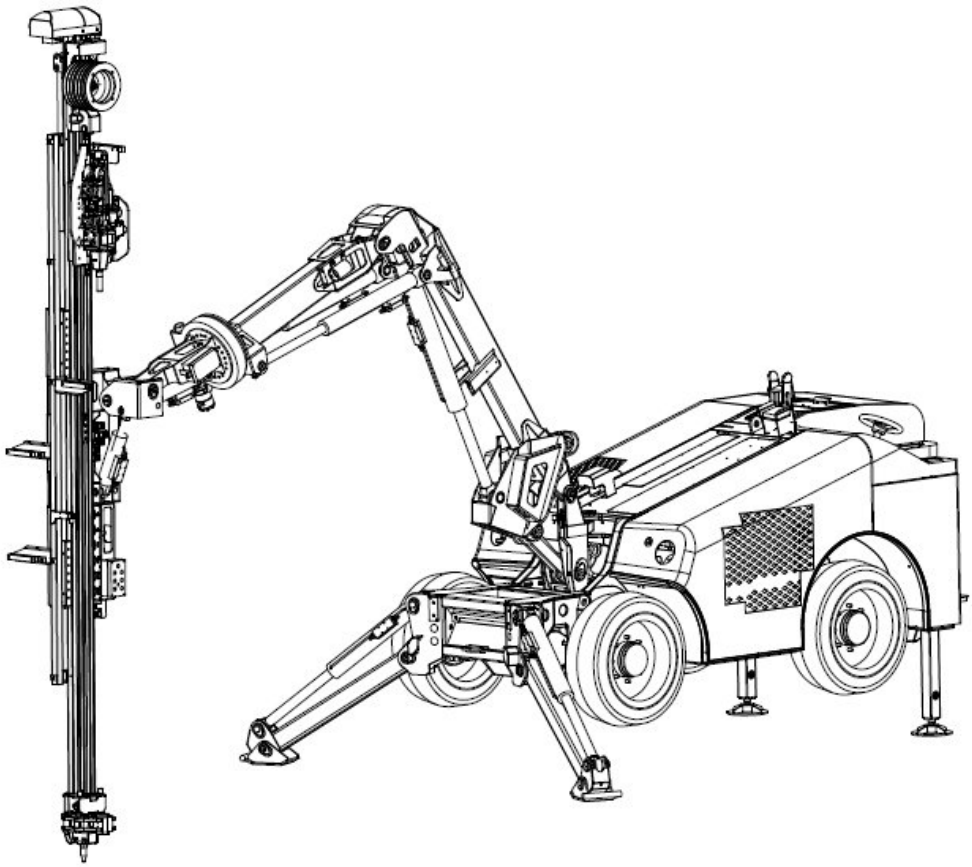
Atlas Copco

FlexiROC T20 R

Operator's instructions



PM No. 9852 2467 01a

SAFETY INSTRUCTIONS

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

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

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.

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

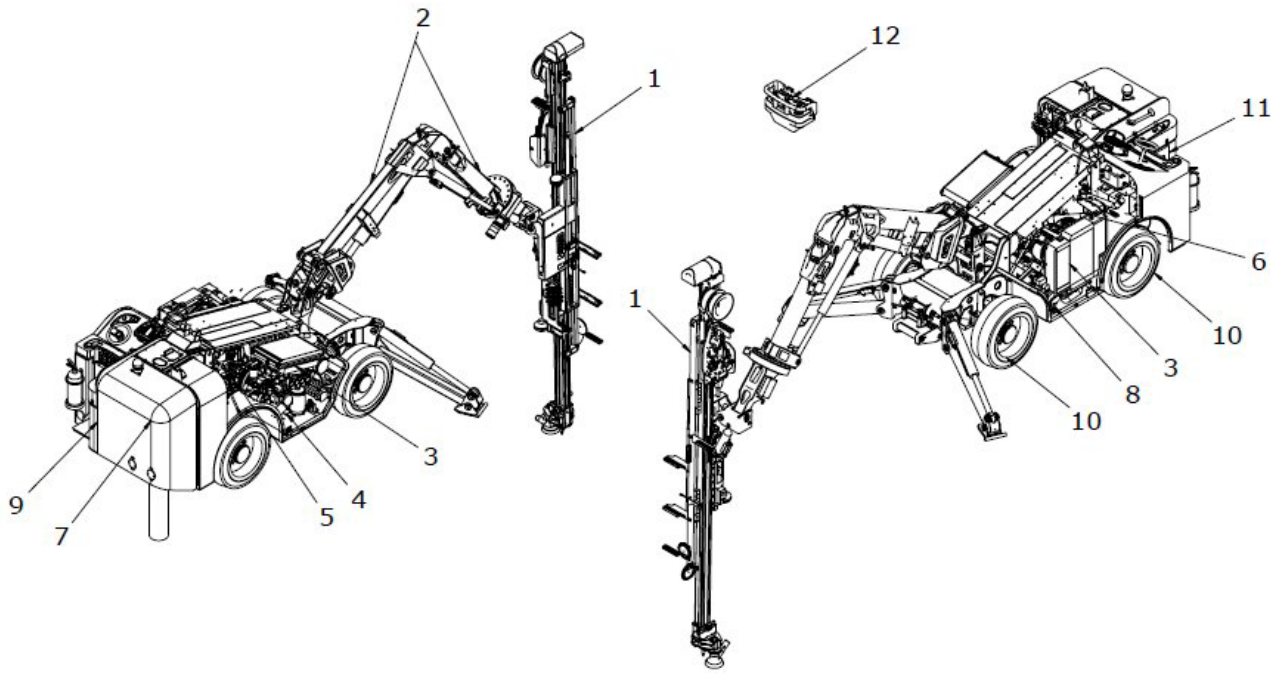


Figure: Principal components

1	Feeder	7	Dust collector (DCT)
2	Boom system	8	Compressor
3	Radiator	9	Radio receiver
4	Hydraulic oil pumps	10	Wheels
5	Diesel engine	11	Electric cabinet
6	Air tank	12	Remote control box

General system description

General description of the drill rig

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

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

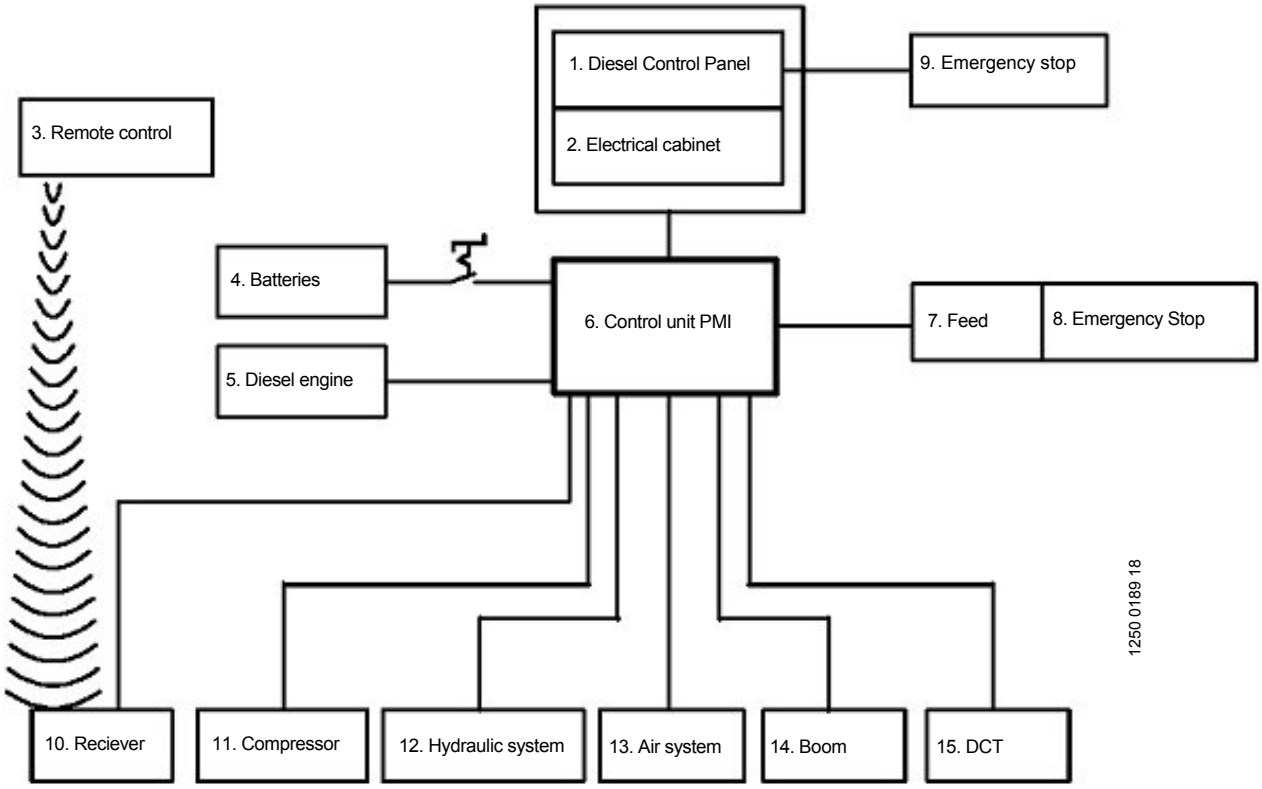


Figure: General Description

Table:

1	Control panel for diesel engine	9	Emergency stop
2	Electric cabinet (A1)	10	Receiver
3	Remote control box	11	Compressor
4	Batteries	12	Hydraulic systems
5	Diesel engine	13	Air system
6	Control unit PMI	14	Boom
7	Feeder	15	Dust collector (DCT)
8	Emergency stop cable		

Wheeled chassis frame

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

The 4 wheels are driven by two steering axles with integrated brake.

The body covers the diesel engine, the compressor, the different lubrication tanks, the valves and the hydraulic hoses. Inspection hatches facilitate access to the different machine components. All the hatches lock in the open
position with a pneumatic spring.

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 shut-down functions.

The drilling carriage is driven by 2 steering axles connected to each other by a universal joint and powered by a hydraulic motor.

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 lighting, 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 principal components of the hydraulic system comprise oil cooler, hydraulic oil tank, valves, hoses and four hydraulic pumps.

The four hydraulic pumps create hydraulic pressure in order to control the different functions. The table below indicates which hydraulic pump controls which function.

Table: Description of hydraulic pump function

Pump No.	Description
1	All movements and percussion
2	Carriage translation
3	DCT, cooling fan

The hydraulic oil tank is located in the centre of the drilling carriage.

The radiator on the right side of the drilling carriage cools the water of the engine, the intercooler and the oil compressor. The radiator on the left side cools the hydraulic oil.

Hydraulic pumps

Hydraulic pump 1

Main hydraulic system pump 1 is a variable-displacement piston type and provides hydraulic power to the following functions.

- All movements
- Percussion

Hydraulic pump 2

Hydraulic pump 2 is a variable-displacement, closed-circuit hydrostatic type and provides oil to translation.

Hydraulic pump 3

Hydraulic pump 3 is a gear type mounted on the engine distribution and provides oil to the extractor and cooling fan.

Table: Hydraulic pump output (2500 rpm)

Pump no.	CC	Flow (litres/min.)	Pressure (bar, max)
1	60	139	310
2	42	97	420
3	23	49	190

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 supplies air for flushing in the bore hole, cleaning of the dust collector filter and the rock drill lubrication system and ECL.

2. Technical data

FlexiROC T20 R

Weight (standard equipment without drill steel)

FlexiROC T20 R	
Weight	5650 kg

Performance

Diesel engine, Cummins QSB3.3	
power output at 2400 rpm/min	82 kW 110 HP
Temperature range in operation	-25° C +40° C
Tramming speed, max.	10 Kmh
Traction force (low/high gear)	59 kN
Ground clearance	220 mm
Max. hydraulic pressure	290 bar
Noise Level	
Max. engine speed (2500 giri/min.)	117 dB
Drilling (2500 giri/min.)	124,5 dB

Tilt angles

Note

Stability is specified with respect to CE standards stipulating that rigs must not be operated on inclines steeper than 20 degrees without the use of a winch.
ANGLES MUST NOT BE COMBINED!

Tilt angles for drill rig when drilling:	
longitudinally, max. (Downward/Upward)	20°
lateral (left/right).	15°
laterally, (left/right), in extreme positions.	15°
Tilt angles - tramming (in direction):	
downward/upward, max. without winch	20°
laterally, max. (Left/Right)	15°
downward/upward, with winch	>20° - < 30°

Hydraulic systems

Hydraulic oil cooler for max. ambient temperature	40° C

Electrical system

Voltage	24V
Batteries	
Voltage	2 x 12 V/100 Ah
Front working floodlights	
Voltage	2 x 70 W
Rear working floodlights	
Voltage	2 x 60 W
Column working floodlights	
Voltage	2 x 70 W
Generator	
Voltage	24 V/55 Ah

Air system

Compressor: Garden Denver E6 Plus	
Max. air pressure	12 bar
Free air delivery	50 l/s

Capacities

Hydraulic oil reservoir	
min/max level	50 / 60 l
Hydraulic systems	
total	120 l
Fuel tank	140 l
Compressor oil	9 l
Lubricating oil tank	6 l
Diesel engine oil	8,5 l
Engine cooling system	15 l

Miscellaneous

Fire extinguisher	
A-B-C powder	1 x 6Kg
Tire pressure	5,2 bar

Dimensions

Dimensions

Transport dimensions

Length	Width	Height
5600 mm	1900 mm	2450 mm

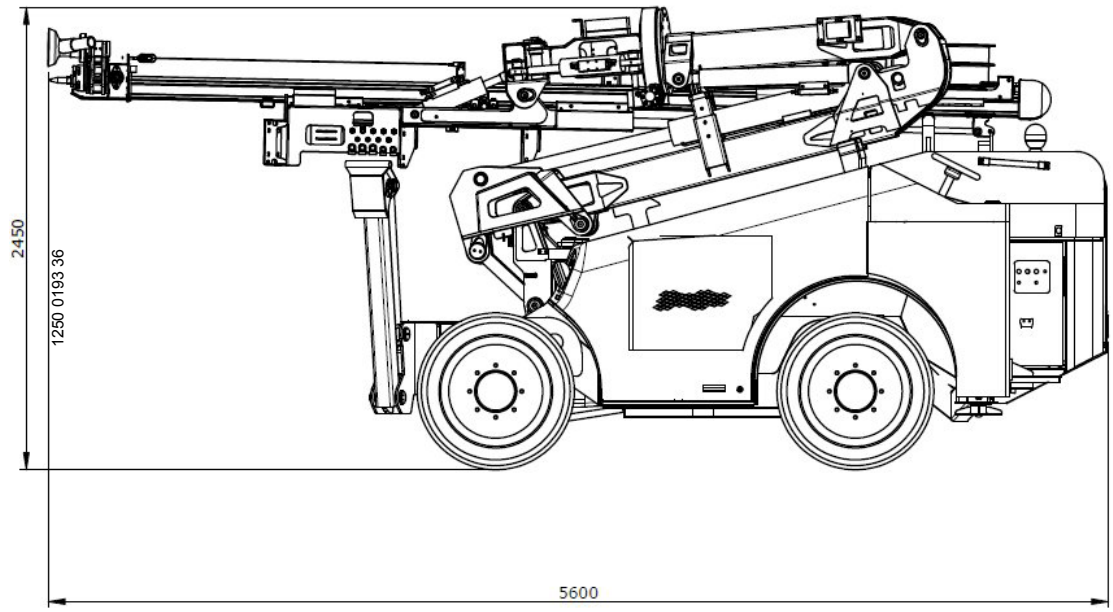


Figure: Transport dimensions

Coverage area

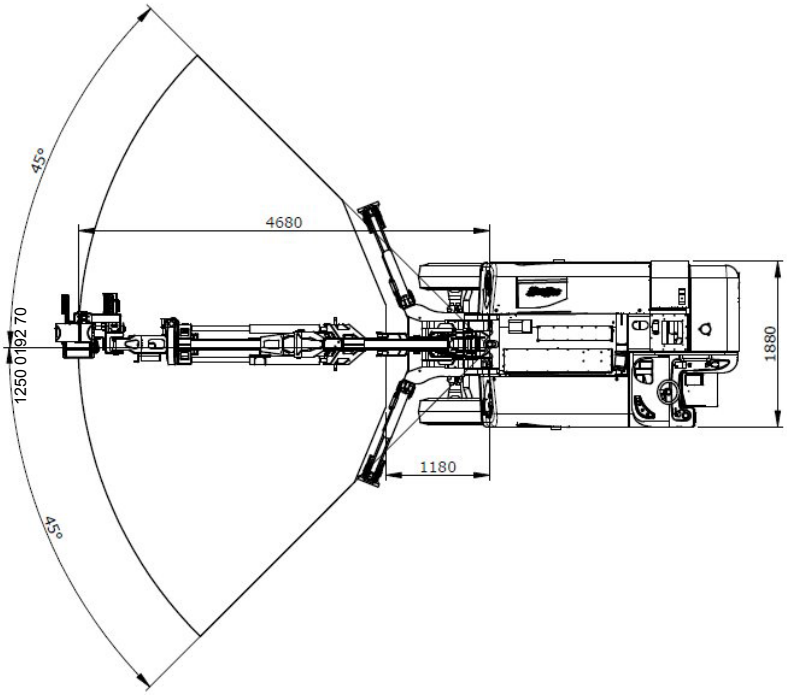


Figure: Coverage area

Danger zone

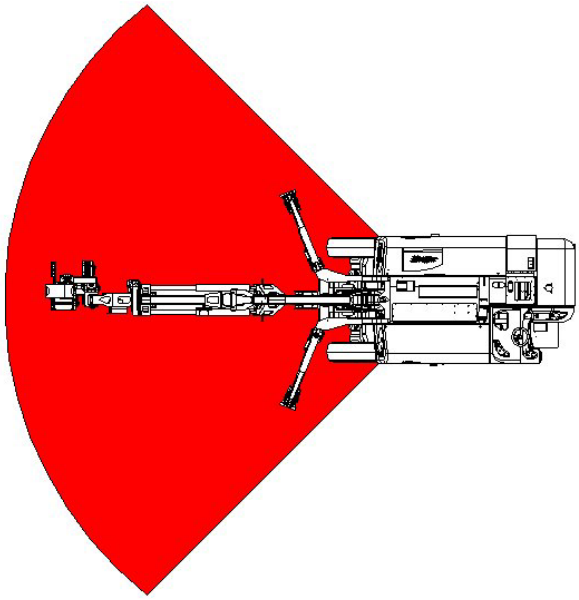


Figure: Danger zone

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 startup**
- **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).

Check points

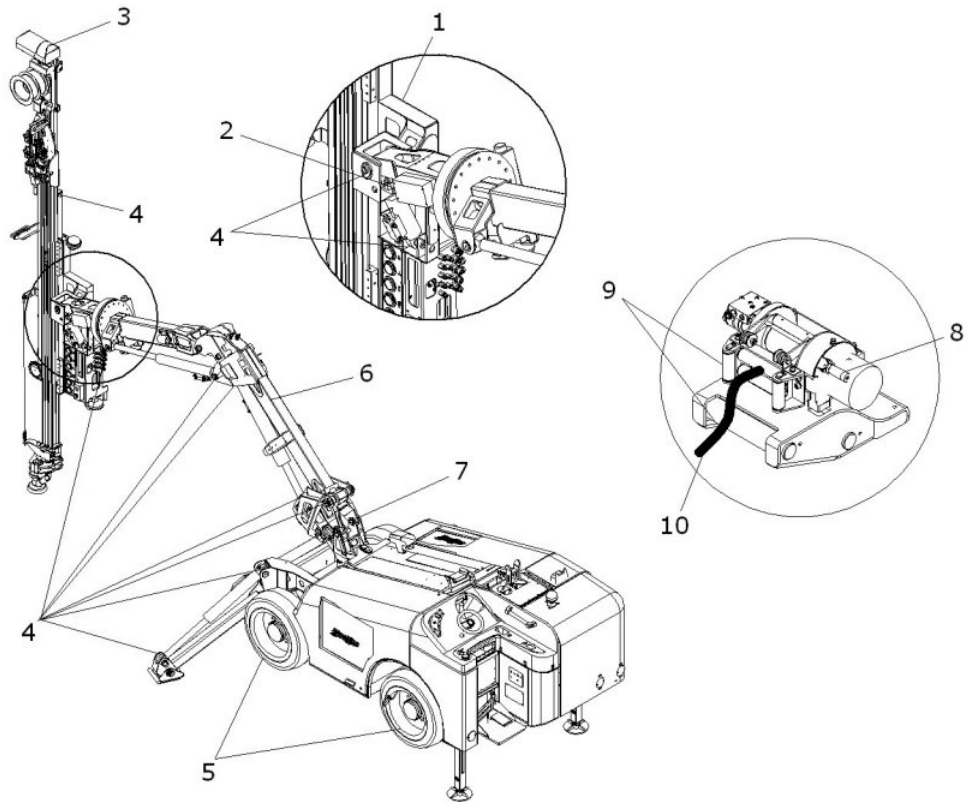


Figure: Check points

Table:

1	Feed holder with attachment	6	Boom
2	Boom head	7	Boom support
3	Feed motor	8	Release/engage mechanism
4	Cylinder brackets	9	Winch with brackets
5	Wheels	10	Winch wire rope with hook

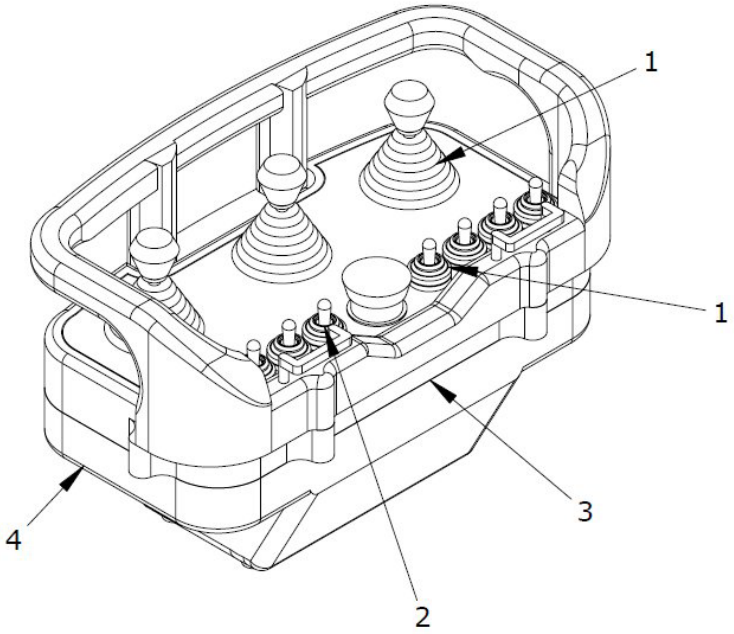


Figure: Remote control box

Table:

1	Rubber bellows on levers and switches	3	The joint between the upper and lower halves of the box must be well tightened.
2	Seals on switches and knobs	4	The box must not be cracked

Before starting

Safety

WARNING

- **Danger of moving parts**
- **Can cause serious injuries**
- **Set all levers and switches in NEUTRAL position before startup 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**

Checks

Table: Checks before starting.

Check point	Inspection	Instructions
Drill rig.	Visual check	Make sure there are no signs of leaks, damage, breakage or cracks.
Hydraulic oil	Oil level	Check oil level. Top up as necessary.
Lubrication oil	Oil level	Check oil level. Top up as necessary.
Motor oil	Oil level	Check oil level. Top up as necessary.
Compressor oil	Oil level	Check oil level. Top up as necessary.
Water separator	Fuel prefilter	Drain off the water

For further instructions, see: Maintenance instructions

Functionality test after start

Checks

Table: Checks after starting

Check point	Inspection	Instructions
Emergency stop	Function	Check that all emergency stops are working (see chapter Safety for location)
Rock drill	Rock drill hydraulic hoses	Make sure there is no abnormal vibration.
Rock drill	Visual check	Make sure the lubrication is in working order
Diesel panel	Visual check	Make sure there are no faults indicated
Dust collector (DCT)	Suction ability and filter cleaning	Check filters, suction hose and drill-steel support gasket
Hydraulic oil filter	Visual check	Make sure the hydraulic oil filter is not clogged
Hydraulic pressure	Visual check	Observe the pressure gauges to make sure no abnormal pressure arises

For further instructions, see: Maintenance instructions

Function test while drilling

Checks

Table: Checks during drilling

Check point	Inspection	Instructions
Rock drill hydraulic hoses	Abnormal vibration	Check the accumulators, for further instructions see "Maintenance instructions for rock drill".
Rock drill	Shank adapter	Make sure that oil trickles out between the front and the shank adapter.
Indicator lamps	Diesel panel	Make sure no faults are indicated. If a fault indication is shown, stop the drill rig and rectify the fault.
Dust collector (DCT)	Suction ability and filter cleaning	Check the filter in the filter holder and suction hose and also the drill-steel support's drill gasket.
Drill rig	Complete drill rig	Check for signs of leaks.
Pressure gauge	Pressure gauge panel	Check all the pressure gauges to see that the hydraulic pressure is normal. Call for a service technician if there are any deviations.

For further instructions, see: Maintenance instructions

4. Controls

Controls

General

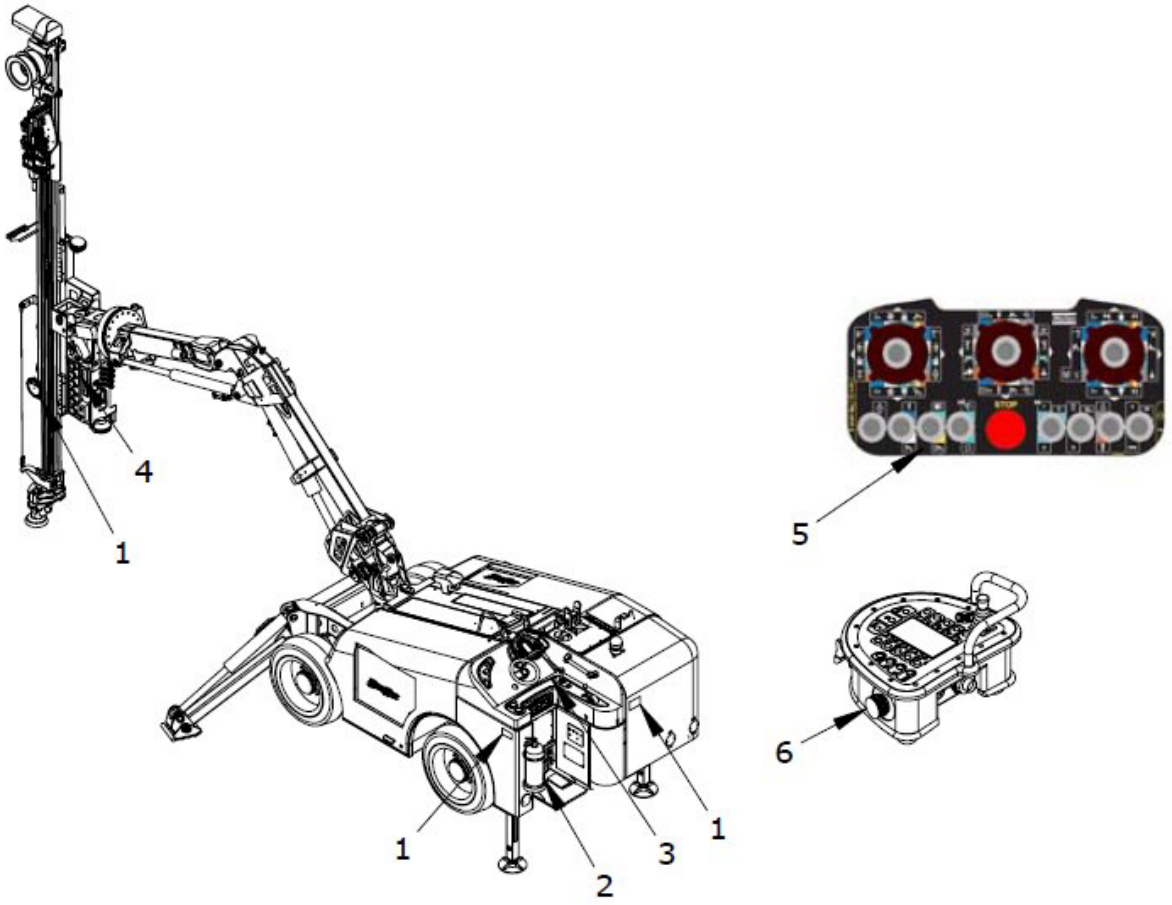


Figure: General drawing

1	Gradient meter
2	Fire extinguisher
3	Diesel panel
4	Pressure gauge panel
5	Remote control box
6	PMI

Remote control box

The machine has an onboard control called the PMI and a remote radio control.

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**
- **Always deactivate the remote control box when it is not in use**
- **Do not activate the remote control from the platform of the drilling carriage when using the winch.**

WARNING

- **When the remote control box is deactivated then no functions can be controlled**

Functions

Remote control

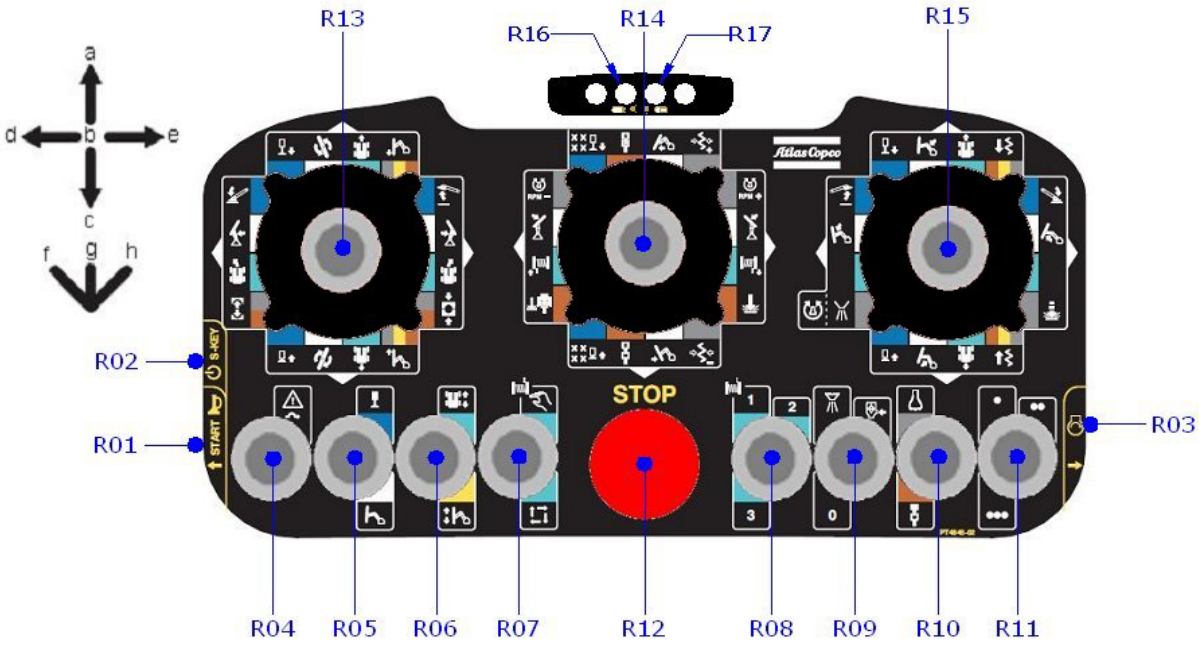


Figure: Remote control box.

The remote control has various working modes, which are:

Translation/Winch (blue)

Legs (orange)

Positioning (yellow)

Positioning (violet)

Rod change (green)

Drilling (white)

Table: Functions

R01	Activation of the remote control
	Horn
R02	Electronic key for activating remote control
R03	**Button** for starting/stopping the diesel engine
R04	**Button** man present

R05 Mode selector

a) Stabilizers (orange)

b) Neutral position

c) Positioning (yellow)

R06 Mode selector

a) Vehicle (blue)

b) Neutral position

c) Positioning (violet)

R07 Winch selector

a) winch in manual

b) winch off

c) winch in automatic

R08 Winch pulling force selector

a) high

b) medium

c) low

R09 Extractor/pump water flush selector (option)

a) Water flush active

b) Extractor active

c) Extractor/Water flush inactive

R10 Mode selector

a) manual drilling

b) Neutral position

c) Change rods (green)

R11 Selector for option

R12 **Button** emergency stop

R13 Multi-function lever

Stabilizer modes **(orange)**

a) left rear support leg lowered

c) left rear support leg raised

d) left front support leg lowered

e) left front support leg raised

Positioning mode **(yellow)**

a) left drilling slide thrust block rotation

c) right drilling slide thrust block rotation

d) left arm rotation

e) right arm rotation

Positioning mode **(violet)**

a) slide movement down

c) slide movement up

Vehicle mode **(blue)**

a) vehicle forwards

c) vehicle backwards

d) vehicle steering left

e) vehicle steering right

Change rods mode **(green)**

a) slide movement down

c) slide movement up

d) rod support open

e) rod support closed

Drilling mode **(white)**

a) slide movement down

c) slide movement up

d) rod support open

e) rod support closed

R14 Multi-function lever

Stabilizer modes **(orange)**

a) all support legs lowered

c) all support legs raised

Positioning mode **(yellow)**

a) slide inclination forwards

c) slide inclination backwards

d) slide inclination right

e) slide inclination left

Vehicle mode **(blue)**

a) differential lock
d) winch winding

e) winch unwinding

Change rods mode **(green)**

a) slide in rods

c) slide out rods

d) activate rotation and percussion

e) activate percussion

Drilling mode **(white)**

a) increase thrust pressure

c) decrease thrust pressure

d) decrease number of rod revolutions

e) increase number of rod revolutions

R15 Multi-function lever

Stabilizer modes **(orange)**

a) right rear support leg lowered

c) right rear support leg raised

d) right front support leg lowered

e) right front support leg raised

Positioning mode **(yellow)**

a) lower arm

c) raise arm

d) retract arm

e) extend arm

Positioning mode **(violet)**

a) move drill down

c) move drill up

Vehicle mode **(blue)**

a) vehicle forwards

c) vehicle backwards

Change rods mode **(green)**

a) move drill down

c) move drill up

Drilling mode **(white)**

a) move drill down

c) move drill up

d) activate rotation

One push activates flushing

Holding down for more than one second activates rotation and flushing

e) activate percussion

R16 Indicator lights

PMI

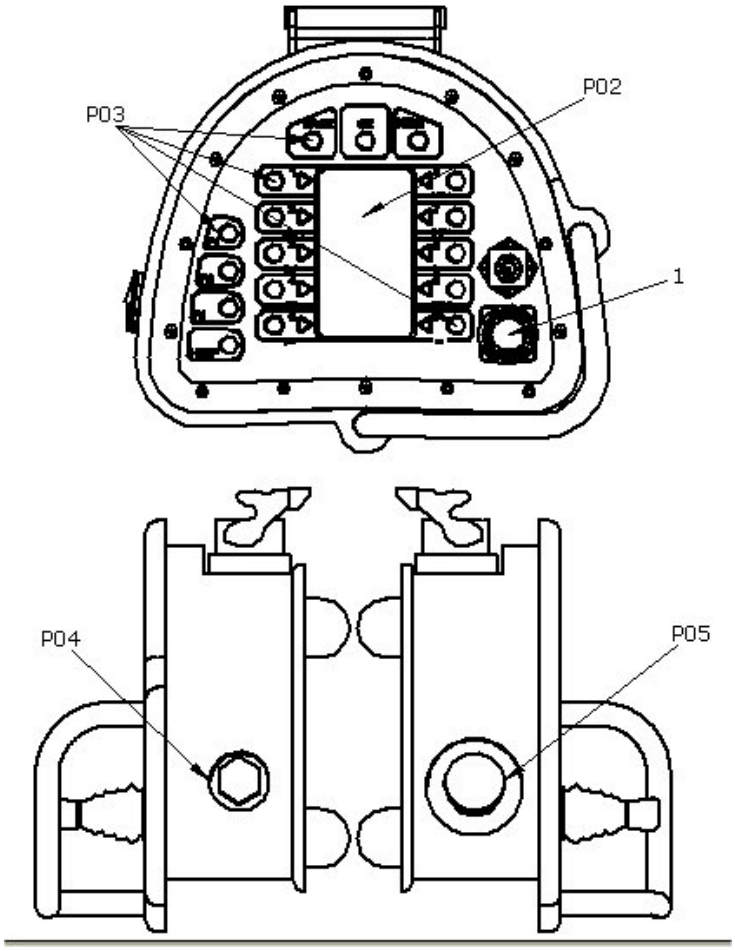


Figure: PMI

Table: Functions

P01	Multi-function lever
P02	Display
P03	Screen navigation keys
P04	Button enable emergency circuit
P05	Emergency stop

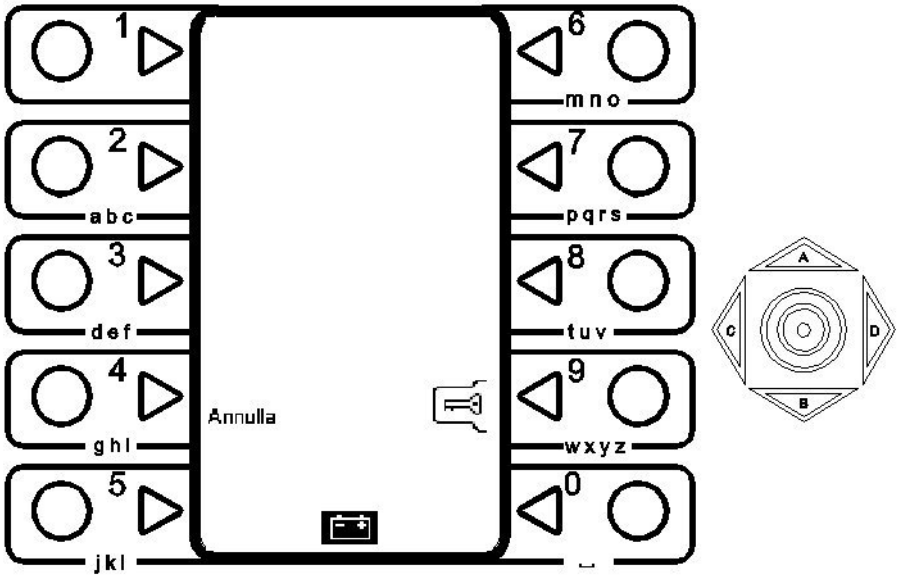


Figure: Start engine screen

Key 4 Cancels engine start-up and goes to next screen

Key 9 Machine start

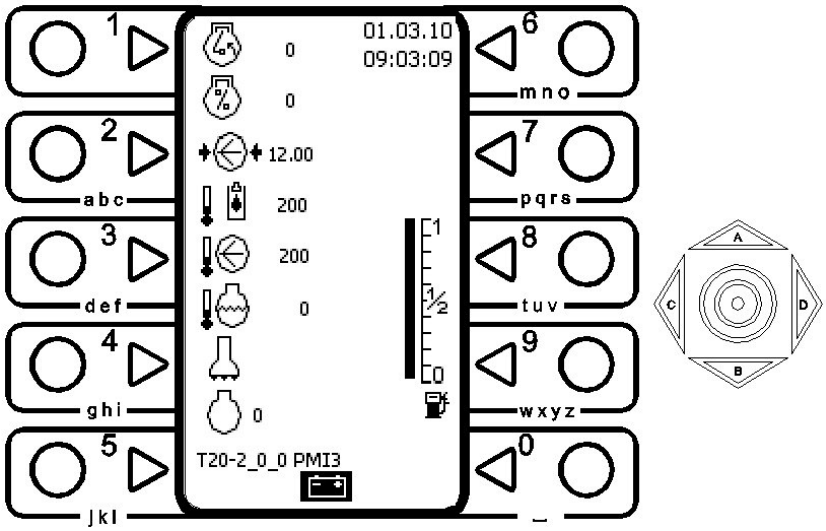


Figure: Default screen

This screen shows the main machine parameters, which are:

Left column

- Engine RPMs
- Torque percentage internal combustion engine
- Air circuit pressure (bar)
- Hydraulic power plant oil temperature (°C)
- Compressor oil temperature (°C)
- Engine water temperature (°C)
- Drilling hours
- Machine hours
- PMI software version

Right column

- Date
- Time
- Fuel level

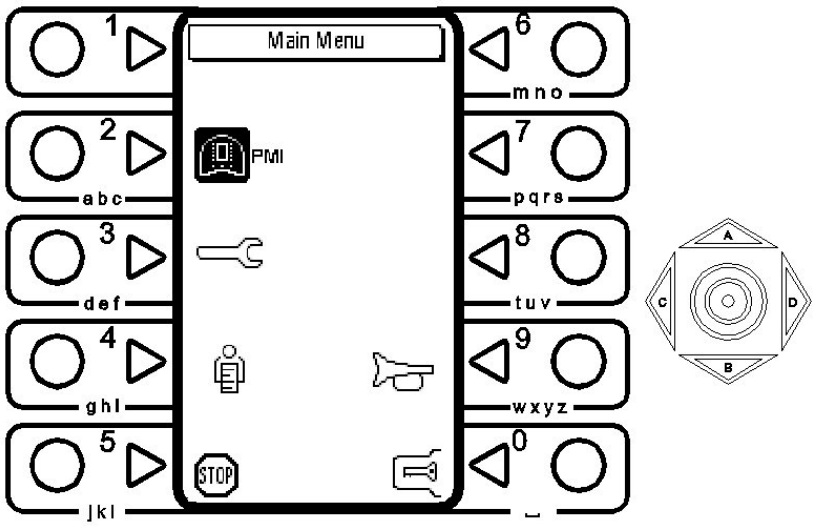


Figure: Work Environment Screen

Key 2	Select control point: CBM, PMI or Remote control
Key 3	Settings screen
Key 4	Diagnostics screen
Key 5	Turn-off machine
Key 7	Drilling slide screen
Key 9	Horn
Key 0	Machine start

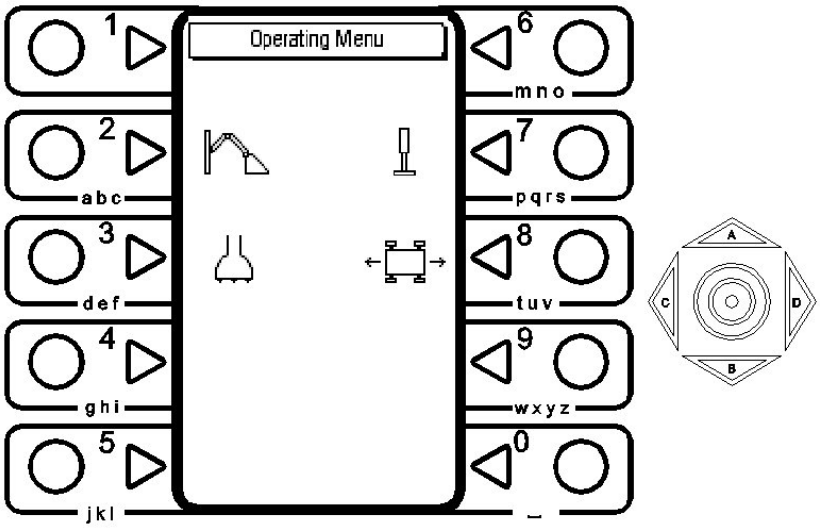


Figure: Drilling slide screen

Key 2	Drilling slide carriage positioning mode screen
Key 3	Manual drilling screen
Key 7	Leg screen
Key 8	Translation-winch screen

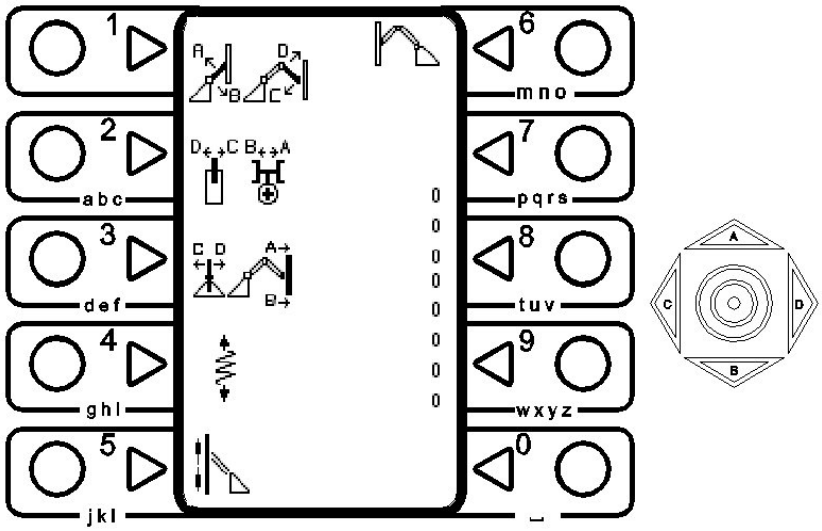


Figure: Slide carriage positioning mode screen

Key 1 **Arm Raising/Lowering – Retraction/ Extension**

Key pressed and multi-function lever P01 on A Lower arm

Key pressed and multi-function lever P01 on B Raise arm

Key pressed and multi-function lever P01 on C Retract arm

Key pressed and multi-function lever P01 on D Extend arm

Key 2 **Arm rotation – Drilling slide rotation**

Key pressed and multi-function lever P01 on A Slide left rotation

Key pressed and multi-function lever P01 on B Slide right rotation

Key pressed and multi-function lever P01 on C Arm left rotation

Key pressed and multi-function lever P01 on D Arm right rotation

Key 3 **Slide inclination**

Key pressed and multi-function lever P01 on A Slide backwards inclination

Key pressed and multi-function lever P01 on B Slide forwards inclination

Key pressed and multi-function lever P01 on C Slide left inclination

Key pressed and multi-function lever P01 on D Slide right inclination

Key 4 **Raise/Lower Drill**

Key pressed and multi-function lever P01 on A Lower drill

Key pressed and multi-function lever P01 on B Raise drill

Key 5 **Raise/Lower slide - Drilling rod support**

Key pressed and multi-function lever P01 on A Lower slide

Key pressed and multi-function lever P01 on B Raise slide

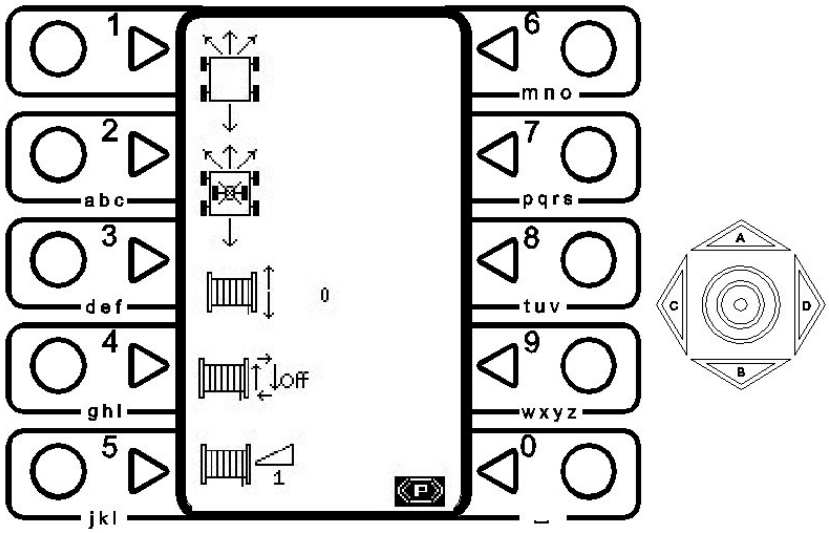


Figure: Translation-winch screen

Key 1 **Carriage translation**

Key pressed and multi-function lever P01 on A Carriage forwards

Key pressed and multi-function lever P01 on B Carriage backwards

Key pressed and multi-function lever P01 on C Carriage left steering

Key pressed and multi-function lever P01 on D Carriage right steering

Key 2 **Carriage translation with differential locking on**

The movements are the same as key 1

Key 3 **Winding/Unwinding winch cable (active in A/I mode)**

Key pressed and multi-function lever P01 on A Cable winding

Key pressed and multi-function lever P01 on B Cable unwinding

Key 4 **Winch mode**

OFF

A/I Winch in manual

T Winch in automatic

Key 5 **Winch power level**

1 low

2 medium

3 high

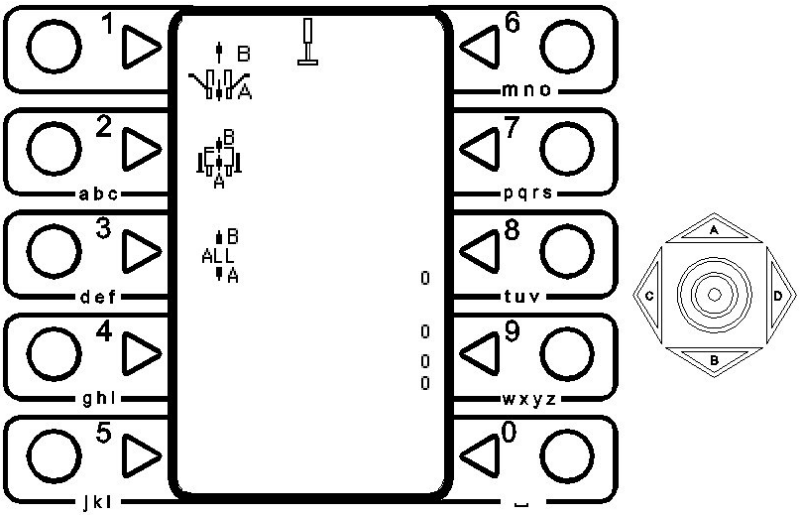


Figure: Leg screen

Key 1 **Front legs**

Key pressed and multi-function lever P01 on A Lower front legs

Key pressed and multi-function lever P01 on B Raise front legs

Key pressed and multi-function lever P01 on C + A Lower left front leg

Key pressed and multi-function lever P01 on C + B Raise left front leg

Key pressed and multi-function lever P01 on D + A Lower right front leg

Key pressed and multi-function lever P01 on D + B Raise right front leg

Key 2 **Rear legs**

Key pressed and multi-function lever P01 on A Lower rear legs

Key pressed and multi-function lever P01 on B Raise rear legs

Key pressed and multi-function lever P01 on C + A Lower left rear leg

Key pressed and multi-function lever P01 on C + B Raise left rear leg

Key pressed and multi-function lever P01 on D + A Lower right rear leg

Key pressed and multi-function lever P01 on D + B Raise right rear leg

Key 3 **All legs**

Key pressed and multi-function lever P01 on A Lower all legs

Key pressed and multi-function lever P01 on B Raise all legs

Key pressed and multi-function lever P01 on C + A Lower rear legs

Key pressed and multi-function lever P01 on C + B Raise rear legs

Key pressed and multi-function lever P01 on D + A Lower front legs

Key pressed and multi-function lever P01 on D + B Raise front legs

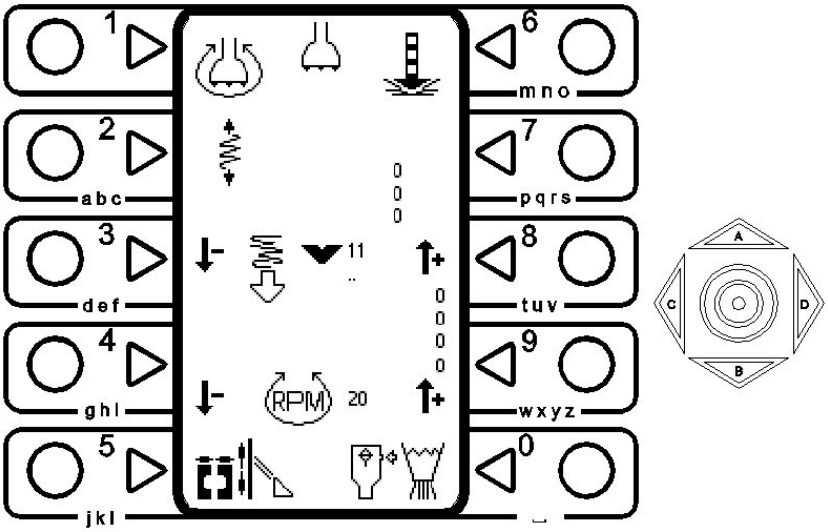


Figure: Drilling screen

Key 1 **Rotation and flushing**

Key pressed and multi-function lever P01 on C or D activates flushing

Key pressed and multi-function lever P01 for more than 1 second on C or D activates flushing and rod rotation

Key pressed and multi-function lever P01 on C or D deactivates flushing

Key 6 **Percussion**

Key pressed and multi-function lever P01 on C or D activates rod percussion

Key pressed and multi-function lever P01 on C or D deactivates rod percussion

After the activation of Rotation, Percussion or both:

- Multi-function lever P01 on A: lowers the drill; when released the drill stops
- Multi-function lever P01 on B: Raises the drill; when released the drill stops

Activation of automatic lowering of the drill

- Multi-function lever P01 on A at mid-travel for 3 seconds: activates automatic slow lowering of the drill
- Multi-function lever P01 on A at end of travel for 3 seconds: activates automatic fast lowering of the drill
- Multi-function lever P01 on B and release to stop automatic lowering of the drill

Upon activation of Rotation and Percussion, the icons of keys 2 and 7 change function:

With rotation and drilling deactivated

Key 2	**Lower/Raise Drill**
	Key pressed and multi-function lever P01 on A Lower drill
	Key pressed and multi-function lever P01 on B Raise drill
Keys 3 and 8	**Regulation of drill thrust pressure**
	Key 3 decreases the pressure
	Key 8 increases the pressure;
Keys 4 and 9	**Regulation of rod rotation speed**
	Key 2 decreases intervention limit
	Key 7 increase intervention limit
Key 5	**Rod support – Lower/Raise slide**
	Key pressed and multi-function lever P01 on A Lower slide
	Key pressed and multi-function lever P01 on B Raise slide
	Key pressed and multi-function lever P01 on C Open rod support
	Key pressed and multi-function lever P01 on D Close rod support
Key 0	**Activation extractor/water pump**
OK key	**Position carriage for drilling screen**
NEXT key	**Change Rod Screen**
	Access to the screen with percussion and rotation deactivated

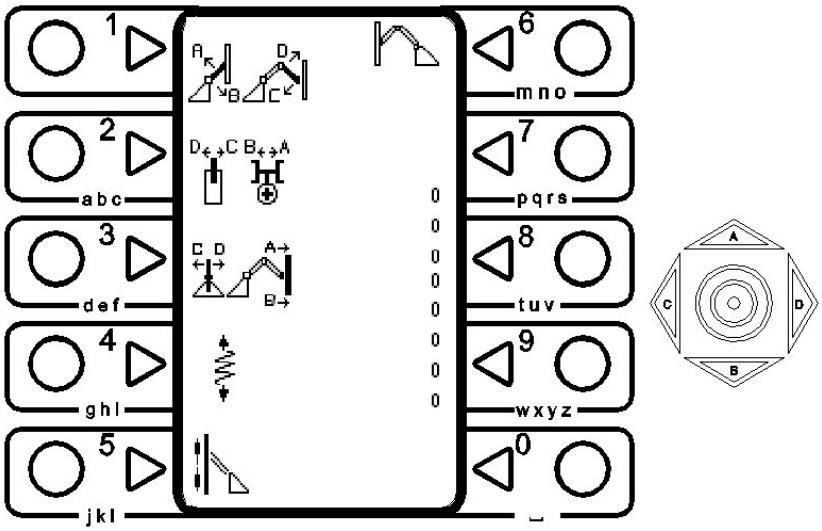


Figure: Position carriage for drilling screen

Key 1 **Arm Raising/Lowering – Retraction/ Extension**

Key pressed and multi-function lever P01 on A Lower arm

Key pressed and multi-function lever P01 on B Raise arm

Key pressed and multi-function lever P01 on C Retract arm

Key pressed and multi-function lever P01 on D Extend arm

Key 2 **Arm rotation – Drilling slide rotation**

Key pressed and multi-function lever P01 on A Slide left rotation

Key pressed and multi-function lever P01 on B Slide right rotation

Key pressed and multi-function lever P01 on C Arm left rotation

Key pressed and multi-function lever P01 on D Arm right rotation

Key 3 **Slide inclination**

Key pressed and multi-function lever P01 on A Slide backwards inclination

Key pressed and multi-function lever P01 on B Slide forwards inclination

Key pressed and multi-function lever P01 on C Slide left inclination

Key pressed and multi-function lever P01 on D Slide right inclination

Key 5 **Raise/Lower slide - Drilling rod support**

Key pressed and multi-function lever P01 on A Lower slide

Key pressed and multi-function lever P01 on B Raise slide

Key pressed and multi-function lever P01 on C Open rod support

Key pressed and multi-function lever P01 on D Close rod support

Key 6 **Raising/Lowering slide with increased force**

Key pressed and multi-function lever P01 on A Lower slide

Key pressed and multi-function lever P01 on B Raise slide

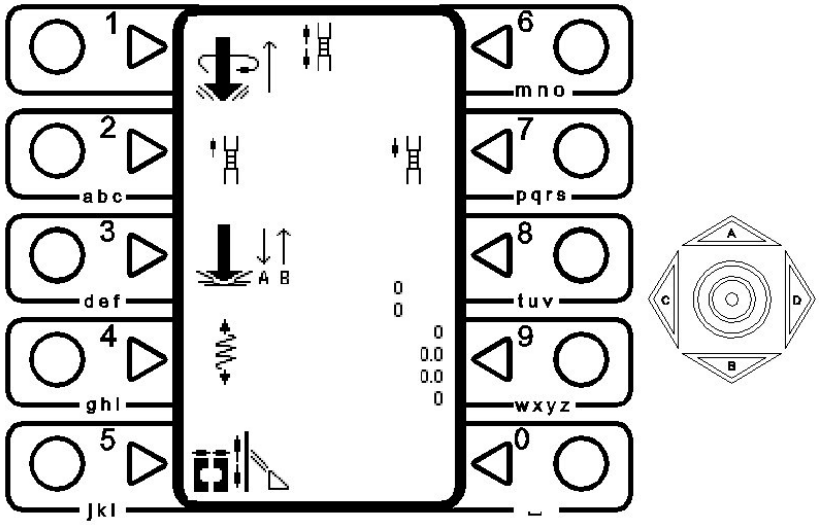


Figure: Change Rod Screen

Key 1 **Rotation – Percussion – Lower/Raise Drill**

Key pressed and multi-function lever P01 on A Activation of rotation, percussion and lowering drill

Key pressed and multi-function lever P01 on B Activation of rotation, percussion and raising drill

Key 2 **Unscrewing rods**

Key pressed Activation raising drill and clockwise rotation of drill

Key 3 **Lowering – Raising drill – Percussion**

Key pressed and multi-function lever P01 on A Activation of percussion and lowering drill

Key pressed and multi-function lever P01 on B Activation of percussion and raising drill

Key 4 **Raise/Lower Drill**

Key pressed and multi-function lever P01 on A Lower drill

Key pressed and multi-function lever P01 on B Raise drill

Key 5 **Raise/Lower slide - Drilling rod support**

Key pressed and multi-function lever P01 on A Lower slide

Key pressed and multi-function lever P01 on B Raise slide

Key pressed and multi-function lever P01 on C Open rod support

Key pressed and multi-function lever P01 on D Close rod support

Key 7 **Screwing rods**

Key pressed Activation lowering drill and counter-clockwise rotation of drill

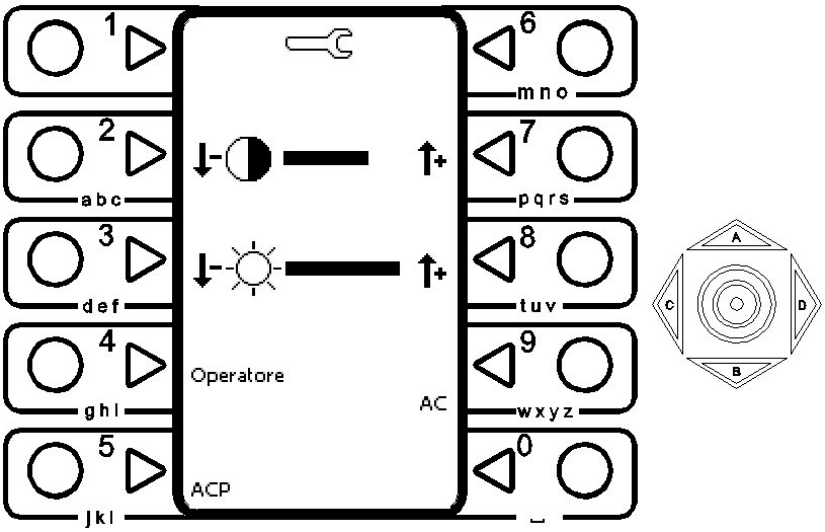


Figure: Settings screen

Keys 2 and 7	**Contrast adjustment**
	Key 2 decreases display contrast
	Key 7 increases display contrast
Keys 3 and 8	**Brightness adjustment**
	Key 3 decreases display brightness
	Key 8 increases display brightness
Key 4	**Operator Parameters Screen**
Key 5	**Manufacturer Parameters Screen (ACP)**
Key 9	**Authorized Service Screen (CA)**

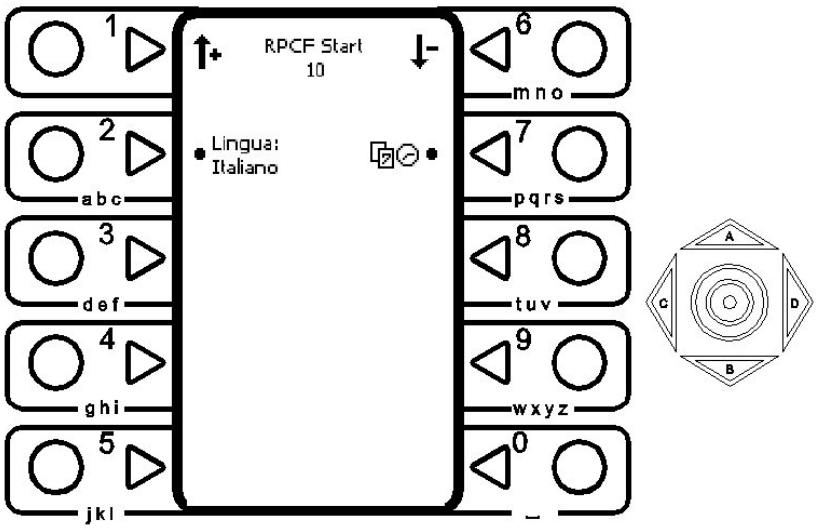


Figure: Operator Parameters Screen

Keys 1 and 6	**RPCF intervention regulation**
	Key 1 increases the start intervention pressure
	Key 6 decreases the start intervention pressure
Key 2	**Choice of PMI language**
Key 7	**Set date and time**

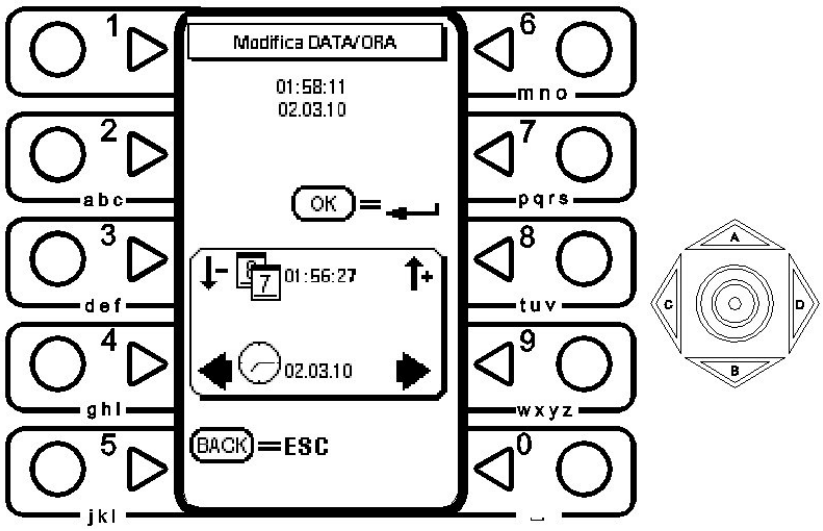


Figure: Change Date/Time screen

Keys 3 and 8	**Set Date**
	Key 3 decreases the value
	Key 8 increases the value
Keys 4 and 9	**Set time**
	Key 4 decreases the value
	Key 9 increases the value
OK	**Confirms the changes**
ESC	**Cancels the changes made**

Manometer panel

Note
The pressure gauges must be checked during drilling.

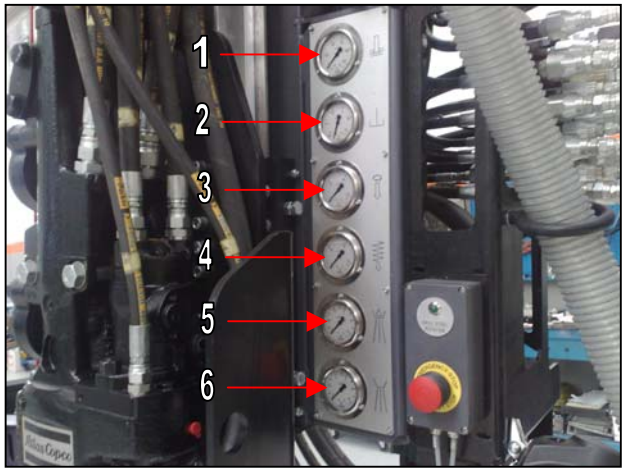


Figure: Slide manometers

1 Percussion pressure manometer
2 Damper pressure manometer
3 Rotation pressure manometer
4 Thrust pressure manometer
5 Lubrication air manometer
6 Flushing air pressure manometer

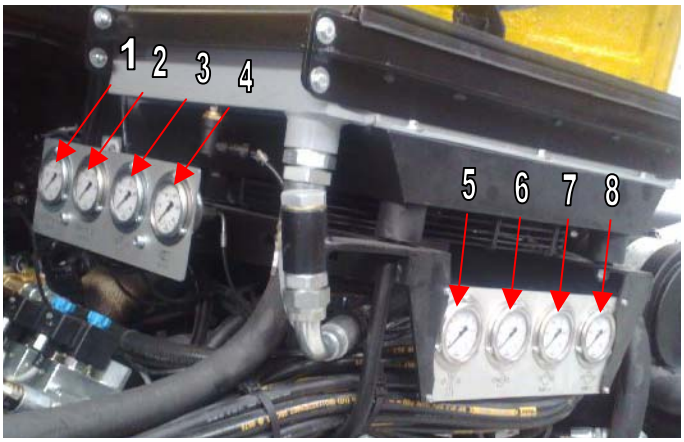


Figure: Engine compartment manometers

1 LS signal pressure manometer
2 Standby pressure manometer
3 LS pump pressure manometer
4 Damper pressure manometer

5 Lubrication air manometer

6 Air plant pressure manometer

7 General gear pump pressure manometer

8 LS pump pressure manometer

Gradient meter

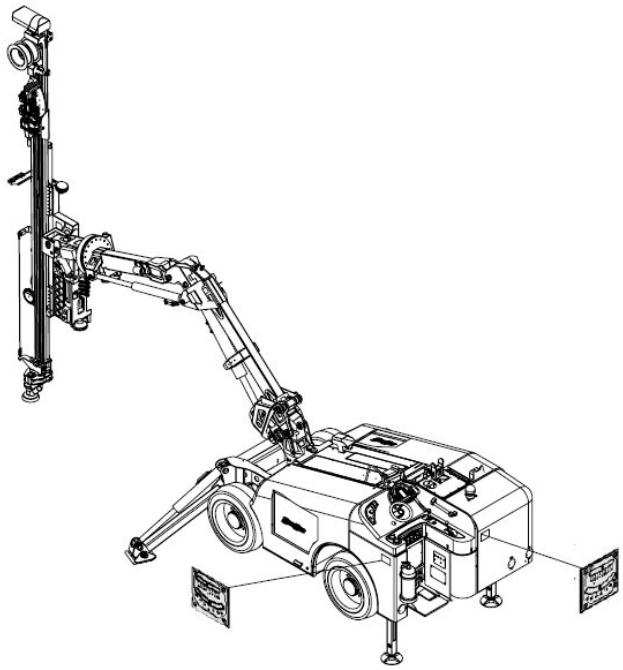


Figure: Gradient meter

The meter indicates the angles for safe operation of the drill rig. The chassis could tip over outside the specified angle limits.

CAUTION

- **The gradient meter shows the chassis frame angle and not the actual ground camber**

Control panel for diesel engine (CBM)

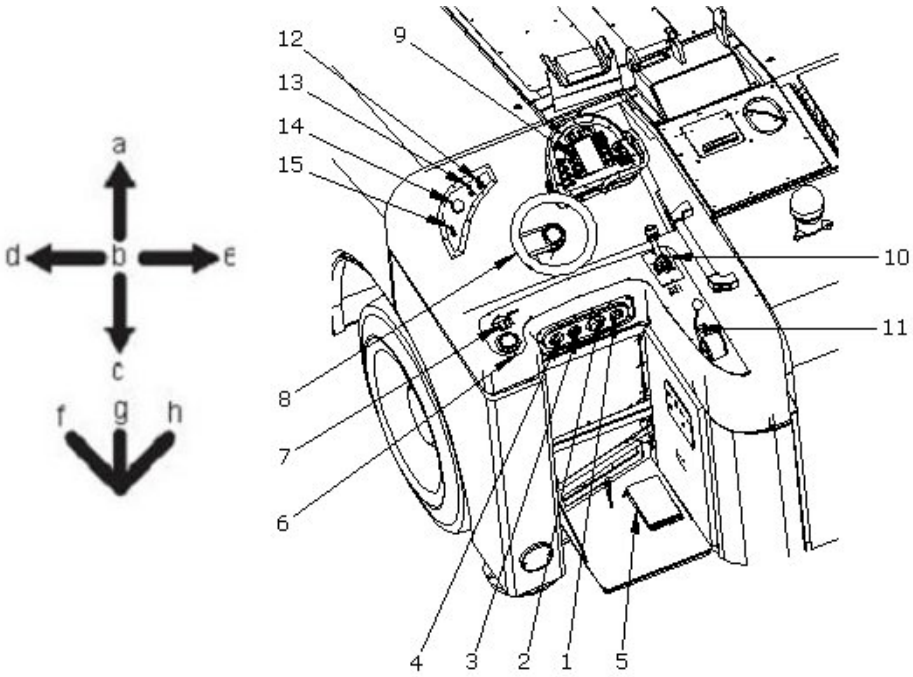


Figure: Control panel for diesel engine

Table: Functions

01	Machine ignition key block
02	Low-beam headlight switch
03	Steering mode/horn selector
04	Slow, fast speed and differential lock selector
05	Man-present pedal
06	Angle indicator
07	LS pump pressure manometer
08	Steering

09	PMI
10	Forwards/backwards direction lever
11	Manual accelerator
12	-----
13	Parking brake engaged indicator
14	Emergency stop

Other controls

Electric cabinet

Figure: electric cabinet

Table: Functions

A01	Enable emergency circuit
A02	Enable emergency circuit indicator
	On enabled
	Off not enabled
A03	Machine emergency exclusion key selector
A04	Remote control battery charger selector
	On battery charger on
	Off battery charger off
A05	Remote control battery charger indicator
A06	Diagnostics

Emergency exclusion

Figure: Emergency exclusion

DANGER

- **Danger of moving parts**
- **Risk of serious personal injury**
- **Exclude emergencies only for maintenance and if necessary**
- **Give the emergency exclusion key to the site manager or maintenance manager and never to the machine operator**

The machine has a device to exclude all the emergencies that can be activated by a special key which is supplied and to be used exclusively when maintenance is being carried out on the machine. Using this key and inserting it into the specific key selector on the electric cabin, the emergencies are excluded and a message appears on the display of the PMI warning that the emergencies have been excluded.

Drill slide

Figure: Drill slide

Table: Functions

01	Emergency stop
02	Rod rotation indicator
	Red rotation activated
	Green rotation deactivated

5. Operating

General Information

The machine is prepared to be controlled from three different control points, which are:

- Diesel engine control panel (CBM)
- PMI
- Remote control.

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 set correctly before operating**
- **Always deactivate the remote control box when it is not in use**

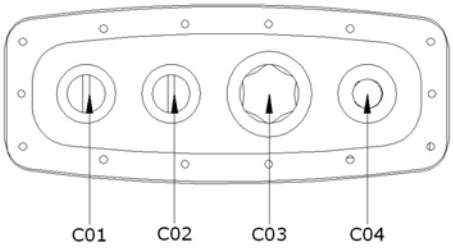
Diesel engine starting

N.B.

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

Starting from CBM

Turn machine ignition key C04 to position 1



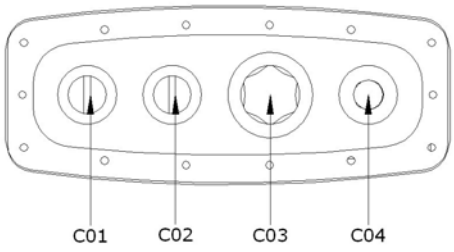
1 Wait for the horn to sound

Press the safety circuit enable button A1 on the electrical panel

Turn machine ignition key C04 clockwise and start the machine

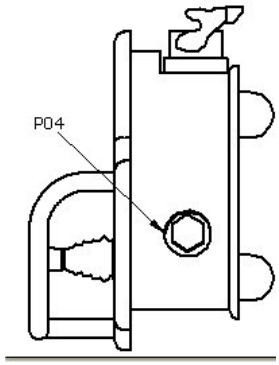
Starting from PMI

1 Turn machine ignition key C04 to position 1

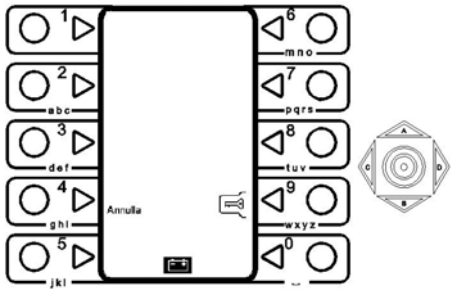


2 Wait for the horn to sound and the PMI to start and wait for the safety circuit enable screen

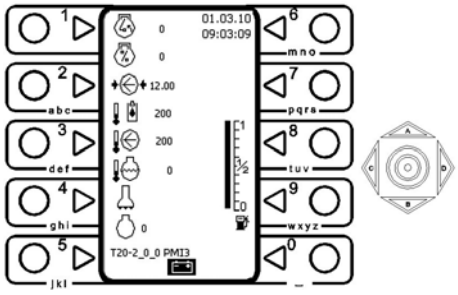
Press enable button P04 on the PMI



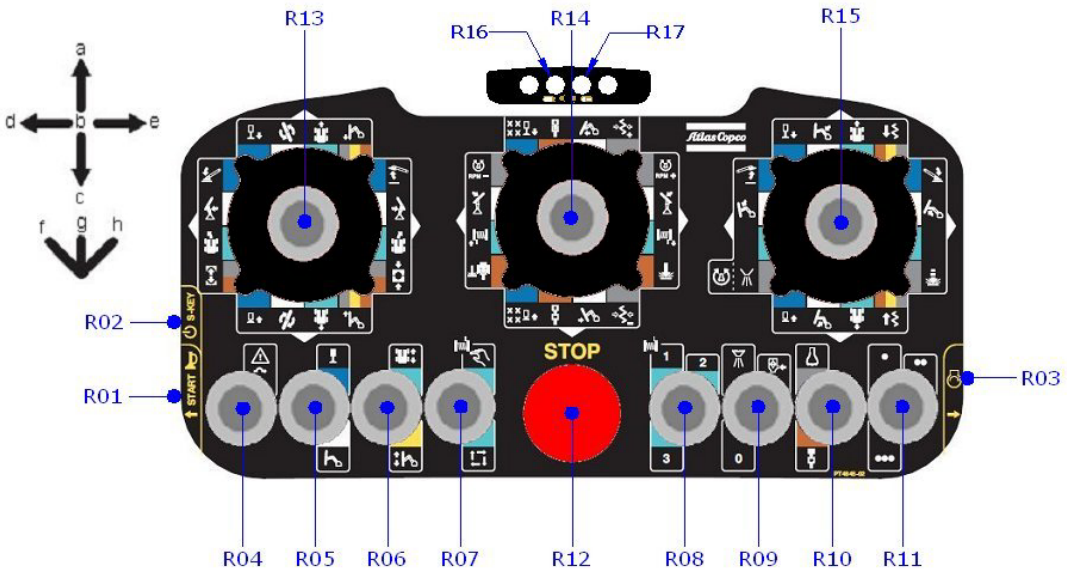
Wait for the engine start-up screen and press key 8 and then key 9



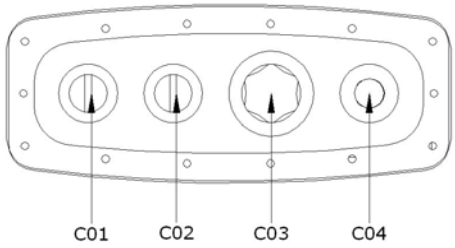
After the machine starts, the default screen will appear



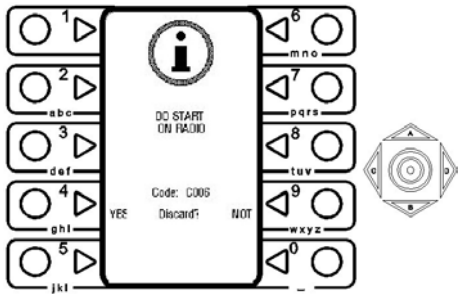
Starting from the Remote control



1 Turn machine ignition key C04 to position 1



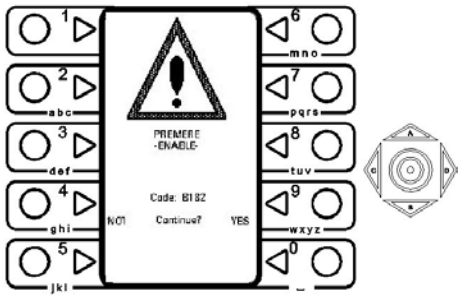
2 The PMI starts; wait for the remote control activation screen



3 Press run button R02 on the Remote control

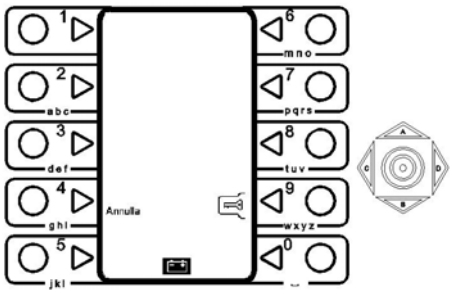
Wait for LED R16 to change from fast to slow flashing.

4 Wait until the PMI displays the screen indicating that the transmitter and receiver are communicating and then the safety circuit enable screen appears



5 Activate the safety circuit by pressing button R04 and, at the same time, move the multi-function lever to remote control

6 The start engine screen appears on the PMI



7 Press start engine button R03 and wait for the horn to sound; after 2 seconds the machine starts

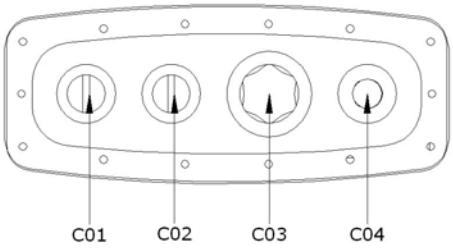
Stopping the diesel engine

N.B.

If the engine is hot, run it at idling speed for a couple of minutes before switching off.

Stopping from CBM

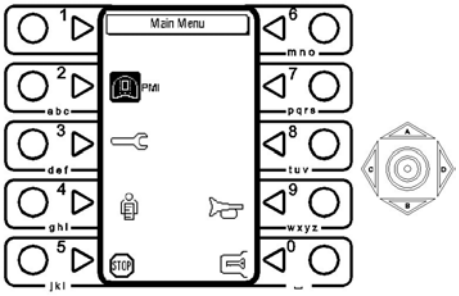
1 Turn machine ignition key C04 to position 0



Stopping from PMI

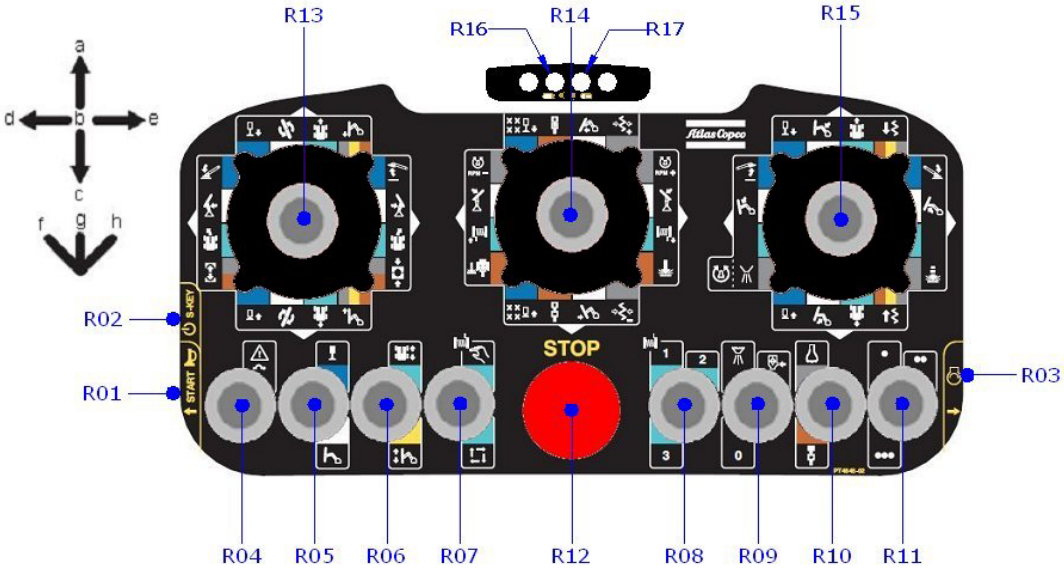
1 Go to the work environment screen

From the default screen, press the next key. From any other screen press the back key until the work environment screen is displayed.



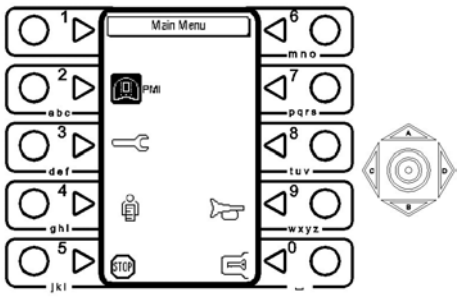
Press key 5 to stop.

Stopping from Remote control



Position selectors R05, R06, R07, R08, R09, R10 and R11 of the remote control to neutral position b.

The work environment screen appears on the PMI

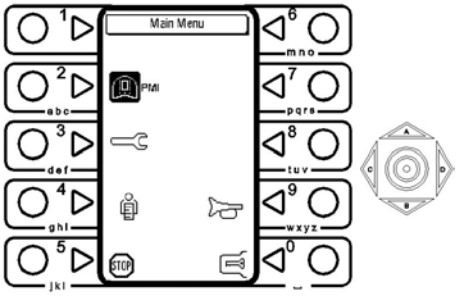


Press stop engine button R03 on the remote control

Enable controls

To enable one of the three control points, proceed as follows:

1 Display the work environment screen on the PMI.



Select the control point with key 2

Note:

The selected control point is stored even after the machine is stopped.

Repositioning

Operation

WARNING

- **Risk of tipping/sliding**
- **May cause severe personal injury and damage to property**
- **Always check the prevailing ground conditions where the rig shall be operated**
- **Inclination angles for Downward/Upward/Lateral CANNOT be combined with each other**
- **Do not exceed the incline angles. See Technical data**
- **Note the gradient meters' values**
- **Never operate the drill rig from the down side during remote control operation**
- **Always ensure that unauthorized personnel are outside the working area**

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**
- **Always deactivate the remote control box when it is not in use.**

WARNING

- **Danger of high-voltage cables**
- **May cause serious personal injury and damage to property**
- **Keep away from high-voltage cables**

WARNING

- **Tipping risk**
- **May cause serious personal injury and damage to property**
- **Feeder and boom must be in transport position before the jacks are raised.**

CAUTION

- **Note that worn tyres reduce friction with the ground considerably and consequently increase the risk of sliding**

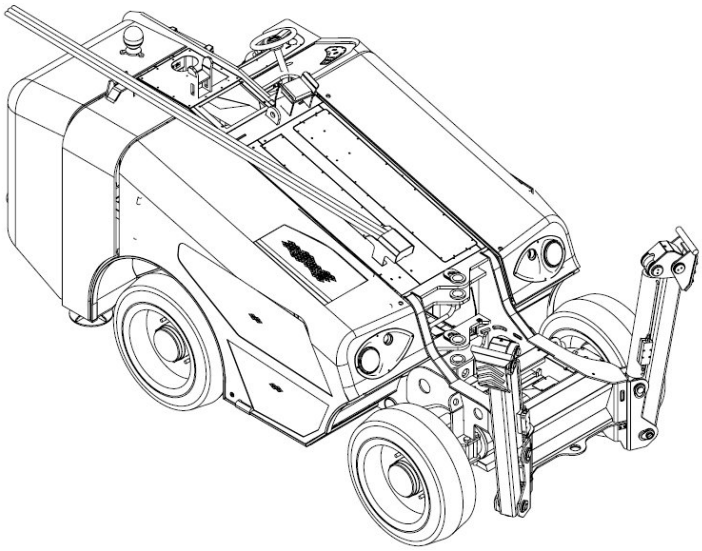


Figure: Drill steel location

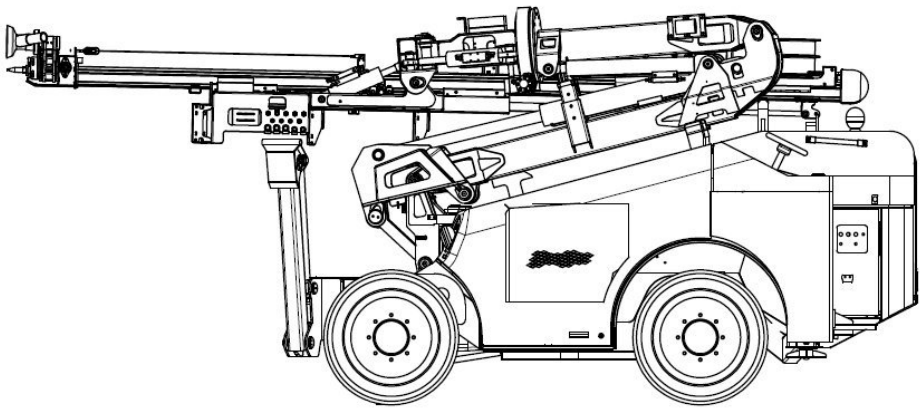


Figure: Position for tramming (tramming position)

N.B.

The gradient meter shows the chassis frame angle and not the actual ground incline

WARNING

- **Risk of falling from the platform**

The drill is designed to be moved from the three control points so we will, first, describe the common procedure for all three control points and then how to operate in the three control modes.

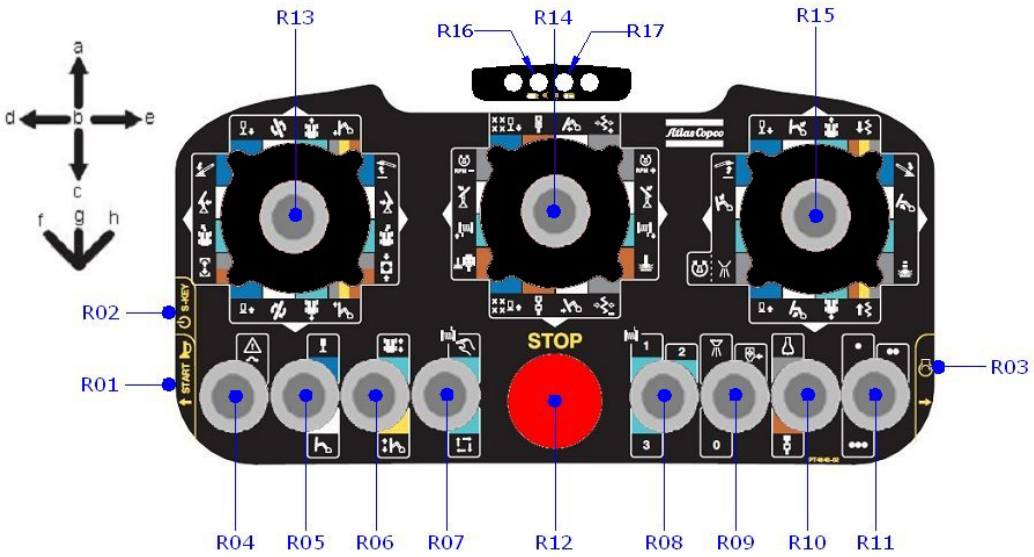


Figure: Remote control panel

1 Start the machine.

2 Bring the slide to the transport position

PMI	Slide carriage positioning mode screen
Remote control	Select Positioning mode (Yellow), Selector R05 on C.
	Multi-function levers R13 – R14 – R15

3 Raise all the legs

PMI	Leg screen
Remote control	Select Leg mode (Orange) Selector R05 on A.
	Multi-function levers R13 – R14 – R15

Moving from CBM

AVVERTENZA

- **Risk of falling from the platform**
- **Do not operate from the CBM on frontal inclinations greater than 5°; you must use the PMI or the remote control**

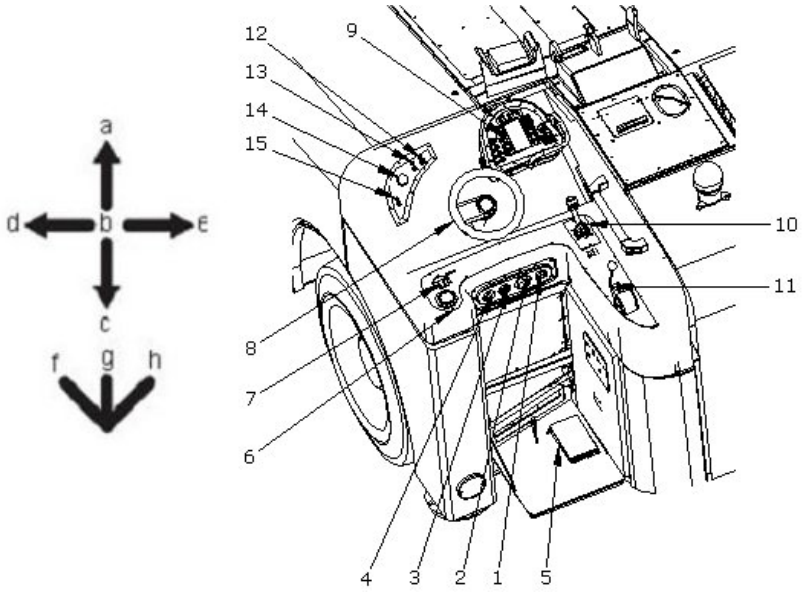


Figure: Diesel engine control panel

1 Set the control point on the **CBM**

PMI Work Environment Screen

2 Select type of steering (3)

3 Select speed of translation (4)

4 Accelerate the motor revolutions slightly by acting on the manual accelerator (11)

5 Press the man-present button to activate the controls. (5)

6 Grip the steering wheel to guide the machine. (8)

7 Act on the direction lever (10) to select the running direction (forwards/backwards).

8 Position the drilling carriage at the desired location

Note:

If the operation releases the man-present pedal when the drill is moving, the machine will stop. If the man-present pedal is pressed again with the advancement lever (10) inserted, the drill will not move.

To reactivate the controls, release the man-present pedal and set the advancement lever (10) on B.

Moving from PMI

AVVERTENZA

- **When using the PMI control point to move the machine, you must execute the movement from the ground and never onboard the drill.**

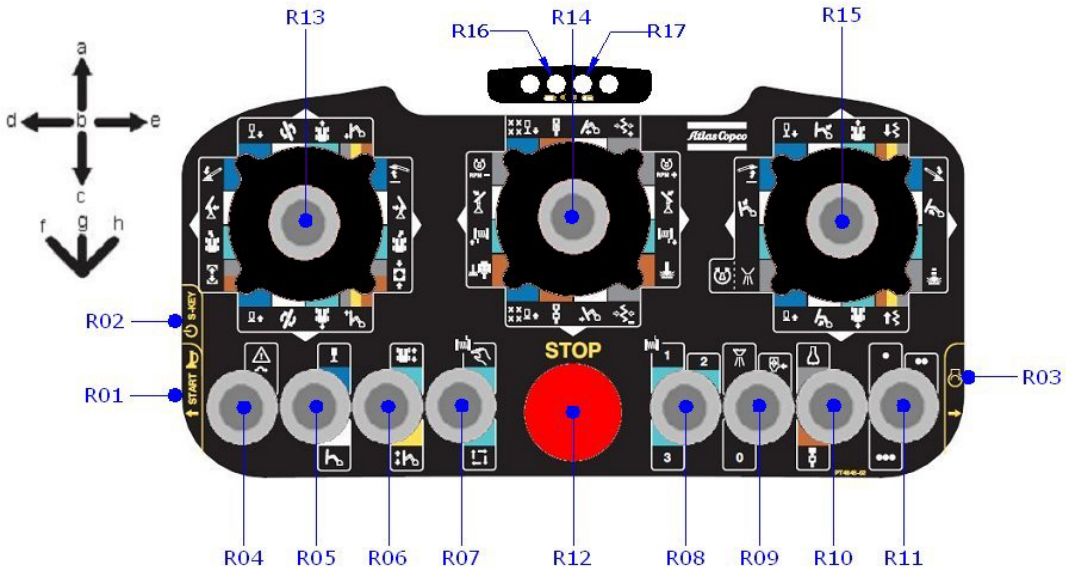


Figure: Remote control panel

1 Set the control point **PMI**

PMI	Work Environment Screen

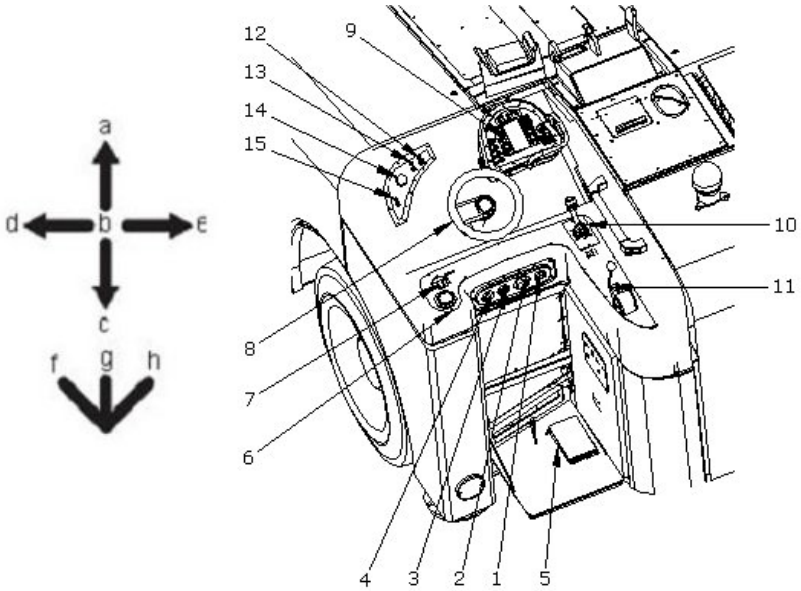


Figure: Diesel engine control panel

2 Select type of steering (3)

3 Select speed of translation (4)

4 Execute the translation - Translation – Winch screen PMI

5 Position the drilling carriage at the desired location

Moving from the Remote control

AVVERTENZA

- **When using the remote control point to move the machine, you must execute the movement from the ground and never onboard the drill.**

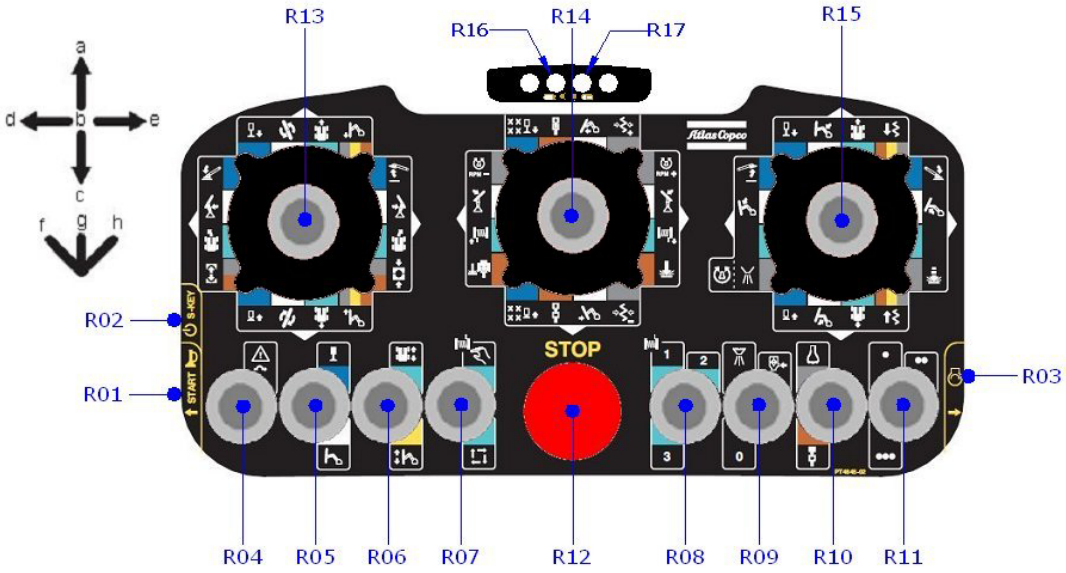


Figure: Remote control panel

1 Set the control point

PMI Work Environment Screen

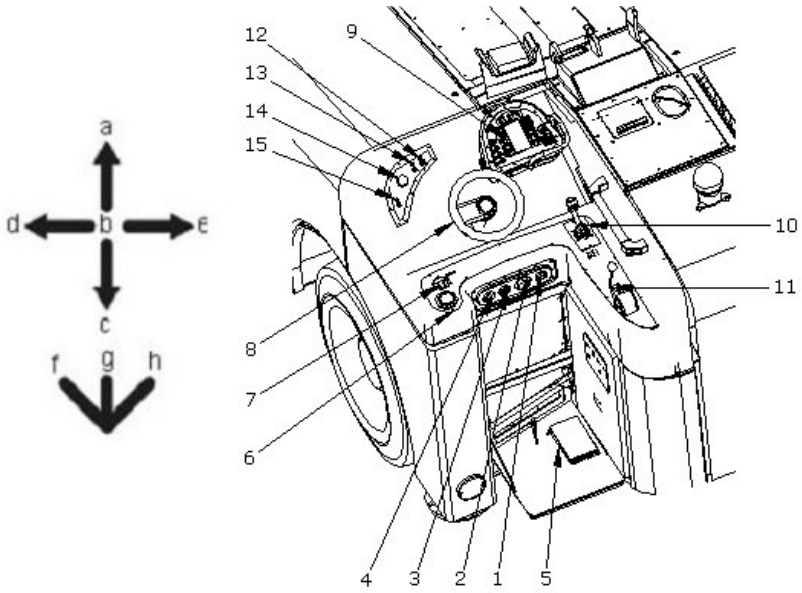


Figure: Diesel engine control panel

2 Select type of steering (3)

3 Select speed of translation (4)

4 Activate the vehicle mode, R06 on A, and act on multi-function levers R13 – R14 – R15.

5 Position the drill carriage at the desired location

Checking after tramming

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

Tramming - General principles

Tramming, general

Position the boom and feed beam to transport position. Always check the terrain where the drill rig shall be operated. Adapt speed according to terrain.

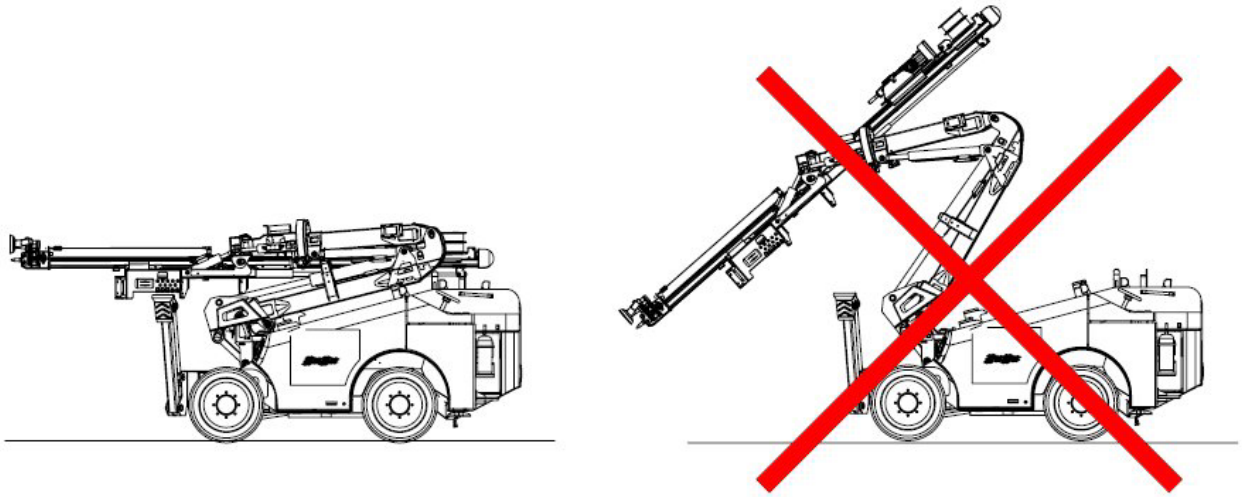
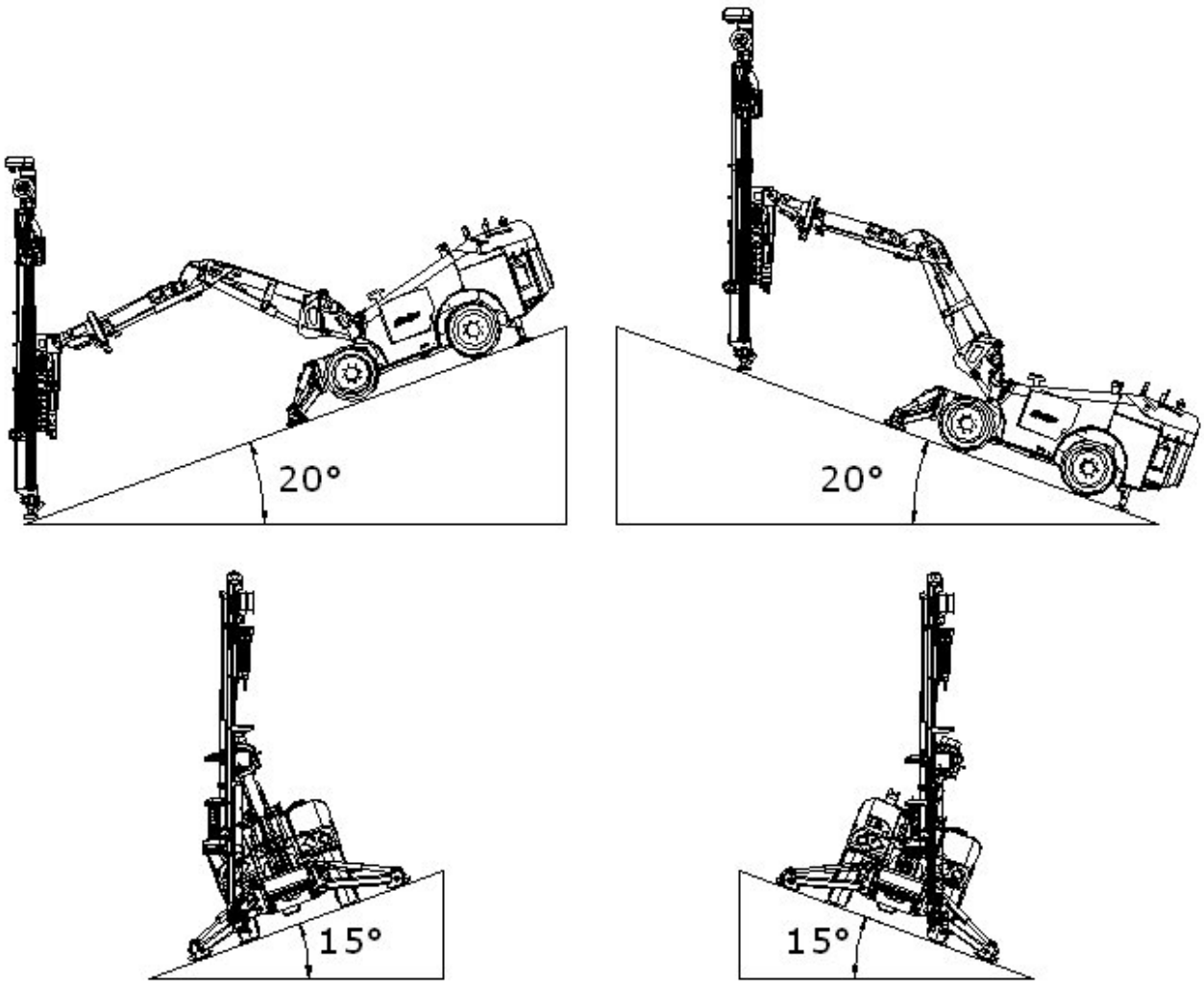


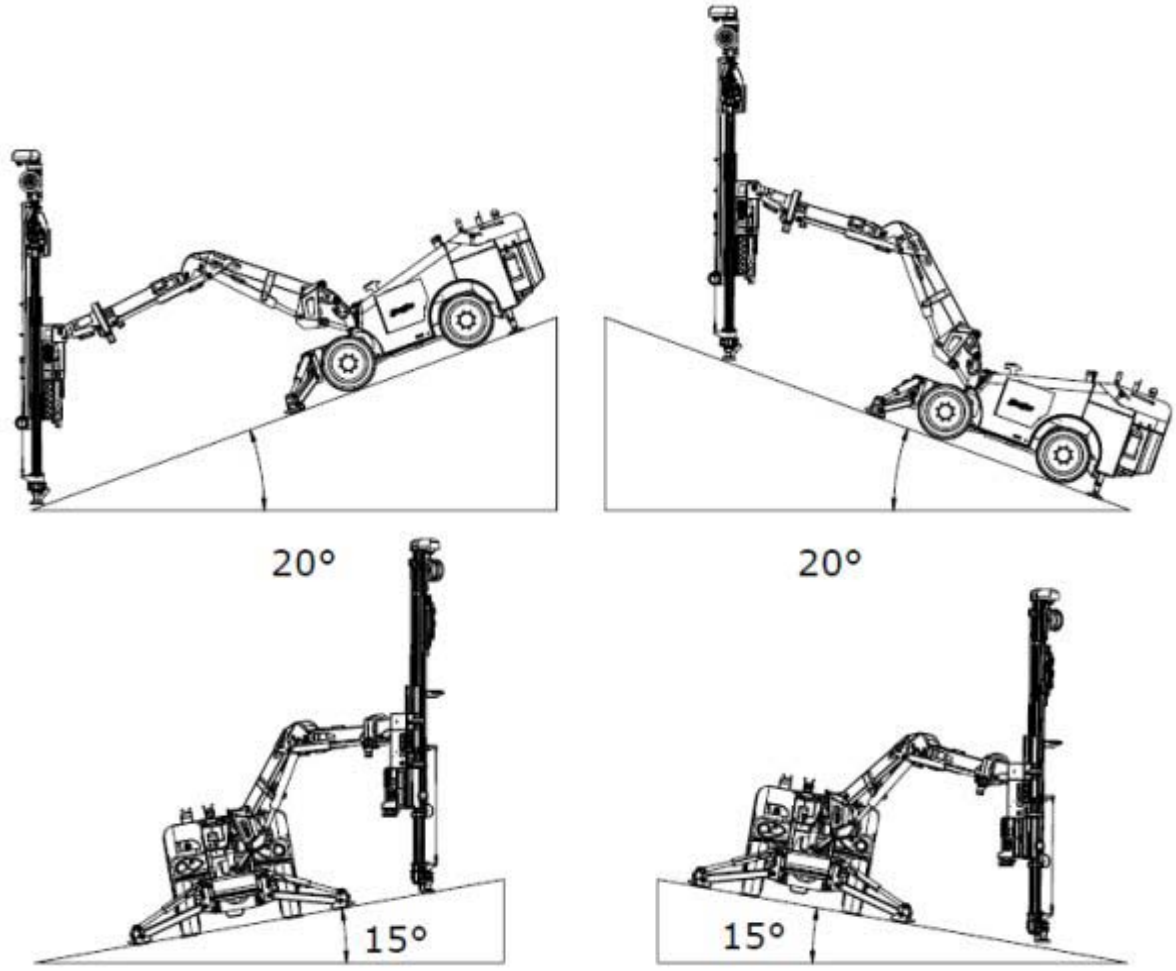
Figure: Left: Correct position for general tramming. Right: Wrong position

Maximum permitted angles of inclination during setting-up for drilling

Setting-up for drilling with the feeder in vertical position and centred between the wheels



Setting-up for drilling with the feeder in vertical position and swung max to left

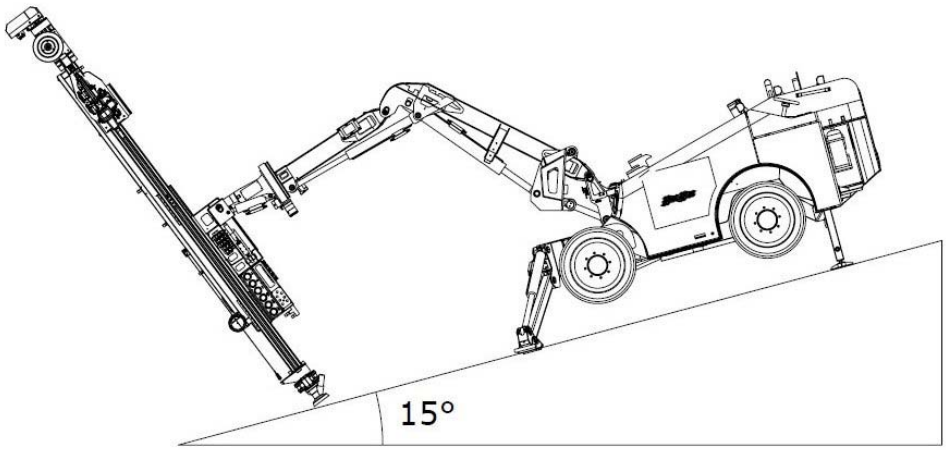


Setting-up for drilling with the feeder in vertical position and swung max to right

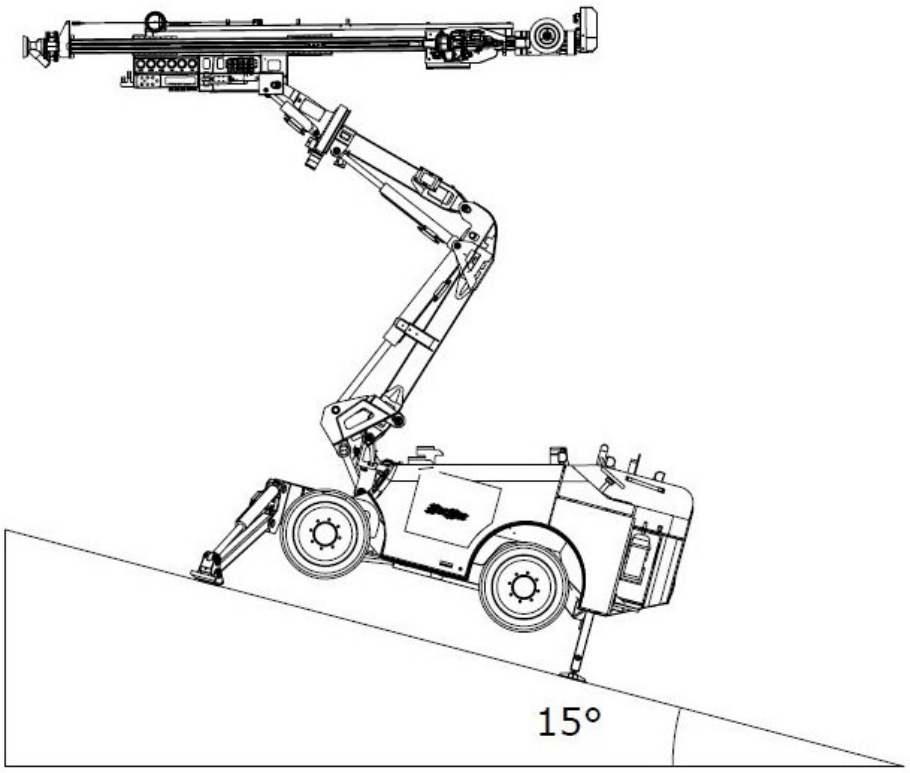
Note

The rig is symmetrical so the same angles apply as in the chapter "Setting-up for drilling with the feeder in vertical position and swung max to left".

Setting-up for drilling with the feeder top in extreme position forwards, the feeder laterally vertical and centred between the wheels



Setting-up for drilling with the feeder top in extreme position rearwards, the feeder laterally vertical and centred between the wheels



Using the winch when tramming

WARNING

- **Risk from tipping 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 tipping 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 and the remote control box**
- **Always check that the controls are set correctly before operating**
- **Always deactivate the remote control box when it is not in use**
- **The remote control box must not be operated from the drill rig when the winch is in use**

General

The winch can be used as an additional safety feature, either to provide extra tractive effort 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.

Note
The winch can only be operated from the remote control box and PMI

WARNING

- **Risk of tipping.**
- **May cause severe personal injury and damage to property**
- **The angles for Downward/Upward/Lateral CANNOT be combined with each other**
- **Do not exceed the incline angles. See Technical data**
- **Note the gradient meters' values**
- **Never operate the drill rig from the down side**

WARNING

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

Translation when climbing/descending with PMI

1 Activate the PMI control point (see Enable controls)

2 Go to the Translation – Winch screen

3 Disengage the winch drum with the disengagement mechanism (A) to enable the cable to be pulled out.

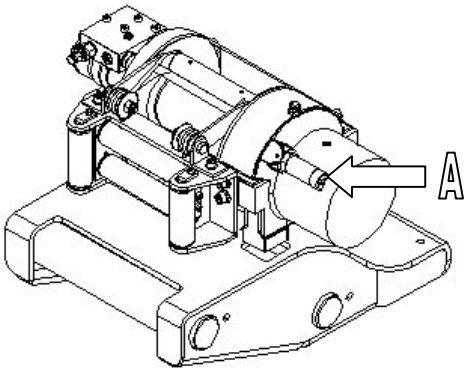


Figure: Disengagement mechanism, winch

4 Pull out the wire and fasten the eye to the anchor point.

5 Lock the winch drum with the disengagement mechanism (A).

6 Set the power of the winch on the Translation – Winch screen by acting on key 5

7 Set the mode of the winch to Manual (A/I key 4)

8 Hold down key 3 and act on the multi-function lever to tension the winch cable

9 Set the winch mode to Automatic (T key 4)

10 Execute the movement of the drill by holding down key 1 and acting on the multi-function lever.

Translation when climbing/descending with Remote control

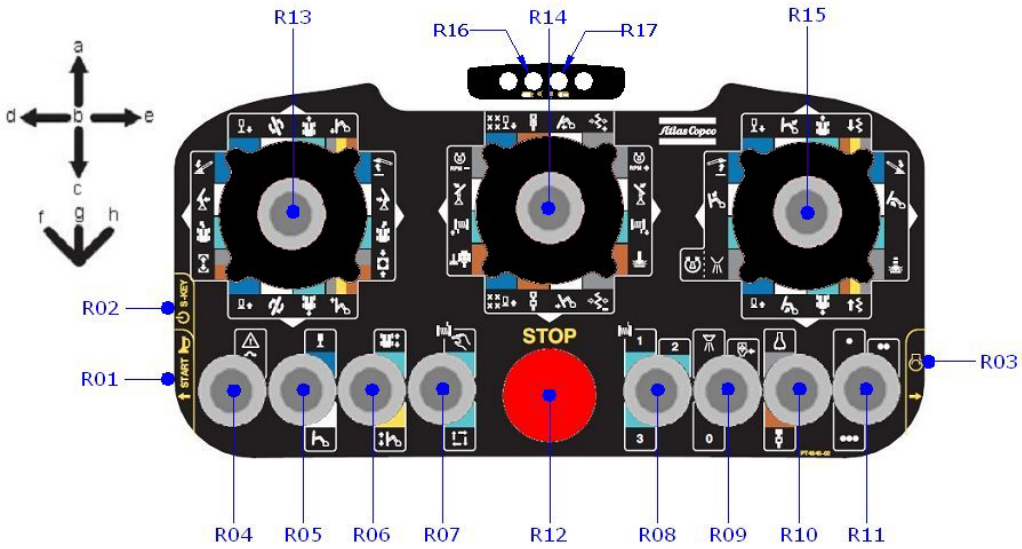


Figure: Remote control panel

1 Activate the remote control point (see Enable controls)

2 Disengage the winch drum with the disengagement mechanism (A) to enable the cable to be pulled out.

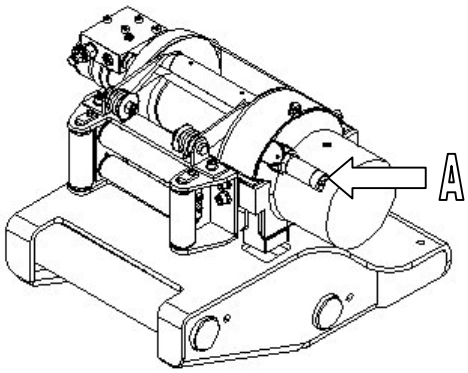


Figure: Disengagement mechanism, winch

3 Pull out the wire and fasten the eye to the anchor point.

4 Lock the winch drum with the disengagement mechanism (A).

5 Position mode selector **R06**on **a** to activate Vehicle mode (Blue)

6 Set the winch power with selector **R08**

7 Set the winch mode to Manual by positioning selector **R07** on **a**

8 Act on multi-function lever **R14** to tension the cable

9 Set the winch mode to Automatic by positioning selector **R07** on **c**

10 Act on multi-function levers **R13** and **R15** to move the drill.

Note:
When moving the drill backwards, set the winch value to the lowest value to allow the cable to unwind.

6. Before drilling

Safety

WARNING

- **May cause severe personal injury**
- **Ensure that unauthorised personnel are not within the working area**
- **Follow the instructions carefully**

Setting up for drilling

WARNING

- **Risk of tipping**
- **May cause severe personal injury and damage to property**
- **The angles for Downward/Upward/Lateral, specified in Technical data, must NOT be combined**
- **Do not exceed the tilt angles, see Technical data**
- **Note the gradient meters' values**
- **Never operate the drill rig from the downhill 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**

PMI

1. Position the drill at the drilling point
2. Go the Leg screen and position the drill horizontally by lowering the support legs.
3. Move the slide and arm to the desired position. Using the multi-function levers, arrange the contrast cylinder stably on the ground without raising the drilling carriage.

Remote control

1. Position the drill at the drilling point

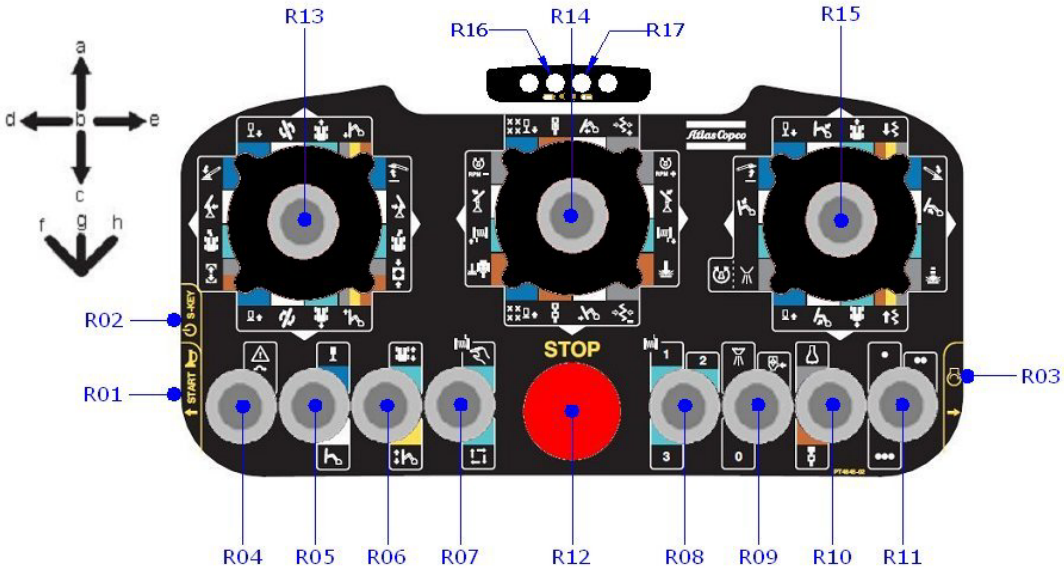


Figure: Remote control panel

2. Position selector R05 on A to activate Leg mode (Orange)
4. Act on multi-function levers R13, R14 and R15 to position the drill horizontally by lowering the support legs.
3. Position selector R05 on C and selector R06 on C to activate Positioning mode (Yellow and Violet).
4. Move the slide and arm to the desired position. Using the multi-function levers, arrange the contrast cylinder stably on the ground without raising the drilling carriage.

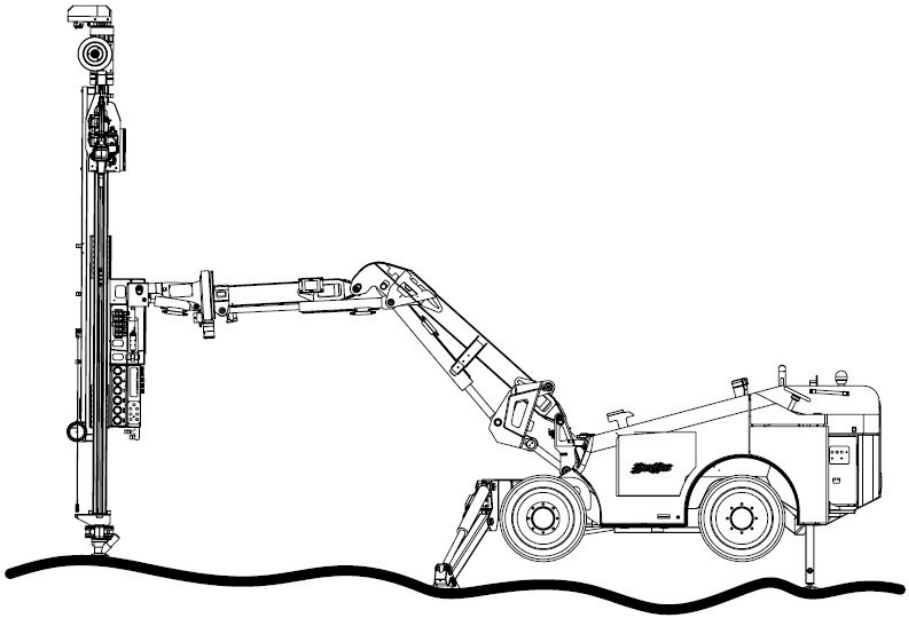


Figure: Correct set up for drilling

N.B.

Do not lift the drill rig with the feeder Do not lift the drill rig with the feeder

Setup for drilling - General principles

General setup

Align the rig as horizontally as possible using the **jacks** .

Place the feed spike firmly against the ground without lifting the frame off the ground.

Note
Position the boom and feeder with smooth movements.

Downhill setup

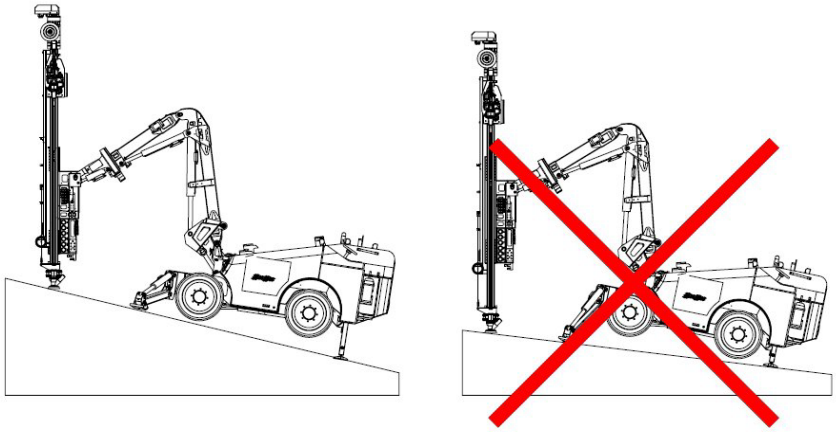


Figure: Left: Correct position for drilling uphill. Right: Wrong position.

Downhill setup

Note

NB! If the camber is >10° then the winch should be used!

Set up the drill rig as close to the horizontal as possible.

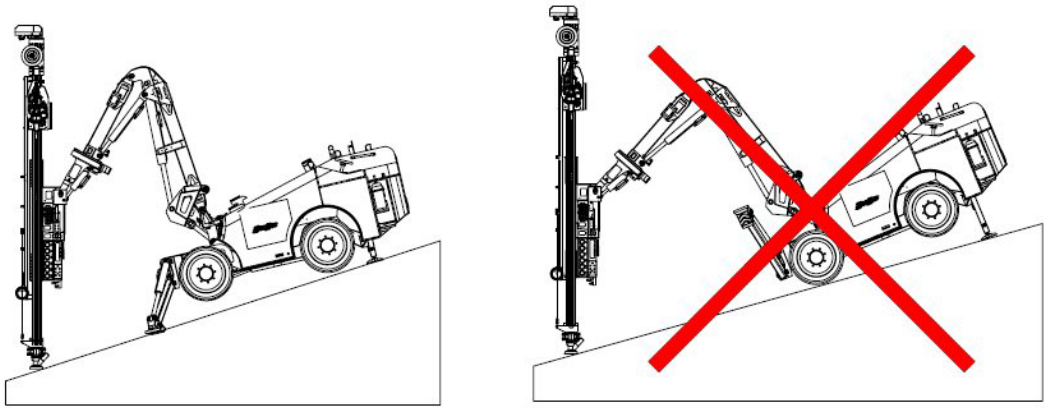


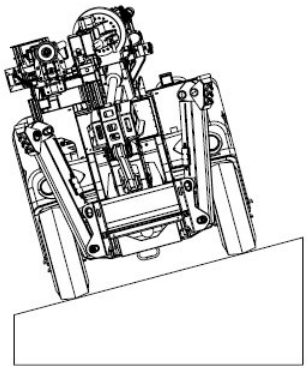
Figure: Left: Correct position for drilling downhill Right: Wrong position.

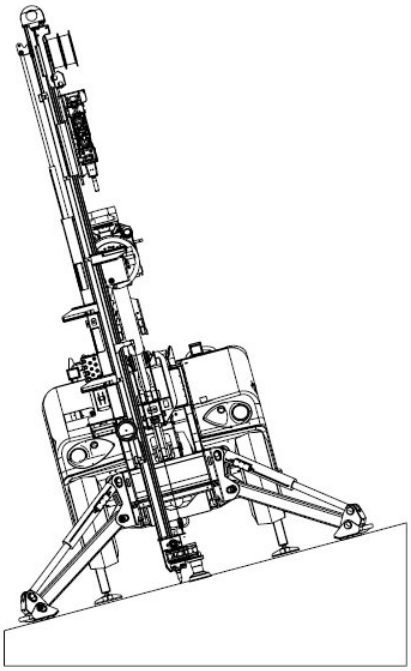
Setup - Transverse incline

NB! The risk of slipping is greatest when setting up on a transverse incline.

NB! Always observe ground conditions.

NB! Always be very careful when setting up on a transverse incline, always use smooth movements during setup.





7. Drilling

WARNING

- **Danger of accidental operation**
- **May cause serious personal injury and damage to property**
- **The operator must always have an overview 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 it is not in use**

Start drilling from PMI

1. Go to the Drilling screen on the PMI
2. Activate rotation by holding down key 1 and moving multi-function lever P01 on C or D
3. Activate percussion by holding down key 6 and moving the multi-function lever to c or D
4. Activate automatic slow lowering of the drill by moving multi-function lever P01 on A, holding that position for 3 seconds at mid-travel
5. Activate automatic fast lowering of the drill by moving multi-function lever P01 on A, holding the position for 3 seconds at the end of travel
6. To deactivate drill lowering, move and release multi-function lever P01 on C or D.

Start drilling from the control panel

1. Position selector R10 on A to activate drilling mode (White)
2. Activate rotation by moving multi-function lever R15 on D
3. Activate percussion by moving multi-function lever R15 on e
4. Activate automatic slow drilling by moving multi-function lever R15

5. on a, holding the position for 3 seconds at mid-travel

6. Activate automatic fast lowering of the drill by moving multi-function lever R15 on A, holding the position for 3 seconds at the end of travel

7. To deactivate drill lowering, move and release multi-function lever R15 on B

Feeder adjustment during drilling

CAUTION

- **The equipment can be damaged**
- **The drill rig can only be interrupted in drilling mode or with emergency stop**

The following adjustments can be made during drilling:

- Adjustment of drill thrust
- Adjustment of Anti-Jamming
- Adjustment of rod rotation speed

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 percussion hose vibration.
  - Check the pressure in the rock drill accumulators.
- Check that the shank adapter is sufficiently lubricated.
  - Lubricating oil/air should leak out at the shank adapter.
- 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 frame.

Loosening

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 it is not in use**

Figure: Control onboard the slide

WARNING

- **Before working on the drilling rod with your hands, ALWAYS make sure that indicator light 2 located on the control box onboard the slide is GREEN**
- **If the indicator is not working, call for service immediately and do not operate the drill**

Detaching from PMI

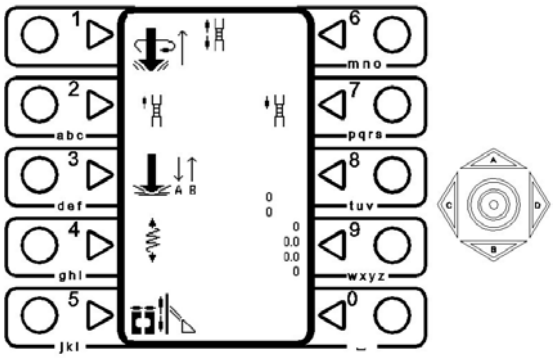


Figure: Change Rod Screen

1. Interrupt drilling
2. Go to the Change rod screen
3. Activate percussion by pressing key 1 and releasing it when the detachment of the joint is achieved.

Detaching from the Control Panel

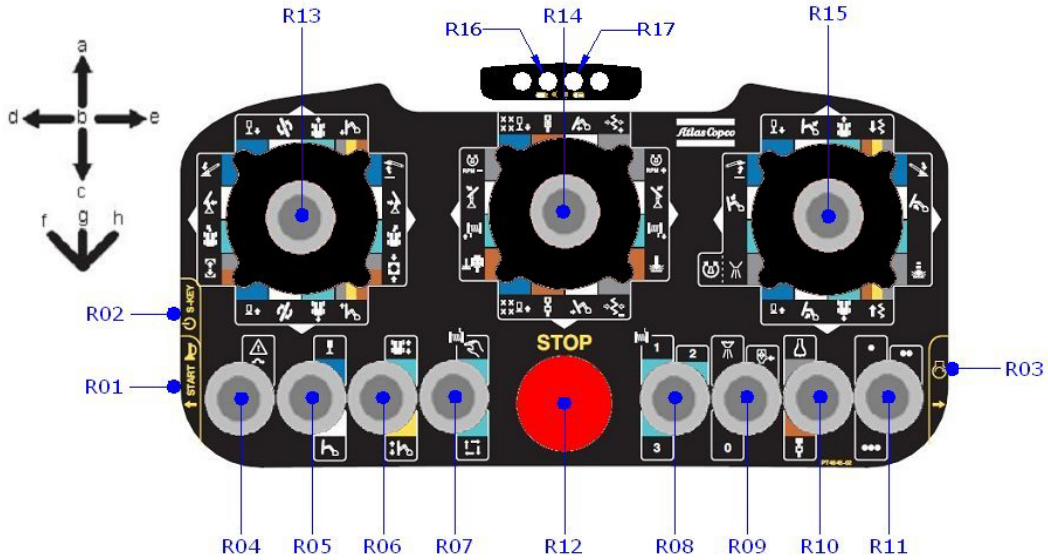


Figure: Control panel

1. Interrupt drilling
2. Position selector R10 on C
3. Activate percussion by acting on multi-function lever R14, moving it towards E and releasing it once the joint is detached.

Adding rod

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 it is not in use**
- **The rock drill must never be moving when adding rods.**
- **Before working on the drilling rod with your hands, ALWAYS make sure that indicator light 2 located on the control box onboard the slide is GREEN**

Adding rods takes place manually.

Unthreading and extracting

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 it is not in use**
- **Before working on the drilling rod with your hands, ALWAYS make sure that indicator light 2 located on the control box onboard the slide is GREEN**

Sliding off and picking from PMI

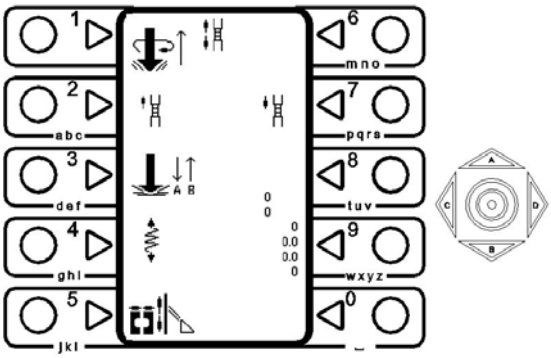


Figure: Change Rod Screen

1. Check that the joint is detached.
2. Open the drilling rod support. Key 5 and multi-function lever P01 in position C
3. Raise the drilling battery until the sleeve reaches the drilling rod support. Key 5 and multi-function lever P01 in position B
4. Close the upper drilling rod support. Key 5 and multi-function lever P01 in position D
5. Activate sliding off by acting on key 2
6. Slide the grip off of the drilling rod.

Sliding off and picking from the control panel

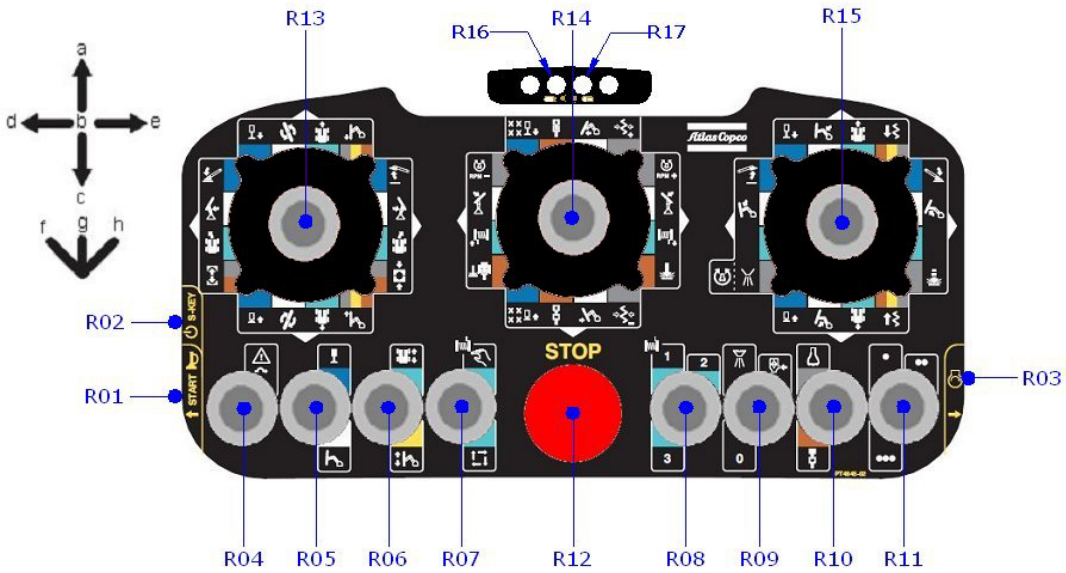


Figure: Control panel

1. Check that the joint is detached.
2. Open the drilling rod support. Selector R10 on C and multi-function lever R13 in position D
3. Raise the drilling battery until the sleeve reaches the drilling rod support. Selector R10 on C and multi-function lever R15 in position C
4. Close the upper drilling rod support. Selector R10 on C and multi-function lever R13 in position E
5. Activate sliding off by bringing multi-function lever R14 in position C
6. Slide the grip off of the drilling rod.

Changing drill bit

WARNING

- **Moving parts**
- **Risk of personal injury, clothing can be trapped**
- **Stop rock drill rotation when changing bits**
- **Before working on the drilling rod with your hands, ALWAYS make sure that indicator light 2 located on the control box onboard the slide is GREEN**

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.

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.

Hole deflection

1. Try to drill with as low a drill feed pressure as possible

2. Check the condition of the drill bit

3. 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

Electric filler pump

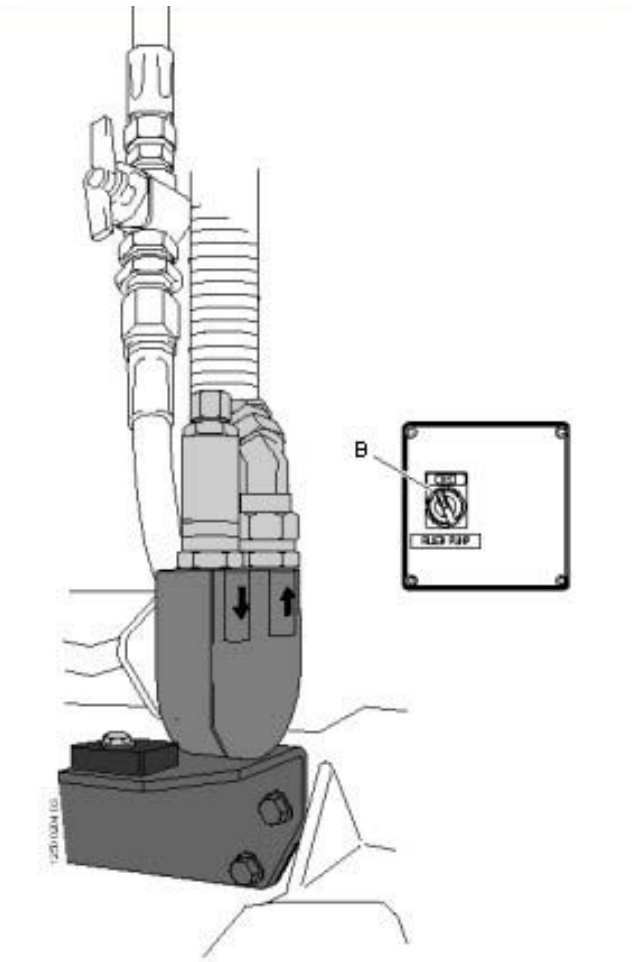


Figure: Electric filler pump

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. Activate switch (B) to position 1 to start filling.

The electrical filler pump stops automatically when the drill rig's fuel tank is full.