

User guide

TPS Control

Atlas Copco Tools and Assembly Systems

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1 Introduction

1.1 Safety and operating instructions

⚠ WARNING Read all warnings and all instructions.

The safety and operating instructions as described in the Atlas Copco Product instructions that is included in the delivery of the system must be read and complied. Ensure that you read and understand all instructions. Failure to follow all the instructions may result in electric shock, fire and/or serious personal injury. All locally legislated safety regulations with regard to installation, operation and maintenance must be adhered to at all times. Refer installation and servicing to qualified personnel only.

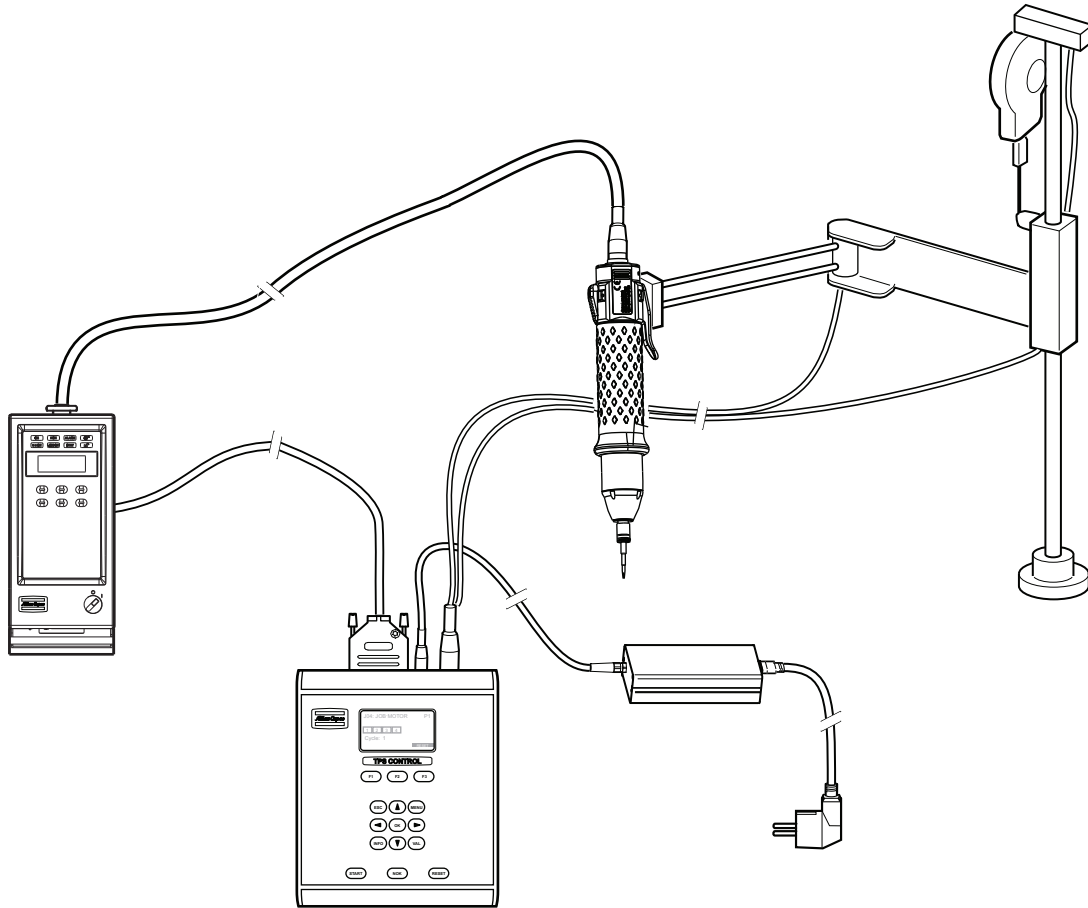
Save all instructions for future reference.

Contact your Atlas Copco representative if questions regarding the safety and operating instructions arise.

1.2 System overview

This user guide describes how to install, configure and use the Tool Positioning System (TPS) Control.

TPS Control is used for controlling and monitoring tightening sequences and positioning operations for a variety of pneumatic and electronic tools. The TPS Control system is designed for the modern assembly industry with high demands on quality and production efficiency, and offers full modularity through the combination of different hardware and software.



A typical setup of the TPS contains the controller itself connected to a screwdriver and torque arm, with external operating and display elements and a digital I/O cable to a tool controller.

The TPS can either be used with a single tool or be connected to a torque arm that holds the tool. If the controller is used with a torque arm, it is equipped with a distance and angle sensor and can detect the position of the screw currently being handled.

The TPS primarily monitors the sequence of screws and the tightening program, with and without position control.

The TPS can easily be connected to different tool controllers using digital 24 VDC signals. These digital input and output signals are used to enable and control workstations. The OK/NOK classification of the individual tightening operations is handled by the tool controllers which transmits these results through the digital input signals to the TPS Control. The TPS has 10 digital inputs and 6 digital outputs.

In TPS, the complete sequence definition for a work piece is called a job. The TPS can store up to 50 jobs with a total of 500 sequence element memories for positions available for these jobs. These sequence elements

can be freely allocated to the 50 supported jobs. Each position within a job can be assigned to a specific pset or several positions can be assigned to the same pset. Psets are configured in the ToolsTalk software and it contains the complete set of parameters that controls the tightening process.

TPS Control can also handle additional functions such as input queries defined for specific positions and external starting signals and output signals used in clamping procedures.

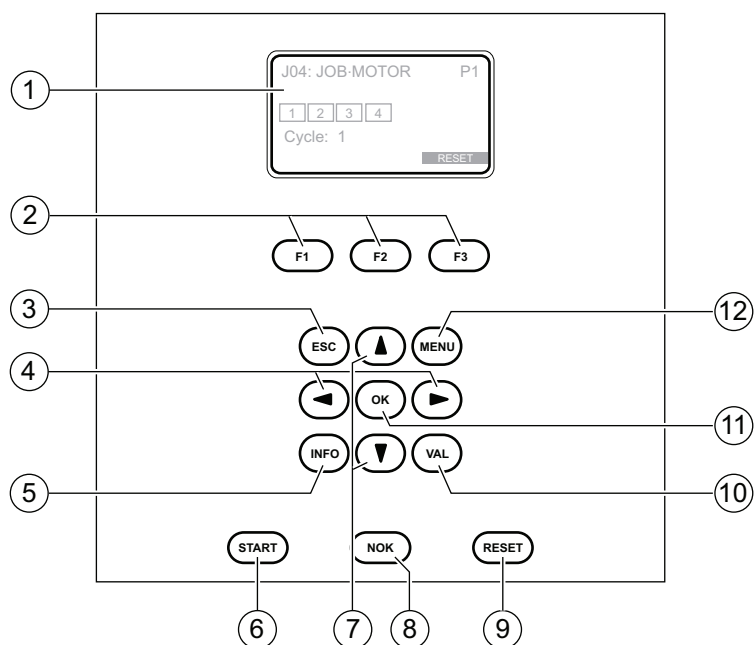
1.3 TPS controller

The main part of the TPS Control system is the TPS controller. It is contained in a metal casing with a front panel and connection interface on the short side of the unit. The front panel can be rotated 180 degrees to be able to have the connections on top or bottom of the unit, depending on how the controller will be installed.



1.3.1 User Interface

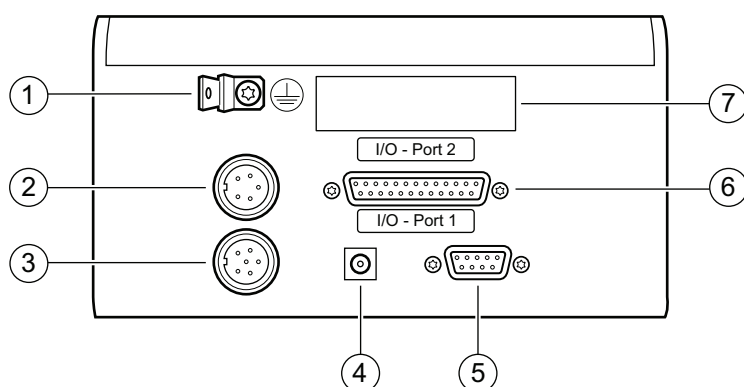
You operate the controller using the front panel which has a graphical display and a keyboard with special keys and navigation keys. The display has a resolution of 128 x 64 pixels and supports different fonts and text sizes as well as graphics. The display backlight can change between red, green, blue, or white colour.



Number	Part	Description
1	Display	<p>The front panel has a configurable display. A power-save function de-activates the backlight on the display if it is not used for a user-defined time period (in minutes).</p> <p>The display is divided into three segments:</p> <ul style="list-style-type: none"> • Upper part shows the last selected job/current job. • Middle part shows status information about ongoing operations. • "Lower part shows the menu alternatives that can be accessed using the soft keys.
2	Function keys	Soft keys with functionality according to the display.
3	ESC	Use this key to cancel any ongoing jobs or parameter settings. When cancel parameter settings, no changes are stored in memory.
4	Left/Right arrow key	Use these keys to display parameter options or creating/removing positions when programming new jobs.
5	INFO	Press this key to get information about the TPS Control device ID, firmware version and activated licensed functions.
6	START	Use this key to start selected job.

Number	Part	Description
7	Up/Down Arrow key	When in parameter list, use these keys to go up or down in the list to select a desired parameter. For selected parameter, use the arrow keys up/down to change the options of the parameter.
8	NOK	Use this key to release the tool after a position has resulted in NOK state and the tool is disabled. This is only used if parameter NOK acknowledge has been set to ON.
9	RESET	Use this key to stop the ongoing job during any time of the procedure
10	VAL	Use this key to validate and store all changed parameters in memory
11	OK	Use this key to open the list with possible options for a selected parameter or confirm the selected option for the parameter.
12	MENU	Use this key to enter the set up menu parameters

1.3.2 Connections



Number	Part	Description
1	Ground	For flash plug for ground connection.
2	Distance sensor interface	For 5-pin flange socket (Binder, Series 680) connected to the analogue sensor on the torque arm
3	Angle sensor interface	For 7-pin flange socket (binder, Series 680) connected to the angle sensor on the torque arm
4	Power supply	For connection to the mains, 5.5 mm socket with 2.1 mm center pin

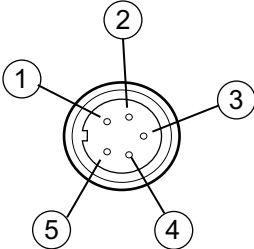
Number	Part	Description
5	RS-232C serial interface	For 9-pin Sub-D socket connected to the external equipment, for example Barcode scanner or PC
6	Digital I/O connection I/O Port 1	For 25-pin Sub-D socket connected to the tool controller.
7	I/O Port 2	Not used.

1.3.2.1 Ground connection

A 6.3 mm flash plug used for ground connection. This connection has to be linked to the protective ground for safe operation of the TPS Control.

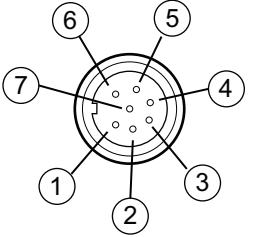
1.3.2.2 Distance sensor connection

Interface with a 5-pole connection for a distance sensor. Use a 5-pole pin plug from the Binder 680 Series. This sensor can either be of a lineary or angle type using analogue 0-10 V.

	PIN	Signal
	1	24 V Supply
	2	24 V GND
	3	Analogue input
	4	Analogue GND
	5	Not connected

1.3.2.3 Angle sensor connection

SSI Interface with a 7-pole connection for the angle sensor. Use a 7-pole pin plug from the Binder 680 Series.

	PIN	Signal
	1	24 V Supply
	2	Clock +
	3	Clock -
	4	Data -
	5	Data +
	6	Not connected
	7	24 V GND

1.3.2.4 Power supply

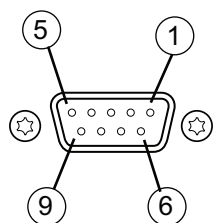
The TPS Control is powered by an external 24-volt power supply unit. The external power supply unit can be ordered as an accessory from Atlas Copco.

As an alternative, the unit can be supplied with 24 VDC from an external power signal through the I/O plug.



1.3.2.5 RS-232C serial interface

Serial interface with a 9-pole connection for external devices, such as PC or barcode scanners. COM port settings: 9600 Baud to 115 KBAud. TPS Control can only communicate with one tool controller at a time through the serial interface.

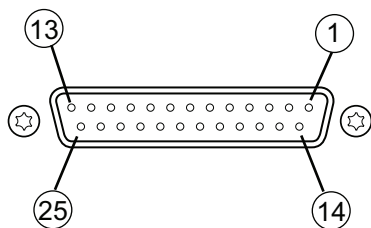


PIN	Signal	Description
1	Not connected	
2	TxD	Transmit 1
3	RxD	Receive 1
4	Not connected	
5	GND	Potential-free GND of RS-232 interface
6	Not connected	
7	HSI	Handshake input or Receive 2
8	HSO	Handshake output (constantly -12 V) or Transmit 2
9	Not connected	

1.3.2.6 Digital I/O connection

Digital I/O interface with a 25-pole connection for synchronization with tool controllers.

Introduction



PIN	Signal	Description
1	GND 24 V	
2	OUT1	Output, positive switching 24V, max 0.7 A, short-circuit proof
3	OUT2	Output, positive switching 24V, max 0.7 A, short-circuit proof
4	OUT3	Output, positive switching 24V, max 0.7 A, short-circuit proof
5	IN2	Digital input 16-32 volt
6	IN4	Digital input 16-32 volt
7	GND 24 V	
8	IN6	Digital input 16-32 volt
9	IN9	Digital input 16-32 volt
10	OUT4	Output, positive switching 24V, max 0.7 A, short-circuit proof
11	OUT5	Output, positive switching 24V, max 0.7 A, short-circuit proof
12	OUT6	Output, positive switching 24V, max 0.7 A, short-circuit proof
13	GND 24 V	
14	+24 V	
15	GND 24 V	
16	GND 24 V	
17	IN1	Digital input 16-32 volt
18	IN3	Digital input 16-32 volt
19	IN5	Digital input 16-32 volt
20	IN7	Digital input 16-32 volt
21	IN8	Digital input 16-32 volt
22	IN10	Digital input 16-32 volt
23	GND 24 V	
24	GND 24 V	

PIN	Signal	Description
25	Not connected	

2 Setup

2.1 Start TPS

1. Connect cables and ground connection according to section *TPS Controller*.
2. Switch on the power. The controller starts up immediately.

2.2 Set up TPS

2.2.1 Set up system parameters

This section describes how to set up general system parameters in TPS.

1. Press **MENU**.
2. Press **SETUP**.
3. Default language is English. If you want to change language go to **Service**, press **OK** to enter menu.
4. Select appropriate language in **User language**. Confirm selection with **OK**. Possible languages are English, German or French.
5. Press **VAL** to change to selected language.
6. Go to **System parameter** and press **OK** to enter menu.
7. Set **Special functions** to ON to view advanced programming functions. Press **OK**.
8. Enter values for additional parameters. The parameters and options are described in detail in section *System Parameters*.
9. Press **VAL** to confirm changes or **ESC** to quit without making any changes.

2.2.2 Set up input and output parameters

This section describes how to set up the input signals and output signals in TPS for communication with the tool controller. Note that the input signals in tool controller corresponds to the output signals for TPS control, and the relays in tool controller corresponds to the input signals in TPS Control.

1. Go to **Input configuration**.
2. Set the required inputs corresponding to the relays set in ToolsTalk. See section *Connect to tool controllers* for an example configuration.
3. Press **VAL** to confirm changes or **ESC** to quit without making any changes.
4. Go to **Output Configuration**.
5. Set the required outputs corresponding to the input signals set in ToolsTalk. See section *Connect to tool controllers* for an example configuration.
6. Press **VAL** to confirm changes or **ESC** to quit without making any changes.

2.2.3 Set up sensor parameters

This section describes how to set the position parameters related to distance and angle sensors on the torque arm that must be calibrated before any tightening operations can be created. For a complete list of position parameters, see section *Position*.

The parameters to set are as follows:

- SSI Interface parameters
 - SSI coding
 - SSI resolution
 - SSI factor
 - SSI resolution
- Length
 - Length 1 (L1)
 - Length 2 (L2)

The calculation of L1 and L2 differs, depending on what type of torque arm that will be used.

The following Atlas Copco torque arms can be used together with TPS:

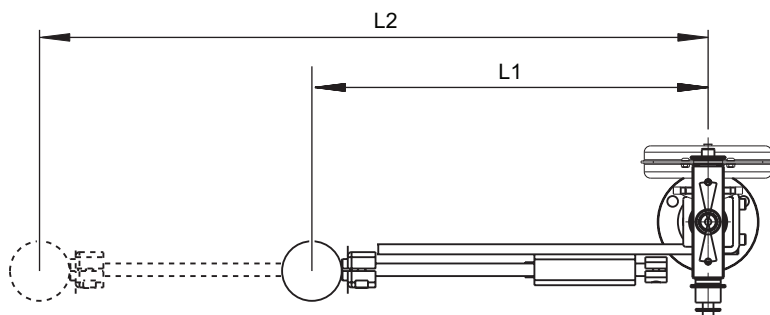
- SML-T (Angle/Linear)
- SMS-T (Angle/Angle A)

Note! The Rotation stop kit on the torque arm must be kept intact on the torque arm to ensure that the positioning encoder will work properly. For more information of the torque arms, see the applicable PI.

2.2.3.1 Set up SSI Interface

See section *Position* to set up the parameters for SSI interface.

2.2.3.2 Measure angle/linear arms



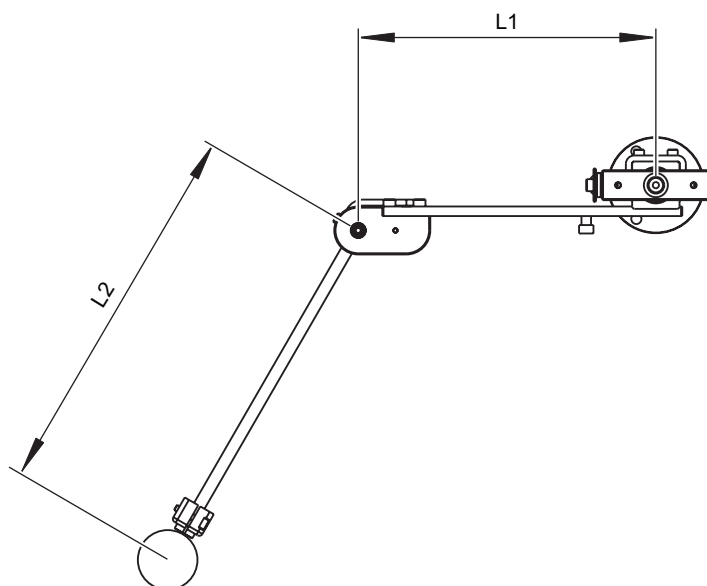
1. Go to **Position**.
2. Set **Arm type** to Angle/Linear.
3. Measure Length 1 (L1) on the torque arm from the centre of the axis to the centre of the tool when fully retracted to start position. Check that the sensor value is set to zero in this position in **Service>Test functions>Test Inputs**.
4. Measure Length 2 (L2) on the torque arm from the centre of the axis to the centre of the tool when fully extracted to maximum length.

If the fully extracted arm has a sensor value less than **1023** the following formula should be used to calculate L2.

$$L2_{\text{Input}} = L1 + 1023 * (L2 - L1) / (D2 - D1) \text{ where D stands for sensor value.}$$

5. Enter the values for L1 and L2 in **Length 1** and **Length 2**.
6. Press **VAL** to confirm changes or **ESC** to quit without making any changes.

2.2.3.3 Measure angle/angle A arms



1. Go to **Position**.
2. Set **Arm type** to Angle/angle A.
3. Measure Length 1 ($L1$) from the centre of the axis to the centre of the elbow when fully retracted to start position.
4. Measure Length 2 ($L2$) from the centre of the elbow to the centre of the tool when fully extracted to maximum length.
5. Enter the values for $L1$ and $L2$ in **Length 1** and **Length 2**.
6. Press **VAL** to confirm changes or **ESC** to quit without making any changes.

2.2.4 Set up start parameters

This section describes how to set parameters required to start jobs with the TPS controller.

To set up start controlled by external devices, see *Sequence*

1. Go to **System Parameter**.
2. In **Job Selection**, select Keyboard.
3. Go to **Sequence**.
4. Set start signal as follows:

- Set to **Edge** if you want to start the job each time by pressing **Start** on the TPS controller.
- Set to **Level** to start the job the first time by pressing **Start** on TPS controller. After that the job is started automatically.

2.3 Connect to tool controllers

2.3.1 Connect to Power Focus

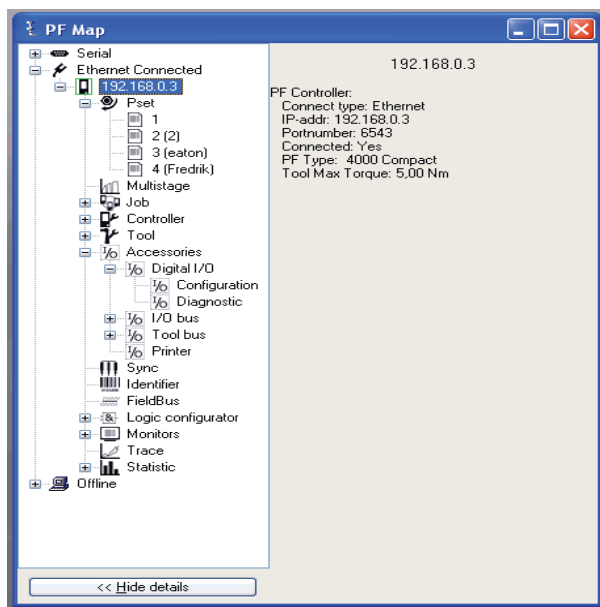
This section describes how to configure Power Focus and TPS Control to set up communication between the controllers. Power Focus has four relay contacts (outputs) and four inputs that can be used for communication with TPS. All inputs and outputs can be configured using the ToolsTalk PF software. For a complete instruction of ToolsTalk PF, see the applicable Power Focus user guide.

Note! This section describes an example of how to configure the tool controller and TPS. Depending on the type of operation you may need to set the inputs and outputs to other values.

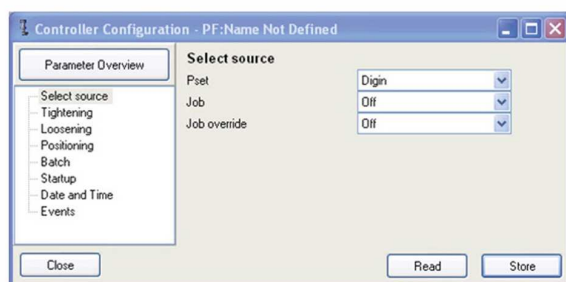
1. Check that the digital I/O cable is connected to the TPS and the PF.
2. Check that a PC with the ToolsTalk PF software installed is connected to the PF.

In ToolsTalk PF

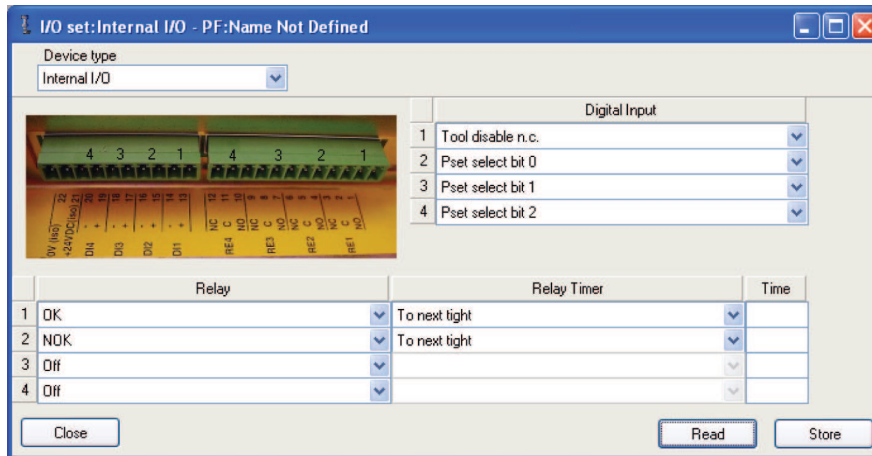
1. Depending on how the tool controller is connected to the PC, make sure the PF is visible in either **PF Map>Ethernet Connected** or **PF Map>Serial**.



2. In **PF Map** window, double-click on **Controller** and then double-click on **Configuration**. A new window appears.
3. In **Select Source**, set **Pset** to Digin to enable TPS to control which Pset to use. Click **Store**.



4. In PF Map, select **Accessories>Digital I/O** and double-click **Configuration**.
5. Set PF input signals in **Digital Input** and PF output signals in **Relay** according to the figure below.



- Click **Store** to store all selected values in memory.

In TPS Control

- Go to **Menu>Setup>Input Configuration** and set the signals and inputs matching the relay signals set up in ToolsTalk PF.

OK tool 1	IN-1
NOK tool 1	IN-2
Clamp closed	---
External start	---
External reset	---
INPUT CONFIGURATION	

- Press **VAL** to confirm the selection.
- Press **ESC** to leave menu.
- Go to **Output Configuration** and set the signals matching the input signals in the tool controller.

Out tool enable	OUT-1
...	
Out Pset bit 1	OUT-2
Out Pset bit 2	OUT-3
Out Pset bit 4	OUT-4
OUTPUT CONFIGURATION	

5. Press **VAL** to confirm the selection.
6. Press **ESC** to leave menu.

2.3.2 Connect to Tensor DS/DL Drive

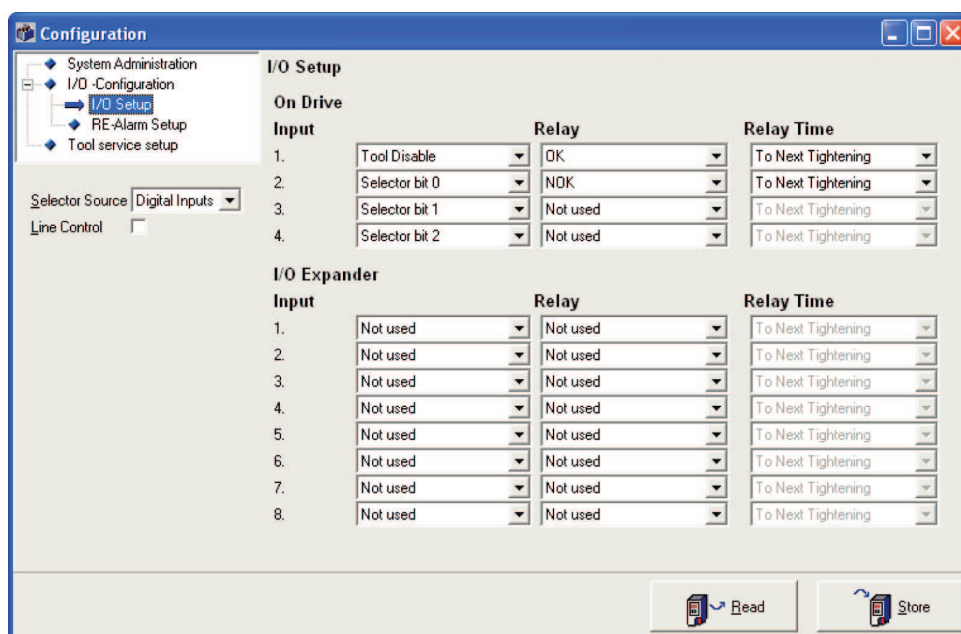
This section describes how to configure Tensor DS/DL Drive and TPS Control to set up communication between the controllers. Tensor DS/DL Drive has four relay contacts (outputs) and four inputs that can be used for communication with TPS. All inputs and outputs can be configured using the ToolsTalk DSDL software. For a complete instruction of ToolsTalk DSDL, see the applicable Tensor DS/DL Drive user guide.

Note! This section describes an example of how to configure the tool controller and TPS. Depending on the type of operation you may need to set the inputs and outputs to other values.

1. Check that the digital I/O cable is connected to the TPS and Tensor.
2. Check that a PC with the ToolsTalk DSDL software installed is connected to Tensor.

In ToolsTalk DSDL

1. Select **Configuration** in the menu **Window**. A new window appears
2. Select **I/O Setup**.
3. Set **Select Source** to Digital Inputs.
4. Set Input and output signals as seen in the figure below.



- Click **Store** to store all selected values in memory.

In TPS Control

- Go to **Menu>Setup>Input Configuration** and set the signals and inputs matching the relay signals set up in ToolsTalk DSDL.

OK tool 1	IN-1
NOK tool 1	IN-2
Clamp closed	---
External start	---
External reset	---
INPUT CONFIGURATION	

- Press **VAL** to confirm the selection.
- Press **ESC** to leave menu.
- Go to **Output Configuration** and set the signals matching the input signals in the tool controller.

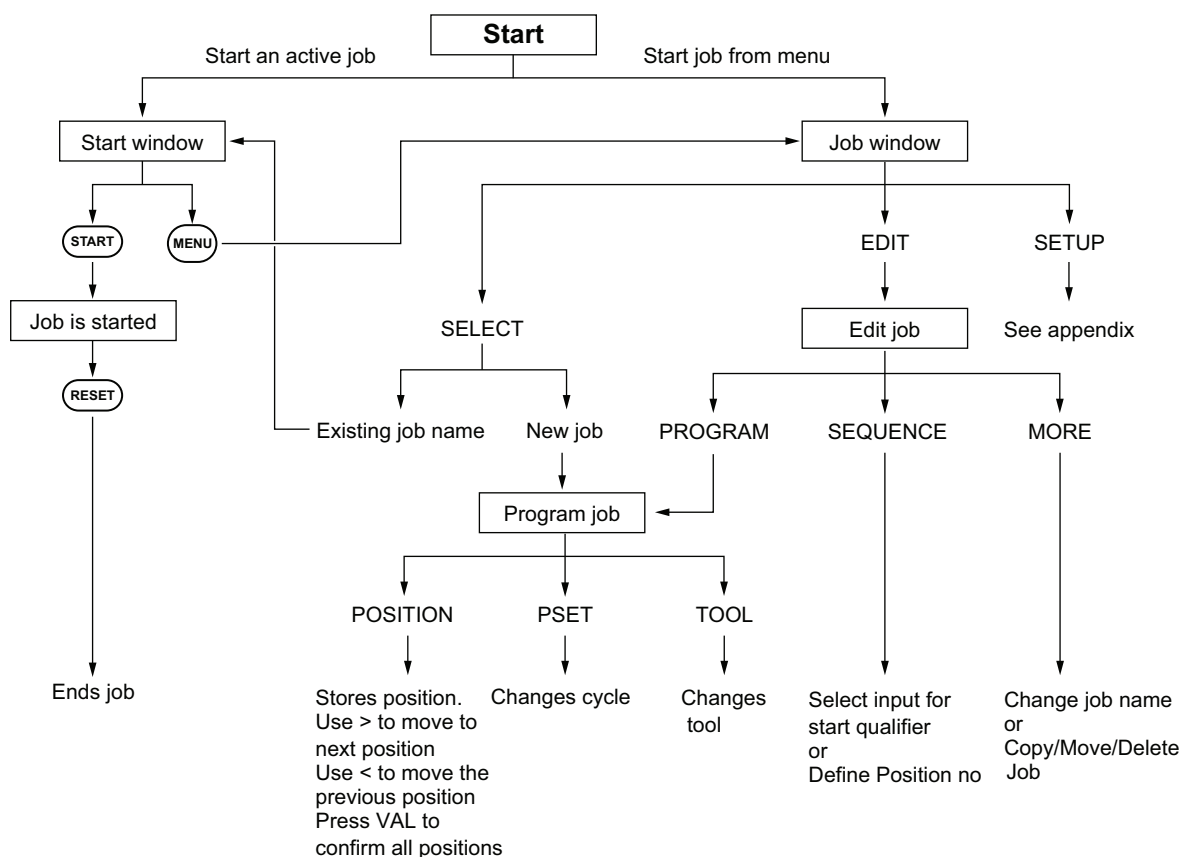
Out tool disable	OUT-1
...	
Out Pset bit 1	OUT-2
Out Pset bit 2	OUT-3
Out Pset bit 4	OUT-4
OUTPUT CONFIGURATION	

5. Press **VAL** to confirm the selection.
6. Press **ESC** to leave menu.

3 Operation

3.1 Quick guide

This section includes a quick guide how to start different jobs.



3.2 Job handling

When at least one job is programmed you can activate the job menu by pressing the Menu key. This can only be done if no job is ongoing.

Pressing the Menu key displays the following selection menu in the bottom line:

New Job
J01: JOB-01
J02: Mirror Holder
J03: Module 5
J04: Module 18
SELECT
EDIT
SETUP

The following options are available from this menu:

- Existing jobs can be selected with the Arrow Up / Down keys.
- OK or SELECT (F1) activates the job.
- The New Job option lets you program a new job.
- EDIT (F2) lets you edit the selected job.
- Pressing SETUP (F3) displays the Setup menu
- ESC can be used to exit the menu without making a selection.

The following colour codes are used in the graphical display to indicate the results of the operation:

Colour	Description
Blue	Position found
Red	Position lost
Green (blinking)	One sequence element processed correctly
Green (steady)	Complete job procedure performed correctly

3.2.1 Create new job

This section describes how to program a new job.

1. Select **New Job** to program new job. The position programming window appears. Position 1 is automatically enabled.
2. Position the tool on the work piece where you want to program position 1. Press **POSITION** (F1) to store the position in memory. The inverted box indicates that the position is stored.
3. By default, Pset 1 is always suggested for the first position.
If Output Pset Selection setup parameters have been set already, you can change pset with the Pset keys.
Use Pset to enter the pset number that should be transmitted to the screwdriver controller for this position.
4. Press the Right Arrow key to program the next position. The value for Pset is always copied from the previous position but can be changed when necessary.
5. Repeat step 2-4 for all positions you want to program. When finished, press **VAL** to confirm the programmed positions

If you want to delete a position during the programming procedure, press the Left Arrow key. The box with the position is removed.

3.2.2 Start existing job

This section describes how to start an already selected job or select and start an existing job from the job menu.

The display shows the previously selected job or, if a job is activated by an external device, the job currently selected through the relevant inputs.

1. To select this job, press **START** (F1). The job can also be started after an external start signal if the controller is connected to any external devices, see section *Parameter* for more details.
2. If you want to change job, press **MENU** and select any of the available jobs with the Arrow Up / Down keys. Press **OK** or **SELECT** key to activate the job.
Position the tool in position 1. The LED backlight remains white or flashes green and white until the position is reached depending upon the results of the previous tightening operation position. As soon as the position is reached, the LED backlight changes to blue and the output enabling the screwdriver is activated.
3. Perform the operation for this position.
4. If the screwdriver transmits an OK signal, the position is marked as processed (the corresponding box turns black) and the LED backlight changes to flashing green and white.
5. Move the tool to the next position. As soon as the next position is reached, the backlight reverts to blue.
6. Repeat steps 4-7 until all positions have been processed.
7. The complete tightening operation is flagged by an inversion of the box symbol.

If you have set the parameter Enable Backstep to on, a Back button is shown as soon as at least one position has been completed. The Back button is used to enable a repetition of a tightening operation even in the event of an OK result.

If you want to stop the tightening operation, press the RESET button. Press Yes at the question Really cancel the job? The procedure is stopped and the LED backlight changes to red, the procedure is displayed as NOK and the operation can be restarted by pressing the START button.

If the screwdriver transmits a NOK signal, the backlight changes to red and the tool is disabled. The next step in the procedure depends on how the unit is configured in regards to the parameters Acknowledge NOK and NOK Max Count.

NOK acknowledgement not required: If NOK does not require an acknowledgement, the operator can immediately repeat the tightening operation for this screw; however, the tool must first have left the position of the current screw before the same screw is released again for processing. If the NOK Max Count parameter is set to any value except 0 (zero), the operator can only start the number of repeated attempts set in the parameter value. If the number is exceeded, a signal is issued and the pset has to be reset.

NOK acknowledgement required: The operator has to press the NOK key on the device or, if accordingly configured, activate the external Acknowledge NOK input signal (for example with a key switch). The position is released for repeated processing after this acknowledgement has been signalled. If NOK acknowledge is activated, the NOK Max Counter parameter is not evaluated.

In both cases, the operations can be cancelled with the Reset button.

3.2.3 Change existing job

The EDIT menu lets you process an already existing job. The following functions can be executed with a job in this area:

J02: Mirror Holder			EDIT
1	2	3	
Pset: 1			
PROGRAM		SEQUENCE	MORE

- **PROGRAM** lets you re-program the positions again. Only the same number of positions that were available before the job can be re-programmed.

- SEQUENCE lets you set the position queries and position-specific output signals. Furthermore, the Pset values can be subsequently changed for the specific positions.
- MORE opens another menu with the possibility of changing the job name or completely deleting a job.
- Edit Job Name

You can enter a job name with up to 19 characters.

You can use upper-case letters, lower-case letters, numbers and special characters. To change character input, press the F1 key until the preferred input is displayed. Use the Arrow keys to change the job name.

To insert additional characters, use the Insert (F2) key.

To delete a selected character, use the Delete (F3) key.

- Copy an existing job

Creates an exact copy of an existing job. Select a target location in the job list where you want to store the copy. The job automatically gets a different job name. If the selected target job is not empty, a question asking if you want to replace this job appears. If the query is confirmed with the OK button, the target job is overwritten with the copy

- Move a job

Moves a job to a new location in the job list. The job keeps the original job name. If the selected target job is not empty, a question asking if you want to replace this job appears. If the query is confirmed with the OK button, the target job is overwritten.

- Delete a job

Completely removes a job. You are asked to confirm the removal with the OK button.

4 Maintenance

4.1 Firmware updates

The unit can be updated with new firmware through the serial interface. Note that this function deletes the existing firmware in TPS Control. The TPS Control cannot be operated anymore without the matching update file.

Only trained personnel should update the firmware.

⚠ NOTICE! *Do not switch off the power during the firmware update to avoid damaging the unit.*

1. Store the files blprog.exe and the TPS-Control-V500.hex file in the same directory on the PC.
2. Connect TPS and PC with a serial cable.
3. Identify the COM port that is used on the PC. Make a note of the port number for future reference.
4. Switch on TPS Control.
5. Press **MENU > Setup**.
6. Select **Service**.
7. Select **Firmware Update**.
8. Press **OK** to start firmware update when question Erase flash? appears in display or press **ESC** to cancel firmware update process.
9. Wait until display in TPS turns dark before proceeding with next step.
10. Double-click on the executable file named blprog.exe.
11. Enter the number of the COM port you are using.
12. When the program asks for what files to program, either press enter if there is only one hex file or enter full names if there are multiple hex files.

The firmware update starts. It will take 2-3 minutes and after that the device will automatically reset with the new firmware.

5 Reference

5.1 Parameters

The system parameters and a number of special functions can be accessed from the Setup menu. To facilitate navigation, the Setup menu is divided into the following subgroups:

- System parameter
- Input configuration
- Output configuration
- Sequence
- Position
- Service

5.1.1 System parameter

Parameter name	Description	Range/Values
Station number	Identifier for this tightening system	0-255 Default: 0
Position control	No = TPS Control is used without a torque arm (TPS Control is only used as counter) Yes = TPS Control is used with a torque arm (counter and position check)	No/Yes Default: Yes
Special functions	Defines if advanced parameters will be visible in display. Values set for the advanced parameters will still remain even if this parameter is set to Off).	Off/On Default: Off
Timed outputs	Sets the length of the pulse for output signals in positions defined as a pulse.	0.0 - 9.9 Default: 0.5
Job selection	Specifies if the job selection is controlled by a barcode scanner, other external devices or the keyboard.	Ext. Inputs, Keyboard, Barcode Default: Keyboard
Sound signal	Selects if and for which result the built-in beeper gives an acoustic signal.	Off, Signal OK, Signal NOK Default: Signal NOK
RS-232 set up	Sets the serial connection parameters (in a separate submenu)	
Display set up	Sets the display parameters (in a separate submenu)	

Reference

Parameter name	Description	Range/Values
Enter password	Selects if a fixed password should be entered for access to the Setup Menu and Job Edit functions. If enabled, enter the following password in sequence upon request: NOK - Reset - VAL - INFO - ESC - MENU - OK	Off, Single, Always Default: Off

5.1.1.1 RS-232 set up

Parameter name	Description	Range/Values
C1:baudrate	Defines the transmission speed for the serial interface	4800-115200 Default: 38400
C1:character delay	Defines a waiting period when transmitting after each character (in ms)	0-20 ms Default: 0
C1:line delay	Defines a waiting period when transmitting after each line (in ms)	0-99 ms Default: 0

5.1.1.2 Display set up

Parameter name	Description	Range/Values
Display contrast	Adapts the display contrast to the surroundings	30-63 Default: 48
Screen saver (min)	Sets the time limit for the idle period before the screensaver is activated.	Off, 1-15 minutes Default: 6
RGB portion Red	Sets a fixed percentage value to specify the amount of red, green and blue colour in the display backlight. For example, for a completely white backlight set Red=100%, Green=100%, and Blue=100% and for a pure red backlight set R=100%, G=0%, B0%.	25% 37% 50% 62% 100% Default: 50%
RGB portion Green	See RGB portion Red	25% 37% 50% 62% 100% Default: 50%
RGB portion Blue	See RGB portion Red	25% 37% 50% 62% 100% Default: 50%

5.1.2 Input configuration

Parameter name	Description	Range/Values
OK tool 1	Sets an external signal for OK message from the tool controller. Only applicable if tool type = electrical	---, IN-1-IN-10 Default: ---
NOK tool 1	Sets an external signal for NOK message from the tool controller. Only applicable if tool type = electrical	---, IN-1-IN-10 Default: ---
Clamp closed	Sets an external signal for confirmation when clamping is engaged	---, IN-1-IN-10 Default: ---
External start	Sets an external input signal for start. If set, the corresponding keys are deactivated on the keyboard.	---, IN-1-IN-10 Default: ---
External reset	Sets an external reset input. If set, the corresponding keys are deactivated on the keyboard. A high level signal for this input results in cancellation of a currently processed job.	---, IN-1-IN-10 Default: ---
External repeat	Sets an external input for the Repeat function.	---, IN-1-IN-10 Default: ---
External NOK ackn.	Sets an external input for the NOK Acknowledge function. If input is set, the corresponding button is deactivated on the keyboard. Only applicable if NOK acknowledge = Yes in the Sequence menu	---, IN-1-IN-10 Default: ---
Loosening / rework	Activates a Loosen and rework mode (repair mode) which enables you to go back to already processed positions to unscrew, adjust or repair previous operations.	---, IN-1-IN-10 Default: ---
Force ext. Job selection	The input signal can force a switch of the selected job method. If the input is inactive, the job will be selected with the method given in the system parameter Job selection. If the input is active, external inputs will select the job, regardless of the setting of system parameter job selection.	---, IN-1-IN-10 Default: ---
Jobselect bit 1	Bit 1 of a Job Select value (0-5 bits possible)	---, IN-1-IN-10 Default: ---
Jobselect bit 2	Bit 2 of a Job Select value (0-5 bits possible)	---, IN-1-IN-10 Default: ---
Jobselect bit 4	Bit 3 of a Job Select value (0-5 bits possible)	---, IN-1-IN-10 Default: ---
Jobselect bit 8	Bit 4 of a Job Select value (0-5 bits possible)	---, IN-1-IN-10 Default: ---
Jobselect bit 16	Bit 5 of a Job Select value (0-5 bits possible)	---, IN-1-IN-10 Default: ---
Jobselect bit 32	Bit 6 of a Job Select value (0-5 bits possible)	---, IN-1-IN-10 Default: ---

5.1.3 Output configuration

Parameter name	Description	Range/Values
Output ready	Is set if the TPS can process a start signal.	---, OUT-1...OUT-6 Default: ---
Output in job	Is set to 1 when a job is being processed.	---, OUT-1...OUT-6 Default: ---
Out clamp 1	If the parameter Out clamp 2 is not set, this output actuates a spring valve. If the Out clamp 2 signal is set, clamping 1 is the pulse output for engage clamping.	---, OUT-1...OUT-6 Default: ---
Out clamp 2	If this output is set, both the clamping 1 and clamping 2 outputs are used for actuating a pulse valve. In this case, clamping 1 is the Engage Clamping signal and clamping 2 is the Disengage Clamping signal. The pulse duration can be configured via the Clamping Pulse Duration item in the Process menu.	---, OUT-1...OUT-6 Default: ---
Out tool enable	Enables the tool controller as soon as the position is reached and, if applicable, defined additional query conditions are met.	---, OUT-1...OUT-6 Default: ---
Out tool disable	Disables the tool controller as soon as the position is reached and, if applicable, defined additional query conditions are met.	---, OUT-1...OUT-6 Default: ---
Out in position	Switches to active as soon as a specified position has been reached.	---, OUT-1...OUT-6 Default: ---
Out OK	Output for the OK signal for individual tightening operation.	---, OUT-1...OUT-6 Default: ---
Out NOK	Output for the NOK signal for individual tightening operations	---, OUT-1...OUT-6 Default: ---
Out complete OK	Output for a job with all OK signals, that is, all positions successfully processed.	---, OUT-1...OUT-6 Default: ---
Out complete NOK	Output for a job with all NOK signals, which means the job is cancelled.	---, OUT-1...OUT-6 Default: ---
Out Pset bit 1	Bit 1 of a Pset select value (0-8 bits possible) Only applicable if tool type = electrical	---, OUT-1...OUT-6 Default: ---
Out Pset bit 2	Bit 2 of a Pset select value (0-8 bits possible) Only applicable if tool type = electrical	---, OUT-1...OUT-6 Default: ---
Out Pset bit 4	Bit 3 of a Pset select value (0-8 bits possible) Only applicable if tool type = electrical	---, OUT-1...OUT-6 Default: ---
Out Pset bit 8	Bit 4 of a Pset select value (0-8 bits possible) Only applicable if tool type = electrical	---, OUT-1...OUT-6 Default: ---
Out Pset bit 16	Bit 5 of a Pset select value (0-8 bits possible) Only applicable if tool type = electrical	---, OUT-1...OUT-6 Default: ---
Out Pset bit 32	Bit 6 of a Pset select value (0-8 bits possible)	---, OUT-1...OUT-6

Parameter name	Description	Range/Values
	Only applicable if tool type = electrical	Default: ---
Out Pset bit 64	Bit 7 of a Pset select value (0-8 bits possible) Only applicable if tool type = electrical	---, OUT-1...OUT-6 Default: ---
Out Pset bit 128	Bit 8 of a Pset select value (0-8 bits possible) Only applicable if tool type = electrical	---, OUT-1...OUT-6 Default: ---
Label trigger output	Output signal for when the TPS receives label information from a barcode scanner.	---, OUT-1...OUT-6 Default: ---
Out I/O Rework		---, OUT-1...OUT-6 Default: ---

5.1.4 Sequence

Parameter name	Description	Range/Values
Label	Defines how a job should be started when the TPS receives label information from a barcode scanner	allow start, change job, start job Default: allow start
Start signal	Selects between <ul style="list-style-type: none"> Edge To start job, it is necessary to change from low to high input signal Level Job always starts, when the input signal is high Continuous To start job requires a rising edge and also the start signal has to be available during the entire operation (otherwise operation will be ended) 	Edge, Level, Continuous Default: Edge
Debounce start	The meaning for start evaluation of flank/duration time in 0.1 seconds (that has to be the low signal to ensure that flank is accepted). The meaning for start evaluation of condition: forced interruption between the end of the last operation and the start of the new operation when the start signal is always high	Off, 0.1-9.9 seconds Default: Off
Start pause		
Enable Backstep	Enables the operator to go back to previous position and perform procedure although the result of the previous operation was OK.	Off, On Default: Off
Forward step	Enables the operator to go forward one position when having used the Back button without completing the position operation.	Off, On Default: Off
NOK acknowledge	Enables a tool to be released for next operation if the previous position has returned a NOK result.	Off, On Default: Off

Reference

Parameter name	Description	Range/Values
NOK max count	Defines the maximum number of repeated attempts per position when the pset has returned a NOK result. If the number is exceeded, a signal is issued and the pset has to be reset.	Off, 1-99 Default: Off
NOK max acknowledge	Defines the maximum number of times the NOK button can be pressed after the pset has returned a NOK result. If the number is exceeded, a signal is issued and the pset has to be reset.	Off, On Default: Off
Max NOK's per job	Defines the maximum number of NOK results in a job. If the number is exceeded, a signal is issued and the pset has to be reset.	Off, 1-255 Default: Off
Clamp delay	Defines how long clamping will be activated after start.	0.0-25.5 seconds Default: 0.0
Clamp time close		0.0-99.9 seconds Default: 0.0
Clamp time open		0.0-99.9 seconds Default: 0.0
Clamp pulse time		0.0-99.9 seconds Default: 0.0
Position timeout	Defines the maximum time which can be spent in a position step.	Off, 1-99 seconds Default: Off
Missing pos.qualifier	Defines the system behaviour when a position query drops for more than 500 ms after being available once. <ul style="list-style-type: none"> hold The system waits until the signal comes again abort The system interrupts this cycle with NOK 	hold, abort Default: hold
Rework Psets	Defines if only a loosen program or several tightening programs can be selected as a Reworking special operation. The value entered equals the highest pset number that can be selected in this operating mode. A 5 means that pset 1-5 are available in reworking mode.	Loosen only, 1x Default: Loosen only
Loose Pset	Sets the Pset number defined for loosening operations to be used in reworking mode. The pset number may be in the range of the enabled reworking cycles (refer to the prior parameters) or outside of this range (Reworking Special Operation)	1-31 (depending upon the number of the configured cycle selection outputs) Default: 1
Enable during program	Allows TPS Control to perform operation procedures while programming positions.	Off, On Default: Off
Result report	Defines how TPS Control should report results from operations	Off, per position, per job Default: Off

5.1.5 Position

Parameter name	Description	Range/Values
Position window	Specifies the size of the rectangular search field surrounding the target position.	0.5-25.5 mm Default: 2.0
Position hysteresis	The position hysteresis is used together with parameter position window. When the tool is located near the edge of the search field defined as position window, the position is only considered lost if the position hysteresis was exited. This parameter should always be set to a value larger than or equal to 1.	1.0-9.9 Default: 2.0
Arm type	Defines the torque arm type used. Only two options are applicable for TPS Control: <ul style="list-style-type: none"> Angle/linear (for SML-T) Angle/Angle A (for SMS-T) 	Angle/linear Linear/Linear Angle/Angle A Angle/Angle B Default: Angle/Linear
Length 1	Depending on arm type the length varies. For more information, see section <i>Set up sensor parameters</i>	
Length 2	Depending on arm type the length varies. For more information, see section <i>Set up sensor parameters</i> .	
SSI coding	Defines the coding method used for the SSI Interface	Binary, Gray Default: Binary
SSI resolution	Defines the SSI resolution in bits for the SSI sensor. TPS uses a 13 bit value to calculate the resolution; using a 13 bit encoder gives a maximum value of the encoder of 8191. If you are using an SSI sensor with another resolution than 13, you will get a lower or higher maximum value. The aim is to come as close as possible to value 8191. For lower values than 13 bits: SSI factor x Max value = Should return a value as close as possible to 8191. SSI Divider = 1 For higher values than 13 bits: SSI factor = 1 Max value / SSI Divider = Should return a value as close as possible to 8191.	8-24 Default: 13
SSI factor	See SSI resolution for explanation	1-99 Default: 1
SSI Divider	See SSI resolution for explanation	1, 2, 4, 8, 16, 32, 64, 128 Default: 1

5.1.6 Barcode input

Parameter name	Description	Range/Values
Format label data	Opens a submenu.	
Define new code	Opens a submenu.	

5.1.6.1 Format label data

Parameter name	Description	Range/Values
Control length	Defines the length of the barcode label.	Variable, 1-53 Default: 8
Number of STX chars	Sets the number of prefix characters.	0-4 Default: 0
Number of ETX chars	Sets the number of postfix characters	0-4 Default: 2
Character code STX1-STX4	Only visible if Number of STX chars = 1..4.	
Character code ETX1-ETX4	Only visible if Number of ETX chars = 1..4.	
Check label digits		Default: 8
Id1 Length	Sets the number of characters that is used for the part of the barcode defined as Id1	0-32 Default: 0
Id2 Length	Sets the number of characters that is used for the part of the barcode defined as Id2	0-32 Default: 0

5.1.6.2 Define new code

Parameter name	Description	Range/Values
Start position	Sets start position from where identification of the barcode should start.	1-255 Default: 1
Start counting from	Selects if counting should start from beginning or end of barcode.	head, tail Default: head
Code	Specifies the characters in the barcode that if found triggers a job to start.	A-Z, a-z , 0-9
Job number	Sets the job to start when the specified character code is found in a barcode	1-63 Default: 1

5.1.7 Service

Parameter name	Description	Range/Values
User language	Enables the selection of the language for the operating dialogue between English, German and French.	English Deutsch Francais Default: English
System information	Gives information regarding Device ID, software version and version number of the I/O modules and the enabled options	
Print out	Opens the submenu with the printing functions	
Test functions	Opens the submenu with the test functions	
Reset parameter + jobs	Resets all setup parameters to the factory settings and deletes all jobs.	
Reset jobs only	Deletes all jobs, but keeps the parameter settings.	
Reset system	Restarts the TPS Control system (corresponding to the power-on cycle)	
Licence keys	Enables optional functions (in a separate submenu). Enabling codes can be ordered from Atlas Copco giving the unit device ID	
Firmware update	Prepares the unit for a firmware update through the serial interface.	

5.1.7.1 Print-Out

Parameter name	Description	Range/Values
Print parameters	Prints a plain text list of all setup parameters on the serial interface	
Print jobs	Prints a plain text list of all jobs on the serial interface	
Print all	Prints all parameters and all jobs on the serial interface	

5.1.7.2 Test functions

Parameter name	Description	Range/Values
Test inputs	A function for testing the digital inputs and sensor inputs for distance and angle sensors	
Test outputs	A function for testing the digital outputs	
Test TPS-Control	Runs several tests for the TPS control display and keyboard.	
Test I/O-Port 1	Runs a hardware test of the input/output module no.1	

5.1.7.3 Licence keys

Parameter name	Description	Range/Values
New licence key	Opens up a dialogue for entering licence functions	

5.2 I/O configuration

5.2.1 Communication between TPS and Power Focus

This section shows an example of how to set up I/O communication between TPS and Power Focus.

TPS I/O		Power Focus I/O
Output 1 (Pin 2)	→	Tool Disable, normally closed (Pin 13/14)
Output 2 (Pin 3)	→	Pset Select Bit 0 (Pin 15/16)
Output 3 (Pin 4)	→	Pset Select Bit 1 (Pin 17/18)
Output 4 (Pin 10)	→	Pset Select Bit 2 (Pin 19/20)
Input 1 (PIN 17)	←	OK (Pin 1/2)
Input 2 (Pin 5)	←	NOK (Pin 4/5)

5.2.2 Communication between TPS and Tensor DS/DL Drive

This section shows an example of how to set up I/O communication between TPS and Tensor DS/DL.

TPS I/O		Tensor DS/DL I/O
Output 1 (Pin 2)	→	Tool Enable, normally closed (Pin 13/14)
Output 2 (Pin 3)	→	Pset Select Bit 0 (Pin 15/16)
Output 3 (Pin 4)	→	Pset Select Bit 1 (Pin 17/18)

TPS I/O		Tensor DS/DL I/O
Output 4 (Pin 10)	→	Pset Select Bit 2 (Pin 19/20)
Input 1 (PIN 17)	←	OK (Pin 1/2)
Input 2 (Pin 5)	←	NOK (Pin 4/5)

5.3 Licence handling

The following optional functions can be activated by entering a licence code:

Licence number	Licence name
0	Pneumatic
3	Barcode scanner
6	Result reporting

The licence codes are provided by Atlas Copco AB.

1. To activate a licence code, go to **Service>Licence keys** and select option **NEW** (F1).
2. Enter the licence code. Press **OK**.
3. The entered licence code is shown in the display. Press **VALID** (F3) to confirm the licence code.

After entering a valid licence code, the corresponding option is displayed in the menu of available options.

Any available option can be temporarily deactivated by placing the bar cursor on the appropriate option with the arrow up/arrow down keys and pressing ON-OFF (F2). A [--] flag appears before a deactivated option. Repeating the process reactivates the option.

An option is completely removed with delete and the enabling code has to be re-entered.

To see what licensed functions are activated, go to **Service>System information. Options** lists the available licence numbers.

5.4 Result reporting

The result reporting function is an optional function and is activated with a licence code. Section 4.2. describes how to activate licensed functions.

You can select between the following result reports:

- **Position report**
Gives a result for every tightening position. If a Job has five tightening positions, a separate report for each position is generated.
- **Job report**
Gives one result report for the complete job.

To activate result reporting, perform the following procedure:

1. Press **Setup>Sequence**.
2. Select parameter Result Report and press **OK**.
3. Select if to activate a position report or job report. To deactivate function, select option Off.
4. Press **VAL** to confirm the selected option.

5.5 Barcode scanning

The barcode function extends the TPS Control by using a barcode scanner to a second serial interface and carrying out the job selection by means of the read-in barcode.

The TPS Control has two RS-232 serial ports to connect the unit to a PC and a barcode reader. As both RS-232 interfaces are available on the same Sub-D 9-pin connector, a Y-cable adapter has to be used if the barcode scanner and the PC connection will be used at the same time. For information about cables, see the TPS Product Instructions.

The barcode function allows to read a barcode string with up to 255 characters from the scanner. To allow secure identification of the start and end of a code, there are different parameters to setup the used label format. The system can handle labels with a fixed length or a variable length.

The actual label characters can be prefixed or suffixed by additional STX or ETX character sequences. The prefix can contain up to 4 characters (STX1-STX4) and the postfix can also contain up to 4 characters (ETX1-ETX4). Prefix and postfix can both be omitted. The individual characters are entered with their ASCII code. In case of a variable control length, an ETX sequence must be defined, so that the end of the label data can be detected.

With many scanners, the STX sequence is empty and the ETX sequence consists of a CR-LF (Carriage Return, Line Feed) sequence. The CR for example has the ASCII code 13 and the LF the ASCII code 10.

The connected barcode scanner sends the read-in label automatically to the PRS Control.

For example you can have a label with variable length, no prefix and one postfix character (CR, carriage return = 13 decimal).



This will be transmitted by the scanner as

6159326580:10D1762186<CR>

The CR character is not part of the barcode, but it is generated by the scanner. Typically the scanner can be setup to have specific prefix and/or postfix characters.

If the first part of the barcode string (6159326580) is the part type, this could be used for selecting a specific job. To specify jobs to different barcodes you will have to setup a barcode definition in the TPS system.

5.5.1 Barcode definition parameters

The system must be told which labels initiate a particular job. The entry of these numbers is carried out in the parameter menu under the menu item **Barcode input**. When selecting this menu, the following window appears:

Label data format		
New code definition		
C1: ##1234*	J01	
C2: ##6754*	J02	
SELECTION	SORT	DELETE

The menu item **Label data format** is used to open a submenu, which enables the definition of the control length and the STX or ETX sequence.

If you select **New code definition**, a submenu is opened where you can enter the label parameters for a new label. This is followed by listing of all existing barcode definitions and the corresponding job selection. The display of the already existing codes takes place with the following characters: # is a wildcard for any individual character, * is a wildcard for one or more individual characters, and can only be used at the beginning or end. The permissible characters in the comparison string are: A - Z, a - z, 0 - 9. This menu also includes a code deletion function and switching of the sorting (sorting by codes or sorting by assigned jobs).

The system can process labels containing up to 54 characters. From the 54 possible characters of a label, the user can define a range with a maximum length of 10 characters as relevant characters; these characters will then be saved as the comparison value for this label.

The start position of this comparison string can be defined by the user either in relation to the start or the end of the label data.

Start position:	1-53
Counting from:	Head or Tail
Code (10 characters)	1234567890
Job number	1-63

Parameter examples (control length = variable)

Start position 1, counting from head Code: 123 Job number: 10

With these parameters, all labels starting with the characters 123 would select Job 10. Display in overview menu: Cx: 123*

Start position 4, counting from head Code: 78 Job number: 3

With these parameters, all labels with a 7 as the 4th character and an 8 as the 5th character would select Job 3. Display in overview menu: Cx: ###78* Depending on whether the system is equipped with Start/end sequence processing, or uses this, the label must either be read in before the start (without Start sequence use), or it is read in at the end of the start sequence, and then selects the assigned job.

By setting the parameter **Label** in the menu **Sequence** it can be defined if a new label must be read in for every start, or if the previous job selection will continue when starting without a new label.

A read-in label will be shown in the display of the TPS Control if it cannot be processed. A total of 200 labels can be used in TPS Control.

All label data can also be printed out with the Print function.



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