button on the Remote Control.
   – Select "Oil refill" in the "Function" menu on the display.
   – Press and hold the button (C) to fill the hydraulic oil.
   – Check that the oil level in the display is 100%.
   – If the Fill pump caviates, Refer to: Section 9.3 “*Troubleshooting Guide*”, page 107.

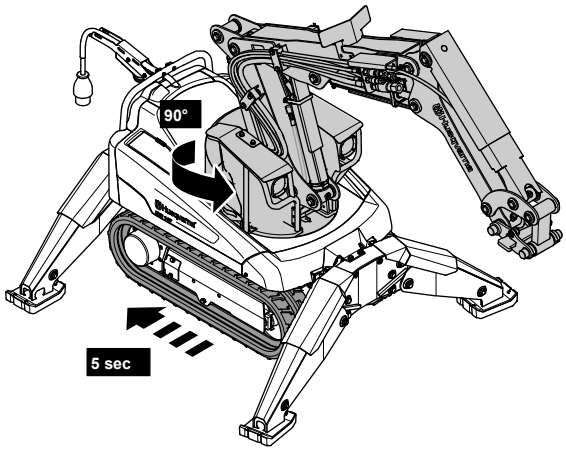
Change/Flush procedure

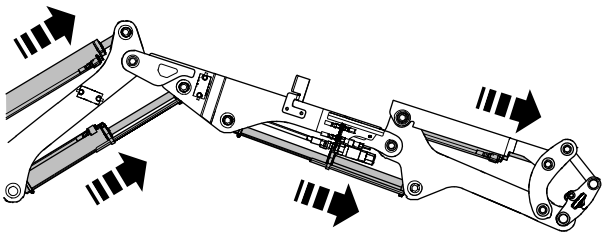


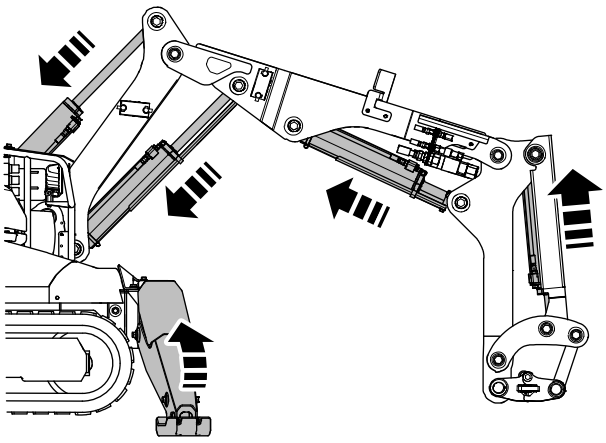
1. Press START and activate the machine.

> **NOTE!**
> Activate the machine as soon as possible after the engine starts, to avoid accidentally emptying the new oil.

2. Confirm any pressure warnings and restart.
3. Fully lower the outriggers.
4. Press STOP.
5. Fill up with new oil.







6. Press START and active the machine.

> **NOTE!**
> Activate the machine as soon as possible after the engine starts, to avoid accidentally emptying the new oil.

7. Slowly rotate the turret 90° back to normal position.

> **NOTE!**
> Be careful with hoses and containers when rotating the machine not to spill oil.

8. Run both track drives for 5 seconds at full speed.
9. Press STOP.
10. Fill up with new oil.
11. Press START and activate the machine.

> **NOTE!**
> Activate the machine as soon as possible after the engine starts, to avoid accidentally emptying the new oil.

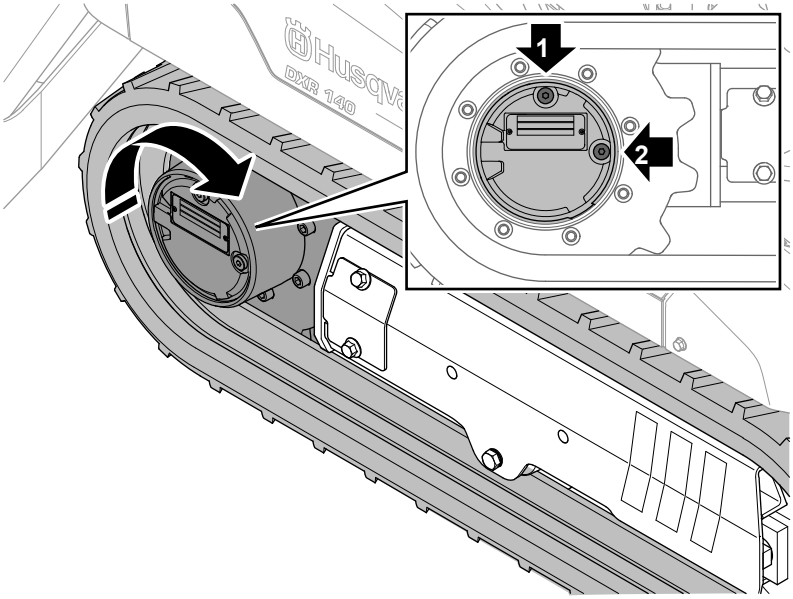
12. Fully extend all the cylinders of boom-stick.
13. Press STOP.
14. Reconnect the hoses to normal.
15. Fill up with new oil.

> **NOTE!**
> Only fill up the oil to 70% level.

16. Press START and active the machine.
17. Fully retract all the cylinders of the boom-stick and the outriggers.
18. Press STOP.
19. Check the fluid level - fill up if needed.

7.7 Level check Gearbox Drive Motor

> **CAUTION!**
> Position the machine on a horizontal surface.
>
> Clean the component before opening for checks or filling. Always prevent dirt from entering the system.
>
> Refill the hydraulic oil if the level is low, refer to Section 15.2 “*Guide Values and Specifications*”, page 209.



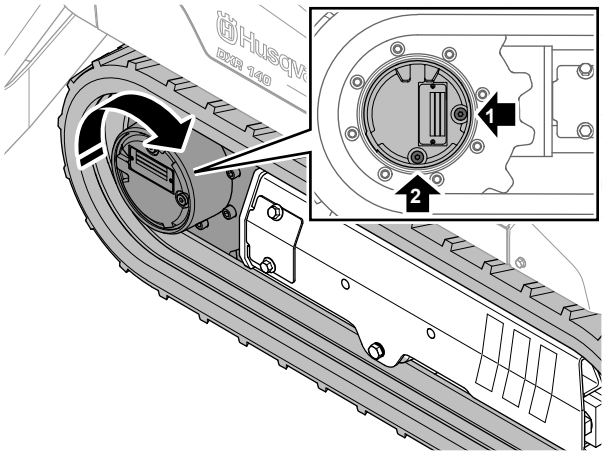
– Rotate the Hydraulic Drive Motor until one of the plugs is in level with the hub center (2) and the other one is at the top position (1).
– Unscrew the lower plug (2).
– The oil level should reach up to the hole.
– Refer to the install section in Section 7.8 “*Drain and Refill Gearbox Drive Motor*”, page 87.

7.8 Drain and Refill Gearbox Drive Motor

Preparations before start

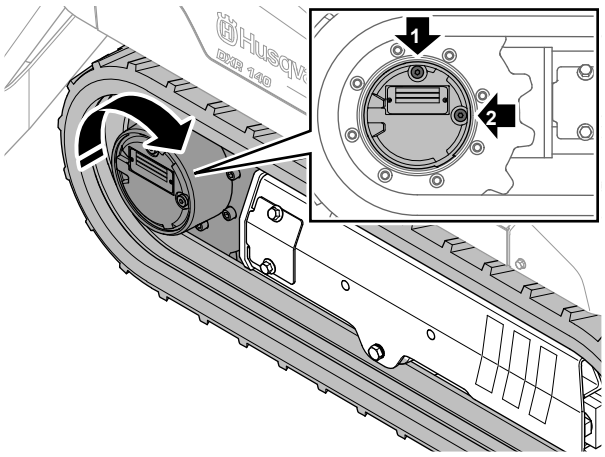
Raise the machine on the Outriggers and put the machine on stands. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Remove



1. Rotate the Hydraulic Drive Motor until one plug is pointing straight down (2).
2. Remove the two plugs (1, 2) on the Hydraulic Drive Motor and drain the gearbox.

Install



1. Rotate the Hydraulic Drive Motor until one plug is pointing straight up (1).
2. Fill up with new oil until it is in level with the lower hole (2).

   Required amount of oil is 0.35 liters.
3. Mount the two plugs (1, 2) on the Hydraulic Drive Motor.

7.9 Welding - Check for Wear and Damage

RISK OF FIRE!

Risk of fire. The machine contains flammable liquids and components.

– Do not undertake any welding in direct connection with flammable liquids, e.g. hydraulic oil, hydraulic tank or hoses.
– Ensure that there is a fire-extinguisher on site at the workplace.

WARNING!

Risk of inhaling harmful substances. Toxic gases can be formed.

– When welding indoors, use equipment to extract welding fumes.
– Never weld near rubber or plastic material. Use a breathing mask.

Welding work on the machine			
General	Only qualified welders should carry out welding operations on the machine.		
Components that should not be welded	The following components should not be repaired but replaced:		
	– Tool hitch – Tool link and lever – Cotters	– Adaptor plates – Cylinders	– Cast parts – Hydraulic tank
Recommended welding wire	Flex cored wire:	Esab OK 14.03 Tubrod, Class: AWS A5.28 E110C-G	
	Solid:	Elgamatic 100, Class: AWS A5.18 ER70S-6	
	Rod:	Esab OK 75.75, Class: AWS A5.5 E11018-G	

CAUTION!

Deal with worn components as quickly as possible.

There is an increased risk of mechanical breakdown if the machine is used despite damaged or worn components.

Wear and Damage	
Shafts and slide bearings	Bearings and any shafts must be replaced in the event of play in joints and cylinder mountings. Replace or repair damaged components: – Replace bearings if there is play in joints. – Replace shafts if they have wear damage. – Wear damage on a tapered lock ring indicates that it has not been sufficiently tightened. – Swing joints must be kept lubricated so that any dirt that have entered is pressed out, and to reduce wear on shafts and bearings.
Rubber components	Check that rubber tracks and outrigger feet are intact. – Replace if metal has worn through.
Hydraulic hoses	Do not use hoses that are distorted, worn or damaged. Make sure that the cords are not visible. Always have a spare hose at hand. – Replace damaged hoses immediately. Check that none of the hoses are rubbing against sharp edges. Be aware of the risk of abrasive jets. Adjust the length of hydraulic hoses. They must never be stretched. Ensure that the hose is not twisted while coupling it. Avoid sharp bends in the hose.
Hydraulic couplings	Check that the couplings are not damaged. Damaged couplings may deteriorate hoses with the result that they come off. – Replace damaged couplings immediately. The hydraulic couplings should be lubricated before tightening to reduce friction.
Electric cables	The power cable must be disconnected when electric cables are checked! – Check that the cables' insulating casings are not damaged. – Replace damaged cables immediately.

WARNING!

Leakage can cause serious mechanical breakdowns and an increased risk of slipping. Wash the machine regularly to increase the chance of defecting leakage at an early stage. Deal with leaks as quickly as possible and refill when necessary.

Leakage	
Hydraulic fluid	Leakage of hydraulic fluid leads to an increased risk of dirt getting into the hydraulic system, which can lead to breakdowns and mechanical damage. Hydraulic fluid underneath the machine or on the base plate is probably due to leakage. Check for leakage at the hose connectors, couplings and cylinders. Leakage can also occur at other hydraulic components and can manifest itself with a strip of dirt. Increase temperature to find leak: – Cover cooler and run outriggers up/down. Check O-rings and replace if damaged.

Cracks	
General	A clean machine makes it easier to detect cracks. The greatest risks of crack formations are: – Weld seams. – Holes or sharp corners.
Check in particular for cracks:	

Cracks	
Frame	Around outrigger mountings, both on the frame and on the outriggers, gear ring mounting and weld seams between the frame and the track units.
Boom-stick	Boom-stick joints, cylinder mountings and weld seams.

8.1 Display Messages - Machine

Table 36. Error codes in the Machine

Code	Warning level	Trigger condition/Cause	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Solution
1	Error	Start signal sent, no contactor error and lack off soft start bypass signal after X s	Softstart error	Start not possible	Contact Husqvarna service	Check led indicators on soft start
2	Error	The fault message is set when the following conditions are met in the machine: – No phase error signal – A soft start overload signal for more than 2 sec	Softstart	Fault indication	Check incoming voltage and let the machine cool down	1. Identify the fault message (number of flashes). Refer to Section 5.3.4.2 “*Soft Starter (T2)*”, page 44. 2. Check the Soft Start Relay (T2) settings. Refer to Section 5.3.4.2 “*Soft Starter (T2)*”, page 44. 3. Check the incoming voltage. 4. Check for loose cables. 5. Follow the 400V System troubleshooter.
3	Error	The fault message is set when the following conditions are met in the machine: – Phase lost for more than 3 sec	Incoming power	Phase lost	Check incoming voltage and cables	Check incoming voltage and cables
5	Caution	Wrong frequency detected compared to machine frequency setting. 50Hz +/- 2Hz 60Hz +/- 3Hz	Incoming power	Grid frequency	Grid frequency out of range has been detected	Check site frequency
6	Caution	The fault message is set when the following conditions are met in the machine: – Voltage out of range for 5s or more: 50Hz 400V: Voltage < 360V 60Hz 480V: Voltage < 414V	Incoming power	Voltage too low	Check incoming voltage and cables	Follow the 400V System troubleshooter
7	Caution	The fault message is set when the following conditions are met in the machine: – Voltage out of range for 5s or more: 50Hz 400V: Voltage > 440V 60Hz 480V: Voltage > 506V	Incoming power	Voltage too high	Check incoming voltage and cables	Check incoming voltage and cables
10	Warning	Frequency setting (Europe/US) not equal to measured. Setting 60 -> mismatch 50+/-1	Grid frequency	Out of range	Grid frequency does not match machine setting. Contact Husqvarna service	Settings can be changed in remote service menu

Code	Warning level	Trigger condition/Cause	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Solution
11	Warning	If the oil temperature is over temperature limit (90°C) for more than 3 sec. The error is reset if the oil temperature is 5°C below the limit	Oil temperature	High	Reduced speed and tool disabled. Leave the machine running with motor on	1. Run machine in idle state to cool down the oil. 2. Clean the Cooler. 3. Check the Cooler Fan.
12	Warning	If the oil temperature is less than the threshold value 0°C for more than 3 sec. The fault is reset if the temperature is 5°C above the limit.	Oil temperature	Low	Reduced speed and tool disabled. Leave the machine running with motor on	1. Warm up the lower section by running the caterpillar tracks, first slowly and then more quickly with the outriggers extended. 2. Check the settings for the adjustable temperature limit. 3. Check the temperature sensor (T4) and cables to the sensor. 4. Make sure that the oil viscosity grade (ISO VG) correspond to the operating conditions . Refer to: Section 15.2 “*Guide Values and Specifications*”, page 209.
13	Warning	The fault message is set when the following conditions are met in the machine: – Req pressure > 30 Bar AND – The pressure is higher (+20 Bar) than the selected pressure for more than 2sec.	Oil pressure	Too high	Contact Husqvarna service	1. Check the Pressure Control Valve (QV5). 2. Follow the Pressure Testing troubleshooter.
16	Warning	i_OilLevelStatus < 6. Oil level has 10 levels where 10 is full for more then 3s	Hydraulic oil level	Low	Refill hydraulic oil	Refill hydraulic oil
17	Warning	The fault message is set when the following conditions are met in the machine: – A return pressure of ≥2 bar and the oil temperature is >40°C for more than 20 sec.	Oil filter	Service needed	Replace oil filter	Change the Oil Filter. Refer to: Section 10.5.4.2 “*Hydraulic Oil Filter*”, page 150
19	Warning	No contact to remote control for more than 120s.	Remote control	Communication lost	Connection to remote control lost for more than 120s	"NOTEXT"
20	Warning	The fault message is set when following conditions are met in the machine: – Motor temperature >135°C for more than 3s	Motor temperature	Too high	Reduced speed and tool disabled. Check incoming voltage and let the machine cool down	1. Leave machine in Idle mode to cool down 2. Check the incoming voltage.
21	Error	The fault message is set when following conditions are met in the machine: – Motor temperature >140°C for more than 3s	Motor temperature	Too high	Motor turned off. Check incoming voltage and let the machine cool down	1. Leave machine in Idle mode to cool down 2. Check the incoming voltage.

Code	Warning level	Trigger condition/Cause	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Solution
25	Advisory	Motor has been running for 10min without any joystick activation.	Run time	Idle	Motor timed out. Turn OFF/ON/START switch to ON and start again	
28	Error	No connection between the Master Control Module and Slave Control Module for more than 5 sec.	Control module	Connection lost	KE2. Contact Husqvarna service	1. Check the fuse F5 2. Check the control modules and the CAN connections in the machine.
29	Error	No connection between the Master Control Module and Slave Control Module for more than 5 sec.	Control module	Connection lost	KE3. Contact Husqvarna service	1. Check the fuse F6 2. Check the control modules and the CAN connections in the machine.
30	Advisory	Motor will not start if knob is turned directly from "OFF" to "Motor start"	Motor start	Failed	Turn OFF/ON/START switch to ON and START again	
32	Error	No connection between the Master Control Module and the powermeter for more than 5 sec.	Control module	Connection lost	KE4. Contact Husqvarna service	1. Check the fuse F7. 2. Check the powermeter and its connections 3. Check the control modules and the CAN connections in the machine.
34	Error	Default value 0 for machine type selected	Machine type	Not selected	Contact Husqvarna service	1. Enter correct machine type via CST/HSH
57-58	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Cylinder 1. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
60-61	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Cylinder 2. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
63-64	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Cylinder 3. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
66-67	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Cylinder 4. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
70-71	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Cylinder 5. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.

Code	Warning level	Trigger condition/Cause	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Solution
75-76	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Tool. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
78-79	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Extra1 valve. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
81-82	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Extra2 valve. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
84	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Outrigger down. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
85	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Outrigger up. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
87	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Left caterpillar track forward. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
88	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Left caterpillar track backward. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
90	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Right caterpillar track forward. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
91	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Right caterpillar track backward. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.

Code	Warning level	Trigger condition/Cause	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Solution
93	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Front left outrigger valve. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
94	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Grease pump valve. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
95	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Water valve. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
96	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Front right outrigger valve. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
99	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Rear left outrigger valve. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
102	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Rear right outrigger valve. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
114	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Work light, left. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
115	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Work light, right. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
117	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Warning light. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.

Code	Warning level	Trigger condition/Cause	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Solution
120	Warning	The electrical circuit to the valve is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Horn. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
121	Warning	Sensor signal recieved is out of range / not recieved	Cable error	Loss of function	Oil filter monitoring. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
122	Warning	Sensor signal recieved is out of range / not recieved	Cable error	Loss of function	Motor temperature monitoring. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
123	Warning	Sensor signal recieved is out of range / not recieved	Cable error	Loss of function	Oil level monitoring. Contact Husqvarna service	1. Check solenoid valve and cable 2. Replace cable, and, or solenoid valve 3. Replace master/slave controller module.
124	Warning	Sensor signal recieved is out of range / not recieved	Cable error	Loss of function	Oil temperature monitoring. Contact Husqvarna service	1. Check the electrical circuits. 2. Check the sensor. 3. Replace the sensor.
130	Error	The electrical circuit to the component connected to safety PLC output is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Circulation valve. Contact Husqvarna service	Check the electrical circuits. See the Service Diagram for connections.
131	Error	External voltage detected when expected to be 0 on safety PLC output.	Cable error	Loss of function	Circulation valve. Contact Husqvarna service	Check the electrical circuits. See the Service Diagram for connections.
132	Error	The electrical circuit to the component connected to safety PLC output is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Pressure control valve. Contact Husqvarna service	Check the electrical circuits. See the Service Diagram for connections.
133	Error	External voltage detected when expected to be 0 on safety PLC output.	Cable error	Loss of function	Pressure control valve. Contact Husqvarna service	Check the electrical circuits. See the Service Diagram for connections.
134	Error	The electrical circuit to the component connected to safety PLC output is checked for a short or an open circuit every time it is activated.	Cable error	Loss of function	Rotational valve. Contact Husqvarna service	Check the electrical circuits. See the Service Diagram for connections.
135	Error	External voltage detected when expected to be 0 on safety PLC output.	Cable error	Loss of function	Rotational valve. Contact Husqvarna service	Check the electrical circuits. See the Service Diagram for connections.

8 FAULT MESSAGES

Code	Warning level	Trigger condition/Cause	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Solution
150	Caution	Timer > service interval Service shall be able to reset timer First service interval 50h, after that 250h. Message shall trigger at 10h before 50h service runtime and 20h before 250h service runtime	Service of machine	Needed	Contact Husqvarna service	Performe service of the machine
151	Advisory	Oil temp back within range. Machine will return to normal state after advisory message has been cleared by user. Fault codes 11 and 12 no longer active	Oil temperature	Normal	Machine will return to normal state. Machine speed no longer reduced and tool activated	*NOTEXT*
152	Advisory	Motor temp back within range. Machine will return to normal state after advisory message has been cleared by user. Fault code 20 no longer active	Motor temperature	Normal	Machine will return to normal state. Machine speed no longer reduced and tool activated	*NOTEXT*
153	Advisory	Automatic calibration process interupted	Auto calibrate	Failed	Try again	*NOTEXT*
154	Advisory	User tries to activate track tension when AC motor is OFF	Track tension	Failed	Track tension can only be activated when electric motor is on. Start motor and try again	*NOTEXT*
156	Advisory	User tries to activate oil refill pump when AC motor ON	Oil refill	Failed	Oil refill is not possible when the electric motor is on	*NOTEXT*
157	Advisory	Machine wont activate due to joystick out of neutral position during start	Machine activation	Failed	Make sure joysticks are in neutral position	*NOTEXT*
170	Error	See FSR_01 for trigger	Safety PLC error	Safety Stop	Turn main switch OFF and start again	1. Check / Change cables (Error code for spec. cable set) 2. Check / Change safety PLC
171	Warning	See FSR_03 for trigger	Oil pressure sensor	Safety Stop	Turn main switch OFF and start again	1. Check the electrical circuits. 2. Check the sensor. 3. Replace the sensor. 1. Cable 2. Sensor 3. Safety PLC
172	Error	See FSR_03 for trigger	Oil pressure sensor	Safety Stop	Turn main switch OFF and start again	1. Cable 2. Sensor 3. Safety PLC
173	Error	See FSR_04 for trigger	System pressure	Safety Stop	Turn main switch OFF and start again	Idle valve Pressure sensor Cables Safety PLC
174	Error	See FSR_05 for trigger	Contactor error	Safety Stop	Turn main switch OFF and start again	Cable Contractor Safety PLC

Code	Warning level	Trigger condition/Cause	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Solution
175	Error	See FSR_06 for trigger	Contactor error	Safety Stop	Turn main switch OFF and start again	Cable Contractor Safety PLC
176	Error	See FSR_07 for trigger	Remote control error	Safety Stop	Turn main switch OFF and start again	Remote control Radio reciever Safety PLC
177	Error	(STOP1 = LOW OR STOP2 = LOW)	Emergency stop activated	Safety Stop	Reset emergency stop button to continue operation	Cable E-stop Safety PLC
178	Error	STOP1 = LOW =/= STOP2 = LOW	Emergency stop error	Safety Stop	Turn main switch OFF and start again	Cable E-stop Safety PLC
179	Error	IF Machine start AND [(STOPNC_CAN1=0x00 AND STOPNC_CAN2=0xFF) OR (STOPNO_CAN1=0xFF AND STOPNO_CAN2=0x00)] AND Machine is not locked by FSR 17 (Safe locking of machine function)	Machine stop activated	Safety Stop	Reset machine stop button to continue operation	Remote Control
180	Error	Signals STOPNO_CAN1, STOPNO_CAN2, STOP_NC_CAN1 AND STOPNC_CAN2) are not corresponding to each other (e.g STOPNC_CAN1=0xFF AND STOPNO_CAN1=0xFF. The CAN signals mentioned above shall be evaluated long enough time and at least 3 pairs of CAN open safety signals shall be invalid. Missing signal is defined as not receiving signal in defined intervals and it is considered as invalid as well.	Remote control error	Safety Stop	Turn main switch OFF and start again	CAN Cable Remote control Radio reciever Safety PLC

Code	Warning level	Trigger condition/Cause	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Solution
181	Error	"When hydraulic pump pressure controller is set to 0% (disabled) OR when the circulation valve goes HIGH: If Within 300 [ms] pressure is not less than 100 bar OR Within 600 [ms] pressure is not less than 50 bar OR Within 1500 [ms] pressure is not less than 30 bar Then shall the following outputs be set to LOW within 100 [ms]:	System pressure	Safety Stop	Turn main switch OFF and start again	Cables Particle in hydraulic system Pump regulator Pressure sensor Hydraulic pump Safety PLC
182	Error	See FSR014 for trigger	System pressure	Safety Stop	Turn main switch OFF and start again	Cables Particle in hydraulic system Pump regulator Pressure sensor Hydraulic pump Safety PLC
183	Error	If (MOVE_CAN1=0x00 AND MOVE_CAN2=0xFF) for more than 3 [s] following output shall be set to LOW (disabled) within 100 [ms]: - Hydraulic pump pressure controller If System pressure > 30 bar And Circulation valve has not changed state within 500 [ms]	System pressure	Safety Stop	Turn main switch OFF and start again	Cables Particle in hydraulic system Pump regulator Pressure sensor Hydraulic pump Safety PLC
184	Error	See FSR18 for trigger	System pressure	Safety Stop	Turn main switch OFF and start again	Cables Particle in hydraulic system Pump regulator Pressure sensor Hydraulic pump Safety PLC
185	Error	See FSR15A for trigger	System pressure	Safety Stop	Turn main switch OFF and start again	Cables Particle in hydraulic system Pump regulator Pressure sensor Hydraulic pump Safety PLC

8.2 Fault Messages - Remote Control

NOTE!

Refer to the Scanreco document 'SCANRECOU-20195 G6 error codes' for trouble shooting support.

Table 37. Fault Messages in the Remote Control

Code	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Description/Solution
1001	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1101	Left joystick	X-axis disabled	Release the joystick and restart the remote control	Left joystick X-axis (side-to-side) not in center position at start. Release the joystick and restart the remote control.
1102	Left joystick	Y-axis disabled	Release the joystick and restart the remote control	Left joystick Y-axis (back-and-forth) not in center position at start. Release the joystick and restart the remote control.
1103	Left joystick	Side switch disabled		Left joystick side switch not in center position at start. Release the joystick and restart the remote control.
1104	Right joystick	X-axis disabled	Release the joystick and restart the remote control	Right joystick X-axis (side-to-side) not in center position at start. Release the joystick and restart the remote control.
1105	Right joystick	Y-axis disabled	Release the joystick and restart the remote control	Right joystick Y-axis (back-and-forth) not in center position at start. Release the joystick and restart the remote control.
1106	Right joystick	Side switch disabled	Release the joystick and restart the remote control	Right joystick side switch not in center position at start. Release the joystick and restart the remote control.
1107-1108	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1109	Left joystick	Top button disabled	Release the joystick and restart the remote control	Left side on left joystick top button pressed at start. Release the joystick and restart the remote control.
1110	Left joystick	Top button disabled	Release the joystick and restart the remote control	Right side on left joystick top button pressed at start. Release the joystick and restart the remote control.
1111	Right joystick	Top button disabled	Release the joystick and restart the remote control	Left side on right joystick top button pressed at start. Release the joystick and restart the remote control.
1112	Right joystick	Top button disabled	Release the joystick and restart the remote control	Right side on right joystick top button pressed at start. Release the joystick and restart the remote control.
1113-1116	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1201	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left joystick X-axis faulty.
1202	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left joystick Y-axis faulty.
1203	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left joystick side rocker faulty.
1204	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right joystick X-axis faulty.

Code	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Description/Solution
1205	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right joystick Y-axis faulty.
1206	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right joystick side rocker faulty.
1207-1208	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1209	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left side on left joystick top rocker faulty.
1210	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right side on left joystick top rocker faulty.
1211	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left side on right joystick top rocker faulty.
1212	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right side on right joystick top rocker faulty.
1213-1216	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1301	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left joystick X-axis faulty.
1302	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left joystick Y-axis faulty.
1303	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left joystick side rocker faulty.
1304	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right joystick X-axis faulty.
1305	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right joystick Y-axis faulty.
1306	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right joystick side rocker faulty.
1307-1308	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1309	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left side on left joystick top rocker faulty.
1310	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right side on left joystick top rocker faulty.
1311	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Left side on right joystick top rocker faulty.
1312	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Right side on right joystick top rocker faulty.
1313-1316	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.

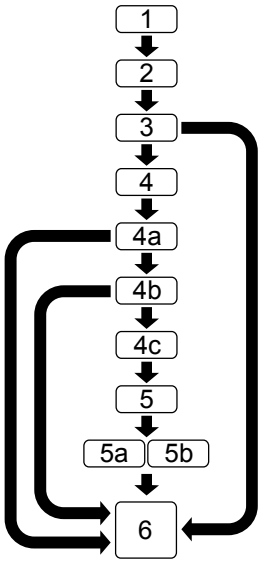
Code	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Description/Solution
1401-1408	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1501-1504	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1701-1702	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1801	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Tool speed potentiometer faulty.
1802	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Machine speed potentiometer faulty.
1803-1816	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
1901	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Tool speed potentiometer faulty.
1902	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	Machine speed potentiometer faulty.
1903-1916	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2002/2202	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2003/2203	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2004/2204	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2005/2205	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2006/2206	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2007/2207	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2008/2208	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2009/2209	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2010/2210	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2011/2211	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2012/2212	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.

Code	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Description/Solution
2013/2213	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2014/2214	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2015/2215	Remote control	Faulty	Contact Husqvarna service and report the error. codes in the information center display	The remote control is faulty.
2016/2216	Remote control	Faulty	Contact Husqvarna service and report the error. codes in the information center display	The remote control is faulty.
2017/2217	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2018/2218	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2019/2219	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2020/2220	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2021/2221	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2022/2222	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2023/2223	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2024/2224	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2025/2225	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2026/2226	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2027/2227	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2028/2228	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2029/2229	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2030/2230	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2098/2298	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
2099/2299	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.

Code	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Description/Solution
2102/2302	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2103/2303	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2104/2304	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2105/2305	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2106/2306	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2107/2307	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2108/2308	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2109/2309	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2110/2310	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2111/2311	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2112/2312	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2113/2313	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2114/2314	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2115/2315	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2116/2316	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2117/2317	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2118/2318	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2119/2319	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2120/2320	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2122/2322	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.

Code	Text displayed row 1	Text displayed row 2	Text displayed row 3-5	Description/Solution
2123/2323	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2198/2398	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
2199/2399	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
3103	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
3201-3204	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
8101-8107	Receiver CAN interface	Communication not working	Check the CAN-bus connection to the machine	A CAN bus communication error between the remote control receiver and the machine has occurred. Check wiring between the remote control receiver and the machine.
9001-9002	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
9501-9505	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
9101-9199	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
9301-9399	Remote control receiver	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control receiver (mounted on the machine) is faulty.
9401-9499	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.
9801-9899	Remote control	Faulty	Contact Husqvarna service and report the error codes in the information center display	The remote control is faulty.

9.1 Method Strategy



Most accidents involving machines occur during troubleshooting, service and maintenance as staff have to locate themselves within the machines risk area. Prevent accidents by being alert and by planning and preparing the work thoroughly before start.

1. Get a good knowledge of the customers description of the fault.

Always start by checking if any error code or message is displayed in the Remote Control.

The LEDs on the electrical relays, worklight flashing and horn sound can also be part of an fault message.

Follow the instructions for the displayed message described in the chapter Display Messages.

2. If there are no displayed messages in the Remote Control, fault analysis can be carried out on the basis of symptoms.

Make sure that no emergency stop or machine stop are pressed by turning the switches clockwise.

Make sure that the battery for the remote control is charged and correctly installed (The display symbol is not red).

3. Component Check - Make a check of all components and connections for damage or leakage.

Replace damaged hoses or cables immediately. Repair the machine as indicated.

4. Hydraulic Check - Make a check of the pressure in the system.

Check the pressure and compare with the specfication of the machine.

Listen if the Hydraulic Pump operates as it should without any abnormal noise.

– 4a. Oil Level Check - Make a check of the hydraulic oil level in the oil tank.
  Refill but check which quality of hydraulic oil the machines hydraulic system contains before refilling.
– 4b. Oil Check - Compare and make sure the hydraulic oil temperature is within correct value.
  Make sure it is not a discoloured hydraulic oil due to water leakage or overheating.
  Do not mix different types of hydraulic oil. The hydraulic system may clog and damage the machine.
  Change the hydraulic oil if it is a risk that mixed types of oil have been used in the machine.
– 4c. Filter Check - Remove the Hydraulic Oil Filter and check if it is an unusually large amount of large metal particles or sealing compound in it.
  - If this is the case, the machines hydraulic system must be checked for faults.

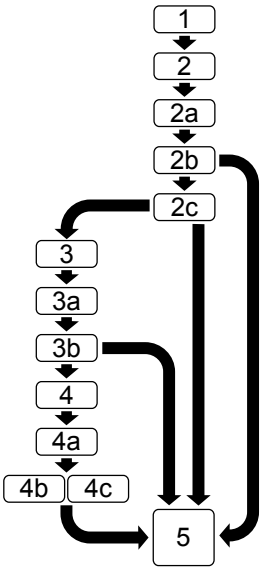
5. Function Check - Make an electrical or a mechanical check of all the affected components.

Perform a troubleshooting on the faulty component based on customer complaint, use the electrical schematics and hydraulic schematics.

– 5a. Repair part if possible and according to procedure depending of what part it concerns.
– 5b. Change the defective part.

6. Final inspection and testing must be carried out after the machine has been repaired.

9.2 Fault Diagnosis Strategy



1. The fault diagnosis strategy should be based on the a customer description of the trouble. If necessary, the customer must demonstrate the trouble on the machine to avoid all misunderstanding.

2. Fault messages which refer to secondary faults may have been generated in the machine.

– 2a. Compare the customer complaint with the description of symptoms for the different fault messages.
– 2b. Certain fault symptoms can be remedied by reprogramming the control modules.
  Check if the customer complaint match to an already known related firmware fault.
  Make a check of the installed firmware of the machine and make sure that the latest or correct version is installed.
  Update the machine with the correct firmware.
– 2c. If the description of symptoms for any fault message coincides with the customer complaint, this fault message is probably caused by the primary fault.
  Repair the machine as indicated.

3. If there are no points of coincidence with fault messages, fault diagnosis can be carried out on the basis of symptoms.

– 3a. Check the Troubleshooting Guide in the workshop manual on the basis of symptoms in the system where the fault occurs.
– 3b. If the description of symptoms in the system concerned coincides with the customer complaint, the right fault diagnosis description has probably been found.
  Repair the machine as indicated.

4. If there are no items that match with the diagnostic or symptom, the technician or mechanic will perform fault diagnosis without assistance.

Good technical product knowledge is required to solve this type of problem.

– 4a. Perform a visual inspection of defective components and wiring harness based on the customer complaint.
– 4b. Replace or repair the defective component.
– 4c. Perform a troubleshooting on the faulty component based on the customer complaint, use the Electrical Service Diagrams.
  Check the fuses for the system with the faulty component.
  Make a check of relays and connections for retracted pins or defective pin clamping forces.
  Measure the voltage between the pinout for the supply, shown in the Electrical Service Diagrams, to the faulty component and the Ground Terminal Block (X1) to make sure the supply is correct.
  Measure the resistance in the wires between the faulty component and the surrounding connected components.
  Repair the machine as indicated.

5. Clear all diagnostic trouble codes for all systems. A Function Test must be carried out after the machine has been repaired.

9.3 Troubleshooting Guide

If service operations or troubleshooting does not require the machine to be switched on, the power cable must be removed and positioned so that it cannot be connected by mistake.

This troubleshooting guide will provide tips to help finding the fault. Always start by checking if any error message is displayed on the Remote Control. Refer to: Section 8.1 “*Display Messages - Machine*”, page 91

Table 38. Troubleshooting Guide

Fault	Possible Cause	Suggested Action
Electrical Motor does not start.	Possible cause of the fault: – An Emergency Stop is pressed. – A fuse has blown. – Main voltage to the machine is too low.	1. Check the emergency stop buttons. 2. Check the External supply. 3. Check the fuses in the electrical cabinet.
Fuses for the main connections blow during start.	Possible cause of the fault: – Incorrect rating of fuses for the machine. – Electrical Motor has blown (sharp smell). – The Hydraulic Pump is broken.	1. Check the fuses of the main connection. 2. Check the Hydraulic Oil Filter. If it is full of debris, it is an indication of a broken Hydraulic Pump. 3. Replace the Electrical Motor.
Machine operates but the fuses for the main connections blow during the operation.	Possible cause of the fault: – Main voltage to the machine is too low. – Incorrectly dimensioned power cable.	1. Check power supply and ensure correct voltage. 2. Ensure that the power cable is correctly dimensioned.
Electrical Motor runs but the hydraulic functions have no power or do not work at all.	Possible cause of the fault: – Not enough hydraulic oil in the tank. (Knocking noise coming from the pump). – Circulation valve is continuously open, does not close when activating the machine. – LS/standby pressure too low. – Fault in the pump regulator.	1. Stop the motor at once and check for leaks. 2. Refill of hydraulic oil. 3. Check the wires between the Circulation Valve and the Control Module and the bypass signal from soft start to control module. 4. Check the Circulation Valve for surrounding magnetic field. 5. Extend an unloaded cylinder to its end position and check the pump pressure in the display. Refer to: Section 15.2 “*Guide Values and Specifications*”, page 209 – If the pressure is correct, the pump regulator is OK. 6. Check the pressure settings in the Remote Control. 7. Activate the Remote Control without running any functions and check the LS/standby pressure in the display. – The correct pressure should be 20±1 bar.
Boom-Stick movements and tool function run slowly.	Possible cause of the fault: – Tool speed adjustment and Slow motion control on the Remote Control have been set too low. – LS/standby pressure is set too low.	1. Adjust the speed settings of the two Remote Control knobs. Refer to the Owners Manual. 2. Activate the Remote Control without running any functions and check the idle pressure in the display. – The correct pressure should be 20±1 bar.

Fault	Possible Cause	Suggested Action
Remote Control does not work.	Possible cause of the fault: – Low battery. – No communication between the Remote Control and the machine.	1. If the display in the Remote Control shows a warning for low battery, check the charge of the battery and if it is correct installed. 2. Make sure it is the correct Remote Control being used. Green symbol in the display indicates contact. 3. Check that the Communication cable and Antenna cable on the machine are properly secured – test run the machine. Check diodes of the radio module on the machine. – Check the fuse F5. – Replace the radio module (KE5). **Note -** The machine can be controlled with the Remote Control when the communication cable is connected between the Remote Control and the machine.
An individual function is running slowly.	Possible cause of the fault: – Incorrectly adjusted max current. – Restriction in a hydraulic hose. – Valve spool runs with friction. – Internal fault/leakage in the cylinder or motor.	1. Adjust the maximum current to the default value. 2. Extend an unloaded cylinder to its end position and check the Hydraulic Pump pressure in the display. Refer to: Section 15.2 “*Guide Values and Specifications*”, page 209 3. Clean the affected valve spool. Refer to: Section 10.5.1.4 “*Valve*”, page 139 4. Replace the valve spool if it is scratched or deformed.
An individual function is not working.	Possible cause of the fault: – Joystick is in an operative position during start of the Remote Control. – Fault in the cylinder/motor valve or the spool in the valve is stuck or damaged.	1. Restart the Remote Control with the Joystick in a neutral position. 2. Clean the cylinder/motor valve. Refer to: Section 10.5.1.4 “*Valve*”, page 139 3. Replace the valve spool if it is damaged.
The machine sinks on the Outriggers.	Possible cause of the fault: – Leaking Cylinder Safety Valve on the Outrigger Cylinder. – Internal leakage in the cylinder.	– Check the Cylinder Safety Valve on the cylinder housing. – Dismantle the cylinder and replace damaged parts and seals.
Jerky movements of the Boom-Stick.	Possible cause of the fault: – The hydraulic oil has been heated up in a cold machine. – A valve spool is seizing due to contamination. – Broken O-rings in the pilot control valve. – Fault in the servo circuit. – Fault in the LS load sensing system.	1. Wait for the machine to heat up more evenly. 2. Clean the valve thoroughly. – Replace spool with visible scratches. 3. Replace old/faulty O-rings. 4. Clean and repair the servo circuit. 5. Check the pressure during activation. – The correct LS/standby pressure should be 20±1 bar.
Cylinder sinks* * If cylinder 3 (stick) or 4 (tool) slowly sinks (aprox. 1 cm/min), this is entirely normal as they do not have any counter balance valves.	Possible cause of the fault: – Contamination in the hydraulic system. – Leakage in the cylinder. – Defective valve. – Faulty counter balance valve.	1. Check for possible leaks. – Repair the leakage or replace the damaged component. 2. Change the hydraulic oil and replace the oil filter. 3. Clean the counter balance valve with compressed air or replace if necessary. 4. Check the cylinder valve housing, clean and replace if necessary.

Fault	Possible Cause	Suggested Action
Overheating in the hydraulic system.	Possible cause of the fault: – Cooler blocked or obstructed. – Defective cooler thermostat. – Too high ambient temperature. – Defective hose or coupling. – Restriction in main line or line to tool. – Power extraction too high due to faulty or unsuitable tool. – Defective Hydraulic Pump. – Check the Fan on the cooler.	1. Clean the Cooler. 2. Use forced cooling. 3. Replace the cooler thermostat. 4. Replace defective Cooler. 5. Replace defective hose or coupling. 6. Check the tool pressure and the flow and make sure it is compatible with the machines specifications. 7. Replace the Fan and DC-motor if faulty. Refer to: Section 10.5.2.2.1 “*Fan*”, page 142 8. Replace the Hydraulic Pump. Refer to: Section 10.5.3.1 “*Hydraulic Pump*”, page 143
Knocking noise in the hydraulic system	Possible cause of the fault: – Not enough hydraulic oil in the tank. – Air in the hydraulic oil. – Defective Hydraulic Pump.	1. Stop the motor at once and check for leaks. 2. Check the hydraulic oil level. 3. Run the machine without a load until air and oil have separated. 4. Replace the Hydraulic Pump. Refer to: Section 10.5.3.1 “*Hydraulic Pump*”, page 143
Discolored hydraulic oil.	Possible cause of the fault: – Cloudy grey oil indicates water in the system. – Black oil indicates coke formation due to too high operating temperature.	1. Check and repair the fault if the hydraulic oil indicates water leakage into the system. – Change the hydraulic oil and replace the Hydraulic Oil Filter. 2. Clean the Cooler and the Cooler Fan if the hydraulic oil indicates too high operating temperature. – Change the hydraulic oil and replace the Hydraulic Oil Filter.

9.4 Diagnostics for the Remote Control

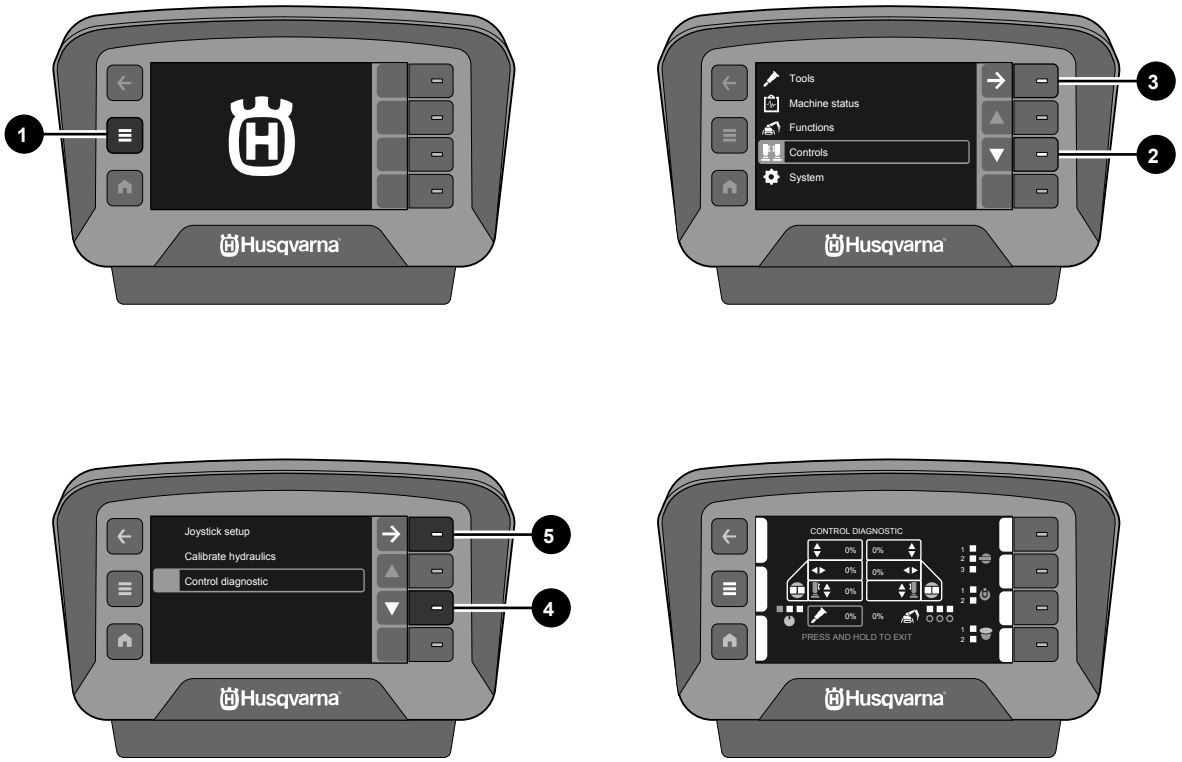


Figure 9.4-1. Controls diagnostics

Controls Diagnostics

To test the functions of the Joysticks, potentiometers and buttons start the Remote Control and press the menu button (1).

Press the down button (2) to move down to "Controls".

Press the button for the information center display (3) to enter the Controls Menu.

Press the down button (4) to move down to "Control diagnostic".

Press the button for the information center display (5) to enter Controls diagnostic.

Push the menu buttons, rotate the potentiometers and move the joysticks to verify their functionality.

The control indicators in the display changes from white to orange when you do the function tests. Operate a control on the remote control to its maximum. The control operates correctly when the control indicator shows 100% in the display.

9.5 Electrical Final Check

Finalization

Make sure all the parts are correctly mounted and all the connectors correctly connected.

– Use the correct torque when mounting parts. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211.
– Before connect and start of the electrical system make sure the power cable, all connectors and sockets are correctly connected so no risk of accidents can occur.

Hydraulic System

A refill is needed if the hydraulic system has been drained during the troubleshooting. Refer to: Section 7.5.2 “*Drain and Refill Hydraulic Oil*”, page 82.

Clear all Messages

Clear all fault messages to make sure the machine is ready to use.

– Make a restart of the machine. The system makes a self-test during start.
– Repair the machine before use if any fault message is displayed in the Remote Control.

Function Check

WARNING!

Be aware of risks.

Make sure no one is within the machine's risk area during test of the machine.

Make a Function Test before start of use. Refer to: Section 6.1 “*Function Test*”, page 69.

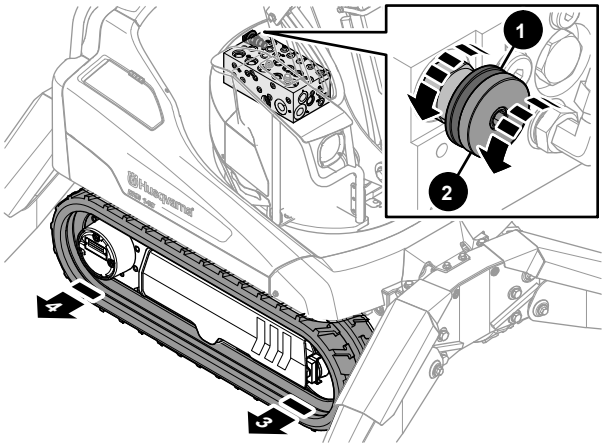
10.1 Traction System

10.1.1 Rubber Tracks

Preparations before start

Raise the machine on its Outriggers.

Remove



1. Open the Side Cover Left.
2. Release the counter lock knob (1).
3. Release the pressure by twisting the release knob to the end position (2).

   Make sure it is locked in it's pulled out position.

   Push on the Tension Idler to fully retract the Tensioning Cylinder to its end position if the cylinder is stuck.
4. Remove the Rubber/Steel Track from the Tension Idler (2).
5. Remove the Rubber/Steel Track from the Drive Gearwheel (3).

Install

1. Install the Rubber/Steel Track.

   Do the steps above in reverse order.

   When fitting a new Rubber/Steel Track, check that the Drive Gearwheel teeth engage properly in the Rubber/Steel Track.

   OPTIONAL METHOD

   If the Rubber/Steel Track is very stiff (e.g. in cold conditions), it can be removed as follows:

   – Lift off from the Tension Idler and slowly run the track drive in reverse.

   Install as follows:

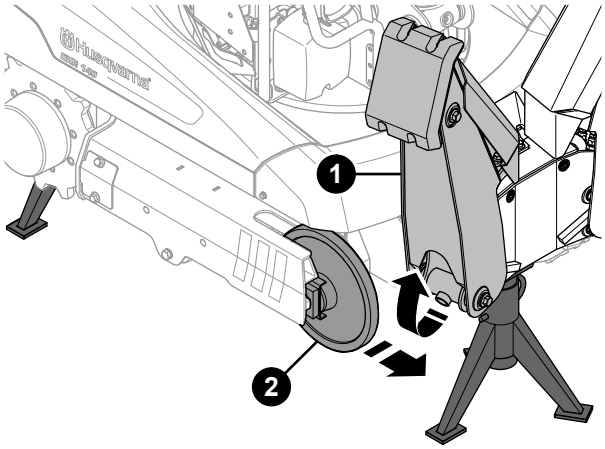
   – Place the rubber track on the Tension Idler and over the Drive Gearwheel. Slowly run the track drive in reverse direction until the teeth fits into the Rubber/Steel Track.

10.1.2 Tension Idler

Preparations before start

Remove the Rubber/Steel Tracks. Refer to:Section 10.1.1 “*Rubber Tracks*”, page 113

Remove



1. Lift up the Outrigger (1) to be able to remove the Tension Idler.
2. Remove the Tension Idler (2).

Install

1. Install the Tension Idler.

   Do the steps above in reverse order.

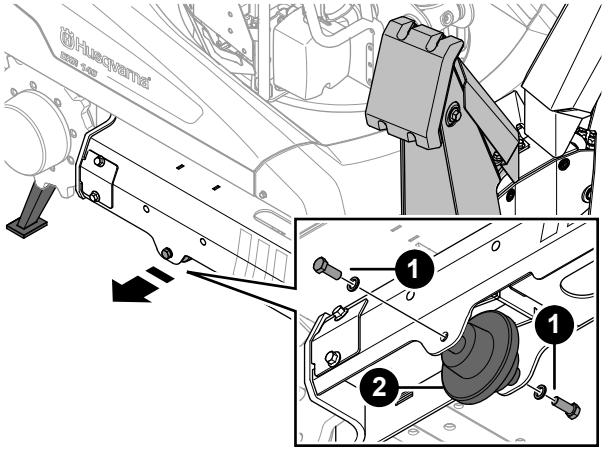
10.1.3 Track Roller

It is easy to remove and install the part if the machine is on its left side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Preparations before start

Remove the Rubber/Steel Tracks. Refer to:Section 10.1.1 “*Rubber Tracks*”, page 113

Remove



1. Remove the two fasteners (1) for the Track Roller.
2. Remove the Track Roller (2).

Install

1. Install the Track Roller.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

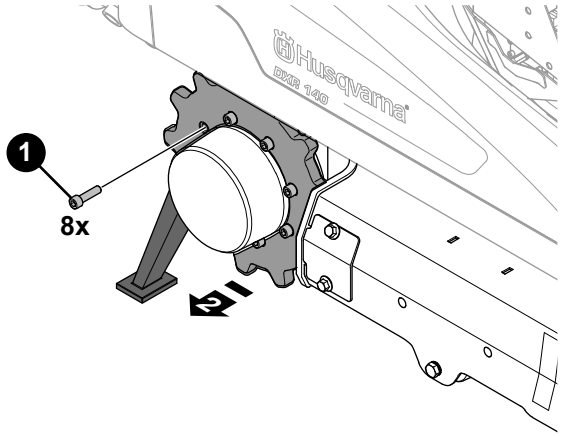
10.1.4 Drive Gearwheel

Raise the machine on the Outriggers.

Preparations before start

Remove the Rubber/Steel Tracks. Refer to:Section 10.1.1 “*Rubber Tracks*”, page 113

Remove



1. Remove the eight fasteners (1) from the Drive Gearwheel.
2. Remove the Drive Gearwheel (2).

Install

1. Install of the Drive Gearwheel.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.1.5 Hydraulic Drive Motor

It is easy to remove and install the part if the machine is on its left side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Preparations before start

Remove the Rubber/Steel Track. Refer to: Section 10.1.1 “*Rubber Tracks*”, page 113

Remove the Drive Gearwheel. Refer to:Section 10.1.4 “*Drive Gearwheel*”, page 115

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

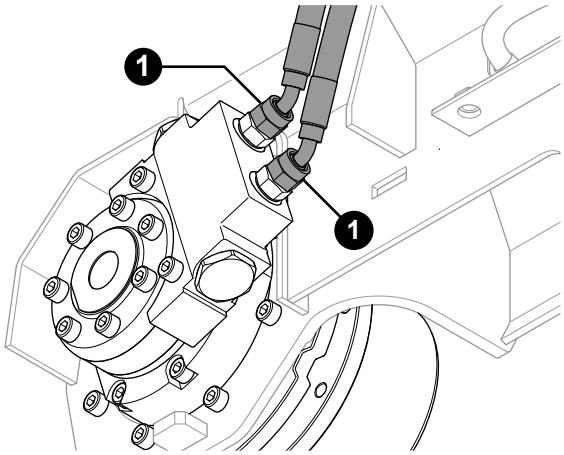
Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

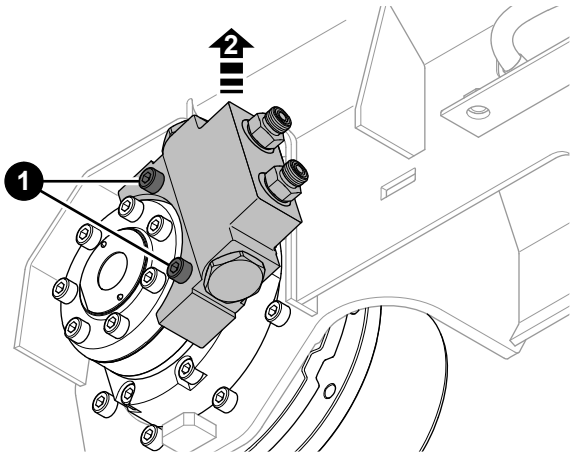
AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

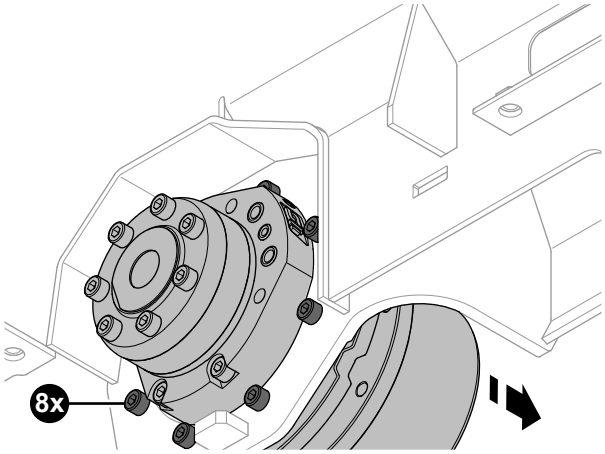
Remove



1. Gently remove and plug the two hydraulic hose couplings (1) fot the Hydraulic Drive Motor. Refer to Section 7.1.2 “*Hydraulic Couplings*”, page 73
2. Plug all the openings.



3. Remove the two fasteners (1) for the valve.
4. Remove the valve (2).



5. Remove the eight fasteners for the Hydraulic Drive Motor.
6. Remove the Hydraulic Drive Motor.

Install

1. Install of the Hydraulic Drive Motor.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

   Check the oil level and refill if necessary. Refer to: Section 7.5.2 “*Drain and Refill Hydraulic Oil*”, page 82

10.1.6 Track Tension Valve Block

10.1.6.1 Tensioning Release Valve

It is easy to remove and install the part if the machine is on its left side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Preparations before start

Remove the Rubber/Steel Tracks. Refer to:Section 10.1.1 “*Rubber Tracks*”, page 113

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

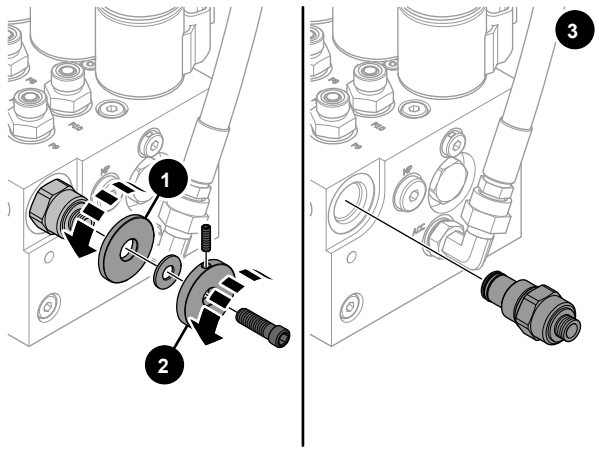
Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Release the counter lock knob (1).
2. Release the pressure by twisting the release knob to the end position (2).
3. Remove the Tensioning Release Valve (3).

Install

1. Install of the Tensioning Release Valve.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.1.7 Tensioning Cylinder

It is easy to remove and install the part if the machine is on its left side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Preparations before start

Remove the Rubber/Steel Track. Refer to: Section 10.1.1 “*Rubber Tracks*”, page 113

Remove the Tension Idler. Refer to:Section 10.1.2 “*Tension Idler*”, page 114

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

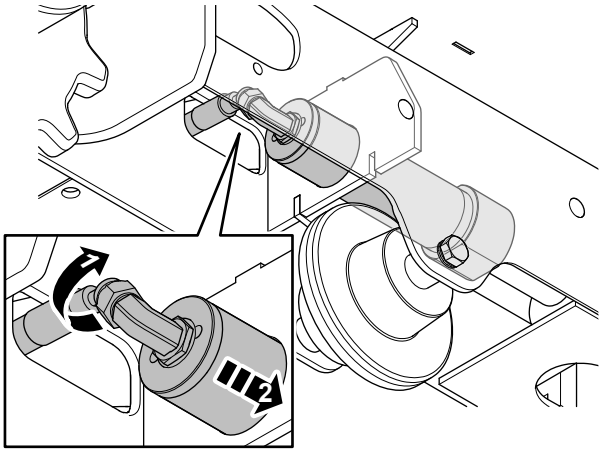
Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Gently remove the hydraulic coupling (1) from the Tensioning Cylinder and plug the openings. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73

2. Pull out the Tensioning Cylinder (2).

Install

1. Install of the Tensioning Cylinder.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.1.8 Tensioning Accumulator

10.1.8.1 Tensioning Accumulator

Preparations before start

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

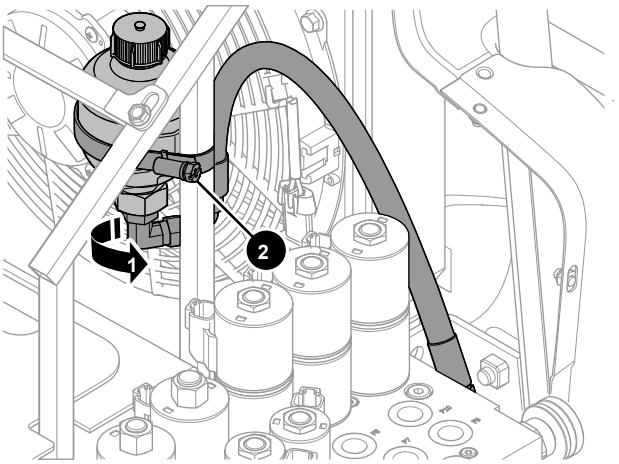
Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Release the tension of the Rubber/Steel Tracks. Refer to step 1 and 2: Section 10.1.1 “*Rubber Tracks*”, page 113

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Gently remove the hose (1) from the Tensioning Accumulator. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
2. Remove the clamp (2) that fixates the Tensioning Accumulator.
3. Remove the Tensioning Accumulator.

Install

1. Install of theTensioning Accumulator.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

   Operate the Outriggers up and down to re-tension the Rubber/Steel Track.

10.1.9 Tensioning Release Valve

It is easy to remove and install the part if the machine is on its left side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Preparations before start

Remove the Rubber/Steel Tracks. Refer to:Section 10.1.1 “*Rubber Tracks*”, page 113

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

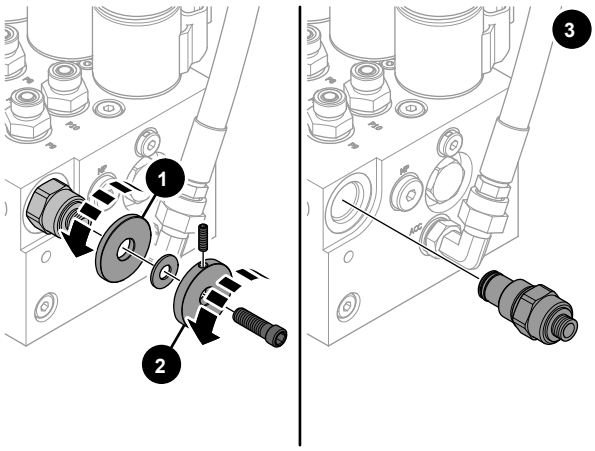
Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Release the counter lock knob (1).
2. Release the pressure by twisting the release knob to the end position (2).
3. Remove the Tensioning Release Valve (3).

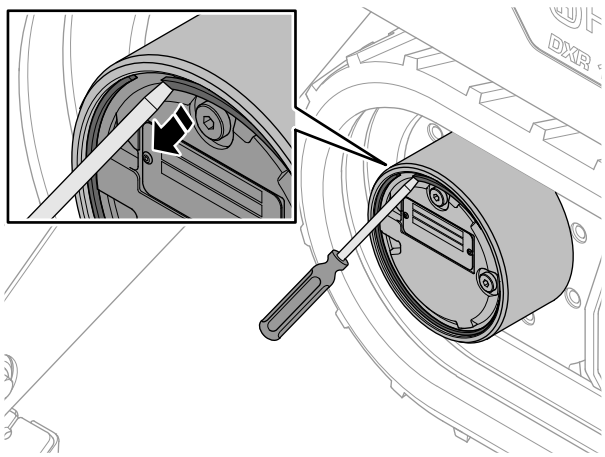
Install

1. Install of the Tensioning Release Valve.

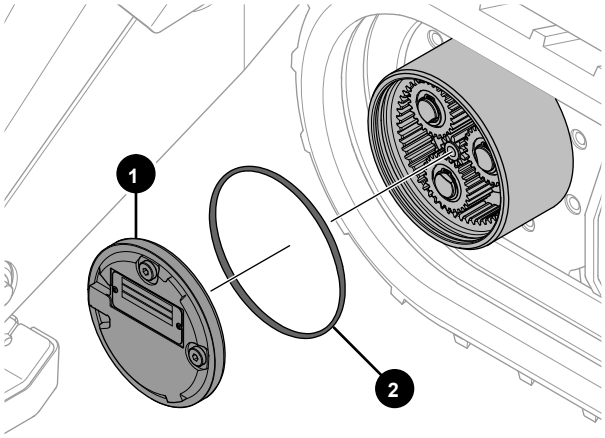
   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.1.10 Lid, Hydraulic Drive Motor

Remove



1. Remove the locking ring.



2. Remove the lid (1)
3. Remove the O-ring (2).

Install

1. Install the Lid.

   Do the steps above in reverse order. (Lubricate the O-ring with oil before installation)

   Refill and check the oil level. Refer to: Section 7.5.2 “*Drain and Refill Hydraulic Oil*”, page 82

10.2 Outriggers

10.2.1 Outrigger Cylinder

10.2.1.1 Outrigger Cylinder

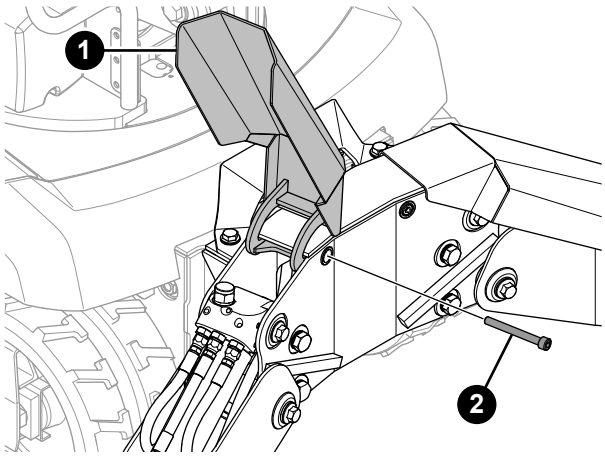
Preparations before start

Lower the Outrigger to the ground without any press so that it just touches the ground.

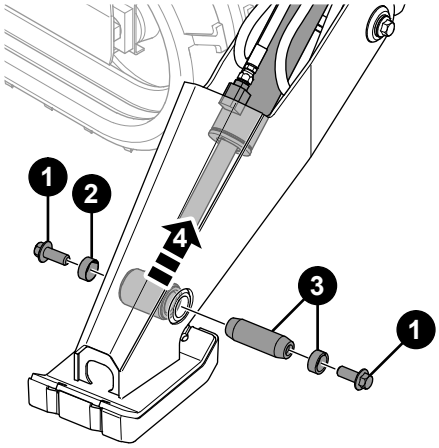
AVOID POLLUTING THE HYDRALIC SYSTEM!

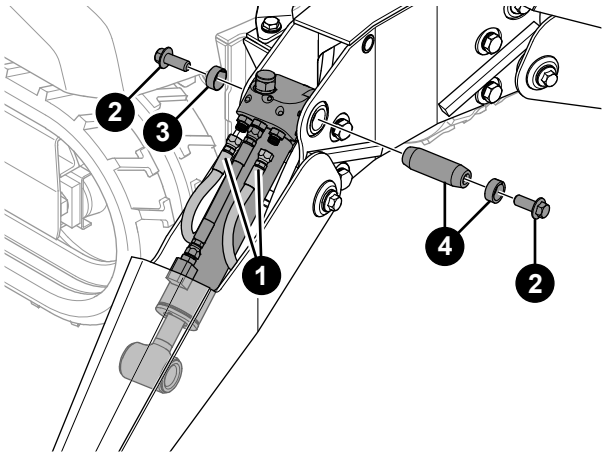
Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the Cylinder Shield.





2. Remove the two fasteners (1) for the outer Outrigger Cylinder shaft.
3. Remove the cone ring (2). Refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
4. Remove the shaft and the other cone ring (3).
5. Start the machine and retract the cylinder (4) to minimize the amount of oil in the part.
6. Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

7. Mark the lines and gently remove the hydraulic couplings (1). Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
8. Plug all the couplings.
9. Remove the two fasteners (2) for the inner cylinder shaft.
10. Remove the cone ring (3). Refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
11. Remove the shaft and the other cone ring (4).
12. Remove the Outrigger Cylinder.

Install

1. Install of the Outrigger Cylinder.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.2.2 Outrigger Cylinder Safety Valve

Preparations before start

Lower the Outriggers to the ground without any press and make sure that they just touch the ground.

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

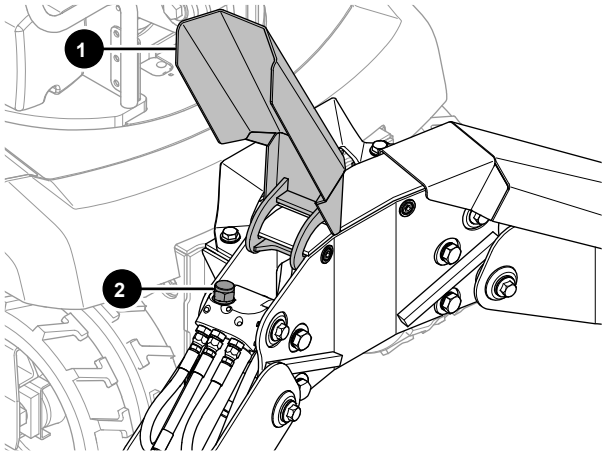
Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149.

AVOID POLLUTING THE HYDRALIC SYSTEM!

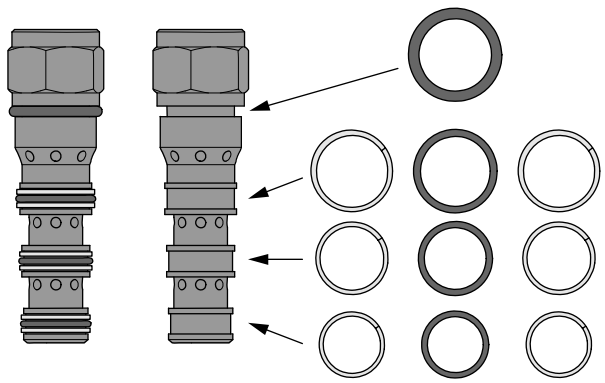
Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Fold up the Cylinder Shield (1).
2. Remove the Outrigger Cylinder Safety Valve (2) from the Outrigger Cylinder.
3. Plug the opening to prevent dirt in the hydraulic system.
4. Make a check of the Outrigger Cylinder Safety Valve before you perform the next step.
   - Determine if the valve needs to be replaced.
   - Determine if the seals need to be replaced.
5. Remove the seals from the Outrigger Cylinder Safety Valve. Do not scratch the metal surface.

Install



1. Oil or grease the new seals. Install the seals on the Outrigger Cylinder Safety Valve.
2. Fit the valve to the Outrigger Cylinder. Tighten to 50 Nm.
3. Loosen the Outrigger Cylinder Safety Valve once to make sure that the seals are intact. Tighten again to 50 Nm.

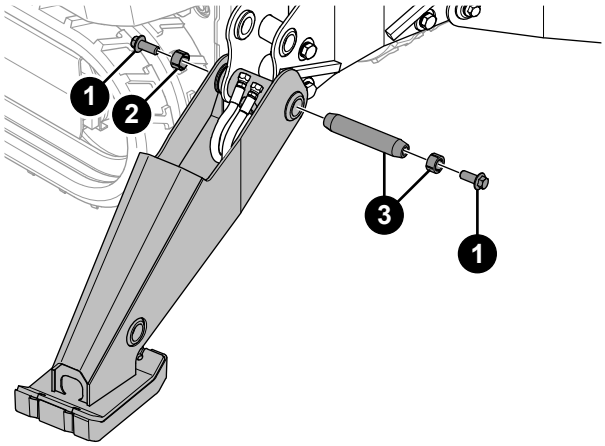
10.2.3 Outriggers

10.2.3.1 Outrigger

Preparations before start

Remove the Outrigger Cylinder. Refer to:Section 10.2.1.1 “*Outrigger Cylinder*”, page 121

Remove



1. Remove the two fasteners (1) for the Outrigger.
2. Remove the cone ring (2). Refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
3. Remove the shaft, the other cone ring (3) and the shims if installed.
4. Remove the Outrigger.

Install

1. Install of the Outrigger.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

   Due to heavy intermittent loads all joints should be tightened as firmly as possible and according to correct torque recommendations.

   This ensures the highest precision when operating the machine. Refer to: Section 10.3.2 “*Install a Shaft with Shims*”, page 128

10.2.4 Outriggers and Bracket Complete

Preparations before start

Lower the Outriggers to the ground without any press so that it just touches the ground.

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

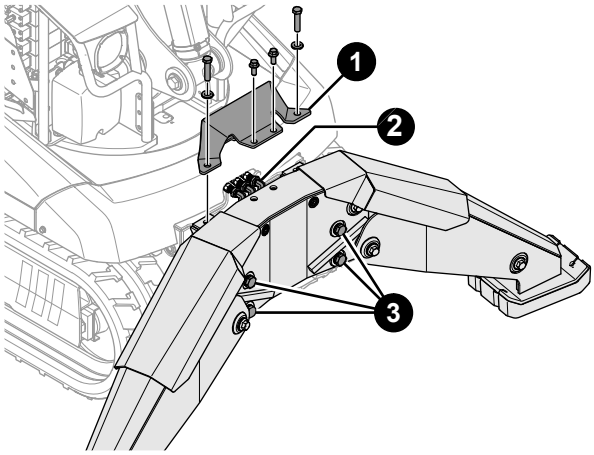
Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

AVOID POLLUTING THE HYDRALIC SYSTEM!

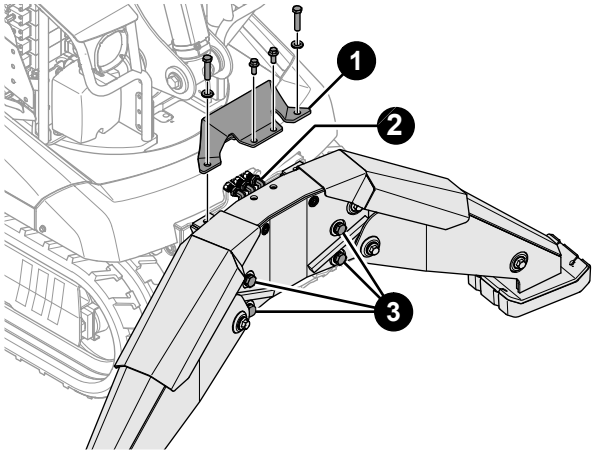
Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the four fasteners (1) and the shield.
2. Mark the lines and gently remove the hydraulic couplings (2). Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
3. Plug all the couplings.
4. Remove the four fasteners (3) for the Outrigger Bracket.
5. Remove the complete Outrigger Bracket with Outriggers.

Install



Install of the Outriggers and the Bracket Complete.

1. Place the Outriggers and Outrigger Bracket so they can be re-installed.
2. Install the hydraulic couplings (2). Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
3. Install the four fasteners (1) by hand. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211
4. Install the four fasteners (3) in a cross pattern order. Use the correct torque for the Outrigger Bracket:**197 Nm**
5. Tighten the four fasteners (1). Use the correct torque for the Outrigger Bracket:**81 Nm**

10.2.5 Outrigger Bracket

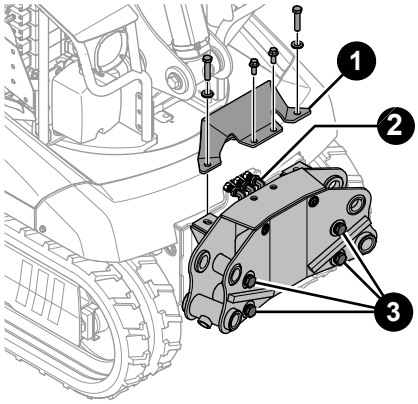
Preparations before start

Remove the Outrigger Cylinders and the Outriggers on both sides of the Outrigger Bracket. Refer to:Section 10.2.1.1 “*Outrigger Cylinder*”, page 121 and Section 10.2.3.1 “*Outrigger*”, page 124

AVOID POLLUTING THE HYDRALIC SYSTEM!

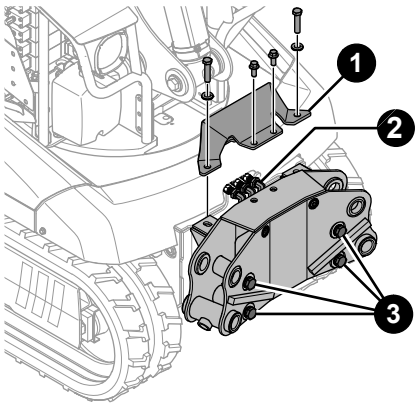
Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the four fasteners (1) and the shield.
2. Mark the lines and gently remove the hydraulic couplings (2). Refer to:Section 7.1.2 “*Hydraulic Couplings*”, page 73
3. Plug all the couplings.
4. Remove the fasteners (3) for the Outrigger Bracket.
5. Remove the Outrigger Bracket.

Install



Install of the Outrigger Bracket.

1. Place the Outrigger Bracket so it can be re-installed.
2. Install the hydraulic couplings (2). Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
3. Install the four fasteners (1) by hand. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211
4. Install the four fasteners (3) in a cross pattern order. Use the correct torque for the Outrigger Bracket:**197 Nm**
5. Tighten the four fasteners (1). Use the correct torque for the Outrigger Bracket:**81 Nm**

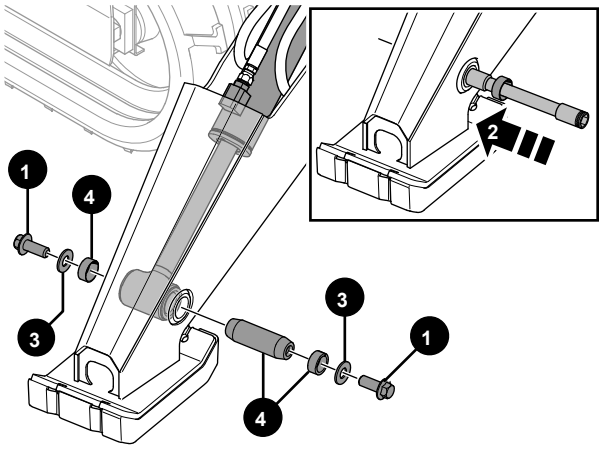
10.3 Boom

10.3.1 Shaft of Joints and Cylinders

Preparations before start

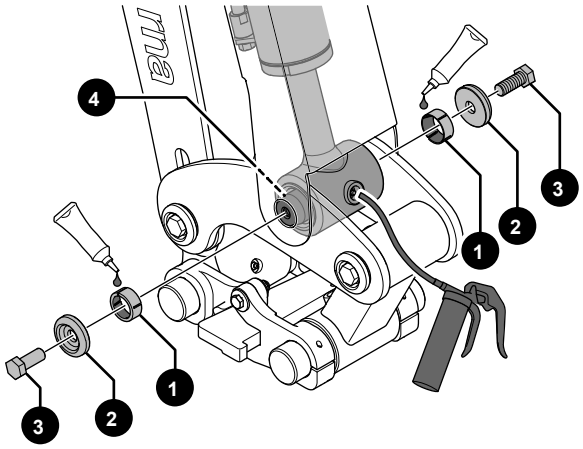
Prepare the disassembling by checking that the weight of the concerned structure is safely balanced and the hydraulic hoses are properly removed or tied up in a safe way.

Remove



1. Remove the fasteners (1) on both sides of the cylinder joint and remove the washers (3).
2. Tap (2) the axle alternatively on left and right side until the tension on the sleeves is released (use a piece of pipe between the mallet/hammer not to damage the threads).
3. Remove the sleeves and axle (4). DO NOT DAMAGE THE THREADS.

Install



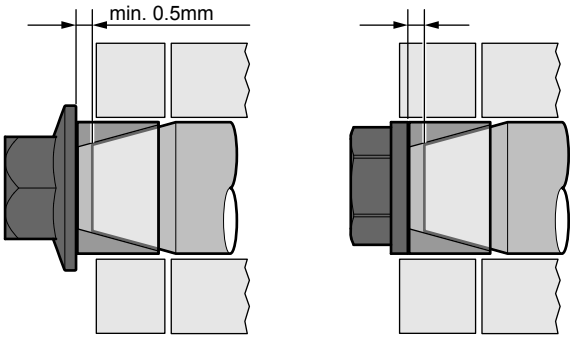
Install of the cylinder.

1. Lubricate the shaft (4).
2. Position the cylinder and install the shaft.

   Make sure the conical surface are free from scratches and damage.

   All joints should be tightened as firmly as possible. Use shims if needed. Refer to: Section 10.3.2 “*Install a Shaft with Shims*”, page 128
3. Put grease on the tapered lock rings (1) and install the rings on both sides.

   Make sure the conical surface are free from scratches and damage.
4. If the attachment previously had washer mounted, install the washers (2) on both sides.
5. Install the fasteners (3) on both sides evenly and center the attachment.
6. Tighten the attachment first by hand.
7.
8. Lubricate the shaft by pressing in grease through the shaft nipple. Refer to: Section 7.4 “*Lubrication, Grease Nipples*”, page 81.



9. The fasteners, or the washers if they are mounted, shall not be in contact with the shaft or the surface of the part, only in contact with the tapered lock ring. Leave a min. 0.5mm space.
10. After initial torque, move machine through full range of motion several times and recheck torque. Check the torque after 10 hours, 40 hours and at regular service intervals to ensure proper seating of the sleeves.

    When the fasteners is fixed and not move during the re-tightening the installation is correct.

    If it still is possible to turn the fasteners during the re-tightening, repeat the procedure after 40 hours.

NOTE!

RETIGHTENING OF THE EXPANDER SYSTEM IS NECESSARY TO ATTAIN A SUCCESSFUL INSTALLATION. CHECK THE TORQUE AT REGULAR SERVICE INTERVALS.

NOTE!

LUBRICATION OF THE JOINT IS DETERMINANT OF THE FUNCTIONALITY AND LIFE SPAN OF THE EXPANDER SYSTEM.

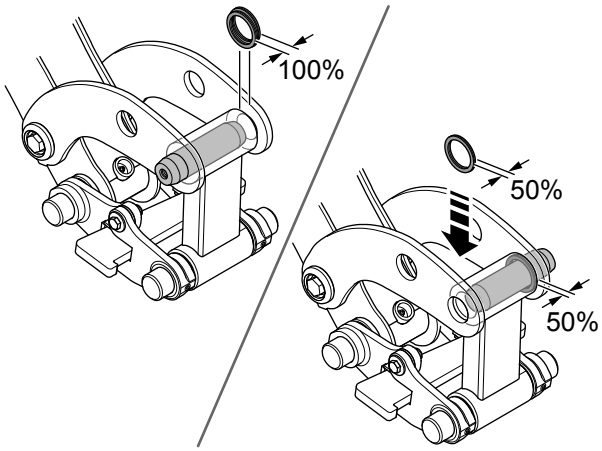
10.3.2 Install a Shaft with Shims

Due to heavy intermittent loads, all joints should be tightened as firmly as possible. This allows for high precision when operating the machine.

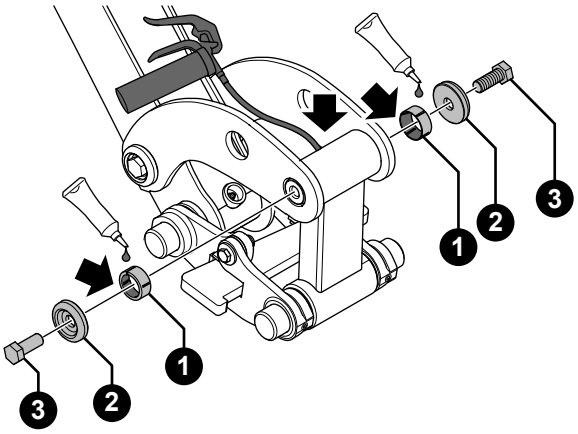
Remove

1. Save removed shims for reuse during installation.

Install



1. Insert the shaft partially as illustrated.
2. Check the amount of shims needed to achieve a firm fit.
3. Install half of the shim package on one side and the other half on the other side of the joint shaft.



2. For further instructions refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127

10.3.3 Boom Cylinder

Preparations before start

Lower the Outriggers to the ground and position the Boom-Stick for easy access of the Boom-Cylinder.

Firmly secure the Boom-Stick on the ground. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Remove the covers for the Turret. Refer to: Section 4.4 “*Covers*”, page 9

Remove the five fasteners for the right Turret Light Frame and remove the frame.

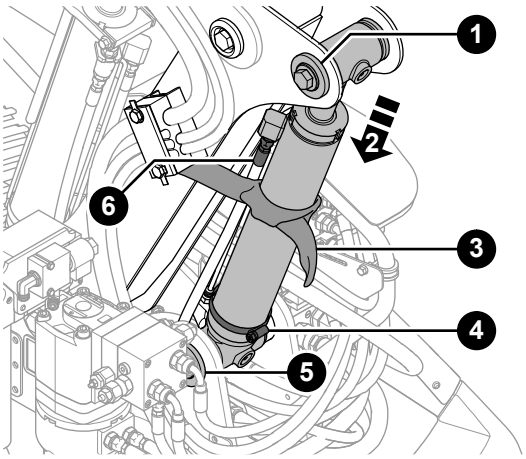
Remove the Slave Control Module Body. Refer to: Section 10.7.1 “*Master Control Module KE1*”, page 166

Remove the fasteners for the Valve Block Arm System and fold away to be able to remove the fasteners for the inner cylinder joint.

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Use a strap (3) around the Boom-Cylinder to secure it when removing it.
2. Remove the two fasteners (1) for the outer cylinder joint.
3. Remove the outer Boom-Cylinder shaft (1). Refer to:Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
4. Start the machine and retract the cylinder (2) to minimize the amount of oil in the part.
5. Turn off the machine and disconnect the power supply cable.

   HIGH PRESSURE FLUID!

   Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

   Always assume that the system might have some pressure left in the system when removing the couplings.

   Refer to: Section 10.5.4.1 “*Air Filter*”, page 149
6. Mark the lines and gently remove the hydraulic couplings (6) and plug all the lines. Refer to:Section 7.1.2 “*Hydraulic Couplings*”, page 73
7. Remove the clamp with hose padding (4).
8. Remove the fasteners (5) for the inner cylinder joint.
9. Remove the inner Boom-Cylinder shaft (5). Refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
10. Carefully loosen the strap and remove the Boom-Cylinder.

Install

1. Install of the Boom-Cylinder.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.3.4 Boom Extension Cylinder

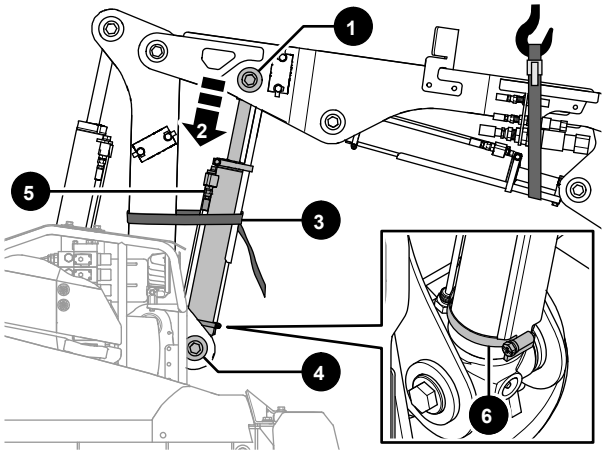
Preparations before start

Lower the Outriggers to the ground. Rotate the turret 90° to position the Boom-Stick. Firmly secure the Boom-Stick on the ground or on a pallet at a convenient height. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Secure the Boom-Stick with a strap or on a pallet to prevent it from falling down when removing the Boom Extension-Cylinder.
2. Put a strap (3) around the Boom Extension-Cylinder to secure it from falling down when removing it.
3. Remove the two fasteners (1) for the outer cylinder joint.
4. Remove the outer Boom Extension-Cylinder shaft (1). Refer to:Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
5. Start the machine and retract the cylinder (2) to minimize the amount of oil in the part.
6. Turn off the machine and disconnect the power supply cable.

   HIGH PRESSURE FLUID!

   Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

   Always assume that the system might have some pressure left in the system when removing the couplings.

   Refer to: Section 10.5.4.1 “*Air Filter*”, page 149.
7. Mark the lines and gently remove the hydraulic couplings (5) and plug all the lines. Refer to:Section 7.1.2 “*Hydraulic Couplings*”, page 73
8. Remove the clamp with hose padding (6).
9. Remove the fasteners (4) for the inner cylinder joint.
10. Remove the inner Boom Extension-Cylinder shaft (4). Refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
11. Carefully loosen the strap (3) and remove the Boom Extension-Cylinder.

Install

1. Install of the Boom Extension-Cylinder.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.3.5 Stick Cylinder

10.3.5.1 Stick Cylinder

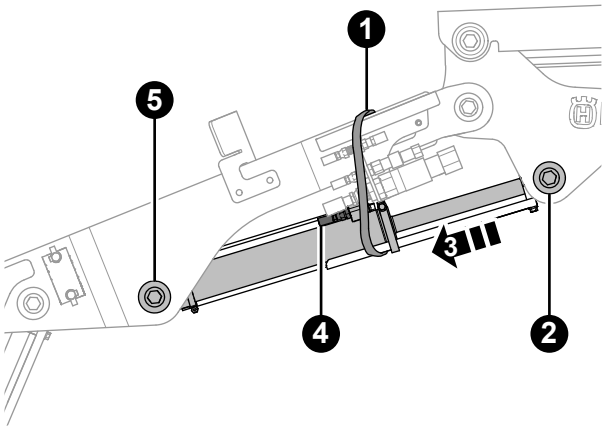
Preparations before start

Lower the Outriggers to the ground. Rotate the turret 90° to position the Boom-Stick. Fully withdraw the Tool-Cylinder and fully extend the Boom-Stick at a desired working height.

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Secure the Boom-Stick with a strap or on a pallet to prevent it from falling down when removing the Stick-Cylinder.
2. Put a strap (1) around the Stick-Cylinder to secure it from falling down when removing it.
3. Remove the two fasteners (2) for the outer cylinder joint.
4. Remove the outer Stick-Cylinder shaft (2). Refer to:Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
5. Start the machine and retract the cylinder (3) to minimize the amount of oil in the part.
6. Turn off the machine and disconnect the power supply cable.

   HIGH PRESSURE FLUID!

   Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

   Always assume that the system might have some pressure left in the system when removing the couplings.

   Refer to: Section 10.5.4.1 “*Air Filter*”, page 149
7. Mark the lines and gently remove the hydraulic couplings (4) and plug all the lines. Refer to:Section 7.1.2 “*Hydraulic Couplings*”, page 73
8. Remove the fasteners (5) for the inner cylinder joint.
9. Remove the inner Stick-Cylinder shaft (5). Refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
10. Carefully loosen the strap (1) and remove the Stick-Cylinder.

Install

1. Install of the Stick-Cylinder.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.3.6 Tool Cylinder

Preparations before start

Lower the Outriggers to the ground and position the Boom-Stick as described below:

Rotate the turret 90°, the Tool-Cylinder fully withdrawn and the Boom-Stick fully extended at the desired working height.

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

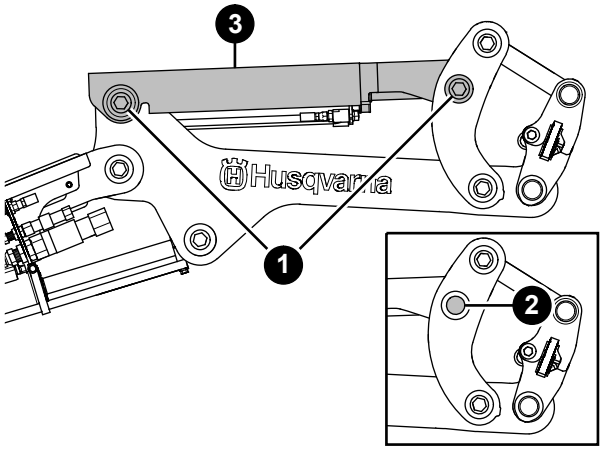
Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149.

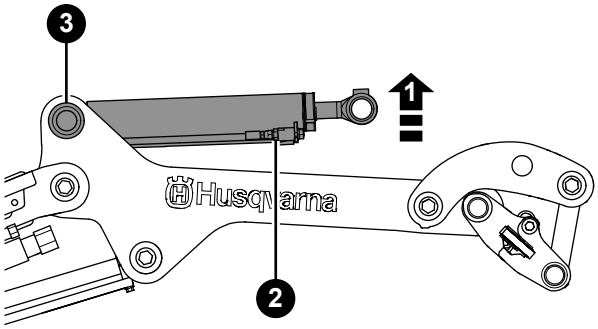
AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the four Tool-Cylinder bolts with washers (1).
2. Remove the outer cylinder shaft (2) from the Tool Lever. Refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
3. Remove the Cylinder Shield (3).



4. Fit in something to slightly lift up (1) the Tool-Cylinder (e.g. a mallet) to easily remove the couplings.
5. Gently remove the two hydraulic couplings (2) of the Tool-Cylinder. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
6. Plug all the couplings.
7. Remove the inner cylinder shaft (3). Refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
8. Remove the Tool-Cylinder.

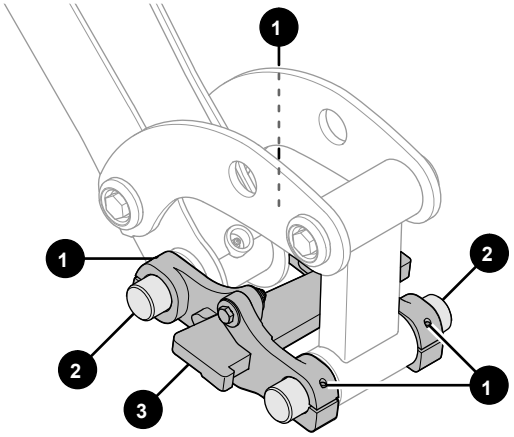
Install

1. Install of the Tool-Cylinder.

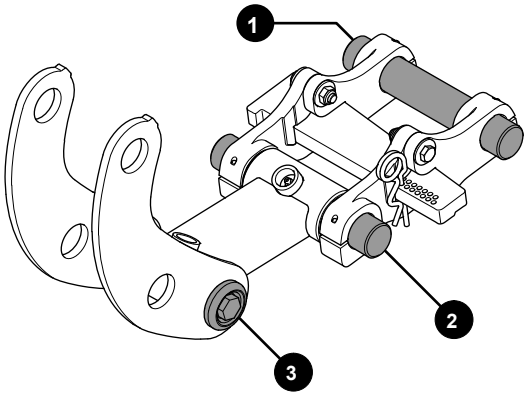
   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211.

10.4 Tool Link/Hitch

Remove



1. Loosen the Allen locking screws (1) for both the inner and outer Tool Hitch shaft.
2. Remove the shafts (2).
3. Remove the Tool Hitch (3).



2. **Overview:**
   1. Inner Tool Hitch Shaft
   2. Outer Tool Hitch Shaft
   3. Joint between Tool Link and Hitch Lever

Install

1. Install of the Tool Link.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

   Due to heavy intermittent loads, all joints should be tightened as firmly as possible. This allows for high precision when operating the machine. Refer to: Section 10.3.2 “*Install a Shaft with Shims*”, page 128

10.5 Hydraulic

10.5.1 Valve Blocks/Hydraulic Manifolds

10.5.1.1 Valve Block Chassis

Preparations before start

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

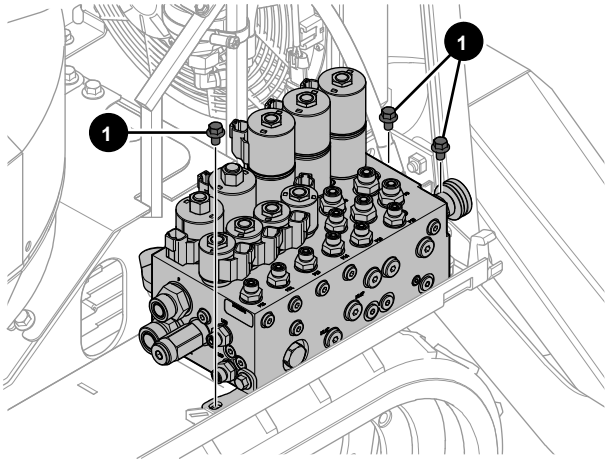
Remove the Side Cover Left. Refer to: Section 4.4 “*Covers*”, page 9

Release the track tension. Refer to: [Multiple targets: "D003495-A097642" (E008)]

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Mark and remove all the electrical connectors conntected to the Valve Block Chassis. Refer to: Section 7.1.3 “*Connectors*”, page 74
2. Mark the lines and gently remove all the hydraulic couplings connected to the Valve Block Chassis. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
3. Plug all the openings.
4. Remove the three fasteners (1) for the Valve Block Chassis.
5. Remove the Valve Block Chassis from the machine.

Install

1. Install of the Valve Block Chassis.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

   Make a check of the hydraulic oil level before use.

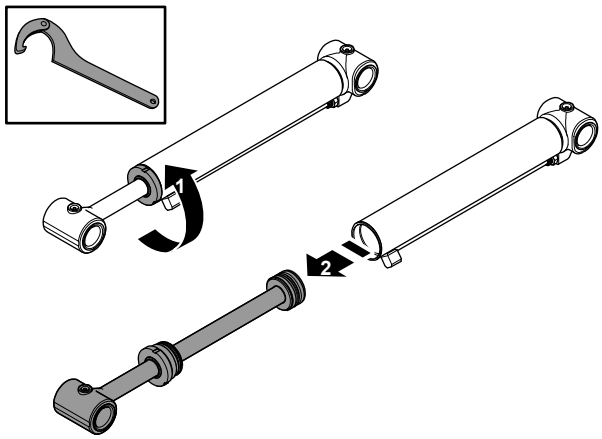
10.5.1.2 Hydraulic cylinder

Preparations before start

Make sure that the weight of the concerned structure is safely balanced and the hydraulic hoses are properly removed or tied up in a safe way.

Compress the cylinder as much as possible to avoid oil spill.

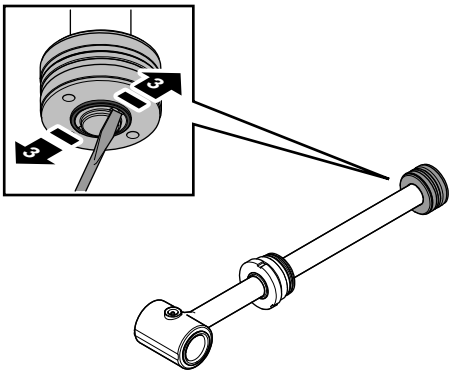
Remove



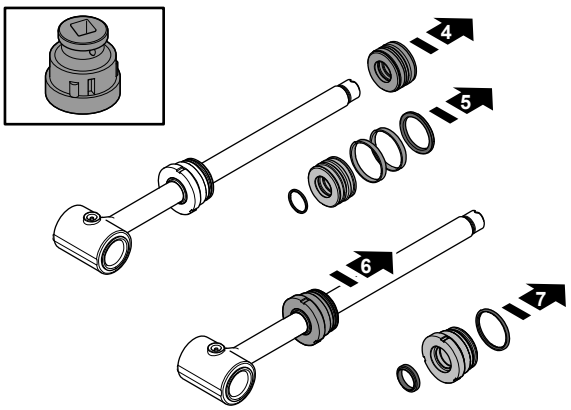
1. Use a hook wrench to unscrew the cylinder cap from the cylinder.

   You may need to apply localized heat, approximately 250°C, and disassemble while hot.

2. Remove the piston from the cylinder.



3. Bend/pry back the lock tap on both sides of the hydraulic cylinder.

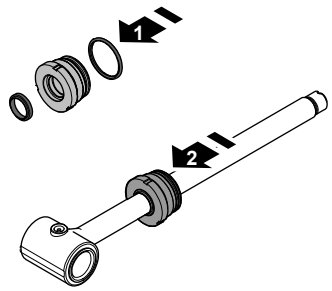


4. Un-thread and remove the piston head from the piston rod.
   - NOTE: The piston heads are firmly tighten in production. Loctite 638 is used.

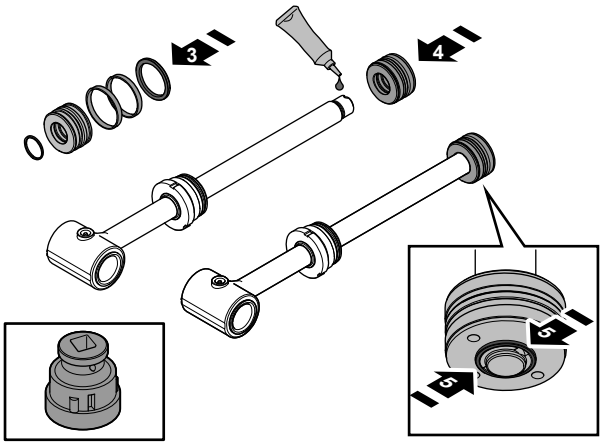
     You may need to apply localized heat, approximately 250°C, and disassemble while hot.
   - Use the Piston head tool to un-thread the piston head.

     Make sure you use the correct size of Piston head tool.
5. Carefully remove the sealings.
6. Remove the cylinder cap from the piston rod.
7. Carefully remove the sealings from the cylinder cap.

Install



1. Clean all threads on the cylinder cap with white alcohol and a wire brush to remove oil and old Loctite residue.
2. Apply a thin layer of oil on the sealings to make them easy to install.
3. Install the the sealings on the cylinder cap.
4. Install the cylinder cap on the piston rod.



5. Clean all threads on the piston head with white alcohol and a wire brush to remove oil and old Loctite residue.
6. Apply a thin layer of oil on the sealings to make them easy to install.
7. Install new sealings.
8. Install the piston head on the piston rod.

   Apply Loctite 638/Loxeal 83.55 on the top of the piston threads and on the first thread of the piston head.

   – Use the Piston head tool to torque the piston head to the rod.

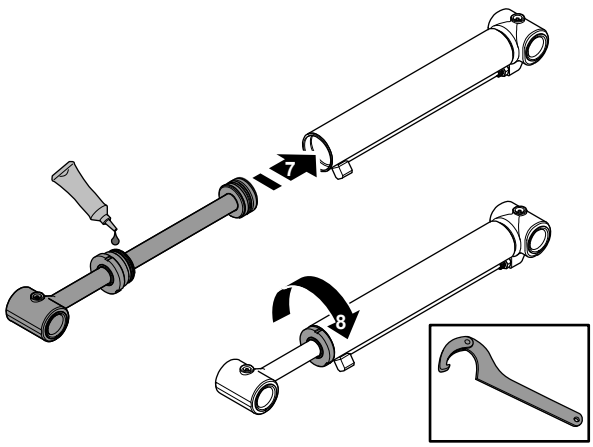
     Make sure you use the correct size of Piston head tool.

     • Torque the boom cylinders 1-4 to 425 Nm.
     • Torque the outrigger cylinders to 240 Nm.

9. Lock/secure the piston head in place on the piston rod by knocking down the two lock tabs (refer to Remove step 3).

   NOTE: Make sure there are no cracks there the flange bends.

   – Wipe off the excess spill.
10. Apply Loctite 243/Loxeal 55.03 on the cylinder cap threads.
11. Install the piston into the cylinder barrel.
12. Install and firmly tighten the cylinder cap with the hook wrench.



10.5.1.3 Valve Block Arm System

Preparations before start

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Remove the covers for the Turret. Refer to: Section 4.4 “*Covers*”, page 9

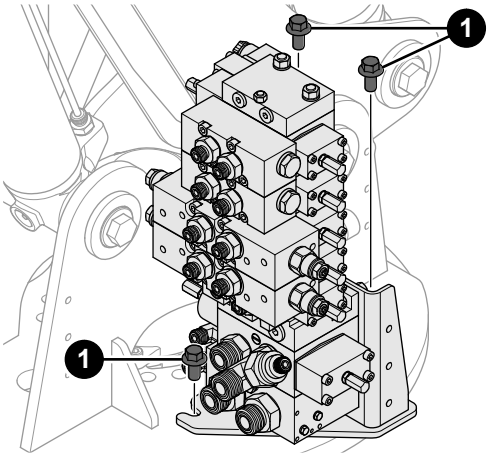
Remove the right Turret Light Frame.

Remove the Slave Control Module Body. Refer to: Section 10.7.1 “*Master Control Module KE1*”, page 166

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Mark and remove all the electrical connectors conntected to the Valve Block Arm System. Refer to: Section 7.1.3 “*Connectors*”, page 74
2. Mark the lines and gently remove all the hydraulic couplings connected to the Valve Block Arm System. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
3. Plug all openings.
4. Remove the three fasteners (1) for the Valve Block Arm System.
5. Remove the Valve Block Arm System from the machine.

Install

1. Install of the Valve Block Arm System.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

   Check the hydraulic oil level before use.

10.5.1.4 Valve

The valve spools are secured by one spool limiter block at each end. To remove the spool, the spring end must be cleared by removing one of the spool limiters.

Preparations before start

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

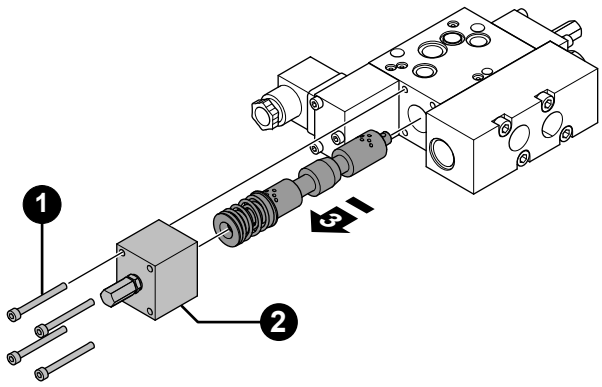
Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149.

AVOID POLLUTING THE HYDRALIC SYSTEM!

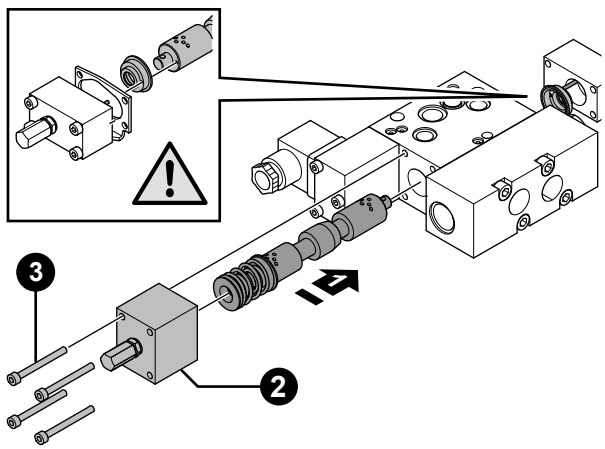
Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the four fasteners (1) for the spool limiter block.
2. Lift off the limiter block (2).
3. Pull out and remove the valve spool (3).

Install



1. Insert the valve spool and gently rotate the valve spool to fit in its end on the axis lock pin (1).

   Note! A spool with visible scratches should be replaced.
2. Install the spool limiter block (2).
3. Install the four fasteners (3) for the spool limiter block. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211
4. Install the Air Filter. Refer to: Section 10.5.4.1 “*Air Filter*”, page 149.

10.5.1.5 Valve Spool Package

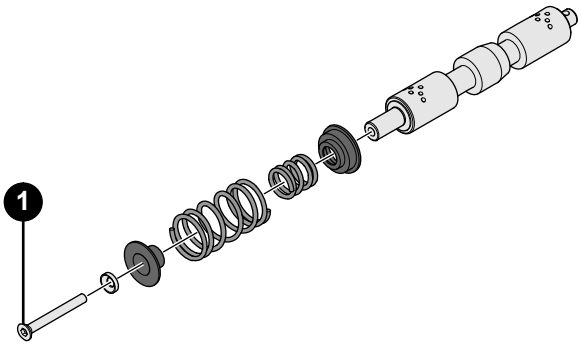
Preparations before start

Remove the valve. Refer to: Section 10.5.1.4 “*Valve*”, page 139

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings.

Remove



1. Remove the screw (1) for the spool spring package by fitting in a small tool in the spool end and gently remove the screw.

Install

1. To install, put together the spool spring package and mount the screw (1).

NOTE!

A spoole with visible scratches should be replaced.

10.5.2 Cooling System

10.5.2.1 Cooler and Fan Assembly

Preparations before start

Turn of the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

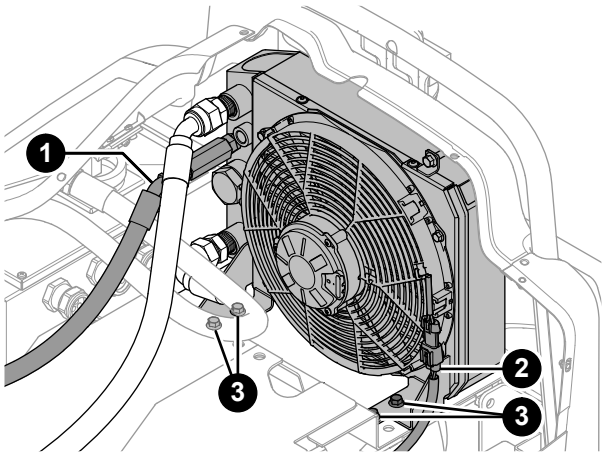
Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Remove the Top Cover. Refer to: Section 4.4 “*Covers*”, page 9

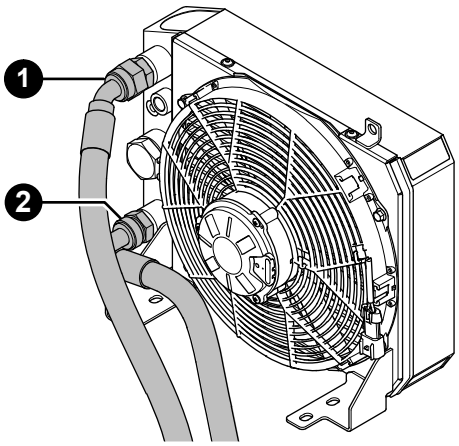
AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the four fasteners (3) for the Cooler package.
2. Remove the fill hose (1) from the Cooler Check Valve and plug the openings. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
3. Disconnect the connector (2) from the Fan. Refer to: Section 7.1.3 “*Connectors*”, page 74



4. Remove the Inner Dual Motor Cover Left and the Inner Dual Motor Cover Right. Refer to: Section 4.4 “*Covers*”, page 9
5. Lift the assembly up and turn it over to the left and place it on the side on clean absorbents.
6. Remove the return flow hose (2) and plug the openings.
7. Remove the tank hose (1) and plug the openings.

Install

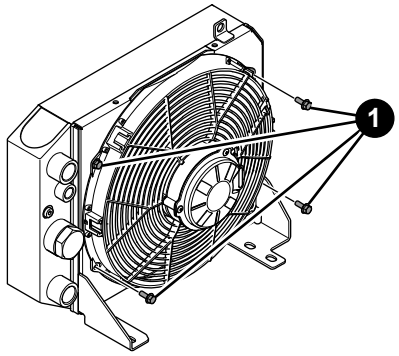
1. Install of the Cooler and Fan Assembly.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.5.2.2 Fan

Fan

Remove



1. Remove the side covers, refer to Section 4.4 “*Covers*”, page 9.
2. Disconnect the connector to the Fan. Refer to: Section 7.1.3 “*Connectors*”, page 74
3. Remove the four fasteners (1) for the Fan.

Install

1. Install of the Fan.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.5.2.3 Thermostat

Preparations before start

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

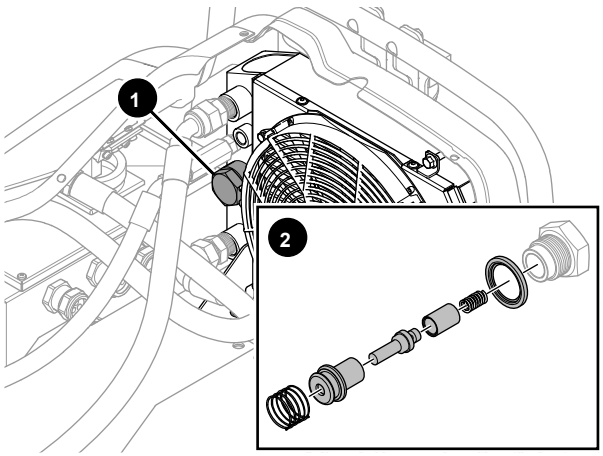
Refer to: Section 10.5.4.1 “*Air Filter*”, page 149.

Remove the Top Cover. Refer to: Section 4.4 “*Covers*”, page 9.

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the cover (1) for the Cooler Thermostat.
2. Remove the Cooler Thermostat (2) from the Cooler.
3. Plug the openings.

Install

1. Install of the Cooler Thermostat.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211.

10.5.3 Hydraulic Pump

10.5.3.1 Hydraulic Pump

This repair procedure requires the machine on its left side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Preparations before start

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

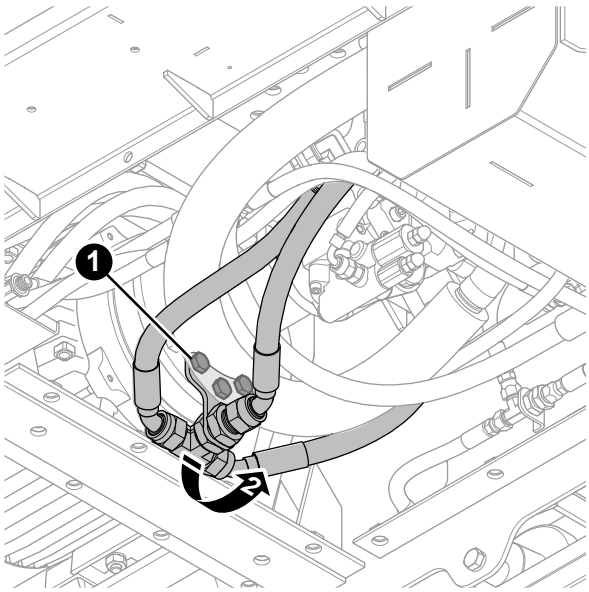
Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Remove the Bottom Center Plate. Refer to: Section 4.4 “*Covers*”, page 9

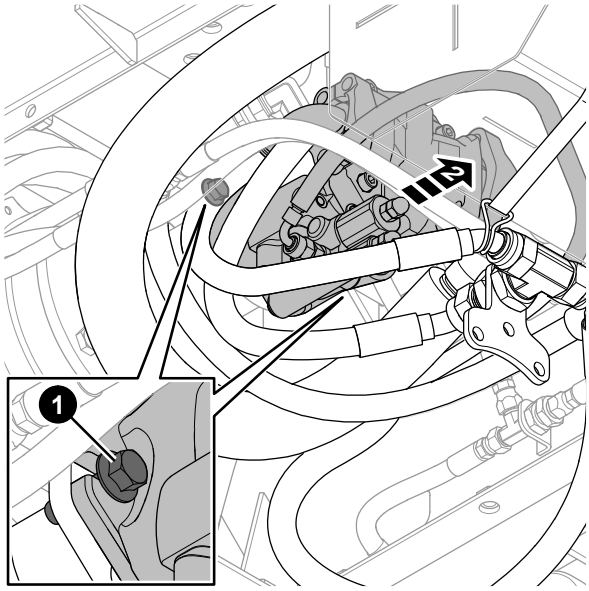
AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

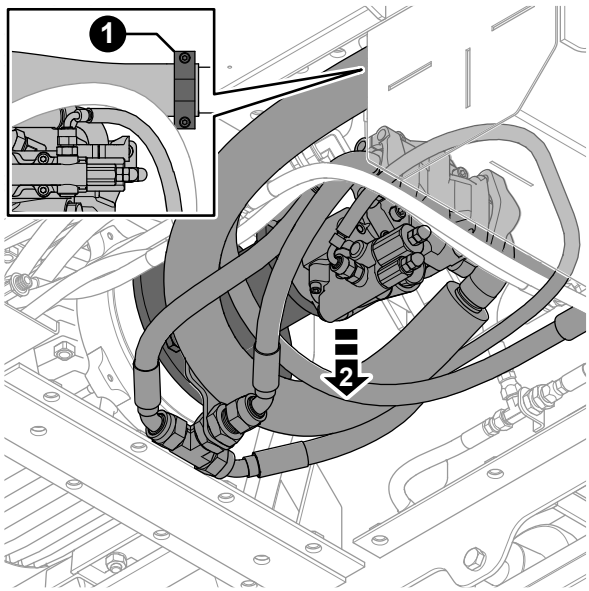
Remove



1. Remove the three fasteners (1) for the T-coupling bracket.
2. Fold away (2) and fixate the pressure hose package including the T-coupling with a strap.



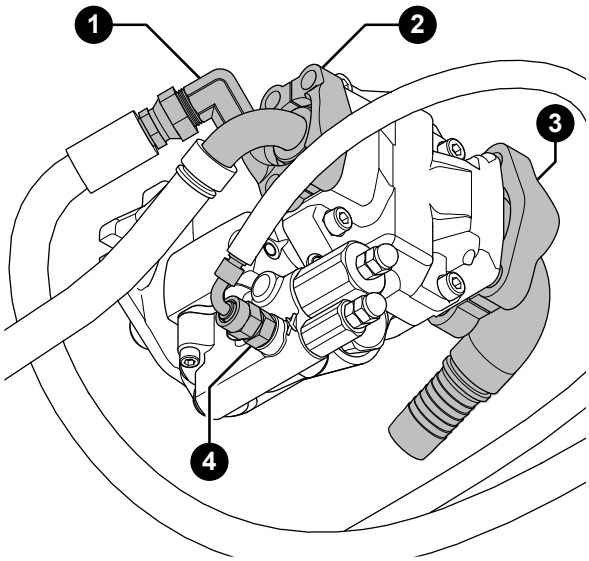
3. Remove the two fasteners (1) for the Hydraulic Pump.
4. Firmly pull out (2) the pump and fill hose and disengage the claw coupling.



5. Loosen the clamp (1) for the feed hose at the Hydraulic Oil Tank to be able to twist the hose still attached to the tank.
6. Remove the strap for the pressure hose package including the T-coupling.
7. **AVOID POLLUTING THE HYDRALIC SYSTEM!**

   Twist the feed hose (1) at the Hydraulic Oil Tank and remove (2) the Hydraulic Pump.

   Place the pump on clean absorbents at the lower track unit.
8. Remove the feed hose (1) from the Hydraulic Oil Tank and plug the openings.

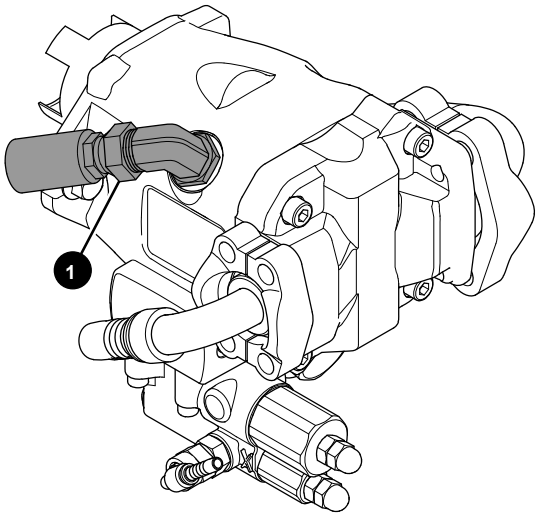


9. Remove the four fasteners (3) for the feed hose.

   Remove the hose and plug all openings. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
10. Remove the four fasteners (2) for the pressure hose.

    Remove the hose and plug all openings.
11. Remove and plug the load sensing coupling (4).
12. Remove and and plug the drain flow coupling (1).

Install



1. Install of the Hydraulic Pump.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

   Pump must be prefilled with oil upon commissioning.

   Fill as much as you can to avoid the pump runs dry the first seconds at start-up. Oil should be filled in the following place:

   1. Case (~ 1l)

   The chamber is filled most easily when the pump is mounted in the machine.

   Remove the original plug (case drain) and fill the chamber with oil.

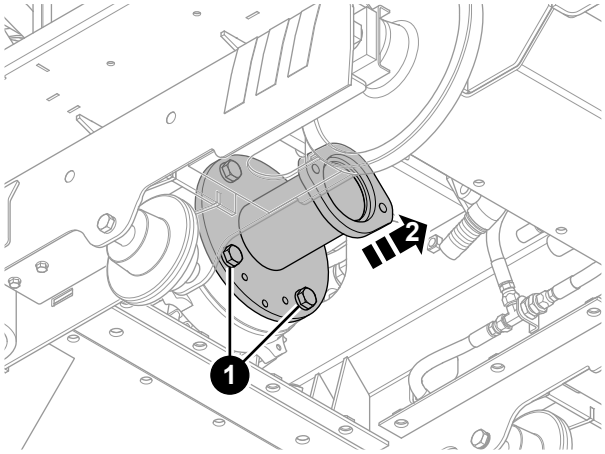
   Finally mount the 45 degree adapter and associated drain hose.

10.5.3.2 Hydraulic Axis Coupling

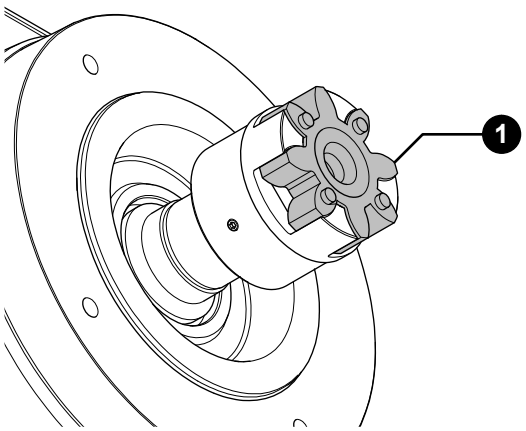
Preparations before start

Remove the Hydraulic Pump. Refer to: Section 10.5.3.1 “*Hydraulic Pump*”, page 143

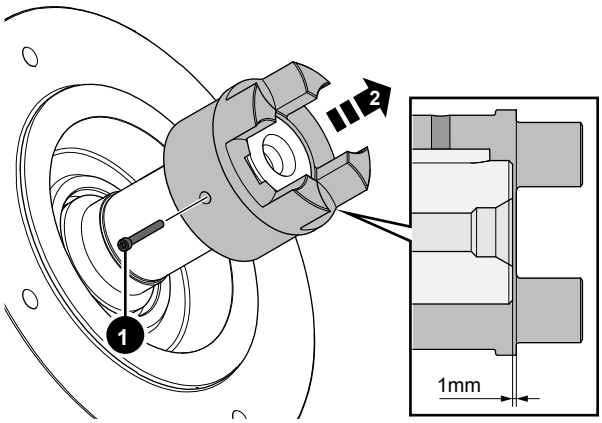
Remove



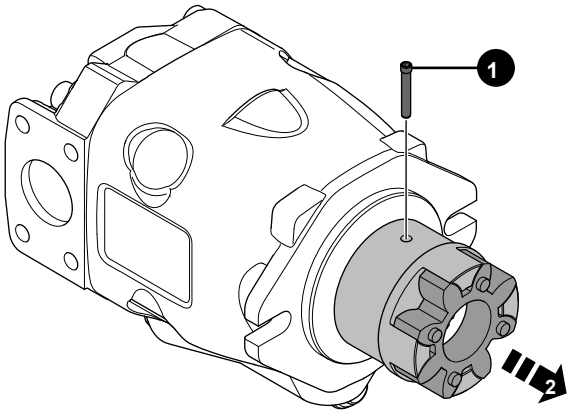
1. Remove the four fasteners (1) for the Hydraulic Axis Tube.
2. Pull out the tube (2).



3. Remove the Cushioning Ring (1).



4. Release the axis lock screw (1).
5. Pull out and remove the axis coupling (2) from the motor axis. Use an extractor and/or heating if the axis coupling is stuck.



6. Release the axis lock screw (1).
7. Pull out and remove the axis coupling (2) from the pump axis.

Install

1. Install of Hydraulic Axis Tube.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

   Add LOCTITE 243 on both axis lock screws.

   The axis coupling should be installed as close to the pump as possible before locking with the axis lock screw.

   The axis coupling should extend 1mm from the axis outer edge on the Electrical Motor.

   Replace the Cushioning Ring if it is cracked or worn.

   A damaged Cushioning Ring may indicate misalignment of motor or pump, or that the position of a claw unit needs adjustment.

10.5.3.3 High Pressure and Pressure - Flow Compensator

This repair procedure requires the machine on its left side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Preparations before start

Turn off the machine.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

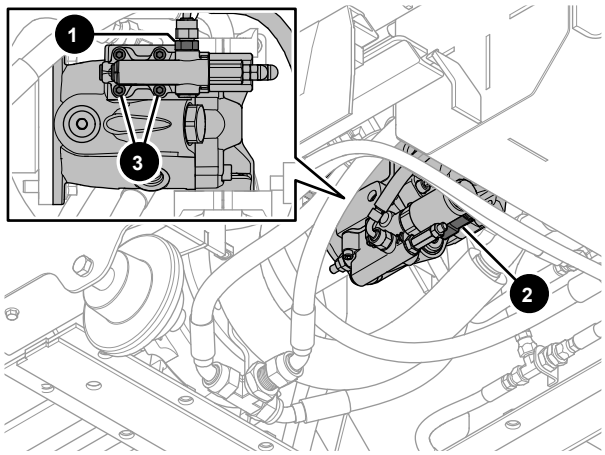
Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Remove the Bottom Center Plate. Refer to: Section 4.4 “*Covers*”, page 9

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Gently remove the LS Hose (1) and plug the openings. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
2. Remove the electrical connector (2) from the High Pressure compensator.
3. Remove the four fasteners (3) and remove the High Pressure and Pressure - Flow Compensator.

Install

1. Install of the High Pressure and Pressure - Flow Compensator.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.5.3.4 Load Sensing (LS) Pressure Tuning

This repair procedure requires that the machine on its left side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Preparations before start

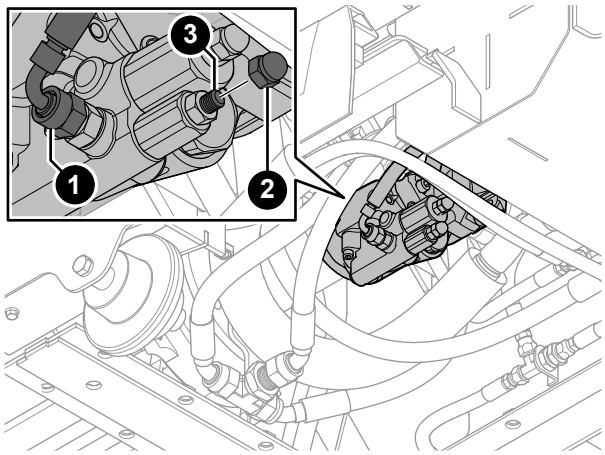
Turn off the machine.

Remove the Bottom Center Plate. Refer to: Section 4.4 “*Covers*”, page 9

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Gently remove the LS Hose and plug the LS Hose opening with a PO-plug (1).

   Plug the opening to the LS valve with a plastic plug. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73

2. Remove the covering cap and the washer (2) of the tuning screw.

3. Unlock the tightening nut while holding the tuning screw (3) in place at the same time.

4. Adjust the pressure level by turning the tuning screw:

   – Clockwise to increase the pressure
   – Anticlockwise to decrease the pressure.

5. Start the machine and press down left button of the right Joystick to set the machine in an active standby-mode.

   Check the pressure in the Remote Control and read the value continuously when turning the tuning screw.

   Press and hold down the left button of the right Joystick to keep the machine in an active standby-mode.

6. Set the spring tension of the Load Sensing Regulator to 20 bar (+/- 1 bar).

Install

1. Reassembling.

   Do the steps above in reverse order.

10.5.4 Hydraulic Oil Tank

10.5.4.1 Air Filter

Change of the Air Filter is required every 500 hr. Change more often if the machine is used in extremely dusty environment.

Preparations before start

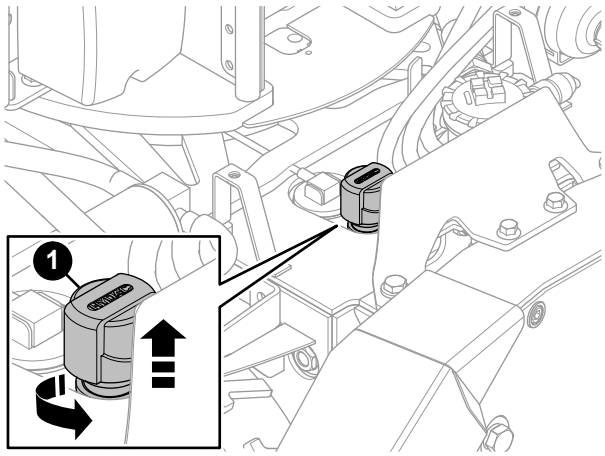
Turn off the machine and disconnect the power supply cable.

Remove the Front Cover. Refer to: Section 4.4 “*Covers*”, page 9

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the Air Filter

Remove



1. Remove the Air Filter (1) by turning it anticlockwise.
   – Loosening the filter discharges the tank pressure.
2. Remove the Air Filter.

Install

1. Install of the Air Filter.

   Do the steps above in reverse order.

10.5.4.2 Hydraulic Oil Filter

Change of the Hydraulic Oil Filter is required every 500 hr.

Preparations before start

Turn off the machine and disconnect the power supply cable.

Remove the Front Cover. Refer to: Section 4.4 “*Covers*”, page 9

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

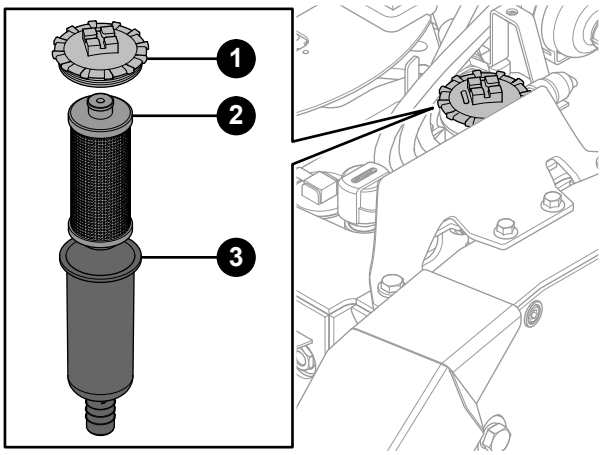
Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the Air Filter and the Hydraulic Filter

Remove



1. Remove the lid (1) to the Hydraulic Oil Filter by turning it anticlockwise.
2. Make a check of the O-ring for kinks or cracks.
   – Replace the O-ring if it is damaged.
3. Remove the plastic sleeve (3) including the filter.
4. Pull out the Hydraulic Oil Filter (2) to disengage it from the plastic sleeve.

Install

1. Install of the Hydraulic Oil Filter.

   Do the steps above in reverse order.

10.5.4.3 Fill Pump

Preparations before start

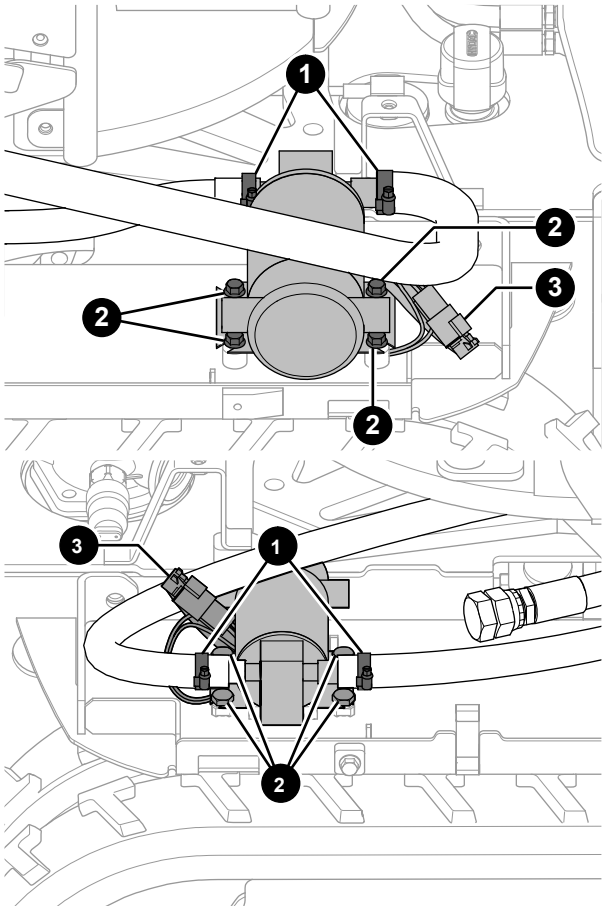
Turn off the machine and disconnect the power supply cable.

Remove the Side Cover. Refer to: Section 4.4 “*Covers*”, page 9

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Disconnect the connector (3) to the Filling Pump . Refer to: Section 7.1.3 “*Connectors*”, page 74
2. Remove the two hoses (1). Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
3. Plug the openings.
4. Remove the four fasteners (2) for the Filling Pump .
5. Remove the Filling Pump .

Install

1. Install of the Filling Pump .

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

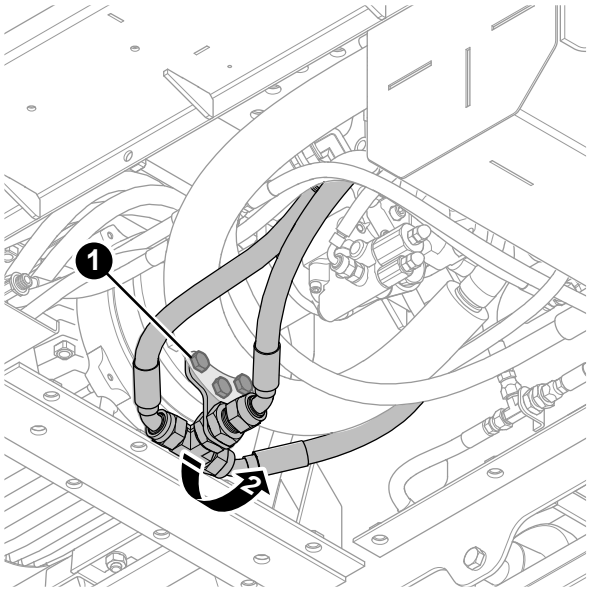
10.5.4.4 Hydraulic Oil Tank

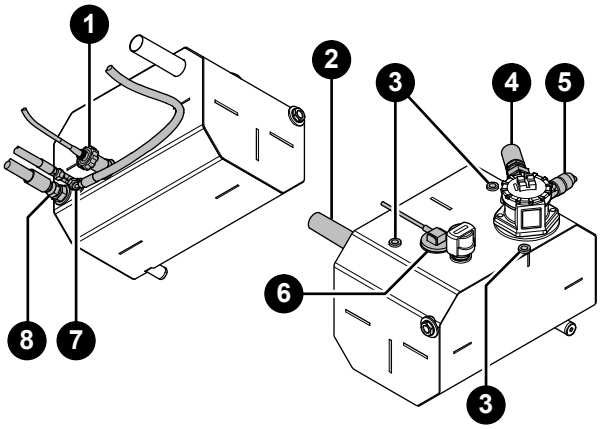
Preparations before start

This repair procedure requires the machine on its left side in the beginning of the procedure. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Remove the Bottom Center Plate. Refer to: Section 4.4 “*Covers*”, page 9

Remove





1. **AVOID POLLUTING THE HYDRALIC SYSTEM!**
   Clean all areas around the hydraulic couplings and keep the plugs available.
2. Remove the three fasteners (1) for the T-coupling bracket.
3. Fold away (2) and fixate the pressure hose package, including the T-coupling, with a strap.
4. Turn off the machine and disconnect the power supply cable.
5. **HIGH PRESSURE FLUID!**
   Gently loosen and remove the Air filter

   Refer to: Section 10.5.4.1 “*Air Filter*”, page 149
6. Drain the Hydraulic Oil Tank. Refer to: Section 7.5.2 “*Drain and Refill Hydraulic Oil*”, page 82
7. Remove the feed hose (2) at the Hydraulic Oil Tank and plug the openings.
8. Remove the pump drain hose (8) at the Hydraulic Oil Tank and plug the openings.
9. Remove the drain hose (7) from the Hydraulic Oil Tank and plug the openings.
10. Remove the Temperature Sensor Hydraulic Oil (1) and plug the opening.
11. Remove the Front Cover. Refer to: Section 4.4 “*Covers*”, page 9
12. Remove the return flow hose (4) connected to the Hydraulic Oil Filter and plug the openings.
13. Remove the connector (5) for the Pressure Guard Oil Filter. Refer to: Section 7.1.3 “*Connectors*”, page 74
14. Remove the Pressure Guard Oil Filter.
15. Remove the Oil Level Sensor by turning the sensor (6) anticlockwise.
16. Remove the three fasteners (3) for the tank.
17. Remove the Hydraulic Oil Tank from the machine.

Install

1. Install of the Hydraulic Oil Tank.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.5.5 Grease Pump

10.5.5.1 Grease Pump

Preparations before start

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

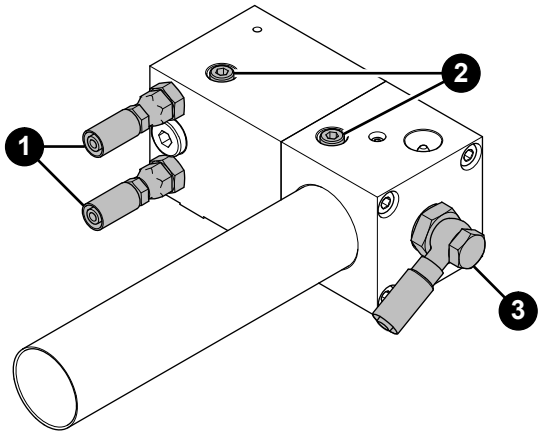
Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Disconnect and remove the LED - Work Light Left. Refer to: Section 7.1.3 “*Connectors*”, page 74

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the tube with tool grease.
2. Gently remove the two hydraulic couplings (1) connected to the pump. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
3. Plug the openings.
4. Remove the exit hose (3) for the grease.
5. Remove the two fasteners (2) for the Grease Pump.
6. Remove the Grease Pump.

Install

1. Install of the Grease Pump.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211.

   Make sure that there is grease in the tube with tool grease.
2. Make sure that there is no air in the Grease Pump. Refer to Section 10.5.5.3 “*Venting the Grease Pump*”, page 154.

10.5.5.2 Adjust for Grease Pump Capacity

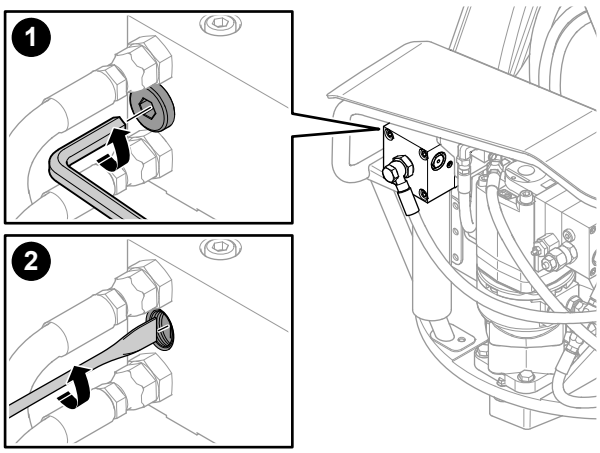
Preparations before start

Turn off the machine.

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings.

Remove



1. Remove the plug for the adjustment screw (1).
2. Adjust the level by turning the tuning screw (2).

   To increase the pump capacity:

   – Default factory setting - 3 turns anticlockwise from the end position.
   – Maximum pump capacity - 6 turns anticlockwise from the end position.

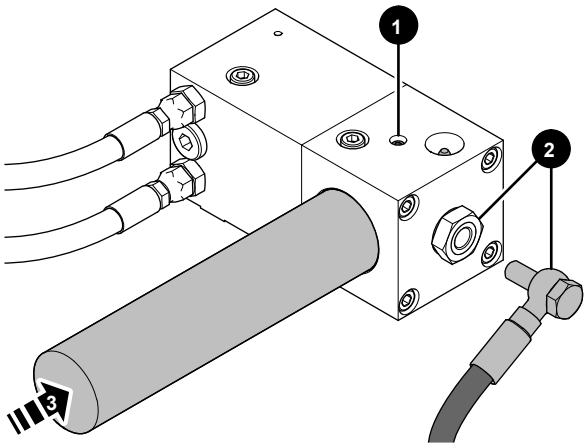
   To get minimum capacity, turn the screw clockwise until it reaches its end position.

Install

1. Install the plug for the adjustment screw.

10.5.5.3 Venting the Grease Pump

Remove



1. Remove the exit hose (2).
2. Remove the allen screw and its washer (1).
3. Release air by gently pressing the follower piston (3) into the cartridge by hand, until grease appears through the hole (1).
4. Install the allen air screw and its washer (1).
5. Disconnect the hammer from the DXR-machine.

   Activate the hammer function in the remote control, allow the hydraulic pressure to last up to ~40 sec.

   Check that grease is pumped out through the exit (2).

Install

1. Install the exit hose (2). Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211.

10.5.6 Sensors

10.5.6.1 Pressure Sensor, P2

Preparations before start

Turn off the machine and disconnect the power supply cable.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Remove the covers for the Turret. Refer to: Section 4.4 “*Covers*”, page 9

Remove the five fasteners for the right Turret Light Frame and remove the frame.

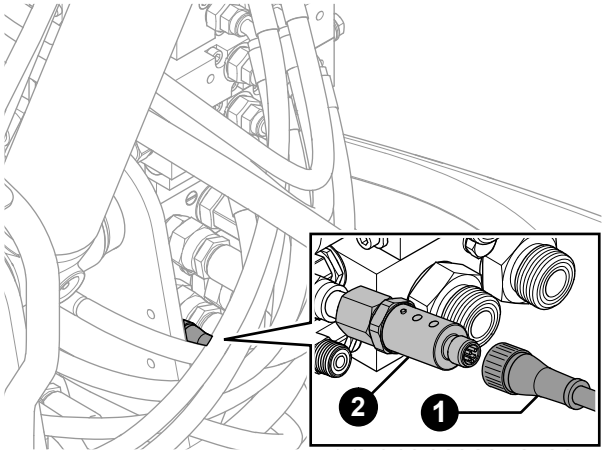
Remove the Slave Control Module Body. Refer to: Section 10.7.1 “*Master Control Module KE1*”, page 166

Remove the fasteners for the Valve Block Arm System and fold away to get easy access to the Pressure Sensor. Refer to: Section 10.5.1.3 “*Valve Block Arm System*”, page 138

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the connector (1) for the Pressure Sensor.
2. Remove the Pressure Sensor (2) from the machine.

Install

1. Install of the Pressure Sensor.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.5.6.2 Temperature Sensor Hydraulic Oil, B2

Preparations before start

This repair procedure requires the machine on its left side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

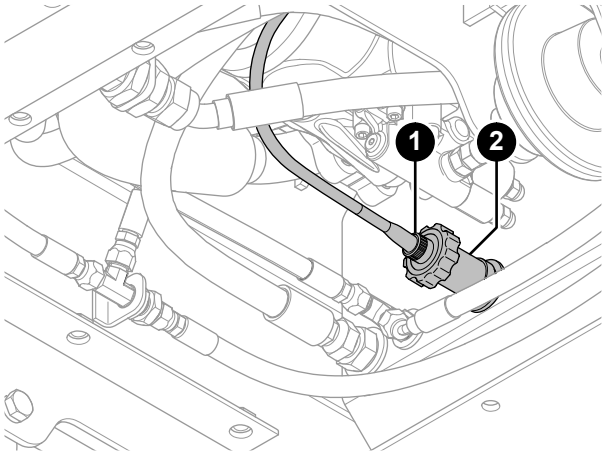
Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Remove the Bottom Center Plate. Refer to: Section 4.4 “*Covers*”, page 9

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



1. Remove the cable (1) connected to the Temperature Sensor Hydraulic Oil.
2. Place absorbents on the ground to collect oil spill when changing the sensor.
3. Have a new sensor nearby and remove the Tredo-seal (rubber and steel washer) and the sensor (2) from the Hydraulic Oil Tank.

   Note! Hydraulic oil will pour out from the tank, install the new sensor and a new Tredo-seal quickly to the hole in the tank!

Install

1. Install of the Temperature Sensor Hydraulic Oil.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.5.6.3 Oil Level Sensor, T5

Remove

1. Remove of the Oil Level Sensor. Refer to (step 15): Section 10.5.4.4 “*Hydraulic Oil Tank*”, page 152

10.5.6.4 Pressure Switch Filter, B3

Remove

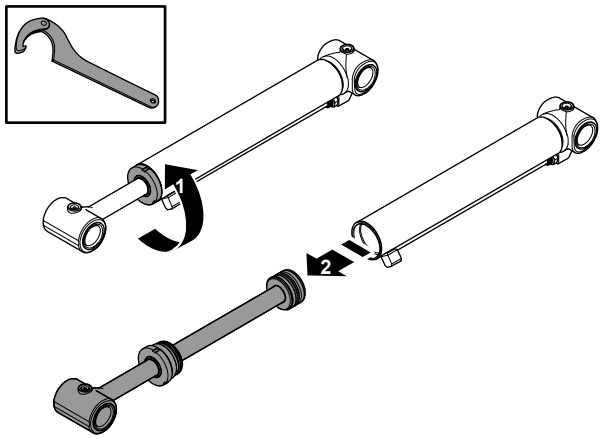
1. Remove of the Pressure Guard Oil Filter. Refer to (step 13-14): Section 10.5.4.4 “*Hydraulic Oil Tank*”, page 152

10.5.7 Hydraulic cylinder

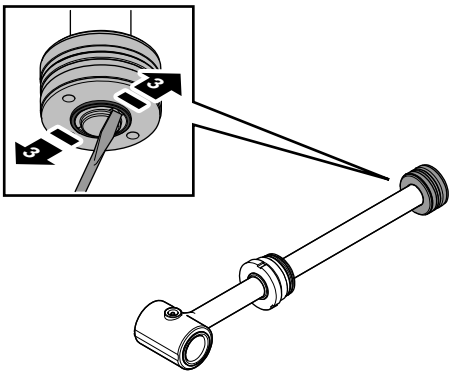
Preparations before start

Make sure that the weight of the concerned structure is safely balanced and the hydraulic hoses are properly removed or tied up in a safe way.

Remove



1. Use a hook wrench to unscrew the cylinder cap from the cylinder.
2. Remove the piston from the cylinder.



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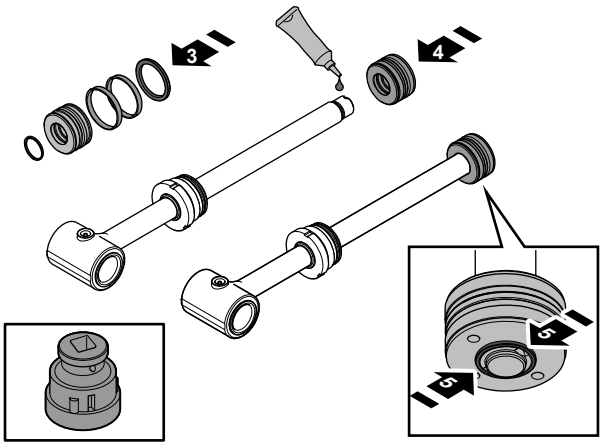
3. Bend/pry back the lock tap on both sides of the hydraulic cylinder.
4. Un-thread and remove the piston head from the piston rod.
   - NOTE: The piston head is tighthend to 240 Nm in production. Loctite 638 is used. You may need to use heat to loosen the piston head.
   - Use the "SPECIAL TOOL" to un-thread the piston head.
5. Carefully remove the sealings.

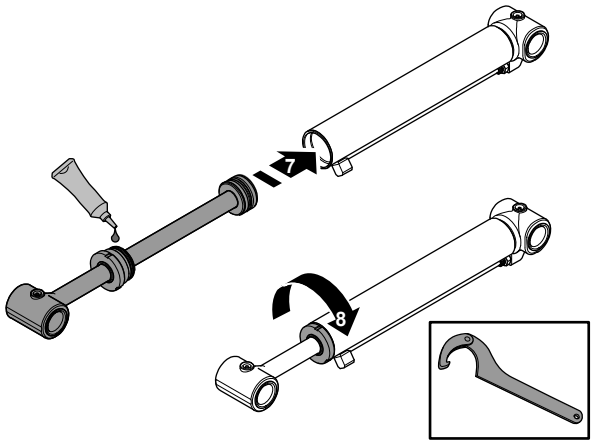
Install



1. Clean all threads with white alcohol to remove oil and old Loctite residue.
2. Install new sealings.
3. Install the piston head on the piston rod.

   Apply Loctite 638/Loxeal 83.55 on the top of the piston threads and on the first therad of the piston head.
   - Use the special tool to torque the piston head to the rod.
     - Torque cylinder 1-4 to 500 Nm.
     - Torque the outriggers to 425 Nm.
4. Lock/secure the piston head in place on the piston rod by knocking down the two lock tabs (refer to Remove step 3).

   Make sure there are no cracks there the flange bends.
   - Wipe off the excess spill.



5. Apply Loctite 243/Loxeal 55.03 on the cylinder gland threads.
6. Install the piston into the cylinder barrel.
7. Install and firmly tighten the cylinder gland with the hook wrench.

10.6 Slewing System and Motor

10.6.1 Slewing Motor

10.6.1.1 Slewing Motor

Preparations before start

Turn off the machine and disconnect the power supply cable.

Remove the Top Cover, Side Cover Left, Upper Turret Cover and Lower Turret Cover. Refer to: Section 4.4 “*Covers*”, page 9

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

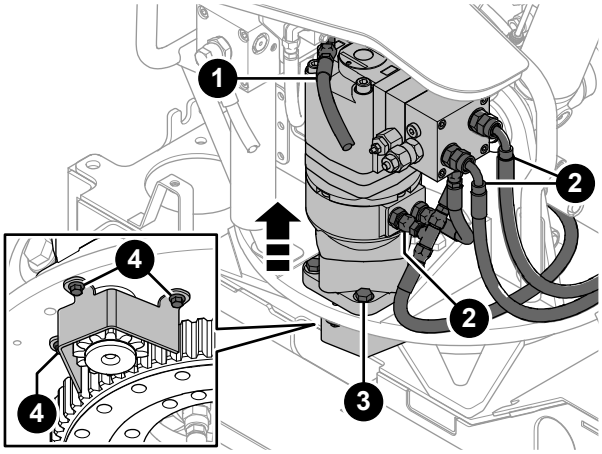
Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Remove the Grease Pump. Refer to: Section 10.5.5.1 “*Grease Pump*”, page 153

AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

Remove



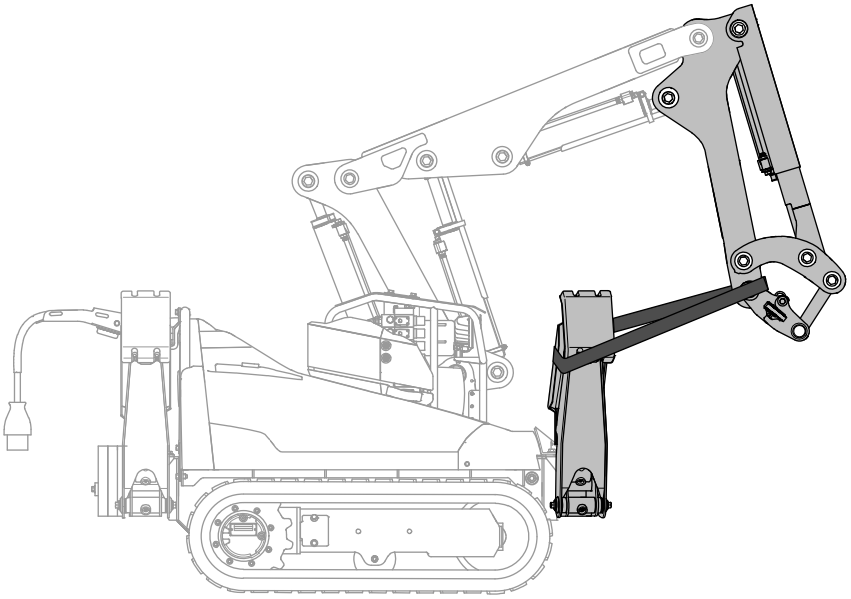
1. Remove the three hydraulic couplings (2) to the Slew Motor and plug all openings. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73
2. Remove the pressure supply coupling (1) to the Grease Pump valve solenoid for easier access. Plug all openings.
3. Remove the four fasteners (3) for the Slew Motor.
4. Remove the Slew Motor by lifting it up and at the same time twist it to loosen it.
5. To dismantle the protection for the sprocket, remove the three fasteners (4) and remove the bracket.

Install

1. Install of the Slew Motor.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.6.1.2 Adjust the pressure

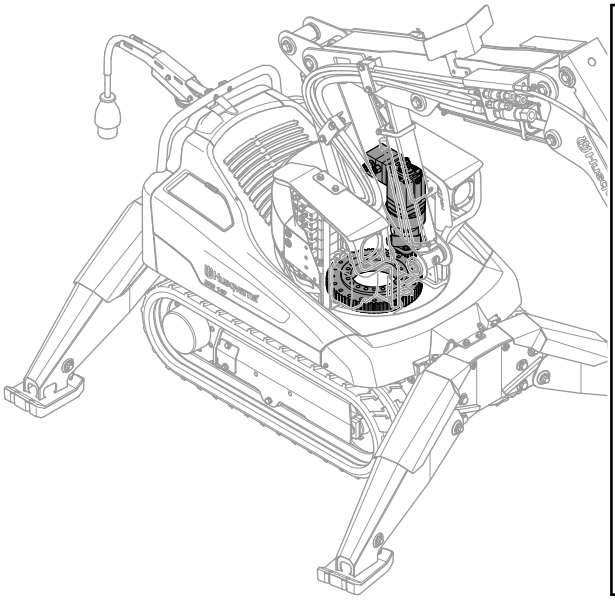


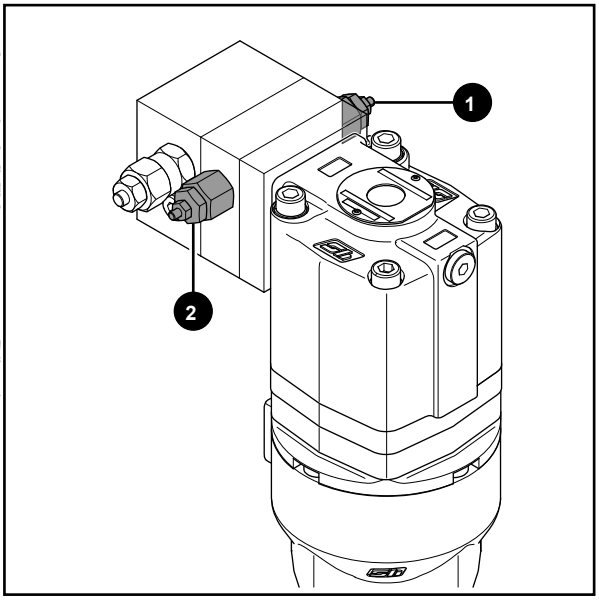
Fold up the Outriggers. Mount a strap around the front Outriggers and the Tool Hitch.

Rotate the Boom-Stick and stretch the strap.

Check the pressure on the HMI Display.

The pressure should be 180 bar for both clockwise (CW) and counter clockwise (CCW) rotation of the boom.





1. CCW rotation
2. CW rotation

Release the locknut. Use an Allen key to turn the Pressure relief valve to adjust the pressure to 180 bar.

Turn the screw clockwise to increase the pressure. Turn the screw counter clockwise to decrease the pressure.

10.6.2 Swivel

This repair procedure requires the machine on its left side.

Use jack stands to secure the machine on its side. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Preparations before start

Remove the Side Cover Right. Refer to: Section 4.4 “*Covers*”, page 9

Remove the lid for the Slave Control Module Body.

HIGH PRESSURE FLUID!

Slightly loosen the Air Filter to make sure that the hydraulic system is without pressure.

Always assume that the system might have some pressure left in the system when removing the couplings.

Refer to: Section 10.5.4.1 “*Air Filter*”, page 149

Remove the Hydraulic Pump (step 1-9).

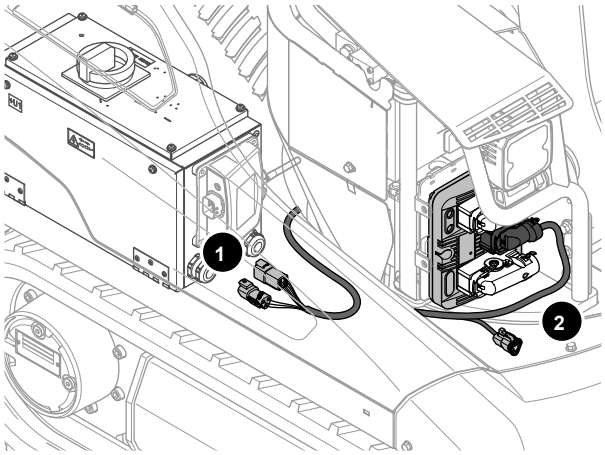
The pump will hang in its hoses. Refer to: Section 10.5.3.1 “*Hydraulic Pump*”, page 143

Remove the Boom-Cylinder and fold away to get clearance to the Swivel. Refer to: Section 10.3.3 “*Boom Cylinder*”, page 130

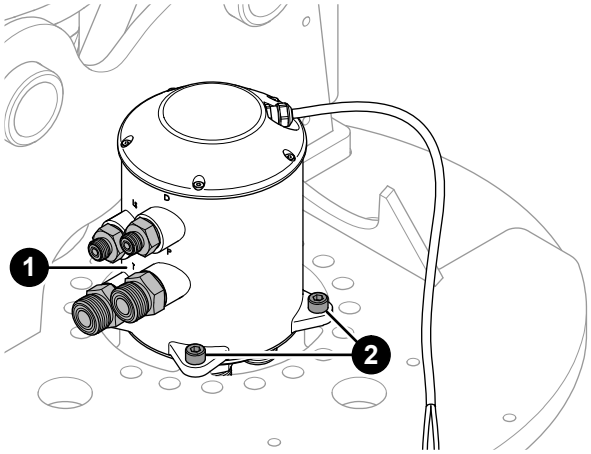
AVOID POLLUTING THE HYDRALIC SYSTEM!

Clean all areas around the hydraulic couplings and keep the plugs available.

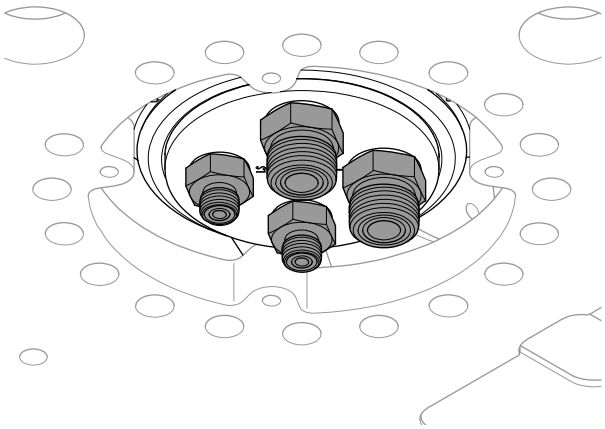
Remove



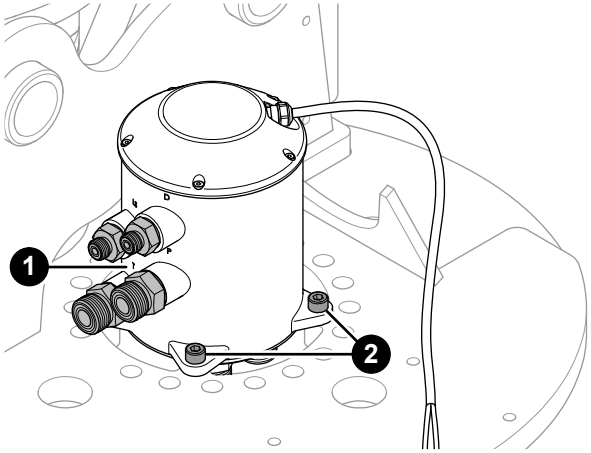
1. Disconnect the in-line connector XE:33 and XE:4 connected to the Electrical Cabinet (1).
2. Disconnect the connector KE:3 and XE:34 connected to the Slave Control Module Body (2).



3. Remove all couplings (1) and plug the openings. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73



4. Remove all couplings from the interior of the machine and plug all openings. Refer to: Section 7.1.2 “*Hydraulic Couplings*”, page 73



5. Remove the four fasteners (2) to the Swivel 90° from turret base plate to be able to remove it.

Install

1. Install of the Swivel.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.6.3 Electrical Swivel

Preparations before start

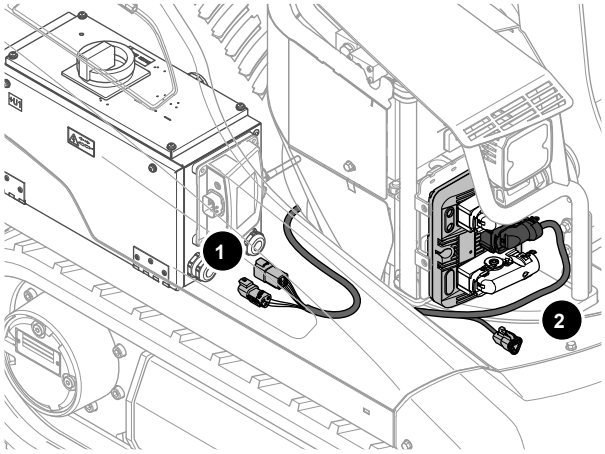
Remove the Side Cover Right. Refer to: Section 4.4 “*Covers*”, page 9

Remove the lid for the Master Control Module . Refer to: Section 10.7.1 “*Master Control Module KE1*”, page 166

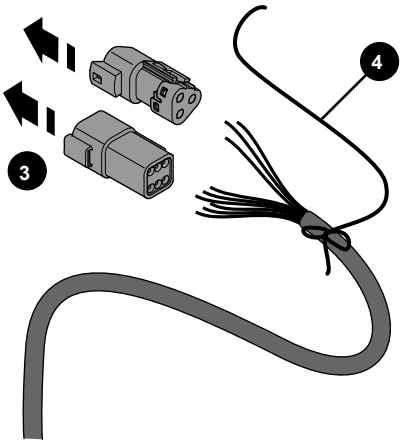
Remove the outer two fasteners and the Boom-Cylinder shaft and fold away to get clearance to the Swivel. Refer to: Section 10.3.3 “*Boom Cylinder*”, page 130

Turn off the machine and disconnect the power supply cable.

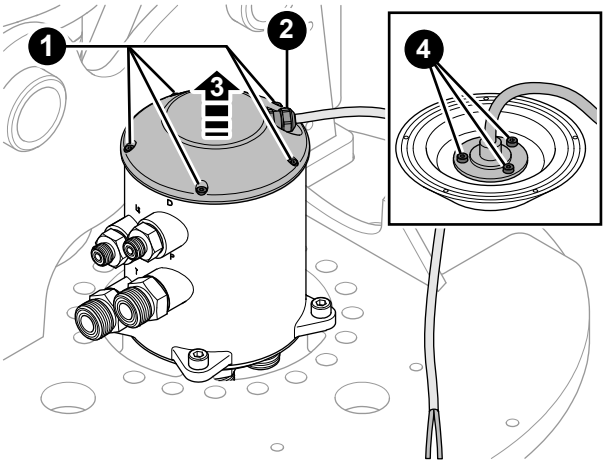
Remove



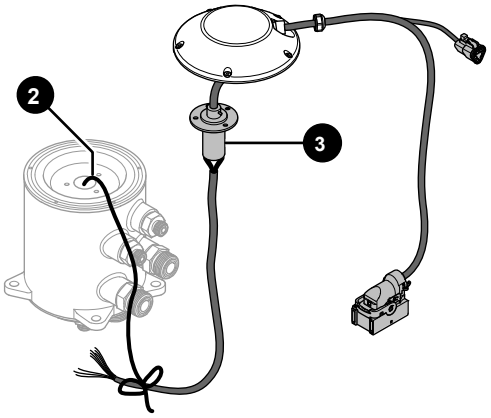
1. Disconnect the in-line connector XE:33 to the Saftey PLC Master and XE:4 to the Electrical Cabinet (1).
2. Disconnect the connector KE:3 connected to the Slave Control Module and XE:34 connected to the rotation valve, cable W171 (2).



3. Remove the connector pins from connector housing XE:33 and XE:4 (3) to enable the harness W51 to slide through the hydraulic swivel.
4. Attach a long string (4) around the harness W51 to future help with the installation.

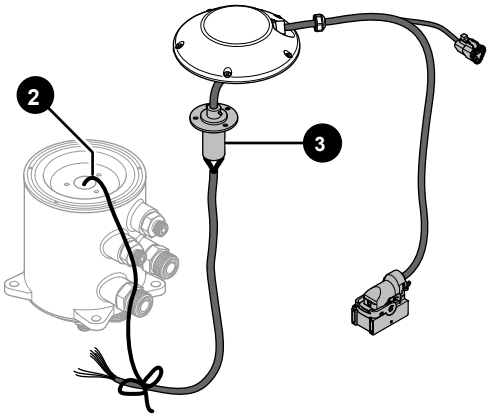


5. Remove the five fasteners (1) for the Swivel top lid.
6. Un-tighten the cable locking nut (2) until the cable is loose.
7. Remove the Swivel top lid (3).
8. Remove the three fasteners (4) for the Electrical Swivel.

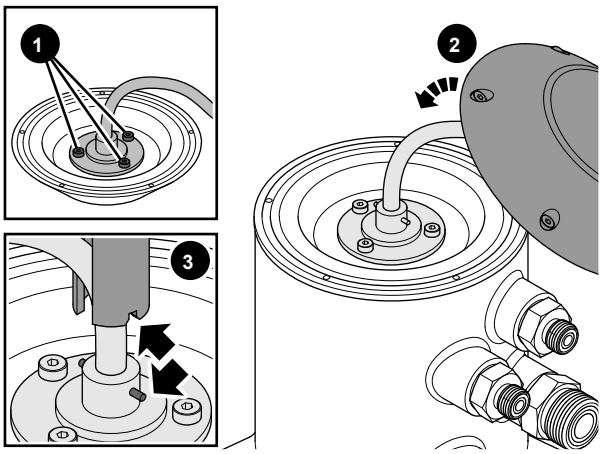


9. Pull the harness with the string (2) through the hydraulic swivel.
10. Remove the string (2) from the harness W51 (3).

Install

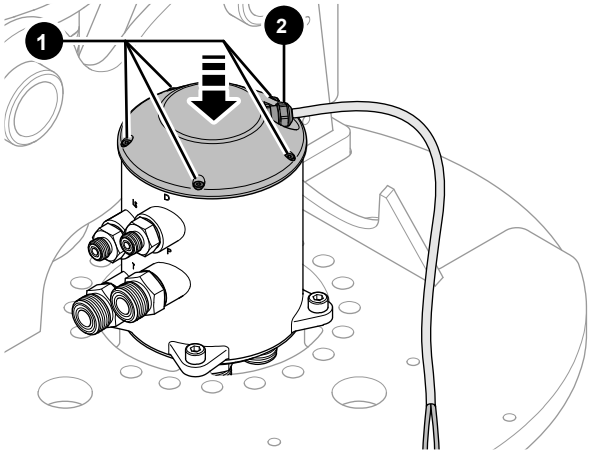


1. Attach a long string (2) around the harness W51 (3) and pull the harness through the hydraulic swivel with help of the string.

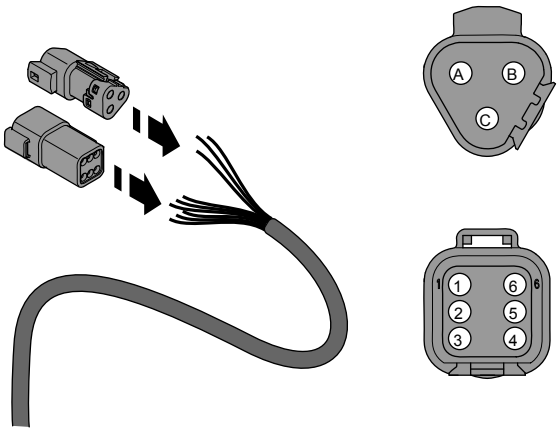


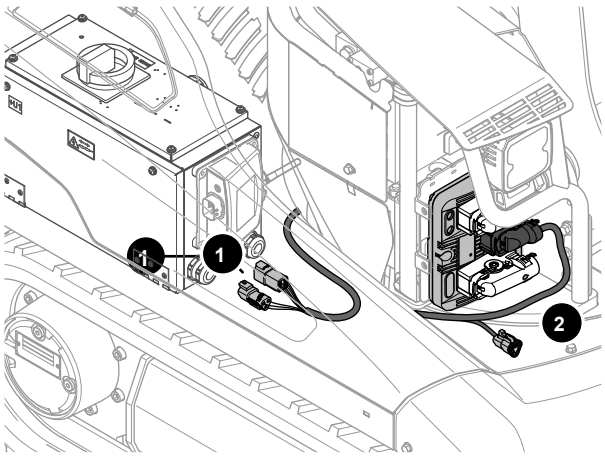
2. Install the three fasteners (1) for the Electrical Swivel.
3. Install the Swivel top lid (2).

   Make sure the tabs are installed correctly in the lid (3).



4. Install the five fasteners (1) for the Swivel top lid.
5. Gently pull the harness from the Swivel top lid and tighten the cable locking nut (2).





6. Install the connector pins to the connector housing XE4 according to:
   - Pin XE4/1 - green cable
   - Pin XE4/2 - white cable
   - Pin XE4/3 - black cable
   - Pin XE4/4 - red cable
   - Pin XE4/5 - grey cable
   - Pin XE4/6 - violet cable
7. Install the connector pins to the connector housing XE33 according to:
   - Pin XE33/A - yellow cable
   - Pin XE33/C - blue cable
   - Pin XE33/B - brown cable
8. Connect the connector KE:3 to the Slave Control Module and XE:34 to the rotation valve, cable W171 (2).
9. Connect the in-line connector XE:33 to the Saftey PLC Master and XE:4 to the Electrical Cabinet (1).

10.6.4 Adjust Gear Backlash

10.6.4.1 Adjust Gear Backlash

Improper gear backlash affects the precision when turning the Turret.

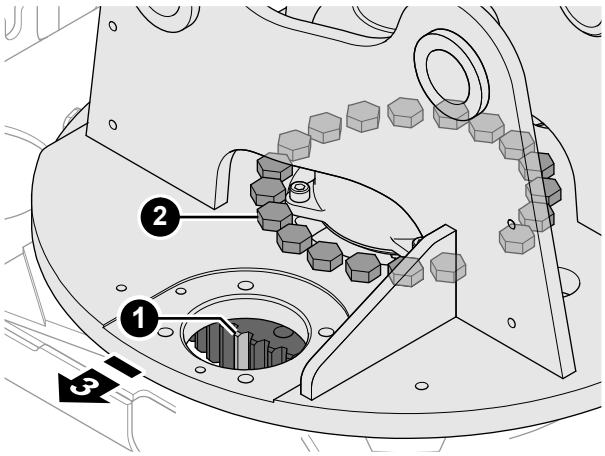
Jerky slewing operation, replacement of Slewing Ring or Slew Motor are reasons to re-check the backlash between motor sprocket and Slewing Ring gears.

Preparations before start

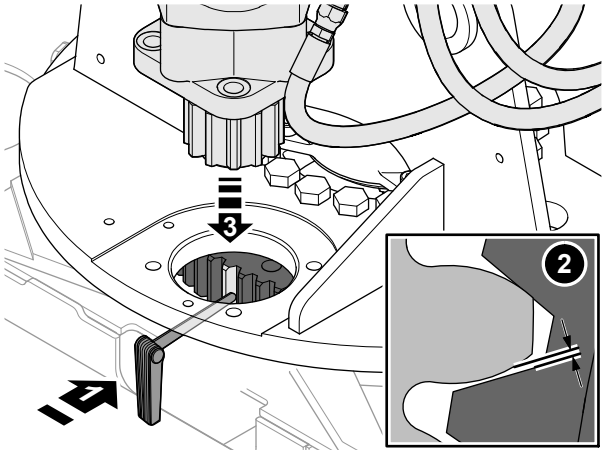
Remove the Slew Motor. Refer to: Section 10.6.1.1 “*Slewing Motor*”, page 158

Remove the complete Boom from the Turret. Refer to: Section 10.3.4 “*Boom Extension Cylinder*”, page 131, Section 10.3.3 “*Boom Cylinder*”, page 130 and Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127

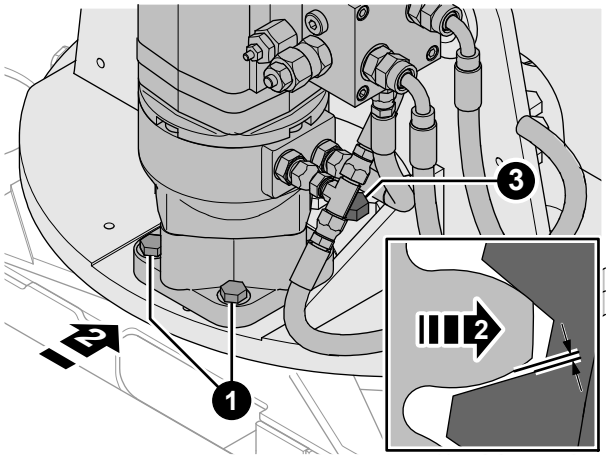
Remove



1. Rotate the Turret until the green marked tooth (1) on the Slewing Ring is visible through the sprocket opening.
2. Loosen all the Turret fasteners (2) by about 2 turns but leave one fastener tightened at 90° from the green marked tooth (1).
3. Increase the gear backlash to maximum by moving the Turret Base Plate (3).
   - Move it by knocking with a mallet.



4. Fit in a 0,2mm feeler blade (1) at the green marked tooth.
5. Carefully fit in the Slew Motor and its sprocket (3) and make sure the 0,2mm feeler blade is installed between the teeth (2).



6. Install two fasteners (1) for the Slew Motor.
7. Decrease gear backlash to match thickness of feeler blade (0,2mm) by moving the Turret Base Plate (2).
   – Move it by knocking with a mallet.
8. Secure the position by tightening the Turret fasteners (3) in the Slew Motor area.
9. Remove the two fasteners (1) for the Slew Motor.
10. Remove the Slew Motor.
11. Remove the feeler blade.
12. Install the Slew Motor again.
13. Install the four fasteners (1) for the Slew Motor. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211
14. Tighten all the Turret fasteners (3) by **81 Nm**.

    Note - Proper backlash distance is 0,2mm.
15. Install the Slew Motor properly. Refer to: Section 10.6.1.1 “*Slewing Motor*”, page 158
16. Install the complete Boom to the Turret. Refer to: Section 10.3.1 “*Shaft of Joints and Cylinders*”, page 127
17. Install the Boom-Cylinder. Refer to: Section 10.3.3 “*Boom Cylinder*”, page 130
18. Install the Boom Extension-Cylinder. Refer to: Section 10.3.4 “*Boom Extension Cylinder*”, page 131

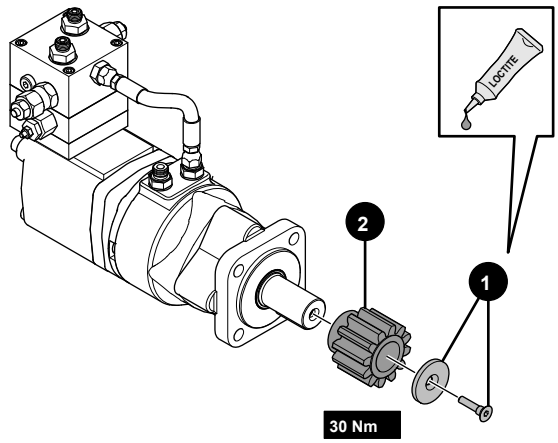
10.6.5 Slewing Motor Gear

Preparations before start

Turn off the machine and disconnect the power supply cable.

Remove the Slew Motor. Refer to: Section 10.6.1.1 “*Slewing Motor*”, page 158

Remove



1. Remove the washer and the fastener (1).
2. Remove the slewing motor gear (2) .

Install

1. Install of the slewing motor gear.

   Use LOCTITE 243 when install of washer and fastener (1).

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.7 Radio and Control Modules

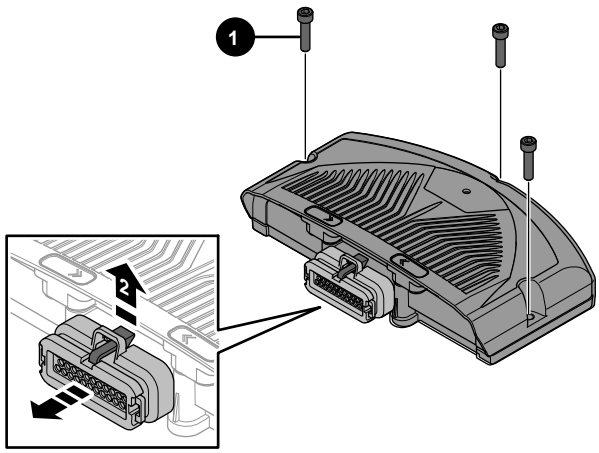
10.7.1 Master Control Module KE1

Preparations before start

HIGH VOLTAGE!

Turn off the machine and disconnect the power supply cable.

Remove



1. Disconnect the connector for the Master Control Module (EPEC SC52), pull up the locking tab (2).
2. Remove the three fasteners (1) for the Master Control Module .
3. Remove the Master Control Module.

Install

1. Install of the Master Control Module.

   Do the steps above in the reverse order.

   Make a software update. Refer to: Section 11.1 “*Software update/upload*”, page 180.

10.7.2 Slave Control Modules KE2/3

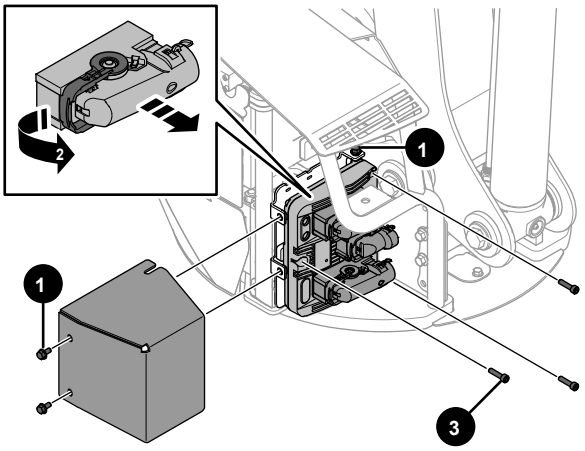
Preparations before start

HIGH VOLTAGE!

Turn off the machine and disconnect the power supply cable.

Remove the Rear Inner Cover, the control module is mounted between the electrical cabinet and the customblock. The other control module is mounted on the front of the turret. Refer to: Section 4.4 “*Covers*”, page 9.

Remove



1. Remove the two fasteners (1) on the front of the Control Module (EPEC GL84) cover.
2. Loosen the fastener (1).
3. Remove the cover.
4. Disconnect all three connectors, pull up the lock tab (2) for each connector and remove.
5. Remove the three fasteners (3) for the Control Module.
6. Remove the Control Module.

Install

1. Install of the Control Module.

   Do the steps above in the reverse order.

   Make a software update. Refer to: Section 11.1 “*Software update/upload*”, page 180.

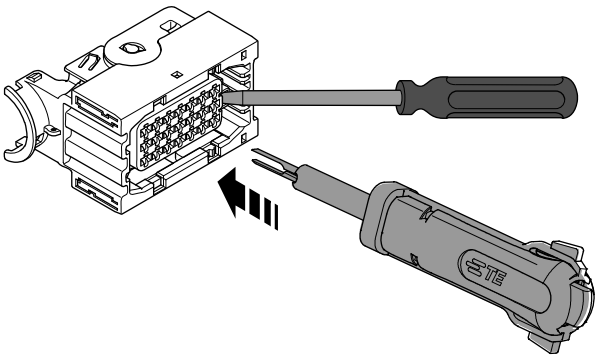
10.7.3 Remove and Install Wires

Preparations before start

WARNING!

Turn off the machine and disconnect the power supply cable.

Remove



1. Use a small screwdriver to release the integrated tab lock on the connector.
2. Use the Contact Extraction tool to disengage the wire pin. Insert the blades into the connector cavity until they stop.
3. Pull out the wire from the connector house.

Install

1. Install a Wire:

   Make sure that the integrated tab lock is in the unlocked position.

   Push the wire pin into the connector house until a quiet click is felt.

   Pull slightly to make sure that the pin is locked in place.

   Push back the grid protector properly, the integrated tab lock must be locked in position.

10.8 Electrical Motor

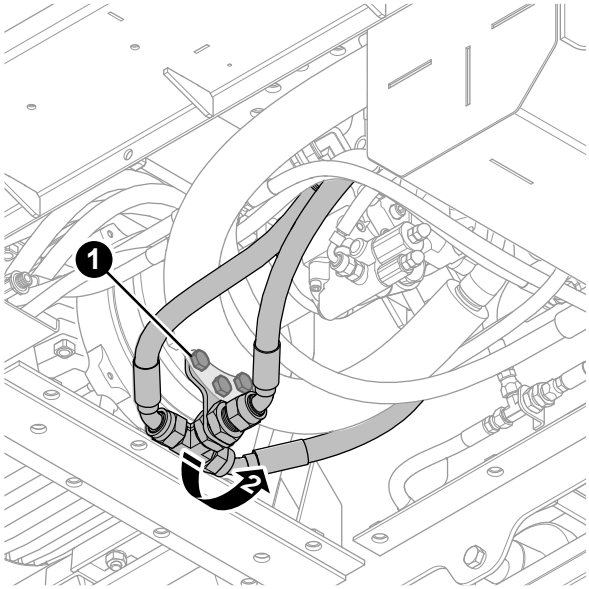
10.8.1 Electrical Motor

Preparations before start

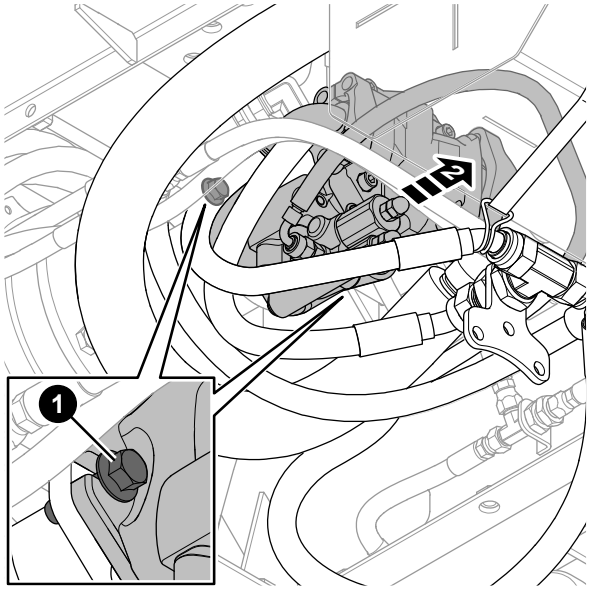
This repair procedure requires the machine on its left side in the beginning of the procedure. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

Remove the Bottom Center Plate. Refer to: Section 4.4 “*Covers*”, page 9

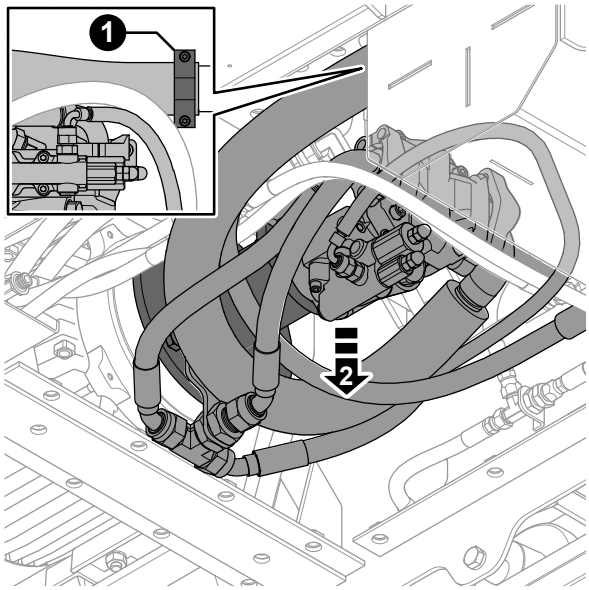
Remove



1. Remove the three fasteners for the T-coupling bracket (1).
2. Fold away and fixate the pressure hose package including the T-coupling with a strap (2).
3. Raise the machine and put the machine on jack stands. Refer to: Section 7.1.1.1 “*Positioning and Securing the Machine*”, page 71

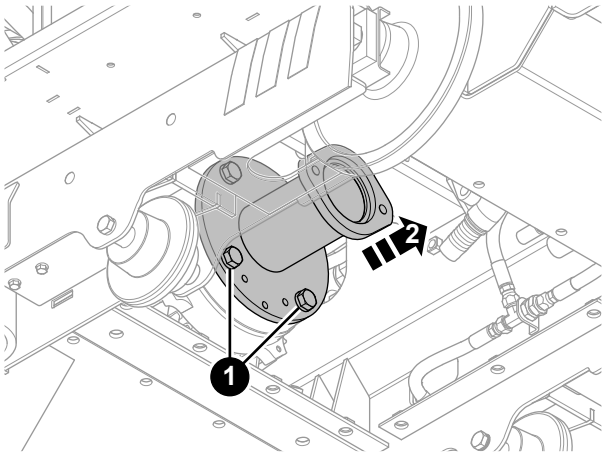


4. Remove the two fasteners for the Hydraulic Pump (1).
5. Firmly pull out the pump and fill house and disengage the claw coupling (2).



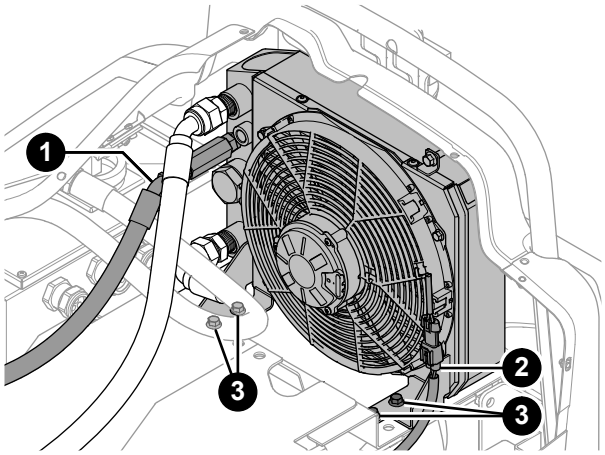
6. Loosen the clamp for the feed hose at the Hydraulic Oil Tank to be able to twist the hose still attached to the tank (1).
7. Remove the strap for the pressure hose package including the T-coupling.
8. Disengage the Hydraulic Pump (2) by twisting the feed hose at the Hydraulic Oil Tank and pull out the pump.

   The pump will hang loose in its hoses.



9. Remove the four fasteners for the Hydraulic Axis Tube (1).
10. Pull out the tube (2).
11. Remove the Top Cover, Inner Dual Motor Cover Left, Inner Dual Motor Cover Right and the Outer Motor Cover. Refer to: Section 4.4 “*Covers*”, page 9

    To change the complete axis coupling. Refer to: Section 10.5.3.2 “*Hydraulic Axis Coupling*”, page 145

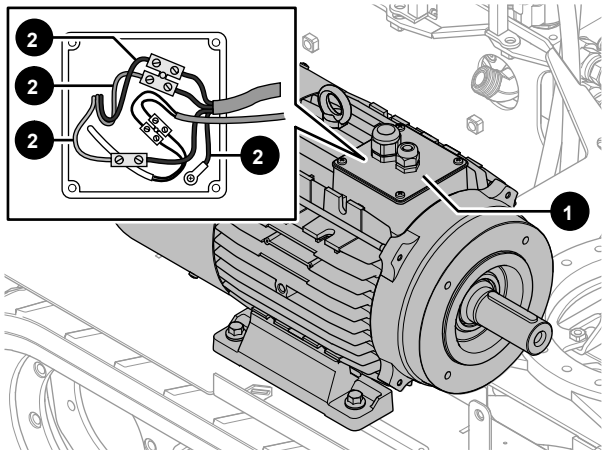


12. Remove and flip away the Cooler to be able to remove the cover for the electrical box on the Electrical Motor. Refer to: Section 10.5.2.1 “*Cooler and Fan Assembly*”, page 141
13.

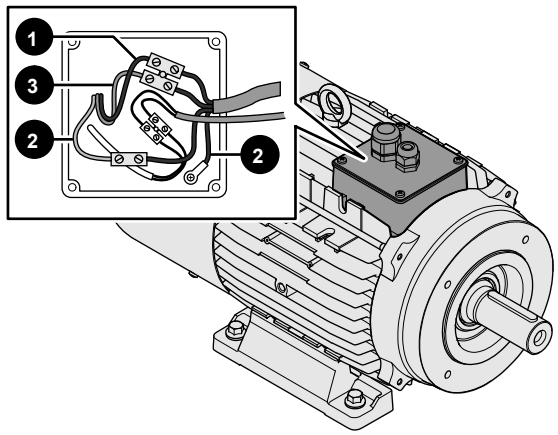
HIGH VOLTAGE!

Turn off the machine and disconnect the power supply cable.

Make sure it´s not possible to reconnect the cable by misstake during the repair prodecure.



14. Remove the cover for the terminal box (1).
15. Mark the wires and disconnect the connections in the terminal box and release the cables from the Electrical Motor (2).



7. **Terminal Box:**

   PLC cabels (Thermal switch) (1)

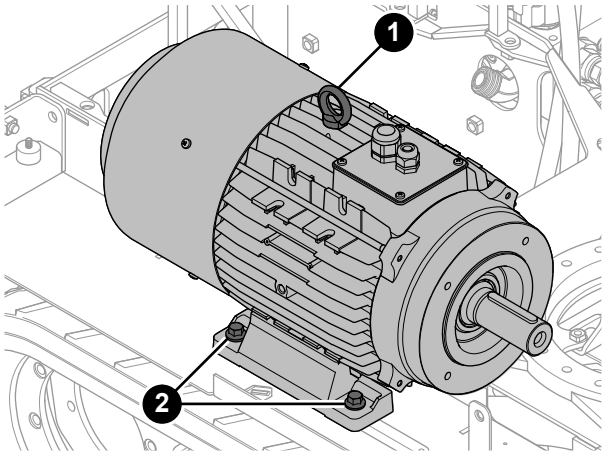
   Ground cable (2)

   Power cabels (3)

   The black, green and red power cables connect the electrical motor with the electrical cabinet and its soft starter (T2).

Table 39. electric motor

Electric motor			Soft start (T2)	
Cable color	Terminal marking		Cable marking	Pin
Black	U	->	1	T1
Green/White	V	->	2	T2
Red	W	->	3	T3



16. Remove the four fasteners for the Electrical Motor (2).
17. Mount a lifting eye to the top of the Electrical Motor (1).
18.

HEAVY WEIGHT!

Take proper safety precautions!

The Electrical Motor is heavy.

Use a lifting device capable of 200 kg.

Lift and disengage the motor from the machine.

19. **Optional!** Complete package with Electrical Motor including the Hydraulic Pump is possible to remove.

    Remove all hoses connected to the Hydraulic Pump. Refer to: Section 10.5.3.1 “*Hydraulic Pump*”, page 143

    Continue from step 11 as described above to fulfill the procedure.

    The Bottom Center Plate must be dismounted to allow for disengaging the entire package.

Install

1. Install of the Electrical Motor.

   Do the steps above in reverse order. Refer to: Section 15.3 “*Mountings and Tightening Torque*”, page 211

10.9 Remote Control

10.9.1 Replace Joystick

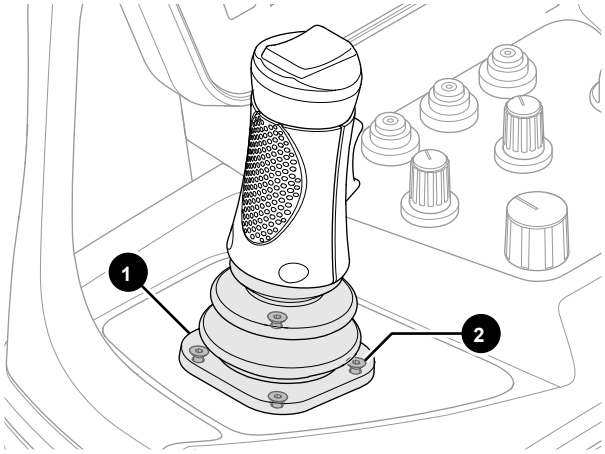
Preparations before start

WARNING!

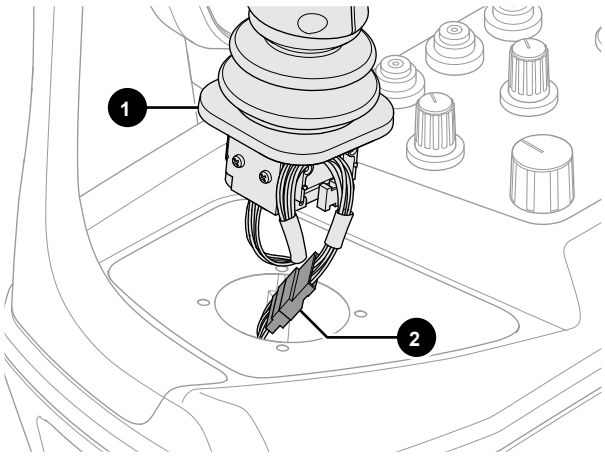
Use a static control grounding mat (ESD)

Remove the battery before opening the Remote Control and touching the cables.

Remove



1. Remove the four fasteners (2) to release the joystick (1).



2. Lift up the joystick (1) disconnect the connector (2) remove the Joystick.

Install

1. Do the steps above in reverse order.

10.9.2 Replace the Joystick bellow

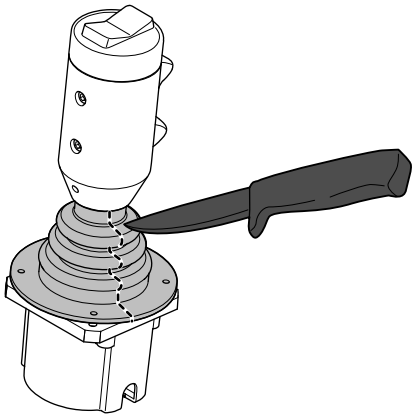
Preparations before start

WARNING!

Use a static control grounding mat (ESD)

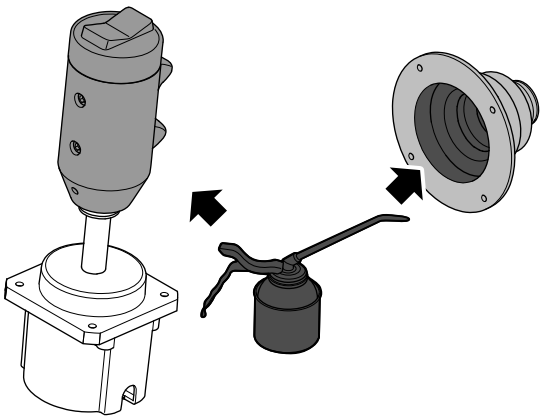
Remove the battery before opening the Remote Control and touching the cables.

Remove

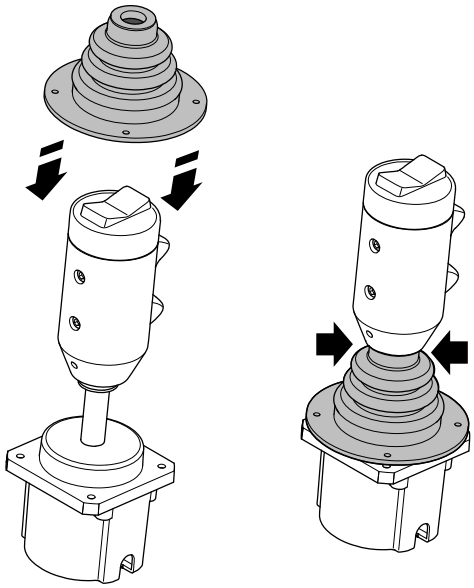


1. Remove the Joystick from the Remote Control. Refer to Section 10.9.1 “*Replace Joystick*”, page 172.
2. Remove the old Joystick bellow, carefully make a cut throughout the bellow.

Install



1. Lubricate the inside of the new rubber bellow and the Joystick handle to reduce friction.



2. Gently pull down the new rubber bellows over the Joystick handle.

   Make sure that the upper edge of the rubber bellows fits firmly around the Joystick handle and its designated groove to prevent dust and moisture intrusion

3. Remove any excess oil from the Joystick.
4. Install the Joystick into the Remote Control in reverse order. Refer to Section 10.9.1 “*Replace Joystick*”, page 172.

10.9.3 Replace the Joystick handle and buttons

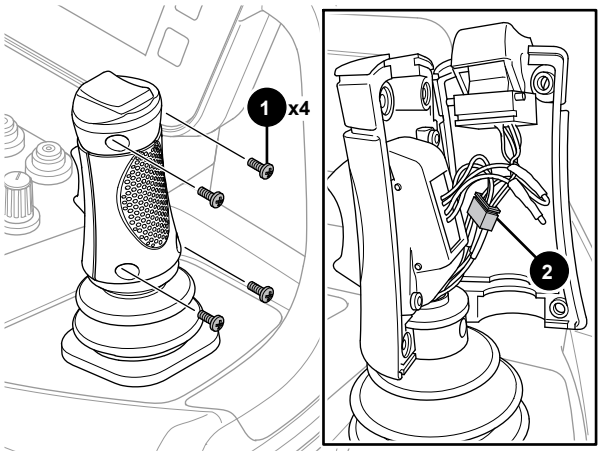
Preparations before start

WARNING!

Use a static control grounding mat (ESD)

Remove the battery before opening the Remote Control and touching the cables.

Remove



1. Remove the four fasteners (1) from joystick handle.
2. Carefully divide the handle.
3. Disconnect the connector (2).
4. Remove the buttons and the handle from the joystick.

Install

1. Do the steps above in reverse order.

10.9.4 Replace Potentiometer

Preparations before start

WARNING!

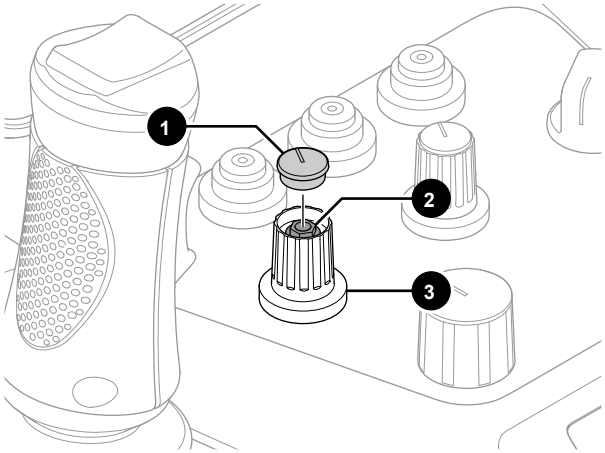
Use a static control grounding mat (ESD)

Remove the battery before opening the Remote Control and touching the cables.

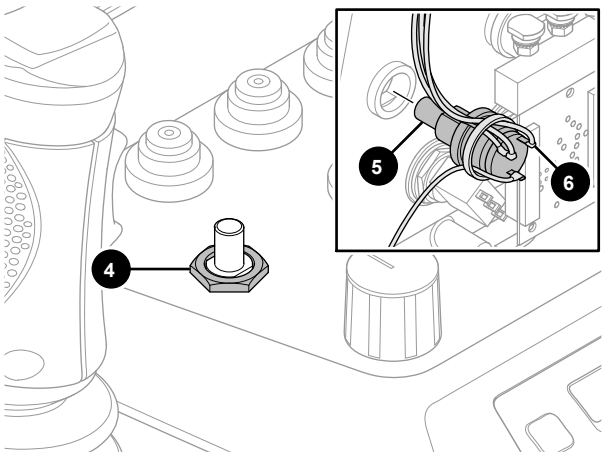
Remove the LCD screen before removing the protective frame, Refer to: Section 10.9.6 “*Replace the LCD screen*”, page 176

Remove the printed circut board before removing the Potentiometer, Refer to: Section 10.9.5 “*Replace the Circuit Board*”, page 175

Remove



1. Remove the knob lid (1).
2. Remove the knob fastener (2).
3. Remove the knob (3).



4. Remove the fastener from the potentiometer (4).
5. Remove the potentiometer (5) from the Remote Control.
6. Carefully solder the wiring from the potentiometer. Mark the wires before removal.

Install

1. Solder the wiring to the potentiometer.

   Do the steps above in reverse order.

10.9.5 Replace the Circuit Board

Preparations before start

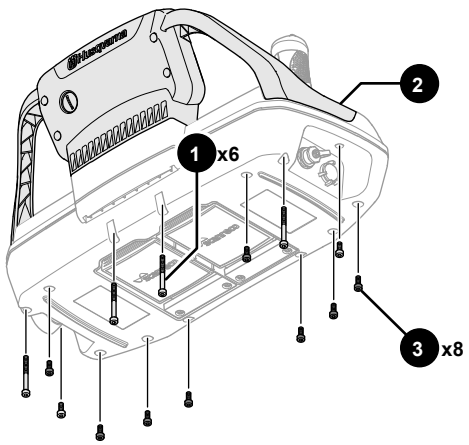
WARNING!

Use a static control grounding mat (ESD)

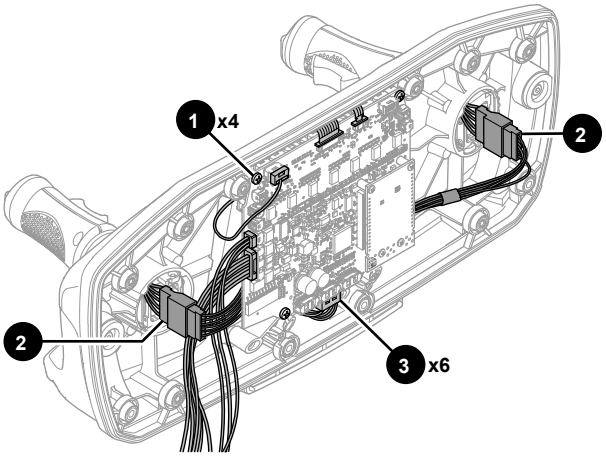
Remove the battery before opening the Remote Control and touching the cables.

Remove the LCD screen before removing the protective frame, Refer to: Section 10.9.6 “*Replace the LCD screen*”, page 176

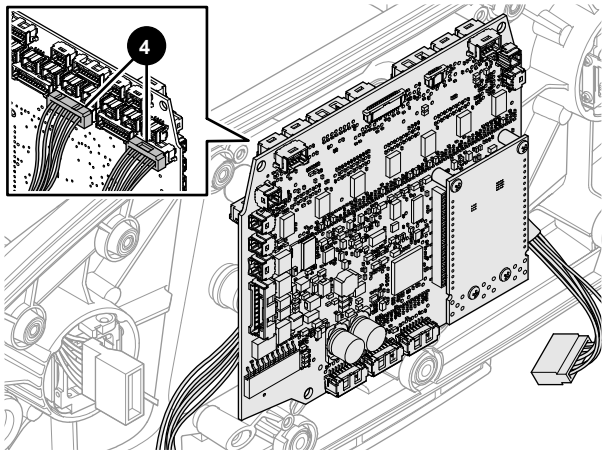
Remove



1. Remove the six fasteners (1) remove the protective frame (2) from the Remote Control.
2. Remove the eight fasteners (3) at the backside of the Remote Control and open up the Remote Control.

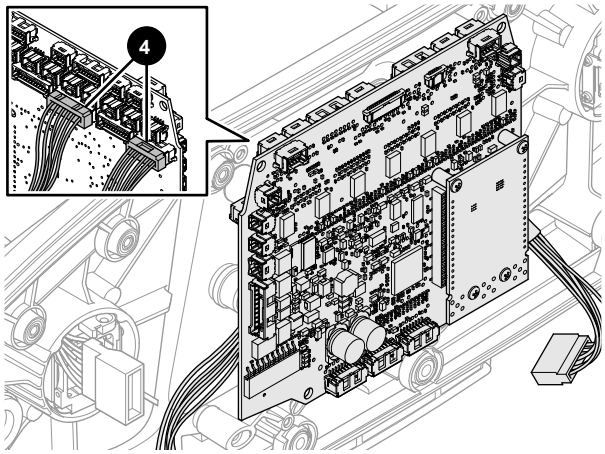


3. Remove the four fasteners (1) connected to the printed circuit board.
4. Disconnect the two connectors (2) connected from the joysticks.
5. Disconnect the six connectors (3) from the printed circuit board.



6. Lift up the printed circuit board and disconnect the two connectors (4) connected to the printed circuit board.
7. Remove the circuit board from the Remote Control.

Install



1. Connect the two connectors (4) and install the printed circuit board.

   Be careful with the color coding on the connectors when installing.

   Do the steps above in the reverse order.

   New circuit board is pre-programmed and ready.

10.9.6 Replace the LCD screen

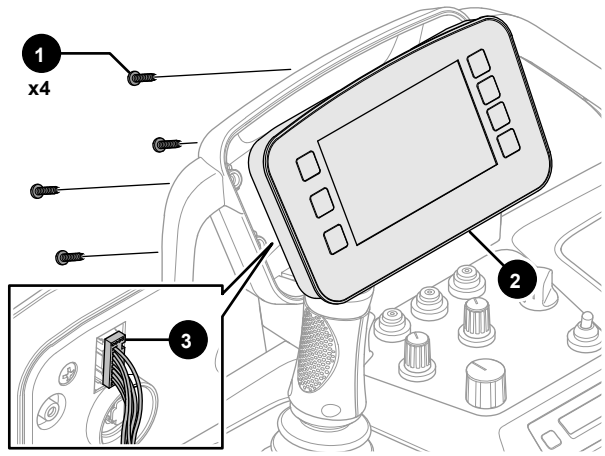
Preparations before start

WARNING!

Use a static control grounding mat (ESD)

Remove the battery before opening the Remote Control and touching the cables.

Remove



1. Remove the four fasteners (1).
2. Lift out the LCD screen (2) from the protective frame to access the harness connector (3).
3. Disconnect the connector (3) remove the LCD screen (2).

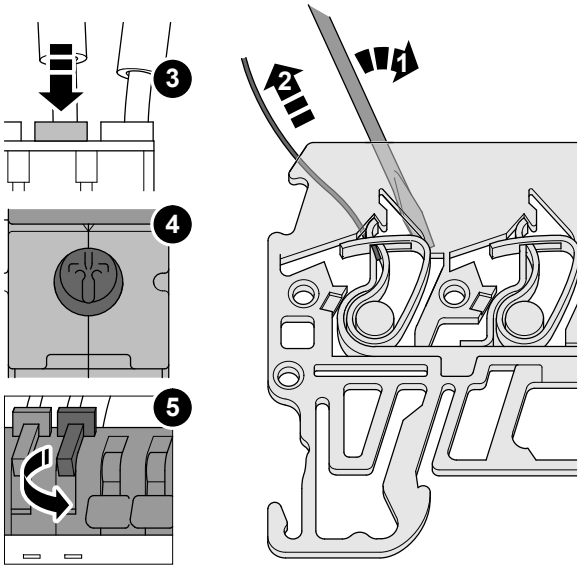
Install

1. Do the steps above in the reverse order.

2. Activate the new LCD screen by upload latest available software via Husqvarna Service Hub.

10.10 Electrical Cabinet Components - Remove wires

Remove and Install



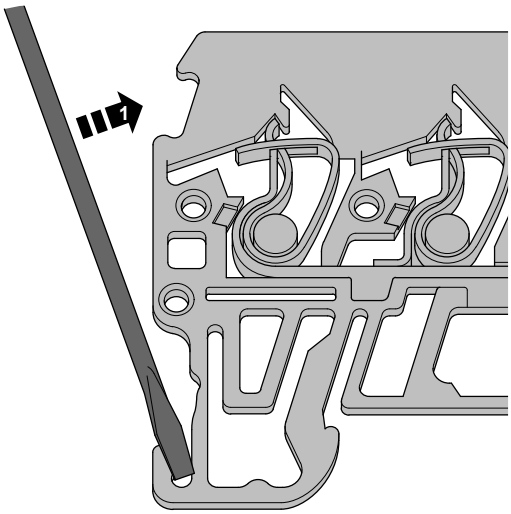
1. To remove a wire in the Terminal Blocks X1 - X2, Relays K2 - K3, fuses 1 - 8 and the Contactors K1_1 - K1_2, do as follows:
   - Put a tool in the hole next to the connected wire and push the tool (1) to disconnect the wire.
   - Pull out the wire (2) from the component.

   To install, do the steps above in reverse order.
2. To remove a wire in the Power Meter KE4 , do as follows:
   - Use a small tool to push in the orange locking lid (3) and pull out the wire.

   To install, do the steps above in reverse order.
3. To remove a wire in the Soft Start Relay (T2), fuses (F1) and main power switch (Q1), do as follows:
   - Remove the screw anticlockwise (4) until the wire is loose and pull out the wire.

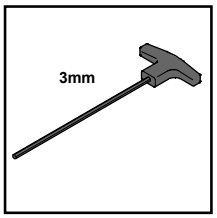
   To install, do the steps above in reverse order.
4. To remove a wire in the 24 VDC Power Supply (T1), do as follows:
   - Pull up the locking device (5) to release the wire and pull out the wire.

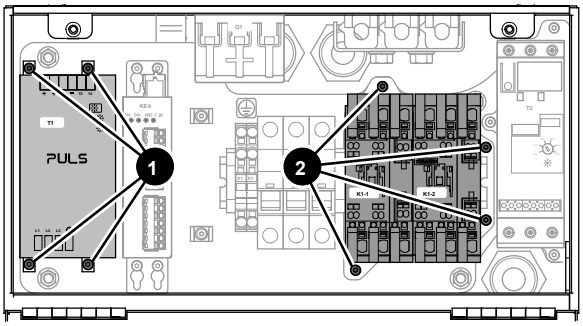
   To install, do the steps above in reverse order.



5. **To remove a component in the Electrical Cabinet:**
6. To remove the Terminal Blocks X1 - X2 and fuses 1 - 8, do as follows:
   - Mark and remove all wires connected to the component, see step 2 above.
   - Put a tool in the locking device in the lower side of the component (1).
   - Pull the tool to release the component from the cabinet.
   - Remove the component.

   To install, attach the upper part of the component to the DIN rail and push the lower end until you hear a click sound. Install the wires.



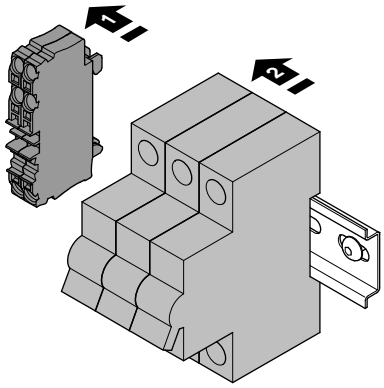


7. To remove the 24 VDC Power Supply (T1), do as follows:
   - Mark and remove all wires connected to the component, see step 5 above.
   - Remove the four fasteners (1) with a 3mm T-handle tool.
   - Remove the component.

   To install, do the steps above in reverse order.

8. To remove the contactors K1_1 and K1_2, do as follows:
   - Mark and remove all wires connected to the component, see step 2 above.
   - Remove the four fasteners (2) with a 3mm T-handle tool.
   - Remove the component.

   To install, do the steps above in reverse order.



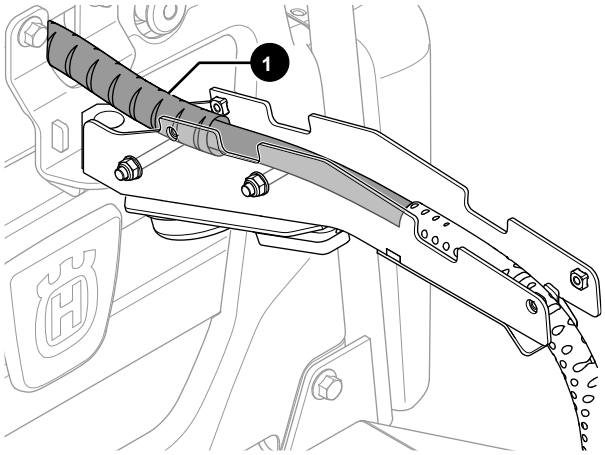
9. To remove the 3-Phase fuses (F1), do as follows:
   - Remove and fold away the Terminal Block X1 (1) from the DIN rail, see step 7 above.
   - Mark and remove all wires connected to component F1, see step 4 above.
   - Gently slide off (2) the component F1 from the DIN rail to remove it from the Electrical Cabinet.

   To install, do the steps above in reverse order.

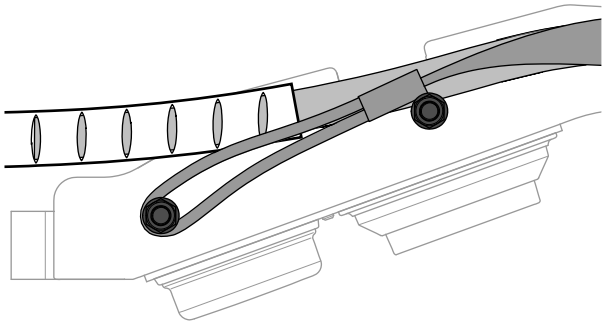
10.11 Installation Cable Arm

Read the manuals for the relevant DXR-machine and for the specific hand-tool for complete information regarding handling and safety.

Install

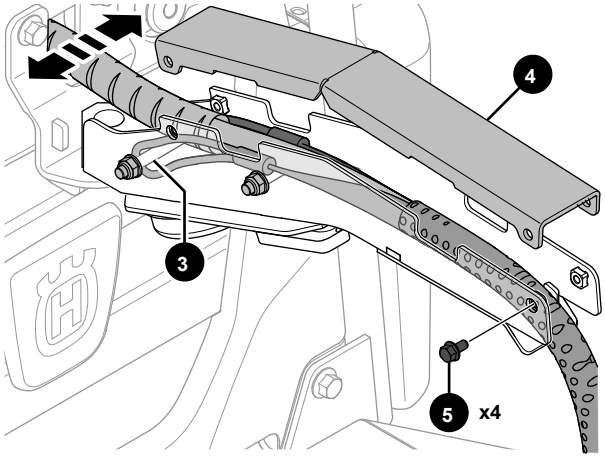


1. Run the Plastic spiral (1) under the "ceiling"



2. CABLING: Run the electric cable and steel sock above the fastener.

> **NOTE!**
> Make sure that the antenna cable runs on the opposite side of the fastener's thread.



3. STEEL SOCK: Run the steel sock (3) tight against the fastener and make sure that the power cable is slack.

4. Install the protective cover (4) with the four fasteners (5).

11.1 Software update/upload

The software of the Remote Control and the master and slave modules can be updated from a PC. Descriptions, procedures on how to connect to the remote control and to the controller modules can be found on Husqvarna Customer Portal.

Use the Husqvarna Service Hub for all updates.

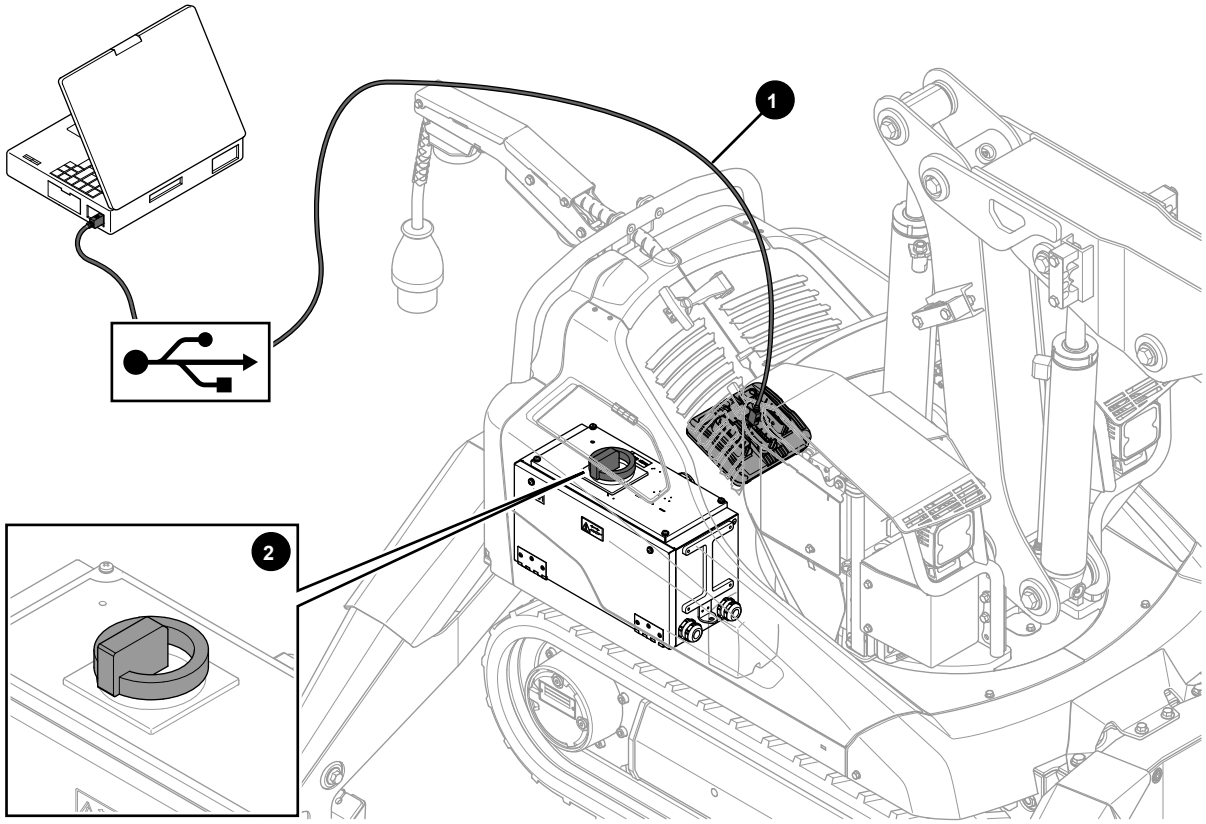


Figure 11.1-1. Connection guide Machine

Update/upload the machine controller module software:

1. Connect the PC and software update cables to the rear slave controller module and connection X4/5.
2. Power on the machine/controller modules.

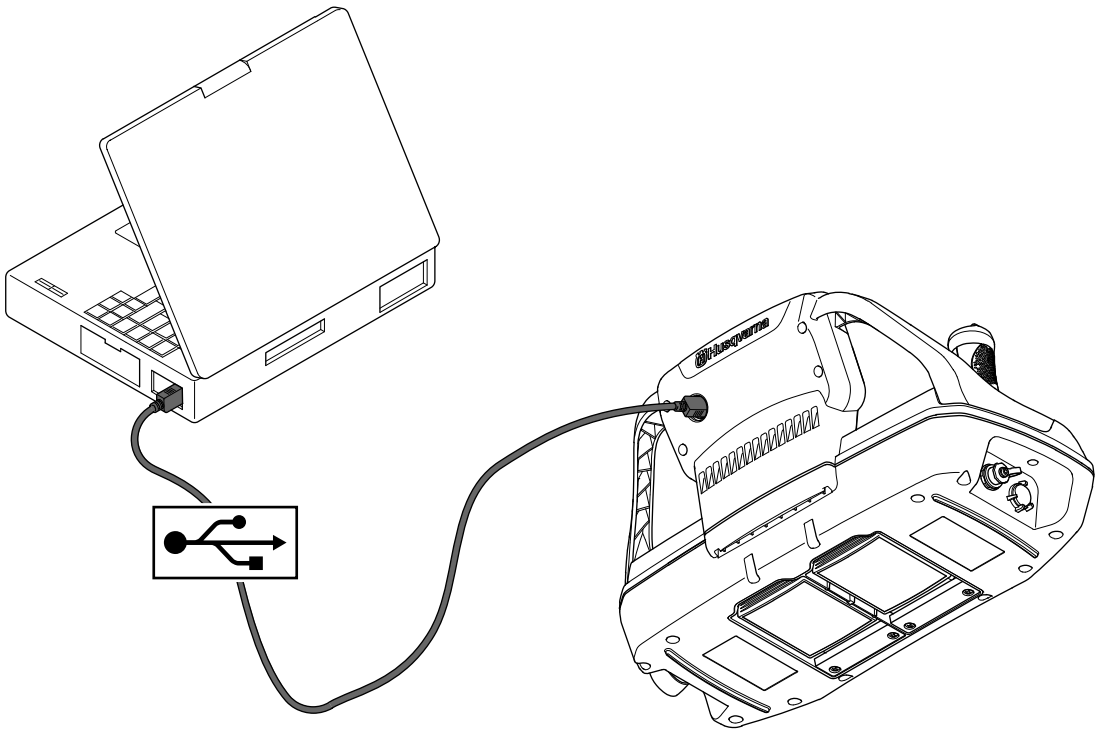


Figure 11.1-2. Connection guide Remote Control

Update the Remote Control software:

1. Connect the computer and USB micro-B cable to the Remote Control.

12.1 Set the voltage and frequency in the Remote Control

Set the voltage (400/460VAC) in the Remote Control to ensure that the software knows which warning levels to apply.

Set the voltage

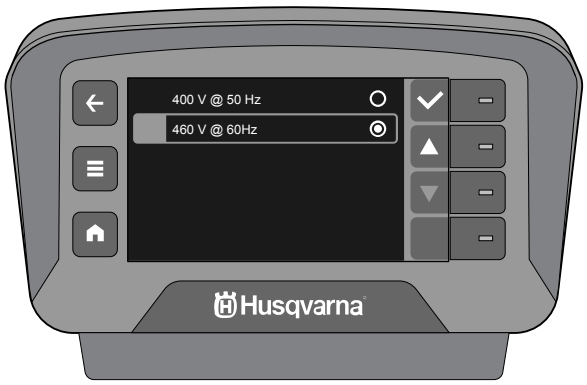
1. Select "System" in the Remote Control display.

2. Select "Factory settings".

3. Enter the service pin code: 134213.

4. Select "Set voltage" in the factory menu.

5. Select "400 V @ 50Hz" or "460 V @ 60Hz".



12.2 Adjustment of Pump Flow

Correct pump output flow

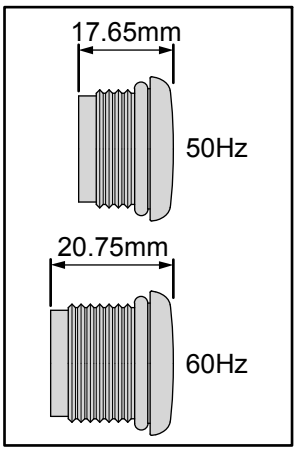
Adjust the pump maximum displacement in accordance with the difference in motor rotation speed due to changing alternating current: ~50Hz or ~60Hz. Use a displacement plug that increases or decreases the maximum pump displacement.

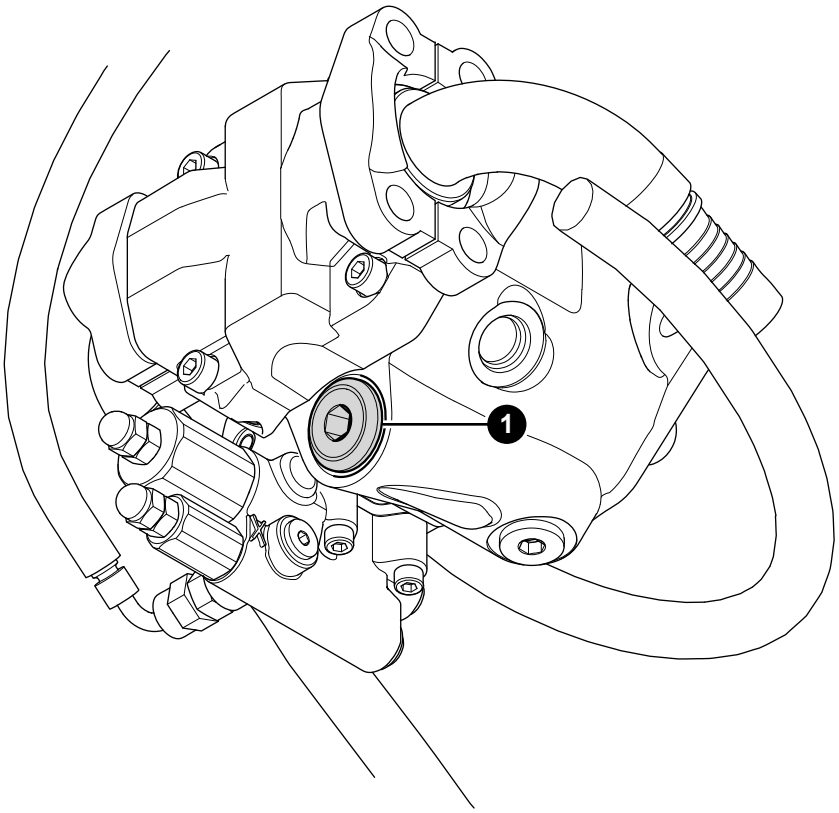
Preparations:

– Tip the machine to its side (refer to Section 3.3.3.1 “*Positioning and Securing the Machine*”, page 6)
– Open the Bottom Center Plate (refer to Section 4.4 “*Covers*”, page 9)

AVOID POLLUTING THE HYDRALIC SYSTEM!

12 ADJUST TO CHANGE FREQUENCY (~50/~60 HZ)



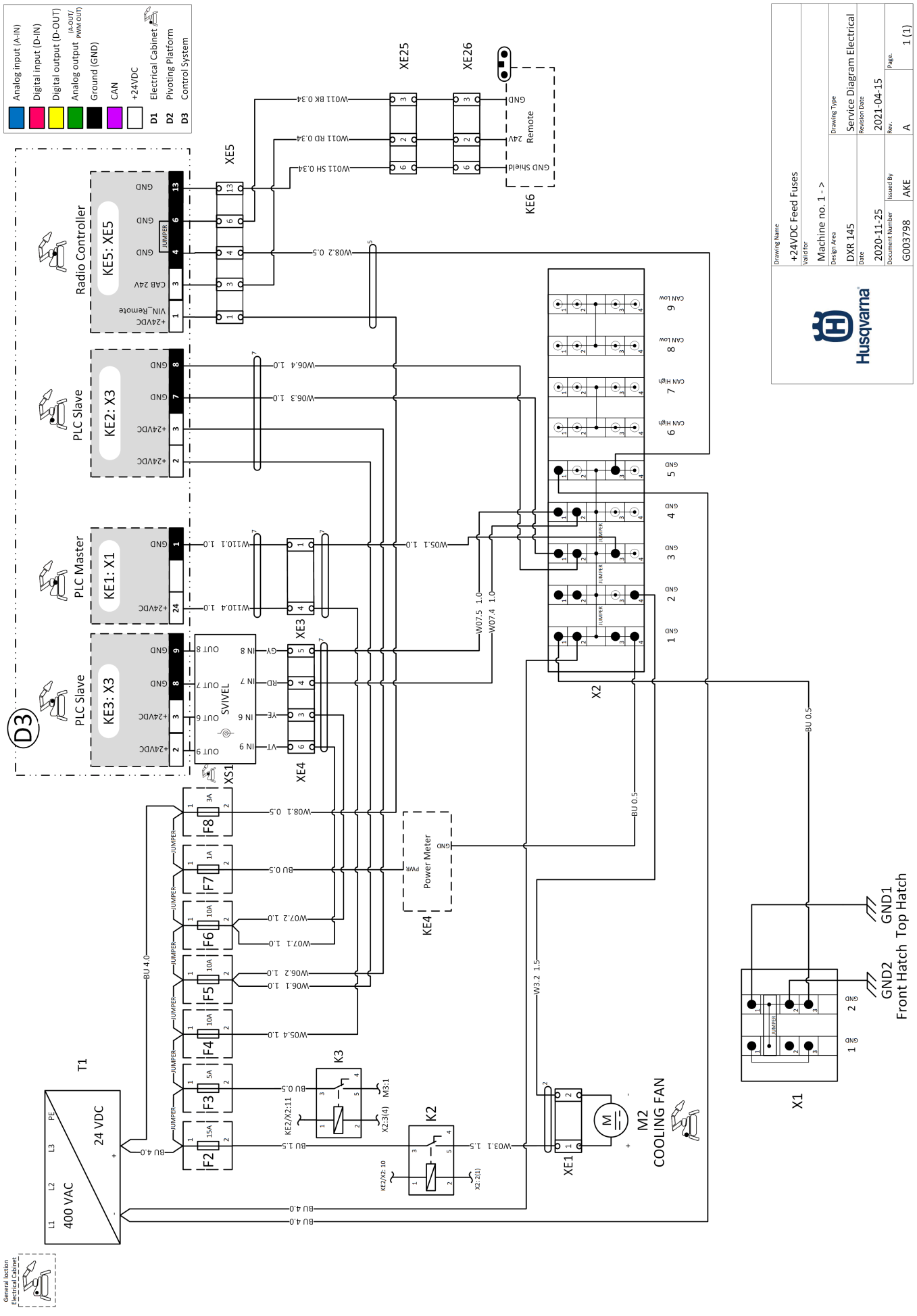


Replace displacement plug

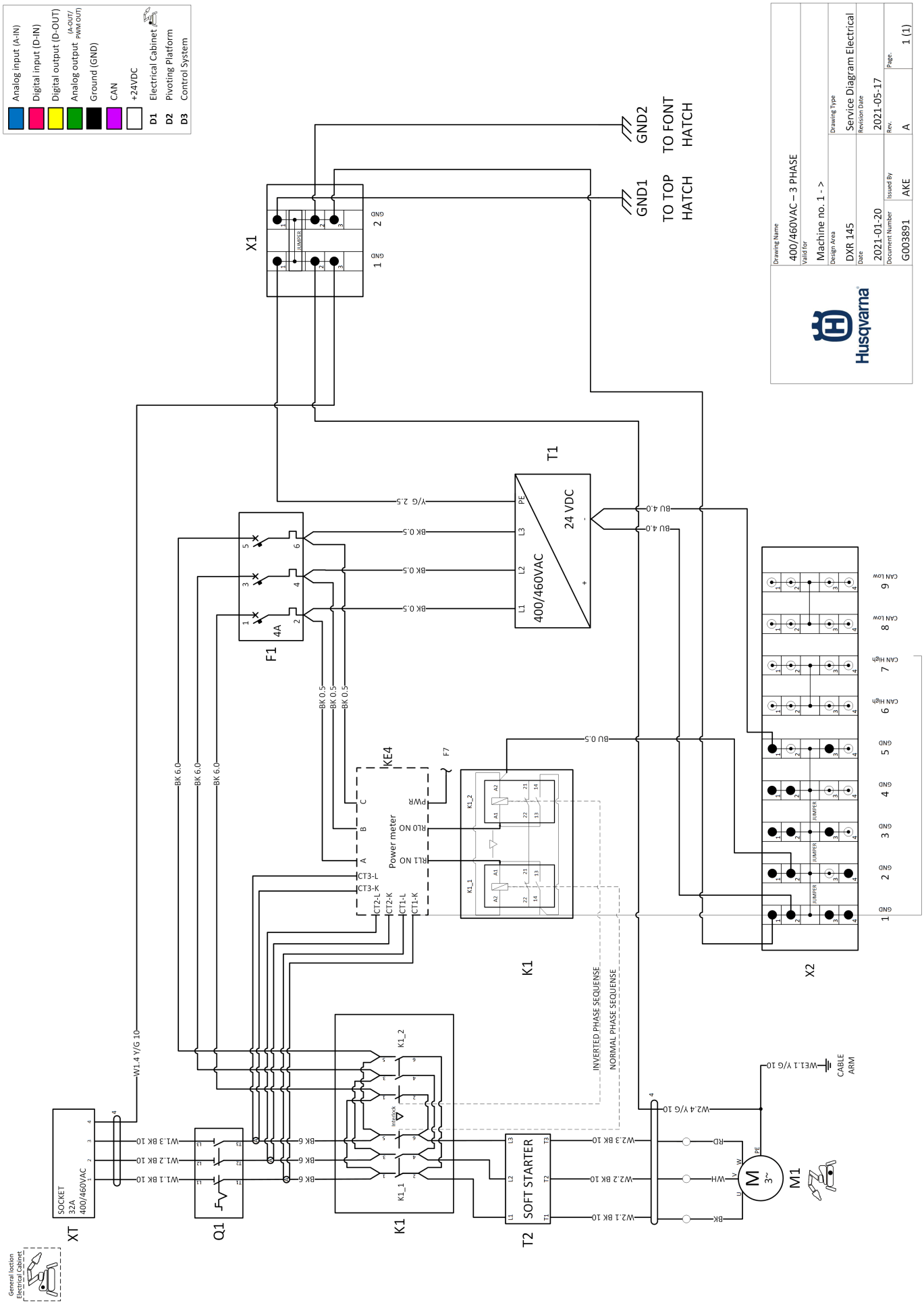
Locate the displacement plug (1). The plug is factory mounted with an adhesive compound, which requires some extra force to undo.

– Replace the plug with one rated to the current frequency:
  - ~50Hz, length: 17.65mm
  - ~60Hz, length: 20.75mm
– Check the O-ring for kinks or damages
– Tightening torque: 190Nm

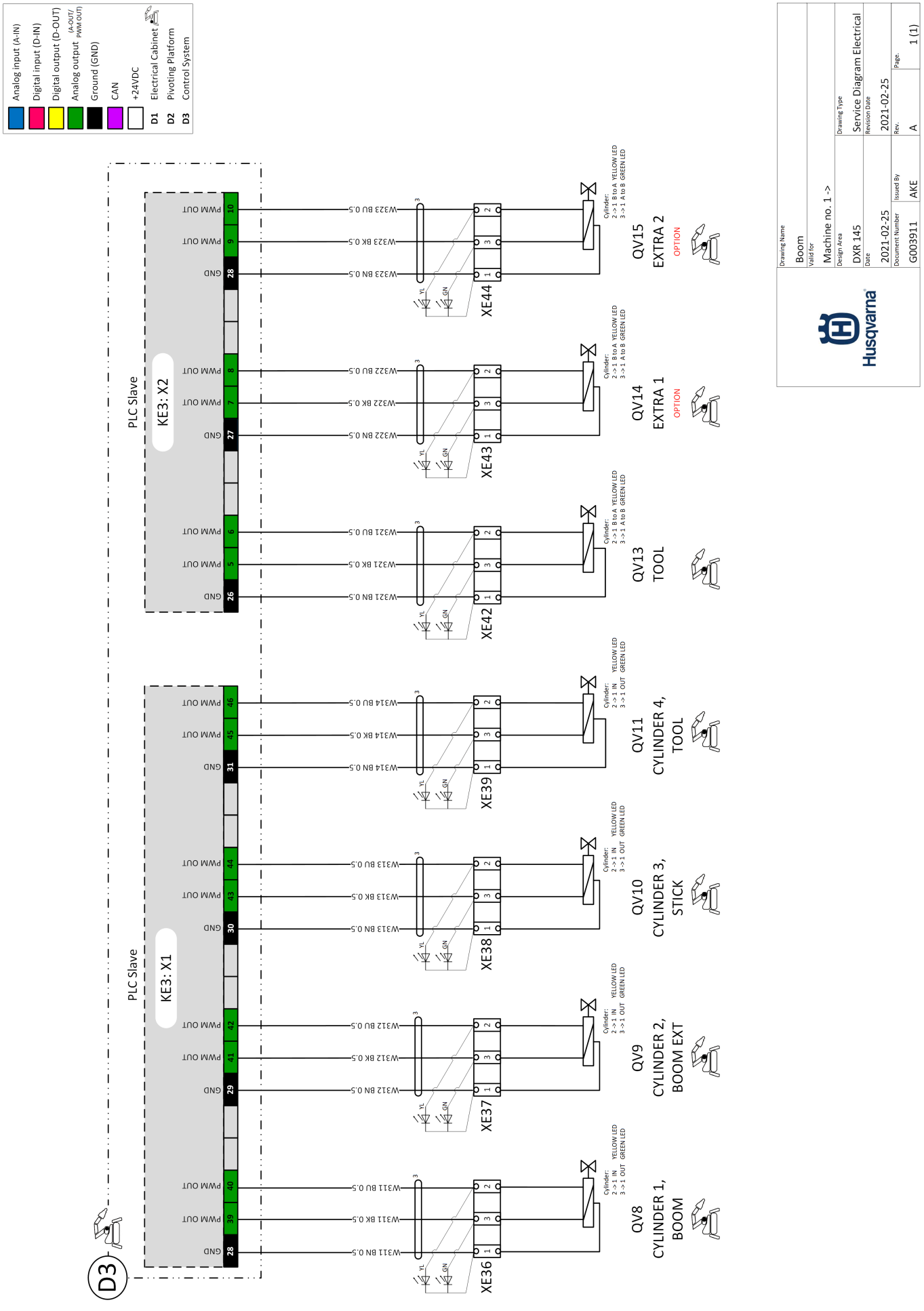
13.1 +24VDC Feed



13.2 400/460VAC 3-Phase



13.3 Boom


Analog input (A-IN)
Digital input (D-IN)
Digital output (D-OUT)
Analog output (A-OUT/PWM OUT)
Ground (GND)
CAN
+24VDC
D1 Electrical Cabinet
D2 Pivoting Platform
D3 Control System
D3
PLC Slave
KE3: X1
KE3: X2
PWM OUT
GND
W311 BU 0,5
W311 BK 0,5
W311 BN 0,5
W312 BU 0,5
W312 BK 0,5
W312 BN 0,5
W313 BU 0,5
W313 BK 0,5
W313 BN 0,5
W314 BU 0,5
W314 BK 0,5
W314 BN 0,5
W321 BU 0,5
W321 BK 0,5
W321 BN 0,5
W322 BU 0,5
W322 BK 0,5
W322 BN 0,5
W323 BU 0,5
W323 BK 0,5
W323 BN 0,5
XE36
XE37
XE38
XE39
XE42
XE43
XE44
YL
GN
Cylinder:
2 -> 1 IN
3 -> 1 OUT
YELLOW LED
GREEN LED
Cylinder:
2 -> 1 B to A YELLOW LED
3 -> 1 A to B GREEN LED
QV8
CYLINDER 1,
BOOM
QV9
CYLINDER 2,
BOOM EXT
QV10
CYLINDER 3,
STICK
QV11
CYLINDER 4,
TOOL
QV13
TOOL
QV14
EXTRA 1
OPTION
QV15
EXTRA 2
OPTION
Drawing Name
Boom
Valid for
Machine no. 1 ->
Design Area
DXR 145
Drawing Type
Service Diagram Electrical
Date
2021-02-25
Revision Date
2021-02-25
Document Number
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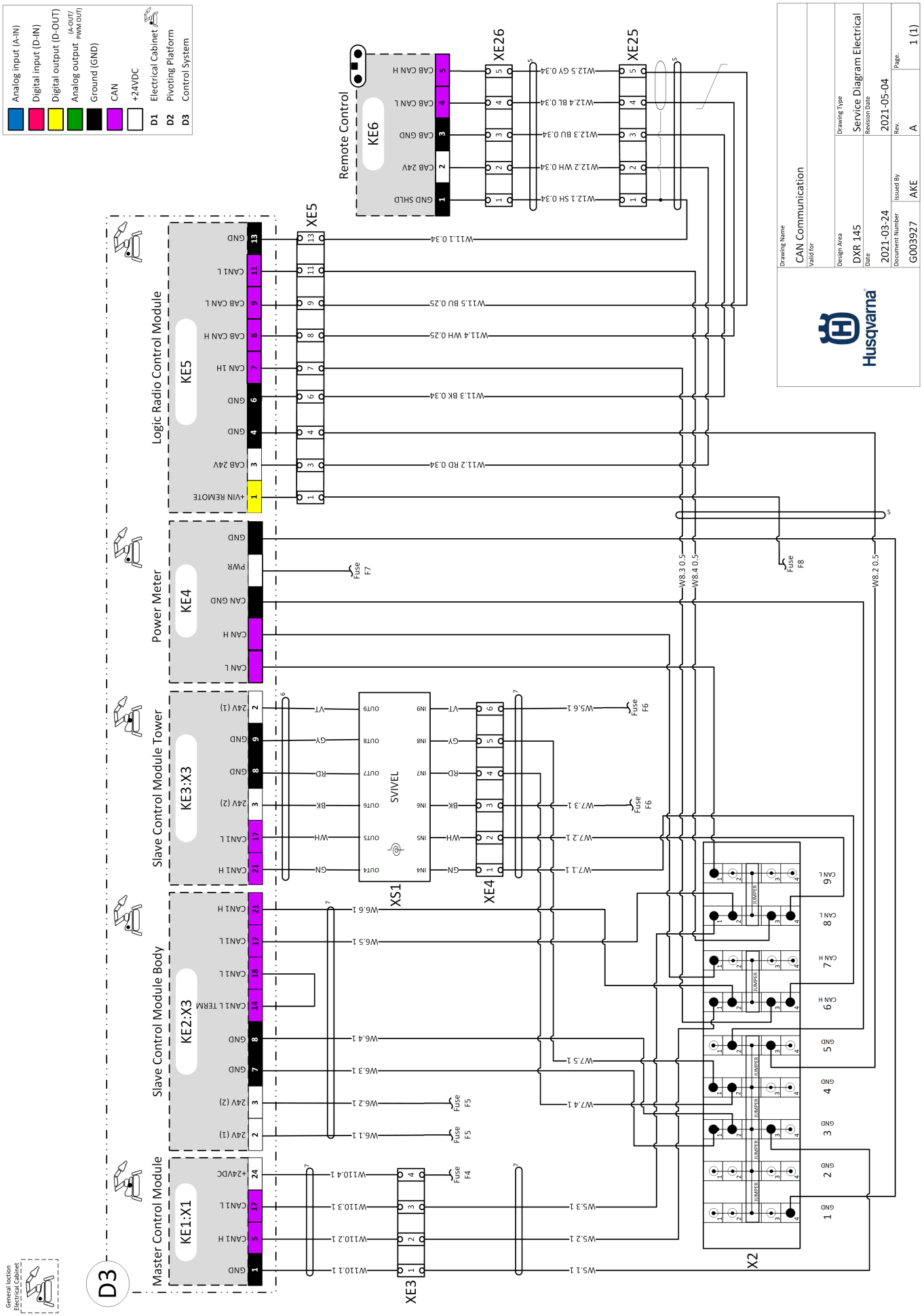
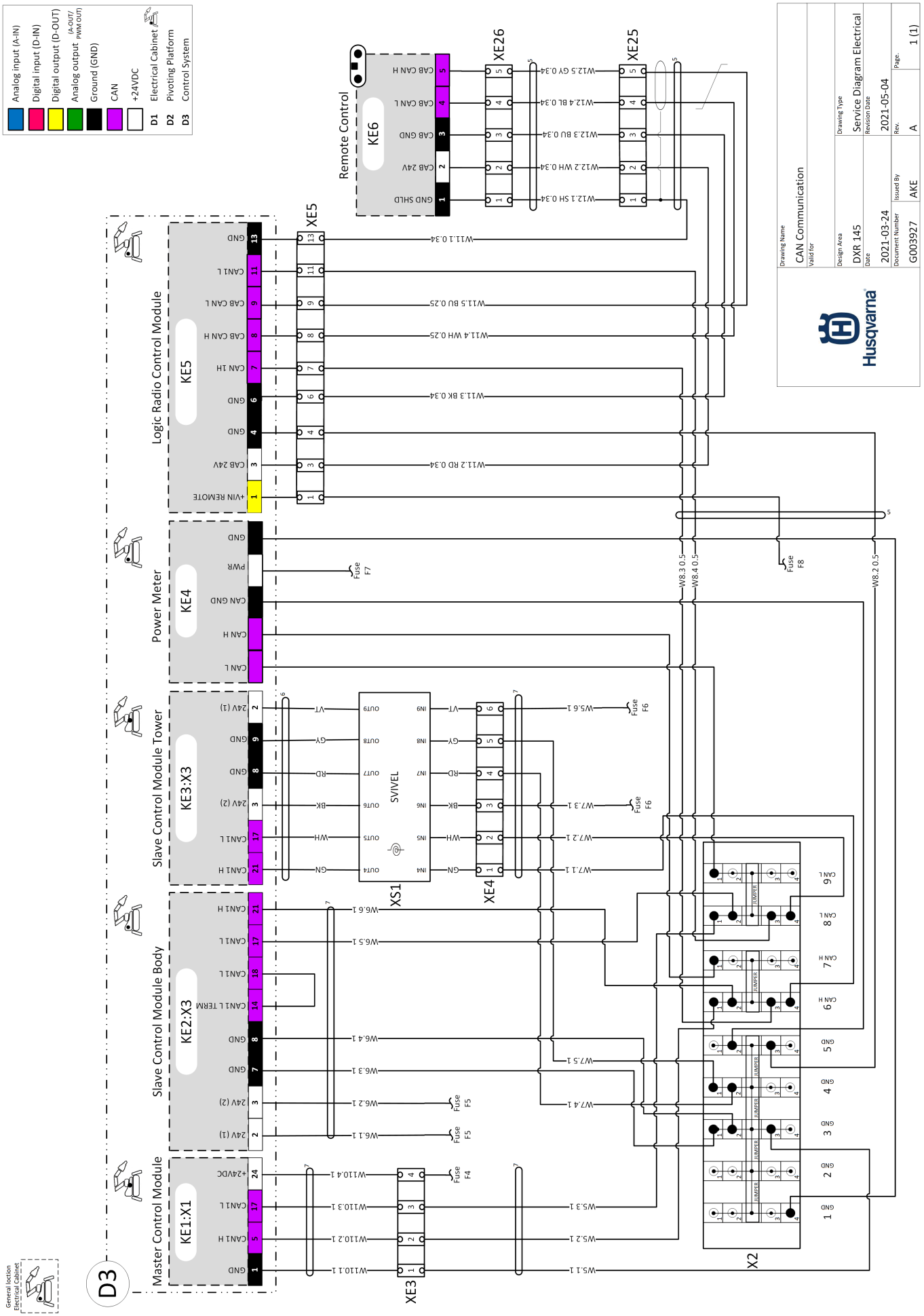
Husqvarna

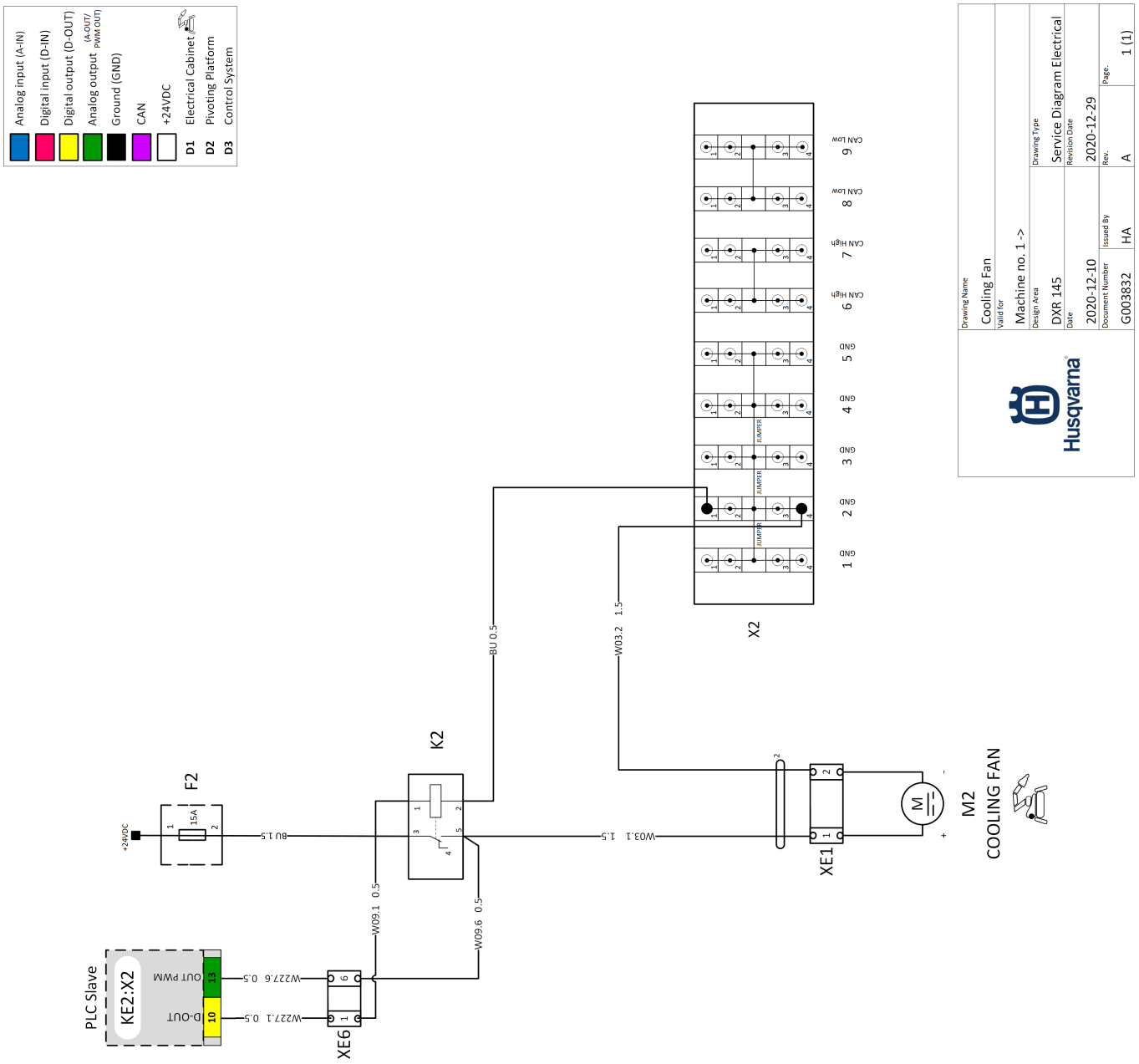
13.4 CAN Communication



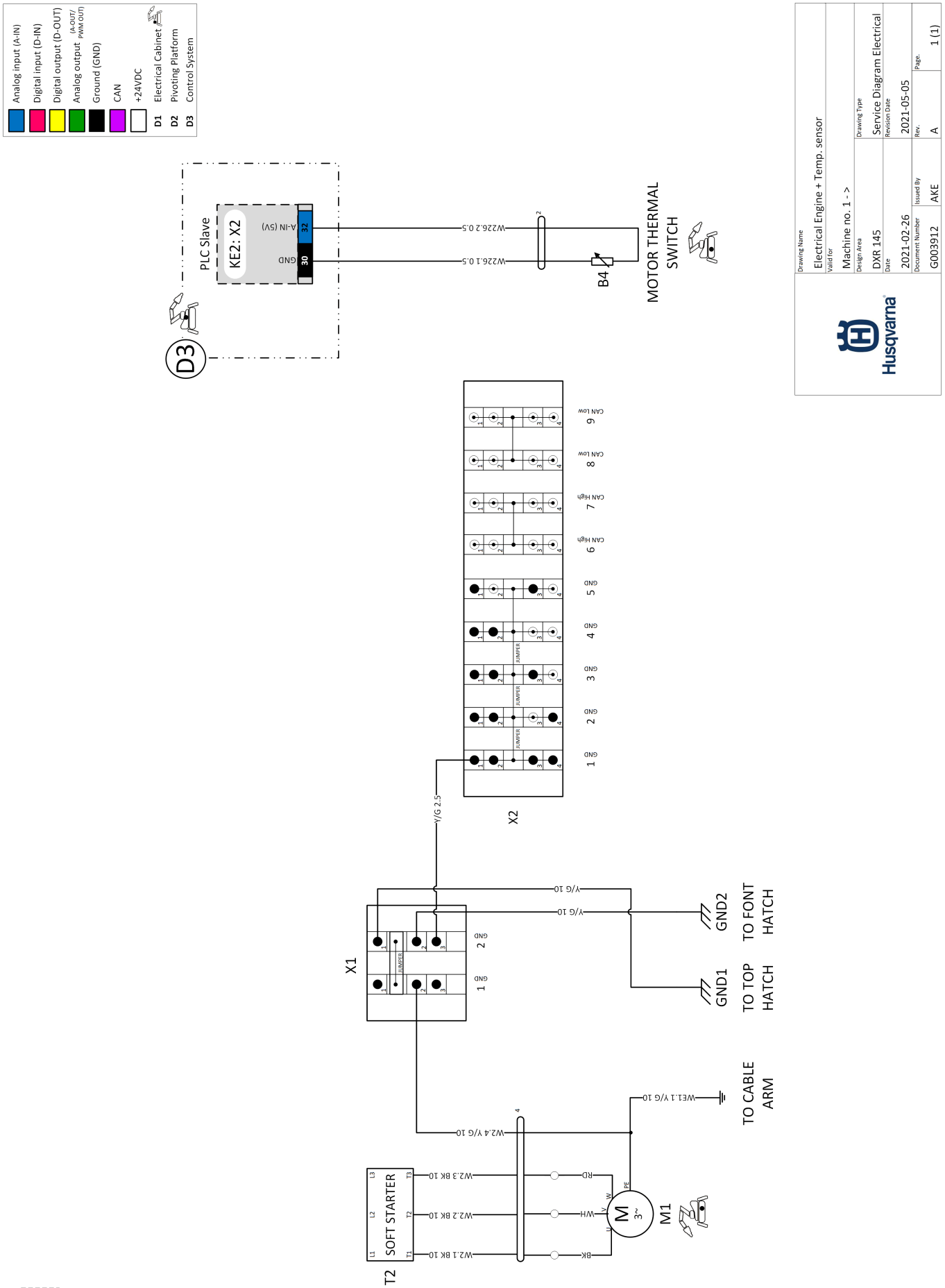
13.5 Circulation Valve



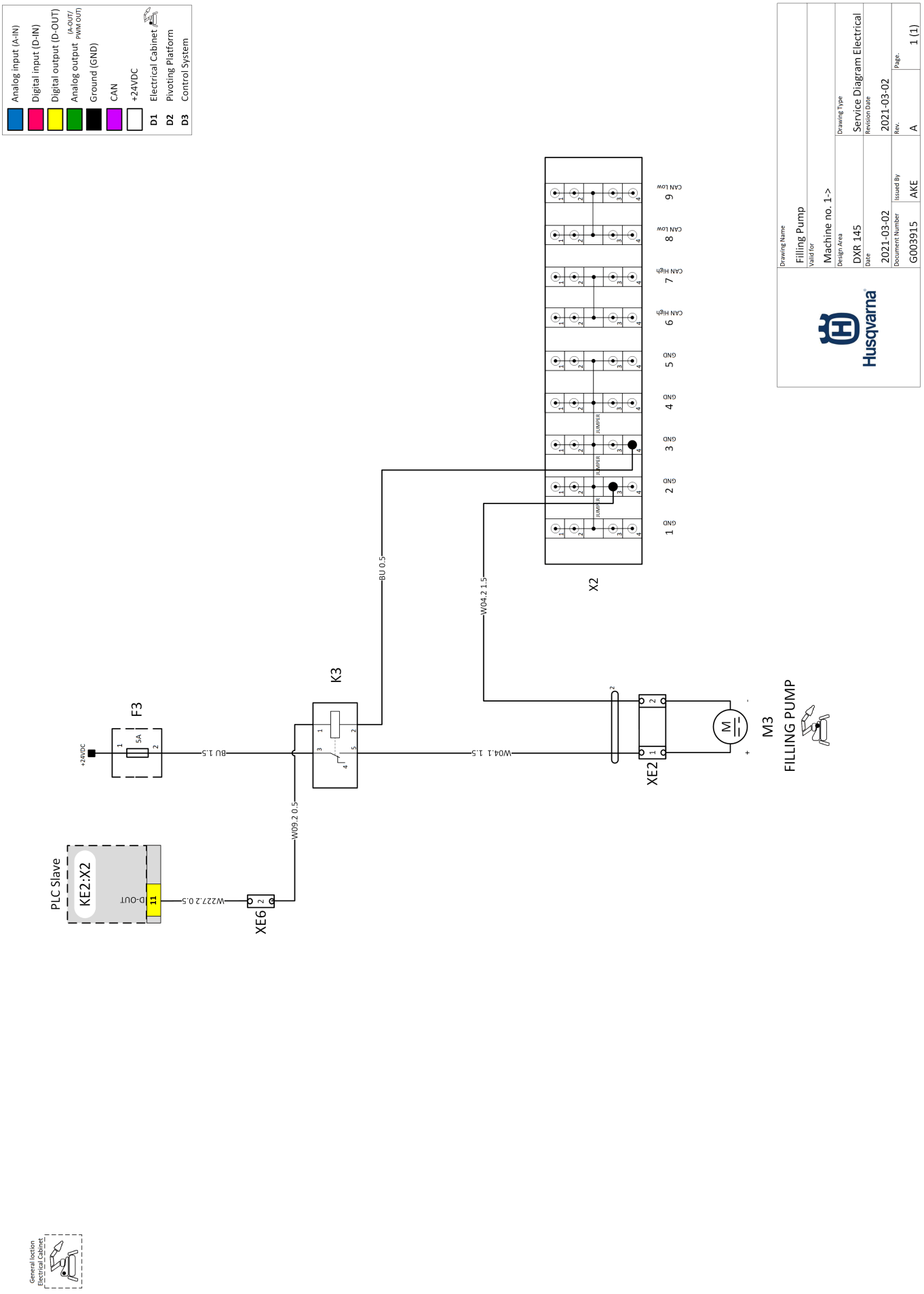
13.6 Cooling Fan



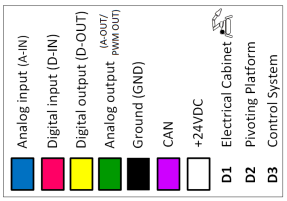
13.7 Electrical Engine + Temperature sensor



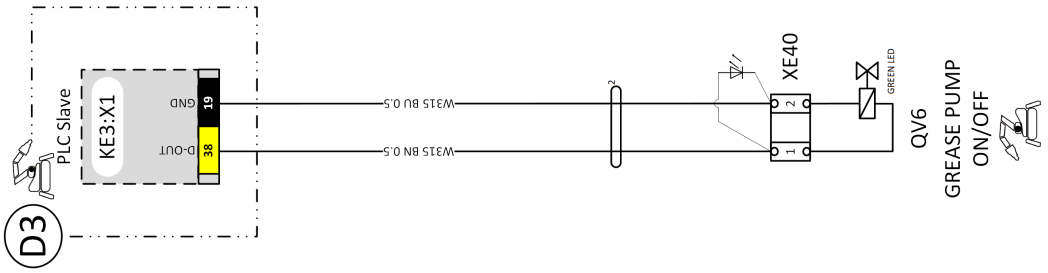
13.8 Filling Pump



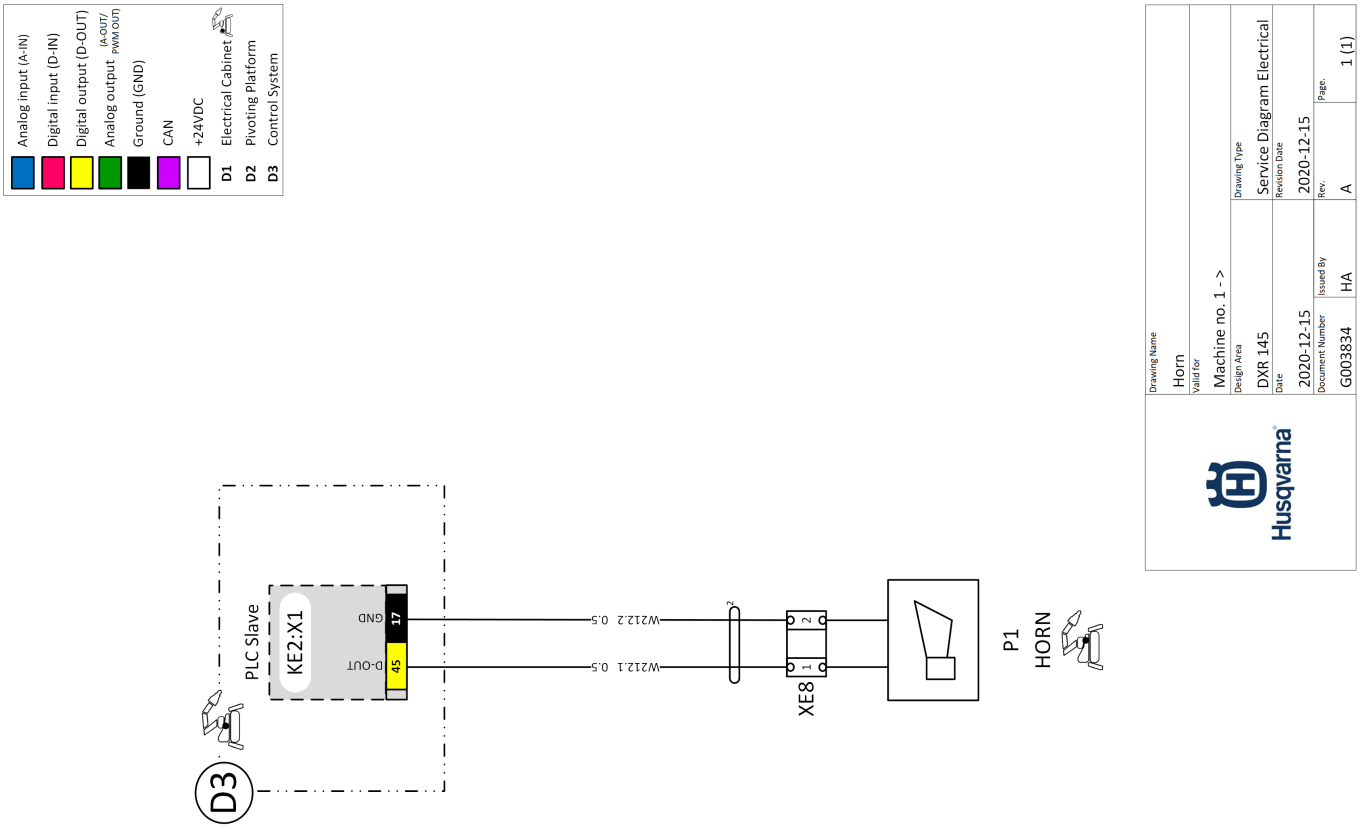
13.9 Grease Pump



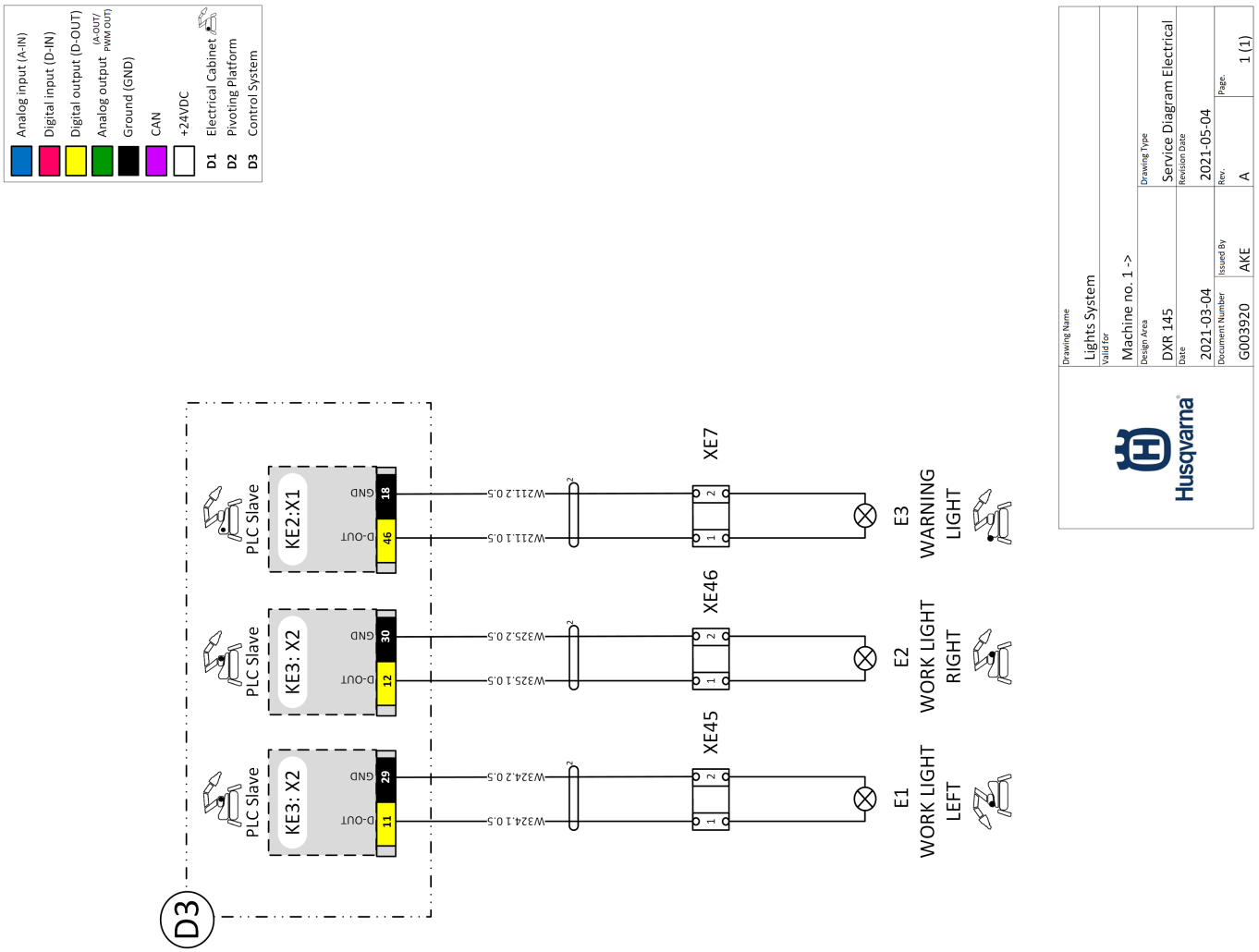
Drawing Name	Grease Pump
Valid for	Machine no. 1 ->
Design Area	DXR 145
Date	2020-12-15
Document Number	G003833
Issued By	HA
Drawing Type	Service Diagram Electrical
Revision Date	2020-12-15
Rev.	A
Page.	1 (1)



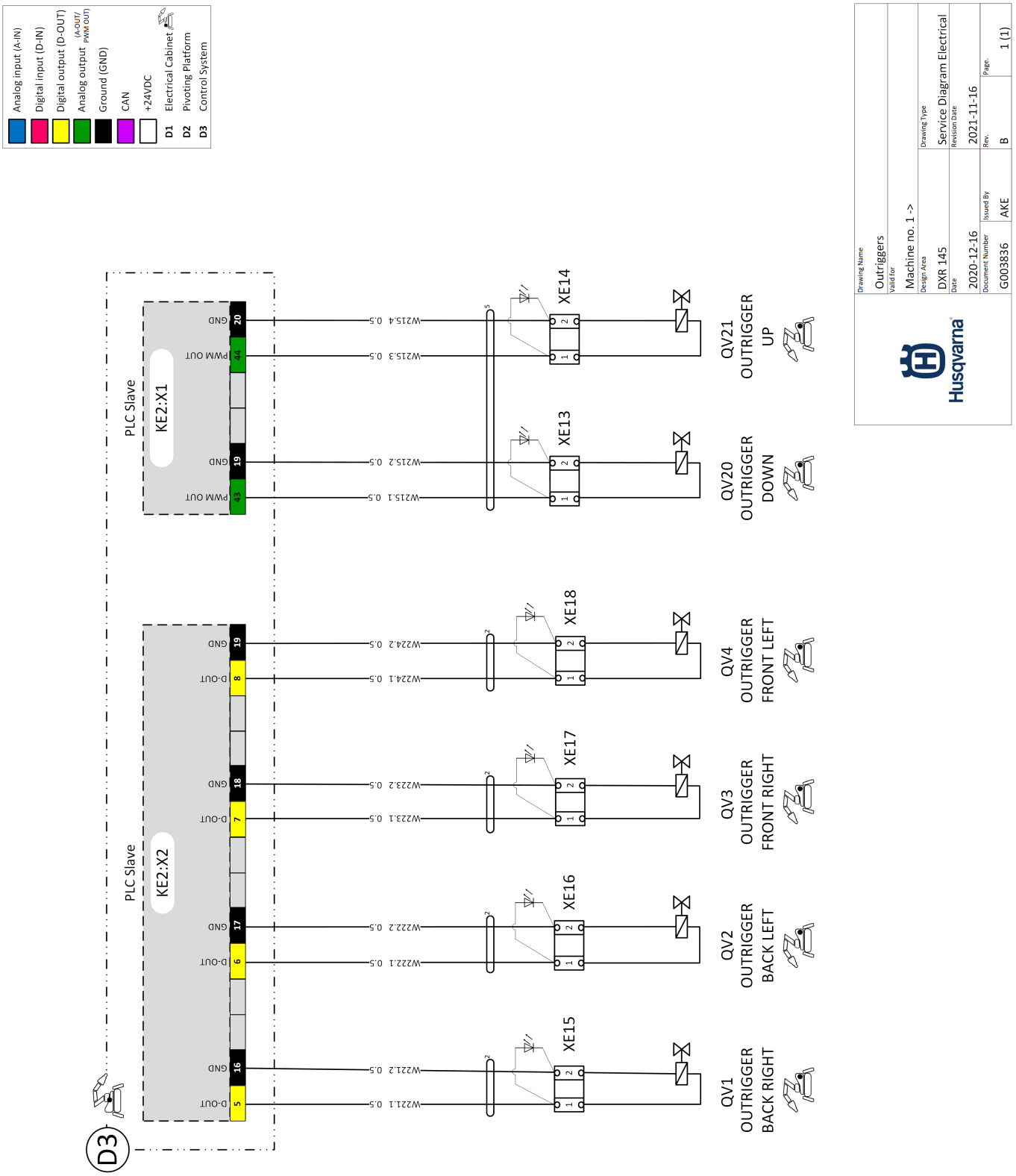
13.10 Horn


Analog input (A-IN)
Digital input (D-IN)
Digital output (D-OUT)
Analog output (A-OUT/PWM OUT)
Ground (GND)
CAN
+24VDC
D1 Electrical Cabinet
D2 Pivoting Platform
D3 Control System
Drawing Name
Horn
Valid for
Machine no. 1 - >
Design Area
DXR 145
Date
2020-12-15
Document Number
G003834
Issued By
HA
Drawing Type
Service Diagram Electrical
Revision Date
2020-12-15
Rev.
A
Page.
1 (1)
Husqvarna
PLC Slave
KE2:X1
GND
D-OUT
17
45
W212.2 0.5
W212.1 0.5
XE8
2
1
P1
HORN
D3

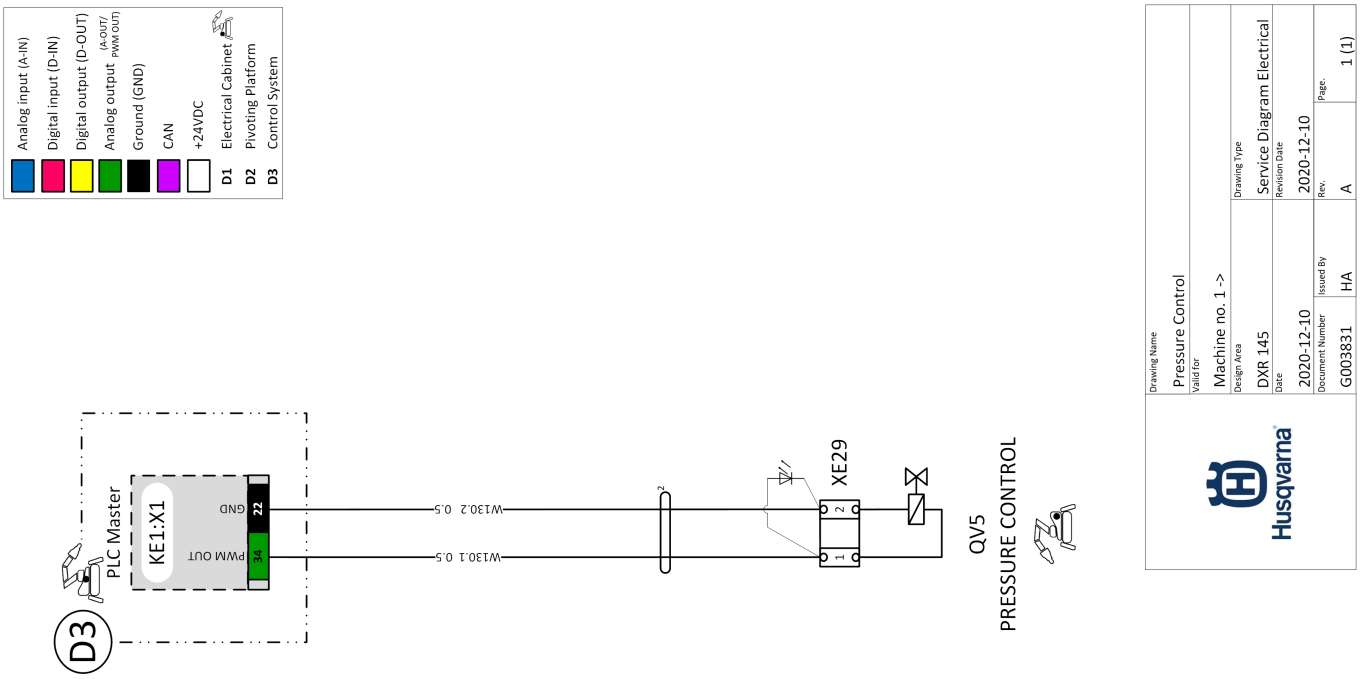
13.11 Lights System



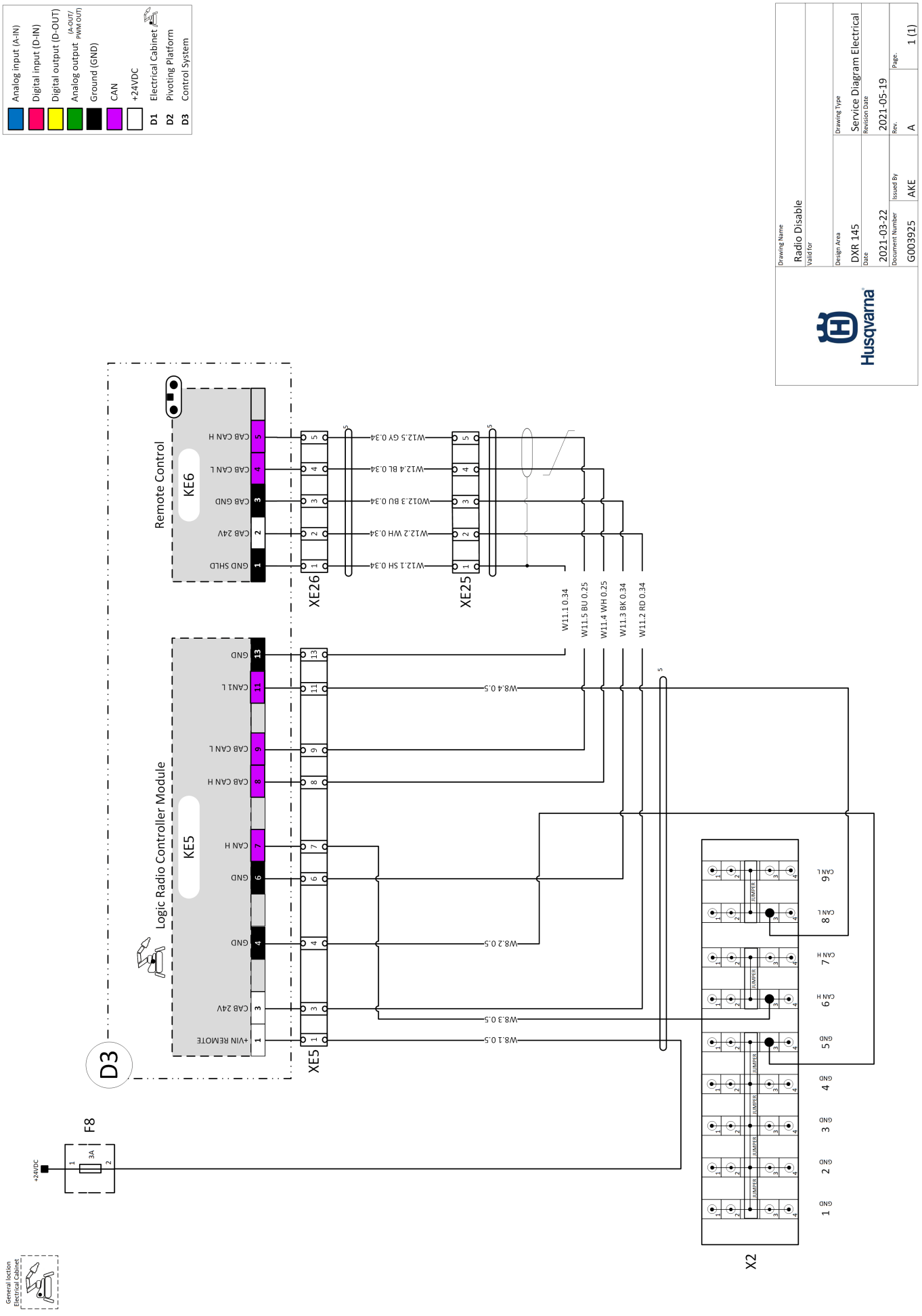
13.12 Outrigger



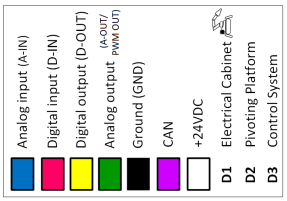
13.13 Pressure Control



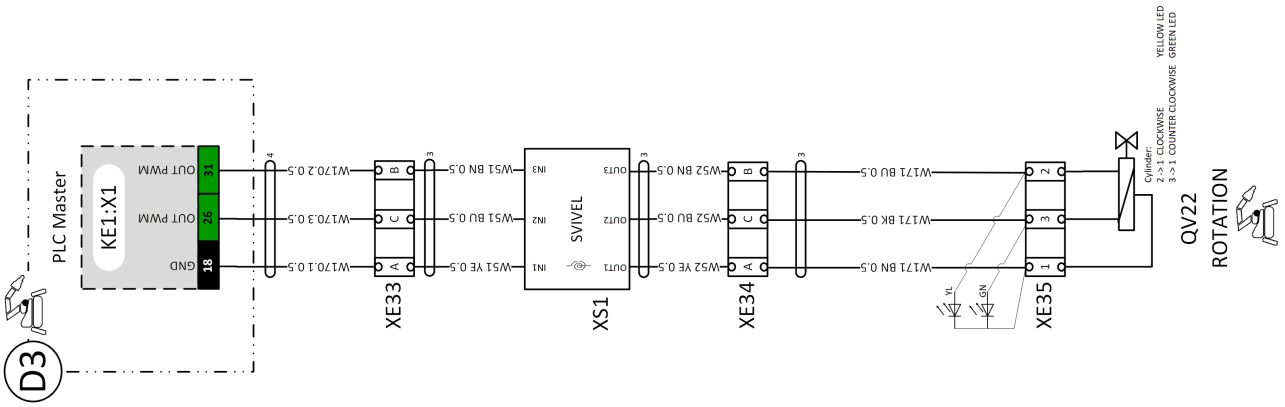
13.14 Radio Disable



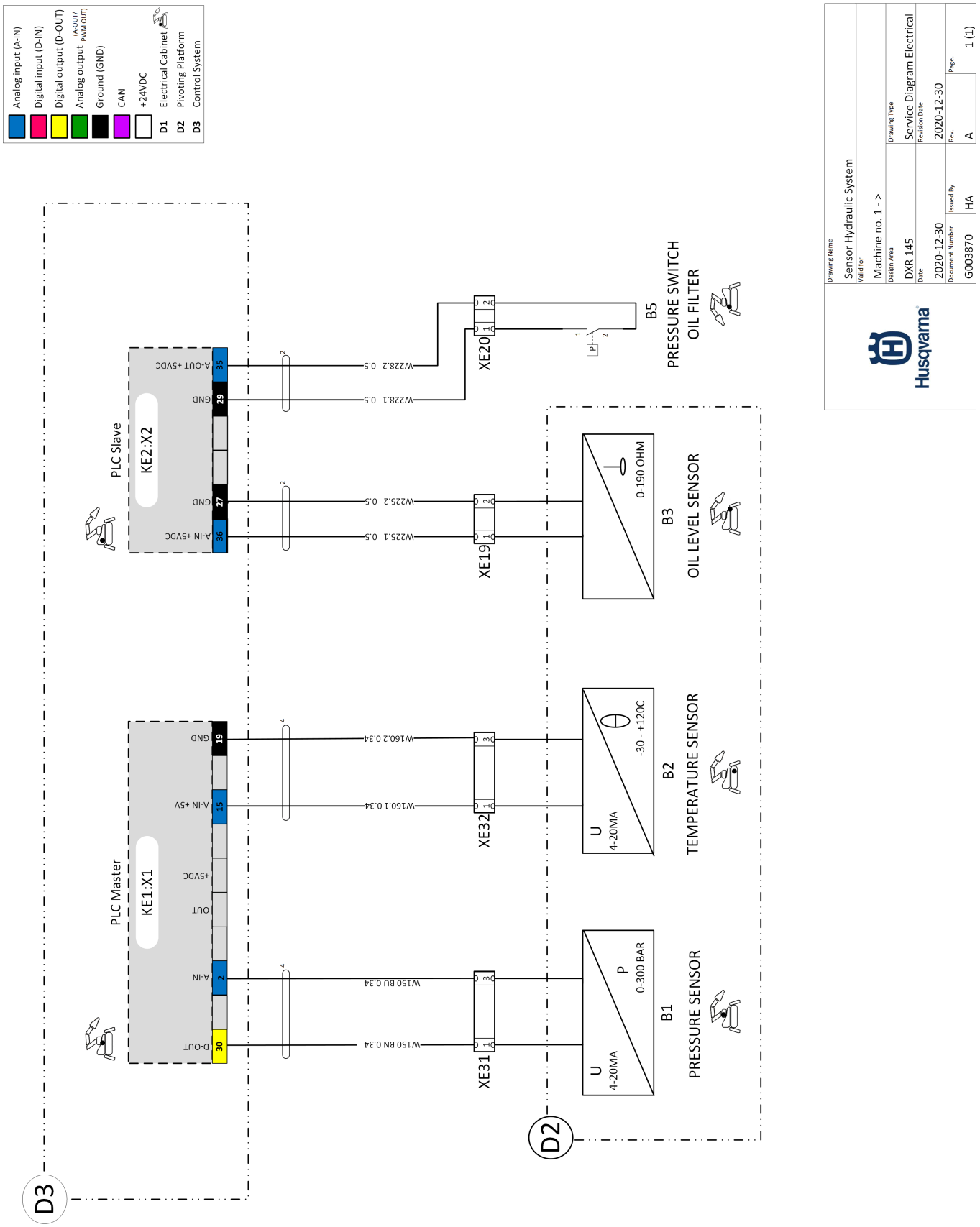
13.15 Rotation



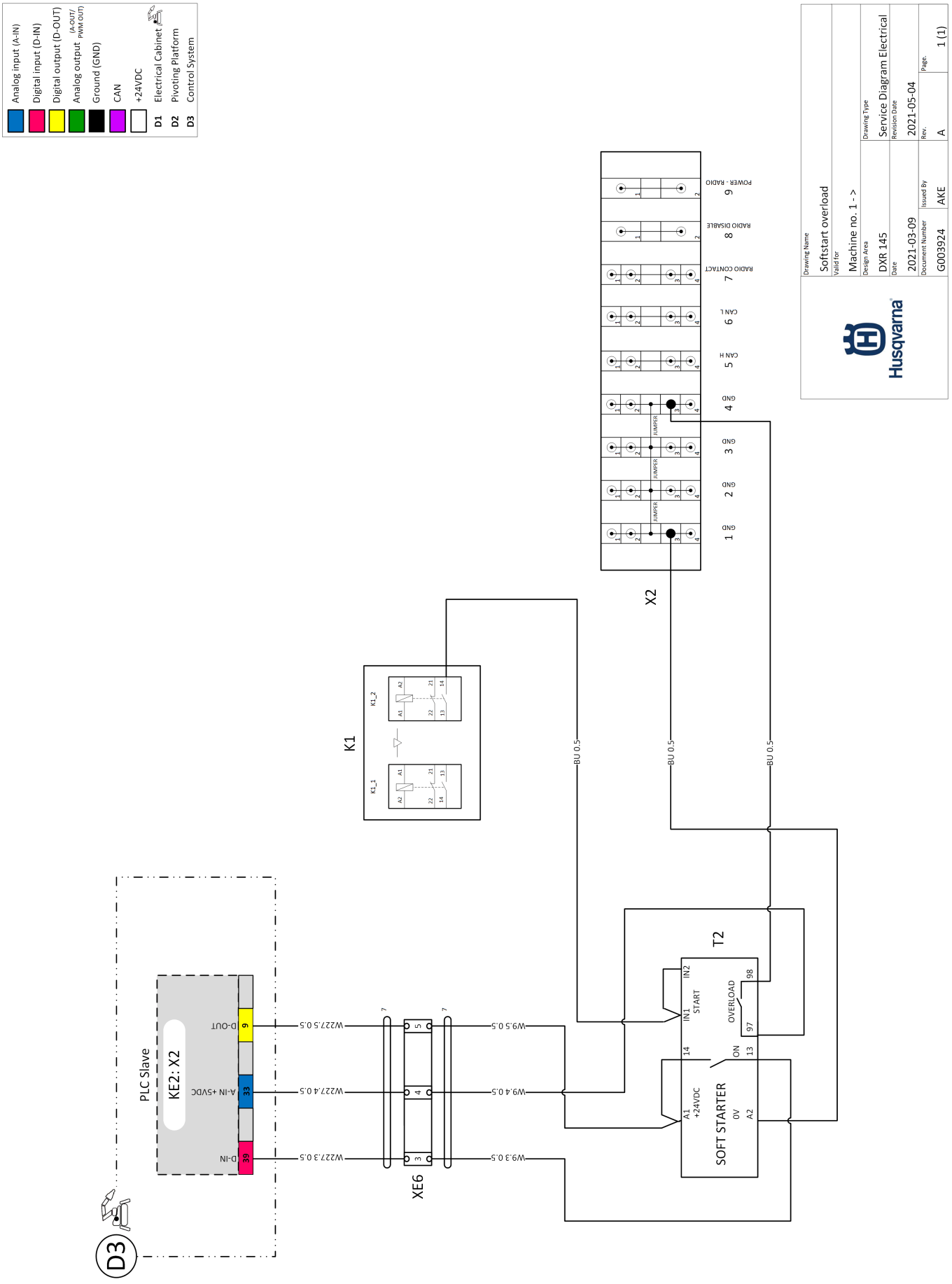
Drawing Name	Rotation
Valid for	Machine no. 1 - >
Design Area	DXR 145
Drawing Type	Service Diagram Electrical
Date	2021-02-25
Revision Date	2021-05-04
Document Number	G003910
Issued By	AKE
Rev.	A
Page.	1 (1)



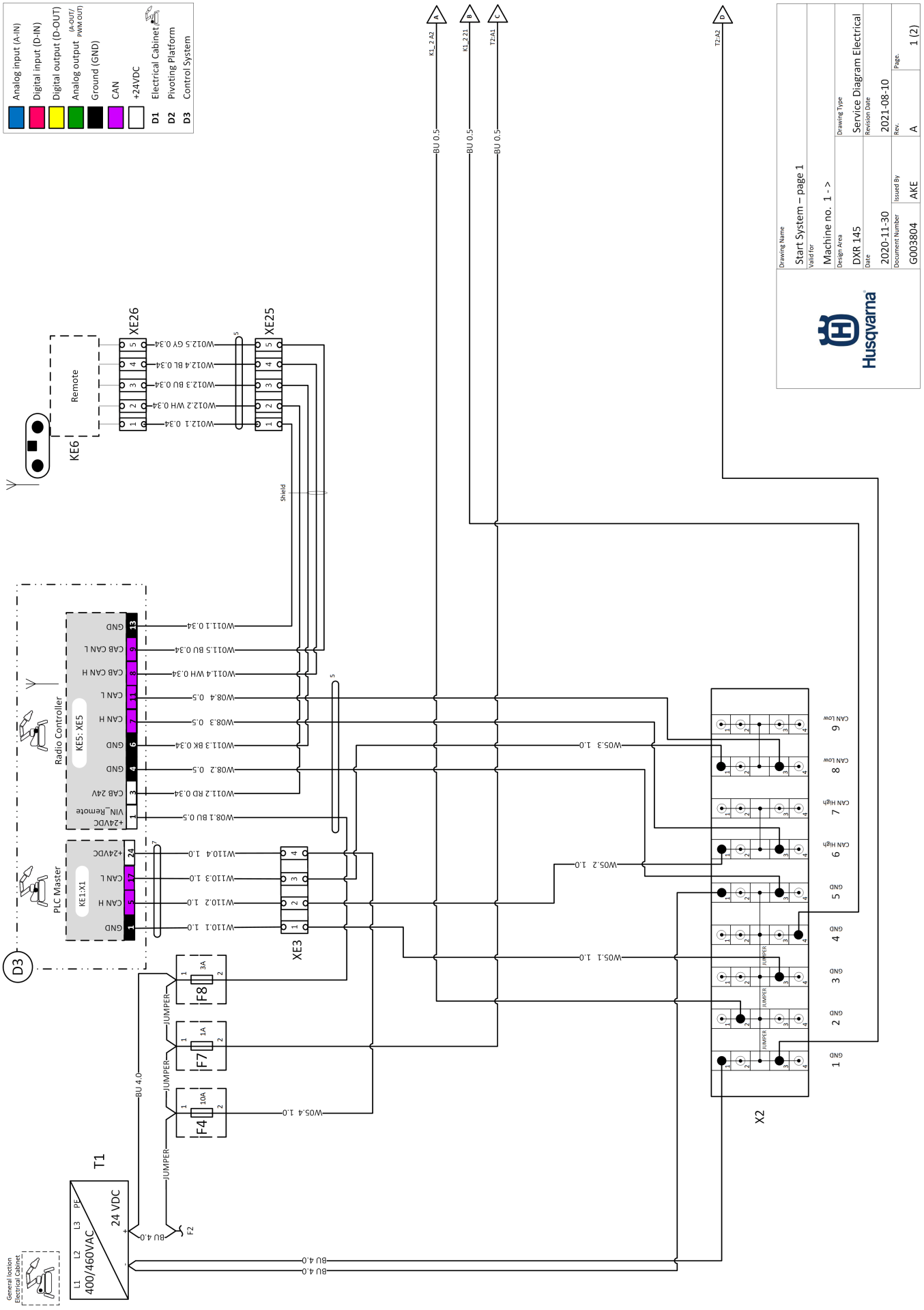
13.16 Sensor Hydraulic System



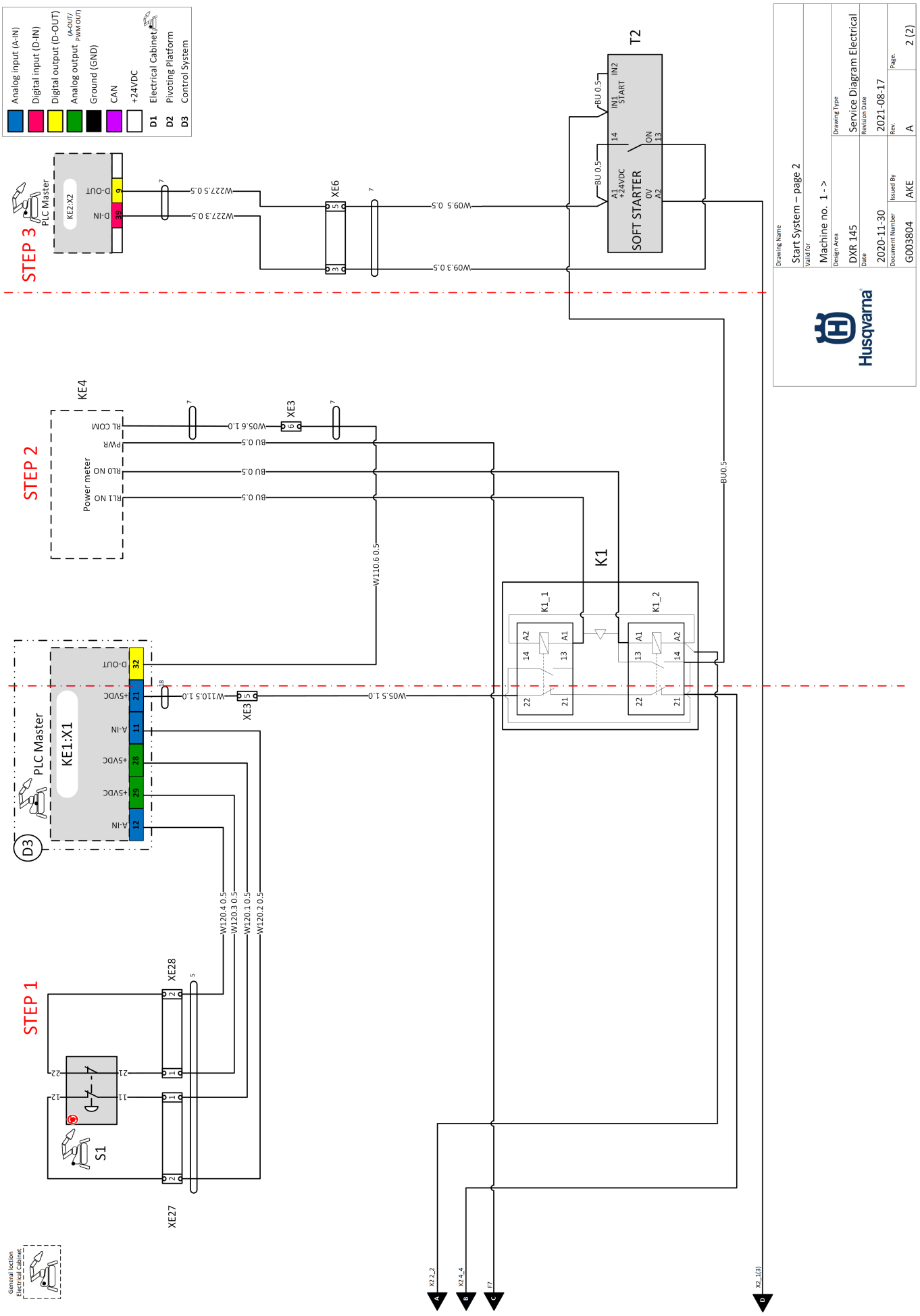
13.17 Softstart overload



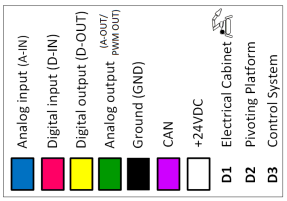
13.18 Start System page 1(2)

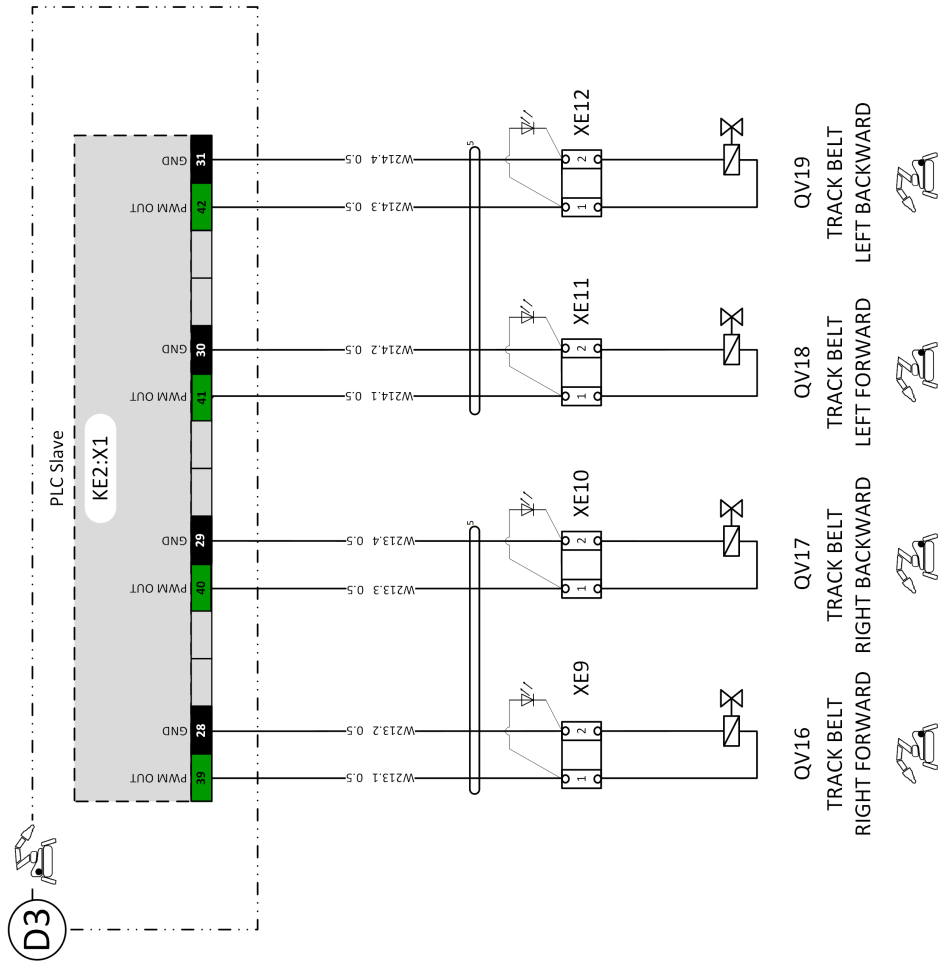


13.19 Start System page 2(2)

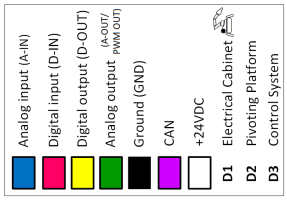


13.20 Track Belt

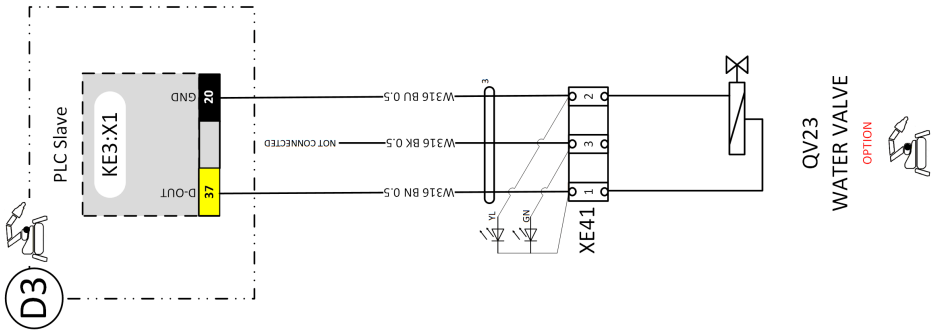




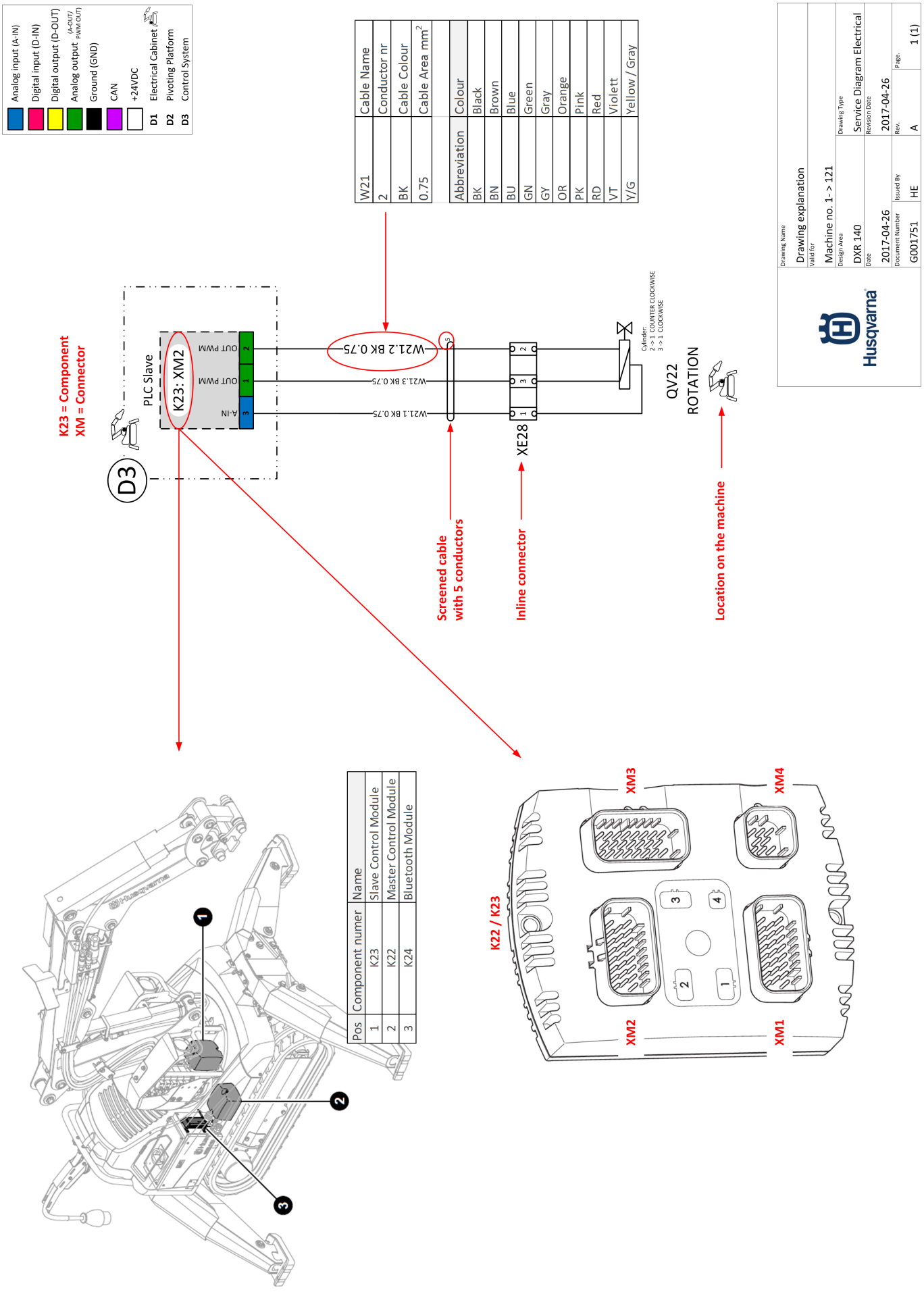
13.21 Water Valve



Drawing Name	Water Valve
Valid for	Machine no. 1 - >
Design Area	DXR 145
Date	2021-03-04
Document Number	G003918
Issued By	AKE
Drawing Type	Service Diagram Electrical
Revision Date	2021-03-04
Rev.	A
Page.	1 (1)



13.22 Drawing explanation

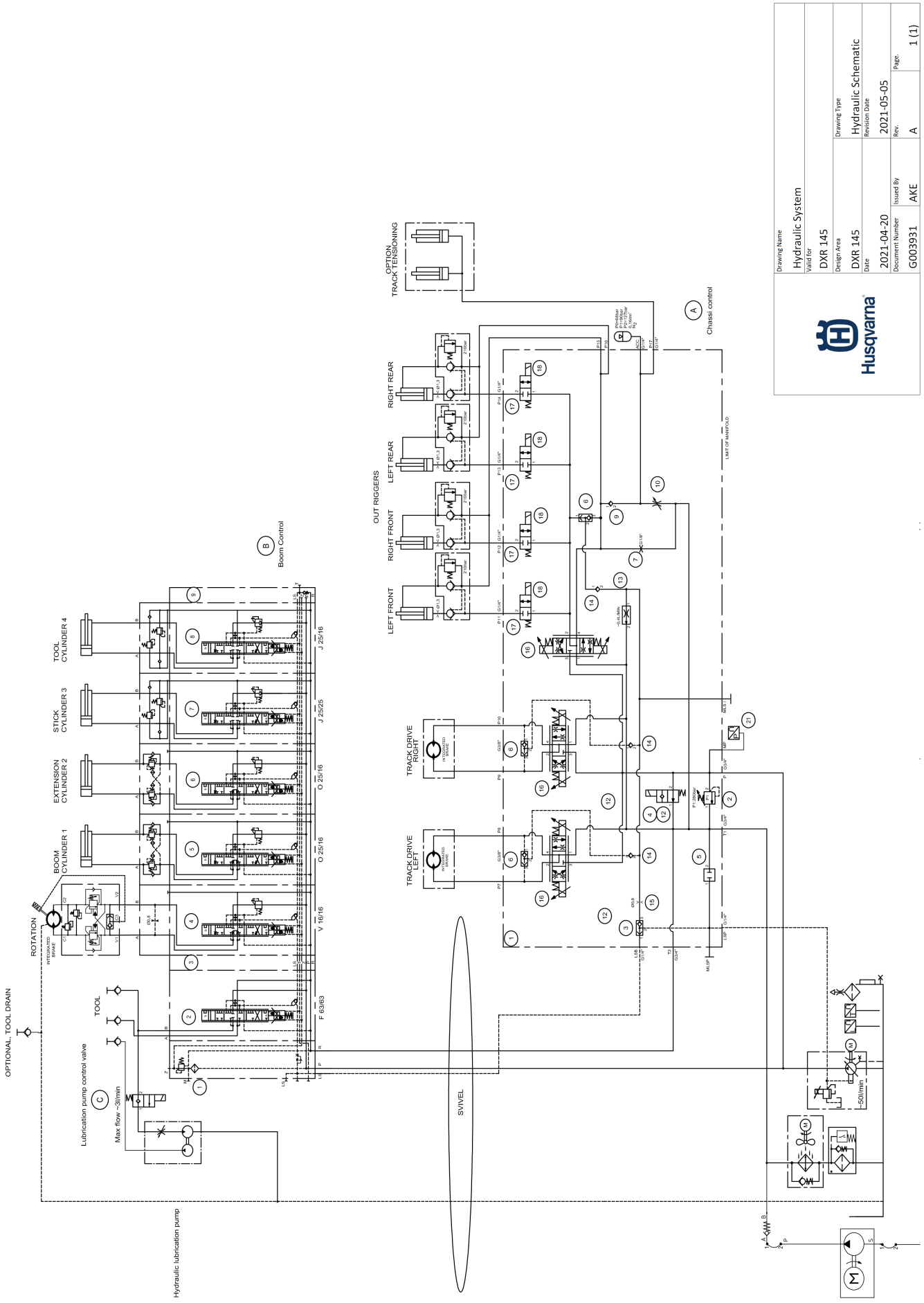


13.23 Electrical Components

Table 40. DXR145 & DXR275/305/315

Component Id	Component Name	Component Id	Component Name
B1	Pressure Sensor	KE5	Radio Control Module
B2	Temperature Sensor Hydraulic Oil	KE6	Remote Control
B3	Oil Level Sensor (DXR145)	KE7	IoT module
B3	Pressure Guard Oil Filter (DXR275/305/315)	M1	Electrical Motor
B4	Electrical Motor Temperature Sensor	M2	Cooling Fan
B5	Pressure Guard Oil Filter (DXR145)	M3	Filling Pump
E1	LED - Work Light Left	P1	Horn
E2	LED - Work Light Right	Q1	On/Off Switch Main Power
E3	LED - Warning Light Back	QV1 - QV23	Hydraulic Valve
Fx	Fuse	S1	Emergency Stop - Rear
GND	Ground	T1	24VDC Power Supply
K1	Reversing Contractor 400/460VAC	T2	Soft Start
KE1	Master Control Module	X1	Ground Terminal Block
KE2	Slave Control Module Body	X2	Signal and power terminal block
KE3	Slave Control Module Tower	XS1	Swivel (DXR145)
KE4	Power Meter		

14.1 Hydraulic System



15.1 Technical Data

Table 41. Technical Data

Category	Technical Feature	Specification	
General	Model	DXR 145	
	Rotation speed of turret [rpm]	6	
	Transport speed max [km/h]/[mph]	3/1.9	
Hydraulic System	Volume hydraulic system [l]/[gal]	40/10	
	Pump type	Load sensing axial piston pump with variable displacement	
	Pump flow max.* [l/min]/[gal/min]	52/13.7	
	System pressure (nom. Max) [Bar]/[psi]	200/2900	
	System pressure (boosted) [Bar]/[psi]	250/3630	
Electric Motor	Frequency [Hz]	50	60
	Voltage [V]	380-420	440-480
	Power [kW]	18.5	18.5
	Speed [rpm]	2885	3500
	Current [A]	32	30
Control System	Control Type	Remote control	
	Signal transmission	Radio/cable	
	Working range, radio [m]/[y]	300/328	
	Battery	7.4V Li-ion, 5100 mAh	

* Maximum pump flow and system pressure cannot be taken out at the same time, the engine will be overloaded. 60 Hz has limited displacement.

15.2 Guide Values and Specifications

Mains Connection

The power cable must be dimensioned in accordance with national and local regulations by a qualified person. The mains socket must be dimensioned for the same amperage as the machines electrical socket and extension cable (e.g. a 32A electrical socket must be preceded by a 32A fuse).

Table 42. Guide Values

Nominal voltage from power source [V]	Frequency [Hz]	Cable area [mm²/AWG]	Starting current [A]	Motor power [kW]	Setting thermal overload relay [A]	Max. cable length [m/ft]
400	50	6/10	75	18.5	27.0	100/328
		10/8				175/574
		16/6				285/935
460	60	6/10			22.0	130/427
		10/8				218/715
		16/6				349/1145

Table 43. Hydraulic System Pressure

Type of pressure			Pressure [PSI/Bar]
Pump pressure	- The pressure in the pipes between the pump and the main stop valve - The pressure varies between standby and max. pressure depending on which hydraulic functions being used	Tool, max.	3626/250
		Rotating function	2611/180
		Outrigger up/down	3626/1885 / 250/130
		Arm functions	2901/200
Standby pressure	- The pressure the pump delivers when no function is activated and the circulation valve is shut		290 +/-14.5 / 20 +/-1

Table 44. Hydraulic Oil

Grade	Min. starting temperature [°F/°C]	Max. temperature [°F/°C]	Ideal working temperature [°F/°C]
Mineral oil ISO VG32	-4/-20	167/75	95-140/35-60
Mineral oil ISO VG46 (standard)	14/-10	185/85	113-158/45-70
Mineral oil ISO VG68	23/-5	194/90	131-176/55-80

Always ask the machine manufacturer befor using any type of hydraulic oil not mentioned above. The quailty of the hydraulic oil originally supplied is indicated on the sticker next to the filling pump.

CAUTION!

The machine can be damaged if different types of hydraulic oil are mixed.

Check which quality the hydraulic system contains before refilling or changing.

Table 45. Preset Limit Values

Description	Temperature [°F/°C]
Hydraulic oil temperature too high	194/90
Hydraulic oil temperature too low	23/-5

Table 46. Lubricant

Component	Grade	Standard
Track drive motor gears	SAE 80W-90	API GL 5
All lubrication points with grease nipples	NLGI 2	
Breaker grease	Chisel paste	

15.3 Mountings and Tightening Torque

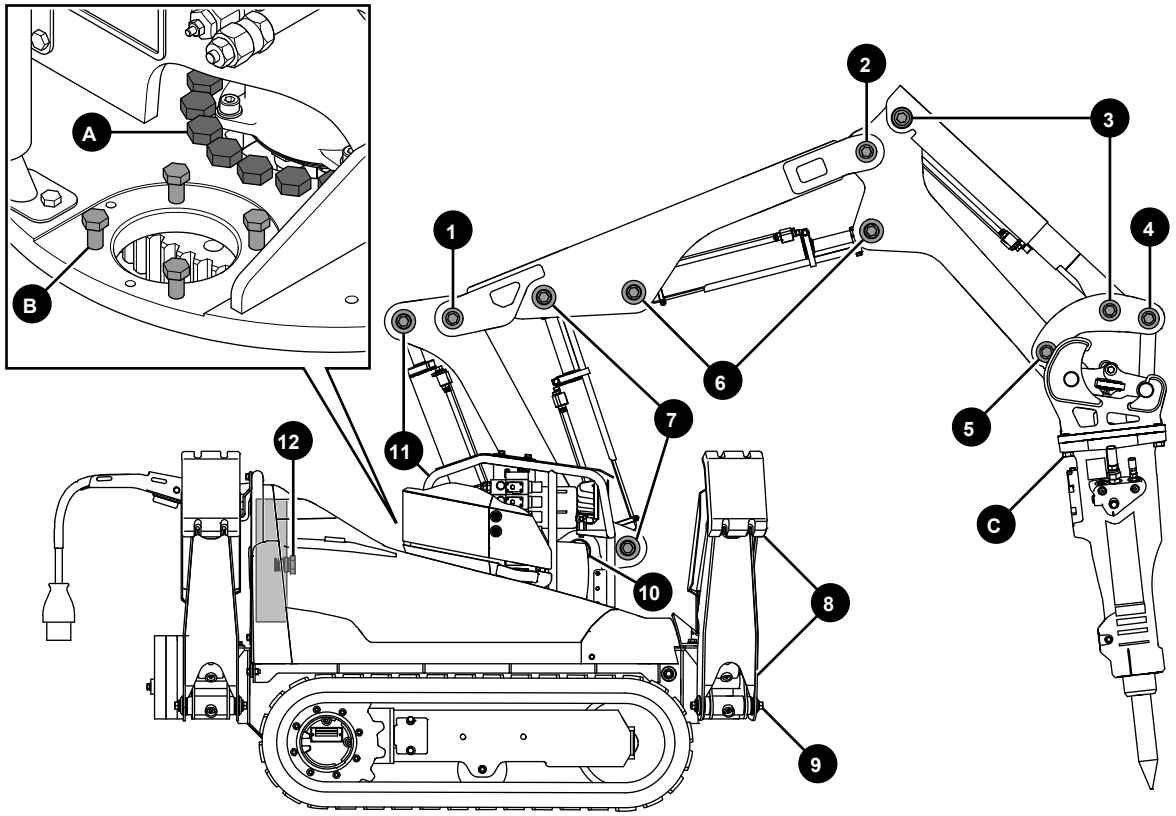


Figure 15.3-1. Shafts

1. Extension joint
2. Stick joint
3. Tool cylinder (2)
4. Link joint
5. Lever joint
6. Stick cylinder (2)
7. Extension cylinder (2)
8. Rear and front outrigger cylinder shafts (8)
9. Rear and front outrigger joints (4)
10. Boom joint
11. Boom cylinder (2)
12. Thermostat

Table 47. Mountings

General	All components must be properly secured and tightened to avoid wear damage.
	A bolted joint that is secured with adhesive compound should not be re-tightened. Simply check that it is firm. If it has come loose, clean the threads before applying new adhesive.
	Check shafts for proper mounting/locking by re-tightening with a torque wrench.
	Check lock pins for damage or faulty mounting.
Shafts	New shafts and tapered lock rings (grease inside) must be re-tightened frequently until they have bedded in.
	Centre shaft and re-tighten evenly. Wear damage on tapered lock rings is a typical sign of insufficient tightening.

Table 48. Tightening Torque

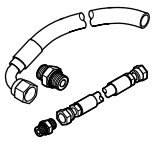
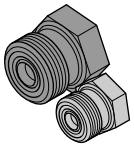
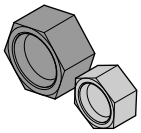
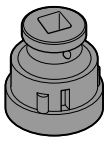
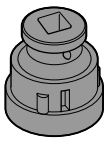
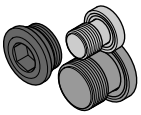
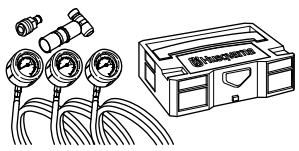
General	Use abutment when torquing through shafts to avoid the shaft rotating.	
Position (in fig 1. Shafts)	Components	[Nm]
A	Slewing ring, turret - ring bearing bolts	81
B	Slewing ring, ring - carriage bolts	81
C	Tool against adaptor plate	197
1-7, 10-11	Boom-stick shafts	204
8-9	Rear and front outrigger	128
12	Thermostat	57

Table 49. Torque for occurring metric fasteners

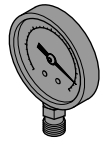
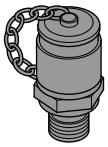
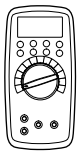
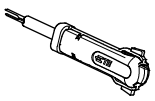
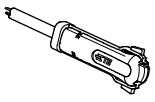
	SS-ISO 8981/1 rating						
	Type/Grade Class	8.8 [Nm]		10.9 [Nm]		12.9 [Nm]	
Washer		Standard	Nord-Lock	Standard	Nord-Lock	Standard	Nord-Lock
Coarse pitch threads	M4	2.9	3.8	4	4.5	4.9	5.1
	M5	5.7	7.5	8.1	8.9	9.7	10
	M6	9.8	13	14	15.5	17	17
	M8	24	32	33	37	40	42
	M10	47	62	65	73	79	82
	M12	81	107	114	126	136	142
	M16	197	260	277	307	333	345
	M20	385	510	541	602	649	676

16.1 Special Service Tools - Supplied

Table 50. Supplied Tools

Image	Tool	Usage
	**Kit for Complete change/flush of Hydraulic Oil** Article No. 579 67 77–01 -Drain hose 2m female 1-3/16" 90° -Refill hose female 13/16" -Adapter straight 13/16" -Adapter SOO 1319	Use for change of hydraulic oil and for flushing the hydraulic system.
	**Kit of PO-plugs** Article No. 576 94 53–01 Pressure proof metal plugs	Selection of hose plugs of occurring sizes.
	**Kit of O-rings** Article No. 576 94 54–01	Selection of replacement hydraulic O-rings of occurring sizes.
	**Kit of NOP-plugs** Article No. 576 94 56–01 Pressure proof metal caps	Selection of occurring sizes.
	**Kit of plastic plugs and caps** Article No. 576 94 55–01	Selection of male and female service plugs. Prevent leakage or contamination of the hydraulic system.
	**Piston head tool for DXR145** Outriggers: Article No. 531 09 54-1 Arm cylinders: Article No. 531 09 57-1	Use to remove and install piston heads on hydraulic cylinderson the DXR145.
	**Piston head tool for DXR2x5/3x5** Outriggers: Article No. 531 09 57-01 Arm cylinders: Article No. 531 09 55-01	Use to remove and install piston heads on hydraulic cylinders on the DXR2x5/3x5.
	**Kit of VSTI-plugs** Article No. 576 94 57–01 Pressure proof metal plugs	Selection of male plugs of occurring sizes for e.g. manifold ports.
	**Husqvarna Manometer Kit** Article No. 590 41 74-01	A manometer uses a column of liquid to measure pressure.

16 SPECIAL TOOL

Image	Tool	Usage
	**Manometer** (Included in Husqvarna Manometer Kit 590 41 74-01) Article No. 579 77 72-01 – 0-40 bar Article No. 579 77 71-01 – 0-300 bar Article No. 579 77 70-01 – 0-600 bar	A manometer uses a column of liquid to measure pressure.
	**Manometer test hose** (Included in Husqvarna Manometer Kit 590 41 74-01) Article No. 579 77 74-01	Connects the manometer to the measuring port.
	**Test hose adapter G¼** (Included in Husqvarna Manometer Kit 590 41 74-01) Article No. 579 77 76-01	Use between the test hose and the measuring port.
	**Husqvarna Multimeter** Article No. 581 54 15-01	Make: Amprobe 37XR-A. Measures voltage, current, resistance and inductance. – Use to check the electric motor's functions.
	**Optical Tachometer** Article No. 502 28 80-01	Use when synchronizing the tracks.
	**Extra reflector tape 200mm** Article No. 574 15 45-01	Use when synchronizing the tracks.
	**Contact Extraction Tool - EPEC control module connector, 21 pin** Article No. 529845201	Use when disconnecting wires.
	**Contact Extraction Tool - EPEC control module connector, 46 pin** Article No. 529842901	Use when disconnecting wires.

16.2 Recommended Tools - Not supplied

Table 51. Wrench Tools and Spanners

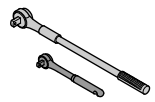
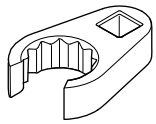
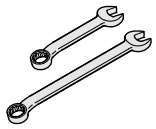
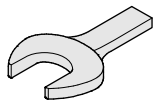
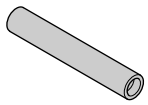
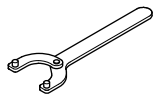
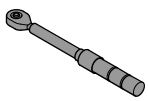
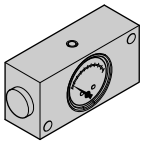
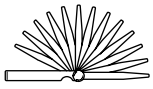
Image	Tool	Use
	**Ratchet wrenches** Large and small	Use for various bolts and screws.
	**Manifold fasteners etc.**	
	**Spanner kit + short kit** 10—19mm	Covers basic service. Standard and short length.
	**Large size spanners**	Covers larger dimensions. Standard and short length.
	**Extra extension shafts**	Use added extension when you remove the cooler and turret manifold.
	**Hook wrench**	
	Ø ~ 74 mm	Cylinder gable Boom
	Ø ~ 61 mm	Cylinder gable Outriggers
	**Pin wrench**	
	Ø ~ 45 mm	Piston Boom
	Ø ~ 34 mm	Piston Outriggers

Table 52. Tools for Measuring

Image	Tool	Use
	**Torque wrench** 20-300Nm	Use for tightening torque of various mountings.
	**Flow meter** 65 l/m	Use for complementary measurement of actual hydraulic flow.
	**Feeler blade** 0,2mm	Use for backlash measurement.

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