User Guide

Pulsor C

Pulsor C System manual

Atlas Copco Tools and Assembly Systems

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Contents - chapter overview

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1 Introduction to Pulsor C

1.1 Conventions used in this manual

The following conventions are used from chapter 1.3 onwards:

When *new concepts* are introduced and not yet explained they will be written in *italic* style. These will be explained directly or shortly after the first use. It may happen that concepts are written in italic style more than once. References to chapters will also use the italic style.

Parts and concepts of the Pulsor system will have their first letter Capitalized. This style will also be used for ToolsTalk Controls.

Table heads and details that are to **stand out** are written in **bold** style.

1.2 About this document

This user manual for the **Pulsor C** system is divided into three main parts:

Part	Name	Description
Part I	Getting started with Pulsor C – chapter 1-5	This part introduces Pulsor C and is also a step by step instruction on how to get to the point of doing real tightenings with your Pulsor C system.
Part II	Working with Pulsor C chapter 6-21	Describes in detail functions and features of the Pulsor C system.
Part III	Reference information on Pulsor C chapter 22-	Gives important reference information on Pulsor C such as event codes and specifications on hardware.

1.3 Overview of the Pulsor system

A minimal Pulsor C system consists of a *Pulsor Focus* controlling/monitoring unit, a *Tool Control Box* (*TCB*) and a Pulsor C tool.

The system is easy to use. Connect the different parts of the system with air hoses and cables, perform a *Tool setup* on the actual joint/joints and you are ready to go. No mechanical adjustment of the tool is normally needed. If monitoring of the tightenings is desired, limits may be set either manually or automatically (by performing a *Monitoring setup).* Follow the instructions in the PulsorC Quickstart Guide to begin working with the system as quickly as possible.

Tightenings can be prrformed using one of two strategies; the *Pulsor Fixed* or the *Angle Shutoff* strategies. In the first, the *Pulsor Fixed* strategy, the optimal pressure for a certain joint and Pset is set once and this pressure is then used throughout all tightenings performed with that Pset. The second strategy is used for torque+angle tightenings. The system will shut off after the specified angle is reached above a torque threshold value. This strategy is good at producing consistent clamp force between similar joints.

Whichever strategy is used, the Pulsor Focus collects information about ongoing tightenings and decides when to shut off the tool. It is possible to mix Psets with different strategies on the Pulsor C system.

During Tool Setup, i.e. when setting up a Pset, the tightening speed can be set in five steps. This makes the system usable both for speed critical applications and applications where higher accuracy is needed. As usual the rule of “faster tightenings, higher scatter” applies.

As the target torque and control parameters are set in software, there is no need for mechanical adjustments of the tool. Therefore, it is easy to use the same tool for tightenings with different target torques, as long as the target torque lies within the valid torque range of the tool. Just create additional Psets and perform a Tool Setup for each application (different target torques and/or widely different joint hardness). The same tool will tighten the joint as specified in the currently active Pset. For the torque range of the different pulsor models, please consult www.atlascopco.com/tools.

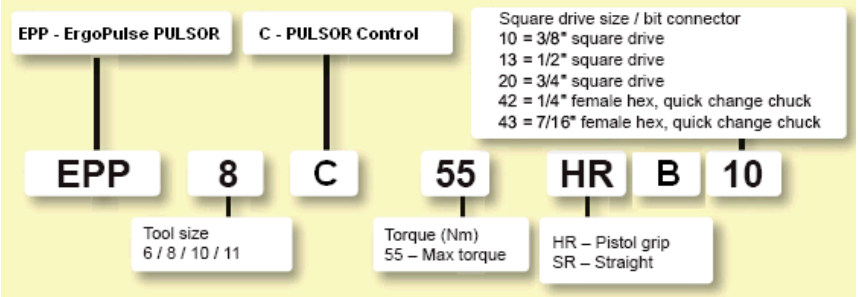
The tool measures the torque during pulsing. The torque measured is, as always, the torque in the outgoing shaft from the tool. What this torque pulse actually achieves for the installed torque depends on the characteristics of the joint, the use of extensions, sockets etc. For the system to correctly translate the tool torque into installed torque the following procedure needs to be performed once for each Pset, during Tool Setup: several tightenings are performed on the same type of joint and the resulting torque is manually measured and input to the system via ToolsTalk or PulsorFocus front panel. According to these measurements, the *Torque Tuning Factor* will be calculated. This factor is one of the parameters that are automatically calculated during Tool Setup. Later tightenings will be adjusted with this factor and a result that agrees well with the installed torque is produced.

The main features of Pulsor C are:

Functions	**Description**
Tool setup	Pulsor C features an easy to use *Tool Setup* to help you get ready to use the system as quickly as possible. By performing a couple of tightenings and telling the system what torque is actually achieved, the system parameters are automatically set to appropriate values. There is no need for any mechanical adjustments of the tool.
Pulsor Fixed strategy	Using this strategy the optimal pressure to use for the actual joint is calculated during Tool Setup. This pressure is then used throughout the whole tightening. Some parameters, among these the air pressure, can be set manually if necessary. The speed is set in five steps and affects the pressure that is used for tightening.
Pulsor Angle Shutoff strategy	After a user defined torque threshold is reached, the system will continue to tighten the joint. It will continue until it reaches a programmable angle. Angle measurement starts at the threshold torque (angle at threshold is zero). Pressure will be fixed during tightenings with this strategy.
Tightening monitoring	Monitoring parameters can be used to suit your specific monitoring needs. Monitoring max limits for torque, angle and number of pulses are also shutoff limits, meaning that if a tightening is going to be rejected the system will automatically shut off. The monitoring limits may be set manually or, by performing a Monitoring Setup, the system can suggest values for these parameters. Even if a Monitoring Setup is performed, the user can later change the parameters to suit the specifications for the joint. The user can also choose which monitoring parameters should be active and thereby capture or ignore different faults such as rehits and cross threads as desired.
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 tightening result information.
Batch counting of tightenings	Function for counting tightenings to assure that no bolts are forgotten.
Loosening detection	It is possible to detect and count loosenings.
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 indicator	The parameters for the service indicator 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 an event code is displayed stating which parameter caused the alarm.
Tool Drift Alarm	Tool Drift Alarm is a function that helps detect changes 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. Extensive support for Fieldbus usage is also provided.
External units	The Pulsor system also includes a number of optional accessories such as selector, RE-alarm, I/O Expander and barcode reader.

1.4 Pulsor components

A Pulsor system includes the following main components:

Product	Name	Description
	Tools	See product catalog for available tools. Example: 
	Pulsor Focus controller unit	In principle, all functions are adjusted and set using a PC running ToolsTalk Pulsor connected to a Pulsor Focus unit (referred to as Pulsor Focus in the rest of this document), locally or via a network. Many common functions can be operated directly from the front panel of the Pulsor Focus.
	TCB	The TCB (Tool Control Box) is a combination of a pressure regulator, valve and electronics. This unit controls the air supplied to the tool. Electronically, it is fit in between the PF and the tool, and pneumatically between your air system and the tool.
	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 software offers simple and user-friendly system setup and monitoring of the Pulsor Focus units in real time. All settings in the Pulsor C system can be set from ToolsTalk Pulsor.

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

See chapter 25, *Pulsor Focus hardware description* for detailed information about the Pulsor Focus connections.

1.5 Pulsor accessories

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

Product	Name	Description
	Selector	Selector is a socket rack that selects which Pset (parameter set) the tool shall use.
	I/O expander	The I/O expander makes it possible, when necessary, to connect more digital inputs/outputs in addition to the built-in 4+4.
	RE alarm	The RE alarm (Lamp/sound box) indicates the tightening status to the operator.
	Operator panel	The **operator panel** is a general purpose lamp- and switchbox, replacing the customer specials that are made today.
	Stacklight	**Stacklight** is a flexible light and switch device.
	ToolsNet	**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.

See chapter 19, *ToolsNet* and chapter 20, *Accessories* for more information.

2 Connecting and installing the Pulsor C system

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

- Make sure that all required hardware and software is included.
- 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 Microsoft Windows®.
- Connect computer to Pulsor Focus by using ToolsTalk Pulsor. This step can be skipped if Tool setup will be started from the Pulsor Focus front panel.

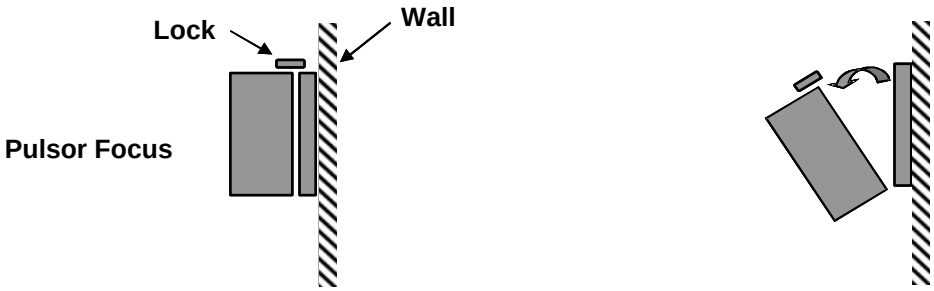
After completing the steps above you can start using the Pulsor system and proceed with the Tool setup. It is recommended though to skim through chapters 3 and 4 before starting to use the tool.

2.1 Required hardware and software

Installation checklist:

- Pulsor Focus unit
- Power cable
- TCB (Tool Control Box)
- RBU
- 1 Pulsor cable Pulsor Focus to Tool Control Box
- 1 Pulsor cable Tool Control Box to tool
- Pulsor C Tool
- ToolsTalk Pulsor Software (Recommended)
- Air hose for connection TCB – tool. Use air nipple supplied with TCB for the TCB side of the hose.

2.2 Connect the physical parts of the system



Before performing step 9 below, make sure the Tool Control Box is fit with the correct air sockets. A socket that is "locked" when no air hose is connected, i.e. a female socket, must be used for the Tool Control Box air outlet to the tool. If possible, use the ErgoQic fitting already mounted on delivery.

For more information concerning air quality, air lubrication etc. please refer to the Product Instructions for the Tool Control Box.

1. Open the lock mechanism and open the Pulsor Focus by pulling the upper part towards you.
2. Connect the TCB cable, power cable, Ethernet/Serial cable etc.
3. Connect the RBU.
4. Check the ground fault cirquit interrupter is switched on.
5. Close the Pulsor Focus and lock it.
6. Connect the power cable to a power supply.
7. Connect the TCB cable to the TCB.
8. Connect the TCB to the tool using the tool cable.
9. Connect air hose from your air system to the TCB.
10. Connect the tool and TCB with air hose.
11. Turn on the power on the TCB. After approximately 30s an air hose test will be performed automatically. This will be recognized as a rapid series of air puffs from the TCB.

2.3 Install the ToolsTalk Pulsor C software

The requirements for using ToolsTalk Pulsor are:

- **Hardware**: A PC with at least 256 Mb RAM (The absolute minimum is 64 Mb RAM but this is not recommended).
- **Operating system**: Microsoft 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 the **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 license number you got when purchasing ToolsTalk Pulsor.

2.4 Initial connection of ToolsTalk Pulsor

ToolsTalk Pulsor can connect to Pulsor Focus either using serial interface (RS-232 or USB) or using TCP/IP over Ethernet. Using Ethernet is the preferred alternative since it allows higher speed than the serial interface. To use Ethernet, the Pulsor Focus must first be given an IP address. The IP address, Subnet mask and eventual gateway parameters can be set from Pulsor Focus front panel or from ToolsTalk Pulsor C by first connecting using the serial interface (RS-232 or USB).

After connecting as described below you can start setting up the Pulsor system for your application. The next step is to proceed with performing a Tool Setup, described in chapter **Error! Reference source not found.**, ***Error! Reference source not found.***.

2.4.1 Connecting with USB

1. Driver installation needed for first connection via USB is described in chapter 6.1.1, *Connecting via USB cable*.

2. Start ToolsTalk Pulsor C.

3. In the PF Map, Double click “Serial PF” item (located just below “Serial” tree item). ToolsTalk Pulsor will by default use the first available com port. If using any other com port, go to Options->Settings, Communication tab to set the correct com port.

2.4.2 Connecting serially

1. Connect the Pulsor Focus serial port #2 (on the backside of the Pulsor Focus) to the PC by using a serial cable.

2. Start ToolsTalk Pulsor C.

3. In the PF Map, Double click “Serial PF” item (located just below “Serial” tree item). ToolsTalk Pulsor will by default use the first available com port. If using any other com port, go to Options->Settings, Communication tab to set the correct com port.

2.4.3 Connecting over Ethernet

1. Set the IP address on the Pulsor Focus controller. This can be done by either:

- On the Pulsor Focus front panel, press the F button until F3 (IP) shows. Press Enter. Set the IP address, Subnet mask and eventual default gateway by using the +/- buttons and Enter button. The first 4 numbers set are the IP address, the next 4 numbers are the subnet mask, and the last 4 are the default gateway.
- From ToolsTalk Pulsor C, first connect serially as described above. Then, go to Communication under Config (see chapter 11.1, *Introduction to Config* and 11.4, *Communication* for more information on how to do this). Set the IP address, subnet mask and, where applicable, the default gateway. Store and restart Pulsor Focus.

2. Connect the Pulsor Focus to the PC directly using a twisted Ethernet cable or connect both PC and Pulsor Focus to the LAN.

3. From Settings under the Options menu, set the IP address and Subnet mask to the Pulsor Focus you wish to connect to as described in chapter *Settings in ToolsTalk Pulsor*.

4. Connect with Ethernet to the selected Pulsor Focus with a double click on item “Ethernet PF” in the PF Map or a click on the connect button.

2.5 Exchange of tools (Hot swap)

You can exchange tools while the system is on (Hot swap) even if the system is connected to ToolsTalk Pulsor.

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 i.e. there are multiple faults.

3.2 Tool Control Box buttons and lights

The Tool Control Box (TCB) features two signal lights and two configurable buttons for easy access to the most used functions. The lights are used to inform the operator of the air status of the system.

Color	Description
Green	System ready to perform a tightening / tightening in progress.
Red	Air shut off by system due to some fault.
None	Air turned off by system by other reasons (e.g. a situation where the system waits for input from the user and the tool should not be used.)

What function to perform when a button is pressed is configurable. The buttons are used as digital inputs to the Pulsor Focus. Use ToolsTalk Pulsor to define what these buttons should do as described in chapter 12, *Tool* . The defaults are

Button	Description
Green button	Tool enable
White button	Perform air hose test

Read more about the air hose test and when it needs to be started manually in chapter 4.1.2, *The Air Hose Test.*

3.3 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.

3.3.1 Indicator lights

Light nr	Indicator light	Description
1	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.
2	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.
3	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.
4	PSET SETUP (graph symbol)	The PSET SETUP light indicates when the Tool Setup or Monitoring Setup programming function is active. The light goes off when the Setup is finished.
5	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.
6	JOB OK	The JOB OK light indicates that the Job is finished and that the results are OK according to the job parameters. The light remains active until the next cycle starts or the system is reset.
7	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.
8	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 does not have programming control, the padlock flashes and the only buttons on the unit that can be used are Question Mark and Enter. If the opened padlock is steady green, any key can be accessed, provided the soft keys are enabled (parameter *[C124]*).

3.3.2 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)	Press **F** (Function button) to display functions F1 – F9. 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 wait 30 seconds for the screen to automatically update). **F1 - Setting minimum limit for torque monitoring**: "F1" / "rtLL" alternates in the display. If no Pset is selected "F1" / "----" is displayed. Press **Enter** to enter edit mode. Change the value by pressing the **+/– keys**. Press **Enter** to save and exit. Press **F** to exit without saving. **F2 - Setting maximum limit for torque monitoring**: "F2"/"rtUL" alternates in the display. If no Pset is selected "F2" / "----" is displayed. Press **Enter** to enter edit mode. Change the value by pressing the **+/– keys**. Press **Enter** to save and exit. Press **F** to exit without saving. **F3 – Setting IP-address:** **"F3/IP" alternates in the display.** Press **Enter** to enter edit mode. The IP settings are divided into 12 numbers. The first four are the IP address; the next four are the Subnet mask and the last four are the IP address to the default gateway. Increase/decrease each number by pressing the **plus/minus** keys. Press **Enter** to confirm each number and edit the next number in IP settings. Repeat this for all remaining address parts. Event code *Reboot needed before changes take effect [E857]* will be blinking on the display when finished. Press **Enter** to acknowledge the event code. **Restart** the Pulsor Focus controller. **F4 - Selecting Pset**: "F4"/"Pset" alternates in the display if the *Pset select source [C222]* 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). **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). **F6 – Create Pset** "F6"/"CrPS" alternates in the display if the *Pset select source [C222]* is Keyboard. Otherwise "F6" / "----" is displayed. Press Enter to access available Pset list. The value shown is the first free Pset. Press the +/- buttons to change Pset number.

Key	Description
	Press Enter to create and select the Pset. Press F to exit (no save). **F7 - Torque Tuning adjustment – set new measured torque** "F7"/"nEtq" alternates on the display. Press Enter to access the Torque tuning value. The value shown is equal to the target torque for the Pset. Press the +/- buttons to change this value to the mean torque achieved during recent tightenings. Press **Enter** to save and exit. Press **F** to exit (no save). **F8 - Set Pset pressure** "F8"/"PSPr" alternates on the display. Press **Enter** to access the Pset pressure value. The value shown is the current Pset Pressure value. Change the value with the +/- buttons. Press **Enter** to save and exit. Press **F** to exit (no save).
Pset Setup	The **Pset Setup** button is used to enter both Tool Setup and Monitoring setup. See chapter 5.7, *Tool Setup from Pulsor Focus front panel* and 9.6, *Making Monitoring Setup via Pulsor Focus front panel* for information on how to use the Pulsor Focus display to make a Tool Setup and Monitoring Setup, respectively.
Question Mark (?)	Pressing the **Question Mark** button will display the following information (press repeatedly to step through list): **RBU License level**: "rbu" toggle with RBU type. PuAu for Gold RBU. **Software version**: ("rEL" with version number roll on the display from right to left.) **Tool model name**: The tool model name rolls on the display from right to left. **Current Pset**: "Pset" alternates with the current Pset ID, e.g. "P2". **Current Job**: "Job" alternates with the current Job ID, e.g. "J3".
Enter	The **Enter** button is used to execute selected functions and for event acknowledgement.

3.4 ToolsTalk Pulsor

ToolsTalk Pulsor is a Microsoft Windows® application that lets you configure your system in detail and simplifies setup of the system. Many parameters are not available from the Pulsor Focus front panel but only from ToolsTalk Pulsor. An introduction can be found in chapter 6.2 to 6.5. If you have used ToolsTalk Pulsor before, you can skip reading these chapters.

4 Tool Control Box and tool introduction

The Pulsor C pulse tool comes in a number of different sizes and models. The Pulsor Focus and Tool Control Box used are the same for all tool sizes.

4.1 The Tool Control Box

The Tool Control Box (TCB) is responsible for supplying the air pressure to the tool. At any given time, the TCB feeds the air pressure as determined by the system.

It is important that the air supply to the tool is sufficient. To secure that the tool works under optimal conditions, make sure that the coupling between the air system and the TCB allows air to flow freely into the TCB.

For the connection between TCB and tool hose a coupling of type ErgoQic will be provided with the TCB. It is strongly recommended to use this coupling or another high throughput coupling here, as the scatter characteristics of the tightenings will be heavily dependent on the capacity of this coupling.

For recommended tool hose diameters for the different tool models, see chapter *The tool*.

4.1.1 Buttons

Located on the TCB front are a green and a white button. The buttons have default functions assigned to them as described in chapter 3.2, *Tool Control Box* . To change the assigned functions, refer to chapter 12.1, *Tool Control Box settings*.

4.1.2 The Air Hose Test

The Pulsor C system supports air hose lengths of up to 10 meters between TCB and tool. It may work with a longer hose, but the quality of the tightenings will decrease when using a long hose.

A shorter air hose between TCB and tool improves tightening accuracy and decreases tightening scatter.

To be able to determine when to shut off the air to the tool the system needs to estimate how much time will pass after air shutoff until the air pressure is down at a certain level. This time delay is called the Air Shutoff Time. To measure Air Shutoff Time and Maximum Available Pressure the system uses the **Air Hose Test**. The Air Hose Test is run whenever the user orders it, on system startup, when a tool is connected or when a Tool Setup is started. The TCB will emit a series of air “puffs” while performing the test.

If you change the air hose length between the TCB and tool it may be necessary to manually initiate an air hose test. This is done to update the system with new information on when to shut off the air. The Air Hose Test can be started in a number of ways: from ToolsTalk Pulsor, by disconnecting and reconnecting the tool, with the white button on the TCB (if not reconfigured to perform another action) or by restarting the system. Make sure the air hose is correctly connected to the tool before you start the test to get correct tightenings. Do not press the trigger during the Air Hose Test.

To prevent loss of tightening accuracy, make sure an Air Hose Test is run if you change the hose between TCB and tool.

4.1.3 Starting Air Hose Test from Tool Control Box

The white TCB button is by default set to start an Air Hose Test. The functions associated with the TCB buttons can be changed from ToolsTalk Pulsor.

4.1.4 Lights

The TCB features two signal lights, one green and one red. What the lights mean is described in chapter 3.2, *Tool Control Box* .

4.1.5 Silencing

A silencer is delivered with the system to attenuate the noise produced by outrushing air during air shutoffs. This silencer will keep the noise emitted from the TCB at a reasonable level. The system can be further silenced by leading the outrushing air away from the working position. To do this, remove the silencer, connect an air hose instead and lead the hose to the desired place. You can optionally fit the silencer at the end of this hose to further reduce the noise. Make sure that the air hose used for leading the air away has at least the same diameter as the hose from TCB to tool, to admit quick air evacuations from the tool hose.

4.1.6 Lock functionality

The TCB will automatically shut off air to the tool under certain circumstances. The system can additionally be configured to shut off the air in a number of other situations.

The air will always be shut off in these situations:

- When the Pulsor Focus is powered off.
- No tool connected or tool connection problem.
- No RBU connected.
- System event, i.e. an event that need acknowledgement.
- No Pset 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 tool on alarm [D136]*).

4.2 The tool

Consult www.atlascopco.com/tools for the latest list of available tools. Recommended air hose diameters for the tools available when this manual is printed are:

Tool size	Air hose diameter
EPP6C32 – EPP10C90	10 mm
EPP11C110 – larger tools	13 mm

4.2.1 Tool adjustments

By default, no mechanical adjustments of the tool can be done, all settings are done in software. However, the tool is delivered with a trim valve if the need should arise. The trim valve can be exchanged for a silencer supplied with the tool if the trim valve is not needed. When the trim valve is fit to the tool, it can be used to adjust the air flow out from the tool. The trim valve is by default fully open, to provide maximum air flow through the tool. When using the Pulsor Fixed strategy on particularly hard joints it may be necessary to change this setting to decrease the air flow. This will slow the tool down a bit so the first pulse will be weaker. The more the air flow is attenuated, the weaker the tool will become, though the valve setting will affect the first pulse more than the rest of the tightening. Because the decrease in pulse effect for the first pulse is greater than the decrease in further pulses, in effect this will prevent overshoots in the first pulse while reducing overall performance significantly less.

4.2.2 Oil level in the pulse unit

With continuous use the oil level in the pulse unit will gradually decrease. This will increase the tool's pulse frequency. The pulse frequency can be monitored in Tool Drift Alarm, see section 13.3, *Tool drift alarm*.

When the oil level in the pulse unit gets too low the pulses become weaker and the pulse frequency will get noticeably 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 dependent on the tool size). If the tool still does not function satisfactorily, please see the tool's *Product Instructions 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 may have problems reaching high torques.

5 Performing Tool Setup

The Tool Setup can be started from ToolsTalk Pulsor or directly from the Pulsor Focus using the buttons on the front panel. If you want to perform Tool Setup from ToolsTalk Pulsor but are new to the program, please consult chapter 6.1, *Connecting the computer to Pulsor Focus* to 6.5, *Activating Pset and showing Pset main window* before continuing with this chapter.

5.1 Introduction

The same Pulsor Focus unit can be used to tighten different joints with different target torques and with different Pulsor C tools. For each combination you want to use, you need to create one Pset (Parameter set). For example, if you want to tighten one joint to 45 Nm and another to 55 Nm you need to create two Psets although in this case you can use the same tool. All Pulsor tightenings are carried out in the context of their respective Pset. During Tool Setup correct parameter values will be determined for the Pset. Before a Tool Setup has been performed for a Pset, the Pset can not be used. When the Tool Setup is ready, the Pset is initialized with Torque Tuning Factor, pressure values and other parameter values suitable for the application. The Torque Tuning Factor translates the torque recognized by the tool into the actual torque installed in the joint.

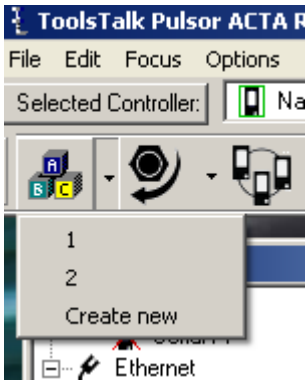
To perform a Tool Setup, you will need a Pulsor C system, test joints (the actual application joints) and your preferred torque measuring tool, e.g., torque wrench or inline torque transducer.

5.2 Starting Tool Setup from ToolsTalk Pulsor

There are three different ways to start a Tool Setup. In two of the methods you use ToolsTalk Pulsor, these methods are described here.

5.2.1 Starting Tool Setup from ToolsTalk, method 1

The generally quickest way to start Tool Setup is by using the Tool Setup dropdown menu (symbolized as boxes with the letters ABC). This dropdown is located in the toolbar. Select a Pset from the list and the system will automatically select the Pset and start the Tool Setup. If you choose the bottom alternative in the list, *Create new*, a new Pset is created and you will be given the option to name the Pset. Thereafter it is automatically selected and Tool Setup is started.

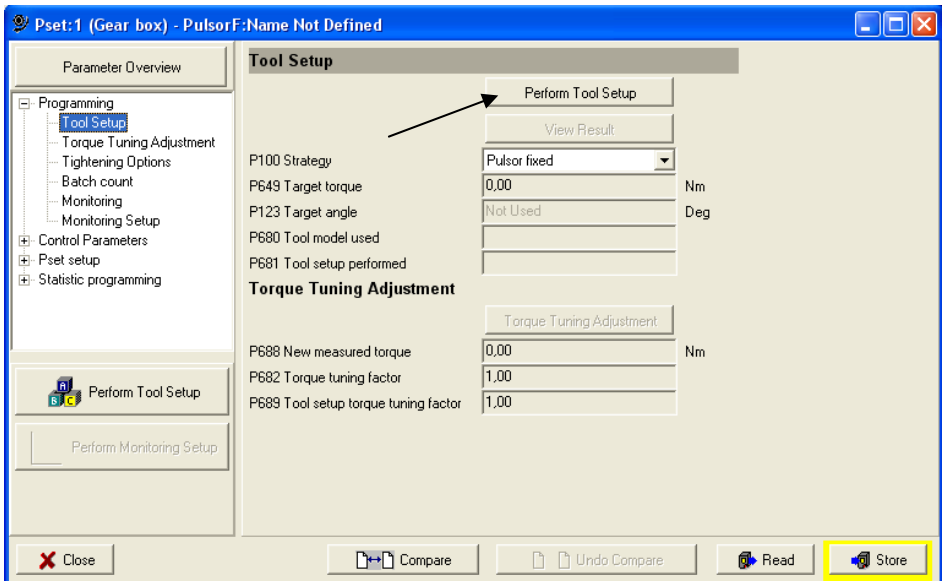


ToolsTalk Pulsor can select a new Pset only if Pset Select Source is set to Ethernet/Serial. If it is not, ToolsTalk Pulsor will ask if it should set the Pset select source for you. Answering yes in this dialog will set Pset select source and store automatically.

To set Pset select source manually, see chapter 11.3.4, *Pset select source*.

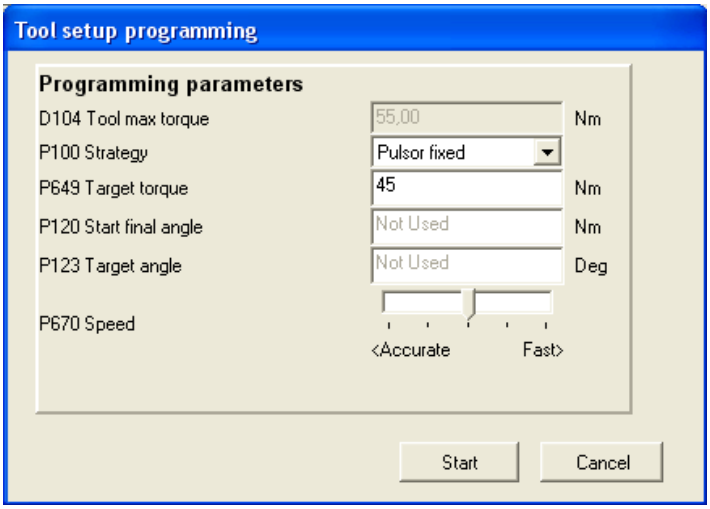
5.2.2 Starting Tool Setup from ToolsTalk, method 2

Make sure the correct Pset is activated and that the Pset window for that Pset is open. Start Tool Setup by clicking the Perform Tool Setup button, located in the Pset window, Programming->Tool Setup. If the correct Pset is active, the Tool Setup window will be shown. The Perform Tool Setup button will be greyed out if the correct Pset is not active.

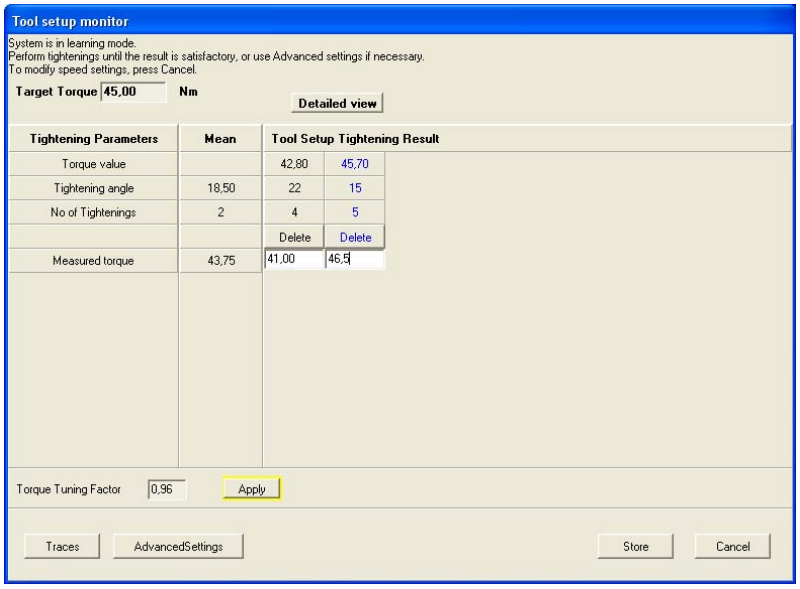


5.3 Tool Setup window

The first window shown is the Tool Setup window. In the topmost box of this window, the specified max torque for the connected tool will be shown. Below this, you can select the desired tightening strategy. Two strategies are available, the Pulsor Fixed strategy and the Pulsor Angle Shutoff strategy. These strategies were described in chapter 1.3, *Overview of the Pulsor system*. After having set the desired target parameters press the Start button. This will bring up the *Tool Setup Monitor* window.



5.4 Tool Setup Monitor

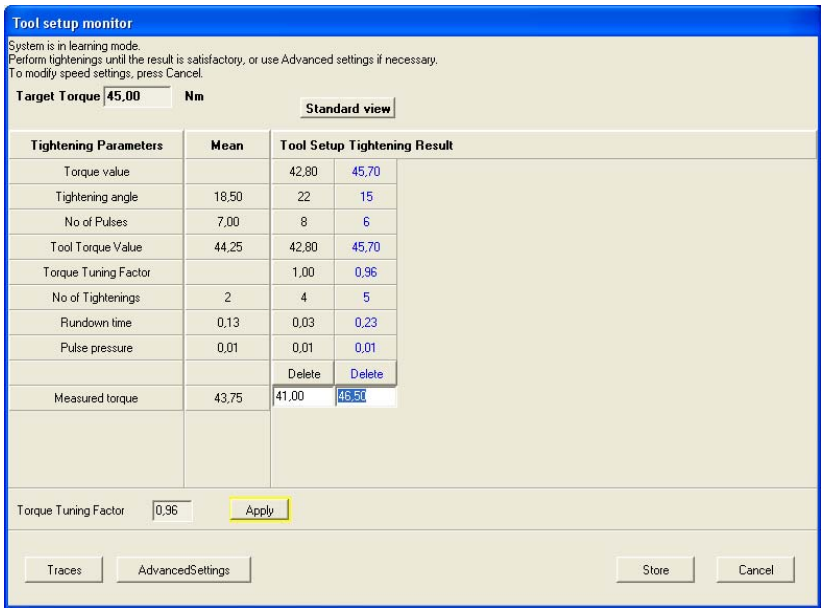


In the Tool Setup Monitor all tightenings performed during Tool Setup will be shown. The tightenings you perform and the measured torque values you enter in this window will help the system determine how to reach the target at the desired speed. During Tool Setup the End Time (the time between air shutoff to air-on after a tightening), is set to a fixed value of one second. The high time delay is used to help the operator to perform correct Tool Setup tightenings. The parameter is reset to previous value after the Tool Setup. If using Pulsor Angle Shutoff strategy, StartFinalAngle and TargetAngle will be shown in the topmost left corner instead of Target Torque.

5.4.1 Description of buttons in Tool Setup Monitor

See picture in table below for button positions.

When you enter Tool Setup Monitor it is shown in Standard view mode. Pressing the **Detailed view** button toggles between Standard view and Detailed view. The button text changes accordingly. The view mode determines how many tightening parameters are shown.



Pressing the **Apply** button will update the Torque Tuning Factor parameter. This is necessary for the system to evaluate how the tightenings should reach the target with the desired speed. It is recommended to write in measured torque and press Apply after each representative tightening. The Apply button will be greyed out before the first tightening is performed.

By pressing the **Traces** button a torque over time graph will appear on the right hand side of the Tool Setup Monitor window. This can be closed again by pressing the **Hide** button located below the graph.

The **Advanced Settings** button is used when you want to manually set parameters. This may be desirable for particularly difficult joints where the Tool Setup gives poor results. You can also use Advanced settings to view the parameters during Tool Setup. After changing a value and pressing the Store button, the system will no longer calculate new values for the affected control parameters. However, more tightenings during Tool Setup still contributes to the Torque Tuning calculation. Among the parameters shown in this window are the parameters shown in the Control Parameters tab in the Pset window.

Pressing the **OK** button will automatically perform an apply and then close the Tool Setup Monitor window.

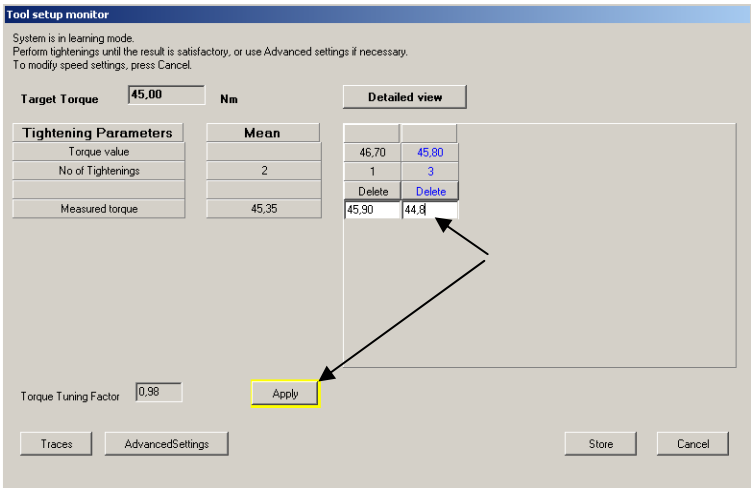
After each tightening is performed, a new column with data from that tightening will be shown in a table. In the bottom of each data column is a **Delete** button. Pressing this button will remove the tightening from the set of Tool Setup tightenings. Depending on whether this is done for the most recent tightening or not, there is an important difference in how the system handles the removal. More on this in chapter 5.4.3 below.

5.4.2 Making Tool Setup tightenings, ToolsTalk Pulsor

Make sure you perform the tightenings with the same equipment as will be used in production. For example, if an extension will be used in production, this should be fit to the tool while Tool Setup is performed also.

The first tightening during Tool Setup will be a standard tightening with parameters set for a careful tightening to simplify initial calculation of joint characteristics. When you perform the tightenings, do not release the trigger before the system has shut off the air pressure. When the air is shut off, release the trigger.

Start by performing one tightening on the correct joint. The performed tightening will show up in a new column in the Tool Setup Monitor window. It is recommended that, for each good tightening, the measured installed torque is entered in the Measured Torque row of the new column followed by pressing Apply. The installed torque can be measured with a torque wrench or an inline transducer. You can do the tightenings without going through the process of writing in the installed torque value and pressing Apply after each tightening. However, it is recommended to write them in often, especially for the first tightenings.



After having pressed Apply, proceed with tightening the next joint, if any. If only one joint is used, it is recommended to perform a number of tightenings on that type of joint and write in measured torque until you are satisfied with the Tool Setup results.

A Tool Setup can be performed without writing in any measured torque value at all, although this is not recommended. In such cases the Torque Tuning factor is set to 1, i.e. the basic calculated torque value will be used.

If no measured values are written in during Tool Setup, the torque actually installed in the joints during production tightenings may deviate a lot from the torque result presented.

Torque and angle values will not be reported to ToolsNet if no torque tuning has been done.

5.4.3 Deletion of Tool Setup tightenings

During Tool Setup, certain parameters are calculated to identify joint properties, which in turn determine how Tool Setup tightenings should be interpreted.

During Tool Setup it may happen that tightenings are performed that are not representative or wrong in some way. Examples of this are rehits, wrong screws etc. These measurements can be deleted by pressing the Delete button, located in the last row of every tightening column (see picture in previous section). There is a difference between deleting the most recent tightening and earlier tightenings. For earlier tightenings, the column and the associated values will be deleted, and the Torque Tuning Factor will be recalculated when you press Apply. Additionally, if you **delete the most recent tightening**, the joint dependent parameters will be restored to their previous values as well. In effect this resets the Tool Setup to the state it was in before the faulty tightening (pressure is restored etc.) Tool Setup can then continue as if no faulty tightening was made.

If the deletion is not done before the next tightening, the calculated Pset pressure may be wrong for your application, most often leading to slower tightenings than necessary and therefore reduced performance when later used in production. The exact result of wrongly calculated joint parameters depends on the chosen tightening strategy.

To help the Tool Setup generate optimal tightening parameters, it is important that an erroneous tightening is deleted before performing the next tightening.

5.5 Finished with the tightenings

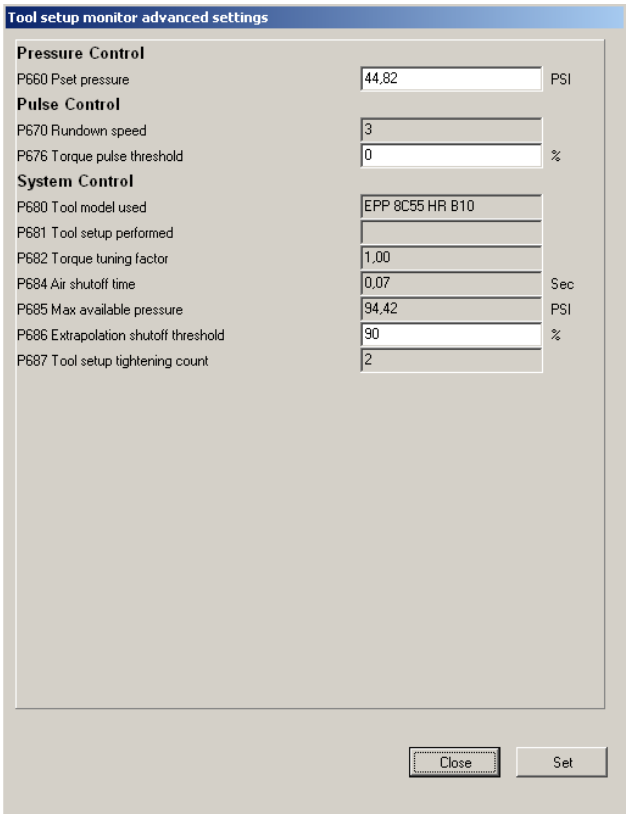
It is recommended to continue performing Tool Setup tightenings until the system torque value is close to the manually measured torque. Most often around five tightenings is enough to accomplish this. After the desired number of tightenings has been performed, you have two choices:

1. If you are satisfied with the Tool Setup results press Store to store the settings in Pulsor Focus.
2. If you are not satisfied, press Cancel. Cancel discards the performed tightenings and the Tool Setup Window will be shown again, where settings can be changed.

If Cancel was pressed the Tool Setup window gives the option to either cancel Tool Setup completely by pressing Cancel, or start over by entering new settings and pressing “Perform tightenings”.

5.6 Manual Tool Setup

If the joint is particularly difficult the Tool Setup may fail to find the correct parameters. In this case you can perform a manual Tool Setup. Start Tool Setup as usual. Set Tightening Strategy, Target Torque and Speed. Press the Perform Tightenings button. Then, in the Tool Setup Monitor, press the Advanced Settings button. Here you can set a number of parameters that control the tightening. The different parameters are described in chapter 23.1, *Pset parameters*. These parameters are the same as the ones shown in the Control Parameters tab in the Pset window. The Pset window is described later.



When a Pset is created, default values are provided for all Pset parameters. Most of these are not changed automatically during Tool Setup, they are kept at their initial values. Exceptions are the parameters mentioned below.

During automatic (non-manual) Tool Setup, after you have begun to perform tightenings the parameter P660 (Pset Pressure) is automatically calculated and updated. When this parameter is changed and stored under Advanced Settings (as is the case during Manual Tool Setup) Tool Setup will not continue to automatically calculate it.

5.7 Tool Setup from Pulsor Focus front panel

5.7.1 Making Tool Setup Tightenings, Pulsor Focus front panel

Make sure you perform the tightenings with the same equipment as will be used in production. For example, if an extension will be used in production, this should be fit to the tool while Tool Setup is performed also.

The first tightening during Tool Setup will be a standard tightening with parameters set for a careful tightening to simplify initial calculation of joint characteristics. When you perform the tightenings, do not release the trigger before the system has shut off the air pressure. When the air is shut off, release the trigger.

5.7.2 Performing Tool Setup from Pulsor Focus front panel

Note that the Pulsor Fixed strategy will always be used when performing Tool Setup from the Pulsor Focus front panel.

Press the Pset Setup button once.

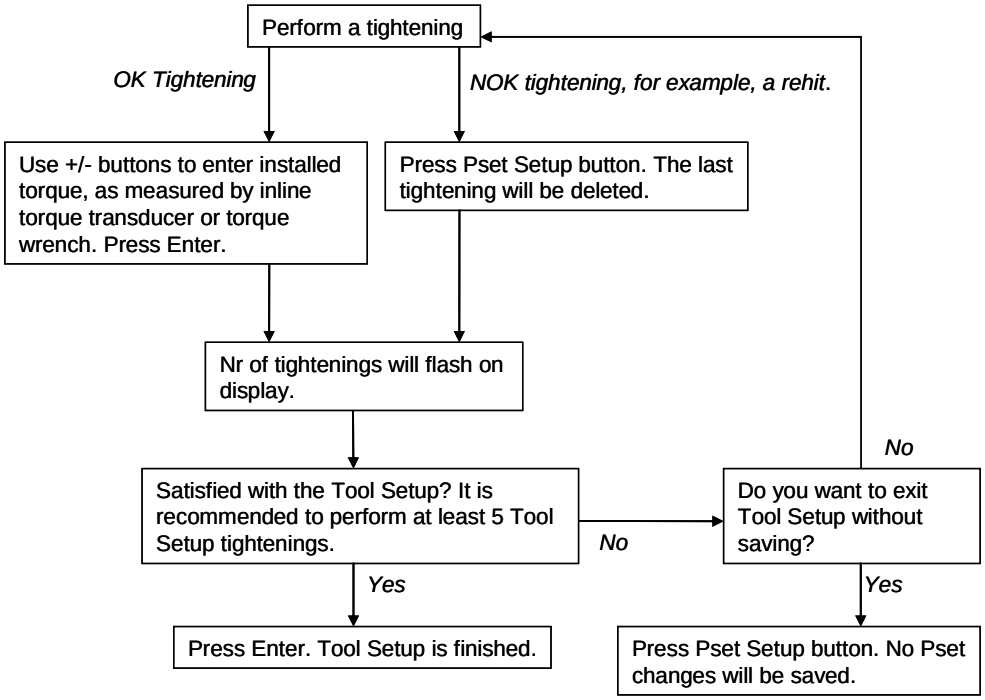
If no Tool Setup has been done for this Pset previously, air hose test will be performed and Tool Setup is started.

If a Tool Setup has been performed for this Pset already, tSEt/rSEt will flash on the display. Use +/- keys to select tSEt and press Enter to start Tool Setup.

A suggested target torque value will flash. Use the +/- key to change this value. Press Enter when done.

The Tool Setup is now in tightening mode and you can start to perform the tightenings on the joint. Here, you may cancel Tool Setup by pressing the Pset Setup button.

Follow the flow chart below for the recommended Tool Setup procedure. Below the flow chart, the Tool Setup process will be described in text with all alternatives in the different stages presented.



Perform the tightenings. After each tightening, the torque measured by the system is presented on the display. You now have the following options:

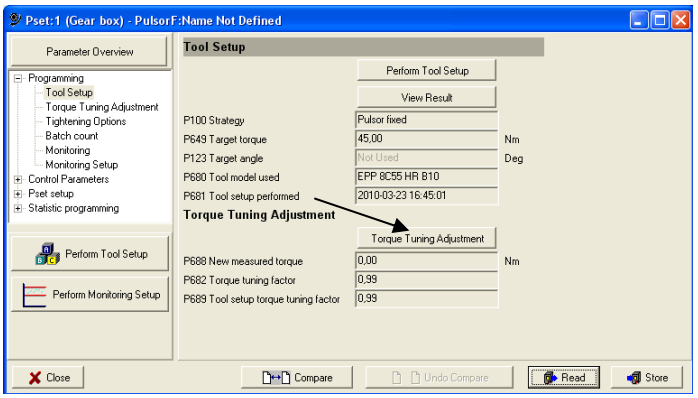
1. Press +/- buttons to set the actually installed torque. Accept with Enter. The installed torque can be measured with a torque wrench or an inline torque transducer. It is recommended to perform this step after each valid tightening.
2. Perform a new tightening. By doing this, you accept the tightening but do not set installed torque.
3. Press Enter to accept the Tool Setup. The performed tightenings is accepted and the Pset is saved. If no tightening is in memory (ie. all tightenings have been deleted) this option is not available.
4. Press Pset Setup to delete the last tightening. This is important to do if the tightening was erroneous, e.g. a rehit.
5. Press Pset Setup again to cancel Tool Setup. Nothing from this Tool Setup will be saved in Pset.

5.8 Changing parameters after a Tool Setup

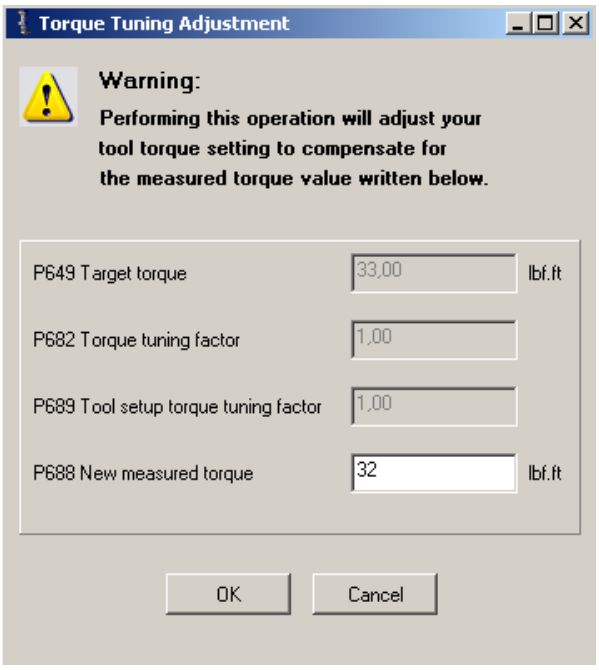
The settings mentioned below can be found in the Pset window for the actual Pset.

5.8.1 Changing Torque Tuning

After a Tool Setup has been performed all necessary parameters for the current application are stored in the Pset. It may happen that, at a later point, it becomes clear that the system is slightly mistuned and although it presents values that are within the boundaries the actual installed torque is a bit off. To correct this, use the Torque Tuning Adjustment function. To open the function window, press the Torque Tuning Adjustment button in the Pset main window.



Three read-only parameters will be shown: the target torque for the current Pset, the current torque tuning factor and the torque tuning factor from the Tool Setup. The two latter will be identical if no Torque tuning adjustment has been performed for this Pset. Write in the mean value of the torque the tool has actually installed in the joints (measured by torque wrench or inline transducer) in the New measured torque box. When OK is pressed, new parameters will be calculated to adjust for the difference between the target torque value and the actual installed torque.



5.8.2 Changing Control parameters

In the Control Parameters tab the parameters used to control the tightening for this Pset are presented. All parameters are automatically calculated during Tool Setup but some can be edited later if needed. The most usable parameters are described in chapter 7.3, *Control Parameters*. A description of all parameters can be found in chapter 23, *Parameter list*.

6 Working with ToolsTalk Pulsor

This chapter describes how to use ToolsTalk Pulsor.

6.1 Connecting the computer to Pulsor Focus

The computer can be connected to the Pulsor Focus by using any of the following options:

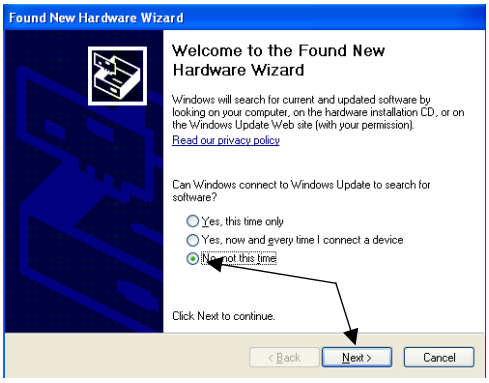
1. USB cable
2. Serial cable
3. Crossover Ethernet cable

6.1.1 Connecting via USB cable

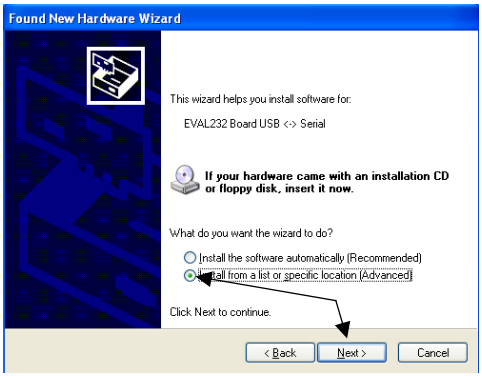
The USB connection is found just below the front panel of the PF4000, under the small rubber cover.

Connect the PC to the Pulsor Focus with the USB cable. The computer will detect a USB device, a **USB to RS232 converter**.

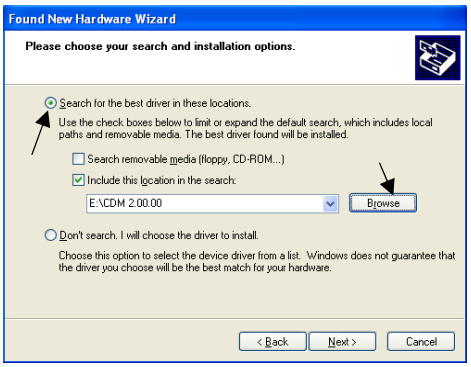
If this is the first time the Pulsor Focus is connected to this PC the **Hardware wizard** window will pop up. Make sure the ToolsTalk Pulsor CD is inserted in the CD/DVD drive. On Windows XP, click **No, not this time** in the first popup window and then click **Next**.



Click **Install from a list or specific location (Advanced)** and then click **Next**.

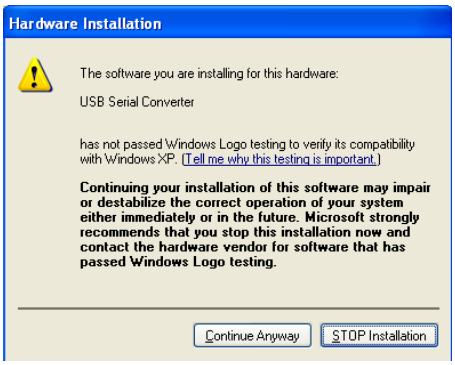


Click **Search for the best drivers in these locations**. Click **Browse** to find the driver location on the ToolsTalk Pulsor CD. When the driver folder has been selected, click **Next**.

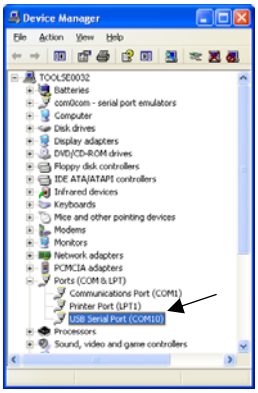


If a warning window about unsigned software appears, click **Continue anyway** and then click **Finish**.

The above procedure has to be finished twice before the USB port can be used. The new serial interface will be given the name **ComN** where N is the first available com port on your computer. The next time a Pulsor Focus is connected to this computer, it will automatically be detected.



If uncertain of which com port is used by the connected Pulsor Focus, open up the **Device Manager** (**Control Panel > System > Hardware tab**) and click the + sign to the left of **Ports** to expand that option. The device appears as a **USB Serial Port** with the Com number in parentheses.



The USB interface is now set up and ready to use. It is used exactly as if you were using a serial cable. In the rest of this manual, wherever text is referring to serial communication, this applies to USB communication as well. Go to chapter 6.2, *Starting ToolsTalk Pulsor* for more information on how to use serial communication together with ToolsTalk Pulsor.

6.1.2 Connecting via serial cable

Connect your computer to the Pulsor Focus with an Atlas Copco serial cable. The serial port can be found on the backside of the Pulsor Focus, serial port #2. No special installation has to be done. Go to chapter 6.2, *Starting ToolsTalk Pulsor* for more information on how to use serial communication together with ToolsTalk Pulsor.

6.1.3 Connecting via crossover Ethernet cable

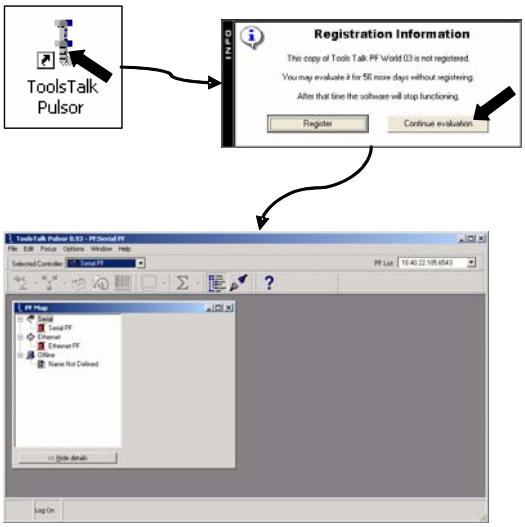
Connect your computer to the Pulsor Focus with a crossover Ethernet cable. The PF needs to be set up (i.e. be given an IP address etc.) before it can be used over Ethernet. If the PF is not set up yet, use a serial or USB cable to connect to the Pulsor Focus, follow the instructions in 6.2, *Starting ToolsTalk Pulsor*, and then set up the Pulsor Focus according to chapter 11.4, *Communication*.

6.2 Starting ToolsTalk Pulsor

Make sure that the PC is connected to Pulsor Focus as described in previous chapter and that the Pulsor Focus is powered on.

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

If running the demo version, select **Continue evaluation** or select **Register** to register now.

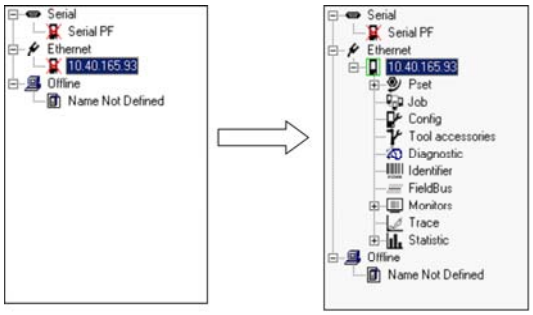


Connect to Pulsor Focus by *either*:

- Double clicking **Serial PF** below Serial.

or

- Double clicking **<IP number>** below Ethernet or selecting a Pulsor Focus from the PulsorF dropdown list. The <IP number> shown will be the latest connected Pulsor Focus IP number. If this computer has not been used to connect via Ethernet before, these options may not be available.



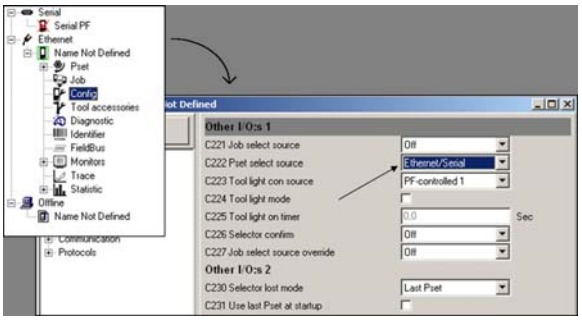
See introduction of chapter 6.6, *Settings in ToolsTalk Pulsor* and 6.6.1, *Settings – Communication* on how to set up ToolsTalk for communication.

For **serial** communication, how to select com port.

For **Ethernet** communication, how to add Pulsor Focus IP-addresses to the ToolsTalk PF list. After a Pulsor Focus has been added to the PF list, you can connect to it by selecting it from the PulsorF dropdown list.

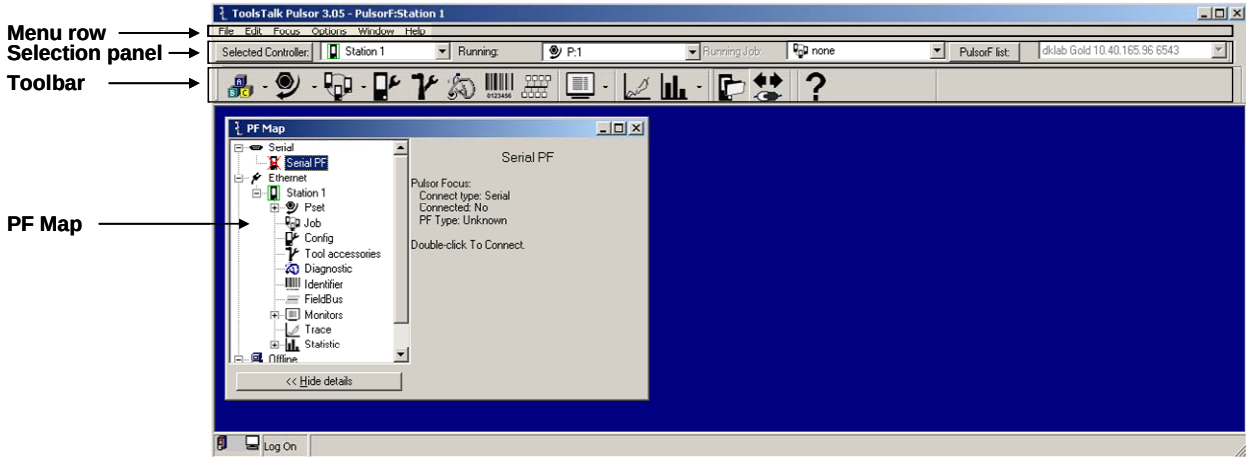
If the IP address of the controller is invalid (e.g. the first time the PF is used) you need to connect serially, then you can set up the PF for Ethernet communication according to 11.4, *Communication*.

Check that **Pset select source** in Config is set to Ethernet/Serial. This setting is permanent and need not normally be changed. This is done so that Psets can be selected from ToolsTalk. Use another Pset select source if you want to select Pset by other means.



6.3 ToolsTalk Pulsor user interface

The figure below shows the principal areas in ToolsTalk Pulsor's user interface:



There are several ways to start a function in ToolsTalk Pulsor. Generally, all functions can be reached by a menu item in the menu row, by clicking on a tool button in the toolbar or by double clicking on the item in the PF Map. It is recommended to use a mouse, however it is also possible to operate ToolsTalk Pulsor using only a keyboard.

6.3.1 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 dependent on which window is active. For example, if the Pset window is active, "Pset" will be visible with menu items 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. Settings made in Offline mode can later be loaded to a Pulsor Focus.
Options	The following functions are available from the **Options** menu: View/Hide Toolbar Settings Change language Get Event Log View Com Messages (NOTE: only available if LOG is set to ON in Options->Settings, communication tab) Forced Release Program Control Reboot PF Action
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 manual as a .pdf) from the **Help** menu. The About ToolsTalk Pulsor item shows registration and version information regarding the current installation of ToolsTalk.

6.3.2 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.
PulsorF list button	Press this button to open up Settings->PulsorF list tab directly without using the Settings menu item.
PulsorF List dropdown	You can use the PF List dropdown to easy connect to a Pulsor Focus via Ethernet. Select an item in the dropdown list 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, PulsorF list tab. You can also press the PulsorF list button as mentioned in the item above.

6.3.3 Toolbar

Icon	Name	Description
	Tool Setup button	Clicking this button will start Tool Setup for the active Pset. Click the arrow to the right of this button to show a drop down list of available Psets and an option to create a new Pset. After a Pset is activated or created, the Pset will be selected and Tool Setup for that Pset will automatically be started. Note that Pset select source in Config must be set to Ethernet/Serial for ToolsTalk to be able to select a new Pset. You will get an option to set this automatically when the Tool Setup button is pressed, if not set already. See chapter 11.3.4, *Pset select source*, for instructions on how to set this manually.
	Pset	This icon opens the Pset programming window. Click on the arrow to the right to show the programmed Psets with numbers and names.
	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	Press this button to open the Tracking results monitor. Click on the arrow to the right of this icon to select between the following monitors: Result monitor, Job monitor, Operator monitor or Tracking Results monitor.
	Trace	Click the Trace icon to bring up a graphical display of a tightening. Up to 5 tightenings can be superimposed on the graph.
	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 button to connect to/disconnect from the Pulsor Focus.
	Help	Show manual.

6.3.4 The PF Map

The **PF Map** gives you an overview and shortcuts to all settings in the Pulsor Focus. Click on the minus or plus symbols to open or close menus. Double click on the function names to open the corresponding function. Brief information on the selected item is shown in the right panel of the PF Map. **Right click** on the function name to create a new copy of the function (available for some functions). Only the left panel of the PF Map is displayed if you click on the **Hide details** button.

6.4 Event codes in ToolsTalk Pulsor

There are two kind of event codes you may 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. There are three ways to acknowledge an event code: 1. Press the Acknowledge button in the event code window in ToolsTalk Pulsor. 2. Press the Enter button on Pulsor Focus front panel. 3. Do a Tool Enable from a digin or TCB (Green button is configured to Tool Enable by default).
Other events codes	The event code is displayed 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.

Events will be shown in ToolsTalk Pulsor as a popup window with a single button. A text describing the event is shown in the window. If the event needs acknowledging, the window contains a button (Acknowledge), which when pressed will acknowledge the event. If it is a non-acknowledge event, the window contains a button (Ok) which when pressed will close the window.

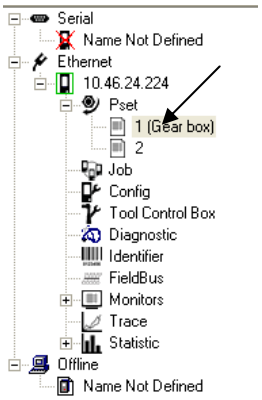
Chapter 22, *Event codes*, provides more information on the different event codes. The event code will end up in an Event log that can be analyzed at a later time.

6.5 Activating Pset and showing Pset main window

This section describes how to activate a Pset (parameter set) and show the main window for a Pset. In the Pset main window you can start a Tool Setup, Monitoring Setup or change/view other Pset parameters.

Activate the desired **Pset** in the **Selection panel** in ToolsTalk Pulsor (a prerequisite is that Pset select source is set to Ethernet/Serial, see section 11.3.4, *Pset select source* for more information).

Open the Pset main window for example by double-clicking on the required Pset under Pset in the PF Map.

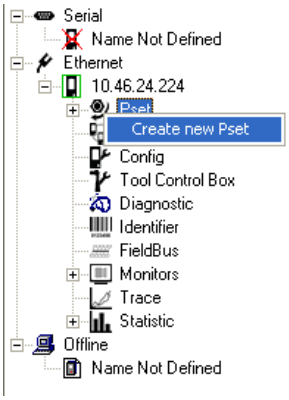


6.5.1 Creating a new Pset

Each type of joint has its 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 the **right mouse button** on Pset in the PF Map. Select “Create new Pset”.



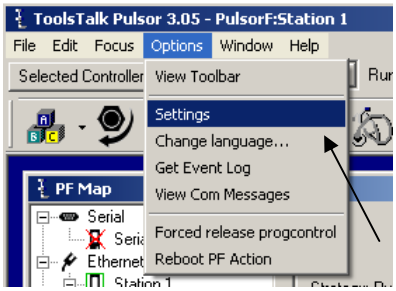
Give the Pset an ID from the list (or accept the suggested ID) and, if required, give the new Pset a name. Click on **OK**.

Select the Pset in the Selection panel in ToolsTalk Pulsor. This last step will activate the Pset. Note that the Pset can not be used until a Tool Setup has been performed for the Pset.

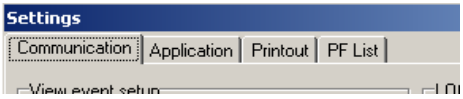
6.6 Settings in ToolsTalk Pulsor

This section describes the Settings functionality in ToolsTalk Pulsor.

Select **Settings** from the Options menu.



The Settings window has four tabs:



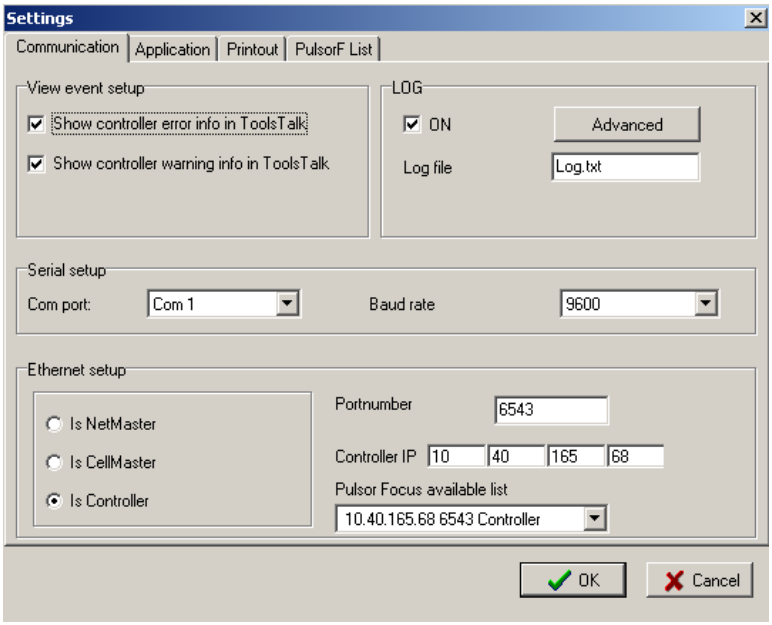
- **Communication** - Information about communication and connection.
- **Application** - Settings for displaying information in ToolsTalk Pulsor.
- **Printout** - Printer settings.
- **PF List** - PF list management.

6.6.1 Settings – Communication

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

The **View event setup** section 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 or 9600.



Make sure all connected Pulsor Focus is set to use the same baud rate to prevent changing ToolsTalk setting unnecessarily often.

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.

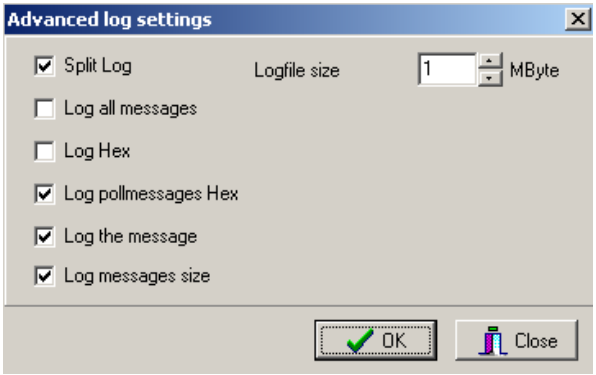
To be able to edit Ethernet setup parameters ToolsTalk Pulsor must not be connected to a PF.

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 **Logfile size**. When the file is full the file will be renamed to "log~.txt" and the contents of "log.txt" will be erased. Then data will continue to be stored in "log.txt".



6.6.2 Settings – Application

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

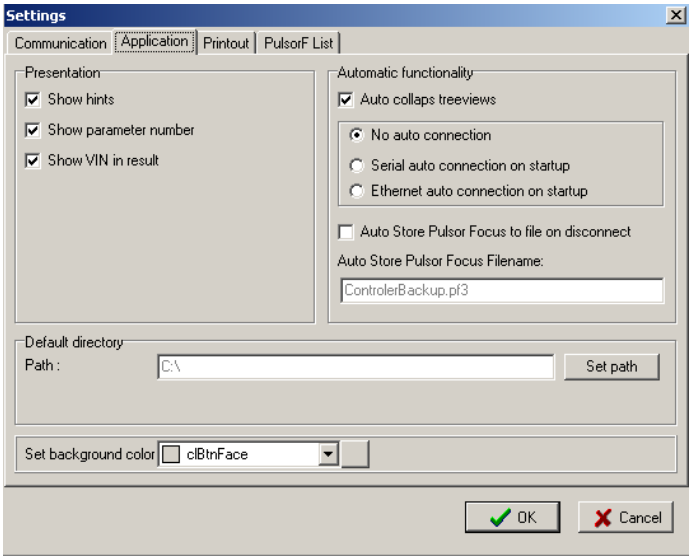
The first section is about **ToolsTalk Presentation**. Use this if you want to view hints and parameter numbers.

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 this directory.



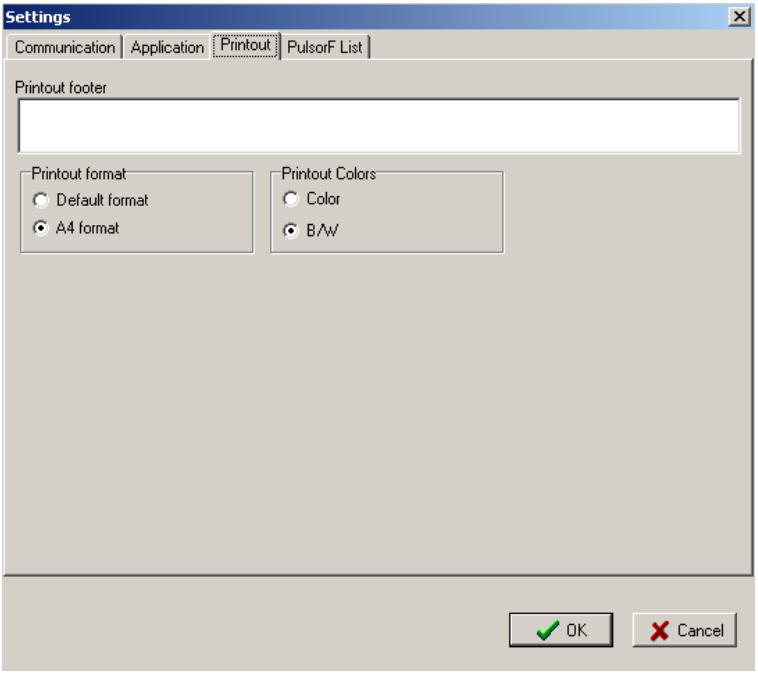
6.6.3 Settings – Printout

The **Printout** tab contains printout settings.

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

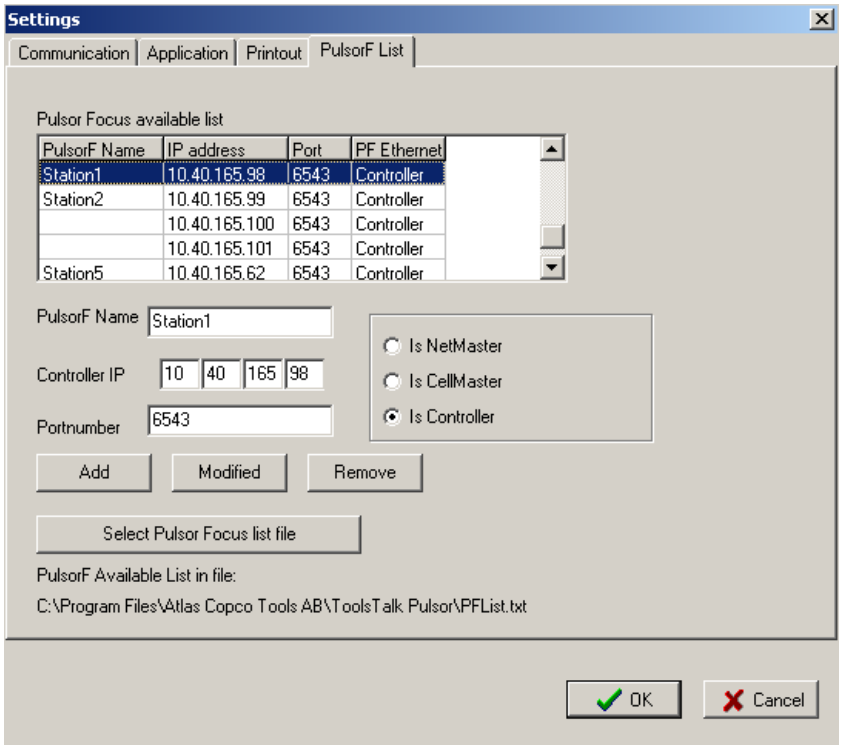
If you use the A4 **Printout format**, select A4 format, otherwise select Default format.

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



6.6.4 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.



6.7 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 depending on which corresponding window is currently active.

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

When you store PF to file, Tools Talk will ask you to name the file. Then, ToolsTalk will store the programmed settings on a number of files (for example one file for each Pset and Job). A Pset will be stored in a file with extension ".pfp". All files will begin with the desired name but will have extensions as below.

File extension	Explanation
pf3	Overhead file
pfp	Pset
pfc	Config
pfj	Job
pfd	Diagnostics
pfq	Function
pfi	Identifier
pfk	Tool Drift Alarm result data
pfg*	Trace

*The trace will not be saved to file when storing Pulsor Focus to file. To save a trace, use Save trace from the File menu when a trace is active on screen.

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®.

6.8 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 - <Name> - Connect** (shown to the right).

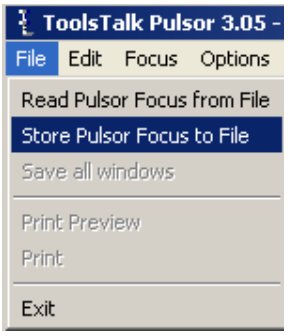
Select last alternative in the Selected Controller box.

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

The file can be located on the local hard drive or 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. Depending on the license level (Gold RBU or differently branded RBU) of the Pulsor Focus the corresponding file shall be selected. You can recognize the different license levels by the names of the default files: Gold.pf3 in the case of a Gold RBU. A good idea is to make a backup of these files.

A file can be created by first connecting (Serially or by Ethernet) to a Pulsor Focus and then selecting **Store PF to File** from 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. The selected file is opened and you can change it, just as if you were connected to a Pulsor Focus. If a file with higher license level is selected you can change its contents, but the file can not be read to a Pulsor Focus unit with an RBU of a lower license level.



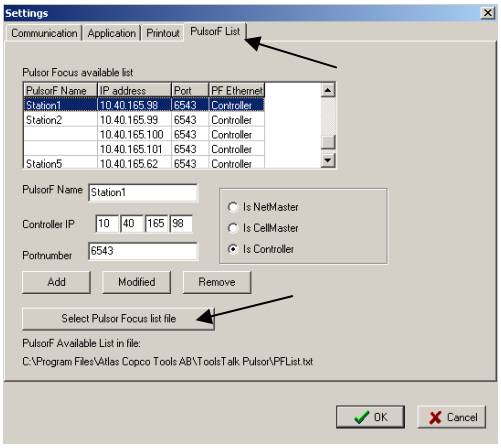
6.9 Miscellaneous ToolsTalk Pulsor tasks

6.9.1 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.

In the settings window, click on the **PF List** tab.

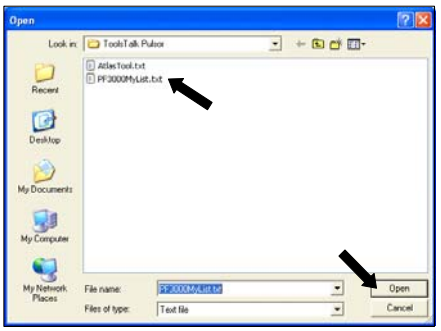
Click on the **Select Pulsor Focus list file** button.



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

Click **Open**.

Choose **OK** to exit.



6.9.2 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 the computer running ToolsTalk Pulsor to the Pulsor Focus. Follow the instructions below to 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 connections – Local area connection on Windows® XP.)
- 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 subnet 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 Pulsor Focus (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. With the subnet mask above the three first numbers should be equal.
- 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 it on again.
- 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.

7 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 controls and monitors the tightening process, including the result of Tool and Monitoring 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 (Tool Setup, Monitoring Setup, Tightening options and Monitoring) see chapter 5, *Performing Tool Setup*, 9, *Performing a Monitoring Setup* and 8, *Tightening and monitoring* respectively.

For parameter description see Parameter list, section 23.1, *Pset*.

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

7.1 Activating Pset

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

Select the required Pset in the Selection panel in ToolsTalk Pulsor (a prerequisite is that Pset select source is set at Ethernet/Serial, see section 11.3.3, *Other I/O:s settings*).

7.2 Programming

7.2.1 Strategies

Here you can view/edit the tightening strategy used. The strategy is normally selected during Tool Setup. An exception from this is the Click Wrench strategy, which does not use a Tool Setup. Note that if you change from one strategy to another it is important to perform a new Tool Setup before using the Pset. Parameters calculated for one strategy is not reusable for the other.

7.2.2 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 either taken from the Pset, or can be set from Ethernet/Serial or Fieldbus. In the example below the count is taken from the Pset.

Open the relevant Pset from the PF Map.

Select Tightening options under programming from the navigation area.

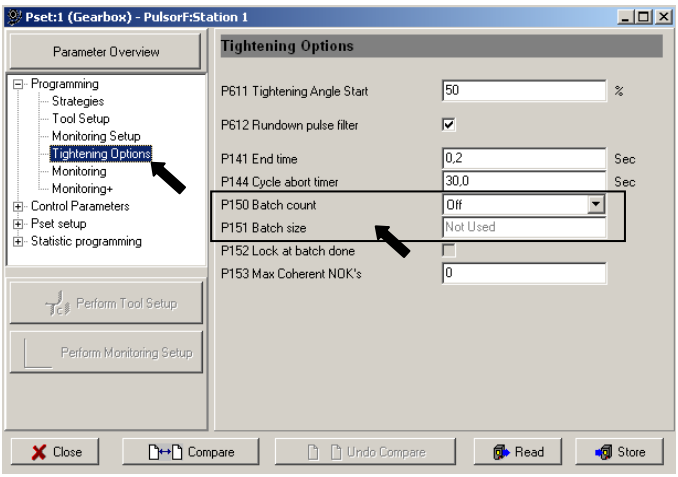
Activate Batch count by selecting Pset from the list in **Batch count** and then enter the number in the Batch size field.

The parameter Max coherent NOK's will count how many NOK tightenings that may be performed consecutively until air will be shut off.

Save by clicking **Store**.

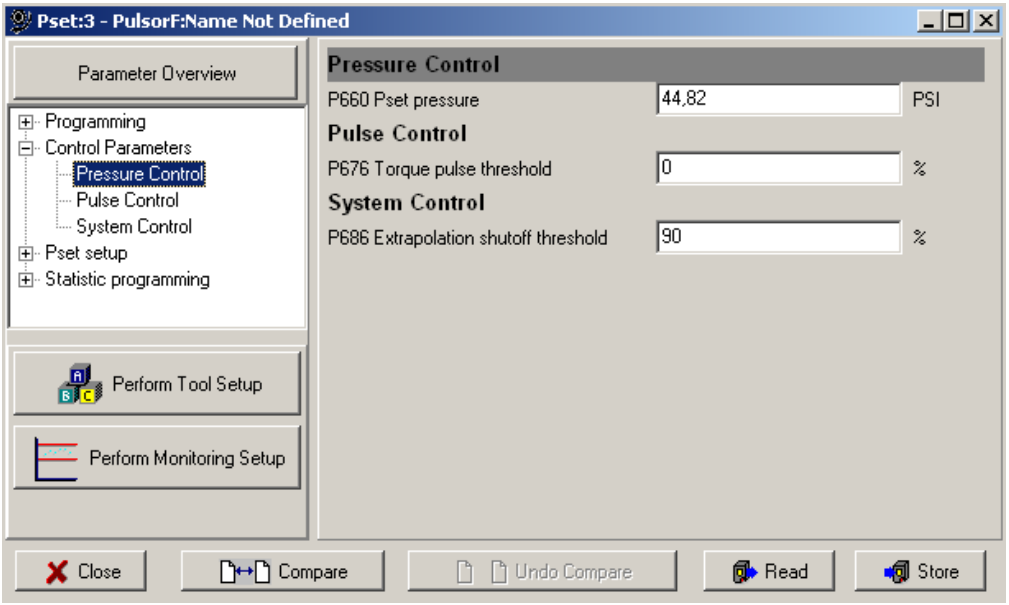
There are also settings in Config that affect batch counting. See section 11.2.3, *Settings for Options* for more information.

See also section 23.1.1, *P1xx Programming*.



7.3 Control Parameters

In the Control Parameters tab the parameters used to control the tightening for the Pset are presented. All parameters are automatically calculated during Tool Setup. Some can be edited later if needed. A description of all parameters is given in chapter 23, *Parameter list*.



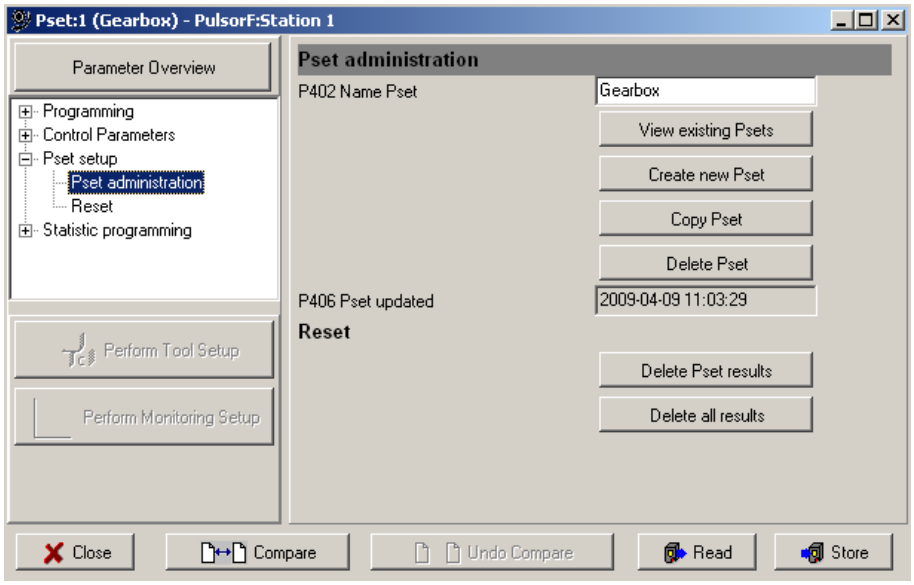
P660 will affect rundown and tightening speed and should be set so that the torque installed by the first pulse is sensible.

P676: Torque Pulse Threshold, expressed as a percentage of the target torque. *At time of print, this parameter do not affect the tightening or tightetning results*.

P686: Extrapolation Shutoff Threshold, expressed as a percentage of the target torque. The system waits until the torque has reached this level until torque extrapolation is activated. When extrapolation is active, the system will estimate the following pulse torques and shut off the air when the estimated values of the coming pulses exceeds the target torque. This parameter should normally be around 90% but may be lowered if using hard joints combined with long air hoses. Values lower than 70% is not recommended.

7.4 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 the list and name the Pset.



7.5 Loosening

Loosening should be performed by keeping the trigger button pressed until the joint is entirely loosened. Avoid pressing the trigger button repeatedly during the loosening.

It is possible to take loosenings in account if batch count is used. This is done by setting parameter C133 *Decrement batch at OK loosening*. See section 11.2.3, *Settings for Options*.

It is also possible to disallow loosenings after a correctly performed tightening. This is done by setting parameter C131, *Disable loosening at OK* (see section 11.2.3, *Settings for Options*). Note that an attempt to loosen a correctly tightened joint will also be counted as a batch decrement, if batch count is used, since the joint's clamp force may have been altered before the air was shut off.

8 Tightening and monitoring

This chapter describes the parameters that are measured when performing tightenings and how they can be used. Advices on what to think of and how different problems can be resolved are given.

Go directly to sections 8.4, *Tightening monitoring*, and 8.5, *Changing limits and activate monitor parameters*, if you want to get started quickly and adjust the tightening monitoring. It is also advisable to read section *Viewing results*, on how the results can be displayed.

Chapter 9, *Performing a Monitoring Setup*, describes how to automatically calculate monitoring parameters from a number of representative test tightenings.

8.1 Performing tightenings

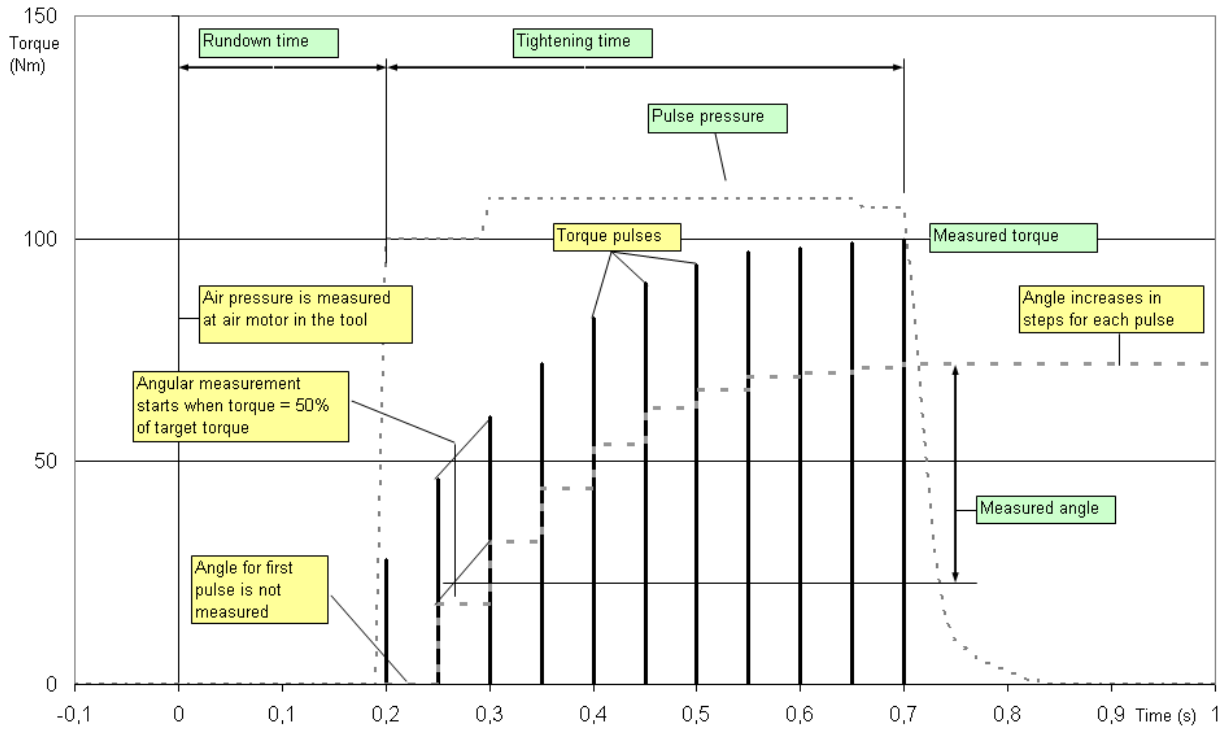
To get as accurate measurements as possible from tightenings, the following need to be considered:

- 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 as this will affect the angle measurement.

When the tightening is completed, a correct tightening can be verified by the green OK light on the tool.

If the tool has not been used for a long time, it may “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.

8.2 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. During the

first 0.2 seconds the thread is run down and then the first pulse occurs and the actual tightening is started. The torque and the tightening angle increases in stages for each pulse. When the pulse torque is sufficiently high the air to the tool will be shut off and the tightening is completed.

The tool air pressure decreases to zero when the operator releases the trigger and/or the system has shut off the air supply.

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 removes them from the calculations of 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 torque and pulse frequency.
Trigger lost	This indicates that the operator has released the trigger before the tightening is ready.
Torque value	The highest torque measured during tightening. By default, the first pulse is not counted when calculating the torque value. The pulse filter is used for this function irrespective of whether or not the pulse filter is on.
Relative torque	The achieved torque as a percentage of the target torque. It has the same features that apply to torque value as described above.
Start final angle max	If the torque of the first pulse is far above the threshold torque where angle should be calculated from, then the angle calculation starts too late. This is especially a problem when using the Pulsor Angle Shutoff strategy, where the low angle measurement results in bolts being tightened too far. When this monitoring limit is activated, the tightening will stop if the first pulse exceeds this value.
Final angle	Expressed in degrees. This is measured from a torque threshold value (default 50% of target torque). In most cases 50% of target torque is a good choice of threshold value. If the threshold value is set at 0 the angle is always measured from the first pulse, as is the case if the threshold value lies below the torque value of the first pulse. **The angle of the first pulse cannot be measured.** If a Monitoring Setup has been performed, the average of the angles is used as basis for the tightening angle monitoring parameters.
No of Pulses	The number of pulses registered during the tightening. 10-15 pulses is enough for good accuracy, more than 20 pulses will not contribute to the accuracy. Too many pulses has the drawback that oil must be filled more often in the pulse unit. If you consistently have more than 30 pulses per tightening a larger tool size is recommended for the application. Conversely, 3 pulses or less has the drawback that the accuracy becomes poor and the pulse frequency (which is used when using the tool drift alarm function) cannot be calculated. In this case, a smaller tool model can be better for the application.
Tightening time	The time between the first pulse and the last pulse.
Rundown time	The time between the tool trigger is activated and the first pulse.
Pulse frequency	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.
PF pressure	The maximum requested pressure from the Pulsor Focus during a tightening.
Pulse pressure	The maximum air pressure in tool (between pulses) during the tightening.
TCB pressure	The maximum pressure reached at the outlet of the TCB during tightening.

8.3 Viewing results

The Pulsor Focus can display one or two tightening parameters on the display. 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 Torque value is displayed.

See section 11.2.2, *Display and toggle display* for instructions on how to use ToolsTalk Pulsor to set the display.

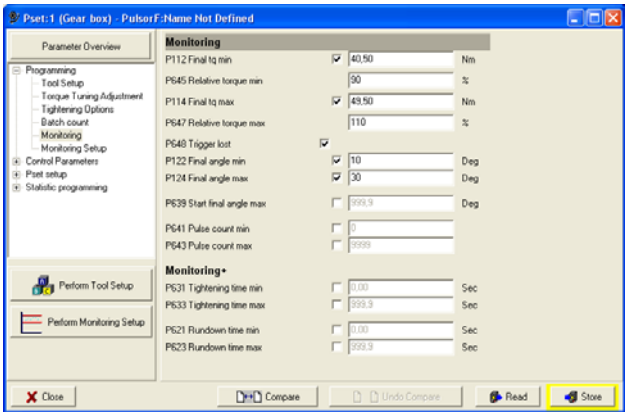
When using ToolsTalk Pulsor, the Tracking result monitor show all results from the tightenings. See chapter 16, *Monitors* for more information.

8.4 Tightening monitoring

Monitoring is used to determine if a tightening is OK or not OK. If, after a tightening, a parameter that is monitored lies outside of its accepted interval that tightening will be rejected. How the system should react on a rejected tightening is configurable. The signal lights on the tool will show if a tightening was rejected or not as described in 3.1, *Signal lights on the tool*. The limit values can be set in the monitoring tabs in the Pset window as described below. Which monitor limits to activate can also be set here.

If Monitoring Setup has been performed for the Pset limit values will automatically be provided for all the parameters you can monitor on. Most tightenings will lie within these limits. Changes made in the monitoring tabs will not affect the result of a Monitoring Setup. The Monitoring Setup results are saved and shown under **View Result** in the Pset window, Monitoring Setup tab.

8.5 Changing limits and activate monitor parameters



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.

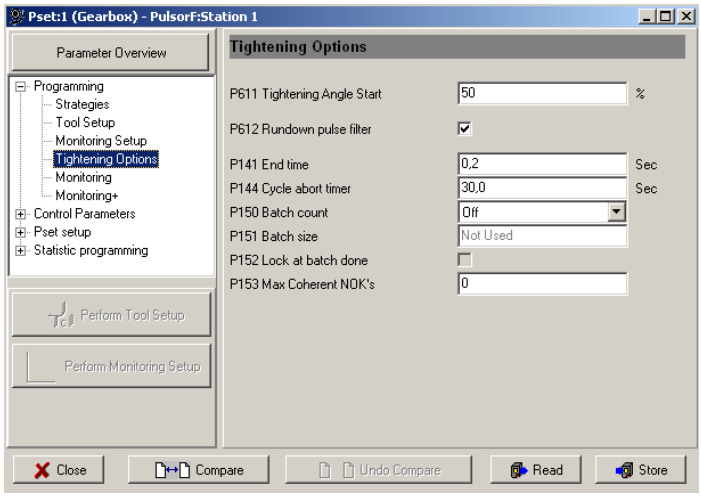
Relative torque value is 100% when the tightened torque is equal to the target torque.

Only **Torque** and **Trigger lost** (no machine shut-off) limits are activated by default. The absolute and relative torque values are linked - if one is changed, the other will follow.

Check the parameter limits that should be activated.

If Relative torque or Tightening Angle has limits “-1” the Monitoring Setup has not been able to determine these parameters. They will not be monitored correctly while having these values.

If the limit values generated during Monitoring setup are asymmetrical it is due to the offset between the target torque and the mean torque achieved during Monitoring setup. Save changes by clicking **Store**.



You can change the tightening settings in **Tightening Options.** If the angle values have a high variation, try changing the Tightening Angle Start parameter.

Batch related settings are also set in this window.

Save changes by clicking **Store**.

8.6 Using the tightening monitoring options

A change in Tightening angle start and Rundown pulse filter will affect the values of the corresponding tightening results. If this is changed the limits for monitoring may need to be adjusted as well.

Limit values, Tightening angle start and Rundown pulse filter can be changed, activated or deactivated arbitrarily at any time.

Rundown pulse filter: If early pulses occur that are not part of the tightening such as Rundown pulses of self locking nuts the measurement of various parameters such as tightening time may be incorrect. To prevent this there is a Rundown pulse filter that excludes such pulses from the calculations. The filter is on by default, but can be switched off.

8.7 Changing parameters via Pulsor Focus front panel

Some parameters can be changed using the function button (F) on the front panel. The function can be used assuming no other user is accessing the controller. Confirm with Enter to go to *edit mode* for the currently selected function shown on the display. Confirm with Enter when you have made an adjustment to exit edit mode.

- Press **F** to select parameter **F1**, the minimum limit for torque monitoring. The parameter value (e.g. 92) will flash. After entering edit mode, this value can be increased/decreased using the +/- buttons.
- Press **F** again to select parameter **F2**, the maximum limit for torque monitoring.
- Press **F (F3)**. Pulsor Focus IP address.
- Press **F (F4)**. Active Pset. Note that Pset select source must be set to PF Keyboard for this to work. For more information see section 11.3.4, *Pset select source*.
- Press **F (F5)**. The number of batch tightenings.
- Press **F (F6)**. Select this to create a new Pset. Note that Pset select source must be set to PF Keyboard for this to work. For more information see section 11.3.4, *Pset select source*.
- Press **F (F7)**. Select this to perform a Torque tuning adjustment.
- Press **F (F8)**. Pset pressure.
- Press **F** again to exit to working mode.

Press the F button repeatedly to exit edit mode, or wait 30 seconds.

8.8 Strategies for tightening monitoring

Torque – limit values: The number of rejected tightenings will vary accordingly to the limits set. If a Monitoring Setup has been performed and the limits are set unnecessarily tight or too wide, set the limits to better values, preferably according to specification.

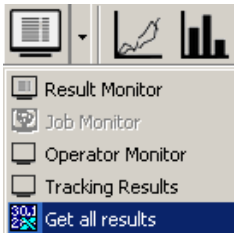
Rehit: There is no automatic function for detecting a rehit. However, you can set the parameter limits so that a rehit is detected (tightening time, tightening angle, number of pulses). Make a number of correct tightenings and then carry out a rehit on these to check which parameter(s) that is most suited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

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

8.9 Analysis of improvements

Once the tool is adjusted and has been working for a while, it may be appropriate to analyze how the tool and the monitoring have functioned. With the help of **Get all results** (found in the monitors dropdown menu), all the parameters from the tightenings can be viewed.



When the results are shown, you can send the results to Excel®. There you can, for example, sort out all rejected values. An analysis of the result data can show how the process can be further improved.

9 Performing a Monitoring Setup

9.1 Introduction

A Pset may be set to monitor on a lot of tightening parameters. To automatically generate suggestions for these limit parameters you can perform a **Monitoring Setup**. This will teach the Pset the difference between “good” and “bad” tightenings.

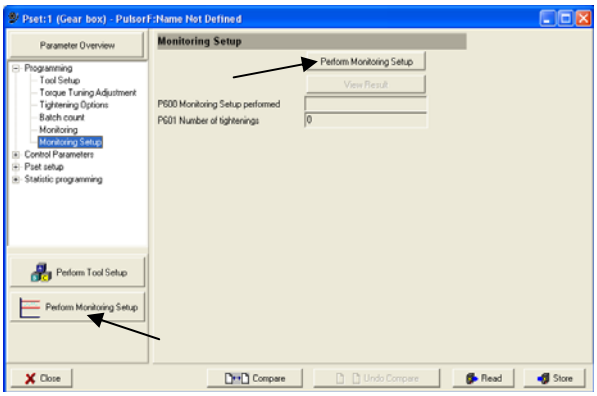
A prerequisite for being able to carry out a Monitoring Setup is that a Tool Setup has been performed for the Pset according to the instructions in chapter 5, *Performing Tool Setup*.

It is also possible to carry out a simpler type of Monitoring Setup directly from the Pulsor Focus front panel. See section 9.6, *Making Monitoring Setup via Pulsor Focus front panel* for more information.

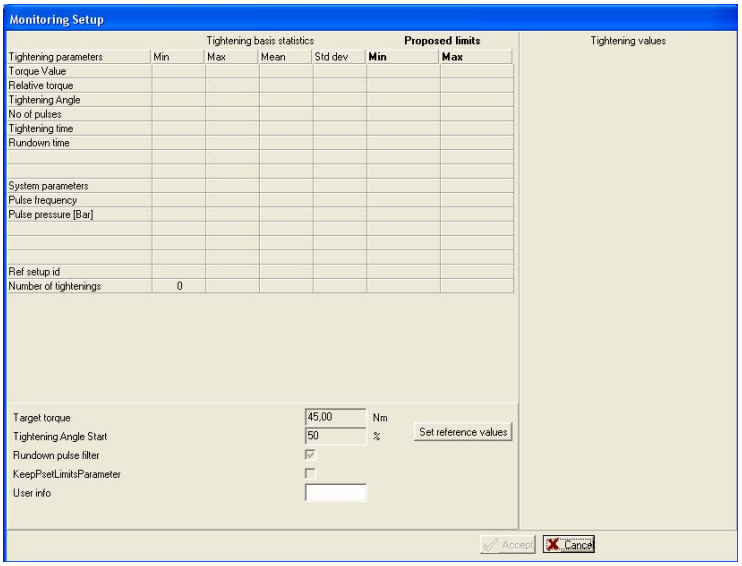
If you want to set up limits for monitoring parameters without performing a Monitoring Setup, you can skip this chapter. For more information about how to manually set monitoring parameters see chapter 8.4, *Tightening monitoring*, and 8.5, *Changing limits and activate monitor parameters*.

9.2 Starting Monitoring Setup

In the window for the active Pset Click on either **Perform Monitoring Setup** button.



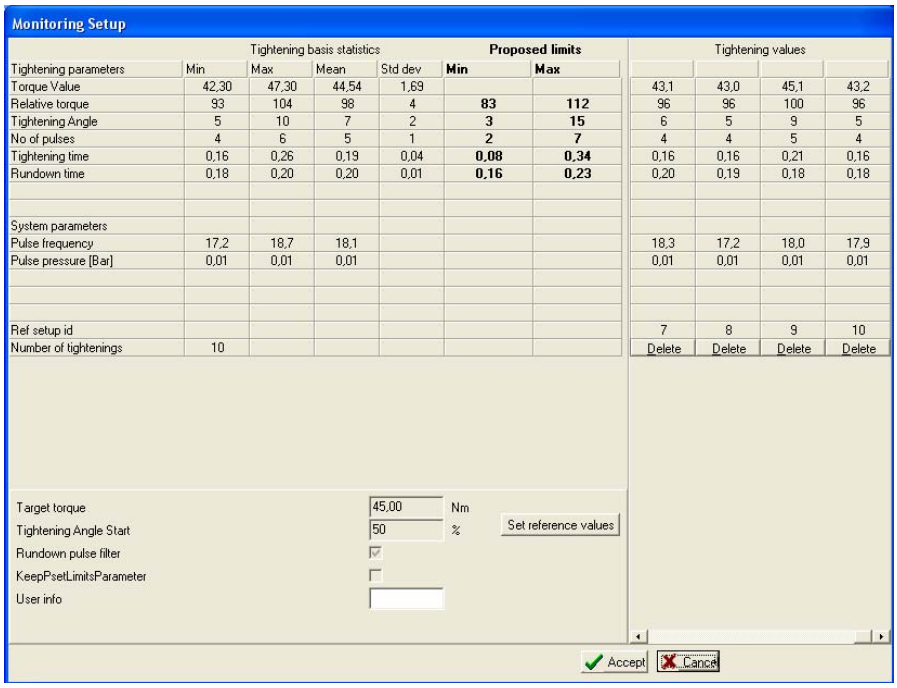
The Monitoring Setup is displayed.



9.3 Making Monitoring setup tightenings

Important information regarding tightenings:

- Use the tool on the actual target joint.
- Perform the tightenings.
- Do not release the tool trigger prematurely. The tool must shut off after each tightening (tightenings where the tool has not shut off are not included in Monitoring Setup).
- If a performed tightening has spin error it is not included in Monitoring setup. The tool oil level must be checked before Monitoring Setup can be continued.
- No lights will light up on the tool, the Pulsor Focus front panel or other accessories that are connected when you carry out Monitoring Setup tightenings (since the system does not monitor these tightenings).
- It is strongly recommended to have at least 5 pulses and at the most 30 pulses to have optimal use of the tool. A warning message will be shown upon leaving Monitoring Setup if this recommendation is not followed. See also section 8.2, *A tightening and its parameters*.
- New limit values for monitoring are calculated for each new Monitoring Setup tightening (as are certain statistics on the tightening result).
- Check that the Monitoring Setup tightenings have been done correctly.



- Tightenings where the torque lies outside 15% of the mean value are shown in orange.
- Tightenings with invalid parameter values are shown with "-", (for example tightenings with a negative angle or pulse frequency value when less than 3 pulses). Min and max values are presented with "-" and proposed limits are set to "-1" for that parameter since they cannot be evaluated.
- It is recommended to perform at least 10 tightenings. Only one tightening will work but more tightenings will provide better statistics. Max 50 tightenings is allowed.
- 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. See also the following section.

9.3.1 Making setups during Monitoring Setup

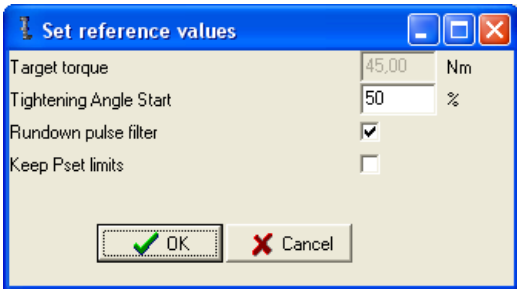
By pressing the Set reference values button you can change the following parameters while carrying out a Monitoring Setup. These parameters affect the measurement values, also for tightenings already done during Monitoring Setup.

- Target torque (not editable): Specified target torque for this PSet.
- Tightening angle start: This should be set to the relative torque level from where angle measurement is to start. The default start is at 50% of target torque.
- 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 default when a Pset is created but can be shut off. See more under section 8.8, *Strategies for tightening monitoring*.
- Keep Pset torque limits: if this checkbox is marked, torque limits in monitoring limits will not be changed after an accepted Monitoring Setup.

Click the **Set reference values** button.

If needed, change the parameters. See explanation in table above.

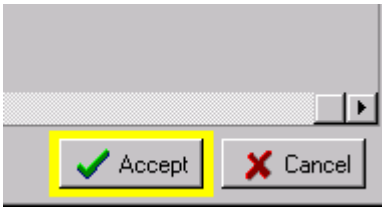
Click on **OK**.



Changing these parameters results in recalculation of all the tightening results from this monitoring Setup.

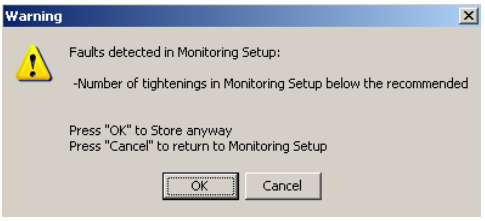
9.4 Completing Monitoring Setup

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



When enough tightenings have been made, the Accept button will be marked in yellow, or, if Tools Talk identifies a problem with the Monitoring Setup, see below.

Setup is completed by clicking the **Accept** button. The Monitoring Setup window will be closed, the results stored and no changes or additions to this Monitoring Setup can be made later, though it is always possible to perform a new Monitoring Setup. If there are any faults in the Monitoring Setup a new window will be shown. The problems will be listed and a chance is given to go back and fix the faults or store anyway.



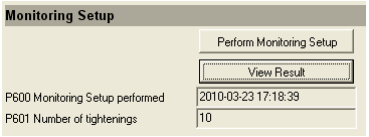
The **Accept** button will be red if there are fewer than ten Monitoring Setup tightenings.

You have now set the monitoring parameters to values according to the tightenings performed during the Monitoring Setup. See chapter 6, *Working with ToolsTalk Pulsor* for more information.

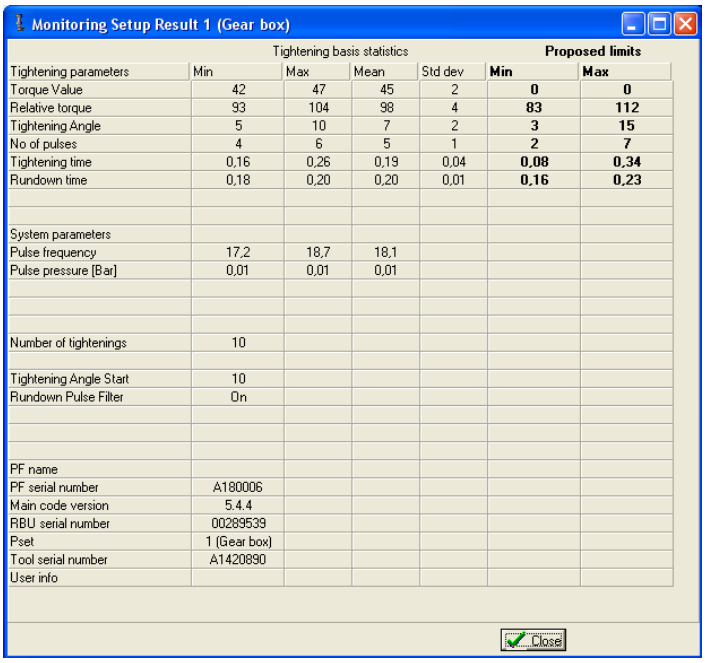
9.5 Result values from a Monitoring Setup

When a Monitoring Setup is complete, the proposed limit values are stored in the tightening monitoring parameters. The result values from the Monitoring Setup are saved for later reference.

In the window of the active Pset, click on **View Result** under Monitoring setup to check the saved values from Monitoring Setup.



Result values from a Monitoring Setup are displayed.



Proposed limits are calculated on the following basis:

- Limit values are calculated as +/- 4 standard deviations, but no closer to the 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.

9.6 Making Monitoring Setup via Pulsor Focus front panel

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

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

- The tightening angle start is taken from the Pset.
- The rundown pulse filter setting cannot be changed (the settings are taken from the Pset).
- Incorrect tightenings can not be deleted.

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

- Make sure a Tool Setup has been performed before you start.
- Select/activate the appropriate parameter set (default P1). Press **Pset Setup** button, then "**+**" or "**-**" button to select Monitoring Setup menu item (rSEt will flash on screen). Press **Enter** to accept.
- Check that the setup light comes on and that "rSEt" appears on the display together with the Pset number.
- 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 **Pset Setup** if you wish to abort the setup.
- Press the **Enter** button. The upper relative torque limit and lower relative torque limit is toggled on the display.
- Monitoring Setup is complete and the result is stored in the relevant Pset (parameter set).

When the Monitoring 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 Monitoring Setup or at a later time. See section 8.6, *Using the tightening monitoring options* for more information.

10 Job

The Job function is useful when an object requires tightenings in a controlled sequence, often with more than one Pset used for the application. 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.

For parameter descriptions see Parameter list.

.

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

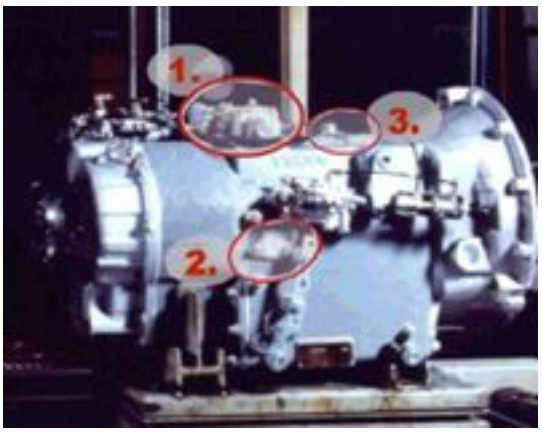
- A Job is created by combining a set of Psets.
- The Job list may contain 30 entries (Psets).
- It is possible to use a Pset more than once in a Job.
- Up to 100 Jobs can be stored in Pulsor Focus.

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

1. Four bolts - hard joint
2. Three bolts - soft joint
3. One bolt – medium joint

For this example three different Psets should be created

The Job is performed by one Pulsor Focus and automatic Pset selection is desired.



The following Job would solve the task above, provided that the Psets previously have been set up:

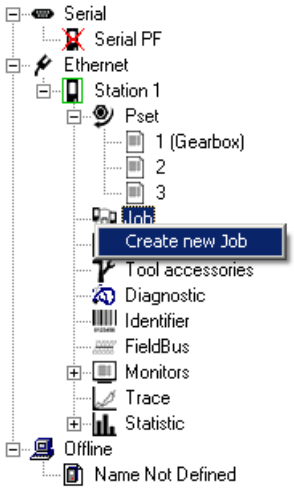
Pulsor Focus	Pset	Pset Name	Auto select	Batch size
1	1	Pset1	Yes	4
1	2	Pset2	Yes	3
1	3	Pset3	Yes	1

10.1 Creating a standalone Job

The Job creation section is accessible from ToolsTalk Pulsor.

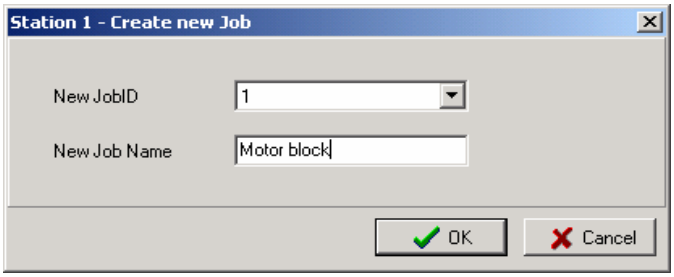
Every Job has a unique ID number (1..100). Create a Job by combining Psets as shown below.

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

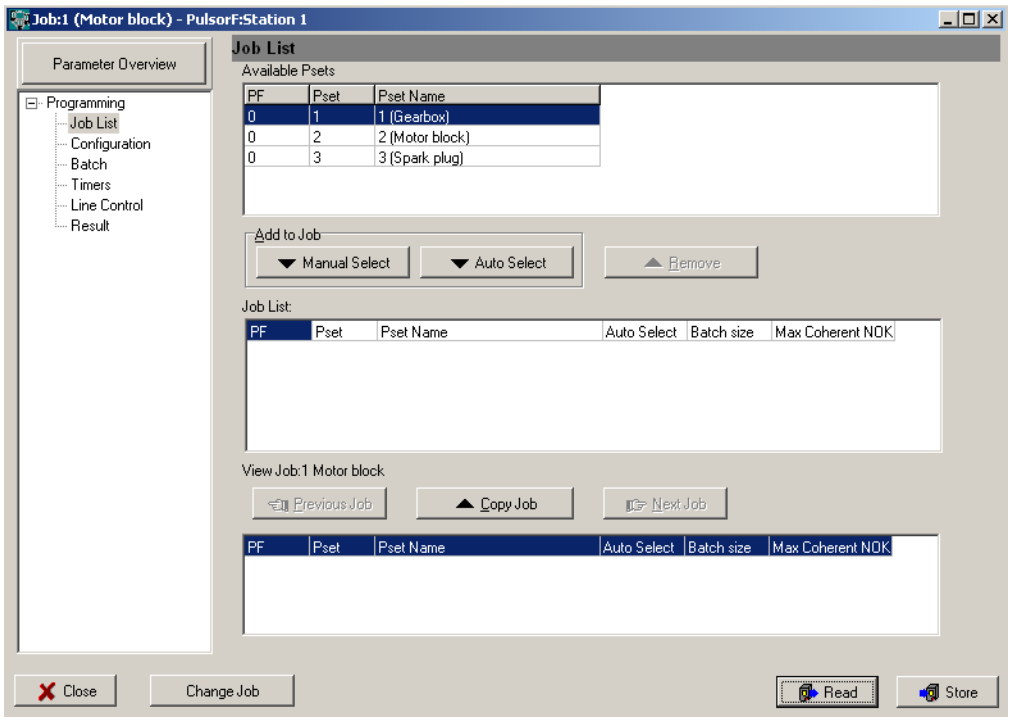


Select **New Job ID** and give the Job a name (optional).

Click **OK** to continue.



The Job window appears.



The topmost list is the list of available Psets.

The list in the middle is the list of Psets currently in the job.

Between the two lists are three buttons: Manual select, Auto select and Remove. The first two are used to add Psets from the available list to the Job list (list of Psets in the Job). Select the first Pset you would like to add to the Job. Pressing Manual Select will add the Pset to the Job list and set the "Auto Select" parameter to "Yes". Similarly, pressing "Auto Select" will add the Pset to the Job list and set the "Auto Select" parameter to "No". Marking a Pset in the Job list and pressing "Remove" will remove the entry from the Job list.

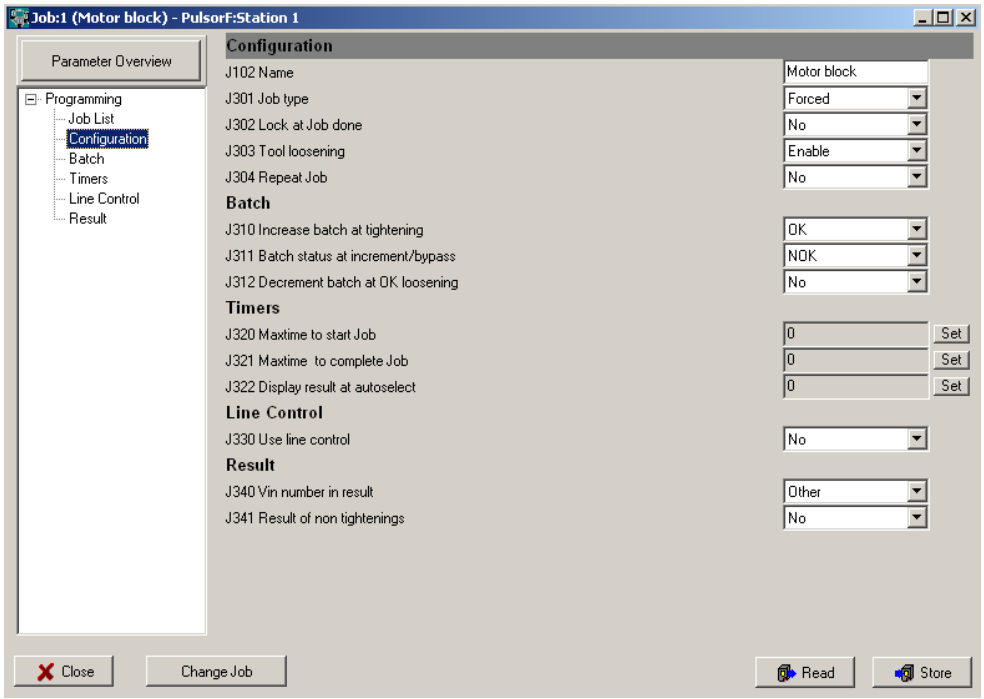
In the bottom of the window you can view existing Jobs and their included Psets. The list in the bottom of the window shows the Psets of the currently viewed, already existing, Job. You can select a Job with the "Previous Job" and "Next Job" buttons, and then press "Copy Job" to transfer the Psets of that Job to the one you are currently setting up.

It is possible to change between Manual and Auto select afterwards by clicking in the Job list table in the Auto Select column for the actual Pset entry.

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.

In the **Configuration** tab you can set *Name [J102]*, *job type [J301]*, *lock at job done [J302]*, *tool loosening [J303]* and *repeat job [J304]*. Continue with the parameters in **Batch**, **Timers**, **Line Control** and **Result.** See parameter list, section Job for more information.

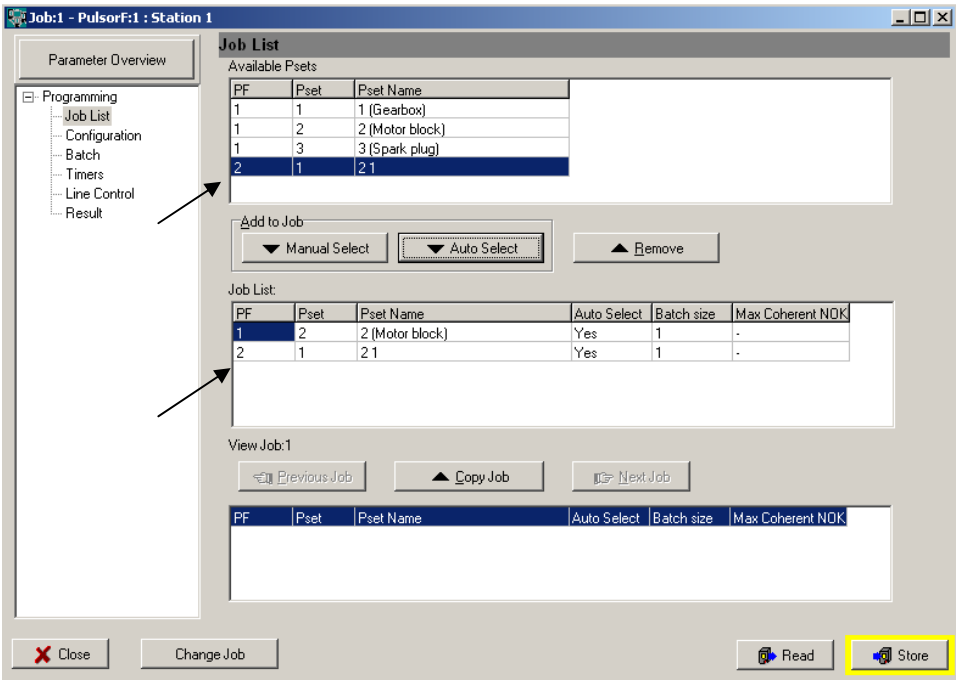


10.2 Creating Multi Pulsor Focus Jobs

More than one Pulsor Focus can be used to perform a Job. If this functionality is desired, the Pulsor Focuses used in the Job needs to be members of the same Cell, see chapter 18, *Cell and Net* for details about how to set up Cells. When using more than one Pulsor Focus in a job, one Pulsor Focus is the *Job Reference*. All other Pulsor Focuses in the job are called Job clients. The Job Reference will make sure the correct Job Client is enabled at the correct time, and that the correct Psets will be selected. To set up a Multi Pulsor Focus Job, set up the Job on the Job Reference only.

See chapter 11.4, *Communication* for information regarding how to set the Job Reference IP address. The Job Reference IP address needs to be set on all Pulsor Focuses that are to be used in the Job, both for the Job Reference and the Job Clients.

After this is done, set up the job as described in chapter 10.1, *Creating a standalone Job* on the Job Reference. The list of available Psets now contains all the Psets from the Job Reference and Job Clients.



10.3 Running Jobs

When a Job has been selected it is possible to select a new Job only until the first tightening is started or a batch increment is performed. After that, 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 (no abortion, selection only)
- Fieldbus

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.

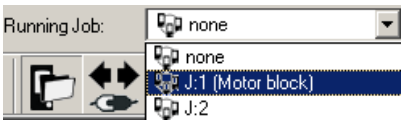
- *Job select source override [C227]* has a higher priority than *Job select source [C221]*.

- 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.

10.3.1 Running Jobs using ToolsTalk Pulsor

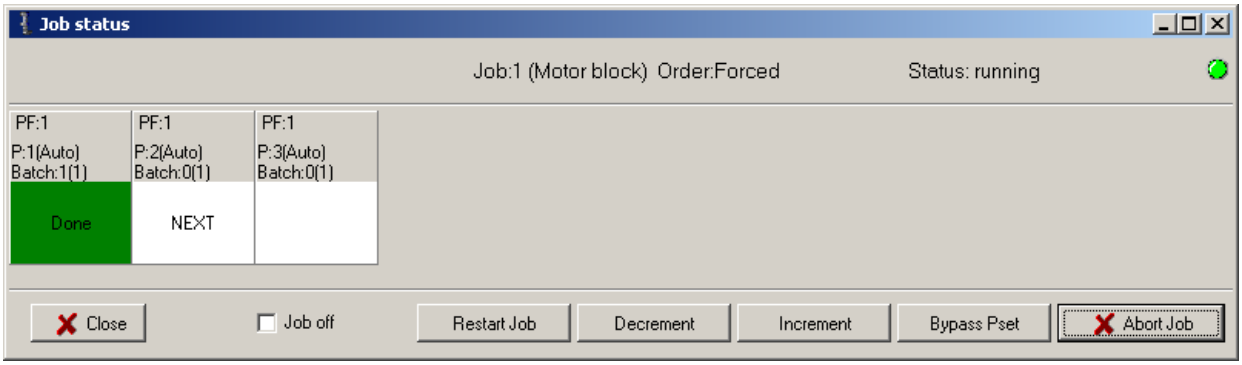
In ToolsTalk Pulsor, select Job to run from the combo box (in the selection row).



To run the Job from ToolsTalk Pulsor, set parameter C221, *Job select source* to "Ethernet/Serial" in Config window, Other I/O:s 1 tab.

In ToolsTalk Pulsor, click on the arrow to the right of the **Monitor icon** and select **Job Monitor**. Alternatively, double click Job Monitor from the PF Map as shown to the right.

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



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

10.3.2 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** 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. If using Job reference, 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 *Batch status at increment/bypass [J311]* is selected as NOK. Otherwise, the Job Status will be OK. If using Job Reference: 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.

Function	Description
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 on parameter *Batch status at increment/bypass [J311]*. If using Job reference: 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	When a Job abort request is received the Job functionality will wait for completion of the ongoing tightening result before aborting the Job. Abort can be an external signal as well as an internal order (see *Max time to start Job [J320]* and *Max time to complete Job [J321]*). If using Job reference: Abort Job is only allowed via the JobReference.
Job off	This function offers the possibility to turn off the Job functionality and unlock all involved tools. **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 *Pset select source [C222]*) Otherwise the latest selected Pset in the Pulsor Focus will remain. **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 *Pset select source [C222]*). Otherwise the latest selected Pset in the Pulsor Focus will remain. When a Pulsor Focus is in Job off mode it is possible to perform tightening with any existing Pset. 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 shut off. The only occasion when the Job off functionality affects the JobClients is when they have lost communication with their JobReference. In this case it is possible to unlock the JobClients locally by using the Job off functionality. **Only the JobReference will remember the Job mode after a reboot.**
Job status (information)	**Job OK**: Received if all Psets included in the Job have been correctly performed. Alternatively if Batch increment/bypass has been used (if Batch Increment/Bypass is configured as an OK event). **Job NOK**: Received if any Pset included in the Job have not been correctly performed. Alternatively it is considered as NOK (Not OK) if Batch increment/bypass has been used (if Batch Increment/Bypass is configured as a NOK event). **Job Aborted**: The Job was aborted.

10.3.3 Loosening in job

It is possible to monitor loosenings during a job. If monitored, you can either count the loosenings (Pulsor Focus will decrement batch), disallow loosenings after an OK tightening or disallow loosenings altogether (see section 10.1, *Creating a standalone Job*). The functionality is the same as for Loosening in Pset, see section 7.5, *Loosening*.

10.4 Unlock the tool

If the tool is locked by the Tool Control Box after a job, unlock the tool by selecting a new job, deleting all existing jobs, or selecting job off.

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

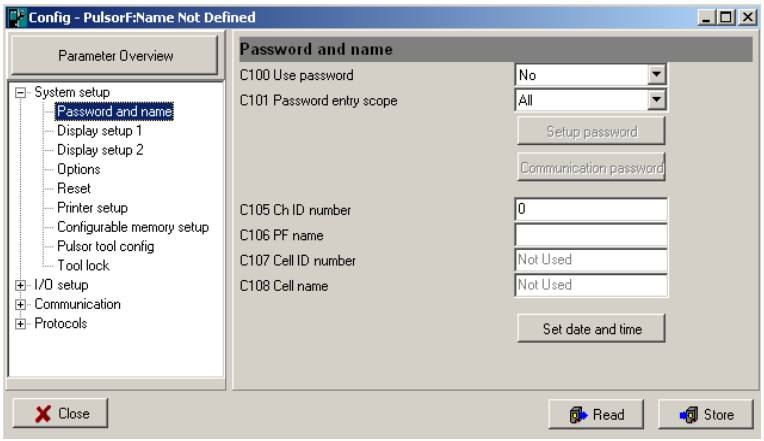
11 Config

11.1 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.

Start Config from ToolsTalk Pulsor either by double clicking on Config in the PF Map 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. In addition to the internal I/O ports it is 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 (RS232 and USB) and can communicate with ToolsTalk Pulsor and database applications such as ToolsNet. IP address 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.

11.2 System setup

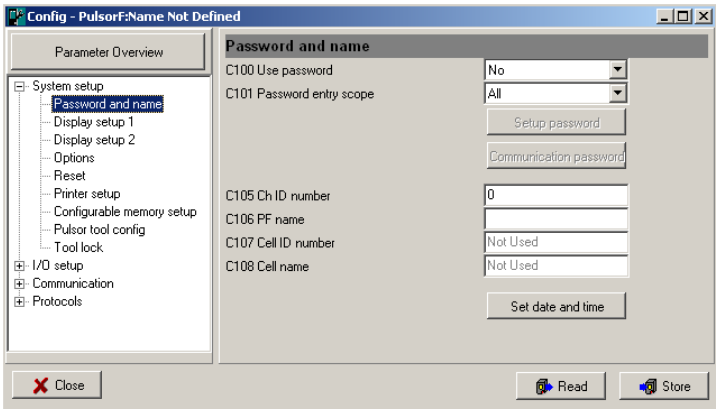
System Setup contains basic Pulsor Focus features such as name and display options.

11.2.1 Password and Name

Select the **Password and Name** tab under System setup in 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 is stamped with wrong time data.

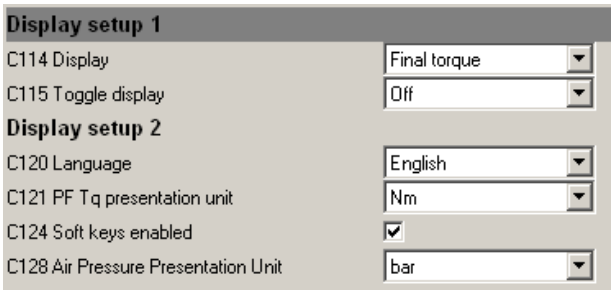
11.2.2 Display and toggle display

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

Select **Display setup (1 or 2)** under System setup from the navigation area.

Select the appropriate options, see below for details.

Click **Store** to save.



[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
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
Final torque	92.1
Final angle [º]	123
Target torque	25.00

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

[C120] will select the language used for printouts from the printer port. See also section 11.2.5, *Settings for print*.

[C121] will select presentation unit for torque measurements.

[C124] if checked the keys on the Pulsor Focus front panel will be enabled, otherwise disabled.

[C128] the air pressure units displayed in the system for pressure parameters. Valid units: bar, PSI, kpond/cm^2 and kPa.

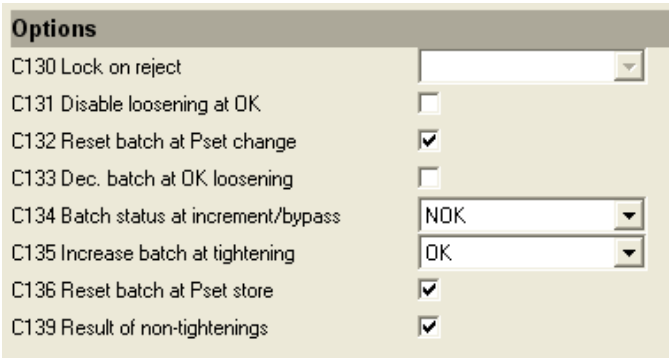
11.2.3 Settings for Options

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 **Store** to save.



[C130] Used to shut off the air supply to the tool after a NOK tightening.

[C131] Used to shut off the air supply to the tool when a loosening is started after an OK tightening.

[C132] If active, Batch Counter will be reset when changing Pset.

[C133] For all Psets with Batch Counting activated, performing a loosening will decrement the Batch Count.

[C134] This parameter determines whether the batch is to be considered OK or NOK when a tightening is bypassed or Batch Counter is incremented manually.

[C135] Determines if only the OK tightenings should increment the Batch Counter, or if NOK tightenings should increment the counter as well.

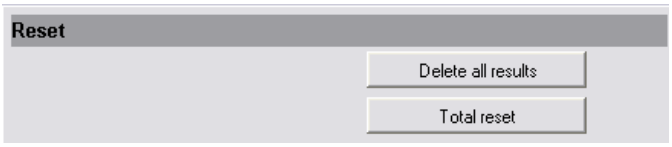
[C136] If checked, the Batch counter will be reset when storing an edited Pset.

[C139] Determines if non-tightening events, e.g. loosenings or batch increments and decrements, shall generate results.

11.2.4 Reset

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

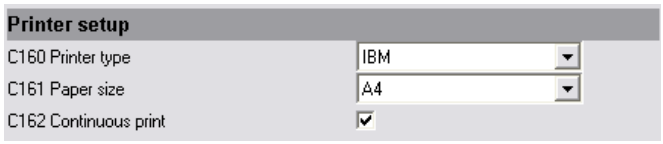
Here it is possible to *Delete all results* or to perform a *Total reset*. A total reset will clear all Pulsor Focus settings including network configuration. The RBU will also be cleared.



11.2.5 Settings for printer

Select **Config - System setup – Printer setup**.

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



11.2.6 Settings for configurable memory

Configurable memory is described in detail in chapter 21, *Configurable memory*.

11.2.7 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.

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

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

[C195] determines if the tool should be locked when a service alarm has triggered.

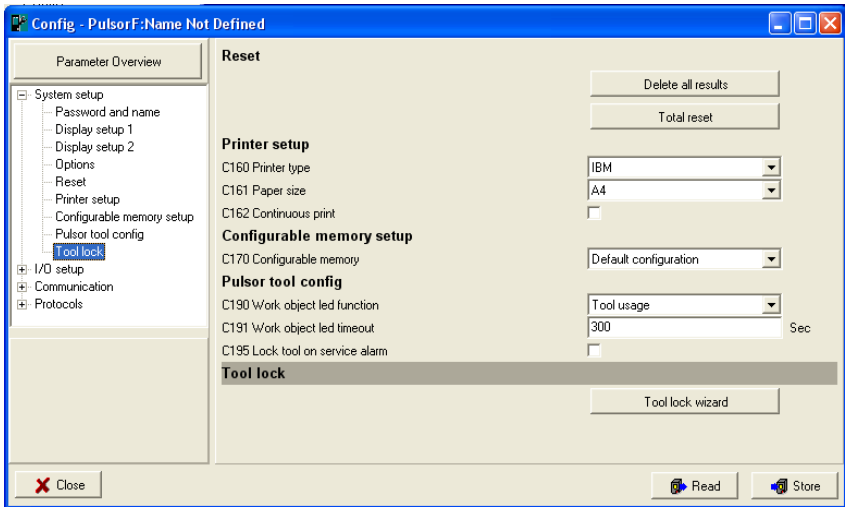
11.2.8 Settings for Tool lock functionality

The tool lock wizard provides a quick way of setting conditions for locking the tool. All these settings can be done in the respective Psets and Jobs as well, the tool lock wizard merely presents an easy way to overview and set lock functionality.

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

Press the button **Tool lock wizard** for quick programming of lock conditions.

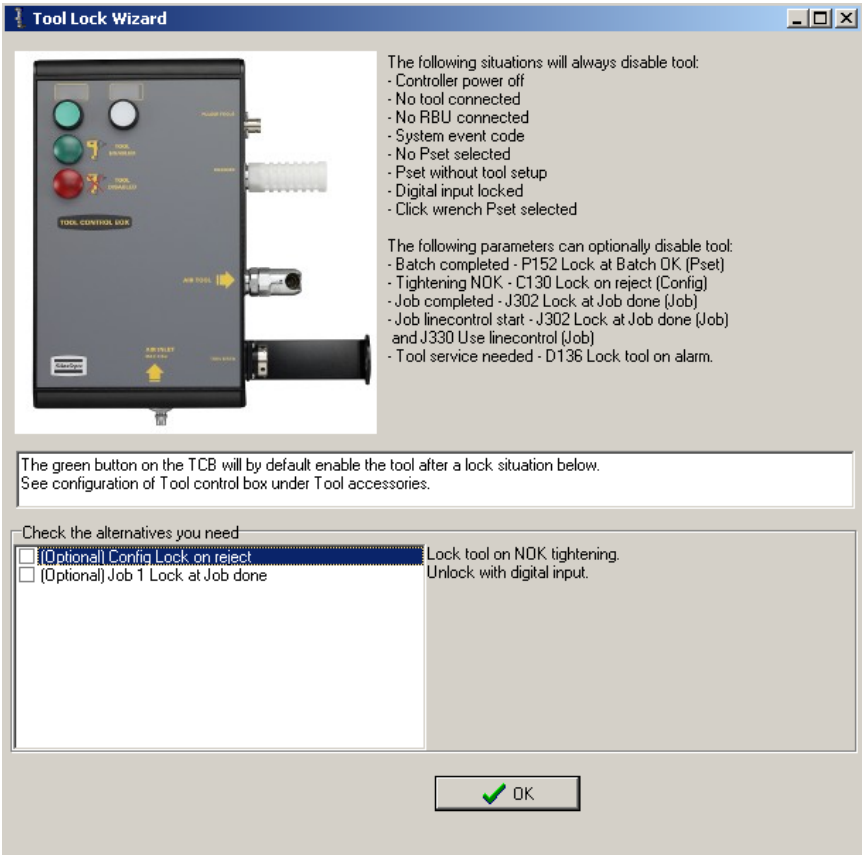
Click on **Store**.



Using the Tool lock wizard

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

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



Depending on the Psets and Jobs configured, the system will detect the Optional conditions which can lock the tool. Select the the desired optional conditions by checking the corresponding checkbox.

Finally, press the OK button.

Custom I/O settings

You can use I/O devices to trace the Pulsor tool enabled state (Relay) and set the tool enabled state etc (Dig In). If desired, configure the I/O device for lock functionality according to section 20.3.1, *Setup of I/O Expander.*

The air will always be shut off in these situations:

- When the Pulsor Focus is powered off.
- No tool connected or tool connection problem.
- No RBU connected.
- System event, i.e. an event that need acknowledgement.
- No Pset selected.
- Pset without Tool Setup is active.
- 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 tool on alarm [D136]*).

11.3 I/O setup

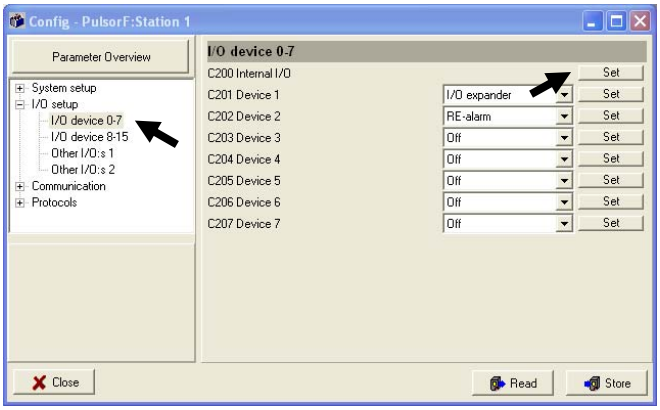
Pulsor Focus has extensive I/O capabilities, configured in branch **I/O Setup**. Apart from the internal I/O ports it is also possible to connect up to 15 external I/O devices to the Pulsor Focus I/O Bus.

11.3.1 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.

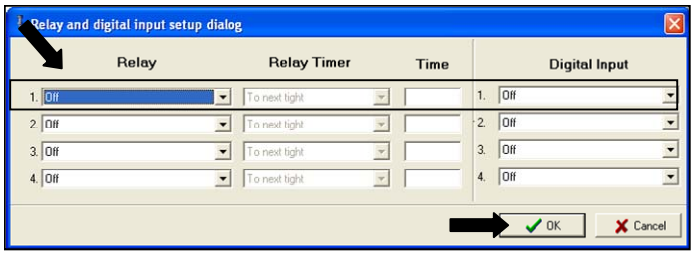
Click on **Set** on Internal I/O line to open the configuration window.



Set the wanted Relay functions and choose its behavior.

Set the Digital input functions.

Click **Store** to save when configuration is done.



11.3.2 External I/O devices

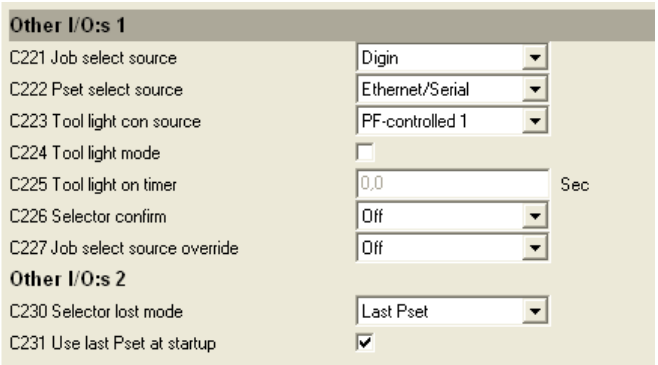
Setting up external I/O devices is explained in chapter 20, *Accessories*.

11.3.3 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.



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

[C222] determines which source the Pulsor Focus shall use to select Psets. See section 11.3.4, *Pset select source*, for more information.

[C223] – [C225] is used to configure the behavior of the tool status LEDs. See chapter 23, *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.

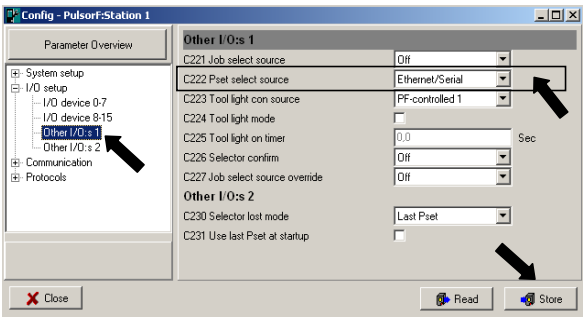
11.3.4 Pset select source

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. Other choices include Field bus and digin. By selecting digin, you can choose to select Pset with the buttons on the Tool Control Box.

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

If tools talk should be used to select Pset, select Ethernet/Serial from the list.

Click on **Store** to save.



11.4 Communication

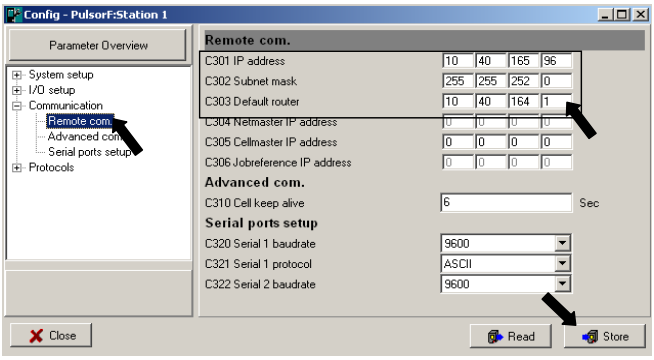
Pulsor Focus communicates by both Ethernet and Serial communication links and can work together with ToolsTalk Pulsor and database applications such as ToolsNet, etc. Parameters such as IP addresses and baud rate are set up in this window.

Select **Remote com** under Communication in 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).



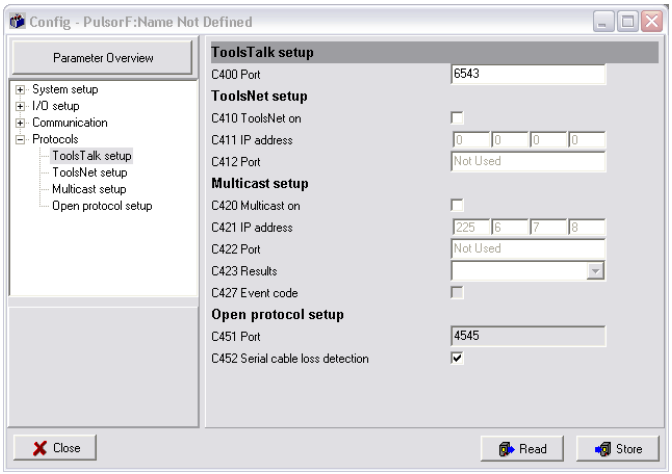
[C301] – [C303] are required when communicating using Ethernet.

[C304] – [C305] and *[C310]* are explained in chapter 18, *Cell and Net*.

[C306] is the IP address of the Job reference. This can only be set if the Pulsor Focus is part of a cell, i.e. C304 must have been set before C306 can be changed.

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

11.5 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 19, *ToolsNet*.

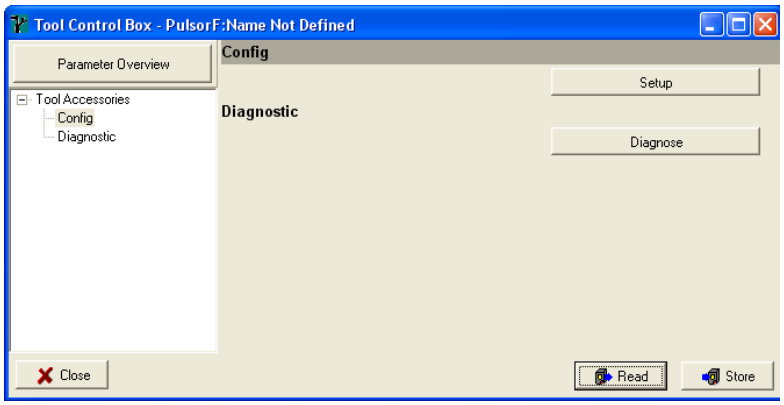
[C420] – [C427] are used with the older software Factory Overview.

*[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.

12 Tool Control Box

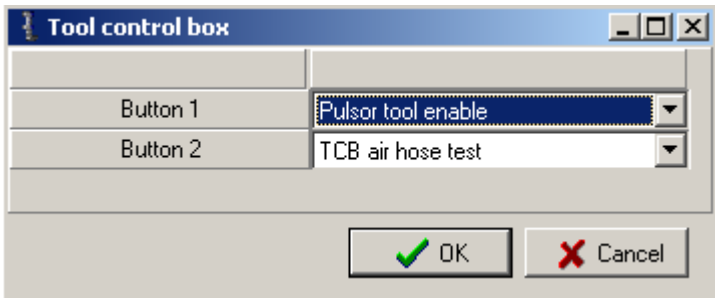
The Tool Control Box item contains parameters and diagnostic tools for the Tool Control Box. Here you can view firmware information, set what action to assign to the TCB buttons and check that the buttons work correctly. Open the Tool Control Box window by double clicking the Tool Control Box item in the PF map. Under the tabs Config and Diagnostic you will find two buttons named Tool Control Box and Diagnose Accessories, respectively.



12.1 Tool Control Box settings

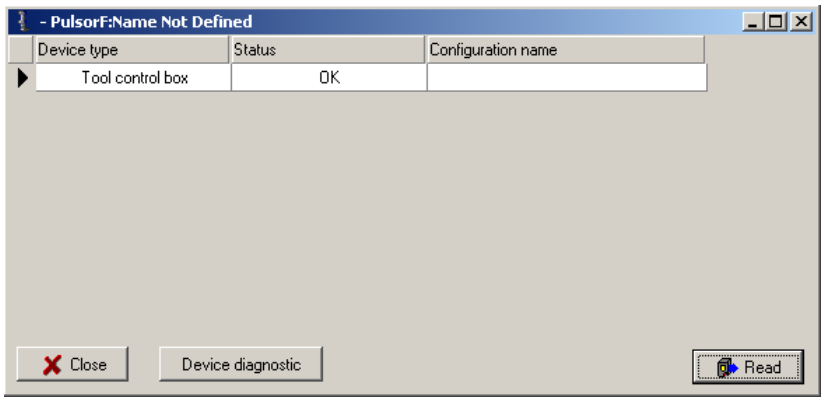
Press the Tool Control Box button. In the appearing window you define what actions to assign to the two TCB buttons. Button 1 is the green button and button 2 is the white button.

The green button is by default set to Pulsor Tool Enable. The default for the white button is Air Hose Test.



12.2 Diagnose Accessories

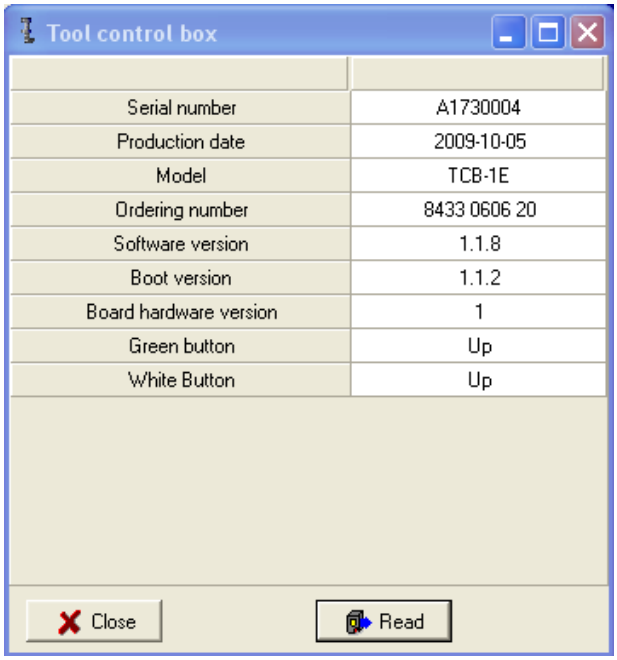
Pressing this button will open up a list of items that can be diagnosed in your system. The common item selectable is the Tool Control Box. This item will be selected by default on a system where only the TCB of the accessories can be diagnosed this way. After having selected the Tool Control Box, press Device Diagnostic to bring up information and diagnostic tools.



12.2.1 Diagnose Accessories – Tool Control Box

In this window common information about the TCB will be shown. The information contains Serial number, Production date, Model, Ordering number, Software version, Boot version, Boot hardware version and status of TCB buttons.

When Read is pressed the window (including button status: button pressed or not) will be updated.



13 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 for service indicator, **tool drift alarm** and performing an **air sensor tuning and Air Hose Test**.

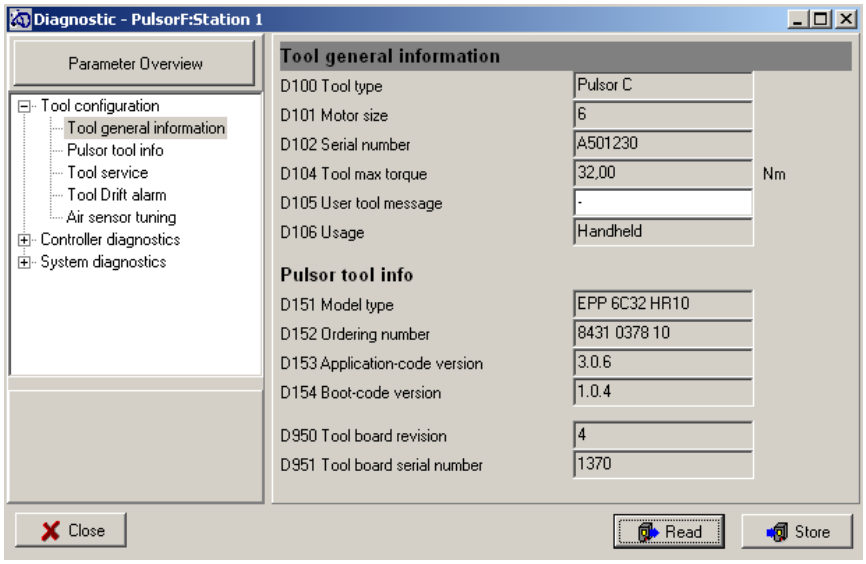
For parameter descriptions see Parameter List, section 23.4, *Diagnostic.*

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.

13.1 Tool general information and Pulsor tool info

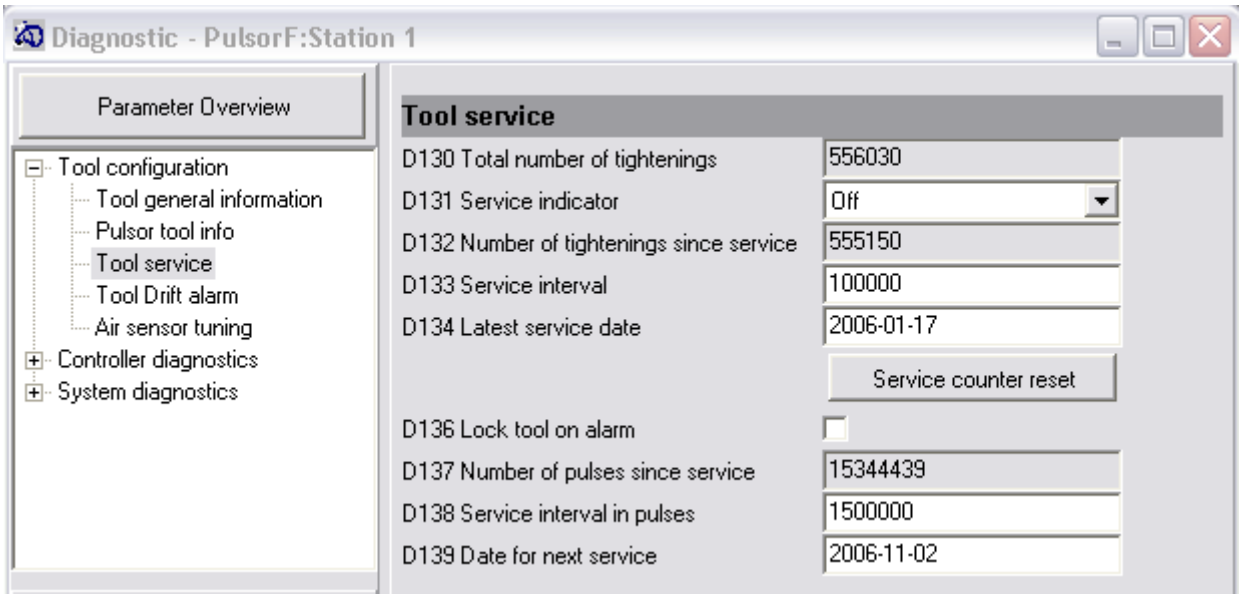
Tool general information section shows general information about the connected tool.



13.2 Tool service and Service indicator

The service parameters are stored in the tool. If any active service parameter exceeds a preset alarm limit the “alarm” light on Pulsor Focus comes on and an event code will state which parameter has caused the alarm.

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



Service indicator alarm, configured in the **Tool service** section, provides a mechanism to remind Pulsor Focus users when it is time to service the tool. The user specifies how many tightenings is allowed (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.

When Service indicator alarm is activated the following will happen: The alarm LED on the front panel of Pulsor Focus will flash continuously. Event code *Tool service interval expired [E502]* will be generated. 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 service alarm [C195]*.

13.3 Tool drift alarm

13.3.1 Introduction

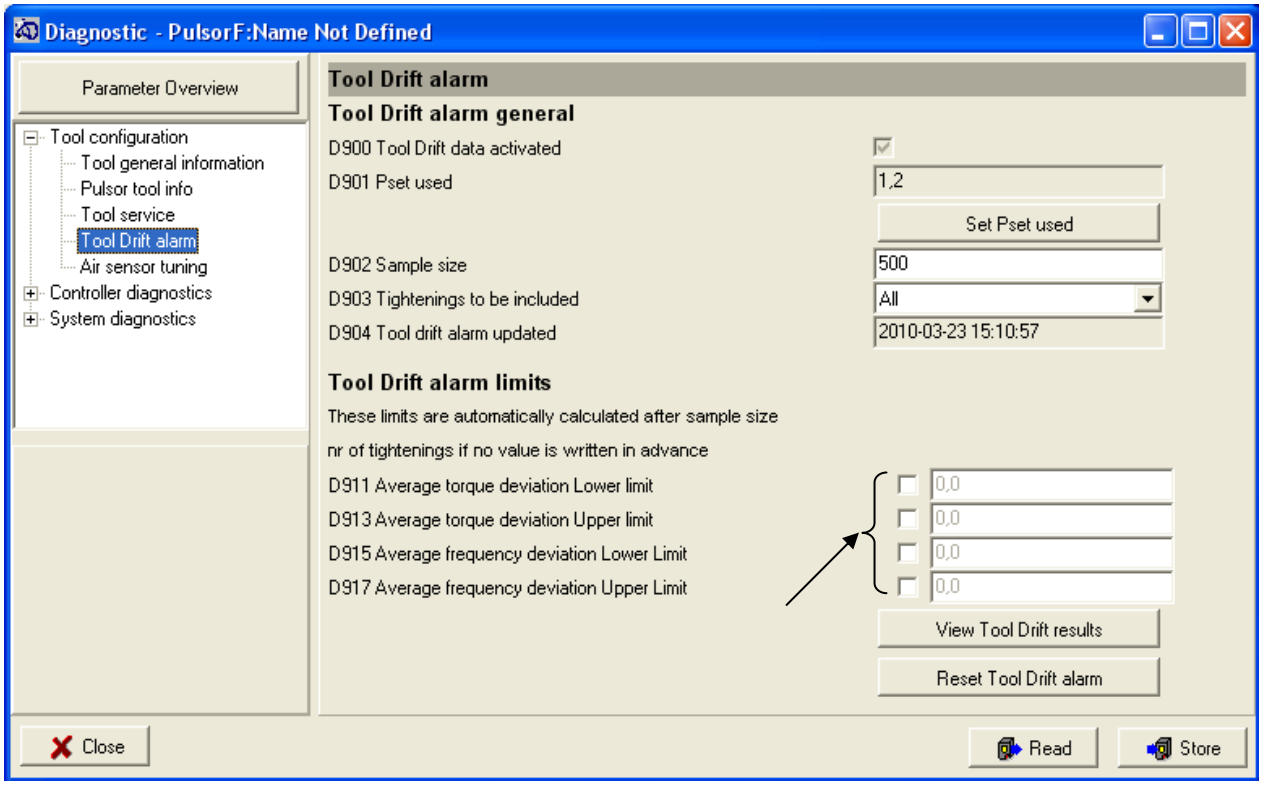
Tool drift alarm is a function that detect changes in tool performance (tool drift) before it has an impact on production. The cause of this performance change can be lack of oil in the pulse mechanism, a technical fault in the tool or a change in line air pressure.

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

13.3.2 Enabling Tool drift alarm

Follow this step by step instruction to enable Tool drift alarm:

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

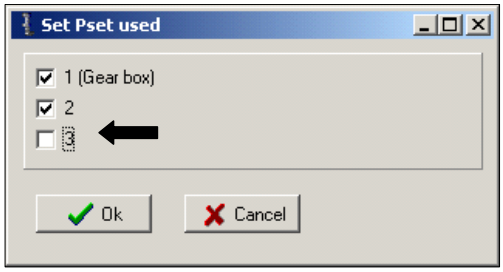


The **Tool Drift data activated** is always on. This means that the system collects data for tool drift calculation in the background.

Normally all Psets are used as basis for the tool drift calculation. The torque statistics is based on the achieved percentage of target torque. Before tightenings from a new Pset are included in tool drift alarm tightenings, the system will collect <Sample size> tightenings with this Pset. Based on these tightenings, a mean frequency will be calculated. When further tightenings are made with the Pset, the pulse frequency is compared to the mean frequency calculated from the first tightenings, generating a relative frequency value. A value of 100% means the pulse frequency has not changed since the mean was calculated.

Because tool drift alarm values are based on relative torque and pulse frequency, it is possible to use Psets with different target torques and pulse frequencies as basis for tool drift calculation. If you feel uncertain

of which Psets to use, select all Psets (default). 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).

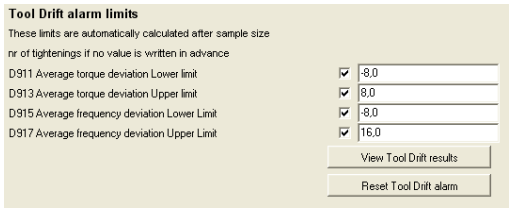
Tick the checkboxes below Tool Drift alarm limits that is of interrest. Normally, ticking all boxes provides the best tool drift alarm functionality. Each limit value will be updated after <sample size, parameter D902> number of tightenings has been performed, if the value is 0.0 by that time.

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. 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.

All limits that is zero by the time that the first average is calculated will automatically be set by the system, all other will be left unmodified. You can 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.

13.3.3 Restarting Tool Drift alarm

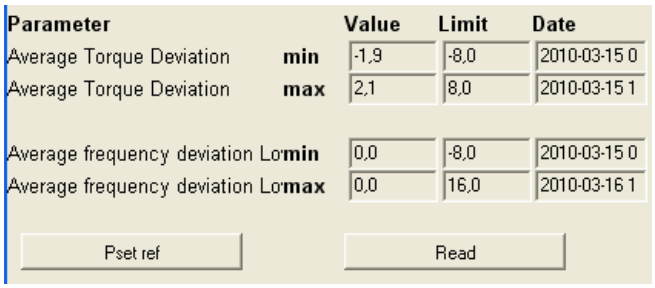
Tool Drift alarm can be restarted at any time, for example after the tool has been serviced.

When having pressed Reset Tool Drift alarm and acknowledged that historical data really is to be deleted, a message will pop up asking whether the alarm limits should be reset as well. After this, the historical values (and, if desired, the alarm limits) will be reset. Tool drift data collection will start again from the

beginning. If alarm limits are reset, these will be updated again the next time <sample size> tightenings has been performed.

13.3.4 Tool drift alarm supervision

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



Pressing Pset ref button will bring up a window showing the current Psets reference values.

When tool drift alarm is initiated the Pulsor Focus will continuously, after each tightening, compare the mean values of 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 generated, stating which parameter has caused the alarm.

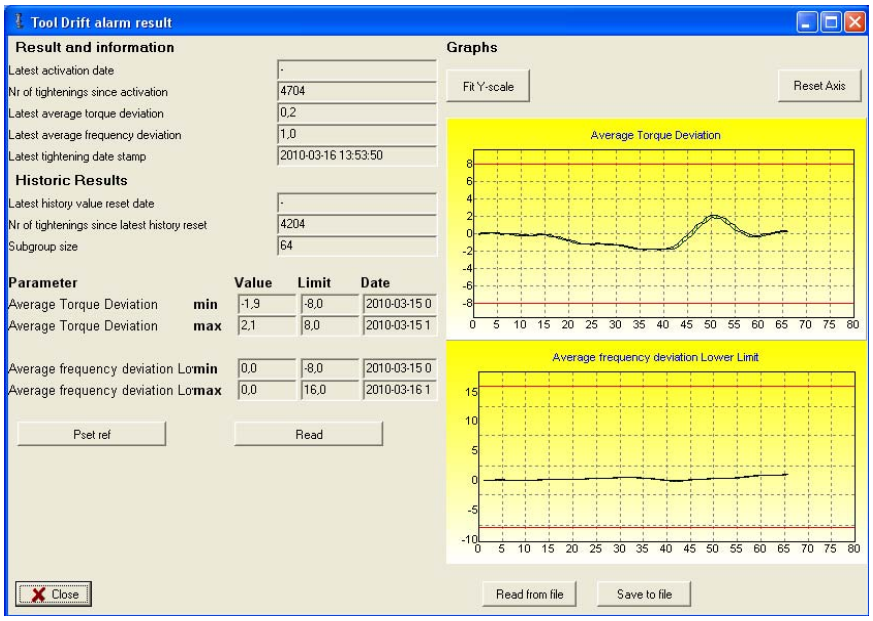
The event code will be generated after every 100:th tightening, as long as the tool drift alarm is active. If desired, it is possible to configure a digital output to trigger when Tool Drift Alarm activates for any parameter.

When a new Pset is created, it will automatically be included in the Tool Drift Alarm function, provided the user does not actively exclude it as described in section 13.3.2, *Enabling Tool drift alarm*, item 3. Tool Setup and Monitoring Setup tightenings are NOT included in the calculations of the mean value for the Tool Drift Alarm parameters.

Changing 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.

13.3.5 Tool drift alarm graphical view

After the number of tightenings passes the sample size, it is possible to see a graphical view of the tool drift. Press **View Tool Drift alarm results** button to view the information.

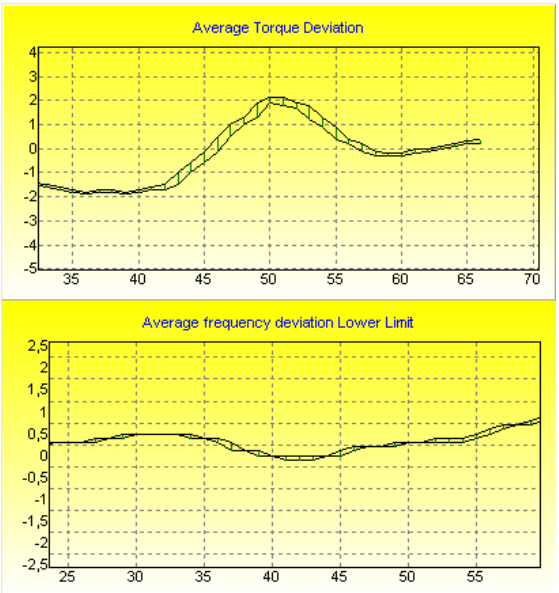


The graph will show a staple diagram containing maximum 80 values depicting the maximum and minimum values of the subgroup for each parameter. The subgroup size is 2 in the beginning. When all staples have been drawn the subgroup size will be doubled and the staple diagram will proceed from the 41:st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



13.4 Air sensor tuning

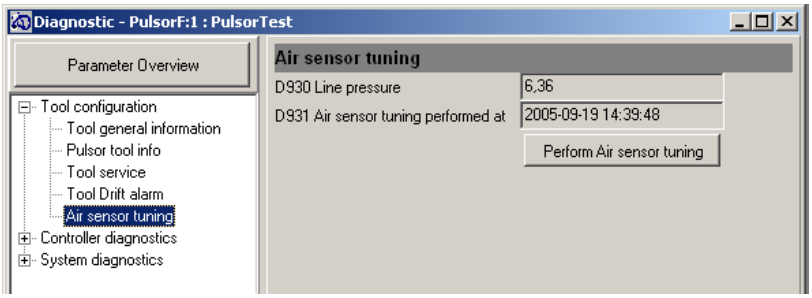
All Pulsor tools have their air pressure sensor tuned when delivered. You should only perform a new adjustment of the sensor if you suspect that there is something wrong with the current sensor tuning.

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

When performing the tuning a valve pin (can be obtained from Atlas Copco Tools, order no. 4080 1340 00 for EPP6 – EPP13, 4080 1340 01 for EPP15 – EPP19) must be fit in according to the first figure in the table below.

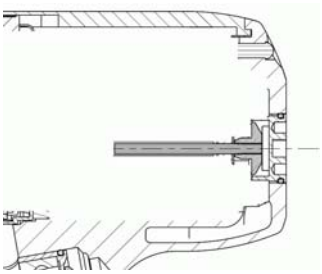
Adjustment is carried out with ToolsTalk Pulsor connected to Pulsor Focus and an external air pressure gauge, with an accuracy of 0.1 bars or better. The operator first confirms, without pressing the trigger, to ToolsTalk Pulsor that the pressure is zero. The tool trigger is then pressed and kept pressed until 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 pressure from the external sensor is entered in ToolsTalk.

Do not forget to remove the valve pin when you are finished with the tuning.

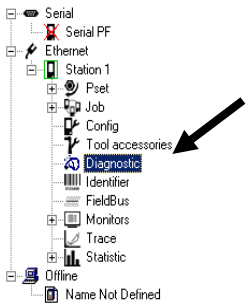


See below for detailed instructions on how to perform an air sensor tuning.

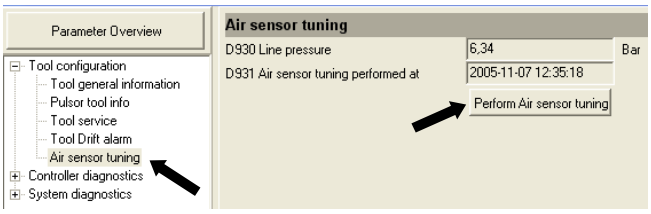
To be able to perform air sensor tuning you need a special valve pin, obtainable from Atlas Copco Tools. Make sure the air supply to the tool is disconnected. Fit the valve pin like shown to the right.You need to unscrew the plug from the back of the tool before you do this. Then fasten the plug and connect the air hose to the tool again before proceeding with the steps below.



Start **Diagnostic** from the PF Map.



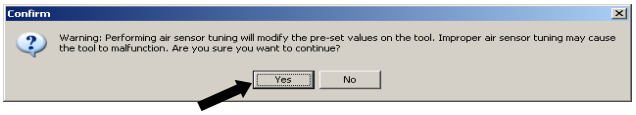
Select **Air sensor tuning** under Tool configuration in the navigation area.



In the Air sensor tuning window you can see the pressure value (in the unit selected) and date of the last adjustment in the current tool.

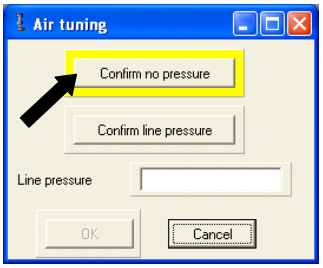
Click on **Perform air sensor tuning** to make a new adjustment of the air pressure sensor.

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



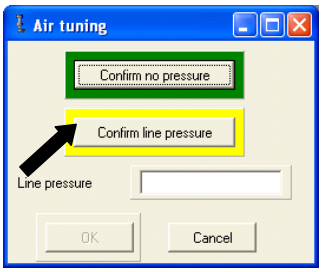
Click the **Yes** button to continue.

With the trigger released, click on the **Confirm no pressure** button.

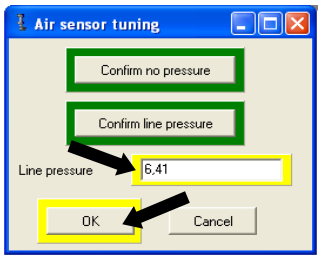


Press and keep the trigger pressed while you read the value on the air pressure gauge and then click on **Confirm line pressure**.

The trigger can then be released.



Enter the measured value from the air pressure gauge (with the air pressure unit stated in parameter *[C128] Air Pressure presentation unit*, see section 11.2.2, *Display and toggle display*) and click on **OK** to complete the adjustment.

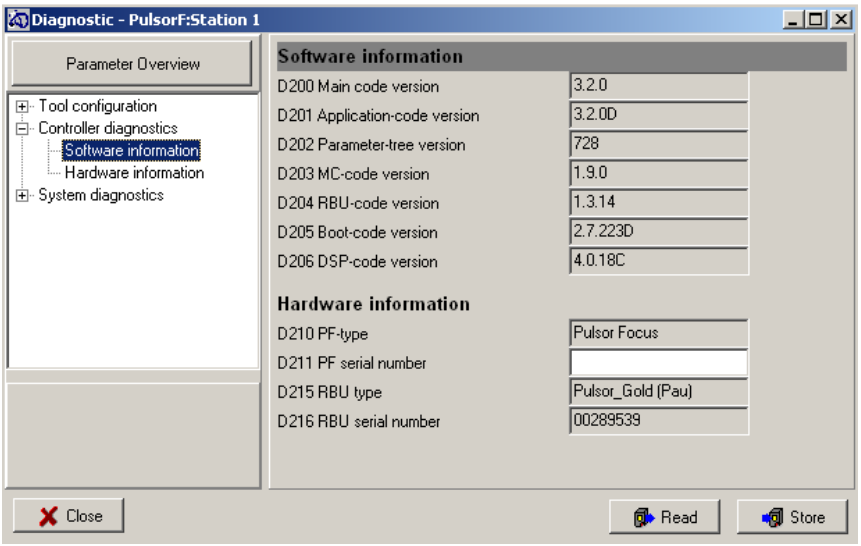


Suitable air pressure when performing Air sensor Tuning is between 4 and 7 bar (58 to 102 PSI).

It is possible to verify the air pressure sensor with air sensor tracking, see section 13.6, *System diagnostics*. Also here the valve pin must be inserted into the tool. After having finished this procedure, do not forget to remove the valve pin again. The tool will not work with the pin inserted.

13.5 Controller diagnostics

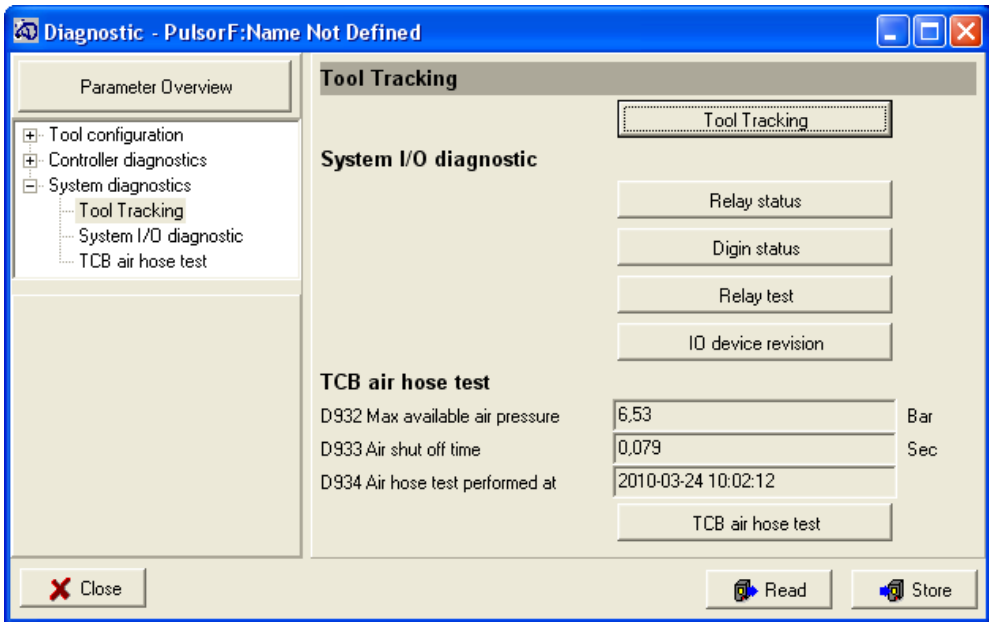
The **Controller diagnostics** window shows the software versions and hardware configuration installed on the Pulsor Focus unit.



If *PF Serial number [D211]* is not set, you can write in the serial number from the back of the PF here. Press store to save in PF.

13.6 System diagnostics

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



The system air pressure can be diagnosed using the **Tool Tracking** function. The purpose of this function is to check that the TCB and tool air pressure sensor is working properly and is properly tuned (see section Air sensor tuning). When in Tool Tracking mode the tool air pressure is shown both in ToolsTalk and on Pulsor Focus display.

When the Tool 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.

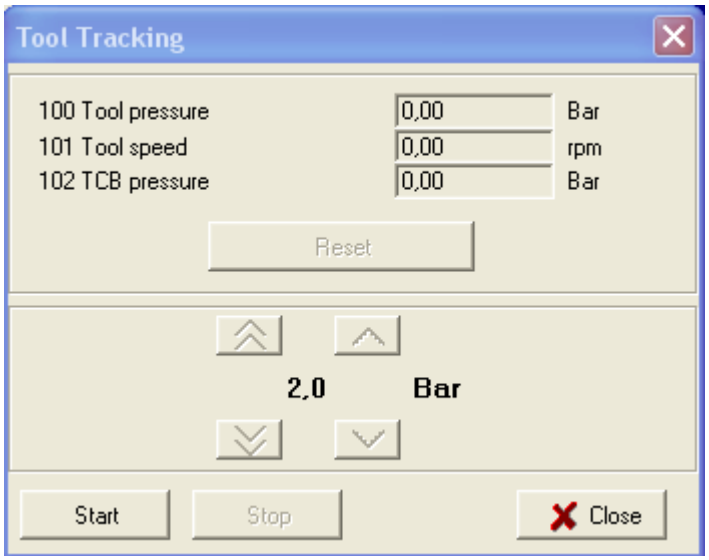
The Read status button has to be pressed in order to update this view to reflect changes. The Relay Test function enables to set the relays on a selected I/O device.

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.

13.6.1 Tool tracking

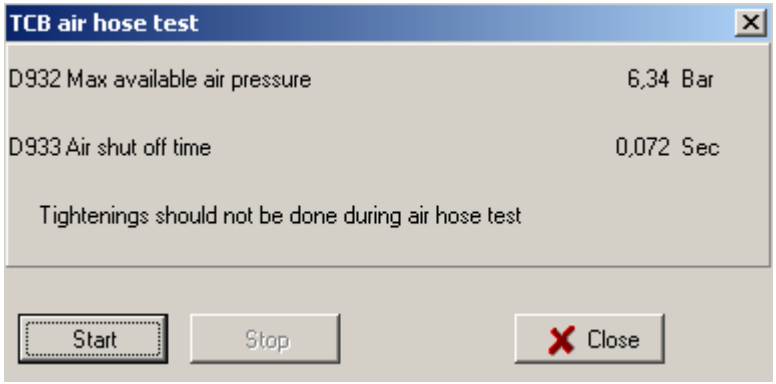
Here you can set a pressure to be delivered from the TCB. Press start to start tracking mode. Press up or down arrows to set the requested pressure. The delivered TCB pressure, Tool pressure and Tool speed will be shown. By connecting an external air pressure sensor after the TCB the functionality of both the TCB pressure sensor/regulation and the tool pressure sensor can be checked.

Note that the valve pin must be fit in the tool if you are to compare Tool pressure with TCB pressure.



13.6.2 TCB air hose test

When the TCB air hose test button is pressed the TCB air hose test window will be shown. Here you can choose to start the test, stop the test (in case something is wrong) and close the window. When Start is pressed, the system will perform an Air Hose Test. A series of air puffs will be emitted from the TCB as the air system and hose characteristics are measured. After the measurements are done, resulting data will be presented in the diagnostic window, in the boxes right above the TCB air hose test button. Press Close to return to diagnostic window.



14 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.

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.

14.1 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)

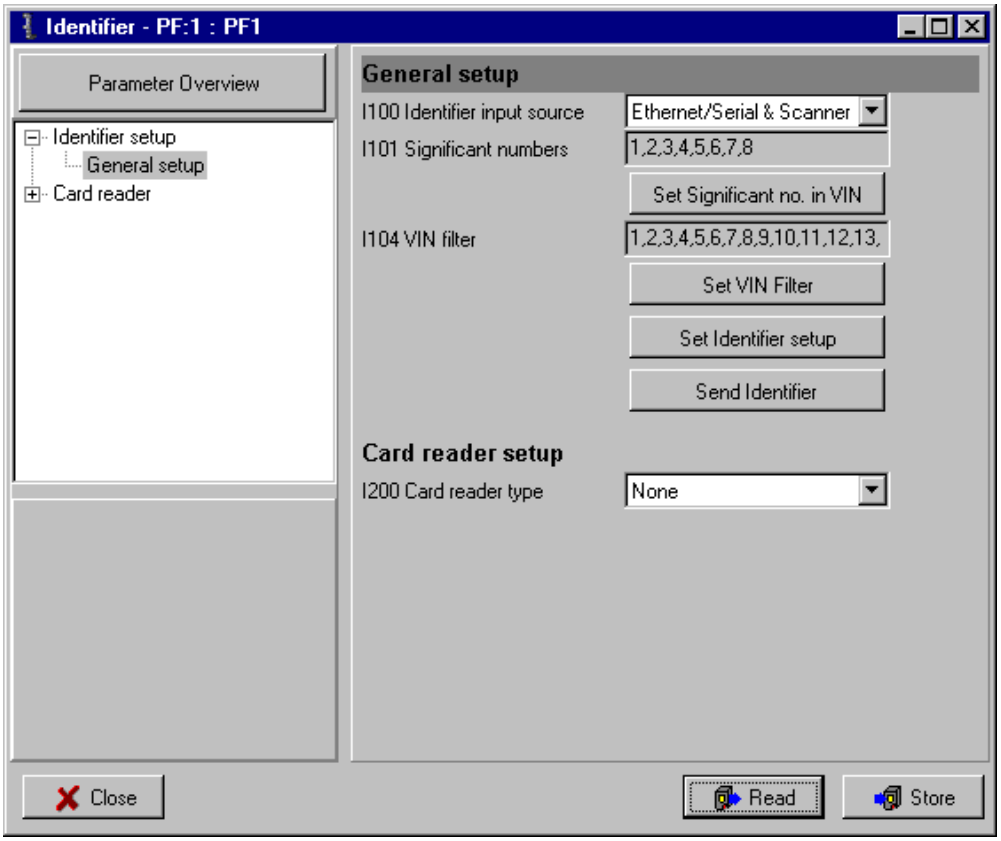
14.2 Identifier setup

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

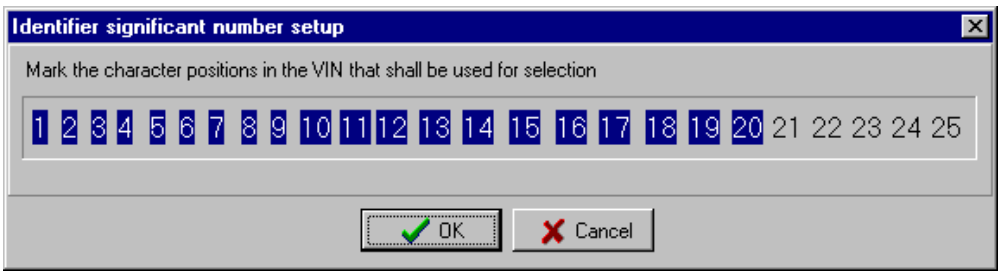
To select Psets via a barcode reader, parameter Pset select source [C222] should be set to Identifier.

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

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



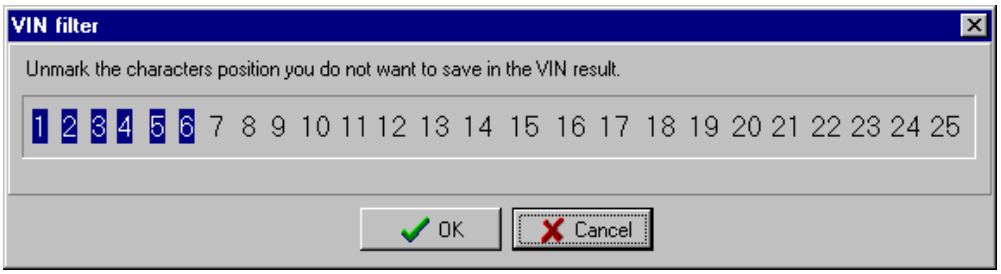
Click on **Set Significant no in VIN** and set *Significant numbers [I101]*.



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.

Click on **Set Identifier setup**.

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

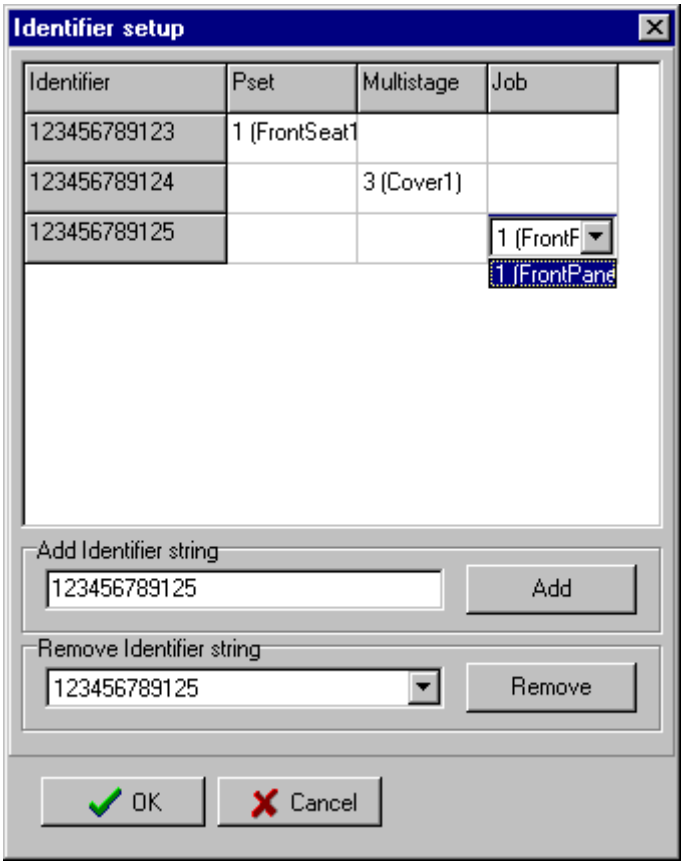
Enter a string (same length as in parameter significant number above) in the **Add Identifier string** field and click **Add**. A matrix where the columns represent existing function ID numbers and the rows represent the added Identifier strings is then formed.

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.



15 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 23.6, *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, ProfiNET, DeviceNet**, **InterBus**, **ModBusPlus**, **ModBus/TCP** and **Ethernet/IP** are the possible selections.

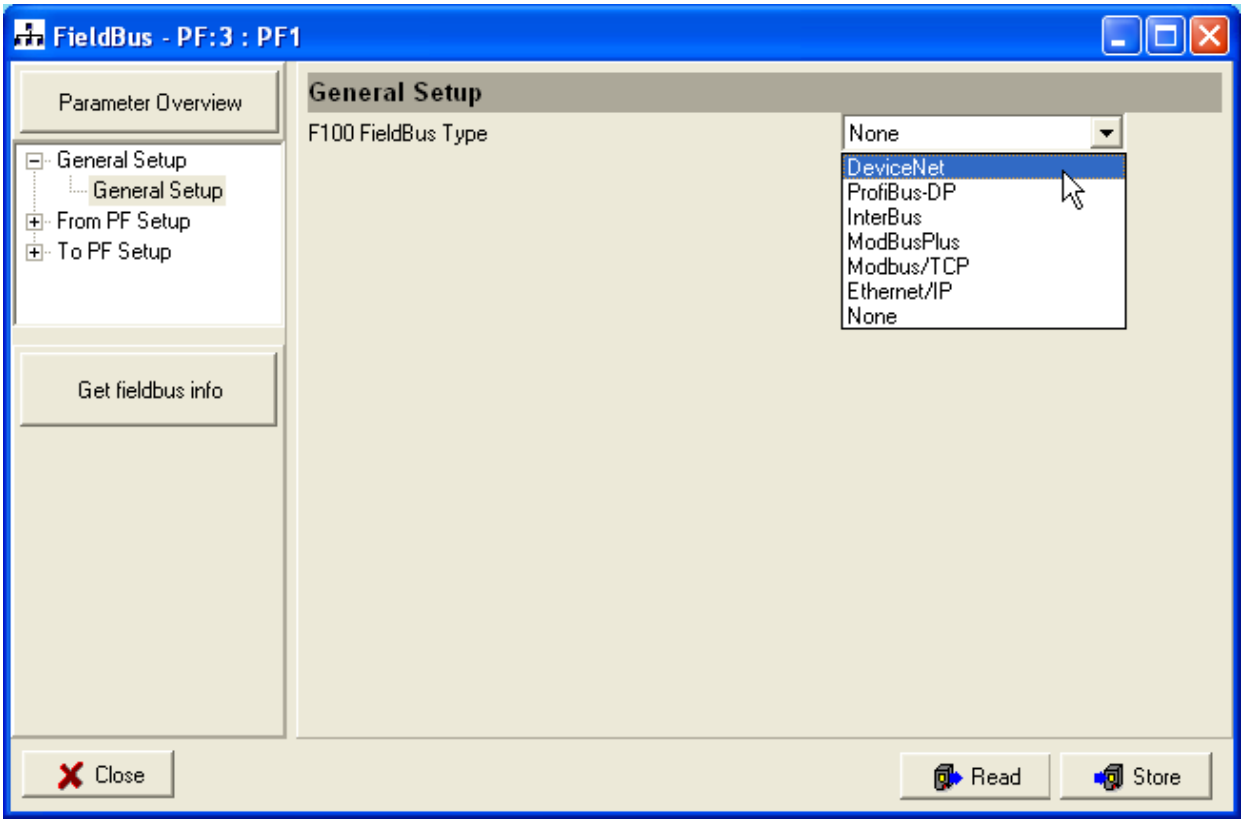
Pulsor Focus acts as a slave in a FieldBus system. A PLC or similar will act as the master.

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.

15.1 General setup

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



15.1.1 Parameters in General setup

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

Parameter	DeviceNet	ProfiBus-DP	InterBus	ModBusPlus	ModBus/TCP	Ethernet/IP	Profinet
F100 FieldBus Type	X	X	X	X	X	X	X
F102 From PF DataLength	X	X	X	X	X	X	X
F103 To PF DataLength	X	X	X	X	X	X	X
F104 From PF Global DataLength				X			
F105 To PF Global DataLength				X			
F110 Set node address and baudrate from	X	X		X	X	X	
F111 FB Node Address	X	X		X			
F112 Baudrate	X						
F113 Connection Mode	X						
F130 PCP length			X				
F131 Process DataLength			X				
F140 Set source address from				X			
F141 Source address				X			
F150 IP address					X	X	X
F151 Subnet Mask					X	X	X
F152 Gateway					X	X	X
F200 FB Update Interval	X	X	X	X	X	X	X
F210 Tool Stop at Offline	X	X	X	X	X	X	X
F300 Bitmap select	X	X	X	X	X	X	X

See chapter 30 - *FieldBus configuration appendix* for specific FieldBus type data.

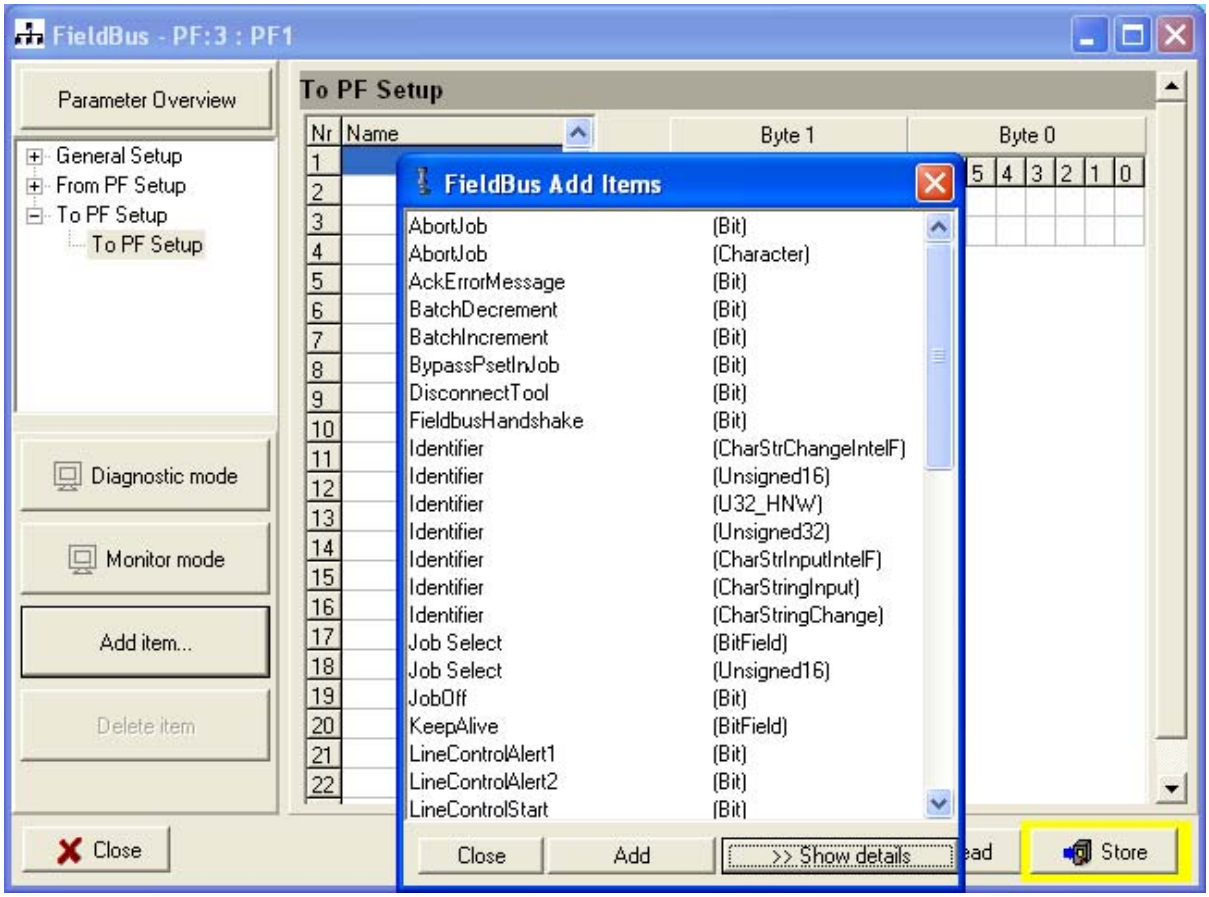
15.2 From/To PF setup

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.

15.2.1 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 30, *FieldBus configuration appendix*.

15.2.2 Delete item

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

15.3 Other functions

15.3.1 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.

15.3.2 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.

15.3.3 Store to file and Read from file

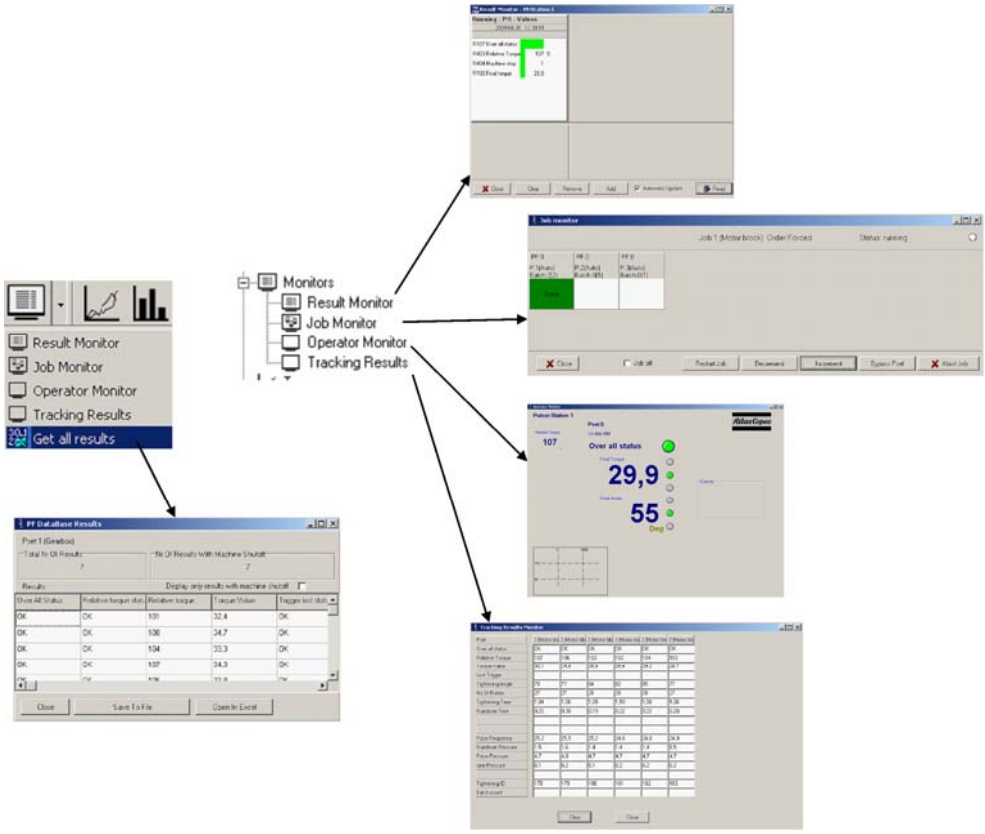
Store and read FieldBus configurations to file. Use the Read/Save FieldBus functions in the File menu in ToolsTalk. To store to or read from a file you must first activate the FieldBus window.

The FieldBus file extension is *.pff

16 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 16.4, *Tracking Results* 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 Microsoft Excel® sheet.

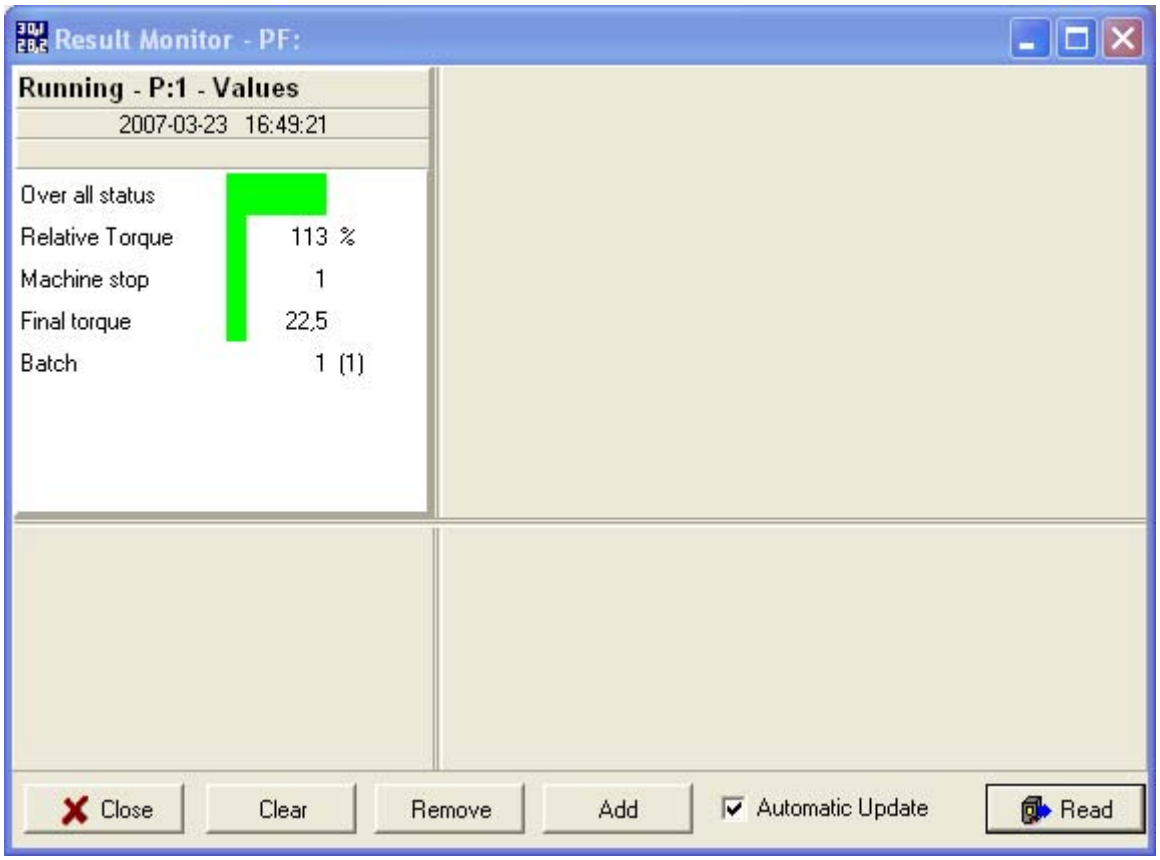


16.1 Result monitor

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

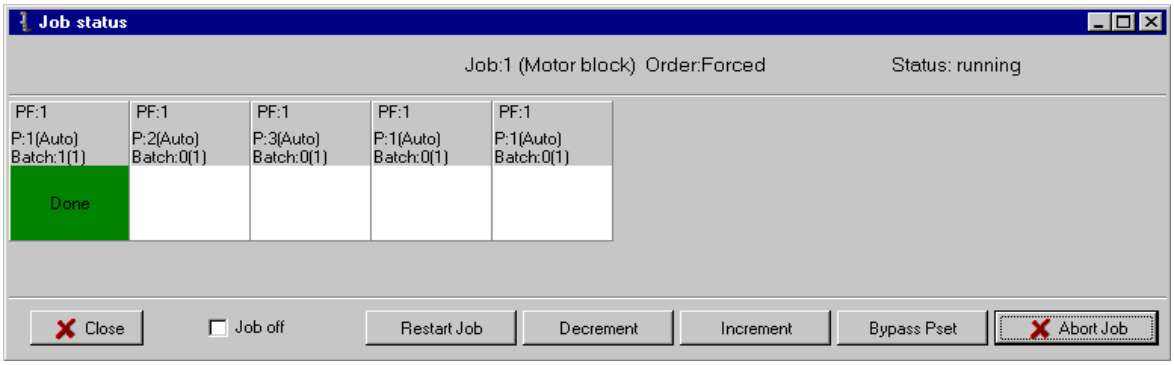
The tightening result includes those parameters that are monitored in the currently used Pset. Final torque will be shown if torque monitoring is on and at least one manually measured torque value was written in during Tool Setup.

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



16.2 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 10, *Job*.

16.3 Operator monitor and Picture monitor

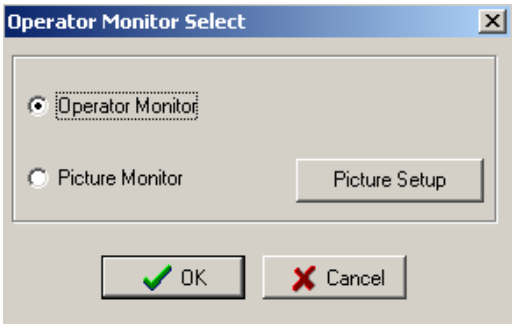
16.3.1 Operator monitor

Select **Operator monitor**.

Press **OK**.

Operator monitor window appears.

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

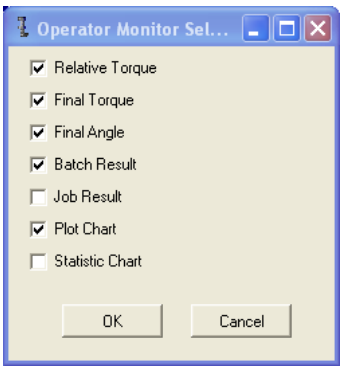


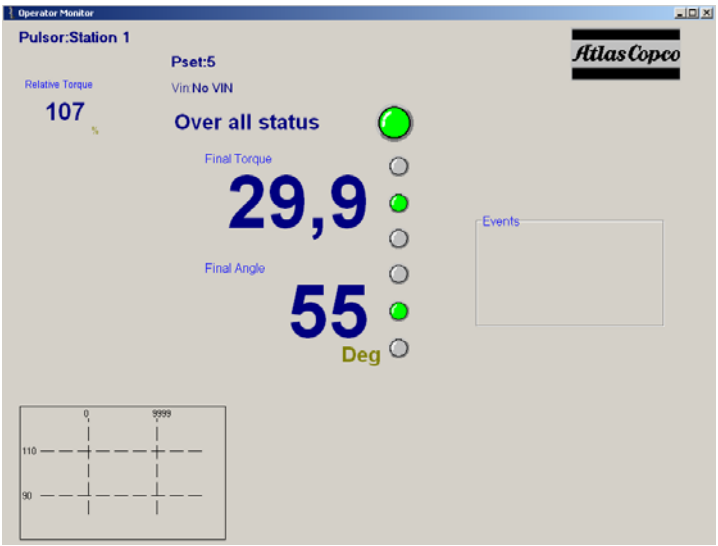
- **Activate Presentation**: User preferences for the content of the Operator monitor.
- **Set Background Color**: Possibility to set the background color for the Operator monitor.
- **Toggle Window**.
- **Toggle Mouse Cursor**.
- **Set Label Color**: Possibility to set the label color for the Operator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

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

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

Press **OK**.





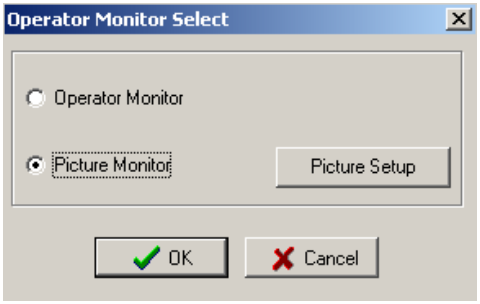
Part	Description
Pulsor	The name of the Pulsor Focus unit.
Pset	Pset used to perform the tightening.
VIN	Vehicle Identification Number.
Over all status	Indicator for the overall status of the tightening.
Torque	Torque of the tightening.
Torque status	Status-indicator for torque (Yellow-Low/ Green-OK/Red-High).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

16.3.2 Picture monitor

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

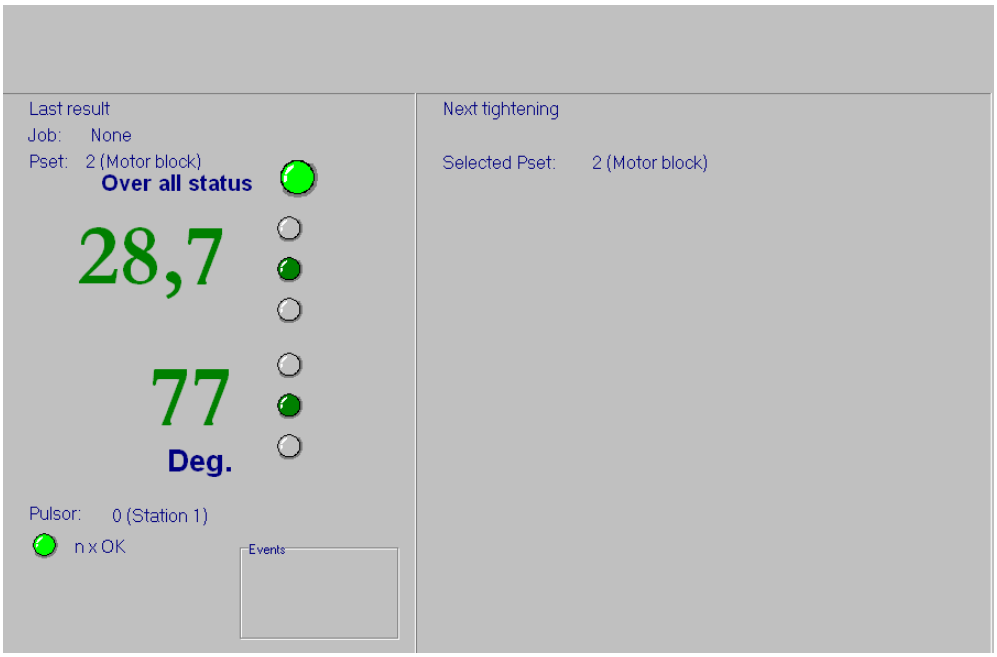
When selecting Operator Monitor the window to the left is shown.

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.



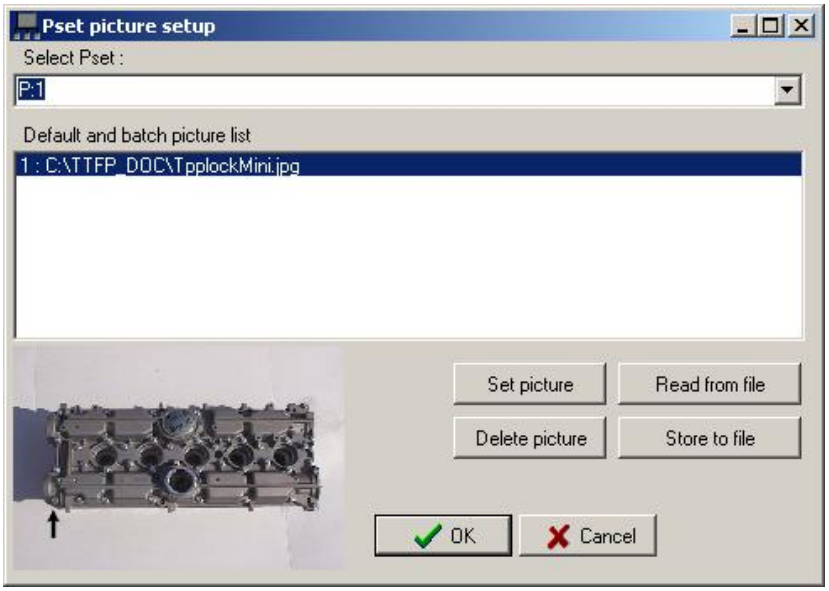
Picture monitor is not adjusted for Pset with batch counter. Only one picture per Pset is allowed.

To edit Picture monitoring, choose **Picture Setup** after selecting Picture Monitor.

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.

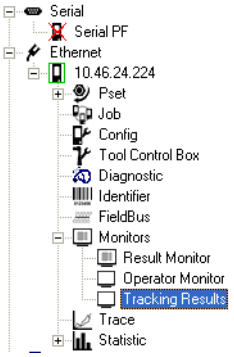
To import saved settings for the Picture monitor click on **Read from file**. To save the settings click on **Store to file**. A Save As-window will appear and the user can choose where to store the file containing the settings. When finished click **OK**.

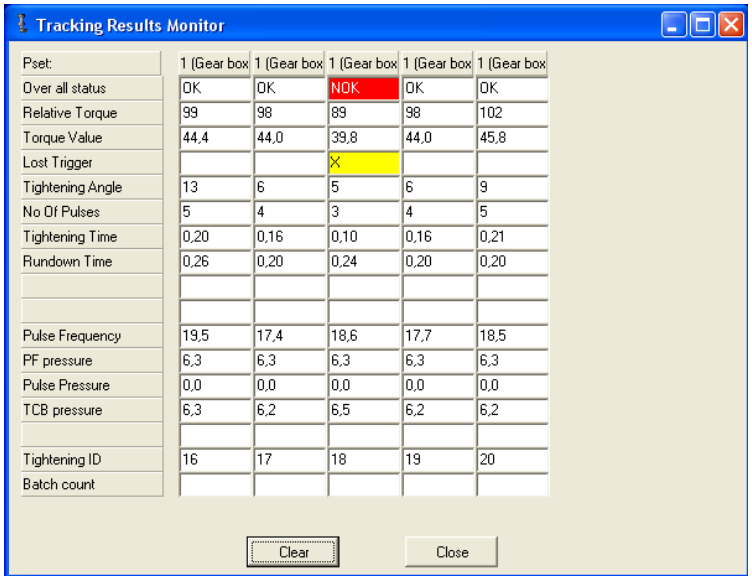


16.4 Tracking Results

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

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





Pset:	1 (Gear box	1 (Gear box	1 (Gear box	1 (Gear box	1 (Gear box
Over all status	OK	OK	NOK	OK	OK
Relative Torque	99	98	89	98	102
Torque Value	44,4	44,0	39,8	44,0	45,8
Lost Trigger			X		
Tightening Angle	13	6	5	6	9
No Of Pulses	5	4	3	4	5
Tightening Time	0,20	0,16	0,10	0,16	0,21
Rundown Time	0,26	0,20	0,24	0,20	0,20
Pulse Frequency	19,5	17,4	18,6	17,7	18,5
PF pressure	6,3	6,3	6,3	6,3	6,3
Pulse Pressure	0,0	0,0	0,0	0,0	0,0
TCB pressure	6,3	6,2	6,5	6,2	6,2
Tightening ID	16	17	18	19	20
Batch count					

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)]

If batch count is used, it is presented in the last row.

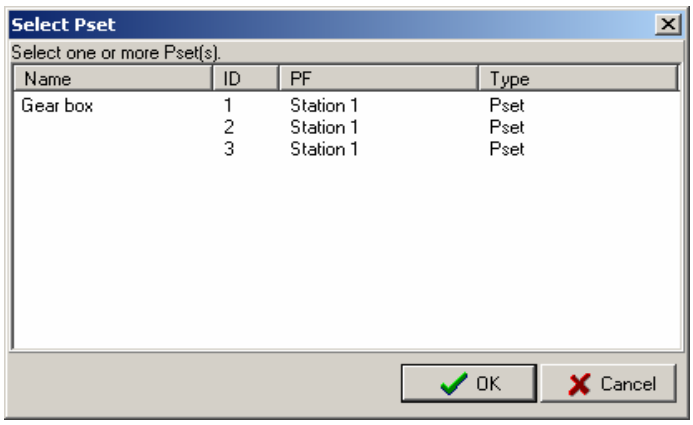
[(1)] Examples of things that may cause invalid parameter values are for example a disturbance of sensor reading during the final pulse, spin in the tool, or too few pulses making pulse frequency impossible to calculate.

16.5 Get all results

This displays result information from all tightenings stored in the Pulsor Focus memory. Start the function by selecting Get All Results from the Selection panel in ToolsTalk Pulsor. The information can be exported to a file such as a Microsoft Excel® sheet.

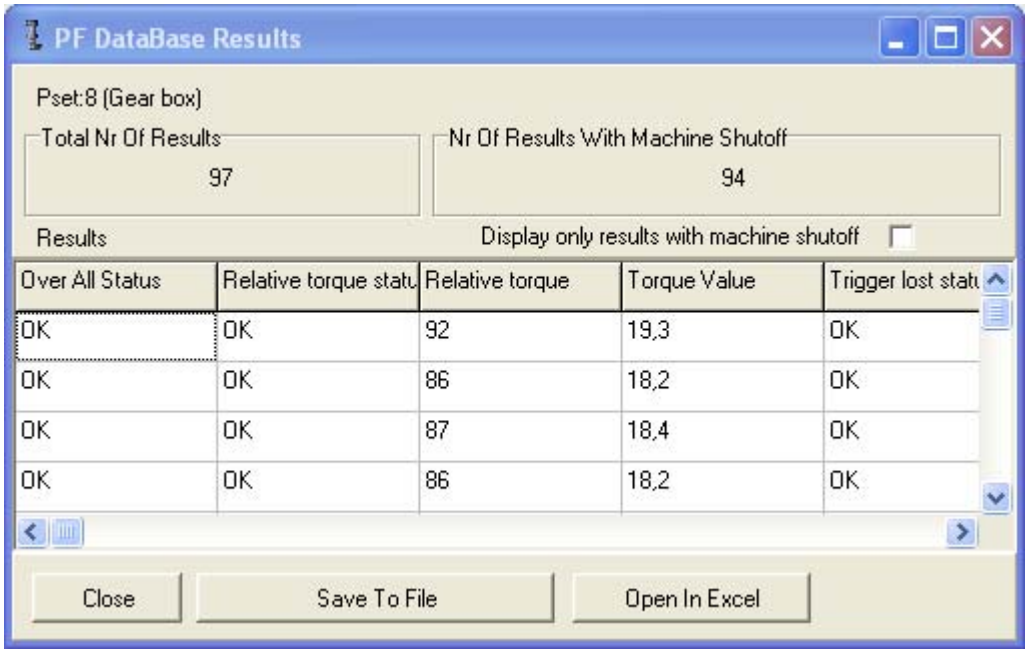
The result information in Excel® can easily be sorted with the help of Excel® filters, for example the auto filter. To give an example, all rejected tightenings can be filtered. You can then see easily what happens when something has gone wrong and thereby understand what measures can further refine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

Pulsor Focus can store up to 4000 tightening results. Each tightening result consists of 30 result parameters. Retrieve and view these with the **Get all results** option. The user also has the choice of saving results 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:



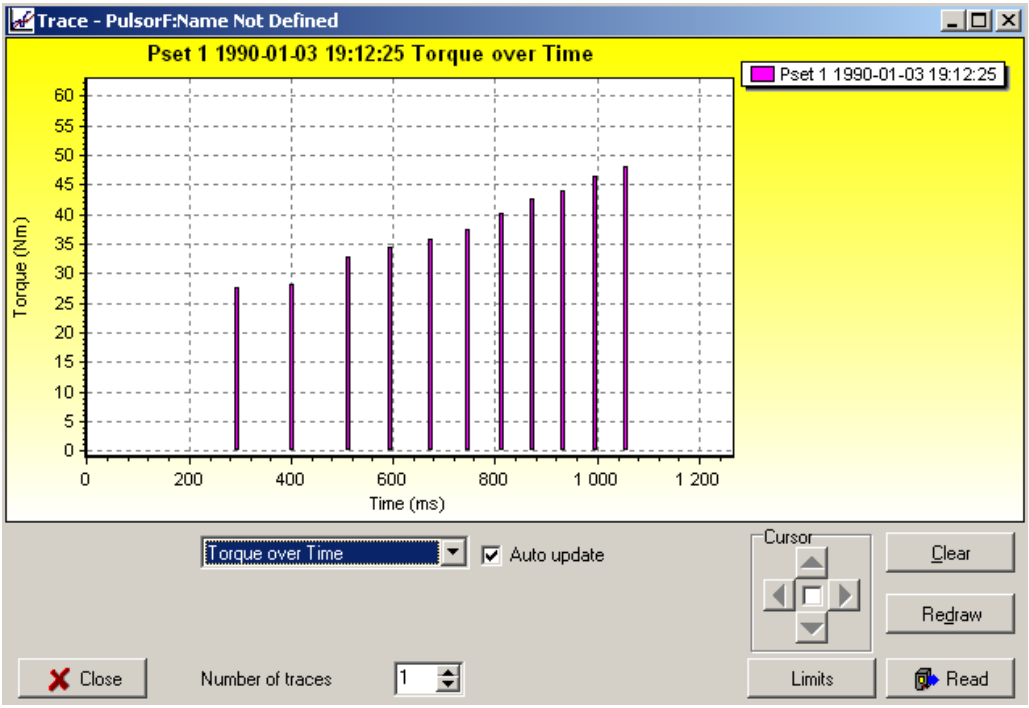
By choosing **Save To File** the results are saved to a text file. By clicking **Open In Excel** the results are opened in Microsoft Excel® if installed.

16.6 Trace

There are three different ways to open the Trace section:

- Select **window** in the main menu and then click **activate-trace**.
- Use the **PF Map**. Double click **trace**.
- Click the **trace icon** on the toolbar.
- Select which type of chart to view (Relative torque over time, Angle over time, Torque over time, Final torque and final angle over time, Torque over angle, Pulse pressure over time, Vmin and Vmax over time).

Additionally, when performing a Tool Setup you can activate trace by pressing the Traces button in the Tool Setup Monitor. In this trace, only Torque value over time is available. This trace updates automatically but no other option of the options below are available.



With **Auto update** selected the charts will automatically update as new tightening data arrives. With auto update deselected the user must press **Read** to see the latest tightening.

The **Limits** function allows the user to see the min and max limits for torque and/or angle.

With **Number of traces** it is possible to superimpose up to 5 consecutive tightenings.

It is possible to see a single pulse value with the **Cursor** function.

It is possible to zoom inside the diagram by creating a zoom box with the mouse button pressed.

17 Statistics

17.1 Introduction to Statistics in Pulsor Focus

The Pulsor Focus statistics are measured after each tightening and can be sent to a PC via serial or Ethernet connection. It is also possible to send statistical reports to a printer. 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**
Torque	As selected in system	Torque.
Final angle	deg	Final angle in degrees.
Number of pulses		Number of pulses in the tightening.

Line pressure is displayed in the unit stated in parameter C128 Air Pressure presentation unit, see section 11.2.2, *Display and toggle display*).

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.
$\overline{X}$	The mean value for the selected Pset.
σ	Sigma. Shows the calculated standard deviation.
$\overline{X}$ -3 σ	Mean - 3 sigma
$\overline{X}$ +3 σ	Mean + 3 sigma
6 σ	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).

17.2 Statistical Process Control (SPC)

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

Statistical Process Control (SPC) functions are used on torque.

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.

17.3 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.

17.4 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 ($\overline{\overline{X}}$ and / or $\overline{R}$)

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

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

Point = subgroup

The mean is the average of $\overline{x}$ and r $\overline{\overline{X}}$ and $\overline{R}$). 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.

17.5 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.

17.6 Calculation of $\overline{\overline{X}}$ and $\overline{R}$

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.

17.7 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

$$Range = R = Max - Min$$

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

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

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

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

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

Tightenings

X_1 X_2 X_3 X_4 X_5

X_6 X_7 X_8 X_9 X_{10}

X_i X_{i+1} X_{i+2} X_{i+3} X_{i+4}

X_{i+5} X_{i+6} X_{i+7} X_{i+8} X_{i+9}

X_{i+10} X_{i+11} X_{i+12} X_{i+13} 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.

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

Subgroup size =Group size = z

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

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

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

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

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 5 subgroups.

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

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

$$\overline{X}UCL = \overline{\overline{X}} + \left(A_2 * \overline{R}\right)$$

$$\overline{X}LCL = \overline{\overline{X}} - \left(A_2 * \overline{R}\right)$$

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

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

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

17.8 Constants for calculation of SPC variables

Subgroup size	**Divisors for estimation of standard div.**		**Factors for control limits**					
N	**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

18 Cell and Net

The Pulsor Focus software offers extended networking facilities. The **Cell and Net** concept is part of the Gold RBU software version (see chapter 24, *RBU information*). It provides functions to logically arrange 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.

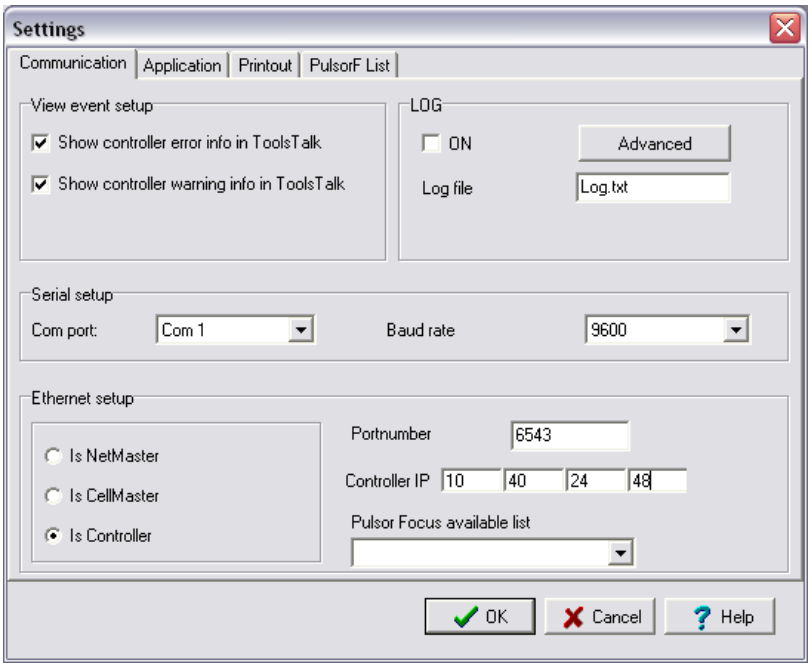
All Pulsor Focus units in a Cell must have the same software version installed.

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.

18.1 Network setup via ToolsTalk Pulsor

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

In the Serial setup section, select the **Com port** connected to the Pulsor Focus.



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

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

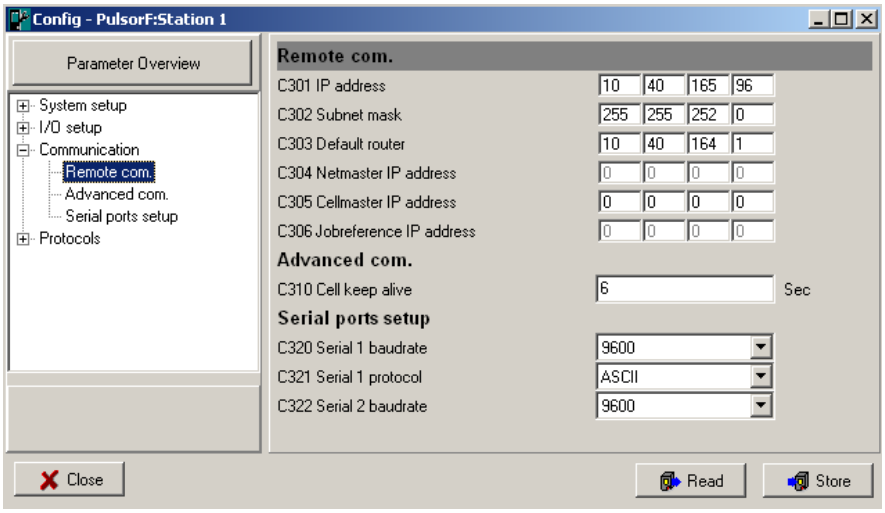
Set the **IP address** of the connected Pulsor Focus to a unique number within the network.

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

Default router is optional.

Click **Store** to save settings.

Restart the Pulsor Focus unit.



18.2 Cell and Net configuration via ToolsTalk Pulsor

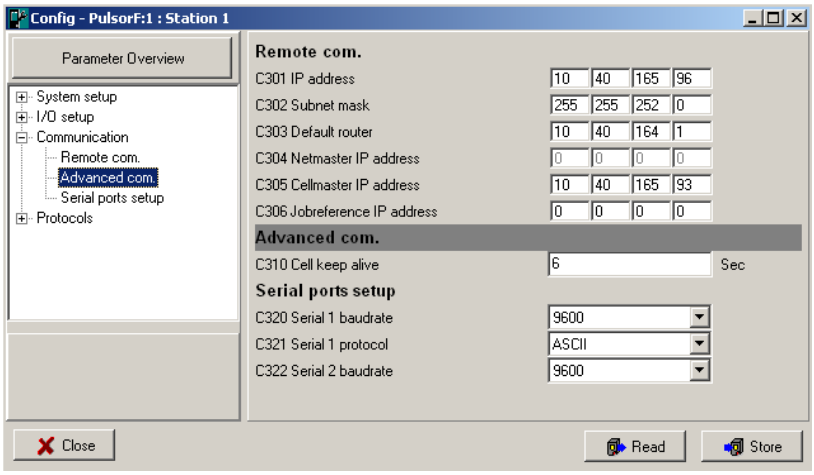
Open the **Remote Com** window (Config - Communication - Remote Com).

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 current PF as a CellMaster or NetMaster, set CellMaster IP address/NetMaster IP address to same IP address as current PF. If the PF in the case below should be Cellmaster, C305 Cellmaster IP address should be set to 10.40.165.96.



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

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

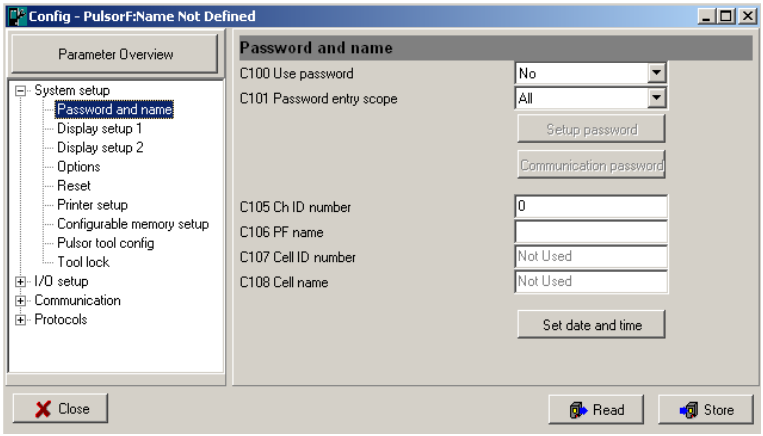
PF name is optional.

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.



18.2.1 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.

19 ToolsNet

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

19.1 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 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 a limited number of tightenings (around 4000, depending on memory configuration) but the capacity in the ToolsNet database 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.
- Overall status, torque status and angle status can be seen for all Pulsor Focus tightenings.

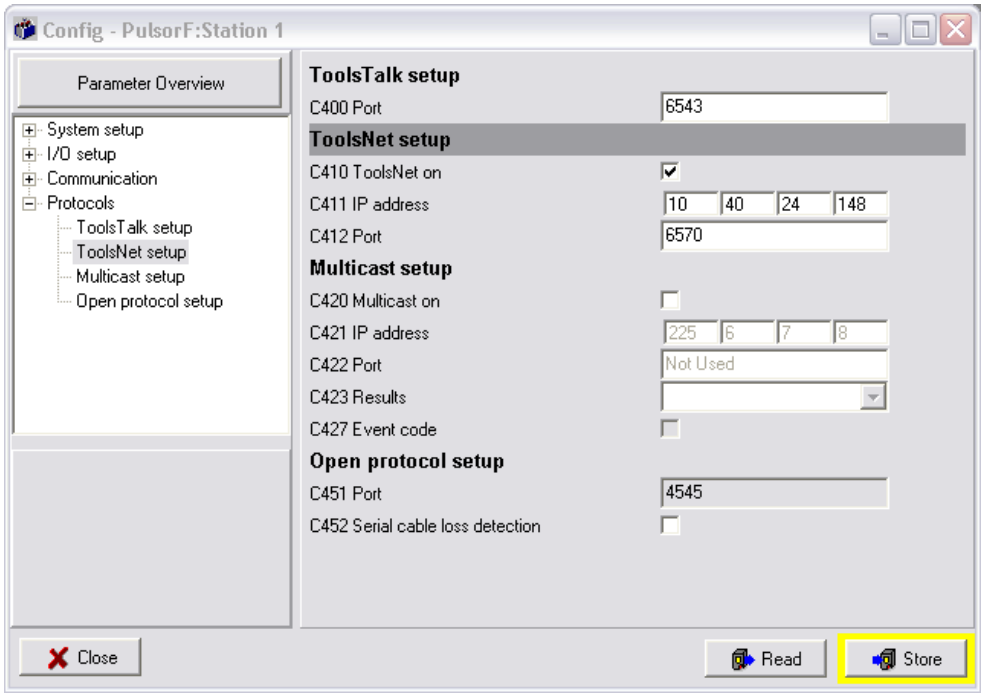
Torque values will only be reported to ToolsNet if a valid torque tuning has been made during Tool Setup. This means that manually measured torque values must have been written in. Note that the torque presented is dependent on this torque tuning, and results are therefore not measurement traceable However, they are process traceable.

19.2 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 has already been installed.

Proceed as follows to enable Pulsor reporting to ToolsNet:

- Find out the IP-address and port 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 PowerFocus folder in the ToolsNet web reporter tree view.

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

20 Accessories

20.1 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 *Product Instructions 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.

20.2 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

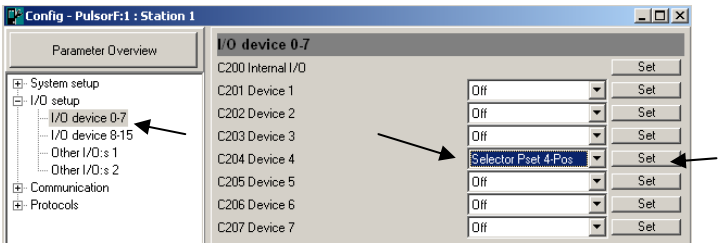
20.2.1 Setup of Selector

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 28, *Connector descriptions* and the *Product Instructions document* for Selector.

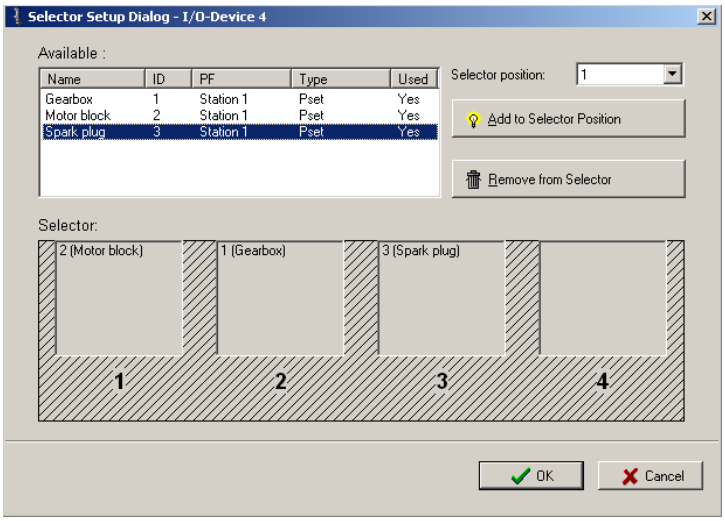
Software Setup

In ToolsTalk Pulsor, open the Config dialog and select I/O Setup. Select Selector under appropriate I/O Device. This should be the same as the device number set with the rotating switch on the bottom of the selector. Device 5 is the default for Selector 4 and device 6 is the default for Selector 8.



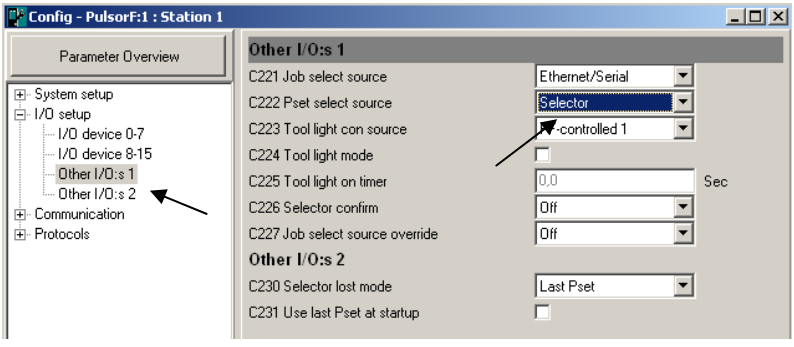
Click on **Set**.

Drag the Psets that you have created before to the desired positions of the socket tray.



Click **OK** to save settings.

Go back to **Other I/O:s 1** and set the Pset select Source to Selector, then press **Store** to complete the setup.



20.3 I/O Expander

I/O Expander order number: 8433 0564 38

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.

20.3.1 Setup of I/O Expander

Hardware Setup

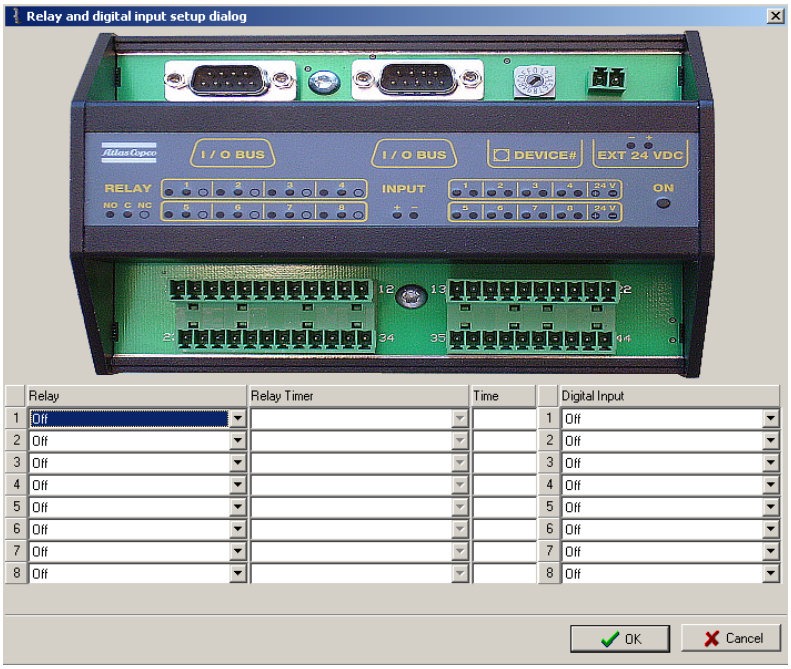
Connect the I/O Expander via I/O Bus to the Pulsor Focus. Make sure that the I/O Bus is terminated in both ends. For detailed information, see chapter 28, *Connector descriptions* and the *Product Instructions document* for I/O expander.

Software Setup

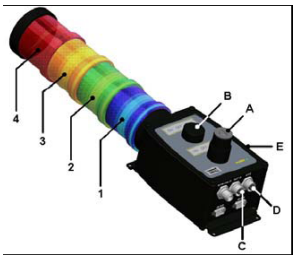
In ToolsTalk Pulsor, open the Config dialog and select **I/O Setup**. Choose appropriate I/O device tab. Select **I/O Expander** under appropriate I/O Device. Device 2 is the default for I/O Expander.

Select your alternatives. The procedure is the same as for Internal I/O: See section 11.3.1, *Internal I/O*.

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



20.4 Stacklight



The Stacklight features four lights piled on each other (it is possible to use up to five lights). 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.

A light/lamp uses one output, a switch uses two inputs. If a two-way switch is used, then A1/B1 represents the left switch state and A2/B2 the right switch state. When a push button or one-way switch is used it is enough to configure A1/B1 (but it is possible to use both outputs for different functions).

Stacklight has two external outputs [C] and two external inputs [D], which is useful for various functions such as position switches and external warning lights. Via an I/O bus connector [G] is Stacklight connected to the tightening controller. A termination plug should be applied to the second I/O bus connector if Stacklight is at the end of the I/O bus line.

Device 1

Relay	**Stacklight part**	**Input**	**Stacklight part**
1	Light[1]	1	External input 1 [D]
2	Light[2]	2	External input 2 [D]
3	Light[3]	3	Switch state [A1]
4	Light[4]	4	Switch state [A2]
5	Light[5] (optional)	5	Switch state [B1]
6	Lamp [A]	6	Switch state [B2]
7	Lamp [B]	7	Not used
8	Buzzer [E] (sound 1)	8	Not used

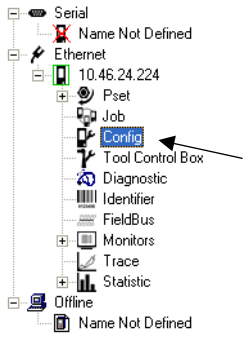
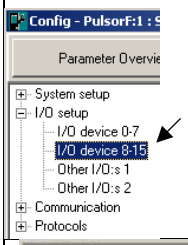
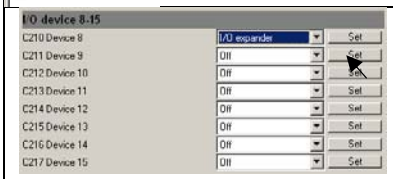
Device 2

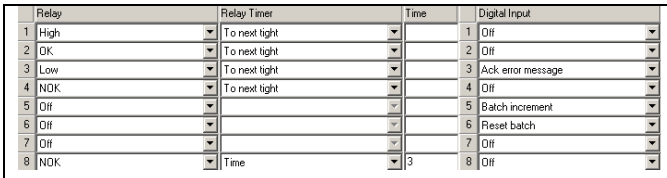
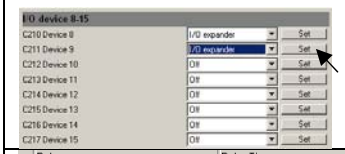
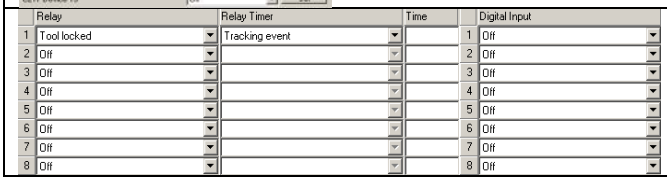
Relay	**Stacklight part**	**Input**	**Stacklight part**
1	Buzzer [E] (sound 2)	1	Not used
2	External output 1 [C]	2	Not used
3	External output 2 [C]	3	Not used
4	Not used	4	Not used
5	Not used	5	Not used
6	Not used	6	Not used
7	Not used	7	Not used
8	Not used	8	Not used

20.4.1 Setting up a stack light using ToolsTalk

This section includes a step-by-step instruction on how to set up a Stacklight standard ESL-04 with:

- Light 1 indicating tightening result with high torque.
- Light 2 indicating tightening result OK.
- Light 3 indicating tightening result with low torque.
- Light 4 indicating result tightening result NOK (not OK).
- The push button used for acknowledging of events.
- The key switch used for batch increment (left switch state) and to reset batch (right switch state).
- The buzzer sound alerting on NOK tightenings and when the tool is locked.

	Connect Stacklight to the Pulsor Focus controller by using the I/O bus cable.
	Open ToolsTalk and connect to the controller.
	In the PF map, double click on Config.
	If using the default stacklight address setting (eight) then select select I/O device 8-15 in the config menu tree. Note: The address is by default set to start at device eight. To change the address, first loosen the four screws on the front panel of the stacklight. Then open the lid and turn the address switch. Possible addresses are between 1-15 (0-9, A-F).
	Select “I/O expander” for option C210 Device 8 and click Set.

	1. Select “High” for Relay 1. This output is connected to light 1. 2. Select “OK” for relay 2. This output is connected to light 2. 3. Select “Low” for relay 3. This output is connected to light 3. 4. Select “NOK” for relay 4. This output is connected to light 4. 5. Select “NOK” for relay 8. Set the relay timer to 3 seconds. This output is connected to the buzzer. 6. Select “Ack error message” for digital input 3. This input is connected to the push button. 7. Select “Batch increment” for digital input 5. This input is connected to the left key switch state. 8. Select “Reset batch” for digital input 6. This input is connected to the right key switch state. 9. Click OK.
	Select “I/O expander” for option C211 device 9 and click Set.
	1. Select ”Tool locked” for relay 1. This output is connected to the buzzer. 2. Click OK. 3. Click Store to save settings.

20.5 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

20.5.1 Setup of RE-Alarm

Hardware Setup

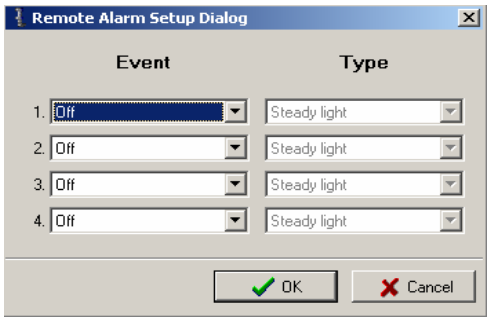
Connect the RE-Alarm via I/O Bus to the Pulsor Focus. Make sure that the I/O Bus is terminated in both ends. For detailed information, see chapter 28, *Connector descriptions* and the *Product Instructions document* for RE-alarm.

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.



20.6 Other accessories

20.6.1 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 14, *Identifier*, how to configure a barcode reader.

There is no standard Atlas Copco barcode reader model.

20.6.2 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 Operator Panel Product Information for more information on how to set up the Operator Panel.

21 Configurable memory

All data stored in the Pulsor Focus controller, except parameters *IP address [C301], subnet mask [C302]* and *default router [C303]*, will be erased when changing memory setup. Therefore, use ToolsTalk Pulsor function "Store Pulsor Focus to file" to save the existing data configuration (including Psets and jobs). The data can later be retrieved via function "Read Pulsor Focus from file", see section 6.7, *Storing programming on file*.

When changing the memory setup the Pulsor Focus controller must be rebooted for changes to take effect. It is recommended to reboot immediately.

21.1 Configurable memory conditions

Besides the default memory configuration, Pulsor Focus provides the following configurable memory options: **more Psets**, **more jobs**, **more results**, **more events, more identifiers** and **more Psets/Jobs**.

Condition	No. of Psets	No. of jobs	No. of results	No. of events	No. of identifiers
Default configuration	30	30	4000	500	100
More Psets	100	8	4000	500	100
More jobs	8	100	4000	500	100
More results	8	8	5000	500	100
More events	8	8	4000	1000	100
More identifiers	8	8	4000	500	400
More Psets/Jobs	100	100	3500	500	100

Number of identifiers is the maximum number of significant barcode strings available for identifiers used to select Psets or jobs. For more information, see chapter 14, *Identifier*.

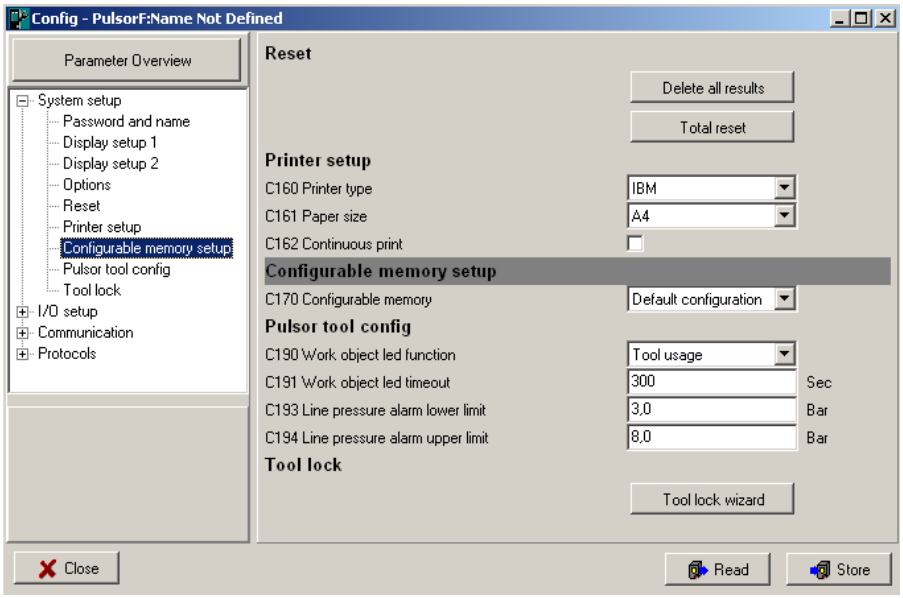
When increasing database elements, a decreasing of other elements might be necessary. For instance, if 100 Jobs and 100 Psets are required it is not possible to have more than 3500 results (option More Psets/Jobs).

21.2 ToolsTalk Pulsor operations

This section shows only examples of possible parameter settings.

21.2.1 Memory setup

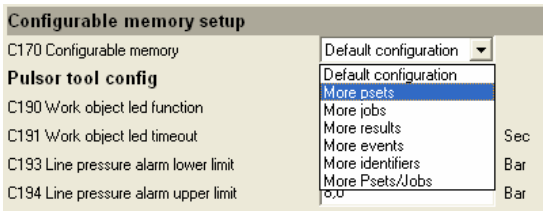
In the PF Map, select **config - system setup - configurable memory setup**.



Make a selection for *Configurable memory [C170]*.

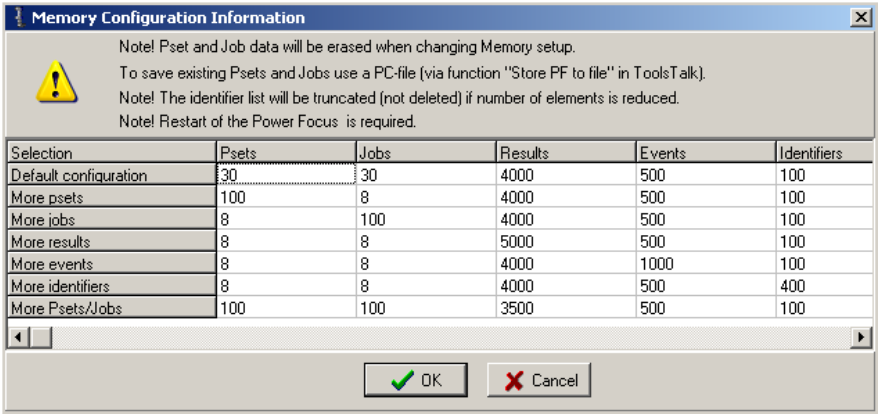
To have more Psets, select **More psets**.

Click **OK** to continue.



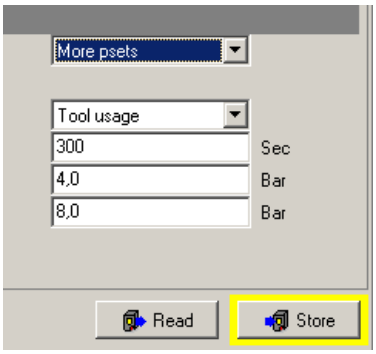
A table showing the valid memory setups is displayed.

Click **OK** to continue.



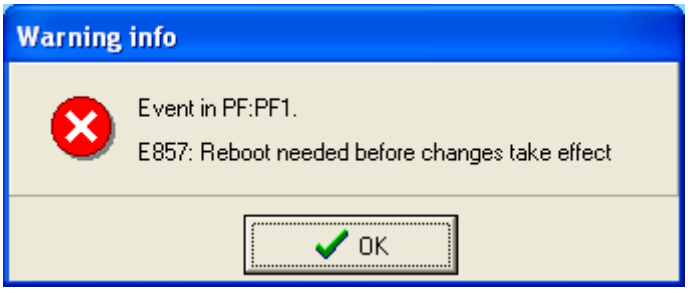
Selection	Psets	Jobs	Results	Events	Identifiers
Default configuration	30	30	4000	500	100
More psets	100	8	4000	500	100
More jobs	8	100	4000	500	100
More results	8	8	5000	500	100
More events	8	8	4000	1000	100
More identifiers	8	8	4000	500	400
More Psets/Jobs	100	100	3500	500	100

Click **Store** to save the settings.



The changes made in configurable memory setup will reset the Pulsor Focus memory at the next reboot. All data will be lost, except parameters *IP address [C301]*, *subnet mask [C302]* and *default router [C303]*.

Reboot of the Pulsor Focus controller is needed before changes take effect.



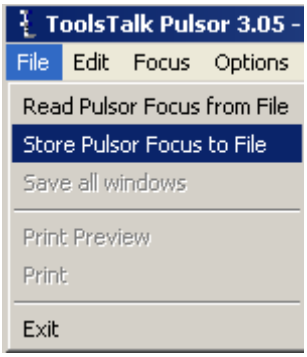
Press **OK** to accept.

Before reboot, make a store of the previous settings through function **Store PF to file.** See next section.

21.2.2 Store Pulsor Focus to file

In the **file** drop down menu select **store PF to file**.

A **save as** dialog box appears. State target, type name and save the PF3000 text file (*.pf3).



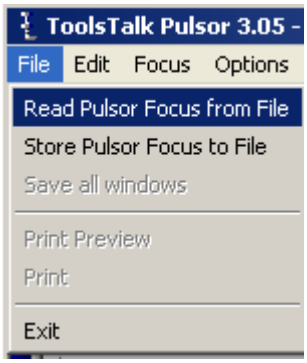
The "PF3000 Text file" should be used for the restoring of data when the memory setup is done (see section 21.2.3, *Read Pulsor Focus from file*).

Now you can reboot the Pulsor Focus. This can be done either with the power switch on the front panel or via the Reboot PF Action under Options in ToolsTalk Pulsor menu row.

Tightening results, event log and tool drift alarm results are not stored in file, these will be deleted after reboot.

21.2.3 Read Pulsor Focus from file

When memory setup is done and the system is running again after reboot, the PF3000 text file including the previous data configuration (saved before setup) can be restored into the Pulsor Focus controller again.



Read Pulsor Focus from file will overwrite current programming and configuration in connected Pulsor Focus controller.

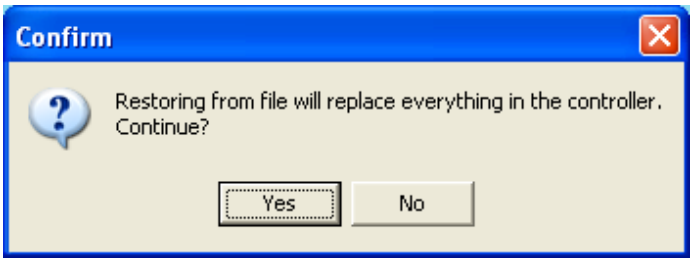
Open ToolsTalk Pulsor and connect to the Pulsor Focus controller.

In the **file** drop down menu select **read PF from file**.

A **confirm** pop up window appears.

Select **yes** to accept.

Select **no** to abort operation.



Read selection window appears.

Select functions to restore. An unchecked box means no replacement of data in that function area.

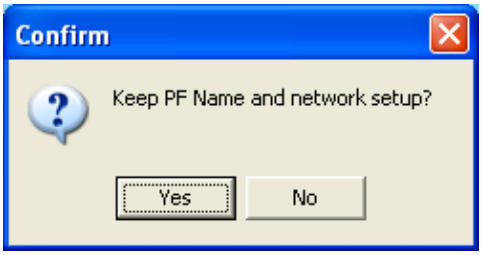
Click **OK** to confirm.

The configuration data, Psets and jobs will be restored to the system from file.

A **confirm** popup window appears.

Select **yes** to keep present Pulsor Focus name and Network setup.

Select **no** to restore Pulsor Focus name and network setup from file.



Once more, a confirm pop up window appears.

Select **yes** to keep present Pulsor Focus password setup.

Select **no** to restore Pulsor Focus password setup from file.

22 Event codes

Event codes are displayed on the Pulsor Focus display and in ToolsTalk as popup windows to inform users about 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 24.1, *RBU functionality*). Once the log is full, the oldest events will be overwritten by the most recent ones.

22.1 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.

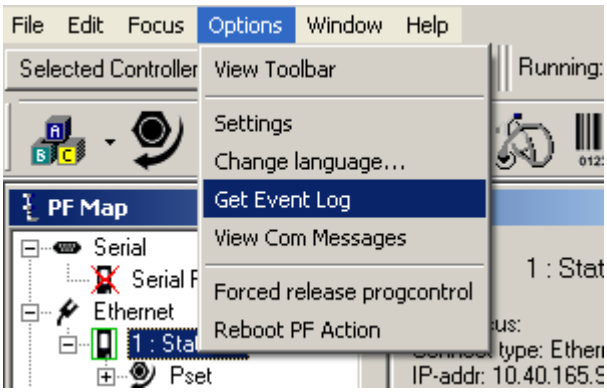
Click **clear** to delete all events in the log.

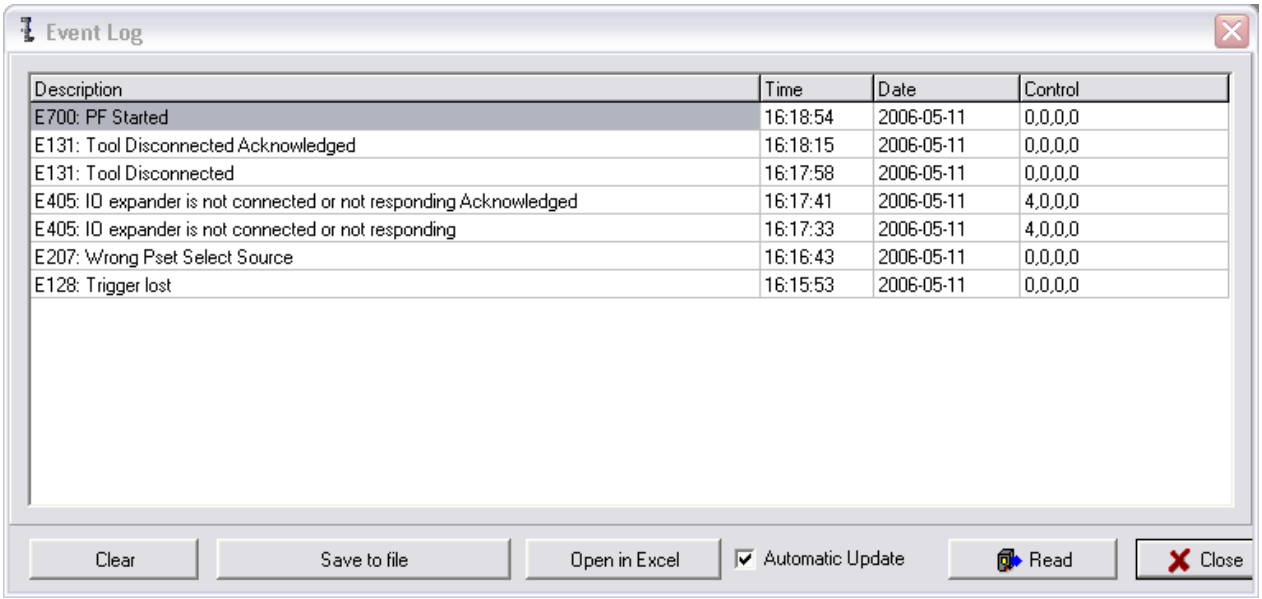
Click **save to file** to store the event log as a text file.

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

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

When option **automatic update** is checked, the events in the log are shown directly when they appear.





22.2 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

22.3 Event code list

22.3.1 Abbreviations

Abbreviation	Description
ACK	Acknowledgement
TLU	Tool locked unconditionally.

22.3.2 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. Replace tool.	ACK
E053	Sensor signal error	Angular sensor signal fault. If frequent contact service.	

22.3.3 TCB and hose related errors

E060	Air hose test failed	Air hose test should be reperformed.	ACK
E061	Air hose length error	Air hose test indicates that the hose is too long.	ACK
E066	Tool control box disconnected	Tool control box disconnected or not responding.	ACK
E067	Tool control box air shutoff error	Air hose not connected TCB->tool or TCB unable to shut off air.	ACK
E068	Tool control box wrong model	The TCB model connected is not supported by this software configuration.	ACK
E069	Tool Control Box pressure error	Check that the TCB is receiving the correct pressure input and check all the hose connections to the TCB and the tool. If all seems OK, and the problem prevails after a restart, the TCB must be checked for service.	

22.3.4 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
E125	Alarm on timeout/ alarm on torque lost	The torque was not reached in 200 pulses. During Tool Setup other limits is active: Pulsor Control: 100 pulses; Pulsor Fixed: 70 pulses.	
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 is generated when communication can not be established between tool and PF. The tool may be disconnected from the Tool Control Box and/or the Tool Control Box is disconnected from the PF. The event code is also generated when an attempt to start a disconnected (logically or electrically) tool is done. A damaged cable can result in a disconnected tool.	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”.	

Code	Name of event	Information	Note
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
E149	Tool locked disable loosening at OK	The function *Disable loosening at OK [C131]* has locked the tool	
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 *Channel ID number [C105]* for the Job client that does not respond. The second, third and fourth parameters are not used.	
E151	Job in OFF mode	Not possible to select a new Job (Pulsor Focus is in Job OFF mode).	
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 Monitoring setup when the pulse filter is inactivated.	
E183	Tightening data timeout	Maximum tightening time exceeded (30 seconds).	
E184	Tightening with a Pset without a Tool Setup	A tightening has been performed with a Pset without a Tool Setup.	TLU
E186	Relative torque variation high in Monitoring Setup	Monitoring Setup has relative torque variation outside the interval 85% - 115%.	
E189	Monitoring Setup pulse limit exceeded	The tightening has more than 300 pulses and will be truncated.	ACK
E192	Tool pressure sensor error	Tool pressure sensor reading is not normal. The cause of this may be technical problems with the sensor or a bad air sensor tuning.	ACK

Code	Name of event	Information	Note
E193	Too many tightenings performed in Monitoring Setup	More than the maximum 50 tightenings have been performed in Monitoring Setup. Further results will be discarded.	ACK
E194	Setup aborted due to exchange of tool	The tool was exchanged during Tool Setup or Monitoring Setup.	ACK
E195	Monitoring Setup contains invalid parameter	Monitoring Setup contains one or more tightenings with invalid result for one or more parameter.	ACK
E196	Spin error	The tool has pulses which are not distinct enough to be measured. This is probably due to lack of oil in the pulse unit. Check oil level according to tool instruction manual (product information).	
E198	Start final angle exceeded	The first pulses exceeded the start final angle value with more than 20% during tool setup. There is a risk that the angle measurement will not be correct.	ACK

22.3.5 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.	
E237	Strategy Configuration error	An attempt has been made to tighten with the wrong tool model for this Pset. Use the same tool model that was used during Tool Setup.	
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 Monitoring Setup below the recommended	A Monitoring Setup with fewer tightenings than recommended has been performed. The recommendation is at least ten tightenings.	ACK

22.3.6 Statistical events

Code	Name of event	Information
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	Not 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.
E340	Xucl torque	The last subgroup mean torque value is larger than the upper control limit.
E341	Xlcl torque	The last subgroup mean torque value is lower than the lower control limit.
E342	Rucl torque	The last subgroup range torque value is larger than the upper control limit.
E343	Rlcl torque	The last subgroup range torque value is lower than the lower control limit.
E344	Cp torque	The torque Cp is lower than 2.
E345	Cpk torque	The torque Cpk is lower than 1,33
E346	7inc x torque	Trend alarm, the subgroup relative torque mean value has increased 7 times consecutively.
E347	7dec x torque	Trend deviation alarm, the subgroup torque mean value has decreased 7 times consecutively.
E348	7inc r torque	Trend deviation alarm, the subgroup torque range value has increased 7 times consecutively.

Code	Name of event	Information
E349	7dec r torque	Trend deviation alarm, the subgroup torque mean value has decreased 7 times consecutively.
E350	7above x torque	Trend deviation alarm, the subgroup torque mean value has been above the average mean value of the average of the last ten subgroups 7 times consecutively.
E351	7below x torque	Trend deviation alarm, the subgroup torque mean value has been below the average mean value of the average of the last ten subgroups 7 times consecutively.
E352	7above r torque	Trend deviation alarm, the subgroup torque range value has been above the average range value of the average of the last ten subgroups 7 times consecutively.
E353	7below r torque	Trend deviation alarm, the subgroup torque range value has been below the average range value of the average of the last ten subgroups 7 times consecutively.
E354	2sigma x torque	Trend deviation alarm, the last subgroup torque average is outside Xrt-bar-bar-2 sigma.
E355	2sigma r torque	Trend deviation alarm, the last subgroup torque range average is outside Rrt-bar-bar-2 sigma.
E360	Xucl angle	The last subgroup mean angle value is larger than the upper control limit.
E361	Xlcl angle	The last subgroup mean angle value is lower than the lower control limit.
E362	Rucl angle	The last subgroup range angle value is larger than the upper control limit.
E363	Rlcl angle	The last subgroup range angle value is lower than the lower control limit.
E364	Cp angle	The angle Cp is lower than 2.
E365	Cpk angle	The angle Cpk is lower than 1,33
E366	7inc x angle	Trend deviation alarm , the subgroup angle mean value has increased 7 times consecutively.
E367	7dec x angle	Trend deviation alarm , the subgroup angle mean value has decreased 7 times consecutively.
E368	7inc r angle	Trend deviation alarm , the subgroup angle range value has increased 7 times consecutively.
E369	7dec r angle	Trend deviation alarm , the subgroup angle mean value has decreased 7 times consecutively.
E370	7above x angle	Trend deviation alarm, the subgroup angle mean value has been above the average mean value of the average of the last ten subgroups 7 times consecutively.
E371	7below x angle	Trend deviation alarm, the subgroup angle mean value has been below the average mean value of the average of the last ten subgroups 7 times consecutively.
E372	7above r angle	Trend deviation alarm, the subgroup angle range value has been above the average range value of the average of the last ten subgroups 7 times consecutively.
E373	7below r angle	Trend deviation alarm, the subgroup angle range value has been below the average range value of the average of the last ten subgroups 7 times consecutively.
E374	2sigma x angle	Trend deviation alarm, the last subgroup angle average is outside Xang-bar-bar – 2 sigma.
E375	2sigma r angle	Trend deviation alarm, the last subgroup angle range average is outside Rang-bar-bar – 2 sigma.

22.3.7 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

Code	Name of event	Information	Note
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 initialization of FieldBus.	
E461	Fieldbus type gen com fault	Error detected in initialization of FieldBus.	
E462	Fieldbus mailbox message fault	Error detected in initialization of FieldBus.	
E463	Fieldbus gen com fault	Error detected in initialization of FieldBus.	
E464	Fieldbus hardware fault	The FieldBus module is broken and has to be replaced.	
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 initialization 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 initialization 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.	

Code	Name of event	Information	Note
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.	

22.3.8 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
E512	Tool revision not supported by this drive SW	The tool is not supported by the controller (SW version incompatible)	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 relative pulse frequency low	Mean relative pulse frequency below limit.	
E583	Tool drift alarm relative pulse frequency high	Mean relative pulse frequency above limit- check oil!	

22.3.9 Hardware errors DC3000/MC3000

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

22.3.10 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.	
E799	Internal info	Internal info appearing only in event log. Of interest mainly to design department. See Subinformation for event codes, section 22.4.4, *E799* if this error info occurs frequently.	

22.3.11 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

Code	Name of event	Information	Note
E840	Feature Not Available In Software Revision	This event is displayed if the tool software version contains functionality not supported by the controller software version or an attempt is made to store a Pset with a Pset-id larger than the max number of Pset.	
E841	SW function not available for this tool type.	This event is displayed if the tool software version is lower than needed for corresponding controller functionality (e.g. loosening),	
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. E.g., a customer protocol is 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.	

22.3.12 Events MMI3000

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

22.4 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 22.1, *ToolsTalk Pulsor operations* how to display event code integers.

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

22.4.1 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.

22.4.2 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.

22.4.3 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.

22.4.4 E799

If the first parameter contains a value above 256 there are communication problems between tool and controller which might be due to the cable. If the value is below 256 the tightenings are difficult to measure, possibly due to lack of oil in tool. The second parameter, if present, will show if there is a sensor signal error, and what error it is. If this event code is frequent in the event log, it is recommended to check the cable and the tool. The third and fourth parameters are not used.

23 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 programming window.

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

23.1 Pset parameters

23.1.1 P1xx Programming

P10x Tightening Options

Parameter number	Parameter name	Description	Default setup
P100	Strategy	**Pulsor Fixed:** The air pressure is fixed and depends on the chosen Pset. **Pulsor angle shutoff:** Air pressure is fixed for this Pset. The tightening will stop when a specified angle is reached from a threshold torque. **Click wrench**: A digital input signals the completion of an arbitrary activity. No tightening is performed by tool.	Pulsor Fixed
P107	Click wrench no.	This parameter is only used if Click wrench is chosen as *Control strategy [P100]*. It is used to connect the Click Wrench strategy to any one of four defined DigIn.	Click wrench 1
P112	Final tq min	Monitoring limit minimal accepted torque. Connected to P645.	0 Nm
P114	Final tq max	Monitoring limit maximal accepted torque. Connected to P647.	999,9 Nm

P14x Tightening Options

Parameter number	Parameter name	Description	Default setup
P141	End time	The time between air shut-off until air is turned on again after a finished tightening. For loosenings the time is fixed, changing this parameter has no effect.	0,5 seconds
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	A function that signals to the operator when a certain number of tightenings have been performed. The number of tightenings is set either in the Pset (P151) or by other means. Select batch size source as follows: **Off**: Batch count functionality is not used. **Pset**: Use Batch size in Pset (P151). **Fieldbus:** An external source determines *Batch size* via fieldbus. **Ethernet/Serial**: An external source determines *Batch size* via Ethernet or serial interface. **If batch count is used in Job this parameter shall be set to "Off".**	Off
P151	Batch size	The size can be 1 - 99. This parameter can be set when the *Batch count [P150]* is in active mode.	1
P152	Lock at batch done	Setting "Lock at batch done" turns off the air supply upon completing a batch to indicate to the user that all bolts have been tightened.	Off
P153	Max coherent NOK's	Defines the number of allowed not ok tightenings in a row. Accessible when *batch count [P150]* is set to "Pset" or "off". Scope: 0 (Off), 1 - 10.	0 (Off)

23.1.2 P4xx Pset setup

P40x Pset administration

Parameter number	Parameter name	Description	Default setup
P400	View existing Psets	Button. To view existing Psets in the current PF channel. Both numbers and logical names will be displayed.	
P401	Create new Pset	Button. To create and open a new Pset. Each Pset has a unique ID number between 1 and 8 (or up to 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	Button. Used when a source Pset is to be copied to a destination Pset.	
P404	Delete Pset	Button. 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 latest Pset modification. Not editable.	

P41x Reset

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

23.1.3 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

23.1.4 P6xx Programming

P60x Monitoring setup

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

P61x Tightening options

Parameter number	Parameter name	Description	Default setup
P611	Tightening angle start	Angle is measured from this threshold torque.	50% of target
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

Parameter number	Parameter name	Description	Default setup
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. Connected to P112.	
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. Connected to P114.	
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
P649	Target torque value	Target torque in user units to be used in the tightening application. This value corresponds to 100% Relative torque.	0.0
P650	Keep Pset torque limits	Checkbox. With this setting the Pset torque monitoring limits will be kept even if a new Monitoring setup is performed.	No

P66x – P68x Control Parameters

Parameter number	Parameter name	Description	Editable
P660	Pset pressure	For the Control strategy, this is the air pressure supplied to the tool before tightening. For the Pulsor Fixed strategy, this pressure is used throughout the whole tightening.	Yes
P664	Loosening pressure	The air pressure when performing a loosening.	Yes
P676	Torque pulse threshold	Below this threshold, a pulse is not counted as strong enough to start regulation. Mostly used with prevailing torque joints, e.g. Nyloc® nuts. Expressed in % of target torque.	Yes
P680	Tool model used	The tool model used when performing Tool Setup.	No
P681	Tool Setup performed	The date and time when the Tool Setup was started.	No
P682	Torque tuning factor	The current torque tuning factor. May be modified through the Torque Tuning Adjustment function.*	Yes*
P684	Air shutoff time	The air shutoff time from the Air Hose Test performed just before Tool Setup.	No
P685	Max available pressure	The max available pressure from the Air Hose Test performed just before Tool Setup.	No
P686	Extrapolation shutoff threshold	When a pulse reaches this torque level the system starts to determine when to shut off the air pressure. Expressed in % of target torque.	Yes

P687	Tool setup tightening count	The number of tightenings performed during Tool Setup, not including deleted tightenings.	No
P688	New measured torque	The measured torque value written in when performing a Torque Tuning Adjustment. The parameter is set in the Torque Tuning Adjustment window.	Yes
P689	Tool Setup torque tuning factor	The Torque Tuning Factor generated during Tool Setup.	No

P78x Control Parameters

Parameter number	Parameter name	Description	Editable
P785	Measured torque	The mean value of the manually measured torques during Tool Setup.	No

23.2 Job

23.2.1 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

23.2.2 J3xx Programming

J30x Configuration

Parameter number	Parameter name	Description	Default setup
J300	Job list	The job list specifies the Psets that can be included in the job. The total number of Psets in one job can not exceed 30. This parameter contains: PF channel: Pulsor Focus channel ID that the selected Pset belongs to. 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. Pset name: name of the selected Psets Auto select: yes = auto select, no = manually select. With auto select the job functionality automatically chooses the next Pset. With a manually selected Pset the operator must manually choose the next Pset. **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 *job order type [J301]*).** **A job has override privileges, in comparison to a single Pset, on a selected possible number of NOT OK tightenings.** Batch size: A batch size should be specified for each Pset in a job. The batch size specifies the number of tightenings to be performed for each Pset. 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. 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 *max coherent NOK's [P153]*). The tool will be locked (for both tightening and loosening) when number of possible not OK tightenings is reached for each batch. When the tool is locked due to possible not OK tightenings the only ways to unlock the tool are: Reset counter for performed not OK tightening via a digital input. Select abort job (in case the selected job shall not lock the tool). Select job off.	

Parameter number	Parameter name	Description	Default setup
J301	Job order type	A Job must be defined as Forced order Job, Free order Job or Free and Forced order Job. **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. **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. **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.	Forced
J302	Lock at job done	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
J303	Tool loosening	This parameter controls the tool loosening functionality during a running job. Enable: tool loosening functionality is unlocked during a running job. Tool loosening is enabled for all job members. Disable: tool loosening functionality will be locked during a running job. Enable only on NOK tightening: The tool loosening is disabled during a job but it will be enabled when a NOK tightening is performed.	Enable
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	**OK**: Specifies that only accepted tightenings will be considered performed and counted. **OK+NOK**: Specifies that also not accepted tightenings will be considered performed and counted. **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).**	OK
J311	Batch status at increment/bypass	**OK**: The batch status will be OK at Batch Increment or Bypass event. The nxOK led on the Pulsor Focus controller will light. **NOK**: The batch status will be NOK (nxNOK) at Batch Increment or Bypass event.	NOK
J312	Decrement batch at OK loosening	Decrement batch at OK loosening makes it possible to redo the latest made tightening/increment in a job. The batch counter of the Pset or multistage is decreased with one step. It is not possible to go back one step after the job has been completed. **If “batch counter type” is set to OK and last tightening was a NOK tightening, an OK loosening will not decrease the batch counter.**	No

J32x Timers

Parameter number	Parameter name	Description	Default setup
J320	Max time to start job	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. Allowed values are between 1 - 9999 seconds. Value 0 (seconds)	0

Parameter number	Parameter name	Description	Default setup
		deactivates this function.	
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
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

23.3 Config

23.3.1 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: Off Relative torque Tightening angle Number of pulses Tightening time Rundown time Remaining in batch Completed in batch Selected Pset Final torque Target torque	Final torque
C115	Toggle display	Selects result parameter to be toggled on display with chosen parameter above (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.	English
C121	PF Tq presentation unit	Select which unit to use for torque presentation both on PF display and in ToolsTalk.	lbf.ft
C124	Soft keys enabled	Here you connect and disconnect the menu selection buttons. On the Pulsor Focus the functions Monitoring Setup, plus (+) and minus (-) button will be affected.	Yes
C128	Air Pressure Presentation Unit	Select unit for showing air pressure. Available options: bar, PSI, kPond/cm^2, kPa.	PSI

C13x Options

Parameter number	Parameter name	Description	Default setup
C130	Lock on reject	Allows the air to be shut off whenever a non-approved tightening has been done.	Off
C131	Disable loosening at OK	Yes/No When activated the Tool Control Box box will shut off the air if trying to loosen after an OK tightening. If batch count is used the batch will be decremented irrespective of the settings for C133.	No
C132	Reset batch at Pset change	Yes/No Resets the batch counter when a new Pset is selected.	Yes
C133	Decrement batch at OK loosening	Yes/No An OK loosening generates a batch decrement for the latest made tightening/increment.	No
C134	Batch status at increment/bypass	OK/NOK Defines if an increment or bypass operation is 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
C139	Result of non-tightenings	Yes/No A non-tightening, i.e. a loosening or a batch increment/decrement operation, will generate a null tightening result. This null result will be saved.	No

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
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 it Work object LED should be always on, always off or turned on when the tool is used.	Tool Usage
C191	Work object LED	Specifies the time the LED should be on when controlled by tool	300

	timeout	usage.	
C195	Lock tool on service alarm	If on, the tool will be locked unconditionally if a service alarm has triggered.	Off

23.3.2 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 27, *Digital inputs and outputs*.	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

Parameter number	Parameter name	Description	Default setup
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 *Tool light mode [C224]* is on.	
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. This means that the socket must be removed from the selector **after** Pset is selected. If the socket is already removed from the selector, put it back on the selector again, then pick it up and mount it on the tool.	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 *Job select source [C221]*. 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

23.3.3 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

23.3.4 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 *ToolsNet on [C410]* 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 devices on this sub net) and 239.255.255.255 (Multicast standard). Only valid if *Multicast on [C420]* is activated.	225.6.7.8

Parameter number	Parameter name	Description	Default setup
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

23.4 Diagnostics

23.4.1 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 and 11.
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. 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 *Number of tightenings since service [D132]* and *Number of pulses since service [D137]* also sets *Latest service date [D134]* to current date and sets *Service indicator [D131]* to off.

Parameter Number	Parameter Name	Description
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. Automatically increased to 1 year from todays date when Service counter reset is performed.

D15x Pulsor Tool Info

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

23.4.2 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	PF 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 type: Gold.
D216	RBU serial number	Shows the serial number of the RBU. (Shows half of the unique MAC address).

23.4.3 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.

23.4.4 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.	On
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.	Off
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.	Off
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.	Off
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.	Off
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 senor 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

23.5 Identifier

23.5.1 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

23.6 FieldBus

Parameter Number	Parameter Name	Description	Default value
F100	FieldBus type	This parameter shall be selected first. It includes the types; DeviceNet, ProfiBus-DP, ProfiBUS, 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
F102	From PF DataLength	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. The maximum length that can be programmed is different for each FieldBus type. **If InterBus is used the Pulsor Focus unit has to be restarted when the data length is changed.**	

Parameter Number	Parameter Name	Description	Default value
F103	To PF DataLength	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. The maximum length that can be programmed is different for each FieldBus type. **If InterBus is used the Pulsor Focus unit has to be restarted when the data length is changed.**	
F104	From PF Global DataLength	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. **From PF Datalength - From PF Global Datalength = From PF point-to-point DataLength (which only available in ModBusPlus).**	
F105	To PF Global DataLength	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. **To PF Datalength - To PF Global Datalength = To PF point-to-point DataLength (which only available in ModBusPlus).**	
F110	Set node address and baudrate from	Some buses can use a SW-configured node address and baud rate. This parameter has two selections: **Software**: Makes it possible to program node address and baud rate from user interface. **Hardware**: Node address and baud rate is configured with the switches on the FieldBus card. **Normally the switches on the FieldBus card must be set in a specific way to enable these parameters from ToolsTalk.**	
F111	FB node address	This parameter specifies the network ID number used in the FieldBus system. You can set the node address if the selected FieldBus type has this feature. Two units in the same FieldBus network cannot have the same node address. It is possible to set FB node address from 1 to 125.	
F112	Baudrate	Communication speed on the FieldBus system. You can set the baud rate if the selected FieldBus types have this feature. **The baud rate shall be the same in all Pulsor Focus controllers and in the PLC.**	
F113	Connection mode	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.	

Parameter Number	Parameter Name	Description	Default value
		The settings in the Pulsor Focus controller and the PLC must be the same.	
F120	Set node address from	ModBusPlus global data exchanges require a source address, which is a node address where you want to get the global data from. **Software**: the node address is set from user interface. **Hardware**: the node address only can be set from the switches on ProfiBus card.	
F130	PCP length	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 then the process data. Available selections are 0, 1, 2, and 4. These numbers are the lengths in words. 0 = no PCP. **The Pulsor Focus unit has to be restarted when the PCP length is changed. The length must be the same in the PLC.**	
F131	Process DataLength	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. **The Pulsor Focus unit has to be restarted when the Process DataLength is changed. The length must be the same in the PLC.**	
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	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. Valid settings range from 0.05 to 10 seconds.	0.10 s
F210	Tool stop at offline	If the FieldBus system goes down or Pulsor Focus goes offline it might be necessary to stop running tool for safety purpose. **No tool stop**: does not stop running tool **Tool stop - FieldBus start**: stops running tool if tool start select source is FieldBus.	
F300	Bitmap select	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. Default settings are the type that is common for the selected FieldBus type. For DeviceNet, Intel Endian must be used. For ProfiBus, Motorola Endian must be used.	

24 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.

At the time of this manuals print, there is one RBU available, the Gold RBU. The functions available are presented in the table below.

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 RBU.

24.1 RBU functionality

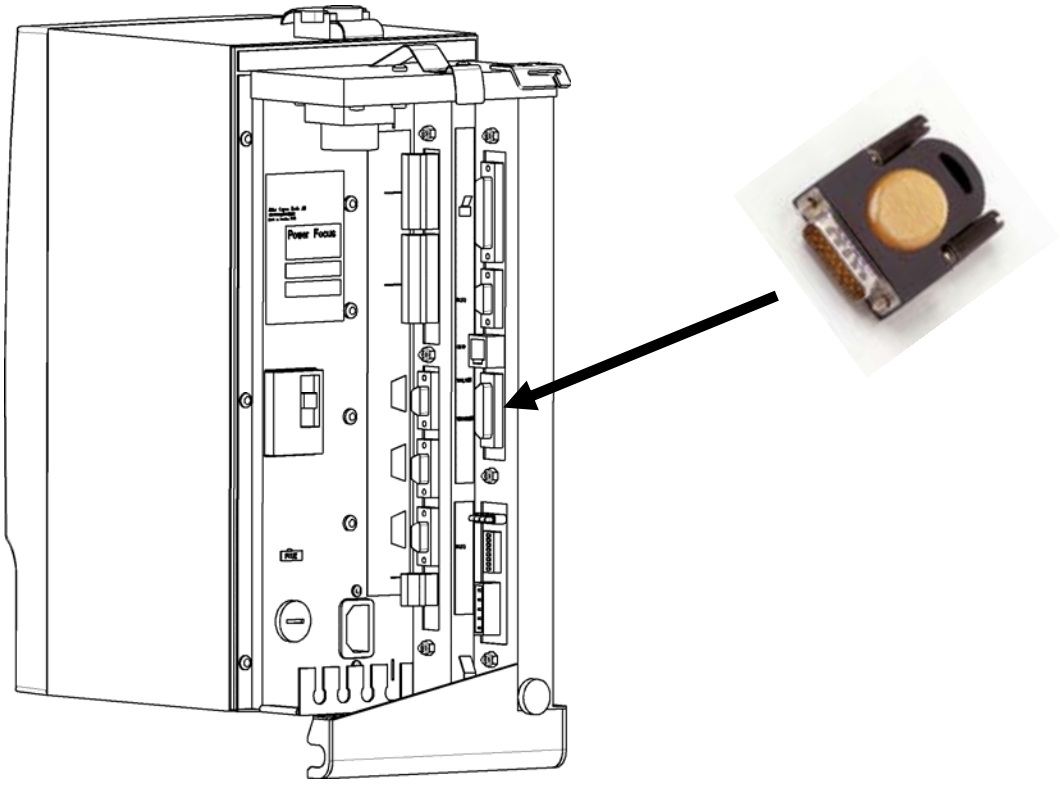
The table below displays the functionality for the RBU available at the time of print.

Capacity	**Gold RBU**
Number of Psets (max)	100
Number of Jobs (max)	100
Number of tightening results (max)	5000
Number of events stored (max)	1000
Functionality	**Gold RBU**
Pulsor Fixed strategy	X
Batch counting	X
Job	X
Tool drift alarm	X
Configurable memory	X
I/O	**Gold RBU**
Programming port (RS232)	X
I/O Expansion (up to 124 inputs and 124 outputs)	X
Network / TCP/IP	X
Barcode reader port (RS232)	X
Fieldbus (with AnyBus HW)	X
Networking	**Gold RBU**
Cell	X
Net	X
Multicast	X
ToolsNet	X
Other	**Gold RBU**
Traces to ToolsTalk	X
Real time statistics	X
SPC (Alarm)	X
Barcode reading	X
Open Protocol	X

24.2 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.



24.3 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 possible to load the configuration from the RBU, but not from the PF.

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

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**.

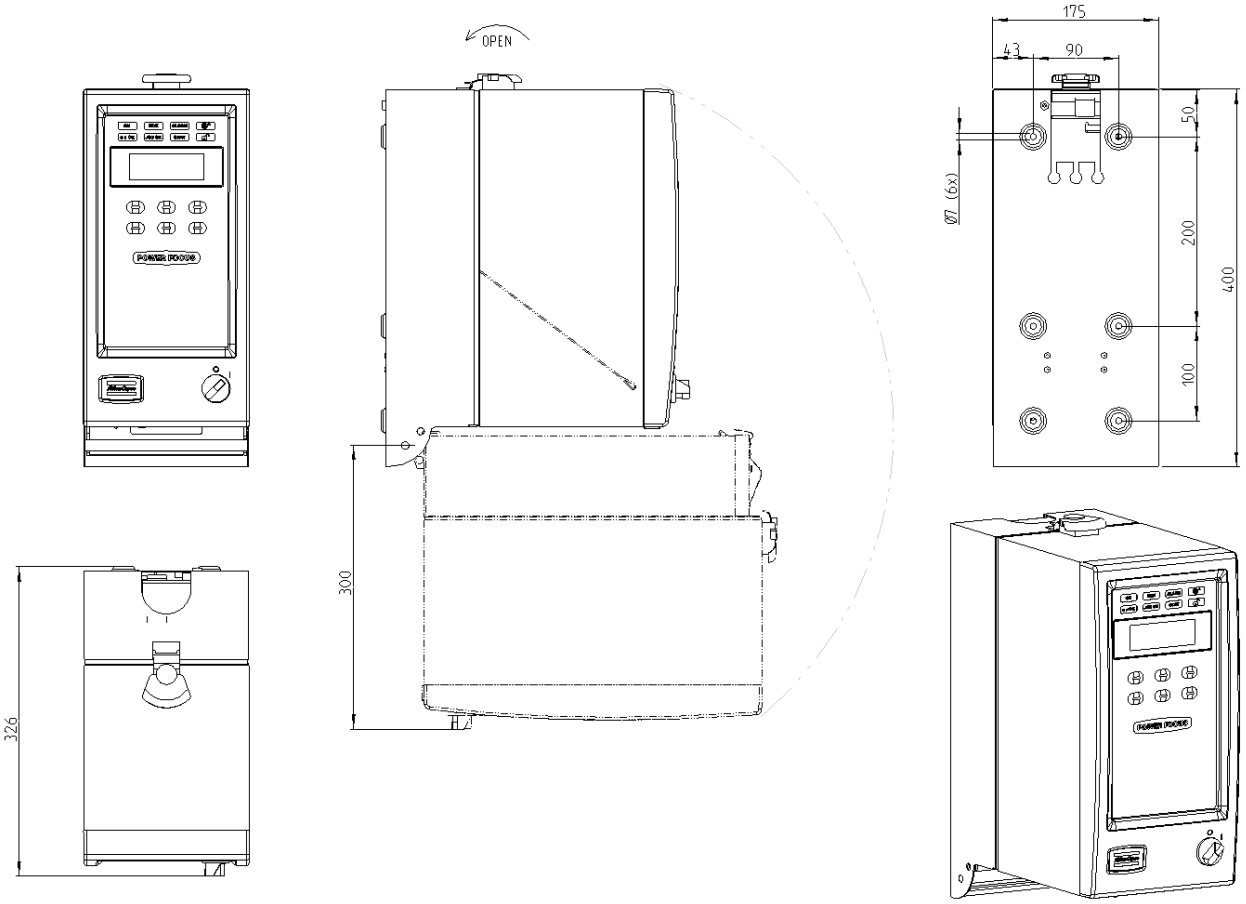
Changing RBU will clear the tightening result database.

Selecting "Stop" will only prevent the result database from being erased if the RBU has been changed within the same brand (provided the previous RBU is re-inserted). A change between a Gold and a differently branded RBU 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.

25 Pulsor Focus hardware description

25.1 Physical data

25.1.1 Dimension drawing



25.1.2 Weight

The Pulsor Focus weighs about 12 kg.

25.2 Electrical data

25.2.1 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.

25.2.2 Power consumption

The power consumption of Pulsor Focus is about 20 W.

25.2.3 Mains fuse

Recommended mains fuses (power outlet):

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

25.2.4 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.

26 Tool Control Box hardware description

See the TCB instruction manual (Product Instructions) for information about the Tool Control Box.

27 Digital inputs and outputs

27.1 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 for Power Focus compatibility, use "Pulsor Tool Enable" instead.** 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 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 for Power Focus compatibility. Use "tool disable n.o." instead.** The function is similar to "tool disable n.o."	X	X
Tool loosening disable	The function is similar to tool disable n.o only applicable to loosening	X	X
Batch increment	Increase the batch counter one step. Batch status is depending on *Batch status at increment/bypass [C134].*	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 in the running Job. Batch status is depending on *Batch status at increment/bypass [C134].*	X	X
Abort Job	Abort current Job. Job status will be Job aborted. If Lock at *Job done [J302]* 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 0-6	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
Select previous Pset	Select lower number Pset.	X	X
Job select bit 0-6	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

Name	Description	Available	
		Internal I/O	I/O Expander
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
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” all bits will 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
Open Protocol commands disable	When activated all commands received by the Pulsor Focus via Open Protocol are rejected.	X	X
Pulsor Tool Enable	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
External monitored 1-8	These generic digital inputs will activate the relays External controlled relays 1-8.	X	X
TCB air hose test	When activated, the TCB will perform an air hose test	X	X

27.2 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	
Batch done	Batch counter is equal to batch size.	X	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 *Tool start select source [C220]*.			X
Tool tightening	Tool tightening in progress.			X
Tool loosening	Tool loosening in progress.			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	**This relay is present for Power Focus compatibility, use “Pulsor Tool Enabled” instead.** Is active whenever the Pulsor Focus wants to disable the tool. “Tool locked” is the inverse of “Pulsor Tool Enabled”.			X
Identifier received	An identifier string is received.	X	X	
Running Pset bit 0-6	Shows selected Pset. 0 = no Pset selected, tool locked.			X
Running Job bit 0-6	Shows selected Job. 0 = no running Job.			X

Name	Description	Duration		
		Time	To next tightening	Tracking
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 *Service indicator [D131]* 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
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
Monitoring setup active	Monitoring setup is ongoing.			X
Pset with Tool Setup performed	The selected Pset has a Monitoring 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	
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	
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	This relay is active as long as the Pulsor Focus wants the air supply to the tool enabled.			X
Open protocol commands disabled	Set when the Open Protocol commands disable is activated. In this case all commands that Pulsor will receive from Open Protocol are disabled.			X
External controlled relays 1-8	Set when External monitored inputs 1-8 are enabled.			X

28 Connector descriptions

28.1 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	Initialize printer	25	Ground
8	Data bit 6	17	Select input		
9	Data bit 7	18	Ground		

28.2 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

28.3 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

28.4 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	----

28.5 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.

28.6 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

28.7 Digital inputs

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

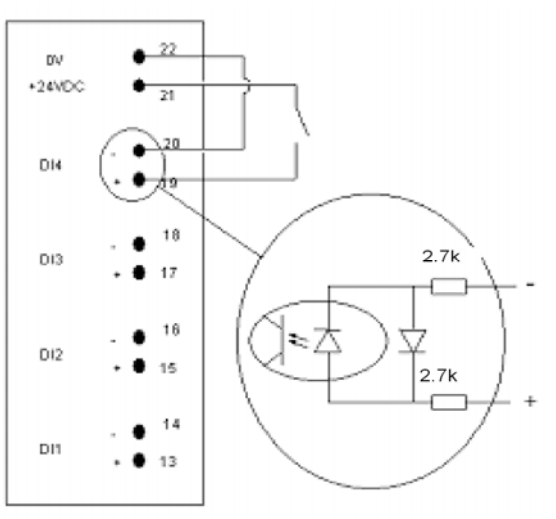
Function: Isolated opto-coupled digital input. Logical function is set in the configuration of the Pulsor Focus.

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)



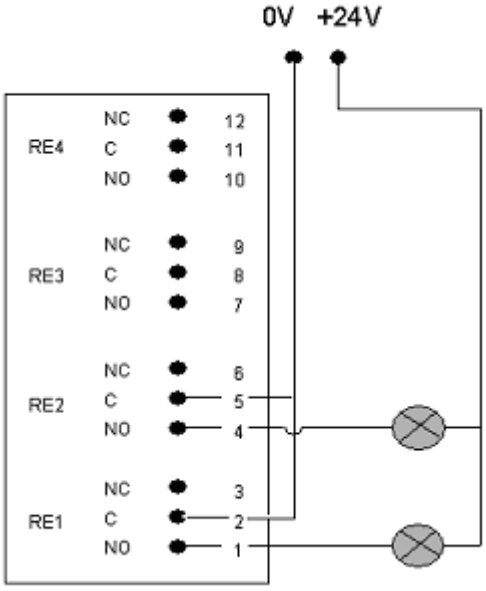
28.8 Digital outputs (relays)

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



28.9 I/O Bus #1

Connector: 9-pin DSUB male.

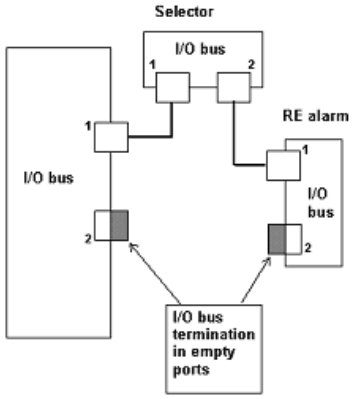
Function: To connect Atlas Copco I/O Bus accessories. Parallel with I/O Bus connector #2.

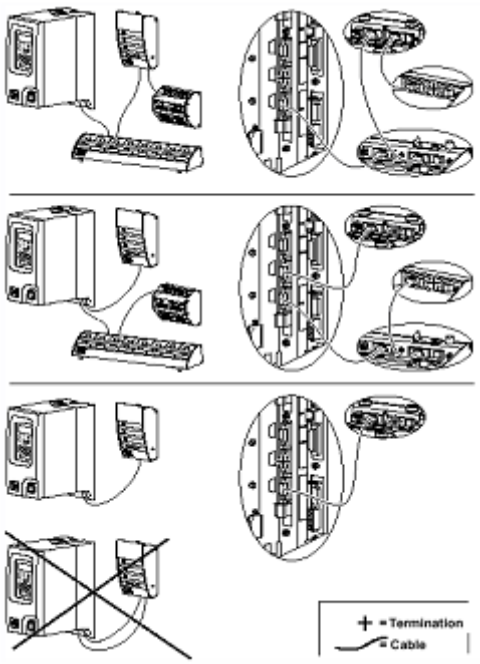
There is a range of Pulsor Focus accessories that connect over the proprietary Pulsor Focus I/O Bus, for example:

- 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)





28.10 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.

28.11 Mains power connector

Connector: IEC320

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

29 Pulsor Quick Guide

29.1 Introduction

The Quick guide is provided as a separate document. The purpose of the guide is to clarify the minimum that needs to be done in order to get started with the system and give some additional information regarding common tasks. Basic information not shown in the Quick guide can be found below.

The tool will automatically be shut off by the system when a given target criteria has been reached. By performing a Tool Setup for a given Pset you can set the target torque and preferred speed of the tightening for that Pset. The higher the tightening speed, the higher the torque scatter. A Tool Setup must be performed before the tool can be used to perform any tightenings. The tool setup should be done on the actual joint type used in production.

The electronics measure what happens while tightening. While the Tool Setup is performed, the Pulsor Focus “learns” how to set the air pressure for a correct tightening. Correctly carrying out the Tool Setup is therefore very important.

Note the differences between performing a Tool Setup (mandatory, sets up the system for the joint) and performing a Monitoring Setup (optional, helps finding limits for monitoring parameters).

30 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.

30.1 Bit map select (Endian Mode)

30.1.1 Motorola Endian

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

30.1.2 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.

30.2 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.

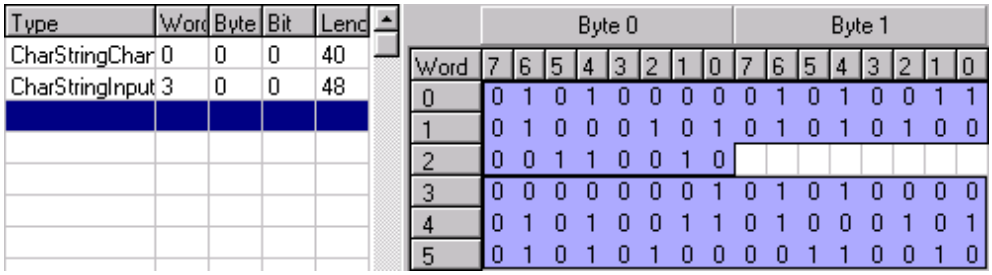
Data type	Description
Character String Input	Character string with an extra “counter” byte in front. The extra byte is an integer counter and must increase each time when the character string is entered to be able to detect a new input. If you want to enter the same value again (e.g. the same Job number), 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.

30.2.1 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, the new input is considered.

Motorola Endian

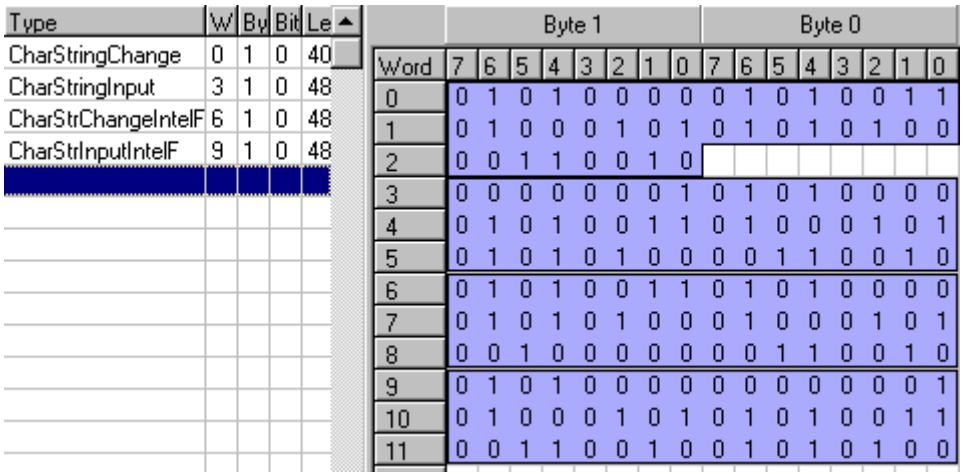


Type	Word	Byte	Bit	Length
CharStringChar	0	0	0	40
CharStringInput	3	0	0	48

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

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
CharStringChange	0	1	0	40
CharStringInput	3	1	0	48
CharStrChangeIntelF	6	1	0	48
CharStrInputIntelF	9	1	0	48

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

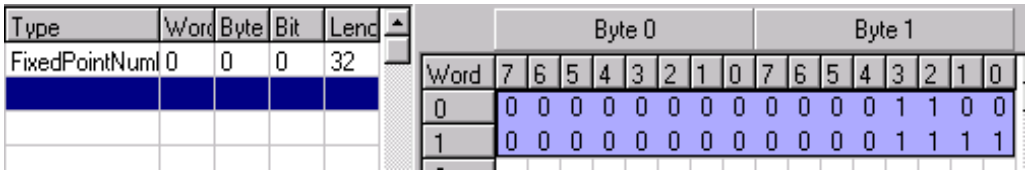
Data Type	Word	Byte 1	Byte 0	Convert to PF data
CharStringChange	0	P	S	
	1	E	T	
	2	2		PSET2
CharStringInput	3	1 (counter)	P	
	4	S	E	
	5	T	2	PSET2
CharStringChangeIntelF	6	S	P	
	7	T	E	
	8		2	PSET2
CharStringInputIntelF	9	P	1 (counter)	
	10	E	S	
	11	2	T	PSET2

30.2.2 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):

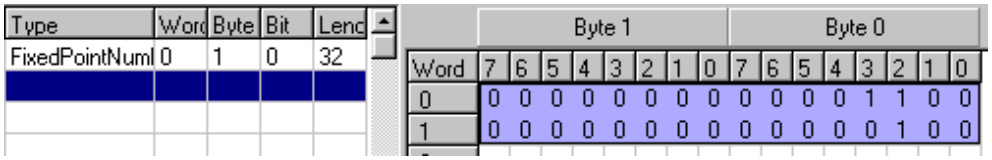
Integer part (in digits)	Decimal part (in digits)
1 or 2	2
3	1
4	0

Motorola Endian



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

Intel Endian

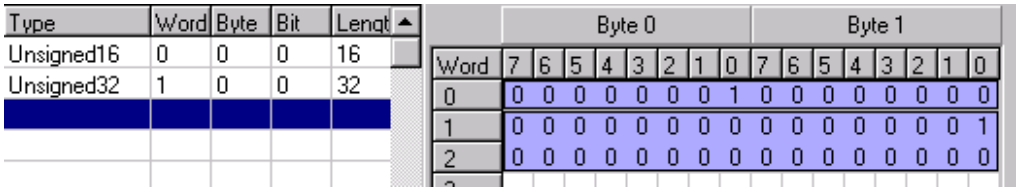


Data type	Word	Byte 1	Byte 0	Convert to PF data
FixedPointNumber	0	0	12	
	1	0	4	12.04

30.2.3 Integer

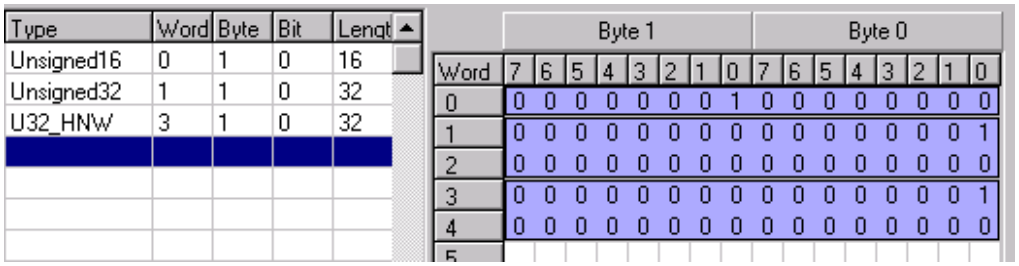
Unsigned16 is a 16-bit integer and Unsigned32 is a 32-bit integer. U32_HMW is a special case of Unsigned32, which is used in Intel Endian.

Motorola Endian



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	Lengt
Unsigned16	0	1	0	16
Unsigned32	1	1	0	32
U32_HNW	3	1	0	32

	Byte 1								Byte 0							
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	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
5																

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

30.3 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
BatchDone	Indicate batch finished. Batch done OK or NOK.	Bit	1 bit	0 = Not completed 1 = Done
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
Completed batch	Displays current completed batch	Bit Field	2 - 8 bits in the same byte.	00000000 = 0 11111111 = 255
		U16	2 bytes	Binary representation Decimal 0-65535
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
ErrorCode	Shows error code.	U16	2 bytes	Binary representation (Decimal 0-65535)
FieldBusHandShakeAck	Indicates handshake from PLC received by Pulsor Focus.	Bit	1 bit	0 = Not used 1 = Handshake
FinalAngle	Final angle result.	U16	2 byte	Binary representation (Decimal 0-65 535)
Final torque	Torque result.	Fixed point	4 byte	Binary representation (2 byte integer part, 2 byte decimal part)

Items From PF	Description	Data type	String length	Value
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 of 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
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

Items From PF	Description	Data type	String length	Value
		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
PsetFinalTarget	Shows running Pset “Final target”	Fixed point	32 bits	The value is 2 digits if torque value is less than 100, one digit if 100 <= torque value < 1000 and 0 if torque value >= 1000. For example, if torque value is 25.64, the two byte integer part shows 25 and the two byte decimal part shows 64; if torque value is 345.5, the integer part shows 345 and decimal part shows 5; if torque value is 2431, the integer part shows 2431 and decimal part shows 0. The value is represented in the units determined by the user
PsetFinalTqMin	Shows running Pset “Relative Tq Min” in percent multiplied by 100.	U16	2 bytes	Binary representation Decimal 0-65535
PsetFinalTqMax	Shows running Pset “Relative Tq Max” in percent multiplied by 100.	U16	2 bytes	Binary representation Decimal 0-65535
PsetFinalAngleMin	Shows running Pset “Tightening Angle Min” in degrees.	U16	2 bytes	Binary representation Decimal 0-65535
PsetFinalAngleMax	Shows running Pset “Tightening Angle Max” in degrees.	U16	2 bytes	Binary representation Decimal 0-65535
ReceivedIdentifier	Indicates identifier has been received by PF.	Bit	1 bit	0 = not used 1 = Received identifier
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)
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

Items From PF	Description	Data type	String length	Value
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 are 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
Tool loosening		Bit	1-bit	0 = Tool is not loosening 1 = Tool is loosening
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 tightening 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
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

	Description	**Data type**	**String length**	**Value**
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.

30.4 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
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

Items To PF	Description	Data type	String length	Value
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
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
ToolLooseningDisable	The function is similar to Tool Disable, but only for loosening.	Bit	1 bit	0 = Loosening enable 1 = Loosening disable

Items To PF	Description	Data type	String length	Value
ToolTighteningDisable	The function is similar to Tool Disable, but only for tightening.	Bit	1 bit	0 = TighteningEnable 1 = TighteningDisable
UnlockTool	Unlock tool if tool locked by batch ok or lock on reject	Bit	1 bit	0 = Not used 1 = Unlock tool

30.5 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 organizations.

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.

30.5.1 ProfiBus-DP for Pulsor Focus

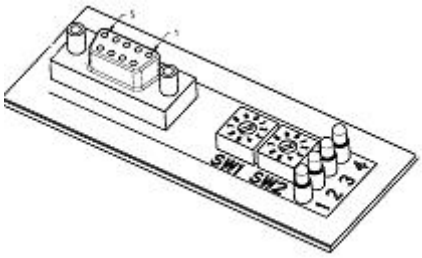
Physical interface

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 (TT Pulsor)
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 functions 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 initialization 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 initialization of the module is not equal to the length/contents set during configuration of the network. Flashing Red 4 Hz– Error in initialization 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

30.6 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.

30.6.1 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

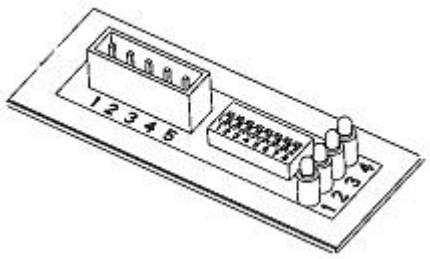
Configuration

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

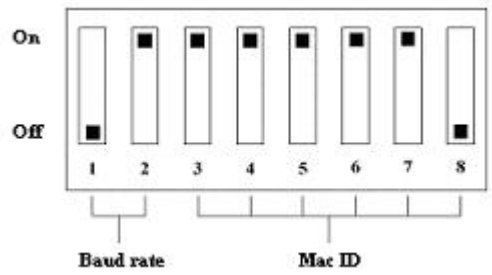


LED 1: Not used

LED 2: Network status

LED 3: Module status

LED 4: Not used



On = 1

Off = 0

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 colors 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 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.

File name: pf3devn.ico

30.7 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 is 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.

30.7.1 InterBus for Pulsor Focus

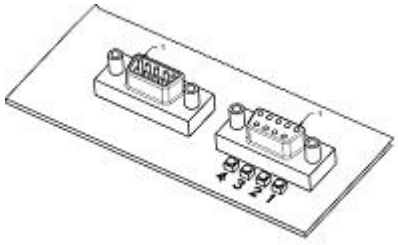
Physical interface

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	Remote Bus DisAble	Active RED when outgoing remote bus is switched off
2. TR	Transmit/Receive	Active GREEN when PCP communication is carried out over the InterBus (0.6 s hold time to be visual).
3. CC	Cable Check	Active GREEN if the cable connection is good and the InterBus Master is not in RESET
4. BA	Bus Active	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.

30.8 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.

30.8.1 ModBusPlus for Pulsor Focus

Physical interface

Interface	Description
Transmission media	ModBusPlus uses 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.

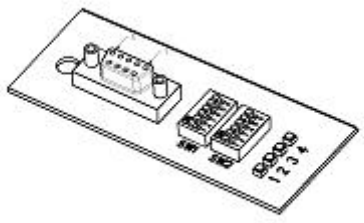
Protocol and supported functions

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 initialized Turned Off – peer interface is not initialized

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 recognize our product and it does not support icon files.

30.9 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.

30.9.1 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 being 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
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	Must be the same in PF and PLC.

Variable	Limits	Information
	1024 bytes data.	
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 which 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

30.10 Profinet

The embedded Profinet interface is a complete Profinet solution for a Profinet IO device. All analogue and digital components that are needed for a complete Profinet IO interface with soft-real time (RT) are mounted on the module. The module is based on the Siemens Profinet I/O software technology.

The Profinet module works as an I/O-Device on the Profinet network. The module supports up to 512 bytes of IO for both Input and Output data. The module baud rate is 100Mbit/s (full duplex). The IP-address can be configured either via DHCP (BootP) or DCP. Three diagnostic LEDs continuously indicate the actual Profinet status and eventually error messages. The module also supports the normal Profinet Alarm functionality. In the standard version the module uses a normal RJ45 connector for the bus connection.

Features

- Up to 64 slots / 1 sub slot
- Up to 1024 bytes cyclical I/O (512 input & 512 output)
- 2 ms cycle time

Indicators

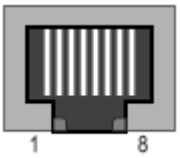
Led	Indication	State	Description
1	Link/Activity	Green	Link established
		Green flashing	Receiving/Transmitting data
		Off	No link or power off
2	Communication Status	Green	Online, Run Connection with IO Controller established IO Controller is in Run state
		Green, 1 flash	Online, Stop Connection with IO Controller established IO Controller in Stop state
		Off	Offline - No connection with IO Controller
3	Module Status	Green	Initialized, no error
		Green, 1 flash	Diagnostic data available
		Green, 2 flashes	Blink, Used by an engineering tool to identify the fieldbus module
		Red, 1 flash	Configuration Error Too many modules/sub modules I/O size derived from IO controller configuration is too large Configuration mismatch (no module, wrong module)
		Red, 3 flashes	No device name or no IP address assigned
		Red, 4 flashes	Internal error
		Off	No power or not initialized
4	-	-	-

GSD

On Profinet, the characteristic of a device is stored in an XML data file. This file, referred to as the “GSD” – file is used by Profibus configuration tool when setting up the network.

Connector

Connector RJ45 standard Ethernet connector is used.



31 Troubleshooting

Use the following table to get possible solutions to problems that may arise when using the Pulsor C system.

Symptom	Possible problem	Solution
The tool is weak and the pulse frequency is higher than normal, many more pulses than usual are needed to reach the target.	Not enough oil in the pulse unit.	Fill the pulse unit with more oil.*
The tool is weak, the pulse frequency normal or lower.	Tool engine is defect.	Service tool.
-“-	Air pressure low.	Feed the Pulsor system (Tool Control Box) with the correct air pressure.
-“-	Pset pressure too low	Increase Pset pressure.**
Large torque spread, first pulses high.	Pset pressure too high.	Lower Pset pressure.** This will ensure the torque is increased in smaller steps.
-“-	Tool size too large for application.	Adjust the trim valve on the air outlet of the tool clockwise. This will reduce air flow, preventing overshoots in the first pulses while still maintaining much of the tool performance later in the tightening.
-“-	-“-	Use a smaller tool.
Invalid torque and/or angle values.	The tool spins because of lack of oil.	Fill the pulse unit with more oil.*
	Soft joint, lower end of tools torque range.	Try reducing Pset pressure, otherwise smaller tool model may be needed.

31.1 Tips and tricks

Very hard joints: In order to reduce the force in the first pulses, the rundown speed must be lowered. This can be done by reducing the air pressure. If the Pulsor Fixed strategy is used, this will also lower the performance of the tool. In this case the method can not be used if the resulting final torque is too low.

* See tools PI for detailed instructions.

** Change these parameters in the Control Parameters tab in the Pset window if Tool Setup is already finished, or press Advanced Settings if performing Tool Setup from ToolsTalk Pulsor.

32 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
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
kPa	kilo Pascal
kpond/cm^2	meter*kg per second^2 per square cm
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LCK	Tool Locked
MC	Motor card
n	Number (of values)
Nm	Newton meter
No.	Number
NOK	Not approved (tightenings)
nxOK	Number of approved (tightenings)
OK	Approved (tightenings)
PF	Pulsor Focus

Abbreviation	Description
PFNR	Pulsor Focus Not Ready (PF Not Ready)
PI	Product Information
PLC	Programmable Logic Controller
PROG	Program (button)
Pset	Parameter set
PSI	Pound per square inch
R chart	Range chart
RAM	Random Access Memory
RAS	Remote Access Server
RBU	Rapid Backup memory
rpm	Revolutions per minute
RS232	Serial communication link
RT	Relative Torque
SPC	Statistic Parameter Control
STAT	Statistic (button)
SW	Software
TCB	Tool Control Box
TLU	Tool Locked Unconditionally
TNR	Tool Not Ready
Tq	Torque
TTP	ToolsTalk Pulsor (SW)
UCL	Upper control limit
V	Volt
VIN	Vehicle Identification Number
X-bar	The mean value
X-bar-bar	The average of mean values
z	subgroup size, group size

33 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.

33.1 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.

33.2 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.

33.3 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.

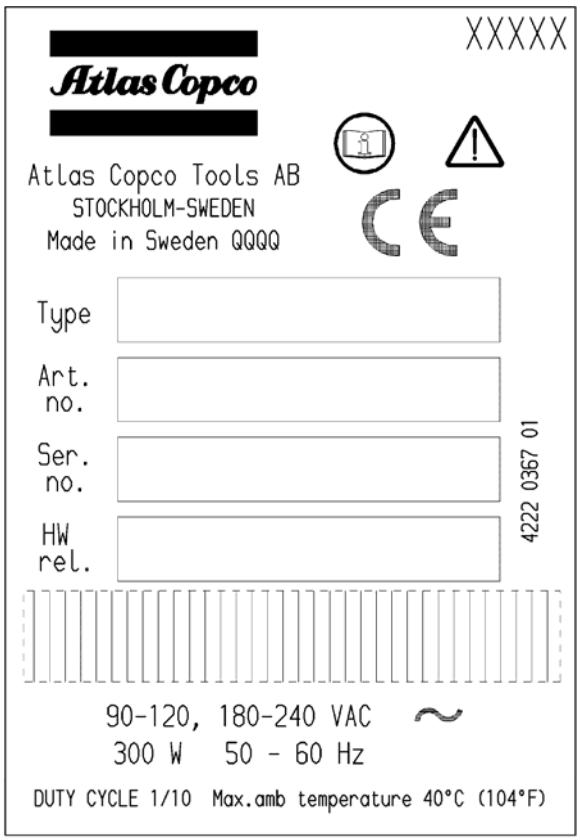
Only use accessories that are recommended by the manufacturer for your model. Accessories that may be suitable for one tool may become hazardous when used on another tool.

33.4 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 unauthorized 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.



ETL LISTED
CONFORMS TO UL STD
ANSI/UL 508C-2000

CERTIFIED TO
CAN/CSA STD C22.2 NO.14-95

34 EC declaration of conformity

EC DECLARATION OF CONFORMITY
DÉCLARATION DE CONFORMITÉ CE
EG KONFORMITÄTSERKLÄRUNG
DECLARACION DE CONFORMIDAD CE
DECLARAÇÃO DE CONFORMIDADE CE
DICHIARAZIONE DI CONFORMITÀ CE
EG KONFORMITEITSVERKLARING
EF OVERENSSTEMMELSESERKLÆRING
EF ERKLÆRING OM OVERENSSTEMMELSE
EY:N VAATIMUSTENMUKAISUUSILMOITUS
ΔΗΛΩΣΗ ΣΥΜΜΟΡΦΩΣΗΣ ΣΕ ΟΔΗΓΙΑ ΤΗΣ ΕΥΡΩΠΑΪΚΗΣ ΚΟΙΝΟΤΗΤΑΣ
EG-DEKLARATION OM ÖVERENSSTÄMMELSE

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 reglementations 89/336/EEC, 73/23/EEC, 93/68/EEC.

Wir **Atlas Copco Tools AB** – STOCKHOLM SWEDEN erklären hiermit in alleiniger Verantwortung, daß das Produkt auf das sich diese Erklärung bezieht, mit folgende 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 Richlinien 89/336/EEC, 73/23/EEC, 93/68/EEC.

Nosotros **Atlas Copco Tools AB** – STOCKHOLM SWEDEN declaramos bajo nuestra 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 exclusiva 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 conforme 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 exclusieve verantwoordelijkheid dat het produkt waarop deze verklaring betrekking heeft, in overeenstemming aan volgende normen of normatieve dokumenten:
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 produkten, som denne erklæringen gjelder for, er i overensstemmelse 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 vaatimusten mukainen:
EN 50081-1, EN 50144 -1,EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 seuraavien säántöjen mukaisesti 89/336/EEC, 73/23/EEC, 93/68/EEC.

Εμεις η **Atlas Copco Tools AB** – STOCKHOLM SWEDEN δηλώνουμε υπεύθυνα ότι το προϊόν στο οποίο αφορά η παρούσα δήλωση βρισκεται σε πλήρη συμμόρφωση με τις απαιτήσεις τους καιωσιγθόωσ η καταόκευαότικές όυότάόεις:
EN 50081-1, EN 50144 -1,EN 50144 -2-2, EN 61000 -3-2, EN 61000 -3-3, EN 61000 -6-2 κατά τις διατάχεις του καυουιομώυ της Κοιυης Αγοράς 89/336/EEC, 73/23/EEC, 93/68/EEC.

Vi **Atlas Copco Tools AB** – STOCKHOLM SWEDEN förklarar härmed på vårt fulla 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 / Tyyppi / Τυπος / Typ

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 funktie van de uitgever / Udsteder, navn og stilling / Utsteders navn og stilling / Ilmoituksen antajan nimi ja asema / Ονομα και θέση εκδότη / Utfärdarens 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 / Utsteders signatur / Ilmoituksen antajan allekirjoitus / Υπογραφή εκδότη / Utfärdarens namnteckning

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