DRILLMEC
DRILLING TECHNOLOGIES
TRAINING CENTER

ELECTRIC TOP DRIVE
ETD 500

DRILLMEC DRILLING TECHNOLOGIES TRAINING CENTER

ELECTRIC TOP DRIVE ETD500

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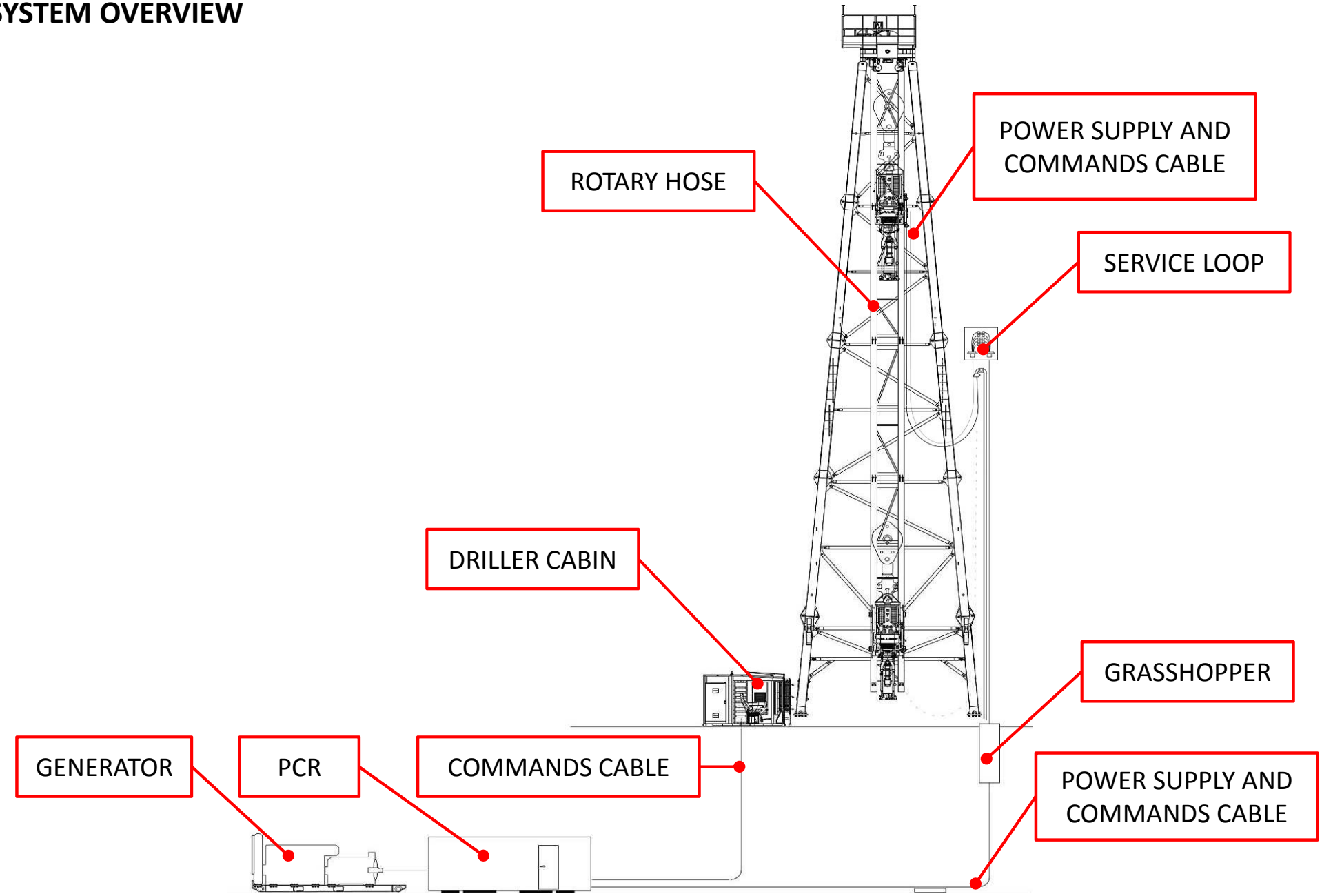
ELECTRIC TOP DRIVE ETD500

GENERAL DESCRIPTION

SYSTEM OVERVIEW



ELECTRIC TOP DRIVE ETD500

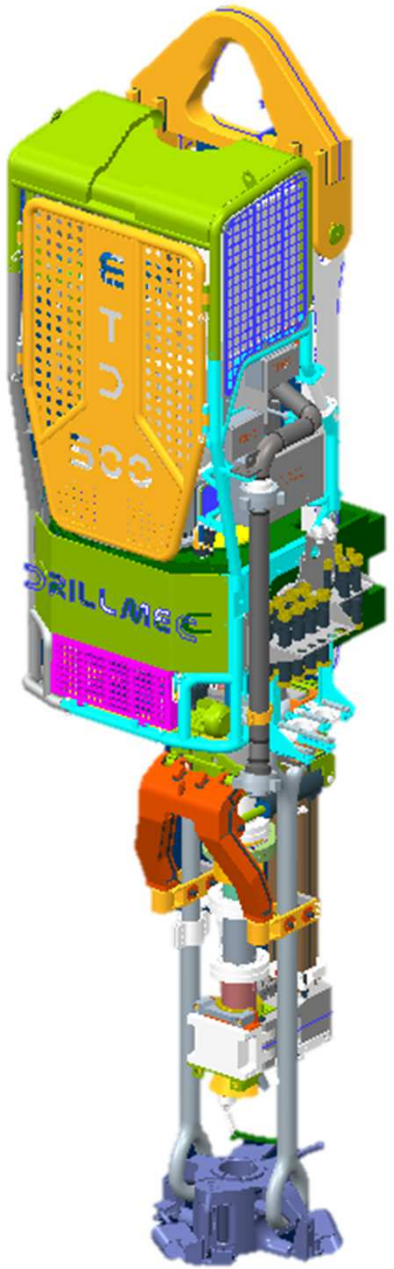
GENERAL DESCRIPTION

MAIN FEATURES

Electric Top Drive Drillmec ETD500, 500 ton capacity, manufactured in accordance with API specifications. The System is powered by one AC motor.

Top Drive includes the following items:

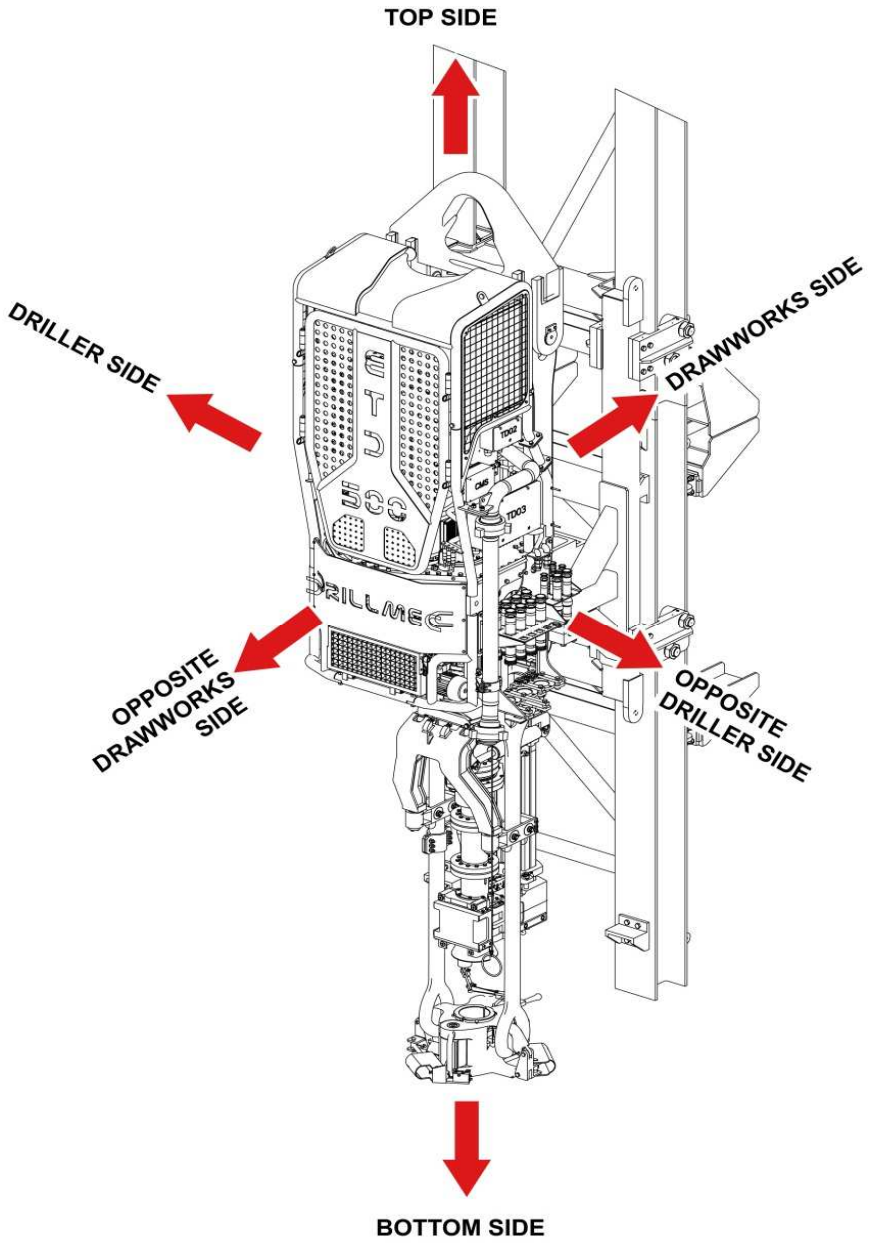
- Counterbalance system;
- Rotable pipehandler;
- Link-tilt-system (links included);
- One elevator for 5” OD DP, 350 ton capacity;
- Two saver subs with bottom connection XT54 & XT39;
- Remote-controlled and manual IBOP 15000 psi WP;
- Back up wrench;
- Torque guide;
- Service loop for cables and hoses connecting the top drive to the rig;
- Driller console;
- Hydraulic unit;
- Top drive VFD unit integrated in the PCR.



ELECTRIC TOP DRIVE ETD500

GENERAL DESCRIPTION

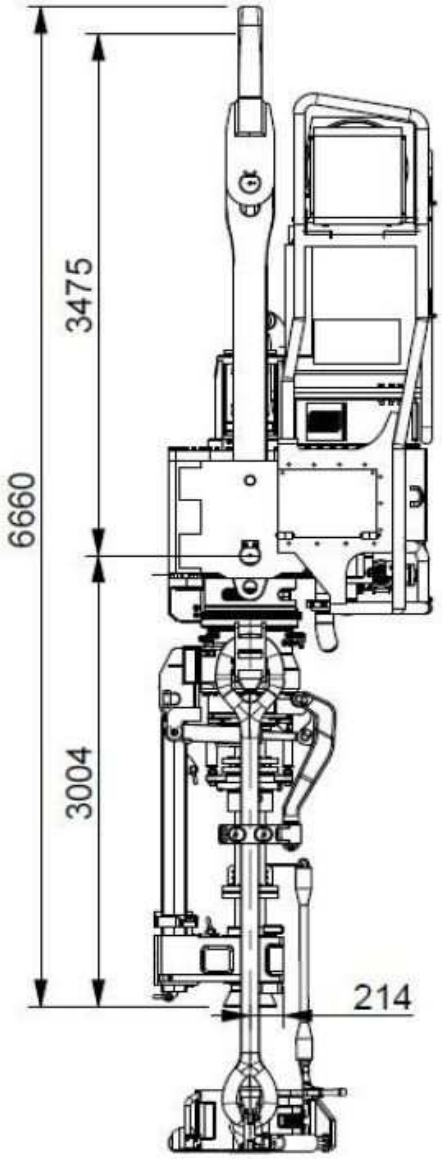
ORIENTATION

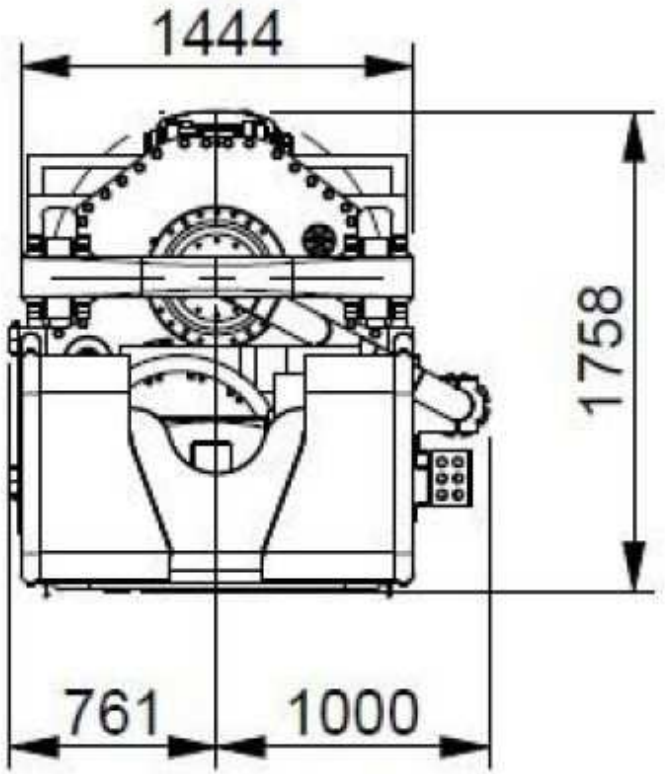


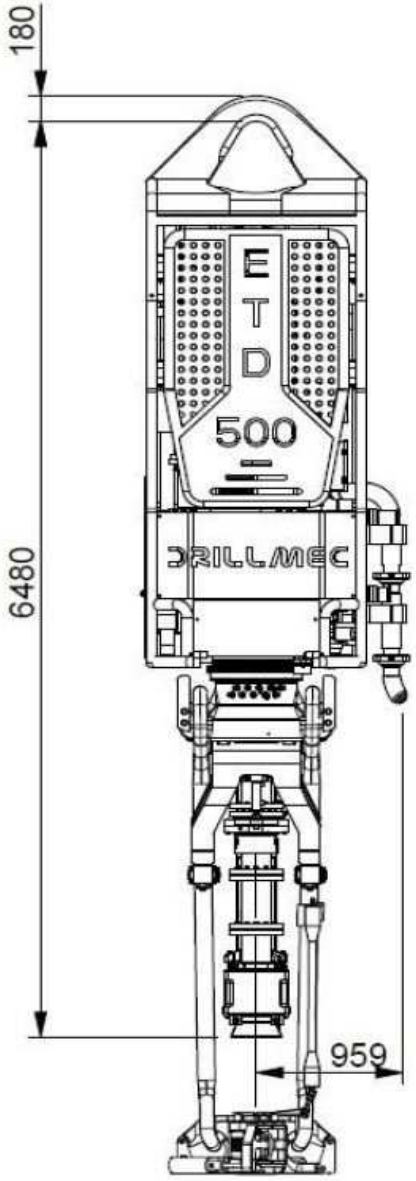
ELECTRIC TOP DRIVE ETD500

GENERAL DESCRIPTION

DIMENSIONS



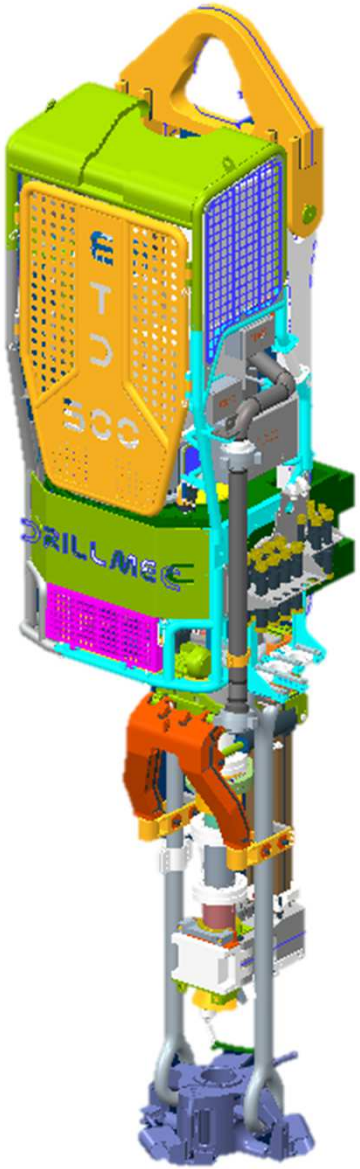




ELECTRIC TOP DRIVE ETD500

GENERAL DESCRIPTION

TECHNICAL DATA

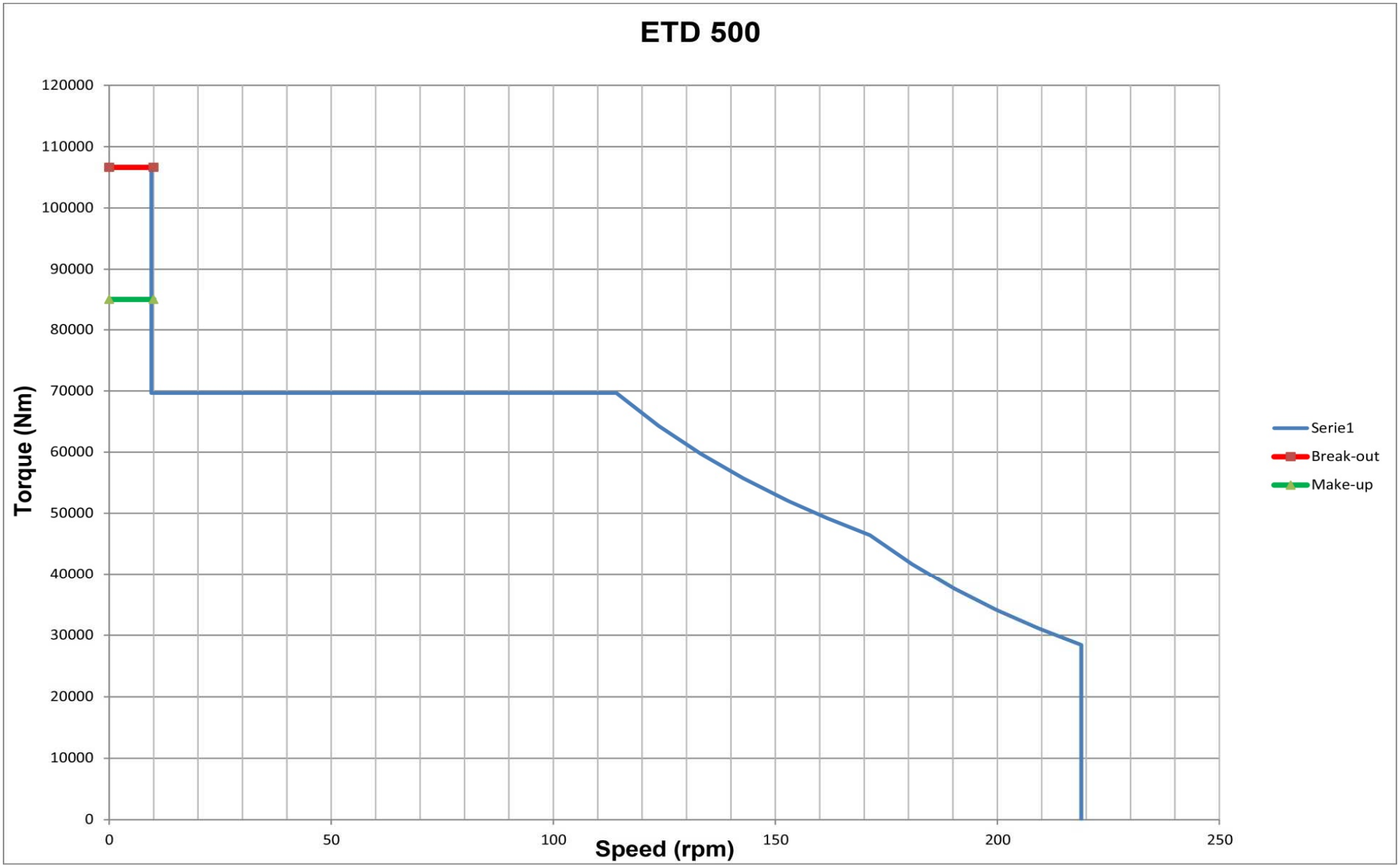


TECHNICAL DATA	
MAKE	DRILLMEC S.P.A.
LOAD RATING CAPACITY	1 000 000 LBS (453 M. TON)
POWER RATING	1 150 HP (857 KW)
DRILLING TORQUE (CONTINUOUS)	51 630 LBS X FT (70 000 NM)
DRILLING SPEED	115 RPM
MAX SPEED	220 RPM
MAX BREAK-OUT TORQUE	73 750 LBS X FT (100 000 NM)
STATIC BRAKE TORQUE	92 200 LBS X FT (125 000 NM)
QUILL ID AND WP	3'' (76,2 MM) – 7500 PSI (517 BAR) WP
LINK TILT LIFTING CAPACITY	5500 LBS (2500 KG) @ 4,6 FT (1,4 M)
GEARBOX RATIO	10,508 : 1
TEMPERATURE RANGE	- 10°C + 55°C

ELECTRIC TOP DRIVE ETD500

GENERAL DESCRIPTION

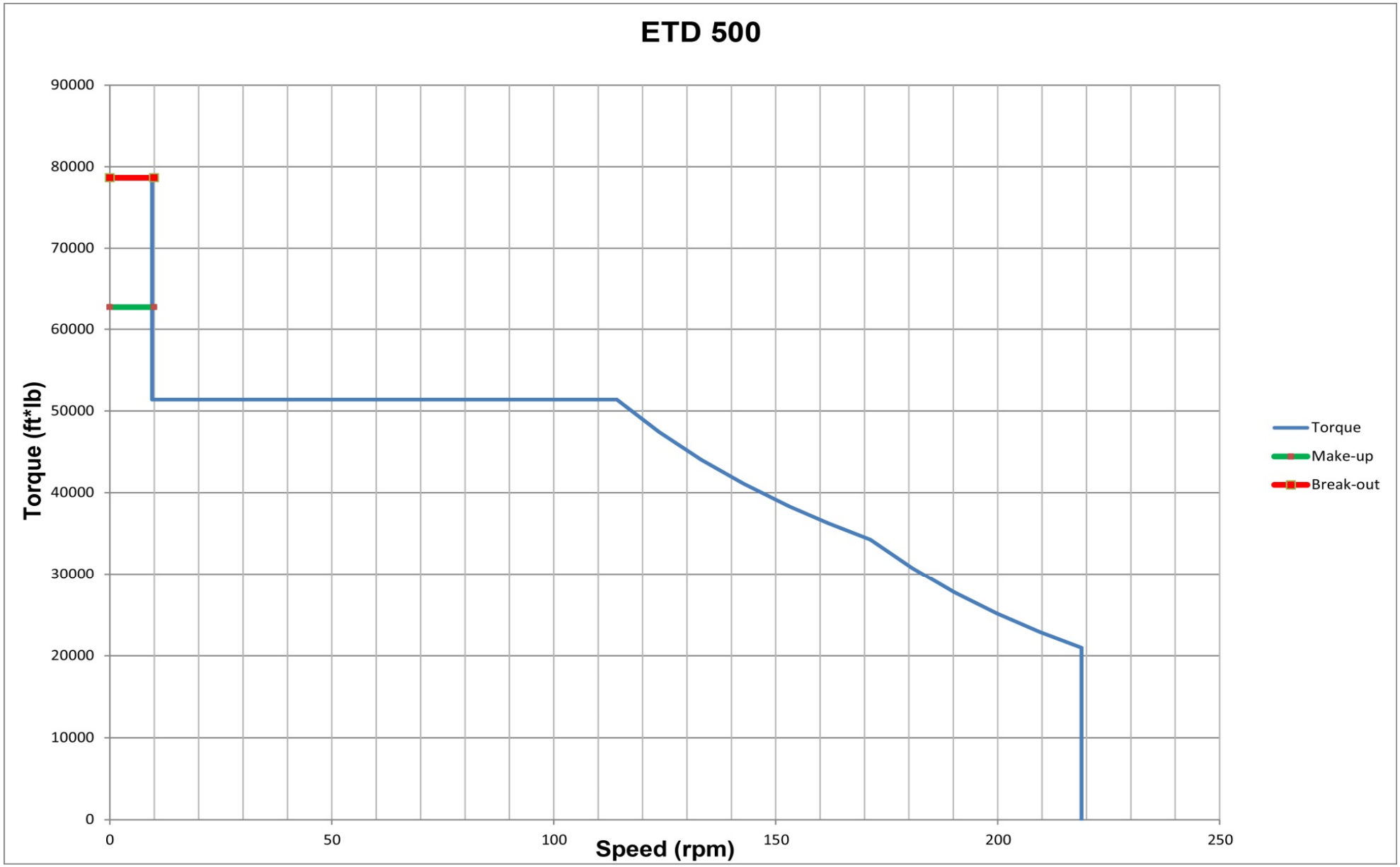
PERFORMANCES (METRIC UNITS)



ELECTRIC TOP DRIVE ETD500

GENERAL DESCRIPTION

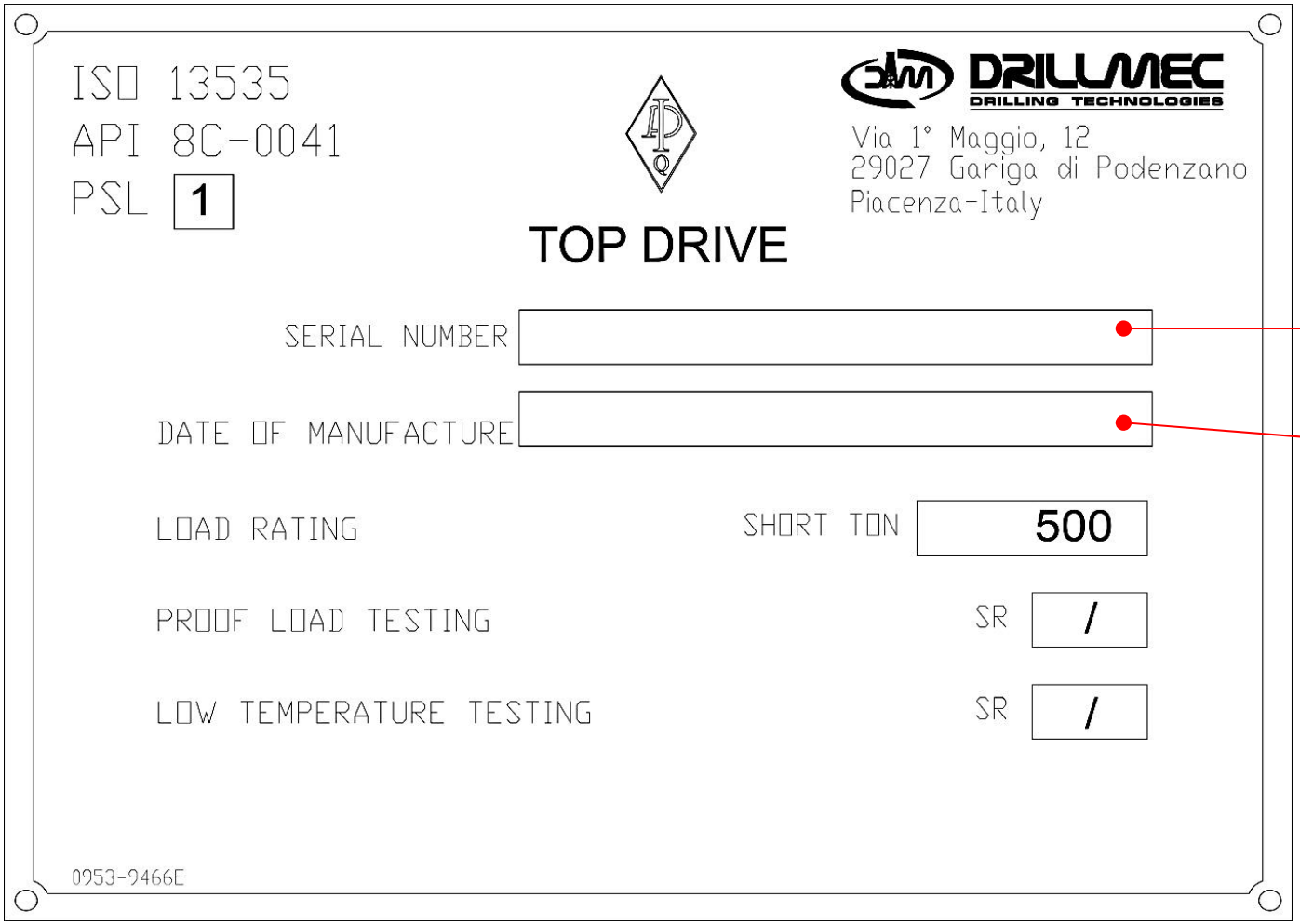
PERFORMANCES (IMPERIAL UNITS)



GENERAL DESCRIPTION

IDENTIFICATION PLATES

The plates of all the main mechanical, hydraulic and electric components not manufactured by DRILLMEC (pumps, motors, etc.) are located on the relevant components, in the positions where the respective manufacturers decided to place them.



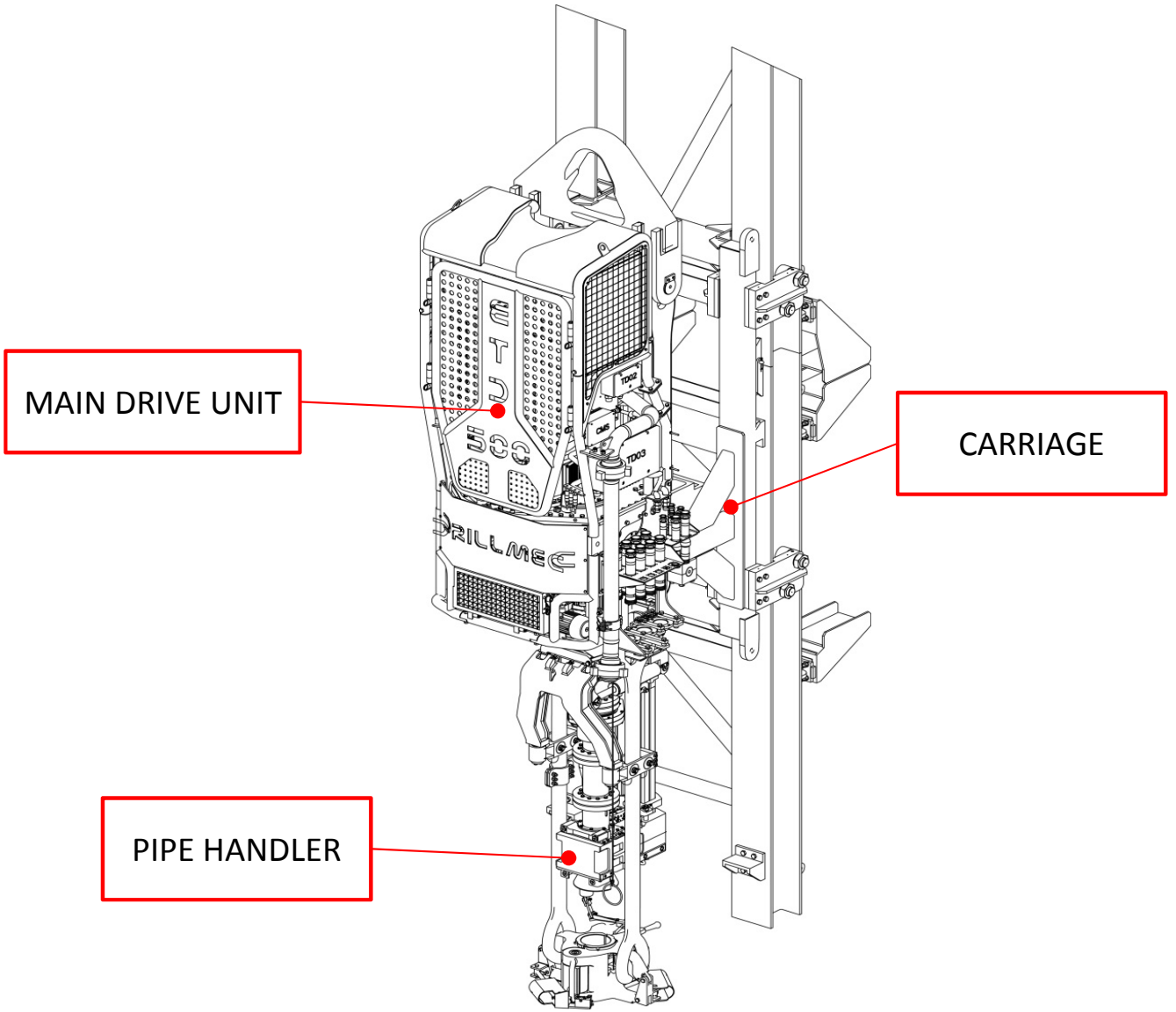
SERIAL NUMBER

YEAR OF MANUFACTURE

ELECTRIC TOP DRIVE ETD500

GENERAL DESCRIPTION

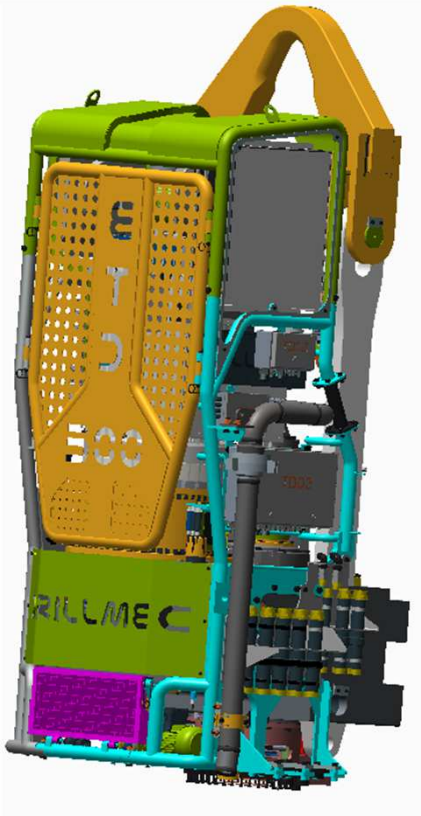
FUNCTIONAL GROUPS

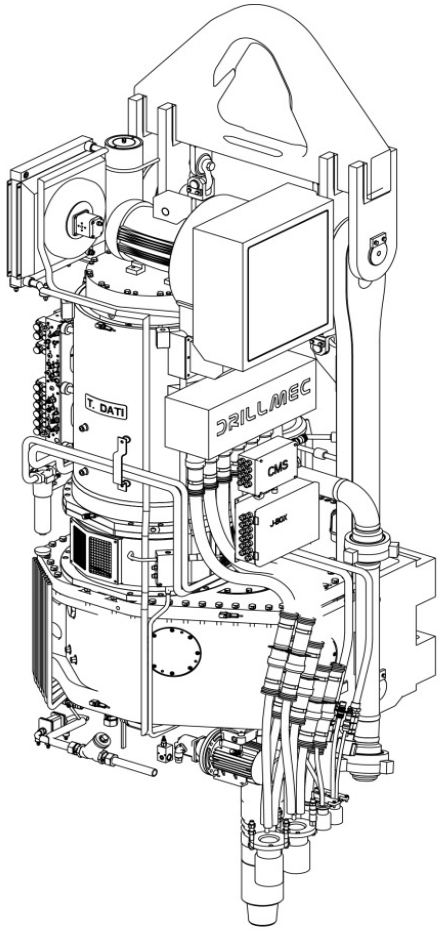


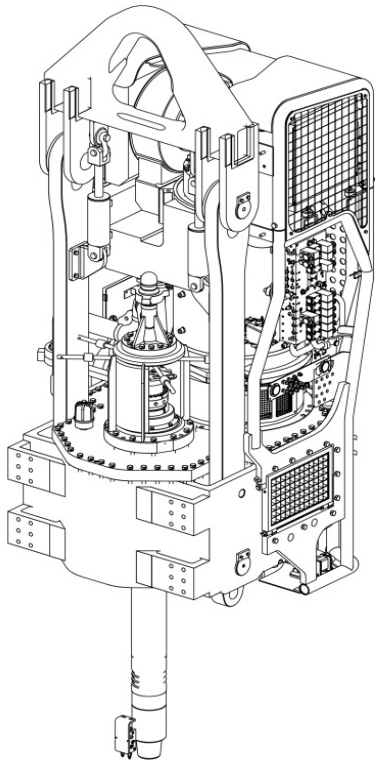
ELECTRIC TOP DRIVE ETD500

MAIN DRIVE UNIT

OVERVIEW



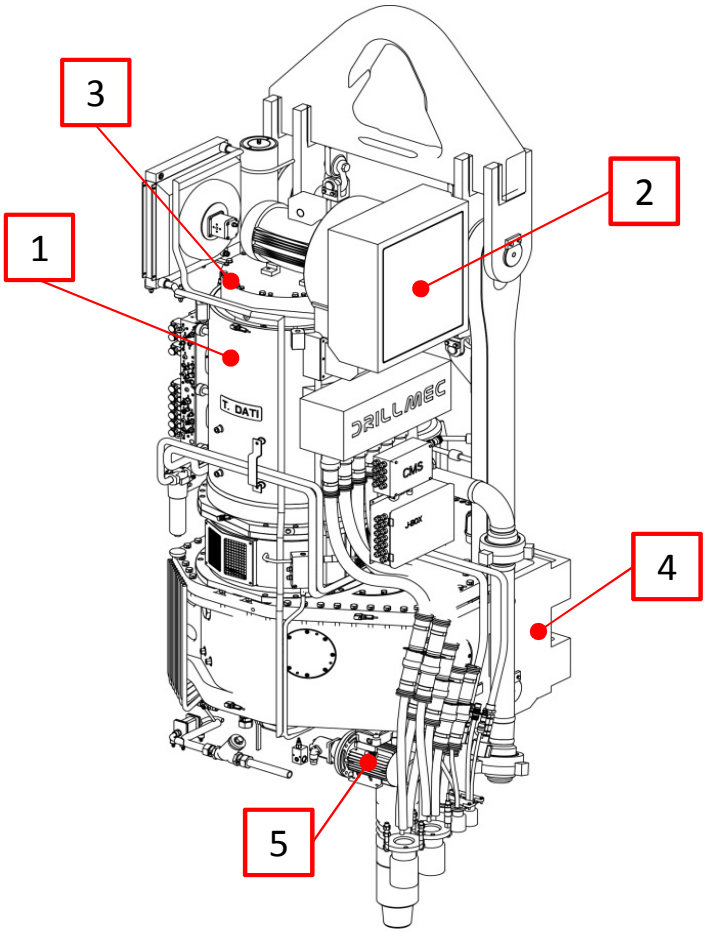




ELECTRIC TOP DRIVE ETD500

MAIN DRIVE UNIT

COMPONENTS AND DESCRIPTION

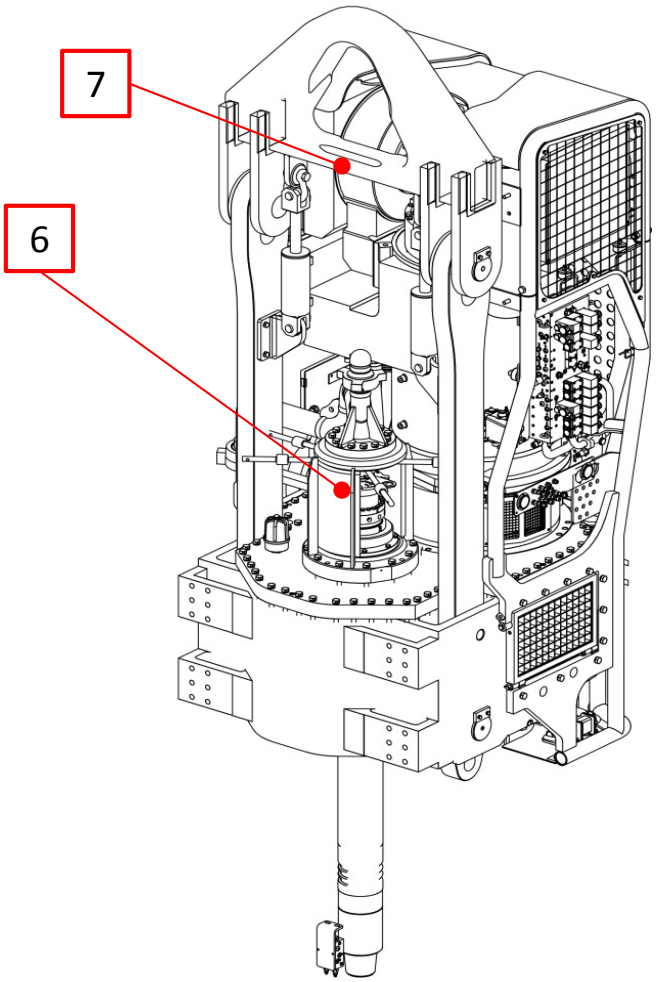


TECHNICAL DATA		
1	ELECTRIC MOTOR	Provides the necessary torque for rotation of the main shaft.
2	BLOWER SYSTEM	Air cooling of the motor using a blower. The hot air is expelled from the external cover grids on the motor.
3	HYDRAULIC BRAKE	Single disc brake hydraulically released for motor braking.
4	GEAR BOX	Two stage gear box for torque transfer from the motor shaft to the main shaft with a gear ratio.
5	GEAR BOX LUBRICATION SYSTEM	Lubricates and cools the gears and gear box bearings. The lubrication oil is cooled using an air/liquid exchanger.

ELECTRIC TOP DRIVE ETD500

MAIN DRIVE UNIT

COMPONENTS AND DESCRIPTION

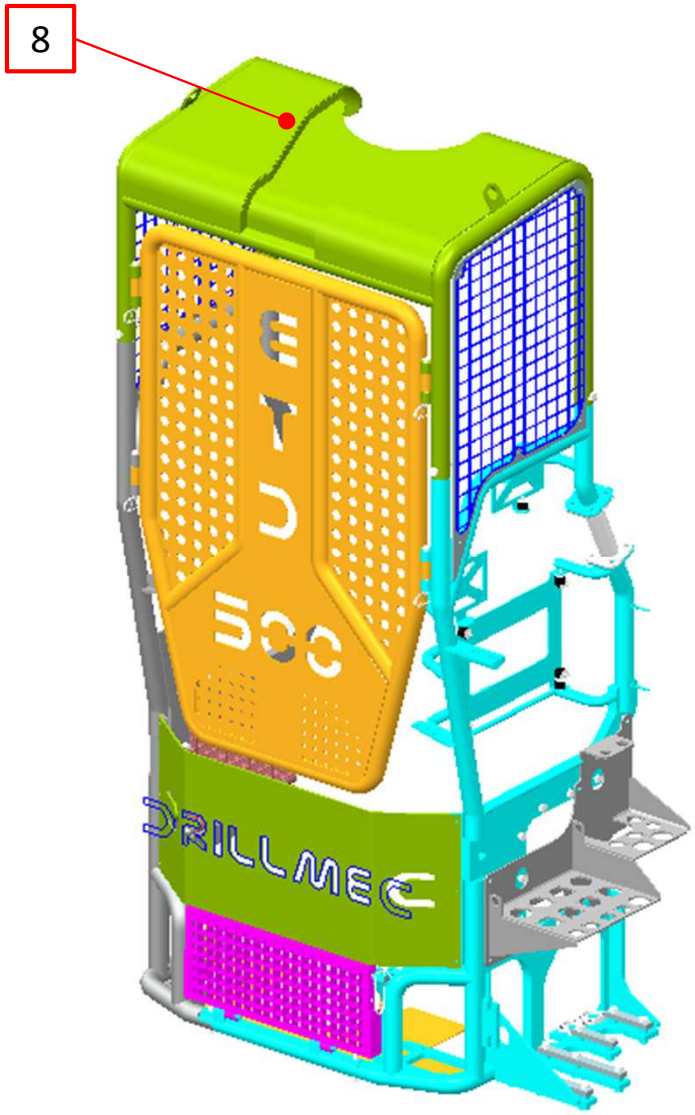


TECHNICAL DATA		
6	MUD SUPPLY GROUP	Connects the fixed mud supply line (gooseneck) with the rotating shaft (quill) by means of the washpipe.
7	COUNTERBALANCE SYSTEM	Support unit on the drive with a balancing system.

ELECTRIC TOP DRIVE ETD500

MAIN DRIVE UNIT

COMPONENTS AND DESCRIPTION



TECHNICAL DATA		
8	PROTECTION FRAME	Protection frame for the components installed on board. It is fixed on the gearbox case.

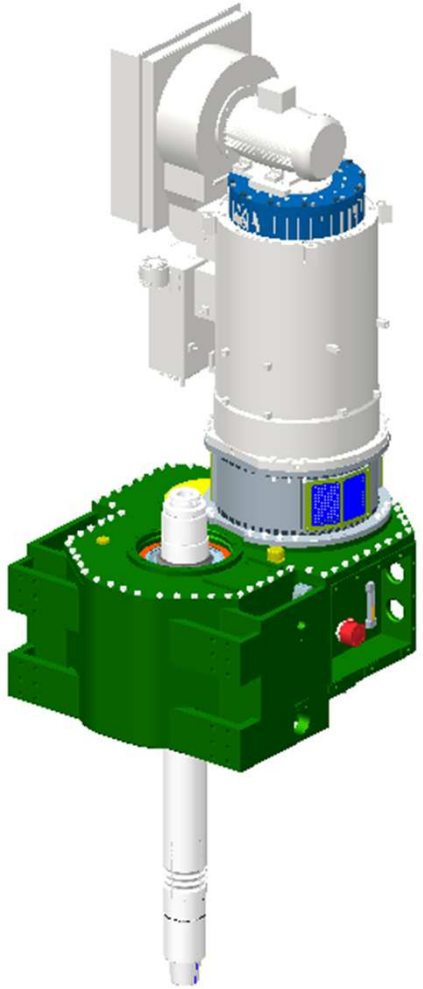
ELECTRIC TOP DRIVE ETD500

MAIN DRIVE UNIT

ELECTRIC MOTOR

The rated power of the motor is 850 KW / 1150 HP. It is controlled by a frequency drive and temperature monitored. The maximum operating temperature is controlled by sensors in the motor.

TECHNICAL DATA	
MODEL	AFD 400.S644EXTDD
NOMINAL SPEED	1200 RPM
MAX SPEED	2300 RPM
NOMINAL VOLTAGE	575 – 600 V AC
PROTECTION CLASS	IP44, ATEX II2 G EX E IIB T4
INSULATION CLASS	H



EQUIPMENT:

- 6 PT100 for windings temperature;
- 2 PT100 for bearings temperature;
- 3x100w space heater (ex d);
- Air cooling;
- Main terminal box with customized position, ip56.

ELECTRIC TOP DRIVE ETD500

MAIN DRIVE UNIT

BLOWER

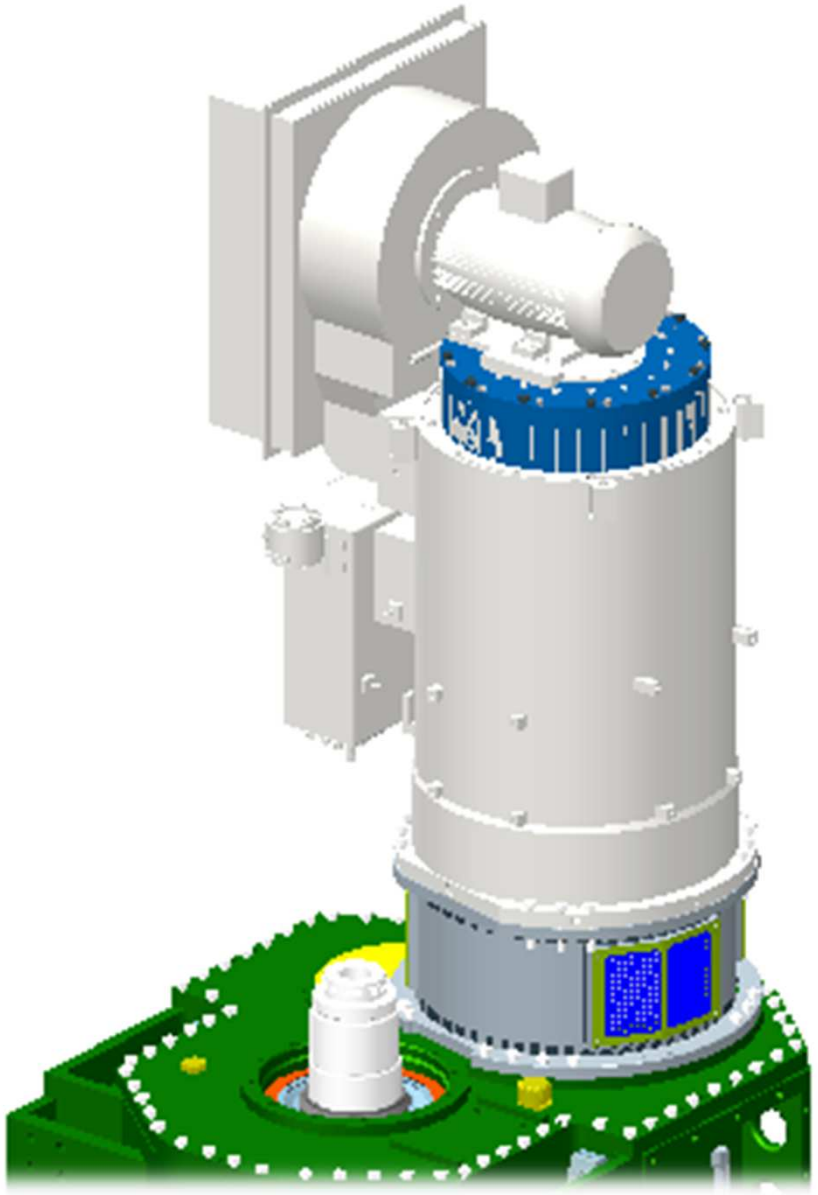
A motor drives the engine fan. Cooling air is conducted via a noise reduced suction hood through a blower channel into the ac motor of the Top Drive and transmission oil cooler.

TECHNICAL DATA	
NOMINAL VOLTAGE	400 V AC
NOMINAL POWER	11 kW
HEATER	230 V

HYDRAULIC BRAKE

Hydraulically operated brake disc type. It is coupled between the electric motor base and gearbox.

TECHNICAL DATA	
BRAKING TORQUE	10000 Nm
NOMINAL PRESSURE	25/30 bar



ELECTRIC TOP DRIVE ETD500

MAIN DRIVE UNIT

GEARBOX

The speed of the motor is reduced twice before it is transferred to the bullgear of the gearbox.

The gearbox is lubricated with combined splash/pressure lubrication.

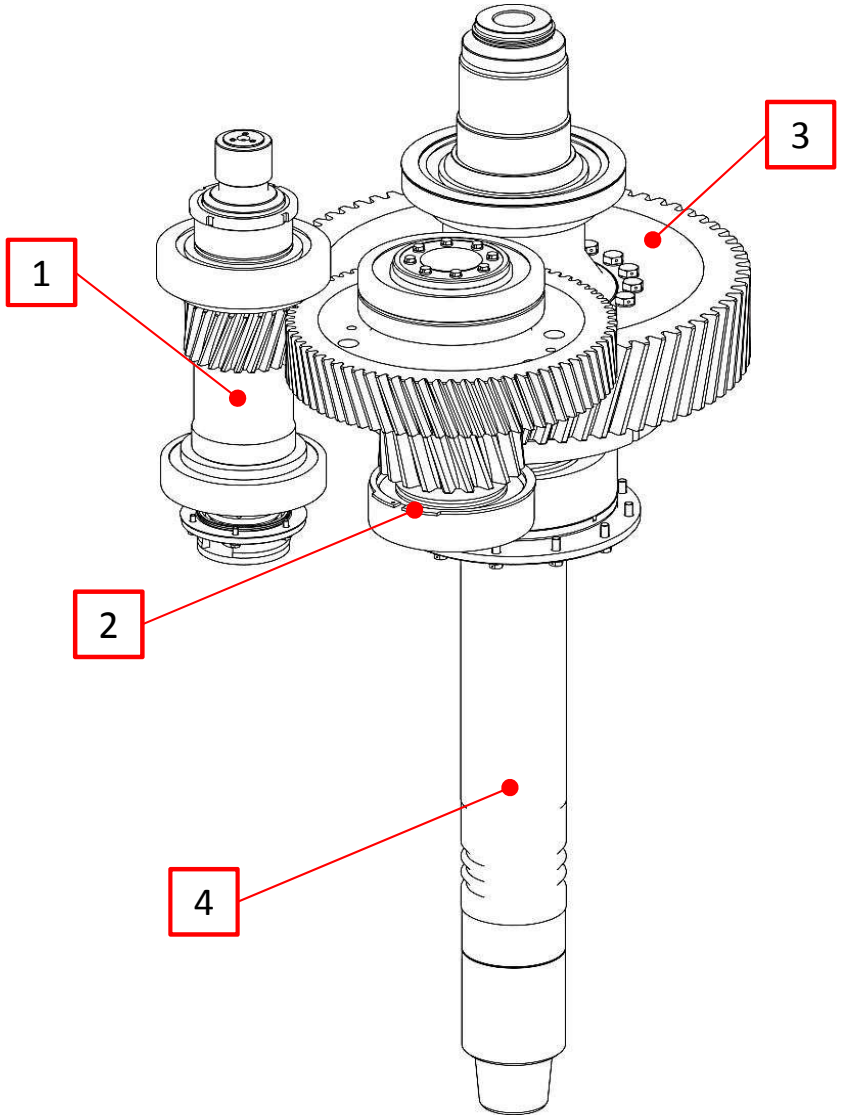
If the gear oil has reached its maximum temperature it is piped via a bypass through an oilcooler. The oilcooler is included in the blower system of the motor.

TECHNICAL DATA	
RATIO	10,508 : 1

ELECTRIC TOP DRIVE ETD500

MAIN DRIVE UNIT

GEARBOX



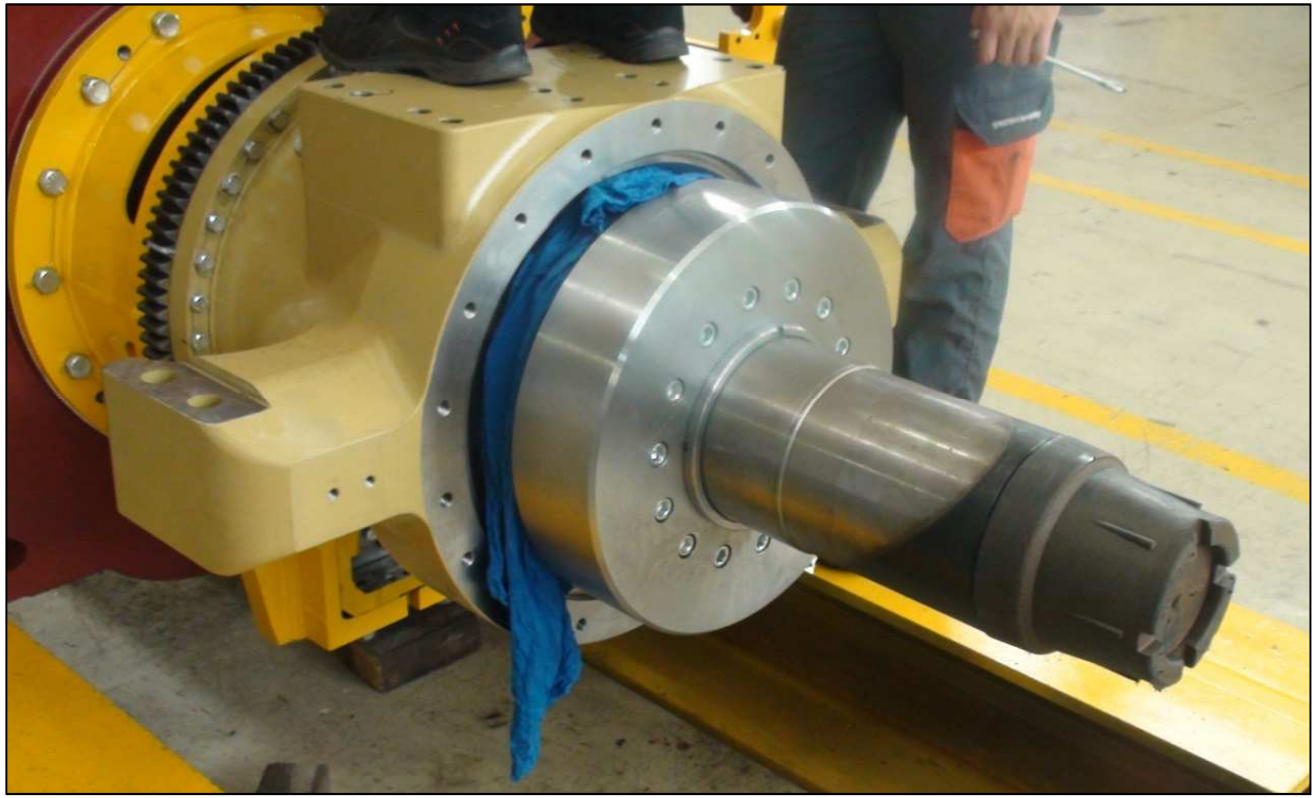
COMPONENTS	
1	MOTOR SHAFT (PINION SHAFT)
2	INTERMEDIATE SHAFT (COUNTERSHAFT)
3	TRANSMISSION SHAFT (BULLGEAR)
4	MAIN SHAFT (QUILL)

MAIN DRIVE UNIT

MAIN SHAFT (QUILL)

The mainshaft – powered by the bullgear – is located in the gearbox together with the thrust bearing.
It is conducted via lower bearing. In order to execute drilling fluid a washpipe is connected. At the bottom of the mainshaft there is an API pin as connection to the drill string. The drill string is powered by the mainshaft. The mainshaft holds the load collar which bears the link adapter that holds the drill pipe during elevator operation.

TECHNICAL DATA	
CONNECTION	6 5/8 ‘’ API REG
INSIDE DIAMETER	76 MM (3’’)



ELECTRIC TOP DRIVE ETD500

MAIN DRIVE UNIT

MUD SUPPLY GROUP

The mud feeding comprises a 3“ washpipe and a goose neck with 2“ input for wireline operation as well as a 4” mud hose connection.

The mud feeding disposes of a pressure rating of 7500 PSI.

TECHNICAL DATA	
PRESSURE RATING	517 BAR (7 500 PSI)
WASHPIPE ID	76 MM (3’’)
GOOSNECK ID	102 MM (4’’)
WIRELINE PLUG ID	51 MM (2’’)

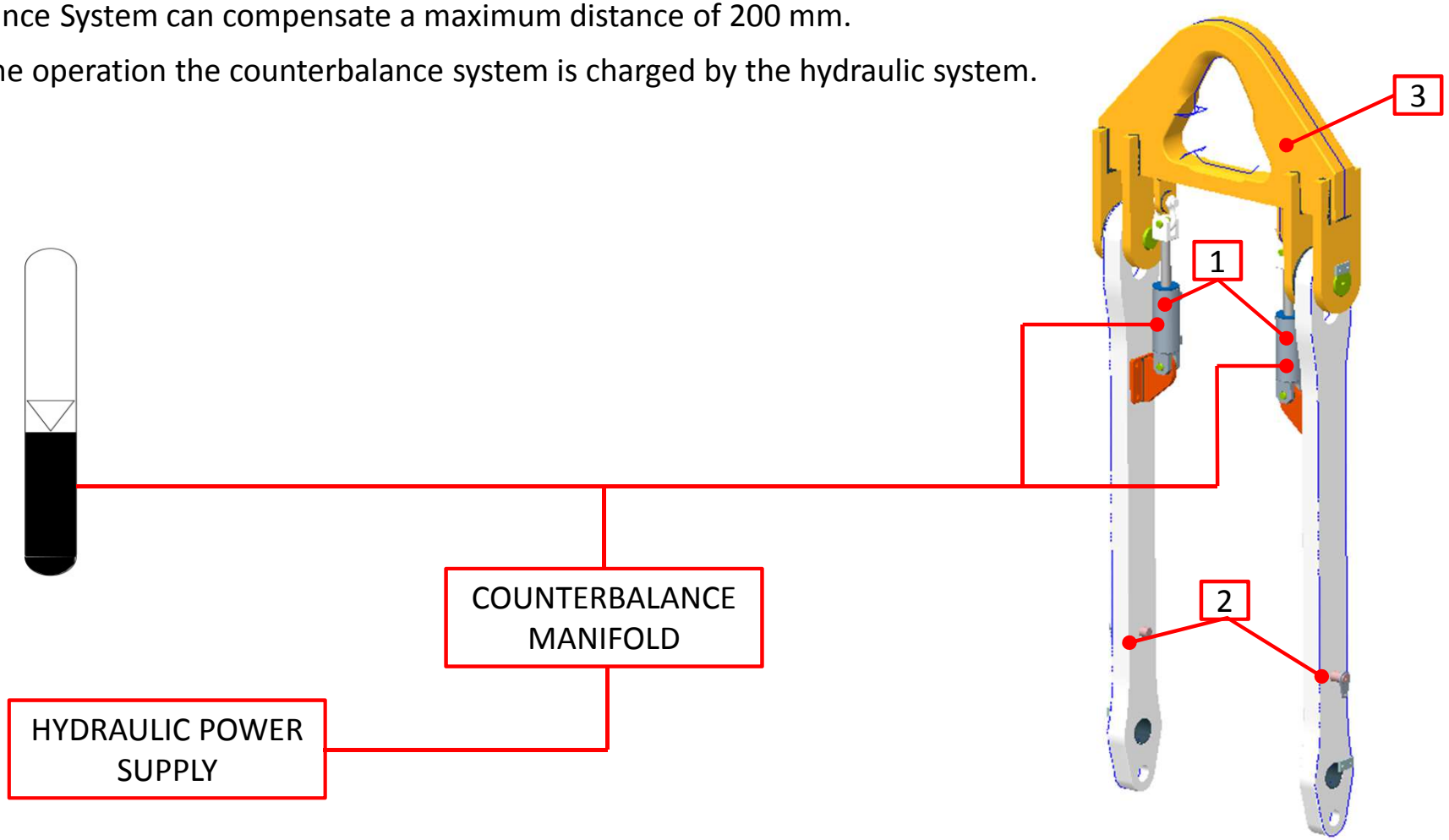
MAIN DRIVE UNIT

COUNTERBALANCE SYSTEM

The counterbalance system prevents damage to the threads of the saver sub and drill pipe by offsetting the weight of the top drive. The system consists primarily of two hydraulic cylinders [1] , a counterbalance manifold and one hydraulic accumulator. The cylinders are assembled on the links [2] and the bail [3] .

The Counterbalance System can compensate a maximum distance of 200 mm.

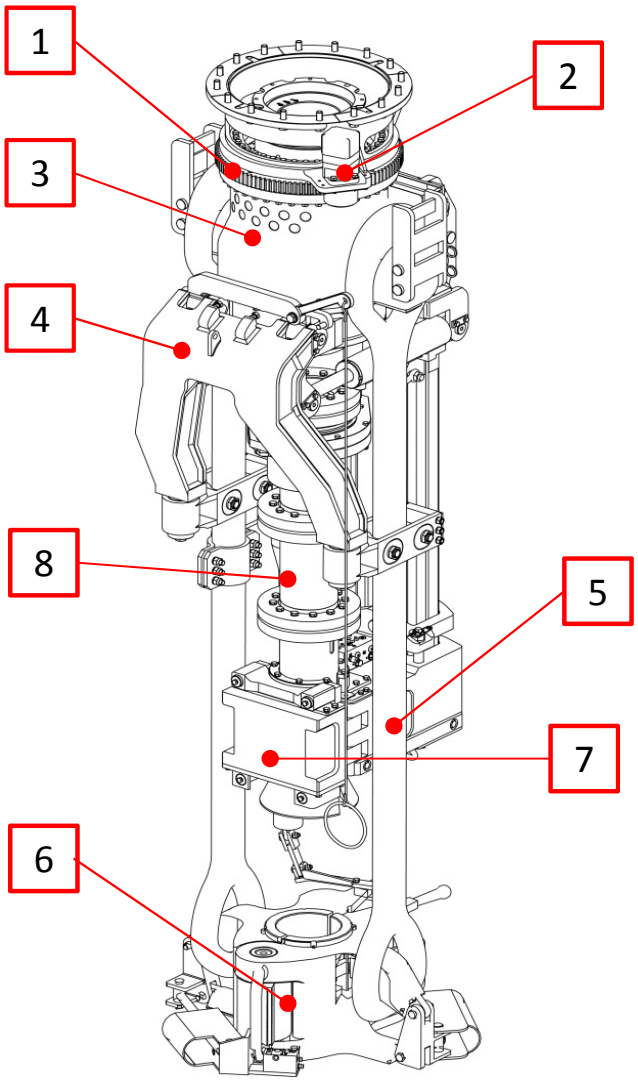
When starting the operation the counterbalance system is charged by the hydraulic system.



ELECTRIC TOP DRIVE ETD500

PIPE HANDLER

COMPONENTS AND DESCRIPTION

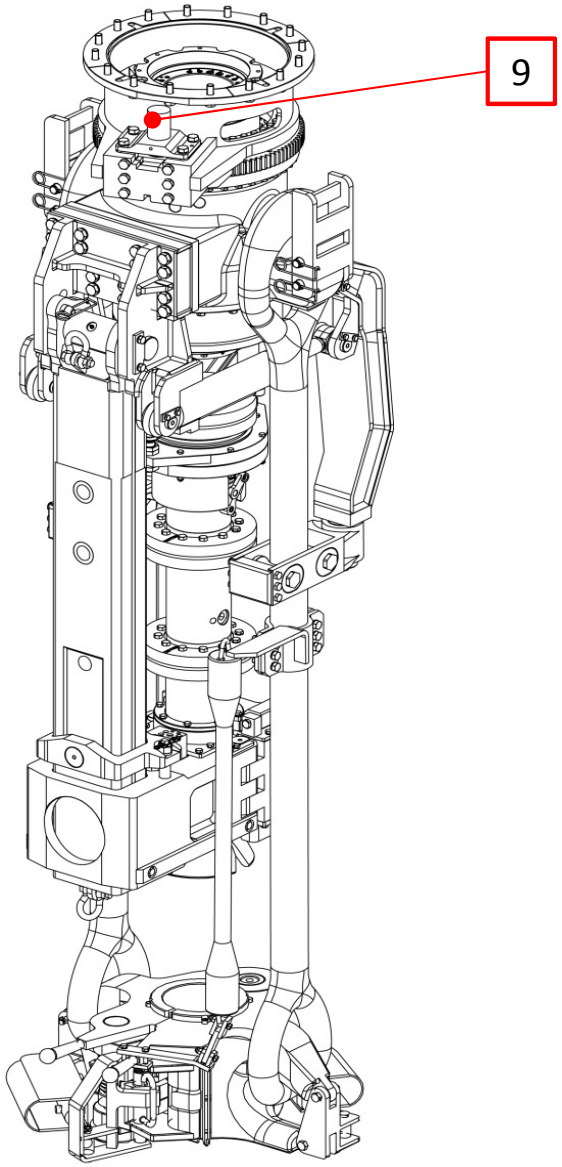


TECHNICAL DATA		
1	GEAR WHEEL FOR LINKS ROTATION	A gear wheel activated by a hydraulic motor that enables the link orientation based on the well axis.
2	ROTATION ACTUATOR	Hydraulic motor with pinion to activate the gear wheel.
3	LINK ADAPTER	Connection of the rotating part on the fixed part of the pipe handler.
4	LINK TILT ASSEMBLY	Using the two cylinders, enabling movement of the links and the drill pipe elevator.
5	LINKS	Allow movement of the drill pipes.
6	DRILL PIPE ELEVATOR	Connection between links and drill pipes.
7	BACK UP CLAMP	For make up/break out drill pipe connections between Top drive and drill string.
8	IBOP VALVE	Control the mud flow inside the main shaft on which they are located. The upper valve is remotely activated, while the lower one is manual.

ELECTRIC TOP DRIVE ETD500

PIPE HANDLER

COMPONENTS AND DESCRIPTION



TECHNICAL DATA		
9	ROTATION LOCKING SYSTEM	System assigned to locking the gear wheel (with 3° intervals) after the orientation operations. The system is composed of a locking rack activated by a hydraulic cylinder.

ELECTRIC TOP DRIVE ETD500

PIPE HANDLER

GEAR WHEEL FOR ROTATION

The pipehandler is infinitely rotatable by 360°. The main gear wheel is run by the pinion.

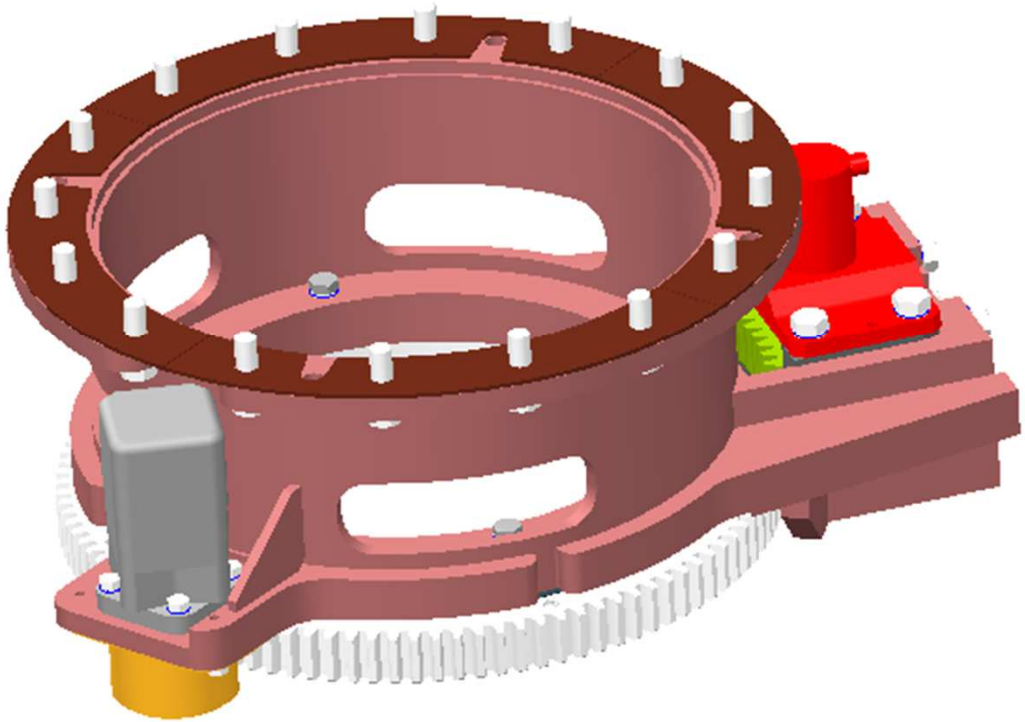
ROTATION ACTUATOR

The pinion is moved by a hydraulic motor.

LOCKING SYSTEM

The gear segment is moved by a hydraulic cylinder.

It grabs at the main gear wheel and arrests the pipe handler in intervals of 3°.



ELECTRIC TOP DRIVE ETD500

PIPE HANDLER

LINK ADAPTER

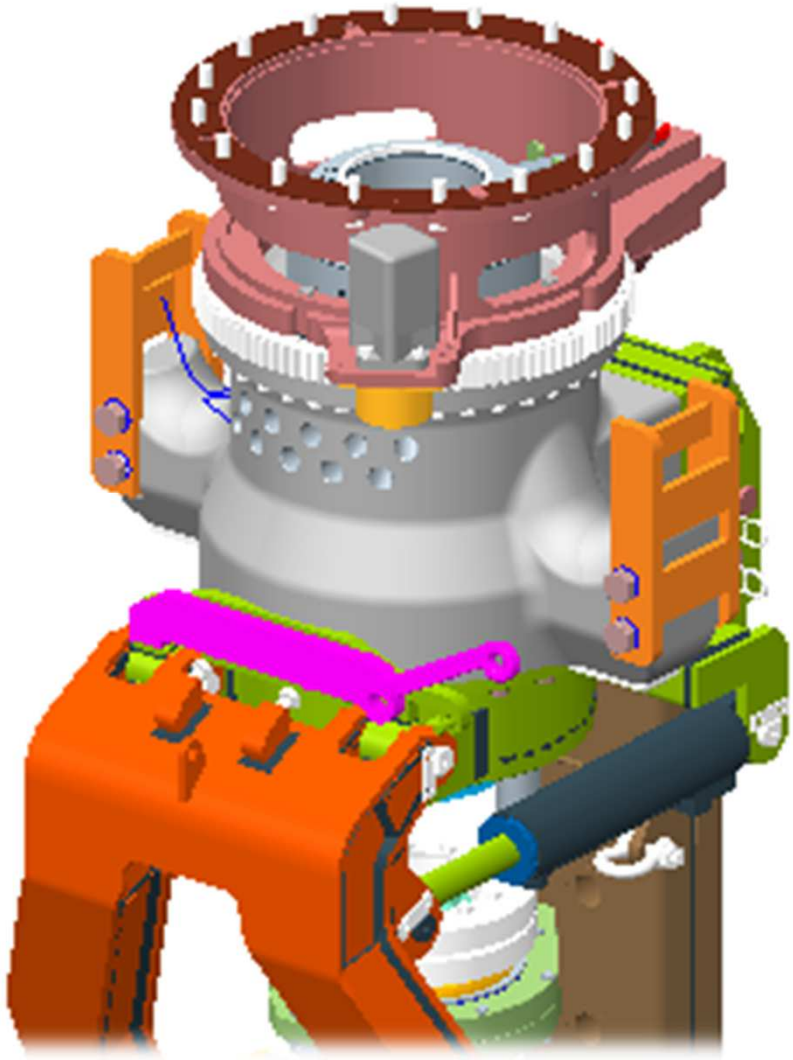
The link adapter is positioned in the link adapter frame. The load collar holds the link adapter during elevator operation.

The load collar transfers the load into main shaft.

The load collar consists of two half-shells with grooves that grap into the main shaft. A housing keeps the shells together.

Hydraulic lines of the consumer of the Pipehandler are transferred through the rotary union.

Free channels are available, enabling the connection of additional consumers.



ELECTRIC TOP DRIVE ETD500

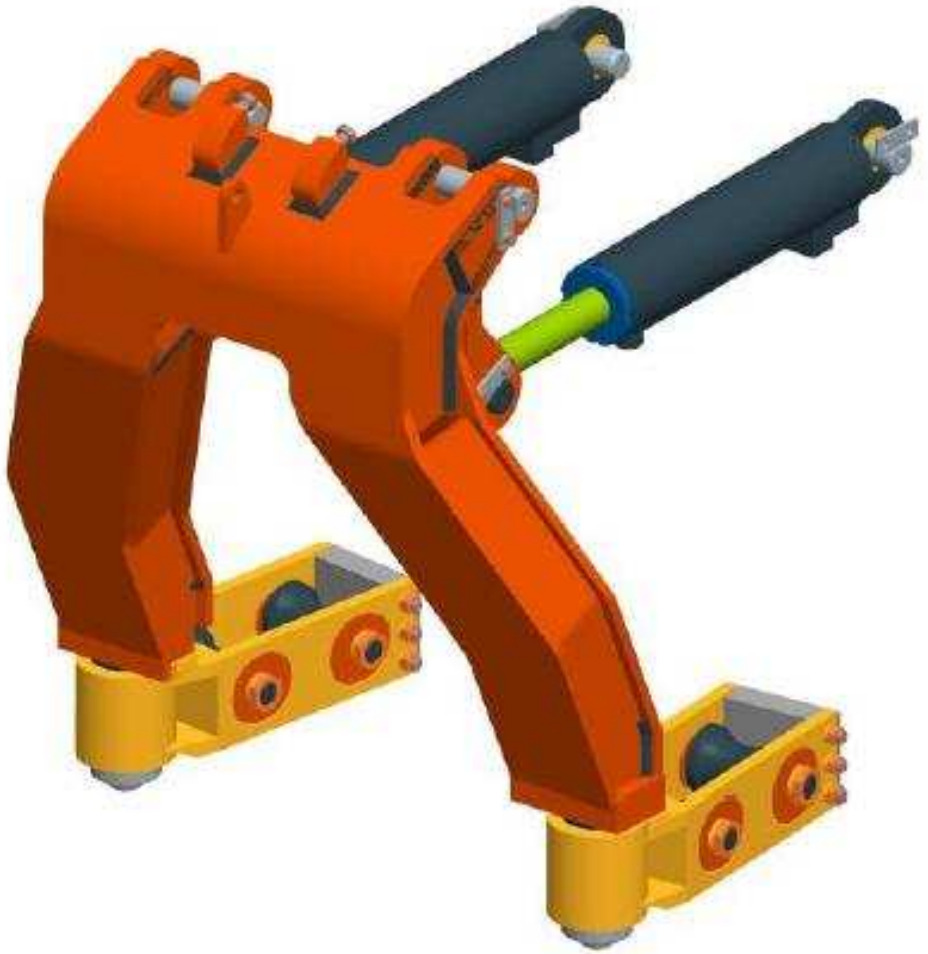
PIPE HANDLER

LINK TILT ASSEMBLY

Two hydraulic cylinders move Links and Elevator.

Hereby the elevator can be placed in any position necessary for picking the pipes.

The system can lift 2,5 t at a distance of 1,583 m from the center well (moushole position) and 0,5 t at a distance of a 2,439 m (overdrill position).



ELEVATOR LINKS

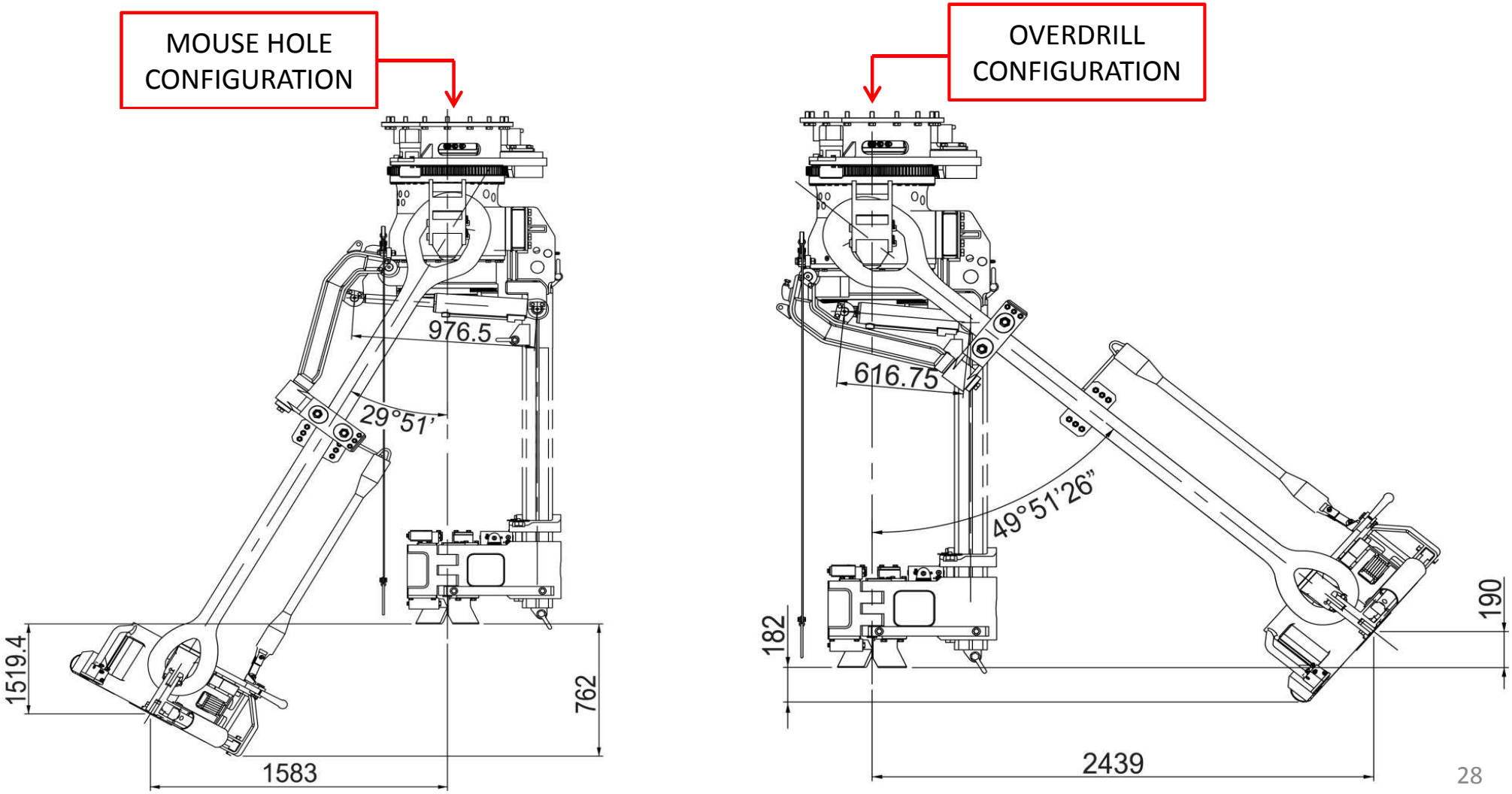
One set of 500 Tons capacity elevator links, 3 .” size, 120" length.

ELECTRIC TOP DRIVE ETD500

PIPE HANDLER

LINK TILT CONFIGURATIONS

Extension configuration of the links forward towards the mouse hole and backward in the overdrill position.



ELECTRIC TOP DRIVE ETD500

PIPE HANDLER

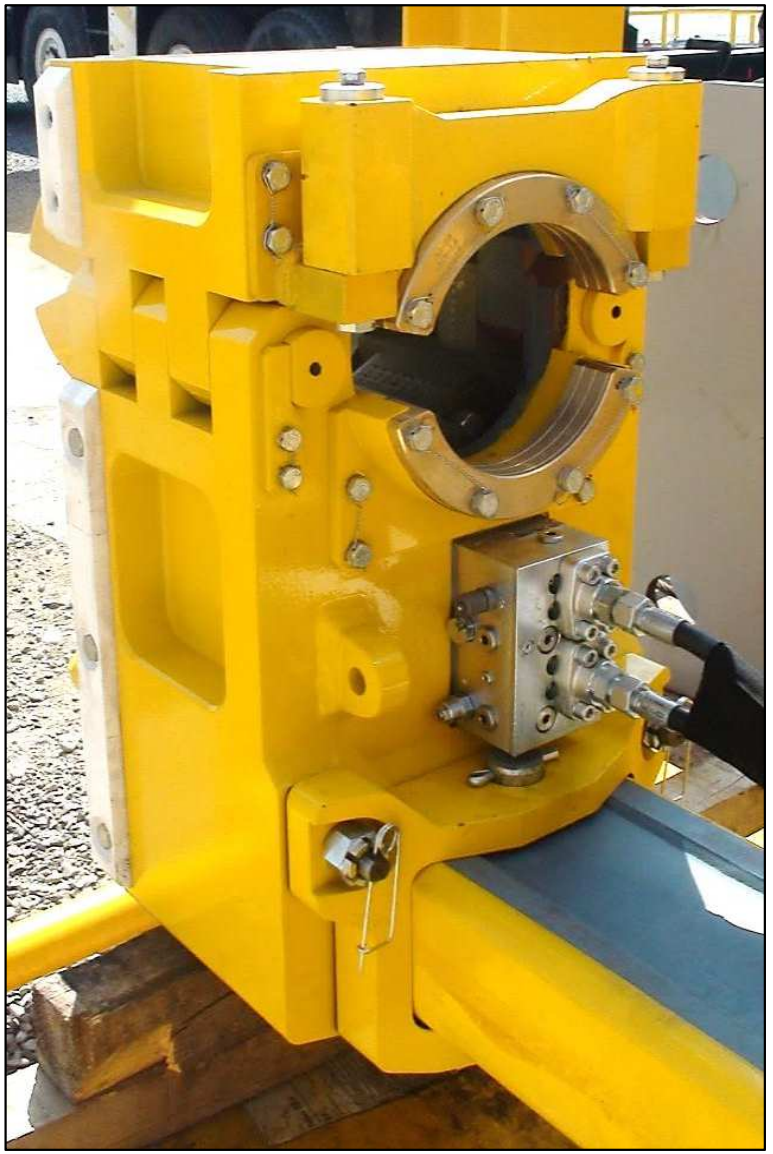
BACKUP CLAMP

The purpose of the backup Clamp is making up and breaking drill pipe connections between Top Drive (Saversub) and drill string. The back up clamp is connected to the Linkadapter-frame via torque beam.

The Jaw Assemblies are moved by an hydraulic cylinder. Using different kinds of jaw assemblies allows making up and breaking of drill pipe with various OD`s.

The Top Drive is equipped with one Jaw size. Additional Sizes for other Tool Joint OD's are available as the option "Tool Joint Adapter Kit". The break-out capacity is 106 630 Nm (78 646 lbs/ft) and the make-up capacity is 85 000 Nm (62692 lbs/ft)

JAWS SIZES	
1°	4,75'' – 6''
2°	6,25'' – 7,5''
3°	7,75'' – 8,25''

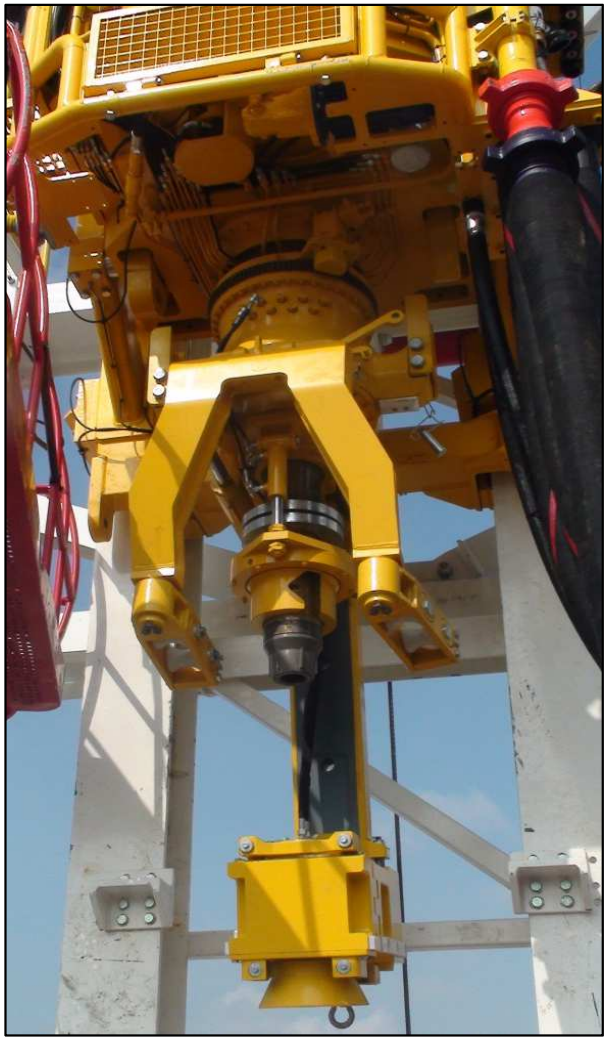


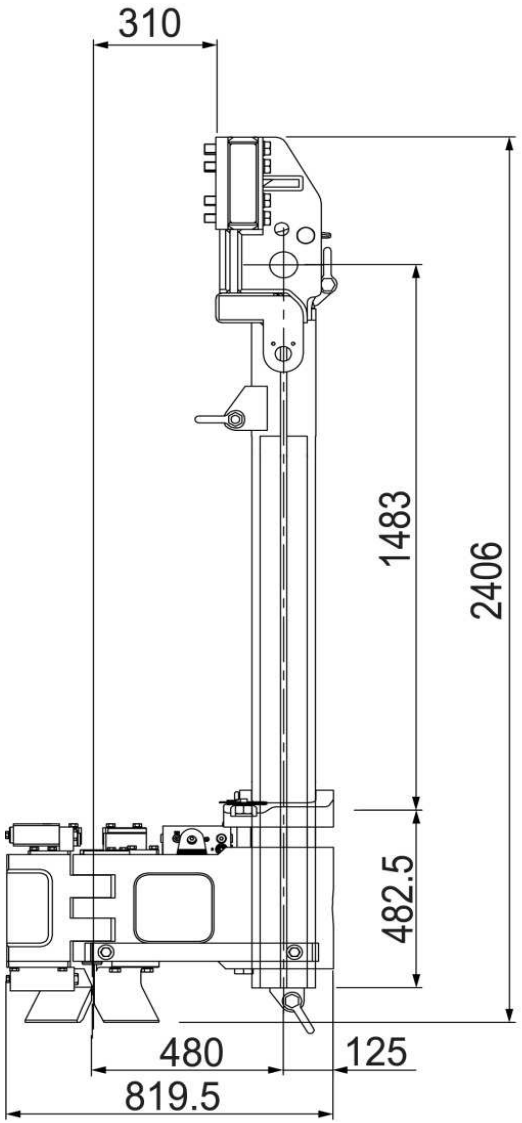
ELECTRIC TOP DRIVE ETD500

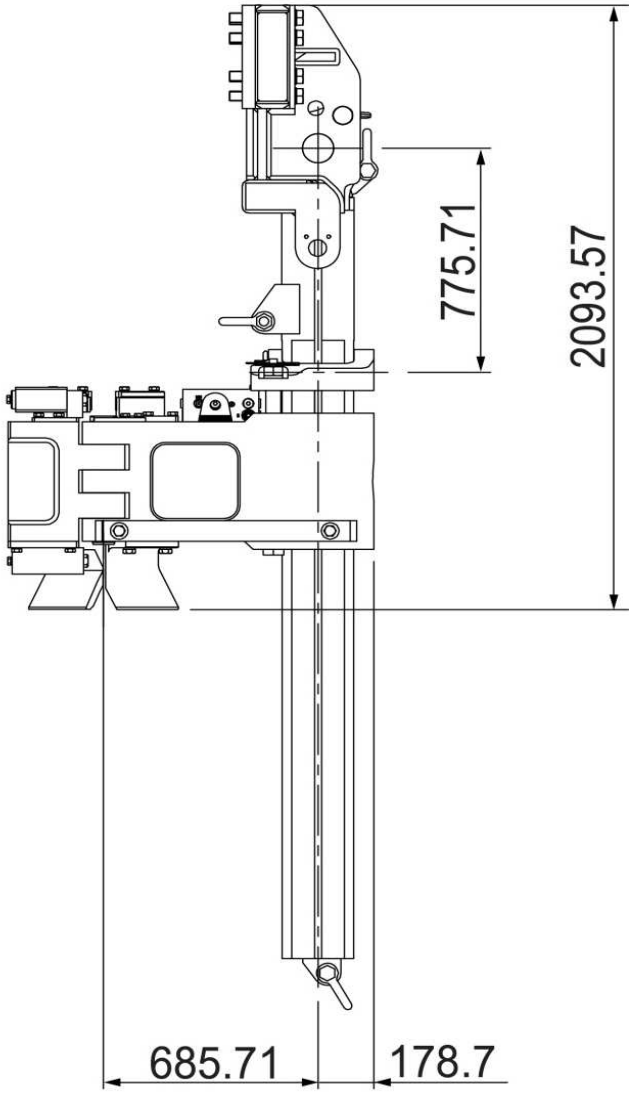
PIPE HANDLER

BACKUP CLAMP

The figure represents the two positions of the backup clamp along the support guide.







ELECTRIC TOP DRIVE ETD500

PIPE HANDLER

IBOP VALVE

The IBOP is connected to the mainshaft via API pin:

- Upper IBOP valve, 15000 PSI WP
- Upper actuator
- Lower IBOP valve, 15000 PSI WP
- Saver sub

TECHNICAL DATA	
UPPER IBOP VALVE	
External diameter	200 mm (7 7/8'')
Connection	6 5/8'' API Reg RH Box Pin type
Operation pressure	1 034 bar (15 000 PSI)
LOWER IBOP VALVE	
Connection	6 5/8'' API Reg Box Pin type
Operation pressure	1 034 bar (15 000 PSI)

ELECTRIC TOP DRIVE ETD500

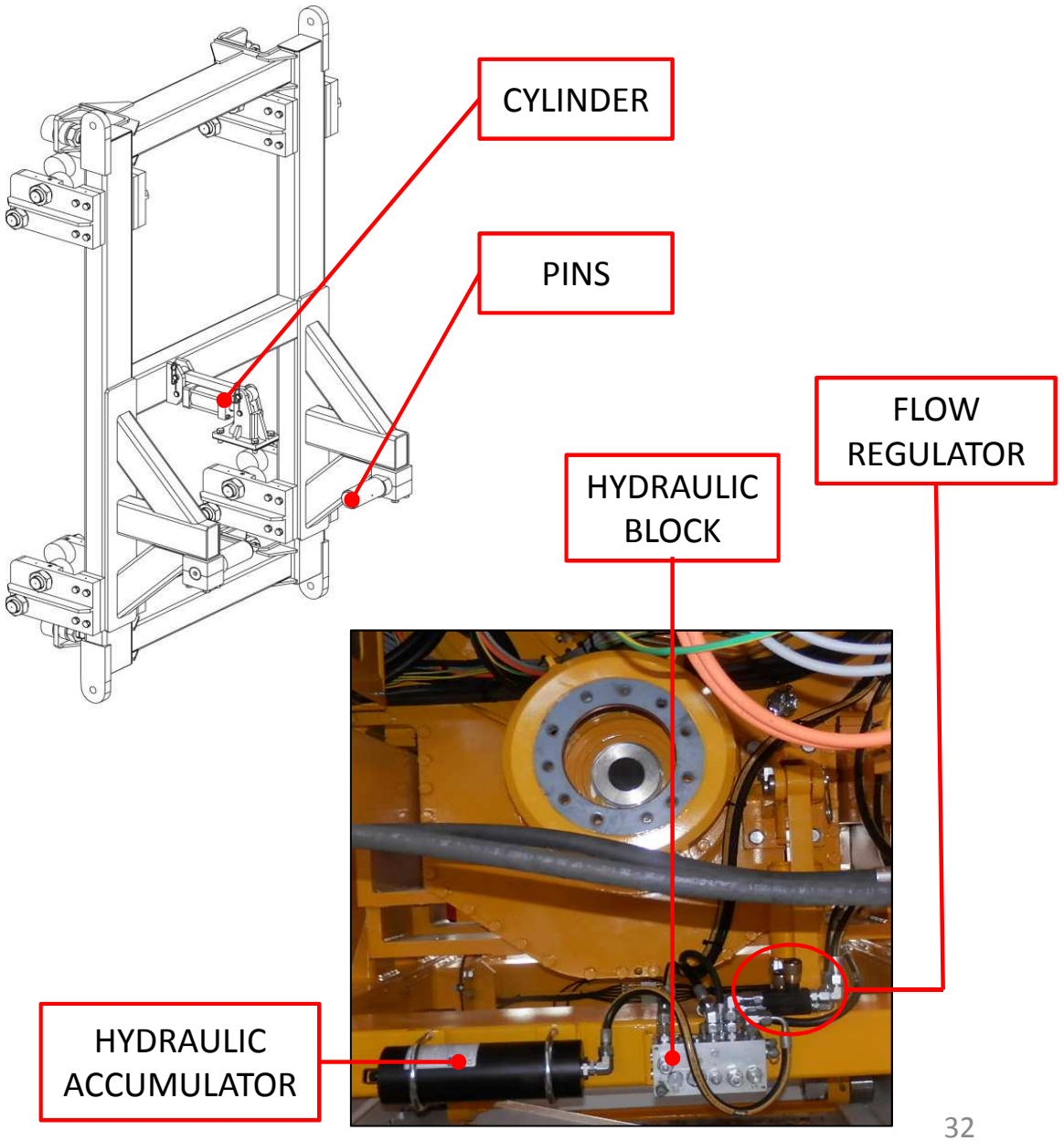
CARRIAGE

GENERAL DESCRIPTION

The top drive is suspended on the travelling block and is guided by a sliding carriage along the double rail guides fastened to the derrick, which enable vertical movement.
The carriage is composed of one **frame** with twenty **guide rollers** . The top drive is fixed to the carriage by two lateral **pins**. On the carriage is mounted the alignment cylinder system. The cylinder alignment system consists of a **cylinder**, an **hydraulic accumulator** , two **flow regulator** and an **hydraulic block**.

The cylinder is fixed between the top of the gear box and the carriage frame. It connects to an accumulator circuit located on the carriage frame. The accumulator is charged with nitrogen and maintained at a predetermined pressure setting by the hydraulic block.

The cylinder maintains a vertical orientation for top drive when it is disconnected from the drill string, while allowing the main drive unit to float slightly about its links, aligning with the drill string while drilling or hoisting.



INSTALLATION

BRIEFING

The ETD top drive interfaces with the rig lifting system and a separate power supply system.

The mast and electric system must be modified if necessary, when the ETD is installed on the existing rig. Particular attention must be paid to guaranteeing correct passage between the top drive and the racking board and the accessories assembled on it.

Do not hesitate to contact Drillmec Technical Support for technical support during installation, for suggestions and the necessary approval. Addresses, telephone and fax numbers are on paragraph B-2.1 of this manual.

Installing the guides on the mast on the drawworks side, and opposite the V-door is the ideal arrangement to manage the drill pipes.

It is important to consider the position in installation of the service loop and the rotary hose, guaranteeing correct bending to prevent wear on the service loop and the rotary hose.

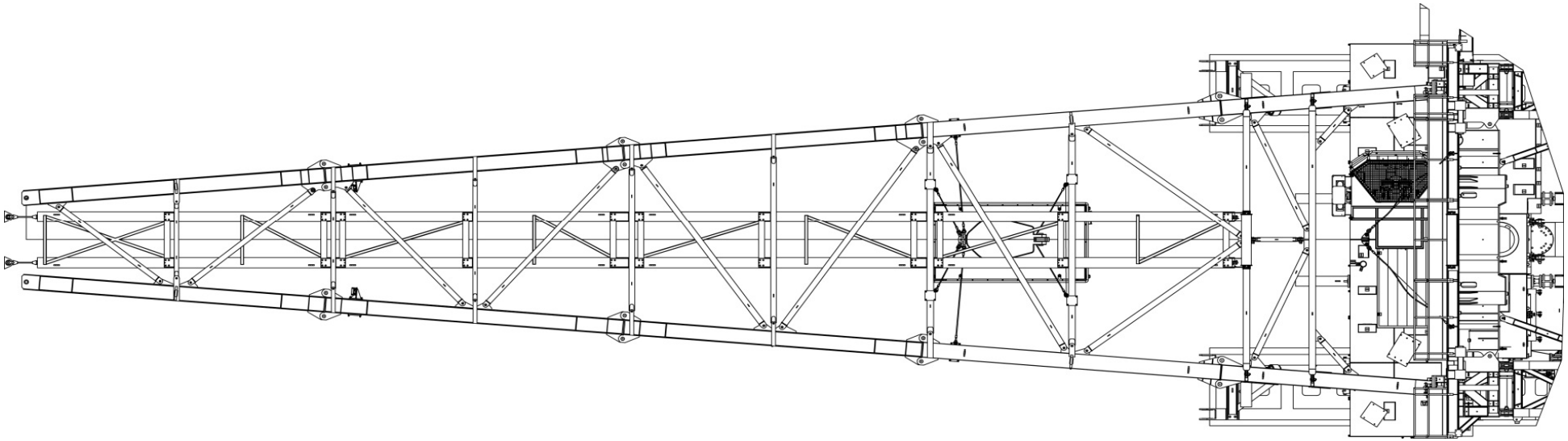
Consider the position of the other important installations:

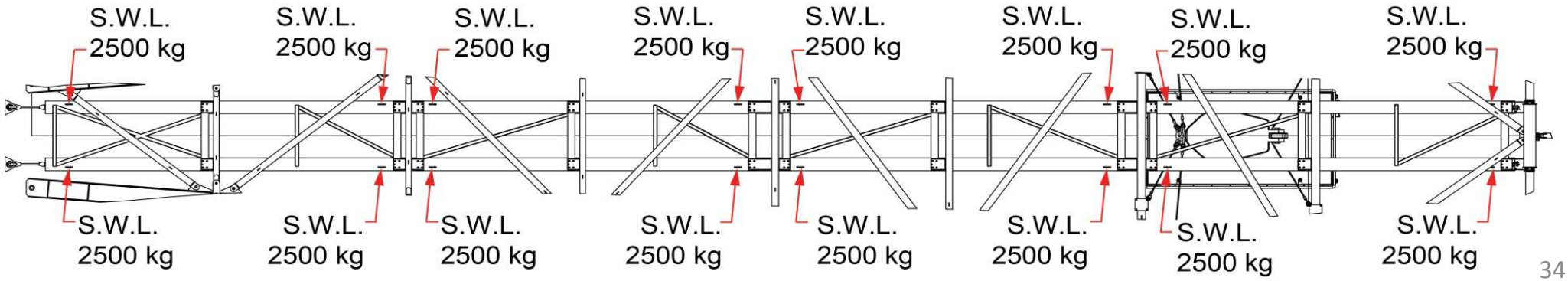
- Tubing board;
- Accessories on the derrick and drill floor;
- Drawworks fast line;
- Guides anchorage;
- Mud stand pipe extension.

INSTALLATION

GUIDE INSTALLATION

Install all guides except the lower guide that is mounted with the top drive. The guides are fixed to each other and to the supports of the mast horizontal beams. Connect the two support tie-rod on upper side on crown block.

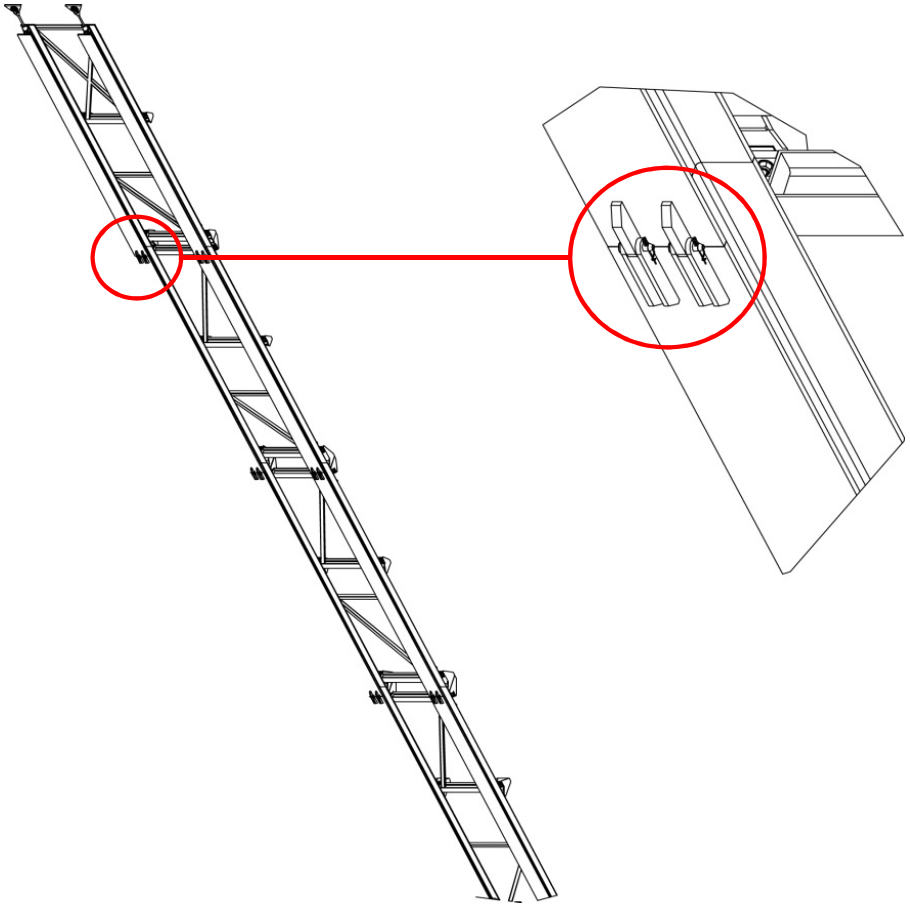


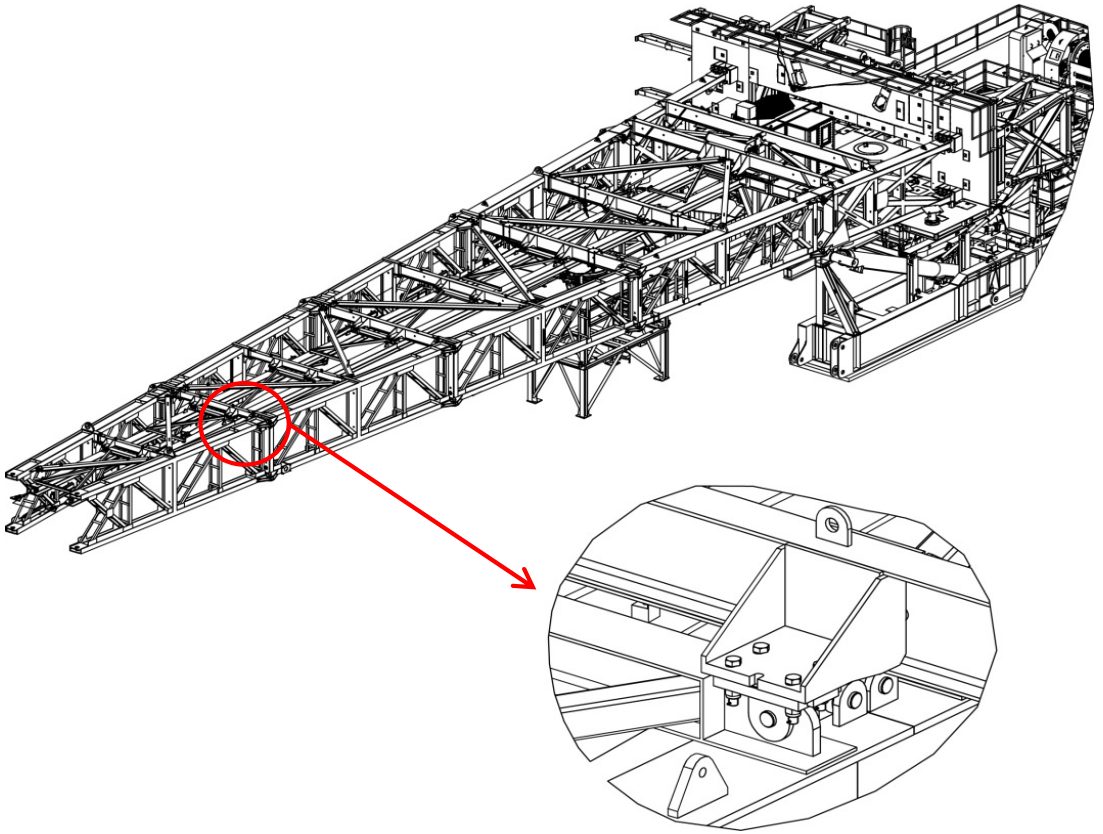


INSTALLATION

GUIDE INSTALLATION

Install all guides except the lower guide that is mounted with the top drive. The guides are fixed to each other and to the supports of the mast horizontal beams. Connect the two support tie-rod on upper side on crown block.





ELECTRIC TOP DRIVE ETD500

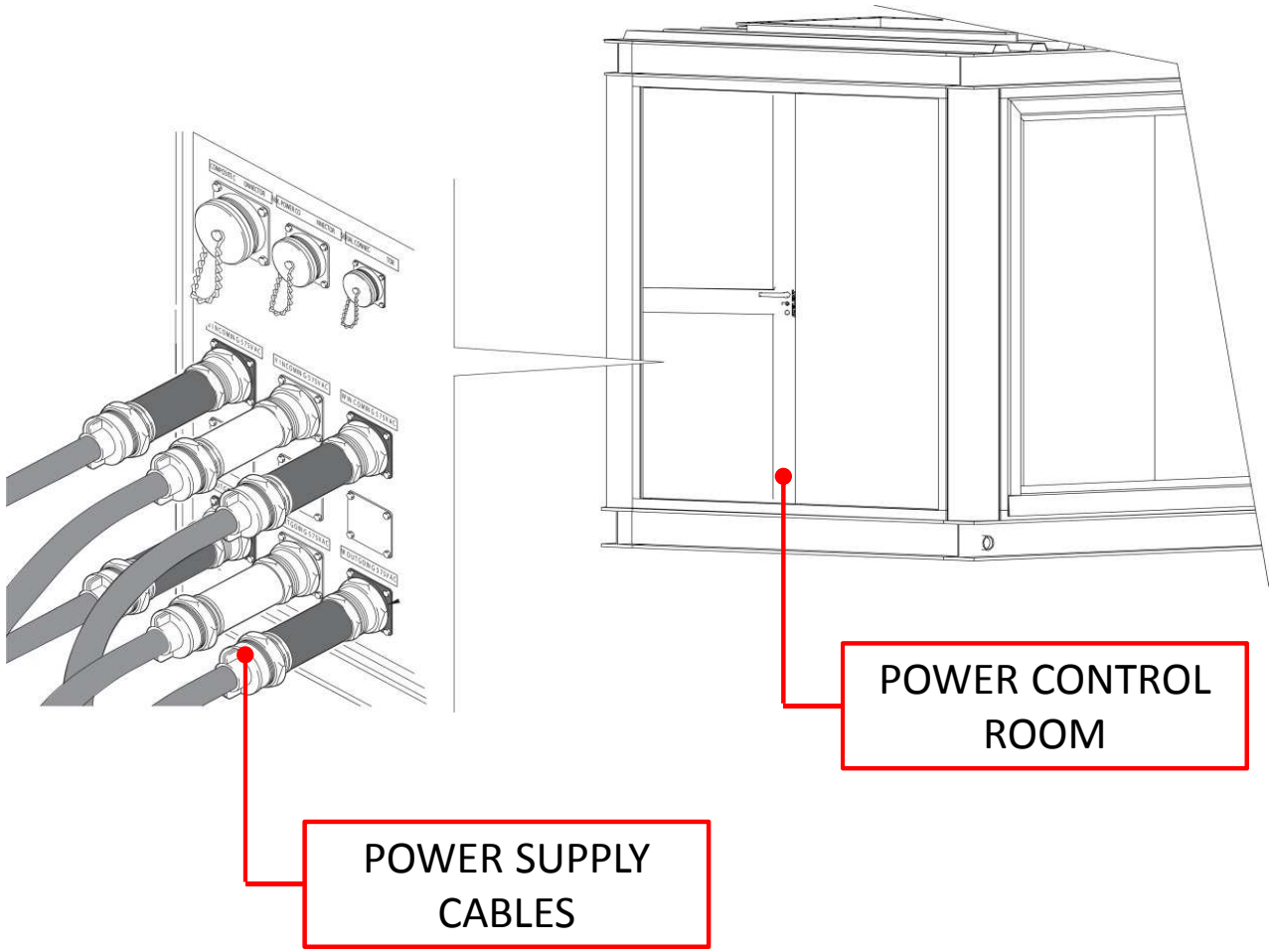
INSTALLATION

ELECTRIC CONNECTIONS

Clean all the connector contacts. Connect the power cables with the main switch off. Connect the power cables from the PCR to Driller cabin.

Connect the power supply cables from the PCR to the grasshopper, from the grasshopper to the service loop. Connect the cables that arrive from the service loop to the top drive leaving the end that arrives to the top drive tied to the base of the mast.

These operations must be carried out with the mast in the horizontal position. Connect the power cables following the electrical diagram supplied.



ELECTRIC TOP DRIVE ETD500

INSTALLATION

HYDRAULIC CONNECTIONS

The hydraulic control unit is positioned on the drill floor.

There are two hoses from the control unit, one is the oil output and the other is the input, going to the service loop and then the top drive.

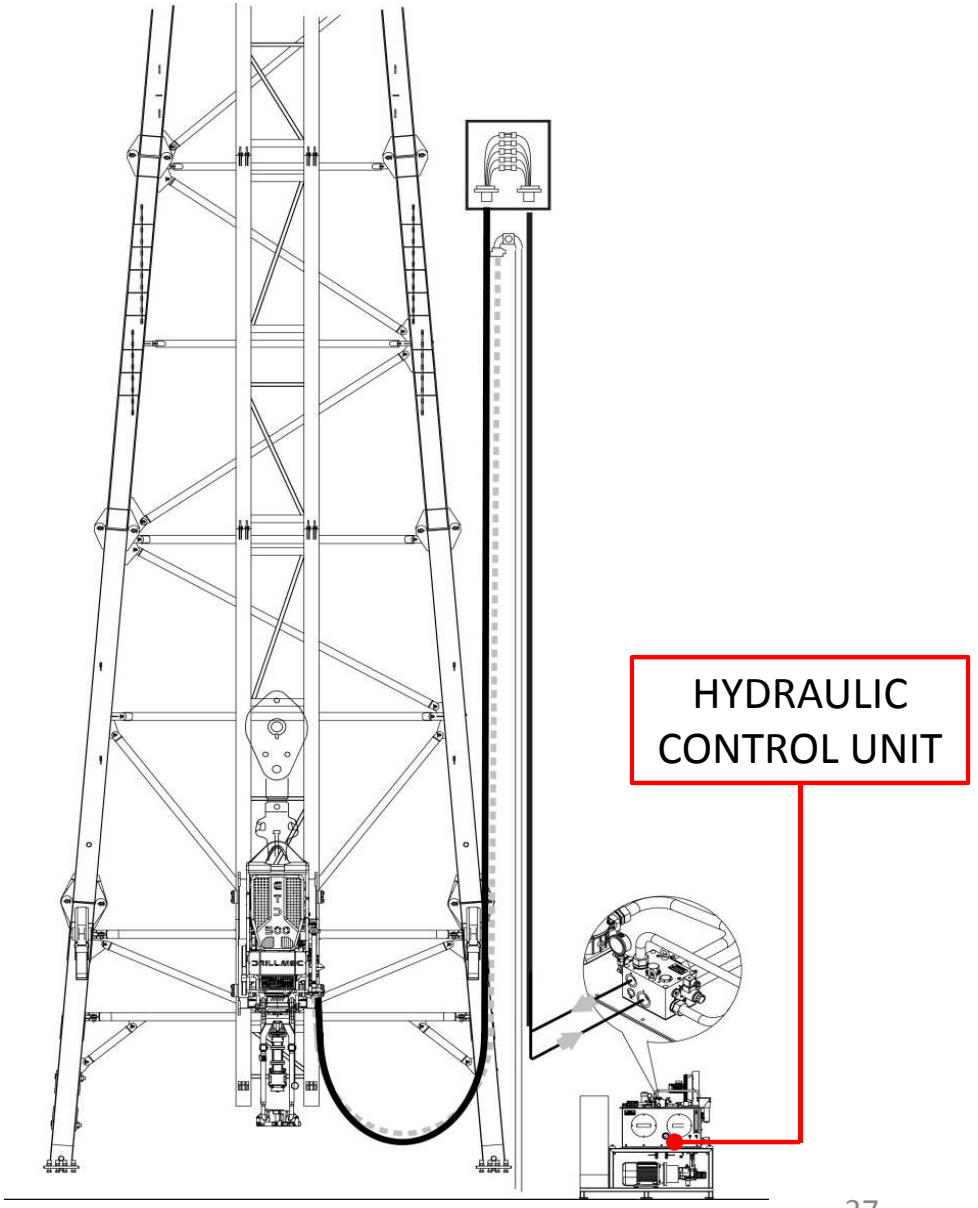
Connect the hydraulic pipes following the hydraulic diagram provided.

PRE-INSTALLATION FINAL CHECKS

Check all the pre-installation planning and rig-up planning is complete before installing the top drive.

This includes:

- Ensuring the mast is in the vertical position, with the mobile pulley in the centre of the well;
- Check all the guides are installed;
- Check the service loop is installed on the mast;
- Check the power supply and command devices are installed.

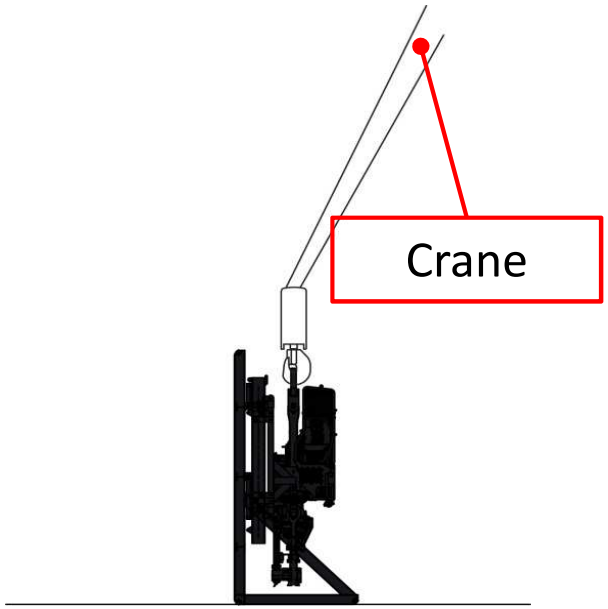


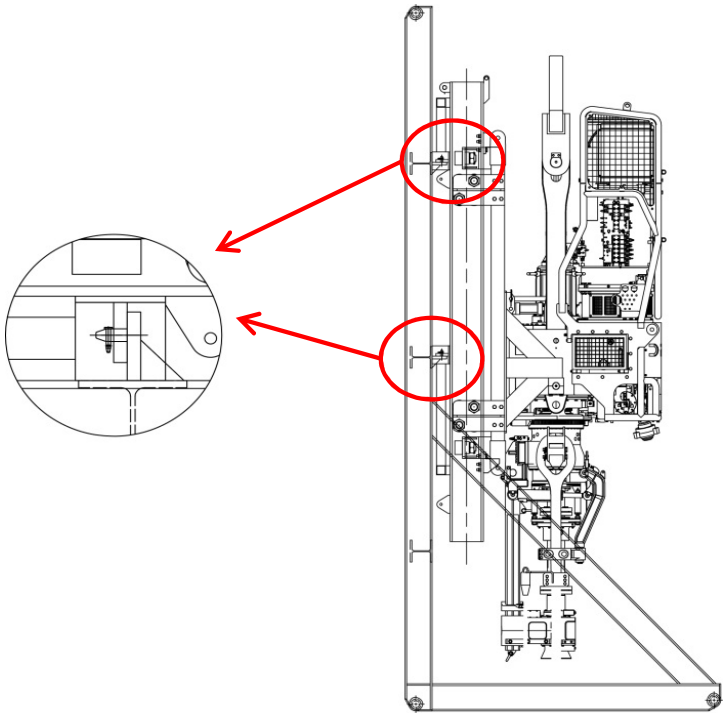
ELECTRIC TOP DRIVE ETD500

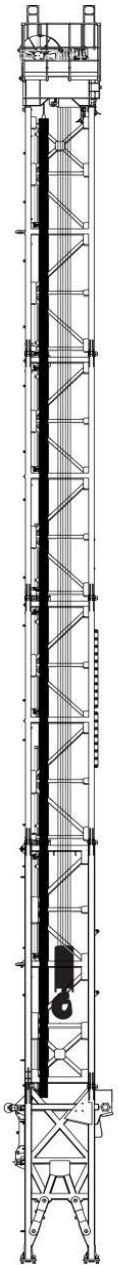
INSTALLATION

PREPARING THE SUPPORT FRAME

- Bring the top drive on the ground near the substructure.
- Couple the hook of the crane to the saddle of the top drive. Keep some tension the rope of the crane
- Remove the fixing pin between the lower guide with top drive and the transport frame.





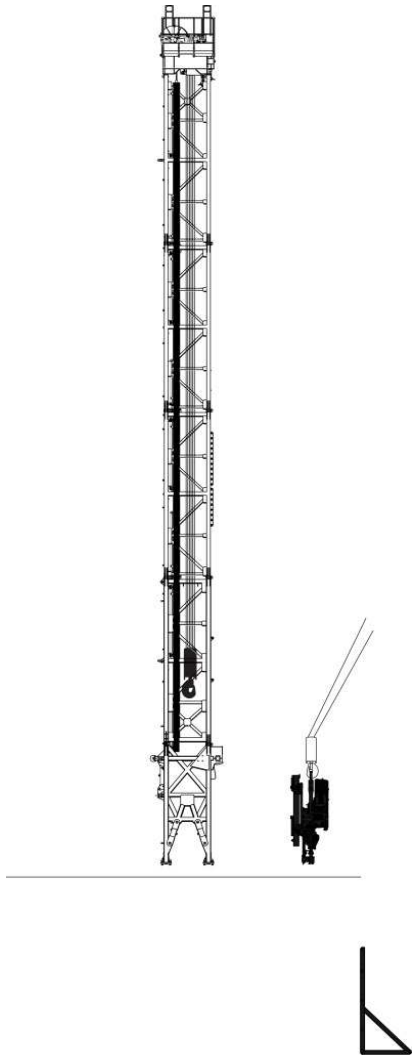


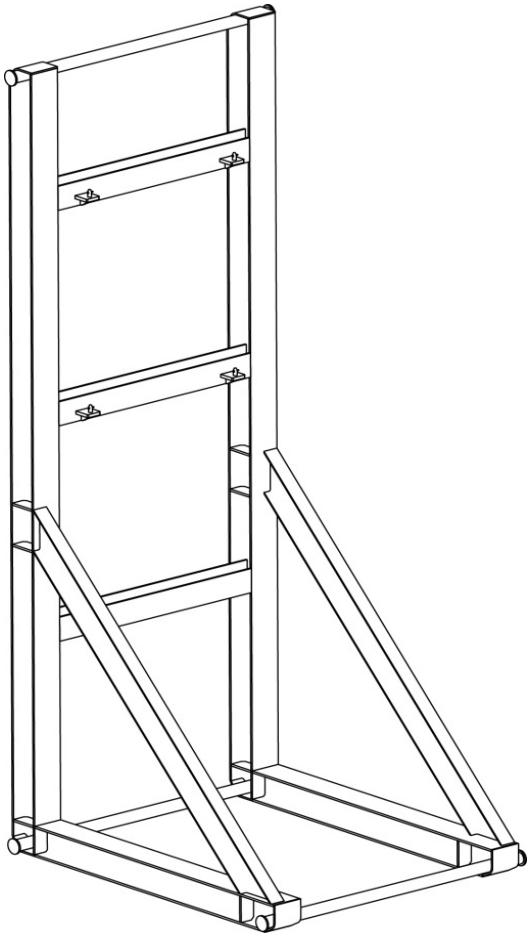
ELECTRIC TOP DRIVE ETD500

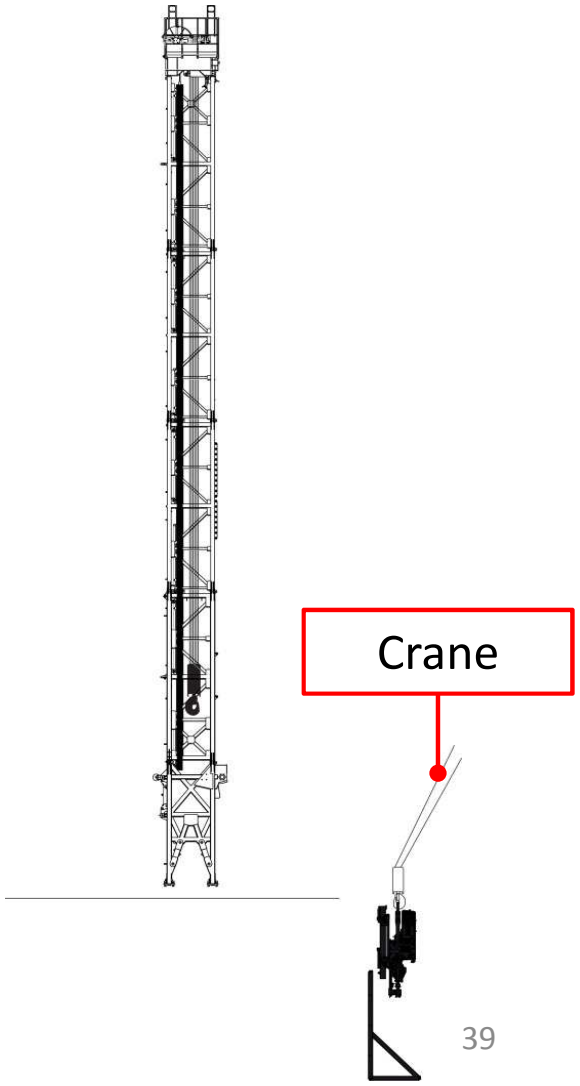
INSTALLATION

LIFTING TO DRILL FLOOR

- Raise the top drive on the drill floor





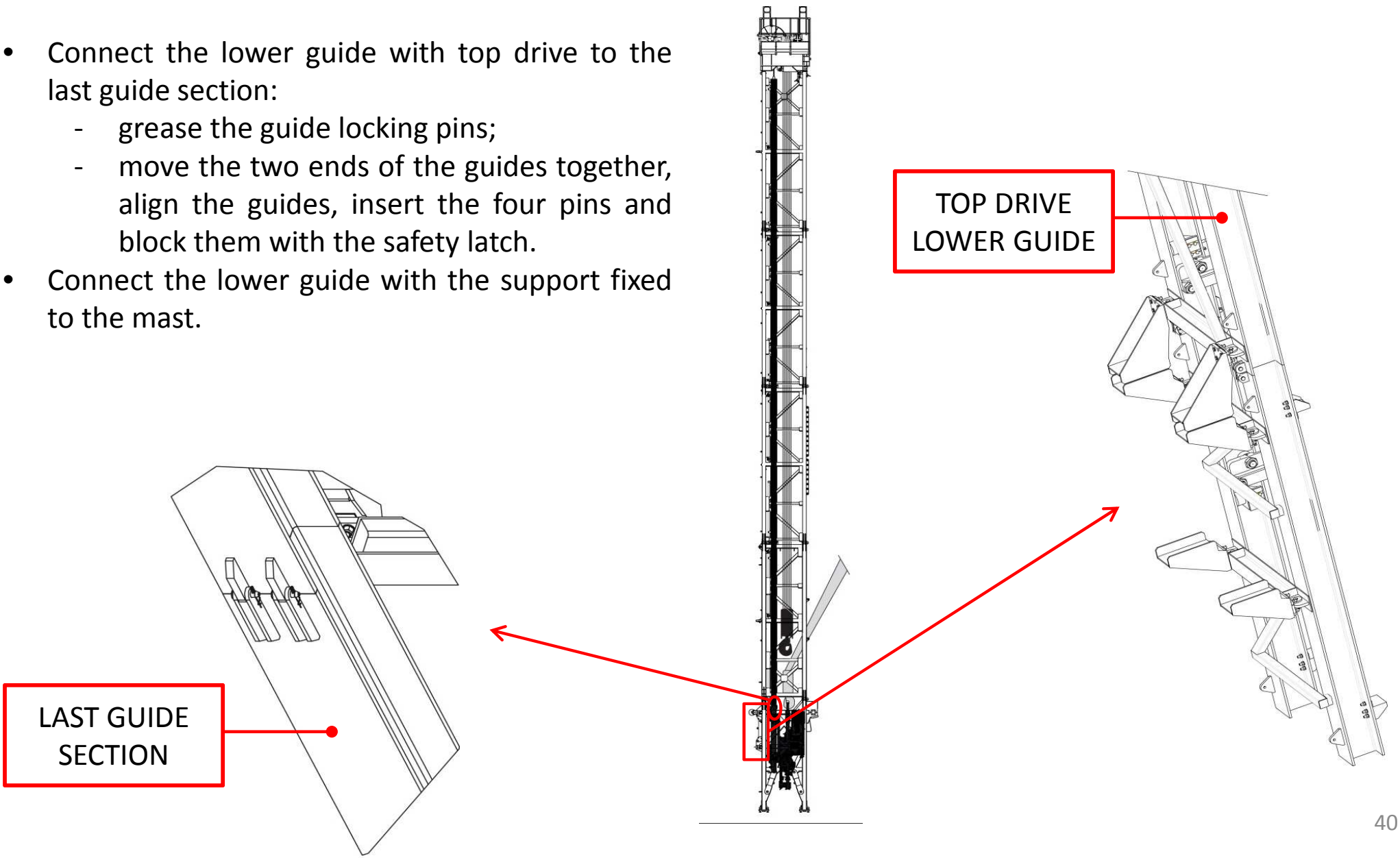


ELECTRIC TOP DRIVE ETD500

INSTALLATION

LOWER GUIDE CONNECTION

- Connect the lower guide with top drive to the last guide section:
  - grease the guide locking pins;
  - move the two ends of the guides together, align the guides, insert the four pins and block them with the safety latch.
- Connect the lower guide with the support fixed to the mast.

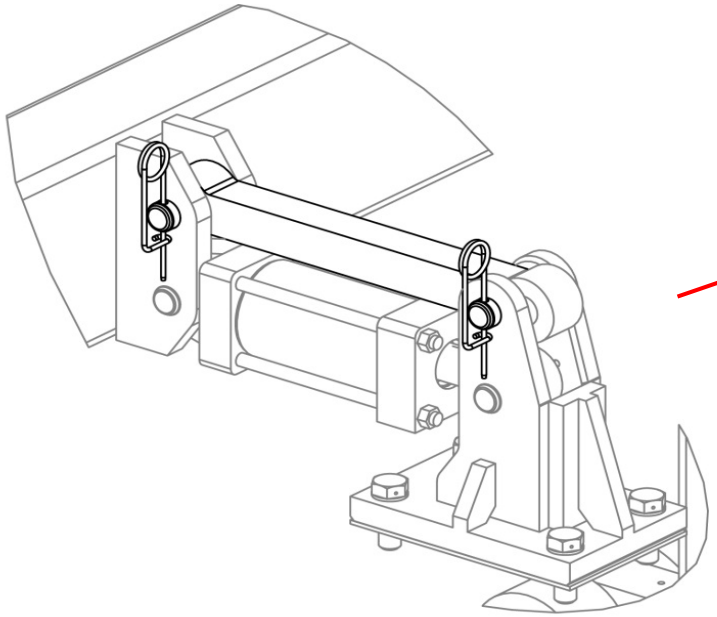


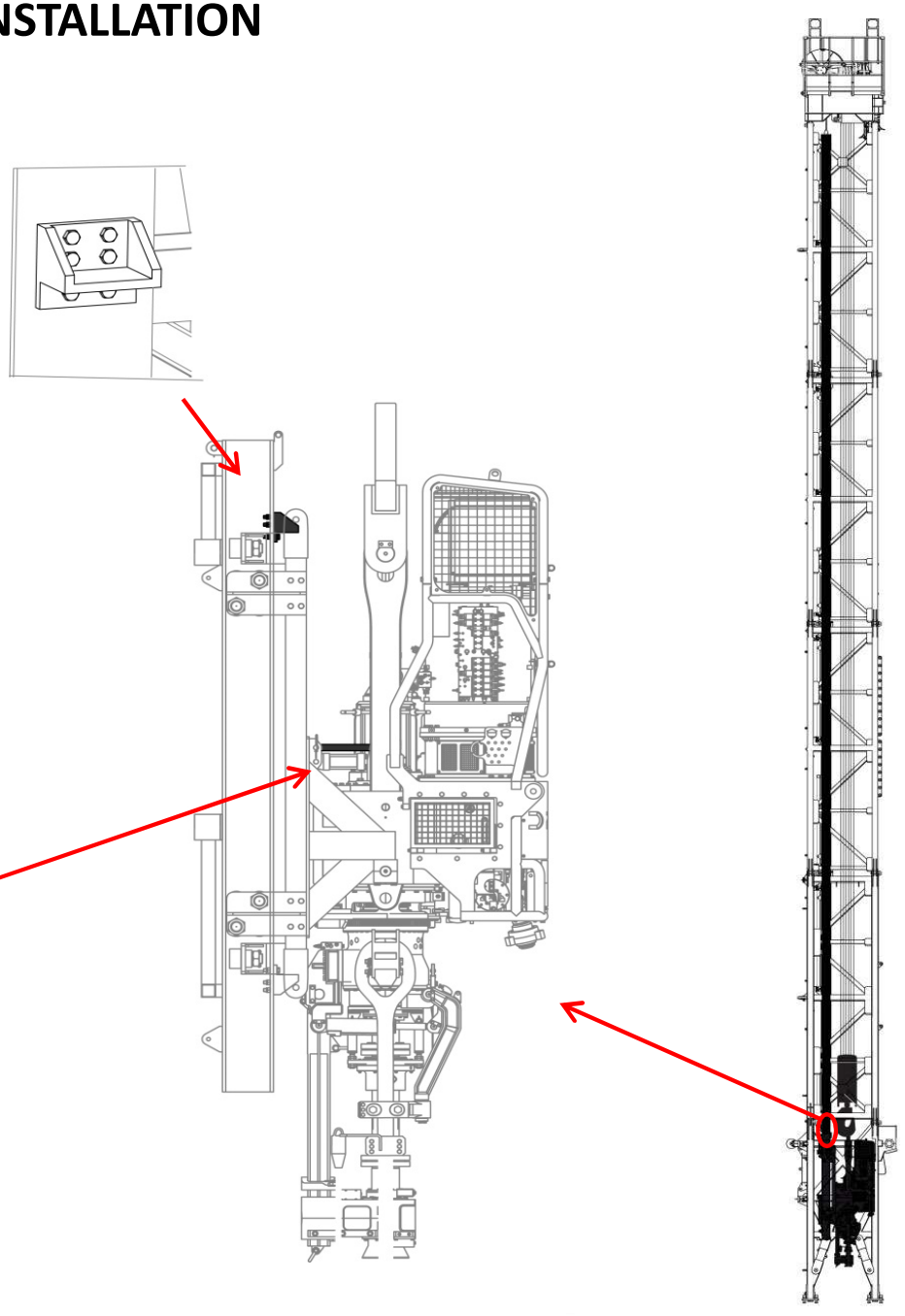
ELECTRIC TOP DRIVE ETD500

INSTALLATION

TRAVELLING BLOCK CONNECTION

- Couple the travelling block to the saddle of the top drive and unhook the hook of the crane.
- Remove the top drive trolley upper lock on the guide, on both sides.
- Remove the shipping brace of the alignment cylinder system

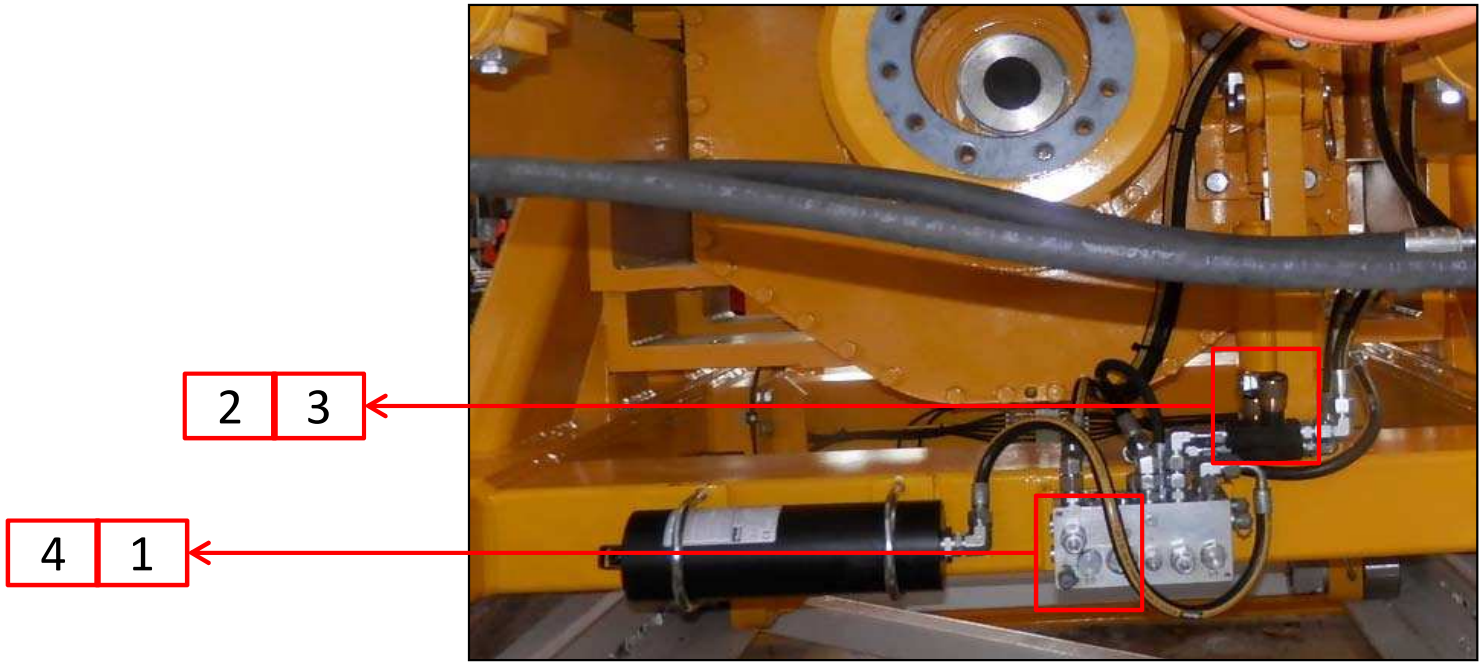




INSTALLATION

ALIGNMENT ADJUSTING

- Use the following procedure to properly adjust the alignment before operating top drive :
- With the hydraulic power unit turned off, bleed down the alignment cylinder accumulator by opening the needle valve **1** located on the hydraulic block.
- Verify that the shipping brace from the alignment cylinder system is removed.
- Turn on the power unit and allow the system to circulate for approximately two minutes.
- Close the needle valve **1**.
- Open the two flow control valves **2** and **3** located at the alignment cylinder supply return lines 1/2” turns off their seats.



INSTALLATION

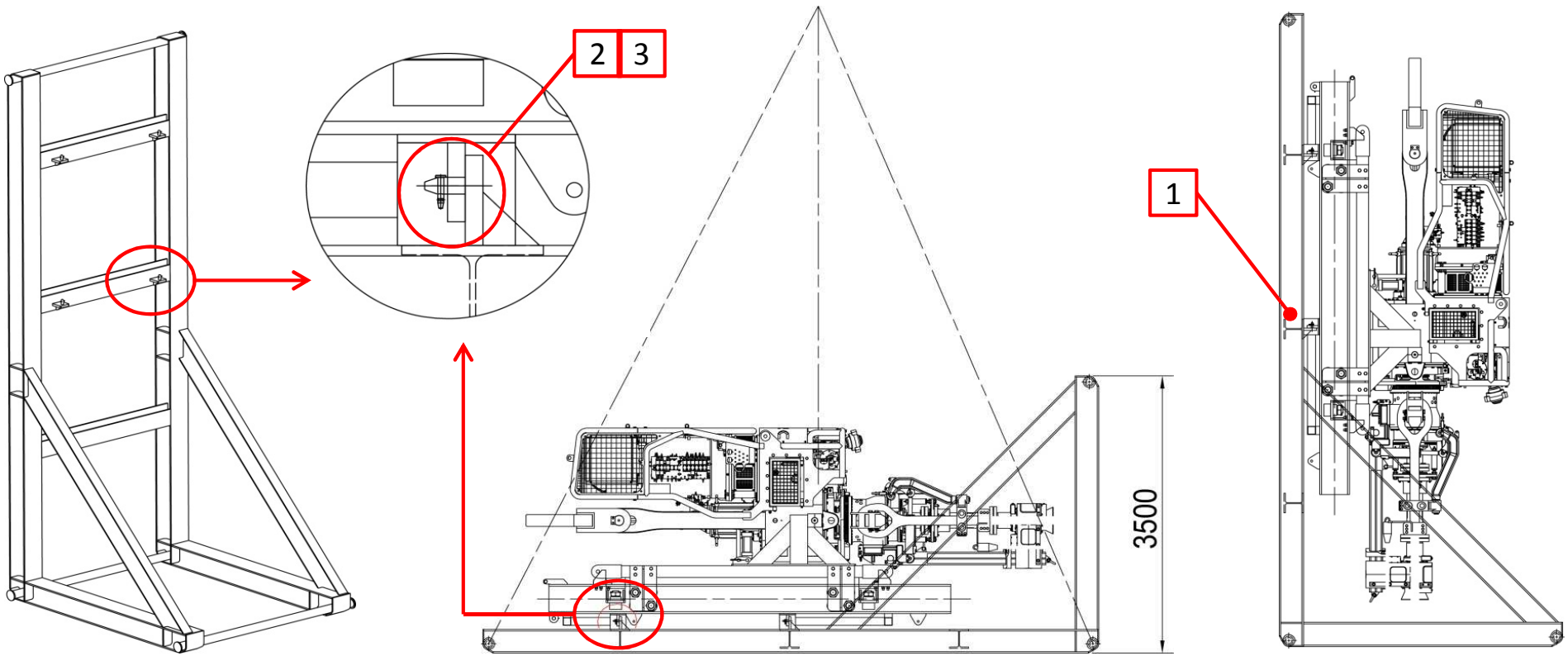
ALIGNMENT ADJUSTING

- Verify the correct pressure setting using the following procedure:
  a) With the power unit on, back down the pressure using the Pressure Reducing Valve **4** until the saver sub begins to pivot away from the guide. Record this pressure.
  b) Slowly increase the pressure until the saver sub no longer moves closer to the guide as pressure increases. At this time, the cylinder should be in a “dead band” area.
  c) Slowly increase the pressure until the saver sub begins to move toward the guide again. Record the pressure reading when this occurs.
  d) To determine the correct pressure setting, add the average pressure readings from steps a and c above and divide by two. The resulting pressure “dead band” provides equal preload in each direction both toward and away from the guide.
  e) Record the pressure setting for future reference.
- Set a joint of drill pipe in the slips.
- Bring the top drive down as if stabbing the saver sub into the box. The pin and the box should be in alignment so that the OD of the pin clears the shoulder of the box. If necessary carry out the adjustment.

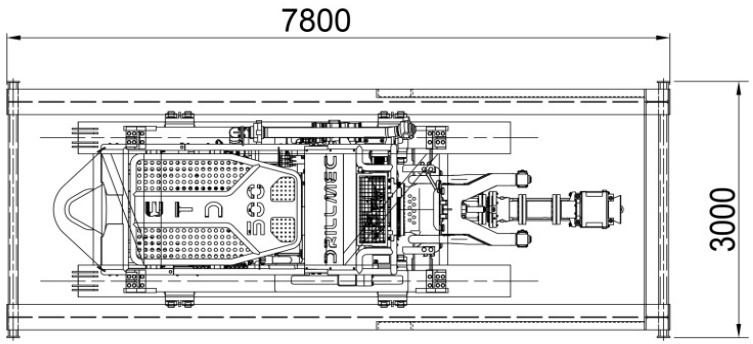
ELECTRIC TOP DRIVE ETD500

TRANSPORT

TRANSPORT FRAME



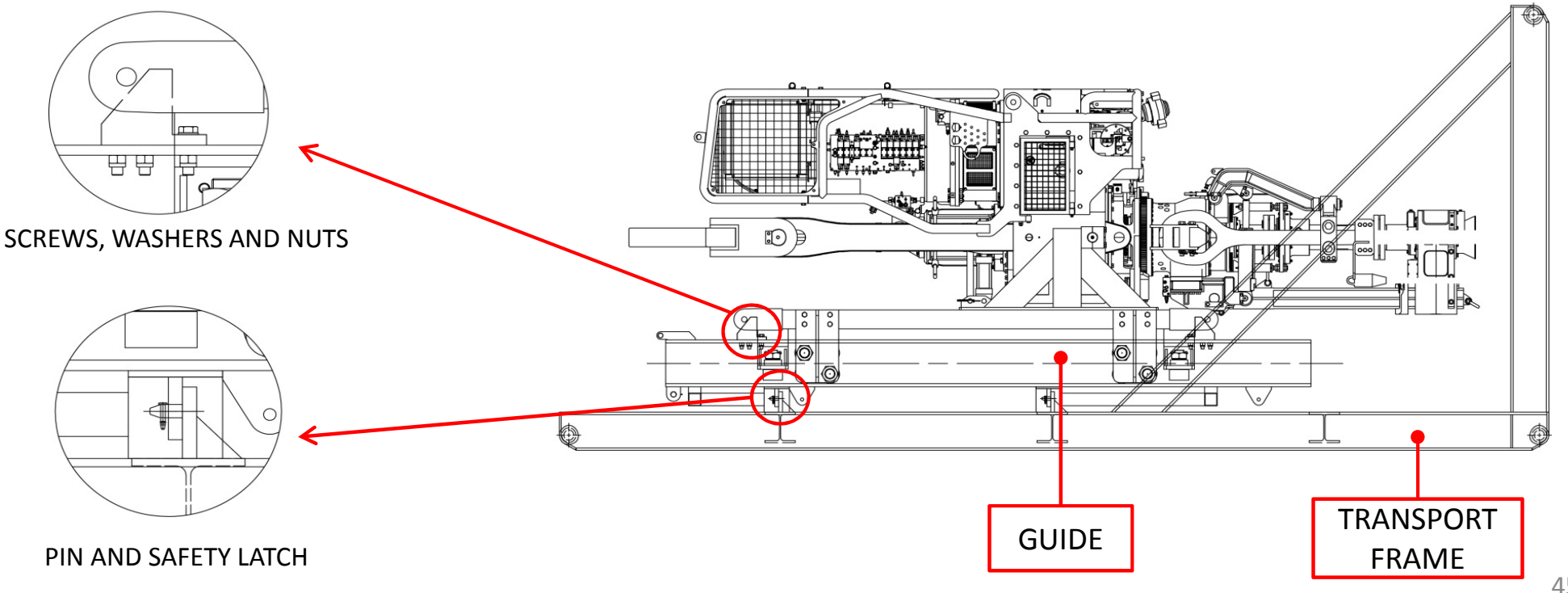
ITEMS	DESCRIPTION
1	TRANSPORT FRAME
2	SAFETY LATCH
3	PIN



TRANSPORT

TRANSPORT PREPARATION

- Position the top drive on lower guide and lock it by means the four mechanical stops.
- Each mechanical stop is fixed by means of:
  - Six screws;
  - Six washers;
  - Six nuts.
- Position the top drive with guide on the transport frame.
- Fix the guide to the transport frame using pin and safety latch.



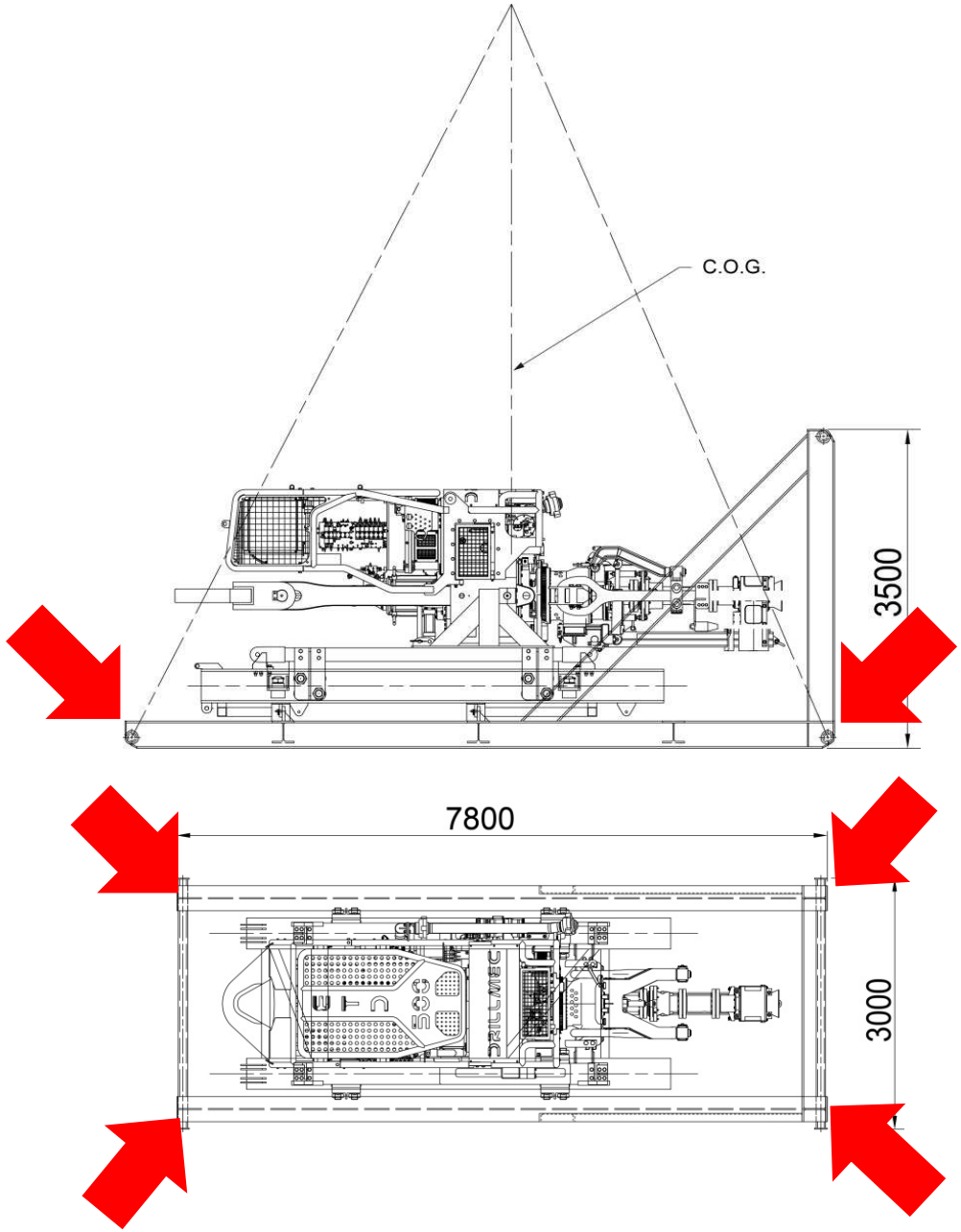
ELECTRIC TOP DRIVE ETD500

LIFTING

Strictly follow the recommendations indicated below:

- Check the frame is correctly installed.
- Ensure all the casings are closed and there are no free materials (tubes, mechanical parts, etc.) that could move.
- For lifting operations, use an adequately sized crane for the capacity and use ropes of adequate capacity for the load.
- To lift the top drive, fit the ropes to the attachment points indicated (Fig. B-16) and hook the other ends to the crane's hook.

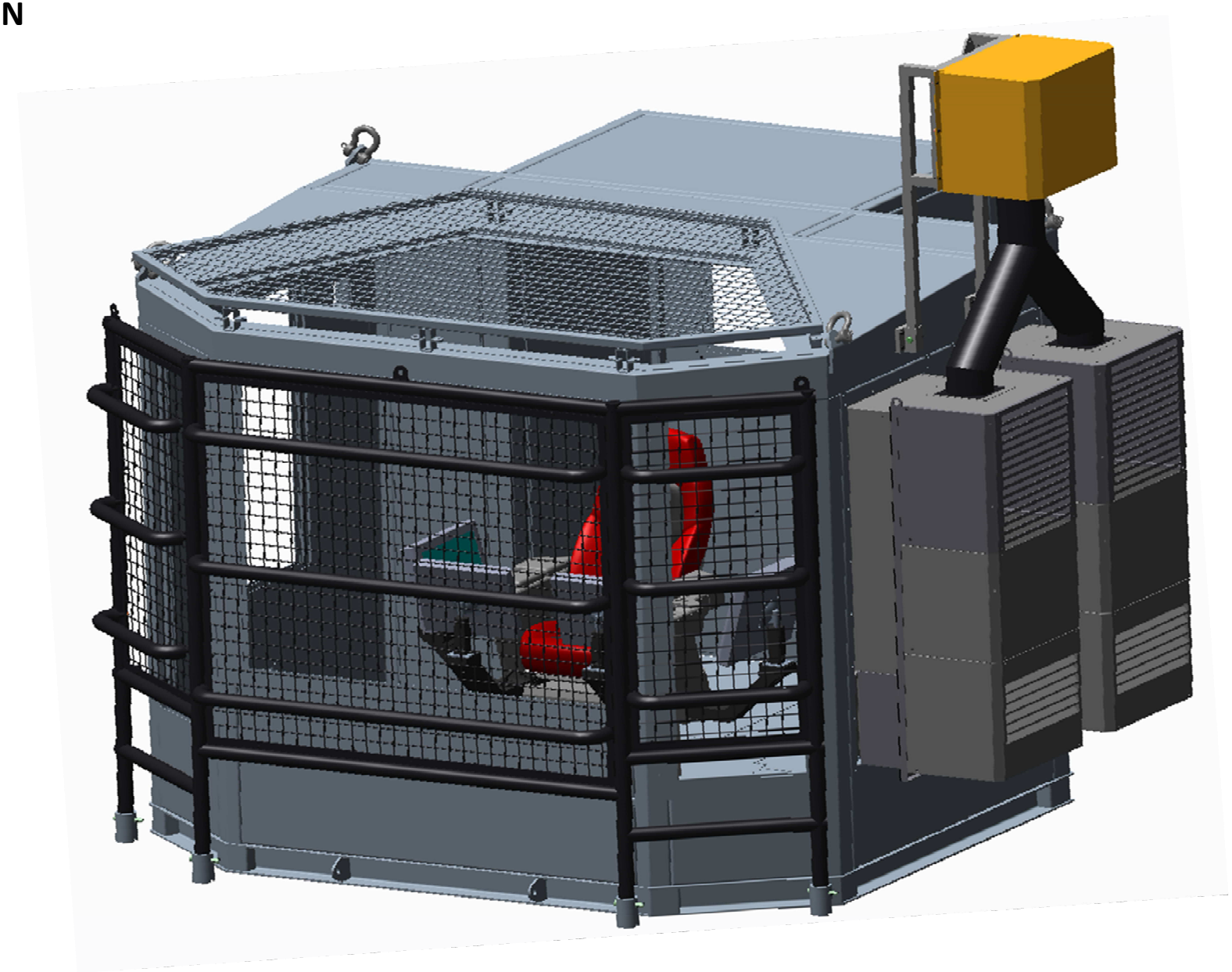
TRANSPORT



ELECTRIC TOP DRIVE ETD500

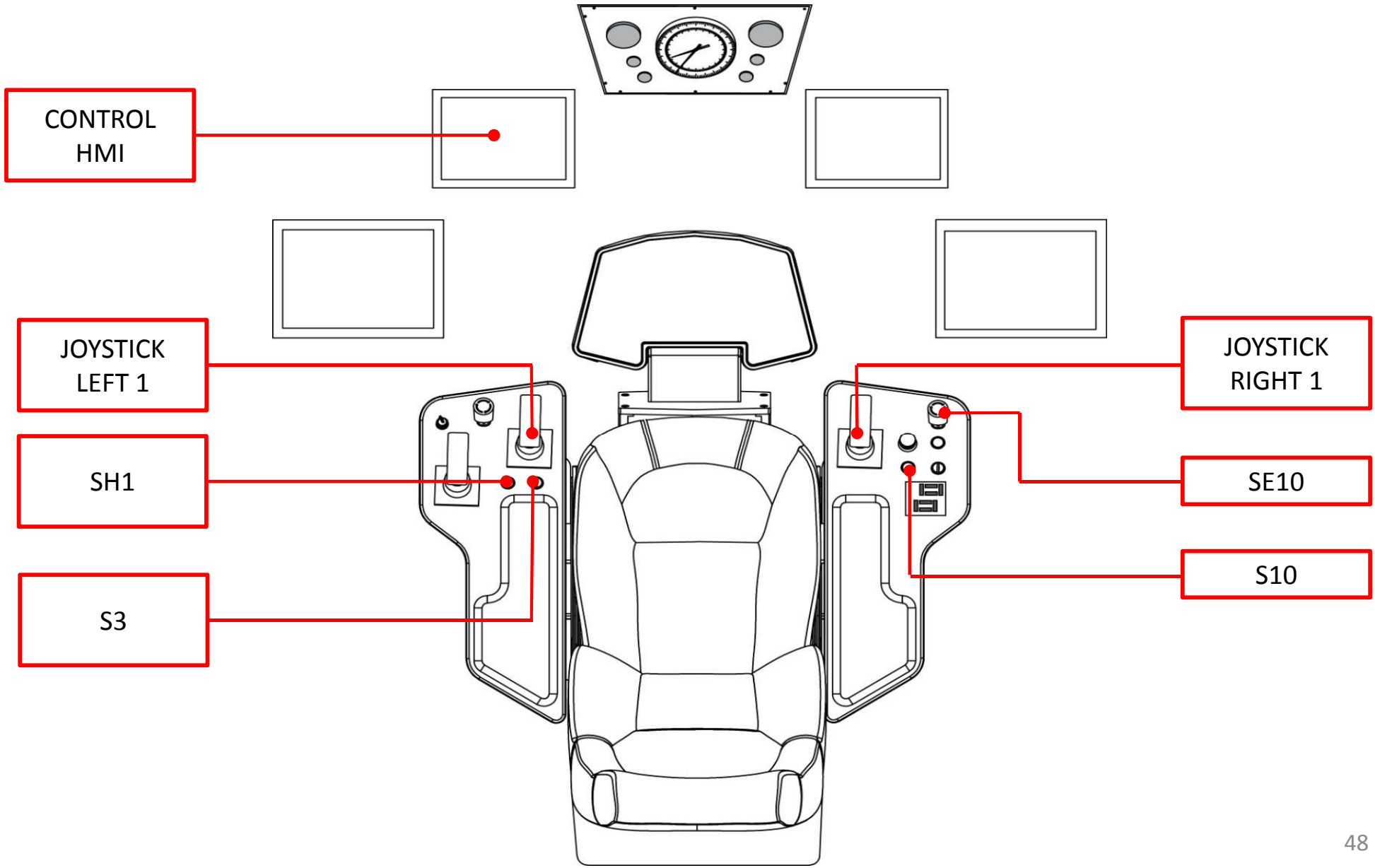
CONTROLS

CONTROL CABIN



CONTROLS

CONTROLS LAYOUT



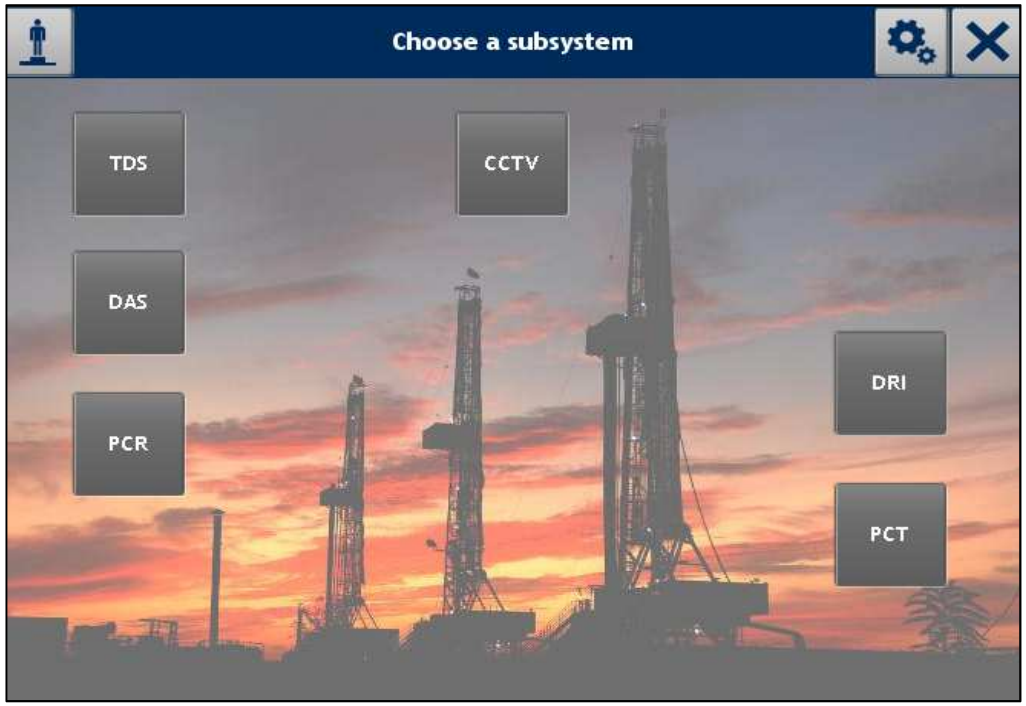
ELECTRIC TOP DRIVE ETD500

CONTROLS

SUBSYSTEM

- From any page on the HMI software page, press the navigation button under the DRILLMEC logo to display the “Choose a subsystem”. pop-up window.
- Press the TDS button: the first page of the TDS sub-system is displayed.

Path: TDS sub-system > HOME button > TOP DRIVE Tab



ELECTRIC TOP DRIVE ETD500

CONTROLS

CONFIGURATION

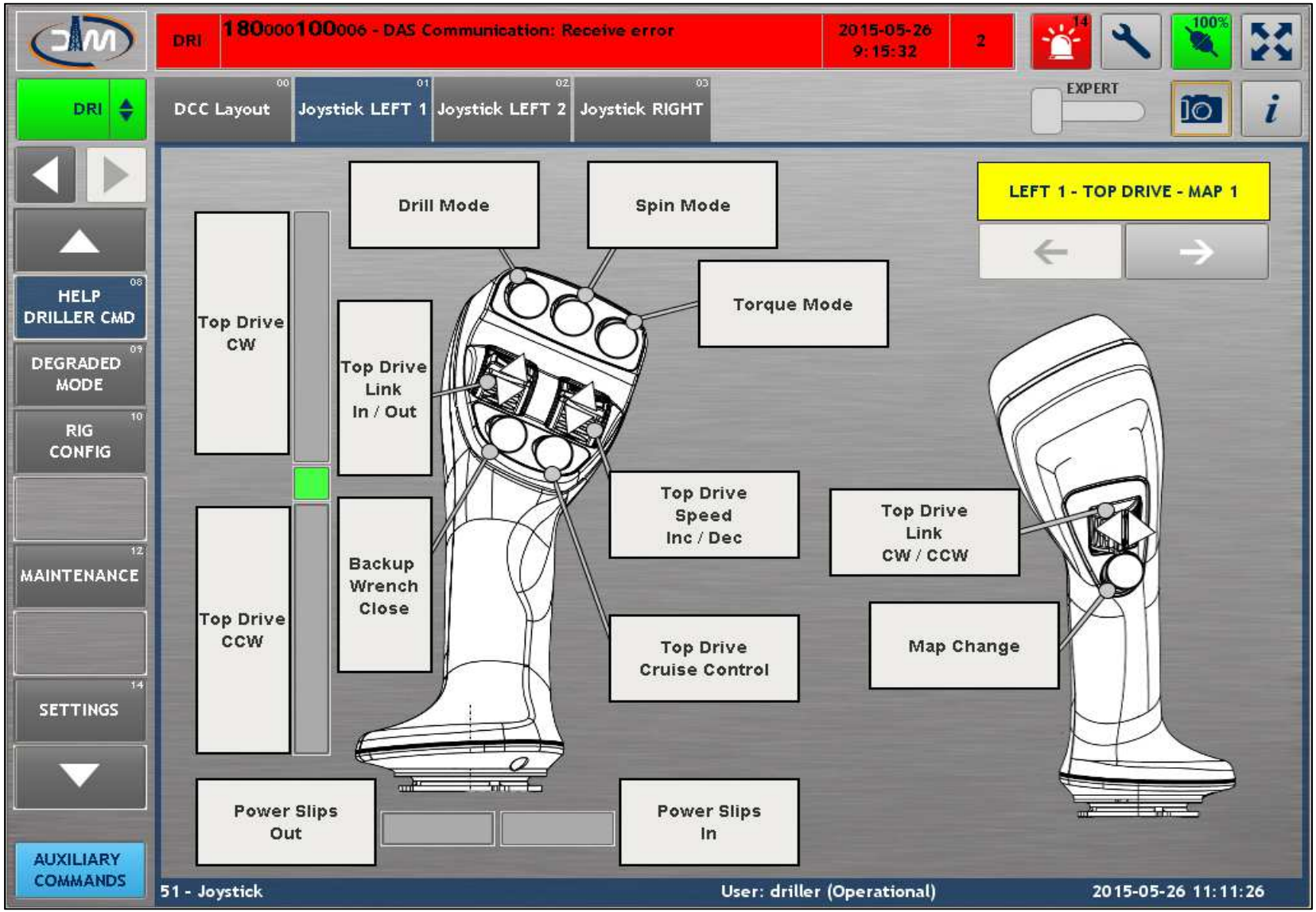
Path:
DRI sub-system >
RIG CONFIG button >
RIG CONFIG Tab

These buttons allow to configure which device is controlled by joysticks left 1 and 2.

Press the ETD pushbutton to control the Top Drive by means of joystick left 1.

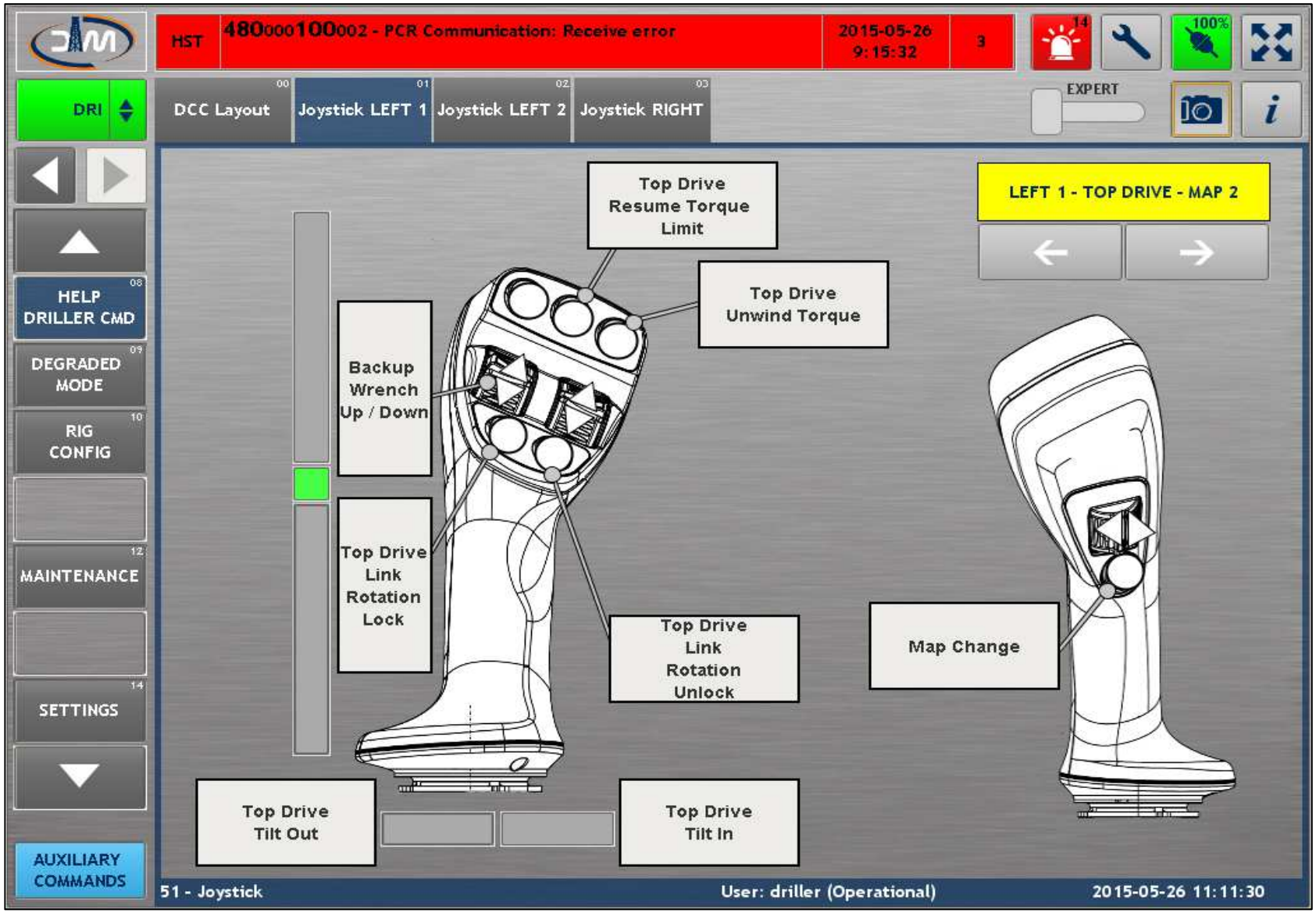
CONTROLS

JOYSTICK FUNCTIONS – MAP 1



CONTROLS

JOYSTICK FUNCTIONS – MAP 2

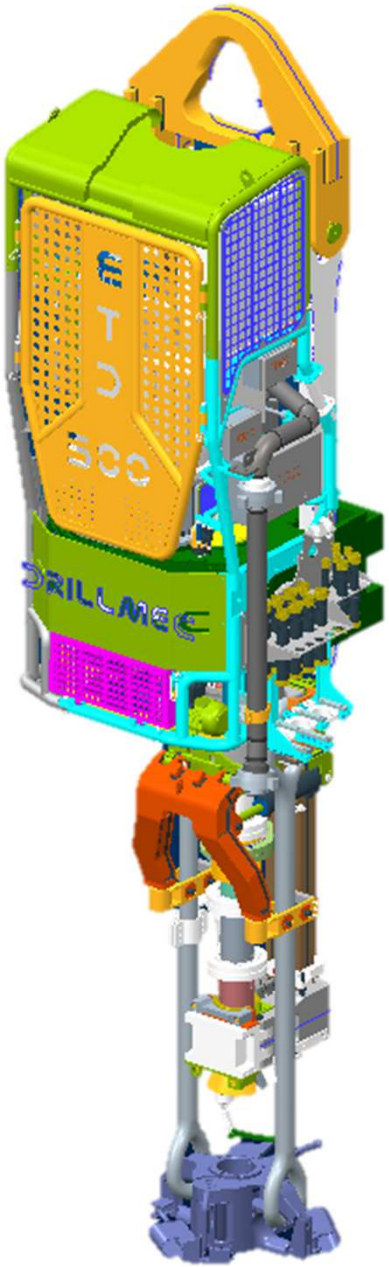


ELECTRIC TOP DRIVE ETD500

MAINTENANCE

BRIEFING

- Pressurized leaking oil can cause injuries.
- Never work with the top drive on.
- Block the top drive and the equipment to avoid accidental movements and start-up.
- Maintenance should only be carried out with technically perfect equipment suitable for the type of specific work.
- When working on the electrical system or parts of it, tools, etc...which are in contact with the electric system parts, isolate the power source.
- Open or remove the guards only when drives have stopped or they are blocked to avoid sudden start up.
- Before cleaning the top drive, for safety reasons cover or wrap all the openings with insulating tape so water, vapor or detergents cannot penetrate.
- Always keep the equipment, the workplace and the top drive clean. Before carrying out maintenance intervention, clean all the connections and the threaded joints of oil or grease. Do not use aggressive detergents. To clean, only use non-abrasive clothes.



ELECTRIC TOP DRIVE ETD500

MAINTENANCE

LUBRICATION AND GREASING SCHEDULE

MAINTENANCE OPERATIONS - LUBRICATION/GREASING	Frequency					Ref.
	Daily	Weekly	3 months	6 months	Two years	
Gear box - Check oil level	x					1
Main drive unit (washpipe, gear box shafts, pins of counterbalance system links) - Centralized greasing	x					2
Link tilt assembly -Greasing	x					4
IBOP valve - Greasing	x					5
Carriage (rollers, lateral pins) - Centralized greasing	x					3
Gear wheel for adapter rotation - Greasing		x				6
Link adapter - Greasing		x				7
Oil filter gear box - Replacing			x			1
Gear box - Replacing oil			x			1

ELECTRIC TOP DRIVE ETD500

MAINTENANCE

LUBRICATING OIL

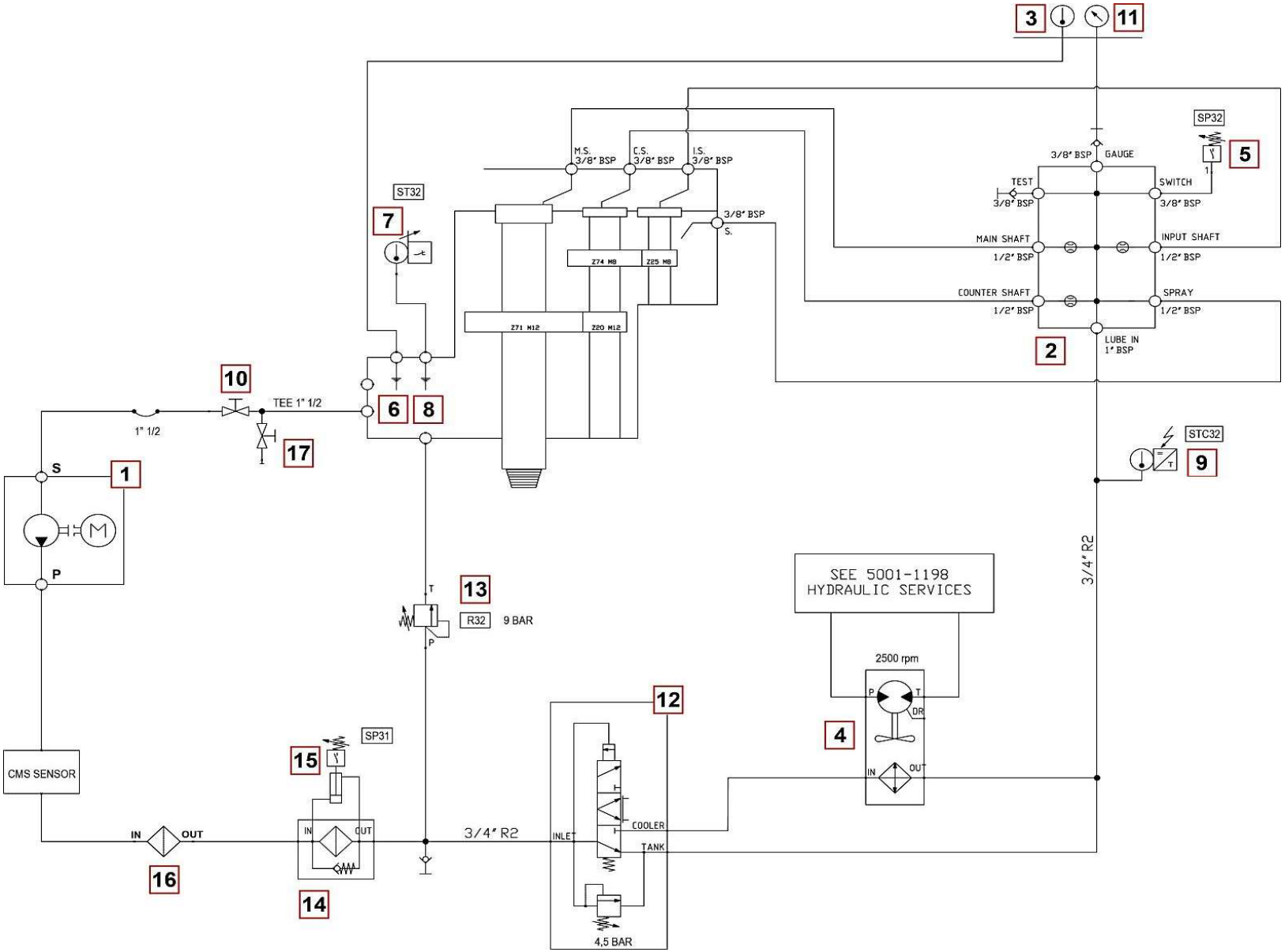
Component	Oil type	Quantity (l)
Gear box	SHELL SPIRAX S5 ATE 75W/90	173

Property	Method	SHELL SPIRAX S5 ATE 75W/90
SAEViscosity	SAE J 306	75W-90
Density, kg/m³ at 15°C	ISO 12185	879
Kinematic Viscosity: cSt at 40°C mm²/s cSt at 100°C mm²/s	ISO 3104	 81 14.9
Viscosity Index	ISO 2909	194
Dynamic Viscosity mPa s	ISO 9262	35000
Flash Point (COC) °C	ISO 5292	205
Pour Point °C	ISO 3016	-45

ELECTRIC TOP DRIVE ETD500

MAINTENANCE

LUBRICATION SYSTEM



ELECTRIC TOP DRIVE ETD500

MAINTENANCE

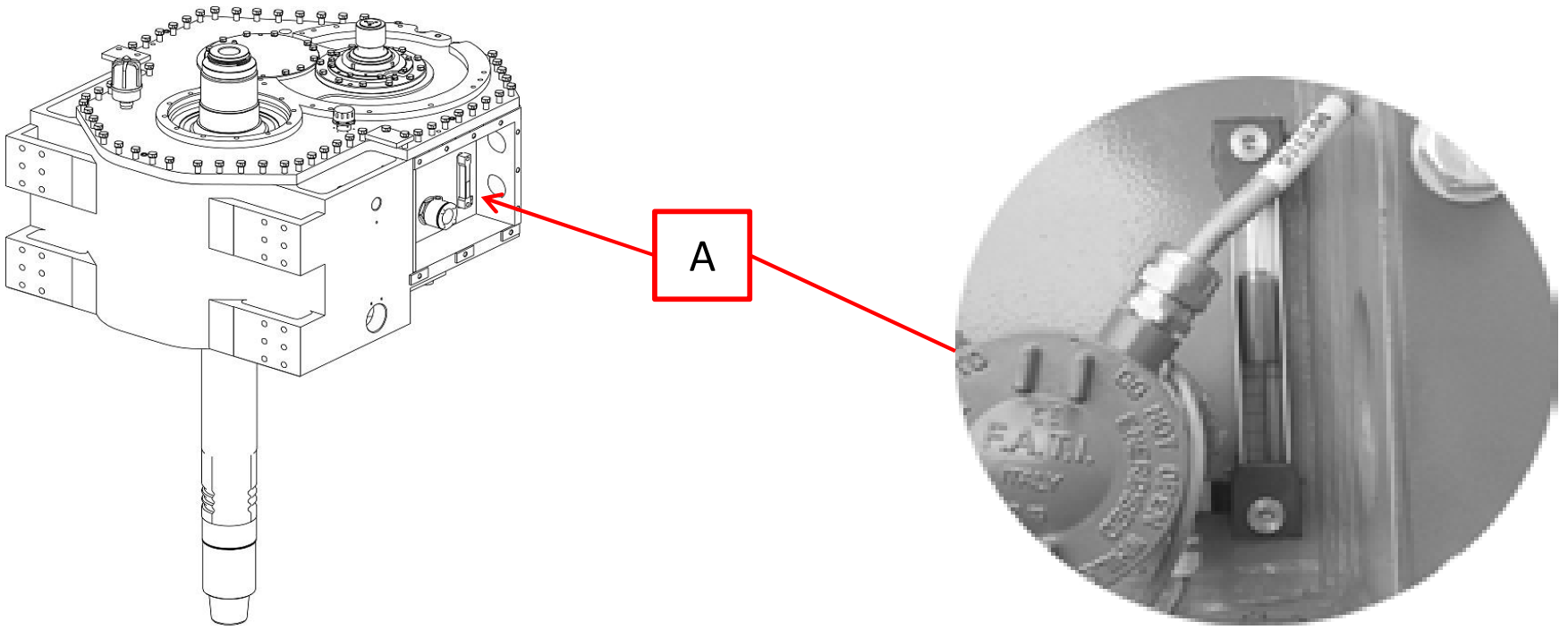
LUBRICATION SYSTEM

ITEMS	QTY	DESRIPTION
1	1	MOTORPUMP 2.2 kW
2	1	LUBRICATION MANIFOLD
3	1	THERMOMETER
4	1	HEAT EXCHANGER
5	1	PRESSURE SWITCH
6	1	THERMOWELL
7	1	TEMPERATURE SWITCH
8	1	THERMOWELL
9	1	TEMPERATURE TRANSMITTER
10	1	BALL VALVE 1.1/2” BSP
11	1	GAUGE
12	1	THERMOSTATIC VALVE (60°)
13	1	RELIEF VALVE
14	1	SPLIT-ON FILTER
15	1	CLOGGING INDICATOR
16	1	MAGNETIC FILTER
17	1	BALL VALVE 1’’ BSP

MAINTENANCE

LUBRICATING OIL LEVEL CHECK

To conduct an oil level control on the gear box, you need to place the machine in the working configuration, with the driving head in the easiest to access position. Check the oil level, possibly hot, using the specific oil level indicator **A**. The oil level must correspond to the halfway notch on the indicator. If necessary, top up. Check the oil level every day to start the system.

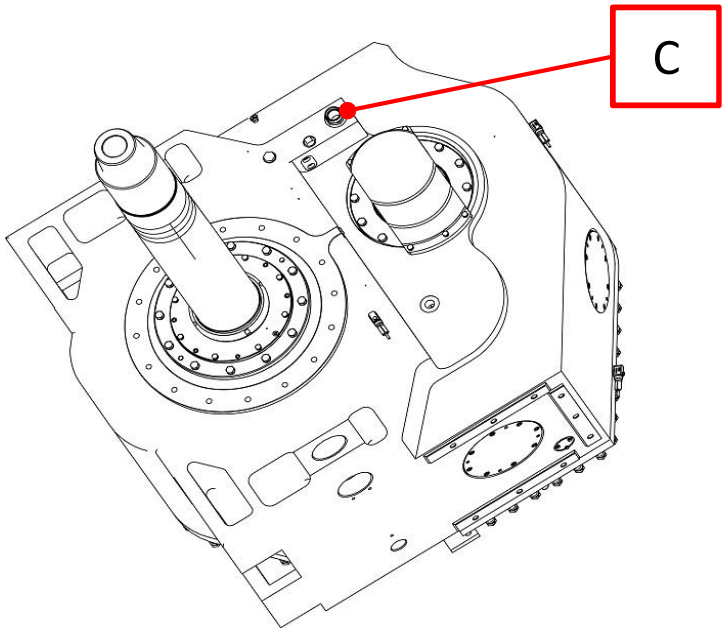


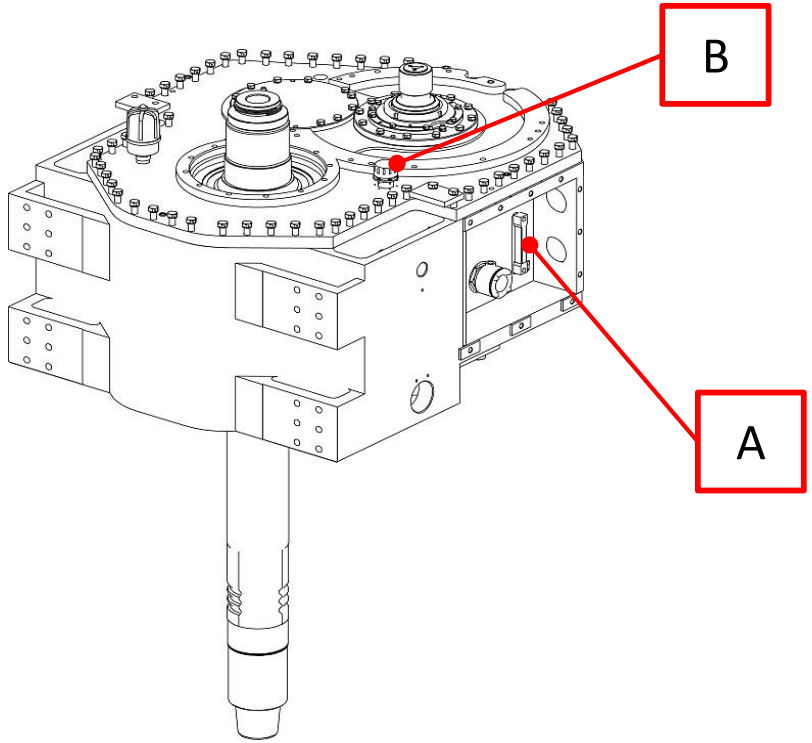
MAINTENANCE

LUBRICATING OIL CHANGE

To change the oil, you need to place the machine in the working configuration, with the top drive in the easiest to access position.

- Prepare an exhausted oil collection system to connect to the emptying plug **C**.
- Unscrew plug **C** and allow all the exhausted oil to flow out.
- Screw plug **C** back on and fill using the oil top-up plug **B**.
- Check the oil level using the level indicator **A**.

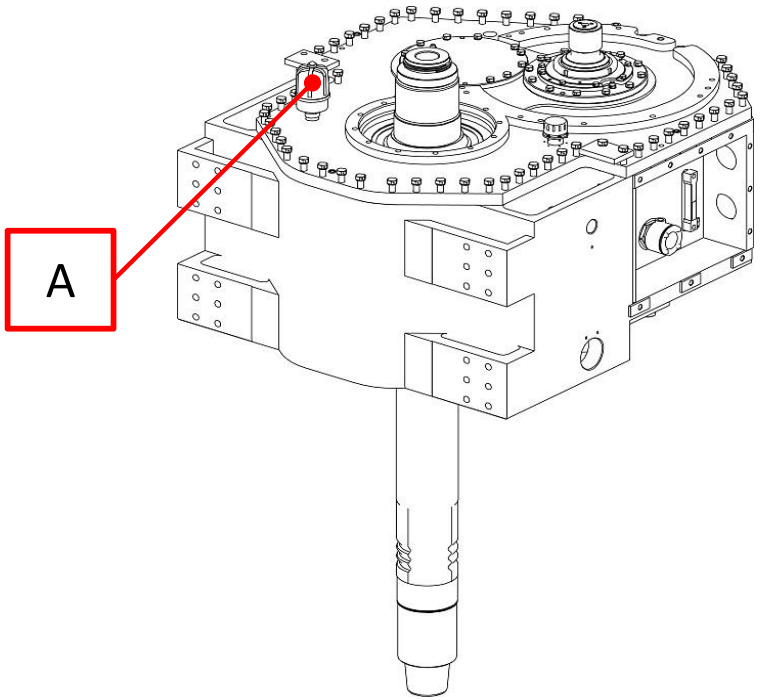




MAINTENANCE

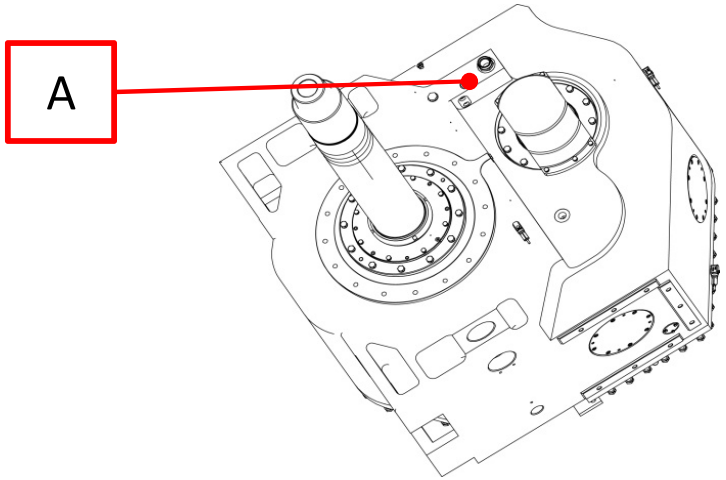
OIL FILTER REPLACEMENT

Unscrew the filter positioned over the gear box. Drain the residual oil contained in the filter. Replace the filtering part.



MAGNETIC ROD CLEANING

A magnetic rod is inserted on the bottom of the gearbox, to attract magnetic particles that could end up in the oil. Clean the magnetic rod each time you replace the oil.



ELECTRIC TOP DRIVE ETD500

MAINTENANCE

GREASE

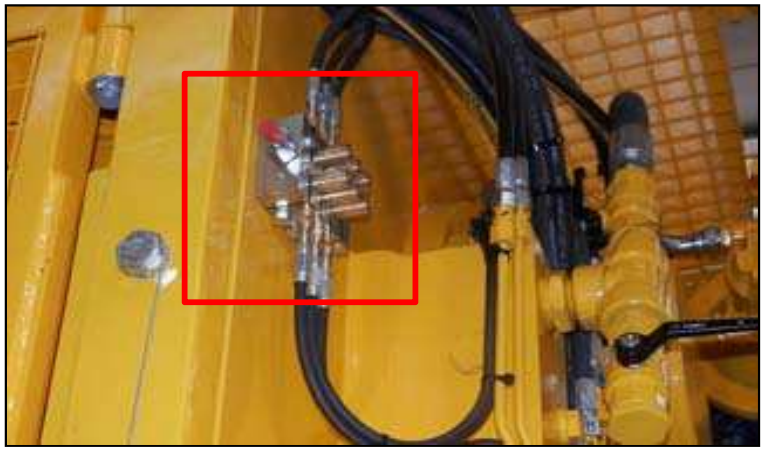
Typical physical characteristics	
Consistency NLGI	2
Type of soap	Lithium
Type of base oil	Mineral
Kinematic viscosity: cSt a 40°C cSt a 100°C (IP 71/ASTM-D445)	 220 19
Dropping point °C (IP 396)	180
Penetration worked @ 25°C 0.1 mm (IP 50/ASTM-D217)	265/295

GREASE TYPE: **SHELL GADUS S2 V220 2**

MAINTENANCE

MAIN DRIVE UNIT GREASING

Use the block for centralized greasing for the components of the main drive unit. Operation to execute with top drive into position more easily accessible.



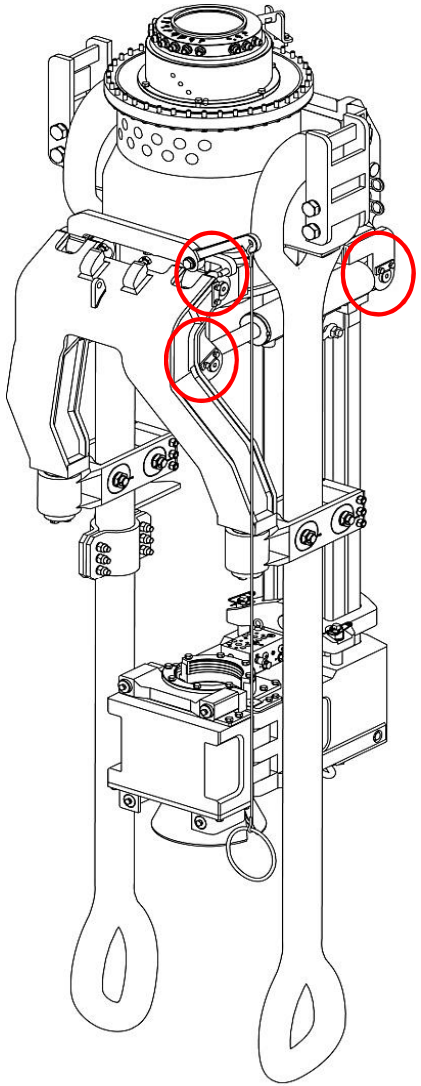
CARRIAGE GREASING

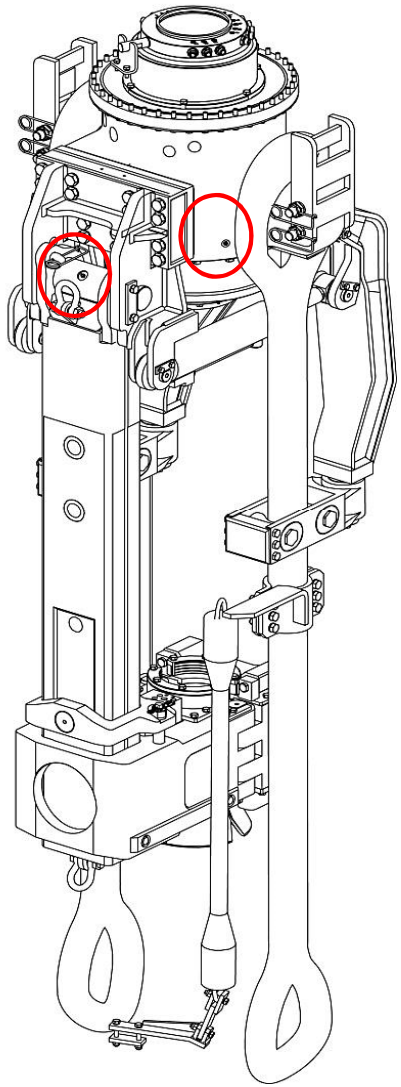
Use the block for centralized greasing for carriage. Operation to execute with top drive into position more easily accessible.

MAINTENANCE

PIPE HANDLER GREASING

Grease the cylinders for the link tilt (4 lubricators, 2 for cylinder), the link adapter (2 lubricators) and the pin in the clamp.

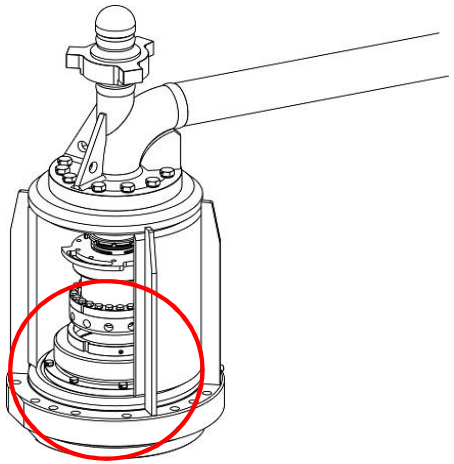


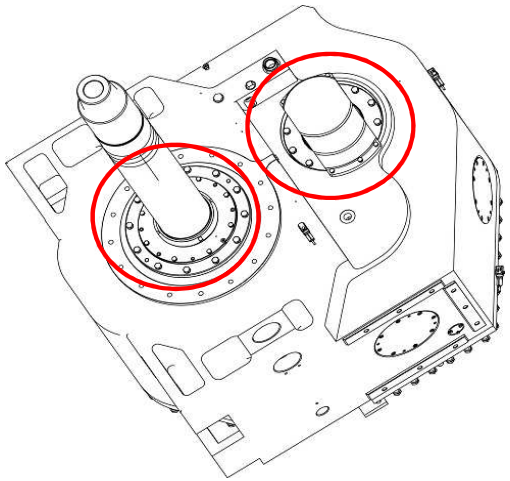


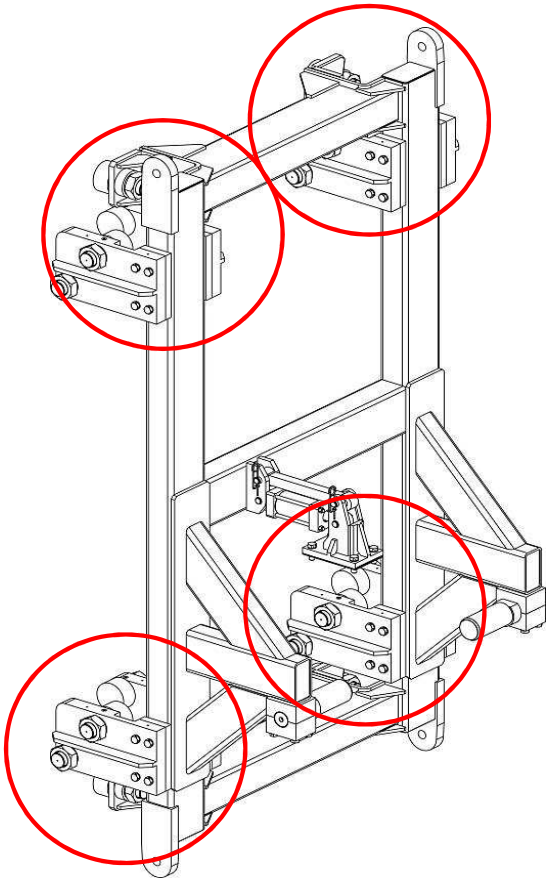
ELECTRIC TOP DRIVE ETD500

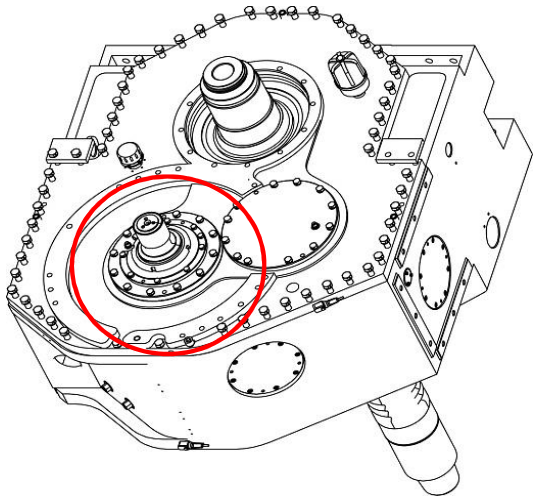
MAINTENANCE

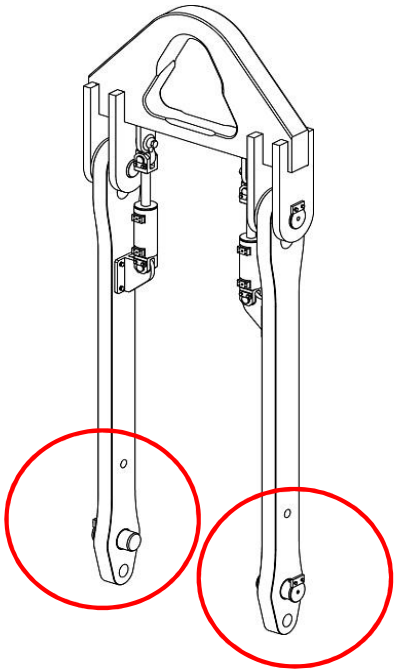
GREASING POINTS







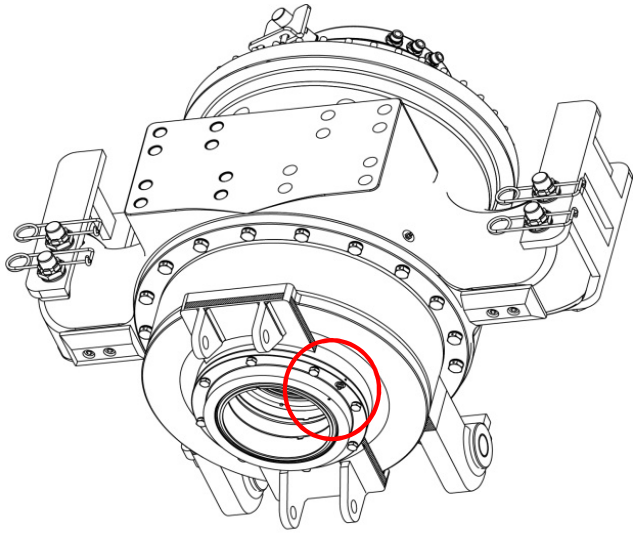




ELECTRIC TOP DRIVE ETD500

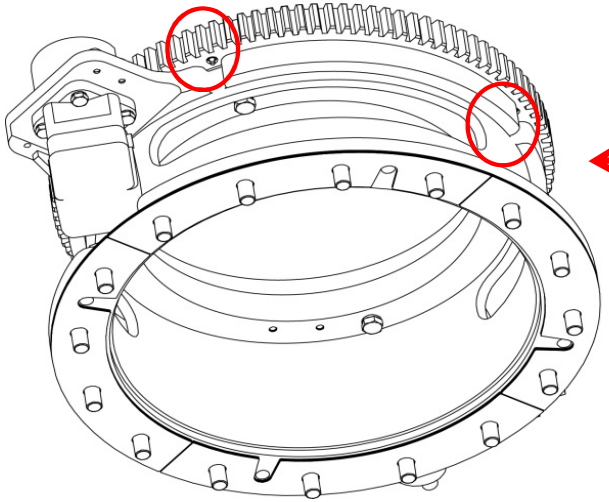
MAINTENANCE

GREASING POINTS

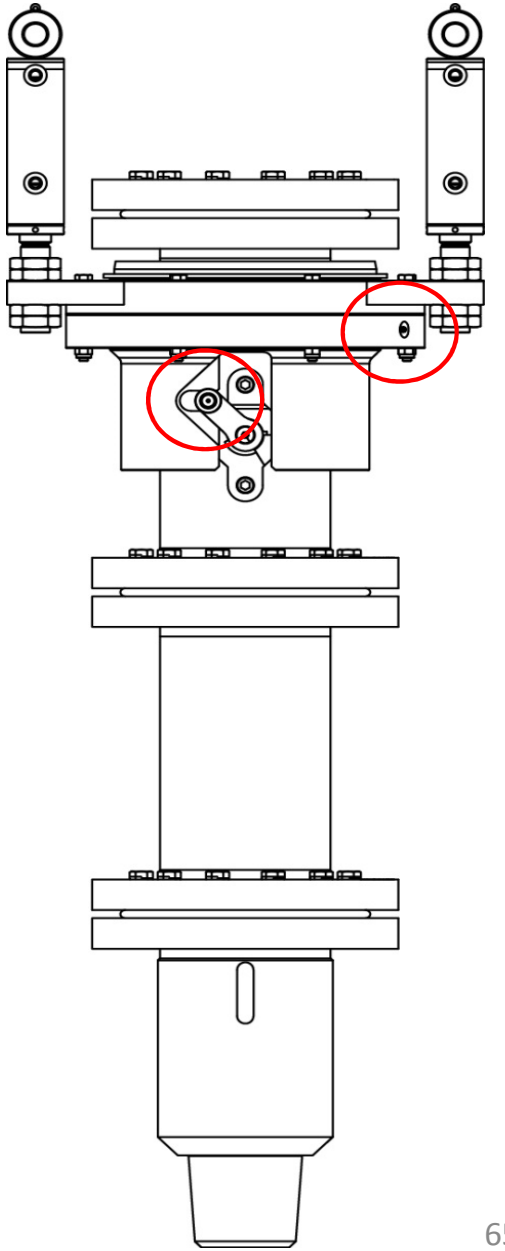


LINKS ADAPTER

IBOP MECHANISM



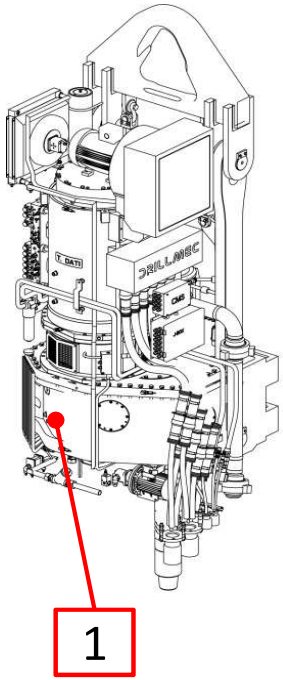
GEAR WHEEL
FOR ROTATION

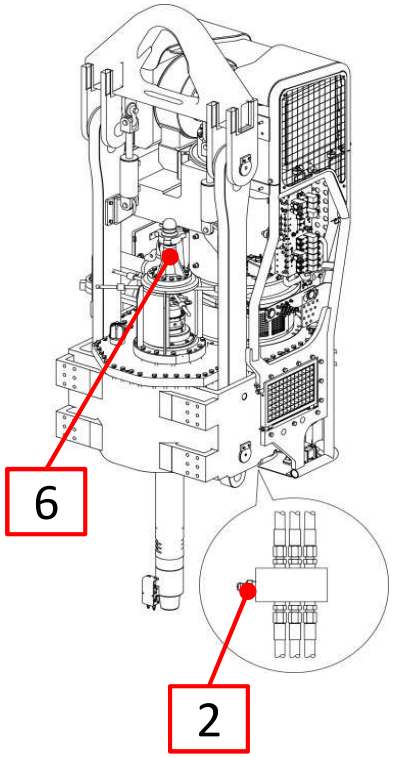


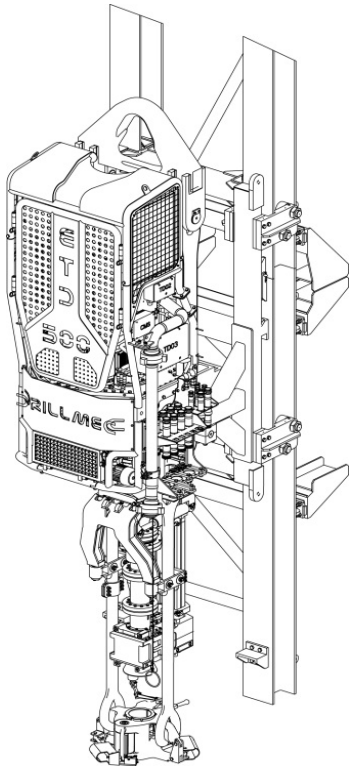
ELECTRIC TOP DRIVE ETD500

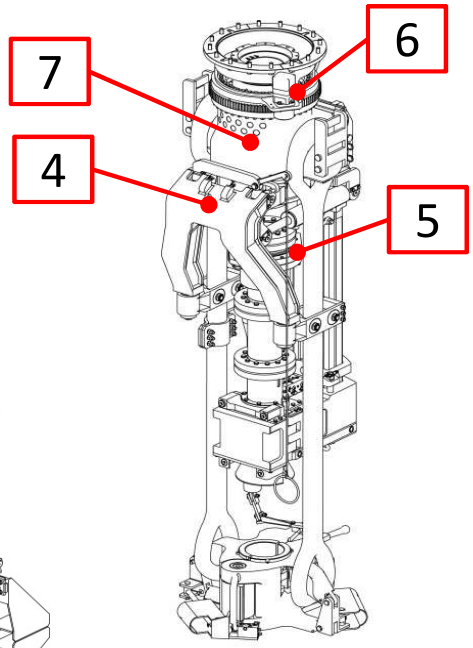
MAINTENANCE

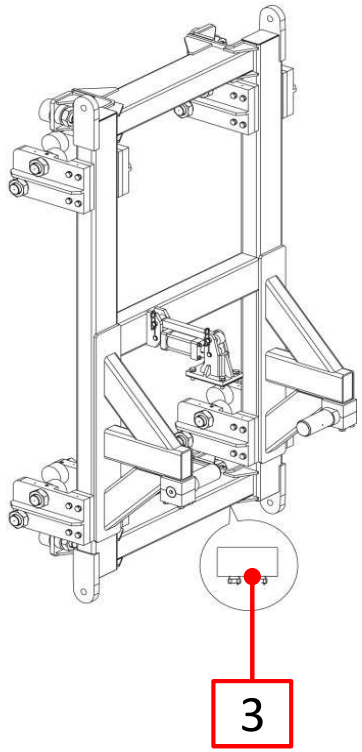
INSPECTION PROGRAM











ELECTRIC TOP DRIVE ETD500

MAINTENANCE

INSPECTION PROGRAM

MAINTENANCE OPERATIONS - TESTING/CLEANING	Frequency					Ref.
	Daily	Weekly	3 months	6 months	Two years	
Gear box magnetic rod - cleaning			x			1
IBOP valve - check			x			5
Bolt tightening hold - check			x			
Top drive guides - check				x		
Gooseneck - check				x		6
Gear box - complete inspection					x	1

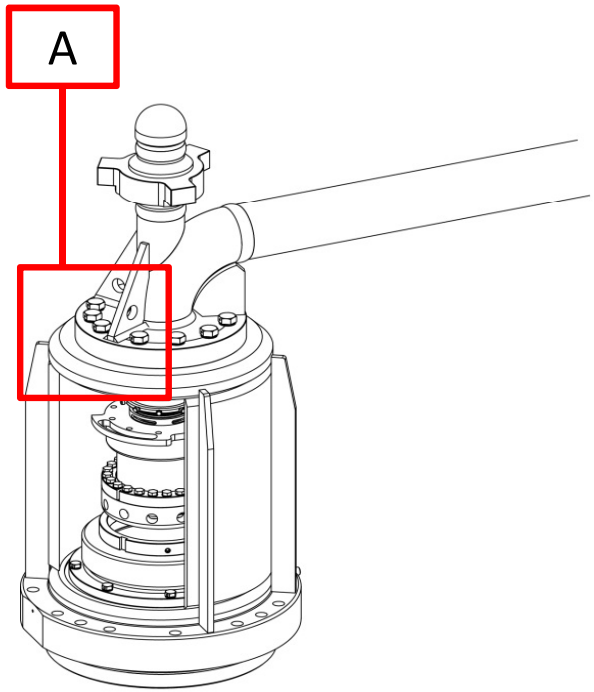
The inspection intervals listed in the following table are based on normal working conditions. Some conditions (excess load, dusty or corrosive environment, extreme temperature, etc.) can justify more frequent maintenance intervals.

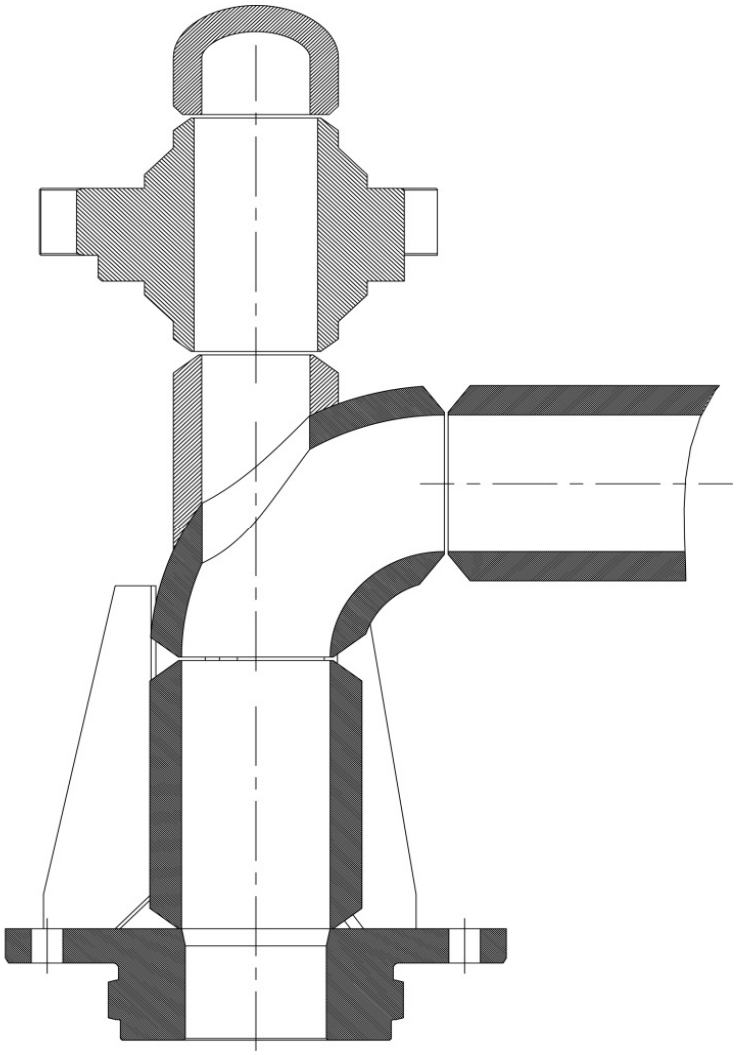
ELECTRIC TOP DRIVE ETD500

MAINTENANCE

GOOSENECK INSPECTION

- Unscrew the hammer lug connecting the flexible hose to the gooseneck.
- Unscrew the eleven bolts **A** connecting the gooseneck to the washpipe support
- Clean the bore of the gooseneck and inspect for visible signs of pitting, corrosion, or erosion.
- Remove and perform an ultrasonic inspection on the gooseneck if visual inspection indicates erosion or corrosion.
- Check condition of the seals.
- Apply pipe dope to the threads before re-installing.



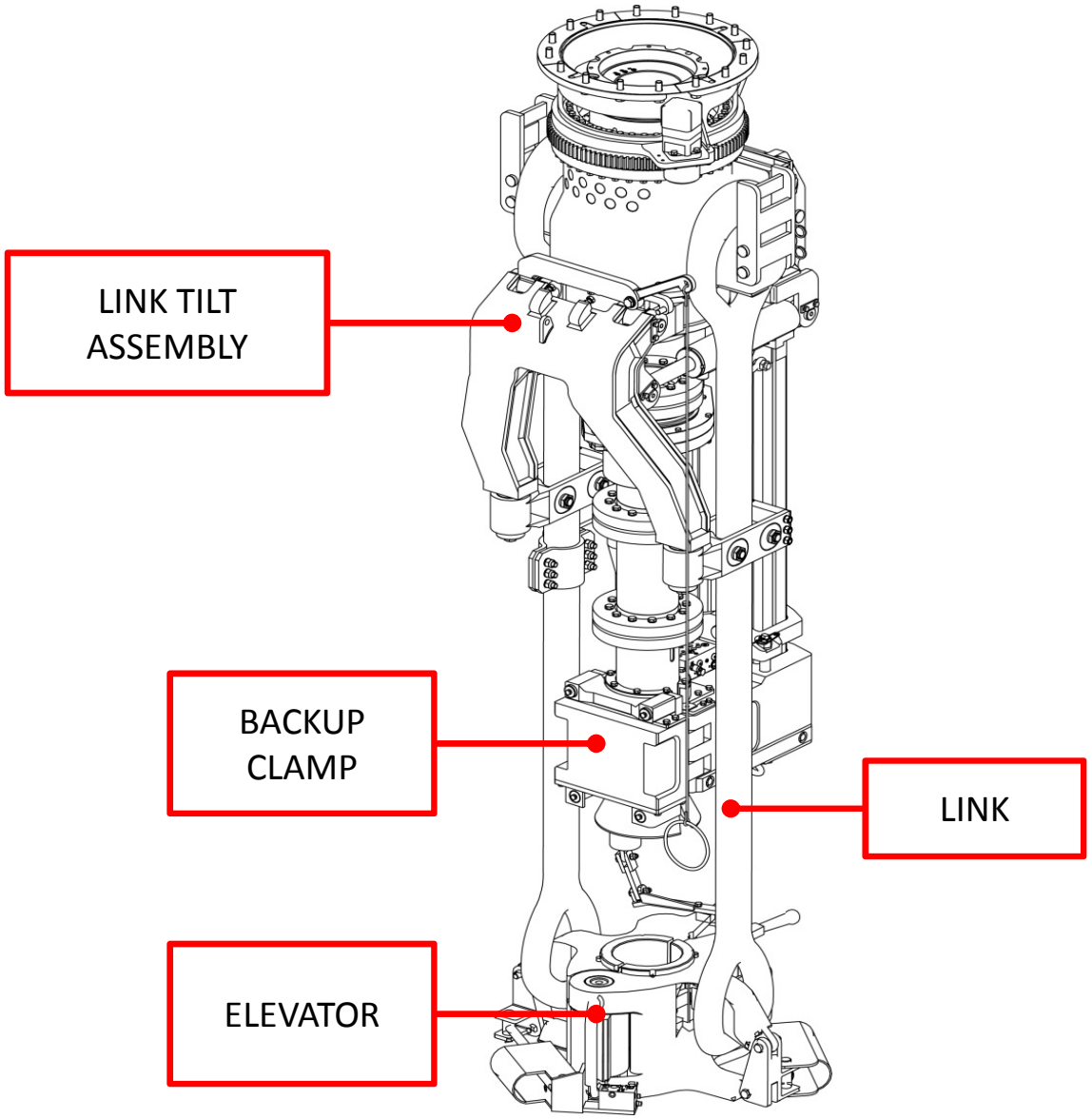


ELECTRIC TOP DRIVE ETD500

MAINTENANCE

PIPE HANDLER INSPECTION

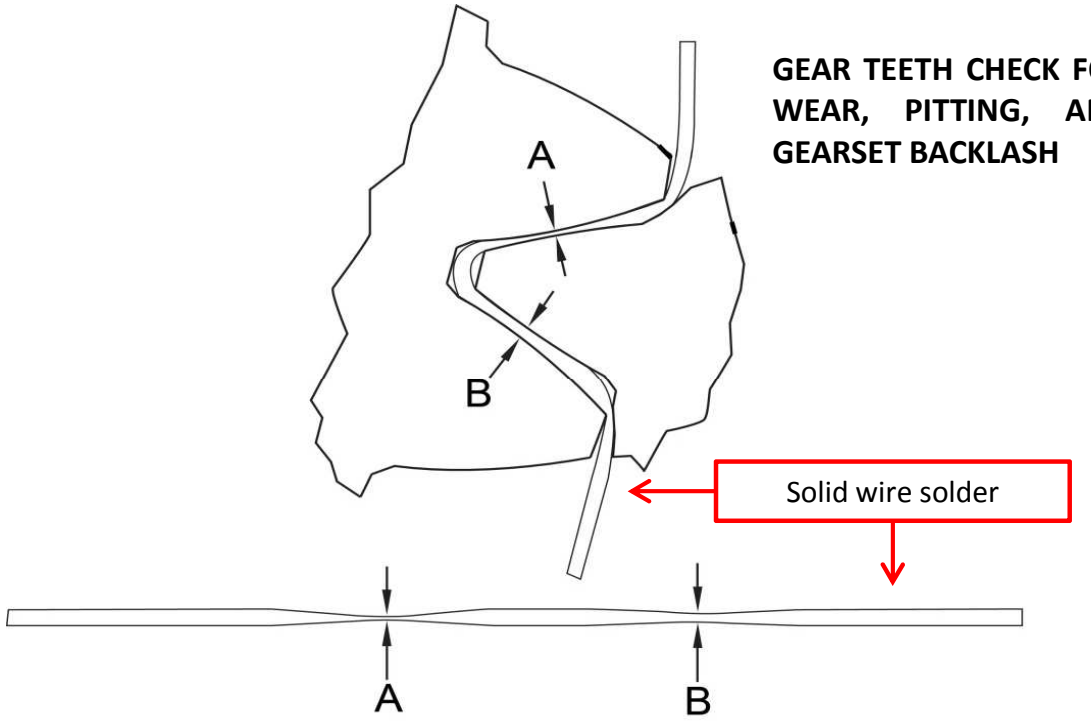
- Inspect the pipe handler installed on the lower part of the top drive, checking the pins and the holding systems are correctly installed.
- Tighten the bolts if they are loose and replace each pin or safety latch that is missing or damaged.
- The figure indicates the main parts of the pipe handler.



MAINTENANCE

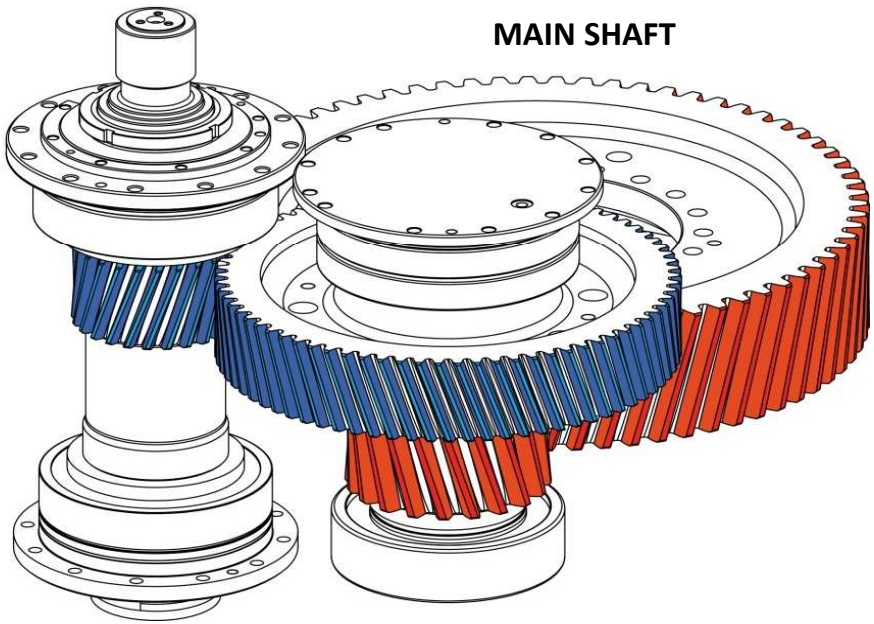
GEARBOX BACKLASH INSPECTION

Remove covers placed on the side of the gear housing on the top drive and check the gear set backlash between the motor shaft and the intermediate shaft and then check the gear set backlash between the intermediate shaft and the main shaft (sleeve). Run a piece of solid wire solder through the primary and secondary gear meshes and measure the thickness of the two flat spots made by the gear teeth surfaces with a micrometer. If the primary gear mesh backlash exceeds 0.030” or the secondary gear mesh backlash exceeds 0.040”, excessive gear wear or bearing failure may be indicated.



GEAR TEETH CHECK FOR WEAR, PITTING, AND GEARSET BACKLASH

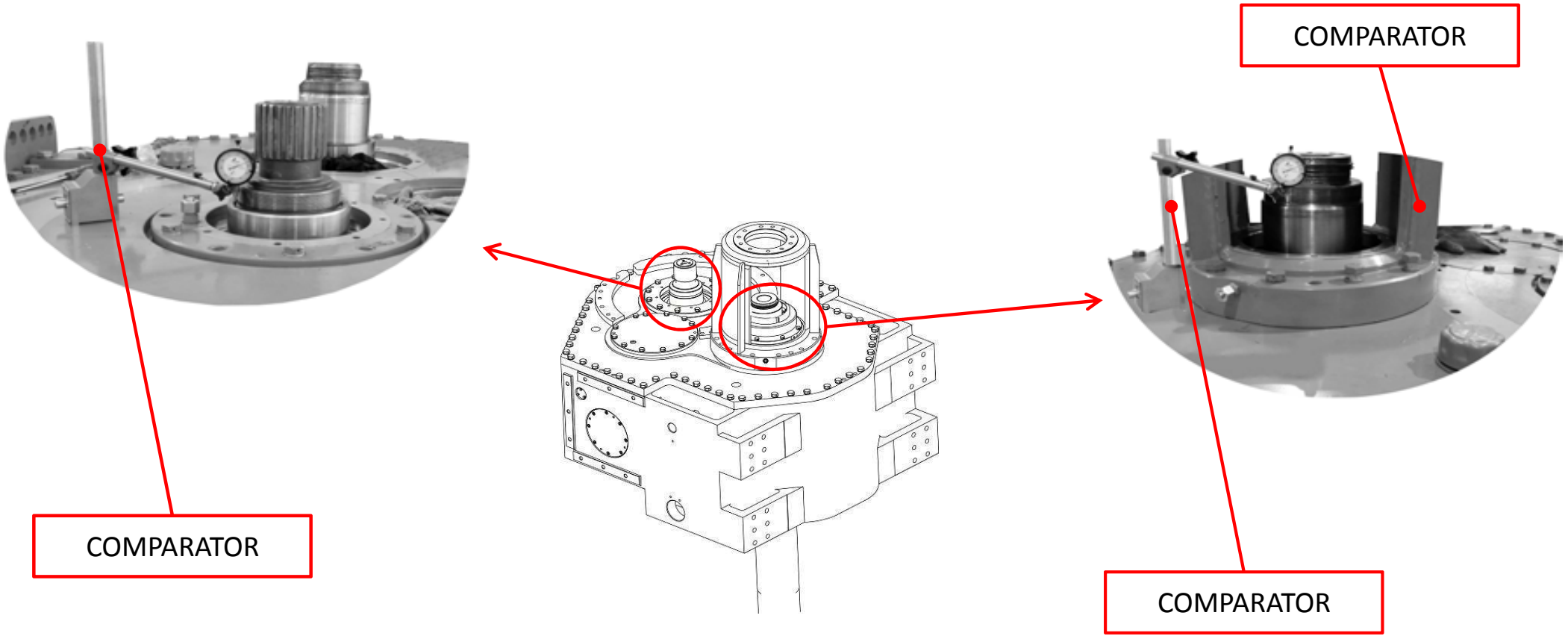
DIM. A + DIM. B = BACKLASH



MAINTENANCE

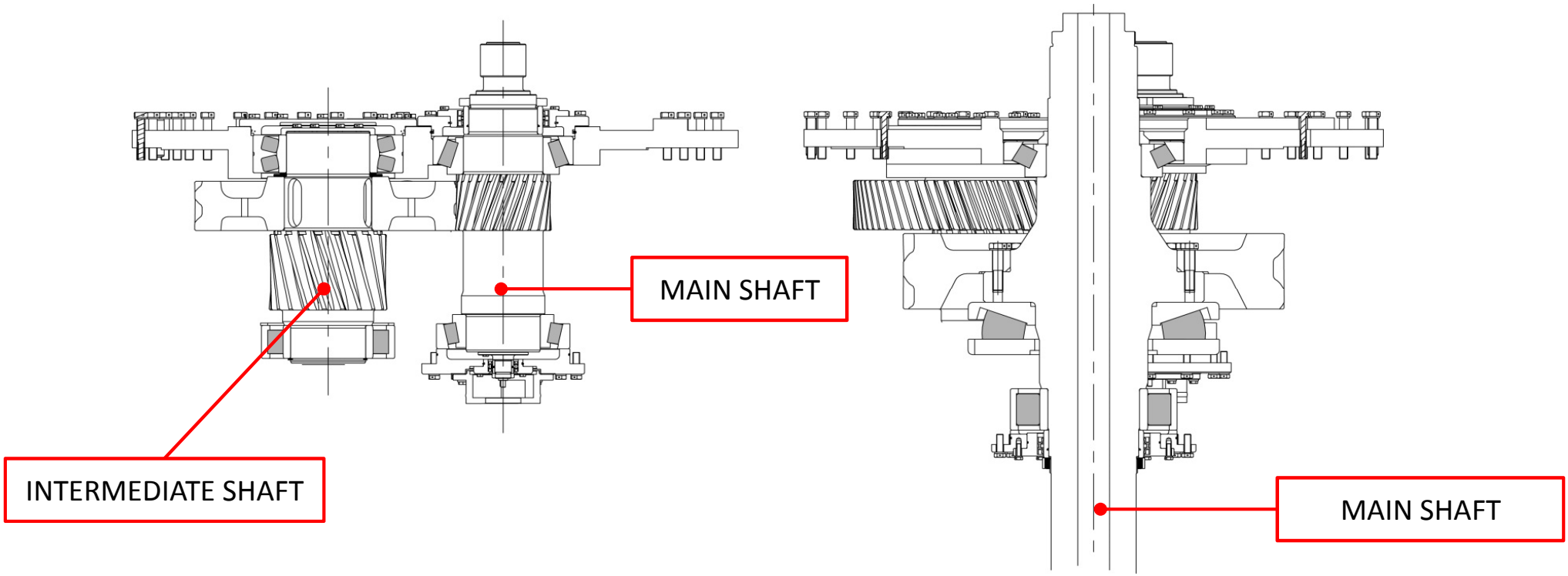
GEARBOX AXIAL MOVEMENT INSPECTION

- Check axial movement on the ends of the motor shaft by applying a force on the shaft upwards and measuring movement with a comparator.
- Check axial movement on the ends of the main shaft by applying a force on the shaft upwards and measuring movement with a comparator.



MAINTENANCE

GEARBOX AXIAL MOVEMENT INSPECTION

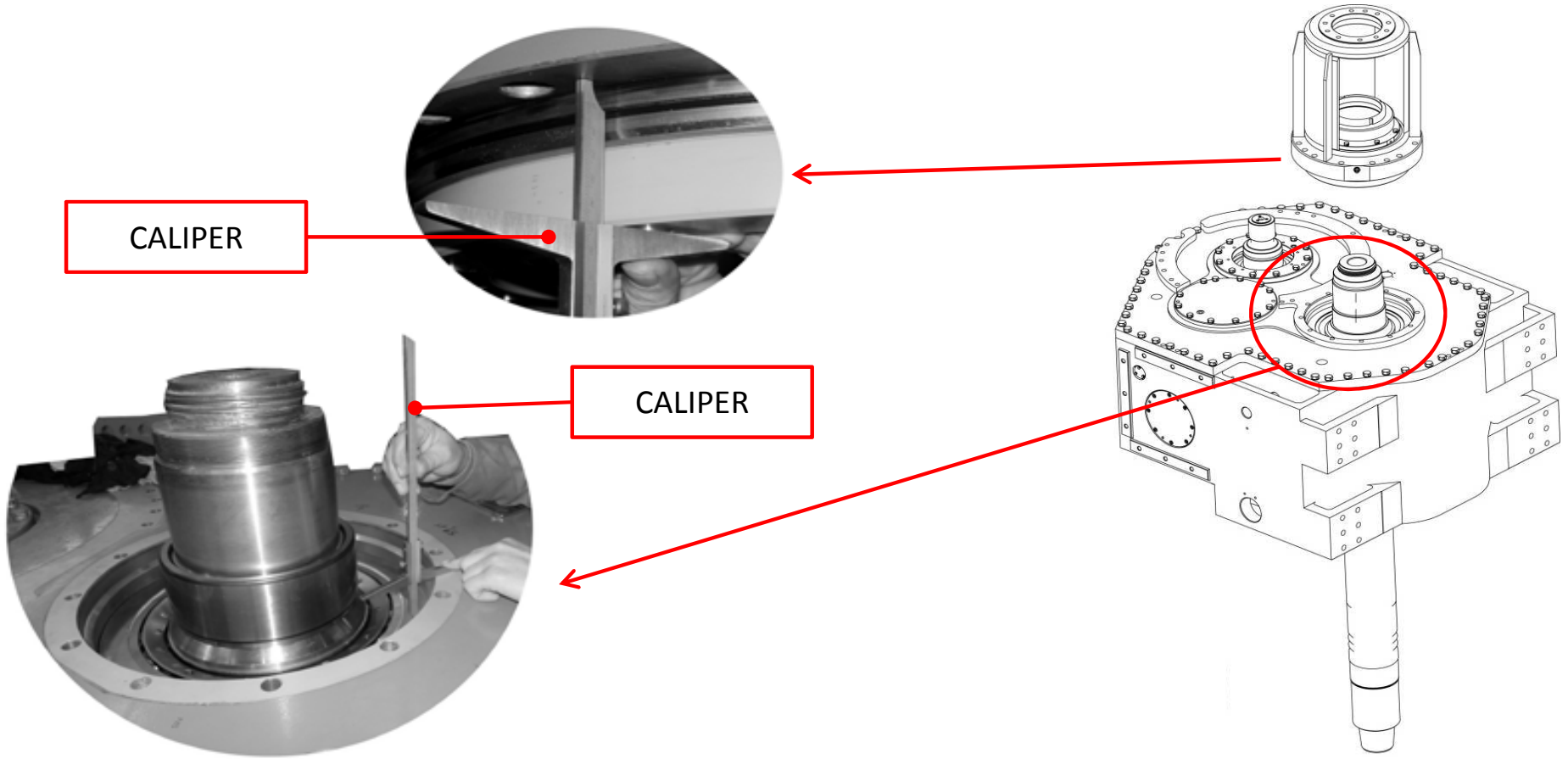


Test carried out	Assembly range	Bearings replacement limit recommended by Drillmec
Motor shaft bearings	0.25 mm	≥ at double the assembly range
Main shaft bearings	1.2 mm	2 mm

MAINTENANCE

GEARBOX SHAFT BEARING REPLACEMENT

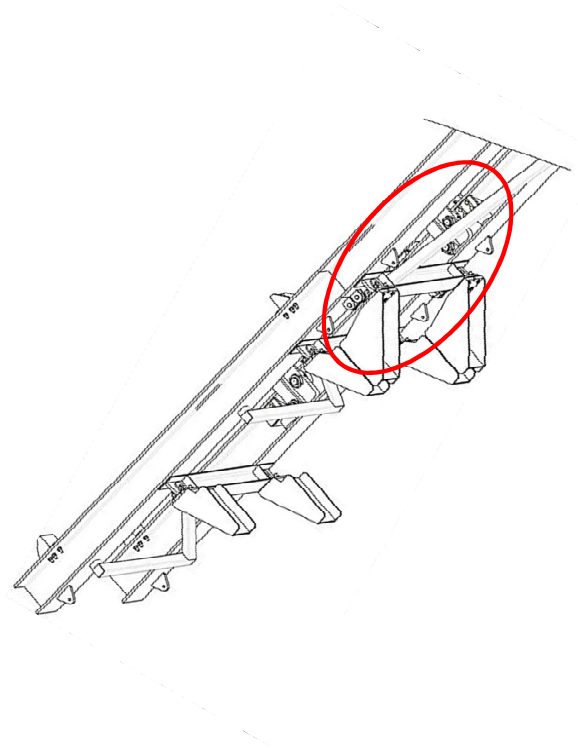
When you replace the bearings of the motor shaft, also check the bearings on the intermediate shaft and replace them, if necessary. When replacing the main shaft bearings, axial movement of the shaft on assembly must be 1.2 mm. Before positioning the support assy and fastening it with the housing screws, insert the shims (as indicated in the figure) and measure the depth with a caliper. The bearing pre-loading pins in release exit the support assy flange by 1.5 mm.

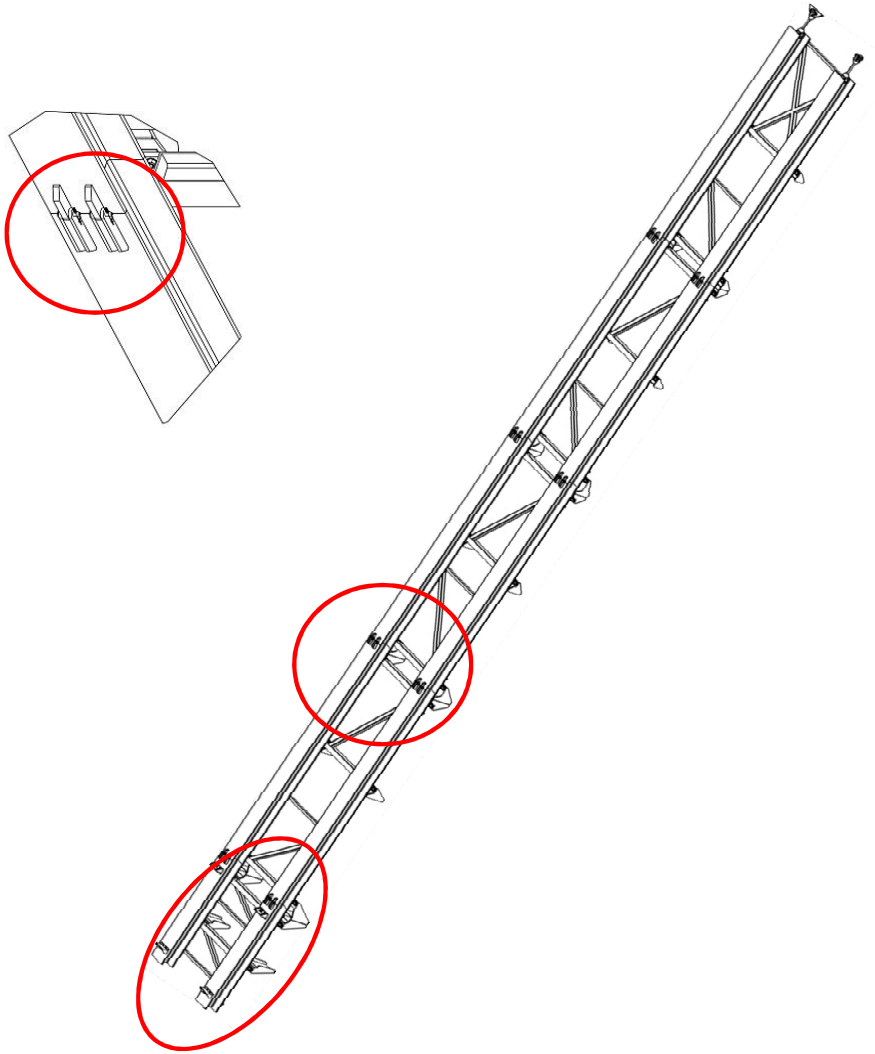


MAINTENANCE

GUIDES INSPECTION

- Inspect the guides on the top drive, checking the pins and the supports are correctly installed.
- Tighten the bolts if they are loose and replace each pin or safety latch that is missing or damaged.





ELECTRIC TOP DRIVE ETD500

MAINTENANCE

RECOMMENDED TEST PERIODS

Requirements for hydraulic hose assembly	Recommended test period
Normal requirements	12 months
Increased requirements for safety, e.g. due to: - increased operating times (e.g. multiple-shift operation); - strong external influences; - intended prolonged duration of use ; - (replacement intervals, see. chapter 3.5) or - provisions stated by the machine manufacturer for particular gravity-loaded axes.	6 months

RECOMMENDED REPLACEMENT INTERVALS

Requirements for the hydraulic hose assembly	Recommended replacement intervals
Normal requirements	6 years
Increased requirements for safety, e.g. by: - increased operating times (e. g. multiple-shift operation); - strong external influences; - provisions stated by the machine manufacturer for particular gravity-loaded axes.	2 years

ELECTRIC TOP DRIVE ETD500

MAINTENANCE

BOLT TIGHTENING

Tightening torques MA for screws with head contact dimensions according to DIN 912, 31, 933 and 7984 as well as metric standard thread according to DIN 13. The tightening torques indicated here are to be considered as standard values, because various factors are decisive here.

Friction value µges = 0,14

Grade	8.8	10.9	12.9
Diameter	MA in Nm		
M4	2.9	4.1	4.9
M5	6	8.5	10
M6	10	15	17
M8	25	35	41
M10	49	69	83
M12	86	120	145
M14	135	190	230
M16	210	295	355
M18	290	405	485
M20	410	580	690
M22	550	780	930
M24	710	1000	1200
M27	1050	1500	1800
M30	1450	2000	2400
M36	2450	3450	
M42	3950	5550	
M48	5950	8400	
M56	9550	13400	
M64	14300	20100	