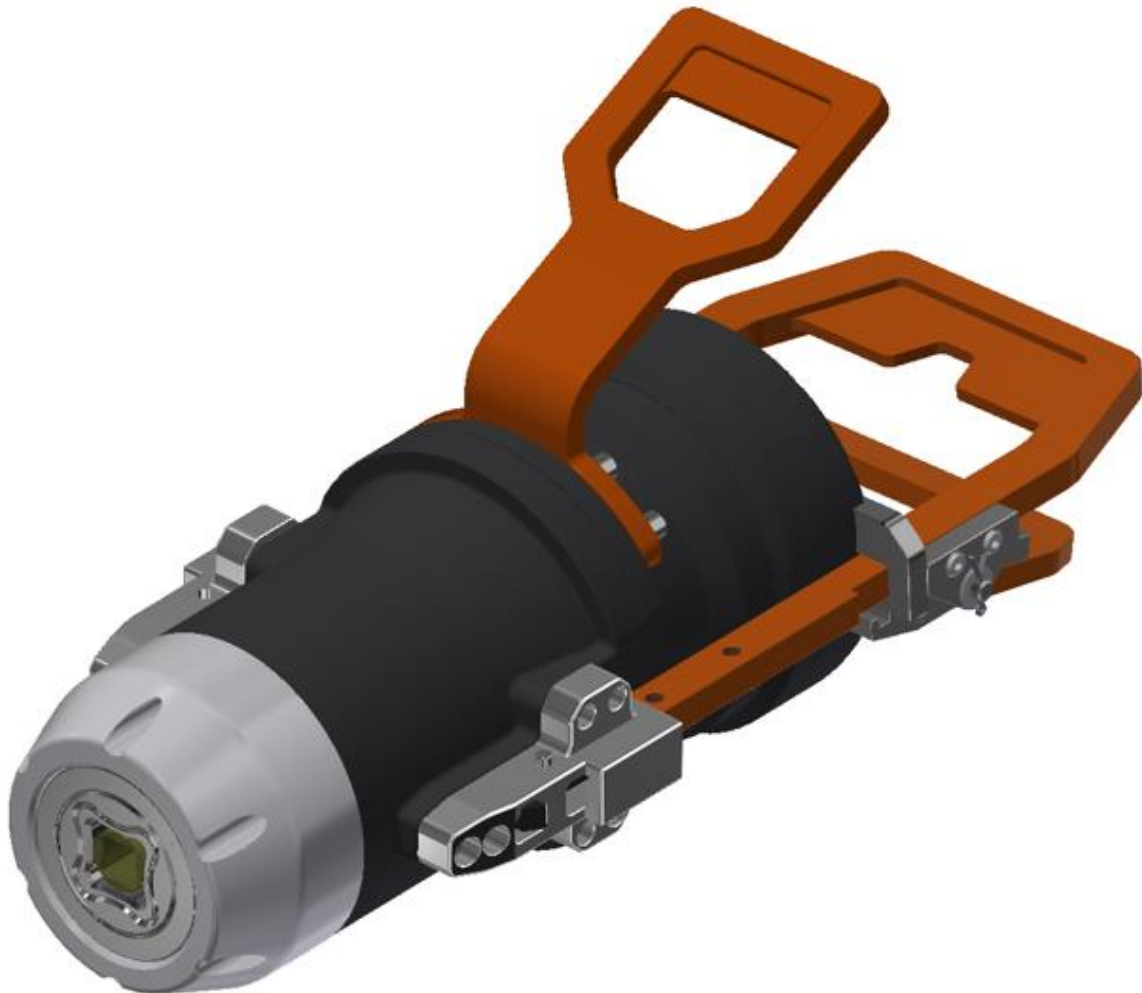




OPERATION AND MAINTENANCE MANUAL

DOCUMENT TITLE: OMM for Torque Tools Class 1 - 4, New GUI
PROJECT TITLE: 8.1. ISO 1 to 4-Mech.Interfaces
PROJECT: 600144
DOCUMENT NUMBER: 600144-TD-0026
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REVISION CHANGE/RECORD

REV	REASON FOR REVISION/ DESCRIPTION OF CHANGES
01	Document initiated for use. New software/GUI implemented.
02	Torque Tool with Auto Select added.
03	Data for supply voltage updated and synchronized. Information for installation and use of hydraulic latch mechanism added. Datasheet and safety data sheet for gear-oil added as appendix. Added instructions for installation of software.
04	Removed additional Torque Tool variants, i.e. user manual only related to the standard Electric Torque Tool.
05	Update wrt. auto-shift of gear and issue related to shaft stuck in Cl1&2. Added instruction for replacement of auto-shift mechanism.
06	Correction of Torque Tolerances in Technical Data.
07	Update of technical data. Input regarding RPM setting when hard end stop may cause torque spike. Instructions for installation of CL4 socket with CL2 properties.
08	Software and GUI updated



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1. INTRODUCTION

1.1. PURPOSE AND SCOPE

The objective of this document is to present a comprehensive user manual for the Blue Logic standard Electrical Torque Tool, ELTT. Relevant technical aspects for information and familiarization are covered as well as detailed technical data.

The Blue Logic Electrical Torque Tool Systems are designed as compact and accurate multipurpose Torque Tool System designed for all typical Subsea Torque Tool operations.

Note 1:

This manual is only valid for torque tools with the latest software/GUI implemented in 2022. For tools with old GUI version, reference is made to 600144-TD-0003.

Note 2:

Make sure that serial number on actual torque tool and label on PC corresponds. The Torque Tool can only be operated by the PC labelled with the correct TT serial number. If another PC must be used, see section 4.3 for instructions related to software installation and set-up.

This OMM covers the following specific Torque Tool kits:

Art. No.:	Description:
BB3306	2,7kNm Torque Tool Kit
BC0454	2,7kNm Torque Tool wAutomatic Class Switch Stage 3 Output Kit
BC0145	2,7kNm Torque Tool wAutomatic Class Switch Stage 2-3 Output Kit

1.2. ABBREVIATIONS

ELTT	Electrical Torque Tool
ELTTS	Electrical Torque Tool System
EPC	Electrical Power Can
GUI	Graphical User Interface
IC	Inductive Connector
OMM	Operation and Maintenance Manual
ROV	Remotely Operated Vehicle
TT	Torque Tool
EFR	Equipment Failure Report
CP	Cathodic Protection
PFC	Power Factor Control
CW	Clockwise
CCW	Counterclockwise

1.3. SYMBOLS

The following words and symbols found throughout this manual, highlights special messages to alert the operator of specific information.



WARNING: The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. All users must be familiar with the contents of the appropriate manuals before attempting to install, operate, maintain or in any other way work on the equipment. Blue Logic AS disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.



CAUTION: The equipment to which this manual applies operates on high voltage and has the potential to results in death or severe injury if handled incorrect. The equipment should only be used by qualified personnel. The equipment contains no serviceable parts inside.

1.4. WARRANTY CONDITIONS AND GUARANTEES

It is the responsibility of the end user to make sure that the product is used in such a manner for which it is designed. This includes accounting for material/fluid compatibility, sour service, temperature, pressure rating etc.

When performing operation above water do not run tool on full load for prolonged periods. Consider water-cooling if operation is expected to take time. Consider ambient temperature.



1.5. REFERENCES

Latest version of the following documents

Id.	Doc. No	Originator	Document Title
/01/	BB3306	Blue Logic	2,7kNm Torque Tool Kit
/02/	600144-TD-0008	Blue Logic	ETT Check List Mob/Demob
/03/	600144-TD-0024	Blue Logic	Operation and Maintenance Manual for Change Out Tool
/04/	BC0454	Blue Logic	2,7kNm Torque Tool wAutomatic Class Switch Stage 3 Output Kit
/05/	BC0145	Blue Logic	2,7kNm Torque Tool wAutomatic Class Switch Stage 2-3 Output Kit

2. HEALTH, SAFETY AND ENVIRONMENT

Safety must always be the highest priority when performing operations, maintenance and tests when using the ELTT.

Personnel involved in the test/work operation shall be familiar with the contents of this document.

2.1. PERSONAL PROTECTIVE EQUIPMENT

The following minimum PPE must be worn when operating the ELTT.

Personal Protective Equipment
Protective glasses
Protective shoes
Protective gloves

2.2. QUALIFICATIONS AND TRAINING

It is essential that all operating personnel have been given training and education, in how to operate and maintain the equipment as described in this manual.

3. TECHNICAL DESCRIPTION FOR ELECTRICAL TORQUE TOOL

The Blue Logic Class 1-4 Electrical Torque Tool (ELTT) is a module designed Torque Tool (TT). The ELTT is a compact, flexible, and robust precision tool for subsea and ROV operations.

The Blue Logic ELTT System combines all known advantages from a hydraulic torque tool system with the technology and advantages from a modern servo based electrical controlled drive system. Also included is an auto detect system which detects what type of mechanical interface class 1-4 socket has been installed, and automatically switches between Low Torque (LT) mode and High Torque (HT) mode accordingly.

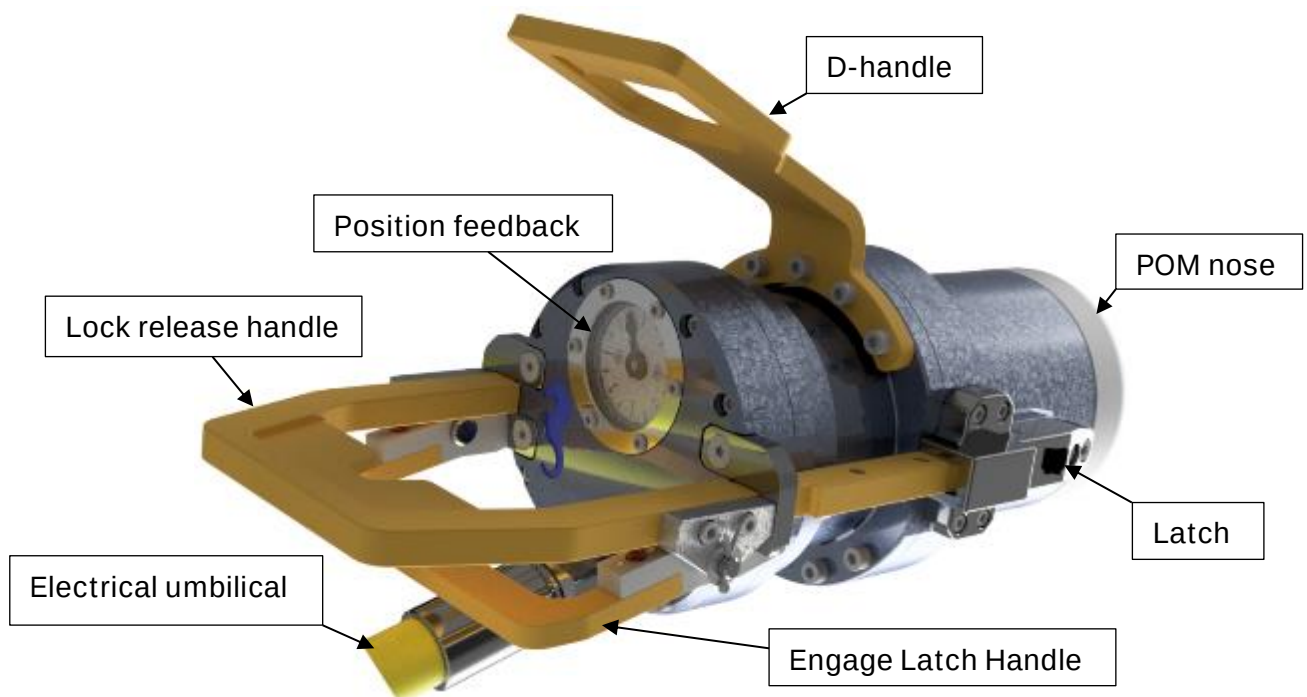


Figure 1: ELTT



HIGH VOLTAGE:

The Torque Tool operates on high voltage and has the potential to result in death or severe injury if handled incorrect. The equipment should only be used by qualified personnel. The equipment contains no serviceable parts inside.



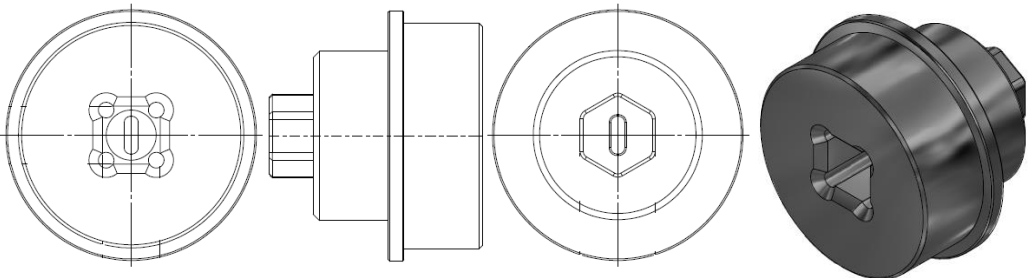
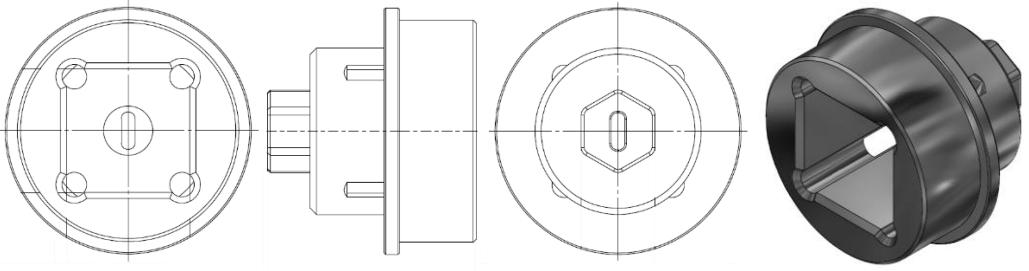
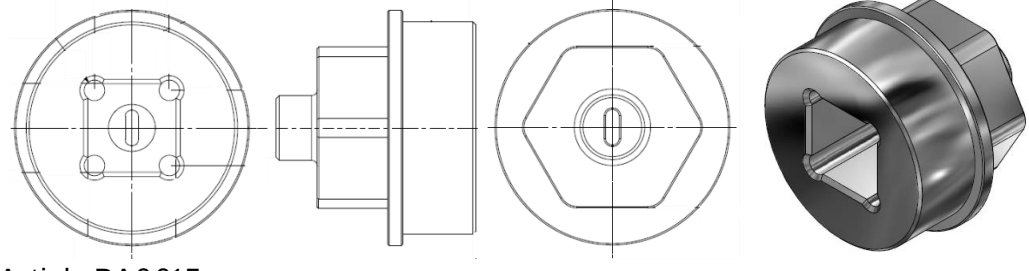
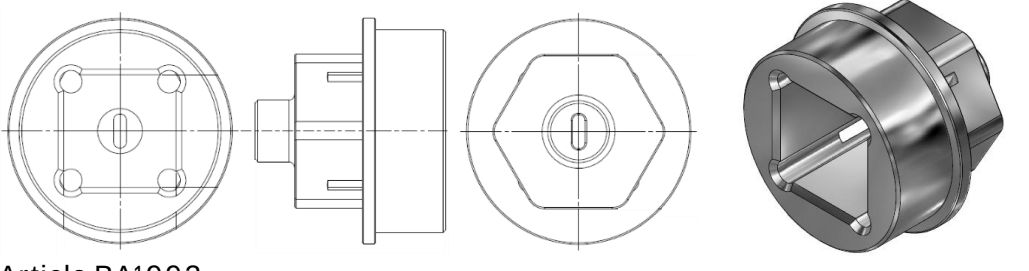
WARNING:

Rotating parts can be hazardous. Keep hands and body out of the operating area. Failure to follow these warnings could result in death or severe personal injury.

3.1. INTERFACE DESCRIPTION – STANDARD TORQUE TOOL

NOTE:

Make sure to install correct socket according to torque class and required torque!

ISO Class 1 & 2: 67,5 – 270 Nm  Article BA2951	Select Class 1-2 in GUI Class Detect, ref. 7.3.2
ISO Class 4, Low-Torque: 67,5 - 270 Nm  Article BA7297	Select Class 1-2 in GUI Class Detect, ref. 7.3.2
ISO Class 3: 500 - 1355 Nm  Article BA6615	Select Class 3-4 in GUI Class Detect, ref. 7.3.2
ISO Class 4, High-Torque: 500 - 2700 Nm  Article BA1992	Select Class 3-4 in GUI Class Detect, ref. 7.3.2

ELTT has *mechanical interface class 1-4 socket* designed according to ISO 13628-8 valves class 1-4. *Mechanical socket* is easily changed topside by removing the POM Nose. ELTT will automatically switch between High Torque (HT) and Low Torque (LT) mode. Class 1 and 2 valves are operated in Low Torque mode, whereas Class 3 and 4 are operated in High Torque mode. It is not necessary to change the ELTT motor between HT and LT mode.

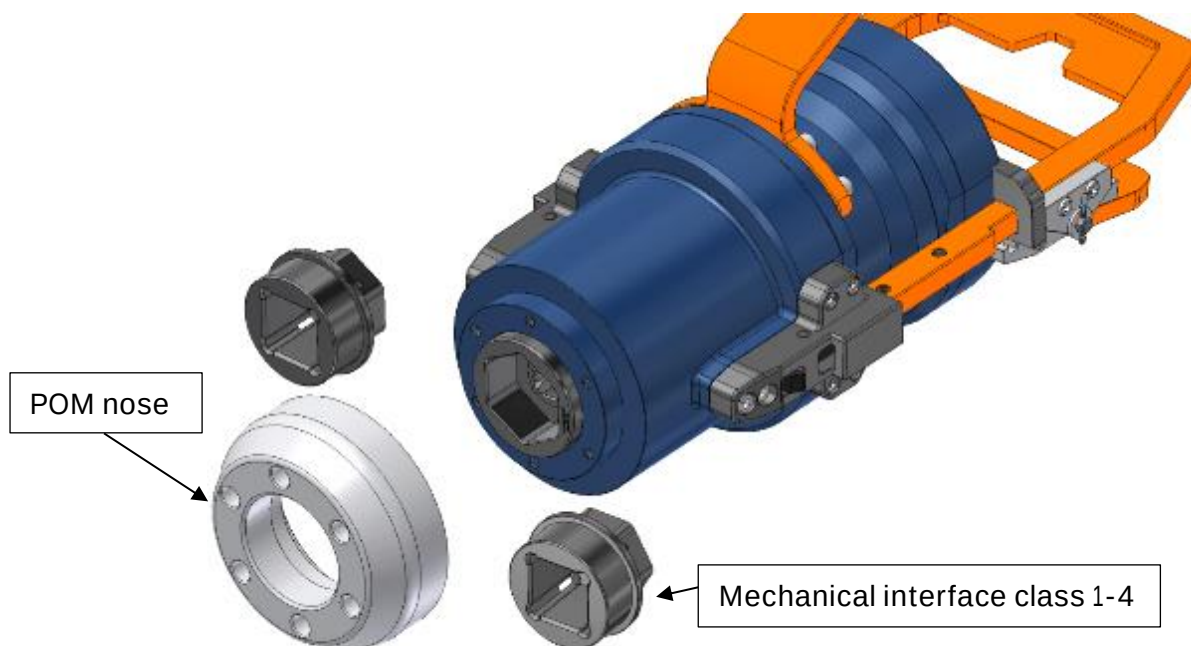


Figure 2: Mechanical Interface socket

To replace the mechanical socket, see section 7.2.2.

3.2. INTERFACE DESCRIPTION – AUTO CLASS SELECT VERSION

The 2,7kNm El. Torque Tool wAutomatic Class Switch, article BC0454, has a multi-socket interface nose including all classes, i.e. Class 1&2, Class 3 and Class 4. The three sockets are mounted in a co-centric configuration with spring suspension to ensure engagement of correct socket whenever docking onto interface bucket with CI 1&2, CI3 or CI4.

If not aligned when installed, the correct socket will engage with the square stem once rotated and aligned. There is a docking feature in the GUI to slowly operate tool until engaged. Once engaged, the GUI will ask user to confirm the auto-detected class selection prior to operation.

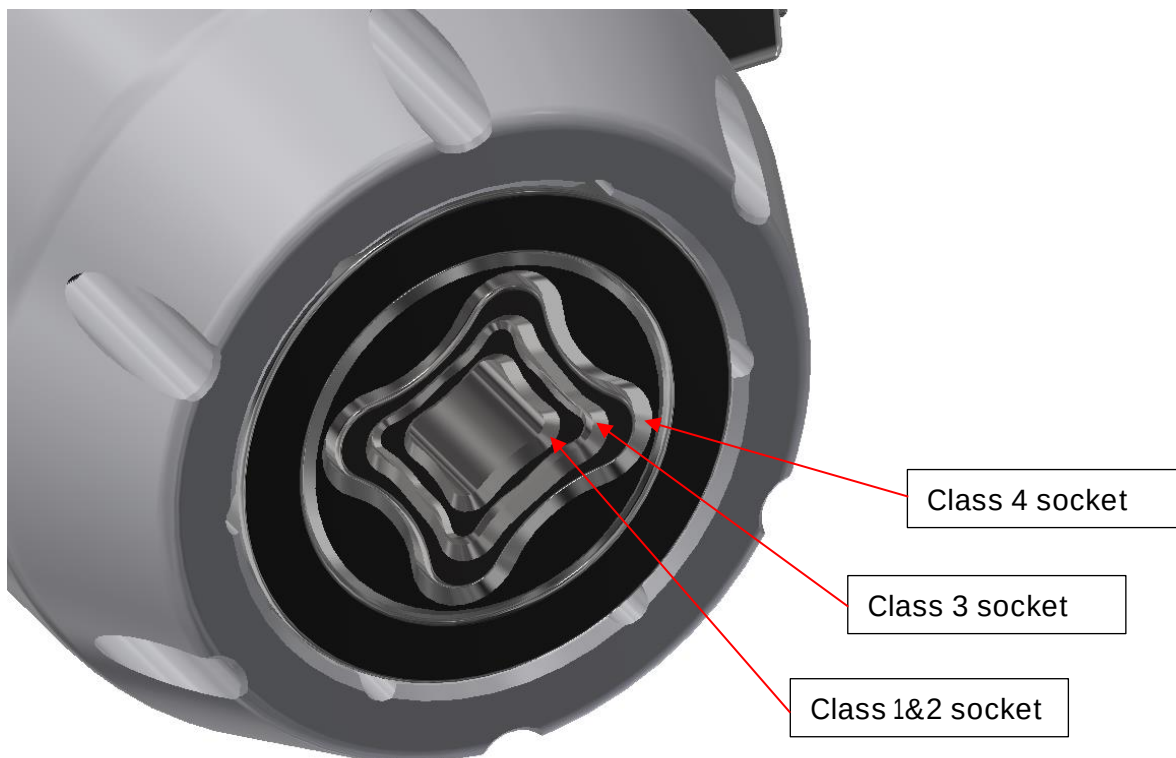


Figure 3, Interface nose for Torque Tool with Auto Class Select

Note:

For the Auto Class Select Torque Tool kit with article number BC0454, CI1&2 will have similar parameters as for CI4 operation, except from available torque that will be limited to 300Nm. This means reduced accuracy and limited speed at low torque. Reference is made to section 3.4.2.1 for technical details.

Replacement of auto-shift mechanism to new version including shift of gear described in section 3.2.1. If high speed and high accuracy is required, the BB3306 and BC0145 kits are better alternatives for the operation.

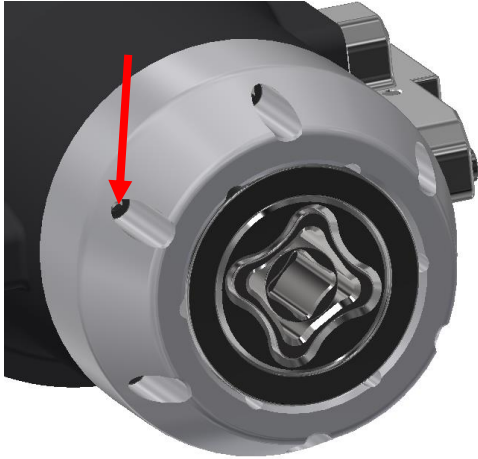
OPERATION AND MAINTENANCE MANUAL

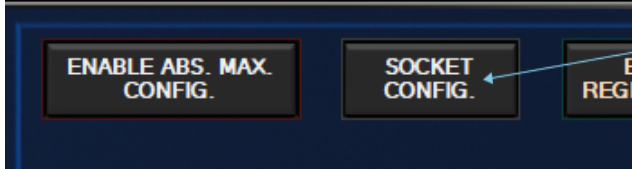
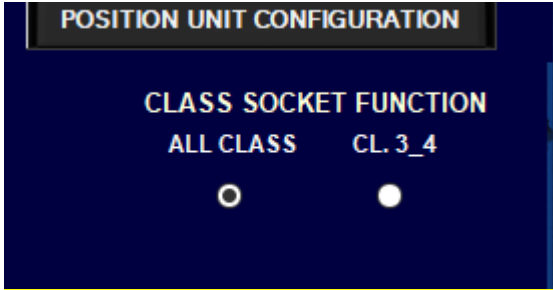
3.2.1. Replacement of Auto-Shift Mechanism

This procedure describes how to replace the auto-shift mechanism without gear shift to the updated version including shift of gear. Reference is made to Torque Tool with article BC0497 (kit BC0454) which will operate in C14 mode in all classes. By performing the below sequence, the tool will shift gear according to actual class. Article number for the replacement kit is BC0449.

Step & Description	Step & Description
1) Remove 6 off M8x40 bolts form the Torque Tool's nose section. Remove the nose. 	2) Pull out the interface section. 
3) Remove the M4x8 bolt from the C11&2 socket. 	4) Pull out C11&2 socket. 

Step & Description	Step & Description
5) Install shaft for position, art. BB5785. 	6) Install the lock ring, art. 105815. 
7) Verify that the thrust bearing, art. BB5781, is installed onto the Cl1&2 socket. 	8) Install the ring for position Cl3&4, art. BB9447, onto the Cl1&2 socket. Insert the Cl1&2 socket, art. BB5779. Make sure to align Cl1&2 socket with splines <u>and</u> position shaft. 

Step & Description	Step & Description
9) Make sure to align socket with slot in position shaft.  Align slot and pin (spring removed for clarity) Secure socket with M4x8 bolt. Apply Loctite 243 and torque to 4,5Nm.	10) Reinstall the interface section. 
11) Reinstall the nose section using 6 of M8x40 and Ø8 washers. Apply Loctite 243 and torque to 19Nm. 	12) Check for free movement and full stroke for the two inner sockets

Step & Description	Step & Description
13) In GUI click SOCKET CONFIG:  When asked for password, write BLtt.2025	
14) Select ALL CLASS to activate full auto class select functionality. 	
15) Restart GUI to implement the new settings. Operate tool and verify that the system shifts to correct class, check for all classes if feasible.	

3.3. LOCKING SYSTEM

The ELTT locking system is manually operated by use of the ROV manipulator arm. The locking system has three positions, Latch Open, Auto Latch and Latch Locked. The lock is operated by use of a push-pull mechanism connected to the ROV handle. With the spring activated handle pushed in, the main handle can be moved up and down to shift between latch-modes.

It is highly recommended that all operators get familiar with the handle operation on deck prior to operation.

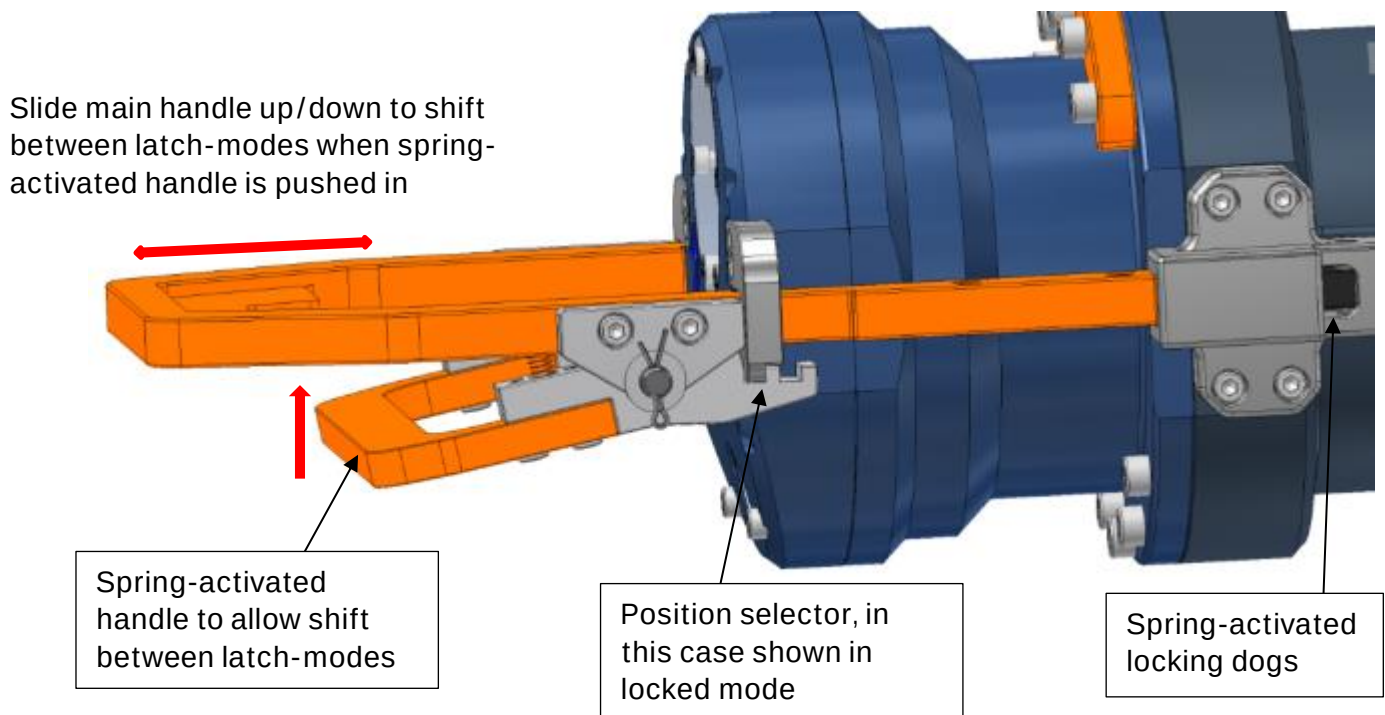
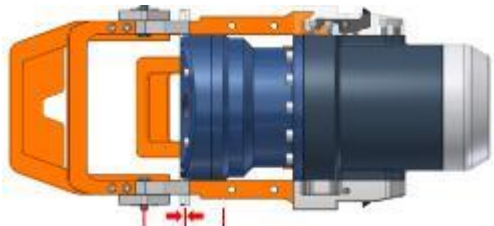
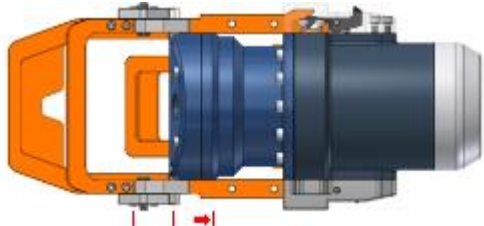
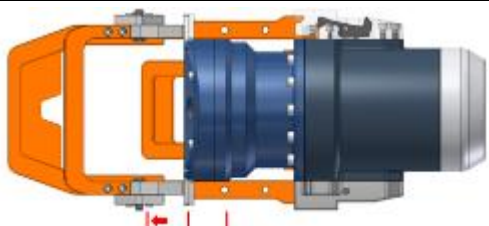


Figure 4: Locking system

Auto Latch:		
01	Mid position. The latches are spring loaded.	
	When ELTT is being guided into the valve interface, the latches will auto lock the tool in the correct position. If auto-lock not required, the ELTT may also be installed with the handle in Latch Open mode, see below.	
Latch Locked:		
02	Handle is positioned all the way down.	
	In order to lock the ELTT to the valve interface, the lock will complete full engagement of the system. Note: It is not possible to install the tool with the latch in locked position.	
Latch Open:		
03	Handle in fully outward position.	
	This position can also be used when inserting the tool into the interface bucket. Different from latch-mode, the tool will not be auto-locked in this mode.	

3.3.1.1. Hydraulic Operated Latch

To ease operation of the latch-mechanism, a hydraulically operated add-on device can be installed. The hydraulic latch-mechanism is designed to be fitted onto the main handle and uses a single-acting hydraulic cylinder with spring-return to ensure fail-safe release if hydraulic pressure is lost.

Hydraulic interface is represented by 2 off 1/8" BSP ports, and minimum operating pressure is 140 Bar. It is recommended to connect the hydraulic cylinder's second port of the ROV's compensation system.

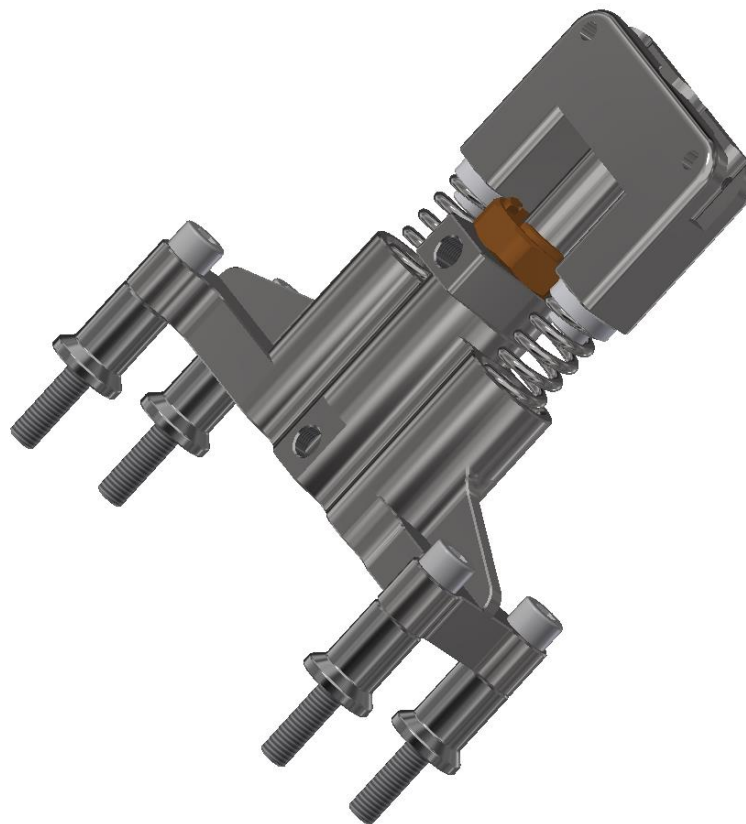
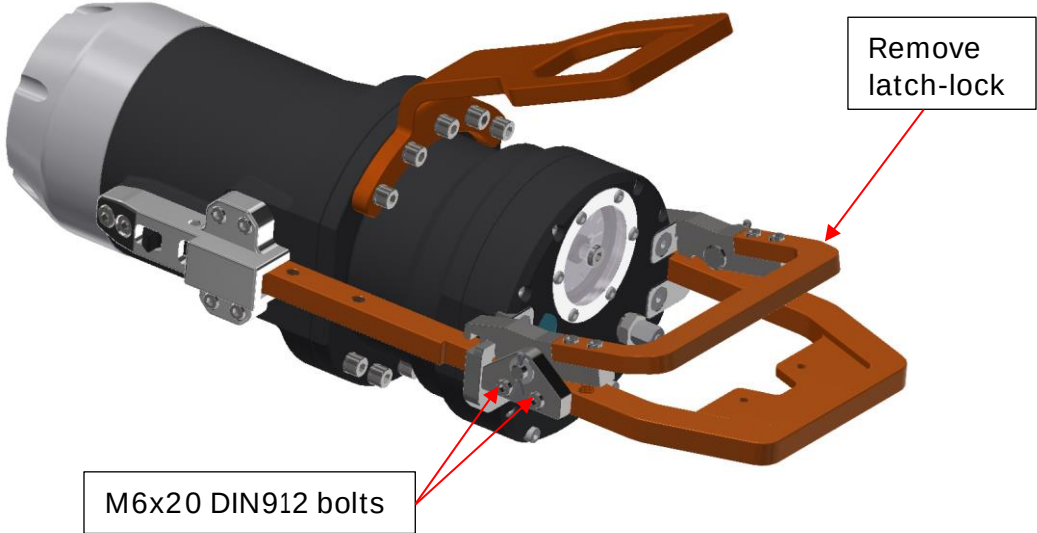
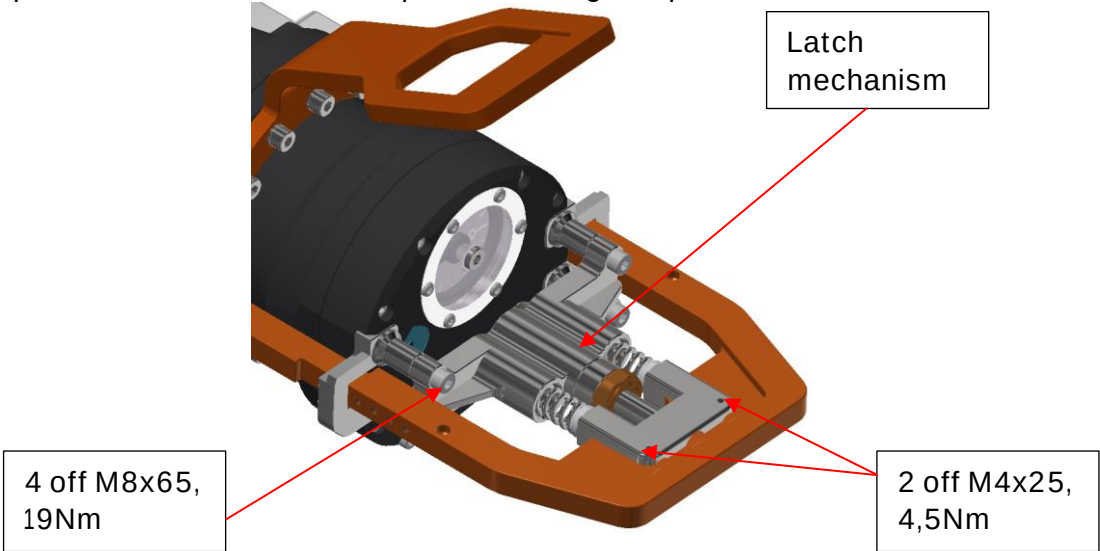


Figure 5, Hydraulic latch mechanism

Installation of Latch Mechanism:

No.	Description
1.	Remove latch-lock handle, unscrew 4 off M6 bolts to remove. 
2.	Install the latch mechanism onto the TT handle as shown below. The latch mechanism can be installed in two positions, i.e. 0° and 180° compared to the below figure. Select best possible orientation with respect to routing and protection of hoses.  Note: For earlier versions of the TT, the M4 holes may be missing. Drill and tap M4 holes using the hydraulic latch mechanism as drill-template.
3.	Connect the hydraulic hose to the 1/8" BSP port. An open-centre valve is required for this feature. The second port at the cylinder can be open to sea, but it is recommended to connect it to the ROV's compensation system.
4.	Test activation and fail-safe-release several times to ensure correct functionality.

3.3.2. Position Feedback

ELTT is featured with two types of socket position feedback systems, one mechanically – directly coupled to the output shaft presenting the information through the gauge close to the ROV handle, and one electrically – providing feedback through the GUI. The position feedback presented in the GUI has a reset function making it possible to reset rounds and angle at any time.

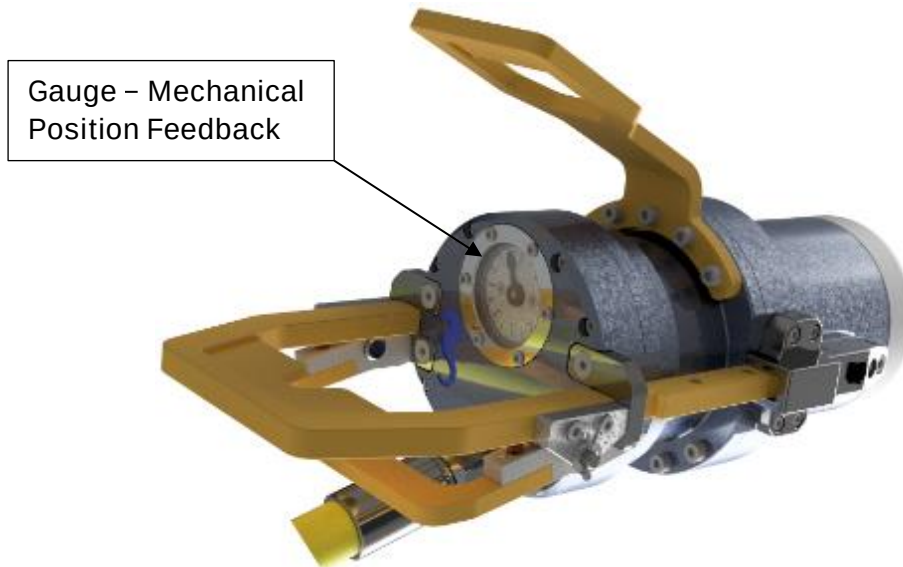


Figure 6: TT rear end with position feedback instrument

Note:

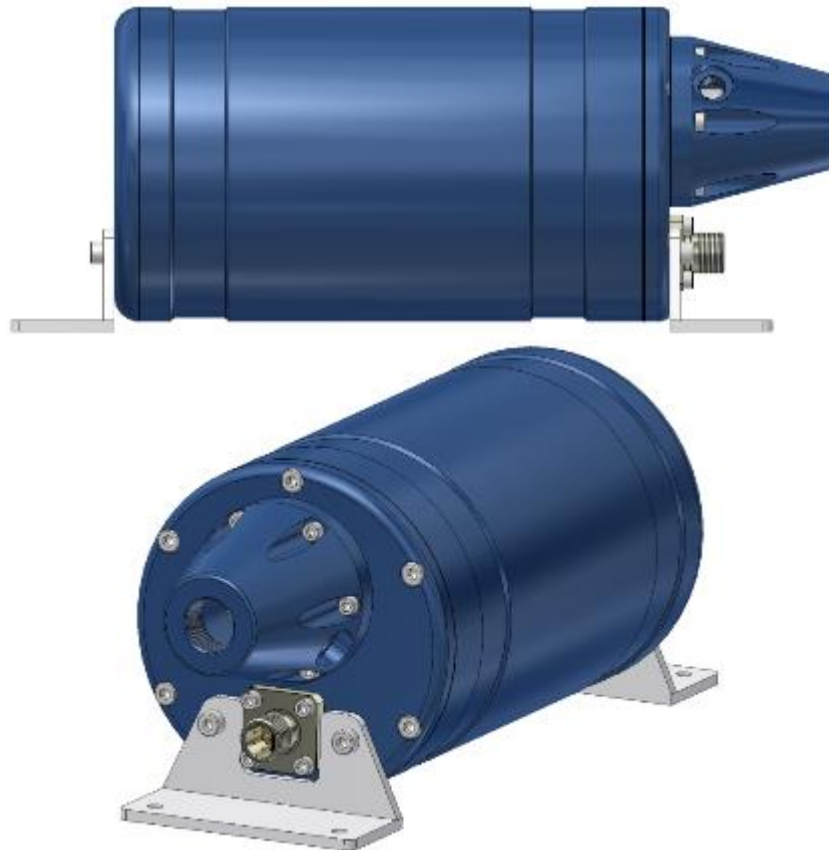
When shifting between CW and CCW operation, there will be a deviation with respect to accurate position of the output socket and reading in GUI. This is caused by internal, mechanical tolerances in the gearbox. The slack will typically represent 5 - 10° before the output socket starts rotating in opposite direction. Stop and restart in same direction will not cause any slack.

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3.3.3. Electrical Power Canister, EPC

The EPC is a separately installed power and control unit. The EI Power Can (EPC) is an atmospheric can converting supplied power 110 - 250 VAC to 145 - 350 VDC.

The EPC will normally be installed onto the ROV frame at a suitable location and is equipped with connectors for input power/ signal and tool output power and signal.

**HIGH VOLTAGE:**

The EI Power Can operates on high voltage and has the potential to result in death or severe injury if handled incorrect. Qualified personnel should only use the equipment. The equipment contains no serviceable parts inside.

The cable/umbilical between the EPC and TT is equipped with a safety wire to protect against damaging snap-force in case of dropped TT, ROV drift-off etc. The safety wire shall be shorter than the cable/umbilical and connected to TT and ROV.

A 0,5L pressure compensator is included in the kit, and shall be connected to the EPC's termination adapter to ensure pressure compensation of both umbilical and TT. The pressure compensator comes with a 1,5m hose to allow flexibility wrt. installation on the ROV.

3.3.3.1. Technical Data EI Power Can

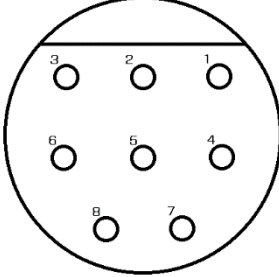
Table 1: Mechanical Data

Description	Specifications
Dimensions	Ø185 x 325 mm
Mechanical interface	4 off Ø8,5 holes @415 x 110 mm
Depth rating	3000 m
Weight in air	17,9 kg
Weight in water	12,6 kg

For power and communication interface, reference is made to section 3.4.1.1.

3.3.3.2. Interface Description

Table 2: Electrical Interface

Interface	Interface Type
Burton connector 5507	2008 8 pin connector
	
Pin #	5506-2008-0004
1	110-250 VAC / 145-350 VDC
2	110-250VAC / 0VDC
3	Chassis
4	N.C.
5	RX RS232
6	TX RS232
7	N.C.
8	Com/GND

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3.4. 2,7KNM TORQUE TOOL KITS

The Electric Torque Tool System is typically supplied in kits containing relevant equipment for use. Although client specific setup and/or kits can be agreed and delivered, there are 3 available standard kits.

3.4.1. 2,7kNm Torque Tool Kit, BB3306



Figure 7: BB3306 Torque Tool Kit

The BB3306 kit consists of:

Item	QTY	Art No.:	Description
1.	1	BB3254	2700Nm Class 4 EI Tool V2
2.	1	BB2985	ETT Control PC wGUI Software and Pelicase
3.	1	BB1086	Alu Box 240L incl. Foams
4.	1	BA7297	Class 4 Interface Socket Low Torque
5.	1	BA6615	Class 3 Interface Socket
6.	1	BA2951	Class 1 & 2 Interface Socket
7.	1	600144-TD-0026	Operation and Maintenance Manual Electric Torque Tool Class 1 - 4
8.	1	102860	Burton Dummy
9.	1	102354	Burton Test Cable
10.	1	100499	Burton Pigtail*

Item	QTY	Art No.:	Description
11.	1	BC0309	Compensator 0,5L Kit for 2,7kNm Torque Tool

*NOTE: For rental tools, Item 10 Burton Pigtail, is regarded as consumables and will be invoiced if used in operation.

3.4.1.1. Technical Data - 2,7kNm Torque Tool Kit, BB3306

Depth rating	3000 m
Supply voltage	110-250 VAC 50/60Hz or 145-350 VDC
Standards	API17D/ISO 13628-8
Output sockets	API17D/ISO 13628-8 Class 1 - 4
Weight in air, incl. el. pod.	55,1 kg
Weight in seawater	38,7 kg
Torque range, CI1-2	67,5 – 300Nm
Torque range, CI3-4	300– 2711Nm
Low torque max speed	30 RPM
High Torque max speed	6 RPM
High torque accuracy*	+/-10% @ torque above 300Nm, @1RPM
Low torque accuracy*	+/-5% @ torque below 300Nm, @1RPM
Positioning precision	+/- 1 °
Max. power consumption**	2000 W
Min. current required	6A
Max current draw	230V: 8,7A 110V: 18,2A
Communication	RS232 or RS485, Modbus RTU Protocol Baud rate 38 400
Electrical interface	8 pin Burton 5506-2008 connector
Gear oil	Q8 T 65 75W-90
Gear oil, total volume	Approx. 2L

* Note that accuracy with respect to torque output will be influenced by rotational velocity, RPM. If high torque precision at hard end-stop is required, RPM shall be set to 1RPM. Higher RPM settings will cause some hammering effect, thus higher peak-torque at end-stop. The hammering effect at end stop will increase with higher RPM's.

Accuracy= +/-5% for CI1&2 when correct sockets are installed. Special CI4 socket for low torque operations available. This socket will have +/-5% accuracy like socket for class 1 & 2. See section 7.2 for installation instructions. These sockets must be installed manually on deck.

**Maximum allowed power consumption can be limited in GUI to suit available power from ROV, ref. section 3.4.1.1.

OPERATION AND MAINTENANCE MANUAL

3.4.2. 2,7kNm Torque Tool Kit, BC0454

This Torque Tool has auto-socket as described in section 3.2. but limited to stage 3 output for all classes.



Figure 8: BC0454 Torque Tool Kit with auto class, stage 3 output

The BC0454 kit consists of:

Item	QTY	Art No.:	Description
1.	1	BC1765	Compensator 0,25L Kit for 2,7kNm Torque Tool
2.	1	BC0497	2,7kNm El Torque Tool wAutomatic Class Switch Stage 3 Output
3.	1	BB2985	ETT Control PC wGUI Software and Pelicase
4.	1	BB1086	Alu Box 415L incl. Foams
5.	1	600144-TD-0026	Operation and Maintenance Manual Electric Torque Tool Class 1 - 4
6.	1	102860	Burton Dummy
7.	1	102354	Burton Test Cable
8.	1	100499	Burton Pigtail

*NOTE: For rental tools, Item 10 Burton Pigtail, is regarded as consumables and will be invoiced if used in operation.

3.4.2.1. Technical Data - 2,7kNm Torque Tool Kit, BC0454

Depth rating	3000 m
Supply voltage	110-250 VAC 50/60Hz or 145-350 VDC
Standards	API17D/ISO 13628-8
Output sockets	API17D/ISO 13628-8 Class 1 - 4
Weight in air, incl. el. pod.	53,6 kg
Weight in seawater	37,0 kg
Torque range, CI1-2	100 – 300Nm
Torque range, CI3-4	300– 2711Nm
Low torque max speed	6 RPM
High Torque max speed	6 RPM
High torque accuracy*	+/-10% @ torque above 300Nm, @1RPM
Low torque accuracy*	+/-20% @ torque below 300Nm, @1RPM
Positioning precision	+/- 1 °
Max. power consumption**	2000 W
Min. current required	6A
Max. current draw	230V: 8,7A 110V: 18,2A
Communication	RS232 or RS485, Modbus RTU Protocol Baud rate 38 400
Electrical interface	8 pin Burton 5506-2008 connector
Gear oil	Q8 T 65 75W-90
Gear oil, total volume	Approx. 2L

*Note that accuracy with respect to torque output will be influenced by rotational velocity, RPM. If high torque precision at hard end-stop is required, RPM shall be set to 1RPM or less. Higher RPM settings will cause some hammering effect, thus higher peak-torque at end-stop. The hammering effect at end stop will increase with higher RPM's. 0,5RPM is recommended for low-torque operations.

Special CI4 socket for low torque operations available. This socket will limit torque and shift to +/-5% accuracy in low torque area (67,5-300Nm). See section 7.2.1 for installation instructions. This socket must be installed manually on deck.

**Maximum allowed power consumption can be limited in GUI to suit available power from ROV, ref. section 3.4.1.1.

OPERATION AND MAINTENANCE MANUAL

3.4.3. 2,7kNm Torque Tool Kit, BC0145

This Torque Tool has auto-socket as described in section 3.2. and automatic shift between stage 2 and 3.



Figure 9: BC0145 Torque Tool Kit with auto class, stage 2-3 output

The BC0145 kit consists of:

Item	QTY	Art No.:	Description
1.	1	BC1765	Compensator 0,25L Kit for 2,7kNm Torque Tool
2.	1	BC1749	2,7kNm EI Torque Tool wAutomatic Class Switch Stage 2-3 Output
3.	1	BB2985	ETT Control PC wGUI Software and Pelicase
4.	1	BB1086	Alu Box 415L incl. Foams
5.	1	600144-TD-0026	Operation and Maintenance Manual Electric Torque Tool Class 1 - 4
6.	1	102860	Burton Dummy

Item	QTY	Art No.:	Description
7.	1	102354	Burton Test Cable
8.	1	100499	Burton Pigtail

*NOTE: For rental tools, Item 10 Burton Pigtail, is regarded as consumables and will be invoiced if used in operation.

3.4.3.1. Technical Data - 2,7kNm Torque Tool Kit, BC0145

Depth rating	3000 m
Supply voltage	110-250 VAC 50/60Hz or 145-350 VDC
Standards	API17D/ISO 13628-8
Output sockets	API17D/ISO 13628-8 Class 1 - 4
Weight in air, incl. el. pod.	53,7 kg
Weight in seawater	37,1 kg
Torque range, CI1-2	67,5 – 300Nm
Torque range, CI3-4	300 – 2711Nm
Low torque max speed	30 RPM
High Torque max speed	6 RPM
High torque accuracy*	+/-10% @ torque above 300Nm, @1RPM
Low torque accuracy*	+/-5% @ torque below 300Nm, @1RPM
Positioning precision	+/- 1°
Max. power consumption**	2000 W
Min. current required	6A
Max current draw	230V: 8,7A 110V: 18,2A
Communication	RS232 or RS485, Modbus RTU Protocol Baud rate 38 400
Electrical interface	8 pin Burton 5506-2008 connector
Gear oil	Q8 T 65 75W-90
Gear oil, total volume	Approx. 2L

* Note that accuracy with respect to torque output will be influenced by rotational velocity, RPM. If high torque precision at hard end-stop is required, RPM shall be set to 1RPM. Higher RPM settings will cause some hammering effect, thus higher peak-torque at end-stop. The hammering effect at end stop will increase with higher RPM's.

Special CI4 socket for low torque operations available. This socket will limit torque and shift to +/-5% accuracy. See section 7.2.3 for installation instructions. This socket must be installed manually on deck.

**Maximum allowed power consumption can be limited in GUI to suit available power from ROV, ref. section 3.4.1.1.



4. TOPSIDE CONTROL SOFTWARE

The control software is installed on a laptop operated from topside. The software controls the TT output, either in Nm, revolutions per minute or turn count. The software is also able to log/load operational data.

Note 1:

Each tool is delivered with dedicated PC with correct set-up for actual tool. Make sure to use PC labelled with the same serial number as the torque tool.

Note 2:

Log in with a certified Microsoft account with MS Office to make Excel available for logging etc. The original MS account will be deactivated after some time.

Note 3:

A memory stick with TT software is supplied in the Torque Tool kit if the original PC is lost or damaged. For installation onto the new PC, please follow instructions in section 4.3.

4.1. GUI

The GUI has two windows; Main Window and Setup Window. The ELTT is operated from the Main Window which displays tool feedback. It contains all operational data such as torque, speed, socket angle, torque graph, set limits and more.

In the Setup Window Operator accessible parameters are available without password. However, these parameters are normally not needed to adjust. Absolute max. torque is for information only and needs password to change. This should only be done with supplier support. "Socket Config" settings are needed when sockets are changed. (Except standard sockets). These settings require a password described in this document. All other settings are password protected and should only be edited with supplier support.

Operation Modes	Description
Manual	Normal start/ stop in selected direction, torque limit but no turn or angle limit
Multi turn	Running the tool a specified number of turns and/or angle

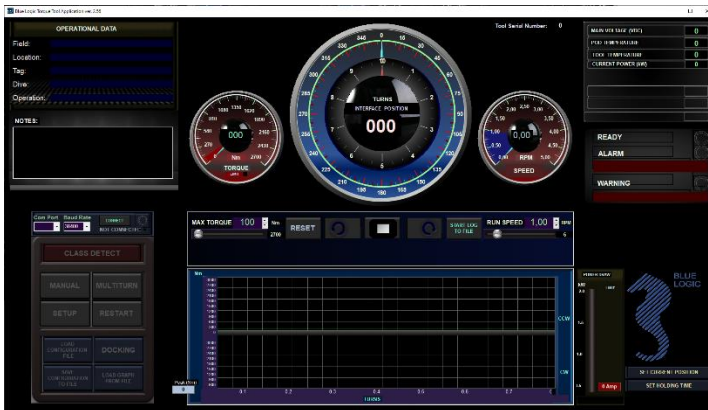


Figure 10: Main window

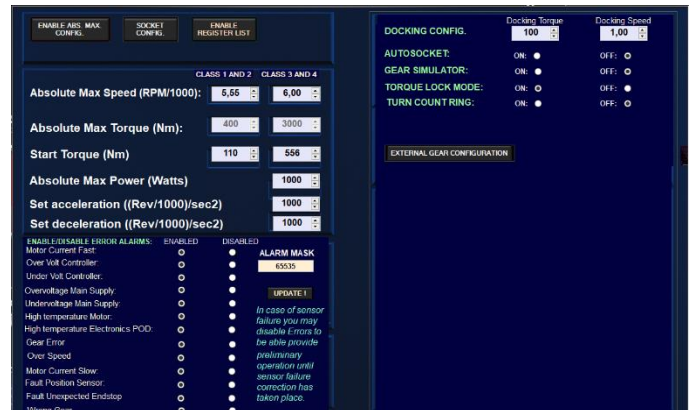
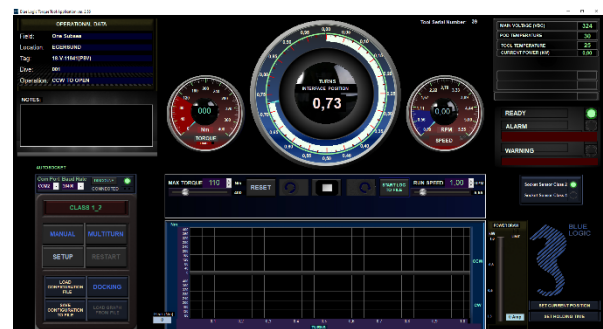


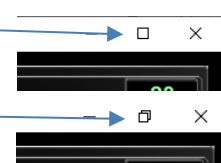
Figure 11: Setup Window

4.2. SCALING GUI

GUI size is scalable. Click corner or side of GUI window and drag window to desired size. During drag window content will not be updated until mouse button is released. When the mouse button is released the window's X-size will adjust according to Y-Size to keep circular instruments round.



Pressing the window maximize button will make GUI filling the screen



When maximized and you press
GUI will return to initial size.

4.2.1. Main Window

Main window is split into eight sections named boards. The different boards contain all tool controls and information on tool feedback.

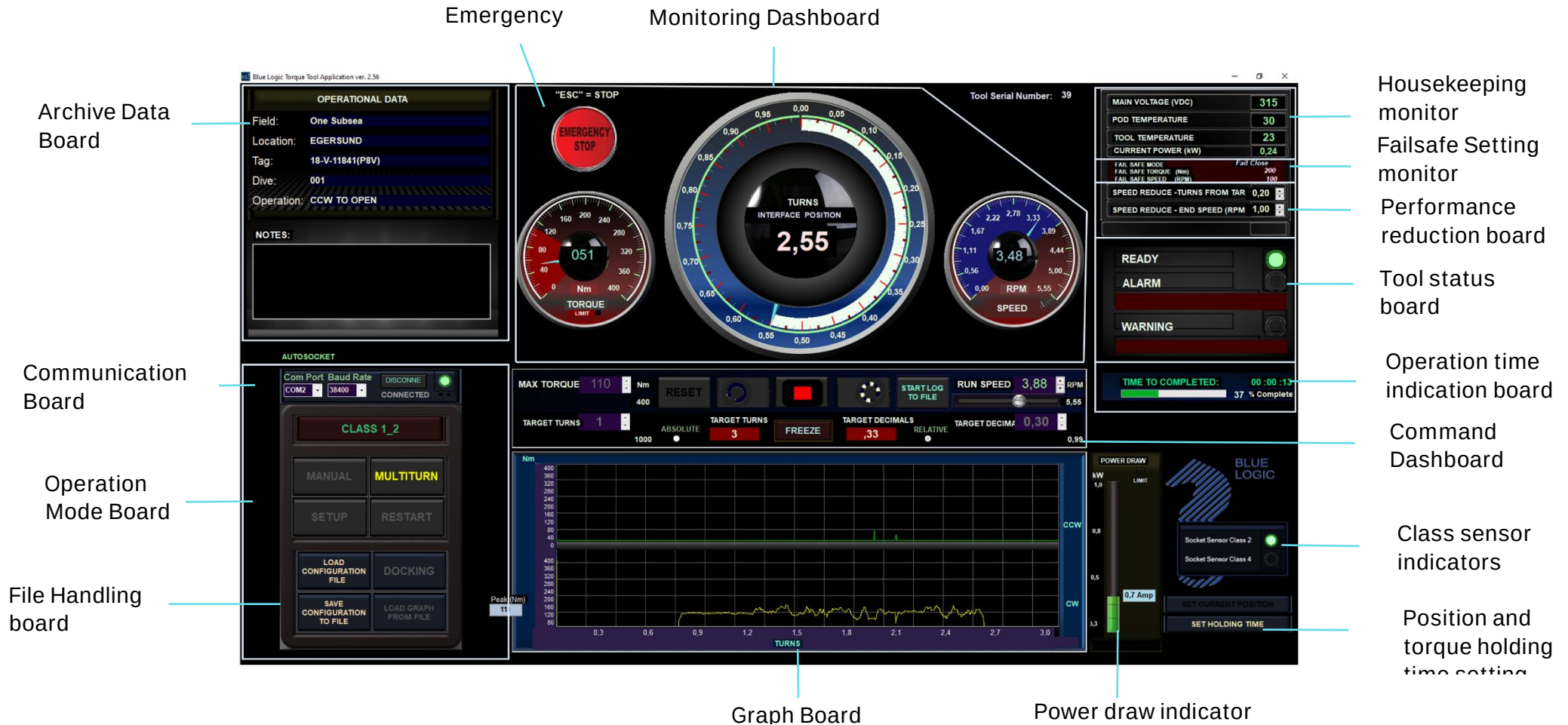
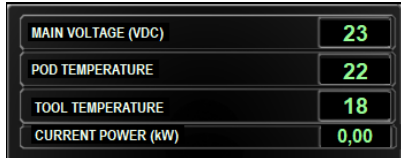
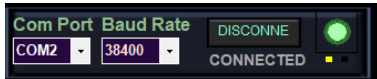
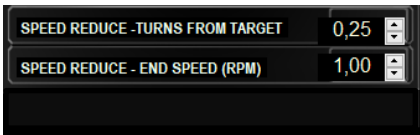
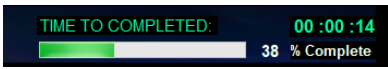
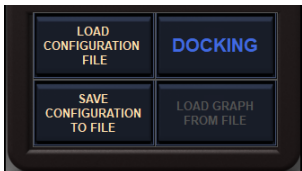


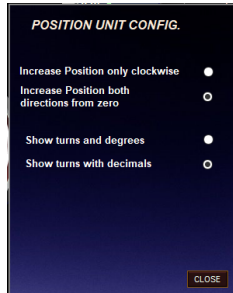
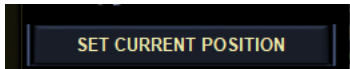
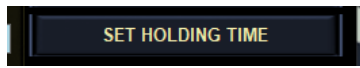
Figure 12: Main Window Overview

4.2.2. Main Window Information Boards

Board	Model	Description
Operation Mode Board		The Operation Mode Board let the user select the different operational modes. In addition, the Setup Window can be entered here. Manual mode: Starts running when command button is clicked and stops when stop button is clicked. Multiturn mode: Rotates the tool towards a preset position. It will move and stops when target position is reached. If self-protect function has shut down the tool, restarting the tool is done via this board. Mode change is only available when operation is stopped.
Housekeeping monitor		Critical tool information is presented in this board. The Message window shows more detailed messages related to instrument lamps and status. Messages are: - Description of alarms/warnings. - Status indication (e.g. Initializing or Operating).
Communication Board		Presents communication information. Selection of valid com port and baud rate. <i>NB! Baud rate must be compatible with the TT controller's baud rate. If wrong the connection lamp will still be green since the lamp only shows connection to the USB/RS converter. (Typical Moxa converter).</i> Default baud rate is 38400. Round lamp indicates com port status. (Green – live, red-Port failed, Yellow-connecting, dark-Port disconnected). Small square lamps indicated traffic between GUI – tool.

Failsafe Setting monitor		Board that occurs if fails safe mode differs from fail as is. This board gives information about fail safe operation direction, fail safe torque limit and speed. (Fail safe speed and Torque limit may differ from normal operations torque limit and speed.)
Performance reduction board		Operator can write the position (Degrees) from target (Multiturn mode only) where speed will be changed to avoid high speed impact if end stop will be reached.
Tool status board		Board showing if no alarms are detected, and TT is ready for operation. If alarm occurs, alarm lamp will light red and detailed alarm message will show below. If more than one alarm occurs the different messages will toggle. Warning lamp is lit yellow with toggling messages below. Errors may be reset using "RESTART" button.
Operation time indication board		Board showing completion of operation shown in % and time count down. (Hours, minutes, seconds). Board shown in Multiturn mode only.
Monitoring Dashboard		This board contains instruments showing real time position, torque and speed. Tool serial number is uploaded from TT when connection is established and shown here. NB! If tool serial number value remains 0, indicates no real communication with TT is established. Reason may be no power at TT or wrong baud rate selected. Settings opens menu for quick operator settings.

Class detection		This field will default show the auto detected Iso Class output pipe (governed by if the pipe is connected to stage 2 or 3 in the gear) If External gear mode is selected Class higher than 4 will be shown. In these cases, the text will occur in white color. In special cases where special designed output pipes are used, the field can be manually edited, see section 7.3.2 NOTE: Make sure that the output socket corresponds with torque rating for the job, ref section 3.1.
Command Dashboard		Buttons and indicators for setting torque limit, speed, positions and direction. Which button/Indicators that are shown depends on selected mode. (Multiturn mode is shown).
Archiving Data Board		Board for operator to tag the following operation with necessary data for file handling and reports. Notes: Text written here will be added as notes to reports. Text may also be loaded to GUI at a later stage.
File Handling board		Board for Saving current setup configurations and loading previous Configurations. Activate docking mode can also be selected here.
Power draw indicator board		This board shows current power drawn from torque tools power source. Range of power bar is limited to maximum power. (Maximum power is selected in "Setup" window. If maximum power is reached a limit lamp will illuminate and speed will reduce.

External gear configuration		Board for defining and selecting additional classes when TT is connected to an external gearbox. If external gearbox is selected, GUI's instruments, settings and graphs will represent the external gears output shaft.
Position unit configuration		By pressing the unit button, a selection window gives the possibility to change monitored position units. <i>NB!! These functions are not available from version 2.56.</i>
Class sensor indicators		Only tools equipped with auto socket. Shows which class is connected when docking is completed.
Set current position		This button is only available when no mode is set. If the operator want to set another position than 0, current position can be written here.
Set holding time		Time max torque will be present if reached end stop.

4.2.3. Setup Window

Setup window is divided into four sections holding the different set limits, limiting the operational freedom found in the Main Window. The set limits can have a huge impact on ELTT performance; a password has been applied in order to change values.

Both the Performance Config and Failsafe Configurations are password protected, with two different passwords.

Passwords can be made available on request to Blue Logic.

Setup window also shows actuator data that are loaded from the actuator during connection.

An additional "Advanced settings" window may be opened containing Alarm/warning settings and limits.

OPERATION AND MAINTENANCE MANUAL

BLUE LOGIC



Password control
for setup editing

Performance config

Recommended
values for
acceleration and
deceleration

Alarm handling

ENABLE AND DISABLE ALARMS

SOCKET CONFIG

ENABLE REGISTER LIST

CLASS 1 AND 2

CLASS 3 AND 4

Absolute Max Speed (RPM/1000):

5,55

6,00

Absolute Max Torque (Nm):

400

3000

Start Torque (Nm)

110

556

Absolute Max Power (Watts)

1000

Set acceleration ((Rev/1000)/sec2)

1000

Set deceleration ((Rev/1000)/sec2)

1000

ENABLE/DISABLE ERROR ALARMS:

ENABLED

DISABLED

ALARM MASK

65535

UPDATE !

In case of sensor failure you may disable Errors to be able provide preliminary operation until sensor failure correction has taken place.

Motor Current Fast:

0

1

Over Volt Controller:

0

1

Under Volt Controller:

0

1

Overvoltage Main Supply:

0

1

Undervoltage Main Supply:

0

1

High temperature Motor:

0

1

High temperature Electronics POD:

0

1

Gear Error

0

1

Over Speed

0

1

Motor Current Slow:

0

1

Fault Position Sensor:

0

1

Fault Unexpected Endstop

0

1

Wrong Gear

0

1

DOCKING CONFIG.

Docking Torque

100

Docking Speed

1,00

AUTOSOCKET:

ON:

OFF:

GEAR SIMULATOR:

ON:

OFF:

TORQUE LOCK MODE:

ON:

OFF:

TURN COUNT RING:

ON:

OFF:

FAILSAFE CONFIG.

FAIL CW = FAIL OPEN

FAIL CW = FAIL CLOSE

EXTERNAL GEAR CONFIGURATION

ALARM THRESHOLD LEVELS:

POD humidity threshold:

50

Motor temperature threshold:

80

POD temperature threshold:

80

MAIN Under Voltage threshold:

100

CLASS SOCKET FUNCTION

ALL CLASS

CL_3_4

MODBUS REGISTER LIST

PROTOCOL DASHBOARD

TORQUE STEP DOWN SETTINGS:

Minimum Torque Down (Nm) Forced Stop

0

Step Frequency (ms) Forced Stop

100

Step No. Of. Intervals. Forced Stop

12

Torque holding time (ms) End Stop

5000

Minimum Torque Down (Nm) End Stop

0

Step Frequency (ms) End Stop

100

Step No. Of. Intervals. End Stop

12

External Gear step Dwn factor

6

Motor Serialnumber:

178

Number of Polepairs:

8

Tool MotorType:

2

Docking configuration.

Autosocket selection

Gear simulator setting

Failsafe
configurations. (Decide

Setting if external
gear is used.

Set socket to be

Dashboard for
calibration and tuning.

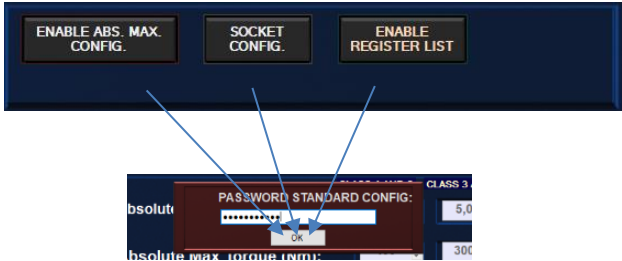
Modbus protocol

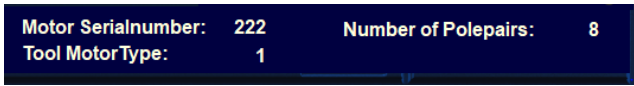
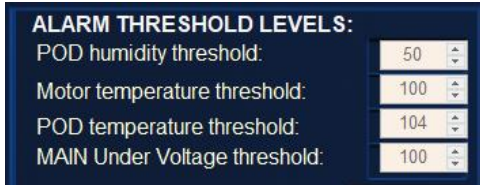
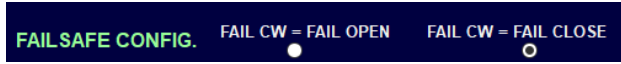
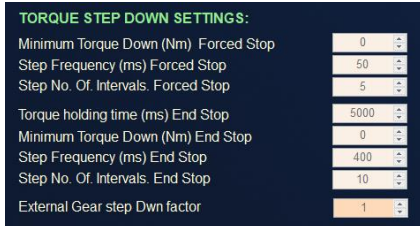
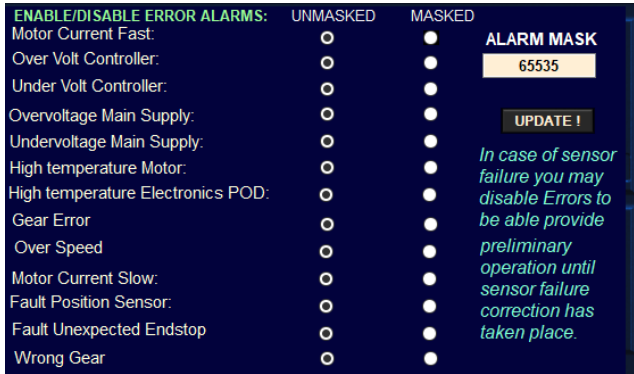
Setting Torque step
down settings.

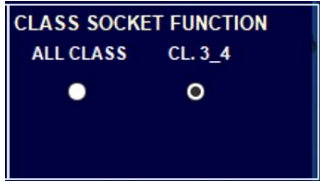
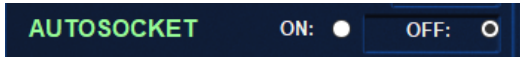
Tool motor data
(Read only)

Some alarm
thresholds.
Additional level may
be adjusted using

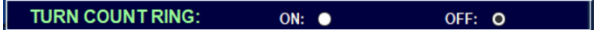
4.2.4. Setup Window Sections

Section	Mode	Description
Performance Config.		This board holds all absolute max limits towards socket output values (Torque speed). These parameters are password protected. <i>Contact supplier for change.</i> Start Torque is torque limit to be set a startup or class change. Max Power draw can be set. Acceleration/deceleration settings can also be accessed here. Large number = fast speed change. Low number = slow speed change (Ref. section 3.4.1.3)
Password control for setup editing		Writing the correct password here will enable all parameters in setup for editing and enables entering of additional forms. Standard config: <i>Enable all parameters in the Setup window.</i> Enable register list and dashboard: <i>Enable access to Modbus register and protocol dashboard.</i> Read only parameters will not be accessible.

Section	Mode	Description
Tool motor data (Read only)		Information about motor loaded from tool.
Some alarm thresholds. Additional levels may be adjusted using the protocol dashboard.		Pod Humidity and main undervoltage threshold must be adjusted here. The rest is read only but can be adjusted in "Protocol Dashboard".
Failsafe configurations		Decide if Clockwise rotation will open or close valve. Selection will show correct mode in main window.
Modbus protocol tools.		Opens the Modbus development tool or a dashboard for handling all protocol registers. (Meant for programmers and for factory tool setup and calibration).
Torque Step down settings.		Setting parameters regarding torque limit down ramping after forced stop or after mechanical end stop.
Alarm handling		Alarm handling. If the tool stops as a result of a present alarm and the alarm is obvious not valid. (Typical sensor failure). >It is possible to disable the alarm to be able to continue operations. However, care must be taken since all the alarms are present to protect the tool and performance. When tool

Section	Mode	Description
		power is recycled all alarm will be re activated.
Class detect setting		Class socket function: Password is needed to adjust this setting. Setting is based on which socket is installed. All class: Access to class detect or manual select. CL.3_4: Manual select only. Ref.Section 3.2.1, step12/13.
Docking configuration		Docking configuration Setting for torque and speed for operation in Docking mode.
Autosocket selection		Autosocket selection. Set ON when tool is equipped with Auto socket front pipe. <i>NB! If sensor failure occurs in the auto socket pipe operation may be possible by setting this mode to OFF, and then select class manually.</i>
Gear simulator setting		Gear simulator setting. If gear error occurs permanently because of socket position sensor failure it is possible to operate by setting gear simulator till ON. <i>NB! In this mode only motors position sensor is operating, so direct output socket position measuring is deactivated.</i>



Section	Mode	Description
		Torque lock ON will lock selected max torque when an operation is started. To adjust max torque, ongoing operation must be stopped, or “Freeze” must be actiavted. If set to OFF, it is possible to adjust max torque even if an operation is ongoing. Default is ON for safety reasons.
		Turns count ring ON will show an increasing circular ring for each performed turn. It will be red at the positive side of position 0, and blue at the negative side of 0. If OFF the ring will not show.

4.2.5. Operational Modes

The different operational modes are pre -fixed operation programs designed to suit ELTT operations. By being able to select between several modes containing different safety and limit features, the operation can be conducted with high safety.

Two modes are available: *Manual* and *Multi Turn*. In addition, a gearbox mode is available for operation of class 5, 6, 7 and custom defined gearbox.

Manual:

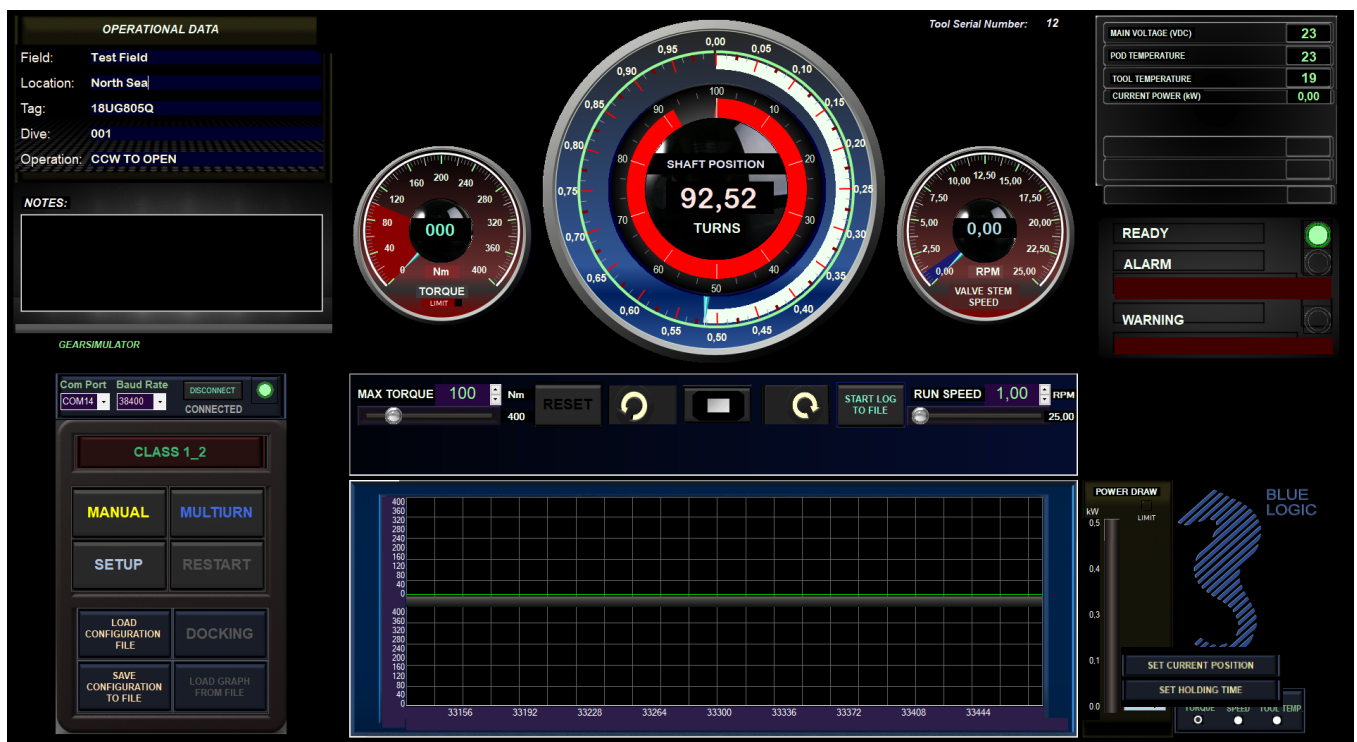
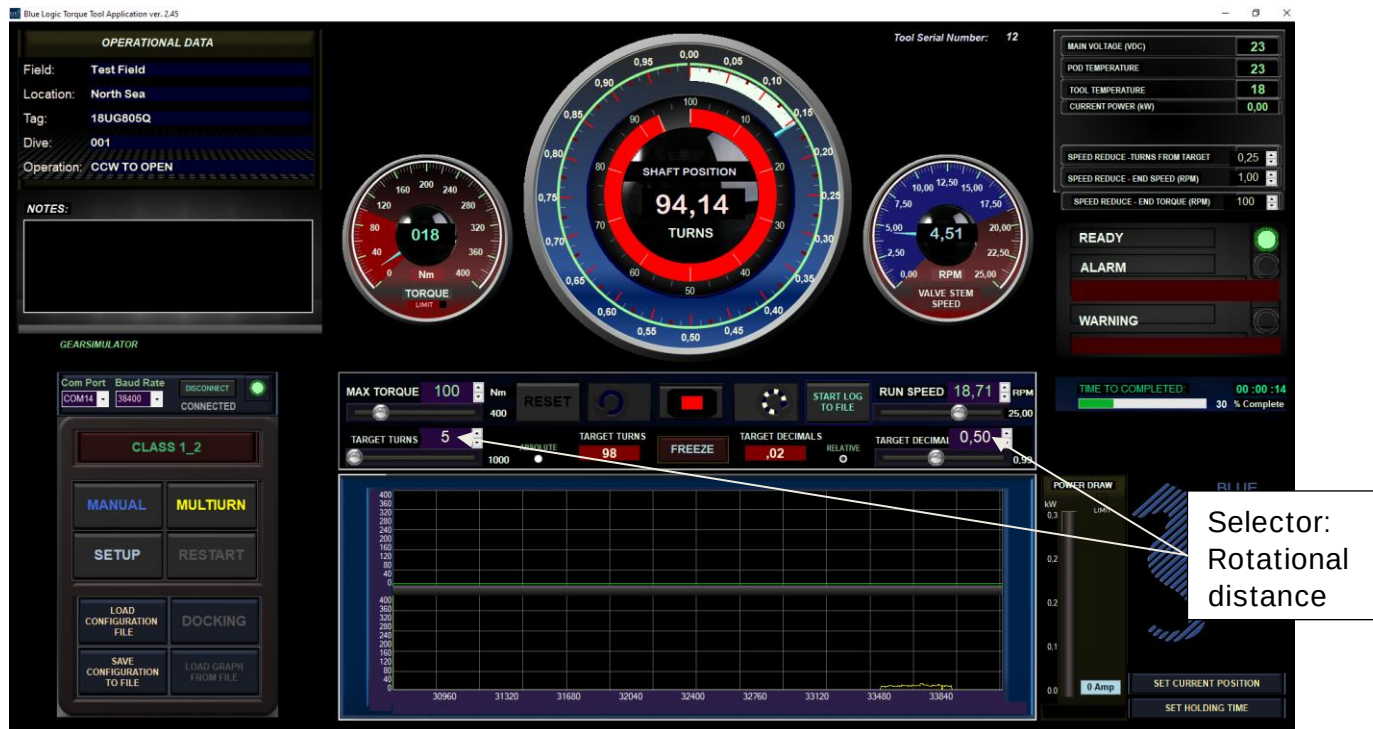


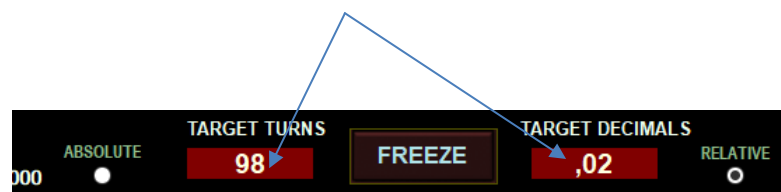
Figure 13: GUI Manual Mode

In Manual mode the ELTT will start continuously running according to selected speed. If required torque is higher than selected torque, actual speed will be lower than selected speed. Tool output will be stopped when stop button is engaged, or selected torque limit prevents running. If stop button is pressed Once Tool will stop smoothly according to “deceleration”-setting in Setup window. If the Stop button is double clicked, the Tool will stop immediately. Target position or number of rotations cannot be set in this mode.

*Multi Turn:*

In Multi Turn mode the operator can select relative number of turns and rotational degrees the ELTT shall run before it stops. When in Multi Turn Mode a section in Operation Set Limit Board will appear where to set target position before operation. If “RELATIVE” is selected set position will be relative according to present position. If “ABSOLUTE” is selected the set position is absolute according to positions 0.

In “Relative”-mode target position will be different regarding which direction will be started. If cursor is held over the Run-Clockwise-button the red boxes show what will be the target position if the Run Clockwise-button is clicked. If cursor is held over the Run-Counter-Clockwise-button a target position in the Counter-clockwise direction will show.

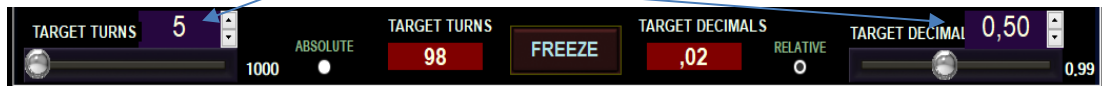


Ex.: If 2 turns and 126 degrees are set, Torque tool will rotate to the given distance in selected direction.

When target position is reached a new operation will rotate the output shaft the same distance in addition.

E.g.: if 1 turn and 180 degrees are set, and the Torque Tool has reached target position. If a new operation activates with the same settings target position will be 3 turns and 0 degrees. Alternatively, if a new operation in opposite direction is activated target position will be 0 turns and 0 degrees. (See point 3 below).

In “Absolute”-mode the red target position boxed will be hidden since the target position always will be the same as written in the blue set target position boxes.



Speed setting may be changed during operation.

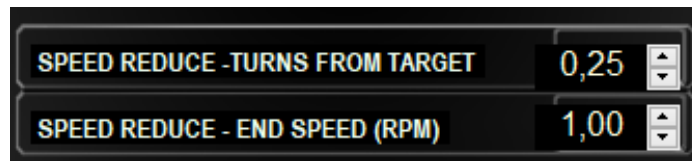
The Following functions are available in this mode:

1. Stop:
During operation, it is possible to stop the rotation by pressing the stop button. In “Relative”-mode and If target position is not reached the rest of the operation is excluded. When target is reached or stop is performed Target position setting is reset to zero. When Set position is zero the Run buttons are turned off. New set position must be selected before it is possible to press the new operation. Pressing the new operation will start a new distance according to selected rotational distance.
In “Absolute”-mode a new operation will continue to the set target. When target position are equal to set position run buttons are turned off since there will be no distance to operate.
2. Freeze:
If freeze is selected operation will stop temporary. A blinking message will indicate that temporary stop is activated, and the freeze button text will change to “unfreeze”. Selecting the unfreeze button will continue the operation until target position is reached. When freeze is selected it is possible to adjust max torque.
3. Change target position during operation.
If is not possible to change target position during operations. Execute stop before setting a different target position.
4. Speed reduction before target position is reached.
If a valve’s end position is unknown, there is sometimes a risk of reaching mechanical end stop before Target is reached. Under these circumstances it may be desired to enter the target area with low speed to avoid the risk of high-force impact. However, if the operation requires multiple turns, it is not appropriate to run the operation at low speed since the operation time will be too long. For this reason, the operator can set a given position where speed automatically will be reduced.



Ex.: The target position is 5 turns and 90 degrees. Speed setting is 5 rpm. The operator types as follows;

90 degrees(In degrees mode) or 0,25 turns (in turns mode) (in “Speed reduce – position from Target” and 1 in “Speed reduce – End Speed”. Tool will run at 5 rpm and 1000 Nm limit until 5 turns are reached and the reduce speed to 1 rpm for the last 90 degrees.



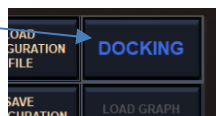
Auto Socket Mode and Docking:

In auto socket mode Torque tool must be equipped with multi-socket interface nose including all classes. (Ref. section 3.1.3 Interface Description – Auto Class Select Version).

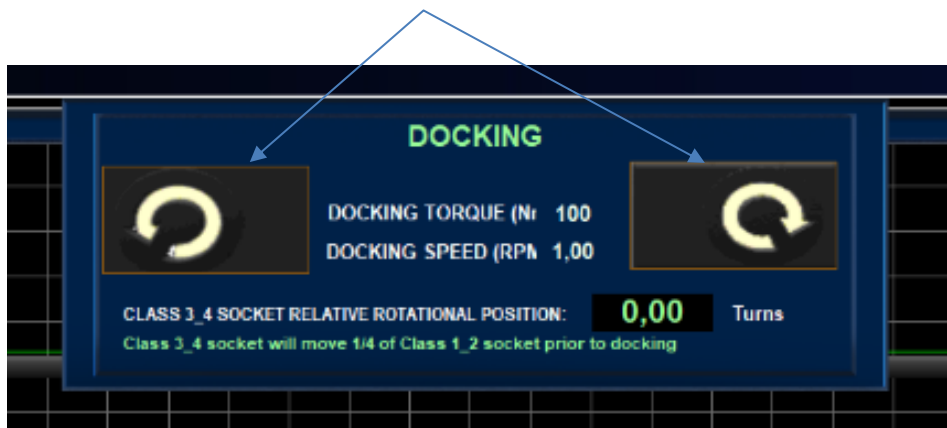
When Tool is not docked, default detected class is 1_2. Otherwise, the socket parts are not in legal position.

- Connect tool. In undocked position Class 1_2. Operator must verify the detect class

- Activate docking mode
Docking mode is available in all modes except Multiturn.



- If tool is running and sensors indicate illegal state, the tool will stop immediately. Exception is docking mode.
- When the tool is in position, perform Docking by click and holding button. Docking speed and torque can be changed in Setup. Socket will rotate as long as button is activated, max. 100Nm in docking mode.



- In Auto socket mode the tool will always be class 1_2 until docking is completed. Docking into a class 3_4 interface will occur when the tools class 3_4 sockets are in position. Before dock class1_2 socket in monitored by the position instrument and the class 3_4 socket is moving slower. When docking into class 3_4 interface, watch the relative position of class 3_4 socket here. It shall be in position within 0.25 turn relative rotation. (Instrument and class 1_2 socket will rotate up to 1 turn).
- Deactivate docking by releasing Docking button again.
- If Class 3_4 socket sensor indication will change and detected class need to be verified

NB!

If docking fails and socket remains in an illegal state or sensor fault occurs following will show:



If sensor fault occurs it may be possible to operate as follows:

- Open setup.
- Set "Autosocket" to "OFF"
- Select class manually.



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Class 5,6,7 and Custom Gearbox Mode

By activating these modes, the turns and torque output will be displayed as actual output values for the gearbox. 4 different gearboxes can be configured and stored in this window. Configuration is password protected while selection is available for the operator. Torque and turns will be presented as calculated values based on the defined gear ratio of the selected class.



Torque, speed and position settings and monitoring will be calculated, and instruments and graph will represent the output of the external mounted gear.

4.3. PREPARATION OF NEW PC

If the original PC is damaged, lost or for any other reason must be replaced, follow the below procedure to prepare a new PC for TT operation. The PC must have Windows 10 Professional and the following requirements as a minimum:

- i5
- 8GB RAM
- 512GB SSD
- 15,6" screen
- Wired USB mouse

No.	Description
1.	Computer shall not be set up as a member of any domain.
2.	Setup is done with basic/general provisioning and patching – see user info in step 8.
3.	Split disk into 2 partitions: C-drive and E-drive.
4.	Install Office 365 64bit
5.	Install Teams, Acrobat Reader and VLC Media Player.
6.	Teamviewer host from Blue Logic: https://get.teamviewer.com/bluelogic-torquetoolpc
7.	Configure Windows regional settings to: English OS
8.	Create two local users: a. TTadmin: administrator rights. b. TTpilot: ordinary user without administrator rights / no rights to install software.
9.	Set standard password on TT-admin a. Password on TTpilot should be blank / no password b. Set Windows scaling to 100% on both users (scaling might interfere with TT software) c. Start Office on both the TT-Admin and TT Pilot users, and activate English menus in the office suite, if this is not already active
10.	Disable password expiration on users by running CMD as admin and typing the following:



No.	Description
	a. WMIC USERACCOUNT WHERE Name='ttpilot' SET PasswordExpires=FALSE b. WMIC USERACCOUNT WHERE Name='ttadmin' SET PasswordExpires=FALSE c. net accounts /maxpwage:unlimited
11.	Disable Windows Updates and Windows 11 upgrade notification by either entering the values below manually, or using the registry file here: a. Go to HKEY_LOCAL_MACHINE\SOFTWARE\Policies\Microsoft\Windows. b. Create folder "WindowsUpdate" c. Create a new DWORD 32-bit value: "AUOptions" and set the value of this to 1 d. Create a new DWORD 32-bit value: "TargetReleaseVersion" and set the value of this to 1 e. Create a new STRING value and call it "ProductVersion" and set the value of this to "Windows 10" f. Create a new STRING value and call it "TargetReleaseVersionInfo" and set the value of this to "22H2"
12.	Uninstall any update software from the PC manufacturer. If you can't find it on the control panel, search for it in the start menu and possibly right-click+uninstall.
13.	Disable autostart of Teams, but have a working shortcut on the toolbar at the bottom.
14.	Set a working default printer in Windows, otherwise Excel might not open TT chart properly.
15.	Install TT software according to instructions in section 4.3.1.

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4.3.1. Software Installation Guideline

This sequence describes instructions for installation of TT software on a PC without pre-installed software. To allow correct functionality, it is crucial that serial number for actual tool corresponds with the serial number in the file name.

Prior to Software installation create a folder: "C:\TTfiles"

Copy file from software folder named "*serial number*" and ".txt" to folder C:\TTfiles

Ex. "32.txt." for serial number 32.

NOTE!

This file will be loaded to the GUI during connection to the tool. If the name of the *.txt file is different from the respective tool's serial number, then rename the file to the correct *serialnumber.txt*

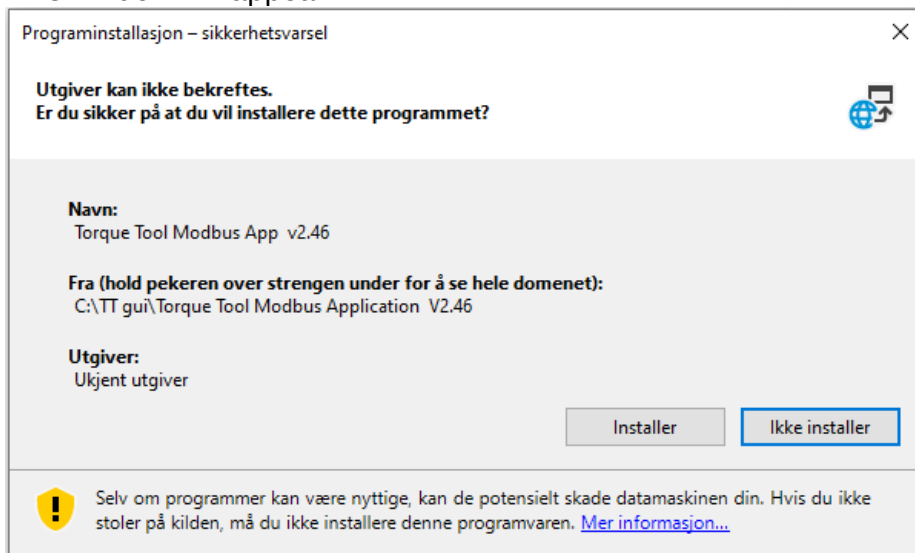
Open respective folder:

 Torque Tool Modbus Application V2.46

Double click "setup file"

	Application Files	19.08.2024 11:50	Filmappe	
	setup.exe	19.08.2024 11:50	Program	420 kB
	Torque Tool Modbus App v2.46.applicati...	19.08.2024 11:50	Application Manif...	6 kB

This window will appear:



Click "install" and the software will be installed.

GUI will automatically open after installation and are ready for use.



5. AUXILIARY EQUIPMENT

5.1. EQUIPMENT MATRIX

Action	LOGISTICS	MOBILIZATION	DE-MOBILIZATION	PRE DIVE PREP.	POST DIVE PREP.	OPERATION	MAINTENANCE
Typical Tools. Allen Keys, Wrench and sockets.		X		X	X	X	X
PPE	X	X	X	X	X	X	X
Calibration jig		X					X

6. MOBILISATION/DE-MOBILISATION

6.1. ONSHORE PREPARATIONS

Prior to shipping offshore, a mobilization/ verification should be performed. All functions should be tested and verified. The following checklist should be used as a guideline for activities to be performed prior to offshore mobilization.

No.	Description	Check/Verified
1	Inspect tool for visual damage or unusual wear and tear	
2	 Make sure that serial number on torque tool and label on PC corresponds. See section 4.3.1 for instructions if numbers are non-corresponding.	
3	Inspect EPC and/or IC for visual damage or unusual wear and tear. Special attention should be focused on its connectors.	
4	Inspect Umbilical/Cable for visual damage or unusual wear and tear	
5	Inspect that the ISO key is secure and fastened.	
6	Assemble the TT system and connect to power. Make sure that umbilical has the slack necessary to operate the ELTT	
7	Verify that the TT functions can be operated when connected.	
8	Verify that the torque is accurate by use of a calibration jig. Note: Max RPM for test in Cl.2 jig: 1,0 RPM* Max RPM for test in Cl.4 jig: 1,0 RPM *For BC0454 see section 3.4.2.	
9	Check oil level in compensator, refill as required. Total oil-volume is approx. 2L. Bleed any air through the pressure relief valve on the TT: 	



No.	Description	Check/Verified
	Let ELTT stand on the floor with the position feedback glass as the highest point. There should be minimal air bubbles visible inside the glass.	
10	Verify correct packing and documentation in the transport box. The transport box should include as a minimum Electrical Torque Tool Operation and Maintenance Manual	

6.2. MOBILISATION PROCEDURE

Item	Procedure
1	Check the condition of the transport box. Repair any damage or replace if necessary.
2	Check all items to be present according to the inventory list.
3	If any, check and follow the check-out procedure before delivering the tool for shipping.

6.3. DE-MOBILISATION PROCEDURE

Item	Procedure
1	Perform preventive maintenance according to /05/
2	Check the condition of the transport box. Repair any damage or replace if necessary
3	Check all items to be present according to the inventory list.
4	Fill in EFR if necessary. (To be stored in transport box.)
5	Storage according to chapter 9.3



7. OPERATION

7.1. TOPSIDE OPERATION

When performing operation above water do not run tool on full load for prolonged periods.

Observe the Graphical User Interface for temperature warnings.

Consider water-cooling if operation is expected to take time.

Consider ambient temperature.

7.2. OFFSHORE PREPARATIONS

7.2.1. Pre-Dive Check

Prior to dive, the Electrical Torque Tool System shall be inspected and function tested.

No	Description	Check/Verified
01	Inspect tool for visual damage or unusual wear and tear.	
02	NOTE! Make sure that serial number on torque tool and label on PC corresponds. The TT will only operate correctly when connected to correct PC.	
03	Inspect Power Can (EPC) for visual damage or unusual wear and tear	
04	Inspect Umbilical/Cable for visual damage or unusual wear and tear.	
05	Connect the safety wire to a structural section on the ROV. Make sure that the wire is shorter than the cable to avoid damage to cable if the tool is dropped, ROV drift-off etc. during operation.	
06	Inspect that the ISO key is secure and fastened.	
07	Verify that the TT is connected to power.	
08	Verify that the TT functions can be operated when connected.	
09	Verify torque using calibration jig if available. Run Torque Tool in static cell at 500, 1000, 1500, 2000, 2500 and 2700Nm. Compare numbers from GUI with set load and test both CW and CCW operation. Run no longer than 5-10 sec. to avoid heat generation.	



No	Description	Check/Verified
	Activate logging of data according to instructions in section 7.8 to document the calibration check. Note 1: Recommended RPM for operation in test jig is 1,0 RPM. Higher rotational speeds may cause peak-torque at hard end stop depending on test jig mechanical design, sampling rate etc. This recommendation is valid for operation in static test jig only as there are normally no restrictions and load on the torque tool before full stop towards test jig end stop. Due to rotational inertia in the torque tool motor and gear, the test jig might revert with a slightly higher torque reading compared to setting in GUI. For normal dynamic subsea operations, where the torque tool typically experiences a dynamic load prior to end stop (valves, clamps etc.) this phenomenon is not relevant. Note 2: If torque deviation exceeds 10%, please contact Blue Logic for instructions and/or return for inspection and service. Note 3: The Torque tool and Test Jig cables need to be laid out straight with 1m distance apart to avoid any interference during testing	
10	Verify and test locking mechanism. It is highly recommended that all ROV pilots get familiar with the locking mechanism on deck.	
11	Check oil-level in compensator, refill if required. Ref section 6.1.	

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7.2.2. Changing the ISO Key – ELTT

For tools equipped with interface for subsea change out of socket, reference is made to /6/.

No.	Description	Check/Verified
1	 Remove the six M8x35 Socked Head bolts located at ELTT nose	
2	Remove POM nose.	
3	Switch socket to the one desired. Clean socket holder thoroughly if dirty.	
4	Install POM nose and bolts. Note: Use AquaShield and thread lock on bolts before mounting	
5	Operate tool and verify that the system detects correct socket automatically. Override socket type in GUI if auto-detect fails. Caution: It is crucial that correct socket is selected in GUI prior to any operation!	

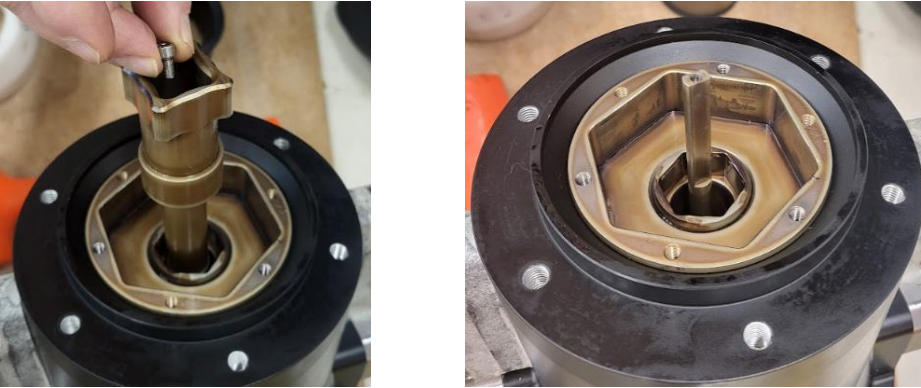
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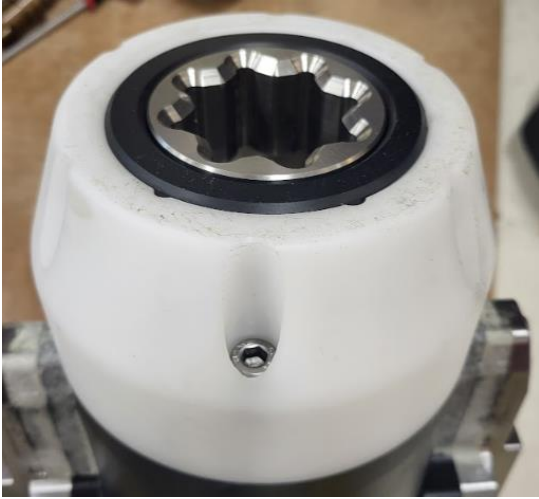
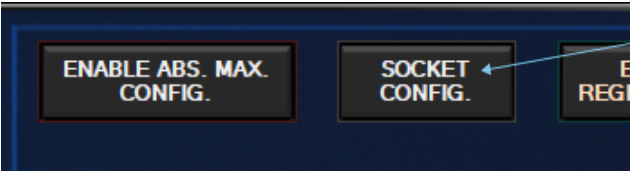
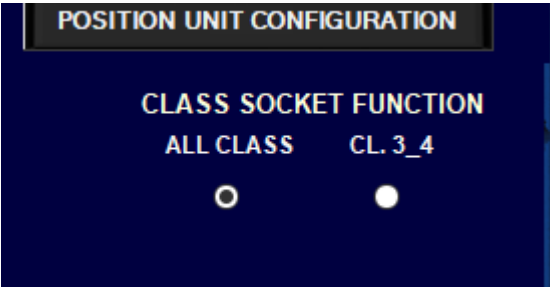
7.2.3. Auto Class Select – Change to CI4 with CI2 Properties

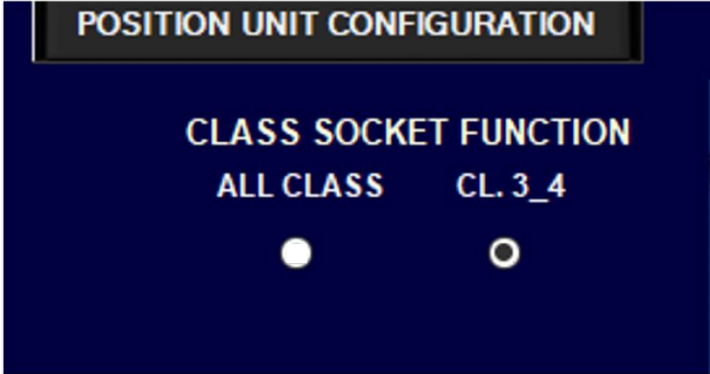
In situations where CI4 interface is limited to CI2 input, a dedicated CI4 socket, BC2629, is available. By installing this socket, the tool will shift to CI2 output, hence limiting torque and optimize accuracy.

The below sequence describes how to replace output socket to CI4 type with CI2 properties. Only valid for TT with Auto Class select.

No.	Description	Check/Verified
1	Remove the six M8x35 Socked Head bolts located at ELTT nose Remove POM nose. 	
2	Pull off the auto socket assy. 	

No.	Description	Check/Verified
3	Remove the bolt in the inner socket, M4 socket head bolt, and remove the socket and spring. 	
4	Install the CI4 socket, BC2629. Gently align socket with indicator pin and hex-interface. 	
5	Install the socket's bushing, BC2628. 	

No.	Description	Check/Verified
6	Reinstall POM nose and bolts.  Note: Apply AquaShield to bolts before mounting	
7	Note! The following steps are valid for <u>BC0454</u> only: In GUI click SOCKET CONFIG:  When asked for password, write BLtt.2025	
8	Select ALL CLASS to ensure that the TT recognizes the CI4 socket as CI2 and shifts to CI2 output accordingly. 	
9	Restart GUI to implement the new settings. Operate tool and verify that the system is set to CI2 properties.	

No.	Description	Check/Verified
10	Caution! When putting BC0454 back to default mode, i.e. auto-socket interface, it is crucial the CLASS SOCKET FUNCTION as described above is set to CL.3_4: 	



7.3. PRE-DIVE OPERATION STARTUP

After communication has been established, the following must be done to start an ELTT operation:

- Check set-up settings
- Detect interface socket
- Select operation mode
- Add archiving information

7.3.1. Check Setup Settings

When defining setup settings, the following checklist should be followed, though not limited to:

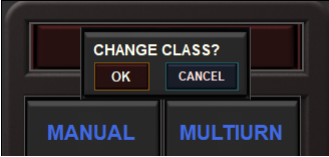
No.	Description
1	Max TT power consumption set according to host power supply
2	TT max engine rpm is set according to highest suitable operational socket rpm
3	Max output torque is set according to operation
4	Max output torque, Ball Valve mode, set according to operation
5	Docking torque set according to operation
6	Break torque end position
7	Seating Torque start position
8	Arrange archiving file structure
9	Verify Failsafe Config

7.3.2. Torque Class Detection

By recognizing socket interface class, the tool will automatically select between Low and High Torque mode.

Caution:

It is crucial that correct socket is selected prior to any operation! Verify correct selection, override in GUI if auto-detect fails to recognize correct socket.

No.	Description	Figure
1	Push Class identification button to detect class. Motion starts for sensing output socket type.	
2	Confirm automatic or manual class detection	
3	If manual mode is selected chose class, consider warnings and confirm with OK	
4	When selected class is detected, define configuration and limits respectively. Class is shown Class window	
5	Startup is completed and Torque tool is ready for operation	
6	If socket class is not detected, all operations are disabled. (See trouble shooting section; “Not able to Class Detect”)	
7	To change class at a later stage, perform following instructions: Turn off current selected mode. Now the Class Identification button is blinking weakly. Push the button and process class detection as described above.	

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7.3.3. Add Archiving Information

To edit Tag information just add the information to the “Data Fields”.

Click in the fields and fill in required text.

The screenshot shows a form titled "OPERATIONAL DATA". It contains several input fields: "Field:", "Location:", "Tag:", "Dive:", and "Operation:". Below these fields is a section labeled "NOTES:" followed by a large text area. Two callout boxes are present: one labeled "Data Fields" with an arrow pointing to the "Field:" input field, and another labeled "Note Field, notes will be added to saved files and logs" with an arrow pointing to the "NOTES:" text area.

The following operations data may be typed in or imported by loading configuration file (See section 7.9.1).

In the Note Field the operator can include notes or free text related to the operation. This text will be included in the Configuration file together with operational data, date and time. (See section 7.9.1).



7.4. SUBSEA OPERATION

No.	Description	Check/Verified
1	Start ELTT Software and communication.	
2	Verify ELTT Engage Latch Handle to be positioned in Mid position.	
3	Adjust max. torque value* according to equipment to be operated.	
4	Dock ELTT into selected location by use of D-Handle. If ELTT does not interface valve bucket due to un-alignment of valve stem and interface socket, operate tool in docking mode until aligned.	
5	Auto Class Select: If the tool fails to drop all the way into the torque bucket, pull the ELTT out and re-insert.	
6	Change grip to Engage Latch Handle. To complete full engagement on to valve bucket, set Engage Latch Handle in Latch Locked position.	
7	Start logging and operate Torque Tool to complete valve operation. Note: If comments to valve operation gains additional track information. Add comments to note board.	
8	Stop Torque Logging	
9	Release Torque Tool from valve bucket. Note: There might be a residual torque after stopping ELTT, approx. 50Nm. Engage docking mode and operate in opposite direction if ROV struggles to pull the ELTT out of the interface bucket.	

*Note that accuracy with respect to torque output will be influenced by rotational velocity, RPM. If high precision at hard end-stop is required, RPM shall be set to 1RPM. Higher RPM settings may cause some hammering effect, thus higher peak-torque at end-stop. The hammering effect at end stop will increase with higher RPM's.
In general, we recommend lowering RPM to 1,0 prior to hard end-stop.



7.5. POST DIVE CHECK

No.	Description	Check/Verified
1	Recover ELTT equipment to deck.	
2	Perform a visual inspection and function test with special attention to the following: Interface section and output socket ROV Handle and latch mechanism Cable and connectors Fittings Surface treatment	
3	Flush all equipment thoroughly with fresh water	
4	Check oil-level in compensator, refill as required	
5	Dry off equipment and apply protective oil, WD40 or similar, prior to storage.	

7.6. HOOK-UP AND COMMUNICATION

The ELTT System is easily installed to its host, connect the Torque Tool to EPC. When the program is started communication must be established and verified (see table below).



Figure 14: Communication Board

No.	Description
1	Select com port
2	Select Baud Rate. (Default is 38400).
3	Press Connect
4	LIVE: Green – communication with (USB/Serial converter) Traffic indicators: (Small square lamps). The left indicator blinks for every data package sent till tool. The Right indicator blinks for every data package received from tool. Both indicators blinking frequently: Communication with tool established. NB! Connection indicator only refers to connection between PC and USB/Serial converter. This means that communication with tool only is verified if “Tool serial number” are updated and “Main Voltage” appears. If no Tool communication is verified wrong baud rate may have been selected. Try the other baud rate. Failure!: Red – Communication with Torque Tool (USB/Serial converter) failed. See trouble shooting section; “Communication problems”.

7.7. ELTT OPERATION

7.7.1. Operational Controls

This section describes general operation controls for start, stop and adjustments:

	The right and left arrows will start rotation in direction as indicated (clockwise or counterclockwise). If the symbol is steady lit, the ELTT is ready to operate.
	If any symbols are dark, the ELTT is unable to perform that operation. Typical if the system is not ready or no mode has been selected.
	Only valid in speed mode. Symbol light rolling. This occurs when button is clicked (<u>NOT double-clicked</u>) and left mouse button is held down. Output shaft rotates clockwise according to torque and speed settings and stops when left mouse button is released.
	Output shaft rotates clockwise according to torque and speed settings, even if the left mouse button is released. To stop rotation, stop button needs to be pressed, or target position achieved.
	If stop button is dark the operation is not valid : - No rotation started - No mode set - System not ready
	The stop button light is steady red when output shaft rotates. Pressing stop button will stop the rotation. To activate soft stop according to the set deceleration, press stop button once (do not double-click). <u>Stop button will start blinking</u> until rotation has completely stopped. <u>To activate quick stop, double click the button</u>

7.7.2. Adjustment Operations

In every mode and before or during operation, Torque limit and speed can be adjusted in the Operation Set Limit Board or Command and Operation Dashboard



Adjustment can be performed by pressing and dragging the slider handles in the Operation Set Limit Board, or by clicking the one-step vice selector. Values can also be typed directly in the Operation Set Limit Board. Slider is moved by holding the cursor over and holding down the left mouse button.

Max. torque value updates as the slider moves. However, values are updated first when the mouse button is lifted.

Maximum values are limited by the absolute max values set in Setup Window (see section 4.2.4). If a higher value is typed, the value will change to predefined absolute max value for safety reasons. The Slider bar range will always be adjusted according to the predefined absolute maximum value in the setup.

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7.7.3. Torque and Speed Monitoring (Meters)

Instrument range:

Range for instruments is defined by absolute max values set in the setup window.

Marked Area:

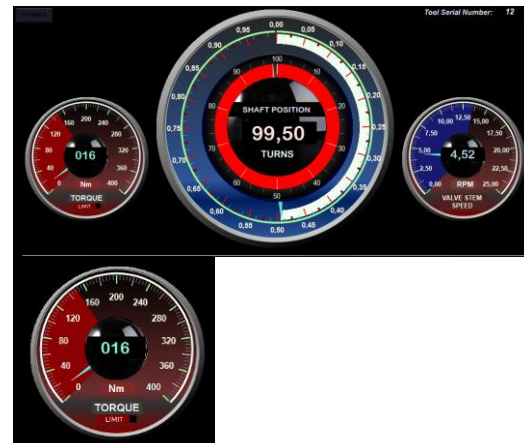
Marked area in instrument are defined by selected max value set in the Operation Set Limit Board (Section 3.4.1.2).

Meter Needle:

Meter needle show measured instrument value. (Also given in text in center).

Torque limit:

If current torque has reached max torque, limit lamp will illuminate.



7.7.4. Power Draw limit and monitor

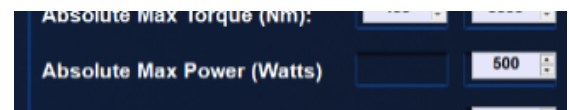
To achieve optimal performance with limited available external power, a limit for maximum power can be set. If required torque and wanted speed exceeds maximum available power, speed will automatically be reduced to prevent exceeding absolute max. power set in setup window.

This feature will thus prevent external fuse trip or overloading.

Range of power draw bar is adjusted from 0 to max. power.

Amp window shows DC-bus current. (Not external current).

Current power is shown here



Limit lamp is illuminated when max power is reached

MAIN VOLTAGE (VDC)	23
POD TEMPERATURE	22
TOOL TEMPERATURE	19
CURRENT POWER (kW)	0.00

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7.7.5. Reset Socket Position

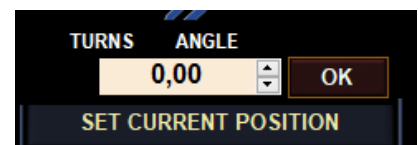
Pressing reset will set actual output socket position to zero.



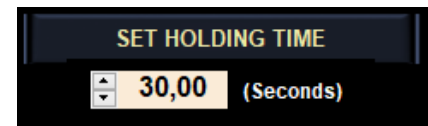
Reset button will only be active when no operating is executing.

7.7.6 Set current Position and Set Holding Time

Press button Set current position when active. Write in wanted position using turns and decimals. Press OK. Position instrument will update till written value.



Press button Set holding time when active. Write in wanted holding time. (The time torque shall be held when end stop is reached)

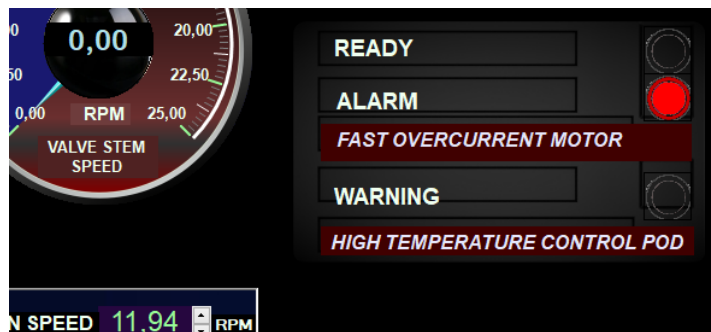


Close the window by pressing the button again.

7.7.7 Power Loss or Power Recycling Tool

NB! If power is lost or power till tool is switched off close GUI. When power is on open GUI and establish connection.

7.7.8 Diagnostics and Restart



ELTT System Diagnostics contain continuously monitoring of the following parameters:

- El-Pod temperature
- Transistor cooling block temperature
- Actuator temperature
- Main supply voltage
- Motor current
- Performed torque
- Motor position
- Actuator output shaft position

Warnings according to the above list will change the “WARNING” lamp to yellow, and specified details will occur in the “MESSAGE” window below warning lamp.

Error will change the “ERROR” lamp to red and operation is shut down. Exception is if detected error is disabled. (see section 3.7.7)

Specified details will occur in “MESSAGE” window below alarm lamp.

If high temperature is detected, reset will not be possible until acceptable temperature is reached again.

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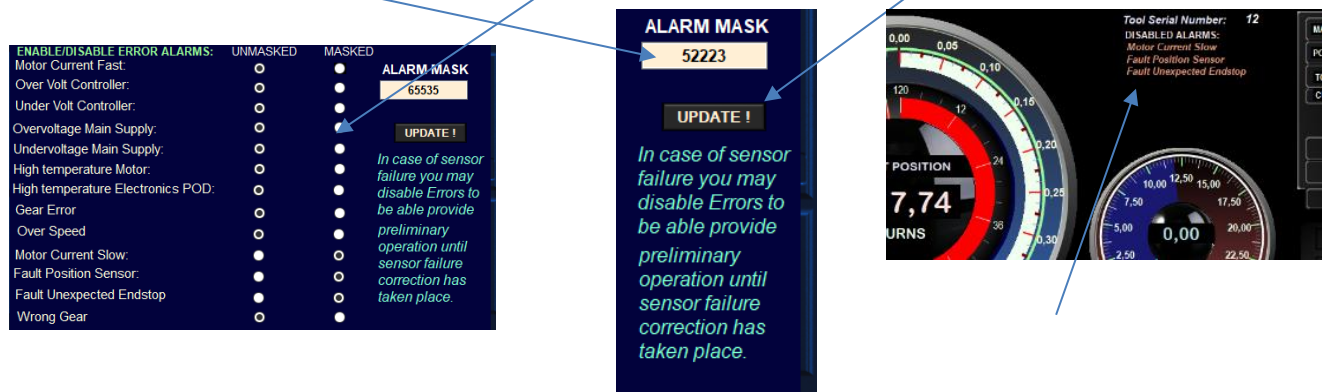
7.7.9 Error Shutdown Override Function

If sensor failure occurs, operation may shut down and the tool will be impossible to operate.

If it is obvious that sensor value is a result of sensor failure, shut down function can be overridden by disabling respective sensor in Setup; advanced settings (Section 3.1.4; Advanced Settings).

If error is disabled in Setup, and confirmed by operator during startup, error message will still occur, but operation will not be shut down.

Disabling an error is done by setting the alarm till “MASKED”. Then press “Update” button. The Alarm Mask code number shall change and differ from “65535”.



In addition to the error message in the message window, blinking messages will appear below the “Tool serial number” text to notify the operator that error shutdown is overridden. If one or more errors are disabled at startup and the operator decide to have all errors enabled select “Enable all errors” and continue without entering setup.

For safety reasons, when the torque tool is power cycled all alarmed will return to unmasked (enabled).

Pressing the restart button will reset the error and reactivate the tool. The ready lamp will change from red to green. If the error reset not possible due to hazardous failure, the ready lamp will stay dark and error message will remain. (See section 3.7.6).

7.8 LOGGING AND REPORTING

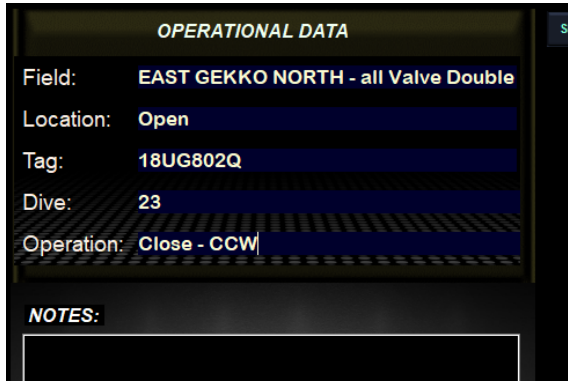
The logging function is divided into 3 levels:

- 1) Tool Level: Everything done with the tool (automatic)
- 2) Log Level: one file for every active change in “Archiving Information”
- 3) Start Stop Level: every time you push “Save Graph to File” button.

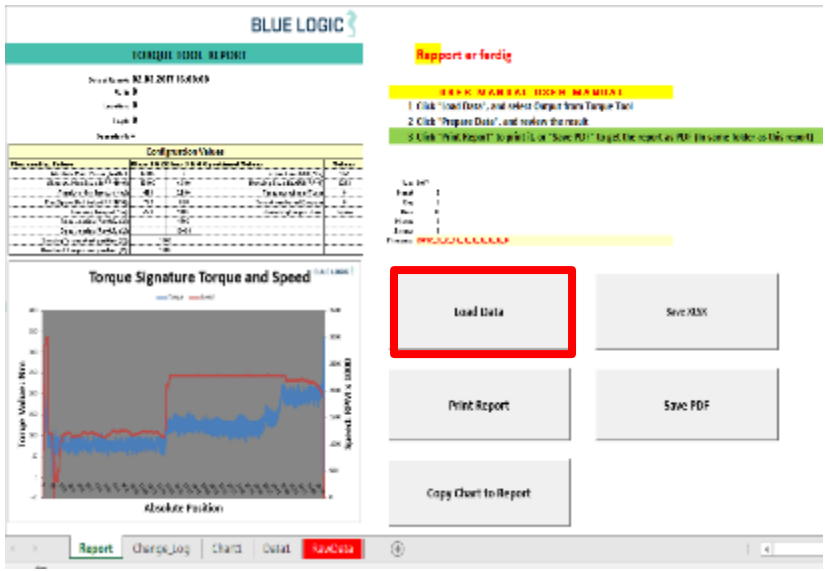
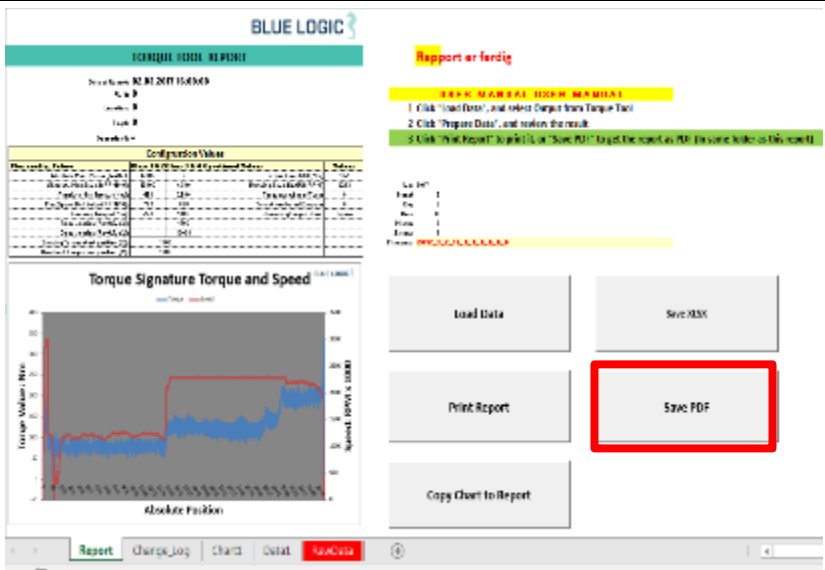
All the 3 files can be printed to a report in .xls format.

7.8.1 Generate Operation Report (PDF)

Use the following sequence to generate a PDF rapport:

1	Enter data in the Data Fields	
2	Click the “Start Log to file” in the Archive Board (see Figure 12) prior to operation performance. Button text is toggling between “Logging” and “Stop log to File”. (Means that logging is active).	
3	After operation: Click the “Stop Log to file” in the Archive Board (see Figure 12). (Button color changes back to light green.) Report file is completed. All operations between start and stop log is included in the report.	



4	Open the following Excel file: E:\Torquetool log files\Torque Import_rev7.xlsm	
5	Click the “Load Data” button	
6	Open the following Excel file: E:\Torquetool log files\” Choose desired date folder” \” Files To Report”\ Choose desired .xlsm rapport”	
7	Click the “Save PDF” button The PDF is saved in the relevant	

7.8.2 Save or Print Report



To print the entire report, the user must select all tabs at the same time:



First select the “Report” tab hold down the “Shift” key on the keyboard and click the “Data1” Tab, now all tabs are white and will be printed or saved to PDF. When all tabs are selected, a change in the spread sheet cells will make a change to the call of all the tabs at the same time.

Note:

It is important to unselect the sheets after print or save, hold shift and click on “Report” tab.

7.8.3 Report Front Page

All operational configuration parameters will be included in the top section:

TORQUE TOOL REPORT

Date of Report: **24.10.2022 10:50:51**

Field: **EAST GEKKO NORTH - all Valve Double Seated, Inlet**

Location: **Open**

Tag #: **18UG802Q**

Operation#: **1**

Dive# **23**

Configuration Values				
Max config. Values	Class 1 & 2	Class 3 & 4	Operational Values	Values
Absolute Max. Power (Watts):	1499	1499	Torque Limit GUI (Nm)	2600
Absolute Max Speed (RPM/1000):	6000	6000	Running Speed in GUI (RPM)	5,99
Absolute Max Torque (Nm):	350	2789	Target number of Turns	12
Max Speed Ball Valve (RPM/1000):	6000	6000	Target number of Degrees	0,5
Docking Torque (Nm):	350	2789	Operating torque Class:	CLASS 3_4
Acceleration (Rev/Sec2):	345			
Deceleration (Rev/Sec2):	567			

The max. configuration values should be the damage torque and the Operational values should be the running torque of the task at hand.

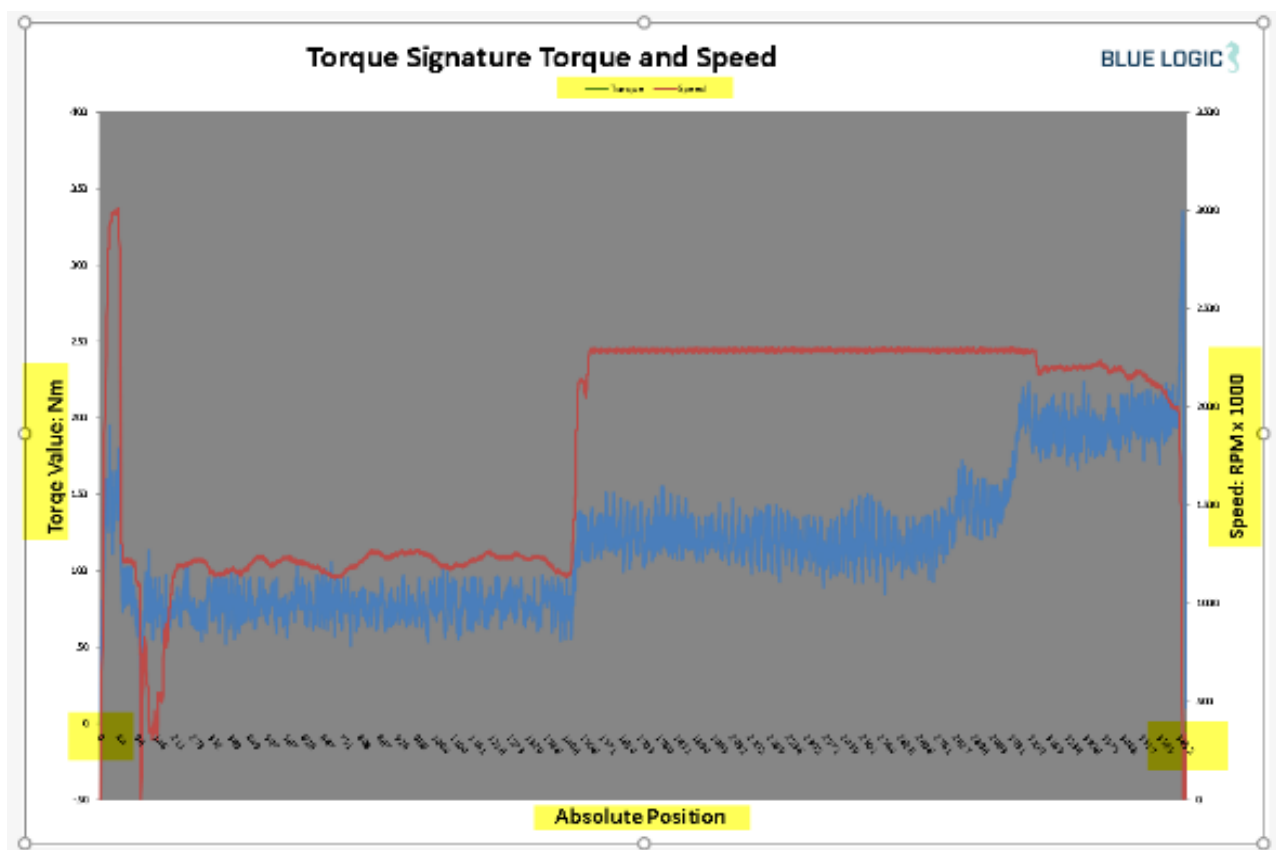
OPERATION AND MAINTENANCE MANUAL

7.8.4 Chart

The plot of a torque job is presented in a 2D chart. Both Torque (Blue) and Speed (Red) are plotted.

The speed value is plotted in the same value as input on the tool RPM multiplied with 1000. E.g. a plotted speed of 2500 is equal to an RPM of 2.5.

On the X-Axis the Start position and stop position is plotted as a value of 3663 degrees divided by 360= 10,18 revolutions, or 10 revolutions and 63 degrees.



7.8.5 Automatic Filename Calculation

Year 2017

Month 3

Day 2

Hour 16

Minute 8

Second 8

Filename: **2017_3_2_16_8_8_Sandnes_Forus_Blue Logic_No.001 Close**

Year, Month, Day, Hrs, Minute, and second + the location parameter.



7.8.6 Change Log

All keystrokes by the tool operator are logged. The Tool position, time stamp, torque value, speed and system action, and manual notes will be included in the change/event log.



TORQUE TOOL REPORT

Date of Report: **02.03.2017 16:08:08**

Field: **Sandnes**

Location: **Forus**

Tag #: **Blue Logic**

Operation#: **No. 001 Close**

Change Log				
Absolute Pos	Time Stamp	Torque	Speed	Action
0	02.03.2017 15:56:01	0	0	Sys_Class manual selected
0	02.03.2017 15:56:05	0	0	Sys_Manual Mode Set
0	02.03.2017 15:56:07	0	0	Sys_Start Clockwise
0	02.03.2017 15:56:07	0	0	Sys_Start Clockwise
0	02.03.2017 15:56:07	0	0	Sys_Start Clockwise
105	02.03.2017 15:56:19	69	1103	Sys_Stop
108	02.03.2017 16:01:38	0	0	Sys_Start Clockwise
108	02.03.2017 16:01:38	13	4	Sys_Start Clockwise
133	02.03.2017 16:01:46	66	368	Sys_Start Clockwise
133	02.03.2017 16:01:46	66	368	Sys_Start Clockwise
134	02.03.2017 16:01:46	67	364	Sys_Start Clockwise
134	02.03.2017 16:01:46	67	364	Sys_Start Clockwise
134	02.03.2017 16:01:46	75	366	Sys_Start Clockwise
134	02.03.2017 16:01:46	75	366	Sys_Start Clockwise
3664	02.03.2017 16:07:53	90	39	Sys_Stop

All reports will also have a time stamp of when they were printed to the csv file.

OPERATION AND MAINTENANCE MANUAL

7.9 PREDEFINED OPERATIONS

It is possible to predefine an operation by manipulating certain files.

7.9.1 Save to/load from Files

Setup Configurations, Operational configurations and torque-position graphs can be loaded from file or saved to new files. Filename will contain operational data. File folder can be defined in the setup window. Otherwise, a folder will automatically be established on the E-drive, with relevant subfolders.

In multiturn mode, predefined target positions will be loaded to file.

NB!

Torque tool position will be reset (set to zero) when file is loaded and Multiturn mode will be set to absolute.

Save configuration to file:

Example:

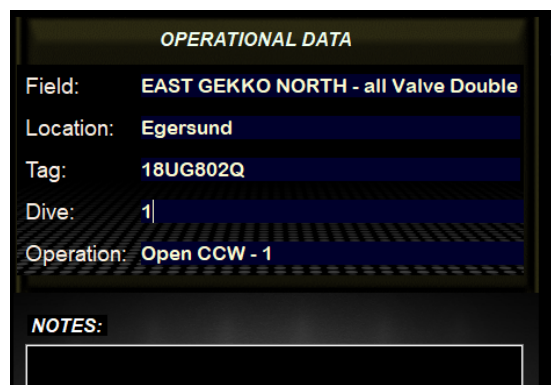
A specific valve shall be operated. Complete setup for this valve shall be predefined and saved to file. This file will be made for open to close operation.

Valve specification:

- Damage torque 40000 Nm.
- Breakout Torque 38500 Nm.
- Running torque 28500 Nm.
- Max. Valve speed 1 rpm
- Number of turns to Open 0,25
- Direction to Open Counter-Clockwise (CCW).
- ROV- interface Class 7

Make configuration file:

1. Fill in operational data:



The screenshot shows a software interface titled "OPERATIONAL DATA". It contains several input fields with the following values: Field: EAST GEKKO NORTH - all Valve Double; Location: Egersund; Tag: 18UG802Q; Dive: 1; Operation: Open CCW - 1. Below these fields is a section labeled "NOTES:" with an empty text area for additional information.

2. Fill in operational values:

a. Select Class 7



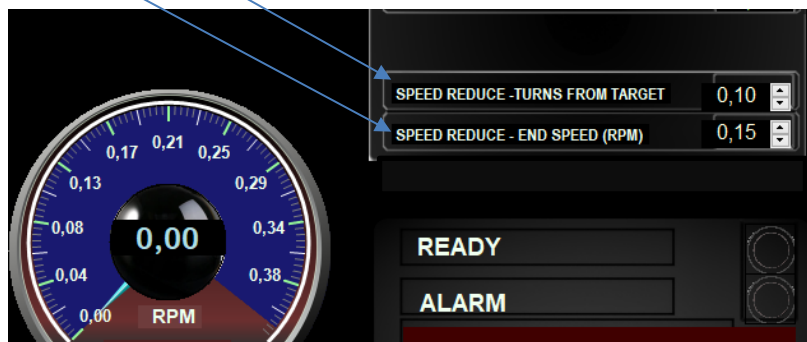
b. Select multiturn. Fill in Specific valves max torque, running speed, Target Turns and Target decimals. Multiturn mode shall be set to absolute.



c. Check that absolute max torque and Max running speed is below valve's damages torque and Max running speed.

Target Turns ≥ 0 = CW and Target Turns ≤ -0 = CCW.

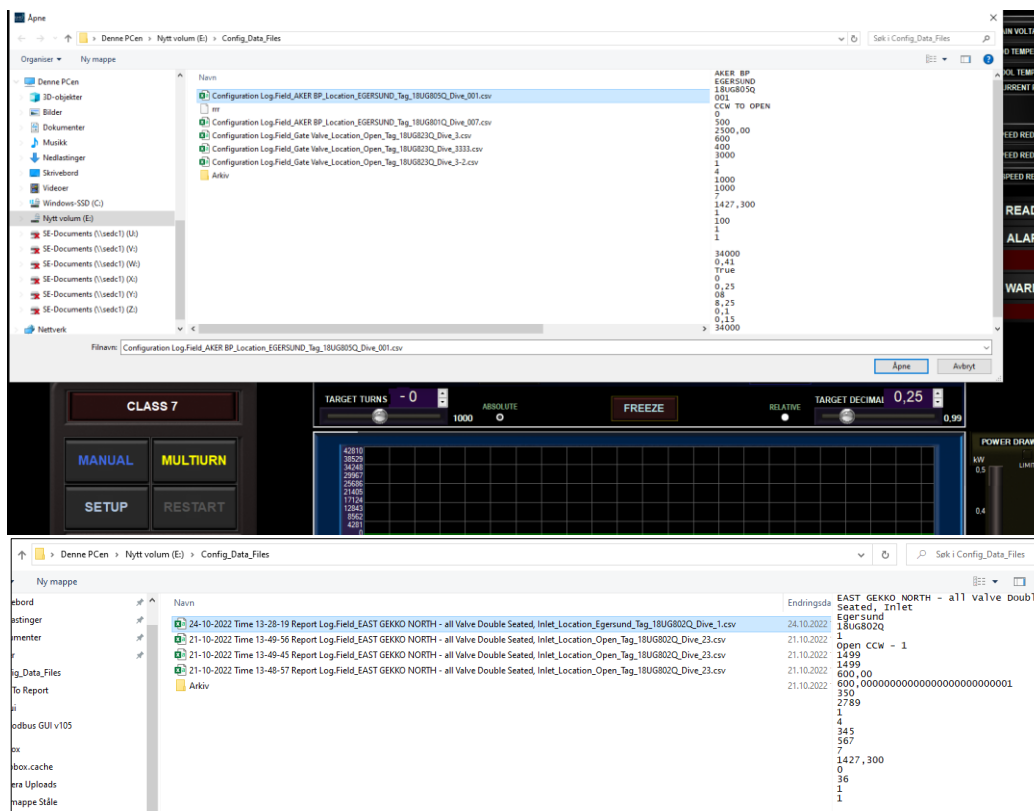
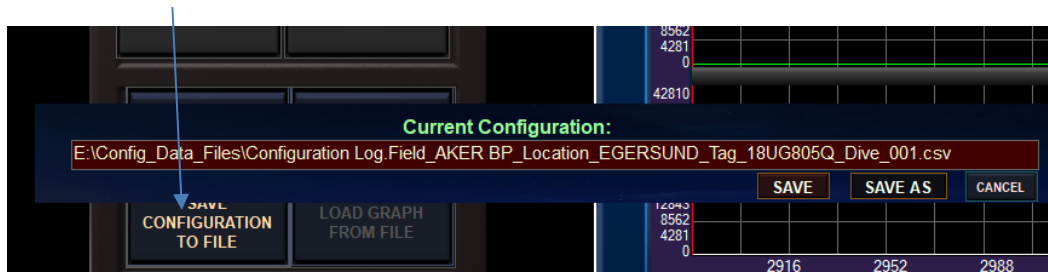
d. Set Position where speed will be reduced before target position has reached and Speed reduced to. (0,10 turns = 36 degrees).





OPERATION AND MAINTENANCE MANUAL

Click to save configuration to file. Saved file location.

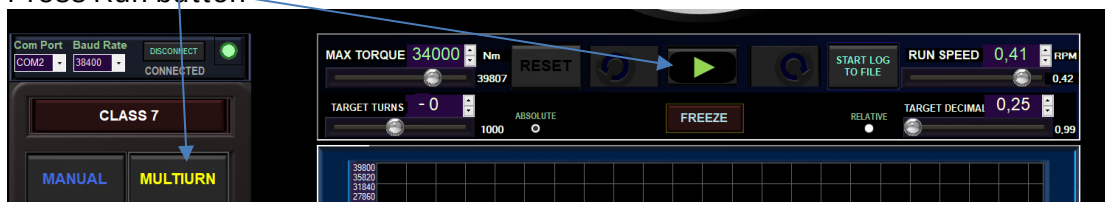


Select «Load Configuration File» to load

Select desired files for loading

Select Multiturn:

Press Run button



Operation will be executed according to loaded configuration.



Predefined or default folder is shown in the open window. Since operational data is part of the filename, it should be easy to select the relevant file. When the file is selected, press “Open”. The configuration is imported and data in setup window and main window will be updated.

Note:

It is important to verify that the intended configuration file is correct loaded since configuration files contain limits. These limits can have a huge impact on ELTT performance.

Press Setup and check configuration data.

All files will be saved in .csv format.

When each operation is completed a graph-file are automatically saved to a folder named the current date, in E:\Graphfiles\.

(E.g. E:\Graphfiles\2019.3.26\ReportLog.Field_Location_Tag_dive_3.txt)

7.9.2 -Preparation of Configuration Files for Each Activity

```
24.10.2022 10:50:51
EAST GEKKO NORTH - all Valve Double Seated, Inlet
Open
18UG802Q
23
1
1499
1499
6000
6000
350
2789
6000
6000
350
2789
345
567
350
350
2600
5,99
CLASS 3 4
12
0,50
136;24.10.2022 10:50:51;0;0;
0,38;24.10.2022 10:50:51;0;0,02;Sys_Start Clockwise
0,38;24.10.2022 10:50:51;31;0,52;
0,38;24.10.2022 10:50:52;36;0,67;
0,39;24.10.2022 10:50:52;43;0,84;
0,39;24.10.2022 10:50:52;47;0,99;
0,39;24.10.2022 10:50:52;52;1.15;
```

First 5 lines of the torque report is operational data (in blue)

Max Power in Watts (In green)

Class 1-2 Max torque (in yellow)

Class 3-4 Max torque (in yellow)

Acceleration (Rev/sec²) (in green)

Deceleration (Rev/sec²) (in green)

Valve operation settings;

- Torque
- Speed
- Class
- Target turns
- Target turn decimals (in blue)

Note: the colors do not appear in notepad

Open in Torque Tool GUI to adjust and save new file.

To prepare the ROV operation it can be valuable to prepare separate files for every torque operation. That way it is much easier to change wording on the torque graph reporting during the offshore campaign.

OPERATION AND MAINTENANCE MANUAL

8 TROUBLE SHOOTING

8.1 GENERAL

In case of loss or bad operation, failure in log file production or GUI application crash, the following are helpful to localize and solve the problems.

8.2 LOSS OF CONFIGURATION

Configuration file with the same name as torque serial number must be present in the folder "c:\TTfiles\". If the file is missing, the following message will appear and following windows message will appear:

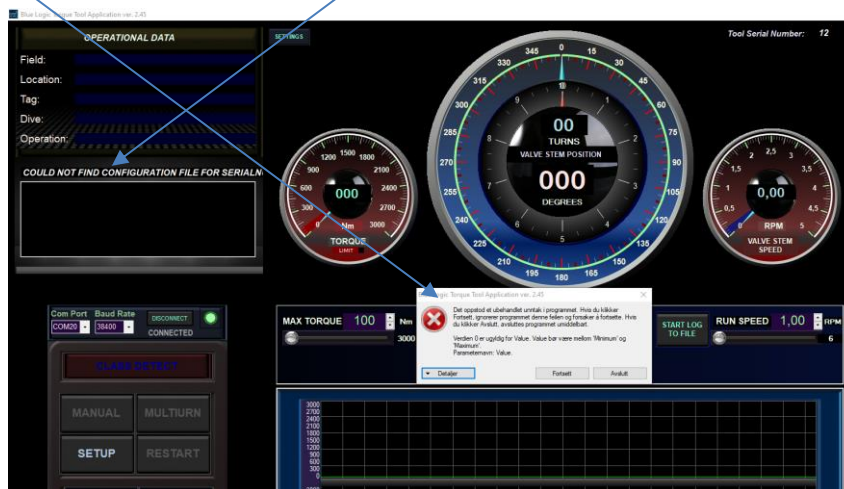


Figure 15: Torque Tool Files

Close GUI. A new config file will be generated. NB! The new file is corrupt. Enter TTfiles map and delete the new config file. Copy the backup config file and save it in TTfiles. Rename the file to "Serialnumber".txt. Restart GUI.

- When pressing "CONNECT", the following message appears:



This message appears if the config file has been modified outside GUI. Verify by checking all data in setup window.

8.3 EMERGENCY STOP

To perform Emergency stop you can double click stop button or press the Emergency stop button. However, if Tool is operating and mouse functions are lost, press escape (ESC) button. Emergency stop will immediately be activated. Emergency stop button will only be visible during operation.



8.4. TROUBLE SHOOTING TABLE

Error Message/ Behaviour	Explanation	Recommended action
Position sensor fault	Occurs if serial communication between POD's controller and position sensor controller are lost or poor. (Sensor failure has no impact).	See section 7.6
Motor overload	Occurs when motor current exceeds current threshold set in POD's controller	See section 8.4
Motor over temperature	Occurs when tool temperature exceeds tool temperature threshold. (Typical if tool has reached end stop and continues performing high torque over time).	Measure surface temperature at tool. Is the temperature close to reported motor temperature? Yes: Cool down. No: Change motor <i>over-temperature</i> threshold setting in GUI. OK? No: Motor temperature sensor failure. Change MENC-LS. (Ref. Section 4.2.4; Advanced Settings).
Motor over speed	Occurs if motor speed exceeds the max speed threshold set in POD's controller (Typical reached if spring force rotate rotor with high energy when motor is disabled, or very quick loss of load occurs.	Reduce acceleration and deceleration in Setup OK? No: If possible, reduce set speed and torque to avoid external force back drive. OK? No: Increase parameter 21 (Using MEFCASIM. (Ref. parameter 21 in Extended protocol TT - SEFA protocol v1.1)

Motor Driver tripped	Occurs when motor current exceeds motor Drivers hardware fuse limit.	Reset error. OK? Yes: Reduce performance if possible. OK? No: Follow procedure in section 8.4 Reset error OK? No: Power stage failure. Transistor shortened. <i><u>Note!</u> Frequently repeated errors may cause major control system damage.</i>
Main overvoltage	Occurs if measured main voltage reaches a dangerous high level	Main overvoltage shall not exceed 500VDC. Reduce external back drive force. (Typical valve spring force).
Main undervoltage	Occurs if measured main voltage reaches a dangerous low level	Check Main undervoltage threshold in Setup Advanced settings. OK? No: Check if System power supply are sufficiently dimensioned. 110VAC min.1500W 230VAC min.2000W. OK? No: Increase power supply power or reduce performance settings. OK? No: Check if voltage drops when tool is enabled, but without any load. YES: Hardware fail; CapController No: Check calibration. (Ref. Section 4.2.4; Advanced Settings).

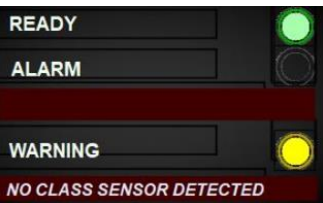
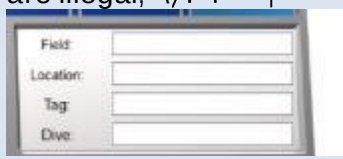


Controller overvoltage	Occurs if measured controller level reaches a dangerous high level	Open POD: Measure MENC- is 24VDC output. OK? YES: Replace Servo controller. OK? No: Replace MENC-ISI.
Controller undervoltage	Occurs if measured controller level reaches a dangerous low level	Open POD: Measure MENC- is 24VDC output. OK? YES: Replace Servo controller. OK? No: Replace MENC-ISI.
Communication lost	Occurs if POD's controller has not received any data from GUI during 1 second after communication is established.	Check system communication device. (Typical MOXA usb/RS232 unit). Are output LED on the device blinking? No: Change unit. OK? Yes: Check communication cable configuration according to wiring diagram. OK? No: Open POD. Measure 24VDC input to Servo controller. Are 24VDC present? Yes: Change Servo controller. No: Change MENC-ISI.

Poor communication	GUI sends approximately 50 data packets per second to POD's controller and POD's controller sends same amount of data packets to GUI. Controller and GUI verifies the data packets validity using Checksum. Number of data packets approved and failed are counted and the percentage of failed packets vs approved are calculated. If the failure percentage reaches a certain level poor communication error are shown and communication are stopped.	Check communication send / receive duration time and fault rate. See section 8.4.7 Check RS232 communication cables shield and ground, and POD shield and ground. OK? NO: Replace system communication device. OK? No: Replace Servo Controller.
Communication failure	If GUI's communication with the topside communication device (port) fails, communication shuts down and communication failure is indicated.	Check port settings in windows device manager. Are Selected Com number present in the device manager? No: Are there any com ports available in device manager? No: Reconnect communication device. OK? No: Update communication device drive and reconnect. OK? Yes: Try to connect with the present Com number. OK? No: Change the communication device and try again.



Data not present in Setup	Configuration file is corrupt. (See section 8.2)	When “connect” is activated “Tool SN-Number” are shown. Open explorer and go to C:\TTfiles”. Open the file with the same name as Tool SN-number. If all numbers on first page are 0, copy the file with the same name from folder C:\TTfiles\Backup. OK? No: Continue and open “Setup”. Write all data manually in setup and close GUI. Reopen GUI and connect.
Class detect failure	No relative deviation between motor position sensor and socket position sensor occurs during class detect operation.	Check that a socket is mounted. OK? Yes: Make sure that tool is turning freely. (No load). OK? Yes: Select class manually. Operate tool and check that position feedback works correctly. OK? Yes: Close GUI. Open GUI and run class detect. OK? No: Open setup and check value in “class detect value”. If 0 increase the value to approx. 40. Try again. OK? No: Increase “class detect value” further. OK? No: Select class manually and run speed in manual. Check that

		mechanical position indicator turns. OK? Yes: Check output shaft calibration using calibration GUI. OK? No: Recalibrate output shaft. Yes: Increase further.
Socket position failure (Output shaft position sensor).	When starting and stopping manually or multiturn operation the GUI's position meter performs a jump larger than 1-2 degrees	If motor unit has been opened there is a risk that the output position sensor shaft is mounted 180 degrees offset since calibration was performed. If so, recalibrate output shaft position sensor using calibration GUI. Thereafter a fine position calibration must be performed using the GUI. When this calibration is completed data is stored automatically when GUI is closed.
Warning: No Class Sensor Detected 	This issue can occur after removing the tool from the torque bucket and is caused by the spline for Cl1&2 not engaging properly. This issue is only valid for TT with article no. BC1749.	Put the TT back into the torque bucket. The spline connection will be aligned when TT is pulled out again. Run the TT to verify correct class detected, up to 0,9 revolutions may be required.
Failure in Log file production	When operation has been performed and button "Empty current log to file" has been operated no file are generated in folder: E:\Torquetool log files\ (Current date)".	If a character is typed here that is illegal for wiring filename the file generating will be excluded without any notice. Following characters are illegal; \/:*?"<> 



When operation is activated but no torque is output, motion or error message occurs	No failure identified. May be hardware failure, calibration failure or parameter setting failure.	This an abnormal situation where the following action should be taken: If possible, operate output shaft using external force to verify if the position sensor operates correctly and in correct direction. OK? Yes: Open calibration GUI and run; Motor position sensor; “Load graph”. Observe visually that motor turns during this operation.
Motion or torque is performed when communication is lost or disconnected	Failsafe mode are unintentional activated. Motor runs in a given direction using torque and speed values defined in parameters.	Open Setup in GUI and enable failsafe config. Select failsafe mode “Fail as is, motor off”. Close setup and close GUI. Reopen GUI and try again. OK? No: Repeat above.
Motion is performed with fixed speed and only in one direction	May occur as a result of calibration failure.	Serious calibration error; Open calibration GUI and check motor position sensor calibration. OK? Yes: Commutation number may be wrong. Check Commutation number (See section 3.4.1.4 Operation times and Motor data). Is the Commutation number equal to the latest documented Commutation number? No: Type the correct Commutation number (HallCAIibrate using Mefca Simulator) and store. Try again. OK? No:



		Recalibrate. OK? No: Check motor windings. OK? Yes: Try another tool. OK? No: Change Servo controller. OK? No: Change Power stage.
DC-bus voltage drops rapidly when operation mode is activated, and the tool is loaded.	Hardware failure or power supply failure.	Check a different tool system connected to the same power supply. OK? Yes: Probably Cap controller failure. (POD hardware failure)
No error messages, but torque and speed are significant lower than selected limits	Parameter "Max-PWM" may be set low. Reduces general performance	Use MEFCASIM and check parameter Max_PWM. If < 15000 adjust to 15000 press "W1" write and store to flash. Try Again

8.4.6 Motor Overload

1	Check output torque present when overload occurred. If above 2700Nm, reduce torque limit and/or speed, restart and try again. OK? No: run the tool without load for 5 minutes @ speed 2500. Try again. OK?
2	If torque is less than 2600Nm when error occurs check current limit parameters and increase to max. 7800. OK? No: Open calibration GUI. Load graph for Menc-HS. Check deviation. OK?
3	Perform Total calibration. Calibration succeeded? No:
4	Open motor and check magnets regarding metal chips and magnets position. Remove chips and make sure correct position. Calibrate again. OK?
5	Magnet failure or sensor board failure. Load graph when Mag-Sense A are selected. Repeat with mag sense B. Compare graphs with previous stored Mag-Sense graph if possible. Are graphs similar? Yes: Position sensing OK! No: Check rotor friction. OK? Yes: Change magnet. No:
6	Reduce rotor friction to normal and calibrate. OK? No: Change Magnet. OK? No:
7	Check motor winding resistance according to wiring diagram and motor datasheet. OK? No: Replace Power stage in POD (Ref. parameter 22 and 27 in Extended protocol TT - SEFA protocol v1.1)

8.4.7 Slow Communication

Torque tool communicates at Baud rate 38400. Each command or request packet to/from POD will normally use $((1/38400) * 8 \text{ (bytes)} * 8 \text{ (bits)} * 2 (1\text{send} + 1\text{receive})) = 3,3\text{ms}$. Processing time in each side need to be added to achieve communication cycle time.

Normal cycle time will be approx. 4-5 milliseconds.

Most commands include speed command (Manual mode) or position command (Multiturn mode).

If communication lines are distributed through several converters additional delays may occur. Then if cycle updates appear abnormally check communications health:

Hold cursor over
com port lamp
Communication
diagnostic appears



If both send and
receive is "0"
communication is
OK.

If any > "0" data
packets are lost and
communication line
needs to be checked.



9 LOGISTICS

Verify the following:

1. Sender Name and Address clearly visible
2. Receiver Name and address clearly visible
3. Inventory list correctly filled in

9.1 HANDLING AND LIFTING

To be lifted in dedicated transportation box. Forklift pockets to be used for transportation boxes heavier than 40 Kg.

9.2 TRANSPORTATION

Transport in dedicated transportation box.

9.3 STORAGE

Description
Store the TT system in its dedicated transportation box
Thoroughly coat all exposed surfaces of the Tool with a preservation oil (e.g. WD-40)
Long term storage temperature = 15 deg C



10 MAINTENANCE

The Electric Torque Tools are robust subsea systems with few critical moving parts. There are however a few important inspections points that require attention.

Inspection and maintenance can be performed by the operator, but it is recommended to return the TT to Blue Logic for 6-month inspection, maintenance and calibration.

10.1 DAILY INSPECTION

No.	Description	Check/Verified
1	Perform a visual inspection of ELTT. Special attention should be given to the following: Oil level ELTT; Check for correct oil-volume in compensator, refill as required. Oil type: Q8 T 65 LS. Keep the tool in an up-right position, i.e. output socket down. Make sure to evacuate any trapped air through the hose. Black cover must be removed to access the end of the hose. Max pressure 10Psi. ROV Handle Mechanism Hose/cable Excessive wear and tear	
2	Flush with fresh water	

10.2 WEEKLY INSPECTION

No.	Description	Check/Verified
1	Perform a visual inspection of TT. Inspect surface treatment and verify no corrosion. Special attention should be given to the following: Seal areas Output socket ROV Handle Hose Fittings Surface treatment	
2	Flush with fresh water	

10.3 MONTHLY INSPECTION

No special activities are required monthly. If the Electrical Torque Tool system has been extensively used and repeatedly exposed to dirt and aggressive fluids, pay extra attention to seal areas. Disassemble front socket and clean thoroughly as required.

10.4 HALF YEARLY INSPECTION AND MAINTENANCE

No.	Description	Check/Verified
1	Half yearly inspection and maintenance are recommended to be performed by Blue Logic. The tool will go through a full teardown and calibration. If available, new software will be installed.	



11.5. END OF PRODUCT LIFE MANAGEMENT

When the Torque Tool has reached the end of its service life and is beyond repair, the equipment shall be disassembled and returned to recycling based on type of material. Possible re-use of parts and systems shall be investigated prior to discarding. The Torque Tool system contains no environmental harmful products.

11 SUPPORT CONTACT

BLUE LOGIC AS
Luramyrvæien 29
4313 SANDNES
NORWAY

Phone: +47 910 06 950

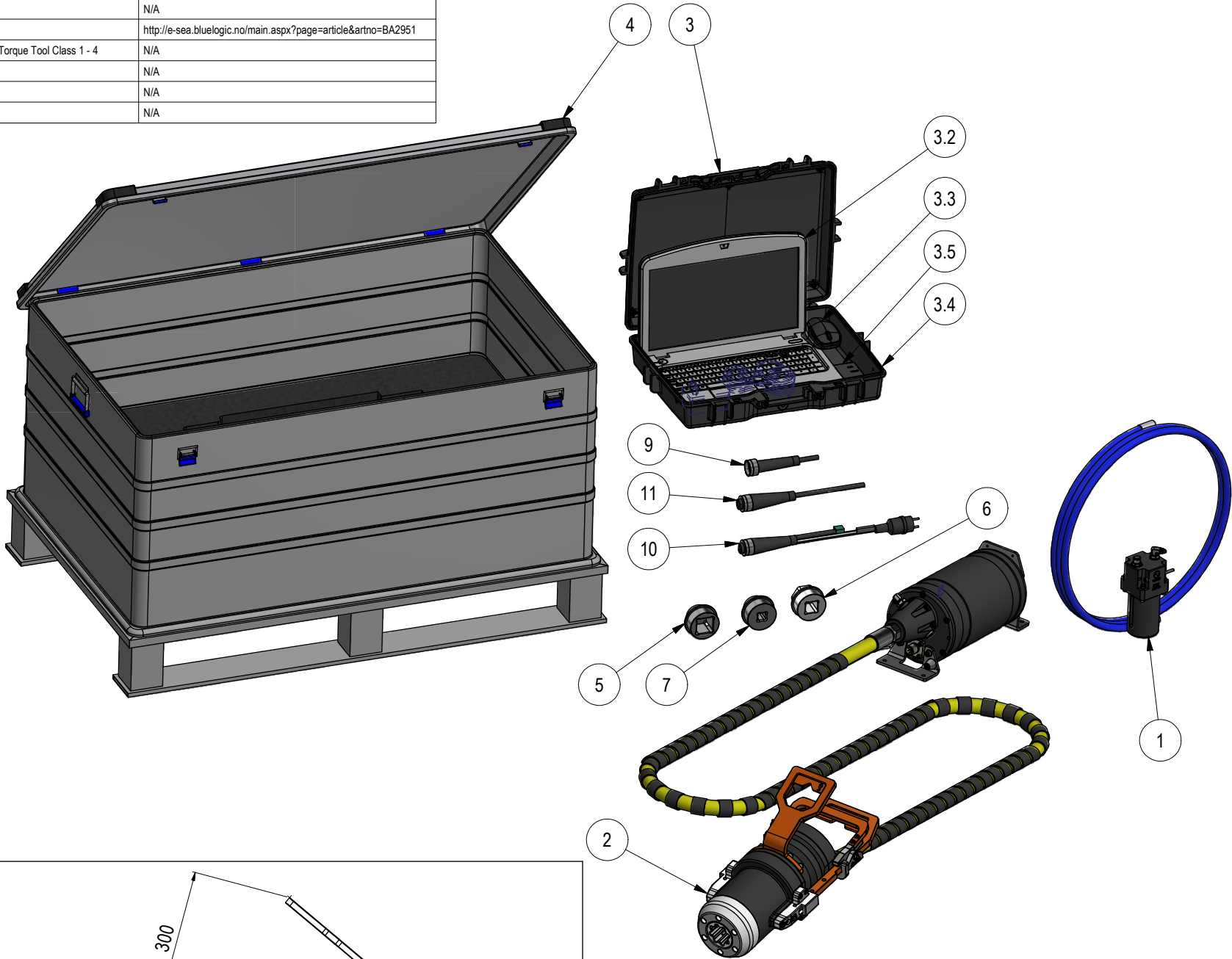
support@bluelogic.no

<https://www.bluelogic.no/home>

APPENDIX 1 DRAWINGS

Drawing No	Document Title
BB3306	2,7kNm Torque Tool Kit
BC0454	2,7kNm Torque Tool wAutomatic Class Switch Kit
BC0145	2,7kNm Torque Tool wAutomatic Class Switch Stage 2-3 Output Kit
BB1935	Hyd Actuator for Latch EL Torque Tool

Parts List				
ITEM	QTY	PART No.	TITLE	WEBLINK
1	1	BC1765	Compensator 0,25L Kit for 2,7kNm Torque Tool	N/A
2	1	BB3254	2,7kNm Class 4 EI Torque Tool V2	N/A
3	1	BB2985	ETT Control PC wGUI Software and Pelicase	N/A
3.1	1	900279	GUI Software for LTT HardWare 2C Revision 2,9991	N/A
3.2	1	103650	ThinkPad Lenovo	N/A
3.3	1	102857	Computer Mouse	N/A
3.4	1	101817	Pelicase 1495D	N/A
3.5	1	100687	Moxa UPort 1150I	N/A
4	1	BB1086	Alu Box 415L incl. Foams	N/A
5	1	BA7297	Class 4 Interface Socket Low Torque	http://e-sea.bluelogic.no/main.aspx?page=article&artno=BA7297
6	1	BA6615	Class 3 Interface Socket	N/A
7	1	BA2951	Class 1 & 2 Interface Socket	http://e-sea.bluelogic.no/main.aspx?page=article&artno=BA2951
8	1	600144-TD-0003	Operation and Maintenance Manual Electric Torque Tool Class 1 - 4	N/A
9	1	102860	Burton Dummy	N/A
10	1	102354	Burton Test Cable	N/A
11	1	100499	Burton Pigtail	N/A



NOTE: 1
DESIGN CODE:
ISO 13628-8

NOTE: 2
TECHNICAL CLASSIFICATION:
Article Type: 008-Actuation
Main Group: 8.01. ISO 1 to 4 Actuation
Intermediate Group: 8.44.01. Tool
Sub Group: 8.44.114.02. Intervention

NOTE: 3
INTERFACE INFORMATION:
Pressure Rating Bar: 3000m
Design Water Depth: N/A
Material: Hard Anodize Aluminium
Weight in Air: 55 kg
Volume: 149,08 dm^3
Surface Area: 244308 cm^2
Hydraulic: N/A
Mechanical: N/A
Electrical: 110-250 VAC / 145-350 VDC
Com. & Protocol: RS232

NOTE: 4
ADDITIONAL INFORMATION:
Complete Class 1-4 Electrical Torque Tool System prepared for offshore use and operation, includes EI Torque Tool, Control Canister, cables, class 2 and 4 sockets and control pc.

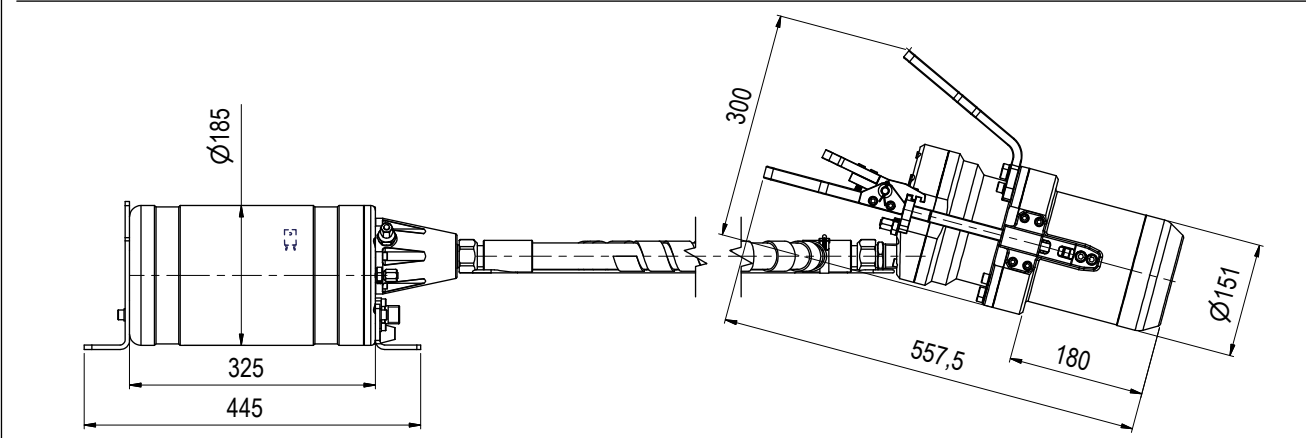
The Blue Logic Class 1-4 Electrical Torque Tool (ELTT) is a module based, compact, flexible and robust precision tool for operation in all Subsea and ROV applications.

The system combines all known advantages from a hydraulic torque tool system with the technology and advantages available from a modern servo based electrical controlled drive system. The included class 4 and class 2 interface sockets are easy to change on deck prior to deployment. The control system will automatically, detect socket and tool gear ratio and automatically switch between Low torque and High torque mode. The different sockets will automatically interface the gear system to utilize the optimal gear ration and power/speed utilization.

The ELTT is designed for operation on ROV's with minimum 5-10A 110 VAC of continuous power available. Maw allowed power consumption can be limited in the ELTT control system setup. Max continuous current consumption is 20A. The tool communicates through RS232 protocol. The ELTT is connected to the ROV thru a 3,5mtr. oil filled yellow umbilical connected to an electrical power control module mounted on the ROV

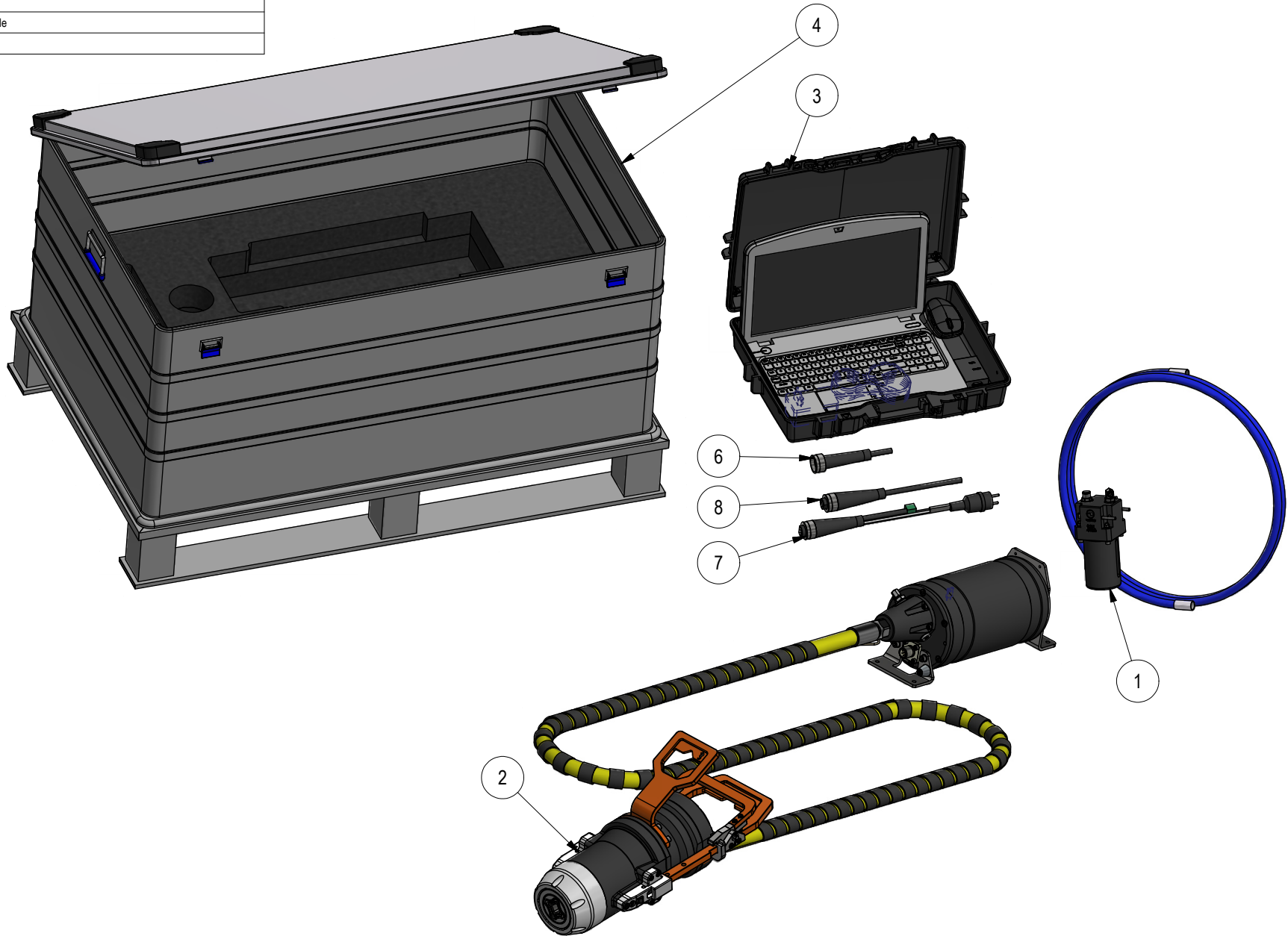
The system is delivered in an aluminum transport box size 1182x782x500 for onshore and offshore handling.

*RS485 Optional



07	13.11.2024	9-IFU (Issued for Use)		WTJ	LGH	WTJ	BLUE LOGIC This Drawing is the Property of Blue Logic AS © and must Not be Loaned, Reproduced or Transferred to others without written Permission	Dwg Scale: NTS	Drawing title: 2,7kNm Torque Tool Kit	Drawing number: BB3306	Rev. 07
06	8.11.2023	9-IFU (Issued for Use)		WTJ	LGH	WTJ		Dwg Proj: 			
05	10.10.2023	9-IFU (Issued for Use)		WTJ	LGH	KHA		Dwg Format: A3			
04	25.11.2021	9-IFU (Issued for Use)		WTJ	LGH	WTJ					
Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.					

Parts List			
ITEM	QTY	PART No.	TITLE
1	1	BC1765	Compensator 0,25L Kit for 2,7kNm Torque Tool
2	1	BC0497	2,7kNm EI Torque Tool wAutomatic Class Switch Stage 3 Output
3	1	BB2985	ETT Control PC wGUI Software and Pelicase
4	1	BB1086	Alu Box 415L incl. Foams
5	1	600144-TD-0003	Operation and Maintenance Manual Electric Torque Tool Class 1 - 4
6	1	102860	Burton Dummy
7	1	102354	Burton Test Cable
8	1	100499	Burton Pigtail



NOTE: 1
DESIGN CODE:
ISO 13628-8

NOTE: 2
TECHNICAL CLASSIFICATION:
Article Type: 008-Actuation
Main Group: 8.01. ISO 1 to 4 Actuation
Intermediate Group: 8.44.01. Tool
Sub Group: 8.44.114.02. Intervention

NOTE: 3
INTERFACE INFORMATION:
Pressure Rating Bar: 3000m
Design Water Depth: N/A
Material: Hard Anodize Aluminium
Weight in Air: 55 kg
Volume: 148,59 dm^3
Surface Area: 244854 cm^2
Hydraulic: N/A
Mechanical: N/A
Electrical: 110-250 VAC / 145-350 VDC
Com. & Protocol: RS232

NOTE: 4
ADDITIONAL INFORMATION:
Complete Class 1-4 Electrical Torque Tool System designed for subsea operations. Including Torque Tool wAuto Class Select, Control Canister, pressure compensator, cables and control PC.

The system combines all known advantages from a hydraulic torque tool system with the technology, advantages and precision only available from a modern servo-based electrical controlled drive system.

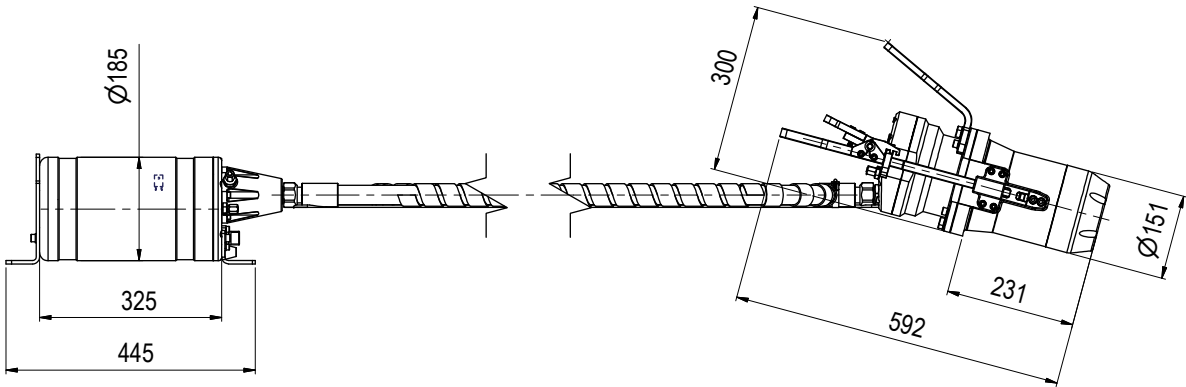
The Auto Class Select feature allows for automatic, mechanical adaption between Class 1 thru 4.
The control system will automatically detect engaged socket size.

The ELTT is designed for operation by ROV's with minimum 5-10A, 110 VAC of continuous power available. Max. allowed power consumption can be limited in the ELTT control system setup. Max continuous current consumption 20A.
Communication via RS232* protocol.

The ELTT is connected to the ROV using a 3,5m, oil-filled umbilical connected to an electrical power control module to be mounted on the ROV.

The complete system is delivered in an aluminum transport box size 1182x782x500 for onshore and offshore handling.

*RS485 Optional



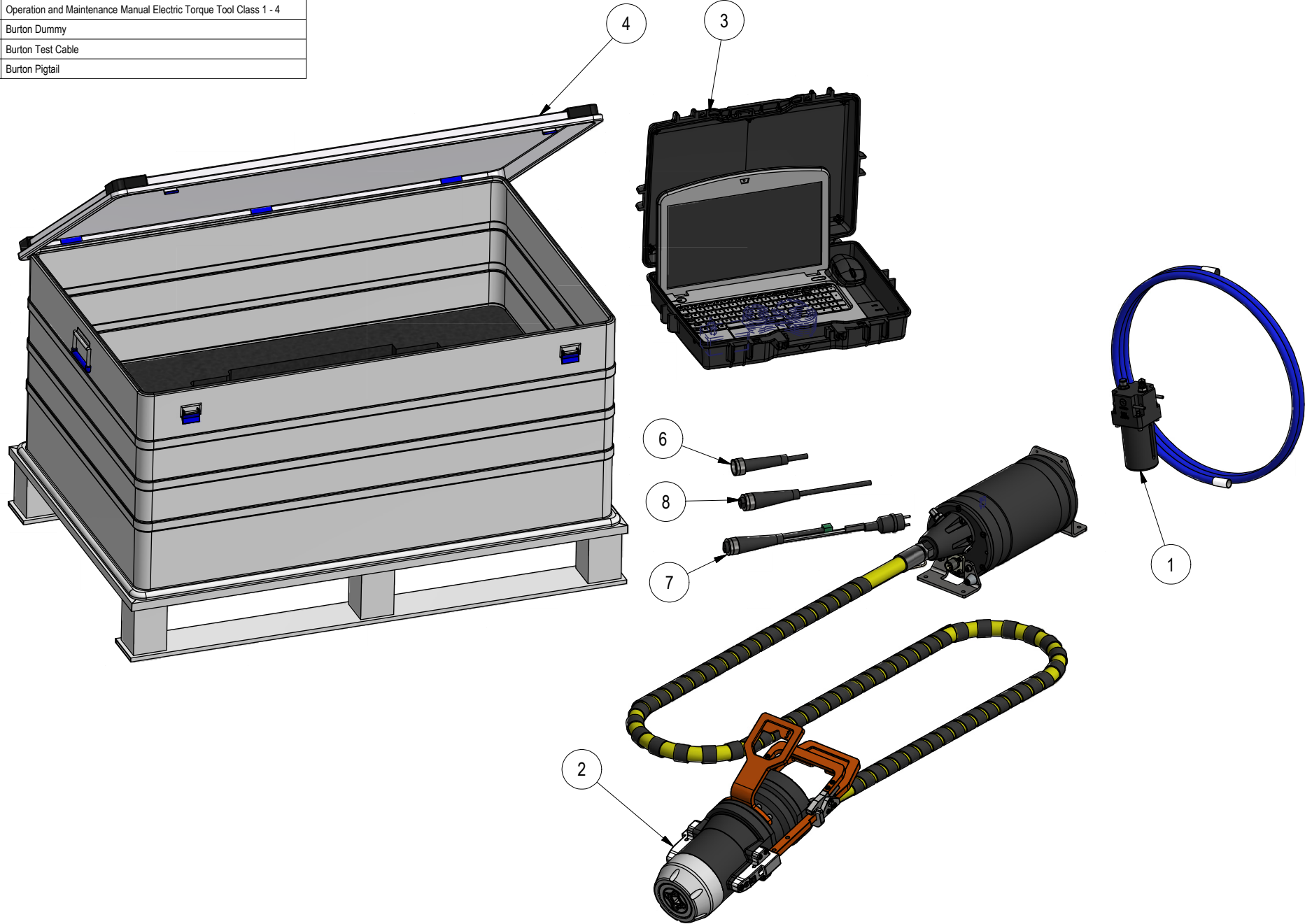
07	13.11.2024	7-IFC (Issued for Construction)		WTJ	LGH	WTJ
06	4.10.2024	7-IFC (Issued for Construction)		WTJ	LGH	WTJ
05	13.9.2024	7-IFC (Issued for Construction)		WTJ	LGH	WTJ
04	19.8.2024	7-IFC (Issued for Construction)		LGH	WTJ	LGH
Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.

BLUE LOGIC

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Dwg Scale: NTS	Drawing title: 2,7kNm Torque Tool wAutomatic Class Switch Stage 3 Output Kit	
Dwg Proj:		
Dwg Format: A3	Drawing number: BC0454	
		Rev: 07

Parts List			
ITEM	QTY	PART No.	TITLE
1	1	BC1765	Compensator 0,25L Kit for 2,7kNm Torque Tool
2	1	BC1749	2,7kNm EI Torque Tool wAutomatic Class Switch Stage 2-3 Output
3	1	BB2985	ETT Control PC wGUI Software and Pelicase
4	1	BB1086	Alu Box 415L incl. Foams
5	1	600144-TD-0003	Operation and Maintenance Manual Electric Torque Tool Class 1 - 4
6	1	102860	Burton Dummy
7	1	102354	Burton Test Cable
8	1	100499	Burton Pigtail



NOTE: 1
DESIGN CODE:
ISO 13628-8

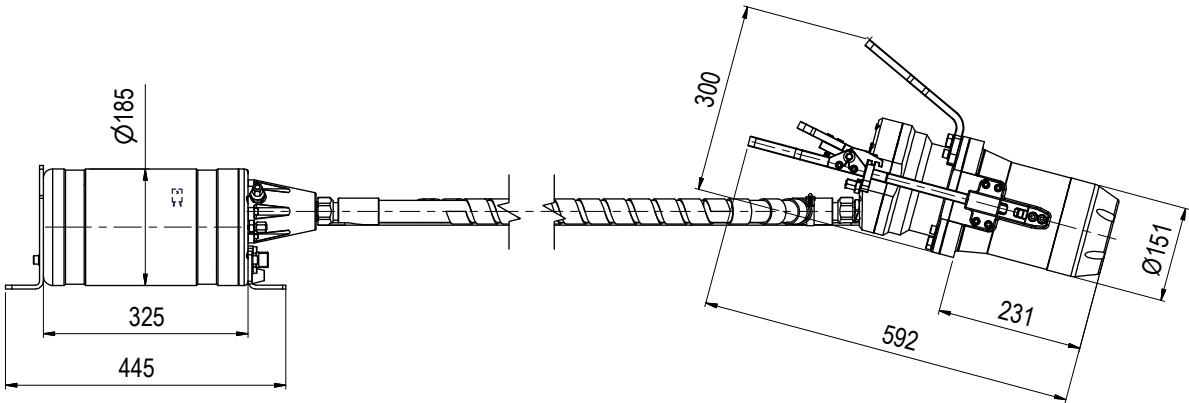
NOTE: 2
TECHNICAL CLASSIFICATION:
Article Type: 008-Actuation
Main Group: 8.01. ISO 1 to 4 Actuation
Intermediate Group: 8.44.01. Tool
Sub Group: 8.44.114.02. Intervention

NOTE: 3
INTERFACE INFORMATION:
Pressure Rating Bar: N/A
Material: Hard Anodize Aluminium
Weight: 55 kg
Volume: 148,85 dm^3
Surface Area: 245041 cm^2
Hydraulic: N/A
Mechanical: N/A
Electrical: 110-250 VAC / 145-350 VDC
Com. & Protocol: RS232

NOTE: 4
ADDITIONAL INFORMATION:
Complete Class 1-4 Electrical Torque Tool System for ROV subsea intervention. Kit includes EI Torque Tool with automatic selection of output socket, Control Canister, cables, and control pc with dedicated software for operation.

The Blue Logic Class 1-4 Electrical Torque Tool (ELTT) is a module based, compact, flexible and robust precision tool for subsea intervention. The system features advantages available from a modern servo based electrical controlled drive system including full control and logging of all parameters. Automatic socket selection to fit any Class 1 through 4. The control system will automatically detect selected socket and switch between stage 2 and stage 3 torque output accordingly. By shifting between stage 2 and 3, maximum accuracy is maintained throughout the overall torque range. The ELTT is designed for operation by ROVs with minimum 5-10A 110 VAC of continuous power available. Max. allowed power consumption can be limited in the ELTT control system setup. Max. continuous current consumption is 20A. The tool communicates through RS232 protocol*. The ELTT is connected to the ROV thru a 3,5m oil-filled umbilical connected to an electrical power control module to be mounted on the ROV. The system comes in an aluminum transport box, size 1182x782x500mm, for onshore and offshore handling.

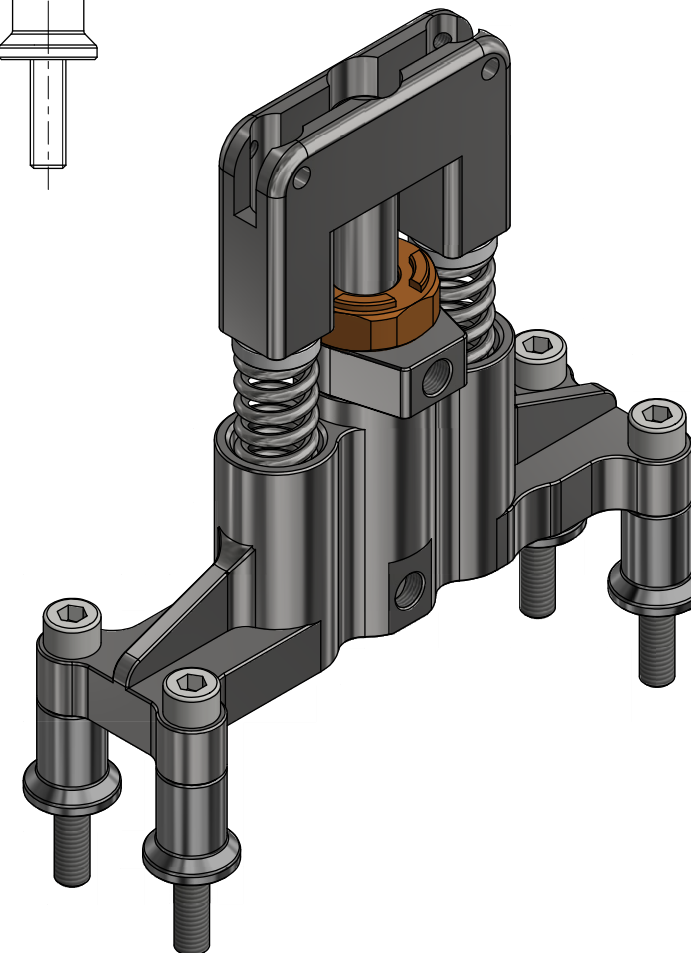
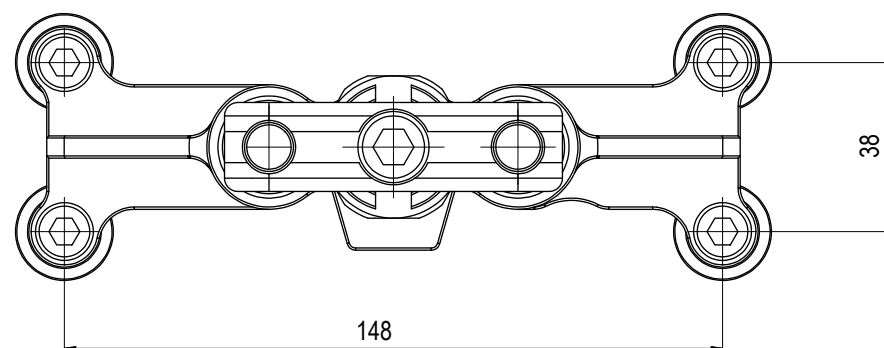
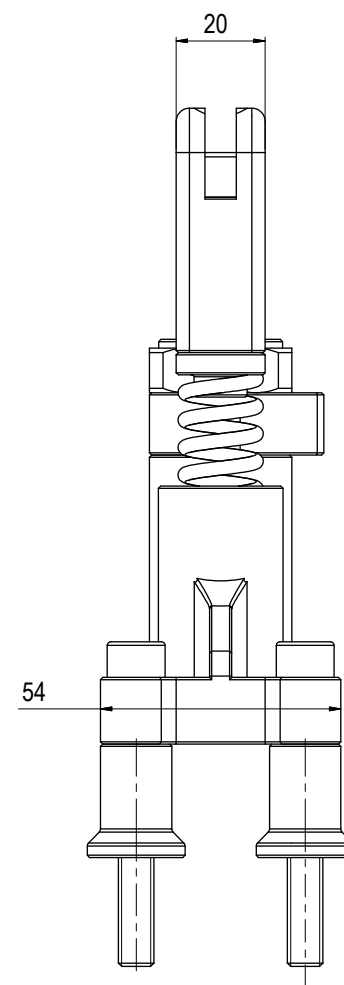
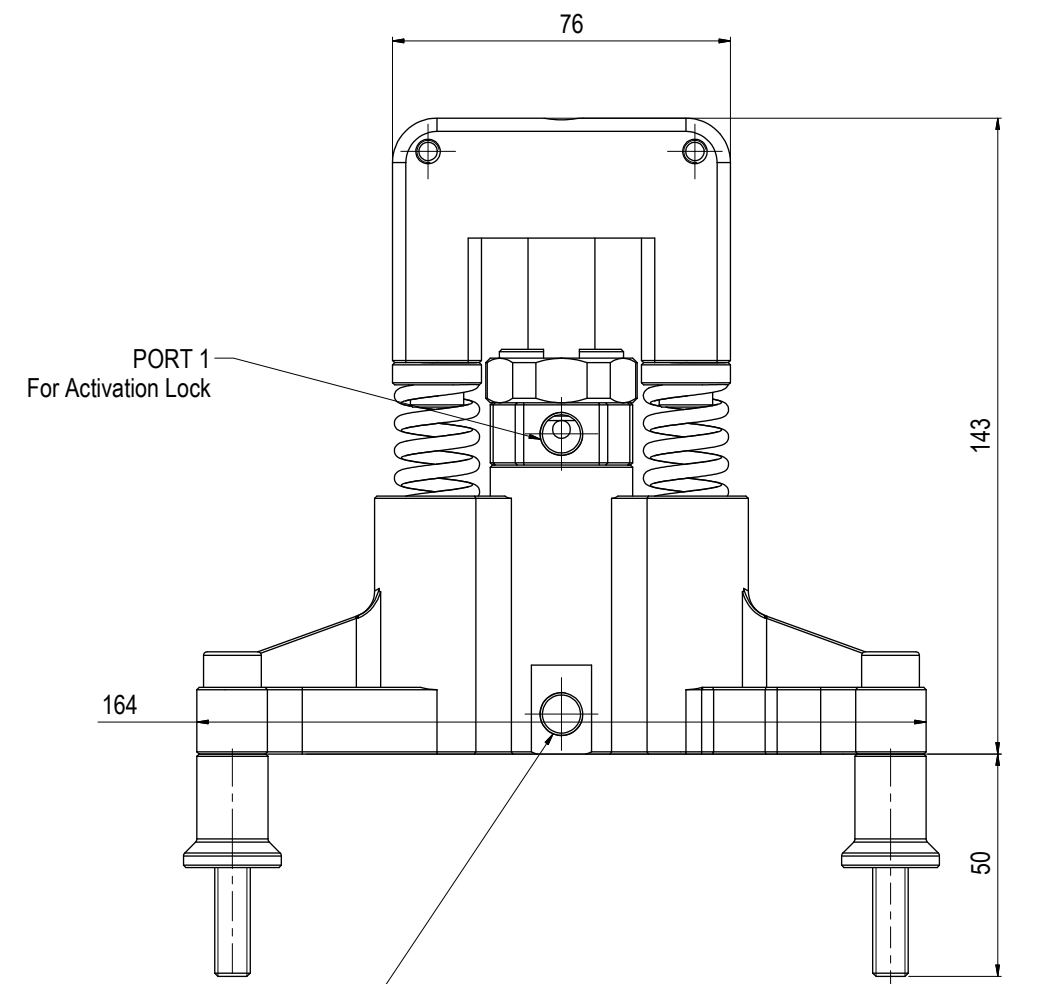
* Optional: RS485



03	13.11.2024	7-IFC (Issued for Construction)		WTJ	LGH	WTJ
02	4.10.2024	7-IFC (Issued for Construction)		WTJ	LGH	WTJ
01	24.8.2023	2-IFT (Issued for Tender)		WTJ	AJE	WTJ
Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.



Dwg Scale: NTS	Drawing title: 2,7kNm Torque Tool wAutomatic Class Switch Stage 2-3 Output Kit
Dwg Proj:	
Dwg Format: A3	
Drawing number: BC0145	Rev. 03



NOTE: 1
DESIGN CODE:
N/A

NOTE: 2
INTERFACE INFORMATION:
Hydraulic: 1/8" BSP
Mechanical: N/A
Electrical: N/A
Data Com.: N/A

NOTE: 3
PROPERTIES:
Material Class: N/A
Temperature Class: N/A
Rated Work Press Bar: 210
Test Pressure: N/A
Specification Level: N/A
Flow Rate: N/A
Qualification: N/A
Application: N/A
Load Rating: N/A
Torque Rating: N/A
Design Water Depth: 3000m
Weight in Air: 1,8 kg
Volume: 0,24 dm³
Submerged Weight: 1,59 kg

NOTE: 4
ADDITIONAL INFORMATION:
The hydraulic latch-mechanism is designed to be fitted onto the torque tool's main handle and uses a single-acting hydraulic cylinder with spring-return to ensure fail-safe release if hydraulic pressure is lost.

Hydraulic interface is represented by 2 off 1/8" BSP Ports.
PORT 1: Max. 215 Bar, Min. 140 Bar
PORT 2: 0,2-1 Bar

It is recommended to connect the hydraulic cylinder's second port of the ROV's compensation system.

NOTE: 5
OPERATION & MAINTENANCE INFORMATION:
600144-TD-0026

05	10.9.2024	7-IFC (Issued for Construction)		WTJ	LGH	WTJ
04	20.11.2023	7-IFC (Issued for Construction)		WTJ	LGH	WTJ
03	24.8.2023	7-IFC (Issued for Construction)		WTJ	LGH	HNJ
02	13.7.2020	2-IFT (Issued for Tender)		HNJ	N/A	N/A
Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.

APPENDIX 2 DATASHEET & SAFETY SHEET - GEAROIL Q8T65LS

Blue Logic documents 900460 and 900461.

Q8 T 65 75W-90

Synthetic API GL-5 axle fluid

Description

Q8 T 65 75W-90 is a superior synthetic axle lubricant. The product provides extreme protection due to its low operating temperature capability and oxidation resistance and facilitates easy gear shifting. The lubricant is formulated for heavy duty equipment such as rear-axes, final drives and selected manual transmissions, requiring special low temperature fluidity.

Applications

Q8 T 65 75W-90 is designed for heavy duty equipment such as rear-axes, final drives and selected manual transmissions, requiring special low temperature fluidity. It meets the requirements of the API GL-5 specification.

Benefits

- Full synthetic formulation to provide an extreme thermal stability.
- Superb fuel economy benefits, especially when used in axles.
- Reduces drive-line operating temperatures.
- Outstanding internal friction reduction.
- Outstanding protection against rust and corrosion.

Specifications, recommendations and approvals

API	GL-5	MB	235.0
Clark	ALC-1 5M 7-80 KE	Rockwell International	O-76-E
Clark	TLC-25 3M 8-83	Tatra	TDS 100/40 *
Eaton/Fuller	Bulletin 2052	Volvo	97312 (<2013)
Eaton/Fuller	Bulletin 2053	ZF	TE-ML 05A
Eaton/Fuller	Form 121	ZF	TE-ML 07A
Ford	M2C175-A	ZF	TE-ML 12A
Ford	M2C210-A	ZF	TE-ML 17B
GM	1940759 (90188629)		

* Pending approval

Properties

	Method	Unit	Typical
Density, 15 °C	D 4052	g/ml	0,860
Viscosity Grade	-	-	SAE 75W-90
Kinematic Viscosity, 40 °C	D 445	mm ² /s	92.8
Kinematic Viscosity, 100 °C	D 445	mm ² /s	14.1
Viscosity Index	D 2270	-	160
Brookfield Viscosity, -40 °C	D 2983	Pa.s	98
Pour Point	D 97	°C	-45
Flash Point, COC	D 92	°C	216

The figures above are not a specification. They are typical figures obtained within production tolerances.

Sustainability

*The product Carbon Footprint (PCF), cradle-to-gate (Q8Oils state of the art facility in Belgium), of Q8 T 65 75W-90 is **1.87** kg CO₂eq / kg.*

*Please contact Q8Oils to learn more about the positive environmental impact, the handprint, of this product.
For more info check here*



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SAFETY DATA SHEET

Q8 T 65 75W-90



SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name : Q8 T 65 75W-90
Viscosity or Type : SAE 75W-90

1.2 Relevant identified uses of the substance or mixture and uses advised against

Material uses : Lubricating oil for automotive transmissions

1.3 Details of the supplier of the safety data sheet

Supplier : Kuwait Petroleum Companies in the Benelux
Company Office: Brusselstraat 59, 2018 Antwerp, Belgium
Contactaddress: Petroleumkaai 7, 2020 Antwerp, Belgium
Tel. +32 3 247 38 11, Fax +32 3 216 03 42

Manufacturer / Distributor : Kuwait Petroleum Belgium N.V./S.A. / Q8Oils Italia S.r.l.
Petroleumkaai 7 Via Volpedo 2
B-2020 Antwerp 15050 Castellar Guidobono (AL)
Belgium Italy

e-mail address of person responsible for this SDS : SDSinfo@Q8.com, communication preferably in English only.

PCN Information contact : PCNinfo@Q8.com, communication preferably in English only.

1.4 Emergency telephone number

Europe : +44 (0) 1235 239 670
Global (English only) : +44 (0) 1865 407 333



National advisory body/Poison Center

Belgium : Poison Centre : +32 (0)70 245 245

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Not classified.

The product is not classified as hazardous according to Regulation (EC) 1272/2008 as amended.

Ingredients of unknown toxicity : None.

Ingredients of unknown ecotoxicity : None.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Signal word : No signal word.

Hazard statements : No known significant effects or critical hazards.

Precautionary statements

Q8 T 65 75W-90

SECTION 2: Hazards identification

General	: P103 - Read carefully and follow all instructions. P102 - Keep out of reach of children. P101 - If medical advice is needed, have product container or label at hand.
Prevention	: Not applicable.
Response	: Not applicable.
Storage	: Not applicable.
Disposal	: Not applicable.
Supplemental label elements	: Contains Reaction products of bis(4-methylpentan-2-yl)dithiophosphoric acid with phosphorus oxide, propylene oxide and amines, C12-14-alkyl (branched) and Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.. May produce an allergic reaction. Safety data sheet available on request.
Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles	: Not applicable.
Special packaging requirements	
Containers to be fitted with child-resistant fastenings	: Not applicable.
Tactile warning of danger	: Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII	: This mixture does not contain any substances that are assessed to be a PBT or a vPvB.
Other hazards which do not result in classification	: Prolonged or repeated contact may dry skin and cause irritation. May cause endocrine disruption.

SECTION 3: Composition/information on ingredients

3.2 Mixtures	: Mixture
--------------	-----------

Product/ingredient name	Identifiers	%	Classification	Specific Conc. Limits, M-factors and ATEs	Type
Severely refined mineral oil (C15 - C50) * - Not classified.	-	≥10 - ≤25	Not classified.	-	[2]
Severely refined mineral oil (C15 - C50) * - H304	-	≤5	Asp. Tox. 1, H304	-	[1] [2]
Reaction products of bis (4-methylpentan-2-yl) dithiophosphoric acid with phosphorus oxide, propylene oxide and amines, C12-14-alkyl (branched)	REACH #: 01-2119493620-38 EC: 931-384-6	<2.5	Acute Tox. 4, H302 Eye Irrit. 2, H319 Skin Sens. 1B, H317 Aquatic Chronic 2, H411	ATE [Oral] = 2000 mg/kg Eye Irrit. 2, H319: C ≥ 50% Skin Sens. 1, H317: C ≥ 9.39%	[1]
Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.	REACH #: 01-2119971727-23 EC: 939-460-0 CAS: 1471311-26-8	≤0.3	Skin Irrit. 2, H315 Eye Dam. 1, H318 Skin Sens. 1B, H317 Aquatic Chronic 3,	-	[1] [3]

Q8 T 65 75W-90

SECTION 3: Composition/information on ingredients

			H412 See Section 16 for the full text of the H statements declared above.		
--	--	--	--	--	--

* Contains one or more of the following:

CAS: 64742-54-7, EC: 265-157-1, EU REACH: 01-2119484627-25

CAS: 64742-55-8, EC: 265-158-7, EU REACH: 01-2119487077-29

CAS: 64742-56-9, EC: 265-159-2, EU REACH: 01-2119480132-48

CAS: 64742-65-0, EC: 265-169-7, EU REACH: 01-2119471299-27

The mineral base oils contained in this product are severely refined and contain less than 3% DMSO extract according to IP 346 method, and are therefore not classified as carcinogen according to Regulation (EC) No 1272/2008, note L.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard

[2] Substance with a workplace exposure limit

[3] Substance of equivalent concern

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** : Wash skin thoroughly with soap and water or use recognized skin cleanser. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

- Eye contact** : No specific data.
- Inhalation** : No specific data.
- Skin contact** : Adverse symptoms may include the following:
irritation
dryness
cracking
- Ingestion** : No specific data.

SECTION 4: First aid measures

4.3 Indication of any immediate medical attention and special treatment needed

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

- Suitable extinguishing media** : Use dry chemical, CO₂, alcohol-resistant foam or water spray (fog).
- Unsuitable extinguishing media** : Do not use water jet.

5.2 Special hazards arising from the substance or mixture

- Hazards from the substance or mixture** : In a fire or if heated, a pressure increase will occur and the container may burst.
- Hazardous combustion products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

5.3 Advice for firefighters

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

- : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6.3 Methods and materials for containment and cleaning up

- Small spill** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

SECTION 6: Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Dispose of via a licensed waste disposal contractor.

6.4 Reference to other sections : See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8).
Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

7.2 Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

7.3 Specific end use(s)

Recommendations : Not available.
Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
Severely refined mineral oil (C15 - C50) * - Not classified.	Limit values (Belgium, 5/2021). [] TWA: 5 mg/m ³ 8 hours. Form: mist STEL: 10 mg/m ³ 15 minutes. Form: mist EU OEL (Europe). TWA: 5 mg/m ³ 8 hours. Form: Mist STEL: 10 mg/m ³ 15 minutes. Form: Mist
Severely refined mineral oil (C15 - C50) * - H304	Limit values (Belgium, 5/2021). [] TWA: 5 mg/m ³ 8 hours. Form: mist STEL: 10 mg/m ³ 15 minutes. Form: mist EU OEL (Europe). TWA: 5 mg/m ³ 8 hours. Form: Mist STEL: 10 mg/m ³ 15 minutes. Form: Mist

Biological exposure indices

No exposure indices known.

SECTION 8: Exposure controls/personal protection

Recommended monitoring procedures : Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.	DNEL	Long term Oral	0.33 mg/kg bw/day	General population	Systemic
	DNEL	Long term Inhalation	0.58 mg/m ³	General population	Systemic
	DNEL	Long term Inhalation	2.35 mg/m ³	Workers	Systemic
	DNEL	Long term Dermal	33.33 mg/kg bw/day	General population	Systemic
	DNEL	Long term Dermal	66.7 mg/kg bw/day	Workers	Systemic

PNECs

No PNECs available.

8.2 Exposure controls

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Wear suitable gloves tested to EN374. Recommended: < 1 hour (breakthrough time): nitrile rubber 0.17 mm. Provide employee with skin care programmes.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

SECTION 8: Exposure controls/personal protection

- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Recommended: Boiling point > 65 °C: A1; Boiling point < 65 °C: AX1; Hot material: A1P2.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

- Physical state** : Liquid. [Oily liquid.]
- Appearance** : Clear.
- Color** : Yellow [Light]
- Odor** : Characteristic.
- Odor threshold** : Not available.
- Melting point/freezing point** : Not applicable.
- Pour point** : <-39°C (<-38.2°F) [ASTM D 5950]
- Initial boiling point and boiling range** : >300°C (>572°F)
- Flammability** : Not applicable.
- Lower and upper explosion limit** : Not available.
- Flash point** : Open cup: >180°C (>356°F) [ASTM D92.]
- Auto-ignition temperature** : >300°C (>572°F)
- Decomposition temperature** : >300°C
- pH** : Not applicable.
- Viscosity** : Kinematic (40°C (104°F)): 92.8 mm²/s (92.8 cSt) [ASTM D 445]
Kinematic (100°C (212°F)): 14 to 16 mm²/s (14 to 16 cSt) [ASTM D 445]
- Solubility(ies)** :

Media	Result
cold water	Not soluble
hot water	Not soluble

- Solubility in water** : Not available.
- Miscible with water** : No.
- Partition coefficient: n-octanol/ water** : Not applicable.
- Vapor pressure** : <0.01 kPa (<0.075006 mm Hg)
- Density** : 0.87 g/cm³ [15°C (59°F)] [ASTM D 4052]
- Vapor density** : Not available.
- Explosive properties** : Not applicable.
- Oxidizing properties** : Not applicable.
- Particle characteristics**
- Median particle size** : Not applicable.

9.2 Other information

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SECTION 9: Physical and chemical properties

9.2.1 Information with regard to physical hazard classes

Explosive properties : Not applicable.
Oxidizing properties : Not applicable.

9.2.2 Other safety characteristics

Miscible with water : No.

SECTION 10: Stability and reactivity

10.1 Reactivity : No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability : The product is stable.

10.3 Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid : No specific data.

10.5 Incompatible materials : Reactive or incompatible with the following materials:
Strong oxidizing materials

10.6 Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Severely refined mineral oil (C15 - C50) * - Not classified.	LC50 Inhalation Dusts and mists	Rat - Male, Female	5.53 mg/l	4 hours
	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
Severely refined mineral oil (C15 - C50) * - H304	LC50 Inhalation Dusts and mists	Rat - Male, Female	5.53 mg/l	4 hours
	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
Reaction products of bis(4-methylpentan-2-yl) dithiophosphoric acid with phosphorus oxide, propylene oxide and amines, C12-14-alkyl (branched)	LD50 Oral	Rat - Male, Female	2000 mg/kg	-

Conclusion/Summary : Not available.

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapors) (mg/l)	Inhalation (dusts and mists) (mg/l)
Q8 T 65 75W-90	123571.2	N/A	N/A	N/A	N/A
Severely refined mineral oil (C15 - C50) * - Not classified.	N/A	N/A	N/A	N/A	5.53
Severely refined mineral oil (C15 - C50) * - H304	N/A	N/A	N/A	N/A	5.53
Reaction products of bis(4-methylpentan-2-yl) dithiophosphoric acid with phosphorus oxide, propylene oxide and amines, C12-14-alkyl	2000	N/A	N/A	N/A	N/A

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SECTION 11: Toxicological information

(branched)

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Severely refined mineral oil (C15 - C50) * - Not classified.	Eyes - Iris lesion	Rabbit	0	48 hours	72 hours
Severely refined mineral oil (C15 - C50) * - H304	Eyes - Redness of the conjunctivae	Rabbit	0.33	48 hours	72 hours
	Skin - Edema	Rabbit	0	72 hours	7 days
	Skin - Erythema/Eschar	Rabbit	0.17	72 hours	7 days
	Eyes - Iris lesion	Rabbit	0	48 hours	72 hours
	Eyes - Redness of the conjunctivae	Rabbit	0.33	48 hours	72 hours
	Skin - Edema	Rabbit	0	72 hours	7 days
	Skin - Erythema/Eschar	Rabbit	0.17	72 hours	7 days

Conclusion/Summary : Not available.

Sensitization

Product/ingredient name	Route of exposure	Species	Result
Severely refined mineral oil (C15 - C50) * - Not classified.	skin	Guinea pig	Not sensitizing
Severely refined mineral oil (C15 - C50) * - H304	skin	Guinea pig	Not sensitizing
Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.	skin	Guinea pig	Sensitizing

Conclusion/Summary : Not available.

Mutagenicity

Product/ingredient name	Test	Experiment	Result
Severely refined mineral oil (C15 - C50) * - Not classified.	474 Mammalian Erythrocyte Micronucleus Test	Experiment: In vivo Subject: Mammalian-Animal Cell: Somatic	Negative
Severely refined mineral oil (C15 - C50) * - H304	474 Mammalian Erythrocyte Micronucleus Test	Experiment: In vivo Subject: Mammalian-Animal Cell: Somatic	Negative

Conclusion/Summary : Not available.

Carcinogenicity

Product/ingredient name	Result	Species	Dose	Exposure
Severely refined mineral oil (C15 - C50) * - Not classified.	Negative - Dermal - TC	Mouse - Female	-	78 weeks
Severely refined mineral oil (C15 - C50) * - H304	Negative - Dermal - TC	Mouse - Female	-	78 weeks

Conclusion/Summary : Not available.

Reproductive toxicity

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SECTION 11: Toxicological information

Product/ingredient name	Maternal toxicity	Fertility	Development toxin	Species	Dose	Exposure
Severely refined mineral oil (C15 - C50) * - Not classified.	Negative	Negative	Negative	Rat - Male, Female	Oral: 1000 mg/kg	-
Severely refined mineral oil (C15 - C50) * - H304	Negative	Negative	Negative	Rat - Male, Female	Oral: 1000 mg/kg	-

Conclusion/Summary : Not available.

Teratogenicity

Product/ingredient name	Result	Species	Dose	Exposure
Severely refined mineral oil (C15 - C50) * - Not classified.	Negative - Dermal	Rat	2000 mg/kg	7 days per week
Severely refined mineral oil (C15 - C50) * - H304	Negative - Dermal	Rat	2000 mg/kg	7 days per week

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Product/ingredient name	Result
Severely refined mineral oil (C15 - C50) * - H304	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Not available.

Potential acute health effects

- Eye contact** : No known significant effects or critical hazards.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Defatting to the skin. May cause skin dryness and irritation.
- Ingestion** : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No specific data.
- Inhalation** : No specific data.
- Skin contact** : Adverse symptoms may include the following:
irritation
dryness
cracking
- Ingestion** : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

- Potential immediate effects** : Not available.
- Potential delayed effects** : Not available.

Long term exposure

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SECTION 11: Toxicological information

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
Severely refined mineral oil (C15 - C50) * - Not classified.	Sub-acute LOAEL Oral	Rat - Male	125 mg/kg	13 weeks; 5 hours per day
	Sub-chronic NOAEL Oral	Rat - Male, Female	≥2000 mg/kg	13 weeks; 5 days per week
	Sub-acute NOAEL Inhalation Vapor	Rat - Male	>980 mg/m ³	4 weeks; 5 days per week
Severely refined mineral oil (C15 - C50) * - H304	Sub-acute LOAEL Oral	Rat - Male	125 mg/kg	13 weeks; 5 hours per day
	Sub-chronic NOAEL Oral	Rat - Male, Female	≥2000 mg/kg	13 weeks; 5 days per week
	Sub-acute NOAEL Inhalation Vapor	Rat - Male	>980 mg/m ³	4 weeks; 5 days per week

Conclusion/Summary : Not available.

General : Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

11.2 Information on other hazards

11.2.1 Endocrine disrupting properties

Not available.

11.2.2 Other information

Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
Severely refined mineral oil (C15 - C50) * - Not classified.	Acute NEL >100 mg/l Fresh water	Algae	72 hours
	Acute NEL >10000 mg/l Fresh water	Daphnia - <i>Daphnia Magma</i>	48 hours
	Acute NEL ≥100 mg/l Fresh water	Fish - <i>Pimephales promelas</i>	96 hours
Severely refined mineral oil (C15 - C50) * - H304	Chronic NEL 10 mg/l Fresh water	Daphnia - <i>Daphnia magna</i>	21 days
	Acute NEL >100 mg/l Fresh water	Algae	72 hours
	Acute NEL >10000 mg/l Fresh water	Daphnia - <i>Daphnia Magma</i>	48 hours
	Acute NEL ≥100 mg/l Fresh water	Fish - <i>Pimephales promelas</i>	96 hours
	Chronic NEL 10 mg/l Fresh water	Daphnia - <i>Daphnia magna</i>	21 days

Conclusion/Summary : Not available.

12.2 Persistence and degradability

Product/ingredient name	Test	Result	Dose	Inoculum
Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.	-	17.4 % - 28 days	-	-

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SECTION 12: Ecological information

Conclusion/Summary : Not available.			
Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Severely refined mineral oil (C15 - C50) * - Not classified.	-	-	Inherent
Severely refined mineral oil (C15 - C50) * - H304	-	-	Inherent
Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.	-	-	Not readily

12.3 Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.	9.4	-	High

12.4 Mobility in soil

Soil/water partition coefficient (K _{oc})	: Not available.
Mobility	: Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Endocrine disrupting properties

May cause endocrine disruption.

12.7 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product	
Methods of disposal	: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.
Hazardous waste	: Yes.
European waste catalogue (EWC)	
Waste code	Waste designation
13 02 05*	mineral-based non-chlorinated engine, gear and lubricating oils

Packaging

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SECTION 13: Disposal considerations

- Methods of disposal** : The generation of waste should be avoided or minimized wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.
- Special precautions** : This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number or ID number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class(es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

- 14.6 Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

- 14.7 Maritime transport in bulk according to IMO instruments** : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

[EU Regulation \(EC\) No. 1907/2006 \(REACH\)](#)

[Annex XIV - List of substances subject to authorization](#)

[Annex XIV](#)

Intrinsic property	Ingredient name	Status	Reference number	Date of revision
Substance of equivalent concern for environment	Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.	Listed	-	-
Endocrine disrupting properties for environment	reaction products of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and 4-heptylphenol, branched and linear (RP-HP) (with $\geq 0,1$ % w/w 4-heptylphenol, branched and linear)	Listed	57	01-05-2022

[Substances of very high concern](#)

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SECTION 15: Regulatory information

Intrinsic property	Ingredient name	Status	Reference number	Date of revision
Substance of equivalent concern for environment	Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.	Candidate	-	-
Endocrine disrupting properties for environment	reaction products of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and 4-heptylphenol, branched and linear (RP-HP) with $\geq 0.1\%$ w/w 4-heptylphenol, branched and linear (4-HPbl)	Recommended	ED/01/2018	01-10-2019

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

No listed substance

Other EU regulations

Industrial emissions (integrated pollution prevention and control) - Air : Not listed

Industrial emissions (integrated pollution prevention and control) - Water : Not listed

Explosive precursors : Not applicable.

Ozone depleting substances (1005/2009/EU)

Not listed.

Prior Informed Consent (PIC) (649/2012/EU)

Not listed.

Persistent Organic Pollutants

Not listed.

Seveso Directive

This product is not controlled under the Seveso Directive.

National regulations

Germany

Hazard class for water (WGK) : 2

Switzerland

VOC content : Exempt.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

SECTION 15: Regulatory information

Inventory list

Australia	: All components are listed or exempted.
Canada	: All components are listed or exempted.
China	: All components are listed or exempted.
Eurasian Economic Union	: Russian Federation inventory : Not determined.
Japan	: Japan inventory (CSCL) : All components are listed or exempted. Japan inventory (ISHL) : Not determined.
New Zealand	: All components are listed or exempted.
Philippines	: All components are listed or exempted.
Republic of Korea	: All components are listed or exempted.
Taiwan	: All components are listed or exempted.
Thailand	: Not determined.
Turkey	: Not determined.
United States of America	: All components are active or exempted.
Viet Nam	: Not determined.

15.2 Chemical Safety Assessment	: Chemical Safety Assessments for all substances in this product are either Complete or Not applicable.
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SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms	: ADN = European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway : ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road : ASTM = American Society for Testing and Materials : ATE = Acute Toxicity Estimate : BCF = Bioconcentration Factor : CAS = Chemical Abstracts Service : CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008] : DIN = German Institute for Standardization : DMEL = Derived Minimal Effect Level : DNEL = Derived No Effect Level : EC = European Commission : EC50 = Half maximal effective concentration : EN = European Standard (Norm) : EUH statement = CLP-specific Hazard statement : GHS - Globally Harmonized System of Classification and Labeling of Chemicals : IATA = International Air Transport Association : IBC = Intermediate Bulk Container : IC50 = Half maximal inhibitory concentration : IMDG = International Maritime Dangerous Goods : IMO = International Maritime Organisation : ISO = International Organization for Standardization : LC50 = Median lethal concentration : LD50 = Median lethal dose : LOAEL / LOAEC = Lowest Observed Adverse Effect Level / Concentration : MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution) : N/A = Not available : NOAEL / NOAEC = No Observed Adverse Effect Level / Concentration : NOEL / NOEC = No Observed Effect Level / Concentration : OECD = Organisation for Economic Co-operation and Development : OEL = Occupational Exposure Limit : PBT = Persistent, Bioaccumulative and Toxic : PNEC = Predicted No Effect Concentration
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SECTION 16: Other information

REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals
Regulation [Regulation (EC) No. 1907/2006]
RID = The Regulations concerning the International Carriage of Dangerous Goods
by Rail
SDS = Safety Data Sheet
SVHC = Substances of Very High Concern
STEL = Short Term Exposure Limit
TLV = Threshold Limit Value
TWA = Time Weighted Average
UFI = Unique Formula Identifier
UN = United Nations
VOC = Volatile Organic Compound
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Not classified.

The mineral base oils contained in this product are severely refined and contain less than 3% DMSO extract according to IP 346 method, and are therefore not classified as carcinogen according to Regulation (EC) No 1272/2008, note L.

Note L: The classification as a carcinogen need not apply if it can be shown that the substance contains less than 3 % DMSO extract as measured by IP 346 "Determination of polycyclic aromatics in unused lubricating base oils and asphaltene free petroleum fractions — Dimethyl sulphoxide extraction refractive index method", Institute of Petroleum, London. This note applies only to certain complex oil-derived substances in Part 3.

Full text of abbreviated H statements

H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.
H411	Toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.

Full text of classifications [CLP/GHS]

Acute Tox. 4	ACUTE TOXICITY - Category 4
Aquatic Chronic 2	AQUATIC HAZARD (LONG-TERM) - Category 2
Aquatic Chronic 3	AQUATIC HAZARD (LONG-TERM) - Category 3
Asp. Tox. 1	ASPIRATION HAZARD - Category 1
Eye Dam. 1	SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
Eye Irrit. 2	SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2
Skin Irrit. 2	SKIN CORROSION/IRRITATION - Category 2
Skin Sens. 1B	SKIN SENSITIZATION - Category 1B

Training advice	: Ensure operatives are trained to minimise exposures.
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Prepared by	: Kuwait Petroleum Research & Technology B.V., The Netherlands

Notice to reader

The information in this SDS is based on the present state of our knowledge and on current laws. The product is not to be used for purposes other than those specified under section 1 without first obtaining written handling instructions. It is always the responsibility of the user to take all necessary steps to fulfill the demands set out in the local rules and legislation. The information in this SDS is meant to be a description of the safety requirements for our product. It is not to be considered a guarantee of the product's properties.