User guide

Power Focus

Atlas Copco Industrial Technique AB

Contents

1 General safety instructions

Ensure that you 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 regulations with regard to installation, operation and maintenance must be adhered to at all times. Refer installation and servicing to qualified personnel only.

1.1 Work area

Keep the work area clear and well illuminated. Cluttered benches and unlit 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 at a safe distance while operating a power tool. Distractions may cause you to lose control.

1.2 Electrical safety

Earthed tools must be plugged into a socket that has been properly installed and earthed according to appropriate regulations. Never remove the earth pin 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, the earth 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 Power Focus (PF) cannot be fitted with a galvanic 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 PF is equipped with an isolated transformer. Test the earth fault protector by pressing the test button located on the rear panel of PF.

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 physical contact with grounded surfaces such as pipes, radiators, ovens and refrigerators. There is an

increased risk of electric shock if your body is grounded.

Do not 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, locate the controller as far as possible from sources of electrical noise, e.g. arc welding equipment etc.

Do not abuse the power lead. Never use the power lead to carry the tool or to pull the plug from a socket. Keep the power lead away from heat, oil, sharp edges or moving parts. Replace damaged leads immediately. Damaged leads increase the risk of electric shock.

1.3   **Personal safety**

Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a 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 jewelry. Tie long hair back. Keep your hair, clothing, and gloves away from moving parts. Loose clothes, jewelry, or long hair can become caught in moving parts.

Avoid accidental starting. Ensure switches are in the off position before plugging in. Carrying a tool with your finger on the switch or plugging in a tool that has the switch set to "On" is inviting an accident.

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 could lead to 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 Tensor tool for your application. The correct tool will do the Job better and more safely in a manner for which it was designed.

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

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

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

the hands of untrained users.

Check for misalignment, obstruction 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.

1.4   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 lead to electric shock or personal injury.

Always refer to the *Product Information for PF4000 (9836 3113 00)* and *Product Information for PF3000 (9836 2156 01)* for spare parts and instructions, and Atlas Copco spare part list for the tool used.

⚠️ **There is a risk 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 the manufacturer's instructions.**

2 Introduction

This manual describes the Power Focus (PF) controller and how to configure it using ToolsTalk PF.

- The first sections describe PF with hardware and software accessories, how to connect, and the user interface.
- The main part of the user guide describes how to use the ToolsTalk PF software to configure PF.
- The last part of the user guide lists the parameters and event codes used in PF.

2.1 Revision history

Apart from editorial updates, this manual has been revised as follows.

- Updates to reflect functional changes: Contact Atlas Copco for a release description for the current release.

2.2 Abbreviations

Abbreviation	Description
$\overline{R}$	The center 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)
%	Percent
A	Ampere
AC	Alternating Current
ACK	Acknowledged
Admin	Administration
Ang con	Angle control
Ang mon	Angle monitoring
bits/s	Bits per second

Abbreviation	Description
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
Deg C	Degrees centigrade
DigIn	Digital Input
DigOut	Digital Output (relay)
DSP	Digital Signal Processor
ft.lb	Foot-pound
GFI	Ground Fault Interrupter
HW	Hardware

Abbreviation	Description
Hz	Hertz (unit of frequency)
I/O	Input/Output
ID	Identification
in.lb	Inch-pound
IR	Infra-Red
IRC	Industrial Radio Communication
kpm	Kilo pound meter
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LCK	Tool Locked
LCL	Lower Control Limit
MC	Motor Card
ms	millisecond
n	Number (of values)
Nm	Newton meter
No.	Number
NOK	Not approved (tightenings)
nxOK	Number of approved (tightenings)
OK	Approved (tightenings)
PF	Power Focus
PFNR	Power Focus Not Ready (PF not ready)
PLC	Programmable Logic Controller
PROG	Program (button)
Pset	Parameter set
PVT	Prevailing Torque

Abbreviation	Description
R chart	Range chart
RAM	Random Access Memory
RAS	Remote Access Server
RBU	Rapid Backup Memory
rpm	Revolutions per minute
RS232	Serial communication link
S4/S7/S9	Motor sizes in Tensor S tools
sec	second
SPC	Statistic Parameter Control
STAT	Statistic (button)
SW	Software
TNR	Tool not ready
Tq	Torque
Tq con	Torque control
Tq mon	Torque monitoring
TTPF	Tools Talk Power Focus (SW)
UCL	Upper Control Limit
UTL	Upper Tolerance Limit
V	Volt
VIN	Vehicle Identification Number
X-bar	The mean
X-bar-bar	The average of means
z	subgroup size, group size

3 Introduction to Power Focus

Power Focus is the latest generation of control and monitoring systems for advanced tightening technology. The system is designed for the modern assembly industry with high demands and stringent quality and efficiency requirements, and offers full modularity through the combination of hardware and software.

> **ⓘ** **This manual handles the ToolsTalk PF but is also applicable for Power Focus Graph. When programming on a Power Focus Graph display, we refer to the corresponding section in ToolsTalk PF.**

This section includes an overview of the system, and a brief description of the options and accessories. For more information about the available system parts and their functionality, contact your Atlas Copco representative and consult the relevant user guide or catalog.
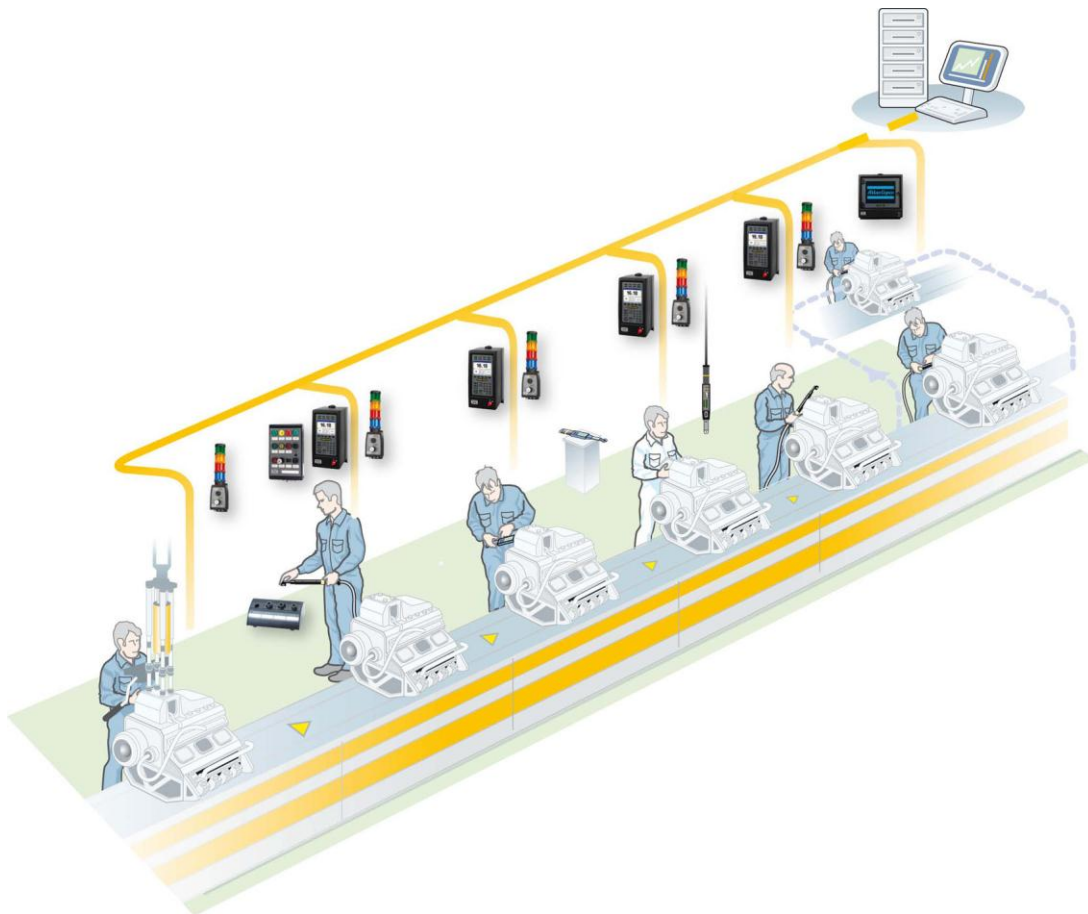
3.1   PF 4000

PF 4000 is a new generation of control systems suitable for most Tensor tools. Unlike its predecessor, PF 3100, PF 4000 is available in one model with two versions (Compact and Graph) that can handle all torque levels.

Advanced control functions built into Power Focus 4000 prevent the operator from deviating from the required process. When it receives assembly information, the programmed Job function automatically selects the correct tightening sequence and parameters. When combined with barcode scanning for component identification, the Job function offers traceable, zero-fault process control.

The controller is equipped with a USB connector for laptop access. It is located on the front of the unit for maximum accessibility. Communication is also possible over serial RS232, Ethernet TCP/IP and various fieldbus types.

PF 4000 Graph has an easy-to-read LCD color display. Statistical data is collected, analyzed and presented on the screen. Changes and trends in the assembly process are indicated by diagnostics and statistical alarms, such as SPC monitor charts and capability (Cpk) alarms. Alpha-numeric keys allow on-unit setup and easy checking of traces and statistics. PF 4000 Graph model has a very compact design, and a standardized mounting plate ensures easy installation at every workstation.

Completing the range, **PF 4000 Compact** has a basic operator interface with six-button keyboard and LED display. Pre-programmed using ToolsTalk PF and with a PC as the interface, it offers the same functionality as the Graph model.

PF 4000 Compact   PF 4000 Graph

> **For technical data, dimensions drawings, connections and spare parts list,**
> see *Product Information for PF4000 (9836 3113 00)*

3.2   PF 3000/3100/3102

The **PF 3000** is a control system for Atlas Copco Tensor S and DS tools. **PF 3100** is a control system for Atlas Copco Tensor ST tools (including functionality for S and DS tools). **PF 3102** is the control system for Atlas Copco Tensor SL tools.

> **Tensor STB tools require a communication kit to work with Power Focus 3100. The kit consists of a serial port adapter (access point); cable connector (supplies the serial port adapter with power).**

Two different hardware units are available, Graph and Compact.

PF 3000 Compact offers minimum hardware expenditure and is easily stackable for multiple tool configurations. **PF 3000 Graph** models offer full stand-alone programming via an integrated keyboard and large display located on the front panel of the unit. PF Graph can also be used as a terminal for one or more PF Compact controllers.

PF 3000 Compact   **PF 3000 Graph**

> **For technical data, dimensions drawings, connections and spare part list, see *Product Information for PF3000 (9836 2156 01).***
>
> **For PF 3102 controllers (SL tool drivers) only the Compact model is available.**

3.3   RBU

RBU (Rapid Backup Unit) unlocks a specified level of functionality and acts as a back-up unit for the configuration of PF. There are different types of RBU; Gold, Silver, Bronze, X (for ETX tool functionality) and DS (for Tensor DS tool functionality). The RBU Gold unlocks the full capacity and functionality of the Power Focus. Combine the RBU giving the required functionality with the chosen hardware.

For a list of the current RBU functionality, contact your Atlas Copco representative.

When an RBU is plugged in to an empty PF, the RBU configuration is transferred to the controller. This allows the quick installation and replacement of controllers on the assembly line.

3.4   ToolsTalk PF

ToolsTalk PF, a PC software package developed by Atlas Copco, offers easy and user-friendly programming and real time monitoring of Power Focus units. ToolsTalk PF is based on extensive experience and thorough analysis of existing manufacturing industry needs.

ToolsTalk PF can be installed on standard PCs running Windows XP, Windows 7 (32-bit), or Windows 7 (64-bit) [1] and communicates with PF via the serial port or via Ethernet TCP/IP. The real time monitoring functions include access to Cpk, Traces, Operator monitor, etc.

3.5   Communication

Built-in communication provides efficient use of modern communication technologies with Atlas Copco products. The Power Focus system can be built to suit the user's needs, from a simple system offering many functions, to a complete factory system. Using open standards like TCP/IP, it is possible to connect and communicate with external systems and allows global communication.

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[1] *Windows is a registered trademark of Microsoft Corporation in the United States and other countries.*
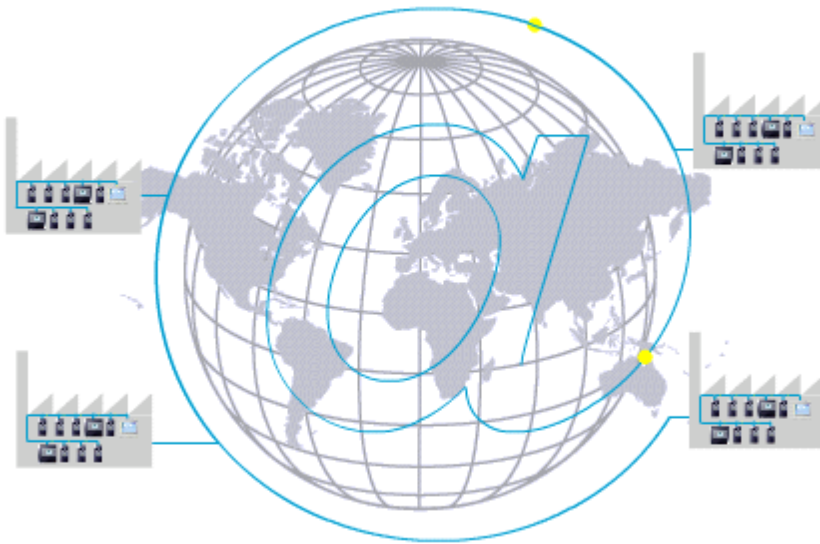
Communicate with one PF at a time via the serial connection or with a complete network of PF units via the built-in TCP/IP connection.

Power Focus communicates with a range of accessories via the internal I/O bus. PF units and accessories can be combined according to the customer's requirements.

The Power Focus can be configured to communicate via the most common buses on the market; ProfiBus, DeviceNet, InterBus, etc. Real time communication is done over a proprietary I/O bus for tool synchronization. Several outputs can be activated for communication with PLC's and other external equipment. Each PF has four relay contacts, four optic isolated inputs and a 24 V DC / 1 A internal power supply for external control circuits. All inputs and outputs can be configured using the ToolsTalk PF software. The number of digital inputs and outputs can be increased using an I/O Expander on the I/O bus.

With Power Focus, full networking capability is available in the controller as an integrated function, in relation to both hardware and software. ToolsNet is Windows NT compatible, which offers easy to use, effective database and data collection functions, using standard databases like SQL, Oracle and Microsoft Access. PF can be connected to a network for central programming and data collection using ToolsNet. With the modular concept, the Power Focus is the building block used to create complete and cost efficient solutions that satisfy the various needs of modern industrial assembly operations.

3.6   Tensor tools

This is a brief overview of Atlas Copco Tensor tools and tool accessories. See tool specific information for a complete list of tools and options for each tool.

Tensor STB communicates with the tightening controller systems through wireless digital communication, built on IRC (Industrial Radio Communication) technique.

Tensor ST tools communicate with controllers through digital communication, allowing new tool features and greater flexibility due to not so many wires and leads. Compared with a Tensor S tool, it is also lighter with improved accessibility.

Tensor SL is a range of low torque transducerized tools based on Tensor ST technology.

Tensor S tools are available in different configurations and motor types. Fixtured applications can easily be installed and integrated with standard Atlas Copco components.

The ultra-compact **ETX tool** is designed for fixtured applications.

Atlas Copco's **Tensor DS** tools have no transducer. Instead of receiving an electrical signal from a strain gauge, the tool derives the torque from several relevant parameters, such as voltage, speed, temperature and current.

An **open-end** tool (or tube nut tool) is a Tensor tool equipped with an open-ended head. It is used to tighten nuts on tubes and similar applications. The open-end is available for several, but not all, tools.

⚠️   **Open-end tools can only be used with lock-off lever for personal safety reasons.**

Tool parts

Figure shows Tensor ST.
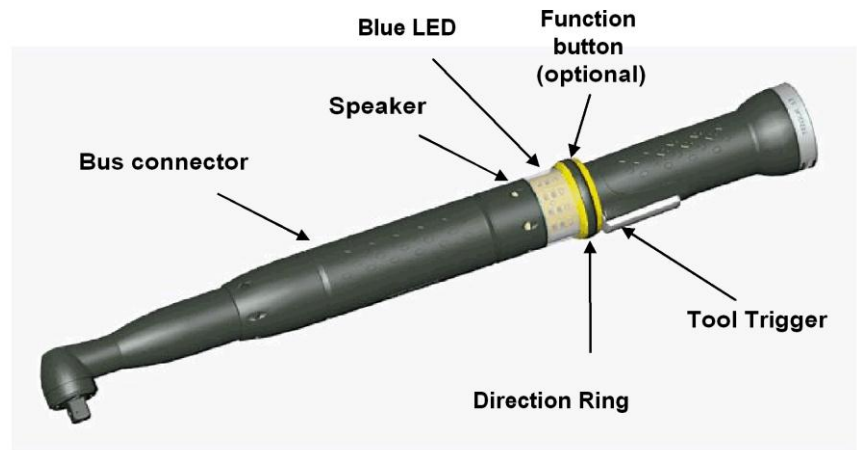
STwrench is a torque wrench that can be controlled by the Power Focus. The STwrench communicates with the tightening controller systems through wireless digital communication, built on IRC (Industrial Radio Communication) technique.

3.6.1 Tool accessories

See Atlas Copco tool specific information for a list of options for each tool.

ST scanner is placed on the tool and works as a barcode reader. For more information about the function of identifiers, see section *Identifier*.

GPIO (General purpose I/O) is a digital input and output connector. The four buttons combined with four LED's can each be configured as a digital input and/or digital output.

ST selector has two different modes, mode 1 and mode 2. In **Mode 1,** the selector only utilizes the tool accessory bus as GPIO. This mode only supports a maximum of 15 Psets (1-15). In **Mode 2,** the selector takes full advantage of the bus capabilities.

For more information about the ST selector, see section *ST-selector connection.*

TLS ST Tag is an external positioning unit for positioning of the tool in the surroundings. The unit also has a 7-color LCD indicator for sending status messages to the operator.

3.7 Hardware accessories

The Power Focus concept features a number of accessories that simplify the guidance and follow-up of performed tightenings. The accessory functions can be set up using ToolsTalk PF or a PF Graph unit.

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 Power Focus. This arrangement increases flexibility and quick installation.

Power Focus uses 24 V DC, 1 A to power the bus, which is also used to power external I/O's. If more current is needed, the bus must be powered externally. Every device has a 24 V DC input for this purpose.

I/O Expander enables the connection of several 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/O's. Each input and relay can be configured individually.

I/O Expander, sealed

The sealed I/O Expander is designed for more demanding environments than I/O Expander. It will add eight digital inputs as well as four digital and four relay outputs to your system.

Indicator Box is a flexible display indicator used together with our Start handle for indication of status signals from the controller. The box can easily be connected to the Power Focus with premade cablings.

Socket Selector is a socket tray with LED's that can be used to guide the user through, for example, a Job sequence. 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.

The Socket Selector is available with four or eight sockets, and communicates on the I/O bus.

Operator Panel is an external device for PF. It is a general purpose lamp- and switchbox, replacing the customer specials that are made today. The Operator Panel communicates directly with Power Focus and the device configuration is made in ToolsTalk PF.

Stacklight ESL-04 is a flexible light and switch device designed to interface with controllers equipped with an I/O Bus.

Stacklight DSL-03 is a simple and customizable light and switch device, designed to interface with controllers equipped with Internal I/O connectors instead of I/O-bus.

The stacklight comes with features such as buzzer, rotating light etc.

MiniDisplay is a compact remote interface. It runs the Operator Guidance application program to give the operator visual support. It is equipped with a touch-screen and is fully configurable. The MiniDisplay is connected through Ethernet and does not support I/O-bus communication.

3.8 Software accessories

3.8.1 ATS

The ATS (Assembly Tools Software) works together with PF to complete the tightening process. The following software products are part of ATS.

ToolsNet

ToolsNet works together with the controllers and the selected database, MS SQL Server or Oracle to collect, store and visualize all historic tightening-related data. ToolsNet allows the user to get reports on shifts, lines, individual vehicles or controllers for process improvement purposes. All the reports can easily be exported to Excel.

- ToolsNet can be used as a standalone product or together with the other modules from the ATS.

Factory Overview

Factory Overview is the portal to the tightening process. It visualizes the whole process and makes it possible to monitor all tightening applications from one central place. Factory Overview can be used both as a standalone product and together with the other modules from the ATS.

Event Monitor

Event Monitor offers real-time event reporting from the controllers in a centralized and filtered format.

Event Monitor can be used both as a standalone product and together with the other modules from the ATS.

Open Protocol

The PF open protocol can be run using Ethernet or serial communication. It is a full duplex protocol, which means that data can be exchanged in both directions simultaneously. Every communication partner must be able to operate a send and receive facility simultaneously.

The torque controller is the server and the station computer the client. The torque controller can accept up to 5 connections at a time. The protocol used is TCP/IP.

3.8.2   ACTA 4000

An **ACTA 4000** performs a full range of functions, from simple torque checks to advanced graphic tightening analysis. It comes in different models and it is easy to upgrade.

ACTA 4000 measures torque, angle, and pulses and facilitates the conduction of statistical analyses of the tightening process. An ACTA 4000, together with the ToolsTalk QAT PC utility, is a complete SPC tool.

4 Connecting devices

This section describes the connections on PF backplane. It also describes the start-up process for PF and for the tools.

4.1 PF connections

Backplane connections

1	Digital input + internal 24 V DC
2	Relays
3	Ground Fault Interrupter (GFI)
4	Serial #1 (RS 232) to MC-card
5	I/O Bus #1
6	I/O Bus #2
7	Remote start
8	Main fuse
9	Main fuse power connector
10	Ground connection
11	Fieldbus card (optional)
12	RBU
13	Ethernet
14	Serial #2 (RS232) to CC-card
15	Printer
16	Tool output
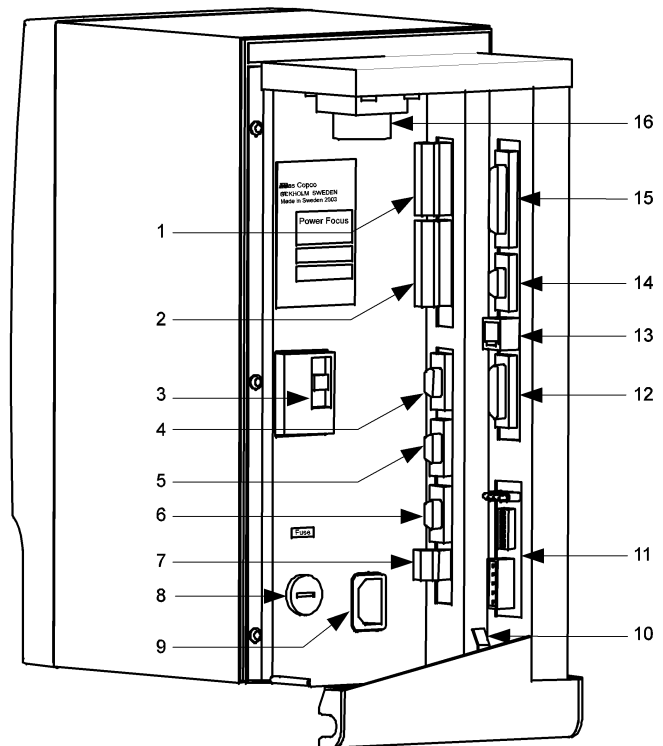
In addition to backplane connections, PF4000 has a USB connection on the front underside.

4.2   RBU

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

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

The RBU unlocks the software and works as a backup memory for the Power Focus setup data.

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

Connector: 15-pin D-sub female.

Function: For connection of Atlas Copco RBU.

4.2.1   MAC-address

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

ℹ️   **Cell network connection requires PF units with identical RBU types inserted.**

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

Example: RBU with serial number C00015767:

- 00015767 (decimal) → 003D97 (hexadecimal)
- 003D97 (hexadecimal) → 00-50-D6-00-3D-97 (MAC address)

4.2.2   PF start-up instructions

At start-up, the Power Focus checks for differences 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 PF units by using the RBU. The user is also given the possibility to clear both configurations.

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

Press the plus (+) or minus (-) key on PF Compact front panel to toggle between the selections. Confirm selection with the enter key. Press the corresponding soft key to make a selection on PF Graph.

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

Message at start-up	Action
No message	The memory areas of PF and the RBU are identical, and the checksums are correct.
Clear / RBU / PF	The memory areas of PF and the RBU show correct checksums, but they are different. You need to decide which memory content to use before continuing, or whether to clear both.
PF / Clear / Stop	The memory area of PF shows correct checksum, but the checksum of the RBU is incorrect, which could indicate a hardware problem. You can select between using PF setup or clear the memories.
RBU / Clear / Stop	The memory area of the RBU shows correct checksum, but the checksum of PF is incorrect, which could indicate a hardware problem. You can select between using the RBU setup or clear the memories.
Clear / Stop	The memory areas of both PF and the RBU show incorrect checksums, which could indicate a hardware problem. Your option is to clear the memories.

⚠ **Changing RBU will clear the tightening result database in Power Focus.**

ℹ **Selecting "Stop" will only prevent the result database from being erased if the RBU has been changed between RBU Silver and Gold (provided the previous RBU is re-inserted). A change between RBU Gold and Silver, or bronze and DS will clear the result database even if selecting "Stop". If PF is turned on with no RBU or a PF Graph is turned on with a RBU bronze the tightening result database will be cleared without querying the user.**

4.3   Tool connection and start-up

4.3.1   Tools with cable connection

ST and SL tools are used together with a cable, especially designed for the particular tool type. The cables are equipped with memory devices used for storing information about the tool cable, number of tightenings etc. This information can be viewed in the Accessories branch.

An ST tool can be connected and replaced when the PF is powered up. For S tools, use *T460 Disconnect* to replace tool without losing data.

4.3.2   **Tensor STB**

For connection of the wireless Tensor STB, ensure the correct tool connection is configured before starting the pairing procedure. See PF parameters under **Tool > Configuration > Connection and Tool > Configuration > Radio**. For instructions on the pairing procedure, see Tensor STB documentation.

1	Bus connector (hidden)
2	Buzzer
3	LEDs
4	Function button
5	Battery
6	Direction ring
7	Tool trigger

STB tool

> ℹ **Check tool documentation for compatibility between tool, PF and RBU.**

4.3.3   **Start-up instruction for open-end tools**

The start-up instruction is recommended every time an open-end tool connected PF is started up (rebooted), or a hot swap of the tool has been made. The advantages of this are a faster tool rotation to the open-end position, possibility to select *C230 OE forward positioning*, and automatic generation of alarms. Note that the operator has the possibility to perform tightenings without completing the start-up configuration.

To do a start-up configuration, follow these steps:

1. Reboot PF (or make a tool hot swap).

2. Press the tool trigger on the open-end tool once. The tool head rotates slowly in order to find a reference position. The tool should now alternate between tightening and positioning when pressing the tool trigger.

3. Perform ten consecutive tool trigger pressings without installing on a joint; five tightenings and five positionings, and let the open-end head rotate at least 360 degrees for every tightening. **Note that during this setup phase the OE positioning type is torque based reverse and the max torque positioning limit is not valid**.

4. After five correct tightenings and five correct positionings, the open-end head should rotate with a faster speed meaning that correct reference point had been set.

If an open-end positioning fails (which happens if positioning is performed with a tool head fixed on the tube), more tightenings and positionings are needed.

> **To perform an open-end tuning, see section *Open-end tuning*.**

4.3.4   Wireless tools

For wireless tools, performing a start-up configuration every time the battery is changed would be ineffective for the operator. Therefore, there is no start-up configuration for STB. Instead, when the trigger is first pressed after a battery change, the tool rotates slowly in order to find its reference position. Alternatively, if the operator has selected open-end tuning on PF before pressing the trigger, an open-end tuning is run. After a successful open-end positioning or open-end tuning, the tool is ready.

4.3.5   ST GPIO connection

The four buttons combined with four LED's can each be configured as a digital input and/or digital output.

Pin	Function	Input	Output	Duration	Time
1-4	Input or output	Logical function	Logical function	Output duration	Duration time

4.3.6   ST-selector connection

Keep the left button on the selector pressed when powering up (this is done by
hot swapping the tool or powering up PF). The selector will now enter the
configuration mode.

Press the right button on the selector to toggle between mode 1 and 2. Confirm
mode selection by pressing the left button.

Pin	Function (input)
4	Pset Select bit 3
3	Pset Select bit 2
2	Pset Select bit 1
1	Pset Select bit 0

If Mode 1 is selected the number of Psets (1-15) to use must now be set. Press the right button to select
the number of Psets to use. Use the left button to confirm. The selector is now ready to use. When using
mode 1 parameter *T210 Mode* must be set to "GPIO" with the GPIO device configured according to the
table to the right. Parameter *C200 Pset* must also be set to "DigIn".

If Mode 2 is selected the *T210 Mode* must be set to "ST bus". Parameter *C200 Pset* also must be set to "ST
selector". The selector has a number of configurable parameters (see table below).

Selector parameter	Selections
Left button and right button	Off: button disabled. Next Pset: select next Pset. Previous Pset: select previous Pset.
LED status	Off and On
Display[1]	Off: display disabled. Pset no.: displays selected Pset number. Pset target: displays selected Pset target value (torque or angle). Result: displays the tightening result. Pset no. + result: toggles between Pset number and tightening result [2]. Pset target + result: toggles between Pset target and tightening result [2]. Pset no. + Pset target: toggles between Pset number and target [2]. Pset no. + Pset target + result: toggles between Pset number, target and tightening result [2].

[1] Event codes always displayed, except for "Off"

[2] The Pset number (or Pset target) is displayed until a tightening result is generated. The tightening
result is displayed until the next tightening is started or a new Pset is selected. In mode "Pset no. + Pset
target" the Pset number and target toggle will show on the display until a result is generated.

4.4 Printer

Connector: 25-pin D-sub 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		

4.5 Serial connection

There are two serial connection ports.

> **The ToolsTalk PF software must be connected to RS232 port 2.**

It is necessary to check if connected device is fully supported by PF and properly configured. If device responds to unrecognized commands with error messages or sends unexpected data it can invalidate functionality.

4.5.1 Serial RS232 #1

Connector: 9-pin D-sub female

Function: RS232 serial

Connections: This port is used for communication with minor load, for example scanners.

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	Not used
9	Not used

4.5.2   Serial RS232 #2

Connector: 9-pin D-sub female

Function: RS232 serial connection. Use Atlas Copco serial cable to connect to a PC.

Connections: This port is used for communication with high load, such as ToolsTalk PF or Open Protocol. It can also be used for connection with scanners.

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

4.6   Ethernet TCP/IP

Connector: Shielded RJ45 for 10-baseT connection

Function: 10 Mbit half duplex Ethernet communication

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

4.7   Digital inputs

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

Function: Isolated optic-coupled digital input. Logical function is set in the configuration of the Power 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).

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)
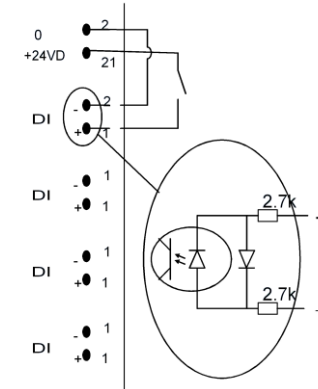
4.8 Digital outputs (relays)

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

Function: Two ways dry contact relays, isolated outputs. Logical function is set in the configuration of the Power Focus.

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

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
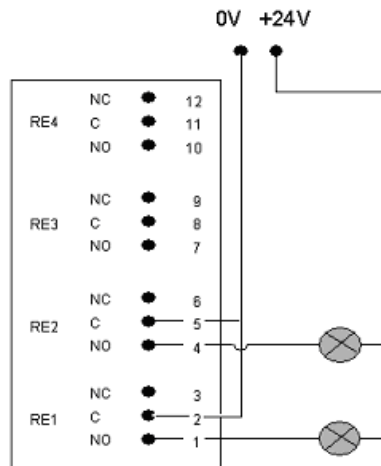
4.9   24 VDC output

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.

4.10   I/O Bus

There are two I/O bus connectors.

Connector: 9-pin D-sub male.

Function: To connect Atlas Copco I/O bus accessories and interconnect several PF units in Synchronization mode. I/O bus connector #1 is parallel with I/O bus connector #2.

There is a range of Power Focus accessories that connect over the proprietary Power Focus I/O bus, for example Socket selector or I/O Expander.

To have a well functioning I/O bus, always use bus connectors. All accessories and PF units are equipped with two parallel connectors. When all cables are connected, plug a lead into the empty connector. I/O bus connectors #1 and #2 are fully parallel and can be used in any combination.

For I/O bus Sync configuration information, see section *Sync*.

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)
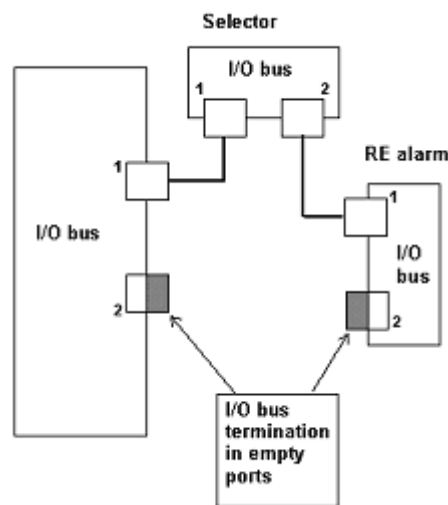
4.11   Remote start connector

Connector: 4-pin detachable screw terminal. Mating connector phoenix MCVR 1.5/4-ST-3.81 or compatible.

Function: Remote start input for use with external start switch. To run tool in reverse, first close the reverse switch and then close the start switch. Pin 1 and 2 must be connected at power on to be able to use the built-in tool trigger. If remote start is to be controlled from other inputs (I/O Expander, Sync, fieldbus or digital input), pins 2 and 4 must be connected at power on.

Pin	Function
1	Tool built-in start switch
2	Common
3	Remote reverse
4	Remote start

Remote start wiring diagram

Remote Control

Start and direction controlled from the tool trigger.

Start and direction controlled from I/O bus, FieldBus or DigIn.
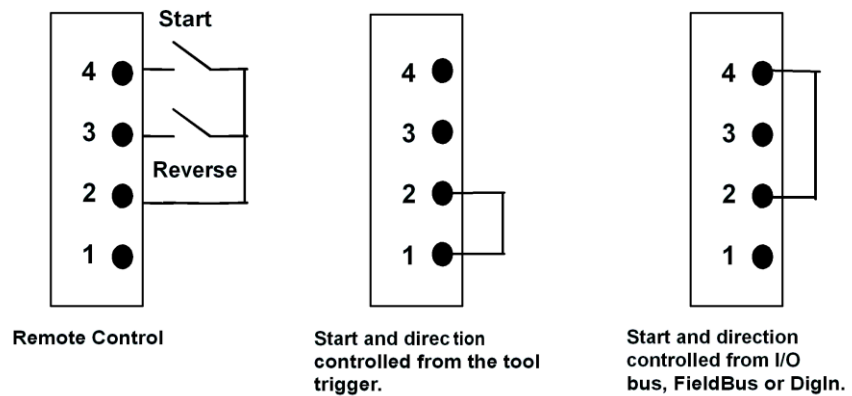
Remote start is not available for Tensor STB tools.

Make sure that the power is switched off when changing the remote start connector.

4.12   Main power connector

Connector: IEC320

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

5 PF user interface

This section describes the PF user interface. Except for differences in the user interface, PF Graph and PF Compact have the same functionality and capacity.

ℹ️ **For a description of connections, see section** *Connecting devices***, or documents** *Product Information for PF3000 (9836 2156 01),* **or** *Product Information for PF4000 (9836 3113 00).*

5.1 PF Graph

PF Graph can be programmed in ToolsTalk PF, through a pre-programmed RBU, or by using the function buttons on the front panel. Another PF can also be programmed by the Graph unit if both controllers are members of the same cell. A Pset can also be programmed directly via the unit's Auto set function.

5.1.1 Front panel

The front panel of PF Graph consists of a display, indicator lights, keys and a red and white power switch.

Number	Part	Description
1	Indicators	Eight indicators
2	Display	The front panel has a configurable color display. A power-save function deactivates the backlighting on the display if it is not used for 30 minutes.
3	Soft keys	Five soft keys with functionality according to the display
4	Function keys and keyboard	Used to program PF.
5	Power switch	Red and white power switch.

Indicators

Indicator	Description
OK	The OK light indicates when the result of the tightening is within the specified limits. The indicator remains active until the next cycle starts. OK flash light indicates that it is safe to disconnect the tool. The LED goes off when the tool is disconnected.
n x OK	The n x OK light indicates when the number of approved tightenings corresponds to the number (batch size) programmed into PF. The indicator remains active until the next cycle starts.
NOK	The NOK red light indicates when at least one result of the tightening falls outside the specified limits. The light is active until the next cycle starts. NOK flashing red indicates that it is NOT safe to disconnect the tool. The LED goes off after three seconds.
JOB OK	The JOB OK light indicates when the result of the Job is finished. The light remains active until the next cycle starts or when the system is reset.
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 an active alarm that does not need to be acknowledged, i.e. service indicator alarm.
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.
Autoset (arrow target)	The Auto set light indicates when the Auto set programming function is active. The light goes off when Auto set is finished.
PROG. CONTROL (padlock symbol)	If PF is in programming mode the Programming control light (illustrated by an open padlock) flashes green. Programming control can be undertaken via the unit itself, via another PF Graph or via ToolsTalk PF. A steady green light indicates that the programming keys on the front panel are unlocked.

Soft keys and keypad

Key	Description
Soft keys	Each **soft key** is used to select an option or a menu block from the display.
Channel [+/-]	Select another controller within the configured cell.
Pset [+/-]	In result mode: Select Pset to use if C200 is set to PF keyboard. In programming mode: Select Pset or Job to configure.
Question Mark [?]	Pressing the **Question mark** key displays information about the software, RBU type and the connected tool.
Print symbol	Press the Print key to do a print-out to a connected printer.
Arrows	Up and down arrows: Scroll up and down in the menus Left arrow: Leave current option or view Right arrow: Execute selected function, select current option or view
RESULT	Select result mode. Menu block **View** has options for the result view.
PROG	Select programming mode.
OK	OK is used to execute selected functions and acknowledge event.
CANCEL	Cancel the current operation and return to the previous view.
Keypad	Numeric keypad. Press repeatedly to toggle between letters and numbers
CL	Clear the last input letter or number.
ENTER	Enter is used to activate inputs in the programming blocks

5.1.2   Display

PF 4000 Graph features a large back-lit 72 x 96 mm color display with a dialog box-like interface to allow accurate measurement readings and simple programming.

Header with three fields: channel number and current Pset or Job, Pset name, and number of tightenings (in batch). If the field is light-blue, this indicates that the displayed information is inactive or from another PF.

Result or **Programming** dialog box. Available result view options are shown under the **View** menu block. This figure shows the **Last Results** view for one channel.

The last result lower windows are configurable.

Menu blocks representing programming tree functions, short-cuts, arrows. The menu blocks are controlled by the **soft keys** below.
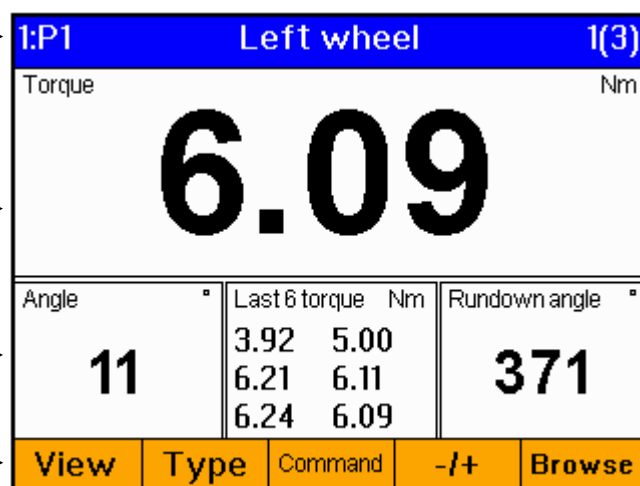
Menus

The **Menu blocks** are located at the bottom of the display. Each **soft key** is used to select a menu block.

When selecting a menu block with more than one item, a pull-up menu appears on the display.

To select an option, do one of the following:

- Keypad: Press the digit on the numeric keypad that corresponds to the desired option.

- Soft keys: Scroll up or down using the soft keys under the arrows. Then press the soft key under **Enter**, or press **ENTER** on the keypad.

- Arrows: Scroll up or down using the arrows. Then press the right arrow to confirm the selection.
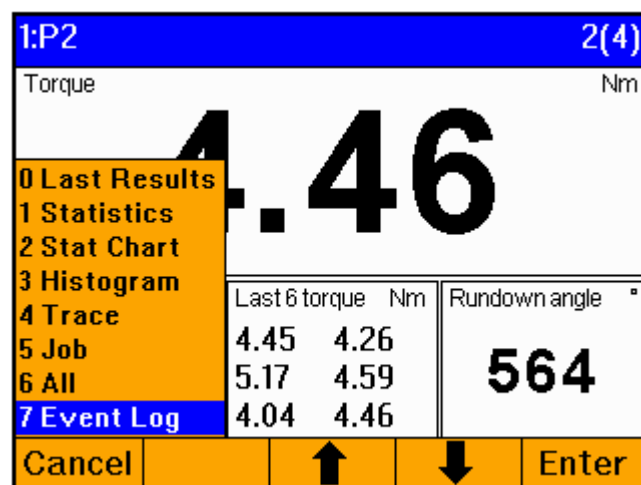
Data input

To access the data input boxes, do one of the following:

- Highlight it and then press **ENTER**.

- Press the digit on the numeric keypad that corresponds to the option.

To enter data, do the following:

- If it is a text box, use the keypad and press until the desired figure, letter or symbol appears. Press **ENTER** to confirm and exit the data field.

- If it is a selection list, do one of the following:

  o Use the soft keys under the arrows to highlight the desired parameter. Press **ENTER** to confirm and exit the selection list.

  o Press the digit on the numeric keypad that corresponds to the desired parameter to confirm and exit the selection list.

Press **Store** to save the changes in the controller and stay in the current display.

Press **OK** to confirm changes and return one level up in the menu tree. More changes can be made before storing.

Press **Cancel** to cancel any changes and leave the dialog box.

Text box

Selection list

5.1.3   Programming PF Graph

To program PF Graph, do the following:

Press **PROG**. The padlock symbol starts blinking to show that the PF Graph has programming control, and the programming menu is displayed. Select and fill in applicable parameters.

ⓘ **If another person or program has programming control, a message is displayed.**

When a change has been made, **Store** is shown in a lighter color. Press the soft key below **Store** to confirm changes.

Press **RESULT** to return to the result view.

Programming another PF

To program another PF through PF Graph, both channels have to be members of the same cell. The cell configuration is done through ToolsTalk PF.

Press the **Channel -/+** to access other controllers in the cell from the menu tree in the programming mode or from the result view. Do the applicable programming.

Changing IP address

To change IP address on a controller in the network, do the following:

Press **PROG** and then **4,3,0,0** to open the IP address dialog box.

Use the keypad to enter the correct IP address.

Press **Store** and then **RESULT** to confirm changes and return to the result view.

To change IP address on other channels in the cell, do the following:

Press **Channel -/+** to access the correct controller. This can be done from the menu tree in the programming mode, or from the result view.

Change the IP address.

Press **Store** and then **RESULT** to confirm changes and return to the result view.

Programming the last result view

The last result view can be programmed to show different parts of the last result, and also to show the result from one or two channels.

Press **PROG** and then **4,5,1** to open the result view.

Press **0** or **1** to select one or two channels.
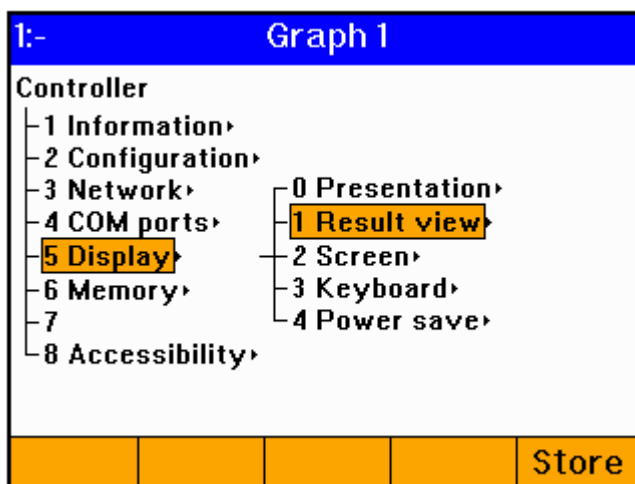
The programming mode for the result view is displayed.

Press the number in the area to edit, then press **Enter** to open the selection list for the result view area. Make a selection and proceed with the other result view areas.

To view more than one channel, press **3** or **4** to access the lower part of the result view. Select another PF with **Channel -/+**, and another Pset with **Pset -/+.**

Press **Store** and then **RESULT** to confirm changes and return to the result view.
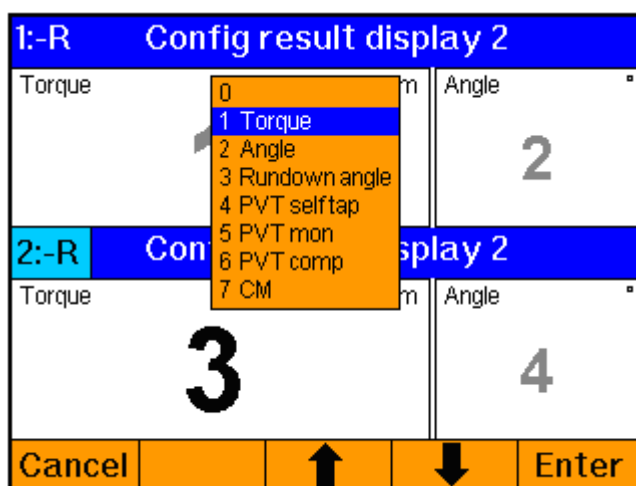
In the result view, press the **Type** soft key and select two channels to show the result from two channels. The upper part displays the viewed channel and the lower any selected channel in the cell. **R** means running Pset.

Print reports

The print key opens the print menu.

If print is selected from, for example the controller menu, the controller report is pre-selected.

```
0:P1                                    -(-)
        Select print report
┌────────────────────┐
│ 0 Result report    │      1 Pset
│ 1 Pset report      │      ┌───┐
│ 2 Multistage report│      │ 1 │
│ 3 Job report       │      └───┘
│ 4 Controller report│
│ 5 Accessories report│
│ 6 Tool report      │
│ 7                  │
│ 8 Identifier report│
│ 9 Trace report     │
│ ▼                  │
└────────────────────┘
Cancel        ⬆      ⬇      Enter
```
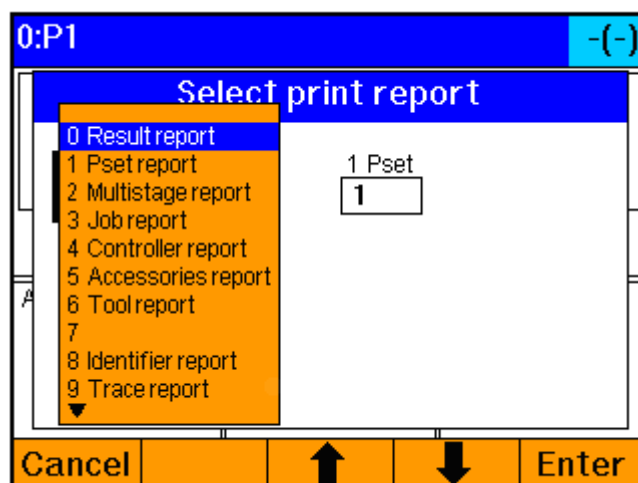
Trace

One or multiple traces can be shown in the PF Graph display.

To show traces select **Trace** in the **View** menu block. Select which type of chart to view via the **Type** menu block.

```
0:P1                                    -(-)
Torque                                   Nm
        9.01
0 Last Results
1 Statistics
2 Stat Chart
3 Histogram   ┌─────────────┬──────────────┐
4 Trace       │Last 6 torque Nm│Rundown angle °│
5 Job         │ 9.10   9.02 │              │
6 All         │ 9.10   9.03 │  -------     │
7 Event Log   │ 9.34   9.01 │              │
Cancel        ⬆      ⬇      Enter
```
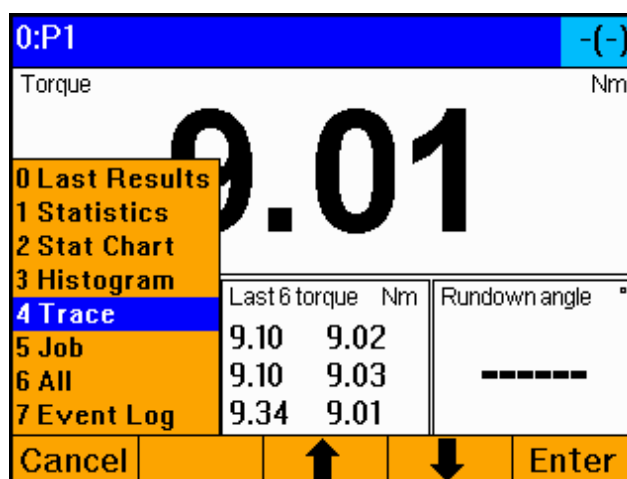
In **Torque over time** trace mode it is possible to plot several traces in the same chart. This is done by accessing the **Select** menu block and activating **Multiple Traces**. The last ten traces are displayed in the chart. The chart is scaled according to the reference. If a reference is not selected the chart is scaled according to the first plotted trace.
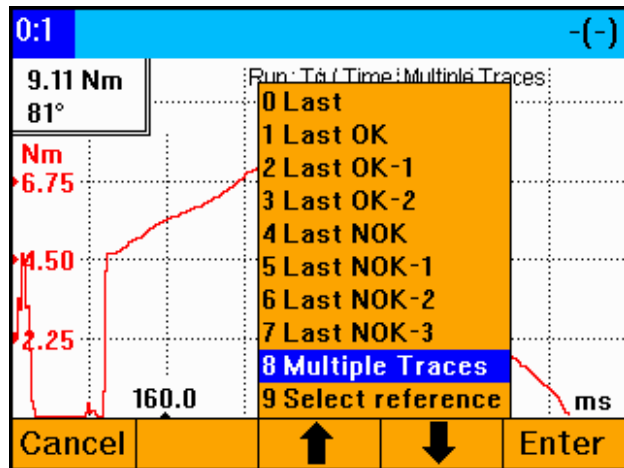
In **Multiple Traces** mode a tightening trace can be set as a reference by using the **Select reference** command. The last tightening trace is set as the reference. When a reference is selected, all traces except the reference is cleared. The reference that is shown in red color is stored in the memory and is available after reboot. In **Select reference** mode the last nine traces and the references are displayed in the chart.
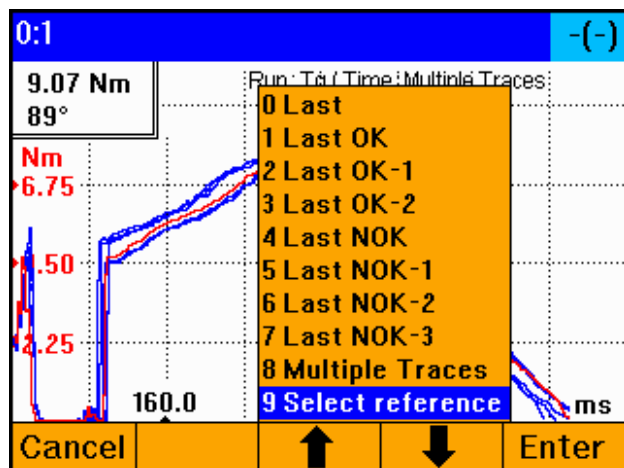
5.2   PF Compact

PF Compact can be programmed in ToolsTalk PF, through a pre-programmed RBU, or programmed using the cell function on a PF Graph. A Pset can also be programmed directly via the unit's Auto set function. Except for differences in the user interface, PF Compact has the same functionality and capacity as the Graph model.

5.2.1   Front panel

The front panel of PF Compact consists of a display, indicator lights, keys and a red and white power switch. The display is set up using parameter *C512 Compact display*.

PF 3000

PF 4000

Number	Part	Description
1	Display	The front panel contains a 4-digit, 7-segment display.
2	Power Switch	Red and white power switch.

5.2.2　Display

After a tightening, result is presented on the display in configured presentation unit. If the presentation value is bigger than 9999, display shows 'EEEE'.

Engineering unit	Convert factor
Nm	1
Nm to Ozfin	141.6
Nm to Lbfin	8.851
Nm to Lbfft	0.737562
Nm to Kgfm	0.101972
Nm to Kgfcm	10.197162

Torque is presented as real numbers in the following format. The decimal point indicates that the number is a torque value.

Torque (engineering unit)	No of decimals
0.00 – 9.99	2
10.00 – 99.99	2
100.0 – 999.9	1
.1000 – .9999	0

> **In the 1000-9999 interval, a decimal point is located to the left of the first digit to distinguish torque values from angle values which do not have a decimal point. The reason to the left position is HW related on the display card.**

Angle values are presented as integers in the interval 0-9999 degrees. When a tightening result is composed by torque and angle, the display alternating shows the torque and angle result (changes every 0.8 sec)

During tightening, the P-set number is displayed. Events are presented on the display with an event code, being a 3 digit number preceded with an 'E'.

5.2.3   Indicator lights

Indicator	Description
OK	The OK light indicates when the result of the tightening is within the specified limits. The indicator remains active until the next cycle starts.
	OK flash light indicates that it is safe to disconnect the tool. The LED goes off when the tool is disconnected.
NOK	The NOK red light indicates when at least one result of the tightening falls outside the specified limits. The light is active until the next cycle starts.
	NOK flashing red indicates that it is NOT safe to disconnect the tool. The LED goes off after three seconds.
JOB OK	The JOB OK light indicates when the result of the Job is finished. The light remains active until the next cycle starts or when the system is reset.
n x OK	The n x OK light indicates when the number of approved tightenings corresponds to the number (batch size) programmed into PF. The indicator remains active until the next cycle starts.
ALARM	The ALARM indicates that an alarm message needs to be acknowledged. The light is active until the message is cleared. The alarm light can also flash indicating an active alarm that does not need to be acknowledged, i.e. service indicator alarm.
PROG. CONTROL (padlock symbol)	If PF is in programming mode the Programming control light (illustrated by an open padlock) flashes green. Programming control can be undertaken via the unit itself, via a PF Graph or via ToolsTalk PF. A steady green light indicates that the programming keys on the front panel are unlocked.
	If PF Compact keypad is locked, the only keys on the controller that can be used are question mark and enter. (If the keypad is unlocked, steady green, any key can be accessed.)
AUTO SET (graph symbol)	The Auto set light indicates when the Auto set programming function is active. The light goes off when Auto set is finished.
STAT	The STAT light indicates when the calculated values fall outside statistical control limits. The light remains active until the values are within the control limits or the memory has been reset.

5.2.4   Keypad

Key	Description
Plus [+]	Navigates through menus on the display and increases numbers.
Minus [-]	Navigates through menus on the display and decreases numbers.
Autoset (arrow target)	Press the **Autoset** key to enter Autoset programming mode. Aset/Ft alternates in the display and the Autoset LED comes on. Press **Enter**. Change the *P113 Final target* value (if required) by pressing the **+/- keys**. Press **Enter** to select the *P113 Final target*. Aset is shown in the display. Perform a number of tightenings. When Autoset is ready, the selected Pset number is displayed and the Autoset LED goes out. To abort Autoset press the **Autoset** key (exit and no save).
Question Mark [?]	Pressing the **Question mark** key displays the following information: **RBU License level: rbu** toggle with RBU type. Au = Gold, Ag = Silver and Br = Bronze.**Software version**: **rEL** followed by version number rolls on the display from right to left. **Tool model name: type** toggles with the tool model name.**Current Pset**: **Pset** toggles with the current Pset ID, e.g. P1. **Current Job**: **Job** toggles with the current Job ID, e.g. J3.
Enter	The **Enter** key is used to execute selected functions and for event acknowledgement.

Function Key [F]	Description
General	Press **F** (Function key) to display functions. To display function F1 press **F** once, to display function F2 press **F** twice etc. Press **Enter** to access and edit a function. When finished, press **F** repeatedly to display result mode again (or else it takes 30 seconds for the screen to update automatically). Note: The functionality is dependent on the RBU version.
F1 Setting Final Target value	F1/Ft alternates in the display. If no Pset is selected F1/---- is displayed. Press **Enter** to select a new *P113 Final target* value. Change the value by pressing the **+/- keys**. Press **Enter** to save and exit. Press **F** to exit (no save).
F2 Setting Torque Tune Factor	F2/tunE alternates in the display if the selected *P100 Control strategy* is equal to DS control. Otherwise F2/---- is displayed. Press **Enter** to access the torque tune factor. Change the value by pressing the **+/– keys** (range 80% - 220%, default value 100%). Press **Enter** to save and exit. Press **F** to exit (no save).

Function Key [F]	Description
F3 Motor tuning	Press the **F** key three times. F3/tool alternates in the display if a tool is connected. Otherwise F3/---- is displayed. Press **Enter** to activate the motor tuning process. The display shows the process status during progress, (1 to 7). Press the **Tool trigger** to start motor tuning. The trigger must be pressed during the entire process. Release **Tool trigger** or press **F** to abort the motor tuning process. When the motor tuning process ends, done (for succeeded) or Err (for failed) is displayed. After a few seconds F3/tool starts alternating on the display.
F4 Selecting Pset	F4/Pset alternates in the display if the *C200 Pset* is set to PF 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 Disconnect tool	F6/DISC alternates in the display if a tool is connected. Otherwise F6/---- is displayed. If safe to disconnect tool is rolling on the display press **Enter**. The tool may now be disconnected. If Fail is displayed, DO NOT disconnect the tool. Press **F** or **Enter** to exit.
F7 Sync motor tuning	Press the **F** key seven times. F7/stun alternates in the display. Press **Enter** to activate the Sync motor tuning process. The display shows two numbers simultaneously during progress. The number to the left is the percentage of Sync member that has finished motor tuning, and the number to the right is the process status (1 to 7). Press the **Tool trigger** on the Sync reference to start Sync motor tuning. The trigger must be pressed during the entire process. Release the **Tool trigger** or press the **F** key to abort the motor tuning process. When the motor tuning process ends, done (for succeeded) or Err (for failed) is displayed. After a few seconds F7/stun starts alternating on the display.
F8 Controller IP settings	Press the **F** key eight times.F8/IP alternates in the display. Press **Enter**. Addr is shown. Press **Enter** to edit the first part of the IP address. Increase/decrease the number by pressing the **Plus/Minus** keys. Press **Enter** to confirm and edit the second part of the address. Repeat the procedure for all remaining IP address parts. Press **Enter**. Sub is shown. Press **Enter** to edit the first part of the subnet mask. Increase/decrease the number by pressing the **Plus/Minus** keys. Press **Enter** to confirm and edit the second part. Repeat the procedure for all remaining subnet parts. Press **Enter**. rout is shown. Press **Enter** to edit the first part of the default router. Increase/decrease the number by pressing the **Plus/Minus** keys. Press **Enter** to confirm and edit the second part. Repeat the procedure for all remaining router parts. Event code *E857 Reboot needed before changes take effect* will be blinking on the display when finished, if any changes have been made. Press **Enter** to acknowledge the event. **Restart** PF.
F10 Wireless tool pairing mode	Press the **F** key ten times. F10/pair alternates in the display. Press **Enter** to activate the pairing process. The display shows the process status during progress (1 to 5). Event code *E550 Radio contact with tool established, tool accessible* is shown on the display when finished.

6   Getting started with ToolsTalk PF

ToolsTalk PF is an application that acts as an interface between the user and the Power Focus. It is used for programming and monitoring Power Focus from a PC.

With ToolsTalk PF installed, users can communicate with the Power Focus via the serial port (RS232) as well as over the Ethernet.

Ethernet communication makes the management of Power Focus easy and efficient, since ToolsTalk PF can be installed on a PC anywhere in the network.

ToolsTalk PF serves as an interface between the user and PF. With ToolsTalk PF, users can create and edit instructions and settings for the controller. The settings needed to control the tightening process performed by the Power Focus include; tightening strategies, control parameters, torque parameters, angle parameters, speed and ramp parameters and time parameters.

The settings are transferred to Power Focus via an Ethernet connection, via the serial port, or via the USB port on PF 4000. Process data can be collected from the Power Focus and monitored in real-time. ToolsTalk PF makes management of Power Focus easy and efficient, since the software can be installed on any PC on the network.

ToolsTalk PF is fully compatible with Microsoft Windows and supports widely accepted communication protocols such as; Ethernet, TCP/IP and RS232 (serial communication).

6.1   Installing ToolsTalk PF

ToolsTalk PF is easy to install:

- Insert the installation CD and follow the instructions
- It is possible to select installation of multiple instances of ToolsTalk PF. This means it is possible to open several ToolsTalk PF instances at the same time in your desktop.
- Open ToolsTalk by selecting **Start > Program > Atlas Copco Tools AB > ToolsTalk Power Focus**

6.2   ToolsTalk overview

Almost every function in ToolsTalk PF has its own window. The figure below shows the ToolsTalk PF interface with menu list, selection panel, toolbar and PF Map.

There are several ways to start a function in ToolsTalk PF. With almost all functions, it is possible to use a menu item in the menu list. Click on a symbol in the toolbar or double-click on the text in PF Map.
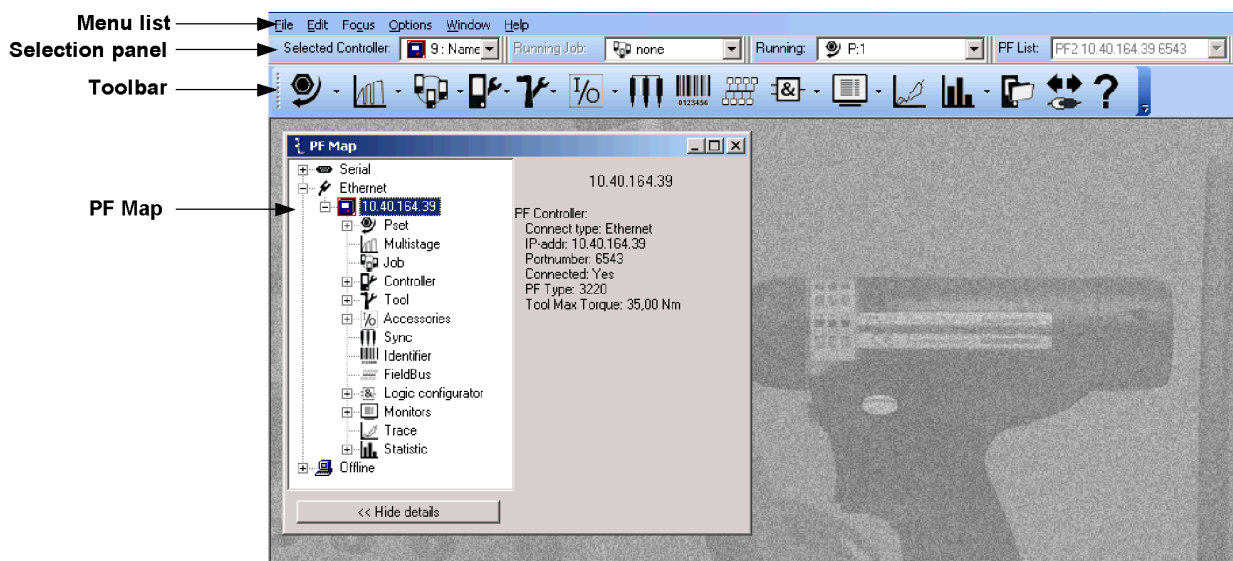
6.2.1   Menu list

The following options are available in the PF Menu list.

> **An additional menu appears in the Menu list when opening a function window. For example, when opening a Pset window, a new menu named "Pset" appears in the menu list.**
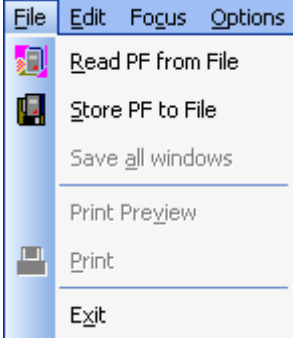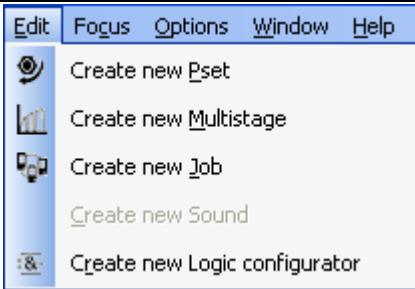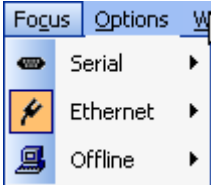
Illustration	Name	Description
File Edit Focus Options Read PF from File Store PF to File Save all windows Print Preview Print Exit	File	Read and store files, print and exit ToolsTalk PF from the File menu. If, for example, the Pset window is active, options for reading and storing Pset appear in the File menu.
Edit Focus Options Window Help Create new Pset Create new Multistage Create new Job Create new Sound Create new Logic configurator	Edit	Create a new Pset, Multistage, Job, Sound and Logic Configurator from the Edit menu.
Focus Options W Serial Ethernet Offline	Focus	The Focus menu specifies the type of connection to use when connecting to the Power Focus. Choose between an Ethernet connection and a Serial connection. The Offline mode allows access to ToolsTalk PF without the need for a connection to a Power Focus.
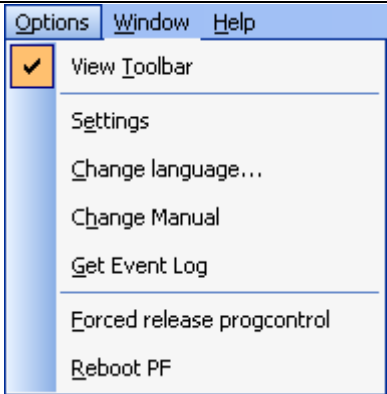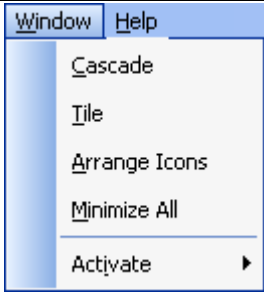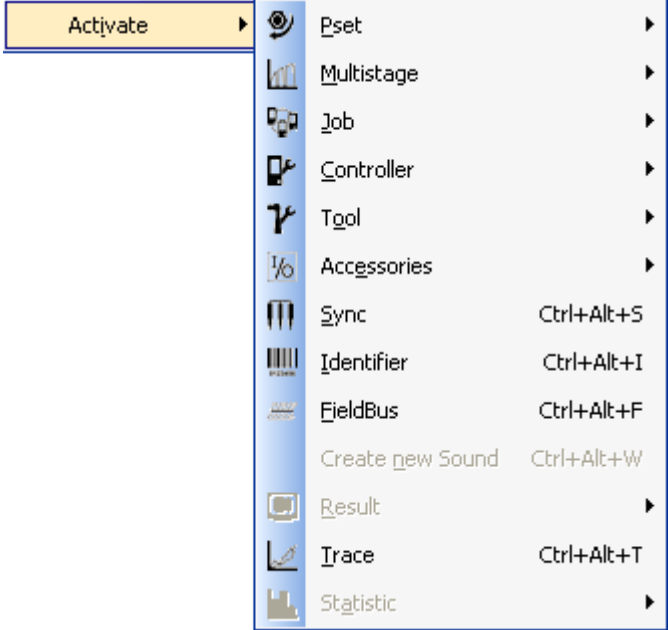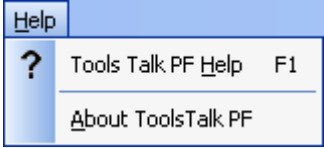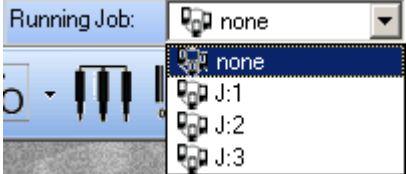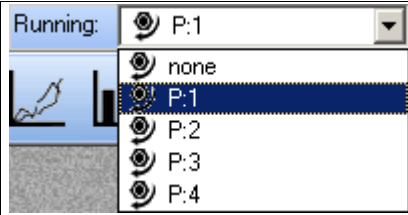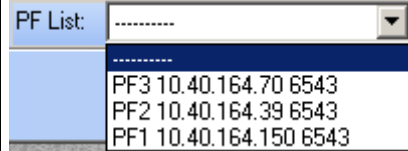
Illustration	Name	Description
Options Window Help ✔ View Toolbar Settings Change language… Change Manual Get Event Log Forced release progcontrol Reboot PF	Options	The Options menu includes: ToolsTalk interface settings: View Toolbar, Settings, Change language and Change Manual. See section Configuring ToolsTalk for more information. Get Event Log: Retrieves the event log from the connected PF Forced release progcontrol terminates the connection to the current PF and enables another user to take programming control over PF. Forced release progcontrol disconnects another ToolsTalk when programming control (progcontrol) over the database in PF is needed, for example for a configuration change. Forced release progcontrol can not disconnect a graph interface in the programming view. Reboot PF. A pop-up window prompts for confirmation before reboot.
Window Help Cascade Tile Arrange Icons Minimize All Activate ▶	Window	Set properties for windows and icons from the Window menu as well as enable and open the Activate menu.

Illustration	Name	Description
	Activate	The Activate menu contains a list of all available functions (Pset, Job, Multistage, etc.).
	Help	The Help menu allows access to the Power Focus help file. Pressing F1 on the keyboard gives access to the help file from any window. About ToolsTalk PF brings up details about the version of the ToolsTalk PF program in use.

6.2.2   Selection panel
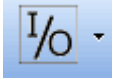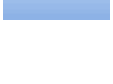
Illustration	Name	Description
	Selected Controller	The available options are: Serial connection, Ethernet connection and Offline mode.
	Running Job	If parameter *C201 Job* is set to Ethernet/Serial, it is possible to select a Job to run.

		Running Pset/Multistage	If parameter *C200 Pset* is set to Ethernet/Serial, it is possible to select a Pset or Multistage to run.
		PF List	To simplify the Ethernet connection to a Power Focus, use the PF List. Select an item and ToolsTalk PF connects to the corresponding Power Focus. The information in the list contains; name, IP address and port number.

6.2.3 Toolbar

The toolbar icons are short-cuts to the basic functions in ToolsTalk PF. See the corresponding section in this manual for a detailed description of each function.

Icon	Icon name	Description
	Pset	This icon opens the programming window for the first Pset.
		A Pset contains all the necessary information Power Focus needs to perform a tightening. There are a number of parameters included in a Pset, among them; control parameters, torque parameters, angle parameters etc.
		Click on the arrow to the right to select between existing Psets (shown along with number and name).
		Use the function in the PF Map to create a new Pset.
	Multistage	This icon opens the programming window for the first Multistage.
		In some instances it is necessary to perform a tightening in several stages. These circumstances require specific tightening strategies. Multistage allows the user to create linear sequences of up to eight Psets to perform a tightening divided into stages.
		Click on the arrow to the right to select between existing Multistages (shown along with number and name).
		Use the function in the PF Map to create a new Multistage.
	Job	This icon opens the programming window for the first Job.
		A Job is a collection of Psets or Multistages, which are useful when performing several multiple tightening operations, each with different requirements. This is convenient since the operator does not have to select a new Pset or Multistage for every tightening.
		Click on the arrow to the right to select between existing Jobs (shown along with number and name).
		Use the function in the PF Map to create a new Job.
	Controller	This icon opens the first part in the Controller programming section.
		Controller contains information and settings for PF. This includes network, COM ports, display, memory and accessibility.
		Use the arrow to the right to select between the sub-menus.

Icon	Icon name	Description
	Tool	This icon opens the first part in the Tool programming section.
		The Tool branch includes information, configuration, diagnostic and maintenance for the Tensor tool connected to PF.
		Use the arrow to the right to select between the sub-menus.
	Accessories	This icon opens the first part in the Accessories programming section.
		In the Accessories branch are the digital inputs and outputs of the PF configured and diagnosed. It also includes information about the devices connected to the I/O bus and tool bus, and how to configure these devices.
		Use the arrow to the right to select between the sub-menus.
	Sync	This icon opens the Sync programming section.
		Up to ten PF units in the same logical Cell can be Synchronized to perform the same task simultaneously, a function known as Sync. This type of operation requires Synchronization of the Power Focuses involved.
	Identifier	This icon opens the Identifier programming section.
		It is possible to send an Identifier string to a PF. This string is normally sent by a barcode reader connected to one of the serial ports on PF. (This barcode is in car plants usually known as a VIN or ESN).
	Fieldbus	This icon opens the fieldbus programming section.
		Fieldbus communication is useful for data communication between PF and PLC's. It is an effective and fast way for the data transfer of short data packages.
	Logic Configurator	This icon opens the programming window for the first Logical Configurator.
		The ToolsTalk PF software feeds the controller (PF 4000 only) with inputs, called Configurator sheets. The Configurator sheets consist of a Relay status array and a DigIn status array. The arrays have the status of each relay/digital input function (if the function is defined on the internal I/O's or one of the I/O Expanders).
		Every Logic Configurator circuit instruction list is evaluated every 100 ms which corresponds to a tick or every time an input status changed.
		Click on the arrow to the right to select between existing Logical Configurators (shown along with number and name).
		Use the function in the PF Map to create a new Logical Configurator.
	Monitors	Click on the arrow to the right of this icon to select an appropriate monitor; Result monitor, Job monitor, Operator monitor, Identifier monitor and Get all results.
		ToolsTalk PF provides a number of monitors designed to present extensive information about the various functions of Power Focus.
	Trace	Click the Trace icon to bring up a graphical display of the tightening results.
		Via the Trace function it is possible to view tightening graphs with different display settings.
	Statistic	Click on Statistic icon to display statistical results and graphs. Via the arrow to the right it is possible to select a statistic to run.
	PF Map	This icon opens the PF Map if it is closed.

Icon	Icon name	Description
	Connect	The Connect icon changes appearance depending on the connection status. When the PC is not in contact with the Power Focus, this icon is visible. Clicking on it establishes a connection between the PC and PF. Choose connection in "selected controller" list (ToolsTalk PF menu list).
	Disconnect	Once a connection is established this icon appears. Clicking on it disconnects the PC from PF.
	Help	This icon opens the Help section.

6.2.4   PF Map

The **PF Map** gives an overview of and shortcuts to all settings in ToolsTalk PF. Expand and collapse to open and close menus and double click on function names (Pset, Multistage, Job, etc.) to open the corresponding function. **Right-click** the function names to create a new instance of the function.

Brief information about the selected setting is displayed in the right panel of the PF Map.
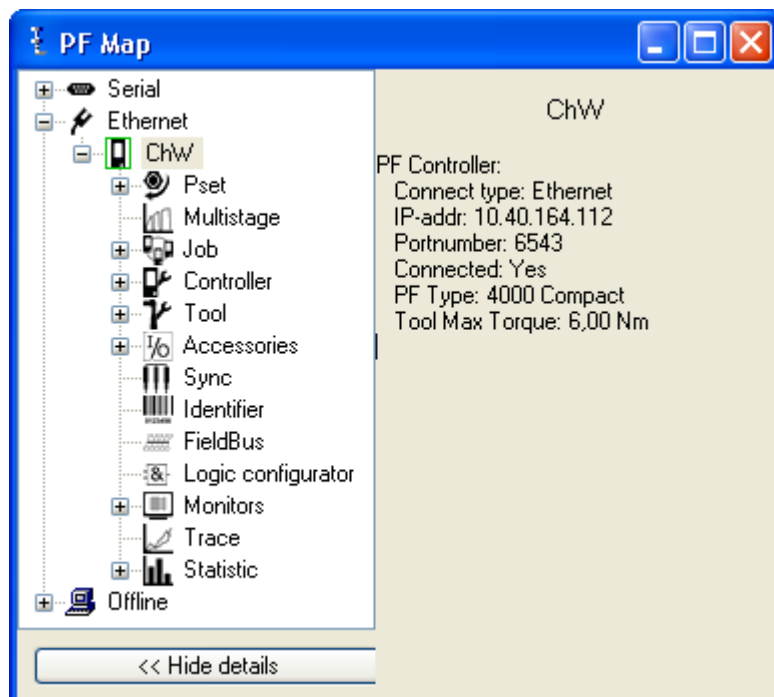
6.3 Configuring ToolsTalk settings

This section describes some of the available ToolsTalk settings. The following settings are located in the **Settings** dialog box. The settings are configurable off-line.

- Setup for communication with PF
- Setup for viewing information inside the ToolsTalk PF application
- Printout setup
- Administration of the PF list

On the menu bar, open **Options>Settings**.

6.3.1 Communication

The **Communication** tab has four areas; **View event setup, Serial setup, Ethernet setup** and **LOG**.

In the **View event setup** area, make selections for viewing controller errors and warnings.

In the **Serial setup** area, select which Com port to use on the PC, normally Com1 or Com2, for communication with PF. The Baud rate can be set to 2400, 4800, 9600, 19200, 38400, 57600 or 155200.

ⓘ **The TTPF baud rate must match the baud rate set in PF. The default value is 9600.**

In the **Ethernet setup** area, enter the data for PF. The Port number is default 6543 and does not normally need to be changed. If using an item from the PF list (PF available list) then all three parameters (type, port, IP) are set simultaneously.

ⓘ **To edit Ethernet setup parameters, ToolsTalk PF has to be in disconnected mode.**

In the **LOG** area, enable the log function for communication between Power Focus and ToolsTalk PF. Messages are stored in the file stated in the log file area. Create rules for logging by clicking the **Advanced** key.

If **Split log** in the **Advanced log settings** is activated the size of log.txt file can not exceed the value set in **Log file size**. When the file is full, the program copies the contents to a file called log~.txt and erase the content of log.txt. Data will then continue to be stored in log.txt.
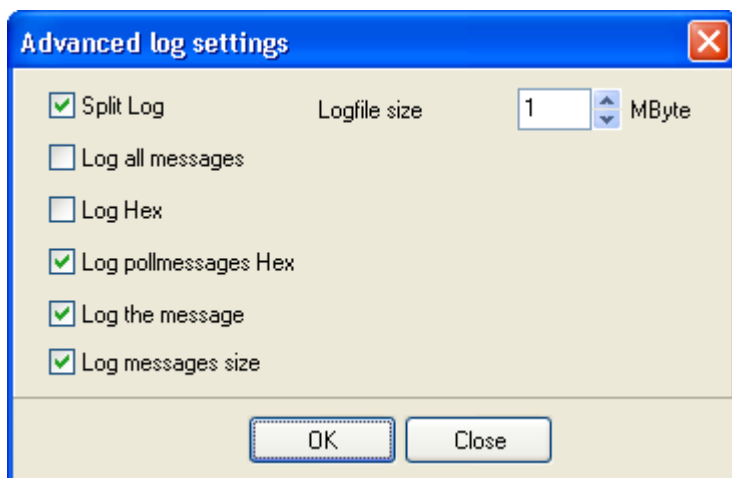
6.3.2   Application

The **Application** tab has three areas; **Presentation, Automatic functionality**, and **Default directory**.
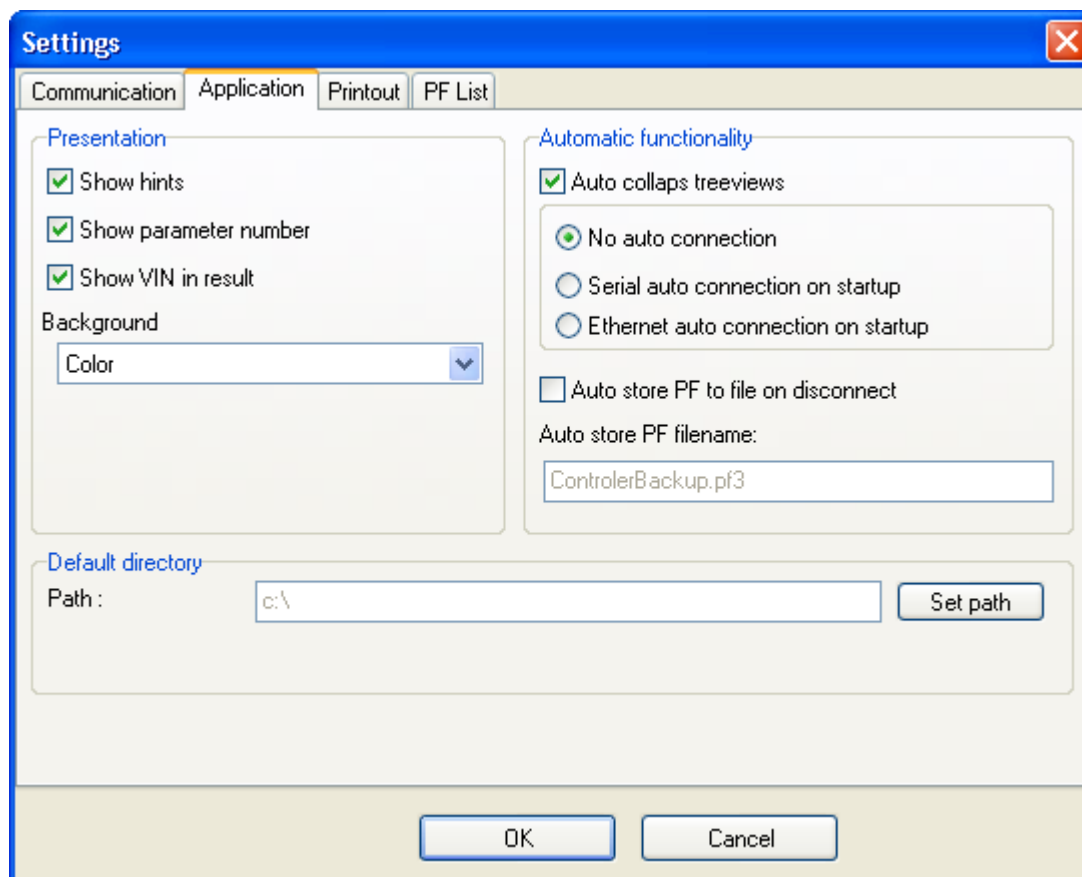
The first area concerns the ToolsTalk PF presentation.

▪ If the **Show hints** checkbox is selected, then the limits for each parameter are displayed in the status bar when the cursor is placed over a parameter box.
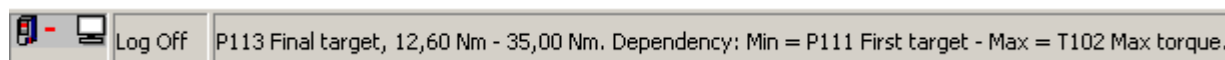
▪ If the **Show parameter number** checkbox is selected, then all parameter numbers are displayed in the windows.

▪ If the **Show VIN in result** checkbox is selected, then the result parts selected in the Identifier function are displayed in the Result monitor.

The **Automatic functionality** area activates/deactivates the following functions:

- Auto collapse tree views

- Type of connection at startup: If **Serial auto connection on startup** or **Ethernet auto connection on startup** is checked, ToolsTalk PF connects to Power Focus immediately on start-up.

- If the **Auto store PF to file on disconnect** box is checked, then ToolsTalk PF stores the PF data to file when disconnecting.

In the **Default directory** area, specify where the log files and auto stored PF files are saved.

6.3.3   Printout

The **Printout** tab contains printout settings.

Text entered in the **Printout footer** field appears on every printed paper.

In the **Printout format** and **Printout colors** areas, make settings for printout.
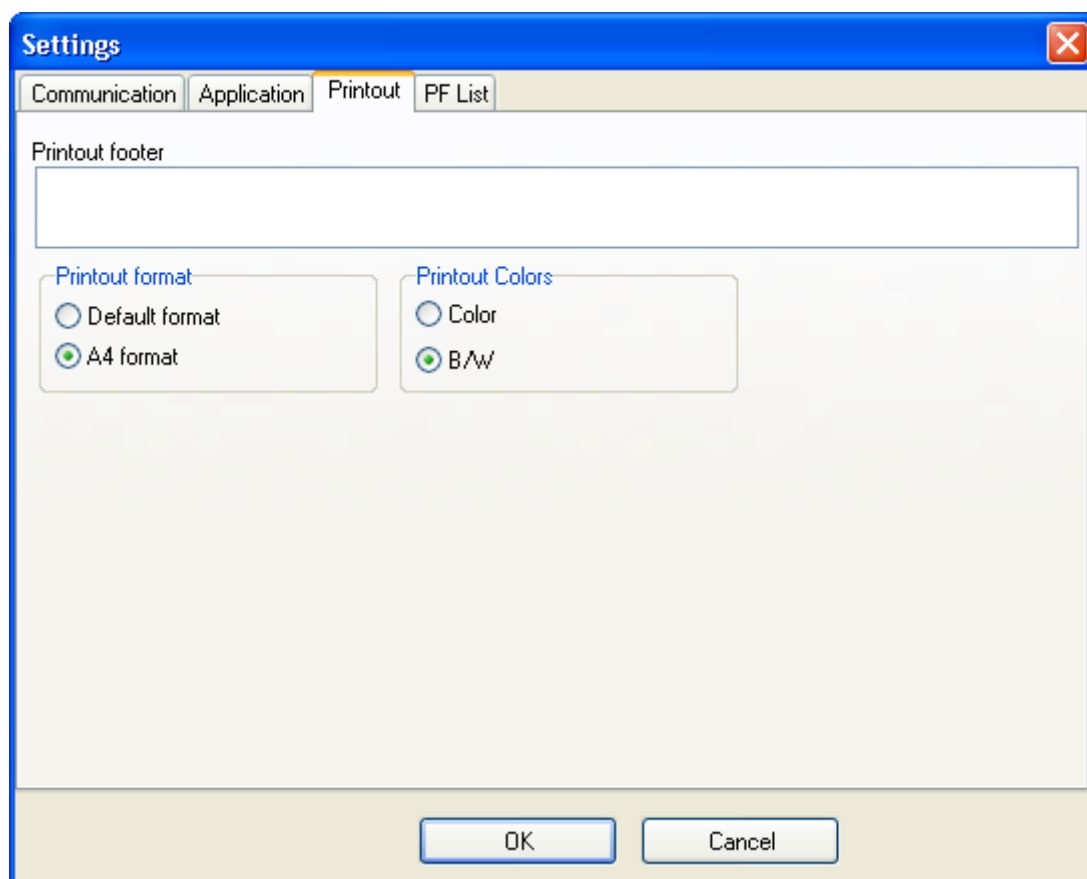
6.3.4 PF List

The **PF List** tab contains the **PF available list** box. Add, modify and remove items from here. **PF Ethernet type** defines PF in the net, seen from ToolsTalk. Note that the configuration of PF in the net is made from **PF Map>Controller>Network**.
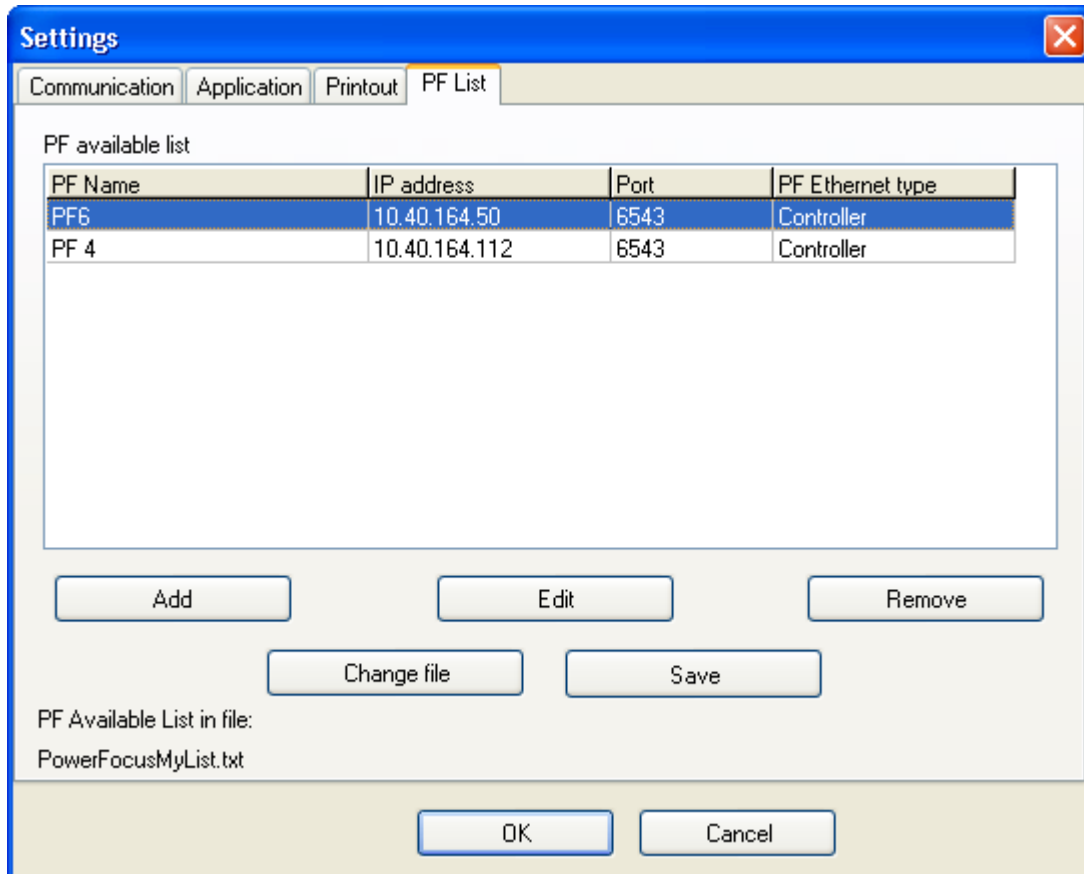
6.4 Connecting a PF

There are different types of connection possibilities; Ethernet TCP/IP, Serial RS232 and USB. USB connection is only available for PF 4000.

6.4.1 Ethernet connection

To make an Ethernet connection between PF and Tools Talk, PF must be configured with a unique IP address. This address must be stored in Tools Talk.

Setting IP address in PF

Do either of the following:

- Connect a PC to PF through serial connection. Follow the instructions in section Network or set the IP-address in PF from ToolsTalk.

- Use the keypad directly on PF. For PF Compact, select **F8** and enter the IP address.

- For PF Graph, press **PROG** and open the **Controller>Network>Ethernet** branch. Enter the IP-address.

Storing PF IP address in Tools Talk

- From the **Options** menu, open the **Settings** dialog box. Do either of the following:

- Click the **Communication** tab, **Ethernet setup** area, type the Controller IP address of the PF to connect to. Also click the option for **NetMaster, CellMaster** or **Controller**.

- Click the PF List tab, and create a list of PF. Note: To configure a cell or net, see section *Network*

- Save the settings and proceed to section *To connect*.

6.4.2 Serial connection

    When using the serial connection, it is important to use the proper baud rate settings. In order to establish a connection between ToolsTalk PF and PF they must use the same baud rate. The default baud rate is set to 9600 bit/s.

From the **Options** menu, open the **Settings** dialog box. Check the Baud rate for the PC Com port.

Make sure that the serial cable is connected to the correct **Com port** on the PC and to Serial **RS 232 (2)** on PF.

Open **PF Map>Controller>COM ports** and check the settings for PF, Serial 2 *C410 Baud rate*.

Save the settings and proceed to section *To connect*.

6.4.3   USB connection

ⓘ   **A USB port is standard on PF 4000. The port is located under the PF front panel.**

Connect a USB cable between PF and the PC (PF acts as USB device). An extra COM port should now be visible on the PC. Open ToolsTalk and connect serially via the extra COM port.

Prior to using USB connection, FTDI's virtual COM port (VCP) drivers should be installed. The V.2.08.14 of the file is used for Windows 7, Vista, XP and 2000.

1. Run the **CDM20814_Setup.exe** file

2. Click **Run**

3. The driver has been installed when the console window disappears
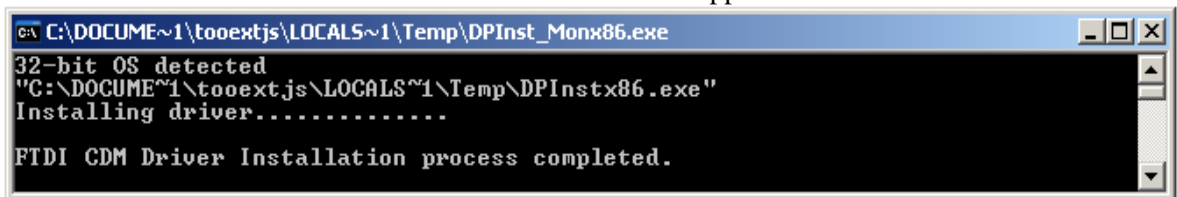
4. A virtual COM port will appear when connecting to the USB on PF4000 to the PC. Select that COM port when running Tools Talk Power Focus

ⓘ   If using a different OS then above or to get the latest version of drivers, this driver can be download from: **http://www.ftdichip.com/Drivers/VCP.htm**
Also a detailed installation guides are available from:
http://www.ftdichip.com/Documents/InstallGuides.htm .

Contact Atlas Copco representative to obtain more information about available drivers.

6.4.4   To connect

There are several ways to connect a Power Focus from ToolsTalk PF:

- Select **Focus** in the Menu list and then choose between **Serial connection** and **Ethernet connection**.

- In the drop-down list for **Selected** controller in Selection panel, click on either **Serial PF** or **Ethernet PF**.

- In the **PF Map**, double-click on the controller under **Serial PF** or **Ethernet PF**.

- Use the **Connect icon** on the Toolbar. By default, this icon creates a serial connection. However, it remembers the most recent connection.

- Use predefined PF units from the **PF List** in the Selection panel.

6.4.5   To disconnect

To disconnect, click on the **Disconnect** icon on the Toolbar or select **Disconnect** in the Menu list (**Focus > Ethernet/serial > PF name > Disconnect**).

6.4.6   Cordless tools

If the Power Focus is connected serially to an IRC-module for communication with a cordless tool, special considerations must be taken before serial or USB connection can be established with TTPF.

- The parameter T294 *Serial connection* in the **Tool Configuration->Connection menu must be set to Internal**.

- The baud rate as mentioned in section 6.4.2 must be set the same on the PF 4000 as on TTPF.

- If an IRC Focus is used, the serial connection is available for other use than the cordless tool communication, so no special consideration is needed.

6.5   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>**
- **Store PF to File**

<Object> could be a section in the PF Map, for instance in Pset, Multistage, Job, Controller, Tool, Sync, Identifier, Fieldbus, Trace or Diagnostic.

See table below for option descriptions.

Option	Description
Store PF to File	Programmed settings in the Power Focus are stored to a file when connected to a Power Focus.
Read PF from File	Power Focus updates with programmed settings stored on file when connected to a Power Focus and performing Read PF from file. ⚠ **Read PF from file overwrites current programming and configuration in the connected PF.**
Save <object> (Controller, Pset, Job etc.)	This function stores a single object to file. The selected window in ToolsTalk PF is stored to file.
Read <object > (Controller, Pset, Job etc.)	This function writes a single object file to the Power Focus. The selected window is updated with data from the file.

6.5.1   Store PF to file

When performing **Store PF to File**, the user should name the file. ToolsTalk PF stores the programmed settings for more than one file (for example one file for each Pset, Multistage and Job).

When storing **PF to file,** it is possible to store files in Excel format. Select Excel as file format in the **Save as** dialogue. The overhead file has the extension pft. Extensions for the other stored files are xls.

Open ToolsTalk PF and connect to PF.

On the **Menu bar**, open **File**>**Store PF to file**.

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

A **Confirmation message** is displayed.

ⓘ   **The "PF Text file" should be used for the restoring of data when the memory setup is done.**
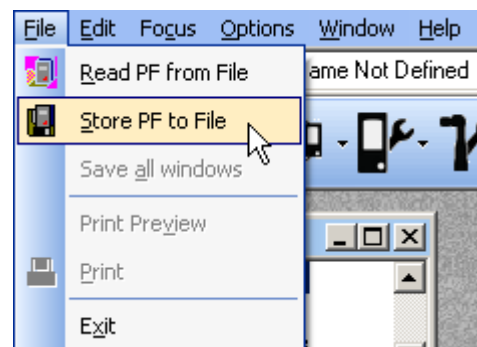
6.5.2   Read PF from file

⚠ **Command "Read PF from file" overwrites current programming and configuration in connected PF.**

ℹ **It is necessary to perform "Read PF from file" TWO times and reboot PF one extra time for changes to take effect.**

Open ToolsTalk PF and connect to PF.

On the **Menu bar**, open **File**>**Read PF from file**.
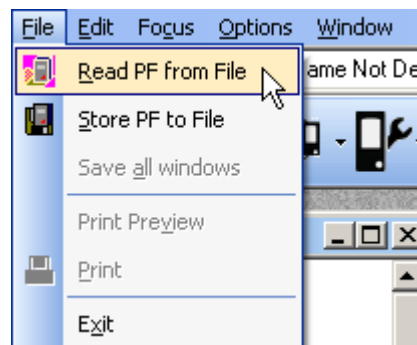
A **Confirm** pop up window informs that restoring from file will replace everything on the controller.

Select **Yes** to continue.

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.

A **Confirm** pop up window appears.

Select **Yes** to keep present Power Focus name and Network setup.

Select **No** to restore Power Focus name and network setup from file.
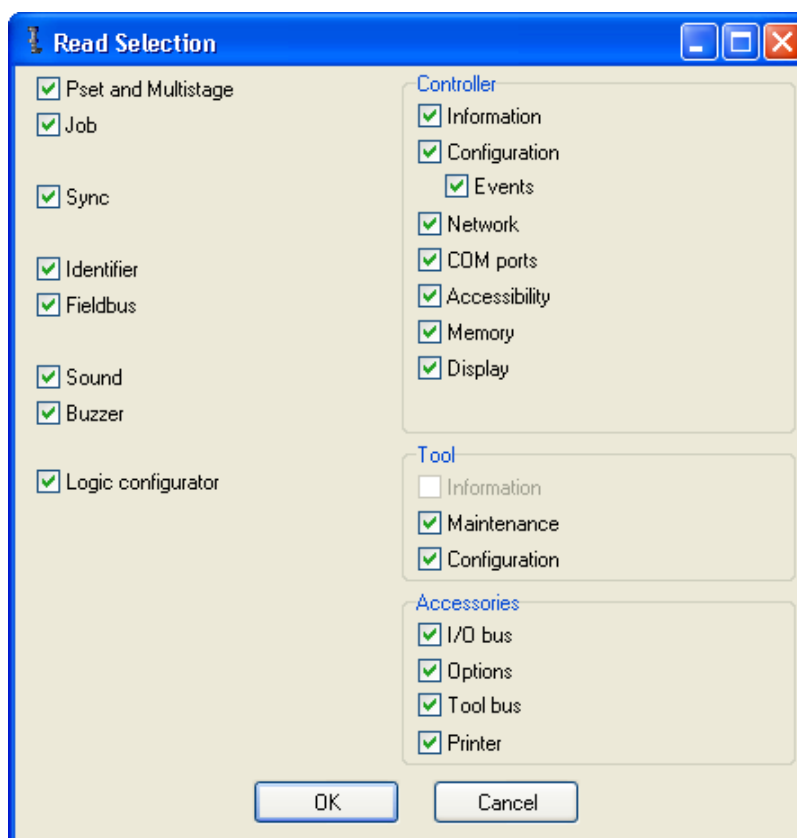
6.6   Offline

Offline mode gives the user the opportunity to conduct programming and configuration, without a PF connection. All programming is stored to or read from a file. It is possible to copy this file to one or more PF units.

There are three different ways to select the offline mode:

- In the main **Menu list**, select **Focus>Offline**.
- In the **Selected controller** drop menu, select **Offline**.
- In the **PF Map**, double-click **Offline**.

The file can be located on the local hard drive, network, etc. There is a certain number of default files supplied when installing ToolsTalk PF. Also, find these files separately on the ToolsTalk PF installation CD-ROM. Depending on the RBU license level; just select the file to use. The different RBU types correspond to the names of the default files ("DS.pf3", "Gold.pf3", "Silver.pf3" and "Bronze.pf3"). It is recommended to make a backup of these files.

Select a file with the same license level as PF. ToolsTalk PF opens the selected file and enables the user to change it.

It is possible to continue to change the content of a file with a higher RBU license level, but when trying to use the file with a PF with a lower license level a warning message is generated.

Note: It is also possible to modify the current configuration. Before disconnecting, use commend **File>Store PF to File** to store the current configuration file.

To upload the file, connect PF and select **File>Read PF from File**.
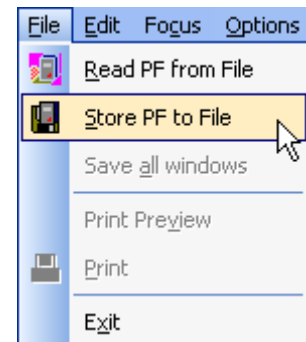
6.6.1 Configuring a tool offline

In offline mode, open **Tool>Information** in the **PF Map**.

Click **Set tool**. The **Set tool** window appears.

Select a tool or configure a new tool via the **Create tool key**.

Tool name	Max torque	Gear ratio	Calibration value
ETV STB33-15-I06QB	15,0	41,9	15,0
ETV STB33-15-I06QBCRB	15,0	41,9	15,0
ETV STB33-15-B10B	15,0	41,9	15,0
ETV STB33-15-B10BCRB	15,0	41,9	15,0
ETV STB33-20-10B	20,0	62,4	20,0
ETV STB33-20-10BCRB	20,0	62,4	20,0
ETV STB33-20-B10B	20,0	62,4	20,0
ETV STB33-20-B10BCRB	20,0	62,4	20,0
ETV STB33-30-10B	30,0	87,0	30,0
ETV STB33-30-10BCRB	30,0	87,0	30,0
ETV STB33-30-B10B	30,0	87,0	30,0
ETV STB33-30-B10BCRB	30,0	87,0	30,0
ETV STB63-30-10B	30,0	32,8	30,0
ETV STB63-30-10BCRB	30,0	32,8	30,0
ETV STB63-30-B10B	30,0	32,8	30,0
ETV STB63-30-B10BCRB	30,0	32,8	30,0
ETV STB63-40-10B	40,0	44,1	40,0

Tool Type: STB
Tool Model: Angle head
Motor Type: 3
Max torque: 30,00
Gear ratio: 87,03
Calibration value: 30,00

Tool values
ETV STB33-30-10BCRB
Gear ratio: 87,03
Max torque: 30,00
Calibration value: 30,00

Delete tool | Create tool | OK | Cancel

7   Pset

The set of parameters that controls the tightening process is contained within a **Pset**. This section describes how to setup the basic parameters necessary to perform a tightening. Create a Pset by using Autoset, Quick programming or by setting the parameter values manually using PF Graph or ToolsTalk PF.

> **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**
>
> **See parameter list section *Pset* for a description of all available Pset options.**

The basic Pset parameters are located under the **Programming** branch:

- Control
- Torque
- Angle
- Speed and ramp
- Time
- Batch count
- High speed rundown
- Positioning
- Additional settings are found under Programming+, Pset setup and Statistic programming.

An easy way to program a Pset is to use the **Autoset** function.

Quick programming is intended to help users to quickly configure a Pset. After completing a Quick programming procedure, the tool is ready to use for tightening.

Programming help shows an image of the selected strategy.

Every time a Pset changes, the ID of the person changing the Pset is stored in P409 *PSet updated by*. This information is useful for tracing who has made the last change in any given PSet. If no user has logged in the filed values are: TTPF if changed via ToolsTalk, OPER if changed via the controller, and BLANK if the Pset has been created in an earlier version of the software. (For being able to log users this functionality requires a special SW called ToolsUserAdmin, which handles the access level for users via TTPF.)
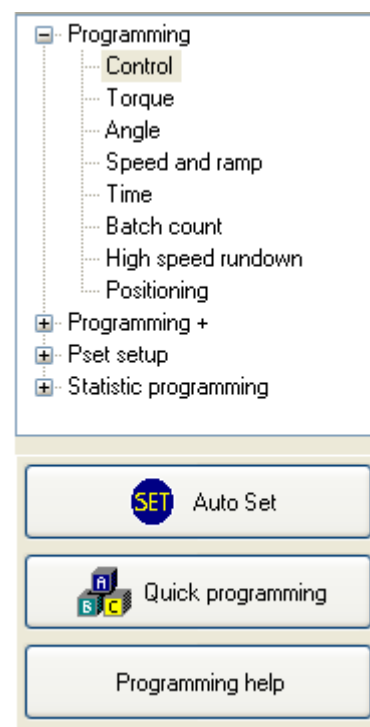
All Pset changes are reflected in ToolsNet.

7.1 Create new Pset/Open Pset

In the **PF Map**, right-click and select **Create New Pset**.

Alternatively, **double-click** or right click on an existing Pset, to open the Pset configuration window.

> ⓘ **As default there is one Pset existing in ToolsTalk PF.**
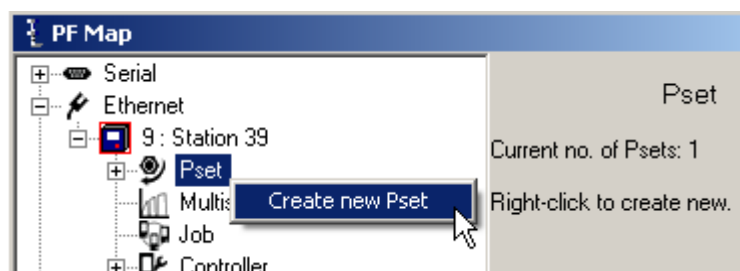
The **Create new Pset** window pops up.

Select available **New Pset ID** from drop down menu.

Enter a **New Pset Name** (optional).

Click **OK** to open the new Pset setup window.
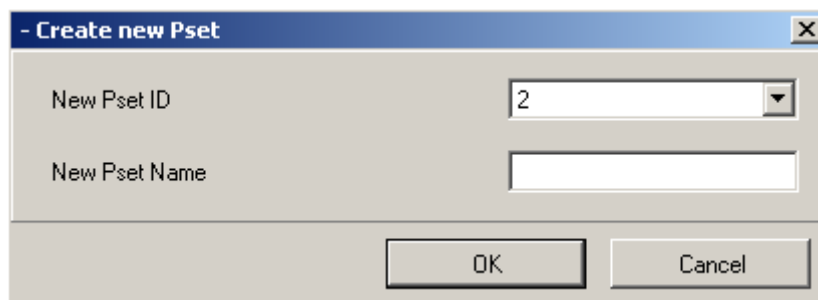
Continue with **Autoset**, **Quick Programming** or **Programming**.

7.2   Autoset

An easy way to program a Pset is to use the **Autoset** function. Power
Focus adapts the programming to the specific joint characteristics and
sets all the parameters automatically. Autoset does not change any
parameters outside the used Pset.

Autoset uses *P100 Control strategy* DS con for DS tools and
Tq con/ang mon for all other tools.
Autoset can only be selected:

- When a tool is connected

- When PF is switched on

- On the running Pset (displayed in the selection panel)
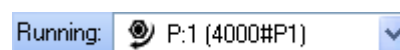
> (i) **If using an existing Pset, the parameters are erased and
> replaced by the Autoset calculated parameters.**

Click **Autoset** in the Pset window.

A green light on the front panel of the PF indicates that Autoset is activated. When this signal is shut off,
Autoset is finished and PF is now programmed for that joint. The Autoset procedure can be aborted by
clicking cancel before the green light shuts off.

Enter the *P113 Final target* value
and click **OK**.
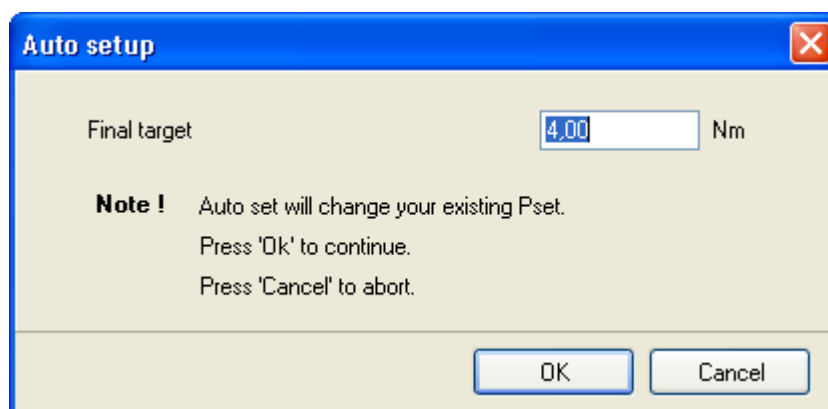
Perform a number of tightenings with the tool.

The first two tightenings are completed at very low speed. Normally, three to ten tightenings are required in order for the Power Focus to calculate and set the required parameters for the specific joint characteristics.
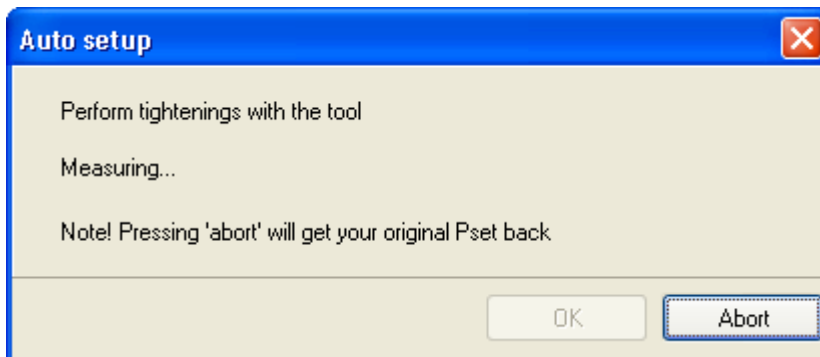
Click **OK** when prompted.

Clicking **Abort** before the Autoset procedure is completed cancels the operation and restores the previous settings.

7.3 Quick programming

Quick programming is intended to help users to quickly configure a Pset and gives the opportunity to use the Power Focus after a fast and simple programming.

The joint angle is the distance from when the screw (nut) head touches the surface and the torque starts to build up, until it reaches the set limit. It is possible to measure the joint angle by using a torque wrench.

For hard joints, it is best to set the value at 30 degrees. For soft joints we recommend setting the joint angle above 100 degrees. This gives a better tightening during the first stage and a distinct second stage. Adjust the angle if the second stage is too long. It is important that there is a second stage; otherwise the tool may jerk at full torque (overshoot).

> **If using an existing Pset, the parameters are erased and replaced by the Quick programming calculated parameters.**
>
> **For quick programming, the final target value must be larger or equal to 25 percent of** *T102 Tool max torque.*

Open an existing Pset or create a new one.

Click **Quick programming** in the Pset window.

Select *P100 Control strategy* and enter the joint angle and *P113 Final target*.

Click **OK** to finish.

Quick Programing - Pset:1			✕
Control strategy	Tq con / Ang mon ▼		
Joint Angle	100	Deg	
Final target	13	Nm	

Note ! Quick programing will change your existing Pset.
Press 'Ok' to finish.
Press 'Cancel' to abort.

[OK]   [Cancel]
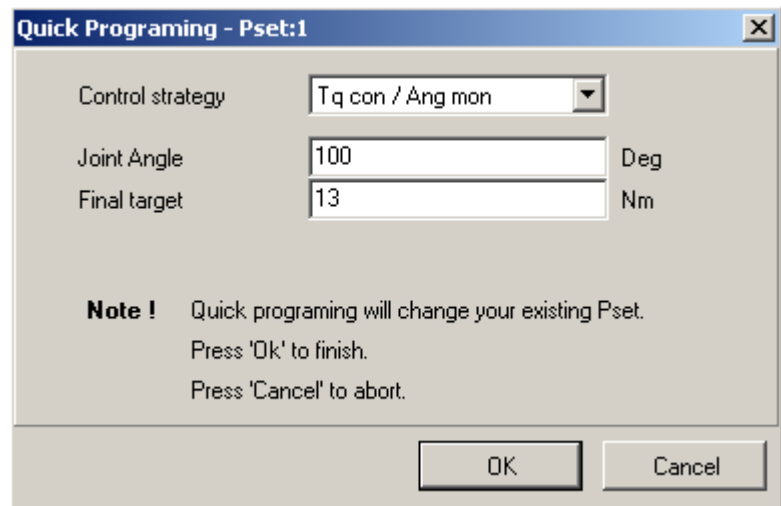
7.4   Programming help

Via the **Programming help** function ToolsTalk PF can illustrate an example of the selected control and tightening strategy.

Click **Programming help** in the Pset window.

SET Auto Set

Quick programming
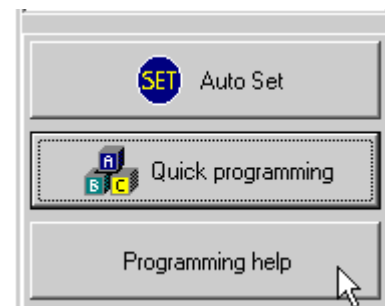
Programming help

7.5 Programming

In the Pset setup window, expand the **Programming** branch.

Select **Control**.
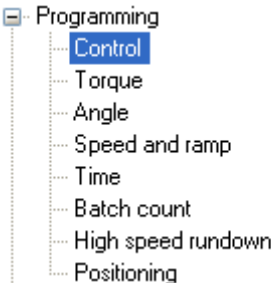
Choose the desired *P100 Control strategy*, *P101 Tightening strategy* and settings for the other parameters.

Control

P100 Control strategy	Tq con / Ang mon
P101 Tightening strategy	Two stage
P104 Rundown angle	No
P105 Zoom step	☐
P107 Click wrench no.	Not Used
P108 Start trace from	Cycle start
P109 Monitor end time from	Cycle start

ⓘ **For more information, see sections *Control strategies, Tightening strategies* and *Additional control options*.**

In the Pset **Programming** branch, select **Torque** or **Angle**.

Make suitable parameter settings.

Torque

P110 Cycle start	2,00	Nm
P111 First target	10,00	Nm
P112 Final tq min	12,00	Nm
P113 Final target	25,00	Nm
P114 Final tq max	20,00	Nm
P115 Cycle complete	1,20	Nm
P116 Rundown complete	Not Used	Nm
P118 Measure torque at	Torque peak	
P119 Loosening limit	4,00	Nm

Angle

P120 Start final angle	10,00	Nm
P121 Measure angle to	Angle peak	
P122 Final angle min	0	Deg
P123 Target angle	Not Used	Deg
P124 Final angle max	50	Deg
P125 Rundown angle min	Not Used	Deg
P126 Rundown angle max	Not Used	Deg
P127 Final angle max mon	55	Deg
P128 Rehit angle	Not Used	Deg

In the Pset **Programming** branch, select **Speed and ramp** or **Time**.

Make suitable parameter settings.

Speed and ramp		
P130 Soft start speed	10	%
P131 Step 1 speed	100	%
P132 Step 2 speed	40	%
P133 Loosening speed	100	%
P134 Loosening ramp	0	%
P135 Step 1 ramp	0	%
P136 Step 2 ramp	20	%
P137 Ergoramp	Not Used	%
P138 Zoom step speed	Not Used	%
P139 Speed unit	%	

Time		
P141 End time	0,20	Sec
P142 Soft start time	0,2	Sec
P143 Tool idle time	0,0	Sec
P144 Cycle abort timer	30,0	Sec

In the Pset **Programming** branch, select **Batch count, High speed rundown, Positioning** or **Snug gradient**.

Make suitable parameter settings.

Click **Store** to save the settings.

Batch count		
P150 Batch count	Off	
P151 Batch size	Not Used	
P152 Lock at batch done	☐	
P153 Max Coherent NOK's	0	
High speed rundown		
P160 High speed rundown	☐	
P161 Rundown speed	Not Used	%
P162 High speed interval	Not Used	Deg
P163 Ramp at high speed rundown	Not Used	%
P164 Disable high speed rundown once if NOK	Not Used	
Positioning		
P170 Adjustable limit	☐	
P171 Limit	Not Used	Nm
Snug gradient		
P180 Delta angle	Not Used	Deg
P181 Delta torque	Not Used	Nm
P182 Torque limit	Not Used	Nm
P183 PVT distance	Not Used	Deg
P184 PVT interval	Not Used	Deg
P185 Compensate value	Not Used	
P186 Delay monitoring after cycle start	Not Used	Deg

7.6 Control strategies

For all **Tq con** and **DS con** tightenings the process starts when the torque reaches *P110 Cycle start*. When the torque reaches target and then falls below *P115 Cycle complete* the process ends. When the torque drops below *P115 Cycle complete* without having reached target before, a timer is started. In this case, if the torque does not increase above *P115 cycle complete* during *P141 End time* seconds, the process ends.

For **Reverse ang** the tightening process also starts when the torque reaches *P110 Cycle start*.

For **Rotate spindle forward/reverse** the tightening process starts immediately when the tool starts running.

The *P123 Target angle* is defined by *P121 Measure angle to* and can be measured from *P120 Start final angle* to *Torque peak*, *Angle peak, P115 Cycle complete,* or *Shut off.*

> **P124 Final angle max** is always evaluated from **P120 Start final angle** to angle peak.
>
> **For cordless tools some of the control strategies and options are not available.**
> **Please consult the relevant tool manuals for more information.**

7.6.1 Tq con

The **Tq con** strategy controls the torque. This strategy is selectable for both one stage and two stage tightenings. The tool stops when the torque reaches the *P113 Final target*.

If, for some reason, the tool should exceed *P114 Final tq max*, the tool shuts off and the (NOK) tightening result is shown.

1. P112 Final torque min
2. P114 Final torque max
3. P113 Final target
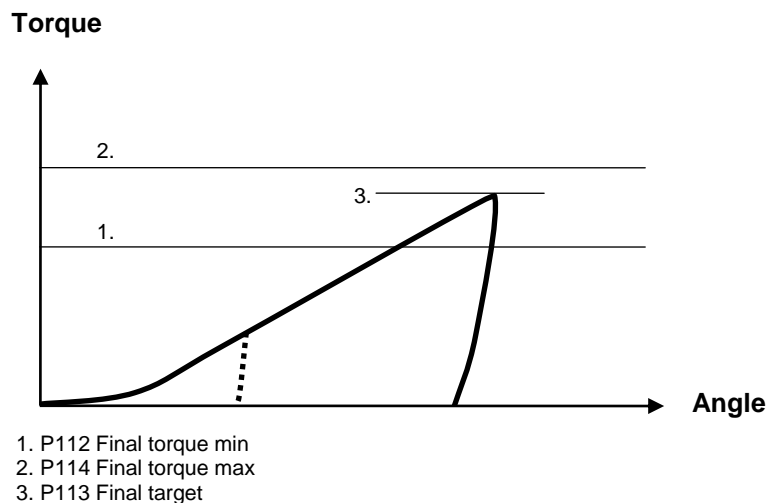
7.6.2 Tq con/ang mon

The **Tq con/ang mon** strategy controls the torque and monitors the angle. This strategy is selectable for both one and two stage tightenings. The tool stops when the torque reaches the *P113 Final target* value.

If the tool for some reason should exceed *P114 Final tq max* or *P124 Final angle max*, the tool shuts off and the (NOK) tightening result is shown.

Torque

1. P112 Final torque min
2. P114 Final torque max
3. P113 Final target
4. P122 Final angle min
5. P124 Final angle max
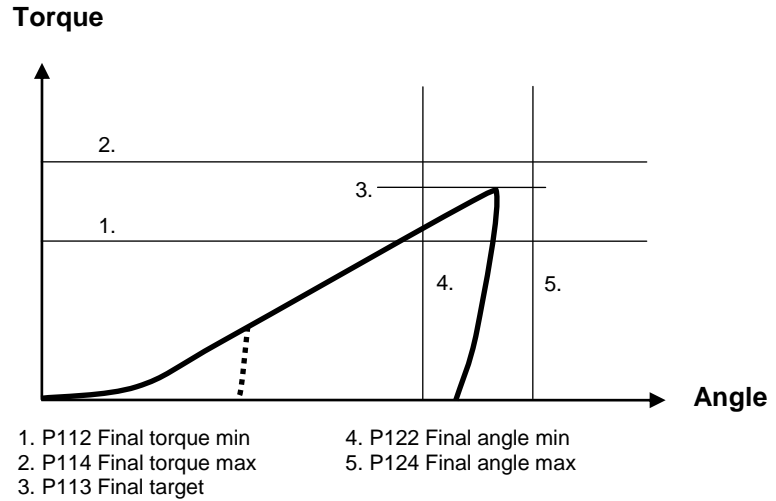
7.6.3 Ang con/tq mon

Ang con/tq mon strategy controls the angle and monitors the torque. This strategy is selectable for both one and two stage tightenings. *P123 Target angle* is then defined as the number of degrees between *P120 Start final angle* and angle peak. The tool stops at *P123 Target angle*.

If the tool for some reason should exceed *P114 Final tq max* or *P124 Final angle max*, the tool shuts off and the (NOK) tightening results are shown.

Torque

1. P112 Final torque min
2. P114 Final torque max
4. P122 Final angle min
5. P124 Final angle max
6. P123 Target angle
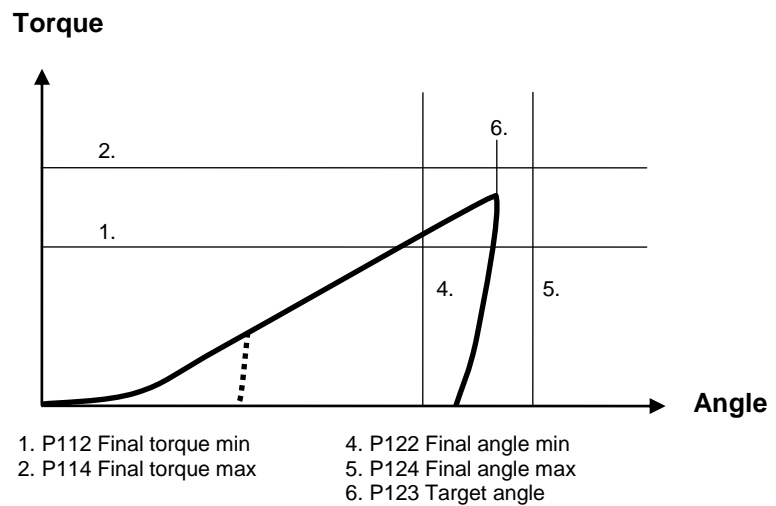
7.6.4 Tq con/ang con (AND) / (OR)

The **Tq con/ang con (AND)/ (OR)** strategy controls both torque and angle. This strategy is selectable for both one and two stage tightenings.

For **Tq con/ang con (AND)**, Power Focus controls the *P113 Final target* value and the *P123 Target angle* value. The tool stops when both targets are reached. They do not have to be reached at the same time.

For **Tq con/ang con (OR)**, Power Focus controls the *P113 Final target* value and the *P123 Target angle* value. The tool stops when the first of these two targets are reached.

Torque

1. P112 Final torque min
2. P114 Final torque max
3. P113 Final target
4. P122 Final angle min
5. P124 Final angle max
6. P123 Target angle

For both **Tq con/ang con (AND)** and **Tq con/ang con (OR)** the torque and the angle result must be within respective min and max limit.

If, for some reason, the tool should exceed *P114 Final tq max* or *P124 Final angle max*, the tool shuts off and the (NOK) tightening results are shown.

7.6.5   Reverse ang

The **Reverse ang** strategy reverses the spindle a specified number of degrees in the opposite tool tightening direction. This is useful when, for example, the bolt needs to be loosened before the final tightening. Create a Multistage to combine and perform several Psets as one.

P123 Target angle is defined as the number of degrees between the *P120 Start final angle* and the peak angle. The tool stops at *P123 Target angle*.
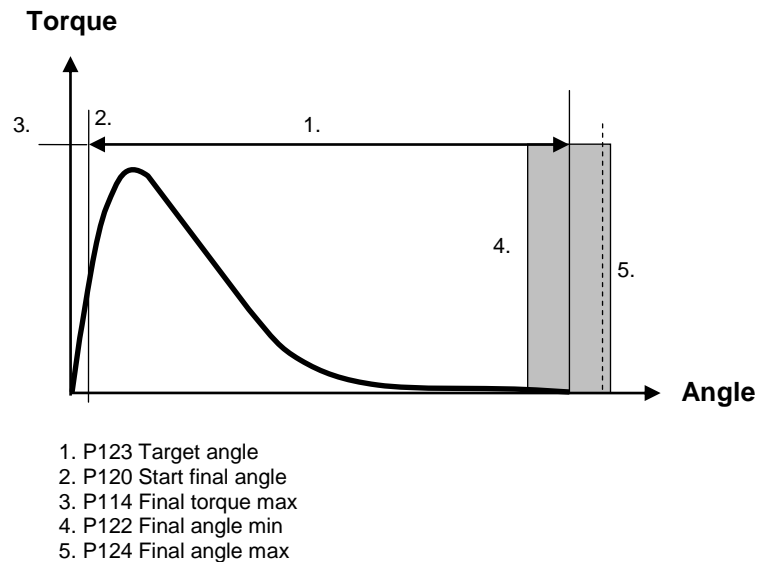
1. P123 Target angle
2. P120 Start final angle
3. P114 Final torque max
4. P122 Final angle min
5. P124 Final angle max

If the tool for some reason should exceed *P114 Final tq max* or *P124 Final angle max*, the tool shuts off and the (NOK) tightening results are shown. The torque value shown in the result is torque at peak angle. Angle measurement starts when the *P120 Start final angle* is reached.

> **For reverse ang, the "active" direction of the tool socket rotation is the opposite of the *P240 Tool tightening direction*. For instance, to select CW turn the Direction ring to the left position. For safety reasons, it is not possible to loosen the joint in this way.**

7.6.6   Rotate spindle forward/reverse

The **rotate spindle forward/reverse** functions rotate the spindle a specified number of degrees, either forward or reverse, independently of torque. The only torque values monitored are *P114 Final tq max* and *P112 Final tq min*. *P123 Target angle* is defined as the number of degrees between start of tightening and the peak angle. The tool stops at *P123 Target angle*.

If, for some reason, the tool should exceed *P114 Final tq max* or *P124 Final angle max*, the tool shuts off and the (NOK) tightening results are shown.

Torque

Angle

1. P112 Final torque min
2. P114 Final torque max
4. P122 Final angle min
5. P124 Final angle max
6. P123 Target angle
7. Acceptance window
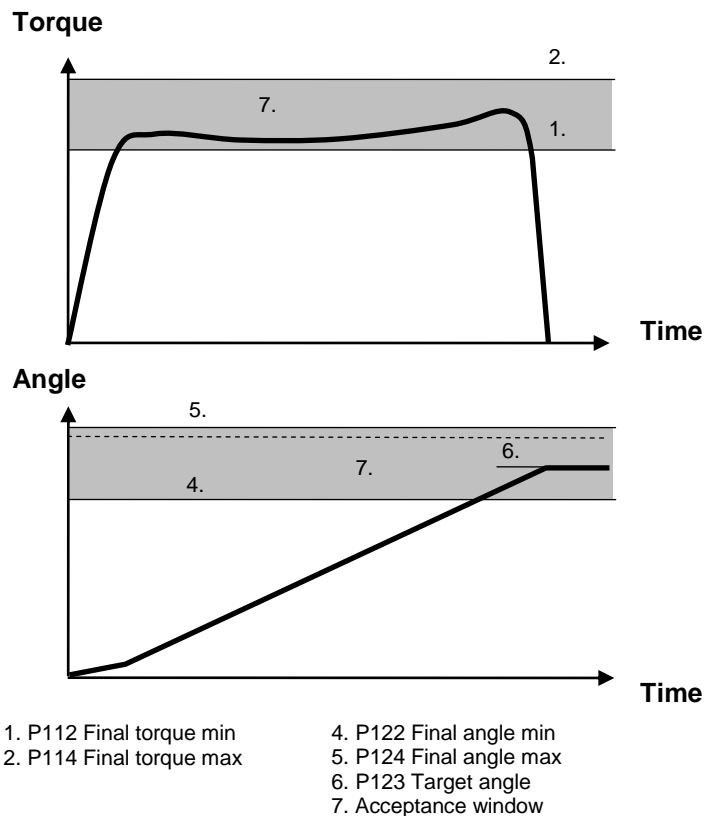
The tightening process begins when the trigger is pressed.

For rotate spindle reverse, the "active" direction of the tool socket rotation is the opposite of the *P240 Tool tightening direction*. For instance, if "CW" is selected turn the direction ring to the left position. For safety reasons, it is not possible to loosen the joint with this strategy.

7.6.7   Click wrench

Select the **Click wrench** function if the Power Focus result data base should include a click wrench or a non-tightening operation in the work process, such as ocular inspections or the filling of fluid containers.

It is possible to configure four independent click wrench operations. A click wrench Pset consists of a *P107 Click wrench no*, *P113 Final target* only. Each *P107 Click wrench no.* is associated with one digital input. Activating the digital input indicates to PF that the specified operation has been performed. Use *P113 Final target* to set the torque result level for click wrench operations.

> **Resulting torque is the final target set by the Pset.**

7.6.8   Home position forward and reverse

The **home position** function, suitable for fixtured tools, makes it possible to mark a socket position using the *Set home position* digital input. When triggered, the socket rotates (CW for *Home position forward* or CCW for *Home position reverse*) to the home position. The digital output *Home position* is triggered when the position is reached. The only torque values monitored are *P114 Final tq max* and *P112 Final tq min*. The home position function is not available for open-end tools.

If, for some reason, the tool should exceed *P114 Final tq max* or *P124 Final angle max*, the tool shuts off and the (NOK) tightening results are shown.

Torque

Angle

Time

1. P112 Final torque min
2. P114 Final torque max
4. P122 Final angle min
5. P124 Final angle max
6. Acceptance window
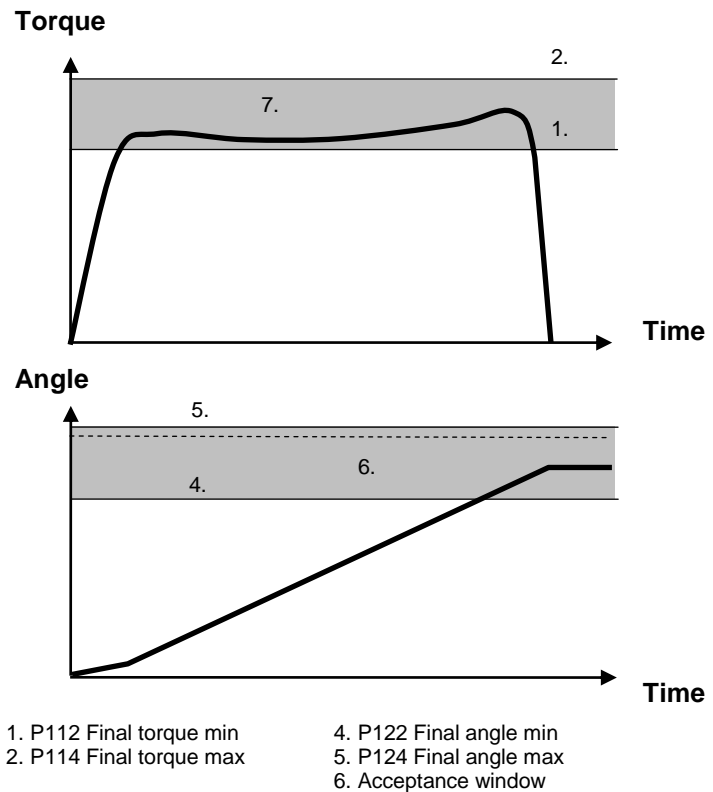
> **The tightening process begins when the trigger is pressed.**

> **This strategy is suitable only for tools which are dedicated for fixtured solutions and full repeatability can not be guaranteed for normal tools.**

7.6.9 Yield control (Yield)

Yield control is activated by selecting the *P100 Control strategy* to **Yield**. The *P101 Tightening strategy* can be set to **One stage**, **Two stage** or **Quickstep**. Yield control interacts in the second stage of the tightening. *P105 Zoom step* strategy ending is eliminated when yield control is selected.

The settings for **Yield** are found under Programming+. For more information, see *Yield control* in section Programming+.

7.6.10 Yield/Tq con (OR)

Select **Yield/Tq con (OR)** in *P100 Control strategy*.

In addition to the settings for **Yield** (see *Yield control* in section Programming+) a final target is set. The tool stops when *P113 Final target* is reached if the yield function has not stopped the tool before.
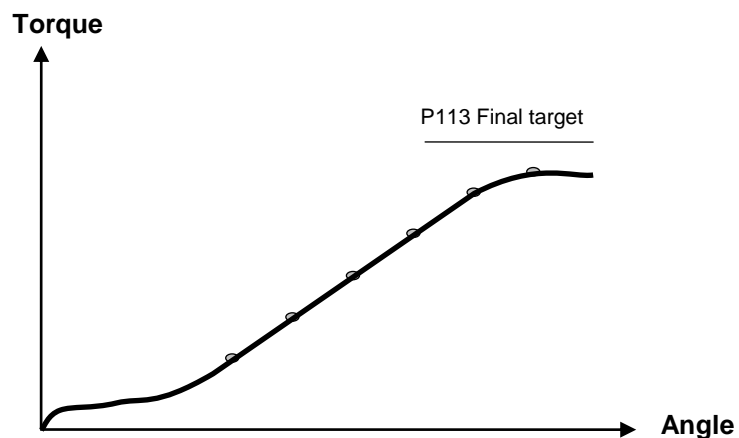
7.6.11 DS con

The **DS con** function controls the torque based on the current measurement and monitors the angle. This function is selectable for two stage tightenings only. The tool stops when the torque reaches the *P113 Final target* value.

If the tool for some reason should exceed *P124 Final angle max*, the tool shuts off and the (NOK) tightening result is shown.

Torque

Angle

1. P112 Final torque min
3. P113 Final target

4. P122 Final angle min
5. P124 Final angle max
7. Acceptance window
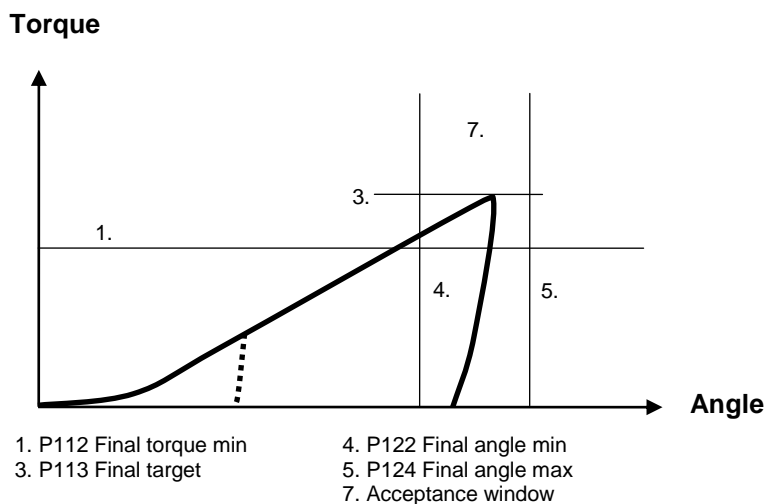
⚠️ **When programming the DS control strategy it is of greatest importance to have a well-developed second stage. The fastener/socket should allow some angle rotation in the second stage of the tightening, or else the torque may overshoot. The best way to determine this is simply by observing the angle rotation during the second stage.**

If the tool overshoots, a red toggling LED is displayed on the tool. The criteria for overshoot are a short or a non-existing second stage in combination with a high speed in the first stage. On the display event code *E003 Torque measurement possibly invalid* is visible.

Torque tuning is performed either from the PF Graph user interface, ToolsTalk PF or automatically with ACTA 4000. It allows an easy adjustment to the reference system torque values (e.g. ACTA 4000) and compensates for tool-drive-programming and joint variations. One torque-tuning factor is stored with each Pset. When a tool is controlled against an external torque reference for calibration, it is recommended to calculate a new torque tuning value. There is one **Torque-tuning factor** for each Pset (when changing Pset settings a new torque tuning factor is needed):

Perform a number of tightenings with the external torque gauge connected, preferably 20 tightenings or more to achieve a good mean value.

- Calculate the mean value from the tightenings

$$New\,Torque\,Tuning\,Factor = \frac{Final\,Target}{Measured\,\,Mean} \times Old\,Torque\,Tuning\,Factor$$

- Enter and store the new DS torque tuning factor
- Perform another set of tightenings to control the torque
- If the torque is OK it is possible to run. If not, do the complete procedure over again.

7.6.12   DS con/tq mon

The **DS con/tq mon** function controls the torque based on the current measurement and monitors the transducer based torque. It also monitors the angle. This strategy is selectable for two stage tightenings only. The tool stops when the current based torque reaches the *P113 Final target* value.

If the tool for some reason should exceed *P114 Final tq max* and *P124 Final angle max*, the tool shuts off and the (NOK) tightening result is shown.
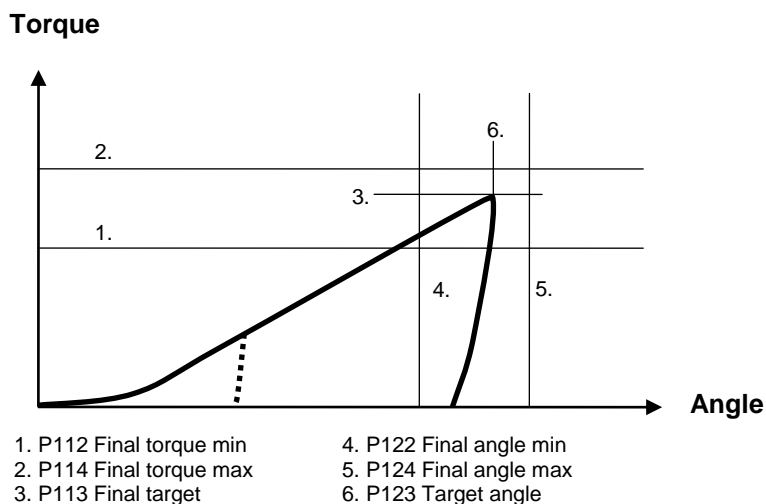

1. P112 Final torque min
2. P114 Final torque max
3. P113 Final target
4. P122 Final angle min
5. P124 Final angle max
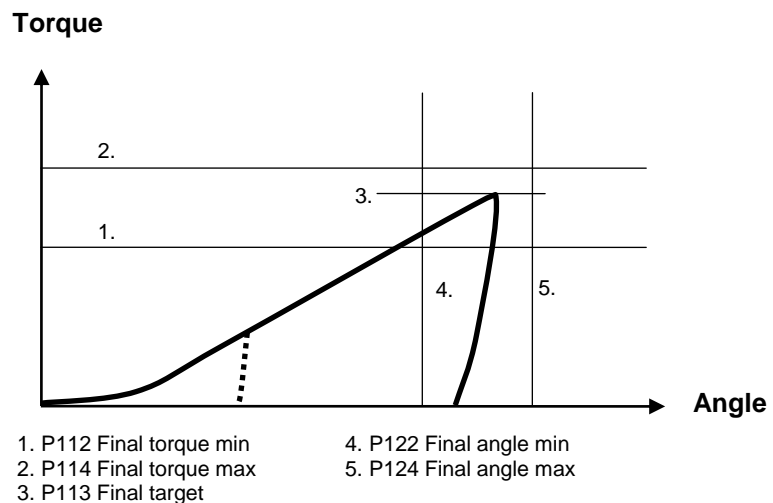
7.6.13   Snug gradient

The **Snug gradient** strategy runs the specified *P123 Target angle* from the observed Snug point. **Snug gradient** controls the angle and monitors the torque. This strategy is selectable for both one and two stage tightening.

The Snug gradient is the slope calculated by *P180 Delta angle* and *P181 Delta torque*. The Snug point is defined as the position followed by two subsequent slopes larger than the specified Snug gradient. As soon as two subsequent slopes are larger than the Snug gradient the Snug-point is found. From this point, the spindle runs the specified *P123 Target angle*.

If the tool should exceed *P182 Torque limit* without finding the Snug point, the tool shuts off and the (NOK) tightening results are shown.

Snug point

1

2

3

4

2

2

2

Angle

1. P110 Cycle start
2. P180 Delta angle

3. P182 Torque limit
4. P123 Target angle

Torque

Snug gradient

Snug point

1

2

3

3

2

2

Angle

1. P110 Cycle start
2. P180 Delta angle

3. P181 Delta torque
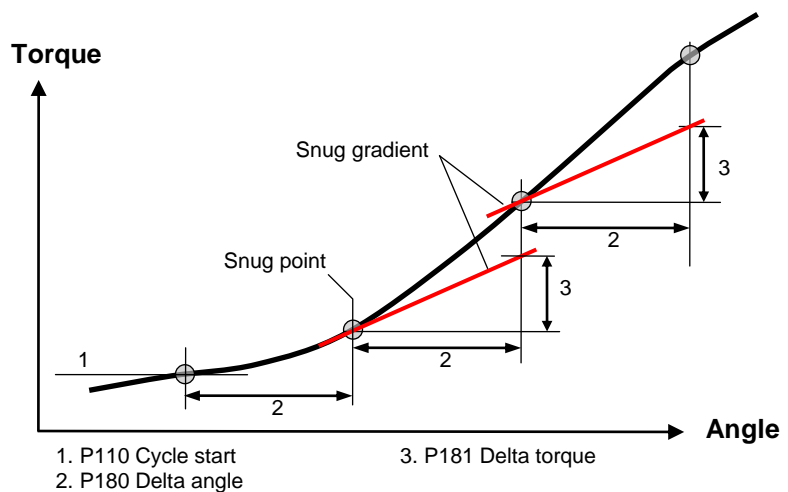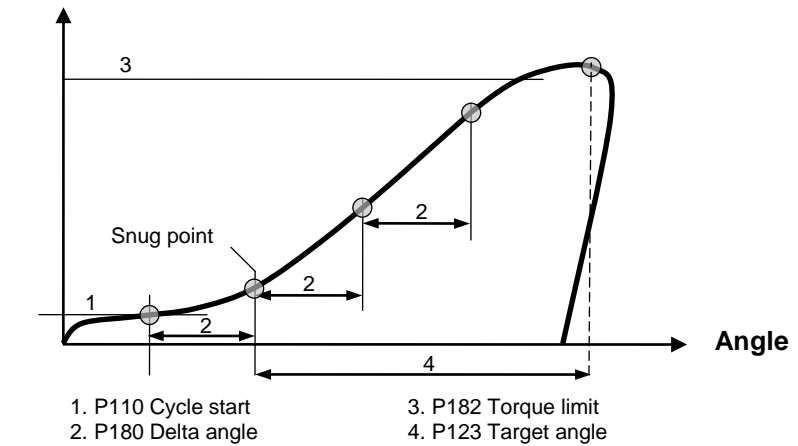
7.6.14   PVT comp with snug

This tightening strategy is a development of the existing **PVT comp** strategy described in 7.8.4. This strategy is useful when the PVT comp torque level is higher than *P113 Final target*.

The PVT compensate value is retrieved using the **Snug gradient** method described above for finding the snug point and then calculating the torque compensate value defined by following parameters.

- *P183 PVT distance*: a point a defined angle backwards from Snug point

- *P184 PVT interval*: an angle interval during which the comp value shall be calculated

- *P185 Compensate value*: option 'Peak' or 'Average' torque value within the interval.
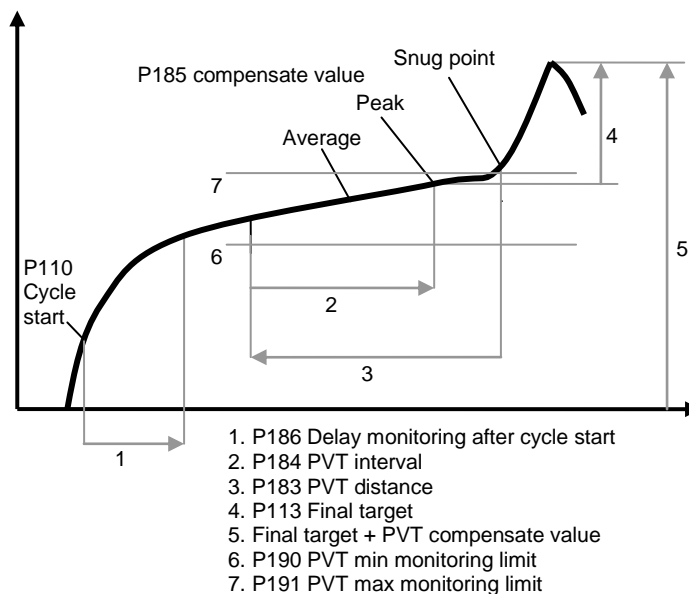
P186 Delay monitoring after cycle start: is a parameter for filtering out a certain angle in the beginning of a tightening where monitoring for a certain 'gradient' is not interesting. (Useful when the gradient is high at cycle start etc.).

1. P186 Delay monitoring after cycle start
2. P184 PVT interval
3. P183 PVT distance
4. P113 Final target
5. Final target + PVT compensate value
6. P190 PVT min monitoring limit
7. P191 PVT max monitoring limit

After finding the snug point and the PVT comp value, the torque defined by *P113 Final target* is added to the PVT comp value for reaching a total torque target. The achieved torque and the PVT comp value are presented as in existing PVT comp strategy (i.e. dependent on C503).

If any of the torque values measured while searching after Snug point are lower than *Snug PVT monitoring min* (P190) or higher than *Snug PVT monitoring max* (P191) the tightening shall stop when Snug is found.

The presented final angle in the result is measured from the snug point.

7.7   Tightening strategies

The Power Focus supports a number of different **tightening strategies** in order to achieve the best quality, speed and ergonomic behavior. Both standard and proprietary patented strategies are supported. This section provides a generic description of the tightening strategies available.

7.7.1   One stage

Tightening is performed in **One stage** until the *P113 Final target* torque has been reached.

Torque

2.

1.

6.

Time

3.

4.

5.

1. P110 Cycle start
2. P113 Final target
3. P130 Soft start speed
4. P135 Step 1 ramp
5. P131 Step 1 speed
6. P115 Cycle complete
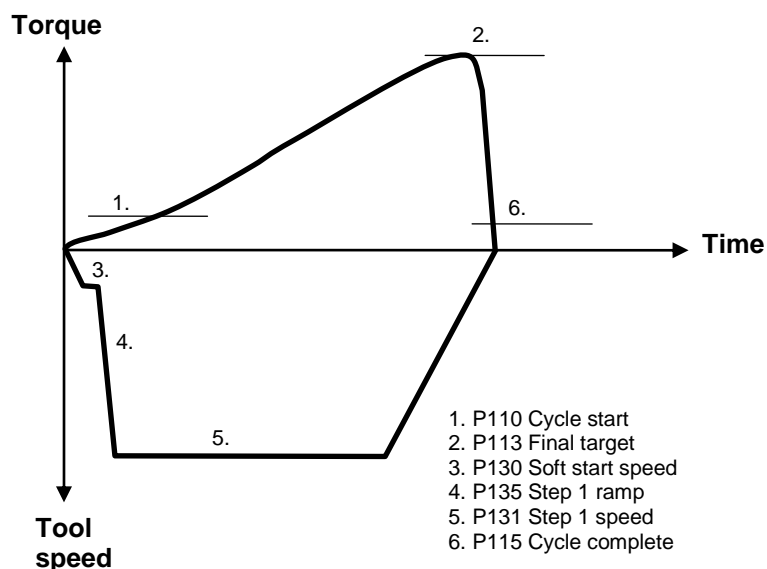
Tool speed

7.7.2   Two stage

In a **Two stage** tightening, the tool operates at high speed during the first stage and a lower speed during the second stage. The tool stops for about 50 milliseconds between the stages to reduce joint relaxation and then accelerates for the second stage.

In this example the strategy ends with a *P105 Zoom step*, which reduces the risk of overshooting.

Torque

3.

2.

1.

10.

Time

4.

7.

8.

9.

5.

6.

1. P110 Cycle start
2. P111 First target
3. P113 Final target
4. P130 Soft start speed
5. P135 Step 1 ramp
6. P131 Step 1 speed
7. P136 Step 2 ramp
8. P132 Step 2 speed
9. P105 Zoom step
10. P115 Cycle complete
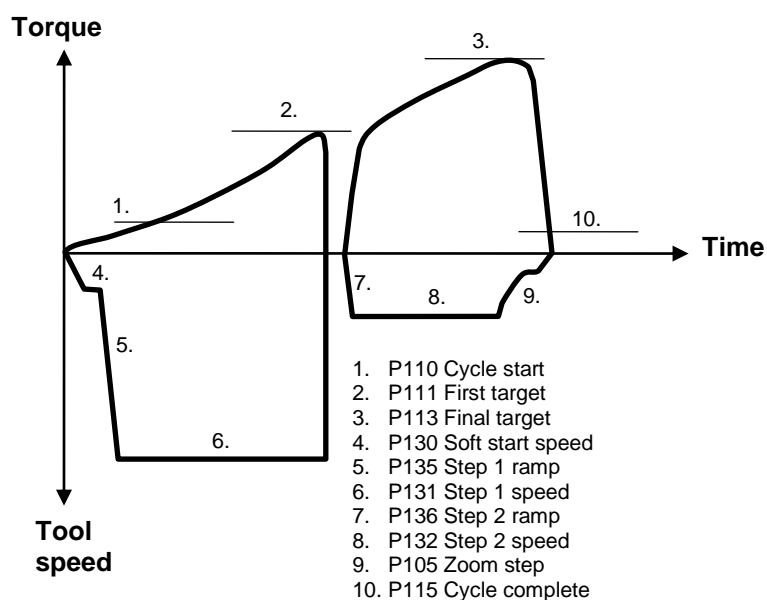
Tool speed

7.7.3 Quick step

Quick step is a type of two stages tightening with high tool speed during the first stage and a lower tool speed during the second stage. The speed changes from first to second stage speed without pausing in between.

In this example the strategy ends with a *P105 Zoom step*, which reduces the risk of overshooting.

1. P110 Cycle start
2. P111 First target
3. P113 Final target
4. P130 Soft start speed
5. P135 Step 1 ramp
6. P131 Step 1 speed
7. P136 Step 2 ramp
8. P132 Step 2 speed
9. P105 Zoom step
10. P115 Cycle complete
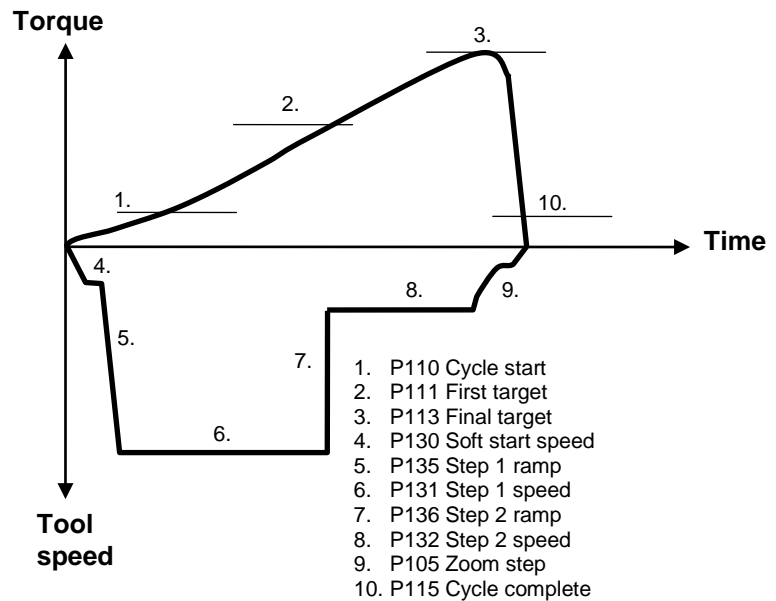
7.7.4   Ergo ramp

Ergo ramp is a two stage tightening with a constant increase of torque during the second stage. It is set automatically using the programmed *P137 Ergo ramp* value and the hardness of the joint.

This strategy has the ergonomic advantage of giving the user the same reaction torque in the second step for both soft and hard joints when using the same Pset.

In this example, the strategy ends with a *P105 Zoom step*, which reduces the risk of overshooting.

1. P110 Cycle start
2. P111 First target
3. P113 Final target
4. P137 Ergoramp
5. P105 Zoom step
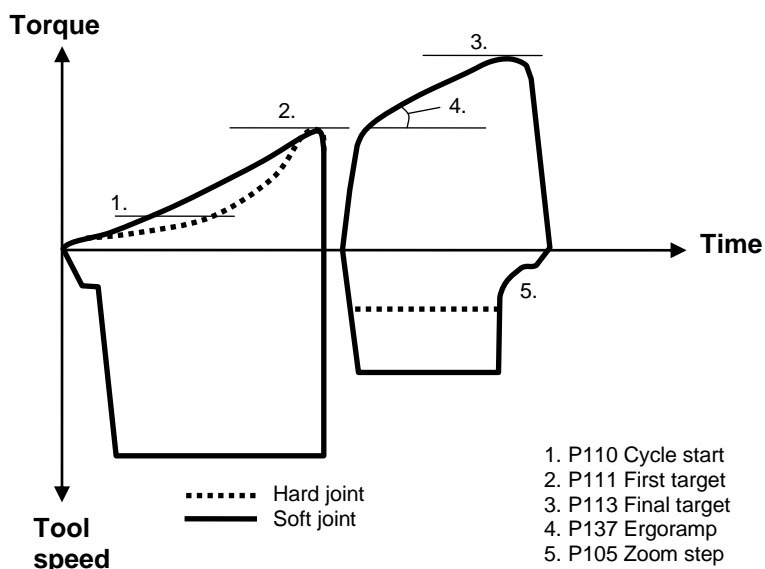
7.7.5   Additional control options

Rundown angle

The **Rundown angle** option monitors the angle at *P116 Rundown complete*.

If the *P104 Rundown angle* option **From start** is selected the rundown phase starts when the tool trigger is pressed. If *P104 Rundown angle* option **From cycle start** is selected the rundown phase starts when the torque exceeds *P110 Cycle start*. The acceptance window for the rundown angle is set with the *P125 Rundown angle min* and *P126 Rundown angle max*.

Zoom step

The **Zoom step** option reduces tool speed when the torque approaches *P113 Final target*. Tool speed is reduced gradually towards the *P138 Zoom step speed*, which can be set between 2 and 20 percent of the maximum speed. Zoom step produces very accurate results, low scatter and quick tightenings.

Combined Zoom step and Ergo ramp

By combining zoom step and ergo ramp, the advantages of both strategies is achieved. Tightenings are precise and, at the same time, ergonomically correct for the operator.

Zoom step and ergo ramp strategies can be combined for most types of bolted joints.

7.7.6   Rehit detection

The rehit functionality is designed to detect re-tightenings of an already tightened joint, thereby avoiding batch counting errors etc. Two parameters have been found to be good indicators of a so-called rehit, tool speed and tightening angle. If, for two stage torque control tightenings, the tool does not get up to speed before the first target occurs and the angle of the second stage is not great enough the rehit alarm is activated.

For two stage torque control tightenings, the speed must reach more than ¼ out of *P131 Step 1 speed* between *P110 Cycle start* and *P111 First target* or the angle between *P111 First target* and *P113 Final target* must be greater than 120 degrees to avoid a rehit alarm. For one stage tightenings, the speed at *P110 Cycle start* and the angle between *P110 Cycle start* and *P113 Final target* are used as indicators.

The large angle interval required means that for most normal tightenings it is the speed condition that is met. Only for very soft joints with a low *P111 First target* or one stage tightenings is the angle condition met.

For two stage angle control tightenings, the rehit alarm is activated if the tightening is aborted on *P114 Final tq max* and the tool speed has not reached ¼ of the *P131 Step 1 speed* between *P110 Cycle start* and *P111 First target*. For one stage tightenings, the speed at *P110 Cycle start* is used as indicator.

The rehit functionality is valid for most, but not all, control strategies.

7.8   Programming +

Expand the **Programming +** branch.

This section has applications for additional Pset functionality.

The **Current monitoring** includes parameters regarding the motor current.

PVT selftap includes settings when the joint has a torque peak at the start of the tightening.

PVT monitoring include settings where the prevailing torque during the rundown phase is monitored, and **PVT compensate** settings where it is included in the calculation for the target torque.

The PVT options can be used together or independently of each other.

The **Options** window includes settings for tool tightening direction and some alarm settings, for example.
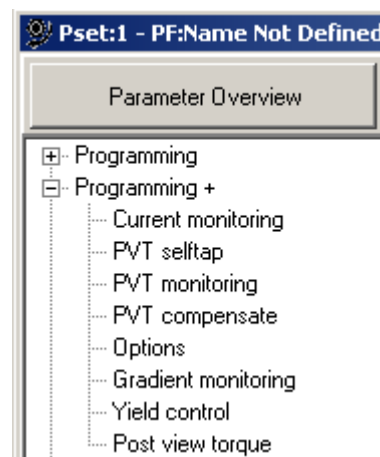
Gradient monitoring, for monitoring joint hardness.

Yield control, available for PF 4000, for individual joint control at the second stage of the tightening.

The **Post view torque** function makes it possible to monitor torque values during two specified angular intervals.

7.8.1   Current monitoring

Select **Current monitoring** and make suitable parameter settings.

Current monitoring		
P200 Current monitoring	☑	
P201 CM min	0	%
P202 CM max	150	%

The spindle torque is proportional to the motor current. By measuring motor current, a method of measurement that is independent of the torque transducer is achieved. The torque forming current is expressed as a percentage of the nominal current at *T102 Tool max torque*. With *P200 Current monitoring* selected it is possible to set an acceptance window for the torque as a redundant process control.

Torque

1. P201 CM min
2. P202 CM max
3. Acceptance window
4. Torque (transducer)
5. Torque (current)
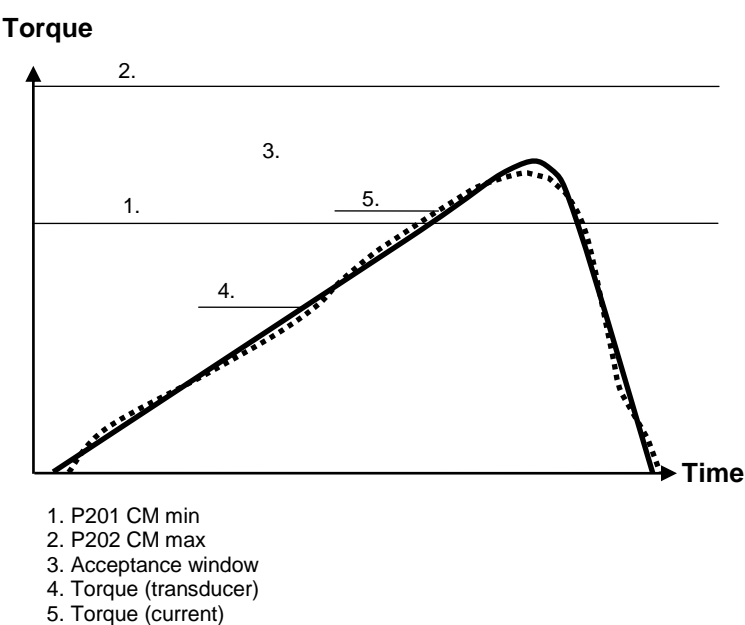
7.8.2   PVT selftap

In the Pset **Programming +** branch, select **PVT selftap**.

When the joint has a torque peak at the start of the tightening it is recommended to use the PVT selftap monitoring option, *P210 Selftap*, to ensure that the tightening achieves the right characteristics.

PVT selftap

PVT selftap		
P210 Selftap	✔	
P211 Selftap interval	1	Deg
P212 No. of selftap windows	1	
P213 Selftap min	1,05	Nm
P214 Selftap max	6,00	Nm

PVT selftap also makes it possible to perform tightenings where the start torque is higher than the *P113 Final target* or *P114 Final tq max*.

The selftap interval starts at *P110 Cycle start*. During the *P211 Selftap interval* the torque has to reach at least the *P213 Selftap min* level but must stay below the *P214 Selftap max* limit. The *P214 Selftap max* is monitored in real time during the selftap interval. The *P213 Selftap min* value is evaluated against the selftap interval peak value at the end of the interval.

To reduce the effects of noise, mean values are calculated from *P212 Number of selftap windows.* A small number of windows means that more samples are grouped together, hence one odd sample has less

impact on the calculated mean value and vice versa. A high number of windows make the monitoring more sensitive; a low number filters more noise.

Torque

1. P211 Selftap interval
2. P110 Cycle start
3. P213 Selftap min
4. P214 Selftap max
5. Acceptance window

Angle
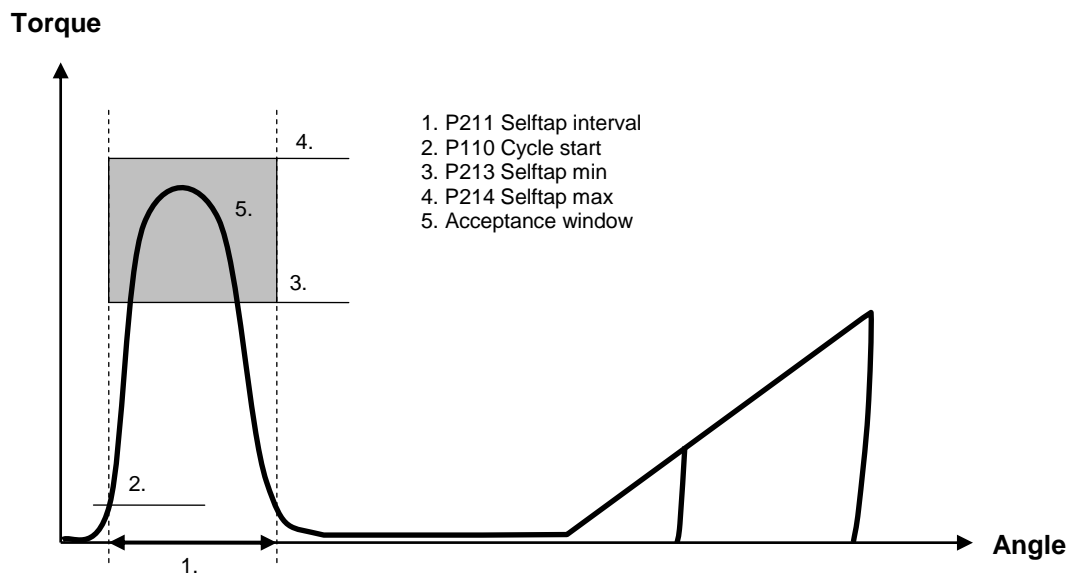
Graph illustrating PVT selftap

7.8.3 PVT monitoring

In the Pset **Programming +** branch, select **PVT monitoring**.

PVT monitoring is used when the joint torque has to pass through an acceptance window prior to *P116 Rundown complete* in order to pass as a correct tightening.

PVT monitoring		
P220 PVT monitoring	☑	
P221 PVT delay interval	0	Deg
P222 PVT monitor interval	1	Deg
P223 No. of PVT windows	1	
P224 PVT min limit	1,05	Nm
P225 PVT max limit	7,00	Nm

With *P220 PVT monitoring* selected, an acceptance window for the torque before *P116 Rundown complete* is set. The *P225 PVT max limit* is monitored in real time during the *P222 PVT monitor interval*. The tool stops immediately if this limit is exceeded. The *P224 PVT min limit* is evaluated against the monitor interval average value at the end of the interval. Monitoring starts at cycle start or after selftap interval.

To reduce the effect of noise, the mean values are calculated from *P223 No of PVT windows*. A high number of windows make the monitoring more sensitive; a low number filters more noise.

Torque

1. P221 PVT delay interval
2. P222 PVT monitor interval
3. P224 PVT min limit
4. P225 PVT max limit
5. Acceptance window
6. P110 Cycle start

Angle
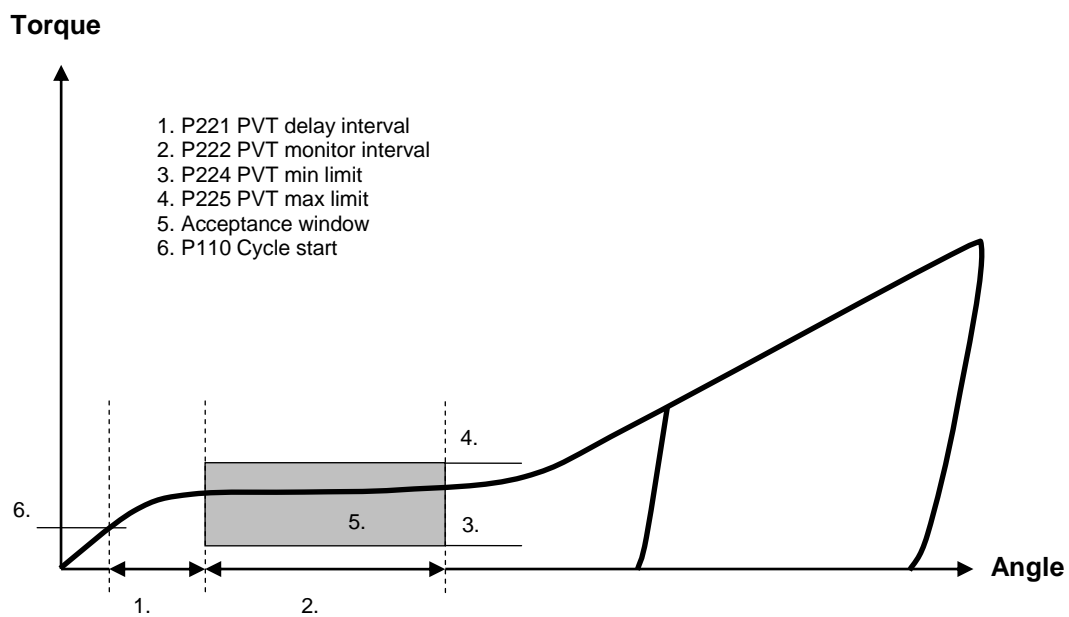
Graph illustrating PVT monitoring

7.8.4   PVT compensate

In the Pset **Programming +** branch, select **PVT compensate**.

PVT compensate

P230 PVT comp	☑
P231 PVT comp point	10 Deg

Via the **PVT compensate** function, PF allows the *P111 First target, P113 Final target* and *P114 Final tq max* to be compensated for the prevailing torque during the rundown phase.

The PVT compensation value is calculated at *P116 Rundown complete* as an average torque from an interval preceding the *P231 PVT comp point*. The PVT compensation value is used as a base reference for the torque used during tightening, and the torque levels can change dynamically for each new tightening.

> ⓘ   **When setting *P231 PVT comp point* larger than the total performed angle at rundown complete, the tightening will be aborted and the error *PVT compensate overflow* is triggered.**

As default, the tightening results are presented with the compensation value subtracted, but can be presented with PVT compensation value added by checking the box *C503 Torque with PVT comp.*

1. P116 Rundown complete
2. P231 PVT comp point
3. Compensation value
4. Final torque with compensation value added
5. Final torque
6. First torque with compensation value added
7. First torque
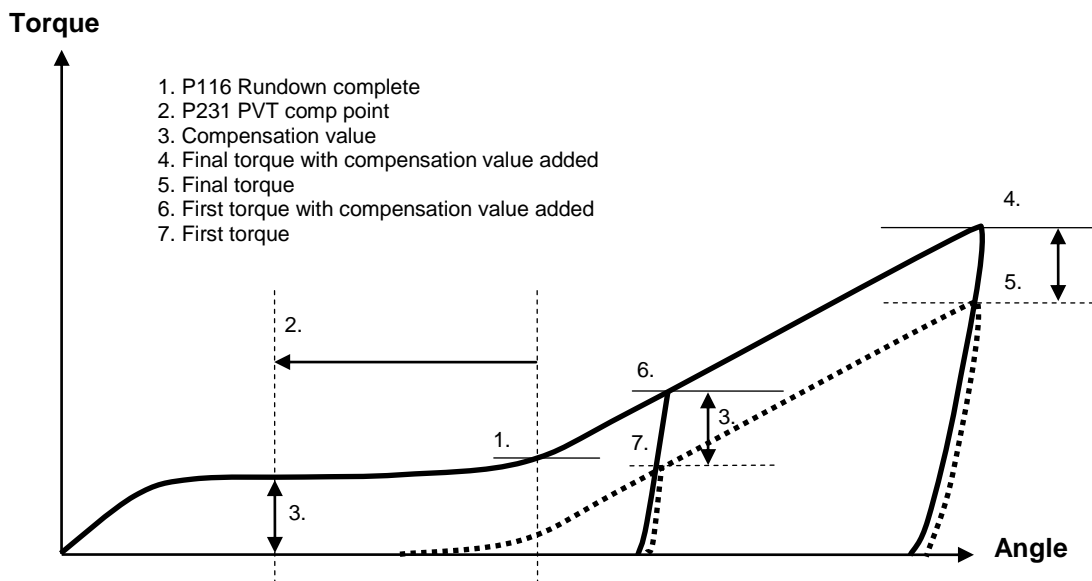
Graph illustrating PVT compensate

7.8.5   Options

In the Pset **Programming +** branch, select **Options**.

Make suitable parameter settings.

See parameter list section *Pset* for information on parameters P241-P247. P240 see below.

Options

P240 Tool tightening direction	CW
P241 Soft stop	☑
P242 Alarm on rehit	☐
P243 Alarm on Tq < target	☐
P244 Alarm on lost trigger	☐
P245 DS torque tuning factor	Not Used %
P246 Alarm on end time shutoff	☐
P247 Socket release	☐

Tool rotation direction

There are different variables that control the tool rotation direction: tool direction ring, *P240 Tool tightening direction* and *P101 Tightening strategy*.

Tightening a screw or nut is in accordance with the selected *P100 Control strategy*. Loosening is equal to reversing the screw or nut. Loosening speed and ramp can be programmed. Reverse is a control strategy that loosens the screw or nut a programmed number of degrees. The direction is always the opposite of the tightening direction.

The position of the tool direction ring at the time the tool trigger is pressed decides the direction of rotation. If the ring is in the right position, the tool rotates clockwise (CW), and counter clockwise (CCW) if the ring is in the left position. However, the direction does not change if the direction ring is moved while the tool is running.

With the parameter *P240 Tool tightening direction* the default tightening direction of the tool is selected. This means that the tool tightens the joint clockwise (right-hand threaded joints) if "CW" is selected and the direction ring is in the right position. Select "CCW" for counter clockwise tightenings.

> ⓘ **The direction ring adjusts the rotation direction of the tool socket, while parameter *P240 Tool tightening direction* decides whether it is a right- or left handed threaded joint.**

> ⚠ **If different tightening directions are used on the same tool, there is a risk that the operator will use the wrong direction for a specific screw. This could lead to unexpected reaction forces in the tool that could be dangerous for the operator.**

With regard to reverse angle or rotate spindle reverse, the "active" direction is the opposite from the *P240 Tool tightening direction*. For instance, if "CW" is to be selected turn the direction ring to the left position. For safety reasons, it is not possible to loosen the joint with these strategies.

The remote start input is connected in parallel with the tool trigger and has the same functionality. If

remote start input is used the tool trigger is disabled.

If a digital input is used as start signal input, the direction ring and trigger on the tool are bypassed and the tool starts tightening in the direction programmed in the parameter *P240 Tool tightening direction*.

The fieldbus tool start input works in the same way as the tool start from digital input. The 4-pin connector must be wired correctly.

> ℹ️ **The 4-pin connector on Power Focus back panel must be wired correctly.**
>
> **Do not use tool start from digital input via an I/O Expander on a Synchronized tool group. Use only the four internal digital inputs.**
>
> **Remote start is not available for Tensor STB tools.**

For information on setting of *P245 DS torque tuning factor*, see section *DS con*.

7.8.6   Gradient monitoring

In the Pset **Programming +** branch, select **Gradient monitoring** to find additional parameters for monitoring joint hardness.

Gradient monitoring		
P250 Gradient monitoring	☑	
P251 Gradient torque min	0,00	Nm
P252 Gradient torque max	9999	Nm
P253 Joint hardness	10	Deg
P254 Start torque	0,25	Nm
P255 Angle offset	0	Deg

With *P250 Gradient monitoring* selected, monitoring starts when *P254 Start torque* and *P255 Angle offset* are reached.

The gradient is defined as the mean torque difference between each interval as defined by the parameter *P253 Joint hardness*. A lower value indicates a hard joint and a higher value a soft joint. The calculated gradient is evaluated against *P251 Gradient torque min* and *P252 Gradient torque max*.

When this function is activated, a gradient is calculated for each new torque and angle sample available. Tightening is aborted and a gradient high or low result is displayed if the gradient exceeds the limits.
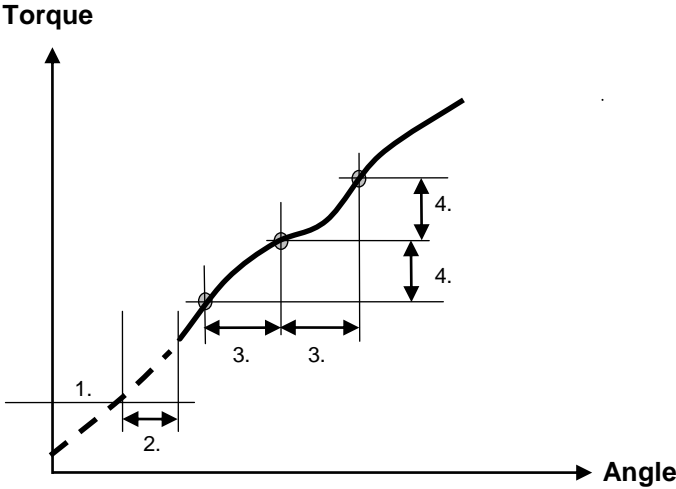
Torque

1. P254 Start torque   3. Intervals set as P253 Joint hardness
2. P255 Angle offset   4. Gradient

7.8.7   Yield control

Yield control is activated by selecting the *P100 Control strategy* to **Yield** or **Yield/Tq con (OR)**. The *P101 Tightening strategy* can be set to **One stage**, **Two stage** or **Quickstep**. Yield control starts at *P260 Start torque*.

In the Pset **Programming +** branch, select **Yield control**.

Yield control		
P260 Start torque	20,00	Nm
P261 Step angle	3	Deg
P262 Window angle	5	Deg
P263 Yield slope ratio	50	%
P264 Extra angle step	8	Deg

The spindle runs in the chosen direction until the yield point is detected. Search for the yield point starts when the torque has reached the threshold *P260 Start torque*. The average torque over the measurement window *P262 Window angle* is calculated [1].

[1] $T_n = \dfrac{\sum T_{Mes}}{NoSamples}$ T_{Mes} : Measured torque value in sample.

The sample frequency in Power Focus is 2 kHz. If the number of samples in the window is too low for a calculation of a torque average, the tightening is aborted and an event code is displayed. The procedure of

average torque calculation is repeated after **Step Angle** degrees and the difference between every second value is calculated (TDIFF in the illustration below):

[2] $\quad TDIFF = T_n - T_{n-2}$

Each value of difference in torque is compared and the maximal difference (T_{max}) is stored. The yield point is considered reached when a calculated difference in torque is less than **Yield slope ratio** (expressed as a percentage) of the current T_{max}:

[3] $\quad TDIFF < Yield.slope.ratio * T_{max} \Rightarrow YIELD$

If the parameter *P264 Extra angle step* is set, then the tightening is continued for the stated angle after the yield point is reached. The figure below illustrates the steps of the yield control.

> **Prerequisites and limitations for Yield control;**
> **- Gold or ETX RBU**
> **- PF4000**
> **- Fixtured application, parameter T101 Usage set to fixtured**
>
> **For the STwrench tool interfacing with the PF, the yield strategy is programmed in a different way. Only parameter P264 *Extra angle step* needs to be set together with the torque target and limits, and the angle limits. Check with your local Atlas Copco representative how to setup your specific application.**

Torque

1. P260 Start Torque
2. P261 Step angle
3. P262 Window angle
4. Torque difference (TDIFF)

5. P264 Extra angle step
6. P262 Yield slope ratio, example 100%
7. P262 Yield slope ratio, example 70%
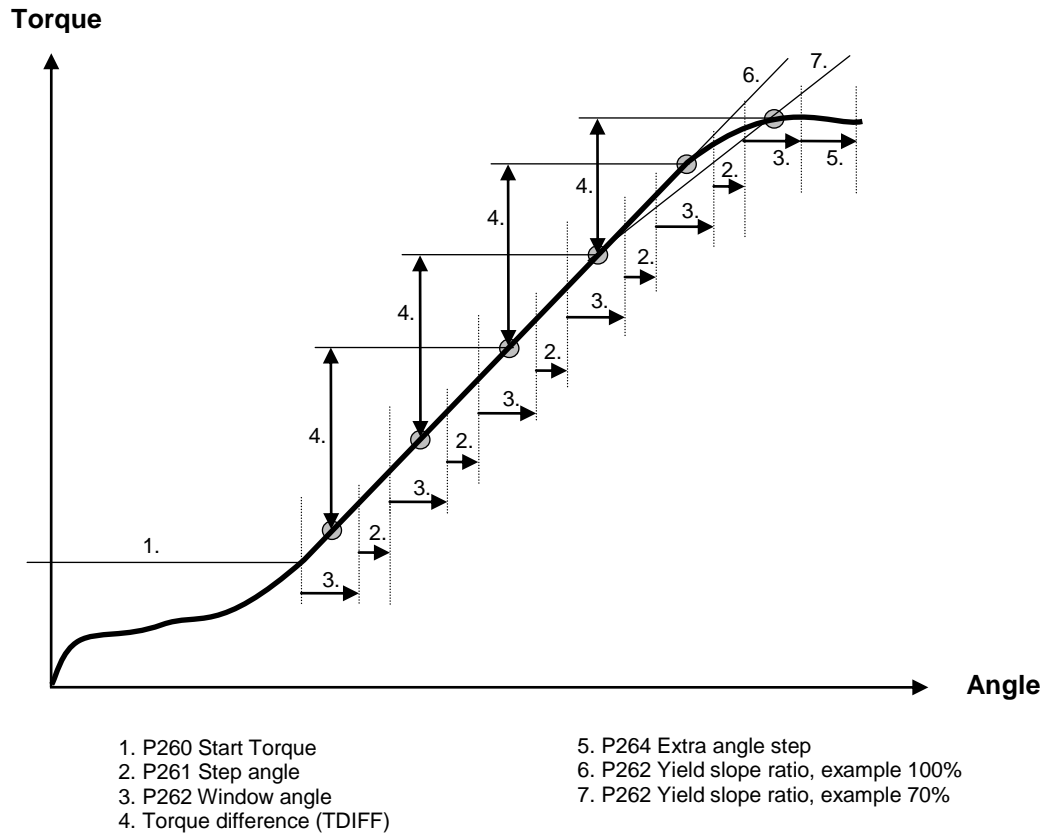
7.8.8   Post view torque

In the Pset **Programming +** branch, select **Post view torque**.

Make suitable parameter settings.

Post view torque		
P280 Post view torque	☐	
P281 Post view min torque	Not Used	Nm
P282 Post view min monitor start	Not Used	Deg
P283 Post view min monitor interval	Not Used	Deg
P284 Post view max torque	Not Used	Nm
P285 Post view max monitor start	Not Used	Deg
P286 Post view max monitor interval	Not Used	Deg

Some joints have a torque peak prior of *P116 Rundown complete*. Post view torque function makes it possible to monitor torque values during two specified angular intervals. The interval start is defined as angle prior to *P116 Rundown complete*. Torque is then monitored for a specified angular interval. Evaluation (OK/NOK) is done when rundown complete is reached.

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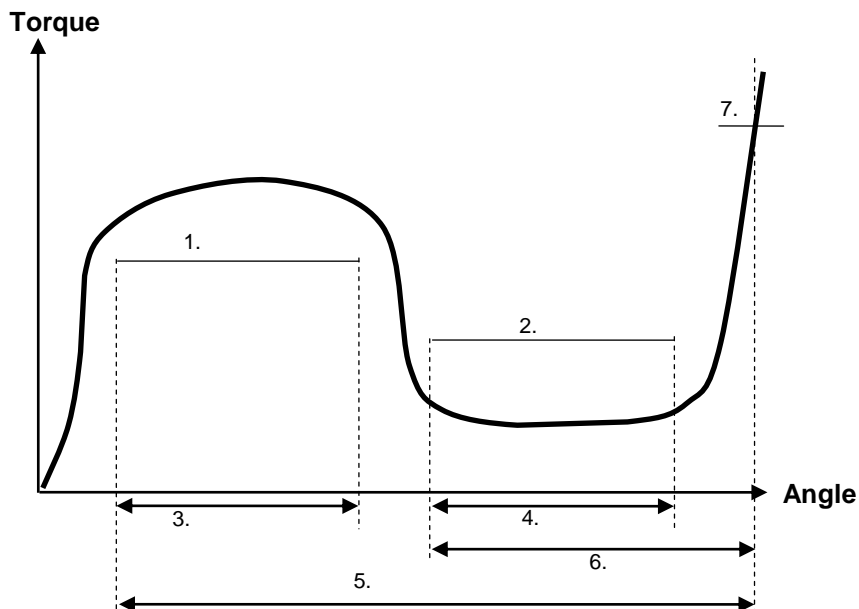
Torque

1. P281 Post view min torque
2. P284 Post view max torque
3. P283 Post view min monitor interval
4. P286 Post view max monitor interval
5. P282 Post view min monitor start
6. P285 Post view max monitor star
7. P116 Rundown complete

When reviewing a trace in TTPF, for a tightening made using the post view torque strategy, the limits (two boxes according to *P281-P285*) are only shown if the trace is in Torque over Angle mode, not in Torque over time mode.

7.9   Pset setup

Expand the **Pset setup** branch to access parameters handling administration, Pset results and comments.

⊞ Programming
⊞ Programming +
⊟ Pset setup
    Pset administration
    Reset
    Pset comment
⊞ Statistic programming
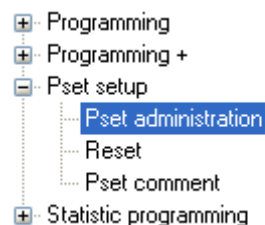
Add a name for the Pset (optional).

This section also contains options for **View existing Pset**, **Create new Pset**, **Copy Pset** and **Delete Pset**.

Click **Delete Pset result** to select the Pset result to remove from the Power Focus memory.

When clicking **Delete all results** a confirmation window appears. Select Yes to accept or No to abort operation.

Pset administration

P402 Name Pset   test1

[View existing Psets]

[Create new Pset]

[Copy Pset]

[Delete Pset]

P406 Pset updated   2010-06-02 08:22:46

P409 Pset updated by   TTPF

Reset

[Delete Pset results]

[Delete all results]

The Pset specific comments are shown here.

When parameter C600 is set to Pset comments, a comment can be entered each time a Pset is changed and stored.

The Comment dialog box appears after a change, when pressing Store.

Pset:1 - PF:Name Not Defined

[Parameter Overview]

Speed and ramp
Time
Batch count
High speed rundown
Positioning
Programming +
Pset setup
   Pset administration
   Reset
   Pset comment
Statistic programming

[Auto Set]

[Quick programming]

Pset comment
P420 Comment
Final torque changed to 14 Nm.
Batch count 5

Comment
Final torque changed to 14 Nm.
Batch count 5

[OK]   [Cancel]

[Close] [Compare] [Undo Compare] [Read] [Store]

7.10 Statistic programming

Expand the **Statistic programming** branch.

In this branch it is possible to define conditions to be included in the statistical calculations for the tightenings (Psets).

Click **Store** to save the settings.
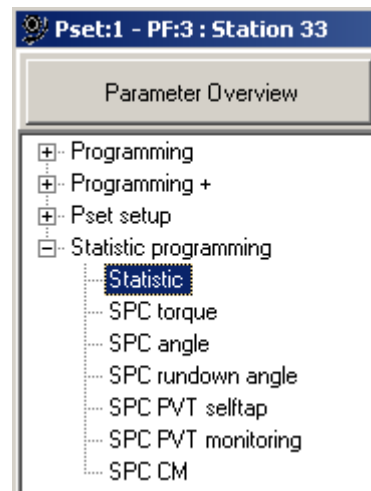
7.11 Running a Pset

To run (activate) the Pset, select the Pset in the **Selection panel** or via any configured Pset control source. This must correspond with the selected source in *C200 Pset*, see information in section Controller *Configuration* and parameter list *Configuration*.
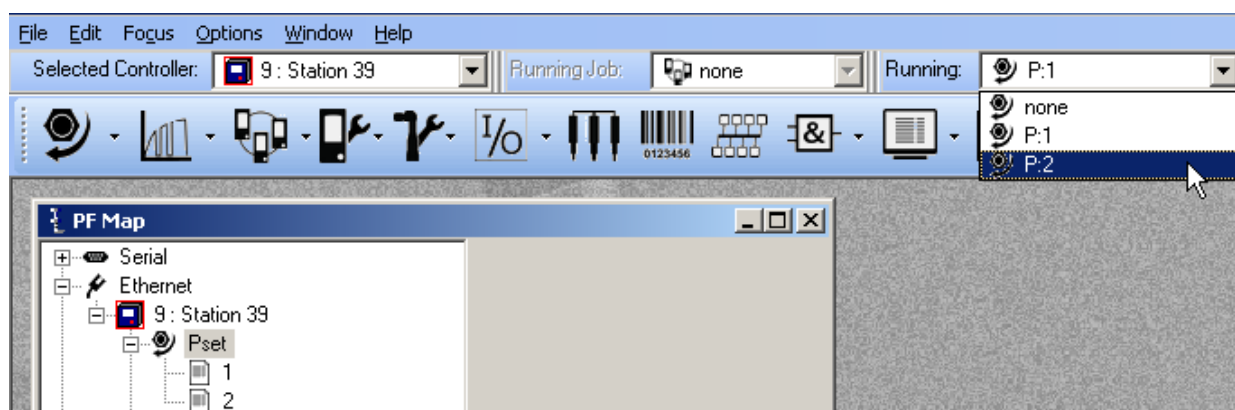
8   Multistage

The **Multistage** feature offers a dynamic link to up to eight Psets in several steps for performing a sequence of operations.

A typical application scenario such as joint conditioning, where the fastener is run to a torque level of 10 Nm then backed off by 180 degrees and then fastened to a final torque level of 14 Nm. This operation would be regarded as a three step Multistage. This is performed by the operator when in a hand held configuration by depressing the trigger in the normal way until the end of the operation, or alternatively when used in a fixed operation where the start signal is either latched or externally triggered.

> ℹ **When running a Multistage the ring button must always be in the CW direction, even if the first Pset is in the CCW direction.**

Multistage:
1: Pset 1 10 Nm
2: Pset 2 Back off 180
3: Pset 3 14 Nm

The Multistage tightening results and statistics are a combination of all the results from the different Psets within the Multistage. The default setting is all results from the last Pset in the Multistage.

Individual Pset min and max limits function in all stages and the tool shuts off when a max limit is exceeded (or for any reason if the min limit is not reached) as per normal operation. The result displayed is then taken from the stage where the shut off occurred.

> ℹ **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**
>
> **See parameter list section *Multistage* for a description of all available Multistage options.**

8.1 Create new Multistage/Open Multistage

In the PF Map, mark **Multistage**, **right-click** and select **Create New Multistage**. Alternatively, **double-click** on an existing Multistage to open the configuration window.
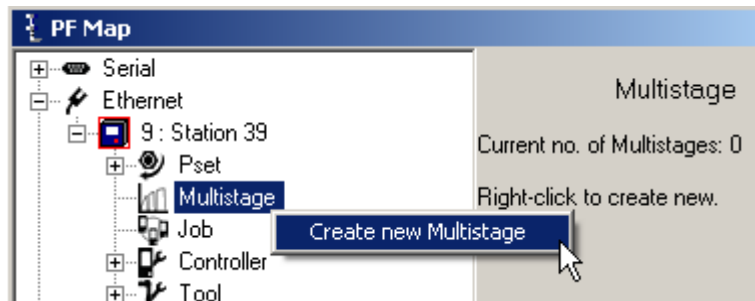
Select **New Multistage ID**, enter the **New Multistage name** (optional) and click **OK** to open the Multistage window.
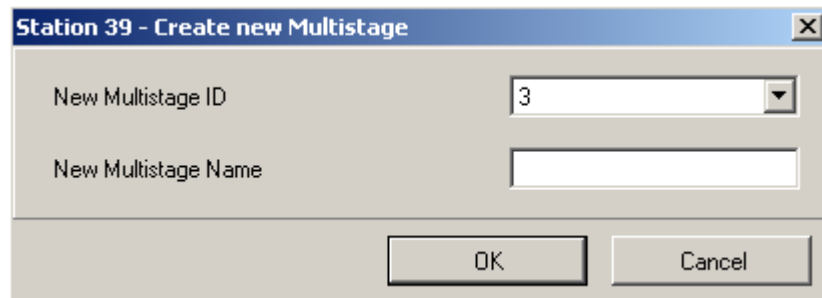
Click **Add** to select Psets to be included in the Multistage.

In the left upper window part, make selections for **Options**, **Results** and **Statistics** (mark to activate).

Click **Store** to save the settings for the Multistage.

> **The selection of a Multistage (via PC, Selector, Digital input etc.) is handled in the same way as a Pset.**
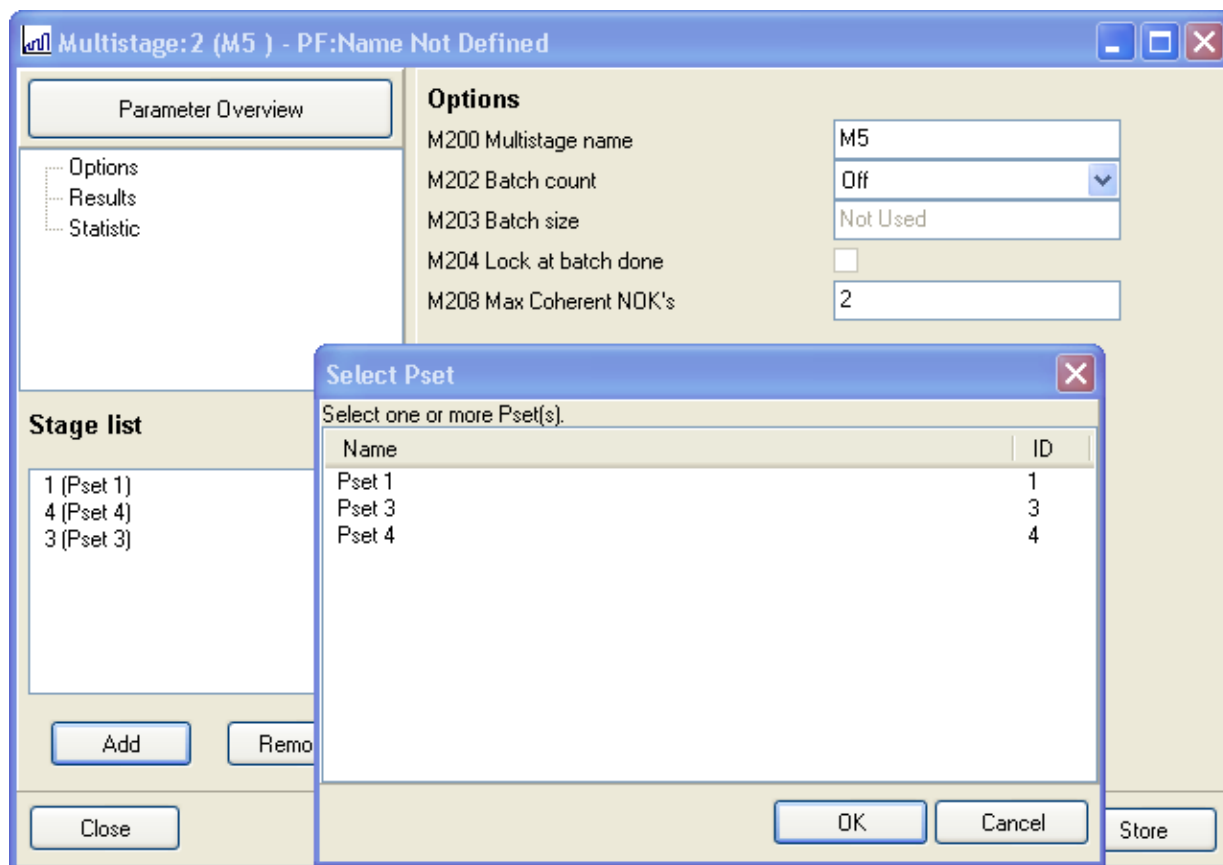
The Multistage strategy is not supported by Power Focus with wireless tools.

9   Job

The **Job** function is advantageous when an object has bolts or screws that require different torque and angle values for tightening. A Job is useful when an object needs different Psets and Multistages. Instead of manually selecting each Pset or Multistage, the Job functionality keeps Psets and Multistages in a predefined order.

Power Focus allows 50 Psets/Multistages in a Job, and the storage of 99 Jobs (with the memory setup it is possible to store up to 400 Jobs, see section *Memory*).

The Job function is RBU-dependent.

A Job is normally pre-programmed (static). A static job is created and stored in the Power Focus or from ToolsTalk PF. A dynamic job is created externally and sent to PF via Open Protocol for immediate execution. The lifetime of a dynamic Job is the time for the Job to be executed.

For more information on Open Protocol, see section MID 140 Execute dynamic Job request in the *Power Focus Open Protocol User Guide*.

> ⓘ **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**
>
> **See parameter list section *Job* for a description of all available Job options.**

9.1   Job concepts

The Job function in Power Focus can be defined by two categories, **Standalone Job** and **Cell Job.** Standalone Job is when just one PF is involved in the Job, and Cell Job is a Job in which several PF units are involved. The Psets/Multistage included in a Job can be selected from a stand-alone PF or from several PF units in a Cell.

All PF units that perform a Cell Job must belong to the same **Job group**. A Job group consists of a maximum of 20 controllers within the same Cell (see section *Controller* for more information).

A single PF can only belong to one Job group, but it is possible to create several Job groups in the same Cell.

In a Job group, all included controllers are Job members. One of the Job members acts as a Job reference, the others act as Job clients (see figure on next page). The Job reference retains a list of all Psets and Multistages available for all Job members. The Job reference is the main controller and remote controls the Job clients.

Job example

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

Four bolts that require a torque of: 39 Nm

Three bolts that require a torque of: 70 Nm

One bolt that requires a torque of: 88 Nm

For this example three different Psets have to be created:

- Pset1: final target 39 Nm

- Pset2: final target 70 Nm

- Pset3: final target 88 Nm
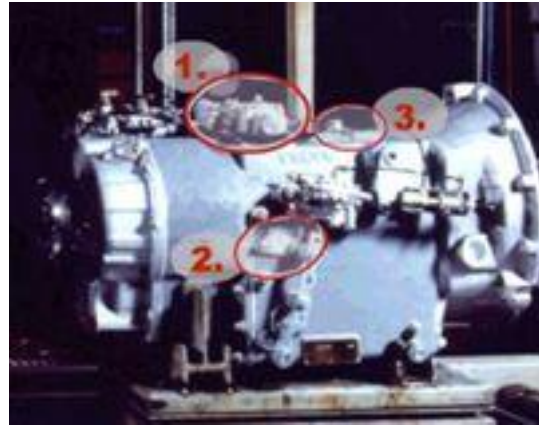
By combining the Psets in the above example, the following Job list is created (see table below).

PF	Pset	Pset name	Batch size	Max cohered NOK
1	1	Pset1	4	3
1	2	Pset2	3	-
1	3	Pset3	1	-

The Job in this example is performed by one single PF. "Batch size" means the number of times the tightening should be repeated with the same Pset. JOB OK is signaled when all tightenings within the Job have been performed correctly.

If *P153* or *M208 Max coherent NOK's*, or *P151* or *M203 Batch size* are used for the Psets or Multistages included in the Job, these settings are ignored by the Job setting. The same is true for other Job settings.

> **If the torque controller is powered off before the completion of the Job, the Job is lost.**

9.2 Job configuration

9.2.1 Creating a Job group

The PF units in a Job group must be working in the same Cell. Therefore, before creating Job groups a Cell has to be configured (see section *Controller* for more information).

After cell configuration, the next step is to create a Job group including Job reference and Job client.

In the **PF Map**, select **Controller > Network**.

To define a **Job reference**, set the parameter *C316 Job reference IP* address equal to the parameter *C300 IP address* of the same controller.

To define a **Job client**, set the *C316 Job reference IP* to the *C300 IP address* of the **Job reference** controller.

Click **Store** to save the settings and reboot PF.

Job reference settings

Job member settings

9.2.2   Creating a new Job

ℹ **With the configuration setup it is possible to store up to 400 Jobs (see section *Memory* for more information).**

When creating a Cell Job the programming has to be done in the Job reference controller.

Right-click **Job** in the PF Map and select **Create new Job**. Alternatively, **double-click** on an existing Job to open the Job configuration window. Every Job has a unique ID number.
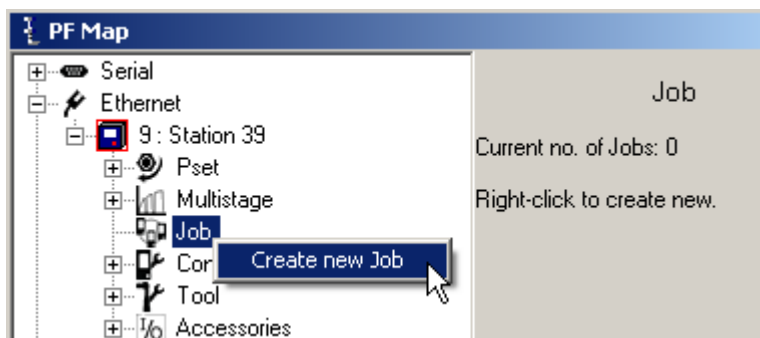
Select **New Job ID** in the drop list, give the Job a name (optional) and click **OK** to open the Job window.
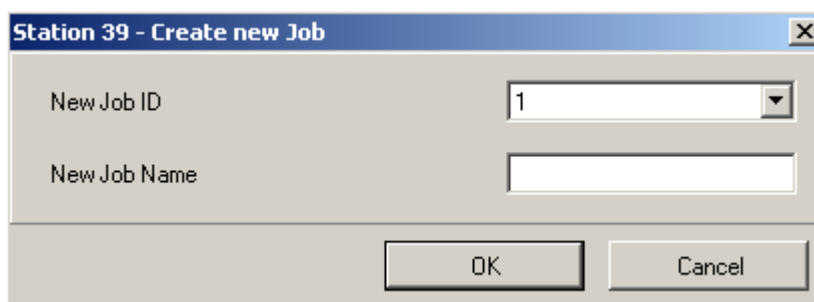
The upper part of the Job window shows the available Psets and Multistages and **Job list**, see *J300 Job list* in parameter list section *Job* for a description.

Select Psets or Multistages and add them to the Job list by clicking on either **Manual select** or **Auto select**. With manual select the Pset is selected by the setting in *C200 Pset,* with Auto select the Pset is automatically selected. A precondition for Auto select is that *J301 Job type* is set to Forced. It is possible to change between manual and auto select by clicking in the table in the auto select column.

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

To specify **Max coherent NOK's**, click in the column in the Job list table and enter a value.

> 🛈 **Auto select is not allowed for free order Jobs, with two or more Psets/Multistages selected from the same Power Focus.**
>
> **The batch size defined in Job overrides the batch size defined for a specific Pset/Multistage (see parameters *P150 Batch count* and *M202 Batch count*. It is not recommended to use the batch count function in Job and Pset/Multistage settings simultaneously.**

Continue and make settings for the options in **Configuration**, **Batch**, **Timers**, **Line control**, **Result** and **View**. See parameter list section *Job* for a description of the parameters.

J330 Use line control must be set to **Yes** before the digital inputs and relay settings for line control can be activated.

9.2.3 Select Job

Power Focus allows two different possibilities for Job selection; *C201 Job* and *C202 Job override*. To be able to select a Job at least one of the two parameters has to be set. The parameters are set from **PF Map>Controller>Configuration>Select source**. The system remembers the most recently selected source until the Job is either completed or aborted. After a Job has been started, it is not possible to select a new Job until Job done or Job aborted.

C202 Job override has a higher priority than *C201 Job*. If a Job is selected from *C202 Job override*, then it always terminates a present Job and is selected instead.

If a Job is selected from the select source in *C201 Job*, then it is only possible to select a new Job from the same source before the first tightening in the Job has been done (or after the Job has been ended). During the Job, it is only possible to select a new Job from the select source in *C202 Job override*.

If a Job is selected from the select source in *C202 Job override*, it is only possible to select a new Job from the same source after the selection and during the Job.

If a Job has been 'overridden' it will be aborted before the new Job is selected.

> **To be able to select/abort a Job from the PF Graph display, *C201 Job* or *C202 Job override* must be set to "PF keyboard".**
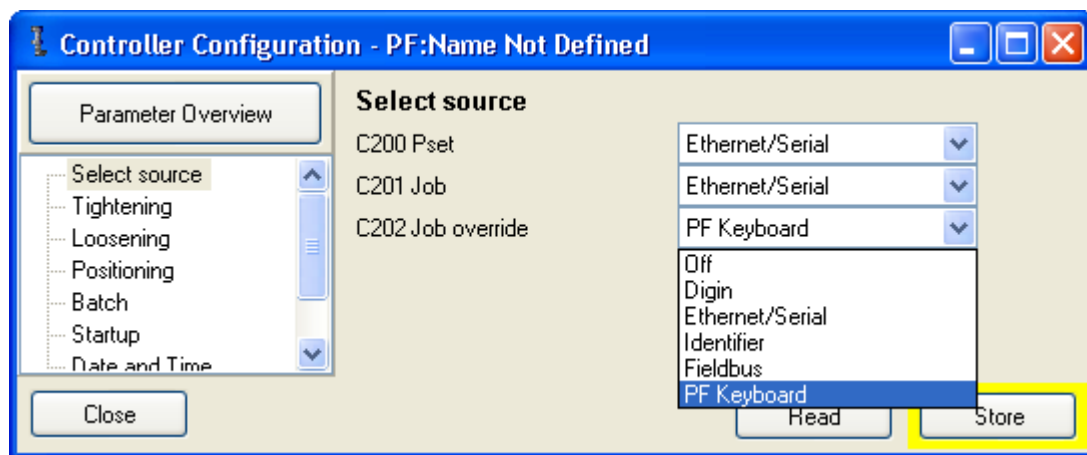
> **A Cell Job can only be selected or aborted from the Job reference.**
>
> **To be able to select a Cell Job the Job reference needs to communicate with the Job clients that form the selected Job. Otherwise the Job reference will not start the Job. All the Job clients detect communication failure with the Job reference and vice versa. If the Job reference loses communication with a Job client it will try to re-establish the communication.**

Two cases when the Job reference loses the communication with a Job client during a running Job:

- If the disconnected Job client has tightenings left to perform, the Job reference will abort the running Job immediately.

- If the disconnected Job client did not have any tightenings left to perform, or had no part in the running Job, the Job continues.

If a Job client loses communication with its Job reference, the Job client immediately stops running the Job and locks the tool.

To select the Job from ToolsTalk PF, set parameter *C201 Job* to Ethernet/Serial.
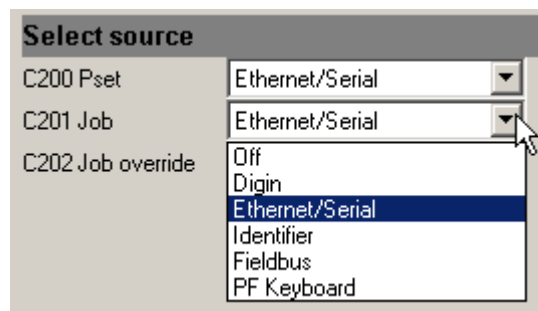
Select the Job to run in the **Selection panel.**
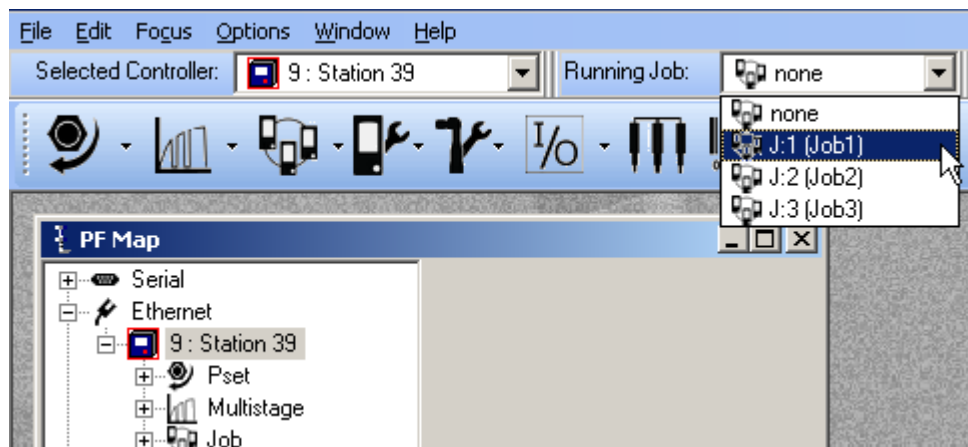
If selecting an empty Job, without any Pset/Multistage included, Power Focus will send a Job OK signal.

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

Job monitor displays the selected Job and provides a management function.

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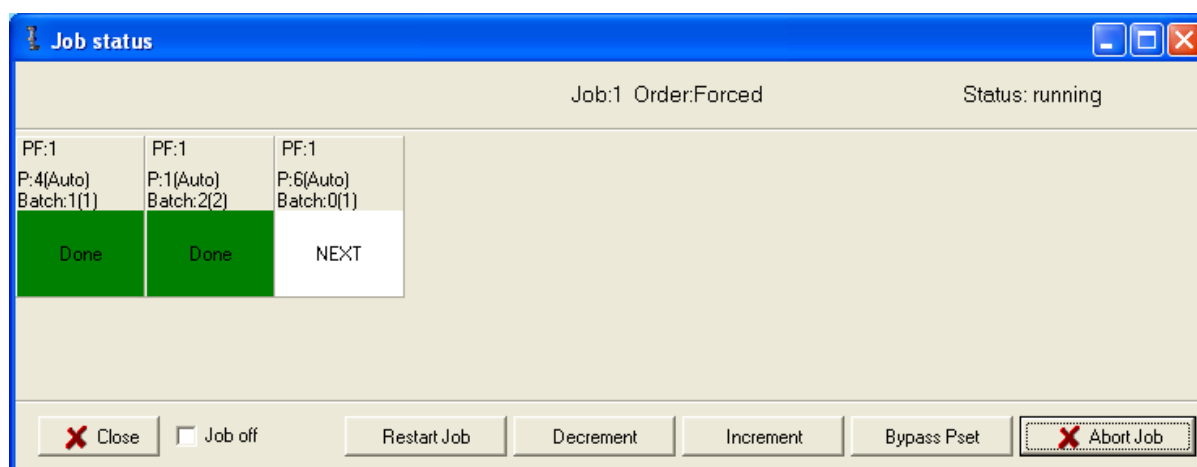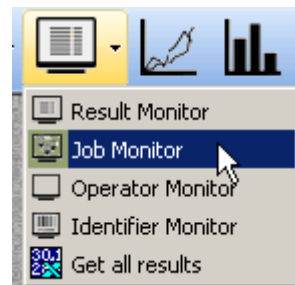
9.3   Functions in the Job monitor

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 are reset and the Job timer restarts.
Decrement	Batch decrement makes it possible to redo the last tightening/increment in a Job. The batch counter of the Pset or Multistage is decreased by one step. It is not possible to go back one step after the Job has been completed. The Job batch decrement function is accessible only from the Job reference controller.
Increment	Batch increment makes it possible to increment the batch counter value of a Pset/Multistage without performing a tightening. It is possible to complete a Job by using the batch increment function. After performing batch increment in a Job, the Job status will be NOK (not OK) when *J311 Batch status at increment/bypass* is configured to NOK, If set to OK, the Job status can be OK. In a Job with free order, only the Job client with the active Pset/Multistage is able to utilize batch increment. In Jobs with forced order, the Job client with the active Pset/Multistage and the Job reference are able to utilize batch increment.

Function	Description
Bypass	Bypass skips a specific Pset/Multistage 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/Multistage is bypassed. The Job status will be OK/NOK depending on the parameter *J311 Batch status at Increment/bypass*.
	In a Job with free order, only the Job client with the active Pset/Multistage is able to use the bypass function.
	In a Job with forced order, the Job client with the active Pset/Multistage and the Job reference are able to use bypass the function.
Abort Job	Abort Job is only accessible via the Job reference controller. Abort can be an external signal as well as an internal order (see *J320 Max time to start Job* and *J321 Max time to complete Job*).
	When a Job abort request is received the Job functionality will wait for completion of the ongoing tightening result before aborting the Job.
Job off	This function offers the possibility to turn off the Job function and unlock all involved tools.
	Running Job: When selecting Job off for a running Job the tool/tools will always be enabled. The Job reference will order all Job members to select the latest Pset from the digital input, fieldbus or selector (in case one of these is *C200 Pset*) otherwise the latest selected Pset in the Power Focus will remain.
	No running Job: The Job reference will unlock the tools of all Job members. The Job reference will also order Job members to select the latest Pset, which was selected from the digital input, fieldbus or selector (in case one of these is the *C200 Pset*). Otherwise the latest selected Pset in the Power Focus will remain.
	When a PF is in Job off mode it is possible to perform tightening with any existing Pset or Multistage. As long as the Job reference is in Job off mode the user cannot select a new Job, the Job off mode must first be inverted.
	The only occasion when the Job off function affects the Job clients is when they have lost communication with their Job reference. In this case there is the possibility to unlock the Job clients locally by using the Job off function.
	Only the Job reference will remember the Job mode after a reboot.
Job status (information)	Job OK: Received if all Psets/Multistages included in the Job have been correctly performed, alternatively if batch increment/bypass has been used (presupposed that batch increment/bypass is configured as an OK event).
	Job NOK: Received if any Pset/Multistage included in the Job has not been correctly performed and if *J310 Increase batch at tightening* is configured OK+NOK. Alternatively it is considered as NOK (Not OK) if batch increment/bypass has been used (presupposed that Batch Increment/Bypass is configured as an NOK event).
	Job aborted: Received if a Job is considered aborted.

9.4 Unlock the tool

Unlock the tool by selecting a new Job, deleting all existing Jobs or select Job off.

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

It is not possible to unlock the tool by rebooting PF.

10   Controller

The **Controller** section contains configurations common to all tightenings and is unique to each PF.

> 🛈 **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**
>
> **See parameter list section *Controller* for a description of all available Controller options.**

10.1   Information

Expand the **Controller** branch in the PF Map.

Double-click **Information**.
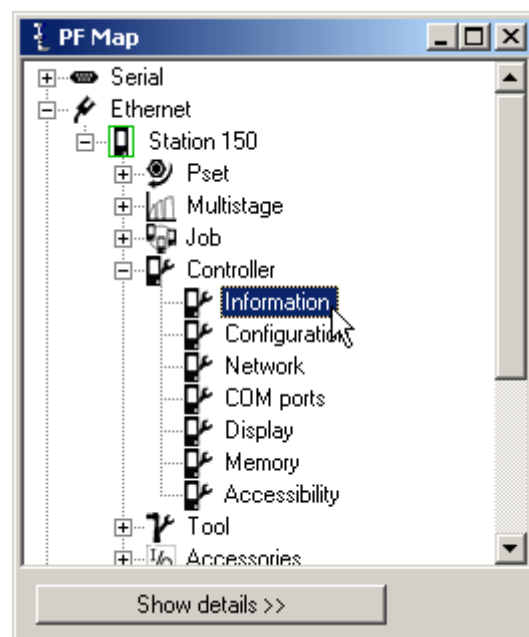
This window contains information about the ToolsTalk PF **Software** and the Power Focus **Hardware**.

Software

C100 Main code version	Head.185
C101 Application code version	14.14.0
C102 Parameter tree version	240
C103 RBU code version	1.3.14
C104 Boot code version	2.7.222
C105 DSP code version	4.0.19
C106 MC code version	5.76.0

Hardware

C110 Controller type	Compact
C111 Serial number	F770003
C115 RBU type	Gold (Au)
C116 RBU serial number	00164256
C118 MAC address	00:50:D6:02:81:A0

10.2 Configuration

In the PF Map **Controller** branch, double-click on **Configuration**.
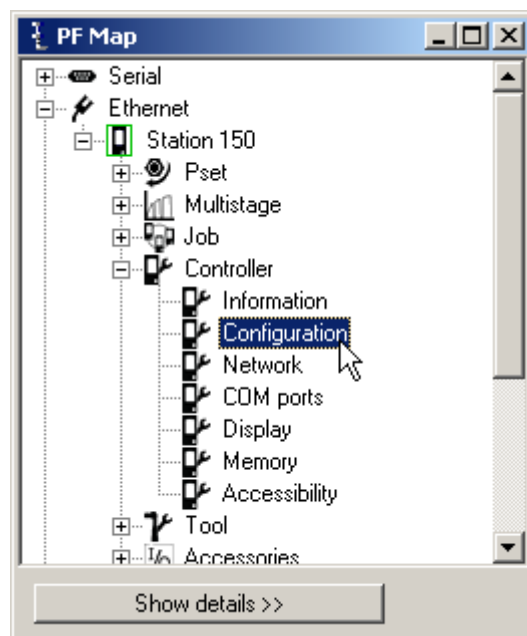
Make settings for **Select source**.

Selector: A selector configured on the I/O bus.

Digin: A digital input can be a device on the I/O bus, an internal digital input, an ST GPIO device or a Logic configurator.
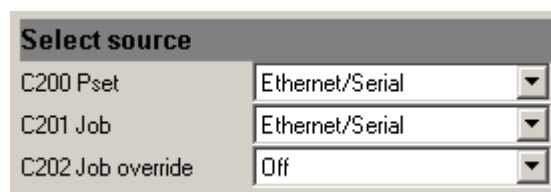
Ethernet/Serial: ToolsTalk, Open protocol, or a customer specific protocol.

Identifier: A scanner configured. See section *Identifier*.

Fieldbus and Fieldbus selector: See section *Select Pset from fieldbus and set batch size*.

PF keyboard: The Pset is selected from directly from the PF Graph (Pset + or -), or Compact (F-buttons).

ST selector: An ST selector attached to the tool configured in Mode 2.

Make settings for **Tightening**, **Loosening** and **Positioning**.

The parameter *C230 OE positioning type* defines how the open-end position is reached. In all *C230* strategies the tools rotates slowly the first 30° to detect that the tool is not in contact with the nut. Thereafter the tool rotates faster; the tool is stopped if the *P171 Limit value* is exceeded.

The *C230* parameter can be set to:

Forward - The tool rotates forward to open end position

Reverse - The tool rotates reverse to open end position

For these two options, if the *P171 Limit* value is exceeded, the event *E122 Open end positioning failure* is triggered.

> ⓘ **To avoid that a nut is incorrectly loosened when the Forward / Reverse strategy is used, set *P171 Limit* as low as possible as long as the inner friction in the tool is exceeded.**

Reverse Torque Based - Open end position is found via a slow reverse rotation. However, if the P171 Limit value is exceeded before the open end position is found, the home position relay is set, but the event E122 Open end positioning failure is not triggered.

Tightening	
C210 Lock on reject	No
C211 Result of non-tightening	☐
Loosening	
C220 Disable loosening at OK	☐
Positioning	
C230 OE positioning type	Forward

Make settings for **Batch** and **Startup**.

Click **Set** under **Date and Time** to store computer and user time to PF.

Note!
If using Toolsnet, Toolsnet will act as the Date and Time master synchronizing the time in the PF to the time in Toolsnet.

Click **Events** to configure which events to log and show.

Click **Store** to save settings.

Batch

C240 Reset batch at Pset change	☑
C241 Reset batch at Pset store	☑
C242 Dec. batch at OK loosening	☐
C243 Batch status at increment/bypass	NOK
C244 Increase batch at tightening	OK

Startup

C250 Use last Pset	☐

Date and Time

Set

Events

Events

10.3   Network

Power Focus uses both Ethernet and serial communication, and works together with ToolsTalk PF and database applications such as ToolsNet, etc.

The Cell and Net concept allows all PF units on an assembly station to communicate and work together. See also sections *Cell and Net, Job* and *Sync.*

In the PF Map **Controller** branch, double-click on **Network**.

Make settings for **Ethernet** and **Cell**.

If used, activate and setup **Multicast**.

Multicast	
C320 Multicast on	☑
C321 IP address	225 6 7 8
C322 Port	8086
C323 Results	All
C324 Traces	None
C325 Sync status	☐
C326 Event code	☐

Make settings for **Open Protocol, Tools Talk** and the **Acta** port.

If used, activate and setup **ToolsNet**.

Click **Store** to save settings.

Open protocol	
C330 Port	4545
C331 Serial cable loss detection	☑
Tools Talk	
C340 Port	6543
ToolsNet	
C350 ToolsNet on	☑
C351 IP address	0 0 0 0
C352 Port	6570
C353 Traces	None
C354 Keep Pset date on restore	Off
Acta	
C360 Port	6540

10.3.1   Cell and Net configuration

The Power Focus software offers extended networking possibilities. The **Cell** and **Net** concepts are part of the RBU Gold and RBU Silver types.

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

Via the **Cell** concept, it is possible to arrange all PF units at an assembly station in a group, giving extra functionality to the work station. The **Net** concept enables functionality to group all cells on the assembly line into one net.

The figure below illustrates a cell consisting of four PF Graph controllers and a switch.

A cell consists of one **Cell reference,** a maximum of 19 **Cell members,** thus a total of 20 PF units. Cells can then be grouped into **Nets**; the maximum number of cells in a net is 1000. Each net has a **Net reference**. One PF can function as both **Cell reference** and **Net reference**.

Every cell has a Cell identification number (Cell ID) unique to the network. Within a cell, every PF has its own unique channel identification number (Channel ID). With the PF Graph, the user can browse through the different channels and program and view the result from any other controller in the same cell.

The Cell reference and Cell members can be configured through a PF Graph user interface or ToolsTalk PF.

> **All PF units in a Cell must have the same software version and the same RBU-type installed.**

> **When configuring a remote PF, make sure it is not in use by anyone else. Otherwise it might lead to the damaging of the tool or a joint. It might also lead to personal injury.**

The RBU Gold also enables Sync functionality (see section *Sync*) and running Cell Jobs (see section *Job*).

The figure below illustrates an example of a factory network configuration, a Net with three Cells. Each Cell has a Cell reference and three Cell members. One Cell reference also functions as the Net reference.

Net with three Cells

1. Cell

2. ToolsNet

3. ToolsTalk

4. Router

5. Switch

6. Cell master

7. Net master
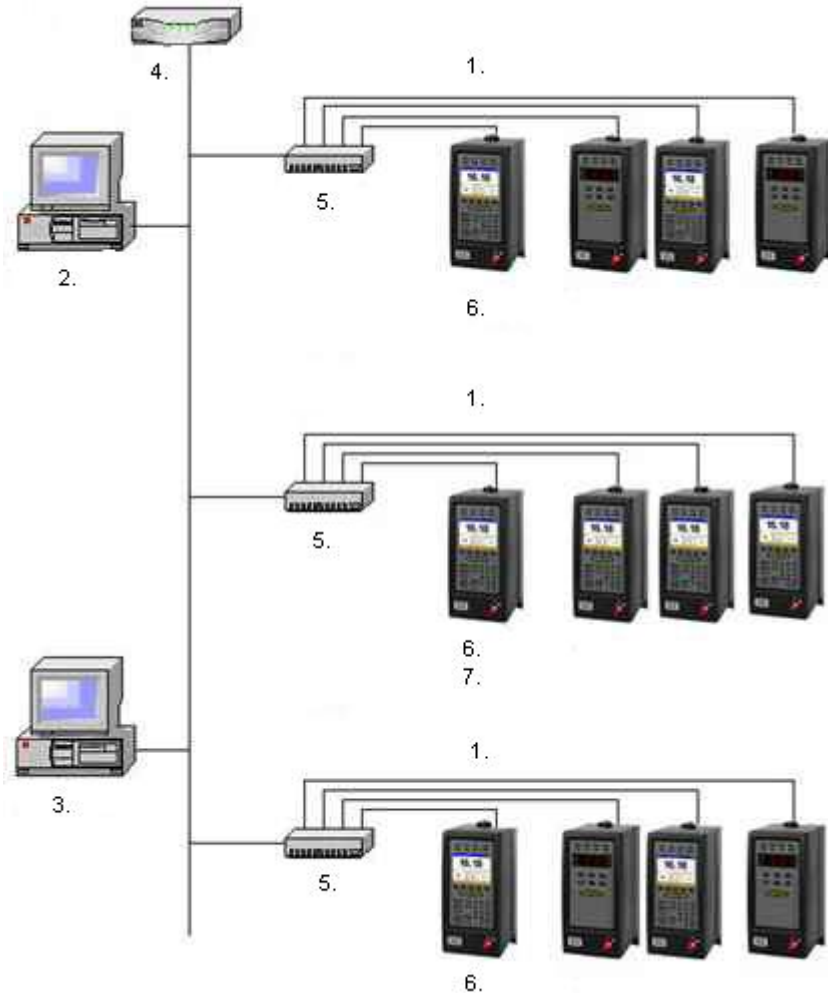
Network setup

ℹ️ **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**

To set up a network, PF must have an IP-address. See section *Connecting a PF*.

Open **PF Map>Controller>Network**.

Set the *C300 IP address*, *C301 Subnet mask* and *C302 Default router*.

Set the *C312 Cell reference IP* to the IP address of the Cell reference.

Set the *C315 Net reference IP* to the IP address of the Net reference.

> ℹ️ **To define a Cell reference or Net reference, set the Cell reference IP /Net reference IP the same as its own IP address.**

Set *C310 Channel ID* to a number unique within the Cell (1-20).

C311 Channel name is optional.

Ethernet				
C300 IP address	10	40	164	39
C301 Subnet mask	255	255	255	0
C302 Default router	10	40	164	1

Cell				
C310 Channel ID	7			
C311 Channel name	Front Cover			
C312 Cell reference IP	10	40	164	39
C313 Cell ID number	1			
C314 Cell name	Cell 1			
C315 Net reference IP	10	40	164	150
C316 Job reference IP	0	0	0	0
C317 Sync reference IP	0	0	0	0

Set *C313 Cell ID number* to a number unique within the network (1-1000). Only available when the controller is the Cell reference.

C314 Cell name is optional. Click **Store** to save the settings.

> ℹ️ **After all the settings have been made, restart all Power Focus units.**

Power Focus connection

When connecting to a controller, Cell reference or Net reference make sure that the following settings are correct.

On the Menu list, open **Option>Settings**.

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

Under **Ethernet setup**, check whether the connected Power Focus is a controller, Cell reference or a Net reference.

To connect PF, Cell reference or Net reference, click the **Connect** symbol.

When a Cell reference or Net reference is connected, clicking the corresponding line in the **PF Map** expands the Cell tree or Net tree.

If the C315 Net reference IP address has not been entered in a PF when adding it to the network, the added PF will be shown as a controller in the PF Map list of the Netmaster anyhow.
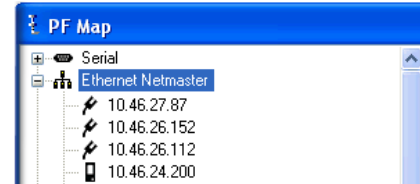
10.4   COM ports

In the PF Map **Controller** branch, double-click on **COM ports**.

Make settings for **Serial 1** and **Serial 2**.

Click **Store** to save settings.
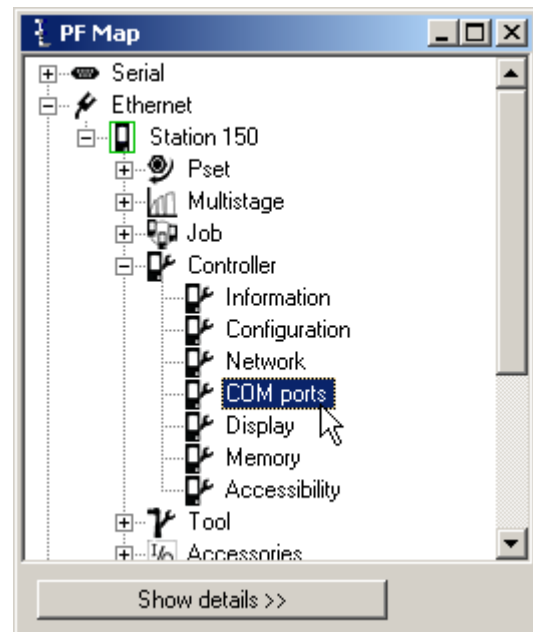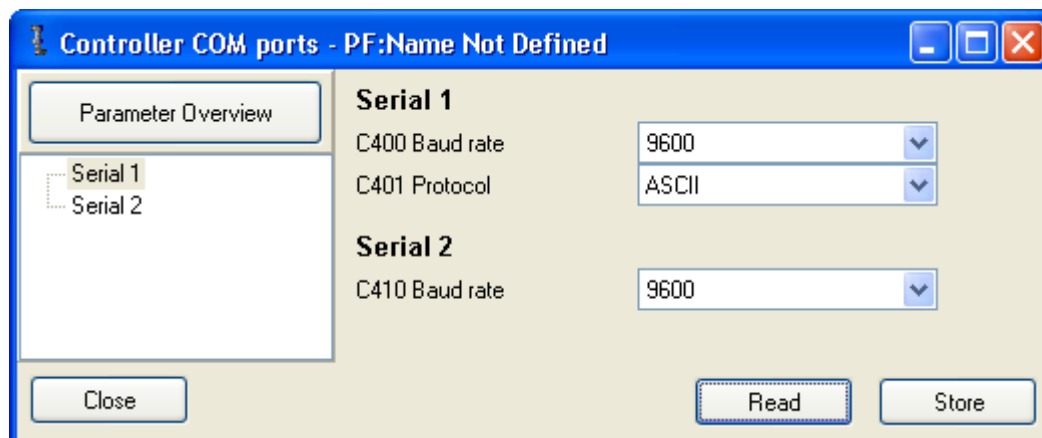
10.5 Display

In the PF Map **Controller** branch, double-click on **Display** to make settings for the controller display.
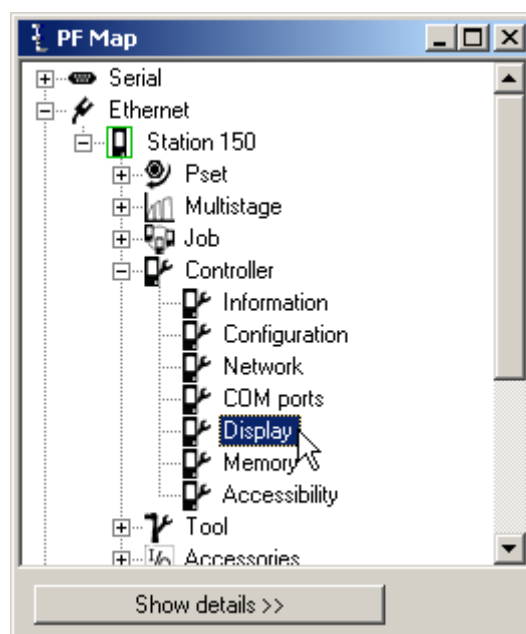
Make settings for **Presentation**, **Result view**, **Keyboard** and **Power save**.

Note that there are more selections available on the controller display. See parameter list section *Display*.

Click **Store** to save settings.

Presentation	
C500 Language	English
C501 PF Tq presentation unit	Nm
C503 Torque with PVT comp	☐

Result view

One channel

Compact display

Keyboard

C530 Soft keys enabled ☑

Power save

C540 Backlight auto off ☑

Make settings for **screen colors:**

Color theme
Background color for **OK** result
Foreground (text) color for **OK** result
Background color for **NOK** result
Foreground (text) color for **NOK** result

Click **Store** to save settings.

Colors	
C550 Theme	PF4000
C551 OK background	Default
C552 OK foreground	Default
C553 NOK background	Default
C554 NOK foreground	Default

10.6 Memory

⚠️ **All data stored in PF, except parameters *C300 IP address*, *C301 Subnet mask* and *C302 Default router*, will be erased when changing memory setup. Therefore, use the ToolsTalk PF function "Store PF to file" to save the existing data configuration (including Psets, Multistages, and Jobs). The data can later be retrieved via function "Read PF from file".**

ℹ️ **When changing the memory setup PF must be rebooted for the changes to take effect. It is necessary to "Read PF from file" twice and reboot PF one extra time.**

It is recommended to reboot immediately.

Configurable memory is only available for RBU Gold and RBU Silver.

Besides the 'default configuration' and 'totally configurable' (which gives the possibility to manually configure the Power Focus memory freely), Power Focus provides seven more configurable memory options; **More Psets, More Jobs, More Results, More Events, More Identifiers, QDAS,** and **Pset comments.**

Selection	Psets	Jobs	Results	Events	Identifiers	Statistical events	Identifier result parts	Traces
Default configuration	250	99	5000	100	100	100	1	8
More Psets	300	100	4000	100	100	100	1	8
More Jobs	100	400	4000	100	100	100	1	8
More results	100	100	6000	100	100	100	1	8
More events	200	100	5000	500	100	100	1	8
More identifiers	200	100	5000	100	400	100	1	8
Totally configurable	1-600	1-700	1-9000	1-800	400	1-500	1-4	1-100
QDAS	250	99	4000	100	100	100	1	8
Pset comments	200	100	5000	100	100	100	1	8

Number of identifiers is the maximum number of significant identifier strings available for identifier **Type 1** (Identifier Type 1 is used to trigger Psets, Multistages or Jobs). **Number of identifier result parts** is the amount of Identifier strings to be stored together with the tightening result. For more information, see section *Identifier*.

When increasing database elements, a decreasing of other elements might be necessary. For instance, if 6000 results are required it is not possible to have more than 100 Psets (option more results).

Memory setup

Store existing data, see *Store PF to file*, including Psets, Multistages, and Jobs before changing the memory setup. The data can later be retrieved, see *Read PF from file.*

In the **PF Map**, select **Controller>Memory**.

Make a selection for *C600 Type*. To manually configure the memory, select **Totally configurable**.

Click **OK** to continue.
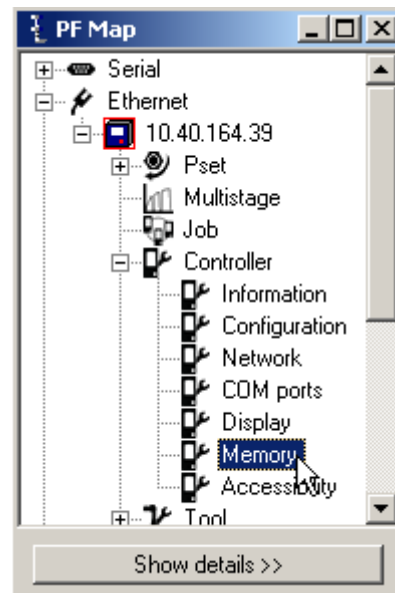
Select number of Psets, Jobs, Results, Identifier result parts, Events, Statistical events and Traces.

> **Indicator estimated memory usage is automatically updated in percent (a maximum of 100 percent is allowed).**
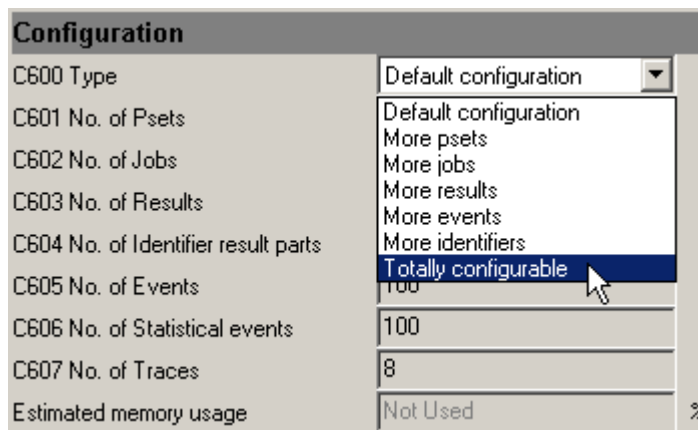
Ensure that all data is stored before saving the settings.

> **When changing the memory setup, PF must be rebooted for the changes to take effect. It is recommended to reboot immediately.**

After reboot, make a restore of the previous settings through function **Read PF from file**, see section *Read PF from file*.

Memory reset

Store important data, see *Store PF to file*, including Psets, Multistages, and Jobs before resetting the memory. The data can later be retrieved, see *Read PF from file*.

In the **PF Map**, select **Controller>Memory**.

To reset the memory or parts thereof, click the corresponding button.
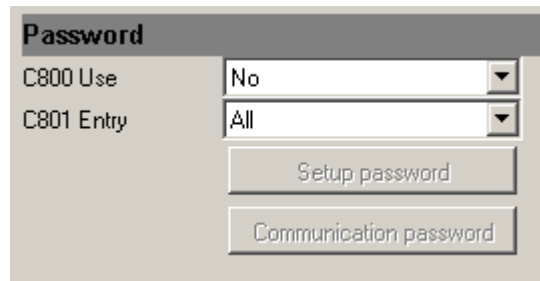
10.7   Accessibility

In the PF Map **Controller** branch, double-click on **Accessibility**.
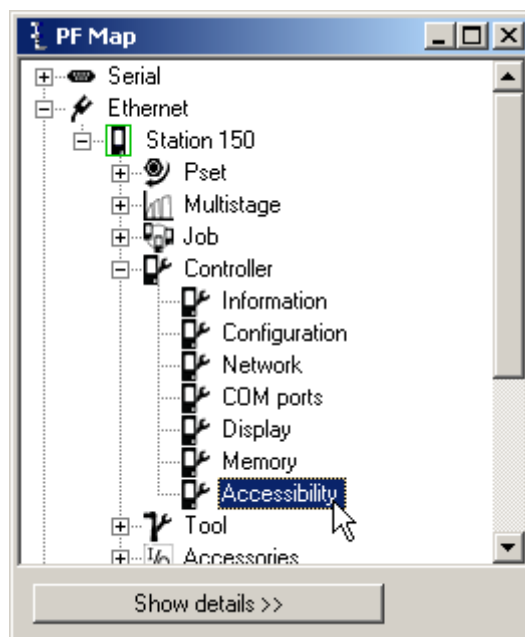
Make settings for **Password**.

Passwords should have between 1 and 8 characters (letters or numbers) and are case sensitive. There are separate passwords for communication and setup parameters. An identical password can be set for both. In this case only one password will be prompted in TTPF, but still both in PF graph. The password handling is configured with the two parameters C800 Use and C801 Entry. Change to C800 resets unused passwords. There is no prompting for empty passwords, both in PF graph and TTPF. When password Use is activated (other than: 'No') and Entry scope is set to Tools Talk, access to all parameters from PF keyboard is restricted even with empty passwords.

> **When uploading/downloading PF configuration to/from a file, password strings will not be stored and restored. Software update performed by Software Loader will clear passwords in the unit but not C800 and C801.**

> **PF Compact units have access to password protected parameters only via TTPF, due to simplified keyboard functionality.**

> **FieldBus configuration is accessible only from TTPF and is not protected by any type of password.**

> **Total memory reset defaults all password settings.**

Click **Store** to save settings.

11   Tool

The **Tool** section contains information for Tensor tools connected to Power Focus. The information available through PF includes for example general tool information and service status, as well as hardware- and software configuration.

ⓘ   **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**

See parameter list section *Tool* for a description of all available Tool options. See tool specific information for more information about the options for each tool.

The tool parameters are visible depending on which tool is connected. For STB, most parameters are invisible when the tool is offline.

11.1   Tool information

Expand the **Tool** branch in the PF Map.

Double-click on **Information**.
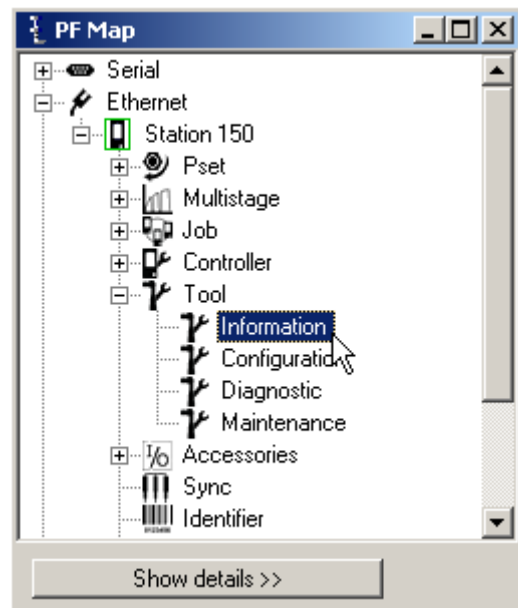
The **Model** and **Motor** sections contain information about the Tensor tool connected to PF.

Model	
T100 Type	ST
T101 Usage	Handheld
T102 Max torque	40,00 Nm
T103 Gear ratio	32,8
T104 Production date	2003-11-25
T105 Serial number	577013
T106 Spindle denomination	ETV ST61-40-10
T107 Spindle product number	8433 2027 85
Motor	
T110 Size	6

The **Software** section contains information about the application- and boot-code version for the tool.

Software	
T130 Application-code version	7.16.44
T131 Boot-code version	2.6.13

11.2 Tool configuration

In the PF Map **Tool** branch, double-click on **Configuration**.

The following submenus are available:

Tool start
Accessory bus
Sound
Function Button
Blue LED
Illuminator
Lights
Radio
Connection
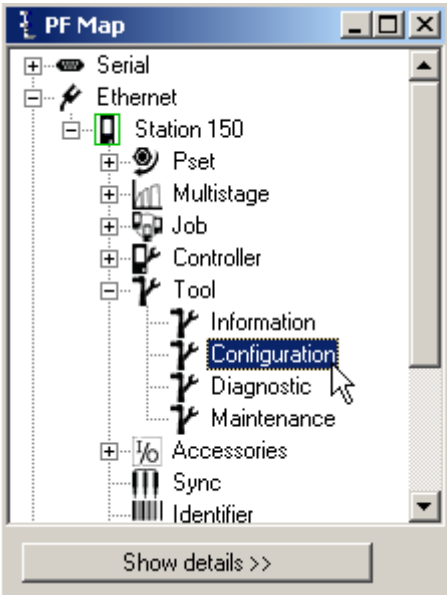
11.2.1 Tool start and Accessory bus

Make settings for **Tool start** and **Accessory bus**.

The main purpose of *T200 Tool start select source* option "Safety trigger" is to ensure that both hands are placed on the tool while it is running, and that the tool stops as soon as one hand is released.

Tool start

T200 Tool start select source	Tool trigger
T201 Timer enable tool	Off
T202 Timer enable tool time	Not Used	Sec
T203 Direction alert	CW
T204 Alert type	Buzzer

Accessory bus

T210 Mode	Off

The safety trigger is suitable for applications where a high level of safety is desired.

The safety trigger function requires the start trigger and safety trigger buttons to be pushed simultaneously in order to start the tool. The second button must be pushed within 0.5 seconds from pushing the first button, the order is arbitrary. If the safety trigger button or the start trigger is released

while the tool is running, the tool stops immediately.

Once the tool has been started, the safety trigger function requires both buttons to be released before the tool can be started again.

A safety trigger button is mounted on the ST tool and connected to GPIO 4. The parameter is only accessible when GPIO 4 is set to "Off".

The main purpose of the *T201 Timer enable tool* function is to prevent unintentional starting of the tool. It is immune to tape, i.e., it is not possible to override the function by putting tape on the "enable button". The timer enable tool is suitable for applications where a reasonable level of safety is required and applications where both hands cannot remain on the tool during tightening (one hand must be used to hold the working piece during tightening etc.).

When the *T201 Timer enable tool* is activated, the tool is disabled by default. In order to enable the tool, the user must enable the tool using the digital input function *Timer enable tool*.

Once enabled, the tool will remain enabled for the configured period of time (timer enable tool time). As soon as the time period expires, the tool will be disabled again.

If the tool is started during the period it is enabled, it remains enabled while it is being run. When the tool is stopped, it remains enabled for an additional period of time (according to release and configuration). This behavior is comparable to key lock functionality on cellular phones; once unlocked, the keys are locked when a given period of time has passed since the last key press.

> **The "Timer enable tool" function was previously called "safety trigger".**
>
> **Digital input *Timer enable tool* must be changed from status "low" to "high" in order to enable the tool (the tool will not remain enabled when the time period has expired, even if input to the digital input *Timer enable tool* remains high).**

With *T203 Direction alert* and *T204 Alert type* parameters, a sound or an indicator can be configured to notify the operator of the direction of the tool.

Parameter *T210 Mode* defines the function of the Tool accessory bus.

11.2.2 Sound and buzzer

In the **Sound** window, the settings include the type of sound and the event that should trigger the sound.

Make settings for **Sound**.

Enable/disable sound and adjust the volume.

Two types of sound files can be stored in the Power Focus memory, buzzer and sound (stream) waves. A **Buzzer wave** is a frequency-based sound generated by the tool. The buzzer wave can be programmed by the user (as default one buzzer is included in Power Focus). A **Sound (stream) wave** is a pre-programmed "wav file" that can be downloaded from disk (hard drive/ file). It is possible to use a microphone to record wav files and download them to Power Focus.

To select an existing buzzer wave, select an **ID number** from the drop down menu (as default one buzzer wave is included).

To create a new buzzer wave, click **Add buzzer**. It is possible to store up to 10 buzzer waves in Power Focus.

The **BuzzerWave** window appears.

Give the Buzzer wave an *E100 Name* (recommended).

Select *E101 Frequency*, *E102 Time On*, *E103 Time Off*, *E104 Repetition* and *E105 Volume*.

The volume is a relative (in percent) of parameter *T221 Volume*, which could be set to high, medium or low. *T221 Volume* can be found in the sound setup window.

After every change in setup, click **Store** to save settings into the tool memory.

BuzzerWave

E100 Name		
E101 Frequency	800	Hz
E102 Time On	0,10	Sec
E103 Time Off	0,20	Sec
E104 Repetition	3	
E105 Volume	50	

Play sound

Delete BuzzerWave

Click **Play sound** to listen to the buzzer sound in the tool (if not working, try to click **Store**).

Click **Delete buzzer wave** to remove the selected buzzer. Click **Store** to save settings.

To create a sound (stream) wave, select **Add sound** in the **Sound** window. To select an existing Sound wave, select an **ID number** from the drop down menu.

> ℹ️ **It is possible to store up to 10 stream waves in Power Focus.**

The **Create new sound** window appears.

Select a **New sound ID** and type **new sound name** (recommended). Click **OK**.

The **Wave** window appears.

Click **Open wave file** and search for the wave file to use on disk (hard drive/file).

> ℹ️ **The wav file can use up to 8 bits and a frequency of up to 8000 Hz. It provides only mono playing and has an interval of maximum 3 seconds.**

Wave

W102 Stream Name | Sound1

File

Open Wave file

Play sound

Delete Sound

Click **Play sound** to listen to a sound file. The sound is played in the tool.

Click **Delete sound** to remove a sound file.

Click **Store** to save settings. **Close** window.

To connect a configured buzzer or sound to an event, click **Add** in the **Sound** window.

Select a digital output (relay) in the **Event** list.

Select a sound or buzzer wave (created earlier) in the **Sound Type** list to connect to the event.

Select a priority from the **Sound Prio** list connected to the specific sound event.

> ⓘ **The Sound Prio setting controls which sound event that has the advantage in the case of a collision between more than one sound file during tool operations.**

Click **Remove** to remove an event from the list.

Click **Store** to save changes in the Window.

11.2.3   Tool function buttons

Make settings for **Function buttons**.

The T230 – T235 function button settings are available for ST and SL tools. There are three possible user interaction types for this button; single push, double-push and pressed. (For available relay functions, see section *Digital I/O and fieldbus items*.)

The parameter *T236 Push detection interval* states the maximum time (in milliseconds) between the button pressed and the button being released, for push to be detected. Parameter *T237 Next push interval* states the maximum time (in milliseconds) between the button being released after the first push and the button pressed again, to detect double pushed.
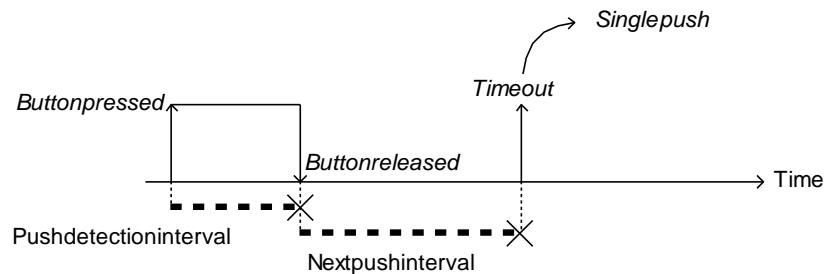
Single push - the button is pressed down and released before the *T236 Push detection interval* expires. The *T237 Next push interval* expires before the button is pressed again.
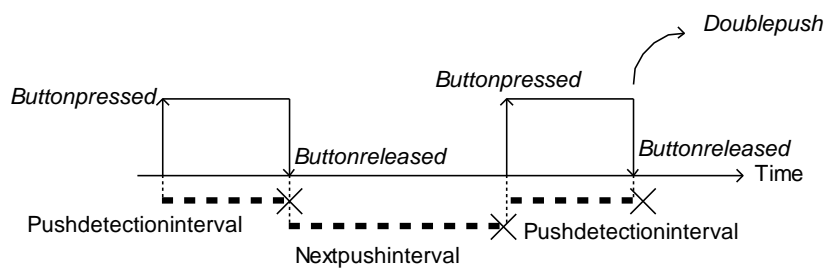
Double push - the button is pressed down and released before the *T236 Push detection interval* expires. Then the button is pressed down before the *T237 Next push interval* expires and is released before the *T236 Push detection interval* expires.
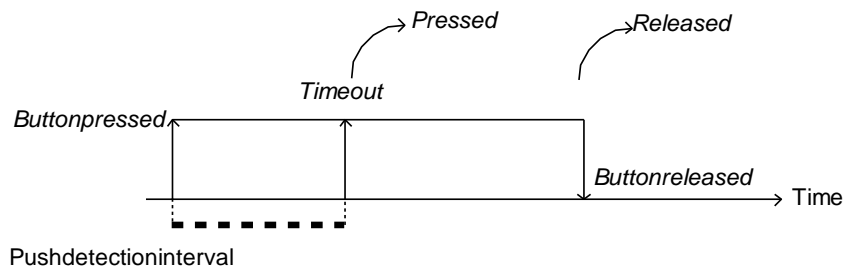
Pressed - the button is pressed down and is kept down for a longer time than the *T236 Push detection interval*. When the *Push detection interval* expires, the button function is considered to be pressed until it is released. Notice that if no function is configured for single push or double push in the current tool direction, the *Push detection interval* is ignored and the button function is considered to be pressed as soon as it is pressed down.

It is possible to configure a digital input function, similar to the digital inputs on PF, for each user interaction type and tool direction. Tool direction is shown by the direction ring on ST tools and by the direction LED on SL tools.

From the digital input functions point of view, single push and double push user interaction types do generate pulses. This means that they do not have duration where input to the digital input function remains high. **Single push** and **Double push** user interaction types are therefore not suitable for digital input functions that are intended to "follow" the status of the button. The **pressed** user interaction type provides duration; i.e. input to the digital input function remains high as long as the function button is pressed and goes low when it is released. It can therefore be used with digital input functions intended to follow the button status.

Feedback is provided to the user to indicate which user interaction type was detected. If a **Single push** is detected, the tool LED's flash once and if a **Double push** is detected, the tool LED's flash twice. Feedback is only given when there is a function configured for the currently performed user interaction type and current direction. For example, if a **Double push** is performed while operating in CCW mode, but *T235 CCW double push* is set to "Off", no response is given.

For SL tools, the function button normally is configured to change tool direction in some way ("toggle CW/CCW", "toggle CW/CCW for next run" and "set CCW").

11.2.4   Blue LED

Make settings for **Blue LED** (if applicable). The Blue LED indicates when a predefined event occurs. The events are relays connected from Power Focus to the tool.

To configure the *T240 Events* click **Add** and select type of **Event, Duration** and **Time** (if applicable).

Click **Store** to save settings.

Blue LED		
T240 Events		
Event	Duration	Time
High TQ	To next tight	
Add	Remove	

11.2.5   Tool illuminator and lights

Make settings for **Illuminator** and **Lights**.

The illuminator, which is a group of LEDs in the front of SL and ST pistol tools, provides light for the operator during tool operations.

The parameter *T250 Illuminator mode* can be set to:

Illuminator	
T250 Illuminator mode	Off
T251 On event	Not Used
T252 Off event	Not Used
T253 On time	Not Used Sec
Lights	
T260 Control type	PF-controlled 1
T261 Use ON time	☐
T262 ON time	0,0 Sec
T263 Indicator mode	Off

- **Off** - illuminator is constantly off.

- **On** - illuminator is constantly on.

- **Tracking event** - illuminator follows status of specified *T251 On event*.

- **Event controlled** - illuminator is turned on when specified *T251 On event* occurs and is turned off when specified *T252 Off event* occurs. If *T252 Off event* is set to "Off", the expiration of *T253 On time* turns off the illuminator.

The parameters *T251 On event*, *T252 Off event* and *T253 On time* are related to the input from *T250 Illuminator mode*.

T253 On time sets the maximum time for the illuminator to remain on since the last occurrence of *T251 On event*, if *T250 Illuminator mode* is set to Tracking event or Event controlled.

The parameter T260 Control type is used to define the control source for the Tool LED light. The T260 parameter can be set to:

- **PF-controlled 1** - Light is controlled via specified limits for torque and/or angle

- **PF-controlled 2** - Customer specific option

- **PF-controlled 3** - Tool LED's used to acknowledge Event Code Tightening NOK / Tightening OK

- **Light off** - Tool LED's functionality disabled.

The parameters *T261 Use ON time* and *T262 ON time* is used to specify that the tool LED's should light for a specified period of time (on) or continuously (off) after a tightening.

T263 Indicator, used to show selected Pset (Pset 1-8) on the tool LED's. Applicable only if an ST tool is connected.

11.2.6   Radio and Connection

Make settings for **Radio** and **Connection.**

Some of the settings are explained in detail below. All of the tool configuration parameters are listed in tool parameter section *Configuration*.

Radio		
T270 Power save timeout	Not Used	Min
T271 Start condition	Not Used	
T272 Link timeout	Not Used	ms
T276 Max sender power	Not Used	
T277 Torque and angle trace	No	
Connection		
T290 Primary tool	IRC-B	
	IRC pairing	
T293 Power Focus IP port	Not Used	
T294 Serial port	Serial 2	
T296 IRC-W operational mode	Not Used	
T297 IRC-W channel	Not Used	

> ⓘ   **The radio section is accessible when Primary tool is other than Cable.**

T270 Power save timeout: IRC turns off after this time, if tool is inactive. To reconnect, press trigger once and Blue LED on tool lights up after approximately 10 seconds.

T271 Start condition: The start condition if using IRC connection for tool. None: Up to 20 tightenings can be performed if IRC connection is lost (Blue LED off). Connected: IRC connection must be established (Blue LED on) to run tool. Start request: IRC connection must be established (Blue LED on) and link time out must not have started.

T272 Link timeout: If the tool loses IRC connection it is considered offline and the connection LED (blue) on the tool turns off after the link timeout time.

T277 Torque and angle trace: Switch on/off tracing of torque and angle. (Up to 10 traces can be stored in the tool if connection is lost.)

T290 Primary tool. Note that PF needs to be restarted after changing primary tool setting. Click **Store** to save settings.

11.3   Tool diagnostic

In the PF Map **Tool** branch, double-click on **Diagnostic**.
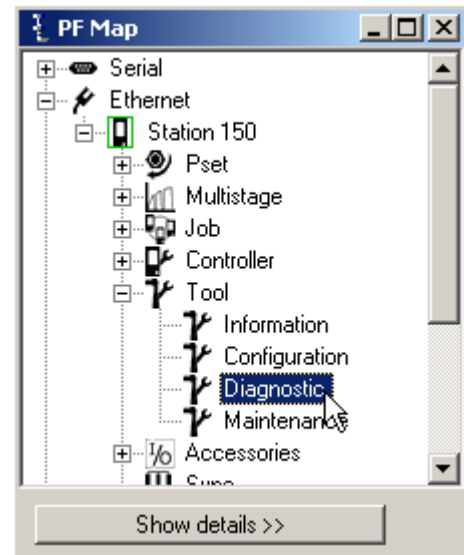
Click **Sensor tracking** to introduce torque and angle readings in real time.

Click **Peripherals** to diagnose tool LED's and buttons.

Temperature parameters are for information only.

Click **Active response time** under **Radio** to diagnose the wireless connection.

11.3.1 Sensor tracking

To monitor Torque/Angle readings from the
tool press **Start**. To set reference point for Angle
value during monitoring press **Reset**.

For S, DS tools it is even possible to read value
of the transducer offset shown in percentage of
the nominal torque range.

For other tool families this parameter is not
accessible (always set to 0.00%).

11.3.1 Transducer calibration

When tool is triggered, a check of transducer and transducer electronics is carried out. Results
(offset and gain) are sensitive to temperature, material wear and even **proper handling of tool
during calibration**. **Don't manually rotate gear when tool is triggered** to obtain most accurate
transducer readings. If program discovers offset or gain values being out of correction limits or
that these parameters have changed too much since last calibration, the corresponding event
(E544) will be displayed and rundown will be aborted. Following table shows these limits for
different type of tools.

> As long offset and gain change is not caused by fast, manual rotation of the gear during
> triggering of the tool, even relatively big offset and gain changes are completely
> compensated in the system, not having influence on specified measurement accuracy.

Parameter	Tool family							Event if failed
	S,ETX	ST	SL21	STP1	STP2	ST2	STB	
Offset range (% nominal torque)	36%	16%	16%	16%	16%	16%	28%	E537
Offset change (+-% nominal torque)	4%	2%	2%	2%	2%	2%	7%	E539
Gain* range (% nominal gain)	23%	21%	21%	51%	34%	42%	-	E538
Gain* change (+-% nominal gain)	10%	3%	4%	4%	3%	3%	-	E540
Nominal torque	100%	100%	100%	100%	100%	100%	100%	
Nominal gain* (% nominal tq)	114%	126%	125%	99%	148%	151%	-	

* There are different definitions of gain (shunt calibration) parameter for each tool depending on HW/SW solution implemented. STB uses no shunt calibration.
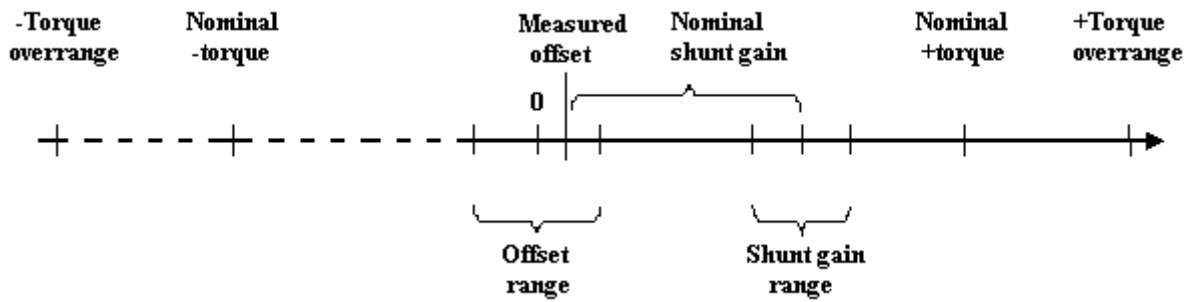
11.4 Tool maintenance

In the PF Map **Tool** branch, double-click on **Maintenance**.

The following submenus
are available:

Calibration
Service
Open end
Wear
ACTA
Motor tuning
Disconnect tool
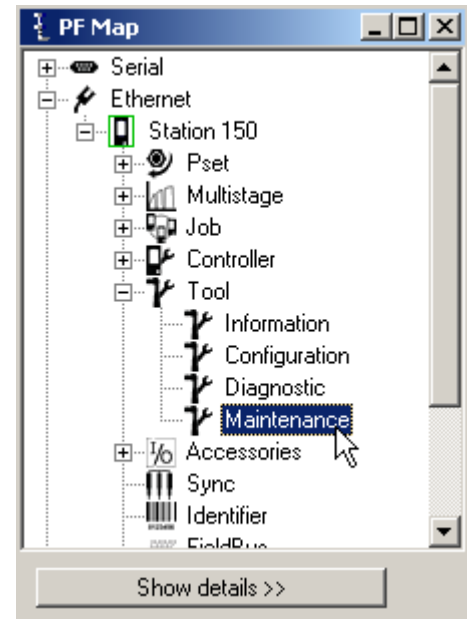
11.4.1 Calibration and Service

Make settings for **Calibrations** and **Service**.

Click **Store** to save the settings.

Calibration

T400 Calibration value	30,00	Nm
T401 Calibration date	2006-03-15	
	Set calibration value	
T403 Normalisation value	1000	
T404 Calibration alarm	☐	
T405 Calibration alarm date	2007-03-06	
	Set calibration alarm date	

Service

T410 Total no. of tightenings	562
T411 Service indicator	Off
T412 No. of tightenings since service	22
T413 Service interval (x10000)	1
T414 Latest service date	2007-03-06
	Service counter reset
T416 Lock tool on alarm	☐
T417 User message	

11.4.2 Open-end tuning

Before using an open-end tool, make sure that the tool head and tool body have been assembled and configured correctly. If not, the tool can run in the wrong direction and the mechanical stop in the open-end head may be damaged.

If performing an OK tightening (green tool LED's are on) with *C230 OE forward positioning* set to "No" and pressing the tool trigger button, then the LED's turn OFF and ON again. This behavior can only be seen on S and DS tools (not on ST and SL tools) and is normal.

The "Reverse angle" and "Rotate spindle forward/reverse" strategies are not applicable for open-end tools.

It is not possible to use open-end tools in a Multistage configuration.

For S, ST and DS tools, use parameter *T420 Use open end* to activate the open-end functionality.

For SL and STB tools it is not possible to change the open-end parameters in Tools Talk or Graph. Use Tools Talk Service to modify open-end settings.

Open end

T420 Use open end	☑
T421 Inverted motor rotation	☐
T422 Tightening direction	CW
	Open end tune
T424 Max torque positioning limit	10,60 Nm

T421 Inverted motor rotation should be checked if an open-end head is used which changes the rotation direction of the spindle.

⚠ **If the *T421 Inverted motor rotation* is set in the wrong way the tool may not operate in a correct manner and the mechanical stop may be damaged if a tightening is done.**

Set *T422 Tightening direction* to the direction that fits the application and open-end head. "CW" is selected for right hand threaded fasteners and "CCW" for left hand threaded. This setting is valid for all programmed Psets.

ⓘ **Parameter *P240 Tool tightening direction* has no effect when running an open-end tool.**

When finished with parameter settings, press **Store**.

Click **open-end tune** key in the open-end parameters section.

Make sure the open-end head can rotate freely and press the tool trigger.

Open-end tuning measures the gear ratio and gear play and stores it to the tool memory.

Open end tuning

Open end tuning in progress: Please press tool button.
Starting.

Abort   ✓ Ok
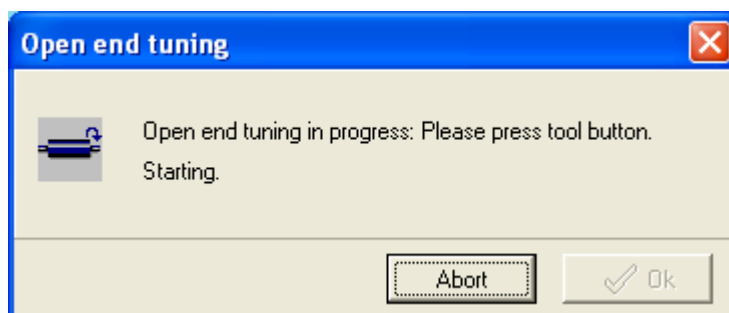
ⓘ **The old *T103 Gear ratio* value will be overwritten.**

A confirmation message is displayed if open-end tuning succeeded.

11.4.3   Wear indicator

Wear indicator provides a mechanism to inform tool users with an event code when it is time for tool service. It is also possible to configure a controller to lock the tool with parameter *T416 Lock tool on alarm*.

Wear

T430 Wear indicator	On
T431 Wear used	1
T432 Remaining tightenings	0
T433 Alarm factor	100
T434 Min wear tightenings	0

The amount of wear before an alarm is issued is set in *T433 Alarm factor*.

> **If wear indicator is on it will be reset to initial state after a tool service when a Service counter reset is performed.**

11.4.4   ACTA

The **ACTA** section contains a tool calibration session.
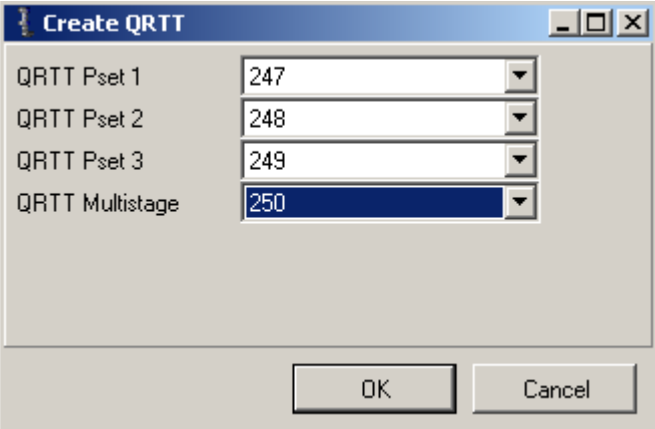
> **The calibration does not work with Tensor DS tools.**

A tool calibration session is started by connecting the ACTA 4000 to the Power Focus and fitting the QRTT device to the spindle. One Multistage with three Psets is used when the calibration is run, one torque tightening (for torque calibration) and two different spindle rotations (for loosening and angle calibration) Psets.

ACTA

T440 QRTT on	☐
T441 QRTT Pset 1	0
T442 QRTT Pset 2	0
T443 QRTT Pset 3	0
T444 QRTT Multistage	0
	Create QRTT

Click **Create QRTT** to create the Psets and Multistages needed. The target torque and angle is then set by the ACTA 4000 before the start of each calibration.

The tool calibration is started by a command from the ACTA 4000 or by pressing the tool trigger depending on if the tool is configured for remote start or not. The result of a calibration is displayed as a normal tightening. When a calibration batch is completed, event code *E710 ACTA/QRTT calibration* is displayed and stored in the event log of the Power Focus.

It is necessary for the Power Focus to have enough memory space available to store the Multistages and Psets needed. If the calibration shows an unsatisfactory result the operator is assumed to take the appropriate action. No calibration value (calibration- or normalization value etc.) is changed automatically.

11.4.5   Motor tuning

Motor tuning adjusts the tool and motor control unit. **Sync motor tuning** feature is only available from the Sync reference of a configured Sync group with between two and ten Sync members. The Sync motor tuning process starts simultaneously for all Sync members when pressing the tool trigger of the Sync reference. For information about the Sync functionality, see section *Sync*.

⚠️ **It is important that no torque is applied to the socket of the tool when it is subject to any kind of motor tuning. Make sure that the socket is able to rotate freely.**

Standalone motor tuning

Click **Perform motor tuning**.

Motor tuning

Perform motor tuning

Perform Sync motor tuning
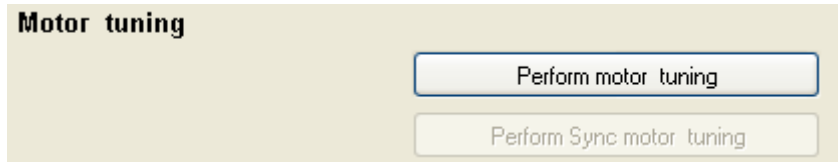
Press **Tool trigger** and keep it pushed during the motor tuning process (the status is displayed).

Release **Tool trigger** or click **Abort** to cancel.

When finished the result of the motor tuning is displayed.

Motortuning

Motortuning in progress: Please press tool button.
Starting.

Abort   ✓ Ok
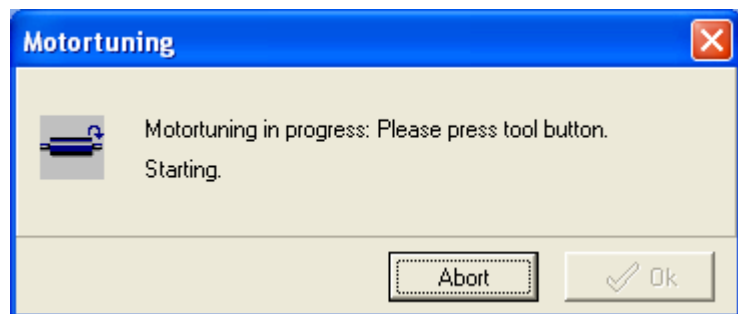
Sync motor tuning

Click **Sync motor tuning**.

Push **Tool trigger** and keep it pushed during the motor tuning process.

Release **Tool trigger** or click **Abort** to cancel.

Sync Motor Tuning

Channel ID	Status
1	Accepted
2	Accepted

Abort   ✓ Ok
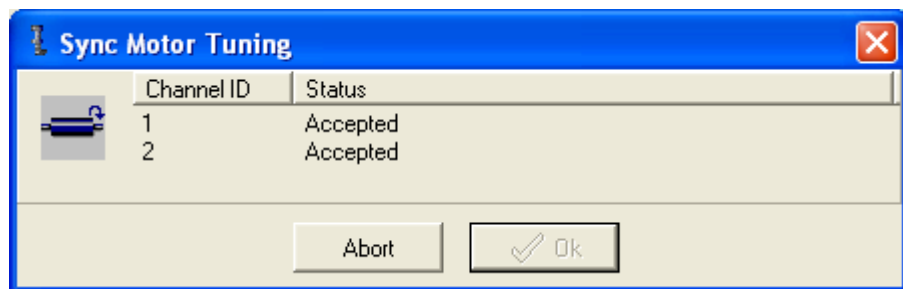
ⓘ   **Accessing Sync motor tuning is only allowed on a Sync reference.**

Channel ID and motor tuning status for Sync reference and all Sync members are displayed.

When finished, the result of the motor tuning is displayed.

11.4.6   Disconnect tool

Click **Disconnect tool** and click **OK** to logically disconnect the tool.

Disconnect tool
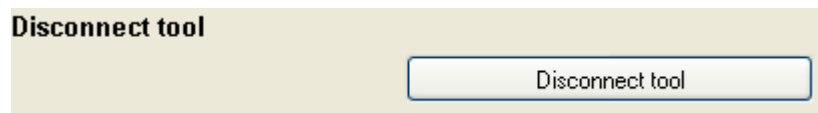
Disconnect tool

> ⓘ **Do not disconnect a tool during tightening, loosening, positioning, motor tuning, open-end tuning or tracking.**
>
> **Logical disconnection is not necessary for ST and SL tools (this tool types allows hot swap functionality).**

If the operation succeeded, the green OK LED flashes continuously (on the Power Focus) and the message "Command accepted" is displayed. Click **OK** to continue.

If disconnection of the tool was not allowed, the red NOK LED flashes continuously for 3 seconds and the text "Operation failed" is displayed. Click **OK** to continue.

When a tool is connected again, *E131 Tool disconnected* is displayed and then acknowledged automatically.

In order to be able to use digital I/O to disconnect the tool, one digital input must be configured as *Disconnect tool* and optionally one relay can be configured as *Safe to disconnect tool*.

Once configured, proceed as following to logically disconnect the tool using digital I/O:

- Set voltage level on the digital input (configured as *Disconnect tool*) to high in order to logically disconnect the tool
- If the operation succeeded, the relay configured as *Safe to disconnect tool* switches and the green OK LED (on PF) will flash continuously. If disconnection of the tool was not allowed, the relay configured as *Safe to disconnect tool* does not switch and the red NOK LED flashes continuously for 3 seconds
- Disconnect the tool
- When a tool is inserted again, *E131 Tool disconnected* is displayed and then acknowledged automatically

> ⚠ **Do not physically disconnect an S or DS tool, unless it has first been successfully logically disconnected. This can damage the tool memory. If the user physically disconnects a non-ST tool, without a successfully logically disconnection, PF has to be rebooted before connecting the tool again.**

11.4.7   Hot swap

It is possible to replace an individual tool with another tool, just by disconnecting the tool from the tool cable and attach the new tool. Hot swap is only available for S and ST type tools.

⚠️   **When hot swapping a tool, the new tool must be of the same type to ensure that all parameter settings in the Power Focus will be interpreted correctly.**

Even if all settings are accepted by a new tool of another tool type, some parameters can cause the new tool to behave differently than the original tool.

An example is the speed setting parameters (P130-P138). If P139 is set to "Percent", these parameters are stored in the PF database as percentage of max tool speed for the particular tool type, the value for the new tool type might differ from the original tool type. On the other side using absolute speed values (P139 set to "RPM") can generate strategy configuration errors for slower than swapped tools.

11.5   Tool lock functionality

The tool can be locked either by an internal state that does not allow the tool to be used, or intentionally by configurable functions in the Power Focus or by external sources.

11.5.1   Locking of tools from an external source in time critical applications

When production is arranged into line assembly, the tightening process is often planned in great detail. To assure that tightenings are performed on the correct joints, the user might wish to disable the tool in between operations on the same vehicle within a work station. In addition, there can be a timing requirement, meaning that the tightenings have to be made within a certain time period.

If in these cases an external source (for example fieldbus) is used to disable and enable the tools, it is important to thoroughly analyze the risks. Otherwise reduced productivity or bad ergonomics can be the result.

There is a small delay between the moments when the triggering event occurs, for example a ready signal from a positioning system, and when the tool is actually enabled or disabled. During a delay, the operator can unintentionally disturb the counting in the process by pressing the trigger several times.

Therefore, the use of external sources for regularly locking and unlocking the tool in time critical applications is not recommended. In order to enable and disable the tool quickly enough in these cases, only Power Focus internal sources should be applied (only 1-2 ms reaction time).

In time critical applications, the following general strategy could be used:

- For enabling the tool, use the external source for selecting the Pset in Power Focus when the conditions for "start tightening" are fulfilled

- For disabling the tool, use functions *P152 Lock at batch ok* or *J302 Lock at Job done*, which are internal tool locking sources within Power Focus

11.5.2 Intentional locking of tools

By locking and unlocking the tool in certain situations, it is possible to prevent unintended usage of it. In this way it is possible to avoid some of the mistakes that could normally be made during assembly.

11.5.3 Definition of a locked tool

When the tool is locked, one or several services are disabled. Services are normally tightening and loosening, but do in some cases include positioning, motor tuning, open-end tuning and tracking.

11.5.4 Tool locking event codes

In case the tool is locked while a user attempts to start a service (normally tightening or loosening), the Power Focus shows an event code to explain why or by which functionality the tool is locked. In case the tool is locked while a service is being performed, the service is aborted and an event code explaining why, or by which function, the tool was locked is displayed.

For more information, see section *Event codes*.

Combinations and tool locking

Different conditions, functions and external sources may simultaneously cause the tool to be locked.

For example, the tool can be locked both by the digital input function *Disable tool n o* and by the "Lock on reject" function. For the tool to be unlocked, the digital input *Disable tool n o* must be altered and the "Lock on reject" lock must be unlocked using the digital inputs *Unlock tool* / *Master unlock tool* or the CW/CCW ring (depending on configuration).

When event codes are generated while the tool is locked for multiple reasons, only one of the possible event codes is generated. It is not specified which of the possible event code messages that will be generated.

12 Accessories

In the **Accessories** branch, the digital inputs and outputs of PF are configured and diagnosed. The branch also includes information about the devices connected to the I/O bus and tool bus, and how to configure these devices.
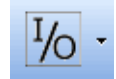
> **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**
>
> **See parameter list section *Accessories* for a description of all available Accessories options.**

12.1 Digital I/O

Power Focus has extensive I/O capabilities. Apart from the internal I/O ports it is also possible to connect up to 15 external I/O devices to the Power Focus I/O bus, such as a Pset selector, I/O Expander or Stacklight.

In the PF Map, open **Accessories>Digital I/O** and double-click **Configuration,** or right-click **Configuration** and select **Open I/O set**.
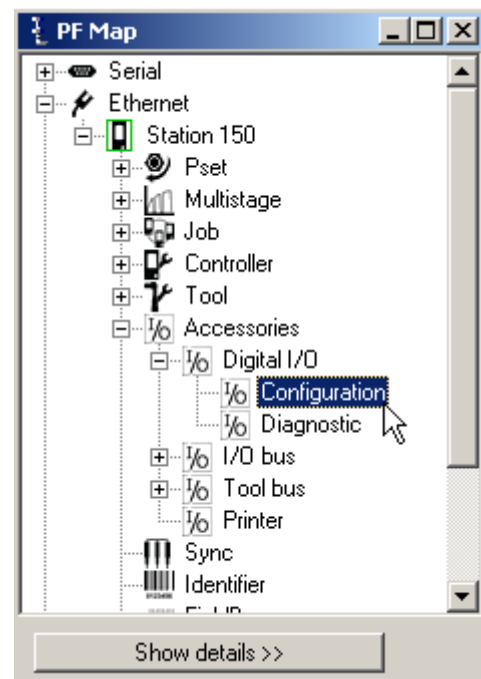
The **I/O set** dialog box appears.
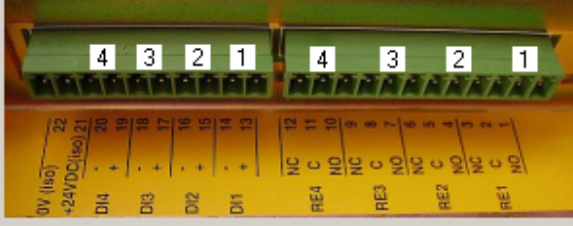
Select **Device type**.

Select **Digital inputs** and **Relays** (with relay timer). For more information, see section *Digital I/O and fieldbus items*.

Note that *J330 Use line control* must be set to Yes before the digital inputs and relay settings for line control can be activated.

In the **PF Map**, open **Accessories>Digital I/O** and double-click **Diagnostic,** or right-click **Diagnostic** and select **Open I/O Diagnostic**.
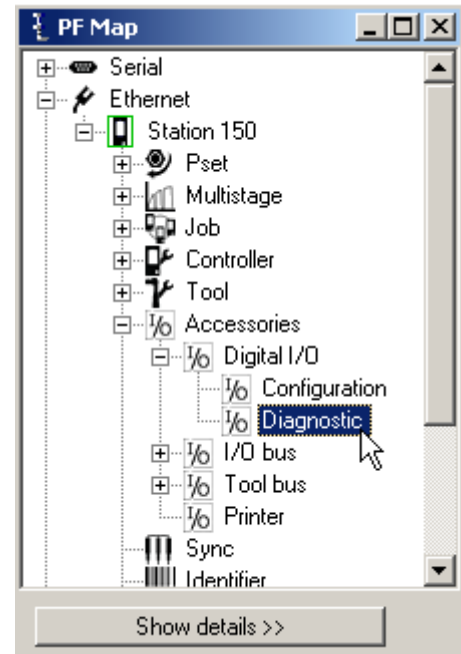
The **I/O Diagnostic** window appears.

Here the status of all internal and external I/O devices can be viewed.

It is possible to set the status of relays. All configured I/O devices appear on the list of available devices. This function enables testing of the interaction between PF and different external devices. For instance, it could be useful when trouble shooting complex systems with one or several PLC units connected to the controller.

The **Read** key shows the status of the selected I/O device. The read status key has to be clicked in order to update this view to reflect changes.

Output test function activates and de-activates relays on a selected I/O device when **Set** is clicked.

The **Restore** key restores the relays to reflect the current status of the PF. Click **Read** to update this view to reflect changes triggered by other events.
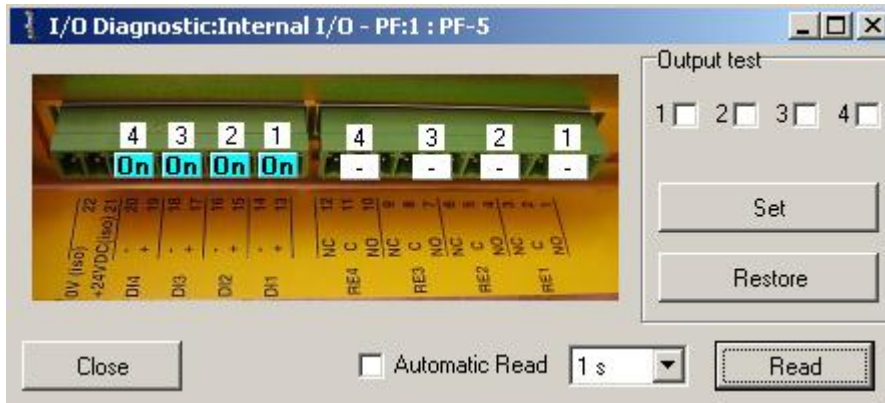
12.2   I/O bus

Power Focus has extensive I/O capabilities. Apart from the internal I/O ports it is also possible to connect up to 15 external I/O devices to the Power Focus I/O bus.

In the PF Map, open **Accessories>I/O bus** and double-click **Information**.
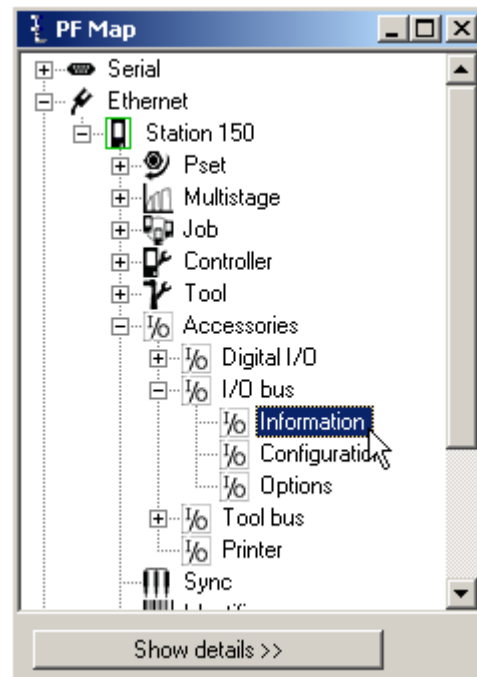
Information for each device on the I/O bus is displayed.

Click **Config** to configure the selected device.

Click **Diagnostic** to diagnose the selected device.
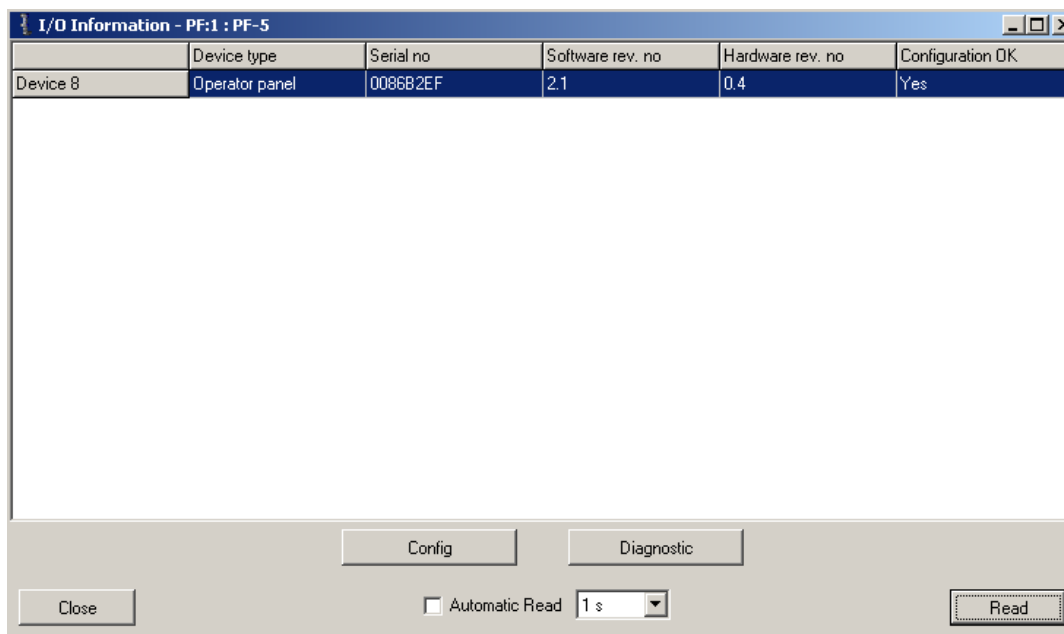
In the PF Map, open **Accessories>I/O bus.** Right-click **Configuration** and select **Create new I/O Device**.

Alternatively, **double-click** on an existing I/O Device to open the configuration window.
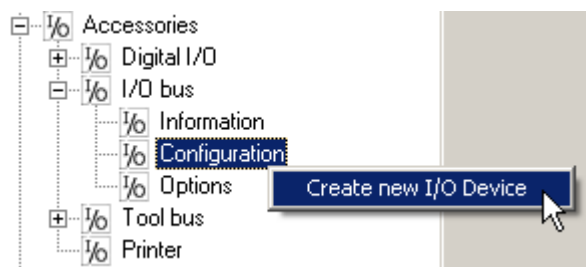
Select **New I/O Device ID** and **Device type**.

Click **OK** to open the configuration window.
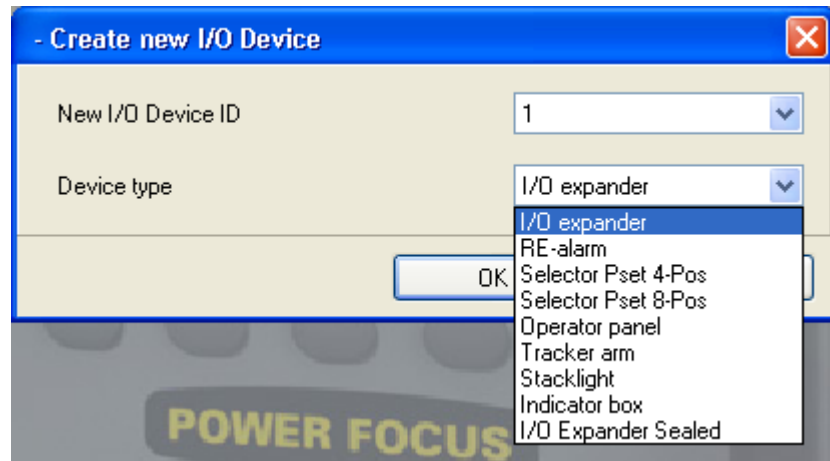
Make settings for the device by clicking on the positions (the example below shows an Operator panel).

> ℹ **See the user guides for each accessory device for more information.**

Click **Store** and **Close** when finished with configuration.
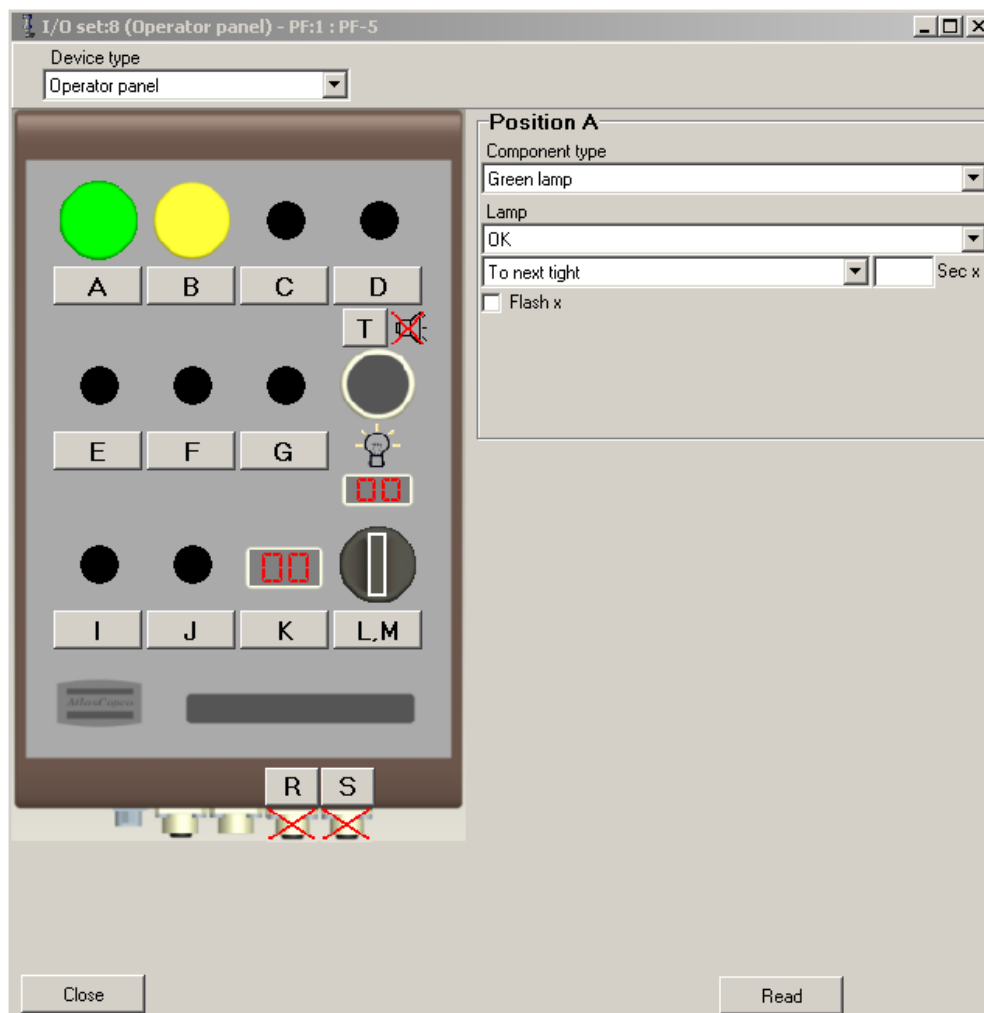
In the **PF Map**, open **Accessories>I/O bus** and double-click **Options**.
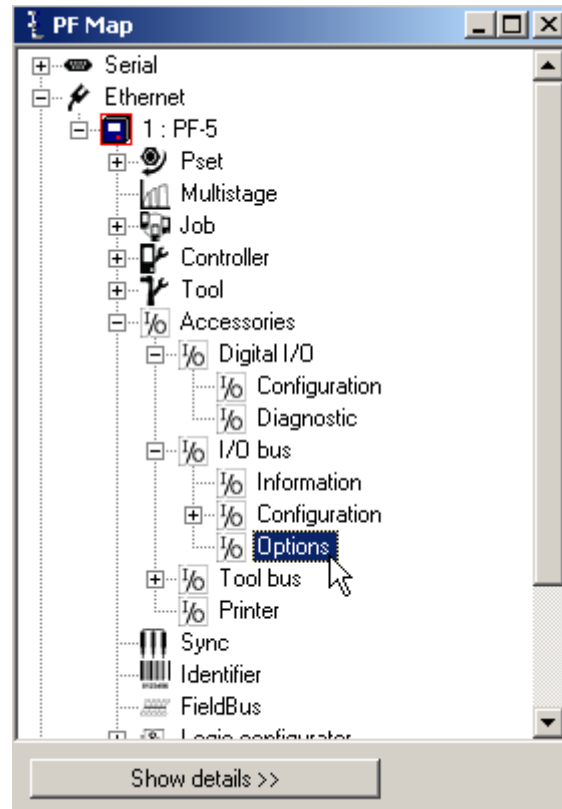
Make settings for **Options**.

Click **Store** and **Close** window when finished.

12.3   Tool bus

In the **PF Map**, open **Accessories>Tool bus** and double-click **Information**.
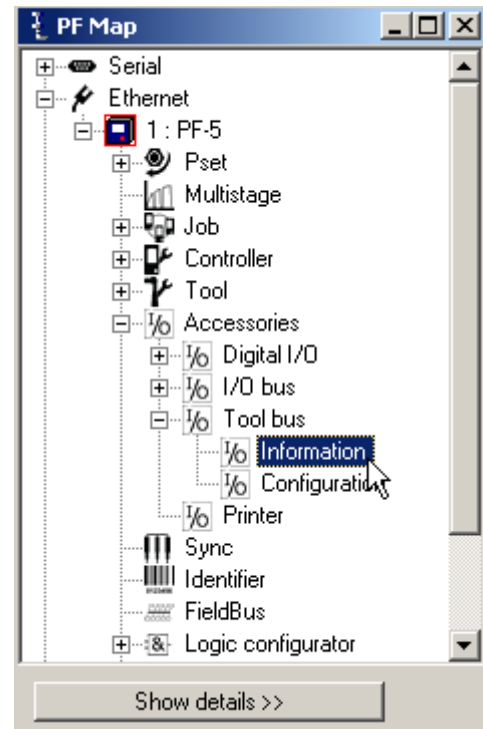
Select Device type and click **Device information**.

The Device information window appears with information about the connected device.
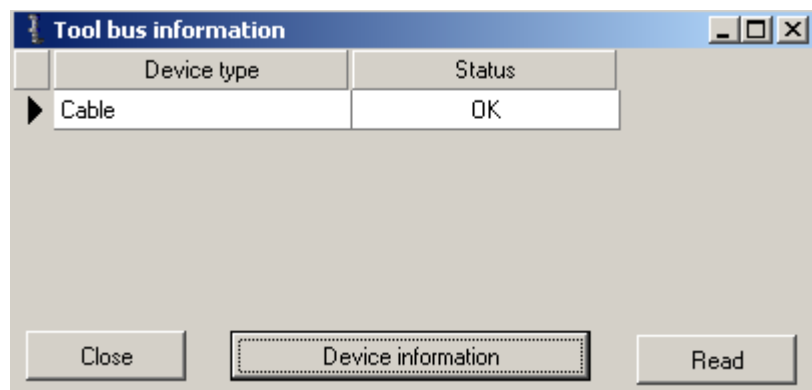
In the **PF Map**, open **Accessories>Tool bus** and double-click **Configuration**.
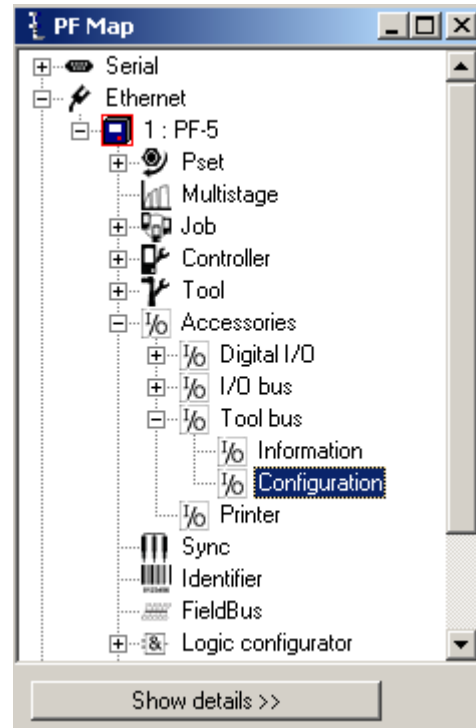
In the Tool bus Configuration window, click **General purpose I/O**.

Make settings for the digital inputs and outputs (see section *Digital I/O and fieldbus items* for descriptions of available selections).

Digin	Event	Digout	Event	Duration	Time
1	Off	1	Off		
2	Off	2	Off		
3	Off	3	Off		
4	Off	4	Off		
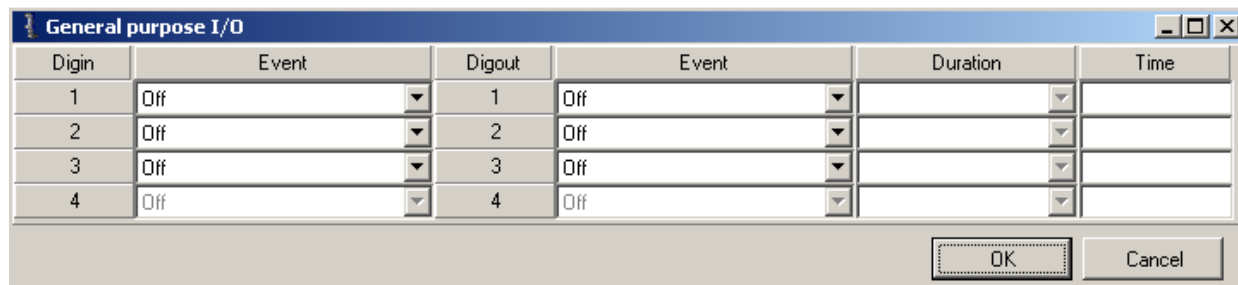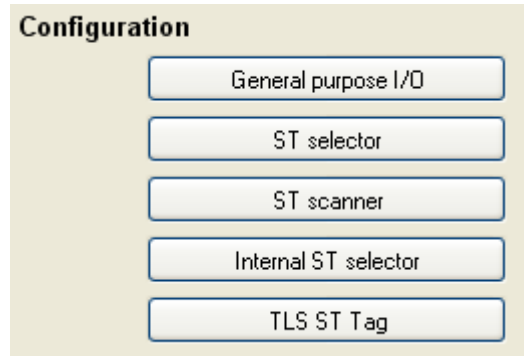
In the Tool bus Configuration window, click **ST selector**.

Make settings for the ST selector.

The same settings are available for **Internal ST selector**.

ST selector	
Left button	Select previous Pset
Right button	Select next Pset
Status leds	On
Display	Pset no. + result

OK   Cancel
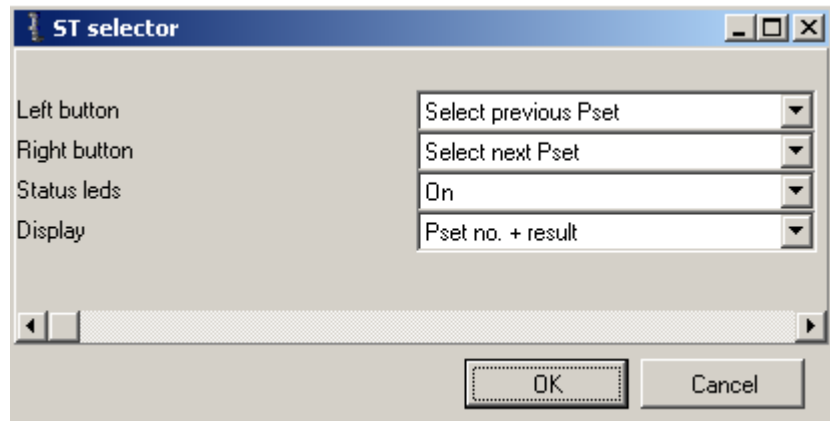
In the Tool bus Configuration window, click **ST scanner**.

Make settings for the ST scanner.

See section *Identifier* for information on identifier settings.

Click **Set Scan Engine Default Values** to delete all custom scan engine settings and revert back to the Atlas Copco production defaults.

Click **Set Highest Security Level** to set the scan engine Linear code type security setting to its highest level (4) and turn the Bidirectional redundancy on.

ST scanner		
Scanner source	Scanner button	Set Scan Engine Default Values
Status leds	Tool LEDs	Set Highest Security Level
Scan led	During scan	
Scan OK led	Identifier received	
Scan time	3	Sec

OK   Cancel
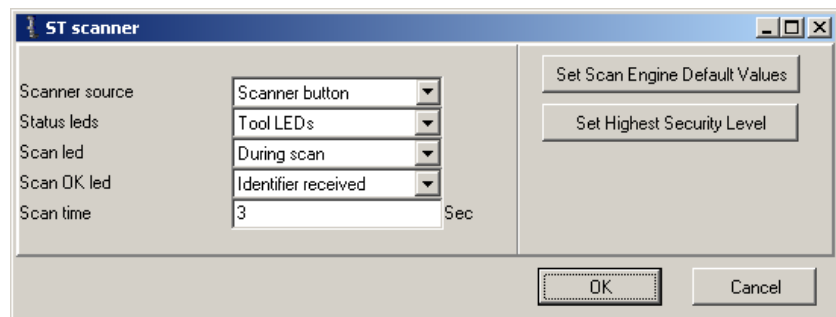
In the Tool bus Configuration window, click **TLS ST Tag**.

Make settings for the ST Tag.

Event	Color	Intensity	Priority	Type	Time
OK	Red	100	1	To next tight	
NOK	Yellow	100	2	Time	10
Low	Green	100	3	To next tight	
High	Cyan	100	4	Time	12
Low TQ	Blue	100	5	To next tight	
High TQ	Magenta	100	6	To next tight	
Cycle complete	White	100	7	To next tight	

Add   Remove

OK   Cancel
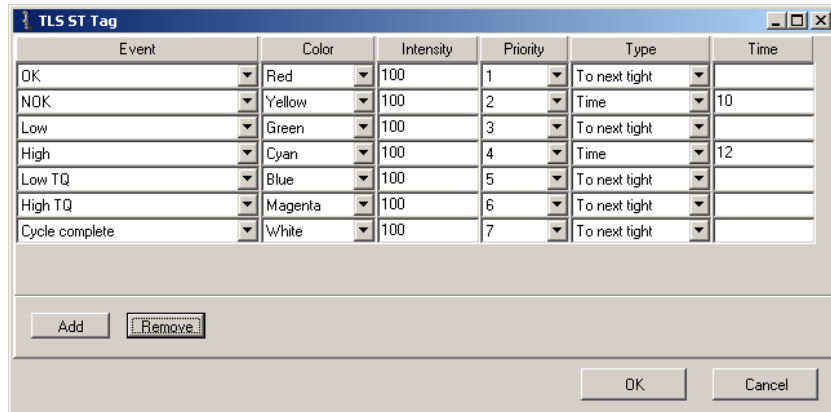
12.4   Printer

In the **PF Map**, open **Accessories**>**Printer**.
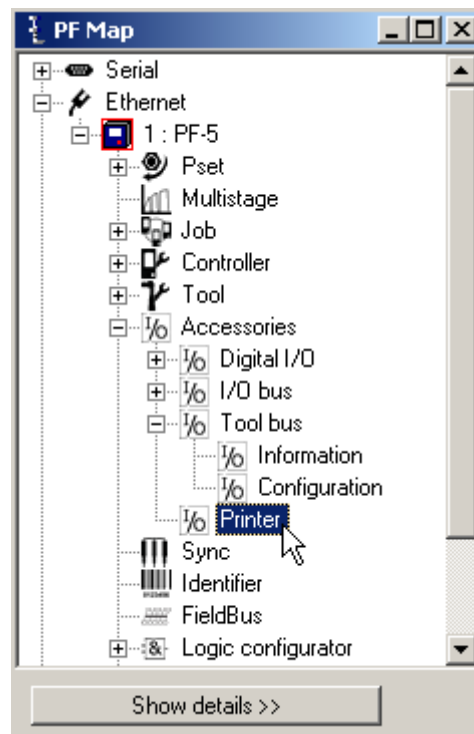
The connected *A400 Brand* and *A401 Paper size* are setup here. If *A402 Continuous print* is activated, then it is possible to also select *A404 New page at Job done*.

Push the Print button on the Power Focus Graph front panel to view a list of available reports to print.

Click **Store** to save configuration.

Configuration	
A400 Brand	IBM ▼
A401 Paper size	A4 ▼
A402 Continuous print	☑
A403 Trace with angle offset	☑
A404 New page at Job done	☐

13   Sync

Sync allows a group of spindles to perform the same task simultaneously. Examples where a Sync solution could be applicable are the tightening of car wheels and the tightening of cylinder head bolts. The Sync function is RBU-dependent.

> (i) **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**
>
> **See parameter list section *Sync* for a description of all available Sync options.**

A **Sync group** consists of PF units working in the same **Cell**.

One of the controllers is defined as **Sync reference**. The other controllers are **Sync members**.

The Sync reference handles the Synchronization between the tools, the selection of Psets and the result reporting for the Sync. A Sync group can be viewed as one PF with more than one tool.

A Sync group can be part of a Job (see chapter *Job*). Note that it is the Job reference, and not the Sync reference, that counts the batch in a Job with Sync.

The status information on each controller and tool shows the individual result for that spindle. The overall Sync OK/NOK can be given on the fieldbus, RE-Alarm or relays controlled by the Sync reference. The results from every spindle are registered separately.

The status from individual Sync members can be viewed on the Sync reference controller.
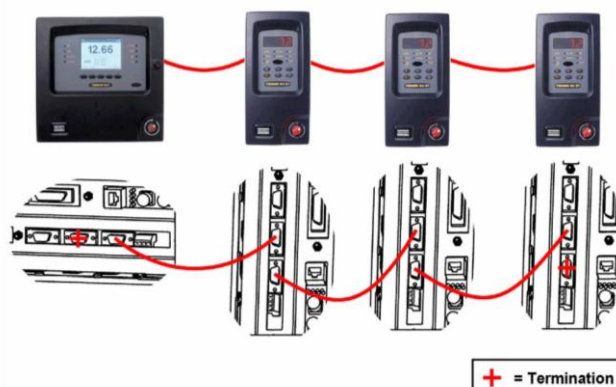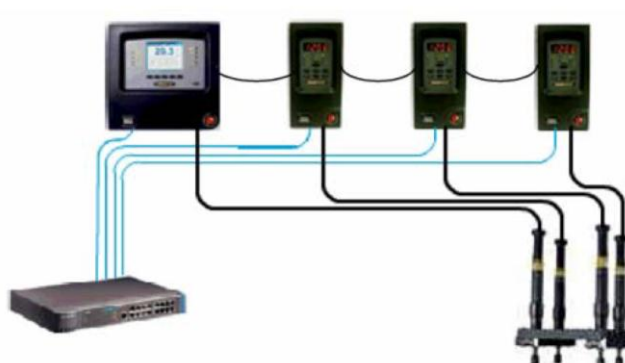
Sync is performed in steps or SynchroTork (PF4000 only). In step Sync, all Synchronized spindles wait for each other at a number of checkpoints before they continue with the next step. A typical two stage tightening has checkpoints at *P111 First target* and *P113 Final target*. SynchroTork allows continuous

Synchronization during the final tightening.

13.1   Sync prerequisites and limitations

A Sync group consists of two to ten PF units. The SynchroTork option is limited to six tools.

All Sync members must be part of the same cell, but a cell can consist of more than one Sync group. The cell reference does not have to be a member of the Sync group. For creating a cell, see section *Controller*.

All Sync members must have the same Sync reference.

All Sync members must be connected via the internal I/O-bus, which is used for time critical Synchronization communication. Do not connect two Sync groups via the I/O-bus.

The Sync reference can control external I/O bus units, such as RE-Alarm, Socket Selector and I/O Expander.

All Psets must be configured from the Sync reference.

Do not configure any external I/O devices (device 1-15) on the Sync members.

No I/O bus cable connection is allowed from any of the sync group members to a non-sync group member PF unit.

Ethernet communication is used for non-time critical communication such as start-up time, creating/updating Psets and Multistages and transferring result data between the Sync reference and the Sync members.

To be able to use Sync start, the 4-pin remote start connector on the Power Focus back panel must be configured for remote start.

If a sync group is used for loosening the entire group will be classified as OK when at least one sync member performs a successful loosening.

In a Synchronized application, the Sync communication has top priority on the I/O bus when the tools are running. For that reason tool start, tool disable and other safety critical functions must not be connected to the I/O bus via I/O Expander.

For a description of how to do Sync motor tuning, see section *Tool*.

13.2   Hardware configuration

Connect all PF units in the Sync group via the I/O-bus on the back panel.

Set the 4-pin remote start connector to remote start on each of the Sync members, and to the selected start source on the Sync reference.

If applicable, connect external I/O devices (for example alarms or start source) to the Sync reference, but never to the Sync members.

Sync reference   **Sync member**   **Sync member**   **Last Sync member**

I/O-bus connection 1 is   I/O-bus connection 2 is
terminated or external I/O   always terminated.
devices are connected.

13.3   Sync configuration

To set up a Sync group, configurations are made in **Network**, **Tool** and **Sync** windows.
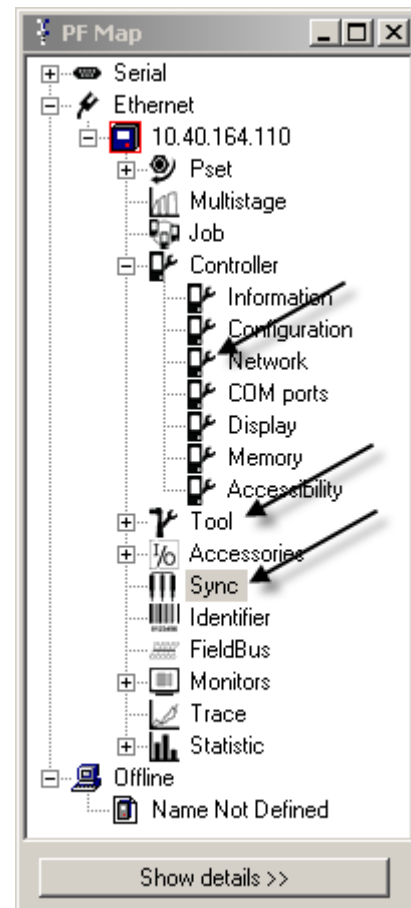
13.3.1   Sync members configuration

Connect the Sync reference.

In the PF Map, open **Controller**>**Network**.

Ensure that all PF units in the Synchronized group are part of the same Cell. Parameter *C312 Cell reference IP* must be the same.

In this example, PF is a Sync member, and the Sync reference is the same as the cell reference.

Click **Store** to save settings.

Ethernet

C300 IP address	10	40	164	112
C301 Subnet mask	255	255	255	0
C302 Default router	10	40	164	1

Cell

C310 Channel ID	10			
C311 Channel name	Station 150			
C312 Cell reference IP	10	40	164	35
C313 Cell ID number	Not Used			
C314 Cell name	Not Used			
C315 Net reference IP				
C316 Job reference IP	0	0	0	0
C317 Sync reference IP	10	40	164	35

In the **PF Map**, open **Tool>Configuration>Tool start**, and set *T200 Tool start select source* to **Sync start**.

Click **Store** to save settings and restart PF.

Repeat the procedure for all Sync members.

13.3.2 Sync reference configuration

Connect the Sync reference.

In the **PF Map**, open **Controller**>**Network**. Ensure that the Sync reference is part of the same cell as the Sync members.

Set *C317 Sync reference IP* equal to *C300 IP address*.

Click **Store** to save settings.

Restart the Sync reference controller and connect ToolsTalk PF to it again.

In the **PF Map**, open **Sync**.

Select controllers in the **Available Power Focus list** and click **Add** to create a **Sync group list**.

Note: The Sync reference (SR) must always be at the top of **Sync group list**.

Make settings in the **Options** field. Store and close the window.

Sync - PF:5 : Name Not Defined								_ □ ×

Available Power Focus List

ID	PF	Used	SR	Sync ref IP
5		Yes	SR	10.40.164.35
10		Yes		10.40.164.35
11		Yes		10.40.164.35

Sync group list

ID	PF	Used	SR	
5		Yes	SR	
10		Yes		
11		Yes		

[Add] [Remove]

Options

S101 Tightening strategy	Stage ▾
S102 Loosening strategy	Sync loosening ▾
S103 Continue if sync failed	☐
S104 Sync OK time	0,0 Sec

[Close]   [Read]   [Store]

13.4 Troubleshooting

Follow the procedure in this section. For more information, see section *Event codes*.

Symptom	Reason/Action
Tools in a Sync group do not start or do not tighten correctly	Programming errors: 1. Check that all Psets are configured from the Sync reference. 2. Check that all Sync members have *T200 Tool start select source* set to Sync start. 3. Check that all Sync members have *C317 Sync reference IP* set to the IP-address of the Sync reference. 4. Reboot any reprogrammed Sync member or Sync reference. Hardware-related errors: 1. Check that the I/O Bus cables between the Sync members is correctly connected and without faults. 2. Check that the remote start connector in the Sync members is correctly wired for remote start. Error elimination: 1. Select a new Pset from the Sync reference. If all Sync members change to the same Pset, the Sync group programming is correct. If not, check the programming and the Ethernet cables and connections. 2. Select normal loosening and start a loosening from the Sync reference. If not all Sync members start, check the tool trigger configuration in the Sync members and the wiring of the remote start input. Check also the I/O Bus connection and the I/O Bus cabling. 3. If a single spindle does not start, the tool, tool-cable or controller might be broken. If all spindles in the group start loosening but not tightening, check that all Psets are configured in the same way. If not, restore them again from the Sync reference (all Psets must be configured from the Sync reference).
An event code is displayed.	See section ***Event codes***.

14　Identifier

The **Identifier** section describes the identifier concept, functions and settings.

An identifier, or barcode string, can be used for example to select Psets or Jobs, identify motor vehicles (VIN) and other work pieces, variants, and operators. The tightening result can then be saved together with this information.

> **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**
>
> **See parameter list section *Identifier* for a description of all available Identifier options.**

14.1　Identifier concepts

There are three ways to use the identifier function, all possible to use independently of each other:

- To select a Pset/Multistage or Job through scanning a barcode string (only Type 1).
- To create a work order for identification of, for example, work pieces connected to a tightening.
- To store additional information to the tightening result.

An identifier (barcode) string can have different standards and lengths. It can be scanned and stored as it is, but PF can also be configured to identify parts of the string. These parts are called **significant strings**.

The **Type 1** identifier can be configured for selection of Pset/Multistage or Job in addition to being stored as additional information to the tightening result or being selected in a work order.

The **Type 2, Type 3** and **Type 4** identifiers can be stored as additional information to the tightening result or be selected in a work order. These **multiple identifiers** are RBU-dependent.

A **significant string** is a set of characters within a barcode string that can be defined.

The **significant positions** are the positions where the significant strings are located.

A **wildcard** character is represented by a ¤ symbol and means that a certain position in the significant string can have any character value.

A **work order** consists of different types of identifiers (**Type 1** is mandatory). It is configured when Power Focus should receive identifiers in a predefined order. An identifier not included in the work order is called **Optional identifier**. An optional identifier must not be identical to an identifier included in the work order.

The **Result part** is additional information stored together with each tightening result in the Power Focus database. This information can come from one or more of the defined identifier types independently. Multiple identifiers provide storage of up to four result parts (RBU-dependent) after memory reconfiguration. The additional information from the result parts is displayed in the **Identifier monitor**, and the result of the tightening is displayed in the **Result Monitor**.

The result part additional information is stored with the tightening result in the Power Focus database.

Example:

An airbag is mounted in a car.

Type 1 represents the airbag which can be of different variants that need different Psets. Type 2 represents the car (VIN) and Type 3 identifies the work station.

A work order is configured where Type 2 (VIN) and Type 3 (work station) have to be scanned before Type 1 (airbag).

Each tightening result from the Psets listed under Type 1 is stored with the VIN, the airbag ID, and the work station ID.

The Identifier monitor shows the Work order and the Result monitor shows the tightening result. The tightening result with all the additional information can be retrieved via command **Get all results** or via Tools Net.

Part Id scan: This concept offers the opportunity to scan a variant of a part and select a specific Pset in the Job. (The job itself may have been selected by another identifier). The significant numbers and part id identifier length do not necessarily have to have a full match to select a specific Pset. This is achieved by means of wildcards.

14.2   Identifier prerequisites and details

Prerequisites for significant strings:

- 400 significant strings can be set for Type 1
- A string can only be added once in Type 1
- A Pset, Multistage or Job ID can be added to any string of Type 1
- Wildcards can be used in Type 1 strings if the significant positions are different and outside the length of some Type 1 strings

- The number of characters in the significant string (for example 10) must be the same as the number of significant positions
- The length can be max 100 characters
- Standard alphanumeric characters are accepted. Apostrophe (') and colon (:) are not accepted
- Standard alphanumeric ASCII characters (33-126) are accepted

	Max scanned characters	Max significant positions	Max significant strings	Max stored characters
Type 1	100	50	400	25
Type 2	100	50	1	25
Type 3	100	50	1	25
Type 4	100	50	1	25

Prerequisites for incoming data:

- Identifiers can be sent to the Power Focus via a scanner (connected to the serial port), fieldbus, Ethernet, an ST scanner, or an STwrench Tag (connected to the ST tool). Input source must be correct (accepted).
- The incoming identifier string must have the following barcode reader standard syntax: STX<data>ETX. (STX=02H ETX=03H).
- Scanner or similar device must not respond to unrecognized commands or send other data than the identifier string
- An incoming identifier that goes directly to a Job or Sync member erases the received identifier that is sent to the member from the Job or Sync reference.

Prerequisites for result parts:

- If using more than one result part, the memory configuration *C604 No. of identifier result parts* must be updated (RBU-dependent).
- If the system is set up in a Cell Job or Sync configuration, the parameter *C604 No. of identifier result parts* must be configured with identical values (1-4) for all PF units included in the Job/Sync group.
- The information from the identifier types can be displayed in the result parts independently of result part number. For example, all result parts can display information from Type 1 (or even depending on the subtype of the Type 1).
- A work order has to be completed before the Power Focus stores the accepted identifiers in the result database and selects a next Pset/Multistage or Job.
- Autoselected Psets in a Job will inherit the result parts (if any) from the previous Pset.

Identifier reset can be done if any of the following actions are taken:

- Restoring of identifier configuration is made
- A **Reset all identifier** command is issued from the identifier monitor or digital input

- The parameters *J342 Reset all identifier at Job done* and *I183 Reset all identifiers at Pset batch done* are activated

After a reset, the following occur:

- All identifiers are reset
- Work order is (cleared) aborted
- Tool is unlocked if *I181 Tool locked during work order* is activated

14.3 Configuration of identifier functions

The identifier functions are related to a number of parameters and views.

Identifier includes settings for configuration of identifiers, result parts and work order. A command to send an identifier to PF directly is also located here.

Configuration; Identifier can be set as the source to select Pset, Job, or Job override.

Memory includes settings for Result parts. Note that memory reconfiguration requires saving of PF to file and reboot of PF. If a memory reconfiguration is needed, it is recommended to start the procedure here. See section *Memory*.

Identifier Monitor displays the result parts. The following functions are also available here:

- Bypass identifier
- Reset latest identifier
- Reset all identifiers
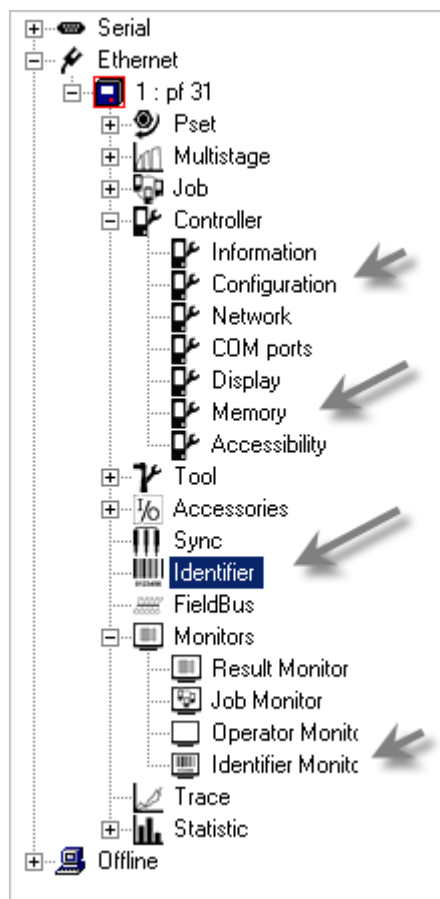
14.3.1   Configuring identifiers

The procedure to set identifiers differs between identifier types 1 and types 2-4. Always start with Type 1.

To set up identifiers, do the following:

In the PF Map, double-click **Identifier** to open the **Type setup** window. The figure below shows a completely configured identifier setup.

Select **Input source** for identifier **Type 1**.

State **Length** of the incoming identifier. – (hyphen) means no length check.

Click **Set** to open the pop up window Identifier significant position setup.
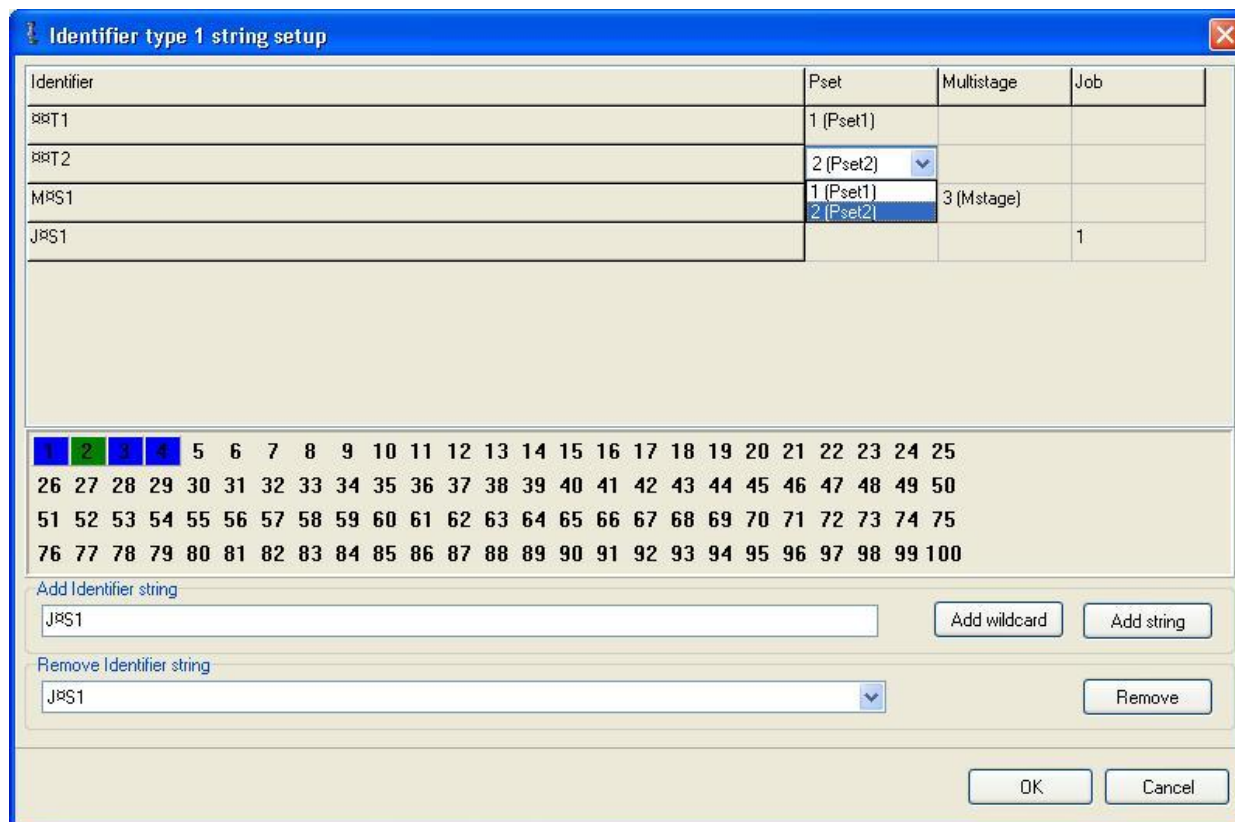
Mark the significant positions for the identifier. The positions can be selected freely. Click **OK**.

To define the significant string for identifier Type 1, click **Set strings for Type 1** to open the **Identifier Type 1 string setup** window.

Note: To define the significant string for identifier Type 2-4, click the box and type the string directly.

Write string name in field **Add identifier string** and click **Add**

Wildcards can be used in Type 1 strings if the significant positions are different and outside the length of some Type 1 strings.

Double-click a box to select Pset, Multistage or Job to each string. When finished, click OK.

Click **Store** to save the settings, or continue with

- Configuring a new type of identifier
- Configuring a work order
- Configuring Result parts.

   The STwrench TAG must be programmed in a special way in ToolsTalk in order to work properly, when using Identifier Input source STwrench tag.. The length must be 3 with 3 significant characters. For example, if the tag number is 1 the configured string must be "001".

14.3.2   Configuring a work order

To configure a work order, do the following:

Open **PF Map > Identifier > Options**.

Add identifier types to the work order, and arrange the correct order using the arrow buttons.

Note: Identifier Type 1 must always be included in the work order.

If applicable, select *Tool locked during work order* and *I183 Reset all identifiers at Pset batch done*.

When activating *I183 Reset all identifiers at Pset batch done*:

- All identifiers are reset
- Work order is (cleared) aborted
- Tool is unlocked if *I181 Tool locked during work* order is activated

To avoid re-selecting an ongoing Job, Pset or Mset by a work order (and override selected), check the *I184 Ignore identical work orders* option.

Click **Store** to save the settings.

Note: The **Send Identifier button** is described in Additional Identifier functions.

14.3.3   Configuring result parts

To configure more than one result part, the parameter *C604 No of Identifier result parts* must be set to the correct number of result parts. If a memory reconfiguration is made, the PF data must be stored to file and PF rebooted. See section *Memory* for instructions. It is possible to configure up to 4 separate result parts.

The results are displayed in the Identifier Monitor. See section *Additional identifier functions*.

To configure result parts, do the following:

Open **PF Map > Identifier > Type setup**.

Select the identifier type to correspond with Result part 1 (2, 3 and 4) from the drop-down list.

Click **Set** to open the pop up window **Identifier significant position setup**.

Set **Significant positions** by marking character positions that should be added to the result part.

Click **Store** when finished.

In the example below, six positions from Type 4 are copied to result part 1 and stored together with the tightening result. Eight positions for Type 1 (any subtype) are copied to result part 2, and so on.

Result Parts to display and store

Result part	Belongs to type	Significant positions	
1 (old vin)	4	1,2,3,4,5,6	Set
2	1	1,2,3,4,5,6,7,8	Set
3	3	3,4,5	Set
4	3	6,7,8	Set

For Type 1, it is possible to specify any of the subtypes Pset/Mset/Job in any of the Result parts. For example, result part 2 can have Type 1 subtype Job and result part 3 can have Type 1 subtype Pset.

14.3.4 Additional identifier functions

The following functions are available in the **Identifier Monitor** window:
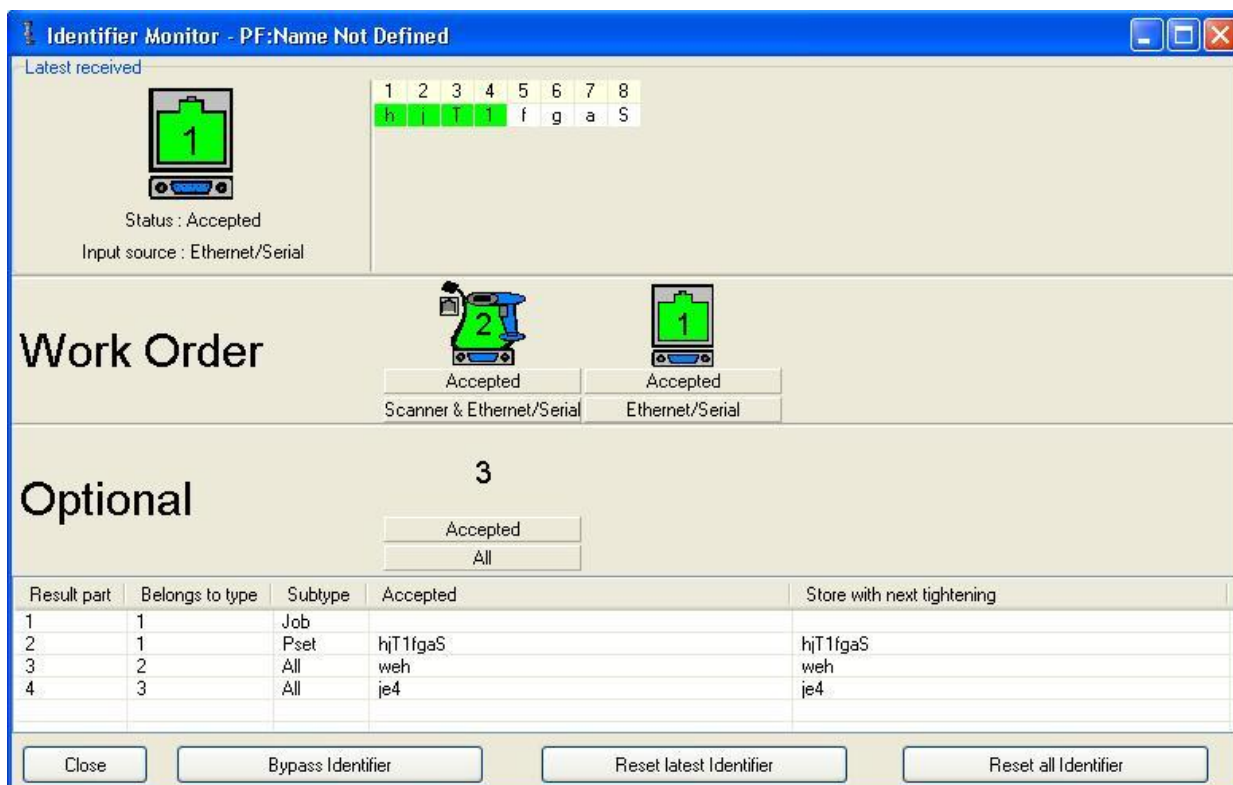
Function	Description
Bypass identifier	Skips a specified identifier type in a work order.
	It is not possible to bypass the first type in the work order if it simultaneously exist types outside the work order.
Reset latest identifier	The latest accepted identifier string is cleared with the command (or digital input) *Reset latest identifier*.
	It is not possible to perform *Reset latest identifier* for the last type in a work order.
Reset all identifier	All accepted identifier strings are cleared with the command (or digital input) *Reset all identifiers*.

The following function is available in the **Send Identifier** window in the **Identifier** menu (see figure in section *Configuring a work order*).

Function	Description
Send Identifier	Sends an identifier string from ToolsTalk PF to PF manually. The result is displayed in the Identifier Monitor.
	To select Pset/Multistage or Job from an identifier string, parameters *C200 Pset, C201 Job* or *C202 Job override* have to be set to Identifier.

15 Fieldbus

Fieldbus communication can be used for data communication between Power Focus and a PLC (programmable logic controllers). It is an effective and fast way for the data transfer of short data packages. Fieldbus is normally used to send discrete I/O data instead of using a large number of cables that have to be hard wired to relays and digital inputs.

There are many different fieldbus standards on the market and they all have different hardware and software protocols. To be able to communicate on the fieldbus, Power Focus must be equipped with a specific card for the preferred type of fieldbus.

> **Power Focus acts as a client in a fieldbus system. A PLC or similar acts as the reference (master).**
>
> **This section includes screenshots from ToolsTalk PF. The screenshots show examples of parameter settings and are NOT intended to be generally applicable. Check with your local Atlas Copco representative how to set up your specific system environment.**
>
> **See section *Digital I/O and fieldbus items* for a description of all available fieldbus options.**

With ToolsTalk PF, the fieldbus functionality in PF can be configured to fit the user-specific bitmap. It also makes configuration or modification of a bitmap very easy. When the configuration is done, it can be downloaded to Power Focus or saved as a file for later use.

15.1 General setup

In the **PF Map**, double-click **Fieldbus**.
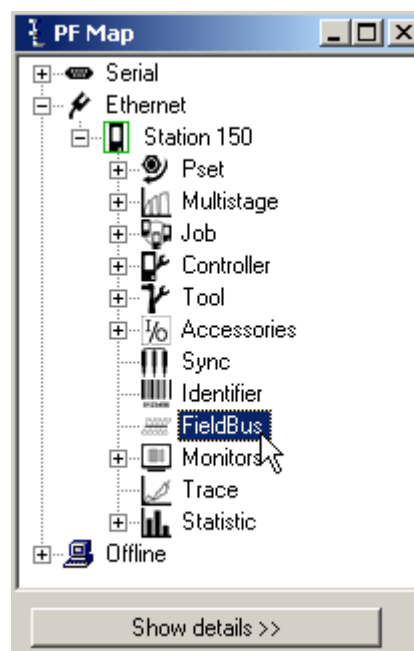
Select *F100 Fieldbus type* from the drop down menu.
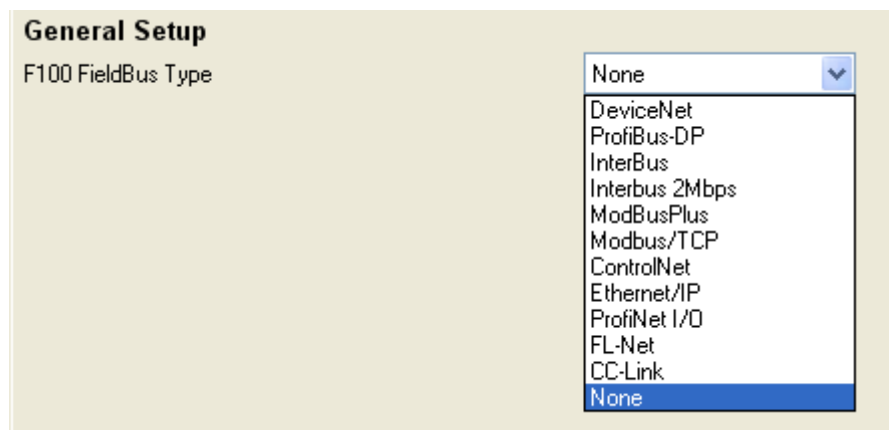
> (i) **All fieldbus parameters are reset to default and data items cleared.**

Confirm by clicking **OK**.
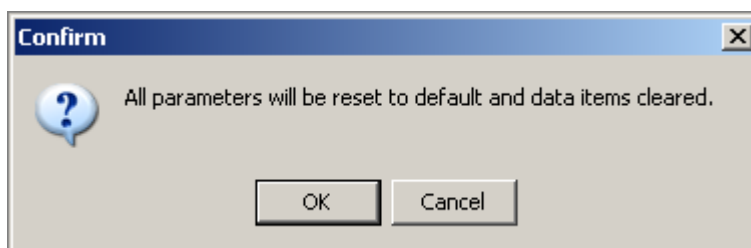
The screenshot below displays available parameters for fieldbus type **DeviceNet**. Click Store to save the settings.

15.1.1 Parameters in General setup

The table below shows parameters available for all fieldbus types. For an explanation of the parameters, see parameter list section *Fieldbus*.

Parameter	Device-Net	ProfiBus-DP	Inter-Bus	ModBus Plus	Control-Net	ModBus/ TCP	Ethernet/IP	Inter-Bus 2MB	Profinet-IO	FL-Net	CC-link
F100 Fieldbus type	X	X	X	X	X	X	X	X	X	X	X
F102 From PF data length	X	X	X	X	X	X	X	X	X	X	X
F103 To PF data length	X	X	X	X	X	X	X	X	X	X	X
F104 From PF global data length				X							
F105 To PF global data length				X							
F106 From PF Data Offset										X	
F107 To PF Data Offset										X	
F110 Set node address and baud rate from	X										X
F111 FB node address	X										
F112 Baud rate	X										X

Fieldbus

Parameter	Device-Net	ProfiBus-DP	Inter-Bus	ModBus Plus	Control-Net	ModBus/ TCP	Ethernet/IP	Inter-Bus 2MB	Profinet-IO	FL-Net	CC-link
F113 Connection mode	X										
F120 Set node address from		X		X	X	X	X			X	
F121 FB address from		X		X	X						
F130 PCP length			X					X			
F131 Process data length			X					X			
F140 Set source address from				X							
F141 Source address				X							
F150 IP address						X	X		X	X	
F151 Subnet Mask						X	X		X		
F152 Gateway						X	X		X		
F155 Device Name									X		
F157 Assembly instance							X				
F160 Virtual fieldbus										X	
F161 Virtual from PF data length										X	
F162 Virtual to PF data length										X	
F163 Virtual from PF data offset										X	
F164 Virtual to PF data offset										X	
F170											X
F171											X
F200 FB update interval	X	X	X	X	X	X	X	X	X	X	X
F210 Tool stop at offline	X	X	X	X	X	X	X	X	X	X	X
F220 Read result handshake	X	X	X	X	X	X	X	X	X	X	X
F300 Bitmap select	X	X	X	X	X	X	X	X	X	X	X

15.1.2   View fieldbus information

Select **General setup**.

Click **Get fieldbus info** to display fieldbus module type, module software version, module serial number and status of the LED's.

Parameter Overview

□ General Setup
    General Setup
⊞ From PF Setup
⊞ To PF Setup

Get fieldbus info

Module Fieldbus Type: Ethernet/IP

Module Software Version: 01.21

Module Serial Number: 2684537851

LED 1: LED off or not used

LED 2: LED green

LED 3: LED off or not used

LED 4: LED off or not used

Select **General setup**.

Click **Get fieldbus info** to display fieldbus module type, module software version, module serial number and status of the LED's.

Parameter Overview

□ General Setup
    General Setup
⊞ From PF Setup
⊞ To PF Setup

Get fieldbus info

Module Fieldbus Type: Ethernet/IP

Module Software Version: 01.21

Module Serial Number: 2684537851

LED 1: LED off or not used

LED 2: LED green

LED 3: LED off or not used

LED 4: LED off or not used
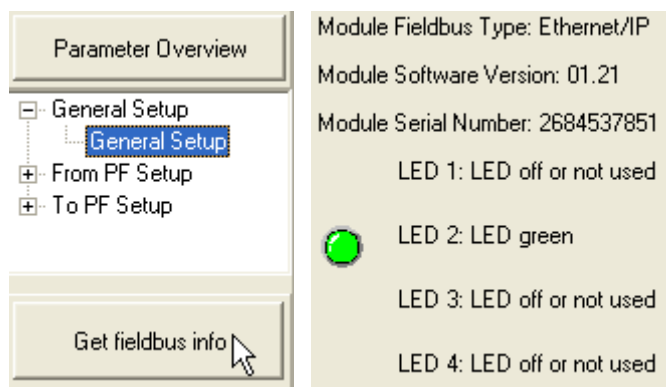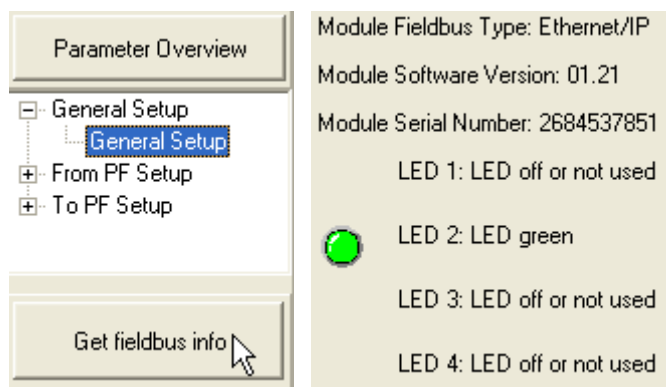
15.2   From PF setup and to PF setup

Select **From PF setup** or **To PF setup**.

Via **From PF Setup** the bitmap (defined in *F102 From PF Data Length*) sent out from the Power Focus can be configured.

Via **To PF setup** the bitmap (defined in *F103 To PF Data Length*) sent in to the Power Focus can be configured.

Click **Add item...** to activate a selection list. On the right side of the item list, see information about highlighted item.

Highlight the item and **double-click** on it or click **Add**. The item is then entered to the item list on the first available line.
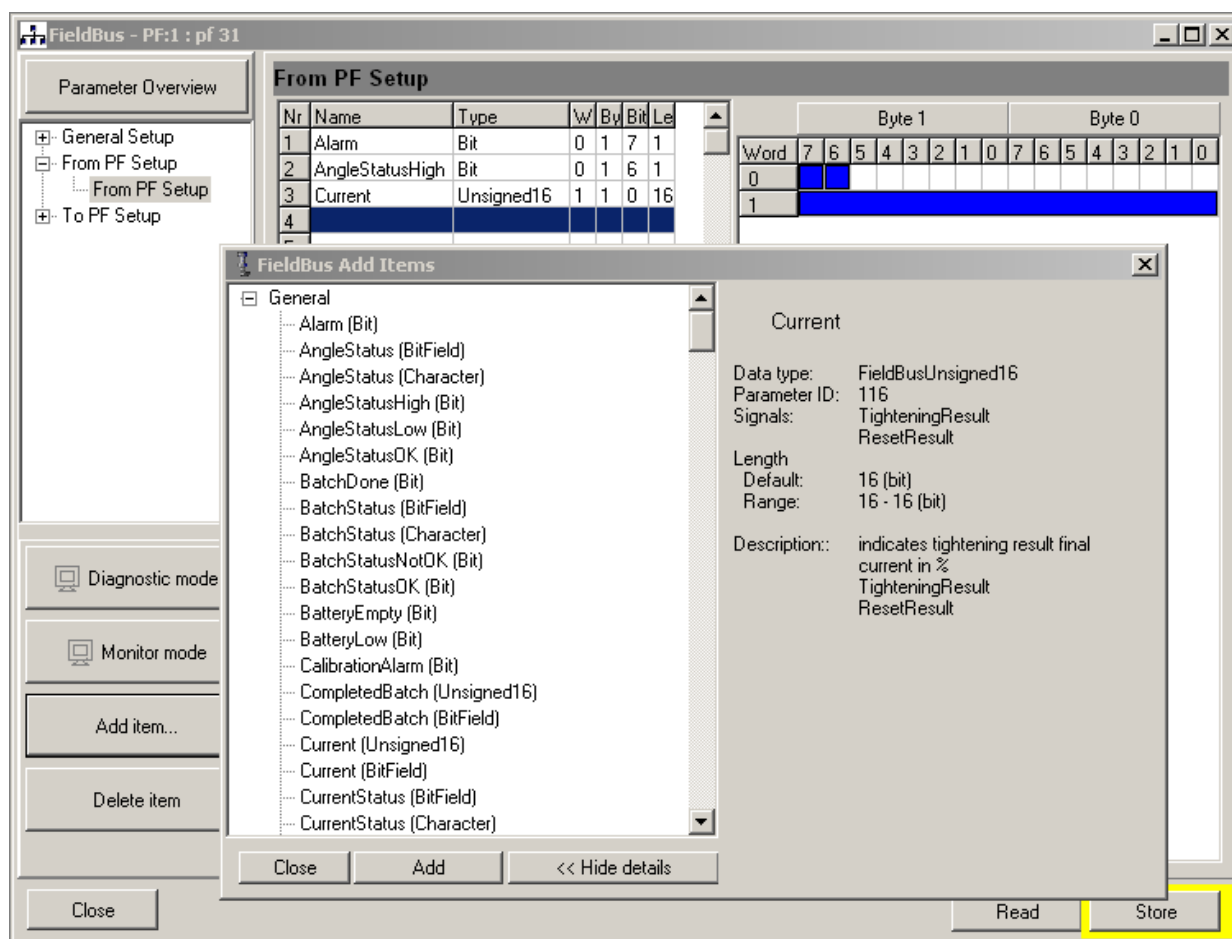
In the list, the start word, start byte, start bit, and length for the selected item are visible. It is easy to change the position in the bitmap by changing the start position in the item list and pressing **Enter** on the keyboard after each line is changed. If the length of an item is variable, it can also be changed here.

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 bitmap is changed, and a conflict occurs, this part is marked with red.

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

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

For detailed information of the available selections, see section *Digital I/O and fieldbus items*.

15.2.1 Fieldbus modes

The normal mode is when neither Diagnostic mode nor Monitor mode is selected. In normal mode, the operator can change position of a bit in a word (in a byte) for a selected item (not the content of the bit). For instance, the operator can change the **Job off** from bit position 7 to bit position 3 just by drag and drop, or by writing it into the **Bit** column and pressing **Enter** on the keyboard.

Diagnostic mode

In Diagnostic mode, it is possible to set fieldbus data in ToolsTalk PF and send the data to PF by clicking Set value. If Diagnostic mode **From PF Setup** is used, then the Power Focus passes data from ToolsTalk PF to the PLC and ignores the data from Power Focus. If Diagnostic mode **To PF Setup** is used, then the Power Focus activates functions, which are set in ToolsTalk PF and ignores PLC data.

> **In Diagnostic mode the operator can only change a small part of the fieldbus setting data (only the content of a bit from zero <--> one).**

Monitor mode

Monitor mode is used to monitor fieldbus data communication for testing purpose. This function works only when ToolsTalk PF is online (connected to PF).

When Monitor mode is active, the data from Power Focus to PLC is visible in the **From PF Setup** window bitmap. Likewise the data from PLC to Power Focus is visible in the **To PF Setup** window bitmap. It is not possible to change and store fieldbus configurations in monitor mode. Data can be displayed in two formats, defined data type format and binary format. The data in the monitor windows is updated at a rate of three messages per second.

15.3　Storing fieldbus configuration

To store or read fieldbus data, first activate the fieldbus window. On the **Menu bar**, use command **File>Read Fieldbus**, or **File>Save Fieldbus**. The fieldbus file extension is "*.pff".

15.4　Disable fieldbus carried signals

It is possible to run PLC-selected Jobs over the fieldbus in automatic mode (i.e. "fieldbus" is selected for parameter *C201 Job*), and select Jobs with a digital input in emergency mode (i.e. "DigIn" is selected for parameter *C202 Job override*). When emergency mode is activated, the fieldbus signals could still disturb the communication. To avoid this type of problem it is recommended to use digital input **Disable fieldbus carried signals.** When this digital input goes high the following events occur:

- Fieldbus communication is disabled

- Relay *Fieldbus carried signals disabled* goes high

- In ToolsTalk PF monitoring mode on fieldbus "To PF" side, it is possible to display changes in signals sent to PF over the fieldbus. (Note that the signals have no effect on the Power Focus, since all fieldbus communication is disabled).

- On the fieldbus side "From PF", bits are reset to zero (0)

- The traffic of "keep alive" signals continues on the fieldbus. In this way no event codes (i.e. *No connection on fieldbus*) are 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 is aborted

15.5   Fieldbus data format

This section describes the different data types that are used in the fieldbus configuration.

15.5.1   Bitmap select (Endian mode)

Big endian (Motorola mode) is default setting for ProfiBus-DP, Profinet IO, InterBus, Interbus 2Mb, CC-link, ModBusPlus and ModBus TCP.

Little endian (Intel mode) is default setting for DeviceNet, ControlNet, Ethernet/IP and FL-net.

Big endian (Motorola mode)

Byte 0 (send 1 st)								Byte 1 (send 2 nd)							
MS Byte (PF)								LS Byte (PF)							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Little endian (Intel mode)

Byte 1 (send 2 nd)								Byte 0 (send 1 st)							
MS Byte (PF)								LS Byte (PF)							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

15.5.2   Fieldbus data types

The Power 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 file Power Focus item data types into fieldbus we define 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.
BitField (BF)	Length is 1-16 bits. All bits must be in the same byte. The left bit is the most significant bit and the right bit is the least significant bit, i.e. 0001=1, 1000= 8.
Character (Char)	One byte ASCII code.
CharacterStringChange (CSC)	Character string. Each character uses one byte ASCII code. Range: 2 - 25 bytes.
CharacterStringInput (CSI)	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. To enter the same value again (e.g. the same Job number), just change the counter.
FixedPointNumber (Fixed point)	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.
Unsigned16 (U16)	16-bit unsigned integer. Decimal 0 – 65 535.
Unsigned32 (U32)	32-bit unsigned integer. Decimal 0 – 4 294 967 295.
U32_HNW	32-bit unsigned integer. MSW is the higher number word. Only shown in Intel Endian
CharStringChangeIntel (CSCI)	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. Only shown in Intel Endian
CharStringInputIntel (CSII)	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. 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. Only shown in Intel Endian
OctetArray (OA)	It contains several octet data in the byte order.
LongCharStringChange (LCSC)	It contains max 100 bytes character.
LongCharStrChIntel (LCSCI)	In Intel mode, only allows whole word, up to 100 bytes. Only shown in Intel Endian.

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

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. A new input is considered when the counter changes.

Big endian (Motorola mode)

Data type	Word	Byte 0	Byte 1	Convert to PF data (hex)	Convert to FB data (hex)
CharStringChange	0	P	S		
	1	E	T		
	2	2		PSET2(00)	PSET2(00)
CharStringInput	3	1 (counter)	P		
	4	S	E		
	5	T	2	(01)PSET2	(01)PSET2

Little endian (Intel mode)

Data type	Word	Byte 1	Byte 0	Convert to PF data	Convert to FB data (hex)
CharStringChange	0	P	S		
	1	E	T		
	2	2		PSET2(00)	SPTE(00)2
CharStringInput	3	1 (counter)	P		
	4	S	E		

	5	T	2	(01)PSET2	P(01)ES2T
CharStringChangeIntelF	6	S	P		
	7	T	E		
	8		2	PSET2(00)	PSET2(00)
CharStringInputIntelF	9	P	1 (counter)		
	10	E	S		
	11	2	T	(01)PSET2	(01)PSET2

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

Big endian (Motorola mode)

Data type	Word	Byte 0	Byte 1	Convert to PF data	Convert to FB data (hex)
FixedPointNumber	0	0	12		
	1	0	15	12.15	(00 0B 00 0F)

Little endian (Intel mode)

Data type	Word	Byte 1	Byte 0	Convert to PF data	Convert to FB data (hex)
FixedPointNumber	0	0	12		
	1	0	4	12.04	(0B 00 04 00)

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.

Big endian (Motorola mode)

Data type	Word	Byte 0	Byte 1	Convert to PF data	Convert to FB data (hex)
Unsigned16	0	1	0	256	(01 00)
Unsigned32	1	0 (MSB)	1		
	2	0	0 (LSB)	65536	(00 01 00 00)

Little endian (Intel mode)

Data type	Word	Byte 1	Byte 0	Convert to PF data	Convert to FB data (hex)
Unsigned16	0	1	0	256	(00 01)
Unsigned32	1	0 (MSB)	1		
	2	0	0 (LSB)	65536	(01 00 00 00)
U32_HNW	3	0	1 (LSB)		
	4	0 (MSB)	0	1	(01 00 00 00)

15.6 Fieldbus selector configuration

The **Fieldbus selector** function makes it possible for an external source (PLC) to control the selection of Psets on selectors via fieldbus.

The intended type of working stations where the proposed software is to be installed are rework stations and similar, without fixed workflows. The tightenings are often unique for each work piece depending on the previously performed failed tightenings on that work piece. The external source (PLC) is responsible for setting the green LED's on the selector(s) and for selecting the Psets in the Power Focus.

> **To use this function the parameter *C200 Pset* must be set to Fieldbus selector. The fieldbus selector function can not be combined with the Job function.**

The selector is set up in **Accessories>I/O bus>Configuration**.

Set selector LED

Light on/flash/turn off for Selector green Led on positions where Pset is configured. Two bits for one position: 00 – off , 01 – flash, 10 – solid.

In an eight-socket selector, the first four positions are for **Selector LED 1-4**, and the last four positions are for **Selector LED 5-8**. If a four-socket selector is used, only selector LED 1-4 is mapped.

Big endian (Motorola mode)

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Device ID								Not used							
LED 4		LED 3		LED 2		LED 1		LED 8		LED 7		LED 6		LED 5	

Little endian (Intel mode)

Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Not used								Device ID							
LED 8		LED 7		LED 6		LED 5		LED 4		LED 3		LED 2		LED 1	

Selector information

Big endian (Motorola mode)

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Device ID								Bit 0-7 Socket 1-8 information (1- lifted, 0- not or not configured, FF-							

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

(first row above spans: all ones – more then one socket lifted)

Little endian (Intel mode)

Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit 0-7 Socket 1-8 information (1-lifted, 0- not or not configured, FF- all ones – more than one socket lifted)								Device ID							
LED 8	LED 7	LED 6	LED 5	LED 4	LED 3	LED 2	LED 1

Selector Control Green (Red) Light

For selector external controlled function A232. Set selector green (red) light. Two bits for one position: 00 – off , 01 – flash, 10 – solid. Bitmaps are as in chapter Set Selector Led.

> ⓘ **To use this function the parameter A232 must be set.**

The A232 is set up in **Accessories>I/O bus>Options**.

15.7   Select Pset from fieldbus and set batch size

In order to set batch size and select Pset from fieldbus, parameter *C200 Pset* must be Fieldbus or Fieldbus selector. Also, parameter *P150 Batch count* must be set to Fieldbus.

Big endian (Motorola mode)

Byte 0	Byte 1
Pset ID	Batch size

Little endian (Intel mode)

Byte 1	Byte 0
Batch size	Pset ID

Function (C200 Pset is set to Fieldbus)

	0 < Batch size < 99	Batch size = 0, Batch size > 99
Pset ID = 0	No Pset selected	No Pset selected

0 < Pset ID < max number of Pset	Select Pset and set batch size	No Pset selected

Function (C200 Pset is set to Fieldbus selector)

		0 < Batch size < 99	Batch size = 0, Batch size > 99
Pset ID = 0	**Selector socket lifted correctly**	No Pset selected	No Pset selected
	Selector socket lifted incorrectly	Display event code *E475 Fieldbus PsetID mismatch selector lifted socket* No Pset selected	Display event code *E475 Fieldbus PsetID mismatch selector lifted socket* No Pset selected
0 < Pset ID < max number of Pset	**Selector socket lifted correctly**	Select Pset, set batch size and unlock tool	Display event code *E475 Fieldbus PsetID mismatch selector lifted socket* No Pset selected
	Selector socket lifted incorrectly	Display event code *E475 Fieldbus PsetID mismatch selector lifted socket* No Pset selected	Display event code *E475 Fieldbus PsetID mismatch selector lifted socket* No Pset selected

15.8   Fieldbus information

This section lists the fieldbus types.

15.8.1   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 organization called ProfiBus International, PI, and other local and national organizations. General technical questions regarding the fieldbus should be addressed to the 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.

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 D-sub (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 optic 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 to enable the node address from SW (ToolsTalk PF).
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 - 200 bytes The string length in PF is limited to 200 bytes. ProfiBus-DP standard allows 244 bytes.	Must be the same in PF and PLC.
Data from PF length	0 - 200 bytes The string length in PF is limited to 200 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
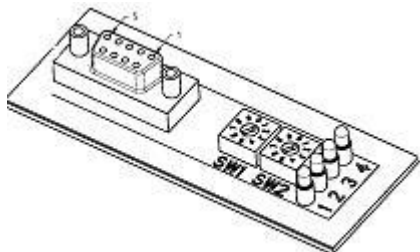
Fieldbus connectors

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 D-sub

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, such as optical transceivers (RS485 to fiber 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 fiber 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 fiber 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 enable node address configuration from ToolsTalk PF 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 Power Focus ProfiBus DP module has an auto baud rate detection function, do not 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 LED's

The module is equipped with four colored LED's, used for debugging purposes. The function of the LED's is 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 are 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 the local Atlas Copco service representative for a copy of the GSD file.

File name: pf3profb.gsd

Icon file

Contact the local Atlas Copco service representative to get a copy of the icon file for Power 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

15.8.2   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.

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 – 200 bytes The data string is in PF limited to 200 bytes. DeviceNet standard allows 255 bytes.	Must be the same in Power Focus and PLC

Variable	Limits	Information
Data from PF length	0 – 200 bytes The data string is in PF limited to 200 bytes. DeviceNet standard allows 255 bytes.	Must be the same in Power Focus 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 it is also possible to set baud rate, with the following baud rates being available: 125, 250 and 500 Kbit/s. All nodes in the network have to communicate at the same baud rate.

On the Power 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 PF. 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 Power 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
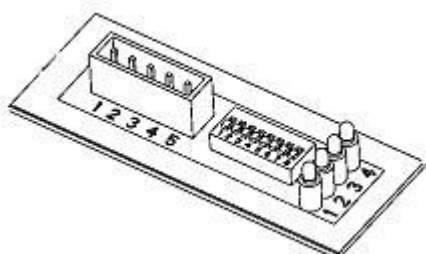
LED 1: Not used

LED 2: Network status

LED 3: Module status

LED 4: Not used
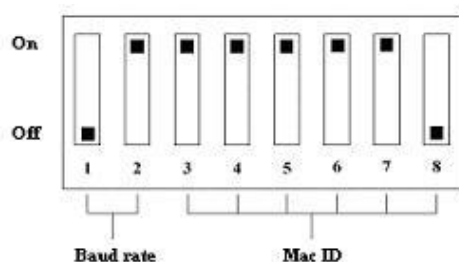
On = 1

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)

To set the Mac ID from ToolsTalk PF 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 Power Focus internal 24VDC (screw terminal) the same connection shall only power one DeviceNet module. This means that the DeviceNet cable connected to PF must not include voltage wires. Normally there is 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 LED's

The module is equipped with four colors LED's, used for debugging purposes.

LED number	Function	Information	Condition
1	Not in use		
2	Network status	Not powered / Not online	Off
2	Network status	Link OK online. Connected	Steady green
2	Network status	Critical link failure	Steady red
2	Network status	Online 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

The termination of the fieldbus requires a terminating resistor at each end. 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 the local Atlas Copco service representative for a copy of the EDS file.

File name: pf3devn.eds

Icon file

Contact the local Atlas Copco service representative to get a copy of the icon file for Power Focus. This file can be used to have a Power Focus Icon in PLC configuration SW.

File name: pf3devn.ico

15.8.3   InterBus/InterBus2MB

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 organization called the InterBus Club. The organization 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 Power 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. The first way is a 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 Power 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.**

Physical interface

Interface	Description
Transmission media	InterBus two differential lines.
Topology	Ring Structure.
Fieldbus connectors	9 pin male D-sub.
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 optic 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, 2Mbit/sec
Process string length	<= 20 bytes
Parameter string length (send with PCP)	200 byte – Process string length The string length in the Power Focus is limited to 200 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

The following figure shows typical Data Map To/From PF for Interbus protocol.

Item	Bytes	Words		Bytes	Words
Data Length	<=20	<=10		>20	>10
PCP Length	= 0	= 0		2,4,8	1,2,4
Process Data	= Data Length			=20-2*PCP	=10-PCP
Parameter Data	0	0		<= 200 - Process Data	

Byte	Word		From /To PF Data	
			Byte 0 (LSB)	Byte 1(MSB)
0	0	*Process Data*	**Process Data**	
2	1	*This portion is send*		
4	2	*every cycle*		
6	3			
8	4	*The max length of it*		
10	5	**is 20 bytes - PCP**		
12	6			
14	7	*Allocate here time*		
16	8	*critical PF data*		
18	9		**MAX 20 bytes - PCP**	
20	10		**Parameter Data**	PCP
22	11		*Index I = 0x00*	PCP
...	...	*This portion is divided*	*32 Byte*	PCP
...	...	*in PCP length slices and delivered in*		PCP
...	...			PCP
50	25	*n = Parameter Data Length / PCP Length*		PCP
52	26	*bus cycles*	**Parameter Data**	PCP
...	...		*Index I = 0x01*	PCP
...	...	*To Read/Write each*	*32 Byte*	PCP
...	...	**max 32 byte segment**		PCP
...	...	*use PCP services*		PCP
82	41	**0x6000 + I for R/W To**		PCP
64	32	**0x6040 + I for RO From**	**Parameter Data (last**	PCP
...	...		*Index I = n (0x06 max)*	PCP
...	...	*The last segment can be shorter...*	*Max 32 Byte*	PCP
				PCP
198	99	**Max: 200-Process Data**		PCP

(i) **Due to Interbus standard specification it is necessary to cycle power on PF to validate changes in Fieldbus configuration.**

Hardware
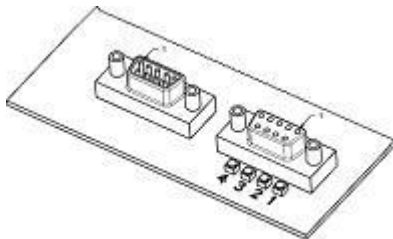
LED 1 = RBDA (Remote Bus Disable)

LED 2 = TR (Transmit/Receive)

LED 3 = CC (Cable Check)

LED 4 = BA (Bus Active)

BUS-IN (9-pin D-sub 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 D-sub 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 Power Focus InterBus module will terminate the outgoing bus.

Functionality of the indicator LED's

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 the local Atlas Copco service representative to get a copy of the Icon file for Power Focus. This file can be used to have a Power Focus Icon in the PLC configuration SW. File name: **pf3intb.ico**

15.8.4 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 the local ModBusPlus User Group in the first instance.

A contact address list is available from the ModBusPlus Internet site http://www.modicon.com.

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 D-sub.
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.
ASIC's 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 does not initiate any point-to-point communication to other nodes, it only responds 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 source 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 - 200 bytes (The string length is in Power Focus limited to 200 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 - 200 bytes (The string length is in Power Focus limited to 200 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
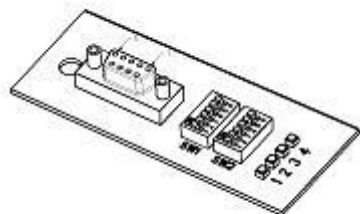
LED 1: Not used

LED 2: Error

LED 3: MBP Active

LED 4: MBP Init

Functionality of the indication LED's

The module is equipped with four colored LED's used for debugging purposes (LED 1 not used). The function of the LED's 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 D-sub

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.

15.8.5   Ethernet/IP

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. The technology 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 http://www.iaona-eu.com.

Hardware

The module is based on a high performance CPU operating at 66 MHz. It features 8MB RAM and 2 MB FLASH. Both EthernetIP and ModbusTCP use the same interface card from HMS.
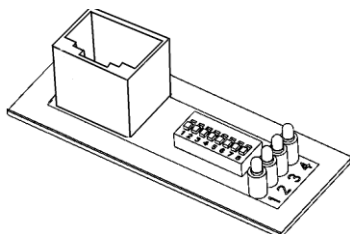
LED #
1. Link
2. Module Status
3. Network Status
4. Activity

> **All dipswitches have to be set in OFF position and parameter F120 (Set node address from) must be set to Hardware if DHCP server is to be used.**

.

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 fieldbus modules that is based on the CIP, i.e., DeviceNet and ControlNet, the same vendor specific objects are implemented, together with new objects for servicing and monitoring the IT functionality.

Ethernet/IP 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*	This address is based on words.
	0000h + I (I = 0, 1, …) From PF* 4000h + I (I = 0, 1, …) To PF*	This address is based on bits
EtherNetIP Assembly Instance 0	Input (Producing Instance): 100 (64h), Output (Consuming Instance): 150 (96h), Configuration Data Instance /size = 0/: 197 (C5h), Input-Only (Heartbeat): 198 (C6h), Listen-Only (Heartbeat): 199 (C7h)	This is used to configure and transfer data to/from EtherNetIP module For Anybus FW >1.32 (For FW > 2.00 and TTPF SW > 10.8 when Assembly instance parameter F157 is 0)
EtherNetIP Assembly Instance 1	Input (Producing Instance): 100 (64h), Output (Consuming Instance): 150 (96h), Configuration Data Instance /size = 0/: 5 (05h), Input-Only (Heartbeat): 3 (03h), Listen-Only (Heartbeat): 4 (04h)	This is used to configure and transfer data to/from EtherNetIP module For Anybus FW <1.33 (For FW > 2.00 and TTPF SW > 10.8 when Assembly instance parameter F157 is 1)
Data to PF total length	0 - 200 bytes*	Must be the same in PF and PLC.
Data from PF total length	0 - 200 bytes*	Must be the same in PF and PLC.

* The data length is in PF limited to 200 bytes. ModBus/TCP and Ethernet/IP standard allows 1024 bytes data

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 LED's.

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

15.8.6   Modbus/TCP

Modbus TCP is developed by Modicon, Inc. For more information visit http://www.modbus.org.

Modbus/TCP uses the same hardware as Ethernet/IP. See section Ethernet/IP. The status indicators for Modbus/TCP are listed in the table below.

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	Flashing green 1 Hz	Connected	IP address is not set using the configuration switch
	Flashing red 1 Hz	Major fault	Invalid MAC address
	Flashing red 2 Hz	Major fault	Failed to load Ethernet configuration from Flash memory.
	Flashing red 4 Hz	Major fault	Fatal internal error.
	Steady red	Minor fault	Duplicate IP address detected

LED	State	Summary	Description
LED 3 - Network Status	Flashing green	Number of connections	The number of flashes on this LED indicates the number of established Modbus/TCP connections to the module.
LED 4 - Activity	Flashing green	Package received	Each time a packet is received or transmitted.

15.8.7 ControlNet

ControlNet is based on the Control and Information Protocol (CIP), which is also the application layer for DeviceNet and Ethernet/IP.

The ControlNet module is classified as a ControlNet adapter, i.e., it cannot originate connections on its own, but a scanner node can open a connection towards it. The module is implemented according to the ControlNet International specification for a Communication adapter.

ControlNet module is accessible by other nodes via UCMM (unscheduled) messages. Unscheduled messages are usually used for information such as configuration data.

The module is also equipped with a NAP (Network Access Port) for temporary connection of configuration tools, e.g., a PC card.

Features

The ControlNet module includes the following features:

- ControlNet adapter
- Network access port (NAP)
- Media redundancy support
- Conforms to communication adapter, profile 12
- MAC ID can be set via onboard switches or application interface
- Up to 450 bytes of I/O data in each direction
- UCMM Client/Server support
- Galvanically isolated bus electronics
- UL & CUL conformance

EDS file

Each device in a ControlNet network is associated with an EDS file, containing information needed for network configuration. The network configuration tool uses this file during network configuration.

Network Access Port (NAP)

The NAP (Network Access Port) provides temporary access to the ControlNet network for diagnostic and configuration. (RJ45)

ControlNet channels A & B

The module is equipped with two BNC contacts for connection to ControlNet. If redundant operation is desired both connectors are used, otherwise connector A or B is used. (BNC)

Mac ID switches (x10 and x1)

On a ControlNet network, each node must be assigned its own unique node address. The module features on board switches for Mac ID configuration, providing an address range of 1 – 99.

In the example below the Mac ID is set to 42 (4 x 10 + 2 x 1).
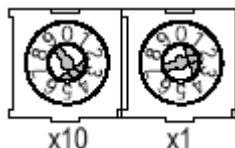
Indicators

ControlNet status indicators indicate run time status and errors to the user.

LED	Indication	State	Description
1	Module status	Green	Connection in run state
		Green Flashing	Connecting connection idle
		Red	Major fault
		Red Flashing	Minor fault
2 and 3	Channel A and Channel B	Off	Module not initialized
		Red	Major fault
		Alternating red/green	Self test
		Red Flashing	Node configuration error, duplicate Mac ID etc.
2 or 3	Channel A or Channel B	Off	Channel disabled
		Green	Normal operation of channel
		Green Flashing	Temporary error (node will self correct) or not configured
		Red Flashing	No other nodes, or media fault
		Red & Green Flashing	Network configuration error
4	Module owned	Off	No connection has been opened
		Green	A connection has been opened towards the module

15.8.8   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.
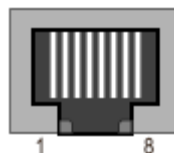
15.8.9 FL-Net

FL-Net is a control network, primarily used for interconnection of devices like PLCs, Robot controllers, and Numerical Control Devices. FL-NET has both cyclic data and message data. There is no master on a FL-Net network; a token communication method is used for data transmission.

The FL-Net network is based on IP/UDP broadcast messages.

The module is classified as a "Class 1" FL-Net node as it can both send and receive cyclic data.

PF only transfer cyclic data and only use area 2.

Cyclic transfer

FL-Net has two areas for cyclic data, Area 1 and Area 2. These two memory areas are shared by all nodes on the network. And every node configures the part of the area it updates.

- Area 1 is 512 words.
- Area 2 is 8192 words.

The cyclic data is mapped to the module I/O area, which maximizes the size of I/O data to 512 bytes in each direction-for the module.

The time from reception of a token until transmission should not exceed 1.56 ms.

Indicators

Led	Indication	state	description
1	Ethernet Link	Green	Module is connected to Ethernet
		Off	No link
2	Error	Red	Indicates that the unit must be replaced (For example, invalid MAC ID) or Anybus watchdog in was not updated.
		Red, flash	Parameter error
		Off	Normal state
3	Activity (COM)	Green	No activity
		Off	Flash green each time a packet is received or transferred
4	FL-Net Link	Green	Participates in FL-Net
		Off	No participation

Connector

Connector RJ45 standard Ethernet connector is used.
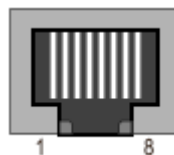
Address dipswitch

A dipswitch with 8 positions is used to configure the low byte of the IP address.

IP configuration

The IP configuration can be set with DIP switch or mailbox message. Subnet mask is always 255.255.255.0, gateway is not used.

The different IP configuration options (see table below).

Method	Description	Restriction
Software setting	Configure via ToolsTalk PF	Software setting overrides the DIP switch.
DIP switch	Use 192.168.250.X where X is set with the DIP switch. See RFC 1918. **This is the preferred method for FL-NET.**	Must be set before power on.

15.8.10 CC-Link

CC-Link is an open-architecture network managed by the CC-Link Partner Association (CLPA). For more information visit http://www.cc-link.org

In brief:
- Baud rate can be selected among 156k, 625k, 2.5M, 5M and 10 M.
- Based on RS485 with networks up to 1.2 km, or extended to 13.2 km with repeaters
- 64 stations per network
- Refresh time of <3.9mSecs for 65 I/O stations (distance dependent)
- Master/Slave network with Floating Masters and hot swap of stations

Hardware

- Transmission media: shielded 3 line copper wire
- Topology: trunk line, multi drop
- FieldBus connectors: M12, CLPA, D-Sub9
- PF connector: 5 pin DeviceNet/CANopen Open Style Connector
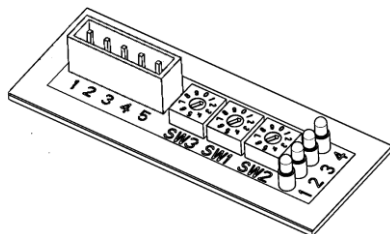
LED #
1. Run
2. Error
3. Receive Data
4. Send Data

Connectors

The PF standard connector is a 5 pin pluggable screw connector (same as for DeviceNet).

Pin	Color	Code	Signal
1	Blue	DA	Communication line A
2	White	DB	Communication line B
3	Yellow	DG	Digital GND
4		SLD	Shield
5		FG/PE	Frame Ground
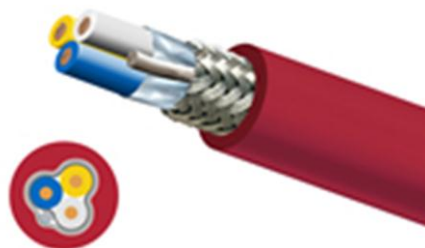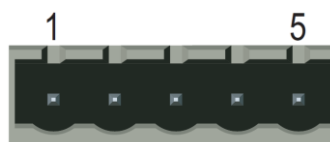
Bus termination

When repeater or CC-Link dedicated, high performance 130 Ohm cables are not used connect terminal resistor (110 Ohm 5% 0,5W) between DA and DB on each edge of the trunk line (CC-Link dedicated 110 Ohm impedance cables should be used).
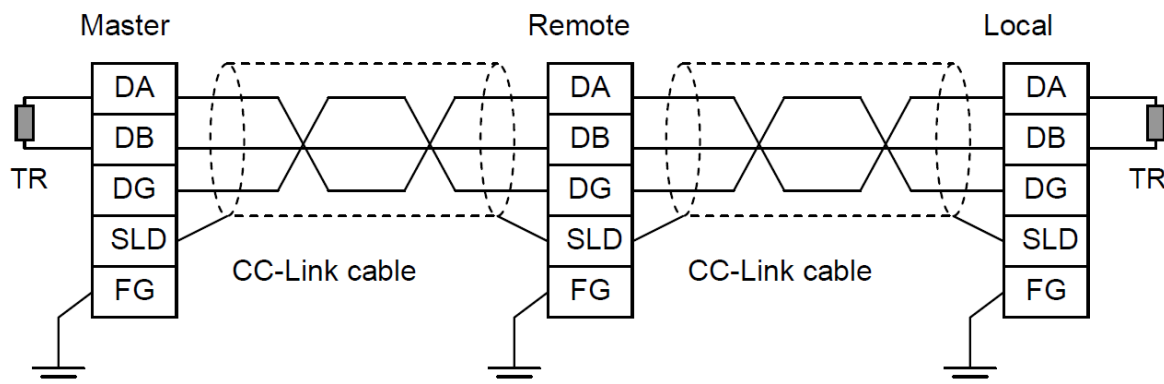
Fig. 4.5 Connection of terminal resistor

Functionality of the indication LED's

The module is equipped with four bicolour LED's used for debugging purposes. The function of the LED's is described in the table and figure below.

LED	Indication	State	Description
1	Run	Off	Network non-participating or time out status
		Green	Normal operation
2	Error	Off	Normal operation
		Red	CRC error, wrong station number or wrong baud rate
3	RD	Off	No data reception
		Green	Data being received
4	SD	Off	No data transmission
		Green	Data being transmitted

Station Number

Station Number is set with the two rotary switches on the FieldBus module; this enables address settings from 1-64 in decimal form (see switches on the top drawing):

Switch 1 (SW1) digit x10
Switch 2 (SW2) digit x1
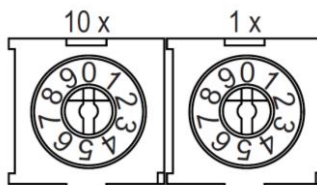
Example:

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 TT the switches must be set to 99.

> The node address can not be changed when the power is switched on.
>
> **The SW1 and SW2 are 2 most right placed!**

Baud rate

The baud rate on a CC-Link network is set during configuration of the master and only one baud rate is possible in a CC-Link installation.

Baud Rate Switch (SW3).This rotary switch is used to specify the baudrate of the module. This can also be specified by software (TTPF), in this case the switch must be set to '9'.

> **The SW3 is placed to the left of SW1 and SW2!**

Pos	Bauds rates supported by PF
0	156 kbit/s
1	625 kbit/s
2	2.5 Mbit/s
3	5 Mbit/s
4	10 Mbit/s
9	SW set

CC-Link Configuration

Set node address and baud rate from

If set from "Software" backplane switches SW1 to SW3 should be set all to 9 (9-9-9). When "Hardware" is selected refer to information in APPENDIX B about configuring switches.

Note: PF reboot is needed after change!

Baud Rate

Baud rate can be selected among 156k, 625k, 2.5M, 5M and 10 M.

Station Number

Station Number can be set from 1 to 64.

CC-Link Version

In CC-Link data is transferred via virtual memory on the network. Each device has deterministic area in this memory. The minimum area is the 1 station area. One device **occupy up to 4 station memory area** for own slave communication. Following diagram shows typical data one station long:

Slave Transmission (Maximum data without Transient Message)

PF, classified as Remote Device Station can use both RY (bit data) and RWw (word data) for transfer of To/From PF Data.

Max data size in CC-Link version 1 is 48 bytes, which include 128 bit points (16 bytes) and 16 words (32 bytes) – when taking 4 station memory area.

Max data size in CC-Link version 2 is 368 bytes, which include 896 bit points and 128 words. But PF limited the max data length to 200 for all the Fieldbus types. The length is depending not only on number station areas taken but also on number of extension cycles. Max occupied station is 4 and extension cycles are 8.

Data representation with CC-Link version 1

The module will use the data length defined in TTPF F102 and F103 to determine the number of occupied stations, actual IO data size used on CC-Link as follow:

Data length (in bytes)	Occupied stations	Bit data (in bytes)	Word data (in bytes)	Description
$0 < $ length $ \leq 4$	1	s	0	No word data
$4 < $ length $ \leq 12$		4	length - 4	Word data range 1-8 bytes

12 < length ≤ 24	2	8	length - 8	Word data range 5-16 bytes
24 < length ≤ 36	3	12	length - 12	Word data range 13-24 bytes
36 < length ≤ 48	4	16	length - 16	Word data range 21-32 bytes
48 < length ≤ 200		16	32	Data after 48 bytes not accessible from the bus

Data representation with CC-Link version 2

When using version 2, the module can optionally use an extended number of bus cycles to exchange larger data size. Note that this feature requires a CC-Link v.2 capable master. The relation between the occupied stations and the number of extension cycles are defined in the following table. The PF supported combinations are marked with yellow color.

Occupied stations	1 Extension Cycles			2 Extension Cycles			4 Extension Cycles			8 Extension Cycles		
	Points	Bytes	Data length bytes	Points	Bytes	Data length bytes	Points	Bytes	Data length bytes	Points	Bytes	Data length bytes
1	32 bits	4	12	32 bits	4	20	64 bits	8	40	128 bits	16	80
	4 words	8		8 words	16		16 words	32		32 words	64	
2	64 bits	8	24	96 bits	12	44	192 bits	24	88	384 bits	48	176
	8 words	16		16 words	32		32 words	64		64 words	128	
3	96 bits	12	36	160 bits	20	68	320 bits	40	136	640 bits	80	272
	12 words	24		24 words	48		48 words	96		96 words	192	
4	128 bits	16	48	224 bits	28	92	448 bits	56	184	896 bits	112	368
	16 words	32		32 words	64		64 words	128		128 words	256	

When running version 2, the data length defined in TTPF for F102 or F103 must match the corresponding data sizes in the table above, otherwise, the module will indicate an error. In this position data length is selected from drop-down list.

16 Logic Configurator

The **Logic Configurator** is a tool to combine and configure process signals coming from the screw tightening process or from an external device. It is available in the **Power Focus 4000** hardware only and is programmed over the ToolsTalk PF interface.

The Logic Configurator consists of up to 8 different so called "Configurator sheets", each denoted with a number (1 to 8, automatically chosen) and a name (25 positions, editable).

Each Configurator sheet consists of;

▪ inputs, i.e., selectable events from the Relay status array and the DigIn status arrays

▪ instruction list, i.e., logic gate information

▪ output configuration

Every Logic Configurator circuit instruction list is evaluated every 100 ms which corresponds to a tick or every time an input status changed.

> **If one digital input is configured several times, on two IO expanders for instance, the DigIn function status is the OR result of both digital inputs.**
>
> **The logical events used for input to the Logic Configurator are of the type tracking or pulse. The pulse type signals are reset after one tick.**
> **Example 1: OK relay is pulsed after an OK tightening and goes low after 100 ms.**
> **Example 2: Reset batch input is pulsed when activated and goes low after 100 ms.**

16.1   Process description (an example)
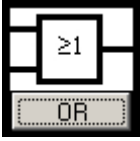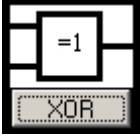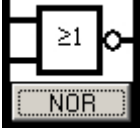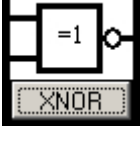
When a work piece is positioned, a proximity switch in the fixture detects its presence. The work piece is held in position by an air cylinder. The position **work piece fixtured** is detected by a second proximity switch.

When the two proximity switches **work piece in place** and **work piece fixtured** are active, the tightening operation can begin. After finalizing the tightening operation, a green lamp lights and stays lit to indicate the OK result to the operator.
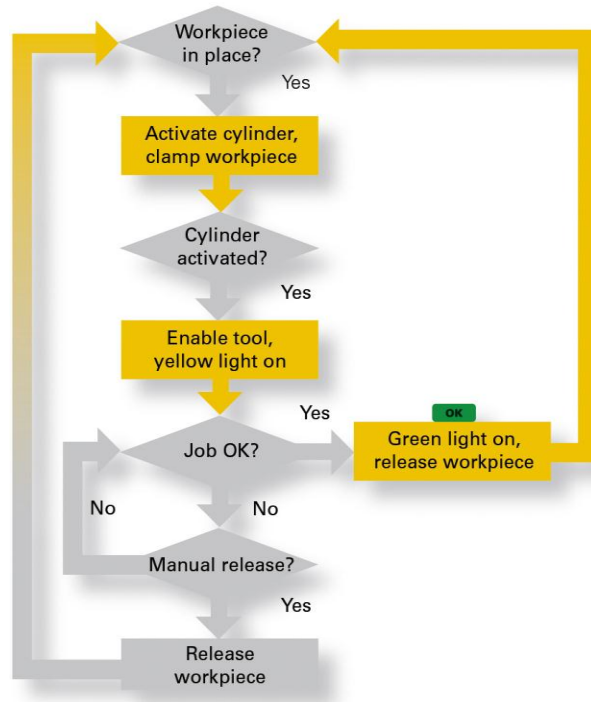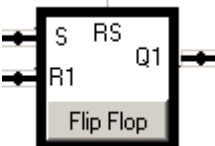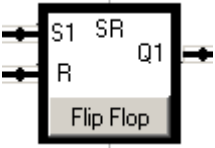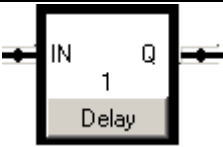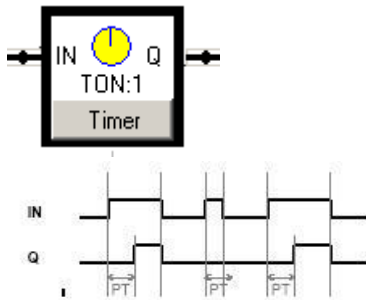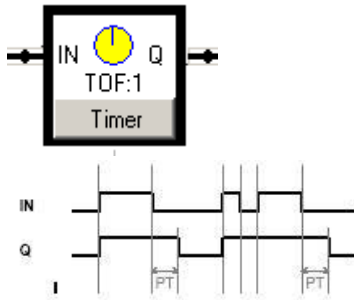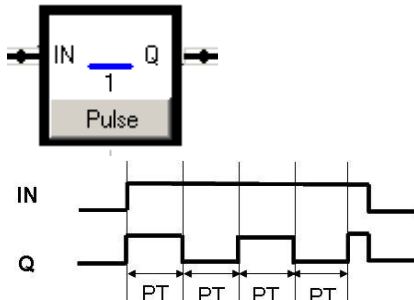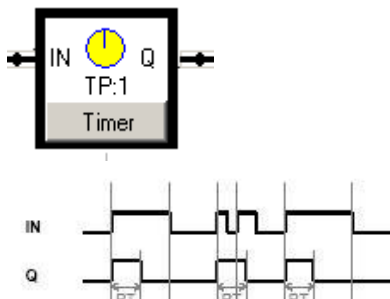
16.2 Logic operators and function blocks
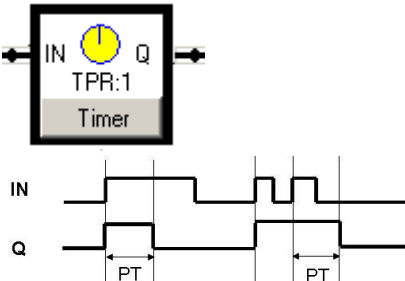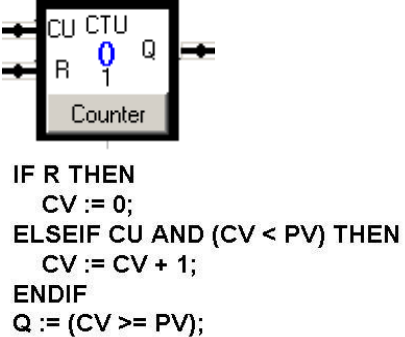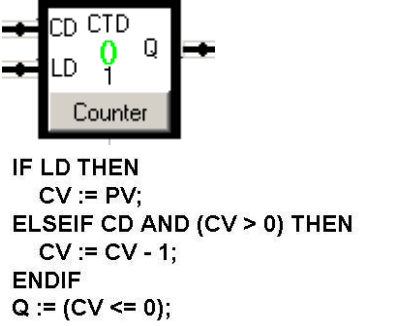
16.2.1 Logic gates

Symbol	Description	Input		Output
& AND	The output signal is HIGH only if both inputs to the gate are HIGH. If neither or only one of the inputs is HIGH, the output is LOW.	**A**	**B**	**A AND B**
		0	0	0
		0	1	0
		1	0	0
		1	1	1
≥1 OR	The output signal is HIGH if one or both inputs to the gate are HIGH. If neither of the input is HIGH, the output signal is LOW.	**A**	**B**	**A OR B**
		0	0	0
		0	1	1
		1	0	1
		1	1	1
=1 XOR	The output signal is HIGH if one, and only one of the inputs to the gate is HIGH. If both inputs are LOW or both are HIGH, the outputs signal is LOW.	**A**	**B**	**A XOR B**
		0	0	0
		0	1	1
		1	0	1
		1	1	0
& NAND	The outputs signal is LOW only if both the inputs to the gate are HIGH. If one or both inputs are LOW, the output signal is HIGH.	**A**	**B**	**A NAND B**
		0	0	1
		0	1	1
		1	0	1
		1	1	0
≥1 NOR	The output signal is HIGH output results if both the inputs to the gate are LOW. If one or both input is HIGH, the outputs signal is LOW	**A**	**B**	**A NOR B**
		0	0	1
		0	1	0
		1	0	0
		1	1	0
=1 XNOR	The outputs signal is HIGH if both inputs to the gate are the same. If one but not both inputs are HIGH, the outputs signal is LOW.	**A**	**B**	**A XNOR B**
		0	0	1
		0	1	0
		1	0	0
		1	1	1

16.2.2 Function blocks

Symbol	Name	Description
S RS Q1 R1 Flip Flop	Flip Flop Reset Dominant (Flip Flop RS)	The Flip Flop gate is also called latch or bi-stable relay and acts like a memory. R and S stand for **Reset** and **Set**. The stored bit is present on the output marked Q1. If S receives a positive flank (transition low to high) while R1 is low, then the Q1 output goes high, and stays high when S returns low. If R1 goes high while S is low, then the Q1 output goes low, and stays low when R1 goes inactive. If S goes high while R1 is high, then the output Q1 remains low since priority is given to the R1 input. **S R1 Q1** 0 0 Keep state (memory) 1 0 1 0 1 0 1 1 0 (Reset dominant)
S1 SR Q1 R Flip Flop	Flip Flop Set Dominant (Flip Flop SR)	If S1 receives a positive flank while R is low, then the Q1 output goes high, and stays high when S1 returns low. If R goes high while S1 is low, then the Q1 output goes low, and stays low when R returns low. If R goes high while S1 also is high, then the Q1 output remains high since priority is given to the S1 input. **S1 R Q1** 0 0 Keep state (memory) 1 0 1 0 1 0 1 1 1 (Set dominant)
IN Q 1 Delay	Delay	The Delay is implemented as a shift register. It has a preset timer (delay time) multiple with the PLC tick. PT stands for Preset Time and is configurable.

Symbol	Name	Description
IN ⊙ Q TON:1 Timer (IN/Q waveform)	Timer ON (TON)	The output Q is triggered only if the input IN is held high during at least Present Time (PT). The output Q goes low when the input IN goes low.
IN ⊙ Q TOF:1 Timer (IN/Q waveform)	Timer OFF (TOF)	Q is triggered every time the input IN receives a positive flank The output is high during Present Time (PT) after the input IN has gone low.
IN — Q 1 Pulse (IN/Q waveform)	Pulse	Present Time (PT) corresponds to the pulse ON and OFF time. The pulse frequency is equal to f = 1 / (2 * PT) Hz The output Q is active while the input IN is high.
IN ⊙ Q TP:1 Timer (IN/Q waveform)	Timer Pulse (TP)	Q is triggered for Present Time (PT) after a positive flank. Note that if the new input up flanked takes place while Q is high it will be ignored.

Symbol	Name	Description
IN Q TPR:1 Timer (waveform: IN, Q, PT, PT)	Timer Pulse Reset (TPR)	Q is triggered for Present Time (PT) after a positive flank. Note that if a new positive flank is received while Q is high, the "on" timer will be reset and the output will be held high for a new PT time.

CU CTU 0 Q R 1 Counter `IF R THEN`
`    CV := 0;`
`ELSEIF CU AND (CV < PV) THEN`
`    CV := CV + 1;`
`ENDIF`
`Q := (CV >= PV);`
	Counter Up (CTU)	The CTU has one output Q. PV is the preset value of the counter i.e. the counter value to reach for the output to be forced high. The counter up has a current counter value CV. When CV is equal to PV the output Q goes high. CV is incremented after every positive flank of the CU input Note that if CV = PV, then CV is not incremented. CV is reset after a positive flank on the input R. The output Q is kept high while CV = PV and until R receives a positive flank

CD CTD 0 Q LD 1 Counter `IF LD THEN`
`    CV := PV;`
`ELSEIF CD AND (CV > 0) THEN`
`    CV := CV - 1;`
`ENDIF`
`Q := (CV <= 0);`
	Counter Down (CTD)	The CTD has one output Q. PV is the preset value of the counter i.e. the start value of the counter. The counter down has a current counter value CV. When CV is equal to zero the output Q goes high. CV is decremented after every positive flank of the CD input Note that if CV = 0, CV is not decremented. CV is reloaded (CV is set equal to PV) after a positive flank on the input LD. The output Q is kept high while CV = 0 and until LD receives a positive flank.

16.3   Logic Configurator setup

The first step to program the Logic Configurator is to open a Configurator sheet.

Right-click **Logic Configurator** in the PF Map and select **Create new Logic Configurator**.
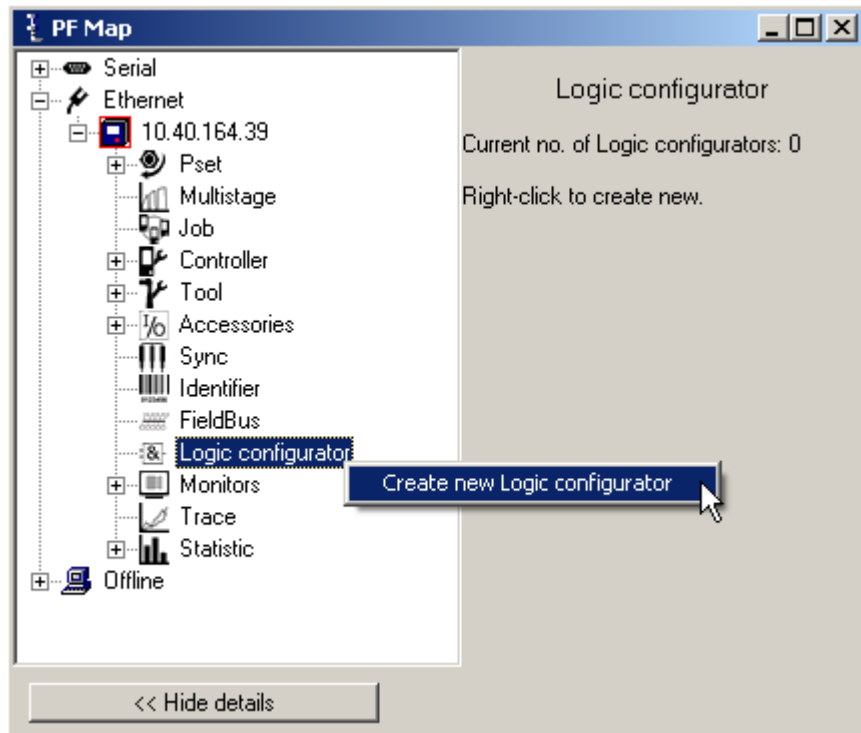
ToolsTalk proposes an ID no. for the new Configurator sheet, but this can also be chosen by the user.

Select a name that relates to the function the Configurator sheet should have.

Click **OK** to confirm.

A warning appears.

Click **OK**.
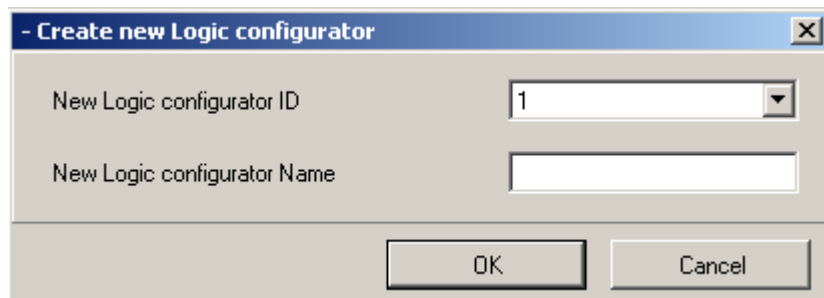
A new window appears where the next step is to define the number of inputs for the Configurator sheet.
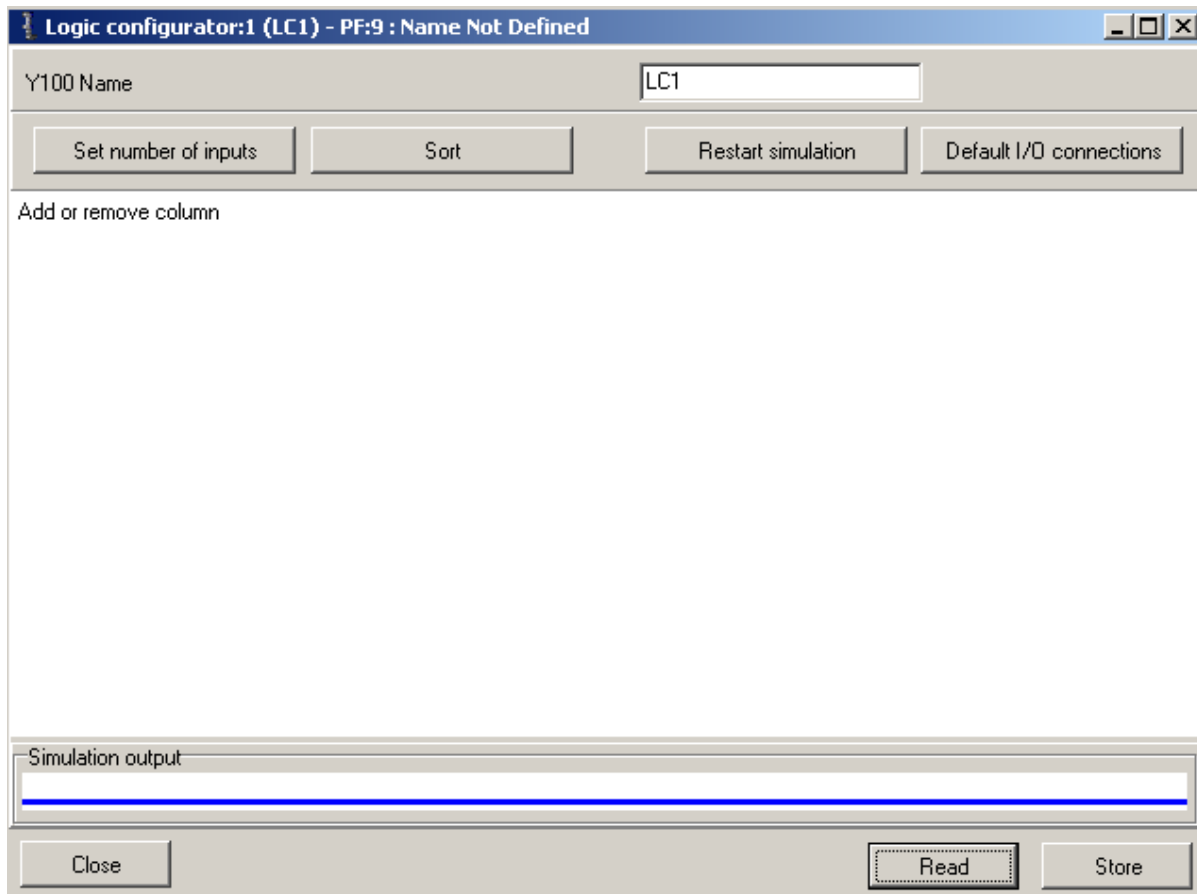
Click the **Set number of inputs** key.
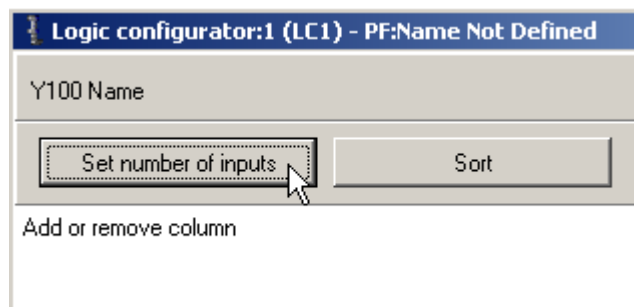
Move the slide bar (or type in the number directly) to set an input count.

Click **OK**. A new window appears that shows the layout of the Configurator sheet with the selected number of inputs.

Click **OK** again to reach the setup window.

Now it is time to configure the inputs, outputs and logical gates.
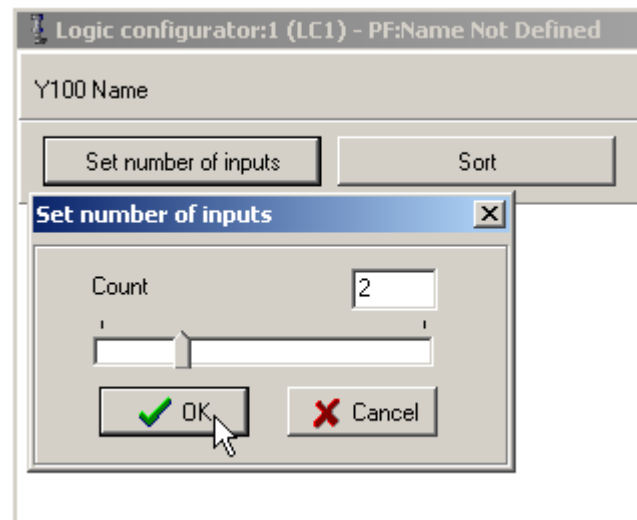
Let's start with the inputs. Click on the **Input** key to select the input event. By selecting Digital input from the first drop-down menu, the events tied to the inputs of the Power Focus can be reached.

If choosing Digital outputs, the list of events will contain the signals generated in the Power Focus.
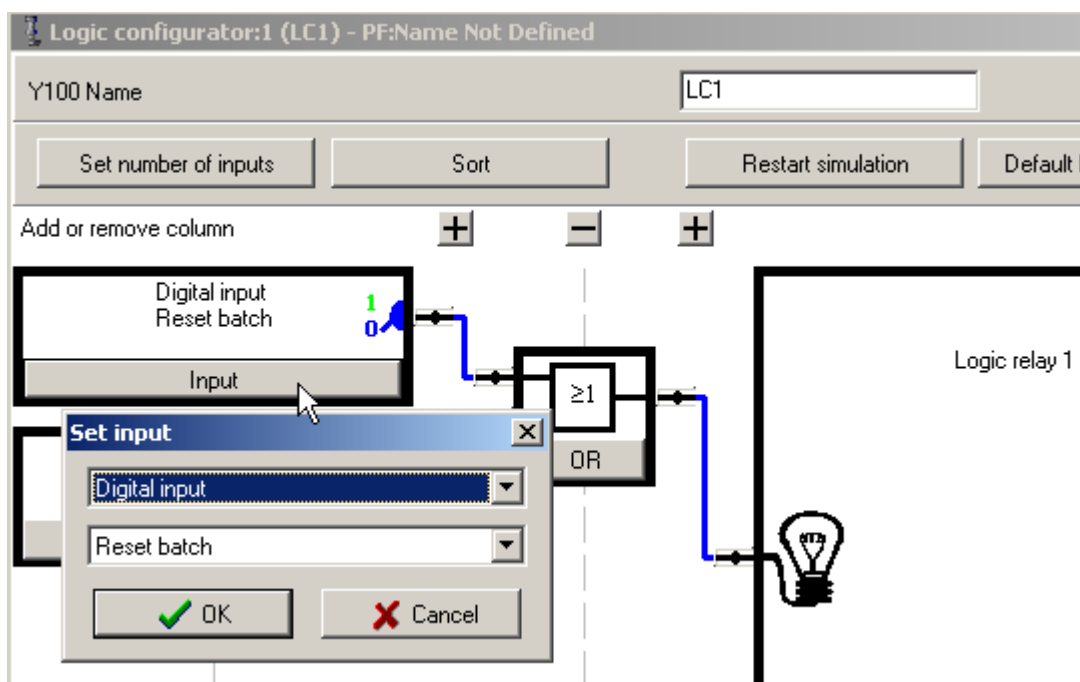
Next, let's define what the output signal of the Configurator sheet should be used for.

If the output signal should be used as input to another Configurator sheet, or be put out directly on a physical Relay, no action is required in this window. The output signal from the Configurator sheet is automatically labeled "Logic Relay #", where "#" is the number of the Configurator sheet. The signal "Logic Relay #" is available in the drop-down menu of e.g. the Relay setup window under "Accessories" in the PF Map.

If the output of the Configurator sheet should be used for other purposes, click on the **Output**. Then select up to four events under **Trigger digital inputs**, or one of the three quick choices (**Select Job**, **Select Pset** and **Use text**).

Click **OK** when finished.
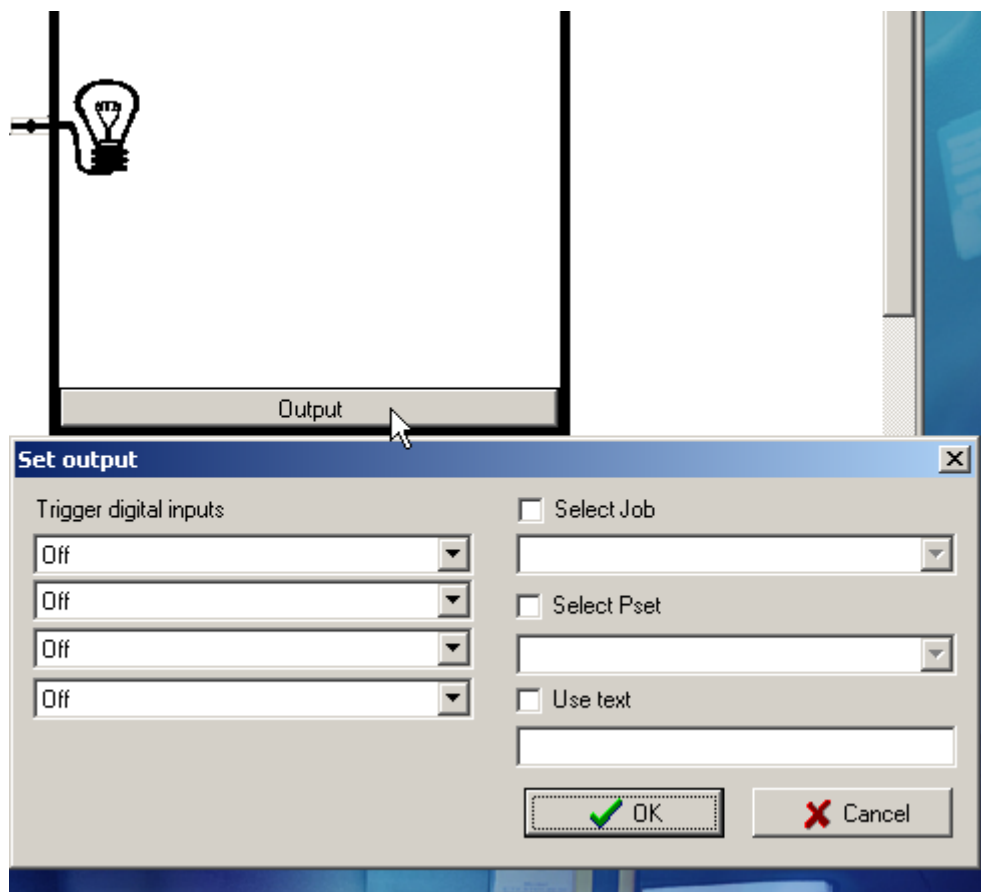
Now the logical grid remains to be set up.

By clicking on the keys in the gate symbol, a drop-down menu showing the logic functions appear.

> ⓘ **See table in section *Logic gates* for a description of the available gates (AND, OR, XOR, NAND, NOR, XNOR).**
>
> **See table in section *Function blocks* for a description of the available functions (Pass, NOT, Timer, Delay, Flip Flop, Counter).**

Select the gate and where applicable, the timer or counter value.

If the depth of the grid (right-to-left) needs to be increased for your functionality, click on the **Plus** icon to insert a new level. To reduce the depth of the grid, click the corresponding **Minus** sign.
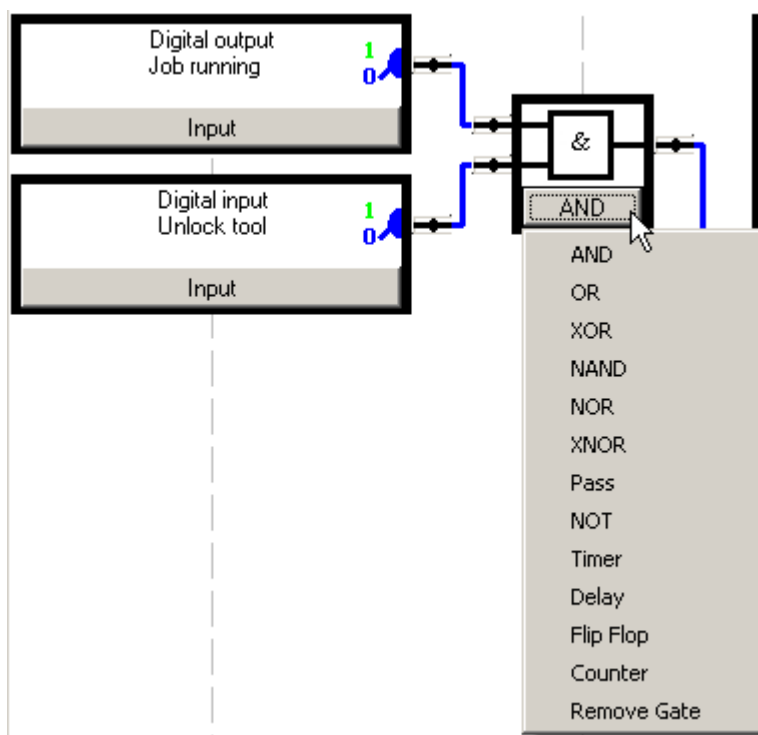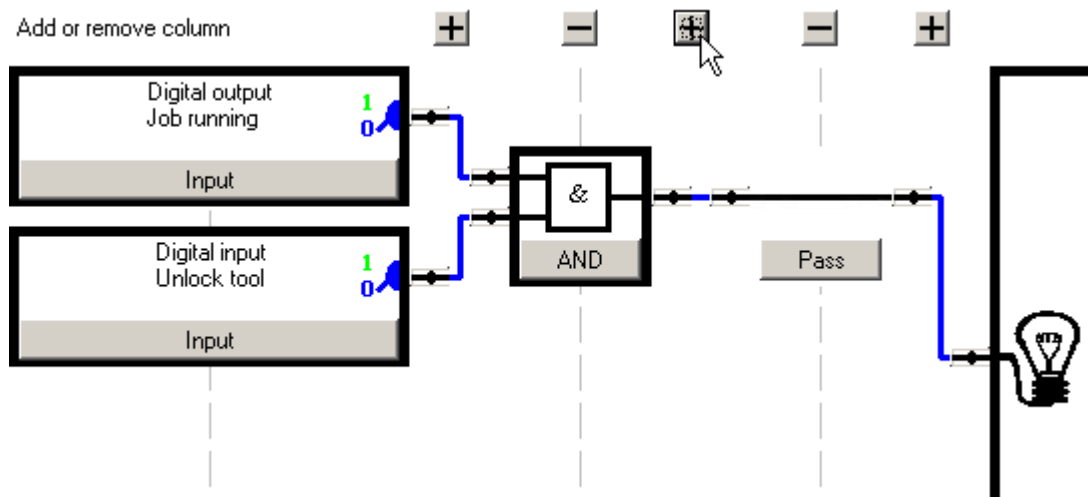
16.3.1 Simulation

The Logic Configurator features an off-line simulator that helps verifying the logical grid. The line at the lower part of the window is blue and low as long as the input settings and logic gates result in a LOW output signal. When the inputs and the grid result in a HIGH output signal, the line turns green and alters to the high position. The transitions up and down of the simulator will shift to the right in the window due to the time factor.

Correspondingly, the colors of the connections in the logical grid changes color – blue when inactive and green when active.

Manipulate the simulator input signals by clicking on the switch symbol in the input blocks. One click will toggle the status of the signal between HIGH and LOW.

Click the Restart simulation key to clear (set zero) all signals.

Click **Store** to save all settings.
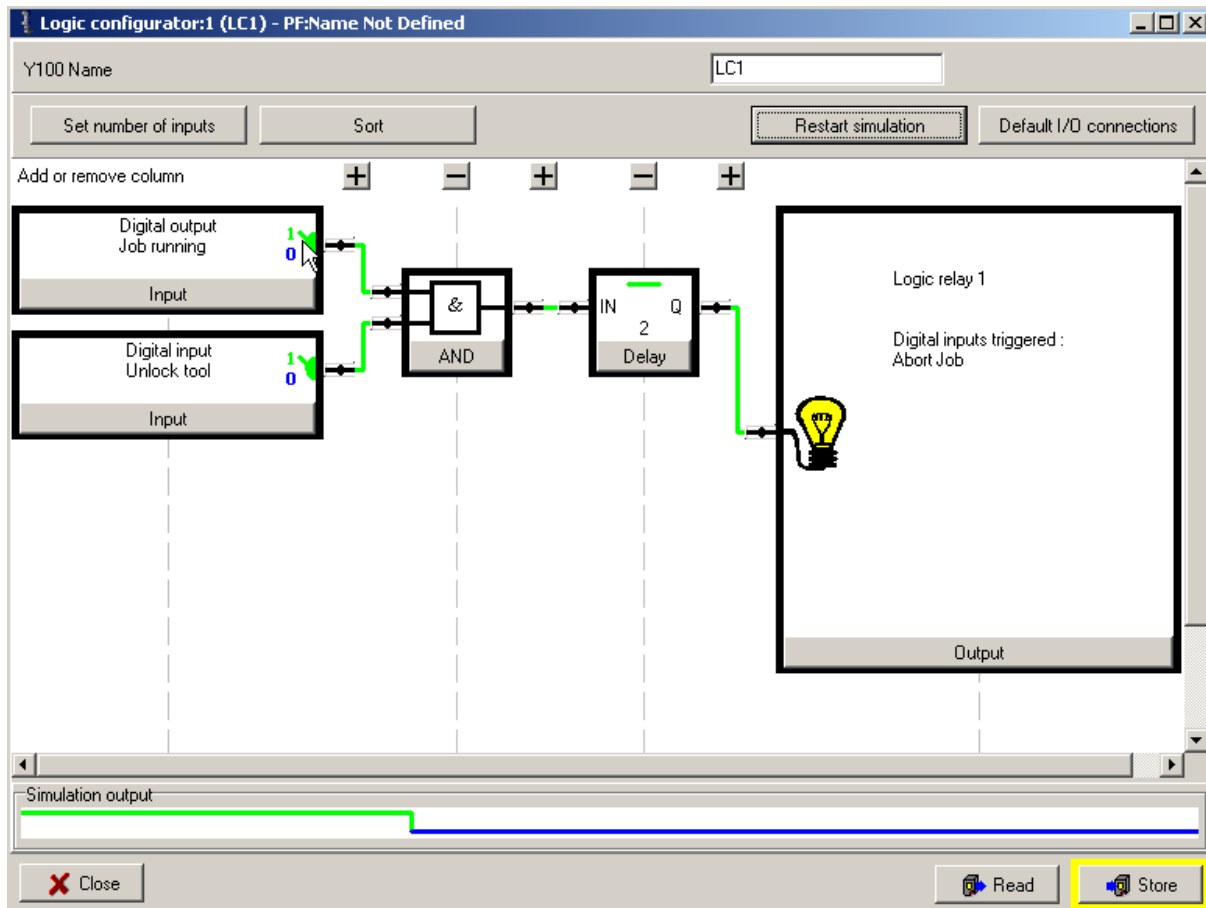
17 Monitors

ToolsTalk PF offers various monitors to present real-time information about the processes that Power Focus is involved in (see the table below).

Function	Description
Result monitor	Result monitor displays tightening results and statistics.
Job monitor	Job monitor displays Jobs and provides functionality for managing Jobs.
Operator monitor	Operator monitor displays tightening result information, also containing graphic representation such as charts and status indicators.
Picture monitor	Picture monitor displays a visual description of the tightening process, suitable for training purposes.
Get all results	Get all results displays result information stored in the Power Focus and export possibilities.
Trace	Trace displays detailed chart information from the latest tightening.

To open monitors:

- In the main Menu list, select **Window > Activate > Result**.
- In the **PF Map**, expand the **Monitors** branch and double-click on the monitors.
- On the Toolbar, use the drop menu to the right of the **Monitor icon**.

17.1   Result Monitor

In the PF Map **Monitor** branch, double-click on **Result Monitor**.
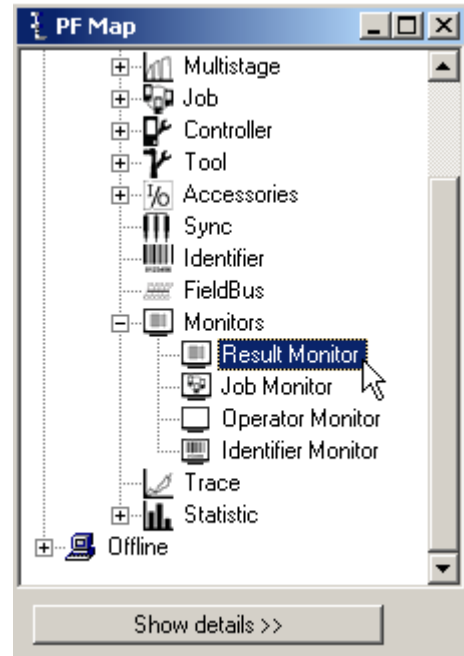
The **Result Monitor** presents the latest tightening results from the Power Focus and the used Pset.

The tightening result includes the Final torque, Final angle, Overall status, Torque chart and Angle chart. Select between Torque Chart, Angle Chart or Torque/Angle Plot to display results for a unique Pset.

It is possible to display several windows with different views, with a maximum limit of four.

Result Monitor - PF:PF1

P:1 (Pset 1) - Values

2003-09-01 14:08:42

Final torque	12,01 Nm
Final Angle	86 Deg
Batch	3 (3)
Rundown Angle	223 Deg
Over all status	

P:1 (Pset 1) - Torque Chart

2003-09-01 14:08:42

P:1 (Pset 1) - Angle Chart

2003-09-01 14:08:42

P:1 (Pset 1) - Tq/Ang Plot

2003-09-01 14:08:42

X Close   Clear   Remove   Add   ☑ Automatic Update   🖪 Read
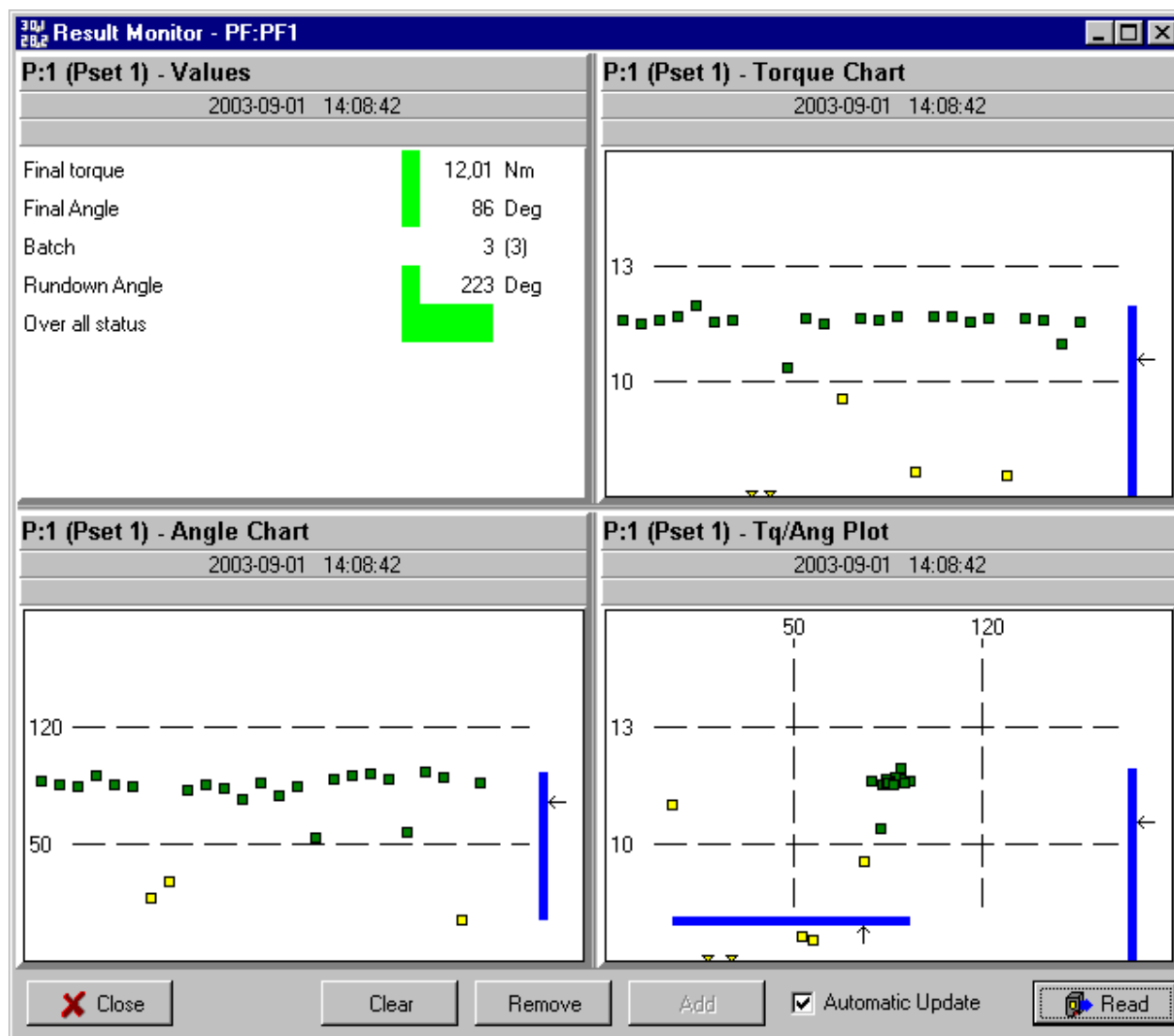
17.2   Job Monitor

In the PF Map **Monitor** branch, double-click on **Job Monitor**.

Job Monitor displays Jobs and provides functionality for managing Jobs.

For a function description (Restart Job, Decrement, Increment, Bypass, Abort Job and Job off) see section *Job*.
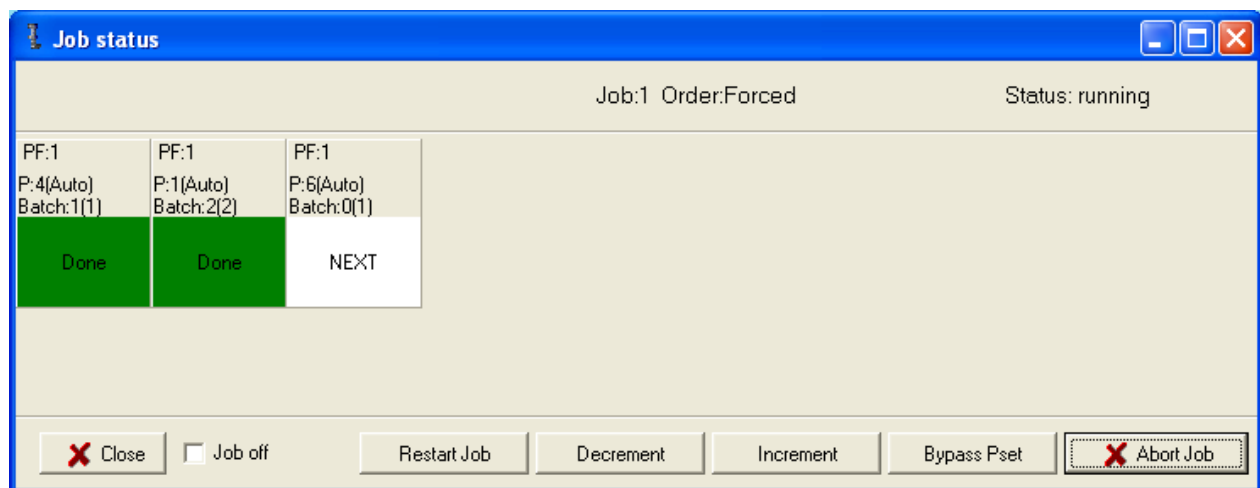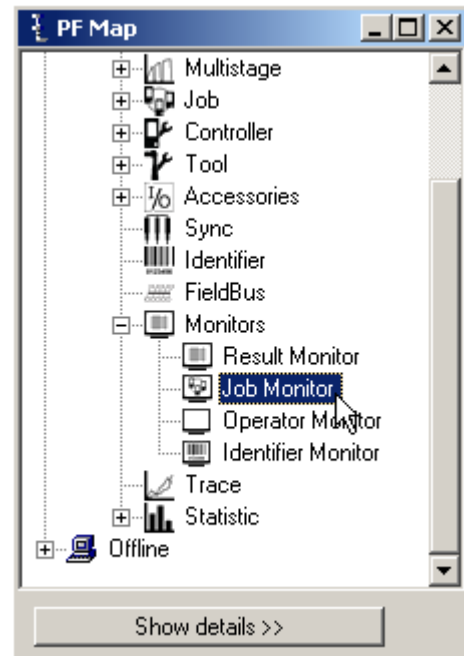
17.3   Operator Monitor

In the PF Map **Monitor** branch, double-click on **Operator Monitor**.
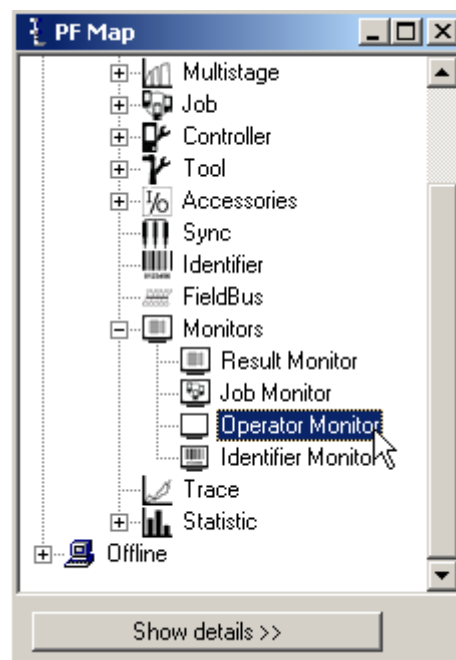
Select **Operator Monitor**.

Click **OK** and the monitor appears (see figure and table below).
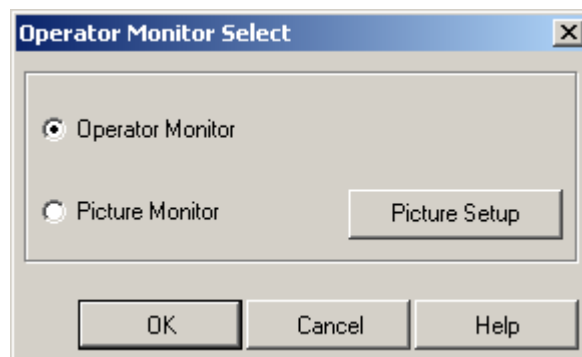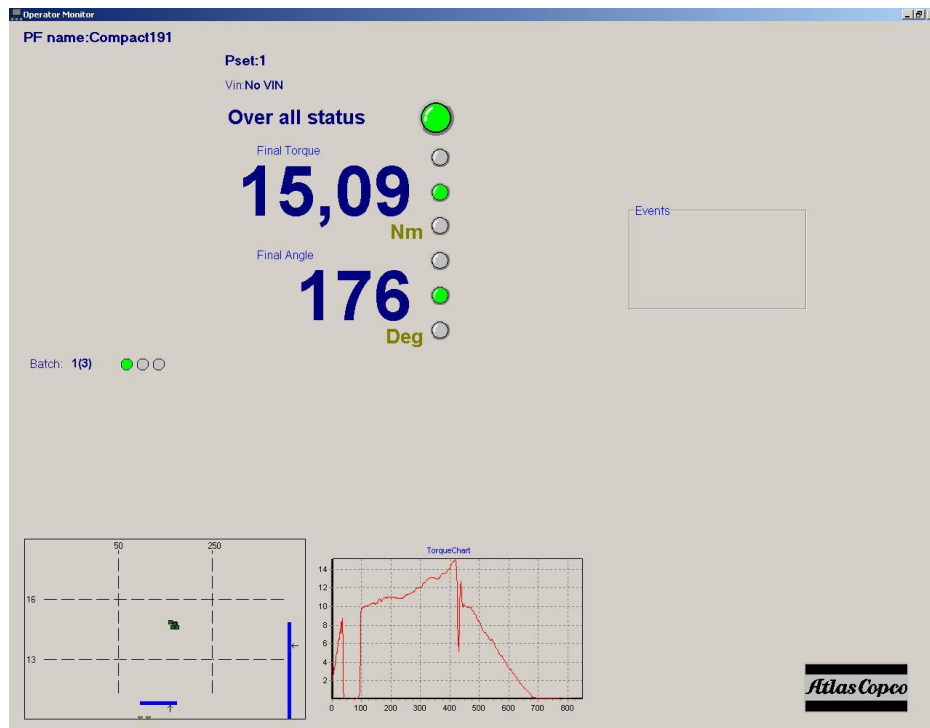
Part	Description
PF name	Name of PF
Pset	Pset used to perform the tightening
VIN	Vehicle Identification Number
Overall status	Indicator for the overall status of the tightening
Final torque	Final torque of the tightening
Final torque status	Status-indicator for final torque. (yellow-low/ green-OK/red-high)
Final angle	The final angle of the tightening
Final angle status	Status-indicator for the final angle. (yellow-low/ green-OK/red-high)
Batch	The order of the current operation in the batch
Batch order	The overall status of the respective operation in the batch
Plot chart	Displays the final torque and final angle, relative to the acceptance window
Torque chart	Displays the torque as a function of time
Events	Warnings and events

Right-click anywhere in the window to open the **Options menu**.
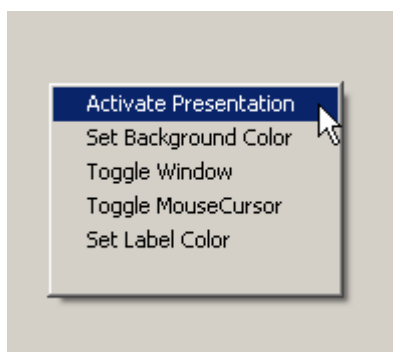
Option	Description
Activate presentation	User preferences for the content of the operator monitor
Set background Color	The option to set the background color of the operator monitor
Toggle window	Maximize or minimize the window
Toggle mouse cursor	The mouse is visible or invisible
Set label color	Option of setting the label color for the operator monitor

Choosing **Activate Presentation** the user customizes the information shown in the Operator Monitor by checking the boxes.

Click **OK**.
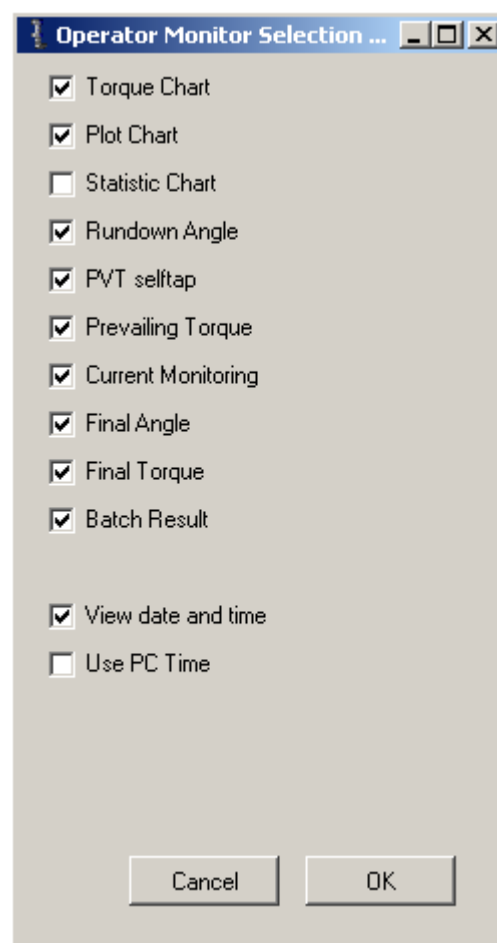
17.3.1 Picture Monitor

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

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

To edit Picture Monitoring, click **Picture Setup**.

Click **Set Picture** and select an image-file using the file selector window.

> ⓘ **The user has the possibility to associate an image-file with a Pset (available format; *.jpg", *.bmp", *.ico, *.emf and *.wmf). Select a Pset from the list.**
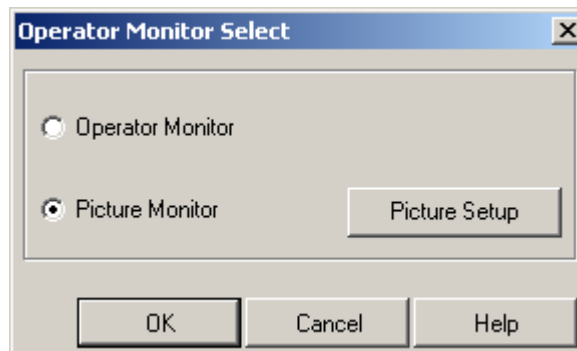
To import saved settings for the picture monitor, click **Read from file**.

To save the settings click on **Store to file**. A save as-window appears and the user can choose where to store the file containing the settings. When finished click **OK**.
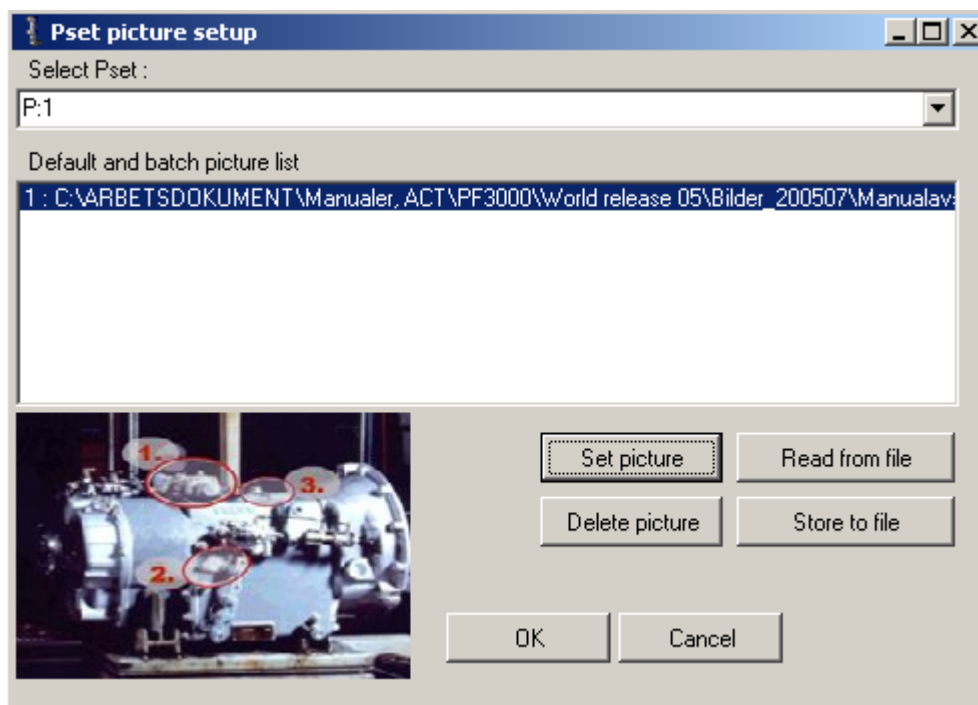
17.4   Identifier Monitor

In the PF Map **Monitor** branch, double-click on **Identifier Monitor**.

Identifier monitor displays the status (accepted/not accepted) of the identifier included in the **Work order** and **Optional** identifier (not included in work order). For more information, see section *Identifier*.

> ⓘ   **In the example below, all Identifier input sources are set to "Ethernet/serial".**
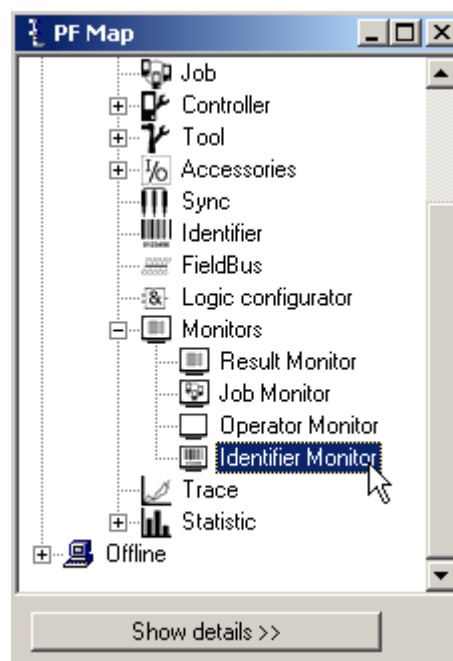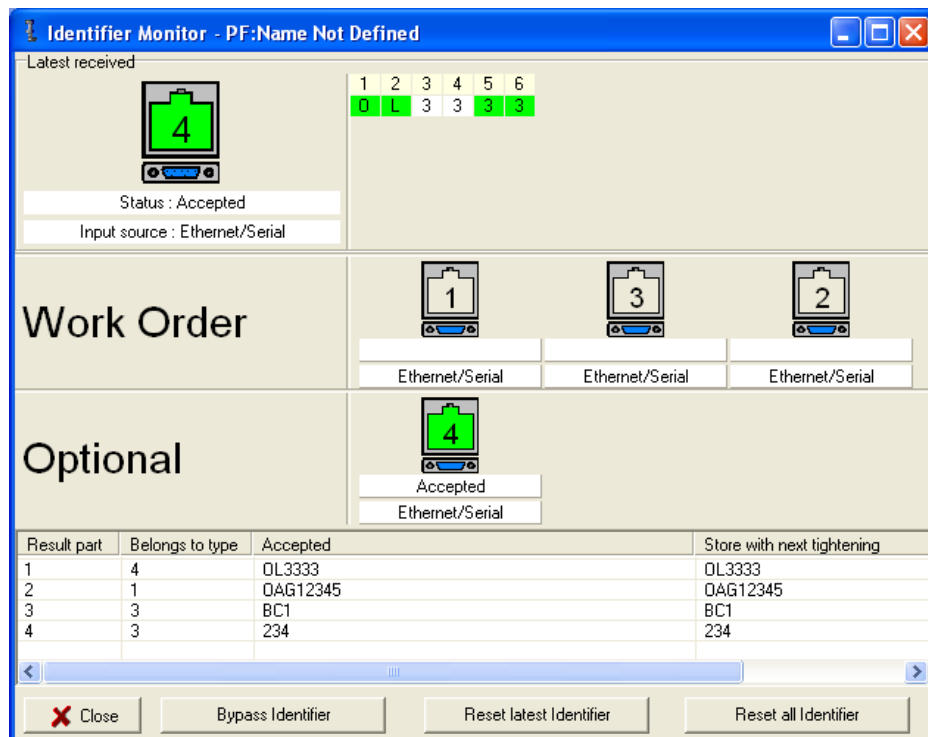
Function	Description
Bypass identifier	Skips a specified identifier type in a work order.
	If a type is not included in the work order, bypassing the first type in the work order is not possible.
Reset latest identifier	The latest accepted identifier string is cleared with the command (or digital input) *Reset latest identifier*.
	It is not possible to perform *Reset latest identifier* for the last type in a work order.
Reset all identifier	All accepted identifier strings are cleared with the command (or digital input) *Reset all identifiers*.

17.5   Get all results

Power Focus can store up to 5000 individual tightening results. With the **Get all results** option, the user is able to retrieve and view these. The user also has the choice of saving them to a text file or an Excel file.

In the Toolbar, select **Get all results**.
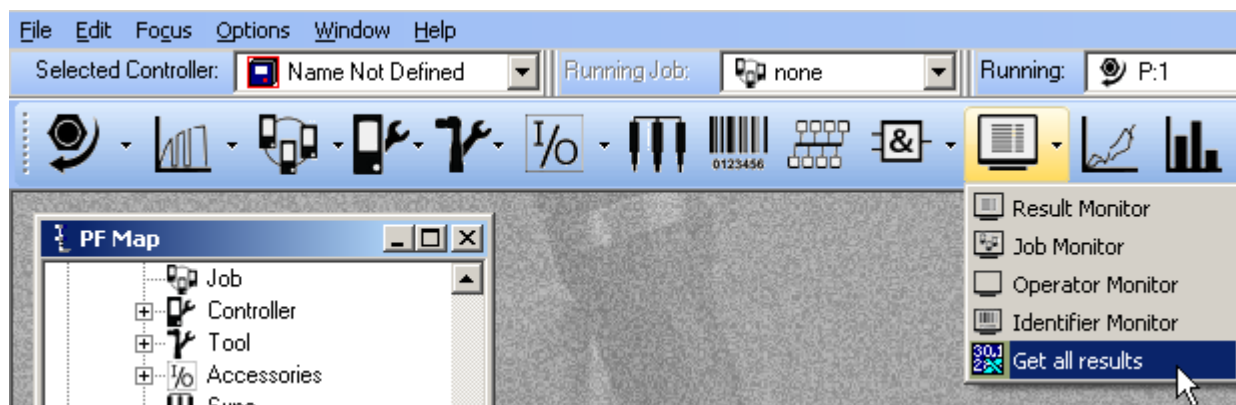
Choose a specific Pset or Multistage and click **OK**.
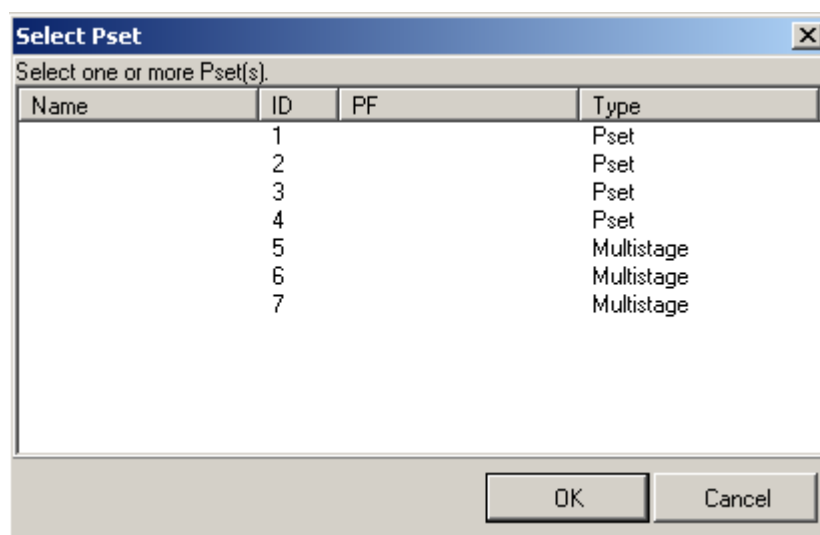
The tightening results from that Pset/Multistage appear. Picking up data takes some time depending on the type of connection and the number of results.

By choosing **Save to file** the results are saved into a text file.

The user can also choose to open and view the results in Microsoft Excel by selecting **Open in Excel**. This, of course, requires a properly installed version of Microsoft Excel.

PF DataBase Results

Pset:1

Total Nr Of Results

16

Nr Of Results Within Stat Limits

16

Results

Display only results within statistic limits ☐

Over All Status	Torque Status	Torque	Angle Status	Angle
OK	OK	11,37	OK	49
OK	OK	11,09	OK	50
OK	OK	11,24	OK	48
OK	OK	11,23	OK	50

[Close]   [Save To File]   [Open In Excel]

18   Trace

ToolsTalk PF provides a Trace function designed to present extensive information about the tightenings.

There are three different ways to open the Trace monitor:

- In the **PF Map**, and double-click **Trace**.

- In the main Menu list, select **Window > Activate > Trace**.

- Click the **Trace icon** on the Toolbar.
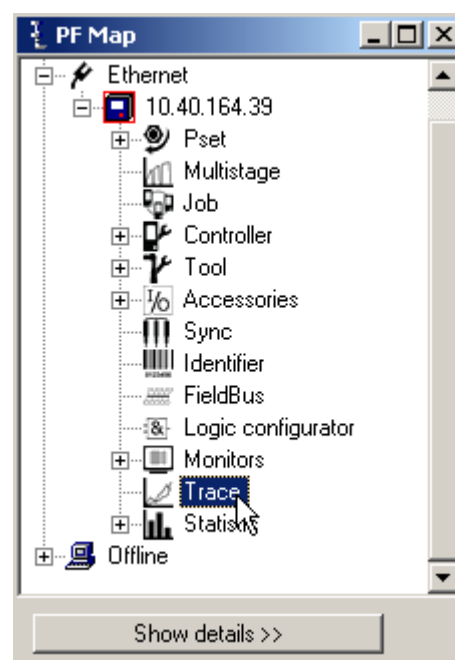
18.1   The trace window

Select which type of chart to view; **Torque over time, Angle over time, Speed over time, Torque and angle over time, Torque over angle, Torque and Speed over time.**

Press **Scale limits** to configure the axis according to preference.

With **Angle offset** selected, Trace shows graph from the *P120 Start final angle* torque value i.e. the Angle axis is set to zero according to the *P120* value. Traces that are below this value are shown in grey color. If deselected, Trace shows graph from *P110 Cycle start* torque value.

With **Envelop** selected, the sample spread between traces is shown. Envelop is made of two traces; one made of the maximum sample values and one with the minimum sample values taken from all displayed traces.

With **Auto update** selected, the charts are automatically updated as new tightening data arrives. If deselected, the user can choose which trace to view.

The **Limits** function allows the user to customize the limits in the chart.

History settings make it possible to view previous OK/ NOK traces. To view **History** set the **Index** according to the number of the trace that should be displayed and press **Get**. E.g. **Index** 2 results in that the second last OK/ NOK trace is displayed. The number of stored traces is limited by *C607 No. of Traces*.

There are two alternatives for saving traces from this window; saving the active trace or saving all traces. Note that from the File menu it is also possible to print the latest trace as it is shown in the window, or print all types of charts for the latest trace.

Zooming in to a smaller part of the chart is done by selecting an area (i.e. clicking the mouse button somewhere in the chart, moving the cursor down and to the right, and releasing the mouse button). Unzooming is done by clicking the mouse button and moving it up to the left before releasing it.
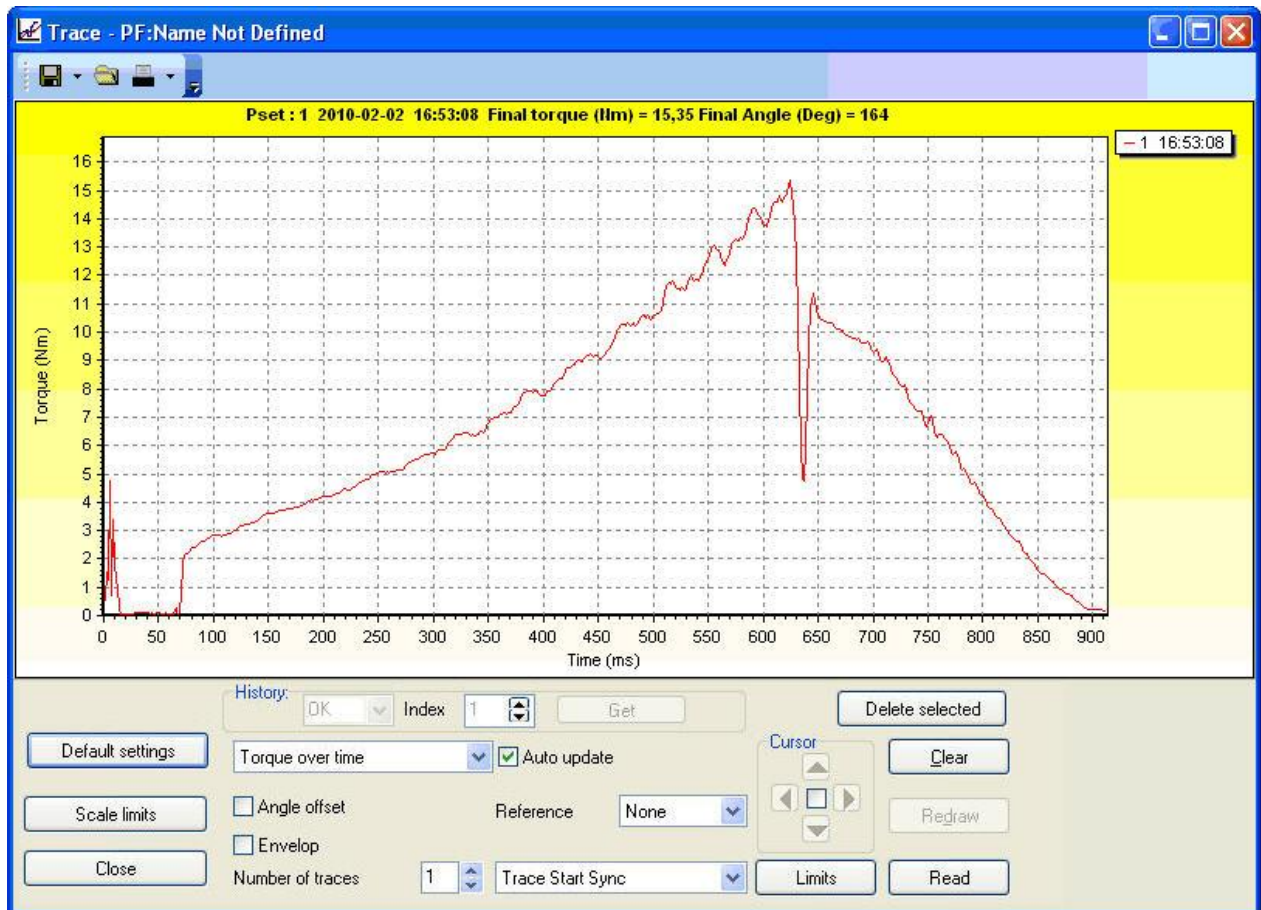
19   Statistics

Power Focus has extensive statistics functionality. The values are updated after each tightening, and can be shown on the display in real time, or sent to a PC. It is also possible to send statistical reports to a printer. On the front panel of PF there is a LED for statistical alarms.

Settings are made in **PF Map>Pset>Statistic Programming**. Statistics are calculated based on the following result parameters:

Result	Unit	Description
Torque	Nm*	Final torque in selected tq presentation unit.
Angle	Deg	Final angle in degrees.

* = Other units can be used.

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. σ
$\overline{X}$ -3 σ	Mean - 3 sigma
$\overline{X}$ +3 σ	Mean + 3 sigma
6 σ	6 sigma
Cr	Cr is a calculated viability number (capability). The lower the value, the better the process.
Cp	Cp is a viability factor. The higher the value the better process.
Cpk	Cpk is a viability factor. The higher the 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

Sub-group results	Description
$\overline{x}$	Mean value for the latest completed subgroup
σ	Sigma for the latest completed subgroup
Other definitions	**Description**
$\overline{R}$	Mean of subgroup range (number of subgroups)
$\overline{\overline{X}}$	Mean of subgroup mean (number of subgroups)

In order to rapidly detect changes in the process, Power Focus is equipped with a number of statistical alarm limits based on the $\overline{x}$ and R calculations for torque and angle.

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

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

If any of the following criteria are true, then the stat alarm is lit 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.

19.1 Statistic alarm

$\overline{x} > \text{UCL}$

$\overline{x} < \text{LCL}$

$R > \text{UCL}$

$R < \text{LCL}$

$Cp < 2.0$

$Cpk < 1.33$

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

19.2   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.

19.3   Calculation of UCL and LCL

Power 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.

19.4   Calculation of mean values

Power Focus calculates the mean values $\overline{\overline{X}}$ and $\overline{R}$. The operator can then choose if he wants to use these values or enter another value. Sub group size, subgroup frequency and number of subgroups parameters are used in the calculations.

19.5 Calculation formulas

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

Power 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 is recalculated.

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

The formulas for the statistic parameters used by Power Focus:

- X_i = value

- n = number of tightenings
- Min = minimum value from all the tightenings in the Power Focus memory
- Max = maximum value from all the tightenings in the Power Focus memory
- minl = minimum acceptable value
- maxl = maximum acceptable value

$Range = R = Max - Min$

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

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

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

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

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

Tightenings

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

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

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

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

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

$X_{i+...}$

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

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

Subgroup size = Group size = z

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

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

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

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 6 subgroups.

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

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

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

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

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

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

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

19.6 Constants for calculation of SPC variables

Sub group 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

20   Quick reference guide

Use this appendix in conjunction with as a reference guide when programming the Power Focus. A more general description of the tightening and control strategies available can be found in the previous chapters.
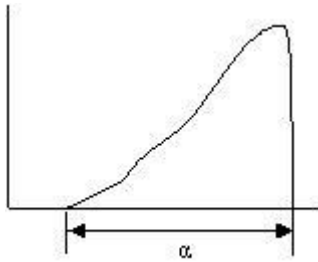
A joint is regarded as hard if α (clamping angle) is small, and soft if α is large. There is no limit, but test standards define $\alpha < 30°$ as hard. The dynamic effects on tightening increase dramatically if angles go down substantially (approximately 15°).

On the following pages, different control and monitoring strategies are calculated. Study the graphs and the parameters that need to be set. Note that the graphs are presented schematically, which means that programming results may look different compared to the graph.

20.1 Tq con

20.1.1 One stage

Torque

P114 Final tq max

Acceptance Window

P113 Final target

P112 Final tq min

P110 Cycle start

P115 Cycle complete

Time

P143 Tool idle time

Angle

P126 Rundown angle max

Acceptance Window

P125 Rundown angle min

Time

P142 Soft start time

P138 Zoom step speed

P130 Soft start speed

P135 Step 1 ramp

P131 Step 1 speed

Speed

20.1.2　Two stage

20.1.3   Quick step

20.1.4   Ergo ramp

20.2 Tq con/ang mon

20.2.1 One stage

20.2.2   Two stage

20.2.3   Quick step

20.2.4   Ergo ramp

20.3 Tq con/ang con (AND) and Tq con/ang con (OR)

20.3.1 One stage

20.3.2   Two stage

20.3.3   Quick step

Torque

P114 Final tq max

P113 Final target

Acceptance Window

P112 Final tq min

P111 First target

P120 Start final angle

P110 Cycle start

P115 Cycle complete

Time

Angle

P143 Tool idle time

P124 Final angle max

P127 Final angle max mon

P123 Target angle

Acceptance Window

P122 Final angle min

P126 Rundown angle max

Acceptance Window

P125 Rundown angle min

Time

P142 Soft start time

P138 Zoom step speed

P130 Soft start speed

P135 Step 1 ramp

P132 Step 2 speed

P131 Step 1 speed

Speed

20.3.4   Ergo ramp

Torque

P114 Final tq max

Acceptance Window

P113 Final target

P112 Final tq min

P111 First target

P137 Ergo ramp
P120 Start final angle

P110 Cycle start

P115 Cycle complete

Time

P143 Tool idle time

Angle

P124 Final angle max

P127 Final angle max mon

Acceptance Window

P123 Target angle

P122 Final angle min

P126 Rundown angle max

Acceptance Window

P125 Rundown angle min

Time

P142 Soft start time

P130 Soft start speed

Hard Joint

P135 Step 1 ramp

P131 Step 1 speed

Soft Joint

P138 Zoom step speed

Speed

20.4 Ang con/tq mon

20.4.1 One stage

20.4.2   Two stage

Torque

P114 Final tq max

Acceptance Window

P112 Final tq min

P111 First target

P120 Start final angle

P110 Cycle start

P115 Cycle complete

Time

P143 Tool idle time

Angle

P124 Final angle max

P127 Final angle max mon

P123 Target angle

Acceptance Window

P122 Final angle min

P126 Rundown angle max

Acceptance Window

P125 Rundown angle min

Time

P142 Soft start time

P138 Zoom step speed

P130 Soft start speed

P135 Step 1 ramp

P132 Step 2 speed

P136 Step 2 ramp

P131 Step 1 speed

Speed

20.4.3   Quick step

20.4.4   Ergo ramp

Torque

P114 Final tq max

Acceptance Window

P112 Final tq min

P111 First target

P137 Ergo ramp
P120 Start final angle

P110 Cycle start

P115 Cycle complete

Time

P143 Tool idle time

Angle

P124 Final angle max

P127 Final angle max mon
Acceptance Window

P123 Target angle

P122 Final angle min

P126 Rundown angle max
Acceptance Window

P125 Rundown angle min

Time

P142 Soft start time

P130 Soft start speed

Hard Joint

P135 Step 1 ramp

P131 Step 1 speed

P138 Zoom step speed

Soft Joint

Speed

20.5 Reverse ang

20.6   Rotate spindle forward and Rotate spindle reverse

20.7 Home position forward and reverse

20.8   DS con

20.8.1   One stage

This strategy is not available in DS control.
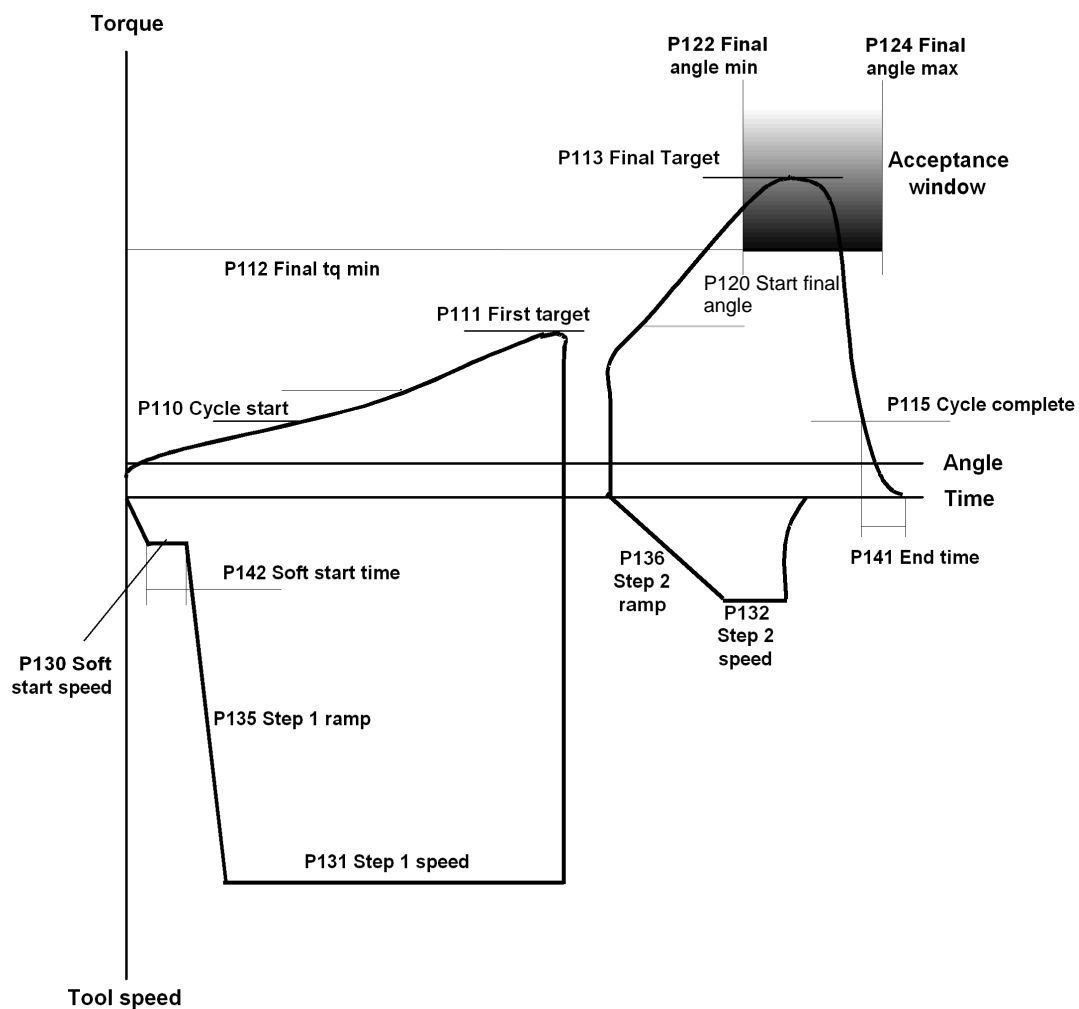
20.8.2   Two stage
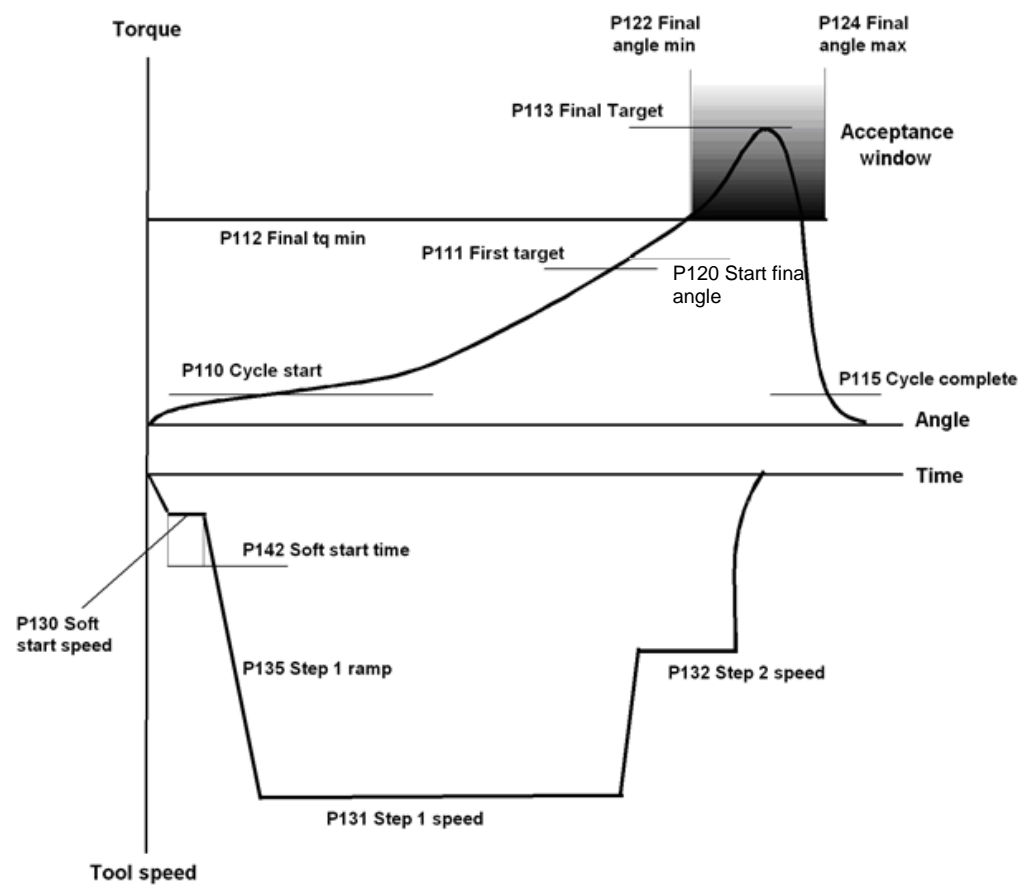
20.8.3   Quick step

20.8.4 Ergo ramp
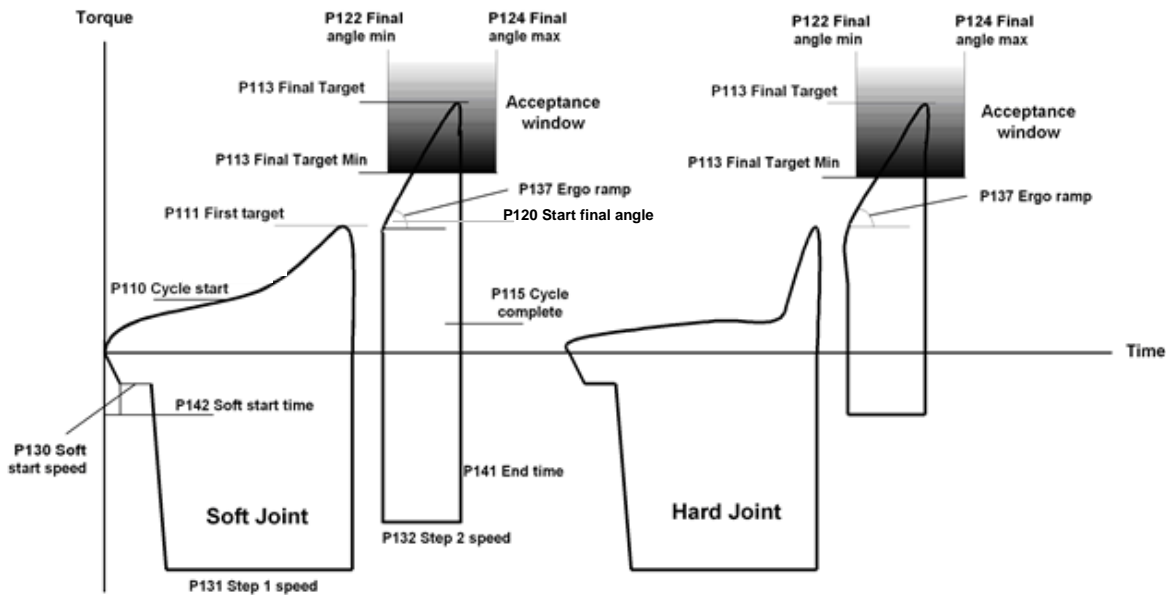
20.9 Snug gradient

20.9.1 One stage
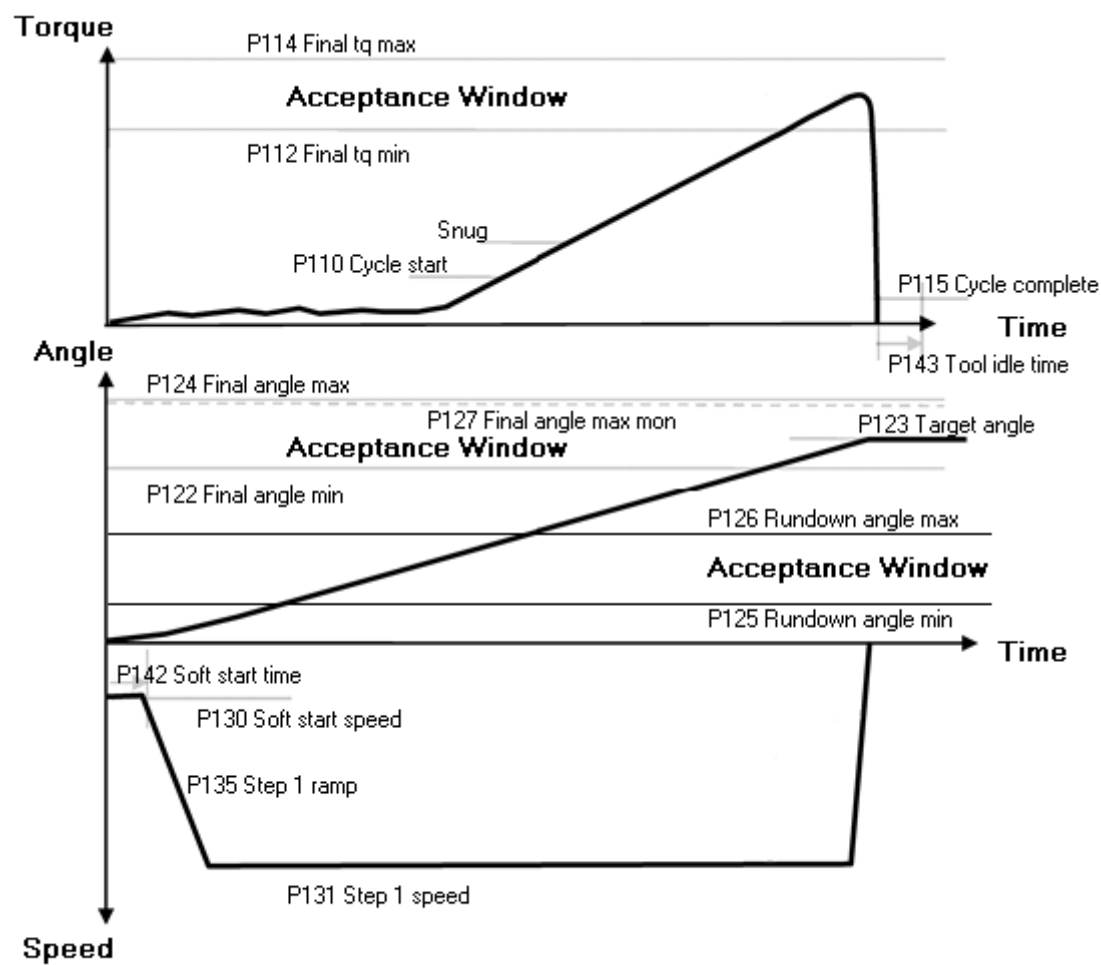
20.9.2 Two stage

20.9.3   Quick step

Torque

P114 Final tq max

Acceptance Window

P112 Final tq min

Snug

P110 Cycle start

P115 Cycle complete

Time

P143 Tool idle time

Angle

P124 Final angle max

P127 Final angle max mon

P123 Target angle

Acceptance Window

P122 Final angle min

P126 Rundown angle max

Acceptance Window

P125 Rundown angle min

Time

P142 Soft start time

P130 Soft start speed

P135 Step 1 ramp

P132 Step 2 speed

P131 Step 1 speed

Speed

21 Digital I/O and fieldbus items

The following sections list the digital inputs and outputs (relays) and the fieldbus items.

21.1 Digital output (relay) and fieldbus items from PF

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

For fieldbus: Set signal = a signal to set a bit/byte/bytes in the PLC. Reset signal = a signal to reset a bit/byte/bytes in the PLC.

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Alarm	Follow the Alarm light on the PF front.	1 bit	0 = Off 1 = On	Alarm on / Alarm off			X	X	X		X
Angle status	Status Angle result.	1 byte ASCII character	O = OK L = Low H = High	Tightening result / Start new tightening or new Pset selected or new Job selected							
		2 bits BF	00 = Not used 01 = OK 10 = High 11 = Low								
Angle status HIGH	Angle result is above max limit.	1 bit	0 = Not used 1 = High	Tightening result / Start new tightening or new Pset selected or new Job selected							
Angle status LOW	Angle result is below min limit.	1 bit	0 = Not used 1 = Low	Tightening result / Start new tightening or new Pset selected or new Job selected							

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Angle status OK	Angle result is within limits.	1 bit	0 = Not used 1 = OK	Tightening result / Start new tightening or new Pset selected or new Job selected							
Batch done	Indicate batch finished. Batch done OK or NOK.	1 bit	0 = Not completed 1 = Done	Batch finished / Reset result	X	X	X	X	X		X
Batch status	Batch OK (done) or NOK	1 byte ASCII character	O = OK N = NOK	Tightening result / Start new tightening or new Pset selected or new Job selected							
		2 bits BF	00 = Not used 01 = OK 10 = NOK								
Batch status NOK	Batch is NOK.	1 bit	0 = Not used 1 = NOK	Tightening result / Start new tightening or new Pset selected or new Job selected							
Batch status OK (nxOK)	Batch is OK (nxOK).	1 bit	0 = Not used 1 = OK	Tightening result / Start new tightening or new Pset selected or new Job selected							
Battery empty	Indicates tool battery empty	1 bit	0 = Not used 1 = Battery empty	Tool battery empty / no signal			X	X	X		X
Battery low	Indicates tool battery low	1 bit	0 = Not used 1 = Battery low	Tool battery low / no signal			X	X	X		X
Calibration alarm	Calibration date expired. New date to be entered.	1 bit	0 = Off 1 = On	Calibration date expired / Reset or set a new calibration date			X	X	X		X
Channel ID	Gives the channel ID number on the fieldbus Power Focus.	2 - 8 bits in the same byte BF	0000 0001=CH 1 0001 0000=CH 16	PF ready and channel ID programmed in config / No signal							

Name	Description	Fieldbus items			Duration			Tensor ST/SL			
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
		16 bits in one word U16	00….0001=CH 1 00….1000=CH 8								
Channel name	Shows C311 Channel name	16-200 bits CSC, CSCI		Channel name stored in controller set / No signal							
Current	Indicates tightening result final current in percent (%).	2 – 8 bits BF	Integer number	Tighten result / Tighten started or Pset Selected or Job selected							
		16 bits U16	Integer number								
Completed batch		BF U16		Batch Counter Changed / No signal							
Completed batch bit (0-6)	Display currently completed batch.						X				
Cycle abort	Display cycle aborted by cycle abort timer expired	1 bit	0 = Not used 1 = Cycle abort	Cycle Abort / Reset result			X	X	X		
Cycle complete	Indicates that a tightening is finished. Do not care about the result.	1 bit	0 = Not used 1 = Cycle complete	Tightening done / Start new tightening or new Pset selected or new Job selected	X	X		X	X		X
Cycle start	Indicate cycle started.	1 bit	0 = Not used 1 = Cycle started	Cycle start / Start new tightening	X	X					
DigIn# # = 1-4	Mimic the status on a DigIn in Power Focus or I/O Expander. The input must be configured to fieldbus DigIn # X. There are four different items.	1 bit	0 = Input Off 1 = Input On	DigIn # X On / DigIn # X Off							
DigIn controlled # 1-4	Controlled by DigOut monitored 1 – 4 To PF	1 bit	0 = DigIn bit reset 1 = DigIn bit set	DigIn control1Set / Reset			X	X	X		X

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Dir switch CW	Indicates tool Switch is in CW direction.	1 bit	0 = Ring CCW 1 = Ring CW	Ring CW / Ring CCW			X	X	X		X
Dir switch CCW	Indicates tool Switch is in CCW direction.	1 bit	0 = Ring CW 1 = Ring CCW	Ring CCW / Ring CW			X	X	X		X
Direction alert	Direction alert is active						X				
Disabled FB job status	Mimic the status on a digital input Disable FB Job status in Power Focus or I/O Expander.	1 bit	0 = Enabled Job status 1 = Disabled Job status	Disable FB Job Status / Enable FB Job status							
Dset calibration value	Shows the tool calibration value in selected engineering units.	4 bytes fixed point	See Item Final Torque.	Dset data / No signal							
Effective loosening	Set when the Power Focus reaches the minimum loosening torque (defined in % of tool max torque).				X	X		X	X		X
Enable scanner	The relay enable scanner is set when the tool trigger is pressed during tool locked condition, and if no job is running.				X	X		X	X		X
Error code	Shows event code.	2 bytes U16	Binary representation (Decimal 0-65535)	Event occurs / Event acknowledge or time out			X	X			
External controlled 1-10	Relay controlled by external source outside Power Focus.						X				
Fieldbus carried signals disabled	Indicates fieldbus signals disable.						X				
Fieldbus handshake ack	Indicates handshake from PLC received by Power Focus.	1 bit	0 = Not used 1 = Handshake	Handshake set / Handshake reset							
Fieldbus offline	When fieldbus goes offline the light on this bit turns off.						X	X	X		X
Fieldbus relay 1-4	Relays controlled from fieldbus.						X	X	X		X

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Final angle	Final angle result.	2 byte U16	Binary representation (Decimal 0-65 535)	Tightening done / Start new tightening or new Pset selected or new Job selected							
Final angle start	Indicate final angle started.	bit		Final Angle Start / Cycle Completed							
Final torque	Final torque result.	4 byte	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 selected engineering units in the Power Focus.	Tightening done / Start new tightening or new Pset selected or new Job selected							
Function button	Function button pressed.						X	X	X		X
Function button ack.	Function button pressed acknowledge.				X	X		X	X		X
High	Any result is above any of the programmed max limits.				X	X		X	X		X

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
High angle	Angle result is higher than max angle limit.				X	X		X	X		X
High current	Current status is high.				X	X		X	X		X
High PVT monitoring	PVT monitoring is high				X	X		X	X		X
High PVT selftap	PVT selftap is high				X	X		X	X		X
High rundown angle	Rundown angle is high				X	X		X	X		X
High torque	Torque result is higher than max torque limit.				X	X		X	X		X
Home position	Indicates that the socket has reached the position set by digital input Set home position, or an Open end head in open position.	1 bit	0 = Not used 1 = Home position	Socket in home position / Start new tightening			X	X			X
Identifier identified / Identifier recognized	An identifier with Type 1, 2, 3, 4 has been entered in correct order and has been accepted by the system logic.	1 bit	0 = not used 1 = identified	Identifier identified / Start new tightening	X	X		X	X		X
Identifier multi	Shows an identifier, Max length 100 bytes.	16 – 800 bits CC	Max 100 char in a string	Multi identifier selected / No signal							
		16 – 800 CSCI	Max 100 char								
Identifier result part A-D	Show identifier result part, witch in each tightening result.	16 – 200 bits CSC	Max 25 char	Tighten result / Start new tightening							
Identifier type # # = 1-4 Received	An identifier with Type 1, 2, 3, 4 has been entered in correct order and has been accepted by the system logic.	1 bit		Received identifier type / Bypass identifier / Reset latest Identifier / Reset all identifier	X	X		X	X		X

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Identifier received	Becomes active when an identifier is sent to the PF, regardless of the source of the identifier (RS232, field bus, keyboard etc.)				X	X	X	X	X		X
Illuminator	Echo tool illuminator LED.	1 bit	0 = Led off 1 = Led on	Light on / light off			X	X	X		X
Job done status	Job OK (done) or NOK (done) or aborted (reset).	1 byte ASCII character	O =OK N = NOK A = Aborted	Job done or reset / Start new tightening or new Job selected							
		2 bits BF	00 = Not used 01 = OK 10 = NOK 11 = Aborted								
Job done status job aborted / Job aborted	Shows Job aborted.	1 bit	0 = Not used 1 = Job aborted	Job aborted / Start new tightening or new Job selected	X	X		X	X		X
Job done status NOK / Job NOK	Job is NOK (Not all tightening OK).	1 bit	0 = Not used 1 = NOK	Job done / Start new tightening or new Job selected	X	X		X	X		X
Job done status OK (nxOK) / Job OK	Job is OK (nxOK)	1 bit	0 = Not used 1 = OK	Job done / Star new tightening or new Job selected	X	X		X	X		X
Job off	Job is in Off mode; 1: Job Off; 0: Job On.	1 bit	0 = Job on 1= Job off	Job off / Job on			X	X	X		X
Job running	A Job is selected and "running".	1 bit	0 = Job done and no Job selected 1 = Job is running	Job selected / Job done			X	X	X		X
Keep alive ack	Indicates fieldbus communication alive, which sends back the save value received from PLC.	2 - 8 bits in the same byte BF	00000000 = 0 11111111 = 255	Keep alive value changed / No signal							

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Lifted socket number	Indicates which socket is lifted.	16 bits OA	Byte 0=Device ID Byte 1=lifted socket number, if 255=more than one socket lifted	Socket lifted / socket back to position							
Line control alerted 1	Indicates Line control alert 1 received by Power Focus.	1 bit	0 = Not used 1 = Line control alerted 1	Line control alerted 1 / Start new tightening	X	X	X	X	X		X
Line control alerted 2	Indicates Line control alert 2 received by Power Focus.	1 bit	0 = Not used 1 = Line control alerted 2	Line control alerted 2 / Start new tightening	X	X	X	X	X		X
Line control done	Indicates Job with line control finished before line control alert2 input.	1 bit	0 = Not used 1 = Line control done	Line control done / Start new tightening	X	X		X	X		X
Line control start ack	Indicates that Power Focus received Line control start.	1 bit	0 = Line control start reset 1 = Line control start	Line control start bit set / Line control start bit reset	X	X		X	X		
Line control started	Indicates line control start set in Power Focus. Activate with J330 set to Yes.	1 bit	0 = Not used 1 = Line control start	Line control started / Start new tightening	X	X		X	X		X
Lock at batch done	Indicate tool locked at batch done which is activated by P152	1 bit	0 = Not used 1 = Tool locked	Lock at batch done / Unlock tool			X	X	X		X
Logic relay 1-10	The result of a logic configuration with the corresponding number. (PF4000 only.)						X	X	X		X
Loosening disabled	Loosening function currently disabled.						X	X	X		X
Low	Any result is below any of the programmed min limits.				X	X		X	X		X
Low angle	Angle result is lower than min angle limit.				X	X		X	X		X
Low current	Current status is low.				X	X		X	X		X

Name	Description	Fieldbus items			Duration			Tensor ST/SL			
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Low PVT monitoring	PVT monitoring is low				X	X		X	X		X
Low PVT selftap	PVT selftap is low				X	X		X	X		X
Low rundown angle	Rundown angle is low				X	X		X	X		X
Low torque	Torque result is lower than min torque limit.				X	X		X	X		X
Max coherent NOK reached	Indicates Max coherent NOK tightening counter value is reached	1 bit	0 = Not used 1 = Max NOK reached	Max NOK reached / Reset NOK counter	X	X	X	X	X		X
Motor tuning disabled	Motor tuning function currently disabled.						X	X	X		X
N x OK	Batch OK. Only available in the Job function.				X	X		X	X		X
N x NOK	Batch status NOK.				X	X		X	X		X
Necking failure					X	X		X	X		X
New Job selected	Indicates a new Job is selected JobID>0	1 bit	0 = Not used 1 = New Job	New Job Selected / Start new tightening	X	X		X	X		X
New Pset selected	Indicates a new Pset is selected PsetID>0	1 bit	0 = Not used 1 = New Pset	New Pset Selected / Start new tightening	X	X		X	X		X
Next tight	Indicates that PF started a new tightening.				X			X	X		X
No tool connected	Indicates controller has no connection with tool	1 bit	0 = Not used 1 = Tool connected	Controller has no connection with tool / no signal			X		X		
NOK	Any result is above or below any of the programmed max or min limits, or some other not approved result such as rehit.				X	X		X	X		X
Off	Output is not used.										
OK	All results are within the specified limits.				X	X		X	X		X
Open End tuning disabled	Open End function currently disabled						X	X	X		X

Name	Description	Fieldbus items			Duration			Tensor ST/SL				
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED	
Open protocol commands disable	Set when the Open Protocol Commands DigIn has been activated. In this case all the commands that the Power Focus can receive via Open Protocol are disabled.						X	X	X		X	
Open protocol conn lost	Indicates connection with open protocol lost.	1 bit	0=connected 1=disconnected	Open protocol disconnected / Open protocol connected			X	X	X		X	
PF ready	No severe errors in PF.	1 bit	0=Errors in PF 1=No errors in PF	PF ready (no errors) / PF not ready (errors)			X	X	X		X	
PIN code OK	A PIN code entered on the RFID card reader has been validated by the Power Focus.				X							
Positioning disabled	Positioning function currently disabled.						X	X	X		X	
Power ON	Indicates that PF is power supplied.						X					
Pset final angle min / Pset final angle max / Pset step1 speed / Pset step2 speed/ Pset rundown angle min/ Pset rundown angle max.	Shows Pset parameters from the running Pset. Pset step1 speed / Pset step2 speed shown in percentage of max speed or rpm depending on *P139 Speed unit*.	2 bytes U16	Binary representation (Decimal 0-65535)	New Pset selected or updated / No signal. On until new Pset is selected or current Pset updated								
Pset final target / Pset final torque min / Pset final torque max / Pset start final angle	Shows Pset parameters from the running Pset in selected engineering units.	4 bytes Fixed point	See Item Final Torque.	New Pset selected or updated / No signal. On until new Pset is selected or current Pset updated								

Name	Description	Fieldbus items			Duration			Tensor ST/SL			
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Pset Target Angle	Show Pset parameter P123 Target angle.	2 bytes U16		New Pset selected or updated / No signal. On until new Pset is selected or current Pset updated							
PVT compensate	Indicates PVT compensate	4 bytes Fixed point	2 bytes integer part and 2 bytes decimal part	Tightening result / Start new tightening or new Pset selected or new Job selected							
PVT mon status / Run down angle status / PVT selftap status / Current status	Status on one of the result parameters PVT mon, Rundown angle, PVT selftap or Current.	1 byte ASCII character	O = OK L = Low H = High	Tightening result / Start new tightening or new Pset selected or new Job selected							
		2 bits BF	00 = Not used 01 = OK 10 = High 11 = Low								
PVT mon status HIGH / Run down angle status HIGH / PVT selftap status HIGH / Current status HIGH	Result is above max limit. There are three different variables in the setup.	1 bit	0 = Not used 1 = High	Tightening result / Start new tightening or new Pset selected or new Job selected							

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
PVT mon status LOW / Run down angle status LOW / PVT selftap status LOW / Current status LOW	Result is below min limit. There are three different items in the setup.	1 bit	0 = Not used 1 = Low	Tightening result / Start new tightening or new Pset selected or new Job selected							
PVT mon status OK / Run down angle status OK / PVT selftap status OK / Current status OK	A result is within limits. There are three different variables in the setup.	1 bit	0 = Not used 1 = OK	Tightening result / Start new tightening or new Pset selected or new Job selected							
Read result Handshake ack	Handles read result	1 byte BF	0 = Not used 1 = Read 2 = Skip 4 = Flush 8 = Result data in queue	Result is in the queue or Readresult Handshake is set in To PF / No signal							
Received identifier	Indicates identifier has been received by PF.	1 bit	0 = Not used 1 = Received identifier	Received identifier / Start new tightening	X	X		X	X		
Rehit	Indicates tool is rehit	1 bit	0 = Not used 1 = Rehit	Tightening result / Reset result	X	X		X	X		X
Remaining batch	Display currently remaining batch	BF U16		Batch Counter Changed / No signal							
Remaining batch bit 0-6	Display currently remaining Batch. Batch Counter 1 to 99 can be displayed. "0" means that there is no remaining batch counter (batch is completed).						X				

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Result type	Shows what type of result is, i.e. tightening result, loosening result and so on.	2 – 8 bits BF	1 to 13 is defined for the different result type	Tighten result / Reset result							
Ring button ack	Ring button pressed acknowledge.	1 bit	0 = Not used 1 = New Pset	Ring Button Pressed / Start new tightening							
Rundown Angle	Show Result Rundown angle	2 bytes U16		Tightening result / Start new tightening or new Pset selected or new Job selected							
Running job ID	Running Job identification number.	2 - 8 bits in the same byte BF	0000 0001 = Job 1 0001 0000 = Job 16	Job selected / Job done							
		16 bits in one word U16	00….0001 = Job 1 00….1000 = Job 8								
Running Job bit 0-8	Shows selected Job. Bit pattern analogue to input Job select bits. 0 = no running Job.						X				
Running Pset ID	Running Pset identification number.	2 - 8 bits in the same byte BF	0000 0001 = Pset 1 0001 0000 = Pset 16	Pset selected / No signal. On until new Pset is selected							
		16 bits in one word U16	00….0001 = Pset 1 00….1000 = Pset 8								
Running Pset bit 0-9	Shows selected Pset. Bit pattern analogue to input Pset select bits. 0 = no Pset selected, tool locked.						X				
Running Pset ID 0 is 1	Shows running Pset and Pset number is bit field number +1, i.e. 00 is Pset 1.	2 - 8 bits in the same byte BF	0000 0001=Pset2 0001 0000=Pset 17	Pset selected / No signal. On until new Pset is selected							

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Safe to disconnect tool		1 bit	Ack for disconnect tool request from fieldbus.	Disconnect tool allowed / Done			X				
Sent tightening ID	Indicates which tightening result is sent to PLC.	2 bytes U16	Integer value	Result is sent to PLC / No signal							
Selected channel in Job	Indicates selected channel in a forced order Cell Job.	1 bit	0 = Not used 1 = Selected channel	Prompt selected channel / Cancel prompt channel			X	X			X
Selector socket info	Indicates the socket status on a selector	16 bits OA	Byte 0=Device ID Byte 1=lifted socket position	Socket lifted / socket back to position							
Selector info	Indicates selector socket and LED information.	32 bits OA	Byte 0 = device ID Byte 1=lift sock no. Byte 2, 3 =selector LED	Select Led or socket changed / No signal							
Service indicator alarm / Service indicator	Indicates that the number of tightenings in the tool memory has reached the service interval limit.	1 bit	0 = Alarm Off 1 = Alarm On	Service indicator alarm on / Reset counter			X	X	X		X
Start trigger active	Used to let the tool trigger or the external tool start trigger control Illuminator. This relay function is available for Illuminator only.						X	X			
Stat alarm	Echo display stat LED.	1 bit	0 = Off 1 = On	Stat alarm On / Stat alarm Off	X	X		X	X		X
Sync channel# Green/Red/ Yellow LED # = 1-10	A result from a Sync channel. Follow tool light. There are 30 (3x10) different items in the setup.	1 bit	0 = Not used 1 = green / red / yellow	Sync tightening result / Start new tightening or new Pset selected or new Job selected							

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Sync ch1 status /..../ Sync ch10 status	Indicate Sync channel XX result status.	2 bits BF	00 = Not used 01 = Sync Channel OK 10 = Sync Channel OK	Sync tightening result / Start new tightening or new Pset selected or new Job selected							
		8 bits character	O = Sync Channel OK N = Sync Channel NOK								
Sync ch1 status NOK /.../ sync ch10 status NOK / Sync spindle (1-10) NOK	Indicates Sync channel XX result status NOK.	1 bit	0 = Not used 1 = Sync Channel NOK	Sync tightening result / Start new tightening or new Pset selected or new Job selected	X	X		X	X		X
Sync ch1 status OK /…/ Sync ch10 status OK / Sync spindle (1-10) OK	Indicates Sync channel XX result status OK.	1 bit	0 = Not used 1 = Sync Channel OK	Sync Tightening result / Start new tightening or new Pset selected or new Job selected	X	X		X	X		X
Sync total status	Indicates Sync total result status.	2 bits BF	00 = Not used 01 = Sync Total Status OK 10 = Sync Total Status NOK	Sync Tightening result / Start new tightening or new Pset selected or new Job selected							
		8 bits character	O = Sync Total Status OK N = Sync Total Status NOK								
Sync total status NOK / Sync NOK	Indicates Sync total result status NOK.	1 bit	0 = Not used 1 = Sync Total Status NOK	Sync tightening result / Start new tightening or new Pset selected or new Job selected	X	X		X	X		X

Name	Description	Fieldbus items			Duration			Tensor ST/SL			
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Sync total status OK / Sync OK	Indicates Sync total result status OK.	1 bit	0 = Not used 1 = Sync Total Status OK	Sync tightening result / Start new tightening or new Pset selected or new Job selected	X	X		X	X		X
Tightening date	Tightening date taken from the most recent result. Format YYYY:MM:DD	80 bit (10 characters / bytes) CSC	I.e. 2000:05:07 (→ 10 ASCII characters)	Tightening result / Start new tightening or new Pset selected or new Job selected							
		80 bits CSCI	I.e. 70:50:0002 (← from right to left)								
Tightening date day	The tightening date (day part only) taken from the most recent result.	16 bit (one word) U16	1 – 31	Tightening result / Start new tightening or new Pset selected or new Job selected							
Tightening date month	The tightening date (month part only) taken from the most recent result.	16 bit (one word) U16	1 – 12	Tightening result / Start new tightening or new Pset selected or new Job selected							
Tightening date year	The tightening date (year part only) taken from the most recent result.	16 bit (one word) U16	Year number 4 digits	Tightening result / Start new tightening or new Pset selected or new Job selected							
Tightening disabled	Tightening function currently disabled.						X	X	X		X
Tightening status	Combined status for all tightening result parameters that are used.	1 byte ASCII Character	OK = O NOK = N	Tightening result / Start new tightening or new Pset selected or new Job selected							
		2 bits BF	00 = Not used 01 = OK 10 = NOK								
Tightening status high	Indicate tightening result status is high.	1 bit	0 = Not used 1 = High	Tighten result / Reset result							
Tightening status low	Indicate tightening result status is low.	1 bit	0 = Not used 1 = Low	Tighten result / Reset result							

Name	Description	Fieldbus items			Duration			Tensor ST/SL			
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Tightening time	The tightening time taken from the most recent result. Format HH:MM:SS	64 bit (8 characters) CSC	I.e. 08:15:08 (→8 ASCII characters) 24 hour	Tightening result / Start new tightening or new Pset selected or new Job selected							
		64 bits CSCI	I.e. 80:51:80 (← from right to left)								
Tightening time hour	The tightening time (hour part only) taken from the most recent result.	16 bit (one word) U16	0 – 24 hour	Tightening result / Start new tightening or new Pset selected or new Job selected							
Tightening time min	The tightening time (minutes only) taken from the most recent result.	16 bit (one word) U16	0 - 60 min	Tightening result / Start new tightening or new Pset selected or new Job selected							
Tightening time sec	The tightening time (seconds only) taken from the most recent result.	16 bit (one word) U16	0 - 60 sec	Tightening result / Start new tightening or new Pset selected or new Job selected							
Tightening status NOK	Tightening result has one or more Not OK results.	1 bit	0 = Not used 1 = NOK	Tightening result / Start new tightening or new Pset selected or new Job selected							
Tightening status OK	All tightening result is OK.	1 bit	0 = Not used 1 = OK	Tightening result / Start new tightening or new Pset selected or new Job selected							
Tool connected	Indicates connection established between tool and controller	1 bit	0 = Not used 1 = Tool connected	Tool is connected / no signal			X	X	X		X
Tool disabled	Indicates if the tool is disabled or not.	1 bit	0 = Tool enabled 1 = Tool disabled	Tool disable / Tool enable							
Tool enabled	Indicates if the tool is enabled or not.	1 bit	0 = Tool disabled 1 = Tool enabled	Tool enable / Tool disable							

Name	Description	Fieldbus items			Duration			Tensor ST/SL				
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Tool green light	This item follows the tool green light.	1 bit	0 = Not used 1 = Green	Tightening result or flash green light / Start new tightening or Reset LED			X				
Tool in product space	Tool is located in product space						X				X
Tool in work space	Tool is located in work space						X				X
Tool locked	Tool is locked (tool not ready).						X	X	X		X
Tool loosening	Indicates that the tool is loosening.	1 bit	0 = Tool is not loosening 1 = Tool is loosening	Tool is loosening / Tool is stopped			X				
Tool ready	Indicates that the tool is ready for tightening.	1 bit	0 = Tool is not ready 1 = Tool is ready	Tool is ready / Tool is not ready			X	X	X		X
Tool red light	This item follows the tool red light.	1 bit	0 = Not used 1 = Red	Tightening result / Start new tightening			X				
Tool running	Indicates that the tool is rotating CW or CCW.	1 bit	0 = Tool is not run 1 = Tool is running	Tool is running / Tool is stopped			X				
Tool serial no	Show tool serial number after each tightening	32 bits U32	Intel Endian 32 bits integer	Tighten result / Start new tightening							
		32 bits U32_HNW	Intel Endian 32 bits integer								
Tool start switch	Indicates tool is switching.	1 bit	0 = Not used 1 = rotating	Tool is rotating / Tool stopped			X				
Tool tightening		1 bit	0 = Tool is not tighten 1 = Tool is tightening	Tool is Tightening / Tool is stopped			X				

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
Tool yellow light	This item follows the tool yellow light. (If "PF_ control _3" is selected yellow LED shows the fatal error and reset when error acknowledged)	1 bit	0 = Not used 1 = Yellow	Tightening result or fatal error / Start new tightening or error Ack			X				
Tools Net conn lost	Indicates connection with Tools Net lost.	1 bit	0 = connected 1 = disconnected	Tools Net connection lost / Connected			X	X	X		X
Torque status	Status torque result.	1 byte ASCII Character	O = OK L = Low H = High	Tightening result / Start new tightening or new Pset selected or new Job selected							
		2 bits BF	00 = Not used 01 = OK 10 = High 11 = Low								
Torque status HIGH	Torque result is above max limit.	1 bit	0 = Not used 1 = High	Tightening result / Start new tightening or new Pset selected or new Job selected							
Torque status LOW	Torque result is below min limit.	1 bit	0 = Not used 1 = Low	Tightening result / Start new tightening or new Pset selected or new Job selected							
Torque status OK	Torque result is within limits.	1 bit	0 = Not used 1 = OK	Tightening result / Start new tightening or new Pset selected or new Job selected							
Tracking disabled	Tracking function currently disabled						X	X	X		X

| Name | Description | Fieldbus items | | | Duration | | | Tensor ST/SL | | | |
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
VIN input	Shows the VIN number input 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 than the VIN input length the Power Focus will take the first x characters and cut the end. If the VIN number is shorter then this parameter length the Power Focus will not fill with zero.	24-208 bit (3-26 bytes) CSI	One ASCII sign for each character. First byte is counter. Counter increases each time a new identifier string inputted.	Identifier selected /No signal							
		16-200 bit (2-25 bytes) CSC	Identifier input character string. One ASCII sign for each character.								
		16-192 bit (2-24 bytes) CSCI	In Intel Endian mode, whole words. One ASCII sign for each character.								
		32-208 bit (4-26 bytes) CSII	In Intel Endian mode, whole words. One ASCII sign for each character. First byte is counter. Counter increases each time a new barcode inputted.								
		U32	Convert barcode to U32 number. Corresponding to Identifier U32 in To PF side.								

Name	Description	Fieldbus items			Duration			Tensor ST/SL			
		String length	Value	Set signal / Reset signal	Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)	Illuminator	TLS ST Tag LED
		U32_HNW	Convert barcode to U32_HNW number. Corresponding to identifier U32_HNW in To PF side.								
		U16	Convert barcode to U16 number. Corresponding to identifier type U16 in To PF side.								
VIN used in tightening	Shows the VIN number used in a tightening. This is the VIN used in the tightening result. If the VIN is longer than the VIN input length the Power Focus will take the first x characters and cut the end. If the VIN number is shorter then this parameter length the Power Focus will not fill with zero.	16 – 200 bit (2-25 bytes) CSC	One ASCII sign for each character.	Tightening result / Start new tightening or new Pset selected or new Job selected							
		16 – 192 bits (2 – 24 bytes) CSCI	Only show in Intel Endian and must be whole words.								
		16 bits U16	Convert barcode to U16 number. Corresponding to identifier type U16 in To PF side.								
		32 bits U32	Convert barcode to U32 number. Corresponding to identifier U32 in To PF side.								
		32 bits U32_HNW	Only show in Intel Endian. Convert barcode to U32_HNW number. Corresponding to identifier U32_HNW in To PF side.								

Name	Description	Fieldbus items			Duration			Tensor ST/SL				
		String length	**Value**	**Set signal / Reset signal**	**Time**	**To next tightening**	**Tracking**	**Blue LED**	**Sound (time duration for all)**	**Illuminator**	**TLS ST Tag LED**	
		16 – 200 bits CSCI	Max 25 char									
Wear indicator	Active until service is performed (i.e. while wear alarm is pending)						X	X	X		X	

21.2 Digital input and fieldbus items to PF

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

For fieldbus: Set signal = a signal to set a bit/byte/bytes in the PLC. Reset signal = a signal to reset a bit/byte/bytes in the PLC.

	Description	Fieldbus items			Digital inputs			
Name	**Description**	**String length Data type**	**Value**	**Set signal /Reset signal**	**Internal I/O**	**I/O Expander**	**ST GPIO**	**Function button (optional)**
Abort Job	Aborts the running Job. Job status is Job aborted.	1 bit	0 = Not used 1 = Abort	Abort Job /no signal	X	X	X	X
		8 bit (1 byte) Character	A = Abort					
Abort Job and status	Abort Job And Reset all result status	1 bit	0 = Not used 1 = Abort	Abort job and status /no signal				
Ack error message	Acknowledge event/error message.	1 bit	0 = Not Used 1 = Ack Error	Ack event message /no signal	X	X	X	X

Name	Description	Fieldbus items			Digital inputs			
	Description	String length / Data type	Value	Set signal /Reset signal	Internal I/O	I/O Expander	ST GPIO	Function button (optional)
Batch decrement	Decrements the batch counter with one. In Job, batch decrement is only possible from the Job reference and it is not possible to decrement batch once the Job is completed	1 bit	0 = Not used 1 = Decrement	Batch decrement /no signal	X	X	X	X
Batch increment	Increments the batch counter with one. Batch status is dependent on C243 Batch status at increment	1 bit	0 = Not used 1 = Increment	Batch increment /no signal	X	X	X	X
Bypass Identifier	Bypasses the next identifier in the Work order for entering identifier types.	1 bit	0 = Not used 1 = Bypass Id	Bypass next identifier /no signal	X	X	X	X
Bypass Pset in Job	Skips the next Pset or Multistage in the running Job. Batch status is dependent on C243 Batch status at increment	1 bit	0 = Not used 1 = Bypass Pset in Job	Bypass Pset /no signal	X	X	X	X
Click Wrench 1-4	Use in combination with the click wrench tightening strategy to confirm a click wrench operation.				X	X	X	X
Dig out monitored # = 1-4	Monitored by DigIn Controlled 1 - 4	1 bit	0 = reset 1 = set	Set DigIn controlled /Reset DigIn controlled	X	X	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 PF monitoring mode on fieldbus "To PF" side, it is possible to display changes in signals sent to PF over the fieldbus. (Note that the signals have no effect on the Power Focus, since all fieldbus communication is disabled). On the fieldbus side "From PF" will all bits be reset to zero. The traffic of "keep alive" signals continues on the fieldbus. In this way no event codes (i.e. No connection on fieldbus) will be displayed. All tools are enabled (presupposed that the tools were disabled from a source over the fieldbus before then). If there is a running Job, which has been selected via the fieldbus, the Job will be aborted.				X	X	X	X
Disable ST scanner	Disables scanning from ST scanner.	1 bit	0 = Not used 1 = disable ST scan	Disable ST scanner /no signal	X	X		X
Disconnect tool	Sends disconnect tool request.	1 bit	0 = Not used 1 = disconnect	Disconnect tool /no signal	X	X		

Name	Description	Fieldbus items			Digital inputs			
	Description	String length Data type	Value	Set signal /Reset signal	Internal I/O	I/O Expander	ST GPIO	Function button (optional)
External monitored 1-8	Used for external input, for example from a PC application.				X	X	X	
Fieldbus digin 1-4	These inputs give a direct link to fieldbus. Fieldbus digital input numbers must be configured in Power Focus, I/O Expander and in fieldbus. Fieldbus mimics the status of a digital input.				X	X	X	
Fieldbus handshake	Sends to PF to check if fieldbus works.	1 bit	0 = Not used 1 = Handshake	Fieldbus Hand shake Set /Fieldbus Handshake Reset				
Flash tool green light, or Tool light flash green	Activates the tool green light (flashing at approximately 1.33 Hz). The light is on until tightening starts. After tightening the tool light indicates status according to result. This input is ignored during rundown.	1 bit	0 = Not used 1 = Tool light flash	Tool light flash green /no signal	X	X	X	X
Flash tool yellow light, or Tool lights flash yellow	Activates the tool yellow light (flashing at approximately 1.33 Hz). The light is on until tightening starts. After tightening the tool light indicates status according to result. This input is ignored during rundown.	1 bit	0 = Not used 1 = Tool light flash	Tool light flash yellow /no signal	X	X	X	X
Forced CW once	The tool will be forced to perform one loosening even if the ring is positioned in CW. After the loosening has been performed the tool will return to the current ring position							X
Forced CW toggle	The tool will be forced to perform loosening until the function has been selected again. After the function has been selected again the tool will return to the current ring position.							X
Forced CCW once	The tool will be forced to perform one loosening even if the ring is positioned in CW. After the loosening has been performed the tool will return to the current ring position							X
Forced CCW toggle	The tool will be forced to perform loosening until the function has been selected again. After the function has been selected again the tool will return to the current ring position.							X

	Description	Fieldbus items			Digital inputs			
Name	**Description**	**String length** **Data type**	**Value**	**Set signal /Reset signal**	**Internal I/O**	**I/O Expander**	**ST GPIO**	**Function button (optional)**
ID-card	Signal input from card reader to indicate that an ID-card is inserted in the reader.				X	X	X	

Name	Description	Fieldbus items		Set signal /Reset signal	Digital inputs			
	Description	String length Data type	Value		Internal I/O	I/O Expander	ST GPIO	Function button (optional)
Identifier	Input of VIN number from the PLC. Set identifier input source in PF to "Fieldbus". 0 string is ignored.	24 – 208 bit (3-26 bytes) CSI	One ASCII sign for each character First byte is counter	New VIN input /no signal				
		16 – 200 bit (2-25 bytes) CSC	One ASCII sign for each character					
		2 bytes in the same word U16	U 16: If the value is less than 5 digits decimal, PF will fill with zeros in front.					
		4 bytes in two words U32	U32: If the value is less than 10 digits decimal, PF will fill with zeros in front.					
		4 bytes in two words U32_HNW	Only for Intel format					
		16 – 192 (2 – 24 bytes CSCI	One ASCII sign for each character, string is in Intel byte order					
		32 – 208 bytes) CSII	One ASCII sign for each character. First byte is counter. String is in Intel byte order.					
Identifier_Multi	Max 100 characters in identifier string.	16 – 800 bits CSC	Char string	Identifier /no signal				
		16 – 800 bits CSCI	Intel Endian					

Name	Description	Fieldbus items		Set signal /Reset signal	Digital inputs			
	Description	String length Data type	Value		Internal I/O	I/O Expander	ST GPIO	Function button (optional)
		16 bits in one word U16	00….0001 = Job 1 00….1000 = Job 8					
Job off	Gets off Job mode and unlocks tool.	1 bit	0 = Job On 1 = Job Off	Job Off /Job On	X	X		
Job select bit (0-8)	Job select input when selecting Job from digital input.				X	X	X	
Job select	Selects a Job. Job select source must be set to Fieldbus. Job 0 = no Job selected.	2 – 8 bits in the same byte. BF	0000 0001 = Job 1 0001 0000 = Job 16	Select Job /no signal				
		16 bits in one word U16	00….0001 = Job 1 00….1000 = Job 8					
Keep alive	Sends to PF to check if fieldbus communication alive.	2 – 8 bits in the same byte BF	00000000 = 0 11111111 = 255	Keep alive changed /no signal				
Last DigIN	Must be the last one							
Line control alert1	Input for a position breaker. Gives alarm if a Job with line control is not finished.	1 bit	0 = Not Used 1 = Line control alert 1	Line control alert 1 /no signal	X	X	X	
Line control alert2	Input for a position breaker. Gives alarm if a Job with line control is not finished.	1 bit	0 = Not Used 1 = Line control alert 2	Line control alert 2 /no signal	X	X	X	
Line control start	Input signal to start the line control function. Activate with J330 set to Yes.	1 bit	0 = Not Used 1 = Line control	Line control start set /Line control start reset	X	X	X	
Logic digin 1-10	DigIn not connected to any function but used by the Logic Operator function. (PF4000 only)				X	X		
MasterUnlockTool	Unlocks all locks which are regarded as event controlled.	1 bit	0 = Not used 1 = Master Unlock	Master unlock tool /no signal	X	X	X	X
Open protocol commands disable	When activated all the commands received by the Power Focus via Open Protocol are rejected.				X	X	X	X

Name	Description	Fieldbus items			Digital inputs			
	Description	String length Data type	Value	Set signal /Reset signal	Internal I/O	I/O Expander	ST GPIO	Function button (optional)
Off	The input is not used.							
Pset select bit (0-9)	Pset select input when selecting Pset from digital input. The table shows the relation between bit set and Pset ID. Bit 2 / Bit 1 / Bit 0 / Pset/Job ID 0 / 0 / 0 / 0 0 / 0 / 1 / 1 0 / 1 / 0 / 2 0 / 1 / 1 / 3 1 / 0 / 0 / 4 ... / ... / ... / ...				X	X	X	
Pset select	Select a Pset. C200 Pset must be set to "Fieldbus". Pset0 = no Pset selected.	2 – 8 bits in the same byte. BF	0000 0001 = Pset 1 0001 0000 = Pset 16	Select Pset /no signal				
		16 bits in one word U16	00….0001 = Pset 1 00….1000 = Pset 8					
Pset select 0Is1	Selects a Pset. C200 Pset must be set to "Fieldbus". Pset0 = no Pset selected. Number 0 = Pset1 number 1 = Pset2 etc.	2 – 8 bits in the same byte. BF	0000 0001 = Pset 2 0001 0000 = Pset 17	Select Pset /no signal				
Pset select and set batch size	Selects Pset and sets its batch size. Byte0: PsetID; Byte1: BatchSize	16 bits OA	Byte 0 = PsetID Byte 1 = Batch size	Set Batch Size and Select Pset /no signal				
Pset toggle	Toggle between Psets connected to one socket in a Selector. C200 Pset must be set to "Selector".	1 bit	0 = Not used 1 = Pset Tog	Pset Toggle /no signal	X	X	X	X
Read result handshake	Handles read results.	1 byte BF	0 = Not used 1 = Read 2 = Skip 4 = Flush	ReadResult Handshake /no signal				

Name	Description	String length / Data type	Value	Set signal /Reset signal	Internal I/O	I/O Expander	ST GPIO	Function button (optional)
Relay pos# # = 1-4	Controls a relay from fieldbus. In I/O setup the selected relay must be programmed to fieldbus relay x. There are four different items.	1 bit	0 = Relay OFF 1 = Relay ON	Set fieldbus relay x /Reset fieldbus relay x				
Remote start cont.,	Tool starts tightening. The tool stops if the input signal disappears (equal to a start with tool trigger). ⚠ **The position of the tool direction ring is not taken into account. This may cause tool reaction forces in a direction unexpected to the operator.** ℹ **Remote start is not available for Tensor STB tools.**				X			
Remote start pulse	Tool starts tightening if the input pulse is > 100 ms. Tool runs until target is reached. ⚠ **The position of the tool direction ring is not taken into account. This may cause tool reaction forces in a direction unexpected to the operator.** ℹ **Remote start is not available for Tensor STB tools.**				X			
Request ST scan	Sends a scan request to ST scanner. The scan LED on an ST scanner is lit if a scan request is configured for the LED in ST scan configuration. Scanner source must be correct.	1 bit	0 = Not used 1 = request	Request ST Scan /no signal	X	X		
Reset all Identifiers	Resets all identifiers and relays for identifier.	1 bit	0 = Not used 1 = Reset all ID	Reset all identifier /no signal	X	X	X	X
Reset batch	Resets the batch counter to 0.	1 bit	0 = Not used 1 = Reset the batch	Reset batch /no signal	X	X	X	X
Reset bistab relay 1	Reset bi-stable relay No. 1				X	X	X	
Reset bistab relay 1	Reset bi-stable relay No. 1				X	X	X	
Reset Job status	Resets Job done status.	1 bit	0 = Not used 1 = Reset Job Status	Reset Job Status /no signal				

Name	Description	String length Data type	Value	Set signal /Reset signal	Internal I/O	I/O Expander	ST GPIO	Function button (optional)
	Description	**Fieldbus items**			**Digital inputs**			
Reset latest Identifier	Resets the latest identified identifier.	1 bit	0 = Not used 1 = Reset latest Id	Reset latest identifier /no signal	X	X	X	X
Reset NOK counter	Unlocks (if locked) and resets Possible coherent not ok tightening counter.	1 bit	0 = Not used 1 = Reset NOK counter	Reset NOK counter /no signal	X	X	X	X
Reset relay	Resets all relays except tracking event relay	1 bit	0 = Not used 1 = Reset	Reset relay /no signal	X	X	X	
Reset result status	Resets all result status on relay, RE-Alarm and fieldbus.	1 bit	0 = Not Used 1 = Reset result	Reset result status /no signal				
Restart Job	Stops current Job and restarts the same Job from 0.	1 bit	0 = Not used 1 = Restart Job	Restart Job /no signal	X	X	X	X
Select next Pset	Selects next Pset.	1 bit	0 = Not used 1 = Select next Pset	Select next Pset /no signal	X	X	X	X
Select prev Pset	Selects previous Pset.	1 bit	0 = Not used 1 = Select previous Pset	Select previous Pset /no signal	X	X	X	X
Selector control green light	Used to set green light on selector when selector external controlled is active. Two bits for one position, 01 flash, 10 solid others off.	32 bits OA	0=device ID 1=not used 2=position 1-4 3=position 5-8	Set selector green light /reset selector green light				
Selector control red light	Used to set red light on selector when selector external controlled is active. Two bits for one position, 01 flash, 10 solid others off.	32 bits OA	0=device ID 1=not used 2=position 1-4 3=position 5-8	Set selector red light /reset selector red light				
Set batch size / Set batch size Pset ID	Sets batch size in indicated Pset ID (Set Batch Size Pset ID). These two items must be used together. 0<Batch Size<=99	2 - 8 bits in the same BF	00000000 = 0 11111111 = 255	Set batch size and Pset id /no signal				
		2 bytes U16	Binary representation (Decimal 0-65535)					
Set bistab relay 1	Activate bi-stable relay No. 1				X	X	X	
Set bistab relay 2	Activate bi-stable relay No. 2				X	X	X	

| Name | Description | Fieldbus items | | | Digital inputs | | | |
		String length Data type	Value	Set signal /Reset signal	Internal I/O	I/O Expander	ST GPIO	Function button (optional)
Set CCW	Sets direction according to input level. Low level corresponds to CW and high level corresponds to CCW. SL tool only.	1 bit	0 = set CW 1 = set CCW	Set CCW /Set CW	X	X		X
Set home position	Sets home position for home position strategy.	1 bit	0 = Not used 1 = Set home position	Set home position /no signal	X	X	X	X
Set monostab relay 1	Activate mono stable relay No. 1				X	X	X	
Set monostab relay 2	Activate mono stable relay No. 2				X	X	X	
Set selector LED	Sets/Resets selector LED from fieldbus Byte0: DeviceID; Byte1: Not used; Byte2: Sel LED 1-4; Byte3: Sel LED 5-8	32 bits OA	Byte 0 = Device ID Byte 1 = Not used Byte2, 3 = selector LED	Set selector LED /no signal				
Start ST scan	Sends a scan start request to ST scanner. Scanning starts directly. Scanner source must be correct.	1 bit	0 = Not used 1 = Start ST Scan	Start ST Scan /no signal	X	X		X
Store current tightening program in the tool	This is a command input to store the current tightening program settings into the wireless tool NVRAM. The tool must be set in standalone mode				X	X		
Timer enable tool	Used with the function Timer enable tool that locks the tool according to configuration. The function unlocks the tool for a period of five seconds. Once the period expires, the tool is locked again. If a start attempt is made before five seconds have passed, the tool remains unlocked until it is stopped or button is released (plus that a new five seconds period starts).	1 bit	0 = reset 1 = set	Timer Enable Tool /Timer Enable Released	X	X	X	X

Name	Description	String length Data type	Value	Set signal /Reset signal	Internal I/O	I/O Expander	ST GPIO	Function button (optional)
	Description	**Fieldbus items**			**Digital inputs**			
Toggle CW/CCW	Toggles direction between CW and CCW. SL tool only.	1 bit	0 = Not used 1 = Toggle	Toggle CW/CCW /no signal	X	X		X
Toggle CW/CCW for next run	Changes direction and changes back automatically after one run. SL tool only.	1 bit	0 = Not used 1 = Toggle	Toggle CW/CCW for next run /no signal	X	X		X
Tool disable n.c.	The tool does not start when this input is active. If the tool rotates, it will immediately stop. The input is active when the circuit is opened (normally closed).				X			
Tool disable n.o.	The tool does not start when this input is active. If the tool rotates, it will immediately stop. The input is active when the circuit is closed (normally open).				X			
Tool disabled	Fieldbus disable tool. To avoid conflicts this parameter shall not be selected if Tool enabled is used.	1 bit	0 = Enable tool 1 = Disable tool	Tool disable /Tool enable				
Tool enabled	Fieldbus enable tool. To avoid conflicts this parameter shall not be selected if Tool disabled is used.	1 bit	0 = Disable tool 1 = Enable tool	Tool enable /Tool disable				
Tool in work space	TLS System reports that the tool is in work space via Open protocol interface.				X			
Tool in product space	TLS System reports that the tool is in product space via Open protocol interface.				X			
Tool lights flash green, see Flash tool green light								
Tool loosening disable	The function is similar to Tool Disable, but only for loosing.	1 bit	0 = Loosening enable 1 = Loosening disable	Tool loosening disable	X			
Tool start loosening	Starts the tool in loosening direction. Direction depends on CW/CCW in PF. Tool start input source must be set to Fieldbus.	1 bit	0 = Stop tool 1 = Start loosening	Start loosening /Stop tool	X			
Tool start tightening	Starts the tool in tightening direction. Direction depends on CW/CCW in PF. Tool start input source must be set to Fieldbus.	1 bit	0 = Stop tool 1 = Start tightening	Start tightening /Stop tool				

	Description		Fieldbus items			Digital inputs			
Name	**Description**	**String length** **Data type**	**Value**	**Set signal** **/Reset signal**		**Internal I/O**	**I/O Expander**	**ST GPIO**	**Function button (optional)**
Tool stop	Stops the tool.	1 bit	0 = Not used 1 = Stop tool	Stop tool /no signal					
Tool tightening disable	The function is similar to Tool Disable, but only for tightening.	1 bit	0 = Tightening Enable 1 = Tightening Disable	Tool tightening disable /Tool tightening enable		X			
Tool tightening pulse	Tool starts tightening if the pulse is longer than 100 ms and continues until target or current limit is reached	1 bit	0 = Not used 1 = Start Tighten Pulse	Tool tightening start /no signal					
Unlock tool	Unlocks tool if tool locked by batch ok or lock on reject	1 bit	0 = Not used 1 = Unlock tool	Unlock tool /no signal		X	X	X	X

22 Parameter list

This section lists the Power Focus parameters.

22.1 Pset

22.1.1 Programming

Parameter number	Parameter name	Description	Default setup
P100	Control strategy	For a description of the options, see section Control strategies. Tq con Tq con/ang mon Tq con/ang con (AND) Tq con/ang con (OR) Ang con/tq mon DS con DS con/tq mon Reverse ang Reverse tq Click wrench Rotate spindle forward Rotate spindle reverse Home position forward Home position reverse EP monitoring Yield Yield / Tq con (OR) Pulsor fixed Pulsor control Snug gradient Residual Tq7Time Residual Tq/Angle Breakaway peak Loose and tightening Pulsor angle shutoff **The Reverse angle, Rotate spindle forward/reverse, and Home position forward/reverse strategies are not applicable for Open end tools.**	IF DS tool: DS con ELSE: Tq con/ang mon

Parameter number	Parameter name	Description	Default setup
P101	Tightening strategy	One stage: tightening is performed in one stage. Control is done from *P110 Cycle start* until *P113 Final target* is reached.	Two stage
		Two stage: tightening is performed in two stages. Control is done from *P110 Cycle start* until *P111 First target*. The tool stops and then accelerates to a lower speed and controls until P113 Final target is reached.	
		Quick step: quick step is a variant of a two stage tightening. The difference is that the tool speed changes directly from the higher speed to the lower speed without stopping.	
		Ergo ramp: This is a two stage strategy with a constant increase in torque during the second stage of the tightening. Gives the operator constant reaction torque in the tool regardless of joint hardness.	
P104	Rundown angle	This parameter is optional. If chosen, there are two alternatives.	No
		From start: The rundown phase starts when the tool trigger is pressed and continues until the torque value reaches *P116 Rundown complete*.	
		From cycle start: The rundown phase starts when the torque level exceeds the *P110 Cycle start* torque level and continues until *P116 Rundown complete* is reached.	
P105	Zoom step	This parameter enables the zoom step function. Zoom step strategy combines quick tightening with high precision and low scatter.	No
P107	Click wrench no.	This parameter is only used if Click wrench is chosen as *P100 Control strategy*. It is used to connect the click wrench strategy to any one of four defined digital input.	Click wrench 1
P108	Start Trace from	Will generate a Trace from *Tool start* or *P110 Cycle start*.	*P110 Cycle start*
		For STwrench, only *P110 Cycle start* is available.	
P109	Monitor end time from	Decides if monitoring of end time (cycle complete) will start from *P110 Cycle start* or *P116 Rundown complete*.	P110 Cycle start
P110	Cycle start	Defines the starting level for a tightening cycle.	IF P100 Control strategy is set to DS con or DS con/tq mon: 0.1 * T102 ELSE: 0.05 * T102 Tool max torque
P111	First target	Defines the level at which the changeover takes place between the first and second stage in a two stage tightening, quick step or ergo ramp.	0.25 * T102 Tool max torque
P112	Final tq min	Defines the lower torque limit for OK tightening.	0.3 * T102 Tool max torque

Parameter number	Parameter name	Description	Default setup
P113	Final target	Defines the desired final torque value when a torque (tq) *P100 Control strategy* is used. The tool shuts off when the final target value is reached. ⓘ **To maintain accuracy when tightening, final target shouldn't be lower than specified minimum for the tool in use. Refer to tool catalogue for necessary data.**	9999 Nm
P114	Final tq max	Defines the upper torque limit for OK tightening. The tool shuts off if the torque value exceeds this value.	0.5 * T102 Tool max torque
P115	Cycle complete	This parameter indicates the torque level when the tightening cycle is complete (valid if the tool has shut off prior to reaching this level)..	0.03 * T102 Tool max torque
P116	Rundown complete	The torque level when the rundown phase is finished. (Only used if *P104 Rundown angle* or any of the PVT options are selected).	0.2 * T102 Tool max torque
P118	Measure torque at	Defines at what point the torque is measured. Torque peak: gives the highest torque value during the tightening. Angle peak: gives the torque at the highest angle value. Shut off: measures the torque when the target condition has been fulfilled.	Torque peak
P119	Loosening limit	Defines the limit for a valid loosening. Adjustable from 0 to *T102 Tool max torque*.	0.1 * T102 Tool max torque
P120	Start final angle	Angle measurement starts when the torque value exceeds this value. *P120 Start final angle* must be selected equal to or greater than *P110 Cycle start*. (If a PVT option is used then it has to be greater than *P116 Rundown complete*.)	0.25 * T102 Tool max torque
P121	Measure angle to	Defines to what point the final angle is measured. The start point is always *P120 Start final angle*. Torque peak: gives the angle at the highest torque value. Angle peak: gives the highest angle value during the tightening. Cycle complete: measures the angle at *P115 Cycle complete*. Shut off: measures the angle when the target condition has been fulfilled.	Angle peak
P122	Final angle min	This parameter indicates the lower limit for final angle. If the final angle is below this level the tightening is considered as NOK.	0 deg
P123	Target angle	Indicates the target value for the angle in degrees when angle control, ang con, is used. When this value is reached the tool is turned off.	0 deg
P124	Final angle max	Defines the upper limit for the tightening angle. If the angle exceeds this level the tightening is considered as NOK and the tool will shut off.	9999 deg
P125	Rundown angle min	This parameter indicates the min limit value for *P104 Rundown angle*. If the angle is smaller than this value at *P116 Rundown complete*, "low" is indicated and the tool will shut off.	0 deg
P126	Rundown angle max	This parameter indicates the max limit value for *P104 Rundown angle*. If the angle is larger than this value, "high" is indicated and the tool will shut off.	9999 deg

Parameter number	Parameter name	Description	Default setup
P127	Final angle max mon	Defines the upper limit for the tightening angle. If the angle exceeds this level the tightening is considered as NOK but the tightening will NOT shut off due to this.	9999 deg
P128	Rehit angle	Defines the max angle for rehit detection. Only for MW tool.	0 deg
P130	Soft start speed	Defines the tool speed during the soft start interval. Allowed interval is between 1 and 30 percent of maximum tool speed.	10%
P131	Step 1 speed	Defines the first step speed. Speed is adjustable between 1 and 100 percent of max tool speed.	100%
P132	Step 2 speed	Defines the second step speed. Speed is adjustable between 1 and 40 percent of the tool max speed. If two stage tightening is used the speed in the second step will increase according to the *P136 Step 2 ramp* until it reaches this value. If quick step is used the tool changes to step 2 speed directly without using a ramp.	40%
P133	Loosening speed	Defines speed during loosening. The value is adjustable between 1 and 100 percent.	100%
P134	Loosening ramp	Defines acceleration during loosening. The value is adjustable between 0 and 100 percent. A low percentage gives fast acceleration.	0%
P135	Step 1 ramp	Defines step 1 acceleration. The value is adjustable between 0 and 100 percent. A low percentage gives fast acceleration (0% is normally used).	0%
P136	Step 2 ramp	Defines step 2 acceleration. A low percentage gives fast acceleration (0-100%).	20%
P137	Ergo ramp	Defines the acceleration. The value is adjustable between 0 and 100 percent. Only used if ergo ramp is chosen as the *P101 Tightening strategy*.	40%
P138	Zoom step speed	Defines the speed used for zoom step strategy. The value is a percentage of the tool's max speed. The value is adjustable between 1 and 20 percent. To set zoom step speed, parameter *P105 Zoom step* must be active.	10%
P139	Speed unit	Sets speed parameters (P130-P133, P138 and P161) relative to tool max speed ("Percent") or absolute ("RPM") for current P-set. **Changes between RPM and % due to less accuracy in % can lead to quantization effects in values for speed parameters.**	"Percent"
P141	End time	Defines the time required for the torque level to stay below *115 Cycle complete* before the tightening is aborted (valid if the tool has not shut off prior to reaching cycle complete). The value is adjustable between 0.02 and 5.0 seconds.	0.2 s
P142	Soft start time	During this time, from the moment that the tool trigger is pressed, the spindle rotates very slowly. This gives the operator a chance to fit the socket on the screw. The value is adjustable between 0.0 and 5.0 seconds.	0.2 s
P143	Tool idle time	Defines the idle time between a completed tightening and the start of the next tightening. (Used in Multistage). The value is adjustable between 0 and 32 seconds.	0.0 s

Parameter number	Parameter name	Description	Default setup
P144	Cycle abort timer	If the tool does not reach its shut off point, this timer will shut it off. The timer is activated when the tool trigger is pressed. The value is adjustable between 0.1 and 60.0 seconds.	30 s
P150	Batch count	Activates a function that measures how many times a tightening is repeated. It must be determined from where *P151 Batch size* value should be read, if this parameter is activated. Options: Off: batch count functionality is not used. Pset: use batch size of a Pset. Fieldbus: an external source decides *P151 Batch size* via fieldbus. Ethernet/serial: an external source decides *P151 Batch size* via Ethernet or serial interface. ⓘ **If batch count is used in a Job (that includes the specific Pset), this parameter is recommended to be set to "Off".**	Off
P151	Batch size	The size can be 1 - 99. To set this parameter, the *P150 Batch count* must be in active mode. ⓘ **Batch size defined in Job overrides batch size defined in Pset.**	1
P152	Lock at batch done	The tool will be locked when reaching Batch done. Batch done is reached when the number of correct tightenings is equal to *P151 Batch size*.	No
P153	Max coherent NOK's	Defines the number of possible subsequent NOK (not OK) tightenings. This parameter is overruled by M208. To be able to set a value for P153 the parameter *J301 Job type* must be set to 'Forced' or 'Free and forced' Range: 1-10.	0 (Off)
P160	High speed rundown	High speed rundown is a function for reducing the cycle time by running the tool at high speed during rundown. High speed rundown is a stage inserted between Soft start and Step 1, i.e. the Soft start time and Soft start speed affects the number of degrees of the rundown phase. This gives the possibility for fast tightening cycles even for long bolts with a small angle that require a slow step-one speed to avoid overshoots.	Off
P161	Rundown speed	Rundown speed in percent.	100 %
P162	High speed interval	High speed rundown interval.	9999 deg
P163	High speed ramp	Defines the acceleration to *P161 Rundown Speed* during the high speed rundown stage. The value is adjustable between 0 and 100 percent. A low percentage gives fast acceleration.	10%
P164	Disable high speed rundown speed once if NOK	Disable the high speed rundown function after a NOK tightening and enable high speed rundown speed when the tightening is OK. This function is only possible to enable if the *P160* is On	Off
P170	Adjustable limit	Adjustable positioning limit for open end tools. Used to set torque limit for the positioning of the tool after tightening. If set to No the internal default value is used as limit.	No

Parameter number	Parameter name	Description	Default setup
P171	Limit	Maximum torque during positioning. Default value is tool dependent and stored in tool memory. The max value is limited to *T424 Max* torque positioning *limit*. ⓘ **The limit must be lower than the maximum torque in reverse specified by the open end gear supplier. Using higher values can result in damaging the open end gear.**	Tool dependent
P180	Delta angle	Gradient angle interval	10 deg
P181	Delta torque	Gradient torque interval	Tool dependent, 5% of Tool max tq
P182	Torque limit	Torque search limit for snug detection	Tool dependent, Tool max tq
P183	PVT distance	Defines how many degrees before the Snug point the start value of the PVT compensation torque shall be used.	0 deg
P184	PVT interval	The angle interval after the PVT distance point, during which the PVT compensate torque is evaluated.	0 deg
P185	Compensate value	Option to choose between an average value and peak value during the PVT interval.	Average
P186	Delay monitoring after cycle start	During this interval all Snug Gradients found will be disregarded. The delay interval starts when Cycle start has been passed.	0 deg
P190	Snug PVT monitoring min	The lowest torque value allowed while searching after Snug point.	P110 Cycle start
P191	Snug PVT monitoring max	The highest torque value allowed while searching after Snug point	P182 Torque limit

22.1.2   Programming +

Parameter number	Parameter name	Description	Default setup
P200	Current monitoring	ⓘ **This function is not applicable for DS tools.** Activates the current monitoring function. The spindle torque is proportional to the motor current. By measuring motor current a method of measurement that is independent of the torque transducer is achieved. The torque forming current is expressed as percentage of nominal current at *T102 Tool max torque*. Set an acceptance window for the torque as redundant process control via parameters *P201 CM min* and *P202 CM max*.	No
P201	CM min	Defines min limit for OK tightening.	0.0%

Parameter number	Parameter name	Description	Default setup
P202	CM max	Defines max limit for OK tightening.	150%
P210	Selftap	Activates the PVT selftap function. When the joint has a torque peak at the start of the tightening it can be recommended to use the PVT selftap monitoring option to ensure that the tightening gets the right characteristics. It also makes it possible to perform tightenings where the start torque is higher than *P113 Final target* or *P114 Final tq max*.	No
P211	Selftap interval	Defines the section where measuring is performed. Setting is performed in degrees in the interval 1 to 9999.	1
P212	No. of selftap windows	Defines the number of windows that the *P211 Selftap interval* is to be divided into. Each window is then evaluated separately. Mean value foundations are calculated from a number of windows to reduce the effect of noise. Fewer number of windows mean that more samples will be grouped together, hence one odd sample will have less impact on the calculated mean value and vice versa. A higher *P212 No. of selftap windows* makes the monitoring more sensitive whereas a lower number will filter more noise. The number of windows can be chosen between 1 and 9999.	1
P213	Selftap min	Indicates the lowest torque level for the interval. If the torque level falls below this level, a low-level alarm will be generated. If *P109 Monitor end time* from is set to Cycle start, then range is from *P115 Cycle complete* value to *P214 Selftap max*. If *P109 Monitor end time* from is set to Rundown complete, then range is from 0 to *P214 Selftap max*.	P115 Cycle complete
P214	Selftap max	This parameter indicates the highest torque level for the interval. If the torque level exceeds this level, a high level alarm will be generated. Range is from *P213 Selftap min* to *T102 Tool max torque*.	9999 Nm
P220	PVT monitoring	Activates the PVT monitoring function.	No
P221	PVT delay interval	Defines delay before *P220 PVT monitoring* starts. Setting is performed in degrees in the interval 0 to 9999.	0 deg
P222	PVT monitor interval	Defines the interval during which the *P220 PVT monitoring* is to be performed. Setting is performed in degrees in the interval 1 to 9999.	1 deg
P223	No. of PVT windows	Defines the number of windows that the *P222 PVT monitor interval* is to be divided into. Each window is then evaluated separately. Mean value foundations are calculated from a number of windows to reduce the effect of noise. Fewer number of windows mean that more samples will be grouped together, hence one odd sample will have less impact on the calculated mean value and vice versa. A higher *P223 No. of PVT windows* makes the monitoring more sensitive whereas a lower number will filter more noise. The number of windows can be chosen between 1 and 9999.	1

Parameter number	Parameter name	Description	Default setup
P224	PVT min limit	This value is evaluated against the monitor interval peak value at the end of the interval. If the torque value falls below this limit, an alarm is generated. If P109 Monitor end time from is set to Cycle start, then range is from *P115 Cycle complete* value to *P225 PVT max limit*. If P109 Monitor end time from is set to Rundown complete, then range is from 0 to *P225 PVT max limit*.	P115 Cycle complete
P225	PVT max limit	This parameter is monitored in real time during the monitor interval and if exceeded, an alarm is generated.	P116 Rundown complete
P230	PVT comp	When this option is set to "Yes" a prevailing torque PVT compensate is (measured at the interval of 20 samples preceding start of *P231 PVT comp point*) used as reference for the torque during the actual tightening cycle. ⓘ **All torque values; i.e. P113 Final target, P111 First target and P114 Final tq max are compensated (subtracted) from the prevailing value. Also, the results are compensated.**	No
P231	PVT comp point	The value can be set between 0 and 9999 degrees.	10 deg
P240	Tool tightening direction	CW/CCW Select tool rotation direction. "CW" for right hand threaded screws and "CCW" for left hand threaded screws. To be able to start in the decided direction, turn the tool direction ring to its correct position. ⓘ **This parameter has no effect when running an Open end tool (tube nut tool).**	CW
P241	Soft stop	Yes/No The PF will ramp down the torque when target is reached. The "Yes" option is recommended.	Yes
P242	Alarm on rehit	Yes/No If selected, Power Focus will detect rehits (event code E112 Rehit). The red tool LED will be lit when a rehit is detected. The criteria for a rehit are a short or a non-existent second stage in combination with a slow speed in the first stage.	No
P243	Alarm on tq < target	Yes/No Decides if the tightening should be approved if the final torque is lower than the *P113 Final target* but above *P112 Final torque min*.	No
P244	Alarm on lost trigger	Yes/No Power Focus will detect if the tool trigger was released before the *P113 Final target* was reached.	No
P245	DS torque tuning factor	Only used if "DS con" is chosen as a *P100 Control strategy*. It compensates for the error that DS measurement induces. The value can be set between 80 and 220 percent. For information how to adjust the DS torque-tuning factor, see section DS con.	100%
P246	Alarm on end time shutoff	Yes/No If end time times out before *P113 Final target* was reached then an event code will be displayed.	No

Parameter number	Parameter name	Description	Default setup
P247	Socket release	Rotates the socket approximately three degrees backwards after the tightening is done.	No
P250	Gradient monitoring	Monitors the torque increase or decrease for an angle window.	No
P251	Gradient torque min	Minimum increase of the torque for the angle window.	0
P252	Gradient torque max	Maximum increase of the torque for the angle window.	9999
P253	Joint hardness	Hardness coefficient for the joint. 1- hard joint, 20- soft joint	10
P254	Start torque	Torque threshold where the gradient monitoring is to be started.	Start final angle
P255	Angle offset	Additional angle from *P254 Start torque* before gradient monitoring is started.	0 deg
P260	Start torque	The torque threshold where the yield control is to be started. **Yield control is activated by selecting the P100 Control strategy to Yield or Yield/Tq con (OR). The P101 Tightening strategy can be set to One stage, Two stage or Quickstep, and yield control will always interact in the second stage of the tightening. P105 Zoom step strategy ending is disabled when yield control is selected. An additional tightening angle can be added after the yield point is reached by setting an angle to the P264 Extra angle step parameter.**	0.0 Nm
P261	Step angle	Defines the angle interval between the sample windows.	0 deg
P262	Window angle	Defines the length of the angle interval (the window) in which an average of the torque values shall be calculated.	0 deg
P263	Yield slope ratio	This parameter decides the sensitivity of the yield point detection. The set value is the percentage of the maximum slope, at which the yield point is considered reached. 100% corresponds to the maximum slope during the tightening (early shut-off and highest sensitivity), and 0% to a completely horizontal portion of the trace (late shut-off close to or after peak torque).	50 %
P264	Extra angle step	Additional angle step after the yield point is reached.	0 deg
P280	Post view torque	Enable/disable the post view torque functionality. Only useful if torque is to be measured during monitoring interval. Some joints have a torque peak prior of P116 Rundown complete. Post view torque function makes it possible to monitor torque values during two specified angular intervals. The interval start is defined as angle prior to rundown complete. Torque is then monitored for a specified angular interval. Evaluation (OK/NOK) is done when rundown complete is reached. **Not accessible when any PVT-option is selected.**	No
P281	Post view min torque	Defines the low limit for the torque during the entire interval.	P110 Cycle start
P282	Post view min monitoring start	Start of min monitor interval.	9999
P283	Post view min monitoring interval	Length of min monitor interval.	1

Parameter number	Parameter name	Description	Default setup
P284	Post view max torque	Defines the high limit for the torque during the entire interval.	*P116 Rundown complete*
P285	Post view max monitoring start	Start of max monitor interval.	1
P286	Post view max monitoring interval	Length of max monitor interval.	1

22.1.3   Pset setup

Parameter number	Parameter name	Description	Default setup
P400	View existing Psets	To view existing Psets in the current PF channel. Both numbers and logical names will be displayed.	
P401	Create new Pset	To create and open a new Pset. Each Pset has a unique ID number between 1 and 250 (or up 300 with the configurable memory functionality).	
P402	Name Pset	Used when a selected Pset is to be named with a logical name. Up to 25 characters.	Empty string
P403	Copy Pset	Used when a source Pset is to be copied to a destination Pset.	
P404	Delete Pset	Used when a Pset is to be removed. **If a Pset is a part of a Job it can not be deleted.**	
P406	Pset updated	Timestamp (date and time) for Pset latest modification. Not editable.	
P409	Pset updated by	Displays the name of the user who last changed the Pset. Not writable. If no user has logged in the filed values are: TTPF if changed via ToolsTalk, OPER if changed via the controller, and BLANK if the Pset has been created in an earlier version of the software.	
P410	Delete Pset results	Used when all results that belong to the current Pset are to be cleared.	
P411	Delete all results	Used when all Pset results are to be cleared.	
P420	Comment	The comments displayed here are entered in a dialog box each time a Pset is stored. A prerequisite is that parameter C600 is set to Pset comments. Length 0-100 characters.	No

22.1.4   Statistic programming

Parameter number	Parameter name	Description	Default setup
P500	Min valid stat tq limit	The result must be greater than or equal to this value in order for it to be included in the statistical calculations.	0 Nm

Parameter number	Parameter name	Description	Default setup
P501	Max valid stat tq limit	The result must be less than or equal to this value in order for it to be included in the statistical calculations.	9999 Nm
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 2 and 20.	4
P503	No. of subgroups	Power 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.	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.	1
P505	Latest n values	The latest number of values (1 - 100) that is used in the statistical calculations.	30
P506	SPC alarm tq	With this parameter it is possible to switch on or off the torque SPC alarm function.	Off
P507	SPC alarm angle	With this parameter it is possible to switch on or off the angle SPC alarm function.	Off
P508	SPC alarm CM	With this parameter it is possible to switch on or off the current SPC monitoring alarm function.	Off
P510	Torque X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually.	0 Nm
P511	Torque X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually.	9999 Nm
P512	Torque range LCL	The lower control limit for range. Calculated automatically or entered manually.	0 Nm
P513	Torque range UCL	The upper control limit for range. Calculated automatically or entered manually.	9999 Nm
P514	Torque X-bar-bar	The desired mean value for calculated mean values for groups of tightenings.	0 Nm
P515	Torque range-bar	The desired mean value for calculated mean ranges for groups of tightenings.	0 Nm
P520	Angle X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually.	0 deg
P521	Angle X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually.	9999 deg
P522	Angle range LCL	The lower control limit for range. Calculated automatically or entered manually.	0 deg
P523	Angle range UCL	The upper control limit for range. Calculated automatically or entered manually.	9999 deg
P524	Angle X-bar-bar	The desired value for calculated mean values for groups of tightenings.	0 deg

Parameter number	Parameter name	Description	Default setup
P525	Angle range-bar	The desired value for calculated mean ranges for groups of tightenings.	0 deg
P530	Rundown angle X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually. This function is only available if parameter *P104 Rundown angle* is selected.	0 deg
P531	Rundown angle X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually.	9999 deg
P532	Rundown angle range LCL	The lower control limit for range. Calculated automatically or entered manually. This function is only available if parameter *P104 Rundown angle* is selected.	0 deg
P533	Rundown angle range UCL	The upper control limit for range. Calculated automatically or entered manually. This function is only available if parameter *P104 Rundown angle* is selected.	9999 deg
P534	Rundown angle X-bar-bar	The desired mean value for calculated mean values for groups of tightenings. This function is only available if parameter *P104 Rundown angle* is selected.	0 deg
P535	Rundown angle range-bar	The desired mean value for calculated mean ranges for groups of tightenings. This function is only available if parameter *P104 Rundown angle* is selected.	0 deg
P540	Selftap X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually. This function is only available if parameter *P210 Selftap* is selected.	0 Nm
P541	Selftap X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually. This function is only available if parameter *P210 Selftap* is selected.	9999 Nm
P542	Selftap range LCL	The lower control limit for range. Calculated automatically or entered manually. This function is only available if parameter *P210 Selftap* is selected.	0 Nm
P543	Selftap range UCL	The upper control limit for range. Calculated automatically or entered manually. This function is only available if parameter *P210 Selftap* is selected.	9999 Nm
P544	Selftap X-bar-bar	The desired value for calculated mean values for groups of tightenings. This function is only available if parameter *P210 Selftap* is selected.	0 Nm
P545	Selftap range-bar	The desired value for calculated mean ranges for groups of tightenings. This function is only available if parameter *P210 Selftap* is selected.	0 Nm
P550	PVT X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually. This function is only available if *P220 PVT monitoring* is selected.	0 Nm
P551	PVT X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually. This function is only available if *P220 PVT monitoring* is selected.	9999 Nm

Parameter number	Parameter name	Description	Default setup
P552	PVT range LCL	The lower control limit for range. Calculated automatically or entered manually. This function is only available if *P220 PVT monitoring* is selected.	0 Nm
P553	PVT range UCL	The upper control limit for range. Calculated automatically or entered manually. This function is only available if *P220 PVT monitoring* is selected.	9999 Nm
P554	PVT X-bar-bar	The desired value for calculated mean values for groups of tightenings. This function is only available if *P220 PVT monitoring* is selected.	0 Nm
P555	PVT range-bar	The desired value for calculated mean ranges for groups of tightenings. This function is only available if *P220 PVT monitoring* is selected.	0 Nm
P560	CM (X-bar) LCL	The lower control limit for mean value. Calculated automatically or entered manually.	0%
P561	CM (X-bar) UCL	The upper control limit for mean value. Calculated automatically or entered manually.	9999%
P562	CM R LCL	Defines the low limit for permitted variations in the range calculations.	0%
P563	CM R UCL	Defines the high limit for permitted variations in the range calculations.	9999%
P564	CM (X bar-bar)	Defines the desired CM average for all of the subgroups calculated automatically or entered manually. (If calculated: In each subgroup the average tightened CM value is calculated. Then an average is calculated based on all of the averages.)	0%
P565	CM (R bar)	Defines the desired average of the CM variation for all of the subgroups. Calculated automatically or entered manually. (In each subgroup the average tightened CM variation is calculated. Then an average is calculated based on all of the averages.)	0%

22.2   Multistage

22.2.1   Setup

Parameter number	Parameter name	Description
M100	View existing Multistages	To view all existing Multistages.
M101	Create new Multistage	To create a new Multistage.
M102	Copy Multistage	Used for the copying of an existing Multistage.
M103	Delete Multistage	Used when a Multistage is to be deleted.

22.2.2 Multistage programming

Parameter number	Parameter name	Description	Default setup
M200	Multistage name	Used when a selected Multistage should be given a name (optional).	
M201	Stage list	Stage list specifies the list of available Psets that can be linked together into a Multistage. Executes the specified link list of Psets into a Multistage.	Pset 1
M202	Batch count	Activates a function that measures how many times a Multistage tightening is repeated. It must be determined from where the batch size value should be read, if the batch count is activated. Options: Off: batch count is not used. Pset: use Psets batch size. Fieldbus: An external source decides batch size via fieldbus. Ethernet/serial: an external source sets batch size via Ethernet or serial interface. ⓘ **If batch count is used in a Job (that includes the specific Pset), this parameter is recommended to be set to "Off".**	Off
M203	Batch size	Specifies the number of Multistage tightenings in a batch. The range is 0 to 99.	1
M204	Lock at batch OK	The next time batch OK is reached the tool will be disabled until it is unlocked by the operator.	No
M208	Max coherent NOK's	Defines the maximum allowed amount of possible NOK (not OK) subsequent tightenings. This parameter overrules *P153 Max coherent NOK's*.	Off
M210	Torque result	Defines from what stage the torque result will be received. Accessible when torque is selected as a *P100 Control strategy*.	Last stage
M211	Angle result	Defines from what stage the angle result will be received. Accessible when angle is selected as a *P100 Control strategy*.	Last stage
M212	Rundown result	Defines from what stage the rundown angle result will be received. Accessible when parameter *P104 Rundown angle* is used.	Last stage
M213	PVT Selftap result	Defines from what stage the PVT selftap result will be received. Accessible when *P210 Selftap* is activated.	Last stage
M214	PVT mon. result	Defines from what stage the PVT mon. result will be received. Accessible when *P220 PVT monitoring* is activated.	Last stage
M215	CM result	Defines from what stage the current monitoring result will be received. Accessible when *P200 Current monitoring* is activated.	Last stage
M216	Trace	Defines the point from what stage the graph results (Trace diagram) will be received.	Last stage
M217	Post view torque result	Defines from what stage the graph will be received. Accessible when *P280 Post view torque* is activated.	Last stage

Parameter number	Parameter name	Description	Default setup
M220	Min valid stat tq limit	>=Cycle start, < Max valid stat tq limit The result must be greater than or equal to this value to be included in the statistical calculations. Not accessible when a DS strategy or reverse is selected (see *P100 Control strategy*). **Results are only stored in the Multistage, not in the individual Pset.**	P110 Cycle start
M221	Max valid stat tq limit	>Min valid stat tq limit, <=tool max torque The result must be less than or equal to this value to be included in the statistical calculations. Not accessible when a DS strategy or reverse is selected (see *P100 Control strategy*). **Results are only stored in the Multistage, not in the individual Pset.**	T102 Tool max torque
M222	Subgroup size	2 - 20 Defines the size of the subgroup that forms the basis for the statistical calculations. If this parameter is changed, all statistics have to be recalculated or deleted. Not accessible when a DS strategy or reverse is selected (see *P100 Control strategy*). **Results are only stored in the Multistage, not in the individual Pset.**	4
M223	No. of subgroups	1 - 7500 Power Focus calculates control limits on request. For these limits to be relevant they must be based on a large number of data, at least 100. This parameter defines the number of subgroups to be used in the statistical calculations. If this parameter is changed, all the results have to be recalculated. Not accessible when a DS strategy or reverse is selected (see *P100 Control strategy*).	10
M224	Subgroup frequency	1 – 7500 This parameter indicates the number of subgroups that are disregarded between every stored subgroup. Not accessible when a DS strategy or reverse is selected (see *P100 Control strategy*).	1
M225	Latest n values	1 – 100 The number of tightening values which are included in the latest statistical calculations. Not accessible when a DS strategy or reverse is selected (see *P100 Control strategy*).	30
M226	SPC alarm tq	This parameter switches the torque SPC alarm function on or off. Not accessible when a DS strategy or reverse is selected (see *P100 Control strategy*).	Off

Parameter number	Parameter name	Description	Default setup
M227	SPC alarm angle	This parameter switches the angle SPC alarm function on or off. Not accessible when a DS strategy or reverse is selected (see *P100 Control strategy*).	Off
M228	SPC alarm CM	This parameter switches the current monitoring SPC alarm function on or off. Accessible when *P200 Current monitoring* is activated.	Off

22.3　Job

22.3.1　Setup

Parameter number	Parameter name	Description	Default setup
J100	View existing Jobs	To view existing Jobs in the current PF channel. Both numbers and logical names will be displayed.	
J101	Create new Job	Create and open a new Job. Each Job has a unique ID number between 1 and 99 (or up 400 with the configurable memory function). Combining selected Psets/Multistages creates a Job. The new Job contains default values on all parameters.	1
J102	Name	The name of the Job helps the operator to identify the different Jobs (maximum 25 characters).	None
J103	Copy Job	Power Focus offers the possibility to copy the properties of an already existing Job to another Job. If the target Job has not already been created it will be created automatically. The source Job keeps its Job ID and the target Job gets a new Job ID.	
J104	Delete Job	This function deletes an already existing Job from the Power Focus memory and the RBU. A running Job will be considered as aborted before it is deleted.	

22.3.2 Programming

Parameter number	Parameter name	Description	Default setup
J300	Job list	The Job list specifies the Psets and Multistages that can be included in the Job. The total number of Psets/Multistages in one Job can not exceed 50. This parameter contains: PF channel: Power Focus channel ID that the selected Pset and Multistage belongs to. Pset/Ms (Event): identification number of Psets/Multistages included in the Job. The Psets/Multistages specified in the Job must be predefined, and they can be included in more than one Job. Same Pset/Multistage can be used several times in a Job. Pset name: name of the selected Psets/Multistages. (Pset name is not visible in Job list on PF Graph). Auto select: yes = auto select, no = manually select. With auto select the Job functionality automatically chooses the next Pset. With a manually selected Pset/Multistage 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 J301 Job order type).** **A Job has override privileges, in comparison to a single Pset/Multistage, on a defined maximum allowed amount of possible NOK (not OK) subsequent tightenings.** Batch size: A batch size should be specified for each Pset or Multistage in a Job. The batch size specifies the number of tightenings to be performed for each Pset or Multistage. Maximum batch size is 99. It is possible to define free running Psets/Multistages 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 defined maximum allowed amount of possible NOK (not OK) subsequent tightenings for each Pset/Multistage in a Job. If *P153 Max coherent NOK's* or *M208 Max coherent NOK's* is used for the Psets or Multistages included in the Job, these settings are ignored by the Job setting. 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 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/Multistages in any order. The Job members work independently from each other. In a Cell Job with free order, all Job members are able to perform tightenings at the same time. Forced order: Psets/Multistages must be performed in the order specified in the Job list. One Job member at a time performs a tightening while the other Job members are locked. Free and forced order: allows the operator to perform Psets/Multistages in the same PF 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	Yes: tools of the Job members will be disabled during a Job except the member who performs tightening according to the Job list. After a Job is completed or aborted, tools of all Job members will be disabled for both tightening and loosening. The tool remains locked until a new Job is selected or the tool is enabled again. No: the tool will be enabled for all Job members after the Job is completed. For those Job members who are not involved in the Job the tool will be enabled also while the Job is in progress.	Yes
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. Disable at Batch start: The tool loosening functionality is locked until the batch is done.	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
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 directly 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 PF Graph or PF Compact will light. NOK: The batch status will be NOK at batch increment or bypass event.	NOK

Parameter number	Parameter name	Description	Default setup
J312	Decrement batch at OK loosening	Yes/No/If last tightening OK If YES, an OK Loosening generates a batch decrement for both OK and NOK tightening. Set to If last tightening OK to decrement only for OK tightening. 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.** **When the control strategy "Ds con" is implemented and this parameter is set to "Yes", the batch does not decrement after an OK loosening.**	No
J320	Max time to start Job	This parameter defines the time limit, from when the Job is running to when 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) deactivates this function.	0
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/Multistages. It defines the time for tightening result to be displayed on a PF Graph or PF Compact. The result disappears, and LED OK, NOK and nxOK shuts 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/Multistage is selected or when a Pset/Multistage is deselected. Allowed values are between 1 - 60 seconds. Value 0 (seconds) deactivates this function.	0
J330	Use line control	The Job will be ready to start when a Job with activated Line control has been selected and the 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 PF 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 an effect on a Job reference and when this parameter is set to Yes.	No

Parameter number	Parameter name	Description	Default setup
J341	Result of non-tightenings	Yes/No Yes: The non-tightening events; OK loosening, batch increment or batch decrement, and not performed tightenings due to digital inputs, Bypass Pset in Job or Abort Job, generate a result that is stored in the PF database. No: No non-tightening results for Job are stored in the Power Focus database. If this parameter is set to Yes, parameter C211 for Pset and Multistage is disregarded in Job.	No
J342	Reset all identifiers at Job done	If activated, a reset will be made for all identifiers (Type 1, Type 2, Type 3 and Type 4) at Job done.	No
J350	Header in result view	Select whether running Pset name, Job name or PF name shall be displayed in the header of result view (PF Graph display).	Pset name

22.4 Controller

22.4.1 Information

Parameter number	Parameter name	Description
C100	Main code version	The version number of the Power Focus software release (i.e. the full software package).
C101	Application code version	The version number of the application code.
C102	Parameter tree version	The version of the parameter-tree.
C103	RBU code version	The version number of the RBU-code.
C104	Boot code version	The version number of the Boot-code.
C105	DSP code version	The version number of the DSP-code.
C106	MC code version	The version number of the MC-code.
C110	Controller type	The type of the Power Focus.
C111	Serial number	The serial number of the Power Focus unit. It is possible to change the number.
C115	RBU type	The type of RBU (Rapid Backup Unit) inserted in the Power Focus. The available RBU types are; Bronze, Silver, Gold, DS, X or a Customer special.
C116	RBU serial number	The serial number of the RBU (the hard-coded, unique, MAC-address).
C118	MAC address	Ethernet MAC address.
C119	Drive size	Shows the drive size of the controller. Available drive sizes are: SL, Small, Medium, Large, Uni, IRC.

22.4.2 Configuration

Parameter number	Parameter name	Description	Default setup
C200	Pset	Defines what device is to be used when selecting the running Pset. Available options; Off, Selector, DigIn, Ethernet/Serial, Identifier, Fieldbus, PF Keyboard, Fieldbus selector, STwrench tag and ST Selector.	Off
C201	Job	Defines what device is to be used when selecting the running Job. The option is accessible when Job is accessible (RBU type). Available options; Off, DigIn, Ethernet/Serial, Identifier, Fieldbus and PF Keyboard	Off
C202	Job override	Defines what device is to be used when selecting the running Job. This source has a higher priority than *C201 Job*. The option is accessible when Job is accessible (RBU type). Available options; Off, DigIn, Ethernet/Serial, Identifier, Fieldbus and PF Keyboard	Off
C210	Lock on reject	When this parameter is activated, the tool locks when a NOK tightening has occurred. Available options; No, DigIn unlock and Rev ring unlock To unlock tool use digital input unlock, rev ring unlock, Fieldbus or the Ethernet/serial protocol.	No
C211	Result of non-tightenings	Yes/No If Yes is selected, then a non-tightening event i.e. loosening, batch operation will generate a result. If the checkbox is selected, then the non-tightening events; OK loosening, batch increment or batch decrement generate a result that is stored in the PF database. This parameter is used for Pset and Multistage. For Job, see J341.	No
C220	Disable loosening at OK	Yes/No Used to prevent the operator from loosening a correctly tightened joint.	No
C230	OE positioning type	Reverse/Forward/Reverse Torque Based Selects type of positioning mode for open end.	Forward
C240	Reset batch at Pset change	Yes/No Resets the batch counter when a new Pset is selected.	Yes
C241	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
C242	Decrement batch at OK loosening	Yes/No/If last tightening OK If YES, an OK Loosening generates a batch decrement for both OK and NOK tightening. Set to If last tightening OK to decrement only for OK tightening. ⓘ **This function only works with a single spindle, NOT with Sync.**	No
C243	Batch status at increment	OK/NOK Defines if an increment or bypass operation is OK or NOK.	NOK

Parameter number	Parameter name	Description	Default setup
C244	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
C250	Use last Pset	Yes/No Use last Pset which was selected before Power Focus reboot.	No
C260	Set	Time and date are set by this command.	
C270	Events	Opens the window for event log and display options.	

22.4.3 Network

Parameter number	Parameter name	Description	Default setup
C300	IP address	The IP address is a number for identification in a network.	0.0.0.0
C301	Subnet mask	Specifies the number of IP addresses on the subnet and also the number of PF that can be placed below a Net reference, if no router is used.	0.0.0.0
C302	Default router	IP address of the router used on the subnet.	0.0.0.0
C310	Channel ID	Identification number of the channel/system to which the programming refers. Valid values are 0-20. 0 is only used for standalone PF.	0
C311	Channel name	Name of PF. It is possible to use up to 25 characters.	
C312	Cell reference IP	Defines the IP address to the Power Focus acting Cell reference. The Cell reference monitors and collects information from the Cell members included in the group. **This IP address must be written into each included Cell member.**	0.0.0.0
C313	Cell ID number	The Cell ID is a unique number for the Cell reference (a kind of identification number). Valid values are 0-1000. Accessible when the Power Focus is a Cell reference.	0
C314	Cell name	A unique name to be able to find the Cell in the network. It is possible to use up to 25 characters. Accessible when the Power Focus is a Cell reference.	
C315	Net reference IP	Defines the IP address to the Power Focus acting Net reference. The Net reference monitors and collects information from the Net members included in the group. **This IP address must be written into each included Net member.**	0.0.0.0

Parameter number	Parameter name	Description	Default setup
C316	Job reference IP	Defines the IP address to the Power Focus acting Job reference. The Job reference monitors and collects information from the Job members included in the group. RBU dependent. ⓘ **This IP address must be written into each included Job member.**	0.0.0.0
C317	Sync reference	Defines the IP address to the Power Focus acting Sync reference. The Sync reference monitors and collects information from the Sync members included in the group. RBU dependent. ⓘ **This IP address must be written into each included Sync member.**	0.0.0.0
C320	Multicast	On/Off. Enable/disable Multicast functionality.	Off
C321	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 *C320 Multicast* is activated.	225.6.7.8
C322	Port	Port number for multicast communication.	8086
C323	Results	None/All/Not ok The results that are reported to the multicast address.	All
C324	Traces	None/All/Not ok The traces that are reported to the multicast address.	None
C325	Sync status	On/Off. Used if sending Sync status on multicast.	Off
C326	Event code	On/Off. Used if sending event code on multicast.	Off
C330	Port	Port number for open protocol server Ethernet communication.	4545
C331	Serial cable loss detection	When enabled, Power Focus detects cable loss when running open protocol serial on serial port 1 or 2.	On
C340	Port	Port number for ToolsTalk PF Ethernet communication.	6543
C350	ToolsNet	On/Off Result after each tightening is recorded in ToolsNet. A ToolsNet database registers and stores the results from tightenings, traces, data and history. Each PF units can store information from approximately 5000 tightenings. But the capacity in the ToolsNet database is, in principle, unlimited. The information can be mapped against the Power Focus, object or VIN-number, as desired.	Off
C351	IP address	IP address for ToolsNet server. Only valid if *C350 ToolsNet* is activated.	0.0.0.0
C352	Port	Port number for ToolsNet communication. ⓘ **Port 6570 is not to ToolsNet but to the PIM server which connects PF units to ToolsNet.**	6570
C353	Traces	None/All/Not ok The traces reported to ToolsNet.	None

Parameter number	Parameter name	Description	Default setup
C354	Keep Pset date on restore	Used to keep Pset time stamp when Pset data is read from file. On: Pset date is kept when uploading file to controller. Off: Pset date is changed to current date when uploading file to controller.	None
C360	Port	Port number for Acta Ethernet connection.	6540

22.4.4   COM ports

Parameter number	Parameter name	Description	Default setup
C400	Baud rate	The baud rate of the Serial 1 COM port on the MC-card of the Power Focus. Available options: 2400, 4800 and 9600	9600 bits/s
C401	Protocol	The type of protocol running on the serial 1 COM port on the MC-card of PF. Available options: None, ASCII, 3964R and IDESCO	ASCII
C410	Baud rate	The baud rate of the Serial 2 COM port on the CC card of the Power Focus. Available options: 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bits/s	9600 bits/s

22.4.5   Display

Parameter number	Parameter name	Description	Default setup
C500	Language	Select language for the Power Focus display. Options available in ToolsTalk: Chinese, English, French, German, Italian, Japanese, Brazil, Spanish and Swedish	English
C501	Torque unit	Select unit for showing torque. Options available: Nm, lbf.ft, lbf.in, kpm, kgf.cm, ozf.in, and dNm.	Nm
C503	Torque with PVT comp	Add PVT compensate value to display torque value.	No
C510	One channel	Shows how the result after a tightening will be presented in the PF Graph user interface. Four variables can be shown at the same time. In PC, activate the part window with the left mouse button, open the list with variables with the right mouse button, and select the variable to follow.	
C511	Two channels	Possible to show two PF channels at the same time. Select window to edit with keys 1, 2, 3 and 4. Then press the enter key to activate list of options. Pset and PF channel no. is changed with Pset (-/+) and change (-/+) keys. This function is valid only for the PF Graph user interface.	
C512	Compact display	Used to set-up the compact display.	
C520	Viewing angle	Set the PF Graph display-viewing angle to modify display visibility. (Not for ToolsTalk PF user).	

C530	Soft keys enabled	Function that connects and disconnects the menu selection keys. On the PF Graph display, the five top keys will be locked. On the PF Compact the functions Autoset, plus (+) and minus (-) key will be locked.	Yes
C540	Backlight auto off	If selected, the lights on the PF Graph display will turn off after 30 minutes of inactivity. The light will turn on again after a key is pushed or after a tightening.	Yes
C550	Theme	Selected color theme. Available options: PF4000, Classic, Night	PF4000
C551	OK background	Background color in result windows for OK results. Available options: Default, Black, White, Green	Default
C552	OK foreground	Foreground (text) color in result windows for OK results. Available options: Default, Black, White, Green	Default
C553	NOK background	Background color in result windows for NOK results. Available options: Default, Black, White, Green	Default
C554	NOK foreground	Foreground (text) color in result windows for OK results. Available options: Default, Black, White, Green	Default

22.4.6 Memory

Parameter number	Parameter name	Description	Default setup
C600	Type	Presents different options to configure the memory. Access is depending on RBU type. Available options: Default configuration, More Psets, More Jobs, More results, More events, More Identifiers and Totally configurable, Pset comments.	Default configuration
C601	No. of Psets	Number of Psets possible to configure. Always readable. Writable if *C600 Type* is set to "Totally configurable". Scope: 1 to 600	250
C602	No. of Jobs	Number of Jobs possible to configure. Always readable. Writable if *C600 Type* is set to "Totally configurable". Scope: 1 to 700	99
C603	No. of Results	Number of results possible to save. Always readable. Writable if *C600 Type* is set to "Totally configurable". Scope: 1 to 9000	5000
C604	No. of Identifier result parts	Number of VINs possible to save in each result. Always readable. Writable if *C600 Type* is set to "Totally configurable". Scope: 1 to 4	1
C605	No. of Events	Number of events possible to save. Always readable. Writable if *C600 Type* is set to "Totally configurable". Scope: 1 to 800	100
C606	No. of Statistical events	Number of statistical events possible to save. Always readable. Writable if *C600 Type* is set to "Totally configurable". Scope: 1 to 500	100

Parameter number	Parameter name	Description	Default setup
C607	No. of Traces	Number of traces possible to save Always readable. Writable if *C600 Type* is set to "Totally configurable". Scope: 1 to 100	8
C609	Estimated memory usage	Command that informs the user about the memory allocation. Always readable. Not writable.	
C610	Delete all results	Tightening and statistical database for the Power Focus is deleted.	
C611	Total reset	Totally reset of the Power Focus memory. ⚠ **All programming, tightenings and statistics will be deleted.**	
C612	Reset general event log	All events in the general event log are deleted.	
C613	Reset statistical event log	All events in the statistical event log are deleted.	

22.4.7 Accessibility

Parameter number	Parameter name	Description	Default setup
C800	Use	Prevents parameter updates on the Power Focus keyboard and from ToolsTalk PF applications.	No
C801	Entry	Specify unit allowed to enter the password. Available options: Tools Talk and All	All
C802	Setup password	Choose a password, which will give write access to all parameters except those for the network.	
C803	Communication password	Choose a password, which will give write access to the network parameters.	

22.5 Tool

The tool parameters are visible depending on which tool is connected. For STB, most parameters are invisible when the tool is offline.

22.5.1 Information

Parameter number	Parameter name	Description	Default value
T100	Type	Shows information about the connected tool type.	

Parameter number	Parameter name	Description	Default value
T101	Usage	Type of tool, fixed or handheld. Fixed tools have a lower max speed, which means that this parameter has to be evaluated when calculating the speed factor. Options available. Handheld and Fixed Accessible when a tool is connected, except STB offline.	
T102	Tool max torque	Shows the maximum tightening torque for the tool in chosen unit. Possible values between 0.1 and 6553 Nm. The value is possible to change if correct password privileges are met. Accessible when a tool is connected, except STB offline. ⓘ **This parameter must only be changed by users with tool knowledge. Read only access for ST/SL tools and STB online.**	Nm
T103	Gear ratio	Shows the mechanical gear ratio for the tool.	
T104	Production date	Tool production date. In Unix format.	
T105	Serial number	Shows the serial number of the tool.	
T106	Denomination		
T107	Product number		
T110	Size	Shows information about the motor size in the tool.	
T111	Type	Shows information about the connected Tensor tool type. Accessible when an ETX tool is connected.	
T112	Serial number	Shows the serial number of the tool. Accessible when an ETX tool is connected.	
T113	Denomination	Accessible when an ETX tool is connected.	
T114	Product number	Accessible when an ETX tool is connected.	
T120	Serial number	Shows the serial number of the tool. Accessible when an ETX tool is connected.	
T121	Denomination	Accessible when an ETX tool is connected.	
T122	Product number	Accessible when an ETX tool is connected.	
T130	Application code version	Shows the version number of the application code.	
T131	Boot code version	Shows the version number of the boot-code.	

22.5.2   Configuration

The tool parameters are visible depending on which tool is connected. For STB, most parameters are invisible when the tool is offline.

Parameter number	Parameter name	Description	Default value
T200	Tool start select source	Defines which device is allowed to start the tool. When safety trigger is used, GPIO 4 function must be set to "Off". To start the tool, safety trigger and start trigger must be pushed simultaneously (second button must be pushed within 0.5 s from first button, order is arbitrary). If any safety trigger or start trigger is released while tool is running, tool will stop immediately. Once tool has been started using safety trigger, both buttons must first be released to allow the tool to be started again. Options available: Tool trigger, DigIn, Fieldbus, Sync start, Remote start, Front/Push start, Front/Push start AND Tool trigger, Front/Push start OR Tool trigger, Safety trigger ⓘ **Remote start is not available for Tensor STB tools.**	Tool trigger
T201	Timer enable tool	Determines if and how the tool shall be locked by default, and requires to be unlocked by digital input Timer enable tool. The function unlocks the tool for a period of T202 seconds. Once the period expires, the tool will be locked again. If a start attempt is made before T202 seconds have passed, the tool will remain unlocked until it is stopped or button is released. Options: Off: timer enabled tool functionality will not be in use. Always: timer enabled tool functionality will be in use, and that tightening, loosening and positioning (for Open end tools) will be disabled. Tightening: timer enabled tool functionality will be in use, and that tightening will be disabled. Loosening: timer enabled tool functionality will be in use, and that loosening will be disabled. Positioning: timer enabled tool functionality will be in use, and that positioning (for Open end tools) will be disabled. ⓘ **At least one input source must be configured to use digital input Timer enable tool, otherwise the configuration will be useless (the tool will be disabled and it will not be possible to enable it).**	Off
T202	Timer enable tool time	Timer function within range 0.5 to 5.0 seconds. For more information, see section Tool.	0,5 s
T203	Direction alert	Possibility to add alert to tool direction. Options: Off, CW, CCW.	Off
T204	Alert type	Defines the type of alert for T203. Options: Buzzer, flash tool LEDs, buzzer and LEDs.	
T210	Mode	Defines the function of the Tool accessory bus. Available options: Off, Power on, General purpose IO, ST Bus Not applicable on SL drives	Off
T220	Enable		On
T221	Volume	Available options: Low, Medium, High	High

Parameter number	Parameter name	Description	Default value
T224	Events	The event-sound configuration.	
T230	CW pressed	Defines the function of function button when ring is in CW position. Available functions are described in chapter.	For SL-drive:97 (Toggle CW CCW) Otherwise: Off
T231	CCW pressed	Defines the function of the function button when ring is in CCW position. Available functions are described in chapter.	For SL-drive:97 (Toggle CW CCW) Otherwise: Off
T232	CW single push	Defines the function of function button single push when ring is in CW position. Available functions are described in chapter.	Off
T233	CCW single push	Defines the function of function button single push when ring is in CCW position. Available functions are described in chapter.	Off
T234	CW double push	Defines the function of function button double push when ring is in CW position. Available functions are described in chapter.	Off
T235	CCW double push	Defines the function of function button double push when ring is in CCW position. Available functions are described in chapter.	Off
T236	Push detection interval	Defines the maximum time that may elapse from button down to button up for a push to be detected. Range: 250 to 1000 ms.	300
T237	Next push interval	Defines the maximum time that may elapse from successful detection of a push for a new push to be detected. Range: 250 to 1000 ms.	300
T240	Events	The blue LED is used to highlight events similar to the relays of the controller. The blue LED may be set to highlight several events. Use the add key to add events and set duration. Remove events with the remove key. Available functions are described in chapter.	Off
T250	Illuminator mode	Defines operation mode of illuminator (LED's in front of the tool and corresponding relay function). Available selections are off, on, tracking event and event controlled.	Off
T251	On event	Defines which event (relay function) that is used to turn on illuminator while operating in "tracking event" or "event controlled" mode. For available events see Digital I/O and fieldbus items (Blue LED).	Off
T252	Off event	Defines which event (relay function) that is used to turn off illuminator while operating in "event controlled" mode. For available events see Digital I/O and fieldbus items (Blue LED).	Off
T253	On time	Defines how long illuminator will remain lit, if not turned off by event, while operating in "tracking event" or "event controlled" mode. On time period starts to elapse when on event occurs. In case on event occurs again before on time has elapsed, the on time period will be restarted.	60

Parameter number	Parameter name	Description	Default value
T260	Control type	Selection of tool light control sources. Defines which protocol the tool lights should follow: Available options: PF-controlled:1, PF-controlled:2, PF-controlled:3, Light off. The table below shows the functionality of the tool LED's for each option.	PF-controlled:1

Option	Yellow tool light	Red tool light	Green tool light
PF-controlled:1	LOW. Torque and/or angle values under specified limits.	HIGH. Torque and/or angle values over specified limits.	OK. Torque and angle values within specified limits.
PF-controlled:2	Customer specific.		
PF-controlled:3	Event code to be acknowledged	Tightening NOK	Tightening OK
Light off	Tool LED's functionality disabled.		

Parameter number	Parameter name	Description	Default value
T261	Use on time	On/Off. Defines whether the tool LED's should light for a specified period of time (on) or continuously (off) after a tightening. Default is off.	Off
T262	On time	Select time for tool light LED, can be set between 0 and 300 seconds. Only valid if C261 Use on time is on.	
T263	Indicator mode	Configures ST tool to show selected Pset (Pset 1-8) on the tool LED's. Available options: Off, Pset indication. Applicable only if an ST tool is connected.	Off
T270	Power save timeout	Tool will turn off automatically if inactive for this period of time. Unit: Minutes. Min value: 1. Max value: 120.	30
T271	Start condition	Tool radio start condition. Alternatives: Off, Connected, Start request	Off
T272	Link timeout	After this timeout the tool is considered offline. Unit: Milliseconds. Min value: 1000. Max value: 60000.	5000
T276	Max sender power	Max sender power on the IRC module. Only IRC-B.	Full
T277	Torque and angle trace	Whether or not a torque and angle trace should be produced for every tightening. Only IRC-B.	No
T278	Power save	Sets if the parameter T270 Power save timeout is active or not.	On
T279	Delay "tool lock"	This setting determines if a tool lock request shall be delayed until the current tightening/loosening/positioning is completed.	On
T290	Primary tool	Expected primary tool connection. Cable or IRC.	Cable
T292	IRC pairing	When selected, IRC pairing starts if tool is in pairing mode and tool connection is IRC-B.	
T293	Power Focus IP port	Port for STB tool IP connection.	6677
T294	Serial port	Serial port where IRC-B device is connected. Serial 2 or internal.	Serial 2

Parameter number	Parameter name	Description	Default value
T296	IRC-W operational mode	Operational mode when IRC-W is used. Ad-hoc or Infrastructure	**Ad-hoc**
T297	IRC-W channel	Radio channel when IRC-W is used. Valid channels: Auto, 1-14, 36, 40, 44, 48	Auto

22.5.3   Diagnostic

The tool parameters are visible depending on which tool is connected. For STB, most parameters are invisible when the tool is offline.

Parameter number	Parameter name	Description
T300	Sensor tracking	Sensor tracking monitors the torque and angle sensors in real-time. A window with torque, angle and zero offset values updates continuously. Sensor status is monitored while the spindle is rotated (manually) or if the tool is heated/cooled etc. The motor does not run. An exit-button ends the command and returns the user to the main diagnostic window. **ⓘ** **Sensor tracking function is not possible to use during a tightening.** **For DS tools have torque and zero offset tracking no validity since they have no transducer. The value presented is therefore set to zero (0).**
T310	Trigger	Diagnostics for tool LED's and buttons.
T311	Direction ring	Diagnostics for tool LED's and buttons.
T312	Function button	Diagnostics for tool LED's and buttons.
T313	Lights	Diagnostics for tool LED's and buttons.
T320	Motor temp.	Shows the current motor temperature.
T321	Motor temp. limit	Temperature when the motor is considered overheated.
T322	No. of over temp.	Number of times the motor has reached its temperature limit.
T323	Peak motor temp.	Maximum measured motor temperature.

22.5.4   Maintenance

The tool parameters are visible depending on which tool is connected. For STB, most parameters are invisible when the tool is offline.

Parameter number	Parameter name	Description	Default value
T400	Calibration value	Shows the calibration value stored in the tool.	
T401	Calibration date	Shows the date of latest calibration for the tool. Automatically updated when the calibration value is set.	

Parameter number	Parameter name	Description	Default value
T402	Set calibration value	This parameter sets the *T400 Calibration value* and the *T401 Calibration date* in the tool memory, and performs a shunt calibration. The shunt calibration is useful for determining if the shunt calibration value received at a previous shunt calibration tends to drift away. The shunt calibration is also performed before each new tightening, and the same checks and boundaries apply.	
T403	Normalization value	Shows the normalization value for the tool. Valid scope: 100 to 9999.	1000
T404	Calibration alarm	0 = No alarm is active, 1 = activating of parameter *T405 Calibration alarm date*. (Unix format no of seconds from 1970-01-01).	0
T405	Calibration alarm date	This parameter makes it possible to change date for next calibration alarm.	
T406	Set calibration alarm date	Not applicable in the PF Graph HMI.	
T410	Total no. of tightenings	Total number of tightenings performed by the tool during its entire lifetime.	
T411	Service indicator	Enable/disable (on/off) tool service indicator alarm function.	
T412	Number of tightenings since service	Number of performed tightenings since latest tool service.	
T413	Service interval	Number of tightenings between tool services. This parameter serves as service indicator alarm limit. Value between 1 and 250 (x 10 000).	
T414	Latest service date	Shows the date of when the latest service was performed. Automatically updated when Service counter reset is performed. Possible to set manually to any date.	
T415	Service counter reset	Sets *T412 Number of tightenings since service* to zero, sets *T414 Latest service date* to current date and sets *T411 Service indicator* to off.	
T416	Lock tool on alarm	Enables/disables lock on alarm. Tool will be locked while service indicator alarm or while wear indicator alarm is activated.	
T417	User message	Shows a user specified message-string of maximum 35 characters plus a null-termination. The message shall be stored in the tool memory.	
T420	Use Open end	Defines if a tool with an Open end head should be used.	
T421	Inverted motor rotation	Shows if the Open end has to use an inverted motor rotation.	
T422	Open end tightening direction	Defines if Open end CW (clockwise) or CCW (counter clockwise) is to be used.	
T423	Open end tune	The Open end tune command sets the reference position of the Open end head, and measures the gear ratio and gear play. The tool rotates slowly in the reverse direction until its true open position at the mechanical stop in the Open end head is reached. Open end tuning measures the total *T103 Gear ratio* and writes the new value to the tool memory.	
T424	Max torque positioning limit	Defines the max value for *P171 Limit*	

Parameter number	Parameter name	Description	Default value
T430	Wear indicator	Enables/disables (on/off) the wear indicator alarm function.	
T431	Wear used	For every tightening the wear is calculated through a formula with in-parameters: torque, speed and temperature etc. As soon as a tightening or loosening is started, the wear is calculated and added to T431, which is the accumulated wear since last service. When the T431 has reached 100%, it's time for service When the tool has been serviced this parameter is set to 0.	
T432	Remaining tightenings	Estimated number of tightenings that can be performed before wear indicator alarm occurs.	
T433	Alarm factor	Using T433, the customer can scale the effective service interval (time to wear alarm is activated). In case T433 is set to 25%, the alarm will activate 4 times earlier than by default. In case T433 is set to 400%, the alarm will activate 4 times later than default.	100%
T434	Min wear tightenings	An additional condition for activation of wear indicator alarm. Specifies the minimum amount of tightenings (since latest service) that must be performed before wear indicator alarm activates.	250000
T440	QRTT on	On/Off Automatic tool calibration using the ACTA 4000 and a QRTT device is enabled in this branch. A tool calibration session is started by connecting the ACTA to the Power Focus and fit the QRTT device to the spindle. One Multistage with three Psets is used when the calibration is run, one torque tightening (for torque calibration) and two different rotate spindle (for loosening and angle calibration) Psets. It is necessary for the Power Focus to have enough memory space available to store the Multistages and Psets needed. If the calibration shows an unsatisfactory result the operator is assumed to take the appropriate action. No calibration value (calibration- or normalization value etc.) will be changed automatically.	Off
T441	QRTT Pset 1	Pset used by ACTA.	0
T442	QRTT Pset 2	Pset used by ACTA.	0
T443	QRTT Pset 3	Pset used by ACTA.	0
T444	QRTT Mset	Multistage used by ACTA.	0
T445	Create QRTT	Creates the QRTT Pset and Multistage. Use only when tool is connected.	
T450	Perform motor tuning	When selected, this parameter will perform motor tuning on the connected tool.	
T451	Perform Sync motor tuning	When selected, this parameter will perform Sync motor tuning on the connected tools (a Sync group must exist).	
T460	Disconnect tool	Disables reading and writing to the tool memory and allows the user to change tools without power off.	

22.5.5   Buzzer configuration

The tool parameters are visible depending on which tool is connected. For STB, most parameters are invisible when the tool is offline.

Parameter number	Parameter name	Description	Default value
E100	Name	Sound buzzer name.	
E101	Frequency	Valid scope: 400 - 4000 Hz	800
E102	Time On	Valid scope: 0.01 - 65.0 Seconds	0.1
E103	Time Off	Valid scope: 0.01 - 65.0 Seconds	0.2
E104	Repetition	Valid scope: 0 - 100 times	3
E105	Volume	Valid scope: 0 - 100 % This parameter is relative (in percent) to parameter T221 Volume, which could be set to high, medium or low. T221 Volume is found in the sound setup window.	50

22.5.6   Sound configuration

The tool parameters are visible depending on which tool is connected. For STB, most parameters are invisible when the tool is offline.

Parameter number	Parameter name
W102	Stream name

22.6 Accessories

22.6.1 Digital I/O

Parameter number	Parameter name	Description
A110	Relay status	Shows the usage and status of the relay devices.
A111	DigIn status	Shows the usage and status of the digital input devices.
A112	Relay test	Performs a test of the relays used. ⚠️ **Be aware of that changing the state of a relay may effect equipment connected to it. Please ensure that no damage or injury can be caused by the connected equipment before activating.** ℹ️ **It is not possible to have Power Focus in normal operation during the test.**

22.6.2   I/O bus

Parameter number	Parameter name	Description	Default setup
A230	Selector confirm	Available when *A232 Selector external controlled* is set to No. Options: off, on, on with acknowledge. Off: function disabled. On: when a new Pset/Multistage is selected Power Focus needs a confirmation signal from the selector. This is made by lifting a socket from the indicated socket tray. The exception is when a Pset/Multistage from the same socket tray is selected sequentially. Then no confirmation is needed. On with acknowledge: Every time a new Pset/Multistage is selected Power Focus needs a confirmation signal from the selector. This is made by lifting a socket from the indicated socket tray. With this option there is no exception when a Pset/Multistage from the same socket tray is selected sequentially. Then the Power Focus still needs a confirmation signal from the selector **ⓘ Selector confirmation is also applicable when selecting Psets/Multistages in a Job.**	Off
A231	Selector lost mode	Determines whether the last selected Pset or "No Pset" is selected when communication with a selector is lost. Available when *A232 Selector external controlled* is set to No.	Last Pset
A232	Selector external controlled	Turns selectors into externally controlled mode. Used to externally control the Selector LED's via fieldbus items *Selector control green light* and *Selector control red light*. For more information, see section *Digital I/O and fieldbus items*.	No

22.6.3   Tool bus

Parameter number	Parameter name
A310	GPIO
A311	ST selector
A312	ST scanner
A313	Internal ST selector
A314	TLS ST Tool Tag

22.6.4   Printer

Parameter number	Parameter name	Description	Default setup
A400	Brand	With parameter printer type the printer is selected. Options are: IBM, HP and Epson.	IBM
A401	Paper size	With parameter paper size the paper format is selected. Options are: A4, US Letter or Printer roll..	A4
A402	Continuous print	With this parameter selected, the results after each tightening are automatically sent to the printer port.	No
A403	Trace with angle offset	Used when printing a trace from the Power Focus printer port.	No
A404	New page at Job done	With *A402 Continuous print* and this parameter selected, each new job is printed on a new page.	No
A405	Include C311 P402 VIN	Adds an extra header containing Channel name, Pset name and VIN to the beginning of each batch.	

22.7   Sync

22.7.1   Programming

ℹ️   **Sync programming options are only available if PF is a Sync reference.**

Parameter number	Parameter name	Description	Default value
S100	Sync group list	Create a Sync group list by selecting available PF units.	
S101	Tightening strategy	Defines strategy to use for Sync tightening. Available options: Stage and SynchroTork SynchroTork allows continuous Synchronization of up to six spindles during final tightening. This will improve assembly quality in the joints where an even clamp force build-up is critical, such as in U-bolt applications. The torque difference between the spindles is minimized during the tightening stage by adjusting the individual speeds. Synchronization of the tools is assured through high-speed communication via the proprietary Power Focus accessory bus. It should be noted that this function does not eliminate the need for a reaction bar, or similar, in higher-torque applications. **(i) Option SynchroTork is only available for PF 4000.** **SynchroTork is not applicable for angle and DS control strategies.**	State Sync
S102	Loosening strategy	Normal/Sync loosening. Sync loosening is a safety feature that makes all spindles sense torque before loosening starts. Normal means that all spindles are loosening with full speed and power.	Normal
S103	Continue if Sync failed	Yes/No. If this option is selected the Sync group is allowed to continue tightening with the Sync members that reached the first target value in time. The spindles that did not reach the first target value in time are disabled. Only valid for two stage tightenings.	No
S104	Sync OK time	Used together with continue if Sync failed and defines the time that the spindles in the Sync group wait, after reaching the first target value, for all spindles to reach the same status. If this time limit is exceeded, the Sync tightening continues without the spindles that did not reach the first target in time. Permitted values are between 0 and 13 seconds.	2

22.8   Identifier

22.8.1   Identifier setup

Parameter number	Parameter name	Description	Default value
I100	Input source	Defines what source is accepted when an identifier from Type 1 is read. Available options: Off, Scanner, Fieldbus, Ethernet/Serial, Ethernet/Serial & scanner, ST scanner, Scanner & Fieldbus, All.	List menu
I101	Significant positions	A string of integers that tells PF which positions to look at in the VIN.	

Parameter number	Parameter name	Description	Default value
I102	Significant strings	A table that matches each filtered string from VIN to a Pset or Job number.	
I103	Send identifier	Makes it possible to send a 100 character long identifier to the Power Focus.	Input menu
I104	Significant positions for Result Part 1	A string of integers that tells PF which positions in the scanned barcode that are considered for result part A.	
I105	Belongs to Type	An integer that tells which ID type result part A belongs to.	1
I107	Length	Length of the incoming identifier string.	Input menu
I180	Identifier work order	Defines in which order different Identifier types are entered	1
I181	Tool locked during work order	If selected, the tool is locked until the work order is completed.	0
I183	Reset all identifiers at Pset batch done	If selected, all identifiers (in the work order) for the selected Pset are deleted at batch done and the work order needs to be recreated for the next Pset. If not selected, usually only one identifier type needs to be changed (in the work order) for the next Pset.	0
I184	Ignore Identical Work Orders	If selected, all Work Orders that are repetitive will be discarded	0

22.9   Fieldbus

Parameter number	Parameter name	Description
F100	Fieldbus type	This parameter must be selected first. It includes the types; DeviceNet, ProfiBus-DP, InterBus, ModBusPlus, ModBus/TCP, ControlNet, Ethernet/IP, Profinet-IO, FL-net, and InterBus 2Mb. If there is no fieldbus configuration inside the Power 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 starting. If there is no fieldbus card installed in Power Focus, fieldbus programming only works in offline mode.
F102	From PF data length	From PF data length is the total length of the data string sent from PF to the PLC. The lengths 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, PF has to be restarted when the data length is changed.**

Parameter list

Parameter number	Parameter name	Description
F103	To PF data length	To PF data length is the total length of the data string send from the PLC to PF. 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, PF has to be restarted when the data length is changed.**
F104	From PF global data length	From PF global data length is the length of sending broadcast data to the network. This is a special function for ModBusPlus, not available for other fieldbus types. If only point-to-point data is transferred, set this parameter to zero. **From PF data length - From PF global data length = From PF point-to-point data length (which is only available in ModBusPlus).**
F105	To PF global data length	To PF global data length 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 data length - To PF global data length = To PF point-to-point data length (which is only available in ModBusPlus).**
F106	From PF data offset	The FL-net memory area 2 for cyclic data transfer is 8192 words. This area is shared by all nodes in the network. Each node configures the part of the area it will update. "From PF data offset" is the start address for data from PF.
F107	To PF data offset	The FL-net memory area 2 for cyclic data transfer is 8192 words. This area is shared by all nodes in the network. Each node configures the part of the area it will update. To PF data offset is the start address for data to PF.
F110	Set node address and baud rate 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 PF.**
F111	FB node address	This parameter specifies the network ID number used in the fieldbus system. Two controllers in the same fieldbus network cannot have the same node address. Valid for DeviceNet (0-63).
F112	Baudrate	Communication speed on the fieldbus system. **The baud rate shall be the same in all PF units and in the PLC.**
F113	Connection mode	This parameter manages the way the fieldbus system detects changes of data on the different controllers. Some fieldbus types have the possibility to set different connection modes. There are three modes; polled, bit strobe and change of state. **The settings in PF and the PLC must be the same.**

Parameter number	Parameter name	Description
F120	Set node address from	Some buses can use a SW-configured node address. This parameter has two selections: Software: Makes it possible to program node address from user interface. Hardware: Node address 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 PF.**
F121	FB node address	This parameter specifies the network ID number used in the fieldbus system. Two controllers in the same fieldbus network cannot have the same node address. Valid for Profibus-DP (1-124), ModbusPlus (1-99), and ControlNet (1-64).
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 Power 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 PF has to be restarted when the PCP length is changed. The length must be the same in the PLC.**
F131	Process data length	Process data length is the first part of the InterBus message. The length has to be same for both input and output data. Maximum process data length 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 PF has to be restarted when the process data length is changed. The length must be the same in the PLC.**
F140	Set Source address from	ModBusPlus global data exchanges require a source address, which is a node address where 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.
F141	Source address	Source address is the network ID number used in the fieldbus system. Set address to get global data from this source.
F150	IP address	Set an Ethernet connection IP address for fieldbus module, such as ModBus/TCP, Ethernet/IP, Profinet-IO, FL-Net.
F151	Subnet mask	Set an Ethernet connection Subnet mask for fieldbus module, such as ModBus/TCP, Ethernet/IP, Profinet-IO.
F152	Gateway	Set an Ethernet connection Gateway for fieldbus module, such as ModBus/TCP, Ethernet/IP, Profinet-IO.
F155	Device name	A set for Profinet-IO, define a device name and master need to know the device name to get communicate with it.
F157	Assembly instance	Parameter valid only for Ethernet/IP and works only on Anybus FW 2.xx or later. It makes possible to configure Anybus card with Assembly Instances as in FW 1.32 or earlier. For 0: it is ODVA compatible, 1: FW 1.32 compatible (Listen-only 4, Input-only 3)
F160	Virtual fieldbus	This is a choice to make a virtual fieldbus. One virtual master can have four virtual members
F161	Virtual from PF data length	From PF Data length for the virtual member.

Parameter number	Parameter name	Description
F162	Virtual to PF data length	To PF Data length for the virtual member.
F163	Virtual from PF data offset	From PF data offset for the virtual member.
F164	Virtual to PF data offset	To PF data offset for the virtual member.
F200	FB update interval	If the fieldbus system is heavily loaded, it might be necessary to slow down the update interval in Power Focus fieldbus card. If this parameter is set to 0.5 seconds, the Power 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. Default value 0.10 s. Valid settings range from 0.05 to 10 seconds.
F210	Tool stop at offline	If the fieldbus system goes down or Power 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.
F220	Read result handshake	If selected, the result is not sent until the PLC sends the read command. To enable this function, ReadResultHandshake in To PF Setup, and ReadResultHandshakeAck and SentTighteningId in From PF setup have to be added in the bitmap.
F300	Bitmap select	This parameter makes it possible to view the bitmap in the same way in Power 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.

23 Event codes

Event codes are displayed as popup windows to inform users of the status of Power Focus. All events are stored in the Statistics event log or the General event log, depending on the event code type. The number of events that can be stored in the log depends on memory configuration (see section *Memory*). Once the log is full, the oldest events will be overwritten by the most recent ones.

There are three severity levels defined for the events. The characteristics for each one are:
- **Info**: Events that only informs the user of some activity, for example 'PF Started'.
  - o PF4000 Graph: White background
  - o TTPF: Info symbol
- **Warning**: Events that may indicate unexpected behavior, for example 'Torque high'.
  - o PF4000 Graph: Yellow background
  - o TTPF: Warning symbol
- **Error**: Severe errors in the system or events that indicates a failure of some sort. Almost all events with this severity level needs to be acknowledged, for example "Current limit reached".
  - o PF4000 Graph: Red background
  - o TTPF: Error symbol

To open the event log, click **Get Event Log** in the **Options** list.

The **Event Log** window appears.

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

Click **Save** to file to store the event log as a text file.
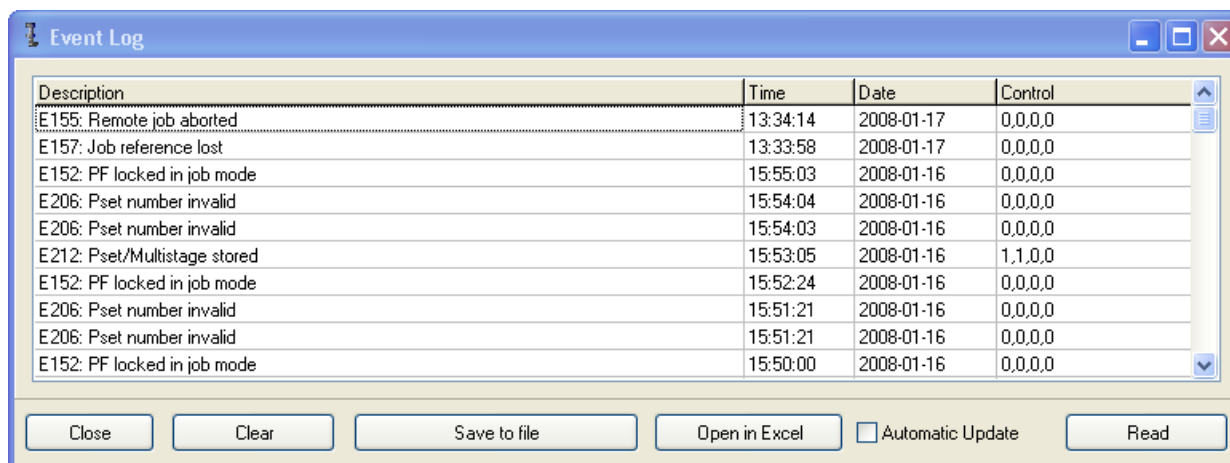
Click **Open in Excel** to export the log to the Microsoft Excel software.

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

When option **Automatic update** is checked, the events in the log are showed in real-time (in the same way as event pop up widows).

The event codes are logged with four integer parameters shown in the **Control** column. For some event codes, these parameters are used to store extra information about the event.

As default, all events are displayed and logged.

It is possible to configure PF to show or log selected events only.

Open **Controller>Configuration>Events** and click the **Event** button to open the **Controller Events** window.

Select **Log** to log the event in the Power Focus Statistic or General event log.

Select **Show** to display the event in Graph and TTPF interfaces.
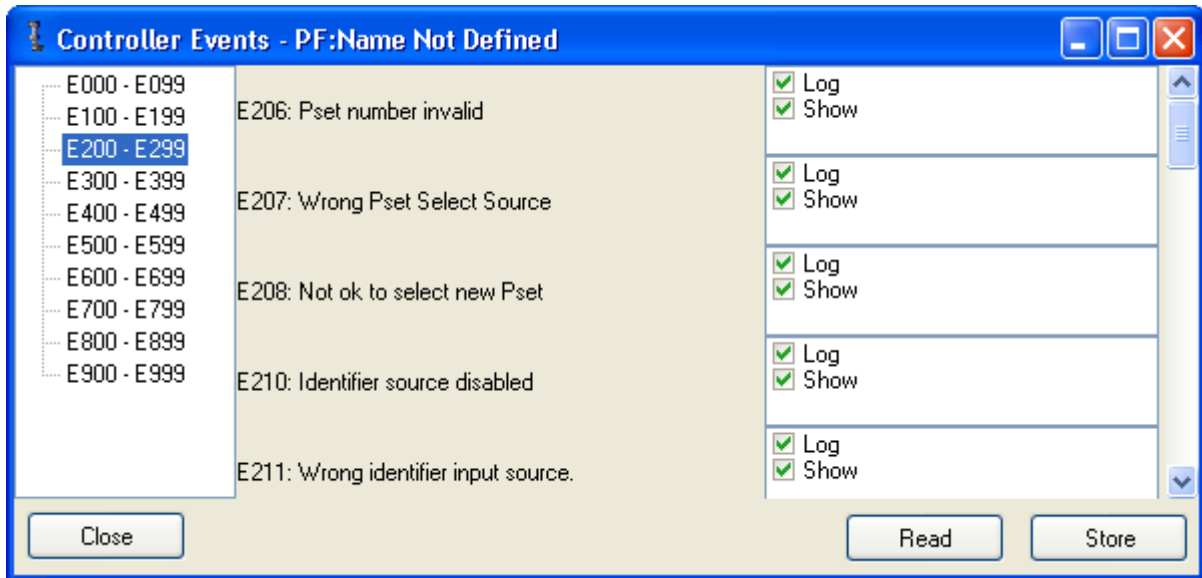
The Statistic and General event log can also be cleared from the system setup branch.

Open **Controller>Memory** and click **Reset general event log** and/or **Reset statistical event log**. Confirm the command in the pop-up window.
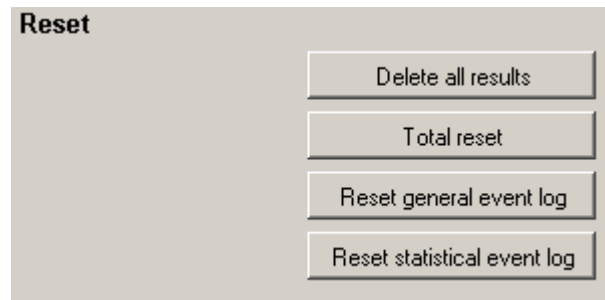
23.1   Event code list

The event codes are listed with number, name, description and a procedure to clear the event. The Acknowledge column indicates that the event has to be acknowledged before proceeding. An 'x' in the columns for PF ready and Tool ready indicate that the relay and corresponding fieldbus item are affected, and that an action (described under 'Procedure') has to be taken before proceeding.

Before any work is performed, ensure that the safety instructions for the controller and the tool have been read and understood. Note that some of the procedures described only can be performed by an Atlas Copco authorized service provider.

See also the General safety instructions in this manual, and Product Information for the controller and the tool.

The events are grouped according to the table below.

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
E700-E799	7	Hardware events
E800-E899	8	Software events
E900-E999	9	Events MMI

23.1.1　E001-E099 Rundown failures

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E003	Torque measurement possibly invalid	The programming is incorrect as no movement is possible in the second stage.	Check the programming for the Pset. Ensure that there is some movement in the second stage.			

23.1.2   E100-E199 Event related errors

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E102	Rundown prohibited due to Lock on Reject	An attempt to make a tightening is made and tightenings are disabled by the parameter *C210 Lock on reject* because the result was not OK. Additional parameter information: First integer parameter: 0=Locked during tightening, 1=locked during loosening Second integer parameter 0=Service denied, 1=service aborted.	Depending on *C210 Lock on reject* configuration, either unlock the tool by the direction ring or by digital input Unlock tool or Master unlock tool. If applicable, reconfigure *C210 Lock on reject*.			x
E103	Tool locked by digital input	One or several of the digital input functions lock the tool: Tool disable, Tool tightening disable, Tool loosening disable. Additional parameter information: First integer parameter: 0=Locked during tightening, 1=locked during loosening Second integer parameter 0=Service denied, 1=service aborted.	Unlock the tool with one of the following digital input functions: Tool disable, Tool tightening disable, Tool loosening disable Note: Unlock tool or Master unlock tool will not act as unlock trigger.			x
E107	Rundown prohibited due to Line control, batch not enabled	A Job using line control is selected with parameter Use J330 line control. The Job does not start until a line control start signal is received from digital input function Line control start signal. Additional parameter information: First integer parameter: 0=Locked during tightening, 1=locked during loosening Second integer parameter 0=Service denied, 1=service aborted.	Unlock the tool with one of the following digital input functions: Line control start signal, Job abort or Master unlock tool.			x
E112	Rehit	An attempt to tighten an already tightened bolt was made.	For information only.			
E113	Current limit reached - Rundown aborted	The current limit has been reached, the drive is disabled.	Acknowledge the event. Perform a motor tuning. Tool>Maintenance>Motor tuning.	x	x	x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E117	Tool locked – cannot access RBU	Power Focus cannot communicate with the RBU and must be rebooted to protect data. Additional parameter information: First integer parameter: 0=Locked during tightening, 1=locked during loosening Second integer parameter 0=Service denied, 1=service aborted.	Acknowledge the event. Turn off PF and check that the RBU is correctly connected. Reboot PF.	x	x	x
E120	Motor tuning failure	The connection between the tool and PF is incorrect or faulty, or the remote start connector is missing or incorrectly wired.	Acknowledge the event. Check that the remote start connector on PF is present and correctly wired. Check that the tool cable and connectors are undamaged and correctly connected. Service the tool.	x	x	x
E121	Open end tuning failure	This event indicates that the Open end tuning command has not been successfully performed.	Acknowledge the event. Check that the remote start connector on PF is present and correctly wired. Verify that parameters *T421-T422* match the geometry of the attached OE head. Check that the mechanical stop is undamaged and working properly.	x	x	x
E122	Open end positioning failure	Open end positioning failed due to too much torque during positioning phase.	Remove the tool from the joint. Restart the positioning.			
E125	Alarm on timeout / Alarm on torque lost	This event is issued when parameter P246 Alarm on end time shutoff is activated and the time defined in *P141 End time* is exceeded before final torque is reached. The reason can be that the tool has slipped off the joint, for example.	Redo the tightening. If the event reappears, set *P141 End time* to a higher value or set *P246 Alarm on end time* shutoff to No.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E126	Multistage aborted	This event indicates that the current running Multistage has not been performed entirely (the drive has been shut off or the tool trigger was released before the end).	Check the additional information to see which events occurred. Follow the procedure for those events. If the second parameter in the sub information is zero (no event is indicated), activate *P244 Alarm on lost trigger* and *P246 Alarm on end time* shutoff in the stage in which the multistage was aborted.			

E126 additional parameter information

- The first integer parameter indicates at which stage that the Multistage was aborted.

- The second integer parameter indicates which event occurred. 0= no event occurred.

- The third and fourth integer parameters, each containing 32 bits, indicate what went wrong with the tightening.

Example 1: E126 (2, 113, 9, 8)

The multistage was aborted (E126) in stage 2 (first digit), when the tightening reached current limit (E113 Current limit reached rundown aborted). The third digit, 9, equals 1+8 that correspond to Multistage aborted and Current limit reached. The fourth digit, 8, corresponds to Final angle max exceeded.

NOTE: Current Limit Reached is one of few event codes for which there is a corresponding tightening error bit.

Example 2: E126 (3, 129, 1, 16896)

The multistage was aborted (E126) in stage 3 (first digit), when torque lower than target occurred (E129 Torque lower than target). The third digit, 1, means Multistage aborted, and the fourth digit 16896 equals 16384+512, Torque less than target and Current monitoring max exceeded.

First integer		Second integer		Third integer			Fourth integer		
The stage when the Multistage aborted		The event code		Error bits part I			Error bits part II		
					Dec	Event		Dec	Event
n	Stage n	nnn	No of event that occurred		1	Multistage aborted		1	Rundown angle max exceeded
					2	Rehit		2	Rundown angle min not reached
					4	Torque measurement possible invalid		4	Final torque max exceeded
					8	Current limit reached		8	Final angle max exceeded
					16	Timeout on end time shutoff		16	Self tap max exceeded
					32	Remove fastener limit		32	Self tap min not reached
					64	Drive disabled		64	PVT monitoring max exceeded
					128	Transducer lost		128	PVT monitoring min not reached
					256	Transducer short circuit		256	PVT Compensate overflow
					512	Transducer corrupt		512	Current monitoring max exceeded
					1024	Sync timeout		1024	Post view torque min not reached
					2048	Dynamic CM Min Tq		2048	Post view torque max exceeded
					4096	Dynamic CM Max Tq		4096	Post view torque angle too small
					8192	Angle Max mon		8192	Trigger lost
					16384	Yield nut off		16384	Torque less than target
					32768	Yield too few samples		32768	Tool hot

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E127	PVT shut off	This event indicates that the drive was shut off in the selftap or prevail phase of the rundown, or the compensate conditions were not fulfilled.	In the Trace monitor, check the result and change the settings accordingly.			
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.	For information only.			
E129	Torque lower than target	When the function torque lower than target is activated in the Pset, this event indicates that the torque result is below final target. The torque status is NOK even if the torque result was larger than final torque min.	For information only. Note: Check also E128 to see if E129 is issued because the trigger was released before final target.			
E130	Post view torque shut off	Post view torque conditions were not fulfilled.	In the Trace monitor, check the result and change the settings accordingly.		x	
E131	Tool Disconnected	This event code is generated when the tool is disconnected (logically or physically) from PF. The event code is also generated when an attempt to start a disconnected (logically or physically) tool is done. Additional parameter information: First integer parameter: 0=locked during tightening, 1=locked during loosening, 2=locked during positioning, 3=locked during motor tuning, 4=locked during open end tuning. Second integer parameter 0=Service denied, 1=service aborted. ⓘ **A damaged cable can result in a disconnected tool.**	Acknowledge the event. If the tool has been logically disconnected, disconnect physically also. Note: The tool can be logically disconnected if the user requests disconnection or if the open end settings are modified.	x	x	x
E132	Wrong tool start input setting	T200 Tool start select source is not corresponding to the remote start jumper position.	Acknowledge the event. Check the wiring of the remote start connector. Verify that the tool trigger is not pressed during hot swap or system start-up.	x	x	x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E133	Tool locked by Tools Talk	The tool is prohibited via ToolsTalk PF. Additional parameter information: First integer parameter: 0=locked during tightening, 1=locked during loosening, 2=locked during positioning, 3=locked during motor tuning, 4=locked during open end tuning. Second integer parameter 0=Service denied, 1=service aborted.	Unlock the tool by - sending an "Enable tool" message via ToolsTalk PF protocol or - using digital input Master unlock tool.			x
E136	Tool locked by batch OK	This event code is displayed if the tool is locked by the function P152 Lock at batch OK. Additional parameter information: First integer parameter: 0=locked during tightening, 1=locked during loosening, 2=locked during positioning, 3=locked during motor tuning, 4=locked during open end tuning. Second integer parameter 0=Service denied, 1=service aborted.	Unlock the tool by - using the digital inputs Unlock tool or Master unlock tool or - sending an "Enable tool" message on fieldbus, Open protocol or ToolsTalk PF protocol.			x
E137	Tool locked by fieldbus	The tool is locked by fieldbus. Additional parameter information: First integer parameter: 0=locked during tightening, 1=locked during loosening, 2=locked during positioning, 3=locked during motor tuning, 4=locked during open end tuning. Second integer parameter 0=Service denied, 1=service aborted.	Unlock the tool by - sending an "Enable tool" message via fieldbus or - using the digital input Master unlock tool.			x
E138	Wrong tool start input source	It is only possible to start the tool from selected tool start select source.	Check the setting for *T200 Tool start select source*.			
E139	Tool locked by Open protocol	The tool is locked by open protocol. Additional parameter information: First integer parameter: 0=locked during tightening, 1=locked during loosening, 2=locked during positioning, 3=locked during motor tuning, 4=locked during open end tuning. Second integer parameter 0=Service denied, 1=service aborted.	Unlock the tool by - sending an "Enable tool" message via Open protocol or - using the digital input Master unlock tool.			x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
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. Additional parameter information: First integer parameter: 0=locked during tightening, 1=locked during loosening, 2=locked during positioning, 3=locked during motor tuning, 4=locked during open end tuning. Second integer parameter 0=Service denied, 1=service aborted.	Insert a valid ID card.			x
E141	Tool locked during work order	Multiple identifiers; tool is locked during work order. Tool will be unlocked when all expected identifiers have been received in correct order.	Check the work order settings in the Options dialog in the Identifier branch. Scan the identifiers in the correct work order without pushing the trigger. Unlock the tool by Restoring of identifier configuration is done Reset all identifiers command is performed via digital input, open protocol or identifier monitor Reset latest identifier command is performed after the first type in the work order is accepted.			x
E143	Tool locked by system	The PF has detected a serious condition and needs to lock the tool.	Usually this is an operator error. Check configuration in PF.	x		x
E145	Tool locked by Timer enable tool	The tool is locked by digital input Timer enable tool when the Job was not started within the time set in *J320 Max time to start Job*.	Unlock the tool with digital input Timer enable tool. If applicable, set *J320 Max time to start Job* to a higher value.			x
E146	No tool cable detected	Incorrect or damaged cable.	Ensure that the tool cable is correctly connected and without damage. Replace the cable.			x
E147	Tool locked by click wrench Pset	A Pset with click wrench tightening strategy is selected for a tool. Additional parameter information: First integer parameter: 0=Locked during tightening, 1=locked during loosening Second integer parameter 0=Service denied, 1=service aborted.	Use the correct combination of tool and Pset.			x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E149	Tool locked disable loosening at OK	The function *C220 Disable loosening at OK* has locked the tool. Additional parameter information: First integer parameter: 1=locked during loosening Second integer parameter 0=Service denied, 1=service aborted.	Unlock the tool by selecting forward on the tool, or by digital input Master unlock tool. Continue tightening.			x
E150	Job client does not respond	When running a Cell Job, this event is displayed by the Job reference when one of the Job members does not respond. Additional parameter information: The first integer parameter indicates the channel ID for the Job client that does not respond.	Check which controller in the Cell that is not responding. Check the cables and connections between the Cell member and the Cell reference. Check that the IP addresses in the Cell group are correct. Check that IP addresses within the Cell is not used by someone else.			
E151	Job in OFF mode	It is not possible to select a new Job. The Power Focus is in Job off mode.	In the Job monitor, clear the Job off check box. Select new Job.			
E152	PF locked in Job mode	Conditions within the job functionality have locked the tool. E.g. due to not currently active tool in or after job sequence, or tool not enabled after job selection etc. Additional parameter information: First integer parameter: 0=locked during tightening Second integer parameter 0=Service denied, 1=service aborted.	Activate the controller. If possible, disable *J302 Lock at Job done.*			x
E153	Not ok to select new Job	A Job must be completed or aborted before selecting a new Job. A Job must be selected on a Job master.	Finish running the present Job. If needed, abort running Job or select new Job on Job master.			
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 reference.	For information only.			
E155	Remote Job aborted	When running a Cell Job, this is displayed by the Job members when a Cell Job is aborted.	For information only.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E156	Job members lost	When running a Cell Job, this is displayed by the Job reference when it has lost contact with one of the Job members. Additional parameter information: The first integer parameter indicates the channel ID for the lost Job client.	Check cables and connections to the lost Job client. In the Controller menu of the lost Job client, open Network and check that the Job reference IP-address is correct, and that the Job member is part of the same cell as the Job reference. In the Job menu of the Job reference, check that the all PFs are present in the Job list.			
E157	Job reference lost	When running a Cell Job, this is displayed by the Job clients when they have lost contact with their Job reference.	Check cables and connections to the Job reference. In the Controller menu, check the network settings for the Job reference and the Job clients. All Job clients and the Job reference must belong to the same cell.			
E158	Invalid Job ID	When the selected Job does not exist.	In the Job reference, open the PF Map and check the ID of all defined Jobs.			
E159	No Pset in selected Job	When the selected Job does not contain any Pset.	In the Job reference, open **PF Map > Job**, and double-click the selected Job. Add the correct Psets and store the settings.			
E160	Job select source not valid	Attempt to select a Job with the wrong input source.	In the Job reference PF Map, open Controller>Configuration. In the Select source view, check the settings for *C201 Job*.			
E161	Line control alert 1	The line control has been activated, and the first control alert limit has been reached.	For information only.			
E162	Line control alert 2	The line control has been activated, and the second control alert limit has been reached.	For information only.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E166	Job aborted	This event will be displayed when a running Job is aborted. Additional parameter information. First integer parameter: 2 Digital input 3 Ethernet/serial (PC 5 Field bus 6 Keyboard 7 Reserved 8 Reserved 9 Manual mode (the current active job is aborted and a new job becomes active when selected from digital input) 10 Timer 1 (max time to start job) 11 Timer 2 (max time to complete job) 12 Deleted (a pending job is deleted from PF database) 13 Job off mode 14 Line control Alarm 2 15 Job override	For information only.			
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).	For information only.			x
E168	ST scanner settings not production default	Issued at ST scanner power-on if scan engine settings are not the same as production defaults.	For information only.			
E169	ST scanner settings not at highest security level	Issued at ST scanner power-on if scan engine settings are not at the highest security level.	For information only.			
E175	Configuration will be erased at next reboot	The Power Focus will erase the configuration in the Power Focus memory and the RBU since the memory setup has been changed.	Accept or reject the memory re-configuration.			
E177	Functionality not in RBU	The user is trying to use functionality that is not enabled in the RBU.	Replace the RBU or use another functionality.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E178	Memory allocation error	The user is trying to allocate more memory than exists in the Power Focus.	Check settings for **Controller > Memory**. Decrease the number of results, Psets or Jobs until the memory usage is below 100%.			
E179	Totally configurable memory needed	Not possible to configure this functionality without function "totally configurable memory".	Save the PF configuration to file. Open **Controller > Memory**. *C600 Memory type* must be set to Totally configurable memory. Reboot PF, the PF memory is remapped and erased. Reload the configuration without the memory settings.			
E190	Wrong ST scan source	Attempt to scan from wrong source.	Open **PF Map > Accessories > Tool bus** and double click Configuration. In the Tool bus configuration dialog box, click ST scanner. Ensure that the Scanner source item list selection is applicable.			
E191	ST scanner overheated	The ST scanner temperature has exceeded max temperature.	Disconnect the tool Let the scanner cool for 15 minutes			
E199	Not possible to store Reference Trace	If You try to store the Reference Trace(In Multiple Traces menu), but it does not exist anymore.	Make new tightenings and find a new Reference Trace and press store again.			

23.1.3   E200-E299 User input events

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E206	Pset number invalid	An attempt was made to perform a tightening with the wrong Pset number. Additional parameter information: First integer parameter: 0=Locked during tightening, 1=locked during loosening Second integer parameter 0=Service denied, 1=service aborted.	Check parameter *C200 Pset* and select a Pset from the correct source.			x
E207	Wrong Pset Select Source	Attempt to select Pset from a source not specified for parameter *C200 Pset*.	Check parameter *C200 Pset* and select a Pset from the correct source.			
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.	Proceed in the Job order until the Job is finished. To select a new Job or Pset; Select *C202 Job override*, select new Job, or select Job off.			
E209	Pset configuration updated	The configuration of the Pset has been changed.	For information only.			
E210	Identifier source disabled	An Identifier source is disabled. All Identifiers sent by a disabled source are discarded.	Switch back to Automatic Mode to enable the Identifier source.			
E211	Wrong identifier input source	Wrong input source for an identifier string.	Open **Identifier>Type setup** and check that the input source is correct. Scan the identifier string.			
E212	Pset/Multistage stored	Event displayed every time a Pset or Multistage is stored or restored. Additional parameter information: First integer parameter: Pset or Multistage number Second integer parameter 0=Pset, 1=Multistage	For information only.			
E213	Pset number not present	An attempt to start a Job containing a Pset not present in PF has been performed.	Choose correct Job or reprogram the Job.			
E220	Fastener broken	Displayed if fastener (screw or nut) breaks during yield control.	Ensure that more than one comparison is obtained before yield is reached. In ToolsTalk, open the trace monitor and analyze the tightening. Change the applicable parameter.			
E221	Too few samples for yield control	Too few samples for mean torque calculation in yield algorithm.	Increase parameter *P262 Window angle* or reduce speed during yield control.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E233	Final Target range error	This event code is displayed when an attempt is made to tighten with a final target out of range (larger than tool max torque or 9999). Additional parameter information: First parameter: Pset number Second parameter: Parameter number with an incorrect value Third parameter: Parameter in second integer is dependent on this parameter Fourth parameter: Parameter in second integer violates this limit.	Change the value for "Final Target" to a value within tool limits. Store and try again.			x
E234	Start final angle range error	This event code is displayed when an attempt is made to tighten with a *P120 Start final angle* out of range. First parameter: Pset number Second parameter: Parameter number with an incorrect value Third parameter: Parameter in second integer is dependent on this parameter Fourth parameter: Parameter in second integer violates this limit.	Change the value for *P120 Start Final Angle* to a value within tool limits. Store and try again.			x
E235	Incompatible system configuration	Some configurations are not compatible. Some combinations of devices, tools and accessories can not be configured.	Usually this is an operator error. Check configuration in PF.	x		x
E236	Configuration set inconsistent	This event code is displayed if one device on the I/O bus has the correct ID but incorrect type specified (for example a Selector is connected and an RE-Alarm is configured). Additional parameter information: First integer parameter: Number of I/O device with configuration problems. Second integer parameter 2=I/O-expander or Operator panel, 3=RE-alarm, 5=Four-position socket selector, 6=Eight-position socket selector.	Acknowledge the event. Ensure that the ID and the type of I/O device are the same.	x	x	x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E237	Strategy configuration error	No valid control strategy was chosen for the stored Pset. Additional parameter information: First parameter: Pset number Second parameter: Parameter number with an incorrect value Third parameter: Parameter in second integer is dependent on this parameter Fourth parameter: Parameter in second integer violates this limit.	Change control strategy valid for used tool. Check that the Pset parameters are correct and store the Pset.			x
E238	Not possible to run a Multistage with a Click Wrench Pset	An attempt was made to perform a Multistage tightening containing at least one Pset with a click wrench strategy.	Open the Multistage. Remove the click wrench Pset. Add an applicable Pset and store the settings.			x
E239	Serial number missing	Tightening and loosening prohibited due to missing serial number				TNR
E240	Password Incorrect Input Source	The password is entered from an invalid source according to the configuration.	Enter the password from ToolsTalk or change parameter *C801 Entry*.			
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.	If needed, open **PF Map > Job > Timer** and change the parameter *J320 Maxtime to start Job*, or set to 0 to shut off timer. Store Job and try again.			
E251	Max time to complete Job run out	This message is displayed and the Job is terminated if the Job is not completed within the specified time in Job configuration.	If needed, open **PF Map > Job > Timer** and change the parameter *J321 Maxtime to complete Job*, or set to 0 to shut off timer. Store Job and try again.			
E281	Identifier not accepted, the length is not correct.	The length of the incoming barcode string is wrong.	Open **PF Map > Identifier** and check that the string Length matches the scanned string, and that the scanned string does not exceed 100 characters.			
E282	Identifier not accepted, does not match any type	The incoming barcode string does not match any type.	Open **PF Map > Identifier** and check Input source, string Length and Significant position are correctly configured.			
E285	Bypass Identifier not possible	The Type 1 identifier can not be bypassed when an optional Type exists.	Open **PF Map > Identifier** and remove optional Type if not used.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E286	Reset Identifier not possible	Reset latest identifier is not possible when a complete Work Order has been accepted.	Use digital input Reset all identifiers.			
E287	All Result Parts can not be stored	All Result Parts can not be stored.	Make sure that the Job Master and all of the Job Members have the same number of Result Parts in the configuration. Make sure that the Sync Master and all of the Sync Members have the same number of Result Parts in the configuration.			

23.1.4   E300-E399 Statistical events

Event code	Event name	Description	Procedure
E333	Not allowed subscription	The requested statistic subscription is not allowed. For example it is not allowed to set an angle statistic subscription for a Pset using only the torque control strategy.	Change the subscription.
E334	No statistic available for this Pset	The Pset strategy is not suitable to calculate statistics (no strategy is chosen).	For information only.
E335	Not enough data	Not enough data is available to calculate the statistic control limits.	Do more tightenings to get enough data. Calculation used: nbrofsubgroups * subgroupsize * (1 + subgroup frequency) Check and if necessary change *P503 No of subgroups*.
E336	Mem alloc fail	It is not possible to allocate enough memory for the statistic subscription.	Open **Controller > Memory** and set *C600 Type* to Totally configurable. Check settings.

Event code	Event name	Description	Procedure
E340	Xucl tq	The last subgroup mean torque value is larger than the upper control limit.	The statistic events give an indication of irregularities in the tightening process. If needed: Check the programming. Check the tool status. Check the tightening material and joint components. Check the work station set-up and procedure.
E341	Xlcl tq	The last subgroup mean torque value is lower than the lower control limit.	See *E340 Xucl tq*
E342	Rucl tq	The last subgroup range torque value is larger than the upper control limit.	See *E340 Xucl tq*
E343	Rlcl tq	The last subgroup range torque value is lower than the lower control limit.	See *E340 Xucl tq*
E344	Cp tq	The torque Cp is lower than 2.	See *E340 Xucl tq*
E345	Cpk tq	The torque Cpk is lower than 1.33.	See *E340 Xucl tq*
E346	7inc x tq	Trend deviation alarm, the subgroup torque mean value has increased 7 times consecutively.	See *E340 Xucl tq*
E347	7dec x tq	Trend deviation alarm, the subgroup torque mean value has decreased 7 times consecutively.	See *E340 Xucl tq*
E348	7inc r tq	Trend deviation alarm, the subgroup torque range value has increased 7 times consecutively.	See *E340 Xucl tq*
E349	7dec r tq	Trend deviation alarm, the subgroup torque range value has decreased 7 times consecutively.	See *E340 Xucl tq*
E350	7above x tq	Trend deviation alarm, the subgroup torque mean value has been above the average mean value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*
E351	7below x tq	Trend deviation alarm, the subgroup torque mean value has been below the average mean value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*
E352	7above r tq	Trend deviation alarm, the subgroup torque range value has been above the average range value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*

Event code	Event name	Description	Procedure
E353	7below r tq	Trend deviation alarm, the subgroup torque range value has been below the average range value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*
E354	2sigma x tq	Trend deviation alarm, the last subgroup torque average is outside Xtq-bar-bar - 2 sigma.	See *E340 Xucl tq*
E355	2sigma r tq	Trend deviation alarm, the last subgroup torque range average is outside Rtq-bar-bar - 2 sigma.	See *E340 Xucl tq*
E360	Xucl ang	The last subgroup mean angle value is larger than the upper control limit.	See *E340 Xucl tq*
E361	Xlcl ang	The last subgroup mean angle value is lower than the lower control limit.	See *E340 Xucl tq*
E362	Rucl ang	The last subgroup range angle value is larger than the upper control limit.	See *E340 Xucl tq*
E363	Rlcl ang	The last subgroup range angle value is lower than the lower control limit.	See *E340 Xucl tq*
E364	Cp ang	The angle Cp is lower than 2.	See *E340 Xucl tq*
E365	Cpk ang	The angle Cpk is lower than 1.33.	See *E340 Xucl tq*
E366	7inc x ang	Trend deviation alarm, the subgroup angle mean value has increased 7 times consecutively.	See *E340 Xucl tq*
E367	7dec x ang	Trend deviation alarm, the subgroup angle mean value has decreased 7 times consecutively.	See *E340 Xucl tq*
E368	7inc r ang	Trend deviation alarm, the subgroup angle range value has increased 7 times consecutively.	See *E340 Xucl tq*
E369	7dec r ang	Trend deviation alarm, the subgroup angle range value has decreased 7 times consecutively.	See *E340 Xucl tq*
E370	7above x ang	Trend deviation alarm, the subgroup angle mean value has been above the average mean value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*
E371	7below x ang	Trend deviation alarm, the subgroup angle mean value has been below the average mean value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*
E372	7above r ang	Trend deviation alarm, the subgroup angle range value has been above the average range value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*

Event code	Event name	Description	Procedure
E373	7below r ang	Trend deviation alarm, the subgroup angle range value has been below the average range value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*
E374	2sigma x ang	Trend deviation alarm, the last subgroup angle average is outside Xang-bar-bar-2 sigma.	See *E340 Xucl tq*
E375	2sigma r ang	Trend deviation alarm, the last subgroup angle range average is outside Rang-bar-bar-2 sigma.	See *E340 Xucl tq*
E380	Xucl cm	The last subgroup mean CM value is larger than the upper control limit.	See *E340 Xucl tq*
E381	Xlcl cm	The last subgroup mean CM value is lower than the lower control limit.	See *E340 Xucl tq*
E382	Rucl cm	The last subgroup range CM value is larger than the upper control limit.	See *E340 Xucl tq*
E383	Rlcl cm	The last subgroup range CM value is lower than the lower control limit.	See *E340 Xucl tq*
E384	Cp cm	The CM Cp is lower than 2.	See *E340 Xucl tq*
E385	Cpk cm	The CM Cpk is lower than 1.33.	See *E340 Xucl tq*
E386	7inc x cm	Trend deviation alarm, the subgroup CM mean value has increased 7 times consecutively.	See *E340 Xucl tq*
E387	7dec x cm	Trend deviation alarm, the subgroup CM mean value has decreased 7 times consecutively.	See *E340 Xucl tq*
E388	7inc r cm	Trend deviation alarm, the subgroup CM range value has increased 7 times consecutively.	See *E340 Xucl tq*
E389	7dec r cm	Trend deviation alarm, the subgroup torque range value has decreased 7 times consecutively.	See *E340 Xucl tq*
E390	7above x cm	Trend deviation alarm, the subgroup CM mean value has been above the average mean value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*
E391	7below x cm	Trend deviation alarm, the subgroup torque mean value has been below the average mean value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*
E392	7above r cm	Trend deviation alarm, the subgroup CM range value has been above the average range value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*

Event code	Event name	Description	Procedure
E393	7below r cm	Trend deviation alarm, the subgroup CM range value has been below the average range value of the average of the latest ten subgroups 7 times consecutively.	See *E340 Xucl tq*
E394	2sigma x cm	Trend deviation alarm, the last subgroup CM average is outside XCM-bar-bar-2 sigma.	See *E340 Xucl tq*
E395	2sigma r cm	Trend deviation alarm, the last subgroup CM range average is outside RCM-bar-bar-2 sigma.	See *E340 Xucl tq*

23.1.5   E400-E499 Communication events

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E401	Duplicate device IDs on I/O bus	Two I/O devices with the same ID are present on the I/O bus. This event occurs even if the devices are not configured in PF.	Acknowledge the event. Make sure that all of the devices on the bus have a unique ID.	x	x	x
E403	I/O device not responding	I/O device is not properly connected or the ID of the device is not the same as the one configured. Additional parameter information: First integer parameter: Number of device not responding.	Check IO cables. Check the configuration of the accessories on the IO bus and compare it with the devices on the IO bus.	x	x	x
E407	IO device has invalid ID selected	An I/O device has selected ID 0, which is invalid. Additional parameter information: First integer parameter: Number of device not responding.	On the device, select an ID between 1 and 15 (in ToolsTalk) or 1-F (on selector)	x	x	x
E417	Too many communication sessions at one time	There are too many connections at the same time (ToolsTalk PF, Tools Net, Operator Panel etc.) The most common problem is that an external program allocates all the communication.	Wait until the other sessions are done and close their connection.			
E420	ST Accessory not supported.	A device connected to the ST-bus is not recognized by PF.	Acknowledge the event. Upgrade PF software.	x	x	x
E421	Safety trigger not supported by tool software	The tool software version does not support safety trigger function.	Acknowledge the event. Upgrade the tool software.	x	x	x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E433	No RBU present	No RBU detected at start-up or RBU found missing at runtime.	Acknowledge the event. Check that there is an RBU and that it is connected properly.	x	x	x
E434	RBU Timeout	RBU did not respond to command from Power Focus.	Acknowledge the event. Check that the RBU is connected properly. Reboot PF. If the event reappears, replace the RBU	x	x	x
E436	RBU file system warning	RBU file system warning because of download interruption.	Reboot PF. If the event reappears, replace the RBU			
E437	RBU file system corrupt	RBU file system fault. An attempt will be made to repair it by means of erasing the RBU.	Acknowledge the event. Reboot PF. Replace the RBU.	x	x	x
E438	RBU file mismatch	A file with incorrect name or size was returned to a read request.	Acknowledge the event. Reboot PF. Replace the RBU.	x	x	x
E440	RBU no files	RBU file system fault.	Acknowledge the event. Reboot PF. Replace the RBU.	x	x	x
E441	RBU access too busy	RBU has answered to the poll but Power Focus is too busy to receive the reply.	Acknowledge the event. Acknowledge the event. Upgrade PF software.	x	x	x
E442	RBU no such file	RBU file system fault.	Acknowledge the event. Reboot PF. Replace the RBU.	x	x	x
E444	RBU packet rejected	RBU responds with an answer not matching the last request. This is probably due to duplicates sent when the Power Focus does not acknowledge packages.	Acknowledge the event. Reboot PF. Replace the RBU.	x	x	x
E445	RBU corrupt	RBU software fault.	Acknowledge the event. Reboot PF. Replace the RBU.	x	x	x
E446	RBU read error	RBU read operation failed.	Acknowledge the event. Try read again Reboot PF Replace the RBU	x	x	x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E447	RBU write error	RBU write operation failed.	Acknowledge the event. Try write again. Reboot PF. Replace the RBU.	x	x	x
E448	RBU delete error	RBU delete operation failed.	Acknowledge the event. Try delete again. Reboot PF. Replace the RBU.	x	x	x
E449	RBU flush error	RBU erase operation failed.	Acknowledge the event. Try erase again. Reboot PF. Replace the RBU.	x	x	x
E450	RBU list error	RBU update operation failed.	Acknowledge the event. Try update again. Reboot PF. Replace the RBU.	x	x	x
E451	RBU update failed	Database synchronization between Power Focus and RBU failed.	Acknowledge the event. Try update again. Reboot PF. Replace the RBU.	x	x	x
E460	Fieldbus type mailbox message fault	Error detected in initialization of fieldbus.	Contact the Atlas Copco service representative.			
E461	Fieldbus type gen com fault	Error detected in initialization of fieldbus.	Contact the Atlas Copco service representative.			
E462	Fieldbus mailbox message fault	Error detected in initialization of fieldbus.	Contact the Atlas Copco service representative.			
E463	Fieldbus gen com fault	Error detected in initialization of fieldbus.	Contact the Atlas Copco service representative.			
E464	Fieldbus hardware fault	The fieldbus module is broken and has to be replaced.	Acknowledge the event. Contact the Atlas Copco service representative.	x	x	x
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.	Switch off PF. See chapter Fieldbus for information about how to set the switch position. Correct the switch and turn on PF.			
E466	Fieldbus offline	The fieldbus went from online to offline.	Check if PF is connected to the network. Check if the PLC is down.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E467	Fieldbus configuration fault	Error detected in initialization of fieldbus.	Contact the Atlas Copco service representative.			
E468	Fieldbus hardware mismatch	The fieldbus module installed in Power Focus is not the same fieldbus type as configured with ToolsTalk PF. Change fieldbus module or configuration to get a match.	Check the configured filedbus type. Check which fieldbus type is installed in PF. Reconfigure to match the installed fieldbus type.			
E469	Fieldbus init error	Error detected in initialization of fieldbus.	Contact the Atlas Copco service representative.			
E470	Fieldbus PCP error	InterBus PCP length error. Maximum length is 20 bytes.	Check the length of the process data and the PCP data. If the data exceeds 20 bytes, then correct the configuration.			
E471	Fieldbus claim area failed, lost one message	Too much data traffic has caused one packet lost.	Reduce the data from the PLC that needs acknowledgement from PF.			
E472	Fieldbus release area timeout	Release area command timed out.	Information event. If the event occurs frequently, then reduce the data from the PLC that needs acknowledgement from PF.			
E473	Fieldbus communication buffer alarm	Communication buffer full due to too many input signals or incorrect fieldbus update interval.	Check if there is a frequent input signal, or if *F200 FB Update Interval* needs to be changed. Decrease the input signals and/or decrease the fieldbus update interval.			
E474	Fieldbus monitor buffer alarm	Fieldbus monitor buffer full.	In TTPF, turn off the fieldbus monitor.			
E475	Fieldbus PsetID mismatch Selector lifted socket	Fieldbus selected Pset does not match the lifted socket.	In the PLC, check the Pset ID. If the Pset and socket do not correspond, then lift the correct socket or change the Pset.			
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.	Acknowledge the event. Open **PF Map > Controller > Network > Cell** and change parameter *C310 Channel ID* to be within 1 and 20 and unique within the cell.	x	x	x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E481	Cell member registration failed	The Cell member registration failed because one Cell member is already registered with the same channel ID.	Acknowledge the event. In the cell member, open **PF Map > Controller > Network > Cell** and change parameter *C310 Channel ID* to be within 1 and 20 and unique within the cell.	x	x	x
E482	SW version not compatible with cell	The application code version differs from the cell reference. To be able to run the cell functionality, ensure that all members in the cell use the same release as the cell reference.	In the cell members, open **PF Map > Controller > Information** and check *C101 Application code version*. Ensure that all cell members have the same SW version.			
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.	Acknowledge the event. Open **PF Map > Controller > Network > Cell** and set *C313 Cell ID* to a correct number unique within the network.	x	x	x
E491	Net member registration failed	The Net member registration failed because one Net member is already registered with the same Cell ID.	Acknowledge the event. In the Net member, open **PF Map > Controller > Network > Cell** and set *C313 Cell ID* to a correct number unique within the network.	x	x	x
E492	SW version not compatible with net cell	The application code version differs from the net reference. To be able to run the net cell functionality, ensure that all cell references in the net use the same release as the net reference.	In the cell members, open **PF Map > Controller > Information** and check *C101 Application code version*. Ensure that all cell members have the same SW version.			

23.1.6   E500-E599 Hardware events (tools)

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E500	New tool connected	A new tool has been connected to the drive				

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E501	Tool overheated	The tool is too hot and the drive is disabled. Additional parameter information: First integer parameter indicates at which stage the tool was locked: 0=Tightening, 1=Loosening, 2=Positioning, 3=Motor tuning, 4=open-end tuning, Second integer parameter: 0=Service denied, 1=service aborted.	Let the tool rest until it is cool enough to run. If the event reappears, reconsider the workstation set-up and the tightening strategy. Service the tool.		x	x
E502	Tool service interval expired	Service the tool. See parameter *T413 Service interval*. Additional information: The event appears, for 3 seconds, every 100 tightenings after *T412 No of tightenings since service* exceeds *T413 Service interval*, and *T411 Service indicator* = ON. The alarm LED indicates tracking during this period. The tool is locked if *T416 Lock tool on alarm* is checked.	Acknowledge the event. Service the tool. Open **Tool > Maintenance > Service**, click Service counter reset and confirm by clicking OK. Note: To remove the event and unlock the tool, set *T411 Service indicator* to Off.			
E503	Calibration date expired	The calibration date has expired.	Use a torque measurement equipment to calculate a calibration value. Update tool calibration value using *T402 Set calibration value*. Update parameter *T405 Calibration alarm date*.			
E504	Tool wear indicator alarm	Tool wear indicator alarm indicates that the tool should be serviced.	Service the tool. Connect tool to ToolsTalk Service and reset the wear indicator.			
E505	Tool rebuilt to/from OE-type	Tool redesigned. E.g. angled tool type redesigned to an OE-tool type.	For information only.		x	x
E506	Tightenings prevented by RBU	Tool locked due to incurred software release and with wrong RBU.All Hea d build requires a FieldTest RBU to be able to perform tightenings.	Change to a RBU that supports the used build.		x	x
E507	Motortuning performed	A motortuning has been performed. Measured values from the tool motortuning process are entered in sub information arguments 1 to 4	For information only.		x	x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E508	Motortuning warning	Measured values from the tool motortuning process indicates that the tool is not running optimally. The tool may run warmer than normal. Values for supporting this decision are entered in sub information arguments 1 to 4. (This event is default off).	The accuracy of the tool is not influenced by this problem. However, if the performance of the tool is considered to be a problem, send it to motor service.		x	x
E510	Tool type not supported by RBU	The tool type is not supported by the RBU.	Acknowledge the event. Check which RBU-level the tool requires. Replace the RBU.	x	x	x
E511	Tool-Power Focus 3000 size mismatch	Mismatch between the tool and PF 3000 controller (for example S4/S7 tool connected to a S9 controller).	Acknowledge the event. Replace the PF3000 with the correct PF3000 or a PF4000, to match the tool.	x	x	x
E512	Tool revision not supported by this drive SW	The tool is not supported by the drive (drive version too old)	Change tool or PF SW	x	x	x
E513	Tool EEPROM corrupt - service tool	Checksum indicates that tool memory is corrupt. Tool must be serviced.	Acknowledge the event. Reprogram the tool and restore the memory, using Tools Talk service.	x	x	x
E514	Motortune parameters invalid - Motortune	Checksum indicates that the motor tuning or the open-end tuning table is corrupt. Additional parameter information: First integer parameter indicates at which stage the tool is locked: 0= tightening, 1= loosening, 2=positioning, 3=motor tuning, 4=open-end tuning, 5=tracking Second integer parameter 0=Service denied, 1=service aborted.	Acknowledge the event. Open Tool>Maintenance and do a motor tuning or an open-end tuning.	x	x	x
E517	Tool max torque invalid	Tool max torque invalid, service tool.	Acknowledge the event. Set parameter T102 to an appropriate value. For S/DS/ETX tools: use TTPF or Graph. Other tools: use TTS.	x	x	x

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E518	Tool normalization out of range	Tool normalization value out of range, service tool.	Acknowledge the event. Use a torque measurement equipment to calculate a normalization value. Use the strategy DS-control during measurements. Open **Tool > Maintenance > Calibration** and update *T403 Normalisation value*.	x	x	x
E519	Tool calibration value out of range	Tool calibration value out of range, service tool.	Acknowledge the event. Recalibrate the tool, using ACTA. If the event reappears, replace the tool.	x	x	x
E520	Wear indicator data in tool invalid	Data in tool memory used for wear indicator is invalid. Service tool.	Open **Tool > Maintenance > Wear** and set *T434 Min wear tightenings* to <100000.			
E521	Wear data in tool not updated	Tool memory or MC software not responding.	Acknowledge the event. Check that the tool cable and connectors are undamaged and correctly connected. Please reboot PF	x		
E535	Torque transducer error	Cables to transducer cut off or shorted.	Acknowledge the event. Check that the tool cable and connectors are undamaged and correctly connected. If the event reappears, service the tool.	x	x	x
E536	No transducer (sensor)	Cables to transducer cut off or shorted.	Check that the tool cable and connectors are undamaged and correctly connected.		x	
E537	Calibration not OK, offset outside limits	Calibration offset outside limits.	Service the tool.			
E538	Calibration not OK, CalVal outside limits	Calibration value outside limits.	Service the tool.			
E539	Calibration not OK, Offset changed > 5% of max value since last calibration	Calibration not OK, offset changed > 5% of max value since last calibration.	Try to calibrate again. If the event reappears, service the tool.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E540	Calibration not OK, CalVal changed > 5% of max value since last calibration	Calibration not OK, calibration value changed > 5% of max value since last calibration.	Service the tool.			
E541	Transducer (sensor) lost during tightening	Cables to transducer cut off or shorted.	Acknowledge the event. Service the tool.	x	x	x
E542	Transducer (sensor) lost during tightening from drive	When tightening values are lost the process reads the tool register and finds out that one or several error bits have been set. Symptom of failure in transducer electronics inside the tool.	Acknowledge the event. Service the tool.	x	x	x
E543	Transducer (sensor) lost during tightening from DSP	When tightening values are lost the process reads the tool register and finds out that NO error bits have been set. Symptom of failure in connection between tool and PowerFocus.	Acknowledge the event. Check for damage connection path between PowerFocus and the tool: sockets and plugs contact pins, the cable. Service the tool, PowerFocus or the cable.	x	x	x
E544	Spindle rotated during transducer calibration	Rotation of spindle during calibration indicates that operator possibly strained transducer creating offset/gain change	Make sure that all parts are still relative to each other at tool start			
E550	Radio contact with tool established, tool accessible	Radio contact with tool established, tool accessible.	For information only.			
E551	Radio contact with tool lost, tool inaccessible	Radio contact with tool lost, tool inaccessible.	Re-establish connection.			
E552	Communication error with tool	An intermittent communication disturbance between tool and controller.	For information only. If occurring frequently, reposition Serial Port Adapter. If re-occurring, contact your Atlas Copco representative.			
E553	Pairing attempt with wireless tool failed	An attempt to pair the Power Focus with a wireless tool failed.	Set the tool in pairing mode according to the pairing procedure. Perform another pairing attempt. If the event reappears, replace the tool.			
E554	Command not performed, wireless tool inaccessible	A command (batch increment, reset batch etc.) could not be performed and was discarded because the tool was currently inaccessible.	Re-establish connection. Perform the action causing the event again.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E555	Condition change not reflected in tool, wireless tool inaccessible	A condition change in the controller (Pset selection, Job selection, Job aborted etc.) could not be reflected in the tool. The tool was currently inaccessible.	Re-establish connection. The condition change is now automatically transferred to the tool.			
E556	Tool battery low	Tool battery voltage is low.	Replace the tool battery. Place the discharged battery in the battery charger.			
E557	Tool battery empty	Tool battery empty. Tool locked.	Replace the battery. The tool is unlocked automatically.			
E558	Tool software version mismatch	The implemented protocol version in Power Focus for connected tool differs from the protocol version in tool. Additional parameter information: First parameter is Power Focus protocol version. Second parameter is tool protocol version.	Upgrade the software in tool or PF to match each other.			
E559	IRC pairing completed	An IRC paring sequence has been successfully completed.	For information only.			
E560	Tool RBU error	An RBU error was detected by the tool software.	Check that the RBU is correctly mounted, otherwise service tool.			
E561	Tool locked, do Store standalone	Tool locked since no Pset has been actively stored in the tool.	Do Store Standalone or deselect Standalone, parameter T470 Use Standalone.			
E562	Condition change not reflected in tool, wireless tool stand alone	A condition change in the controller (Pset selection, Job selection, Job aborted …) could not be reflected in the tool. The tool was currently stand alone	Make changes in the stand alone interface instead if the change is meant to apply.			
E563	IRC configuration mismatch	Not possible to establish radio connection with wireless tool	Check if tool is in correct operation mode (Ad-hoc and not Infrastructure mode); Also check the PF IRC settings.	X		
E564	Reboot of wireless tool needed for changes to take effect	Reboot of wireless tool needed for changes to take effect	Acknowledge the event on the PF and power cycle the wireless tool.	X		
E565	Locked while updating Pset/Job in tool	The controller has locked the tool while updating the Pset/Job in the (for instance wireless) tool.	For information only.			X

23.1.7   E600-E699 Hardware events

Event code	Event name	Information	Procedure	Acknowledge	PF ready	Tool ready
E601	System voltage low	DC voltage too low. Tool locked.	Acknowledge the event. Power Focus: Verify that the input voltage is within specified limits and reboot the system. STB: Replace battery. If occurring frequently, check Pset, service tool.	x	x	x
E602	DC-bus HI during rundown	DC voltage too high	Acknowledge the event. Verify that the input voltage is within specified limits.			
E603	Drive overheated	The DC drive is too hot, drive deactivated.	Let the system cool for 15 minutes Continue operation.			x
E604	24V output error	24 V output disabled (overload or short circuit)	Acknowledge the event. Check that the cable and connectors are undamaged and correctly connected. Reduce overload by disconnecting one or more devices. Connect an external isolated 24V power source to the 24V DC input of the devices.	x	x	x
E619	Drive deactivated	DC drive deactivated during operation.	Contact the Atlas Copco service representative.			
E620	Tool stall	Tool motor stall.	Check that the tool cable and connectors are undamaged and correctly connected. If possible use a shorter tool cable. For STB, see E601			
E621	Current measurement error	Current measurement error. Current cannot reliably be measured.	Contact the Atlas Copco service representative.	x		
E622	Angle transducer error	The controller has received invalid angle information from the tool.	Acknowledge the event. Open Tool>Maintenance>Motor tuning and perform a motor tuning.			
E623	Safety current monitoring error	The torque measured by the torque transducer is inconsistent with the torque estimated from the measured current.	Contact the Atlas Copco service representative.	x		
E624	Battery failure	DC voltage too high or too low: battery failure.	Contact the Atlas Copco service representative and send back	x	x	x

Event code	Event name	Information	Procedure	Acknowledge	PF ready	Tool ready
			battery to Atlas Copco (do not reuse it!)			

23.1.8   E700-E799 Hardware events

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E700	PF started	This event code is only visible in the event log and indicates when PF is started.	For information only.			
E701	Backup battery low level	The backup battery level is low. The battery should be changed.	Replace the backup battery.			
E702	Backup battery empty or missing	The backup battery level is very low or the battery is missing. A new battery should be inserted as soon as possible.	Replace the backup battery.			
E703	Ground fault in tool circuit	An earth (ground) fail detected, probably a tool circuit failure	Acknowledge the event. Rebuild the tool.	x		
E710	ACTA/QRTT calibration	An ACTA/QRTT calibration has been performed. See below for additional information.	For information only.			
E720	Protective earth to tool interrupted	Protective earth between tool and controller is interrupted.	Acknowledge the event. Check tool cable, tool and controller.	x	x	x
E721	Tool internal error - Service tool	Indicator board overcurrent error. Tool service needed.	Acknowledge the event. Service the tool.	x	x	x
E722	Illegal ring position	The direction ring is not in a defined position.	Place the direction ring correctly.			x
E723	Swivel lock activated	There is a mismatch between swivel lock and tool start source				x
E724	Wrong gear box	Wrong gear box is mounted on the tool	Mount the correct gearbox.			x
E799	Internal info	Internal info in event log info. Only of interest to design department.				

ACTA/QRTT calibration information

When an ACTA/QRTT calibration batch is completed, event code E710 ACTA/QRTT calibration is displayed.

Torque result bits show the result of the torque calibration. All bits are sent as an unsigned 16 bit integer.

Angle result bits show the result of the angle calibration. All bits are sent as an unsigned 16 bit integer.

First integer		Second integer		Third integer	Fourth integer
Torque result bits		**Angle result bits**			
Dec	**Event**	**Dec**	**Event**	Not used	Channel number.
1	Batch result torque OK.	1	Batch result angle OK.		
2	Torque min failed.	2	Angle min failed.		
4	Torque max failed.	4	Angle max failed.		
8	Torque LCLx failed.	8	Angle LCLx failed.		
16	Torque UCLx failed.	16	Angle UCLx failed.		
32	Torque LCLr failed.	32	Angle LCLr failed.		
64	Torque UCLr failed.	64	Angle UCLr failed.		
128	Torque CP > failed.	128	Angle CP > failed.		
512	Torque CPK > failed.	256	Angle CPK > failed.		
1024	Torque CAM > failed.	512	Angle CAM > failed.		
2048	T Diff < failed.				

23.1.9 E800-E899 Software events

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E805	PF Model unknown	This event indicates that the RBU revision is not supported by the controller (for example an RBU bronze in a PF Graph controller), the RBU is missing, or the RBU license file is missing or corrupt.	Acknowledge the event. Check that the correct RBU is connected to PF. If the event reappears, then upgrade the PF software.	x	x	x
E808	Error condition detected by software	An error condition was detected in software. Power Focus: The probable cause is that an external application has started too many subscriptions. STB: Software error	Power Focus: Close external programs connected to Power Focus. STB: Return tool to service.			
E810	Database is corrupt	Database must be cleared, db version is not correct		x		
E822	No Job ACK from control	Tightening initialization phase failed. Hardware failure.	Acknowledge the event. Contact the Atlas Copco service representative.	x	x	x
E823	No calibration result	No calibration was received from the drive during the tightening initialization phase (timeout 100 ms).	Acknowledge the event. Check tool cable. Reboot PF.	x	x	x
E824	Cycle abort timeout	No tightening result was received from the drive before the cycle abort timeout.	If necessary, increase the *P144 Cycle abort timer* in Pset.			
E831	Autoset wrong angle	Autoset could not be executed. The calculated angle was too small.	Acknowledge the event. Program the Pset manually or by Quick programming.	x		
E833	Autoset tight NOK result	The Autoset could not be executed, four NOK tightenings were performed.	Acknowledge the event. Program the Pset manually or by Quick programming.	x		
E834	Autoset rejected Pset in CCW direction	Auto set is only permitted on a CW Pset.	Program the Pset manually or by Quick programming. If Quick programming is used, then change the direction from CW to CCW after programming.			
E840	Feature Not Available In Software Revision	This event is displayed when an attempt is made to run Multistage with a RBU bronze, or handle a Pset with a PsetID larger than the max number of Psets.	Reconfigure to an allowed configuration or an available function.			

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E841	SW function Not Available for this tool type	The software function is not available for this tool type.	Change to the correct tool type.			
E851	Connection with Tools Net server lost	The connection with the Tools Net server is lost and the Power Focus is trying to reconnect. The Tools Net server might be down or it might be an Ethernet cable problem.	Check the network configuration and in particular the ToolsNet IP address, Subnet mask and Default router. Check if the ToolsNet server is down. Check that the Ethernet cables are OK. Check that the routers and switches are correctly connected and without damage.			
E856	Router unreachable	The router in the configuration setting could not be reached. Check the network configuration and in particularly the subnet mask and the default router.	Check the network configuration and in particular the Subnet mask and the Default router. Ping the router to see if it is alive. Check the Ethernet cable.			
E857	Reboot needed before changes take effect	The configuration changes will not take effect until after a system reboot.	Acknowledge the event. Reboot PF. If the event reappears, the PF is faulty. Contact the Atlas Copco service representative.	x		
E858	IP address already in use	The IP address of this PF is already in use by another system.	Acknowledge the event. Change the IP-address in PF.	x		
E859	IP address collision	Another system attempts to use the same IP address as this PF.	Check the network settings.			
E860	Memory allocation error	Configuration changes has not taken effect	Acknowledge the event and reboot	x		
E861	Session handler internal error	Configuration changes has not taken effect	Acknowledge the event and reboot	x		
E862	Ethernet overload Error	The Ethernet driver of the PF is temporarily switched off due to an overloaded network.	Check the network.			
E863	IP Port already in use	An attempt was made to bind a TCP or UDP socket to a port already in use. For instance, a user protocol might be using the same port as ToolsTalk PF.	Acknowledge the event. Check all network settings.	x		

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E864	Ethernet echo detected	An Ethernet packet was discarded, since its source MAC address was equal to the Power Focus' 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.	Check the network.			
E865	Reboot and new IRC pairing needed	The configuration changes will not take effect until after a system reboot and new IRC pairing after that.	Acknowledge the event. Reboot PF and perform a new IRC pairing. If the event reappears, the PF is faulty. Contact the Atlas Copco service representative.	x		x
E870	Sync member registration failure	The Sync member registration failed because of a mismatch in the sync configuration list.	In the sync reference, open **PF Map > Sync > Options > Sync group list** dialog box, and check that all IDs are correct and unique. In the sync reference, open **Controller > Network settings**, and check that the IP address and ID are correct.			x
E871	Sync reference configuration failure	The channel ID of the Sync reference is not first in the Sync list as required.	In the sync reference, open **PF Map > Sync > Options**, and check that the sync reference is at the top of the Sync group list.		x	x
E872	Sync initialization failure	Tightening synchronization initialization failed.	Check the I/O bus cable between all sync members. Check that all Sync members have the same active Pset/multistage. Check the external start bridge.			x
E874	Sync members missing	Only Sync reference is defined in the Sync group list.	Acknowledge the event. In the sync reference, open **PF Map > Sync > Options** and add sync members to the Sync group list.	x		

23.1.10 E900-E999 Events MMI

Event code	Event name	Description	Procedure	Acknowledge	PF ready	Tool ready
E901	MMI Start-up Error	Error in MMI detected.	Acknowledge the event. Reboot PF.	x	x	X

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