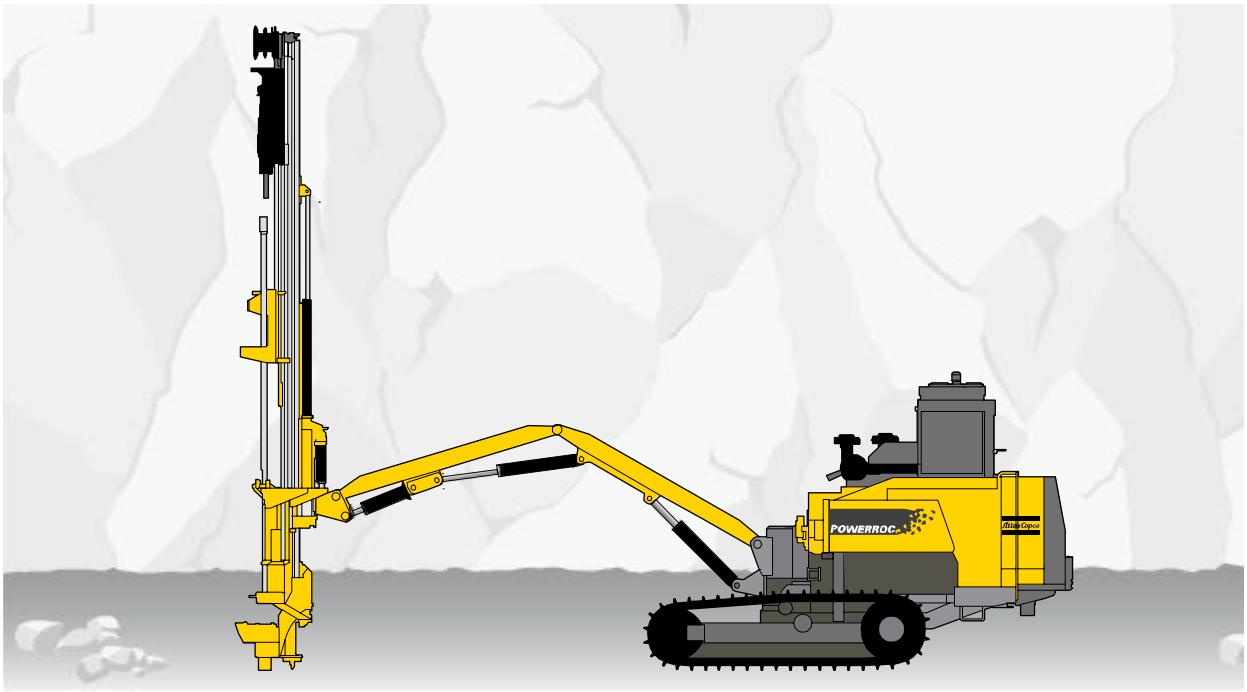
Atlas Copco

PowerROC T30 E Tier 4
Operator’s instructions



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2013-10

Atlas Copco

SAFETY INSTRUCTIONS

- **Before starting, read all instructions carefully.**
- **Special attention must be paid to information alongside this symbol.**

- **Only use genuine Atlas Copco parts.**

1250 0071 04

Translation of original instructions.

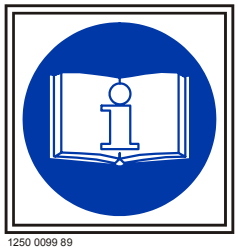
Atlas Copco Rock Drills AB
SE-70191 Örebro, Sweden

Safety

Reference

Note

Always read the information in the Safety document before starting to use the rig or starting maintenance work.



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Operator’s instructions

1. General

Foreword

This instruction manual is part of the complete delivery of the drill rig. It provides information on the design and operation of the drill rig and contains advice and the measures necessary to keep the rig operational. This instruction manual is no replacement for thorough training on the drill rig.

This instruction manual should be read in advance by all persons who are to operate or repair the drill rig or carry out maintenance on it.

See separate instructions for documentation on the rock drill/rotation unit, the diesel engine and certain other components.

For other questions refer to the local Atlas Copco company office. Addresses and telephone numbers are in the Maintenance instructions.

Principal components

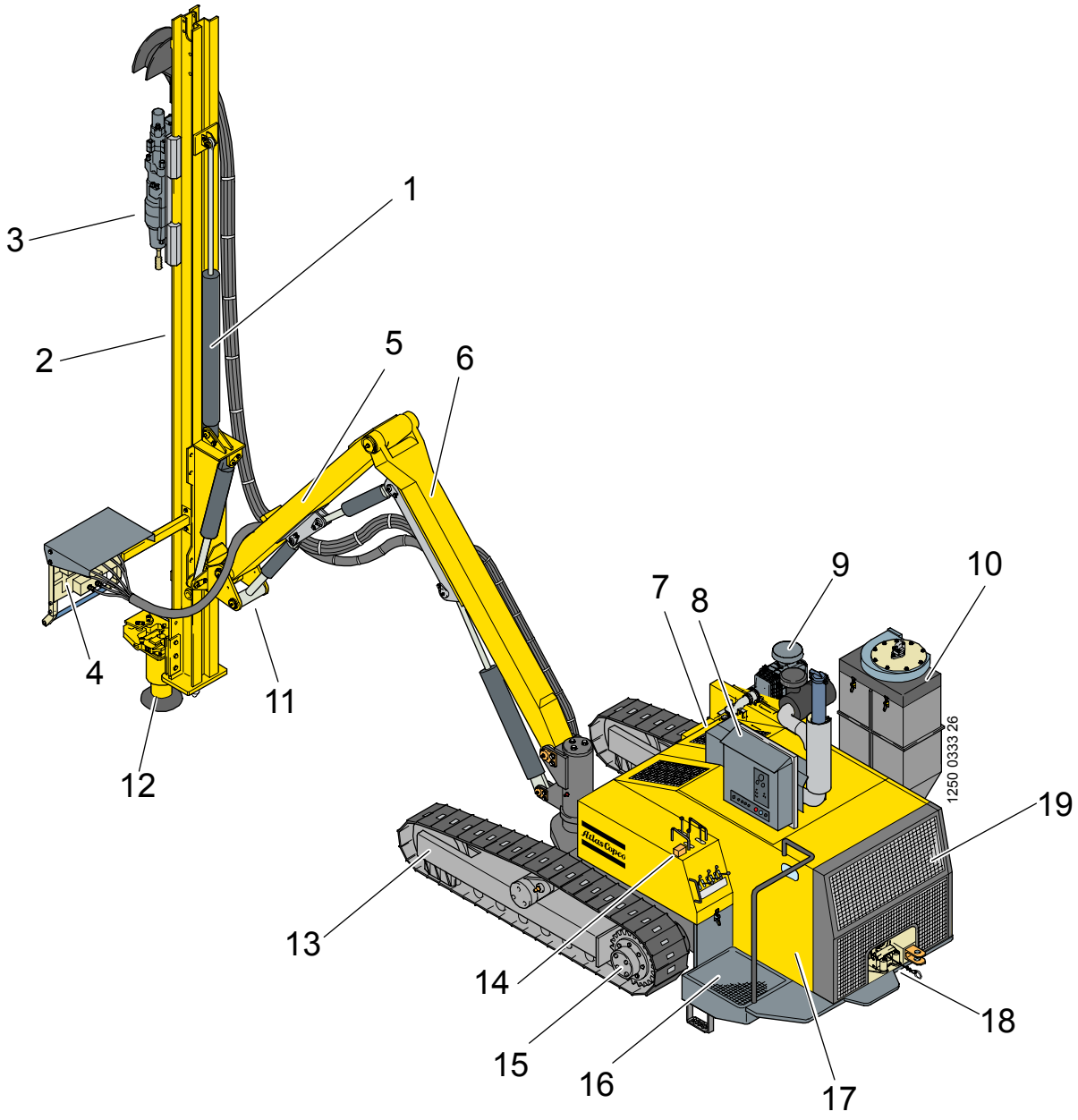


Figure: Principal components.

Table: Principal components

Position	Component	Position	Component
1	Feed cylinder	11	Boom head
2	Feeder	12	Drill support
3	Rock drill	13	Track frame
4	Front control panel	14	Rear control panel
5	Outer boom	15	Power Pack
6	Inner boom	16	Operator platform

Position	Component	Position	Component
7	Fuel tank	17	Diesel engine
8	Electrical cabinet with control panel for diesel engine	18	Winch
9	Air filter	19	Compressor
10	Dust collector		

Note

When the rig is equipped with rod handling (optional equipment) the front control panel is fitted on a separate swing arm.

General system description

General rig description

The drill rig is a fully diesel-hydraulic rig designed for drilling on surface applications such as stone quarries and construction sites.

The drill rig consists of the following main components: (See illustration under General Description)

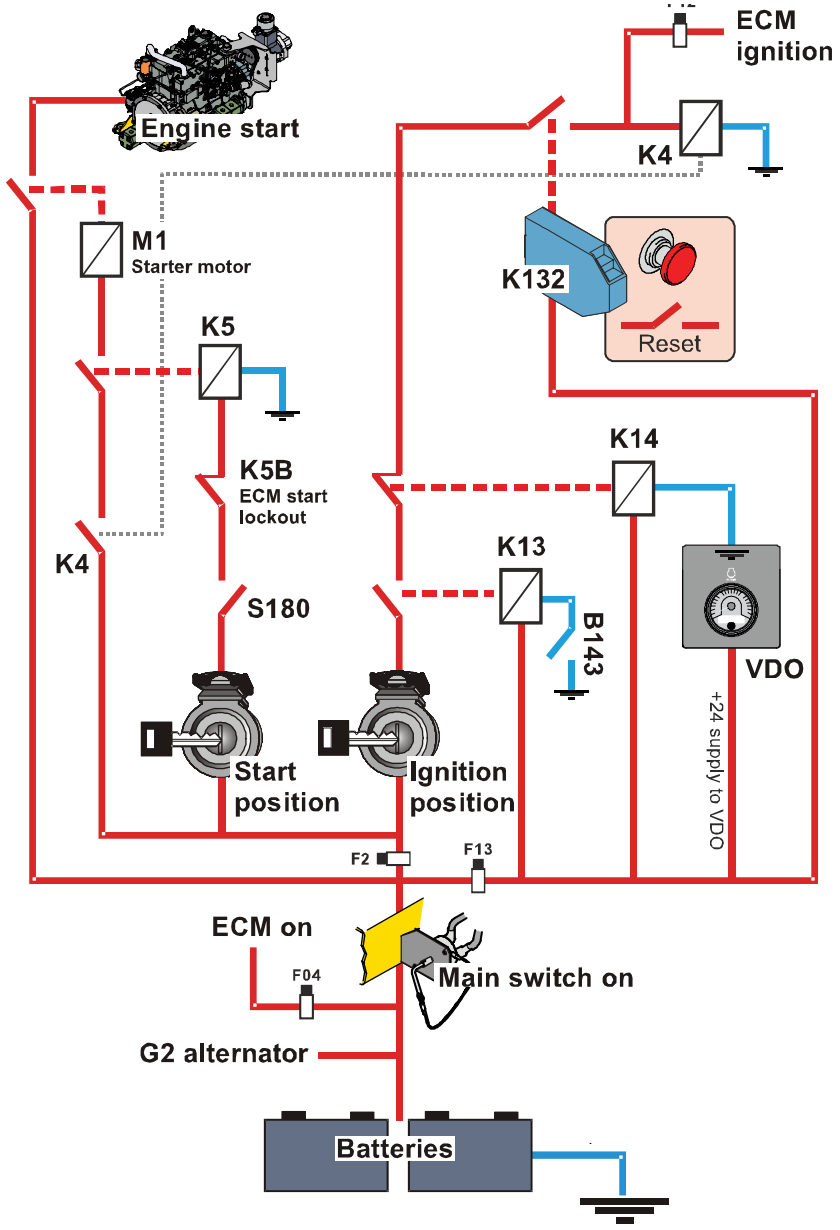


Figure: General Description

Position	Component
K5	Starter relay
K4	Ignition relay
K132	Safety relay
K13	Relay for hydraulic oil level
K14	Relay for compressor temperature

Wagon frame with track frames

The diesel engine, chassis, dust collector, hydraulic system, air system and boom system are mounted on the wagon frame.

The chassis frame comprises a frame with the operator's platform mounted on the left-hand side. Controls for tramming are installed on the operator's platform.

The track frames are carried on journals in the wagon frame. When tramming on uneven ground the drill rig is balanced by means of two compensating cylinders.

Each track frame has its own service brake. The brakes are operated by two separate control systems.

The body covers the diesel engine, the compressor, the different lubrication tanks, the valves and the hydraulic hoses. Inspection covers allow easy access to the different machine components.

The dust collector is mounted at the back of the rig on the right-hand side.

Power pack

This hydraulic drill rig is powered by a turbocharged, water-cooled diesel engine.

The diesel engine is equipped with a monitoring system that includes automatic shutdown functions.

The drill rig is driven by two tramming motors with gears. The tramming motors with gears are mounted in the track frames.

The hydraulic pumps and the compressor are driven by a diesel engine.

Boom system

The boom system consists of inner/outer boom bodies, boom head, feed holder and associated hydraulic cylinders. The boom system is controlled by directional valves for positioning the feed with the rock drill at different distances and directions.

Dust collector

The hydraulically driven dust collector features automatic cleaning and consists of a filter unit, pre-separator, suction fan and suction hose.

Electrical system

The 24 V electrical system is supplied with current by an alternator and two batteries.

The electrical system comprises starting equipment, work lights, electric controls and safety devices.

The emergency stop buttons/cables are connected in series with the diesel engine cut-out system. As soon as an emergency stop button/cable is activated, the diesel engine will be stopped immediately. Reset the emergency stop buttons before restarting the engine. The engine cannot be started while one of the emergency stops is still activated.

For further details, see separate wiring diagram.

For details of the diesel engine, see separate diesel engine instructions.

Hydraulic system

The hydraulic system comprises four hydraulic pumps, oil cooler, hydraulic oil tank, valves, hoses, etc.

The four hydraulic pumps create hydraulic pressure as follows:

Table: Hydraulic pumps

Pump no.	Description
1	Percussion, tramming, drill feed
2	Rotation, panel selector, winch
3	Cylinder positioning, dust collector
4	Cooling fan

(For further details, see hydraulic system diagram)

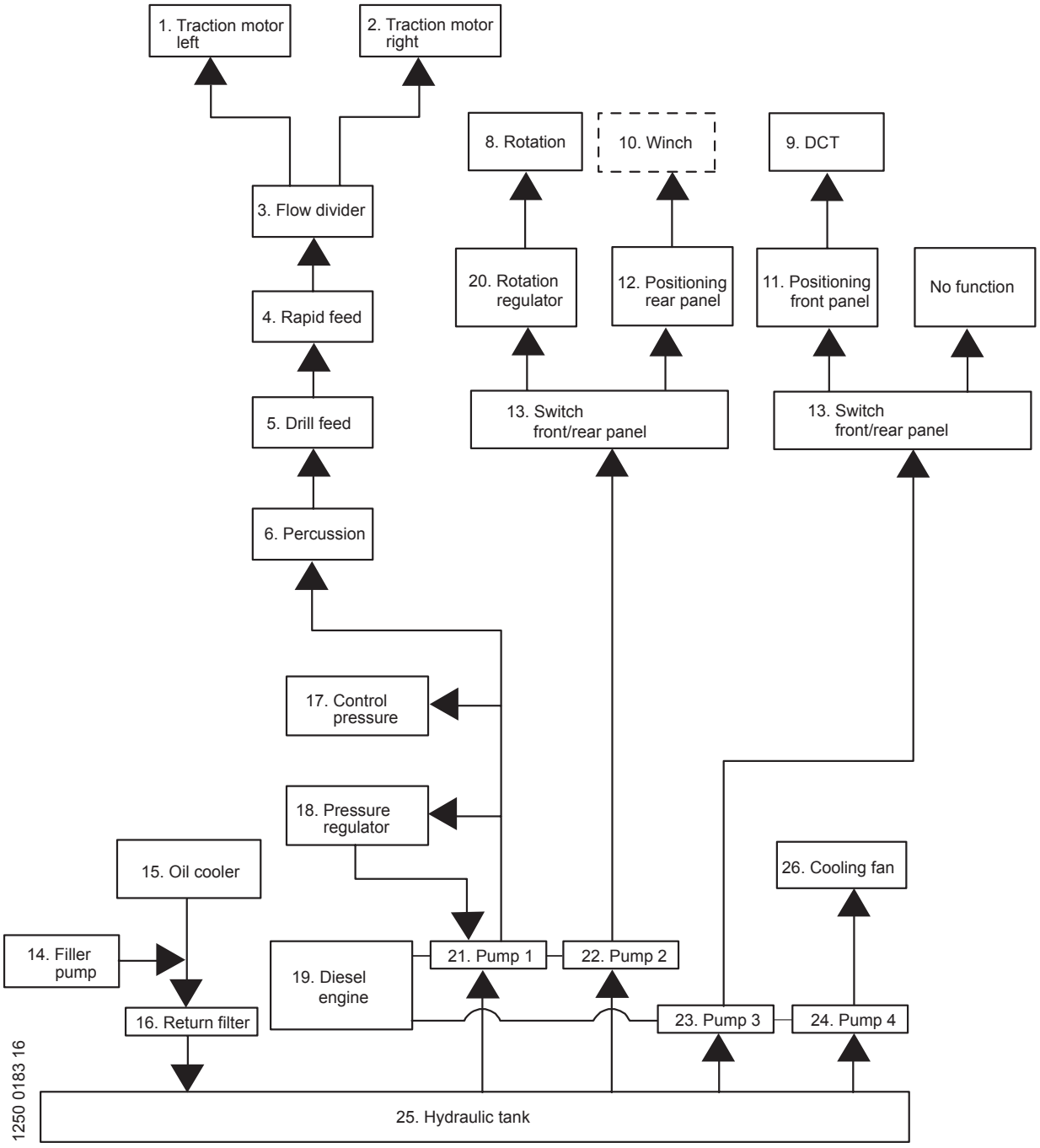


Figure: Block diagram, hydraulic system

Table: Hydraulic systems

1	Tramming motor, left	14	Filler pump
2	Tramming motor, right	15	Filter
3	Flow distributor	16	Return filters
4	Rapid feed	17	Control pressure
5	Drill Feed	18	Pressure control
6	Percussion	19	Diesel engine

7	RPC-F	20	Rotation control
8	Rotation	21	Pump 1
9	DCT (Dust collector)	22	Pump 2
10	Winch	23	Pump 3
11	Positioning, front panel	24	Pump 4
12	Positioning, rear panel	25	Hydraulic Tank
13	Panel selector	26	Cooling fan

Air system

The air system consists of the compressor with oil separator, hoses and valves. The compressor is belt-driven from the diesel engine.

The compressor element is lubricated by an air-oil mixture. The mixture is separated in the oil separator.

The system delivers air for flushing the borehole, cleaning the dust collector filter and to the rock drill lubrication system (ECL).

Pump configuration, see separate instructions

Identification of the drill rig

Data plates are affixed to the front part of the chassis frame and the right-hand side of the boom support.

Table:

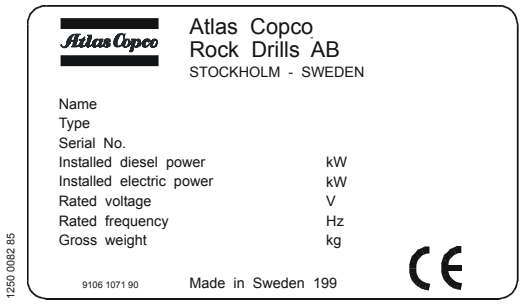


Figure: Data plate for CE approved rig

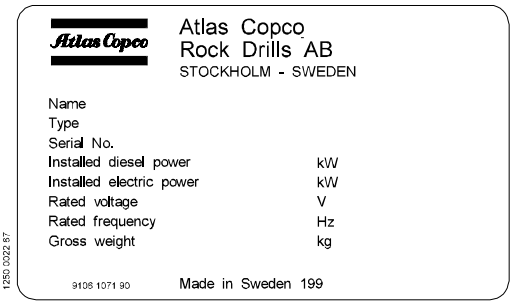


Figure: Data plate for non-CE approved rig

- They contain the following information:
  - Address
  - Type of drill rig
  - Serial number
  - Installed power
  - Total weight of drill rig

- CE marking if applicable

2. Technical data

PowerROC T30 E

Weight (standard equipped without drill steel and optional equipment)

PowerROC T30 E	
Weight with RHS and counterweights	11500 kg
Winch	280 kg

Performance

Diesel engine, Cummins QSB 4.5 Tier 4	
power output at 2000 rpm	116 kW
Temperature range in operation	-25 ºC to +50 ºC
Tramming speed, max.	1,1/3,1 km/h
Thrust	95/37 kN
Ground pressure, average	0.15 N/mm2
Ground clearance	340 mm
Max. hydraulic pressure	230 bar
Track oscillation	±15°
Noise level	
Idling (800 rpm)	97 dB(A)
Full engine speed (2000 rpm)	106 dB(A)
Drilling (2000 rpm)	124 dB(A)
LWA (guaranteed value in accordance with 2000/14/EC)	128 dB(A)

Inclination angles

Note

Stability is specified with respect to CE standards stipulating that rigs must not be operated on inclinations steeper than 20 degrees without the use of a winch.

Inclination angles - tramming	
downward/upward, max. without winch	20°/20º
downward/upward, max. with winch	30º/30º
laterally, max.	20°/20°
Inclination angles for drill rig when drilling:	
longitudinally, max. (Upward/Downward)	20°/20º
Lateral (left/right)	4º/10°

Hydraulic systems

Hydraulic oil cooler for max. ambient temperature	+50°C

Electrical system

Voltage	24 V
Batteries	
Voltage	2 x 12 V/185 Ah
Working lights	
Voltage	24 V/70W
Alternator	
Voltage	28V/55Ah

Air system

Compressor: XA 70	
Max. air pressure	8.5 bar
Free air delivery at 7 bar	95 l/s
Working pressure	7 bar

Capacities

Hydraulic oil reservoir	200 l
Hydraulic systems	
total	250 l
Fuel tank	270 l
Traction gear	3 l
Compressor oil	20 l
Lubricating oil tank	10 l
Diesel engine	11 l
Engine cooling system	31 l

Others

Fire extinguisher	
A-B-C powder	1 x 6 kg

Dimensions

Dimensions (-01)

Transport dimensions

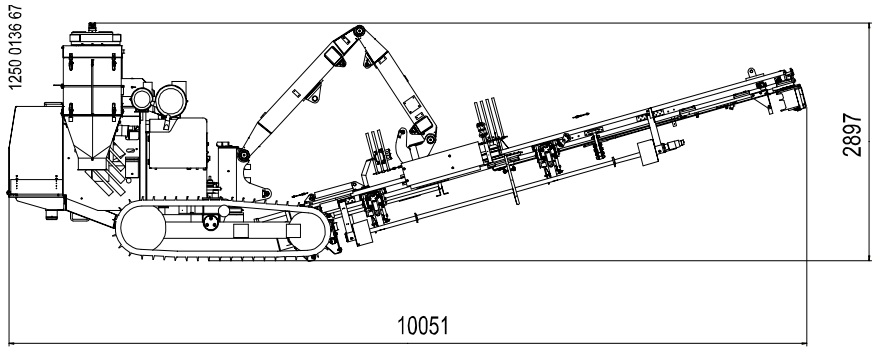


Figure: Transport alternative 1

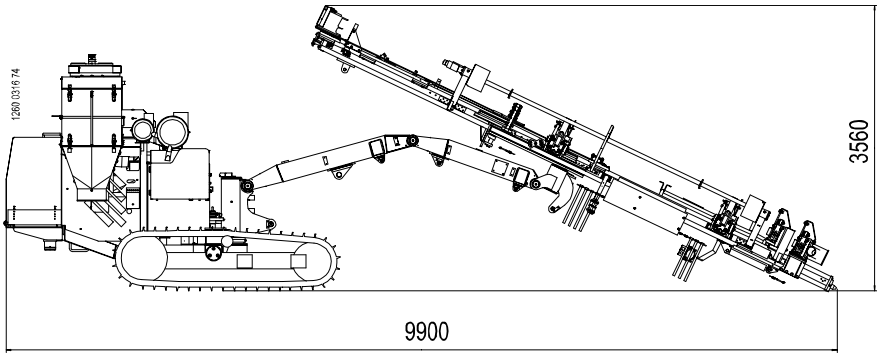


Figure: Transport alternative 2

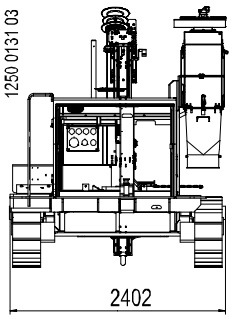
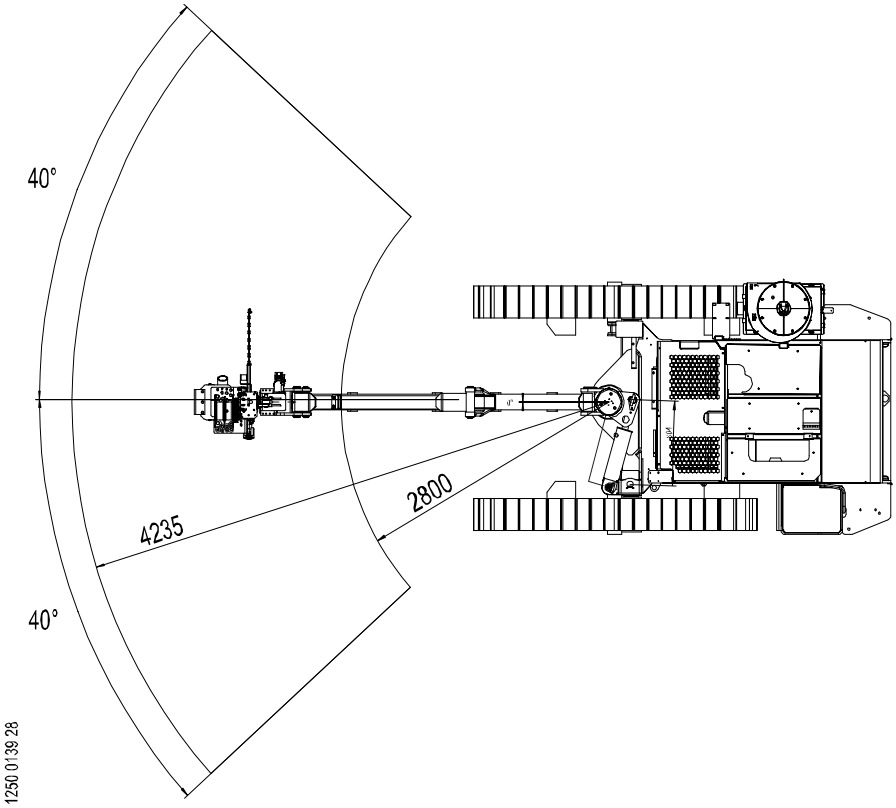


Figure:

Service ranges



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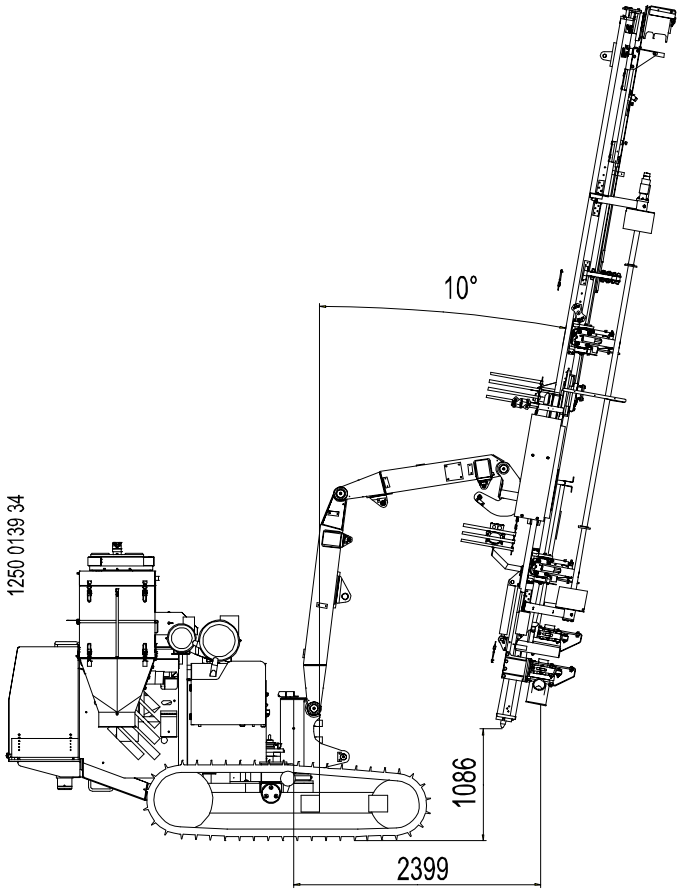

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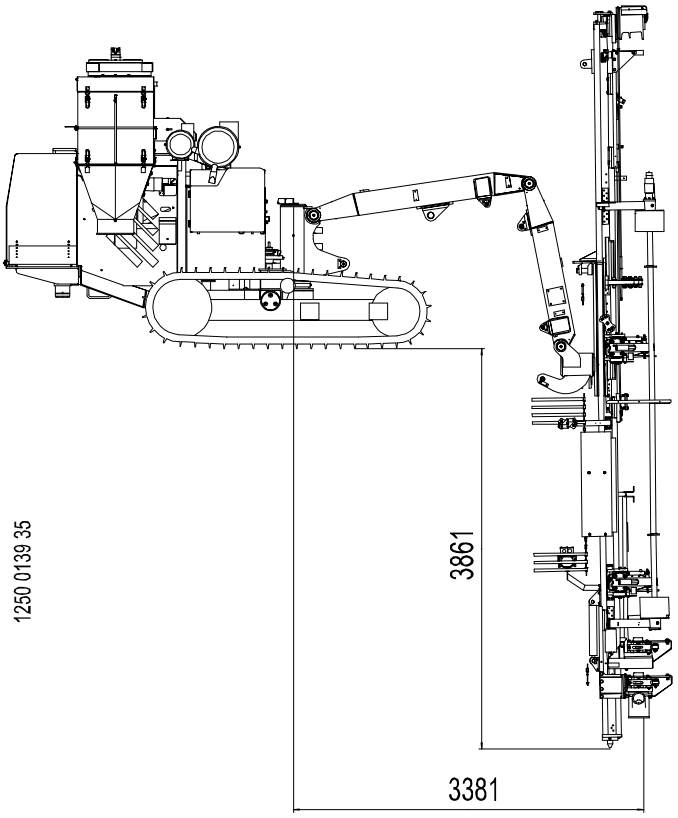

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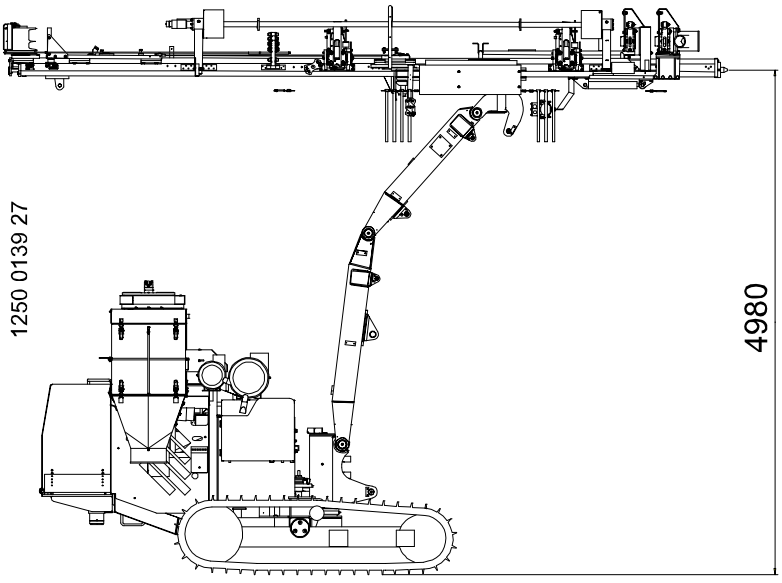

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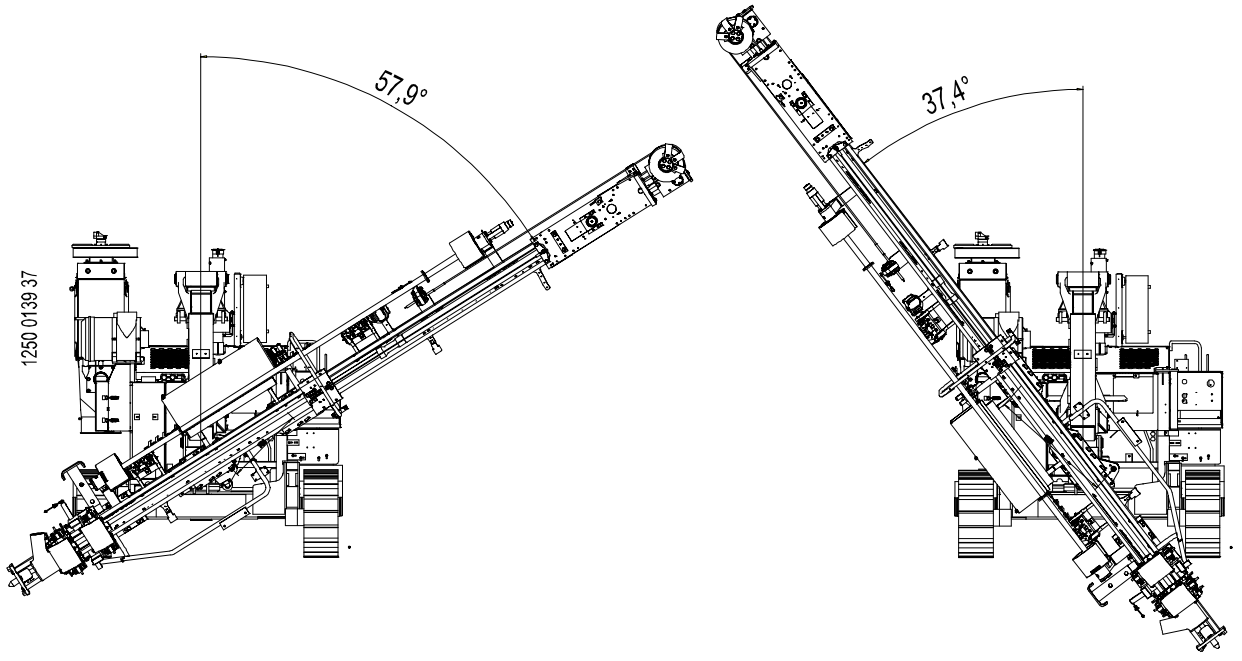


Figure:

3. Daily checks

Foreword

This chapter provides instructions for daily inspection and maintenance to be carried out by the operator before each shift.

Regarding weekly inspections ad other maintenance tasks, see separate instructions " **Maintenance schedules** ".

Extra safety check

Safety

DANGER

- **Danger of moving parts**
- **Risk of serious personal injury**
- **Set all levers and switches in neutral position before preparing start-up**
- **Perform the extra safety check without the engine running**

DANGER

- **The side hatches on the drill rig are not dimensioned for extra weight**
- **Risk of serious personal injury**
- **Standing, sitting or leaning on the side hatches can result in serious injury**
- **The side hatches must be closed when work is carried out on top of the rig**

Before each shift starts an extra and thorough visual safety check should be carried out in order to detect:

- Damage that could give rise to structural weakness or cracks.
- Wear that could have the same consequences.
- Cracks or fractures in materials or welded joints.

If the drill rig has been subjected to abnormally high stresses, vital load-bearing components may have been damaged. From a safety viewpoint, it is therefore especially important to check the following points (see illustration: Check points).

Checklist

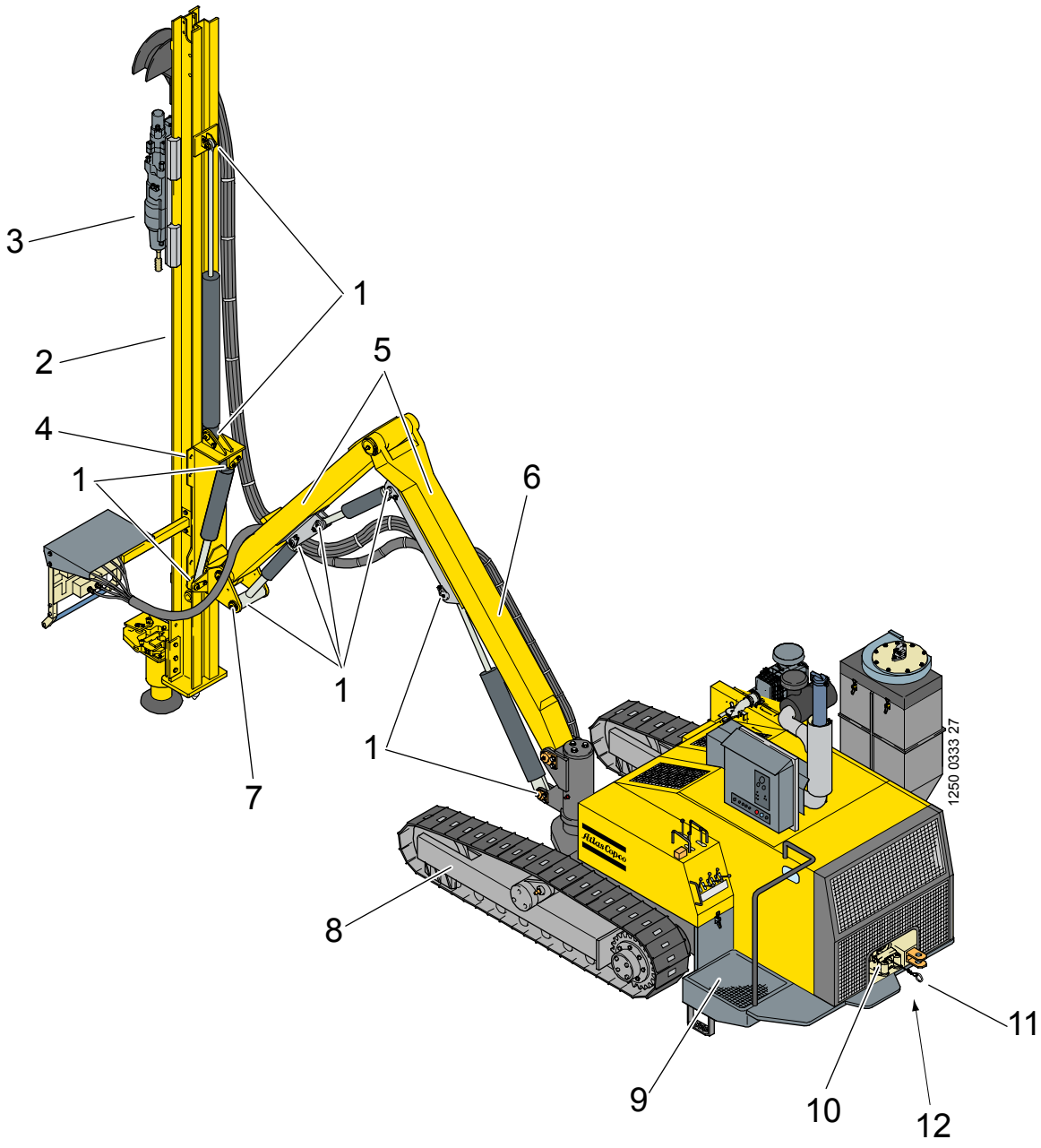


Figure: Check points.

Table: Checklist

Position	Component	Position	Component
1	Cylinder mountings	8	Track frames with attachments
2	Feed wire with attachments	9	Operator platform with attachments
3	Rock drill with cradle	10	Winch with brackets
4	Feed holder with brackets	11	Winch
5	Boom	12	Jack

Position	Component	Position	Component
6	Boom bracket with pin	*	All emergency stops
7	Boom head		

Before Starting

Safety

WARNING

- **Danger of moving parts**
- **Can cause serious personal injury**
- **Set all levers and switches in NEUTRAL position before start-up preparations**
- **Carry out the procedures with the engine switched off**

WARNING

- **Dangerous compressed air**
- **Can cause serious injury**
- **Release the pressure in the tank before removing the filler plug**

Drill rig.

Table: Drill rig.

Check point	Inspection	Instructions
Drill rig.	Visual check	Check for any signs of leaks, damage, breakage or cracks.

Hydraulic oil

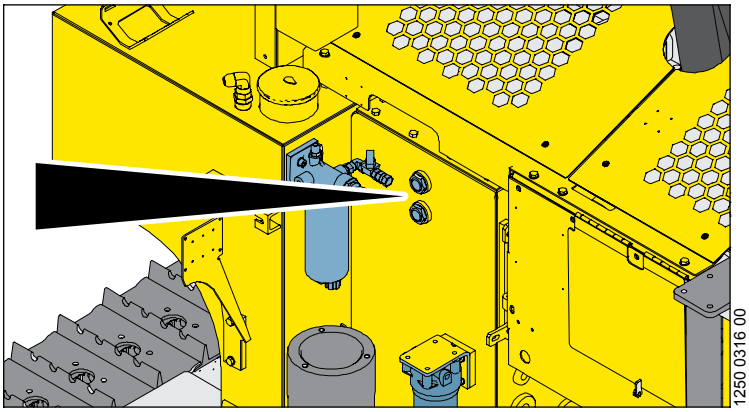


Figure: Hydraulic oil reservoir

Table: Hydraulic oil reservoir.

Check point	Inspection	Instructions
Hydraulic oil	Oil level	Top up as necessary. See Maintenance Instructions; Oils.
Hydraulic oil	Leakage	Check leakage at the tank and pumps.

Lubrication

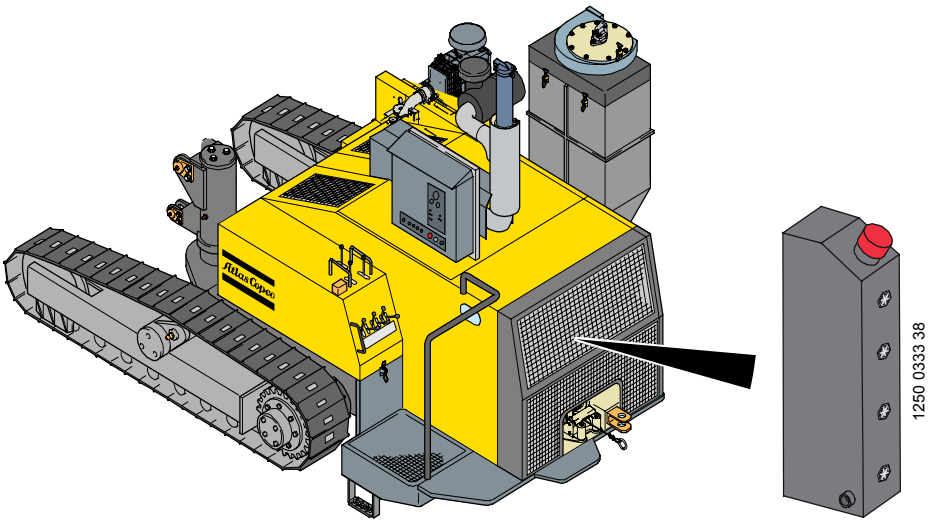


Figure: Lubricating oil tank.

Table: Lubricating oil tank.

Check point	Inspection	Instructions
Lubrication	Oil level	Top up as necessary. See Maintenance Instructions; Oils.

Engine oil

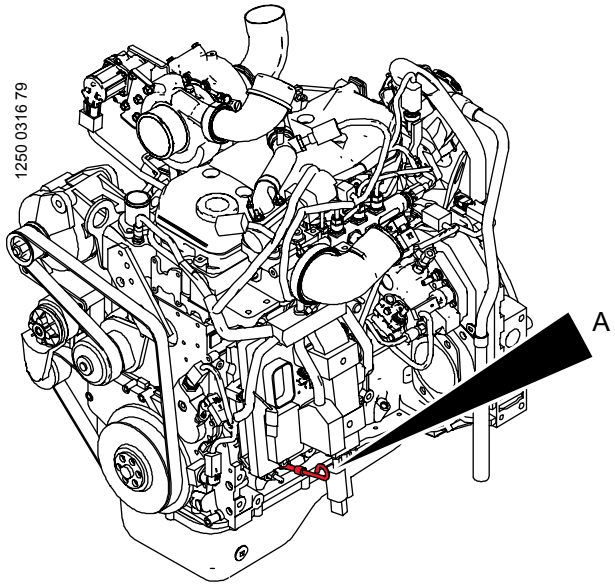


Figure: Diesel engine.

Table: Diesel engine.

Check point	Inspection	Instructions
Engine oil	Oil level (A)	Top up as necessary. See Maintenance Instructions; Oils.
Engine oil	Engine	Check for leaks.

Compressor oil

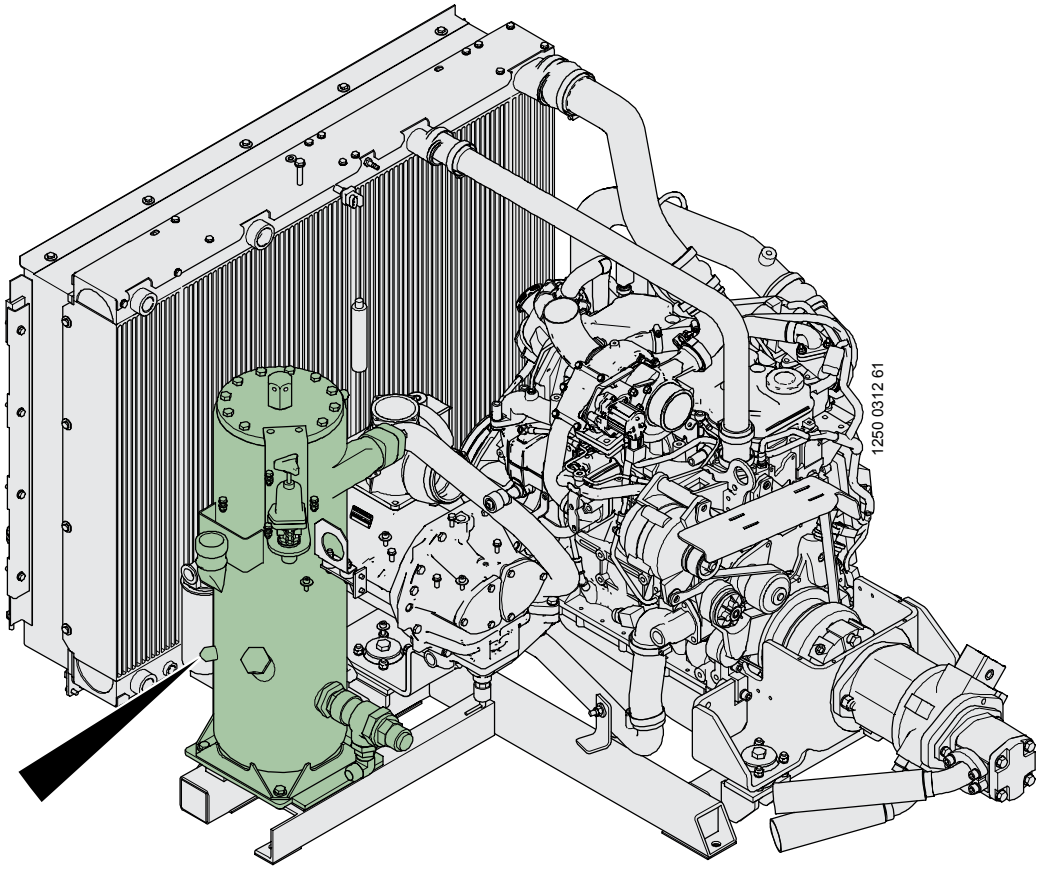


Figure: Compressor air tank.

Table: Compressor.

Check point	Inspection	Instructions
Compressor oil	Oil level	Top up as necessary. See Maintenance Instructions; Oils.

Functionality test after start

Emergency stop

Note

The emergency stop buttons and the emergency stop bar must be checked before each shift and after tramming.

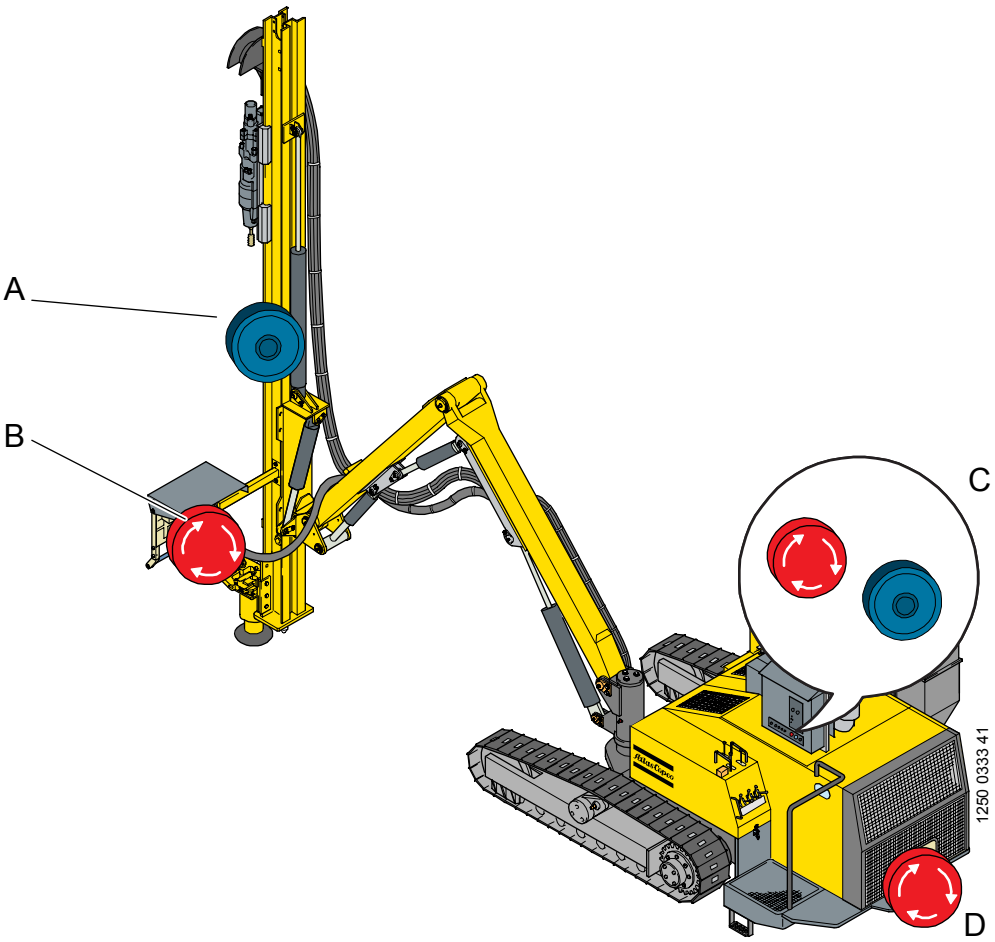


Figure: Emergency stop

A Reset button and emergency stop cable on feeder
B Emergency stop button on front control panel
C Emergency stop button and reset button on diesel panel
D Emergency stop button on winch

Table: Emergency stop.

Check point	Inspection	Instructions
Emergency stop	Function	Check each emergency stop button individually. The engine must stop! The previous emergency stop must always be reset before restarting and checking the next one.

Function test while drilling

Limit sensors

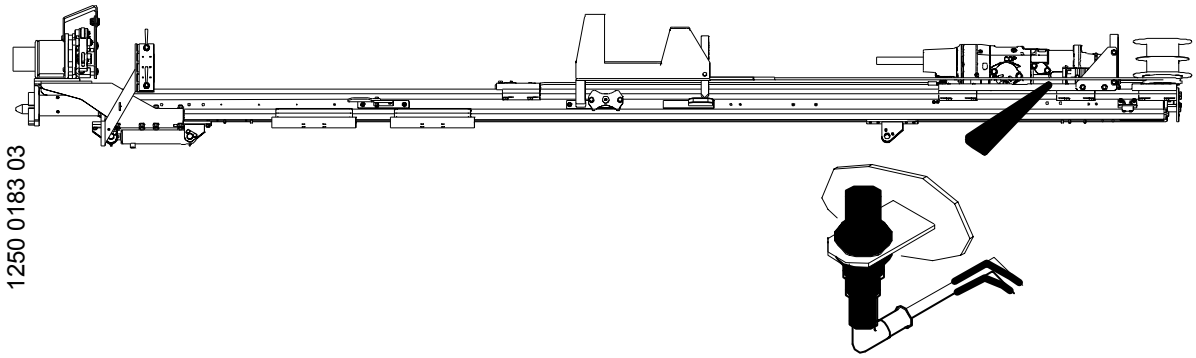


Figure: Limit sensors.

Table: Limit sensors.

Check point	Inspection	Instructions
Limit position sensors (all)	Function	The cradle must stop level with the limit position sensor.

Hydraulic hoses to rock drill

Table: Hydraulic hoses.

Check point	Inspection	Instructions
Hydraulic hoses to rock drill.	Abnormal vibration in hydraulic hoses.	Check the accumulator. For further details see "Maintenance instructions" for the rock drill".

Rock drill

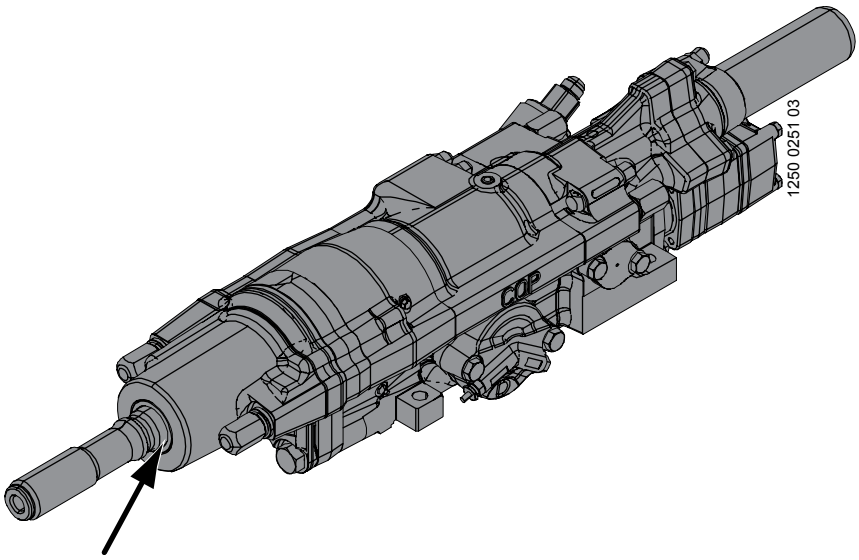


Figure: Rock drill.

Table: Rock drill.

Check point	Inspection	Instructions
Rock drill	Visual check	Make sure that oil trickles out between the front and the shank adapter.

Diesel control panel

Table: Diesel control panel.

Check point	Inspection	Instructions
Diesel control panel	Visual check	Check that no fault indicator lamp is on. In the event of a fault indication, stop the rig and rectify the fault.

Dust collector (DCT)

Table: Dust collector (DCT).

Check point	Inspection	Instructions
Dust collector (DCT)	Suction ability and filter cleaning	In case of dust formation: Check the filter in the filter holder and suction hose and also the drill steel support's drill gasket.

Drill rig

Table: Drill rig.

Check point	Inspection	Instructions
Drill rig	Visual check	Look for any signs of leaks. -Hydraulic systems -Fuel system -Cooling system -Compressor

Hydraulic oil filter

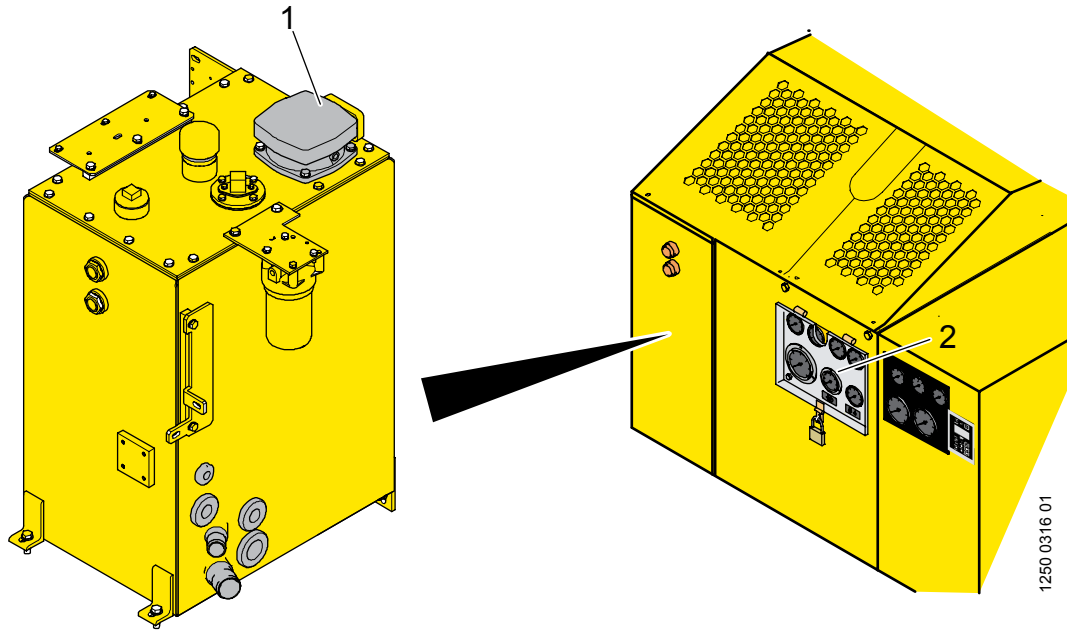


Figure: Hydraulic oil filter and manometer.

Table: Hydraulic oil filter.

Check point	Inspection	Instructions
Hydraulic oil filter (1)	Visual check	If the needle on the **return oil filter pressure** gauge (2) is in the red, the filter must be changed. Call a service technician.

Note

The return oil filter pressure gauge (2) is only reliable when the oil has reached a temperature of at least 40 °C (104 °F)

4. Control

Controls

General

Table: Overview.

1	Pressure gauges
2	Front control panel
3	Rear control panel
4	Electrical cabinet with diesel panel

Pressure gauges I

Note

The pressure gauges must be checked during drilling.

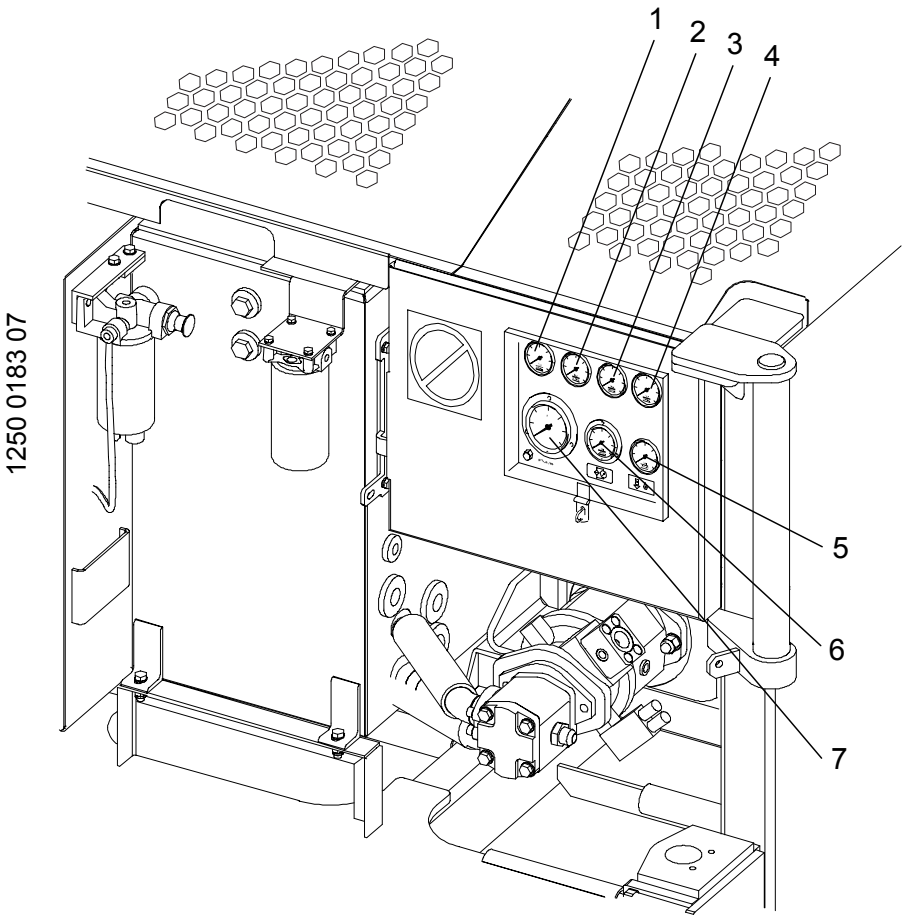


Figure: Pressure gauge panel

1 Pump pressure, pump 1
(Percussion, traction motors, feeder and control pressure too high, and low speed to traction motor)
2 Pump pressure, pump 2
(Rotation motor, panel selector and winch)
3 Pump pressure, pump 3
(Dust collector motor, positioning cylinders and rod handling)
4 Pump pressure, pump 4 (cooling fan)
5 Hydraulic Oil Temp
6 Pressure, return oil filter
7 ECL pressure

Pressure gauges II

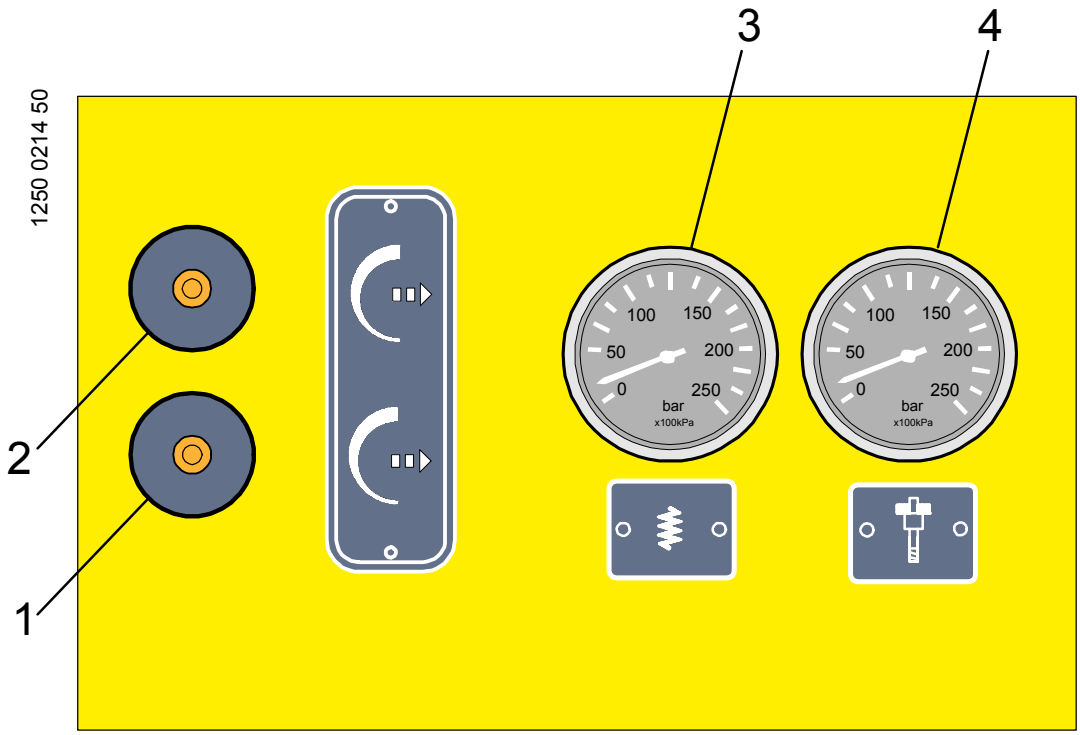


Figure: Pressure gauge panel

1 Regulation of high percussion pressure
2 Regulation of low percussion pressure
3 Feed pressure (only for COP 1640)
4 Damper pressure (only for COP 1640)

Front control panel

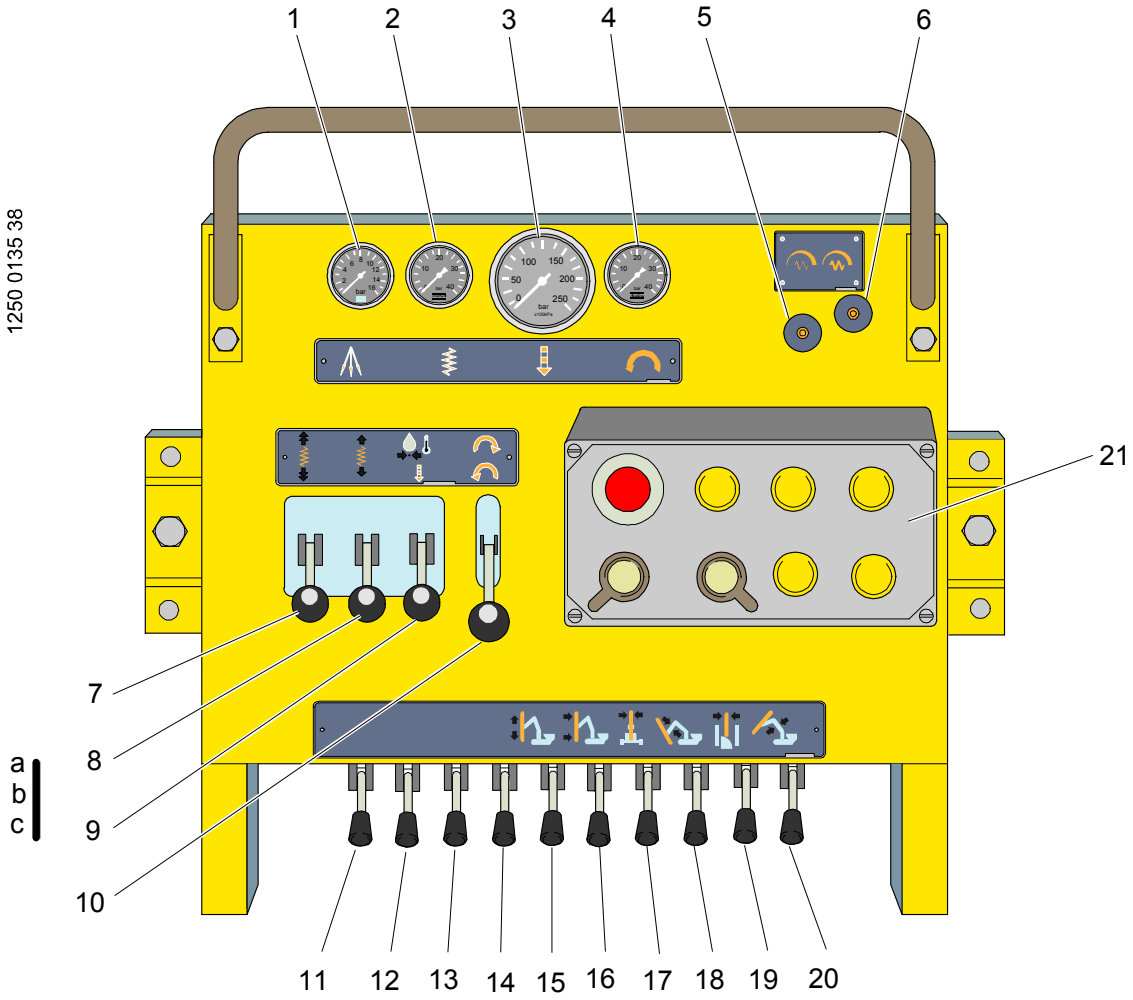


Figure: Front control panel

Table: Front control panel

1	Pressure gauge, flushing air pressure
2	Drill feed pressure gauge
3	Percussion pressure gauge
4	Rotation pressure gauge
5	Pressure valve, low drill feed pressure
a	LOWER (anticlockwise)
b	RAISE (clockwise)
6	Pressure valve, high drill feed pressure
a	LOWER (anticlockwise)
b	RAISE (clockwise)

7 Rapid feed
   a UP
   b NEUTRAL
   c DOWN
8 Feed
   a RETURN FEED
   b NEUTRAL
   c DRILL FEED
9 Percussion mechanism
   a HEATING (hydraulic oil)
   b NEUTRAL
   c PERCUSSION MECHANISM
10 Rotation
   a BACKWARD ROTATION (clockwise)
   b NEUTRAL
   c DRILL ROTATION (anticlockwise)

11 Not used

12 Not used

13 Swing arm, front control panel (optional equipment with RAS)

14 Not used

15 Feed extension
16 Feed dump
17 Feed tilt
18 Boom extension
19 Boom tilt
20 Boom lift

21 Electrical control box

Electrical control box

The electrical control box is fitted on the front control panel.

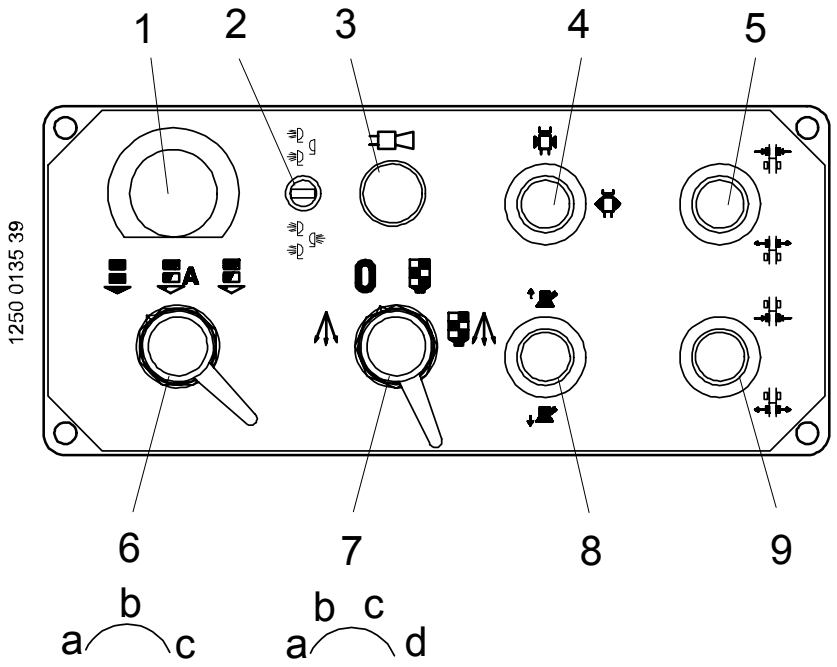


Figure: Electrical control box

Table: Electrical control box

1 Emergency stop

2 Work lights

3 Signal Horn

4 Sleeve retainer, closing/opening

5 Upper drill steel support, closing/opening (only with RAS)

6 Switch, percussion pressure

- a FULL PERCUSSION PRESSURE/DRILL FEED PRESSURE
- b AUTOMATIC CONTROL OF PERCUSSION PRESSURE (normal drilling conditions)
- c REDUCED PERCUSSION PRESSURE/DRILL FEED PRESSURE (used when collaring)

7 Switch, dust collector and flushing air

- a FLUSHING AIR ON (device for screw-cutting oil activated when water flushes up out of the hole)
- b ZERO (filter cleaning on/flushing air off/device for screw-cutting oil off/dust collector off/threading on
- c DUST COLLECTOR ON
- d DUST COLLECTOR ON/FLUSHING AIR ON (device for screw-cutting oil activated)

8 Suction hood, up/down

9 Lower drill steel support, closing/opening

Control lever for rod handling

The control lever is fitted on a separate box located on the right-hand side of the front control panel.

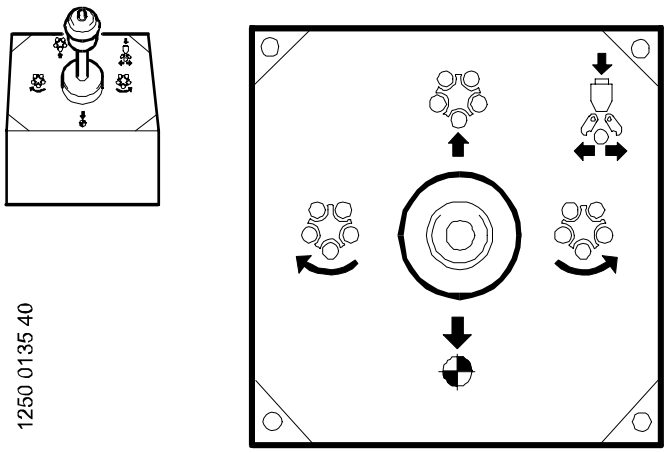


Figure: Control lever for rod handling

Table: Control lever for rod handling

Lever positions		
	Centre	NEUTRAL POSITION/LOOSE GRIP
	Front	ARM TO MAGAZINE
	Rear	ARM TO DRILL CENTRE/HARD GRIP
	Left	ROTATE CAROUSEL CLOCKWISE
	Right	ROTATE CAROUSEL ANTICLOCKWISE
Top contact		
	Depressed	OPEN GRIPPER
	Not depressed	CLOSED GRIPPER

Rear control panel

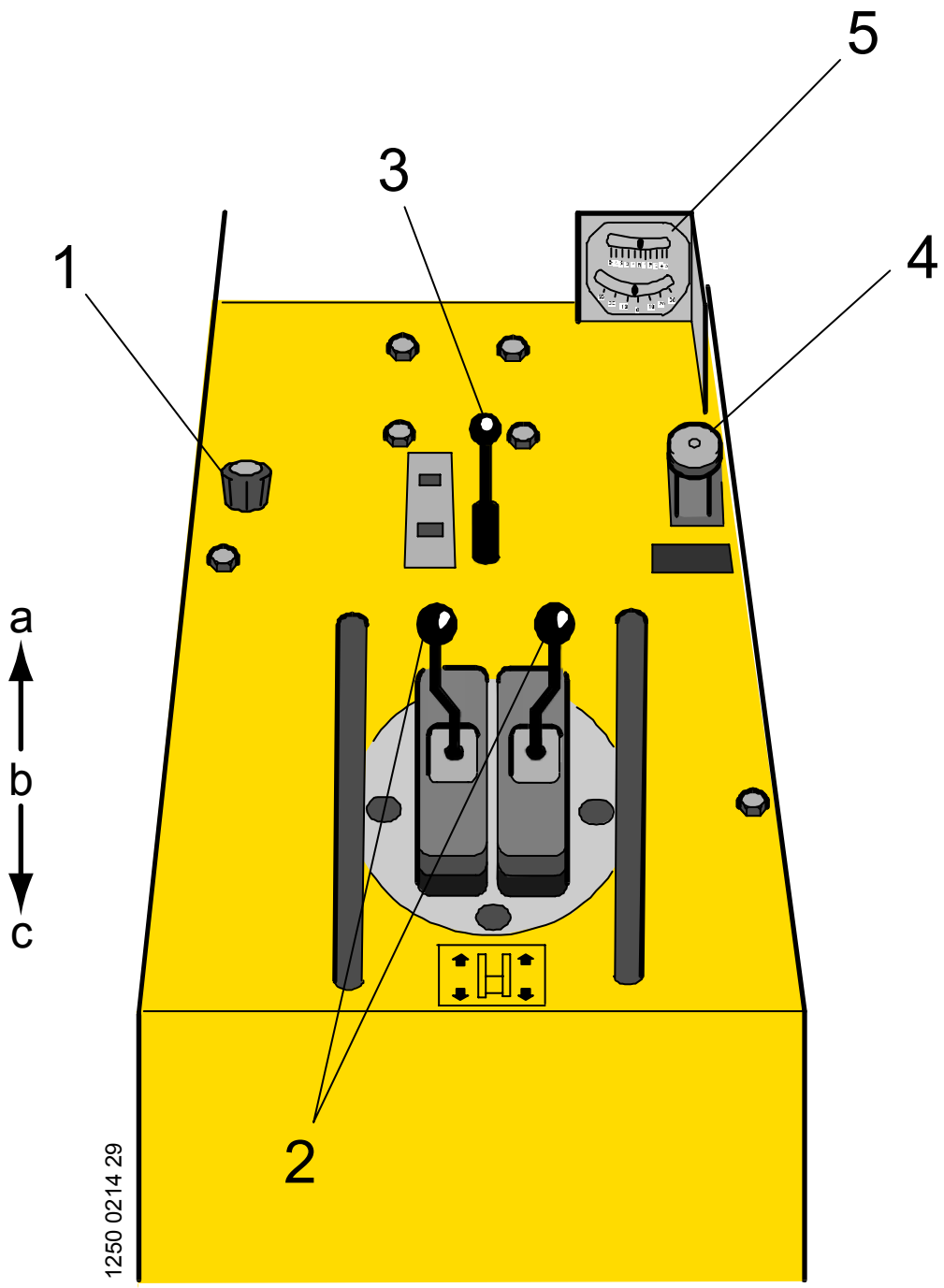


Figure: Rear control panel, operating controls

Table: Rear control panel, operating controls

1 Knob, propulsion speed (changes volume to traction motors)
clockwise=fast
anticlockwise=slow
2 Operating controls (left and right crawler tracks)
a FORWARD
b NEUTRAL
c REVERSE
3 Winch controls
a WIND ON
c UNWIND
4 Valve, winch pressure
clockwise=pressure increase
anticlockwise=pressure reduction
5 Inclinometer

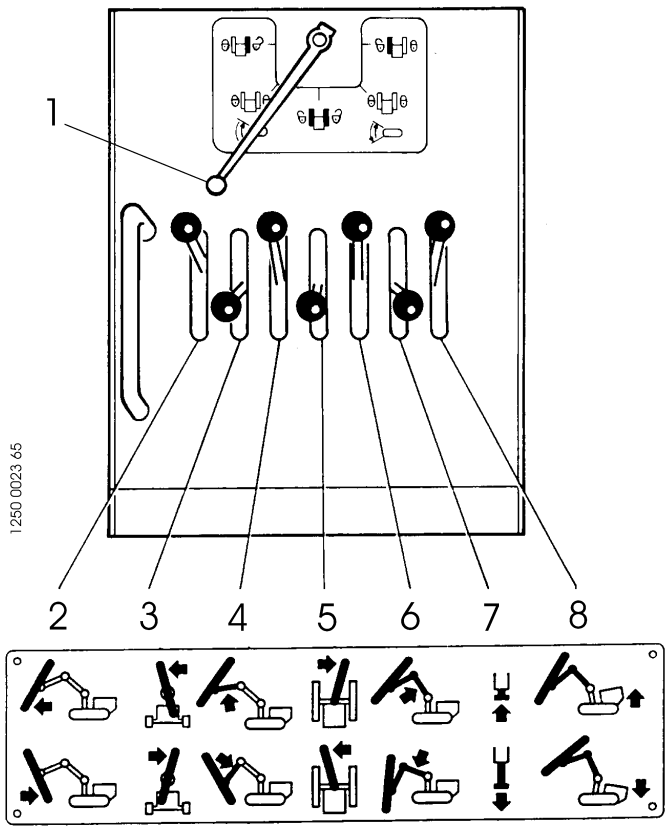


Figure: Rear control panel, controls for track oscillation and positioning

Table: Rear control panel, controls for track oscillation and positioning

1 Controls for track oscillation cylinders
a RIGHT CYLINDER OPEN

b BOTH CYLINDERS CLOSED
c BOTH CYLINDERS OPEN
d BOTH CYLINDERS CLOSED
e LEFT CYLINDER OPEN

2 Feed dump
3 Feed tilt
4 Boom extension
5 Boom tilt
6 Boom lift
7 Jacks (optional equipment)
8 Track oscillation

Diesel panel

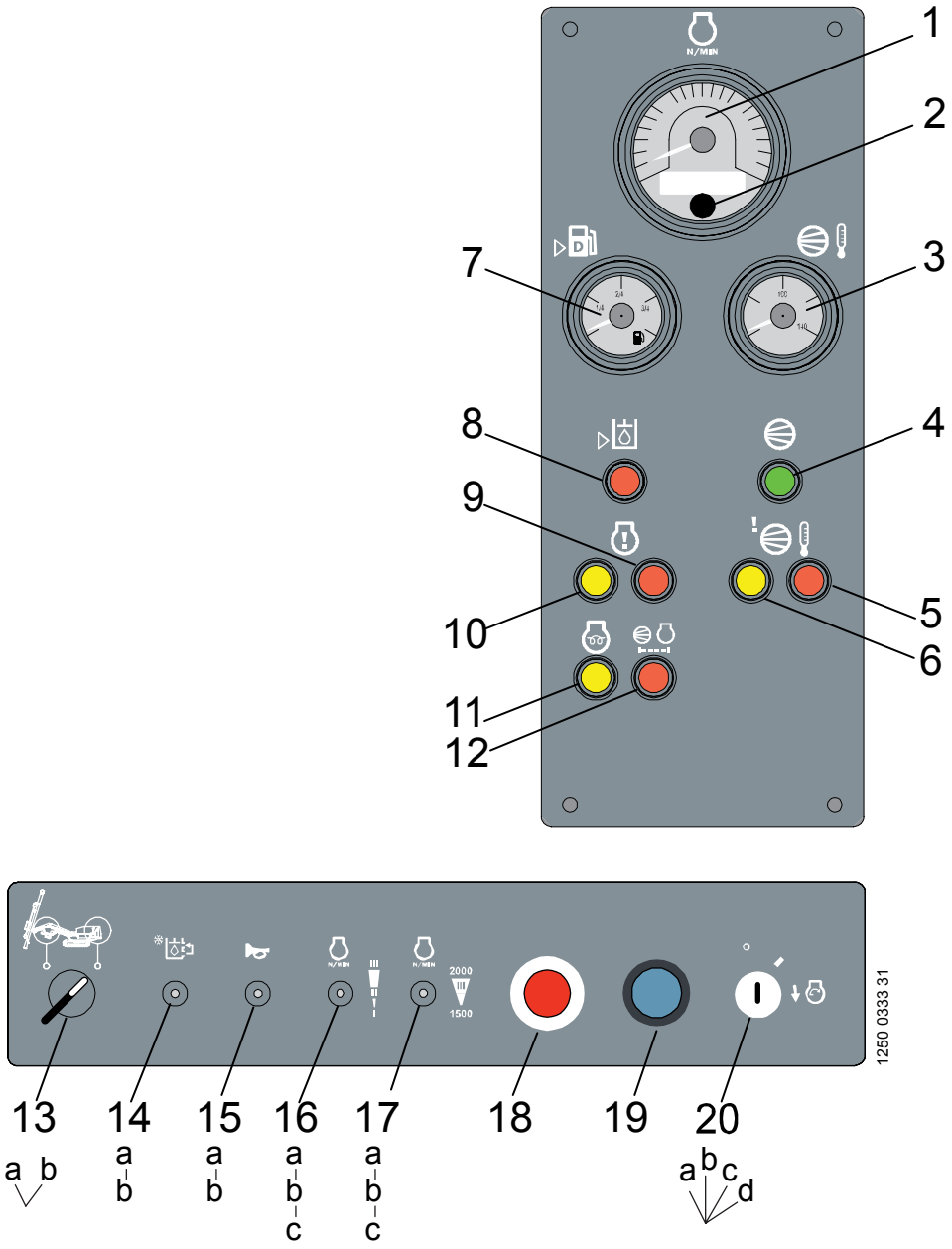


Figure: Diesel panel

Note

Pay attention to the diesel panel when in operation

Table:

1	EMC (Engine Monitoring System) VDO, tachometer with display. To scroll between the menus on the display, press button (2) on the VDO instrument.
2	Button for display
3	Gauge for compressor temperature.

4 Green indicator lamp for compressor. The lamp illuminates when the compressor is switched on.

5 Red alarm lamp for compressor. High compressor temperature. Diesel engine is switched off.

6 Yellow alarm lamp for compressor. Read the error message on the VDO instrument.

7 Fuel level gauge (volume)

8 Red alarm lamp for low hydraulic oil level. Diesel engine is switched off.

9 Red alarm lamp for diesel engine. Diesel engine is switched off. Read the error message on the VDO instrument.

10 Yellow alarm lamp for the diesel engine. The diesel engine is in a critical situation. Read the error message on the VDO instrument.

11 Yellow indicator lamp for preheating the diesel engine. The lamp illuminates when preheating is activated.

12 Red indicator lamp for clogged compressor filter and engine air filter. Stop the engine and replace the filter cartridge.

13 Switch: Compressor charging/Positioning. Reconnect to charge and select the panel from which the boom system shall be positioned.

14 Manual cold start (optional equipment)

15 Signal Horn

16 Speed selector. 3 positions.
a: variable engine speed
b: 1500 rpm
c: 1200 rpm

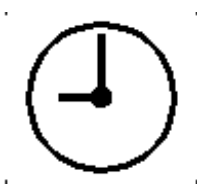
17 Engine speed increase. Used when button (16) is in the position for "variable engine speed""(a).

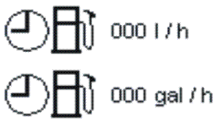
18 Emergency stop. Switches off the diesel engine (reset before restart)

19 Reset button. (Reset before restart!)

20 Ignition key.

Table: Symbols

Symbol	Description	Symbol	Description
	**Hour counter** Shows the total number of hours for the diesel engine, as well as shift memory, by holding the button depressed for 5 seconds.		**Fault codes** Fault codes are stored here until the ignition is switched off.

Symbol	Description	Symbol	Description
	**Tachometer** Shows the current speed of the diesel engine.		Fuel level gauge Shows the quantity of diesel available in the tank. The level is shown on the analogue instrument. A lamp starts to flash on the instrument when 75 litres remain.
	Hydraulic Oil Temp Shows the current temperature of the hydraulic oil.		Compressor temperature Shows the temperature of the compressor. At 115 °C the instrument triggers an alarm, at 120 °C the diesel engine is switched off.
	**Voltmeter** Measures and shows how many volts the rig's batteries have.		Oil Pressure Gauge Shows the oil pressure in the diesel engine to one decimal place.
	**Coolant temperature** Shows coolant temperature.		Turbo Pressure Shows the diesel engine's charge pressure for the turbocharger.
	**fuel consumption** Shows the current fuel consumption for the diesel engine in litres per hour.		Load Shows the current load on the diesel engine in %.
	**Fuel pressure** Shows the fuel pressure for the diesel engine on the high pressure side, (only available in certain systems).		Fault codes Only shown if there is one or more fault codes from the diesel engine. To proceed to Cummins PTC codes, double-click on one of the panel's buttons. If there are several codes then access the next one by clicking again. The code can be acknowledged by holding a button depressed for 5 seconds.

Other controls

Electric cabinet

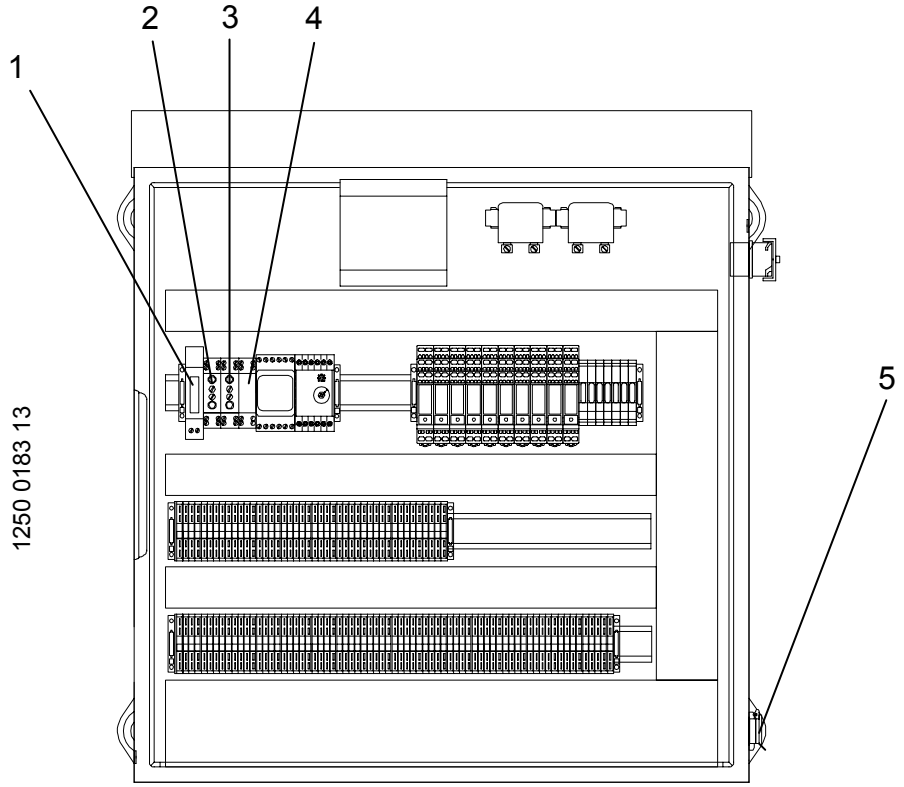


Figure: Electric cabinet.

Table:

1	Hour meter for rock drill
2	Potentiometer Lubricating oil pump (ECL)
3	Potentiometer Screw-cutting oil (ECG)
4	Voltage indicator
5	Electrical socket 24V

Electrical cabinet for dust collector

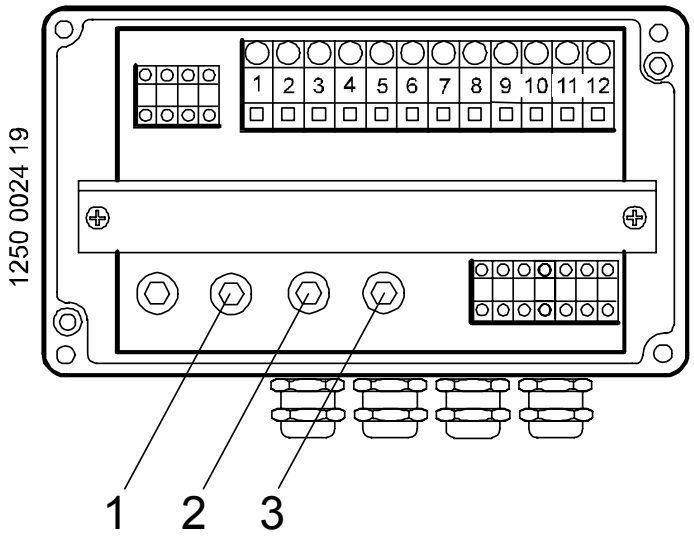


Figure: Electrical cabinet for dust collector

Table:

1	Potentiometer **Interval time**
2	Potentiometer **Pulse time**
3	Potentiometer **Total cleaning cycle**

5. Operating

Diesel engine starting

N.B.

Monitor pressure gauges and display for diesel engine when in operation.

1. Activate the drill rig's main power contactor (position a).

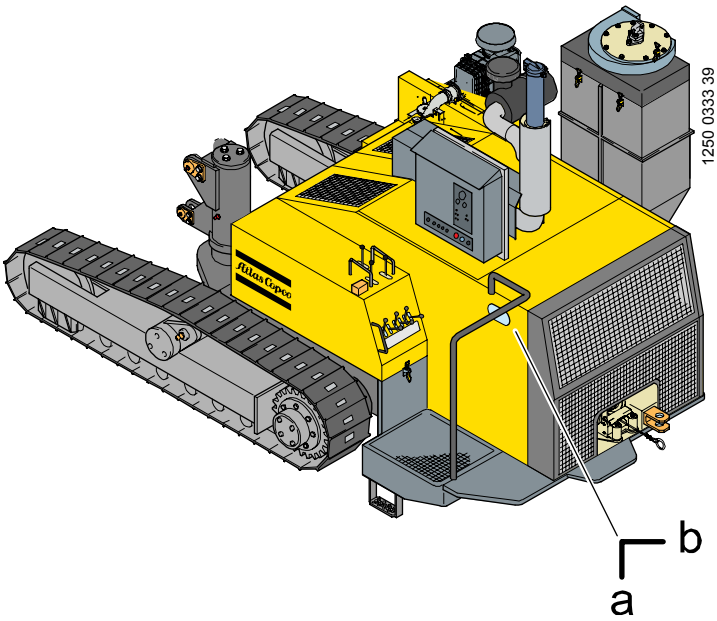


Figure: Drill rig main power contactor.

Note

Note

Always deactivate the drill rig's main power contactor after stopping the diesel engine.

2. Set the switch for **Compressor charging/Positioning** (13) to position (b) COMPRESSOR OFF/POSITIONING REAR CONTROL PANEL.

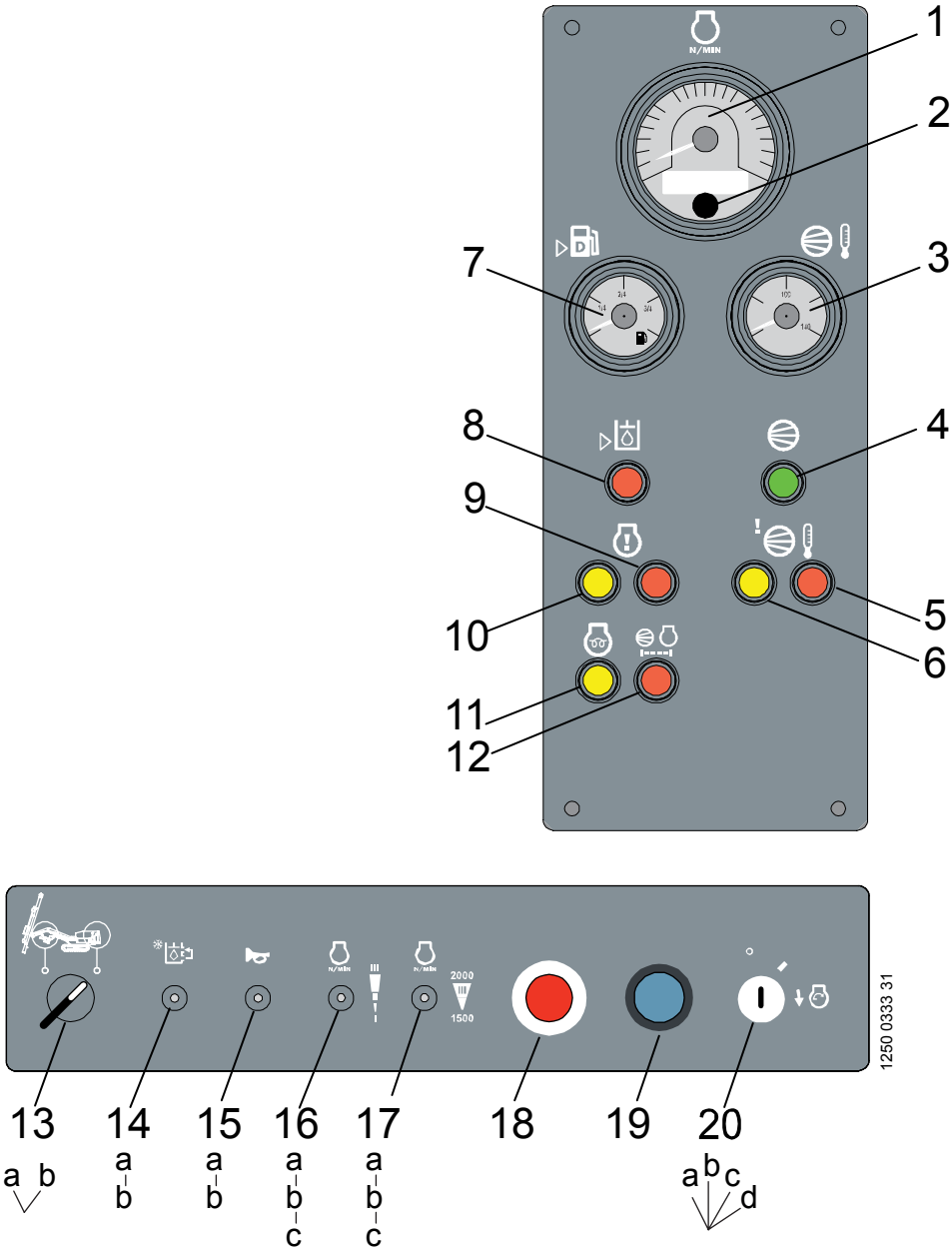


Figure: Diesel panel

3. Press the **Reset button** (19).

4. Turn the **Ignition key** (20) to PREHEATING position (c).

   - **Preheating lamp** (11) and **Alarm lamps** (9) and (10) are switched on.

5. When the **preheating lamp** (11) is switched off, turn the **ignition key to START position (d).**

Note

Manual cold start: If cold start (optional equipment) is installed, the hydraulic pumps are disengaged when the engine is started. The hydraulic pumps are engaged when the engine speed reaches 1200 rpm. In very cold weather the engine may need to be warmed up for a longer time with disengaged pumps. In which case, activate manual cold starting with button (14) before the ignition key is turned to ignition position. At which point, the hydraulic pumps remain deactivated until the button is released.

6. Once the engine has started, release the **Ignition key** , which will spring back to DRIVE POSITION (c).

Note

Should the engine fail to start, stop trying after 20 seconds and wait one minute before trying again.

7. Check the hydraulic oil temperature (must be preheated to at least 20 °C (68 °F)).

Note

If any of the fault indicator lamps on the diesel panel light up, turn off the engine and rectify the fault indicated by the symbol that is on.

Stopping the diesel engine

N.B.

Allow the engine to idle a few minutes before turning it off if it is warm.

1. All controls to NEUTRAL position.

2. Set the switch for **Compressor charging/Positioning** (13) to position (b) COMPRESSOR OFF/POSITIONING REAR CONTROL PANEL.

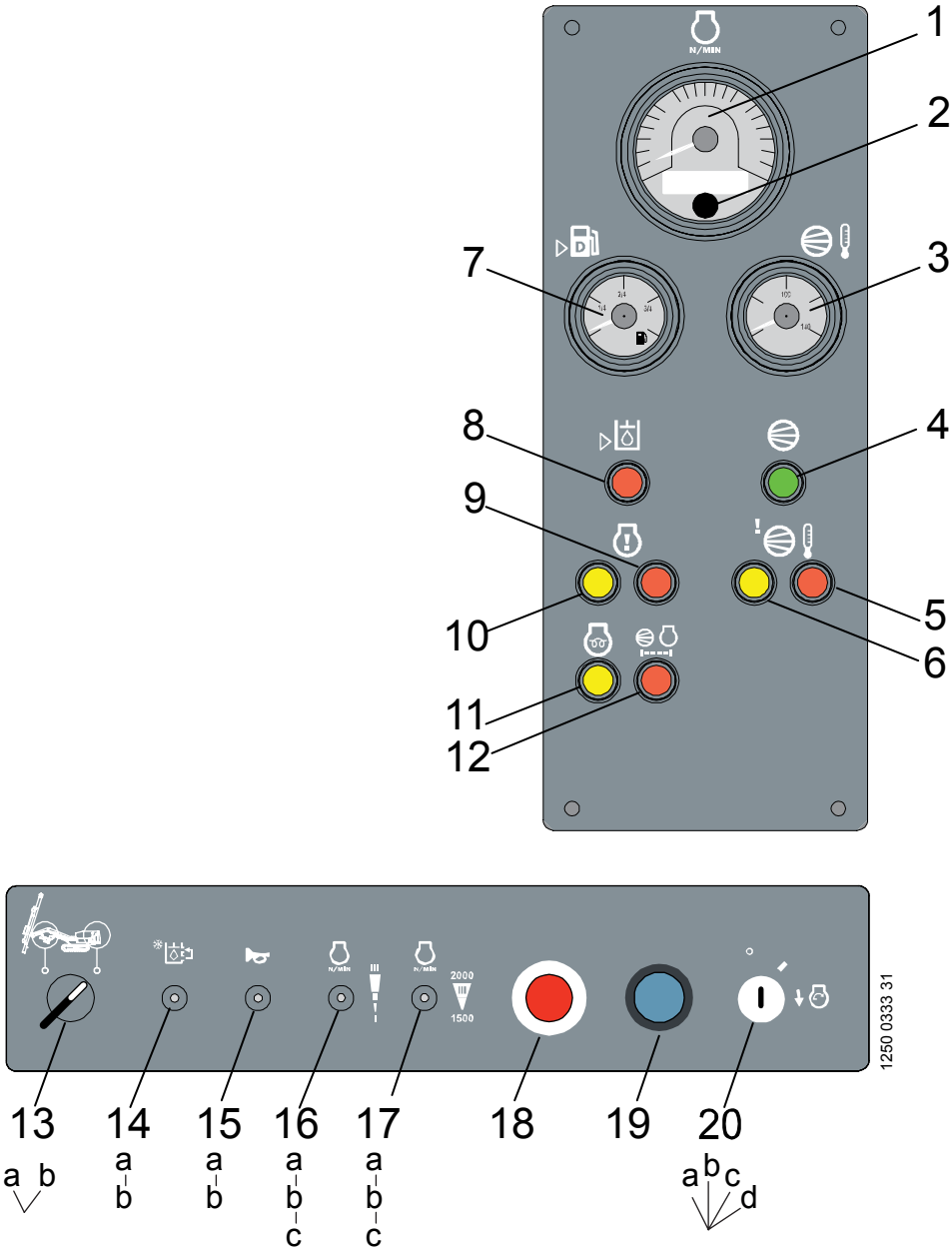


Figure: Diesel panel

3. Set the Speed selection switch (16) in 1200 rpm(c) position.

4. Turn the **Ignition key** (20) to OFF position (b).

5. Deactivate the drill rig's main power contactor (position a).

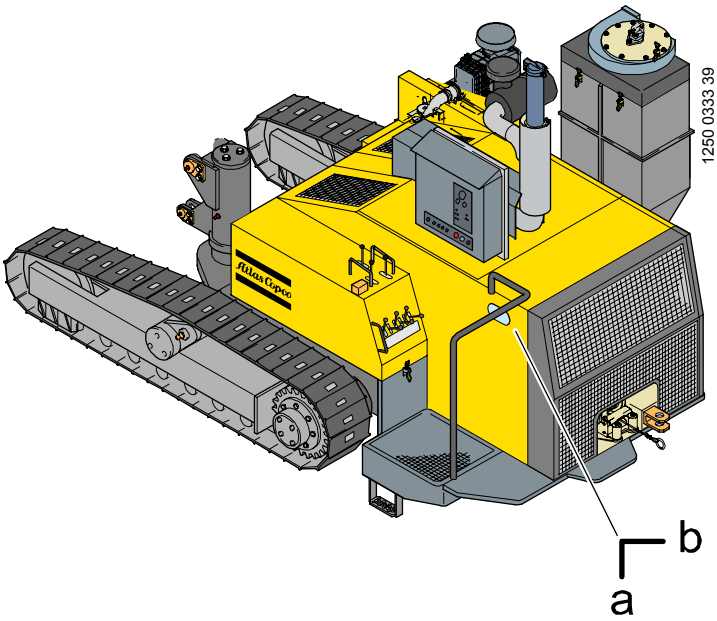


Figure: Drill rig main power contactor.

Tramming

WARNING

- **Risk of dumping**
- **May cause severe personal injury and damage to property**
- **Keep the feeder in tramming position and the boom inside the limits of the crawler tracks**
- **Keep the track oscillation pedals open**
- **Angles for Downward/Upward/ Longitudinal CANNOT be combined with each other**
- **Do not exceed the inclination angles, See technical data**
- **Note the gradient meters' values**
- **Never operate the drill rig from the down side**

WARNING

- **Risk of dumping**
- **May cause severe personal injury and damage to property**
- **Ensure that unauthorised personnel are outside of the working area**
- **Always check the ground where the rig shall travel**

WARNING

- **Danger of accidental operation**
- **May cause serious personal injury and damage to property**
- **The operator must always have an overview of the drill rig and the remote control box**
- **Always check that the controls are correctly adjusted before operating**

N.B.

All emergency stop buttons and the emergency stop cable must be checked after all tramming (see the chapter Daily checks - Function test).

N.B.

If the drill rig is operated from the platform, the speed must always be adapted to the terrain.

1. Raise the hydraulic jack.
2. The lever for the track oscillation cylinders must remain in BOTH CYLINDERS OPEN position.
3. The switch for Compressor charging/Positioning must be in the position for COMPRESSOR CHARGING OFF/POSITIONING REAR CONTROL PANEL.
4. Position the boom system and feeder as compactly as possible. The feeder must be parallel with the outer boom.
5. Adjust the tramming speed control to suit the prevailing terrain conditions
6. Operate the Traction control levers in order to tram the drill rig in the desired direction.

Note

A horn and a beacon indicate that the drill rig is reversing.

Note

If one crawler track is operated while the other is stationary the tracks are subjected to unnecessary stresses. This should therefore be avoided.

Checking after tramming

All emergency stop cables and all emergency stops must be checked after tramming.

Using the winch when tramming

WARNING

- **Risk from dumping and moving parts**
- **May cause serious personal injury and damage to property**
- **Ensure that unauthorised personnel are outside of the working area**
- **Never use the winch with less than three turns remaining on the winch drum**

WARNING

- **Risk from dumping and cable failure**
- **May cause serious personal injury and damage to property**
- **The anchorage point must be firm and secure (pay attention to local regulations)**
- **The safety hook must not be able to slide or detach from its attachment point**
- **A damaged cable or hook must not be used**
- **Check that the winch locking mechanism is fully engaged in the drum before use, following the attachment of the cable eye on the anchorage point**

WARNING

- **Danger of accidental operation**
- **May cause serious personal injury and damage to property**
- **The operator must always have an overview of the drill rig**
- **Always check that the controls are correctly adjusted before operating**

General

The winch can be used as an additional safety feature, either to provide extra thrust when tramming up or down a slippery slope, or as an extra brake when tramming down an incline.

Note

The winch should not be used for any other purpose.

Preparation

WARNING

- **Risk of dumping**
- **May cause serious personal injury and damage to property**
- **The angles for Downward/Upward/Lateral MUST NOT be combined with each other**
- **Do not exceed the inclination angles, See technical data**
- **Never operate the machine from the down side**

WARNING

- **Risk of dumping**
- **May cause serious personal injury and damage to property**
- **Keep the winch cable continuously taught**

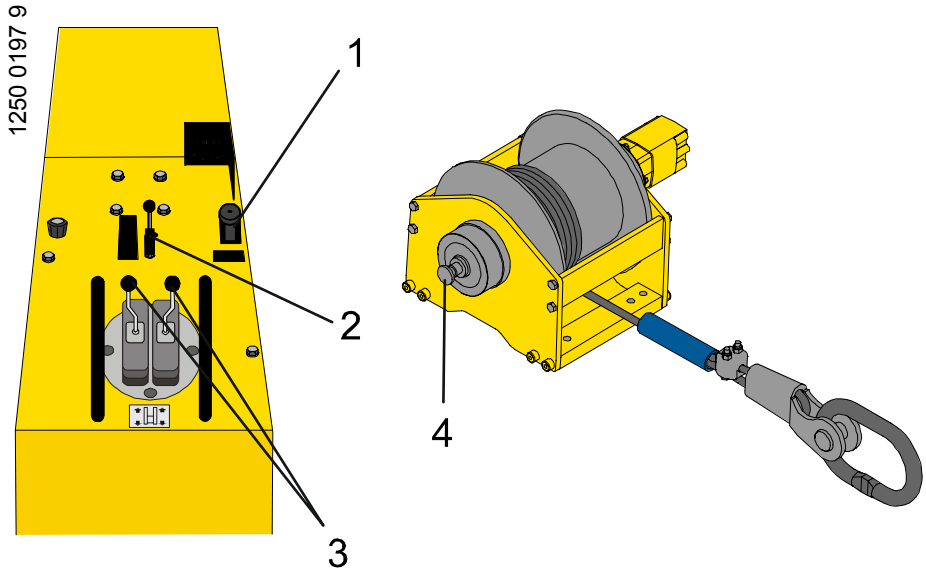


Figure: Rear control panel and winch

1. Disengage the winch drum by pulling out and turning the disengagement lever (4) a quarter-turn to a locked position.

2. Pull out the wire and fasten the eye to the anchorage point.

3. Lift, turn back and press the disengagement lever. Check that drum is **not** disengaged by checking that the lever is **fully** depressed.

Tramming up inclines

1. Set the winch pressure regulator (1) to the desired pressure.

2. Activate the winch circuit by setting the winch lever (2) to WIND ON position.

3. Reverse up the incline using the tramming levers. Make sure that the wire is kept taut constantly.

4. Adjust the pressure of the winch motor in order to attain sufficient thrust by gradually turning the pressure regulator (1) clockwise.

Tramming down inclines

1. Set the winch pressure regulator (1) to maximum pressure by turning it fully clockwise.

2. Activate the winch circuit by setting the winch lever (2) to WIND ON position

3. Tram down the incline using the tramming levers. Make sure that the wire is kept taut constantly.

4. Reduce the winch cable pressure gradually until the drill rig can be driven smoothly down the incline with a suitable counterbalance from the winch. Make sure that the cable remains taut constantly.

6. Before drilling

Safety

WARNING

- **May cause severe personal injury**
- **Ensure that unauthorised personnel are not within the working area**
- **Do not approach the area surrounding rod/pipe gripper or carousel**
- **Always use lifting assistance when loading and unloading the carousel**
- **Do not approach the area surrounding rod/pipe when the drill steel support is closed during loading**
- **Two persons are required to load and unload the carousel**
- **Follow the instructions carefully**

Loading the rod carousel

1. Position the feed beam horizontally with the levers for boom lift, boom extension and feed tilt.
2. Insert the rod handling arms into the carousel by moving the rod handling lever forwards.
3. Rotate the rod carousel anticlockwise to its end position by moving the rod handling lever to the right. Following which, set the lever in neutral position.
4. Rapid feed the rock drill to its lower position by moving the lever for rapid feed to DOWN position. Following which, reset the lever in NEUTRAL position.
5. Open the upper and lower drill steel supports with their respective push buttons.
6. Insert the first drill rod through the drill steel supports (use suitable lifting equipment to lift the drill steel) and then close them.
7. Fully thread the shank adapter into the drill rod's sleeve using the lever for DRILL ROTATION.

8. Rapid feed the rock drill backwards until the drill rod is almost out of the upper drill steel support by moving the lever for rapid feed to UP position. Following which, reset the lever to NEUTRAL position.

9. Open the rod handling grippers and move the rod handling arms to drill centre by pressing in the top contact on the rod handling lever and moving it backwards. Following which, reset the lever in centre position and release the top contact. The grippers are now in drill centre and have loose grip.

10. Rapid feed backwards until the rock drill has reached its end position.

11. Activate hard grip by moving the rod handling lever backwards.

12. If the sleeve retainer is in use then it must now be locked.

    The sleeve retainer is an option and is only used when drill steels with loose sleeves are used.

13. Unthread the shank adapter from the drill rod by moving the rotation lever to BACKWARD ROTATION position. Following which, reset the lever to NEUTRAL position.

14. If the sleeve retainer is in use then it must now be opened.

15. If there is already a rod in the carousel then the carousel must be rotated until there is an empty space.

16. Insert the drill rod into the carousel by moving the rod handling lever forwards. The top contact must not be depressed.

17. Repeat the procedure until the required number of drill rods are in the carousel.

Setting up for drilling

WARNING

- **Risk of dumping**
- **May cause severe personal injury and damage to property**
- **Keep the track oscillation cylinders locked**
- **Do not lower the hydraulic jack too much, the rear sections of the track frames must stand firmly against the ground**
- **The angles for Downward/Upward/ Lateral, specified in Technical data, must NOT be combined**
- **Do not exceed the angles of inclination, see Technical data**
- **Note the gradient meters' values**
- **Never operate the drill rig from the down side**
- **Ensure that unauthorised personnel are not within the working area**

CAUTION

- **Risk of feed beam bending**
- **To avoid overloading the feeder, do no use the cylinder alone for lowering the boom, or the cylinder for feed extension individually to place the feeder against the ground**
- **Do not raise the front section of the track frame from the ground**

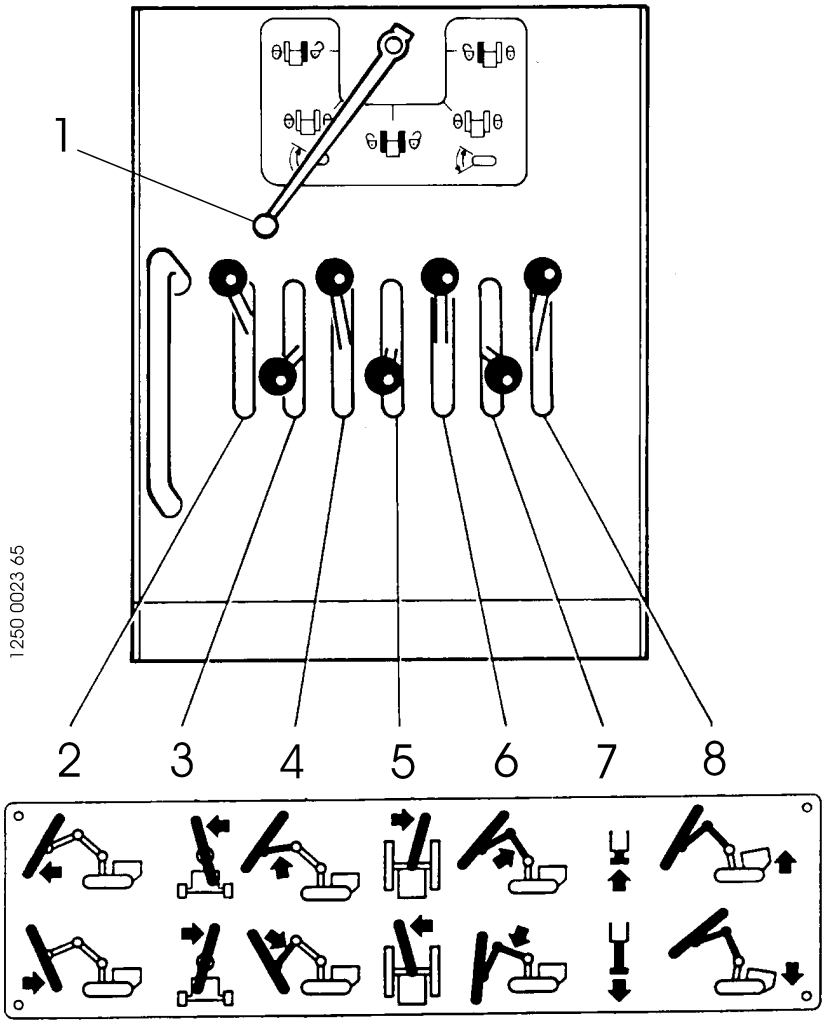


Figure: Rear control panel

1. Unlock the track oscillation using the track oscillation lever (1).
2. Align the drill rig horizontally using the track oscillation lever (8).
3. Set the track oscillation lever to BOTH CYLINDERS CLOSED position.
4. Lower the jack to the ground.
5. Raise the feed beam fully using the feed extension cylinder.
6. Position the feeder.
7. Set the feed spike firmly against the ground without lifting the drill rig by manoeuvring the levers for boom lowering and feed extension alternately and in steps.

   Note

   Do not lift the drill rig with the feeder!

Preparations for drilling

1. Set the switch for Compressor charging/Positioning to COMPRESSOR ON/POSITIONING FRONT CONTROL PANEL position.
2. Set all controls for feed and drilling in NEUTRAL position.
3. Set the switch for Percussion pressure to REDUCED PERCUSSION PRESSURE/ DRILL FEED PRESSURE position.
4. Set the switch for Dust collector and flushing air to ZERO position.
5. Set the sleeve retainer control in OPEN position.
6. Set the drill steel support control in OPEN position.
7. Insert a drill rod with drill bit and screw it into the rock drill.
8. Set the drill steel support control in CLOSED position.

7. Drilling

Start of drilling

WARNING

- **Danger of moving and rotating parts**
- **Can cause serious personal injury**
- **Ensure that unauthorised personnel are outside of the working area**
- **Stay away from the rotating drill rod**

1. Set the switch for percussion pressure to REDUCED PERCUSSION PRESSURE/ DRILL FEED PRESSURE position.
2. Set the switch for dust collector and flushing air to DUST COLLECTOR ON/ FLUSHING AIR ON position.

   Note

   Switch off the dust collector immediately if water flushes up from the hole. Water and dust can clog the hoses and filters.
3. Set the lever for rotation in DRILL ROTATION position.
4. Set the percussion mechanism lever in PERCUSSION MECHANISM position.
5. Set the lever for feed in DRILL FEED position.

   Note

   Apply DRILL FEED carefully until the drill bit has entered solid rock.

   Note

   Collaring with constant feed can make the drill bit veer off in the wrong direction, resulting in hole deflection and extra strain on the drill string.
6. Automatic percussion pressure can be activated after reaching homogenous rock. Set the switch for percussion pressure to AUTOMATIC REGULATION OF PERCUSSION PRESSURE position.
7. When the coupling sleeve approaches the drill steel support, move the drill steel support lever to OPEN position.

8. Continue drilling until the coupling sleeve has come half way into the drill steel support. Move the rotation and feed levers to NEUTRAL position at the same time.

Checks during drilling

Monitor drilling performance and pay particular attention to the points below:

Should anything out of the ordinary occur, stop drilling and clear up the trouble or ask service personnel to investigate.

1. **Rock drill**:
   - Abnormal impact hose vibration.
     - Check the pressure in the rock drill accumulators.
   - Check that the shank adapter is sufficiently lubricated.
     - Lubricating oil/air should leak out from the shank adapter. Lubricating oil pressure should be between 2 and 10 bar on the ECL pressure gauge.
   - Abnormal leakage from the rock drill.
   - Note that the shank adapter has a "float position", i.e. it is pressed out about 4-6 mm from the subframe.
   - If damper pressure is lower than 35 bar or higher than 120 bar, percussion will stop automatically (**For drill rig COP 1800/2150/2550/4050 series**)
     - Stop drilling immediately and ask service personnel to investigate.
     - If the rig is equipped with ECL collection, the ECL collection lamps on the display should be checked.
2. **The borehole:**
   - If water emerges from the drill hole
     - Switch off DCT to protect the filters

Removing the coupling sleeve

1. Make sure the rotation and feed levers are in NEUTRAL position.

   Note

   Note

   If the coupling sleeve is loosened, air will blow out of it.

2. Hold the percussion mechanism lever in PERCUSSION MECHANISM position for a few seconds until the coupling sleeve has come loose and then move the lever to NEUTRAL position.

3. Make sure that the switch for dust collector and flushing air is in ZERO position.

Rod adding

WARNING

- **Danger of accidental operation**
- **May cause serious personal injury and damage to property**
- **The operator must always control of the rig and the remote control box**
- **Always check that the controls are correctly adjusted before operating**
- **Always deactivate the remote control box when not in use**
- **The rock drill must never be moving during rod adding**

Rod adding takes place manually.

Rod adding with RHS

WARNING

- **Crushing hazard**
- **Danger of rotating parts**
- **Do not stay in the vicinity if the rod grippers**

1. Close the upper drill steel support in order to lock the sleeve.
2. Unthread the shank adapter from the sleeve by setting the rotation lever in ROTATION position and the feed lever in RETURN FEED position.
3. When the shank adapter is unthreaded, the levers for feed and rotation are set in NEUTRAL position.

4. Move the rock drill up by setting the lever for rapid feed in UP position. Once the rock drill has reached its upper position, set the lever in NEUTRAL position.

5. Move in a new drill steel from the carousel to drill centre by moving the control lever for rod handling backwards. If there is no drill steel in the rod grippers then the carousel must first be rotated.

6. Thread the shank adapter fully into the new drill steel by setting the rotation lever in DRILL ROTATION position. Following which, reset the lever to NEUTRAL position.

7. Move rod handling lever to centre position. The rod grippers then adopt loose grip with a lower gripping force that allows the drill steel to rotate in the grippers.

8. Thread the new drill steel into the drill string by setting the rotation lever in DRILL ROTATION position. Following which, reset the lever to NEUTRAL position.

9. Open the gripper by holding the top button depressed and then moving the arm into the carousel by moving the rod handling lever to forward. Hold the button depressed throughout the whole action.

10. If necessary, rotate a new drill steel into the rod gripper.

11. Open both drill steel supports before the drilling is resumed.

12. Raise the cradle approx. 100mm by moving the feed lever to RETURN FEED position.

13. Set the switch for percussion pressure to REDUCED PERCUSSION PRESSURE/DRILL FEED PRESSURE position.

14. Set the switch for dust collector and flushing air to DUST COLLECTOR ON/ FLUSHING AIR ON position.

15. Set the lever for rotation in DRILL ROTATION position.

16. Set the lever for feed to DRILL FEED.

17. Set the lever for percussion mechanism in PERCUSSION MECHANISM position.

18. When the coupling sleeve has passed the drill steel support it must be closed. Set the lever for drill steel support in CLOSED position.

19. Set the switch for percussion pressure in AUTOMATIC REGULATION OF PERCUSSION PRESSURE position.

Continued drilling

1. Raise the cradle approx. 100mm by moving the Rotation/Feed lever to RETURN FEED position.

2. Percussion pressure must be low when starting drilling. Prepare by setting the switch for percussion pressure to REDUCED PERCUSSION PRESSURE position.

3. Set the DCT selector to DUST COLLECTOR+FLUSHING AIR position.

4. Move the Rotation/Feed lever to DRILL ROTATION position.

5. Move the Rotation/Feed lever to DRILL FEED position.

6. Start percussion by moving the percussion mechanism lever to PERCUSSION MECHANISM position.

   Drilling now starts.

7. Once the coupling sleeve has passed the drill steel support it must be closed in order to obtain better control of the drill string. Move the drill steel support lever to CLOSED position.

8. Normalise percussion pressure by setting the percussion pressure switch in AUTOMATIC REGULATION OF PERCUSSION PRESSURE position.

Drill until the coupling sleeve reaches the drill steel support and repeat the procedure with removing, jointing and continued drilling until you have reached the desired hole depth.

Unthreading and extracting

Knock loose the joints before extraction.

1. Open the drill steel support fully by moving the drill steel support lever to OPEN position.

2. Pull up the drill string until the sleeve is in the drill steel support by holding the rapid feed lever in UP position.

3. Close the drill steel support by moving the drill steel support lever to CLOSED position.

4. Unscrew the shank adapter from the upper coupling sleeve by holding the rotation lever in BACKWARD ROTATION position.

5. Raise the rock drill about 10cm by holding the rapid feed lever in UP position.

6. Unscrew the rod and put it to one side.

7. Lower the rock drill by holding the rapid feed lever in the DOWN position and then thread the shank adapter into the coupling sleeve that is fastened in the drill steel support by holding the rotation lever in DRILL ROTATION position.

Continue from step 1 until the drill string has been extracted.

Unthreading and extracting with RHS

Knock loose the joints before extraction.

1. Open both drill steel supports with their respective push buttons.

2. Set the switch for dust collector and flushing air in FLUSHING AIR ON position. If air blows out from the coupling sleeve then the thread has loosened.

3. Rapid feed up until the sleeve has reached the upper drill steel support by holding the lever for rapid feed in UP position.

4. Set the lever for rapid feed in NEUTRAL position and close both drill steel supports with their respective push buttons.

5. Hold the top contact on the control lever for rod handling pressed in so that the grippers open, and then move the lever backwards so that the gripper arm reaches drill centre. Grip the drill steel firmly with the rod grippers.

   If a steel is already in the grippers then the carousel must first be rotated clockwise to the next empty position.

6. Tighten the joint between the shank adapter and the upper rod slightly by holding the rotation lever in DRILL ROTATION position for a few brief intervals.

7. Move the rod handling lever to neutral position. The rod grippers then adopt guide position with a lower gripping force that allows the drill steel to rotate in the grippers.

8. Unscrew the drill steel fully from the sleeve in the drill steel support by holding the rotation lever in BACKWARD ROTATION position.

9. Rapid feed backwards until the rock drill stops at the correct height for the drill steel to be moved into the carousel from drill centre by holding the lever for rapid feed in UP position.

10. Reactivate hard grip on the rod grippers by moving the rod handling lever backwards.

11. If drill steel with loose sleeves is used and the rig is equipped with sleeve retainer (optional equipment), it must be closed now.

12. Unscrew the shank adapter fully from the drill steel. Hold the rotation lever in BACKWARD ROTATION position. Move the lever back to NEUTRAL once the shank adapter has been unthreaded.

13. If a sleeve retainer is in use then it must now be opened.

14. Reposition the drill steel from drill centre to the carousel by moving the rod handling lever forwards.

15. Rotate the carousel so that an empty position in the carousel is ready for the next drill steel by quickly moving the rod handling lever to the left. Following which, set the lever in neutral position.

16. Rapid feed down until the shank adapter stops directly above the sleeve in the drill steel support by holding the lever for rapid feed in DOWN position. Following which, set the lever in NEUTRAL position.

17. Thread the shank adapter into the sleeve by simultaneously holding the feed lever in DRILL FEED position, and the rotation lever in DRILL ROTATION position. When the shank adapter is threaded in the levers are set in NEUTRAL position.

18. Repeat steps 1 - 16 until only one drill steel remains.

Note

Observe caution when the drill bit is extracted from the hole so that it is not drawn through the drill gasket.

Changing drill bit

WARNING

- **Moving parts**
- **Risk of personal injury, clothing can be trapped**
- **Stop rock drill rotation when changing bits**

N.B.

Never start percussion with the drill bit free without any resistance.

1. Operate the feeder until the spike is approx. 10 cm from the rock.

2. Make sure that the rotation lever is in neutral.

3. Move the drill bit forward until it is pressed against the rock.
4. Switch on high percussion pressure for several seconds.
5. Switch off percussion pressure when the drill bit has loosened. If the percussion pressure is engaged for too long then the drill steel can detach from the shank adapter.
6. Unscrew the old drill bit by hand and replace with a new one.

Action in case of drilling problems

Drilling problems

If the following trouble occurs during drilling:

- Hot coupling sleeves (loose coupling sleeves).
- Difficulties in uncoupling the coupling sleeves.
- Hole deflections

High coupling sleeve temperature

Note

Coupling sleeve temperature must not exceed 120 ºC (248 ºF).

1. Excessive coupling sleeve temperature is indicated by:
   a. Measuring with a thermometer
   b. Oil dripping from the rock drill vaporises on the coupling sleeve
   c. The coupling sleeve changes colour
2. Depending on the layers of the rock, temperature can vary even within a small area. High coupling sleeve temperature is usually due to a poor relationship between drill feed pressure, percussion pressure and rotation pressure. The following solutions are recommended to reduce coupling sleeve temperature.
   a. Check the condition of the drill bit; an overdrilled bit gives less torque in the coupling sleeve.

      Grind the drill bit.
   b. Change to a drill bit with ballistic buttons.
   c. If the rock is too hard for ballistic bits, then...

reduce rotation speed as much as possible without causing the drill string to rotate jerkily

check the drill feed pressure and set it to the recommended value.

Reduce percussion pressure to below the basic setting (5-10 bar). A reasonable reduction in penetration rate must be accepted.

d. Check and/or adjust damper pressure so that the shank adapter is in "float position".

Difficulties in loosening the coupling sleeve

The best method of loosening the coupling sleeve is to "drill" the last few centimetres without feed pressure and rotation, leaving percussion active for a few seconds to break loose the coupling sleeve.

- Make sure the RPC-F system is set correctly. An RPC-F system that is set too high causes excessive torque in the coupling sleeve.

Hole deflection

1. Try to drill with as low a drill feed pressure as possible.
2. Check the condition of the drill bit.
3. Use TAC pipes, drop centre bits.
4. Only use flushing air and rotation during overload.
5. Drill the first drill steel with reduced drilling for at least half of the drill steel in order to minimise hole deflection at the start of the hole.

8. Options

Thread lubrication

Thread lubrication with brushes

Function

Drill steel threads are lubricated using two brushes (C) mounted on the RHS carousel lower bracket.

Grease comes from a pump (B) located in a grease container (A) at the rear on the right-hand side of the rig. The pump is driven by compressed air from the drill rig's compressor.

The pump can be activated manually or automatically.

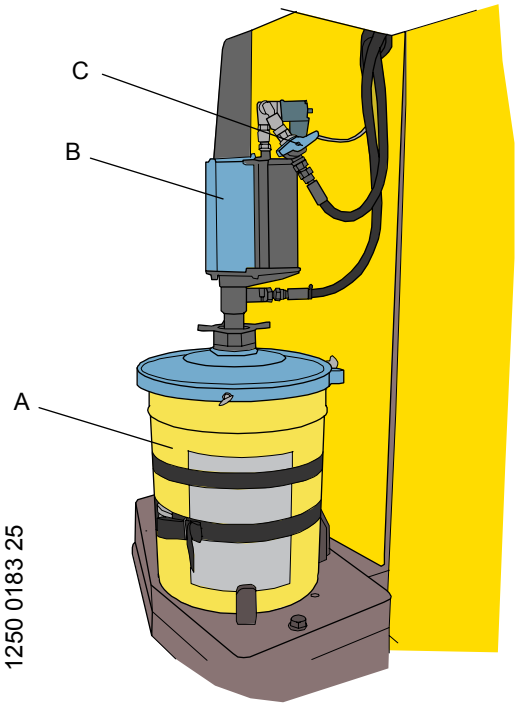


Figure: Thread lubrication system.

A Grease tank.
B Pump.
C Cock.

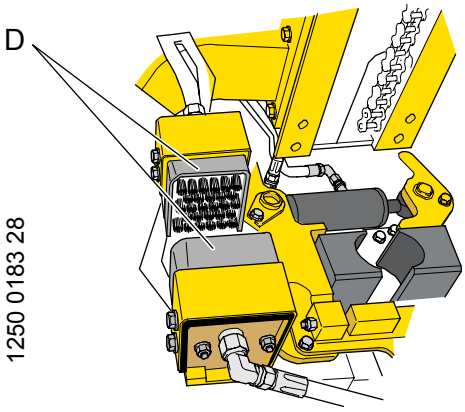


Figure: Brushes for thread lubrication.

Operation

During normal use, the system will operate automatically. The grease pump will then operate when the rod handling lever is in position to move a rod to the drill centre. This means that each time a rod is moved out from the carousel, a certain amount of grease will be pumped to the brushes that the rod threads subsequently pass.

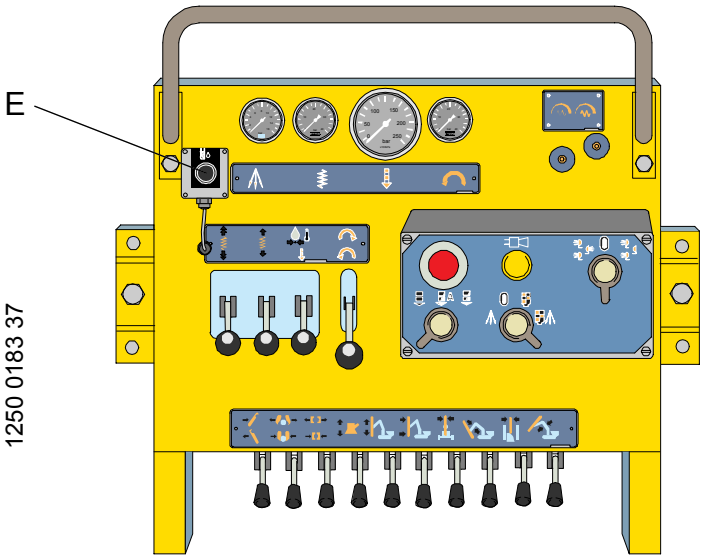


Figure: Front control panel

If it is necessary to pump more grease to the brushes, the system can be operated manually. The grease pump will then be active as long as the button (E) on the front control panel is held depressed.

Adjusting

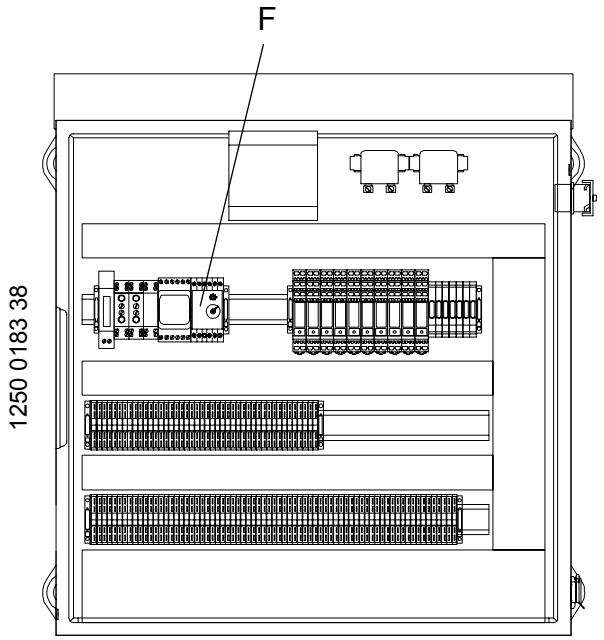


Figure: Electric cabinet

Adjust the quantity of grease pumped out using a relay (F) in the electrical cabinet.

Basic setting: position B, time interval 1-10 seconds, pulse time 3 seconds. Increase the pulse time to increase the quantity of grease.

The entire system can be turned off by stopping the supply of air with the cock (C).

We recommend using Atlas Copco Secoroc thread grease A for lubrication of drill steel threads.

Hole Quality System HQS 9

General

HQS 9 is a system for measuring drill hole bearing. The system comprises:

- Control box with fitted rotating sight. The left-hand display on the control box shows the drill angle in the sight line and the right-hand display shows the drill angle across the sight line.
- Mounting bracket
- Power supply cable

Specification

Power supply	12V - 28V DC
Current usage	0.04A
Operating temperature	-20 - +50 °C
Enclosing	IP65
Angle measurement:	
Measurement range	2 * 20°
Measurement accuracy	0.5°

Assembly and basic setting

Fit the instrument on the feeder so that it is easy to read the two displays and adjust the sight. The brown cable connects to the drill rig's electrical system. Use a 1A fuse. The white cable connects to ground.

Before connecting the instrument to the power supply, the instrument must be in setup mode. This is reached by pressing the accompanying magnet towards the SE mark on the left-hand side of the front panel. Following which, the power supply can be connected.

When the left-hand display shows "SE 1", the instrument is in configuration mode. There are two different configuration modes, "SE 1" and "SE 2". Switch between "SE 1" and "SE 2" by pressing the magnet towards the SE mark. The right-hand display shows the selected values. Switch values by pressing the magnet towards the // mark.

The first configuration mode, "SE 1", specifies the direction of the control box in relation to the drill rig.

Table: Meaning of the values shown in the right-hand display in configuration mode "SE 1"

Value	Meaning
1	Front of the box forward
2	Front of the box to the right
3	Front of the box forward
4	Front of the box to the left

The instrument's resolution is specified in configuration mode "SE 2".

When the desired values are set the power supply is switched off for 5 seconds. Following which, the instrument starts in normal mode.

Align the boom straight forward. Then turn the sight so that it is parallel to the boom and drill rig. Reset the instrument by pressing the magnet to the // mark until both displays are blank.

Instrument is now ready for use.

Application

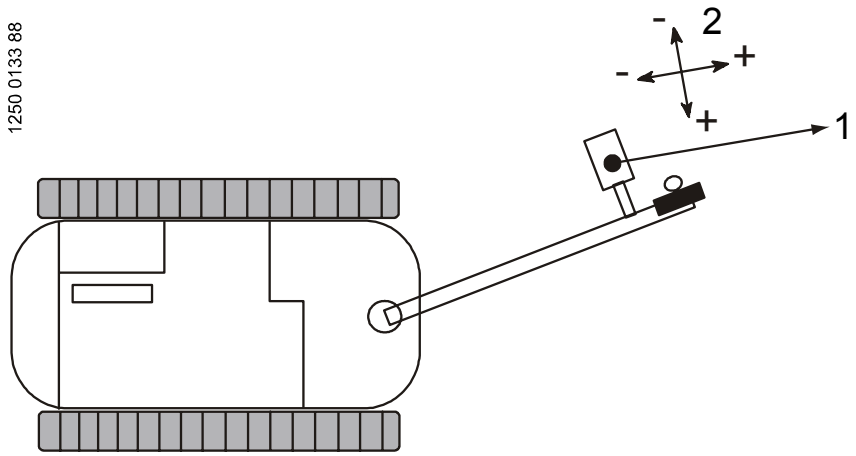


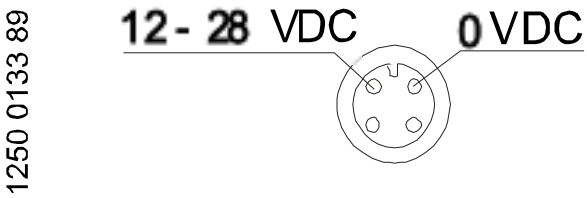
Figure:

1 Line of sight
2 Drilling angles that are shown

- Set up drill rig for drilling with the feeder approximately aligned.
- Adjust the sight so that it points in the drilling direction. Aim at an object as far away as possible that is easy to remember. The displays now show all drilling angles in relation to the line of sight.
- Adjust the feeder so that it is positioned in the right drilling angles.
- Bore.

Diagnostics

Table:

FAULT	ACTION
No angles are indicated and there is no lighting in the displays	Check the voltage between 0 VCD and 12-28 VCD on the power supply cable's connection to the instrument. The voltage should be 12 to 28 V.  If there is no voltage, check the fuse, the cable and the drill rig's electrical system. If there is voltage, replace the instrument.
The displays show no signs or irrelevant signs and the lighting is switched on.	Restart the instrument by disconnecting the power supply for 30 seconds. If the instrument still does not work, replace the instrument.

ROC-ANGIE

General

ROC-ANGIE measures forward/rearward and right/left angles from the feeder's vertical position.

If straight vertical holes are drilled then it is unnecessary to aim ROC-ANGIE.

The drill rig can stand in any direction at all relative to the bench if ROC-ANGIE is correctly aimed.

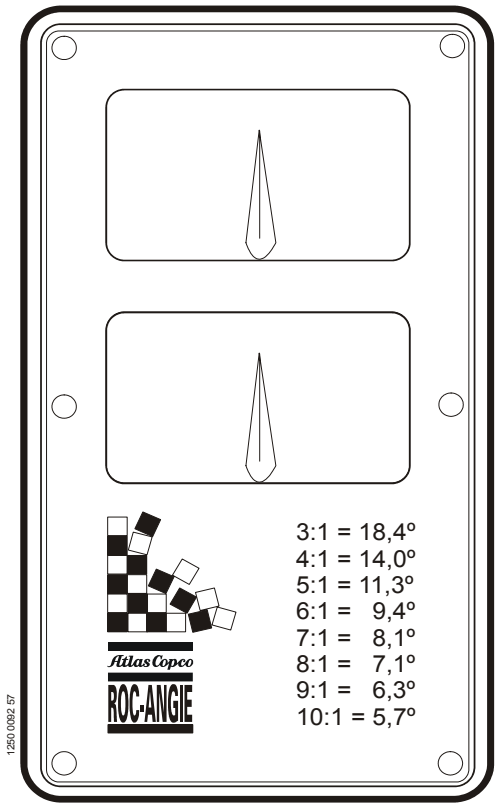


Figure: ROC-ANGIE

What is aiming?

If it were possible to align the drill rig in the same direction for each new hole it would not be necessary to aim ROC-ANGIE. For the drill operator to be able to adjust the forward/rearward and left/right angle in exactly the same way at all holes is however difficult, even with a compass and especially on the top face of the stope.

The solution to this problem is simple. Instead of aiming the entire drill rig in a special direction at each hole, ROC-ANGIE can be turned round a vertical axis and aligned in the desired direction.

Is a compass needed? Not if you can find an object at a distance of a hundred metres to use as an aiming point. You can use a tree, a telegraph pole or similar. The further away it is the better.

If you cannot find an aiming point you can use a compass or make your own aiming point with a pole or the like. If you use a compass, remember that the steel in the drill rig can affect the compass needle.

It is extremely important to aim ROC-ANGIE in the blasting direction or parallel with the direction of the drill hole. If ROC-ANGIE is aimed, the angles shown in the receiver are always relative to the aiming point, not to the drill rig.

Preparations for assembly

1. Set the feed in a vertical position with the aid of a spirit level. Adjust forward/rearward for a precise vertical reading.
2. Adjust left/right for a precise vertical reading.
3. Check that both left/right and forward/rearward are still vertical.

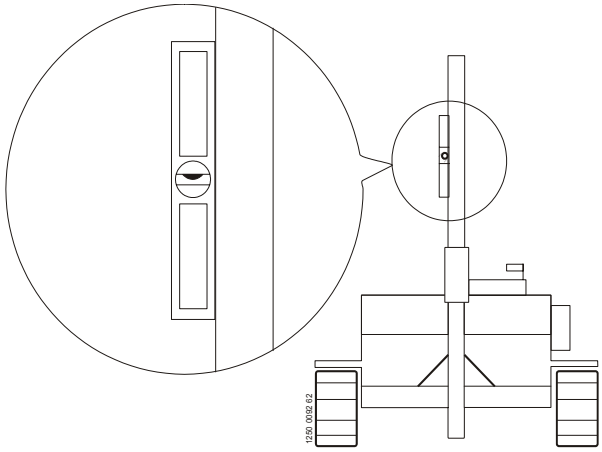


Figure:

Assembly

1. Mount the retaining yoke/bracket or welded beam on the feeder at such a height that the receiver is easy to read. To facilitate matters, mount ROC-ANGIE on the same side as the drill operator.
2. Position ROC-ANGIE in the retaining yoke and tighten the bolts. If everything is correct, both scales should now show 0° even if ROC-ANGIE is rotated round its own axis. If this is not the case, proceed to the "adjustment" section.

Conditions

The feed must be in a precisely vertical position, both left/right and forward/rearward. See the "assembly" section.

Adjust ROC-ANGIE to a zero reading

1. Loosen and retighten all bolts by hand. Look at the upper scale and adjust (a) the left/right bolts to an exact zero reading on the (b) upper scale. Tighten the left/ right bolts by hand.

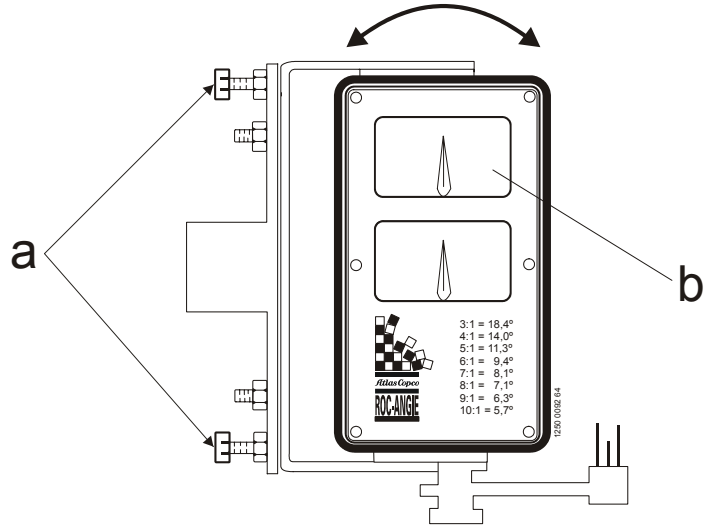


Figure:

2. Look at the (b) lower scale and adjust ROC-ANGIE forward/rearward to an exact zero reading. Tighten the (a) forward/rearward bolts by hand. Check left/right, forward/rearward once again and adjust as necessary. Tighten all bolts using a torque wrench.

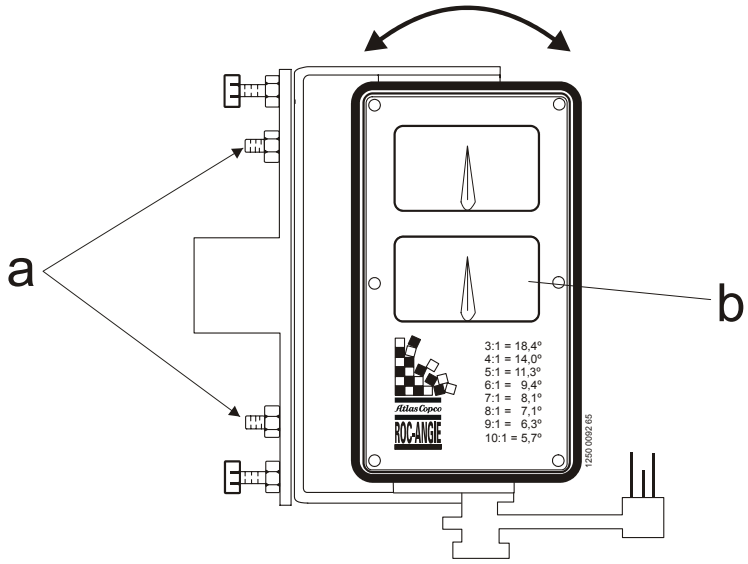


Figure:

Note

Perform a final check by rotating ROC-ANGIE around its own axis while observing the two scales - they should show 0° in all directions.

Installation

1. Choose an aiming point (the further away, the better).
2. Loosen the handle on the top of ROC-ANGIE.
3. Look through the aim and turn ROC-ANGIE around until the centre arrow in the aim is exactly in the middle of the tree and between the two outer arrows. If necessary, adjust the aim or move it to the other side by undoing the knob at the bottom of ROC-ANGIE.

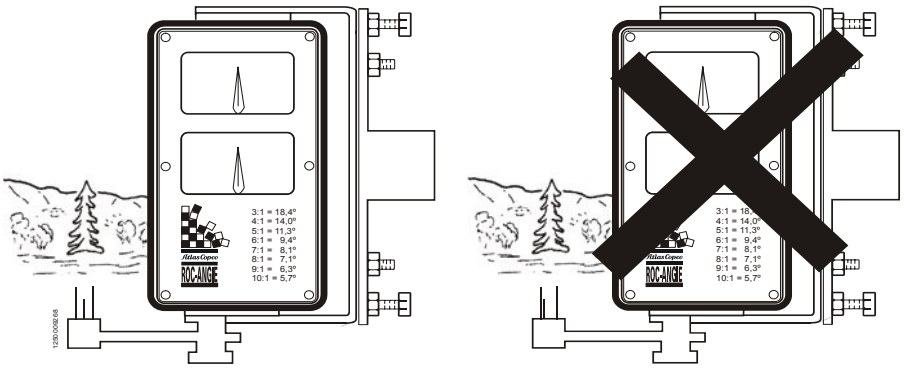


Figure:

4. Lock the handle.
5. Adjust the feeder to the correct angle.
6. Start drilling.

Aiming examples

Two different ways of aiming ROC-ANGIE are described below. In the first example the aiming point is in line with the blasting direction.

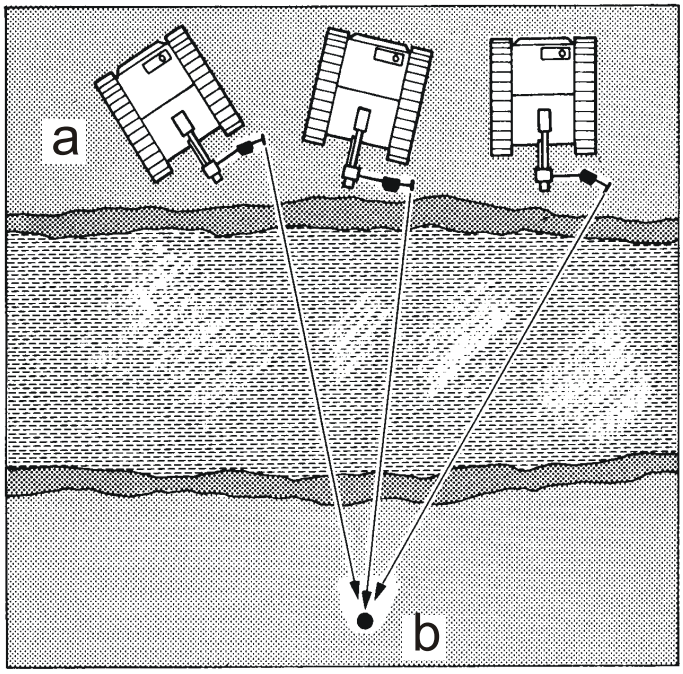


Figure: Example 1

a Bench
b Reference Point

In the second example the aiming point is parallel with the bench. Which method to use? That will often depend on the nature of the terrain and the distance to the aiming point.

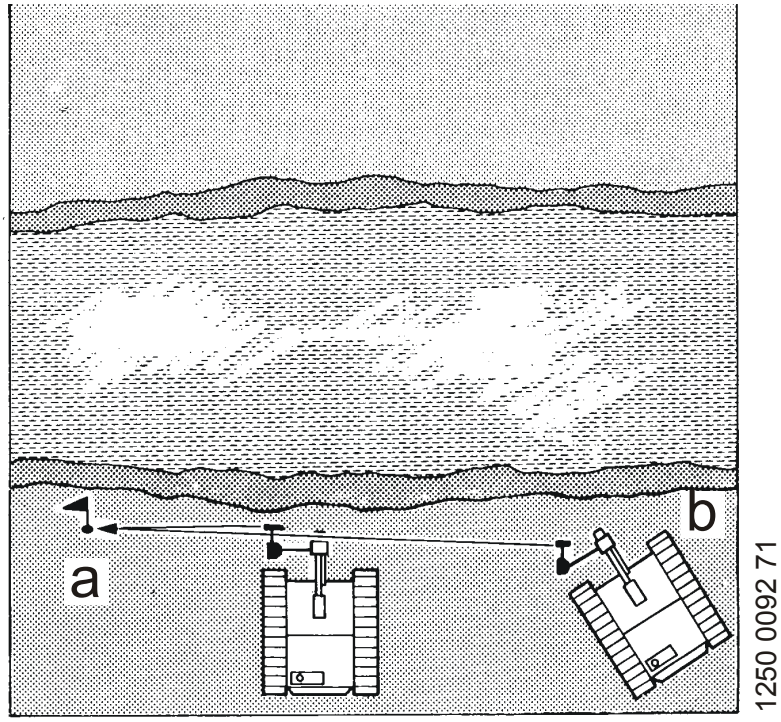


Figure: Example 2

a Stick in drill hole
b Bench

Note

The aiming point should be at a distance of at least 100 m.

Technical data

Measurement range	20°
Precision	9.2°
Weight, including bracket	5.0 kg
Dimensions:	
Width	130 mm
Height	230 mm
Depth	105 mm
Temperature range	-50 °C to 70 °C
Enclosing	IP 65 standard

Electric filler pump

Electric pump for filling fuel

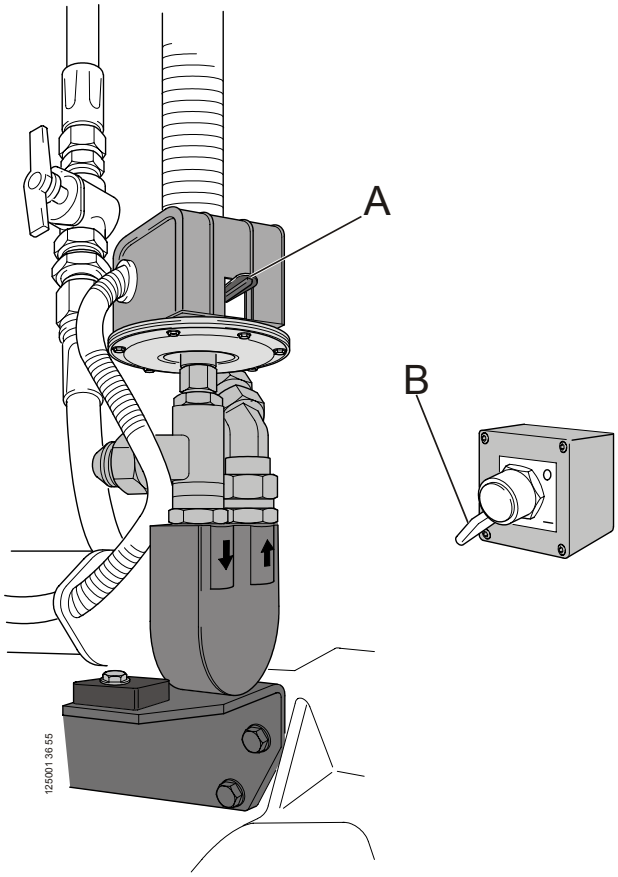


Figure: Electric filler pump

The pump is used to fill fuel.

1. Make sure that the hose and the filter are clean.
2. Connect the attached hose to the fuel source.
3. Move switch (B) to position 1.
4. Activate switch (A) to start filling.

The electric filler pump will stop automatically when the drill rig fuel tank is full. It will also stop if the source of fuel runs out.