

Tensor DS and Tensor DL Drive with Tools Talk DS/DL

Atlas Copco Tools and Assembly Systems AB



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1. Safety Instructions

WARNING

Read and understand all instructions. Failure to follow all the instructions listed below may result in electric shock, fire and/or serious personal injury.

SAVE THESE INSTRUCTIONS

IMPORTANT

All locally legislated safety rules with regard to installation, operation and maintenance must be respected at all times. Refer installation and servicing to qualified personnel only.

Work Area

Keep your work area clean and well lit. Cluttered benches and dark areas invite accidents.

Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust. Power tools create sparks, which may ignite dust or fumes.

Keep bystanders, children, and visitors away while operating a power tool. Distractions may cause you to lose control.

Electrical Safety

Earthed tools must be plugged into an outlet that has been properly installed and earthed in compliance with all relevant codes and ordinances. Never remove the earthing prong or modify the plug in any way. Do not use any adapter plugs. Check with a qualified electrician if you are in any doubt as to whether the outlet is properly earthed. Should the tools suffer electronic malfunction or breakdown, earthing provides a low resistance path to carry electricity away from the user. *Applicable only to Class I (earthed) tools.*

THIS MUST BE EARTHED!

Avoid body contact with grounded surfaces such as pipes, radiators, ranges and refrigerators. There is an increased risk of electric shock if your body is grounded.

Don't expose power tools to rain or wet conditions. Water entering a power tool will increase the risk of electric shock. This instruction does not apply to tools classified as watertight or splash proof.

For minimum electrical interference, place the instrument far away from possible sources of electrical noise, e.g. arc welding equipment etc.

Do not abuse the cord. Never use the cord to carry the tools or pull the plug from an outlet. Keep cord away from heat, oil, sharp edges or moving parts. Replace damaged cords immediately. Damaged cords increase the risk of electric shock.

Personal Safety

Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use tool while tired or under the influence of drugs, alcohol, or medication. A momentary lapse in concentration whilst operating power tools may result in serious personal injury.

Dress properly. Do not wear loose clothing or jewellery. Tie long hair back. Keep your hair, clothing, and gloves away from moving parts. Loose clothes, jewellery, or long hair can be caught in moving parts.

Safety Instructions

Avoid accidental starting. Be sure switches are in the off position before plugging in. Carrying tools with your finger on the switch or plugging in tools that have the switch set to on invites accidents.

Remove adjusting keys or switches before turning the tool on. A wrench or a key that is left attached to a rotating part of the tool may result in personal injury.

Do not overreach. Keep proper footing and balance at all times. Proper footing and balance enables better control of the tool in unexpected situations.

Tool Use and Care

Use clamps or other practical means to secure and support the work piece to a stable platform. Holding the work by hand or against your body is unstable and may lead to loss of control.

Do not force the tool. Use the correct Atlas Copco Tensor tool for your application. The correct tool will do the job better and safer at the rate for which it is designed.

Do not use tool if switch does not work. Any tool that cannot be controlled by the switch is dangerous and must be repaired.

Disconnect the plug from the power source before making any adjustments, changing accessories, or storing the tool. Such preventive safety measures reduce the risk of starting the tool accidentally. The mains plug is considered to be a disconnecting device. Disconnect the tool from the mains by pulling the plug from the socket in order to cut the power.

Store tools out of reach of children and other untrained persons when not in use. Tools are dangerous in the hands of untrained users.

Check for misalignment or binding of moving parts, damage, and any other condition that may affect tool operation. If damaged, have the tool serviced before using. Poorly maintained tools cause many accidents.

Only use accessories that are recommended by the manufacturer for your model. Accessories that may be suitable for one tool may become hazardous when used on another tool.

SERVICE

Tools should only be serviced by qualified repair personnel. Service or maintenance performed by unqualified personnel could expose users to serious personal injury.

When servicing a tool, only use original replacement parts. Use of unauthorised parts or failure to follow Maintenance Instructions may create a result in electric shock or personal injury.

CAUTION

There is a danger of explosion if batteries are incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries in accordance with manufacturer's instructions.

2. Introduction

2.1 General

Tensor S electric nutrunners brought a minor revolution to controlled tightening. They are now the industry standard for critical joints with safety applications, though not economically feasible for use on joints throughout a whole plant.

Tensor DS is the alternative that lets you apply the benefits of advanced electric systems for controlled tightening on all the joints in your product. With Tensor DS you do not need to depend on mechanical devices or human repeatability to safeguard your joint integrity. Tensor DS means you can afford Tensor levels of operator acceptance, operator feedback, productivity, dependability, low service cost, multi-torque and joint control for all your tightening operations.

Tensor DL is the electric tool choice for small screw assembly. Its small size and good performance will increase productivity and reduce costs in your assembly operations. Tensor DL incorporates all the functionality of the Tensor DS, e.g. operator guidance, process control and rundown monitoring functionality.

2.2 DS/DL Drive

The Tensor DS/DL electric nutrunners and screwdrivers are extremely fast and light. The Tensor DS/DL Drive does not use a torque transducer, instead it uses the unique Atlas Copco DigiTork system, proven to achieve excellent repeatability.

The Drive is programmed using the ToolsTalk DS/DL programming tool which runs on a normal Windows based pc or lap top.

It is also possible to program the drive to a limited extent directly on the key pad, see section Key Pad Programming, chapter 3.10.

The Tensor DS Tools come in three different motor sizes DS4, DS7 and DS9, and can handle torques from 1 to 2000 Nm. Each tool requires its own drive unit.

The Tensor DL tools come in two different motor sizes: DL11 and DL 21, and can handle torques from 0,2 to 10 Nm. Each tool requires its own drive unit.

Two different Drive versions

There are two different functionality levels of the Tensor DS/DL system, the D302 / D303 Basic drive and the D312 / D313 Advanced drive with the possibility to program up to ten different parameter settings.

For DS Tools, each drive version comes for different tool sizes: DS4, DS7 and DS9.

For DL tools, there is only one drive version for all tool sizes: DL.

If you have multi-torque applications, you should definitely consider the benefits of D312 / D313. With ten different parameter sets on each tool you as much as halve your initial investment cost. You also benefit from lower installation costs and reduced backup inventory costs.

Besides the Multi Torque capability the D312 / D313 / 313 version is also equipped with: Digital Inputs, Relays, I/O-bus, Line Control, PLC functions, Rotate Spindle, Rundown Monitoring, Self Tap, High Speed Rundown and a Lock on Reject option.

ToolsTalk DS/DL fits with all drive versions (DS & DL) and will automatically detect the version of the drive, D302, D303, D312 and D313 and open up the appropriate functions.

2.3 System Functionality

The DS/DL System has no transducer in the tool. Instead of having an electrical signal from a strain gauge, the DS/DL Tool derives the torque from different relevant parameters in the motor, such as voltage, speed, temperature and current.

A complete system consists of:

The main power supply cable included with the drive

Tensor DS/DL Tool

Tool Cable

DS/DL Drive

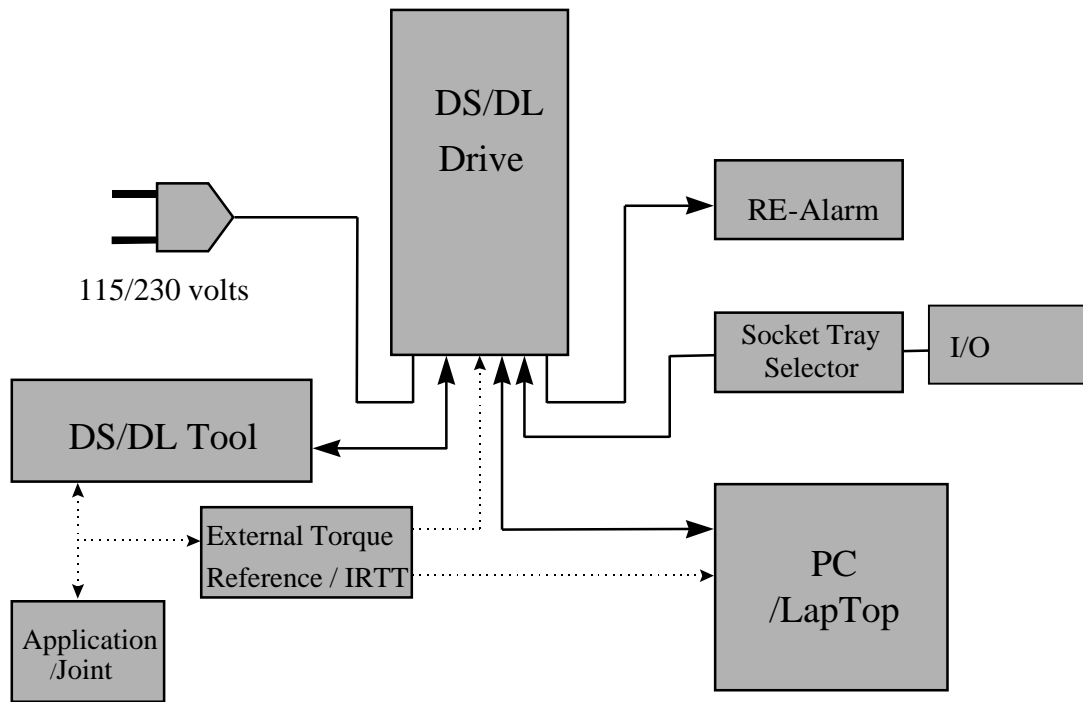
Programming Cable

ToolsTalk DS/DL

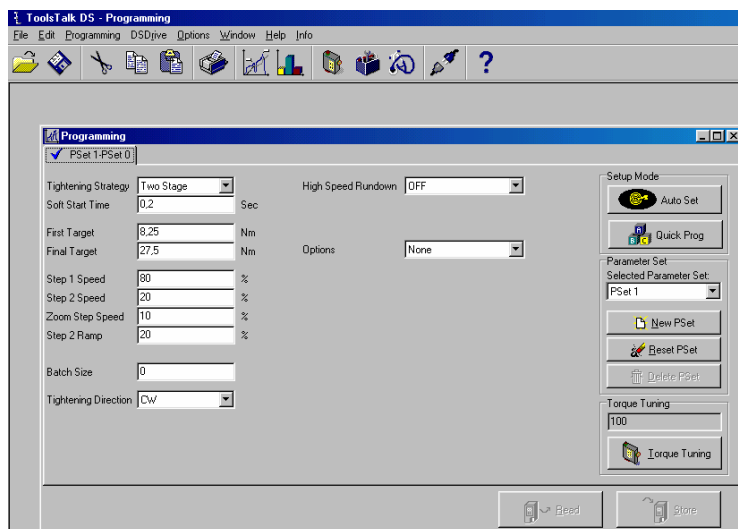
PC / Lap Top



The DS/DL System



2.4 ToolsTalk DS/DL



When programming the Drive a specially designed windows program is used for that purpose, ToolsTalk DS/DL. ToolsTalk is ordered as a single item and is needed in order to get full access to all functions in the drive.

ToolsTalk DS/DL (TTDS/DL) is an Atlas Copco made software running on a normal PC or Lap Top under Windows 95 (i.e. 32 bit Windows which includes Windows 95, 98, 2000 and NT but not Windows 3.X). It is used to program the Drive unit. Tensor DS is a system consisting of one Tensor DS/DL Tool, one cable and one Drive.

Important When Programming the Drive

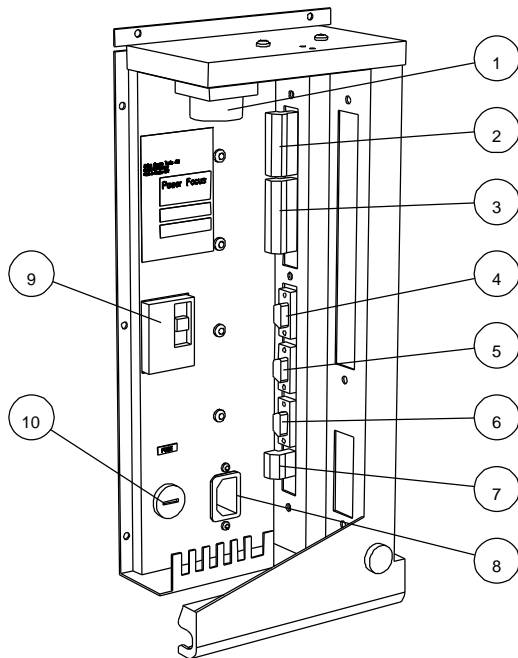
When programming the Drive, It is of greatest importance to have a well developed second stage. The fastener/socket should allow some angle rotation in the second stage of the tightening, or else the torque may overshoot. The best way to determine this is simply by observing the angle rotation during the second stage.

If the tool overshoots a red toggling led will show on the tool. The criteria for high torque is a short or a non-existing second stage in combination with a high speed in the first stage. On the display the message E003 will be shown.

Low torque is anything less than 98% of final target and occurs due to accidental release of the tool trigger during the tightening. It is indicated with a yellow toggling led on the tool. The torque value will be shown on the display.

3. DS/DL Drive

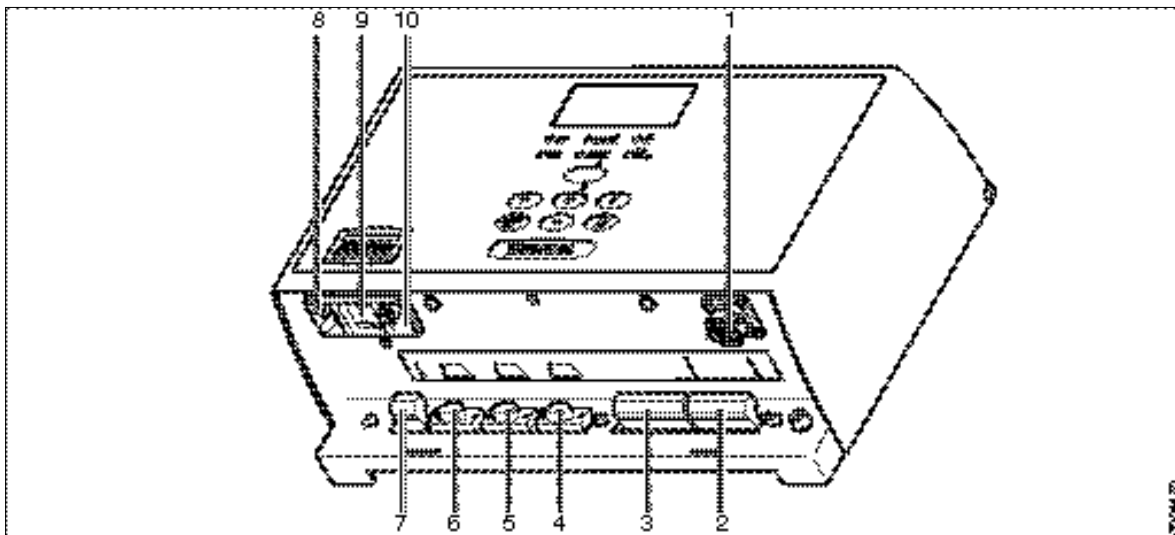
3.1 Connectors DS



Displayed on the previous page is the back end of the DS Drive revealing all connectors. Each number corresponds to a specific connector that is explained below and in detail where needed.

- | | |
|--|--|
| 1. Tool cable connector | 6. I/O bus. Only activated for D312 / D313 |
| 2. Digital inputs. Only for D312 / D313.
See Detailed Description on next page 2. | 7 Remote control |
| 3. Relay outputs. See Detailed Description on
page 3 – 3. | 8. Main power connector |
| 4. RS 232 | 9. Ground fault interrupter, GFI, 30 mA |
| 5. I/O bus. Only activated for D312 / D313 | 10. Main fuse. 6.3 X 32 mm - Slow Blow, 15/20/25 A |
| | 11. Main fuse: 5 X 20 mm – Slow blow 6.3A |

3.2 Connectors DL



Displayed on the previous page is the back end of the DL Drive revealing all connectors. Each number corresponds to a specific connector that is explained below and in detail where needed.

- | | |
|--|--|
| 1. Tool cable connector | 6. I/O bus. Only activated for D312 / D313 |
| 2. Digital inputs. Only for D312 / D313.
See Detailed Description on next page 2. | 7. Remote control |
| 3. Relay outputs. See Detailed Description on
page 3 – 3. | 8. Main power connector |
| 4. RS 232 | 9. Power switch |
| 5. I/O bus. Only activated for D312 / D313 | 10. Main fuse: 5 X 20 mm – Slow blow 6.3A |

3.3 Inputs/Outputs Schematic

Inputs

There are four opto isolated inputs on the drive. It is possible to have an additional six inputs through the CAN bus, but then you will need to have an I/O-Expander connected to the drive. The inputs can be configured to have the functions listed below.

For more information and programming of the I/O's, read chapter 5 and 6.

2a Fixed inputs Schematic on D302 / D303 / 303

Fixed input	Description
Input 1	Reset Batch
Input 2	Batch increment
Input 3	Batch decrement
Input 4	Not used

2b Digital Inputs Schematic - D312 / D313

#	Function	Description
0	Not used	The input is not activated
1	Reset lock on reject	If the checkbox "Lock On Reject" in the configuration window is marked and the tool is locked because of a faulty tightening, the tool will be unlocked when this input is activated.
2	Batch increment	When this input is activated the batch counter will be increased one step, $n=n+1$.
3	Batch Decrement	Decreases the batch counter one step, $n=n-1$.

#	Function	Description
4	Reset batch	Resets the batch counter to zero. No batch OK (nxOK). If batch OK is activated it will be deactivated.
5	Pset select bit 0	P-set select input. The drive will interpret the inputs binary. Binary one will select p-set one, binary two will select p-set two etc. Binary 0=no p-set chosen. Please read chapter 7.2, Selector.
6	Pset select bit 1	
7	Pset select bit 2	
8	Pset select bit 3	
9	Tool Tightening disable	Disables the tool to perform a tightening. Loosening will not be affected. Note* When CCW (counter clockwise) tightening direction is chosen the tightening direction will be the opposite from when CW (clockwise) tightening direction is chosen, and the tool disabled in CCW direction.
10	Tool Loosening disable	Disables the tool to loosen a fastener. Tightening will not be affected. Note* When CCW (counter clockwise) tightening direction is chosen the loosening direction will be the opposite from when CW (clockwise) tightening direction is chosen, and the tool disabled in CW direction.
11	Tool disable	The tool will not start when this input is activated. If the tool is running it shall immediately stop when this input is activated. A new press on the start button is needed to restart the tool.
12	Ack error message	Acknowledge of an error. If the display flashes with an error code the error code will be acknowledged with a signal on this input.
13	Line control start	Activates the tool if Line Control in configuration is chosen. See also Line Control.

DS/DL Drive

#	Function	Description
14	Line control alert 1	Activates relay “Line Control Alert 1”. See also “Line Control”.
15	Line control alert 2	Activates relay “Line Control Alert 2”. See also “Line Control”.
16	Set mono. relay 1	Activates Monostabile relay 1.
17	Set mono. relay 2	Activates Monostabile relay 2.
18	Set bistab. Relay 1	Activates Bistabile relay 1.
19	Reset bistab. Relay 1	Deactivates Bistabile relay 1 if Input Control under Relay Time is chosen on this relay.
20	Set bistab. Relay 2	Activates Bistabile relay 2.
21	Reset bistab. Relay 2	Deactivates Bistabile relay 2 if Input Control under Relay Time is chosen on this relay.

Note! - Relay Type Selector / RE-Alarm

- As noted earlier, you may use Atlas Copco Tensor S series relay type selectors and RE-Alarms.
- If choosing a relay type selector, you need to use adapter 4222 0417 00.
- If choosing a RE-Alarm, you need to use adapter 4222 0472 00.
- When combining both Re-Alarm and relay type selector, use adapter cable 4222 0486 00.

Outputs

Four output relays exist on the drive. It is also possible to have an additional eight relays by using the

I/O expander through the I/O bus. The relays can be configured to have the functions listed below.

3 a) Relay Outputs Schematic - D302 / D303

Fixed Output	Description
Relay 1	OK
Relay 2	NOK
Relay 3	nxOK
Relay 4	Not used

3 b) Relay Outputs Schematic - D312 / D313 / 313 – Programmable via ToolsTalk DS/DL

Relay time

There are four events that can make the relay drop.

“To next tightening”

When the start trigger is pressed and the tool is beginning the next tightening

“Time”

When the timer has run out. The time is programmed in TTDS/DL /Configuration

“Tracking”

The relay is following a certain event. For instance tool running. As long as the tool is running the relay will be pulled

“Input Control”

There are two relays that can be deactivated through inputs. These two are Reset bistable relay 1 and Reset bistable relay 2.

DS/DL Drive

# in TTDS / DL	Function	Relay Time				Description
		To next tightening	Time	Tracking	Input Control	
0	Not used					The relay will not be affected
1	OK	X	X			The relay will be pulled when all results are within limits.
2	nxOK	X	X			The relay pulled when Batch OK, the batch counter is equal with the batch size programmed through Tools Talk DS / DL.
3	NOK	X	X			The relay pulled when one or more results are outside limits or other not acceptable event has occurred, for example Rehit.
4	Low torque	X	X			Relay pulled when the torque value is too low. Possible reason due to start trigger released too early.
5	High torque	X	X			Relay pulled when torque value possibly high. The reason is because the second step angle is too small.
6	Tool tightening			X		The relay is activated when the tool is running in the tightening direction. The relay drops when target is reached or the start trigger is released.

# in TTDS /DL	Function	Relay Time				Description
		To next tightening	Time	Tracking	Input Control	
7	Tool loosening			X		The relay is activated when the tool is running in the loosening direction. The relay drops when the start trigger is released.
8	Tool Running CW			X		The relay is activated when the tool is rotating in clockwise (CW) direction.
9	Tool Running CCW			X		The relay is activated when the tool is rotating in counter clockwise (CCW) direction.
10	Tool Running			X		The relay is activated when the tool is running.
11	Switch in CW position			X		The direction switch on the tool is turned in CW direction.
12	Switch in CCW position			X		The direction switch on the tool is turned in CCW direction.
13	Tightening direction CCW			X		The relay will be pulled when the selected p-set has CCW chosen as tightening direction.
14	DS/DL ready			X		Relay pulled if the DS/DL Drive is ready to perform a tightening. No system errors occurs.
15	Tool ready			X		Relay pulled if the tool is ready to perform a tightening.

DS/DL Drive

# in TTDS / DL	Function	Relay Time				Description
		To next tightening	Time	Tracking	Input Control	
16	Tool locked			X		Relay pulled when the tool is locked due to one or more of following: Line Control without Line Control Start Tool Disable Tool Tightening Disable Tool Loosening Disable Lock On Reject
17	Service indicator			X		Relay pulled until DS/DL Tool serviced.
18	Line control OK	X	X			Relay pulled when Line Control OK occurs.
19	Line control alert 1	X	X			Relay pulled when the Input Line Control Alert 1 is activated without having received Line Control OK. This is Line control warning 1, the first check point on the station.
20	Line control alert 2	X	X			Relay pulled when the Input Line Control Alert 1 is activated without having received Line Control OK. This is Line control warning 2, the second check point on the station.
21	Monostabile relay 1			X		The relay is pulled if there is a signal on the input "Set Monostabile Relay 1". The relay will follow the input and drop when the input goes low.

# in TTDS / DL	Function	Relay Time				Description
		To next tightening	Time	Tracking	Input Control	
22	Monostabile relay 2			X		The relay is pulled if there is a signal on the input “Set Monostabile Relay 2”. The relay will follow the input and drop when the input goes low.
23	Bistabile relay 1	X	X	X	X	The relay is pulled if there is a signal on the input “Set Bistabile Relay 1”. The relay will drop when there comes a signal on the input “Reset bistabile 1” or when the next tightening is started or when the relay time is exceeded.
24	Bistabile relay 2	X	X	X	X	The relay is pulled if there is a signal on the input “Set Bistabile Relay 2”. The relay will drop when there comes a signal on the input “Reset bistabile 2” or when the next tightening is started or when the relay time is exceeded.

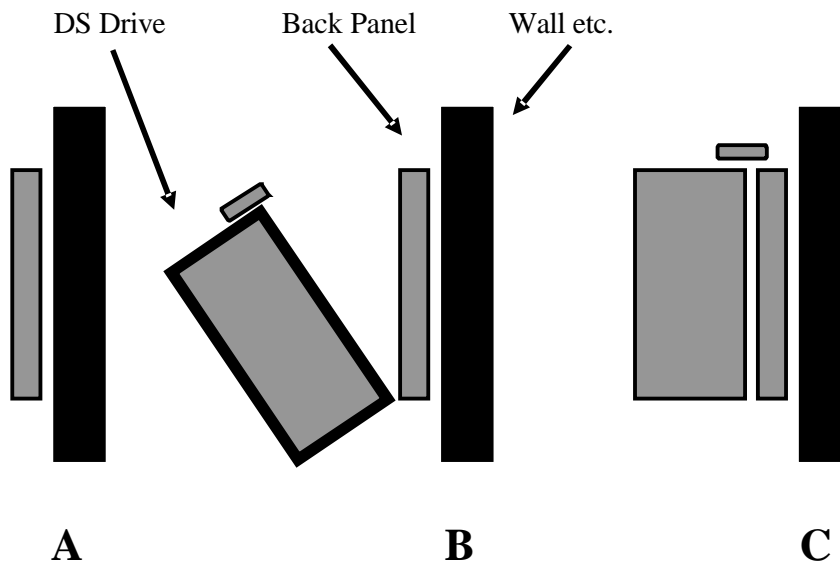
3.4 Installation of DS hardware

Find a suitable place for the drive – see Safety Instructions.

1. Mount the back panel preferable on a wall, A. For dimensions and screw holes, see chapter 3.5.
2. Hang the DS Drive on to the back panel, B.
3. Connect the cables, tool cable, power cable etc, to the connectors and fix the cables with straps to the teeth on the back of the drive.
4. Check so that the GFI is switched on.
5. Fold the drive up and close it by turning the lock on the top of the drive, C.
6. Connect the power cable to a power supply, 115/230 V.
7. Connect a tool to the tool cable.
8. Turn the power on.

IMPORTANT!

Whenever replacing a tool, always turn the power off



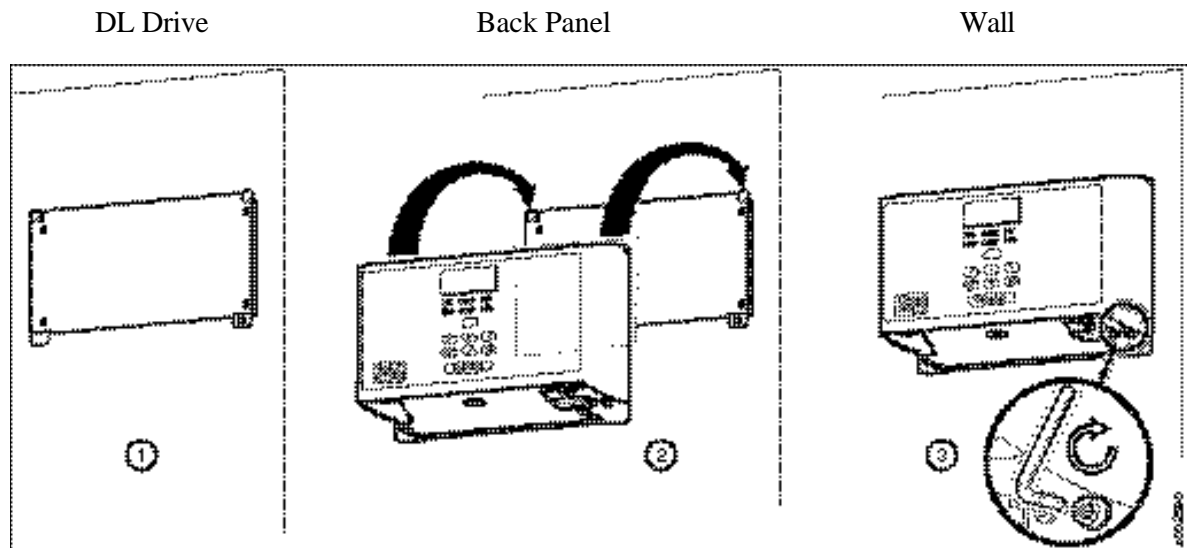
3.5 Installation of DL hardware

Find a suitable place for the drive – see Safety Instructions.

1. Mount the back panel preferable on a wall, A. For dimensions and screw holes, see chapter 3.5.
2. Hang the Drive on to the back panel, attach the fixing screw in the lower right corner of the drive.
3. Connect the cables, tool cable, power cable etc, to the connectors and fix the cables with straps to the teeth on the inside of the protection plate.
4. Close the protection plate by attaching the plate screw to the drive.
5. Connect the power cable to a power supply, 115/230 V.
6. Connect a tool to the tool cable.
7. Turn the power on.

IMPORTANT!

Whenever replacing a tool, always turn the power off



3.6 Installing new software into the DS/DL Drive

Installation guide for software versions 4.4 and higher

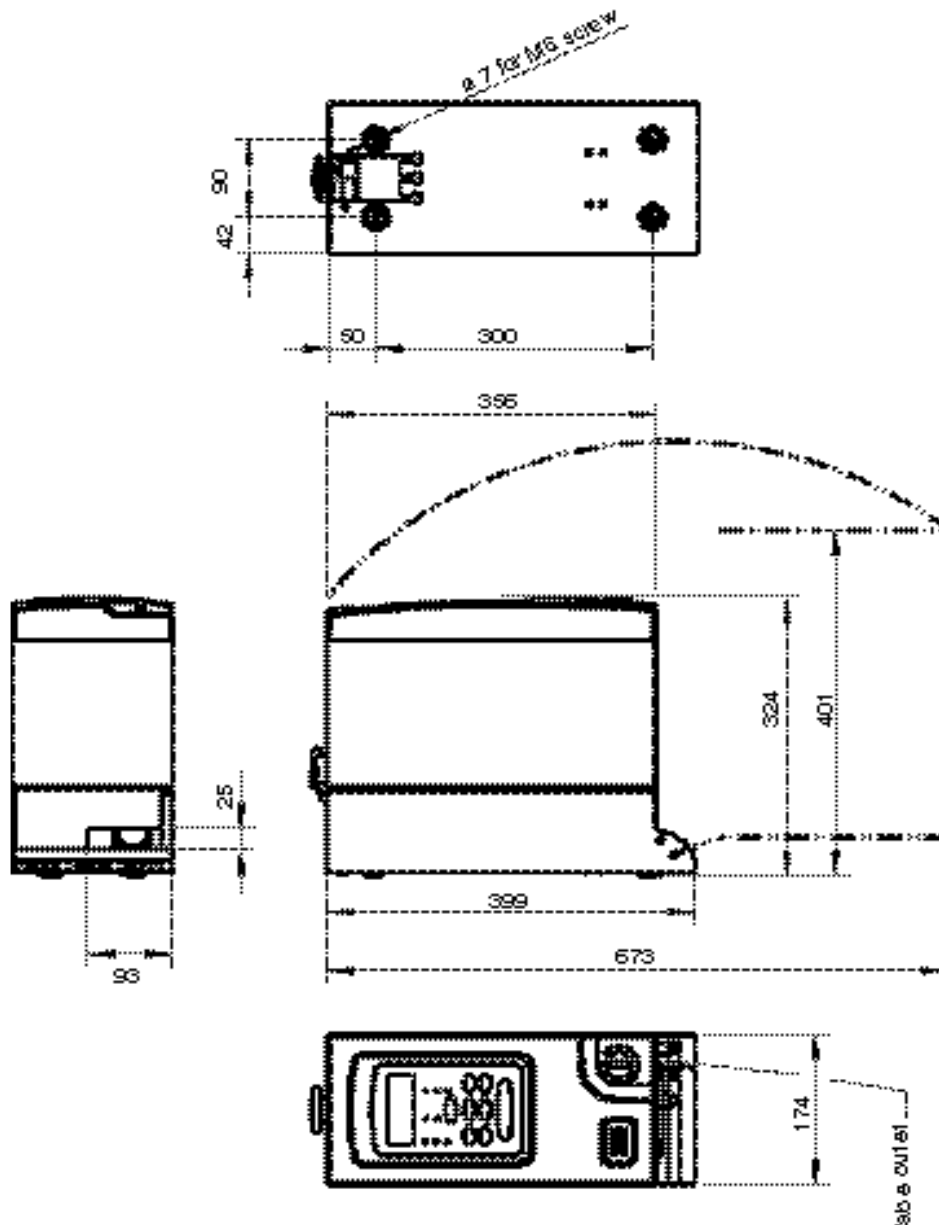
1. Connect a tool.
2. Turn the power on.
3. Turn your PC/Lap Top on.
4. Start Windows Explorer.
5. Create a new directory and put the drive sw on the hard drive/c:.
6. Go to the directory where the software is stored.
7. Double click on the dlds_com1.bat or dlds_com2.bat depending on what com port is used on your PC/Lap Top*.
8. A dos-window will be opened and the drive software loaded automatically, it will take approximately 2 minutes. The drive will power off while loading the soft ware.
9. When the software is loaded the drive will power up automatically and the display will show four dots or four dashes.
10. If the drive does not power up, please retry the procedure, read chapter 7 “Trouble Shooting” or contact your local Atlas Copco dealer.

*If you are using com port 3 or higher please do following:

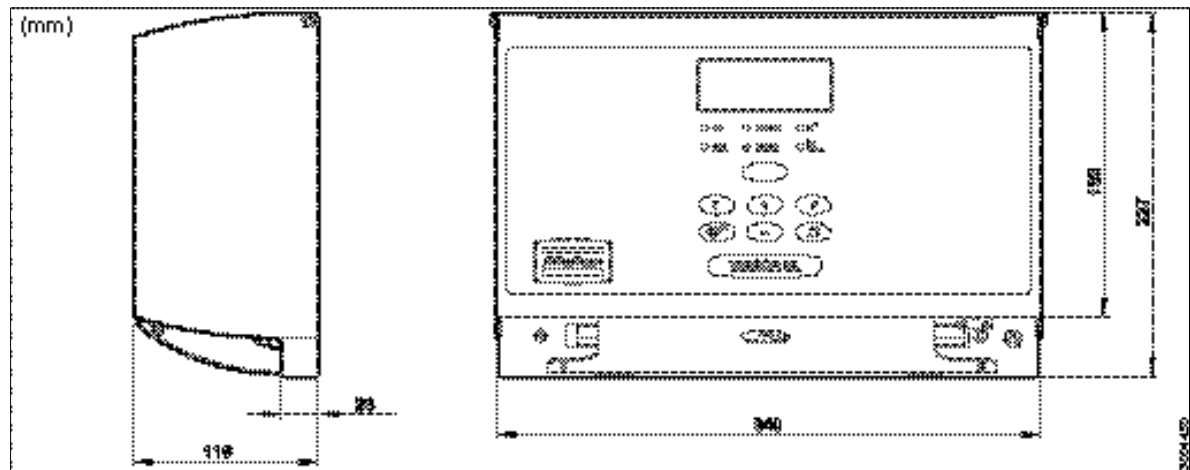
1. Open a dos window
2. Go to the directory where the sw is located
3. Write dlds COM3 or dlds COM4 etc. and press enter. (This command will also work for COM1 and COM2). Note! Use capital letters.

If you have software version 4.4 or higher start with number 8 and the init - command.

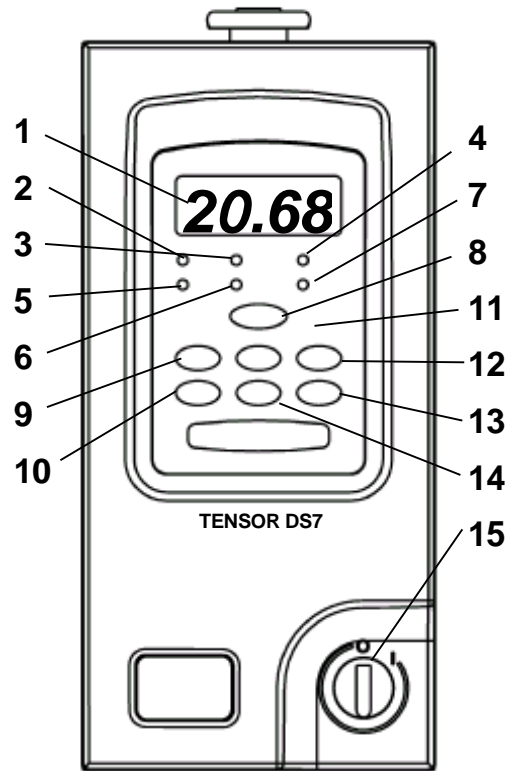
3.7 DS Drive Dimensions



3.8 DL Drive Dimensions



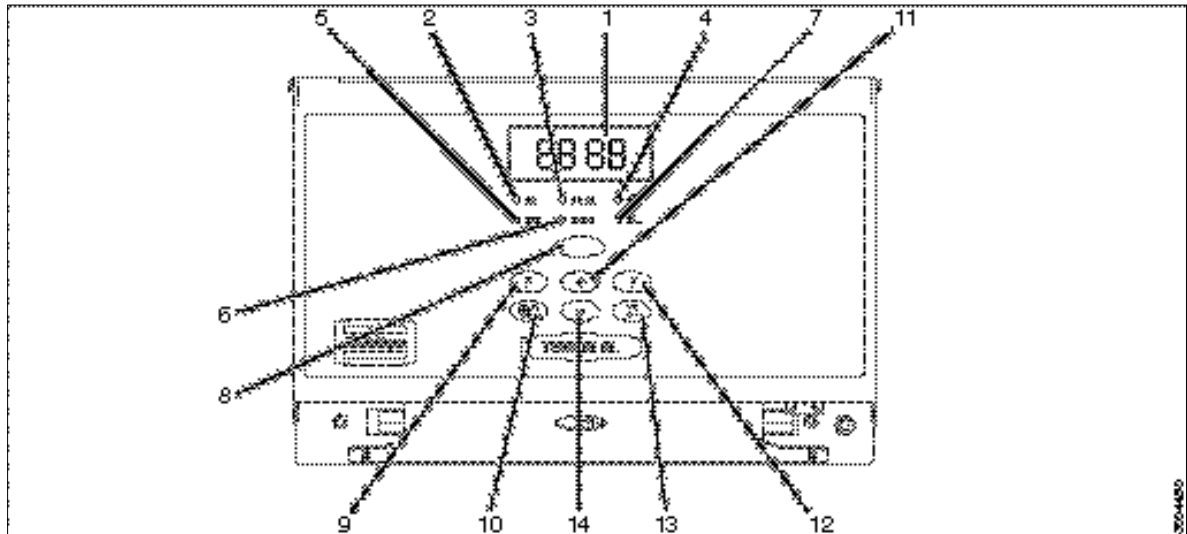
3.9 Display / Key Pad DS Drive



- | | |
|----------------------|-------------------|
| 1. Display | 9. Function |
| 2. OK LED | 10. Autoreset |
| 3. $n \times$ OK LED | 11. Plus button |
| 4. Lock LED | 12. Question mark |
| 5. NOK | 13. Enter key |
| 6. Alarm | 14. Minus button |
| 7. Graph | 15. Power |
| 8. IRDA | |

The DS Drive is primarily designed to be programmed using ToolsTalk DS. However, there are a number of programming features available directly through the key pad on the Drive. See chapter 3.10 Key Pad Programming

3.10 Display / Key Pad DL Drive



- | | |
|---------------|-------------------|
| 1. Display | 8. IRDA |
| 2. OK LED | 9. Function |
| 3. n x OK LED | 10. Autoset |
| 4. Lock LED | 11. Plus button |
| 5. NOK | 12. Question mark |
| 6. Alarm | 13. Enter key |
| 7. Graph | 14. Minus button |

The DL Drive is primarily designed to be programmed using ToolsTalk DL. However, there are a number of programming features available directly through the key pad on the Drive. See chapter 3.10 Key Pad Programming

- | | |
|-------------------|--|
| 1. Display | Displays numerical values up to 9999. |
| 2. OK LED | Lights up after each tightening producing correct torque |
| 3. n x OK LED | Lights up after a batch of OK tightenings (n) set through ToolsTalk DS/DL. Not D302 / D303. |
| 4. Lock LED | Lights up when the DS/DL Drive key pad has been lock unlocked by either the IR-Key or through ToolsTalk DS/DL. |
| 5. NOK | Lights up after each tightening reaching first target but not correct torque. |
| 6. ALARM | Lights up to indicate triggered internal alarms, for example, time to service the tool or errors that need to be acknowledged. |
| 7. GRAPH | Lights up when the SET button is pushed to indicate that. Auto-Set, is activated through the drive key pad. |
| 8. IRDA | Underneath this window the IRDA transmitter and receiver is located. When using the IR-key, point it towards this window. |
| 9. Function | The function key shall be used for selecting DS/DL Drive functions
Function key shall be operable when keyboard is in unlocked state.
When operator wants a function he activates the Function key . |
| 10. Auto set | Pushing this button allows Auto-Set programming to be conducted; perform torque tuning, adjust final target and perform motor tuning DS/DL Drive must first be unlocked. |
| 11. +Torque | Each push raises the final target by one increment, 0.1 or 1. By pressing the button continuously final target final target will be raised by one increment at an increasing speed |
| 12. Question mark | By pushing this button you can see:
Drive program software version
Drive size (DL, DS4, DS7, DS9)
Drive version (D302 / D303, D312 / D313) |
| 13. Enter | Enter key shall be used for execution of selected functions and acknowledge of errors. |
| 14. -Torque | Each push lowers the final target by one increment, 0.1 or 1. By holding the button pushed in the final target will be lowered by one increment at an increasing speed. |

DS/DL Drive

15. POWER Main power switch.

3.11 Different models of DS/DL Drive

Both of the two tightening systems (DS & DL) are available in two different models which can be programmed with one, D302 / D303, or eight, D312 / D313, different parameter sets, p-sets. A (p-set) is the specific programming for a certain joint. In other words one Tensor DS/DL System can do up to ten different torque levels. The p-sets are selected using the digital inputs a Turn Selector or a Socket Tray. Of course, p-sets can also be changed through ToolsTalk DS/DL.

D302 / D303 Single P-Set Drive

The D302 / D303 Drive is a "single torque drive", handling one p-set. It has the following main functions:

- OK Relay
- NOK Relay
- nxOK Relay
- Reset Batch Input
- Increment Batch Input
- Decrement Batch Input
- Auto Set
- Quick Programming
- Torque Tuning
- Tool Signal Lights
- Tool Service Indicator
- CCW, Counter Clockwise Tightening Direction
- Open End Spanner
- Batch Count
- Remote Start
- Lock on reject
- Rundown Monitoring
- Self Tap functionality
- High Speed Rundown

D312 / D313 Multi P-Set Drive

The D312 / D313 is a "multi torque drive" capable of handling up to ten different p-sets. Except for the functions in D302 / D303 it is also equipped with:

- RE-Alarm
- PLC Functions
- Line Control
- Socket Tray/Selector
- I/O Expander
- Up to 12 I/O's
- Rotate Spindle
- I/O Bus
- 10 Parameter Sets

3.12 Functions, D302 / D303 and D312 / D313

OK Relay

Pulls Relay 1 (D302 / D303) when an OK tightening is performed.

NOK Relay

Pulls Relay 2 (D302 / D303) when a tightening reaching at least first target but NOT correct torque.

NxOK Relay

Pulls relay 3 (D302 / D303) when a batch of OK tightenings has been completed.

Reset Batch Input

Resets the batch counter (Input 1 on D302 / D303) when activated.

Increment Batch Input

Increases the batch counter (Input 2 on D302 / D303) one step when activated.

Decrement Batch Input

Decreases the batch counter (Input 3 on D302 / D303) one step.

Auto Set

Auto Set only requires the Final Target, the rest of the parameters are calculated and programmed automatically by the Drive while you perform a number of test tightenings. The Auto Set function does not require the PC to be connected, it can be done by using the keypad on the Drive. For more information, see chapter 3.10, 4.1 and 6.4 Auto Set.

Quick programming

Quick programming is a function to be used through ToolsTalk. Two parameters are given by the operator, stiffness of the joint and final target, and the rest will be programmed automatically.

Torque Tuning

Torque Tuning is performed either from the key pad on the drive or through ToolsTalk. It allows an easy adjust to your reference system torque values and compensates for tool-drive-programming and joint variations. One torque tuning factor is stored with each p-set. For more information, see chapter 5 and 6.

Tool Signal Lights

Gives light signals on the tool and drive to indicate OK or NOK tightenings and other faults.

- Green light indicates OK tightening.
- Yellow light indicates low torque.
- Red light indicates high torque.
- Red and yellow light combined indicate all other faults.

Tool Service Indicator

Alarm lights up and a programmed relay is pulled when the programmed service interval is reached.

Counter Clockwise Tightening Direction , CCW

All DS/DL Drives have a built in functionality for left hand threaded fasteners.

Open End Spanner

All DS/DL Drives have a built in functionality for open end spanner applications.

Batch Counter

By counting number of OK rundowns and give an nxOK signal when a certain number n is reached you can assure that a job has been completed properly. The number of rundowns n in the batch counter is set in ToolsTalk. It is also possible obtain the nxOK signal on a relay. External input signals for batch increment and reset batch are configured through ToolsTalk DS/DL.

RE Alarm

A RE-Alarm is possible to connect to the Drive. The RE Alarm is a portable device, connected to the drive with a cable, that can be placed near the operator to give signals for OK, NOK and nxOK.

There are two types of RE-Alarms. One connects to the Relays and one to the I/O-bus, see table below.

Note that Type of RE Alarm.

Drive version the drive software needed for the I/O-bus to work must be v4.4 or higher.

Type of RE Alarm Drive version	Relay RE Alarm	I/O Bus RE Alarm 8433 0560 03
D301	X	
D311	X	X SW v4.4 or higher
D302 / D303	X	
D312 / D313	X	X SW v4.4 or higher

In order to use RE-Alarm 8431 0455 36 you need a special adapter cable, no 4222 0472 00. When using both Re-Alarm and Tensor S/PF 2000 relay type socket tray/selector in combination, then use adapter cable 4222 0486 00.

IR Key

The IR Key is used to get access to the key pad on the drive. By pressing the button on the key while pointing it towards the IR window on the drive, it will be unlocked.

3.13 Functions, D312 / D313 only

I/O Bus RE Alarm

There are two types of RE Alarms, one I/O bus based and one that uses the relays. For RE Alarm with digital input, please see chapter 3.8.

When using the relay based RE Alarm 8431 0455 36, please read chapter 3.8.

When using the I/O Bus based RE Alarm 8433 0560 03, please read chapter 7.1.

Line Control

The D312 / D313 Drive supports a special Line Control function. See chapter 5 and 6.

Socket Tray/Selector

The I/O bus based selector tray comes in two different versions, selector 4, 8433 0610 04 which has four positions and selector 8, 8433 0610 08, with eight positions. For more information, see chapter 7.2.

Lock on Reject

To assure that no faulty tightenings are passed on unnoticed, this function will lock the Tool/Drive on rejected tightenings. The tool will not be able to run when locked and the operator must then Reset Lock On Reject before next tightening.

3.14 Key Pad Functions

The DS/DL Drive can be programmed directly to a limited extent through the key pad on the front panel. There are five functions available and also a possibility to change parameter sets:

F1 = Auto set

F2 = Final Target

F3 = Torque Tuning

F4 = Motor Tuning.

F5 = Copy Parameter set

+/- button = Change Parameter set (when the +/- button not is used for another function)

Auto-Set Programming

This enables authorized personnel to program a Drive unit right out from a box without ToolsTalk DS/DL. The Auto-Set Programming feature allows the Drive to recognize a joint's stiffness and adjust the tool for maximum performance for that particular joint accordingly.

How to program AutoSet

1. Press the AUTOSSET button (= Dart Board button symbol) once.
2. Choose final target by pressing the +Torque or -Torque buttons on the drive key pad.
3. Press the ENTER button once to activate the Auto Set function. The Graph, LED , lights up.
4. Resume tightening. The first tightening is performed at a very low speed as the DS/DL Drive identifies the joint. The speed will gradually increase during the following tightening as the DS/DL Drive is optimizing the performance for that joint. When the Graph LED lights down, optimum performance has been found.

Note!

Every tightening will reach final target and the programmer can at any point during this process press the SET button, when he or she is satisfied with the tightening results, and thereby set the tightening characteristics at that point as maximum performance. Again, this lights down the Graph LED and the DS/DL Drive is programmed.

Lock the DS/DL Drive. It will also automatically resume a locked position approximately 15 minutes after the last entry on the key pad.

Fine-Tuning Final Target

This enables authorized personnel to fine tune the final target, on site, without assistance from ToolsTalk DS/DL.

1. Unlock the DS/DL Drive with either an IR-Lock or through ToolsTalk DS/DL.
2. Enter the mode to change final target by pressing the FUNCTION button once and **Ft/F2** appears on the display.
3. Adjust the final target by pressing the +Torque or -Torque buttons on the DS/DL Drive key pad.

Note!

Using this programming option, torque can be adjusted a maximum of +15% or -5% from the original final target set through ToolsTalk DS/DL or Auto-Set. All values are stored automatically in the DS/DL Drive memory as they are entered.

4. Press the ENTER button and the display starts to twinkle.
5. When a new final target has been found within above limits, the DS/DL Drive is ready to run that program. Lock the DS/DL Drive. It will also automatically resume a locked position approximately 15 minutes after last entry on the key pad.

Torque Tuning

This is used when a tool is controlled against an external torque reference for calibration. There is one torque tuning factor each parameter set.

1. Unlock the drive.
2. Perform a number of tightenings with the external torque gauge connected, preferably 20 tightenings or more so a good mean value can be achieved.
3. Calculate the mean value from the tightenings.
4. Press the FUNCTION button twice and you see **tunE/F3** on the display.
5. Press the + or - button until you have the external mean value on the display.
6. Press the ENTER button, the display starts to twinkle.
7. Perform another set of tightenings to control your torque.
8. If the torque is OK you are ready to run, if not, do the complete procedure over again.
9. Lock the drive.

Motor Tuning

This function will optimize the performance of the motor and minimize losses.

1. Unlock the drive.
2. Press the FUNCTION button three times until **tool/F4** shows on the display.
3. Press the ENTER-button once again until the display starts to twinkle.
4. Press the trigger on the tool and run until it stops. The procedure will take approximately 35-45 seconds. The tool has now been motor tuned and is ready to use.

Copy Parameter set

This option makes it possible to copy a parameter set.

1. Unlock the drive
2. Press the FUNCTION button four times until it says “**Copy/F5**” on the display.
3. Press the + or – button to select the parameter set you want to copy to another parameter set.
Confirm by pressing the ENTER button.
4. Choose the parameter set that you want to copy the selected parameter set to by pressing the + or – buttons again.
Confirm by pressing the ENTER button
5. Lock the drive

Change parameter Set

When neither of the described functions are selected, the + and – buttons are used to change parameter set.

1. Press + or – button to select wanted parameter set
2. Confirm that you want to change Parameter set by pressing the ENTER button.

Note!

If you don't confirm with the enter button the tools will continue with the former parameter set

Drive software, Drive hardware and Tool version

The question mark will give information on what software version and drive version your drive has. Process as follows:

1. By pressing the QUESTION MARK button once you will get information of the software version.
2. By pressing the QUESTION MARK button twice the drive hardware version will be shown, D302 / D303 or D312 / D313.
3. By pressing the QUESTION MARK button three times the display will show the tool version.

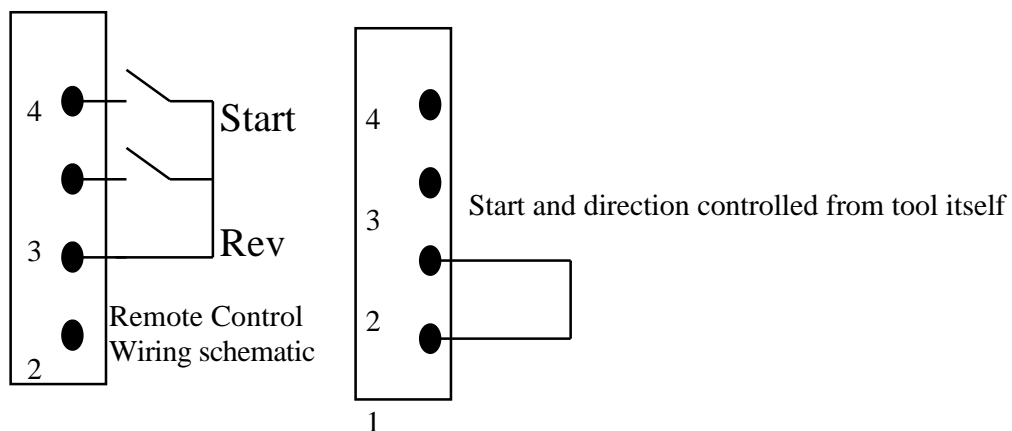
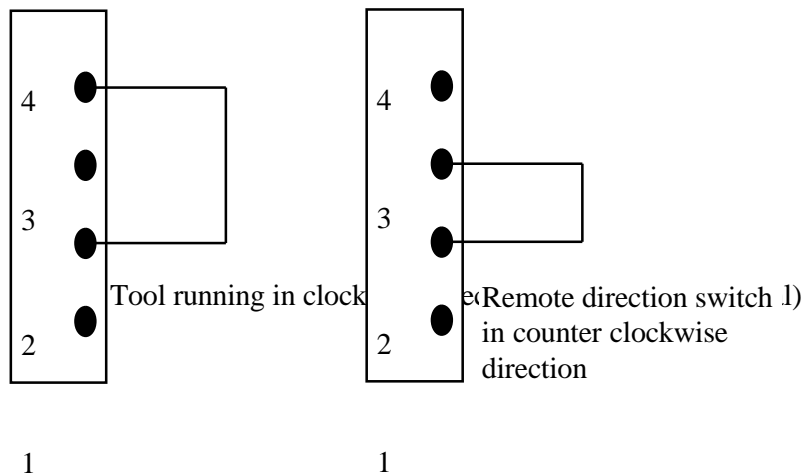
Display	Tool
DS4	ETV/ETD/ETP DS4
DS7	ETV/ETD/ETP DS7
DS9	ETV/ETD/ETP DS9
DL11	ETV/ETD/ETP/DL11
DL21	ETV/ETD/ETP/DL21
DF4	ETF DS4
DF7	ETF DS7
DF9	ETF DS9

Note! ETF = fixtured Tensor DS/DL Tool

3.15 Remote Start

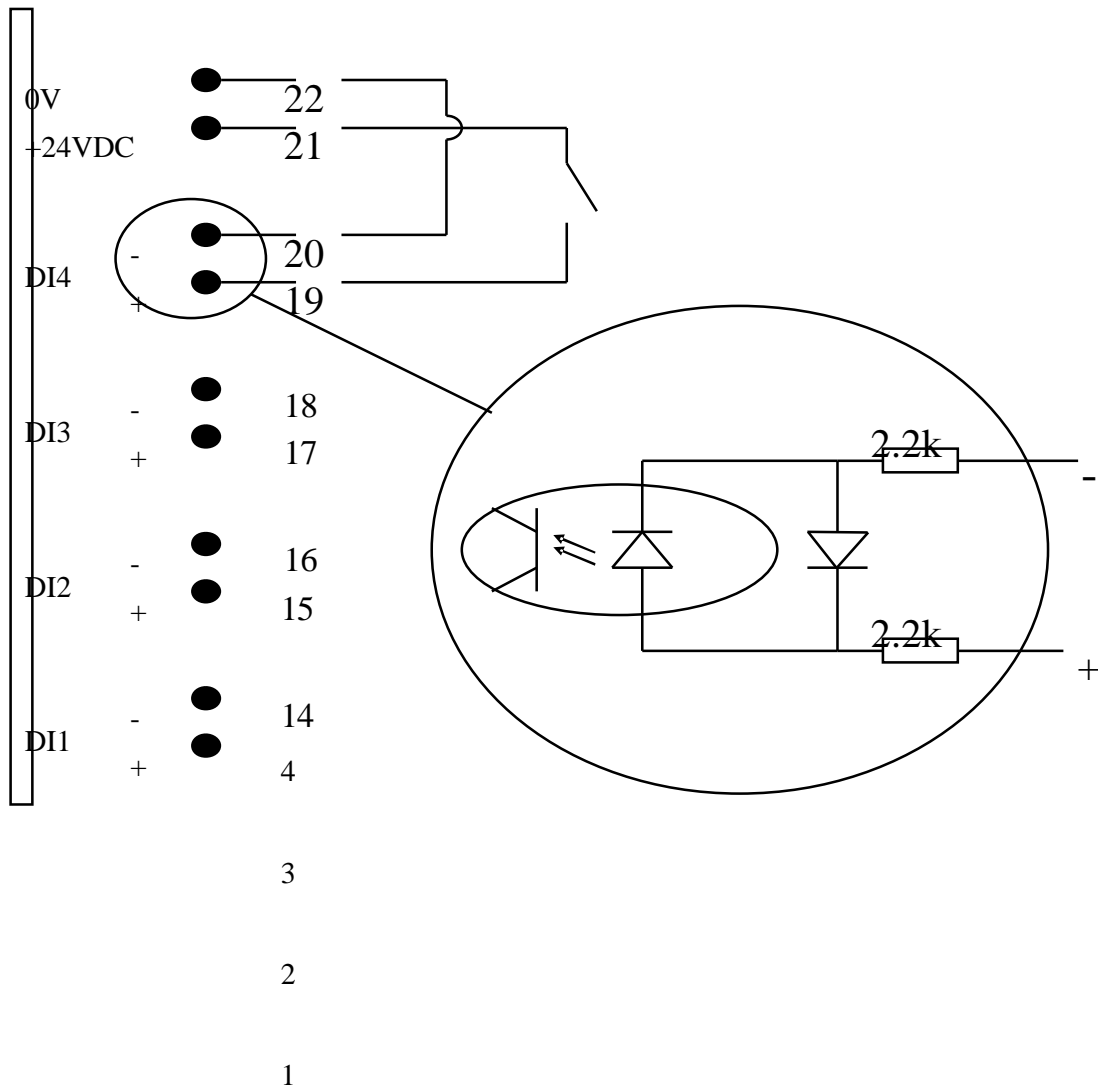
Note 1! When starting more than one Drive from the same start signal, use start box 4222 0550 00

Note 2: When setting up a Tensor DL Drive for remote start, ensure that the start option "Remote start, tool button deactivated" is selected in the Tool Configuration menu in the Configuration section of Tools Talk DS/DL. Then also rewire the the Remote Start connector according to "Remote Control Wiring Schematic."



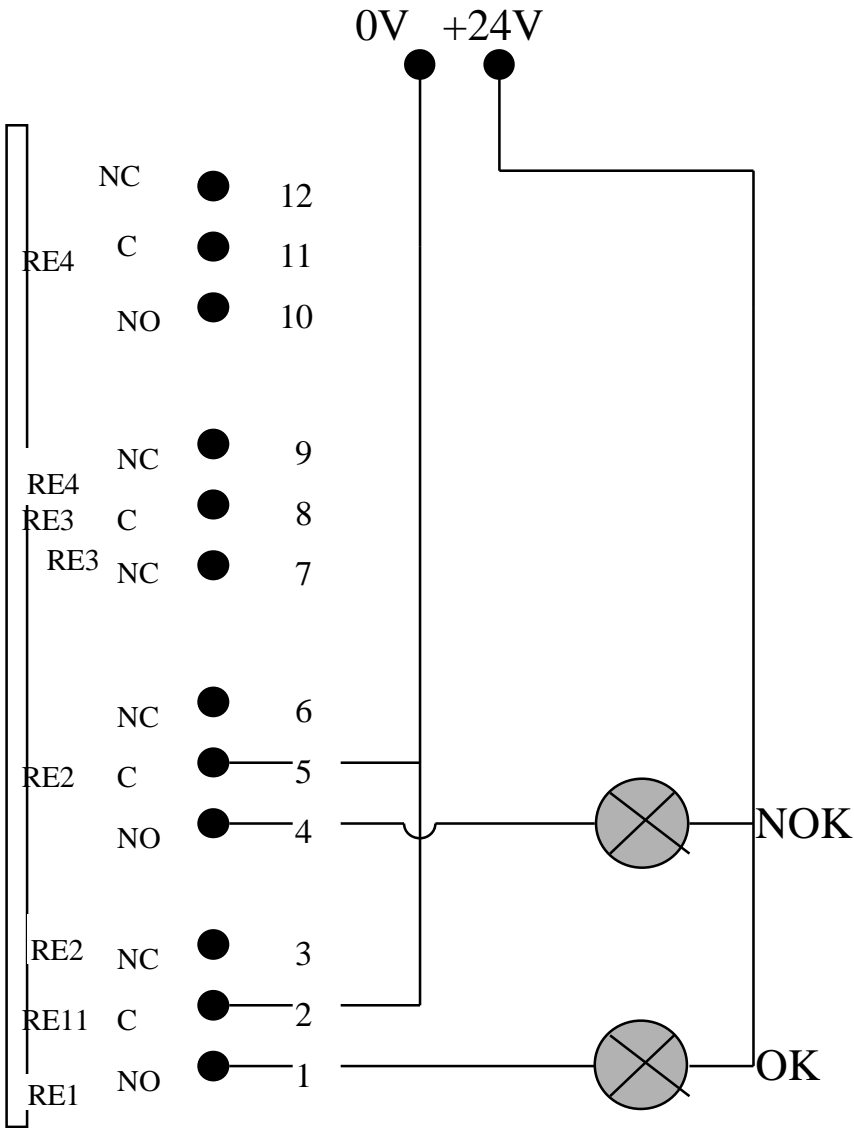
3.16 Inputs and Relays

The Figure below shows how to connect in order to obtain a signal on one of the inputs. The power source can either be built in 24 VDC or an external power source.



DS/DL Drive

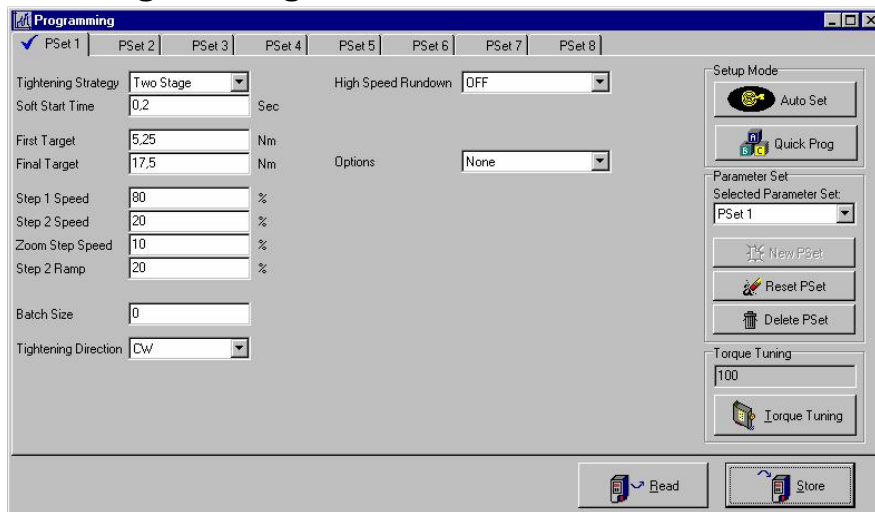
The figure below shows how to connect to obtain OK and NOK signals using RE1 & RE2.



4. Programs

4.1 Selection of program

Full Programming



With Full Programming the most detailed programming can be made. Here you can choose between the four different tightening strategies Two Stage, Quick Step, Ergo Ramp and Rotate Spindle. See chapter 4.2 Tightening Strategies.

Full Programming enables you to fine tune all parameters in order for the tightening to perfectly suit your specific application. The parameters are explained in chapter 5, Tools Talk DS / DL.

Two Stage

With the Two Stage strategy the tool will first perform the first step and then make a complete stop during 50 ms to let the joint relax, thereafter the second step is performed. Since about two thirds of the joint relaxation (on most joints) occurs during the first 30 ms, the two stage strategy provides high quality joints with little joint relaxation. The acceleration in the second step is determined by a ramp called Step 2 Ramp.

Quick Step

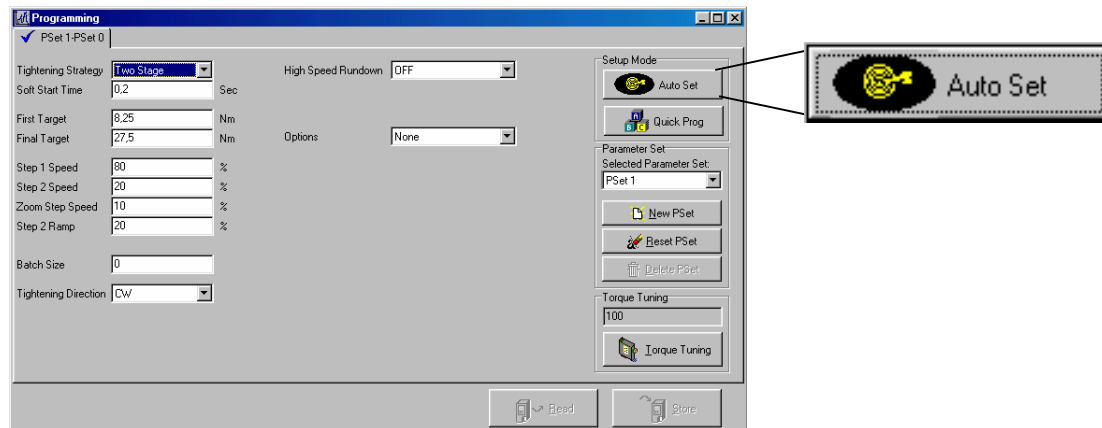
In Quick Step the tool shifts immediately down to a constant Step 2 Speed at the First Target without stopping between the two stages. This is the fastest strategy and is best suited for joints with constant joint hardness and very soft joints.

Ergo Ramp

Ergoramp is a two-stage tightening with constant speed during the second stage. It is set automatically by the programmed value for ergoramp and the hardness of the joint. This strategy has the ergonomical advantage that the user experiences both soft and hard joints as equal. Ergoramp is the correct strategy where there are both hard and soft bolted joints.

Rotate Spindle

In the strategy Rotate Spindle the spindle rotates a pre-set number of turns and when finished, the tool gives an OK signal. If the torque exceeds the rotating torque max, the tool stops and gives a NOK signal.

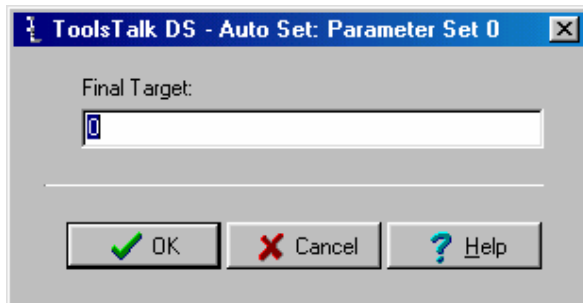


Autoset

If you use the *Auto Set*, the Drive will do the programming automatically. You will find it in the upper right corner of the programming window or in the Pull down menu under *DS/DL Drive* or on the key pad on the drive. You do not have to do any programming at all, you only need to perform a few test tightenings. During these test tightenings the Drive will do its own programming. Each tightening will reach the *Final target* entered by the operator, but at different speeds and strategies. The Drive will customise the programming to the specific joint you are running on.

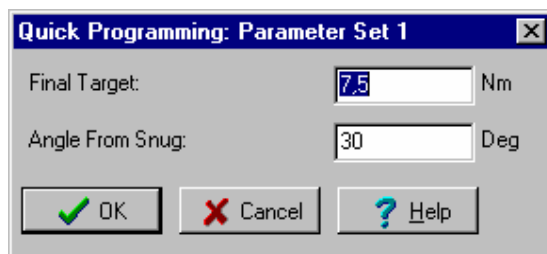
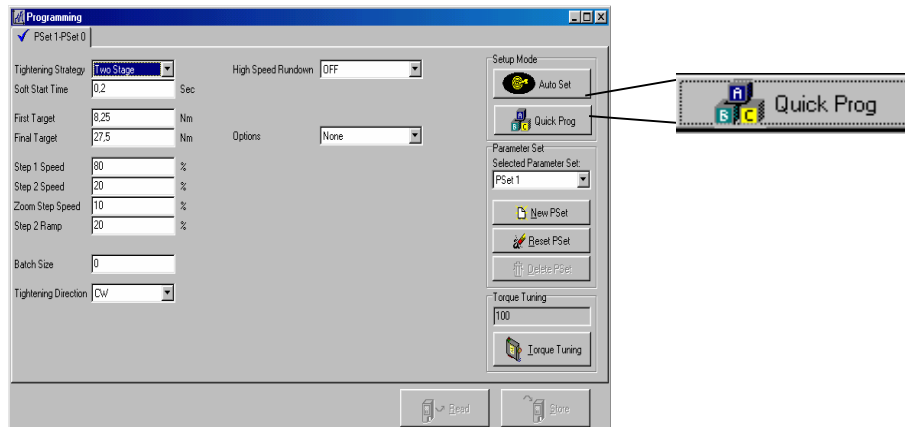
Note! The first test tightenings are performed at a very low speed.

The *Auto Set* is only available when a Drive is connected. When you click *Auto Set* a dialogue window asking you to enter the *Final target* is displayed. When you have entered your value click OK. A window asking you to perform the tightenings will appear. Normally 5-10 tightenings are required for the Drive to find a program suitable for the particular joint characteristics.



While performing the test tightenings a green light on the Drive, marked with a graph, is activated. When this signal light is turned off the Auto Set is finished and the Drive is now programmed according to this specific joint. The Programming window in ToolsTalk DS/DL still displays the old settings. To update the Programming window with the new settings from the Drive simply click the Store button.

Quick programming



Quick programming window

The *Quick programming* mode is meant to help you program the DS/DL Drive in a very simple way. It only requires two pieces of information about your joint, the Final Target and the Joint Angle from Snug. All other parameters are automatically calculated by the system. *Quick programming* results in a *Quick Step tightening*. *Quick Programming* automatically sets the *Torque Tuning Factor* to its default value, 100.

Angle from snug is the angle from when the head of the bolt reaches the surface and the torque starts to increase.

Final Target and Angle from Snug

The Final Target is the specified torque for the joint.

The angle from when the bolt head encounters the work piece to when the final target is reached. On hard joints it is advisable to set it on 10 degrees. For soft joints you can calculate this angle as follows:

1. Enter the Final Target and set the Angle from Snug to 10. Click OK. Change the strategy to *Two Stage* and press the Store button.
2. Make one tightening. The bolt will then be tightened to the correct torque using a very low first target that is automatically set by the system to manage a hard joint.
3. Use a spanner, wrench or equal to untighten the bolt, and estimate how many degrees it takes from fully tightened to the bolt is loose.
4. Enter the angle value found in step 3 as Joint Angle from Snug.

Note! It is recommended that the Angle from snug is set to 10 degrees or more.

As mentioned above, on hard joints it is recommendable to set the Angle from Snug to 10 straight away. By setting the Angle from Snug to 10 the Drive will make a very careful rundown with a low First Target. If you feel that the second stage is too long, just raise the angle until you are satisfied.

However, it is important that there is a second stage otherwise you risk to get an overshoot. The socket has to move a little in the second stage.

The Quick programming mode will get your tool running in no time, but to fully utilise the performance of the Tensor DS/DL System we recommend that you dig into "Full programming" in chapter 6. Full programming enables you to fine tune all parameters in order for the tightening to perfectly suit your specific application.

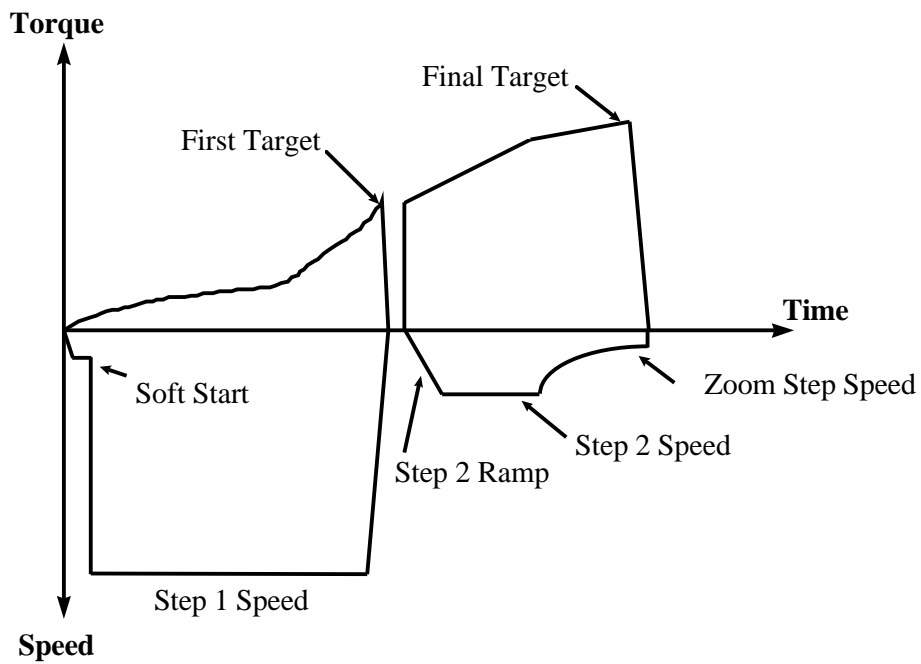
4.2 Tightening strategies

When programming, it is important to have a well developed second stage. The socket shall make an angle movement at the second stage, otherwise the torque may become too great. The best way to see that there is a second stage is simply to observe the socket movement.

If the tool exceeds the torque, a red warning light will illuminate. The explanation is a short or no second stage in combination with high speed in the first stage.

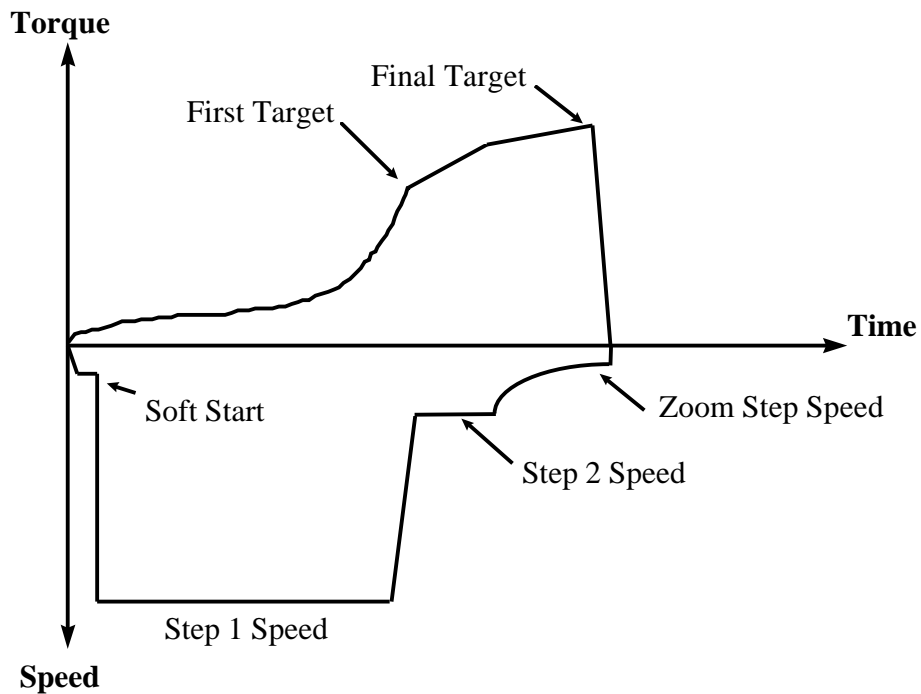
Insufficient torque is lower than 98% of the final torque and is probably caused by releasing the trigger on the tool too early. A yellow light on the tool indicates an insufficient torque.

Two stage



For two stage tightening, the tool has a very high speed during the first stage and lower during the second stage. The tool stops for about 50 ms between stages to reduce settings and then accelerates up to the speed for the second stage.

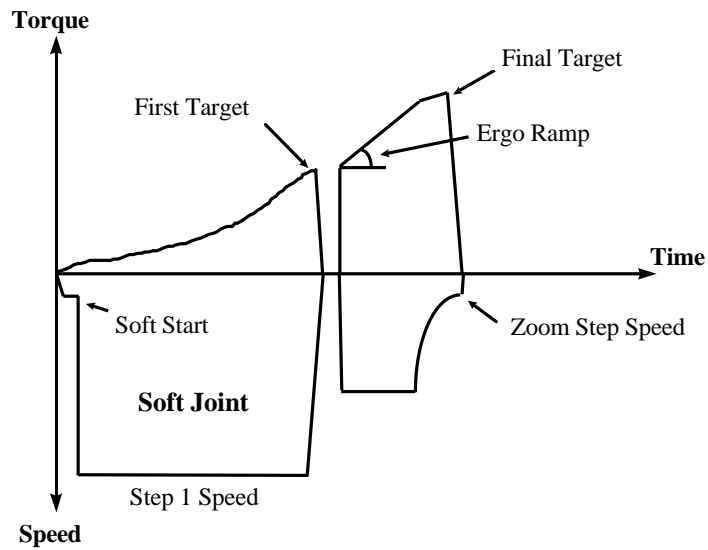
Quickstep



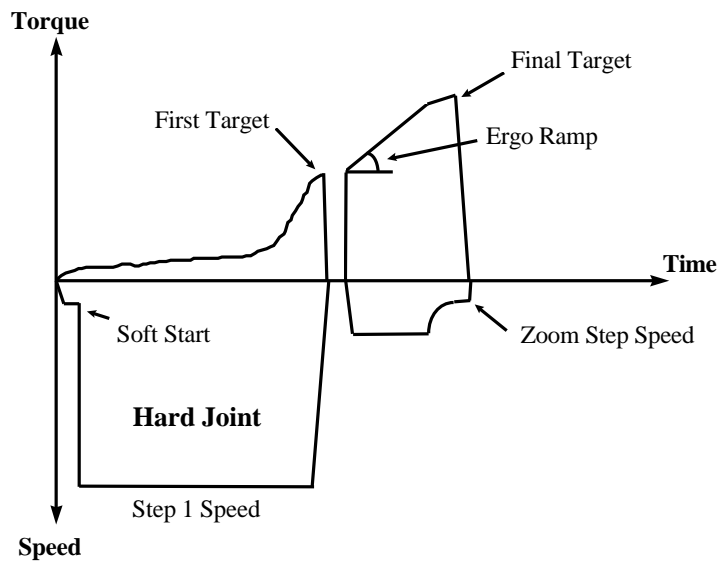
Quickstep is a two-stage tightening with high speed during the first stage and low speed during the second stage. The other stage operates at constant speed. In the end, there is a zoom stage, which reduces tool speed and results in a smoother finish.

In Quick Step the tool shifts immediately down to a constant Step 2 Speed at the First Target without stopping between the two stages. This is the fastest strategy and is best suited for joints with constant joint hardness and very soft joints.

Ergoramp



Ergo Ramp on a soft joint



Ergo Ramp on a hard joint

Ergoramp is similar to Two Stage but the time for the second step is kept constant and the speed in the second step is automatically set due to the ergoramp value and the stiffness of the joint.

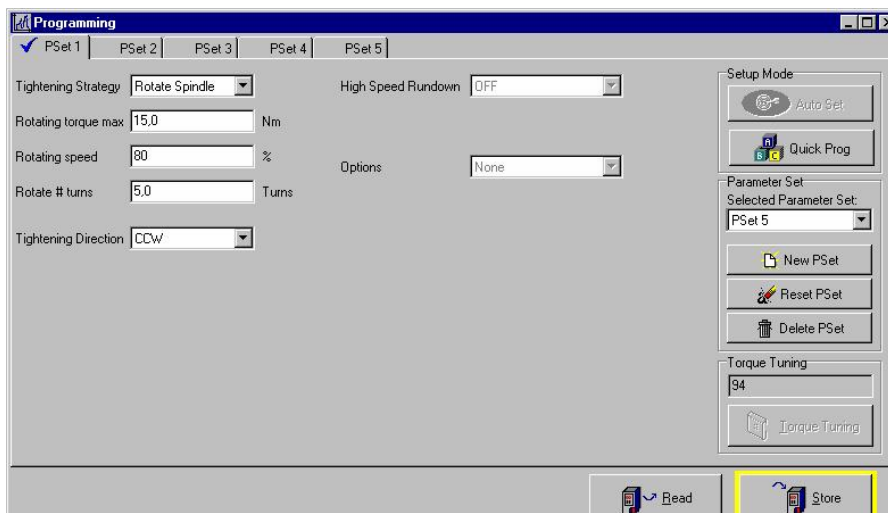
This has the ergonomic benefit to make all joints feel the same for the operator despite variations in joint hardness and is ideal for applications where soft and hard joints are mixed.

With the Ergo Ramp strategy the tool will first perform the first step and then make a complete stop during 50 ms to let the joint relax, thereafter the second step is performed. While we in the Two Stage strategy fix the acceleration to be the same for all tightenings within one p-set, the Ergo Ramp feature calculates the speed in the second step with respect to a time set by the Ergo Ramp strategy itself.

When the Ergo Ramp is programmed the Drive sets a time during which the second step shall be performed. When the tool is running, the speed in the second step is calculated *during the actual tightening*, making the time to complete the second step the same regardless of joint hardness. This means that the speed in the second step varies from joint to joint.

This is a very comfortable strategy for the operator and is perfect when the joint characteristics varies. ErgoRamp will always give you the same reaction force, no matter the joint hardness.

Rotate Spindle



Rotate spindle is a function that allows the operator to get an OK signal when the tool has turned a certain number of turns. The OK signal will be indicated with the green LED's on the tool, the OK lamp on the drive will be lit up and the OK relay will be pulled. If an RE Alarm is connected the OK lamp will be lit up. The function can for example be used for backing off an exact number of turns.

Rotating torque max

This is the maximum torque value while rotating the spindle. The max limit is tool max torque and the min limit is 0. Minimum recommended value is $0.1 \times \text{tool max torque}$.

Rotating speed

The speed with which the tool will rotate. Can be set between 0 and 100%.

Rotate number of turns

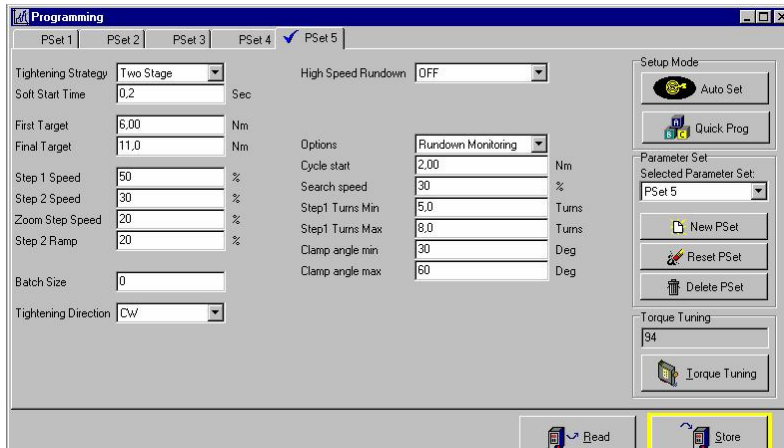
The number of turns which the tool will rotate before giving an OK signal.

Tightening direction

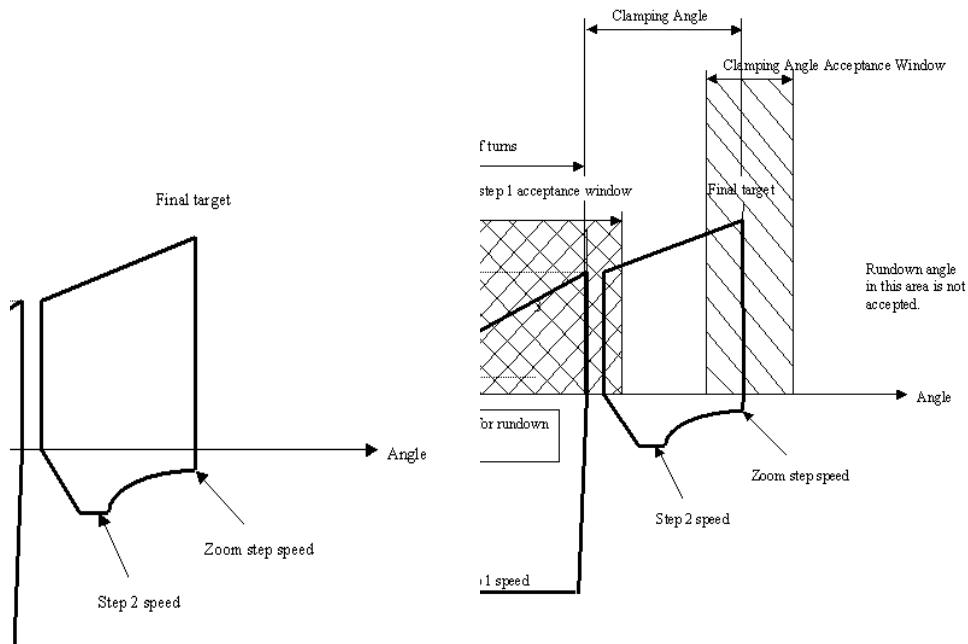
The direction in which the tool will be controlled and the number of turns measured.

4.3 Special Functions

Rundown Monitoring



Rundown Monitoring is a function to detect bad rundowns. The angle in both first and second step is monitored. See graph below



Cycle Start

Cycle start is the torque limit from which the angle is measured. The maximum limit for Cycle Start is First Target.

Search Speed

The search speed is the speed with which the tool will run until Cycle Start limit is reached.

The min limit is 0%. Max limit is Step 1 Speed.

When Cycle Start is reached the tool immediately accelerates to Step 1 Speed.

Step 1 Turns

The angle in the first step is measured from cycle start level until 1st target is reached.

It is possible to program min and max levels for when the angle is OK.

Min = 0 Turns

Max = 200 Turns

The angle is defined in 1/10 of a full turn.

Clamp Angle

The angle in 2nd step is measured from the point where 1st target is reached until final target is reached. The angle in between is called Clamp Angle. It is possible to program min and max levels for when the Clamp Angle is OK.

Min = 0 degrees

Max = 10000 degrees

The angle is defined in steps of 10 degrees.

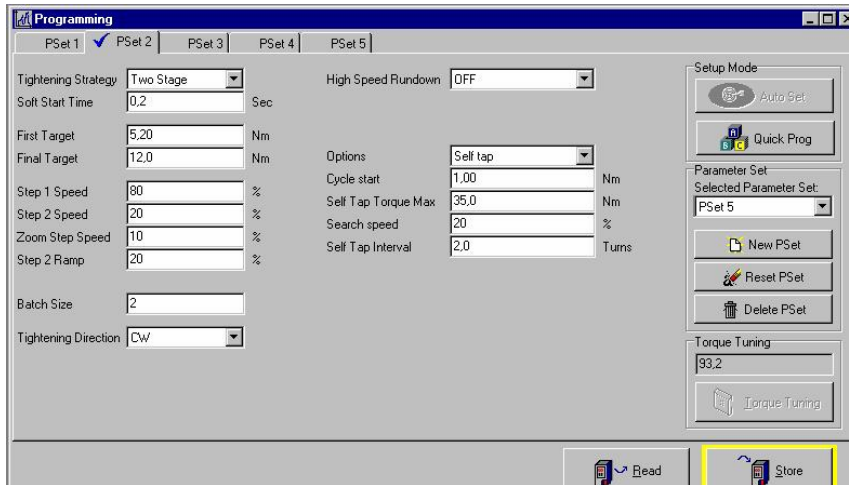
Low angle

If the angle is lower than the min value a twinkling red-yellow light is given on the tool together with the message LO° on the display. The tool stops immediately when the angle is out of range. The same functionality for both 1st and 2nd step. The message on the display is LO°1 if the angle in step 1 is low and LO°2 if the Clamp angle is too low.

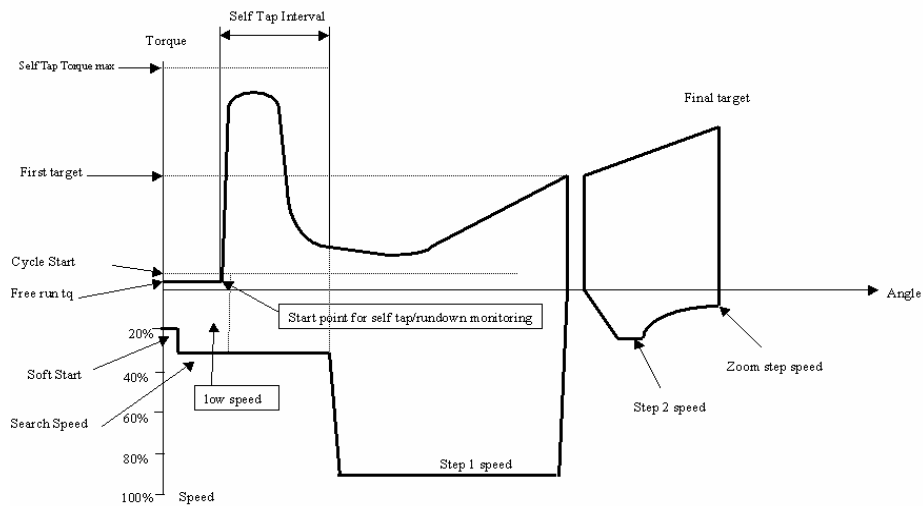
High Angle

If the angle is higher than the max value a twinkling red-yellow light is given on the tool together with the message HI° on the display. The tool stops immediately when the tool is out of range. The same functionality for both 1st and 2nd step. The message on the display is HI°1 if the angle in step 1 is too high and HI°2 if the Clamp angle is too high.

Self Tap



The Self Tap function is used for thread forming screws and other fasteners with a torque pulse in the beginning of the rundown higher than the desired 1st target or final target. See graph below



Following parameters have to be programmed:

- Cycle Start
- Self Tap Torque max
- Search Speed
- Self Tap Interval

Cycle Start

See Rundown Monitoring

It will be the torque level from which the self-tap interval is measured.

Search Speed

See Rundown Monitoring

Search speed is the speed until cycle start and through the Self Tap Interval. After the Self Tap Interval the tool will accelerate to Step 1 Speed.

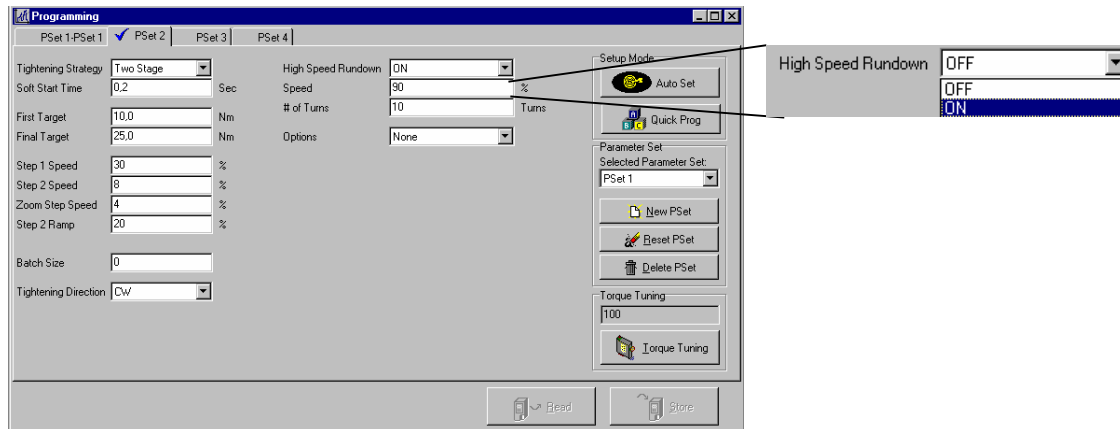
Self Tap Torque Max

Self tap torque max is the maximum thread forming torque allowed. If the torque exceeds that level the tool immediately shuts off giving an error code (E116) on the display.

Self Tap Interval

The Self Tap Interval is the thread forming angle. During this interval the torque is allowed to go as high as Self Tap Torque Max. After the interval the speed will be Step 1 Speed and the next torque level is 1st target.

High speed rundown



High speed rundown allows the tool to make the rundown at a higher speed than the actual Step 1 speed. The function is specially designed for fasteners with a long rundown angle and the risk for overshooting due to a stiff joint is big. A certain number of turns are programmed under which the tool will rotate with a higher speed. When the number of turns is reached the tool will slow down to step 1 speed which is so low so that the tool will not overshoot when reaching first target. After this point the tool will finish the tightening like a normal two stage, ergo ramp or quick step tightening.

Safety

If the tool shall start with the increased speed it is necessary that the previous tightening was OK.

If the tool is restarted before having received an OK signal it will start at the lower step 1 speed. The reason is to prevent an overshoot because of reaching first target too early at the higher speed.

Speed

The “increased speed” during High Speed Rundown.

Number of turns

The number of turns with which the tool will rotate. The angle will be measured from start of the tool.

5. ToolsTalk DS/DL

ToolsTalk DS/DL, TTDS/DL is an Atlas Copco software for programming the DS and DL drives. It is based on and designed for Windows 95, 98, 2000, and NT, in other words 32 bit Windows. TTDS/DL can be used to configure the entire functionality of the DS/DL drive.



5.1 Installation

Begin the installation procedure by checking that your PC or Lap Top has the required capacity according to the following specification. Then, follow the directions under the heading "Proceed as follows".

PC-specification

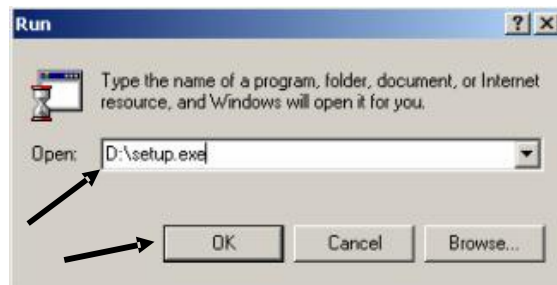
- Operating system Windows 95, 98, 2000, XP, NT
- Available memory: minimum 25 MB on the hard drive and 8 MB RAM
- RS 232 COM port for communication with DS/DL Drive
- Super VGA screen.

Proceed as follows

1. Check that you have the CD-disc with the Tools Talk program.
2. Insert the CD-disc in D:\drive or 3,5” floppy disc in the A:\drive.
3. Select RUN in START-menu.



4. Type in D:\setup.exe or A:\setup.exe and click on OK.



5. Follow the instructions in the installation program.
6. Click on Ready when the installation is finished.
7. Turn off and then re-start your PC.

The installation is now completed.

Shortcut to ToolsTalk

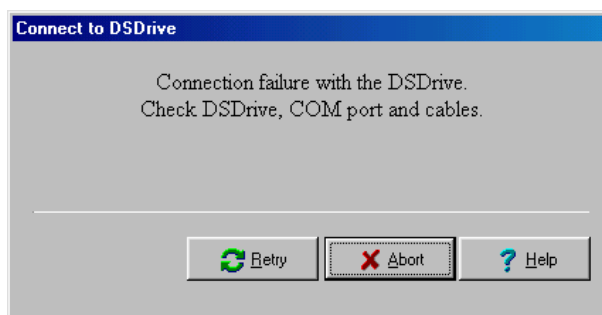
You can create a shortcut to ToolsTalk in the following way:

1. Open the Windows Explorer.
2. Go to the directory where you have the ToolsTalk program. In this case: C:\program\atlas copco\toolstalk\.
3. Click on the file TTDS/DL.
4. Go to File and click on CREATE SHORTCUT.
5. Click on the icon with the right mouse button, keep the button pressed down and move it to the desired position on the Desktop.
6. Then, by double-clicking on the icon, you can access ToolsTalk directly.

Start up

When you start the program, TT DS/DL will automatically make contact with the DS/DL Drive. If you have a Drive connected all the programming in the Drive will be read down by TTDS/DL . When this is finished you will access the programming window in Tools Talk DS / DL.

If you wish to make your programming in advance and load it into the DS/DL Drive at a later stage you probably want to run TT DS/DL without having a Drive connected. When you start TT DS/DL without having a Drive connected TT DS/DL will at start up and try to connect to the Drive, but as the Drive is not present TT DS/DL will not find the Drive and displays the following dialogue box.



Connection with DS/DL Drive failure dialogue box

Tools Talk DS

Click *Abort* and continue with your programming, see “Programming without having the DS/DL Drive connected”. The first thing you will have to do is to set the max. torque for the tool, see “Tool List”, chapter 8, and also specify the Drive version to use, D302 / D303 or D312 / D313.

However, if you do have a Drive connected to the PC and still get this message there is a problem in the communication between the PC and the Drive. Please check the following:

- That the Drive is powered on
- That you have the correct cable and that it is plugged in correctly, see “Cable”, chapter 8
- That the COM port on the computer used by ToolsTalk is not configured for something else. Click Options and then Communications and select another COM port to check the configuration. You might also have your COM ports under the control panel on your PC/lap top.
- That your PC is OK

When you have checked this click *Retry*.

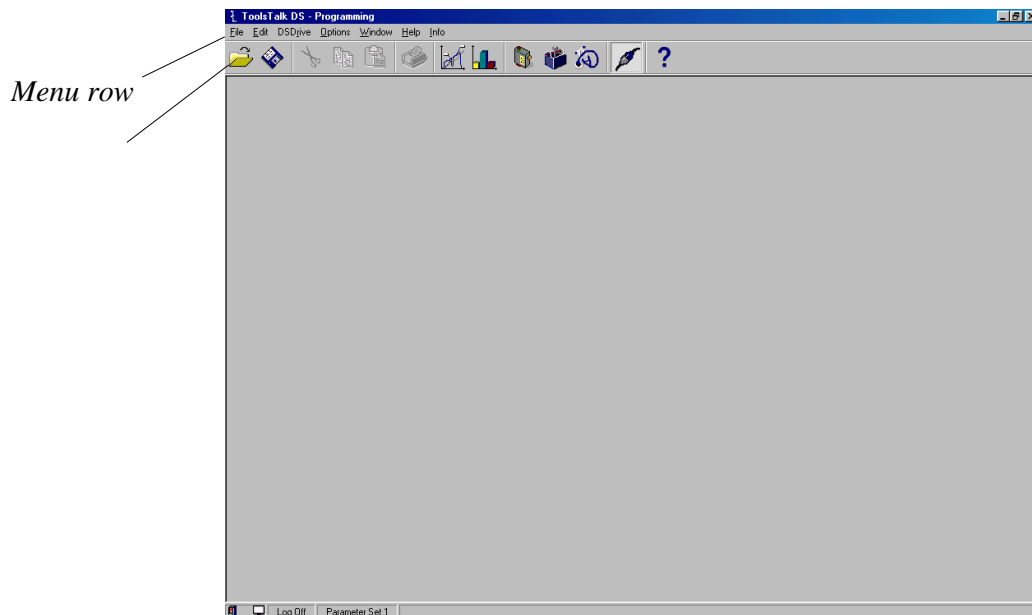
5.2 Working in Tools Talk

If you are familiar to using Windows, you will soon be comfortable with TTDS/DL . The program layout, menus and the way of working is similar to Windows.

If you are unsure of the way to work with Windows, ask for assistance from a person who can instruct you and get you started with the program. After some practise, you will be able to manage on your own.

Connection to local networks and serial connection of equipment requires knowledge of addresses and experience from making such connections. Contact your system administrator.

When you start the program, you will first see the window shown below.



Tools Talk DS

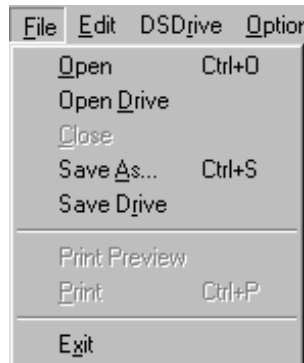
Menu row

We will now look at the functions in the menu line.



File

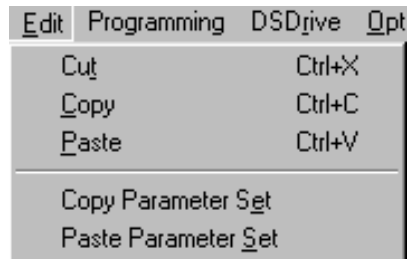
When you open File, you can open, save and close files, print and close the program.



Edit

In the Edit menu, you have the functions Cut, Copy and Paste.

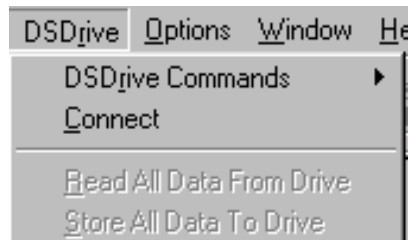
You can also copy and paste parameter sets.



Drive

Drive, you connect the DS/DL Drive and read data from or to the Drive.

When Read All Data From Drive or Store All Data To Drive is selected, both programming and configuration windows are read/stored.



Drive Commands

If you click DS/DL Drive in the pull down menu you can choose between DS/DL Drive Commands:

- Do Motor Tuning
- Connect
- Read All Data from Drive and
- Store All Data to Drive
- Do Motor Tuning



In order for the motor to run smoothly it needs to be correctly motor tuned. This is done in the factory before delivery, but it is advisable to do a Motor tuning on each specific combination of Drive and Tool together. This can of course only be done when a tool is connected.

When you click Do Motor Tuning a dialogue box asks you if you really want to do the motor tuning.

If you click Yes another dialogue box telling you to press the tool trigger will appear. It is important that you keep the trigger pressed during the whole procedure. The tool will turn in both directions, accelerate etc. in order to fine tune the position of the rotor.

Do not release the trigger until you get a "Motor tuning Succeeded" message on the screen. If you release the trigger too early you can click abort and you are back where you started.

Open end Tuning

If you already have marked the Open End box, you can perform Open End Tuning. The Open End Tuning will re-perform the tuning and calculate a new gear ratio and play in the gears. The reason for performing a Open End Tuning could for example be if the tool does not find the open space in the gear

Connect

To connect the PC to the Drive you click Connect. When a Drive is connected there is a check mark before the text Connect. To disconnect the Drive you can click Connect again.

Read All Data from Drive

Choosing this alternative will read all data, including all p-sets and the configuration, from the Drive into ToolsTalk DS/DL.

Store All Data to Drive

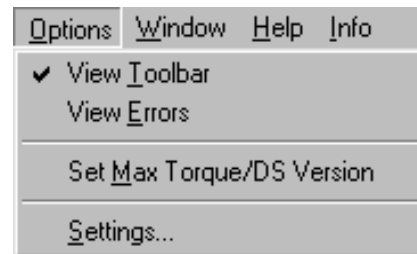
When you click Store All Data to Drive everything that you have entered into ToolsTalk DS/DL, all p-sets and the configuration, will be stored in the memory in the Drive.

Options

If you click Options in the pull down menu you can choose between View Toolbar, Set max. Torque/Drive Version and Settings.

View Toolbar

View Toolbar is an On/Off function that removes the Toolbar from the screen when Off.



Set Max. Torque/DS Version

Set max. Torque/Drive Version is a function that is only active when no tool and/or Drive is connected.

When a tool is connected the Max. Torque for that tool is automatically handled by ToolsTalk DS/DL. If, however, you wish to do the “Programming without having the DS/DL Drive connected”, then you set the Max. Torque and Drive version for your programming yourself with this function.

See “Tool List”, chapter 8 for more information about maximum torque values.

Settings

In Settings you can choose between Communication, Options and Printout, all of them are described below.

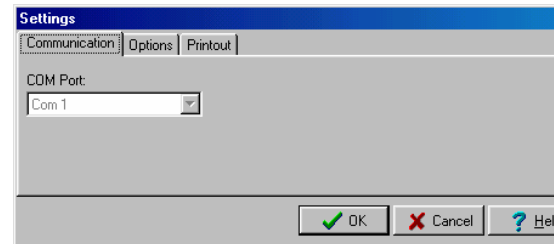
Tools Talk DS

Communication

Under Communication you can choose which COM port ToolsTalk DS/DL will use. Be sure that the COM port chosen is not configured for something else since this will disturb the functioning of ToolsTalk DS/DL.

If you have problems during start up, try to choose another COM port.

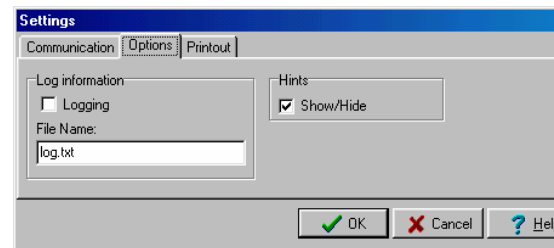
Note! The choice of COM port can only be done when the Drive is disconnected from the PC.



Options

Under Options you can decide whether the communication between the PC/TT DS/DL and the Drive should be logged or not logging. If for some reason a problem would occur, the saved logging could help the Atlas Copco software specialists to find the reason for the problem and chances increase that it can be solved.

Selecting Hints will give you small yellow Pop Up hints that help you when working in ToolsTalk DS/DL. For example explanations of icons.

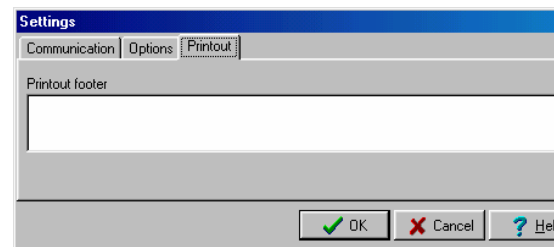


Printout

Under Printout you can write your own printout footer, i.e. your own notations on the bottom of each side of the printout.

You might want to do some notations on the printout specific for your workshop.

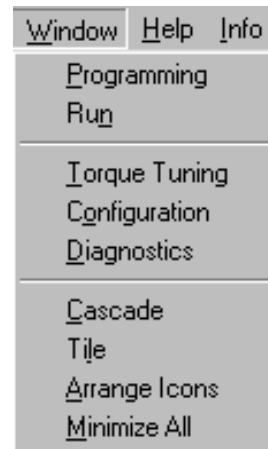
The printout footer enables you to create your own standard for these notations.



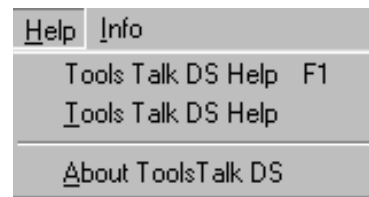
Window

Here, you can see the available functions. The other alternative is to activate the functions by clicking the icons.

The functions of the other commands are similar to them in Windows.

**Help**







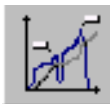
In the Help function, it is possible to open help files for instructions.

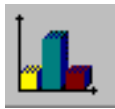
**Info**

In Info you will find a short information about Tensor DS/DL.



Toolbars in TTDS/DL

Symbol	Designation	Explanation
	Open file	<p>If you want to open a file with programming that is saved on the hard disc or on a diskette you click here. For more information about programming from file see “Programming the Drive from file ” in chapter 3.</p> <p>Remember that when you open a file it will automatically update the Programming Window with the new programming. If you do not click Store the new programming will not be stored in to the drive memory. For more information about Store see chapter 6.</p>
	Save file	<p>To save programming on hard disc in or on a diskette click here. For more information about saving programming on file see in chapter 6.</p>
	Cut	<p>If you mark a value and click here, the value is copied into the clipboard and disappears from the screen.</p>
	Copy	<p>If you mark a value and click here, the value is copied to the clipboard while it remains on the screen.</p>
	Paste	<p>When you click <i>Paste</i>, whatever is copied to the clipboard at that moment will be copied back in to the document and placed where the marker is currently positioned.</p>
	Print	<p>The <i>Print</i> icon will print the information in the currently selected window, except for the Main Window and the Rundown Window, and is therefore only lit up when a window is active. To print information from all windows or to change printer, choose <i>File</i> and <i>Print</i> in the pull down menu.</p>
	Open Programming window	<p>Clicking here will open the Programming window, for more information see “Programming Windows” in chapter 5.</p>



Open Run window

Clicking here will open the Run window, for more information see “Run Window” in chapter 5.4.



Open Torque Tuning window

Clicking here will open the Torque Tuning window, for more information see “Torque Tuning Window” in chapter 5.5.



Open Configuration window

Clicking here will open the Configuration window, for more information see “Configuration Window” in chapter 5.6.



Open Diagnostics window

Clicking here will open the Diagnostics window, for more information see “Diagnostic Window” in chapter 5.7.



Make contact with the Drive

When the PC does not have contact with the Drive the upper icon is visible. Clicking here will establish contact between PC and Drive.

When the PC has contact with the Drive the lower icon is visible. Clicking here will disconnect the PC from the Drive. Remember to *Store* before disconnecting.

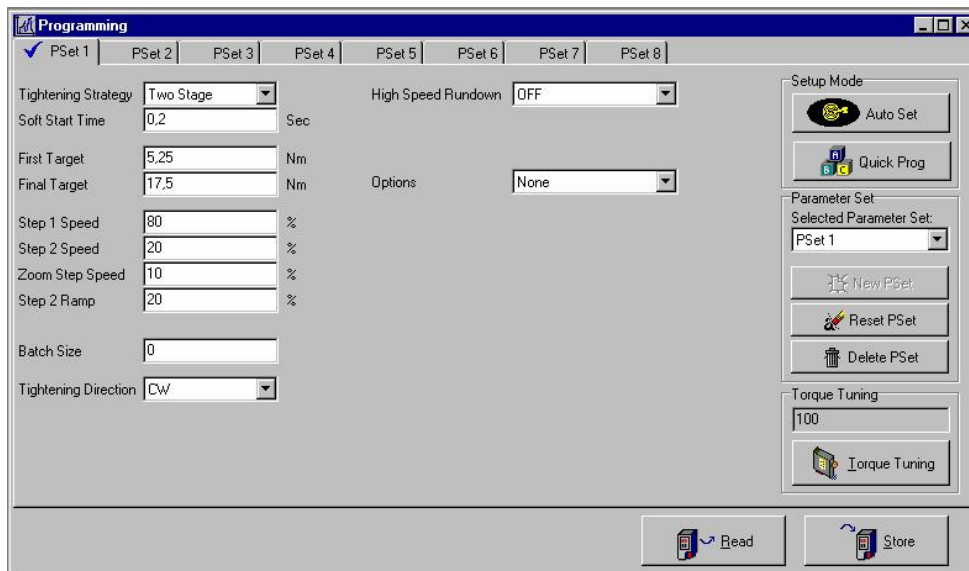
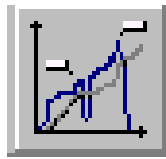
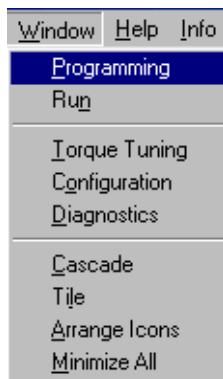


Help

If you click here you will get into the ToolsTalk DS/DL Help files that hopefully can help you solve any programming problems you might have run into.

The function is not activated in this program version.

5.3 Programming Window



The Programming window is the most important window in ToolsTalk DS/DL. Here you set all the torque parameters that the DS/DL Drive uses to control the tool. The programming can be done in three different levels: Auto Set, Quick Programming and Full Programming. The Programming window is different in the two Drive versions, D302 / D303 and D312 / D313. In D302 / D303 you do not have the possibility to change and open parameter sets.

Auto Set only requires the Final Target, the rest of the parameters are calculated and programmed automatically by the Drive while you perform a number of test tightenings. The Auto Set function does not require the PC to be connected, it can be done by using the keypad on the Drive, see “Auto Set” in chapter 6.4.

Quick programming: The Quick programming window does not require any knowledge about the Tensor DS/DL System. All you need to know is the Target Torque and the approximate hardness of your joint. The Quick programming window is shown when you click “Full Programming ” on in chapter 6.2 and disappears when the programming is done.

Note! The “Quick programming ” in chapter 6.3 results in a Quick Step strategy for the tightening, for more information on strategies see ”Full programming” in chapter 6.2.

Full programming: In the Full programming window the complete range of settings is accessible. This is where the skilled programmer fine tunes his DS/DL Drive programming. The Full programming window is the one that you open by clicking the Programming icon in the tool bar.

Important!

The values entered will not be active in the drive until the *Store* button is clicked. When a new value is typed followed by *Enter* it is stored into the Drive directly.

The p-set performed by the Drive is always the selected p-set.

From the Programming window you manage your p-sets, see “Selecting Parameter” in chapter 5.3. Further you can reach the Torque Tuning window by clicking Torque Tuning. This can only be done if the viewed p-set is the same as the selected p-set.

Programming window, D302 / D303

Programming

PSet 1

Tightening Strategy: Two Stage

Soft Start Time: 0.2 Sec

First Target: 8.25 Nm

Final Target: 27.5 Nm

Step 1 Speed: 80 %

Step 2 Speed: 20 %

Zoom Step Speed: 10 %

Step 2 Ramp: 20 %

Step1 Turns Min: 0.0 Turns

Step1 Turns Max: 999.0 Turns

Batch Size: 0

Tightening Direction: CW

Setup Mode: Auto Set, Quick Prog

Parameter Set: Reset PSet

Torque Tuning: 100, Torque Tuning

Read, Store

Programming window, D312 / D313

Programming

1 PSet 1 PSet 2 PSet 3 PSet 4 PSet 5 PSet 6 PSet 7 PSet 8

2 Tightening Strategy: Two Stage

3 Soft Start Time: 0.2 Sec

4 First Target: 5.25 Nm

5 Final Target: 17.5 Nm

6 Step 1 Speed: 80 %

7 Step 2 Speed: 20 %

8 Zoom Step Speed: 10 %

Step 2 Ramp: 20 %

Batch Size: 0

Tightening Direction: CW

High Speed Rundown: ON

Speed: 30 %

of Turns: 0 Turns

Options: Rundown Monitoring

Cycle start: 0 Nm

Search speed: 20 %

Step1 Turns Min: 0.0 Turns

Step1 Turns Max: 999.0 Turns

Clamp angle min: 0 Deg

Clamp angle max: 10000 Deg

Setup Mode: Auto Set, Quick Prog

Parameter Set: Selected Parameter Set: PSet 1

New PSet, Reset PSet, Delete PSet

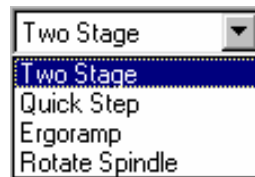
Torque Tuning: 100, Torque Tuning

Read, Store

1. Tightening strategy

You can select strategy choices as shown beside.

The strategy Rotate Spindle is only available for D312 / D313 drive.



2. Soft Start Time

In order to facilitate screw engagement the tool starts by turning at a very low speed during the soft start time.

3. First Target

At this torque level the tool will shift from Step 1 Speed to Step 2 Speed. What First Target to use depends on the joint hardness. On a hard joint it must be quite low to prevent overshoot, while on a soft joint it should be close to the Final Target in order to make the rundown time as short as possible. Make sure that the First Target is set low enough to allow a two stage tightening. A one stage tightening indicates a possible overshoot.

4. Final Target

At this level the tool stops and the tightening is finished. It is very important that the fastener turns at least 10 degrees in the second step. This is easily determined by looking at the fastener while the second step is being performed. If the fastener does not turn at all after the first step you should first lower the *First target* and if this does not help you lower the *Step 1 speed*. It is recommended to always keep the Step 1 Speed as high as possible.

5. Step 1 Speed

The speed with which the tool runs during the first step. On extremely hard joints it might not be enough to lower the First Target to prevent overshoot. The next action to be taken in that case is to lower the Step 1 Speed a little.

6. Step 2 Speed

The speed in the second step.

7. Zoom Step Speed

The speed at which the tool will shut off when Final Target is reached.

8. Step 2 Ramp

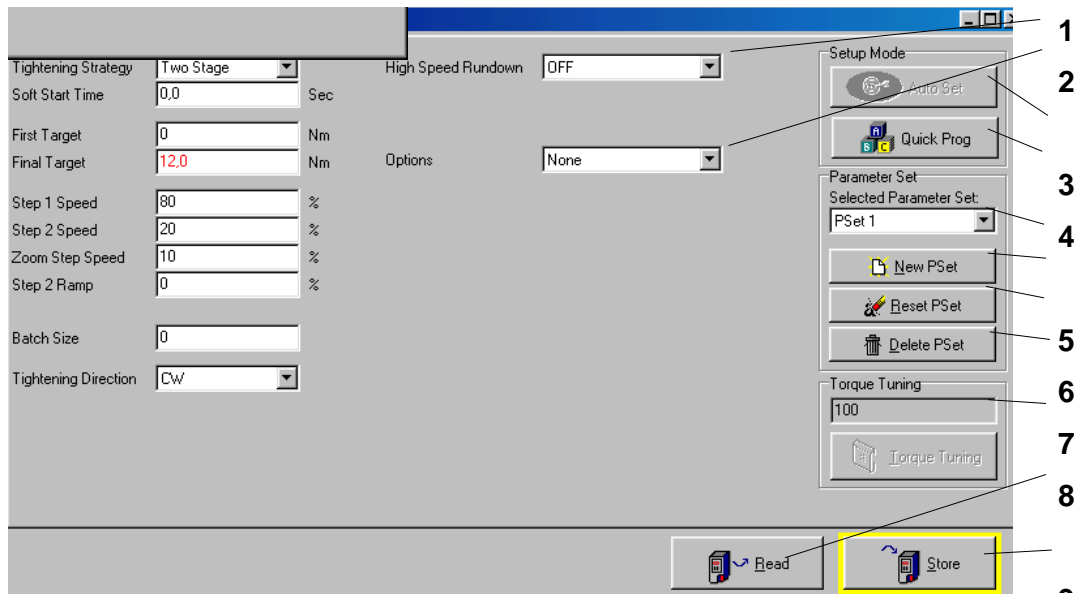
In Step 2 Ramp you can select the acceleration of the tool in step 2 between 0 and 100%.

9. Batch Size

Batch Size defines the number of joints in a batch. See also “Run Window” in chapter 5.4.

10. Tightening Direction

Here you can choose between clockwise tightening, CW, and counter clockwise tightening, CCW.



1 High speed rundown

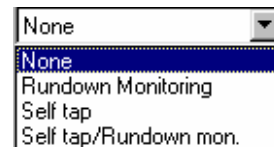
You can select High Speed Rundown ON/OFF, see chapter 4.3 High Speed Rundown.

2 Options

You can select options as shown beside.

Rundown Monitoring: The rundown and tightening angles during tightening are measured.

Self Tap: This function makes it possible to tighten bolted joints where the torque during tightening is higher than the final target. For example, this may be the case when tightening self-tapping screws. For more information, see chapter 4.3.



3 Auto Set

Auto Set only requires the Final Target, the rest of the parameters are calculated and programmed automatically by the Drive while you perform a number of test tightenings. The Auto Set function does not require the PC to be connected, it can be done by using the keypad on the Drive.

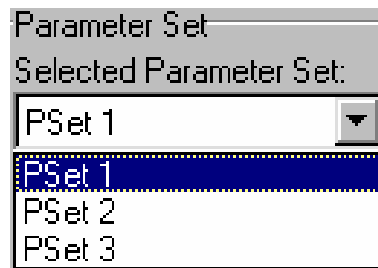
4 Quick programming

The Quick programming window does not require any knowledge about the Tensor DS/DL System. All you need to know is the Target Torque and the approximate hardness of your joint. The Quick programming window is shown when you click Quick Programming button and disappears when the programming is done. If Quick Programming has been used, this will be indicated with a red frame around the Quick Programming button.

Note! The Quick Programming results in a Quick Step strategy for the tightening.

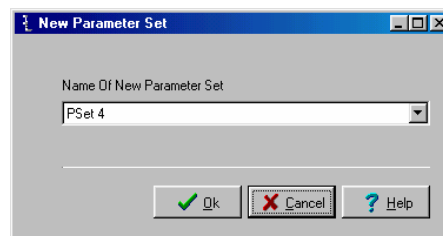
5 Selected Parameter Set, D312 / D313 only

By clicking here you get a list of all opened psets in the drive. By marking one and releasing the mouse the pset is selected in the drive.



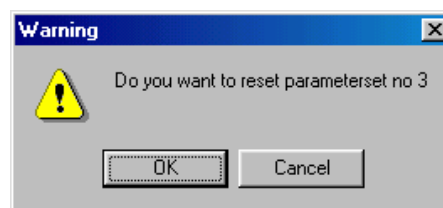
6 New Pset

Here you open psets. New psets will be set to default programming.



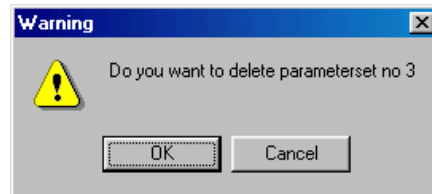
7 Reset Pset

Set all parameters to default values. Default values are depending on the max torque value on the tool used.



8 Delete Pset

Here you delete psets. New psets will be set to default programming.



9 Torque Tuning

All Drives and tools are normalised from delivery. This means that you can use any tool with any drive and the torque will be accurate.

However, sometimes variations in joint characteristics result in a need to fine tune the system in order to get exactly the correct torque on that specific application. See also Torque Tuning in chapter 5.5.

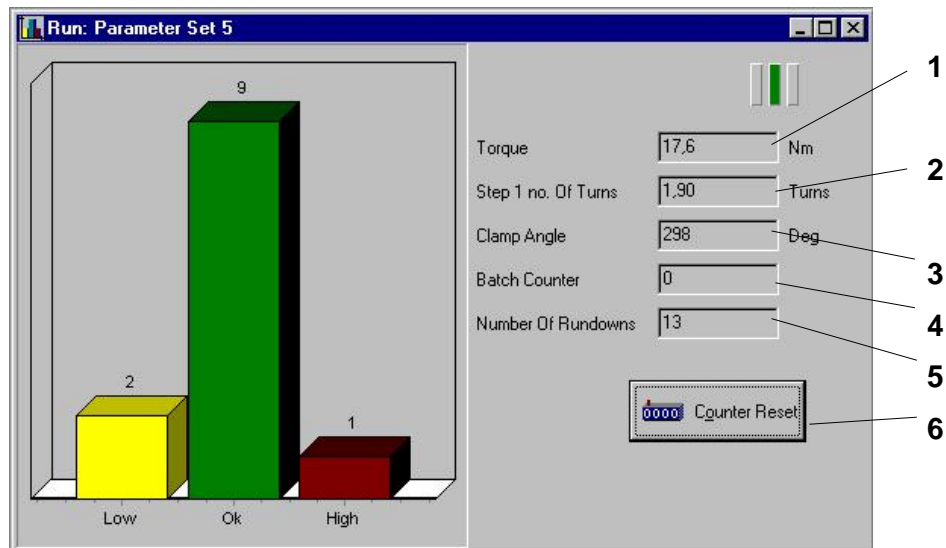
10 Read

Reads the current configuration from Drive.

11 Store

Stores the current configuration to Drive.

5.4 Run Window



1. Torque

The resulting torque for each tightening.

2. Step 1 no. of Turns

The number of turns in 1/10 of a full turn, measured in Step 1. The angle is measured from cycle start until end of Step 1. For more information, see Rundown Monitoring, chapter 4.3.

3. Clamp Angle

The angle from end of Step 1 until final target is reached. See also Rundown Monitoring, chapter 4.3.

4. Batch Counter

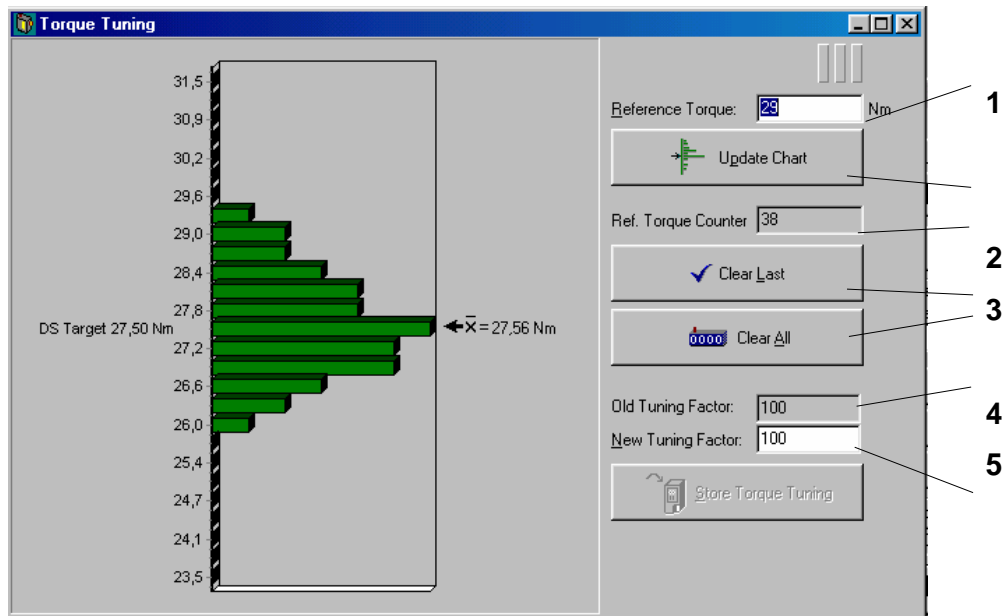
The Batch Counter is incremented by 1 for each OK tightening. When the Batch Counter reaches the number in Batch Size the counter is reset to zero and the nxOK signal light on the Drive is activated.

5. Number Of Rundowns

The number of rundowns performed since the window was opened or since Counter Reset was activated

6. Counter Reset

5.5 Torque Tuning Window



All DL Drives and tools are normalised from delivery. This means that you can use any tool with any drive and the torque will be accurate. Of course the Drive has to be of the correct size, DS4 Drive for DS4 tools etc. However, sometimes variations in joint characteristics result in a need to fine tune the system in order to get exactly the correct torque on that specific application. This is done in the Torque Tuning window. To determine if you need to do a Torque Tuning or not you can check the torque with an in-line transducer.

1. How to perform the Torque Tuning

Run the tool together with an in-line transducer on the specific application. It is important that it is on the real application since a test joint might behave differently.

2. Reference Torque

The value from your reference system, in-line transducer, torque wrench etc.

3. Update Chart

After each rundown input the reference torque (in-line transducer torque, NOT the torque shown on the Drive unit) in the field Reference Torque and press Enter or click Update chart. For each tightening the graph to the left will be updated and the mean value of the reference torques will be displayed. Further a new tuning factor will be calculated and displayed in the lower right part of the screen

4. Reference Torque Counter

The number of tightenings to ensure a good tuning factor must be at least 10, preferably 25.

5. Clear Last and

To erase the last entered Reference Torque simply click *Clear Last*.

6. Clear All

To restart the torque tuning procedure click *Clear All* and all entered values will be erased.

7. Tuning Factor

The Torque Tuning results in a Torque Tuning Factor, displayed in the bottom right corner of as well the Torque Tuning window as the Programming window. The Torque Tuning Factor is allowed to differ from the default value, 100 in a range from 20 to 220. If the Torque Tuning Factor is outside this range the field containing the new Factor value will be marked red and it is no longer possible to store the Torque Tuning Factor to the Drive.

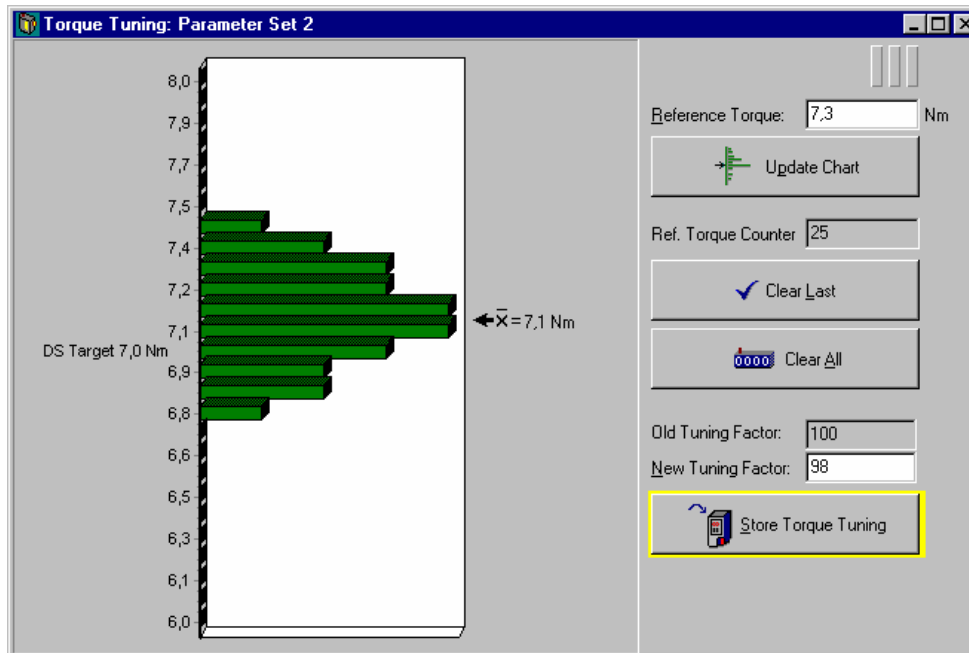
The Torque Tuning Factor can also be altered manually, without performing any tightenings. This requires good knowledge of how the Tensor DS works on the specific joint in question.

However, if you for example want a slight increase in the mean value of your tightenings in a particular p-set without changing the programming, you can increase the Torque Tuning Factor by a few units.

Note! The Torque Tuning Factor is specific for each combination of Drive and Tool. It is recommended to perform a Torque tuning on each combination individually.

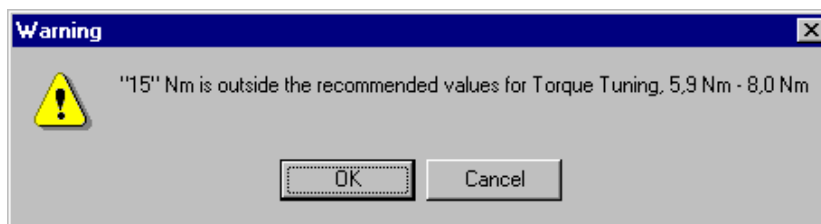
8. Store Torque Tuning

When a sufficient number of tightenings has been made you click *Store Torque Tuning* and the new Torque Tuning Factor will be stored in the Drive



Torque Tuning window, 25 tightenings made

If you would enter a value that is outside $\pm 15\%$ of target you will get an information dialogue box that looks as follows



Information dialogue box, torque outside recommended values

If you click OK the value will be used by TT DS/DL when calculating the new Torque Tuning Factor but if you click Cancel it is discarded.

Important about Torque Tuning

If the program in ToolsTalk DS/DL is not the same as the program stored in the Drive, then a dialogue window with the question "Store changes before Torque Tuning?" appears. Clicking *Yes* means the programming in ToolsTalk DS/DL will be stored into the memory in the Drive and you can proceed with your Torque Tuning. This procedure is designed to prevent operator mistakes, since the Torque Tuning function is performed with the values in the drive as a basis, not the values in ToolsTalk DS/DL / DL.

When *Store Torque Tuning* has been done you can not retrieve the old tuning factor from the Drive. However, the default tuning value from delivery is always 100.

When service has been made to the tool remember to make some rundowns on a joint and run the tool in the air for some 30 seconds before the Torque Tuning is performed. This will make the grease in the gears settle first so the output torque will not change over time.

The Torque Tuning Factor is closely related to the programming used when the Torque Tuning was performed. If you change the programming substantially you should also redo the Torque Tuning in order to get a perfect result.

Note! If you choose *Quick Programming* the Torque Tuning Factor is always set to its default value, 100.

5.6 Configuration Window, Tensor DS & DL

In the Configuration window you set the configuration for the DS/DL Drive. The Configuration window has three different subgroups: *System Administration*, *I/O Configuration (containing I/O Setup and RE-Alarm Setup)* and *Tool Service Setup*. you define the operator interface and in.

In System Administration you define the operator interface.

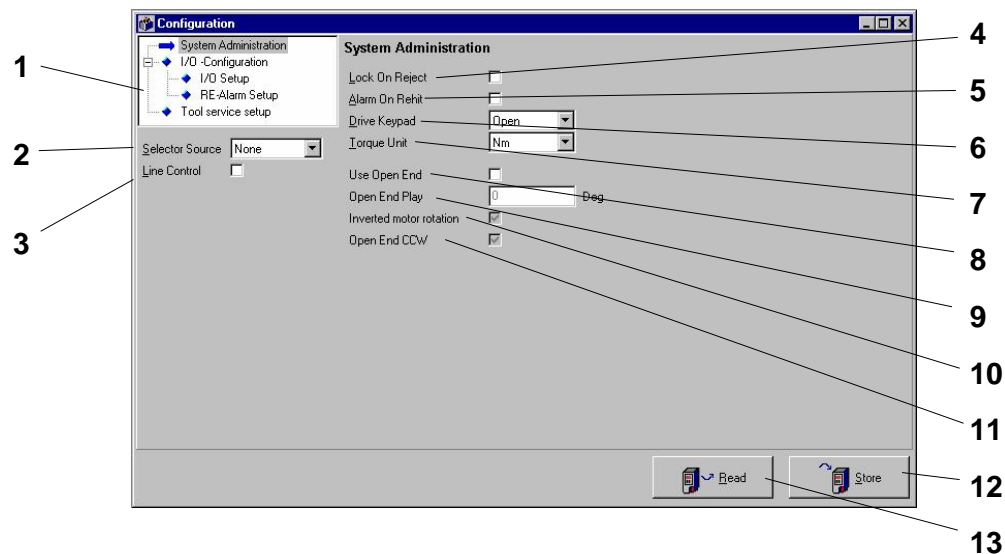
In *I/O Configuration –I/O* you define how to use the different input and output connections on the DS/DL Drive.

In *I/O Configuration - RE-Alarm Setup* you set the characteristics for the external alarm, see chapter 7.1.

Note! The Configuration looks different in the different Drive versions D302 / D303 and D312 / D313. The I/O Setup and the Lock On Reject do not exist in the D302 / D303 version.

The third group, Tool Service Setup, gives you information about the service status of the tool and also a possibility to program your own service interval.

System Administration

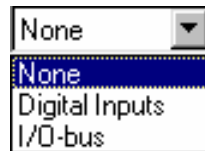


1. Subgroups

Shows the available selections.

2. Selector Source

In this window you can choose Selector Source, i.e. how the change between different p-sets should be done. You can choose between None, Digital input and I/O-bus



None:

None means that you select p-set in the Programming Window.

Digital inputs:

When you use a selector on the Digital Inputs you have the possibility to use Selector 15, Selector 15S or Rotary Selector 15. There are three Digital inputs on the Drive, corresponding to the three cables necessary to represent six different binary codes.

I/O-bus:

The I/O-bus will be used for RE-Alarm, Selector and I/O-Expander. The selector used on the I/O-bus will have p-set 1 connected to position 1 in the socket tray, p-set 2 connected to position 2 etc. When using the I/O-bus it is necessary to set the selector source to *I/O-bus* (when you use RE-Alarms on the I/O-bus you do not have to change any configurations).

Read more about the I/O bus under chapter 7, Accessories.

3. Line Control

Line Control is a built-in feature that is usually done with a PLC. When using *Line Control* all p-sets in the Drive are configured for Line Control. *Line Control* is used when the operator wants to control his station on the line and also make it impossible to go on with the next job before the current job is completed.

Note! Following Inputs **must** be used for a *Line Control*:

- *Line Control Start*, enables the tool
- *Line Control Alert 1*, connected to Relay Line Control Alert 1
- *Line Control Alert 2*, connected to Relay Line Control Alert 2
- *Reset Alarm*, resets Line Control Alert

Following Relays **must** be used with *Line Control*:

"*Line Control Alert 1*", *Line Control OK* must be on before *Line Control Alert 1*, else *Line Control Alert 1* is activated.

"*Line Control Alert 2*", *Line Control OK* must be on before *Line Control Alert 2*, else *Line Control Alert 2* is activated.

"*Line Control OK*", *Line Control OK* will be pulled when *nxok* is fulfilled. *Line Control OK* disables the tool in its tightening direction (CW or CCW). The tool will then be enabled again next time *Line Control Start* is on.

Other I/O-s that are suitable to use together with *Line Control* are *Batch Increment* (Input) and *DS Ready* (Relay), see chapter 5 and 6.

4. Lock On Reject

If you want the Tool/Drive to lock on rejected tightenings you mark "Lock On Reject". The tool will not be able to run when locked and the operator must then reset Lock On Reject before next tightening. To reset the Lock On Reject you need an external signal on one of the Inputs, which should be configured as "Reset Lock On Reject".

5. Alarm On Rehit

Alarm on Rehit will give the operator an alarm if a rehit occurs, i.e. if the operator runs the tool on an already tightened bolt.

6. Drive Keypad

Drive Keypad gives you the possibility to lock the keypad on the Drive. You have three possibilities. You can choose *Open*, then the keypad will be open to use for the operator. If you choose *Locked* you lock the keyboard and you will have to use ToolsTalk DS/DL to open the keypad for use again. The *IR-control* alternative enables you to lock and unlock the Drive using a remote control. To lock or unlock you press the button on the remote control at the same time as you point it at the front of the Drive. This changes the status from locked to unlocked and the other way around.

7. Torque Unit

In the field Torque Unit you choose the unit in which the torque should be programmed and presented. The default unit is Newton meter (Nm).

Note! If you have done the programming in one unit and then, afterwards, change to another unit the program will automatically recalculate all the programming you have done according to the new unit you have chosen. The presentation on the Drive will be the same as in ToolsTalk DS/DL.

8. Use Open End

In order for the tool to release after each tightening, the machine reverses when the trigger is pressed the next time. The tool will remain in that position each time that the trigger is pressed and until the socket has released. Only following this is the machine able to operate forward.

This means that the forward/reverse switch can remain in the same position all the time. If the switch should be in the reverse position, the tool will rotate in reverse, of course.

In reverse, the tool turns slowly and at low torque in order to not damage the socket.

Note! Which direction is forward and reverse depends on the selection rotational direction.

9. Open End Play

Open End Play is the play in the gears in the open end front part on the tool.

The play is automatically measured in the Open End Tuning, see chapter 5.2.

The play can also normally be adjusted by changing the valve in the configuration window. The play is measured in degrees.

10. Inverted Motor Rotation

If you are using an Open End front part that changes the rotating direction on the spindle, you need to mark this check box.

11. Open End CCW

For left hand fasteners.

12. Read

Reads the current configuration from DS/DL Drive.

13. Store

Stores the current configuration to DS/DL Drive.

5.7 Configuration Window, Tensor DL only

For the Tensor DL system, the System Administration section will have more options than for the DS system. The number of open fields will depend on whether you have a push-to-start or lever tool connected.

In System Administration you define the operator interface and behavior of the tool and here you can configure the push-to-start functionality and front lights of the push-to-start tools in the DL series.

Note!: The Configuration looks different for the different Drive versions, D303 and D313. The I/O Setup and the Lock On Reject do not exist on the D303 version. Also if you connect a push-to-start tool, a menu for configuring the push-to-start function and the front lights will be opened.

System administration, Tensor DL

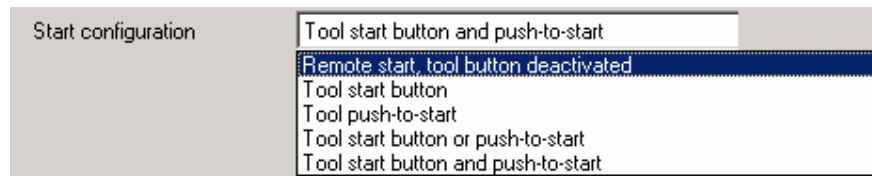
The screenshot shows the 'Configuration' window with the 'System Administration' section selected in the left-hand tree. The main area displays various configuration options for system administration. The 'Selector Source' is set to 'None' and 'Line Control' is unchecked. The 'System Administration' section includes the following settings:

Parameter	Value
Lock On Reject	<input type="checkbox"/>
Alarm On Rehit	<input type="checkbox"/>
Drive Keypad	Open
Torque Unit	Nm
Start configuration	Tool start button and push-to-start
Function button continuous	Toggle tightening/loosening
Function button single push	Next run a loosening, thereafter tightening direction
Function button double push	Change pset to next open pset
Illuminator setup	Startbutton enables illuminator
Illuminator end conditions	Turn off at time
Illuminator on time	15
Use Open End	<input type="checkbox"/>
Inverted motor rotation	<input type="checkbox"/>
Open end tightening direction	CW

At the bottom of the window, there are two buttons: 'Read' and 'Store'.

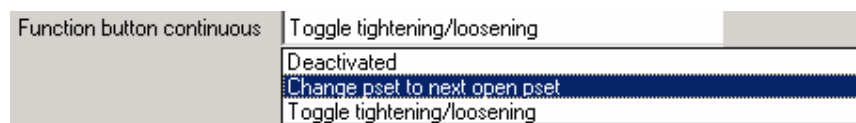
1. Start configuration

This menu configures the behavior of the start button.



- Tool start button
Tool starts by pressing the start button
- Tool Push-to-start
Tool starts by pushing the tool towards the working piece
- Tool start button or push-to-start
Tool starts by pressing the start button or by pushing the tool towards the working piece
- Tool start button and push-to-start
Tool starts by pressing the start button and at the same time pushing the tool towards the working piece
- Remote start, tool tool button deactivated
Tool is started by an external input signal **Note:** This option has to be selected if the remote start option is used

2. Function button continuous



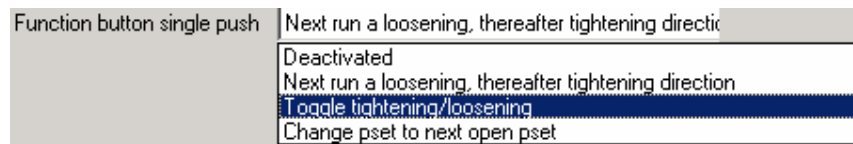
This menu configures the function button when it is pressed continuously. By holding the function button down continuously and press the start button, the tool will behave according to any of the options below:

- Deactivated
Function button continuous is deactivated
- Change pset to next open pset
Function button continuous lets you toggle between open psets with the start button

- Tightening / loosening
Button is dedicated to tightening / loosening direction.

3. Function button single push

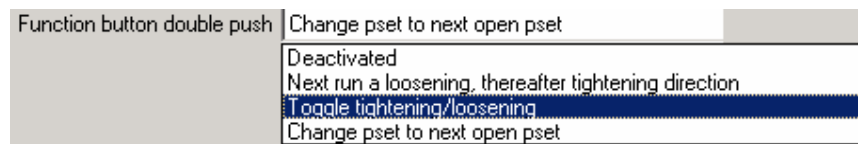
The tool can be set up for different behaviors when the function button is pressed once. The mode can be set up in three different options:



- Deactivated
Function button single push is deactivated
- Next run a loosening, then tightening direction again
Tool will change direction when button is pressed. When start button is released the tool will automatically change to the tightening direction.
- Toggle tightening/loosening
Tool will change direction when function button is pressed and run in that mode until the same button is pressed on more time.
- Change pset to next open pset
When button is pressed, the tool will automatically change the pset setting to the next programmed pset in the drive. In this way, you can toggle through the psets to quickly choose the appropriate one for your application.

4. Function button double push

The tool can be set up for different behaviors when the function button is pressed twice. The function mode with two button pushes can be set up in the same three different ways as for the single push.



- Deactivated
Function button double push is deactivated
- Next run a loosening, then tightening direction again
Tool will change direction when button is pressed. When start button is released the tool will automatically change to the tightening direction.
- Toggle tightening/loosening
Tool will change direction when function button is pressed and run in that mode until the same button is pressed on more time.
- Change pset to next open pset
When button is pressed, the tool will automatically change the pset setting to the next programmed pset in the drive. In this way, you can toggle through the psets to quickly choose the appropriate one for your application.

5. Illuminator setup

The illuminator setup enables configuration of the four, bright illuminator lights in the front of the tool. There are three different operating modes of the illuminator:

- Illuminator off
The illuminator is deactivated
- Startbutton enables illuminator
Illuminator is turned on when the startbutton is pressed
- New pset turns on illuminator
Illuminator is turned on when a new pset is selected, either by digital I/O or by I/O-bus.

6. Illuminator end configuration

Illuminator end conditions	Turn off at nxOK
	Turn off at time
	Turn off at OK
	Turn off at nxOK

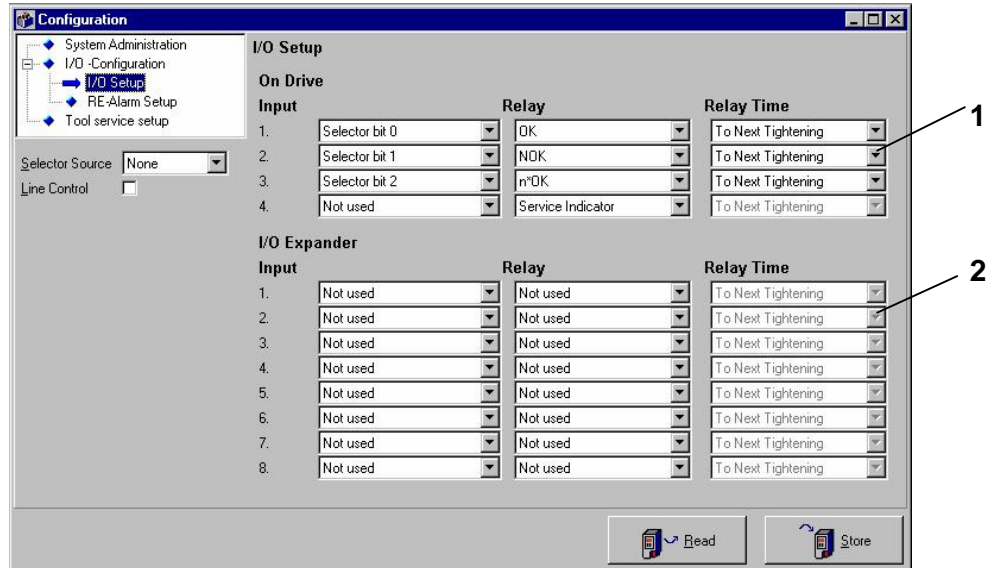
- Turn off at time
Illuminator is turned off at a specific time, which is set in the "Illuminator on time" field below
- Turn off at OK
Illuminator is turned off at OK tightening result
- Turn off at nxOK
Illuminator is turned off at a batch OK (nxOK) tightening result

9. Illuminator on time

Illuminator on time	15
---------------------	----

- This field specifies the illuminator on time in seconds from when the illuminator is started.

I/O Setup, D312 / D313 Version only



1. I/O Setup on Drive

Up to eight additional inputs and relays (giving a total of 12 inputs and relays) can be used with the help of an external I/O-device for the I/O-bus. The number of listed inputs and relays in the I/O Setup window will then be 12. Inputs and relays number 1 to 8 are connected via the I/O-bus.

2. I/O Expander

The I/O expander increases the number of relays and Opto inputs when more than those already built-in are needed. See also chapter 7, Accessories.

You can make following selections:

Input	<div><div>Not used</div><div>Not used</div><div>Reset lock on reject</div><div>Batch increment</div><div>Batch Decrement</div><div>Reset batch</div><div>Selector bit 0</div><div>Selector bit 1</div><div>Selector bit 2</div></div>
Relay	<div><div>Not used</div><div>Not used</div><div>OK</div><div>n*OK</div><div>NOK</div><div>Low torque</div><div>High torque</div><div>Tool tightening</div><div>Tool loosening</div></div>
Relay Time	<div><div>To Next Tightening</div><div>To Next Tightening</div><div>Time: 0,00 Sec</div><div>Input Control</div></div>

For a complete list of inputs and relays, see chapter 3.2 Inputs/Outputs.

Tool Service Setup

Here you get information about date for last service and number of tightenings after service. Also service interval is displayed and the default value is 2500.000 tightenings = our maximum recommended interval between service for a tool tightening a normal joint.

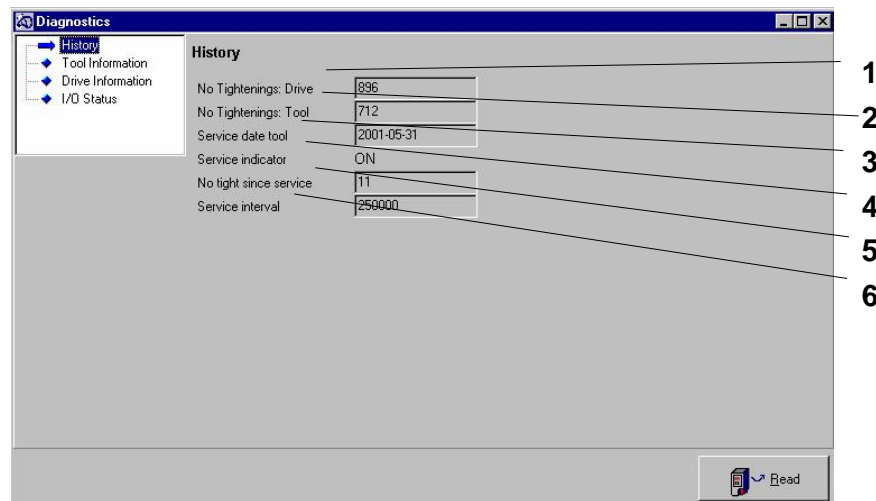
When pressing “Tool Service Reset” –buton you find an option to set your own service interval, between 10.000 and 2.500.000 tightenings, as well as service date. When pressing OK and thereafter STORE the counter will be reset to 0.

Detailed description of *Tool Service Setup*, see chapter 6.6.

5.8 Diagnostics

In the Diagnostics window you can read information from the tool and Drive memories. The Diagnostics Window has four different subgroups: *History*, *Tool Information*, *Drive information* and *I/O Status*

History



1. No tightenings: Drive

The number of tightenings that has been performed with the current DS/DL Drive.

2. No tightenings: Tool

The number of tightenings that has been performed with the connected tool.

3. Service date: Tool

The date for the latest performed service on the tool connected.

4. Service indicator

Tell the user if the service indicator is on or off

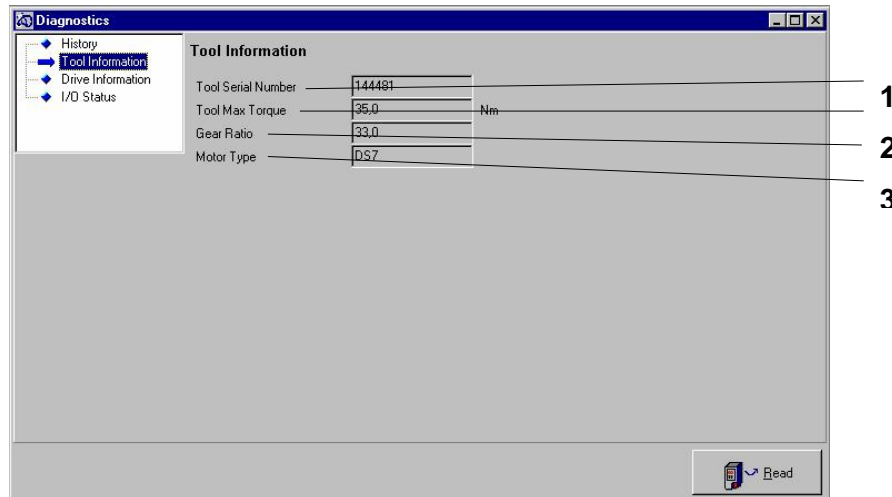
5. No tight since service

The number of tightening that has been performed since service

6. Service internal

The number of tightenings that the service internal set for

Tool Information



1. Tool serial number

This is an identification number unique to each tool.

2. Tool max. Torque

This is the maximum torque for the connected tool.

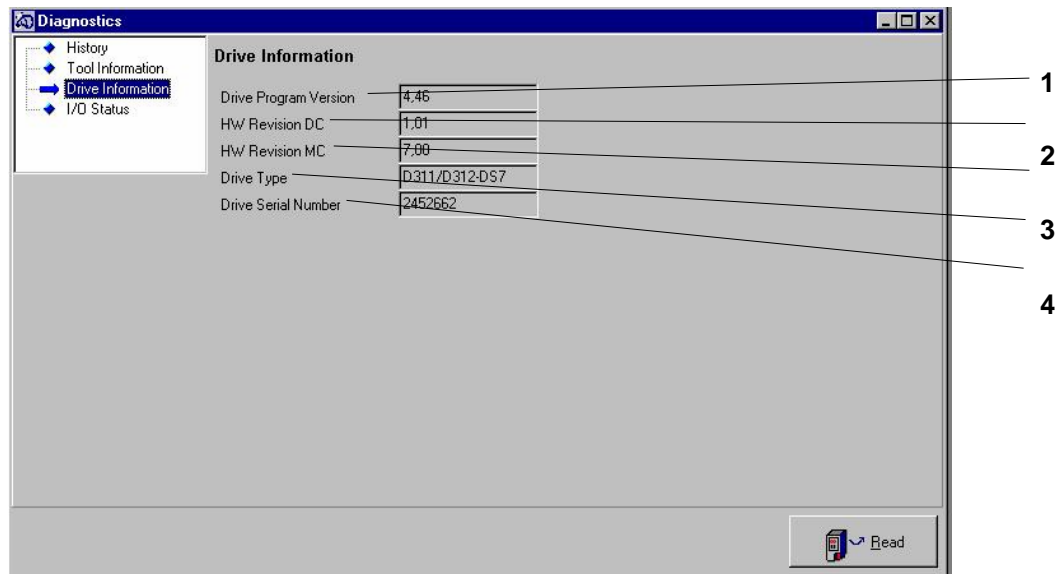
3. Gear Ratio

This number is the Gear Ratio of the connected tool.

4. Motor type

This indicates whether the tool is a DL, DS4, DS7 or DS9.

Drive Information



1. Drive Program Version

This indicates the program version that is used in the Drive, not to confuse with the program version of ToolsTalk DS/DL.

2. Drive HW revision DC

Indicates the revision of the Drive Card (DC).

3. Drive HW revision MC

Indicates the revision of the Motor Card (MC).

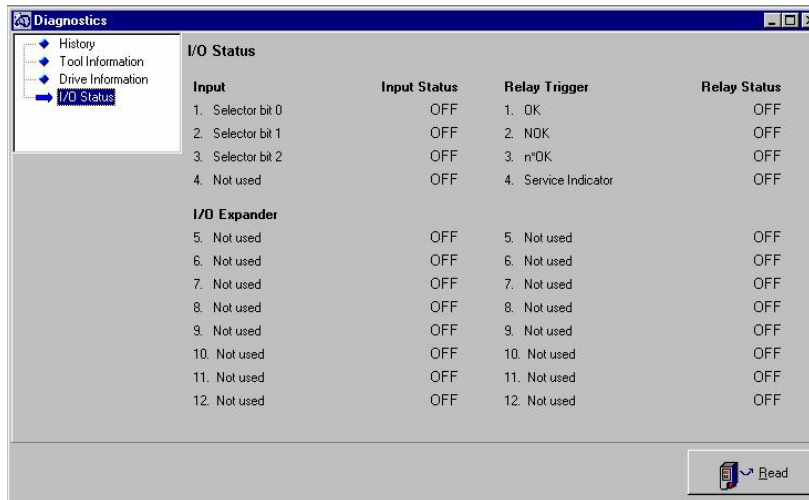
4. Drive type

This information gives you the type of Drive connected, i.e. DS4, DS7 or DS9.

5. Drive Serial Number

This is an identification number specific for each Drive. This number is also marked at the back of the Drive.

I/O Status, D312 / D313 version only



The I/O Status shows you the configuration of the inputs and the relays that is chosen in I/O. You can also see the current status of the inputs and the relays, i.e. if they are On or Off.

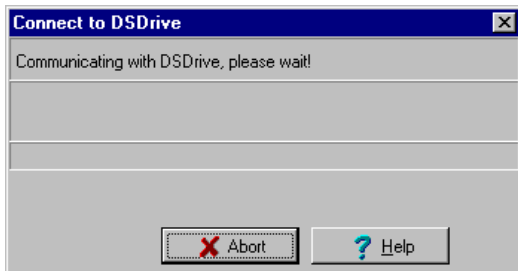
6. Programming

6.1 Hints

In this section we present some hints meant to support you in your work with ToolsTalk DS/DL / DL.

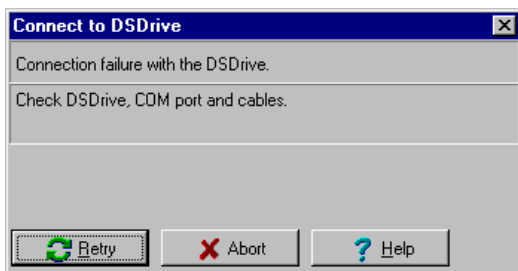
Programming without having the Drive connected

If you wish to make your programming in advance and load it down to the Drive later this is no problem. At the start up of ToolsTalk DS/DL the following window is displayed.



Establishing contact with the Drive dialogue box

You can enter the Main window by clicking *Abort* in the above window. If you do not click OK the following happens. As the Drive is not connected the attempt to connect the PC to the Drive will fail and this window is displayed:



Connection with DS/DL Drive failure dialogue box

Just click Abort.

Programming

Note! Since no drive is connected you now need to set the max. torque value and the Drive version (D302, D303, D312 or D313) yourself. For more information see “Options” and “Tool List” in chapter 3 and 8.

You now end up in the main window and you can continue with your programming. When no Drive is connected some of the functions in the Programming window are disabled. For example:

- It is not possible to select p-sets
- It will of course not be possible to *Store*, since *Store* is a command towards the Drive (it is however both possible and advisable that you *Save* your programming on file.

When no Drive is connected the *Run*, *Torque Tuning* and *Diagnostics* windows will have no practical use.

Important

Remember to save all your programming on diskette or hard disc before connecting to the Drive, otherwise the values in the Drive will overwrite the values you have entered on the ToolsTalk DS/DL screen.

Saving programming on file

When saving files of programming either choose *Save As* under *File* in the pull down menu or click the *Save File* icon.



Save File

The file saving routine is standard in Windows. You can use four different formats when saving:

dru	<i>Drive Unit</i>	All programming is saved, all the p-sets as well as the configuration.
dap	<i>All p-sets</i>	All opened p-sets in the Programming window are saved (only D312 / D313).
dop	<i>One p-set</i>	The viewed p-set is saved. Note! Not the selected p-set!
dcn	<i>Configuration parameters</i>	This format saves all the configuration parameters in the Configuration window.

To save a file you choose format and then you type the name of your file. You create your own file names, however it is recommended to create a certain structure when naming the files to make it easier finding them.

Programming

Programming the Drive from file

Programming from file means that you use a previously done ToolsTalk DS/DL programming stored in your PC or on a diskette to program your Drive. When programming from file just choose *Open* under *File* in the pull down menu or click the *Open File* icon and choose what file you want to use.



Open File

To program from file is the same as just opening the file. This means that when you have found the file you want to use double click on it (or mark it and click OK). Now the file will automatically overwrite whatever programming is on the screen in that moment.

When you click *Store* the chosen file will be stored into the Drive. However, as long as you do not click *Store* the old programming will still be in the Drive.

Store in drive

In the *Programming*, *Torque Tuning* and *Configuration* windows, and in their pull down menus, you will find a possibility to choose *Store*. *Store* means storing programming into the Drive's memory.

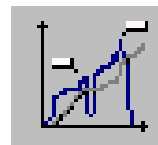
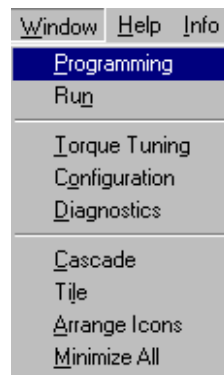
Store is a function that is connected to a particular window, i.e. the *Store* button in the Programming window, for example, stores everything that is in the Programming window into the Drive's memory. As soon as you change a value or a configuration setting a yellow frame will appear around the Store button in the window(s) where you have done the changes. This yellow frame means that the current programming in ToolsTalk DS/DL differs from that in the Drive and that you have to Store the changes before they will be active in the Drive.

6.2 Full Programming of pset

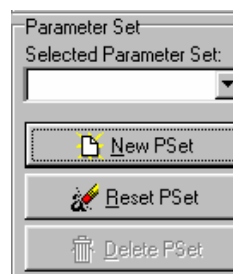
Explanations of respective programming parameter can be found in the section 5 Tools Talk DS / DL.

1. Open the list Window at the menu row. Select Programming or click the Programming icon.

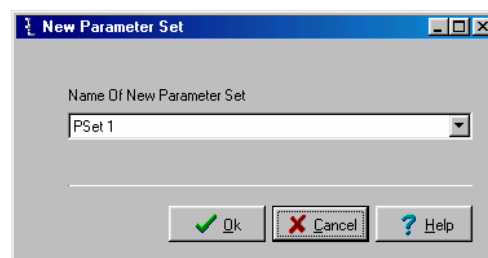
The Programming window becomes active and the corresponding icons are illuminated.



2. Click the New Pset button.

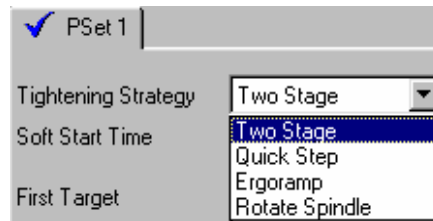


3. Now you can name the Pset



Programming

4. Select tightening strategy by clicking on the arrow to the right of Tightening Strategy. You are given four available selections.



✓ PSet 1

Tightening Strategy: Two Stage

Soft Start Time: Two Stage

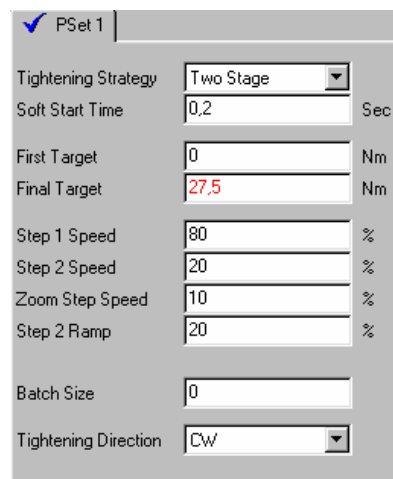
First Target: Ergoramp

Rotate Spindle

5. Continue programming by setting values for the parameters.

Enter desired values in respective column.

Follow the instructions below.



✓ PSet 1

Tightening Strategy: Two Stage

Soft Start Time: 0,2 Sec

First Target: 0 Nm

Final Target: 27,5 Nm

Step 1 Speed: 80 %

Step 2 Speed: 20 %

Zoom Step Speed: 10 %

Step 2 Ramp: 20 %

Batch Size: 0

Tightening Direction: CW

Soft Start

In order to facilitate screw engagement the tool starts by turning at a very low speed during the soft start time.

First Target

At this torque level the tool will shift from Step 1 Speed to Step 2 Speed. What First Target to use depends on the joint hardness. On a hard joint it must be quite low to prevent overshoot, while on a soft joint it should be close to the Final Target in order to make the rundown time as short as possible.

Make sure that the First Target is set low enough to always result in a two stage tightening. A one stage tightening indicates a possible overshoot.

Final Target

At this level the tool stops and the tightening is finished. It is very important that the fastener turns at least 10 degrees in the second step. This is easily determined by looking at the fastener while the second step is being performed.

If the fastener does not turn at all after the first step you should lower the *First target* and if this does not help you lower the *Step 1 speed*.

Step 1 Speed

The speed with which the tool runs during the first step. On extremely hard joints it might not be enough to lower the First Target to prevent overshoot.

The next action to be taken in that case is to lower the Step 1 Speed a little. It is important to always keep the Step 1 Speed as high as possible.

Step 2 Speed

The speed in the second step.

Step 2 Ramp

The Step 2 Ramp function is set as a percentage where 100% is the slowest acceleration and 0% is the fastest.

Programming

Ergoramp

The Ergoramp defines the time for the second stage. The time in the second stage is kept constant, regardless of the stiffness of the joint. 0% is a very short time (high speed) for the second stage and 100% is a long time (slow speed).

Zoom Step Speed

The speed at which the tool will shut off when Final Target is reached.

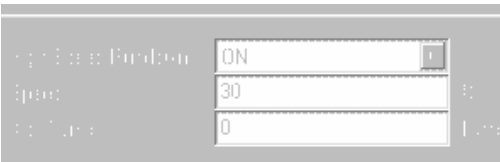
Batch Size

Batch Size defines the number of joints in a batch. See also “Run Windows” in chapter 5.4.

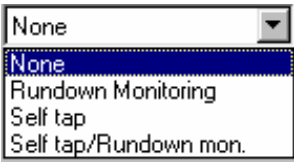
Tightening Direction

Here you can choose between clockwise tightening, CW, and counter clockwise tightening, CCW.

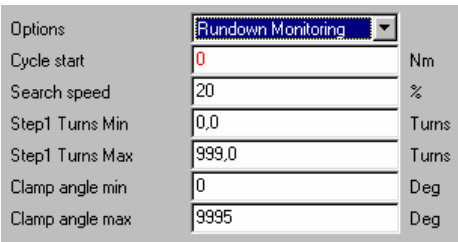
7. If you select ON at High Speed Rundown, the following selections are available. See chapter 4-3.



8. Options give you selections as shown beside. See chapter 4-3.



- 8.1 Rundown Monitoring
See chapter 4-3.



Options		
Cycle start	0	Nm
Search speed	20	%
Step1 Turns Min	0,0	Turns
Step1 Turns Max	999,0	Turns
Clamp angle min	0	Deg
Clamp angle max	9995	Deg

8.2 Self Tap

See chapter 4-3.

Options	Self tap	
Cycle start	0	Nm
Self Tap Torque Max	55,0	Nm
Search speed	20	%
Self Tap Interval	0	Turns

8.3 Self Tap/Rundown Monitoring

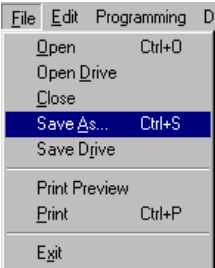
See chapter 4-3.

Options	Self tap/Rundown mon.	
Cycle start	0	Nm
Self Tap Torque Max	55,0	Nm
Search speed	20	%
Self Tap Interval	0	Turns
Step1 Turns Min	0,0	Turns
Step1 Turns Max	999,0	Turns
Clamp angle min	0	Deg
Clamp angle max	9995	Deg

10. After finished programming, the only task remaining is to save the p=sets.



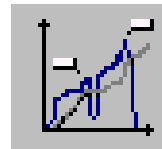
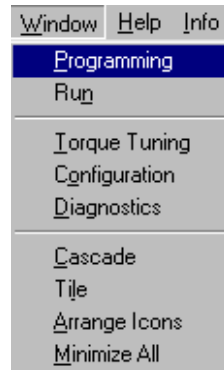
11. Click on File in the menu row at the top of the screen and then Save As.
Save the Pset in the desired directory.



6.3 Quick Programming

1. Open the list Window at the menu row. Select Programming or click the Programming icon.

The Programming window becomes active and the corresponding icons are illuminated.

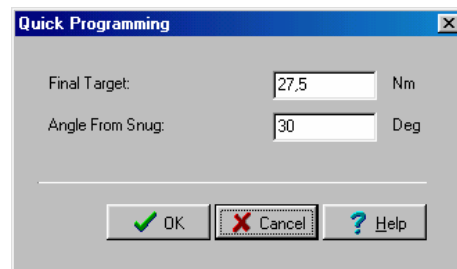


2. Click the Quick Prog button.



3. Set the value for Final Target and Angle from Snug.

Click the OK button.

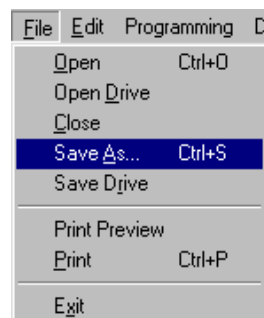


4. After finished programming, the only task remaining is to save the pssets.



5. Click on File in the menu row at the top of the screen and then Save As.

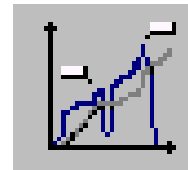
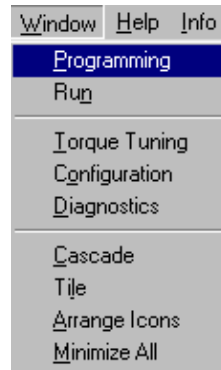
Save the Pset in the desired directory.



6.4 Auto Set

1. Open the list Window at the menu row. Select Programming or click the Programming icon.

The Programming window becomes active and the corresponding icons are illuminated.



2. Click the Auto Set button.



3. Set the value for Final Target.

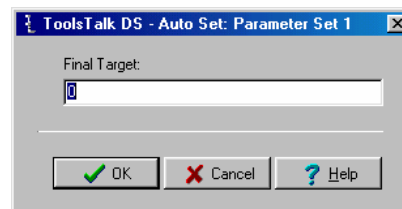
Click the OK button.

Now 5-10 tightenings are required for the Drive to find a program suitable for the particular joint characteristics.

While performing test tightenings, a green LED is lit on the DS/DL Drive, the LED is marked with a graph.

When the LED is turned off the AutoSet is completed and the programming optimized to the specific joint.

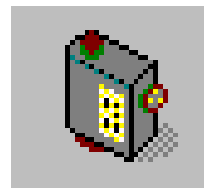
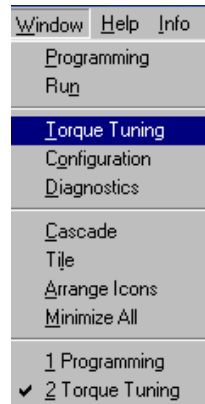
All tightenings, also during the test AutoSet tightenings are considered OK if the Drive shows a green light OK.



6.5 Torque Tuning

1. Open the list Window at the menu row. Select Torque Tuning or click the Torque Tuning icon.

The Torque Tuning window becomes active and the corresponding icons are illuminated.



2. Run the tool together with an in-line transducer on the specific application. It is important that it is on the real application since a test joint might behave differently.

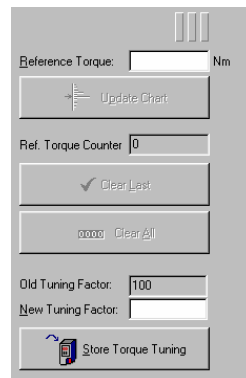
3. After each rundown input the reference torque (in-line transducer torque, **NOT** the torque shown on the Drive unit) in the field *Reference Torque* and press Enter or click *Update chart*.

For each tightening the graph will be updated and the mean value of the reference torques will be displayed. Further a new tuning factor will be calculated and displayed in the lower right part of the screen.

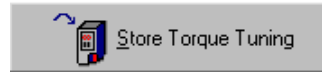
The minimum tuning factor is 80. It is not possible to program and store a value less than 80.

The maximum tuning factor is 220. At 120 a warning is displayed.

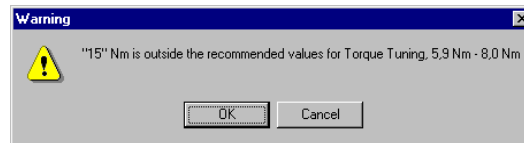
Normally, the tuning factor is in between the interval 80-120.



4. When a sufficient number of tightenings has been made you click *Store Torque Tuning* and the new Torque Tuning Factor will be stored in the Drive. The number of tightenings to ensure a good tuning factor, at least 10, preferably 25 tightenings.



5. If you would enter a value that is outside $\pm 15\%$ of target you will get an information dialogue box that looks as follows



*Information dialogue box,
torque outside
recommended values*

6. If you click OK the value will be used by TT DS/DL when calculating the new Torque Tuning Factor but if you click Cancel it is discarded.
7. To erase the last entered Reference Torque simply click *Clear Last*. To restart the torque tuning procedure click *Clear All* and all entered values will be erased.

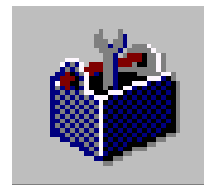
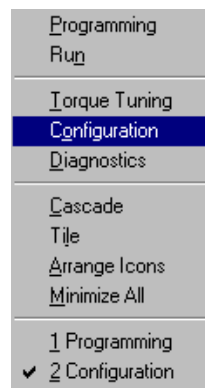


6.6 Configuration

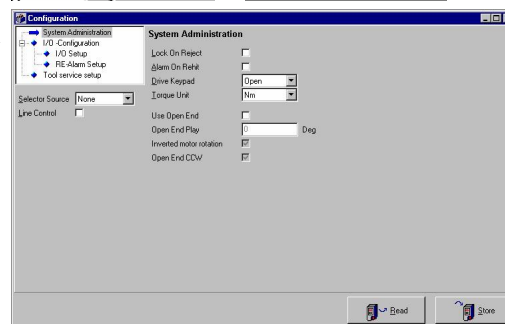
Note! The Configuration menu looks different in the different drive versions D302 / D312 (DS) and D303 / D313 (DL). ToolsTalk DS/DL will automatically launch the appropriate Configuration window depending on the drive and tool attached.

1. Open the list Window at the menu row. Select Configuration or click the Configuration icon.

The Configuration window becomes active and the corresponding icons are illuminated.



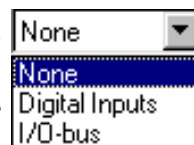
2. The Configuration Window looks like this when System Administration is chosen.



3. Read the current configuration, if any, from DS/DL Drive.

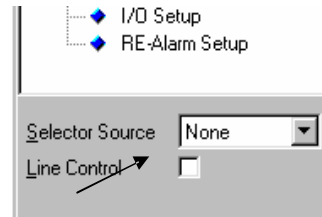


4. In this window you can choose Selector Source, i.e. how the change between different p-sets should be done. You can choose between None, Digital input and I/O-bus



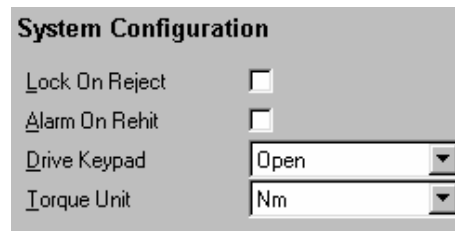
5. *Line Control* is a built-in feature that is usually done with a PLC. When using *Line Control* all p-sets in the Drive are configured for Line Control.

For additional information about use of Inputs for and Relays with Line Control, see chapter 5.



System Configuration DS/DL Drive

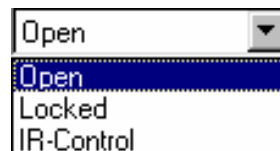
1. If you want the Tool/Drive to lock on rejected tightenings you mark "Lock On Reject". The tool will not be able to run when locked and the operator must then reset Lock On Reject before next tightening. To reset the Lock On Reject you need an external signal on one of the Inputs, which should be configured as "Reset Lock On Reject".
2. Alarm on Rehit will give the operator an alarm if a rehit occurs, i.e. if the operator runs the tool on an already tightened bolt.
3. *Drive Keypad* gives you the possibility to lock the keypad on the Drive. You have three possibilities.



You can choose *Open*, then the keypad will be open to use for the operator.

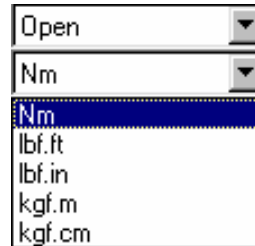
If you choose *Locked* you lock the keyboard and you will have to use ToolsTalk DS/DL to open the keypad for use again.

The *IR-control* alternative enables you to lock and unlock the Drive using a remote control. To lock or unlock you press the button on the remote control at the same time as you point it at the front of the Drive. This changes the status from locked to unlocked and the other way around.



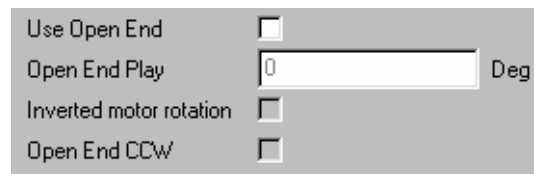
Programming

4. In the field Torque Unit you choose the unit in which the torque should be programmed and presented. The default unit is Newton meter (Nm).



5. Select ON/OFF or value for:

- § Use Open End
- § Open End Play
- § Inverted Motor Rotation
- § Open End CCW

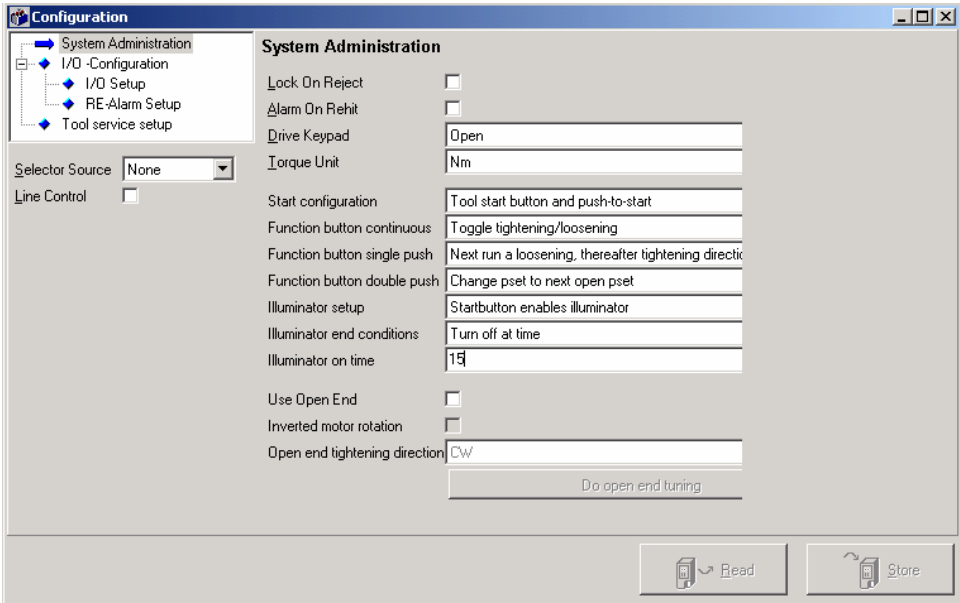


For more info about Open End, see chapter 5.6.

6. Save the current configuration to Drive by clicking Store button..



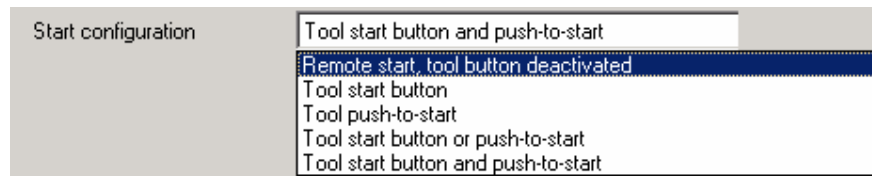
System administration, Tensor DL



Programming

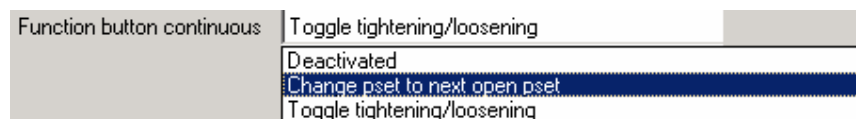
1. Start configuration

This menu configures the behavior of the start button.



- Tool start button
Tool starts by pressing the start button
- Tool Push-to-start
Tool starts by pushing the tool towards the working piece
- Tool start button or push-to-start
Tool starts by pressing the start button or by pushing the tool towards the working piece
- Tool start button and push-to-start
Tool starts by pressing the start button and at the same time pushing the tool towards the working piece
- Remote start, tool tool button deactivated
Tool is started by an external input signal Note: This option has to be selected if the remote start option is used

2. Function button continuous

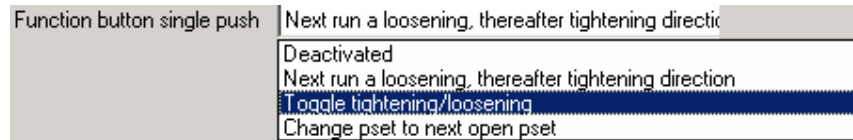


This menu configures the function button when it is pressed continuously. By holding the function button down continuously and press the start button, the tool will behave according to any of the options below:

- Deactivated
Function button continuous is deactivated
- Change pset to next open pset
Function button continuous lets you toggle between open psets with the start button
- Tightening / loosening
Button is dedicated to tightening / loosening direction.

3. Function button single push

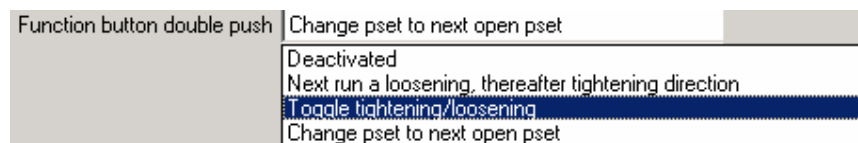
The tool can be set up for different behaviors when the function button is pressed once. The mode can be set up in three different:



- Deactivated
Function button single push is deactivated
- Next run a loosening, then tightening direction again
Tool will change direction when button is pressed. When start button is released the tool will automatically change to the tightening direction.
- Toggle tightening/loosening
Tool will change direction when function button is pressed and run in that mode until the same button is pressed on more time.
- Change pset to next open pset
When button is pressed, the tool will automatically change the pset setting to the next programmed pset in the drive. In this way, you can toggle through the psets to quickly choose the appropriate one for your application.

4. Function button double push

The tool can be set up for different behaviors when the function button is pressed twice. The function mode with two button pushes can be set up in the same three different ways as for the single push.



- Deactivated
Function button double push is deactivated
- Next run a loosening, then tightening direction again
- Tool will change direction when button is pressed. When start button is released the tool will automatically change to the tightening direction.

Programming

- Toggle tightening/loosening
Tool will change direction when function button is pressed and run in that mode until the same button is pressed on more time.
- Change pset to next open pset
When button is pressed, the tool will automatically change the pset setting to the next programmed pset in the drive. In this way, you can toggle through the psets to quickly choose the appropriate one for your application.

5. Illuminator setup

The illuminator setup enables configuration of the four, bright illuminator lights in the front of the tool. There are three different operating modes of the illuminator:

- Illuminator off
The illuminator is deactivated
- Startbutton enables illuminator
Illuminator is turned on when the startbutton is pressed
- New pset turns on illuminator
Illuminator is turned on when a new pset is selected, either by digital I/O or by I/O-bus.

6. Illuminator end configuration

Illuminator end conditions	Turn off at nxOK
	Turn off at time
	Turn off at OK
	Turn off at nxOK

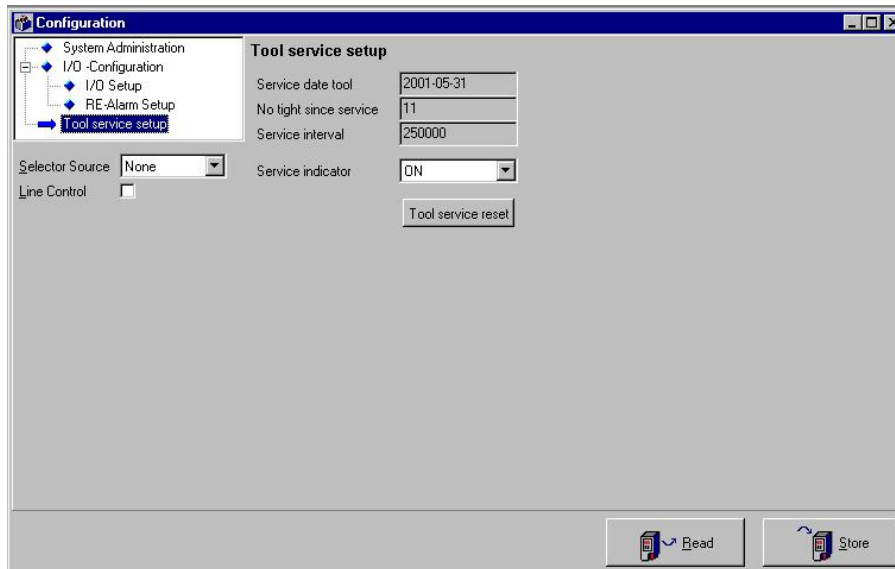
- Turn off at time
Illuminator is turned off at a specific time, which is set in the "Illuminator on time" field below
- Turn off at OK
Illuminator is turned off at OK tightening result
- Turn off at nxOK
Illuminator is turned off at a batch OK (nxOK) tightening result

12. Illuminator on time

Illuminator on time	15
---------------------	----

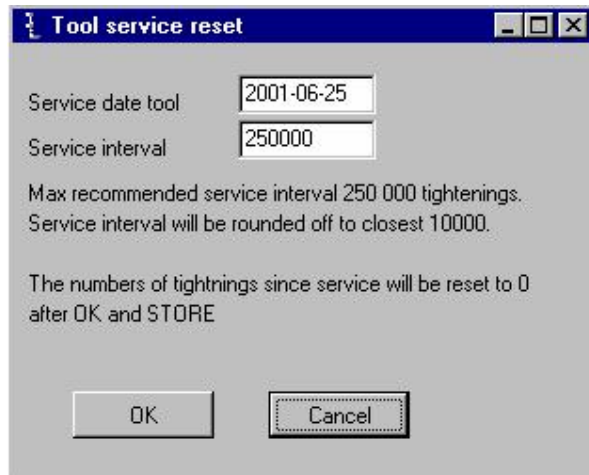
- This field specifies the illuminator on time in seconds from when the illuminator is started.

Tool Service setup



In this window you can see information about date for last service and number of tightenings after service. It is also the starting window for setting the service date in the tool and the service interval. You activate the service indicator by changing the pull down menu to ON.

Programming

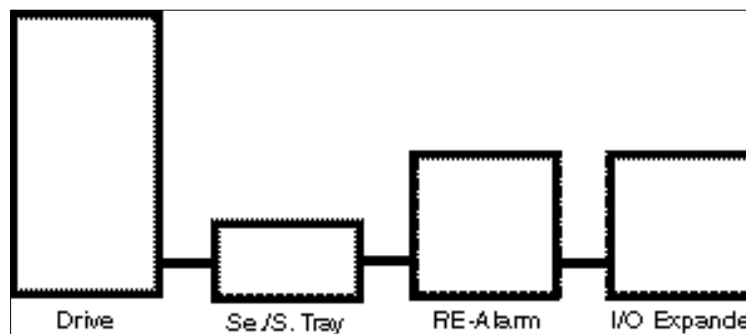


When clicking the "Tool Service Reset" button a new window is shown where you set your service interval as well as service date. The service interval can be set between 10,000 to 2,500,000 tightenings. The default value is 250,000 tightenings which is also our max recommended interval for a normal joint. Note that service interval value will be rounded off to 10,000. When pressing OK and STORE the counter will be reset to 0.

7. Accessories

I/O Bus (D312 / D313 only)

The benefit of using I/O-Bus based accessories is that they can be hard-wired in series - from accessory to accessory rather than hard-wire each accessory to the DS/DL Drive. This arrangement increases flexibility, allows quick installation and decreases stoppage. See example shown below.



7.1 RE Alarm

An RE-Alarm is possible to connect to the Drive. The RE-Alarm is a portable device, connected to the drive with a cable, that can be placed near the operator to give signals for OK, NOK and nxOK.

There are two different type of RE Alarms for Tensor DS312 / D313. One is the RE Alarm designed for Tensor S/PF 2000, 8431 0455 36 and one for Tensor DS, 8433 0560 03.

In order to use RE-Alarm 8431 0455 36 you need a special adapter cable, no 4222 0472 00. When using both Re-Alarm and Tensor S/PF 2000 relay type socket tray/selector in combination, then use adapter cable 4222 0486 00.

RE Alarm, 8431 0455 36

The Drive communicates through the relays with the RE Alarm. There are three different functions on the RE Alarm, OK, NOK, nxOK. The relays shall be configured according to the table below. In the D302 / D303 drive the relays are hard coded to this configuration.

Relay	Function
RE 1	OK
RE 2	NOK
RE 3	nxOK

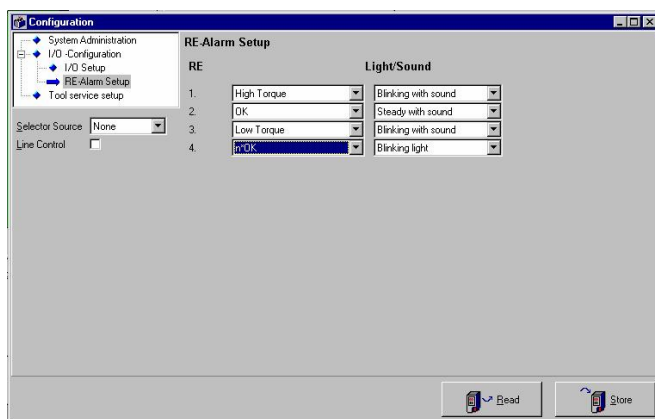
I/O-Bus RE Alarm, 8433 0560 03 (D312 / D313 only)

This RE Alarm do not use any of the digital inputs, instead it communicates with the drive through the I/O-Bus.



Configuration

The drive is configured in TTDS/DL /Configuration window/RE Alarm Setup. Chose which function shall light up the lamp on the RE Alarm in the list underneath RE and what type of sound and light you want to have with that function.



Hex Switch default value

When connecting the RE-Alarm to the drive it is necessary to have the hex switch in the right position. Make sure that the device # is set to default value. The RE-Alarm only work for DS when the device # is set to default.

Device	Default
RE Alarm	3

Cables and Connectors

When installing the RE Alarm use I/O-Bus cables 4222 0470 xx together with termination 4222 0443 00, xx is the length of the cable, for example:

Cable length	Part no.
0.5 meter	4222 0470 00
1 meter	4222 0470 01
3 meter	4222 0470 03
5 meter	4222 0470 05
10 meter	4222 0470 10
15 meter	4220 0470 15

For more information about available lengths of the cable, see the Tensor DS or Tensor DL brochure.

Everywhere where there is a “free” connector there has to be a termination put in. There can not be any “loose ends” in the system. So in order to install one Selector it is necessary to use one

Accessories

cable and two termination plugs. The termination plugs are included with every I/O-Bus accessory.

For more information of the selector please read the selector ASL.

7.2 Selector, only for D312 / D313

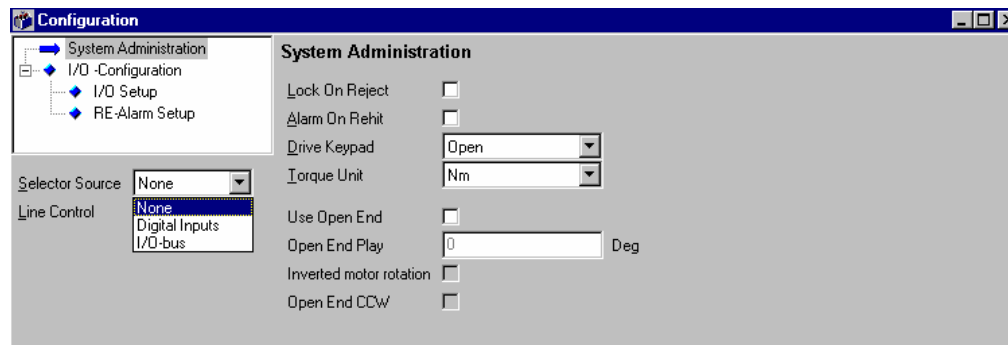
When using multi p-sets it is very convenient to use a socket tray. When using selector it has to be configured through ToolsTalk.

If using the Tensor S/PF 2000 relay type socket tray/selector use adapter cable 4222 0417 00, and if combining above with an Re-Alarm, use adapter cable 4222 0486 00. In order to enable the tool a parameter set has to be chosen, e.g. socket lifted, when the selector function is activated.

Four inputs and four relays are hardwired with individual connectors on the back of the drive.

There are three different ways of choosing p-set. One is through TTDS/DL , the second is through the inputs on the back of the drive and the third is through a Selector connected to the I/O-bus.

In TT DS/DL /Configuration it is possible to chose these three types of selector sources.



Selector source "None"

The p-set is selected through TTDS/DL . In the programming window you can chose p-set under "Selected Parameter Set".

Selector source “Digital inputs”

The p-set is selected through the digital inputs. By programming the inputs with Selector bit 0, Selector bit 1, Selector bit 2 and Selector bit 3 it is possible to have up to eight different p-sets. The inputs are interpreted binary according to the table below.

Parameter Set	Selector bit 3	Selector bit 2	Selector bit 1	Selector bit 0
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0

Example:

P-set 7 uses three inputs and Selector bit 0,1 and 2. Bit 0 binary is equal to 1, bit 1 is 2 and bit 2 is 4. When we have a signal on each one of Selector bit 0-2 this is equal to $1+2+4=7$. This gives us P-set 7.

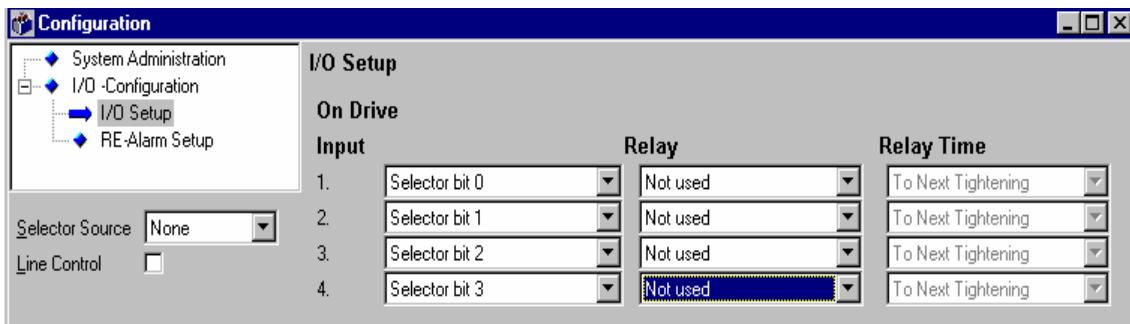
If we are only using three P-sets it is only necessary to use two inputs and Selector bit 0 on one input and Selector bit 1 on the other.

Accessories

Selector 15 and Selector 15 R

There are two Selectors normally used together with Tensor S/PF2000 that can be connected to Tensor DS / DL. These two selectors uses the digital inputs to communicate with the drive. Configure the drive according to the table below and use adapter cable 4222 0417 00 or 4222 0486 00.

Input	Function
Digital Input 1	Selector bit 0
Digital Input 2	Selector bit 1
Digital Input 3	Selector bit 2
Digital Input 4	Selector bit 3



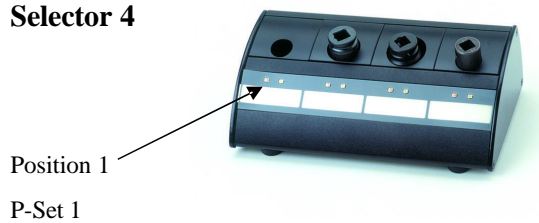
Product	Ordering no.
Selector 15	8433 0601 13
Selector 15R	8433 0606 41

The selector 15 is a socket tray with six positions and Selector 15R is a rotary selector with up to 15 positions. Note that Tensor DS/DL only handles up to ten p-sets.

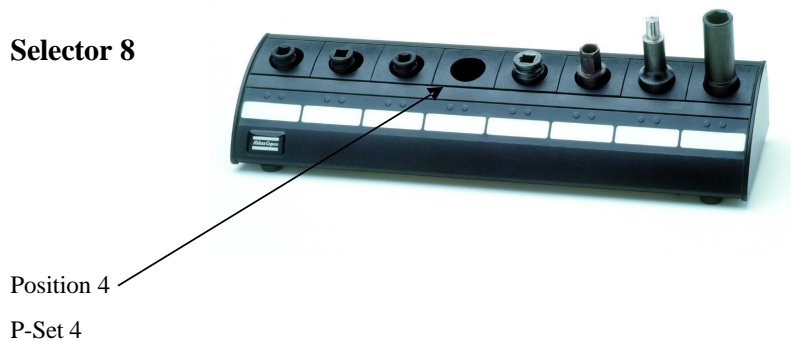
Selector source “I/O-Bus”

There are two different type of selectors developed for Tensor DS / DL, Selector 4 and Selector 8.
8. Only one Selector at a time can be connected to the DS or DL drives.

Selector 4



Selector 8



Parameter Set number

On Tensor DS the P-Set no. is the same as the socket position. P-Set no one is to the left on the socket tray.

Default value

When connecting the selectors to the drive it is necessary to program the Selector Source to “I/O-Bus”. After this make sure that the device # is set to default value. The Selectors only work for DS/DL when the device # is set to default.

Selector	Default
Selector 4	5
Selector 8	6

Accessories

Cables and Connectors

When installing Selector 4 or 8 use I/O-Bus cables 4222 0470 xx shall be used together with termination 4222 0443 00. xx stands for the length of the cable

Cable length	Part no.
0.5 meter	4222 0470 00
1 meter	4222 0470 01
3 meter	4222 0470 03
5 meter	4222 0470 05
10 meter	4222 0470 10
15 meter	4222 0470 15

Everywhere it is a “free” connector there has to be a termination. There can not be any “loose ends” in the system. So in order to install one Selector it is necessary to use one cable and two terminations.

For more information of the selector please read the selector ASL.

7.3 I/O Expander

The I/O Expander increases the number of relays and Opto inputs when more than the four hard I/O are needed. It consists of up to eight extra programmable inputs and relays. The I/O Expander communicates with the drive through the I/O-Bus.

I/O Expander, 8433 0564 38



Configuration

For configurations for the inputs and relays please see how the hard I/O's are programmed in Chapter 5.

Default value

When connecting the I/O Expander to the drive it is necessary to have the hex switch in the right position. Make sure that the device # is set to default value.

<u>Device</u>	<u>Default</u>
I/O Expander	2

Cables and Connectors

When installing the I/O Expander use I/O Bus cables 4222 0470 xx together with termination 4222 0443 00, xx is the length of the cable, for example:

<u>Cable length</u>	<u>Part no.</u>
0.5 meter	4222 0470 00
1 meter	4222 0470 01
3 meter	4222 0470 03
5 meter	4222 0470 05
10 meter	4222 0470 10
15 meter	4220 0470 15

Accessories

7.4 IR Key

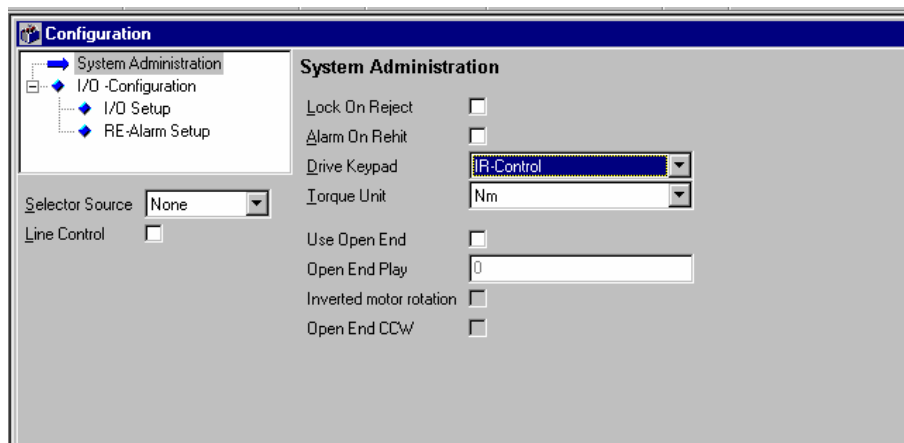
IR Key = Infra red key. This accessory is an infrared remote control key, 8092 1141 00, similar in size and shape of a laser pointer that allows authorised personnel to unlock the KeyPad of the DS/DL Drive for limited manual programming.

The IR Key enables the user to lock and unlock the DL Drive unit, without having to connect a PC to the DL Drive and start ToolsTalk DS/DL.



Configuration

When using the IR Key the drive has to be set into IR Control mode. This is done in TT DL/Configuration window/System Administration shown below.

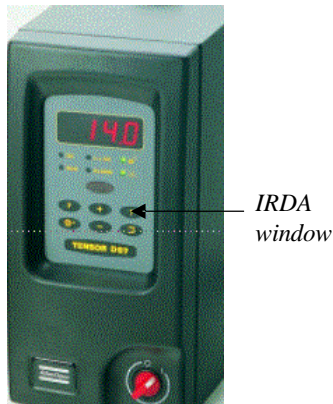


Operating the IR Key

The IR Key shall be pointed against the IRDA window on the drive. The range for the IR Key is approx 0.5 meters, and the angle 30 degrees. This

limitation of range is to prohibit locking/unlocking of the wrong DS/DL Drive when several drives are mounted side by side.

After opened the Key Pad will lock automatically after 15 minutes from the last entry on the Key Pad.



There are three different states for the keypad set through TT DL, Open, Locked and IR Control.

Open

Open means that the keypad is set in a opened state and will remain that way. It is always possible to get access to the keypad. The drive will not be affected with the Remote Control

Locked

Locked means that the keypad is set in a locked position. The keypad will not respond to any presses on the buttons. The drive will not be affected with the remote control.

IR Control

By setting the drive in the IR-Control position it is possible to lock and open the drive from a remote control. When set in this state the drive will automatically resume a locked position 15 min after the last entry was made.

8. Trouble Shooting

8.1 Error Messages in ToolsTalk DS/DL

The error messages from the ToolsTalk DS/DL program presented below are arranged under the different ToolsTalk DS/DL windows where they would occur. Here we have only listed the error messages from ToolsTalk DS/DL.

For further information concerning error messages from the running Operative System on your PC we refer to the manual for the system used.

Main Window

Message	Reason
Unknown File type	File with extension \neq dru, dap, dop, dcn
No programming is done	If invalid values are entered
... is now out of limit!	If the values entered are outside checking-limits
Motor Tuning failed	The Motor Tuning has failed. Press Abort.

Programming / Torque Tuning Window

Message	Reason
The Quick programming value is not correct!	Value not valid or outside the limits
Not a Valid Number!	If a value \neq integer, or name \neq text
...is outside the recommended values for	If the value is outside warning limits
...is not valid	If the value is outside error limits

Trouble Shooting

Communication Messages

Message	Reason
Not able to write value to DS/DL Drive, Check DS/DL Drive, COM port and cables	If the PC cannot connect to the Drive
Connection failure with the DS/DL Drive Check DS/DL Drive, COM port and cables	If the PC tries to make connection with the Drive and does not succeed within a certain time, or you try reconnect and still no contact is made
Check COM port. No COM ports available.	If no COM Ports are available to the program

8.2 Error codes on Drive

System features

Error codes are displayed with 4 characters. All error codes begin with E to indicate error code, and comprise of a three-digit number, where the first digit defines an error code group.

All error codes are sent to Tools Talk DS/DL and can be read here with a short explanation.

Error acknowledgment

Certain errors require a user acknowledge (ack). On the display this is indicated by flashing the error code.

The ALARM led is lit for every error code that has to be acknowledged.

Help text

A small text toggled with the error code. Only for group 0. Timing is 500ms error code 500ms help text.

§ Group 0 Rundown failures, E000-E031

§ Group 1 Event related errors, E100-E131

§ Group 2 User input error, E200-E231

§ Group 4 Communication errors, E400-E431

§ Group 5 Hardware errors TOOL, E500-E531

§ Group 6 Hardware errors DC3000/MC3000, E600-E631

Errcode	Short description	Acknowledge	What to do?	Help text
E000				
E001	Torque LO	No	Start button was probably released to early. Let the tool “finish” the tightening.	“Torque value”
E002	Torque HI	No	The programming is bad. Please check the programming and make sure that you have some movement on the socket in the second stage.	“Torque value”
E003	Torque measurement possibly invalid	No	The programming is bad. Please check the programming and make sure that you have some movement on the socket in the second stage.	
E004	Angle1 LO	No	Check programming or the joint.	LO°1
E005	Angle1 HI	No	Check programming or the joint.	HI°1
E006	Angle2 LO	No	Check programming or the joint.	LO°2
E007	Angle2 HI	No	Check programming or the joint.	HI°2

Trouble Shooting

Errcode	Short description	Acknowledge	What to do?	Help text
E100				
E101	Pset invalid (Check sum error)	Yes	<p>If Tools Talk DS/DL (TTDS/DL) is connected press read and change a parameter in the programming window and store it. After this change the parameter back to what it is supposed to be.</p> <p>If no TT DS/DL is connected then change Final target by the F2 function on the Drive Key Pad and store it. Afterwards change it back to it's original value.</p>	
E102	Rundown prohibited due to Lock on Reject	No	Give a signal on any input programmed with Reset Lock On Reject or unmark Lock On Reject in configuration in TTDS/DL .	
E103	Clockwise direction prohibited via digital input	No	Deactivate the input programmed with "Clockwise disable".	
E104	Reverse direction prohibited via digital input	No	Deactivate the input programmed with "Counter Clockwise".	
E106	Rundown prohibited due to CycleHold active	No	Deactivate the input programmed with "Cycle Hold".	
E107	Rundown prohibited due to Line Control, Line Control Start not enabled.	No	Enable Line Control Start through any input programmed with Line Control Start or unmark Line Control in TT DS/DL Configuration.	
E108	Rundown prohibited due to keypad usage	No	Press on the SET or ENTER button on the key pad until you see four dashes or dots on the display.	

Trouble Shooting

Errcode	Short description	Acknowledge	What to do?	Help text
E109	Pset Revision not supported by this SW	Yes	Connect TT DS/DL version 2.20 or higher. When connected a question to update the p-set will come. Please do this.	
E110	Configuration Revision not supported by this SW	Yes	Connect TT DS/DL version 2.20 or higher. When connected a question to update the p-set will come. Please do this.	
E111	MC Rundown timeout	No	Restart the tool.	
E112	Rehit	No	You tried to tighten the fastener when it was already tightened and Alarm On Rehit was marked in TTDS/DL /Configuration. Please unmark Alarm On Rehit or retighten the fastener.	
E113	Current limit reached – rundown aborted	Yes	Check the system why current limit was reached.	
E114	Open End Reference position not found	Yes	You have tried to perform an Open End Tuning without success. Please check the tool and/or the open end gear.	
E115	Direction uncertain	Yes	You have probably pressed the start button to quick since last time. Please allow more time between releasing the start button and trying to start the tool again.	
E116	Self Tap Torque Max reached – rundown aborted	No	Either the torque while tapping the hole is too great or Self Tap Torque Max is set too low.	
E120	Motortuning failure	Yes	Redo the Motortuning. If this does not work, service the tool.	

Trouble Shooting

Errcode	Short description	Acknowledge	What to do?	Help text
E121	OpenEnd tuning failure	Yes	Redo the Open End Tuning.	
E131	Tool Disconnected	Yes	Shut the drive off and connect the tool. Start the drive.	
E200				
E201	First target > final target	No	Lower First Target or increase Final Target.	
E202	Final target > Tool max torque	No	Lower Final Target.	
E204	Final target < 10% of tool max torque	No	Increase First Target	
E205	Pset not open	No	Open the P-set in TTDS/DL .	
E206	Pset nr invalid	No	Two or more sockets are lifted at the same time or pset 9 or higher is chosen.	
E400				
E403	IO device not responding	No	Check cables and restart drive.	
E408	Multiple devices of same type on IO bus	Yes	You are only allowed to use one	
E409	Multiple selectors on IO bus	Yes		
E410	No selector found and pset source is IO bus	Yes	Connect the Selector and restart the drive or chose none on Selector Source in TT DS/DL /Configuration.	
E412	IO expander has ID ◇ 2	Yes		
E413	RE Alarm has ID ◇ 3	Yes		

Errcode	Short description	Acknowledge	What to do?	Help text
E415	4socket selector has ID < 5	Yes		
E416	8socket selector has ID < 6	Yes		
E500				
E501	Tool overheated	No	Let the tool cool down and restart.	
E502	Service Indicator	Yes	Service the tool	
E511	Tool-DC3000 size mismatch	Yes	Check that the tool and drive are of the same "size". DS4 tool-DS4 drive DS7 tool-DS7 drive DS9 tool-DS9 drive	
E512	Tool revision not supported by this drive SW	Yes	Verify that tool revision is correct.	
E513	Tool EEPROM error	Yes	Service Tool	
E514	Tool EEPROM error	Yes	Perform motor tuning	
E515	Tool commutation sensor error	Yes	Restart drive. If error code still remains then service tool.	
E516	Rotor magnet remanens out of range	Yes	Restart drive. If error code still remains then service tool.	
E517	Tool maxtorque or Gear Ratio out of range	Yes	Check tool memory.	
E518	Tool normalisation out of range	Yes	Perform normalisation.	

Trouble Shooting

E600				
E601	Dcbus LO	Yes	Restart drive. If problem still remains check line voltage.	
E602	Dcbus HI	Yes	Restart drive. If problem still remains check line voltage.	
E603	DC3000 overheated	No	Shut the drive off and let the drive cool down. Restart drive.	
E604	24V output error	Yes	24 volt power supply overloaded. Check current consumption and restart drive. Read specifications for maximum power consumption.	
E605		Yes	Contact Atlas Copco Service personnel	
E611	DC3000 EEPROM corrupt (csum error)	Yes	Contact Atlas Copco service personnel.	
E612	MC3000 EEPROM corrupt (csum error)	Yes	Contact Atlas Copco service personnel.	
E613	Config1 EEPROM corrupt (csum error)	Yes	Connect TT DS/DL and check programming. Change parameters and store.	
E614	FirmWare corrupt (csum error etc)	Yes	Reload drive soft ware.	
E615	Option definition HW/SW mismatch	Yes	Reload the drive software and make sure the right drive version (D302 / D303 or D312 / D313) is chosen.	
E616	Current measurement offset error	Yes	Contact Atlas Copco service personnel.	
E617	Current measurement gain error	Yes	Contact Atlas Copco service personnel.	

8.3 What might have happened...

Below we have described different scenarios that we know can disturb the functioning of the DS/DL System. Mainly these disturbances are triggered by erroneous commands or actions when communicating with the Drive through ToolsTalk DS/DL. However, it is not possible to harm the system permanently no matter how wrong the programming is, the worst case possible is that you might need to restart the Drive.

To restart the Drive just turn the power switch off and wait for ca 5-10 seconds and then turn it back on again. When the Drive is powered on just click the *Connect* icon in ToolsTalk DS/DL and you will be up programming again.

...if the tool does not run when I push the trigger?

First of all check that the power is on and that the tool cable is connected.

More:

Check for Error Codes on the display and read the error code list what might have prevent the tool from running.

If a *Store* has just been made please wait up to 30 seconds and try to run the tool again.

If a selector is used an existing p-set has to be chosen. If a socket tray type selector is used only one socket can be lifted (please check the LED's on the socket tray to verify this, sometimes small sockets do not trig the sensor if no positioning device is used).

Check the programming. Impossible programming (for example if First and Final Target are both zero) will prevent the tool from running.

If the Store button is activated while the tool is running or if the Store button is activated while ToolsTalk DS/DL is busy storing data into the Drive the P-set might not be correctly stored and also impossible to run. This is easily solved by pressing Store again. This will be indicated with E101 on the display.

...if the Drive does not start up?

Please check...

...that the power cable to the Drive and the cable to the tool are connected. Note that a tool of the correct size is needed. In this case DS4, DS7 or DS9, depending on the Drive.

...that the fuses in the Drive are OK.

...that the Ground Fault Interrupter (GFI) is in its "On"-position.

Trouble Shooting

...if the PC does not get contact with the Drive?

Please check...

...that the Drive is powered on.

...that you have the correct type of communication cable between the PC and the Drive, for specification see chapter 9.

...that the communication cable between the PC and the Drive is connected to the RS 232 serial communication port, COM port, on the PC.

... that the correct COM port is selected in ToolsTalk DS/DL.

If it doesn't work, try to select another COM port in ToolsTalk DS/DL by choosing *Options* in the pull down menu and then *Settings* and *Communication*.

If you click the arrow beside *COM ports*, ToolsTalk DS/DL will show you the available COM ports.

...that the right Tools Talk DS/DL version in combination with the drive version is used.

All Tools Talk DS/DL versions are downward compatible.

For drive software versions 4.4 and higher it is necessary to use Tools Talk DS/DL 2.20 or higher version.

If none of the COM ports work, and you have pin pointed the problem down to the COM ports the COM ports in your computer are most likely configured in a special way. For example by using another computer to verify that the Drive and cables are OK.

For more information about how to reset this configuration we refer to the manual for your PC.

...that only one ToolsTalk DS/DL is running in the computer. If by mistake ToolsTalk DS/DL has been opened twice please close both sessions and restart one of them.

...if I do not succeed with my installation of Tools Talk DS / DL?

Please check...

...that the PC fulfils the requirements stated in chapter 10 on page 10 – 2.

Be sure to write **A:\setup** in the installation procedure. Sometimes A:\install is used, but not for ToolsTalk DS/DL.

For Windows NT special routines may be required.

...if I do not succeed with my installation of drive soft ware

If you can not down load the drive sw please check so that the FIFO-buffers are enabled. Below is described where you find the FIFO-buffer.

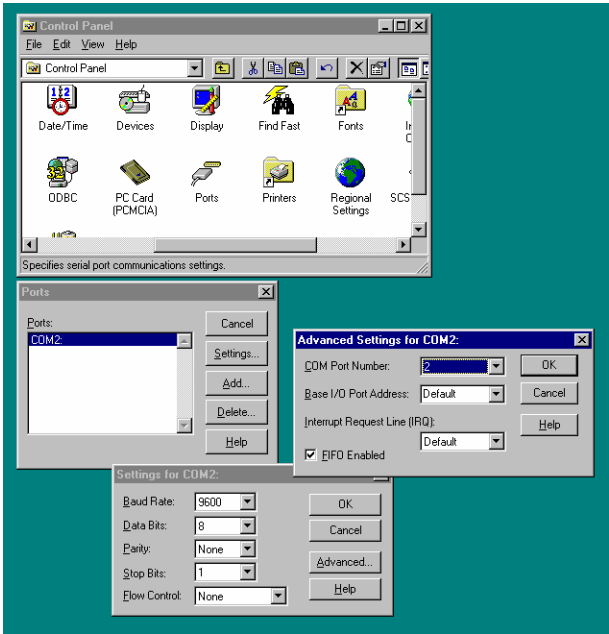
Windows 95 and Windows 98

Go to: Control Panel
System
Device Manager
Ports (COM & LPT)
Port Settings
Advanced
Mark "Use FIFO-buffers" and click on defaults.

Windows NT

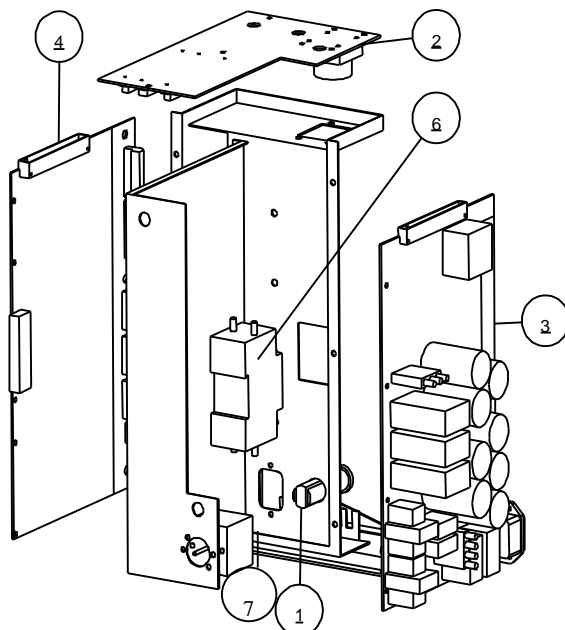
Go to: Control Panel
Ports (COM & LPT)
Settings
Advanced
Mark "FIFO enabled".

Trouble Shooting

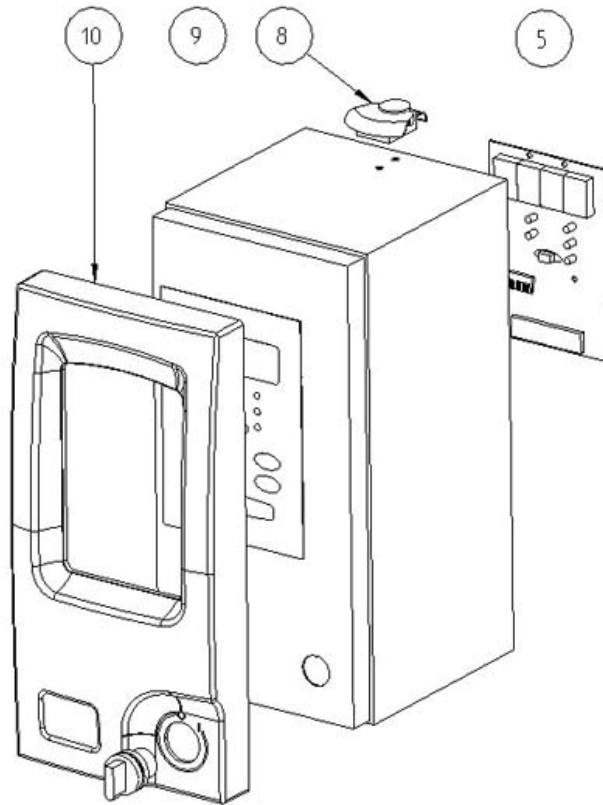


9. Part List

9.1 DS Drive, Part List

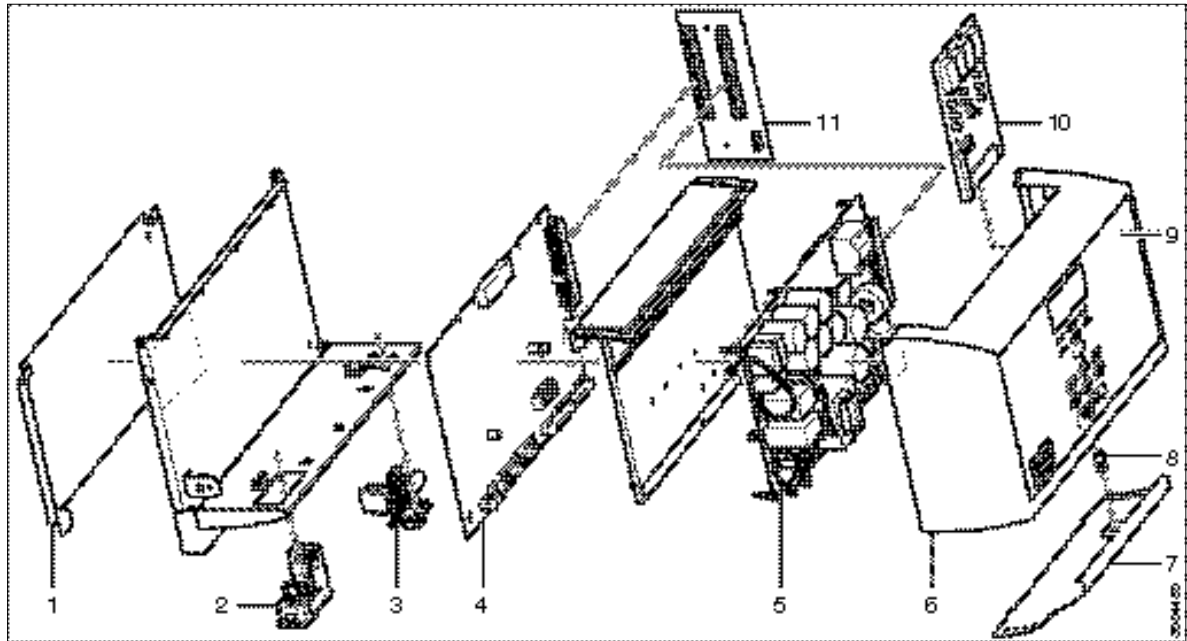


No.Part	Description	Ordering No	Info.
1	Fuse Holder	4220-0412-00	
	Fuse	4220-0413-15	15 A (S4)
	Fuse	4220-0413-20	20 A (S7)
	Fuse	4220-0413-25	25 A (S9)
2	Connector Card	4222-0400-80	
3	Drive Card	4222-0385-80	Tensor DS-4
		4222-0386-80	Tensor DS-7
		4222-0387-80	Tensor DS-9
4	Motor Card	4222-0389-80	D 301
	Motor Card	4222-0390-80	D 311
4	Motor Card	4222-0389-82	D 302
	Motor Card	4222-0390-82	D 312
5	Display Card	4222-0410-80	For three button membrane panel
		4222-0603-81	For six button membrane panel
6	Ground Fault Interrupter	4222-0020-00	10 mA (Special Appl.)
		4222-0020-01	30 mA (DS4, DS7, DS9)
7	Turn Switch (Complete)	4222-0362-90	



No.	Part Description	Ordering No	Info.
8	Back Panel Lock	4222-0363-01	
9	Three button Membrane Switch Panel	4222-0355-82	Tensor DS 4
		4222-0355-83	Tensor DS 7
		4222-0355-84	Tensor DS 9
	Six button Membrane Switch Panel	4222-0605-81	Tensor DS 4
		4222-0605-82	Tensor DS 7
		4222-0605-83	Tensor DS9
10	Front Panel (Complete)	4222-0347-90	
11	Back Panel	4222-0323-82	

9.2 DL Drive, Part List



No.Part	Description	Ordering No	Info.
1	Back panel	4222 0854 00	Wall mount
2	Main switch	4222 0839 00	
3	DL- Cable connector	4222 0857 96	
4	MC- Card	4222 0392 80	D303-DL
4	MC- Card	4222 0393 80	D313-DL
5	Drive card	4222 0847 80	
6	Front	4222 0834 80	
7	Cover	4222 0873 80	
8	Lock screw	4222 0878 00	
9	Membrane panel	4222 0837 00	
10	Display card	4222 0603 80	
11	Connector card	4222 0849 80	

9.3 Tensor DS, Tool List

Model	Square drive	Torque	Speed	Weight		Lengh		CS dist	Ordering No.
	in	Nm/ft lb	r/min	kg	lb	mm	mm		
ETV DS4									
DS4-10-10S	3/8"	4.5-15	3.5-11	585	1.3	2.9	365	13.5	8433 0706 14
DS4-20-10S	3/8"	6-20	4.4-14.5	400	1.3	2.9	365	13.5	8433 0706 49
ETP DS4									
DS4-05-I06S	1/4" (1)	2-5	1.5-3.6	1310	1.1	2.5	195	21	8433 0708 61
DS4-05-06S	1/4"	2-5	1.5-3.6	310	1.1	2.5	190	21	8433 0708 76
DS4-07-I06S	1/4"(1)	2.1-7	1.5-5.1	900	1.1	2.5	195	21	8433 0708 80
DS4-10-I06S	1/4"	3.5-12	2.5-8.8	60	1.1	2.5	195	21	8433 0708 83
DS4-10-06S	1/4"	3.5-12	2.5-8.8	660	1.1	2.5	190	21	8433 0708 92
DS4-10-10S	3/8"	3.5-12	2.5-8.8	660	1.1	2.5	190	21	8433 0709 06
ETD DS4									
DS4-05-I06S	1/4" (1)	2-5	1.5-3.6	1310	1.2	2.7	375	28	8433 0710 26
DS4-05-10S	3/8"	2-5	1.5-3.6	620	1.2	2.7	370	28	8433 0710 29
DS4-05-10ST	3/8"	2-5	1.5-3.6	620	1.3	2.9	420	28	8433 0710 37
DS4-10 10S	3/8"	4-14	3-10	620	1.2	2.7	370	28	8433 0710 52
DS4-10-10ST	3/8"	4-14	3-10	620	1.3	2.9	420	28	8433 0710 73
ETF DS4									
DS4-05-10ST	3/8"	2-5	1.5-3.6	1310	1.1	2.5	390	21.5	8433 0450 08
DS4-10-10ST	3/8"	4-14	4.4-10	620	1.2	2.7	390	21.5	8433 0450 31

Part List

9.4 Tensor DS, Tool List

Model	Square drive	Torque	Speed	Weight		Lengh		CS dist	Ordering No.
	in	Nm/ft lb	r/min	kg	lb	mm	mm		
ETV DS7									
DS7-15-10S	3/8"	5-17	3.6-12.4	1160	1.4	3.1	400	13.5	8433 0720 10
DS7-30-10S	3/8"	10-35	7.3-25	800	1.4	3.1	400	13.5	8433 0721 42
DS7-30-10S-HAD		10-35	7.3-25	800	1.6	3.4	400	14	8433 0721 59
DS7-40-10S	3/8"	12-40	9-29	800	1.6	3.6	420	18	8433 0721 94
DS7-40-10S-HAD		12-40	9-29	800	1.8	4.0	420	18.5	8433 0722 15
DS7-40-10S-FS		12-40	9-29	800	1.8	4.0	420	18.5	8433 0722 03
DS7-50-10S	3/8"	17-55	12-40	480	1.6	3.6	420	18	8433 0722 58
DS7-50-10ST	3/8"	17-55	12-40	480	1.7	3.8	470	18	8433 0722 67
DS7-50-10S-HAD		17-55	12-40	480	1.8	4.0	420	18.5	8433 0722 65
DS7-70-13S	1/2"	24-80	18-58	345	2.1	4.7	445	20	8433 0723 16
DS7-70-13S-FS		24-80	18-58	345	2.3	5.1	445	20.5	8433 0723 26
DS7-100-13S	1/2"	33-110	24-80	240	2.3	5.1	465	20	8433 0723 70
DS7-100-13S-HAD		33-110	24-80	240	2.5	5.6	465	20.5	8433 0723 73
DS7-100-13S-FS		33-110	24-80	240	2.5	5.6	465	20.5	8433 0723 86
DS7-160-13S	1/2"	45-150	33-110	150	2.8	6.3	508	25	8433 0723 98
DS7-160-13S-FS		45-150	33-110	150	3.0	6.7	508	25.5	8433 0724 00
DS7-200-13S	1/2"	60-200	44-146	120	2.8	6.3	508	25	8433 0724 15
DS7-200-13S-FS		60-200	44-146	120	3.0	6.7	508	25.5	8433 0725 01
ETP DS7									
DS7-30-10S	3/8"	10-35	7.3-25	750	1.6	3.6	262	18	8433 0726 36
DS7-50-13S	1/2"	17-55	12-40	535	1.9	4.2	306	23	8433 0726 87
DS7-70-13S	1/2"	21-70	15-51	370	2.1	4.7	327	23	8433 0727 01
DS7-70-13ST	1/2"	21-70	15-51	370	2.2	4.9	377	23	8433 0727 05
DS7-70-13SSW	1/2"	21-70	15-51	370	2.2	4.9	327	23	8433 0727 09
DS7-90-13S	1/2"	28-95	21-69	275	2.1	4.7	327	23	8433 0727 19
DS7-90-13SSW	1/2"	28-95	21-69	275	2.2	4.9	327	23	8433 0727 28
DS7-120-13S	1/2"	38-125	28-91	220	2.1	4.7	327	23	8433 0727 47
DS7-120-13SSW	1/2"	38-125	28-91	220	2.2	4.9	327	23	8433 0727 84

Model	Square drive	Torque	Speed	Weight		Length		CS dist	Ordering No.
	in	Nm/ft lb	r/min	kg	lb	mm	mm		
ETD DS7									
DS7-20-10S	3/8"	6-20	4.4-14.5	750	1.4	3.1	438	28	8433 0730 23
DS7-20-10ST	3/8"	6-20	4.4-14.5	750	1.5	3.3	438	28	8433 0730 44
DS7-30-10S	3/8"	10-35	7.3-25	750	1.4	3.1	438	28	8433 0730 88
DS7-30-10ST	3/8"	10-35	7.3-25	750	1.5	3.3	488	28	8433 0731 05
DS7-50-13S	1/2"	17-55	12-40	535	1.9	4.2	447	28	8433 0731 12
DS7-50-13ST	1/2"	17-55	12-40	535	2.1	4.7	486	28	8433 0731 24
DS7-70-13S	1/2"	21-70	15-51	370	2.2	4.9	468	28	8433 0731 31
DS7-70-13ST	1/2"	21-70	15-51	370	2.4	5.4	507	28	8433 0731 40
DS7-90-13S	1/2"	28-95	21-69	275	2.2	4.9	468	28	8433 0731 45
DS7-90-13ST	1/2"	28-95	21-69	275	2.4	5.4	507	28	8433 0731 52
DS7-120-13S	1/2"	38-125	28-91	220	2.2	4.9	468	28	8433 0731 84
DS7-120-13ST	1/2"	38-125	28-91	220	2.4	5.4	507	28	8433 0731 96
ETF DS7									
DS7-15-10ST	3/8"	5-15	3.6-11	990	1.3	2.9	457	21.5	8433 0455 44
DS7-25-10ST	3/8"	8-25	6-18	595	1.3	2.9	457	21.5	8433 0455 59
DS7-40-13ST	1/2"	12-40	9-29	430	2.0	4.4	455	26.8	8433 0455 78
DS7-50-13ST	1/2"	15-50	11-36	290	2.3	5.1	476	29.5	8433 0456 05
DS7-70-13ST	1/2"	21-70	15-51	220	2.3	5.1	476	29.5	8433 0456 42
DS7-100-13ST	1/2"	30-100	22-73	175	2.3	5.1	476	29.5	8433 0456 82
ETV DS9									
DS9-100-13S	1/2"	40-100	29-73	685	3.3	7.4	575	20	8433 0750 21
DS9-180-13S	1/2"	72-180	53-131	385	3.8	8.5	585	25	8433 0750 68
DS9-180-FS		72-180	53-131	385	4.0	8.9	585	25	8433 0750 73
DS9-270-20S	3/4"	108-270	79-197	235	7.0	15.6	665	34	8433 0751 38
DS9-270-FS		108-270	79-197	235	7.2	16.0	665	34	8433 0751 44
DS9-370-20S	3/4"	148-370	108-270	150	7.1	15.8	665	34	8433 0751 86
DS9-450-20S	3/4"	180-450	131-328	145	11.6	25.8	702	54	8433 0752 04
DS9-600-25S	3/4"	240-600	175-438	145	11.6	25.8	702	54	8433 0752 63

Part List

Model	Square drive	Torque	Speed	Weight		Lengh		CS dist	Ordering No.
	in	Nm/ft lb	r/min	kg	lb	mm	mm		
ETP DS9									
DS9-100-13S	½"	40-100	29-73	715	3.8	8.5	412	29	8433 0765 39
DS9-100-13SSW	½"	40-100	29-73		3.9	8.7	412	29	8433 0765 41
DS9-150-13S	½"	60-150	44-110	455	3.8	8.5	412	29	8433 0765 58
DS9-200-13S	½"	80-200	58-146	330	3.8	8.5	412	29	8433 0766 05
DS9-200-13S	½"	80-200	58-146	330	3.8	8.5	412	29	8433 0766 12
DS9-270-20S	¾"	108-270	131-328	225	5.8	12.9	466	36	8433 0766 49
DS9-270-20SSW	¾"	108-270	131-328	225	5.9	13.1	466	36	8433 0766 54
DS9-450-20S	¾"	180-450	131-328	125	7.4	16.5	502	36	8433 0767 52
DS9-450-20SSW	¾"	180-450	131-328	125	7.5	16.7	502	36	8433 0767 61
DS9-600-20S	¾"	240-600	175-438	110	7.4	16.5	502	36	8433 0768 08
DS9-600-20SSW	¾"	240-600	175-438	110	7.5	16.7	502	36	8433 0768 20
DS9-1000-25S	1"	400-1000	292-730	70	12.0	27	630	52	8433 0768 66
DS9-2000-25S	1"	800-2000	584-1460	40	22	48.9	630	68	8433 0769 20

ETD DS9

DS9-100-13S	½"	40-100	29-73	15	3.0	6.7	536	32	8433 0756 42
DS9-100-13ST	½"	40-100	29-73	715	3.2	7.1	575	32	8433 0756 92
DS9-150-13S	½"	60-150	44-110	455	3.2	7.1	536	32	8433 0757 54
DS9-150-13ST	½"	60-150	44-110	455	3.4	7.6	575	32	8433 0758 03
DS9-200-13S	½"	80-200	58-146	330	3.2	7.1	536	32	8433 0758 71
DS9-200-13ST	½"	80-200	58-146	330	3.4	7.6	575	32	8433 0759 11
DS9-270-20ST	¾"	108-270	79-197	225	6.0	13.4	660	36	8433 0760 55
DS9-450-20ST	¾"	180-450	131-328	125	7.6	17	695	36	8433 0760 88
DS9-450-20SSW	¾"	180-450	131-328	125	7.8	17.4	695	36	8433 0760 94
DS9-600-20ST	¾"	240-600	175-438	110	7.6	17	695	36	8433 0761 35
DS9-600-20SSW	¾"	240-600	175-438	110	7.8	17.4	695	36	8433 0761 59
DS9-1000-25ST	1"	400-1000	292-730	70	12.5	28	826	52	8433 0763 63

Drive units

D302 / D303-S4	8433 0820 48
D312 / D313-S4	8433 0820 33
D302 / D303-S7	8433 0822 48
D312 / D313-S7	8433 0822 33
D302 / D303-S9	8433 0824 48
D312 / D313-S9	8433 0824 33

9.5 Tensor DL, Tool List

Inline tools

Model	Square drive	Torque	Speed	Weight		Lengh		CS dist	Ordering No.
	in	Nm/ft lb	r/min	kg	lb	mm	mm		
<i>Lever start</i>									
ETD DL21-04-I061,2 - 4		0,9 - 3	1 600	0,6	1,3	236	16,5	8433 4014	25
ETD DL21-07-I062,2 - 7		1,6 - 5,2	970	0,6	1,3	236	16,5	8433 4017	31
ETD DL21-10-I06 3 - 10		2,2 - 7,4	720	0,6	1,3	236	16,5	8433 4019	10

All models:

- Are reversible
- Female hexagon drive for bits: 1/4"
- Have quick change chuck

Right angle tools

Model	Square drive	Torque	Speed	Weight		Lengh		CS dist	Ordering No.
	in	Nm/ft lb	r/min	kg	lb	mm	mm		
<i>Lever start</i>									
ETV DL21-04-I06	1,2 - 4	0,9 - 3	1 600	0,6	1,3	tbd	18,5 (?)	8433 4004 47	
ETV DL21-04-I06-QC1	2 - 4	0,9 - 3	1 600	0,6	1,3	tbd	18,5 (?)	8433 4004 73	
ETV DL21-04-10	1,2 - 4	0,9 - 3	1 600	0,6	1,3	tbd	18,5 (?)	8433 4004 91	
ETV DL21-07-I06	2,2 - 7	1,6 - 5,2	970	0,6	1,3	tbd	18,5 (?)	8433 4007 66	
ETV DL21-07-I06-QC2	2 - 7	1,6 - 5,2	970	0,6	1,3	tbd	18,5 (?)	8433 4007 79	
ETV DL21-07-10	2,2 - 7	1,6 - 5,2	970	0,6	1,3	tbd	18,5 (?)	8433 4007 94	
ETV DL21-10-I06	3 - 10	2,2 - 7,4	720	0,6	1,3	tbd	18,5 (?)	8433 4009 34	
ETV DL21-10-I06-QC3	3 - 10	2,2 - 7,4	720	0,6	1,3	tbd	18,5 (?)	8433 4009 61	
ETV DL21-10-10	3 - 10	2,2 - 7,4	720	0,6	1,3	tbd	18,5 (?)	8433 4009 77	

Tool cables

Model	Ordering No.
3 meter	4220 2604 03
5 meter	4220 2604 05
10 meter	4220 2604 10
15 meter	4220 2604 15

Drive units

Model	Ordering No.
Basic DL – D303	8433 4850 48
Advanced DL – D313	8433 4850 33

10. Technical Specifications

10.1 DS Drive

Enclosure

The Drive is enclosed in a steel box. The drive consists of two parts, back panel and drive. The connectors are located on the backside of the drive and display/buttons/power switch on the front part.

Over all dimensions

Width	174 mm
Height	399 mm
Depth	321 mm

Weight	DS4/DS7 9.7 kg DS9 10.2 kg
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Input voltage	100-120, 200-240 VAC, 50-60 Hz
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GFI Ground Fault Interrupter	ΔI max 30 mA
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Operating conditions

Temperature	0 to +50°C, 32 to 122°)
Humidity	5 to 95% non -condensing

Power consumption

Stand by	Normal 20 W, Max 100 W
During Tightening	DS4 < 0.8 kW
	DS7 < 1.1kW
	DS9 < 2kW
Continuously	≈200W

Connectors

24 VDC supply	Max current 800 mA isolated
Inputs	17-50 VDC 5 mA at 24 VDC
Relays	Max 50 V DC/AC Min switching load 1 mA 500 mA max capacity resistive load

10.2 DL Drive

Enclosure

The DL Drive is enclosed in a steel box. The drive consists of two parts, back panel and drive. The connectors are located on the backside of the drive and display/buttons/power switch on the front part.

Over all dimensions

Width	340 mm
Height	225 mm
Depth	116 mm

Weight	6kg
---------------	-----

Input voltage	100-120, 200-240 VAC, 50-60 Hz
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Main fuse	5X20 mm – Slow blow 6.3A
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Operating conditions

Temperature	0 to +50°C, 32 to 122 °)
Humidity	5 to 95% non-condensing

Power consumption

Stand by	Normal 80 W, Max 150 W
During Tightening	DS2 < 250W

Continuously	≈80W
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Connectors

24 VDC supply	Max current 800 mA isolated
Inputs	17-50 VDC
	5 mA at 24 VDC
Relays	Max 50 V DC/AC
	Min switching load 1 mA
	500 mA max capacity resistive load

10.3 Tools Talk DS/DL

The following concerns the equipment you need to run ToolsTalk DS/DL and to communicate with the DL Drive. The equipment needed, besides the Drive, is a Computer and a cable.

ToolsTalk DS/DL runs on an IBM compatible PC or a Lap Top under Windows 95, 98, 2000 or NT. For example 32 bit Windows which includes Windows 95 and Windows NT but not Windows 3.X.

To install ToolsTalk DS/DL the PC has to have a diskette or CD drive.

A serial RS 232 COM port to communicate with the Drive.

The best is if you have a Super VGA screen. It will work fine with only a VGA screen also, but then you might need to adjust the size of the ToolsTalk DS/DL application windows manually.

You need to have at least 25 MB free disk space on your PC to install and run ToolsTalk DS/DL.

The PC has to have a RAM of at least 8 Mb.

It is not necessary to have a mouse to run ToolsTalk DS/DL.

Cable

The cable between the PC and the Drive is a standard Zero Modem computer cable, see below.

The cable has part no. 4222 0255 xx or 4222 0546 xx. xx is the length in meters.

On the Drive side it should have a 9 pin DSub male and on the PC side whatever fits in the serial RS 232 COM port on your computer. Normally 9 pin DSub female.

PC		Drive	
	1 not used	1	
RXD	2	2	RXD
TXD	3	3	TXD
	4 not used	4	
GN	5	5	GN
	6 not used	6	
	7 not used	7	
	8 not used	8	
	9 not used	9	

11. Abbreviations

CAN	Controller Area Network
CCW	Counter-clockwise
CW	Clockwise
Digin	Digital input
GFI	Ground Fault Interrupter
HW	Hardware, (data)
I/O	(Digital) inputs/outputs
IR	Infra red light
n x OK	Number OK. Number of tightenings in an operation is completed
NOK	Not OK, result not approved.
PLC	Programmable Logic Controller
Pset	Parameter set
PVT	Prevailing torque
Qprog	Quick programming, fast way of programming
RS232	Field bus, serial communications link
RE-Alarm	A portable device to give signals for OK, NOK and nxOK
SW	Software, (data) programs, etc
TTDS/DL	Tools Talk DS / DL
VAC	Volt Alternative Current
VDC	Volt Direct Current