Atlas Copco

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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 the 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 jewellery. Tie long hair back. Keep your hair, clothing, and gloves away from moving parts. Loose clothes, jewellery, 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 unauthorised parts or failure to follow maintenance instructions may lead to electric shock or personal injury.

⚠ **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 Abbreviations

Abbreviation	Description
$\overline{R}$	The centre line
$\overline{X}$	The mean
$\overline{\overline{X}}$	The mean of the average
<= =>	Arrow (button)
σ	Sigma (standard deviation)
α	Alpha (often a symbol for angle)
μ	Mu (the values of the mean)
A	Ampere
AC	Alternating current
ACK	Acknowledged
Admin	Administration
Ang con	Angle control
Ang mon	Angle monitoring
ASL	Atlas Service Literature
CAN	Controller area network
CC	Control card
CCW	Counter-clockwise
CD	Compact disc
Ch	Channel
CL	Clear (button)
Config	Configuration
CW	Clockwise
DC	Direct Current
Deg	Degrees
DigIn	Digital input
DigOut	Digital output (relay)
DSP	Digital signal processor
ft.lb	Foot pound
GFI	Ground Fault Interrupter
HW	Hardware
Hz	Hertz (unit of frequency)
I/O	Input/output
ID	Identification
in.lb	Inches pound
IR	Infra red
kpm	Kilo Pound meter
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LCK	Tool Locked
LCL	Lower control Limit
MC	Motor card
n	Number (of values)
Nm	Newton meter
No.	Number

Abbreviation	Description
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
R chart	Range chart
RAM	Random access memory
RAS	Remote access server
RBU	Rapid backup memory
rpm	Revolutions per minute
RS232	Field bus, serial communication link
S4/S7/S9	Motor sizes in Tensor S tools
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 corresponding section in ToolsTalk PF.**

3.1   PF 4000

The **PF 4000** is a new generation of control systems suitable for Tensor S, ST, DS and ETX models. Unlike its predecessor, the PF 3100, the PF 4000 is available in one model with two versions (Compact and Graph) that can handle all torque levels. This favours your maintenance budget, since fewer backup units are required.

Advanced control functions built into the Power Focus 4000 prevent the operator 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 field bus types.

The **PF 4000 Graph** has an easy-to-read LCD colour display. Statistical data is collected, analysed 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, the **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**

> **See the *PF 4000 ASL (9836 3113 00)* for technical data, dimensions drawings, connections and spare part list.**

3.1.1 Logic Configurator

Power Focus 4000 has an integrated Logic Configurator. This provides limited PLC functionality as an integrated part of the controller, without additional hardware components. It is possible to configure specific "PLC style" signal flow between the line or the fixture and the PF 4000. For more information see chapter *Logic Configurator*.

3.1.2 SynchroTork

Available in the Power Focus 4000, SynchroTork allows continuous synchronisation 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 minimised during the tightening stage by adjusting the individual speeds.

Synchronisation 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.

3.1.3 Yield control

With the Power Focus 4000 is it possible to apply a Yield control strategy for the cases where to get the most out of the fastener. While maintaining productivity, the operator can make the fixtured tool shut off where each individual bolt yields, and not based on a firm torque or angle value.

See function description for Yield control in section *Control strategies*.

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.

> ℹ️ **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). For more information see chapter *Tensor tools* .**

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**

> ℹ️ **See the *PF 3000 ASL (9836 2156 01)* for technical data, dimensions drawings, connections and spare part list.**
>
> **For PF 3102 controllers (SL tool drivers) only the Compact model is available.**

3.3 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 2000 or XP 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.

3.4 ToolsNet

ToolsNet is a part of the ATS (Assembly Tools Software) that works together with PF to complete the tightening process.

ToolsNet works together with the controllers and the selected database, MS SQL Server or Oracle to collect, store and visualise 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. ToolsNet as a standalone product:

- Tightening data collection and storage in a standard database management system (ORACLE or MS SQL Server).
- Web based reporting interface with standard reports, statistical information and graphs.
- Process improvement through extensive statistical process control functionality.
- Full traceability of every tightening done with a connected controller.

ToolsNet with Factory Overview:

- All functionality as a standalone product.
- Factory Overview integrated with ToolsNet - Right-click in Factory Overview to get web reports from ToolsNet.

ToolsNet with Event Monitor:

- All functionality as a standalone product.
- Event history in ToolsNet reports.

3.5 Factory Overview

Factory Overview is a part of the ATS (Assembly Tools Software) that works together with PF to complete the tightening process. Factory Overview is the portal to the tightening process. It visualises 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.

Factory Overview as standalone product:

- Graphic overview of tightening status for each controller.
- Displays inactive and disconnected controllers.
- Direct program control from controller icons together with ToolsTalk PF.

Factory Overview with Event Monitor:

- All functionality as a standalone product.
- Graphical overview of event status for each controller.
- Direct access to event list from controller icons.

Factory Overview with ToolsNet:

- Full functionality as a standalone product.

- Right-click controller icons to view controller's spindle reports with tightening results.

3.6   Event Monitor

Event Monitor is a part of the ATS (Assembly Tools Software) that work together with PF, ToolsNet, Factory Overview and the API to complete the tightening process. Event Monitor offers real-time event reporting from the controllers in a centralised and filtered format.

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

- Centralised real-time notification of events, plus a list of the 1000 latest events from all connected units.
- Ability to filter the information to suit the user.
- Ticketing functionality with comments that can eliminate double work and allows the storing of comments for future reference.
- Web based Java application, easy access from any PC without installation overhead.

Event Monitor with Factory Overview:

- Full functionality as a standalone product.
- Event status shown for each controller icon as it is reported from the Event Monitor server to the Factory Overview.
- Right-click controller to get a snapshot of the recent events for that controller.

Event Monitor with ToolsNet:

- Full functionality as a standalone product.
- One database for tightening results and event history offers powerful reporting possibilities.

3.7   API

The **API** (Application Programmers Interface) is an interface to the Power Focus system that enables users to access data in PF from custom-made applications.

The Power Focus API is a software library that serves as the interface between the custom application and the PF. This means that it exports a number of objects and methods that the custom application can access in order to manipulate the PF without needing to know the details on how the actual communication is done. The Power Focus API handles all necessary communication between the PC on which the custom application is installed, and the specific PF involved. The developer of the custom application needs only to know which objects and function(s) to access, and in some cases how the returned data is formatted.

3.8   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.

When a 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.

3.9 Cell

A key word in the Power Focus concept is **Cell**. This means that one PF Graph can monitor and control up to 19 PF Compact controllers (for a total of 20 units), which saves space and hardware cost. Each Cell can be connected to the plant's network via the built-in Ethernet port, and results from the units can be monitored via the Atlas Copco ToolsNet server.

3.10 Job

By scanning the bar code on an object on the assembly line, Power Focus automatically selects the correct parameters. This is one example of the **Job** function. When all fastenings at one station have been performed, the operator on the line is given an overall JOB OK ("Station OK") signal. Several PF units can be linked together via the network to create a Cell Job, issuing an OK signal when all units in one Cell have completed their tightenings.

3.11 Sync

Up to 10 synchronised spindles can be setup within one Cell. This function is called **Sync**. A single start signal starts all tools and a "Sync OK/NOK" is reported, as well as individual tool results. Step-by-step configuration and setup makes it easy to modify and to re-use installed equipment.

3.12 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.
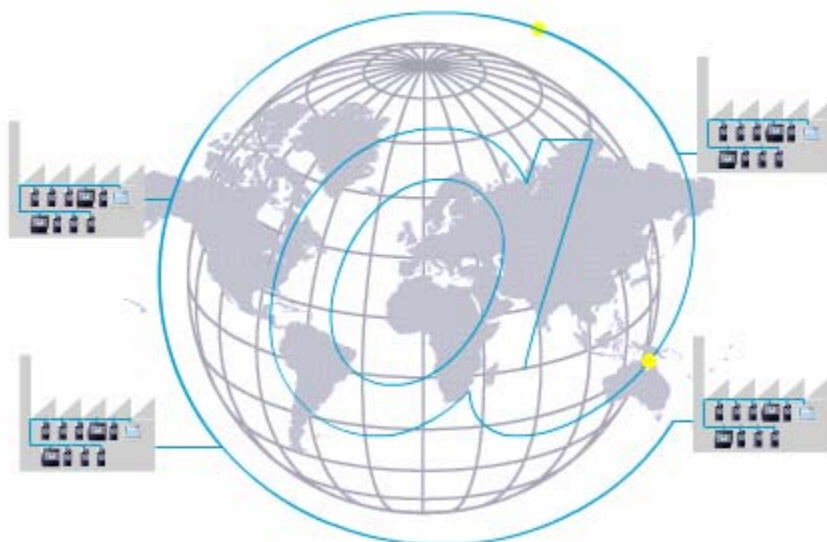
Communicate with one PF at a time via the serial connection or with a complete network of PF units via the built-in TCP/IP connection.

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 synchronisation. 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.

3.13   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 affords quick installation.

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

The **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/Os. Each input and relay can be configured individually.

The **Socket Selector** is a socket tray with LED's that can be used to guide the user through 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.

There are two different types of Socket Selectors, selector 4 and selector 8, the only difference being that selector 4 has four sockets and selector 8 has eight sockets. The Socket Selector is also communicating on the I/O bus.

The **RE-Alarm** gives status information to users using lights and/or audible signals. The RE-Alarm is connected to the Power Focus on the I/O bus. The RE- alarm is configured in the Power Focus and it is possible to configure the information.

The **Operator Panel** is an external device for the 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.

See the *Operator Panel user guide (9836 2456 01)* for more information.

The **StackLight** is a flexible light and switch device for Power Focus, PulsorFocus, PowerMacs and Tensor DS/DL Advanced tightening controllers.

See the *StackLight user guide (9836 2642 01)* for more information.

The **Tensor Tracker Arm SL** is the latest generation of intelligent torque reaction arms that add new features to screwdriver technology. In conjunction with **PF 3102** controller and monitoring system for advanced tightening technology it represents a new step in productivity and quality assurance.

See the *Tensor Tracker SL user guide (9836 2466 01)* for more information.

3.14 Nutrunners

Atlas Copco's **Tensor STB** heralds a new generation of transducerised nutrunners in the Tensor family. STB tools communicate with the **PF 4000** and **PF 3100** tightening controller systems through wireless digital communication, built on IRC (Industrial Radio Communication) technique.

Tensor ST nutrunners communicate with **PF 3100** 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.

Atlas Copco's **Tensor SL** is a range of low torque transducerised tools based on Tensor ST technology. SL tools communicate with the SL driver, **PF 3102**, digitally. The controller is used with low voltage SL tools.

Atlas Copco's **Tensor S**, running on **PF 3000/3100** controllers, are available in four different configurations; fixture, pistol grip, straight and angle application. The three motor types are designated S4, S7 and S9, indicating different motor outputs and speeds. The tools can be combined in various models to meet a variety of requirements within the industry. Fixtured applications can easily be installed and integrated with standard Atlas Copco components.

 The ultra-compact **ETX tool** is designed for fixtured applications, optimised for extreme functionality, durability and flexibility. Controlled by **PF 3100** and featuring a "smart" memory chip calibration and service data. The ETX combines the same advanced control, monitoring options and high productivity as the Tensor S/ST range, with the bonus of a reduced space requirement and extended spindle durability.

Atlas Copco's **Tensor DS** tools, running on **PF 3000/3100** controllers, 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. The DS tool is proven to achieve excellent repeatability. However, the operating range is smaller than for a Tensor S tool, and the user might need to adjust the torque measurement for each Pset and joint for greater accuracy.

An **Open end** tool (or tube nut tool) is a Tensor S or ST tool equipped with an Open ended head. It is used to tighten nuts on tubes and similar applications.

For more tool related information, see chapter *Tensor tools*.

3.15 ACTA 3000

An **ACTA 3000** 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 3000 measures torque, angle and pulses and facilitates the conduction of statistical analyses of the tightening process. An ACTA 3000, together with the ToolsTalk ACTA PC utility, is a complete SPC tool. Furthermore, it has a reminder function to notify the user when calibration and maintenance are due.

4 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 on 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 or via the serial port. 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).

ToolsTalk PF is easy to install:

- Insert the installation CD.

- Run **Setup.exe** and follow the on-screen instructions.

- Open ToolsTalk by selecting **Start -> Program -> Atlas Copco Tools AB -> ToolsTalk Power Focus**.
  Select between a free trial version for 60 days (demo) or register by enter installation and license number. Contact your locally Atlas Copco representative for information how to get the license number.

The software can be registered on the Atlas Copco Tools web site at http://www.atlascopco.com/tools/software.

4.1 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 the PF Map.
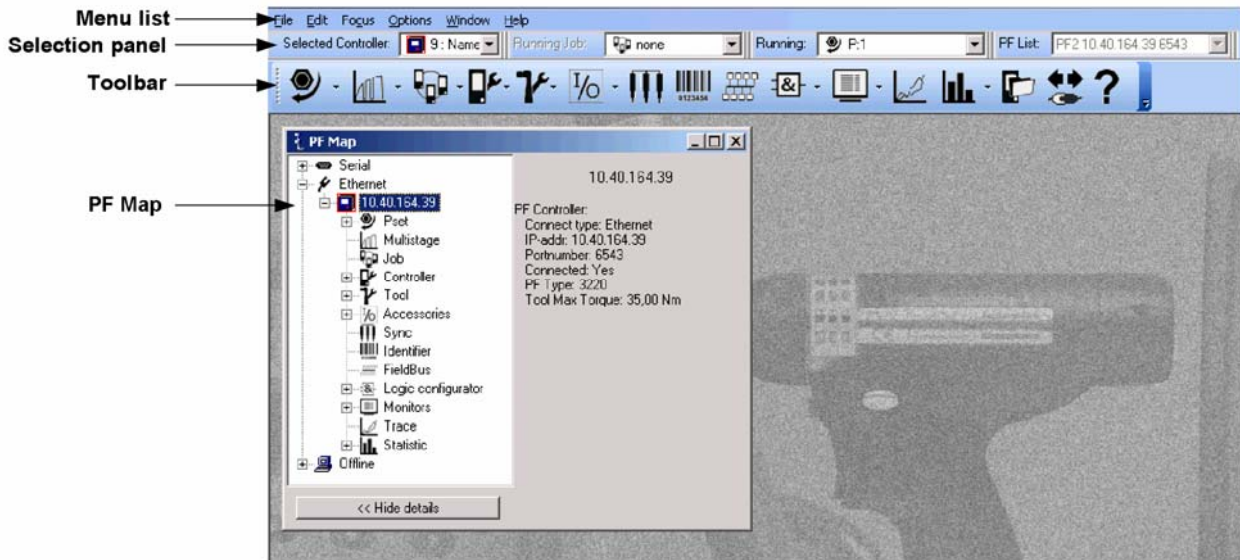
4.1.1   Menu list

> 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" will appear in the menu list.
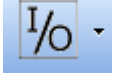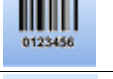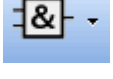
Illustration	Name	Description
File Edit Focus Options Read PF from File Store PF to File Save all windows Print Preview Print Exit	File	Read and store files, print and exit ToolsTalk PF from the File menu.
Edit Focus Options Window Help Create new Pset Create new Multistage Create new Job Create New Wave Sound Create new Logic configurator	Edit	Create a new Pset, Multistage, Job Wave 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.
Options Window Help View Toolbar Settings Change language… Change Manual Get Event Log Forced release progcontrol Reboot PF	Options	From the Options menu it is possible to select whether the toolbar will be shown or not. The following functions are also available; Settings, Change language, Change manual, Get event log, Forced release progcontrol and Reboot PF.
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.

	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. About ToolsTalk PF brings up details about the version of the ToolsTalk PF program in use.

4.1.2 Selection panel

Illustration	Name	Description
	Selected Controller	The available options are; Serial connection, Ethernet connection and Offline mode.
	Running Job	If parameter *Job select source [C201]* is set to "Ethernet/serial", it is possible to select a Job to run.
	Running Pset/Multistage	If parameter *Pset select source [C200]* 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 combo box PF List. Select an item in the combo box and ToolsTalk PF will connect to the corresponding Power Focus. The information in the list contains; name, IP address and port number.

4.1.3   Toolbar

Icon	Icon name	Description
	Pset	This icon opens the programming window for the first Pset.
		Click on the arrow to the right to select between existing Psets (shown along with number and name). The list can contain a maximum of 250 Psets.
		Use the function in the PF Map to create a new Pset.
	Multistage	This icon opens the programming window for the first Multistage (if any).
		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 (if any).
		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.
		Use the arrow to the right to select between all section (Information, Configuration, Network, COM ports, Display, Memory and Accessibility).
	Tool	This icon opens the first part in the Tool programming section.
		Use the arrow to the right to select between all section (Information, Configuration, Diagnostic and Maintenance).
	Accessories	This icon opens the first part in the Accessories programming section.
		Use the arrow to the right to select between all section (Digital I/O, I/O bus, Tool bus and Printer).
	Sync	This icon opens the Sync programming section.
	Identifier	This icon opens the Identifier programming section.
	Field bus	This icon opens the Field bus programming section.
	Logic Configurator	This icon opens the programming window for the first Logical configurator (if any).
		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.
		Result monitor is a convenient way to monitor the tightening status.
	Trace	Click the Trace icon to bring up a graphical display of the tightening results.
	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.
	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 will establish a connection between the PC and the PF. Choose connection in "selected controller" list (ToolsTalk PF menu list).

Icon	Icon name	Description
	Disconnect	Once a connection is established this icon will appear. Clicking on it will Disconnect the PC from the PF.
	Help	This icon opens the Help section.

4.1.4   PF Map

The **PF Map** gives an overview of and shortcuts to all settings in ToolsTalk PF. Click on the minus or plus symbols to open and close menus and double click on function names (Pset, Multistage, Job, etc) to open the corresponding function. Brief information about the selected setting is displayed in the right panel of the PF Map. **Right-click** the function names to create a new instance of the function.

PF Map function	Description
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. See chapter *Pset* for more information.
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. See chapter *Multistage* for more information.
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. See chapter *Job* for more information.
Controller	Controller contains information and settings for the PF. This includes network, COM ports, display, memory and accessibility. See chapter *Controller* for more information.
Tool	The Tool branch includes information, configuration, diagnostic and maintenance for the Tensor tool connected to the PF. See chapter *Tool* for more information.
Accessories	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. See chapter *Accessories* for more information.
Sync	Up to ten PF units in the same logical Cell can be synchronised to perform the same task simultaneously, a function known as Sync. This type of operation requires the Synchronisation of the Power Focuses involved. With this tool Sync parameters can be created. See chapter *Sync* for more information.
Identifier	It is possible to send an Identifier string to a PF. This string is normally generated by a barcode reader connected to one of the serial ports on the PF (this barcode is in car plants usually known as a VIN or ESN). See chapter *Identifier* for more information.
Field bus	Field bus communication is useful for data communication between the PF and PLC's. It is an effective and fast way for the data transfer of short data packages. See chapter *Field bus* for more information.
Logic Configurator	**The Logic Configurator functionality is only available for PF 4000.** The ToolsTalk PF software feeds the PF 4000 controller with inputs, called Logical sets. The Logical sets 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/Os 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. See chapter *Logic Configurator* for more information.
Monitors	ToolsTalk PF provides a number of monitors designed to present extensive information about the various functions of Power Focus (Result monitor, Job monitor, Operator monitor, Identifier monitor and Get all results). Result monitor is a convenient way to monitor the tightening status. See chapter *Monitors* for more information.
Trace	Via the Trace function it is possible to view tightening graphs with different display settings. 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. See chapter *Trace* for more information.
Statistic	The Statistic displays statistical results and graphs. See chapter *Statistic* for more information.

4.2　Settings

The Settings dialog box has four tab sheets:

- **Communication** and connecting an installation.
- Setup for viewing information inside the ToolsTalk PF **Application**.
- **Printout** setup.
- **PF list** administration.

4.2.1　Communication

The **Communication** tab sheet has four sections; View event setup, Serial setup, Ethernet setup and LOG.
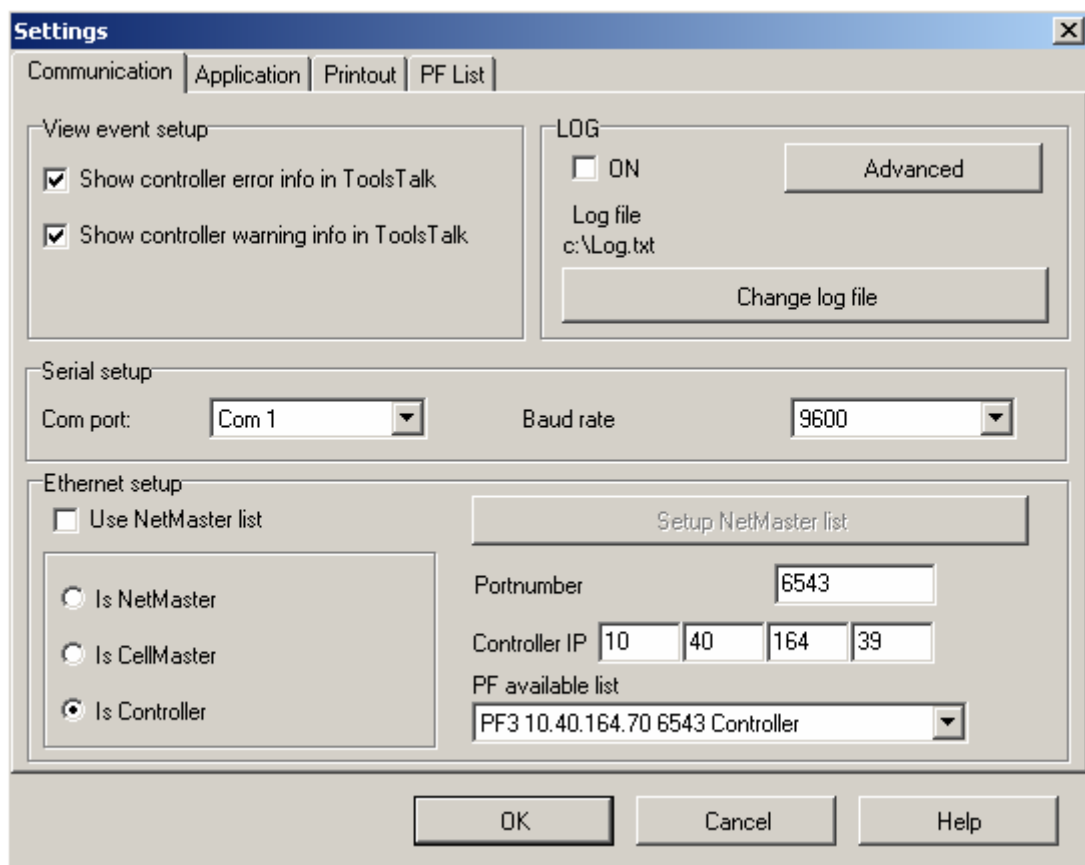
The **View event setup** field contains selections for viewing controller errors and warnings.

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

> **All connected PF units need the same baud rate value in order to be able to work together. The default value is 9600.**

Under **Ethernet setup** select the type of connected Power Focus (Net reference, Cell reference or Controller. Also set the Port number and Controller IP address. The default Port number value is 6543. If using an item from the PF list (PF available list) then all three parameters (type, port, IP) will be set simultaneously.

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

In the **LOG** section it is possible to enable the log function for communication between Power Focus and ToolsTalk PF. If Log is set to "On", then messages will be stored in a file. The file name is stated in the log file field. 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 cannot exceed the value set in **Logfile size**. When the file is full the program will copy the contents to a file called "log~.txt" and erase the content of "log.txt". Data will then continue to be stored in "log.txt".

> **With the additional software application Tool User Administration (TUA) it is possible to log specific user information. The user operations in ToolsTalk PF (i.e. changing of parameters in Config or creating of Psets), together with user name and date can then be included and stored in the log file. Furthermore, TUA offers the configuration of user group accessibility.**
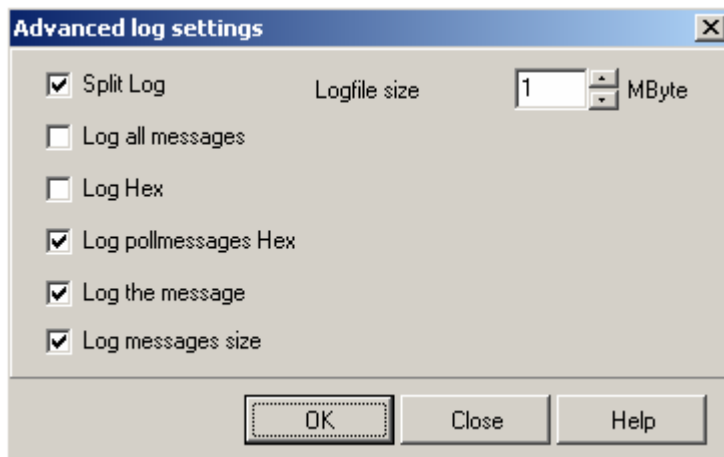
4.2.2   Application

The **Application** tab sheet has three sections; Presentation, Automatic functionality, Default directory.

The first section concerns the ToolsTalk PF **Presentation** for programming windows. Use this to view hints and parameter numbers.

The first checkbox in **Automatic functionality** activates/deactivates Auto collapse tree views. If Serial/Ethernet auto connection on start-up is checked, ToolsTalk PF will try to connect to the Power Focus via serial/Ethernet communication immediately on start-up. If the Auto store PF to file on disconnect box is checked, ToolsTalk PF will store the PF to file when disconnecting.

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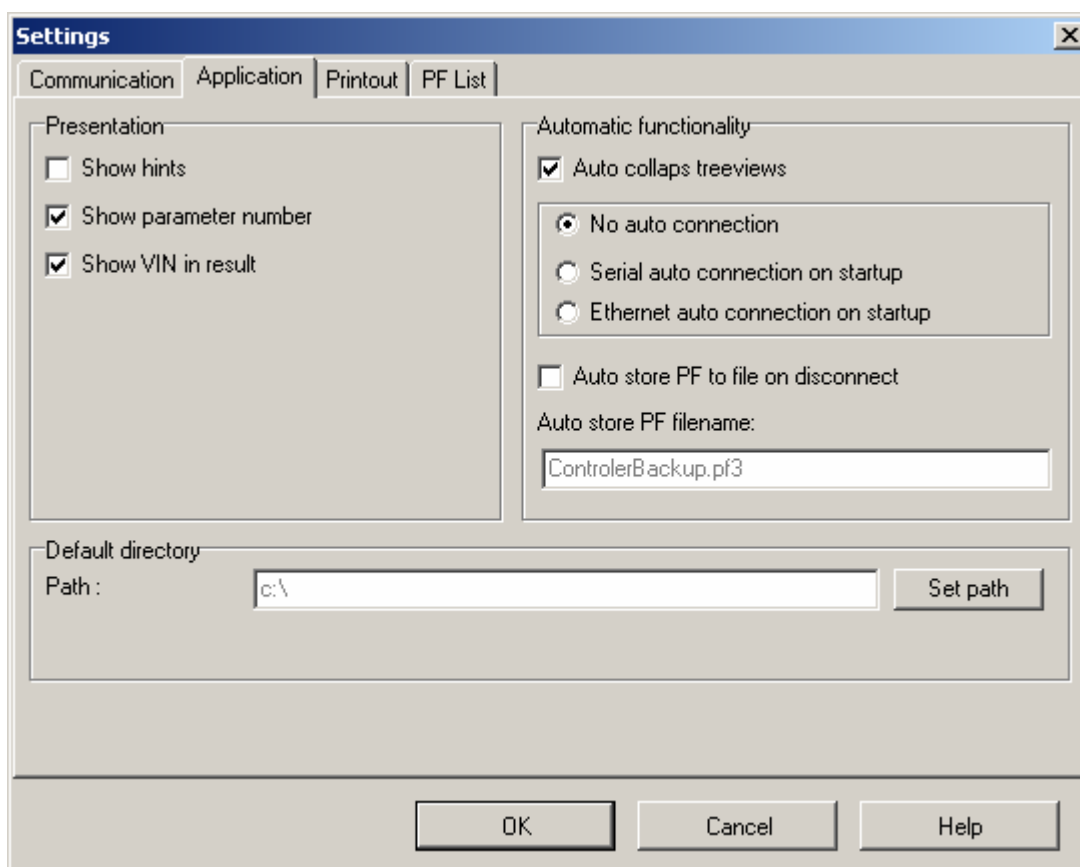
4.2.3   Printout

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

If a text is entered in the **Printout footer** it will then appear on every printed paper.

If using the A4 **Printout format**, select A4 format, otherwise select default format.

Section **Printout colours** is only applicable for colour printers.
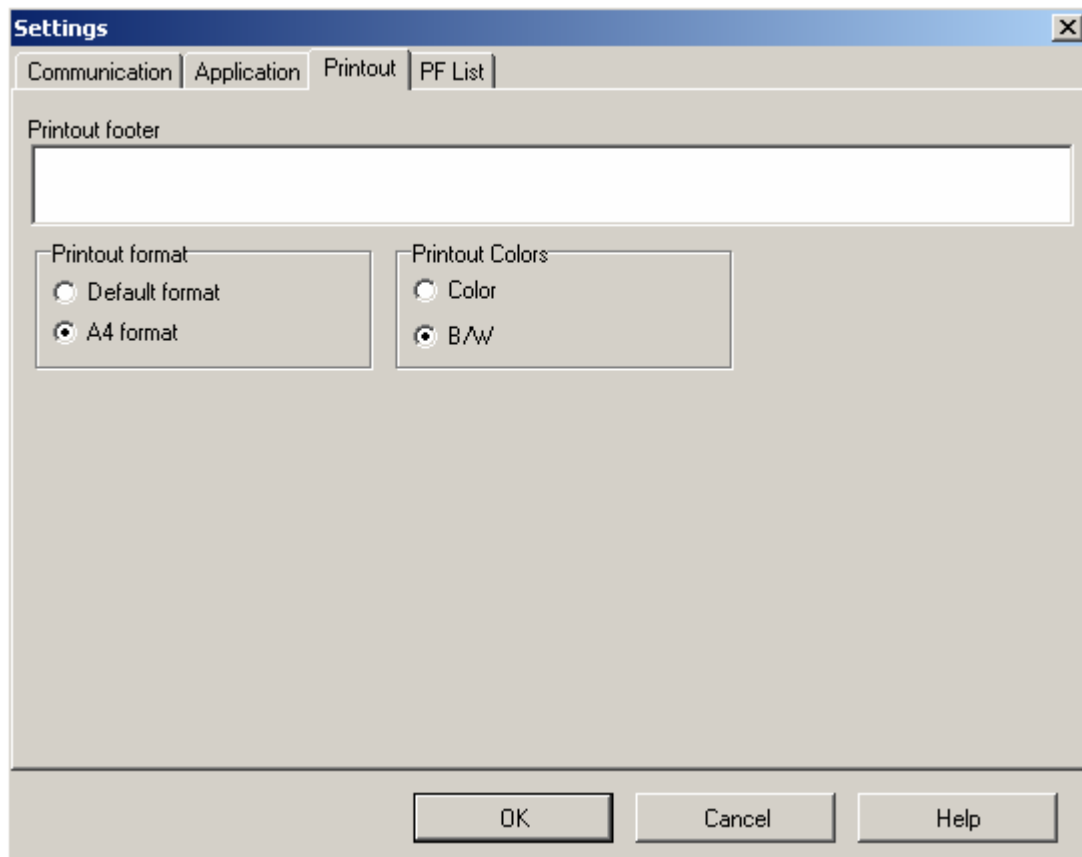
4.2.4   PF List

The **PF List** tab sheet manages the **PF available list**. Add, modify and remove items from here. An item is a PF with name, IP address and port number and controller type.

Settings

| Communication | Application | Printout | PF List |

PF available list

PF Name	IP address	Port	PF Ethernet type
PF1	10.40.164.35	6543	Controller
PF2	10.40.164.31	6543	Controller

[Add]   [Edit]   [Remove]

[Change file]   [Save]

PF Available List in file:

PF3000MyList.txt

4.3   Connecting a PF

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

4.3.1   Ethernet connection

From the Options menu, open the **Settings** dialog box.

Type **Controller IP** address to establish a Power Focus connection.

Also specify whether the Power Focus is a **Net reference**, **Cell reference** or a **Controller** (see chapter *Controller*).

Click **OK**.

When connecting a Cell reference or Net reference a list of all Power Focus (Controllers/Members) in the Cell/Net appears.

To connect to a Controller, double-click on a PF in the PF Map.

4.3.2 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 the PF they must use the same baud rate. The default baud rate is set to 9600 bit/s.**

Change the Baud rate in the **Settings** dialog box (from the Options menu).

Make sure that the serial cable is connected to the correct **Com port** on the PC.

4.3.3 USB connection

> **An USB port is standard on PF 4000. The port is located on the PF front panel.**

Connect an USB cable between PF and the computer/laptop (PF acts USB device).

An extra COM port should now be visible in computer/laptop.

Open ToolsTalk and connect serially via the extra COM port.

4.3.4 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 menu 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 will make a serial connection. However, it remembers the most recent connection.
- Use predefined PF units from the **PF List** in the Selection panel.

4.3.5 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**).

4.4 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, Field bus, Trace or Diagnostic.

See table below for option descriptions.

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

When performing **Store PF to File**, the user should name the file. ToolsTalk PF will store 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 will have the extension "pft". Extensions for the other stored files will be "xls".

4.5 Offline

Offline mode gives the user the opportunity to conduct programming and configuration, without a PF connection. All programming will be 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, and 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 a good idea to make a backup of these files.

To create a file, first connect (Serial or Ethernet) to a Power Focus and then click **Store PF to File** on the file menu. Name the file and store it in an appropriate location.

Select a file with the same license level as the PF. ToolsTalk PF opens the selected file and the user is able 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.
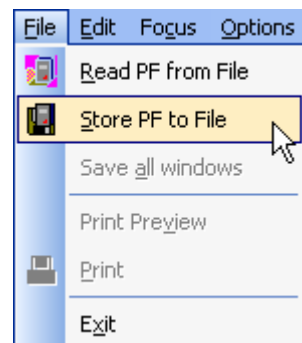
4.5.1   Configuring a tool offline

Double-click **Diagnostic** in the PF Map.

Click **Set** tool.

The Set tool window appears.

It is also possible to configure a new tool via the **Create tool** key.

5   Pset

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

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

The basic Pset parameters are:

- Control
- Torque
- Angle
- Speed and ramp
- Time
- Batch count
- Statistical

An easy way to program a Pset is to use the **Autoset** function, see section *Autoset*. Enter a final target torque value, perform a few tightenings and a new Pset is programmed. 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.

Quick programming, see section *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. After completing a quick programming procedure, the tool is ready to use for tightening to the set torque straight away. It might be necessary to fine-tune some parameters in order to ensure smooth operation of the tool.

5.1   Create new Pset/Open Pset

In the PF Map, mark **Pset**, **right-click** and select **Create New Pset**. Alternatively, **double-click** on an existing Pset to open the Pset configuration window.

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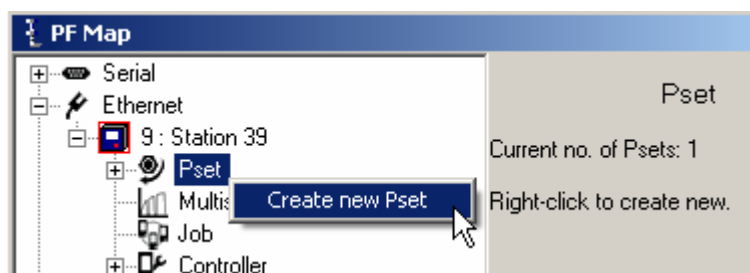
The Create new Pset window pops up.

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

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

Click **OK** to open the new Pset setup window.
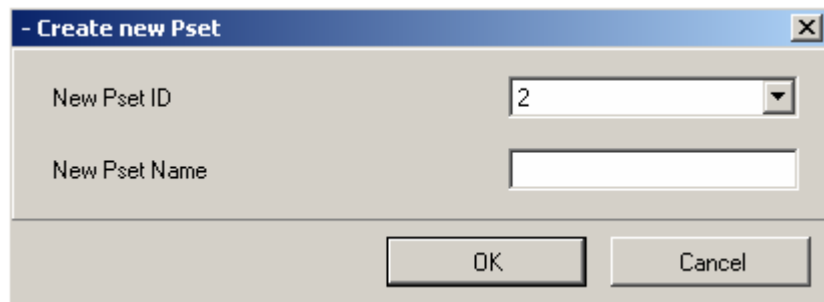
5.2 Programming

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

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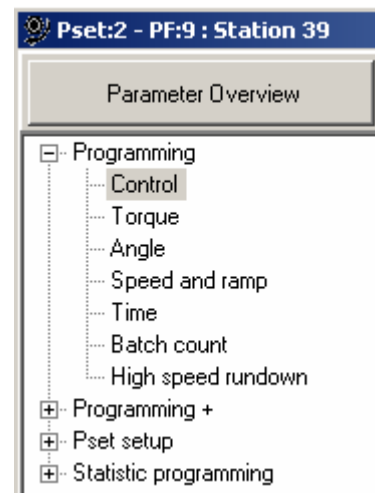
Choose the desired *Control strategy [P100]*, *Tightening strategy [P101]* and settings for the other parameters.

> ⓘ **For strategy information, see section *Control strategies* and section *Tightening strategies*.**
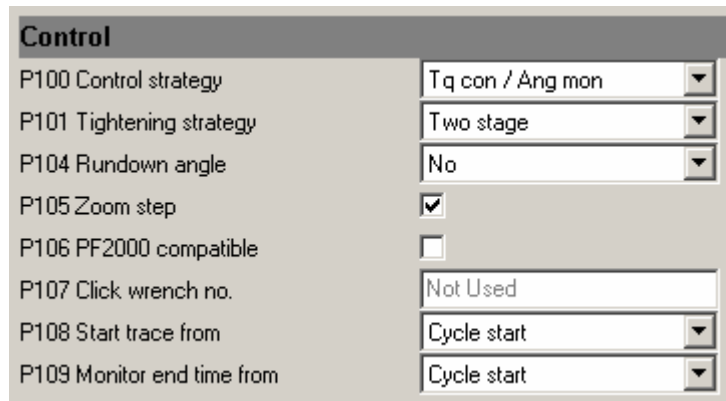
In the Pset **Programming** branch, select **Torque** or **Angle**.

Make suitable parameter settings.

> ℹ **By holding the cursor in the respective parameter box, the limits for each parameter will be displayed in the lower left corner of ToolsTalk PF.**

Torque

P110 Cycle start	1,75	Nm
P111 First target	12,60	Nm
P112 Final tq min	27,00	Nm
P113 Final target	30,00	Nm
P114 Final tq max	33,00	Nm
P115 Cycle complete	1,05	Nm
P116 Rundown complete	Not Used	Nm
P118 Measure torque at	Torque peak ▼	
P119 Loosening limit	3,50	Nm

Angle

P120 Start final angle	1,75	Nm
P121 Measure angle to	Angle peak ▼	
P122 Final angle min	90	Deg
P123 Target angle	Not Used	Deg
P124 Final angle max	100	Deg
P125 Rundown angle min	Not Used	Deg
P126 Rundown angle max	Not Used	Deg
P127 Final angle max mon	150	Deg

📧 - 🖥 Log Off │ P113 Final target, 12,60 Nm - 35,00 Nm. Dependency: Min = P111 First target - Max = T102 Max torque.

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	%

Time

P141 End time	0,2	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** or **High speed rundown**.

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

5.2.1   Control strategies

For all **Tq con** and **DS con** tightenings the process starts when the torque reaches *Cycle start [P110]* and ends when the torque drops below *Cycle complete [P115]* for a period of *End time [P141]* milliseconds.

For **Ang con** and **Reverse ang** the tightening process also starts when the torque reaches *Cycle start [P110]*.

For **Rotate spindle forward/reverse** the tightening process starts immediately when the tool starts running. For all these tightening strategies the tightening process ends when *End time [P141]* milliseconds have elapsed since *Target angle [P123]* has been reached.

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

> ℹ️   ***Final angle max [P124]* is always evaluated from *Start final angle [P120]* to angle peak.**

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 *Final target [P113]*.

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

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 *Final target [P113]* value.

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

Ang con/tq mon

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

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

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 *Final target [P113]* value and the *Target angle [P123]* 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 *Final target [P113]* value and the *Target angle [P123]* value. The tool stops when the first of these two targets are reached.

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 *Final tq max [P114]* or *Final angle max [P124]*, the tool shuts off and the (NOK) tightening results are shown.

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.

Target angle [P123] is defined as the number of degrees between the *Start final angle [P120]* and the peak angle. The tool stops at *Target angle [P123]*. If the tool for some reason should exceed *Final tq max [P114]* or *Final angle max [P124]*, 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 *Start final angle [P120]* is reached.

> **For reverse ang, the "active" direction of the tool socket rotation is the opposite of the *Tool tightening direction [P240]*. 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.**

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 *Final tq max [P114]* and *Final tq min [P112]*. *Target angle [P123]* is defined as the number of degrees between start of tightening and the peak angle. The tool stops at *Target angle [P123]*.

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

> **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 *Tool tightening direction [P240]*. 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.**

Click wrench

Select the **Click wrench** function if the Power Focus indicates a click wrench or to incorporate other non-tightening operations into the work process such as ocular inspections or the filling of fluid containers etc.

It is possible to configure four independent click wrench operations. A click wrench Pset consists of a *Click wrench no. [P107]*, *Final target [P113]* and a *Tool idle time [P143]* only. Each *Click wrench no. [P107]* will be associated with one digital input (see chapter *Digital inputs and outputs*). Asserting the specified digital input indicates to the PF that the specified click wrench operation has been performed. Use *Final target [P113]* to

set the torque result level for click wrench tools. Use *Tool idle time [P143]* to avoid unintentional digital input assertion repetitions.

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

Home position

The **home position** function makes it possible to mark a spindle position using the "set home position" digital input. The spindle will then rotate to that position when this function is run. The only torque values monitored are *Final tq max [P114]* and *Final tq min [P112]*.

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

> ⓘ **The tightening process begins when the trigger is pressed.**

Yield control (Yield)

Yield control is activated by selecting the *Control strategy [P100]* to "Yield". For Yield to work, the *Tightening strategy [P101]* can be set to "One stage", "Two stage" or "Quickstep". Yield control will always interact in the last stage of the tightening.

Zoom step [P105] strategy ending is eliminated when yield control is selected. An additional tightening angle can be added after the yield point is reached by setting an angle to the *Angle step [P264]* parameter.

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 **Torque, TC**. The average torque over the angle of **No. degrees (NOS)** is calculated [1].

[1] $\quad T_n = \dfrac{\sum T_{Mes}}{NoSamples\ in\ NOS}$

T_{Mes} : Measured torque value in sample.

The sample frequency in Power Focus is 2 kHz. If the number of samples in NOS 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 **Increment (INC)** degrees and the difference between every second value is calculated (TDIFF):

[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 **Torque difference %** of the current T_{max}:

[3] $\quad TDIFF < Torque\ difference * T_{max} \Rightarrow YIELD$

If the parameter *Angle step [P264]* is set the tightening will be continued for the stated angle after the yield point is considered reached.

The figure below illustrates the steps of the yield control.

TC	Torque TC	INC	Increment
NOS	No degrees	TDIFF	Difference in average torque
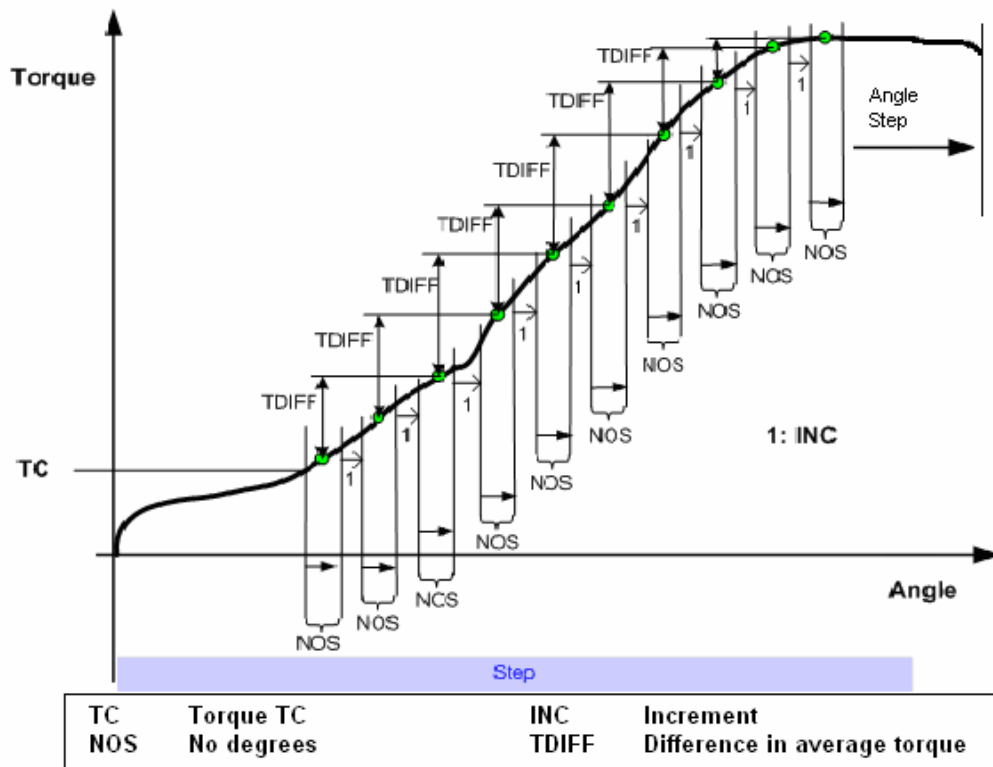
DS con

The **DS con** function controls the torque based on the current measurement and monitors the angle. This function is selectable for both one and two stage tightenings. The tool stops when the torque reaches the *Final target [P111]* value.

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

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 both one and two stage tightenings. The tool stops when the current based torque reaches the *Final target [P111]* value.

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

5.2.2   Tightening strategies

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

One stage
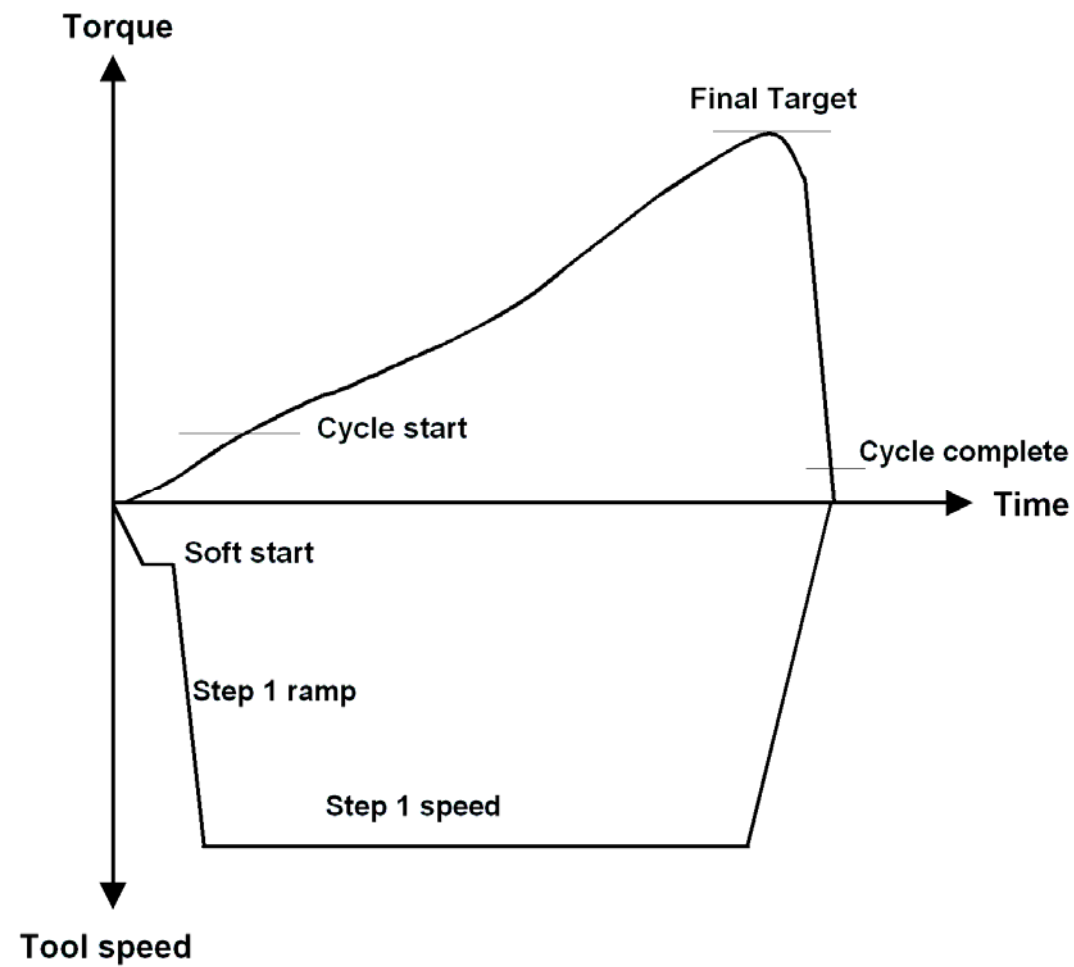
Tightening is performed in **One stage** until the *Final target [P113]* torque has been reached. The tool accelerates quickly to final speed.

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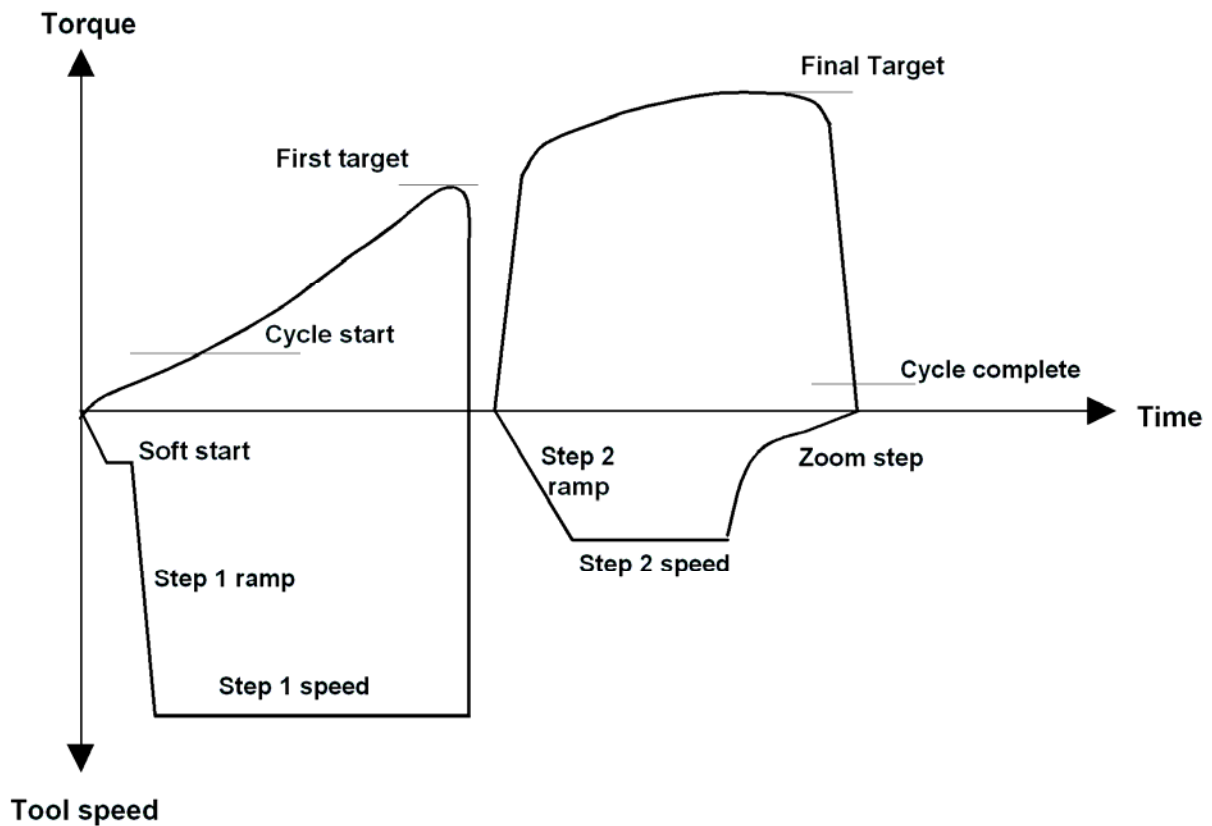
In a **Two stage** tightening, the tool operates at high speed during the first stage and a lower speed during the second stage. The tool stops for about 50 milliseconds between the stages to reduce joint relaxation and then accelerates for the second stage.

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

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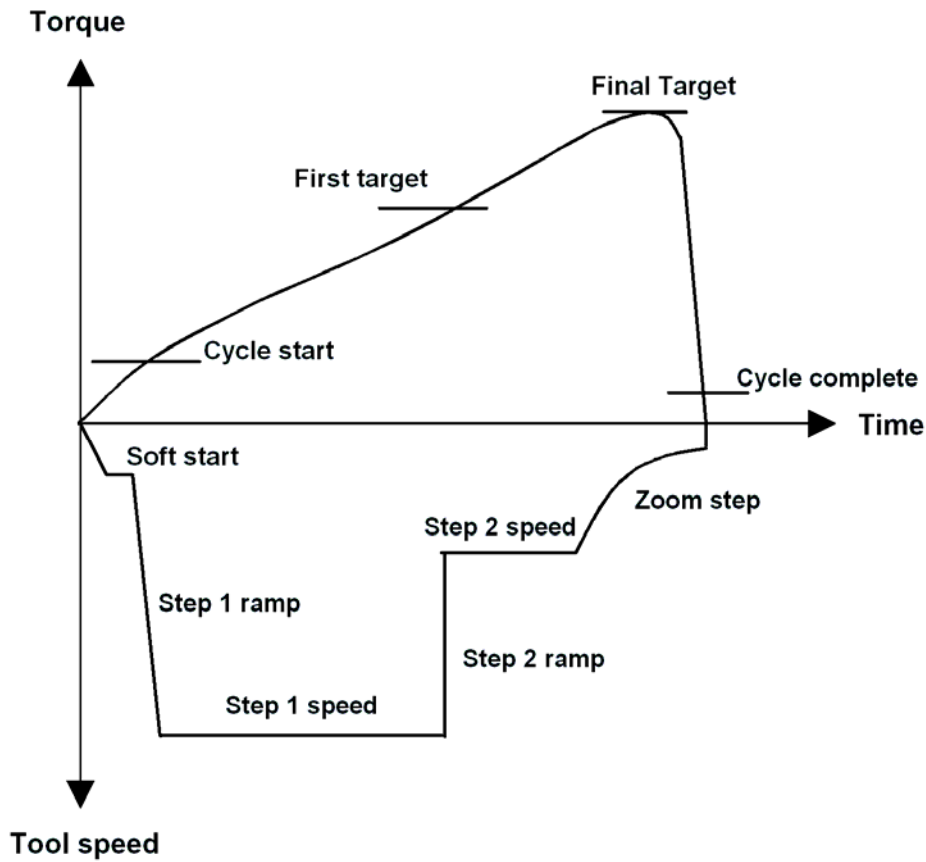
Quick step is a type of two stages tightening with high tool speed during the first stage and a lower tool speed during the second stage. The speed changes from first to second stage speed without pausing in between.

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

Ergo ramp

Torque

Soft joint

First target

Final Target

Ergoramp

Cycle start

Cycle complete

Soft start

Zoom step

Step 1
ramp

Step 2
ramp

Step 2 speed

Step 1 speed

Time

Tool speed

Torque

Hard joint

First target

Final Target

Ergoramp

Cycle start

Cycle complete

Soft start

Step 2
ramp

Zoom step

Step 1
ramp

Step 2 speed

Step 1 speed

Time

Tool speed
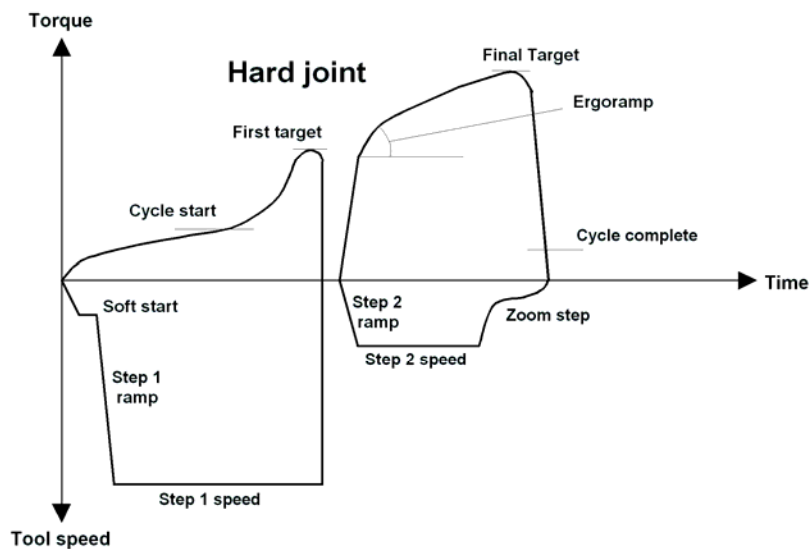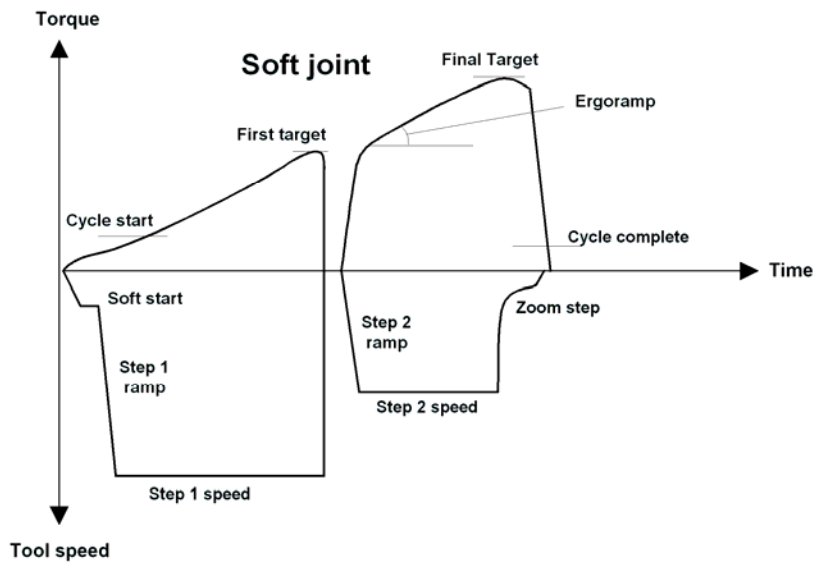
Ergo ramp is a two stage tightening with a constant increase of torque during the second stage. It is set automatically using the programmed ergo ramp value and the hardness of the joint. This strategy has the ergonomic advantage of giving the user the same feeling for both soft and hard joints when using the same Pset. In this example the strategy ends with a *Zoom step [P105]*, which reduces the risk of overshooting.

5.2.3　Control options

Rundown angle

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

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

Zoom step

The **Zoom step** option reduces tool speed when the torque approaches *Final target [P113]*. Tool speed is reduced gradually towards the *Zoom step speed [P138]*, 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 will be 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.

5.2.4　Rehit detection

The re-hit 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 re-hit, 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 re-hit alarm is activated.

For two stage torque control tightenings, the speed must reach higher then ¼ out of *Step 1 speed [P131]* between *Cycle start [P110]* and *First target [P111]* or the angle between *First target [P111]* and *Final target [P113]* must be greater then 120 degrees to avoid a re-hit alarm. For one stage tightenings, the speed at *Cycle start [P110]* and the angle between *Cycle start [P110]* and *Final target [P113]* 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 *First target [P111]* or one stage tightenings is the angle condition met.

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

The re-hit functionality is not valid for the Rotate spindle forward/reverse and Reverse angle strategies.

5.2.5 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.

> (i) **Autoset can only be selected when a tool is connected and the PF is switched on.**
>
> *Control strategy [P100]* **"Tq con/ang mon" should be set to Autoset when Tensor S and ST tools are used. With DS tools strategy "DS con" should be used.**
>
> **If using an existing Pset, the parameters of which will be 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 the PF is now programmed for that joint. The Autoset procedure can be aborted by clicking cancel before the green light shuts off.
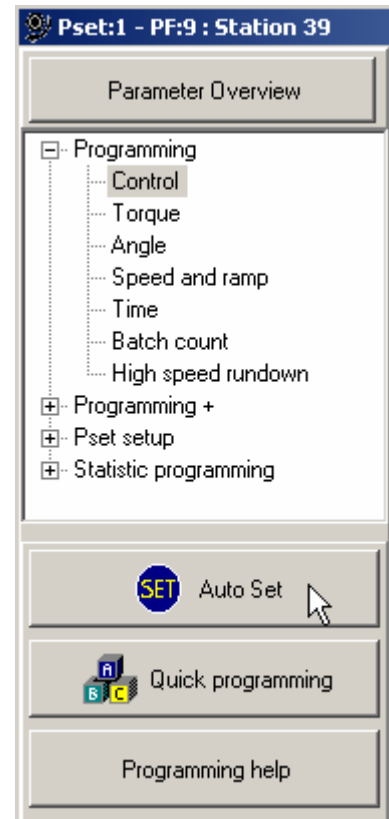
> (i) **By performing Autoset, the existing Pset configuration will be change.**

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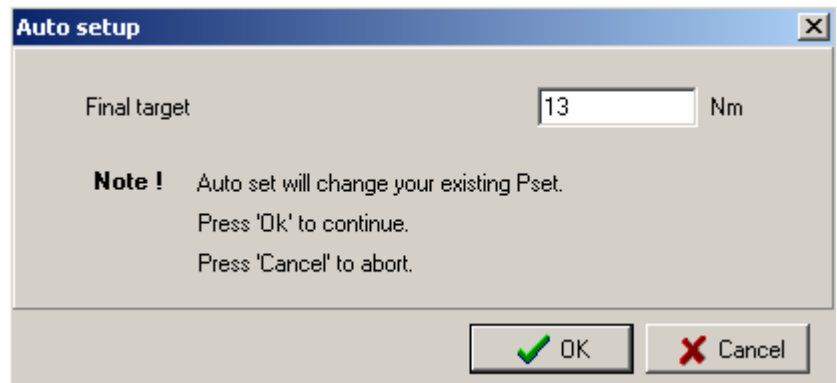
Perform a number of tightenings with the tool.

The first two tightenings will be 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.
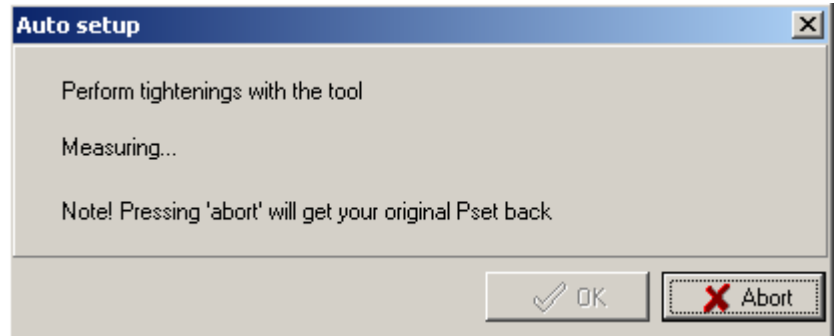
Click **OK** when prompted.

By clicking **Abort** before the Autoset procedure is completed will cancel the operation and restore the previous settings.

5.2.6   Quick programming

Quick programming 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 of which will be 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 *Tool max torque [T102]*.**

Open an existing Pset or create a new one.

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

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

Click **OK** to finish.
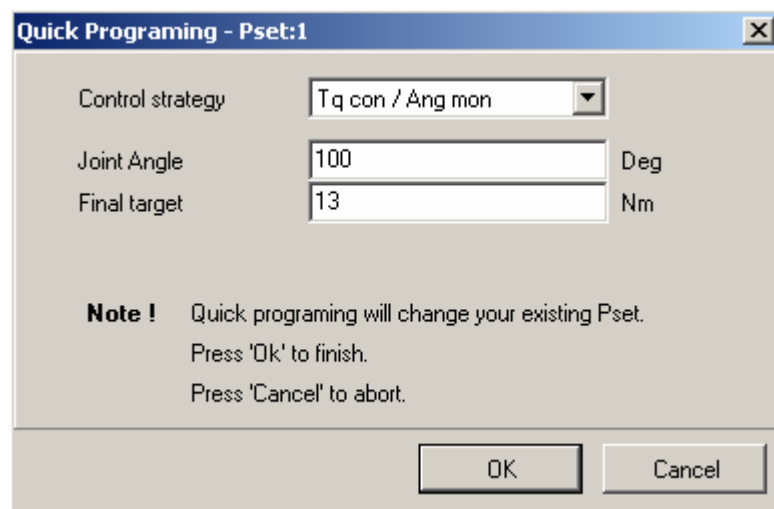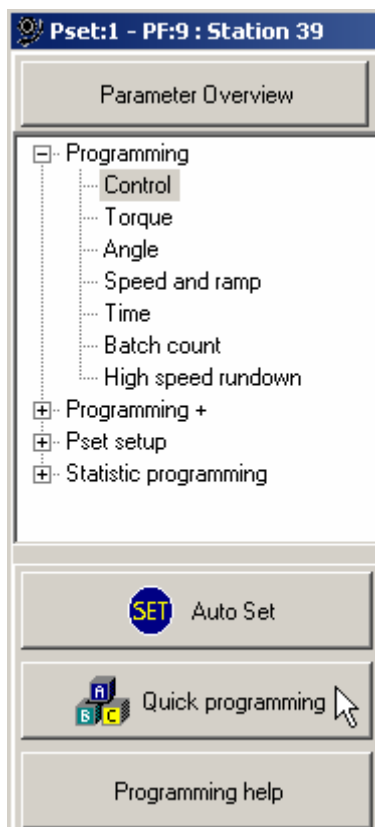
5.2.7 Programming help

Via the **Programming help** function ToolsTalk PF can calculate the selected control and tightening strategy.

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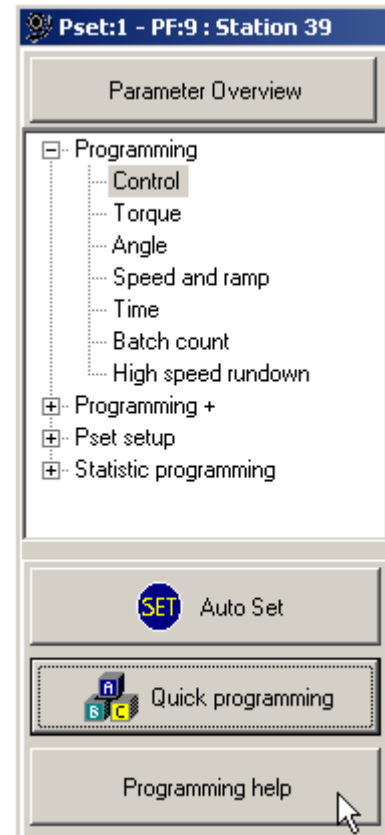
5.3 Programming +

This section is for applications where special Pset functionality is needed.

Expand the **Programming +** branch.

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

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 the nominal current at *Tool max torque [T102]*. With *Current monitoring [P200]* selected it is possible to set an acceptance window for the torque as a redundant process control.
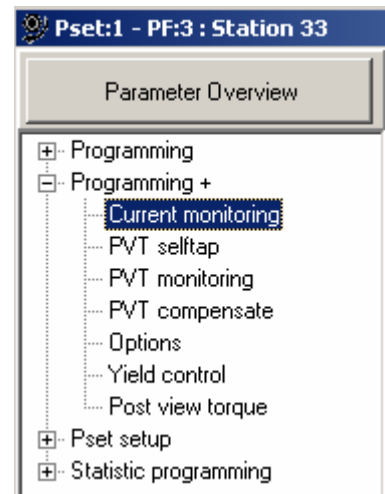
Current monitoring

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

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

Make suitable parameter settings.

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

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 *Final target [P113]* or *Final tq max [P114]*.

The selftap interval starts at *Cycle start [P110]*. During the *Selftap interval [P211]* the torque has to reach at least the *Selftap min [P213]* level but must stay below the *Selftap max [P214]* limit. The *Selftap max [P214]* is monitored in real time during the self tap interval. The *Selftap min [213]* value is evaluated against the selftap interval peak value at the end of the interval.

To reduce the effects of noise, the PVT selftap monitors mean values calculated from a number of windows. A fewer number of windows means 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 *Number of self tap windows [P212]* will make the monitoring more sensitive whereas a lower number will filter more noise.
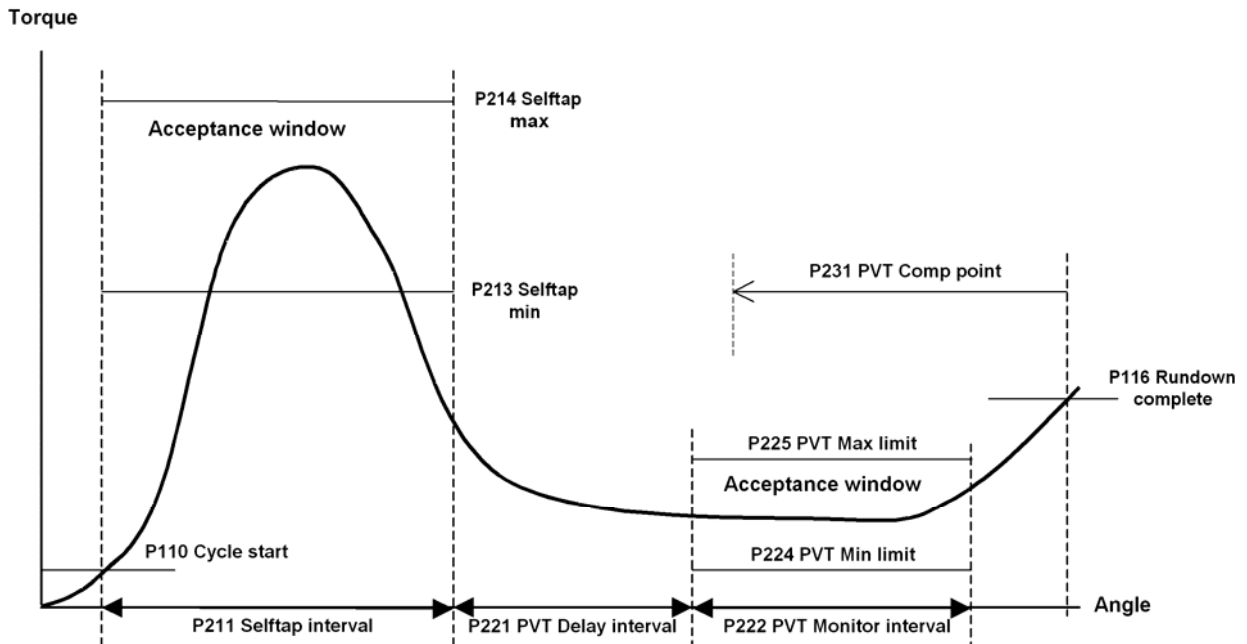
Graph illustrating PVT selftap, PVT monitoring and PVT compensate

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

Make suitable parameter settings.

When the joint torque has to pass through an acceptance window prior to *Rundown complete [P116]* to pass as a correct tightening it is recommended that the PVT monitoring option is used.

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

See the graph in the section for PTV selftap.

With *PVT monitoring [P220]* selected it is possible to set an acceptance window for the torque before *Rundown complete [P116]*. The *PVT max limit [P225]* is monitored in real time during the monitor interval and if exceeded, the tool will stop immediately. The *PVT min limit [P224]* value is evaluated against the monitor interval peak value at the end of the interval.

To reduce the effect of noise, the PVT selftap monitors mean values are calculated from a number of windows. A higher *Number of self tap windows [P212]* will make the monitoring more sensitive whereas a lower number will filter more noise.

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

Make suitable parameter settings.

PVT compensate		
P230 PVT comp	☑	
P231 PVT comp point	10	Deg

See the graph in the section for PTV selftap.

Via this function the PF allows the torque levels to be independent of the prevailing torque, (known as PVT compensate) during the rundown phase. This makes the torque levels change dynamically for each new tightening. In this way, the PVT compensate value is used as a base reference for the torque used during tightening.

The different torque values, e.g. *First target [P111]* and *Final target [P113]*, are compensated for the prevailing torque during the rundown phase. The PVT compensation value is calculated at *Rundown complete [P116]* as an average torque from an interval preceding the *PVT comp point [P231]*. The tightening result is presented with the compensation torque subtracted.

> ℹ️ *Final tq max [P114]* **is also compensated with the PVT compensate value.**

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

Make suitable parameter settings.

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

Options

Option	Value
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	☐

Tightening a screw or nut is in accordance with the selected *Control strategy [P100]*. 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 will decide the direction of rotation. If the ring is in the right position the tool will rotate clockwise (CW), and counter clockwise (CCW) if the ring is in the left position. However, the direction will not change if the direction ring is moved while the tool is running.

With the parameter *Tool tightening direction [P240]* the default tightening direction of the tool is selected. This means that the tool will tighten 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.

> ℹ️ **The direction ring adjusts the rotation direction of the tool socket, while parameter *Tool tightening direction [P240]* 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 ang or rotate spindle reverse, the "active" direction is the opposite from the *Tool tightening direction [P240]*. 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. If tool start from digital input is selected and activated, the tool will start tightening in the direction programmed in the parameter *Tightening direction [P240]*.

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

> **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 synchronised tool group. Use only the four internal digital inputs.**

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

Make suitable parameter settings.

Yield control is activated by selecting the *Control strategy [P100]* to **Yield**. The *Tightening strategy [P101]* can be set to **One stage**, **Two stage** or **Quickstep**. Yield control will always interact in the last stage of the tightening.

Yield control

P260 Torque, TC	Not Used	Nm
P261 Increment	Not Used	Deg
P262 No degrees	Not Used	Deg
P263 Torque difference	Not Used	%
P264 Angle step	Not Used	Deg

Zoom step [P105] strategy ending is eliminated when yield control is selected. An additional tightening angle can be added after the yield point is reached by setting an angle to the *Angle step [P264]* parameter.

See function description for Yield control in section *Control strategies*.

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

Make suitable parameter settings.

Some joints have a torque peak prior of *Rundown complete [P116]*. 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.

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

Click **Store** to save the settings.
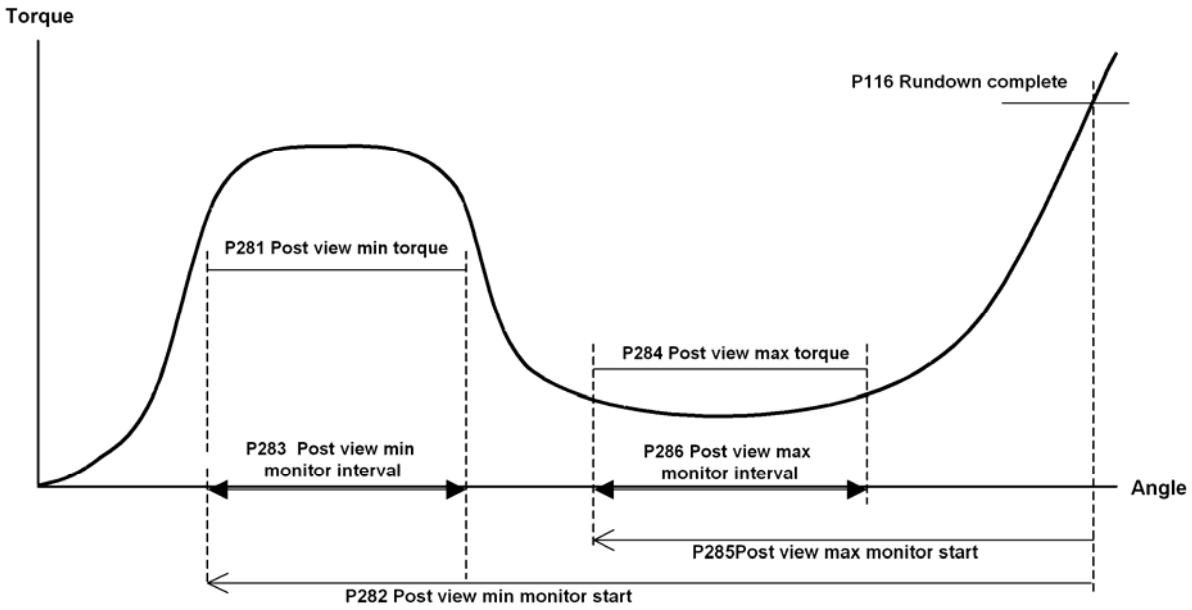
Graph illustrating Post view torque

5.4   Pset setup

Expand the **Pset setup** branch.
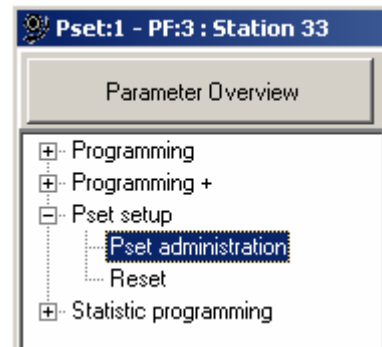
Select **Pset administration**.

Add a name for the Pset (optional).

This section also contains options for **View existing Pset**, **Create new Pset**, **Copy Pset** and **Delete Pset**.
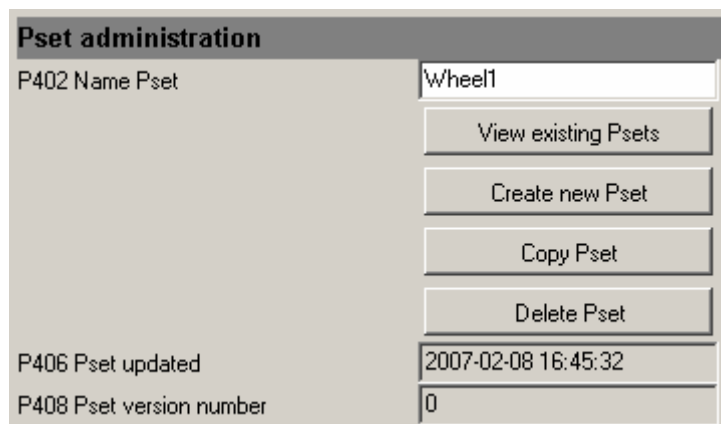
In the **Pset setup** branch, select **Reset**. Click **Delete Pset result** to select the Pset result to remove from the Power Focus memory.
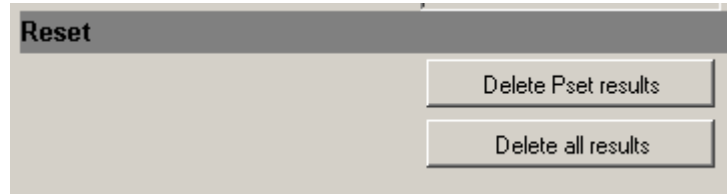
When clicking **Delete all results** a confirmation pop windows appears. Select "Yes" to accept or "No" to abort operation.

Click **Store** to save the settings.

5.5 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.
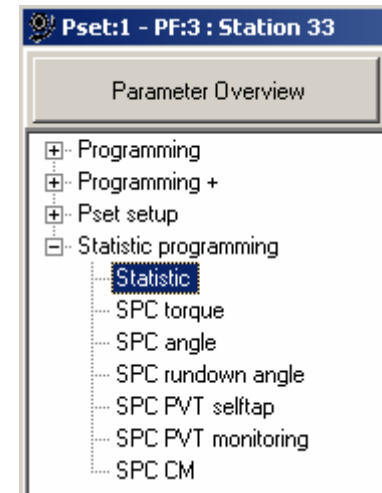
5.6 Running a Pset

To run (activate) the Pset, select the Pset in the **Selection panel** or via any configured Pset control source.
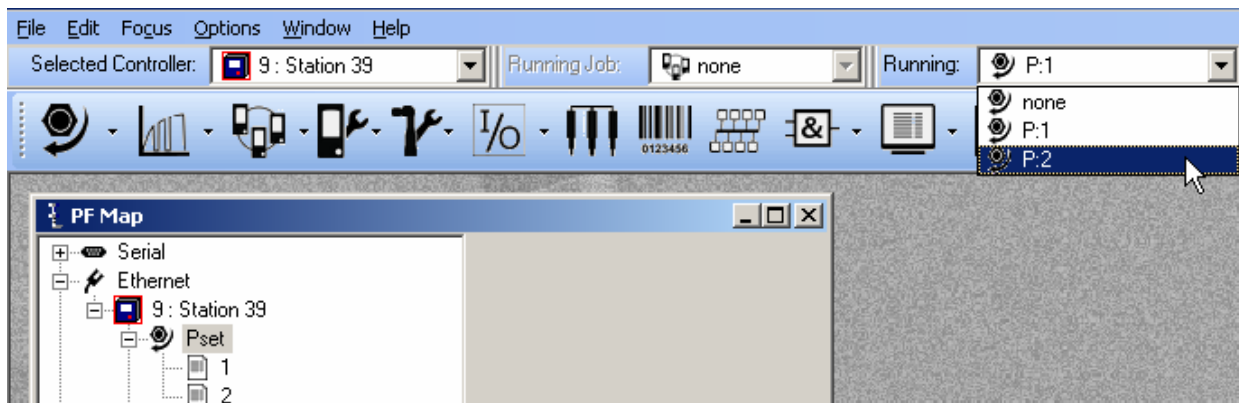
6   Multistage

The **Multistage** feature offers a dynamic link to eight parameters 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.

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 will shut 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 will then be taken from the stage where the shut off occurred.

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

6.1 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.
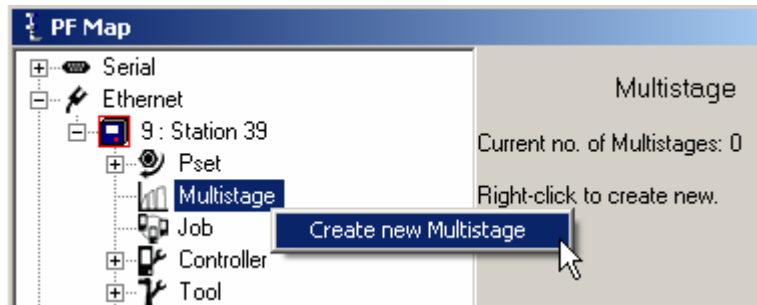
Select **New Multistage ID**, enter the **New Multistage name** (optional) and click **OK** to open the Multistage window.
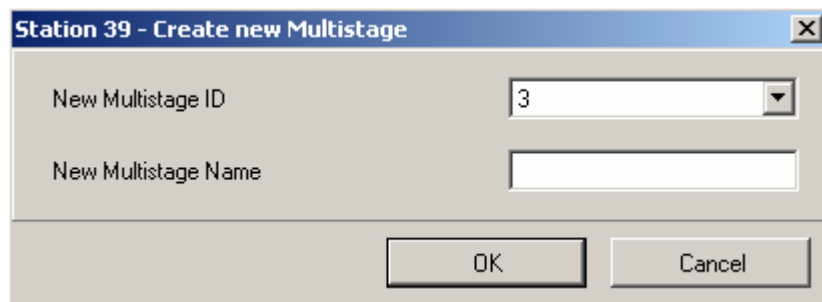
Click **Add** to select Psets to be included in the Multistage.

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.**
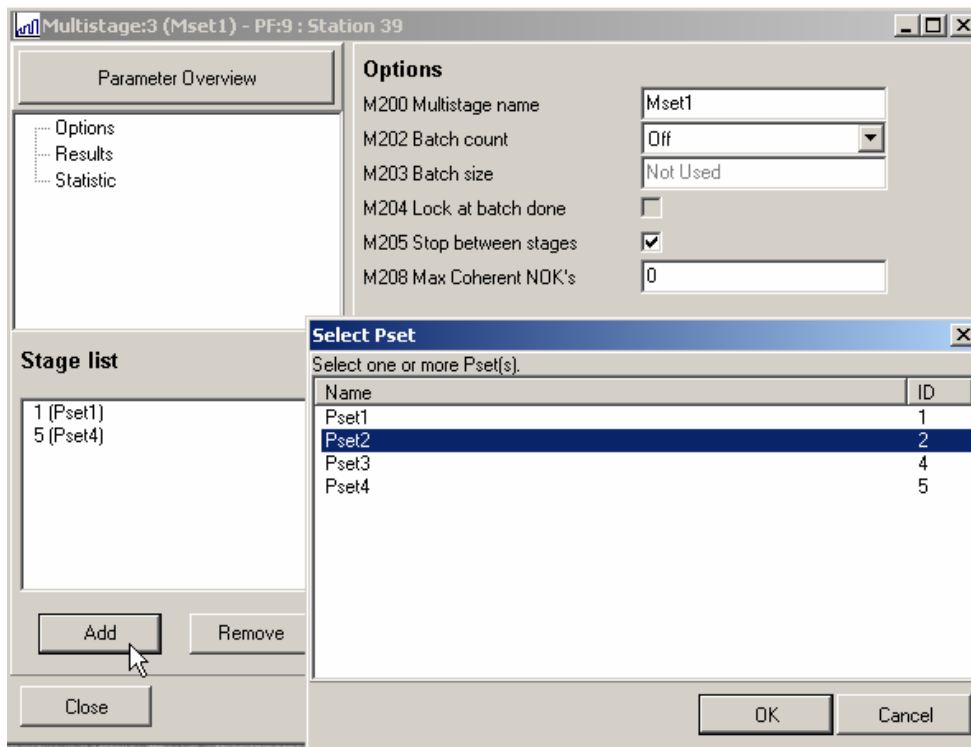
7   Job

The **Job** function is advantageous when an object has bolts/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/Multistage, the Job functionality keeps Psets and Multistages in a predefined order.

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

Power Focus allows 30 Psets/Multistages in a Job, and the storage of 99 Jobs (with the memory setup (see chapter *Controller*) it is possible to store up to 400 Jobs). The Psets/Multistage included in a Job can be selected from a stand alone PF (RBU silver) or from several PF units in a Cell (RBU gold). The figure to the right shows an example of an object with bolts that require different torque values:
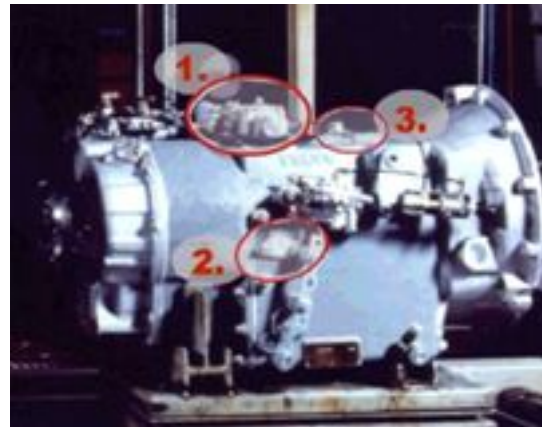
Four bolts that require a torque of: 39 Nm

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 (se table below).

PF	Pset	Pset name	Batch size
1	1	Pset1	4
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. A "JOB OK" signal is received from the Power Focus when all tightenings have been performed correctly.

The Job function in Power Focus can be defined by two categories. **Standalone Job** is when just one PF is involved in the Job.

The standalone Job function is available with RBU gold, silver, X and DS.

Cell Job is a Job in which several PF units are involved.

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 chapter *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 remotes the Job clients.

The Cell Job function is only available with the RBU Gold.

7.1 Create a Job group

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

Once the Cell is configured 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 *Job reference IP [C316]* address equal to the parameter *IP address [C300]* of the **same controller**.

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

Press **Store** to save the settings.

Reboot the PF.

7.2   Create new Job

ⓘ **With the configuration setup it is possible to store up 400 Jobs (see chapter *Controller* 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 between 1 and 99.)
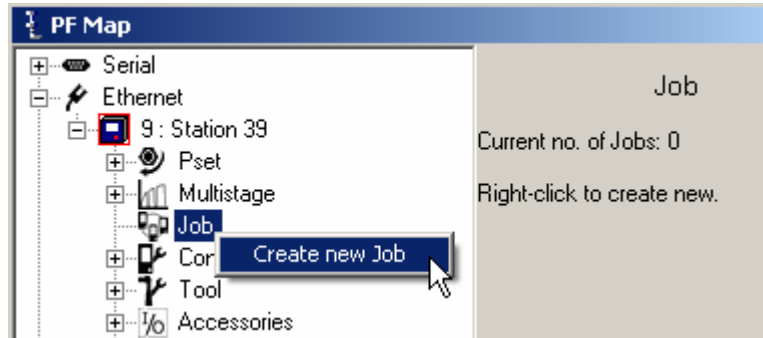
Select **New Job ID** in the drop list, give the Job a name (optional) and click **OK** to open the Job window.
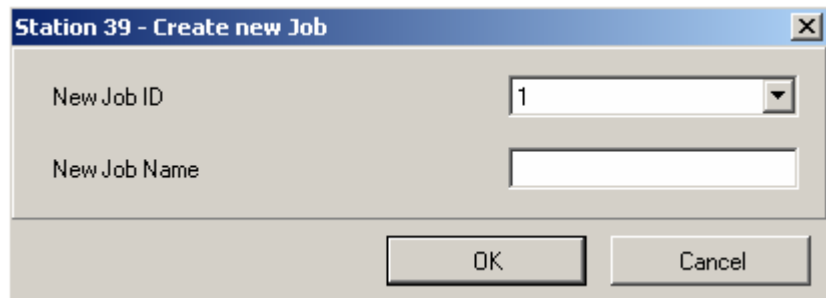
The upper part of the Job window shows the available Psets and Multistages and **Job list**, see *Job list [J300]* in chapter *Parameter list* for a description.

Select Psets/Multistages and add them to the Job list by clicking on either **Manual select** or **Auto select**. It is possible to change between manual and auto select afterwards by clicking in the table 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 *Batch count [P150]* and *Batch count [M202]*). It is not recommended to use the batch count function in Job and Pset/Multistage settings simultaneously.**
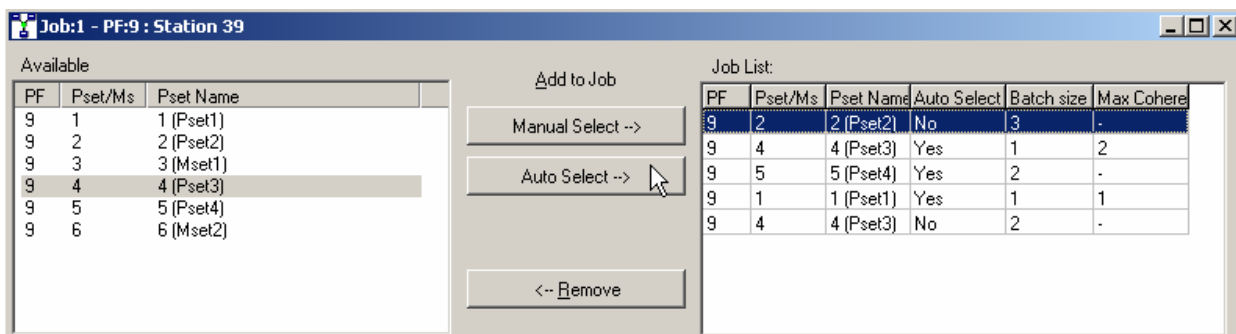
The lower part of the window presents the programming section. Select **Configuration** and set *Job order type [J301], Lock at Job done [J302], Tool loosening [J303]* and *Repeat Job [J304]*.

Continue and make settings for the options in **Batch**, **Timers**, **Line control**, **Result** and **View**.
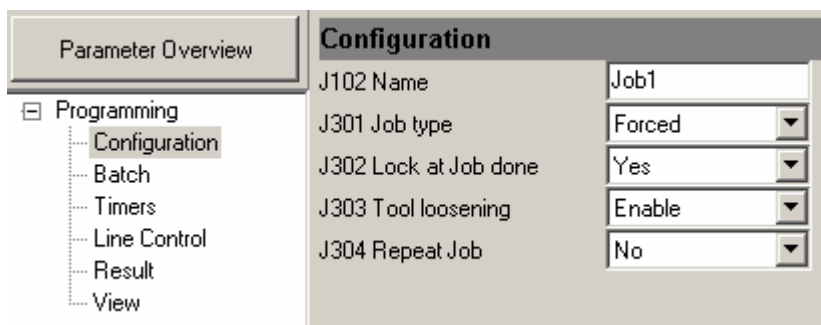
In the PF Map, select **Controller ->Configuration**.

Make a selection for *Job select source [C201]*.

Press **Store** to save the setting.

7.3 Select Job

In a Job selection the Job ID is used. After a Job has been selected it is not possible to select a new Job until the first tightening is started or a batch increment is performed. At that point the only way to select a new Job is either to complete the running Job or to abort the running Job.

Sources that Jobs can be selected and aborted from are "DigIn" (digital input), "Ethernet/serial", "identifier", "Field bus" and the "PF keyboard".

Power Focus allows two different possibilities for Job selection; *Job select source [C201]* and *Job select source override [C202]*. To be able to select a Job at least one of the two parameters has to be set.

Job select source override [C202] has a higher priority than *Job select source [C201]*. If a Job is selected from *Job select source override [C202]*, it will always terminate a present Job and be selected instead.

If a Job is chosen from *Job select source [C201]* then it is possible to select a new Job from the same source or from *Job select source override [C202]*. But if a Job is chosen from *Job select source override [C202]* then it is only possible to select a new Job from the same source.

> **The system will remember the most recently selected source until the Job is either completed or aborted.**
>
> **If a new Job is selected via *Job select source override [C202]*, then a running Job will be aborted and the new one will be started instead. To be able to select/abort a Job from the PF Graph display, *Job select source [C201]* or *Job select source override [C202]* must be set to "PF keyboard".**
>
> **A Cell Job can only be selected or aborted from the Job reference.**
>
> **If selecting an empty Job, without any Pset/Multistage included, Power Focus will send a Job OK signal.**
>
> **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 verse. 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 will continue.

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

> **To run the Job from ToolsTalk PF, set parameter *Job select source [C201]* to "Ethernet/Serial".**

Select the Job to run in the **Selection panel**
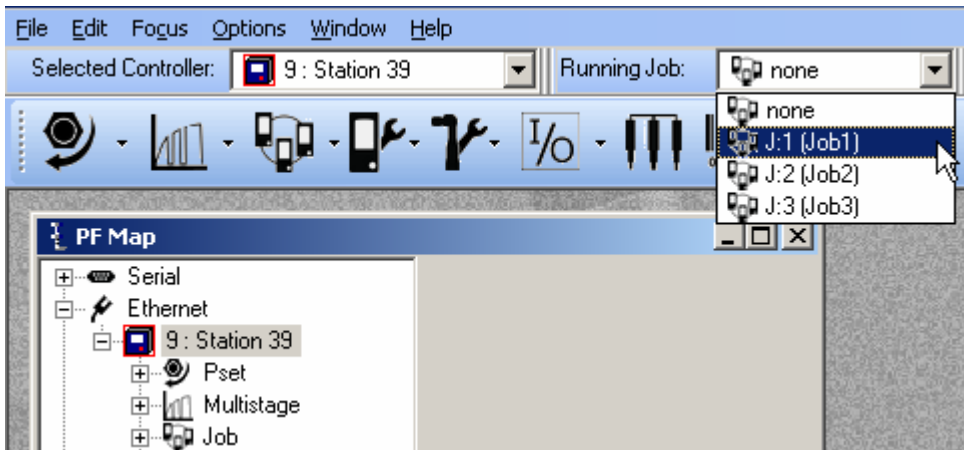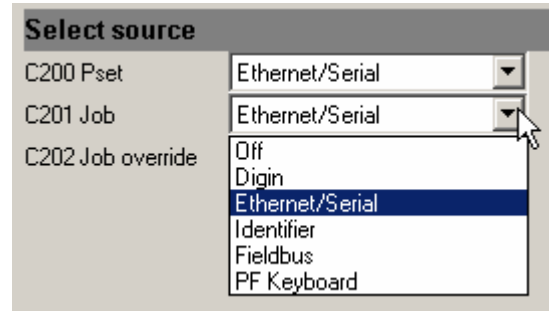
In ToolsTalk PF, click on the arrow to the right of the **Monitor icon** and select **Job Monitor**.

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*.
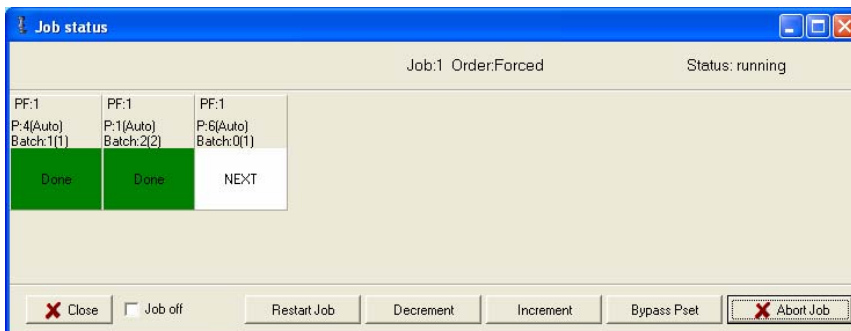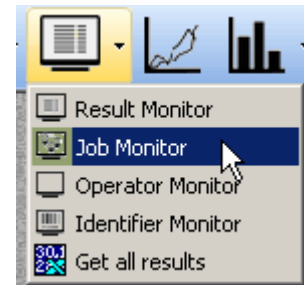
7.3.1 Functions in the Job monitor

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 skip 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 *Batch status at increment/bypass [J311]* is selected. Otherwise, the Job status will be OK.
	In a Job with free order, only the Job client with the active Pset/Multistage is able to utilise batch increment.
	In Jobs with forced order, the Job client with the active Pset/Multistage and the Job reference are able to utilise batch increment.
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 *Batch status at Increment/bypass [J311]*.
	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 *Max time to start Job [J320]* and *Max time to complete Job [J321]*).
	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: Selecting Job off for a running Job is equal to aborting Job, thus the tool/tools will always be enabled. The Job reference will order all Job members to select the latest Pset from the digital input, Field bus or selector (in case one of these is *Pset select source [C200]*) 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, Field bus or selector (in case one of these is the *Pset select source [C200]*). 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. 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.

7.4 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 the PF.

8 Controller

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

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

8.1 Information

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

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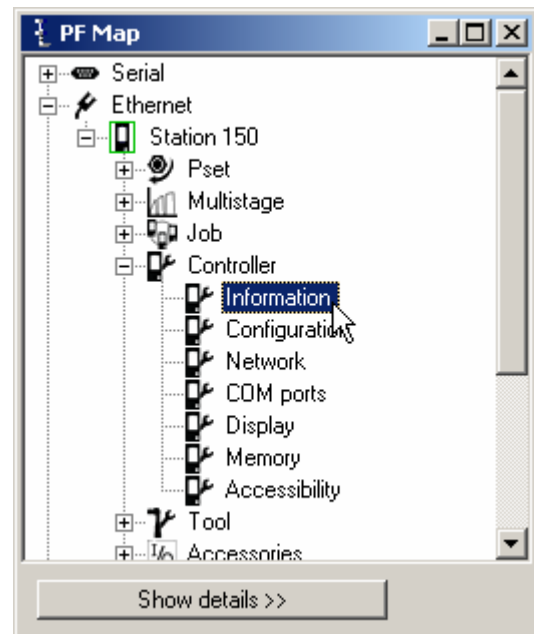
This window contains information about the ToolsTalk PF **Software** and the Power Focus **Hardware**.

Software

C100 Main code version	not a release
C101 Application code version	4.7.11
C102 Parameter tree version	221
C103 RBU code version	1.3.14
C104 Boot code version	2.7.222
C105 DSP code version	4.0.18
C106 MC code version	5.63.0

Hardware

C110 Controller type	Compact
C111 Serial number	F844075
C115 RBU type	Gold (Au)
C116 RBU serial number	00011650

8.2   Configuration

In the PF Map **Controller** branch, double-click on **Configuration**.
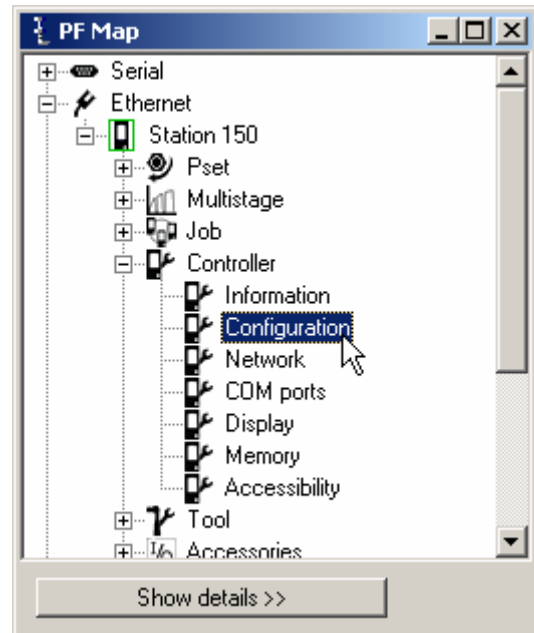
Make settings for **Select source**.
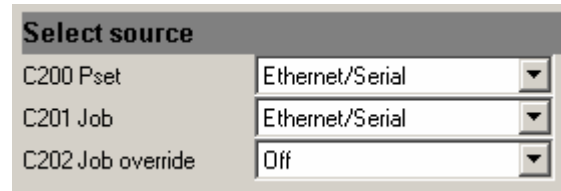
Make settings for **Tightening**, **Loosening** and **Positioning**.
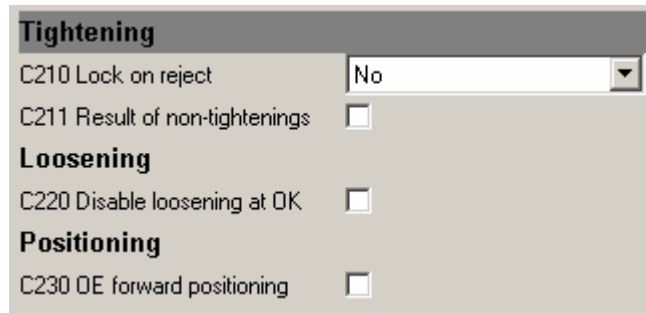
Make settings for **Batch** and **Startup**.

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

Click **Store** to save settings.
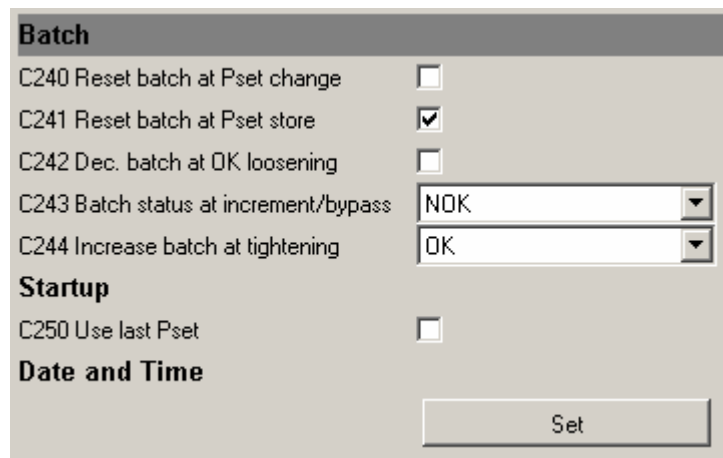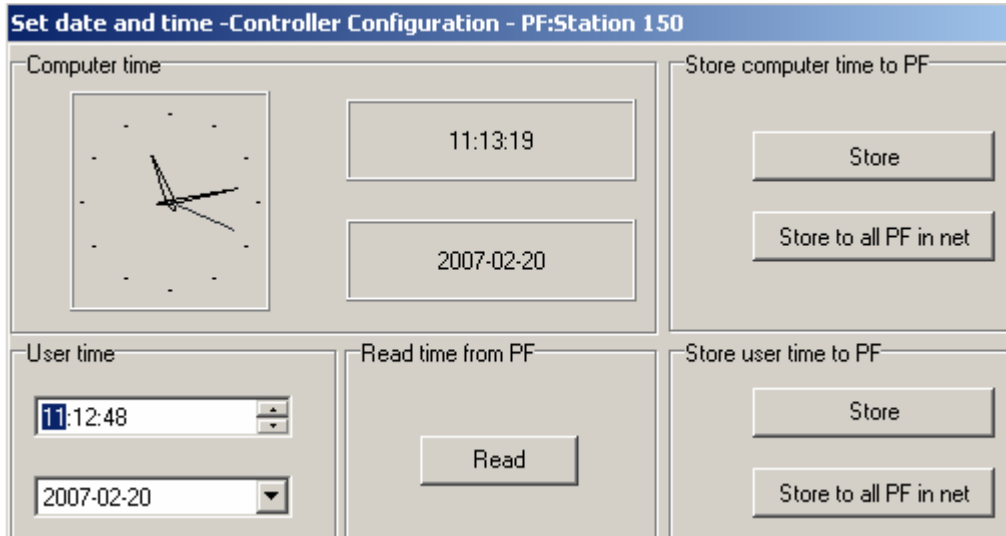
8.3 Network

In the PF Map **Controller** branch, double-click on **Network**.
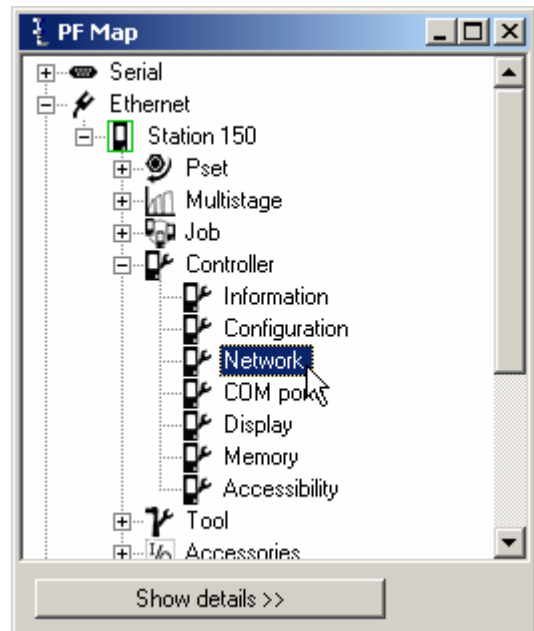
Make settings for **Ethernet** and **Cell**.

> ℹ️ **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. For also section *Job* and section *Sync*.**

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

Make settings for **Open protocol** and the **Tools Talk** port.

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

Click **Store** to save settings.

8.3.1   Cell and Net

The Power Focus software offers extended networking facilities. The **Cell and Net** concept is part of the RBU gold and 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 **Cell**. The Net concept enables functionality to group all Cells on the assembly line in one **Net**.

The figure below illustrates a Cell consisting of three PF Compact controllers, one PF Graph controller and a switch.

A Cell consists of one **Cell reference,** a maximum of 19 **Cell members** and 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 both as 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 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 chapter *Sync*) and to run Cell Jobs (see chapter *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.
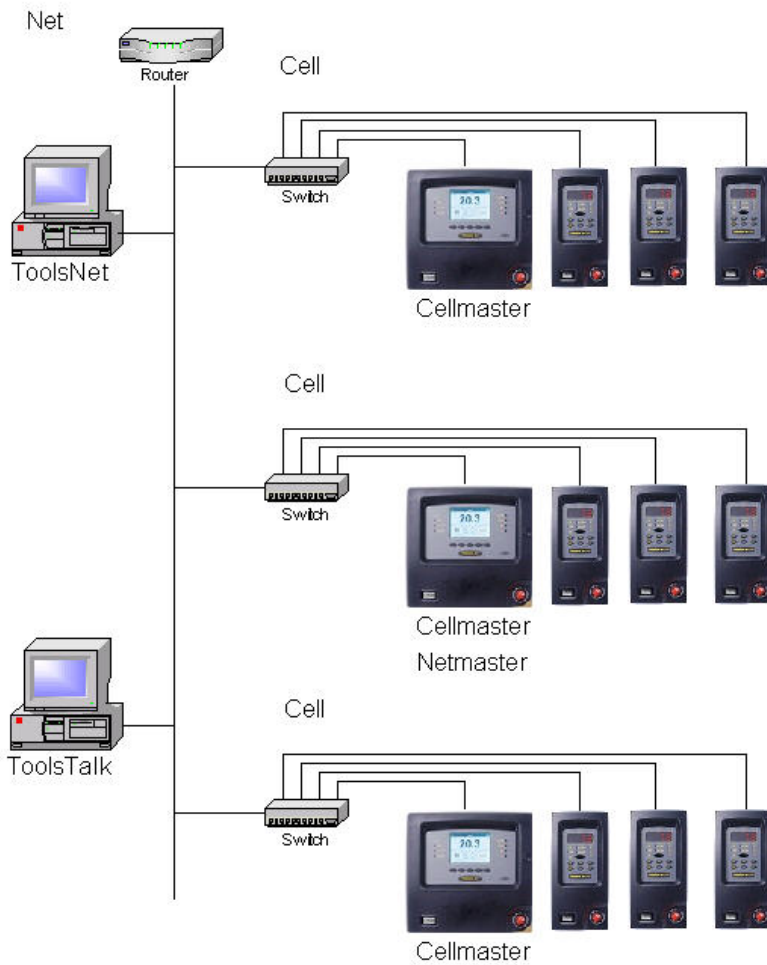
Network setup

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

Open the **Settings** window from the menu bar.

In the serial setup section, select the **Com port** to which the Power Focus is connected.
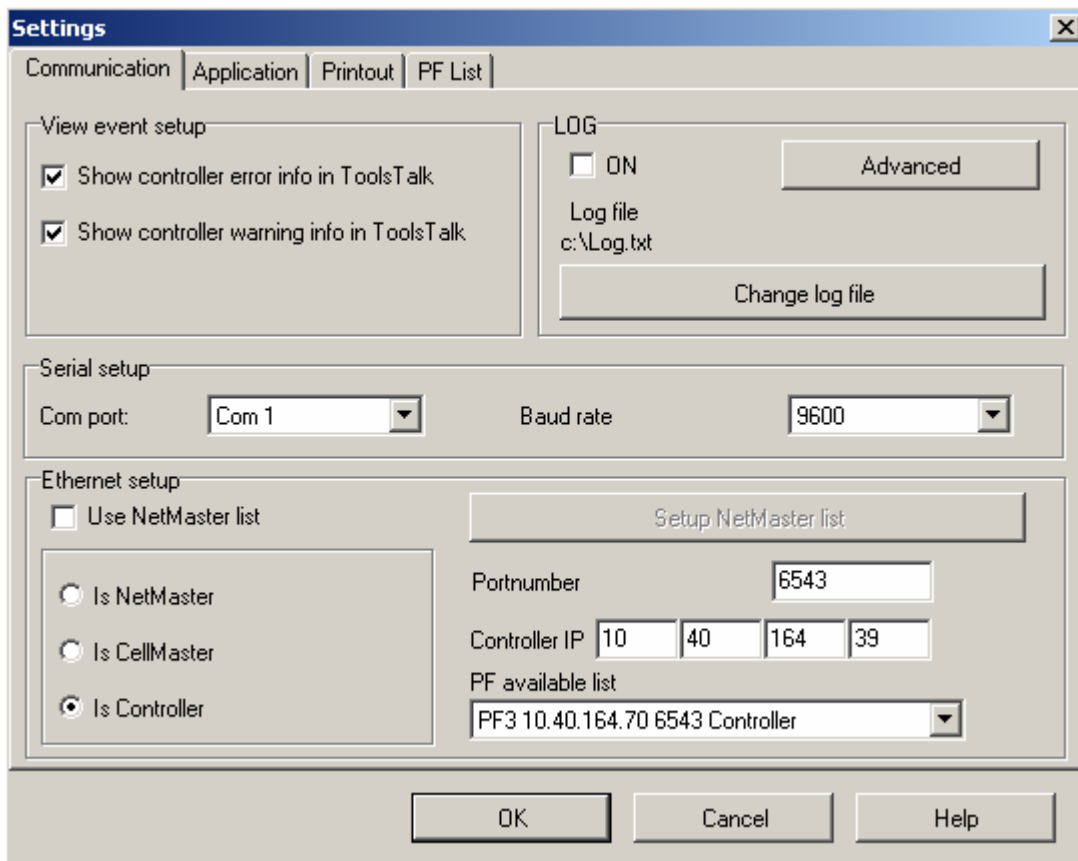
Connect the Power Focus by clicking the **Connect symbol**.

In the PF Map **Controller** branch, double-click on
Network.
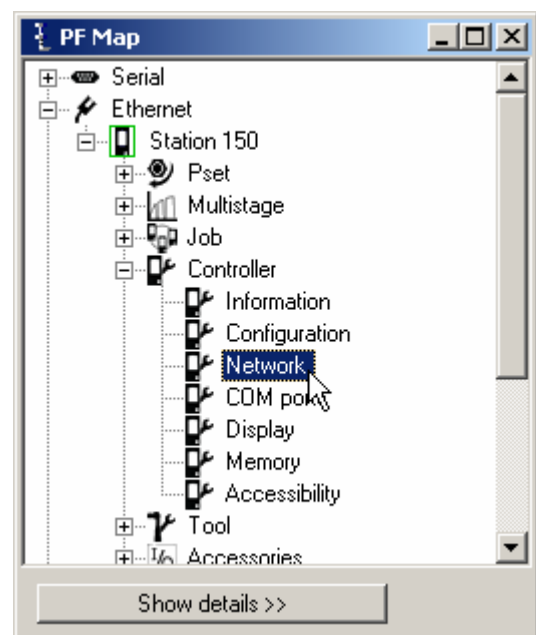
Set the *IP address [C300]* of the connected Power Focus to a unique number within the network.

Set the *Subnet mask [C301]* according to network partitioning.

Default router [C302] is optional.

Click **Store** to save settings.

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

The serial ports of the PF can be configured for different baud rates.

Serial port 1 handles both ASCII and 3964R communication. **Serial port 2** do only handle ASCII communication.

Click **Store** to save settings.

Restart the PF.

Cell and Net configuration

In the PF Map **Controller** branch, double-click on **Network**.
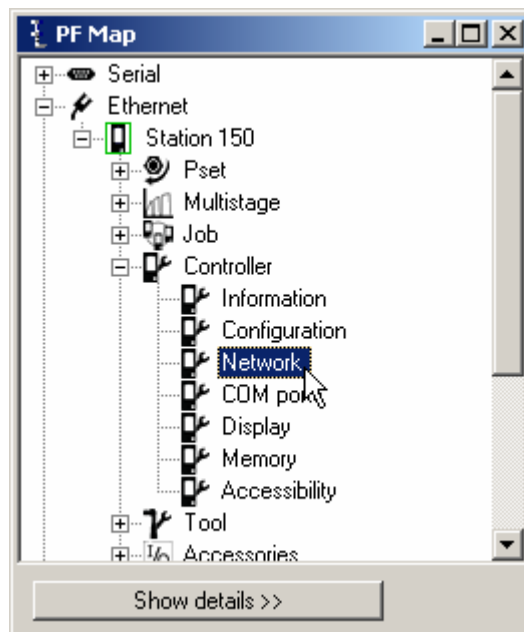
Set the *IP address [C300]*, *Subnet mask [C301]* and *Default router [C302]*.

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

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

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

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

Channel name [C311] 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 *Cell ID number [C313]* to a number unique within the network (1-1000). Only available when the controller is the Cell reference.

Cell name [C314] is optional.

Click **Store** to save the settings.

> **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.

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

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 the 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** will expand the Cell tree/ Net tree.

8.4   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.
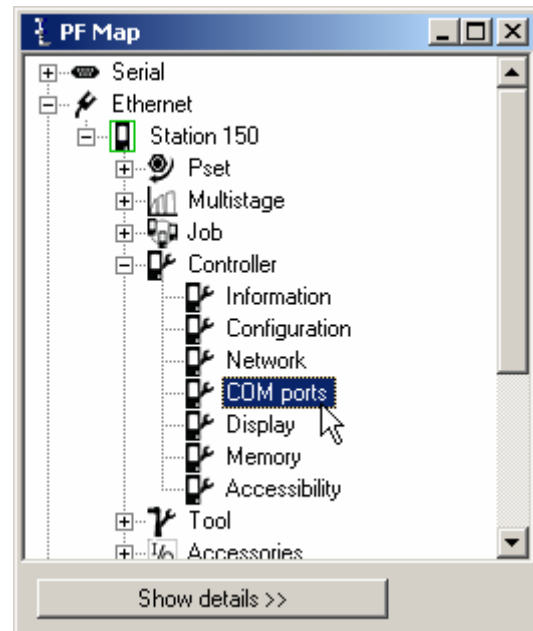
8.5   Display

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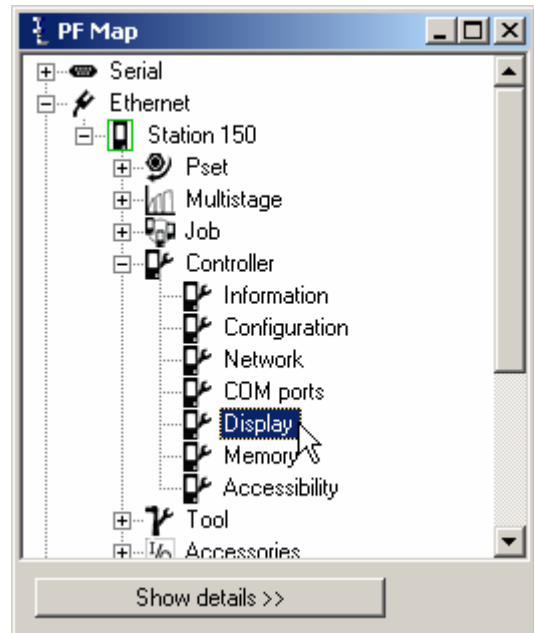
Make settings for **Presentation**, **Result view**, **Keyboard** and **Power save**.

Click **Store** to save settings.

8.6 Memory

⚠️ All data stored in the PF, except parameters *IP address [C300]*, *Subnet mask [C301]* and *Default router [C302]*, will be erased when changing memory setup. Therefore, use 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 the PF must be rebooted for changes to take effect. It is necessary to "Read PF from file" two times and reboot the PF one extra time.

It is recommended to reboot immediately.

Configurable memory is only available for RBU gold and silver.

Besides the default memory configuration, Power Focus provides six more configurable memory options; **More Psets**, **More Jobs**, **More Results**, **More Events, More Identifiers** and **Totally configurable** (which gives the possibility to manually configure the Power Focus memory).

Condition	No. of Psets	No. of Jobs	No. of Results	No. of Events	No. of Identifiers	No. of Statistical events	No. of Identifier result parts	No. of 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	400	1	8
Totally configurable	1-300	1-700	1-9000	1-800	400	1-500	1-4	1-100

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 chapter *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).

8.6.1 Store PF to file

Open ToolsTalk PF and connect to the PF.

In the **File** drop down menu select **Store PF to file**.

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

A **Confirmation message** will be displayed.

ℹ️ The "PF3000 Text file" should be used for the restoring of data when the memory setup is done (see section *Read PF from file*).
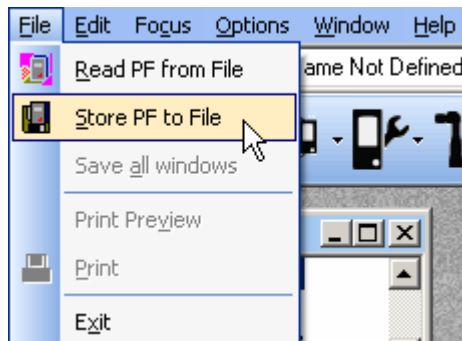
Memory setup

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

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

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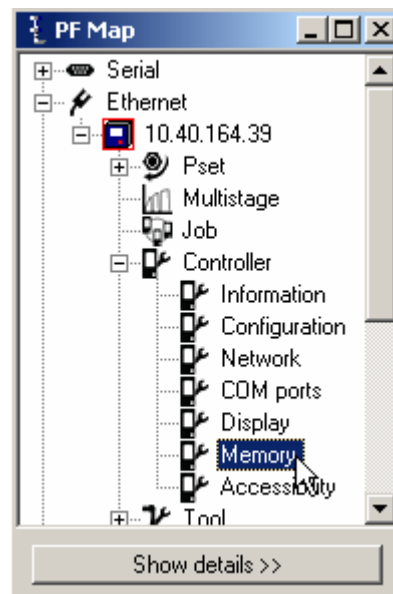
Select number of Psets, Jobs, Results, Identifier result parts, Events, Statistical events and Traces.

> ℹ️ **Indicator estimated memory usage will automatically be updated in percent (a maximum of 100 percent is allowed).**
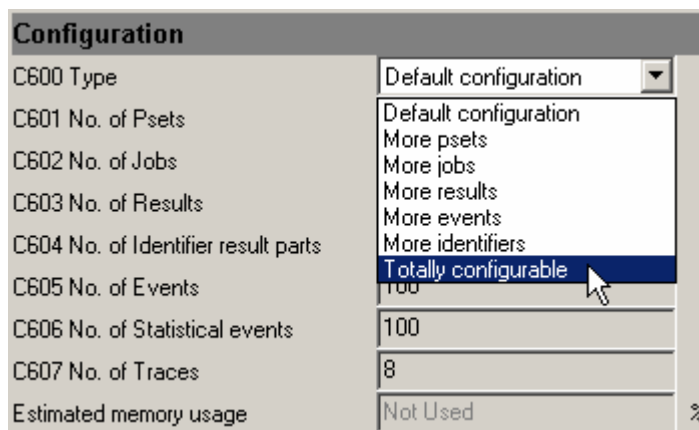
> ⚠️ **The changes made in configurable memory setup will reset the Power Focus memory at the next reboot. All data (tightenings results, programmed Psets, Jobs, Sync groups etc.) will be lost. The only exception is parameters *IP address [C300]*, *Subnet mask [C301]* and *Default router [C302]* which will remain after the reboot.**
>
> **Use 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".**

Configuration

C600 Type	Default configuration
C601 No. of Psets	Default configuration
C602 No. of Jobs	More psets
C603 No. of Results	More jobs
C604 No. of Identifier result parts	More results
C605 No. of Events	More events
C606 No. of Statistical events	More identifiers
C607 No. of Traces	Totally configurable
Estimated memory usage	Not Used

Configuration

C600 Type	Totally configurable
C601 No. of Psets	250
C602 No. of Jobs	700
C603 No. of Results	9000
C604 No. of Identifier result parts	1
C605 No. of Events	200
C606 No. of Statistical events	100
C607 No. of Traces	50
Estimated memory usage	91 %

Click **Store** to save settings.

> 💬 **When changing the memory setup the PF must be rebooted for changes to take effect. It is recommended to reboot immediately.**
>
> **Configurable memory is only available for RBU gold and silver.**

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

8.6.2 Read PF from file

When memory setup is done, the PF3000 text file including the previous data configuration (saved before setup) can be restored into the PF again.

> ⚠️ **Command "Read PF from file" will overwrite current programming and configuration in connected PF.**

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

Open ToolsTalk PF and connect to the PF.

In the **File** drop down menu select **Read PF from file**.
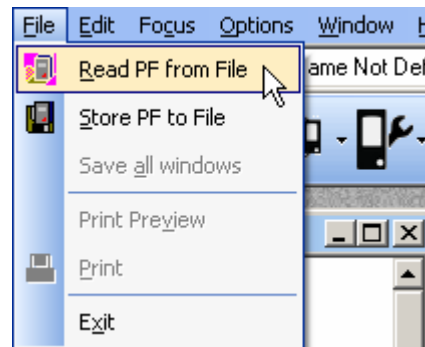
A **Confirm** pop up window informs that restoring from file will replace everything on the controller.

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.
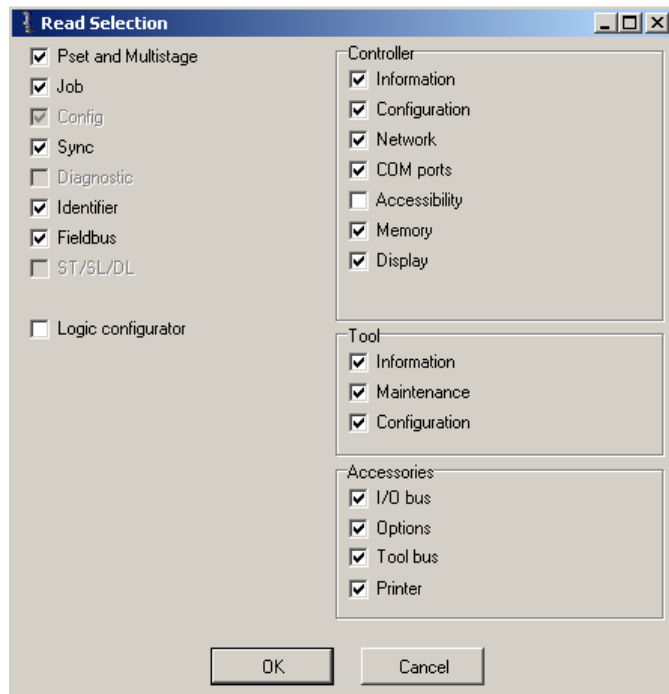
8.7   Accessibility

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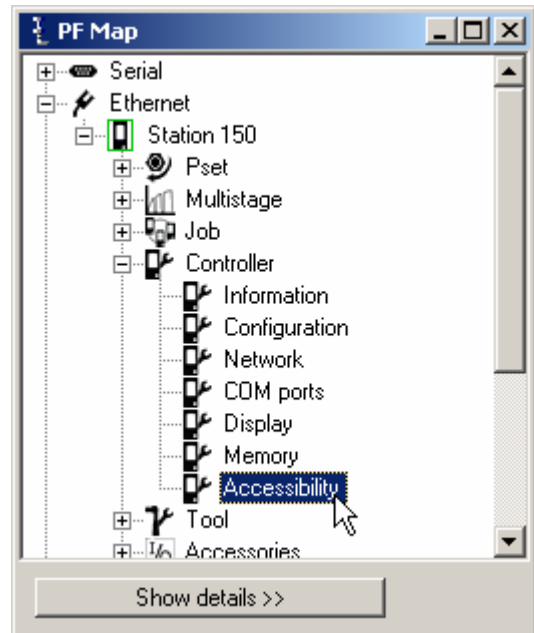
Make settings for **Password**.

Click **Store** to save settings.
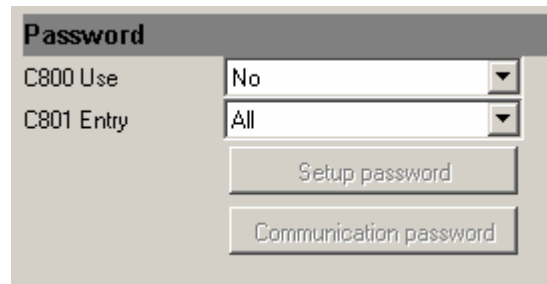
9 Tool

The **Tool** section contains information for Tensor tools connecting to the Power Focus. Information from the PF containing general tool information, service status, hardware- and software configuration etc.

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

9.1 Tool information

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

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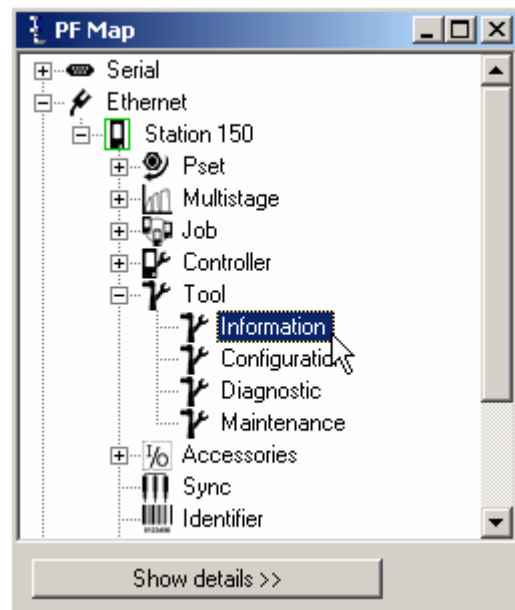
The **Model** and **Motor** sections contain information about the Tensor tool connected to the PF.

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

9.2 Tool configuration

In the PF Map **Tool** branch, double-click on **Configuration**.
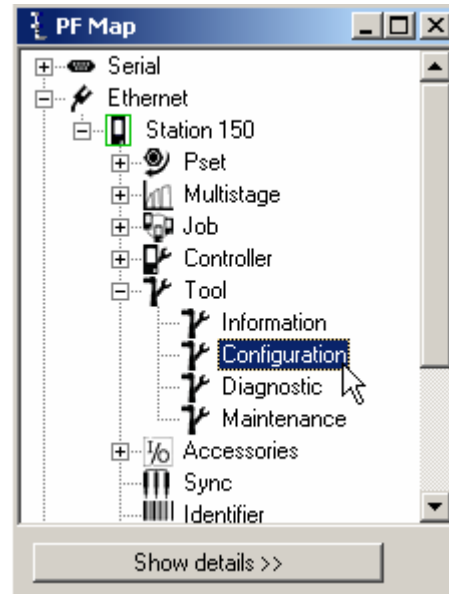
Make settings for **Tool start** and **Accessory bus**.

The main purpose for *Tool start select source [T200]* 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 one hand is released. The safety trigger is suitable for applications where a high level of safety is desired.
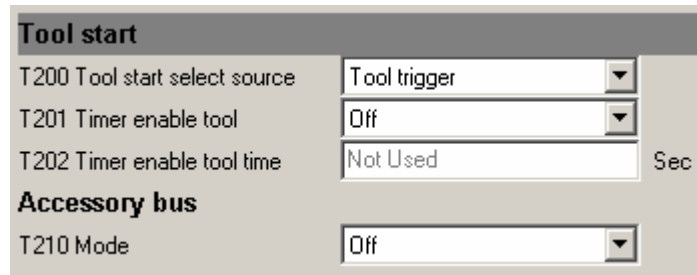
> ℹ **The safety trigger function is only available for ST tools**

The safety trigger function requires the start trigger and safety trigger button to be pushed simultaneously in order to start the tool. The second button must be pushed within 0.5 s from the first button, order is arbitrary. If the safety trigger button or the start trigger is released while the tool is running, the tool will stop 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 *Timer enable tool [T201]* 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 *Timer enable tool [T201]* is activated, the tool will be 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 will remain enabled while it is being run. When the tool is stopped, it will remain enabled for an additional period of time (according to release and configuration). This behaviour is comparable to key lock functionality on cellular phones; once unlocked, the keys will be 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).**

Parameter *Mode [T210]* is for ST selector configuration. The selector has two different modes, mode 1 and mode 2. In Mode 1 the selector only utilises the tool accessory bus as GPIO. This mode only supports a maximum of 15 Psets (1-15). In Mode 2 the selector is a true ST accessory taking full advantage of the bus capabilities.

Keep the left button on the selector pressed when powering up (this is done by hot swapping the tool or powering up the 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.

> **Mode 1 is primarily intended for use with the Power Focus world 3 software release and later. Mode 2 is recommended for users with Power Focus world 5 software releases.**

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 the *Mode [T210]* must be set to "GPIO" with the GPIO device configured according to the table to the right. Parameter *Pset select source [C200]* must also be set to "DigIn".

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 2"is selected the *Mode [T210]* must be set to "ST bus". Parameter *Pset select source [C200]* 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.

Make settings for **Sound**.

Sound	
T220 Enable	On
T221 Volume	High
Add buzzer	Buzzer wave	1
Add sound	Sound wave	

Enable/disable sound and adjust the *Volume [T220]* (low, medium or high).

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 wave 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.

> **ST tools support sound and buzzer functionality.**
>
> **STB and SL tools support only buzzer functionality.**
>
> **S and ETX tools do not support sound and buzzer functionality.**

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 a *Name [E100]* (optional).

Select *Frequency [E101]* (400-4000 Hz), *Time On [E102]* (0.01-65.0 Seconds), *Time Off [E103]* (0.01-65.0 Seconds), *Repetition [E104]* (0-100 times) and *Volume [E105]* (0-100 %). The volume is a relative (in percent) parameter *Volume [T221]*, which could be set to high, medium or low. *Volume [T221]* can be found in the sound setup window.

BuzzerWave		
E100 Name	Buzzer1	
E101 Frequency	800	
E102 Time On	0,10	Sec
E103 Time Off	0,20	Sec
E104 Repetition	3	
E105 Volume	50	
	Play sound	
	Delete BuzzerWave	
	Read	Store

After every change in setup, click **Store** to save settings into the tool memory. Even if a value is within specified limit it could be coloured red. Click **Store** and it will turn to black.
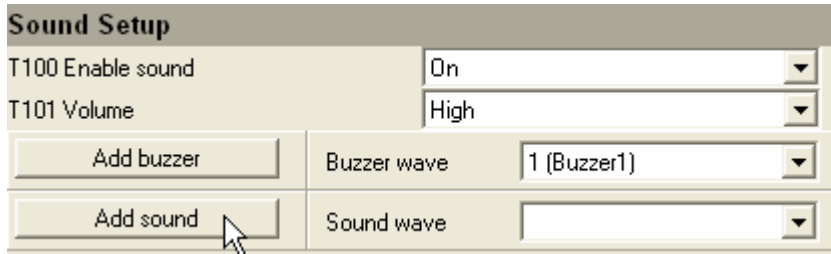
Click **Play sound** to listen to the buzzer sound in the tool (if not working, try to click **Store**).

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.

    (i)   **It is possible to store up to 10 stream waves in Power Focus.**
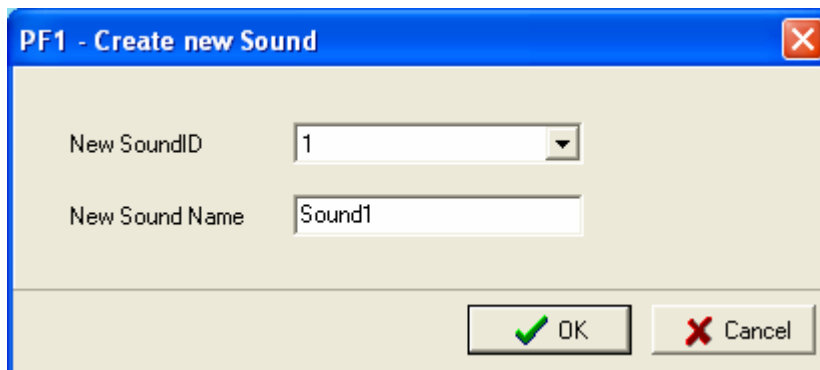
The **Create new sound** window appears.

Select a **New sound ID** and type **new sound name** (optional).

Click **OK**.

The **Wave** window appears.

Click **Open wave file** and search for the wave file to use on disk (hard drive/file).
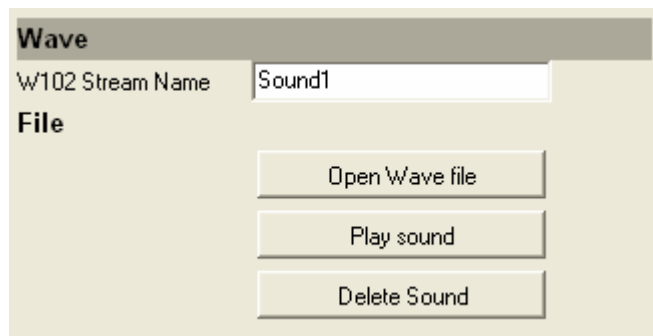
    (i)   **The wav file can use up to 8 bits and a frequency of up to 8000 Hz. It provides only mono playing and has an interval of maximum 3 seconds.**

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

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

Click **Store** to save settings.

Close window.

In the **Sound setup** window, click **Add**.

Sound Setup

T100 Enable sound	On
T101 Volume	High

Add buzzer	Buzzer wave	1 (Buzzer1)
Add sound	Sound wave	1 (Sound1)

T102 Sound Configuration

Event	Sound Type	Sound Prio
OK	1 (Buzzer1)	1

Add   Remove
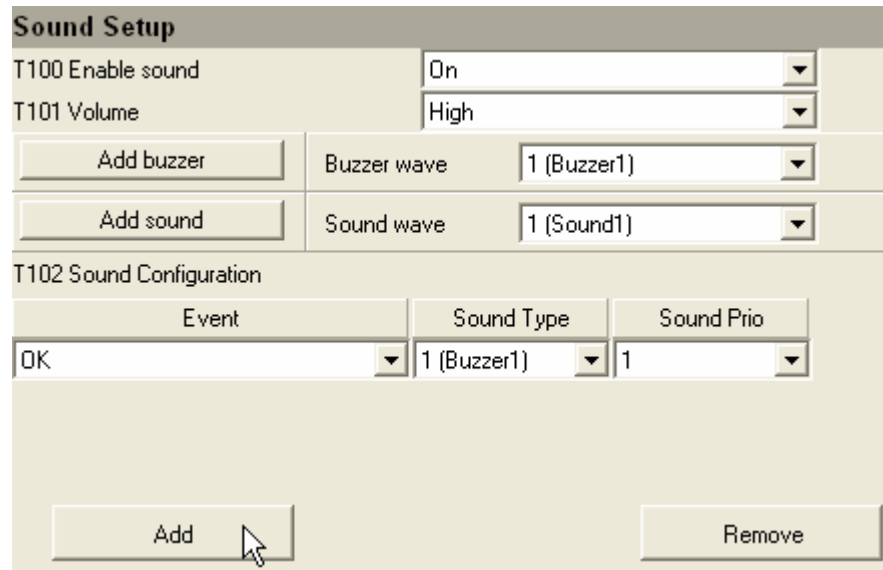
Select a digital relays in the **Event** list. For available relays, see chapter *Digital inputs and outputs*.

Event
OK
OK
NOK
Low
High
Low TQ
High TQ
Low angle
High angle
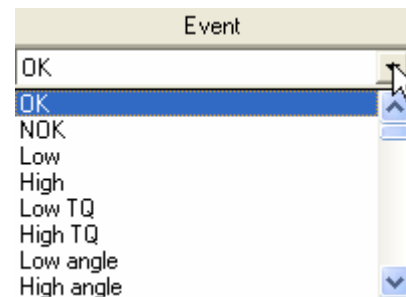
Select a sound or buzzer wave (crated earlier) in the **Sound Type** list to connect to the event.

Sound Type
1 (Buzzer1)
1 (Buzzer1)
2 (Buzzer2)
3 (Buzzer3)
1 (Sound1)
2 (Sound2)
3 (Sound3)
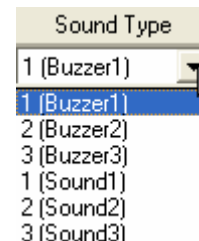
Select a priority from the **Sound Prio** list connected to the specific sound event.
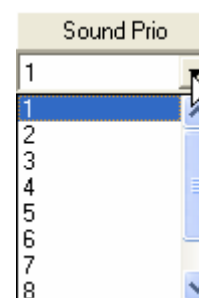
ⓘ   **The priority decides which sound event has the advantage in the case of a collision between more than one sound file during tool operations.**

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

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

Sound Prio
1
1
2
3
4
5
6
7
8

Make settings for **Function buttons**.

The *Function buttons [T230 – T235]* 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 chapter *Digital inputs and outputs*.)

The parameter *Push detection interval [T236]* states the maximum time (in milliseconds) between the button pressed to the button being released for push to be detected. Parameter *Next push interval [T237]* states the maximum time (in milliseconds) between the button being released after the first push and the button pressed again to detect double pushed.

Function Button		
T230 CW pressed	Off	▼
T231 CCW pressed	Off	▼
T232 CW single push	Off	▼
T233 CCW single push	Off	▼
T234 CW double push	Off	▼
T235 CCW double push	Off	▼
T236 Push detection interval	300	ms
T237 Next push interval	300	ms
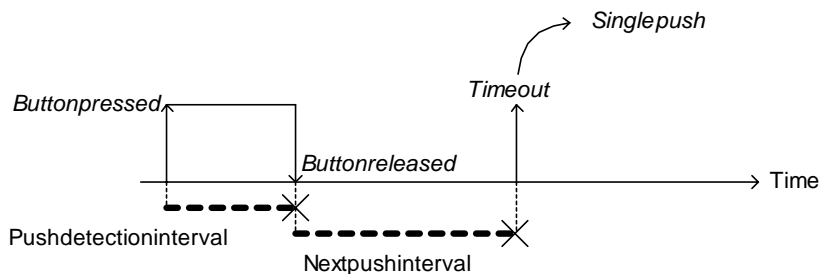
Single push - the button is pressed down and released before the *Push detection interval [T236]* expires. The *Next push interval [T237]* expires before the button is pressed again.
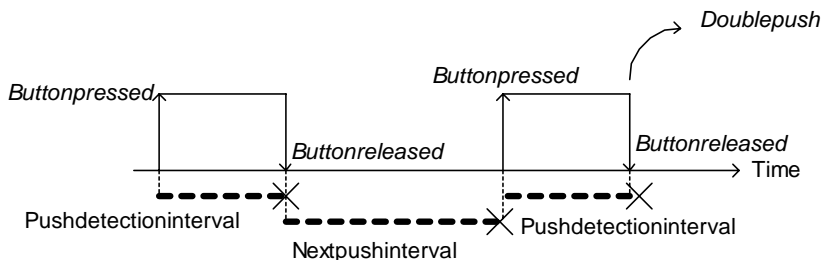
Double push - the button is pressed down and released before the *Push detection interval [T236]* expires. Then the button is pressed down before the *Next push interval [T237]* expires and is released before the *Push detection interval [T236]* expires.
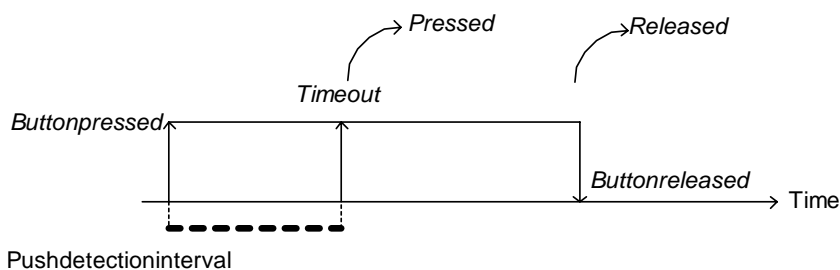
Pressed - the button is pressed down and is kept down for a longer time than the *Push detection interval [T236]*. When the *Push detection interval* expires, the button function is considered to be pressed until it is released. Notice that if no function is configured for single push or double push in the current tool direction, the *Push detection interval* will be 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 the 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 and DL 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 does provide duration; input to the digital input function remains high as long as the function button is pressed and becomes 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 will flash once and if a **Double push** is detected, the tool LED's will 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 *CCW double push [T235]* is set to "off", no response will be given.

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

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

To configure the *Events [T240]* click **Add**.

Select type of **Event**. For available relays, see chapter *Digital inputs and outputs*.

Select **Duration** (to next tightening, tracking event or time).

Click **Store** to save settings.

Blue LED		
T240 Events		
Event	Duration	Time
Add	Remove	
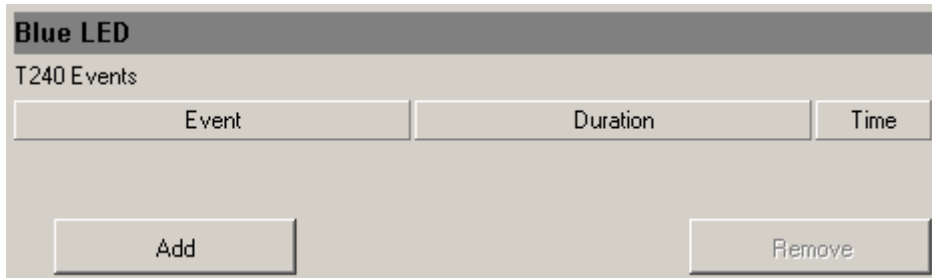
Make settings for **Illuminator** and **Lights**.

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

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

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

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

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

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

Illuminator	
T250 Illuminator mode	Off
T251 On event	Not Used
T252 Off event	Not Used
T253 On time	Not Used
Lights	
T260 Control type	PF-controlled 1
T261 Use ON time	☐
T262 ON time	0,0
T263 Indicator mode	Off
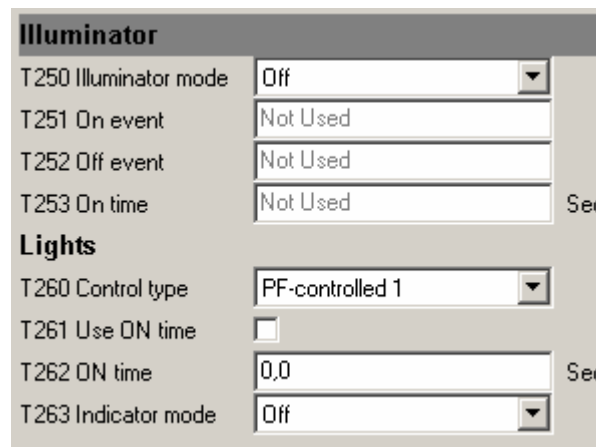
The parameters *On event [251]*, *Off event [T252]* and *On time [T253]* are related to the input from the *Illuminator mode [T250]*.

Maximum time for the illuminator to remain on since the last occurrence of *On event [T251]*.

For available relay functions, see chapter *Digital inputs and outputs*.

Make settings for **Radio**.

> ⓘ **This section is for configuration of STB tools. For more information, see chapter *Tensor tools* and chapter *Parameter list*.**

Click **Store** to save settings.

9.3 Tool diagnostic

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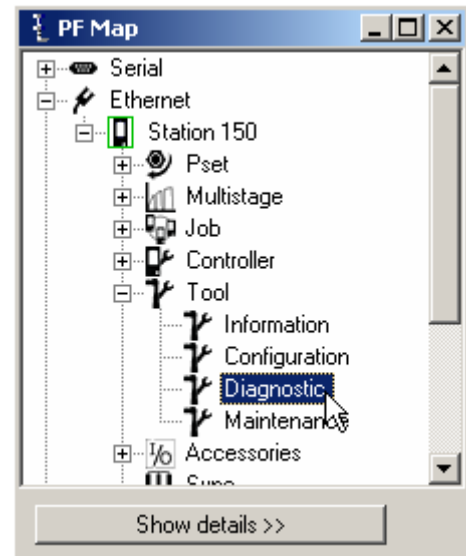
Click **Sensor tracking** to introduce torque and angle readings in real time.

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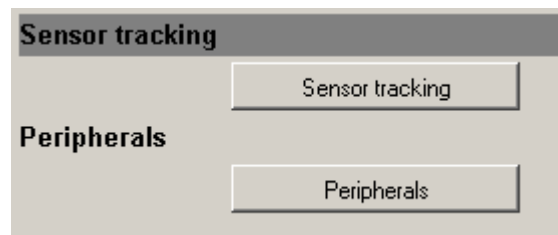
9.4 Tool maintenance

In the PF Map **Tool** branch, double-click on **Maintenance**.
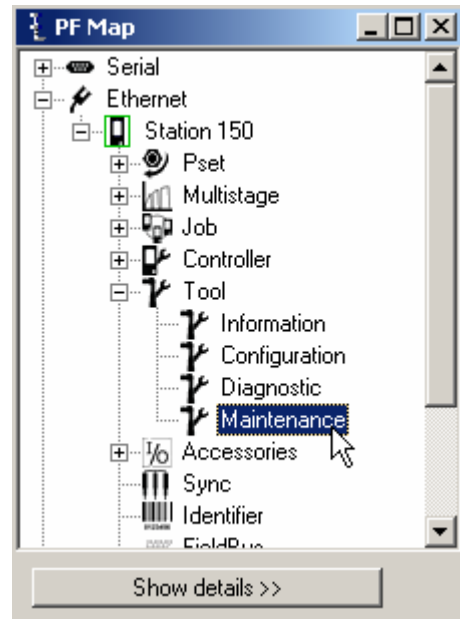
The t **ACTA** section contains a tool calibration session.

> ℹ **The calibration will not work with Tensor DS tools.**

A tool calibration session is started by connecting the ACTA 3000 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.

Click **Create QRTT** to create the Psets and Multistages needed. The target torque and angle is then set by the ACTA 3000 before the start of each calibration.

The tool calibration is started by a command from the ACTA 3000 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 *ACTA/QRTT calibration [E710]* is displayed and stored in the event log of the Power Focus.
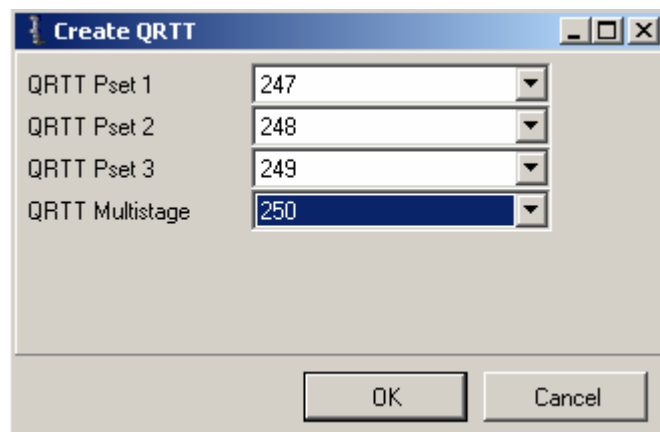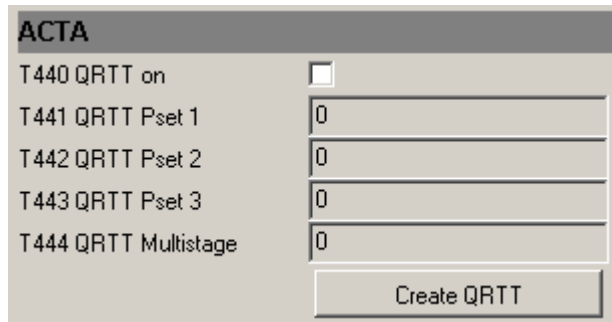
It is necessary for the Power Focus to have enough memory space available to store the Multistages and Psets needed. If the calibration shows an unsatisfactory result the operator is assumed to take the appropriate action. No calibration value (calibration- or normalisation value etc.) will be changed automatically.

9.4.1 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 chapter *Sync*.
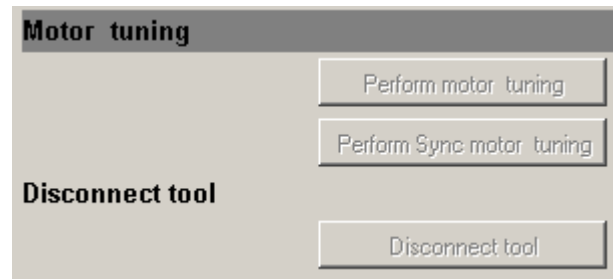
⚠ **It is important that no torque is applied to the socket of the tool when it is subject to any kind of motor tuning. Make sure that the socket is able to rotate freely.**

Standalone motor tuning

Click **Do motor tuning**.

Press **Tool trigger** and keep it pushed during the motor tuning process (the status will be displayed).

Release **Tool trigger** or click **Abort** to cancel.
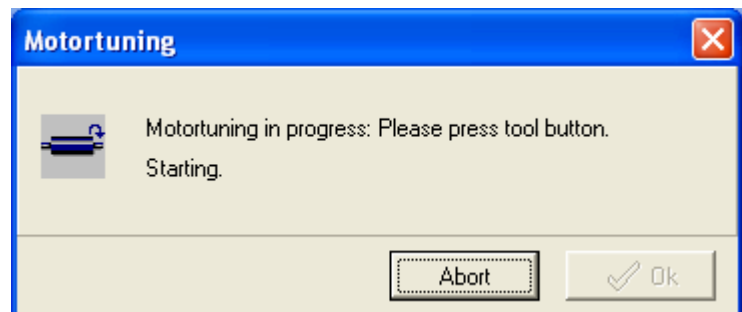
When finished the result of the motor tuning is displayed.
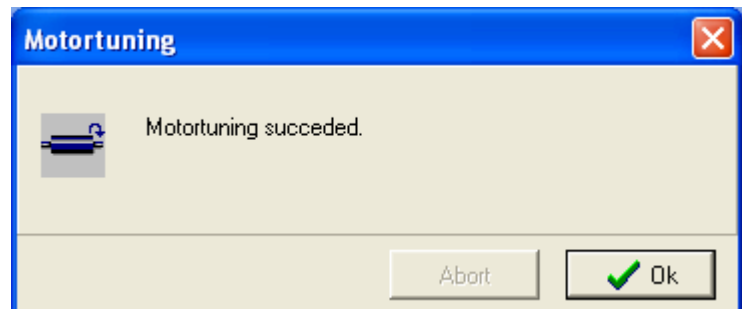
Sync motor tuning

Click **Sync motor tuning**.

Push **Tool trigger** and keep it pushed during the motor tuning process.

Release **Tool trigger** or click **Abort** to cancel.
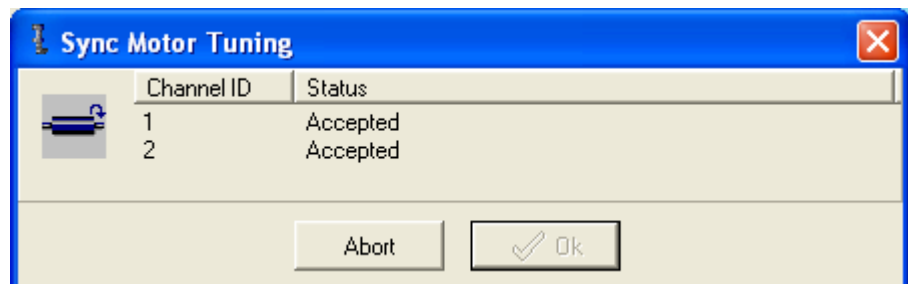
ℹ **Accessing Sync motor tuning is only allowed on a Sync reference.**

Channel ID and motur tuning status for Sync refernce and all Sync members are displayed.
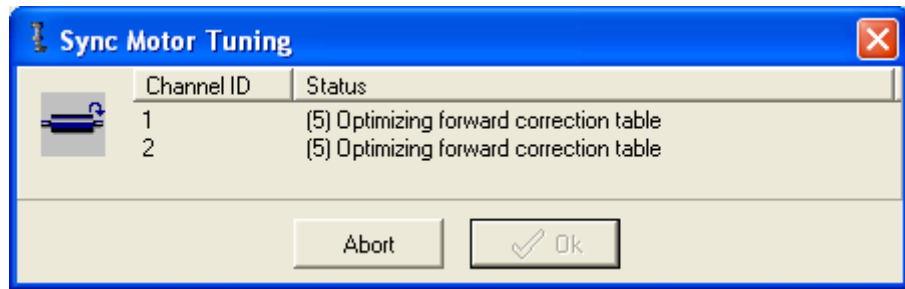
When finished the result of the motor tuning is displayed.
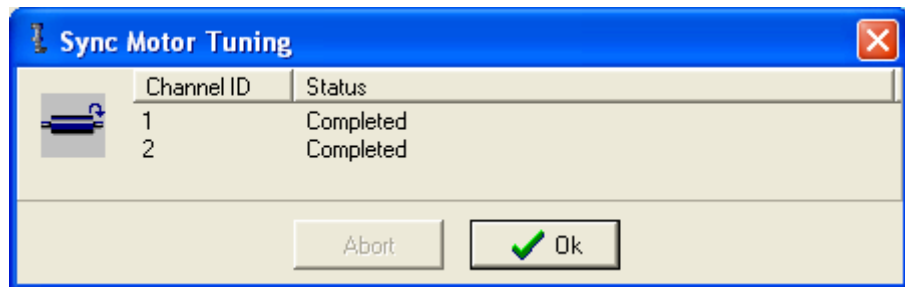
9.4.2 Disconnect tool

Click **Disconnect tool** and click **OK** to logically disconnect the 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/DL tools (this tool types allows hot swap functionality).**

If the operation succeeded, the green OK LED will flash continuously (on the Power Focus) and the message "command accepted" will be displayed. Click **OK** to continue.

If disconnection of the tool was not allowed, the red NOK LED will flash continuously for 3 seconds and the text "operation failed" will be displayed on the display. Click **OK** to continue.

When a tool is inserted again, *Tool disconnected [E131]* will be 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 the PF) will flash continuously. If disconnection of the tool was not allowed, the relay configured as "safe to disconnect tool" will not switch and the red NOK LED will flash continuously for 3 seconds.

- Disconnect the tool.

- When a tool is inserted again, *Tool disconnected [E131]* will be displayed and then acknowledged automatically.

⚠️ **Do not physically disconnect an S or DS tool, unless it has first been successfully logically disconnected. That may damage the tool memory. If the user physically disconnects a non-ST tool, without a successfully logically disconnection, the PF has to be rebooted before connecting the tool again.**

9.4.3 Open end tuning

For ST and SL tools it is not possible to change the Open end parameters.

For S and DS tools, use parameter *Use open end [T420]* to activate the Open end functionality.

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

⚠️ **If the *Inverted motor rotation [T421]* 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 *Open end tightening direction [T422]* 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.

ℹ️ **Parameter *Tool tightening direction [P240]* 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.

ℹ️ **The old *Gear ratio [T103]* value will be overwritten.**

A confirmation message is displayed if Open end tuning succeeded.
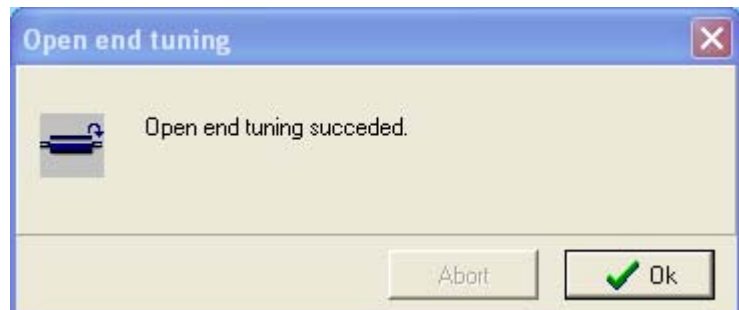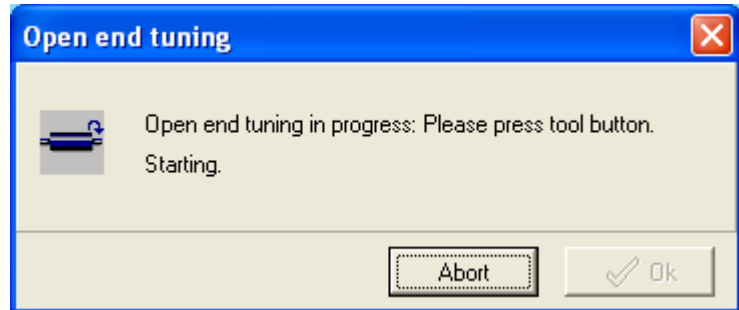
9.4.4   Tool lock functionality

The tool may 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 and external sources.

Locking of tools from an external source in time critical applications

When the Power Focus is used in line assemblies the tightenings are often controlled carefully. The users wish to ensure that all tightenings are performed on the correct joints. For that reason the users wish to lock the tool frequently between the different tightenings on a work piece within a workstation. Often such applications are also time critical, meaning that the operator has to perform a number of tightenings within a short time span. In such cases there is a high risk of obtaining a poor tightening result when locking the tool from an external source, such as via Field bus, the open protocol or the ToolsTalk PF protocol.

The reason for the problems is that by using the mentioned sources for tool locking; the tool is not actually locked until several hundred milliseconds after the triggering event (such triggering events are e.g. controlled by tool positioning systems etc.). Commonly used commands are "Tool disable" and "tool enable" functions in the table in section ***Error! Reference source not found.***. Within a time frame of 100-200 ms the operator may push the tool trigger many times, which destroys the purpose of carefully controlled tightenings.

Therefore, the usage of the listed external sources for locking the tool frequently in time critical applications is not recommended. In order to lock the tool quickly enough in these cases only Power Focus internal sources should be applied (i.e. 1-2 ms reaction time).

In a lot of applications suffering from these problems 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 *Lock at batch ok [P152]* or *Lock at Job done [J302]*, which are internal tool locking sources within Power Focus.

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.

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 (see below) include positioning, motor tuning, Open end tuning and tracking.

Event codes

In case the tool is locked while a user attempts to start a service (normally tightening or loosening), the Power Focus will show an event code to explain why or by which functionality the tool is locked. In case the tool becomes locked while a service is being performed, the service will be aborted and an event code explaining why or by which function the tool was locked will be displayed.

Internal states/conditions

Reason	Event code	Lock trigger	Unlock trigger	Affected services	Comments
Event code to acknowledge	n/a *	An event that must be acknowledged occurs and the corresponding event code message is displayed.	The event code message is acknowledged.	Tightening, loosening, positioning, motor tuning, Open end tuning and tracking; all combined.	* See chapter *Event codes* to view events that must be acknowledged.
RBU disconnected	E117	Disconnection of the RBU is detected.	The Power Focus is turned off, a (healthy) RBU is inserted and the Power Focus is turned on again.	Tightening and loosening combined.	Requires a restart of the PF.
Tool disconnected	E131	The tool is disconnected from the PF.	The tool is reconnected to the PF.	Tightening, loosening, positioning, motor tuning, Open end tuning and tracking; all combined.	Event code messages are generated when attempts to perform tightening or loosening are made from an external source while the tool is disconnected.
Tool locked during work order	E141	Tool is locked during work order.	All expected identifiers have been received in correct order.	Tightening and loosening combined.	See chapter *Identifier*.
No tool cable detected	E146	A tool is used, but the tool cable can not be detected.	The tool cable is detected.	Tightening, loosening, motor tuning, Open end tuning and tracking; all combined.	ST tool cable can not be detected missing when S/DS tool is used.
Click wrench Pset in use	E147	A Pset with click wrench tightening strategy is selected.	A valid non click wrench strategy Pset is selected.	Tightening and loosening combined.	
Invalid Pset number selected	E206	Invalid Pset number selected.	Valid Pset number is selected.	Tightening and loosening combined.	
Tool overheated	E501	The tool is hotter than allowed.	The tool is colder than maximum allowed temperature.	Tightening, loosening, positioning, motor tuning, Open end tuning; all combined.	Let the tool rest until it is cold enough to run.
Tool size mismatch	E511	Mismatch between the tool and the controller (for example S4/S7 tool connected to a S9 controller)	A match between tool and controller is detected.	Tightening, loosening, positioning, motor tuning, Open end tuning and tracking; all combined.	
Motor tuning information incorrect	E514	The motor tuning information in the tool is not correct (has a bad check sum).	The motor tuning information in the tool is correct (has a correct check sum). This should be the case after a successful motor tuning.	Tightening, loosening, positioning, motor tuning, Open end tuning; all combined.	Perform a motor tuning if this event code occurs.
Sync member registration failure	E870	Sync member registration failed.	Sync member registration accomplished successfully.	Tightening, loosening, motor tuning, Open end tuning and tracking all combined.	

Configurable locking

Reason	Event code	Lock trigger	Unlock trigger	Affected services	Comments
Lock on reject	E102	A NOK result.	CW/CCW-ring or Digital input "unlock tool" or "master unlock tool". Reconfiguration.	Tightening only.	See parameter *Lock on reject [C210]*.
Line control (Job)	E107	Job configured for "line control" selected and no line control signal (digital input function "line control start signal") present.	Line control signal (digital input function "line control start signal"). Job abort. Digital input "master unlock tool".	Tightening only.	See chapter *Job*.
Batch (Lock at batch OK)	E136	A batch has been completed with OK results.	Digital input "Unlock tool" or "master unlock tool", Field bus, open protocol, (ToolsTalk PF).	Tightening and loosening combined.	See parameter *Lock at batch OK [P152]*.
ID Card	E140	No valid ID card is inserted.	A valid ID card is inserted. Reconfiguration.	Tightening and loosening combined.	
Timer enable tool	E145	Tool locked by timer enable tool.	Digital input "timer enable tool".	Tightening, loosening and positioning combined.	See chapter *Digital inputs and outputs*.
Disable loosening at OK	E149	An OK result.	A NOK result or digital input "master unlock tool". Reconfiguration.	Loosening only.	See parameter *Disable loosening at OK [C220]*.
Job (PF locked in Job mode)	E152	Cell Job with forced order (wrong Job client makes tightening attempt).	Job client is selected by Cell Job with forced order. Digital input "master unlock tool". Selection of "Job off". Abort Job if running Job is not configured with *Lock at Job done [J302]*.	Tightening only.	See chapter *Job*. Notice that Job often causes *Invalid Pset number [E206]*.
Service indicator alarm	E502	Service indicator alarm is activated.	Service indicator alarm is deactivated.	Tightening only.	See chapter *Tool*.
Wear indicator alarm	E504	Wear indicator alarm is activated.	Wear indicator alarm is deactivated.	Tightening only.	See chapter *Tool*.

External sources

Reason	Event code	Lock trigger	Unlock trigger	Affected services	Comments
Digital inputs	E103	One or several of the digital input functions "Tool disable n.o.", "Tool disable n.c.", "Tool tightening disable", "Tool loosening disable" do lock the tool.	All of the digital input functions "Tool disable n.o.", "Tool disable n.c.", "Tool tightening disable", "Tool loosening disable" do allow the tool to tighten/loosen. Reconfiguration/reassignment of digital input functions may also unlock the tool.	Tightening and loosening, both separately and combined.	"Unlock tool" or "master unlock tool" will not act as unlock trigger.
ToolsTalk PF	E133	"Disable tool" message is sent to Power Focus via ToolsTalk PF protocol.	"Enable tool" message is sent to Power Focus via ToolsTalk PF protocol. Digital input "master unlock tool"	Tightening and loosening combined.	The Power Focus API uses the ToolsTalk PF protocol.
Field bus	E137	Tool is disabled by message sent to Power Focus via Field bus.	Tool is enabled by message sent to Power Focus via Field bus. Digital input "master unlock tool".	Tightening and loosening, both separately and combined.	See chapter *Field bus*.
Open protocol	E139	"Disable tool" message is sent to Power Focus via open protocol.	"Enable tool" message is sent to Power Focus via open protocol. Digital input "master unlock tool".	Tightening and loosening combined.	

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 the "lock on reject" function. For the tool to be unlocked, the digital input to "disable tool n.o" must be altered and the "lock on reject lock" must be unlocked using the digital input "unlock tool"/"master unlock tool" or 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 will be generated. It is not specified which of the possible event code messages will be generated.

10   Accessories

In the **Accessories** branch the digital inputs and outputs of the 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.
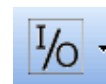
> **This section includes screenshots from ToolsTalk PF. The screenshots shows examples of parameter settings and is NOT intended to be generally applicable. Check with your local Atlas Copco reprehensive how to set up your specific system environment.**
>
> **See chapter *Parameter list* for a description of all available Accessories options.**

10.1   Digital I/O

In the PF Map, select **Accessories - Digital I/O** and double-click **Configuration**.
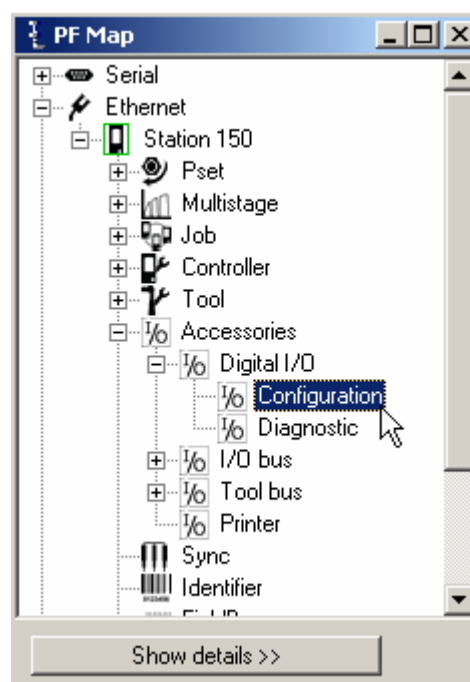
The **I/O set** window appears.

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, RE-Alarm, I/O Expander, StackLight, Operator Panel and Tracker Arm.

Select **Device type**.

Select **Digital inputs** and **Relays** (with relay timer). For more information, see section *Digital inputs and outputs*.
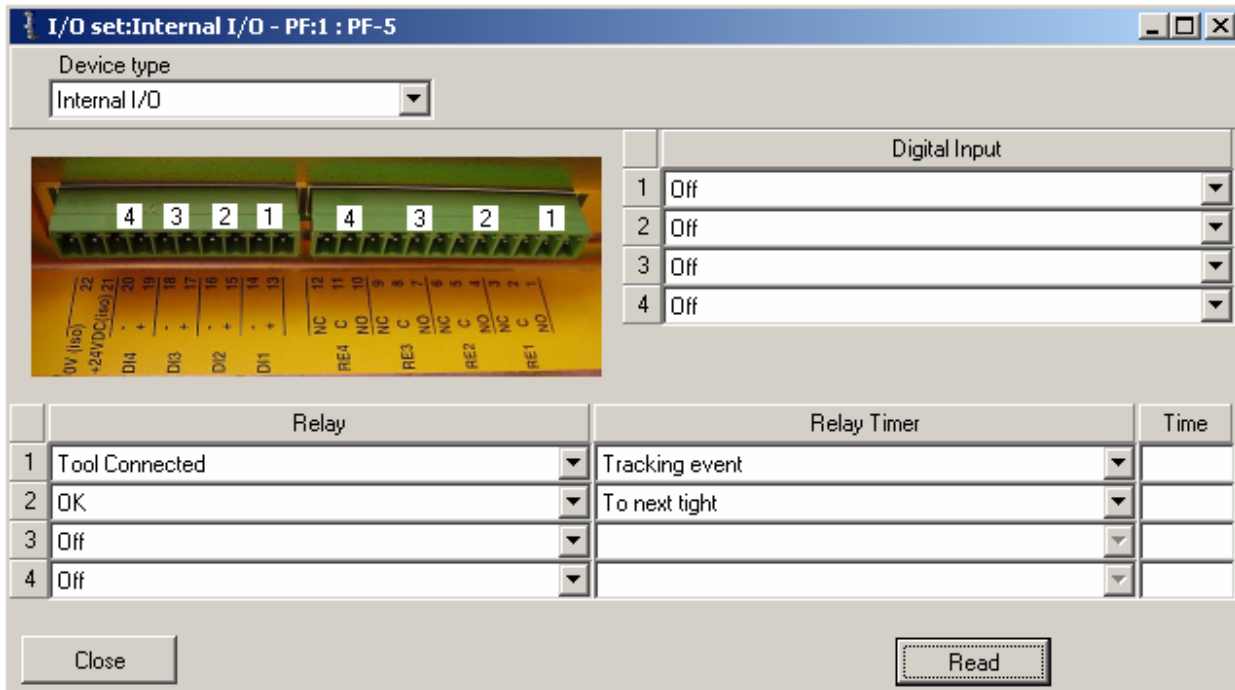
In the PF Map, select **Accessories - Digital I/O** and double-click **Diagnostic**.
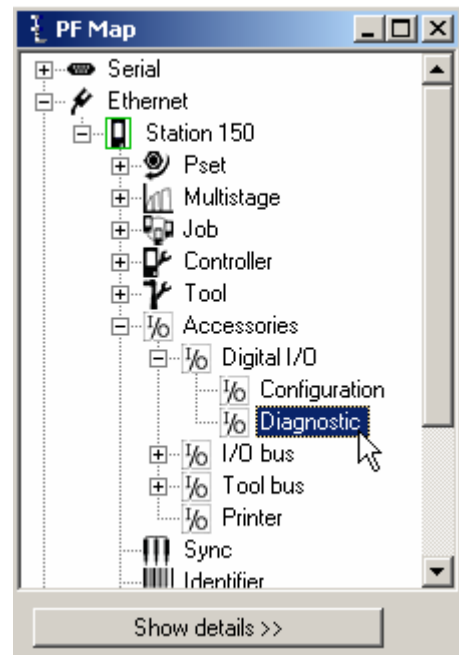
The **I/O Diagnostic** window appears.

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 will appear on the list of available devices. This function tests the interaction between the 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 enables settings of relays on a selected I/O-device. The new status of the relays is set when **Set** key is clicked.

The **Restore** key will restore the relays to reflect the current status of the PF. To update this view to reflect changes triggered by other events click read status.
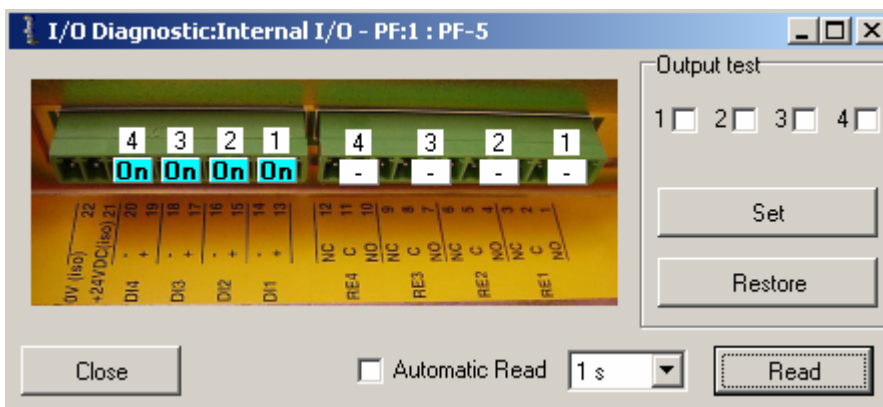
10.2   I/O bus

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, select **Accessories - I/O bus** and double-click **Information**.
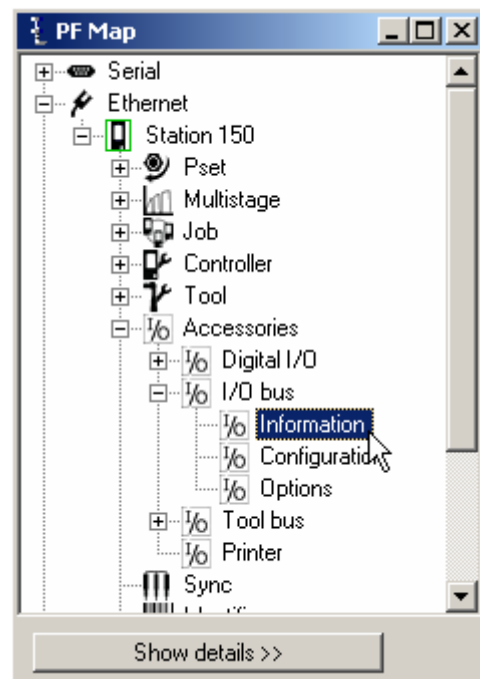
Information for each device on the I/O bus is displayed.

Click **Config** to configure the selected device.

Click **Diagnostic** to diagnose the selected device.
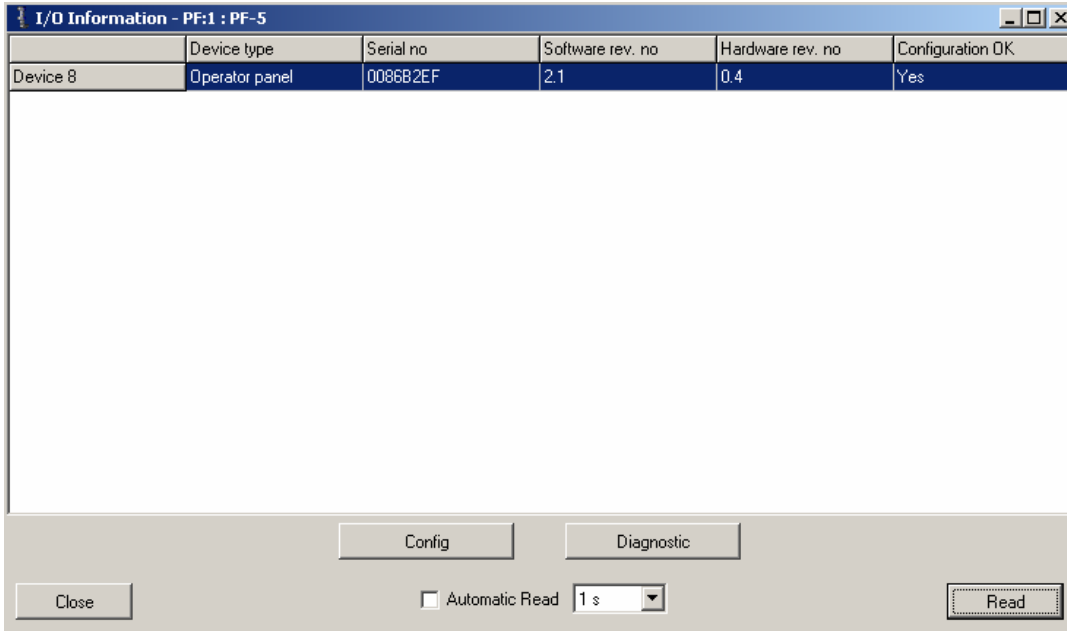
In the PF Map, select **Accessories - I/O bus-Configuration**. Double-click on the device to configure.
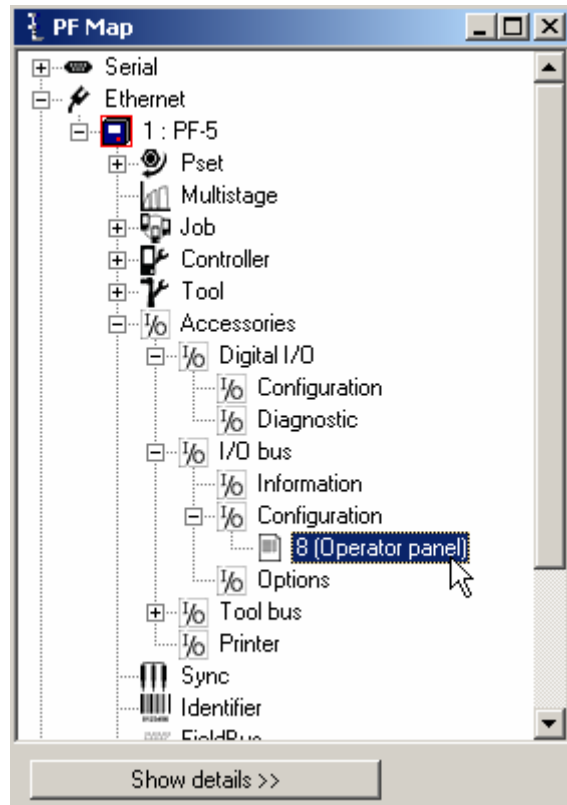
Make settings for the device by clicking on the positions.

Following device types are available:

- I/O Expander
- RE-Alarm
- Selector Pset 4-pos
- Selector Pset 8-pos
- Operator Panel
- StackLight
- Parameter arm

> **See the user guides for each accessory device for more information.**

Click **Close** when finished with configuration.
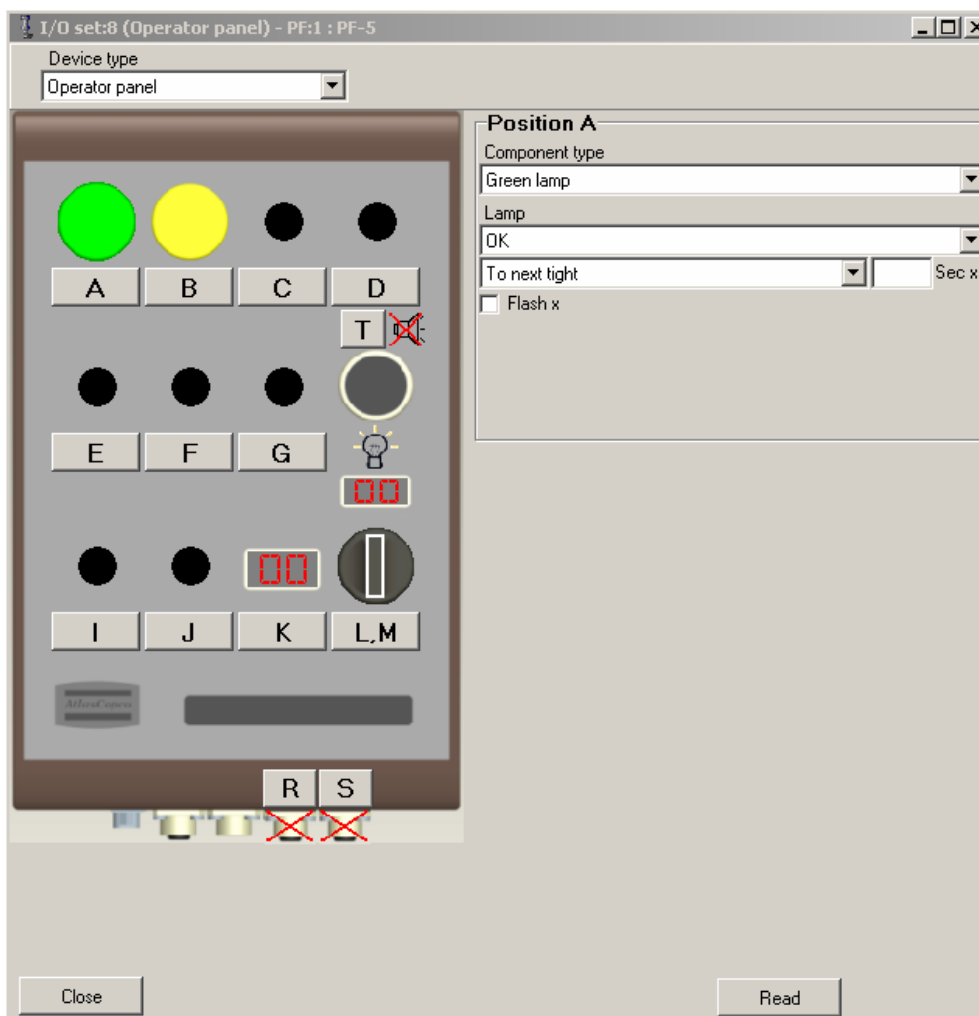
In the PF Map, select **Accessories - I/O bus** and double-click **Options**.
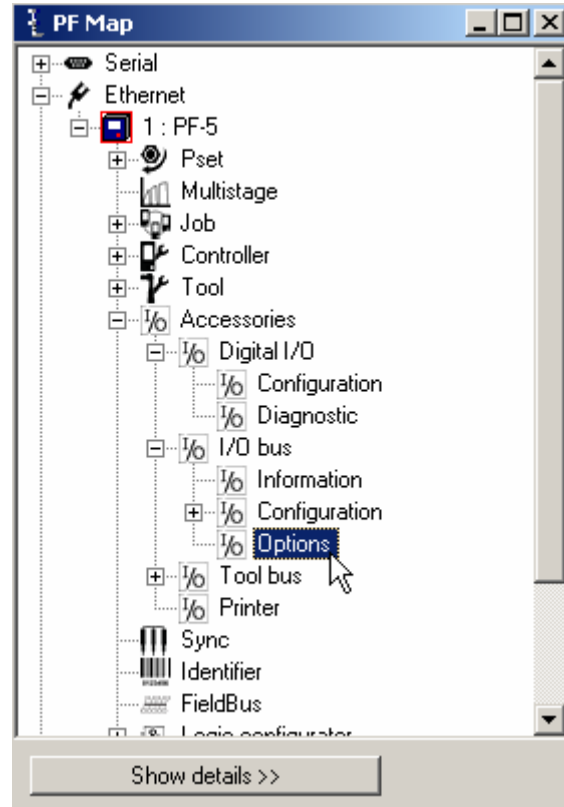
Make settings for **Options**.

Close windows when finished.
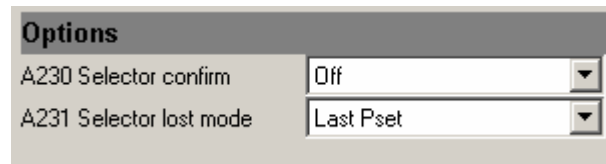
10.3   Tool bus

In the PF Map, select **Accessories - Tool bus** and double-click **Information**.
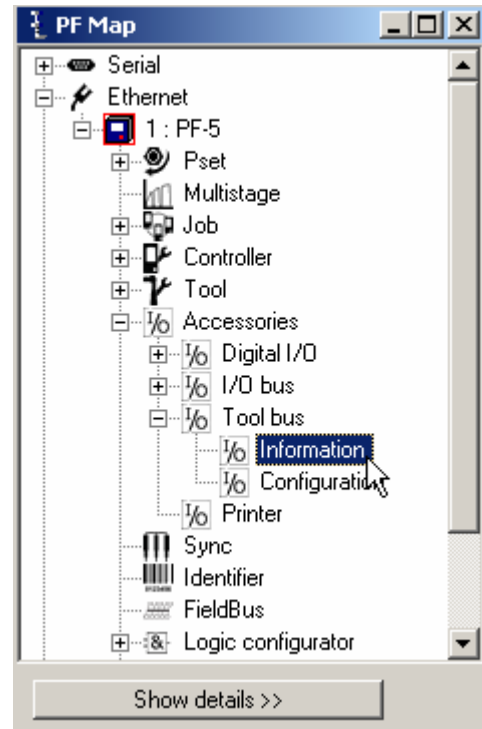
Select Device type and click **Device information**.
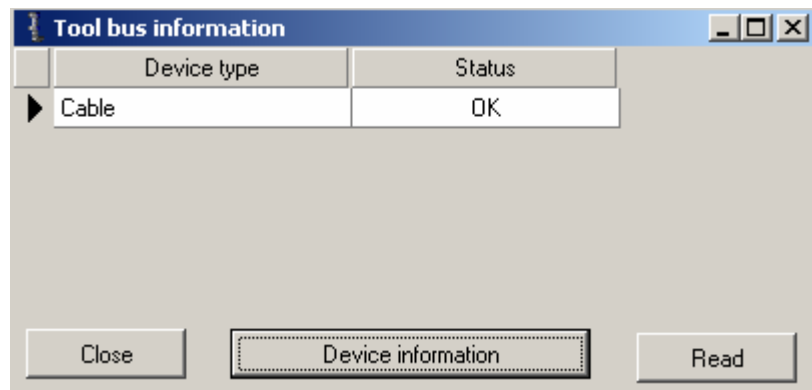
The Device information window appears.

Close windows when finished.

Serial number	A573013
Production date	2003-12-18
Model	Tensor ST tool cable
Ordering number	4220 2636 05
Software version	1.3.11
Boot version	1.1.34
Length	5
Total number of tightenings	581962
Number of OK tightenings	581181

In the PF Map, select **Accessories - Tool bus** and double-click **Configuration**.
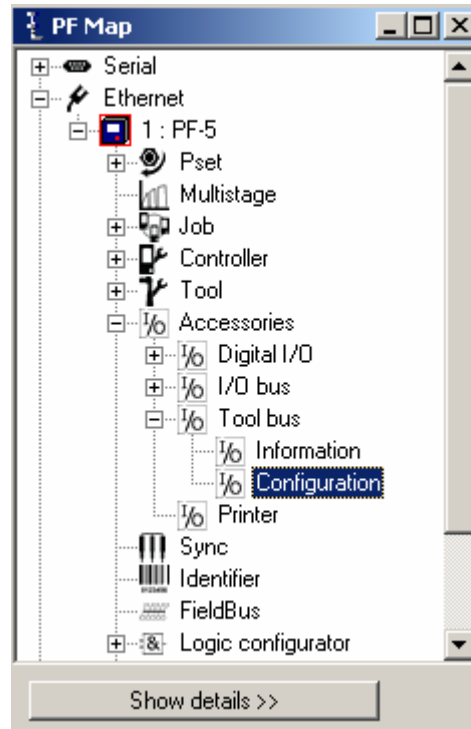
In the Tool bus Configuration window, click **General purpose I/O**.

Make settings for the digital inputs and outputs (see chapter *Digital inputs and outputs* for descriptions of available selections).

General purpose I/O

Digin	Event	Digout	Event	Duration	Time
1	Off	1	Off		
2	Off	2	Off		
3	Off	3	Off		
4	Off	4	Off		

OK   Cancel
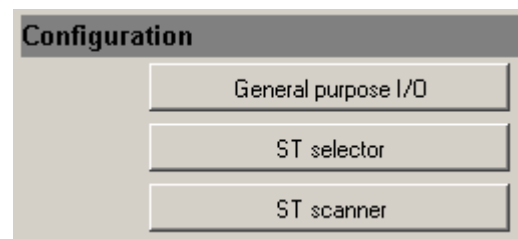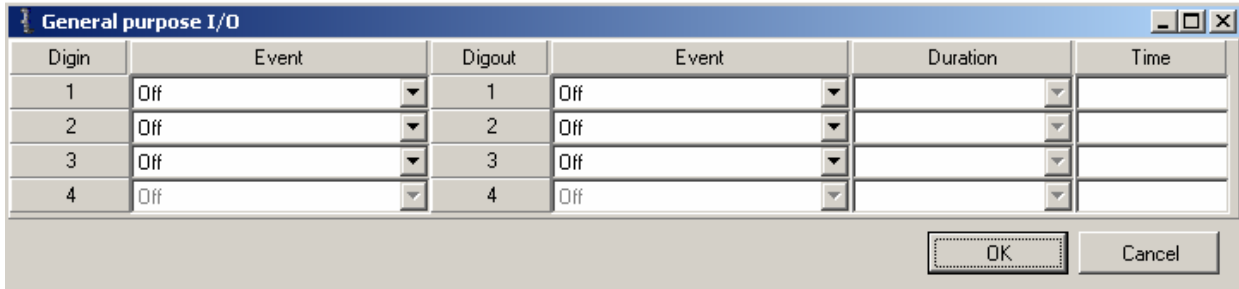
In the Tool bus Configuration window, click **ST selector**.

Make special settings for the ST selector (buttons, status LEDS and display).

ST selector

Left button	Select previous Pset
Right button	Select next Pset
Status leds	On
Display	Pset no. + result

OK   Cancel
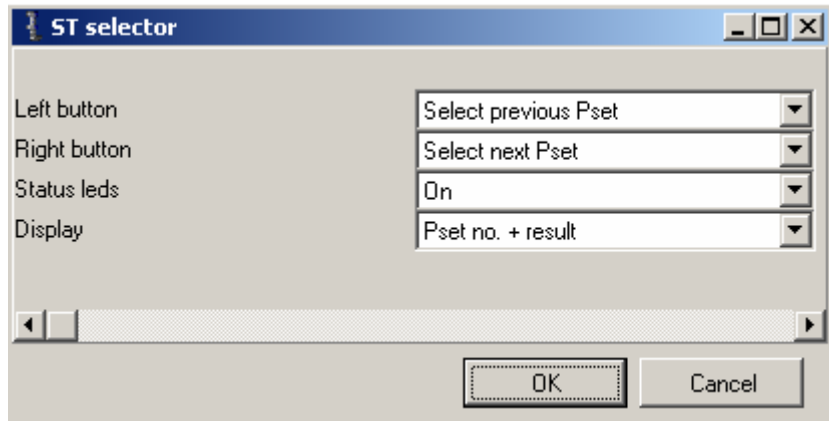
In the Tool bus Configuration window, click **ST scanner**.

Make special settings for the ST scanner (scanner source, status LEDs, scan LED, Scan OK LED and scan time).

Close windows when finished.

ST scanner

Scanner source	Scanner button
Status leds	Tool LEDs
Scan led	During scan
Scan OK led	Identifier received
Scan time	3 Sec

OK   Cancel
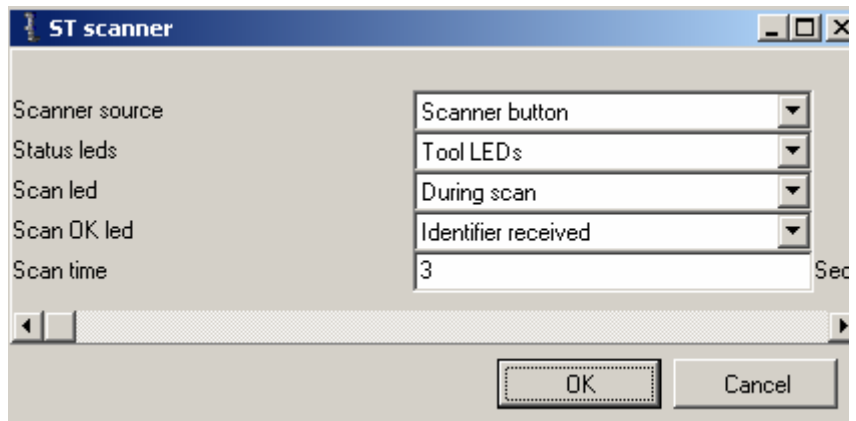
10.4   Printer

In the PF Map, select **Accessories** and double-click **Printer**.
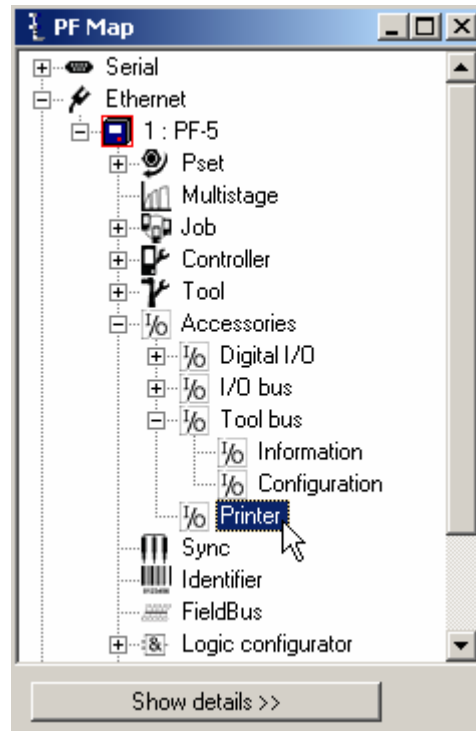
The connected *Brand [A400]* and *Paper size [A401]* are setup here. *Continuous print [A402]* can be activated. Push the Print button on the Power Focus Graph front panel to view a list of available report to print.

> **Laser printers might not handle continuous prints, only single sheet printouts.**
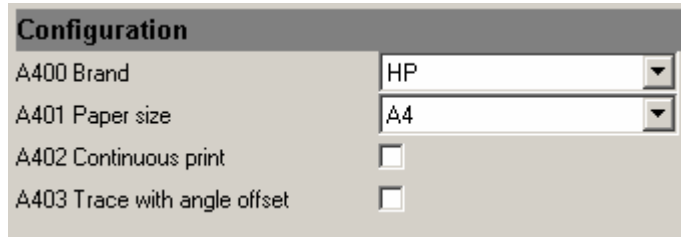
Close windows when finished.

11   Sync

With the Power Focus RBU gold it is possible to synchronise groups of spindles and tools performing the same task simultaneously. This function is called **Sync**. Examples where Sync is used are the tightening of car wheel bolts and the tightening of cylinder head bolts.

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

A **Sync group** (see figure to the right) consists of two to ten PF units, working in the same Cell (a Cell can consist of more than one Sync group). One of the controllers is defined as **Sync reference**. The other controllers are **Sync members**. The Sync reference remotes the Sync members (i.e. the Sync reference decides and controls which Psets/Multistages to run).
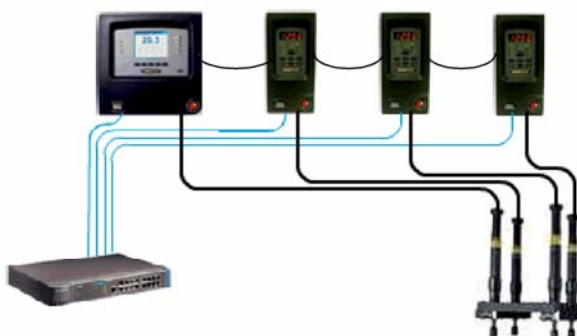
A requirement for using the Sync function is to first create a Cell, see chapter *Controller*.

For a description of how to do Sync motor tuning, see chapter *Tool*.

Sync is performed in steps where all synchronised spindles wait for each other at a number of "checkpoints" before they continue with the next step. A normal two stage tightening has checkpoints at *First target [P111]* and *Final target [P113]*.

Time critical synchronisation communication is performed over the Power Focus internal I/O bus, which means that all controllers have to be connected via the I/O bus. 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. The Sync function can also perform Multistage tightenings to create a synchronised tightening sequence consisting of several steps.

A Sync group can be part of a Job (see chapter *Job*).

> ℹ **It is the Job reference, and not the Sync reference, that counts the batch in a Job with Sync.**

11.1 Hardware configuration

Connect all Sync members and the Sync reference via the I/O bus. The I/O bus connectors are located on the back panel of the PF.

In the figure below is four PF units connected via the I/O bus. It is necessary to connect the I/O bus connections on the controllers with connectors in the way the lower part of the figure shows.

✚ = Termination
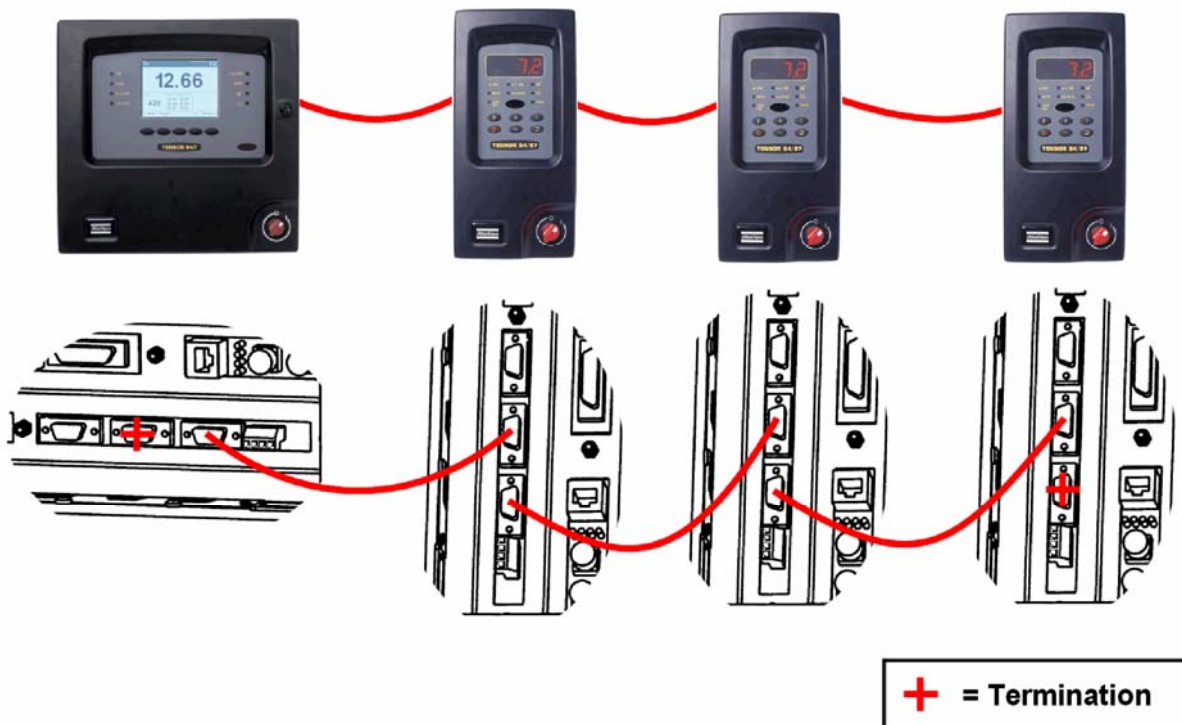
The 4-pin remote start connector must be configured for remote start, see chapter *Connecting devices*. This should be done on each controller in the Sync group, and according to the selected start signal input on the Sync reference. If an external start switch is used, connect it to the Sync reference only.

ℹ️ **Do not connect two Sync groups via the I/O bus.**

Do not configure any external I/O-devices (device 1-15) on the Sync members.

11.2   Sync members configuration

To check before configuration:

- Make sure that all PF units in the synchronised group are connected through the internal I/O bus and that a correct connection is made.

- Make sure that all PF units in the synchronised group are part of the same Cell (see chapter *Controller*).

Decide which controllers should act as Sync reference and Sync members.

In the PF Map, expand the **Controller** branch and double-click **Ethernet**.
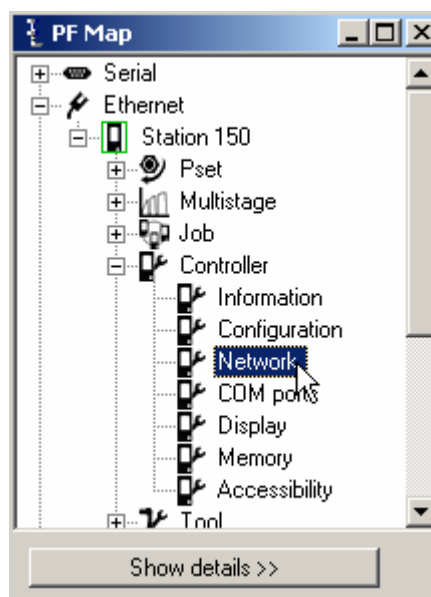
Set an IP address to the controller with parameter *Sync reference IP [C317]*.

> (i) **All Sync members in a Sync group must have the same Sync reference IP address.**
>
> **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. See chapter *Connecting devices*.**

Ethernet

C300 IP address	10	40	164	150
C301 Subnet mask	255	255	252	0
C302 Default router	10	40	164	1

Cell

C310 Channel ID	0			
C311 Channel name	Station 150			
C312 Cell reference IP	10	40	164	140
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	140

Select **Tool - Configuration - Tool start**.

Set *Tool start select source [T200]* to **Sync start**.

Click **Store** to save settings.

Restart the Sync member controller.

Repeat the procedure for all Sync members.

Tool start		
T200 Tool start select source	Sync start	
T201 Timer enable tool	Off	
T202 Timer enable tool time	Not Used	Sec
Accessory bus		
T210 Mode	Off	
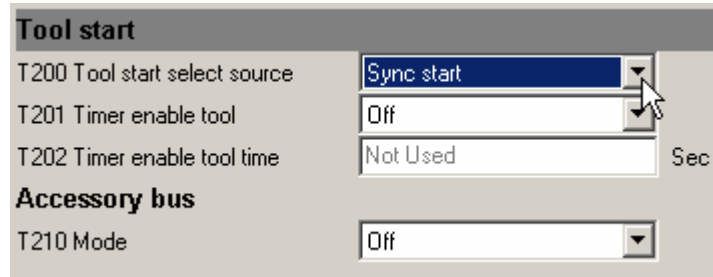
11.3 Sync reference configuration

In the PF Map, expand the **Controller** branch and double-click **Ethernet**.
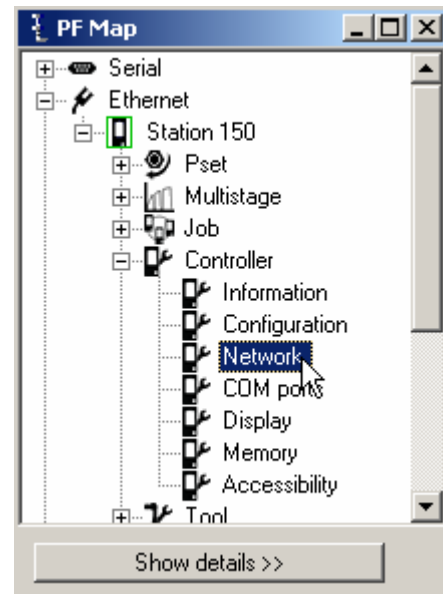
Set *Sync reference IP [C317]* equal to *IP address [C300]*.

Click **Store** to save settings.

Restart the Sync reference controller.

After the restart, connect ToolsTalk PF to the controller again.

Ethernet				
C300 IP address	10	40	164	150
C301 Subnet mask	255	255	252	0
C302 Default router	10	40	164	1

Cell				
C310 Channel ID	0			
C311 Channel name	Station 150			
C312 Cell reference IP	10	40	164	150
C313 Cell ID number	0			
C314 Cell name				
C315 Net reference IP	0	0	0	0
C316 Job reference IP	0	0	0	0
C317 Sync reference IP	10	40	164	150
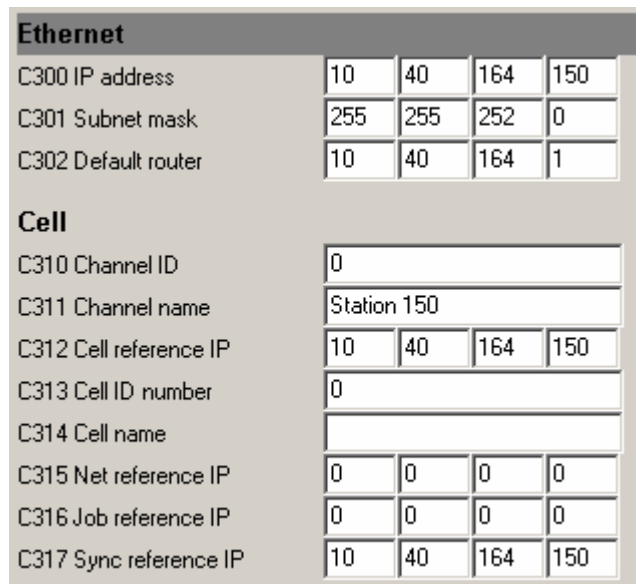
In the PF Map, double-click **Sync**.

Select controllers in the **Available Power Focus list**.

Click **Add** to create a **Sync group list**.

Make wanted selections in the **Options** field.

> ℹ️ **Option "SynchroTork" for parameter** *Tightening strategy [S101]* **is only available for PF 4000.**
>
> **SynchroTork is not applicable for angle and DS control strategies.**
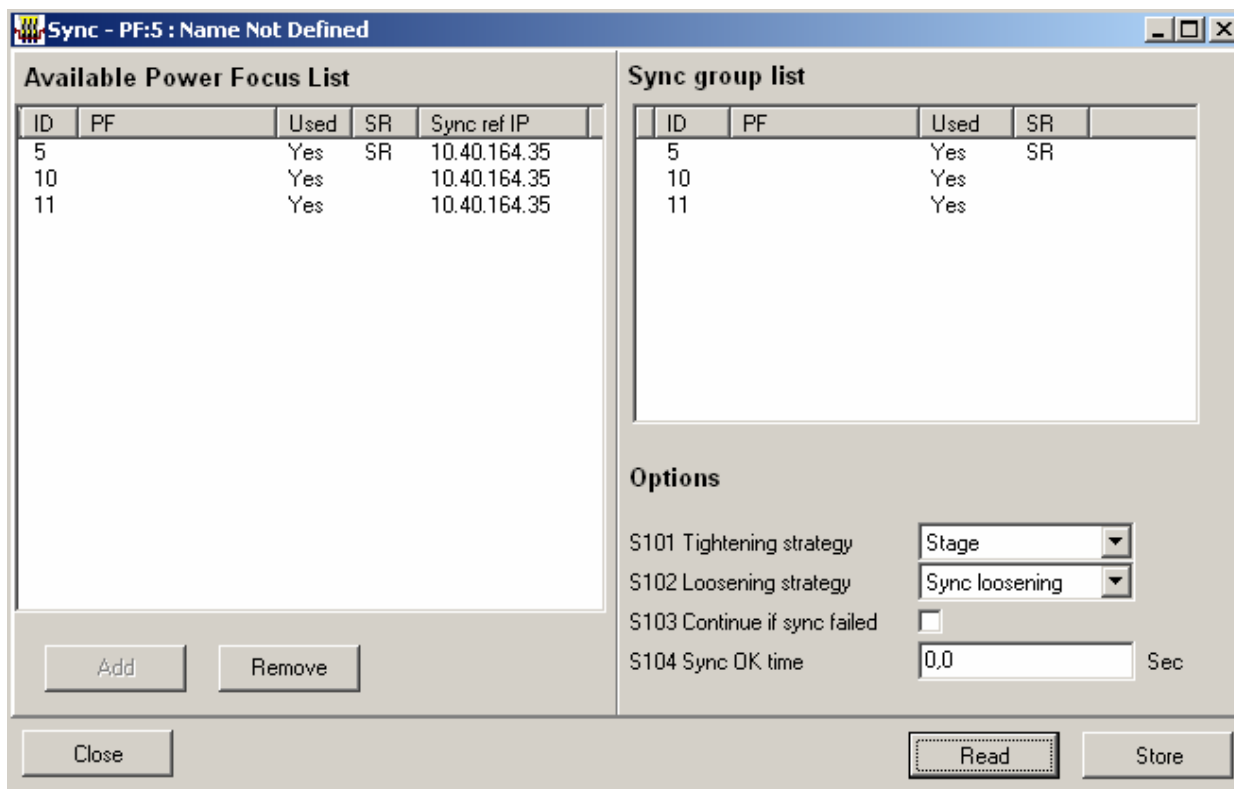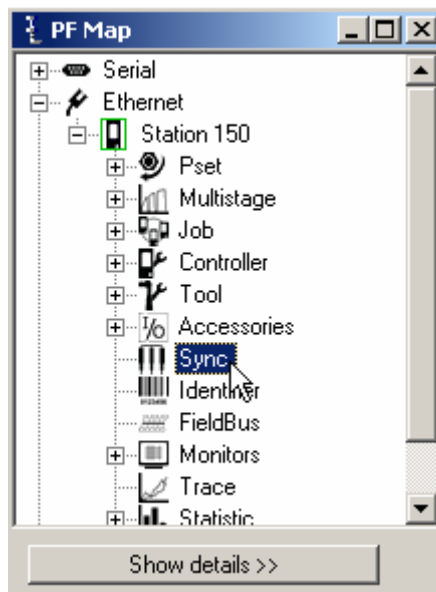
11.4 Running a Sync group

When the Sync group is running, the Sync reference alone is used for programming and selecting Pset etc. I/O bus units, such as RE-Alarm, Socket Selector and I/O Expander, can only be controlled from the Sync reference. On the Sync members only the internal I/O can be used.

> **In a synchronised 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.**

The status information on each controller and tool is the individual result for that spindle. The overall Sync OK/NOK can be given on the Field bus, 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.

11.5 Troubleshooting

Symptom	Reason/Action
Tools in a Sync group do not start	There are a variety of possible reasons for this behaviour.
	Programming-related errors:
	Sync member has not set *Tool start select source [T200]* to "Sync start".
	Wrong *Sync reference IP [C317]* in the Sync member.
	No reboot after programming
	Hardware-related errors:
	IP connection between one of the Sync members and the Sync reference is lost.
	I/O bus cable not correctly connected or broken.
	Missing I/O bus connection.
	The remote start input in Sync members not correctly wired.
	Error elimination:
	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.
	Select normal loosening and start a loosening from the Sync reference. If not all Sync members start, check the tool trigger configuration in Sync members and the wiring of the remote start input. Check also the I/O bus connection and the I/O bus cabling.
	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).
E870 (Sync reference), E871 or E872 is displayed.	See chapter *Event codes*.

12   Identifier

The **Identifier** section describes the single and multiple identifier functions with features. Identifiers can be sent to the Power Focus via a scanner (connected to the serial port), Field bus, Ethernet or a ST scanner (connected to the ST tool).

Power Focus accepts incoming identifiers with up to hundred characters, of which fifty can be declared as a **Significant string**. A significant string is an identifier filter for Power Focus acceptance.

> **Identifiers sent to Power Focus are not allowed to contain the characters apostrophe (')
> and colon (:).**
>
> **This section includes screenshots from ToolsTalk PF. The screenshots shows examples of
> parameter settings and is NOT intended to be generally applicable. Check with your local
> Atlas Copco reprehensive how to set up your specific system environment.**
>
> **See chapter *Parameter list* for a description of all available Identifier options.**

One identifier can be defined with up to fifty (of hundred) significant positions

The following conditions must be met for Power Focus to accept an incoming identifier:

- Incoming identifier string **must be** initiated with "STX" and terminated with "EXT" (barcode reader standard).

- Input source must be correct (accepted).

- Length (if specified or maximum hundred characters long) must be correct.

- Incoming identifier must match the defined significant string.

If

1. restoring of identifier configuration is made

2. or a **Reset all identifier** is made (command in identifier monitor or digital input)

3. or the parameters *Reset all identifier at Job done [J342]* and *Reset all identifiers at Pset batch done [I183]* are activated

Then the following will happen:

- All identifiers will be reset.

- Work order will be (cleared) aborted.

- Tool will be unlocked if *Tool locked during work order [I181]* is activated.

> **An incoming identifier that goes directly to a Job or Sync client will erase the received
> identifier that is sent to the client from the Job or Sync reference.**
>
> **If the system is set up in a Cell Job or Sync configuration, the parameter *No. of identifier
> result parts [C604]* must be configured with identical values (1-4) for all PF units included in
> the Job/Sync group.**

12.1   Single Identifier

With the **Single identifier** solution Power Focus can receive one type of identifier called **Type 1**. This type can be defined with up to 400 significant strings and provide Pset/Multistage and Job selections from a PF.

It is possible to store up to 25 identifier characters in **Result part 1** (old VIN no.). Result part 1 is part of the tightening result in the Power Focus database.

12.2   Multiple Identifier

With **Multiple identifier** solution Power Focus can receive up to four different types of identifier strings, the single identifier **Type 1** (see single identifier above) plus three more types (**Type 2**, **Type 3** and **Type 4**). Types 2-4 only contain one significant string each. It is not possible to specify type 2-4 for Pset/Multistage/Job selection (as for type 1).

Multiple identifiers provide storage in four result parts (**Result part 1**, **Result part 2**, **Result part 3** and **Result part 4**). The result parts are stored together with each tightening result in the Power Focus.

> **The multiple identifier solution requires RBU gold or silver.**
>
> **When using more than one result part, which is the default configuration in Power Focus, it is necessary to increase the parameter *No. of identifier result parts [C604]*. For more information, see section *Result parts*.**

12.2.1   Work order

A **Work order** consists of different types (types 1-4) of identifiers. It is useful when Power Focus should receive identifiers in a predefined order.

An identifier type can be included or not included in the work order, but during the sequence Power Focus only accepts the types included. Type 1 must be part of the work order (i.e. it is not possible to run a work order without type 1).

A work order has to be completed before Power Focus selects the Pset/Multistage/Job. In case a work order exists and type 1 is configured to select a Pset/Multistage/Job.

The work order also has to be completed before Power Focus stores the accepted identifiers in the tightening result database (identifier types not included in the work order can be stored in the tightening results immediately after they are accepted).

> **All types outside the work order must be uniquely defined. Uniquely defined means a separate input source, length or significant string compared to types included in the word order.**

When *Tool locked during work order [I181]* is activated, the tool will be locked when the first identifier type in the work order is accepted. When the work order is completed the tool is unlocked.

The tool will immediately be unlocked during a work order when;

- **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.

12.3 Identifier types and work order

As described above there are different types of identifiers. Furthermore, it is possible to create a work order with a number of identifiers. This section includes a step-by step guide how to set up a work order.

In the PF Map, double-click **Identifier**.
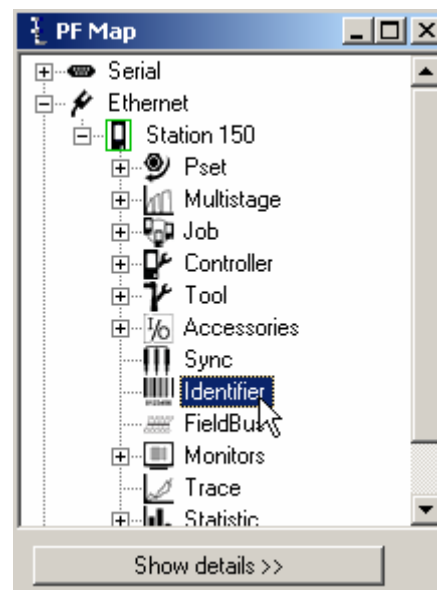
In the Identifier window, select **Type setup** under **Identifier setup**.
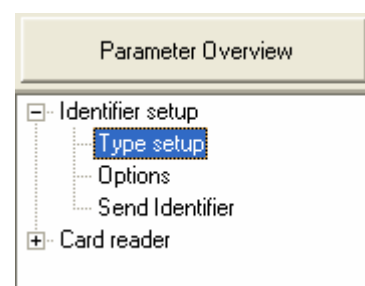
To create an identifier type, select **Input source**.

State **Length** of the incoming identifier (length "- " means no length check).

Click **Set** to mark significant positions.

Type setup

Identification
All identification settings are optional

Type	Input source	Length	Significant positions		Significant strings
1	ST scanner ▼	8		Set	Set strings for Type 1
2	Off ▼	-		Set	
3	Off ▼	-		Set	
4	Off ▼	-		Set	

Only type 1 can be used to select Jobs, Psets and Multistages.
Length = - means that no length identification is done.
Identifier Types included in the Work Order may be undefined.
Identifier Types not included in the Work Order must be uniquely defined.

In the pop up window **Identifier significant position setup**, mark significant positions for the identifier.

> **The characters must not necessarily be selected in one row.**

Click **OK**.
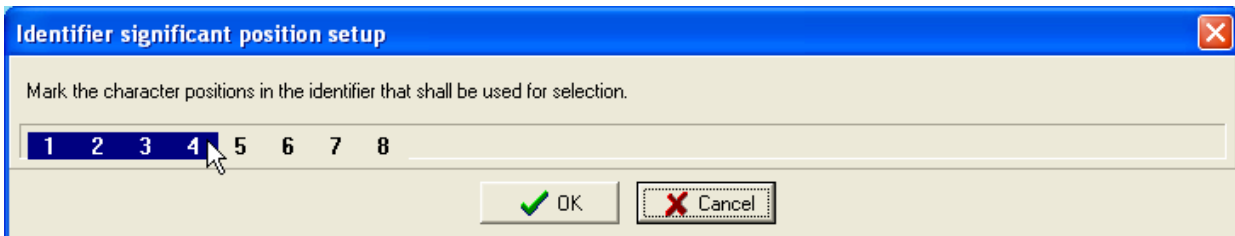
Click **Set strings for Type 1**.
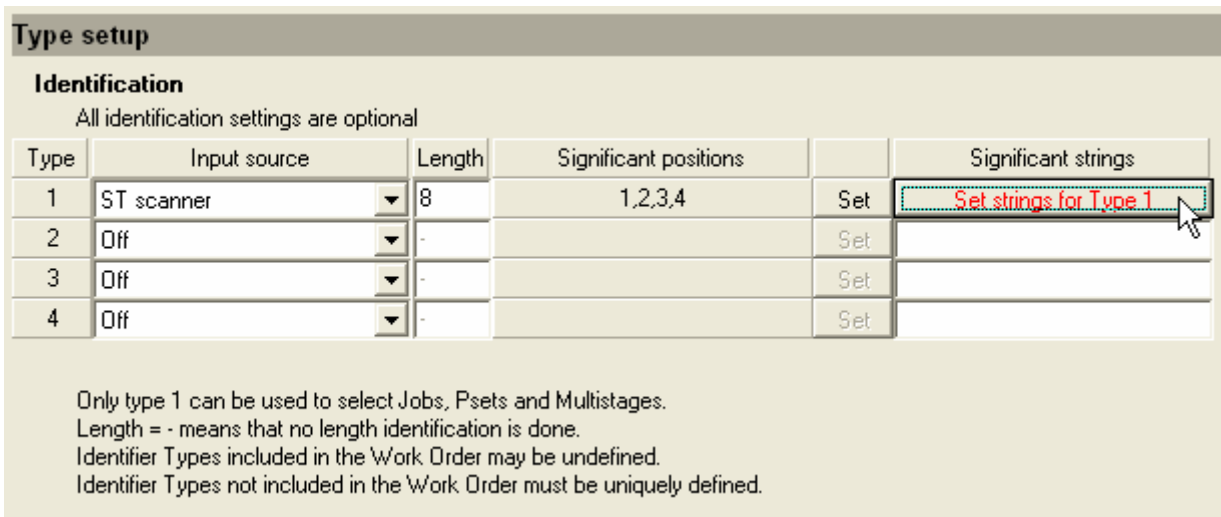
Write significant characters in the field for **Identifier string**.

Write string name in field **Add identifier string** and click **Add**.

Select **Pset**, **Multistage** or **Job** for the identifier string.

When finished, click **OK**.

Continue to add new identifier strings or go back to the type setup menu and click **Store**.

> **It is not allowed to add a string more than once, but it is allowed to connect a specific Pset, Multistage or Job ID to more than one string.**

In the **Type setup** menu it is now possible to type identification settings for type 2, 3 and 4. Select **Input source** and **Length**, set **Significant positions** and write **Significant strings** for the specified type.

Types 2 to 4 in the example below contain only one significant string each, and are not connectable to Psets, Multistages or Jobs (like type 1).

Click **Store** to save settings.

Type setup

Identification

All identification settings are optional

Type	Input source	Length	Significant positions		Significant strings
1	ST scanner	8	1,2,3,4	Set	Set strings for Type 1
2	Fieldbus	4	1,2	Set	OX
3	Ethernet/Serial	-	1,2,3,4,5,6,7,8	Set	OZBC1234
4	Scanner & Fieldbus	6	1,2,5,6	Set	OL33

Only type 1 can be used to select Jobs, Psets and Multistages.
Length = - means that no length identification is done.
Identifier Types included in the Work Order may be undefined.
Identifier Types not included in the Work Order must be uniquely defined.

Select **Options** in the **Identifier setup** branch.

Identifier – PF:Station 150

Parameter Overview

- Identifier setup
  - Type setup
  - Options
  - Send Identifier
- Card reader
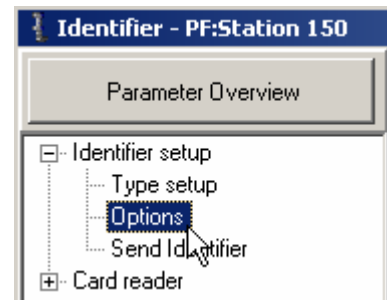
Define a **Work order**. See section *Work order* for more information.

It is possible to have *Tool locked during work order [I181]*.

When activating *Reset all identifiers at Pset batch done [I183]*:

- All identifiers will be reset.
- Work order will be (cleared) aborted.
- Tool will be unlocked if *Tool locked during work order [I181]* is activated.
- **Send identifier** gives the possibility to manually send an identifier string from ToolsTalk PF to the PF.

    To select Pset/Multistage or Job from an identifier string, parameters *Pset select source [C200], Job select source [C201]* or *Job select source override [C202]* have to be set to "Identifier".

12.3.1 Result parts

In **ToolsTalk PF** (presuppose having a RBU gold) it is possible to display and store up to four result parts, each max 25 characters long, which will be stored in the Power Focus database together with every tightening result.

When using more than one result part (only for multiple identifier users) it could be necessary to increase the number of identifier result parts in the Power Focus memory. This section describes how to do this.

The default setting is one result part (old VIN). The Power Focus configurable memory can be changed to handle up to four result parts and is described below.

In the PF Map, expand the **Controller** branch and double-click **Memory**.
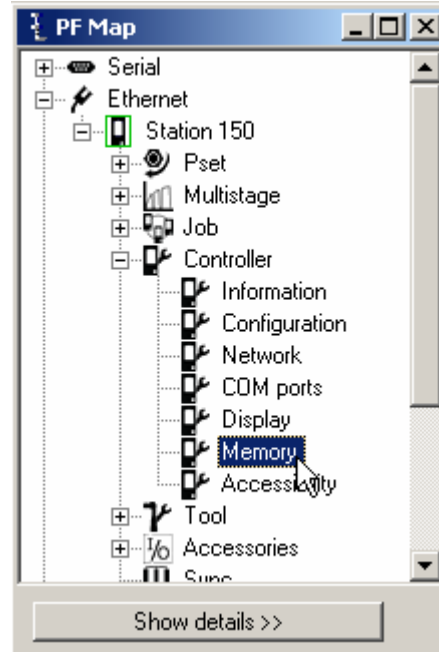
In the list for *Type [C600]*, select **Totally configurable**.
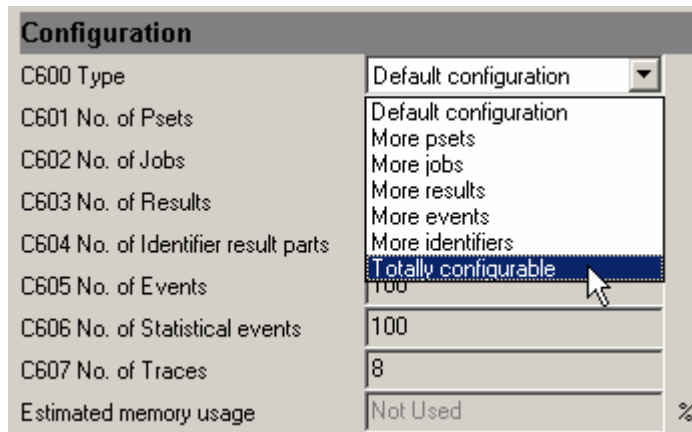
Increase *No. of identifier result parts [C604]* to be used, from 1 to 2, 3 or 4.

Estimated memory usage cannot exceed a hundred percent. It is therefore recommended to decrease *No. of results [C603]* in order to increase *No. of identifier result parts [C604]*.

Click **Store** to save settings.

Configuration

C600 Type	Totally configurable ▼
C601 No. of Psets	250
C602 No. of Jobs	99
C603 No. of Results	5000
C604 No. of Identifier result parts	4
C605 No. of Events	100
C606 No. of Statistical events	100
C607 No. of Traces	8
Estimated memory usage	62 %

⚠ **The changes made in configurable memory setup will reset the Power Focus memory at the next reboot. All data (tightenings results, programmed Psets, Jobs, Sync groups etc.) will be lost.
The only exception is parameters *IP address [C300]*, *Subnet mask [C301]* and *Default router [C302]* which will remain after the reboot.**

Information

These changes will erase your memory at next reboot. Do you still want to store your changes?

[Yes]   [No]

Click **Yes** to continue.

Click **No** to cancel.

ℹ **When changing the memory setup the PF must be rebooted for changes to take effect. Note that it is necessary to "Read PF from file" two times and reboot the PF one extra time. See chapter *Controller* for instructions.**

It is recommended to reboot immediately.

Configurable memory is only available for RBU gold and silver.

After reboot, double-click **Identifier** in the PF Map.
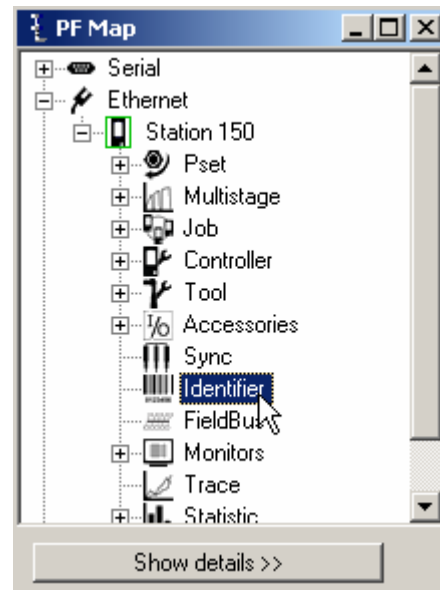
The Result parts are displayed under section **Result parts to display and store** in the Type setup window.

Select **Identifier types** (type 1-4) that the result parts should belong to.

Set **Significant positions** by marking character positions that should be added to the result parts.

In the screen shot example below, six positions from type 4 will be copied to result part 1 and stored together with the tightening result. Eight positions for type 1 will be copied to result part 2, and so on.

Click **Store** when finished.

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

12.3.2   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).

In ToolsTalk PF, click on the arrow to the right of the monitor icon and select **Identifier monitor**.
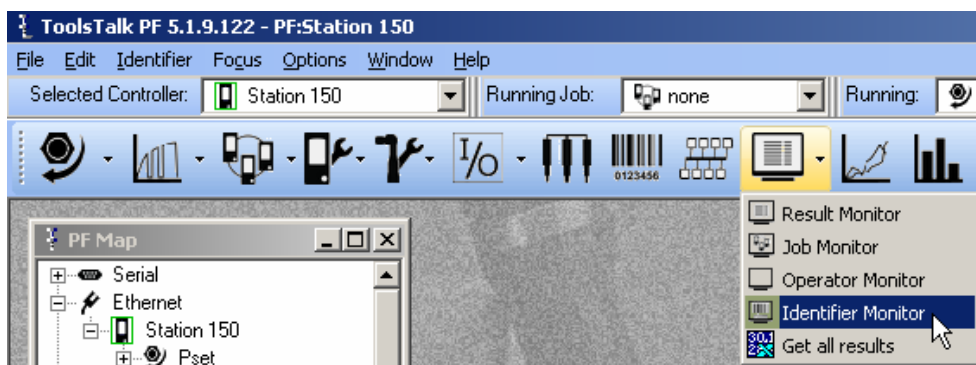
> ℹ️ **In the figure example below, all Identifier input sources are set to "Ethernet/serial".**
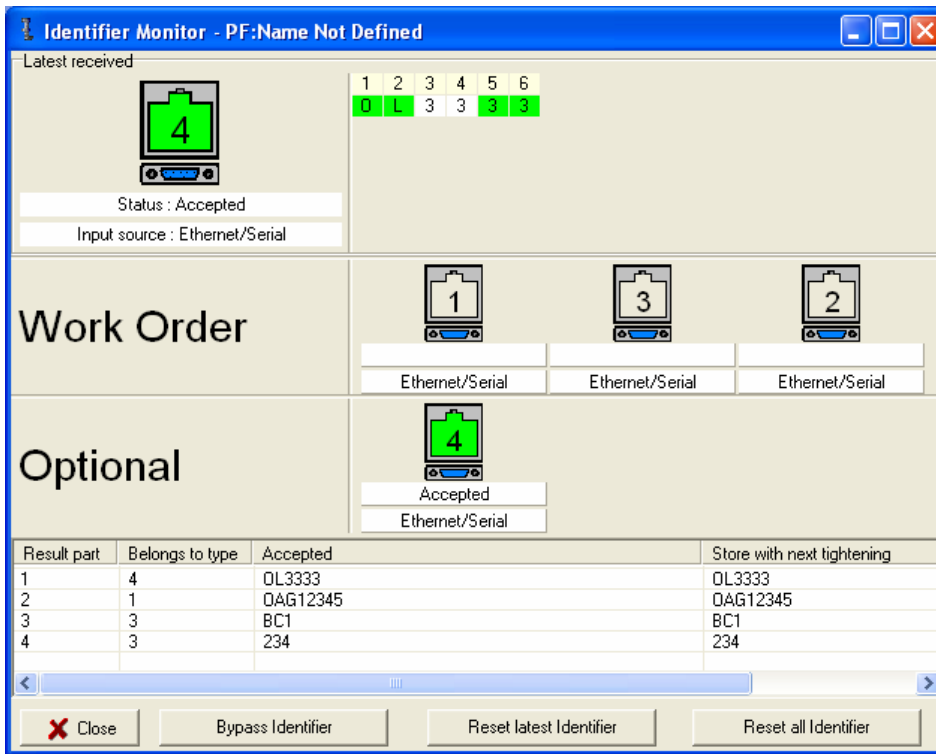
12.3.3 Functions in identifier monitor

> ℹ️ **These functions are only available from ToolsTalk PF.**

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".

13   Field bus

A **Field bus** communication can be used for data communication between Power Focus and PLC's (programmable logic controllers). It is an effective and fast way for the data transfer of short data packages. Field bus 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 Field bus standards on the market and they all have different hardware and software protocols. To be able to communicate on Field bus, the Power Focus must be equipped with a specific card for the preferred type of Field bus. **ProfiBus-DP**, **DeviceNet**, **InterBus/InterBus2MB**, **ModBusPlus**, **ControlNet**, **ModBus/TCP**, **Ethernet/IP**, **ProfiBus-IO** and **FL-Net** are the possible selections.

> ⓘ **Power Focus acts as a client in a Field bus system. A PLC or similar will act as the reference (master).**
>
> **This section includes screenshots from ToolsTalk PF. The screenshots shows examples of parameter settings and is NOT intended to be generally applicable. Check with your local Atlas Copco reprehensive how to set up your specific system environment.**
>
> **See chapter *Parameter list* for a description of all available Field bus options.**

With ToolsTalk PF the Field bus functionality in the PF can be configured to fit the customer specific bitmap. It is a very easy way to configure or modify a customer specific bitmap. When the configuration is done it can be downloaded to Power Focus or saved as a file for later use.

See section *Field bus configuration appendix* for specific Field bus type data.

13.1   General setup

In the PF Map, double-click **Field bus**.
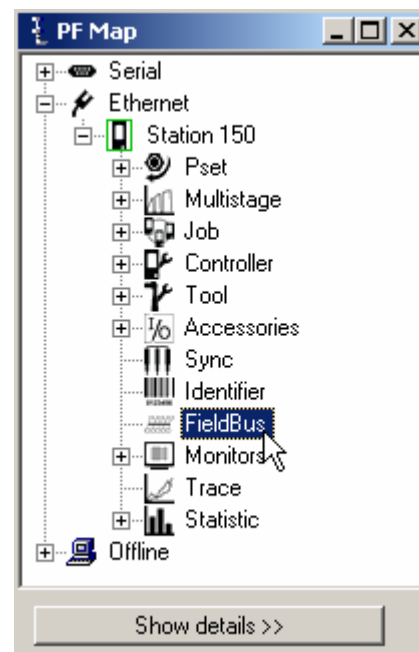
Select *Field bus type [F100]* from the drop down menu.

General Setup

F100 FieldBus Type — None ▼

DeviceNet
ProfiBus-DP
InterBus
ModBusPlus
Modbus/TCP
ControlNet
Ethernet/IP
None
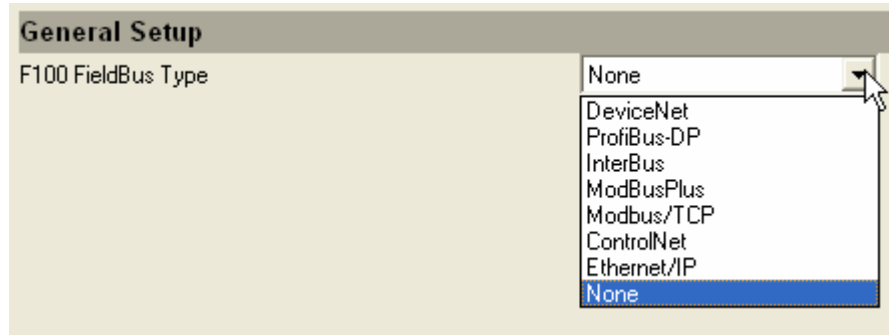
ⓘ **All Field bus parameters will be reset to default and data items cleared.**

Confirm by clicking **OK**.

Confirm ✕

❓ All parameters will be reset to default and data items cleared.

[OK] [Cancel]
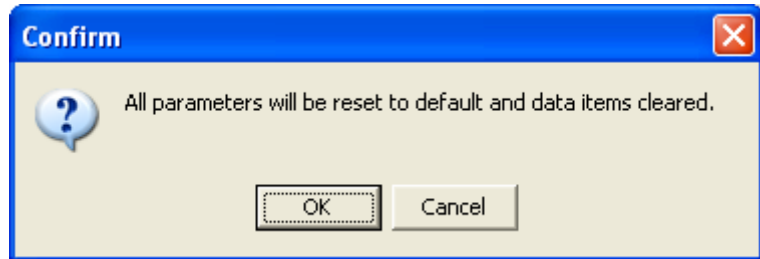
The screenshot below displays available parameters for Field bus type **DeviceNet**.

General Setup

F100 FieldBus Type	DeviceNet ▼	
F102 From PF DataLength	4	Bytes
F103 To PF DataLength	4	Bytes
F110 Set node address and baud rate from:	Software ▼	
F111 FB Node Address	0	
F112 Baud Rate	125 ▼	
F113 Connection Mode	Polled ▼	
F200 FB Update Interval	0,10	Sec
F210 Tool stop at offline	No tool stop ▼	
F300 Bitmap select	Byte 1 Byte 0 ▼	
	7 6 5 4 3 2 1 0 7 6 5 4 3 2 1	
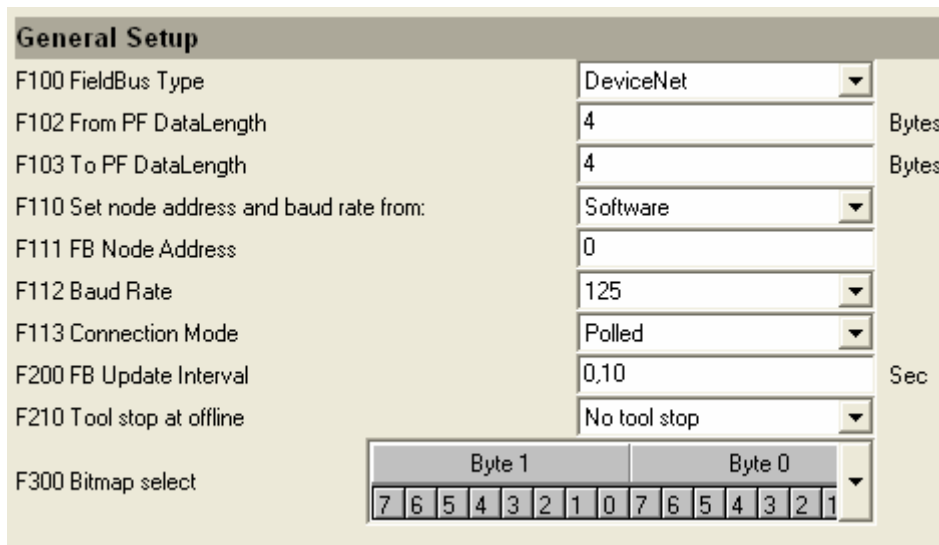
Parameters in General setup

The table below shows parameters available for all Field bus types.

Parameter	Device-Net	ProfiBus-DP	Inter-Bus	ModBus Plus	Control-Net	ModBus/TCP	Ethernet/IP	Inter-Bus 2MB	Profinet-IO	FL-Net
Field bus type	X	X	X	X	X	X	X	X	X	X
To PF data length	X	X	X	X	X	X	X	X	X	X
From PF data length	X	X	X	X	X	X	X	X	X	X
FB update interval	X	X	X	X	X	X	X	X	X	X
Tool stop at offline	X	X	X	X	X	X	X	X	X	X
Set node address and baudrate from	X	X		X	X	X	X			X
FB node address	X	X		X	X					
Baudrate	X									
Set source address from				X						
Source address				X						
Connection mode	X									
PCP length			X					X		
Process data length			X					X		
From PF global data length				X						
To PF global data length				X						
Bitmap select	X	X	X	X	X	X	X	X	X	X
IP address						X	X		X	X
Subnet Mask						X	X		X	
Gateway						X	X		X	
Device Name									X	
From PF Data Offset										X
To PF Data Offset										X
Virtual Field bus										X
Virtual from PF data length										X
Virtual to PF data length										X
Virtual from PF data offset										X
Virtual to PF data offset										X

13.2   From PF setup and to PF setup

Select **From PF setup** or **To PF setup**.

Via **From PF Setup** the bitmap that is sent out from the Power Focus can be configured.

Via **To PF setup** the bitmap that is 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 will then be entered to the item list on the first available line.
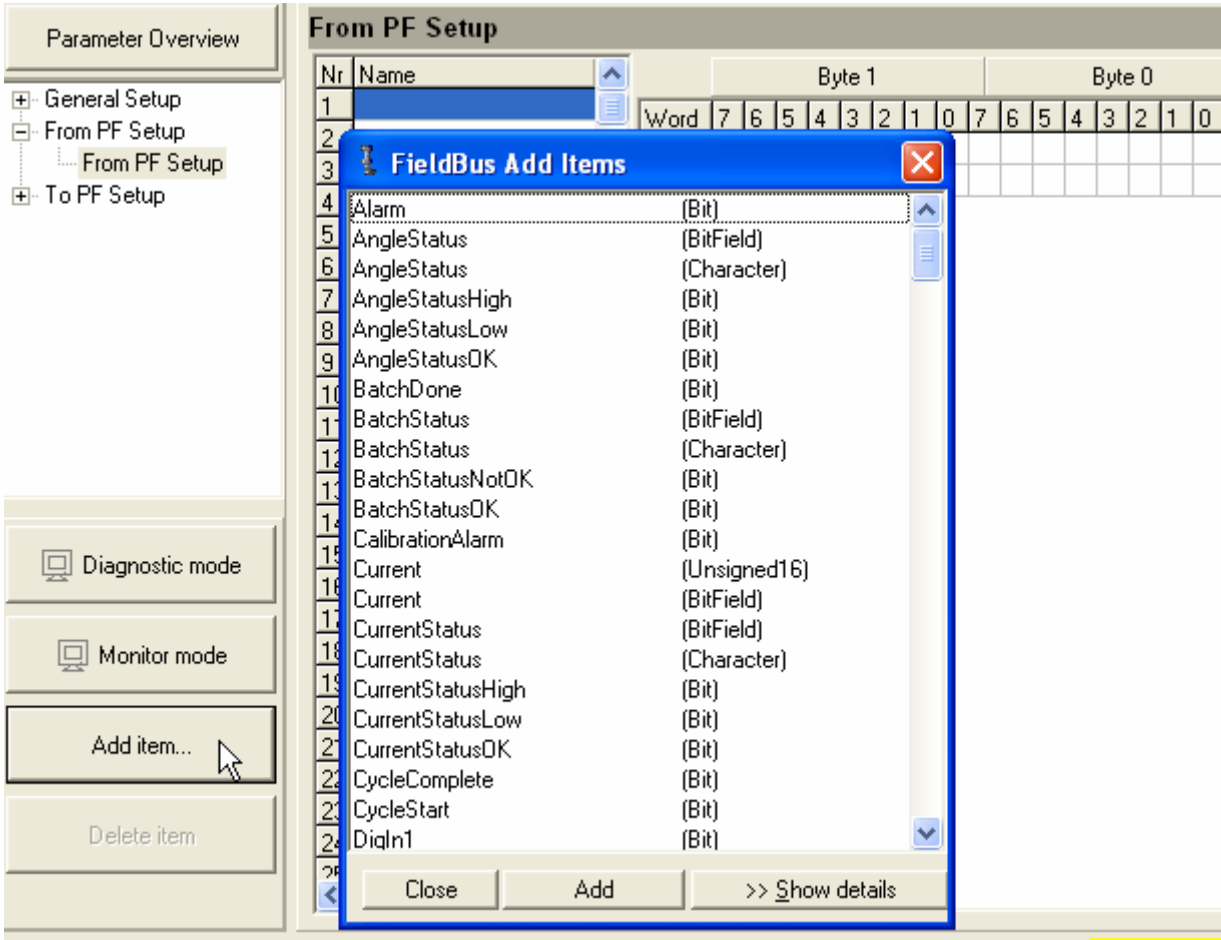
In the list start word, start byte and start bit for the selected item are visible. The start word, byte and bit give the start position of an item in the bitmap. The length can also be seen and sometimes changed. If this does not match the wanted bitmap it is easy to change the length and position in the bitmap by changing the start positions in the item list.

Change one line at a time and then click **Enter** after each line is changed. It is also possible to drag and drop directly in the bitmap. In this case, the start positions in the item list are updated automatically. If the 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 for the possible selections, see section *Field bus configuration appendix*.

13.2.1   View Field bus information

Select **General setup**.

Click **Get Field bus info** to display Field bus
module type, module software version,
module serial number and status of the LED's.
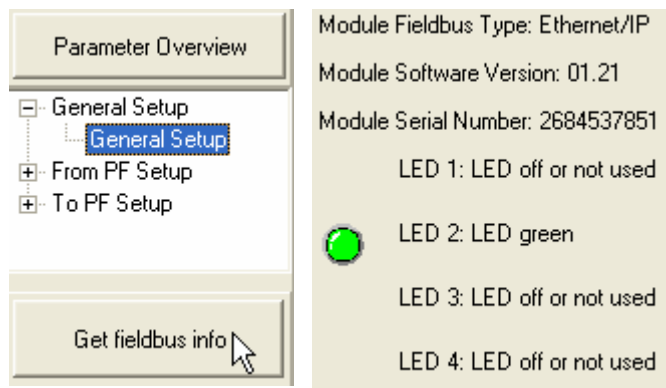
13.2.2   Field bus modes

Diagnostic mode

When Diagnostic mode is on, it is possible to set Field bus data in ToolsTalk PF and send the data to PF
by clicking Set value. If Diagnostic mode "From PF" is used the Power Focus passes data from
ToolsTalk PF to PLC and ignores the data from Power Focus. If Diagnostic mode "To PF" is used the
Power Focus activates functions, which is set in ToolsTalk PF and ignores PLC data.

> **In Diagnostic mode the operator can only change a small part of the Field bus setting data
> (only the content of a bit from zero <--> one). Rest of the settings can only be done in
> Normal mode.**

Monitor mode

Monitor mode is used to monitor Field bus data communication for testing purpose. This function works
only when ToolsTalk PF is online (connected to the PF).

When Monitor mode is active, the data from Power Focus to PLC is visible in the **From PF** window
bitmap. Likewise the data from PLC to Power Focus is visible in the **To PF** window bitmap. It is not
possible to change and store Field bus 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.

Normal mode

The third mode is called **Normal mode**. Normal mode is when none of the Diagnostic mode or Monitor
mode is selected. Under this 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 job off bit position 7 to
bit position 3 by drag and drop it or just by writing it into the Bit column and press enter.

13.2.3   Store to file and read from file

Store and read Field bus configurations to file. Use the read/save Field bus functions in the file menu in
ToolsTalk PF. To store to or read from a file first activate the Field bus window. The Field bus file
extension is "*.pff".

13.3 Field bus selector

> To use this function the parameter *Pset select source [C200]* must be set to "Field bus selector".

The **Field bus selector** function makes it possible to control the selection of Psets on selectors from an external source via the Field bus. The intended type of working stations where the proposed software is to be installed are rework stations and similar. Such stations don't have fixed work flows for the tightening controllers, but are often unique for each work piece depending on the failed tightenings that have been performed previously on that work piece. The external source (e.g. a PLC) is responsible for setting the green LED's on the selector(s) and for selecting the Psets in the Power Focus.

For Pset selector I/O setup instructions, see chapter *Controller*. For Field bus configuration, see section *Field bus configuration appendix*.

13.4 Disable Field bus carried signals

A lot of users run PLC selected Jobs over the Field bus in automatic mode (i.e. "Field bus" is selected for parameter *Job select source [C201]*), and select Jobs with a digital input in emergency mode (i.e. "DigIn" is selected for parameter *Job select source override [C203]*). When emergency mode is activated the Field bus signals could still disturb the communication. To avoid this type of problem it is recommended to use digital input **Disable Field bus carried signals**. When this digital input goes high the following events occur:

- Field bus communication is disabled.

- Relay "Field bus carried signals disabled" goes high.

- In ToolsTalk PF monitoring mode on Field bus "To PF" side, it is possible to display changes in signals sent to the PF over the Field bus. (Note that the signals have no effect on the Power Focus, since all Field bus communication is disabled).

- On the Field bus side "from PF", bits are reset to zero (0).

- The traffic of "keep alive" signals continues on the Field bus. In this way no event codes (i.e. "no connection on Field bus") will be displayed.

- All tools are enabled (presupposed that the tools were disabled from a source over the Field bus before then).

- If there is a running Job, which has been selected via the Field bus, the Job will be aborted.

13.5 Field bus configuration appendix

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

13.5.1 Bitmap select (Endian mode)

Motorola Endian

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

Intel Endian

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

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

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

13.5.2 Field bus 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 Field bus type uses Intel Endian, byte numbers are swapped before encoding or decoding to a specific data type.

The data field in the Field bus is from the beginning a blank data field without structure. In order to file Power Focus item data types into Field bus we define Field bus data type, which holds the information about placement and structure of a certain application data type mapped into the Field bus data field.

The table below shows the different data types used in Field bus 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 2 - 8 bits. All bits must be in the same byte. The left bit is the most significant bit and the right bit is the 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

Data type	Description
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.

Motorola Endian

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

Intel Endian

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

Fixed point number

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

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

Motorola Endian

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

Intel Endian

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

Integer

Unsigned16 is a 16-bit integer and unsigned32 is a 32-bit integer. U32_HMW is a special case of unsigned32, which is used in Intel Endian.

Motorola Endian

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

Intel Endian

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

13.5.3   Field bus selector configuration

The **Field bus selector** function makes it possible to control the selection of Psets on selectors from an external source via the Field bus. The intended type of working stations where the proposed software is to be installed is rework stations and similar. Such stations don't have fixed work flows for the tightening controllers, but are often unique for each work piece depending on the failing tightenings that have been performed previously on that work piece. The external source (e.g. a PLC) is responsible for setting the green LED's on the selector(s) and for selecting the Psets in the Power Focus.

Set selector LED

In one eight socket selector, the first four positions are for **Selector LED 1**, and the last four positions are for **Selector LED 2**. If a four socket selector is used, only selector LED 1 is mapped.

Motorola Endian

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pos 4		Pos3		Pos2		Pos1		Pos8		Pos7		Pos6		Pos5	
Device ID								Not used							
Selector LED 1								Selector LED 2							

Intel Endian

Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pos 8		Pos7		Pos6		Pos5		Pos4		Pos3		Pos2		Pos1	
Not used								Device ID							
Selector LED 2								Selector LED 1							

Selector information

Motorola Endian

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pos 4		Pos3		Pos2		Pos1		Pos8		Pos7		Pos6		Pos5	
Device ID								Socket lifted position number							
Selector LED 1								Selector LED 2							

Intel Endian

Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pos 8		Pos7		Pos6		Pos5		Pos4		Pos3		Pos2		Pos1	
Socket lifted position number								Device ID							
Selector LED 2								Selector LED 1							

Select Pset and set batch size

In order to set batch size and select Pset from Field bus, parameter *Pset select source [C200]* must be "Field bus" or "Field bus selector". Also, parameter *Batch count [P150]* must be set to "Field bus".

Motorola Endian

Byte 0	Byte 1
Pset ID	Batch size

Intel Endian

Byte 1	Byte 0
Pset size	Pset ID

Function (Pset select source [C200] is set to "Field bus")

	0 < Batch size < 99	Batch size = 0, Batch size > 99
Pset ID = 0	Select Pset 0	Select Pset 0
0 < Pset ID < 255	Select Pset and set batch size	Select Pset 0

Function (Pset select source [C200] is set to "Field bus selector")

		Selector socket lifted correct	Selector socket lifted incorrect
Pset ID = 0	**Batch size = any**	Select Pset 0	Display event code *Field bus PsetID mismatch selector lifted socket [E475]* Select Pset 0
0 < Pset ID < 255	**0 < Batch size < 99**	Select Pset, set batch size and unlock tool	Display event code *Field bus PsetID mismatch selector lifted socket [E475]* Select Pset 0
	Batch size = 0 or Batch size > 99	Display event code *Field bus PsetID mismatch selector lifted socket [E475]* Select Pset 0	Display event code *Field bus PsetID mismatch selector lifted socket [E475]* Select Pset 0

13.5.4　Items from PF

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

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.

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
Alarm	Echo display alarm LED.	Bit	1 bit	0 = Off 1 = On	Alarm on	Alarm off
AngleStatus	Status Angle result.	Char	1 byte ASCII	O = OK L = Low H = High	Tightening result	Start new tightening or new Pset selected or new Job selected
		BF	2 bits	00 = Not used 01 = OK 10 = High 11 = Low		
AngleStatusHIGH	Angle result is above max limit.	Bit	1 bit	0 = Not used 1 = High	Tightening result	Start new tightening or new Pset selected or new Job selected
AngleStatusLOW	Angle result is below min limit.	Bit	1 bit	0 = Not used 1 = Low	Tightening result	Start new tightening or new Pset selected or new Job selected
AngleStatusOK	Angle result is within limits.	Bit	1 bit	0 = Not used 1 = OK	Tightening result	Start new tightening or new Pset selected or new Job selected
BatchDone	Indicate batch finished. Batch done OK or NOK.	Bit	1 bit	0 = Not completed 1 = Done	Batch finished	Reset result
BatchStatus	Batch OK (done) or NOK	Char	1 byte ASCII	O = OK N = NOK	Tightening result	Start new tightening or new Pset selected or new Job selected
		BF	2 bits	00 = Not used 01 = OK 10 = NOK		

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
BatchStatusNOK	Batch is NOK.	Bit	1 bit	0 = Not used 1 = NOK	Tightening result	Start new tightening or new Pset selected or Job selected
BatchStatusOK(nxOK)	Batch is OK (nxOK).	Bit	1 bit	0 = Not used 1 = OK	Tightening result	Start new tightening or new Pset selected or Job selected
CalibrationAlarm	Calibration date expired. New date to be entered.	Bit	1 bit	0 = Off 1 = On	Calibration date expired	Reset or set a new calibration date
Current	Indicates tightening result final current in percent (%).	BF	2 – 8 bits	Integer number	Tighten result	Tighten started or Pset Selected or Job selected
		U16	16 bits	Integer number		
CompletedBatch	Display currently completed batch.	BF U16			Batch Counter Changed	No signal
CycleAbort	Display cycle aborted by cycle abort timer expired	Bit	1 bit	0 = Not used 1 = Cycle abort	Cycle Abort	Reset result
CycleComplete	Indicates that a tightening is finished. Do not care about the result.	Bit	1 bit	0 = Not used 1 = Cycle complete	Tightening done	Start new tightening or new Pset selected or new Job selected
CycleStart	Indicate cycle started.	Bit	1 bit	0 = not used 1 = cycle started	Cycle start	Start new tightening
DigIn# [# = 1-4]	Mimic the status on a DigIn in Power Focus or I/O Expander. The input must be configured to Field bus DigIn # X. There are four different items.	Bit	1 bit	0 = Input Off 1 = Input On	DigIn # X On	DigIn # X Off
DigInControlled [# 1-4]	Controlled by DigOut monitored 1 – 4 To PF	Bit	1 bit	0 = DigIn bit reset 1 = DigIn bit set	DigIn control1Set	Reset
DirSwitchCW	Indicates tool Switch is in CW direction.	Bit	1 bit	0 = Ring CCW 1 = Ring CW	Ring CW	Ring CCW
DirSwitchCCW	Indicates tool Switch is in CCW direction.	Bit	1 bit	0 = Ring CW 1 = Ring CCW	Ring CCW	Ring CW
DisabledFBJobStatus	Mimic the status on a digital input "Disable FB Job status" in Power Focus or I/O Expander.	Bit	1 bit	0 = Enabled Job status 1 = Disabled Job status	Disable FB Job Status	Enable FB Job status

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
DsetCalibrationValue	Shows the tool calibration value in selected engineering units.	Fixed point	4 bytes	See Item Final Torque.	Dset data	No signal
ErrorCode	Shows event code.	U16	2 bytes	Binary representation (Decimal 0-65535)	Event occurs	Event acknowledge or time out
FieldbBusHandShakeAck	Indicates handshake from PLC received by Power Focus.	Bit	1 bit	0 = Not used 1 = Handshake	Handshake set	Handshake reset
FinalAngle	Final angle result.	U16	2 byte	Binary representation (Decimal 0-65 535)	Tightening done	Start new tightening or new Pset selected or new Job selected
FinalAngleStart	Indicate final angle started.	Bit			Final Angle Start	Cycle Completed
FinalTorque	Final torque result.	Fixed point	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
HomePosition	Indicates Open end tool in home position.	Bit	1 bit	0 = Not used 1 = Home position	Open end tool in home position	Start new tightening
IdentifierIdentifiered	An identifier with type 1, 2, 3, 4 has been entered in correct order and has been accepted by the system logic.	Bit	1 bit	0 = not used 1 = identified	Identifier identifiered	Start new tightening

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
Identifier_Multi	Shows an identifier, Max length 100 bytes.	CC	16 – 800 bits	Max 100 char in a string	Multi identifier selected	No signal
		CSCI	16 - 800	Max 100 char		
IdentifierResultPart_A-D	Show identifier result part, witch in each tightening result.	CSC	16 – 200 bits	Max 25 char	Tighten result	Start new tightening
IdentifierType# [# = 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.	Bit	1 bit		Received identifier type	Bypass identifier / Reset latest Identifier / Reset all identifier
Illuminator	Echo tool illuminator LED.	Bit	1 bit	0 = Led off 1 = Led on	Light on	Light off
JobDoneStatus	Job OK (done) or NOK (done) or aborted (reset).	Char	1 byte ASCII	O =OK N = NOK A = Aborted	Job done or reset	Start new tightening or new Job selected
		BF	2 bits	00 = Not used 01 = OK 10 = NOK 11 = Aborted		
JobDoneStatusJobAborted	Shows Job aborted.	Bit	1 bit	0 = Not used 1 = Job aborted	Job aborted	Start new tightening or new Job selected
JobDoneStatusNOK	Job is NOK (Not all tightening OK).	Bit	1 bit	0 = Not used 1 = NOK	Job done	Start new tightening or new Job selected
JobDoneStatusOK (nxOK)	Job is OK (nxOK)	Bit	1 bit	0 = Not used 1 = OK	Job done	Star new tightening or new Job selected
JobOff	Job is in Off mode; 1: Job Off; 0: Job On.	Bit	1 bit	0 = Job on 1= Job off	Job off	Job on
JobRunning	A Job is selected and "running".	Bit	1 bit	0 = Job done and no Job selected 1 = Job is running	Job selected	Job done
KeepAliveAck	Indicates Field bus communication alive, which sends back the save value received from PLC.	BF	2 - 8 bits in the same byte	00000000 = 0 11111111 = 255	Keep alive value changed	No signal
LineControlAlerted 1	Indicates Line control alert 1 received by Power Focus.	Bit	1 bit	0 = Not used 1 = Line control alerted 1	Line control alerted 1	Start new tightening

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
LineControlAlerted 2	Indicates Line control alert 2 received by Power Focus.	Bit	1 bit	0 = Not used 1 = Line control alerted 2	Line control alerted 2	Start new tightening
LineControlDone	Indicates Job with line control finished before line control alert2 input.	Bit	1 bit	0 = Not used 1 = Line control done	Line control done	Start new tightening
LineControlStartAck	Indicates that Power Focus received Line control start.	Bit	1 bit	0 = Line control start reseted 1 = Line control start	Line control start bit set	Line control start bit reset
		U16	16 bits in one word	00….0001 = Pset 1 00….1000 = Pset 8		
LineControlStarted	Indicates line control start set in Power Focus.	Bit	1 bit	0 = Not used 1 = Line control start	Line control started	Start new tightening
LockAtBatchDone	Indicate tool locked at batch done which is activated by P152	Bit	1 bit	0 = Not used 1 = tool locked	Lock at batch done	Unlock tool
NewJobSelected	Indicates a new Job is selected JobID>0	Bit	1 bit	0 = not used 1 = new Job	New Job Selected	Start new tightening
NewPsetSelected	Indicates a new Pset is selected PsetID>0	Bit	1 bit	0 = not used 1 = new Pset	New Pset Selected	Start new tightening
OpenProtocolConnLost	Indicates connection with open protocol lost.	Bit	1 bit	0 = connected 1 = disconnected	Open protocol disconnected	Open protocol connected
PFChannelID	Gives the channel ID number on the Field bus Power Focus.	BF	2 - 8 bits in the same byte.	0000 0001 = CH 1 0001 0000 = CH 16	PF ready and channel ID programmed in config	No signal
		U16	16 bits in one word	00….0001 = CH 1 00….1000 = CH 8		
PFReady	No severe errors in PF.	Bit	1 bit	0 = Errors in PF 1 = No errors in PF	PF ready (no errors)	PF not ready (errors)
PsetFinalAngleMin / PsetFinalAngleMax / PsetStep1Speed / PsetStep2Speed/ PsetRundownAngleMin/ PsetRundownAngleMax	Shows Pset parameters from the running Pset.	U16	2 bytes	Binary representation (Decimal 0-65535)	New Pset selected or updated	No signal. On until new Pset is selected or current Pset updated

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
PsetFinalTarget / PsetFinalTorqueMin / PsetFinalTorqueMax / PetStartFinalAngle	Shows Pset parameters from the running Pset in selected engineering units.	Fixed point	4 bytes	See Item Final Torque.	New Pset selected or updated	No signal. On until new Pset is selected or current Pset updated
PVTMonStatus / RunDownAngleStatus / PVTSelftapStatus / CurrentStatus	Status on one of the result parameters PVT mon, Rundown angle, PVT selftap or Current.	Character	1 byte ASCII	O = OK L = Low H = High	Tightening result	Start new tightening or new Pset selected or new Job selected
		BF	2 bits	00 = Not used 01 = OK 10 = High 11 = Low		
PVTMonStatusHIGH / RunDownAngleStatusHIGH / PVTSelftapStatusHIGH / CurrentStatusHIGH	Result is above max limit. There are three different variables in the setup.	Bit	1 bit	0 = Not used 1 = High	Tightening result	Start new tightening or new Pset selected or new Job selected
PVTMonStatusLOW / RunDownAngleStatusLOW / PVTSelftapStatusLOW / CurrentStatusLOW	Result is below min limit. There are three different items in the setup.	Bit	1 bit	0 = Not used 1 = Low	Tightening result	Start new tightening or new Pset selected or new Job selected
PVTMonStatusOK / RunDownAngleStatusOK / PVTSelftapStatusOK / CurrentStatusOK	A result is within limits. There are three different variables in the setup.	Bit	1 bit	0 = Not used 1 = OK	Tightening result	Start new tightening or new Pset selected or new Job selected
ReceivedIdentifier	Indicates identifier has been received by PF.	Bit	1 bit	0 = not used 1 = Received identifier	Received identifier	Start new tightening
Rehit	Indicates tool is rehit	Bit	1 bit	0 = Not used 1 = Rehit	Tightening result	Reset result
RemainingBatch	Display currently remaining batch	BF U16			Batch Counter Changed	No signal
ResultType	Shows what type of result is, i.e. tightening result, loosening result and so on.	BF	2 – 8 bits	1 to 13 is defined for the different result type	Tighten result	Reset result
RingButtonAck	Ring button pressed acknowledge.	Bit	1 bit	0 = not used 1 = new Pset	Ring Button Pressed	Start new tightening
RunningJobId	Running Job identification number.	BF	2 - 8 bits in the same byte.	0000 0001 = Job 1 0001 0000 = Job 16	Job selected	Job done
		U16	16 bits in one word	00….0001 = Job 1 00….1000 = Job 8		

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
RunningPsetId	Running Pset identification number.	BF	2 - 8 bits in the same byte.	0000 0001 = Pset 1 0001 0000 = Pset 16	Pset selected	No signal. On until new Pset is selected
		U16	16 bits in one word	00….0001 = Pset 1 00….1000 = Pset 8		
RunningPsetId0is1	Shows running Pset and Pset number is bit field number +1, i.e. 00 is Pset 1.	BF	2 - 8 bits in the same byte.	0000 0001 = Pset 2 0001 0000 = Pset 17	Pset selected	No signal. On until new Pset is selected
SafeToDisconnectTool		Bit	1 bit	Ack for disconnect tool request from Field bus.	Disconnect tool allowed	Done
SelectedChannelInJob	Indicates selected channel in a forced order Cell Job.	Bit	1 bit	0 = Not used 1 = Selected channel	Prompt selected channel	Cancel prompt channel
SelectorInfo	Indicates selector socket and LED information.	OA	32 bits	Byte 0 = device ID Byte 1=lift sock no. Byte 2, 3 =selector LED	Select Led or socket changed	No signal
ServiceIndicatorAlarm	Indicates that the number of tightenings in the tool memory has reached the service interval limit.	Bit	1 bit	0 = Alarm Off 1 = Alarm On	Service indicator alarm on	Reset counter
StatAlarm	Echo display stat LED.	Bit	1 bit	0 = Off 1 = On	Stat alarm On	Stat alarm Off
SyncChannel# Green/Red/Yellow LED [# = 1-10]	A result from a Sync channel. Follow tool light. There are 30 (3x10) different items in the setup.	Bit	1 bit	0 = Not used 1 = green / red / yellow	Sync tightening result	Start new tightening or new Pset selected or new Job selected
SyncCh1Status/..../SyncCh10Status	Indicate Sync channel XX result status.	BF	2 bits	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
		Char	8 bits	O = Sync Channel OK N = Sync Channel NOK		

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
SyncCh1StatusNok/.../SyncCh10StatusNok	Indicates Sync channel XX result status NOK.	Bit	1 bit	0 = Not used 1 = Sync Channel NOK	Sync tightening result	Start new tightening or new Pset selected or new Job selected
SyncCh1StatusOk/…/SyncCh10StatusOk	Indicates Sync channel XX result status OK.	Bit	1 bit	0 = Not used 1 = Sync Channel OK	Sync Tightening result	Start new tightening or new Pset selected or new Job selected
SyncTotalStatus	Indicates Sync total result status.	BF	2 bits	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
		Char	8 bits	O = Sync Total Status OK N = Sync Total Status NOK		
SyncTotalStatusNok	Indicates Sync total result status NOK.	Bit	1 bit	0 = Not used 1 = Sync Total Status NOK	Sync tightening result	Start new tightening or new Pset selected or new Job selected
SyncTotalStatusOk	Indicates Sync total result status OK.	Bit	1 bit	0 = Not used 1 = Sync Total Status OK	Sync tightening result	Start new tightening or new Pset selected or new Job selected
TighteningDate	Tightening date taken from the most recent result. Format YYYY:MM:DD	CSC	80 bit (10 characters/ bytes)	I.e. 2000:05:07 ($\rightarrow$ 10 ASCII characters)	Tightening result	Start new tightening or new Pset selected or new Job selected
		CSCI	80 bits	I.e. 70:50:0002 ($\leftarrow$ from right to left)		
TighteningDateDay	The tightening date (day part only) taken from the most recent result.	U16	16 bit (one word)	1 – 31	Tightening result	Start new tightening or new Pset selected or new Job selected
TighteningDateMonth	The tightening date (month part only) taken from the most recent result.	U16	16 bit (one word)	1 – 12	Tightening result	Start new tightening or new Pset selected or new Job selected
TighteningDateYear	The tightening date (year part only) taken from the most recent result.	U16	16 bit (one word)	Year number 4 digits	Tightening result	Start new tightening or new Pset selected or new Job selected
TighteningStatus	Combined status for all tightening result parameters that are used.	Char	1 byte ASCII	OK = O NOK = N	Tightening result	Start new tightening or new Pset selected or new Job selected
		BF	2 bits	00 = Not used 01 = OK 10 = NOK		
TighteningStatusHigh	Indicate tightening result status is high.	Bit	1 bit	0 = not used 1 = high	Tighten result	Reset result

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
TighteningStatusLow	Indicate tightening result status is low.	Bit	1 bit	0 = not used 1 = Low	Tighten result	Reset result
TighteningTime	The tightening time taken from the most recent result. Format HH:MM:SS	CSC	64 bit (8 characters)	I.e. 08:15:08 ($\rightarrow$8 ASCII characters) 24 hour	Tightening result	Start new tightening or new Pset selected or new Job selected
		CSCI	64 bits	I.e. 80:51:80 ($\leftarrow$ from right to left)		
TighteningTimeHour	The tightening time (hour part only) taken from the most recent result.	U16	16 bit (one word)	0 – 24 hour	Tightening result	Start new tightening or new Pset selected or new Job selected
TighteningTimeMin	The tightening time (minutes only) taken from the most recent result.	U16	16 bit (one word)	0 - 60 min	Tightening result	Start new tightening or new Pset selected or new Job selected
TighteningTimeSec	The tightening time (seconds only) taken from the most recent result.	U16	16 bit (one word)	0 - 60 sec	Tightening result	Start new tightening or new Pset selected or new Job selected
TighteningStatusNOK	Tightening result has one or more Not OK results.	Bit	1 bit	0 = Not used 1 = NOK	Tightening result	Start new tightening or new Pset selected or new Job selected
TighteningStatusOK	All tightening result is OK.	Bit	1 bit	0 = Not used 1 = OK	Tightening result	Start new tightening or new Pset selected or new Job selected
ToolDisabled	Indicates if the tool is disabled or not.	Bit	1 bit	0 = Tool enabled 1 = Tool disabled	Tool disable	Tool enable
ToolEnabled	Indicates if the tool is enabled or not.	Bit	1 bit	0 = Tool disabled 1 = Tool enabled	Tool enable	Tool disable
ToolGreenLight	This item follows the tool green light.	Bit	1 bit	0 = Not used 1 = Green	Tightening result or flash green light	Start new tightening or Reset LED
ToolLoosening	Indicates that the tool is loosening.	Bit	1 bit	0 = Tool is not loosening 1 = Tool is loosening	Tool is loosening	Tool is stopped
ToolReady	Indicates that the tool is ready for tightening.	Bit	1 bit	0 = Tool is not ready 1 = Tool is ready	Tool is ready	Tool is not ready
ToolRedLight	This item follows the tool red light.	Bit	1 bit	0 = Not used 1 = Red	Tightening result	Start new tightening
ToolRunning	Indicates that the tool is rotating CW or CCW.	Bit	1 bit	0 = Tool is not run 1 = Tool is running	Tool is running	Tool is stopped

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
Tools NetConnLost	Indicates connection with Tools Net lost.	Bit	1 bit	0 = connected 1 = disconnected	Tools Net connection lost	Connected
ToolStartSwitch	Indicates tool is switching.	Bit	1 bit	0 = Not used 1 = rotating	Tool is rotating	Tool stopped
ToolSerialNo	Show tool serial number after each tightening	U32	32 bits	Intel Endian 32 bits integer	Tighten result	Start new tightening
		U32_H NW	32 bits	Intel Endian 32 bits integer		
ToolYellowLight	This item follows the tool yellow light. (If "PF_ control _3" is selected in Cset, yellow LED shows the fatal error and reset when error acknowledged)	Bit	1 bit	0 = Not used 1 = Yellow	Tightening result or fatal error.	Start new tightening or error Ack
TorqueStatus	Status torque result.	Char	1 byte ASCII	O = OK L = Low H = High	Tightening result	Start new tightening or new Pset selected or new Job selected
		BF	2 bits	00 = Not used 01 = OK 10 = High 11 = Low		
TorqueStatusHIGH	Torque result is above max limit.	Bit	1 bit	0 = Not used 1 = High	Tightening result	Start new tightening or new Pset selected or new Job selected
TorqueStatusLOW	Torque result is below min limit.	Bit	1 bit	0 = Not used 1 = Low	Tightening result	Start new tightening or new Pset selected or new Job selected
TorqueStatusOK	Torque result is within limits.	Bit	1 bit	0 = Not used 1 = OK	Tightening result	Start new tightening or new Pset selected or new Job selected
ToolTightening		Bit	1 bit	0 = Tool is not tighten 1 = Tool is tightening	Tool is Tightening	Tool is stopped

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
VINInput	Shows the VIN number input from Field bus, serial or Ethernet. Changes as soon as the number is given. This is not the VIN used in the tightening result. If the VIN is longer then the VIN input length the 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.	CSI	24-208 bit (3-26 bytes)	One ASCII sign for each character. First byte is counter. Counter increases each time a new identifier string inputted.	Identifier selected	No signal
		CSC	16-200 bit (2-25 bytes)	Identifier input character string. One ASCII sign for each character.		
		CSCI	16-192 bit (2-24 bytes)	In Intel Endian mode, whole words. One ASCII sign for each character.		
		CSII	32-208 bit (4-26 bytes)	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.		
		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.		

Items from PF	Description	Data type	String length	Value	Set signal	Reset signal
VINUsedInTightening	Shows the VIN number used in a tightening. This is the VIN used in the tightening result. If the VIN is longer then the VIN input length the 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.	CSC	16 – 200 bit (2-25 bytes)	One ASCII sign for each character.	Tightening result	Start new tightening or new Pset selected or new Job selected
		CSCI	16 – 192 bits (2 – 24 bytes)	Only show in Intel Endian and must be whole words.		
		U16	16 bits	Convert barcode to U16 number. Corresponding to identifier type U16 in To PF side.		
		U32	32 bits	Convert barcode to U32 number. Corresponding to identifier U32 in To PF side.		
		U32_HNW	32 bits	Only show in Intel Endian. Convert barcode to U32_HNW number. Corresponding to identifier U32_HNW in To PF side.		
		CSCI	16 – 200 bits	Max 25 char		

13.5.5   Items to PF

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

Set signal = when a bit is set in the PLC, this signal is sent to PF.

Reset signal = When a bit resets in the PLC, this signal is sent to PF.

Items to PF	Description	Data type	String length	Value	Set signal	Reset signal
AbortJob	Aborts the running Job.	Bit	1 bit	0 = Not used 1 = Abort	Abort Job	No signal
		Character	8 bit (1 byte)	A = Abort		
AbortJobAndStatus	Abort Job And Reset all result status	Bit	1	0 = Not used 1 = Abort	Abort job and status	No signal
AckErrorMessage	Acknowledge event message.	Bit	1 bit	0 = Not Used 1 = Ack Error	Ack event message	No signal
BatchDecrement	Decrements the batch counter with one.	Bit	1 bit	0 = Not used 1 = Decrement	Batch decrement	No signal
BatchIncrement	Increments the batch counter with one.	Bit	1 bit	0 = Not used 1 = Increment	Batch increment	No signal

Items to PF	Description	Data type	String length	Value	Set signal	Reset signal
BypassIdentifier	Bypasses the next identifier in the "Work order for entering identifier types".	Bit	1 bit	0 = Not used 1 = Bypass Id	Bypass next identifier	No signal
BypassPsetInJob	Stops current Pset and jumps to next Pset in the Job.	Bit	1 bit	0 = Not used 1 = Bypass Pset in Job	Bypass Pset	No signal
DigOutMonitored [# = 1-4]	Monitored by DigIn Controlled 1 - 4 From PF.	Bit	1 bit	0 = reset 1 = set	Set DigIn controlled	Reset DigIn controlled
DisableSTScanner	Disables ST scanner.	Bit	1 bit	0 = Not used 1 = disable ST scan	Disable ST scanner	No signal
DisconnectTool	Sends disconnect tool request.	Bit	1 bit	0 = Not used 1 = disconnect	Disconnect tool	No signal
Field busHandShake	Sends to PF to check if Field bus works.	Bit	1 bit	0 = Not used 1 = Handshake	Field bus Hand shake Set	Field bus Handshake Reset
Identifier	Input of VIN number from the PLC. Set identifier input source in PF to "Field bus". 0 string is ignored.	CSI	24 - 208 bit (3-26 bytes)	One ASCII sign for each character First byte is counter	New VIN input	No signal
		CSC	16 - 200 bit (2-25 bytes)	One ASCII sign for each character		
		U16	2 bytes in the same word	U 16: If the value is less then 5 digits decimal, PF will fill with zeros in front.		
		U32	4 bytes in two words	U32: If the value is less then 10 digits decimal, PF will fill with zeros in front.		
		U32_HNW	4 bytes in two words	Only for Intel format		
		CSCI	16 - 192 (2 - 24 bytes)	One ASCII sign for each character, string is in Intel byte order		
		CSII	32 - 208 bytes)	One ASCII sign for each character. First byte is counter. String is in Intel byte order.		

Items to PF	Description	Data type	String length	Value	Set signal	Reset signal
Identifier_Multi	Max 100 characters in identifier string.	CSC	16 – 800 bits	Char string	Identifier	No signal
		CSCI	16 – 800 bits	Intel Endian		
		U16	16 bits in one word	00….0001 = Job 1 00….1000 = Job 8		
JobOff	Gets off Job mode and unlocks tool.	Bit	1 bit	0 = Job On 1 = Job Off	Job Off	Job On
JobSelect	Selects a Job. Job select source must be set to Field bus. Job 0 = no Job selected.	BF	2 - 8 bits in the same byte.	0000 0001 = Job 1 0001 0000 = Job 16	Select Job	No signal
KeepAlive	Sends to PF to check if Field bus communication alive.	BF	2 - 8 bits in the same byte	00000000 = 0 11111111 = 255	Keep alive changed	No signal
LineControlAlert1	Job not finished alarm 1.	Bit	1 bit	0 = Not Used 1 = Line control alert 1	Line control alert 1	No signal
LineControlAlert2	Job not finished alarm 2.	Bit	1 bit	0 = Not Used 1 = Line control alert 2	Line control alert 2	No signal
LineControlStart	Input signal to start the line control function.	Bit	1 bit	0 = Not Used 1 = Line control	Line control start set	Line control start reset
MasterUnlockTool	Unlocks all locks which are regarded as event controlled.	Bit	1 bit	0 = Not used 1 = Master Unlock	Master unlock tool	No signal
PsetSelect	Select a Pset. *Pset select source [C200]* must be set to "Field bus". Pset0 = no Pset selected.	BF	2 – 8 bits in the same byte.	0000 0001 = Pset 1 0001 0000 = Pset 16	Select Pset	No signal
		U16	16 bits in one word	00….0001 = Pset 1 00….1000 = Pset 8		
PsetSelect0Is1	Selects a Pset. *Pset select source [C200]* must be set to "Field bus". Pset0 = no Pset selected. Number 0 = Pset1 number 1 = Pset2 etc.	BF	2 – 8 bits in the same byte.	0000 0001 = Pset 2 0001 0000 = Pset 17	Select Pset	No signal
PsetSelectAndSetBatchSize	Selects Pset and sets its batch size. Byte0: PsetID; Byte1: BatchSize	OA	16 bits	Byte 0 = PsetID Byte 1 = Batch size	Set Batch Size and Select Pset	No signal

Items to PF	Description	Data type	String length	Value	Set signal	Reset signal
PsetToggle	Toggle between Psets connected to one socket in a Selector. *Pset select source [C200]* must be set to "Selector".	Bit	1 bit	0 = Not used 1 = Pset Tog	Pset Toggle	No signal
RelayPos# [# = 1-4]	Controls a relay from Field bus. In I/O setup the selected relay must be programmed to Field bus relay x. There are four different items.	Bit	1 bit	0 = Relay OFF 1 = Relay ON	Set Field bus relay x	Reset Field bus relay x
RequestSTScan	Requests ST scan.	Bit	1 bit	0 = Not used 1 = request	Request ST Scan	No signal
ResetAllIdentifiers	Resets all identifiers and relays for identifier.	Bit	1 bit	0 = Not used 1 = Reset all ID	Reset all identifier	No signal
ResetBatch	Resets the batch counter to 0.	Bit	1 bit	0 = Not used 1 = Reset the batch	Reset batch	No signal
ResetJobStatus	Resets Job done status.	Bit	1 bit	0 = Not used 1 = Reset Job Status	Reset Job Status	No signal
ResetLatestIdentifier	Resets the latest identified identifier.	Bit	1 bit	0 = Not used 1 = Reset latest Id	Reset latest identifier	No signal
ResetNokCounter	Unlocks (if locked) and resets "Possible coherent not ok tightening counter".	Bit	1 bit	0 = Not used 1 = Reset NOK counter	Reset NOK counter	No signal
ResetRelay	Resets all relays except tracking event relay	Bit	1 bit	0 = Not used 1 = Reset	Reset relay	No signal
ResetResultStatus	Resets all result status on relay, RE-Alarm and Field bus.	Bit	1 bit	0 = Not Used 1 = Reset result	Reset result status	No signal
RestartJob	Stops current Job and restarts the same Job from 0.	Bit	1 bit	0 = Not used 1 = Restart Job	Restart Job	No signal
SelectNextPset	Selects next Pset.	Bit	1 bit	0 = Not used 1 = Select next Pset	Select next Pset	No signal
SelectPrevPset	Selects previous Pset.	Bit	1 bit	0 = Not used 1 = Select previous Pset	Select previous Pset	No signal

Items to PF	Description	Data type	String length	Value	Set signal	Reset signal
SetBatchSize / SetBatchSizePsetID	Sets batch size in indicated Pset ID (Set Batch Size Pset ID). These two items must be used together. 0<Batch Size<=99	BF	2 - 8 bits in the same	00000000 = 0 11111111 = 255	Set batch size and Pset id	No signal
		U16	2 bytes	Binary representation (Decimal 0-65535)		
SetCCW	Sets direction according to input level. Low level corresponds to CW and high level corresponds to CCW.	Bit	1 bit	0 = set CW 1 = set CCW	Set CCW	Set CW
SetHomePosition	Sets home position for home position strategy.	Bit	1 bit	0 = Not used 1 = Set home position	Set home position	No signal
SetSelectorLed	Sets/Resets selector LED from Field bus Byte0: DeviceID; Byte1: Not used; Byte2: Sel LED 1-4; Byte3: Sel LED 5-8	OA	32 bits	Byte 0 = Device ID Byte 1 = Not used Byte2, 3 = selector LED	Set selector LED	No signal
StartSTScan	Starts ST scanning if scan source is Field bus.	Bit	1 bit	0 = Not used 1 = Start ST Scan	Start ST Scan	No signal
TimerEnableTool	Enables tool in 5 second for safety trigger.	Bit	1 bit	0 = reset 1 = set	Timer Enable Tool	Timer Enable Released
Toggle CW/CCW	Toggles direction between CW and CCW. SL/DL only.	Bit	1 bit	0 = Not used 1 = toggle	Toggle CW/CCW	No signal
ToggleCW/CCWForNextRun	Changes direction and changes back automatically after one run. SL/DL only.	Bit	1 bit	0 = Not used 1 = Toggle	Toggle CW/CCW for next run	No signal
ToolDisable	Disables the tool. To avoid conflicts this parameter shall not be selected if Tool Enable is used.	Bit	1 bit	0 = Enable tool 1 = Disable tool	Tool disable	Tool enable
ToolEnable	Enables the tool. To avoid conflicts this parameter shall not be selected if Tool Disable is used.	Bit	1 bit	0 = Disable tool 1 = Enable tool	Tool enable	Tool disable

Items to PF	Description	Data type	String length	Value	Set signal	Reset signal
ToolLightsFlashGreen	Starts to flash the tool green light. Resets any existing light pattern on the tool.	Bit	1 bit	0 = Not used 1 = Tool light flash	Tool light flash green	No signal
ToolLooseningDisable	The function is similar to Tool Disable, but only for loosing.	Bit	1 bit	0 = Loosening enable 1 = Loosening disable	Tool loosening disable	Tool loosening enable
ToolStartLoosening	Starts the tool in loosening direction. Direction depends on CW / CCW in PF. Tool start input source must be set to Field bus.	Bit	1 bit	0 = Stop tool 1 = Start loosening	Start loosening	Stop tool
ToolStartTightening	Starts the tool in tightening direction. Direction depends on CW / CCW in PF. Tool start input source must be set to Field bus.	Bit	1 bit	0 = Stop tool 1 = Start tightening	Start tightening	Stop tool
ToolStop	Stops the tool.	Bit	1 bit	0 = Not used 1 = Stop tool	Stop tool	No signal
ToolTighteningDisable	The function is similar to Tool Disable, but only for tightening.	Bit	1 bit	0 = Tightening Enable 1 = Tightening Disable	Tool tightening disable	Tool tightening enable
ToolTighteningPulse	Tool starts tightening if the pulse is longer than 100 ms and continues until target or current limit is reached	Bit	1 bit	0 = Not used 1 = Start Tighten Pulse	Tool tightening start	No signal
UnlockTool	Unlocks tool if tool locked by batch ok or lock on reject	Bit	1 bit	0 = Not used 1 = Unlock tool	Unlock tool	No signal

13.5.6   ProfiBus-DP

ProfiBus-DP is a Field bus normally used in industrial automation, to transfer fast data for motor controllers, MMI, I/O units and other industrial equipment. ProfiBus has an international user organisation called ProfiBus International, PI, and other local and national organisations.

General technical questions regarding the Field bus 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
Field bus 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
Field bus 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 optics couplers.
ProfiBus DP communication ASIC	SPC3 chip from Siemens

ProfiBus-DP module

Variable	Limits	Information
Node Address	1 – 124 (1-99 with HW setting)	Set Switches to 00 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
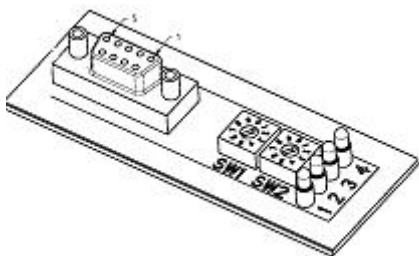
Field bus connectors

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 fibre optics) may require an external power supply from these pins.
5	GND BUS	Isolated GND from RS484 side
		+5V BUS and GND BUS are used for bus termination. Some devices, like optical transceivers (RS485 to fibre optics) may require an external power supply from these pins.
6	+5V BUS	Isolated +5V from RS484 side
		+5V BUS and GND BUS are used for bus termination. Some devices, like optical transceivers (RS485 to fibre optics) may require an external power supply from these pins.
7	Not connected	
8	A-Line	Negative RxD/TxD according to RS485 specification
9	Not connected	

Node address

Node address is set with the two rotary switches on the Field bus 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 coloured LED's, used for debugging purposes. The function of the LED's is described in the table and figure below.

Name	Colour	Function
Field bus diagnostics (LED 4)	Red	Indicates certain faults on the Field bus side.
		Flashing Red 1 Hz - Error in configuration: IN and/or OUT length set during initialisation of the module is not equal to the length set during configuration of the network.
		Flashing Red 2 Hz - Error in user parameter data: The length/contents of the user parameter data set during initialisation of the module is not equal to the length/contents set during configuration of the network.
		Flashing red 4 Hz– Error in initialisation of the ProfiBus communication ASIC.
		Turned off - No diagnostics present
On-Line (LED 2)	Green	Indicates that the module is On-Line on the Field bus.
		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 Field bus.
		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

13.5.7   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 organisation, the Open DeviceNet Vendor Association (ODVA) that assists members in matters concerning DeviceNet. Website: http://www.ODVA.org

The media for the Field bus 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
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 / sec. 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
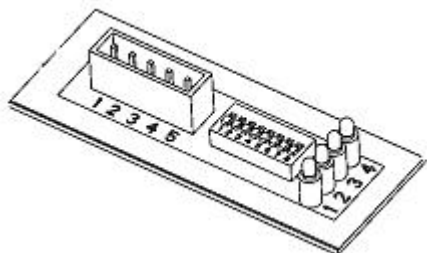
LED 1: Not used

LED 2: Network status

LED 3: Module status

LED 4: Not used
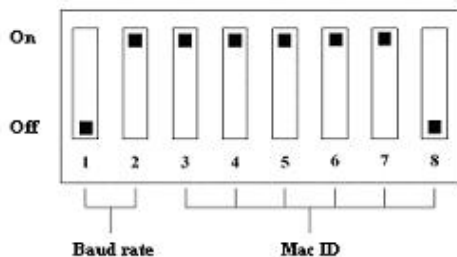
On = 1

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.

Field bus 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 the 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 colours LED's, used for debugging purposes.

LED number	Function	Information	Condition
1	Not in use		
2	Network status	Not powered / Not on line	Off
2	Network status	Link OK on line. Connected	Steady green
2	Network status	Critical link failure	Steady red
2	Network status	On line not connected	Flashing green
2	Network status	Connection time out	Flashing red
3	Module status	No Power	Off
3	Module status	Unrecoverable fault	Steady red
3	Module status	Minor fault	Flashing red
3	Module status	Device operational	Steady green
4	Not in use		

Bus termination

The termination of the Field bus 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

13.6   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 organisation called the InterBus Club. The organisation assists members on a wide variety of matters concerning InterBus. For more information, contact the InterBus Club: http://www.interbusclub.com

The media used by InterBus is a shielded copper cable consisting of three twisted pairs. Two of these pairs are used for the bus connection and in the last pair only one cable is used. This cable is used to earth the bus. The baud rate for the bus is 500 Kbit/s with a total amount of data of 4096 I/O points.

The 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.
Field bus 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

Hardware
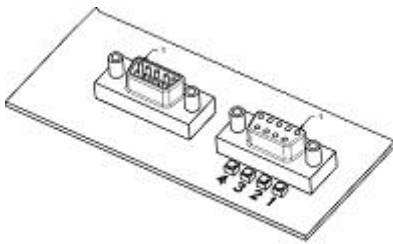
LED 1 = RBDA (Remote Bus Disable)

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

13.6.1   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 organisation called Modicon Inc.

Modbus-IDA

General technical questions regarding the Field bus 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.
Field bus 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 will not initiate any point-to-point communication to other nodes, it will only respond to incoming commands. It can although broadcast global data to all nodes on the network.

Protocol and supported functions

ModBusPlus has two ways of exchanging data. One through fast cyclic I/O data called global data, and one through a somewhat slower ModBusPlus protocol for point-to-point parameter data transfer. The maximum global data is 32 words on the bus. The point-to-point data transfer is handled by using one of the following ModBus functions read holding registers, preset single register and preset multiple registers all 40000 registers.

ModBusPlus module information

Variable	Limits	Information
Node Address	1 - 64	The node address cannot be changed during operation.
Source Address	1 - 64	The 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.

Variable	Limits	Information
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
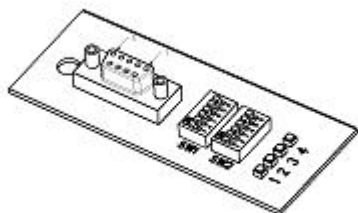
LED 1: Not used

LED 2: Error

LED 3: MBP Active

LED 4: MBP Init

Functionality of the indication LED's

The module is equipped with four coloured 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 initialised Turned Off - peer interface is not initialised

Field bus 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 Field bus 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 Field bus module, this enables address settings from 1-64 in binary format. If the set source address is from SW2, ModBusPlus takes SW source address regardless of hardware switch position.

1 (MSB)	2	3	4	5	6 (LSB)	Function
ON	ON	ON	ON	ON	ON	Source address set to 1
ON	ON	ON	ON	ON	OFF	Source address set to 2
ON	ON	ON	ON	OFF	ON	Source address set to 3
-	-	-	-	-	-	-
OFF	OFF	OFF	OFF	OFF	ON	Source address set to 63
OFF	OFF	OFF	OFF	OFF	OFF	Source address set to 64

    ⓘ   **The source address cannot be changed during operation.**

Icon file

It is not necessary for ModBusPlus to install a special file to recognise our product and it does not support icon files.

13.6.2　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 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.

Supported Field bus 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 Field bus 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 The data length is in PF limited to 200 bytes. ModBus/TCP and EtherNet/IP standard allows 1024 bytes data.	This address is based on words.
	0000h + I (I = 0, 1, …) From PF 4000h + I (I = 0, 1, …) To PF The data length is in PF limited to 200 bytes. ModBus/TCP and EtherNet/IP standard allows 1024 bytes data.	This address is based on bits
EtherNet/IP assembly instance	Input 100, output 150, configuration 5 and size = 0	This is used to configure a EtherNet/IP module
Data to PF total length	0 - 200 bytes The data length is in PF limited to 200 bytes. ModBus/TCP and EtherNet/IP standard allows 1024 bytes data.	Must be the same in PF and PLC.
Data from PF total length	0 - 200 bytes The data length is in PF limited to 200 bytes. ModBus/TCP and EtherNet/IP standard allows 1024 bytes data.	Must be the same in PF and PLC.

Field bus 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

13.6.3   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).
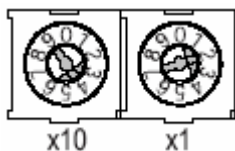
Indicators

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

13.6.4   Profibus-IO

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 a 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 will 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	On line, Run Connection with IO Controller established IO Controller is in Run state
		Green, 1 flash	On line, 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 Field bus module
		Red, 1 flash	Configuration Error Too many modules/submodules 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

ConnectorRJ45 standard Ethernet connector is used
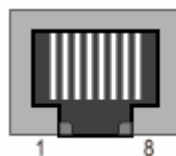
13.6.5   FL-Net

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 will update.

- 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

ConnectorRJ45 standard Ethernet connector is used
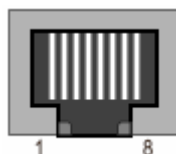
Address dipswitch

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.

14   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.

At a large automotive plant, to assure the tightening quality, a new pre-assembly station required communication between the Atlas Copco tightening system and the mechanical fixture. This would normally have required a PLC. The PF 4000, with its integrated Logic Configurator, solves the problem by offering basic PLC functions.

The Logic Configurator consists of up to 10 different so called Logic Sets, each denoted with a number (1 to 10, automatically chosen) and a name (25 positions, editable).

Each Logic Set consists of;

- the inputs, i.e. selectable events from the Relay status array and the DigIn status arrays

- the Instruction list, i.e. the logic gates

- the 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 Relay or DigIn are of the type tracking or pulse. The pulse types are reset after one tick. Example; OK relay is pulsed after an OK tightening and goes low after 100 ms. Reset batch input is pulsed when activated and goes low after 100 ms.**

14.1   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 an air cylinder. The position "work piece fixtured" is detected by a second proximity switch.

When the tow 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 alight t indicate the OK result to the operator.
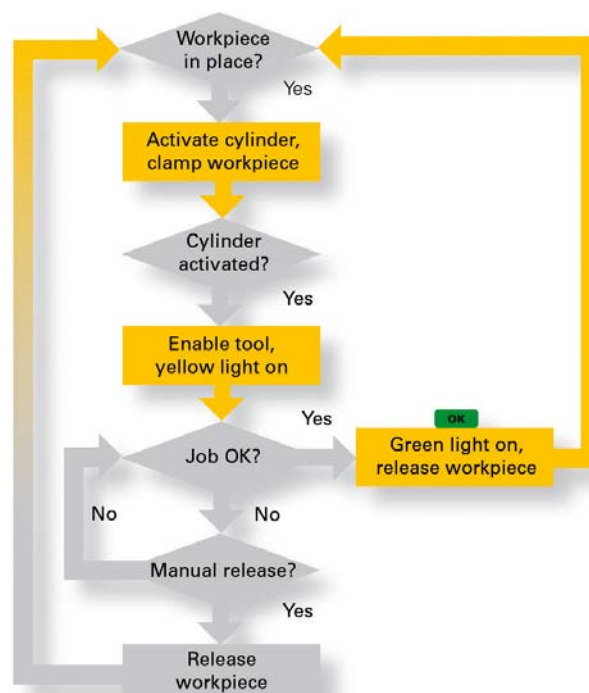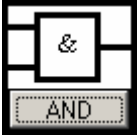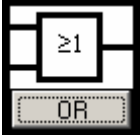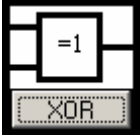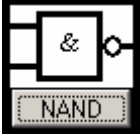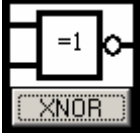
14.2 Logic operators and function blocks
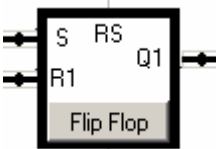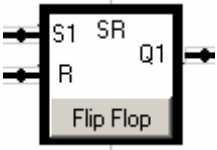
14.2.1 Abbreviations
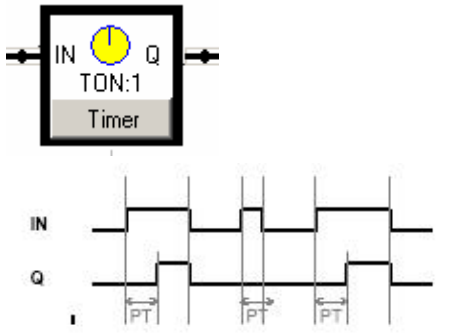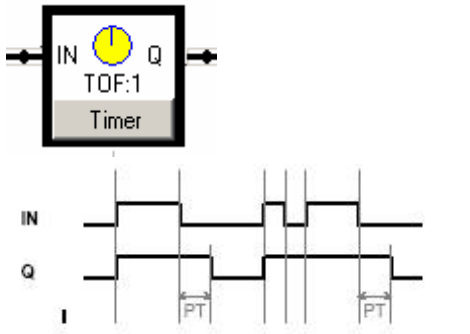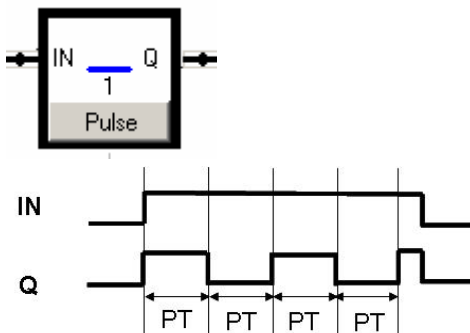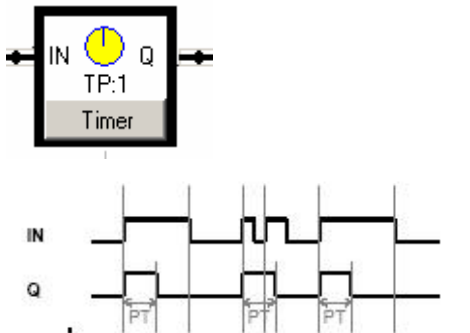
Abbreviation	Description
AND	Logical AND operator
OR	Logical OR operator
NAND	Logical NAND operator
NOR	Logical NOR operator
XOR	Logical XOR operator
XNOR	Logical XNOR operator
TON	Timer ON
TOF	Timer OFF
TP	Timer Pulse
DELAY	Delay
TPR	Timer pulse Reset
CTU	Counter up
CTD	Counter down
CTUD	Counter up down
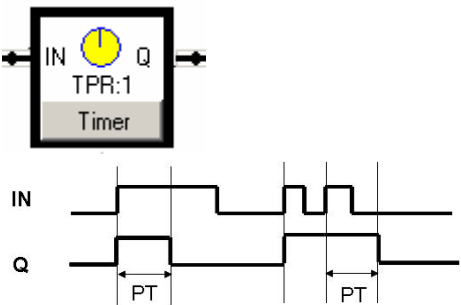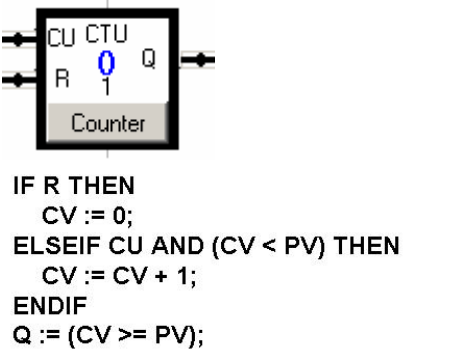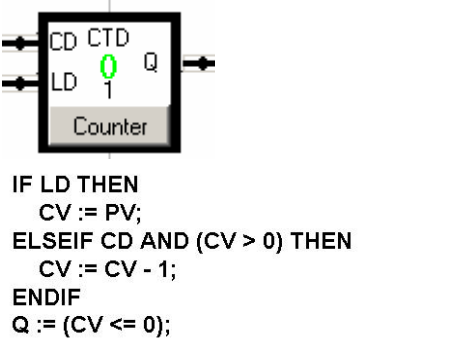
14.2.2   Logic gates

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
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
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
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
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

14.2.3   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 pulse 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 is forced low, and stays low when R1 goes inactive. If both R and S are high, the output Q1is forced to 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)	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 S1 receives a positive pulse while R is low, then the Q1 output goes high, and stays high when S returns low. If R is pulsed high while S1 is held low, then the Q1 output is forced low, and stays low when R returns low. If both R and S are set high, the output Q is forced to low; since priority is given to the R input. **S R1 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
	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.
	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.
	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.
	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 / 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.

14.3 Logic Configurator setup

The first step to program the Logic Configurator is to open a Logical Set.

Right-click **Logic Configurator** in the PF Map and select **Create new Logic Configurator**.
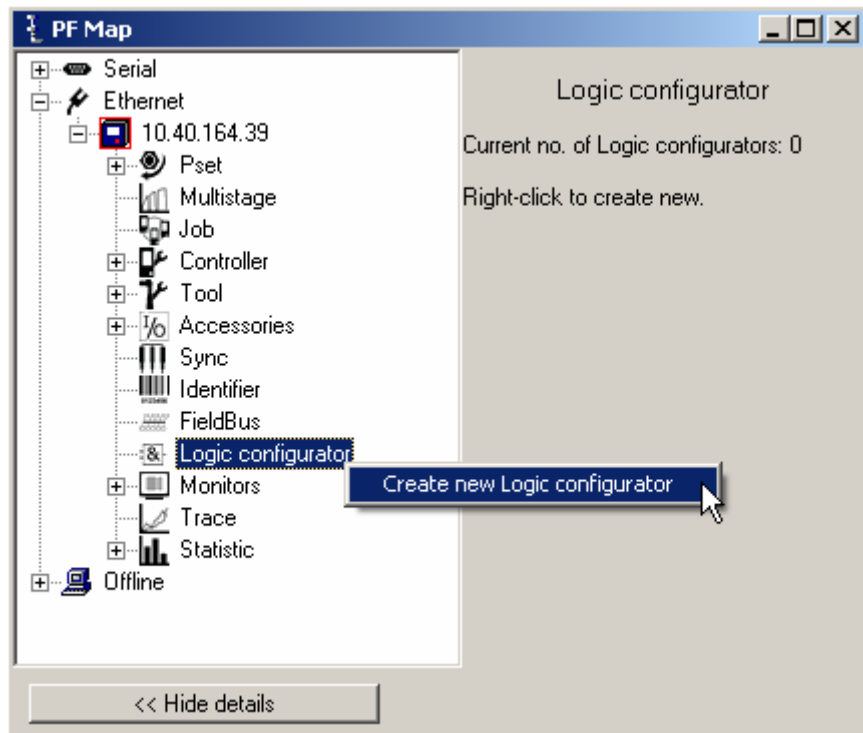
ToolsTalk proposes an ID no. for the new Set, but this can also be chosen by the user.

Select a name that relates to the function the Logical Set should have.

Click **OK** to confirm.

A warning appears.

Click **OK**.
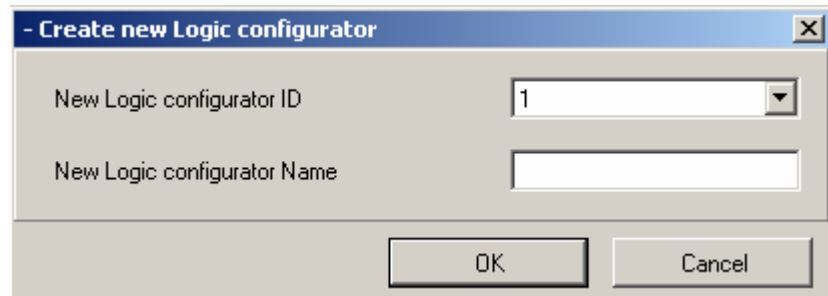
A new window appears where the next step is to define the number of inputs for the Logical Set.
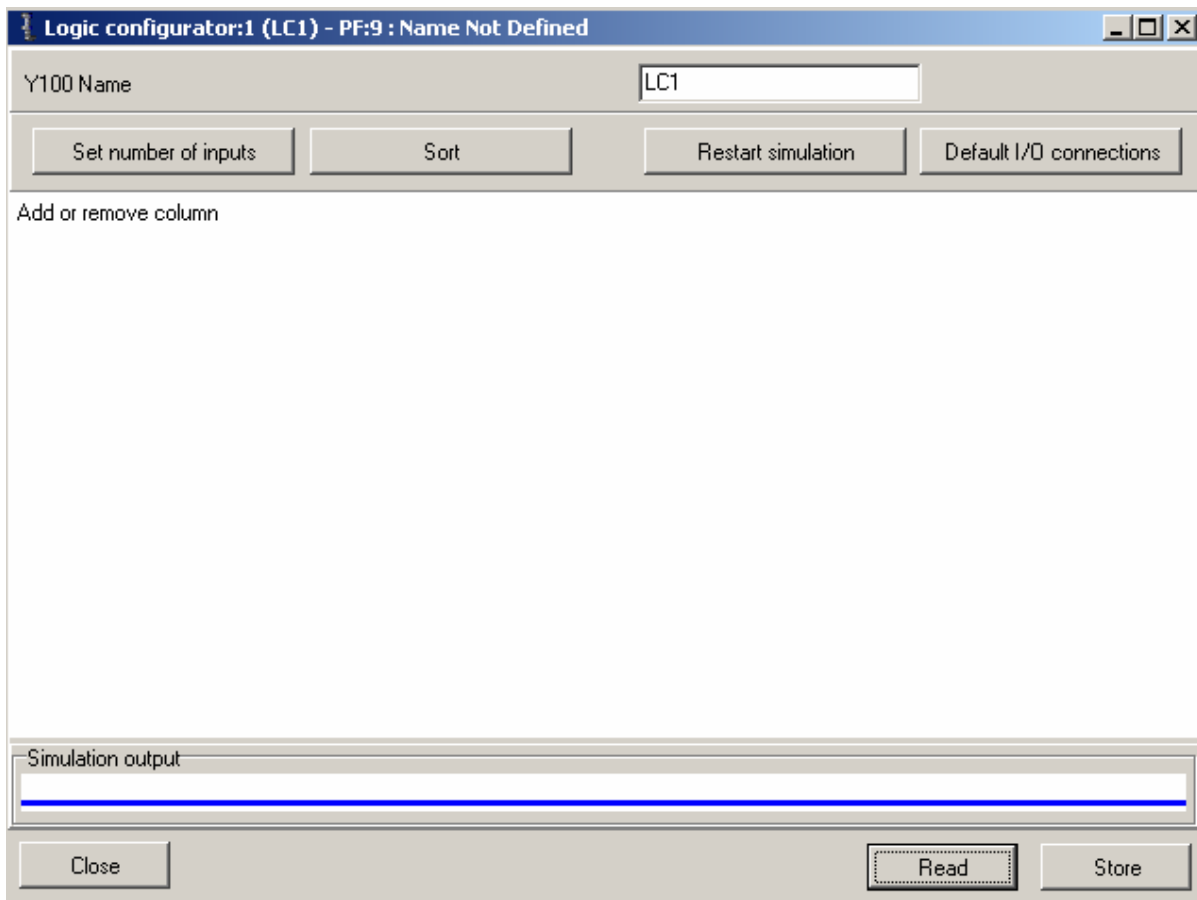
Click **Set** number of inputs.
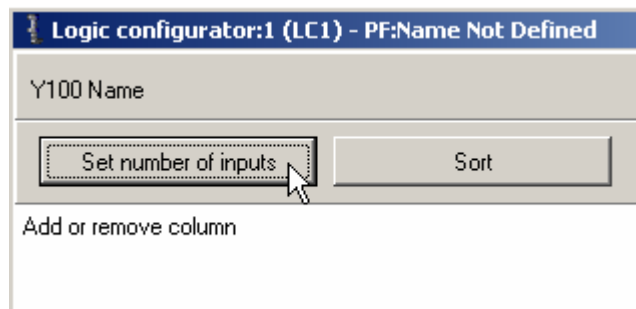
Move the slide bar (or type number directly) to set an input count.

Click **OK**. A new window appears that shows the layout of the Logical Set 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.
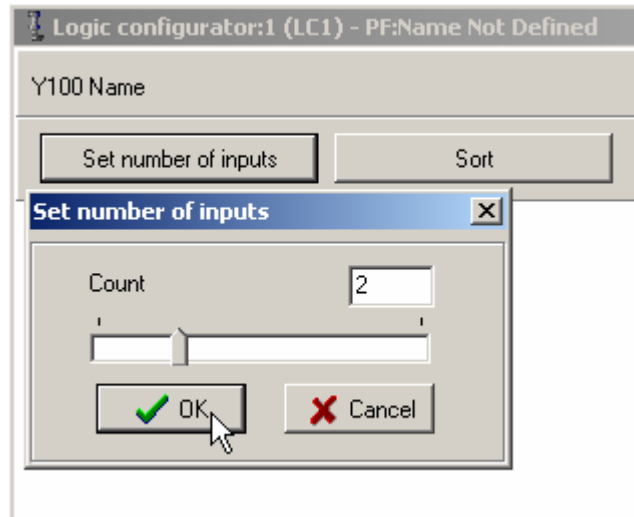
Let's start with the inputs. Click on the **Input** key to select the input event. By selecting Digital input from the first drop-down menu, the events tied to the inputs of the Power Focus can be reached.

If choosing Digital outputs, the list of events will contain the signals generated in the Power Focus.
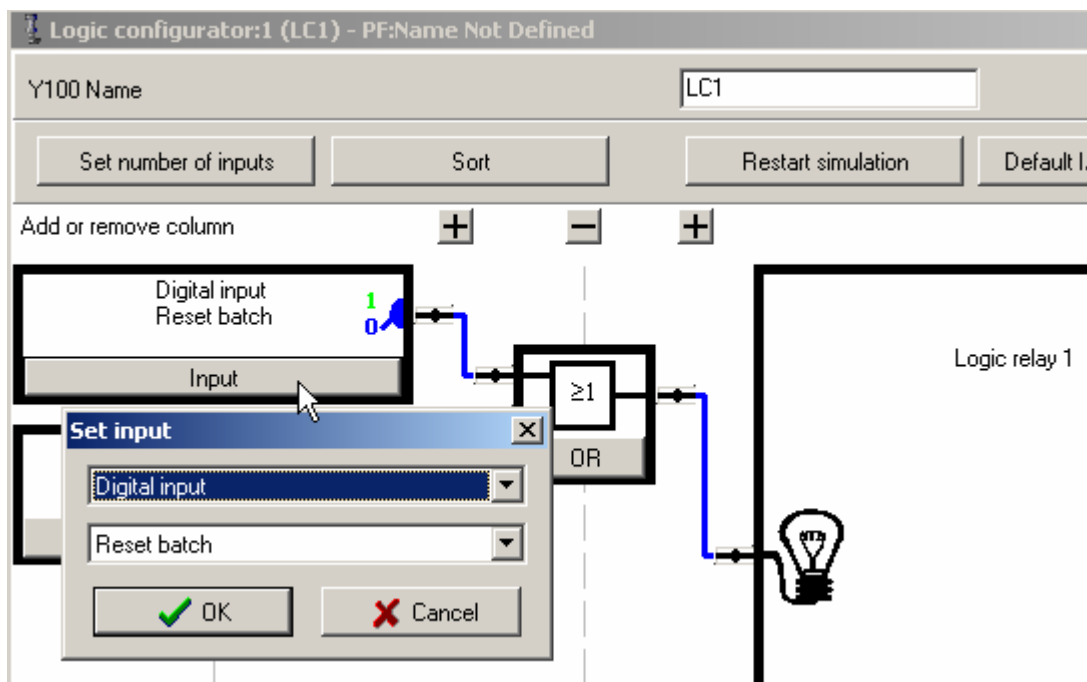
Next, let's define what the output signal of the Logical Set should be used for.

If the output signal should be used as input to another Logical Set, or be put out directly on a physical Relay, no action is required in this window. The output signal from the Logical set is automatically labelled "Logic Relay #", where "#" is the number of the Logical Set. 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 Logical set 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.
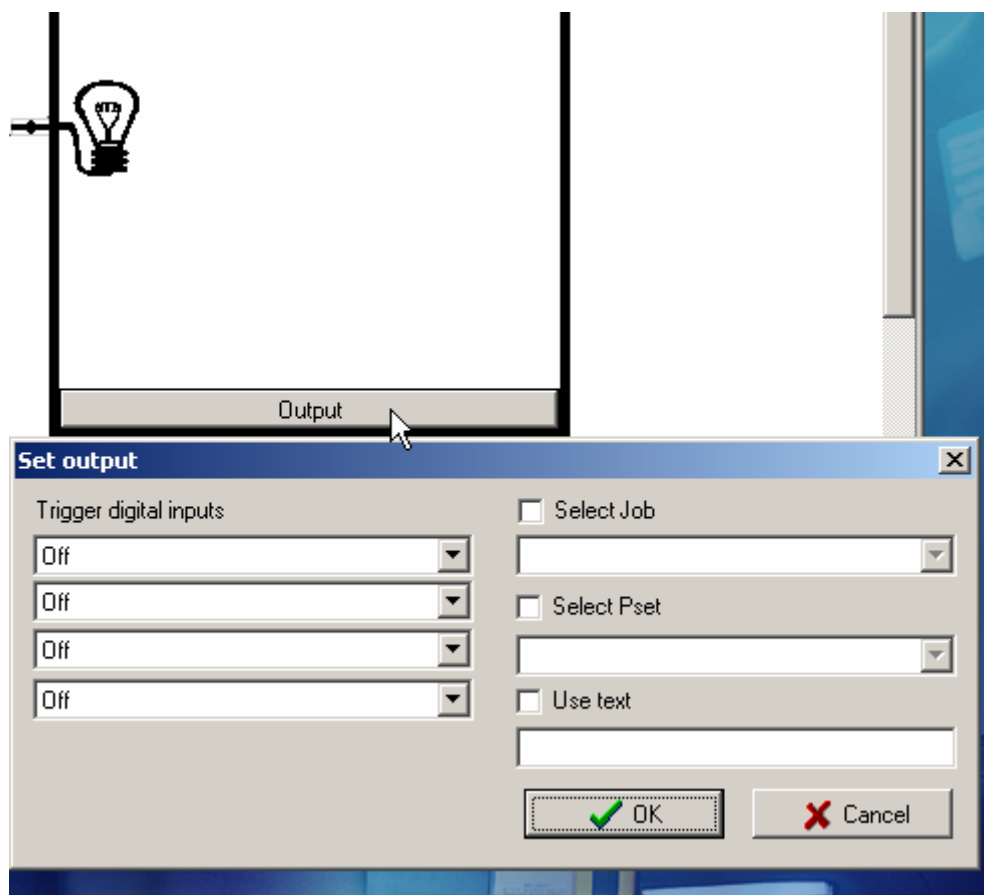
Now the logical grid remains to be set up.

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.

Click on the **Plus** icon to insert a new element. (Click on the **Minus** icon to delete an added element.)
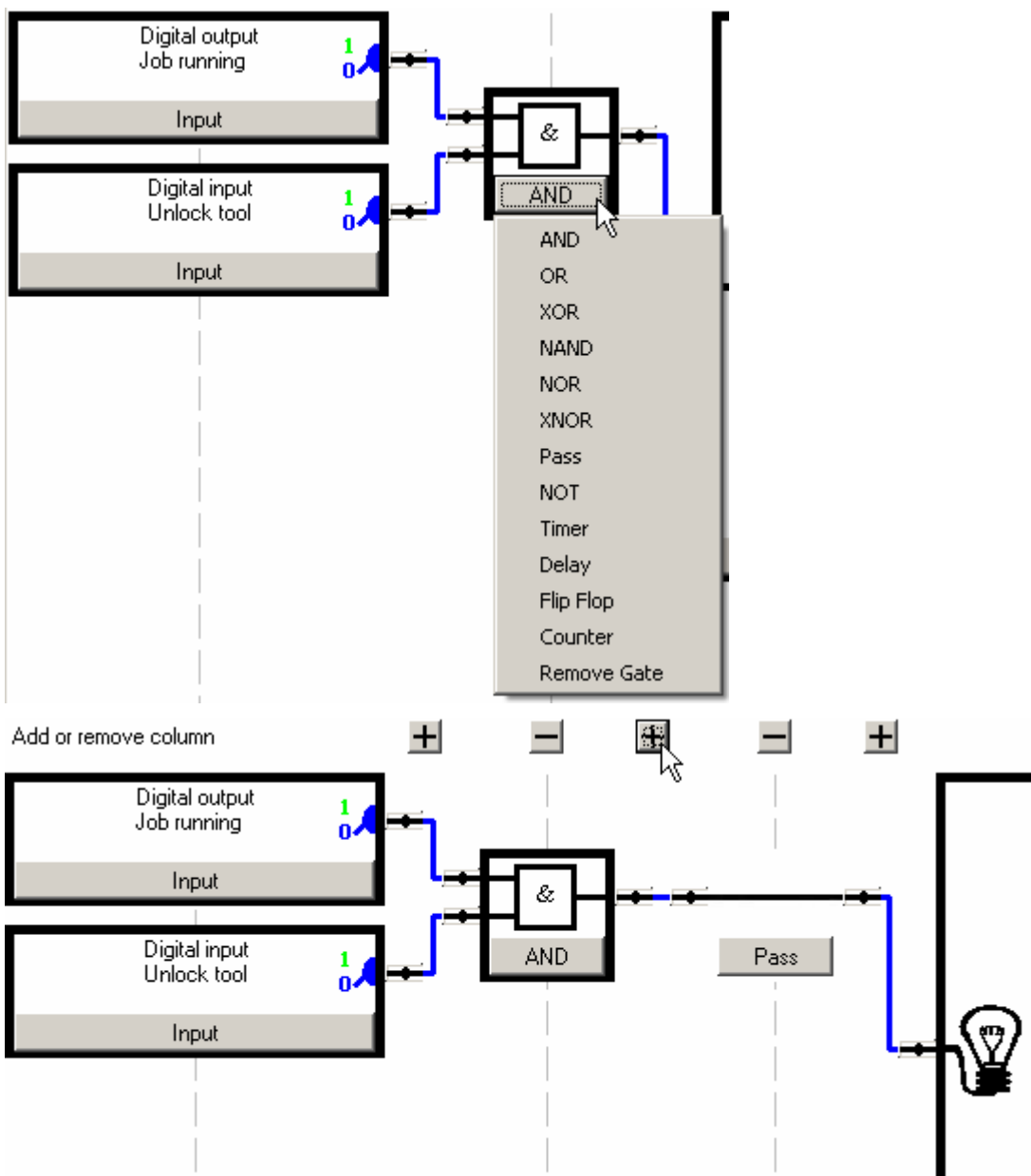
14.3.1   Simulation

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 colours of the connections in the logical grid changes colour – 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.
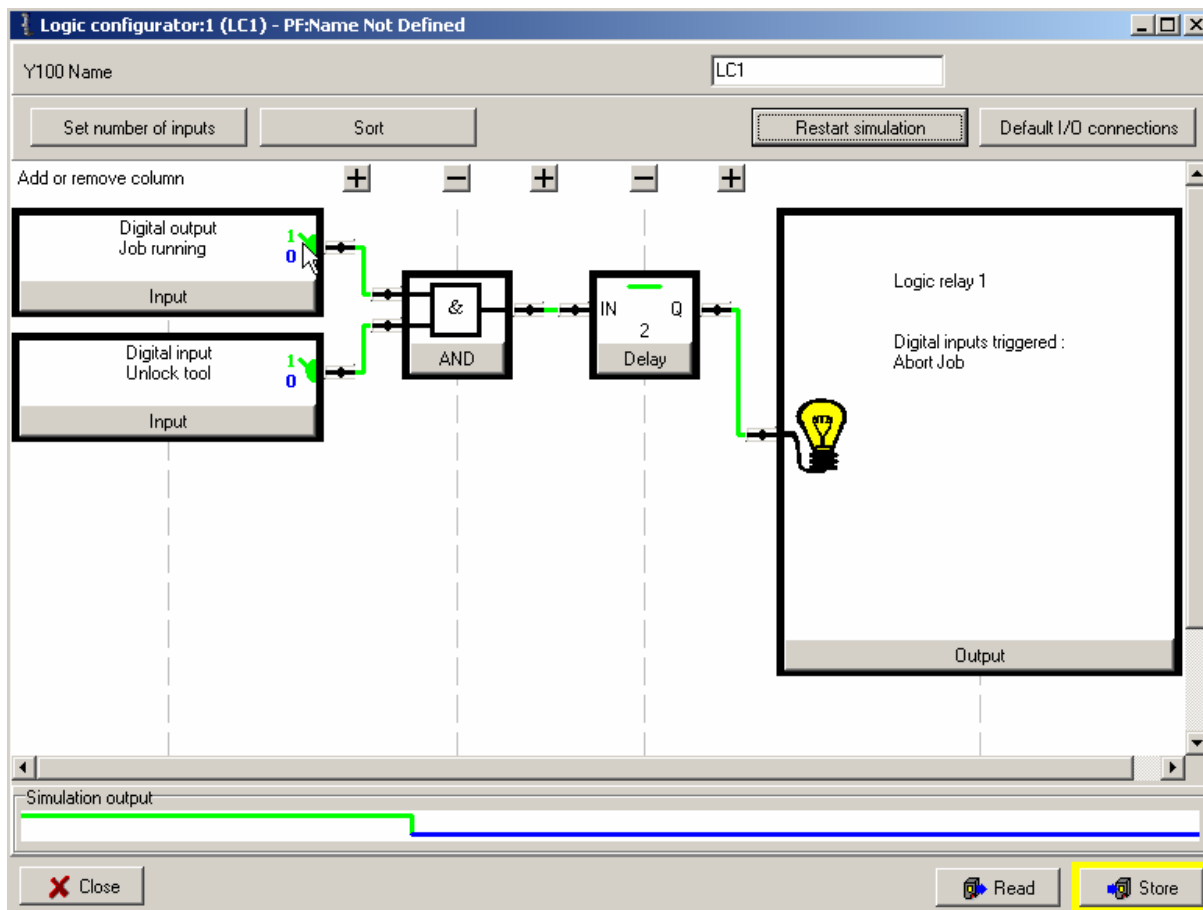
15   Monitors

ToolsTalk PF provides a number of monitors designed to present extensive information about the various functions of Power Focus (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.

There are different ways 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**.

15.1   Result Monitor

In the PF Map **Monitor** branch, double-click on **Result Monitor**.
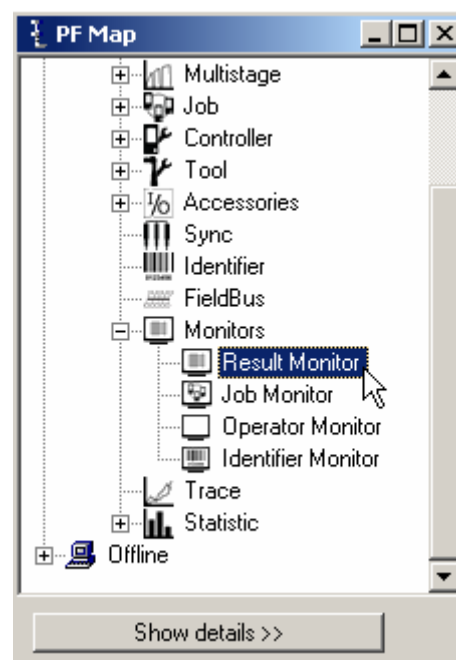
The **Result Monitor** presents the latest tightening results from the Power Focus and the used Pset.

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.
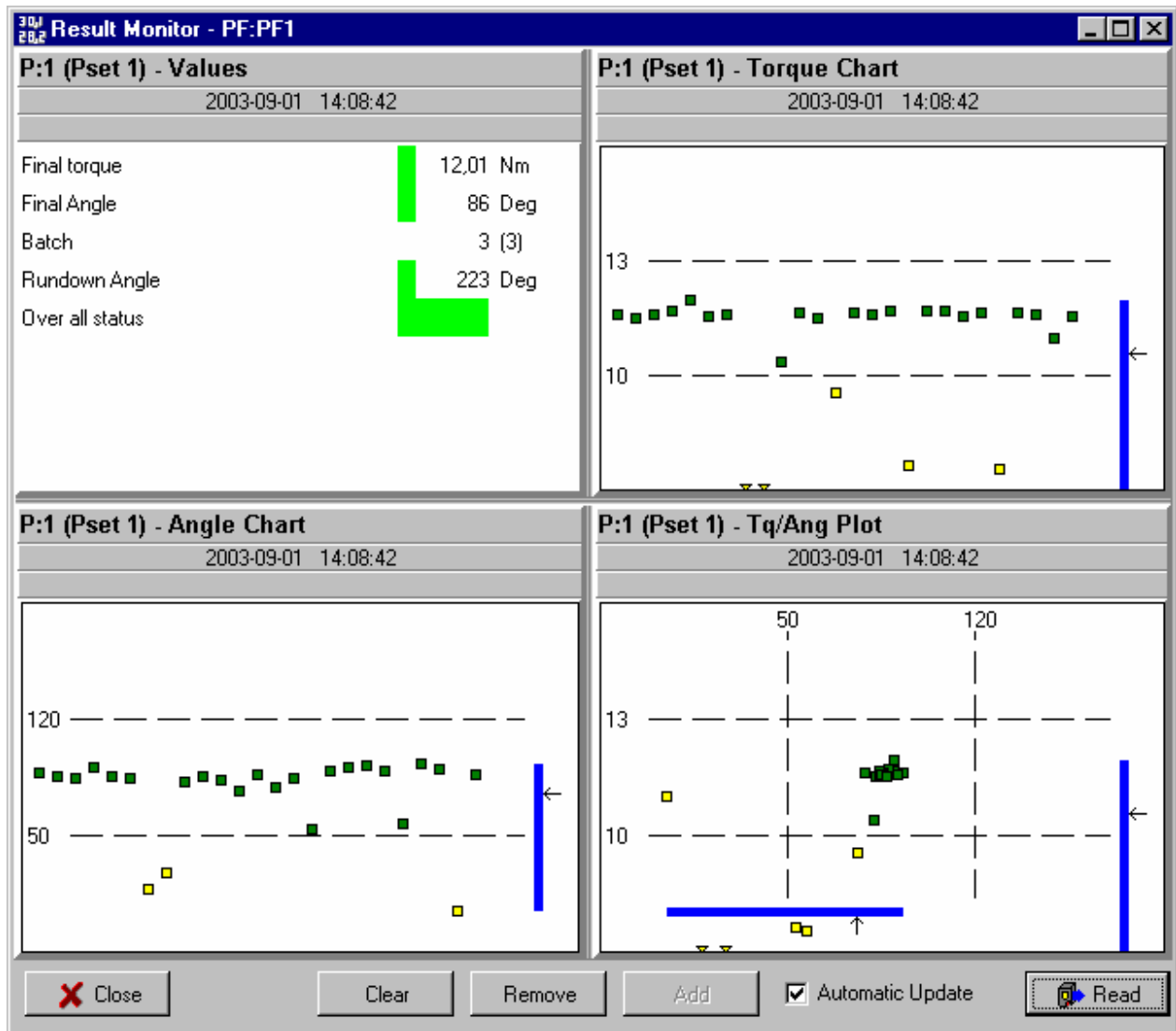
15.2   Job Monitor

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 chapter *Job*.
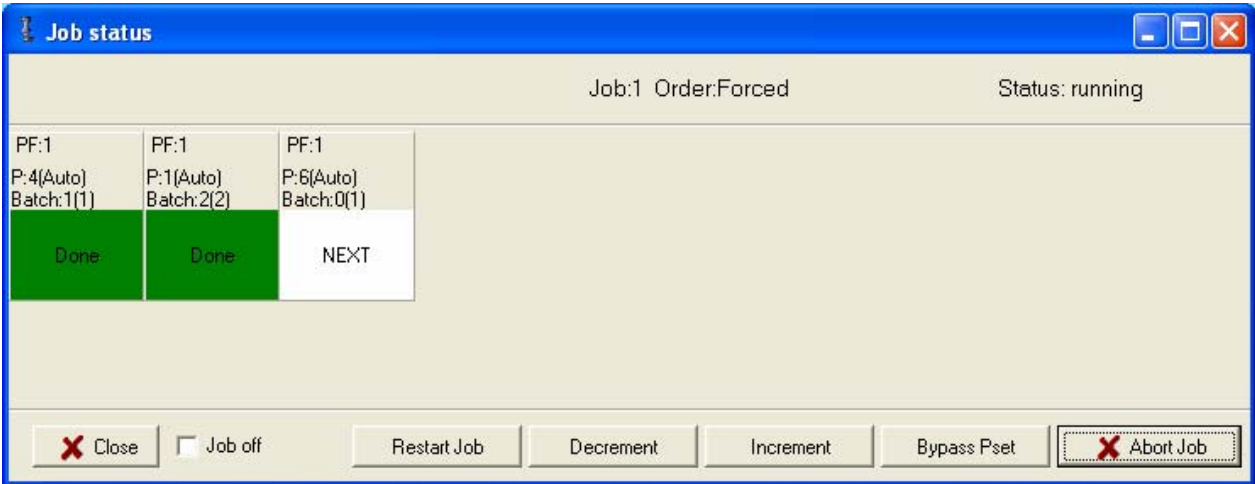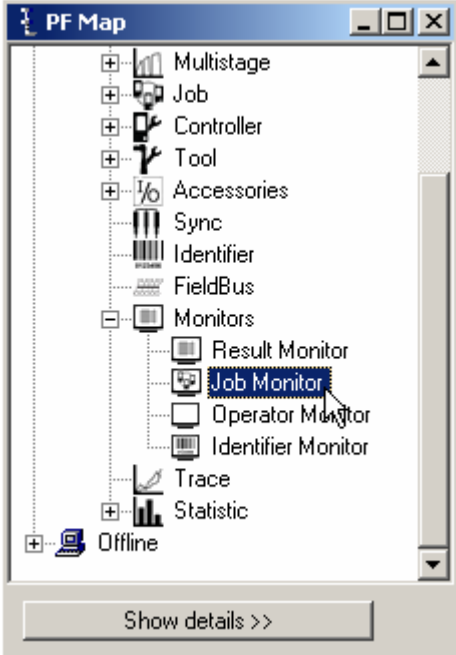
15.3   Operator Monitor

In the PF Map **Monitor** branch, double-click on **Operator Monitor**.
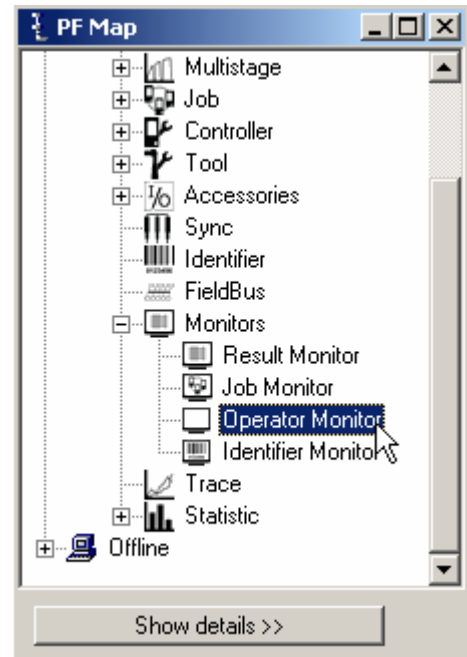
Select **Operator Monitor**.

Click **OK** and the monitor appears (see figure and table on next page).
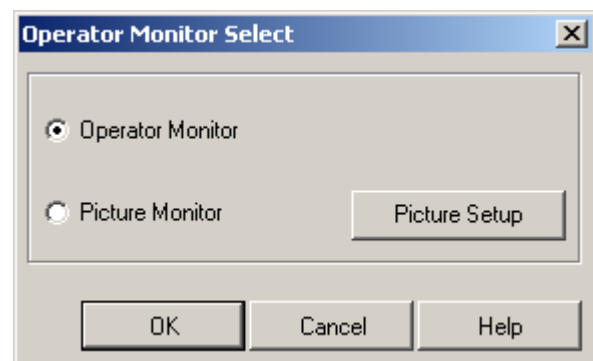
Part	Description
PF name	Name of the PF.
Pset	Pset used to perform the tightening.
VIN	Vehicle Identification Number.
Overall status	Indicator for the overall status of the tightening.
Final torque	Final torque of the tightening.
Final torque status	Status-indicator for final torque. (yellow-low/ green-OK/red-high)
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**.
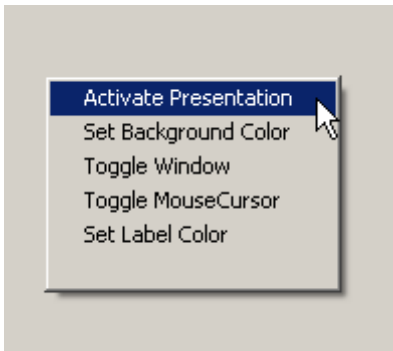
Option	Description
Activate presentation	User preferences for the content of the operator monitor.
Set background Color	The option to set the background colour of the operator monitor.
Toggle window	
Toggle mouse cursor	
Set label colour	Option of setting the label colour for the operator monitor.

Choosing **Activate Presentation** the user customises the information shown in the Operator Monitor by checking the boxes.

Click **OK**.
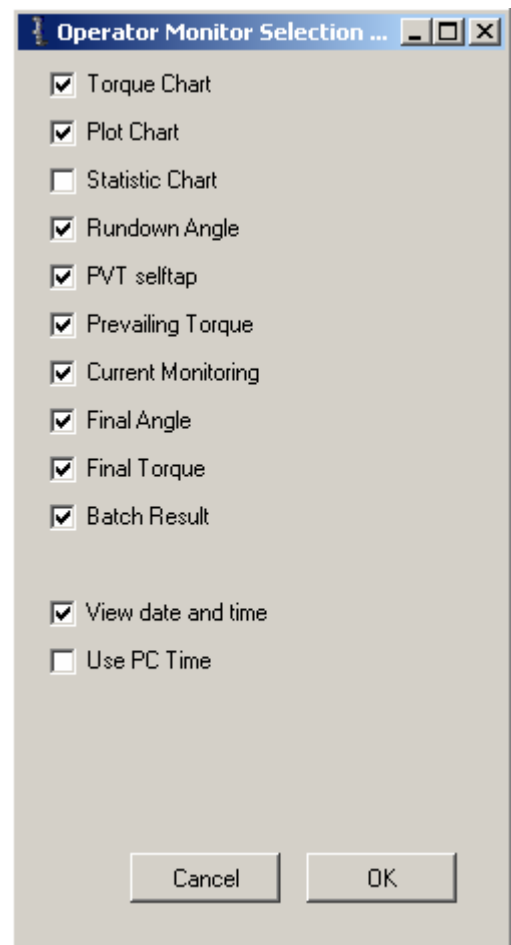
15.3.1 Picture Monitor

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.**
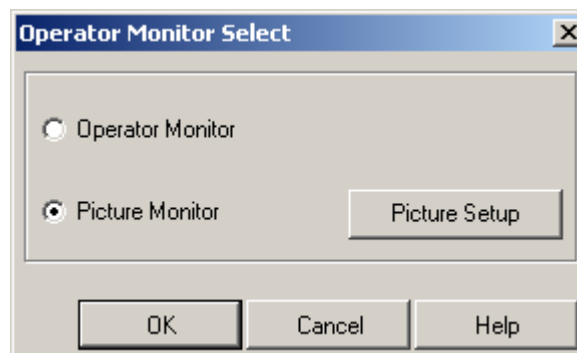
To import saved settings for the picture monitor, click **Read from file**.

To save the settings click on **Store to file**. A save as-window will appear and the user can choose where to store the file containing the settings.

When finished click **OK**.
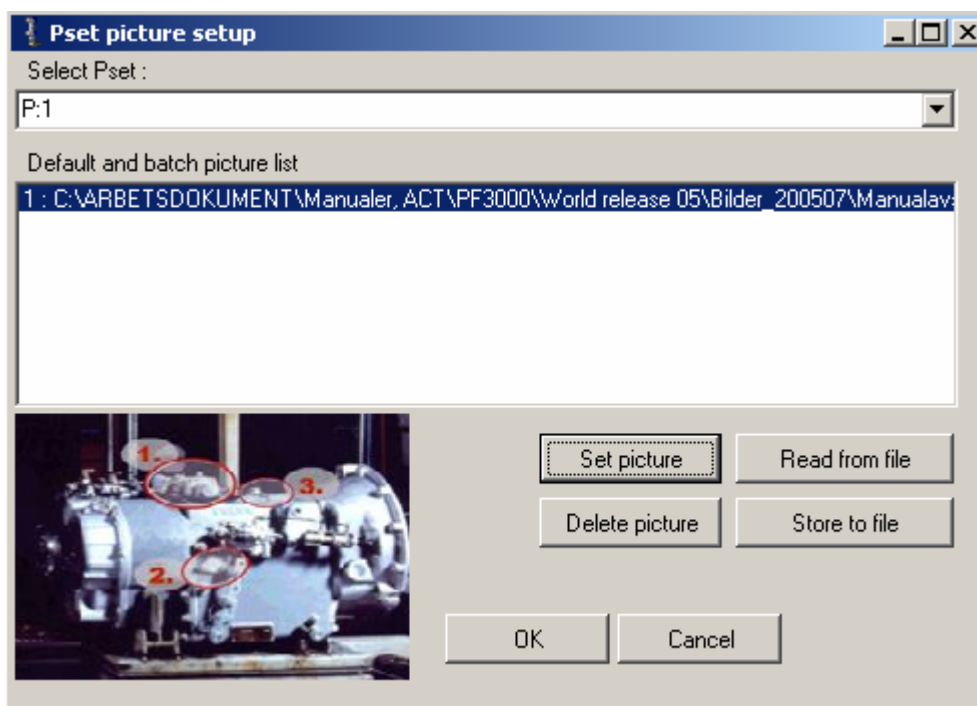
15.4   Identifier Monitor

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 chapter *Identifier*.

(i)   **In the example below, all Identifier input sources are set to "Ethernet/serial".**
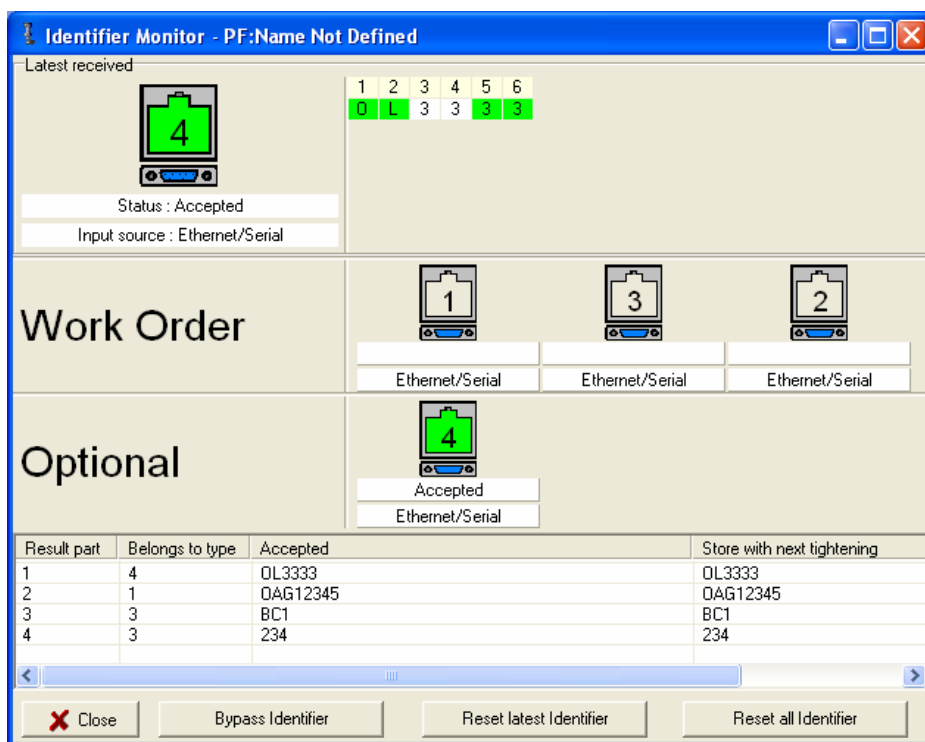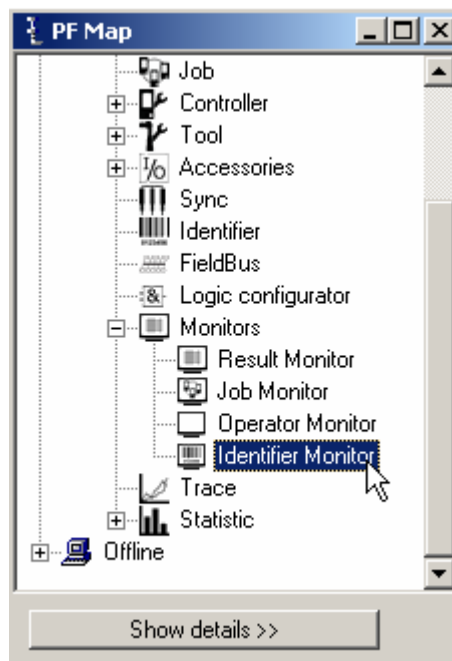
Function	Description
Bypass identifier	Skips a specified identifier type in a work order.
	If a type is not included in the work order, bypassing the first type in the work order is not possible.
Reset latest identifier	The latest accepted identifier string is cleared with the command (or digital input) "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".

15.5 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 result**.
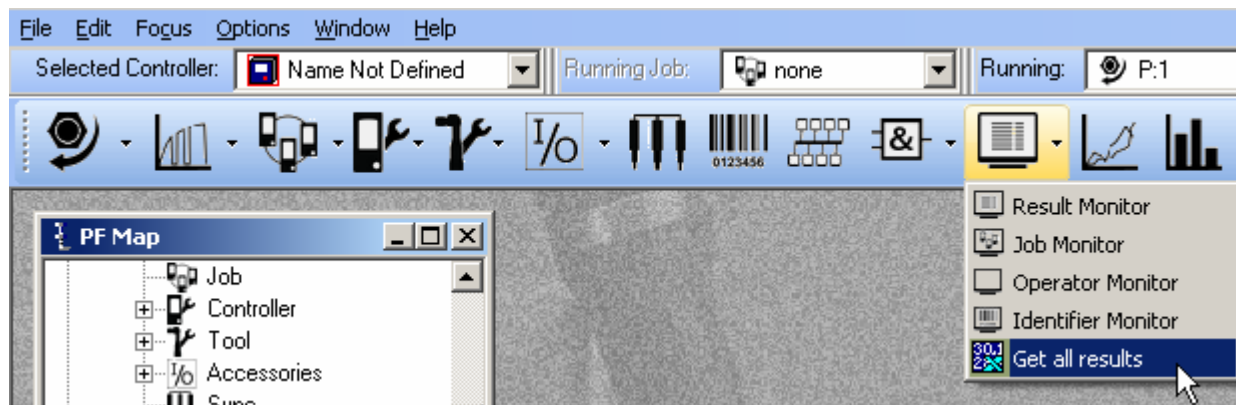
Choose a specific Pset or Multistage and click **OK**.
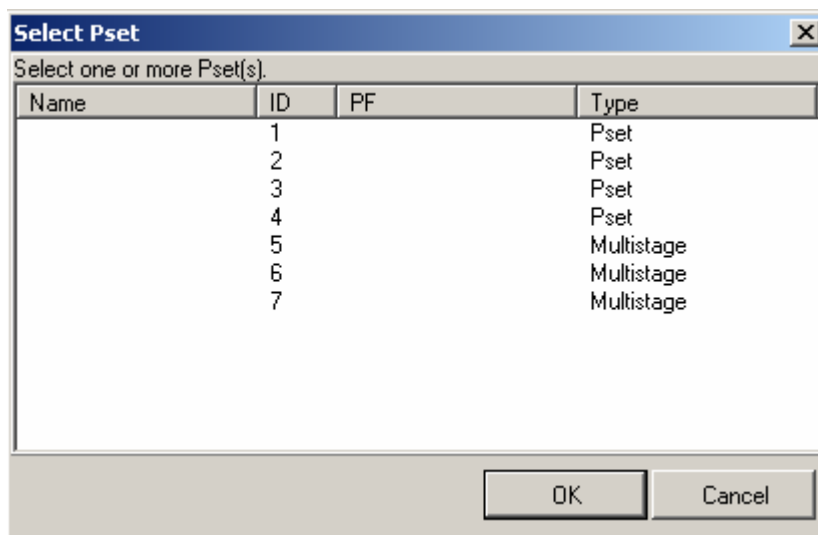
The tightening results from that Pset/Multistage appear. Picking up data will take some time depending on the type of connection and the number of results.

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.
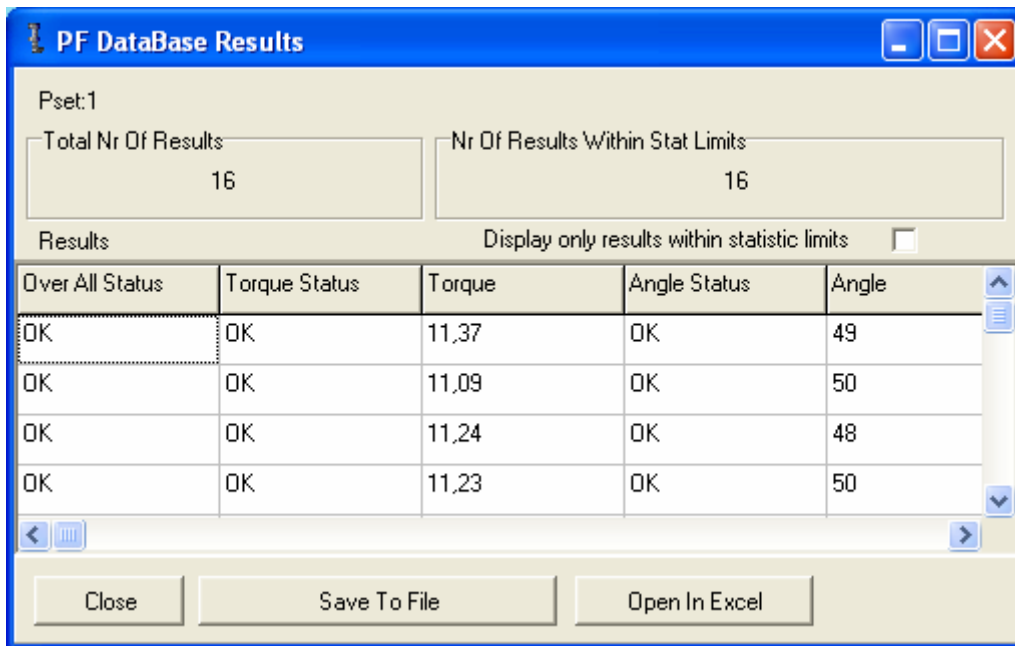
16   Trace

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.
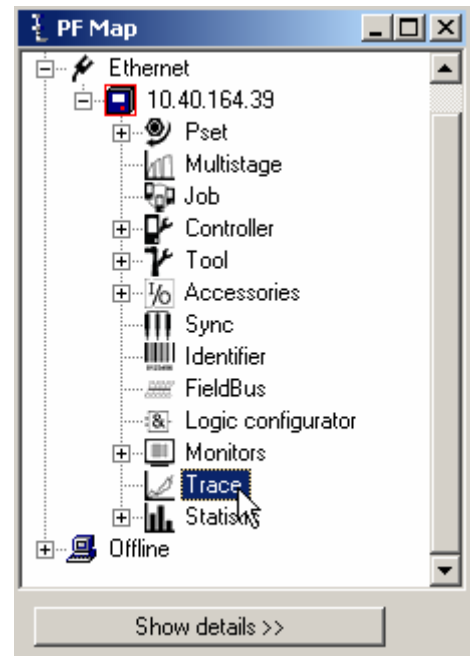
The trace window appears.

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**.

With **Angle offset** selected, Trace views graph from *Start final angle [P120]* torque value. If deselected, Trace views graph from *Cycle start [P110]* torque value.

With **Auto update** selected the charts will automatically update as new tightening data arrives. If deselected, the user can choose between viewing; latest, latest OK, second latest OK, third latest OK, latest NOK, second latest NOK, and third latest NOK tightening (NOK is an acronym for not OK).

The **Limits** function allows the user to customise the limits in the chart. The selections are min max, selftap, PVT, rundown and CM.
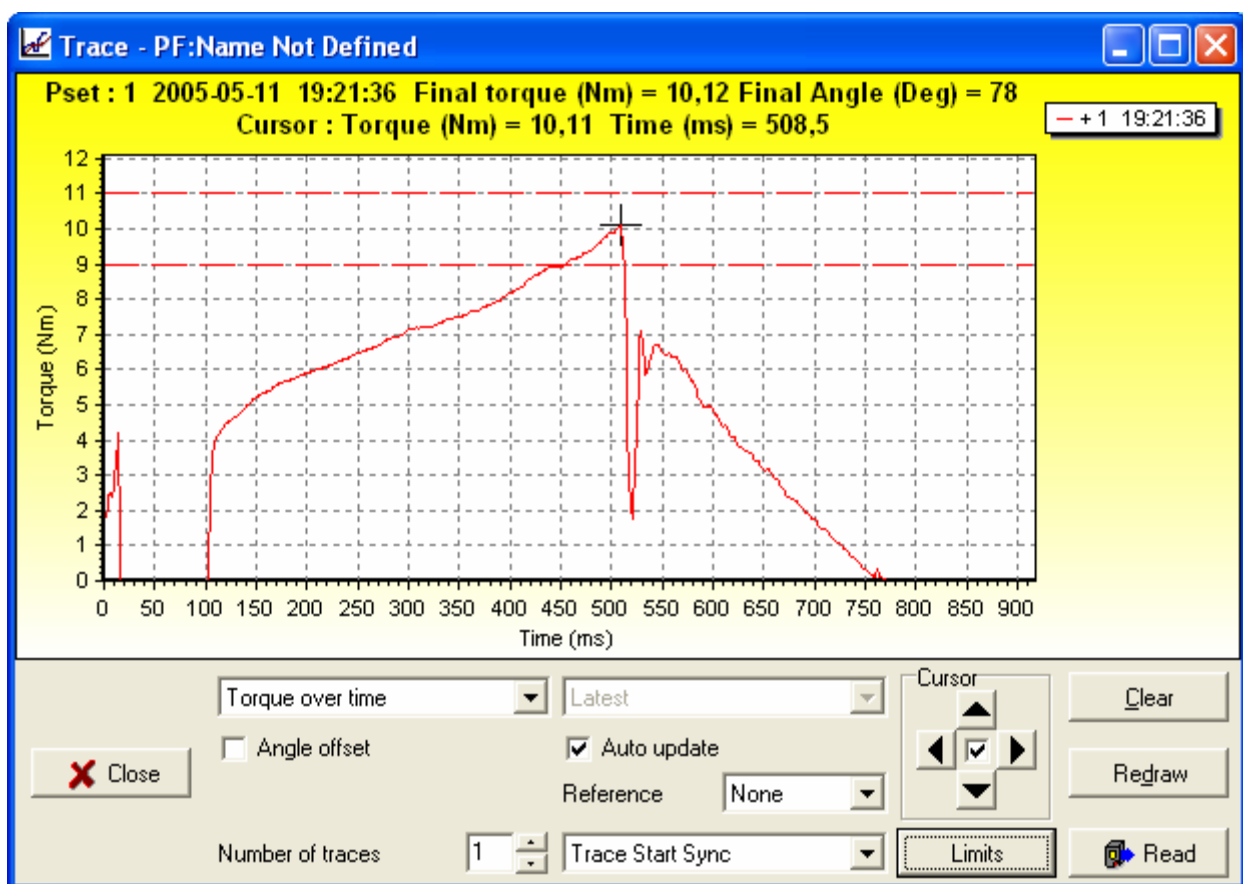
17   Statistic

17.1   Statistic in Power Focus

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

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 analysed Pset.
Min	Lowest result in analysed Pset
Max	Highest result in analysed Pset
R	Range (Max - Min)
Low	% low tightenings in analysed Pset
OK	% OK tightenings in analysed Pset
High	% high tightenings in analysed Pset
$\overline{X}$	The mean value for the selected Pset
σ	Sigma. Shows the calculated standard deviation.
$\overline{X}$ -3 σ	Mean - 3 sigma
$\overline{X}$ +3 σ	Mean + 3 sigma
6 σ	6 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
$\bar{x}$	Mean value for the latest completed subgroup
σ	Sigma for the latest completed subgroup
Other definitions	**Description**
$\bar{R}$	Mean of subgroup range (number of subgroups)
$\bar{\bar{X}}$	Mean of subgroup mean (number of subgroups)

17.1.1   Statistical process control (SPC)

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

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

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

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

17.1.2   Statistic alarm

$\bar{x} > \text{UCL}$

$\bar{x} < \text{LCL}$

$R > \text{UCL}$

$R < \text{LCL}$

$Cp < 2.0$

$Cpk < 1.33$

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

17.1.3   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 $\overline{R}$ ± 2 sigma (sigma for the whole population)

Point = subgroup

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

17.1.4   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.

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

Power Focus calculates recommended values. 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.

17.1.6   Calculation formulas

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

$Range = R = Max - Min$

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

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

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

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

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

Tightenings

X_1 X_2 X_3 X_4 X_5

X_6 X_7 X_8 X_9 X_{10}

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

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

X_{i+10} X_{i+11} X_{i+12} X_{i+13} X_{i+14}

$X_{i+.....}$

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

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

Subgroup size = Group size = z

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

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

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

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

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

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

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

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

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

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

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

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

17.1.7 Constants for calculation of SPC variables

Sub group size	Divisors for estimation of standard div.		Factors for control limits					
N	D₂	C₄	A₂	D₃	D₄	A₃	B₃	B₄
2	1.13	0.798	1.88	-	3.27	2.66	-	3.27
3	1.69	0.886	1.02	-	2.57	1.95	-	2.57
4	2.06	0.921	0.73	-	2.28	1.63	-	2.27
5	2.33	0.940	0.58	-	2.11	1.43	-	2.09
6	2.53	0.952	0.48	-	2.00	1.29	0.03	1.97
7	2.70	0.959	0.42	0.08	1.92	1.18	0.12	1.88
8	2.85	0.965	0.37	0.14	1.86	1.10	0.19	1.82
9	2.97	0.969	0.34	0.18	1.82	1.03	0.24	1.76
10	3.08	0.973	0.31	0.22	1.78	0.98	0.28	1.72
11	3.17	0.975	0.29	0.26	1.74	0.93	0.32	1.68
12	3.26	0.978	0.27	0.28	1.72	0.89	0.35	1.65
13	3.34	0.979	0.25	0.31	1.69	0.85	0.38	1.62
14	3.41	0.981	0.24	0.33	1.67	0.82	0.41	1.59
15	3.47	0.982	0.22	0.35	1.65	0.79	0.43	1.57
16	3.53	0.984	0.21	0.36	1.63	0.76	0.45	1.55
17	3.59	0.985	0.20	0.38	1.62	0.74	0.47	1.53
18	3.64	0.985	0.19	0.39	1.61	0.72	0.48	1.52
19	3.69	0.986	0.19	0.40	1.60	0.69	0.50	1.50
20	3.74	0.987	0.18	0.42	1.59	0.68	0.51	1.49
21	3.78	0.988	0.17	0.42	1.58	0.66	0.52	1.48
22	3.82	0.988	0.17	0.43	1.57	0.65	0.53	1.47
23	3.86	0.989	0.16	0.44	1.56	0.63	0.55	1.46
24	3.90	0.989	0.16	0.45	1.55	0.62	0.56	1.45
25	3.93	0.990	0.15	0.46	1.54	0.61	0.57	1.44

18   Connecting devices

ⓘ **RS232 port 1 is only recommended for low speed communication. Highest recommended baud rate is 4800. RS232 port 2 is recommended for high speed communication such as open protocol. The ToolsTalk PF software must be connected to RS232 port 2.**

18.1   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	Initialise printer	25	Ground
8	Data bit 6	17	Select input		
9	Data bit 7	18	Ground		

18.2   Serial RS232 #1

Connector: 9-pin D-sub female

Function: RS232 serial

Pin	Function
1	Not used
2	RD, Receive data
3	TD, Transmit data
4	Not used
5	GND
6	Not used
7	Not used
8	DigIn. Not used
9	DigOut (relay). Not used

18.3   Serial RS232 #2

Connector: 9-pin D-sub female

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

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

18.4 EtherNet/IP

Connector: Shielded RJ45 for 10-baseT connection

Function: 10 Mbit Ethernet communication

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

18.5 RBU

Connector: 15-pin D-sub female

Function: For connection of Atlas Copco 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

18.5.1 Tool connector (S tools)

Connector: (16 + 4) pin

Function: For connection of Atlas Copco Tensor electric tools. Pin description only for advanced users

18.6   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).

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

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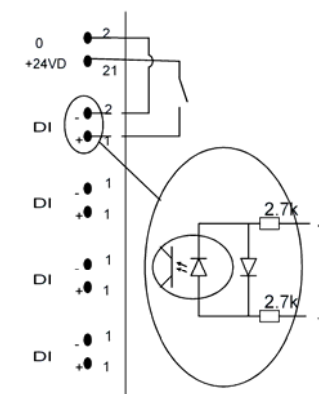
18.7   Digital outputs (relays)

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
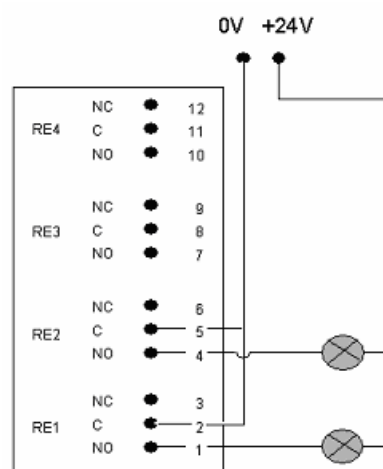
18.8 I/O bus #1

Connector: 9-pin D-sub male.

Function: To connect Atlas Copco I/O bus accessories and interconnect several PF units in synchronisation 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 (socket tray)

- RE-Alarm

- I/O Expander

- Operator Panel

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. If nothing is connected to the I/O bus there is no need for anything to be plugged in.

For I/O bus Sync configuration information, see chapter *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)
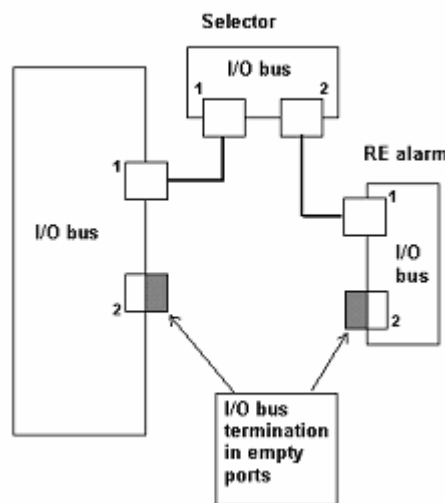
18.9 I/O bus #2

Connector: 9-pin D-sub male.

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

18.10   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, Field bus 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.
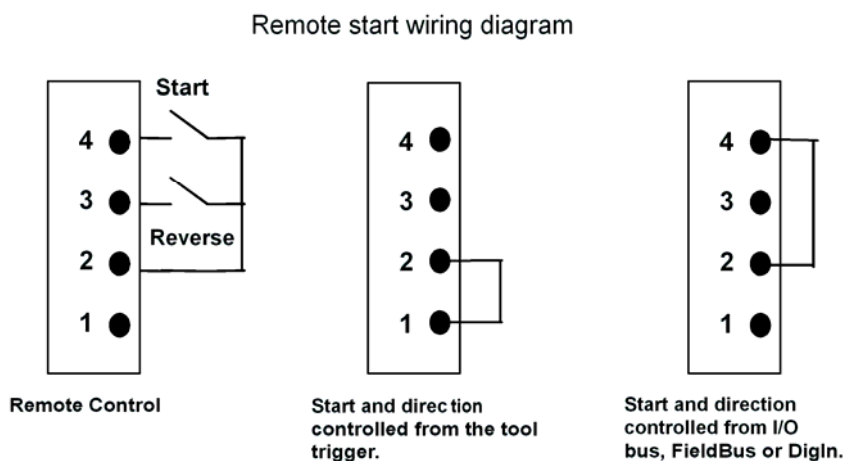
⚠ **Make sure that the power is switched off when changing the remote start connector.**

18.11   Main power connector

Connector: IEC320

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

19 RBU

The **RBU** (Rapid Backup Unit) is a software key and data storage unit for the PF. The RBU unlocks software applications available for each RBU type. It also stores a backup copy of the Power Focus configuration. The RBU backup copy makes it possible to move functionality and configurations between different PF units. A PF cannot be used without a RBU inserted.

There are different RBU types available; gold, silver, bronze, X and DS:

- The **RBU gold** unlocks the full capacity and functionality of the Power Focus. Features such as Cell Jobs and synchronised tightenings are only available with the RBU gold.

- The **RBU silver** unlocks advanced Power Focus functionality such as Multistage and Job. This RBU also enables full networking capability and the possibility to run Tensor DS Tools.

- The **RBU bronze** unlocks the basic Power Focus tightening functionality. It is not possible to run the PF Graph with a RBU bronze.

- The **RBU X** unlocks Power Focus functionality specific to ETX tools.

- The **RBU DS** unlocks Power Focus functionality specific to Tensor DS tools.

RBU Gold   **RBU Silver**   **RBU Bronze**

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

Example RBU with serial number C00015767:

- C00015767 = 003D97 (hexadecimal)

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

> **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.**

19.1 RBU functionality

Hardware	RBU Gold	RBU Silver	RBU Bronze	RBU X	RBU DS
PF Compact	X	X	X	X	X
PF Graph	X	X		X	X
Capacity	**RBU Gold**	**RBU Silver**	**RBU Bronze**	**RBU X**	**RBU DS**
Number of Psets	250 (300*)	250 (300*)	64	250 (300*)	64
Number of Jobs	99 (400*)	99 (400*)	0	99 (400*)	32
Number of tightening results	5000 (6000*)	5000 (6000*)	5000	5000 (6000*)	5000
	*Possible via memory configuration, see chapter *Controller*.				
Control strategies	**RBU Gold**	**RBU Silver**	**RBU Bronze**	**RBU X**	**RBU DS**
Tq con	X	X	X	X	
Tq con/ang mon	X	X	X	X	
Ang con/tq mon	X	X	X	X	
Tq con/ang con (AND)	X	X	X	X	
Tq con/ang con (OR)	X	X	X	X	
Rotate spindle forward	X	X	X	X	X
Rotate spindle reverse	X	X	X	X	X
DS-con	X	X			X
DS-con/tq mon	X	X			
Rev ang con	X	X		X	
Click wrench	X	X	X	X	X
Home position	X			X	
Control options	**RBU Gold**	**RBU Silver**	**RBU Bronze**	**RBU X**	**RBU DS**
PVT mon	X	X	X	X	X
PVT compensate	X	X	X	X	X
PVT selftap	X	X	X	X	X
Rundown angle mon	X	X	X	X	X
Current monitoring	X	X	X	X	
CW/CCW operation	X	X	X	X	X
Functionality	**RBU Gold**	**RBU Silver**	**RBU Bronze**	**RBU X**	**RBU DS**
Multistage	X	X		X	X
Job	X	X		X	X
Cell Job	X			X	
Step sync	X			X	
I/O	**RBU Gold**	**RBU Silver**	**RBU Bronze**	**RBU X**	**RBU DS**
Programming port (RS232)	X	X	X	X	X
I/O expansion	X	X	X	X	X
TCP/IP	X	X		X	X
Optional Field bus card	X	X		X	X
Barcode reader port (RS232)	X	X		X	X
Networking	**RBU Gold**	**RBU Silver**	**RBU Bronze**	**RBU X**	**RBU DS**
Cell	X	X		X	X
Net	X	X		X	X
Multicast	X	X		X	X
Tools net	X	X		X	X

Sync	X			X	
Tool	**RBU Gold**	**RBU Silver**	**RBU Bronze**	**RBU X**	**RBU DS**
Tensor S	X	X	X		
Tensor ST	X	X	X		
Tensor SL	X	X			
ETX				X	
Tensor DS	X	X			X
Other	**RBU Gold**	**RBU Silver**	**RBU Bronze**	**RBU X**	**RBU DS**
Quick programming	X	X	X	X	X
Autoset	X	X	X	X	X
Real time statistics	X	X	X	X	
SPC (alarm)	X	X		X	
Barcode reading	X	X		X	X
Other	**RBU Gold**	**RBU Silver**	**RBU Bronze**	**RBU X**	**RBU DS**
Configurable memory	X	X		X	
Multiple identifier	X	X		X	

19.2   Connecting the 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.**
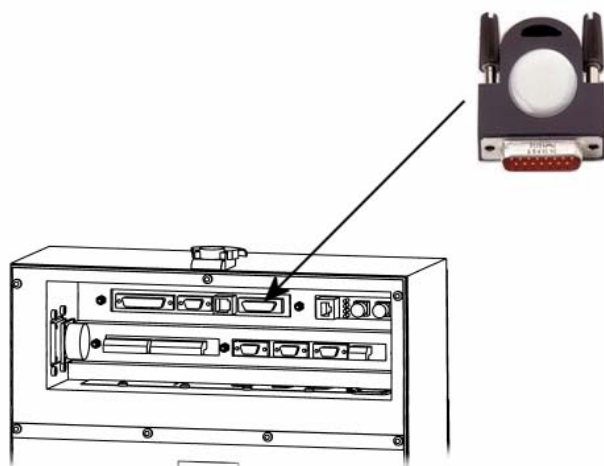
19.3   Start-up instructions

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 the 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 the 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 the PF or the RBU is considered as NOK.

Status	Message at start up		Action
	PF Compact	**PF Graph**	
Power Focus and RBU matches	No message	No message	No action.
Power Focus and RBU don't match	Clear / RBU / PF	Select PF, Clear (All) or RBU	Select "PF" for Power Focus configuration, "RBU" for RBU configuration, or "clear (all)" to clear Power Focus and RBU memories.
Power Focus OK RBU NOK	PF / Clear / Stop	Select PF, Clear (All) or Stop	Select "PF" for Power Focus configuration, "clear (All)" to clear Power Focus and RBU memories. Otherwise select "stop".
Power Focus NOK RBU OK	RBU / Clear / Stop	Select RBU, Clear (All) or Stop	Select "RBU" for RBU configuration, "clear (all)" to clear Power Focus and RBU memories. Otherwise select "stop".
Power Focus NOK RBU NOK	Clear / Stop	Select Clear (All) or Stop	Select "clear (all)" to clear Power Focus and RBU memories. Otherwise select "stop".

⚠ **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 the 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 a querying the user.**

20   PF 3000 Compact user interface

PF Compact can be programmed in ToolsTalk PF, a pre-programmed RBU or offer proper network configuration via a PF Graph. It can also be programmed directly via the unit's Autoset function. Except for differences in the user interface, the PF Compact has the same functionality and capacity as the Graph model.

> ℹ️ **For a description of connections on the PF Compact hardware description, see the *Power Focus 3000 ASL (9836 2156 01).***

20.1   Front panel

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

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

20.1.1 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 and within the specified limits. The light remains active until the next cycle starts or when the system is reset.
n x OK	The n x OK light indicates when the number of approved tightenings corresponds to the number (batch size) programmed into the 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 the 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 the 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.)
AUTOSET (graph symbol)	The Autoset light indicates when the Autoset programming function is active. The light goes off when Autoset 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.

20.1.2   Keypad

Key	Description
Plus [+]	Navigates through menus on the display and increases numbers.
Minus [-]	Navigates through menus on the display and decreases numbers.
Function [F]	Press **F** (Function key) to display functions F1 - F7. 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 will take 30 seconds for the screen to automatically update).
	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 *Final target [P113]* 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 *Control strategy [P100]* 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).

Key	Description
Function [F] Function [F]	**F3 – Motor tuning**:
	Press the **F** key three times. "F3"/"tool" alternates in the display.
	Press **Enter** to activate the motor tuning process. The display will show 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 *Pset select source [C200]* 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 "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:
	Only available with RBU gold.
	Press the **F** key seven times. "F7"/"stun" alternates in the display.
	Press **Enter** to activate the Sync motor tuning process. The display will show 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 address:
	Press the **F** key eight times. "F8"/"Stun" alternates in the display.
	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 address parts.
	Event code *Reboot needed before changes take effect [E857]* will be blinking on the display when finished. Press **Enter** to acknowledge the event code.
	Restart the PF.

Key	Description
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 *Final target [P113]* value (if required) by pressing the **+/- keys**.
	Press **Enter** to select the *Final target [P113]*. "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 will display the following information:
	Power Focus model:
	Model type alternates with RBU type (Au = gold, Ag = silver and Br = bronze).
	("rBu" toggle with RBU type.)
	Software version:
	The entire program code alternates with version number.
	("rEL" with version number rolls on the display from right to left.)
	Motor type:
	"Type" alternates with type number, which is either 4, 7 or 9.
	("tYPE" alternatives with tool type and number, e.g. S7.)
	Current Pset:
	"Pset" alternates with the current Pset ID, e.g. "P27".
	Current Job:
	"Job" alternates with the current Job ID, e.g. "J3".
Enter	The **Enter** key is used to execute selected functions and for event acknowledgement.

21   Tensor tools

21.1   Tensor STB

Atlas Copco's **Tensor STB** is a new generation of nutrunners. STB is battery powered and communicates with the Power Focus 4000 and 3100 tightening controller systems through wireless digital communication, built on IRC (Industrial Radio Communication) technique.

> (i) **Tensor STB tools require a special Communication kit to work with Power Focus 3100 which consists of a, serial port adapter (access point) cable connector (supplies the serial port adapter with power) and serial cable.**

The new digital tool-controller connection makes the tool configurable. Tensor STB tools have features such as built in user-defined inputs and outputs.

IRC generally speaking:

- 2.4 GHz ISM band (2.4 to 2.485 GHz)
- Frequency hopping (to avoid collision)
- BT 2.0 (includes **Adaptive** Frequency Hopping)
- 100 meters range

Atlas Copco adoptions of IRC for industrial use:

- "Quiet" tool when not in use
- New connection strategy
- Configurable use of frequency
- "Active" access point meaning faster connection
- Configurable output power
- Only one STB tool (BT device) per converter/AP, only STB can connect
- Safe and easy paring procedure

21.1.1 Tool functionality

The Tensor **STB tool** is equipped with a buzzer and blue LED's that can be configured as outputs to indicate a series of events, similar to the relays on the PF.

There are also four tool LED's for specific tasks:

- Connection LED: Indicates connection to Power Focus
- Battery LED: Indicates battery status (fixed light for low and flashing light for empty battery)
- Batch/Job LED: Indicates Batch done
- Alarm LED: A failure/event is detected

The function button, situated on the direction ring, can be configured as an input similar to the inputs on the controller. It can generate different inputs depending on the position of the direction ring, clockwise (CW) or counter clockwise (CCW).

Different tool batteries are used for different Tensor tool types (see table below).

Battery	Tool type
NiCd 14.4 V	ETV tools
NiCd 12 V	ETP tools

It is possible to mount external accessories directly on the tool. Connected to the bus connector, the accessories communicate with the controller using the same data link as the tool. The tool accessory bus is configurable to work in different modes depending on the connected device.

Included tightening functionality

The table below shows the tightening functionality included for the Tensor STB tool in the W7.0 release.

All necessary torque, angle, time, speed and ramp parameters are included.

Functionality	Content
Tightening control strategies	Torque control
	Torque control / Angle monitoring
	Torque control / Angle control [AND]
	Torque control / Angle control [OR]
	Angle control / Torque monitoring
	Rotate spindle forward / reverse
	Reverse angle
Tightening strategies	One stage
	Two stage
	Quick-step
	Ergoramp
Tightening options	Rundown angle
	Zoom step
	Click wrench
	Start trace from
	High speed rundown
Batch	Pset
	Field bus
	Ethernet/Serial
	Lock at batch done
	Max Coherent NOK's
High speed rundown	High speed rundown
	Rundown speed
	High speed interval
Options	CW/CCW operation
	Soft stop
	Alarm on rehit
	Alarm on Torque < Target
	Alarm on Lost trigger
	Alarm on End time shutoff

Included miscellaneous functionality

The following miscellaneous functionality is included for the Tensor STB tool in the W7.0 release.

- Auto Set

- Quick programming

- Job

- Buzzer sound (no volume control)

- Function button

- Tool accessory bus

- Tightening counter

Non-included tightening functionality

The following tightening functionality will NOT be included in Tensor STB W7.0.

- Yield control

- Home position

- DS control

- DS control / Torque monitoring

- PF2000 compatible

- Monitor end time from

- PVT Self tap/monitoring/compensate

- Post view torque

- Current monitoring

- Dynamic current monitoring

- Non tightening results

- Multistage

- Step sync

Non-included miscellaneous functionality

The following miscellaneous functionality will NOT be included in Tensor STB W7.0.

- Sensor tracking

- Wear indicator

- Remote start

- Tool Batch LED (nxOK).

- Open end tools

- Safety trigger

- Field bus support for new STB specific digital output.

21.1.2   System setup

ⓘ **The STB tool is running on standard Power Focus 4000 and 3100 controllers with a bronze, silver or gold RBU inserted.**

System parts

The table shows the content of a minimum Tensor STB system.

Quantity	System part
1	STB tool (e.g. Tensor ETV STB31)
1	Tool battery
1	Battery charger
1	Cable connector
1	Serial Port Adapter (access point box) for Power Focus
1	Serial cable for Power Focus

Hardware setup

Setup the Power Focus system according to the local network recommendation.

Charge battery and put it on the tool.

Use a crossover cable (i.e. 4222 0546 03) to connect the Serial Port Adapter to the Power Focus serial port 2, named "RS232 (2)".

Insert the cable plug into the controller.

ⓘ **It is NOT possible to make a serial connection between the controller and ToolsTalk when the cable plug is inserted.**

Use an Ethernet connection for ToolsTalk when the cable plug is inserted.

Attach the small power cable to the Serial Port Adapter.

Power up the Power Focus controller.

The Serial Port Adapter (serial connected to Power Focus) and the tool need to be paired together in order to establish the Bluetooth connection.

The steps below describe the pairing sequence.

Disconnect the battery from the tool.

Hold down the tool trigger while reattaching the battery.

When the tool LED's are turned off, release the tool trigger.

When the tool LED's are turned on again, press the tool trigger.

When the tool LED's are turned off once more, release the tool trigger. Both LED's starts to flash.

When both tool LED's are flashing, press the F-button on the Power Focus controller. This must be done within one minute.

Select F10 and press the return-key to confirm the selection.

Wait a few seconds for the blue connection LED's on the tool and the Serial Port Adapter to light up.

> **The paring is consistent until the tool or the Serial Port Adapter is replaced.**
>
> **It is also possible to do the Bluetooth Paring sequence via ToolsTalk. To do this, make an Ethernet connection with program control from ToolsTalk.**

21.1.3   Crossover Ethernet cable connection

To get started with the Tensor STB tool a ToolsTalk Ethernet connection is needed. An easy way to do that without any available network is by using a crossover Ethernet cable directly connected to a computer (desktop or laptop) running ToolsTalk.

> **The cable between the computer and the Power Focus controller must be a Crossover Ethernet cable.**
>
> **For more information, see the *Tensor STB user guide (9836 3043 01).***

21.2   Tensor ST

Tensor ST is a generation of transducerised tools. Tensor ST communicates with **PF 3100** through digital communication, which gives the benefit of new tool features and greater cable flexibility due to less leads. Compared with a Tensor S tool, it is also lighter, has more power and provides better accessibility.

ST61-40-10
Torque range: 8 - 40 Nm (6 - 29 ft lb)
Weight: 1.4 kg (3.3 lb)
Length: 454 mm
Max speed: 1090 rpm
Configuration: Right angle

> ℹ️ **Running a Tensor ST tool requires a PF 3100 controller and a ST tool cable.**

The new digital tool-controller connection makes the tool configurable. Tensor ST tools have features such as built in user-defined inputs and outputs. Tensor ST and the digital tool-controller connection also enable hot swapping between tools.

The Tensor ST tool is equipped with a **Speaker** and an extra **Blue LED**. These two outputs may be configured to indicate a series of events, similar to the relays on the controller. There is also optional to add an extra **Function button** situated on the direction ring. This button can be configured as a digital input similar to the digital inputs on the controller. It can generate different inputs depending on the position of the **Direction ring**, clockwise (CW) or counter clockwise (CCW).

External accessories can be mounted directly on the tool. Connected to the **Bus connector**, it communicates with the controller using the same data link as the tool. The tool accessory bus is configurable to work in different modes depending on the connected device.
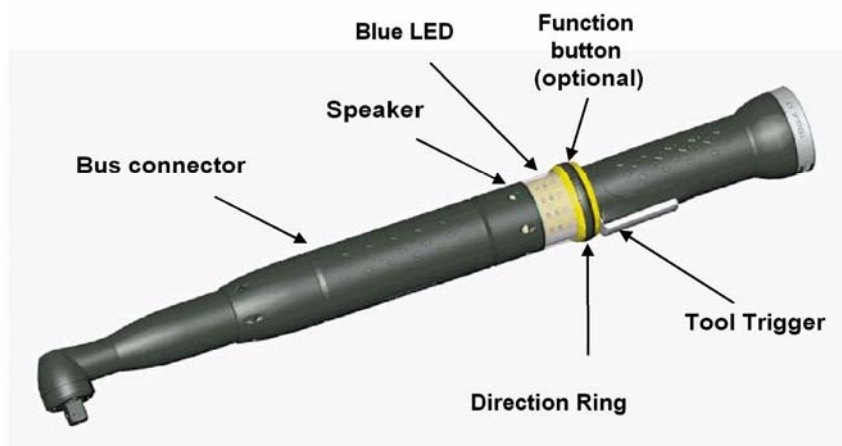
21.3   Tensor SL

Tensor SL is a completely new Tensor handheld nutrunner for low torque, based on Tensor ST technology. Like Tensor ST, digital communication it is used between tool and controller allowing flexible cables and more functionality in the tool. The SL controller, PF 3102 is used with low voltage SL tools. Tensor SL does, just like Tensor ST, support hot swap, see chapter *Tool*.

> **Running Tensor SL tools requires a PF 3102 controller and a SL tool cable.**
>
> **Tensor DL tools can also be connected to the PF 3102 by using a RBU DS/DL.**
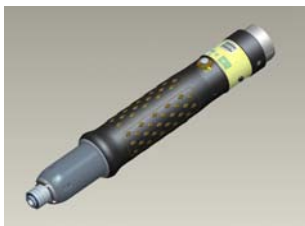
ETD SL21-PS-04
Torque range: 0.8 - 4 Nm (7.1 - 35.4 ft lb)
Weight: 0.7 kg
Length: 243 mm
Max speed: 1600 rpm
Configuration: Handheld
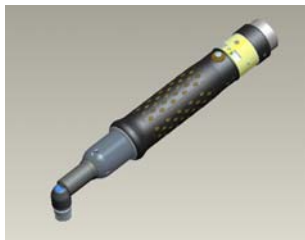
ETV SL21-07-x
Torque range: 1.5 - 7.5 Nm (13 - 66 ft lb)
Weight: 0.8 kg
Length: 245 mm
Max speed: 970 rpm
Configuration: Handheld

A Tensor SL tool is equipped with a **Buzzer** and an extra **Blue LED**. These two outputs may be configured to indicate a series of events, similar to the relays on the controller. The **Function button** may be configured as a digital input similar to the digital inputs on the controller. It can generate different inputs depending on the current direction according to the **Function LED**. Normally the function button is configured to change the direction of the tool. **Illuminator**, a set of four LED's in the front of the tool provides light for the operator.
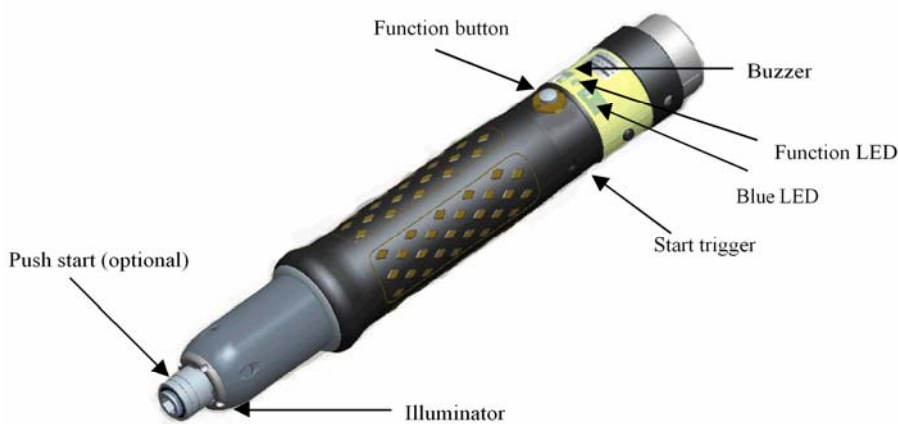
21.4   Tensor S

Atlas Copco's **Tensor S** tools, running on **Power Focus 3000/3100/4000** controllers, are available in four different configurations; fixture, pistol grip, straight and angle application. The three motor types are designated S4, S7 and S9, indicating different motor outputs and speeds. The tools can be combined in various models to meet a variety of requirements within the industry. Fixtured applications can easily be installed and integrated with standard Atlas Copco components.

Below are some of Atlas Copco's main products from the Tensor S electrical nutrunner range.

Name	Technical data	illustration
ETP S4-10-I06	Female hex/drive: 1/4" Torque range: 3 - 12 Nm (2.8 - 8.8 ft lb) Weight: 1.2 kg Length: 195 mm Max speed: 750 rpm Configuration: Pistol Grip	
ETV S7-28-10	Square drive: 3/8" Torque range: 5 - 29 Nm (4 - 21 ft lb) Weight: 1.6 kg Length: 415 mm Max speed: 1300 rpm Configuration: Right angle	
ETF S7-100-13	Telescopic drive/ square drive: 1/2" Torque range: 20 - 110 Nm (15 - 80 ft lb) Weight: 2.9 kg Length: 476 mm Max speed: 225 rpm Configuration: Fixtured	
ETD S9-1000-25	Telescopic drive / square drive: 1" Torque range: 250 - 1000 Nm (180 - 730 ft lb) Weight: 13.0 kg Length: 826 mm Max speed: 80 rpm Configuration: Inline	

21.5 Tensor DS

The DS control strategy makes it possible to run **Tensor DS** tools on PF units.

The DS tool has no transducer. Therefore it is not possible to view torque trace when using this type of tool. Instead of having an electrical signal from a strain gauge, the tool derives the torque from different relevant parameters, such as voltage, speed, temperature and current. The tool is proven to achieve excellent repeatability. However, the operating range is smaller than for a Tensor S tool, and the user might need to adjust the torque measurement for each Pset and joint for better torque accuracy. The *DS torque tuning factor [P245]*, adjusts the torque measurement for each combination of Pset and joint. The lack of a transducer also decreases the number of Tensor S features available in DS control.

> **DS control strategy is not possible to run with Tensor S and ETX tools.**

> **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 will show 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 *Torque measurement possibly invalid [E003]* will be visible.

Torque tuning is performed either from the PF Graph user interface, ToolsTalk PF or automatically with ACTA 3000. It allows an easy adjustment to the reference system torque values (e.g. ACTA 3000) 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.

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

- 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.

21.6   Tensor ETX

ETX tools are designed for fixtured applications that require spindles optimised for durability and where a high requirement on tightening accuracy is needed. ETX is controlled by the Power Focus, just like Tensor S and Tensor ST tools.

Below, data for a tool type ETX50-90COT.

ETX50-90COT

Torque range: 20 - 90 Nm (15 - 65 ft lb)

Max speed: 650 rpm

Weight: 5.9 kg

Length: 519 mm

Gear ratio: 18.21

Socket holder size: ½ inch

ETX offers multiple options when fixturing the front end of the tool. It can be fixtured with a sandwich mount, for easy exchange of the socket holder, or mounted directly onto the front end. Different socket holder lengths (0 – 200 mm), permit access to applications of parts with tight clearances. Spring travel can also be increased from the standard 50 mm to 76 mm, simplifying fastening of longer bolts.

A memory chip in the tool holds calibration data, number of cycles, service data and model-specific data, preventing accidental programming (as when a spindle is replaced during service).

The step Sync functionality synchronises the spindles to provide consistent clamp forces over the entire component mating face, see chapter *Sync*.

21.7   Tools with open end

An **Open end tool** (or tube nut tool) is a Tensor S or ST tool equipped with an Open end head. It is used to tighten nuts on tubes and similar.

Open end tools alternate between tightening and positioning every second time the tool trigger is pressed. Positioning means that the Open end head goes back to the reference position which makes it possible to remove the tool from the tube.

It is not possible to perform loosenings with Open end tools and the direction ring can not be used to control the rotation direction.

> **Before using an Open end tool, make sure that the tool head and tool body has been assembled and configured correctly. If not, the tool can run in 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 *OE forward positioning [C230]* set to "no" and pressing the tool trigger button, the LED's will turn OFF and ON again. This behaviour 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.**

21.7.1   Start-up instruction

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 *OE forward positioning [C230]*, 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:

- Reboot the PF (or make a tool hot swap).
- 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.
- Perform ten consecutive tool trigger pressings, five tightenings and five positionings, and let the Open end head rotate at least 360 degrees for every tightening.
- 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*.**

21.8   Tool accessories

21.8.1   ST scanner

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

21.8.2   ST GPIO

GPIO (General purpose I/O) is a digital input and output connector for ST tools. The four pins (four buttons combined with four LED's on the GPIO device) can each be configured as a digital input and/or digital output (see table below). That means one pin can function as a single digital input/output, or both as a digital input and digital output.

ⓘ   **GPIO is not available for STB tools.**

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

21.8.3   ST selector

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

ⓘ   **Mode 1 is primarily intended for use with the Power Focus world 3 software release and later. Mode 2 is recommended for users with Power Focus world 5 software releases.**

For Selector Mode configuration , see section *Tool configuration*

21.8.4   ST/SL cable

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 diagnostic branch

22 Quick reference guide

Use this appendix in conjunction with chapter *Digital inputs and outputs* as a reference guide when programming the Power Focus. A more general description of the tightening and control strategies available can be found in chapter *Controller*.
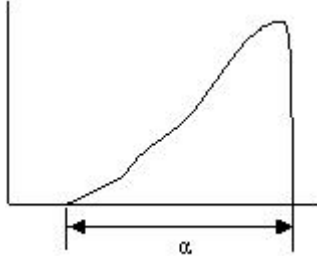
A joint is regarded as hard if the clamping angle, α, is small and soft if α is large. There is no limit, but test standards define α < 30° as hard. The dynamic effects on tightening increase dramatically if angles go down substantially (approximately 15°).

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.

22.1 Tq con

22.1.1 One stage

Torque

P114 Final tq max

Acceptance Window

P113 Final target

P112 Final tq min

P110 Cycle start

P115 Cycle complete

Time

P141 End time

Angle

Time

P142 Soft start time

P138 Zoom step speed

P130 Soft start speed

P135 Step 1 ramp

P131 Step 1 speed

Speed
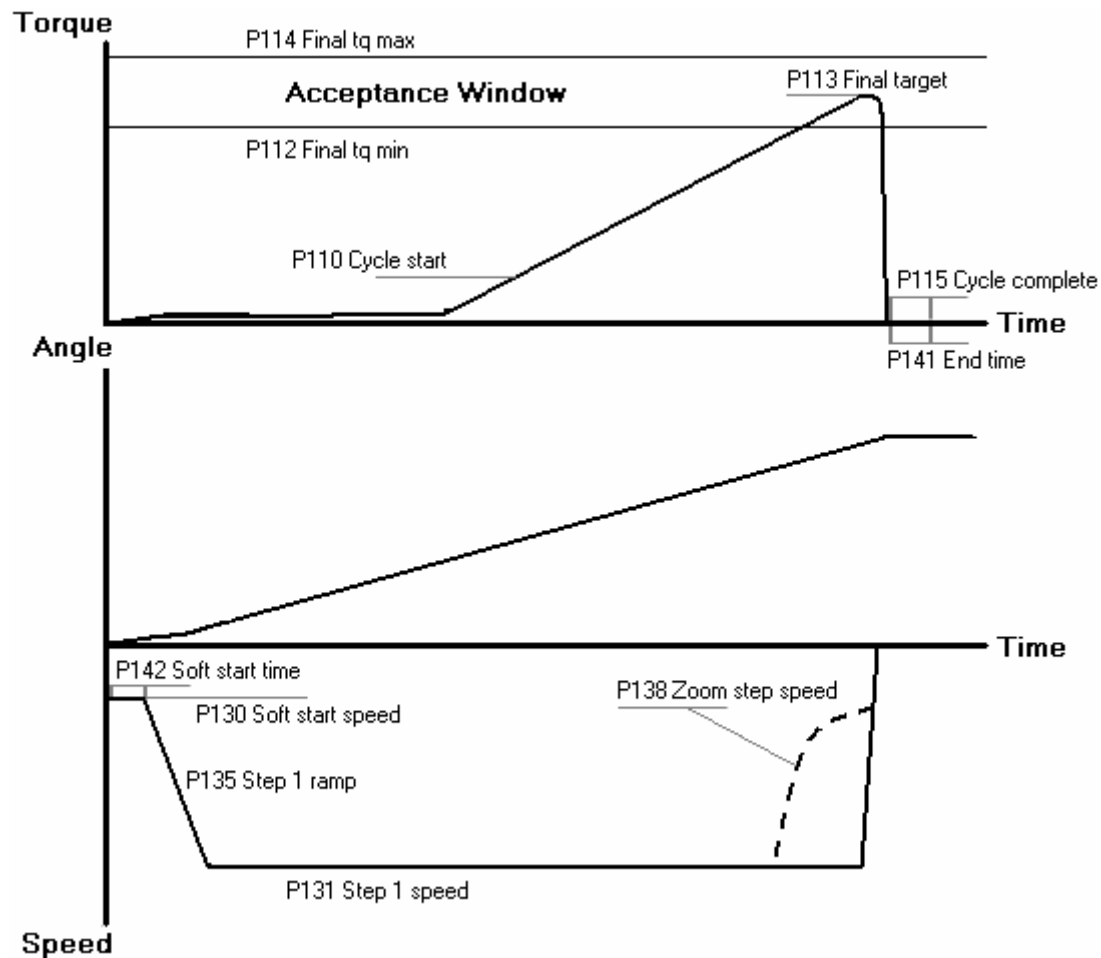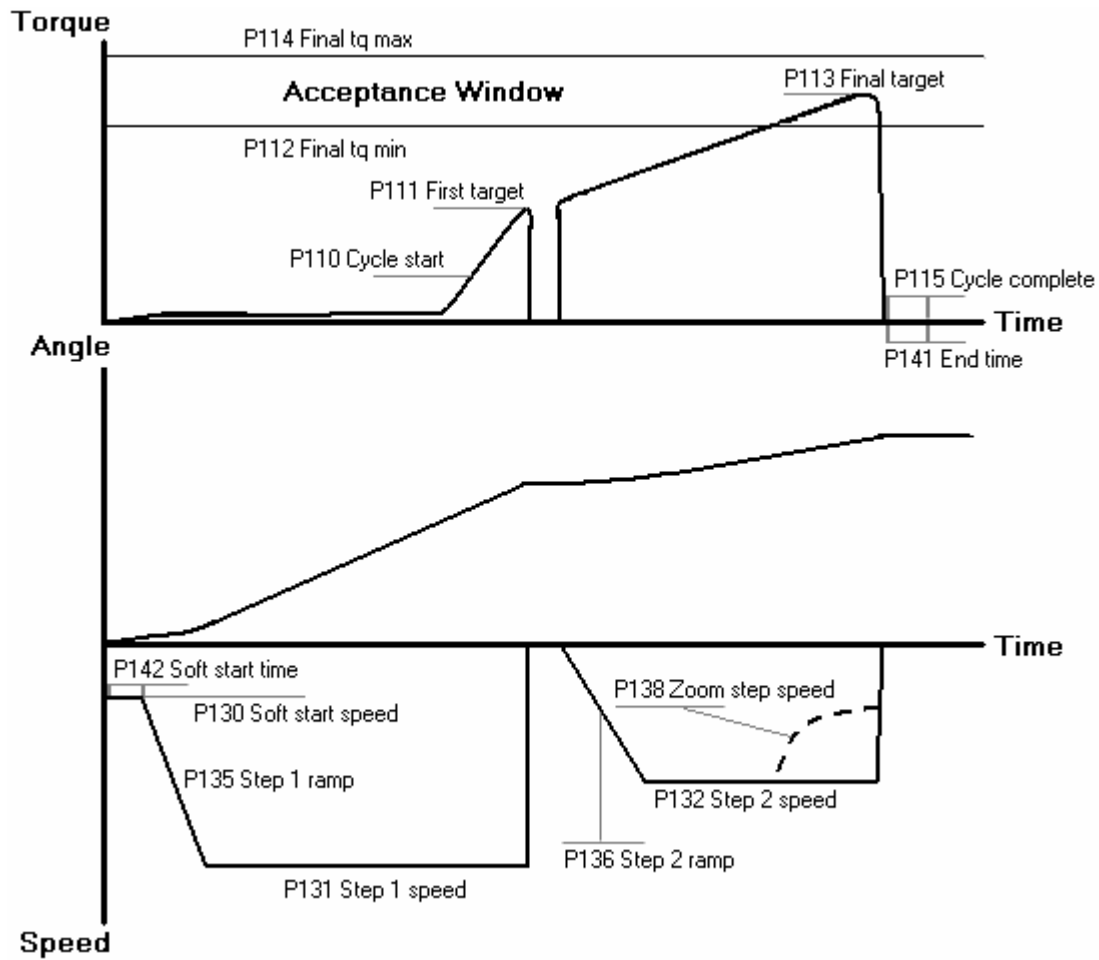
22.1.2 Two stage

22.1.3   Quick step
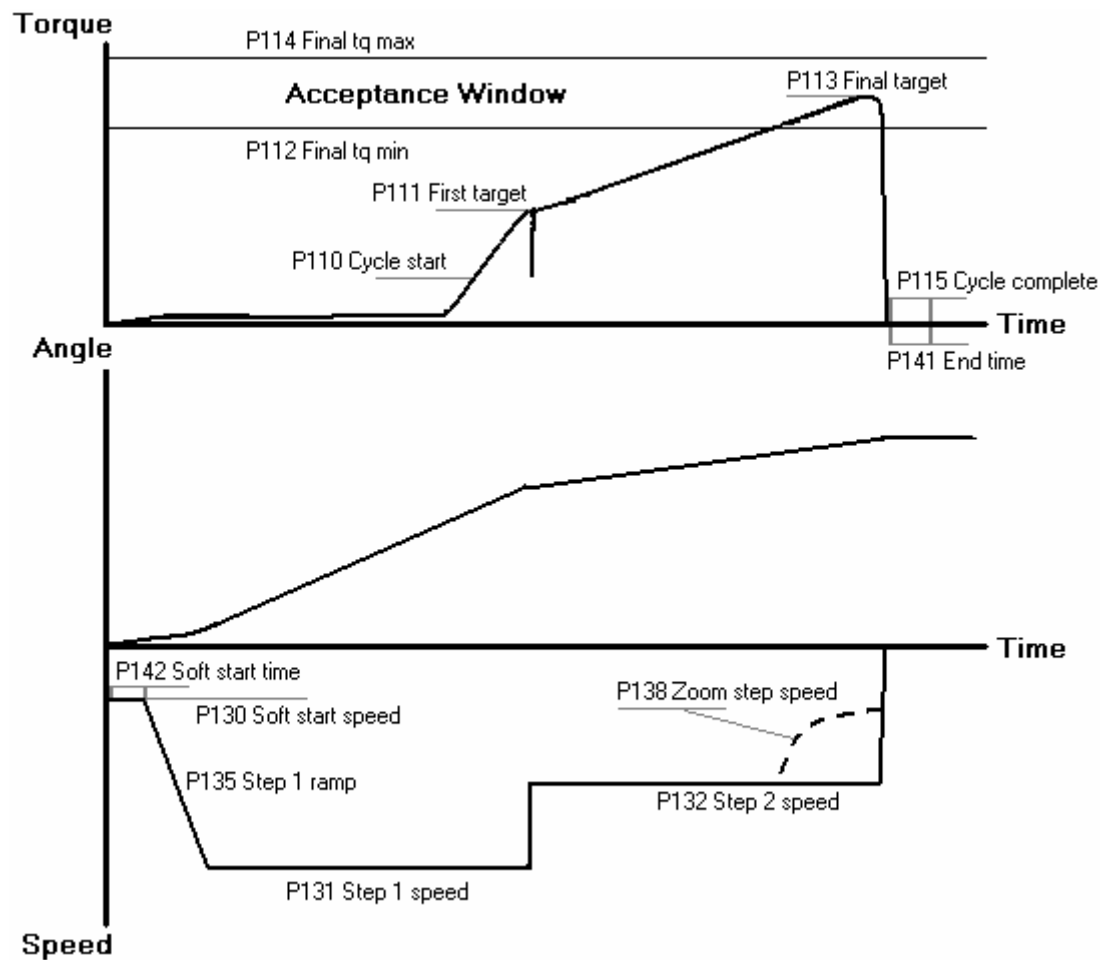
22.1.4   Ergo ramp
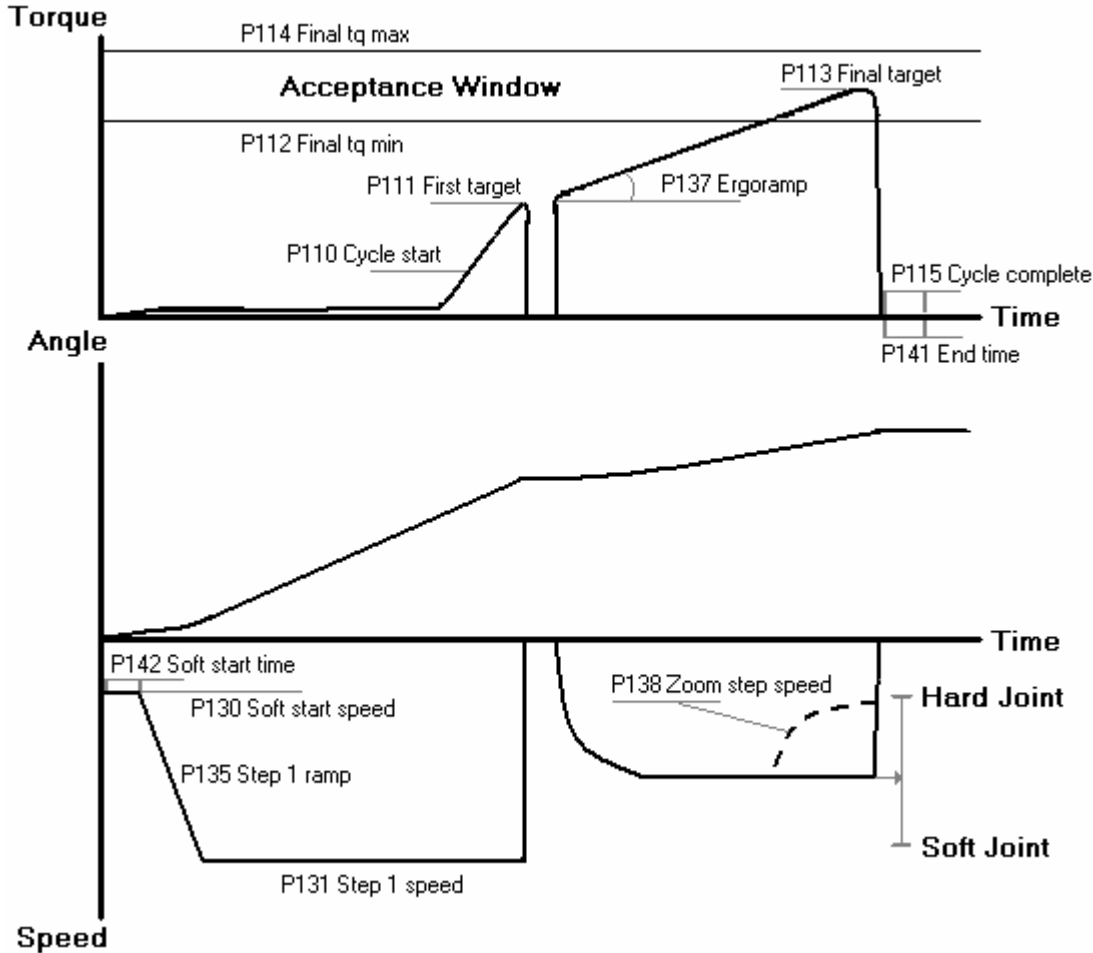
22.2 Tq con/ang mon

22.2.1 One stage
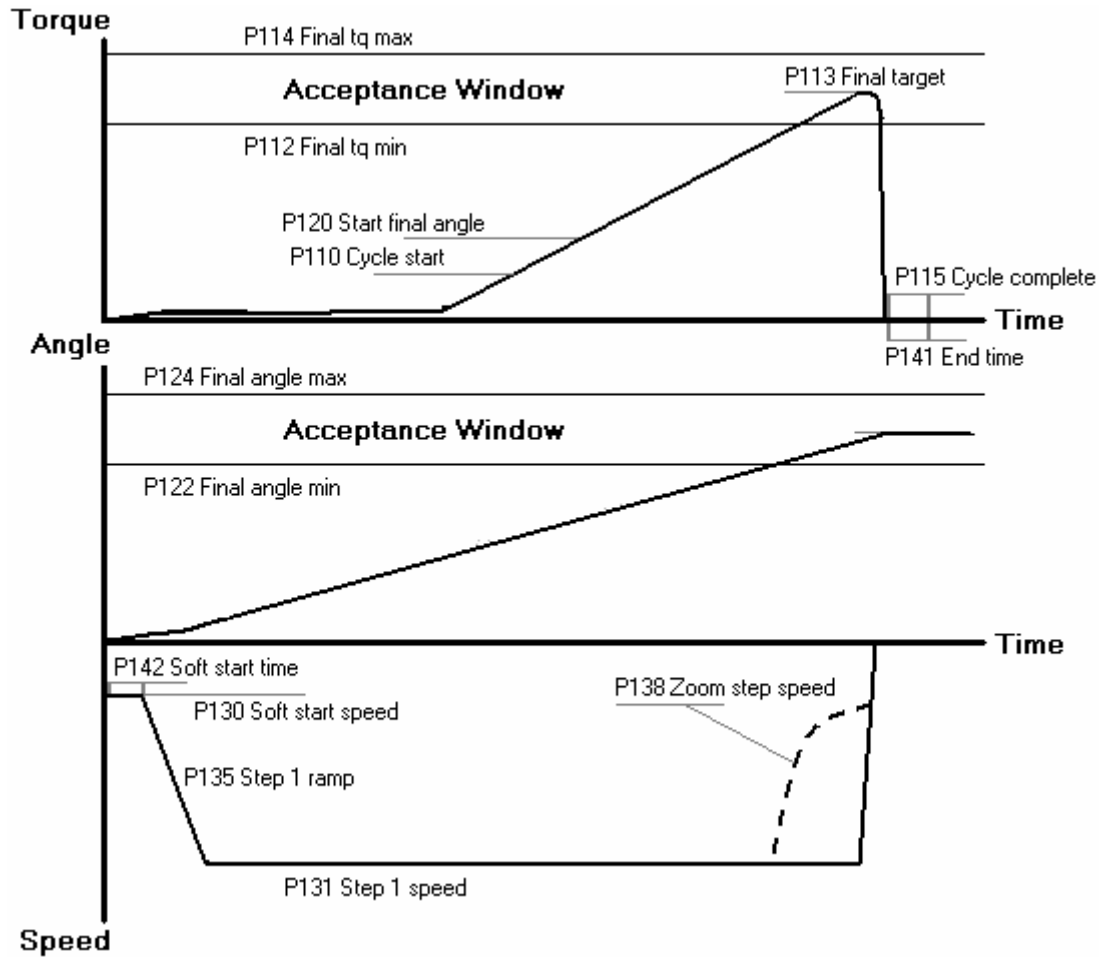
22.2.2   Two stage
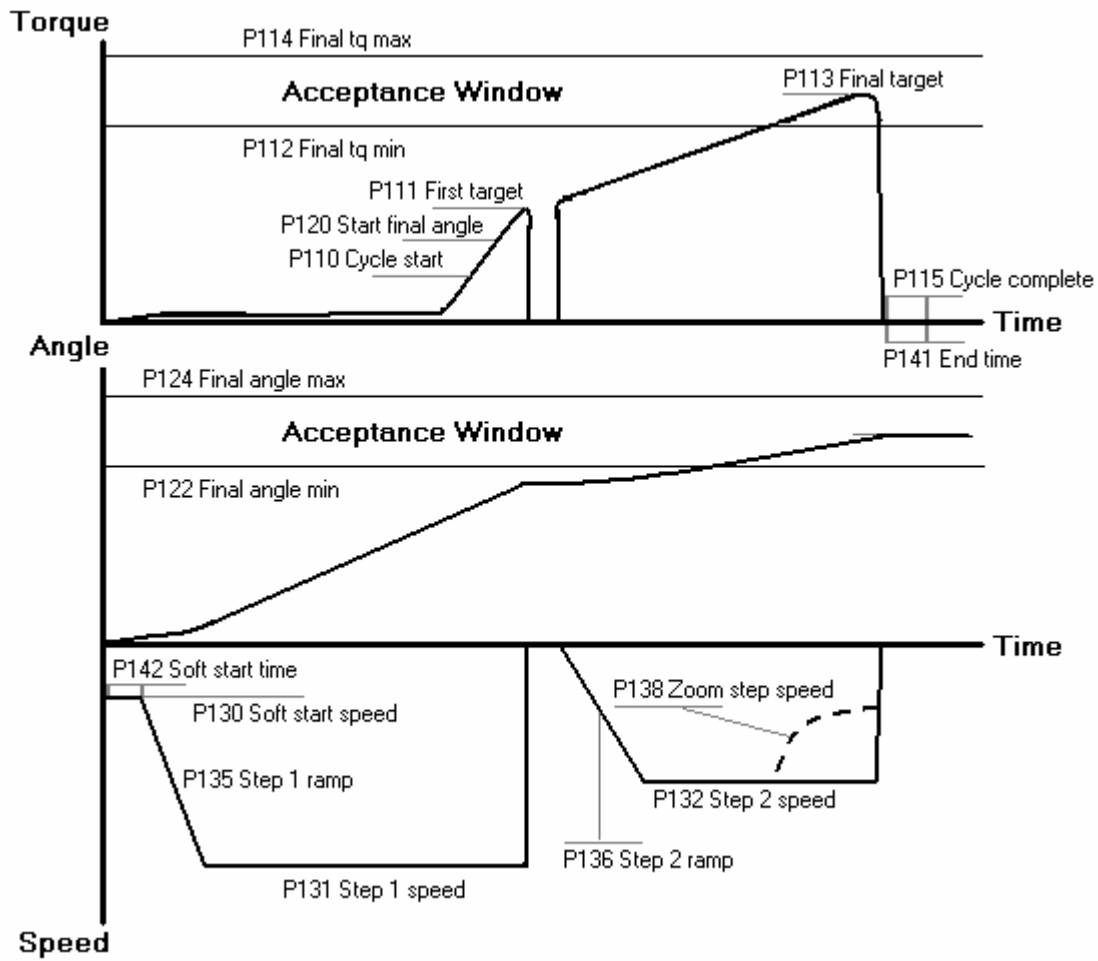
22.2.3 Quick step

22.2.4 Ergo ramp

Torque

P114 Final tq max

Acceptance Window

P113 Final target

P112 Final tq min

P111 First target

P137 Ergoramp

P120 Start final angle

P110 Cycle start

P115 Cycle complete

Time

P141 End time

Angle

P124 Final angle max

Acceptance Window

P122 Final angle min

Time

P142 Soft start time

P130 Soft start speed

P138 Zoom step speed

Hard Joint

P135 Step 1 ramp

Soft Joint

P131 Step 1 speed

Speed

22.3   Tq con/ang con (AND)

22.3.1   One stage
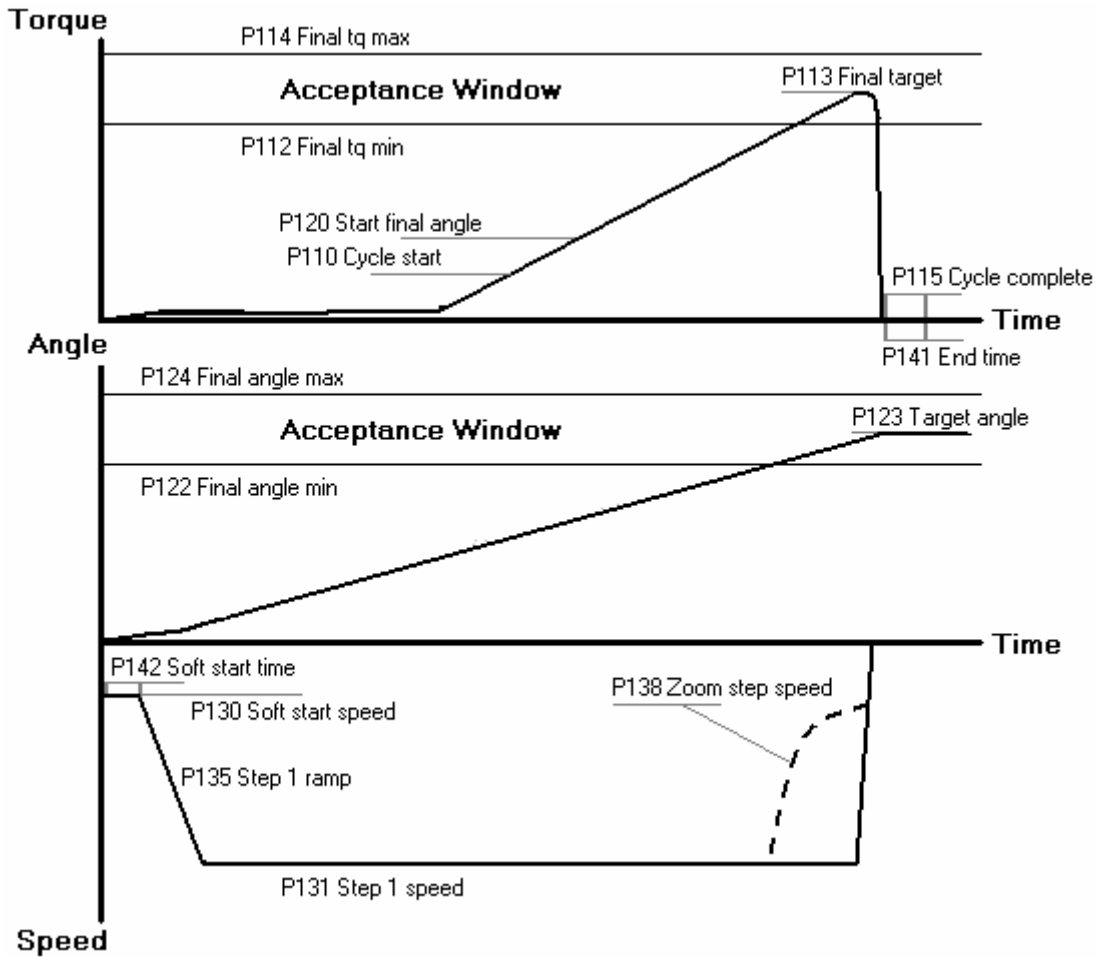
22.3.2 Two stage
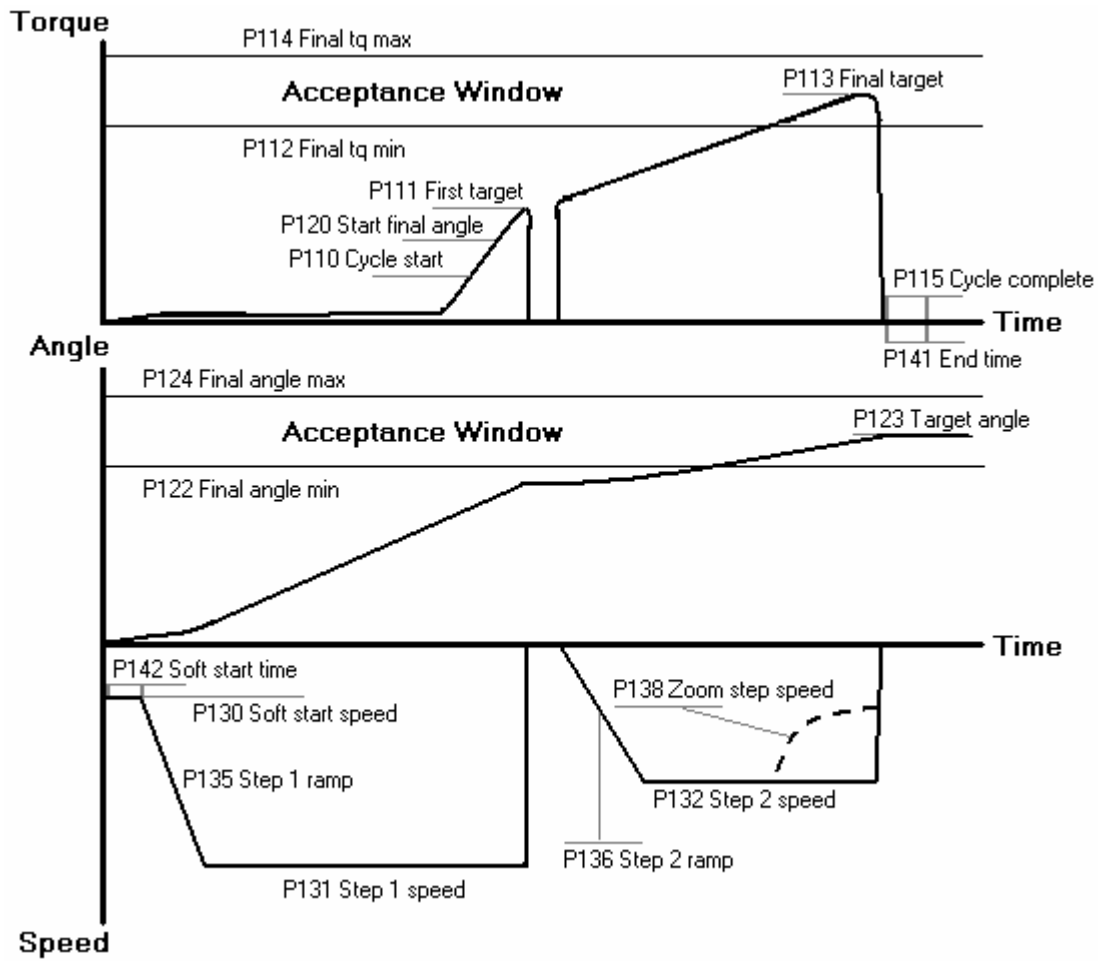
22.3.3   Quick step
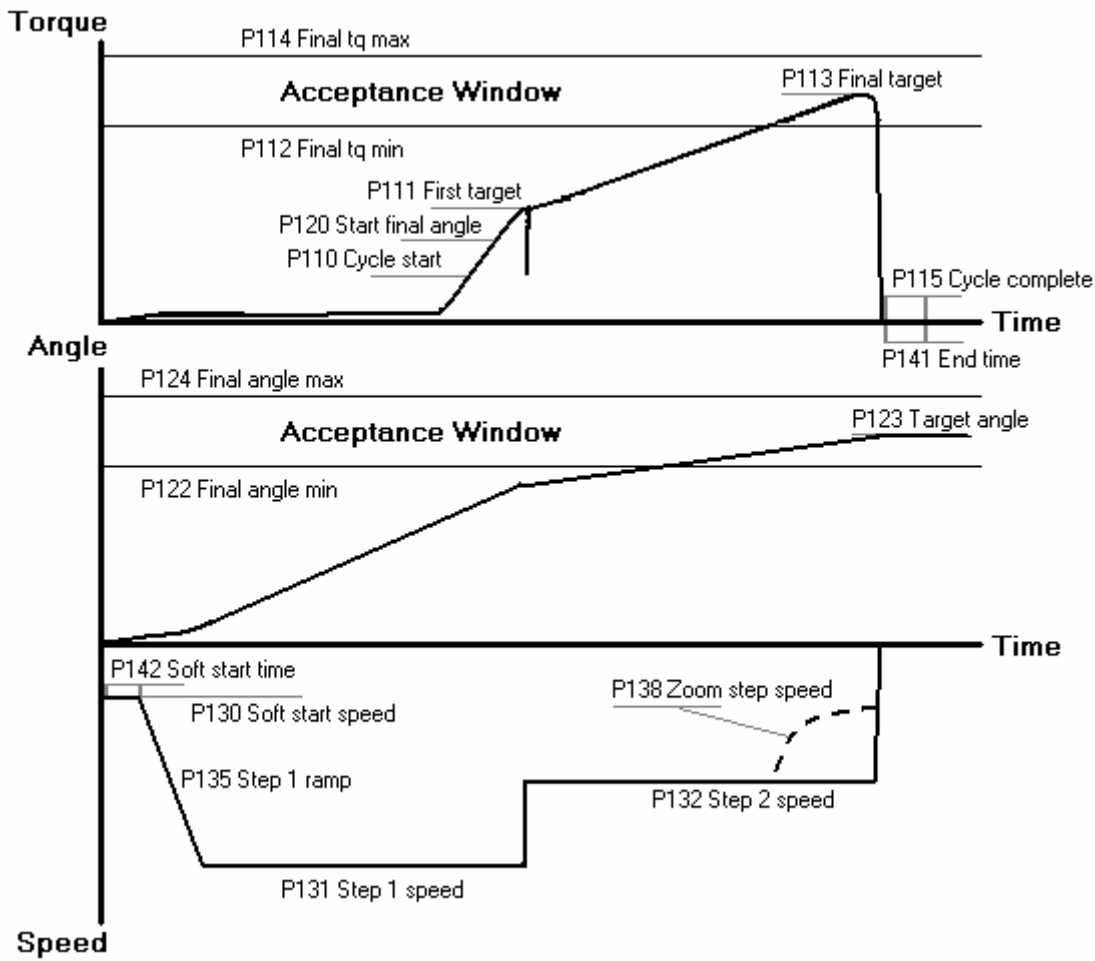
22.3.4 Ergo ramp
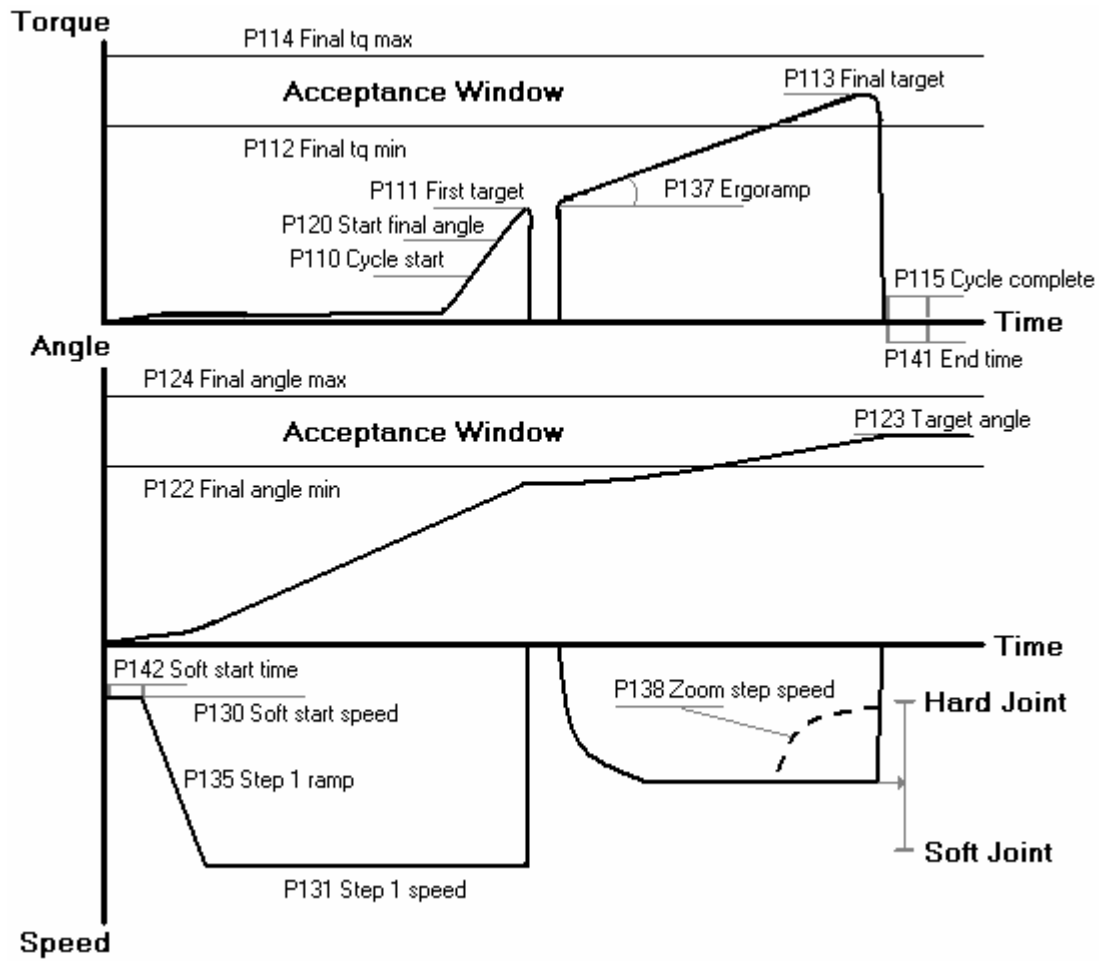
22.4 Tq con/ang con (OR)

22.4.1 One stage
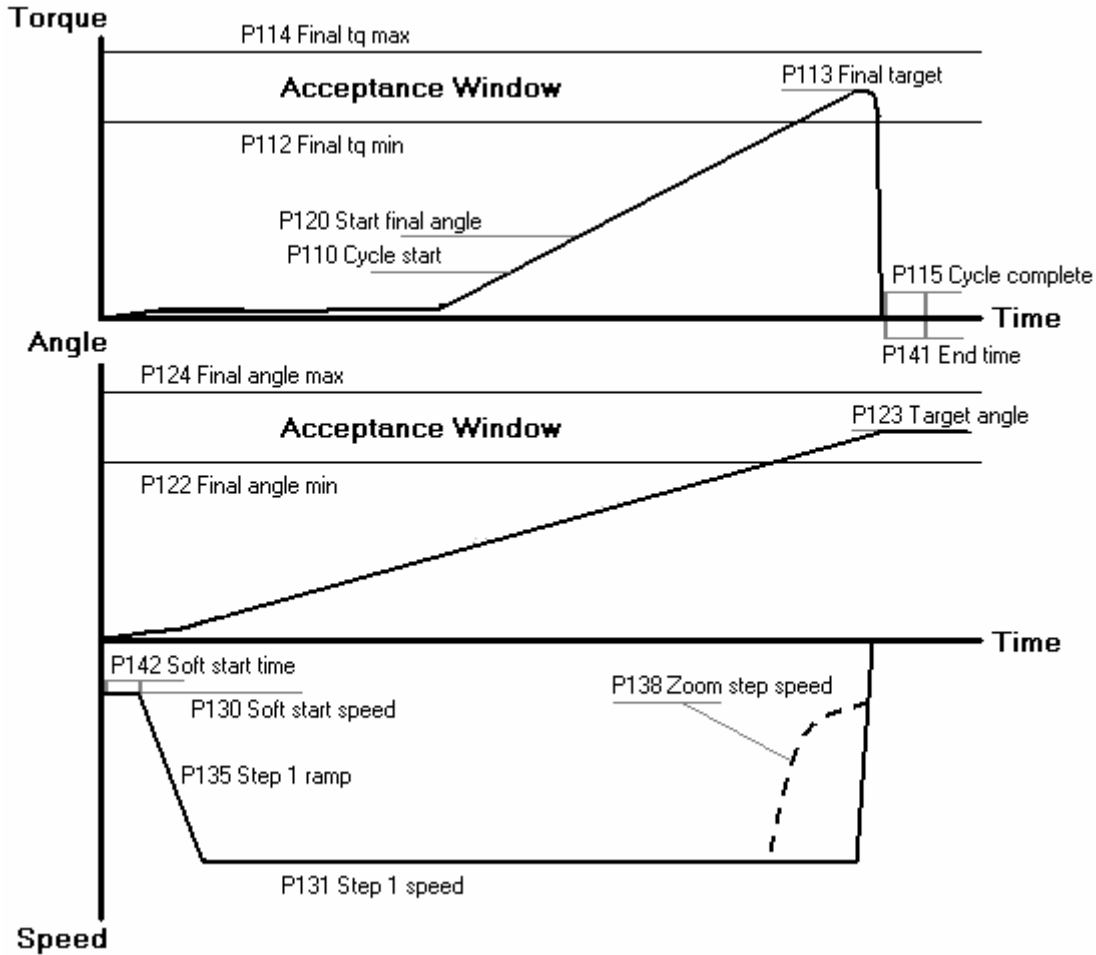
22.4.2   Two stage

22.4.3 Quick step

Torque

P114 Final tq max

Acceptance Window

P113 Final target

P112 Final tq min

P111 First target

P120 Start final angle

P110 Cycle start

P115 Cycle complete

Time

P141 End time

Angle

P124 Final angle max

Acceptance Window

P123 Target angle

P122 Final 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

22.4.4 Ergo ramp

22.5 Ang con/tq mon

22.5.1 One stage
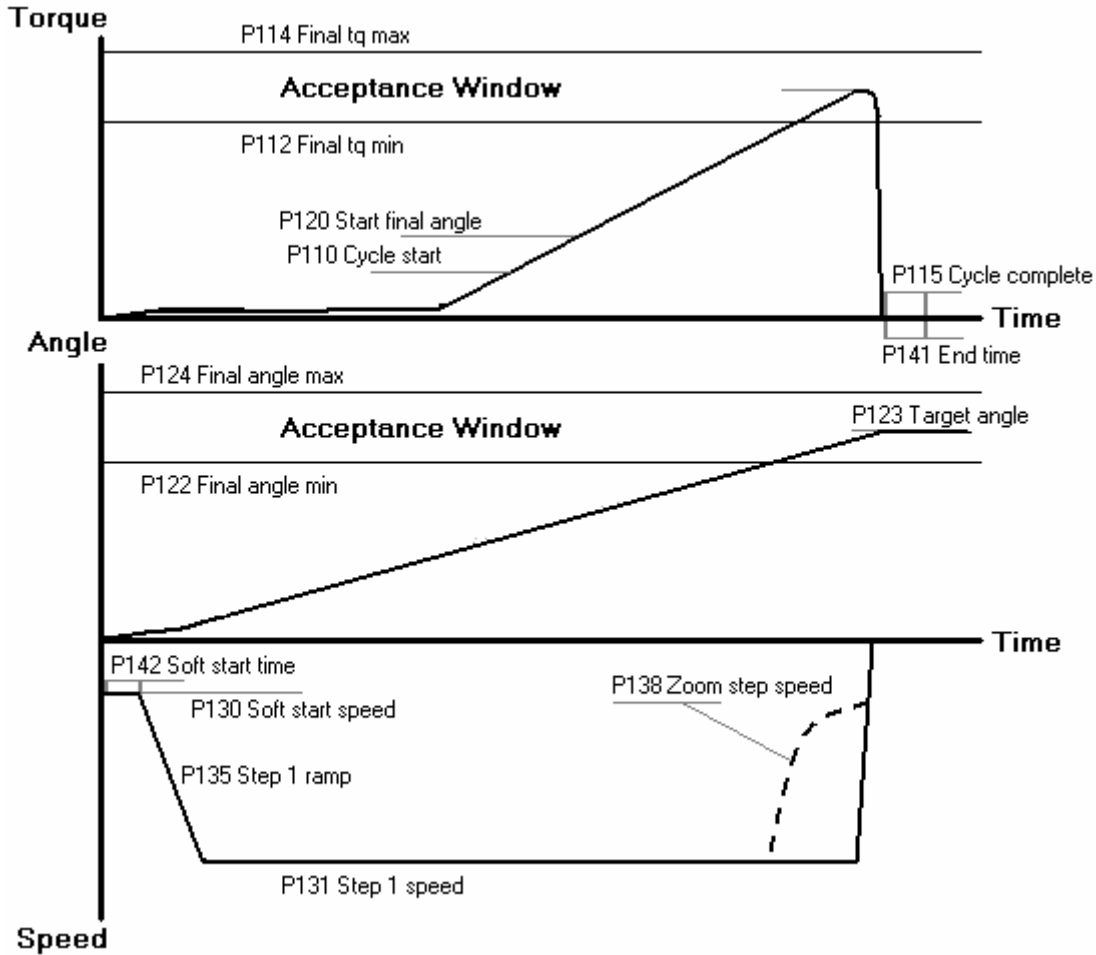
22.5.2　Two stage

22.5.3 Quick step

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

P141 End time

Angle

P124 Final angle max

Acceptance Window

P123 Target angle

P122 Final 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
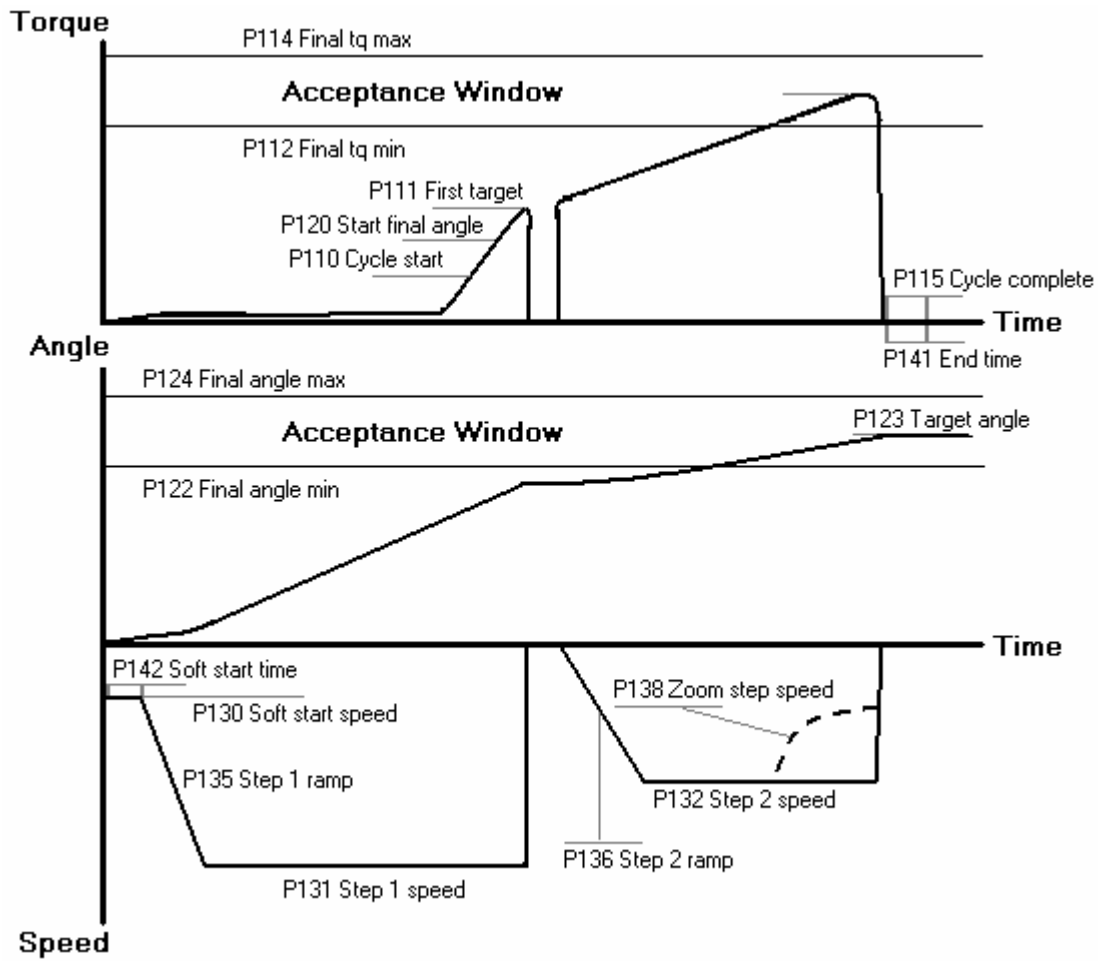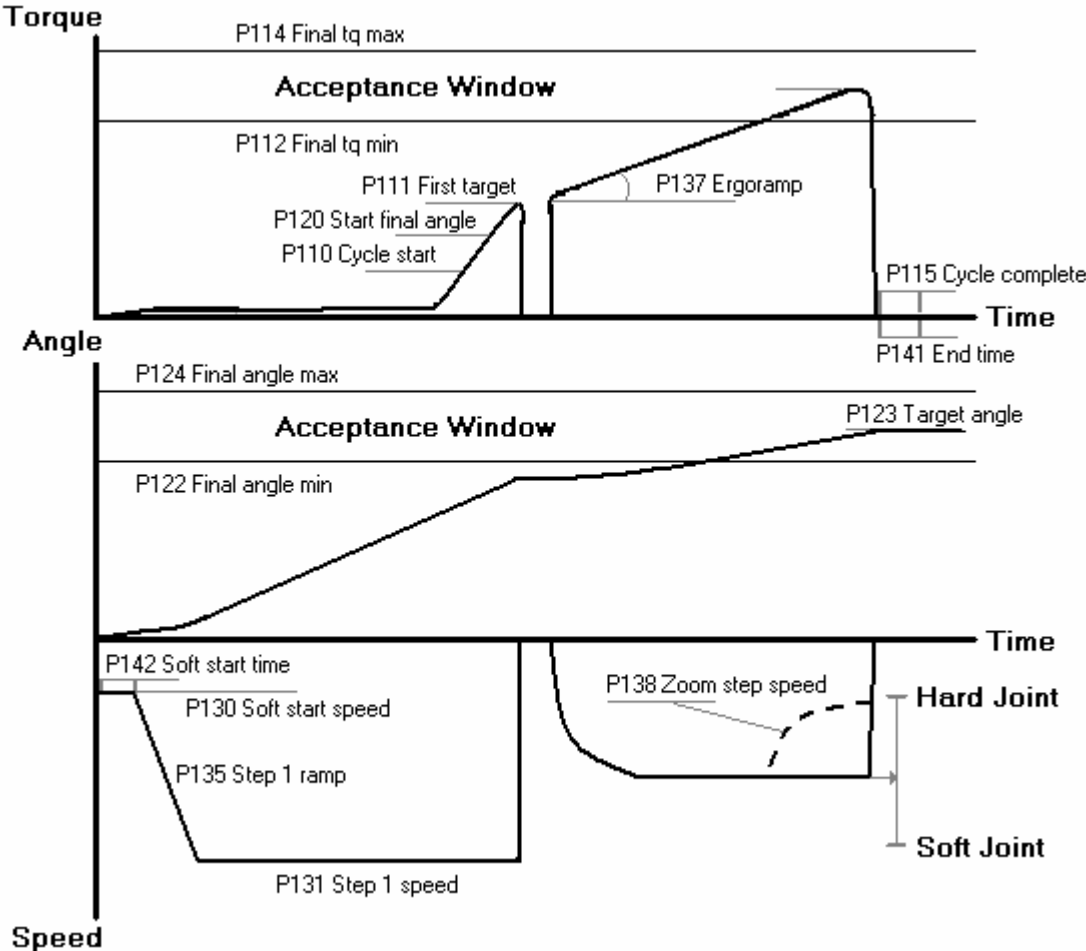
22.5.4   Ergo ramp

22.6 Reverse ang
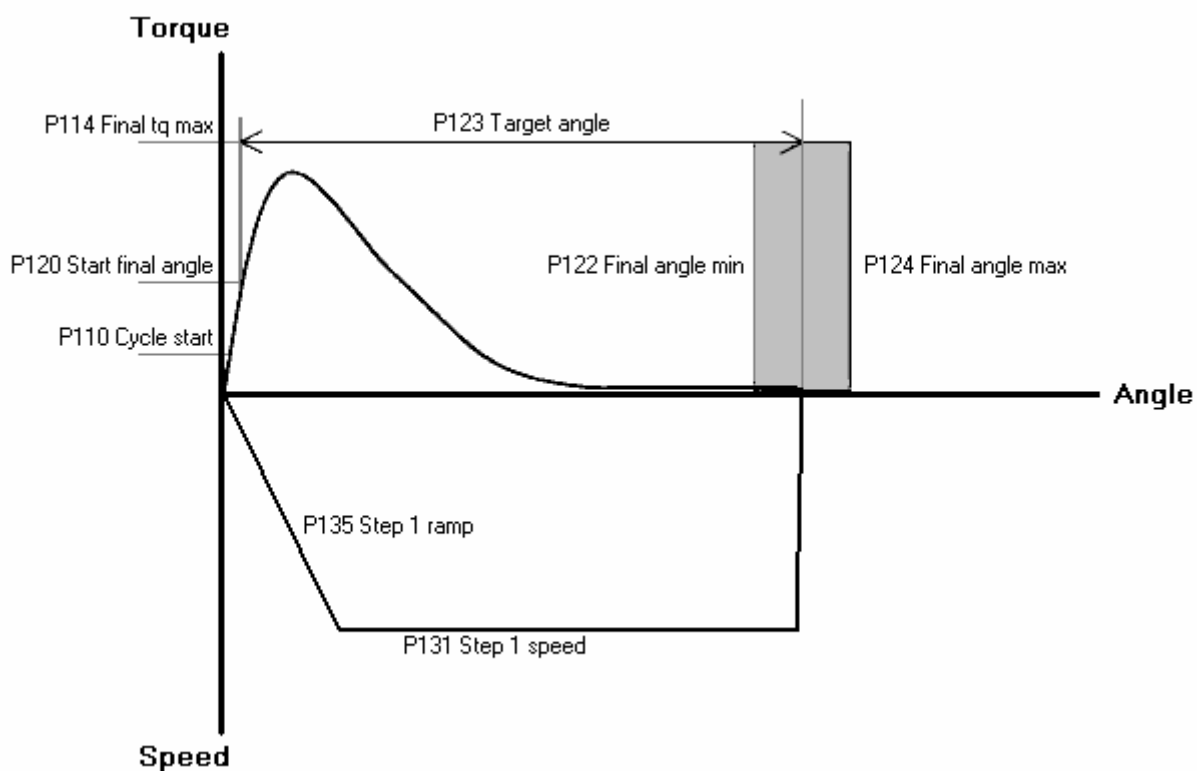
22.7   Rotate spindle forward
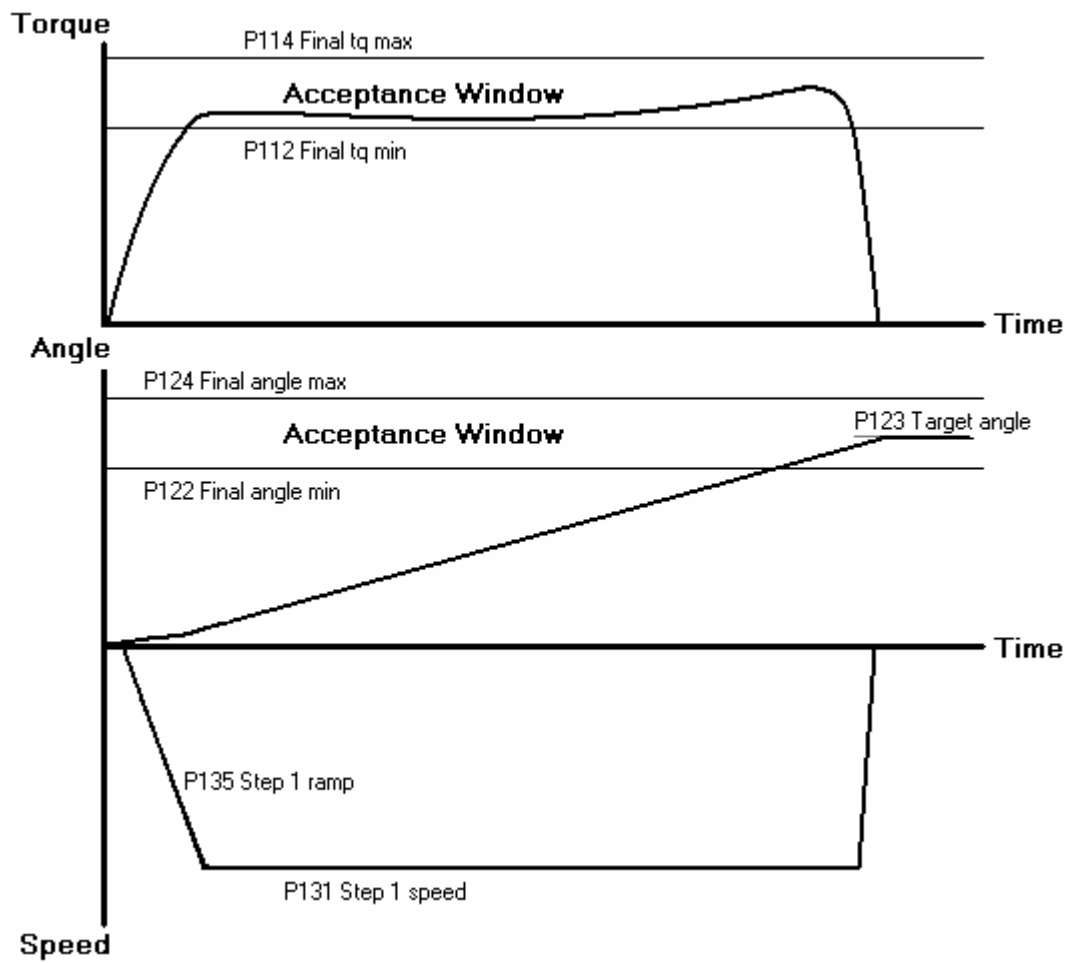
22.8   Rotate spindle reverse
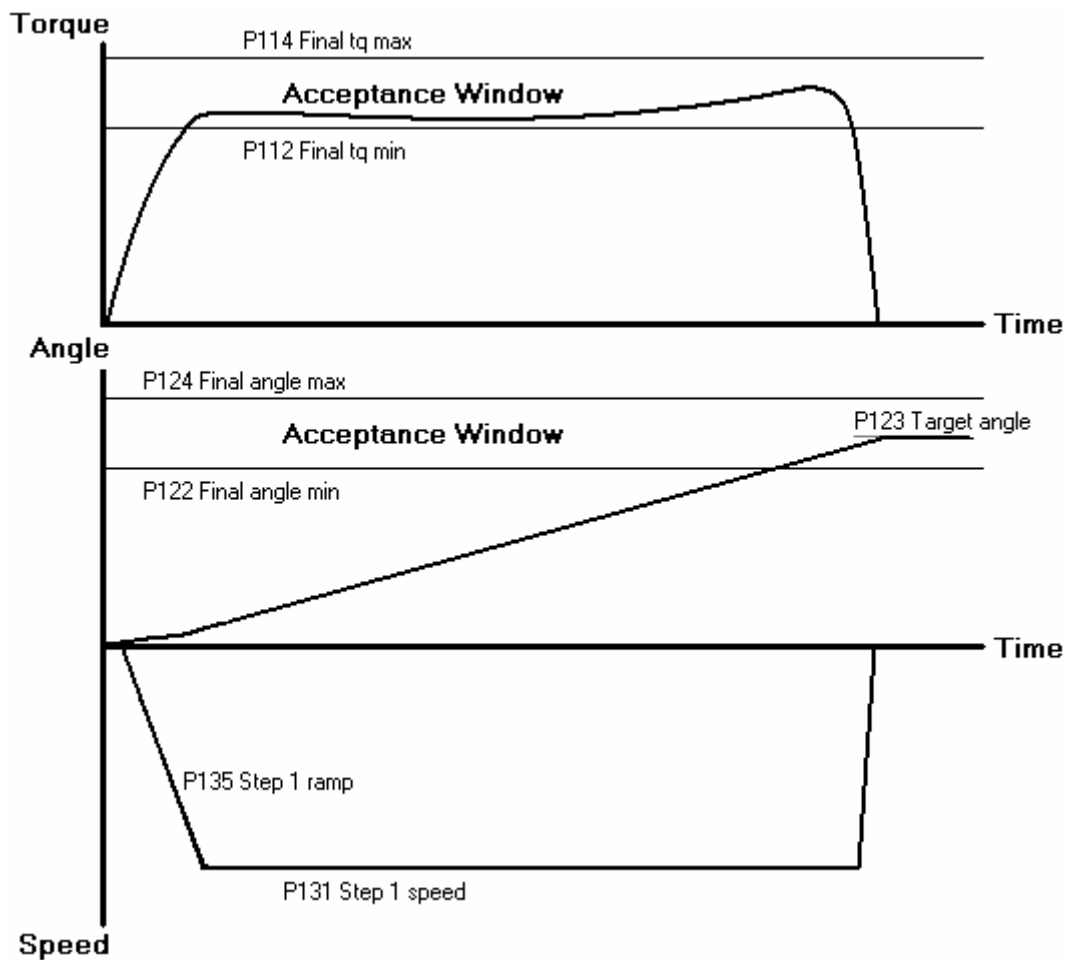
22.9　DS con

22.9.1　One stage

This strategy is not available in DS control.

22.9.2　Two stage
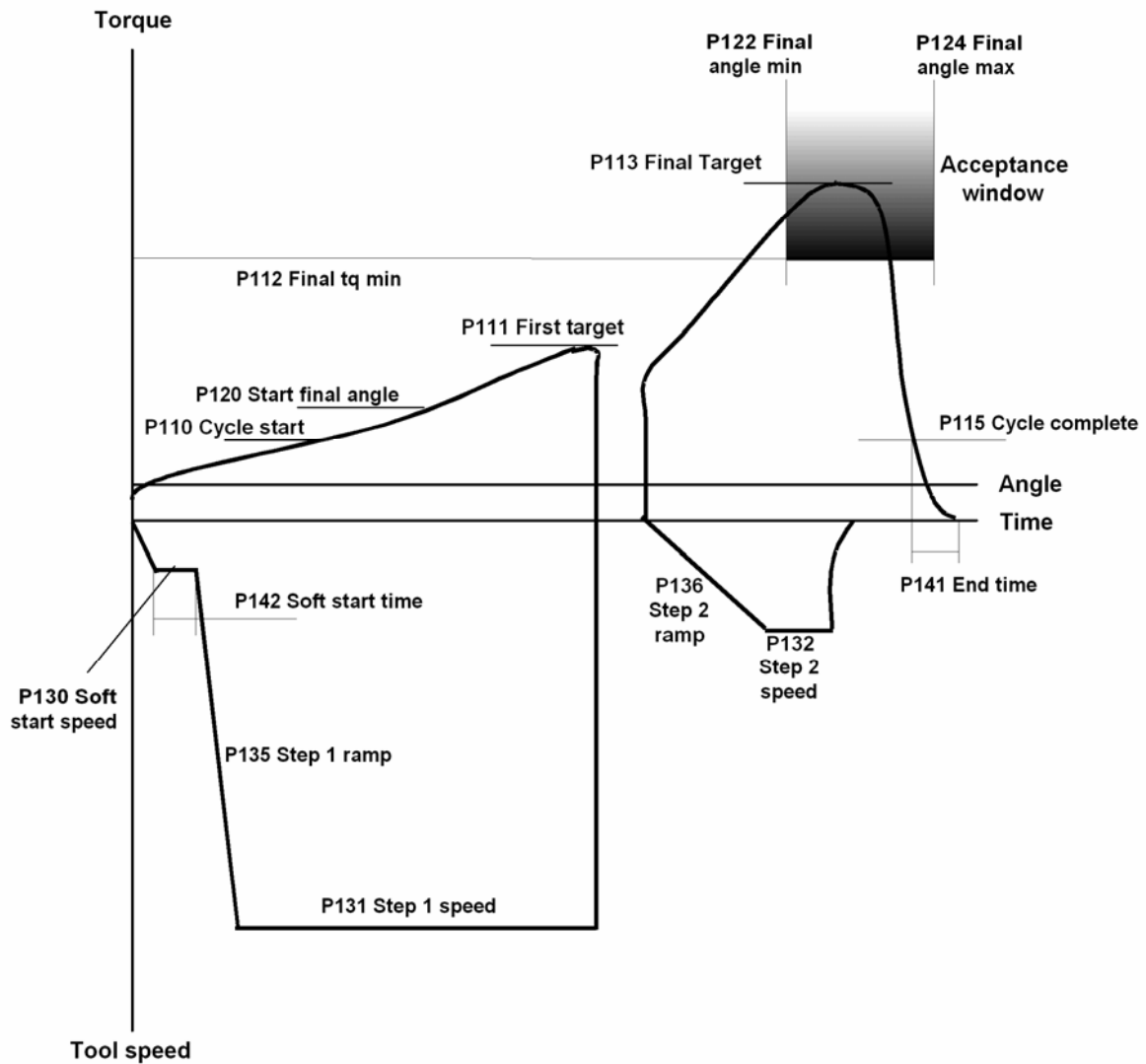
22.9.3   Quick step
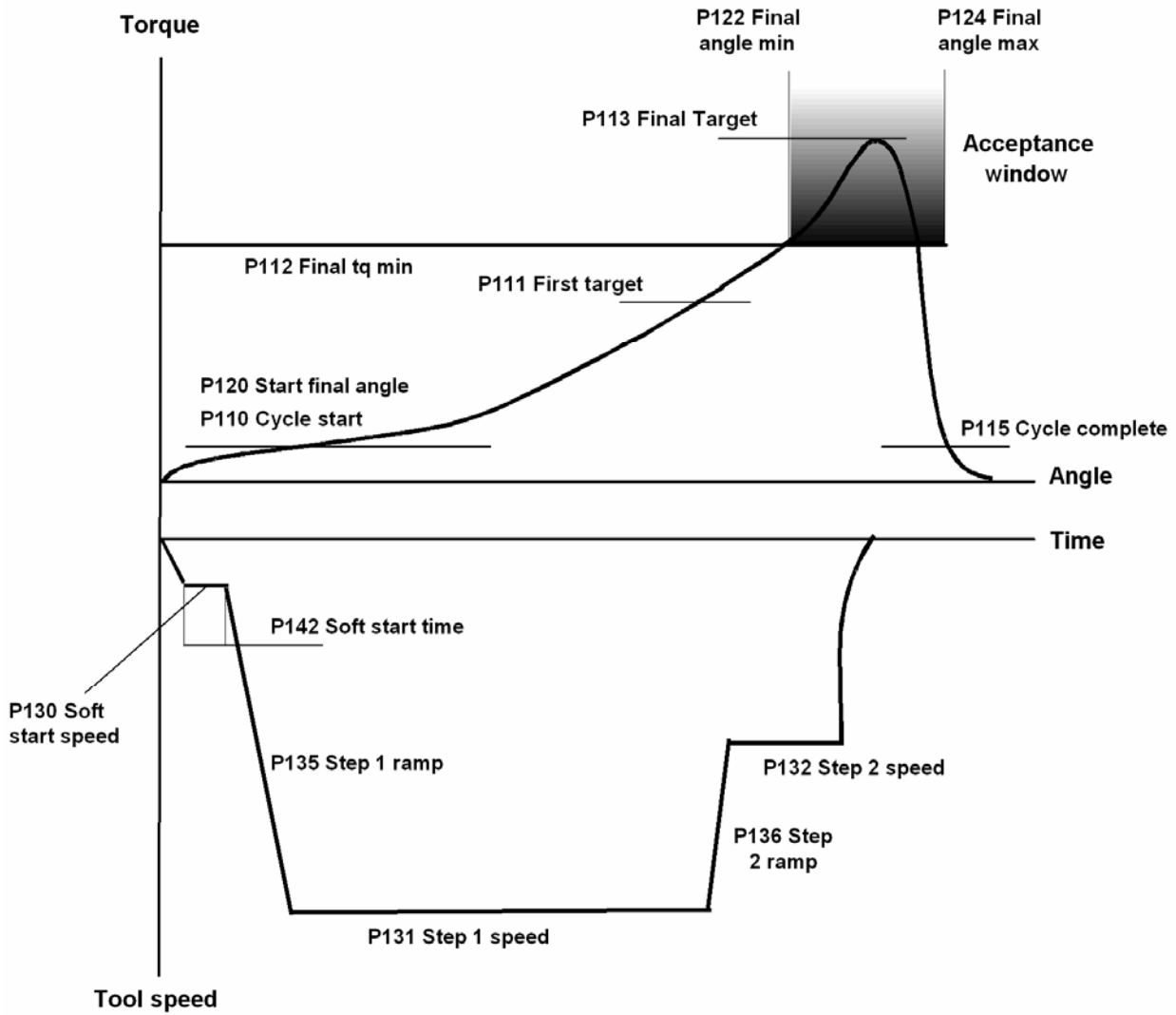
22.9.4   Ergo ramp
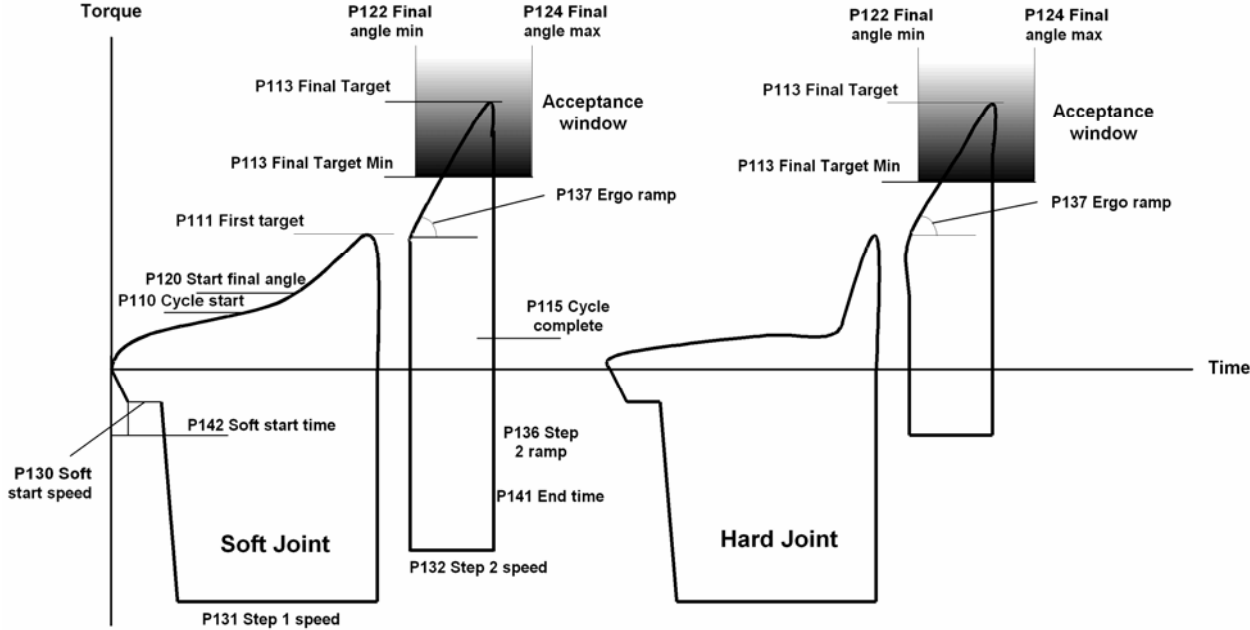
23 Digital inputs and outputs

23.1 Digital inputs

Name	Description	Available			
		Internal I/O	I/O Expander	ST GPIO	Function button (optional)
Abort Job	Abort current Job. Job status will be Job aborted. If *Lock at Job done [J302]* is activated, the tool will be locked.	X	X	X	X
Ack error message	Acknowledgment of an event/error message.	X	X	X	X
Batch decrement	Decrease the batch counter one step. In Job, batch decrement is only possible from the Job reference and it is not possible to decrement batch once the Job is completed.	X	X	X	X
Batch increment	Increase the batch counter one step. Batch status is depending on *Batch status at increment/bypass [C243]*.	X	X	X	X
Bypass Identifier		X	X	X	X
Bypass Pset	Skip the next Pset or Multistage in the running Job. Batch status is dependent on *Batch status at increment/bypass [C243]*.	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
Digout monitored [1-4]	Monitored by digital input controlled [1-4] outputs.	X	X	X	
Disable Field bus carried signals	When this digital input goes high following events occur: Field bus communication is disabled. Relay "Field bus carried signals disabled" goes high. In ToolsTalk PF monitoring mode on Field bus "To PF" side, it is possible to display changes in signals sent to the PF over the Field bus. (Note that the signals have no effect on the Power Focus, since all Field bus communication is disabled). On the Field bus side "from PF" will all bits be reset to zero. The traffic of "keep alive" signals continues on the Field bus. In this way no event codes (i.e. "no connection on Field bus") will be displayed. All tools are enabled (presupposed that the tools were disabled from a source over the Field bus before then). If there is a running Job, which has been selected via the Field bus, the Job will be aborted.	X	X	X	X
Disable ST scanner	Disable scanning from ST scanner.	X	X		X
Disconnect tool	Issue a request to disconnect the tool (hot swap for non ST/SL tools).	X	X		
Field bus digin [1-4]	These inputs give a direct link to Field bus. Field bus digital input numbers must be configured in Power Focus, I/O Expander and in Field bus. Field bus mimics the status of a digital input.	X	X	X	
Flash tool green light	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.	X	X	X	X

Name	Description	Available			
		Internal I/O	**I/O Expander**	**ST GPIO**	**Function button (optional)**
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
ID-card	Signal input from card reader to indicate that an ID-card is inserted in the reader.	X	X	X	
Job off	Turn off Job mode.	X	X	X	
Job select bit [0-8]	Job select input when selecting Job from digital input. See table above for bit information.	X	X	X	
Line control alert 1	Input for a position breaker. Gives alarm if a Job with line control is not finished.	X	X	X	
Line control alert 2	Input for a position breaker. Gives alarm if a Job with line control is not finished.	X	X	X	
Line control start	Input for a position breaker. Needed to start a Job with line control.	X	X	X	
Logic digin [1-10]	DigIn not connected to any function but used by the Logic Operator function	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
Off	The input is not used.	X	X	X	X
Pset select bit [0-8]	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 toggle	Toggle between Psets connected to one socket in a Selector. *Pset select source [C200]* must be set to "Selector".	X	X	X	X

The Pset select table within the Pset select bit [0-8] row:

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
...	...	...	...

Name	Description	Available			
		Internal I/O	I/O Expander	ST GPIO	Function button (optional)
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.**	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.**	X			
Reset all Identifier		X	X	X	X
Reset batch	Reset batch counter for current Pset.	X	X	X	X
Reset latest Identifier		X	X	X	X
Restart Job	Restart the running Job. All batch counters are reset and the Job option timers will be restarted.	X	X	X	X
Reset relays	Resets all timer and to next tight relays (tracking event relays are not reset).	X	X	X	
Request ST scan	Sending a scan request to ST scanner. The scan LED on a ST scanner will light if a scan request is configured for the LED in ST scan configuration (scanner source should be in digital input mode).	X	X		
Reset NOK counter	This digital input unlocks (if locked) and resets the "max coherent not ok tightening counter".	X	X	X	X
Select next Pset	Select higher number Pset.	X	X	X	X
Select previous Pset	Select lower number Pset.	X	X	X	X
Set home position	Set the home position for Home position strategy.	X	X	X	X
Set CCW	Sets direction according to input level. Low level corresponds to CW and high level corresponds to CCW. SL drive only.	X	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 will be locked again. If a start attempt is made before five seconds have passed, the tool will remain unlocked until it is stopped or button is released (plus that a new five seconds period will be started).	X	X	X	X
Toggle CW/CCW	Toggles direction between CW and CCW. SL drive only.	X	X		X
Toggle CW/CCW for next run	Changes direction and changes back automatically after one run. SL drive only.	X	X		X
Tool disable n.c.	Same functionality as "tool disable n.o." above but with inverted input. Normally closed.	X			

Name	Description	Available			
		Internal I/O	**I/O Expander**	**ST GPIO**	**Function button (optional)**
Tool disable n.o.	The tool will not be able to start when this input is active. If the tool rotates, it will immediate stop when this input is active. The input is active when it is switched on. Normally opened.	X			
Tool loosening disable	The function is similar to "tool disable n.o." but only for loosening. Tightening is not affected.	X			
Tool position 3					
Tool start loosening	Start the tool in loosening mode (for all control strategies). Tool stops if the signal disappears. ⚠️ **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.** **Loosening will be performed for all strategies including reverse ang and rotate spindle forward/reverse.**	X			
Tool tightening disable	The function is similar to "tool disable n.o." but only for tightening. Loosening is not affected.	X			
Unlock tool	Will unlock any software functionality lock such as "lock on reject" or "lock at batch OK" etc. ℹ️ **"Unlock tool" does not effect digital inputs like "tool disable n.o/n.c", "tool tightening/loosening disable" etc.**	X	X	X	X

23.2 Digital outputs (relays)

Name	Description	Duration			Tensor ST/SL	
		Time	**To next tightening**	**Tracking**	**Blue LED**	**Sound (time duration for all)**
Alarm	Follow the alarm light on the front of the PF.			X	X	X
Batch done	Goes high when batch counter is equal batch size. Available relay timer options: Next tight, timer and tracking.	X	X	X	X	X
Battery low	Tool has low battery power.			X	X	X
Battery empty	Tool battery is empty.			X	X	X
Calibration alarm				X	X	X
Cycle abort	Set when the Power Focus reaches the cycle abort timer.			X	X	X
Cycle complete	Tightening is finished, OK or NOK.	X	X		X	X

Name	Description	Duration			Tensor ST/SL	
		Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)
Cycle start	Relay that is triggered at *Cycle start [P110]*.	X	X			
Digin controlled [1-4]	Controlled by DigIn monitored [1-4] digital input.					
Dir. switch = CW	Tool direction ring in CW position.			X	X	X
Dir. switch = CCW	Tool direction ring in CCW position.			X	X	X
Effective loosening	Set when the Power Focus reaches the minimum loosening torque (defined in % of tool max torque).	X	X		X	X
External controlled [1-10]	Relay controlled by external source outside Power Focus.					
Field bus carried signals disabled	Indicates Field bus signals disable.			X		
Field bus offline	When Field bus goes offline the light on this bit turns off.			X	X	X
Field bus relay [1-4]	Relays controlled from Field bus.			X	X	X
Function button	Function button pressed.			X	X	X
Function button ack.	Function button pressed acknowledge.	X	X		X	X
High	Any result is above any of the programmed max limits.	X	X		X	X
High angle	Angle result is higher than max angle limit.	X	X		X	X
High torque	Torque result is higher than max torque limit.	X	X		X	X
Home position	Open end tool has successfully reached its home (open) position, or a non Open end tool has successfully completed a home position tightening.			X	X	
Identifier recognised		X	X		X	X
Identifier type [1-4] received		X	X		X	X
Illuminator	Reflects status of illuminator (tool front light).			X	X	X
Job aborted	Running Job was aborted.	X	X		X	X
Job off	Will be active when Job is in off mode.			X	X	X
Job OK	Job is performed and OK.	X	X		X	X
Job NOK	Job is performed and NOK	X	X		X	X
Job running	A Job is selected.			X	X	X
Line control alert 1	Line control warning.	X	X	X	X	X
Line control alert 2	Line control warning.	X	X	X	X	X
Line control done	A Job with line control has been completed without receiving line control alert 2.	X	X		X	X
Line control start	Line control start signal is received.	X	X		X	X
Lock at batch done	Set when batch is ok and parameter *Lock at batch done [P152]* is activated.			X	X	X
Logic relay [1-4]						

Name	Description	Duration			Tensor ST/SL	
		Time	**To next tightening**	**Tracking**	**Blue LED**	**Sound (time duration for all)**
Loosening disabled	Loosening function currently disabled.			X	X	X
Low	Any result is below any of the programmed min limits.	X	X		X	X
Low angle	Angle result is lower than min angle limit.	X	X		X	X
Low torque	Torque result is lower than min torque limit.	X	X		X	X
Max coherent NOK reached	Goes high when max coherent NOK tightening counter is reached.	X	X	X	X	X
Motor tuning disabled	Motor tuning function currently disabled.			X	X	X
N x OK	Batch OK. Only available in the Job function.	X	X		X	X
N x NOK	Batch status NOK.	X	X		X	X
New Pset selected	Goes high when a new Pset is selected. Pset ID must differ from previously selected Pset and must also differ from 0.	X	X		X	X
New Job selected	Goes high when a new Job is selected. Job ID must differ from previously selected Job and must also differ from 0.	X	X		X	X
Next tight						
No tool connected	Controller has no connection with tool.			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
Off	Output is not used.					
OK	All results are within the specified limits.	X	X		X	X
Open end tuning disabled	Open End tuning function currently disabled.			X	X	X
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
Open protocol connection lost				X	X	X
PF ready	The PF is "healthy". No event codes need to be acknowledged.			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
Received identifier	An identifier string is received.	X	X		X	X
Rehit	Tightening is rehit.	X	X		X	X
Remaining batch bit [0-7]	Display currently remaining Batch. Batch Counter 1 to 255 can be displayed. "0" means that there is no remaining batch counter (batch is completed).			X		
Running Job bit [0-8]	Shows selected Job. Bit pattern analogue to input Job select bits. 0 = no running Job.			X		

Name	Description	Duration			Tensor ST/SL	
		Time	To next tightening	Tracking	Blue LED	Sound (time duration for all)
Running Pset bit [0-8]	Shows selected Pset. Bit pattern analogue to input Pset select bits. 0 = no Pset selected, tool locked.			X		
Safe to disconnect tool	Provides answer on disconnect tool request (regardless of origin of request). Will be high when request to disconnect the tool is granted and remain high until the tool is disconnected.			X		
Selected Channel in Job				X	X	
Service indicator	Service level reached. On until the service indicator is reset. Only valid if the *Service indicator [T411]* is turned on.			X	X	X
Stat alarm	Follows the stat indicator on the Power Focus' front. Active when the selected statistic limit or trend is outside of the approved limits.	X	X		X	X
Sync OK	Total OK on a Sync tightening.	X	X		X	X
Sync NOK	Total NOK on a Sync tightening.	X	X		X	X
Sync spindle [1-10] OK	Individual OK on a Sync spindle.	X	X		X	X
Sync spindle [1-10] NOK	Individual NOK on a Sync spindle.	X	X		X	X
Tightening disabled	Tightening function currently disabled.			X	X	X
Tool connected	Connection established between tool and controller.			X	X	X
Tool green light	Relay follows tool green light. Also following the function flash tool green light (no flashing).			X		
Tool locked	Tool is locked (tool not ready).			X	X	X
Tool loosening	Tool loosening in progress.			X		
Tool ready	PF is ready to do tightenings. A valid Job and/or Pset selected. The tool will start when the trigger is pressed.			X	X	X
Tool red light	Relay follows tool red light (no flashing).			X		
Tool running	The tool is running (CW or CCW, tightening or loosening).			X		
Tool start switch	Relay that follows the tool start input. Follow the configured *Tool start select source [T200]*.			X		
Tool tightening	Tool tightening in progress.			X		
Tool yellow light	Relay follows tool yellow light (no flashing).			X		
ToolsNet connection lost				X	X	X
Tracking disabled	Tracking function currently disabled.			X	X	X
Wear indicator	Active until service is performed (i.e. while wear alarm is pending).			X	X	X

24 Parameter list

24.1 Pset

24.1.1 Programming

Parameter number	Parameter name	Description	Default setup
P100	Control strategy	Tq con: controls and monitors torque. Tq con/ang mon: controls torque and monitors torque and angle. Tq con/ang con (AND): controls and monitors torque and angle. Ang con/tq mon: controls angle and monitors angle and torque. DS con: controls a DS-type tool. Reverse ang: controls and monitors angle when tool is used in reverse direction. Click wrench: a digital input signals the completion of an arbitrary activity. No tightening is performed by Tensor tools. Rotate spindle forward: rotates the spindle a configurable number of degrees in the forward direction. Rotate spindle reverse: rotates the spindle a configurable number of degrees in the reverse direction. Tq con/ang con (OR): controls and monitors torque and angle. Stops when either of the criteria's has been reached. ⓘ **The "reverse angle" and "rotate spindle forward/reverse" strategies are not applicable for Open end tools.**	IF DS tool: DS con ELSE: Tq con/ang mon
P101	Tightening strategy	One stage: tightening is performed in one stage. Control is done from *Cycle start [P110]* until *Final target [P113]* is reached. Two stage: tightening is performed in two stages. Control is done from *Cycle start [P110]* until *First target [P111]*. The tool stops and then accelerates to a lower speed and controls until *Final target [P113]* 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 rundown speed.	Two stage
P104	Rundown angle	This parameter is optional. If chosen, there are two alternatives. From start: The rundown phase starts when the tool trigger is pressed and continues until the torque value reaches *Rundown complete [P116]*. From cycle start: The rundown phase starts when the torque level exceeds the *Cycle start [P110]* torque level and continues until *Rundown complete [P116]* is reached.	No
P105	Zoom step	This parameter enables the zoom step function. Zoom step strategy combines quick tightening with high precision and low scatter.	No
P106	PF2000 compatible	This parameter changes the characteristics of the Power Focus 3000 similar to a Power Focus 2000. Acceleration and ramp functions are affected. Programming of parameters is otherwise not affected. If this function is selected, the full capacity of the tool cannot be used. The maximum torque will not be affected.	No
P107	Click wrench no.	This parameter is only used if Click wrench is chosen as *Control strategy [P100]*. It is used to connect the click wrench strategy to any one of four defined digital input.	Click wrench 1

Parameter number	Parameter name	Description	Default setup
P108	Start Trace from	Will generate a Trace from tool start or *Cycle start [P110]*.	*Cycle start*
P109	Monitor end time from	Decides if monitoring of end time (cycle complete) will start from *Cycle start [P110]* or *Rundown complete [P116]*.	*Cycle start [P110]*
P110	Cycle start	Defines the starting level for a tightening cycle.	IF *Control strategy [P100]* is set to "DS con" or "DS con/tq mon": 0.1 * *Tool max torque [T102]* ELSE: 0.05 * *Tool max torque [T102]*
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 * *Tool max torque [T102]*
P112	Final tq min	Defines the lower torque limit for OK tightening.	0.3 * *Tool max torque [T102]*
P113	Final target	Defines the desired final torque value when a torque (tq) *Control strategy [P100]* is used. The tool shuts off when the final target value is reached.	9999 Nm
P114	Final tq max	Defines the upper torque limit for OK tightening. The tool shuts of if the torque value exceeds this value.	0.5 * *Tool max torque [T102]*
P115	Cycle complete	This parameter indicates the torque level when the tightening cycle is complete. When the torque falls below this level, a timer, *End time [P141]*, is started. Tightening is complete when the torque has fallen below the level for *Cycle complete [P115]* and stayed there until *End time [P141]* has been reached.	0.03 * *Tool max torque [T102]*
P116	Rundown complete	The torque level when the rundown phase is finished. (Only used if *Rundown angle [P104]* or any of the PVT options are selected).	0.2 * *Tool max torque [T102]*
P118	Measure torque at	Defines the torque result.	Torque peak
P119	Loosening limit	Defines the limit for a valid loosening. Adjustable from 0 to *Tool max torque [T102]*.	0.1 * *Tool max torque [T102]*
P120	Start final angle	Angle measurement starts when the torque value exceeds this value. *Start final angle [P120]* must be selected equal to or greater than *Cycle start [P110]*. (If a PVT option is used then it has to be greater than *Rundown complete [P116]*.)	0.25 * *Tool max torque [T102]*
P121	Measure angle to	Defines to what point the final angle shall be measured. The start point is always *Start final angle [P120]*. Tq 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 *Cycle complete [P115]*.	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 *Rundown angle [P104]*. If the angle is smaller than this value at *Rundown complete [P116]*, "low" is indicated and the tool will shut off.	0 deg
P126	Rundown angle max	This parameter indicates the max limit value for *Rundown angle [P104]*. 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 limit for the final angle max monitoring.	9999 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 *Step 2 ramp [P136]* 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 *Tightening strategy [P101]*.	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 *Zoom step [P105]* must be active.	10%
P141	End time	This parameter defines the time Power Focus should remain active after the torque level has dropped below *Cycle complete [P115]*. The value is adjustable between 0.1 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 tool idling time between stages in a Multistage tightening. The value is adjustable between 0 and 32 seconds. Accessible when parameter *Stop between stages [M205]* is activated.	0.0 s
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 *Batch size [P151]* value should be read, if this parameter is activated. Options: Off: batch count functionality is not used. Pset: use batch size of a Pset. Field bus: an external source decides *Batch size [P151]* via Field bus. Ethernet/serial: an external source decides *Batch size [P151]* 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 *Batch count [P150]* must be in active mode. ⓘ **Batch size defined in Job overrides batch size defined in Pset.**	1

Parameter number	Parameter name	Description	Default setup
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 *Batch size [P151]*.	No
P153	Max coherent NOK's	Defines the number of possible not ok tightenings in a row. Accessible when *Batch count [P150]* is set to "Pset" or "off". Scope: 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.	%
P162	High speed interval	High speed rundown interval.	Deg

24.1.2   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 *Tool max torque [T102]*. Set an acceptance window for the torque as redundant process control via parameters *CM min [P201]* and *CM max [P202]*.	No
P201	CM min	Defines min limit for OK tightening.	0.0%
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 *Final target [P113]* or *final tq max [P114]*.	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 *Selftap interval [P211]* 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 *No. of selftap windows [P212]* 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. Range is from *Cycle complete [P115]* value to *Selftap max [P214]*.	*Cycle complete [P115]*
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 *Selftap min [P213]* to *Tool max torque [T102]*.	9999 Nm
P220	PVT monitoring	Activates the PVT monitoring function.	No

Parameter number	Parameter name	Description	Default setup
P221	PVT delay interval	Defines delay before *PVT monitoring [P220]* starts. Setting is performed in degrees in the interval 0 to 9999.	0 deg
P222	PVT monitor interval	Defines the interval during which the *PVT monitoring [P220]* 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 *PVT monitor interval [P222]* 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 *No. of PVT windows [P223]* 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
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.	*Cycle complete [P115]*
P225	PVT max limit	This parameter is monitored in real time during the monitor interval and if exceeded, an alarm is generated.	*Rundown complete [P116]*
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 *PVT comp point [P231]*) used as reference for the torque during the actual tightening cycle. ⓘ **All torque values; i.e. *Final target [P113]*, *First target [P111]* and *Final tq max [P114]* 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 *Rehit [E112]*). 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 *Final target [P113]* but above *Final torque min [P112]*.	No
P244	Alarm on lost trigger	Yes/No Power Focus will detect if the tool trigger was released before the *Final target [P113]* was reached.	No
P245	DS torque tuning factor	Only used if "DS con" is chosen as a *Control strategy [P100]*. It compensates for the error that DS measurement induces. The value can be set between 80 and 220 percent. For information how to adjusting the DS torque tuning factor, see chapter *Tensor tools*.	100%
P246	Alarm on end time shutoff	Yes/No If end time times out before *Final target [P113]* was reached then an event code will be displayed.	No

Parameter number	Parameter name	Description	Default setup
P260	Torque, TC	The torque threshold where the yield control is to be started. ℹ️ **Yield control is activated by selecting the *Control strategy [P100]* to Yield. The *Tightening strategy [P101]* can be set to One stage, Two stage or Quickstep, and yield control will always interact in the last stage of the tightening.** **Zoom step [P105] strategy ending is eliminated when yield control is selected. An additional tightening angle can be added after the yield point is reached by setting an angle to the *Angle step [P264]* parameter.**	0.0 Nm
P261	Increment	Defines the angle interval between samples.	0 deg
P262	No degrees	Defines the length of the angle interval in which an average of the torque values shall be calculated.	0 deg
P263	Torque difference	Percent of the maximum torque difference between samples which estimate the yield point limit.	50 %
P264	Angle step	Additional angle step after the yield point is reached.	0 deg
P265	NOS	Parameter for Yield method 2	0 deg
P266	RNOS	Parameter for Yield method 2	0 deg
P267	NNOS	Parameter for Yield method 2	0 deg
P268	Torque difference	Parameter for Yield method 2	50 %
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 *Rundown complete [P116]*. 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. ℹ️ **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.	*Cycle start [P110]*
P282	Post view min monitoring start	Start of min monitor interval.	9999
P283	Post view min monitoring interval	Length of min monitor interval.	1
P284	Post view max torque	Defines the high limit for the torque during the entire interval.	*Rundown complete [P116]*
P285	Post view max monitoring start	Start of max monitor interval.	1
P286	Post view max monitoring interval	Length of max monitor interval.	1

24.1.3   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.	
P407	Disable result on ext.prot.	No result for this Pset is sent on external protocols i.e. Field bus and Open protocol, only sent on ToolsTalk PF protocol.	
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.	

24.1.4   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
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

Parameter number	Parameter name	Description	Default setup
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
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 *Rundown angle [P104]* 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 *Rundown angle [P104]* 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 *Rundown angle [P104]* 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 *Rundown angle [P104]* 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 *Rundown angle [P104]* 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 *Selftap [P210]* 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 *Selftap [P210]* is selected.**	9999 Nm

Parameter number	Parameter name	Description	Default setup
P542	Selftap range LCL	The lower control limit for range. Calculated automatically or entered manually. ⓘ **This function is only available if parameter *Selftap [P210]* 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 *Selftap [P210]* 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 *Selftap [P210]* 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 *Selftap [P210]* 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 *PVT monitoring [P220]* 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 *PVT monitoring [P220]* is selected.**	9999 Nm
P552	PVT range LCL	The lower control limit for range. Calculated automatically or entered manually. ⓘ **This function is only available if *PVT monitoring [P220]* 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 *PVT monitoring [P220]* 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 *PVT monitoring [P220]* 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 *PVT monitoring [P220]* 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%

24.2 Multistage

24.2.1 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.

24.2.2 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. Field bus: An external source decides batch size via Field bus. 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
M205	Stop between stages	Provides stop between the stages in a Multistage. If enabled, parameter *Tool idle time [P143]* for each Pset will be used as input (tightenings has an idle time between two consecutive stages).	Yes
M208	Max coherent NOK's	Defines the number of possible not ok tightenings in a row. Accessible when parameter *Batch count [M202]* is set to "Pset" or "Off".	Off
M210	Torque result	Defines from what stage the torque result will be received. Accessible when torque is selected as a *Control strategy [P100]*.	Last stage
M211	Angle result	Defines from what stage the angle result will be received. Accessible when angle is selected as a *Control strategy [P100]*.	Last stage
M212	Rundown result	Defines from what stage the rundown angle result will be received. Accessible when parameter *Rundown angle [P104]* is used.	Last stage

Parameter number	Parameter name	Description	Default setup
M213	PVT Selftap result	Defines from what stage the PVT selftap result will be received. Accessible when *Selftap [P210]* is activated.	Last stage
M214	PVT mon. result	Defines from what stage the PVT mon. result will be received. Accessible when *PVT monitoring [P220]* is activated.	Last stage
M215	CM result	Defines from what stage the current monitoring result will be received. Accessible when *Current monitoring [P200]* 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 *Post view torque [P280]* is activated.	Last stage
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 *Control strategy [P100]*). **Results are only stored in the Multistage, not in the individual Pset.**	*Cycle start [P110]*
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 *Control strategy [P100]*). **Results are only stored in the Multistage, not in the individual Pset.**	*Tool max torque [T102]*
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 *Control strategy [P100]*). **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 *Control strategy [P100]*).	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 *Control strategy [P100]*).	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 *Control strategy [P100]*).	30

Parameter number	Parameter name	Description	Default setup
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 *Control strategy [P100]*).	Off
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 *Control strategy [P100]*).	Off
M228	SPC alarm CM	This parameter switches the current monitoring SPC alarm function on or off. Accessible when *Current monitoring [P200]* is activated.	Off

24.3   Job

24.3.1   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 Job	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.	

24.3.2 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 30. 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 *Job order type [J301]*).** **A Job has override privileges, in comparison to a single Pset/Multistage, on a selected possible number of NOT OK 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 selectable possible number of Not OK tightenings for each Pset/Multistage in a Job. (This function is also available for each single Pset/Multistage, see parameter *Max coherent NOK's [P153]*). The tool will be locked (for both tightening and loosening) when number of possible not OK tightenings is reached for each batch. When the tool is locked due to possible not OK tightenings the only ways to unlock the tool are: Reset counter for performed not OK tightening via a digital input. Select abort Job (in case the selected Job shall not lock the tool). Select Job off.	
J301	Job order type	A Job must be defined as forced order Job, free order Job or free and forced order Job. Free order: offers the operator to perform Psets/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

Parameter number	Parameter name	Description	Default setup
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.	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 (nxNOK) at batch increment or bypass event. The nxNOK LED will light.	NOK
J312	Decrement batch at OK loosening	Decrement batch at OK loosening makes it possible to redo the latest made tightening/increment in a Job. The batch counter of the Pset or Multistage is decreased with one step. It is not possible to go back one step after the Job has been completed. ⓘ **If "batch counter type" is set to OK and last tightening was a NOK tightening, an OK loosening will not decrease the batch counter.** **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

Parameter number	Parameter name	Description	Default setup
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 the 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.	No
J340	Identifier result part 1 (old parameter name: VIN number in result)	Job VIN number: All tightening results/events during a Job will be saved in database together with the Job VIN numbers (even if other identifier string is received during the running Job). This is applied for all Job members in a Cell Job. Other: always the latest received VIN number (identifier string) will be stored together with tightening result in database.	Other
J341	Result of non-tightenings	Yes: one null result for batch increment, decrement or loosening will be stored in the Power Focus database. One null result will be saved in the database for every tightening not performed due to "Bypass" or "Abort Job". No: no null results will be stored in the Power Focus database.	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

24.4 Controller

24.4.1 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.
C112	CC version	Hardware revision information about the CC-card in the Power Focus.
C113	MC version	Hardware revision information about the MC-card in the Power Focus.
C114	DC version	Hardware revision information about the DC-card in the Power Focus.
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).
C117	Field-bus type	The type of Field bus (i.e. DeviceNet or InterBus) inserted in the Power Focus.
C119	SL drive	Informs the user if the Power Focus has a SL drive card inserted or not.

24.4.2 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, Field bus, PF Keyboard, Field bus selector and ST Selector.	Off
C201	Job	Defines what device is to be used when selecting the running Job. This source has a higher priority than *Job [C201]*. The option is accessible when Job is accessible (RBU type). Available options; Off, DigIn, Ethernet/Serial, Identifier, Field bus and PF Keyboard	Off
C202	Job override	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, Field bus 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, Field bus 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.	

Parameter number	Parameter name	Description	Default setup
C220	Disable loosening at OK	Yes/No Used to prevent the operator from loosening a correctly tightened joint.	No
C230	OE forward positioning	When activated, positioning Open end tools in forward direction instead of backwards. For more information, see chapter *Tensor tools*	No
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 An OK loosening generates a batch decrement for the latest made tightening/increment. ⓘ **This function only works with stand alone spindle, NOT with Sync.**	No
C243	Batch status at increment/bypass	OK/NOK Defines if an increment or bypass operation is OK or NOK.	NOK
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.	None

24.4.3   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 the PF. It is possible to use up to 20 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 s 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 20 characters. Accessible when the Power Focus s a Cell reference.	

Parameter number	Parameter name	Description	Default setup
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. ℹ **This IP address must be written into each included Net member.**	0.0.0.0
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. ℹ **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. ℹ **This IP address must be written into each included Sync member.**	0.0.0.0
C320	Multicast on	On/Off Multicast function.	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 *Multicast on [C320]* 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	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 *ToolsNet on [C350]* is activated.	0.0.0.0
C352	Port	Port number for ToolsNet communication. ℹ **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

24.4.4   COM ports

Parameter number	Parameter name	Description	Default setup
C400	Baud rate	The baudrate of the 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. Available options: None, ASCII, 3964R and IDESCO	ASCII
C410	Baud rate	The baudrate of the 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

24.4.5   Display

Parameter number	Parameter name	Description	Default setup
C500	Language	Select language for the Power Focus display. Options available: English, French, German, Italian, Brazil, Spanish and Swedish	English
C501	Torque unit	Select unit for showing torque. Options available: Nm, "lbf.ft", "lbf.in", kpm, "kgf.cm" and ozf.in"	Nm
C502	Speed unit	Percentage of tool maximum. Options available: % and RPM	%
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.	
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.	50%
C540	Backlight auto off	If "yes" is selected, the lights on the PF Graph display will turn off after 15 minutes of inactivity. The light will come on again after a key is pushed or after a tightening.	Yes

24.4.6 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	Default configuration
C601	No. of Psets	Number of Psets possible to configure. Always readable. Writable if *Type [C600]* is set to "Totally configurable". Scope: 1 to 300	250
C602	No. of Jobs	Number of Jobs possible to configure. Always readable. Writable if *Type [C600]* is set to "Totally configurable". Scope: 1 to 700	99
C603	No. of Results	Number of results possible to save. Always readable. Writable if *Type [C600]* 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 *Type [C600]* is set to "Totally configurable". Scope: 1 to 4	4
C605	No. of Events	Number of events possible to save. Always readable. Writable if *Type [C600]* 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 *Type [C600]* is set to "Totally configurable". Scope: 1 to 500	100
C607	No. of Traces	Number of traces possible to save Always readable. Writable if *Type [C600]* 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.	C610
C611	Total reset	Totally reset of the Power Focus memory. ⚠ **All programming, tightenings and statistics will be deleted.**	C611
C612	Reset general event log	All events in the general event log are deleted.	C612
C613	Reset statistical event log	All events in the statistical event log are deleted.	C613

24.4.7 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.	

24.5 Tool

24.5.1 Information

Parameter number	Parameter name	Description	Default value
T100	Type	Shows information about the connected Tensor tool type. Options available: S, DS, ST, None, Reference Transducer, Pulsor, X, SL, DL, STB offline and STB online Accessible when a tool is connected.	
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, exclusive 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, exclusive STB offline. **This parameter must only be changed by users with tool knowledge.** **Read only access for ST/SL/DL tools and STB online.**	[Nm]
T103	Gear ratio	Shows the mechanical gear ratio for the tool. Accessible when a tool is connected.	
T104	Production date	Tool production date. In Unix format. Accessible when a ST/SL/DL/STB online tool is connected.	
T105	Serial number	Shows the serial number of the tool. Accessible when a tool is connected, exclusive STB offline.	
T106	Denomination	Accessible when a ST/SL/DL/STB online tool is connected.	
T107	Product number	Accessible when a ST/SL/DL/STB online tool is connected.	
T110	Size	Shows information about the motor size in the tool. Accessible when a tool is connected, exclusive STB offline.	
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. Accessible when a ST/SL/DL/STB online tool is connected.	
T131	Boot code version	Shows the version number of the boot-code. Accessible when a ST/SL/DL/STB online tool is connected.	

24.5.2   Configuration

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, Field bus, Sync start, Remote start, Front/Push start, Front/Push start AND Tool trigger, Front/Push start OR Tool trigger, Safety trigger	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" (see chapter *Digital inputs and outputs*). The function unlocks the tool for a period of five seconds. Once the period expires, the tool will be locked again. If a start attempt is made before five seconds have passed, the tool will remain unlocked until it is stopped or button is released (plus that a new five seconds period will be started). 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 chapter *Tool* .	0,5 s
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
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 23 *Digital inputs and outputs*.	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 23 *Digital inputs and outputs*.	For SL-drive:97 (Toggle CW CCW) Otherwise: Off

Parameter number	Parameter name	Description	Default value
T232	CW single push	Defines the function of function button single push when ring is in CW position. Available functions are described in chapter 23 *Digital inputs and outputs*.	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 23 *Digital inputs and outputs*.	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 23 *Digital inputs and outputs*.	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 23 *Digital inputs and outputs*.	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 23 *Digital inputs and outputs*.	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. Available events are described in c chapter 23 *Digital inputs and outputs* (in the Blue LED column).	Off
T252	Off event	Defines which event (relay function) that is used to turn off illuminator while operating in "event controlled" mode. Available events are described in chapter 23 *Digital inputs and outputs* (in the blue LED column).	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
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. {TABLE}	PF-controlled:1
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

Table inside T260:

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
T262	On time	Select time for tool light LED, can be set between 0 and 300 seconds. Only valid if *Use on time [C261]* 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 a 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	Lock on radio connection	Tool radio connection lock configuration. Alternatives: Off; Link down; No start confirm.	Off
T272	Radio link timeout	FDM timeout. Unit: Milliseconds. Min value: 1000. Max value: 60000.	5000

24.5.3   Diagnostic

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/DL tools has 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. Accessible when a tool is connected.
T310	Direction ring	Diagnostics for tool LED's and buttons. Accessible when a tool is connected.
T312	Function button	Diagnostics for tool LED's and buttons. Accessible when a tool is connected.
T313	Lights	Diagnostics for tool LED's and buttons. Accessible when a tool is connected.
D155	Motor temp.	Shows the current motor temperature. Accessible when a ST/SL/DL/STB online tool is connected.
D156	Motor temp. limit	Temperature when the motor is considered overheated. Accessible when a ST/SL/DL/STB online tool is connected.
D157	No. of over temp.	Number of times the motor has reached its temperature limit. Accessible when a ST/SL/DL/STB online tool is connected.
D158	Peak motor temp.	Maximum measured motor temperature. Accessible when a ST/SL/DL/STB online tool is connected.

24.5.4 Maintenance

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.	
T402	Set calibration value	This parameter sets the *Calibration value [T400]* and the *Calibration date [T401]* 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	Normalisation value	Shows the normalisation value for the tool. Valid scope: 100 to 9999.	1000
T404	Calibration alarm	0 = No alarm is active, 1 = activating of parameter *Calibration alarm date [T405]*. (Unix format no of seconds from 1970-01-01). Accessible when a tool is connected, exclusive STB offline.	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 two tool services. This parameter serves as service indicator alarm limit.	
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 *Number of tightenings since service [T412]* to zero, sets *Latest service date [T414]* to current date and sets *Service indicator [T411]* 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.	
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 two tool services. This parameter serves as service indicator alarm limit.	
T420	Use Open end	Defines if a tool with an Open end head should be used. **Read only access for ST/SL/DL tools.**	
T421	Inverted motor rotation	Shows if the Open end has to use an inverted motor rotation. **Read only access for ST/SL/DL tools.**	

Parameter number	Parameter name	Description	Default value
T422	Open end tightening direction	Defines if Open end CW (clockwise) or CCW (counter clockwise) is to be used. ⓘ **Read only access for ST/SL/DL tools.**	
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 *Gear ratio [T103]* and writes the new value to the tool memory.	
T430	Wear indicator	Enables/disables (on/off) the wear indicator alarm function. ⓘ **This function is only available for ST/SL tools.**	
T431	Wear used	Shows amount of accumulated wear compared to recommended amount of wear (in percent). This value is affected by parameter *Alarm factor [T433]*. ⓘ **This function is only available for ST/SL tools.**	
T432	Remaining tightenings	Estimated number of tightenings that can be performed before wear indicator alarm occurs. ⓘ **This function is only available for ST/SL tools.**	
T433	Alarm factor	The alarm factor allows the user to adjust the alarm limit (scaling of recommended amount of wear, see parameter *Wear used [T431]*). A value lower than 100 will reduce the amount of wear needed to trigger the alarm. A value higher than 100 will increase the amount of wear needed to trigger the alarm. ⓘ **This function is only available for ST/SL tools.**	
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.' ⓘ **This function is only available for ST/SL tools.**	250000
T440	QRTT on	On/Off Automatic tool calibration using the ACTA 3000 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 normalisation 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

Parameter number	Parameter name	Description	Default value
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).	
T450	Perform motor tuning	When selected, this parameter will perform motor tuning on the connected tool.	
T460	Disconnect tool	Disables reading and writing to the tool memory and allows the user to change tools without power off.	

24.5.5   Buzzer configuration

Parameter number	Parameter name	Description	Default value
E100	Name	Sound buzzer name.	
E101	Frequency	Valid scope: 400 - 4000 Hz	
E102	Time On	Valid scope: 0.01 - 65.0 Seconds	0.2
E103	Time Off	Valid scope: 0.01 - 65.0 Seconds	0.1
E104	Repetition	Valid scope: 0 - 100 times	3
E105	Volume	Valid scope: 0 - 100 % This parameter is relative (in percent) parameter *Volume [T221]*, which could be set to high, medium or low. *Volume [T221]* could be found in the sound setup window.	75

24.5.6   Sound configuration

ⓘ   **Not available for SL tools.**

Parameter number	Parameter name
W100	Current segment number
W101	Remaining size in bytes
W102	Stream name

24.6   Accessories

24.6.1   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.** ⓘ **It is not possible to have Power Focus in normal operation during the test.**

24.6.2   I/O bus

Parameter number	Parameter name	Description	Default setup
A230	Selector confirm	Available options: off, on, on with acknowledge.	Off
		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.	
		Selector confirmation is also applicable when selecting Psets/Multistages in a Job.	
A231	Selector lost mode	Determines whether the last selected Pset or "no Pset" is selected when communication with a selector is lost.	Last Pset

24.6.3   Printer

Parameter number	Parameter name	Description	Default setup
A400	Selector confirm	Available options: off, on, on with acknowledge.	Off
		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.	
		Selector confirmation is also applicable when selecting Psets/Multistages in a Job.	
A401	Selector lost mode	Determines whether the last selected Pset or "no Pset" is selected when communication with a selector is lost.	Last Pset
A410	Brand	With parameter printer type the printer is selected. Options are: IBM, HP and Epson.	IBM
A411	Paper size	With parameter paper size the paper format is selected.	A4
		Options are: A4 or US Letter.	
A412	Continuous print	With parameter continuous print set to "Yes", the results after each tightening are automatically sent to the printer port.	No
A413	Print trace with angle offset	Used when printing a trace from Power Focus printer port.	No

24.7 Sync

24.7.1 Programming

ℹ️ **Sync programming options are only available if the 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 synchronisation 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 minimised during the tightening stage by adjusting the individual speeds. Synchronisation 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. ℹ️ **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

24.8 Identifier

24.8.1 Identifier setup

Parameter number	Parameter name	Description	Default value
I100	Input source	Defines what source is to be accepted when an identifier from type 1 is to be read. Available options: Off, Scanner, Field bus, Ethernet/serial, Ethernet/serial & scanner, ST scanner and scanner & Field bus.	List menu
I103	Send identifier	Makes it possible to send a 100 character long identifier to the Power Focus.	Input menu
I107	Length	Length of the incoming identifier string.	Input menu

24.8.2 Card reader

Parameter number	Parameter name	Description	Default value
I200	Card reader type	Defines the type of identifier reader connected to the Power Focus. Available options: None and Euchner Ident system	List menu

24.9 Field bus

Parameter number	Parameter name	Description
F100	Field bus type	This parameter shall be selected first. It includes the types; DeviceNet, ProfiBus-DP, InterBus, ModBusPlus, ModBus/TCP and Ethernet/IP. If there is no Field bus configuration inside the Power Focus when open Field bus 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 Field bus card installed in Power Focus, Field bus programming only works in offline mode.
F102	From PF data length	From PF data length is the total length in bytes of the data string sent from the PF to the PLC. The lengths must be the same as defined in the PLC. Because swap bytes are needed for some Field bus type, only even numbers should be programmed (2, 4, 8, 10, etc). Data length should be a number higher than zero.
		The maximum length that can be programmed is different for each Field bus type.
		If InterBus is used, the PF has to be restarted when the data length is changed.
F103	To PF data length	To PF data length is the total length of the data string send from the PLC to the PF. The length must be the same as defined in the PLC. Because swap bytes are needed for some Field bus 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 Field bus type.
		If InterBus is used, the 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 Field bus type. 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 Field bus 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).
F110	Set node address and baudrate from	Some buses can use a SW-configured node address and baud rate. This parameter has two selections:
		Software: Makes it possible to program node address and baud rate from user interface.
		Hardware: Node address and baud rate is configured with the switches on the Field bus card.
		Normally the switches on the Field bus 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 Field bus system. Two controllers in the same Field bus network cannot have the same node address.
		It is possible to set FB node address from 1 to 125.

Parameter number	Parameter name	Description
F112	Baudrate	Communication speed on the Field bus system. ℹ **The baud rate shall be the same in all PF units and in the PLC.**
F113	Connection mode	This parameter manages the way the Field bus system detects changes of data on the different controllers. Some Field bus types have the possibility to set different connection modes. There are three modes; polled, bit strobe and change of state. ℹ **The settings in the PF and the PLC must be the same.**
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 Field bus card. ℹ **Normally the switches on the Field bus card must be set in a specific way to enable these parameters from ToolsTalk PF.**
F120	Set node 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.
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. ℹ **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. ℹ **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 Field bus system. Set address to get global data from this source.
F150	IP address	Set an Ethernet connection IP address for Field bus module, such as ModBus/TCP, Ethernet/IP, Profinet-IO, FL-Net.
F151	Subnet mask	Set an Ethernet connection Subnet mask for Field bus module, such as ModBus/TCP, Ethernet/IP, Profinet-IO.
F152	Gateway	Set an Ethernet connection Gateway for Field bus 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.
F160	Virtual Field bus	This is a choice to make a virtual Field bus. One virtual master can have four virtual slaves
F161	Virtual from PF data length	From PF Data length for the virtual slave.
F162	Virtual to PF data length	To PF Data length for the virtual slave.

Parameter number	Parameter name	Description
F163	Virtual from PF data offset	From PF data offset for the virtual slave.
F164	Virtual to PF data offset	To PF data offset for the virtual slave.
F200	FB update interval	If the Field bus system is heavily loaded it might be necessary to slow down the update interval in Power Focus Field bus 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 Field bus 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 - Field bus start: stops running tool if tool start select source is Field bus.
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 Field bus type. For DeviceNet, Intel Endian must be used. For ProfiBus, Motorola Endian must be used.

25   Event codes

Event codes are displayed as pop up windows to inform users the status of the Power Focus. All events are stored in the **Statistics event log** or the **General event log**, depending on the event code type. Number of events that can be stored in the log depends on memory configuration (see chapter *Controller*). Once the log is full, the oldest events will be overwritten by the most recent ones.

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 status of the event code window.

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

Description	Time	Date	Control
E420: ST accessory not supported Acknowledged	09:49:21	2005-05-12	0,0,0,0
E420: ST accessory not supported	09:49:18	2005-05-12	0,0,0,0
E131: Tool Disconnected Acknowledged	17:58:11	2005-05-11	0,0,0,0
E131: Tool Disconnected	17:54:33	2005-05-11	0,0,0,0
E503: Calibration date expired	17:49:28	2005-05-11	0,0,0,0
E420: ST accessory not supported Acknowledged	17:50:23	2005-05-11	0,0,0,0
E420: ST accessory not supported	17:49:24	2005-05-11	0,0,0,0
E131: Tool Disconnected Acknowledged	17:49:27	2005-05-11	0,0,0,0
E131: Tool Disconnected	17:49:05	2005-05-11	0,0,0,0
E131: Tool Disconnected Acknowledged	17:48:32	2005-05-11	0,0,0,0
E131: Tool Disconnected	17:48:12	2005-05-11	0,0,0,0
E131: Tool Disconnected Acknowledged	17:47:12	2005-05-11	0,0,0,0
E131: Tool Disconnected	17:46:34	2005-05-11	0,0,0,0
E700: PF Started	17:38:03	2005-05-11	0,0,0,0
E212: Pset/Multistage stored	16:01:54	2005-05-11	2,2,0,0
E212: Pset/Multistage stored	16:01:54	2005-05-11	1,1,0,0
E700: PF Started	16:01:32	2005-05-11	0,0,0,0
E857: Reboot needed before changes take effect	16:00:19	2005-05-11	0,0,0,0
E700: PF Started	15:59:51	2005-05-11	0,0,0,0

Clear   Save to file   Open in Excel   ☑ Automatic Update   🔵 Read   ✕ Close

The Statistic and General event log can also be cleared from the system setup branch.

In PF Map, expand the **Controller** branch and double-click **Memory**.
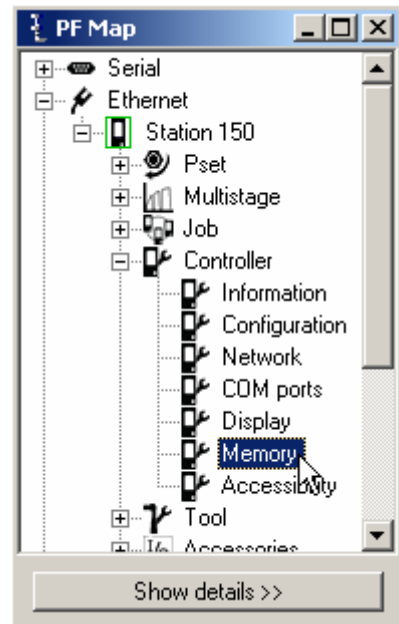
Click **Reset general event log** and/or **Reset statistical event log**.
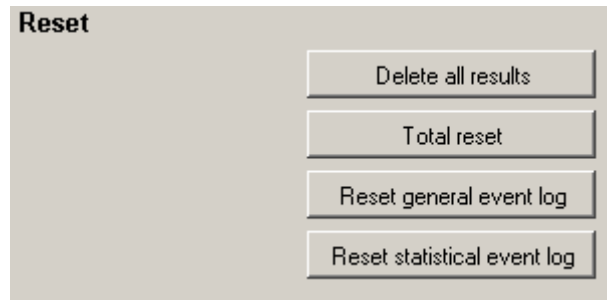
25.1 Event groups

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

25.2   Abbreviations

Abbreviation	Description
ACK	Acknowledgement
PFNR	Power Focus not ready
TNR	Tool not ready ⓘ **TNR-marks on event codes do not affect status of "tool not ready". However, since locking of tool affects "tool not ready", the status will be true while an event code which requires acknowledgement is displayed. Notice that this is due to tool lock and not the event code itself.**
LCK	Tool locked

25.3   Event code list

25.3.1   Rundown failures

Event code	Event name	Information
E003	Torque measurement possibly invalid	The programming is incorrect. Please check the programming and ensure there is some movement on the socket in the second stage.

25.3.2   Event related errors

Event code	Event name	Information	Note
E102	Rundown prohibited due to Lock on Reject	This event code is displayed when an attempt to make a tightening is made and tightenings are disabled by the parameter *Lock on reject [C210]*. For more information see section *Sub information for event codes*.	TNR LCK
E103	Tool locked by digital input	The tool is locked by digital input. For more information see section *Sub information for event codes*.	TNR LCK
E107	Rundown prohibited due to Line control, batch not enabled	A Job using line control is selected. The Job does not start until a line control start signal is received. For more information see section *Sub information for event codes*.	TNR LCK
E112	Rehit	An attempt to tighten an already tightened bolt was made.	
E113	Current limit reached - Rundown aborted	The current limit has been reached, the drive is disabled.	ACK PFNR TNR
E117	Tool locked – cannot access RBU	Power Focus cannot communicate with RBU and must be restarted to protect data. For more information see section *Sub information for event codes*.	PFNR TNR
E120	Motor tuning failure	Motor tuning failed. The trigger could have been released before the end of the motor tuning or the tool has a defect.	ACK PFNR TNR
E121	Open end tuning failure	This event indicates that the Open end tuning command has not been successfully performed.	ACK PFNR TNR
E122	Open end positioning failure	Open end positioning failed due to too much torque during positioning phase.	
E125	Alarm on timeout / Alarm on torque lost	When the function alarm on timeout is activated in the Pset, this event code indicates that a timeout caused the tightening to be aborted. The timeout must be the primary cause for the abort for this alarm to be activated.	
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). For more information see section *Sub information for event codes*.	

Event code	Event name	Information	Note
E127	PVT shut off	This event indicates that the drive was shut off in the selftap or prevail phase of the rundown.	
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.	
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.	
E130	Post view torque shut off	Post view torque conditions were not fulfilled.	PFN
E131	Tool Disconnected	This event code will be generated when the tool is disconnected (logically or physically) from the PF. The event code is also generated when an attempt to start a disconnected (logically or physically) tool is done. For more information see section *Sub information for event codes*. **A damaged cable can result in a disconnected tool.**	ACK PFNR TNR
E132	Wrong tool start input setting	*Tool start select source [T200]* is not corresponding to the remote start jumper position. For remote start information see chapter *Connecting devices*.	PFNR TNR
E133	Tool locked by Tools Talk	The tool is prohibited via ToolsTalk PF. For more information see section *Sub information for event codes*.	TNR LCK
E134	MC Target input active at start attempt	The target signal is active in the drive, although the tightening has been acknowledged by the CC-card.	
E136	Tool locked by batch OK	This event code is displayed if the tool is locked by the function *Lock at batch OK [P152]*. For more information see section *Sub information for event codes*.	TNR LCK
E137	Tool locked by Field bus	The tool is locked by Field bus. For more information see section *Sub information for event codes*.	TNR LCK
E138	Wrong tool start input source	It is only possible to start the tool from selected tool start select source. Please check the setting for *Tool start select source [T200]*.	
E139	Tool locked by Open protocol	The tool is locked by open protocol. For more information see section *Sub information for event codes*.	TNR LCK
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. For more information see section *Sub information for event codes*.	TNR LCK
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.	TNR LCK
E145	Tool locked by Timer enable tool	The tool is locked by digital input "timer enable tool".	TNR LCK
E147	Tool locked by click wrench Pset	A click wrench Pset is in use. For more information see section *Sub information for event codes*.	TNR LCK
E149	Tool locked disable loosening at OK	The function *Disable loosening at OK [C220]* has locked the tool. For more information see section *Sub information for event codes*.	TNR LCK
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. For more information see section *Sub information for event codes*.	
E151	Job in OFF mode	It is not possible to select a new Job. The Power Focus is in Job off mode.	
E152	PF locked in Job mode	This event appears when in a forced Cell Job an attempt is made to tighten with a controller which is not currently active or when a controller has performed all tightenings in the Job. For more information see section *Sub information for event codes*.	TNR LCK
E153	Not ok to select new Job	A Job is currently running, it is not possible to select a new Job until the first is finished in some way (completed or aborted). This message is also displayed if a Job is selected on a Job member.	

Event code	Event name	Information	Note
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.	
E155	Remote Job aborted	When running a Cell Job, this is displayed by the Job members when a Cell Job is aborted.	
E156	Job members lost	When running a Cell Job, this is displayed by the Job reference when it has lost contact with one of the Job members. For more information see section *Sub information for event codes*.	
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.	
E158	Invalid Job ID	When the selected Job does not exist.	
E159	No Pset in selected Job	When the selected Job does not contain any Pset.	
E160	Job select source not valid	Attempt to select a Job with the wrong input source.	
E161	Line control alert 1	The line control has been activated, and the first control alert limit has been reached.	
E162	Line control alert 2	The line control has been activated, and the second control alert limit has been reached.	
E166	Job aborted	This event will be displayed when a running Job is aborted. For more information see section *Sub information for event codes*.	
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).	TNR LCK
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.	ACK
E176	IPM memory needed	Not possible to configure this functionality without "IPM memory".	
E177	Functionality not in RBU	The user is trying to use functionality that is not enabled in the RBU.	
E178	Memory allocation error	The user is trying to allocate more memory than exists in the Power Focus.	
E179	Totally configurable memory needed	Not possible to configure this functionality without function "totally configurable memory". See section *Sub information for event codes*.	
E180	Euchner Ident System only supports Siemens 3964R protocol	The protocol setting for the serial COM port 1, parameter *Protocol [C401]*, is not set to "3964R". It is not possible to use the Euchner Ident system with this configuration.	
E181	Not possible to read ID card	It was not possible to read the ID card inserted in the Euchner system.	
E190	Wrong ST scan source	Attempt to scan from wrong source.	
E191	ST scanner overheated	The ST scanner temperature has exceeded max temperature.	

25.3.3   User input events

Event code	Event name	Information	Note
E206	Pset number invalid	An attempt was made to do a tightening with the wrong Pset within a Job. For more information see section *Sub information for event codes*.	TNR
E207	Wrong Pset Select Source	Attempt to select Pset from a source not specified for parameter *Pset select source [C200]*.	
E208	Not ok to select new Pset	It is not allowed to select new Pset when the already selected Pset is auto selected by Job.	
E211	Wrong identifier input source	Wrong input source for an identifier string.	
E212	Pset/Multistage stored	Event displayed every time a Pset or Multistage is stored or restored. For more information see section *Sub information for event codes*.	
E220	Fastener broken	Displayed if fastener (screw or nut) break during yield control	
E221	Too few samples for yield control	Too few samples for mean tq calculation in yield algorithm. Parameter "No degrees" too small or speed too high during yield control.	
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). For more information see section *Sub information for event codes*.	TNR
E234	Start final angle range error	This event code is displayed when an attempt is made to tighten with a *Start final angle [P120]* out of range. For more information see section *Sub information for event codes*.	TNR
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 a RE-Alarm is configured). For more information see section *Sub information for event codes*.	PFNR TNR
E237	Strategy configuration error	No valid control strategy was chosen for the stored Pset. For more information see section *Sub information for event codes*.	TNR
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.	TNR
E240	Password Incorrect Input Source	The password is entered from an invalid source according to the configuration.	
E250	Max time for first tightening run out (Job)	This message is displayed and the Job is terminated if the first tightening is not performed within the specified time.	
E251	Max time to complete Job run out	This message is displayed and the Job is terminated if the Job is not completed within the specified time.	

25.3.4   Statistical events

Event code	Event name	Information
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.
E334	No statistic available for this Pset	The Pset strategy is not suitable to calculate statistics (no strategy is chosen).
E335	Not enough data	Not enough data is available to calculate the statistic control limits.
E336	Mem alloc fail	It is not possible to allocate enough memory for the statistic subscription.
E340	Xucl tq	The last subgroup mean torque value is larger than the upper control limit.
E341	Xlcl tq	The last subgroup mean torque value is lower than the lower control limit.
E342	Rucl tq	The last subgroup range torque value is larger than the upper control limit.
E343	Rlcl tq	The last subgroup range torque value is lower than the lower control limit.
E344	Cp tq	The torque Cp is lower than 2.
E345	Cpk tq	The torque Cpk is lower than 1,33.
E346	7inc x tq	Trend deviation alarm, the subgroup torque mean value has increased 7 times consecutively.
E347	7dec x tq	Trend deviation alarm, the subgroup torque mean value has decreased 7 times consecutively.
E348	7inc r tq	Trend deviation alarm, the subgroup torque range value has increased 7 times consecutively.
E349	7dec r tq	Trend deviation alarm, the subgroup torque range value has decreased 7 times consecutively.
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.
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.
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.
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.
E354	2sigma x tq	Trend deviation alarm, the last subgroup torque average is outside Xtq-bar-bar - 2 sigma.
E355	2sigma r tq	Trend deviation alarm, the last subgroup torque range average is outside Rtq-bar-bar - 2 sigma.
E360	Xucl ang	The last subgroup mean angle value is larger than the upper control limit.
E361	Xlcl ang	The last subgroup mean angle value is lower than the lower control limit.
E362	Rucl ang	The last subgroup range angle value is larger than the upper control limit.
E363	Rlcl ang	The last subgroup range angle value is lower than the lower control limit.
E364	Cp ang	The angle Cp is lower than 2.
E365	Cpk ang	The angle Cpk is lower than 1.33.
E366	7inc x ang	Trend deviation alarm, the subgroup angle mean value has increased 7 times consecutively.
E367	7dec x ang	Trend deviation alarm, the subgroup angle mean value has decreased 7 times consecutively.
E368	7inc r ang	Trend deviation alarm, the subgroup angle range value has increased 7 times consecutively.
E369	7dec r ang	Trend deviation alarm, the subgroup angle range value has decreased 7 times consecutively.

Event code	Event name	Information
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.
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.
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.
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.
E374	2sigma x ang	Trend deviation alarm, the last subgroup angle average is outside Xang-bar-bar-2 sigma.
E375	2sigma r ang	Trend deviation alarm, the last subgroup angle range average is outside Rang-bar-bar-2 sigma.
E380	Xucl cm	The last subgroup mean CM value is larger than the upper control limit.
E381	Xlcl cm	The last subgroup mean CM value is lower than the lower control limit.
E382	Rucl cm	The last subgroup range CM value is larger than the upper control limit.
E383	Rlcl cm	The last subgroup range CM value is lower than the lower control limit.
E384	Cp cm	The CM Cp is lower than 2.
E385	Cpk cm	The CM Cpk is lower than 1.33.
E386	7inc x cm	Trend deviation alarm, the subgroup CM mean value has increased 7 times consecutively.
E387	7dec x cm	Trend deviation alarm, the subgroup CM mean value has decreased 7 times consecutively.
E388	7inc r cm	Trend deviation alarm, the subgroup CM range value has increased 7 times consecutively.
E389	7dec r cm	Trend deviation alarm, the subgroup torque range value has decreased 7 times consecutively.
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.
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.
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.
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.
E394	2sigma x cm	Trend deviation alarm, the last subgroup CM average is outside XCM-bar-bar-2 sigma.
E395	2sigma r cm	Trend deviation alarm, the last subgroup CM range average is outside RCM-bar-bar-2 sigma.

25.3.5　Communication events

Event code	Event name	Information	Note
E401	Duplicate device IDs on I/O bus	Two I/O-devices with the same ID are present on the I/O bus.	PFNR TNR ACK
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. For more information see section *Sub information for event codes*.	PFNR TNR
E404	Selector is not connected or not responding	The Selector is not properly connected or the ID of the Selector is not the same as the one configured. For more information see section *Sub information for event codes*.	PFNR TNR
E405	I/O Expander is not connected or not responding	The I/O Expander is not properly connected or the ID of the I/O Expander is not the same as the one configured. For more information see section *Sub information for event codes*.	PFNR TNR
E406	RE-Alarm is not connected or not responding	The remote alarm is not properly connected or the ID of the remote alarm is not the same as the one configured. For more information see section *Sub information for event codes*.	PFNR TNR
E417	Too many communication sessions at one time	There are too many connections at the same time (ToolsTalk PF, Tools Net, Operator Panel etc.)	
E420	ST Accessory not supported.	Unknown device, not supported in this release connected to the ST bus.	PFNR TNR ACK
E421	Safety trigger not supported by tool software	The tool software version does not support safety trigger function.	PFNR TNR
E433	No RBU present	No RBU detected at start-up or RBU found missing at runtime.	PFNR TNR
E434	RBU Timeout	RBU did not respond to command from Power Focus.	PFNR TNR
E436	RBU file system warning	There has been a repairable fault in the RBU file system, e.g. power-off or other interruption during download.	
E437	RBU file system corrupt	The RBU file system has too many faults. An attempt will be made to repair it by means of erasing the RBU.	PFNR TNR
E438	RBU file mismatch	A file with incorrect name or size was returned to a read request.	PFNR TNR
E440	RBU no files	A file type is not present in the RBU at start-up.	PFNR TNR
E441	RBU access too busy	RBU has answered to the poll but Power Focus is too busy to receive the reply.	ACK PFNR
E442	RBU no such file	A file has not been localised in the RBU. The RBU is corrupt or not present.	PFNR TNR
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.	PFNR TNR
E445	RBU corrupt	The RBU is corrupt.	PFNR TNR
E446	RBU read error	Read operation failed.	PFNR TNR
E447	RBU write error	Write operation failed.	PFNR TNR

Event code	Event name	Information	Note
E448	RBU delete error	Delete operation failed.	PFNR TNR
E449	RBU flush error	RBU erase failed.	PFNR TNR
E450	RBU list error	Update operation failed.	PFNR TNR
E451	RBU update failed	Database synchronisation between Power Focus and RBU failed.	PFNR TNR
E460	Field bus type mailbox message fault	Error detected in initialisation of Field bus.	
E461	Field bus type gen com fault	Error detected in initialisation of Field bus.	
E462	Field bus mailbox message fault	Error detected in initialisation of Field bus.	
E463	Field bus gen com fault	Error detected in initialisation of Field bus.	
E464	Field bus hardware fault	The Field bus module is broken and has to be replaced.	PFNR TNR
E465	Field bus dip switch error	The software tries to configure the value of node address or baud rate, but the address switch on the Field bus module is not in the right position to enable software setting. Set switches in the right position and then turn on the power.	
E466	Field bus offline	The Field bus went from online to offline. This is just a warning.	
E467	Field bus configuration fault	Error detected in initialisation of Field bus.	
E468	Field bus hardware mismatch	The Field bus module installed in Power Focus is not the same Field bus type as configured with ToolsTalk PF. Change Field bus module or configuration to get a match.	
E469	Field bus init error	Error detected in initialisation of Field bus.	
E470	Field bus PCP error	InterBus PCP length error.	
E471	Field bus claim area failed, lost one message	One packet lost.	
E472	Field bus release area timeout	Release area command timed out.	
E473	Field bus communication buffer alarm	Communication buffer full. Decrease Field bus update timer.	
E474	Field bus monitor buffer alarm	Field bus monitor buffer full. Turn off Field bus monitor mode.	
E475	Field bus PsetID mismatch Selector lifted socket	Field bus selected Pset does not file the lifted socket.	
E480	Channel ID not valid	The channel ID configured is not within the limits permitted. The channel ID must be configured between 1 and 20.	PFNR TNR
E481	Cell member registration failed	The Cell member registration failed because one Cell member is already registered with the same channel ID.	PFNR TNR
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.	PFNR TNR
E491	Net member registration failed	The Net member registration failed because one Net member is already registered with the same Cell ID.	PFNR TNR

25.3.6 Hardware events (tools)

Event code	Event name	Information	Note
E501	Tool overheated	The tool is to hot and the drive is disabled. For more information see section *Sub information for event codes*.	PFNR TNR
E502	Tool service interval expired	Service the tool. See parameter *Service interval [T413]*.	ACK
E503	Calibration date expired	The calibration date has expired.	
E504	Tool wear indicator alarm	Tool wear indicator alarm indicates that the tool should be serviced.	PFNR
E505	Tool rebuilt to/from OE-type	Tool redesigned. E.g. angled tool type redesigned to an OE-tool type.	PFNR TNR ACK
E510	Tool type not supported by RBU	The tool type is not supported by RBU.	PFNR TNR ACK
E511	Tool-Power Focus 3000 size mismatch	Mismatch between the tool and the controller (for example S4/S7 tool connected to a S9 controller). For more information see section *Sub information for event codes*.	PFNR TNR ACK
E513	Tool EEPROM corrupt - service tool	Checksum indicates that tool memory is corrupt. Tool must be serviced.	PFNR TNR ACK
E514	Tool EEPROM corrupt -Motor tune	Checksum indicates that motor tuning or Open end tuning table is corrupt. Do a motor tuning or Open end tuning. For more information see section *Sub information for event codes*.	PFNR TNR ACK
E517	Tool max torque invalid	Tool max torque invalid, service tool.	PFNR TNR ACK
E518	Tool normalisation out of range	Tool normalisation value out of range, service tool.	PFNR TNR ACK
E519	Tool calibration value out of range	Tool calibration value out of range, service tool.	PFNR TNR ACK
E520	Wear indicator data in tool invalid	Data in tool memory used for wear indicator is invalid. Service tool.	
E531	Communication error	Communication error. Restart the controller. **Only available for Tensor DS/DL.**	ACK
E535	Torque transducer error	Cables to transducer cut off or shorted.	PFNR TNR ACK
E536	No transducer (sensor)	Cables to transducer cut off or shorted.	PFNR TNR
E537	Calibration not OK, offset outside limits	Calibration offset outside limits.	PFNR TNR
E538	Calibration not OK, CalVal outside limits	Calibration value outside limits.	PFNR TNR

Event code	Event name	Information	Note
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.	
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.	ACK
E541	Transducer (sensor) lost during tightening	Cables to transducer cut off or shorted.	PFNR TNR
E550	Radio contact with tool established, tool accessible	Radio contact with tool established, tool accessible.	
E551	Radio contact with tool lost, tool inaccessible	Radio contact with tool lost, tool inaccessible.	
E552	DASP Communication error with tool	Communication error between tool and controller on DASP level. Not to possible to read or write from/to an ALP reference.	
E553	Pairing attempt with wireless tool failed	An attempt to pair the Power Focus with a wireless tool failed.	
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.	
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.	
E556	Tool battery low	Tool battery low.	

25.3.7   Hardware events (DC3000/MC3000)

Event code	Event name	Information	Note
E601	System voltage low	DC voltage too low	PFNR TNR ACK
E603	Drive overheated	The DC drive is too hot, drive deactivated.	TNR
E618	Drive HW/SW mismatch	Drive hardware and software mismatch. Check motor type in ToolsTalk DS/DL.	ACK
E619	Drive deactivated	DC drive deactivated during operation.	
E620	Tool stall	Tool motor stall.	
E621	High current offset	High current offset at tightening start	

25.3.8   Hardware events

Event code	Event name	Information	Note
E700	PF started	This event code is only visible in the event log and used when the PF is started.	
E701	Backup battery low level	The backup battery level is low. The battery should be changed soon. Contact the local Atlas Copco service representative.	
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. Contact the local Atlas Copco service representative.	PFNR TNR ACK
E710	ACTA/QRTT calibration	An ACTA/QRTT calibration has been performed.	
E720	Earth failure in ST tool	An earth (ground) fail detected, probably a cable failure.	PFNR TNR
E721	Internal ST tool failure	Diode (LED) board in ST tool disconnected. Tool service needed.	PFNR TNR
E722	Illegal ring position	The reverse ring is not in a defined position.	PFNR

25.3.9   Software events

Event code	Event name	Information	Note
E805	PF Model unknown	This event is displayed after start-up when the RBU is missing, or when the RBU revision cannot be supported by the controller (e.g. RBU bronze on a PF Graph controller), or when the RBU license file is missing or cannot be read by the boot code.	PFNR TNR
E808	Error condition detected by software	An error condition was detected by software.	
E810	Database is corrupt	Database must be cleared, the database version is not correct.	
E822	No Job ACK from control	Tightening initialisation phase failed. Hardware failure.	PFNR TNR ACK
E823	No calibration result	No calibration was received from the drive during the tightening initialisation phase (timeout 100 ms).	PFNR TNR ACK
E824	Cycle abort timeout	No tightening result was received from the drive before the cycle abort timeout. The cycle abort timer is configurable in the Pset.	
E831	Autoset wrong angle	Autoset could not be executed, the angle results of the tightening performed were null.	
E833	Autoset tight NOK result	The Autoset could not be executed, four NOK tightenings were performed.	
E834	Autoset rejected Pset in CCW direction	The Autoset was not allowed by the Power Focus for this Pset because the Pset was configured in the CCW direction. Autoset is only permitted on a CW Pset.	
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 (larger than 64 for RBU bronze or larger than the configured value for RBU gold and silver.	
E841	SW function Not Available for this tool type	The software function is not available for this tool type.	
E851	Connection with Tools Net server lost	The connection with the Tools Net server was lost; the Power Focus is trying to reconnect. The Tools Net server might be down or it might be an Ethernet cable problem.	
E856	Router unreachable	The router in the configuration setting could not be reached. Check the network configuration and in particularly the subnet mask and the default router.	

Event code	Event name	Information	Note
E857	Reboot needed before changes take effect	The configuration changes will not take effect until a system reboot.	ACK
E858	IP address already in use	The IP address of this PF is already in use by another system.	ACK
E859	IP address collision	Another system attempts to use the same IP address as this PF.	
E862	Ethernet overload Error	The Ethernet driver of the PF is temporarily switched off due to an overloaded 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.	
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.	
E870	Sync member registration failure	The Sync member registration failed. Two Sync members can have the same channel ID or one Power Focus with a Sync reference IP address is missing in the Sync list.	TNR
E871	Sync reference configuration failure	The channel ID of the Sync reference is not first in the Sync list as required.	PFNR TNR
E872	Sync initialisation failure	Tightening synchronisation initialisation failed. Check the I/O bus cable, check that all the Sync members have the same active Pset and check the external start bridge.	TNR
E873	SynchroTork not yet implemented	SynchroTork not yet implemented, check the Sync configuration.	TNR
E874	Sync members missing	Only Sync reference is defined in the Sync list.	

25.3.10 Events MMI3000

Event code	Event name	Information	Note
E901	MMI Start-up Error	Error in MMI detected.	PFNR TNR ACK

25.4   Sub information for event codes

Each event code is logged together with four integer parameters. For some event codes these parameters are used to store extra information about the event.

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

25.4.1 E102, E103, E107, E117, E131, E133, E137, E139, E140, E146, E147, E149, E152, E206, E501, E511 and E514

In case the tool is locked while a user attempts to start a service (normally tightening or loosening), the Power Focus will show an event code to explain why or by which functionality the tool is locked. In case the tool becomes locked while a service is performed, the service will be aborted and an event code explaining why or by which functionality the tool was locked will be displayed.

The event codes messages generated because the tool is locked do contain two integer parameters that can be viewed from the event log.

The first parameter explains which service that was denied or aborted (see table below).

Parameter	Definition
0	Tightening
1	Loosening
2	Positioning (Open end tool only)
3	Motor tuning
4	Open end tuning (Open end tool only)
5	Tracking

The second parameter explains if the service was denied during start attempt or aborted while performed (0 = Service denied, 1 = Service aborted).

The third and fourth parameters are not in use.

For more information see chapter *Tool*.

25.4.2 E112

The first parameter contains the Pset/Multistage ID number.

The second parameter states whether it is a Pset (1) or a Multistage (2).

Third and fourth parameters are not in use.

25.4.3   E126

When running Multistage and *Multistage abort [E126]* with parameters (table 21-14) is displayed.

Parameter	Definition
1	The stage when the Multistage aborted.
2	The possible event code for that stage.
3	Possible tightening error bits part I (bit 0-6; dec. 1-127) (more information below).
4	Possible tightening error bits part II (bit 0-15; dec. 1-65535) (more information below).

Possible tightening error bits part I (bit 0-6; dec. 1-127)

Tightening error bits show what went wrong with the tightening (only a few correspond to event codes). All bits are sent as an unsigned 16 bit integer.

Bit	Decimal value	Event
0	1	Multistage aborted
1	2	Rehit
2	4	Torque measurement possibly invalid (for DS Tool only)
3	8	Current limit reached
4	16	Timeout on end time shutoff
5	32	Not used
6	64	Other

Possible tightening error bits part II (bit 0-15; dec.1-65535)

Tightening error bits show what went wrong with the tightening (only a few correspond to event codes). All bits are sent as an unsigned 16 bit integer.

Bit	Decimal value	Event
0	1	Rundown angle max exceeded
1	2	Rundown angle min not reached
2	4	Final torque max exceeded
3	8	Final angle max exceeded
4	16	Self tap max exceeded
5	32	Self tap min not reached
6	64	PVT monitoring max exceeded
7	128	PVT monitoring min not reached
8	256	PVT Compensate overflow
9	512	Current monitoring max exceeded
10	1024	Post view torque min not reached
11	2048	Post view torque max exceeded
12	4096	Post view torque angle too small
13	8192	Trigger lost
14	16384	Torque less than target
15	32768	Tool hot

Example: E126 (3, 129, 1, 16896)

The event code E126 means Multistage aborted.

The first parameter string number means that the Multistage was aborted in stage number three.

The second parameter string number means that event code E129, torque lower than target, occurred (in stage number three).

The third parameter string number means: $1_{10} = 0001_2$. Bit 0 means "Multistage aborted".

The fourth parameter string number means: $16896_{10} = 0100\ 0010\ 0000\ 0000_2$. Bit 9 means "current monitoring max exceeded" and bit 14 means "torque less than target".

> **Current limit reached is one of few event codes for which there is a corresponding tightening result error bit.**

25.4.4   E150

The first parameter contains the *Channel ID number [C310]* for the Job client not responding.

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

25.4.5   E156

The first parameter contains the *Channel ID number [C310]* for the lost Job client.

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

25.4.6   E166

The first parameter gives the ABORT source:

2: Digital input.

3: Ethernet/serial (PC).

5: Field bus.

6: Keyboard.

7 - 8: Reserved.

9: Manual mode (a Job is active and a new Job is selected from digital input. The current Job is aborted and the new Job becomes active).

10: Timer 1 (max time to start Job).

11: Timer 2 (max time to complete Job).

12: Deleted (a pending Job is deleted from Power Focus database).

13: Job off mode.

14: Line control Alarm 2

15: Job override

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

25.4.7   E233, E234 and E237

Parameter	Definition
1	Pset number.
2	Parameter number with an incorrect value.
3	Incorrect parameter (2) is dependent on this parameter.
4	Incorrect parameter (2) violates this limit.

Example: E233 (1, 113, 0, 9999)

1: Strategy configuration error in Pset number 1.

113: Pset parameter 113 *Final target [P113]* incorrect.

0: No valid information.

9999: Parameter 113 violates limit 9999.

Example: E237 (2, 110, 115, 0)

2: Strategy configuration error in Pset number 2.

110: Pset parameter *Cycle start [P110]* incorrect.

115: Parameter 110, *Cycle start [P110]*, dependent of parameter 115, *Cycle complete [P115]*.

0: No valid information.

25.4.8   E236

The first parameter contains the number of the I/O-device with problematic configuration.

The second parameter contains the type of I/O-device (3=RE-Alarm, 2=I/O Expander/Operator Panel, 5 = four position socket selector, 6 = eight position socket selector).

The third and fourth parameters are not in use.

25.4.9   E403, E404, E405 and E406

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

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

25.4.10 E710

When an ACTA/QRTT calibration batch is completed, event code *ACTA/QRTT calibration [E710]* is displayed.

Parameter	Definition
1	Torque result bits (bit 0-10; dec. 1-2048) (more information below).
2	Angle result bits (bit 0-9; dec. 1-1024) (more information below).
3	Not used.
4	Channel number.

Torque result bits (bit 0-10; dec. 1-2048)

Torque result bits show the result of the torque calibration. All bits are sent as an unsigned 16 bit integer.

Bit	Decimal value	Event
0	1	Batch result torque OK.
1	2	Torque min failed.
2	4	Torque max failed.
3	8	Torque LCLx failed.
4	16	Torque UCLx failed.
5	32	Torque LCLr failed.
6	64	Torque UCLr failed.
7	128	Torque CP > failed.
8	512	Torque CPK > failed.
9	1024	Torque CAM > failed.
10	2048	T Diff < failed.

Angle result bits (bit 0-9; dec. 1-1024)

Angle result bits show the result of the angle calibration. All bits are sent as an unsigned 16 bit integer.

Bit	Decimal value	Event
0	1	Batch result angle OK.
1	2	Angle min failed.
2	4	Angle max failed.
3	8	Angle LCLx failed.
4	16	Angle UCLx failed.
5	32	Angle LCLr failed.
6	64	Angle UCLr failed.
7	128	Angle CP > failed.
8	256	Angle CPK > failed.
9	512	Angle CAM > failed.