

A guide to using

Pulsor

Pulsor Focus unit for ErgoPulse



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1 Introduction to Pulsor

1.1 About this document

This document is a user manual for the **Pulsor Focus** system and is divided into three main parts:

Part	Name	Description
Part I	Getting started with Pulsor	This part introduces Pulsor and is also a step by step instruction on how to get to the point of doing real tightenings with your Pulsor system.
Part II	Working with Pulsor	Describes in detail functions and features of the Pulsor system.
Part III	Reference information on Pulsor	Gives important reference information on Pulsor such as event codes and specifications on hardware.

1.2 Overview of Pulsor

The Pulsor concept uses an ErgoPulse auto shut-off pulse tool. This means that the tool contains an adjustable mechanism that shuts off the tool when the desired torque has been reached.

Since there is always a degree of uncertainty of how good the tightening is when using pulse tools, Atlas Copco has come up with the idea to allow mechanical shut-off mechanism to work in parallel with electronic monitoring to achieve a high level of certainty that the joint is correctly tightened.

The tool contains an electronic sensor that measures the torque during the pulses that the tool delivers while tightening. The torque that is measured is (as always) the torque in the outgoing shaft from the tool but what this torque pulse achieves for the installed torque depends on the characteristics of the joint, the use of extensions, sockets etc. If several tightenings are made on the same joint, the torque measurement produces a result that agrees relatively well in the actual joint. If you have adjusted the tool so that you are satisfied with the result it achieves in the actual joint, the torque is shown as a percentage of this level.

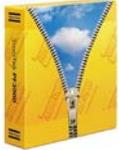
The main features of Pulsor are:

Functions	Description
Tightening monitoring	Reference Setup calculates proposed limits for the different parameters that describe the tightening with the tool on the actual joints. When Reference Setup is completed these values are transferred to the tightening monitoring. Once the Reference Setup is completed, the user can change the limit values in the tightening monitoring to suit the specifications for the joint. The user can also choose to activate and/or adjust additional parameters to capture different faults such as rehit and cross thread.
Result presentation	Basic results are shown on the Pulsor Focus display and lamps on the tool indicate whether the tightening was good or not. For a comprehensive result presentation the PC program ToolsTalk Pulsor is used. It contains a number of functions that present detailed information on the result of the tightenings.
Batch counting of tightenings	A function for counting tightenings to assure that no bolts are forgotten.
Job	Function for making several tightenings on different joint types in a controlled sequence.
Statistics	Functions for calculating statistics on a large number of tightenings.
Service monitoring	The parameters for service monitoring are stored in the tool's memory and follow the tool if it is moved to another Pulsor Focus. If any active service parameter exceeds a preset alarm limit the "alarm" light on Pulsor Focus comes on and a event code is displayed which states which parameter has caused the alarm.

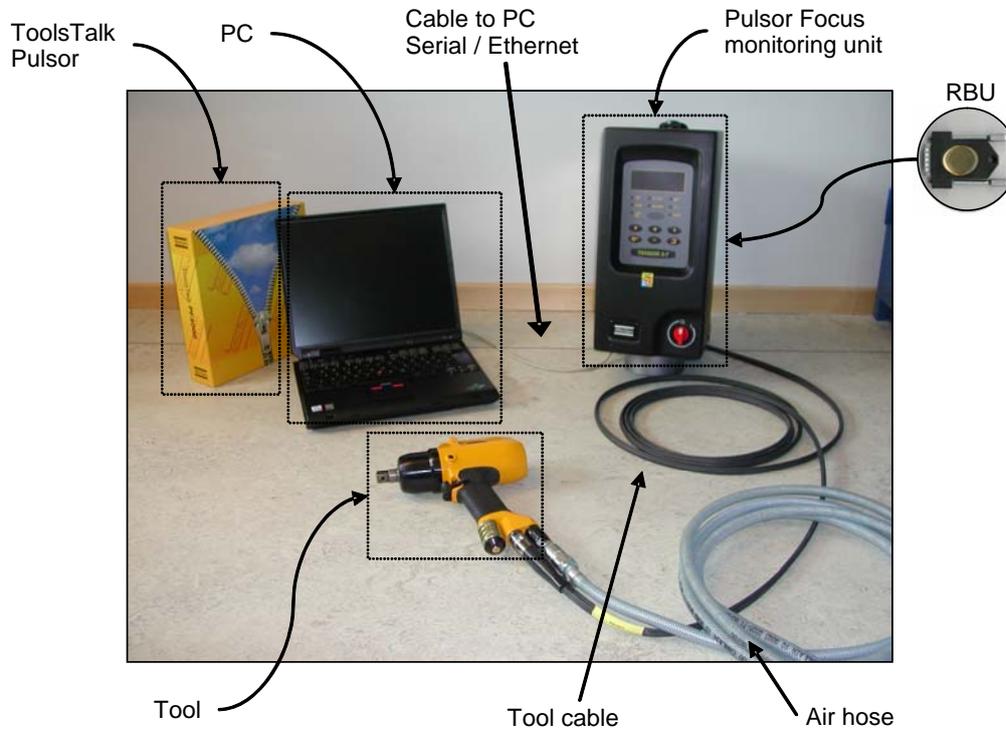
Functions	Description
Tool drift alarm	Tool drift alarm is a function to enable the operator to detect a change in tool performance (tool drift) before it has an impact on production. The cause for this performance change can be lack of oil in the pulse mechanism, a technical fault in the tool or a change in line air pressure.
Network	Pulsor Focus includes complete networking capacity as an integrated function. Pulsor Focus can be connected to a network for central programming and data collection with the help of ToolsTalk Pulsor and ToolsNet.
External units	The Pulsor system also includes a number of optional accessories such as Tool Lock Box, selector, RE-alarm I/O Expander and barcode reader.

1.3 Pulsor components

A Pulsor system includes the following main components:

Product	Name	Description
	Tools	The current ErgoPulse tools for Pulsor are: EPP 11M120 HR13 70- 120 Nm EPP 10M90 HR13 50- 90 Nm EPP 8M70 HR10 40- 70 Nm EPP 8M55 HR10 30- 55 Nm EPP 6M32 HR10 16- 32 Nm EPP 6M28 HR42 15- 28 Nm EPP 6M25 HR10 8- 25 Nm EPP 6M23 HR42 7- 23 Nm
	Pulsor Focus monitoring unit	In principle, all functions are adjusted and set using a PC running ToolsTalk Pulsor connected to a Pulsor Focus monitoring unit (referred to as Pulsor Focus in the rest of this document), locally or via a network. Simple functions can be operated directly on Pulsor Focus's front panel.
	RBU	RBUs (Rapid Backup Units) unlock a specified functionality level and, at the same time, is a memory for backing up the programming and configuration of the Pulsor Focus. It is possible to transfer the configuration from one Pulsor Focus to another with the help of the RBU.
	ToolsTalk Pulsor	This offers simple and user-friendly Reference Setup and monitoring of the Pulsor Focus units in real time.

The following is an illustration of a standard configuration of a Pulsor system:



See chapter 22, *Pulsor Focus hardware description* for a detailed information about the Pulsor Focus connections.

1.4 Pulsor accessories

A number of external accessories are available for the Pulsor system. The following are the most important:

Product	Name	Description
	Pressure regulator	A compressed air regulator provides a stable air pressure that produces a more repeatable result.

	<p>Tool Lock Box</p>	<p>The Tool Lock Box is used to shut off the air supply to the tool when the Pulsor Focus wants to prohibit the operator do more tightenings, e.g. when an error condition occurs.</p>
	<p>Selector</p>	<p>Selector is a socket rack that selects which Pset (parameter set) the tool shall use.</p>
	<p>I/O expander</p>	<p>The I/O expander makes it possible, when necessary, to connect more digital inputs/outputs in addition to the built-in 4+4.</p>
	<p>RE alarm</p>	<p>The RE alarm (Lamp/sound box) indicates the tightening status to the operator.</p>
	<p>Operator panel</p>	<p>The operator panel is an external device for the Power Focus and can also be used for Pulsor Focus. It is a general purpose lamp- and switchbox, replacing the customer specials that are made today.</p>
	<p>Stacklight</p>	<p>Stacklight is a flexible light and switch device for PowerFocus, PulsorFocus, PowerMacs and Tensor DS/DL Advanced tightening controllers.</p>
	<p>ToolsNet</p>	<p>ToolsNet is a standard software package for server usage. This facilitates collection, storage and presentation of data from the tightenings that are done by Pulsor Focus along the production line.</p>

See chapter 17, *ToolsNet* and chapter 18, *Accessories* for more information.

2 Connecting and installing the Pulsor system

This chapter will take you through connecting and installing the Pulsor system. The major steps are:

- Examine that all required hardware and software is available.
- Connect the physical parts of the system.
- Learn about the Pulsor system user interface (chapter 3, *Introducing the Pulsor system's user interface*).
- Install the ToolsTalk Pulsor software on a PC running MS Windows.
- Connect ToolsTalk Pulsor to Pulsor Focus.

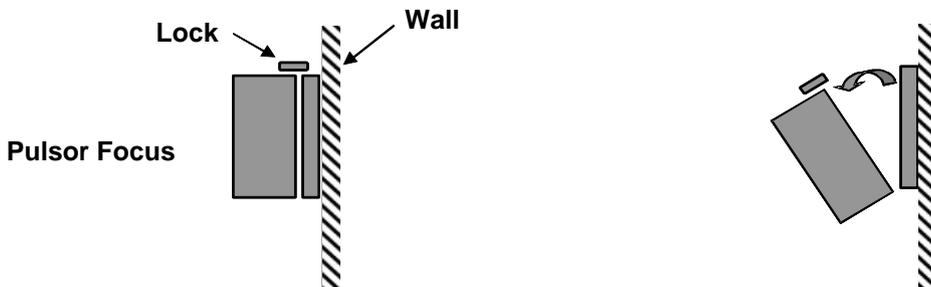
After successfully completing the steps above you can now start using the Pulsor system. The next natural step is to proceed with reading about the Pulsor system's user interface in chapter 3.

2.1 Required hardware and software

Installations checklist:

- Pulsor Focus unit
- RBU
- Cable
- Tool
- ToolsTalk Pulsor

2.2 Connect the physical parts of the system



1. Open the lock mechanism.
2. Open the Pulsor Focus by pulling it.
3. Connect the tool cable, power cable, Ethernet/Serial cable etc.
4. Connect the RBU.
5. Check the earth fault breaker is switched on.
6. Close the Pulsor Focus and lock it.
7. Connect the power cable to a power supply 115/230 V.
8. Connect the tool to the tool cable and air hose.
9. Connect the air hose to the air supply.
10. Turn the power on.

2.3 Learn about the Pulsor system user interface

See chapter 3, *Introducing the Pulsor system's user interface*.

2.4 Install the ToolsTalk Pulsor software

The requirements for using ToolsTalk Pulsor are:

- **Hardware:** A standard PC with at least 256 Mb RAM (The absolute minimum is 64 Mb RAM but this is not recommended).
- **Operating system:** Windows 98 or later.

Proceed as follows to install ToolsTalk Pulsor:

- Insert the installation CD and the installation will start automatically. You can also manually start the installation by double clicking on **Setup.exe** file.
- Follow the instructions on the screen.
- Initially you will be granted a 60 day trial license period. To use ToolsTalk Pulsor after that you need to register.

Registration of ToolsTalk Pulsor is preferably done at the web site <http://www.atlascopco.com/tools/software>. To register you will need the licence number you got when purchasing ToolsTalk Pulsor.

2.5 Initial connection of ToolsTalk Pulsor

ToolsTalk Pulsor can connect to Pulsor Focus either using serial interface or using TCP/IP over Ethernet. Using Ethernet is the preferred alternative since it allows higher speed than the serial interface. To setup the Ethernet connection parameters it is however first necessary to connect using serial interface.

The main steps to connect ToolsTalk Pulsor to Pulsor Focus are:

1. Start ToolsTalk Pulsor.
2. Connect ToolsTalk Pulsor to Pulsor Focus using serial cable.
3. Go to Communication under Config:
 - Set the IP address of the connected Pulsor Focus to a unique number within the network.⁽¹⁾
 - Set the Subnet mask according to network partitioning.⁽¹⁾
 - Set the default Gateway (if needed in your particular network).⁽¹⁾
4. Store and restart Pulsor Focus.
5. From Settings under the Options menu, set the IP address and Subnet mask to the Pulsor Focus you wish to connect to.
6. Connect with Ethernet to the selected Pulsor Focus with a double click in the PF Map or on the connect button.

⁽¹⁾ Contact your network administrator for information about IP-address, Subnet mask and Default gateway.

After successfully completing the steps above you can now start using the Pulsor system. The next natural step is to proceed with adjusting the tool described in chapter 4, *Adjusting the tool*.

2.6 Exchange of tools (Hot swap)

Exchange of tools (so-called Hot swap) allows a tool to be disconnected or connected without having to turn off the Pulsor Focus.



Since all tools have slightly different characteristics it is very probable that the Reference Setup needs to be redone when the tool has exchanged for the system to operate properly.

3 Introducing the Pulsor system's user interface

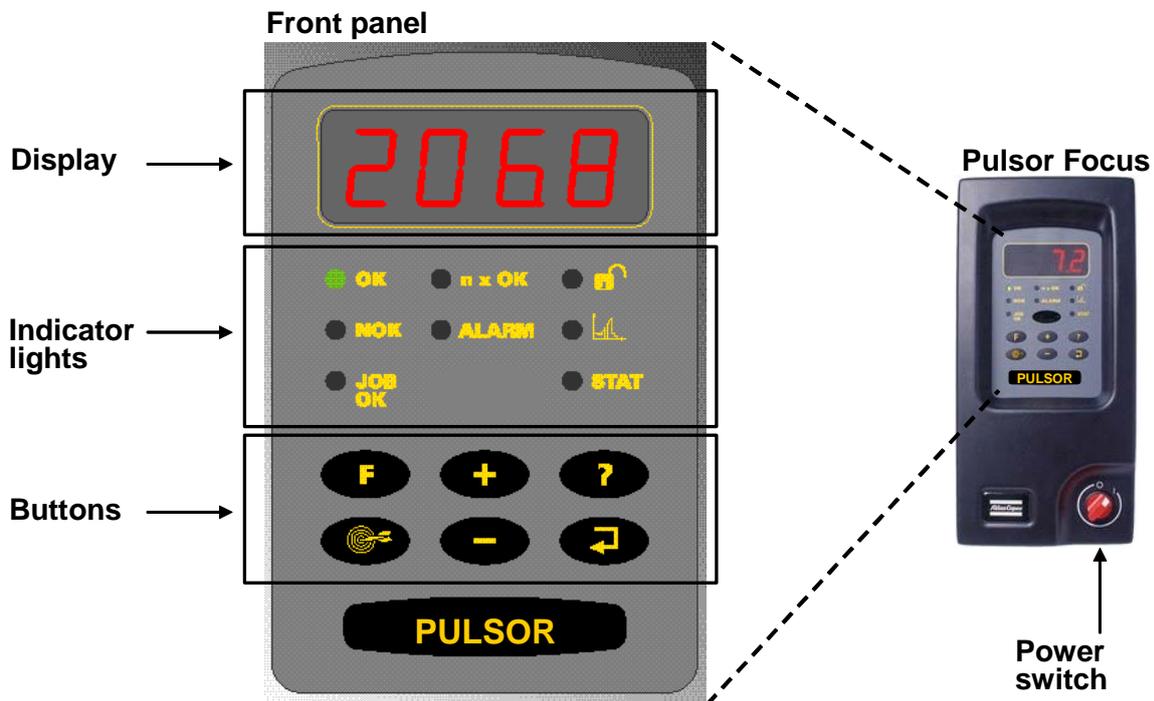
3.1 Signal lights on the tool

The tool has three signal lights – green, yellow and red.

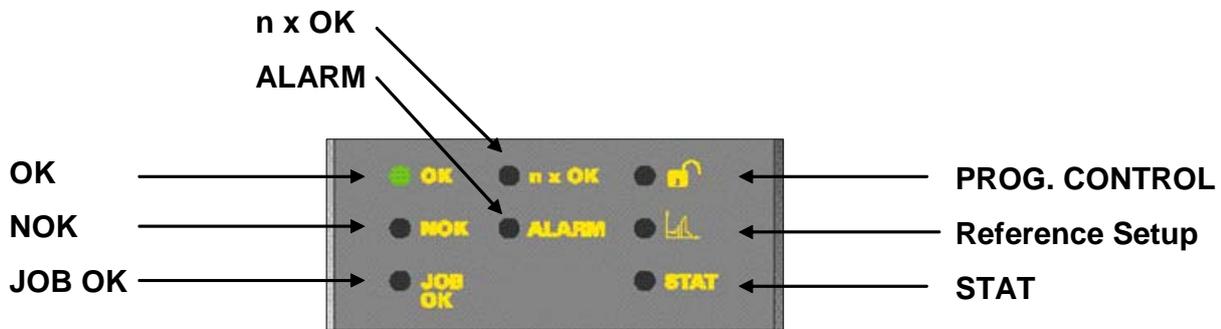
Color	Description
Green	Tightening approved.
Flashing red	Active monitoring parameter is exceeded.
Flashing yellow	An active monitoring parameter is below limits and/or the operator has released the trigger before tool shut-off.
Flashing red and yellow	Both the conditions for flashing red and yellow lights have been met e.g. there are multiple faults.

3.2 Pulsor Focus front panel

The front panel of the Pulsor Focus consists of a display, indicator lights, buttons and a red and white power switch.

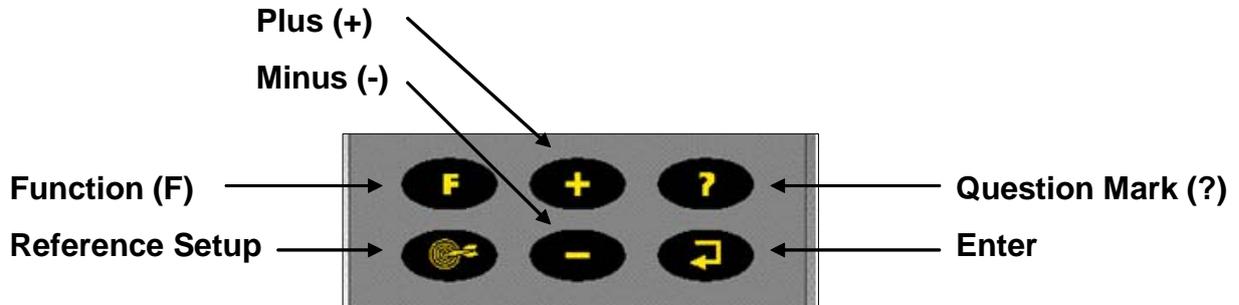


3.2.1 Indicator lights



Indicator light	Description
OK	The OK light indicates that the result of the tightening is within the specified limits. The indicator remains active until the next tightening starts.
NOK	The NOK red light indicates that the result of the tightening falls outside the specified limits. The light is active until the next tightening starts.
JOB OK	The JOB OK light indicates that the Job is finished and the result is within the specified limits. The light remains active until the next cycle starts or when the system is reset.
n x OK	The n x OK light indicates that the number of approved tightenings corresponds to the number (batch size) programmed into the Pset. The indicator remains active until the next tightening starts.
ALARM	The ALARM indicates that an alarm message needs to be acknowledged. The light is active until the message is cleared. The alarm light can also flash indicating active alarm that does not need to be acknowledged e.g. service indicator alarm or tool drift alarm.
PROG. CONTROL (padlock symbol)	When the Pulsor Focus is in programming mode the Programming Control light (illustrated by an opened padlock) flashes green. Programming Control can be undertaken via the Pulsor Focus unit itself or via ToolsTalk Pulsor. A steady green light indicates that the programming buttons on the front panel are unlocked. If the Pulsor Focus is not in programming mode, the only buttons on the unit that can be used are Question Mark and Enter. (If key is unlocked, steady green, any key can be accessed, provided the soft keys are locked. Parameter [C124])
Reference Setup (graph symbol)	The Reference Setup light indicates when the Reference Setup programming function is active. The light goes off when Reference Setup is finished.
STAT	The STAT light indicates when the calculated values fall outside statistical control limits. The light remains active until the values are within the control limits or the memory has been reset.

3.2.2 Keys



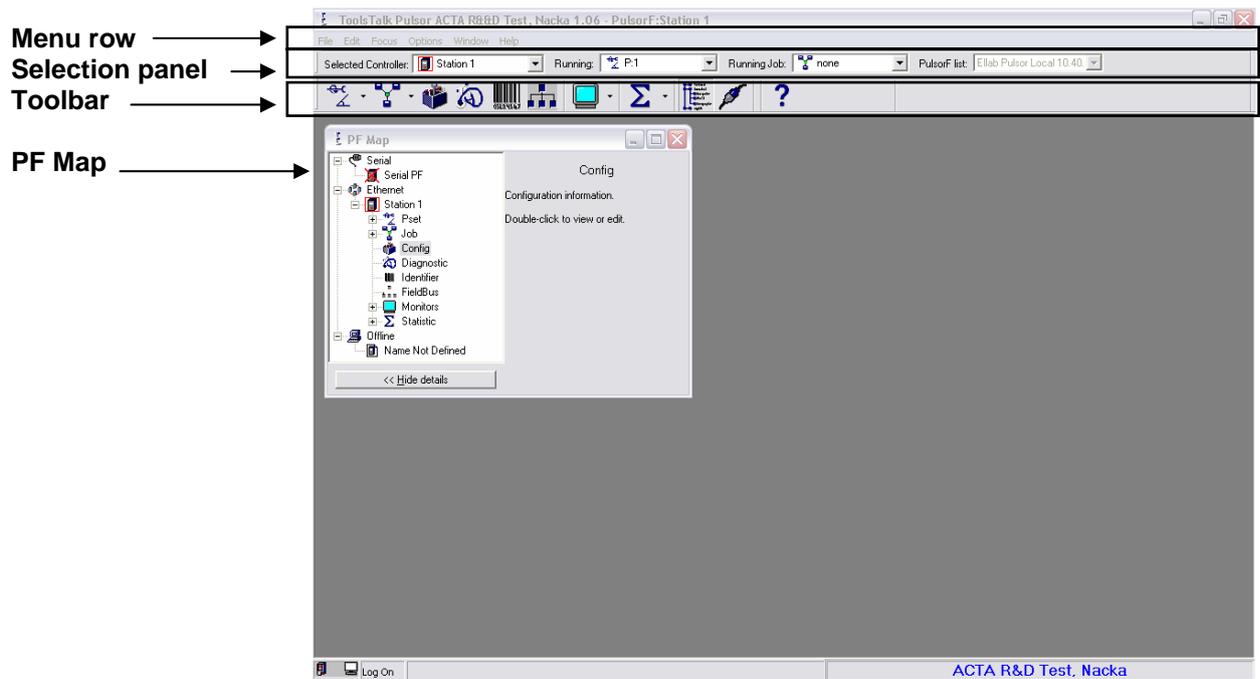
Key	Description
Plus (+)	Navigates through menus on the display and increase numbers.
Minus (-)	Navigate through menus on the display and decrease numbers.
Function (F)	<p>Press F (Function button) to display functions F1 – F5.</p> <p>To display function F1 press F one time, to display function F2 press F two times etc. Press Enter to access and edit a function. When finished, press F repeatedly to display result mode again (or else it will take 30 seconds for the screen to automatically update).</p> <p>F1 - Setting minimum limit for torque monitoring: “F1”/”rtLL” alternates in the display. If no Pset is selected “F1”/”----“ is displayed. Press Enter to select the new Minimum Limit value. Change the value by pressing the +/- keys. Press Enter to save and exit. Press F to exit (no save).</p> <p>F2 - Setting maximum limit for torque monitoring: “F2”/”rtUL” alternates in the display. If no Pset is selected “F2”/”----“ is displayed. Press Enter to select the new Maximum Limit value. Change the value by pressing the +/- keys. Press Enter to save and exit. Press F to exit (no save).</p> <p>(F3 – Not currently in use)</p> <p>F4 - Selecting Pset: “F4”/”Pset” alternates in the display if the <i>Pset select source [C222]</i> is Keyboard. Otherwise “F4”/”----“ is displayed. Press Enter to access the available Psets. Browse existing Psets by pressing the +/- keys. Press Enter to select a Pset and exit. Press F to exit (no selection).</p> <p>F5 - Setting Batch count: “F5”/”batS” alternates in the display, indicating that a Pset is selected. Otherwise “F5”/”----“ is displayed. Press Enter to access the Batch Size value (range 0 - 99). Change the Batch Size value by pressing the +/- keys. Press Enter to save and exit. Press F to exit (no save).</p>

Introducing the Pulsor system's user interface

Key	Description
Reference Setup	<p>Press the Reference Setup button to enter Reference Setup programming mode. "rEFS"/"----" alternates in the display and the Reference Setup led goes on.</p> <p>Press Enter. "rEFS"/Selected Pset alternates in the display.</p> <p>Perform a minimum of 10 numbers of tightenings. When Reference Setup is ready, the selected Pset number is displayed and Reference Setup led goes out.</p> <p>To abort Reference Setup press the Reference Setup button (exit and no save).</p>
Question Mark (?)	<p>Pressing the Question Mark button will display the following information:</p> <p>Pulsor Focus model: Model type alternates with software version (S = Silver and B = Bronze). ("rbu" toggle with RBU type. PAg for Silver or Pbr for Bronze.)</p> <p>Software version: The entire program code alternates with version number. ("rEL" with version number roll on the display from right to left.)</p> <p>Motor type: The tool model name roll on the display from right to left.</p> <p>Current Pset: "Pset" alternates with the current Pset ID, e.g. "P2".</p> <p>Current Job: "Job" alternates with the current Job ID, e.g. "J3".</p>
Enter	The Enter button is used to execute selected functions and for event acknowledgement.

3.3 ToolsTalk Pulsor user interface

If you are familiar with Microsoft Windows® you will feel at home with ToolsTalk Pulsor. The figure below shows the principal areas in ToolsTalk Pulsor's user interface:



There are several different ways of starting a function in ToolsTalk Pulsor. It is generally the case for all functions that you can use a menu item in the menu row, click on a tool button in the toolbar or double click on the text in the PF Map. The ToolsTalk Pulsor is also designed in a way that it can be operated without a mouse. You can therefore access all functions from the menu row using a keyboard although using a mouse makes it easier.

3.3.1 Menu row

This section provides an overview of the different functions that are available via the menu row. Additional menus are displayed in the menu row when you open a function window. If, for example, you open a Pset window you will see a new menu in the menu row called Pset.

Menu option	Description
File	You can open, save and close files, print and close ToolsTalk Pulsor from the File menu.
Edit	You can create a new Pset or a new Job from the Edit menu.
[Active window]	This menu option is dependant on which window is active. For example, if the Pset window is active Pset will be visible with sum menus for creating, deleting and copying a Pset.
Focus	You can choose how to make connections to Pulsor Focus from the Focus menu. You can choose between an Ethernet connection and a serial connection. In the Offline mode you can use ToolsTalk Pulsor without being connected to a Pulsor Focus and settings can later be loaded to a Pulsor Focus.
Options	You choose whether to display a toolbar or not from the Options menu. The following functions are available: Settings Get Event Log Forced Release Program Control
Window	You can make settings for windows and icons in the Window menu. You can also open the Activate menu. If you open the Activate menu you will see a list of available functions (Pset, Job, etc.).
Help	You can open the Pulsor Focus help file (this field test guide as a PDF file) from the Help menu to get instructions. The program version is shown under in About ToolsTalk Pulsor alternative.

3.3.2 Selection panel

Name	Description
Selected Controller	The following options are available: Serial connection, Ethernet connection or Offline mode.
Running Pset	If the selected Pset source (config. Parameter [C222]) is in Ethernet/Serial mode you can select Pset from this window.
Running Job	If the selected Job (config. Parameter [C221]) is in Ethernet/Serial mode you can select active from this window.
PF List	You can use the PF List window for simpler Ethernet connection to a Pulsor Focus Mark an item in the window to connect ToolsTalk Pulsor to the corresponding Pulsor Focus. The information in this list contains: Name, IP address and port number. The PF list is created from Settings in the Options menu.

3.3.3 Toolbar

Icon	Name	Description
	Pset	This icon opens the Pset programming window. Click on the arrow to the right to show the programmed Psets with numbers and names. The list can contain a maximum of 8 Psets.
	Job	This icon opens the Job programming window.
	Configuration	This icon opens the configuration window.
	Diagnostics	This icon opens the diagnostics window.
	Identifier	This icon opens the identifier window (barcodes).
	Fieldbus	This icon opens the fieldbus configuration window.
	Monitors	Click on the arrow to the right of this icon to select the required monitor. Result monitor, Job monitor, operator monitor or Tracking Results monitor.
	Statistics	Click on this icon to display statistical results and graphs.
	PF Map	This icon opens the PF Map if it is closed.
	Connect	Click on the item to connect to Pulsor Focus or to break the connection.

3.3.4 The PF Map

The **PF Map** gives you an overview and short cuts to all settings in ToolsTalk Pulsor. Click on the minus or plus symbols to open or close menus and double click on the function names to open the corresponding

function. Brief information on the selected setting is shown in the right panel of the PF Map. **Right click** on the function name to create a new copy of the function. Only the left panel of the PF Map is displayed if you click on the **Hide details** button.

3.4 Event codes in ToolsTalk Pulsor

There are two kinds of event codes you get when using the Pulsor system:

Types of event code	Display on the front panel in Pulsor Focus	Activity from the user
Event codes that need acknowledging	The event code flashes until acknowledged by the user.	This type of event is of such severity that it needs to be attended to before work can be continued. Press the Acknowledge button in the event code window in ToolsTalk Pulsor or press the Enter button in Pulsor Focus front panel to go back to the working position.
Other events codes	The event code is displayed for 5 seconds.	No activity is required by the user. If you so wish, the event code window in ToolsTalk Pulsor can be switched off by clicking on the OK button.

Chapter 19, *Event codes*, provides more information on what an event code means. The event code will end up in an Event log that can be analysed at a later time.

4 Adjusting the tool

4.1 Introduction

To achieve a satisfactory function, you have the option to:

- Adjust the shut-off mechanism.
- Regulate the air pressure. For most applications a pressure of 6.3 bar is recommended.

You can also check the auto trim valve (Do not try to adjust the auto trim valve if you are unsure of how to do it). See section 4.6, *Auto trim valve* for more information.

Normally it is sufficient to adjust the tool's shut-off mechanism. After that, perform Reference Setup. During Reference Setup the tightenings must be checked carefully since they form the basis for what is "correct".

For best results Atlas Copco recommends:

- Do not use an extension if it can be avoided. If it can't be avoided, make sure that the extension is not longer than necessary.
- Sockets and extensions (if used) should be guided and should not be worn or loosely fit.

The Reference Setup should be repeated if the tool's properties have changed (for example after service).

4.2 How do I check that the tool shuts off at the correct torque?

A rough adjustment of the tool's torque level can be performed on an arbitrary joint. What torque the tool produces must however be checked on the target joint. Checks shall be done by static torque measurement. The tool must also be correctly equipped in this case. For example if an extension is used in production, the tool's torque level must be checked with the extension fitted.



A prerequisite for being able to carry out a correct Reference Setup is that the tool has been previously adjusted according to the instruction in this chapter.

4.3 Shut-off mechanism

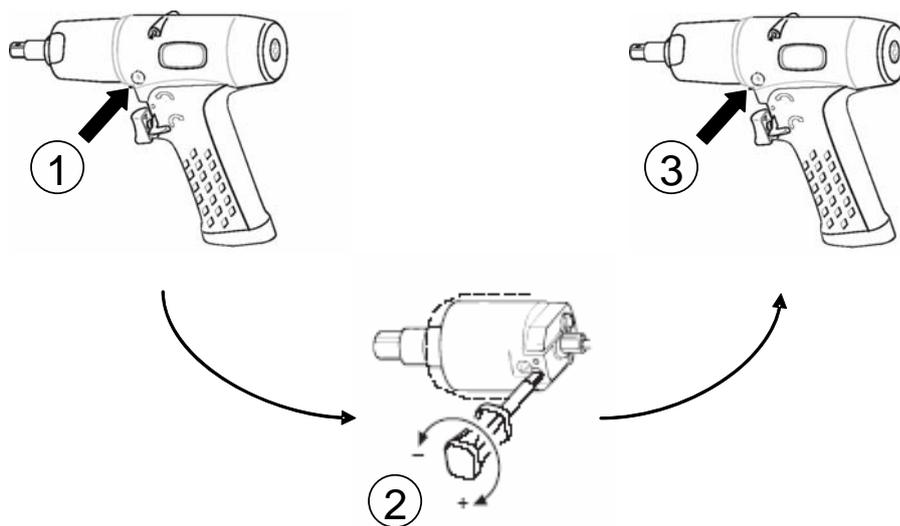
The shut-off mechanism comprises of a spring-loaded inertia body. When the torque is sufficiently high, a valve in the tool shuts off the air supply to the tool. The spring force can be adjusted with a screw so that the tool shuts at the required torque level.

The mechanism is also affected to some degree if the air pressure changes. The shut-off torque normally increases if the air pressure drops.

4.4 Instructions for adjusting the tools shut-off mechanism

Proceed as follows to adjust the tool:

1. Remove the screw. Then rotate the outgoing shaft so that a screw head with double slots appears (looks like a plus symbol).
2. Adjust the shut-off mechanism's torque level (by turning the screw head).
3. Reinsert the screw and make sure it is tight.
4. Check the tightening torque for example by static torque measurement (e.g. using an ACTA 3000 and MRTT torque wrench).



For detailed information refer to the *ASL document* for the tool.

4.5 Regulating the air pressure

Since the tool's properties change as the air pressure changes, e.g. at which torque level the tool shuts off, it is important that the tool is supplied with a stable air pressure.

By using a pressure regulator a more stable air supply can be achieved. A stable air supply will increase the repeatability of the tightening process.

By reducing the air pressure the tool becomes weaker and slower. But since the tightening is done in steps (pulses) the accuracy of the shut-off mechanism will increase since each step is smaller.

In general the tool should not be supplied with a pressure that is higher than what is required for the torque and the tightening time. Nominally the tool shall be supplied with 6.3 bar but the pressure can be reduced to 4 bar. It is not recommended that the tool be supplied with a pressure below 4 bar.



Stable and low air pressure gives a more repeatable result.

The tool can also be made weaker by adjusting the auto trim. But if you already have an adjustable pressure regulator this should be used first (since this is simpler and you do not need to dismantle the tool).

4.6 Auto trim valve

The auto trim valve reduces the air flow during rundown but opens fully when the tool begins to pulse (when the tightening begins). The purpose of this is that the first pulse shall not have such a high force that the torque in the first pulse exceeds the desired torque level. In addition to being able to adjust the auto trim valve to switch over correctly, two additional properties can be adjusted in the auto trim valve:

- How much the speed is reduced during rundown – default approximately 70% of max speed.
- How much the force shall be reduced during tightening (pulsing) – default no reduction.

Basic functional check of the Auto trim valve:

1. Run the tool with reverse switch in forward position in the air.



Make sure that any socket is firmly attached to the tool (the tool should be run with reduced speed).

2. Without releasing the trigger do a quick reverse-forward with the reverse switch, still without releasing the trigger. The auto trim valve should have reversed so that the tool is running with full speed. If there is a noticeable difference in tool speed observed after performing the procedure above, the auto trim valve is ok. If NO difference is noticed the auto trim valve is in need of adjustment or service. For more information on the Auto trim valve, see the *ASL document* for the tool.

4.7 Oil level in the pulse unit

With continuous use of the tool the oil level in the pulse unit will gradually decrease due to an inevitable micro leakage. A lower oil level will increase the tool's pulse frequency. The pulse frequency can be monitored in Tool Drift Alarm, see section 11.3, *Tool drift alarm*. When the oil level in the pulse unit gets too low the pulses becomes weaker and the pulse frequency will get noticeable higher. If the tool has previously worked well but now displays the above described symptoms, you should fill the pulse unit with ca 0,05-0,5 ml oil (the exact amount is dependant on the tool size). If the tool still not functions satisfactory, please see the tool's *ASL document* for the exact method for filling oil in the pulse unit.



If the oil level is too high the tool will run slower and will have problem reaching the correct final torque.

5 Performing a Reference Setup

5.1 Introduction

All Pulsor tightenings are carried out in the context of a Pset (Parameter set). Before a Pset can be used for monitoring the tightenings it must be set up to know what is right and what is wrong. This is done through a process called **Reference Setup**.

A prerequisite for being able to carry out a correct Reference Setup is that the tool has been previously adjusted according to the instruction in chapter 4, *Adjusting the tool*.

It is also possible to carry out a simpler type of Reference Setup without using ToolsTalk Pulsor. See section 5.8, *Making a Reference Setup via Pulsor Focus front panel* for more information.

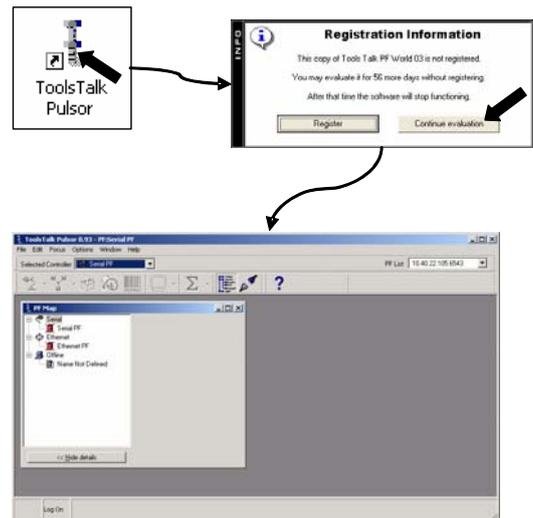
5.2 Starting ToolsTalk Pulsor

Make sure that the PC is connected to Pulsor Focus and the power supply to Pulsor Focus is on.

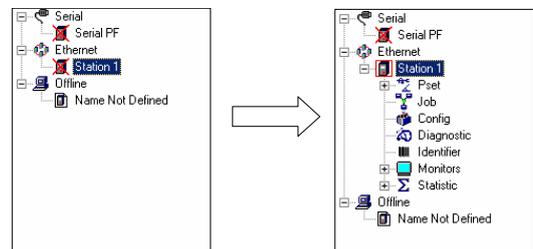
Start **ToolsTalk Pulsor** on the PC for example by double-clicking on the ToolsTalk Pulsor icon on your desktop.

Select **Continue Evaluation** and register later or select **Register** to register now.

See section 3.3, *ToolsTalk Pulsor user interface* for more information about the ToolsTalk Pulsor user interface.

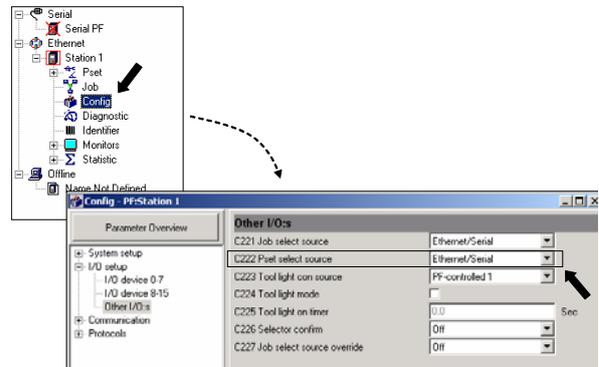


Connect to Pulsor Focus via the Ethernet (recommended) or serially.



Performing a Reference Setup

Check that **Pset select source** in Config is set to Ethernet/Serial. This setting is permanent and need not normally be changed.



5.3 Activating Pset and selecting Pset

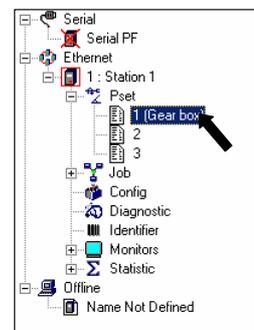
This section describes how you can activate and select a Pset for which you want to carry out a Reference Setup.

Go to section 5.3.1, *Creating a new Pset* below if you want to carry out a Reference Setup on new Pset instead.

Activate the desired **Pset** (parameter set) in the **Selection panel** in ToolsTalk Pulsor (a prerequisite is that Pset select source is set to Ethernet/Serial, see section 10.3.4, *Pset select source* for more information).



Select the required Pset for example by double-clicking on the required Pset under Pset in the PF Map.

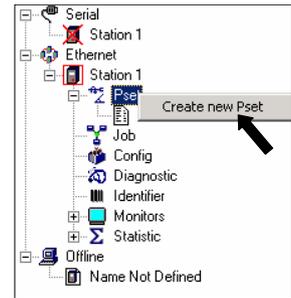


5.3.1 Creating a new Pset

Each type of joint has their own characteristics. If you want to use the tool on different joints you therefore need one Pset for each type of joint.

Proceed as follows to create a new Pset:

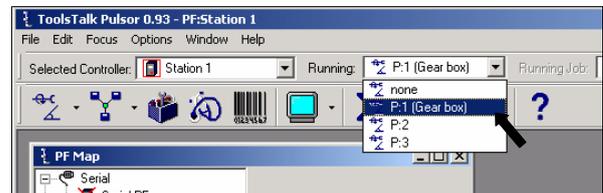
Create a new Pset by clicking with the **right mouse button** on Pset in the PF Map.



Give the Pset an ID from the list (or accept the suggested ID) and, if required, give the new Pset a name. Click on **OK**.

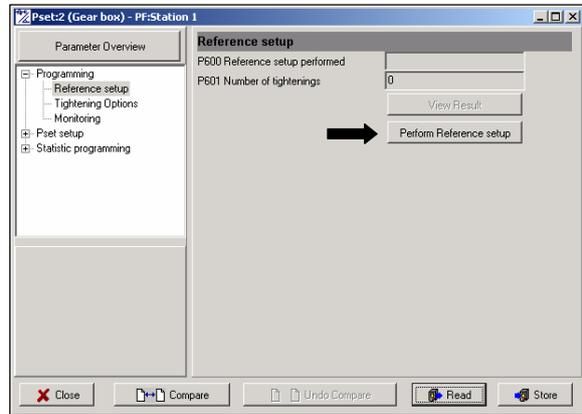


Select Pset in the Selection panel in ToolsTalk Pulsor.

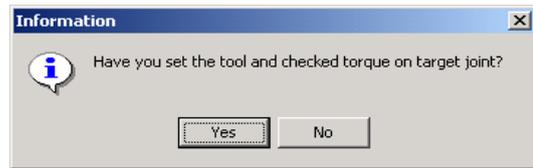


5.4 Starting Reference Setup

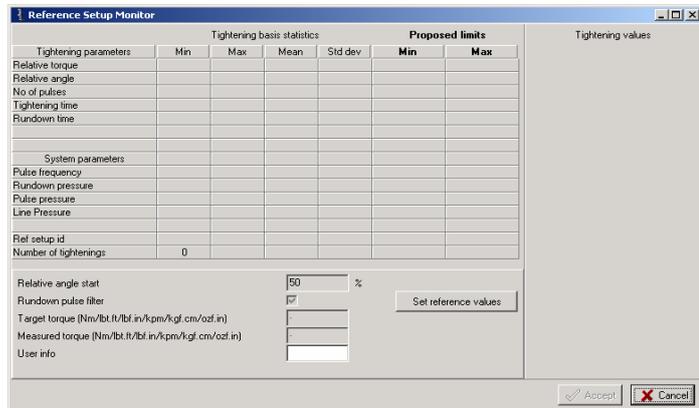
Click on **Reference Setup**.



Acknowledge that the tool has been adjusted mechanically (as instructed in chapter 4, *Adjusting the tool*).



The Reference Setup is displayed.



5.5 Making reference setup tightenings

Important information when you make reference tightenings:

- Use the adjusted tools on the target joint.
- Check that the reference tightenings have been done correctly.
- At least 10 reference tightenings are preferable. Only one reference tightening will work but several (but no more than 50) will provide better statistics and a better result.
- The tool must shut off after each tightening (tightenings where the tool has not shut off are automatically discarded and are not included in Reference Setup).
- No lights will light up on the tool, the Pulsor Focus front panel or other accessories that are connected when you carry out reference tightening (since the system cannot approve tightenings during Reference Setup).

Reference Setup Monitor														
Tightening parameters	Tightening basis statistics				Proposed limits		Tightening values							
	Min	Max	Mean	Std dev	Min	Max								
Relative torque	80	111	100	8	68	132	80	99	97	100	99	111	97	
Relative angle	51	147	100	24	26	197	51	102	105	147	107	115	105	
No of pulses	3	9	7	2	2	13	3	7	7	9	8	8	7	
Tightening time	0.06	0.23	0.17	0.04	0.03	0.35	0.06	0.18	0.18	0.23	0.20	0.21	0.17	
Rundown time	0.32	0.41	0.37	0.03	0.25	0.49	0.32	0.38	0.36	0.32	0.37	0.41	0.36	
System parameters														
Pulse frequency	33.1	34.9	34.0				34.6	34.0	34.2	34.2	34.9	34.0	34.4	
Rundown pressure	3.5	5.5	5.1				5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Pulse pressure	5.5	5.5	5.5				5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Line Pressure	6.4	6.4	6.4				6.4	6.4	6.4	6.4	6.4	6.4	6.4	
Ref setup id							4	5	6	7	8	9	10	
Number of tightenings	11						Delete	Delete	Delete	Delete	Delete	Delete	Delete	
Relative angle start	50 %													
Rundown pulse filter	<input checked="" type="checkbox"/>				Set reference values									
Target torque (Nm/lbf.ft/lbf.in/kpm/kgf.cm/ozf.in)														
Measured torque (Nm/lbf.ft/lbf.in/kpm/kgf.cm/ozf.in)														
User info														
							Accept Cancel							

- Make reference tightenings.
- New limit values for monitoring are calculated for each new reference tightening (as are certain statistics on the tightening result).
- Tightenings where the torque lies outside 15% of the mean value are shown in orange.
- Tightenings with invalid parameter values are shown in purple. Min and max values are presented with “-“ and proposed limits are set to “-1” for that parameter since they cannot be evaluated.
- It is important for the statistics to be based on representative and correct tightenings. Incorrect tightenings can be deleted by clicking on **Delete** for the tightening. If in a situation where you have to delete several tightenings, please refer to section 6.4, *Tightening – problems and suggestions for solutions*. See also the following section.

5.5.1 Making setups under Reference Setup

You can change the following four parameters while carrying out a Reference Setup. These parameters affect the measurement values during reference tightenings.

- Relative angle start: This should be set to the torque level from where Angle measurement should start. The default Relative angle start is 50%.
- Rundown pulse filter: If there are problems with early pulses that are not part of the relevant tightening, such as self-tap or nyloc®, such pulses are filtered out. The filter is on as a default when Pset is created but can be shut off. See more under section 6.8, *Strategies for tightening monitoring*.

If desired, it is possible to make the relative torque result show its value corresponding to the joint's specified value. To do so Target torque and Measured torque must be set. If these two parameters are not set then the relative torque result is corresponding to the average of the Reference setup tightenings.

- Target torque: Specified tightening torque for specific joint. Target torque and Measured torque together give a trace of what 100% corresponds to.
- Measured torque: What the tool has achieved on the joint. Mean value calculated later from static torque measurements. Is used together with Target torque.

Open **Set reference** values window.

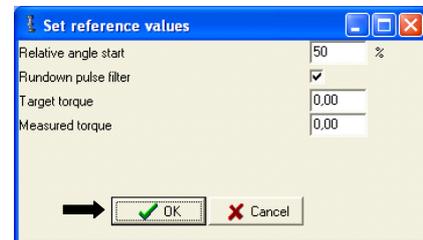


Activate/set parameters. See explanation in table above.

Click on **OK**.



A change to these parameters results in a conversion of all the constituent tightening results.



5.6 Completing Reference Setup

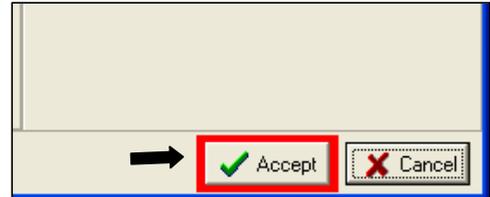
Check that the result from the reference tightenings is reasonable. Review the max/min results: Identify and delete any deviating tightenings.

When Reference Setup is completed by clicking the Accept button it is final - no changes or additions can be made later.

Complete Reference Setup by clicking on **Accept** and to go back to the main programming window.

The result values from Reference Setup are saved.

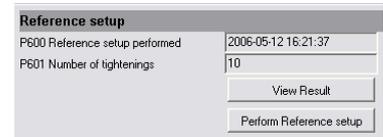
You have now reached a productive stage and can begin to make real tightenings. See chapter 6, *Tightening and monitoring* for more information.



5.7 Result values from a Reference Setup

When a Reference Setup is complete, the proposed limit values are copied automatically in the tightening monitoring and the result values from Reference Setup are saved.

Click on **View Result** to check the stored values from Reference Setup.



Result values from a Reference Setup are displayed.

Tightening basis statistics					Proposed limits	
Tightening parameters	Min	Max	Mean	Std dev	Min	Max
Relative torque	98	104	100	2	90	110
Relative angle	94	113	100	5	78	122
No of pulses	15	19	17	1	12	21
Tightening time	0,57	0,75	0,64	0,05	0,45	0,83
Rundown time	0,30	0,36	0,32	0,02	0,23	0,41
System parameters						
Pulse frequency	24,3	24,6	24,4			
Rundown pressure	5,0	5,0	5,0			
Pulse pressure	5,1	5,2	5,2			
Line Pressure	6,1	6,1	6,1			
Number of tightenings	10					
Relative angle start	50					
Rundown Pulse Filter	Off					
Target Torque						
Measured Torque						
PF name	Station 1					
PF serial number						
Main code version	1.3.1					
RBU serial number	00151433					
Pset	1 (Motor)					
Tool serial number	P123456					
User info						

Proposed limits are calculated on the following basis:

- Limit values are calculated as +/- 4 standard deviations, but no closer to mean value than +/-10%.
- No minimum value shall be less than 50% of the mean value.
- Where the "No of Pulses" parameter is concerned, the limits must not be tighter than +/- 2 pulses. If the result is near zero the limits are min=0 max=4.

5.8 Making a Reference Setup via Pulsor Focus front panel

It is possible to make a Reference Setup without ToolsTalk Pulsor, but there are some limitations.

It is important to know the following when making a Reference Setup via the front panel.:

- The relative angle start is taken from the Pset.
- The rundown pulse filter setting cannot be changed (the settings are taken from the Pset).
- The target torque and measured torque cannot be stated.
- Incorrect tightenings can not be deleted.

Proceed as follows to make a Reference Setup via Pulsor Focus front panel:

- Adjust the tool so that it shuts off at the required torque level.
- Select/activate the appropriate parameter set (default P1) - press **Reference Setup** on Pulsor Focus - press **Enter** to accept.
- Check that the Reference Setup light comes on and that "rEFS" appears on the display.
- Carry out 1-50 tightenings. At least 10 tightenings is recommended.
- The latest Relative torque value and the number of tightenings carried out are shown alternately on the display.
- Press the **Reference Setup** button if you wish to abort Reference Setup.
- Press the **Enter** button. Reference Setup is complete and the result is entered in the relevant Pset (parameter set).

Once the Reference Setup is complete, the display shows the proposed min/max limit values for Relative torque alternately, e.g. 90/110 (%). These limit values can be changed directly after Reference Setup or at a later time. See section 6.7 *Changing parameters via the Pulsor Focus front panel* for more information.

6 Tightening and monitoring

This chapter describes the parameters that are measured when performing tightenings and how they can be used. The chapter also offers advice on what to think about and how different problems can be resolved.

Go directly to sections 6.5 and 6.6 if you want to get started quickly and adjust the tightening monitoring. It is also advisable to read section 6.3 on how the results can be displayed.

6.1 Performing tightenings

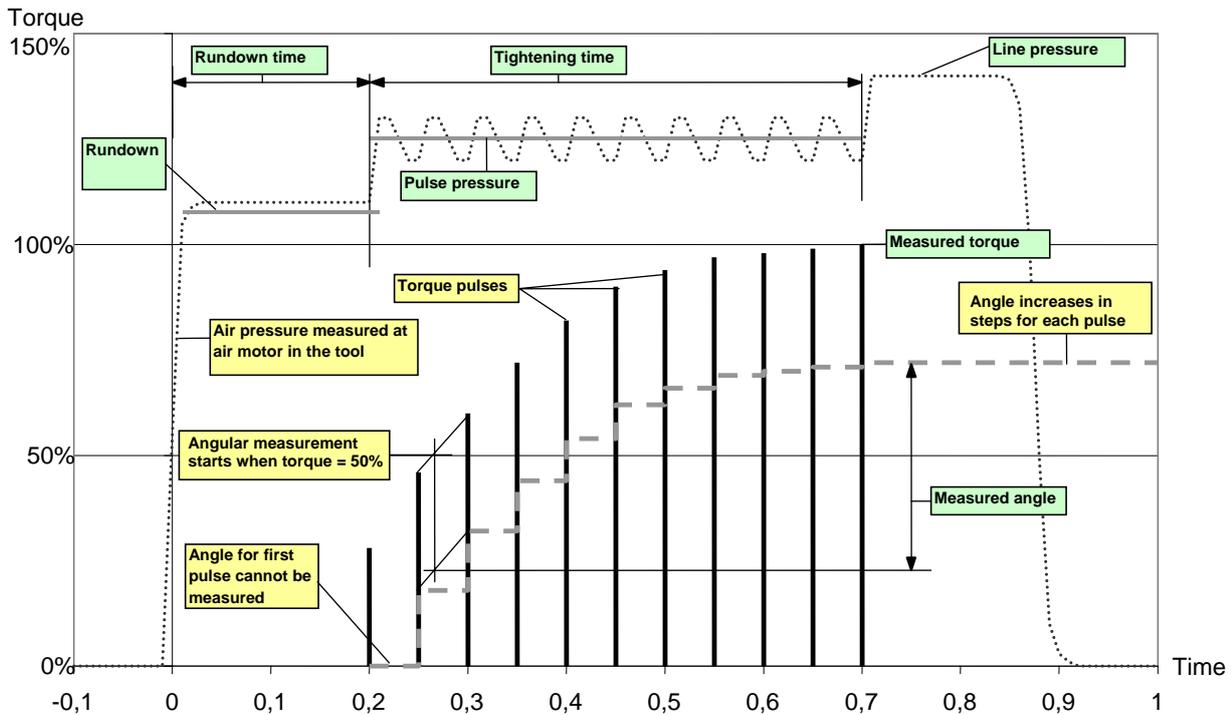
The following need to be considered when doing tightenings:

- Keep the trigger pressed until the tool has shut off.
- Hold the tool steady.
- Keep the tool straight.
- Do not twist the tool while tightening since this will affect the angle measurement.

When the tightening is completed, verify that the green OK light on the tool is illuminated.

If the tool has not been used for a long time, it can “spin” during the first tightening. This is sensed by abnormally high pulse frequency and that the tool feels weaker than normal. It is normal for this to happen after the tool has rested for about an hour. If this happens regularly, fill up oil in the pulse unit.

6.2 A tightening and its parameters



The above graph shows the torque (black), angle (dashed) and the air pressure at the air motor in the tool (dotted) for a typical tightening. The tightening starts ($t=0$) when the tool trigger is pressed and the air pressure increases. During the first 0.2 seconds the thread is run down and then the first pulse occurs and the actual tightening is initiated. The torque and the tightening angle increases in stages for each pulse. When the pulse torque is sufficiently high it activates the torque-sensing shutoff mechanism and the tightening is completed.



The air pressure increases to the line pressure when the air flow has stopped. The air pressure decreases to zero when the operator releases the trigger.

Parameter	Description
Pulse filter	Sometimes a pulse occurs during rundown that has nothing to do with the tightening. Examples of this are when locknuts are used or the thread is damaged. The pulse filter identifies such pulses and does not allow them to be included in the calculations of relative torque, relative angle, number of pulses, tightening time, rundown time, pulse frequency and pulse pressure. Even if the Pulse filter is turned off, it is used when calculating the relative torque and pulse frequency.
Trigger lost	This indicates that the operator has released the trigger before the torque-sensing shutoff mechanism is actuated.
Relative torque	<p>The highest torque measured during tightening. The pulse filter is used for this function irrespective of whether or not the pulse filter is on.</p> <p>The pulse mechanism includes a hydraulic mechanism which uses an oil cushion to “couple” the impact cylinder to the shaft and socket once every turn which generates a torque pulse. The oil cushion must be evacuated so that the impact cylinder can pass this coupling position. The impact cylinder can then accelerate one turn before the next pulse. When the tool is used, the oil quantity in the pulse mechanism is successively reduced because of an unavoidable micro-leakage.</p> <p>When the oil quantity becomes low it is not sufficient for keeping the impact cylinder coupled to the shaft during the entire pulse. Torque measurement then becomes incorrect. This is detected when the torque measurement for this pulse is rejected. The risk of this is greatest during early tightening pulses. If none of the tightening pulses can perform an acceptable torque, the entire tightenings torque measurement is rejected.</p>
Relative angle	<p>This is measured from a threshold value for the torque (default 50%). The angle measurement’s starting point is interpolated between the two pulses that lie below and above the threshold value respectively.</p> <p>The threshold value can be set to an optional value. If the threshold value is set at 0% the angle is always measured from the first pulse. If the threshold value lies below the relative torque value of the first pulse the angle is measured from the first pulse.</p> <p> The angle of the first pulse cannot be measured.</p> <p>Since the torque is stated as a percentage, and the angle is measured from a threshold value for the torque, the angle is also given as a percentage instead of in degrees. The angle is however measured exactly in degrees in the tool. The angle that is measured from the threshold value during Reference Setup is given as 100% (average for measurements during Reference Setup).</p> <p>The angle is measured as the angular difference between the tool and screw, i.e. if the tool is rotated while tightening; this rotation is added to the angular measurement. By intentionally rotating the tool during several tightenings it is possible to get an idea of the effect this has during angular measurement.</p> <p>Since the first pulse’s torque is often approximately 30% of the final torque, and sometimes more, the threshold value should not be set at a lower value. What angle the first pulse achieves varies between different tightenings. Therefore the variation is often large for angular measurements from the first pulse. The threshold value should not be set at an excessive value since small variations between different tightenings (depending on how the operator holds the tool for example) can cause large variations in the result.</p> <p>It is preferable to use the option under Reference Setup for changing the threshold value to see what effect this produces. Perform a few tightenings first and then test by changing the threshold value at both low and high values. Note the standard deviation for the angular measurement. A low standard deviation means stable measurement. Then test by repeating the Reference Setup but now be a bit lax in how you hold the tool. As you will see, the standard deviation will now increase for high threshold values. In most cases 50% lies near to an optimum choice of threshold value.</p>
No of Pulses	The number of pulses registered during the tightening.
Tightening time	This is the time from the first pulse to the last pulse.

Parameter	Description
Rundown time	This is the time from when the tool trigger is activated until the first pulse.
Pulse frequency	This is the number of pulses per second. The time between the first and second pulse is not used in the calculation since this time is not representative. Consequently the tightening must comprise at least 3 pulses for the pulse frequency to be calculated. Since the calculation of the pulse frequency for 3 pulses uses only a single time interval between two pulses, the result in this case should be interpreted with caution. The more pulses the tightening includes, the more reliable the result of the pulse frequency calculation.
Rundown pressure	The average value of the air pressure during rundown from when the tool's pressure is applied to the first pulse. If a pulse occurs during the rundown, the average pressure is calculated only up to this pulse irrespective of whether or not the pulse filter is on. In most cases the rundown pressure is stable during the rundown so that it is of minor significance that the rundown pressure measuring ends at the first pulse, even though the actual rundown phase may continue a while longer.
Pulse pressure	The average value of the air pressure during tightening (pulsing).
Line pressure	The air pressure after the tool's torque-sensing shutoff mechanism has actuated, i.e. when the airflow is zero.  The parameter cannot be measured if the tool is shut off by the operator releasing the trigger before the torque-sensing shutoff mechanism has actuated.

6.3 Viewing results

The Pulsor Focus can display one or two parameters for tightening. ToolsTalk Pulsor is used to select which parameter(s) to display. If two parameters are selected these will be shown alternately on the display. As default, only Relative Torque is displayed.

See section 10.2.2, *Display and toggle display* for instructions on how to use ToolsTalk Pulsor to set the display.

When using ToolsTalk Pulsor, the Tracking result monitor gives a good overview of the tightening results. See chapter 14, *Monitors* for more information.

6.4 Tightening – problems and suggestions for solutions

Large torque spread: A pulse tool tightens the joint in steps (pulses). By reducing the air supply pressure there will be more pulses in smaller steps and a more accurate final torque, while at the same time the tightening will take longer time. However if the air pressure is lowered too much the shut off mechanism will not be able to shut off the tool. A smaller tool should be used if the required torque is significantly lower than the tool's maximum torque. A balance between accurate final torque and the need for rapid tightening is recommended to maintain the equipment's full performance. Alternatively the auto trim can be adjusted so that the strength of the tool is reduced.

Very hard joints: Excessive torque is often the result if the first pulse is so strong that the tool shuts off immediately. In order to reduce the force in the first pulse, the rundown speed must be lowered. This can be done by reducing the air pressure, assuming that the tool's maximum performance is not needed. The auto trim valve can also be adjusted so that the rundown speed is reduced without the force in the tool being reduced. Obviously both methods can be used in combination.

Invalid torque and/or angle values: This will usually be due to spin in the pulse tool. This may be a problem if running in the lower end of the tools torque range on a soft joint. It may also be a result of the tool needing to have the oil filled. In some cases, it might help to reduce the line pressure in the system. It is also not recommended to have tightenings with less than 3 pulses.

6.5 Tightening monitoring

The limit values that are calculated during Reference Setup are intended to show within which limits the different parameters in most tightenings will probably be. This applies to the relevant tool on the target joint.

When reference Setup is completed, the proposed limit values are stored in monitoring. These limit values can be changed arbitrarily here. The limit values to be activated for tightening monitoring can also be freely changed. The limit values proposed earlier are saved and shown under **View Result** in the Reference Setup window.

6.6 Changing limits and determining parameters for monitoring

Select **Monitoring** under Programming in the navigation area for the relevant Pset.

In the Monitoring window you can adjust your limit values for monitoring and activate or deactivate them. The Reference setup and its proposed limits are not affected by adjusting the limits.

Only **Relative Torque** and **Trigger lost** (no machine shut-off) are activated as defaults.

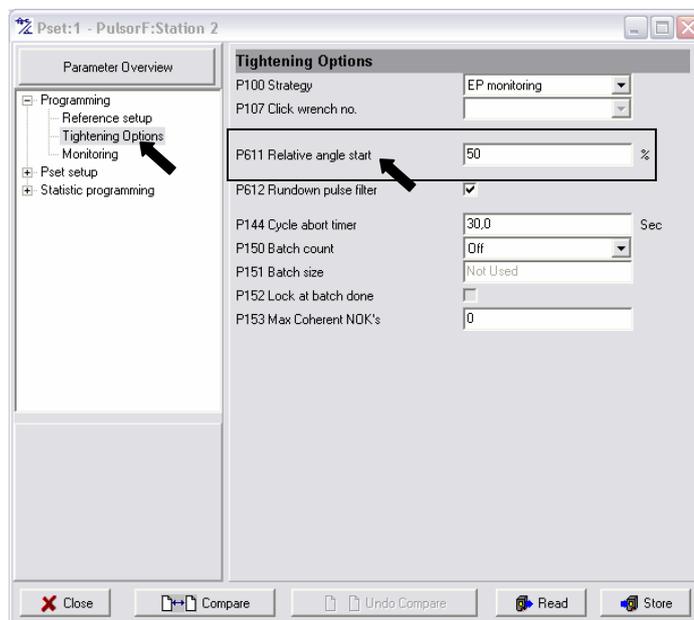
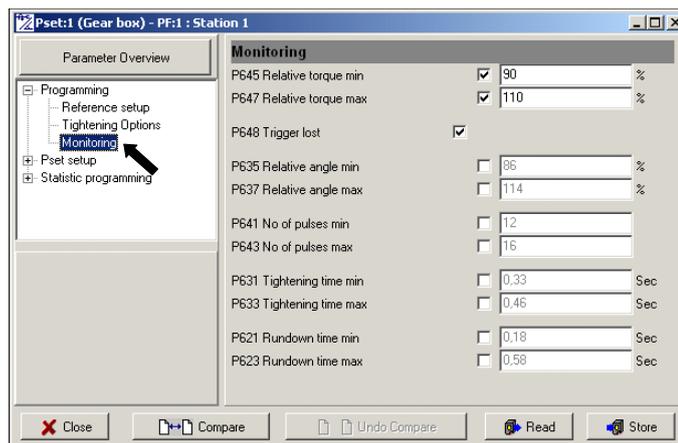
The fact that a parameter limit is activated is shown by its cell being checked.

If Relative torque or Relative Angle has limits “-1” it is strongly recommended to re-perform Reference setup since the parameters cannot be monitored in a correct way.

Save any changes by clicking **Store**.

You can change the tightening settings in **Tightening Options** (Relative angle start and Rundown pulse filter) but this requires more extensive analysis.

Save any changes by clicking **Store**.



6.7 Changing parameters via the Pulsor Focus front panel

Some parameters can be changed using the function button (F) on the front panel. The function can be used at any time. Confirm with Enter to get to a position where you can change the values for the function that is visible on the display. Confirm with Enter when you have made an adjustment.

- If you press **F (F1)**, the minimum limit for torque monitoring (e.g. 92) will flash and this value can be increased/decreased using the +/- buttons.
- The maximum limit can be changed if you press **F (F2)** again.
- Nothing happens if you press **F (F3)** again.
- The selected Pset can be changed if you press **F (F4)** again. Note that Pset select source Focus must be set to PF Keyboard for this to work. For more information see section 10.3.4, *Pset select source*.
- The number of batch tightenings can be changed if you press **F (F5)** again.
- If you press **F** again the procedure is complete and you are back in working mode.



Press the F button repeatedly to get out of the function input position, or wait 30 seconds.

6.8 Strategies for tightening monitoring

Torque – limit values: Reference Setup proposes upper and lower limits on the torque. If tighter limits are required, these can be adjusted, but this may result in an increased number of rejected tightenings. Conversely the limits can be increased if they are considered unnecessarily tight and this reduces the risk of tightenings being rejected unnecessarily.

Similar joints - different requirements: It may be the case that two different joints have different torque limit specifications. In this case, make a copy of the Pset where the Reference Setup has been made. Different torque limits can then be set in the two Psets. Other parameters, such as tightening angle can also be set individually in order to optimize tightening checks. If the tool is used on a joint that is not used during the Reference Setup, it must be checked that this joint is tightened to the correct torque.

Rehit: There is no automatic function for detecting a rehit. However, you can set the parameter limits so that a rehit is detected (tightening time, tightening angle, number of pulses). Make a number of correct tightenings and then carry out a rehit on these to check which parameter(s) that is most suited for detecting the error.

Cross thread: This means that the joint sticks in a non-tightened position as a consequence of damaged threads or that the nut is cross-threaded. In the event of such faults, the tightening angle is often different (both lower and higher) compared to what it should normally be.

Self-lock: If there is a risk that for example nyloc nuts® are mistaken for standard nuts or vice versa, this error can be captured with the help of the rundown time. The rundown time is often longer for nyloc nuts®. Test with a number of each type of nut and check if/how the rundown time can capture the difference.

6.9 Using the tightening monitoring options

A change in Relative angle start and Rundown pulse filter will affect the values of the tightening result and that the limits for monitoring may also need to be adjusted.

Limit values, Relative angle start and Rundown pulse filter can be changed, activated or deactivated arbitrarily at any time after Reference Setup is completed.

Rundown pulse filter: If early pulses occur that are not part of the tightening such as Rundown pulse of nyloc® the measurement of various parameters such as tightening time may be incorrect. That is why there is a filter that excludes such pulses from the calculations. The filter is on as a default. The filter can be switched off.

6.10 Analysis of improvements

Once the tool is adjusted and has been working for a while, it may be appropriate to analyse how the tool and its monitoring has functioned. With the help of **Get all results**, all the parameters from the tightenings can be accessed. There is also a function for opening the results directly in Excel. The results can easily be sorted in different ways with the help of the functions in Excel. For example, all the rejected values can be easily sorted. An analysis of these can show how the process can be further improved.

7 Working with ToolsTalk Pulsor

This chapter describes how to use ToolsTalk Pulsor.

For an introduction to **ToolsTalk Pulsor's user interface**, see section 3.3, *ToolsTalk Pulsor user interface*.

7.1 Settings in ToolsTalk Pulsor

This section describes the Settings functionality in ToolsTalk Pulsor.

Open **Settings** by clicking on the Options menu in ToolsTalk Pulsor and then selecting Settings.



The Settings window has four tabs:

- **Communication** - Information about communication and connection.
- **Application** - Settings for displaying information in ToolsTalk Pulsor.
- **Printout** - Printer settings.
- **PF List** - PF list management.



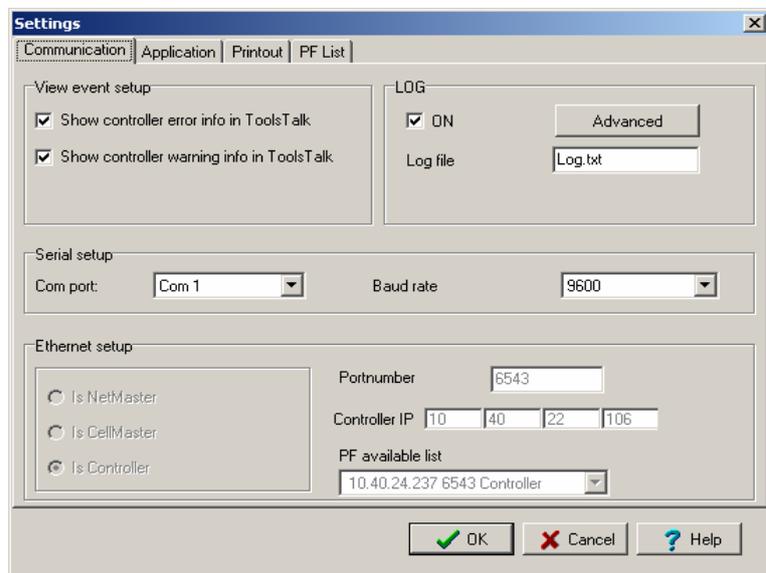
7.1.1 Settings – Communication

The **Communication** sheet has four sections, Communication setup, Serial setup, Ethernet setup and LOG.

The **View event setup** field contains selections for viewing Pulsor Focus errors and warnings.

Under **Serial setup** it is possible to select which Com port to use (normally Com1 or Com2). The baud rate can be set to 2400, 4800, 9600, 19200, 38400, 57600 or 155200.

 **All connected Pulsor Focus need the same baud rate value to work together. Default value is 9600.**



Under **Ethernet setup** select the type of connected Pulsor Focus (NetMaster, CellMaster or Controller), set Port number and Controller IP address. Default port number value is 6543. If using an item from PF List (PF available list) all three parameters (type, port, IP) will be set simultaneously.

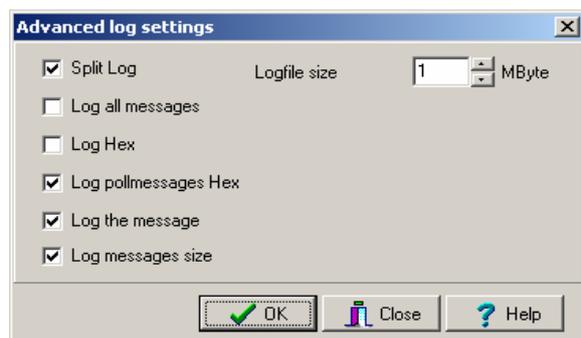
 **To edit Ethernet setup parameters ToolsTalk Pulsor has to be in disconnected mode.**

In the **LOG** section, you can select if you want to log communication between Pulsor Focus and ToolsTalk. If you set Log to On, then messages will be stored in a file. The file name is stated in the Log file field.

Via the **Advanced** button you can make special setup for logging.

If **Split Log** is activated the size of “log.txt”- file cannot exceed the value set in **Log file size**. When the file is full the program will copy the contents to a file called “log~.txt” and erase the content of “log.txt”. Afterwards data will continue to be stored in “log.txt”.

From the **Help** menu, you can open a series of help files.



7.1.2 Settings – Application

The **Application** tab sheet has three sections.

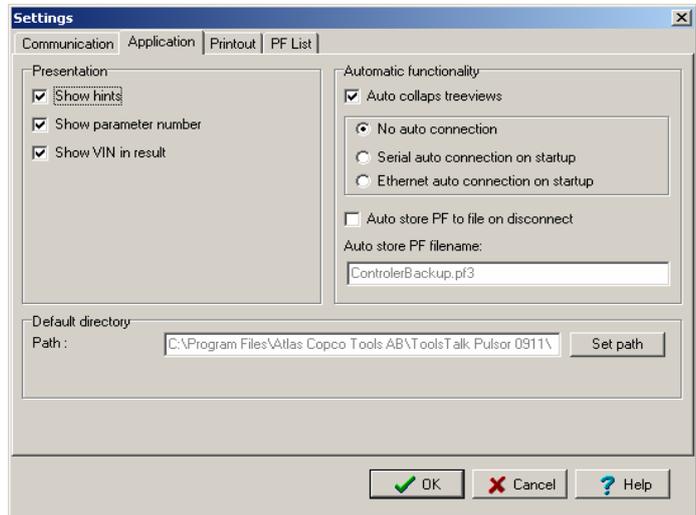
The first section is about **ToolsTalk Presentation** for programming windows. Use this if you want to view hints and parameter numbers.

The first checkbox in **Automatic functionality** activates/deactivates **Auto collapse tree views**.

If **Serial/Ethernet Auto connection on start up** is checked, ToolsTalk will try to connect to the Pulsor Focus via serial/Ethernet communication immediately on start-up.

If the **Auto store PF to file on disconnect** box is checked, ToolsTalk will store PF to file when disconnecting.

The last field allows you to set the path for **Default directory**. Log files and auto stored PF files will be saved to the selected default directory.



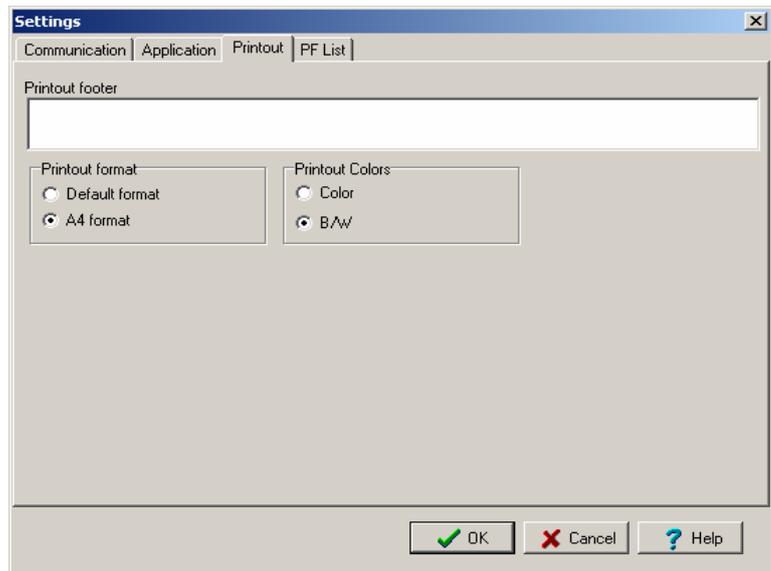
7.1.3 Settings – Printout

The **Printout** tab sheet contains details of printout-settings.

If you enter text in the **Printout footer** it will be appear on every printed paper.

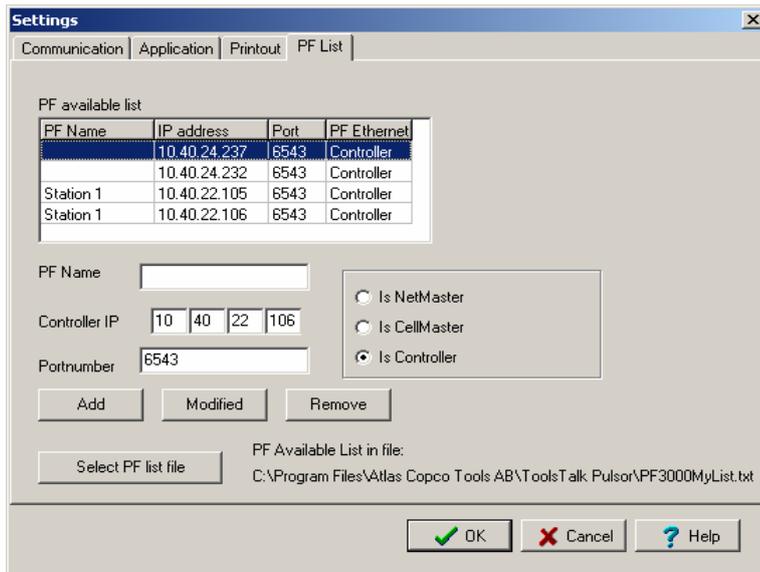
If you use the A4 **Printout format**, select A4 format, otherwise select Default format.

Printout Colors is only applicable if you use a color printer.



7.1.4 Settings - PF List

From the **PF List** tab you can manage the **PF available list**. You can add, modify and remove items. An item is a Pulsor Focus unit with Name, IP address, port number and controller type. If you want to use multiple PF list files you can select which one you want to use.



7.2 Storing programming on file

To store the programmed settings on file, open the **File** menu. The following options are available: **Read <object>**, **Read PF from File**, **Save <object>** and **Store PF to File**. <Object> could be Pset, Job, Config, Identifier or Diagnostics.

Function	Description
Store PF to File	When you are connected to a Pulsor Focus and perform Store PF to File, all programmed settings in the Pulsor Focus will be stored to a file. The user will be asked to name the file.
Read PF from File	When you are connected to a Pulsor Focus and perform Read PF from File. You will update the Pulsor Focus with programmed settings stored on file. The user will be asked to find the file.
Save <object> (Config, Pset, Job etc.)	This function stores a single object to file. The selected window in ToolsTalk will be stored to file. The user will be asked to name the file.
Read <object > (Config, Pset, Job etc.)	This function writes a single object file to the Pulsor Focus. The selected window will be update with data from the file. The user will be asked to find the file.

When you store PF to file, the user is asked to name the file. What actually happens is that ToolsTalk will store the programmed settings on more than one file (for example one file for each Pset and Job). A Pset will be stored in a file with extension “pfp”.

File extension	Explanation
pf3	Overhead file
pfp	Pset
pfc	Config
pfj	Job
pfd	Diagnostics
pfq	Function
pfi	Identifier

When you store PF to File you have the option to store files in Excel format. Select Excel as file format in the **Save As** dialogue. The overhead file will have the extension “pft”. Extensions for the other stored files will be “xls”. These files can be used in Microsoft Excel.

7.3 Offline mode

Offline mode gives the user the opportunity to conduct programming and configuration without being connected to a Pulsor Focus unit. All programming will be stored to or read from a file. This file can be copied to one or more Pulsor Focus units.

There are three different ways to select the Offline mode:

Select **Focus – Offline**. (the illustration to the right)

Select **Offline** from the Selected Controller box.

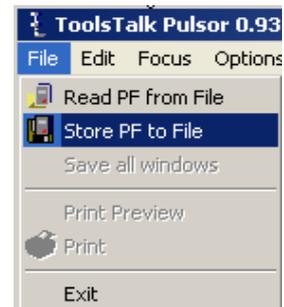
Double click on the **Offline** icon in the PF Map window.



The file can be located on the local hard drive, network, etc. There is a number of default files supplied when installing ToolsTalk. You can also find these files separately on the ToolsTalk installation CD-ROM. Depending on the licence level (Silver RBU or Bronze RBU) of the Pulsor Focus the corresponding file shall be selected. You can recognise the different license levels by the names of the default files: Silver.pf3 and Bronze.pf3. A good idea is to make a backup of these files.

A file can be created by first connecting (Serial or Ethernet) to a Pulsor Focus and then clicking **Store PF to File** on the File menu. Name the file and store it in an appropriate location.

Select a file with the same license level as the Pulsor Focus unit. ToolsTalk opens the selected file and the user is able to change it. If a file with higher license level is selected you can still continue to change its contents, but if you try to use the file with a Pulsor Focus unit with lower license level a warning message will be displayed.



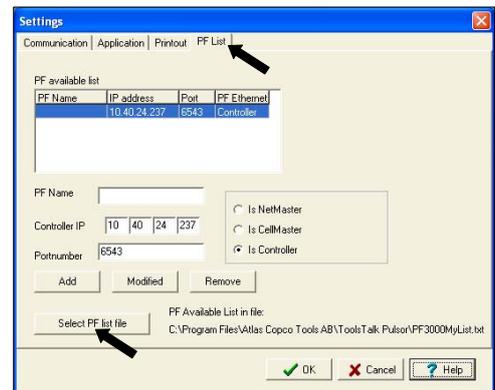
7.4 Miscellaneous ToolsTalk Pulsor tasks

7.4.1 New user for an existing ToolsTalk Pulsor installation

When a new user is added to the computer running ToolsTalk Pulsor, the PF List may be inaccessible due to user access rights or due to the list being stored in an unexpected folder or with an unexpected filename. This section describes how you point out the PF list you want to use for an existing ToolsTalk Pulsor installation.

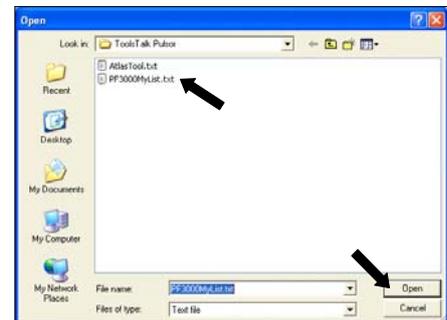
Click on the **PF List** tab.

Then click on the **Select PF List file** button.

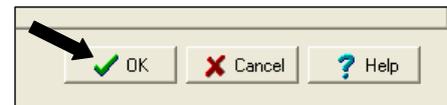


Select file “**PF3000List.txt**” or, if the file is located elsewhere, browse to find the correct directory.

Click **Open**.



Choose **OK** in the PF List tab to end.



7.4.2 Connecting ToolsTalk Pulsor to Pulsor Focus using crossover Ethernet cable

When Pulsor Focus is not connected to a network it is recommended to use a crossover Ethernet cable to connect ToolsTalk Pulsor to Pulsor Focus. Follow the instructions below configure the PC and the Pulsor Focus.

Hardware required

- A Pulsor Focus unit.
- A crossover Ethernet cable (RX/TX crossed).
- A PC with an Ethernet connection (the PC shall not be connected to the network).

Configuring the PC

- Go into Windows network settings (e.g. Start – Settings - Network and remote connections - Connection to local network).
- Select Properties and make sure that TCP/IP is marked. Double-click on it or mark it and select Properties.
- Select the PC's "hard" IP address (often if you are connected to a network the choice "Select an IP address automatically" is selected) such as 192.168.1.1 and specify a net mask e.g. 255.255.255.0). DO NOT specify a default gateway.
- Save the settings by clicking OK.

Configuring Pulsor Focus

- Make a serial connection via RS232 with Focus Pulsor (required first time).
- Go into the Config menu and select Communication.
- Specify an IP address that is similar to (but not identical to) the one allocated to the PC such as 192.168.1.10.
- Specify a Subnet mask as above, i.e. 255.255.255.0.
- DO NOT specify a default router (gateway). If there is one already, delete it. You should see 0.0.0.0.
- Click on **Store** to save.
- ToolsTalk Pulsor displays a message that Pulsor Focus should be rebooted.

Connecting

- Close the ToolsTalk Pulsor connection and reboot the PC if necessary.
- Switch off Pulsor Focus, wait at least 10 seconds and then switch on Focus Pulsor.
- Connect ToolsTalk Pulsor to Pulsor Focus via the Ethernet (it may be necessary to enter your new connection to the PF list) – this is done in Settings under the Options menu.

8 Pset and batch count

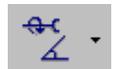
All Pulsor tightenings are performed in the context of a **Pset** (Parameter set). The Pset contains the set of parameters that monitors the tightening process, including the result of the Reference Setup

This chapter introduces basic tasks of creating and activating a Pset and also describes how to enable batch counting of tightenings.

For a description on Pset programming (References Setup, Tightening options and Monitoring) see chapter 5, *Performing a Reference Setup*.

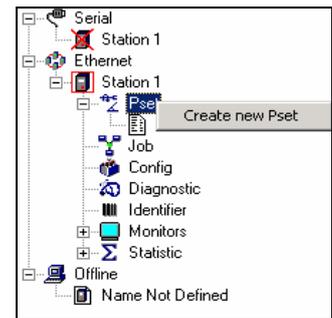
For parameter description see Parameter list, section 20.1, *Pset*.

Start Pset by either double clicking on Pset in the PF Map in ToolsTalk Pulsor or by selecting the function from the toolbar.



8.1 Creating a Pset via ToolsTalk Pulsor

In the PF Map, right click on **Pset** and select **Create New Pset** (or select Create New Pset from the Edit menu).



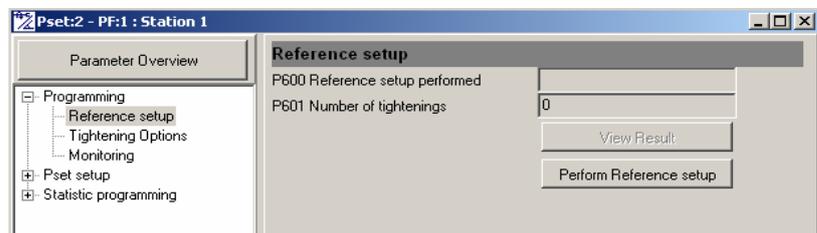
The Create New Pset window pops up.
Name (optional) the Pset and click **OK**.



The Pset **Reference Setup** window appears.

From here you can continue to do a Reference Setup, see chapter 5 *Performing a Reference Setup*.

Click **Store**.



8.2 Selecting Pset

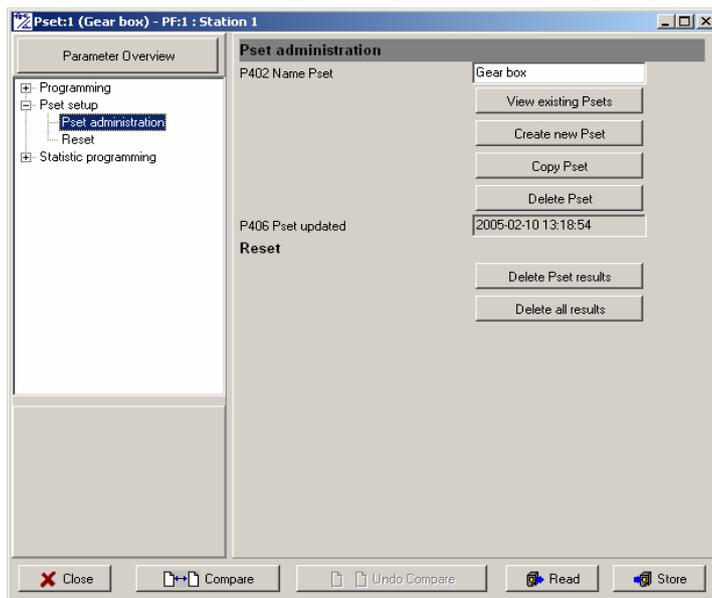
To be able to use a Pset it must be selected:

Select the required Pset in the Selection panel in ToolsTalk Pulsor (a prerequisite is that Pset select source is set at Ethernet/Serial).



8.3 Pset administration

In Pset administration you will be presented with five options - Name Pset, View existing Pset, Create new Pset, Copy Pset and Delete Pset. When creating a new Pset, choose a number in a list and name the Pset.



8.4 Batch count of tightenings

Pulsor has a function for batch counting of tightenings. Batch size indicates the number of tightenings that shall be done in a batch. Batch counting is stated per Pset.

Open the relevant Pset from the PF Map.

Select Tightening options under programming from the navigation area.

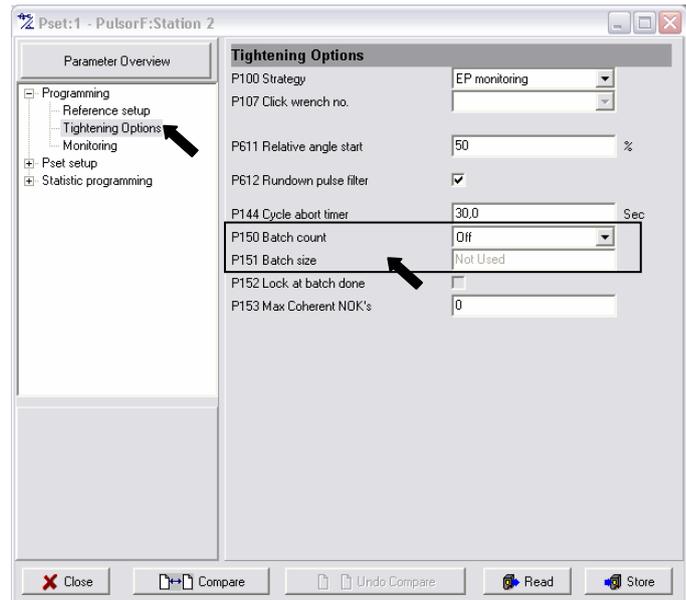
Activate Batch count by selecting On from the list in **Batch count** and then enter the number in the Batch size field.

The parameter Max coherent NOK's will count how many NOK tightenings are performed consecutively until limit is reached.

Save by clicking **Store**.

There are also settings in Config that affect batch counting. See section 10.2.3, *Settings for Options* for more information.

See also section 20.1.1, *PIxx Programming*.



9 Job

Job is a function for making several tightenings in a controlled sequence. The functionality is not yet fully verified but can be used.

The Job function is useful when an object requires tightening to be in a controlled sequence. Instead of manually selecting the Pset you can create a Job and let Pulsor Focus keep track of the parameters that are needed to perform the task. When you perform a Job, Pulsor Focus sends status signals for tightening and keeps account of all parameters and results.

For parameter descriptions see Parameter list, section 20.2, *Job*.

Start Job by either double clicking on Job in the PF Map in ToolsTalk Pulsor or by selecting the function from the toolbar.



- Up to 8 different Psets can be included in a Job and it is possible to save up to 8 Jobs in Pulsor Focus.
- A Job is created by combining the selected Psets.
- A signal “JOB OK” is received from Pulsor Focus when all tightenings have been done correctly.

The figure on the right shows an example of an object with bolts that require different torque values:

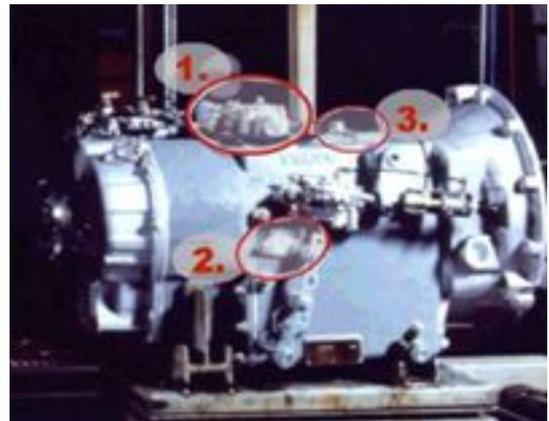
Four bolts - hard joint

Three bolts - soft joint

One bolt – medium joint

For this example three different Psets have to be created

The Job is performed by one Pulsor Focus unit and the Psets should be automatic selected.



By combining the Psets in the example following Job list is created:

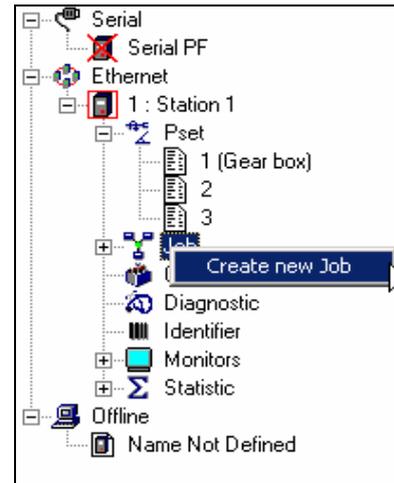
Pulsor Focus	Pset	Pset Name	Auto select	Batch size
1	1	Pset1	Yes	4
1	2	Pset2	No	3
1	3	Pset3	Yes	1

9.1 Creating a Standalone Job

Job creation section is accessible from ToolsTalk Pulsor.

Every Job has a unique ID number between 1 and 8. Combining selected Psets creates a Job.

Right click on **Job** in the PF Map and select **Create New Job**.



Type **New Job ID** and give the Job a name (optional).

Click **OK** to continue.



The Job window appears.

The upper part of the window presents available Psets and the **Job list**.

Select Psets and add them to the Job list by clicking on either **Manual select** or **Auto select** (it is possible to change between Manual and Auto select afterwards by clicking in the table under the Auto Select column).



Auto select is not allowed for Free order Jobs with two or more Psets selected from the same Pulsor Focus.

To change **Batch size** for a Pset/, click in the column in the Job list table and enter value.

The lower part of the window presents the Programming section.

Select and set parameters in Configuration, Batch, Timers, Line Control and Result view.

Available

PF	Pset/Ms	Pset Name
0	1	1 (Motor)
0	2	2 (Gear box)
0	3	3 (Spark plug)

Job List:

PF	Pset/Ms	Pset Name	Auto Select	Batch size	Max Cohere
0	1	1 (Motor)	Yes	1	-
0	2	2 (Gear bo	Yes	1	-
0	3	3 (Spark pl	Yes	1	-

Configuration

J102 Name	Motor block
J301 Job type	Forced
J302 Lock at Job done	
J304 Repeat Job	No

9.2 Running Jobs

In a Job selection the Job ID is used. After a Job has been selected it is possible to select a new Job until the first tightening is started or a batch increment is performed. At that position the only way to select a new Job is either to complete the running Job or to abort the running Job.

Sources that Jobs can be selected/aborted from:

- Digin (Digital input)
- Ethernet/Serial
- Identifier
- PF Keyboard

Pulsor Focus allows two different possibilities for Job selection; *Job select source [C221]* and *Job select source override [C227]*. To be able to select a Job at least one of the two parameters has to be set.

- *Job select source override [C227]* has a higher priority than *Job select source [C221]*.
- If a Job is chosen from *Job select source [C221]* then it is possible to select a new Job from the same source or from *Job select source override [C227]*.
- If a Job is chosen from *Job select source override [C227]* then it is only possible to select a new Job from the same source.



The system will remember the most recently selected source until the Job either is completed or aborted.

9.2.1 Running Jobs using ToolsTalk Pulsor

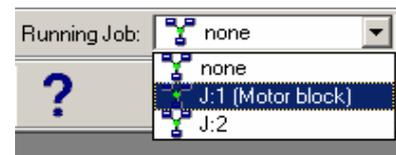
In ToolsTalk Pulsor, select Job to run from the combo box (in the selection row).

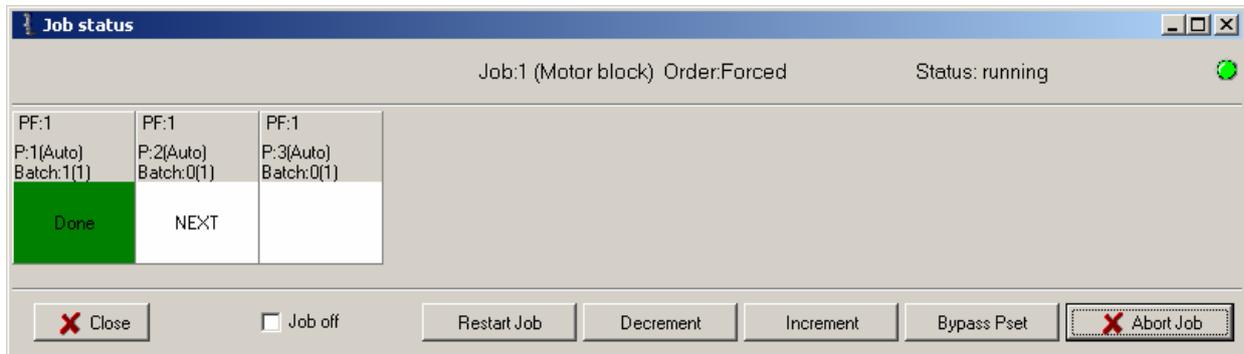


To run the Job from ToolsTalk Pulsor, set parameter Job select source to “Ethernet/Serial”.

In ToolsTalk Pulsor, click on the arrow to the right of the **Monitor icon** and select **Job Monitor**.

Job Monitor displays the selected Job and provides functionality for managing.





For description of **Job off**, **Restart Job**, **Decrement**, **Increment**, **Bypass** and **Abort Job**, see next section *Functions in Job monitor*.

9.2.2 Functions in Job monitor

Function	Description
Restart Job	This function allows the user to restart the running Job without needing to reselect the Job. All batch counters in the running Job resets and Job timers restarts.
Decrement	Batch Decrement makes it possible to redo the latest made tightening/increment in a Job. The batch counter of the Pset is decreased with one step. It is not possible to go back one step after Job has been completed. Job Batch Decrement functionality is only reachable from the JobReference.
Increment	Batch Increment allows skipping the batch counter value of a Pset without performing a tightening. It is allowed to complete a Job by using the Batch Increment function. The Job Status will be NOK (Not OK) in case of <i>Batch status at increment/bypass [J311]</i> is selected as NOK. Otherwise, the Job Status will be OK. In Job with Free Order, only the JobClient with the active Pset is able to use Batch Increment. In Job with Forced Order, the JobClient with the active Pset and the JobReference are able to use Batch Increment.
Bypass	Bypass skips a specific Pset in a running Job, independently of batch size. The batch counter will be set equal to the batch size value and the Pset will be considered as completed when a Pset is bypassed. The Job Status will be OK/NOK depending of parameter <i>Batch status at increment/bypass [J311]</i> . In Job with Free order, only the JobClient with the active Pset is able to use Bypass functionality. In Job with Forced order, the JobClient with the active Pset and the JobReference are able to use Bypass functionality.
Abort Job	Abort Job is only allowed via the JobReference. Abort can be an external signal as well as an internal order (see <i>Max time to start Job [J320]</i> and <i>Max time to complete Job [J321]</i>). When a Job abort request is received the Job functionality will wait for completion of the ongoing tightening result before aborting the Job.

Function	Description
Job off	<p>This function offers the possibility to turn off the Job functionality and unlock all involved tools.</p> <p>Running Job: Selecting Job off for a running Job is equal to aborting Job, thus the tool/tools will always be enabled. The JobReference will order JobMembers to select latest Pset that was selected from DigIn or Selector (in case one of these is <i>Pset select source [C222]</i>) Otherwise the latest selected Pset in the Pulsor Focus will remain.</p> <p>No running Job: The JobReference will unlock all tools of the JobMembers. JobReference will also order JobMembers to select latest Pset, which was selected from DigIn or Selector (in case one of these is <i>Pset select source [C222]</i>). Otherwise the latest selected Pset in the Pulsor Focus will remain.</p> <p>When a Pulsor Focus is in Job off mode it is possible to perform tightening with any existing Pset.</p> <p>As long as the JobReference is in Job off mode the user is denied to select a new Job, the Job off mode must first be inverted.</p> <p>The only occasion when the Job off functionality affects the JobClients is when they have lost communication with their JobReference. In this case there is possibility to unlock the JobClients locally by using the Job off functionality.</p> <p> Only the JobReference will remember the Job mode after a reboot.</p>
Job status (information)	<p>Job OK: Received if all Psets included in the Job have been correctly performed. Alternatively if Batch increment/bypass has been used (presupposed that Batch Increment/Bypass is configured as an OK event).</p> <p>Job NOK: Received if any Pset included in the Job have not been correctly performed. Alternatively if is considered as NOK (Not OK) if Batch increment/bypass has been used (presupposed that Batch Increment/Bypass is configured as an NOK event).</p> <p>Job Aborted :An aborted Job is considered as Job Aborted.</p>

9.3 Unlock the tool

Unlock the tool by selecting a new job, deleting all existing jobs or select job off.

It is only possible to unlock the tool from the job reference.



It is not possible to unlock the tool by rebooting the Pulsor Focus controller.

10 Config

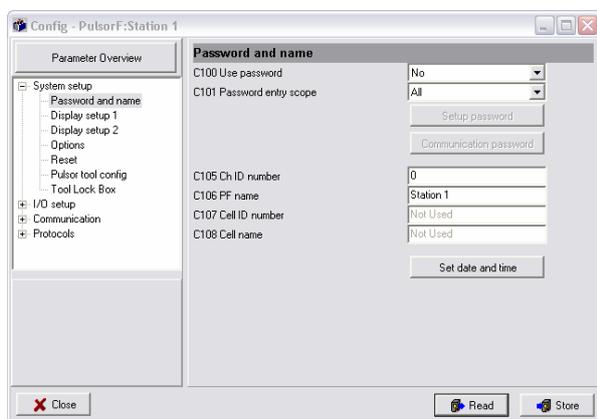
10.1 Introduction to Config

The **Config** contains the configuration parameters that are common to all Psets and is unique for each Pulsor Focus unit. This chapter gives an overview of the Config functionality in Pulsor and how to perform some common configuration tasks such as:

- Setting IP address, Subnet mask and Default router.
- Setting Pset select source.
- Setting Internal I/O.
- Setting Display and toggle display.
- Settings for batch counting.

For Parameter list, see 20.3, *Config*.

Start Config by either double clicking on Config in the PF Map in ToolsTalk Pulsor or by selecting the function from the toolbar.



Section	Description
System setup	System Setup contains basic Pulsor Focus features such as name and display options.
I/O setup	Pulsor Focus has extensive I/O capabilities, configured in branch I/O Setup. Apart from the internal I/O ports it is also possible to connect up to 15 external I/O devices to the Pulsor Focus I/O Bus.
Communication	Pulsor Focus communicates by both Ethernet and Serial communication links and can work together with ToolsTalk Pulsor and database applications such as ToolsNet, etc. IP addresses and baud rate etc are set up in this window.
Protocols	Pulsor Focus communicates through a number of protocols. This window contains the settings for each communication protocol.

10.2 System setup

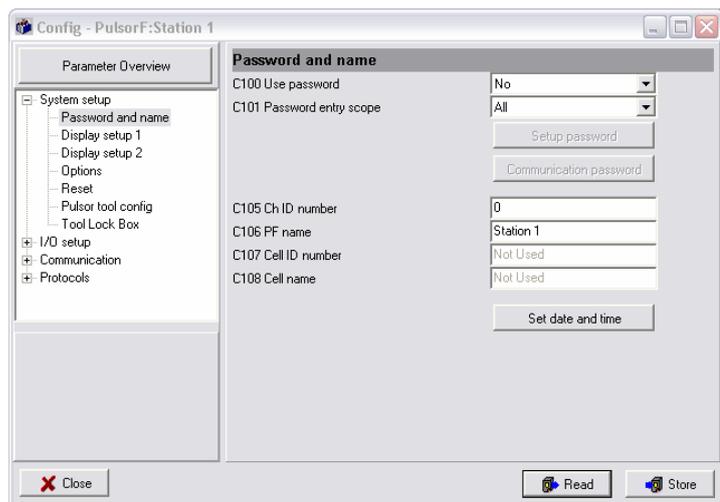
System Setup contains basic Pulsor Focus features such as name and display options.

10.2.1 Password and Name

Select **Password and Name** under System from the navigation area.

Enter the appropriate values, see below for details.

Click on **Store** to save.



[C100], [C101]: Password and Password entry scope is used when you want to limit access to the Pulsor Focus. When the function is enabled the corresponding password setting button will also be enabled.

[C105] is the channel number for this unit when it is a part of a cell.

[C106] is the name of this Pulsor Focus unit.

[C107], [C108]: When this Pulsor Focus unit is a Cell Master the Cell name and Cell number should be entered here.

The date and time of the unit can be set using the **Set date and time**. It is important that the unit has correct date and time settings, otherwise the results will be stamped with the wrong date and time.

10.2.2 Display and toggle display

Display and Toggle display determine what is shown on the Pulsor Focus front panel after each tightening.

Select **Display setup** under System from the navigation area.

Select the appropriate options, see below for details.

Click on **Store** to save.

Display setup 1

C114 Display: Relative torque

C115 Toggle display: Off

Display setup 2

C120 Language: English

C124 Soft keys enabled:

[C114] is used to select what result parameter is to be shown on the display of the Pulsor Focus unit.

Parameter	Display
Relative torque [%]	123.P
Relative angle [%]	123P
Number of pulses	n12
Tightening time [s]	t6.47
Rundown time [s]	r0.59
Completed in batch	01.05
Remaining in batch	04.05
Selected Pset	P1

All parameters starting with a letter is left justified and all parameters ending with a letter is right justified.

[C115] is used to optionally display a second result parameter. The first and second parameters will then toggle on display of the Pulsor Focus unit.

[C120] will select the language used for printouts from the printer port. See also section 10.2.5, *Settings for continuous print*.

[C124] if unchecked the keys on the Pulsor Focus front panel will be disabled.

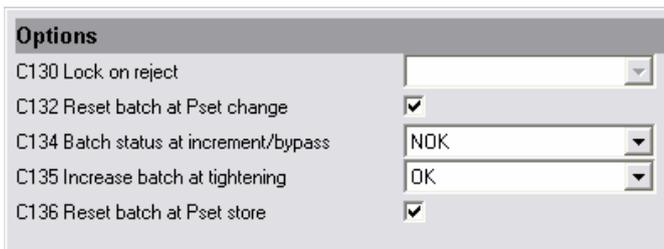
10.2.3 Settings for Options

The batch count settings can be found under Options.

Select **Options** under System setup from the navigation area.

Select the appropriate options, see below for details.

When finished click on **Store** to save.



Options	
C130 Lock on reject	<input type="text"/>
C132 Reset batch at Pset change	<input checked="" type="checkbox"/>
C134 Batch status at increment/bypass	NOK
C135 Increase batch at tightening	OK
C136 Reset batch at Pset store	<input checked="" type="checkbox"/>

[C130] is used in conjunction with Tool Lock Box to disable the tool by shutting of the air supply.

[C132]: When checked Batch counter will be reset when changing Pset.

[C134]: decides if the batch is to be considered OK or NOK when a tightening is bypassed or batch counter incremented manually.

[C135]: decides if only OK or also NOK tightenings should increment batch counter.

[C136]: When checked Batch counter will be reset when storing an edited Pset.

10.2.4 Reset

Select **Config - System setup - Reset**.

Here it is possible to *Delete all results* or to perform a *total reset*. A total reset will clear all Power Focus settings including network configuration. The RBU will also be cleared.

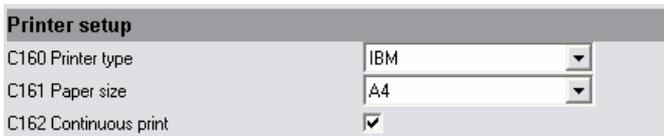


Reset	
<input type="button" value="Delete all results"/>	
<input type="button" value="Total reset"/>	

10.2.5 Settings for continuous print

Select **Config - System setup - Reset**.

The connected *Printer type* [C160] and *Paper size* [C161] are set here. *Continuous print* [C162] is turned on or off.



Printer setup	
C160 Printer type	IBM
C161 Paper size	A4
C162 Continuous print	<input checked="" type="checkbox"/>

10.2.6 Settings for Pulsor tool config

Select **Pulsor tool config** under System setup from the navigation area.

Select the appropriate options, see below for details.

When finished click on **Store** to save.

Pulsor tool config	
C190 Work object led function	Tool usage
C191 Work object led timeout	300
C193 Line pressure alarm lower limit	3,0
C194 Line pressure alarm upper limit	8,0

[C190] decides the function of the Tool's Work object LED. (On, Off or Tool usage).

[C191] decides how long the Work object LED shall be lit after tool trigger release.

[C193] and [C194] is the lower and upper limits for the air pressure. If the air pressure goes outside of these limits an event is triggered.

10.2.7 Settings for Tool Lock Box

Select **Tool Lock Box** under System setup from the navigation area.

Press the button *Tool lock box wizard* for quick programming of Tool Lock Box with Default I/O settings.

Check *Tool Lock Box [C700]* directly if own I/O settings and lock sources will be configured.

See section 20.3.5, *C7xx Tool Lock Box*.

Click on **Store**.

The screenshot shows a software configuration window titled "Config - PulsorF:Name Not Defined". On the left is a "Parameter Overview" tree with categories: System setup (Password and name, Display setup 1, Display setup 2, Options, Reset, Printer setup, Pulsor tool config, Tool Lock Box), I/O setup, Communication, and Protocols. The "Tool Lock Box" option is selected. The main area is divided into sections: "Reset" (Delete all results, Total reset), "Printer setup" (C160 Printer type: IBM, C161 Paper size: A4, C162 Continuous print: unchecked), "Pulsor tool config" (C190 Work object led function: Tool usage, C191 Work object led timeout: 300, C193 Line pressure alarm lower limit: 3,0, C194 Line pressure alarm upper limit: 8,0), and "Tool Lock Box" (C700 Tool lock box: unchecked). A "Tool lock box wizard" button is present. At the bottom are "Close", "Read", and "Store" buttons.

[C700]: Enables the Tool Lock Box functionality. Do not check this unless a Tool Lock box is connected.

10.3 I/O setup

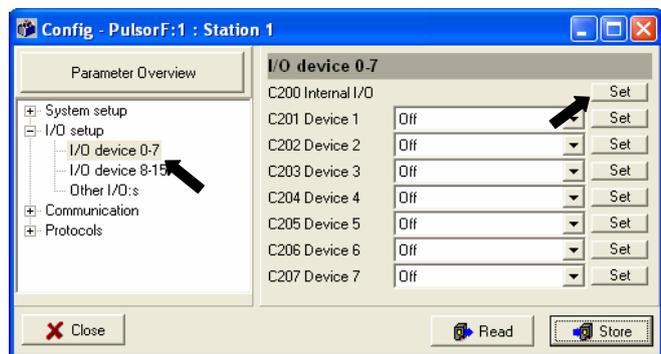
Pulsor Focus has extensive I/O capabilities, configured in branch **I/O Setup**. Apart from the internal I/O ports it is also possible to connect up to 15 external I/O devices to the Pulsor Focus I/O Bus.

10.3.1 Internal I/O

Pulsor Focus has four connections to internal digital inputs and relays. Parameters in Config are used to configure the digital inputs and relays.

Select **I/O device 0-7** under I/O setup from the navigation area.

Click on **Set** on Internal I/O line to open the configuration window.



Set the wanted Relay functions and choose its behaviour.

Set the Digital input functions.

Click on **Store** to save when you have completed your configuration.



10.3.2 External I/O devices

Setting up of external I/O devices is explained thoroughly in chapter 18, *Accessories*.

10.3.3 Other I/O:s settings

Select **Other I/Os** under I/O setup from the navigation area.

Select the appropriate options, see below for details.

Click on **Store** to save.

Other I/O:s	
C221 Job select source	Off
C222 Pset select source	Off
C223 Tool light con source	PF-controlled 1
C224 Tool light mode	<input type="checkbox"/>
C225 Tool light on timer	0,0 Sec
C226 Selector confirm	Off
C227 Job select source override	Off
Other I/O:s 2	
C230 Selector lost mode	Last Pset
C231 Use last Pset at startup	<input type="checkbox"/>

[C221] is used to configure what source to use to select Jobs.

[C222] decides which source the Pulsor Focus shall use to select Psets. See section 10.3.4, *Pset select source* for more information.

[C223] – [C225] is used to configure the behavior of the tool status LEDs. See chapter 20, *Parameter list* for further information.

[C226]: When using a selector, the operator can be forced to use the right socket, even when the selector is not used to select Psets.

[C227]: A secondary source can be used to select Jobs. If a Job is selected using this source it will override the source indicated in [C221].

[C230]: Determines whether last selected Pset or “no Pset” is selected when communication with a selector is lost.

[C231]: When this parameter is checked, Pulsor Focus starts up using the last Pset selected before reboot.

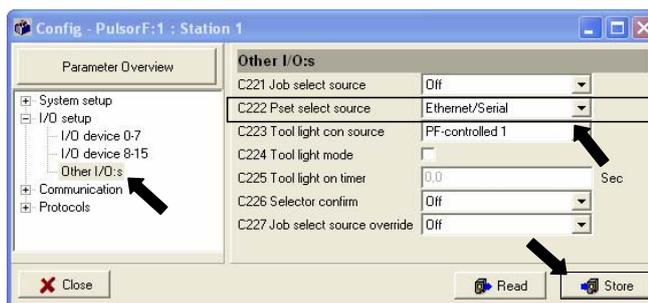
10.3.4 Pset select source

You can select which Pset source Pulsor Focus shall use. By selecting “Ethernet/Serial” for *Pset select source* [C222] you choose to run from ToolsTalk Pulsor. Alternatively, if you want to control the Pset selection from the Pulsor Focus front panel, then select PF keyboard from the List.

Select **Other I/Os** under I/O setup from the navigation area.

Select Ethernet/Serial from the list.

Click on **Store** to save.



10.4 Communication

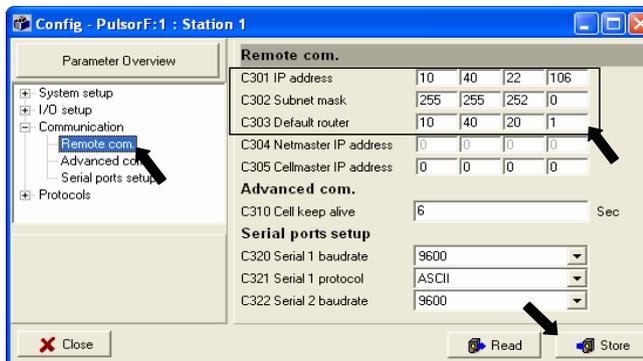
Pulsor Focus communicates by both Ethernet and Serial communication links and can work together with ToolsTalk Pulsor and database applications such as ToolsNet, etc. IP addresses and baud rate etc are set up in this window.

Select **Remote com** under Communication from the navigation area.

Enter appropriate values (ask the network administrator at your site if unsure what values to use).

Click on **Store** to save.

Restart Pulsor Focus using the power switch on the front panel (it must be switched off for at least 10 seconds).



[C301] – [C303] are required when communicating using Ethernet.

[C304] – [C305] and [C310] are explained in chapter 16, *Cell and Net*.

[C320] – [C322] is used to setup the baud rate and protocol for the Pulsor Focus serial ports.

10.5 Protocols

Pulsor Focus communicates through a number of protocols. This window contains the settings for each communication protocol.

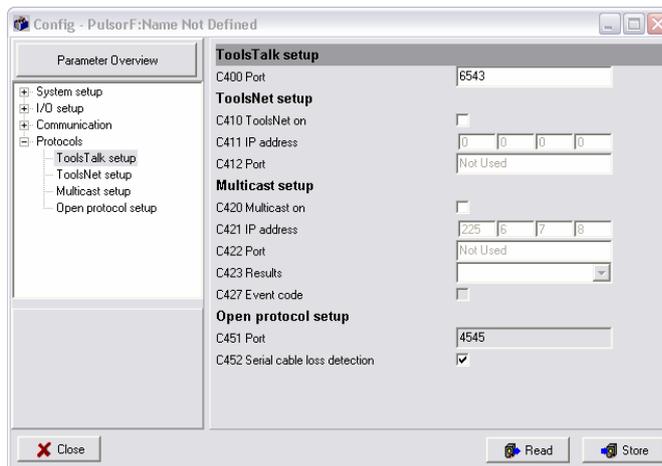
[C400] selects which TCP port to use for ToolsTalk Pulsor. Do not change unless you really have a problem using the default port.

[C410] – [C414] are described in chapter 17, *ToolsNet*.

[C420] – [C427] has no use, except for sites with old installations of the software Factory Overview.

[C451]: The port number for the open protocol server ethernet communication is 4545 (default value).

[C452]: If checked Pulsor Focus will detect cable loss when running the open protocol on serial port 1 or 2.



11 Diagnostics and service

This chapter describes how to use Diagnostic in ToolsTalk Pulsor. The **Diagnostics** functionality can be used for retrieving information from Pulsor Focus containing general tool information, service status, hardware- and software configuration and also includes important Pulsor features such as settings service indicator, **tool drift alarm** and performing an **air sensor tuning**.

For parameter descriptions see Parameter List, section 20.4, *Diagnostic*.

Start Diagnostic by either double clicking on Diagnostic in the PF Map in ToolsTalk Pulsor or by selecting the function from the toolbar.



When storing diagnostics settings it is necessary to have a tool connected.

11.1 Tool general information and Pulsor tool info

Tool general information section shows general information about the connected tool.

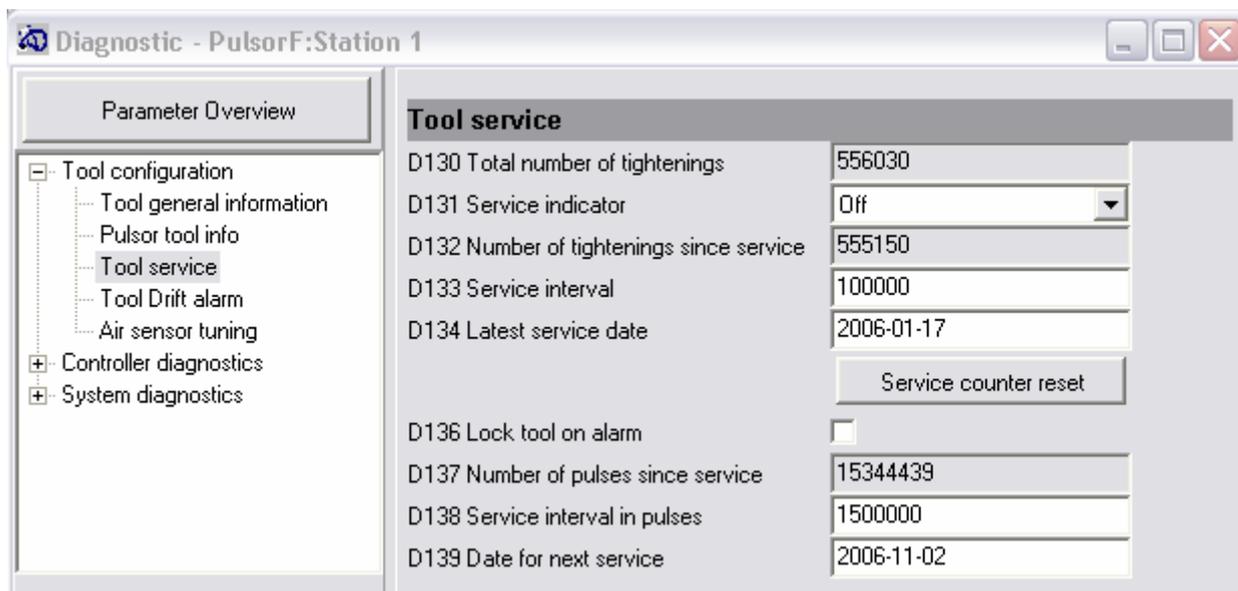
Tool general information	
D100 Tool type	Pulsor
D101 Motor size	6
D102 Serial number	P661002
D104 Tool max torque	32 Nm
D105 User tool message	-
D106 Usage	Handheld

Pulsor tool info	
D153 Application-code version	1.3.44
D154 Boot-code version	1.0.4
D950 Tool board revision	4
D951 Tool board serial number	87

11.2 Tool service and Service indicator

The service parameters are stored in memory located in the tool and are thus transferable to another Pulsor Focus. If any active service parameter exceeds a preset alarm limit the “alarm” light on Pulsor Focus comes on and an event code is shown on the display to state which parameter that has caused the alarm.

The function can be connected to a relay output. The service alarm does not reject a tightening and is only a warning.



Service indicator alarm, configured in the **Tool service** section, provides a simple mechanism to remind Pulsor Focus users when it is time to service the tool. The user specifies how many tightenings that may be performed (since last service) until tool has to be serviced. When *Number of tightenings since service [D132]* exceeds *Service interval [D133]* or when *Number of pulses since service [D137]* exceeds *Service interval in pulses [D138]* or when the current date is later than *Date for next service [D139]* date a service indicator alarm will be activated.

By performing proactive service on a tool, failure due to mechanical wear can be avoided during production.

The alarm LED on the front panel of Pulsor Focus will flash continuously when Service indicator is active. Event code *Tool service interval expired [E502]* will be generated when Service indicator alarm is activated. This event code will also be automatically generated after each 100:th tightening, as long as the service indicator alarm is active.

It is possible to configure the controller to lock the tool when the service indicator alarm activates, see *lock tool on alarm [D136]*.

11.3 Tool drift alarm

11.3.1 Introduction

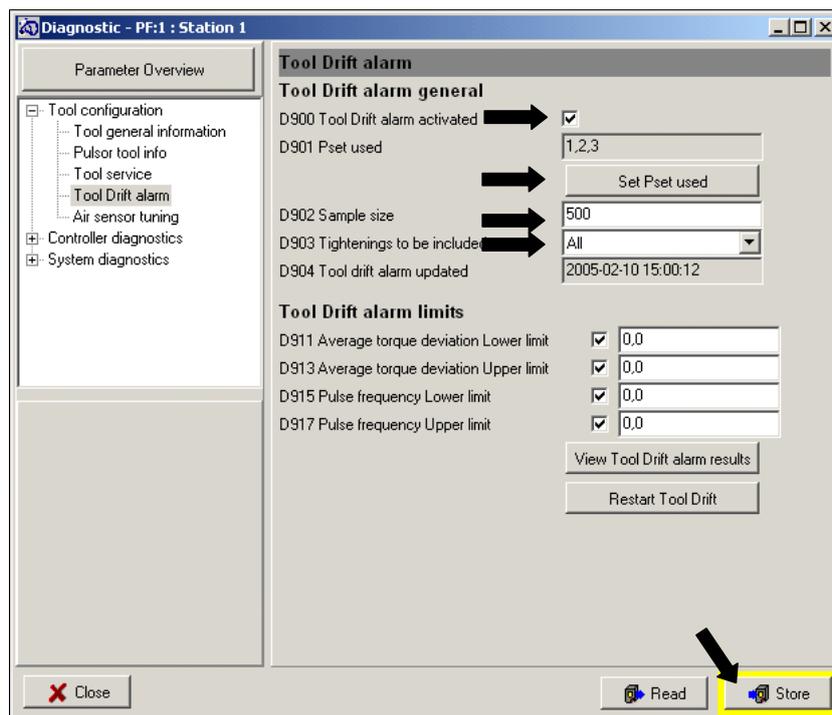
Tool drift alarm is a function to enable the operator to detect a change in tool performance (tool drift) before it has an impact on production. The cause for this performance change can be lack of oil in the pulse mechanism, a technical fault in the tool or a change in line air pressure.

Tool drift alarm calculates a moving average of the relative torque and pulse frequency after each tightening. If this average is above or below an activated limit, the Alarm lamp on Pulsor Focus will start flashing and an event code will be shown as a warning, both on the Pulsor Focus display and in ToolsTalk Pulsor. The Tool drift alarm does not reject a tightening, it is only a warning.

11.3.2 Enabling the Tool drift alarm

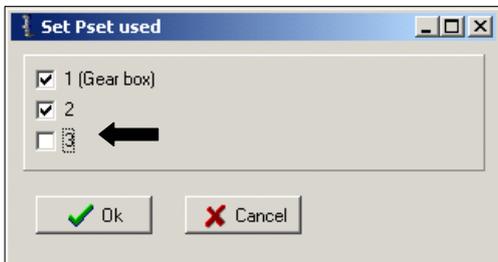
Follow this step by step instruction on how to enable Tool drift alarm for your Pulsor system:

Start **Diagnostic** (by either double clicking on Diagnostic in the PF Map in ToolsTalk Pulsor or by selecting the function from the toolbar) and then select **Tool drift alarm** under **Tool configuration** in the navigation area.



Activate the Tool Drift Alarm function using the **Tool Drift alarm activated** checkbox.

Normally all Psets are used as the basis for the tool drift calculation. To deselect a Pset, click on the **Set Pset used** button and deselect one or more Psets and confirm with **OK**.



Set the number of tightenings to be used in calculation of average (500 is default, generally the sample size should be an approximation of the average number of tightenings during 24 hours or the maximum 1000.)

Select Tightenings to be included (All or Only approved).



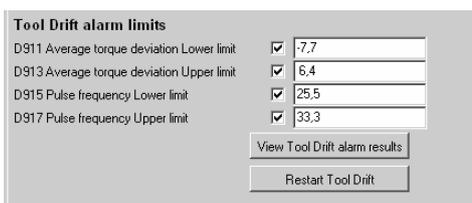
Only tightenings where the tool has shut off are included in Tool Drift Alarm supervision.

Click the **Store** button to save the settings.

The tool drift alarm function is now active and you can start using the tool. The tool drift alarm limits will be set automatically when the specified number of tightenings has been performed and the first average is calculated. You can also manually set the tool drift alarm limits at any time, both before and after the calculation of the first average. It is however recommended that you use the automatically calculated limits.

If you want to manually set the limits or change the automatically calculated limit, follow the procedure below.

The Tool Drift alarm limits can be entered or changed at any time. All limits set to zero by the time that the first average is calculated will be automatically set by the system, all other will be left unmodified by the system. You can also activate or deactivate the limits using their corresponding checkboxes.



You can view the current status of the Tool drift alarm using the View Tool Drift alarm results button.

11.3.3 Tool drift alarm supervision

After initiation, historic results will be displayed in the Tool Drift alarm results panel, for each new tightening that is performed. To see the latest results, press the View result button.

If desired, the historical values can at any time be reset, the stored max and min values will be erased and a new set of max and min values will be displayed as new tightenings are performed.

Parameter		Value	Limit	Date
Average Torque Deviation	min	-0,3	-3,4	2006-05-13 03:45:40
Average Torque Deviation	max	14,3	15,1	2006-05-23 14:46:34
Average Pulse Frequency	min	26,4	24,9	2006-05-14 00:46:35
Average Pulse Frequency	max	29,1	29,2	2006-05-23 14:59:28

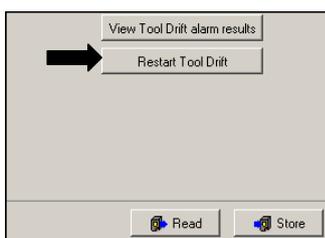
Reset historical values Read

Close

When tool drift alarm is initiated the Pulsor Focus will continuously, after each tightening, compare the mean value for the selected parameters with the limits that are set. If any mean value parameter exceeds a preset alarm limit for 10 consecutive tightenings the “alarm” light on Pulsor Focus will flash continuously and an event code will be shown on the display to state which parameter has caused the alarm.

This event code will also be automatically generated after every 100:th tightening, as long as the tool drift alarm is active. If desired, it is possible to configure a digital output to trigger when Tool Drift Alarm activates for any parameter.

It is possible at any one time to Restart Tool Drift alarm, for example after having serviced the tool.



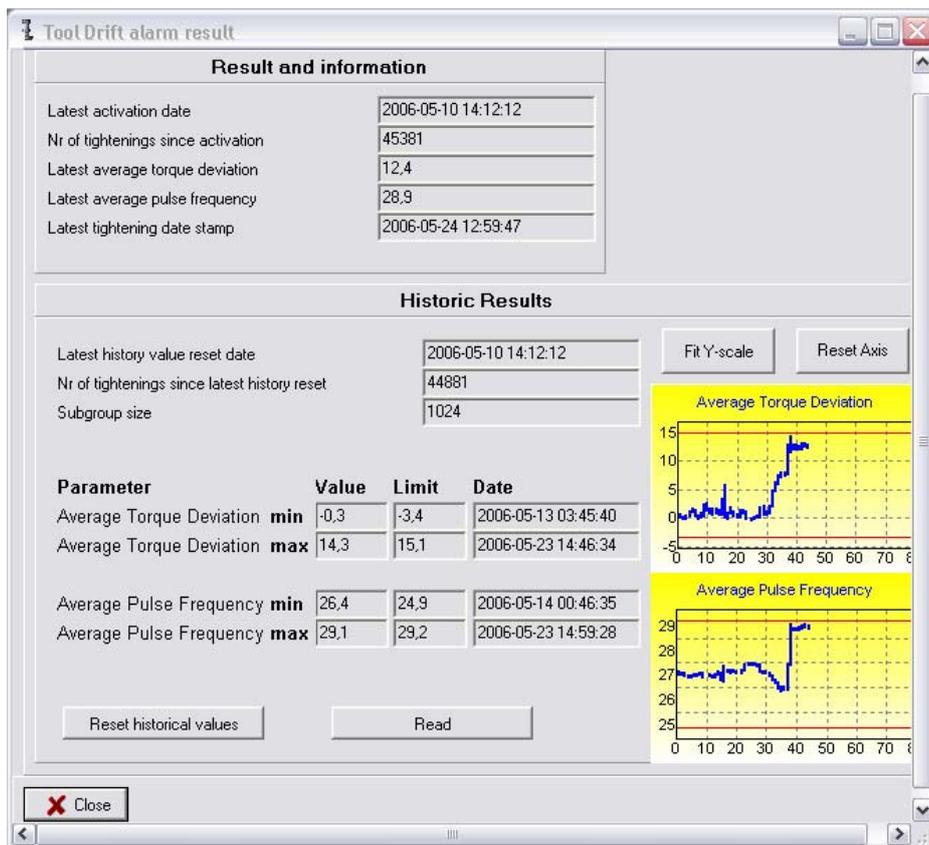
This will reset the alarm limits and also reset all the historical values. Tool drift alarm will start again from the beginning until initiated with new alarm limits, provided Tool Drift Alarm is still activated.

When a new Pset is created, it will automatically be included in the Tool Drift Alarm function, provided the user does not actively exclude as described in section 11.3.2, *Enabling the Tool drift alarm*, item 3. Reference setup tightenings are NOT included in the calculations of the mean value for the Tool Drift Alarm parameters.

Change of tool does not affect Tool Drift Alarm supervision, provided the same tool size is used. If the new tool has a different target torque and/or different application area it is important to note that Tool Drift Alarm supervision might be influenced. It is recommended to restart Tool Drift Alarm in such cases.

11.3.4 Tool drift alarm graphical view

When the number of tightenings performed by the system exceeds the sample size a graphical view of the tool drift can be seen when pressing the button *View Tool Drift alarm results*.

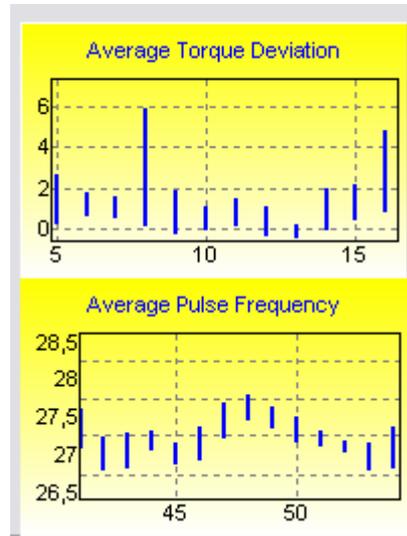


The graph will show a staple diagram containing maximum 80 values depicting the maximum and minimum values of the subgroup for each parameter. The subgroup size is 2 in the beginning. When all staples have been drawn the subgroup size will be doubled and the staple diagram will proceed from the 41:st position in the graph. This is continuously repeated as the tool performs tightenings.

There are two buttons to facilitate the graphical view. *Fit Y-scale* will adapt the curve so that it optimally fits the Y-axis. Pressing the button again will return to the previous position (toggle function). It is also possible to make operations in the graph itself. With the left mouse button it is possible to zoom into and out of a capture area in the graph. This is specially useful when the staples are very small.

If the capture box is made from top left to bottom right it will zoom in, as can be seen in the picture to the right. It shows an expanded view of the individual staples, each staple ranging from the minimum value to the maximum value within the subgroup size.

If the capture box is made from bottom right to top left it will zoom back to initial settings. With the right mouse button it is possible to move inside the graph. Pressing the *Reset axis* button will return graph to initial appearance.



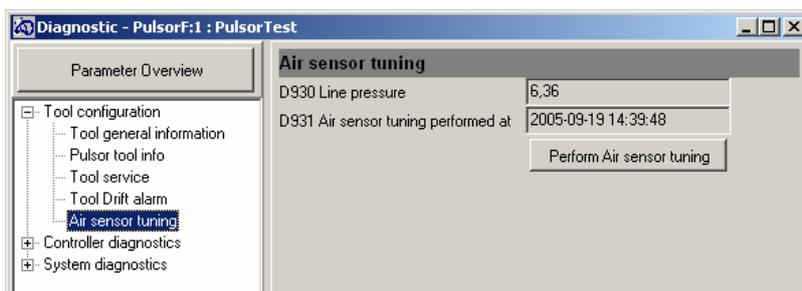
11.4 Air sensor tuning

All Pulsor tools have their sensor tuned when delivered. You should only perform a new adjustment of compressed air sensor if you suspect that there is something wrong with the sensor tuning.



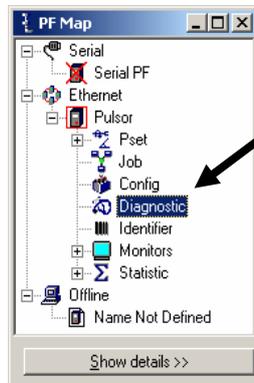
An incorrectly performed air sensor tuning may cause the tool to malfunction.

Adjustment is carried out with ToolsTalk Pulsor connected to Pulsor Focus and an external air pressure gauge, with an accuracy of 0.1 bar or better. The operator first confirms to ToolsTalk Pulsor that the pressure is zero. The tool is then operated until it shuts off – the trigger is kept pressed since the air pressure reaches the sensor in this way. The operator reads off the pressure on the external sensor and confirms the higher pressure (line pressure) in ToolsTalk. The trigger is released and the recorded pressure is stated in ToolsTalk.



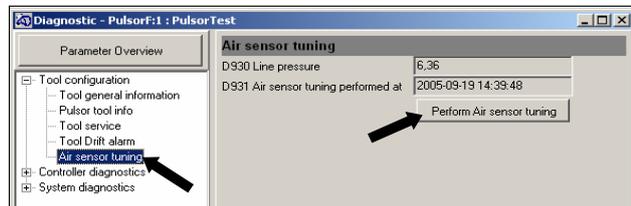
See below for detailed instructions on how to perform an air sensor tuning.

Start **Diagnostics** from the PF Map.

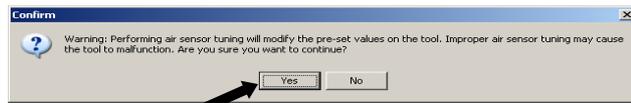


Select **Air sensor tuning** under Tool configuration in the navigation area.

In the Air sensor tuning window you can see the actual value and date of the last adjustment made. Click on **Perform air sensor tuning** to make a new adjustment of the air pressure sensor.

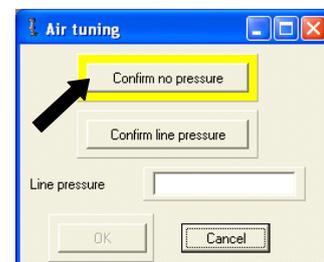


To prevent a user from accidentally making the tool malfunction by performing an improper air sensor tuning, a warning will appear.



Click the **Yes** button to continue.

When the tool is not operating click on the **Confirm no pressure** button.



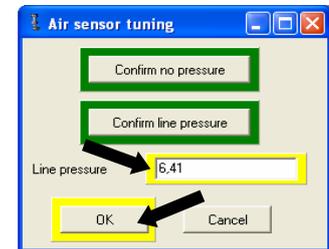
Do a tightening, allow the tool to shut off (but keep the trigger pressed) and read the value on the air pressure gauge and then click on **Confirm line pressure**.

The trigger can then be released.



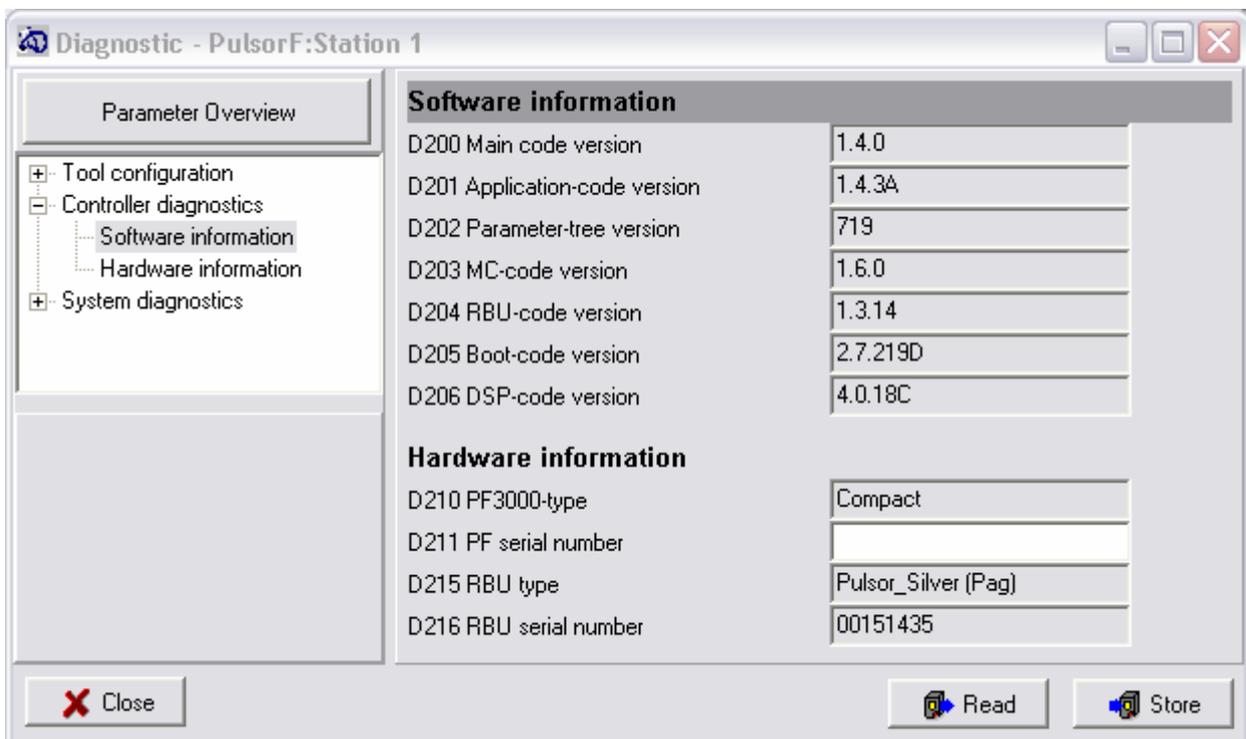
Enter the measured value (bar) from the air pressure gauge and click on **OK** to complete the adjustment.

Suitable air pressure when performing Air sensor Tuning is between 4 and 7 bar.



11.5 Controller diagnostics

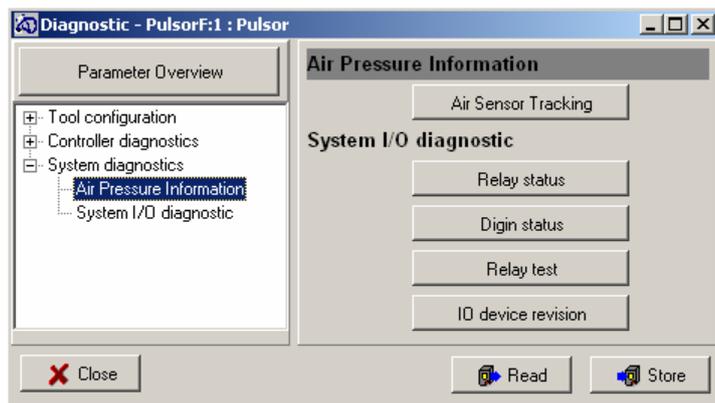
Controller diagnostics window shows the hardware configuration and the software versions installed on the Pulsor Focus unit.



If *PF3000 Serial number [D211]* is not set, it is possible for the user to write own serial number information and store.

11.6 System diagnostics

Systems diagnostics functions enable you to test and diagnose your Pulsor Focus system.



The current air pressure can be read using the **Air Sensor Tracking** function. The purpose of this function is to check that the air sensor is working properly and is properly tuned. When in Air sensor tracking mode the line pressure is shown both in ToolsTalk and on Pulsor Focus display.



When the Air Sensor Tracking function is active the system will stop monitoring and any tightening performed will be discarded.

The status of all internal and external I/O devices can be viewed in **System I/O diagnostics**. You can also set the status of relays. All configured I/O devices will appear on the list of available devices.

This function is useful when you want to test the interaction between Pulsor Focus and different external devices, for instance when trouble shooting complex systems with one or several PLC's connected to the controller.

The Relay Status and DigIn Status windows show the status of the selected I/O device.



The Read status button has to be pressed in order to update this view to reflect changes. The Relay Test function enables to set the relays on a selected I/O device.

The new status of the relays is set when the **Set Relay** button is pressed. Pushing the **Restore** button will restore the relays to reflect the current status of Pulsor Focus. To update this view to reflect changes triggered by other events push the **Read Status** button.

12 Identifier

It is possible to send an **Identifier** (barcode) string to the Pulsor Focus. This string is normally generated from a barcode reader connected to one of the serial ports on the Pulsor Focus (this barcode is usually called VIN or ESN in car plants). When entered, the Pulsor Focus will use this number and send it together with the results to ToolsNet software etc. It is also possible to use the barcode to select Psets and Jobs.

For parameter descriptions see Parameter List, section 20.5, *Identifier*.

A filter can be setup to decide what part of the barcode string that is of interest. The barcode string can be sent to the Pulsor Focus via the serial connector or Ethernet for selecting of Psets and Jobs.

A filter can also be setup to decide which part of the barcode string must be saved together with the tightening result.



Barcode strings sent to Pulsor Focus are not allowed to contain the following characters; apostrophe, comma, semicolon, point, sun (☉) and pound (£).

Start Identifier by either double clicking on Identifier in the PF Map in ToolsTalk Pulsor or by selecting the function from the toolbar.



12.1 Barcode data string

The maximum length of the Barcode data string is 25 ASCII signs. If the string is longer Pulsor Focus will use the 25 first signs.

Serial protocol	
Baud rate	9600 bps
Data bits	8
Stop bits	1
Parity	no
Handshake	off
Data string	STX <data 1-25 characters> ETX (STX = 02H, ETX = 03H)

12.2 Identifier setup

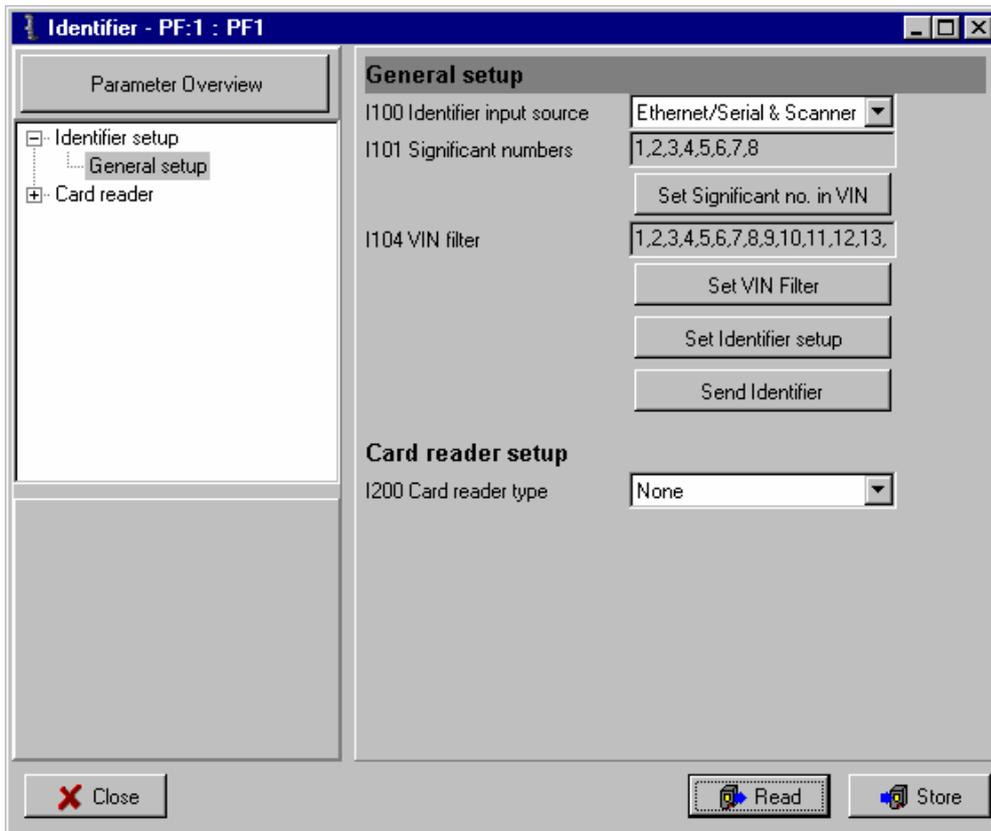
Start by connecting ToolsTalk and the Identifier (Barcode reader) to the Pulsor Focus.



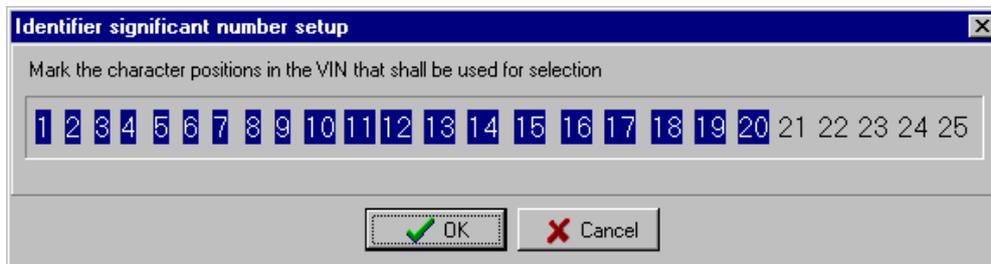
To select Psets via a barcode reader, parameter Pset select source [C222] should be set to Identifier.

Start ToolsTalk and click on **Identifier** in the PF Map.

Under **General setup**, select wanted *Identifier input source* [I100].



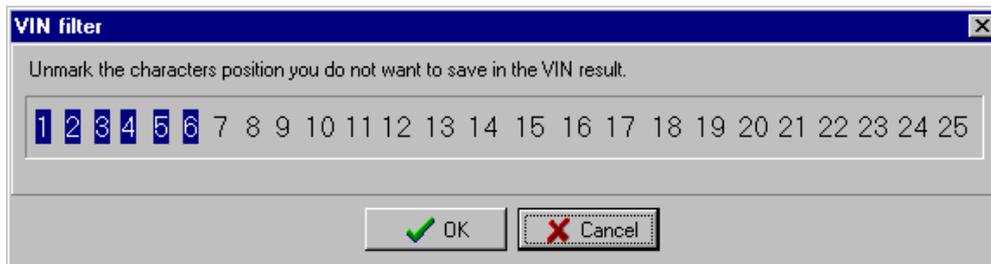
Click on **Set Significant no in VIN** and set *Significant numbers* [I101].



Select positions where the significant information is located in the barcode. number 1 to 25 can be selected (it is not necessary to set them in a row).

Click **OK** when finished.

Click on **Set VIN Filter**.



Unmark the positions of the barcode string that must not be saved with the tightening result.

Identifier

Click on **Set Identifier setup**.

In this window you enter the different combinations of the significant numbers that you need.

Enter a string (same length as in parameter significant number above) in the **Add Identifier string** field and click **Add**. A matrix where the columns represent existing function ID numbers and the rows represent the added Identifier strings is then formed.

Once all strings are entered, associate them with a Pset or Job by double clicking in the corresponding Cell in the matrix and selecting a function ID number from the pop up list.

Click **OK** to exit the window.

Set *Card reader type [I200]*.

Click **Store** to save the settings.

Identifier	Pset	Multistage	Job
123456789123	1 (FrontSeat1		
123456789124		3 (Cover1)	
123456789125			1 (FrontF 1 JFrontPane

Add Identifier string
123456789125 Add

Remove Identifier string
123456789125 Remove

OK Cancel

13 FieldBus

A **FieldBus** communication can be used for data communication between the Pulsor Focus unit and PLC's. It is an effective and fast way for data transferring of short data packages. It is normally used to send discrete I/O data instead of using a large number of discrete cables that have to be hard wired to relays and DigIn.



For parameter descriptions see Parameter list, section 20.6, *FieldBus*.

There are many different FieldBus standards on the market and they all have different hardware and software protocols. To be able to communicate on FieldBus, the Pulsor Focus must be equipped with a specific card for the preferred type of FieldBus. **ProfiBus-DP**, **DeviceNet**, **InterBus**, **ModBusPlus**, **ModBus/TCP** and **Ethernet/IP** are the possible selections.

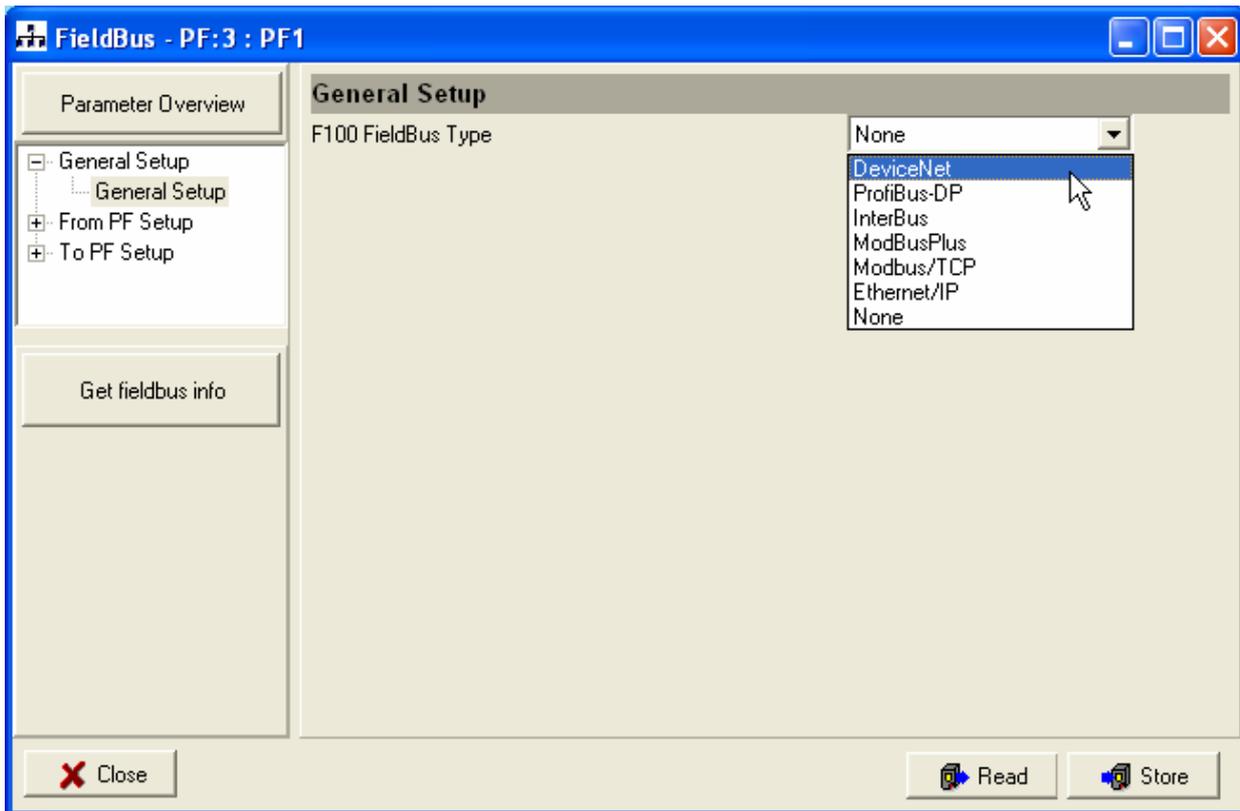
Pulsor Focus acts as a slave in a FieldBus system. A PLC or similar will act as the master.

With help of ToolsTalk the FieldBus functionality in the Pulsor Focus controller can be configured to fit the customer specific bitmap. It is a very easy way to configure or modify a customer specific bitmap. When the configuration is done you can download to the Pulsor Focus or save it as a file for later use.

The ToolsTalk interface for FieldBus consists of three parts, General setup, From PF setup and To PF setup.

13.1 General setup

Select **FieldBus** type under **General Setup**.



13.1.1 Parameters in General setup

The table below shows the parameters available for the selected FieldBus type.

Parameter	DeviceNet	ProfiBus-DP	InterBus	ModBusPlus	ModBus/TC P	Ethernet/IP
FieldBus Type	X	X	X	X	X	X
To PF DataLength	X	X	X	X	X	X
From PF DataLength	X	X	X	X	X	X
FB Update Interval	X	X	X	X	X	X
Tool Stop at Offline	X	X	X	X	X	X
Set node address and baudrate from	X	X		X	X	X
FB Node Address	X	X		X		
Baudrate	X					
Set source address from				X		
Source address				X		
Connection Mode	X					
PCP length			X			
Process DataLength			X			
From PF Global DataLength				X		
To PF Global DataLength				X		
Bitmap select	X	X	X	X	X	X
IP address					X	X
Subnet Mask					X	X
Gateway					X	X

See chapter 26 - *FieldBus configuration appendix* for specific FieldBus type data.

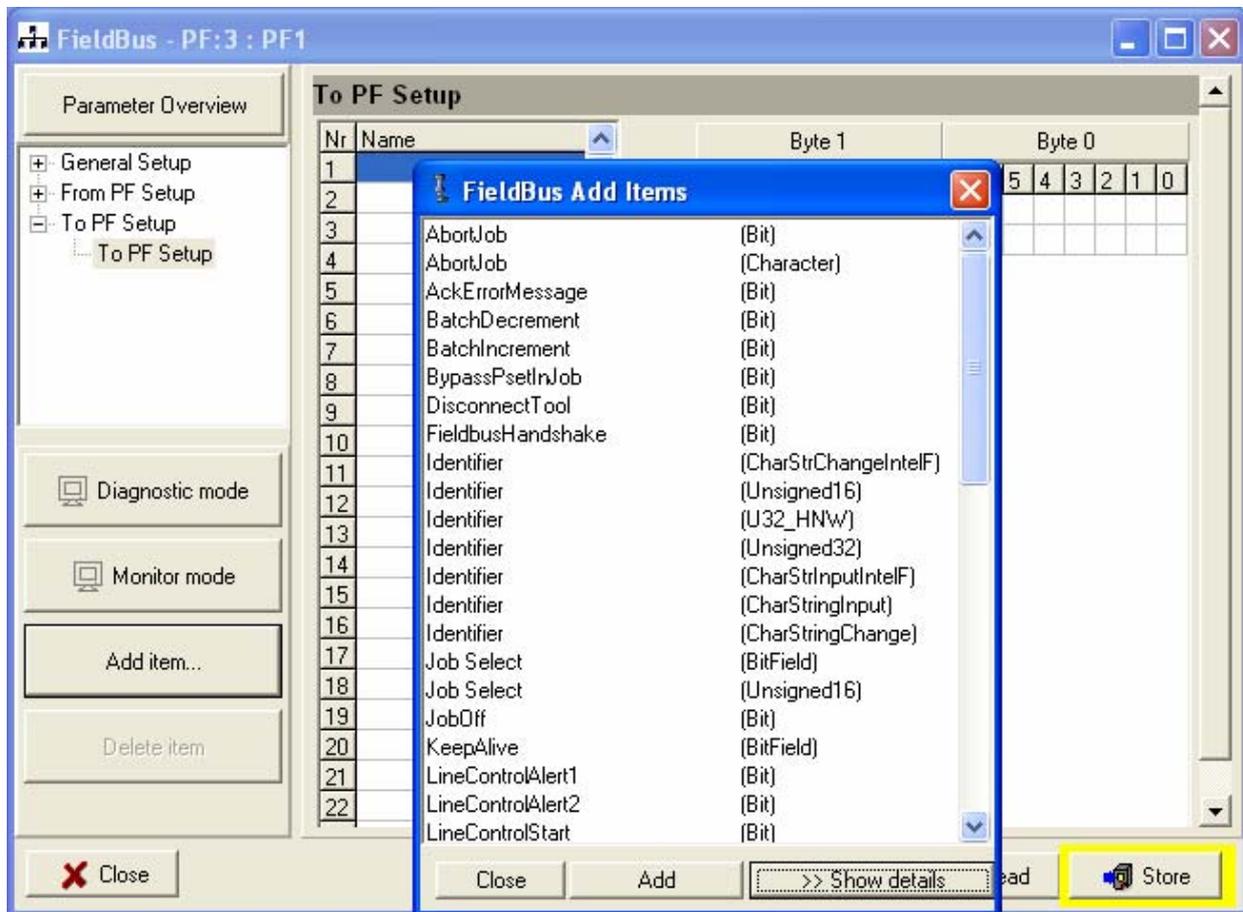
13.2 From/To PF setup

By selecting **From PF Setup** the bitmap that is sent out from the Pulsor Focus can be configured.

By selecting **To PF Setup** the bitmap that is sent in to the Pulsor Focus can be configured.

13.2.1 Add item

When the **Add item** key is clicked, a selection list is activated. On the right side of the item list, see information about highlighted item. Click Hide details button if you do not need this help text. Highlight the item you want and double click on it or click the Add item button. The item will then be entered to the item list on the first available line.



In the list you can see start word, start byte and start bit for the selected item. The start word, byte and bit give the start position of an item in the bitmap. The length is also possible to see and sometimes change. If this does not match the wanted bitmap it is easy to change the length and position in the bitmap by changing the start positions in the item list. Change one line at the time and then press Enter key on the PC

after each line is changed. It is also possible to drag and drop directly in the bitmap. In this case, the start positions in the Item list are updated automatically.

If the bitmapping is changed, and a conflict occurs, this part is marked with red color in the bitmap.

The max number of selected items is 60 in From PF setup and 60 in to PF setup.

For detailed information about all possible selections see chapter 26, *FieldBus configuration appendix*.

13.2.2 Delete item

To delete an item, highlight it in the Item list and click the **Delete item** key.

13.3 Other functions

13.3.1 Diagnostic mode

When **Diagnostic mode** is on, one can set FieldBus data in ToolsTalk and send the data to Pulsor Focus controller by clicking on **Set value** button. If diagnostic mode “From PF” is used the Pulsor Focus passes data from ToolsTalk to PLC and ignores the data from Pulsor Focus. If diagnostic mode “To PF” is used the Pulsor Focus activates functions, which is set in ToolsTalk and ignores PLC data.

13.3.2 Monitor mode

Monitor mode key is used to monitor FieldBus data communication for testing purpose. This function works only when ToolsTalk is online (connected to the Pulsor Focus controller).

When Monitor Mode is active, the data from Pulsor Focus to PLC are visible in the **From PF** window bitmap. Contrary, the data from PLC to Pulsor Focus are visible in the **To PF** window bitmap. It is not possible to change and store FieldBus configuration in monitor mode. Data can be displayed in two formats, defined data type format and binary format. The data in the monitor windows are updated at a rate of 3 messages/second.

13.3.3 Store to file and Read from file

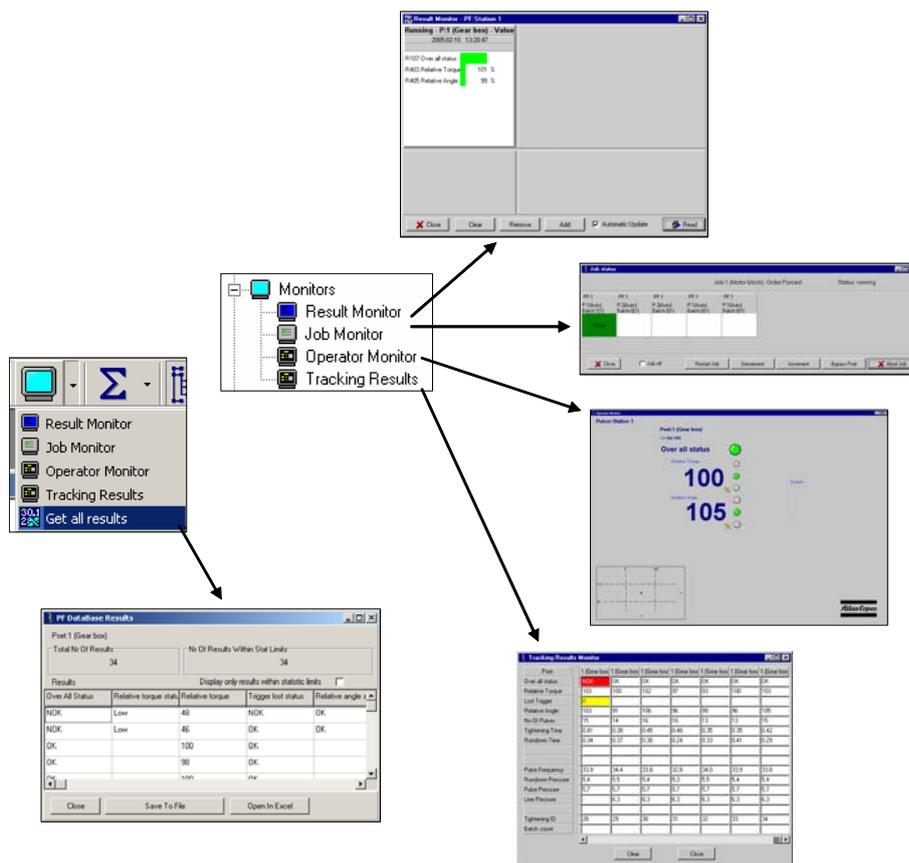
Store and read FieldBus configurations to file. Use the Read/Save FieldBus functions in the File menu in ToolsTalk. To store to or read from a file you must first activate the FieldBus window.

The FieldBus file extension is *.pff

14 Monitors

ToolsTalk Pulsor offers several ways of displaying the tightening result:

Functions	Description
Result monitor	The tightening result for the latest tightening.
Job Monitor	Displays created Jobs and provide functionality for managing Jobs.
Operator monitor and Picture monitor	Displays detailed information on the tightening results as well as a graphic representation with status indicators.
Tracking results	Tracking Results continuously displays tightening results, see section 14.4, <i>Tracking Results</i> for more information.
Get All Results	This displays result information from all tightenings stored in the Pulsor Focus memory. The information can be exported to a file such as an Excel sheet.

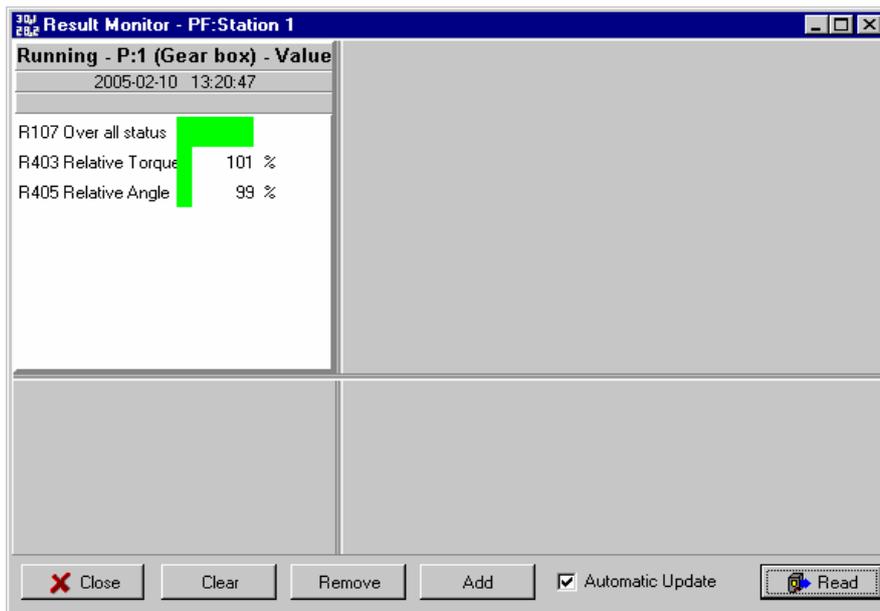


14.1 Result monitor

The **Result Monitor** presents the latest tightening results from the Pulsor Focus and the used Pset.

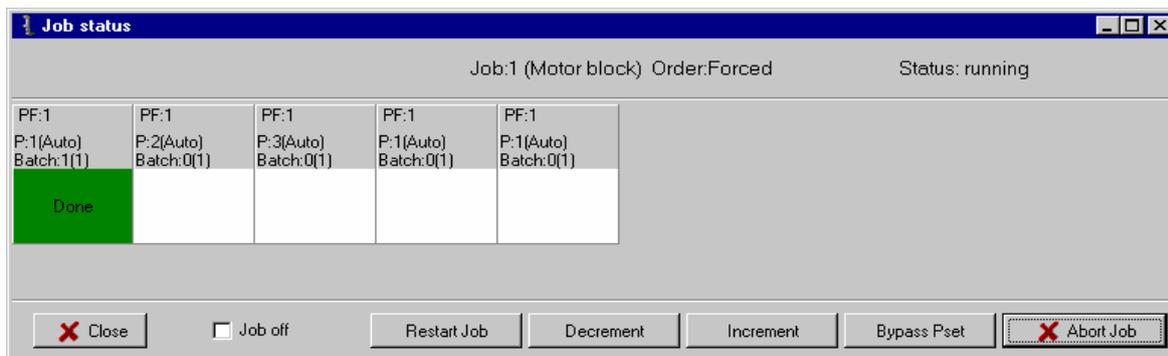
The tightening result includes Relative Torque, Relative Angle and Over all status.

You can watch several windows with different views, with a max limit of four.



14.2 Job monitor

Job Monitor displays running Jobs and provides functionality for managing Jobs.



For a function description (Restart Job, Decrement, Increment, Bypass, Abort Job and Job off) see chapter 9, *Job*.

14.3 Operator monitor and Picture monitor

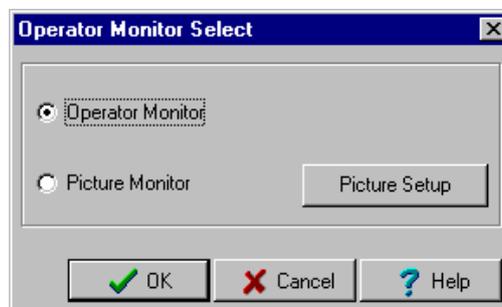
14.3.1 Operator monitor

Select **Operator monitor**.

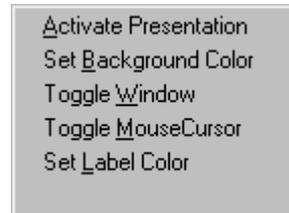
Press **OK**.

Operator monitor window appears.

Right-click anywhere in the window to open options menu.



- **Activate Presentation:** User preferences for the content of the Operator monitor.
- **Set Background Color:** Possibility to set the background color for the Operator monitor.
- **Toggle Window.**
- **Toggle Mouse Cursor.**
- **Set Label Color:** Possibility to set the label color for the Operator monitor.

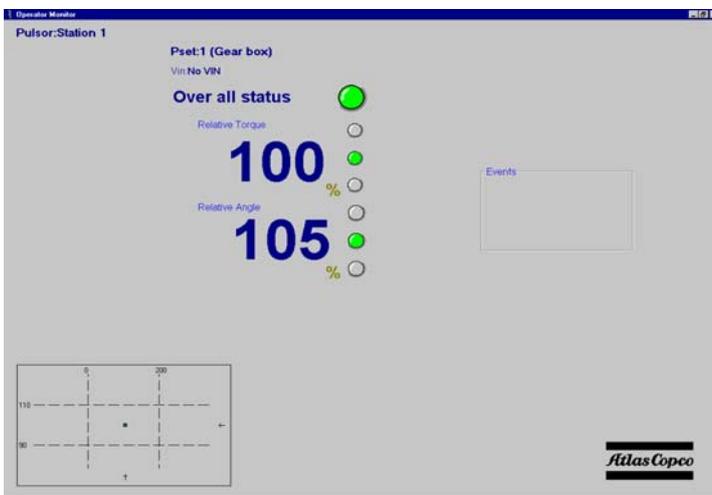


Monitors

When choosing **Activate Presentation** the window to the right is shown.

By checking the boxes the user can customise the information shown in the Operator monitor (see table below for parameter description).

Press **OK**.



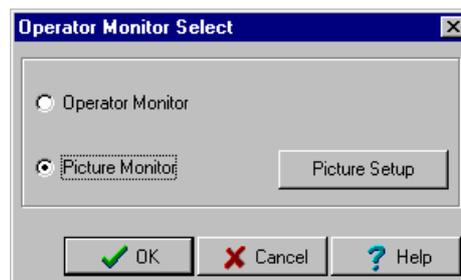
Part	Description
Pulsor	The name of the Pulsor Focus unit.
Pset	Pset used to perform the tightening.
VIN	Vehicle Identification Number.
Over all status	Indicator for the overall status of the tightening.
Relative Torque	Relative torque of the tightening.
Relative Torque status	Status-indicator for Relative torque (Yellow-Low/ Green-OK/Red-High).
Relative Angle	The Relative angle of the tightening.
Relative Angle status	Status-indicator for Relative angle (Yellow-Low/ Green-OK/Red-High).
Batch	The order of the current operation in the batch
Batch order	The Over all status for the respective operation in the batch.
Plot Chart	Displays the final torque and final angle, relative to the acceptance window.
Events	Warnings and events.

14.3.2 Picture monitor

The **Picture monitor** is a feature that gives the user visual guidance throughout the Job sequence. The next tightening (Pset) in can be presented graphically with an image (e.g. a picture of the area where a bolt is placed).

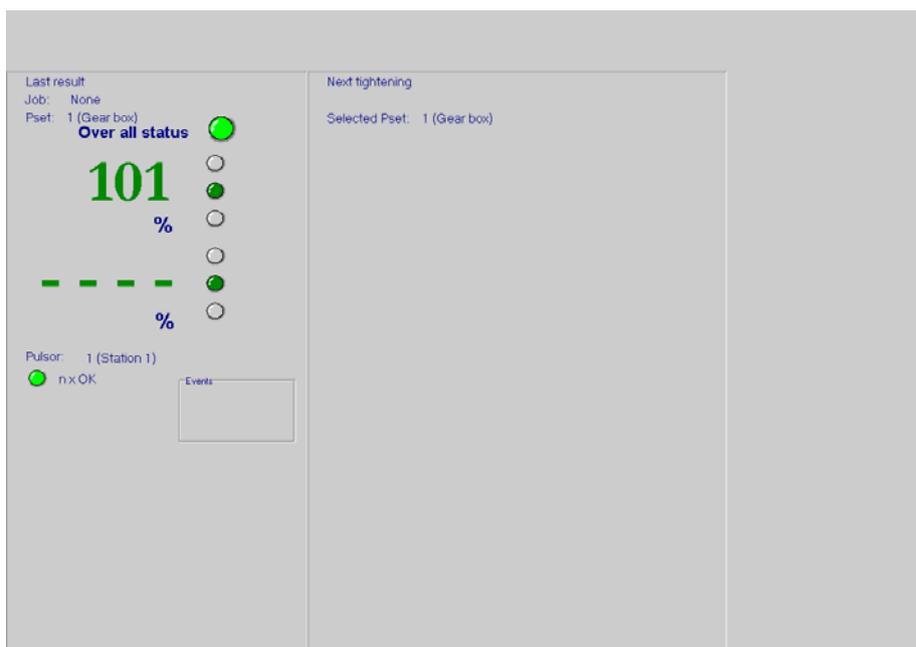
When selecting Operator Monitor the window to the left is shown.

To open the Picture monitor, select **Picture Monitor** and click **OK**.



Select **Picture monitor** and click **OK**.

The window shown is similar to the Operator monitor with information about the latest tightening to the left and a picture associated with the next tightening (Pset) in the Job, to the left.



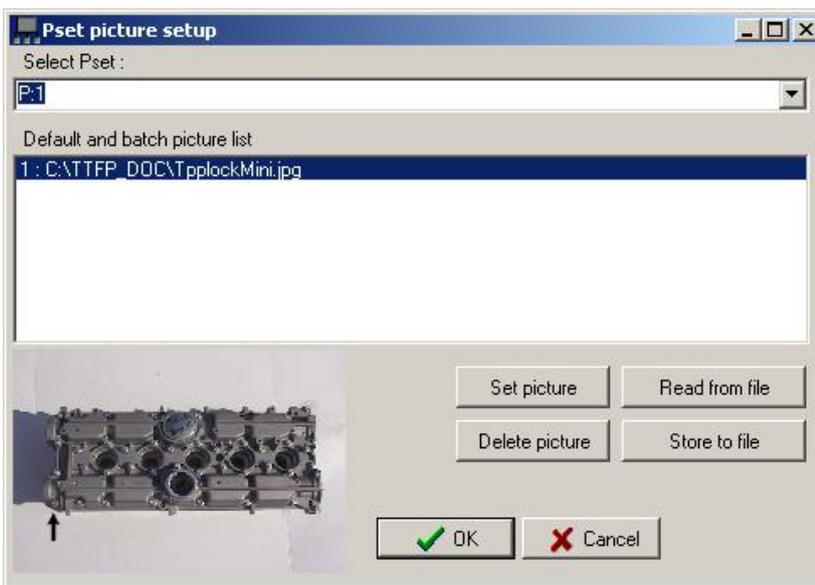
Picture monitor is not adjusted for Pset with batch counter. Only one picture per Pset is allowed.

To edit Picture monitoring, choose **Picture Setup**.

The user has the possibility to associate an image-file with a Pset.

Select a Pset from the list. Click on **Set picture** and select an image-file using the file-selector window.

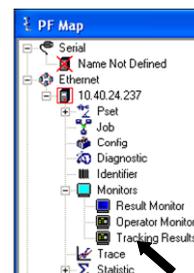
To import saved settings for the Picture monitor click on **Read from file**. To save the settings click on **Store to file**. A Save As-window will appear and the user can choose where to store the file containing the settings. When finished click **OK**.



14.4 Tracking Results

Tracking Results continuously shows the tightening data as they are performed.

Select Tracking Results under **Monitors** in the PF Map.



Pset:	1 (Motor)							
Over all status	OK	NOK						
Relative Torque	96	98	96	98	96	98	97	46
Lost Trigger								X
Relative Angle	94	106	108	100	101	97	104	0
No Of Pulses	16	16	17	15	15	15	16	3
Tightening Time	0,62	0,61	0,66	0,56	0,57	0,57	0,61	0,10
Rundown Time	0,27	0,32	0,27	0,31	0,35	0,30	0,31	0,03
Pulse Frequency	24,7	24,5	24,6	24,8	24,5	24,5	24,7	19,8
Rundown Pressure	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,1
Pulse Pressure	5,1	5,1	5,1	5,1	5,1	5,1	5,1	4,2
Line Pressure	6,1	6,1	6,1	6,1	6,1	6,1	6,1	-
Tightening ID	11	12	13	14	15	16	17	18
Batch count	1 (3)	2 (3)	3 (3)	1 (3)	2 (3)	3 (3)	1 (3)	1 (3)

The following are displayed in the Tracking Results window:

- Rejected tightenings are shown by NOK in red.
- For rejected tightenings the parameter(s) that lie above the activated limits are marked in red whereas the parameters that are below the limit values are marked in yellow.
- Trigger lost is marked in yellow (if it is monitored).
- Parameters that have invalid values are shown in purple.⁽¹⁾

Batch count can be seen, if used.

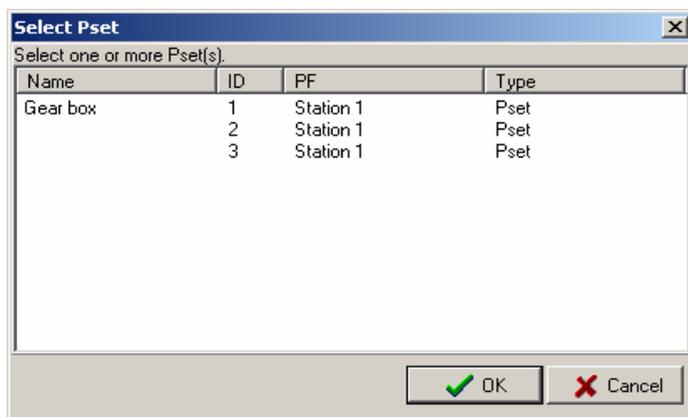
⁽¹⁾ The cause of invalid parameter values is for example a disturbance of sensor reading during the final pulse, spin in the tool, or too few pulses making pulse frequency impossible to calculate.

14.5 Get all results

This displays result information from all tightenings stored in the Pulsor Focus memory. The function is started from the Selection panel in ToolsTalk Pulsor. The information can be exported to a file such as an Excel sheet.

The result information in Excel can easily be sorted such as with the help of the auto filter. To give an example, all rejected tightenings can be filtered. You can then see easily what happens when something has gone wrong and thereby understand what measures can further refine the process.

Pulsor Focus can store up to 4000 individual tightening results. Each tightening result consists of 29 result parameters. With the **Get all results** option, the user is able to retrieve and view these. The user also has the choice of saving them to a text-file or an Excel-file. When the Get All Results option is chosen the window below appears.



Simply choose a specific Pset and click **OK**.

The results from that Pset is then shown in the following window:

PF DataBase Results

Pset:1 (Gear box)

Total Nr Of Results: 4000

Nr Of Results With Machine Shutoff: 4000

Results: Display only results with machine shutoff

Over All Status	Relative torque status	Relative torque	Trigger lost status	Relative angle status	Relative angle
OK	OK	100	OK	OK	129
OK	OK	102	OK	OK	110
OK	OK	98	OK	OK	129
OK	OK	97	OK	OK	129

Close Save To File Open In Excel

By choosing **Save To File** the results are saved into a text-file. The user can also choose to open and view the results in Microsoft Excel® by selecting **Open In Excel**. This, of course, requires a properly installed version of Microsoft Excel.

15 Statistics

15.1 Introduction to Statistics in Pulsor Focus

The Pulsor Focus statistics are measured after each tightening and can be shown on the display in real time and be sent to a PC via serial or Ethernet connection. It is also possible to send statistical reports to a printer for print out. There is a stat alarm LED on the front panel of the Pulsor Focus unit.

Statistics are calculated based on the following result parameters:

Result	Unit	Description
Relative torque	%	Final relative torque in percent.
Relative angle	%	Final relative angle in percent.
Number of pulses		Number of pulses in the tightening.
Line pressure	bar	Line pressure measured at end of tightening.

The following statistical results are calculated and displayed for torque and angle parameters:

Results	Description
# Results	Total number of results that the stat calculations are based on for the analyzed Pset.
Min	Lowest result in analyzed Pset.
Max	Highest result in analyzed Pset.
R	Range (Max – Min)
Low	% low tightenings in analyzed Pset.
OK	% OK tightenings in analyzed Pset.
High	% high tightenings in analyzed Pset.
\bar{X}	The mean value for the selected Pset.
σ	Sigma. Shows the calculated standard deviation.
$\bar{X} - 3 \sigma$	Mean - 3 sigma
$\bar{X} + 3 \sigma$	Mean + 3 sigma
6σ	6 x sigma
Cr	Cr is a calculated viability number (capability). The lower value, the better process.
Cp	Cp is a viability factor. The higher value the better process.
Cpk	Cpk is a viability factor. The higher value the better process.
Cam	Viability factor. The higher the value the better the process.

Sub-group results	Description
Min	Lowest result in the latest completed subgroup.
Max	Highest result in the latest completed subgroup.
R	Range for the latest completed subgroup.
\bar{x}	Average value for the latest completed subgroup.
σ	Sigma for the latest completed subgroup.
Other definitions	Description
\bar{R}	Average of subgroup range (number of subgroups).
$\bar{\bar{X}}$	Average of subgroup average (number of subgroups).

15.2 Statistical Process Control (SPC)

In order to rapidly detect changes in the process, Pulsor Focus is equipped with a number of statistical alarm limits based on the \bar{x} and R calculations for relative torque and line pressure.

Statistical Process Control (SPC) functions are used on relative torque and line pressure.

All checks are performed on the Pset that the tool is currently running with.

If any of the following criteria are true the stat alarm light, and a relay (if used), is activated. The tool may still run even if an alarm is issued. The alarm is only a warning. The alarm signals remain active until the process falls within all limits again or the result memory is cleared. This means that the alarm does not switch off during tightening.

15.3 Statistic alarm

$$\bar{x} > UCL$$

$$\bar{x} < LCL$$

$$R > UCL$$

$$R < LCL$$

$$Cp < 2.0$$

$$Cpk < 1.33$$

SPC \bar{x} and r compared with LCL / UCL alarms cannot function until the LCL and UCL have been programmed.

15.4 Trend deviation alarm

Trend deviation check and alarm are measured and compared against X-bar and the range for the currently used Pset.

7 points consecutively increasing

7 points consecutively decreasing

7 points consecutively above average ($\bar{\bar{X}}$ and / or $\bar{\bar{R}}$)

7 points consecutively below average ($\bar{\bar{X}}$ and / or $\bar{\bar{R}}$)

1 point outside $\bar{\bar{X}}$ or $\bar{\bar{R}} \pm 2$ sigma (sigma for the whole population)

Point = subgroup

The mean is the average of \bar{x} and r ($\bar{\bar{X}}$ and $\bar{\bar{R}}$). This means that the SPC trend alarms cannot function until the number of tightenings in the memory corresponds with the user-specified number of subgroup parameters.

15.5 Calculation of UCL and LCL

Pulsor Focus calculates recommended values for UCL and LCL. The operator can then choose if he wants to use these values or enter another value.

Subgroup size, Subgroup frequency and Number of subgroups parameters are used in the calculations.

15.6 Calculation of $\bar{\bar{X}}$ and $\bar{\bar{R}}$

Pulsor Focus calculates recommended values. The operator can then choose if he wants to use these values or enter another value.

Subgroup size, Subgroup frequency and Number of subgroups parameters are used in the calculations.

15.7 Calculation formulas

When a stat display is requested, the whole memory will be calculated. This will also be done when shifting Pset.

Pulsor Focus controls the lowest and highest values. If some of these drop out from memory once it is full (first in – first out), the entire memory will be recalculated.

The formula for group range is calculated after each completed subgroup.

The formulas for the statistic parameters used by Pulsor Focus are as follows:

X = value

n = number of tightenings

Min = minimum value from all the tightenings in the test series

Max = maximum value from all the tightenings in the test series

minl = minimum acceptable value

maxl = maximum acceptable value

$Range = R = Max - Min$

$$Mean = \bar{X} = \frac{1}{n} \left[\sum_{i=1}^n X_i \right]$$

$$\sigma = S_{n-1} = \sqrt{\frac{1}{n-1} \left[\left(\sum_{i=1}^n X_i^2 \right) - n\bar{x}^2 \right]}$$

$$CR = \frac{6 * \sigma}{Maxl - Minl}$$

$$CP = \frac{Maxl - Minl}{6 * \sigma}$$

$$CPK = \min \left[\frac{Maxl - \bar{X}}{3 * \sigma}, \frac{\bar{X} - Minl}{3 * \sigma} \right]$$

Tightenings

$X_1 \quad X_2 \quad X_3 \quad X_4 \quad X_5$

$X_6 \quad X_7 \quad X_8 \quad X_9 \quad X_{10}$

$X_i \quad X_{i+1} \quad X_{i+2} \quad X_{i+3} \quad X_{i+4}$

$X_{i+5} \quad X_{i+6} \quad X_{i+7} \quad X_{i+8} \quad X_{i+9}$

$X_{i+10} \quad X_{i+11} \quad X_{i+12} \quad X_{i+13} \quad X_{i+14}$

$X_{i+...}$

A subgroup is a group of tightenings. Subgroup size is freely programmable and in the example above it is set to 5, which means that all values in the same group range from i to $i+4$.

\bar{X} -bar is the calculated average of the last completed subgroup.

Subgroup size = Group size = z

$$\text{Grouprange} = W_n = \max[X_{i+1}, X_{i+2}, \dots, X_{i+z}] - \min[X_{i+1}, X_{i+1}, \dots, X_{i+z}]$$

$$W_{n+1} = \max[X_{i+z+1}, X_{i+z+2}, \dots, X_{i+2z}] - \min[X_{i+z+1}, X_{i+z+2}, \dots, X_{i+2z}]$$

$$\bar{W} = \frac{\sum_{j=n-5}^n W_j}{6}$$

$$CAM = \frac{1.746(\max l - \min l)}{6 * \bar{W}}$$

The formula for CAM is calculated using the first 6 subgroups. After that, a new calculation is made using each completed subgroup in conjunction with the last 6 subgroups.

$$\bar{\bar{X}} = \frac{1}{n} \left[\sum_{i=1}^n \bar{x}_i \right]$$

$$\bar{R} = \frac{1}{n} \left[\sum_{i=1}^n r_i \right]$$

$$\bar{X}UCL = \bar{\bar{X}} + (A_2 * \bar{R})$$

$$\bar{X}LCL = \bar{\bar{X}} - (A_2 * \bar{R})$$

$$RUCL = D_4 * \bar{R}$$

$$RLCL = D_3 * \bar{R}$$

A_2, D_3 and D_4 are tabular constants and depend on the Subgroup size.

15.8 Constants for calculation of SPC variables

Subgroup size	Divisors for estimation of standard div.		Factors for control limits					
	D ₂	C ₄	A ₂	D ₃	D ₄	A ₃	B ₃	B ₄
2	1.13	0.798	1.88	-	3.27	2.66	-	3.27
3	1.69	0.886	1.02	-	2.57	1.95	-	2.57
4	2.06	0.921	0.73	-	2.28	1.63	-	2.27
5	2.33	0.940	0.58	-	2.11	1.43	-	2.09
6	2.53	0.952	0.48	-	2.00	1.29	0.03	1.97
7	2.70	0.959	0.42	0.08	1.92	1.18	0.12	1.88
8	2.85	0.965	0.37	0.14	1.86	1.10	0.19	1.82
9	2.97	0.969	0.34	0.18	1.82	1.03	0.24	1.76
10	3.08	0.973	0.31	0.22	1.78	0.98	0.28	1.72
11	3.17	0.975	0.29	0.26	1.74	0.93	0.32	1.68
12	3.26	0.978	0.27	0.28	1.72	0.89	0.35	1.65
13	3.34	0.979	0.25	0.31	1.69	0.85	0.38	1.62
14	3.41	0.981	0.24	0.33	1.67	0.82	0.41	1.59
15	3.47	0.982	0.22	0.35	1.65	0.79	0.43	1.57
16	3.53	0.984	0.21	0.36	1.63	0.76	0.45	1.55
17	3.59	0.985	0.20	0.38	1.62	0.74	0.47	1.53
18	3.64	0.985	0.19	0.39	1.61	0.72	0.48	1.52
19	3.69	0.986	0.19	0.40	1.60	0.69	0.50	1.50
20	3.74	0.987	0.18	0.42	1.59	0.68	0.51	1.49
21	3.78	0.988	0.17	0.42	1.58	0.66	0.52	1.48
22	3.82	0.988	0.17	0.43	1.57	0.65	0.53	1.47
23	3.86	0.989	0.16	0.44	1.56	0.63	0.55	1.46
24	3.90	0.989	0.16	0.45	1.55	0.62	0.56	1.45
25	3.93	0.990	0.15	0.46	1.54	0.61	0.57	1.44

16 Cell and Net

The Pulsor Focus software offers extended networking facilities. The **Cell and Net** concept is part of the Silver RBU software version (see chapter 21, *RBU information*). It provides logically arranging of your network.

Ethernet TCP/IP networking makes it simple to program and overview all Pulsor Focus units in the network from a PC with ToolsTalk software installed. All data traffic from Pulsor Focus could also be collected and compiled by ToolsNet (PC software from Atlas Copco).

Via the Cell concept it is possible to arrange all Pulsor Focus units at an assembly station in a **Cell**. The Net concept enables functionality to group all Cells on the assembly line in one **Net**.

A Cell consists of one **CellMaster** and a maximum of 19 **CellMembers**, a total of 20 units. Cells can then be grouped into Nets, the maximum number of Cells in a Net is 1000. Each Net has a NetMaster. One Pulsor Focus unit can function both as CellMaster and NetMaster.

Every Cell has a Cell identification number (Cell ID) unique on the network. Within a Cell every Pulsor Focus unit has its own unique channel identification number (Channel ID).

CellMaster and CellMembers can be configured through the ToolsTalk Pulsor interface.



All Pulsor Focus units in a Cell must have the same software version installed.

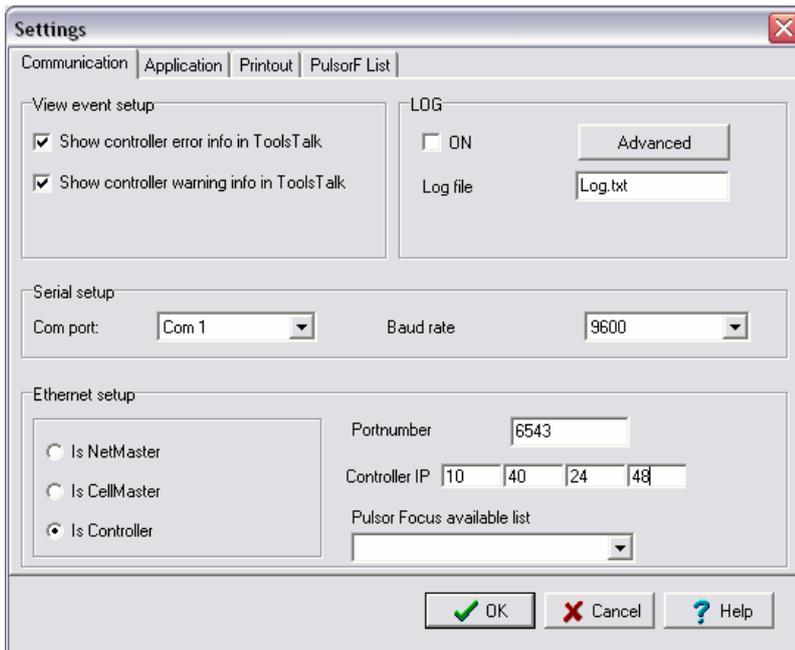


When configuring a remote Pulsor Focus, make sure it is not in use by anyone else. Otherwise it might lead to damages on the tool or a joint. It might also lead to personnel injuries.

16.1 Network setup via ToolsTalk Pulsor

Open **Settings** (via Options from the menu bar).

In the Serial setup section, set **Com port** on which the Pulsor Focus is connected.



Connect the Pulsor Focus by clicking on the **connect** button.



Open **Remote com** in the Config window.

Set the **IP address** of the connected Pulsor Focus to a unique number within the network.

Set the **Subnet mask** according to network partitioning.

Default router is optional.

Click **Store** to save settings.

Restart the Pulsor Focus unit.

The screenshot shows a configuration window titled "Config - PF:1 : Station 1". On the left is a tree view under "Parameter Overview" with categories: System setup, I/O setup, Communication (containing Remote com., Advanced com., and Serial ports setup), and Protocols. The main area is titled "Remote com." and contains the following settings:

C301 IP address	10	40	22	106
C302 Subnet mask	255	255	252	0
C303 Default router	10	40	20	1
C304 Netmaster IP address	0	0	0	0
C305 Cellmaster IP address	0	0	0	0

Below this is the "Advanced com." section with "C310 Cell keep alive" set to 6 Sec.

The "Serial ports setup" section includes:

C320 Serial 1 baudrate	9600
C321 Serial 1 protocol	ASCII
C322 Serial 2 baudrate	9600

At the bottom of the window are buttons for "Close", "Read", and "Store".

16.2 Cell and Net configuration via ToolsTalk Pulsor

Open the **Remote Com** window (Config - Communication - Remote Com).

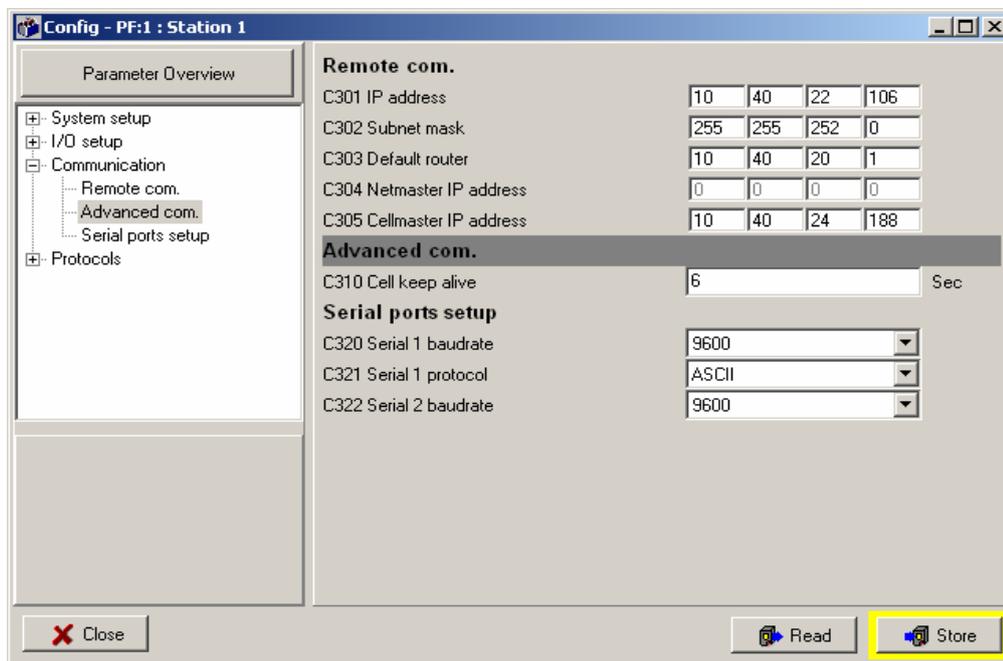
Set **IP address**, **Subnet mask** and **Default router**.

Set **NetMaster IP** address to the IP address of the NetMaster.

Set **CellMaster IP** address to the IP address of the CellMaster.



To define a CellMaster or NetMaster, set CellMaster IP address/NetMaster IP address equal to its own IP address.



Open the **Password and name** window (Config - System setup - Password and name).

Set **Channel ID** to a number unique within the Cell (1-20).

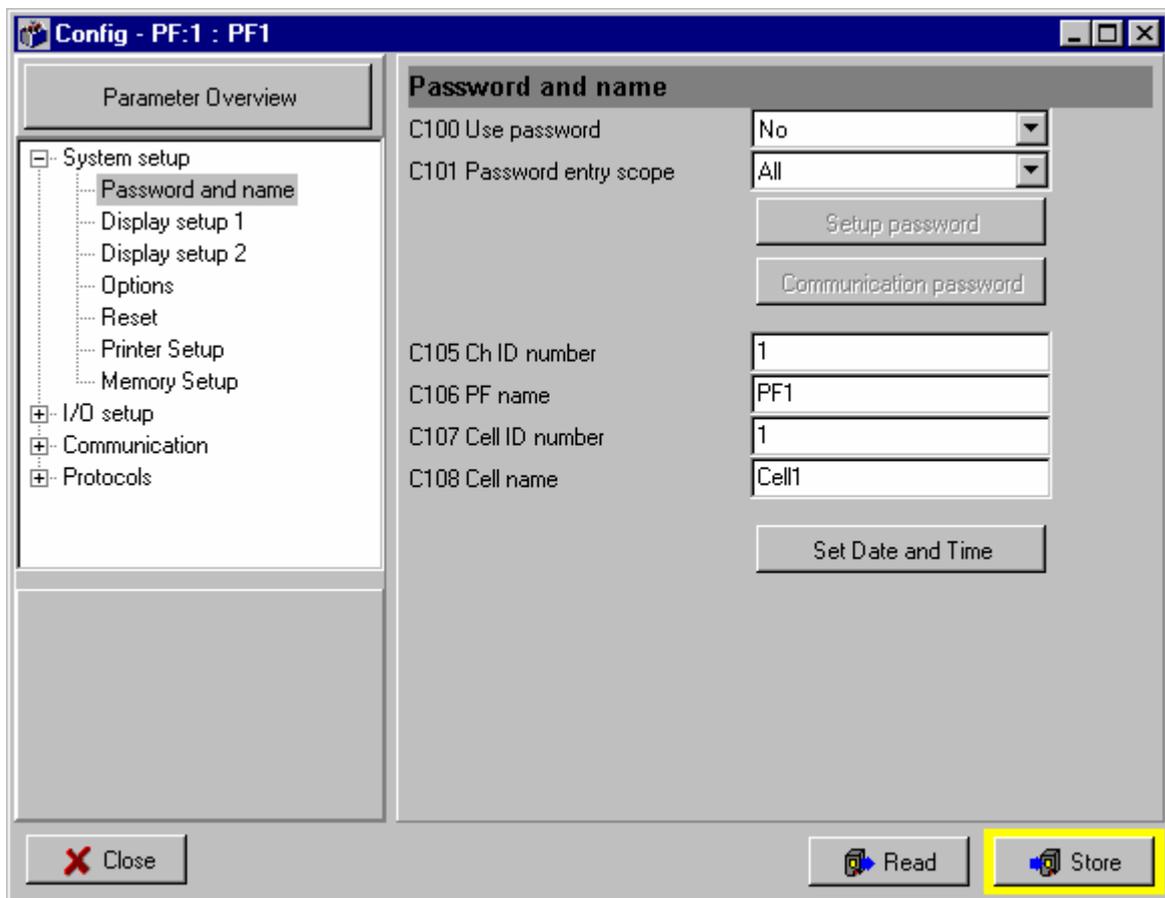
PF name is optional.

Set **Cell ID** to a number unique within the network (1-1000).

Cell name is optional.

Click **Store** to save the settings.

Restart the Pulsor Focus unit.



16.2.1 Connection with ToolsTalk

When connecting to a Controller, CellMaster or NetMaster make sure that the following settings are correct.

Open **Settings** (via Options from the menu bar).

Set **Controller IP** address of the Pulsor Focus to connect.

Under **Ethernet setup**, check whether the connected Pulsor Focus is a Controller, CellMaster or a NetMaster.

To connect the Pulsor Focus, CellMaster or NetMaster, click on the **connect** button.

When a CellMaster or NetMaster is connected, clicking on the corresponding line in the **PF Map** will expand the Cell tree/ Net tree.

17 ToolsNet

This chapter describes how to configure your Pulsor system together with ToolsNet.

17.1 Introduction



ToolsNet is part of the ATS system (Assembly Tools Software) that consists of Factory Overview, Event Monitor and ToolsNet.

ToolsNet collects, saves and displays historical tightening data from Pulsor Focus, Power Focus 3000 and PowerMacs units. It is also possible to include other units or applications that support ToolsNet Open Protocol. Once reporting is enabled, ToolsNet gives the user access to reports on shifts, production lines, individual vehicles or controller units for process improvement.

The stand-alone version of ToolsNet includes the following:

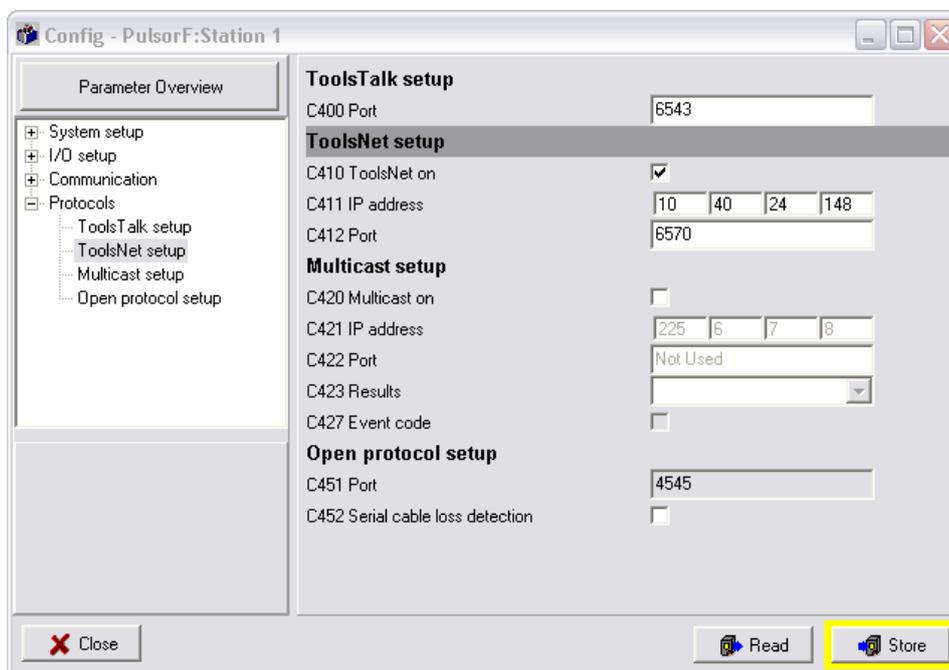
- Collection of tightening data and storage in a standard database (ORACLE or MS SQL Server). Each Pulsor Focus can store information from 4000 tightenings but the capacity in the ToolsNet is, in principle, unlimited. The information can be mapped against Pulsor Focus, object or VIN number as required.
- Web-based report interface with standard reports and statistical information.
- Process improvement through extensive statistical functions for process control.
- It is possible to save each individual tightening made with a connected Pulsor Focus unit.

17.2 Enabling the Pulsor system for ToolsNet

This section gives a step by step instruction on how to enable reporting from the Pulsor system to ToolsNet. These instructions assume that ToolsNet already has been installed.

Proceed as follows to enable Pulsor reporting to ToolsNet:

- Find out the IP-address of the ToolsNet-server.
- Start **Config** (by either double clicking on Config in the PF Map in ToolsTalk Pulsor or by selecting the function from the toolbar) and then select **ToolsNet setup** under **Protocols** from the navigation area.



Enter the values for enabling ToolsNet reporting:

- Check the **ToolsNet on** option.
- Enter the IP-address of the ToolsNet server.
- Keep the default setting for Port (6570).

Save by clicking **Store**.

The enabling of ToolsNet reporting is now complete. Verify that results are stored by making a few tightenings and check that the Pulsor Focus unit and results are shown in the ToolsNet web reporter interface. The Pulsor Focus unit is found under the PF3000 folder in the ToolsNet web reporter tree view.

See the *ToolsNet User Manual* for detailed information on how to use ToolsNet features and functionality.

18 Accessories

18.1 Introduction

This chapter describes available accessories that can be used together with your Pulsor system.

This chapter focuses on the configuration aspects of ToolsTalk Pulsor, for detailed information on the specific accessory; see the corresponding *ASL document* for that accessory.

Some accessories are connected via relays and digital inputs and some are connected via the I/O Bus. Up to 15 accessory units can be connected to the I/O Bus. The I/O Bus is a CAN based serial bus. The benefit of using serial bus-based accessories (I/O Bus) is that they can be connected in series, from accessory to accessory rather than hard wiring each accessory to the Pulsor Focus. The bus and the accessories are powered with 24V DC, 1 A from Pulsor Focus unit. If more current is needed, the bus must be powered externally. Every device has a 24 V DC input for this purpose.

18.2 Tool Lock Box

The **Tool Lock Box** is used to shut off the air supply to the tool.

There are two main reasons why you might want to cut off the air supply:

- The first reason is that the Pulsor Focus is not always in a state when it accepts tightening data from the tool. For example when no Pset is selected or the selected Pset is lacking a Reference Setup or when an event that needs acknowledging has occurred.
- The second reason is workflow control. You might want to shut off the tool to alert the operator that the tightening that was performed was rejected or upon completing a batch or a Job. Another case is when using line control for process control.

The Tool Lock Box consists of a valve, two lamps, two buttons and an override switch with a key. The green lamp indicates that the air valve is open and the red lamp indicates that the valve is closed. When the override key is turned the air valve will open and both lamps will be lit, indicating override mode.



When performing tightenings in override mode, no tightening results will be stored. There will however be events stored in the event log indicating that the operator has done something out of the order.

The green button should be set to enable the tool to unlock the air supply. The white button may be used for any purpose. There is also an Extension Box if it is more suitable to place the buttons closer to the work area. The buttons of the Extension box is connected in parallel with the buttons on the Tool Lock Box.



Tool Lock Box order number: 8433 0606 17 Extension Box order number: 8433 0606 18

18.2.1 Setup of Tool Lock Box

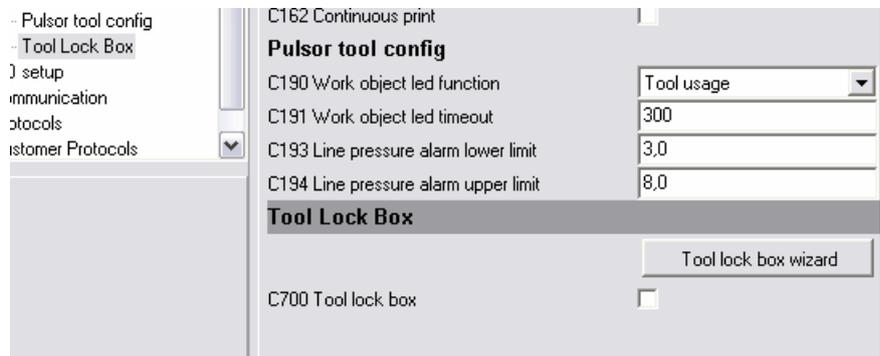
Hardware Setup

Connect the air inlet to the air supply and the air outlet to the tool. Connect the Tool Lock Box to the digital inputs and relays at the back of the Pulsor Focus. If Pulsor Focus' internal digital inputs or relays are already occupied then the Tool Lock Box can be connected to an I/O Expander instead. An external 24V power supply will be needed in that case. Tool Lock Box can also be connected to the output connector of an Operator Panel.

Software Setup Default Settings

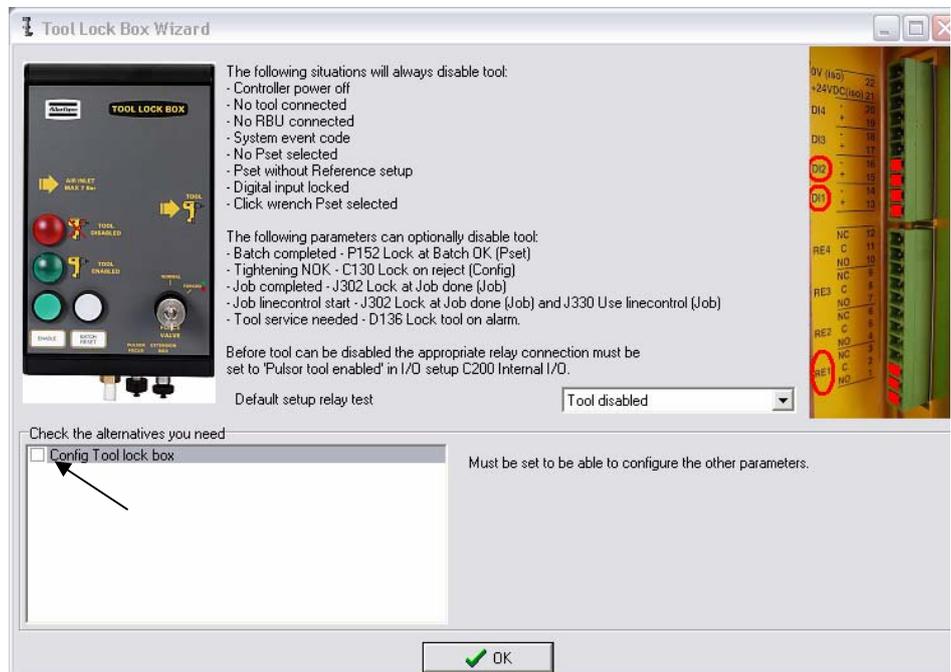
Press the button **Tool lock box wizard**. A new window will open.

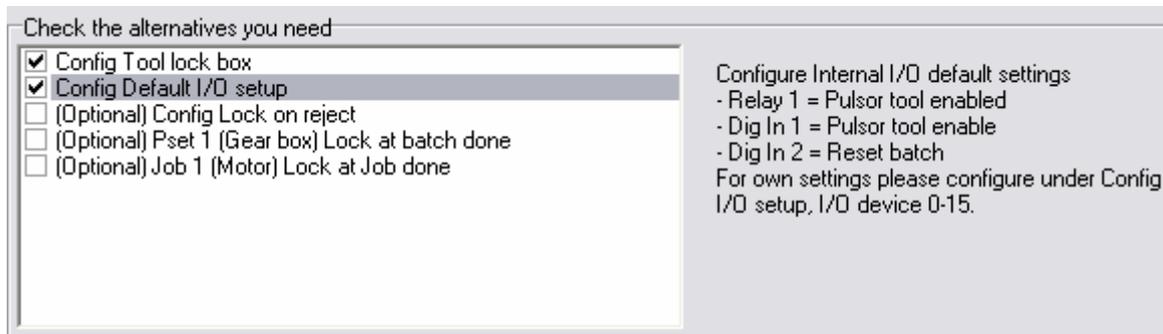
It is always possible to see in parameter *Tool lock box [C700]* if it is configured in the system or not.



In this window there is information about which situations will shut off the air supply.

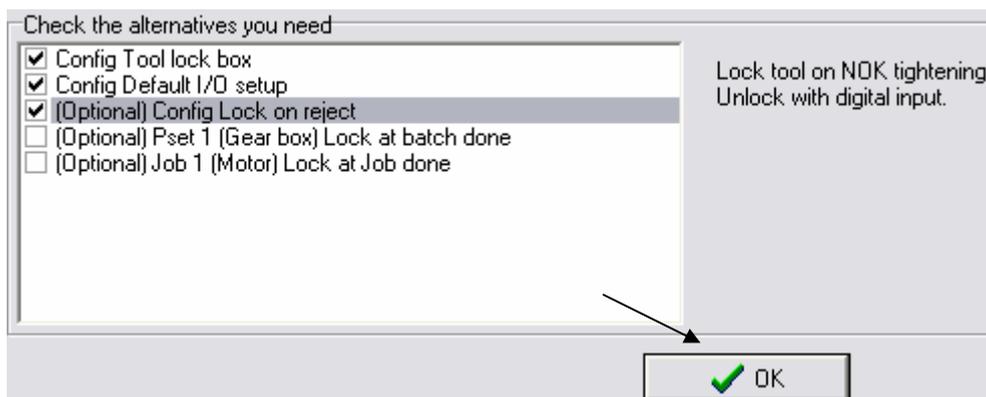
Click on the check box **Config Tool lock box**.



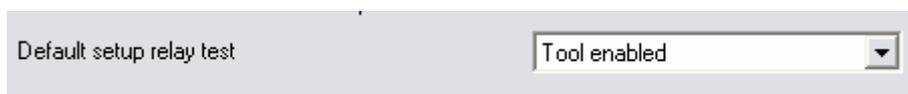


After checking the **Config Tool lock box** button, the system will detect the Optional settings which also can lock the tool according to the Psets and Jobs that are configured.

Now, check the **Config Default I/O setup** button to confirm that the Default I/O settings is to be used. After this select the necessary optional conditions that shall lock the tool.



It is possible to test the Tool Lock Box when using the default I/O setup.



Modify relay output by selecting “Tool enabled” and “Tool disabled”.

Finally, press the OK button. The *Tool Lock Box check [C700]* is now set. You are now ready to start using the Tool lock box.

Software Setup Own I/O settings

The Tool lock box can be used in other I/O configurations than the default as well. This can be done in the same way as above if the checkbox **Config Default I/O setup** is left unchecked when pressing the OK button. Proceed to configure the I/O device that shall be used together with the Tool lock box according to section 18.4.1, *Setup of I/O Expander*.



Tool lock box may still inhibit air flow even if removed from the software configuration. If removal is needed it is important that the tool lock box is physically disconnected as well.

The Tool Lock Box is now set up to cut off the air supply in these situations:

- When Pulsor Focus is powered off. In this case turning the override key will not work since the air valve takes its power from the Pulsor Focus.
- No tool connected or tool connection problem.
- No RBU connected.
- System event, i.e. an event that need acknowledgement.
- No Pset selected.
- Pset without Reference setup selected.
- Locked through digital input.
- Pset with Click wrench strategy selected.

The Pulsor Focus can also optionally disable the air supply in these situations:

- Batch completed (Pset parameter *Lock at batch done [P152]*).
- Non-approved tightening (Config parameter *Lock on reject [C130]*).
- Job completed (Job parameter *Lock at job done [J302]*).
- Job line control (Job parameters *Use line control [J330]* and *Lock at job done [J302]*).
- Service alarm (Diagnostics parameter *Lock on alarm [D136]*).

18.3 Selector

The **Selector** is a socket tray that can guide the operator through a JOB sequence with LEDs. When a socket is lifted, the corresponding Pset will be selected. When using more than one Pset it is very convenient to use a selector. When a socket is lifted, the corresponding Pset will be selected.

There are two different types of Selectors, Selector 4 and Selector 8, the only difference being that Selector 4 has four sockets and Selector 8 has eight sockets.

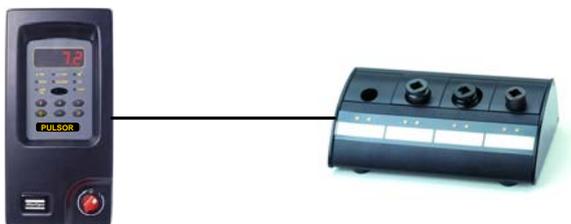


Selector 4 order number: 8433 0610 04 Selector 8 order number: 8433 0610 08

18.3.1 Setup of Selector

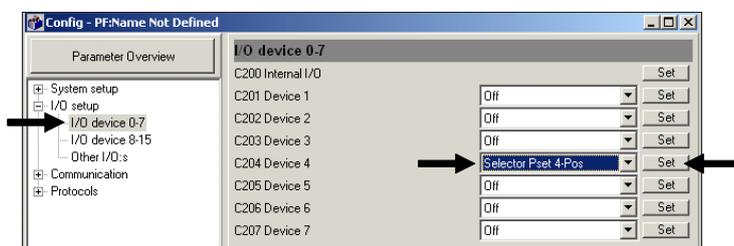
Hardware Setup

Connect the Selector via I/O Bus to the Pulsor Focus. Make sure that the I/O Bus is terminated in both ends. For detailed information, see chapter 24, *Connector descriptions* and the *ASL document* for Selector.



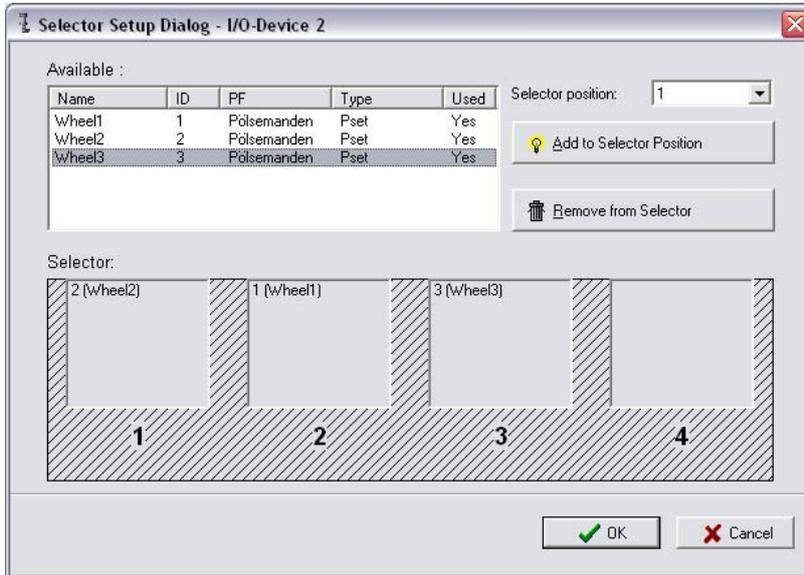
Software Setup

In ToolsTalk Pulsor, open the Config dialog and select I/O Setup. Select Selector under appropriate I/O Device. Device 5 is the default for Selector 4 and device 6 is the default for Selector 8.



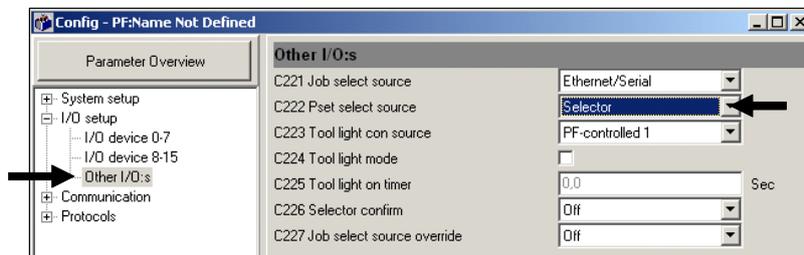
Click on **Set**.

Drag the Psets that you have created before in the desired positions of the socket tray. You can have more than one Pset per socket but then you must use a digital input for toggling between the Psets.



Click **Store** to save settings.

Then go back to **Other I/Os** and set the Pset select Source to Selector and then **Store** again to complete the setup in ToolsTalk Pulsor.



18.4 I/O Expander



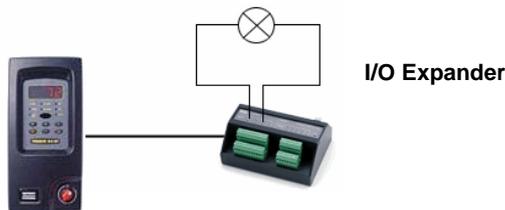
The **I/O Expander** enables the connection of additional inputs and relays when more than those built-in are required. There are 8 inputs and 8 relays with the same functionality as the four built-in I/Os. Each input and relay can be configured individually.

I/O Expander order number: 8433 0564 38

18.4.1 Setup of I/O Expander

Hardware Setup

Connect the I/O Expander via I/O Bus to the Pulsor Focus. Make sure that the I/O Bus is terminated in both ends. For detailed information, see chapter 24, *Connector descriptions* and the *ASL document* for I/O expander.

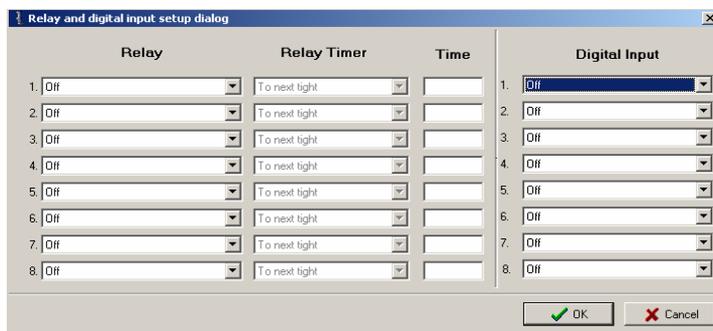


Software Setup

In ToolsTalk Pulsor, open the Config dialog and select **I/O Setup**. Select **I/O Expander** under appropriate I/O Device. Device 2 is the default for I/O Expander.

Select your alternatives. The procedure is the same as for Internal I/O: See section 10.3.1, *Internal I/O*.

Click **Store** to complete the setup in ToolsTalk Pulsor.



18.5 RE-Alarm



The **RE-Alarm** gives status information to users using lights and/or audible signals. It is connected to the Pulsor Focus on the I/O Bus. The RE-Alarm is configured in the Pulsor Focus and it is possible to configure the information you want to see.

RE-Alarm order number: 8433 0560 03

18.5.1 Setup of RE-Alarm

Hardware Setup

Connect the RE-Alarm via I/O Bus to the Pulsor Focus. Make sure that the I/O Bus is terminated in both ends. For detailed information, see chapter 24, *Connector descriptions* and the *ASL document* for Selector.

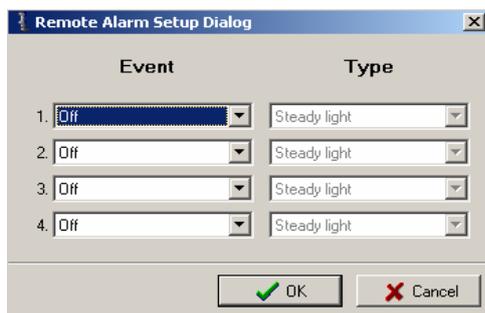


Software Setup

In ToolsTalk Pulsor, open the Config dialog and select **I/O Setup**. Select **RE-Alarm** under appropriate I/O Device. Device 3 is the default for RE-Alarm.

Select the events and the type action it should trigger.

Click **Store** to complete the setup in ToolsTalk Pulsor.



18.6 Other accessories

18.6.1 Barcode reader

The Pulsor Focus is able to identify barcodes via a **Barcode reader** or a RF tag, which enables values to be input from specific car models and tool guides. See chapter 12 *Identifierr*, how to configure a barcode reader.



There is no standard Atlas Copco barcode reader model.

18.6.2 Selector 15 R switch

With this selector switch the desired Pset can be selected. Order Number 8433 0606 15.

18.6.3 Pressure regulator

As mentioned in section 4.5, *Regulating the air pressure*, a **Pressure regulator** is of great importance. A regulator in the Atlas Copco MIDI-series is recommended.

18.6.4 Operator panel

Operator panel (OP) is an external device for Power Focus and Pulsor Focus. It is a general purpose lamp- and switchbox, replacing the customer specials that are made today. The operator panel is configured as 3 I/O expanders. See section 18.4.1, *Setup of I/O Expander*.

18.6.5 Stacklight

The **Stacklight** has four lights that are piled on each other (it is possible to use up to five lights on the stack simultaneously). The user is free to change the order of the lights and also replace lights with different colors. The stacklight is configured as 2 I/O expanders. See section 18.4.1, *Setup of I/O Expander*.

19 Event codes

Event codes are displayed as pop up windows to inform users the status of the Pulsor Focus. All events are stored in the **statistics event log** or the **general event log**, depending on the event code type. Number of events that can be stored in the log depends on RBU (see section 21.1, *RBU functionality*). Once the log is full, the oldest events will be overwritten by the most recent ones.

19.1 ToolsTalk Pulsor operations



This section shows only examples of possible parameter settings.

To open the event log, click **get event log** in the **options** list.

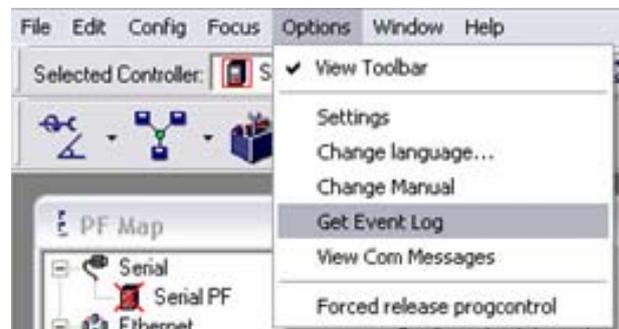
Click **clear** to delete all events in the log.

Click **save to file** to store the event log as a text file.

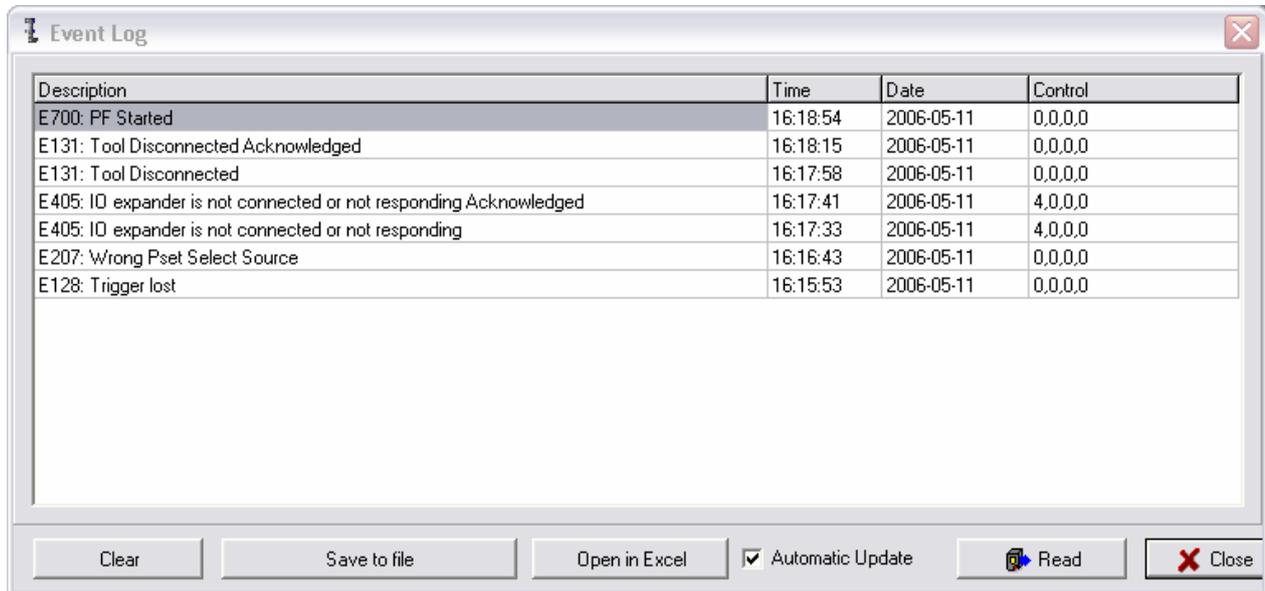
Click **open in Excel** to export the log to the Microsoft Excel software.

Click **read** to update status of the event code window.

When option **automatic update** is checked, the events in the log are showed in “realtime” (in the same way as event pop up widows).



Event codes



The screenshot shows a software window titled "Event Log" with a close button in the top right corner. The window contains a table with four columns: "Description", "Time", "Date", and "Control". The table lists several events, including "E700: PF Started", "E131: Tool Disconnected Acknowledged", "E131: Tool Disconnected", "E405: IO expander is not connected or not responding Acknowledged", "E405: IO expander is not connected or not responding", "E207: Wrong Pset Select Source", and "E128: Trigger lost". Below the table, there are several buttons: "Clear", "Save to file", "Open in Excel", a checked "Automatic Update" checkbox, a "Read" button with a refresh icon, and a "Close" button with a red X icon.

Description	Time	Date	Control
E700: PF Started	16:18:54	2006-05-11	0,0,0,0
E131: Tool Disconnected Acknowledged	16:18:15	2006-05-11	0,0,0,0
E131: Tool Disconnected	16:17:58	2006-05-11	0,0,0,0
E405: IO expander is not connected or not responding Acknowledged	16:17:41	2006-05-11	4,0,0,0
E405: IO expander is not connected or not responding	16:17:33	2006-05-11	4,0,0,0
E207: Wrong Pset Select Source	16:16:43	2006-05-11	0,0,0,0
E128: Trigger lost	16:15:53	2006-05-11	0,0,0,0

19.2 Event groups

Event code	Group	Description
E001-E099	0	Rundown failures
E100-E199	1	Event related errors
E200-E299	2	User input events
E300-E399	3	Statistical events
E400-E499	4	Communication events
E500-E599	5	Hardware events (tool)
E600-E699	6	Hardware events (DC3000/MC3000)
E700-E799	7	Hardware events
E800-E899	8	Software events
E900-E999	9	Events MMI3000

19.3 Abbreviation

Abbreviation	Description
ACK	Acknowledgement
TLU	Tool locked unconditionally when Tool Lock Box is connected (apart from faults that must be Acknowledged).

19.4 Event code list

19.4.1 Rundown failures

Code	Name of event	Information	Note
E050	Tool calculation error	Calculation error in the tool. The results are not reliable.	
E051	Tool communication error	Communication error between tool and controller.	
E052	Sensor mechanical error	Sensor wheel mechanical error.	ACK
E053	Sensor signal error	Angular sensor signal fault.	

19.4.2 Event related errors

Code	Name of event	Information	Note
E102	Rundown prohibited due to Lock on Reject	This event code is displayed when an attempt to make a tightening is made and tightenings are disabled by the function "Lock on Reject".	
E103	Tool locked by digital input	This event is shown when an attempt to make a tightening is made and tightenings are disabled by digital input.	TLU
E107	Rundown prohibited due to Line Control	A Job using Line Control is selected. The Job does not start until Line Control Start signal is received.	
E117	Tool locked – cannot access RBU	Pulsor Focus cannot communicate with RBU. Pulsor Focus must be restarted to protect data.	TLU
E128	Trigger lost	When the function Trigger lost is activated in the Pset, this event indicates that the trigger of the tool was released before final target.	
E131	Tool Disconnected	This event code will be generated when the tool is disconnected (logically or electrically) from or is not connected to the Pulsor Focus. The event code is also generated when an attempt to start a disconnected (logically or electrically) tool is done. Furthermore, a damaged cable can result in a disconnected tool, which generates the event code.	ACK TLU
E136	Tool locked by batch OK	This event code is displayed if the tool is locked by the function "Lock at batch done".	
E137	Tool locked by fieldbus	The tool is locked by fieldbus.	
E139	Tool locked by Open protocol	The tool is locked by open protocol user.	
E140	Insert user ID card to release tool	The tool is locked; the user must insert his ID card in the card reader to release the tool.	
E147	Tool locked by click wrench Pset	Tool trigger was pressed while a Pset with click wrench strategy was selected.	TLU
E150	Job client does not respond	When running a Cell Job, this event is displayed by the Job master when one of the Job members does not respond. The first parameter contains <i>Channel ID number [C105]</i> for the Job client that does not respond. The second, third and fourth parameters are not used.	
E151	Job in OFF mode	It is not possible to select a new Job (the Pulsor Focus is in Job OFF mode).	

Event codes

Code	Name of event	Information	Note
E152	PF locked in job mode	This event appears when in a forced cell Job an attempt is made to tighten with a controller which is not currently active or when a controller has performed all tightenings.	
E153	Not Ok to select new job	A Job is currently running, it is not possible to select a new Job until the first is finished in some way (completed or aborted). This message is also displayed if a Job is selected on a Job member.	
E154	Remote job running	When running a Cell Job, this is displayed by the Job members when a cell Job is selected on the Job master.	
E155	Remote job aborted	When running a Cell Job, This is displayed by the Job members when a cell Job is aborted.	
E156	Job members lost	When running a Cell Job, this is displayed by the master when it has lost contact with one of its Job member.	
E157	Job reference lost	When running a Cell Job, this is displayed by the Job members when they have lost contact with their Job Master.	
E158	Invalid Job ID	When the selected Job does not exist.	
E159	No Pset In Selected Job	When the selected Job does not contain any Pset.	
E160	Job select source not valid	Attempt to select a Job with the wrong input source.	
E161	Line Control Alert 1	The line control has been activated, and the first control alert limit has been reached.	
E162	Line Control Alert 2	The line control has been activated, and the second control alert limit has been reached.	
E166	Job aborted	Job has been aborted.	
E167	Max coherent Not OK tightenings reached	When the number of NOT OK tightenings in a row is reached, then the tool will be locked and can be unlocked only via a digital input (reset NOK counter).	TLU
E180	Euchner Ident System only supports Siemens 3964R protocol	The protocol settings for the serial COM port 1 is not set to 3964R, it is not possible to use the Euchner Ident System with this configuration.	
E181	Not possible to read ID card	It was not possible to read the ID card inserted in the Euchner system	
E182	Pulse filter condition detected	Pulse filter is tagged during Reference setup when the pulse filter is inactivated.	
E183	Tightening data timeout	Maximum tightening time exceeded (30 seconds).	ACK
E184	Tightening with a Pset without a Reference Setup	A tightening has been performed with a Pset that has no Reference Setup.	TLU
E185	Line pressure out of range	Line pressure is not within stipulated limits.	ACK
E186	Relative torque variation high in Reference Setup	Reference Setup has relative torque variation outside the interval 85% - 115%.	
E187	Target torque and measured torque differs more than 5%	Information: the measured torque differs more than 5 % from the target torque.	
E188	Target torque and measured torque differs more than 15%	Warning: the measured torque differs more than 15 % from the target torque. Consider adjusting the tool and performing Reference Setup again.	ACK
E189	Reference Setup pulse limit exceeded	The Reference setup tightening has more than 500 pulses and will be discarded.	ACK

Code	Name of event	Information	Note
E192	Air pressure sensor error	Air sensor reading is not normal. The cause of this may be technical problems with the air pressure sensor or a bad air sensor tuning.	
E193	Too many tightenings performed in Reference Setup	More than the maximum 50 tightenings have been performed in Reference Setup. Further results will be discarded.	
E194	Reference Setup aborted due to exchange of tool	The tool was exchanged during the Reference Setup.	ACK
E195	Reference Setup contains invalid parameter	Reference Setup contains one or more tightenings with invalid result for one or more parameter.	ACK

19.4.3 User input events

Code	Name of event	Information	Note
E206	Pset number invalid	An attempt was made to do a tightening with the wrong Pset.	TLU
E207	Wrong Pset Select Source	Attempt to select Pset from a source not specified in the Cset.	
E208	Not Ok to select new Pset	It is not allowed to select new Pset when the already selected Pset is auto selected by Job.	
E211	Wrong Identifier input source	Wrong input source for a barcode string.	
E240	Password incorrect input source	The password is entered from an invalid source according to the configuration.	
E250	Max time for first tightening run out (job)	This message is displayed and the Job is terminated if the first tightening is not performed within the specified time.	
E251	Max time to complete Job run out	This message is displayed and the Job aborted if it is not completed within the specified time.	
E260	Number of tightenings in Reference Setup below the recommended	A Reference Setup with a fewer number of tightenings than recommended has been performed. The recommendation is at least ten tightenings.	ACK

19.4.4 Statistical events

Code	Name of event	Information
E300	Xucl relative torque	The last subgroup mean relative torque value is larger than the upper control limit.
E301	Xlcl relative torque	The last subgroup mean relative torque value is lower than the lower control limit.
E302	Rucl relative torque	The last subgroup range relative torque value is larger than the upper control limit.
E303	Rlcl relative torque	The last subgroup range relative torque value is lower than the lower control limit.
E304	Cp relative torque	The relative torque Cp is lower than 2.
E305	Cpk relative torque	The relative torque Cpk is lower than 1,33
E306	7inc x relative torque	Trend deviation alarm, the subgroup relative torque mean value has increased 7 times consecutively.
E307	7dec x relative torque	Trend deviation alarm, the subgroup relative torque mean value has decreased 7 times consecutively.
E308	7inc r relative torque	Trend deviation alarm, the subgroup relative torque range value has increased 7 times consecutively.
E309	7dec r relative torque	Trend deviation alarm, the subgroup relative torque mean value has decreased 7 times consecutively.

Event codes

Code	Name of event	Information
E310	7above x relative torque	Trend deviation alarm, the subgroup relative torque mean value has been above the average mean value of the average of the last ten subgroups 7 times consecutively.
E311	7below x relative torque	Trend deviation alarm, the subgroup relative torque mean value has been below the average mean value of the average of the last ten subgroups 7 times consecutively.
E312	7above r relative torque	Trend deviation alarm, the subgroup relative torque range value has been above the average range value of the average of the last ten subgroups 7 times consecutively.
E313	7below r relative torque	Trend deviation alarm, the subgroup relative torque range value has been below the average range value of the average of the last ten subgroups 7 times consecutively.
E314	2sigma x relative torque	Trend deviation alarm, the last subgroup relative torque average is outside $X_{rt}\text{-bar-bar-}2$ sigma.
E315	2sigma r relative torque	Trend deviation alarm, the last subgroup relative torque range average is outside $R_{rt}\text{-bar-bar-}2$ sigma.
E316	Xucl line pressure	The last subgroup mean line pressure value is larger than the upper control limit.
E317	Xlcl line pressure	The last subgroup mean line pressure value is lower than the lower control limit.
E318	Rucl line pressure	The last subgroup range line pressure value is larger than the upper control limit.
E319	Rlcl line pressure	The last subgroup range line pressure value is lower than the lower control limit.
E320	Cp line pressure	The line pressure Cp is lower than 2.
E321	Cpk line pressure	The line pressure Cpk is lower than 1,33
E322	7inc x line pressure	Trend deviation alarm , the subgroup line pressure mean value has increased 7 times consecutively.
E323	7dec x line pressure	Trend deviation alarm , the subgroup line pressure mean value has decreased 7 times consecutively.
E324	7inc r line pressure	Trend deviation alarm , the subgroup line pressure range value has increased 7 times consecutively.
E325	7dec r line pressure	Trend deviation alarm , the subgroup line pressure mean value has decreased 7 times consecutively.
E326	7above x line pressure	Trend deviation alarm, the subgroup line pressure mean value has been above the average mean value of the average of the last ten subgroups 7 times consecutively.
E327	7below x line pressure	Trend deviation alarm, the subgroup line pressure mean value has been below the average mean value of the average of the last ten subgroups 7 times consecutively.
E328	7above r line pressure	Trend deviation alarm, the subgroup line pressure range value has been above the average range value of the average of the last ten subgroups 7 times consecutively.
E329	7below r line pressure	Trend deviation alarm, the subgroup line pressure range value has been below the average range value of the average of the last ten subgroups 7 times consecutively.
E330	2sigma x line pressure	Trend deviation alarm, the last subgroup line pressure average is outside $X_{tq}\text{-bar-bar-}2$ sigma.
E331	2sigma r line pressure	Trend deviation alarm, the last subgroup line pressure range average is outside $R_{tq}\text{-bar-bar-}2$ sigma.
E333	Not allowed subscription	The requested statistic subscription is not allowed.
E334	No statistic available for this Pset	The Pset strategy is not suitable to calculate statistics (no strategy is chosen, click wrench).
E335	Not enough data	No enough data were available to calculate the statistic control limits.
E336	Mem alloc fail	It was not possible to allocate enough memory for the statistic subscription.

19.4.5 Communication events

Code	Name of event	Information	Note
E401	Duplicate device ID:s on IO bus	Two IO devices with the same ID are present on the I/O Bus.	ACK
E403	IO device not responding	The I/O device is not properly connected or the ID of the device is not the same as the one configured.	ACK
E404	Selector is not connected or not responding	The selector is not properly connected or the ID of the selector is not the same as the one configured.	ACK
E405	IO Expander is not connected or not responding	The I/O expander is not properly connected or the ID of the I/O expander is not the same as the one configured.	ACK
E406	RE-alarm is not connected or not responding	The Remote alarm is not properly connected or the ID of the Remote alarm is not the same as the one configured.	
E417	Too many communication sessions at one time	There are too many connections at the same time (ToolsTalk Pulsor, ToolsNet, Open Protocol etc.).	ACK
E433	No RBU present	No RBU detected at start-up or RBU found missing at runtime.	ACK
E434	RBU Timeout	RBU did not respond to command from Pulsor Focus.	
E436	RBU filesystem warning	There has been a repairable fault in the RBU file system, e.g. Power-off or other interruption during download.	ACK
E437	RBU filesystem corrupt	The RBU file system has too many faults. An attempt will be made to repair it by means of erasing the RBU.	ACK
E438	RBU file mismatch	A file with incorrect name or size was returned to a read request.	ACK
E440	RBU no files	A file type is not present in the RBU at start-up.	ACK
E441	RBU access too busy	RBU has answered to the poll but Pulsor Focus is too busy to receive the reply.	ACK
E442	RBU no such file	A file has not been localized in the RBU. The RBU is corrupt or not present.	ACK
E444	RBU packet rejected	RBU responds with an answer not matching the last request. This is probably due to duplicates sent when the Pulsor Focus does not acknowledge packages.	ACK
E445	RBU corrupt	the RBU is corrupt.	ACK
E446	RBU read error	Read operation failed.	ACK
E447	RBU write error	Write operation failed.	ACK
E448	RBU delete error	Delete operation failed.	ACK
E449	RBU flush error	Flush operation failed.	ACK
E450	RBU list error	Update operation failed.	ACK
E451	RBU Update Failed	Database synchronization between Pulsor Focus and RBU failed.	ACK
E460	Fieldbus type mailbox message fault	Error detected in initialisation of fieldbus.	
E461	Fieldbus type gen com fault	Error detected in initialisation of fieldbus.	
E462	Fieldbus mailbox message fault	Error detected in initialisation of fieldbus.	
E463	Fieldbus gen com fault	Error detected in initialisation of fieldbus.	
E464	Fieldbus hardware fault	The fieldbus module is broken and has to be replaced.	

Event codes

Code	Name of event	Information	Note
E465	Fieldbus dip switch error	The software tries to configure the value of node address or baud rate, but the address switch on the fieldbus module is not in the right position to enable software setting. Set switches in the right position and then turn on the power.	
E466	Fieldbus offline	The fieldbus went from online to offline. This is just a warning.	
E467	Fieldbus configuration fault	Error detected in initialisation of fieldbus.	
E468	Fieldbus hardware mismatch	The fieldbus module installed in Pulsor Focus is not the same fieldbus type as configured with ToolsTalk Pulsor. Change fieldbus module or configuration to get a match.	
E469	Fieldbus init error	Error detected in initialisation of fieldbus.	
E470	Fieldbus PCP error	InterBus PCP length error.	
E471	Fieldbus claim area failed, lost one message	One packet lost.	
E472	Fieldbus release area timeout	Release area command timed out.	
E473	Fieldbus communication buffer alarm	Communication buffer full. Decrease fieldbus update timer.	
E474	Fieldbus monitor buffer alarm	Fieldbus monitor buffer full. Turn off fieldbus monitor mode.	
E475	Fieldbus PsetID mismatch selector lifted socket	Fieldbus selected Pset does not file the lifted socket.	
E480	Channel ID not valid	The channel ID configured is not within the limits permitted. The channel ID must be configured between 1 and 20.	ACK
E481	Cell member registration failed	The cell member registration failed because one cell member is already registered with the same channel ID.	ACK
E490	Cell ID not valid	The cell ID configured is not within the limits permitted. The cell ID must be configured between 1 and 999.	ACK
E491	Net member registration failed	The net member registration failed because one net member is already registered with the same cell ID.	

19.4.6 Hardware events (tool)

Code	Name of event	Information	Note
E502	Tool service interval expired	Service the tool.	
E510	Tool type not supported by RBU	Change tool or change RBU	ACK
E513	Tool EEPROM corrupt – service tool	Checksum indicates that tool memory is corrupt. Tool must be serviced.	ACK
E580	Tool drift alarm relative torque deviation low	Mean torque deviation below limit.	
E581	Tool drift alarm relative torque deviation high	Mean torque deviation above limit.	
E582	Tool drift alarm pulse frequency low	Mean pulse frequency below limit.	
E583	Tool drift alarm pulse frequency high	Mean pulse frequency above limit- check oil!	

19.4.7 Hardware errors DC3000/MC3000

Code	Name of event	Information	
E601	System voltage low	DC voltage too low.	ACK

19.4.8 Hardware events

Code	Name of event	Information	Note
E700	PF started	This event code is only visible in the event log and used when the Pulsor Focus is started.	
E701	Backup battery low level	The backup battery level is low, it may be change soon.	
E702	Backup battery empty or missing	The backup battery level is very low or the battery is missing. This must be replaced as soon as possible; otherwise data in NVRAM can be corrupt.	

19.4.9 Software events

Code	Name of event	Information	Note
E805	PF Model unknown	This event is displayed after start-up when the RBU is missing, or when the RBU revision can not be supported by the controller or when the RBU license file is missing or can not be read by the boot code.	
E808	Error condition detected by software	An error condition was detected by software.	ACK
E822	No Job ACK from control	Tightening initialization phase failed. Hardware failure.	ACK
E840	Feature Not Available In Software Revision	This event is displayed if when attempt is made to run multistage with a bronze version, or handle a Pset with a Pset-id larger than the max number of Pset.	
E851	Connection with Tools Net server lost	The connection with the Tools Net server was lost; the Pulsor Focus is trying to reconnect. The Tools Net server might be down or it might be an Ethernet cable problem.	
E856	Router unreachable	The router programmed in the configuration setting could not be reached. Check the network configuration and in particularly the subnet mask and the default router	ACK
E857	Reboot needed before changes take effect	The configuration changes will not take effect before a system reboot.	ACK
E858	IP address already in use	The IP address of this Pulsor Focus is already in use by another system.	
E859	IP address collision	Another system attempts to use the same IP address as this Pulsor Focus.	
E862	Ethernet overload Error	The Ethernet driver of the Pulsor Focus is temporarily switched off due to an overloaded network.	ACK
E863	IP Port already in use	An attempt was made to bind a TCP or UDP socket to a port already in use. For instance, a customer protocol might be using the same port as ToolsTalk.	
E864	Ethernet echo detected	An Ethernet packet was discarded, since its source MAC address was equal to the Pulsor Focus's own MAC address. Notice that this message only occurs once during runtime, even if several such packets are detected. There is most likely a problem in the network.	

19.4.10 Events MMI3000

Code	Event name	Information	Note
E901	MMI Start-up Error	Error in MMI detected.	ACK

19.5 Sub information for event codes

Each event code is logged together with four integer parameters. For some event codes these parameters are used to store extra information about the event. See section 19.1, *ToolsTalk Pulsor operations* how to display event code integers.

The follow sections contain event codes and explanations of the related integer parameters.

19.5.1 E150

The first parameter contains the *Ch ID number [C105]* for the job client not responding.

The second, third and fourth parameters are not in use.

19.5.2 E156

The first parameter contains the *Ch ID number [C105]* for the lost job client.

The second, third and fourth parameters are not in use.

19.5.3 E403, E404, E405 and E406

The first parameter contains I/O-device ID of the not responding I/O-device.

The second, third and fourth parameters are not in use.

20 Parameter list

This chapter specifies the parameters of the Pulsor Focus functionality.

To get a visual overview of all the parameters for each parameter type, click on the **Parameter Overview** button top-left in the current window.

Clicking on a specific parameter in the displayed overview window is a shortcut way of going directly to that parameter in the Config functionality.

It is possible to display parameter numbers in ToolsTalk Pulsor by activating **Show parameter number** under the Application tab in Settings.

20.1 Pset

20.1.1 P1xx Programming

P10x Tightening Options

Parameter number	Parameter name	Description	Default setup
P100	Control strategy	Click wrench: A digital input signals the completion of an arbitrary activity. No tightening is performed by tool. EP monitoring: Tightenings performed with Pulsor tool. The monitoring parameters can be selected by the user.	EP monitoring
P107	Click wrench no.	This parameter is only used if Click wrench is chosen as <i>Control strategy [P100]</i> . It is used to connect the Click Wrench strategy to any one of four defined DigIn.	Click wrench 1

P14x Tightening Options

Parameter number	Parameter name	Description	Default setup
P144	Cycle Abort timer	This parameter is used to limit the time a tightening is allowed to progress.	30 seconds

P15x Batch count

Parameter number	Parameter name	Description	Default setup
P150	Batch count	<p>Activates a function that measures how many times a tightening is repeated. It must be determined from where <i>Batch size [P151]</i> value should be read, if <i>Batch count [P150]</i> is activated.</p> <p>Off: Batch count functionality is not used.</p> <p>Pset: Use Psets Batch size.</p> <p>Ethernet/Serial: An external source decides <i>Batch size</i> via Ethernet or serial interface.</p> <p> If batch count is used in Job this parameter shall be set to “off”.</p>	Off
P151	Batch size	<p>The size can be 1 - 99.</p> <p>To set this parameter, the <i>Batch count [P150]</i> must be in active mode.</p>	1
P152	Lock at batch done	Used in conjunction with Tool Lock Box. Setting “Lock at batch done” turns of the air supply upon completing a batch to indicate to the user that all bolts have been tightened.	Off
P153	Max coherent NOK's	<p>Defines the number of possible not ok tightenings in a row.</p> <p>Accessible when <i>batch count [P150]</i> is set to “Pset” or “off”. Scope: 1 - 10.</p>	0 (Off)

20.1.2 P4xx Pset setup

P40x Pset administration

Parameter number	Parameter name	Description	Default setup
P400	View existing Psets	To view existing Psets in the current PF channel. Both numbers and logical names will be displayed.	
P401	Create new Pset	To create and open a new Pset. Each Pset has a unique ID number between 1 and 8 (or up 300 with the Configurable Memory functionality).	
P402	Name Pset	Used when a selected Pset is to be named with a logical name. Up to 25 characters.	Empty string
P403	Copy Pset	Used when a source Pset is to be copied to a destination Pset.	
P404	Delete Pset	Used when a Pset is to be removed.  If a Pset is a part of a Job it can not be deleted.	
P406	Pset updated	Timestamp (date and time) for Pset latest modification. Not editable.	

P41x Reset

Parameter number	Parameter name	Description
P410	Delete Pset results	Used when all results that belongs to the current Pset is to be cleared.
P411	Delete all results	Used when all Pset results is to be cleared.

20.1.3 P5xx Statistic programming

P50x Statistic common parameters

Parameter number	Parameter name	Description	Default setup
P502	Subgroup size	Defines the subgroup size for statistical diagrams and control limits. If this parameter is changed, the results will be recalculated. Group size can be set between 1 and 500.  For statistic process control, maximum subgroup size is 20.	4
P503	No. of subgroups	Pulsor Focus can automatically calculate statistical control limits. In order for these limits to be reasonable, they must be performed on a greater number of tightenings. This parameter is used to set the number of subgroups used for these calculations. Can be between 1 and 4000.	10
P504	Subgroup frequency	Defines which subgroups that will be used in the statistical calculations. If the frequency is 4 then only every fifth subgroup will be used. Can be between 1 and 4000.	1
P505	Latest n values	The latest number of values (1 - 100) that is used in the statistical calculations.	30

P57x SPC relative torque

Statistic Process Control for relative torque.

Parameter number	Parameter name	Description	Default setup
P570	Relative torque X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually.	0,0
P571	Relative torque X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually.	0,0
P572	Relative torque range LCL	The lower control limit for range. Calculated automatically or entered manually.	0,0
P573	Relative torque range UCL	The upper control limit for range. Calculated automatically or entered manually.	0,0
P574	Relative torque X-bar-bar	The desired mean value for calculated mean values for groups of tightenings.	0,0
P575	Relative torque range-bar	The desired mean value for calculated mean ranges for groups of tightenings.	0,0
P576	SPC alarm relative torque	With this parameter it is possible to switch off the current SPC alarm function.	Off

P58x SPC line pressure

Statistic Process Control for line pressure.

Parameter number	Parameter name	Description	Default setup
P580	Line pressure X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually.	0,0
P581	Line pressure X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually.	0,0
P582	Line pressure range LCL	The lower control limit for range. Calculated automatically or entered manually.	0,0
P583	Line pressure range UCL	The upper control limit for range. Calculated automatically or entered manually.	0,0
P584	Line pressure X-bar-bar	The desired value for calculated mean values for groups of tightenings.	0,0
P585	Line pressure range-bar	The desired value for calculated mean ranges for groups of tightenings.	0,0
P586	SPC alarm Line pressure	With this parameter it is possible to switch off the current SPC alarm function.	Off

20.1.4 P6xx Programming

P60x Reference setup

Parameter number	Parameter name	Description
P600	Reference setup performed	Date for latest Reference setup.
P601	No of tightenings	Number of tightenings in latest Reference setup.
P602	View tightening basis	Button. Active as long as proposed monitoring parameters are unchanged.
P603	Perform auto programming	Button. Perform new Reference setup.

P61x Tightening options

Parameter number	Parameter name	Description	Default setup
P611	Tightening angle start	Tightening is started at % of final relative torque.	50
P612	Rundown pulse filter active	Defines if pulses during rundown phase shall be filtered away when calculating tightening results.	Yes

P62x – P64x Monitoring parameters

Parameter number	Parameter name	Description	Default setup
P620	Rundown time min active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	No
P621	Rundown time min	Defines the lower limit for rundown time.	
P622	Rundown time max active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	No
P623	Rundown time max	Defines the upper limit for rundown time.	
P630	Tightening time min active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	No
P631	Tightening time min	Defines the lower limit for tightening time.	0
P632	Tightening time max active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	No
P633	Tightening time max	Defines the upper limit for tightening time.	0
P634	Tightening angle min active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	No
P635	Tightening angle min	Defines the lower limit for tightening angle.	0
P636	Tightening angle max active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	No
P637	Tightening angle max	Defines the upper limit for tightening angle.	0
P640	No of pulses min active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	No
P641	No of pulses min	Defines the lower limit for number of pulses.	
P642	No of pulses max active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	No
P643	No of pulses max	Defines the upper limit for number of pulses.	
P644	Relative shutoff torque min active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	Yes
P645	Relative shutoff torque min	Defines the lower limit the relative shutoff torque.	
P646	Relative shutoff torque max active	Checkbox. With this setting it is possible to activate monitoring of the current parameter.	Yes
P647	Relative shutoff torque max	Defines the upper limit the relative shutoff torque.	
P648	Trigger lost	Determines if monitoring of machine shutoff shall be active. If the tool trigger is released before the machine shuts off when this parameter is active the tightening will not be approved and an event code will be displayed.	Yes

20.2 Job

20.2.1 J1xx Setup

J10x Admin

Parameter number	Parameter name	Description	Default setup
J102	Name job	The name of the Job helps the operator to identify the different Jobs (Maximum 25 characters).	None

20.2.2 J3xx Programming

J30x Configuration

Parameter number	Parameter name	Description	Default setup
J300	Job list	<p>The job list specifies the Psets and multistages that can be included in the job. The total number of Psets/multistages in one job can not exceed 30.</p> <p>This parameter contains:</p> <p>PF channel: Pulsor Focus channel ID that the selected Pset belongs to.</p> <p>Pset (Event): identification number of Psets included in the job. The Psets specified in the job must be predefined, and they can be included in more than one job. Same Pset can be used several times in a job.</p> <p>Pset name: name of the selected Psets</p> <p>Auto select: yes = auto select, no = manually select.</p> <p>With auto select the job functionality automatically chooses the next Pset. With a manually selected Pset the operator must manually choose the next Pset.</p> <p> This function is only available for forced order jobs. It is not possible to use the auto select functionality for free order jobs (see parameter <i>job order type [J301]</i>). A job has override privileges, in comparison to a single Pset/multistage, on a selected possible number of NOT OK tightenings.</p> <p>Batch size: A batch size should be specified for each Pset or multistage in a job. The batch size specifies the number of tightenings to be performed for each Pset or multistage. Maximum batch size is 99. It is possible to define free running Psets by setting batch size to 0. In this case the bypass function must be used to be able to continue the selected job.</p> <p>Max coherent Not OK tightenings (NOK's): Max coherent Not OK tightenings (NOK's) are a selectable possible number of Not OK tightenings for each Pset in a job. (This function is also available for each single Pset, see parameter <i>max coherent NOK's [P153]</i>).</p> <p>The tool will be locked (for both tightening and loosening) when number of possible not OK tightenings is reached for each batch.</p> <p>When the tool is locked due to possible not OK tightenings the only ways to unlock the tool are:</p> <p>Reset counter for performed not OK tightening via a digital input.</p> <p>Select abort job (in case the selected job shall not lock the tool).</p> <p>Select job off.</p>	

Parameter list

Parameter number	Parameter name	Description	Default setup
J301	Job order type	<p>A Job must be defined as Forced order Job, Free order Job or Free and Forced order Job.</p> <p>Free order: Offers the operator to perform Psets in any order. The JobMembers work independently from each other. In a CellJob with free order, all JobMembers are able to perform tightenings at the same time.</p> <p>Forced order: Psets must be performed in the order specified in the Job list. One JobMember at a time performs a tightening while the other JobMembers are locked.</p> <p>Free and forced order: Offers the operator to perform Psets in the same Pulsor Focus channel as the order defined Job, but the operator is free to perform tightening from any channel in the Job.</p>	Forced
J302	Lock at job done	Used in conjunction with Tool Lock Box. Setting "Lock at Job done" turns of the air supply upon finishing a Job, and thereby prevents use of the tool outside the context of a Job.	No
J304	Repeat job	After a Job is completed, the Job will be automatically restarted. To turn off this feature the Job must be aborted, deleted or the Job Off mode must be selected.	No

J31x Batch

Parameter number	Parameter name	Description	Default setup
J310	Increase batch at tightening	<p>OK: Specifies that only accepted tightenings will be considered performed and counted.</p> <p>OK+NOK: Specifies that also not accepted tightenings will be considered performed and counted.</p> <p> This will also have direct effect on the batch status, which will be NOK (nxNOK when not accepted tightening is performed and counted in a Job).</p>	OK
J311	Batch status at increment/bypass	<p>OK: The batch status will be OK at Batch Increment or Bypass event. The nxOK led on the Pulsor Focus controller will light.</p> <p>NOK: The batch status will be NOK (nxNOK)at Batch Increment or Bypass event. The nxNOK led will light.</p>	NOK

J32x Timers

Parameter number	Parameter name	Description	Default setup
J320	Max time to start job	<p>This parameter defines time limit, from the Job is running to the first tightening is started or Batch increment/bypass is performed. If the time limit is exceeded the Job will be aborted. The timer restarts if a Job is reselected.</p> <p>Allowed values are between 1 - 9999 seconds. Value 0 (seconds) deactivates this function.</p>	0

Parameter number	Parameter name	Description	Default setup
J321	Max time to complete job	This parameter defines time limit, from Job is up running to the last tightening in the Job is started. If the time limit is exceeded the Job will be aborted. Allowed values are between 1 - 9999 seconds. Value 0 (seconds) deactivates this function.	0
J322	Display result at auto select	This parameter is a timer for Jobs with auto selected Psets. It defines the time for tightening result to be displayed on a Pulsor Focus controller. The result disappears, and led OK, NOK and nxOK shots off, when the tool trigger is pushed or if the time limit is exceeded. The timer also works for Restart Job, when a Job is completed, before another Pset is selected or when a Pset is deselected. Allowed values are between 1 - 60 seconds. Value 0 (seconds) deactivates this function.	0

J33x Line control

Parameter number	Parameter name	Description	Default setup
J330	Use line control	The Job will be ready to start when a Job with activated Line control has been selected and Line control start signal has been received. Otherwise, if Line control start signal has not been received the Job will not be ready to start and the tool will be locked until the Line control start signal is received. A Line control start signal is an external signal defined to be received by the Pulsor Focus unit from a digital input. This signal can be received before or after a Job selection. Line control start signal status will be cleared when the running Job has been completed or aborted. Line Control related inputs/outputs have only effect on a JobReference.	No

J34x Result

Parameter number	Parameter name	Description	Default setup
J340	VIN number in result	This function is only applicable if a Job is selected via a scanner. Job VIN number: All tightening results/events during a Job will be saved in database together with the Job VIN numbers (even if other barcode string is received during the running Job). This is applied for all JobMembers in a CellJob. Other: Always the latest received VIN number (barcode string) will be stored together with tightening result in database.	Other

Parameter list

Parameter number	Parameter name	Description	Default setup
J341	Result of non-tightenings	Yes: one null result for batch increment or decrement will be stored in the Pulsor Focus database. One null result will be stored in the database for each step and remaining Psets in a job in case of bypass Pset or abort job. No: No null results will be stored in the Pulsor Focus database.	No

20.3 Config

20.3.1 C1xx System setup

C10x Password and Name

Parameter number	Parameter name	Description	Default setup
C100	Use password	Prevents parameter updates on the Pulsor Focus keyboard and from ToolsTalk applications.	No
C101	Password entry scope	ToolsTalk/All Specify unit allowed to enter the password.	All
C105	Ch ID number	Identification number of the channel/system to which the programming refers. Valid values are 0-20. 0 is only used for standalone Pulsor Focus unit.	0
C106	PF name	Name of the unit. You can use up to 20 characters.	
C107	Cell ID number	Cell identification number. Valid values are 0-1000.	0
C108	Cell name	Name of the HW group, (Cell) name defines the Cell that comprises the HW group. You can use up to 20 characters.	
C109	Set date and time	Allows the user to store computer time or user time, and to read time and date from Pulsor Focus.	

C11x Display setup 1

Parameter number	Parameter name	Description	Default setup
C114	Display	Selects result parameter to be displayed. Available options: Relative torque Relative angle Nr of pulses Tightening time Run-down time Remaining in batch Completed in batch Selected Pset	Relative torque

Parameter number	Parameter name	Description	Default setup
C115	Toggle display	Selects result parameter to be toggle displayed with display 1 (see the options in [C114]). You can also choose to have toggling inactive.	Off

C12x Display setup 2

Parameter number	Parameter name	Description	Default setup
C120	Language	Select language for printout from a list that is available. Options available: English, German.	English
C124	Soft keys enabled	Here you connect and disconnect the menu selection buttons. On the Pulsor Focus the functions Reference Setup, plus (+) and minus (-) button will be locked.	Yes

C13x Options

Parameter number	Parameter name	Description	Default setup
C130	Lock on reject	Used in conjunction with Tool Lock Box. Allows the air to be shut off whenever a non-approved tightening has been done.	Off
C132	Reset batch at Pset change	Yes/No Resets the batch counter when a new Pset is selected.	Yes
C134	Batch status at increment/bypass	OK/NOK Defines if an increment or bypass operation or OK or NOK.	NOK
C135	Increase batch at tightening	OK tightening/OK+NOK tightening Defines if batch counter shall be increased at OK tightenings or at OK+NOK tightenings.	OK
C136	Reset batch at Pset store	Yes/No Used if batch counter for a Pset is to be stored, and a reset of batch counter is wanted.	Yes

C15x Reset

Parameter number	Parameter name	Description	Default setup
C150	Delete all results	Tightening database and statistical database for the Pulsor Focus is deleted.	
C151	Total reset	Resets all programming, tightenings and statistics.	

C16x Printer setup

Parameter number	Parameter name	Description	Default setup
C160	Printer type	With parameter printer type the printer is selected. Options are: IBM, HP and Epson.	IBM

Parameter list

Parameter number	Parameter name	Description	Default setup
C161	Paper size	With parameter paper size the paper format is selected. Options are: A4 or US Letter.	A4
C162	Continuous print	With parameter continuous print set to “Yes”, the results after each tightening are automatically sent to the printer port.	No

C19x Pulsor Tool config

Parameter number	Parameter name	Description	Default setup
C190	Work object LED function	Selects if Work object LED should be always on, always off or turned on when the tool is used.	Tool Usage
C191	Work object LED timeout	Specifies the time the LED should be on when controlled by tool usage.	300
C193	Line pressure alarm lower limit	Specifies the lower limit for line pressure. If line pressure goes below this limit an event (<i>E185</i>) is triggered.	3
C194	Line pressure alarm upper limit	Specifies the upper limit for line pressure. If line pressure rises above this limit an event (<i>E185</i>) is triggered.	8

20.3.2 C2xx I/O setup

C20x I/O device 0-7

Parameter number	Parameter name	Description	Default setup
C200	Internal I/O	Pulsor Focus features four built-in DigIn and relays. These parameters are used to configure the DigIn and relays. For more information, see chapter 23, <i>Digital inputs and outputs</i> .	Off
C201	Device 1	Selection and configuration of connecting devices; Selector (4 and 8 position), RE-Alarm and I/O Expander. In the Selector Setup dialog box, the user can select Pset for each socket. The largest number of Pset per socket is 8.	Off
C202	Device 2		
C203	Device 3		
C204	Device 4		
C205	Device 5		
C206	Device 6		
C207	Device 7		

C21x I/O device 8-15

Parameter number	Parameter name	Description	Default setup
C210	Device 8	Selection and configuration of connecting devices; Selector (4 and 8 position), RE-Alarm and I/O Expander. In the Selector Setup dialog box, the user can select Pset for each socket. The largest number of Pset per socket is 8.	Off
C211	Device 9		
C212	Device 10		
C213	Device 11		
C214	Device 12		
C215	Device 13		
C216	Device 14		
C217	Device 15		

C22x Other I/O:s

Parameter number	Parameter name	Description	Default setup
C221	Job select source	Selection of Job start source: Off DigIn Ethernet/Serial Identifier PF Keyboard	Off
C222	Pset select source	Available options: Off Selector DigIn Ethernet/Serial Identifier PF Keyboard	Off
C223	Tool light con source	Selection of tool light control source. Available options: PF-controlled:1 PF-controlled:2 PF-controlled:3 Light off	PF-controlled:1
C224	Tool light mode	On/Off Defines whether the tool LEDs should light for a specified period of time (On) or continuously (Off) after a tightening. Default is Off.	Off
C225	Tool light on timer	Select time for tool light led, can be set between 0 and 300 seconds. Only valid if <i>Tool light mode</i> [C224] is on.	

Parameter list

Parameter number	Parameter name	Description	Default setup
C226	Selector confirm	Define if the selector confirms selection of Psets. It is also used when selecting Psets in a Job. Available options: Off On On with Ack.	Off
C227	Job select source override	This parameter makes it possible to choose a Job from a second source. This source will have a higher priority than <i>Job select source [C221]</i> . Available options: Off (default) DigIn Ethernet/Serial Identifier PF Keyboard	Off
C230	Selector lost mode	Determines whether the last selected Pset or “no Pset” is selected when communication with a selector is lost.	Last Pset
C231	Use last Pset at start-up	Use last Pset which was selected before reboot.	No

20.3.3 C3xx Communication

C30x Remote com

Parameter number	Parameter name	Description	Default setup
C301	IP address	The IP address is a number for identification in a network.	0.0.0.0
C302	Subnet mask	Specifies the number of IP addresses on the subnet and also the number of Pulsor Focus unit that can be placed below a NetMaster, if no router is used.	0.0.0.0
C303	Default router	IP address of the router used on the Subnet.	0.0.0.0
C304	NetMaster IP address	The NetMaster IP address. The address should be written into each included CellMaster. The NetMaster monitors and collects information from the CellMasters included in the system.	0.0.0.0
C305	CellMaster IP address	The CellMaster IP address. The address must be written into each included CellMember. The CellMaster monitors and collects information from the CellMembers included in the Cell.	0.0.0.0

C31x Advanced com

Parameter number	Parameter name	Description	Default setup
C310	Cell keep alive	Defines the timeout (in seconds) for the Cell communication. All Pulsor Focus units in the factory should use the same time.	6

C32x Serial ports setup

Parameter number	Parameter name	Description	Default setup
C320	Serial 1 baud rate	Options: 2400, 4800, 9600 bits/s	9600 bit/s
C321	Serial 1 protocol	Options: None, ASCII, 3964R	ASCII
C322	Serial 2 baud rate	Options: 2400, 4800, 9600, 19 200, 38 400, 57 600, 115 200 bit/s	9600 bit/s

20.3.4 C4xx Protocols

C40x ToolsTalk setup

Parameter number	Parameter name	Description	Default setup
C400	Port	Port number for ToolsTalk Ethernet communication.  Do not use port number 6543 (default value) when the same IP address is shared between several Pulsor Focus units.	6543

C41x ToolsNet setup

A ToolsNet database registers and stores the results from tightenings, traces, data and history. Each Pulsor Focus unit can store information from approximately 4000 tightenings. But the capacity in the ToolsNet database is, in principle, unlimited. The information can be mapped against the Pulsor Focus, object or VIN-number, as desired.

Parameter number	Parameter name	Description	Default setup
C410	ToolsNet on	On/Off Result after each tightening is recorded in ToolsNet.	Off
C411	IP address	IP address for ToolsNet. Only valid if <i>ToolsNet on [C410]</i> is activated.	0.0.0.0
C412	Port	Port number for ToolsNet communication.  Port 6570 is not to ToolsNet but to the PIM server, which connects Pulsor Focus unit to ToolsNet.	6570

C42x Multicast setup

Parameter number	Parameter name	Description	Default setup
C420	Multicast on	On/Off Multicast function.	Off
C421	Multicast IP address	It is possible to set this IP address between 224.0.0.1 (all device on this sub net) and 239.255.255.255 (Multicast standard). Only valid if <i>Multicast on [C420]</i> is activated.	225.6.7.8
C422	Port	Port number for Multicast communication.	8086
C423	Results	None/All/Not OK The results that are reported to the Multicast address.	All
C427	Event code	On/Off Used if you want to send event code on multicast.	Off

C45x Open protocol setup

Parameter number	Parameter name	Description	Default setup
C451	Port	Port number for open protocol server ethernet communication.	4545
C452	Serial cable loss detection	When enabled, Pulsor Focus detects cable loss when running open protocol serial on serial port 1 or 2.	On

20.3.5 C7xx Tool Lock Box**C70x Tool Lock Box**

Parameter number	Parameter name	Description	Default setup
C700	Tool Lock Box	This checkbox decides if the tool lock functionality of Pulsor shall be used or not. See section 18.2, <i>Tool Lock Box</i> for more information	Off

20.4 Diagnostics**20.4.1 D1xx Tool configuration****D10x Tool General information**

Parameter Number	Parameter Name	Description
D100	Tool type	Shows tool type information.
D101	Motor size	Shows information about size of the tool. Type formats are: 6, 8, 10.

Parameter Number	Parameter Name	Description
D102	Serial number	Shows the serial number of the tool.
D104	Tool max torque	Shows the maximum tightening torque for the tool in chosen unit. Possible values between 0.1 and 6553 Nm. The value is possible to change if correct password privileges are met.  Tool max torque must only be changed by users with tool knowledge.
D105	User tool message	User tool message shows a user specified message string of maximum 35 characters. The message is stored in the tool memory. The value is possible to change if correct password privileges are met.
D106	Usage	Type of tool, fixed or handheld.

D13x Tools service

Parameter Number	Parameter Name	Description
D130	Total number of tightenings	Total number of tightenings performed by the tool during its lifetime.
D131	Service indicator	Enable/disable (on/off) tool service indicator alarm.
D132	Number of tightenings since service	The number of tightenings since latest tool service.
D133	Service interval	Number of tightenings between services. Serves as service indicator alarm limit.
D134	Latest service date	Date of latest performed service.
D135	Service counter reset	Button. Resets the <i>Number of tightenings since service [D132]</i> and <i>Number of pulses since service [D137]</i> also sets <i>Latest service date [D134]</i> to current date and sets <i>Service indicator [D131]</i> to off.
D136	Lock tool on alarm	Enables/disables lock on alarm. Tool will be locked while service indicator alarm or while wear indicator alarm is activated.
D137	Number of pulses since service	The number of pulses since latest tool service.
D138	Service interval in pulses	Number of pulses between services. Serves as service indicator alarm limit.
D139	Date for next service	Serves as service indicator alarm limit. The alarm is triggered when current date exceeds this parameter.

D15x Pulsor Tool Info

Parameter Number	Parameter Name	Description
D153	Application-code version	The version off the tool software.
D154	Boot-code version	The version of the boot code in the tool.

20.4.2 D2xx Controller diagnostics

D20x Software information

Parameter Number	Parameter Name	Description
D200	Main code version	This is the version number of the Pulsor Focus software release.
D201	Application-code version	The version number of the application code.
D202	Parameter-tree version	The version number of the parameter tree.
D203	MC-code version	The version number of the Motor Card code.
D204	RBU-code version	The version number of the RBU code.
D205	Boot-code version	The version number of the Boot code.
D206	DSP-code version	The version number of the DSP code.

D21x Hardware information

Parameter Number	Parameter Name	Description
D210	PF3000 Type	Shows what kind of hardware that hosts the Pulsor application.
D211	PF serial number	Shows the serial number of the Pulsor Focus controller. This parameter is possible to change.
D215	RBU type	The type of RBU. Available types are: Bronze and Silver.
D216	RBU serial number	Shows the serial number of the RBU. (Shows half of the unique MAC address).

20.4.3 D3xx System diagnostics

D31x System I/O Diagnostic

Parameter Number	Parameter Name	Description
D310	Relay status	Button. Shows the usage and status of the relay devices.
D311	Digin status	Button. Shows the usage and status of the digital input devices.
D312	Relay test	Button. Performs a test of the relays used. Note that it is not possible to have Pulsor Focus in normal operation during the test.
D313	I/O device revision	Button. Presents a matrix of all devices currently on the I/O Bus. All hardware connected to the I/O Bus are shown with serial number, software and hardware revisions and if the device is alive.

20.4.4 D9xx Tool Drift alarm

D90x Tool drift alarm general

Parameter Number	Parameter Name	Description	Default setup
D900	Tool Drift alarm activated	With this setting it is possible to activate tool drift alarm for the tool that is being used.	Off

Parameter Number	Parameter Name	Description	Default setup
D901	Pset used	Determines which Psets are included in the tool drift alarm evaluation.	P1 or all created Psets
D902	Sample size	Determines the number of tightenings that shall be used when calculating the running mean value in the tool drift alarm evaluation.	500
D903	Tightenings to be included	Determines if all tightenings shall be included or only approved tightenings.	All
D904	Tool Drift alarm updated	Time stamp for latest update of tool drift alarm general parameters.	

D91x Tool drift alarm limits

Parameter Number	Parameter Name	Description	Default setup
D910	Average torque deviation Lower limit active	Checkbox. With this parameter it is possible to switch off tool drift alarm indication for this parameter.	Yes
D911	Average torque deviation Lower limit	The lower limit for average torque deviation. Calculated automatically or entered manually.	0.0
D912	Average torque deviation Upper limit active	Checkbox. With this parameter it is possible to switch off tool drift alarm indication for this parameter.	Yes
D913	Average torque deviation Upper limit	The upper limit for average torque deviation. Calculated automatically or entered manually.	0.0
D914	Pulse frequency Lower limit active	Checkbox. With this parameter it is possible to switch off tool drift alarm indication for this parameter.	Yes
D915	Pulse frequency Lower limit	The lower limit for pulse frequency. Calculated automatically or entered manually.	0.0
D916	Pulse frequency Upper limit active	Checkbox. With this parameter it is possible to switch off tool drift alarm indication for this parameter.	Yes
D917	Pulse frequency Upper limit	The upper limit for pulse frequency. Calculated automatically or entered manually.	0.1

D93x Air sensor tuning

Parameter Number	Parameter Name	Description
D930	Line Pressure	The line pressure entered when air sensor tuning were performed.
D931	Air sensor tuning performed	Date and time when air sensor tuning was performed.

D95x Tool board info

Parameter Number	Parameter Name	Description
D950	Tool board revision	The hardware revision of the tool's built in electronics.
D951	Tool board serial number	The serial number of the tool's built in electronics

20.5 Identifier

20.5.1 I1xx Identifier setup

I10x General setup

Parameter Number	Parameter Name	Description	Default setup
I100	Identifier input source	Defines what source is to be accepted when a VIN number is to be read. Available options: Off, Scanner, Ethernet/Serial and Ethernet/Serial & Scanner	Off
I101	Significant numbers	This parameter is a string of integers that tells the Pulsor Focus which positions to look at in the Identifier string. The string can have maximum 25 characters.	
I104	VIN filter	This parameter is a string of integers that tells the Pulsor Focus which positions in the scanned barcode that shall NOT be considered as VIN.	All

I20x Card reader setup

Parameter Number	Parameter Name	Description
I200	Card reader type	Defines the type of identifier reader connected to the Pulsor Focus. Available options: None and Euchner ident system

20.6 FieldBus

Parameter Number	Parameter Name	Description	Default value
F100	FieldBus type	This parameter shall be selected first. It includes the types; DeviceNet, ProfiBus-DP, InterBus, ModBusPlus, ModBus/TCP and EtherNet/IP. If there is no FieldBus configuration inside the Pulsor Focus when open FieldBus icon or read from PF, "None" will be shown in the setup window. If Offline programming is used, "None" is selected when you start. If there is no FieldBus card installed in Pulsor Focus, FieldBus programming only works in Offline mode.	None

Parameter Number	Parameter Name	Description	Default value
F102	From PF DataLength	<p>From PF DataLength F102 is the total length in bytes of the data string sent from the Pulsor Focus controller to the PLC. The lengths must be the same as defined in the PLC. Because swap bytes are needed for some FieldBus type, only even numbers should be programmed (2, 4, 8, 10, etc). Data length should be a number higher than zero.</p> <p>The maximum length that can be programmed is different for each FieldBus type.</p> <p> If InterBus is used the Pulsor Focus unit has to be restarted when the data length is changed.</p>	
F103	To PF DataLength	<p>To PF DataLength is the total length of the data string send from the PLC to the Pulsor Focus controller. The length must be the same as defined in the PLC. Because swap bytes are needed for some FieldBus types, only even numbers should be programmed (2, 4, 8, 10, etc). Data length should be a number higher than zero.</p> <p>The maximum length that can be programmed is different for each FieldBus type.</p> <p> If InterBus is used the Pulsor Focus unit has to be restarted when the data length is changed.</p>	

Parameter list

Parameter Number	Parameter Name	Description	Default value
F104	From PF Global DataLength	<p>From PF Global DataLength is the length of sending broadcast data to the network. This is a special function for ModBusPlus, not available for other FieldBus type. Max length = 64 bytes. If only point-to-point data is transferred, set this parameter to zero.</p> <p> From PF Datalength - From PF Global Datalength = From PF point-to-point DataLength (which only available in ModBusPlus).</p>	
F105	To PF Global DataLength	<p>To PF Global DataLength is the length of receiving broadcast data from the network. This is a special function for ModBusPlus, not available for other FieldBus type. Max length = 64 bytes. If only point-to-point data is received, set this parameter to zero.</p> <p> To PF Datalength - To PF Global Datalength = To PF point-to-point DataLength (which only available in ModBusPlus).</p>	
F110	Set node address and baudrate from	<p>Some buses can use a SW-configured node address and baud rate. This parameter has two selections:</p> <p>Software: Makes it possible to program node address and baud rate from user interface.</p> <p>Hardware: Node address and baud rate is configured with the switches on the FieldBus card.</p> <p> Normally the switches on the FieldBus card must be set in a specific way to enable these parameters from ToolsTalk.</p>	
F111	FB node address	<p>This parameter specifies the network ID number used in the FieldBus system. You can set the node address if the selected FieldBus type have this feature. Two units in the same FieldBus network cannot have the same node address.</p> <p>It is possible to set FB node address from 1 to 125.</p>	

Parameter Number	Parameter Name	Description	Default value
F112	Baudrate	<p>Communication speed on the FieldBus system. You can set the baud rate if the selected FieldBus types have this feature.</p> <p> The baud rate shall be the same in all Pulsor Focus controllers and in the PLC.</p>	
F113	Connection mode	<p>This parameter manages the way the FieldBus system detects changes of data on the different units. Some FieldBus types have the possibility to set different connection modes. There are three modes; Polled, Bit Strobe and Change of State.</p> <p> The settings in the Pulsor Focus controller and the PLC must be the same.</p>	
F120	Set node address from	<p>ModBusPlus global data exchanges require a source address, which is a node address where you want to get the global data from.</p> <p>Software: the node address is set from user interface.</p> <p>Hardware: the node address only can be set from the switches on ProfiBus card.</p>	
F130	PCP length	<p>Provides a way to send longer data strings than the standard 20 bytes process data. The data package that is sent to or from the Pulsor Focus can be longer than the 20 bytes process data. The part exceeding the process data is sent in small packages. The PCP length defines the package length. PCP data has lower priority than the process data.</p> <p>Available selections are 0, 1, 2, and 4. These numbers are the lengths in words. 0 = no PCP.</p> <p> The Pulsor Focus unit has to be restarted when the PCP length is changed. The length must be the same in the PLC.</p>	

Parameter list

Parameter Number	Parameter Name	Description	Default value
F131	Process DataLength	<p>Process DataLength is the first part of the InterBus message. The length has to be same for both input and output data. Maximum Process DataLength is 20 bytes minus the PCP length in bytes. This means that the highest Process string length is 20 bytes if PCP is zero.</p> <p> The Pulsor Focus unit has to be restarted when the Process DataLength is changed. The length must be the same in the PLC.</p>	
F141	Source address	Source address is the network ID number used in the FieldBus system. Set this source address if you want to get global data from that address.	
F200	FB update interval	<p>If the FieldBus system is heavily loaded it might be necessary to slow down the update interval in Pulsor Focus FieldBus card. If this parameter is set to 0.5 seconds the Pulsor Focus updates the bus every 0.5 seconds. The average data traffic must be possible to fit within the programmed interval. If the traffic has a higher peak load the messages are buffered.</p> <p>Valid settings range from 0.05 to 10 seconds.</p>	0.10 s
F210	Tool stop at offline	<p>If the FieldBus system goes down or Pulsor Focus goes offline it might be necessary to stop running tool for safety purpose.</p> <p>No tool stop: does not stop running tool</p> <p>Tool stop - FieldBus start: stops running tool if tool start select source is FieldBus.</p>	
F300	Bitmap select	<p>This parameter makes it possible to view the bitmap in the same way in Pulsor Focus and the PLC configuration software. It defines if byte 0 or byte 1 shall be to the left.</p> <p>Default settings are the type that is common for the selected FieldBus type.</p> <p>For DeviceNet, Intel Endian must be used. For ProfiBus, Motorola Endian must be used.</p>	

21 RBU information



The **RBU**, Rapid Backup Unit, is a software key and data storage unit for the Pulsor Focus. The RBU unlocks software/functions available for each version of the Pulsor Focus. It also stores a backup copy of the Pulsor Focus configuration. The RBU backup copy makes it possible to move functionality and configurations between different Pulsor Focus units. A Pulsor Focus can not be used without a RBU inserted.

Currently there is a **Silver** version RBU and a **Bronze** version RBU with reduced functionality.



The RBU serial number is also part of the Pulsor Focus Ethernet MAC address.

Pulsor Focus Ethernet address: 00-50-D6 -XX-YY-ZZ (from serial RBU).

Example RBU with serial number C00015767:

- C00015767 = 003D97 (Hexadecimal)
- C00015767 = 00-50-D6-00-3D-97 (MAC address)



Pulsor Focus cannot be used with a Power Focus 3000 RBU.

21.1 RBU functionality

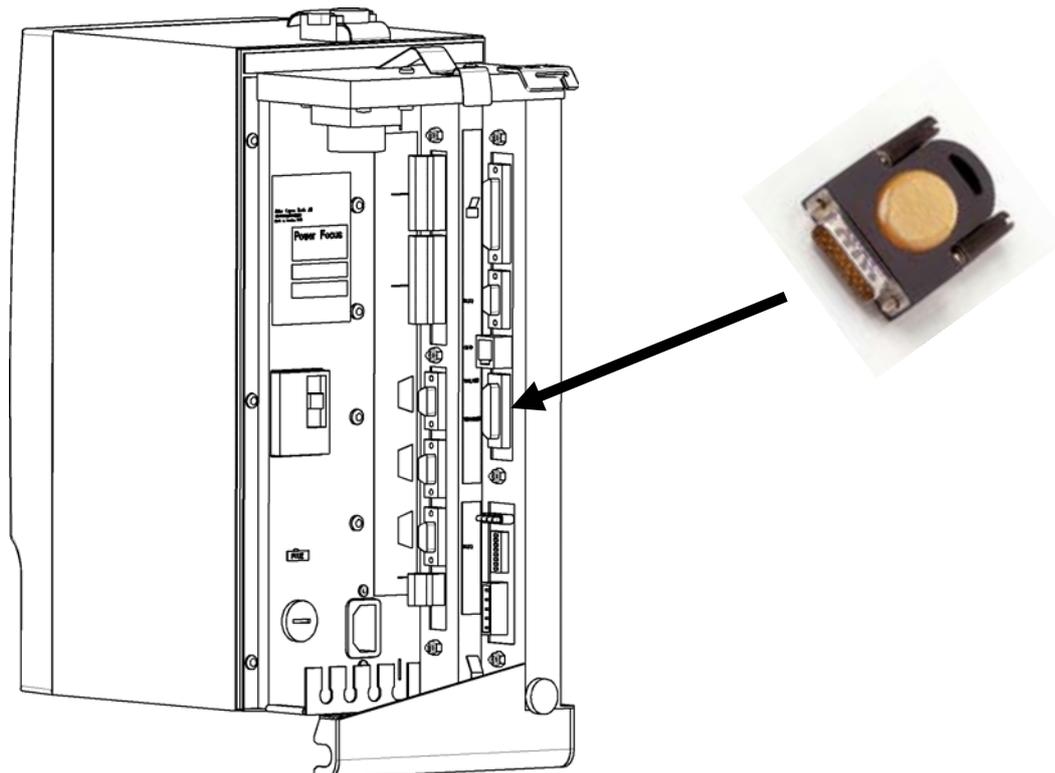
The table below displays the functionality available for each RBU version.

Capacity	Bronze RBU	Silver RBU
Number of Psets	2	8
Number of Jobs	0	8
Number of tightening results	4000	4000
Number of events stored	100	500
Functionality	Bronze RBU	Silver RBU
Batch counting	X	X
Job		X
Tool drift alarm	X	X
I/O	Bronze RBU	Silver RBU
Programming port (RS232)	X	X
I/O Expansion (up to 124 inputs and 124 outputs)	X	X
Network / TCP/IP	X	X
Barcode reader port (RS232)		X
Fieldbus (with AnyBus HW)		X
Networking	Bronze RBU	Silver RBU
Cell		X
Net		X
Multicast		X
ToolsNet		X
Other	Bronze RBU	Silver RBU
Real time statistics		X
SPC (Alarm)		X
Barcode reading	X	X
Open Protocol	X	X

21.2 Connecting the RBU

Connect the RBU to the 15-pin connector on the back panel of the Pulsor Focus (see figure below).

 **Make sure that the power is switched off when connecting and disconnecting the RBU.**



21.3 Start-up instructions

At start-up, the Pulsor Focus checks for inconsistencies between the controller and RBU configurations. If an inconsistency is detected the user is prompted to select either the controller or RBU configuration. This makes it possible to move/copy configurations between Pulsor Focus units by using the RBU. The user is also given the possibility to clear both configurations.

 **When changing RBU type it is only possible to load the configuration from the RBU.**

Press the plus (+) or minus (-) button on the Pulsor Focus unit to toggle between the selections. Confirm selection with the Enter button.

RBU information

The table describes the selections available and how to choose configuration. If the Pulsor Focus and RBU are incompatible for other reasons than a configuration mismatch (e.g. they have an older software version), either the Pulsor Focus unit or the RBU is considered as NOK.

Status	Message at start up	Action
Pulsor Focus and RBU matches	No message	No action. Normal start-up.
Pulsor Focus and RBU don't match	Clear / RBU / PF	Select PF for Pulsor Focus configuration, RBU for RBU configuration, or Clear (All) to clear Pulsor Focus and RBU memories.
Pulsor Focus OK RBU NOK	PF / Clear / Stop	Select PF for Pulsor Focus configuration, Clear (All) to clear Pulsor Focus and RBU memories. Otherwise select Stop .
Pulsor Focus NOK RBU OK	RBU / Clear / Stop	Select RBU for RBU configuration, Clear (All) to clear Pulsor Focus and RBU memories. Otherwise select Stop .
Pulsor Focus NOK RBU NOK	Clear / Stop	Select Clear (All) to clear Pulsor Focus and RBU memories. Otherwise select Stop .



Changing RBU will clear the tightening result database.

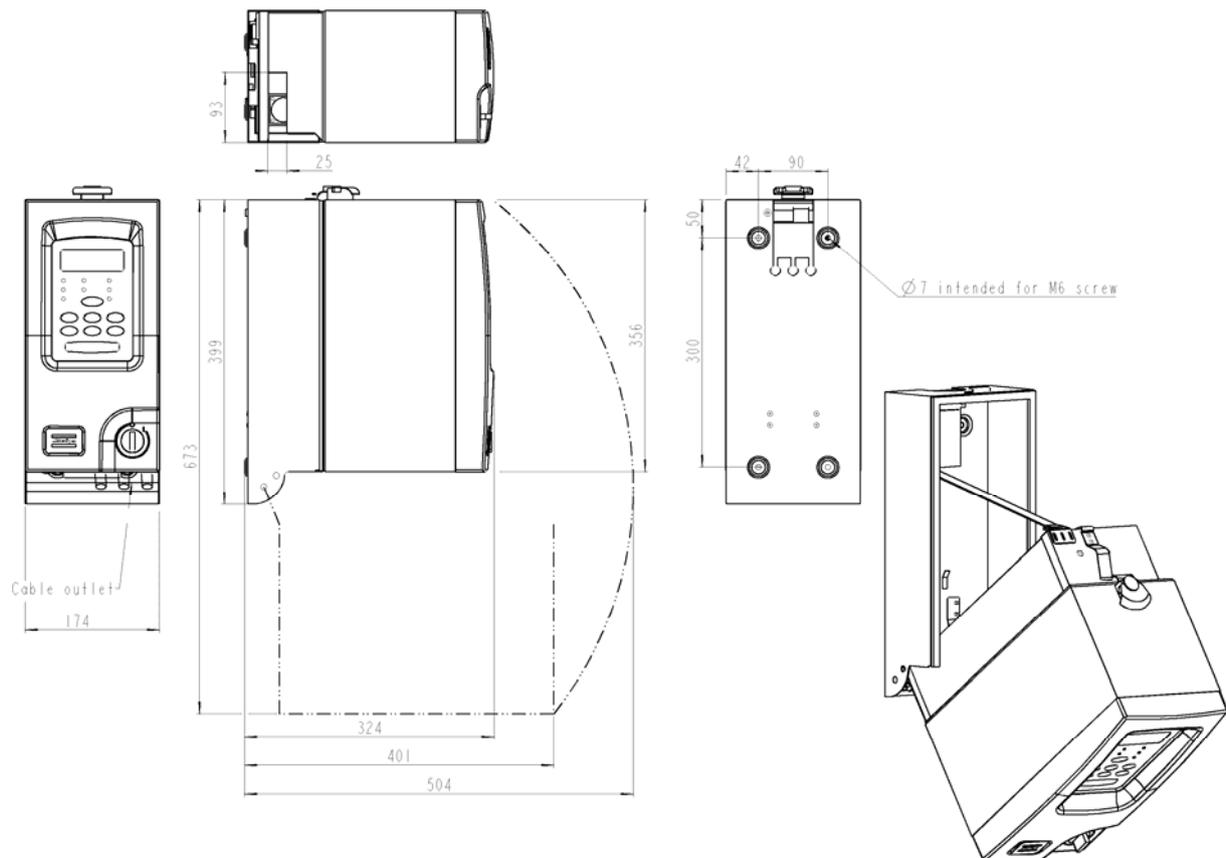


Selecting “**Stop**” will only prevent the result database from being erased if the RBU has been changed within the same (provided the previous RBU is re-inserted). A change between **Bronze** and **Silver** will clear the result database even if selecting “**Stop**”. If the Pulsor Focus unit is turned on with no RBU the tightening result database will be cleared without a query to the user.

22 Pulsor Focus hardware description

22.1 Physical data

22.1.1 Dimension drawing



22.1.2 Weight

The Pulsor Focus weighs about 12 kg.

22.2 Electrical data

22.2.1 Line voltage

Pulsor Focus operates on a single-phase 110 VAC (90-120) or 230 VAC (200-240) line voltage.

Pulsor Focus has a function for sensing the line voltage automatically. This means that the Pulsor Focus automatically switches to the voltage you connect to.

22.2.2 Power consumption

The power consumption of Pulsor Focus is about 20 W.

22.2.3 Mains fuse

Recommended mains fuses (power outlet):

Mains Voltage [V]	Fuse [A]
115	15
230	10

22.2.4 Wiring

All connections are located on the rear of the unit. If it is necessary to change the plug on the mains cable, use the following wiring guide:

Color	Input
Brown or black	Live
Blue	Neutral
Green and yellow	Protective ground



The power cable is the mains disconnecting device. If you open a Pulsor Focus unit first pull out the power cable to make sure that the unit is free from electric power.

Do not use galvanically insulated line voltage since it disrupts the function of the Ground Fault Interrupter (GFI). The test button for the GFI activates the GFI even if the Pulsor Focus is supplied with power from an isolated transformer.

23 Digital inputs and outputs

23.1 Digital inputs

Name	Description	Available	
		Internal I/O	I/O Expander
Off	The input is not used.	X	X
Reset batch	Reset Batch counter for current Pset.	X	X
Unlock tool	 This input is present mainly for Power Focus 3000 compatibility, use “Pulsor Tool Enable” instead. Used in conjunction with Tool Lock Box. Will unlock any software functionality lock such as “Lock on reject” or “Lock at batch done” etc.  “Unlock tool” does not unlock digital inputs like “tool disable n.o/n.c”, “tool tightening disable” etc.	X	X
Tool disable n.o.	The tool will not be able to start when this input is active. If the tool rotates, it will immediate stop when this input is active. The input is active when it is X switched on. Normally opened.	X	X
Tool disable n.c.	Same functionality as “tool disable n.o.” above but with inverted input.	X	X
Tool tightening disable	 This input is present mainly for Power Focus 3000 compatibility. Use “tool disable n.o.” instead. The function is similar to “tool disable n.o.”	X	X
Batch increment	Increase the batch counter one step. Batch status is depending on <i>Batch status at increment/bypass [C134]</i> .	X	X
Batch decrement	Only works if you run a Job.	X	X
Job restart	Restart the running Job. All Batch counters are reset and the Job option timers will be restarted.	X	X
Bypass Pset	Skip the next Pset or Multistage in the running Job. Batch status is depending on <i>Batch status at increment/bypass [C134]</i> .	X	X
Abort Job	Abort current Job. Job status will be Job aborted. If Lock at <i>Job done [J206]</i> is activated, the tool will be locked.	X	X
Job off	Disable the JOB mode. All Pset can be used “manually”. When active Pulsor Focus do not care about new Job number entries. If a Job is running when this input is activated that Job will be aborted and be given status Job NOK.	X	X
Pset toggle	Toggle between Psets connected to one socket in a selector.	X	X
Reset relays	Resets all Timer and To next tight relays (Tracking event relays are not reset).	X	X
Pset select bit 0-3	Pset select input when selecting Pset from digital input. Bit-0 set equals Pset 1, bit-0 and bit-1 set equals Pset 3 etc.	X	X
Select next Pset	Select higher number Pset.	X	X

Digital inputs and outputs

Name	Description	Available	
		Internal I/O	I/O Expander
Select previous Pset	Select lower number Pset.	X	X
Job select bit 0-3	Job select input when selecting Job from digital input. Bit-0 set equals Job 1, bit-0 and bit-1 set equals Job 3 etc.	X	X
Line control start	Input for a position breaker. Needed to start a Job with line control.	X	X
Line control alert 1	Input for a position breaker. Gives alarm if a Job with line control is not finished.	X	X
Line control alert 2	Input for a position breaker. Gives alarm if a Job with line control is not finished.	X	X
Ack error message	Acknowledge an event/error message.	X	X
Fieldbus digin [1-4]	These inputs give a direct link to fieldbus. Fieldbus digital input numbers must be configured in Pulsor Focus, I/O expander and in fieldbus. Fieldbus mimics the status of a digital input.	X	X
Flash tool green light	Activate the tool green light (flashing ca 1.33 Hz). Light is on until tightening starts. After tightening the tool light indicates status according to result. Activating this input at this time will close the status information and start the flashing again. During rundown this input shall be ignored.	X	X
Click wrench 1-4	Click wrench number connected to Pulsor Focus.	X	X
ID Card	Signal to the Pulsor Focus that an ID Card has been inserted in the Euchner system.	X	X
Reset NOK counter	This digital input unlocks (if locked) and resets the “max coherent not ok tightening counter”.	X	X
Pulsor Tool Enable	Used in conjunction with Tool Lock Box. Will unlock any software functionality lock such as “Lock on reject” or “Lock at batch done” etc.  “Pulsor Tool Enable” do not unlock digital inputs like “tool disable n.o/n.c”, “tool tightening disable” etc.	X	X
Disable fieldbus carried signals	When this digital input goes high following events occur: Fieldbus communication is disabled. Relay “fieldbus carried signals disabled” goes high. In ToolsTalk Pulsor monitoring mode on fieldbus “To PF” side, it is possible to display changes in signals sent to the PF over the fieldbus. (Note that the signals have no effect on the Pulsor Focus, since all fieldbus communication is disabled). On the fieldbus side “from PF” will all bits be reset to zero. The traffic of “keep alive” signals continues on the fieldbus. In this way no event codes (i.e. “no connection on fieldbus”) will be displayed. All tools are enabled (presupposed that the tools were disabled from a source over the fieldbus before then). If there is a running job, which has been selected via the fieldbus, the job will be aborted.	X	X

23.2 Digital outputs (relays)

Name	Description	Duration		
		Time	To next tightening	Tracking
Off	Output is not used.			
OK	All results are within the specified limits.	X	X	
NOK	Some result is above or below any of the programmed max or min limits, or some other not approved result such as re-hit.	X	X	
Low	The result is below any of the programmed min limits.	X	X	
High	The result is above any of the programmed max limits.	X	X	
Low TQ	The result is lower than min relative torque limit.	X	X	
High TQ	The result is higher than max relative torque limit.	X	X	
Low angle	The result is lower than min angle limit.	X	X	
High angle	The result is higher than max angle limit.	X	X	
Cycle complete	Tightening is finished, OK or NOK.	X	X	
Alarm	Follow the Alarm light on the Pulsor Focus front.			X
NxOK	Batch status OK.	X	X	
NxNOK	Batch status NOK.	X	X	
Job OK	Job is done and the status of Job is OK.	X	X	X
Job NOK	Job is done but the status of the Job is not OK, because of not OK tightening, batch increment or bypass Pset.	X	X	X
Job Aborted	Running Job was aborted.	X	X	X
Job running	A Job is selected. In case a Job with line control is selected, even the line control start signal is not received, this relay will be on.			X
Job Off	Active when in Job off mode.			X
PF ready	Pulsor Focus controller is "healthy". No errors that needs to be acknowledged.			X
Tool ready	Pulsor Focus is ready to do tightenings. A Valid Job and/or Pset is selected. The tool will start when the trigger is pressed.			X
Tool start switch	Relay that follows the tool start input. Follow the configured <i>Tool start select source [C220]</i> .			X
Tool running	The tool is running.			X
Stat alarm	Follows the stat indicator on the Pulsor Focus' front. Active when some of the selected statistic limits or trend is outside of the approved limits.			X
Tool locked	 <p>This relay is present mainly for Power Focus 3000 compatibility, use "Pulsor Tool Enabled" instead.</p> <p>Is active whenever the Pulsor Focus wants to disable the tool. Used in conjunction with Tool Lock Box. "Tool locked" is the inverse of "Pulsor Tool Enabled".</p>			X

Digital inputs and outputs

Name	Description	Duration		
		Time	To next tightening	Tracking
Identifier received	An identifier string is received.	X	X	
Running Pset bit 0-3	Shows selected Pset. 0 = no Pset selected, tool locked.			X
Running Job bit 0-3	Shows selected Job. 0 = no running Job.			X
Line control start	Line control start signal is received.	X	X	X
Line control done	A Job with Line control has been completed without receiving Line control alert 2.	X	X	
Line control alert 1	Line control warning.	X	X	
Line control alert 2	Line control warning.	X	X	
Service indicator	Service level reached. On until the service indicator is reset. Only valid if the <i>Service indicator [D131]</i> is turned on.			X
Fieldbus relay [1-4]	Relays controlled from fieldbus.			X
Tool red light	Relay follows tool red light (no flashing).			X
Tool green light	Relay follows tool green light. Also following function –Flash tool green light (no flashing).			X
Tool yellow light	Relay follows tool yellow light (no flashing).			X
ToolsNet connection lost				X
Open Protocol connection lost				X
Fieldbus Offline	When fieldbus goes offline the light on this bit turns off.			X
Selected channel in Job				X
Fieldbus Carried Signals Disabled	Indicates fieldbus signals disable.			X
Max coherent NOK reached	Goes high when max coherent NOK tightening counter is reached.	X	X	X
Reference setup active	Reference setup is ongoing.			X
Pset with Reference setup performed	The selected Pset has a Reference setup performed and is ready for use.			X
Rundown time low	The latest rundown time value below the Pset limits.		X	
Rundown time high	The latest rundown time value above the Pset limits.		X	
Rundown angle low	The latest rundown angle value below the Pset limits.		X	
Rundown angle high	The latest rundown angle value above the Pset limits.		X	
Tightening time low	The latest tightening time value below the Pset limits.		X	
Tightening time high	The latest tightening time value above the Pset limits.		X	
Tightening angle low	The latest tightening angle value below the Pset limits.		X	
Tightening angle high	The latest tightening angle value above the Pset limits.		X	

Name	Description	Duration		
		Time	To next tightening	Tracking
Nr of pulses low	The latest number of pulses below the Pset limits.		X	
Nr of pulses high	The latest number of pulses above the Pset limits.		X	
Pulse frequency Tool Drift alarm low	The latest average pulse frequency value is below the active Tool drift alarm limit.			X
Pulse frequency Tool Drift alarm high	The latest average pulse frequency value is above the active Tool drift alarm limit.			X
RT Tool Drift alarm low	The latest average relative torque deviation value is below the active Tool drift alarm limit.			X
RT Tool Drift alarm high	The latest average relative torque deviation value is above the active Tool drift alarm limit.			X
Line pressure out of limits	Active if the latest measured line pressure was outside stipulated limits.			X
Pulsor Tool Enabled	Used in conjunction with Tool Lock Box. This relay is active as long as the Pulsor Focus wants the air supply to the tool enabled.			X

24 Connector descriptions

24.1 Printer

Connector: 25-pin DSUB female.

Function: Parallel printer

Electrical data: Normal TTL levels.

High level signal: 1

Outputs: High > 2.4 V; Low < 0.4 V

Inputs: High > 2.0 V; Low < 0.8 V

Pin	Function	Pin	Function	Pin	Function
1	Strobe	10	Acknowledge	19	Ground
2	Data bit 0	11	Busy	20	Ground
3	Data bit 1	12	Paper end (out of paper)	21	Ground
4	Data bit 2	13	Select	22	Ground
5	Data bit 3	14	Auto feed	23	Ground
6	Data bit 4	15	Error	24	Ground
7	Data bit 5	16	Initialise printer	25	Ground
8	Data bit 6	17	Select input		
9	Data bit 7	18	Ground		

24.2 Serial RS232 #1

Connector: 9-pin DSUB female.

Function: RS232 serial.

Pin	Function
1	Not used
2	RD, Receive data
3	TD, Transmit data
4	Not used
5	GND
6	Not used
7	Not used
8	DigIn. Not used
9	Dig out. Not used

24.3 Serial RS232 #2

Connector: 9-pin DSUB female.

Function: RS232 serial connection. Use crossover cable to connect to PC.

Pin	Function
1	Not used
2	RD, Receive data
3	TD, transmit data
4	+5V max 200 mA
5	GND
6	Not used
7	Not used
8	Not used
9	Not used

24.4 Ethernet

Connector: Shielded RJ45 for 10-baseT connection.

Function: 10 Mbit Ethernet communication.

Pin	Function
1	Out inverse
2	Out
3	In inverse
4	----
5	----
6	In
7	----
8	----

24.5 RBU

Connector: 15-pin DSUB female.

Function: For connection of Atlas Copco RBU.

The RBU unlocks the software you need and works as a backup memory for your Pulsor Focus setup data.

The pin configuration is propriety information for Atlas Copco. This connector cannot be used for other purposes.

24.6 Tool connector

Connector: (16 + 4) pin

Function: For connection of Atlas Copco Tensor electric tools.

Pin	Description
A	Not Used
B	Not Used
C	Not Used
D	Not Used
E	Not Used
F	Not Used
G	Not Used
H	+15VDC
J	GND (0V)
K	GND (0V)
L	Not Used
M	Not Used
N	Not Used
P	RS485 B
R	RS485 A
S	Not Used
GND	Safety power ground

24.7 Digital inputs

Connector: 10-pin detachable screw terminal. Mating connector Phoenix MCVR 1.5/10 -ST- 3.81 or compatible.

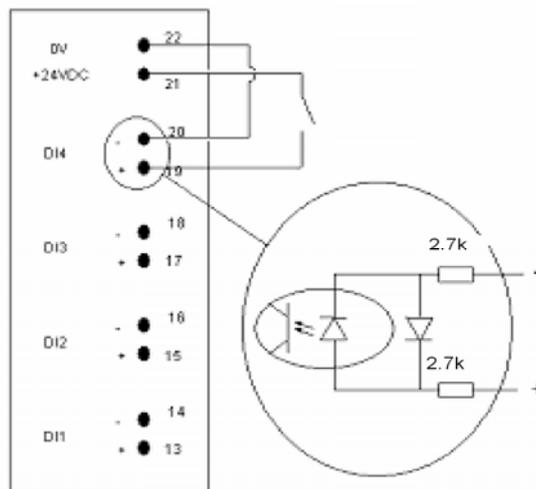
Function: Isolated opto-coupled digital input. Logical function is set in the configuration of the Pulsor Focus.

Electrical data: “High” input (10 - 40) VDC. Current needed to activate input is 5 mA at 24 V.

This input can be connected to run both positive and negative logic (active high or active low).

Isolated 24 VDC output. (19 V - 30 V) 1 A maximum load. This output can be used to feed external equipment such as Stack lights and buzzers. Atlas Copco I/O Bus accessories are also powered from this output.

Pin	Function
13	Digital input 1 +
14	Digital input 1 -
15	Digital input 2 +
16	Digital input 2 -
17	Digital input 3 +
18	Digital input 3 -
19	Digital input 4 +
20	Digital input 4 -
21	+ 24 VDC isolated
22	GND (+24VDC isolated)



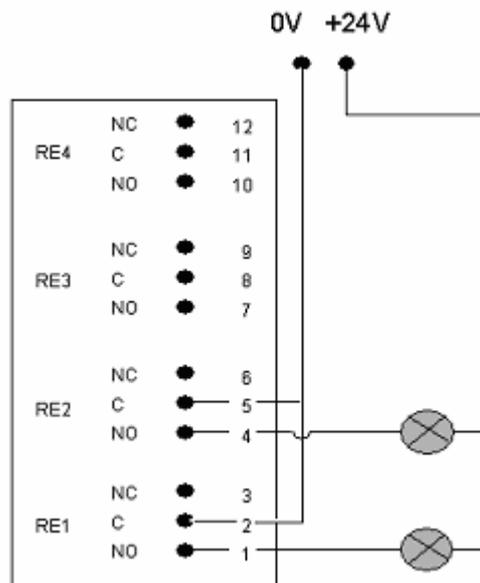
24.8 Digital outputs (relays)

Connector: 12-pin detachable screw terminal. Mating connector Phoenix MCVR 1.5/12-ST-3.81 or compatible.

Function: Two way dry contact relays. Isolated outputs. Logical function is set in the configuration of the Pulsor Focus.

Electrical data: Max 50 V DC/AC. Switching load: min 1 mA, max 500 mA resistive load.

Pin	Function
1	Relay 1 Normally open
2	Relay 1 common
3	Relay 1 Normally closed
4	Relay 2 Normally open
5	Relay 2 common
6	Relay 2 Normally closed
7	Relay 3 Normally opened
8	Relay 3 common
9	Relay 3 Normally closed
10	Relay 4 Normally opened
11	Relay 4 common
12	Relay 4 Normally closed



24.9 I/O Bus #1

Connector: 9-pin DSUB male.

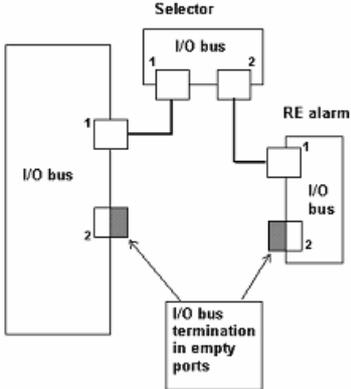
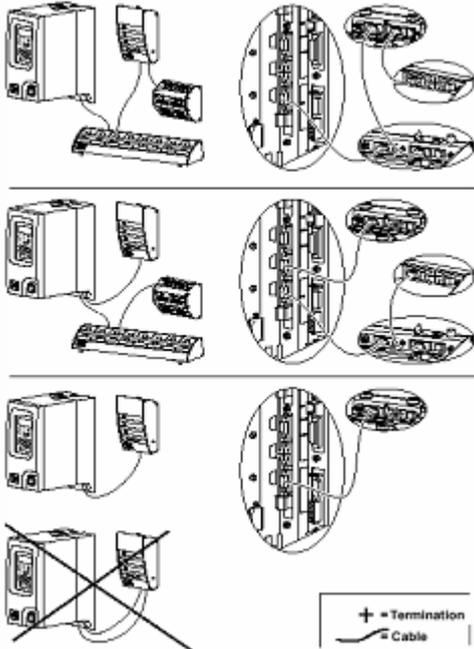
Function: To connect Atlas Copco I/O Bus accessories. Parallel with I/O Bus connector #2.

There is a range of Pulsor Focus accessories that connect over the proprietary Pulsor Focus I/O Bus, for example:

- Selector (socket tray)
- RE-Alarm
- I/O Expander

To have a well functioning I/O Bus, always use bus terminations. All accessories and Pulsor Focus units are equipped with two parallel connectors. When all cables are connected, place a termination in the empty connectors. I/O Bus connectors #1 and #2 are fully parallel and can be used in any combination. If nothing is connected to the I/O Bus there is no need for terminations.

Pin	Function
1	+24 V iso
2	Signal Low
3	0 V (+8V iso)
4	0 V (+24 V iso)
5	Not used
6	0 V (+8V iso)
7	Signal High
8	Not used
9	+8 V iso. (for I/O Bus only)



24.10 I/O Bus #2

Connector: 9-pin DSUB male.

Function: To connect Atlas Copco I/O Bus accessories. Parallel with I/O Bus connector #1.

24.11 Mains power connector

Connector: IEC320

Electrical data: Input voltage (90 - 120) VAC, (200 - 240) VAC, (50 - 60) Hz. Auto select of voltage input span.

25 Pulsor Quick Guide

25.1 Introduction

The purpose of this Quick Guide is to clarify the minimum that needs to be done in order to get started with the system. At the same time there is supplementary information on additional functions. The explanations are very brief so that they fit on one page. If you need further information on any particular point follow the reference to the chapter in the Pulsor manual (at the bottom right-hand corner of the text boxes).

The tool includes a shut-off mechanism that shuts off the tool when a given torque has been reached. The torque level can be adjusted with a screw in the tool. The tool must first be adjusted to work correctly on the target joint. In other words the actual joint you are working on.

The electronics measure what happens while tightening. When the Reference Setup is done, Pulsor Focus “learns” what is a normal tightening - carrying out the reference tightenings correctly is therefore very important. When Reference Setup is completed the limit values for the different parameters are copied automatically in the tightening monitoring. These values show within which limits you can expect most of the tightenings to be.

25.2 Quick Guide instructions

See next page.

The prerequisites are a tool with a Pulsor Focus that is connected to a PC that has a ToolsTalk Pulsor.

- Adjust the tool's torque.
- Test the tool on the actual joint.
- Check that the tightenings are correct. (Chap 4)

Adjust the tool

- Start ToolsTalk Pulsor in the PC.
- Ensure that Pset select source in Config is set to serial/ethernet.
- Activate the desired Pset in the selection panel in ToolsTalk Pulsor. (Chap 5)

Activate Pset

If instead you want to make a Reference Setup on a new Pset:
 • First create a new Pset by clicking the right mouse button on Pset on the PF tree.

- Open Pset window for chosen Pset under Pset in the PF-Map.
- Click on Perform Reference Setup:

Start Reference Setup

Reference Setup Monitor				
Tightening parameters		Tightening basis statistics		
	Min	Max	Mean	Std
Relative torque				
Relative angle				
No of pulses				
Tightening time				
Rundown time				
Rundown revolutions				
System parameters				

- To get statistics that is based on representative and correct tightenings it is strongly recommended that you perform at least 10 tightenings (but not more than 50).
- (It will work with only one tightening but this will not achieve predictable results)
- Incorrect tightenings can be deleted.

- Use the adjusted tool on the relevant joint.
- Check that the reference tightenings are done correctly.
- Carry out at least 10 tightenings.
- The tool must shut itself off. (Chap 5)

Make reference tightenings

- Check that the results from the reference tightenings are reasonable. Review the max/min results: Identify and delete any deviating tightenings (Chap 5)

Check and make any settings under Reference Setup

- Change any actual or reference values for torque by clicking on Set reference values.

- Complete by clicking on Accept.
- The result values from Reference Setup are saved (in the Pset). (Chap 5)

Complete Reference Setup

- As a default for a new Pset, a check is made of the the torque level and that the tool has switched off. (Chap 6)

You have now reached a productive stage and can begin to make live tightenings.

- The tightening monitoring can be adapted to capture miscellaneous errors such as rehit.
- Monitoring can be adapted to the joint's specification.
- Batch counting of tightenings can now be activated.

- The display on the monitoring unit shows: OK/NOK and (as a default configuration) the relative torque. (Chap 3)

Make tightenings

- The tracking result monitor in ToolsTalk Pulsor displays all parameters.

- The green light on the tool shows OK, the yellow light that min value has not been reached and the red light that the max value has been exceeded. (Chap 6)

26 FieldBus configuration appendix

This appendix describes the different possible selections for the **FieldBus**. It also describes the different data types that are used in the FieldBus configuration.

26.1 Bit map select (Endian Mode)

26.1.1 Motorola Endian

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

26.1.2 Intel Endian

Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Motorola Endian is default setting for ProfiBus-DP, InterBus, ModBusPlus and ModBus TCP.

Intel Endian is default setting for DeviceNet and EtherNet/IP.

26.2 FieldBus data types

The Pulsor Focus uses position format in all encoding and decoding data types. In PF position format the Most Significant Bit (MSB) is the bit furthest to the left and the Least Significant Bit (LSB) is the bit furthest to the right.

If a data type is less than one word, the MSB is the bit furthest to the left. If data type is longer than one word, the MSB is the bit furthest top-left. If a FieldBus type uses Intel Endian, byte numbers are swapped before encoding or decoding to a specific data type.

The data field in the FieldBus is from the beginning a blank data field without structure. In order to map Pulsor Focus item data types into FieldBus we defined FieldBus Data Type, which holds the information about placement and structure of a certain application data type mapped into the FieldBus data field.

The table below shows the different data types used in FieldBus data. The section Items From/To PF shows the data type available for different items.

Data type	Description
Bit	One bit. Normally used for discrete I/O-data.
Bit Field	Length is 2 - 8 bits. All bits must be in the same byte. The left bit is the most significant bit and the right bit is the less significant bit, i.e. 0001=1, 1000= 8.
Character	One byte ASCII code.
Character String Change	Character string. Each character uses one byte ASCII code. Range: 2 - 25 bytes.

Data type	Description
Character String Input	Character string with an extra “counter” byte in front. The extra byte is an integer counter and must increase each time when the character string is entered to be able to detect a new input. If you want to enter the same value again (e.g. the same Job number), just change the counter.
Fixed Point Number	Two-byte integer part and two-byte decimal part. The first two bytes hold the integer part and the last two bytes hold the decimal part. Used to represent torque value.
Unsigned 16 (U16)	16-bit unsigned integer. Decimal 0 – 65 535.
Unsigned 32 (U32)	32-bit unsigned integer. Decimal 0 – 4 294 967 295.
U32_HNW	32-bit unsigned integer. MSW is the higher number word.
CharStringChangeIntelF	Character string. Each character uses one byte ASCII code. Range: 2 - 25 bytes. This type makes Intel Endian character string follows byte order; the first character is the lowest byte in the string.
CharStringInputIntelF	Character string with an extra “counter” byte in front. The extra byte is an integer counter and must increase each time when the character string is entered to be able to detect a new input. If you want to enter the same value again (e.g. the same Job number), just change the counter. This type makes Intel Endian character string follows the byte order, the integer counter is the lowest byte in the String.



Common for all data types is that a change must occur in PLC output area (To PF) to get Pulsor Focus to detect a new data entry. For example, if you want to select JOB number 3 two times in a row you must select 0 in between.

26.2.1 Character string

Character String is in a reading order, i.e. from left to right, from top to bottom, regardless of the byte order. The difference between CharStringChange and CharStringInput is a counter byte added before character string in CharStringInput. When the counter changes, a new input is considered.

Motorola Endian

Type	Word	Byte	Bit	Length		Byte 0								Byte 1										
CharStringChar	0	0	0	40		Word	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0		
CharStringInput	3	0	0	48		0	0	1	0	1	0	0	0	0	0	0	1	0	1	0	0	1	1	
						1	0	1	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	0
						2	0	0	1	1	0	0	1	0										
						3	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0
						4	0	1	0	1	0	0	1	1	0	1	0	0	0	1	0	1	0	1
						5	0	1	0	1	0	1	0	0	0	0	1	1	0	0	1	0	0	1

Data type	Word	Byte 0	Byte 1	Convert to PF data
CharStringChange	0	P	S	
	1	E	T	
	2	2		PSET2
CharStringInput	3	1 (counter)	P	
	4	S	E	
	5	T	2	PSET2

Intel Endian

Type	W	By	Bit	Le		Byte 1								Byte 0							
					Word	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
CharStringChange	0	1	0	40	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	1	1
CharStringInput	3	1	0	48	1	0	1	0	0	0	1	0	1	0	1	0	1	0	1	0	0
CharStrChangeIntelF	6	1	0	48	2	0	0	1	1	0	0	1	0								
CharStrInputIntelF	9	1	0	48	3	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0
					4	0	1	0	1	0	0	1	1	0	1	0	0	0	1	0	1
					5	0	1	0	1	0	1	0	0	0	0	1	1	0	0	1	0
					6	0	1	0	1	0	0	1	1	0	1	0	1	0	0	0	0
					7	0	1	0	1	0	1	0	0	0	1	0	0	0	1	0	1
					8	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0
					9	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1
					10	0	1	0	0	0	1	0	1	0	1	0	1	0	0	1	1
					11	0	0	1	1	0	0	1	0	0	1	0	1	0	1	0	0

Data Type	Word	Byte 1	Byte 0	Convert to PF data
CharStringChange	0	P	S	
	1	E	T	
	2	2		PSET2
CharStringInput	3	1 (counter)	P	
	4	S	E	
	5	T	2	PSET2
CharStringChangeIntelF	6	S	P	
	7	T	E	
	8		2	PSET2
CharStringInputIntelF	9	P	1 (counter)	
	10	E	S	
	11	2	T	PSET2

26.2.2 Fixed point number

Fixed Point Number integer part is in low number word, and decimal part is in high number word. The table below shows the conditions valid for the integer and decimal parts (i.e. if integer part is 1 digit or 2 digits, decimal part is 2 digits):

Integer part (in digits)	Decimal part (in digits)
1 or 2	2
3	1
4	0

Motorola Endian

Type	Word	Byte	Bit	Length	Byte 0								Byte 1										
FixedPointNum1	0	0	0	32	Word	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0		
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
					1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1

Data type	Word	Byte 0	Byte 1	Convert to PF data
FixedPointNumber	0	0	12	
	1	0	15	12.15

Intel Endian

Type	Word	Byte	Bit	Length	Byte 1								Byte 0								
FixedPointNum1	0	1	0	32	Word	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
					0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
					1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Data type	Word	Byte 1	Byte 0	Convert to PF data
FixedPointNumber	0	0	12	
	1	0	4	12.04

26.2.3 Integer

Unsigned16 is a 16-bit integer and Unsigned32 is a 32-bit integer. U32_HMW is a special case of Unsigned32, which is used in Intel Endian.

Motorola Endian

Type	Word	Byte	Bit	Length	Byte 0								Byte 1								
Unsigned16	0	0	0	16	Word	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Unsigned32	1	0	0	32	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
					1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
					2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Data type	Word	Byte 0	Byte 1	Convert to PF data
Unsigned16	0	1	0	256
Unsigned32	1	0 (MSB)	1	
	2	0	0 (LSB)	65536

Intel Endian

Type	Word	Byte	Bit	Lenqt ▲
Unsigned16	0	1	0	16
Unsigned32	1	1	0	32
U32_HNW	3	1	0	32

Word	Byte 1								Byte 0							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Data type	Word	Byte 1	Byte 0	Convert to PF data
Unsigned16	0	1	0	256
Unsigned32	1	0 (MSB)	1	
	2	0	0 (LSB)	65536
U32_HNW	3	0	1 (LSB)	
	4	0 (MSB)	0	1

26.3 Items From PF

In this section follows a description of the possible items to select when data from the Pulsor Focus is configured.

Items From PF	Description	Data type	String length	Value
AngleStatus	Status Angle result.	Character	1 byte ASCII	O = OK L = Low H = High
		Bit	2 bits	00 = Not used 01 = OK 10 = High 11 = Low
AngleStatusHIGH	Angle result is above max limit.	Bit	1 bit	0 = Not used 1 = High
AngleStatusLOW	Angle result is below min limit.	Bit	1 bit	0 = Not used 1 = Low
AngleStatusOK	Angle result is within limits.	Bit	1 bit	0 = Not used 1 = OK
BatchStatus	Batch OK (done) or NOK (reset)	Character	1 byte ASCII	O = OK N = NOK
		Bit	2 bits	00 = Not used 01 = OK 10 = NOK
BatchStatusNOK	Batch is NOK (batch aborted).	Bit	1 bit	0 = Not used 1 = NOK
BatchStatusOK(nxOK)	Batch is OK (nxOK)	Bit	1 bit	0 = Not used 1 = OK
CycleComplete	Indicates that a tightening is finished. Do not care about the result	Bit	1 bit	0 = Not used 1 = Cycle complete
DigIn# [# = 1 - 4]	Mimic the status on a DigIn in Pulsor Focus or I/O Expander. The input must be configured to FieldBus DigIn # X. There are four different Items.	Bit	1 bit	0 = Input Off 1 = Input On
DisabledFBJobStatus	Mimic the status on a digital input "Disable FB Job Status" in Pulsor Focus or I/O Expander.	Bit	1 bit	0 = Enabled Job status 1 = Disabled Job status
ErrorCode	Shows error code.	U16	2 bytes	Binary representation (Decimal 0-65535)

FieldBus configuration appendix

Items From PF	Description	Data type	String length	Value
FieldBusHandShakeAck	Indicates handshake from PLC received by Pulsor Focus.	Bit	1 bit	0 = Not used 1 = Handshake
JobDoneStatus	Job OK (done) or NOK (done) or aborted (reset).	Character	1 byte ASCII	O =OK N = NOK A = Aborted
		Bit Field	Bit Field	00 = Not used 01 = OK 10 = NOK 11 = Aborted
JobDoneStatusJobAborted	Shows Job aborted.	Bit	1 bit	0 = Not used 1 = Job Aborted
JobDoneStatusNOK	Job is NOK (Not all tightening OK).	Bit	1 bit	0 = Not used 1 = NOK
JobDoneStatusOK (nxOK)	Job is OK (nxOK)	Bit	1 bit	0 = Not used 1 = OK
JobID	Gives the number on the selected JOB.	Bit field	2 – 8 bits in the same byte.	0000 0001 = Job 1 0001 0000 = Job 16
		U16	16 bits in one word	00...0001 = Job 1 00....1000 = Job 8
JobRunning	A Job is selected and “running”.	Bit	1 bit	0 = Job done and no Job selected 1 = Job is running
KeepAliveAck	Indicate FieldBus communication alive, which send back the save value received from PLC.	Bit field	2 - 8 bits in the same byte	00000000 = 0 11111111 = 255
LineControlAlerted 1	Indicates Line Control Alert1 received by Pulsor Focus.	Bit	1 bit	0 = Not used 1 = LineControlAlerted1
LineControlAlerted 2	Indicates Line Control Alert2 received by Pulsor Focus.	Bit	1 bit	0 = Not used 1 = LineControlAlerted2
LineControlDone	Indicates Job with line control finished before line control alert2 inputted.	Bit	1 bit	0 = Not used 1 = LineControlDone
LineControlStarted	Indicates Line Control Start set in Pulsor Focus.	Bit	1 bit	0 = Not used 1 = LineControlStart
LineControlStartAck	Indicates that Pulsor Focus received Line control start.	Bit	1 bit	0 = LineControlStartreseted 1 = LineControlStart

Items From PF	Description	Data type	String length	Value
NewPsetSelected	Running Pset number.	Bit field	2 - 8 bits in the same byte.	0000 0001 = Pset 1 0001 0000 = Pset 16
		U16	16 bits in one word	00....0001 = Pset 1 00....1000 = Pset 8
NewPsetSelected0Is1	Running Pset number. Number 0 = Pset 1 number 1 = Pset 2 etc.	Bit field	2 - 8 bits in the same byte.	0000 0001 = Pset 2 0001 0000 = Pset 17
PFChannelID	Gives the channel ID number on the FieldBus Pulsor Focus.	Bit field	2 - 8 bits in the same byte.	0000 0001 = CH 1 0001 0000 = CH 16
		U16	16 bits in one word	00....0001 = CH 1 00....1000 = CH 8
PFReady	No severe errors in PF.	Bit	1 bit	0 = Errors in PF 1 = No errors in PF
ReceivedIdentifier	Indicates identifier has been received by PF.	Bit	1 bit	0 = not used 1 = Received identifier
SelectedChannelInJob	Indicates selected channel in a forced order CellJob.	Bit	1 bit	0 = Not used 1 = Selected channel
ServiceIndicatorAlarm	Indicates that the number of tightenings in the tool memory has reached the service interval limit.	Bit	1 bit	0 = Alarm Off 1 = Alarm On
TighteningTime	The tightening time taken from the most recent result. Format HH:MM:SS	Character string change	64 bit (8 characters)	I.e. 08:15:08 (8 ASCII characters) 24 hour
TighteningTimeHour	The tightening time (hour part only) taken from the most recent result.	U16	16 bit (one word)	0 – 24 hour
TighteningTimeMin	The tightening time (minutes only) taken from the most recent result.	U16	16 bit (one word)	0 - 60 min
TighteningTimeSec	The tightening time (seconds only) taken from the most recent result.	U16	16 bit (one word)	0 - 60 min
TighteningDate	The tightening date taken from the most recent result. Format YYYY:MM:DD	Character string change	80 bit (10 characters/bytes)	I.e. 2000:05:07 (10 ASCII characters)

FieldBus configuration appendix

Items From PF	Description	Data type	String length	Value
TighteningDateDay	The tightening date (day part only) taken from the most recent result.	U16	16 bit (one word)	1 – 31
TighteningDateMonth	The tightening date (month part only) taken from the most recent result.	U16	16 bit (one word)	1 – 12
TighteningDateYear	The tightening date (year part only) taken from the most recent result.	U16	16 bit (one word)	Year number 4 digits
TighteningStatus	Combined status for all tightening result parameters that is used.	Character	1 byte ASCII	OK = O NOK = N
		Bit field	2 bits	00 = Not used 01 = OK 10 = NOK
TighteningStatusNOK	Tightening result has one or more Not OK results.	Bit	1 bit	0 = Not used 1 = NOK
TighteningStatusOK	All tightening result is OK.	Bit	1 bit	0 = Not used 1 = OK
ToolGreenLight	This item follows the tool green light.	Bit	1 bit	0 = Not used 1 = Green
ToolRedLight	This item follows the tool red light.	Bit	1 bit	0 = Not used 1 = Red
ToolYellowLight	This item follows the tool yellow light. (If "PF_Control_3" is selected in Cset, yellow led shows the fatal error and reset when error acknowledged.)	Bit	1 bit	0 = Not used 1 = Yellow
ToolReady	Indicates that the tool is ready for tightening.	Bit	1 bit	0 = Tool is not ready 1 = Tool is ready
ToolRunning	Indicates that the tool is rotating CW or CCW.	Bit	1 bit	0 = Tool is not run 1 = Tool is running
ToolTightening		Bit	1 bit	0 = Tool is not tighten 1 = Tool is tightening
TorqueStatus	Status torque result.	Character	1 byte ASCII	O = OK L = Low H = High
		Bit field	2 bits	00 = Not used 01 = OK 10 = High 11 = Low

Items From PF	Description	Data type	String length	Value
TorqueStatusHIGH	Torque result is above max limit.	Bit	1 bit	0 = Not used 1 = High
TorqueStatusLOW	Torque result is below min limit.	Bit	1 bit	0 = Not used 1 = Low
TorqueStatusOK	Torque result is within limits.	Bit	1 bit	0 = Not used 1 = OK
VINInput	Shows the VIN number inputted from FieldBus, serial or Ethernet. Changes as soon as the number is given. This is not the VIN used in the tightening result. If the VIN is longer then the VIN input length the Pulsor Focus will take the first x characters and cut the end. If the VIN number is shorter then this parameter length the Pulsor Focus will not fill with zero.	Character string input	24-208 bit (3-26 bytes)	One ASCII sign for each character. First byte is counter.
		Character string change	16-200 bit (2-25 bytes)	One ASCII sign for each character.
		Character String Change Intel Format	16-192 bit (2-24 bytes)	One ASCII sign for each character.
		Character String Input Intel Format	32-208 bit (4-26 bytes)	One ASCII sign for each character. First byte is counter.
VINUsedInTightening	Shows the VIN number used in a tightening. This is the VIN used in the tightening result. If the VIN is longer then the VIN input length the Pulsor Focus will take the first x characters and cut the end. If the VIN number is shorter then this parameter length the Pulsor Focus will not fill with zero.	Character string change	16 – 200 bit (2-25 bytes)	One ASCII sign for each character.

26.4 Items To PF

This section contains a description of the items that can be selected when data to the Pulsor Focus is configured.

Items To PF	Description	Data type	String length	Value
AbortJob	Aborts the running Job.	Bit	1 bit	0 = Not used 1 = Abort
		Character	8 bit (1 byte)	A = Abort
AckErrorMessage	Acknowledge error message.	Bit	1 bit	0 = Not Used 1 = Ack Error
BatchDecrement	Decrement the batch counter with one.	Bit	1 bit	0 = Not used 1 = Decrement
BatchIncrement	Increment the batch counter with one.	Bit	1 bit	0 = Not used 1 = Increment
BypassPsetInJob	Stop current Pset and jump to next Pset in the Job.	Bit	1 bit	0 = Not used 1 = Bypass Pset in Job
FieldBusHandShake	Send to PF to check if FieldBus works.	Bit	1 bit	0 = Not used 1 = Handshake

Items To PF	Description	Data type	String length	Value
Identifier	Input the VIN number from the PLC. To get this working you must set identifier input source in PF to FieldBus.	Character string input	24 - 208 bit (3-26 bytes)	One ASCII sign for each character First byte is counter
		Character string change	16 - 200 bit (2-25 bytes)	One ASCII sign for each character
		U16	2 bytes in the same word	U 16: If the value is less then 5 digits decimal, PF will fill with zeroes in front.
		U32	4 bytes in two words	U32: If the value is less then 10 digits decimal, PF will fill with zeroes in front.
		U32_HNW	4 bytes in two words	Only for Intel format
		Character string change Intel format	16 - 192 (2 - 24 bytes)	One ASCII sign for each character, string is in Intel byte order
		Character string input Intel format	32 - 208 bytes)	One ASCII sign for each character. First byte is counter. String is in Intel byte order.
JobSelect	Select a Job. Job select source must be set to FieldBus. Job 0 = no Job selected.	Bit Field	2 - 8 bits in the same byte.	0000 0001 = Job 1 0001 0000 = Job 16
		U16	16 bits in one word	00...0001 = Job 1 00...1000 = Job 8
JobOff	Gets off Job mode and unlocks tool.	Bit	1 bit	0 = Job On 1 = Job Off
KeepAlive	Send to PF to check if FieldBus communication alive.	Bit Field	2 - 8 bits in the same byte	00000000 = 0 11111111 = 255
LineControlAlert1	Job not finished alarm 1.	Bit	1 bit	0 = Not Used 1 = Line Control alert 1
LineControlAlert2	Job not finished alarm 2.	Bit	1 bit	0 = Not Used 1 = Line Control alert 2
LineControlStart	Input signal to start the line control function.	Bit	1 bit	0 = Not Used 1 = Line Control

FieldBus configuration appendix

Items To PF	Description	Data type	String length	Value
PsetSelect	Select a Pset. Pset select source must be set to FieldBus. Pset0 = no Pset selected.	Bit Field	2 – 8 bits in the same byte.	0000 0001 = Pset 1 0001 0000 = Pset 16
		U16	16 bits in one word	00....0001 = Pset 1 00....1000 = Pset 8
PsetSelect0Is1	Select a Pset. Pset select source must be set to FieldBus. Pset0 = no Pset selected. Number 0 = Pset 1 number 1 = Pset 2 etc.	Bit Field	2 – 8 bits in the same byte.	0000 0001 = Pset 2 0001 0000 = Pset 17
RelayPos# [# = 1 - 4]	Control a relay from FieldBus. In I/O set-up the selected relay must be programmed to FieldBus relay x. There are four different items.	Bit	1 bit	0 = Relay OFF 1 = Relay ON
ResetBatch	Reset the batch counter to 0.	Bit	1 bit	0 = Not used 1 = Reset the batch
ResetJobStatus	Resets Job done status.	Bit	1 bit	0 = Not used 1 = ResetJobStatus
ResetResultStatus	Reset all result status on relay, RE-Alarm and FieldBus.	Bit	1 bit	0 = Not Used 1 = Reset result
RestartJob	Stop current Job and restart the same Job from 0.	Bit	1 bit	0 = Not used 1 = Restart Job
SelectNextPset	Selects next Pset.	Bit	1 bit	0 = Not used 1 = Select next Pset
SelectPrevPset	Select previous Pset.	Bit	1 bit	0 = Not used 1 = Select previous Pset
SetBatchSize / SetBatchSizePsetID	Sets batch size in indicated Pset ID (SetBatchSizePsetID). These two items must be used together. 0<Batch Size<=99	Bit field	2 - 8 bits in the same	00000000 = 0 11111111 = 255
		U16	2 bytes	Binary representation (Decimal 0-65535)
ToolLightsFlashGreen	Starts to flash the tool green light. Resets any existing light pattern on the tool.	Bit	1 bit	0 = Not used 1 = Tool light flash
ToolTighteningDisable	The function is similar to Tool Disable, but only for tightening.	Bit	1 bit	0 = TighteningEnable 1 = TighteningDisable

Items To PF	Description	Data type	String length	Value
UnlockTool	Unlock tool if tool locked by batch ok or lock on reject	Bit	1 bit	0 = Not used 1 = Unlock tool

26.5 ProfiBus-DP



ProfiBus-DP is a FieldBus normally used in industrial automation, to transfer fast data for motor controllers, MMI, I/O units and other industrial equipment. ProfiBus has an international user organisation called ProfiBus International, PI, and other local and national organisations.

General technical questions regarding the FieldBus should be addressed to your local ProfiBus User Group in the first instance.

A contact address list is available on the ProfiBus Internet site: <http://www.ProfiBus.com>.

For general help on ProfiBus, contact ProfiBus International on:
ProfiBus_international@compuserve.com.

26.5.1 ProfiBus-DP for Pulsor Focus

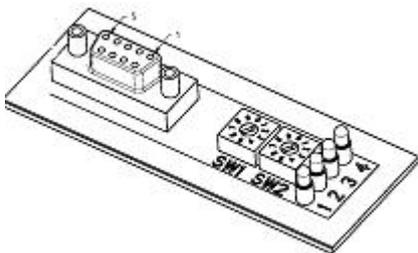
Physical interface

Interface	Description
FieldBus type	PROFIBUS DP EN 50 170 (DIN 19245)
Protocol version	1.10
Protocol stack supplier	SIEMENS
Auto baud rate detection (supported baud rate range)	9.6 kbit - 12Mbit
Transmission media	ProfiBus bus line, type A or B specified in EN50170
Topology	Server-Client communication
FieldBus connectors	9 pin female DSUB (standard)
Cable	Shielded copper cable, twisted pair
Isolation	The bus is galvanically separated from the other electronics with an on board DC/DC converter. Bus signals (A-line and B-line) are isolated via optics couplers.
ProfiBus DP communication ASIC	SPC3 chip from Siemens

ProfiBus-DP module

Variable	Limits	Information
Node Address	1 – 124 (1-99 with HW setting)	Set Switches to 00 if you want to set the node address from SW (TTPF)
Number of nodes in a ProfiBus-DP network	Max 126	
Baud rate	Automatic (9.6 kbaud - 12 Mbaud)	Automatically set from PLC at connection
Data to PF length	0 - 122 bytes The string length in PF is limited to 122 bytes. ProfiBus-DP standard allows 244 bytes.	Must be the same in PF and PLC
Data from PF length	0 - 122 bytes The string length in PF is limited to 122 bytes. ProfiBus-DP standard allows 244 bytes.	Must be the same in PF and PLC
The module only supports cyclic I/O data transmission		

Hardware



FieldBus connectors

The ProfiBus-DP standard EN 50170 (DIN 19245) recommends the use of a 9 pin female D-sub connector. Depending on the protection class and type of application, other connector designs are also allowed.

Connector 9-pin female DSUB

Pin	Name	Function
Housing	Shield	Connected to PE
1	Not connected	
2	Not connected	
3	B-Line	Positive RxD/TxD according to RS485 specification
4	RTS	Request to send +5V BUS and GND BUS are used for bus termination. Some devices, like optical transceivers (RS485 to fibre optics) may require an external power supply from these pins.
5	GND BUS	Isolated GND from RS484 side +5V BUS and GND BUS are used for bus termination. Some devices, like optical transceivers (RS485 to fibre optics) may require an external power supply from these pins.
6	+5V BUS	Isolated +5V from RS484 side +5V BUS and GND BUS are used for bus termination. Some devices, like optical transceivers (RS485 to fibre optics) may require an external power supply from these pins.
7	Not connected	
8	A-Line	Negative RxD/TxD according to RS485 specification
9	Not connected	

Node address

Node address is set with the two rotary switches on the FieldBus module; this enables address settings from 1-99 in decimal form.

Switch 1 x10 ; Switch 2 x1

(See switches on the top drawing)

Example: Address = (Left Switch Setting x 10) + (Right Switch Setting x 1)

Left switch is set to 5 and right switch is set to 2. This gives a node address of 52.

If you want to set the node address from ToolsTalk the switches must be set to 00.



Node address cannot be changed when the power is switched on.

Baud rate

The ProfiBus DP network baud rate is set during configuration of the master and only one baud rate is possible in a ProfiBus DP installation. As the Pulsor Focus ProfiBus DP module has an auto baud rate detection function, you will not have to configure the baud rate on the module.

Supported baud rates: 9.6 kbit/s; 19,2 kbit/s; 93,75 kbit/s ; 187,5 kbit/s; 500 kbit/s; 1,5 Mbit/s; 3 Mbit/s; 6 Mbit/s; 12 Mbit/s

Functionality of the indication LEDs

The module is equipped with four color LEDs, used for debugging purposes. The function of the LEDs are described in the table and figure below.

Name	Color	Function
FieldBus Diagnostics (LED 4)	Red	Indicates certain faults on the FieldBus side. Flashing Red 1 Hz - Error in configuration: IN and/or OUT length set during initialisation of the module is not equal to the Length set during configuration of the network. Flashing Red 2 Hz - Error in User Parameter data: The Length/contents of the User Parameter data set during initialisation of the module is not equal to the length/contents set during configuration of the network. Flashing Red 4 Hz - Error in initialisation of the ProfiBus communication ASIC. Turned Off - No diagnostics present
On-Line (LED 2)	Green	Indicates that the module is On-Line on the FieldBus. Green - Module is On-Line and data exchange is possible. Turned Off - Module is not On-Line
Off-Line (LED 3)	Red	Indicates that the module is Off-Line on the FieldBus. Red - Module is Off-Line and no data exchange is possible. Turned Off - Module is not Off-Line

Bus termination

The end nodes in a ProfiBus DP network have to be terminated to avoid reflections on the bus line. Use cable connectors with built-in termination.

GSD file

Each device on a ProfiBus DP network is associated with a GSD file, containing all necessary information about the device. The network configuration program during configuration of the network uses this file.

Contact your local Atlas Copco Company for a copy of the GSD file

File name: pf3profb.gsd

Icon File



Contact you local Atlas Copco representative to get a copy of the Icon file for Pulsor Focus. This file can be used to have a Power Focus Icon in PLC configuration SW. The file is a bitmap.

File name: pf3profb.bmp

26.6 DeviceNet



DeviceNet is used for industrial automation, normally for the control of valves, sensors and I/O units and other automation equipment. The DeviceNet communication link is based on a broadcast-oriented communications protocol, Controller Area Network (CAN). This protocol has I/O response and high reliability even for demanding applications, e.g. brake control.

DeviceNet has a user organization, the Open DeviceNet Vendor Association (ODVA) that assists members in matters concerning DeviceNet. Website: <http://www.ODVA.org>

The media for the FieldBus is a shielded copper cable composed of one twisted pair and two cables for the external power supply. The baud rate can be changed between 125k, 250k and 500kbit/s. This can be done in two different ways. The first is simply by using the DIP switch, second is via SW configuration. There are several different DeviceNet Scanners available on the market, both for PLC systems and for PCs.

26.6.1 DeviceNet for Pulsor Focus

DeviceNet module

Variable	Limits	Information
Node Address (Mac ID)	0-63	
Number of nodes in a DeviceNet network	Max 63	
Connection modes supported	Polled I/O Bit strobe I/O Change of status/ cyclic I/O	Use same as in PLC
Baud rate	125kbit/sec (Default) 250kbit/sec 500kbit/sec	
Data to PF length	0 – 122 bytes The data string is in PF limited to 122 bytes. DeviceNet standard allows 255 bytes.	Must be the same in PF and PLC
Data from PF length	0 – 122 bytes The data string is in PF limited to 122 bytes. DeviceNet standard allows 255 bytes.	Must be the same in PF and PLC

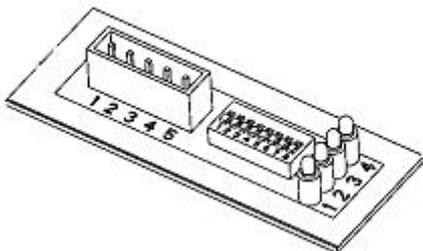
Configuration

In a DeviceNet network, each node has a Mac ID (the address in the network). The Mac ID is a number between 0 and 63. Each node's Mac ID has to be unique, since it is used to identify the node. In a DeviceNet network you can also set baud rate, with the following baud rates being available: 125, 250 and 500 kbit / sec. All nodes in the network have to communicate at the same baud rate.

On the Pulsor Focus DeviceNet module it is possible to set the Mac ID and baud rate using DIP switches mounted on the module or from SW using ToolsTalk. Dip 1 and 2 are used to set the baud rate and dips 3 to 8 are used to configure the node address (Mac ID). Dip 1 is the most significant bit on the DIP switch. See table on the next page.

The Pulsor Focus DeviceNet module is implemented in compliance with the ODVA specification for a Communication adapter (profile no 12). It acts as a "group two only server" on the DeviceNet network.

Hardware

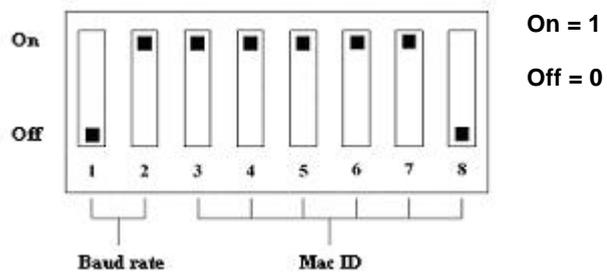


LED 1: Not used

LED 2: Network status

LED 3: Module status

LED 4: Not used



Function	Dip switch #
AD0	8
AD1	7
AD2	6
AD3	5
AD4	4
AD5	3
BD2	2
BD1	1

Baud rate (Bit/sec)	Dip 1 - 2
125k	00
250k	01
500k	10
Reserve (SW-setting)	11

Address	Dip 3 – 8
0	000 000
1	000 001
2	000 010
3	000 011
...	...
62	111 110
63	111 111

Mac ID (Node address)

If you want to set the Mac ID from ToolsTalk all DIP switches must be set to On (11 111 111).

The Mac ID cannot be changed when the power is switched on.

FieldBus connector

Connector 5-pin 5.08mm detachable screw terminal.

Pin	Color code	Description
1	Black	V-
2	Blue	CAN-L
3	Bare	Shield
4	White	CAN-H
5	Red	V+



V- and V+ must come from a fully isolated power supply. That means that the voltage cannot have any reference to ground. This is to prevent the bus from interference caused by ground loop problems. If V- and V+ are connected from a Pulsor Focus internal 24VDC (screw terminal) the same connection shall only power one DeviceNet module. This means that the DeviceNet cable connected to the Pulsor Focus must not include voltage wires. Normally you have a central power supply that feeds all nodes in the network.

Power consumption

Current consumption at 24 VDC (V- to V+) is max 70 mA at power up and 25-30 mA continuously.

Functionality of the indication LEDs

The module is equipped with four colours LEDs, used for debugging purposes.

LED number	Function	Information	Condition
1	Not in use		
2	Network status	Not powered / Not on line	Off
2	Network status	Link OK on line. Connected	Steady green
2	Network status	Critical link failure	Steady red
2	Network status	On line not connected	Flashing green
2	Network status	Connection time out	Flashing red
3	Module status	No Power	Off
3	Module status	Unrecoverable fault	Steady red
3	Module status	Minor fault	Flashing red
3	Module status	Device operational	Steady green
4	Not in use		

Bus termination

Termination of the FieldBus requires a terminating resistor at each end of the FieldBus. These resistors should have a value of 121 Ohm.

EDS file

Each device on a DeviceNet network is associated with an EDS file, containing all necessary information about the device. The network configuration program during configuration of the network uses this file.

Contact your local Atlas Copco representative for a copy of the EDS file.

File name: pf3devn.eds

Icon file



Contact your local Atlas Copco representative to get a copy of the Icon file for Pulsor Focus. This file can be used to have a Power Focus Icon in PLC configuration SW.

File name: pf3devn.ico

26.7 InterBus



InterBus is normally used for industrial automation applications, such as valve, sensor and I/O unit control. InterBus is used in many different types of industry, including: Automobile Industry, Food Industry, Building Automation, Plant Construction, Paper Converting, Wood Processing and Process Engineering.

InterBus has a user organisation called the InterBus Club. The organisation assists members on a wide variety of matters concerning InterBus. For more information, contact the InterBus Club:

<http://www.interbusclub.com>

The media used by InterBus is a shielded copper cable consisting of three twisted pairs. Two of these pairs are used for the bus connection and in the last pair only one cable is used. This cable is used to earth the bus. The baud rate for the bus is 500 kbit/s with a total amount of data of 4096 I/O points.

The Pulsor Focus InterBus module is to be used on InterBus Remote Bus networks. In applications where it is necessary to exchange large amounts of data and where a parallel application interface is required, InterBus is the preferred option.

InterBus has two ways of exchanging data. One through fast cyclical I/O data, called process data. The other is a somewhat slower protocol called PCP, which is mainly used for configuring and setting the parameters of a device. The Pulsor Focus InterBus module supports up to 10 words on the bus, out of which none, one, two or four words may be selected to act as the PCP –channel, necessary if the PCP-protocol required.

The PCP version supported by the module is version 2.0, which is fully backwards compatible.



When using InterBus master boards where the PCP channel is not supported, the maximum input and output is 20 Bytes in and 20 Bytes out.

26.7.1 InterBus for Pulsor Focus

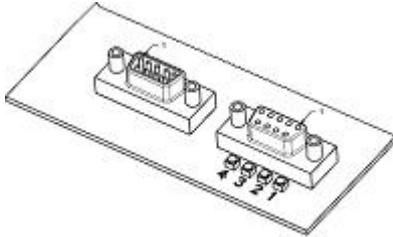
Physical interface

Interface	Description
Transmission media	InterBus two differential lines.
Topology	Ring Structure.
FieldBus connectors	9 pin male DSUB.
Cable	Shielded copper cable, Three Twisted pair.
Isolation	The bus is galvanically separated from the other electronics with two DC/DC Converters. Bus signals are isolated via opto couplers.
ASICs and circuits	Module is based on SUPI 3 and SRE1 chip from Phoenix Contact.

InterBus module

Variable	Limits
Node Address	Auto select
Number of nodes in an InterBus network	
Baud rate	500 kbit/sec
Process string length	<= 20 bytes
Parameter string length (send with PCP)	122 byte – Process string length The string length in the Pulsor Focus is limited to 122 bytes. InterBus standard allows 512 bytes.
PCP length	0, 1, 2, 4 Words
Parameter data index	0x6000 R/W + I (I = 0, 1, ...) 0x6040 RO + I (I = 0, 1, ...)
ID code (in PLC side)	PCP 0 = 3 PCP 1 = 0xF3 PCP 2 = 0xF0 PCP 4 = 0xF1

Hardware



LED 1 = RBDA

LED 2 = TR

LED 3 = CC

LED 4 = BA

BUS-IN (9-pin Dsub male)

Pin	Name
Housing	PE
1	DO1
2	DI1
3	GND
4	Not used
5	Not used
6	/DO1
7	/DI1
8	Not used
9	Not used

BUS-OUT (9-pin Dsub female)

Pin	Name
Housing	PE
1	DO2
2	DI2
3	GND
4	Not used
5	GND
6	/DO2
7	/DI2
8	Not used
9	RBST



Always connect RBST to GND if it is not the last module on the bus. If the RBST is not connected to GND on the output connector, the Pulsor Focus InterBus module will terminate the outgoing bus.

Functionality of the indicator LEDs

LED number	Name	Description
1. RBDA	<u>R</u> emote <u>B</u> us <u>D</u> is <u>A</u> ble	Active RED when outgoing remote bus is switched off
2. TR	<u>T</u> ransmit/ <u>R</u> eceive	Active GREEN when PCP communication is carried out over the InterBus (0.6 s hold time to be visual).
3. CC	<u>C</u> able <u>C</u> heck	Active GREEN if the cable connection is good and the InterBus Master is not in RESET
4. BA	<u>B</u> us <u>A</u> ctive	Active GREEN, is monitoring Layer 2

Icon file



Contact you local Atlas Copco representative to get a copy of the Icon file for Pulsor Focus. This file can be used to have a Power Focus Icon in the PLC configuration SW. File name: pf3intb.ico.

26.8 ModBusPlus



ModBusPlus is a local area network system designed for industrial control and monitoring applications, developed by Modicon, Inc. The network enables programmable controllers, host computers and other devices to communicate throughout plants and substations. ModBusPlus transfers fast data for motor controllers, MMI, I/O units and other industrial equipment. ModBusPlus has an international user organization called Modicon Inc.

General technical questions regarding the FieldBus should be addressed to your local ModBusPlus User Group in the first instance.

A contact address list is available from the ModBusPlus Internet site <http://www.modicon.com>.

26.8.1 ModBusPlus for Pulsor Focus

Physical interface

Interface	Description
Transmission media	ModBusPlus one differential line (RS-485 twisted pair) and shield.
Topology	Token Bus Structure, virtual token ring.
FieldBus connectors	9 pin female DSUB.
Cable	Shielded copper cable, One Twisted pair.
Isolation	The bus signals are separated from the other electronics with a transformer according to ModBusPlus interface description.
ASICs and circuits	Module is based on chip-set and software from Modicon Inc.

Mechanical overview

ModBusPlus module is a host device. This host device can be read and written to from another ModBusPlus host device or controller. ModBusPlus module will not initiate any Point-to-point communication to other nodes, it will only respond to incoming commands. It can although broadcast Global data to all nodes on the network.

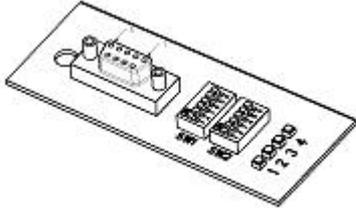
Protocol and supported functions

ModBusPlus has two ways of exchanging data. One through fast cyclic I/O data called Global data and one through a somewhat slower ModBusPlus protocol for point-to-point parameter data transfer. The Maximum Global Data is 32 words on the bus. The point-to-point data transfer is handled by using one of the following ModBus functions Read holding Registers, PreSet Single Register and PreSet Multiple Registers all 40000 registers.

ModBusPlus module information

Variable	Limits	Information
Node Address	1 - 64	The node address cannot be changed during operation.
Source Address	1 - 64	The node address cannot be changed during operation.
Number of nodes in a ModBusPlus network	Max 32 (with repeaters 64)	
Bus length	Max 2000 m with repeaters	
Bus cable length	Max 500 m	
Data address	40001 + I (I = 0, 1, ...) From PF 41025 + I (I = 0, 1, ...) To PF (Global Data From PF Data in the module starts from address 40001 and Point-to-Point Data starts immediately thereafter. Global Data To PF data in the module starts from address 41025 and Point-to-Point Data starts immediately thereafter. For example, If To PF string length is 8 bytes and To PF Global string length is 4 bytes, the Global data are mapped to address 41025 and 41026, the point-to-point data are mapped to address 41027 and 41028.)	This address is based on words.
Baud rate	Automatic (1Mbit/s)	Automatically set from PLC at connection.
Data to PF total length	0 - 122 bytes (The string length is in Pulsor Focus limited to 122 bytes. ModBusPlus standard allows 64 bytes global data and 250 bytes point-to-point data.)	Must be the same in PF and PLC.
Data from PF total length	0 - 122 bytes (The string length is in Pulsor Focus limited to 122 bytes. ModBusPlus standard allows 64 bytes global data and 250 bytes point-to-point data.)	Must be the same in PF and PLC.
Global string length (To/From PF)	0 - 64 bytes	Must be the same in PF and PLC.
Host Firmware Rev. 77		

Hardware



LED 1: Not used

LED 2: Error

LED 3: MBP Active

LED 4: MBP Init

Functionality of the indication LEDs

The module is equipped with four color LEDs, used for debugging purposes. The function of the LEDs is described in the table and figure below.

Name	Color	Function
Error (LED 2)	Red	Indicates that the communication is not OK. Turned Off – communication OK
MBP Active (LED 3)	Green	Indicates different Node Status: Flashing every 160 ms – This node works normally, receiving and passing token. Flashing every 1 s – This node is in Monitor_Offline status. 2 Flashing, off 2 s – This node is in MAC_IDLE never receiving-token status. 3 Flashing, off 1.7 s – This node is not hearing any other nodes. 4 flashing, off 1.4 s – This node has heard a valid packet that has a duplicated-node address sent from another node on the network, using the same Node ID.
MBP Init (LED 4)	Green	Indicates that the peer interface is initialised Turned Off – peer interface is not initialised

FieldBus connectors

ModBusPlus recommends the use of a 9 pin female D-sub connector. Depending on the protection class and type of application, other connector designs may also be used.

Connector 9-pin female DSUB

Pin	Name
1	Cable shielding
2	Line-B
3	Line-A
4	PE

Node address

Node address is set with the first DIP switch on the FieldBus module, allowing address settings from 1-64 in binary format. If the set node address is from SW1, ModBusPlus takes SW node address regardless of hardware switch position.

1 (MSB)	2	3	4	5	6 (LSB)	Function
ON	ON	ON	ON	ON	ON	Node address set to 1
ON	ON	ON	ON	ON	OFF	Node address set to 2
ON	ON	ON	ON	OFF	ON	Node address set to 3
-	-	-	-	-	-	-
OFF	OFF	OFF	OFF	OFF	ON	Node address set to 63
OFF	OFF	OFF	OFF	OFF	OFF	Node address set to 64



The Node address cannot be changed during operation.

Source address

Source address is set using the second dip switch (the one close to LED) on the FieldBus module, this enables address settings from 1-64 in binary format. If the set source address is from SW2, ModBusPlus takes SW source address regardless of hardware switch position.

1(MSB)	2	3	4	5	6 (LSB)	Function
ON	ON	ON	ON	ON	ON	Source address set to 1
ON	ON	ON	ON	ON	OFF	Source address set to 2
ON	ON	ON	ON	OFF	ON	Source address set to 3
-	-	-	-	-	-	-
OFF	OFF	OFF	OFF	OFF	ON	Source address set to 63
OFF	OFF	OFF	OFF	OFF	OFF	Source address set to 64



The source address cannot be changed during operation.

Icon file



It is not necessary for ModBusPlus to install a special file to recognise our product and it does not support icon files.



26.9 EtherNet

Ethernet is one of the most popular network technologies in use today. The major reasons for the popularity are a suitable mix of speed, cost and ease of installation. These benefits, the market acceptance, and the possibility to support, more or less, any non-real-time critical protocol, makes the Ethernet an ideal networking technology for most systems.

More information, as well as links can be found at the web site www.iaona-eu.com.

26.9.1 EtherNet for Pulsor Focus

Hardware

The module is based on a high performance CPU operating at 66 MHz. It features 8MB RAM and 2 MB FLASH.

Supported FieldBus Protocols

ModBus/TCP

The module supports the ModBus/TCP protocol and is conform to the ModBus/TCP specification 1.0. More information about the ModBus/TCP protocol can be found at <http://www.modicon.com/openmbus/index.html>.

EtherNet/IP

The module supports the Ethernet protocol.

EtherNet/IP is based on the control and information protocol, CIP, which is also the framework for both DeviceNet and ControlNet, to carry and exchange data between nodes. To be consistent with the other AnyBus-S modules that is based on the CIP, i.e., DeviceNet and ControlNet, the same vendor specific objects are implemented, together with new objects for servicing and monitoring the IT functionality.

EtherNet module

Variable	Limits	Information
IP address	Do not configure the module to use any of them 0.x.x.x 127.x.x.x x.x.x.0 x.x.x.255	Devices on an EtherNet network are not allowed to be configured to the IP addresses listed in left column

Variable	Limits	Information
ModBus/TCP Data address	000h + I (I = 0, 1, ...) From PF 400h + I (I = 0, 1, ...) To PF The data length is in PF limited to 122 bytes. ModBus/TCP and EtherNet/IP standard allows 1024 bytes data.	This address is based on words.
	0000h + I (I = 0, 1, ...) From PF 4000h + I (I = 0, 1, ...) To PF The data length is in PF limited to 122 bytes. ModBus/TCP and EtherNet/IP standard allows 1024 bytes data.	This address is based on Bits
EtherNet/IP Assembly Instance	Input 100, output 150, configuration 5 and size = 0	This is used to configure a EtherNet/IP module
Data to PF total length	0 - 122 bytes The data length is in PF limited to 122 bytes. ModBus/TCP and EtherNet/IP standard allows 1024 bytes data.	Must be the same in PF and PLC.
Data from PF total length	0 - 122 bytes The data length is in PF limited to 122 bytes. ModBus/TCP and EtherNet/IP standard allows 1024 bytes data.	Must be the same in PF and PLC.

FieldBus connectors

The module uses standard EtherNet connector RJ45.

The module uses twisted-pair cables, and no external termination is required.

RJ45 (Standard)

Pin	Signal
1	TD+
2	TD-
3	RD+
4	Termination
5	Termination
6	RD-
7	Termination
8	Termination

Status indicators

The module has four status LEDs.

LED	State	Summary	Description
Led 1 - Link	Steady Off	Not connected	Module is not connected to EtherNet
	Steady Green	Connected	Module is connected to EtherNet
Led 2 –Module Status	Steady Off	No power	No power applied to the module
	Steady Green	Device operational	Module is operating correctly
	Flashing Green	Standby	The module has not been configured
	Flashing Red	Minor fault	A minor recoverable fault has been detected
	Steady Red	Major fault	A major internal error has been detected
	Flashing Green/Red	Self-test	The module is performing a power on self test
Led 3 - Network Status	Steady Off	No power or no IP address	Module has no power or no IP address
	Steady Green	Connected	Module has at least one EtherNet/IP connection
	Flashing Green	No connections	There are no EtherNet/IP connections established
	Flashing Red	Connection timeout	One or more of the connections in witch this module is the target has timed out. This state is only left if all timed out connections are re-established or if the module is reset
	Steady Red	Duplicate IP	Module has detected that its IP address is already in use.
	Flashing Green/Red	Self-test	Module performing a power on self-test.
LED 4 – Activity	Flashing Green	Active	Flashes each time a packet is received or transmitted

27 Abbreviations

Abbreviation	Description
\overline{R}	The centre line
\overline{X}	The mean
$\overline{\overline{X}}$	The mean of the average
<= =>	Arrow (button)
σ	Sigma (standard deviation)
α	Alpha (often a symbol for angle)
μ	Mu (the values of the mean)
A	Ampere
AC	Alternating Current
ACK	Acknowledged
Admin	Administration
ASL	Atlas Service Literature
CAN	Controller area network
CC	Control card
CCW	Counter-clockwise
CD	Compact disc
Ch	Channel
CL	Clear (button)
Config	Configuration
CW	Clockwise
DC	Direct Current
Deg	Degrees
DigIn	Digital input
DSP	Digital signal processor
ft.lb	Foot pound
GFI	Ground Fault Interrupter
HW	Hardware
Hz	Hertz (unit of frequency)
I/O	Input/output
ID	Identification
in.lb	Inches pound
kpm	Kilo pound meter
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LCK	Tool Locked
MC	Motor card

Abbreviations

Abbreviation	Description
n	Number (of values)
Nm	Newton meter
No.	Number
NOK	Not approved (tightenings)
nxOK	Number of approved (tightenings)
OK	Approved (tightenings)
PF	Pulsor Focus
PFNR	Pulsor Focus Not Ready (PF Not Ready)
PLC	Programmable Logic Controller
PROG	Program (button)
Pset	Parameter set
PVT	Prevailing torque
R chart	Range chart
RAM	Random Access Memory
RAS	Remote Access Server
RBU	Rapid Backup memory
rpm	Revolutions per minute
RS232	Serial communication link
SPC	Statistic Parameter Control
STAT	Statistic (button)
SW	Software
TNR	Tool Not Ready
Tq	Torque
TTP	ToolsTalk Pulsor (SW)
UCL	Upper control limit
UTL	Upper tolerance limit
V	Volt
VIN	Vehicle Identification Number
X-bar	The mean
X-bar-bar	The average of means
z	subgroup size, group size

28 General safety instructions for Pulsor Focus unit

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

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.

28.1 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.

28.2 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 apparatus must be earthed.

A Pulsor Focus unit may not be supplied with a galvanically isolated voltage as this would inhibit the function of the Ground Fault Interrupter (GFI). The test button on the GFI also activates the GFI in instances where a Pulsor Focus unit is equipped with an isolated transformer. Test the earth fault protector by pressing the test button located on the rear panel of the Pulsor Focus unit.

Test the earth protector every month by pressing the test button. Should the earth fault protector disconnect the system, be sure to find the primary reason before you resume operation.

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.

28.3 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.

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 invite 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.

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 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. 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.

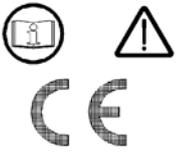
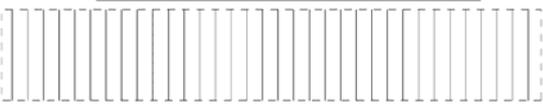
Only use accessories that are recommended by the manufacturer for your model. Accessories that may be suitable for one tool may become hazardous when used on another tool.

28.4 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.

 **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.**

		XXXXX	
Atlas Copco Tools AB STOCKHOLM-SWEDEN Made in Sweden QQQQ			
Type	<input type="text"/>		
Art. no.	<input type="text"/>		
Ser. no.	<input type="text"/>		
HW rel.	<input type="text"/>		4222 0367 01
			
90-120, 180-240 VAC ~ 300 W 50 - 60 Hz			
DUTY CYCLE 1/10 Max.amb temperature 40°C (104°F)			



**ETL LISTED
CONFORMS TO UL STD
ANSI/UL 508C-2000**

**CERTIFIED TO
CAN/CSA STD C22.2 NO.14-95**

29 EC declaration of conformity



EC DECLARATION OF CONFORMITY
 DÉCLARATION DE CONFORMITÉ CE
 EG KONFORMITÄTSEKTLÄRUNG
 DECLARACION DE CONFORMIDAD CE
 DECLARAÇÃO DE CONFORMIDADE CE
 DICHIARAZIONE DI CONFORMITÀ CE
 EG KONFORMITEITSVERKLARING
 EF ÖVERENSSTEMMELSESEKTLÄRING
 EF ERKLÆRING OM ÖVERENSSTEMMELSE
 EY:N VAATIMUSTENMUKAISUUSILMOITUS
 ΔΗΛΩΣΗ ΣΥΜΜΟΡΦΩΣΗΣ ΣΕ ΟΔΗΓΙΑ ΤΗΣ
 ΕΥΡΩΠΑΙΚΗΣ ΚΟΙΝΟΤΗΤΑΣ
 EG-DEKLARATION OM ÖVERENSSTÄMMEELSE

We **Atlas Copco Tools AB** – STOCKHOLM SWEDEN declare under our sole responsibility that the product to which this declaration relates, is in conformity with the following standards or standardized documents:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 in accordance with regulations 89/336/EEC, 73/23/EEC, 93/68/EEC.

Nous **Atlas Copco Tools AB** – STOCKHOLM SWEDEN déclarons sous notre responsabilité exclusive que ce produit, que concerne cette déclaration, est en conformité avec les normes ou documents normalisés suivant:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 conforme aux réglementations 89/336/EEC, 73/23/EEC, 93/68/EEC.

Wir **Atlas Copco Tools AB** – STOCKHOLM SWEDEN erklären hiermit in alleini-ger Verantwortung, daß das Produkt auf das sich diese Erklärung bezieht, mit fol-gende Normen oder normativen Dokumentation übereinstimmt:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 gemäß den Bestimmungen der Richtlinien 89/336/EEC, 73/23/EEC, 93/68/EEC.

Nosotros **Atlas Copco Tools AB** – STOCKHOLM SWEDEN declaramos bajo nu-estra sola responsabilidad que el producto a que se refiere esta declaración, es conforme con las normas o documentos normalizados siguientes:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 de acuerdo con las regulaciones 89/336/EEC, 73/23/EEC, 93/68/EEC.

Nós **Atlas Copco Tools AB** – STOCKHOLM SWEDEN declaramos sob nossa ex-clusiva responsabilidade que o produto a que se refere esta declaração está em conformidade com as seguintes normas ou documentos normativos:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 conforme as disposições das directivas 89/336/EEC, 73/23/EEC, 93/68/EEC.

Noi **Atlas Copco Tools AB** – STOCKHOLM SWEDEN dichiariamo sotto nostra unica responsabilità che il prodotto cui questa dichiarazione si riferisce, è confor-me alla seguenti normative e ai relativi documenti:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 in base alle prescrizione delle direttive 89/336/EEC, 73/23/EEC, 93/68/EEC.

Wij **Atlas Copco Tools AB** – STOCKHOLM SWEDEN verklaren onder onze ex-clusieve verantwoordelijkheid dat het product waarop deze verklaring betrekking heeft, in overeenstemming aan volgende normen of normatieve documenten:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 overeenkomstig de bepalingen van de richtlijnen 89/336/EEC, 73/23/EEC, 93/68/EEC.

Vi **Atlas Copco Tools AB** – STOCKHOLM SWEDEN erklærer under eget ansvar, at produktet hvortil denne erklæring relaterer sig, er i overensstemmelse med følgende normer eller normative dokumenter:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 i henhold til bestemmelserne i direktiverne 89/336/EEC, 73/23/EEC, 93/68/EEC.

Vi **Atlas Copco Tools AB** – STOCKHOLM SWEDEN erklærer herved under vårt fulle ansvar at produktet, som denne erklæringen gjelder for, er i overensstem-melse med følgende standarder eller standard-dokumenter:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 i samsvar med reguleringer 89/336/EEC, 73/23/EEC, 93/68/EEC.

Me **Atlas Copco Tools AB** – STOCKHOLM SWEDEN vakuutamme olevamme yksinomaisessa vastuussa siitä, että tämä toute on allalueteltujen standardien ja standardoimisasiakirjojen vastainen mukainen:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 seuraavien sääntöjen mukaisesti 89/336/EEC, 73/23/EEC, 93/68/EEC.

Εμείς η **Atlas Copco Tools AB** – STOCKHOLM SWEDEN δηλώνουμε υπεύθυνα ότι το προϊόν στο οποίο αφορά η παρούσα δήλωση βρίσκεται σε πλήρη συμμόρφωση με τις απαιτήσεις τους καινοτομίας της κατασκευαστικής διαδικασίας:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 κατά τις διατάξεις του καινοτομίας της Κοινής Αγοράς 89/336/EEC, 73/23/EEC, 93/68/EEC.

Vi **Atlas Copco Tools AB** – STOCKHOLM SWEDEN förklarar härmed på vårt ful-la ansvar att produkten för vilken denna deklaration gäller, överensstämmer med följande normer och dokument:
 EN 50081-1, EN 50144 -1, EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 enligt bestämmelser i riktlinjerna 89/336/EEC, 73/23/EEC, 93/68/EEC.

Type / Type / Typ / Tipo /
 Tipo / Tipo / Type / Type /
 Type / Τύπος / Τύπος /
 Τύπος

Name of and position of issuer / No Name und Position des Erstellers /
 Nombre y cargo del expedidor / Nome e cargo do emissor / Nome e posizione
 del dichiarante / Naam en functie van de uitgever / Udsteder, navn og stilling /
 Ustøderens navn og stilling / Ilmoituksen antajan nimi ja asema / Ονομα και θέση
 εκδότη / Utgårdarens namn och befattning

Håkan Söderström, General Manager

Signature of issuer / Signature de l'émetteur / Unterschrift des Erstellers /
 Firma del expedidor / Assinatura do emissor / Firma del dichiarante /
 Handtekening van de uitgever / Udsteder, underskrift / Ustøderens signatur /
 Ilmoituksen antajan allekirjoitus / Υπογραφή εκδότη / Utgårdarens
 namnteckning