Control and Drive Unit for TENSOR-S Electric Nut Runners

Power Focus 3000

Contents

1 General Safety Instructions

WARNING

Read and understand all instructions. Failure to follow all the instructions listed below may result in electric shock, fire and/or serious personal injury.

SAVE THESE INSTRUCTIONS

IMPORTANT

All locally legislated safety rules with regard to installation, operation and maintenance must be respected at all times. Refer installation and servicing to qualified personnel only.

Work Area

Keep your work area clean and well lit. Cluttered benches and dark areas invite accidents.

Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust. Power tools create sparks, which may ignite dust or fumes.

Keep bystanders, children, and visitors away while operating a power tool. Distractions may cause you to lose control.

Electrical Safety

Earthed tools must be plugged into an outlet that has been properly installed and earthed in compliance with all relevant codes and ordinances. Never remove the earthing prong or modify the plug in any way. Do not use any adapter plugs. Check with a qualified electrician if you are in any doubt as to whether the outlet is properly earthed. Should the tools suffer electronic malfunction or breakdown, earthing provides a low resistance path to carry electricity away from the user. *Applicable only to Class I (earthed) tools.*

THIS APPARATUS MUST BE EARTHED!

A Power Focus unit may not be supplied with a galvanically isolated voltage as this would inhibit the function of the Ground Fault Interrupter (GFI). Please note that the test button on the GFI also activates the GFI in instances where a Power Focus unit is equipped with an isolated transformer. Test the earth fault protector by pressing the test button located on the rear panel of the Power Focus unit.

Every month:

- Test the earth protector by pressing the test button.
- Should the earth fault protector disconnect the system, be sure to find the primary reason before you resume operation.

Avoid body contact with grounded surfaces such as pipes, radiators, ranges and refrigerators. There is an increased risk of electric shock if your body is grounded.

Don't expose power tools to rain or wet conditions. Water entering a power tool will increase the risk of electric shock. This instruction does not apply to tools classified as watertight or splash proof.

For minimum electrical interference, place the instrument far away from possible sources of electrical noise, e.g. arc welding equipment etc.

Do not abuse the cord. Never use the cord to carry the tools or pull the plug from an outlet. Keep cord away from heat, oil, sharp edges or moving parts. Replace damaged cords immediately. Damaged cords increase the risk of electric shock.

Personal Safety

Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use tool while tired or under the influence of drugs, alcohol, or medication. A momentary lapse in concentration whilst operating power tools may result in serious personal injury.

Dress properly. Do not wear loose clothing or jewellery. Tie long hair back. Keep your hair, clothing, and gloves away from moving parts. Loose clothes, jewellery, or long hair can be caught in moving parts.

General Safety Instructions

Avoid accidental starting. Be sure switches are in the off position before plugging in. Carrying tools with your finger on the switch or plugging in tools that have the switch set to on invites accidents.

Remove adjusting keys or switches before turning the tool on. A wrench or a key that is left attached to a rotating part of the tool may result in personal injury.

Do not overreach. Keep proper footing and balance at all times. Proper footing and balance enables better control of the tool in unexpected situations.

Tool Use and Care
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 safer at the rate for which it is designed.

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

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

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

Check for misalignment or binding of moving parts, damage, and any other condition that may affect tool operation. If damaged, have the tool serviced before using. Poorly maintained tools cause many accidents.

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

SERVICE

Tools should only be serviced by qualified repair personnel. Service or maintenance performed by unqualified personnel could exposes users to serious personal injury.

When servicing a tool, only use original replacement parts. Use of unauthorised parts or failure to follow Maintenance Instructions may create a result in electric shock or personal injury.

CAUTION

There is a danger of explosion if batteries are incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries in accordance with manufacturer's instructions.

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

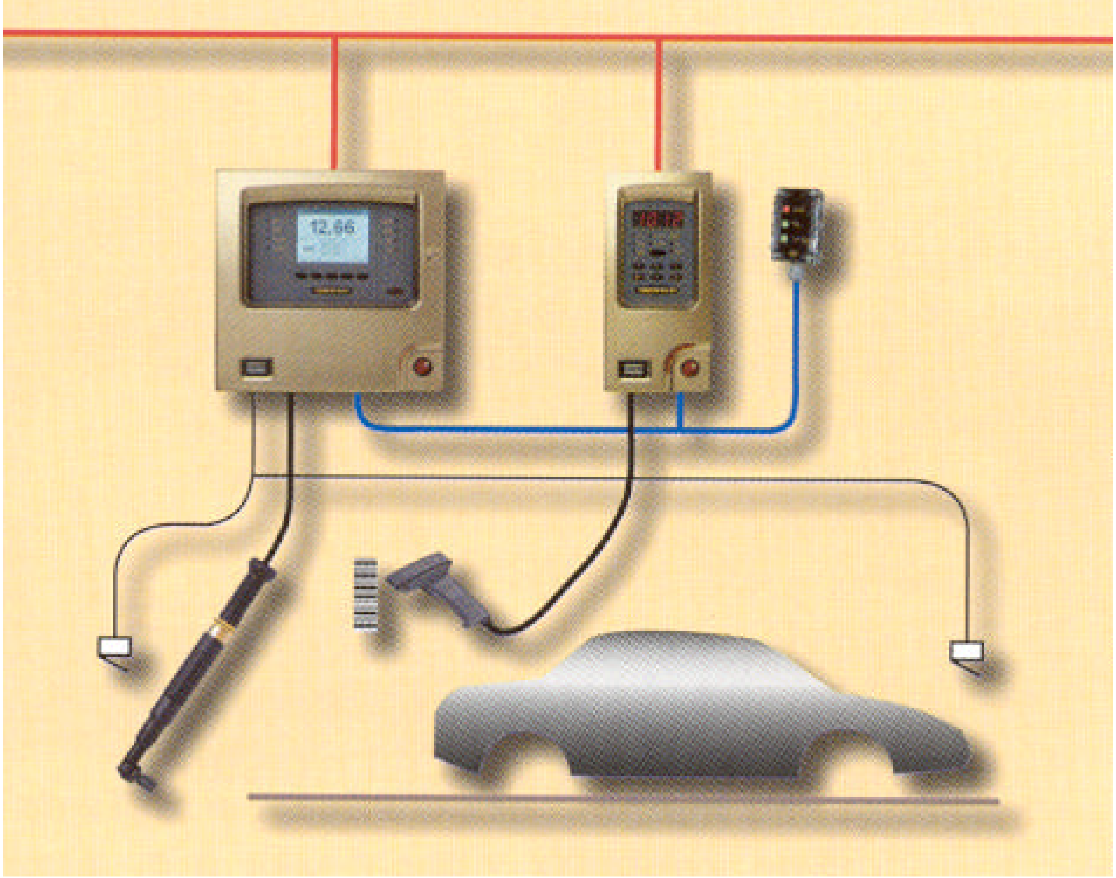
CERTIFIED TO
CAN/CSA STD C22.2 NO.14-95

2 Introduction

Power Focus 3000

Atlas Copco, the market leader in assembly tools, supplies systems and equipment that guarantee high operational reliability and productivity. Atlas Copco systems and equipment are specially designed to support the zero fault philosophy within the manufacturing industries.

Power Focus 3000 is the latest generation of advanced control and monitoring systems for advanced tightening. Power Focus 3000 is a complete solution for the modern assembly industry with high demands and stringent quality and efficiency requirements.



Controllers

The Power Focus 3000 concept offers full modularity through combinations of hardware and software. Tailor the system to meet your particular requirements. Three different hardware units are available: the **Compact**, the **Graph** and the **Graph Colour**.

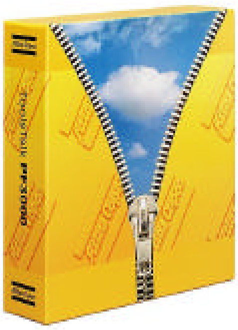
Compact

Graph

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

ToolsTalk (Programming and configuration software)

ToolsTalk, a PC software package developed by Atlas Copco, affords easy and user-friendly programming and real time monitoring of Power Focus 3000 units. ToolsTalk is based on extensive experience and thorough analysis of existing manufacturing industry needs.



ToolsTalk can be installed on standard PCs running Windows 98, 2000 or NT and communicates with Power Focus 3000 via the serial port or via Ethernet TCP/IP. The real time monitoring functions include access to Cpk, traces, operator monitor, etc.

ToolsNet (data collection and historical analysis software)

ToolsNet standard server software facilitates the collection, storage and presentation of data from the tightening operations carried out by the Power Focus 3000 Controller on the production line.

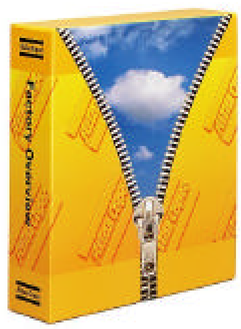
If the network fails, the system has a built-in redundancy and any missing data will be retrieved automatically from the Power Focus 3000 Controllers once the network connection is restored.

The ToolsNet package includes the following elements:

- Data collection – tightening data (including date, time, identity and traces) are received from each Power Focus 3000 and stored in the database. The standard Ethernet TCP/IP protocol is used to prevent lost data packages and for compatibility with existing plant office networks.
- Data storage – ToolsNet is compatible with MS SQL and Oracle standard database packages for the storage of the tightening data and traces. Queries on these databases and done using SQL, which considerably simplifies the process of exporting data to other external databases, e.g. production control systems.
- Data presentation – the built-in webserver creates webpages that can be accessed over the Ethernet network from any computer running a web browser such as Internet Explorer or Netscape. The webpages contain the reports showing graphs and detailed results as well as statistical key figures and charts. Using special filters, the user can safeguard that he only sees relevant data, e.g. all results on a specific vehicle (VIN identity) or specific shift reports (daily, weekly, monthly, etc).

Factory Overview (Real time process monitoring software)

Factory Overview line visualisation software offers real time monitoring of tightening operations and controller hardware status on the relevant production line. Built-in quality and maintenance functions allow plant quality personnel to take immediate corrective action should the process capability fall below defined limits.

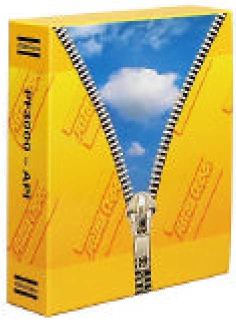


Factory Overview is the platform for Atlas Copco's Power Focus 3000 software products. Power Focus 3000 icons representing the controllers on the production line are displayed on a background picture showing the plant layout. Via the Ethernet network, the controllers report the tightening status in real time. This makes it possible for one person to control and monitor the entire production line from the office.

Actual Cpk values are updated in real time and if a problem is identified, it is easy to take corrective action using the direct link to the ToolsTalk programming software. If the network connection is lost or there is a problem with the communication, a cross will appear over the Power Focus 3000 icon, indicating an action is required, all with minimal response time and downtime.

API (Application Programmer's Interface) Software

The **API**, Application Programmers Interface, is an interface to the Power Focus 3000 system that enables users to access data in the Power Focus units from custom-made applications.



The Power Focus 3000 API is a software library that serves as the interface between the custom application and the Power Focus units. This means that it exports a number of objects and methods that the custom application can access in order to manipulate the Power Focus units without needing to know the details on how the actual communication is done. The Power Focus 3000 API handles all necessary communication between the PC on which the custom application is installed, and the specific Power Focus 3000 units 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.

RBU

RBU's (Rapid Backup Units) unlock a specified level of functionality and act as back-up units for programming and configuration of Power Focus 3000. There are three different types of RBU, Bronze, Silver and Gold, with the Gold RBU unlocking the full capacity and functionality of the Power Focus 3000. Combine the RBU that gives the functionality you need with the hardware you have chosen.

RBU – Rapid Backup Unit

When a programmed RBU is plugged in to an empty Power Focus 3000 controller, the functionality, programming and configuration of the RBU transfers into the Power Focus 3000 controller in a fraction of a second. This means quick installation and replacement of controllers on the assembly line.

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 Power Focus units can be linked together via the network to create a **Cell Job**, issuing an OK signal when all Power Focus units in one station have completed their tightenings.

Cell

A key word in the Power Focus 3000 concept is **Cell**. This means that one Power Focus Graph unit can monitor and control several Power Focus Compact units, which saves space and hardware cost. Each Cell can be connected to the plant's network via the built-in Ethernet part and results from the units can be monitored via the Atlas Copco ToolsNet server.

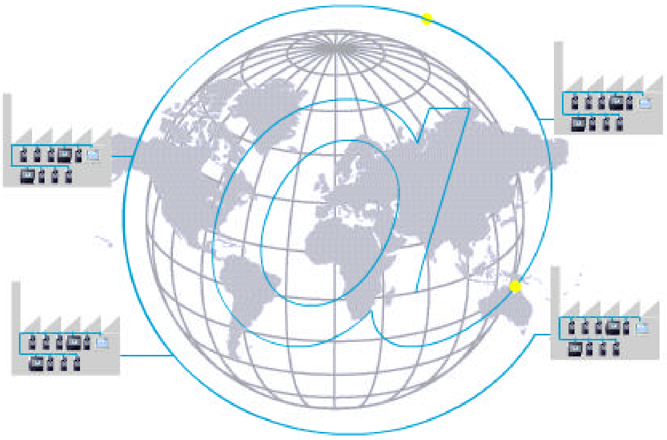
Synchronisation

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

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 system that in its simplest version offers many functions, to a complete factory system. Using open standards like Ethernet TCP/IP, it is possible to connect and communicate with external systems and allows global communication.

Communicate with one Power Focus unit at a time via the serial connection or with a complete network of Power Focus units via the built-in Ethernet TCP/IP connection.



Power Focus 3000 communicates with a range of accessories via the internal I/O-bus. Power Focus units and accessories can be combined according to the customer’s requirements.

Power Focus 3000 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 Power Focus 3000 controller has four dry contacts, four Opto isolated inputs and a 24 V DC / 1 A for external control circuits. All inputs and outputs can be configured using the ToolsTalk software. The number of I/Os can be increased using an I/O expander on the I/O bus.

With Power Focus 3000, 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 affords easy to use, effective database and data collection functions, using standard databases like SQL, Oracle and Access. Power Focus 3000 can be connected to a network for central programming and data collection using ToolsNet. With the modular concept the Power Focus 3000 is the building block used to create complete and cost efficient solutions that satisfy the various needs of modern industrial assembly operations.

Accessories

The Power Focus 3000 concept features a number of accessories that simplify guidance and follow-up of performed tightenings. The accessory functions can be set-up using ToolsTalk or a Graph unit.

The **Selector** is a socket tray that can be programmed to guide a specified work order, the **I/O Expander** enables connection of more units and relays when needed and the **RE-Alarm** indicates tightening status.

Selector ***I/O Expander*** ***RE-Alarm***

Power Focus 3000 is able to read bar codes via a bar code scanner or a RF tag, which enables values to be input from specific car models and tool guides.

Tools

Atlas Copco’s **Tensor-S** is 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 output of the S7 is about five times as high as that of a moped. The tools can be combined in various models to meet a variety of requirements within the industry.

Below you will find four of Atlas Copco's main products from the electrical Nut Runner range.

ETP S4-10-I06CTADS
– Female hex/Square drive: 1/4"
- Torque (min - max): 3 Nm – 12 Nm
- Torque (min - max): 2.8 Ft lb – 8.8 Ft lb
– Weight: 1.2 kg
- Length: 195 mm
- Speed: (max): 750 rpm
– Configuration: Pistol Grip

ETV S7-28-10CTADST
– Female hex/Square drive: 3/8"
– Torque (min - max): 5 Nm – 29 Nm
– Torque (min - max): 4 Ft lb – 21 Ft lb
– Weight: 1.6 kg
– Length: 415 mm
– Speed: (max): 1300 rpm
– Configuration: Right Angle

ETF S7-100-13CTADST
– Female hex/Square drive: 1/2"
- Torque (min - max): 20 Nm – 110 Nm
- Torque (min - max): 15 Ft lb – 80 Ft lb
– Weight: 2.9 kg
- Length: 476 mm
- Speed: (max): 225 rpm
– Configuration: Fixture

ETD S9-1000-25CTADST
– Female hex/Square drive: 1"
– Torque (min - max): 250 Nm – 1000 Nm
– Torque (min - max): 180 Ft lb – 730 Ft lb
– Weight: 13.0 kg
– Length: 826 mm
– Speed: (max): 80 rpm
– Configuration: Inline

Fixture applications can be easily installed and integrated with standard Atlas Copco components.

ACTA 3000

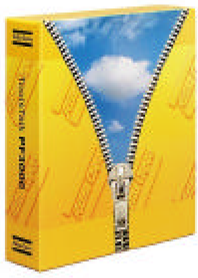
ACTA 3000 enables you to perform a full range of functions, from simple torque checks to advanced graphic tightening analysis. It comes in different models to cover all your needs, and it is easy to upgrade.

The ACTA 3000 measures torque, angle and pulses, and allows you to conduct statistical analyses of the tightening process. The ACTA 3000, together with the ToolsTalk ACTA PC utility, is your complete SPC tool. It will also remind you when it is time for calibration and maintenance.

3 User Interfaces

Compact

Graph



ToolsTalk

This section describes the different interfaces, which are used to monitor and control the Power Focus. There are three different user interfaces:

- **Power Focus 3000 Compact**
- **Power Focus 3000 Graph**
- **ToolsTalk**

The Compact and the Graph are two different Power Focus 3000 models and ToolsTalk is a software package that is used for monitoring and controlling the Power Focus 3000 via a PC or a laptop.

The Compact and the Graph have similar functionality and capacity. The only difference is the user interface.

3.1 Power Focus 3000 Compact

Power Focus 3000 Compact can be programmed either via a Graph, ToolsTalk or a pre-programmed RBU. It can also be programmed directly via the unit's Auto Set function. Except for differences in the user interface, the Compact possesses the same functionality and capacity as the Graph model.

For a description of the connections on the Compact back panel, see *chapter 20, Hardware Description.*

3.1.1 Front Panel

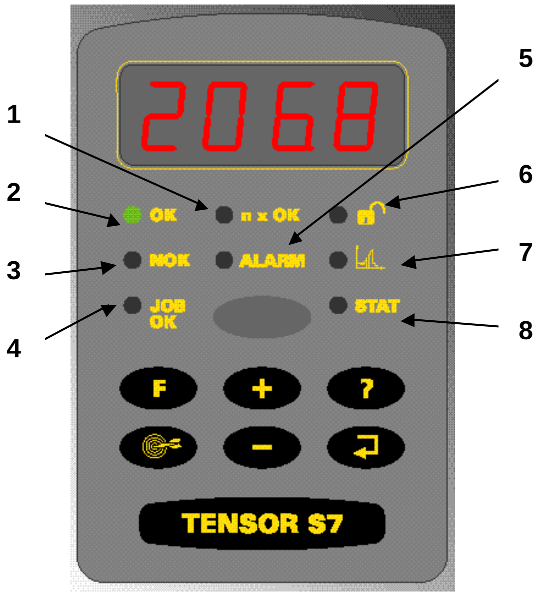
The front panel of the Power Focus Compact consists of a display, indicator lights, buttons and a red and white power switch. There is also an IR window, which can be used in conjunction with an IR key to lock and unlock the buttons on the front panel.

1. Display
The front panel contains a 4-digit, 7-segment display.

2. IR Window
The IR window can be used in conjunction with an IR-key to lock and unlock the buttons on the front panel.

3. Power Switch
Red and white power switch.

3.1.2 Indicator Lights



1. n x OK
2. OK
3. NOK
4. JOB OK
5. ALARM
6. PROG CONTROL
7. AUTO SET
8. STAT

1. n x OK

The n x OK light indicates when the number of approved rundowns corresponds to the number (batch size) programmed into the Power Focus 3000. The indicator remains active until the next cycle starts.

2. OK

The OK light indicates when the result of the rundown is within the specified limits. The indicator remains active until the next cycle starts.

3. NOK

The NOK light indicates when the result of the rundown falls outside the specified limits. The light is active until the next cycle starts.

4. 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.

5. ALARM

The ALARM indicates that an alarm message needs to be acknowledged. The light is active until the message is cleared. The alarm light can also flash indicating active alarm that does not need to be acknowledge, i. e. service indicator alarm.

6. Programming Control

If the Power Focus 3000 is in programming mode the Programming Control light (illustrated by an opened padlock) flashes green. Programming Control can be undertaken via the unit itself, via a Graph or via ToolsTalk. A steady green light indicates that the programming buttons on the front panel are unlocked.

If the Power Focus 3000 Compact is not in programming mode, the only buttons on the unit that can be used are Question Mark and Enter. (If key is unlocked, steady green, any key can be accessed.)

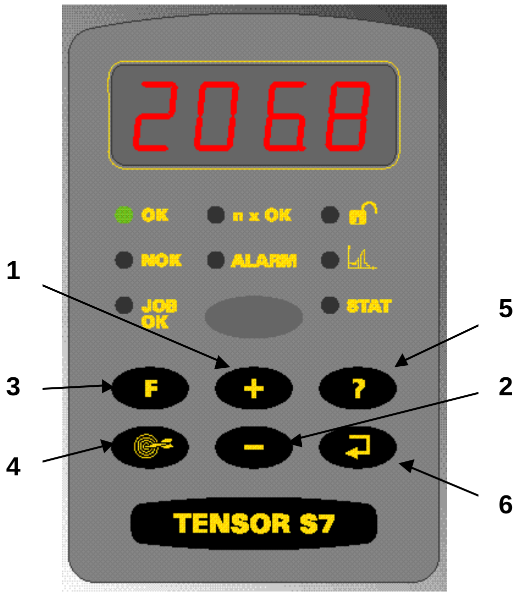
7. Auto Set

The Auto Set light indicates when the Auto Set programming function is active. The light goes off when Auto Set is finished.

8. STAT

The STAT light indicates when the calculated values fall outside statistical control limits. The light remains active until the values are within the control limits or the memory has been reset.

3.1.3 Keys



1. **Plus Button (+)**
2. **Minus Button (-)**
3. **Function Button**
4. **Auto Set**
5. **Question Mark**
6. **Enter**

Plus Button (+)

The Plus Button (+) is used to navigate through menus on the display and increase numbers.

Minus Button (-)

The Minus Button (-) is used to navigate through menus on the display and decrease numbers.

Function Button (F)

Press the Function button to display functions F1 - F5:

F1 - Setting Final Target value

1. “F1”/”Ft” alternates in the display. If no Pset is selected “F1”/”----“ is displayed.
2. Press Enter to select the new Final Target value. Change the value by pressing the +/– keys.
3. Press Enter to save and exit. Press F to exit (no save).

F2 - Setting Torque Tune Factor

1. “F2”/”tunE” alternates in the display if the selected Control Strategy is equals to DS control. Otherwise “F2”/”----“ is displayed.

2. Press Enter to access the Torque Tune Factor. Change the value by pressing the +/– keys (range 80% - 220%, default value 100%).

3. Press Enter to save and exit. Press F to exit (no save).

F3 - Motor tuning

1. “F3”/”tool” alternates in the display.

2. Press Enter to activate the Motor Tuning process. When the Motor Tuning is being performed, the display will show the progress in percent (starting with 0).

3. Press the Tool Trigger Button to start Motor Tuning.

4. Press F at any time to abort the Motor Tuning process.

5. When Motor tuning process ends, “F3”/”tool” starts alternating in the display.

F4 - Selecting Pset

1. “F4”/”Pset” alternates in the display if the Pset Select Source is Keyboard. Otherwise “F4”/”----“ is displayed.

2. Press Enter to access the available Psets. Browse existing Psets by pressing the +/- keys.

3. Press Enter to select a Pset and exit.

4. Press F to exit (no selection).

F5 - Setting Batch count

1. “F5”/”batS” alternates in the display, indicating that a Pset is selected. Otherwise “F5”/”----“ is displayed.

2. Press Enter to access the Batch Size value (range 0 – 99). Change the Batch Size value by pressing the +/- keys.

3. Press Enter to save and exit.

4. Press F to exit (no save).

Auto Set

1. Press the Auto Set button to enter Auto Set programming mode. “Aset”/”Ft” alternates in the display and the Auto Set led goes on.
2. Press Enter to access the Final Target value. Change the Final Target value (if required) by pressing the +/- keys.
3. Press Enter to select the Final Target value. “Aset” is shown in the display.
4. Perform a number of tightenings. When Auto Set is ready, the selected Pset number is displayed and Auto Set led goes out.
5. To abort Auto Set press the Auto Set button (exit and no save).

Question Mark

Pressing the Question Mark button will display the following information:

Power Focus model
Model type alternates with software version (G = Gold, S = Silver and B = Bronze).
(“rBu” toggle with RBU type.)

SW version
The entire program code alternates with version number.
(“rEL” with version number roll 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”.

Note! The Question Mark button is always unlocked.

6. Enter

The Enter button is used to execute selected functions and for error acknowledgement.

Note! The Enter button is always unlocked.

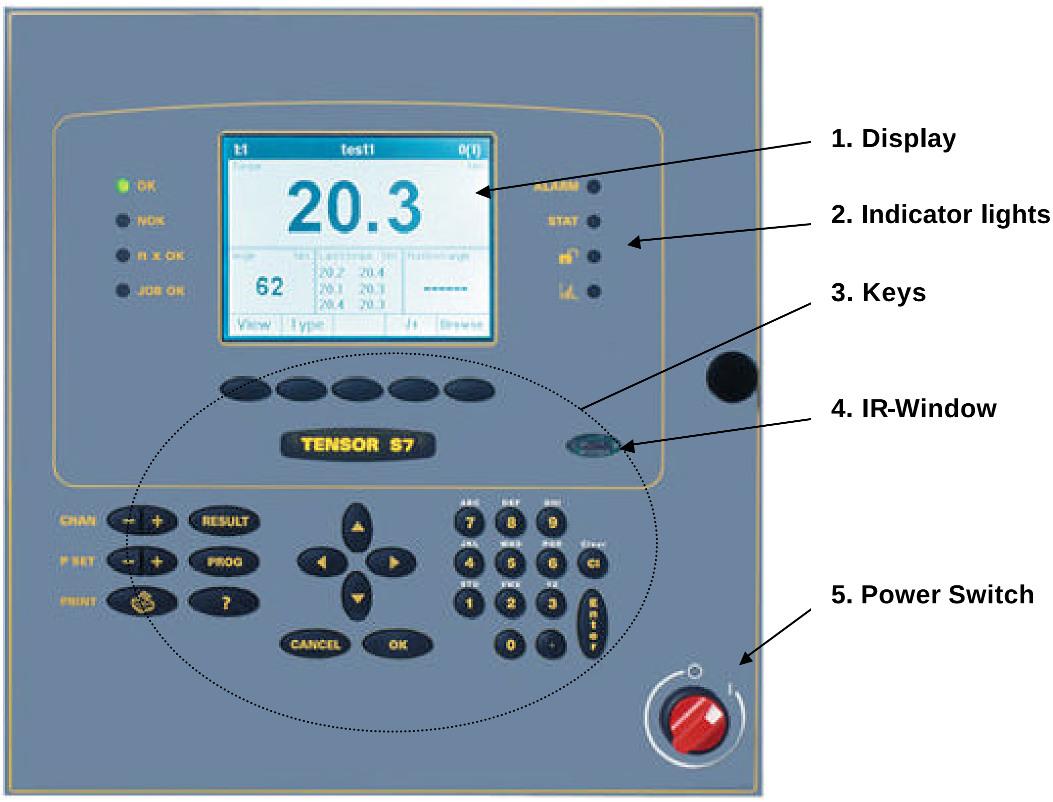
3.2 Power Focus 3000 Graph

Power Focus 3000 Graph can be programmed in a variety of ways: manually setting parameters, by a pre-programmed RBU, by another Graph or by using ToolsTalk. It can also be programmed via built-in functions Quick Programming and Auto Set [see *chapter 7; Parameter Set*]. The Graph can supervise all other units on a network (i.e. acting as the “Cell Master”). Except for differences in the user interface, the Graph possesses the same functionality and capacity as the Compact model.

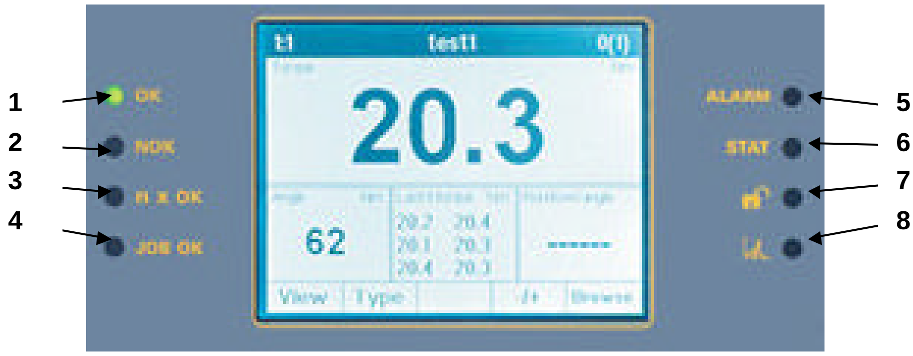
For a description of the connections on the Graph back panel, see *Hardware Description*, chapter 20.

3.2.1 Front Panel

The front panel of the Power Focus Graph (below) contains of a **display** (1), **indicator lights** (2), **keys** (3) and a **power switch** (5). There is also an **IR Window** (4), which can be used in conjunction with an IR key to lock and unlock the keys on the front panel.



3.2.2 Indicator Lights



1. **OK**
2. **NOK**
3. **N X OK**
4. **JOB OK**
5. **ALARM**
6. **STAT**
7. **PROG. CONTROL**
8. **AUTO SET**

The eight light emitting diodes (LEDs) on the front panel of the Power Focus Graph monitor the status of the controller. The lights always show the results from the tool currently in use.

The indicator lights will light up for a short while when the power on the Graph is turned on.

1. OK

The OK light indicates when the result of the rundown is within the specified limits. The indicator remains active until the next cycle starts.

2. NOK

The NOK light indicates when the result of the rundown falls outside the specified limits. The light is active until the next cycle starts.

3. n x OK

The n x OK light indicates when the number of approved rundowns corresponds to the number (batch size) programmed into the Power Focus 3000. The indicator remains active until the next cycle starts.

4. 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.

5. ALARM

The ALARM indicates that an alarm message needs to be acknowledged. The light is active until the message is cleared. The alarm light can also flash indicating active alarm that does not need to be acknowledge, i. e. service indicator alarm.

6. 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.

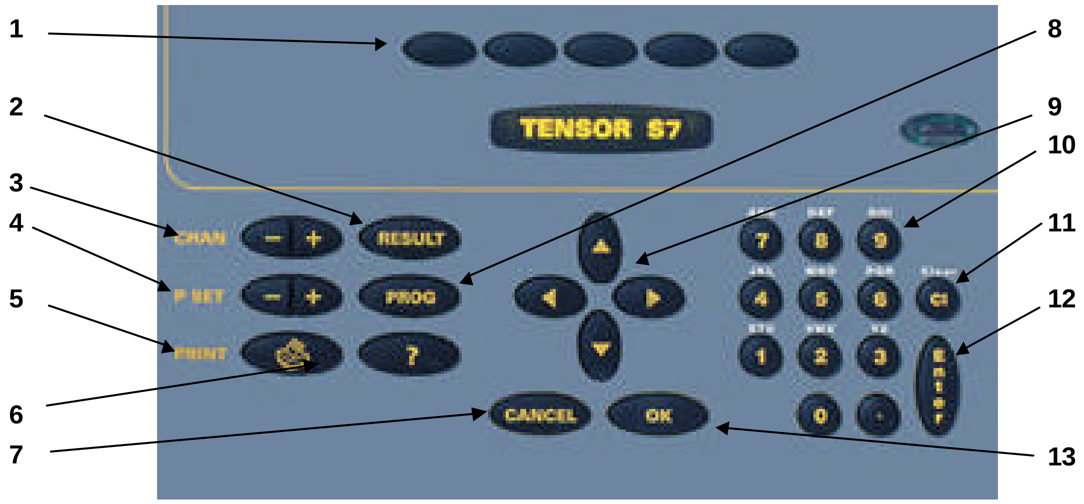
7. Programming Control

If the Power Focus is in programming mode, the green Program Control light (illustrated by an opened padlock) flashes. Program Control can be undertaken via the unit itself, via a Graph or via ToolsTalk. A steady light indicates that the programming keys on the front panel are unlocked.

8. Auto Set

The Auto Set light indicates that the Auto Set programming function is active. The light goes off when Auto Set is finished.

3.2.3 Keys



1. Soft KEYS
2. RESULT
3. CHAN
4. P SET
5. PRINT
6. Question mark KEY
7. CANCEL KEY
8. PROG
9. ARROW KEYS
10. KEYS with numbers and letters
11. Cl
12. Enter
13. OK

1. Soft keys

The function of these five soft keys varies, depending on what is shown in the lower edge of the display. The soft keys can be locked for security reasons.

2. RESULT

Press the RESULT key to exit programming mode and go back to the result monitor. For further information, see the chapter entitled "DISPLAY".

3. CHAN

The CHAN keys are used to select channels in a Cell to program or to display results from. The display shows the Cell Member identity in the upper left corner.

If the key is pressed for more than one second, a list appears with all available channels in the Cell.

4. P SET

Press the P SET keys to select which Pset (or Job) to program or to display results from.

If the key is pressed for more than one second, a list appears with all available Psets. If Pset select source is set to “keyboard”, and the display is in Result Mode 1, running Pset can be change from the Pset key on Graph front panel.

5. PRINT

Press the PRINT key when you want to print a report. The available choices are shown in a list where the current object is selected. The printer must be connected to the parallel port on the back panel of the Power Focus Graph.

6. Question mark

Press the Question Mark key to display available information, e.g. program version number, RBU type, etc.

7. CANCEL

The CANCEL key cancels the last entry made when programming, closes current menu tree level and opens up the next higher level. If changes have been made, you will be prompted to cancel or store.

8. PROG

Press the PROG key to enter Programming mode. This will bring up the programming tree. For further information, see the chapter entitled "DISPLAY".

Note! It is possible to perform tightenings while programming. However, changes will not take effect during a tightening in progress.

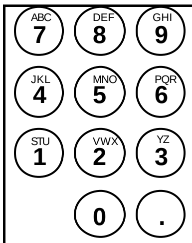
9. Arrow keys

Use the four arrow keys to move the cursor around the menu trees and lists.

- The right arrow key opens the next menu tree level down, enters a parameter field or scrolls right through columns.
- The left arrow key closes the shown level, returns to the higher level or scrolls left through columns.
- The up and down arrow keys are used to move the cursor up and down in programming trees or lists.
- The left and right arrow keys can also be used to move the cursor in parameter field.

10. Keys with numbers and letters

When used for text entry the number on the key appears after scrolling through the letters (press the key several times). Special characters occur depending on selected language.

<table>
<tr>
<td>
</td>
<td>These keys have different functions depending on when they are used.

In Pop-up windows, List menus, etc., a press on one of these keys will select the corresponding entry the list (only digits). No enter is needed.

In an Input menu, a press on one of these keys will print out a letter or number.

Several key presses will toggle the letters. For example: Press on the "7"-key will make the letter scroll in this order: ‘abcABC7’.

Language specific letters can be found on the “0” key.</td>
</tr>
</table>

11. Cl

Clear key. In result mode, this key removes the most recent result from the memory in the used Pset. If you are in the programming menu (in a parameter field), pressing the Clear key will remove the most recently entered character/number.

12. ENTER

Press the Enter key to activate a selection, end an entry or open the next level in a menu tree.

13. OK

Press the OK key to confirm programming or acknowledge messages.

3.2.4 Display

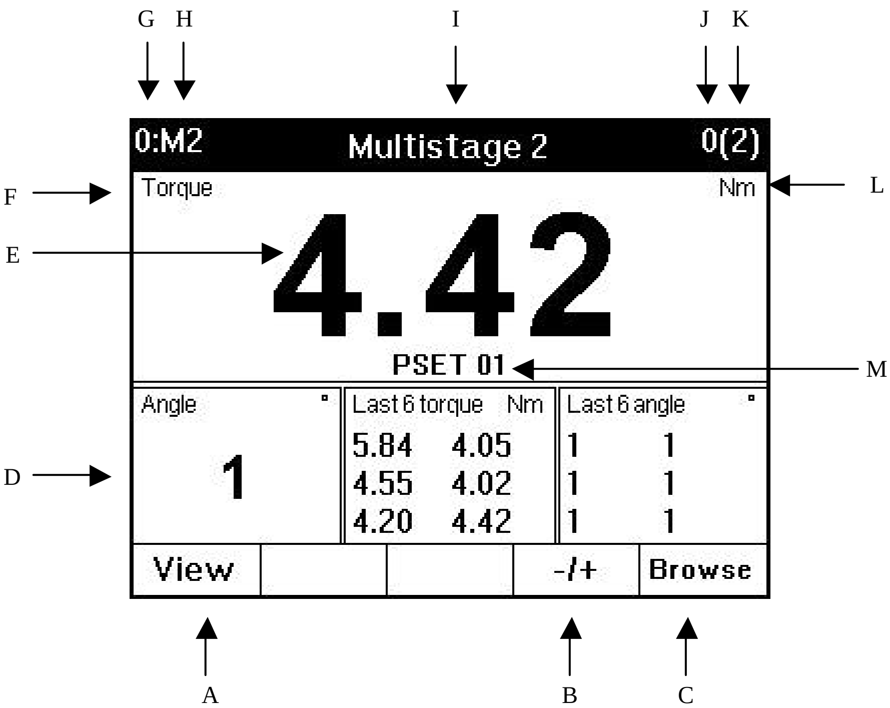
The Power Focus ¼ VGA Display monitors results and programming. It can be configured to show information from any Power Focus within a Cell.

Result mode – last result

During start-up, the Power Focus Graph will automatically enter Last Result Mode (the display will show the most recent result for one channel).

The figure below shows the Graph display in Result mode.

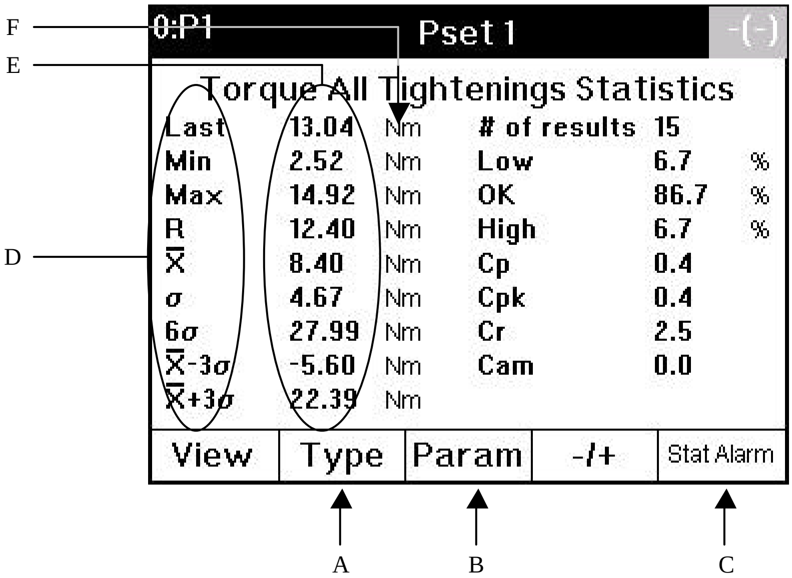
Note! This is only an example (all selection fields can be configured in Cset).



A	View	(Soft key) Pull-up menu for switching between result views. Available views are; Last Results, Statistics, Stat Chart, Trace, Job, Sync, All (results) and Event log
B	- / +	(Soft key) Allows the user to scroll through the channels / Psets and view the most recent result for all cell members (if any).
C	Browse	(Soft key) Allows the user to switch function for the lower right view in runtime (the available selections are depending on the Power Focus 3000 configuration). The default view is configured in Cset.
D	Result Windows (selected parameters 2, 3 and 4)	The Result will flash (blink) if the value is outside programmed limits. When a Pset is chosen but it has no tightenings, '------' will be displayed instead of value.
E	Parameter Window (selected parameter 1)	Value outside programmed limits will blink the result. When a Pset is chosen but it has no tightenings, '------' will be displayed instead of value.
F	Result type	The name of the selected parameter (Torque, Angle etc).
G	Channel number	The number of the monitored channel (tool). If the channel belongs to the current Power Focus the background is black. However, if the channel belongs to another Power Focus in the Cell the background will be grey.
H	Pset / Multistage number	The Pset identification number (belongs to a specific channel (Power Focus). A "P" before the number indicates a Pset. An "M" indicates a multistage.
I	Pset / Multistage name	The name of the monitored Pset / Multistage.
J	Number of tightenings	The number of completed tightenings in a batch.
K	Batch size	The number of tightenings programmed in the batch. If the batch is activated the background will be black. Otherwise it is grey.
L	Result unit	The unit for the selected parameter (engineering unit). (Nm, degree etc.)
M	VIN	Vehicle identification number. Will be displayed simultaneously with the tightening result.

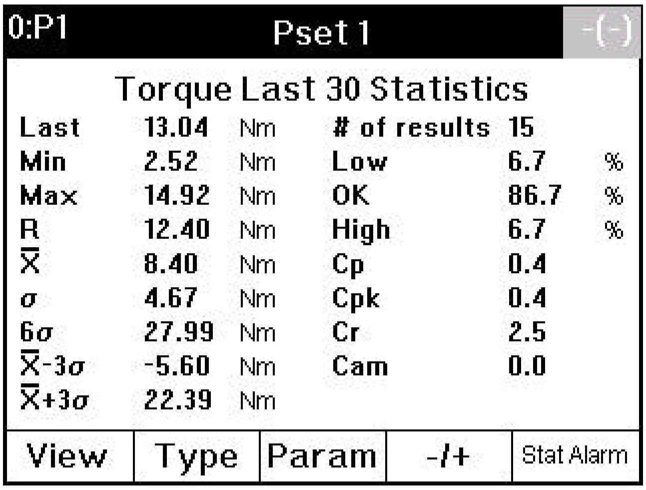
Result mode – Statistics

The screenshot below shows the statistics of all saved tightenings of the monitored channel and Pset.

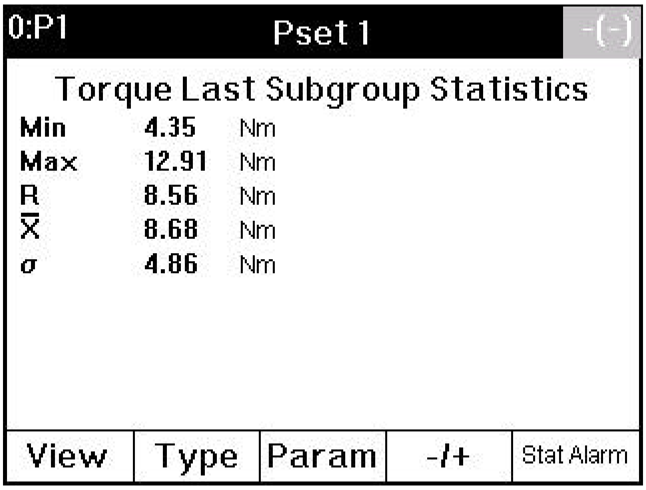


A	Type	(Soft key) Choose between All tightenings, Last subgroup and # of tightenings.
B	Param	(Soft key) Choose between available statistics – torque, angle.
C	Stat alarm	(Soft key) Shortcut to statistical events log
D	Parameter names	Name of parameters.
E	Parameter values	Measured / calculated results.
F	Parameter units	Units in which the parameters are displayed

The view below shows the statistics of the last n (here 30) saved tightenings of the monitored channel and Pset.

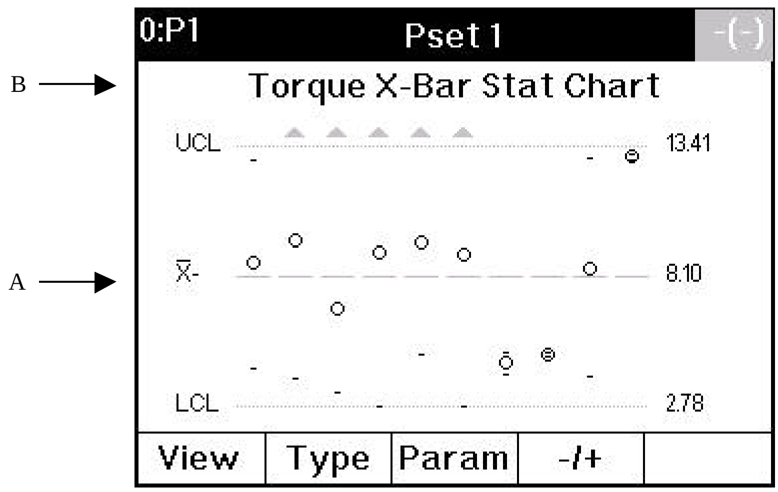


The view below shows the statistics of the last subgroup of the monitored channel and Pset. This view shows the subgroup Statistics of the monitored channel and Pset.



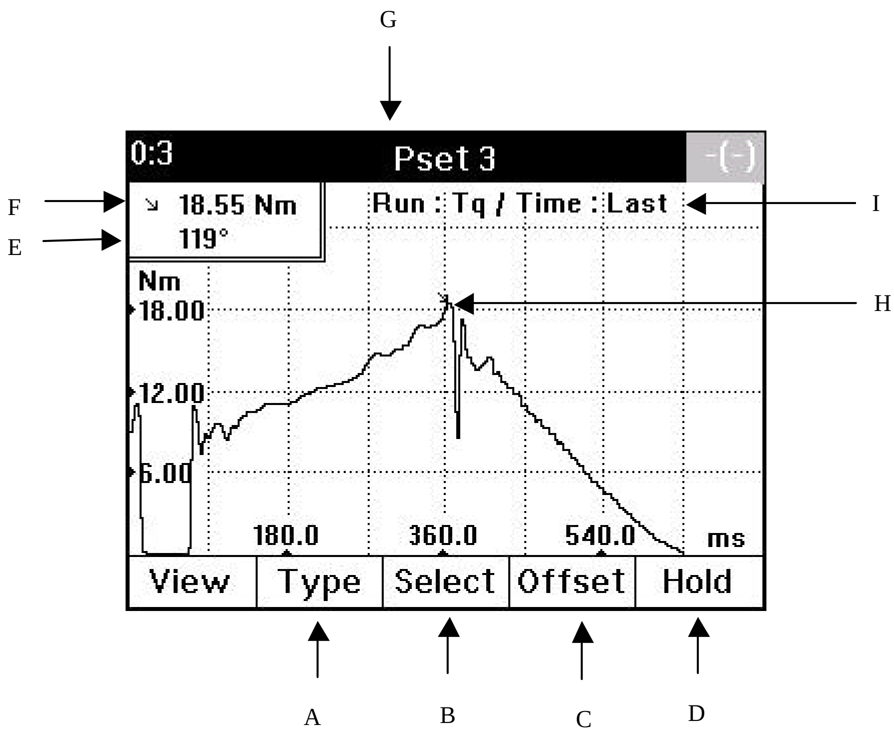
Result mode – Stat Chart

The statistical charts of group mean value and group range are used for statistical process control. When there are less then 10 group results, the remaining columns to the right will be empty when there is anything to show.



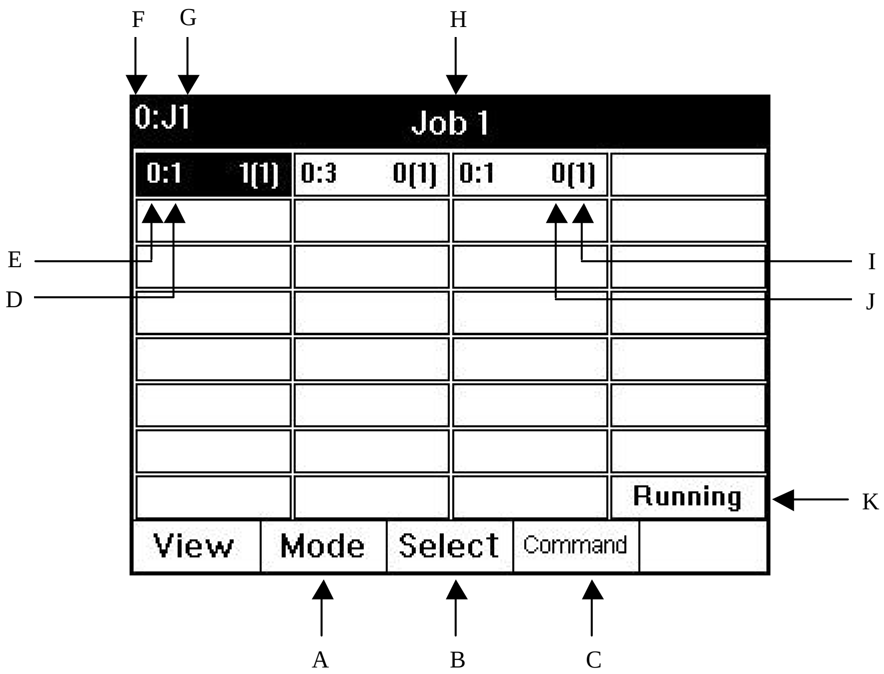
A	Graphical presentation	The last ten subgroups results (the most recent is on the right hand side). The results outside the programmed limits are flagged. An arrow indicates if the value is outside a limit (above the max limit line or below the min limit line).
B	Name and value of calculated parameters	

Result mode – Trace



A	Type	(Soft key) Choose between Tq / Time, Tq / Angle etc.
B	Select	(Soft key) Choose which trace to be displayed (8 selections, Last 3 OK and Last 4 NOK plus the Latest)
C	Offset	(Soft key) Choose between Angle offset (view from Start final angle) or No offset (view from Cycle Start torque).
D	Hold	(Soft key) If the window is in run-mode, the trace will be updated after each completed tightening. If it is in hold mode, it will not be updated.
E	Measured angle	The angle at the same time as when the highest torque was measured. When the result is outside acceptance interval, the text flashes with a frequency of 1 Hz.
F	Peak torque	The highest torque value during the tightening. When the result is outside acceptance interval, the text flashes.
G	Status	Mode (Hold/Run), Type and Select.
H	Peak point	The level where the torque is at maximum.

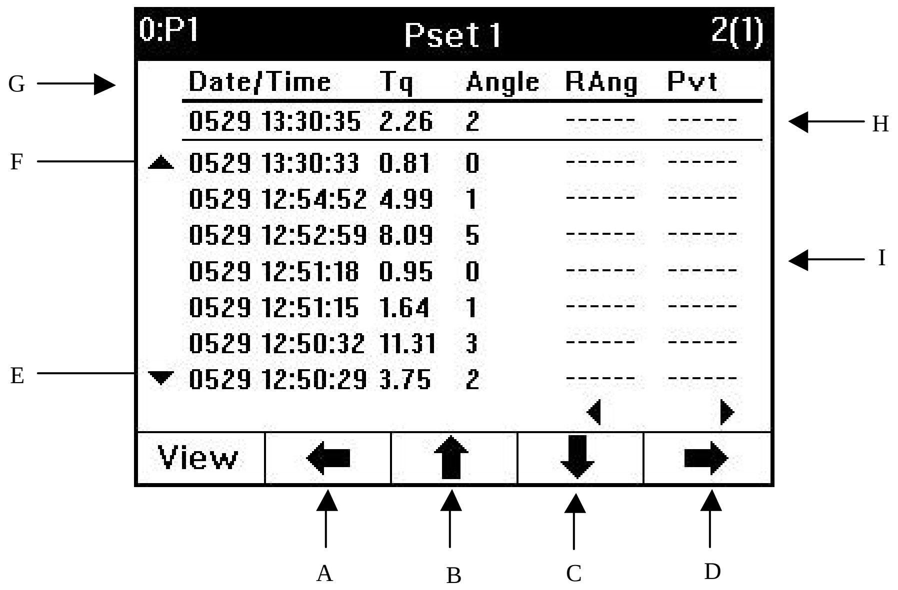
Result mode – Job



The header text is on a black background if the job is currently running, otherwise the header will be text on a grey background. The different Psets are black text on a white background if the Pset is not done, otherwise it will be white text on a black background.

A	Mode	(Soft key) Turn Job mode off / on.
B	Select	(Soft key) Select new Job. (If PF Keyboard is configured for Job select source in Cset.)
C	Command	(Soft key) Issue a command – Restart job, Decrement, Increment, Bypass or Abort job. (If PF Keyboard is configured for Job select source in Cset.)
D	Pset no	The Pset for this channel is programmed for the present Job.
E	Channel no	The channel number within the present Job.
F	Job reference	Channel number of the Job Master.
G	Job no	The number of the current Job.
H	Job Name	The name of the current Job.
I	Batch size	The number of tightenings in a batch. If batch count is active the background is black. Otherwise it is grey.
J	Number of tightenings	The number of completed tightenings.
K	Job Status	Displays the status of the current job.

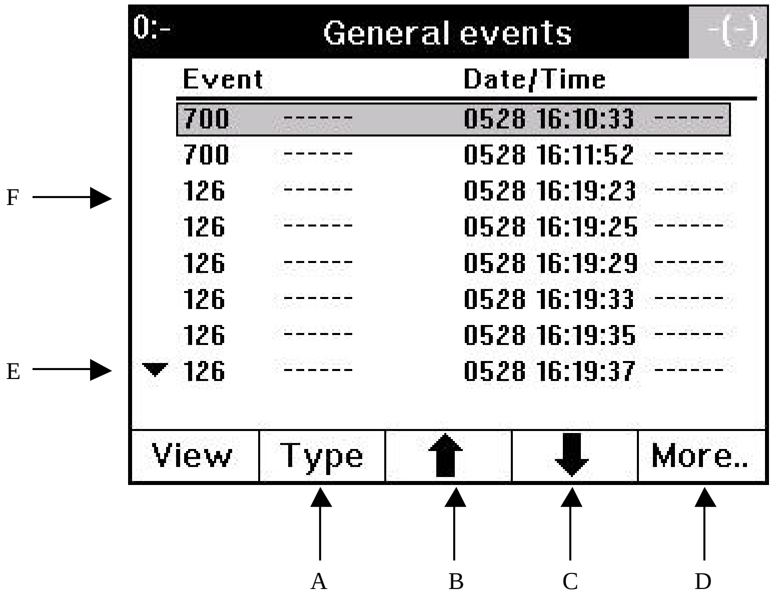
Result mode – (view) all



The header text ("Pset 1") is white on a black background if the Pset is one currently running, otherwise it will be white text on a grey background.

A	Arrow left	(Soft key) Scroll left in columns.
B	Arrow up	(Soft key) Scroll up in rows.
C	Arrow down	(Soft key) Scroll down in rows.
D	Arrow right	(Soft key) Scroll right in columns.
E	Arrow down	Arrow indicating that it is possible to scroll down to view earlier results.
F	Arrow up	Arrow indicating that it is possible to scroll up to view later results.
G	Title of columns	Date/Time; Trq; Angle; (Rundown Angle / PVT / Self-tap / Number in batch / Batch size / Tightening ID) (it is possible to scroll through these last six by using the right/left arrow keys).
H	Most recent result	If a tightening is completed while this window is active, the result will be displayed here.
I	Measured results	Values outside programmed limits are presented in inverse mode. Those parameters which are not measured / stored will be displayed as '---'.

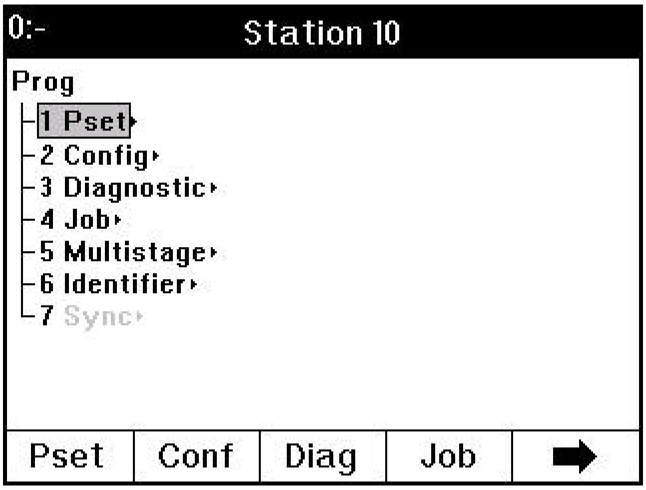
Result mode – Event Log



A	Type	(Soft key) Choose between Statistical and General events.
B	Arrow up	(Soft key) Move cursor one row up.
C	Arrow down	(Soft key) Move cursor one row down.
D	More..	(Soft key) Information about the event.
E	Arrow down	Indicates that it is possible to scroll down to view earlier events.
F	Events	List of event numbers and date / time.

Programming mode – enter Programming Tree

To enter programming mode, press the PROG key.



There are three ways to enter the different sets:

1. Press corresponding softkey.
2. Press the corresponding number key, i.e. 1 for Pset.
3. Move up/down in the tree and enter a branch using the right arrow key or enter.

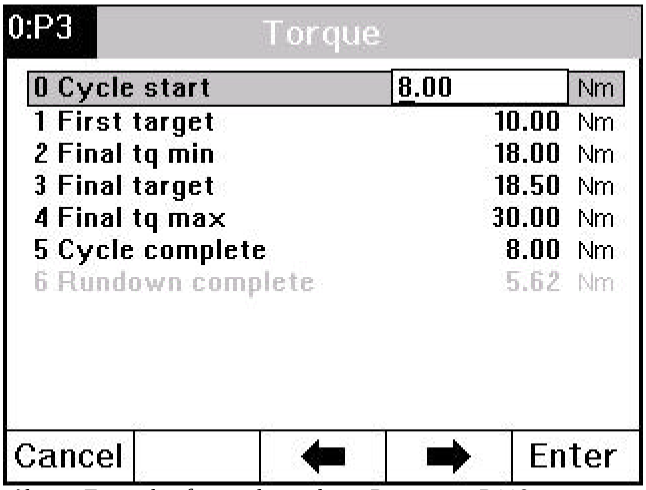
From a branch (a set) there are various ways to enter the correct parameter:

1. Explore the programming tree using the arrow keys.
2. Enter the parameter number. Example: If you have entered Job, the job-branch, and want to edit parameter J100, press 1 – 0 – 0. This will make the Power Focus 3000 show the existing Jobs.

Programming mode – enter parameter values

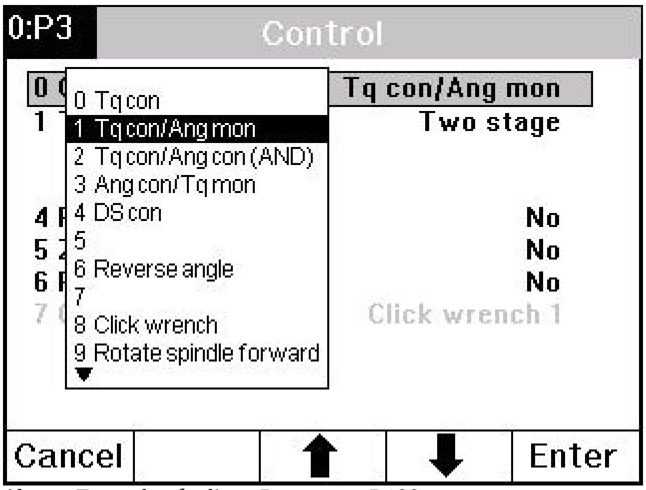
There are various different types of parameter value; *Number*, *List value*, *String value* and *IP address*.

- *Number*, with or without decimals. (Example: P110 – Pset Cycle start)



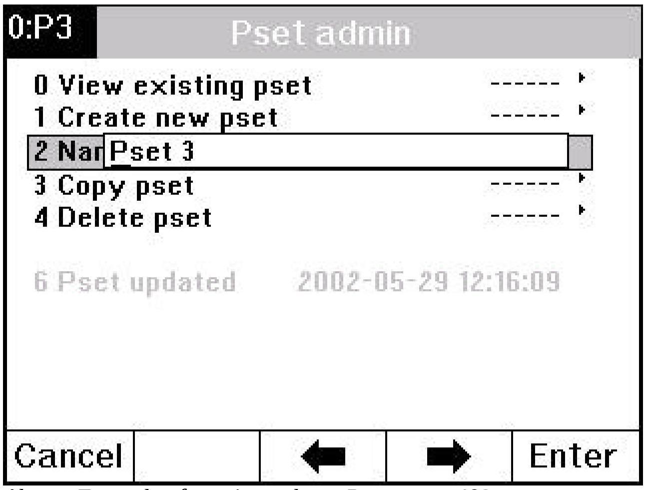
Above: Example of a number value – Parameter P110.

- *List value*. When entering this type of parameter, a list of alternatives will pop up where a value can be shown by scrolling up / down using the arrow keys. (Example: P100 – Pset Control strategy)



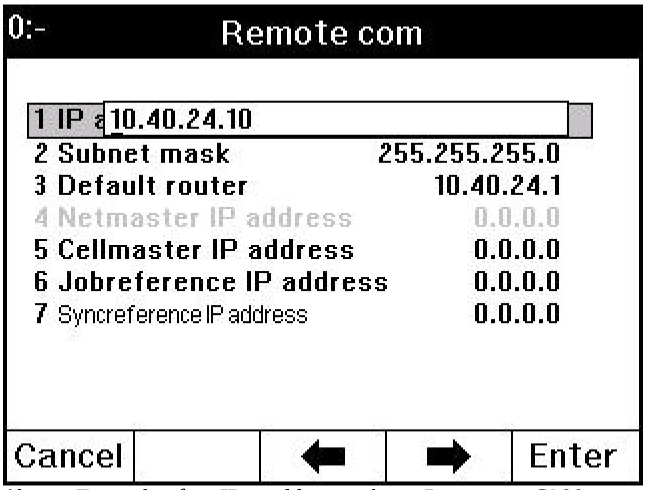
Above: Example of a list – Parameter P100.

- *String value*. Enter a character in the parameter field by pressing the number keypad. Waiting three seconds or pressing arrow right key will result in the cursor moving to the position for the next character. It is also possible to move cursor back using the arrow left key. Pressing the Cl key while the cursor is located on a character will delete the character. (Example: P402 – Pset name)



Above: Example of a string value – Parameter 402.

- *IP address*. Enter the four numbers between 0 and 255, separated by a dot. (Example: C300 – (own) IP address).



Above: Example of an IP – address value – Parameter C300.

3.3 ToolsTalk

ToolsTalk is an application that acts as an interface between the user and the Power Focus 3000. It is used for programming and monitoring Power Focus from a PC.

With ToolsTalk 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 3000 easy and efficient, since ToolsTalk can be installed on a PC anywhere on the network.

3.3.1 Scope

ToolsTalk is an application designed to serve as an interface between the user and Power Focus 3000. With ToolsTalk, users can create and edit instructions and settings for the Power Focus 3000. 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 makes management of Power Focus easy and efficient, since the software can be installed on any PC on the network.

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

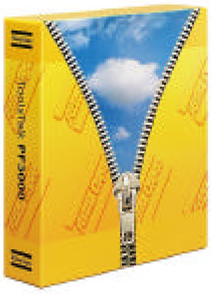
3.3.2 Getting started

Installation

Setup

ToolsTalk is easy to install.

- Insert the installation CD
- Run **setup.exe** and follow the on-screen instructions



Registration

To complete installation a ToolsTalk software registration have to be done. Registration can be done over the web, from the Atlas Copco Tools web site at:
http://www.atlascopco.com/tools/software

Enter your license number and you will be issued with a registration key.

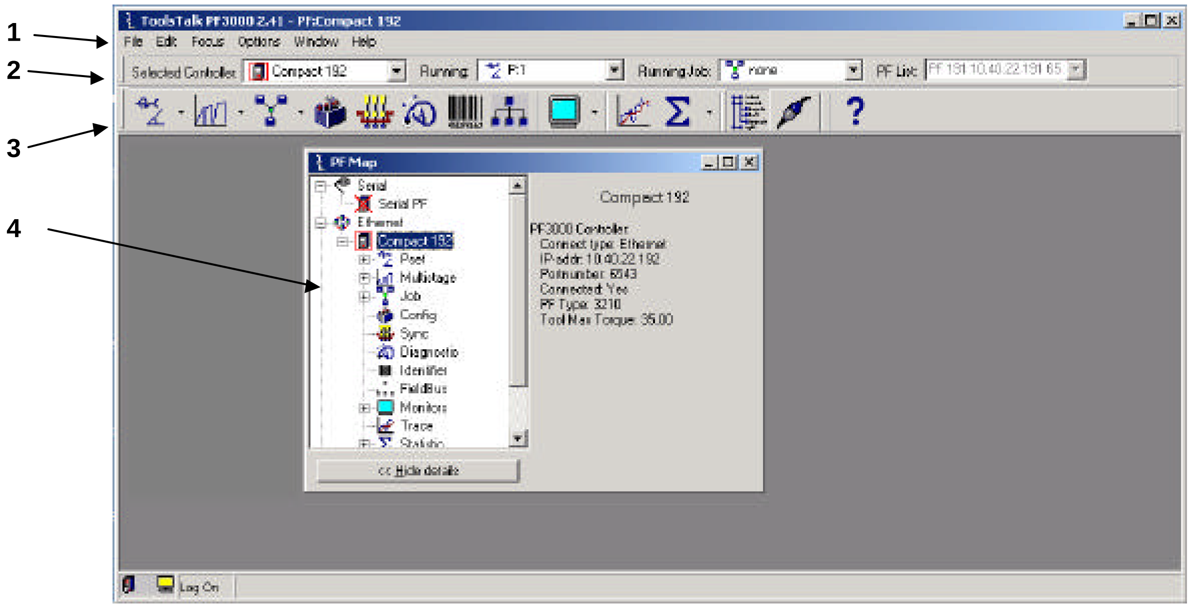
Start ToolsTalk from Windows

Click on the **START** button, select Program and then Atlas Copco Tools and click on ToolsTalk Power Focus 3000.

Alternatively, double-click on the ToolsTalk Power Focus 3000 shortcut on your desktop.

3.3.3 Overview

If you are familiar with Microsoft Windows®, you will soon be comfortable with the ToolsTalk interface. The figure below shows the **Menu row (1)**, the **Selection panel (2)**, the **Toolbar (3)** and the **PF Map (4)**:



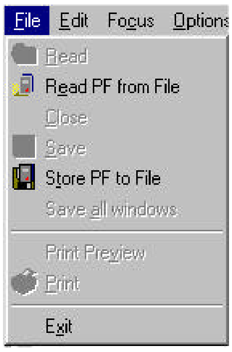
Almost every function in ToolsTalk has its own window.

There are several ways to start a function in ToolsTalk. For almost all functions you can use a menu item in the menu row, click on a tool button in the toolbar or double-click on text in the PF map. ToolsTalk is even designed to work without using a mouse. Therefore is it possible to access all functions from the menu row, even though a mouse will make things easier.

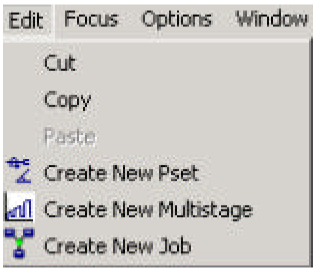
Menu row

This section describes the different functions found in the menu row. Note that an additional menu appears in the menu row when opening a function window. For example, if you open a Pset window, a new menu named “Pset” will appear in the menu row.

When you open **File**, you can open and save files, print and exit ToolsTalk.



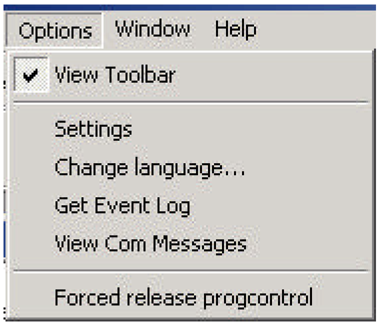
From the **Edit** menu you can create a new Pset, Multistage or Job



The **Focus** menu allows you to decide what kind of connection to use when connecting to the Power Focus. You can choose between an Ethernet connection or a serial connection.

The offline mode allows you to work with ToolsTalk without being connected to a Power Focus.

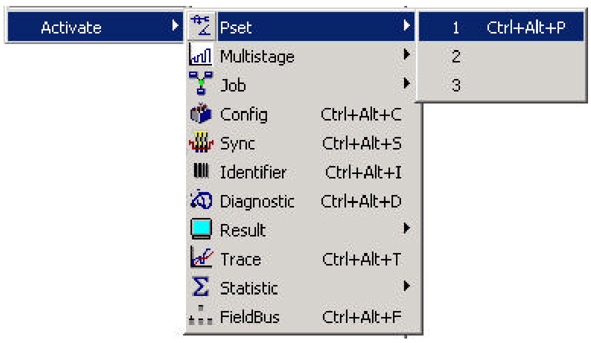
From the **Options** menu, you can select if you want the toolbar to be shown or not. The following functions are available: Settings, Change language, Get Event Log and View Com Messages and Forced release progcontrol.



The **Window** menu allows you to set, properties for windows and icons.

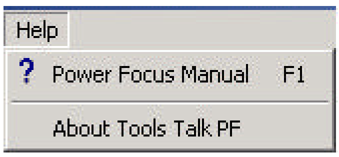
This menu also enables you to open the activate menu.

The **Activate** menu contains a list of all available functions (Pset, Job, Multistage, etc).

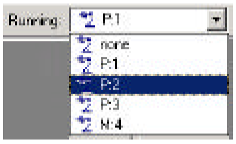
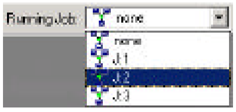
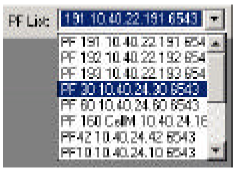


From the **Help** menu, you can access the Power Focus Manual help file.

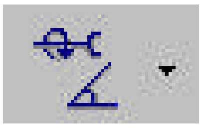
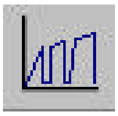
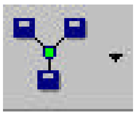
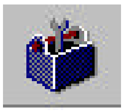
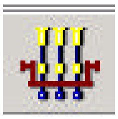
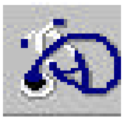
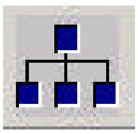
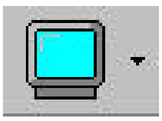
About ToolsTalk PF brings up details about the version of the program you are using.

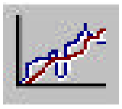
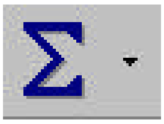
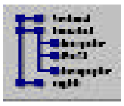
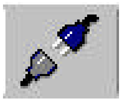
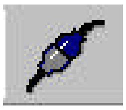


Selection panel

Symbol	Designation	Description
	Selected Controller	The available options are: Serial connection, Ethernet connection or the Offline mode
	Running Pset	If Pset select source (Config parameter C222) is in Ethernet/Serial mode, you can select running Pset/multistage from this combo box
	Running Job	If Job select source (Config parameter C221) is in Ethernet/Serial mode, you can select running job from this combo box
	PF List	To make an easier Ethernet connection to a Power Focus use the combo box PF List. Select an item in the combo box and ToolsTalk will connect to the corresponding Power Focus. The information in the list contains: name, IP address and Port number

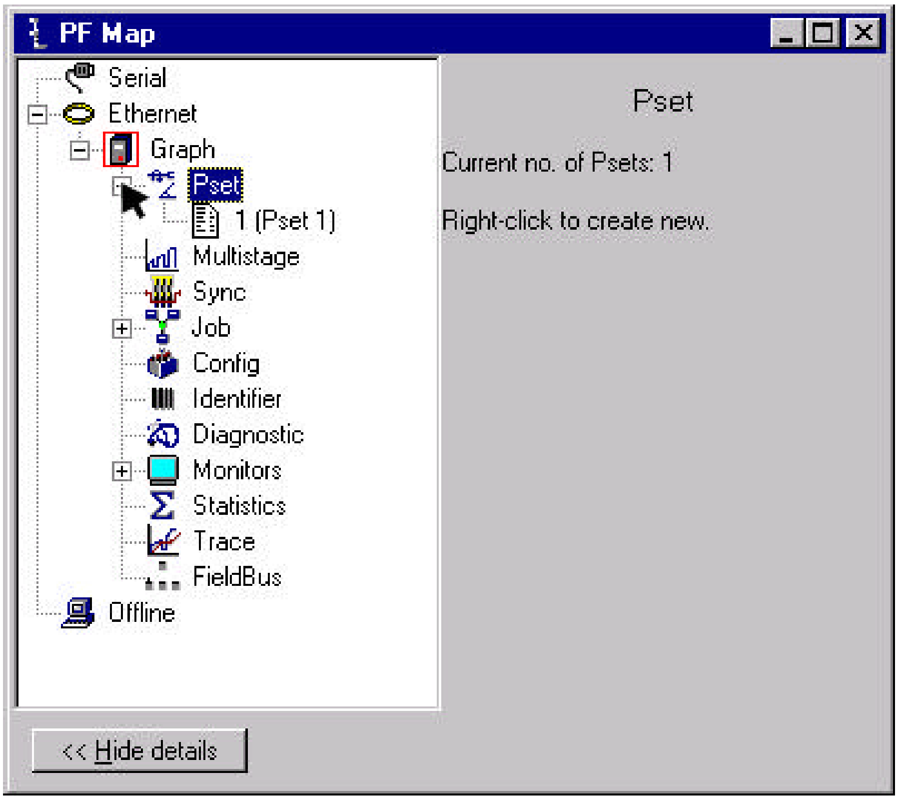
Toolbar

Symbol	Designation	Description
	Pset	This icon opens the Pset (Parameter set) programming window. Click on the arrow to the right and the programmed Psets are shown along with number and name. The list can contain a maximum of 250 Psets
	Multistage	This icon opens the Multistage programming window. Click on the arrow to the right and the programmed Multistages will be displayed along with number and name
	Job	This icon opens the programming window for Job
	Configuration	This icon opens the configuration window
	Synchronisation	This icon opens the synchronisation programming window
	Diagnostic	This icon opens the diagnostics window
	Identifier	This icon opens the identifier window
	FieldBus	This icon opens the FieldBus configuration window
	Monitoring	Click on the arrow to the right of this icon to select an appropriate monitor: Result monitor, Job monitor or Operator monitor. Using a result monitor is a convenient way to monitor tightening status

	Trace	Click the Trace icon to bring up a graphical display of the tightening results
	Statistics	Click on this icon to display statistical results and graphs.
	Focus 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, the upper icon is visible. Clicking on the icon will establish contact between the PC and the Power Focus. Once a connection is established, the lower icon will appear. Clicking on the icon will disconnect the PC from the Power Focus.

3.3.4 PF Map

The PF Map gives an overview and shortcuts to all settings in ToolsTalk. Click on the minus or plus symbols for opening and closing menus and double click on function names (Pset, Multistage, Job, etc) for opening the corresponding function. Brief information about the selected setting is displayed in the right panel of the PF Map. Right click on the function names to create a new instance of the function. If you click the Hide details button, only the left panel of the PF Map will be shown.



3.3.5 Connecting To Power Focus 3000

You can select between the alternatives serial connection or Ethernet connection.

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 and the Power Focus they must use the same baud rate. Default baud rate is set to 9600 bit/s.
To change the baudrate on the ToolsTalk side, use **Settings**. And on the Power Focus side, use Config.

Also make sure that the serial cable is connected to the correct Com port on the PC. The Com port settings can be set in **Settings**.

Ethernet connection

Under **Settings** you can edit the IP Address for the Power Focus to which you would like to establish a connection. You can also set whether that Power Focus is a Netmaster, Cellmaster or a Controller.

If you connect to a Netmaster you will get a list of Cell Masters in the PF Map. Double-click on a Cellmaster to get a list of all Power Focus (Controllers) in the cell.

If you connect to a Cellmaster you will get a list of all Power Focus (Controllers) in the cell. To connect to a controller, double-click on a Power Focus.

To connect

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

- Select **Focus** in Menu row and then choose between serial connection or Ethernet connection.
- Select **Selected Controller** in Selection row, click on Serial PF or Ethernet PF.
- In the PF Map, double-click on **Serial PF** or **Ethernet PF**.
- Use **image in Toolbar**. Default this button will make a serial connection. However, it remembers the most recent connection so if you have made an Ethernet connection previously, the next time you click this button it will make an Ethernet connection.
- Use predefined Power Focus unit from **PF List** (Options menu – Settings – PF List tab). Connect via image in Toolbar.

"Serial PF" and "Ethernet PF" will change to the Power Focus name once the connection is established.

To disconnect

If you want to disconnect, click on the Disconnect image in Toolbar or select **Focus**>**Ethernet** or **Serial**->"PF name"->**Disconnect**.

Offline mode

See Offline section.

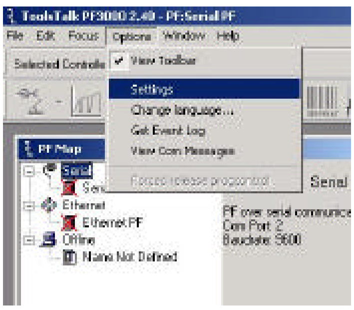
3.3.6 Settings

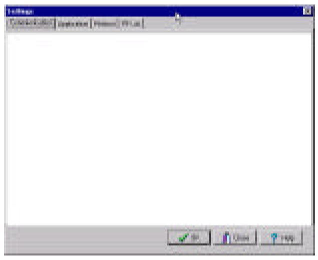
In the **Settings** menu you can set the IP Address for the Power Focus to which you want to establish a connection. You can also state whether that Power Focus is a "Cell Master" or a "Net Master".

In the Settings menu you can also:

1. Setup serial communication with Power Focus 3000
2. Setup Ethernet communication with Power Focus 3000
3. Create settings for logging communication messages between ToolsTalk and Power Focus 3000
4. Select if ToolsTalk should display Power Focus 3000 Error and Warning messages
5. Select the torque unit for display in ToolsTalk (This selection will not affect unit display in Power Focus 3000. See config set-up to find out how to change unit)
6. View parameter number and explanations (hints)
7. Auto store connected Power Focus to file on disconnect
8. Auto connect to Power Focus upon ToolsTalk start-up.
9. Set up printout
10. Administrate PF list

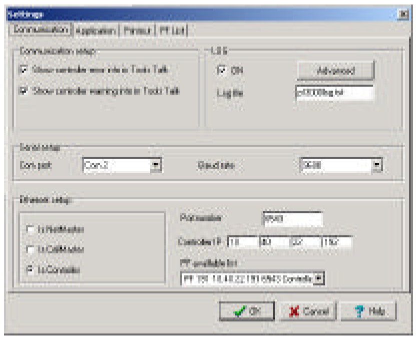
Open the **Settings** menu via Options in the main menu bar.





The Settings dialog has four tab sheets:
1. **Communication** and connecting installation
2. Set-up for viewing information inside the ToolsTalk PF **application**
3. **Printout** set-up
4. **PF List** administration

Click **OK** to store your set-up.
Click **Close** if you do not want to make any changes.
Click **Help** if you need help about Power Focus 3000.



The **Communication** sheet has four sections.

In the **Communication set-up** field you can select if you want to view controller errors and warnings.

Under **Serial set-up** you can 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. Note that all the connected Power Focus 3000 units need the same baud rate value to work together. Default value is 9600.

Under **Ethernet set-up**, you can select the type of connected Power Focus (Netmaster, Cellmaster or Controller), set Port number and Controller IP address. The default port number value is 6543. If you use an item from PF List (PF available list) then all three parameters [type, port, IP] will be set simultaneously.

In the **LOG** section, you can select if you want to log communication between Power Focus and ToolsTalk.

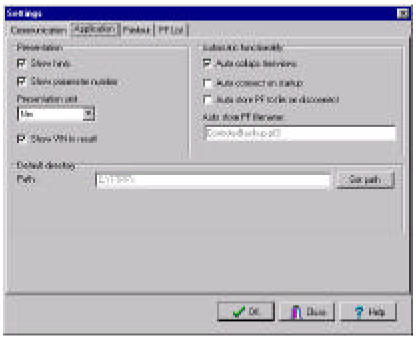
If you set Log to On, then messages will be stored in a file. The file name is stated in the Log file field.

Via the **Advanced** button you can make special set-up for logging.

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

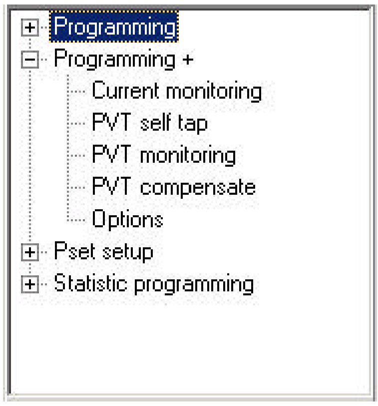
From the **Help** menu, you can open a series of help files.

About ToolsTalk PF shows details about the current program version.



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

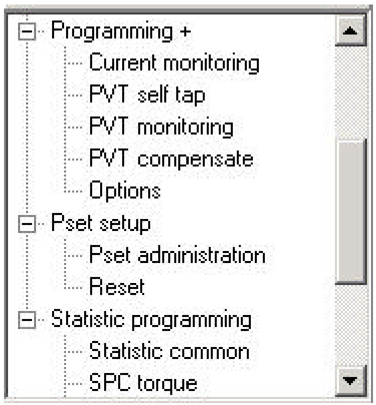
The first section is about ToolsTalk **Presentation** for programming windows. Use this if you want to view hints and parameter numbers. It is also possible to select display units (Nm, lbf.ft, lbf.in or kpm).



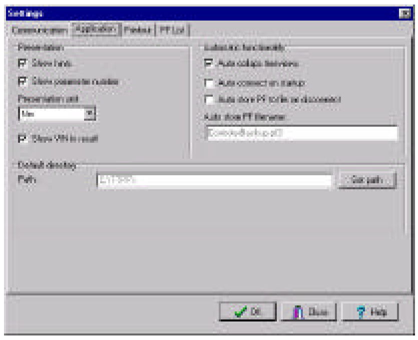
The first checkbox in **Automatic functionality** activates/deactivates **Auto collapse tree views**.

The figure on the right shows what is displayed with the Auto collapse tree views checkbox *selected*.

The figure on the right shows what is displayed with the Auto collapse tree views checkbox *deselected*.



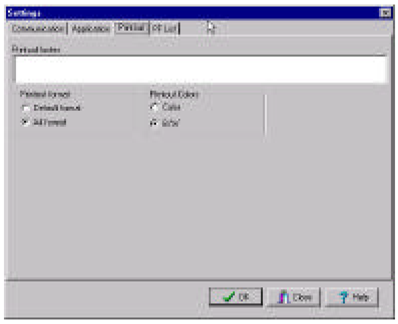
If **Auto connect on start up** is checked, ToolsTalk will try to connect to the Power Focus via serial communication immediately on start-up.



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

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

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

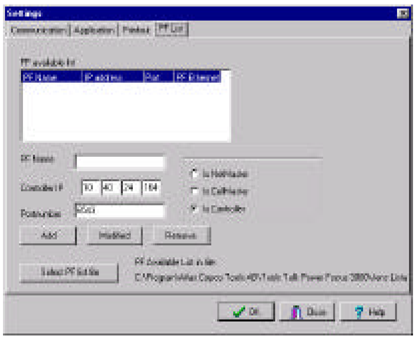


If you enter text in the **Printout footer** it will be appear on every printed paper.

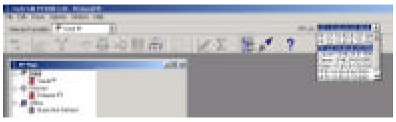
If you use the A4 **Printout format**, select A4 format, otherwise select Default format.

Printout Colours is only applicable if you use a colour printer.

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



Using **PF List in Main Menu**:
The PF List is an easier way to connect a controller. Just select an item in the combo box and ToolsTalk will try to connect to the selected Power Focus 3000.



The PF list can also be used in Communication settings.

3.3.7 Programming

There are several tools available to the user to create various instructions for the Power Focus 3000. This page gives a brief introduction to them.

Pset

A Pset contains all the necessary information Power Focus 3000 needs to perform a tightening. There are a number of parameters included in a Pset, among them: Control parameters, Torque parameters, Angle parameters etc.

For more detailed information about Pset see *chapter 7, Parameter set (Pset).*

Multistage

Under some conditions 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 Psets to perform a tightening divided into stages.

For more detailed information about multistage see *chapter 8, Multistage*.

Job

A Job is a collection of Psets, which is useful when performing multiple tightening operations in a row with different requirements. This is convenient since the operator do not have to select a new Pset for every tightening.

For more detailed information about Job see *chapter 9, Job*.

Config

Config contains functions for configuration of general settings. This includes System settings, I/O settings, Communication settings and Protocol settings.

For more detailed information about Config see *chapter 10, Configuration (Config)*.

Sync

A number of Power Focus 3000 in the same logical cell can be synchronised to perform the same task simultaneously. This type of operation requires synchronisation of the Power Focuses involved. With this tool Synchronisation parameters can be created.

For more detailed information about Sync see *chapter 11, Synchronisation (Sync)*.

Diagnostic

The Diagnostic tool can be used for retrieving information from the Power Focus containing general tool-information, Service status, Hardware- and software-configuration. Some programming is also made using the Diagnostics function.

For more detailed information about Diagnostic see *chapter 12, Diagnostic*.

Identifier

It is possible to send an identifier string to the Power Focus 3000. This string is normally generated from a barcode reader connected to one of the serial ports on the Power Focus 3000 (this barcode is in car plants usually called VIN or ESN).

For more detailed information about Identifier (barcode reader) see *chapter 13, Identifier*.

FieldBus

A FieldBus communication can be used for data communication between the Power Focus 3000 and PLC's. It is an effective and fast way for data transferring of short data packages.

For more detailed information about FieldBus see *chapter 14, FieldBus*.

3.3.8 Monitoring

ToolsTalk provides a number of monitors designed to present extensive information about various functions of Power Focus. They are:

Function	Description
Result monitor	Displays tightening results and statistics
Job monitor	Displays created Jobs and provides functionality for managing Jobs
Operator monitor	Displays in-depth tightening-result information, also containing graphic representation such as charts and status-indicators
Picture monitor	Displays a visual description of the tightening-process, suitable for training purposes
Get All Results	Displays result information stored in the Power Focus and export possibilities
Trace	Displays detailed chart information from the latest tightening

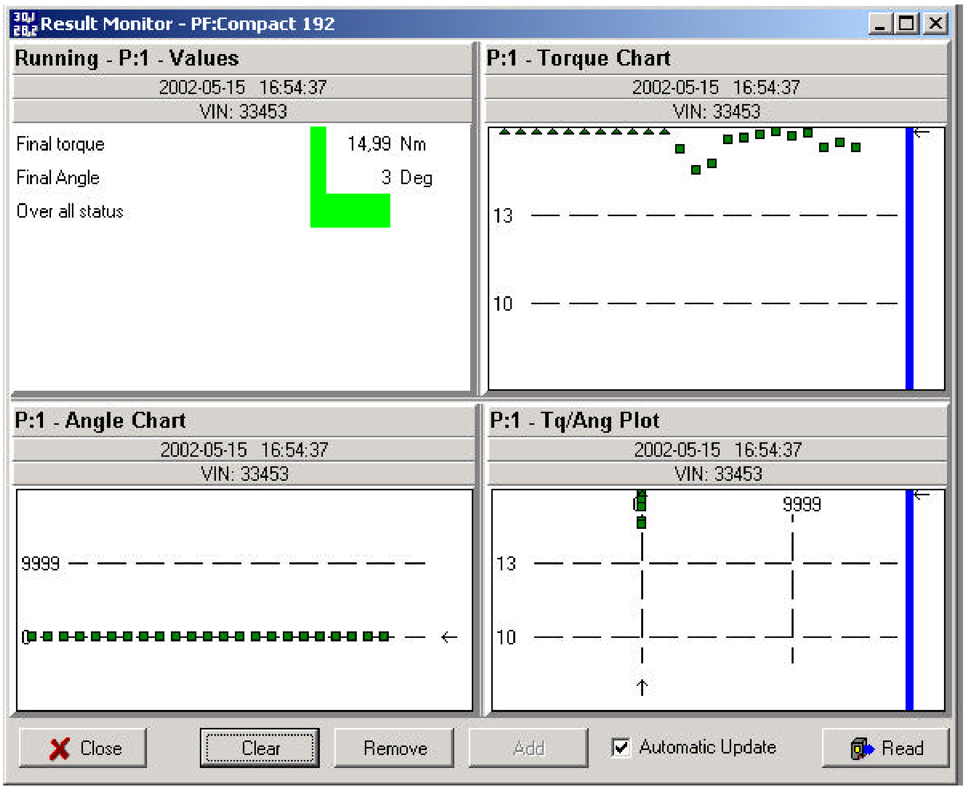
Result monitor

The Result monitor presents the latest tightening results, from the Power Focus 3000 and the used Pset.

The Tightening result includes, among other things: Final Torque, Final Angle, Over all status, Torque chart and Angle chart.

If you want to watch result from a unique Pset you can select between Tightening values, Torque chart, Angle chart or Torque/Angle plot.

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

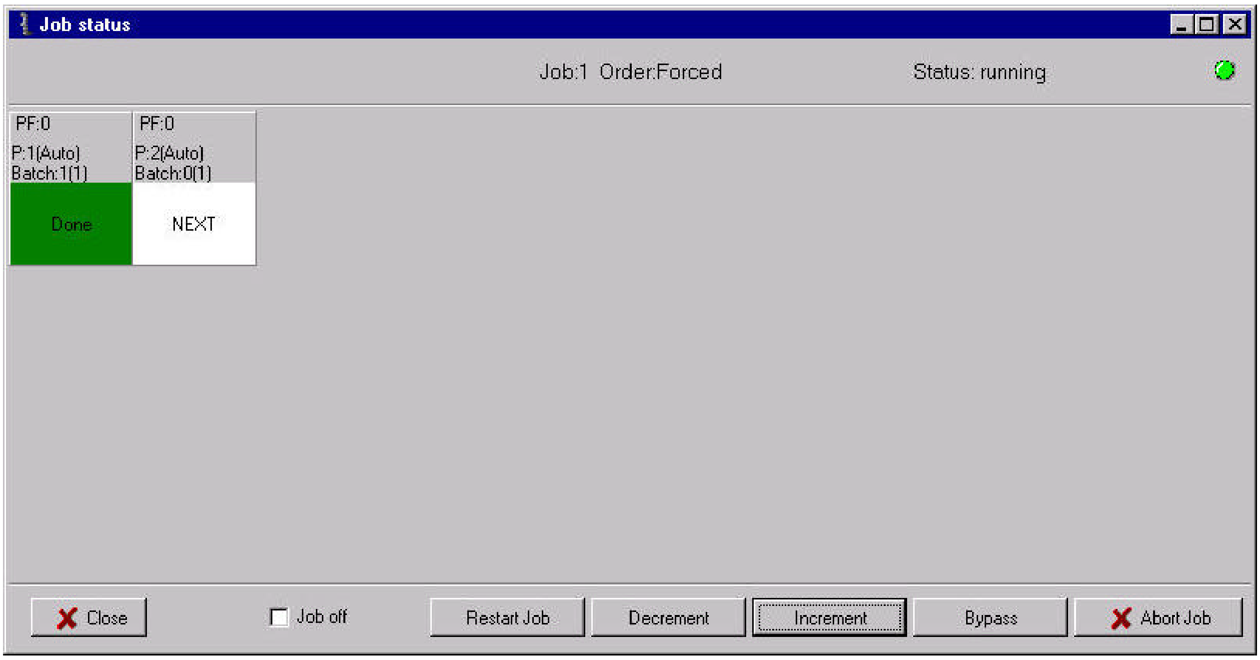


To open the Result Monitor:

- Select Window in the main menu row and then click on Activate->Result->Result Monitor.
- Use the PF map. First, double-click on Monitors and then on Result Monitor.
- Use Monitor icon in Toolbar. First click on the icon and then on Result Monitor.

Job monitor

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

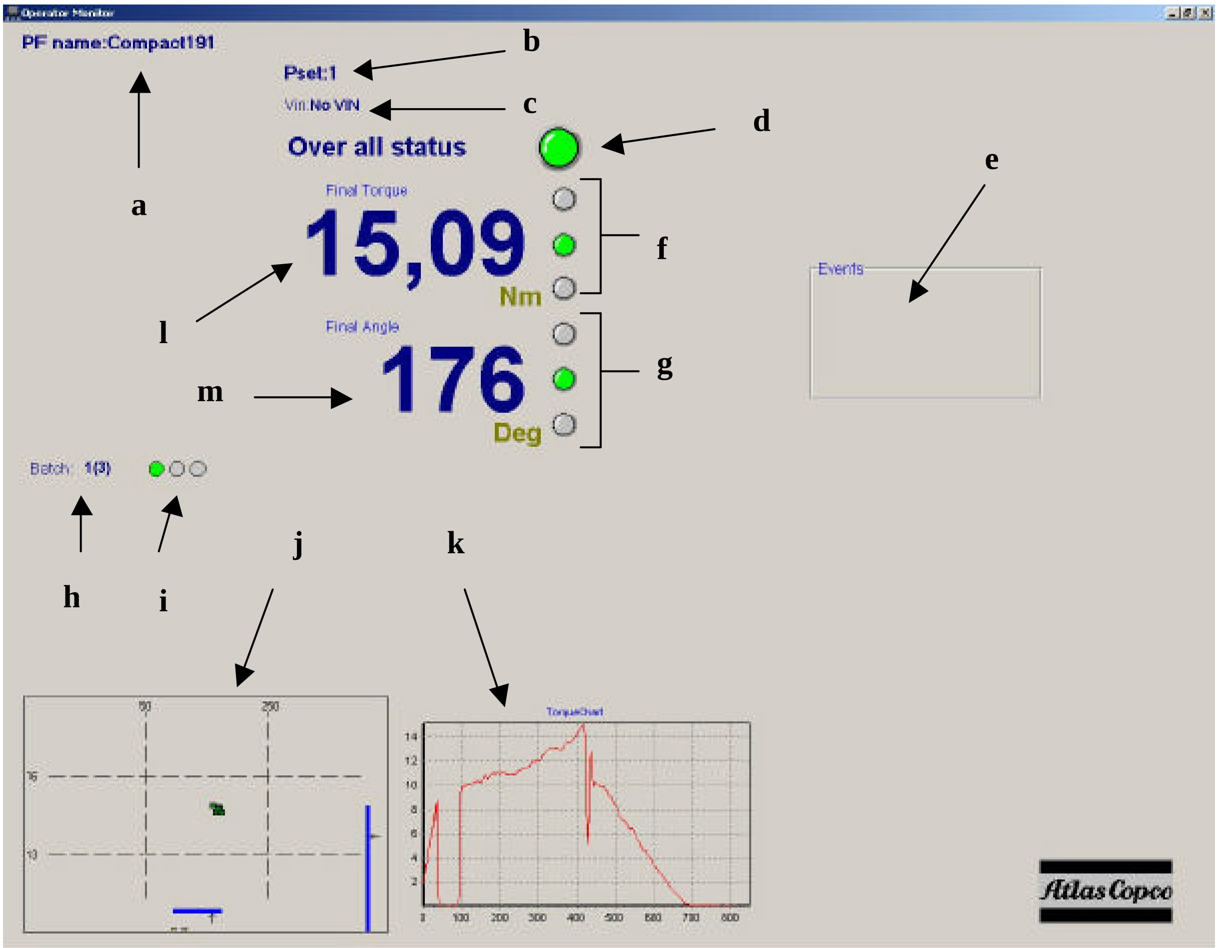


For a function description (Restart Job, Decrement, Increment, Bypass, Abort Job and Job off) see *chapter 9, Job*.

Operator monitor

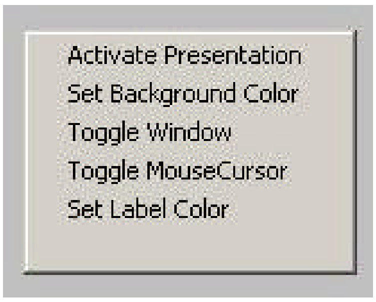
Selecting Operator monitor will bring up the following window:

In the Operator monitor, detailed information about the tightening operation is presented. For details about the information shown in the Operator monitor see below.



Letter	Parameter	Explanation
a	PFName	The name of the PF control
b	Pset	The parameter set used to perform the tightening
c	Vin	Vehicle Identification Number
d	Over all status	The overall-status of the tightening
e	Events	Warnings and errors (See below)
f	Final Torque status	Status-indicator for Final Torque (Yellow-Low/ Green-OK/Red-High)
g	Final Angle status	Status-indicator for Final Angle (Yellow-Low/ Green-OK/Red-High)
h	Batch	The order of the current operation in the batch
i	Batch order	The Over all status for the respective operation in the batch
j	PlotChart	Displays the final torque and final angle, relative to the acceptance window
k	TorqueChart	Displays torque as a function of time
l	Final Torque	Final Torque
m	Final Angle	Final Angle

When Right-clicking anywhere in the Operator monitor, the following menu is shown:



The menu contains options that can be used to customise the Operator monitor.

Alternative	Explanation
Activate Presentation	User preferences for the content of the Operator monitor
Set Background Colour	Possibility to set the background colour for the Operator monitor
Toggle Window	Toggles the window
Toggle MouseCursor	Toggles the Mouse-cursor
Set Label Colour	Possibility to set the label colour for the Operator monitor

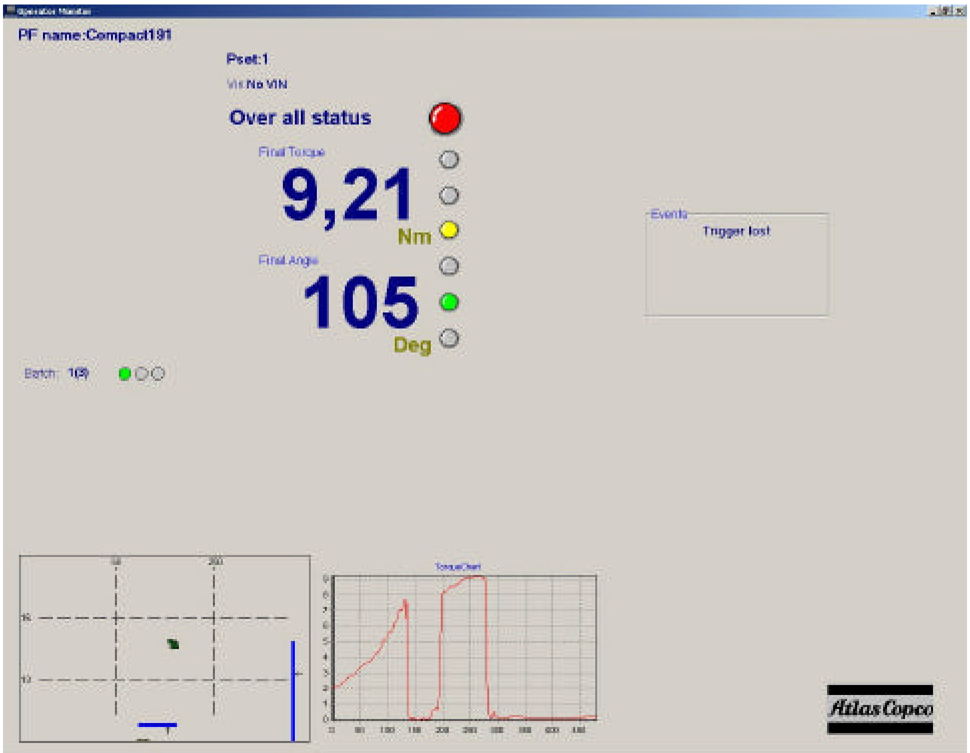
Activate Presentation

When choosing **Activate Presentation** the window on the left is shown.

By checking the boxes, the user can customise the information shown in the Operator monitor

Events

The Over all status is indicating if the operation was performed within the specified limits for Final Torque and Final Angle and whether any error occurred or not. In the case below the over all status was Not OK since the trigger was lost.



Picture monitor

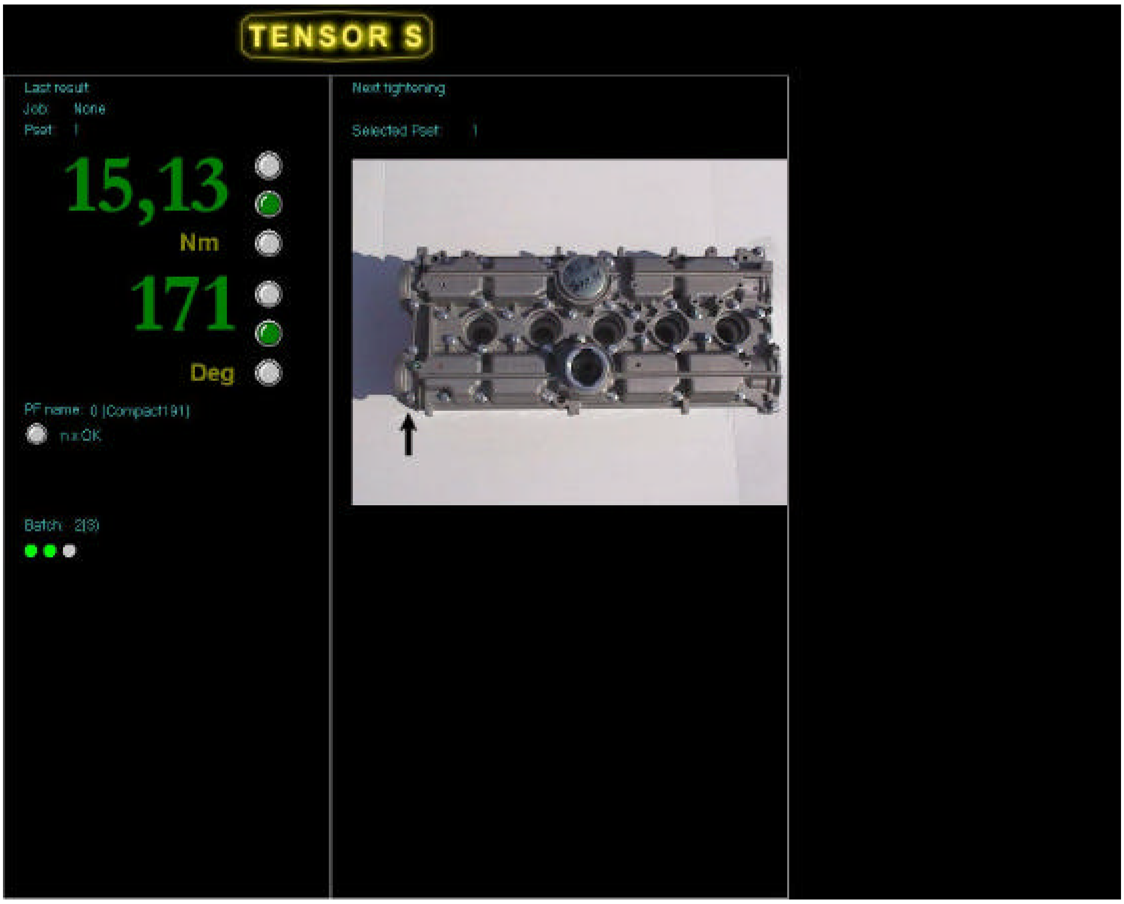
The Picture monitor is a feature that gives the user visual guidance throughout the Job sequence. The next tightening (Pset) in can be presented graphically with an image
(e.g. a picture of the area where a bolt is placed).

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

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

To edit the presentation click **Picture Setup**.

Choosing **Picture monitor** will bring up the following window:

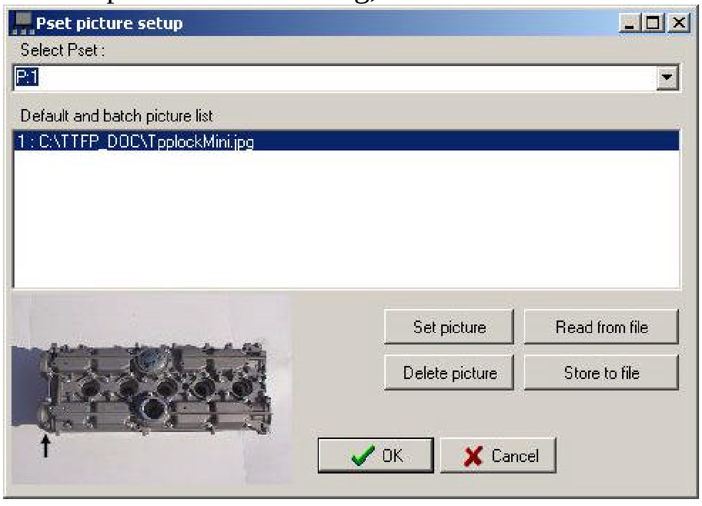


It shows a window similar to the Operator monitor with information about the latest tightening to the left and a picture associated with the next tightening (Pset) in the Job, to the left.

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

Picture monitor set-up

To set up Picture monitoring, choose **Picture Monitor Setup**.



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

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

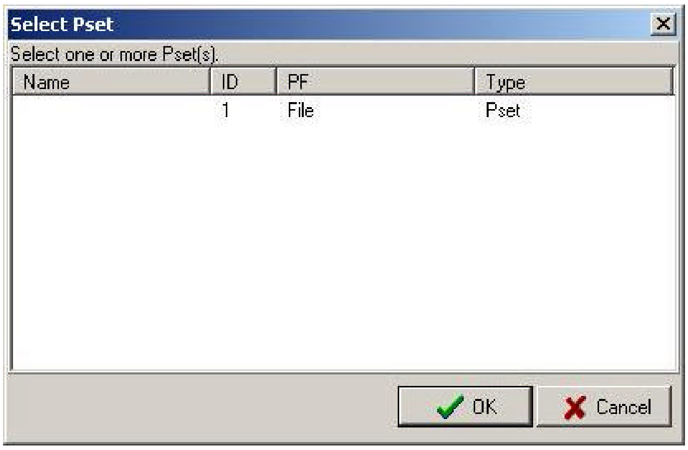
To import saved settings for the Picture monitor click on **Read from file.** To save the settings click on **Store to file**. A **Save As**-window will appear and the user can choose where to store the file containing the settings. When finished click **OK**.

Note! A certain picture can only be specified for a certain Pset, so in order to make the use of Picture monitor easier, each tightening should be individually specified when creating a Job, instead of using Batches as a batch is a sequence of identical Psets.

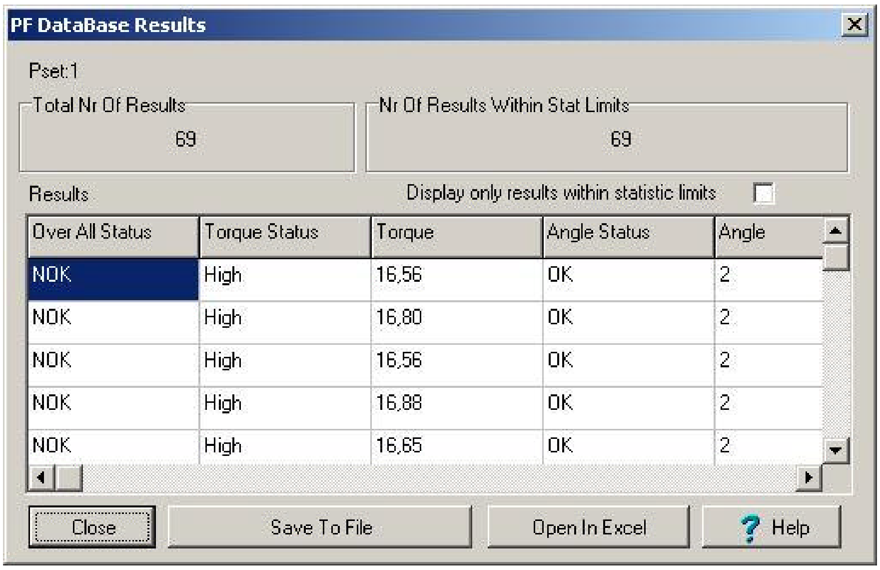
The alternative would be to choose a picture containing the whole batch with **Set picture**.

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. When the Get All Results option is chosen the window below appears.

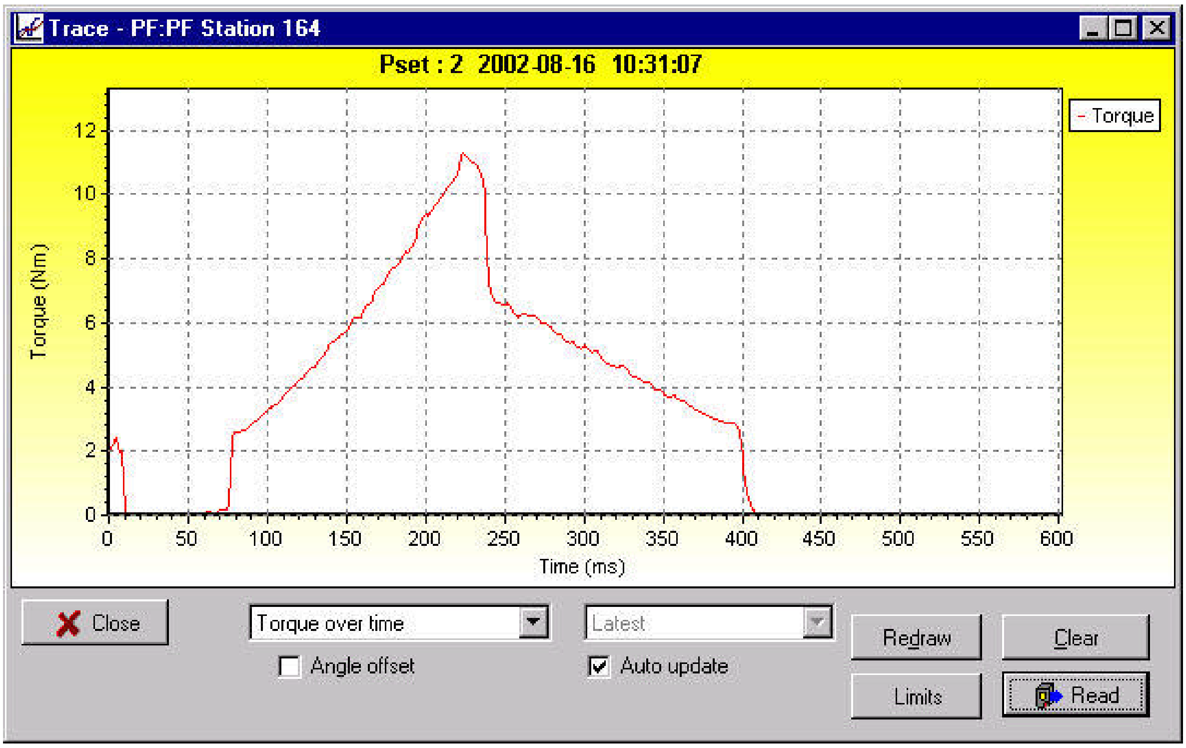


Simply choose a specific Pset and click **OK**. The results from that Pset is then shown in the following window.



By choosing **Save To File** the results are saved 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 Excel.

Trace



Select which type of chart you want to view. The choices available are: Torque over Time, Angle over Time, Speed over Time, Torque and Angle over Time, Torque over Angle or Torque and Speed over Time.

Select if you wish to have Angle Offset and Auto update. Auto update will automatically update the charts as new tightening data arrive. If not selected the user can choose from viewing: Latest, Latest OK, Second latest OK, third latest OK, Latest NOK, Second latest NOK or third latest NOK tightening. NOK says Not OK.

The **Limits** function allows you to customise the limits in the chart. The user can select from: Min Max, Self-tap, PVT, Rundown and CM.

How to open Trace

- Select Window in Main Row and then click on Activate->Trace.
- Use the PF map. Double-click on Trace.
- Use Trace icon in Toolbar. Click on the icon.

3.3.9 Storing programming on file

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

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

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

File extension	Explanation
pf3	Overhead file
pfp	Pset
pfc	Config
pfj	Job
pfm	Multistage
pfs	Sync
pff	FieldBus
pfd	Diagnostic
pfq	Function
pfi	Identifier

Excel

When you store PF to File you have the option to store files in Excel format. Select Excel as file format in the **Save As** dialogue. The overhead file will have the extension xp3. Extensions for the other stored files will be “xls”. This file can be used in Microsoft Excel®.

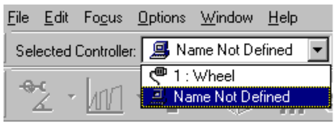
3.3.10 Offline

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

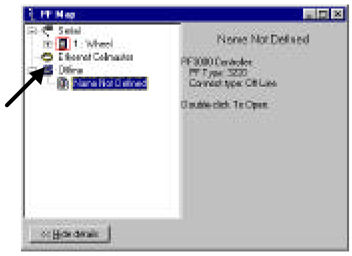
There are three different ways to select the Offline mode:

Select the menu **Focus** -> **Offline**

Select **Offline** from the ‘Selected Controller’ – box

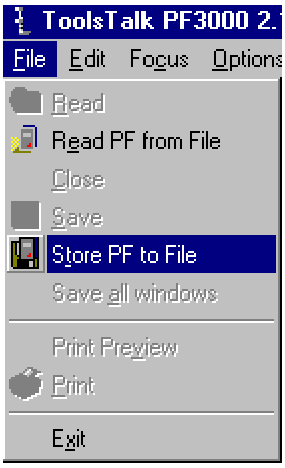


Double click on the **Offline** icon in the ‘PF Map’ window.



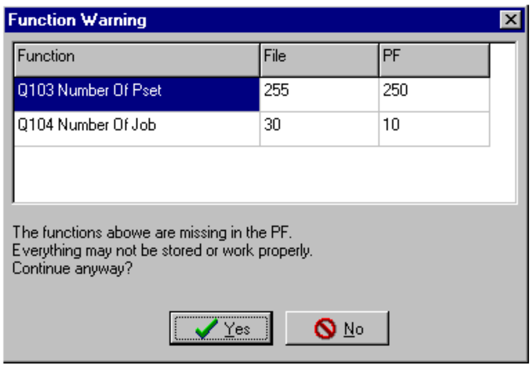
The file can be located on the local hard drive, network, etc. There are a number of default files supplied when installing ToolsTalk. You can also find these files separately on the ToolsTalk installation CD-ROM. Depending on the licence level (Gold, Silver or Bronze) of the Power Focus the corresponding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

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



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

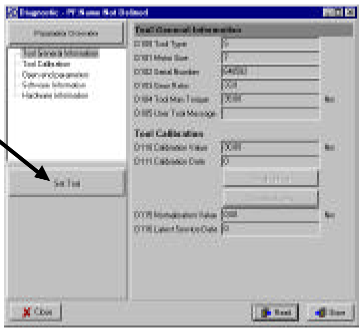
For example, the warning message to the right will be displayed if you try to use a file containing a larger number of Psets and Jobs than the Power Focus will accept. Click Yes if you want to use the file and accept the limitations. In this case the maximum number of Psets and Jobs will be set by the Power Focus.



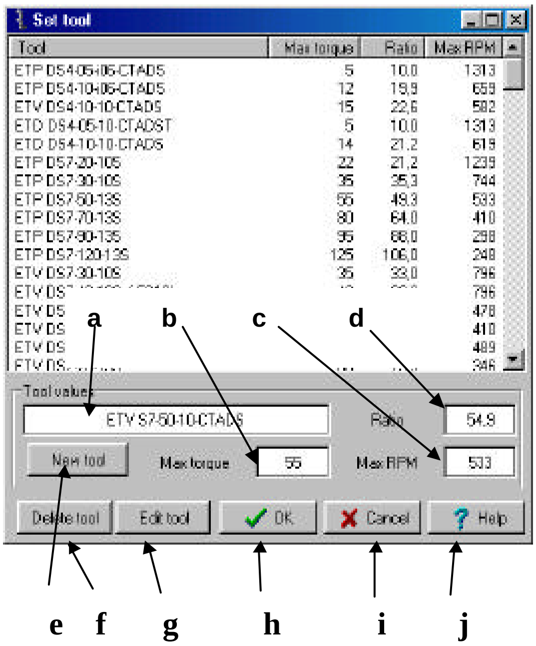
Configuring an offline tool

To be able to set proper values for torque, speed etc in offline mode select first the tool that will be used for the application.

- Open the **Diagnostic** window and click on the **Set Tool** button.



When the Set tool window is opened, the tool list is shown and the following functions are available:



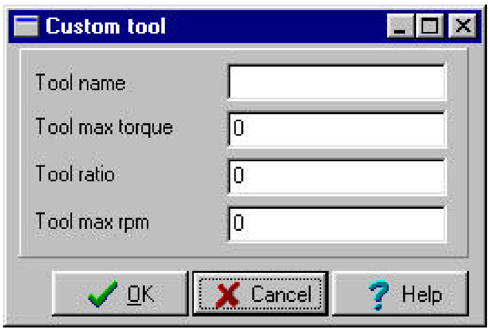
- **a) Tool name**
- **b) Max torque**
- **c) Max RPM**
- **d) Tool ratio**
- **e) New tool**
- **f) Delete tool**
- **g) Edit tool**
- **h) Confirm programming, OK**
- **i) Cancel**
- **j) Help**

It is possible to configure a new tool if the specific tool is not found.

- Click on the **New Tool** button to configure a new tool.

- Fill in the following tool data:

  - Tool name
  - Tool max torque
  - Tool ratio
  - Tool max rpm



- Click on **OK** to confirm the selections.

3.3.11 Tip

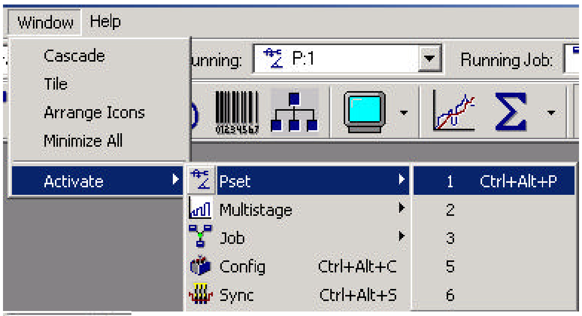
The first letter of an item

If you are placed in a Combo box or tree view you can type the first letter of an item to get focus on that item directly.

Open Pset 1 programming window

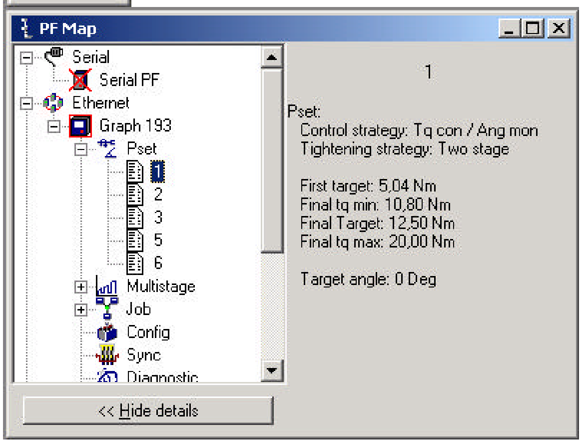
(The same procedure opens a all types of windows; Config, Job, Multistage etc.)

4. Select the menu item **Window** -> **Activate** -> **Pset** -> **1 Ctrl+Alt+P**



5. Select Pset icon in toolbar. Click on the arrow at the right side. This brings up a list with available Psets. Click on the Pset you want to open.

6. Double click on the Pset 1 in the 'PF Map' window. If the Pset tree view is closed, double click on the Pset first.



4 Cells and Networking

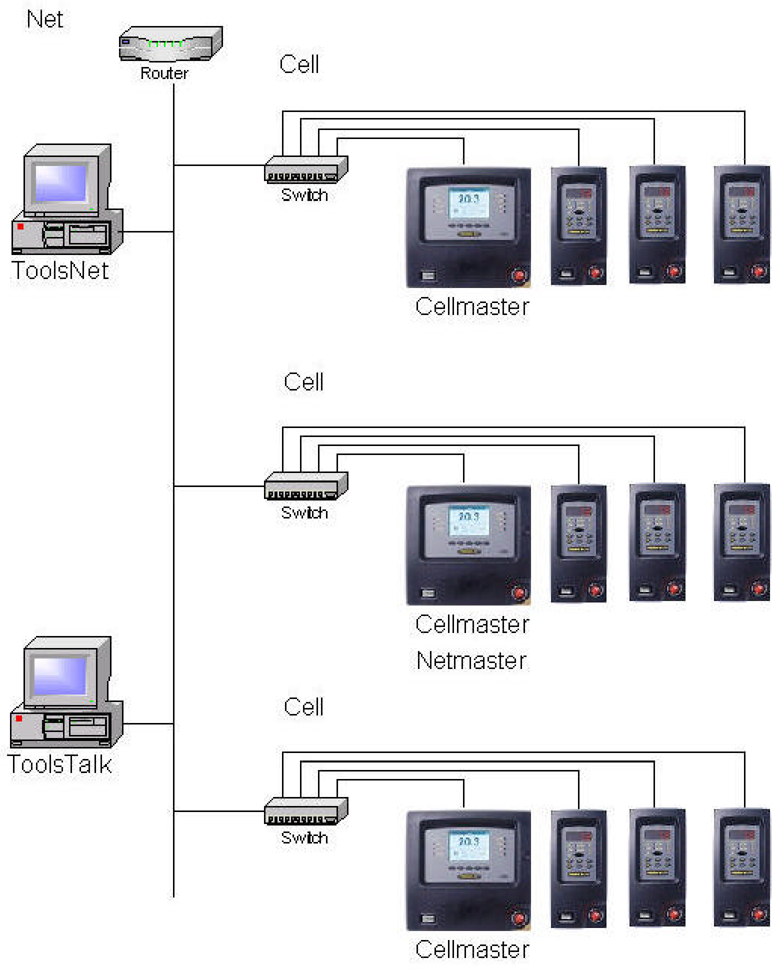
The new Power Focus 3000 software offers extended networking facilities. In Power Focus 3000 a network is created by using Ethernet TCP/IP, which is a standard in network communication. In the Silver and Gold Power Focus versions, Ethernet is a built-in standard feature. No extra network cards are required.

ToolsNet is a web-based utility that collects all data sent out by the Power Focus. It is based on the TCP/IP Ethernet standard. Each network only requires one ToolsNet installation. Netscape or Internet Explorer is used as browser interface. Ethernet TCP/IP networking also makes it simple to program and overview all Power Focuses in the network from a PC with the ToolsTalk software installed. All is built-in as standard functionality. To learn more about ToolsNet and ToolsTalk contact your local Atlas Copco representative.

All units equipped with the Silver or the Gold software versions can be arranged in Cells and Nets. Cells and Nets offer a way of logically arranging and planing a factory network. Since Cells allow Compact Power Focus models to be programmed from Graph Power Focus models, it can also reduce the costs of a factory installation. Once a cell has been set-up, the Gold software enables synchronised groups and Cell Jobs to be run.

In a factory, Power Focus units can be grouped in Cells. A Cell can be constituted of up to 20 Power Focus units. Cells can then be grouped into Nets. Every cell has a unique Cell Network ID and every Power Focus unit within a Cell has its own unique Channel ID. With a Power Focus 3000 Graph model it is possible to browse through the different channels and program or view the result from other Power Focus units in the cell. An ToolsTalk-equipped PC may also program all Power Focus 3000 units. A Cell Member still functions as a separate unit and reports directly to ToolsNet.

To avoid conflicts with other traffic in an existing network, we recommend to build a separate Power Focus network and connect the two with a router or a PC with router functionality. Cells should be hooked up to the Power Focus network via switches. An example of a factory network with Cells and a Net is shown in the figure on the next page.



Example of a factory network configuration. A Net is made up of three Cells. Each Cell has four Cell Members.

4.1 General networking set-up

To create a network you first have to give each unit an individual IP number. This can be done in two ways. Either via a PC equipped with ToolsTalk using RS232 (serial communication) or, on the Graph Power Focus model, through the user interface of the unit. The IP number gives every Power Focus an identity and an address, which enables separation and individual communication with every unit. It is important that each unit has a **unique IP address**. Not having unique IP addresses may cause serious network problems. Power Focus uses **fixed IP addresses**. It is important to plan your network configuration with reference to IP addresses assigned to each Power Focus. Contact your network administrator to know which IP addresses to use.
Every Power Focus uses multicast to send a message used by other devices to verify its presence on the network. The frequency of that message can be specified and it affects how fast a drop out is detected. It also affects the network load. Contact your network administrator before changing the default setting of six seconds.

The **Subnet mask** is used for partitioning a TCP/IP network. The **Default router** is used as gateway in communication with other networks. Contact Your network administrator to get a valid Subnet mask and Default router address. Default router must be on the same Subnet as the IP address.

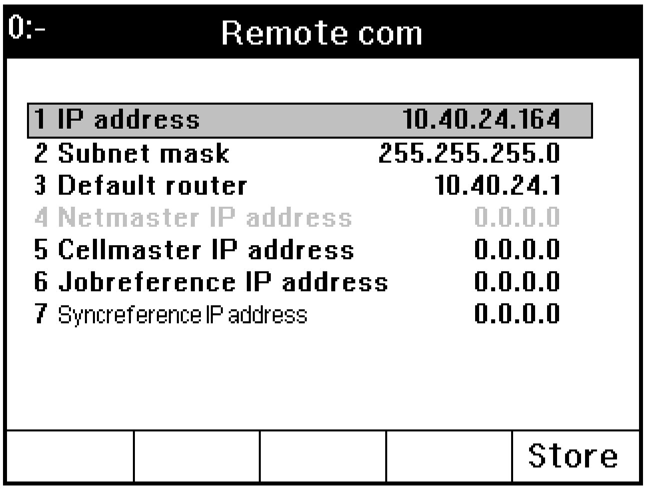
4.1.1 Networking set-up using Power Focus 3000 Graph

Networking set-up using the interface on a Power Focus 3000 Graph.

Note! The Power Focus 3000 **has to be restarted for the network settings to take effect**.

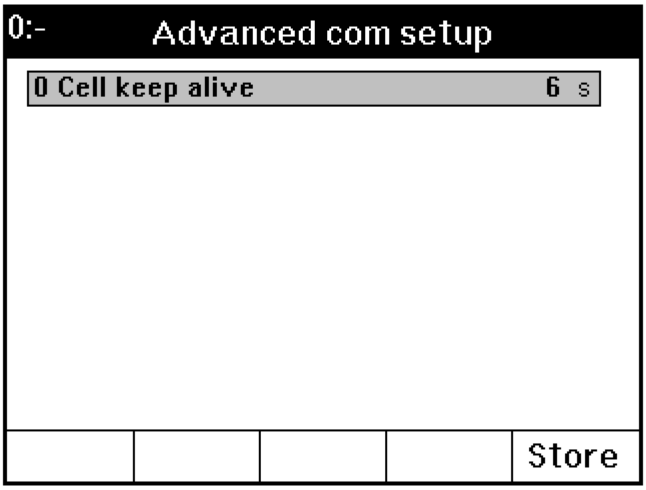
2 Config – 3 Communication – 0 Remote Com

- Set the **IP address** of the connected Power Focus to a unique number within the network.
- Set the **Subnet mask** according to network partitioning.
- **Default router** is optional.
- Press **Store** to save settings in the RBU.
- **Restart** the Power Focus 3000.



2 Config – 3 Communication – 1 Advanced

- **Cell keep alive** is the time interval for multicasting keep alive messages on the network.



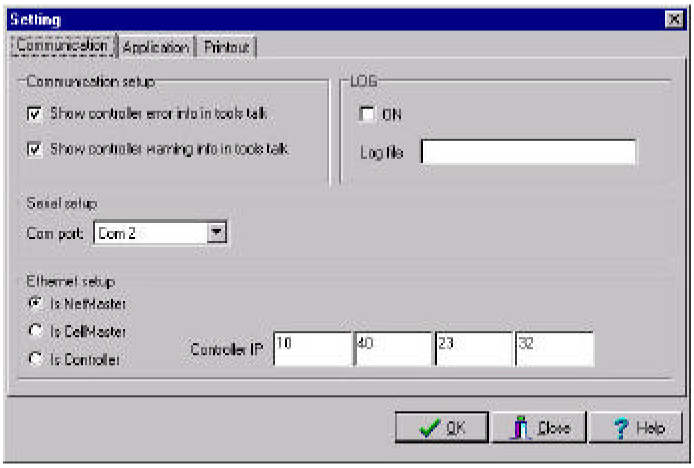
4.1.2 Networking set-up using ToolsTalk

Networking set-up using a ToolsTalk equipped PC connected to the Power Focus 3000 via RS232, serial communication.

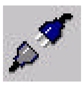
Note! The Power Focus 3000 **has to be restarted for the networking settings to take effect**.

OPTIONS – SETTINGS

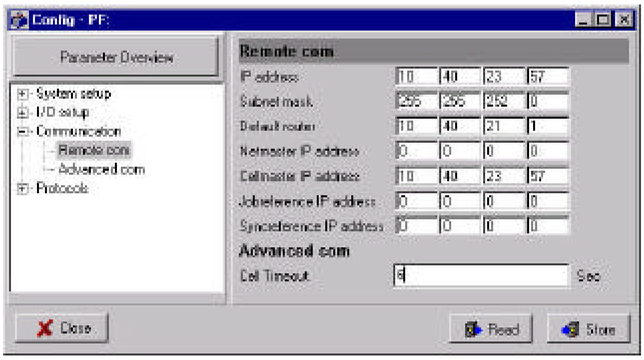
- Set the **Com port** on which the Power Focus is connected.



- Connect the Power Focus by clicking on the connect button.



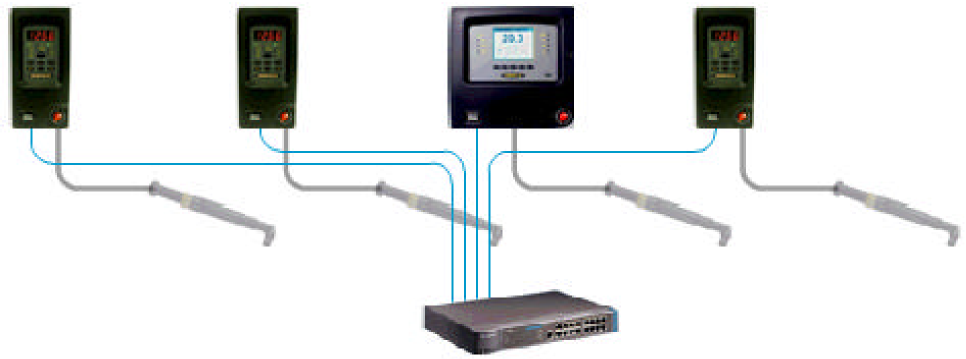
CONFIG – COMMUNICATION



- Set the **IP address** of the connected Power Focus to a unique number within the network.
- Set the **Subnet mask** according to network partitioning.
- **Default router** is optional.
- **Cell Timeout** is the time interval for broadcasting alive messages on the network.
- Click **Store** to save settings.
- **Restart** the Power Focus 3000.

4.2 Cell and Net

The Cell and Net concept is part of the Silver and the Gold software versions. It enables you to logically arrange your network. The Gold software also enables synchronised groups and Cell Jobs to be run. With the Cell concept you can arrange the Power Focus units at an assembly station in a Cell. The Net concept enables you to group all Cells on the assembly line.



The figure shows a Cell that is created by using three Compact units, one Graph unit and a hub.

A Cell consists of one Cell Master and a maximum of 19 Cell Members, a total of 20 units. Cells can then be grouped into Nets, the maximum number of Cells in a net is 1000. Each net has a Net Master. One Power Focus unit can function both as Cell Master and Net Master.

Every cell has a Cell ID unique on the network. Within a Cell every Power Focus unit has its own and unique Channel-ID. With the Power Focus Graph you can browse through the different channels and program or view the result from any other Power Focus unit in the Cell. The Cell Master is not different from the Cell Members when it comes to functionality. Any Power Focus Graph Cell Member can be used to program any other member of the cell, even the Cell Master. All Power Focus units may also be programmed by a PC equipped with ToolsTalk, the Power Focus software. A Power Focus Graph always displays one channel. By default it displays its own Channel-ID.

A Cell Member still functions as a separate unit. Every Cell Member has its own tool. The LEDs on the tool, the Power Focus unit and on possible external devices such as alarms etc, reflect only the results from the unit itself.

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

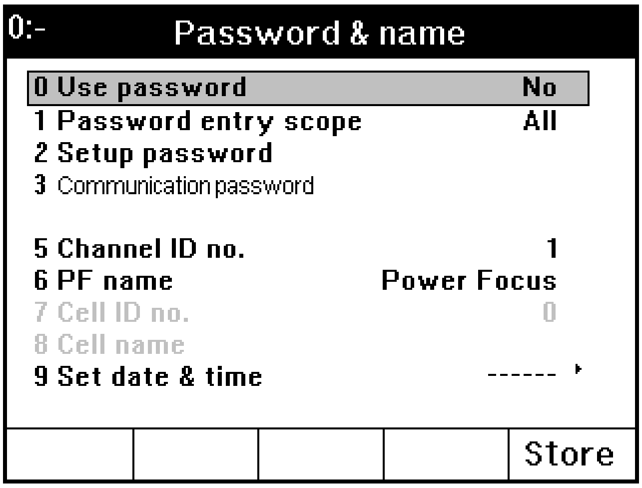
4.2.1 Cell and Net set-up using Power Focus 3000 Graph

This section gives an example on how to set up a **Cell Master** using a Power Focus 3000 Graph.

Note! The Power Focus 3000 **has to be restarted for the cell/net settings to take effect**.

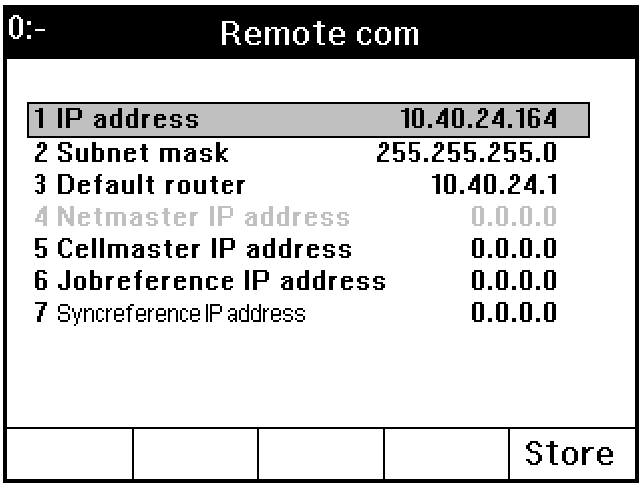
2 Config – 1 System setup – 0 Password & name

- Set **Channel ID** to a number unique within the cell [1-20].
- **PF name** is optional.
  [max 25 characters]
- Set **Cell ID number** to a number unique within the network [1-1000].
- **Cell name** is optional.
  [max 25 characters]
- Press **Store** to save settings in the RBU.



2 Config – 3 Communication – 0 Remote Com

- **IP address**, **Subnet mask** and **Default router**.
- Set **Netmaster IP address** to the IP address of the Net Master.
- Set **Cellmaster IP address** to the IP address of the Cell Master.
- Define a Cell Master or Net Master by setting **Cellmaster IP address** / **Netmaster IP address** equal **IP address**.
- Press **Store** to save the settings.
- **Restart** the Power Focus 3000.



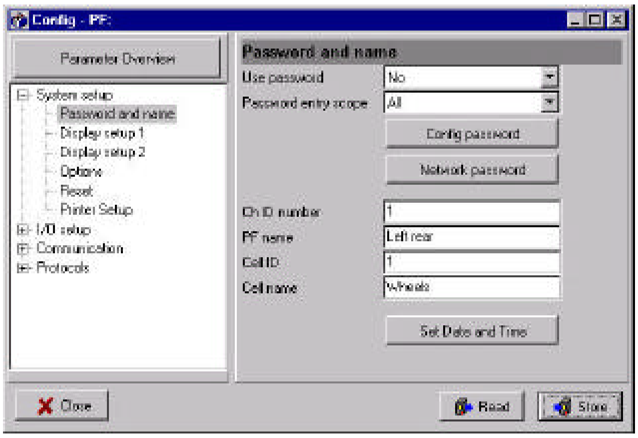
4.2.2 Cell and Net set-up using ToolsTalk

This section gives an example on how to set up a **Cell Master** using ToolsTalk:

Note! Power Focus **has to be restarted for the cell/net settings to take effect**.

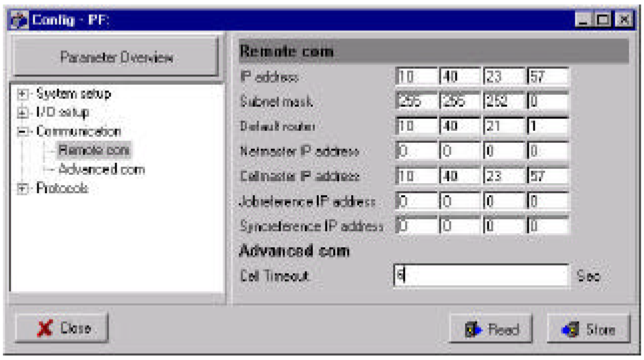
CONFIG –PASSWORD AND NAME

- Set **Channel ID** to a number unique within the cell [1-20].
- **PF name** is optional. [max 25 characters]
- Set **Cell ID** to a number unique within the network [1-1000].
- **Cell name** is optional. [max 25 characters]
- Click **Store** to save the settings.



CONFIG – COMMUNICATION

- **IP address**, **Subnet** mask and **Default router**.
- Set **Netmaster IP address** to the IP address of the Net Master.
- Set **Cellmaster IP address** to the IP address of the Cell Master.
- Define a Cell Master or Net Master by setting **Cellmaster IP address** / **Netmaster IP address** equal **IP address**.
- **Cell Timeout**
- Click **Store** to save the settings.
- **Restart** the Power Focus 3000.

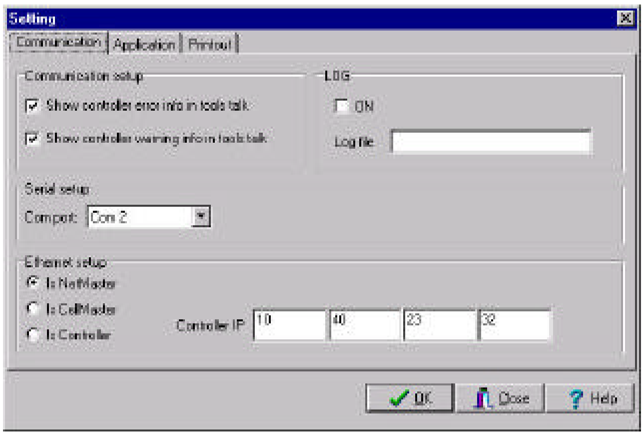


4.3 Connecting ToolsTalk

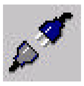
When connecting to a Controller, Cell Master or Net Master make sure that the following settings are correct.

OPTIONS – SETTINGS

- Set **Controller IP** address of the Power Focus that you want to connect.
- Under **Ethernet set-up**, check whether the connected Power Focus is a Controller, Cell Master or a Net Master.



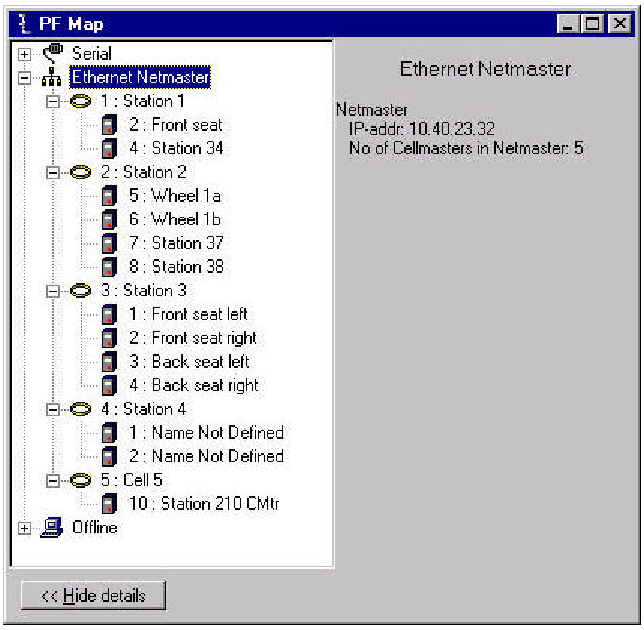
- To connect the Power Focus Controller, Cell Master or Net Master, click on the connect button.



PF MAP

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

The figure to the right shows an example of a PF Map that displays a Net Master with five Cell Masters connected.



5 Rapid Backup Unit (RBU)

The RBU, Rapid Backup Unit, is a software key and data storage unit for the Power Focus 3000 controller. The RBU unlocks software/functions available for each version of the Power Focus 3000. It also stores a backup copy of the Power Focus 3000 configuration. The RBU backup copy makes it possible to move functionality and configurations between different Power Focus 3000 controllers.
There are three different RBU versions, **Bronze**, **Silver** and **Gold**, where the Gold RBU unlocks the full capacity and functionality of the Power Focus 3000. The table on the next page displays the functionality available for each RBU version.

The RBU serial number also is also a part of the Power Focus 3000 **Ethernet MAC address**.
Power Focus 3000 Ethernet address: 00-50-D6 -XX-YY-ZZ (from serial RBU).

Example RBU with serial number C00015767:
00015767 => 003D97 (Hexadecimal)
C00015767 => 00-50-D6-00-3D-97 (MAC address)

RBU Bronze

The Bronze RBU unlocks the basic Power Focus 3000 tightening functionality. Note that it is not possible to run the Power Focus 3000 Graph with a Bronze RBU.

RBU Silver

The Silver RBU unlocks advanced Power Focus 3000 functionality such as Multistage and Job. The Silver RBU also enables full networking capability and the possibility to run Tensor DS tools.

RBU Gold

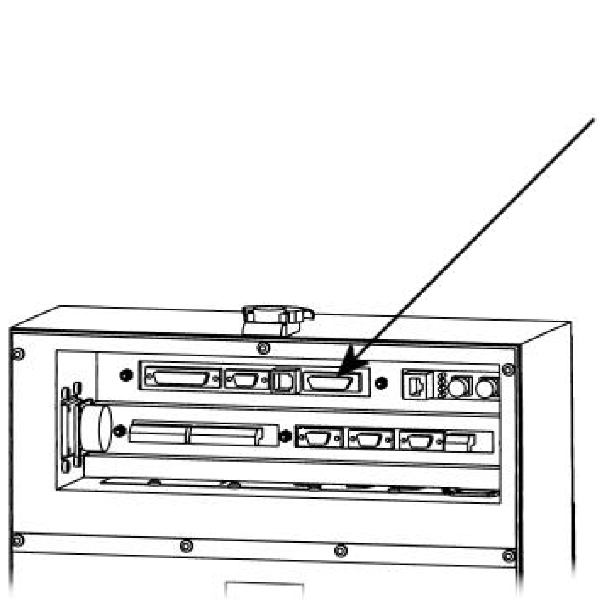
The Gold RBU unlocks the full capacity and functionality of the Power Focus 3000. Features such as Cell jobs and Synchronised tightenings are only available with the Power Focus 3000 Gold version.

The table on the next page shows the RBU functionality overview.

	Bronze	Silver	Gold
Hardware			
Power Focus 3000 Compact	x	x	x
Power Focus 3000 Graph		x	x
Power Focus 3000 Color		x	x
Capacity			
Number of Psets	64	250	250
Number of Jobs	0	99	99
Number of tightening results	5000	5000	5000
Control strategies			
Tq con	x	x	x
Tq con / Ang mon	x	x	x
Ang con / Tq mon	x	x	x
Tq con / Ang con (AND)	x	x	x
Tq con / Ang con (OR)	x	x	x
DS-con		x	x
Rev Ang con		x	x
Click Wrench		x	x
RotateSpindleForward	x	x	x
RotateSpindleReverse	x	x	x
Control options			
PVT mon	x	x	x
PVT compensate	x	x	x
PVT selftap	x	x	x
Rundown angle mon	x	x	x
Current monitoring	x	x	x
CW/CCW operation		x	x
Functionality			
Multistage		x	x
Step synchronisation			x
Job		x	x
Cell job			x
I/O			
TCP/IP		x	x
Programming Port (RS232)	x	x	x
I/O Expansion (up to 124 in/124 out)	x	x	x
Optional Fieldbus Card		x	x
Barcode reader port (RS232)		x	x
IR	x	x	x
Networking			
Cell		x	x
Net		x	x
Syncgroup			x
Toolsnet		x	x
Factory Overview		x	x
Other			
Tensor DS Tools		x	x
Quick programming	x	x	x
Auto set	x	x	x
Real time statistics	x	x	x
SPC		x	x
Barcode reading		x	x

5.1 Connecting the RBU

Make sure that **the power is switched off** when connecting and disconnecting the RBU. Connect (if not already connected) the RBU to the 15-pin connector on the back panel of the Power Focus 3000 (see figure below).



5.2 Start-up instructions

At start-up, the Power Focus 3000 checks for inconsistencies between the controller and RBU configurations. If an inconsistency is detected the user is prompted to select either the controller or RBU configuration. This makes it possible to move/copy configurations between Power Focus 3000 controllers by using the RBU.

The table on the next page describes the selections available and how to choose configuration. If the Power Focus 3000 and the RBU are incompatible for other reasons than a configuration mismatch (e.g. they have an older software version), either the Power Focus 3000 or the RBU is referred to as NOK. When **changing RBU type there is only possible to load the configuration from the RBU**.

Press the plus (+) or minus (-) button on the Power Focus 3000 Compact to toggle between the selections. Confirm selection with the Enter button. Press the corresponding soft button to make a selection on the Power Focus 3000 Graph.

Status	Message at start up		Action
	Compact	Graph	
Power Focus and RBU matches	No message	No message	---
Power Focus and RBU don't match	Clear / RBU / PF	Select PF, Clear (All) or RBU	Select if you want to use the Power Focus' or the RBU's configuration.
Power Focus OK RBU NOK	PF / Clear / Stop	Select PF, Clear (All) or Stop	Select if you want to use the Power Focus' configuration. Otherwise select "Stop".
Power Focus NOK RBU OK	RBU / Clear / Stop	Select RBU, Clear (All) or Stop	Select if you want to use the RBU's configuration. Otherwise select "Stop".
Power Focus NOK RBU NOK	Clear / Stop	Select Clear (All) or Stop	Select "Clear" if you want to clear the Power Focus' and the RBU's memories. Otherwise select Stop.

IMPORTANT

CHANGING RBU WILL CLEAR THE TIGHTENING RESULT DATABASE.

Pushing the "Stop" button will **only** prevent the result database from being erased if the RBU has been changed between silver and gold, provided the previous RBU is re-inserted. Note that a change between gold/silver and bronze will clear the result database **even if** the "Stop" button is pressed.

If the Power Focus 3000 is turned on with **no** RBU or a Power Focus 3000 Graph is turned on with a Bronze RBU the tightening result database will be **cleared without a query to** the user.

6 Control and monitoring

6.1 Important

Tool tightening basics and safety issues

There are different variables that control the tool rotation direction. They are: tool direction ring, tool tightening direction (parameter P240, see Parameter List) and tightening strategies.

Tightening: Tightening a screw or a nut according to the selected control strategy.

Loosening: Back off the screw or nut. This is done with full power. Loosening speed and ramp can be programmed.

Reverse: Control strategy that loose the screw or nut a programmed number of degrees. The direction is always the opposite of the Tightening direction.

6.1.1 Tool trigger start

With some exceptions the position of the tool direction ring at the time the tool trigger is pressed will give 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. The direction will not change if the direction ring is moved while the tool is running.

With parameter P240, *Tool tightening direction*, the 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.

Note! 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.

If Reverse angle or Rotate spindle reverse is used as tightening strategy, the “active” direction is the opposite from the *Tightening direction* (P240). For example, if CW is selected turn the direction ring to the left position. For safety reasons, it is not possible to loosen the joint when these strategies are selected.

6.1.2 Remote start (4-pin connector)

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. The 4-pin connector must be wired correctly.

6.1.3 Tool start from digital input

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 parameter P240, *Tightening direction*. The 4-pin connector must be wired correctly.

Note! 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.

6.1.4 Tool start from FieldBus

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

6.2 Control Strategies

Power Focus 3000 offers several strategies for control and monitoring of the tool. This section gives a generic description of the control strategies available. Appendix A describes in detail how each control strategy works in combination with the tightening strategies.

These control strategies are available in the Power Focus 3000:

- **Torque Control** (Tq con)
- **Torque Control / Angle Monitoring** (Tq con / Ang mon)
- **Torque Control / Angle Control** (Tq con / Ang con [AND]/[OR])
- **Angle Control / Torque Monitoring** (Ang con / Tq mon)
- **Reverse Angle** (Reverse Ang)
- **Rotate spindle forward/reverse** (Rotate spindle forward/reverse)
- **Click wrench** (Click wrench)

For the Torque control tightening strategies the tightening process starts when the torque reaches *Cycle start* and ends when torque drops below *Cycle complete* for a period of *End time* milliseconds.

For the Angle control and Reverse angle tightening strategies, the tightening process also starts when the torque reaches *Cycle start*. For the Rotate spindle tightening strategies, the tightening process starts immediately as the tool starts running. For these tightening strategies the tightening process ends when *End time* milliseconds has elapsed since *Target angle* was reached.

The torque result presented is, with one exception, the peak torque measured during the tightening process. The exception is *Reverse angle* tightenings where the torque at peak angle is presented.

The joint angle is defined by P121, *Measure angle* to. The joint angle can be measured from *Start final angle* to either Torque peak, Angle peak or Cycle complete.

Note! P124, *Final angle max* is always evaluated from Start final angle to angle peak.

6.2.1 Tq con

The Torque control strategy controls the torque. This strategy is selectable for both a one- or two-stage tightenings. The tool stops when the torque reaches the *Final target* value.

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

6.2.2 Tq con / Ang mon

The Torque control and Angle monitor strategy controls the torque and monitors the angle. This strategy is selectable for both a one- or two-stage tightenings. The tool stops when the torque reaches the *Final target* value.
If the tool for some reason should exceed *Final tq max* or *Final angle max*, the tool shuts off and the (NOK) tightening results is shown.

6.2.3 Tq con / Ang con [AND] / [OR]

The Torque control and Angle control strategy controls both torque and angle. This strategy is selectable for both a one- or two-stage tightenings.
[AND]
Power Focus 3000 controls the *Final target* value and the *Final angle* value. The tool stops when both targets are reached. They do not have to be reached at the same time.
[OR]
Power Focus 3000 controls the *Final target* value and the *Final angle* value. The tool stops when the first of these two targets are reached.
For both [AND] and [OR], both 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* or *Final angle max* , the tool shuts off and the (NOK) tightening results are shown.

6.2.4 Ang con / Tq mon

The Angle control and Torque monitoring strategy controls the angle and monitors the torque. This strategy is selectable for both a one- or two-stage tightenings. Target angle is then defined as the number of degrees between *Start final angle* and the peak angle. The tool stops at *Target angle*.
If the tool for some reason should exceed *Final tq max* or *Final angle max*, the tool shuts off and the (NOK) tightening results is shown.

6.2.5 Reverse Ang

The Reverse angle 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 is defined as the number of degrees between Start final angle and the peak angle. The tool stops at Target angle.

If the tool for some reason should exceed Final torque max or Final angle max, the tool shuts off and the (NOK) tightening results is shown.

Note! The torque value shown in the result is torque at peak angle.

Note! Tightening fail if the torque never reaches Cycle start.

6.2.6 Rotate spindle forward/ reverse

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

If, for some reason, the tool should exceed Max final torque or Max final angle, the tool shuts off and the (NOK) tightening results are shown.

Note! Tightening process begins when the trigger is pressed.

6.2.7 Click wrench

Select this strategy if the Power Focus 3000 shall indicate a click wrench or to incorporate other non-tightening operations into the work process such as ocular inspections or filling of fluid containers etc.

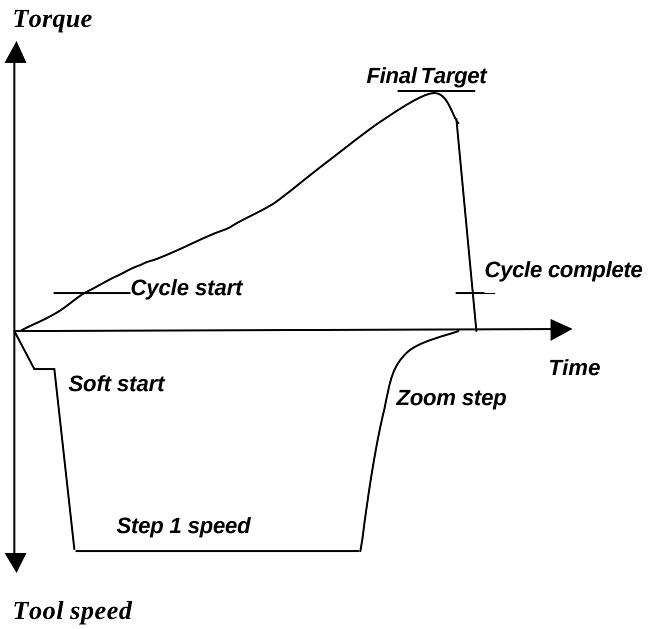
It is possible to configure four independent click wrench operations, *Click wrench number 1 – 4*. A click wrench Pset only consists of a *Click wrench number*, *Final Target torque* and a *Tool idle time.* Each *Click wrench number* shall be associated with one digital input [see *Appendix C; Digital Inputs And Outputs*]. Asserting the specified Digital Input indicates to the Power Focus 3000 that the specified click wrench operation has been performed. Use *Final Target* to set the torque result level for click wrench tools. Use *Tool idle time* to avoid unintentional Digital Input assertion repetitions.

Note! Resulting torque is the *Final torque* set by the Pset.

6.3 Tightening Strategies

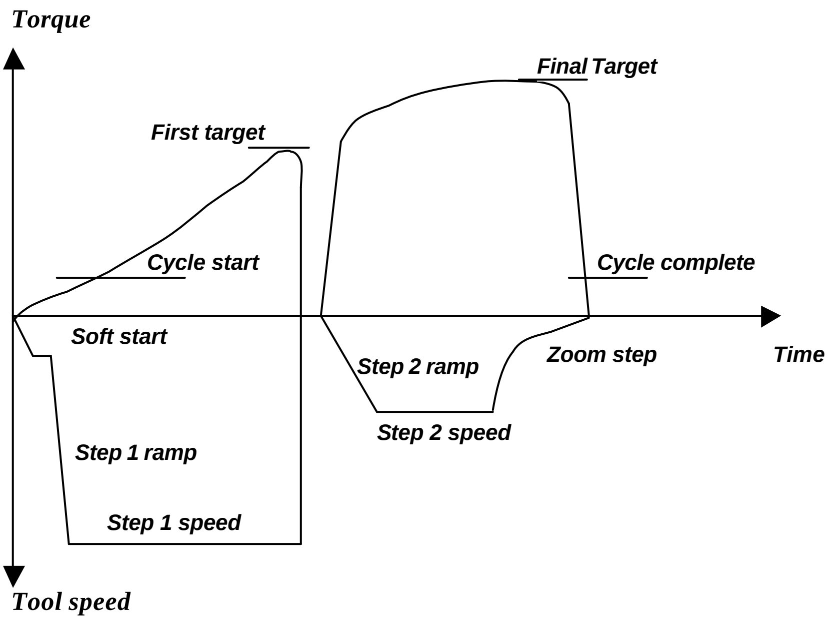
In order to achieve the best quality, speed and ergonomic behaviour the Power Focus 3000 supports a number of different tightening strategies. Both standard and proprietary patented strategies are supported. This section provides a generic description of the tightening strategies available. Appendix A contains a detailed description of how each tightening strategy works in combination with the control strategies.

6.3.1 One-Stage



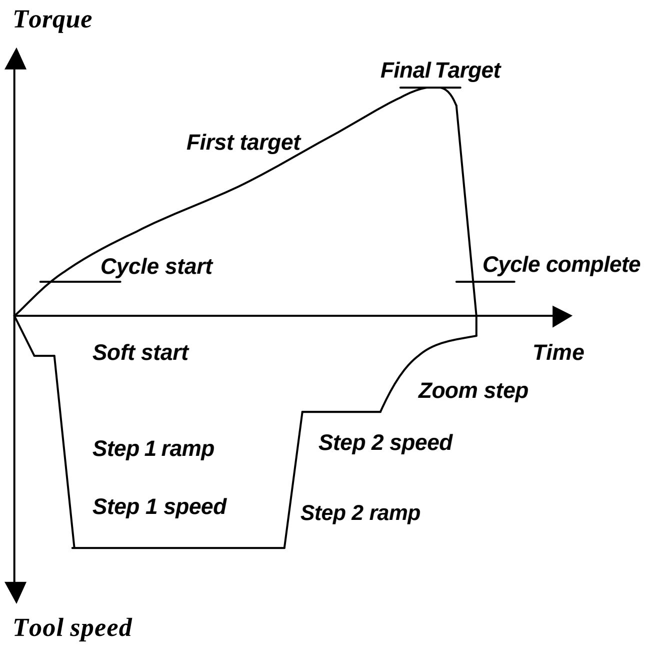
Tightening is performed in **one stage** until *Final Target* torque has been reached. The tool accelerates fast to final speed. In this example, the Zoom step function is activated, which reduces tool speed when torque is close to *Final Target*. This means improved accuracy and reduced risk of overshoot.

6.3.2 Two Stage



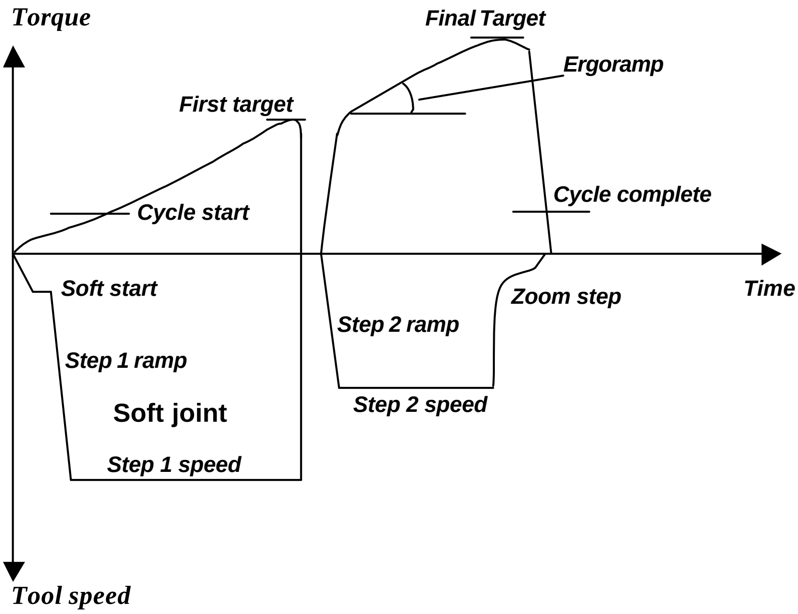
For a **two stage** tightening, the tool operates at high speed during the first stage and at lower speed during the second stage. The tool stops for about 50 ms between stages to reduce joint relaxation and then accelerates for the second stage.

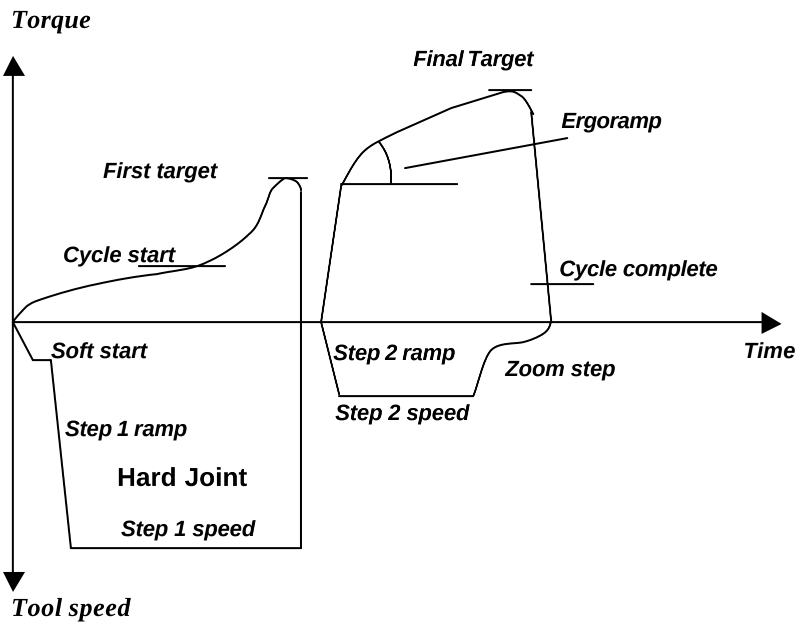
6.3.3 Quick Step



Quickstep is a two stage tightening with high tool speed during the first stage and a lower tool speed during the second stage. The speed changes immediately to second stage speed and does not stop between the stages. In this example the strategy ends with a *Zoom step*, which reduces the risk of overshoot.

6.3.4 Ergoramp





Ergoramp is a two stage tightening with a constant increase of torque during the second stage. It is set automatically using the programmed Ergoramp 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.

6.4 Control options

6.4.1 Rundown angle

The *Rundown angle* option allows the angle at *Rundown Complete* to be monitored.

If *Rundown angel* From start is selected, the rundown phase will start as the tool trigger is pressed. If *Rundown angle* From cycle start is selected, the rundown phase will start as torque exceeds *Cycle start*. The acceptance window for *Rundown angle* is set by *Rundown angle min* and *Rundown angle max*.

6.4.2 Zoom Step

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

6.4.3 Combined Zoom step and Ergoramp

By combining *Zoom step* and *Ergoramp*, the advantages of both strategies will be achieved. Tightenings are precise and, at the same time, ergonomically correct for the operator.

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

6.4.4 PF2000 compatible

This parameter changes the characteristic of the PF3000 so that it becomes similar to that of the PF2000. Acceleration during ramping becomes slower. Programming of parameters is not otherwise affected.

6.5 Programming +

6.5.1 Current Monitoring

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.

With *Current monitoring* selected it is possible to set an acceptance window for the torque.

6.5.2 PVT options

Some joints have a torque peak at the start of the tightening. The Power Focus 3000 can monitor such tightenings to make sure they get the expected torque characteristic curve. It also makes it possible to do tightenings where the start torque is higher then *Final target* or even *Final tq max*. One example is self-tap joints, but it might also be used for other types of joints. Three options are available *PVT Self tap*, *PVT Monitoring* and *PVT Compensate.* They might all be used separately or together. All three options runs during the rundown stage i.e. prior of *Rundown complete.*

6.5.3 PVT self tap

When the joint has a torque peak at the start of the tightening it can be recommended to use the *PVT Self tap* monitoring option to ensure that the tightening gets the right characteristics. It also makes it possible to do tightenings where the start torque is higher then *Final target* or *Final tq max*.

The self tap interval starts at *Cycle start*. During the self tap interval the torque has to reach at leased the *Self tap min* level but must stay below the *Self tap max* limit. *Self tap max* is monitored in real-time during the self tap interval. The *Self tap min* value is evaluated against the self tap interval peak value at the end of the interval.

To reduce the effect of noise (ringing) the *PVT Self tap* monitor mean values calculated from a number of windows. A higher *Number of monitor windows* make the monitoring more sensitive whereas a lower number will filter more noise.

6.5.4 PVT Monitoring

When the joint torque has to pass through an acceptance window prior to Rundown complete to pass as a correct tightening it is recommended to use the PVT Monitoring option.

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

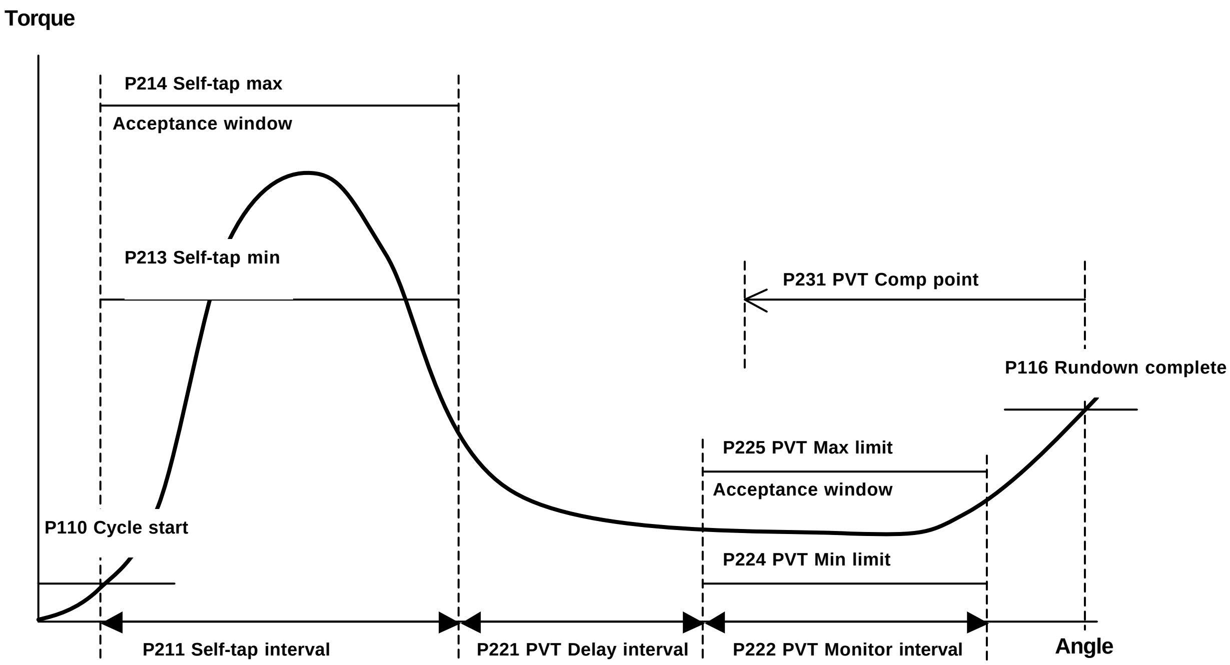
To reduce the effect of noise (ringing) the *PVT Self tap* monitor mean values calculated from a number of windows. A higher *Number of monitor windows* make the monitoring more sensitive whereas a lower number will filter more noise.

6.5.5 PVT Compensate

The Power Focus 3000 lets the torque levels be dependent of the prevailing torque during the rundown phase. That makes the torque levels change dynamically for each new tightening.

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

Warning! *Final tq max* is also compensated with the *PVT Compensate* value.



P11x Torque	**P21x PVT self-tap**	**P22x PVT monitoring**	**P23x PVT compensate**
P110 Cycle start	P210 PVT self-tap	P220 PVT Monitoring	P230 PVT Compensate
P116 Rundown complete	P211 Self-tap interval	P221 PVT Delay interval	P231 PVT Comp point
	P212 no of self-tap windows	P222 PVT Monitoring interval	
	P213 Self-tap min	P223 no. of PVT windows	
	P214 Self-tap max	P224 PVT Min limit	
		P225 PVT Max limit	

6.5.6 Options

Tool tightening direction

Select Tool tightening direction. CW for right hand threaded screws and CCW for left hand threaded screws. To start in the correct direction you must turn the tool direction ring to its correct position. This parameter has no effect when running an Open End tool (Tube Nut tool).

Soft stop

If Yes the Power Focus 3000 will ramp down the torque when target is reached. It is recommended to always use *Soft stop*.

Alarm on rehit

If the *Alarm on Rehit* checkbox is marked the Power Focus 3000 will detect re-hits (event code E112). The red lights on the tool will be lit when a re-hit is detected. The criteria for re-hit are a short or a non-existing second stage in combination with a low speed in the first stage.

Alarm on Tq < target

Decides if the tightening shall be approved if the torque is lower than the *Final target*. This alarm option overrides the *Final tq min* limit, giving an alarm even if torque is within the min and max limit.

Alarm on lost trigger

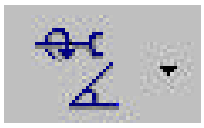
Decides if the tightening shall be approved if the tool trigger is lost before target is reached. If used, a Not OK status will be issued even if the result is within acceptance windows.

DS tuning factor

The *DS tuning factor* is used to adjust the torque readings on Tensor tools running in DS control mode. Used to fine-tune the tool to specific joints. For more information on how to use DS torque tuning factor see section *DS tools (DS control)*.

7 Parameter Set (Pset)

Click on the **Pset icon** in ToolsTalk to view the Pset window.



Push the **PROG button** on a Power Focus 3000 Graph keyboard to enter the Pset menu section.

The set of parameters that controls the tightening process is contained within a so-called Parameter set (Pset). This section describes how to set-up the basic Pset parameters necessary to perform a tightening. Create a Pset by using Auto Set, Quick programming or by setting the parameter values manually using the Power Focus 3000 Graph or ToolsTalk.

The basic Pset parameters:

- Control parameters
- Torque parameters
- Angle parameters
- Speed and Ramp parameters
- Time parameters
- Batch count parameters
- Statistical parameters

The *Parameter list, chapter 18* contains a description of each parameter.

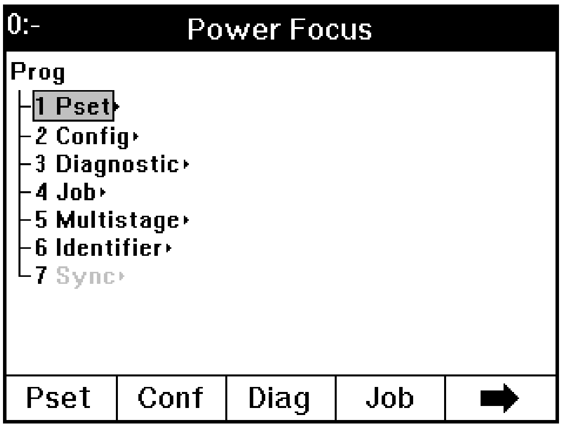
Note! To be able to select Psets from ToolsTalk you have to set the parameter C222, *Pset select source* parameter to *Ethernet/Serial* (Config – I/O set-up - Other I/Os - Pset select source).

7.1 Create a Pset using Graph

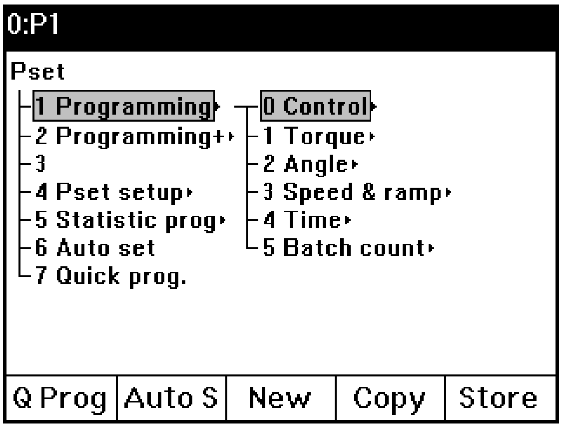
Navigate through the menus with the arrow buttons on the front panel and confirm selections with the Enter button.

- Press the PROG button.

The programming window appears.



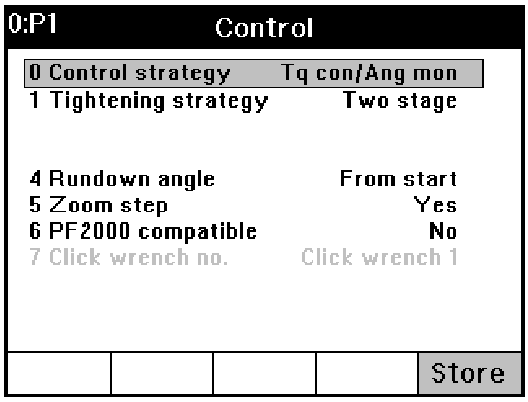
- Select **Pset – Programming - Control**.



- In the **Control** window select:

  - Control Strategy
  - Tightening Strategy
  - Rundown angle
  - Zoom step
  - PF 2000 compatible

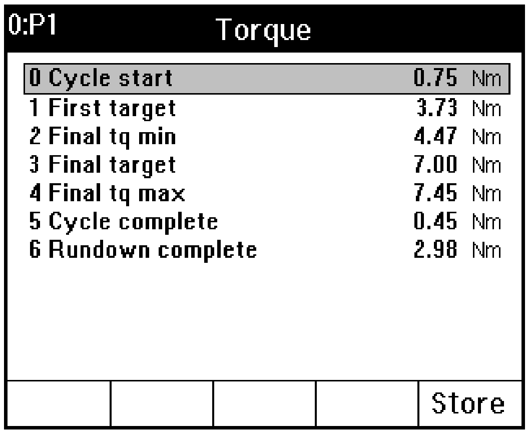
- Save settings by pressing the Store button.



- Go back one level and select **Torque**.

- Set the Torque parameters.

- Press Store or OK to proceed.



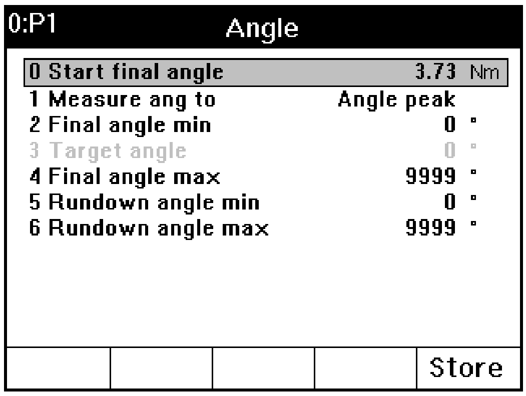
- Go back one level and select **Angle**.

- Set the Angle parameters.

- Press Store or OK to proceed.

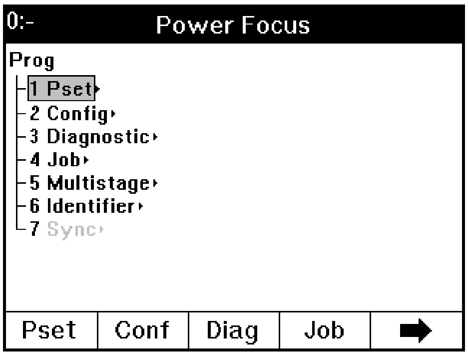
- Continue the programming by setting **Speed and Ramp**, **Time** and **Batch Count** parameters in the same manner.

- Press Store to save the Pset.

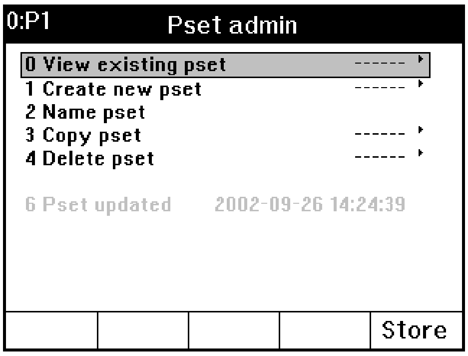


Pset admin

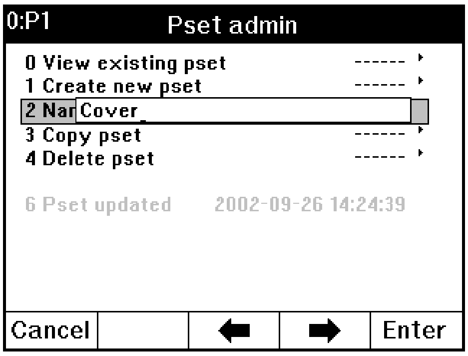
- Select **Pset - Pset setup - Pset admin**.



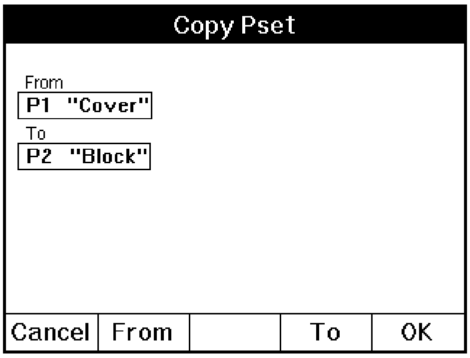
In Pset administration you will be presented with five options – view existing Psets, create new, name, copy and delete Psets.



When you create a new Pset, choose a number in a list and name the Pset.
To name Pset, open the Name Pset window and use number buttons to enter text. First three pushes produce small letters, e.g. a, b, c. The next three pushes will produce capital letters, A, B, C. The next push produces the number of the button.
Use the Cl button to delete characters.



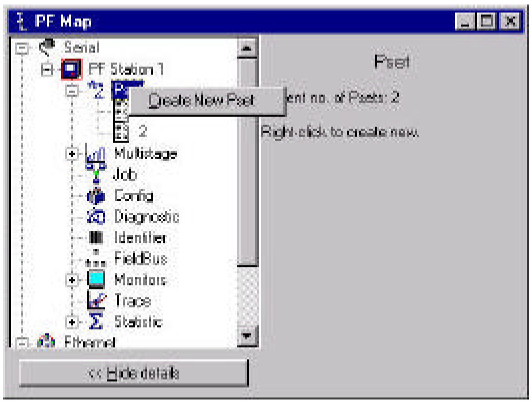
For copying Psets, use soft buttons From and To and arrow buttons up and down for selecting Psets.



- Press Store to save your selections.

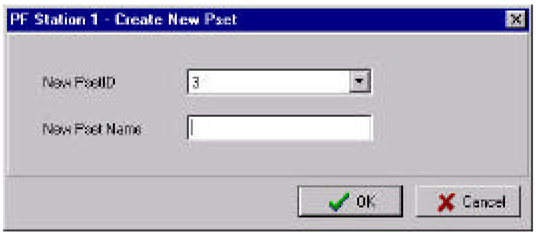
7.2 Creating a Pset using ToolsTalk

- Right click on Pset in the PF Map and select Create New Pset. (Or select Create New Pset from the Edit menu.)



The Create New Pset window pops up.

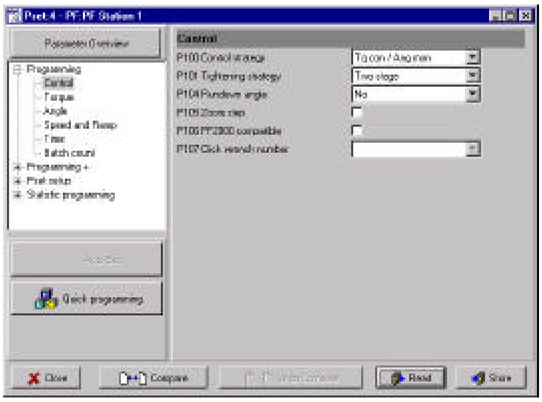
- Name (optional) the Pset and click OK



The programming window appears.

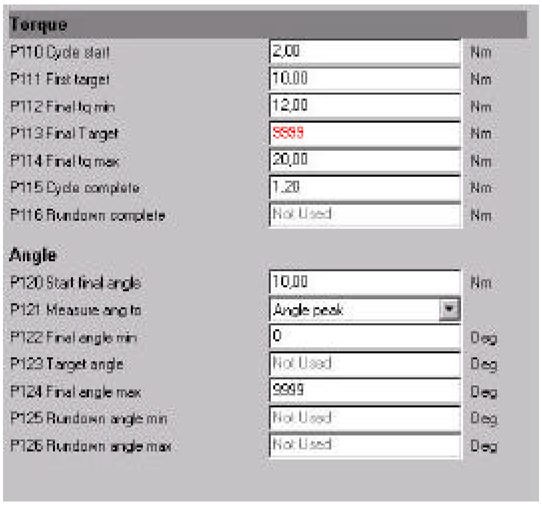
- Select the following and click Store.

  - Control Strategy
  - Tightening Strategy
  - Rundown angle
  - Zoom step
  - PF 2000 compatible



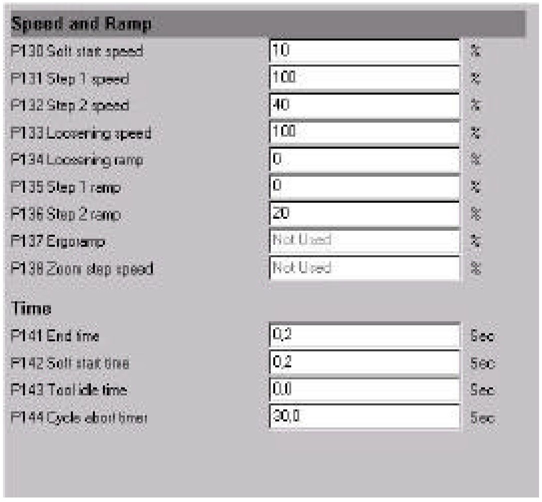
- Click on Torque or Angle in the menu tree and set the Torque and Angle parameters.

Hint! Display limits for each parameter by holding the cursor in respective parameter box.



- Continue the programming by setting **Speed and Ramp**, **Time** and **Batch Count** parameters in the same manner.

- Click Store to save the Pset.



7.3 Auto Set

An easy way to program a Pset is to use the Auto Set function. Enter a Final target torque value, perform a few tightenings and a new Pset is created. Power Focus 3000 adapts the programming to the specific joint and sets all the parameters automatically. Auto Set does not change any parameters outside the used Pset.

Auto Set can only be selected when a tool is connected. Clicking on Auto Set brings up a dialog box, prompting you to enter a tightening torque. Enter a value, press OK and perform a few tightenings. 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 appropriate to the specific joint characteristics. Torque control / angle monitoring is the used strategy for Auto Set when Tensor-S tools are used. In the case of DS –tools, DS control is the tightening strategy used.

When Auto Set is active, a green light is will appear on the front panel of the Power Focus unit. When this signal is shut off, Auto Set is finished and the Power Focus unit is now programmed for that joint. The Auto Set procedure can be aborted by pressing cancel before the green light goes off.

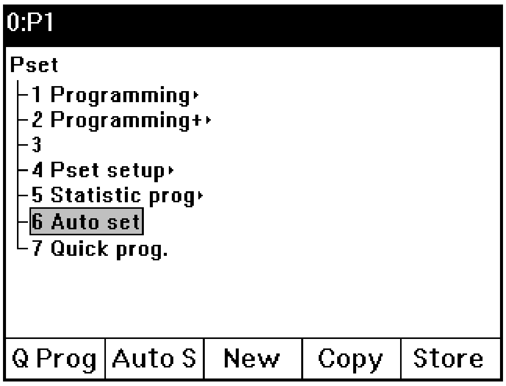
Note! When the Auto Set is complete the new settings are saved and previous ones are erased.

7.3.1 Auto Set using Power Focus 3000 Compact

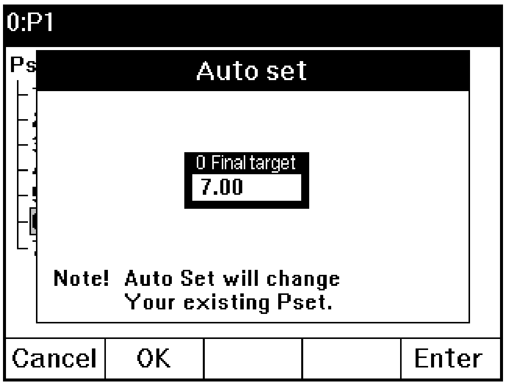
- Press the Auto Set button on the front panel.
- Enter a torque value by pressing the plus or minus button until the desired value is reached and press Enter.
- Perform a couple of tightenings. Power Focus 3000 will automatically calculate and set the parameters.
- Pressing the Auto Set button again before the Auto Set is done will abort the function and restore the previous settings.

7.3.2 Auto Set using Power Focus 3000 Graph

- Press the PROG button on the front panel.
- Select Pset.
- Select Auto Set by navigating with the arrow buttons or by pressing the corresponding soft button.



- Input a final target torque and press Enter.
- Press OK
- Perform a few tightenings and press OK when prompted.
- Pressing Cancel button before the Auto Set procedure is complete will abort the function and restore the previous settings

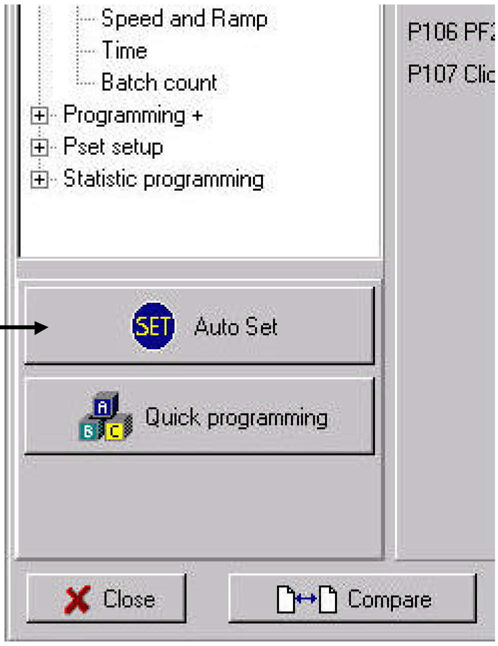


7.3.3 Auto Set using ToolsTalk

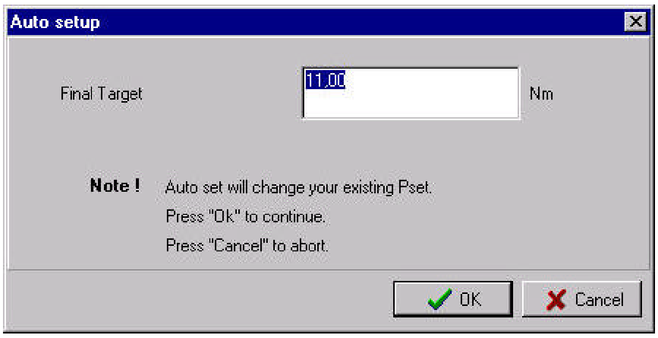
- Right click on **Pset** in the **PF Map** to **Create New Pset**. (You can also use an existing Pset, the parameters of which will be erased and replaced by the Auto Set calculated parameters.)
- Type **New PsetID** and **New Pset Name**.

The Pset window appears.

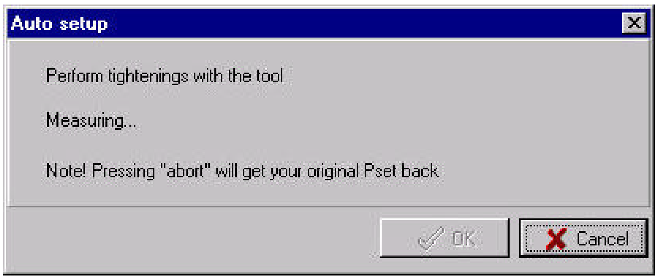
- Click on the **Auto Set** button in the Pset window.



- Enter **Final Target** value and click **OK**.



- Perform a few numbers of tightenings with the tool.
- Click **OK** when prompted.
- Pressing the **Cancel** button before the Auto Set procedure is completed will abort the function and restore the previous settings.



7.4 Quick Programming

Quick programming is intended to help you to quickly configure a Pset and give you the opportunity to use the Power Focus 3000 after a fast and simple programming. After completing a Quick programming procedure, you can start to use the tool and tighten to the correct torque straight away. It might be necessary to fine-tune some parameters in order to ensure smooth operation of the tool. You only need to set the following parameters:

- Control Strategy
- Joint Angle
- Final Target

All other parameters are calculated and set automatically by Power Focus 3000.

Perform settings as follows:

Control Strategy

Select *Control Strategy*.
Press Enter and make a selection. The choices are:
1. Tq con/Ang mon
2. Tq con/ Ang con (AND)
3. Ang con/Tq mon
4. DS con

Final target

Set the desired *Final Target* torque value for the joint.

Joint Angle

The *Joint Angle* is the distance from when the screw (nut) head touches the surface, and the torque starts to build up, until it is tightened to the correct torque. It is possible to measure the Joint angle by using a torque wrench.

For “hard” joints, it is suitable to set the value to 30 degrees. For “soft” joints we recommend to set the joint angle above 100 degrees. This gives a better tightening during the first stage and a distinct second stage. If you consider the second stage too long, adjust the angle until you are satisfied. Observe that it is important that the second stage exists, otherwise the tool may jerk at full torque.

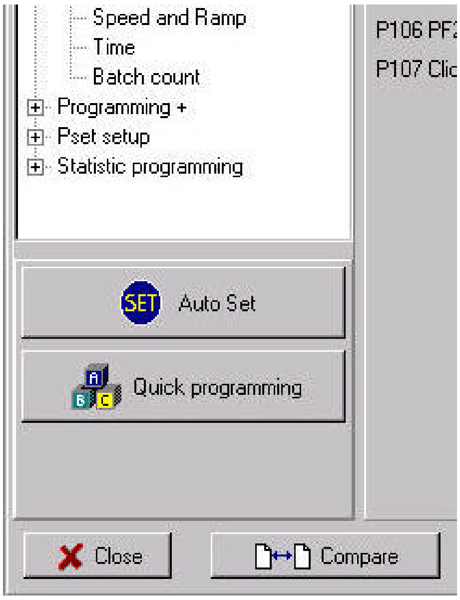
Note! When accepting the new settings by pressing OK, the previous Pset settings are erased.

7.4.1 Quick Programming using Power Focus 3000 Graph

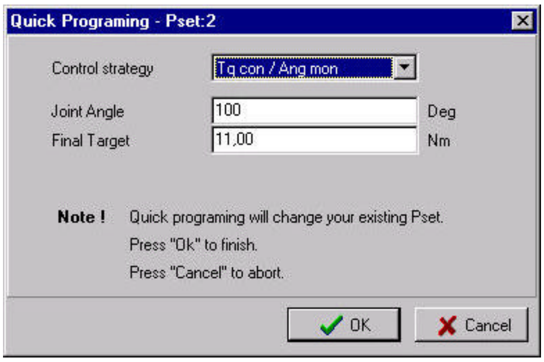
- Press the PROG button on the front panel.
- Select Pset and press the right arrow button to get to the next level in the menu tree.
- Select Quick Programming by navigating with the arrow buttons or pressing the corresponding soft button.
- Select *Control strategy* and enter Joint angle and *Final target*.
- Press the OK button to confirm selections and press the RESULT button to get back to the main window.

7.4.2 Quick Programming using ToolsTalk

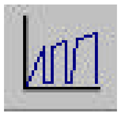
- Right click on Pset in the PF Map to Create New Pset.
- Type New PsetID and New Pset Name.
- The Pset window appears.
- Click the Quick Programming button in the Pset window.



- Select *Control strategy*, enter *Joint Angle* and *Final target.*
- Click OK to confirm the settings.



8 Multistage



Click on the **Multistage icon** in ToolsTalk to view the Multistage window.

Press the **PROG button** on a Power Focus 3000 Graph keyboard to enter the Multistage menu section.

The Multistage feature allows you to dynamically link up to eight (8) parameters in several steps to perform a sequence of operations.

A typical application scenario such as joint conditioning, where you may wish to run the fastener to a torque level of say 10Nm then back it of 360 degrees and then fasten to a final torque level of 20Nm, this operation would be regarded as 3 step multistage. All performed by the operator when in a hand held configuration by depressing the trigger in the normal mode till the end of the operation, or alternatively when used say in a fixed operation where the start signal is either latched or externally triggered.

The results from a Multistage are handled as if it is a normal Pset. To do this, the results and the statistics are a combination of all results from the different Psets within the Multistage. You can pick one torque value and one angle etc.

The default setting, is all results from the last Pset in the Multistage. Individual Pset min and max limits works in all stages and the tool will shut of when a max limit is exceeded as per normal operation. The result displayed will then be taken from the stage where the shut off occurred.

8.1 Creating a Multistage using Graph

Navigate the menus with the arrow buttons on the front panel and confirm selections with the Enter button.

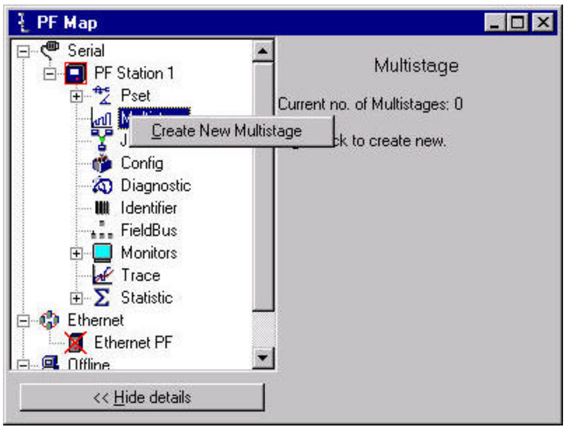
- Press the PROG button.
- Select Multistage and then press the right arrow button to open the next lower level in the menu tree.
- Select Setup and than select Admin.
- Select Create new multistage.
- Select an identification number, press Enter and then go back one level by pressing the left arrow button.
- Select MS Programming and then Options (see Option list below).

Parameter	Default value	Description
Name multistage	---	Name the Multistage.
Pset list	---	Here you select the Psets that are going to be included in the Multistage.
Batch count	Off	Here you activate Batch count.
Batch size	0	The Batch size specifies the number of Multistage tightenings in a batch.
Lock at batch OK	No	Here you decide if you want the tool to be disabled (locked) after reaching Multistage batch OK.
Stop between stages	Yes	When Stop between stages is set to yes, tightening has an idle time between two consecutive stages. The idle time is specified in Tool idle time.

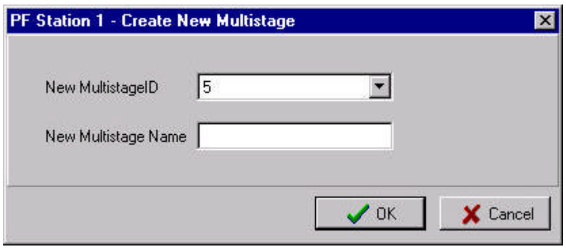
- Select Pset list.
- Press Add to see a list of available Psets.
- Make a selection and press Enter
- Repeat the procedure until all desired Psets are added to the Pset list
- Press OK and then press Store to save the Multistage.
- Press the RESULT button to get back to the main window.

8.2 Creating a Multistage using ToolsTalk

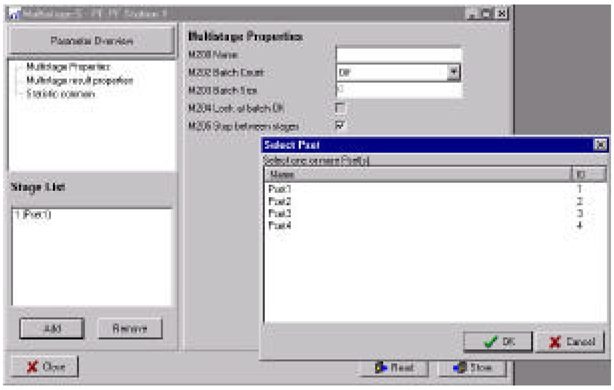
- Right click on **Multistage** in the **PF Map** and select **Create New Multistage**.



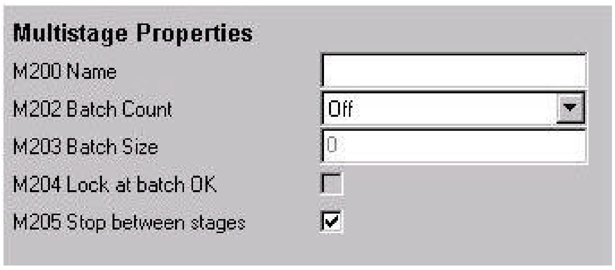
- Choose **New Multistage ID**, type **New Multistage Name** and click **OK** to open the Multistage window.



- Click **Add** to open a window where you can select Psets to be included in the Multistage.

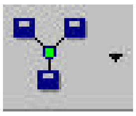


- Edit the **Multistage Properties** (or use the default values). See table in chapter 8.1.1 or the parameter description [see *chapter 18; Parameter List*].



- Click **Store** to save the Multistage.

9 Job

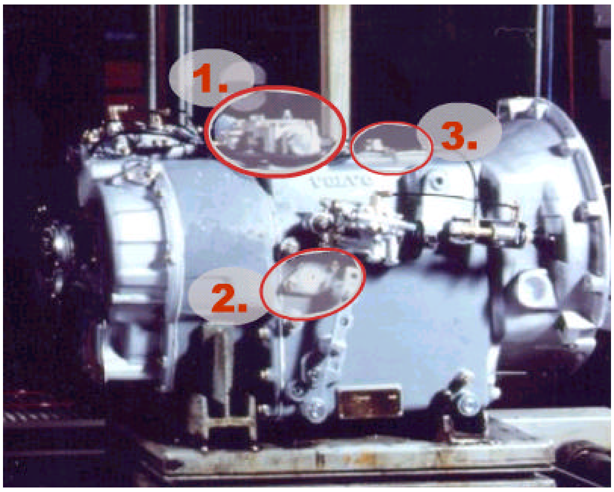


Click on the **Job icon** in ToolsTalk to view the Job window.

Push the **PROG button** on a Power Focus 3000 Graph keyboard to enter the Job menu section.

The Job function is convenient when, for example, an object has bolts that require different torque values to be tightened. Instead of manually selecting the Psets, create a Job and let the Power Focus 3000 keep track of all parameters needed to complete the task. When performing the Job, the Power Focus sends you tightening status signals and keeps track of all parameters and results.

Up to 30 Psets can be included in a Job and it is possible to store 99 Jobs in the Power Focus 3000. The Psets included in a Job can be selected from one Power Focus unit (requires Silver/Gold RBU software version) or from several Power Focus units in a Cell (requires Gold RBU software version).



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

1. Four bolts that require torque: 39 Nm
2. Three bolts that require torque: 70 Nm
3. One bolt that requires torque: 88 Nm

For this example three different Psets have to be created:

Pset 1: Final Target = 39 Nm
Pset 2: Final Target = 70 Nm
Pset 3: Final Target = 88 Nm

Combining the selected Psets creates a Job. For this example a Job (named Job 1) could consist of the following information:

Job 1		
Step	**Perform Pset**	**Number of times**
1	Pset 1	4
2	Pset 2	3
3	Pset 3	5

A “JOB OK” signal is received from the Power Focus when all tightenings are correctly performed.

9.1 Stand Alone Job

Standalone Job can be used when just one Power Focus unit is involved, or when the unit does not belong to any cell.

The Stand Alone Job functionality is available in the Gold RBU software version as well as in RBU Silver software version.

9.2 Cell Job

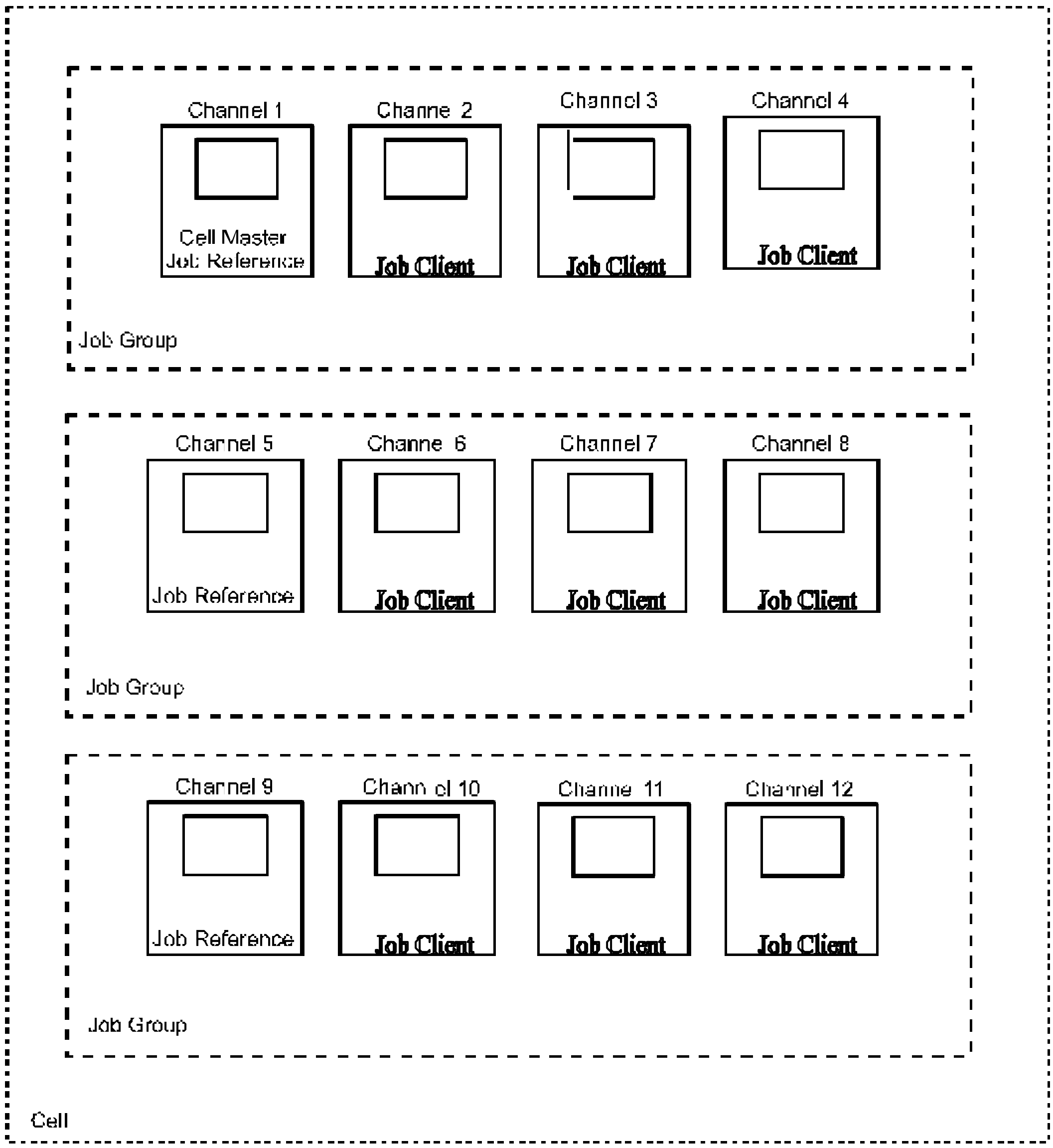
A **Cell Job** allows a Job to be run in which several Power Focus 3000 units are involved. These units must belong to the same **Job Group**. Cell Jobs run in the same way as ordinary Jobs with a **Job Reference** as the main controller.

A **Job Group** consists of up to 20 Power Focus units. All Power Focus units in a Job Group must belong to the same Cell. One Power Focus 3000 unit 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 Power Focus 3000 units are **Job Members**. One of the members acts as the **Job Reference** and those Job Members which are not Job References are called **Job Clients**, see figure on the next page.

The Cell Job functionality is available in the Gold RBU software version.

Note! In Stand Alone Job the Power Focus 3000 unit will act as its own Job Reference.



A Cell containing Job Groups.

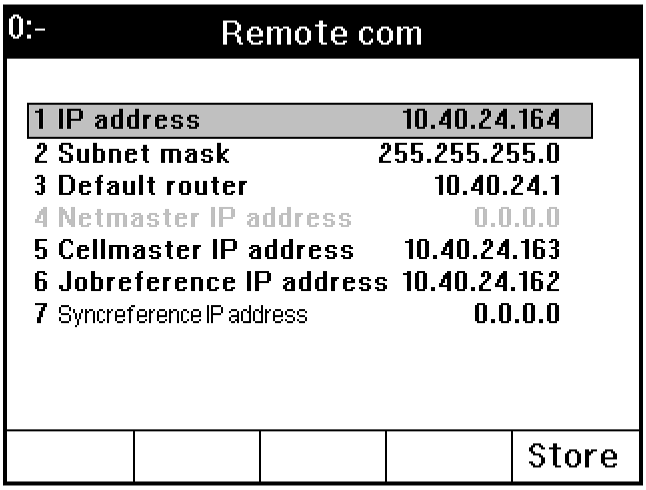
9.2.1 Creating a Job Group

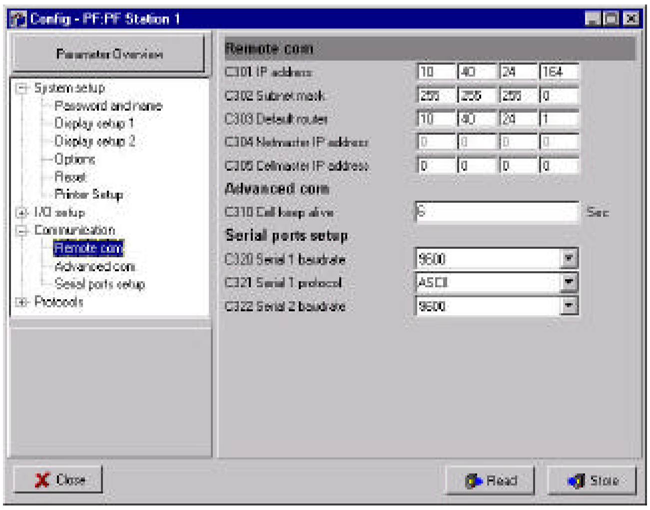
A Job Group is a number of Power Focus 3000 units working in the same Cell. Therefore, when creating Job Groups a **Cell** has to be configured (see *chapter 4, Cell and Networking*).

The figures below are from the Graph display and from ToolsTalk.

CONFIG – COMMUNICATION

- Create a Job Reference by setting the parameter **Jobreference IP address** equal to the parameter **IP address**.
- To define a Job Client, set the **Jobreference IP address** to the IP address of the Job Reference.
- Press **Store** to save the settings.
- Reboot the Power Focus 3000.





9.3 Creating a Job

This section describes the creating of a Job. Job creation is accessible from ToolsTalk or from the keyboard on a Power Focus 3000 unit equipped with a graphical display.

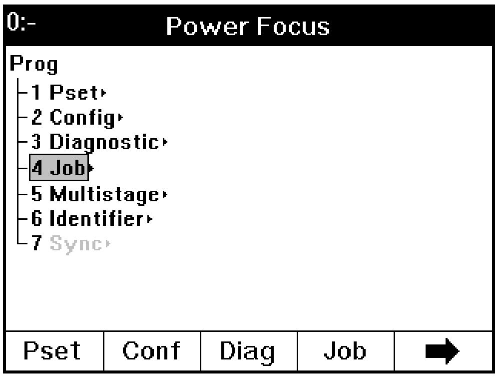
Every Job has a unique ID number between 1 and 99. Combining the selected Psets or/and Multistages creates a Job.

Note! When creating a Cell Job the programming have to be done in the Job Reference.

9.3.1 Create a Job using Graph

Navigate the menus with the arrow buttons on the front panel and confirm selections with the Enter button.

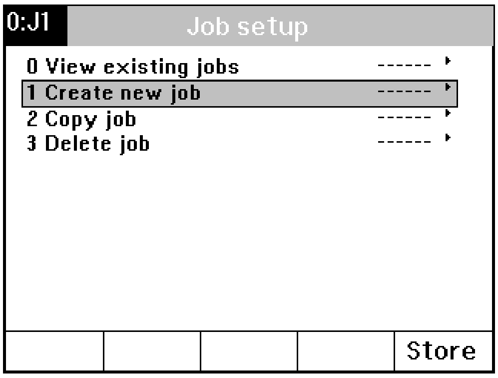
- Press the PROG button.
- Select Job and then press the right arrow button to open the next lower level in the menu tree.



- Select Setup and then select Admin.

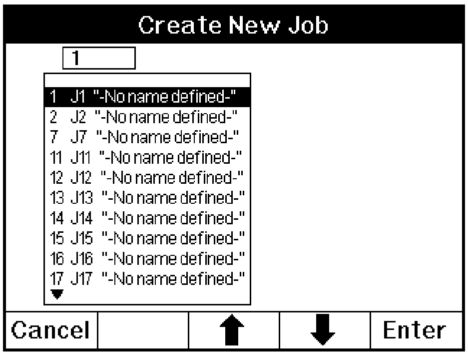
The Job set-up window will appear.

- Select Create new job.

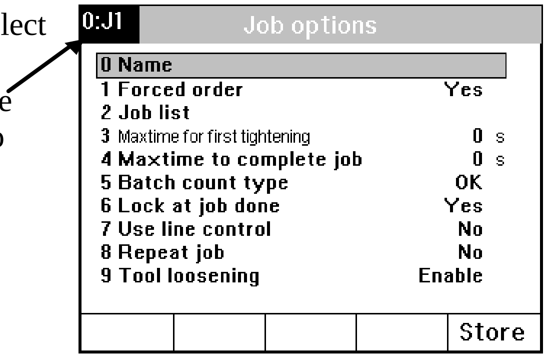


The Job set-up window will appear.

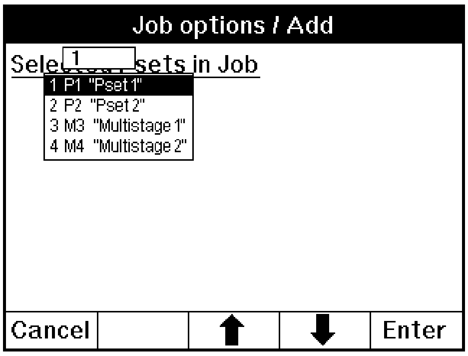
- Select Create new job.
- Select Job identification number and press Enter.
- Press Store and go back to the Job menu tree window by pressing the left arrow key.



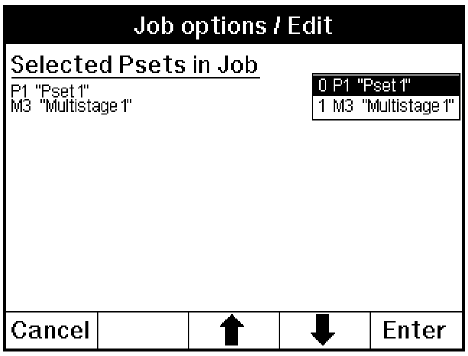
- Select Programming and then select Options.
- Press the **P SET (+/-) keys** on the Graph front panel to select Job to edit.



- Select Job list and press the right arrow key.
- Press Add to see a list of available Psets and/or Multistages. Make a selection and press Enter.

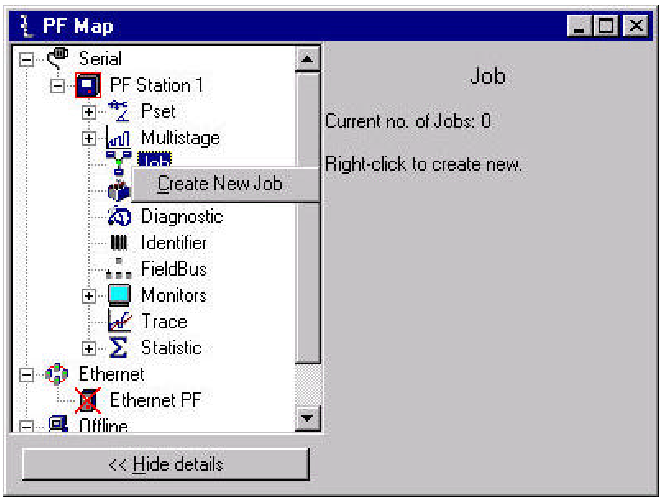


- Press Edit to select and program Job Pset/Multistage parameters (Batch Size, Auto select etc.). Press Store.
- Press the right arrow key and then OK to get back to the Job options window.
- Press Store to save the Job Options and then press the RESULT key to get back to the main window.



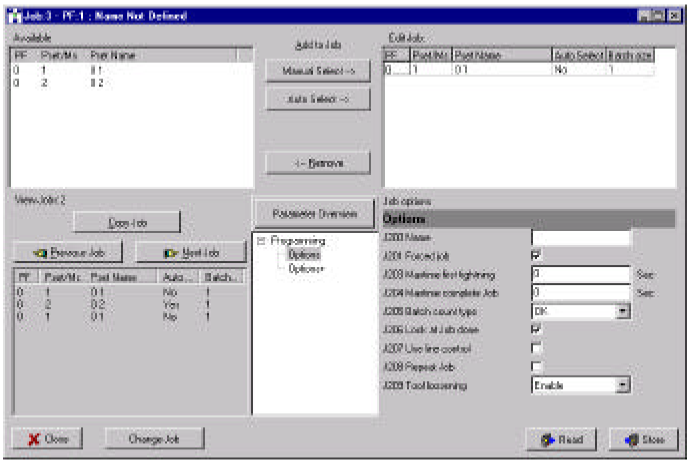
9.3.2 Creating a Job using ToolsTalk

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



- Type a new Job ID, give the Job a name and click OK to continue.

- The Job window appears where you will find a list of all the available Psets and Multistages.
- **Note!** Multistages are listed, like the Psets, with a 'P' before their ID numbers.
- Select the desired Psets and Multistages and add them to the **Edit Job list** by clicking either Manual select or Auto select.

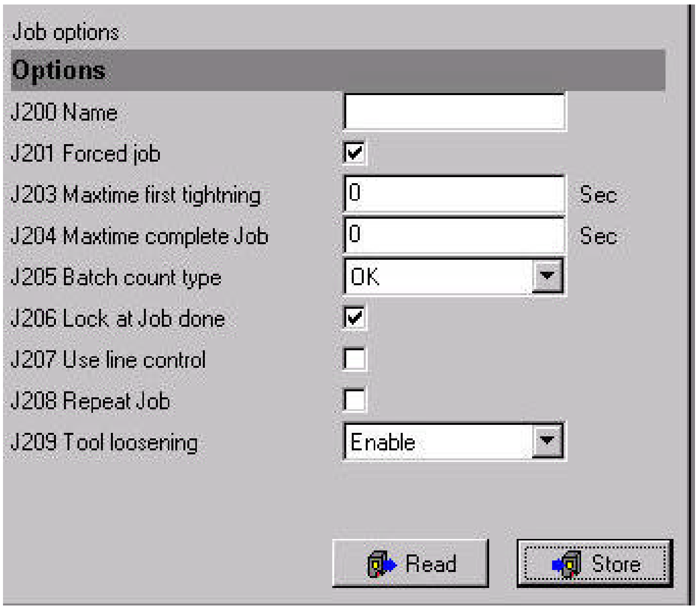


- In the table **on the next page** the headlines in Edit Job list is described.

EDIT JOB Headline	Description
PF	The Power Focus ID number which the chosen Psets or/and Multistages are belonging to.
Pset/Ms	This list contains the chosen Psets and/or Multistages. All Psets or/and Multistages specified in the Job must be predefined. Psets or Multistages can be included in more then one Job. The same Pset or Multistage can also be used several times in a Job.
Auto/Manual Select	If Auto Select is selected it means that the system automatically choose the next Pset, otherwise the operator must manually choose the next Pset. It is not allowed to override the automatically selected Pset in a Job. **Note!** In free order Jobs it is not possible to specify that the Job functionality selects a Pset or Multistage automatically.
Batch Size	For each Pset or Multistage in a Job, a batch size should be specified. The default batch size value is 1. The batch size specifies the numbers of tightenings that should be performed using each Pset or Multistages. The batch size defined in the Psets or Multistages is not used when running a Job. The maximum batch size is 99. It is possible to define *free Running* Pset or/and Multistages by setting batch size to 0. **Note!** If Batch Size is used in Job, Pset batch counter should be set to off. **Note!** It is possible to modify the properties of an already existing Job.

- Select and set **Job options** parameters. [See *chapter 18, Parameter list*, Job section, for parameter descriptions]

- **Note!** Forced job must be selected if Auto Select is used.



9.4 Selecting a Job

In a Job selection the **Job ID** is used. When a Job is selected, the channels involved in the Job will be forced into Job Mode. Once a Job has been selected, it is possible to select a new Job, until the first tightening is started or a batch increment is performed. At that state the only way to select a new Job is either to complete the running Job or to abort the running Job.

9.4.1 Job select source and Job select source override

It is possible to define two different parameters that will be used for Job selection, *Job Select Source* and *Job Select Source Override*. These parameters should be set in Config [see *chapter 10, Config*]. For a more detailed parameter description, see *chapter 18, Parameter List*. To be able to select a Job, at least one of the two parameters has to be set.

Sources that Jobs could be selected from are the following:

- Digin (Digital Input)
- Ethernet/Serial
- Identifier
- Field Bus
- PF Keyboard

Job Select Source Override has a higher priority than Job Select Source. If a Job is chosen from Select Source then it is possible to select a new Job from the same source or Select Source Override.

On the other hand, if a Job is chosen from Select Source Override then it is only possible to select a new Job from the same source. This function is normally used when the normal Select Source (i.e. Ethernet) is down and a manual operation is needed.

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

Note! To be able to select a Job from the Power Focus 3000 Graph display, Job Select Source or Job Select Source Override parameters must be set to "**PF keyboard**".

9.4.2 Selecting and running a Cell Job

In order to be able to select a cell Job, the Job Reference has to communicate with the Job Clients, which is part of the selected Job. Otherwise, the Job Reference will not start the Job. If the Job Reference loses contact with a Job Client it will try to re-establish the communication.

If the Job Reference loses communication with a Job Client during an ongoing Job, the following will happen:

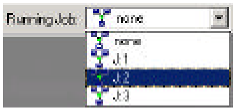
- If the client that is disconnected has tightenings left to perform the Job Reference will abort the running Job immediately.
- If the client that is disconnected has performed all tightenings left to perform or had no part in the running Job, the Job will continue.

If a Job Client loses communication with its Job Reference, it will stop its ongoing part of the Job and lock the tool.

9.5 Job functions and features

Job functions and features enable the operator to change the status of a running Job. All Job functions and features are available from the following devices.

- A defined digital input and/or I/O expander
- Tools Talk
- Graph Display
- Field Bus



Running Job

Select the Job to run from the combo box (in the selection row in ToolsTalk).

Note! To run the Job from ToolsTalk the Job select source (Config parameter C221) have to be in Ethernet/Serial mode.

Job Monitor

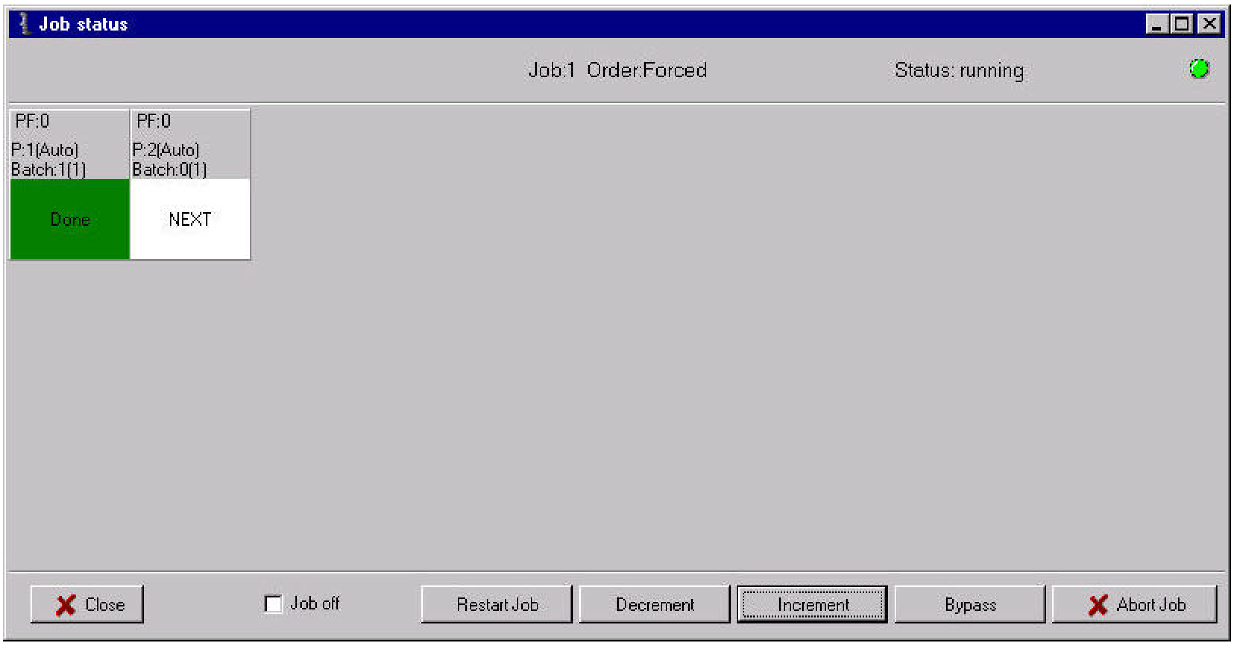
Click on the arrow to the right of this icon to select Job Monitor.

Job Monitor displays created Jobs and provides functionality for managing (se picture below).

Job

In the Job Monitor window the current/latest Job Status (Running, OK, NOK and Aborted) can be displayed.

Job Monitor also displays Job ID and if the running order is free or forced for a running Job.



The table below describes the functions in Job Monitor.

Functions	Description
Restart Job	This function allows you to re-start the running Job without needing to reselect the Job. All Batch counters in the running Job resets and the Job options timers will also be restarted.
Decrement	This function allows you to re-do the last tightening in a Job. The batch counter of the Pset or Multistage is decreased with one step. It is not possible to go back one stage after the job has been completed. In both forced order Job and free order Job batch decrement is only possible from the Job reference.
Increment	This function allows you to skip the batch counter value of a Pset or a Multistage without performing a tightening. It is allowed to complete a Job by using the Batch Increment function. If using batch increment to complete a Job, the status of the Job will be *not ok*. How to use batch increment in: 1. Forced order Job Batch Increment is possible from the Job reference or the Job member with the active Pset. 2. Free order Job Batch Increment is possible from the Job member with the active Pset.
Bypass	This function allows you to skip a specific Pset or Multistage in the running Job, independently of the batch size. When a Pset or Multistage is bypassed, the batch counter will be set equal to the batch size value and the Pset will be considered as completed. If using bypass to complete a Job, the status of the Job will be *not ok*. How to use bypass in: 1. Forced order Job Bypass is possible from the Job reference or the Job client with active Pset. 2. Free order Job Bypass is only possible from the Job client with active Pset
Abort Job	It is *only* possible to select or abort a Job from the Job reference. Abort can be an external signal as well as an internal command. (see subchapter for max time for first tightening and max time to complete Job) When a Job abort request is received, the Job function will wait for the ongoing tightening result to count it in the Job, before aborting the Job. A cancelled Job will be regarded as an *aborted Job*. Abort Job has no effect if there is no running Job.

Job Off (Emergency mode)	This function offers the possibility to turn off Job functionality and unlock all involved tools without delete the Job configuration. • In case of a running Job: The effect of *Job Off* on a running Job is the same as aborting the Job besides that the tool/tools will not be disabled. The Job reference will automatically choose Pset 1 for all of the members. • In case of no running Job: The Job reference unit will unlock all of the members tools, and will automatically choose Pset 1 for all of the members. When a Power Focus unit is in *Job Off* mode, it is possible to perform tightening with any existing Pset or Multistage. Note that as long as the Job reference is in Job Off mode there is no possibility to select a new Job. Job Off mode must first be inverted before selecting a new Job. A Power Focus 3000 has *Job On* (Job Off invert) mode as default settings. The Job reference unit will remember the Job Off mode after a reboot. Note that if the Job reference is in the Job Off mode and the rest of the group is in the Job On (Job Off invert) mode, it is still not possible to select Job. The only occasion when the Job Off functionality affects the Job clients is when the Job clients have lost communication with their Job reference. In this case it is possibility to unlock the clients locally.

9.6 Job result

It is possible to follow a detailed status of a running Job through ToolsTalk or the graphical display on a Power Focus 3000.

The Job Status presented to the operator includes the following information:

- Type of Job (Forced or Free Ordered or Repeat Job).
- A list of all Psets or Multistages included in the Job in their predefined order.
- Channel ID of the Power Focus 3000 unit that each Pset or Multistage belongs to.
- Status of Psets or Multistages (Executed or not)
- Present Batch Counter value of each Pset or Multistage.
- Batch size value of each Pset or Multistage.

The status information is updated each time a tightening or any Job feature has affected the running Job.

Job Completion

A Job is considered completed when all Psets or Multistages included in the Job have been completed.

A Pset or Multistage is considered completed when its batch Counter value equals the batch Size for that Pset or Multistage. A Pset or Multistage can be completed through tightenings or by using functions such as Batch increment or Bypass.

Job Status

Job OK

Job OK is received if all Psets or Multistages included in the Job have been completed through OK tightenings.

Job NOK

A Job is considered as *NOK* (Not OK) if the functions Increment, Bypass or Abort Job was used.

Job Aborted

An cancelled Job is considered as *aborted* (equal to NOK)

Indicator Lights

n x OK

The n x OK light indicates when the number of approved rundowns corresponds to the number (batch size) programmed in the Power Focus 3000. The indicator is active until the next tightening or Job selection is initiated.

OK

The OK light indicates when the result of the rundown is within the specified limits. The indicator is active until the next tightening or Job selection is initiated.

NOK

The NOK light indicates when the result of the rundown falls outside the specified limits. The light is active until the next cycle starts.

JOB OK

The JOB OK light indicates when the Job is finished and all tightenings in the Job were correctly performed. The light is active until the next tightening or Job starts or when the system is reset.

9.7 Situations in which the tool is in locked mode

When the selected Job has its option lock at Job done configured to active, all tools in the Job group will be locked after the Job is performed or aborted. The Power Focus 3000 unit, which is locked in Job mode, will remain locked until a new Job is selected, or until tool is enable again.

As the lock in the Job done parameter is stored in Power Focus memory, it is not possible to unlock the tool by rebooting the unit.

During an ongoing Job with lock at Job done parameter active, all the clients that have no part in the Job will be locked. This is valid for all the clients that had contact with their Job reference at the time the Job was selected.

9.7.1 Unlocking the tool

Unlock the tool by selecting a new Job, selecting Job Off, or deleting all existing Jobs. Remember that you can only unlock the tool from the Job reference, unless you select Job Off.

All Job clients have to be active to be unlocked by the Job reference.

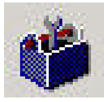
Note that it is not possible to unlock the tool by rebooting the Power Focus 3000!

When a Job is completed or aborted, the following will happen:

- If the last Job had lock at Job done chosen, it will lock the tool for all units in the Job group even the ones that had no part in the last Job.

- If the last Job did **not** have Lock at Job done selected, or if the Job mode is changed from running to Job off, functionality will choose latest Pset which was selected from the Dig in, FieldBus or Selector in case one of these is Pset select source. Otherwise the latest selected Pset in the Job will remains.

10 Configuration (Config)



Click on the **Config icon** in ToolsTalk to view the Config window.

Press the **PROG button** on a Power Focus 3000 Graph keyboard to enter the Config menu section.

The configuration set-up contains the configuration parameters which is common for all tightenings and is unique for each Power Focus 3000 unit.

Note! For more detailed Configuration parameters information see *chapter 18, Parameter List*.

10.1 System set-up

The System set-up contains basic Power Focus 3000 features such as name, language and the appearance of the Power Focus 3000 Graph display.

10.1.1 Password and name

The password and name configuration of Power Focus 3000 is set-up in this branch. The name of a Power Focus 3000 unit may be used to identify it on a network etc. Use password protection to prevent unauthorised tampering with the controller.

10.1.2 Display set-up 1

The appearance of the Power Focus 3000 Graph display is configured in this branch. It is possible to display a number of different data.

10.1.3 Display set-up 2

The language and torque presentation unit of the Power Focus 3000 Graph display is configured in this branch. The use of Back light, soft keys and LCD viewing angle are also set-up in this branch.

10.1.4 Options

The optional functions *Lock on reject*, *Disable loosening at OK* and *Reset batch at Pset change* are set-up in this branch.

10.1.5 Reset

The buttons in this branch is used to *delete all results* or to perform a *Total Reset*. A total reset will clear all Power Focus 3000 settings including network set-up. The RBU will also be cleared.

Note! Clearing the network set-up will cause Power Focus 3000 to lose contact with the network.

10.1.6 Printer Setup

The connected *Printer type* and *Paper size* is set-up in this branch. *Continuous print* is also turned-on or off. Push the Print button on the Power Focus 3000 Graph front panel to view a list of available report to print.

Note! Laser printers may not handle continuous prints, only full sheet printouts.

10.2 I/O set-up

Power Focus 3000 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 3000 I/O bus.

10.2.1 I/O device 0-7

The function of the internal I/O ports and device 0-7 are configured in this branch.
0: internal I/O.
1-7: external I/Os.

10.2.2 I/O device 8-15

The function of I/O device 8-15 is configured in this branch.
8-15: external I/Os.

10.2.3 Other I/Os

Other inputs and outputs to the Power Focus 3000 are set-up in this branch, most notably is the *Tool start select source*, *Job select source* and the *Pset select source*. The *Tools start source* selection must be combined with correctly wired 4-pin Remote Start connector (see *chapter 22, Appendix B: Description of connecting devices*).

10.3 Communication

Power Focus 3000 communicates by both Ethernet and Serial communication links and can tie in with ToolsTalk and database applications such as ToolsNet, etc. IP addresses and baud rates etc are set-up in this window.

10.3.1 Remote com

The IP address configuration of the Power Focus 3000 is set-up in this branch. *Chapter 4, Cells and Networking*, describes the networking capabilities of the Power Focus 3000.

10.3.2 Advanced com

The *Cell keep alive* timer of the Power Focus 3000 is set in this branch. If the timer is adjusted upwards it will reduce network traffic but delay the detection of a Power Focus 3000 loosing connection with the cell. Adjusting the timer downwards will have the opposite effect.

10.3.3 Serial port set-up

The serial ports of the Power Focus 3000 are set-up in this branch. The two serial ports of the Power Focus 3000 can be configured for different baud rates. Serial port 1 handles both ASCII and 3964R communication. Serial port 2 only handles ASCII communication.

10.4 Protocol

Power Focus 3000 communicates through a number of protocols. This window contains the settings for each communication protocol.

10.4.1 ToolsTalk set-up

The ToolsTalk communication port is set-up in this branch. This parameter should correspond with the port number used by ToolsTalk.

10.4.2 ToolsNet set-up

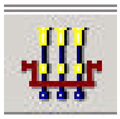
The ToolsNet communication is turned-on and configured in this branch. Make sure that the Power Focus 3000 is set-up in accordance with IP address and port number of the ToolsNet server.

10.4.3 Multicast set-up

Multicasting of tightening results is turned-on and configured in this branch. The multicasting must be turned on in order for the Factory Overview to work. Multicasting messages uses the ToolsNet protocol.

11 Synchronisation (Sync)

Click on the **Sync icon** in ToolsTalk to view the Sync window [the Power Focus 3000 has to be connected as a Cell master].
Push the **PROG button** on a Power Focus 3000 Graph keyboard to enter the Sync menu section.

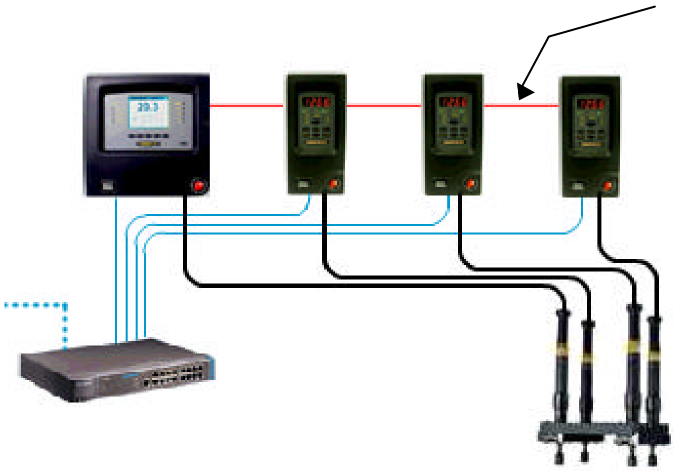


With the Power Focus 3000 Gold RBU version, you have the possibility to create a *Sync Group* and synchronise 2 to 10 spindles, i.e. two or up to 10 tools perform the same task simultaneously. Examples where synchronisation is used are tightening of car wheel bolts and tightening of cylinder head bolts.

An Ethernet Cell must first be created [see *chapter 4, Cell And Networking*]. The Cell can be used as an isolated network and does not need to be connected to the factory network. Select one of the Power Focus 3000 units as the Sync Reference and use the other units as Sync Members.

A *Sync Group* consists of 2 to 10 Power Focus 3000 units in the same Cell. One of the units in the Cell is selected as the *Sync Reference* and will control which Pset to run etc. The other units are called *Sync Members*. A Cell can be set-up with more than one Sync Group.

The figure below shows an example with four synchronised Power Focus 3000 units.



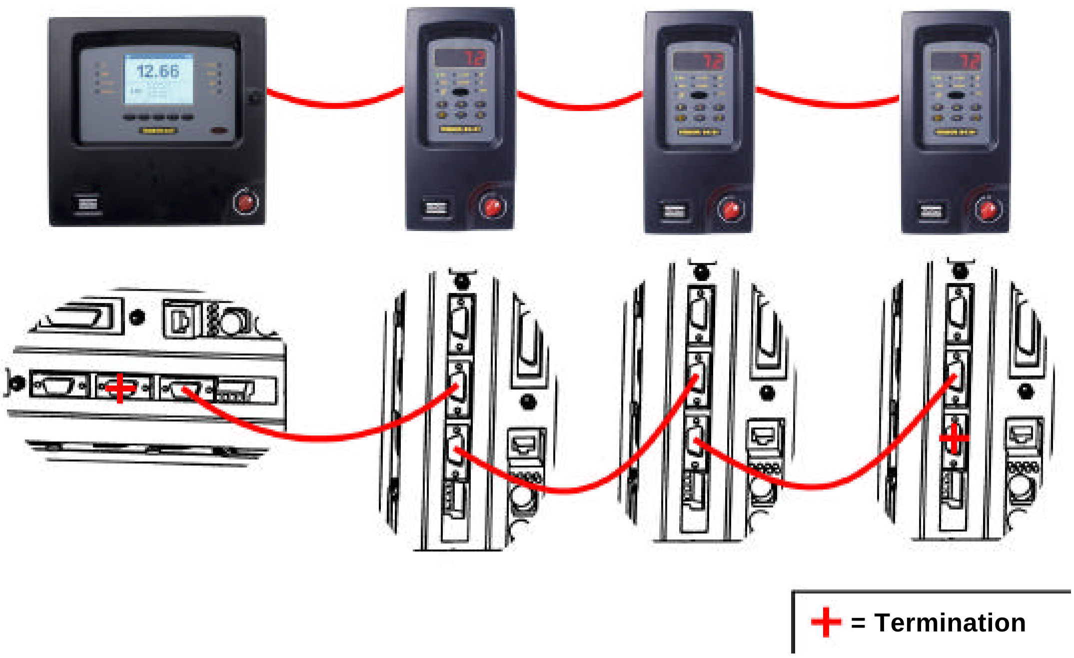
The synchronisation is performed in steps where all synchronised spindles wait for each other at a number of "checkpoints" before they continue with the next step. A normal two stage tightening has checkpoints at *First target* and *Final target*. The time critical sync communication is performed over the Power Focus 3000 internal I/O-bus, which means that all units have to be connected via the I/O bus. Ethernet communication is used for non-time critical communication such as selecting Psets 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 also be ~~a~~ part of a Job.

For more information about accessories such as spindle-fixtures etc, please contact your local Atlas Copco representative.

11.1 Setup

11.1.1 Hardware Setup

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 Power Focus 3000 unit. **Do not connect two Sync groups via the I/O-bus** and do not forget to terminate the I/O-bus with terminators. The figure below shows four Power Focus 3000 units connected via the I/O-bus.



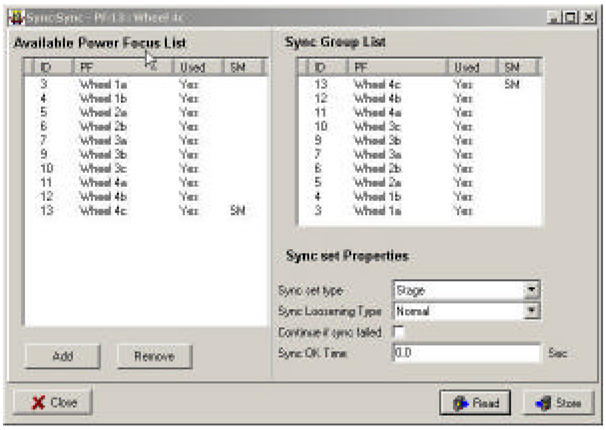
The 4-pin remote **start connector** on the Power Focus 3000 **must be configured for remote start** on the Sync Members and according to the selected start signal input on the Sync Reference. If an external start switch is used, connect it to the Sync Reference only.

Note! Do not configure any external I/O Devices (Device 1-15) on the Sync Members.

11.1.2 Parameter Setup

The parameters in the table below can be reached from the **Sync** branch in ToolsTalk or the Power Focus Graph keyboard.

The picture to the right shows the Sync parameters window in ToolsTalk.



Note! These parameters **can only be programmed on the Sync Reference**. A copy of the Pset are automatically transferred to the Sync Members.

Parameter	Description
Sync Group List	Create a **Sync Group List** by selecting units from the **Available Power Focus List**.
Sync loosening type	Select the type of loosening strategy that you want to use. 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.
Sync loosening type	Select the type of loosening strategy that you want to use. 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.
Continue if sync failed	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.
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 value in time.

Synchronisation (Sync)

The Parameters in the table below can be reach from the **Config** branch in ToolsTalk or the Power Focus 3000 Graph keyboard.

<table>
<tr><th>Parameter</th><th colspan="2">Description</th></tr>
<tr><td rowspan="2">Tool start select source</td><td>Sync Reference</td><td>Tool trigger: The tool trigger is used as start trigger.
Dig in: A digital input is used as start trigger.
The digital inputs must also be configured.
Warning! Do NOT use Dig in on I/O Expander*.
FieldBus : The start signal is sent via FieldBus interface.
Sync start: Not to be used for Sync Reference.</td></tr>
<tr><td>Sync Members</td><td>Sync start: All Sync Members shall be set to sync start.
The 4-pin remote start connector on the back panel must be configured for remote start.</td></tr>
<tr><td>Sync reference IP address</td><td colspan="2">All Power Focus 3000 units in the same Sync Group shall have the same Sync reference IP address.

Note! For the Sync Reference, the Sync reference IP address shall be set equal to the IP address.</td></tr>
</table>

*) **Note!** 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, disable and other safety critical functions shall not be connected to the I/O-bus via I/O Expander.

When the Synchronised Power Focus 3000 group is up and running, the Sync Reference unit alone is used for programming and selecting Pset etc. In a Sync application can I/O-bus units, such as RE-alarm, Selector and I/O Expander, only be controlled from the Sync master. On the Sync members can only the internal I/O be used.

11.1.3 Step by step set-up instructions

Use Ethernet connected ToolsTalk or the Power Focus 3000 Graph interface.

- Make sure that all Power Focus 3000 units in the Synchronised group are connected through the internal I/O-bus.
- Make sure that all Power Focus 3000 units in the Synchronised group are part of the same Cell [see *chapter 4, Cell And Networking*].
- Decide which units should act as Sync Reference and Sync Members.

Sync members

1. Set C307, *Sync reference IP address.*
2. Set C220, *Tool start select source* to Sync start
3. Configure the 4-pin connector on the back panel for remote start.
4. Re-start the Sync Member
5. Repeat step 1-4 for all Sync Members.

Sync reference

6. Set C307, *Sync reference IP address* equal to C301, *IP address*.
7. Create the Sync Group List and set other Sync options.
8. Re-start Sync Reference.
9. Pset programming, and I/O-setup is done **only** on the Sync Reference.

The Synchronised Power Focus 3000 group shall now be up and running.

11.1.4 Results

The status information on each controller and tool is the individual result for that spindle. The overall Sync OK / NOK can be given on FieldBus, RE-alarm or relays controlled by the Sync Reference. The results from every spindle are registered separately.

11.1.5 Event codes

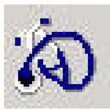
Event	Title	Description / Action
E870	Sync Member registration failure	Sync Member registration failed. This could be caused by two Sync Members having the same channel ID. Or by a Power Focus unit with a *Sync reference IP address* missing in the sync list.
E871	Sync Reference configuration failure	The Sync Reference is not first in the Sync group list. Undo the list and create it again starting with the Sync Reference. If this does not help, check the Sync Reference IP addresses.
E872	Sync initialisation failure	The tightening synchronisation initialisation failed. Check the CAN bus cable and check that all the Sync Members has the same active Pset. Also check the external start bridge and that the termination is ok.

11.1.6 Troubleshooting

Symptom	Reason / Action
Tools in a Sync group does not start	There are a variety of possible reasons for this behaviour. **Programming-related errors:** - Sync Member has not Tool start select source to Sync start. - Wrong Sync Reference IP address 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 terminator. - 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 terminator and the I/O-bus cabling. - If a single spindle does not start, the tool, tool-cable or controller might be broken. - If all Spindle in the group starts in 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 shall be configured from the Sync Reference).

12 Diagnostic

Click on the **Diagnostic icon** in ToolsTalk to view the Diagnostics window.



Press the **PROG button** on a Power Focus 3000 Graph keyboard to enter the Diagnostics menu section.

12.1 Tool Configuration

Tool general Information

This window shows general information about the connected tool. It is also possible to have 36 characters in the tool memory and to change the *Tool Max Torque*. Changing Tool Max Torque requires great caution.

Note! Using a tool for tightening with higher torque then the original *Tool Max Torque* decrease the lifetime of the tool. If the torque is too high the tool may be damage.

Tool Calibration

This window shows the *Calibration* and *Normalisation value* for the tool. It is also possible to change these values. Changing these values requires great caution since it has a direct effect on the torque measurement accuracy.

Note! Do not change these values without contacting an Atlas Copco representative.

The *Motor tuning* command calibrates the tool and motor control unit. This is normally not necessary to do.

Open end parameters

This window consists of the special settings for Open End tools. See ***chapter 16, Open End Tools***, how to use these settings.

Tool Service

This window shows the service status of the tool. By turning the *Service indicator* alarm On the Power Focus 3000 will alert the user when the service interval has expired.

12.2 Controller Diagnostic

This window shows the hardware configuration and the software versions installed on the Power Focus 3000 controller.

12.3 System Diagnostic

These functions enable you to test and diagnose your Power Focus 3000 system.

Sensor Tracking

Sensor tracking enables you to get torque and angle readings in real time. You will also get the zero offset of the torque transducer given as percentage of the calibration value. The *Zero offset* reading should ideally be close to zero when no torque is applied to the tool. However, the affect of for instance heat generated during a tightening, will cause the *Zero offset* to vary over time. This is why Power Focus 3000 is calibrated at the start of each tightening. The Power Focus 3000 is able to correct for deviations of up to ±10% in *Zero offset* drift. Connect a Reference transducer box to ensure that the Power Focus 3000 calibrates and measures torque correctly.

At *Sensor tracking* start-up a calibration of the torque transducer is done together with a reset of the angle sensor. Pressing the *Reset* button will only reset the angle counter.

Note! Torque and zero offset readings will not be generated for **Tensor DS** tools.

Note! It is not possible to do tightenings while performing a Sensor tracking.

I/O Diagnostics

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

This function is useful when you want to test the interaction between the Power Focus 3000 and different external devices. For instance when trouble shooting complex systems with one or several PLC's connected to the Power Focus 3000.

The *Relay status* and *Digin status* windows show the status of the selected I/O device. Note that the *Read status* button has to be pressed in order to updated this view to reflect changes. The *Relay test* function enables you to set the relays of a selected I/O device. The new status of the relays is set when the *Set relay* button is pressed. Pushing the *Restore* button will restore the relays to reflect the current status of the Power Focus 3000. To updated this view to reflect changes triggered by other events push the *Read status* button.

13 Identifier

Click on the **Identifier icon** in ToolsTalk to view the Identifier window.

Press the **PROG button** on a Power Focus 3000 Graph keyboard to enter the Identifier menu section.

It is possible to send an identifier string to the Power Focus 3000. This string is normally generated from a barcode reader connected to one of the serial ports on the Power Focus 3000 (this barcode is in car plants usually called VIN or ESN). When entered, the Power Focus 3000 will use this number and send it together with the results to ToolsNet software etc. It is also possible to use the barcode to select Jobs or Psets.

A filter can be set-up to decide what part of the barcode string that is of interest. The barcode string can be sent to the Power Focus 3000 via the serial connector, FieldBus or Ethernet.

13.1 Barcode String data

The maximum length of the string is 25 ASCII signs. If the string is longer Power Focus 3000 will use the 25 first signs.

Serial protocol

Baudrate	9600 bps
Data bits	8
Stop bits	1
Parity	no
Handshake	off

Data string: STX <data 1-25 characters> ETX
(STX = 02H ETX = 03H)

Trouble shooting

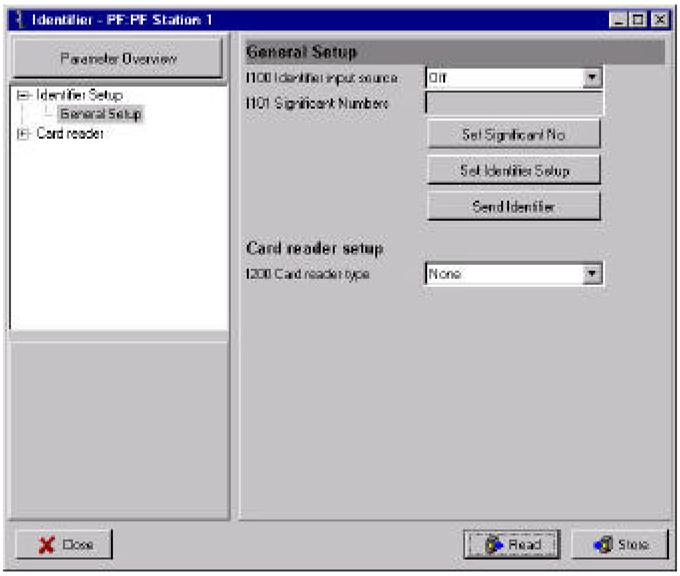
Symptom	Reason / Action
No barcode received in Power Focus 3000	Check the configuration of the barcode reader. Check the cables
No Job or Pset selected	No match between barcode string and “select matrix”

13.2 Identifier set-up

- Start by connecting ToolsTalk and the Identifier (Barcode reader) to the Power Focus 3000.

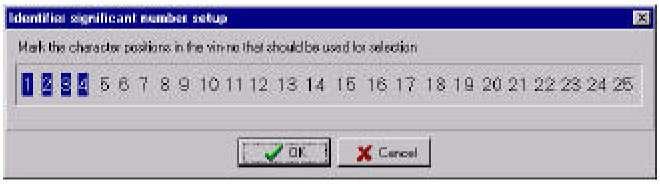
- Start ToolsTalk and click on **Identifier** in the **PF Map**.

- Set **Identifier input source**.



- Click on **Set Significant No.**

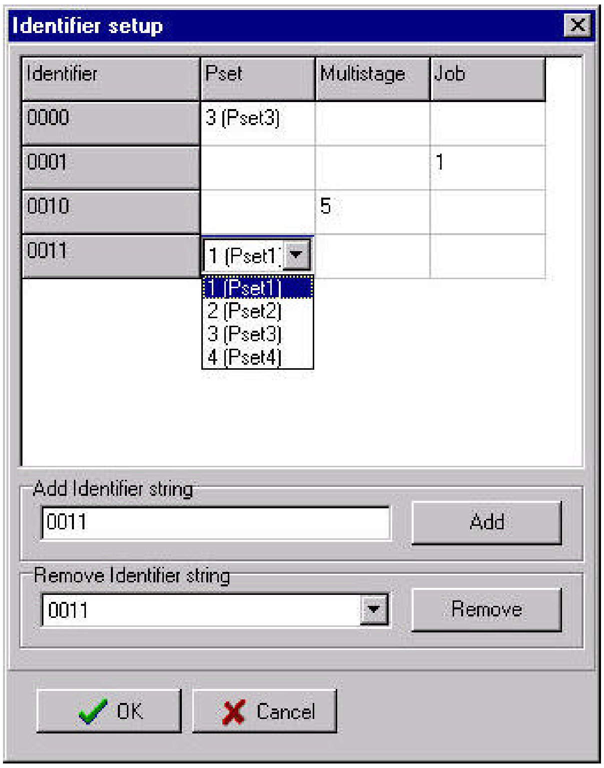
- Select the positions where the significant information is located in the barcode.



1 – 10 numbers can be selected (it is not necessary to set them in a row).

- Click on **Set Identifier Setup**.

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



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

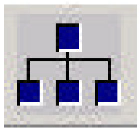
- Once all strings are entered, associate them with a **Pset**, **Multistage** or **Job** by double clicking in the corresponding cell in the matrix and selecting a function ID number from the pop up list.

- Click **OK** to exit the window.

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

14 FieldBus

Click on the **FieldBus icon** in ToolsTalk to view the FieldBus window.



A FieldBus communication can be used for data communication between the Power Focus 3000 and PLC's. It is an effective and fast way for data transferring of short data packages. It is normally used to send discrete I/O data instead of using a large number of discrete cables that have to be hard wired to relays and digital inputs.

There are many different FieldBus standards on the market and they all have different hardware and software protocols. To be able to communicate on FieldBus, the Power Focus 3000 must be equipped with a specific card for the preferred type of FieldBus. Profibus-DP, DeviceNet, Interbus and ModBusPlus are the possible selections.

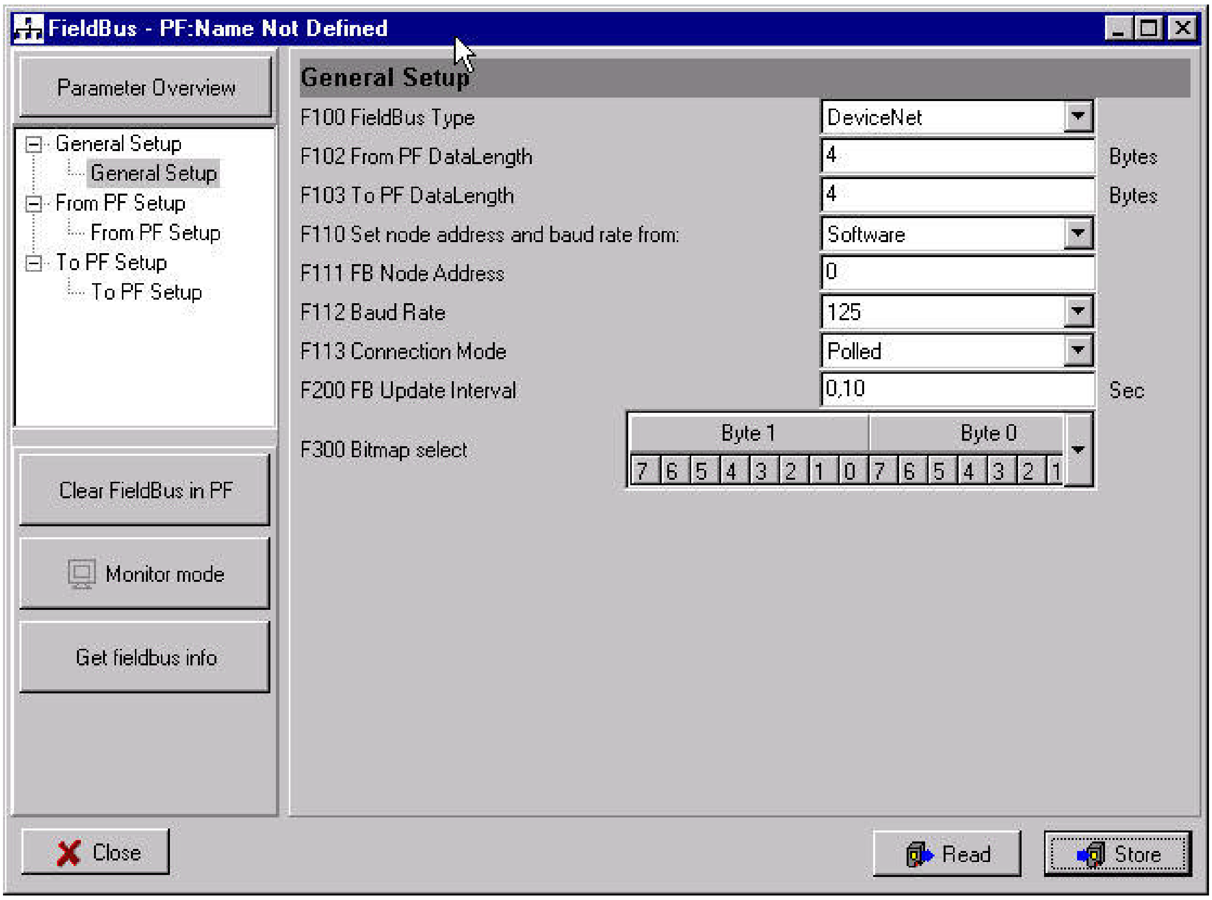
Power Focus 3000 acts as a slave in a FieldBus system. A PLC or similar will act as the master.

With help of ToolsTalk the FieldBus functionality in the Power Focus 3000 can be configured to fit the customer specific bitmap. It is a very easy way to configure or modify a customer specific bitmap. When the configuration is done you can download to the Power Focus 3000 or save it as a file for later use.

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

14.1.1 General set-up

The figure below shows the Tools Talk parameters in General Setup for DeviceNet.



Parameters in General SETUP

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

Parameter	DeviceNet	ProfiBus-DP	InterBus	ModBusPlus
FieldBus Type	X	X	X	X
To PF DataLength	X	X	X	X
From PF DataLength	X	X	X	X
FB Update Interval	X	X	X	X
Set node address and baud rate from	X	X		X
FB Node Address	X	X		X
Baud Rate	X			
Set source address from				X
Source address				X
Connection Mode	X			
PCP length			X	
Process DataLength			X	
From PF Global DataLength				X
To PF Global DataLength				X
Bitmap select	X	X	X	X

X = Available in FieldBus type

FieldBus Type

Select the *FieldBus Type* to use. This parameter shall be selected first. It includes the types; "DeviceNet", "Profibus-DP", "InterBus" and "ModBusPlus". If there is no FieldBus configuration inside the Power Focus 3000 when open FieldBus icon or read from PF, "None" will be shown in the set-up window. If Offline programming is used, "None" is selected when you start. If there is no FieldBus card installed in Power Focus, FieldBus programming only works in Offline mode.

DeviceNet	If DeviceNet module is installed in the Power Focus 3000.
ProfiBus DP	If Profibus module is installed in Power Focus 3000.
InterBus	If Interbus module is installed in Power Focus 3000.
ModBusPlus	If ModbusPlus module is installed in Power Focus 3000.
None	If no FieldBus card is installed or the FieldBus functionality shall be switched off (default).

To PF DataLength

To PF DataLength is the total length of the data string send *from the PLC to the Power Focus 3000*. The length must be the same as defined in the PLC. Because swap bytes are needed for some FieldBus types, only even numbers should be programmed (2, 4, 8, 10, etc). Data length should be a number higher than zero.

The Maximum length that can be programmed is different for each FieldBus type. See the FieldBus specific pages for data.

Note! If InterBus is used you have to restart the Power Focus 3000 when the data length is changed.

From PF DataLength

From PF DataLength is the total length of the data string send *from the Power Focus to the PLC*. The lengths must be the same as defined in the PLC. Because swap bytes are needed for some FieldBus type, only even numbers should be programmed (2, 4, 8, 10, etc). Data length should be a number higher than zero.

The Maximum length that can be programmed varies for different buses. See the FieldBus specific pages for data.

Note! If the InterBus is used, you have to restart the PF when the data length is changed.

FB Update Interval

If the FieldBus system is heavily loaded it might be necessary to slow down the update interval in PF FieldBus card. If this parameter is set to 0.5 seconds the PF updates the bus every 0.5 sec. The average data traffic must be possible to fit within the programmed interval. If the traffic has a higher peak load the messages are buffered.

Valid settings range from 0.05 to 10.00 seconds. Default setting is 0.10 seconds.

Set node address and baud rate from

Some buses can use a SW-configured node address and baud rate**.** There are two choices, software or hardware. When “software” is chosen, it is possible to program node address and baud rate from user interface. When “hardware” is chosen, node address and baud rate is configured with the switches on the FieldBus card.

Note! Normally the switches on the FieldBus card must be set in a specific way to enable these parameters from ToolsTalk.

See the specific bus type pages for possible settings.

FB Node Address

FB Node Address is the network ID number used in the FieldBus system. You can set the Node address if the selected FieldBus type have this feature. Two units in the same FieldBus network cannot have the same node address.

See the specific bus type pages for possible settings.

Baud Rate

Baud rate is the communication speed on the FieldBus system. You can set the baud rate if the selected FieldBus types have this feature.

See the specific bus type pages for possible settings.

Note! The Baudrate shall be the same in all Power Focus units and in the PLC.

Set source address from

ModbusPlus global data exchanges require a source address, which is a node address where you want to get the global data from. There are two choices, software or hardware. Selecting “software” allows you to program Source Address from the user interface. Selecting “hardware” allows you to configure Source Address using the switches on the FieldBus card.

See the specific bus type pages for possible settings.

Source address

Source address is the network ID number used in the FieldBus system. You can set the Source address if you want to get global data from that address.

See the specific bus type pages for possible settings.

Connection Mode

Connection Mode manages the way the FieldBus system detects changes of data on the different units. Some FieldBus types have the possibility to set different connection modes.

See the specific bus type pages for possible settings.

Note! The setting in Power Focus 3000 and the PLC must be the same.

PCP length

PCP (Peripherals Communication Protocol) length is 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 3000 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.

Note! You have to restart the Power Focus 3000 when the PCP length is changed. The length must be the same in the PLC.

Process DataLength

Process DataLength is the first part of the InterBus message. The length has to be same for both input and output data. Maximum Process DataLength is 20 bytes minus the PCP length in bytes. This means that the highest Process string length is 20 bytes if PCP is zero.

Note! You must restart Power Focus 3000 when the Process DataLength is changed. The length must be the same in the PLC.

From PF Global DataLength

From PF Global DataLength is the length of sending broadcast data to the network. This is a special function for ModbusPlus, not available for other FieldBus type. Max length = 64 bytes. If only point-to-point data is transferred, set this parameter to zero.

Note! From PF Datalength – From PF Global Datalength = From PF point-to-point DataLength.

To PF Global DataLength

To PF Global DataLength is the length of receiving broadcast data from the network. This is a special function for ModbusPlus, not available for other FieldBus type. Max length = 64 bytes. If only point-to-point data is received, set this parameter to zero.

Note! To PF Datalength – To PF Global Datalength = To PF point-to-point DataLength.

Bitmap Select

Via this parameter you can select the way you want to present the bit map. It defines if byte 0 or byte 1 shall be to the left. This makes it possible to view the bitmap in the same way in Power Focus 3000 and the PLC configuration software. This parameter is default set to the type that is common for the selected FieldBus type.

14.1.2 Keys

Clear FieldBus in PF

This key is used to erase the FieldBus configuration in Power Focus 3000 (i.e. when you want to remove the FieldBus card). It is not necessary to clear the FieldBus configuration to change the configuration. If the FieldBus configuration is cleared the FieldBus type will be set to none.

When the clear key is pressed the configuration in Power Focus 3000 is deleted but then you can still see the configuration in ToolsTalk FieldBus window. When you press the read key, the window will be updated.

Monitor Mode

This key is used to monitor FieldBus data communication for testing purpose. This function works only when ToolsTalk is online (connected to the Power Focus 3000).

When monitor mode is active, the data from Power Focus 3000 to PLC are visible in the *From PF window bitmap*. The data from PLC to Power Focus 3000 are visible in the *To PF window bitmap*. It is not possible to change and store FieldBus configuration in monitor mode. Data can be displayed in two formats, defined data type format and binary format. The data in the monitor windows are updated at a rate of 3 messages/second.

Get FieldBus Info

When this key is pushed FieldBus module type, module firmware version, and module serial number are displayed.

14.1.3 Other functions

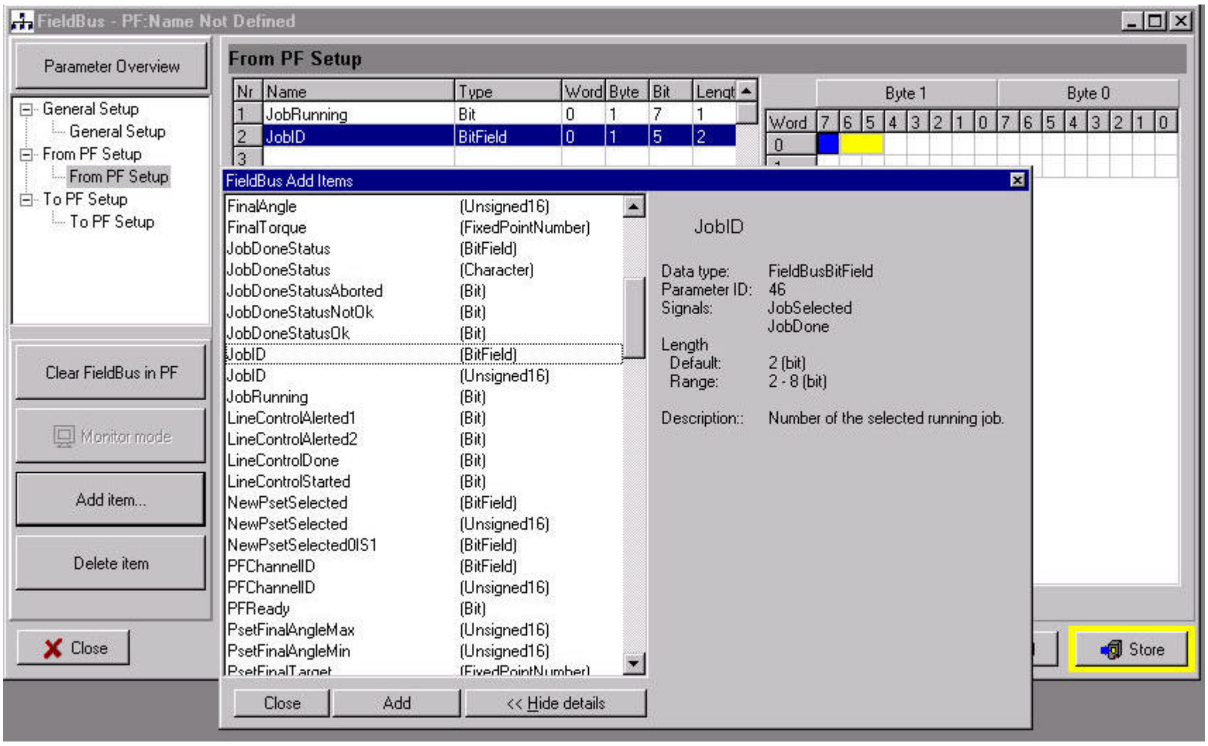
Store to and Read from a file

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

The FieldBus file extension is *.pff

14.1.4 From/To PF Setup

In this window you configure the bitmap that is sent out from the Power Focus 3000 (From PF Setup) and sent in to the Power Focus 3000 (To PF Setup).



Add item

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

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

If the bitmapping is changed so that a mapping conflict occurs, this part is marked with red colour in the bitmap.

The max number of selected items is 60 in From PF set-up and 60 in to PF set-up.

Delete item

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

For detailed information about all possible selections see **Appendix D**.

15 DS Tools

The **DS control** strategy makes it possible to run Tensor DS tools on the Power Focus 3000 controller. This way you can have the same controller for both Tensor S and Tensor DS tools. Note that the DS control strategy is not possible to run with Tensor S tools.

The Tensor DS tool has no transducer. Instead of having an electrical signal from a strain gauge, the DS tool derives the torque from different relevant parameters, such as voltage, speed, temperature and current. The Tensor DS is proven to achieve excellent repeatability. However, the operating range of the Tensor DS is smaller than that of the Tensor S and you 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.

IMPORTANT

When programming a 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 high torque is a short or a non-existing second stage in combination with a high speed in the first stage.
On the display the error massage E003 will be shown.

15.1 Adjusting DS Torque tuning factor

Torque tuning is performed either from the Graph interface, ToolsTalk or automatically with an ACTA 3000. It allows an easy adjustment to your reference system torque values (e.g. an ACTA 3000) and compensates for tool-drive-programming and joint variations. One torque-tuning factor is stored with each Pset.

Tools Talk and Graph

This is how to calculate a new torque tuning value when a tool is controlled against an external torque reference for calibration. There is one torque-tuning factor for each Pset.

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

3. Divide the desired target value with the calculated mean value and multiply by one hundred. This is the new DS Torque tuning factor.

$$\text{New Torque Tuning Factor} = \frac{\text{Final Target}}{\text{Measured Mean}} \times \left[\frac{\text{Old Torque Tuning Factor}}{100} \right] \times 100$$

4. Enter and store the new DS Torque tuning factor.

5. Perform another set of tightenings to control your torque.

6. If the torque is OK you are ready to run, if not, do the complete procedure over again.

ACTA

1. Connect the ACTA and Power Focus 3000 via RS232 cable.

2. Make sure the ACTA is set to communicate with controller.
   Select: Com - Controller

3. Synchronise the ACTA and Power Focus 3000.
   Select: Q.Prog - Synchronise - PF3000

4. Clear the ACTA database.
   Select: Datab - Clear all measurement

5. Perform a number of tightenings with the ACTA connected, preferably 20 tightenings or more so that a good mean value can be achieved.

6. Calibrate the tool.
   Select: Config - Calibration - Tool

7. Perform another set of tightenings to control your torque.

If the torque is OK you are ready to run, if not, do the complete procedure over again.

See ***chapter 21, Appendix A: QUICK Reference Guide***, for DS Tools control strategies.

16 Open End Tools

A Tensor S tool with an Open End head.

An Open End tool, or Tube Nut tool, is used to tighten nuts on tubes and similar. The basic Open End behaviour is that the tool will alternate between tightening and opening every second time you press the start trigger. Opening means that the tool head goes back to open position to make it possible to remove the tool from the nut on the tube.

Before using an Open End tool, make sure that the tool 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.

16.1 Using an Open End Tool

The operation of an Open End tool differs somewhat from normal tools. When the Power Focus 3000 is powered up with a configured Open End tool attached, the tool will run the Open End head to its open position when the tool trigger is pressed for the first time. After that, the tool will alternate between tightening and opening when you press the start trigger. When a tightening is finished, OK or NOK, the tool will run the Open End head to its open position the next time you press the start trigger. If the tool is stopped before the Open End head is fully open the next start of the tool will complete the opening. When the tool is opened a tightening is done the next time that the tool trigger is pressed.

The tool direction ring does not have any effect on the tightening direction. The tightening direction is set by the Open End configuration parameters in the Power Focus 3000 diagnostics. The *Tool tightening direction*, P240, option in Pset programming has no effect and is replaced by the *Open End tightening direction*, D122, option in the Power Focus 3000 diagnostics. These settings are stored in the tool memory. Therefore you only need to configure each Open End tool once.

The *Reverse angle* and *Rotate spindle forward/reverse* tightening strategies cannot be used with Open End tools. Further more is it not possible to use Open End tools in a Multistage configuration.

When you purchase an Open End tool from Atlas Copco it is already pre-configured. The following chapter, *Configuring an Open End Tool*, describes how to configure an Open End tool.

Note! It is very important that the configuration is done correctly. Otherwise the Open End head may be damaged.

16.2 Configuring an Open End Tool

Use the settings under Tool Configuration - Open End parameters in Diagnostics to configure the tool when fitting an Open End head. Fitting an Open End head to the tool will change the way it operates. It is very important to understand those changes when building and using an Open End tool. If you do not, the tool can run in wrong direction and the mechanical stop in the Open End head may be damaged.

The Open End head will effect the gear ratio of the tool. For that reason it is necessary to perform an Open End tuning when a new Open End head has been assembled. The Open End tuning command measures the total gear ratio and writes the new value to the tool memory. This is necessary to get the torque and angle measurement correct. Also make sure to set-up the rotation change option and tightening direction correctly.

Note! It is not possible to restore the tool memory if the Open End head is removed without using special tool programmer.

16.2.1 Open End Parameters

Use Open End

If the tool is built as an Open End tool, i.e. if an Open End head is fitted to the tool, this option shall be checked. When this parameter is checked the other Open End parameters become available.

Inverted motor rotation

If an Open End head is used that changes the rotation direction on the spindle, this option shall be checked. In other words, the *Inverted motor rotation*, D121, option is used to maintain ordinary rotational direction of the spindle.

Open End tightening direction

Set this option to the direction that fits your application. CW is selected for right hand threaded fasteners and CCW for left hand threaded. This setting is valid for all programmed Psets.

Note! Parameter P240, *Tool tightening direction*, has no effect when you are running an OE tool.

Performing Open End Tuning

The Open End tune command is used to find the open position of the tool and measure the gear ratio. The tool rotates slowly in the reverse direction until its true open position at the mechanical stop in the Open End head is reached. The tool memory is updated with the measured gear ratio. The Open End tuning must be OK and you shall be prompted with the message " Open End tuning succeeded".

16.2.2 Step by step Configuration guide

Right hand fasteners

1. Mechanically assemble the right hand Open End head.
2. Make sure that the *Calibration value*, D110, is correct.
3. Check the *Use open end*, D120, check box.
4. Make sure that the *Open end tightening direction*, D121, is set to CW.
5. How you set the check box for *Inverted motor rotation*, D122, depends on the Open End head. If the Open End head (front part) changes the rotating direction, the *Inverted motor rotation* check box should be marked. If *Inverted motor rotation* is set the wrong way the tool may not operate in a correct manner and the mechanical stop may be damaged if a tightening is done.
6. Press S*tore*.
7. Perform an Open End tune.

Left hand fasteners

1. Mechanically assemble the left hand Open End front part
2. Make sure that the *Calibration value*, D110, is correct.
3. Mark the *Use open end*, D120, check box.
4. Make sure that the *Open end tightening direction*, D121, is set to CCW.
5. How you set the check box for *Inverted motor rotation* depends on the Open End head. If the Open End head changes the rotating direction, the *Inverted motor rotation* check box should be marked. If *Inverted motor rotation* is set the wrong way the tool may not operate in a correct manner and the mechanical stop may be damaged if a tightening is done.
6. Press *Store*.
7. Perform an Open End tune.

17 Accessories

17.1 I/O Bus

The benefit of using Serial Bus-based accessories 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 3000 uses 24V 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.

17.2 I/O Expander

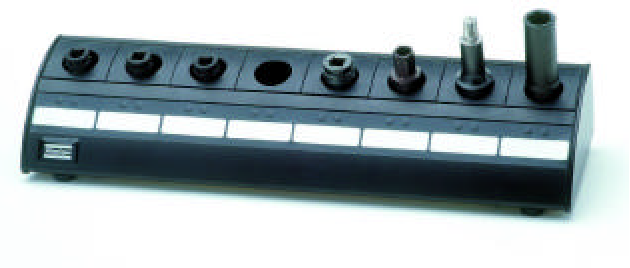
The I/O Expander enables the connection of several inputs and relays when more than those built-in are required. There are 8 inputs and 8 relays with the same functionality as the four built-in I/Os. Each input and relay can be configured individually.
For more detailed information, see the I/O expander manual.

17.3 Selectors

A Selector is a socket tray with light diodes 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 Selector: Selector 4 and Selector 8, the only difference being that Selector 4 has four sockets and Selector 8 has eight sockets.
The Selector is also communicating on the I/O-bus
For more detailed information read the Selector manual.

Selector 4

Selector 8



17.4 RE-Alarm

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 PF3000 and it is possible to configure the information you want to see.
For more detailed information see
The RE-alarm manual.

18 Parameter List

18.1 Parameter set

P100 – 152 Programming

P10x Control Strategies

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 angle: **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. **Rotate spindle forward:** Rotates the spindle a set number of degrees in the forward direction. **Tq con/ang con (OR):** Controls and monitors torque or angle, whichever target is reached first. **Rotate spindle reverse:** Rotates the spindle a set number of degrees in the reverse direction.

P101	Tightening strategy	**One stage:** Tightening is performed in one stage. Control is done from Cycle start until final target is reached. **Two stage:** Tightening is performed in two stages. Control is done from Cycle start until first target. The tool stops and accelerates to a lower speed, and controls until final target is reached. **Quick step:** Quick step is a variant of two-stage tightening. The difference is that speed changes directly from the higher speed to the lower speed without stopping. **Ergoramp:** 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.
P104	Rundown angle	Rundown angle is optional. If chosen, there are two alternatives. If Rundown angle is set From start, the rundown phase starts when the tool trigger is pressed, and continues until the torque value reaches Rundown complete. If Rundown angle is set From cycle start, the rundown phase starts when the torque level exceeds the Cycle start torque level and continues until Rundown Complete is reached.
P105	Zoom Step	This parameter connects the Zoom Step function. Zoom Step strategy combines quick tightening with high precision and low scatter.
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.
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 inputs.

P11x Torque Parameters

P110	Cycle start	Defines the starting level for a tightening cycle.
P111	First target	Defines the level at which the changeover takes place between the first and second stage in a two stage tightening or Quick step.
P112	Final tq min	Defines the lower torque limit for OK tightening.
P113	Final Target	Defines the desired final torque value when a torque control strategy is used. The tool shuts off when the final Target value is reached.
P114	Final tq max	Defines the upper torque limit for OK tightening. The tool shuts of if the torque value exceeds this value.
P115	Cycle complete	This parameter indicates the torque level when the tightening cycle is complete. When the torque falls below this level, a timer, [P141] End time, is started. Tightening is complete when the torque has fallen below the level for [P115] Cycle complete and when [P141] End time has been reached.
P116	Rundown complete	The torque level when the rundown phase is finished. (Only used if Rundown angle [P104] is selected).

P12x Angle Parameters

P120	Start final angle	Angle measurement starts when the torque value exceeds the Start final angle value. Start final angle must be selected equal to or greater than [P110] Cycle start.
P121	Measure angle to	Defines to what point the final angle shall be measured. The start point is always [P120] Start final angle. The end point can be selected to the following alternatives: **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 to cycle complete.

P122	Final angle min	This parameter indicates the lower limit for final angle. If the final angle falls below this level, the tightening is considered NOK.
P123	Target angle	Indicates the target value for the angle in degrees when angle control is used. When this value is reached the tool is turned off.
P124	Final angle max	Defines the upper limit for the tightening angle. If the angle exceeds this level the tightening is considered NOK.
P125	Rundown angle min	This parameter indicates the min limit value for Rundown angle. If the angle is smaller than this value at rundown complete, “low” is indicated and the tool will shut off.
P126	Rundown angle max	This parameter indicates the max limit value for Rundown angle. If the angle is larger than this value, “high” is indicated and the tool will shut off.

P13x Speed and Ramp

P130	Soft start speed	Defines the tool speed during the soft start interval. Allowed interval 5% - 30% of maximum tool speed.
P131	Step 1 speed	Defines the first step speed. Speed is adjustable between 5% -100% of max tool speed.
P132	Step 2 speed	Defines the second step speed. Speed is adjustable between 5% - 40% 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. If Quick step is used the tool changes to the step 2 speed directly without using a ramp.
P133	Loosening speed	Defines speed during loosening. The value is adjustable between 10% – 100%.
P134	Loosening ramp	Defines acceleration during loosening. The value is adjustable between 0% – 100%. A low percentage gives fast acceleration.

P135	Step 1 ramp	Defines Step 1 acceleration. The value is adjustable between 0% – 100%. A low percentage gives fast acceleration (0% is normally used).
P136	Step 2 ramp	Defines Step 2 acceleration. A low percentage gives fast acceleration (0-100%).
P137	Ergoramp	Defines the acceleration. The value is adjustable between 0% – 100%. Only used if Ergoramp is chosen as the tightening strategy [P101].
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 2% - 20%. To set Zoom step speed, parameter [P105] Zoom step must be active.

P14x Time Parameters

P141	End time	This parameter defines how long, after the torque level has dropped below [P115] Cycle complete, that Power Focus should remain active. Default is 0.2 seconds, which is sufficient in most cases. The value is adjustable between 0.1 s – 5.0 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 s – 5.0 s. Default is 0.2 seconds.
P143	Tool idle time	Defines the tool idling time between stages in a Multistage tightening. The value is adjustable between 0 s – 32 s. Default is 0 seconds.
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 s – 60.0 s. Default is 30 s.

P15x Batch count

P150	Batch count	Activates a function that measures how many times a tightening is repeated. It must be determined from where the Batch size value should be read, if the Batch count is activated. **Note!** If batch count is used in Job this parameter shall be set to off. **Off:** Batch count is not used. **Pset:** Use Psets Batch size. **FieldBus:** An external source decides Batch size via FieldBus. **Ethernet/Serial:** An external source decides Batch size via Ethernet or serial interface.
P151	Batch size	The size can be 1 – 99. To set Batch size, parameter [P150] Batch count must be active.
P152	Lock at batch OK	If this parameter is chosen, the tool will be locked when reaching “Batch OK”. Batch OK is reached when the number of correct tightenings is equal to Batch size.

P2xx Programming +

P20x	**Current monitoring**	Measures max compensated torque forming current during tightening as percentage of tool max torque.
P200	Current monitoring	Activates the function. The default value is NO.
P201	CM min	Defines min limit for OK tightening.
P201	CM max	Defines max limit for OK tightening.
P21x	**PVT self-tap**	This function makes it possible to tighten bolted joints where the torque during tightening is higher than the final target. For example, this may be the case when tightening self-tapping.
P210	Self-tap	Activates the function. The default value is NO.
P211	Self-tap interval	Defines the section where measuring is performed. Setting is performed in degrees in the interval 1 – 9999. Default value is 1.
P212	No. of self-tap windows	Defines the number of windows that the Self-tap interval [P211] is to be divided into. Each window is then evaluated separately. The number of windows can be chosen between 1 – 9999. Default value is 1.
P213	Self-tap min	This parameter 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 value to self-tap max. Default value is cycle complete.
P214	Self-tap 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 self-tap min to Tool max torque. Default value is tool max torque that means this parameter must be actively changed.
P22x	**PVT monitoring**	Measures PVT during on going tightening.
P220	PVT monitoring	Activates the function. The default value is NO.

P221	PVT delay interval	Defines delay before PVT monitoring starts. Setting is performed in degrees in the interval 0 – 9999. Default value is 0 degrees.
P222	PVT monitor interval	Defines the interval during which the PVT monitoring is to be performed. Setting is performed in degrees in the interval 1 – 9999. Default value is 1.
P223	No. of PVT windows	Defines the number of windows that the interval should be divided into. Each window is then evaluated separately. The number of windows can be chosen between 1 – 9999. Default value is 1.
P224	PVT min limit	The PVT min 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. Default value is cycle complete value.
P225	PVT max limit	PVT max is monitored in real-time during the monitor interval and if exceeded, an alarm is generated. Default value is rundown complete value.
P23x	**PVT compensate**	The PVT compensate value is used as a base reference for the torque used during tightening. This means that each registered torque value is added to the PVT value before it is compared to the programmed torque values. The different values for torque, for example, Final target and First target for 1st stage, are compensated with the PVT value. Also, the results are compensated.
P230	PVT compensate	Activates the function. The default value is NO. When PVT compensate is set to Yes, a prevailing torque PVT comp, measured at the interval of 20 samples preceding start of PVT comp point is used as the reference for the torque used during the actual tightening cycle. Any torque result is compensated (subtracted) with the prevailing value.
P231	PVT comp point	The value can be set between (0 – 9999) degrees. Default value is 10 degrees.

P24x	**Options**	
P240	Tool tightening direction	Select tool rotation direction. CW for right hand threaded screws and CCW for left hand threaded screws. To be able to start in the correct direction you must turn the tool direction ring to its correct position. This parameter has no effect when running an Open End tool (Tube Nut tool).
P241	Soft stop	Yes/No Reduces tool speed at the end of a tightening cycle. Yes is recommended.
P242	Alarm on Re-hit	Yes/No If selected, Power Focus 3000 will detect re-hits, error code E112. The red tool LED will be lit when a re-hit is detected. The criteria for a re-hit are a short or a non-existent second stage in combination with a slow speed in the first stage. Default is No.
P243	Alarm on Tq < target	Yes/No Decides if the tightening should be approved if the torque is lower than the final target. Default is No.
P244	Alarm on Lost trigger	Yes/No Decides if a lost tool trigger should abort the tightening. Default is No.
P245	DS torque tuning factor	Only used if DS con is chosen as control strategy [P101]. It compensates for the error that DS measurement induces. The value can be set between 80% and 220%. Default value is 100%.
P4xx	**Pset set-up**	
P40x	**Pset admin**	- View existing Pset - Create New Pset - Copy Pset - Delete Pset
P402	Name Pset	Name the Pset. Up to 25 characters. Default value is empty.
P406	Pset updated	Timestamp (date and time) for Pset latest modification. Not editable.

P5xx	**Statistic programming**	
P50x	**Statistic common parameters**	
P500	Min valid stat tq limit	The result must be greater than or equal to this limit value in order for it to be included in the statistical calculations.
P501	Max valid stat tq limit	The result must be less than or equal to this limit value in order for it to be included in the statistical calculations.
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 – 20.
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.

The following Pset parameters are statistical control limits. They can be entered manually or be calculated automatically by Power Focus 3000.

P504	Subgroup frequency	Defines the number of tightening results that are used for one of the statistics calculations.
P505	Latest n values	The latest number of values, 0 – 100.
P506	SPC alarm tq	With this parameter it is possible to switch on or off the torque SPC alarm function.
P507	SPC alarm Angle	With this parameter it is possible to switch on or off the angle SPC alarm function.
P508	SPC alarm CM	With this parameter it is possible to switch on or off the current SPC monitoring alarm function.
P51x	**SPC torque**	Statistic Process Control for torque.
P510	Torque X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually.

P511	Torque X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually.
P512	Torque range LCL	The lower control limit for range. Calculated automatically or entered manually.
P513	Torque range UCL	The upper control limit for range. Calculated automatically or entered manually.
P514	Torque X-bar-bar	The mean value for calculated mean values for groups of tightenings.
P515	Torque range-bar	The mean value for calculated mean ranges for groups of tightenings.
P52x	**SPC angle**	Statistic Process Control for angle.
P520	Angle X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually.
P521	Angle X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually.
P522	Angle range LCL	The lower control limit for range. Calculated automatically or entered manually.
P522	Angle range UCL	The upper control limit for range. Calculated automatically or entered manually.
P524	Angle X-bar-bar	The mean value for calculated mean values for groups of tightenings.
P525	Angle range-bar	The mean value for calculated mean ranges for groups of tightenings.
P53x	**SPC Rundown Angle**	Statistic Process Control for rundown angle. (Only active if Rundown angle is chosen [P04]).
P530	Rundown X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually.

P531	Rundown X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually.
P532	Rundown range LCL	The lower control limit for range. Calculated automatically or entered manually.
P532	Rundown range UCL	The upper control limit for range. Calculated automatically or entered manually.
P534	Rundown X-bar-bar	The mean value for calculated mean values for groups of tightenings.
P535	Rundown range-bar	The mean value for calculated mean ranges for groups of tightenings.
P54x	**SPC Self-tap**	Statistic Process Control for self-tap. (Only active if PVT Self-tap is selected [210]).
P540	Self-tap X-bar LCL	The lower control limit for mean value. Calculated automatically or entered manually.
P541	Self-tap X-bar UCL	The upper control limit for mean value. Calculated automatically or entered manually.
P542	Self-tap range LCL	The lower control limit for range. Calculated automatically or entered manually.
P542	Self-tap range UCL	The upper control limit for range. Calculated automatically or entered manually.
P544	Self-tap X-bar-bar	The mean value for calculated mean values for groups of tightenings.
P545	Self-tap range-bar	The mean value for calculated mean ranges for groups of tightenings.
P55x	**SPC PVT**	Statistic Process Control for prevailing torque. (Only active if PVT monitoring is chosen [220]).
P550	PVT X-bar LCL	The lower control limit for mean value.
P551	PVT X-bar UCL	The upper control limit for mean value.
P552	PVT range LCL	The lower control limit for range.

P552	PVT range UCL	The upper control limit for range.
P554	PVT X-bar-bar	The mean value for calculated mean values for groups of tightenings.
P555	PVT range-bar	The mean value for calculated mean ranges for groups of tightenings.
P56x	**SPC CM parameters**	
P560	CM (X-bar) LCL	Defines the low limit for the permitted values to be in the x-bar calculations.
P561	CM (X-bar) UCL	Defines the high limit for the permitted values to be in the x-bar calculations.
P562	CM R LCL	Defines the low limit for permitted variations in the range calculations.
P563	CM R UCL	Defines the high limit for permitted variations in the range calculations.
P564	CM (X bar)	Defines the wanted CM average for all of the subgroups. (In each subgroup the average tightened CM value is calculated. Then an average is calculated based on all of the averages.)
P565	CM (R bar)	Defines the desired average of the CM variation for all of the subgroups. (In each subgroup the average tightened CM variation is calculated. Then an average is calculated based on all of the averages.)

Multistage

M20x Multistage result properties

M200	Name	Specifies the name of the opened Multistage.
M201	Stage list	Stage list specifies the list of available Psets, input by the operator, that can be linked together into a Multistage. Executes the specified link list of Psets into a Multistage
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 **Off:** Batch count is not used. **Pset:** Use Psets Batch size. **FieldBus:** An external source decides Batch size via FieldBus. **Ethernet/Serial:** An external source sets Batch size via Ethernet or serial interface.
M203	Batch size	The Batch size specifies the number of Multistage tightenings in a batch. The range is 0-99.
M204	Lock at batch OK	When Lock at batch is set to yes, the tool is disabled until next Pset/Multistage is selected.
M205	Stop between stages	When Stop between stages is set to yes, tightening has an idle time between two consecutive stages. The idle time is specified in Tool idle time.
M206	Loosening on NOK	If the status of the Multistage tightening is NOK and Loosening on NOK is asserted, the tool runs in reverse direction to loosen the joint.
M210	Torque result	Specifies after which of the stages the final torque result shall be displayed. Default is last stage.
M211	Angle result	Specifies after which of the stages the final angle result shall be displayed. Default is last stage.
M212	Rundown result	Specifies after which of the stages the final rundown angle result shall be displayed. Default is last stage.

M213	Self-tap result	Specifies after which of the stages the final prevailing torque self-tap result shall be displayed. Default is last stage.
M214	PVT result	Specifies after which of the stages the final prevailing torque monitoring result shall be displayed. Default is last stage.
M215	CM result	Specifies after which of the stages the current monitoring result shall be displayed. Default is last stage.
M216	Trace	Specifies the point at which of the stages the graph results (trace diagram) are to be displayed. Default is last stage.
M22x	**Statistic common**	
M220	Min valid stat tq limit	0 Nm – 9999 Nm The result must be greater than or equal to this value to be included in the statistical calculations.
M221	Max valid stat tq limit	0 Nm – 9999 Nm The result must be less than or equal to this value to be included in the statistical calculations.
M222	Subgroup size	1 – 20 Defines the size of the subgroup that forms the basis for the statistical charts and control limits. If this parameter is changed, all the results have to be recalculated or deleted.
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 when enough results are collected. If this parameter is changed, all the results have to be recalculated or deleted.
M224	Subgroup frequency	1 – 7500 This parameter measures and stores a subgroup with a given range. It also indicates the number of subgroups that are disregarded between every stored subgroup.

M225	Latest n values	1 – 100 The number of tightening values which are included in statistical calculations.
M226	SPC alarm tq	On/Off This parameter switch the torque SPC alarm function on or off.
M227	SPC alarm angle	On/Off This parameter switch the angle SPC alarm function on or off.
M228	SPC alarm CM	On/Off This parameter switch the current monitoring SPC alarm function on or off.

18.2 Job

J200	Name	The name of the Job helps the operator to identify the different Jobs (Maximum 25 characters).
J201	Forced Job	When selecting “Forced job”, the included Psets are performed in the listed order.
J202	Job list / Edit Job	This parameter defines which Psets are included in a Job. Selected Psets must be available. Enable: When Forced order is selected the tightenings must be performed in the order specified in the Job list. Disable: If Forced order is not selected the tightening can be performed in any order (free order).
J203	Maxtime for first tightening	Specifies the time limit allowed from when the Job is selected until the first tightening is performed. If the time limit is exceeded the Job is aborted. This value is adjustable between 0 s – 9999 s, where 0 means no timer and is the default value.
J204	Maxtime complete Job	Specifies the time limit allowed from when the Job is selected until the Job is completed. If the time limit is exceeded the Job is aborted. This value is adjustable between 0 s – 9999 s, where 0 means no timer and is the default value.
J205	Batch count type	OK (default): 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.
J206	Lock at Job done	This parameter determines whether the tools shall continue to be operative following an approved (OK) Job. Enable: The tool will be disabled after the Job is performed. Disable: The tool will not be disabled after the Job is performed.

J207	Use line control	Line Control related inputs and outputs have only effect on a Job reference. A Line control start signal is an external signal that can be received by the Power Focus 3000 unit from a digital input. Enable: Power Focus will wait for an external signal before starting the Job. Disable (default): Line control is disabled.
J208	Repeat job	Enable (default): 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. Disable: The Job will not be restarted when it is completed.
J209	Tool loosening	This parameter determines if it will be allowed to loosen after a performed tightening according to the options above. Enable: Tool loosening is unlocked. Disable: Tool loosening is be locked. Enable only on NOK tightening: The tool loosening is enable when the performed tightening is not accepted. The tool loosening will be disable when the performed tightening is accepted.

18.3 Configuration

C10x Password & name

C100	Use Password	Prevents parameter updates on the Power Focus keyboard.
C101	Password entry scope	Tells which unit is allowed to enter the password. - ToolsTalk - All
C102	Config password	Choose a password, which will give write access to all parameters except those for the network.
C103	Network password	Choose a password, which will give write access to the network parameters.
C105	Ch ID number	Here you can indicate the number ID of the channel/system to which programming refers. Valid values are 0-20. 0 is only used for standalone PF.
C106	PF name	Name of the unit. You can use up to 20 characters.
C107	Cell ID	Cell identification number. Valid values are 0-1000.
C108	Cell name	Name of the HW group (Cell) name defines the cell that comprises the HW group. You can use up to 20 characters.
C109	Set date and time	

C11x Display set-up 1

C110	Config run display 1	Shows how the result after a tightening will be presented in a Graph. 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 that you want to follow.
C111	Config run display 2	Different layouts of display.

C12x Display set-up 2

C120	Language	Select language from a list that is available.

C121	Tq presentation unit	Select unit for showing torque. You can choose between Nm (set value), ft.lb, in.lb and kgfm.
C122	Viewing angle	Set the Graph display-viewing angle.
C123	Back light auto off	If Yes is selected, the lights on the graph display will turn off after 15 minutes of inactivity. The light will come on again after a button is pushed or after a tightening.
C124	Soft key enable	Here you connect and disconnect the menu selection buttons. When connected, the buttons have the functions shown above on the screen.
C126	Graph with angle offset	Defines if graph is shown with angle offset.

C13x Options

C130	Lock on reject	When Lock on reject is set to YES, the tool locks when a NOK tightening has occurred. The options are: Digin reset or Rev ring reset. To open tool use Digin reset or Rev ring reset. Default value is NO.
C131	Disable loosening at OK	Yes/No When yes, it is not possible to loosen the tightening at OK.
C132	Reset batch at Pset change	Yes/No. Default is Yes. Resets the batch counter when a new Pset is selected.

C15x Reset

C150	Delete all results	Tightening database and statistical database for the Power Focus is deleted.
C151	Total reset	Resets all programming, tightenings and statistics.

C16x Printer set-up

C160	Printer type	With parameter Printer type the printer is selected. Options are: IBM, HP and Epson.
C16	Paper size	With parameter Paper size the paper format is selected. Options are: A4 or US letter.
C162	Continuos print	With parameter Continuos print set to YES, the results after each tightening are automatically sent to the printer port.

C20x I/O device 0-7

C200	Internal I/O	Power Focus features four built-in digital inputs and relays. These parameters are used to configure the digital inputs and relays.
C201	Device 1	Here, for example, you can configure a Selector, an RE alarm or an I/O expander.
C202	Device 2	
C203	Device 3	
C204	Device 4	
C205	Device 5	
C206	Device 6	
C207	Device 7	

C21x I/O Device 8-15

C210	Device 8	See I/O device 0-7 [C20x].
C211	Device 9	
C212	Device 10	
C213	Device 11	
C214	Device 12	
C215	Device 13	
C216	Device 14	
C217	Device 15	

C22x Other I/Os

C220	Tool start select source	Selection of tool trigger start source: - Tool trigger - Digin - FieldBus - Syncstart
C221	Job select source	Selection of job start source: - Off - Digin - Ethernet/Serial - Identifier - FieldBus - PF/Keyboard

C222	Pset select source	Define from where you want to select the Psets: - Off - Selector - Digin - Ethernet/Serial - Identifier - FieldBus - PF Keyboard
C223	Tool light con source	Selection of tool light control source. Available options: - PF controlled:1 - PF controlled:2 - PF controlled:3
C224	Tool light mode	On/Off. Defines whether the tool LEDs should light for a specified period of time (on) or continuously (off) after a tightening. Default is Off.
C225	Tool light on timer	Select time for tool light signal, can be set between 0 and 300 sec. Only valid if tool light mode [C224] is on.
C226	Selector confirm	Define if the selector confirms selection of Psets. It is also used when selecting Psets in a job. Options: - Off - On - On with Ack.
C227	Job select source override	This parameter makes it possible to choose a method to override an already selected job. Possible options: - Off (default) - Digin - Ethernet/Serial - Identifier - FieldBus - PF/Keyboard

C30x Remote communication

C301	IP address	The IP address is a number for identification in a network.
C302	Subnet mask	Tells from which Subnet the Power Focus can be reached.
C303	Default router	IP address of the router used on the Subnet.

C304	Netmaster IP address	The Net Master IP address. The address should be written into each included Cell Master. The Net Master monitors and collects information from the Cell Masters included in the system.
C305	Cellmaster IP address	The Cell Master IP address. The address must be written into each included Cell Member. The Cell Master monitors and collects information from the units included in the Cell.
C306	Jobreference IP address	The Job Reference IP address. The address must be written into every included Job Member in the Job group The Job Reference monitors and collects information from the Job Members included in the Job group.
C307	Syncreference IP address	The Sync Reference IP address. The address must be written into every Sync Member. The Sync Reference monitors and collects information from the Sync Members included in the Cell.
C31x	**Advanced com**	
C310	Cell keep alive	Defines the timeout for the link handler between multicast messages. All Power Focus units in the factory should show the same time. Default value is 6 s.
C32x	**Serial ports set-up**	
C320	Serial 1 baudrate	Options: - 2400 - 4800 - 9600
C321	Serial 1 protocol	Options: - None - ASCII - 3964R
C322	Serial 2 baudrate	Options: 2400, 4800, 9600, 19 200, 38 400, 57 600, 155 200 kbit/s

C40x ToolsTalk set-up

C400	Port	Port number for ToolsTalk communication. Default value 6543.
C41x	**ToolsNet set-up**	A ToolsNet database registers and stores the results from tightenings, graphs, data and history. Each Power Focus unit 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.
C410	ToolsNet	Select ON/OFF. When ON, result after each tightening is recorded in ToolsNet.
C411	NetPC IP address	IP address for ToolsNet.
C412	Port	Port number for ToolsNet communication.
C413	Results	None/All/Not Ok The results reported to ToolsNet.
C414	Trace	None/All/Faulty The traces reported to ToolsNet.

C42x Multicast set-up

C420	Multicast	Multicast on/off.
C421	Multicast IP address	Multicast IP address, default value 225.6.7.8. It is possible to set this between 224.0.0.1 (all device on this sub net) and 239.255.255.255 (Multicast standard).
C422	Port	Port number for Multicast communication (default is 8086).
C423	Results	The results that are reported to the Multicast address.
C424	Graphs	The traces that are reported to the Multicast address.
C426	Sync status	Used if you want to send the sync status on multicast.
C427	Event status	Used if you want to send event code on multicast.

18.4 Diagnostic

D10x	**Tool General information**	
D100	Tool type	Shows the tool type, S or DS.
D101	Motor size	Shows information about the motor size in the tool. Type formats are: 4, 7, 9 or 4/7.
D102	Serial No	Shows the serial number of the tool.
D103	Gear ratio	Shows the mechanical gear ratio for the tool.
D104	Tool max torque	Shows the max 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. Note that tool max torque must only be changed if you have tool knowledge.
D105	User tool message	User tool message shows a user specified message string of maximum 35 characters. The message is stored in the tool memory. The value is possible to change if correct password privileges are met.
D11x	**Tool calibration**	
D110	Calibration value	Shows the calibration value stored in the tool.
D111	Calibration date	Shows the date and time for the last performed tool calibration.
D112	Set calibration value	This parameter performs a shunt calibration, writes a new calibration value and calibration date in the tool memory.
D114	Do motortuning	When selected, this parameter will perform motortuning on the connected tool.

D115	Normalisation value	Shows the normalisation value for the tool. The value is possible to change if correct password privileges are met. Valid limits are 1000 to 9999 Nm. Default value is 1000 Nm.
D12x	**Open End parameters**	
D120	Use Open End	Defines if a tool with an Open End head will be used. If open end is set to No, the remaining of the Open end parameters will not be available.
D121	Inverted motor rotation	Shows if the Open end has to use an inverted motor rotation.
D122	Open end tightening direction	Defines if Open end CW (clockwise) or CCW (counter clockwise) is to be used.
D123	Open end play	Shall show the open end play in degrees.
D124	Open end tune	Shall perform an open end tuning.
D13x	**Tools service**	
D130	Total number of tightenings	Total number of tightenings. This counter is never reset.
D131	Service indicator	If Yes, the Power Focus 3000 will alert the user when the service interval has expired.
D132	Number of tightening since service	The number of tightenings since last service.
D133	Service interval	Number of tightenings between services. Multiply the value by 10 000.
D134	Latest service date	The date of the latest performed service.
D135	Service counter reset	Resets the Number of tightenings since the tool was last serviced, sets Latest service date to current date and clears the service indicator alarm.

D2xx Controller Diagnostics

D20x Software information

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

D21x Hardware information

D210	PF3000 type	Shows the type of the Power Focus. Available types are: Compact, Graph and Colour.
D215	RBU type	The type of RBU. Available types are: Bronze, Silver and Gold. There are also customer specific RBUs.
D216	RBU serial number	Shows the serial number of the RBU (the hard coded, unique, MAC address).

D3xx System Diagnostics

D30x Transducer information

D300	Sensor tracking	Sensor tracking will monitor the torque and angle sensors in real-time and display the ongoing results.

D31x System I/O Diagnostic

D310	Relay status	Shows the usage and status of the relay devices.
D311	DigIn status	Shows the usage and status of the digital input devices.
D312	Relay test	Performs a test of the relays used. Note that it is not possible to have PF3000 in normal operation during the test.

18.5 FieldBus

F100	FieldBus type	There are four types of FieldBus available, DeviceNet, ProfiBus-DP, InterBus, ModBusPlus and Profibus. Default value is None.
F102 F103	From PF DataLength and To PF DataLength	From the Power Focus DataLength is the total string length from/to PLC to the Power Focus. The length must be the same as defined in the PLC and all in bytes. The maximum length defined in the Power Focus is 122 in both directions. The total length in Profibus cannot exceed 416 bytes. Because swap bytes are needed for some FieldBus types, only even numbers can be inputted here.
F110	Connection mode	This is the mode of network communication. There are three modes; Polled, BitStrobe and Change of Status. The setting must be the same as the scanner set-up.
F120	FB node address	It is possible to set Node address from 1 to 125.
F131	Set node address from	There are two possible choices: software and hardware. When software is chosen, the node address is set from user interface. When hardware is chosen, the node address only can be set from the switches on Profibus card.
F200	FB update interval	The interval can be between 0.05 and 10 s.
F300	Bitmap select	Bitmap select is used to map data in the correct way with the PLC monitoring. For DeviceNet, Intel Endian must be used. For Profibus, Motorola Endian must be used.

18.6 Identifier

I10x General set-up

I100	Identifier input source	Defines what source is to be accepted when a VIN number is to be read. Available options: - Off - Scanner - FieldBus - Ethernet/Serial - Ethernet/Serial & Scanner
I101	Set significant numbers	This parameter is a string of integers that tells the PF which positions to look at in the Identifier string. The string can have maximum 25 characters.
I102	Set identifier set-up	This parameter is a table that match each string to a Pset (or multistage) no or a Job no. No limit on the number of strings. Several strings can match the same Pset (or multistage) no, or Job no.
I103	Send identifier	This parameter will tell PF3000 that an identifier string is being sent from the identifier-input source.

I20x Card reader set-up

I200	Defines the type of identifier reader connected to the PF3000	Available options are - None - Euchner ident system

18.7 Sync

S10x	**Sync programming options**	Sync programming options are only available if the PF3000 is a sync master
S100	Sync group list	Used to view all existing Power Focus, and to add them to the sync group
S101	Sync tightening strategy	Defines what strategy to use for sync tightening. Available options: - Stage sync
S102	Sync loosening strategy	Defines what strategy to use for loosening. Available options: - Normal - Sync loosening
S103	Continue if sync failed	Used if you want to continue with the sync tightening even if some controller function is lost. Available options Yes or No.
S104	Sync OK time	Time between first and last draw. Permitted values between 0 and 13 s.

19 Event codes

19.1 Event code types

Event codes are displayed to inform the operator of what happens to the Power Focus 3000 unit and why it behaves the way it does.

Power Focus 3000 event codes can be classified in four categories:

1. Statistic event codes
2. Warning event codes
3. Event codes that must be acknowledged
4. Fatal event codes

The event codes are recorded in either the Statistics event log or the General event log (depending on the event code type). Each log can store up to 100 event codes in total.

19.1.1 Statistic event codes

Statistic event codes show the operator that the running process does not meet requirements. When this type of event occurs, the STAT LED on the Power Focus 3000 unit is turned on. Statistic event codes are recorded and stored in the statistic event log, which can be accessed from the view menu of Power Focus 3000 Graph or by clicking the StatAlarm button in ToolsTalk.

19.1.2 Warning event codes

Warning event codes show the operator that although the current settings are not optimal, it is still possible to run the tool, if the tool is not locked. This type of event code disappears from the Power Focus unit’s display after 3 seconds or when it is acknowledged. Warning event codes are recorded and stored in the General event log, which can be accessed from the view menu of Power Focus 3000 Graph or from the Options menu in ToolsTalk.

19.1.3 Event codes that must be acknowledged

These event codes show the operator that it is not possible to run the tool with the present settings. The event codes remains displayed until they are acknowledged. Acknowledge the event by using the buttons on the Power Focus unit, ToolsTalk, or the digital inputs. Event codes that must be acknowledged are recorded and stored in the General event log. The General event log can be accessed from the view menu of Power Focus Graph or from the Options menu in ToolsTalk.

19.1.4 Fatal Event Codes

If a fatal event code occurs, an event that prevents operation of the unit has been detected. The unit is required to be power cycled (and get the problem related to the displayed event code solved) before it is possible to proceed. Fatal event codes are recorded and stored in the General event log, which can be accessed from the view menu of Power Focus 3000 Graph or from the Options menu in ToolsTalk.

19.2 Event Groups

Event code	Group	Description
E000-E099	**0**	Rundown failures
E100-E199	**1**	Event-related errors
E200-E299	**2**	User input error
E300-E399	**3**	Statistical errors
E400-E499	**4**	Communication errors
E500-E599	**5**	Hardware errors TOOL
E600-E699	**6**	Hardware errors DC3000/MC3000
E700-E799	**7**	Hardware errors
E800-E899	**8**	Software errors
E900-E999	**9**	Errors MMI3000

19.3 Event code list

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E000-E099: Rundown errors							
E001	Torque LO	2	-	-	-	-	
E002	Torque HI	2	-	-	-	-	
E003	Torque measurement possibly invalid	2	-	-	-	-	
E004	Angle1 LO	2	-	-	-	-	
E005	Angle1 HI	2	-	-	-	-	
E006	Angle2 LO	2	-	-	-	-	
E007	Angle2 HI	2	-	-	-	-	
E100-E199: Event-related errors							
E101	Pset invalid (check sum error)	3	ACK	-	-	-	
E102	Rundown prohibited due to Lock on Reject	2	-	-	TNR	LCK	This error code is displayed after a NOK tightening when the function Lock on Reject is activated. In this case the tool is disabled, the tool can be unlocked with a digital input or with the tool ring.
E103	Forward direction prohibited via digital input	2	-	-	TNR	LCK	The forward direction is prohibited via the digital input.

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E104	Reverse direction prohibited	2	-	-	-	-	The reverse direction is prohibited via digital input or in Job mode. The reverse direction is prohibited in job mode when Lock at Job Done is selected or batch mode is configured to NOK+OK.
E105	Reverse direction prohibited via ToolsTalk	2	-	-	-	-	The reverse direction is prohibited via Tools Talk.
E106	Rundown prohibited due to active CycleHold	2	-	-	TNR	LCK	The tool is locked due to Cycle hold.
E107	Rundown prohibited due to Line Control, batch not enabled	2	-	-	TNR	LCK	A job using Line Control is selected. The job does not start until Line Control Start signal is received.
E108	Rundown prohibited due to keypad usage	2	-	-	TNR	-	
E109	Pset revision not supported by this SW	2	-	-	TNR	-	
E110	Configuration revision not supported by this SW	2	-	-	TNR	-	
E111	MC Rundown timeout	2	-	-	-	-	The rundown was not terminated before the drive time out (2 minutes).
E112	Rehit	2	-	-	-	-	
E113	Current limit reached – Rundown aborted	2	ACK	PFNR	TNR	-	The current limit has been reached; the drive is disabled.
E114	OpenEnd Reference position not found	3	ACK	PFNR	TNR	-	
E115	Direction uncertain	2	-	-	-	-	
E116	SelfTap maxtorque reached – Rundown aborted	2	-	-	-	-	
E120	MC Motortuning failure	3	ACK	PFNR	TNR	-	Motor tuning failed. The trigger could have been released before the end of the motor tuning or the tool has a defect.
E121	OpenEnd tuning failure	3	ACK	PFNR	TNR	-	This error indicates that the open end tuning command has not been successfully performed. Either the command was aborted by the operator or the command could not be performed for any other reason.
E122-123							
E126	Multistage aborted	2	-	-	-	-	This error 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…).
E127	PVT shut off	2	-	-	-	-	This error indicates that the drive was shut off in the Self-tap or prevail phase of the rundown.
E128	Trigger lost	2	-	-	-	-	When the function Trigger lost is activated in the Pset, this error indicates that the trigger of the tool was released before final target.

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E129	Torque lower than target	2	-	-	-	-	When the function torque lower than target is activat ed in the Pset, this error 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			PFNR	TNR	-	Post view torque conditions were not fulfilled.
E131	Tool Disconnected	4	ACK	PFNR	TNR	-	This error indicates that the tool is not connected to the controller or that the tool cable has been damaged.
E132	Wrong tool start input setting	2	ACK	PFNR	TNR	-	1) Check if the remote start wiring in the PFis correctly set in accordance to the settings in the Configuration parameters (C220). 2) Check if the tool trigger is constantly pressed or if there is some malfunction in the tool.
E133	Forward direction prohibited via ToolsTalk	2	-	-	TNR	LCK	The forward direction is prohibited via Tools Talk.
E134	MC Target input active at start attempt	2	-	-	TNR	-	The target signal is active in the drive though the tightening has been acknowledged by the CC-card
E135	MC No start Ack from CC	2	-	-	TNR	-	No start acknowledgement has been received by the MC drive from the CC-card (timeout 32s)
E136	Rundown prohibited due to batch locked	2	-	-	TNR	LCK	This error is displayed if the function lock at batch OK is enabled and when the batch is completed. The tool can only be unlocked via a digital input.
E137	Rundown prohibited via field bus	2	-	-	TNR	LCK	The rundown is prohibited via field bus.
E138	Wrong tool start input source	2	-	-	TNR	-	It is only possible to start the tool from the selected tool start select source.
E139	Rundown prohibited via Open protocol	2	-	-	TNR	LCK	The rundown is prohibited via Open protocol
E140	Insert user ID card to release tool	2	-	-	TNR	LCK	The tool is locked, the user must insert his ID card in the card reader to release the tool
E141	MC Current Monitoring torque deviation	3	ACK	PFNR	TNR	-	
E142	MC SyncroTorque diffstop	2	-	-	-	-	
E150	Job client does not respond	2	-	-	-	-	When running a Cell Job, this error is displayed by the job master when one of the job members does not respond.
E151	Job in OFF mode	2	-	-	-	-	It is not possible to select a new job, the PF3000 is in Job Off mode.
E152	PF locked in job mode	2	-	-	TNR	LCK	This error appears when in a forced cell job an attempt is made to tighten with a controller which is not currently active or when a controller has performed all tightenings.
E153	Not Ok to select new job	2	-	-	-	-	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	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E154	Remote job running	2	-	-	-	-	When running a Cell Job, this is displayed by the job members when a cell job is selected on the job master.
E155	Remote job aborted	2	-	-	-	-	When running a Cell Job, This is displayed by the job members when a cell job is aborted.
E156	Job members lost	2	-	-	-	-	When running a Cell Job, this is displayed by the master when it has lost contact with one of its job member.
E157	Job reference lost	2	-	-	-	-	When running a Cell Job, this is displayed by the job members when they have lost contact with their Job Master.
E158	Invalid Job Id	2	-	-	-	-	When the selected job does not exist.
E159	No Pset In Selected Job	2	-	-	-	-	When the selected job does not contain any Pset.
E160	Job select source not valid	2	-	-	-	-	Attempt to select a Job with the wrong input source.
E161	Line Control Alert 1	2	-	-	-	-	The line control has been activated, and the first control alert limit has been reached.
E162	Line Control Alert 2	2	-	-	-	-	The line control has been activated, and the second control alert limit has been reached.
E180	Euchner Ident System only supports Siemens 3964R protocol	2	-	-	-	-	The protocol settings for the serial COM port 1 is not set to 3964R, it is not possible to use the Euchner Ident System with this configuration
E181	Not possible to read ID card	2	-	-	-	-	It was not possible to read the ID card inserted in the Euchner system
E200-E299: User input error							
E201	First target > Final target	2	-	-	TNR	-	
E202	Final target > Tool max torque	2	-	-	TNR	-	
E203	First target < XX % of tool max torque	2	-	-	TNR	-	
E204	Final target < YY % of tool max torque	2	-	-	TNR	-	
E205	Pset not open	2	-	-	TNR	-	
E206	Pset number invalid	2	-	-	TNR	-	An attempt was made to do a tightening with the wrong Pset within a job.
E207	Wrong Pset Select Source	2	-	-	-	-	Attempt to select Pset from a source not specified in the Cset.
E208	Not Ok to select new Pset	2	-	-	-	-	It is not allowed to select new Pset when the already selected Pset is auto selected by Job.
E233	Final target range error	2	-	-	TNR	-	This error code is displayed when an attempt is made to tighten with a final target out of range (larger than tool max torque or 9999).
E234	Start final angle range error	2	-	-	TNR	-	This error code is displayed when an attempt is made to tighten with a start final angle out of range.

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E235	Target angle range error	2	-	-	TNR	-	
E236	Configuration set inconsistent	3	ACK	PFNR	TNR	-	This error code is displayed if one device on the IO bus has the right Id but the wrong type (for example a selector is connected and a re-alarm is configured).
E237	Strategy Configuration error	2	-	-	TNR	-	No valid control strategy was chosen for the stored Pset.
E238	Not possible to run a multistage with a click wrench Pset	2	-	-	TNR	-	An attempt was made to perform a multistage tightening containing at least one Pset with a click wrench strategy.
E240	Password Incorrect Input Source	2	-	-	-	-	The password is entered from an invalid source according to the configuration.
E241	Password Access Denied	2	-	-	-	-	
E242	Password Locked Out	2	-	-	-	-	
E250	Maxtime for first tightening run out (job)	2	-	-	-	-	This message is displayed and the job is terminated if the first tightening is not performed within the specified time.
E251	Maxtime to complete job run out	2	-	-	-	-	This message is displayed and the job is terminated if the job is not completed within the specified time.
E300-E399: Statistical errors							
E333	Not allowed subscription	1	-	-	-	-	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	1	-	-	-	-	The Pset strategy is not suitable to calculate statistics (no strategy is chosen, DS control…)
E335	Not enough data	1	-	-	-	-	No enough data were available to calculate the statistic control limits.
E336	Mem alloc fail	1	-	-	-	-	It was not possible to allocate enough memory for the statistic subscription.
E340	Xucl tq	1	-	-	-	-	The last subgroup mean torque value is larger than the upper control limit.
E341	Xlcl tq	1	-	-	-	-	The last subgroup mean torque value is lower than the lower control limit.
E342	Rucl tq	1	-	-	-	-	The last subgroup range torque value is larger than the upper control limit.
E343	Rlcl tq	1	-	-	-	-	The last subgroup range torque value is lower than the lower control limit.
E344	Cp tq	1	-	-	-	-	The torque Cp is lower than 2.
E345	Cpk tq	1	-	-	-	-	The torque Cpk is lower than 1,33.
E346	7inc x tq	1	-	-	-	-	Trend deviation alarm, the subgroup torque mean value has increased 7 times consecutively.
E347	7dec x tq	1	-	-	-	-	Trend deviation alarm, the subgroup torque mean value has decreased 7 times consecutively.
E348	7inc r tq	1	-	-	-	-	Trend deviation alarm, the subgroup torque range value has increased 7 times consecutively.

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E349	7dec r tq	1	-	-	-	-	Trend deviation alarm, the subgroup torque mean value has decreased 7 times consecutively.
E350	7above x tq	1	-	-	-	-	Trend deviation alarm, the subgroup torque mean value has been above the average mean value of the average of the last ten subgroups 7 times consecutively.
E351	7below x tq	1	-	-	-	-	Trend deviation alarm, the subgroup torque mean value has been below the average mean value of the average of the last ten subgroups 7 times consecutively.
E352	7above r tq	1	-	-	-	-	Trend deviation alarm, the subgroup torque range value has been above the average range value of the average of the last ten subgroups 7 times consecutively.
E353	7below r tq	1	-	-	-	-	Trend deviation alarm, the subgroup torque range value has been below the average range value of the average of the last ten subgroups 7 times consecutively.
E354	2sigma x tq	1	-	-	-	-	Trend deviation alarm, the last subgroup torque average is outside Xtq-bar-bar – 2 sigma.
E355	2sigma r tq	1	-	-	-	-	Trend deviation alarm, the last subgroup torque range average is outside Rtq-bar-bar – 2 sigma.
E360	Xucl ang	1	-	-	-	-	The last subgroup mean angle value is larger than the upper control limit.
E361	Xlcl ang	1	-	-	-	-	The last subgroup mean angle value is lower than the lower control limit.
E362	Rucl ang	1	-	-	-	-	The last subgroup range angle value is larger than the upper control limit.
E363	Rlcl ang	1	-	-	-	-	The last subgroup range angle value is lower than the lower control limit.
E364	Cp ang	1	-	-	-	-	The angle Cp is lower than 2.
E365	Cpk ang	1	-	-	-	-	The angle Cpk is lower than 1,33.
E366	7inc x ang	1	-	-	-	-	Trend deviation alarm, the subgroup angle mean value has increased 7 times consecutively.
E367	7dec x ang	1	-	-	-	-	Trend deviation alarm, the subgroup angle mean value has decreased 7 times consecutively.
E368	7inc r ang	1	-	-	-	-	Trend deviation alarm, the subgroup angle range value has increased 7 times consecutively.
E369	7dec r ang	1	-	-	-	-	Trend deviation alarm, the subgroup angle mean value has decreased 7 times consecutively.
E370	7above x ang	1	-	-	-	-	Trend deviation alarm, the subgroup angle mean value has been above the average mean value of the average of the last ten subgroups 7 times consecutively.
E371	7below x ang	1	-	-	-	-	Trend deviation alarm, the subgroup angle mean value has been below the average mean value of the average of the last ten subgroups 7 times consecutively.

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E372	7above r ang	1	-	-	-	-	Trend deviation alarm, the subgroup angle range value has been above the average range value of the average of the last ten subgroups 7 times consecutively.
E373	7below r ang	1	-	-	-	-	Trend deviation alarm, the subgroup angle range value has been below the average range value of the average of the last ten subgroups 7 times consecutively.
E374	2sigma x ang	1	-	-	-	-	Trend deviation alarm, the last subgroup angle average is outside Xang-bar-bar – 2 sigma.
E375	2sigma r ang	1	-	-	-	-	Trend deviation alarm, the last subgroup angle range average is outside Rang-bar-bar – 2 sigma.
E380	Xucl cm	1	-	-	-	-	
E381	Xlcl cm	1	-	-	-	-	
E382	Rucl cm	1	-	-	-	-	
E383	Rlcl cm	1	-	-	-	-	
E384	Cp cm	1	-	-	-	-	
E385	Cpk cm	1	-	-	-	-	
E386	7inc x cm	1	-	-	-	-	
E387	7dec x cm	1	-	-	-	-	
E388	7inc r cm	1	-	-	-	-	
E389	7dec r cm	1	-	-	-	-	
E390	7above x cm	1	-	-	-	-	
E391	7below x cm	1	-	-	-	-	
E392	7above r cm	1	-	-	-	-	
E393	7below r cm	1	-	-	-	-	
E394	2sigma x cm	1	-	-	-	-	
E395	2sigma r cm	1	-	-	-	-	
E400-E499: Communication errors							
E401	Duplicate device IDs on IO bus	3	ACK	PFNR	TNR	-	Two IO devices with the same Id are present on the I/O bus.
E402	IO bus restarted	3	ACK	PFNR	TNR	-	The IO bus has been restarted.
E403	IO device not responding	2	ACK	PFNR	TNR	-	The I/O device is not properly connected or the Id of the device is not the same as the one configured.
E404	Selector is not connected or not responding	3	ACK	PFNR	TNR	-	The selector is not properly connected or the Id of the selector is not the same as the one configured.
E405	IO Expander is not connected or not responding	3	ACK	PFNR	TNR	-	The I/O expander is not properly connected or the Id of the I/O expander is not the same as the one configured.
E406	RE-alarm is not connected or not responding	3	ACK	PFNR	TNR	-	The Remote alarm is not properly connected or the Id of the Remote alarm is not the same as the one configured.
E408	Multiple devices of same type on IO bus	3	-	-	TNR	-	

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E409	Multiple selectors on IO bus	3	-	-	TNR	-	
E410	No selector found and Pset source is IO bus	3	-	-	TNR	-	
E411	Rotary selector has ID <> 1	3	-	-	TNR	-	
E412	IO expander has ID <> 2	3	-	-	TNR	-	
E413	RE Alarm has ID <> 3	3	-	-	TNR	-	
E414	Remote display has ID <> 4	3	-	-	TNR	-	
E415	4socket selector has ID <> 5	3	-	-	TNR	-	
E416	8socket selector has ID <> 6	3	-	-	TNR	-	
E433	No RBU present	4	ACK	PFNR	TNR	-	No RBU detected at start -up or RBU found missing at runtime.
E434	RBU Timeout	4	ACK	PFNR	TNR	-	RBU did not respond to command from PF.
E438	RBU file mismatch	4	ACK	PFNR	TNR	-	A file with incorrect name or size was returned to a read request.
E439	RBU signal mismatch	4	ACK	PFNR	TNR	-	An unexpected signal received by the RBU Manager in Idle status.
E440	RBU no files	4	ACK	PFNR	TNR	-	
E441	RBU no answer	4	ACK	PFNR	TNR	-	
E442	RBU no such file	4	ACK	PFNR	TNR	-	
E443	RBU full	4	ACK	PFNR	TNR	-	
E444	RBU packet rejected	4	ACK	PFNR	TNR	-	RBU responds with an answer not matching the last request. This is probably due to duplicates sent when the PF does not acknowledge packages.
E445	RBU corrupt	4	ACK	PFNR	TNR	-	
E446	RBU read error	4	ACK	PFNR	TNR	-	
E447	RBU write error	4	ACK	PFNR	TNR	-	
E448	RBU delete error	4	ACK	PFNR	TNR	-	
E449	RBU flush error	4	ACK	PFNR	TNR	-	RBU Erase failed.
E450	RBU list error	4	ACK	PFNR	TNR	-	
E451	RBU Update Failed	4	ACK	PFNR	TNR	-	One of the database processes failed to synchronise the NVRAM with the RBU.
E460	FieldBus Type Mailbox Message Fault	3	-	-	TNR	-	
E461	FieldBus Type Gen Com Fault	3	-	-	TNR	-	
E462	FieldBus Mailbox Message Fault	3	-	-	TNR	-	
E463	FieldBus Gen Com Fault	3	-	-	TNR	-	
E464	FieldBus Hardware Fault	3	ACK	PFNR	TNR	-	The FieldBus module is broken and has to be replaced.
E465	FieldBus Dip switch Error	3	-	-	TNR	-	The software tries to configure the value of node address or baudrate, But the address switch on the FieldBus module is not in the right position to enable software setting. Set switches in the right position, then turn on the power.
E466	FieldBus Offline	2	-	-	-	-	The FieldBus went from Online to Offline. This is just a warning.
E467	FieldBus Configuration Fault	3	-	-	TNR	-	

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E468	FieldBus Hardware Mismatch	3	-	-	TNR	-	The FieldBus module installed in PF 3000 is not the same FieldBus type as configured with TTPF. Change FieldBus module or configuration to get a match.
E469	FieldBus Init Error	3	-	-	TNR	-	
E470	FieldBus PCP error	2	-	-	TNR	-	
E480	Channel Id not valid	4	ACK	PFNR	TNR	-	The channel Id configured is not within the limits permitted. The channel Id must configured between 1 and 20.
E481	Cell member registration failed	3	ACK	PFNR	TNR	-	The cell member registration failed because one cell member is already registered with the same channel Id.
E490	Cell Id not valid	4	ACK	PFNR	TNR	-	The cell Id configured is not within the limits permitted. The cell Id must configured between 1 and 999.
E491	Net member registration failed	3	-	-	TNR	-	The net member registration failed because one net member is already registered with the same cell Id.
E500-E599: Hardware errors TOOL							
E501	Tool overheated	2	-	PFNR	TNR	-	The tool is too hot the drive is disabled.
E502	Tool service interval expired	3	-	-	TNR	-	
E511	Tool-PF3000 size mismatch	4	ACK	PFNR	TNR	-	Mismatch between the tool and the controller (for example S4/S7 tool connected to a S9 controller).
E512	Tool revision not supported by this drive SW	4	ACK	PFNR	TNR	-	The tool is supported by the drive (drive version too old).
E513	Tool EEPROM corrupt – service tool	4	ACK	PFNR	TNR	-	
E514	Tool EEPROM corrupt – Motortune	4	ACK	PFNR	TNR	-	
E515	Tool commutation sensor error	4	ACK	PFNR	TNR	-	Commutation sensor failure.
E516	Rotor magnet remains out of range	4	ACK	PFNR	TNR	-	Rotor magnet remains out of range.
E517	Tool maxtorque or Gear Ratio out of range	4	ACK	PFNR	TNR	-	
E518	Tool normalisation out of range	4	-	PFNR	TNR	-	
E534	Illegal data error (Current monitoring)	2	ACK	PFNR	TNR	-	
E535	Torque transducer error	2	ACK	PFNR	TNR	-	Cables to transducer cut off or shorted.
E536	No transducer (sensor)	2	ACK	PFNR	TNR	-	Cables to transducer cut off or shorted.
E537	Calibration not OK, offset outside limits	2	ACK	PFNR	TNR	-	Calibration limits out of bounds.
E538	Calibration not OK, CalVal outside limits	2	ACK	PFNR	TNR	-	Calibration value outside limits.
E539	Calibration not OK, Offset changed > 5% of max value since last calibration	2	-	-	-	-	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	2	-	-	-	-	Calibration not OK, calibration value changed > 5% of max value since last calibration.

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E541	Other calibration error	2	ACK	PFNR	TNR	-	
E600-E699: Hardware errors DC3000/MC3000							
E601	Dcbus LO at start of rundown	3	ACK	PFNR	TNR	-	DC voltage too low
E602	Dcbus HI during rundown	3	ACK	PFNR	TNR	-	DC voltage too high
E603	DC3000 overheated	2	-	-	TNR	-	The drive is too hot, drive disabled
E604	24V output error	4	ACK	PFNR	TNR	-	24 V output disabled (overload or short circuit)
E605	Dcbus HI at start of rundown	3	-	PFNR	TNR	-	
E611	DC3000 EEPROM corrupt (csum error)	4	ACK	PFNR	TNR	-	
E612	MC3000 EEPROM corrupt (csum error)	4	ACK	PFNR	TNR	-	
E613	Config1 EEPROM corrupt (csum error)	4	ACK	PFNR	TNR	-	
E614	FirmWare corrupt (csum error etc)	4	ACK	PFNR	TNR	-	Firmware corrupt (check sum error)
E615	Option definition HW/SW mismatch	4	ACK	PFNR	TNR	-	
E616	Current measurement offset error	4	ACK	PFNR	TNR	-	
E617	Current measurement gain error	4	ACK	PFNR	TNR	-	
E633	SW mismatch CC <-> MC: Too old MC SW	4	ACK	PFNR	TNR	-	
E634	SW mismatch CC <-> MC: Too old CC SW	4	ACK	PFNR	TNR	-	
E700-E799: Hardware errors							
E700	PF started	2	-	-	-	-	This error code is only visible in the error log and used when the PF3000 is started.
E800-E899: Software errors							
E801	Database incompatible with PF software	4	ACK	PFNR	TNR	-	
E802	NVRAM range check error	4	ACK	PFNR	TNR	-	
E803	NVRAM size check error	4	ACK	PFNR	TNR	-	
E804	Database is corrupt	4	ACK	PFNR	TNR	-	
E805	(PF Model unknown)	4	ACK	PFNR	TNR	-	This error is displayed after start-up when the RBU is missing, or when the RBU revision cannot be supported by the controller (e.g bronze RBU on a graph unit), or when the RBU license file is missing or cannot be read by the boot code.
E806	Failed to read from NVRAM	2	-	-	-	-	
E807	Failed to write to NVRAM	2	-	-	-	-	
E811	DPRAM range check error	4	ACK	PFNR	TNR	-	
E821	No calibration ACC from control	4	ACK	PFNR	TNR	-	Tightening initialisation phase failed. Hardware failure.
E822	No Job ACC from control	4	ACK	PFNR	TNR	-	Tightening initialisation phase failed. Hardware failure.

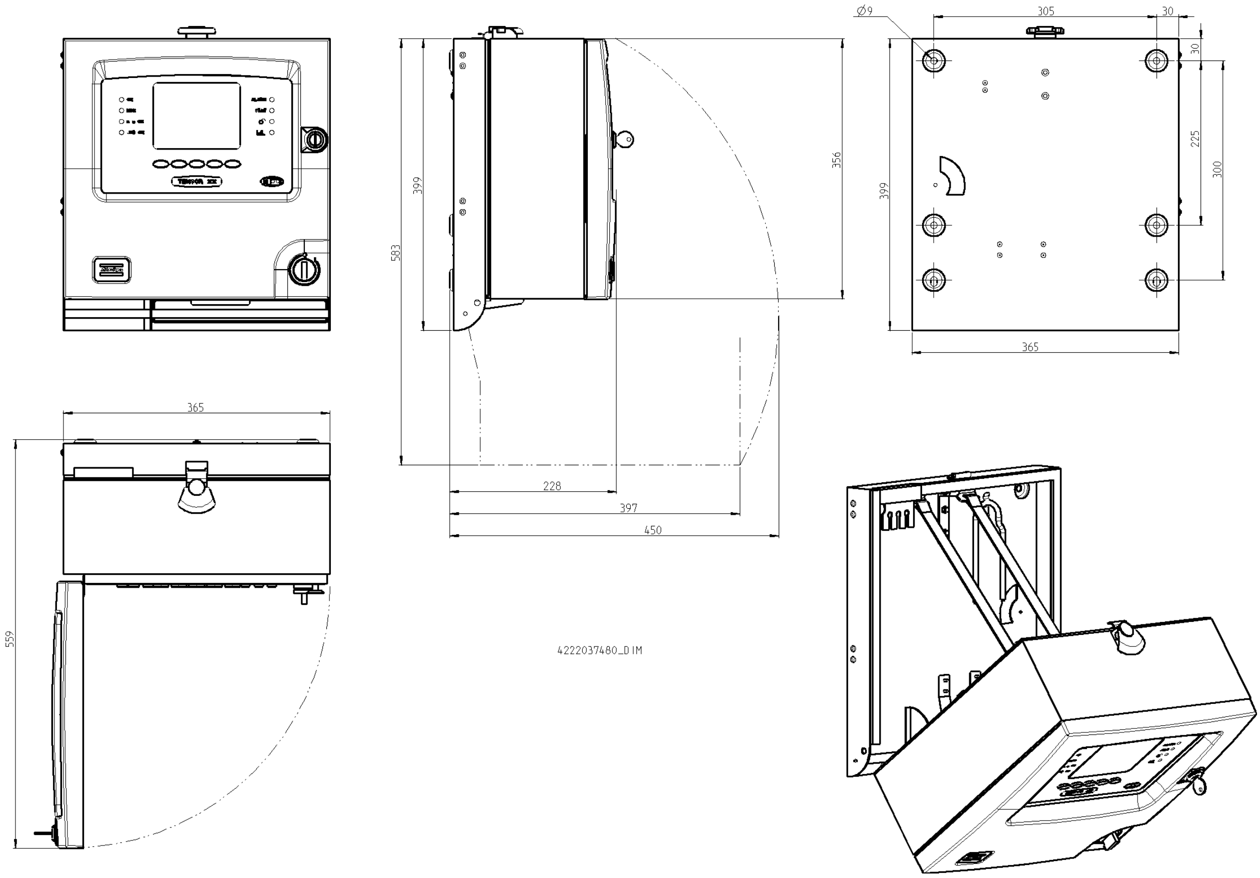
Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E823	No calibration result	4	ACK	PFNR	TNR	-	No calibration was received from the drive during the tightening initialisation phase (timeout 100 ms).
E824	Cycle abort timeout	2	-	-	-	-	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	2	-	-	-	-	Auto set could not be executed, the angle results of the tightening performed were null.
E832	Autoset small angle	2	-	-	-	-	Auto set could not be executed, the angle results of the tightening performed were too small (lower than 15 degrees).
E833	Autoset tight NOK result	2	-	-	-	-	The Auto set could not be executed, four NOK tightenings were performed.
E834	Autoset rejected Pset in CCW direction	2	-	-	-	-	The Auto set was not allowed by the PF3000 for this Pset because the Pset was configured in the CCW direction. Auto set is only permitted on CW Pset.
E840	Feature Not Available In Software Revision	2		-	-	-	This error is displayed if when attempt is made to run multistage with a bronze version, or handle a Pset with a Pset ID larger than the max number of Pset (larger than 64 in a bronze version or larger than 250 in a silver or gold version).
E851	Connection with Tools Net server lost	2	-	-	-	-	The connection with the Tools Net server was lost, the PF3000 is trying to reconnect. The Tools Net server might be down or it might be an Ethernet cable problem.
E855	Connection fatal error			-	-	-	
E856	Router unreachable	3		-	-	-	The router programmed in the configuration setting could not be reached. Check the network configuration and in particularly the sub net mask and the default router.
E857	Reboot needed before changes take effect	3		-	-	-	The configuration changes will not take effect before a system reboot.
E858	IP address already in use	3	ACK	-	-	-	The IP address of this PF3000 is already in use by another system.
E859	IP address collision	2	-	-	-	-	Another system attempts to use the same IP address as this PF3000.
E860	Memory Allocation Error	2	-	-	-	-	It was not possible to allocate enough memory to allow the Tools Net process to set a result subscription.
E862	Ethernet overload Error	2		-	-	-	The Ethernet driver of the PF3000 is switched off due to an overloaded network.
E863	IP Port already in use	3	ACK	-	-	-	An attempt was made to bind a TCP or UDP socket to a port already in use. For instance, a customer protocol might be using the same port as ToolsTalk.

Event code	Short description (graphic display)	Category	Acknowledgement	PF not ready	Tool not ready	Tool locked	Information
EXXX	"Text"	1 / 2 / 3 / 4	ACK / -	PFNR / -	TNR / -	LCK / -	"Text"
E870	Syncmember registration failure	2	-	-	TNR	-	The sync member registration failed. Two sync members can have the same channel id or one PF3000 with a sync reference IP address is missing in the sync list.
E871	Syncmaster configuration failure	2	-	PFNR	TNR	-	The master channel id is not first in the sync list.
E872	Sync initialisation failure	2	-	-	TNR	-	The tightening synchronisation initialisation failed. Check the CAN bus cable, check that all the sync members have the same active pset, check the external start bridge…
E873	Synchrotork not yet implemented	2	-	-	TNR	-	
E891	Precondition Failed	2	-	-	TNR	-	
E892	Postcondition Failed	2	-	-	TNR	-	
E893	Check violation	2	-	-	TNR	-	
E894	Software Warning	2	-	-	TNR	-	
E900-E999: Errors MMI3000							
E901	MMI Start-up Error	4	ACK	PFNR	TNR	-	
E902	Printer start-up error	4	ACK	PFNR	TNR	-	
E903	Incorrect ToolsTalk Version	2	-	-	-	-	The Tools Talk version is not compatible with the current PF3000 software.
END							

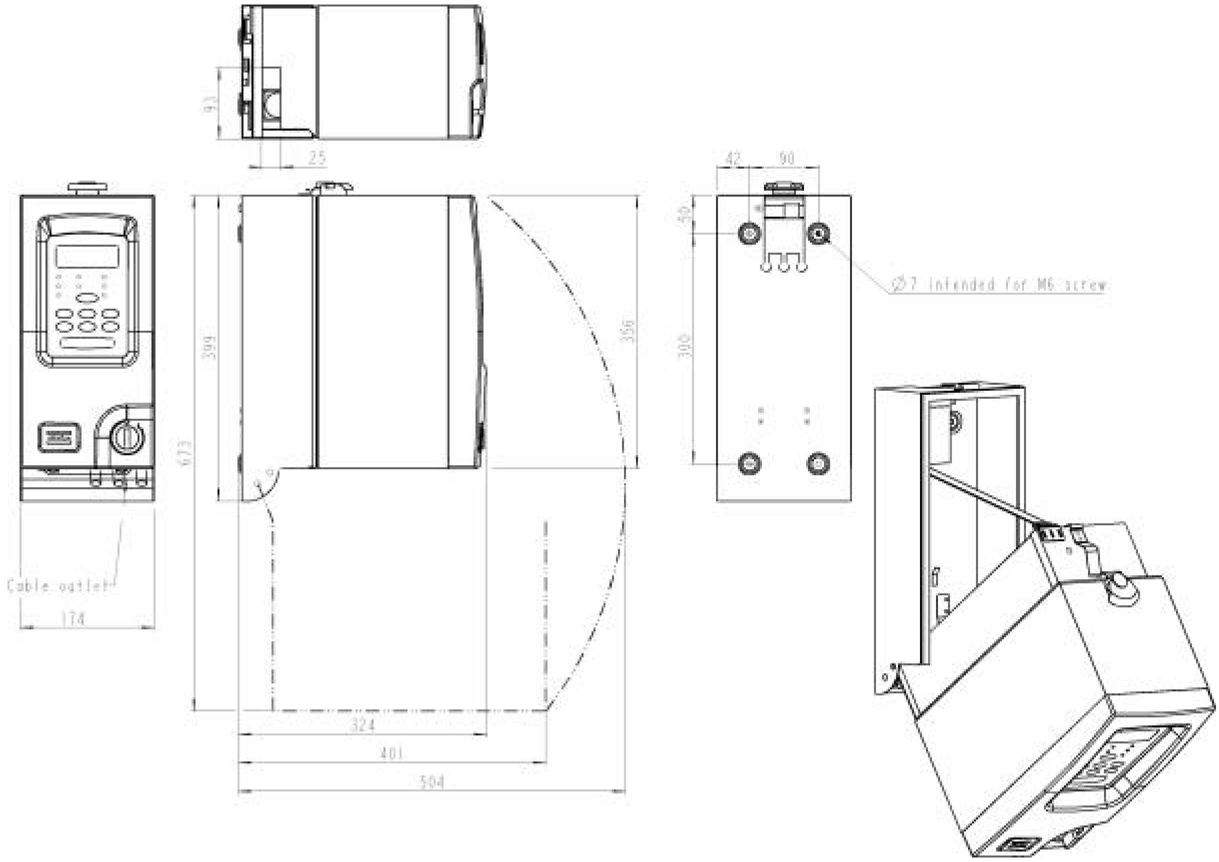
20 Hardware Description

20.1 Dimension Drawings

20.1.1 Power Focus 3000 Graph



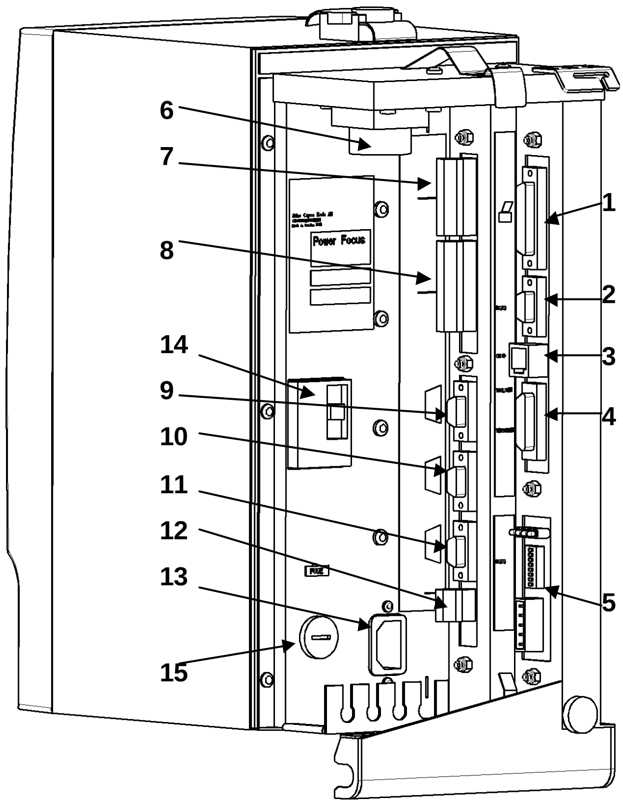
20.1.2 Power Focus 3000 Compact



20.2 Connections

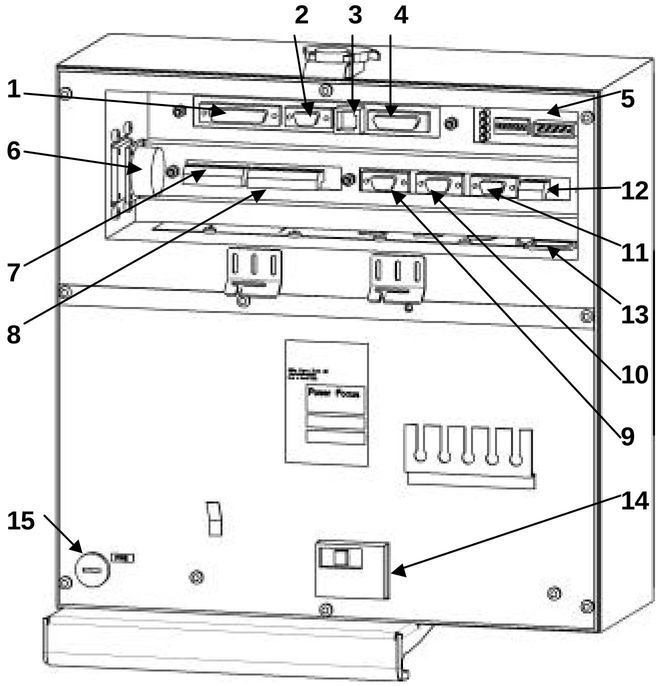
20.2.1 Power Focus 3000 Compact back panel

1. **Printer**
2. **Serial #2 (RS232)**
3. **Ethernet**
4. **RBU**
5. **FieldBus card (optional)**
6. **Tool output**
7. **Digital input**
8. **Relays**
9. **Serial #1 (RS232)**
10. **I/O-bus**
11. **I/O-bus**
12. **Remote start**
13. **Mains power connector**
14. **GFI, Ground Fault Interrupter**
15. **Main fuse**



20.2.2 Power Focus Graph back panel

1. **Printer**
2. **Serial #2 (RS232)**
3. **Ethernet**
4. **RBU**
5. **FieldBus card (optional)**
6. **Tool output**
7. **Digital input**
8. **Relays**
9. **Serial #1 (RS232)**
10. **I/O-bus**
11. **I/O-bus**
12. **Remote start**
13. **Mains power connector**
14. **GFI, Ground Fault Interrupter**
15. **Main fuse**



20.3 Weight

Power Focus model	Weight [Kg]
Compact	12
Graph	16

20.4 Power

Power Focus 3000 operates on a single-phase 110 or 230 VAC line voltage.
Power Focus 3000 has a function for sensing the line voltage automatically. This means that the Power Focus automatically switches to the voltage you connect to.

Line voltage

Line voltage
110 VAC (90-120)
230 VAC (200-240)

Power consumption

Power consumption depends on the speed and torque of the tool.
High speed and torque give the highest power.

Power Focus model/Tool		Standby [W]	Free running [W]
Compact	**S4/S7**	20	150
	S9	20	200
Graph	**S4/S7**	20	150
	S9	20	200

Mains Fuse

Recommended mains fuses (power outlet):

Tool	Mains Voltage [V]	Fuse [A]
S4/S7	115	15
	230	10
S9	115	20
	230	16

If you are running PF3000 as standalone units and trigger the tools manually (random) it is normally possible to connect up to three PF 3000 to one power drop. If you are synchronising the spindles you will need one drop for each PF3000.

Wiring

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

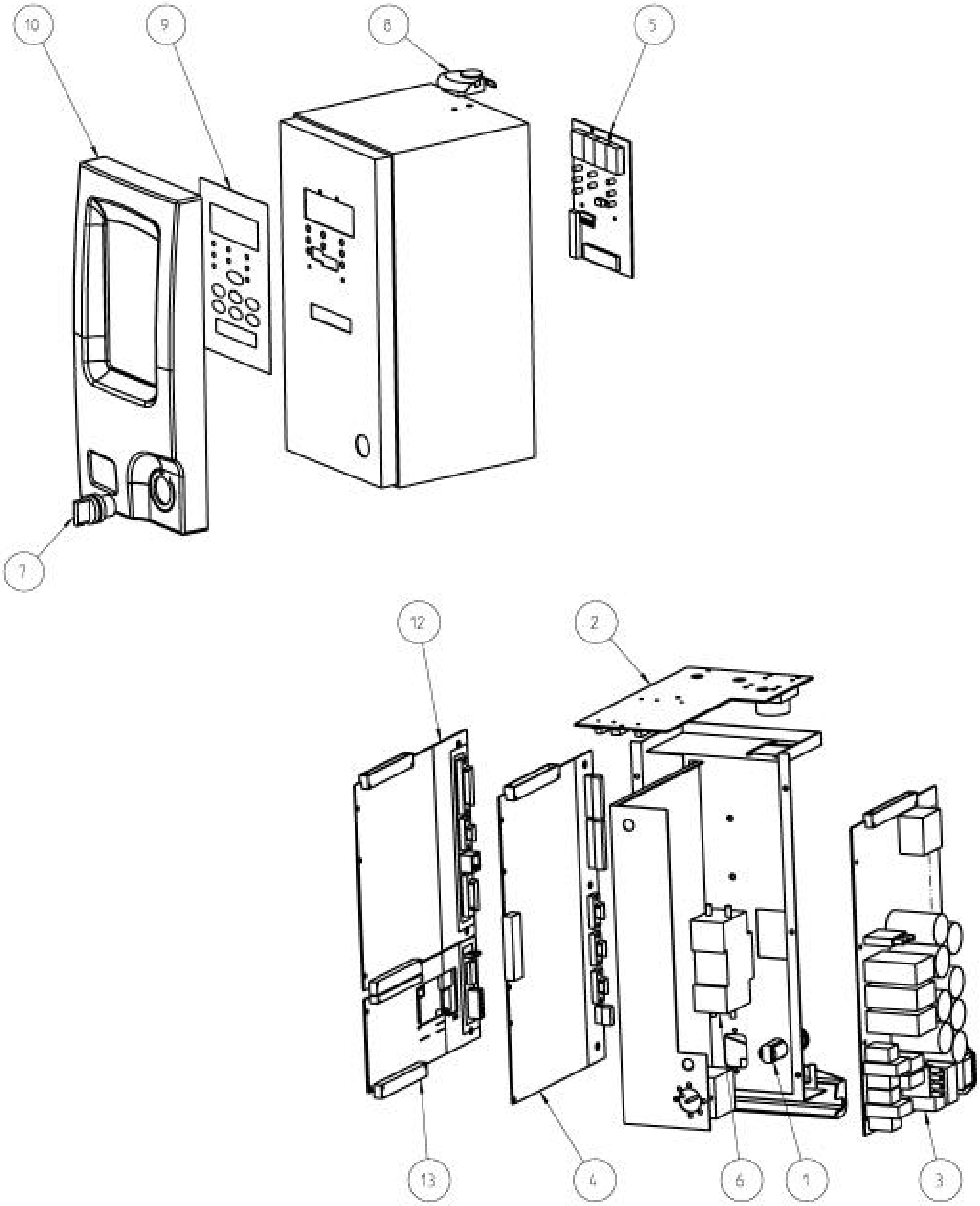
Colour	Input
Brown or black	Live
Blue	Neutral
Green and yellow	Protective ground

Note! The power cable is the mains disconnecting device. If you open the Power Focus, first pull out the power cable to make sure that the unit is free from electric power.
Note! Do not use galvanically insulated line voltage since it disrupts the function of the Ground Fault Interrupter (GFI). Note that the test button for the GFI activates the GFI even if the Power Focus is supplied with power from an isolated transformer.

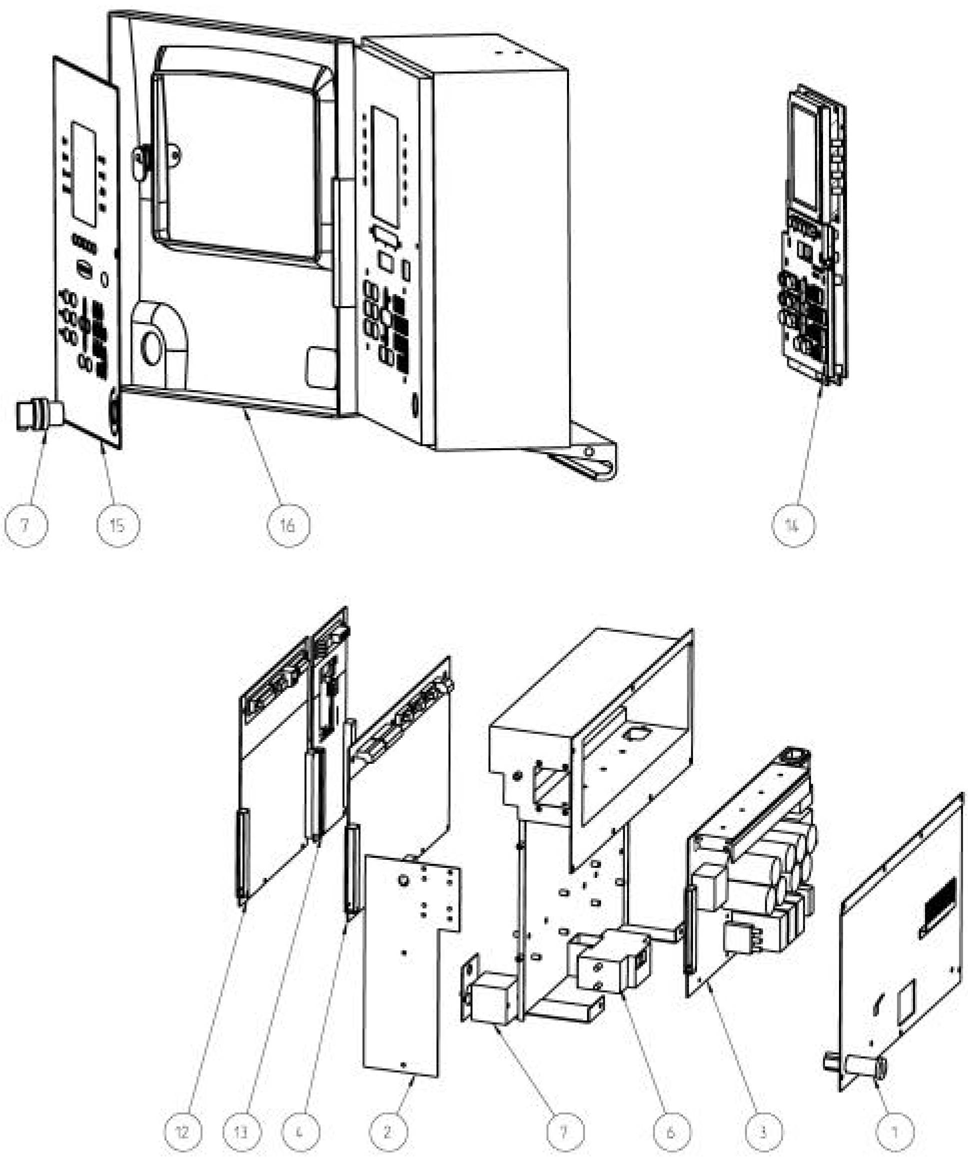
20.5 Parts List

No.	Part Description	Ordering Number	Info.
1.	Fuse Holder Fuse Fuse	4222-0412-00 4222-0413-15 4222-0413-20	 15 A (S4/7) 20 A (S9)
2.	Card Connector Compact Card Connector Graph	4222-0399-80 4222-0398-80	
3.	Drive Card	4222-0386-80 4222-0387-80	Tensor S4/7 Tensor S9
4.	Motor Card	4222-0391-80	
5.	Display Card Compact	4222-0603-80	
6.	Ground Fault Interrupter	4222-0020-01	30 mA
7.	Power switch	4222-0362-80	
8.	Back Panel Lock	4222-0363-01	
9.	Front Panel Compact Membrane switch	4222-0604-83 4222-0604-85	Tensor S4/7 Tensor S9
10.	Front Door Compact	4222-0347-90	
11.	Back Panel Compact Back Panel Graph	4222-0323-82 4222-0374-81	Not Shown
12.	Control Card	4222-0402-80	
13.	FieldBus Card	4222-0649-80 4222-0651-80 4222-0652-80 4222-0802-80	DeviceNet Profibus-DT InterBus ModBus plus
14.	1) Display Card (Complete) 2) Display Card (without keypad) 3) LCD display 4) Keypad 5) Keypad Card	4222-0374-87 4222-0478-80 4222-0381-81 4222-0473-00 4222-0477-80	For Graph
15.	Front Panel Graph Overlay	4222-0380-85 4222-0380-87	Tensor S4/7 Tensor S9
16.	Front Door Graph	4222-0374-88	
17.	Support strap	4222-0757-12	Not shown

Power Focus 3000 Compact



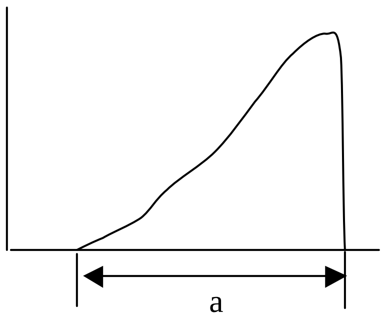
Power Focus 3000 Graph



21 Appendix A: QUICK Reference Guide

Use this appendix in conjunction with the ***Parameter List, chapter 18***, as a reference guide when programming the Power Focus 3000. A more general description of the tightening and control strategies available can be found in ***Control and Monitoring, chapter 6***.

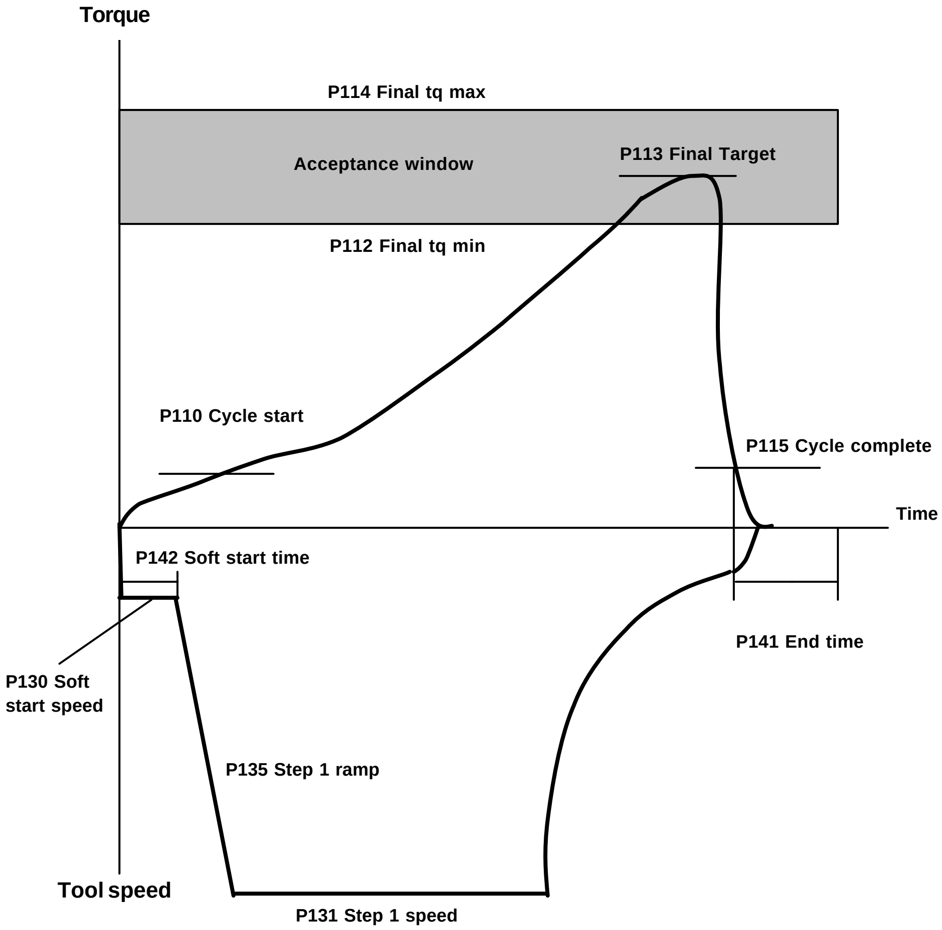
A joint is regarded as hard if the clamping angle, a, is small and soft if a is large. There is no limit, but test standards define a < 30° as hard. The dynamic effects on tightening increase dramatically if angles go down substantially (approximately 15°).



Find the page below that describes the desired strategy and study the graph and the parameters that need to be set. Note that the graphs are presented schematically, which means that your programming results may look different compared to the graph.

21.1 Tq Con

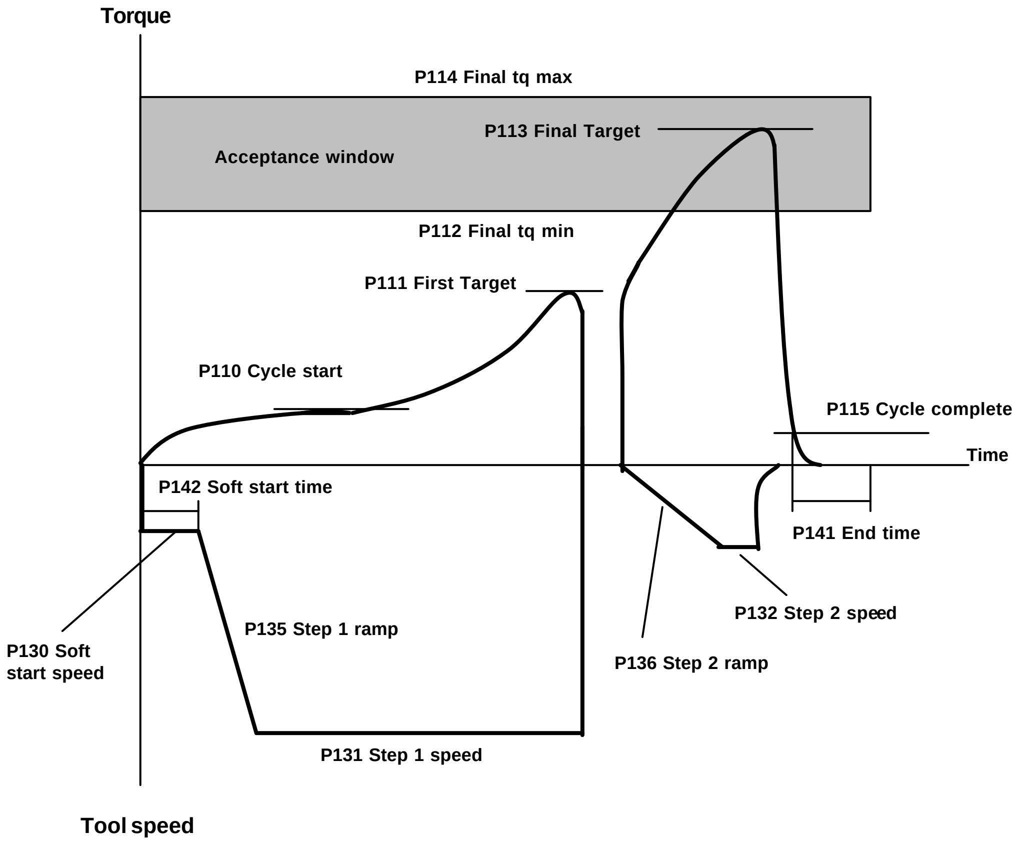
21.1.1 One stage



P1xx Programming	**P10x Control Strategy**	**P11x Torque**	**P13x Speed/Ramp**
Open new Pset	P100 Tq con	P110 Cycle start	P130 Soft start speed
	P101 One stage	P112 Final tq min	P131 Step 1 speed
		P113 Final target	P135 Step 1 ramp
		P114 Final tq max	
		P115 Cycle complete	

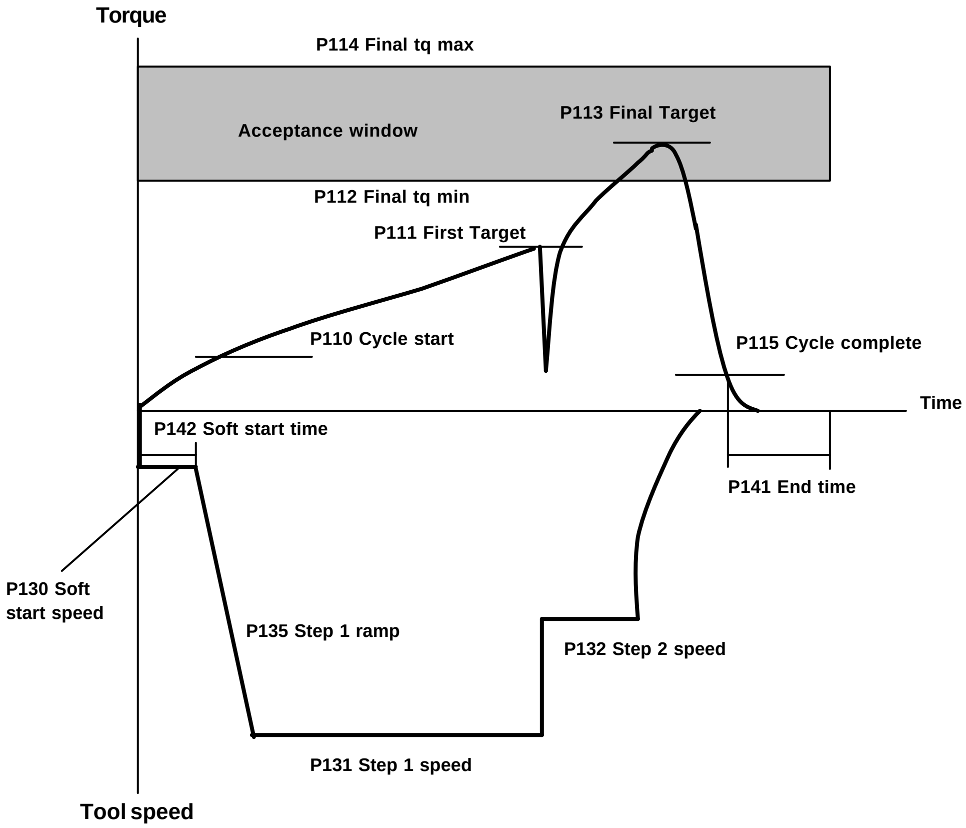
P14x Time	**P15x Batch**
P141 End time	P150 Batch count
P142 Soft start time	P151 Batch size
P144 Cycle abort timer	

21.1.2 Two stage



P1xx Programming	P10x Control Strategy	P11x Torque	P13x Speed/Ramp
Open new Pset	P100 Tq con	P110 Cycle start	P130 Soft start speed
	P101 Two stage	P111 First target	P131 Step 1 speed
		P112 Final tq min	P132 Step 2 speed
		P113 Final target	P135 Step 1 ramp
		P114 Final tq max	P136 Step 2 ramp
		P115 Cycle complete	
P14x Time	**P15x Batch**		
P141 End time	P150 Batch count		
P142 Soft start time	P151 Batch size		
P144 Cycle abort timer			

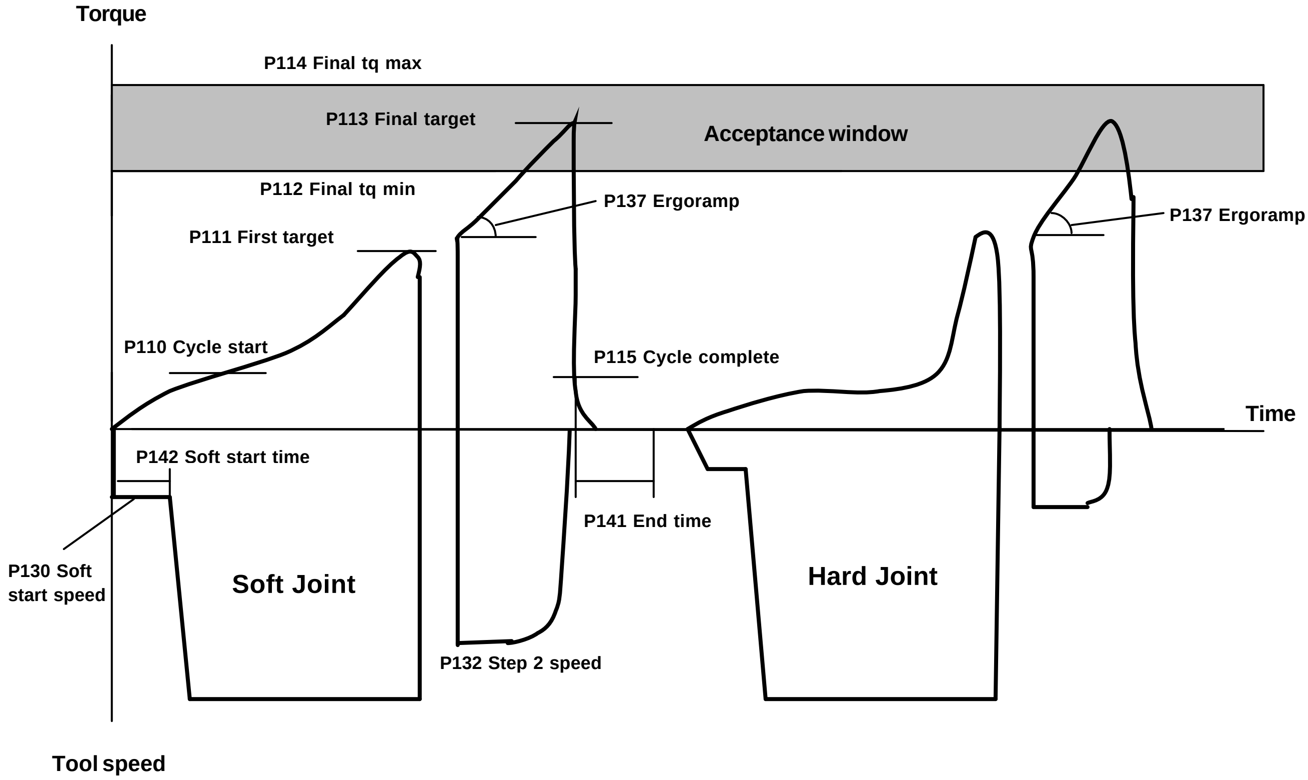
21.1.3 Quick step



P1xx Programming	P10x Control Strategy	P11x Torque	P13x Speed/Ramp
Open new Pset	P100 Tq con	P110 Cycle start	P130 Soft start speed
	P101 Quick step	P111 First target	P131 Step 1 speed
		P112 Final tq min	P132 Step 2 speed
		P113 Final target	P135 Step 1 ramp
		P114 Final tq max	
		P115 Cycle complete	

P14x Time	P15x Batch
P141 End time	P150 Batch count
P142 Soft start time	P151 Batch size
P144 Cycle abort timer	

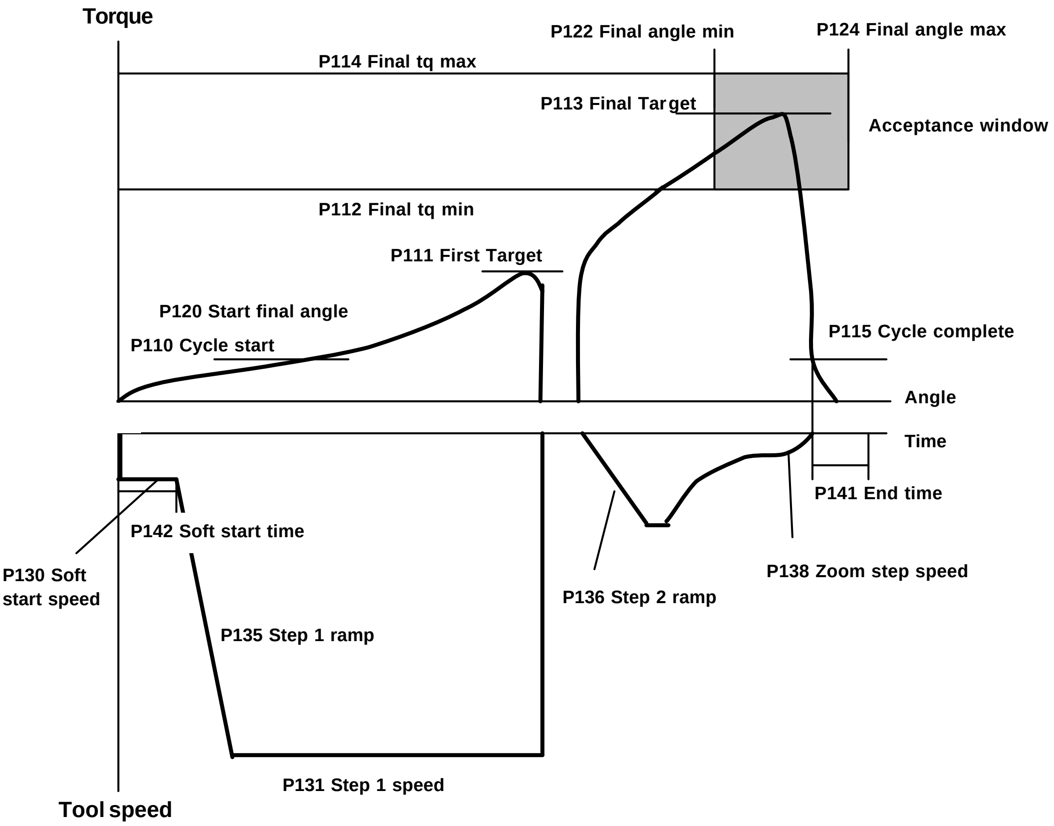
21.1.4 Ergoramp



P1xx Programming	P10x Control Strategy	P11x Torque	P13x Speed/Ramp
Open new Pset	P100 Tq con	P110 Cycle start	P130 Soft start speed
	P101 Ergoramp	P111 First target	P131 Step 1 speed
		P112 Final tq min	P132 Step 2 speed
		P113 Final target	P135 Step 1 ramp
		P114 Final tq max	
		P115 Cycle complete	

P14x Time	P15x Batch
P141 End time	P150 Batch count
P142 Soft start time	P151 Batch size
P144 Cycle abort timer	

21.1.5 Two stage, Zoom step

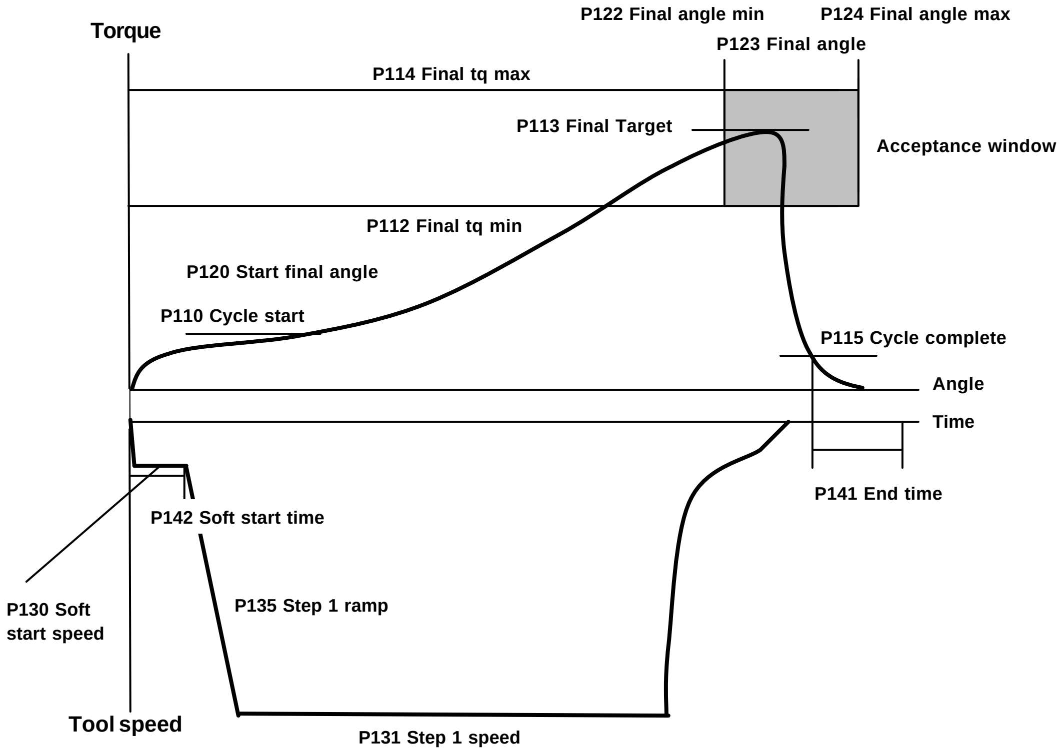


P1xx Programming	**P10x Control Strategy**	**P11x Torque**	**P13x Speed/Ramp**
Open new Pset	P100 Tq con/Ang con	P110 Cycle start	P130 Soft start speed
	P101 Two stage	P111 First target	P131 Step 1 speed
	P105 Zoom step	P112 Final tq min	P132 Step 2 speed
		P113 Final target	P135 Step 1 ramp
		P114 Final tq max	P136 Step 2 ramp
		P115 Cycle complete	P138 Zoom step speed

P14x Time	**P15x Batch**
P141 End time	P150 Batch count
P142 Soft start time	P151 Batch size
P144 Cycle abort timer	

21.2 Tq Con / Ang Mon

21.2.1 One stage



P1xx Programming
Open new Pset

P10x Control Strategy
P100 Tq con/Ang mon
P101 One stage

P11x Torque
P110 Cycle start
P112 Final tq min
P113 Final target
P114 Final tq max
P115 Cycle complete

P12x Angle
P120 Start final angle
P121 Measure angle to
- Peak tq
- Angle peak
- Cycle complete

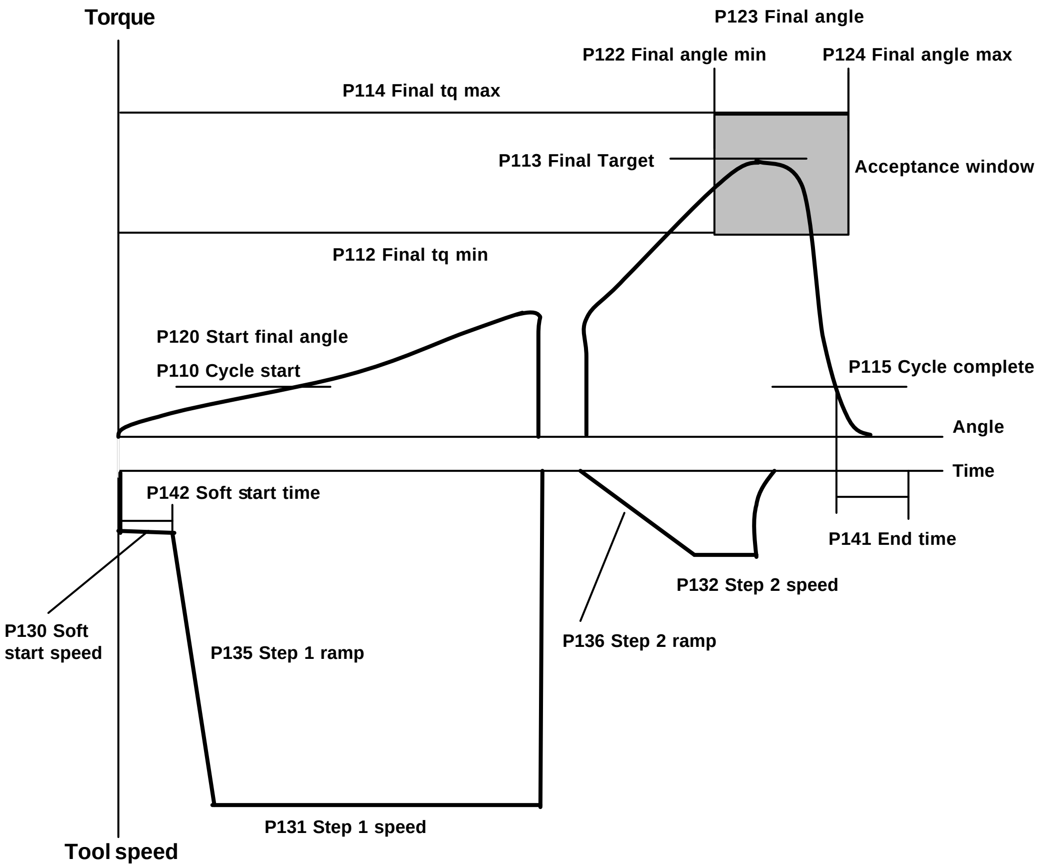
P122 Final angle min
P124 Final angle max

P13x Speed/Ramp
P130 Soft start speed
P131 Step 1 speed
P135 Step 1 ramp

P14x Time
P141 End time
P142 Soft start time
P144 Cycle abort timer

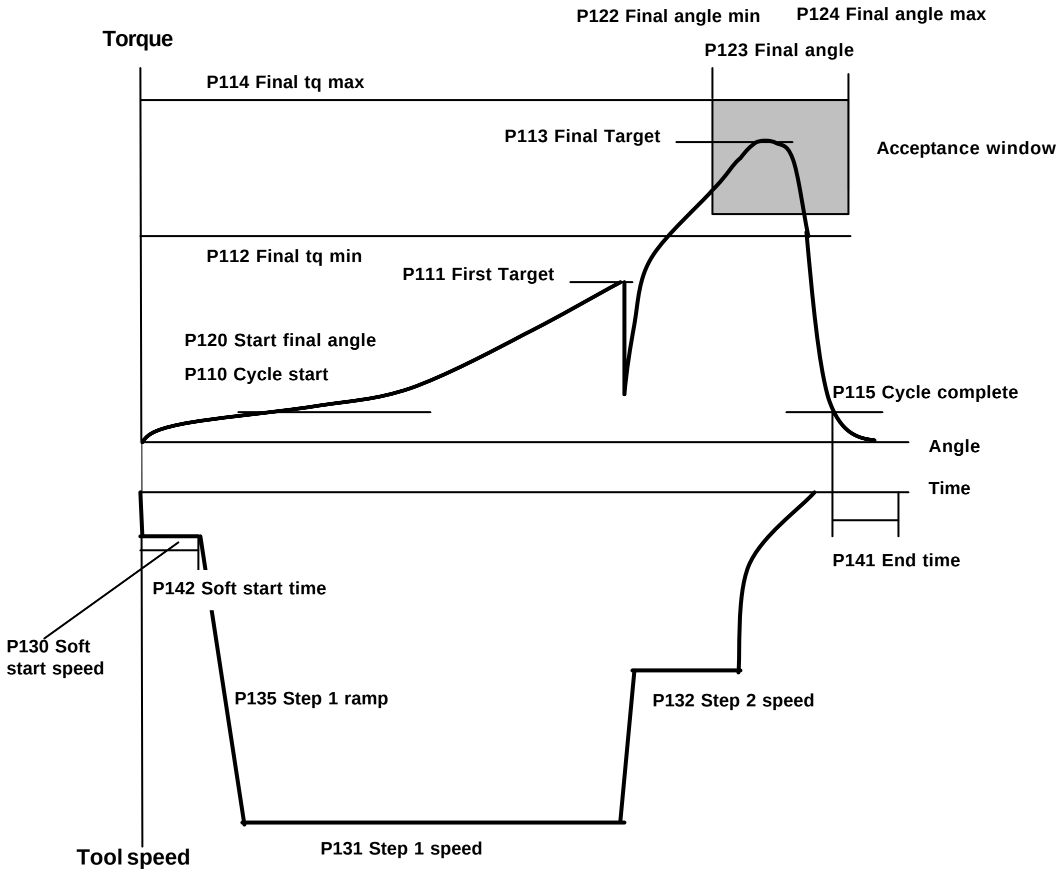
P15x Batch
P150 Batch count
P151 Batch size

21.2.2 Two stage



P1xx Programming	**P10x Control Strategy**	**P11x Torque**	**P12x Angle**
Open new Pset	P100 Tq con/Ang mon P101 Two stage	P110 Cycle start P111 First target P112 Final tq min P113 Final target P114 Final tq max P115 Cycle complete	P120 Start final angle P121 Measure angle to - Peak tq - Angle peak - Cycle complete P122 Final angle min P124 Final angle max
P13x Speed/Ramp	**P14x Time**	**P15x Batch**	
P130 Soft start speed P131 Step 1 speed P132 Step 2 speed P135 Step 1 ramp P136 Step 2 ramp	P141 End time P142 Soft start time P144 Cycle abort timer	P150 Batch count P151 Batch size	

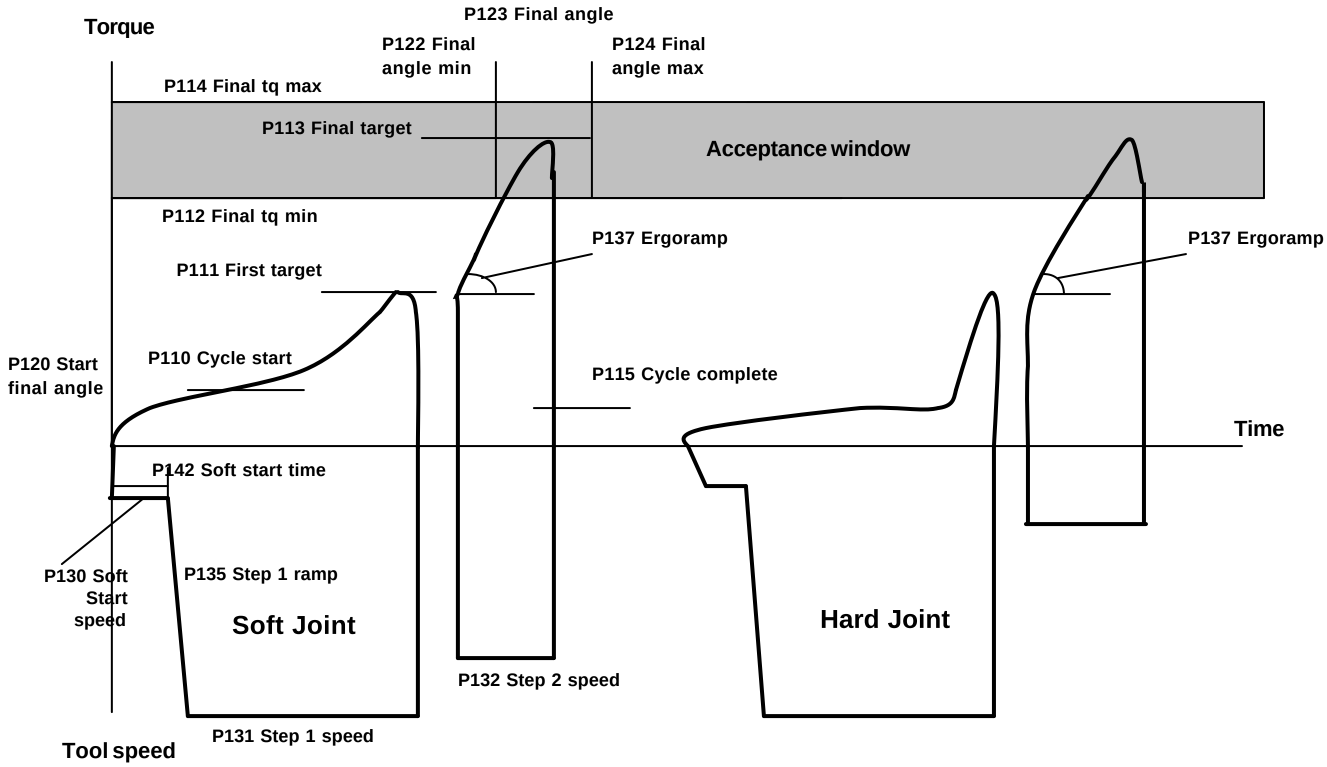
21.2.3 Quick step



P1xx Programming	**P10x Control Strategy**	**P11x Torque**	**P12x Angle**
Open new Pset	P100 Tq con/Ang mon	P110 Cycle start	P120 Start final angle
	P101 Quick step	P111 First target	P121 Measure angle to
		P112 Final tq min	- Peak tq
		P113 Final target	- Angle peak
		P114 Final tq max	- Cycle complete
		P115 Cycle complete	P122 Final angle min
			P124 Final angle max

P13x Speed/Ramp	**P14x Time**	**P15x Batch**
P130 Soft start speed	P141 End time	P150 Batch count
P131 Step 1 speed	P142 Soft start time	P151 Batch size
P132 Step 2 speed	P144 Cycle abort timer	
P135 Step 1 ramp		

21.2.4 Ergoramp



P1xx Programming
Open new Pset

P10x Control Strategy
P100 Tq con / Ang mon
P101 Ergoramp

P11x Torque
P110 Cycle start
P111 First target
P112 Final tq min
P113 Final target
P114 Final tq max
P115 Cycle complete

P12x Angle
P120 Start final angle
P121 Measure angle to
- Peak tq
- Angle peak
- Cycle complete
P122 Final angle min
P124 Final angle max

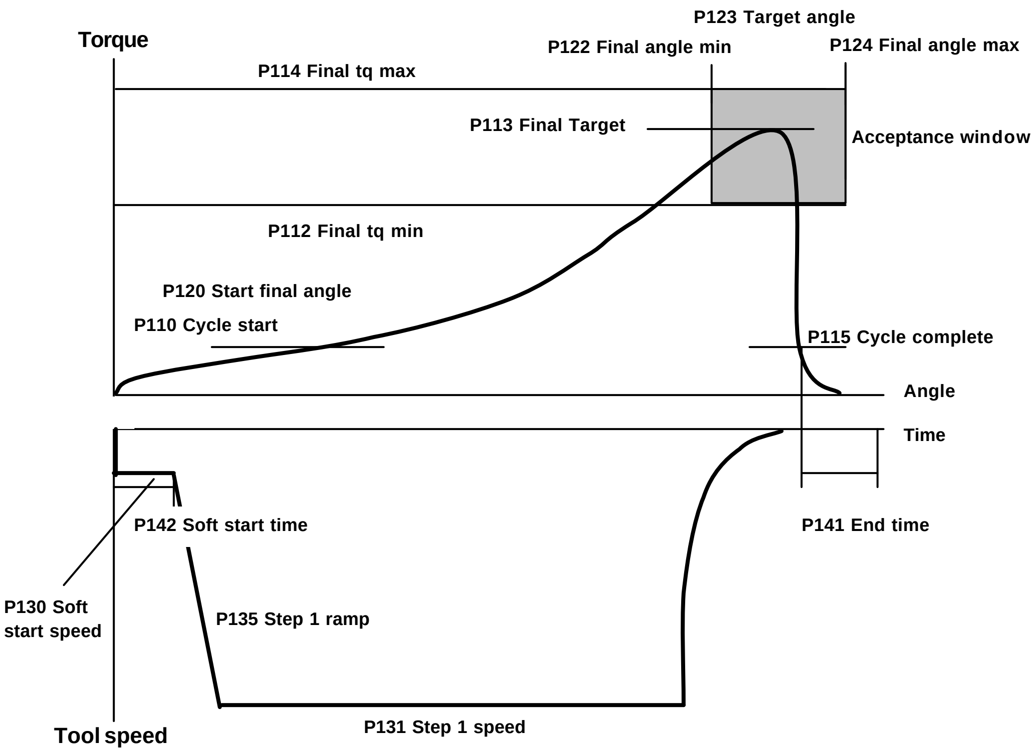
P13x Speed/Ramp
P130 Soft start speed
P131 Step 1 speed
P132 Step 2 speed
P135 Step 1 ramp
P137 Ergoramp

P14x Time
P142 Soft start time
P144 Cycle abort timer

P15x Batch
P150 Batch count
P151 Batch size

21.3 Tq Con / Ang Con [AND] / [OR]

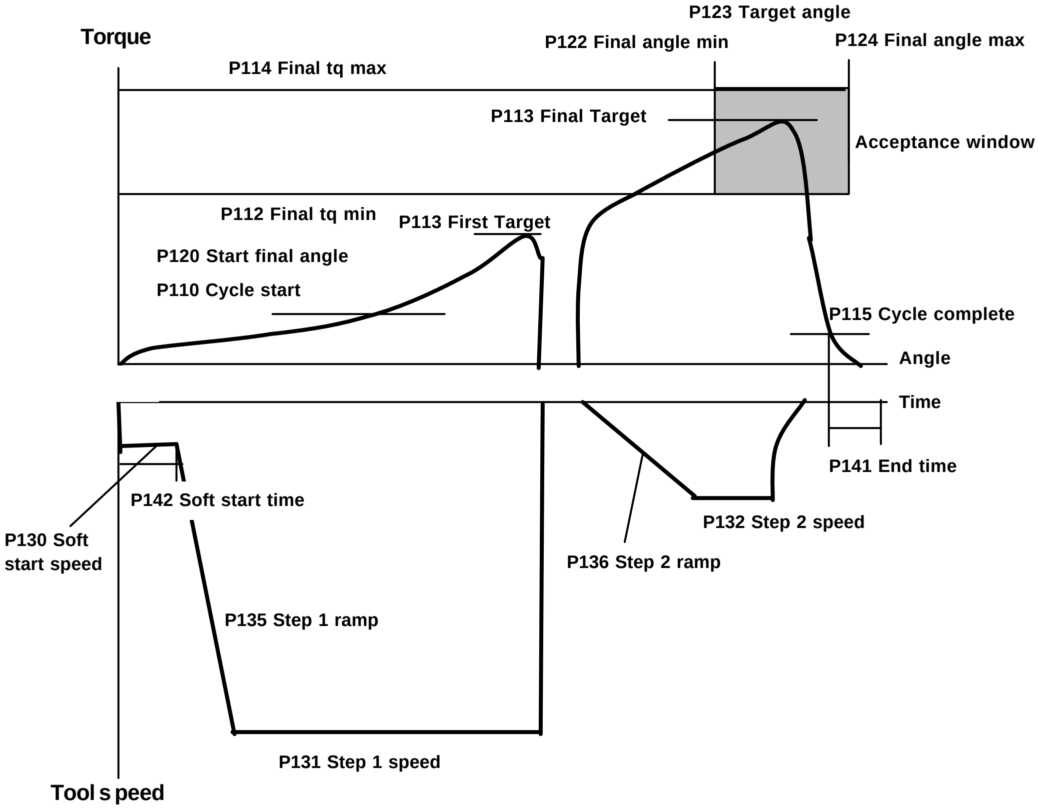
21.3.1 One stage



P1xx Programming	**P10x Control Strategy**	**P11x Torque**	**P12x Angle**
Open new Pset	P100 Tq con/Ang con	P110 Cycle start	P120 Start final angle
	P101 One stage	P111 First target	P121 Measure angle to
		P112 Final tq min	- Peak tq
		P113 Final target	- Angle peak
		P114 Final tq max	- Cycle complete
		P115 Cycle complete	P122 Final angle min
			P123 Target angle
			P124 Final angle max

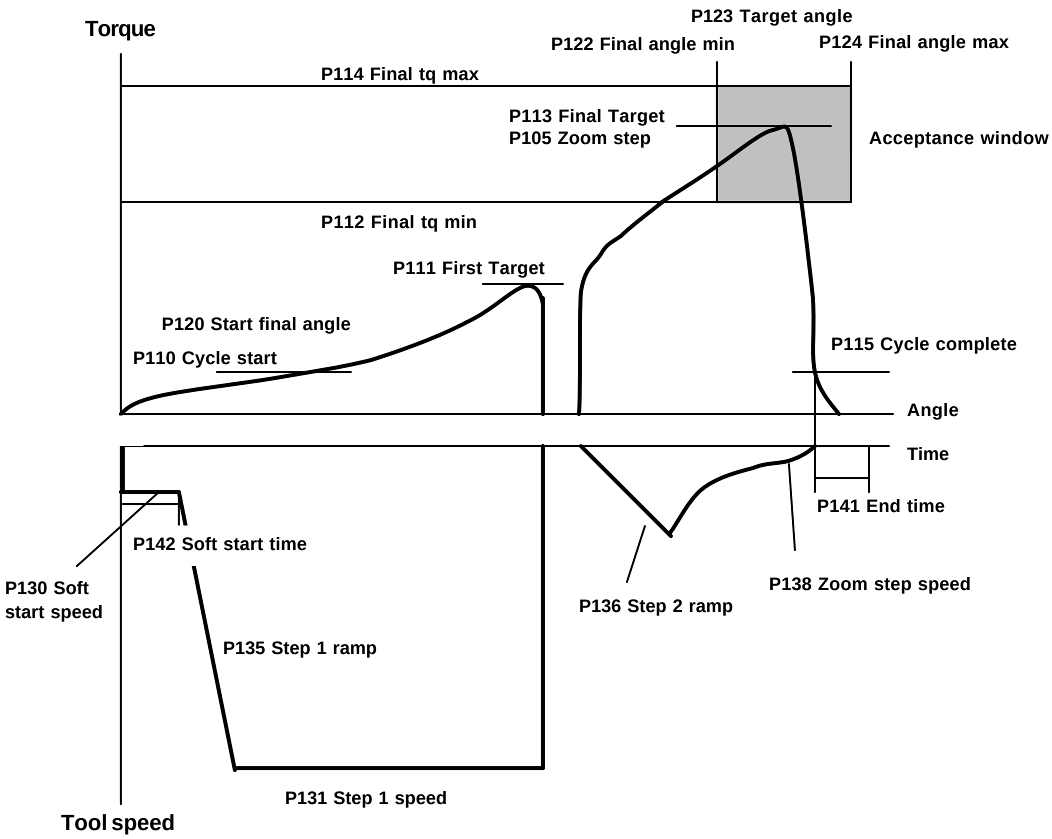
P13x Speed/Ramp	**P14x Time**	**P15x Batch**
P130 Soft start speed	P141 End time	P150 Batch count
P131 Step 1 speed	P142 Soft start time	P151 Batch size
P135 Step 1 ramp	P144 Cycle abort timer	

21.3.2 Two stage



P1xx Programming	**P10x Control Strategy**	**P11x Torque**	**P12x Angle**
Open new Pset	P100 Tq con/Ang con P101 Two stage	P110 Cycle start P111 First target P112 Final tq min P113 Final target P114 Final tq max P115 Cycle complete	P120 Start final angle P121 Measure angle to - Peak tq - Angle peak - Cycle complete P122 Final angle min P123 Target angle P124 Final angle max
P13x Speed/Ramp	**P14x Time**	**P15x Batch**	
P130 Soft start speed P131 Step 1 speed P132 Step 2 speed P135 Step 1 ramp P136 Step 2 ramp	P141 End time P142 Soft start time P144 Cycle abort timer	P150 Batch count P151 Batch size	

21.3.3 Two stage, Zoom step



P1xx Programming
Open new Pset

P10x Control Strategy
P100 Tq con/Ang con
P101 Two stage
P105 Zoom step

P11x Torque
P110 Cycle start
P111 First target
P112 Final tq min
P113 Final target
P114 Final tq max
P115 Cycle complete

P12x Angle
P120 Start final angle
P121 Measure angle to
- Peak tq
- Angle peak
- Cycle complete
P122 Final angle min
P123 Target angle

P13x Speed/Ramp
P130 Soft start speed
P131 Step 1 speed
P132 Step 2 speed
P135 Step 1 ramp
P136 Step 2 ramp
P138 Zoom step speed

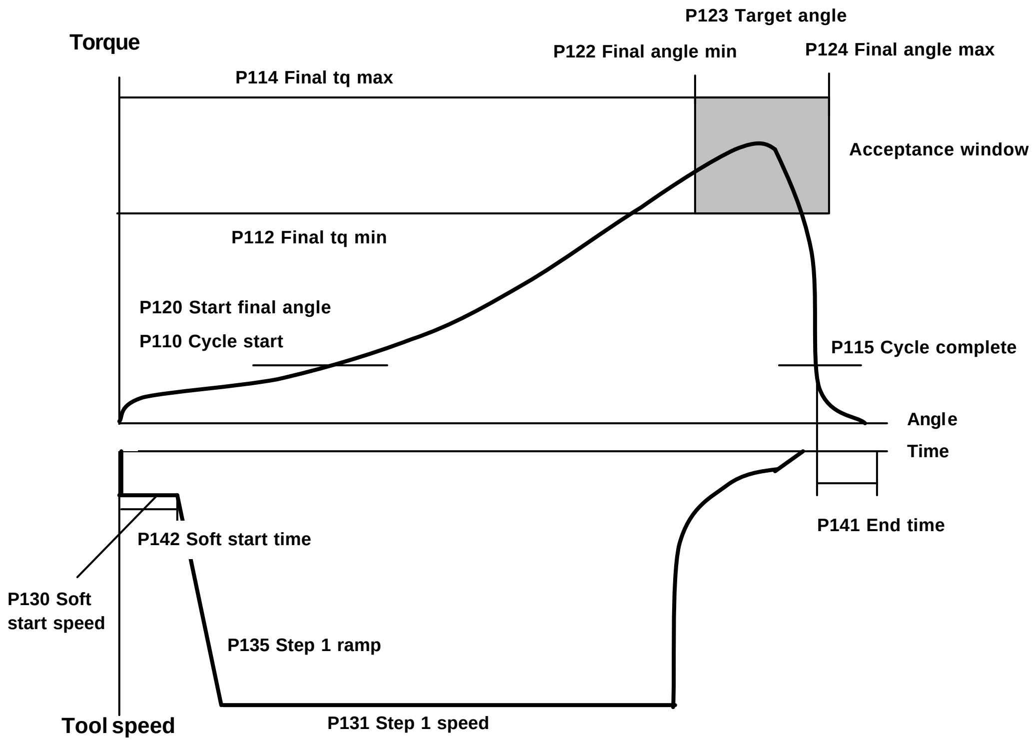
P14x Time
P141 End time
P142 Soft start time
P144 Cycle abort timer

P15x Batch
P150 Batch count
P151 Batch size

P124 Final angle max

21.4 Ang Con / Tq Mon

21.4.1 One stage



P1xx Programming
Open new Pset

P10x Control Strategy
P100 Ang con/Tq mon
P101 One stage

P11x Torque
P110 Cycle start
P112 Final tq min
P114 Final tq max
P115 Cycle complete

P12x Angle
P120 Start final angle
P121 Measure angle to
- Peak tq
- Angle peak
- Cycle complete

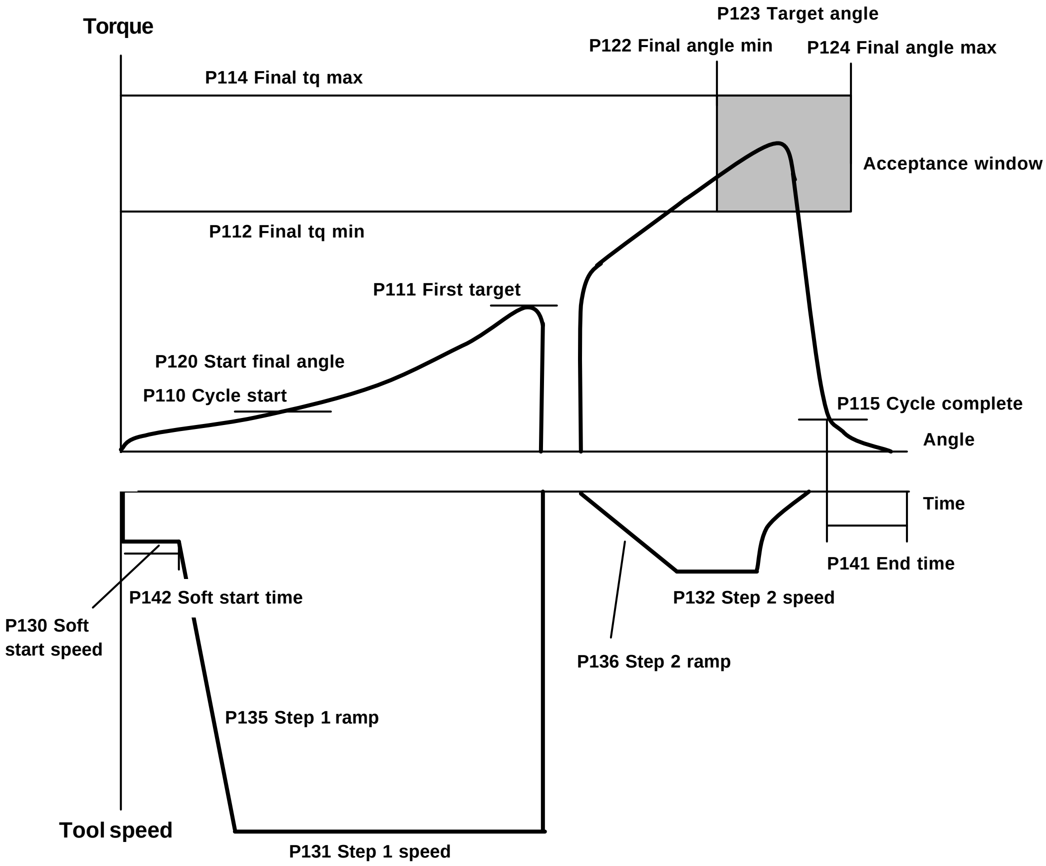
P122 Final angle min
P123 Target angle
P124 Final angle max

P13x Speed/Ramp
P130 Soft start speed
P131 Step 1 speed
P135 Step 1 ramp

P14x Time
P141 End time
P142 Soft start time
P144 Cycle abort timer

P15x Batch
P150 Batch count
P151 Batch size

21.4.2 Two stage



P1xx Programming
Open new Pset

P10x Control Strategy
P100 Ang con/Tq mon
P101 Two stage

P11x Torque
P110 Cycle start
P111 First target
P112 Final tq min
P114 Final tq max
P115 Cycle complete

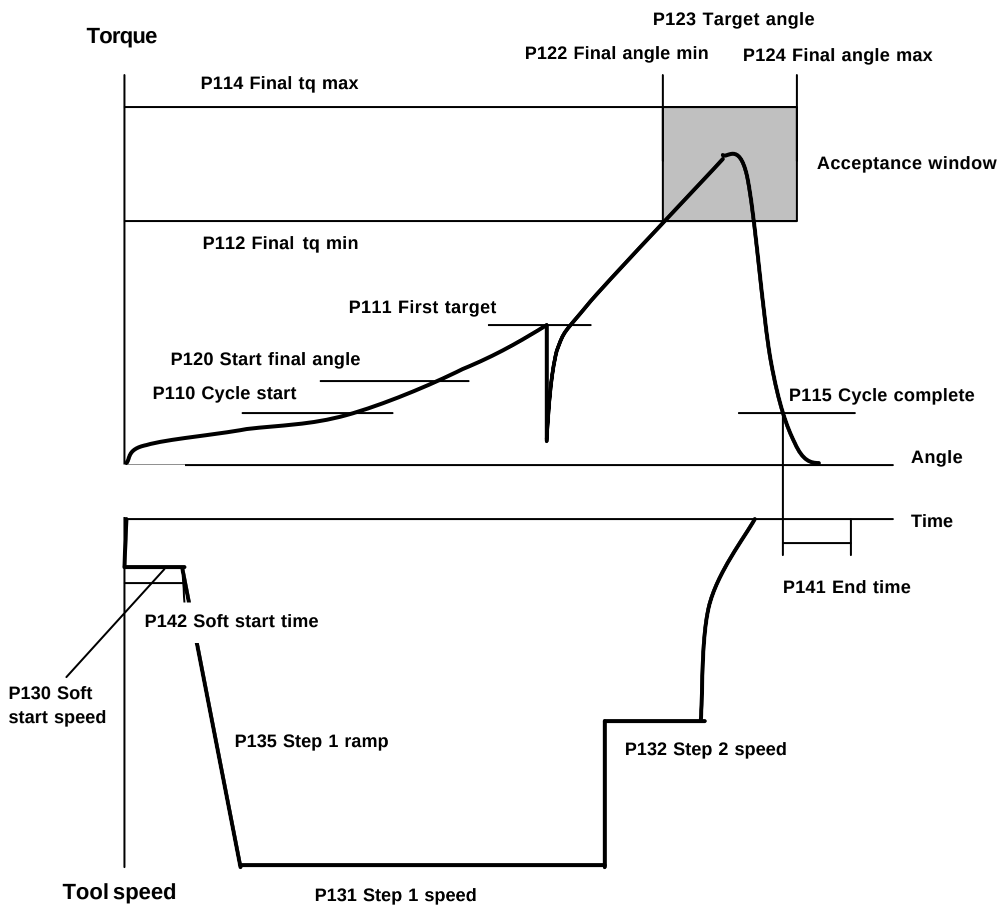
P12x Angle
P120 Start final angle
P121 Measure angle to
- Peak tq
- Angle peak
- Cycle complete
P122 Final angle min
P123 Target angle
P124 Final angle max

P13x Speed/Ramp
P130 Soft start speed
P131 Step 1 speed
P132 Step 2 speed
P135 Step 1 ramp
P136 Step 2 ramp

P14x Time
P141 End time
P142 Soft start time
P144 Cycle abort timer

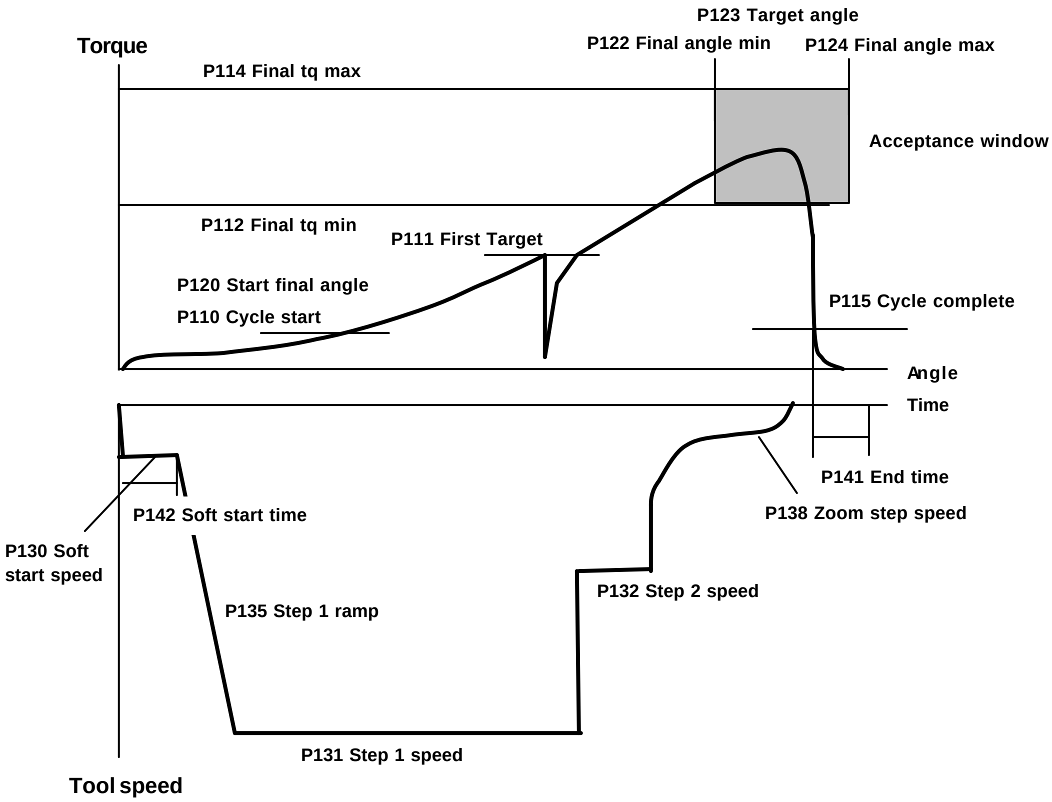
P15x Batch
P150 Batch count
P151 Batch size

21.4.3 Quick step



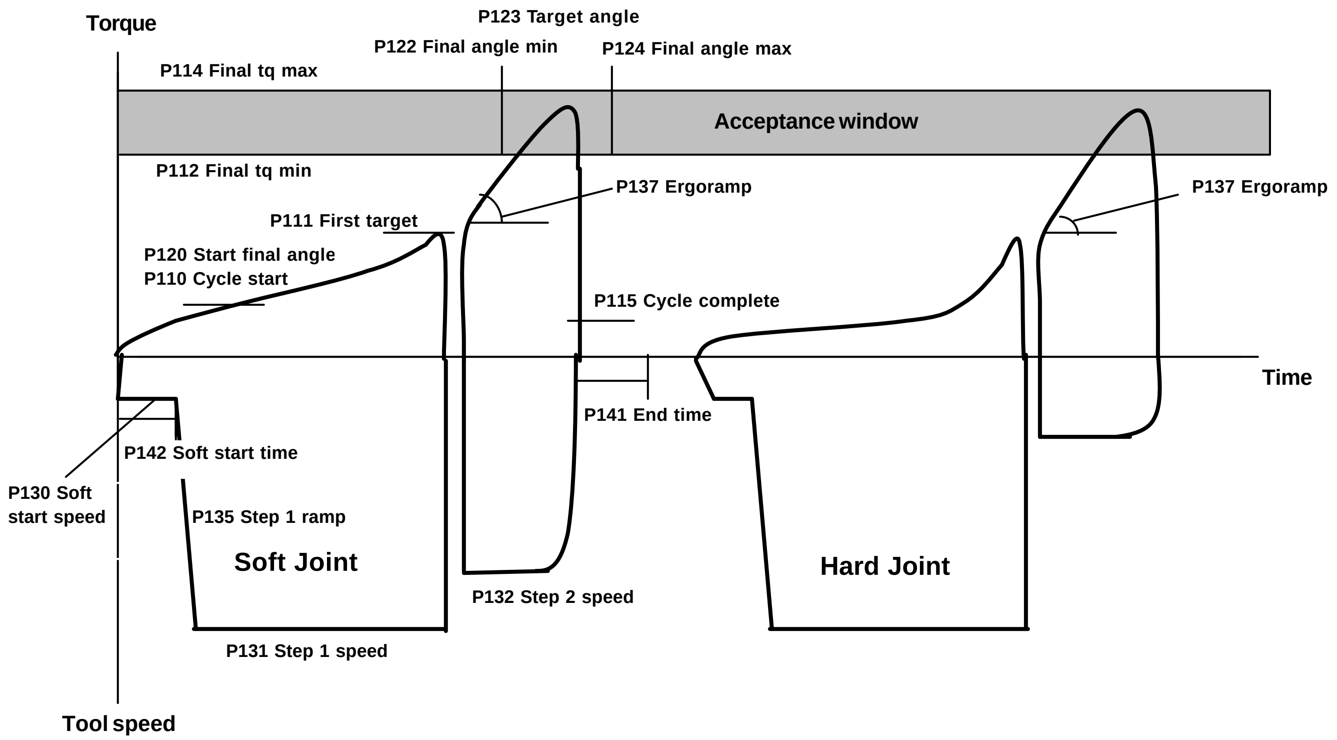
P1xx Programming	**P10x Control Strategy**	**P11x Torque**	**P12x Angle**
Open new Pset	P100 Ang con/Tq mon P101 Quick step	P110 Cycle start P111 First target P112 Final tq min P114 Final tq max P115 Cycle complete	P120 Start final angle P121 Measure angle to - Peak tq - Angle peak - Cycle complete P122 Final angle min P123 Target angle P124 Final angle max
P13x Speed/Ramp	**P14x Time**	**P15x Batch**	
P130 Soft start speed P131 Step 1 speed P132 Step 2 speed P135 Step 1 ramp	P141 End time P142 Soft start time P144 Cycle abort timer	P150 Batch count P151 Batch size	

21.4.4 Quick step, zoom step



P1xx Programming Open new Pset	**P10x Control Strategy** P100 Ang con/Tq con P101 Quick step P105 Zoom step	**P11x Torque** P110 Cycle start P111 First target P112 Final tq min P114 Final tq max P115 Cycle complete	**P12x Angle** P120 Start final angle P121 Measure angle to - Peak tq - Angle peak - Cycle complete P122 Final angle min P123 Target angle P124 Final angle max
P13x Speed/Ramp P130 Soft start speed P131 Step 1 speed P132 Step 2 speed P135 Step 1 ramp P136 Step 2 ramp P138 Zoom step speed	**P14x Time** P141 End time P142 Soft start time P144 Cycle abort timer	**P15x Batch** P150 Batch count P151 Batch size	

21.4.5 Ergoramp



P1xx Programming
Open new Pset

P10x Control Strategy
P100 Ang con/Tq mon
P101 Ergoramp

P11x Torque
P110 Cycle start
P111 First target
P112 Final tq min
P114 Final tq max
P115 Cycle complete

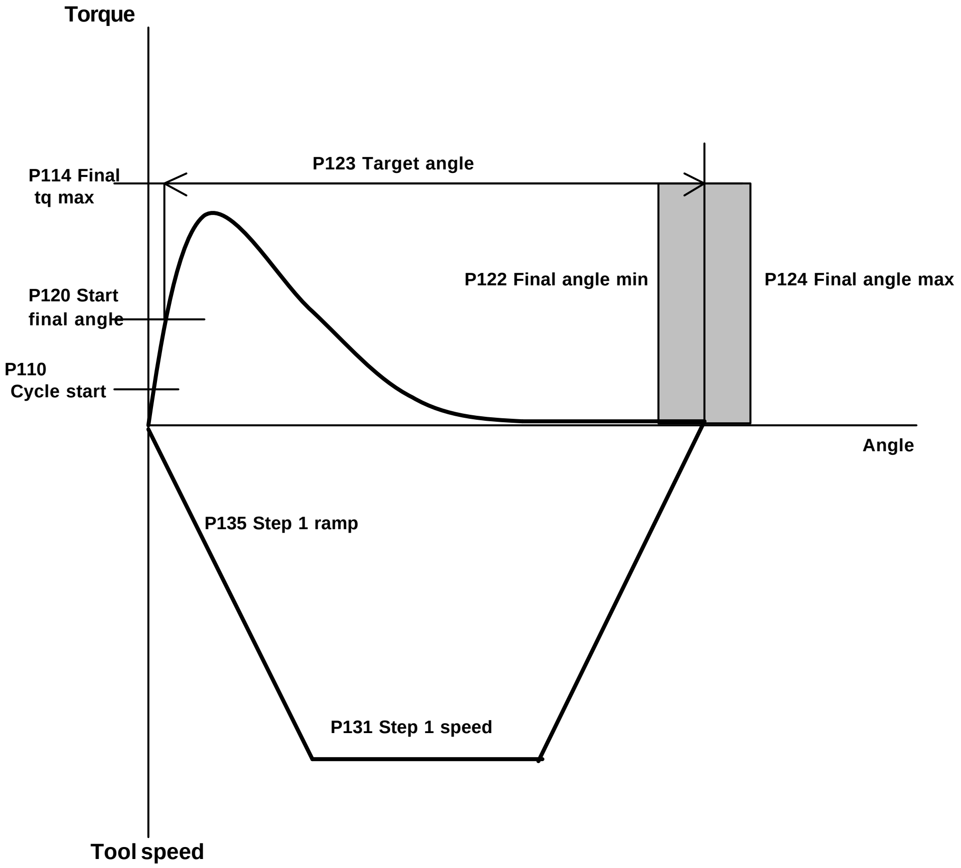
P12x Angle
P120 Start final angle
P121 Measure angle to
- Peak tq
- Angle peak
- Cycle complete
P122 Final angle min
P123 Target angle
P124 Final angle max

P13x Speed/Ramp
P130 Soft start speed
P131 Step 1 speed
P132 Step 2 speed
P135 Step 1 ramp
P137 Ergoramp

P14x Time
P141 End time
P142 Soft start time
P144 Cycle abort timer

P15x Batch
P150 Batch count
P151 Batch size

21.5 Reverse Ang



P1xx Programming
Open new Pset

P10x Control Strategy
P100 Reverse angle

P11x Torque
P110 Cycle start
P114 Final tq max

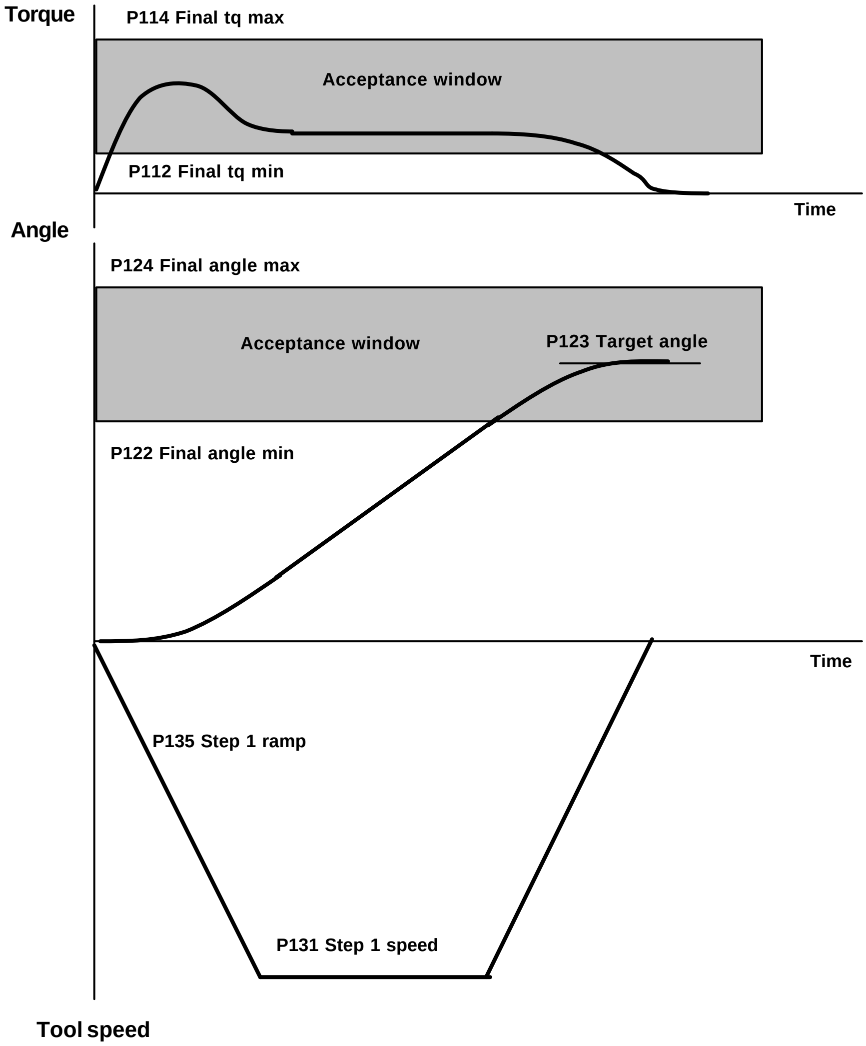
P12x Angle
P120 Start final angle
P122 Final angle min
P123 Target angle
P124 Final angle max

P13x Speed/Ramp
P131 Step 1 speed
P135 Step 1 ramp

P14x Time
P141 End time
P144 Cycle abort timer

P15x Batch
P150 Batch count
P151 Batch size

21.6 Rotate Spindle Forward / Reverse



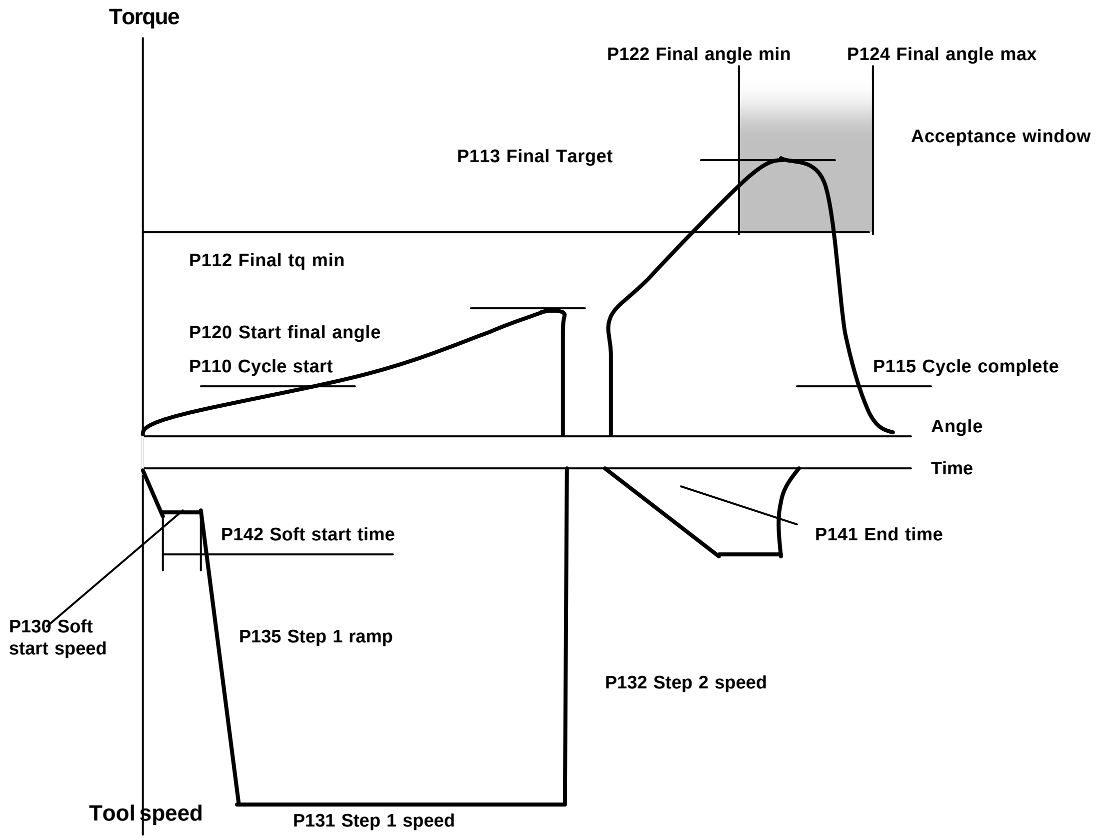
P1xx Programming Open new Pset	**P10x Control Strategy** P100 Rotate spindle forward / reverse	**P11x Torque** P112 Final tq min P114 Final tq max	**P12x Angle** P122 Final angle min P123 Target angle P124 Final angle max
P13x Speed/Ramp P131 Step 1 speed P135 Step 1 ramp	**P14x Time** P141 End time P144 Cycle abort timer	**P15x Batch** P150 Batch count P151 Batch size	

21.7 DS Con

21.7.1 One stage

This strategy is **not** available in DS control.

21.7.2 Two stage



P1xx Programming
Open new Pset

P10x Control Strategy
P100 DS con
P101 TWO STAGE

P11x Torque
P110 Cycle start
P111 First target
P112 Final tq min
P113 Final target
P115 Cycle complete

P12x Angle
P120 Start final angle
P121 Measure angle to
- Peak tq
- Angle peak
- Cycle complete

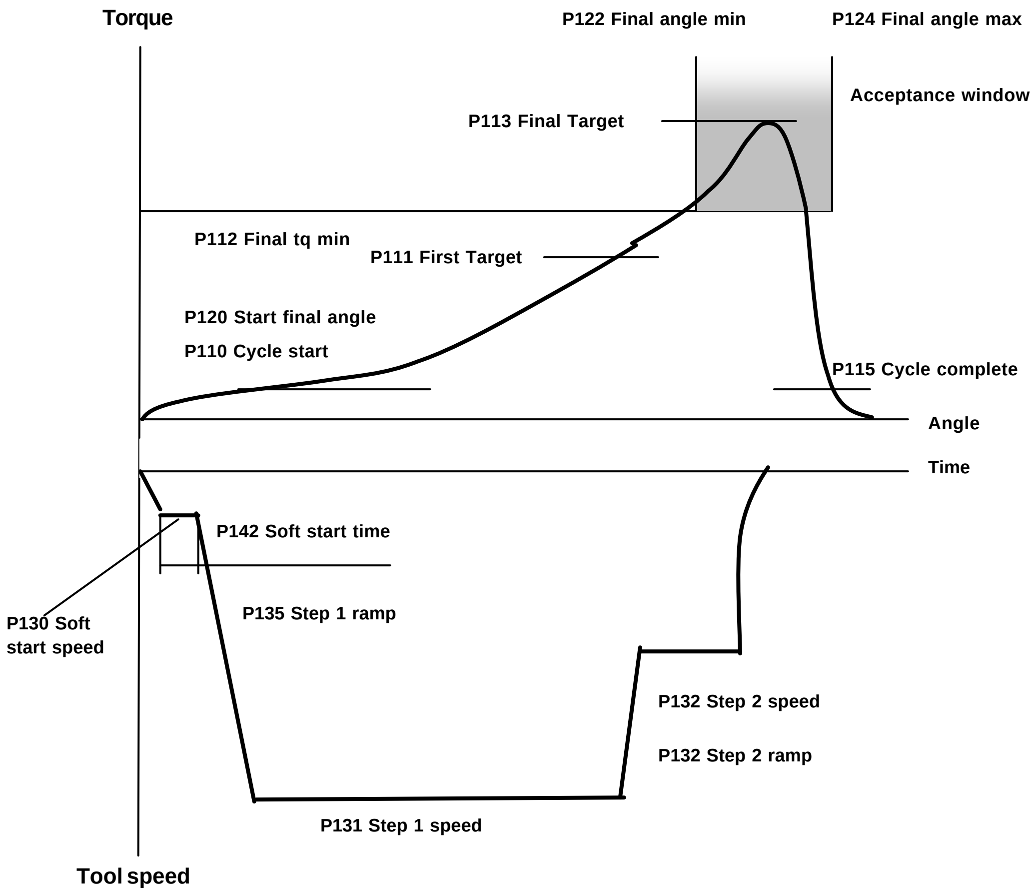
P122 Final angle min
P124 Final angle max

P13x Speed/Ramp
P130 Soft start speed
P131 Step 1 speed
P132 Step 2 speed
P135 Step 1 ramp
P136 Step 2 ramp

P14x Time
P141 End time
P142 Soft start time
P144 Cycle abort timer

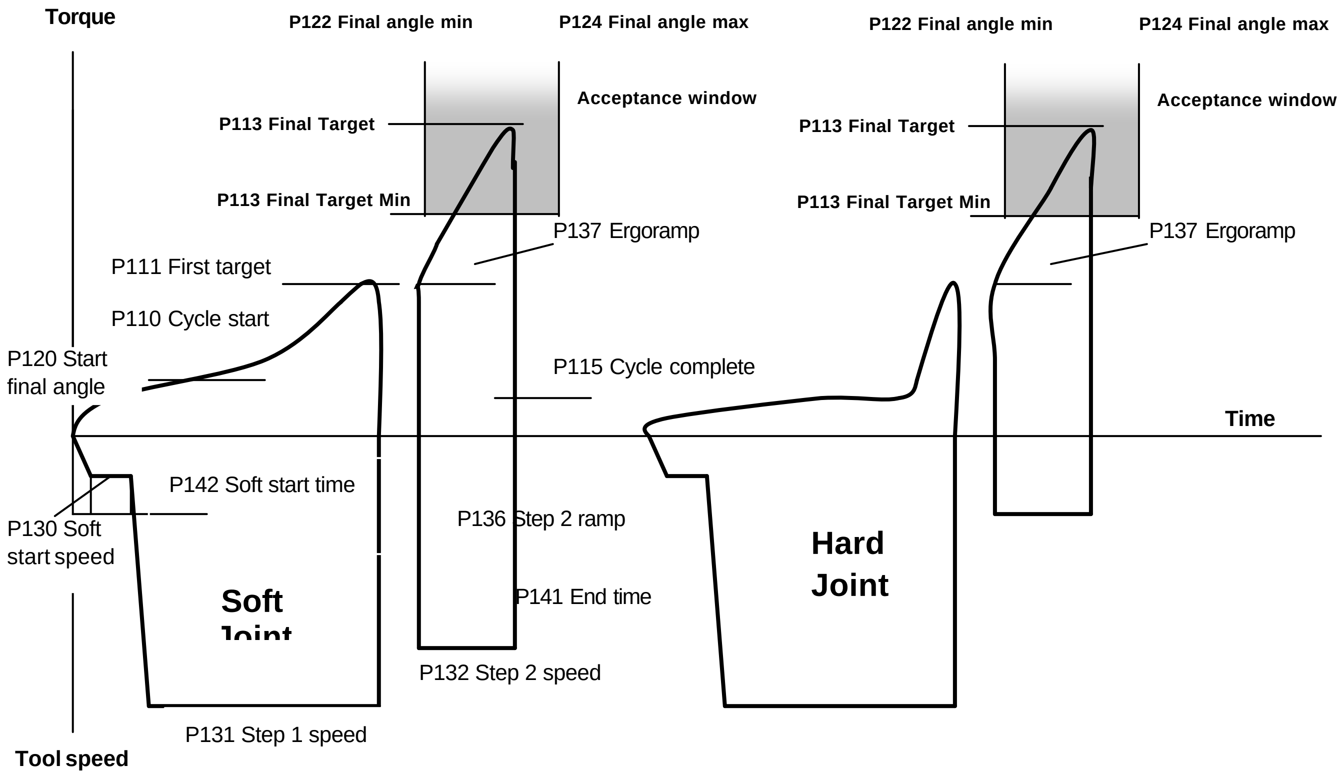
P15x Batch
P150 Batch count
P151 Batch size

21.7.3 Quick step



P1xx Programming Open new Pset	**P10x Control Strategy** P100 DS con P101 Quick step	**P11x Torque** P110 Cycle start P111 First target P112 Final tq min P113 Final target P115 Cycle complete	**P12x Angle** P120 Start final angle P121 Measure angle to - Peak tq - Angle peak - Cycle complete P122 Final angle min P124 Final angle max
P13x Speed/Ramp P130 Soft start speed P131 Step 1 speed P132 Step 2 speed P135 STEP 1 RAMP P136 Step 2 ramp	**P14x Time** P141 End time P142 Soft start time P144 Cycle abort timer	**P15x Batch** P150 Batch count P151 Batch size	

21.7.4 Ergoramp



P1xx Programming
Open new Pset

P10x Control Strategy
P100 DS con
P101 Ergoramp

P11x Torque
P110 Cycle start
P111 First target
P112 Final tq min
P113 Final target
P115 Cycle complete

P12x Angle
P120 Start final angle
P121 Measure angle to
- Peak tq
- Angle peak
- Cycle complete
P122 Final angle min
P124 Final angle max

P13x Speed/Ramp
P130 Soft start speed
P131 Step 1 speed
P132 Step 2 speed
P135 Step 1 ramp
P136 Step 2 ramp
P137 Ergoramp

P14x Time
P141 End time
P142 Soft start time
P144 Cycle abort timer

P15x Batch
P150 Batch count
P151 Batch size

22 Appendix B: Description of connecting devices

22.1 Printer

Connector: 25-pin DSUB female.

Function: Parallel printer

Electrical data: Normal TTL levels.
High level signal = 1

Outputs	Inputs
High > 2.4 V	High > 2.0 V
Low < 0.4 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		

22.2 Serial RS232 #1

Connector: 9-pin DSUB female.

Function: RS232 serial.

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

22.3 Serial RS232 #2

Connector: 9-pin DSUB female.

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

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

22.4 Ethernet

Connector: Shielded RJ45 for 10-baseT connection

Function: 10 Mbit Ethernet communication.

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

22.5 RBU

Connector: 15-pin DSUB female.

Function: For connection of Atlas Copco RBU.

The RBU (Rapid Backup Unit) unlocks the software you need and works as a backup memory for your PF3000 set-up data.

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

22.6 Tool Connector

Connector: (16 + 4) pin

Function: For connection of Atlas Copco Tensor electric tools.

Pin	Description
A	+5 VDC, Excitation tq transducer bridge
B	-5 VDC, Excitation tq transducer bridge
C	+Signal from tq transducer
D	- Signal from tq transducer
E	Signal ground (connected to safety ground and cabinet)
F	Tool commutation signal, Sines
G	Tool commutation signal, Cosines
H	+8/12VDC to tool memory, lights and commutation
J	GND (0V) to tool memory, lights, commutation and temp, start-, stop- and rev-switch.
K	Motor temp signal
L	Start and reverse switch input
M	Tool memory, clock
N	Tool memory, data
P	Yellow tool light
R	Green tool light
S	Red tool light
1	Motor R-phase
2	Motor S-phase
3	Motor T-phase
GND	Safety power ground

22.7 Digital Input

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

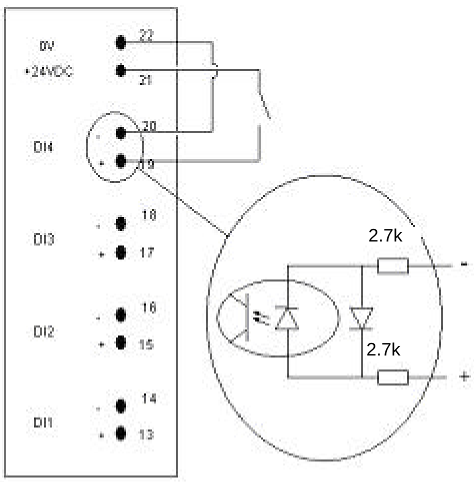
Function: Isolated opto-coupled digital input. Logical function is set in the configuration of the Power Focus 3000.

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)



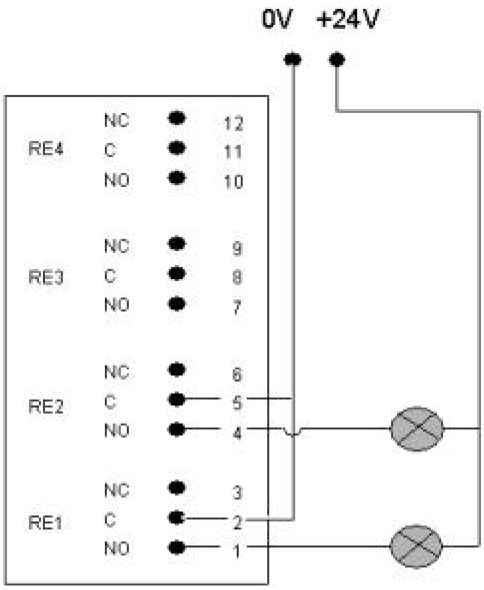
22.8 Relays

Connector: 12-pin detachable screw terminal. Mating connector Phoenix MCVR 1.5/10 -ST-3.81 or compatible.

Function: Two way dry contact relays. Isolated outputs. Logical function is set in the configuration of the Power Focus 3000.

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

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



22.9 I/O-bus #1

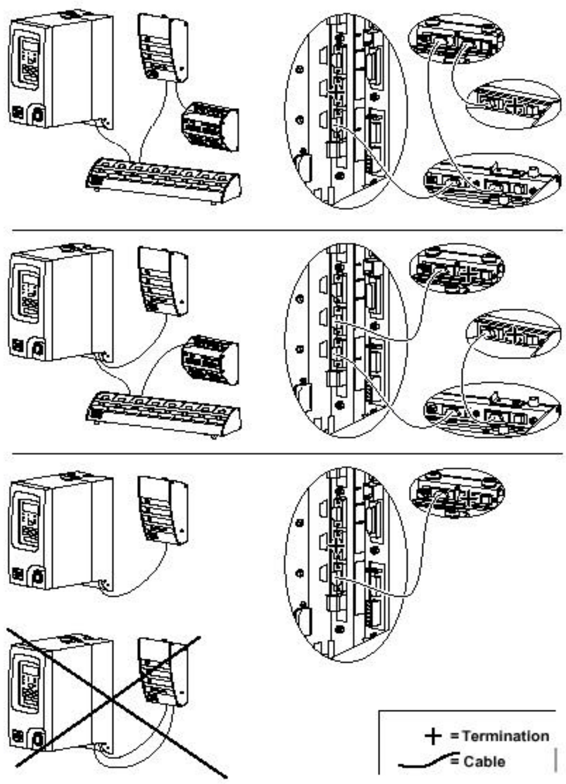
Connector: 9-pin DSUB male.
Function: To connect Atlas Copco I/O-bus accessories and interconnect several Power Focus 3000 in synchronisation mode. Parallel with I/O bus connector #2.

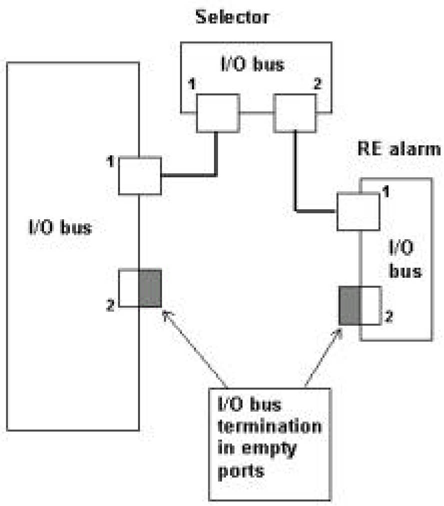
There is a range of Power Focus accessories that connect over the proprietary Power Focus I/O bus, for example:
- Selector (socket tray)
- RE alarm
- I/O-expander

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

Note! Read the Sync chapter for I/O bus sync configuration information.

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. (Note: I/O bus only)





22.10 I/O-bus #2

Connector: 9-pin DSUB male.

Function: To connect Atlas Copco I/O bus accessories and interconnect several Power Focus 3000 in synchronisation mode. Parallel with I/O bus connector #1.

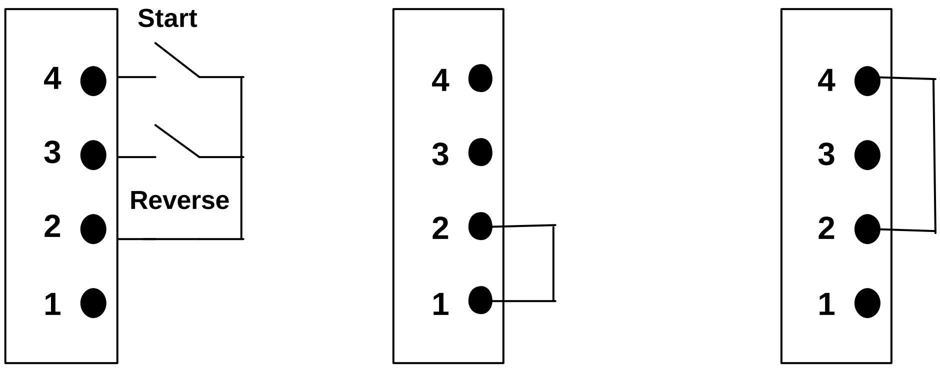
22.11 Remote start connector

Connector: 4-pin detachable screw terminal. Mating connector Phoenix MCVR 1.5/04 –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, FieldBus or digital inputs), 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 digital inputs.

Note! Make sure that the power is switched off when changing the Remote Start Connector.

22.12 Mains power connector

Connector: IEC320

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

22.13 FieldBus connector

See Chapter "**FieldBus**".

23 Appendix C: Digital inputs and outputs

Digital inputs

Function/Name	Description
Not used / Off	The input is not used.
Reset batch	Resets the batch counter for the current Psets.
Unlock tool	If the tool is locked for example because of lock on faulty, it can be unlocked with this input. It influences the same bit as “Tool Tightening Disable”. A fault can occur for that reason if both these are defined on different inputs because they are inverses of each other.
Tool disable n.o.	The tool shall not be able to start when this input is active. If the tool rotates, it shall immediate stop when this input will be active. The input is active when it is switched on. Normally opened.
Tool disable n.c.	The function is similar to Tool disable n.o. but inverted. The tool shall not be able to start when this input is active. If the tool rotates, it shall immediately stop if this input becomes active. Normally closed.
Tool tightening disable	The function is similar to Tool disable n.o. but only for tightening. Loosening is not affected.
Tool loosening disable	The function is similar to Tool disable n.o. but only for loosening. Tightening is not affected.
Remote start. Pulse	Tool start tightening if the input pulse is > 100 ms. Tool continues running until target or current limit is reached. **Warning!** 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.
Remote start. Cont.	Tool start tightening. The tool stops if the input signal disappears (equal to start with tool switch). **Warning!** 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.
Tool start loosening	Start the tool in loosening mode (for all of control strategies). Tool stops if the signal disappears. **Warning!** 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. **Warning!** Loosening will be performed for all strategies including Reverse angle and Rotate spindle forward/reverse.
Batch increment	Activating increases the batch counter with one. If the batch is “filled”, batch OK will be activated, as usual. In the memory these “tightenings” will be stored as OK tightenings but they are marked and include no numerical results. They will not influence the statistic.

Batch decrement	This function allows you to re-do the last tightening in a Job. The batch counter of the Pset or Multistage is decreased with one step. It is not possible to go back one stage after the job has been completed. In both forced order Job and free order Job batch decrement is only possible from the Job reference.
Restart Job	This function allows the user to restart the running Job without needing to reselect the Job. All Batch counters in the running Job resets and the Job options timers will also be restarted.
Bypass Pset	This function offers the option to skip a specific Pset or Multistage in the running Job, independently of batch size.
Abort Job	Cancels a current Job (gives job aborted). If *Lock_at_Job_Done* is activated, the tool will be locked.
Job Off	Disable the JOB-mode. All Psets can be used individually. Useful when fine-tuning is needed on the Psets without remove the job configuration.
Pset toggle	Turns over in those Psets that are connected to a socket in a selector. This function is also used in the Job functionality (Job free order).
Reset relays	Resets all relays. Not valid for relays which are controlled of Tracking event.
Pset select bit 0-7	Pset select input. When selected it decides which Pset will be used. These inputs are hard coded which means that binary 1 is equal to Pset 1 etc. 0 = locked tool. All used select bits shall be configured in the same I/O-device.
Job select bit 0-6	Job select input. When selected it decides which job will be used. These inputs are hard coded which means that binary 1 is equal to job 1 etc. All used select bits shall be configured in the same I/O-device.
Line control start	Input for a position breaker. Needs to start a Job with line control.
Line control alert 1	Input for a position breaker. Gives alarm if a Job with line control is not finished.
Line control alert 2	Input for a position breaker. Gives alarm if a Job with line control is not finished.
Ack error message	Confirms an occurred Error / Event. Equals to press PF enter button.
FieldBus digin 1-4	These inputs give a direct link to FieldBus. FieldBus digin #X must be configured both in PF or I/O expender and in FieldBus. FieldBus mimic the status on a dig input.
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.
Click wrench 1 -4	These inputs are activated if the Click wrench strategy is used.
ID-card	Signal input from Card reader to indicate that a ID-card is inserted in the reader.

Digital outputs

Function/Name	Relay Timer			Description
	To next tight.	Time	Tracking	
Not used / Off				Output is not used.
OK	X	X		All results are within the specified limits.
NOK	X	X		Some result is above or below any of the programmed max or min limits, or some other not approved result as re-hit.
Low	X	X		The result is below any of the programmed min limits.
High	X	X		The result is above any of the programmed max limits.
Low torque	X	X		The result is lower than min torque limit.
High torque	X	X		The result is higher than max torque limit.
Low angle	X	X		The result is lower than min angle limit.
High angle	X	X		The result is higher than max angle limit.
Cycle complete	X	X		Tightening is finished. The tool shut on target and End time is expired.
Alarm			X	Follow the Alarm light on the Power Focus front.
n x OK	X	X		Batch OK.
Job OK	X	X		Job is performed and OK.
Job NOK	X	X		Job is performed and NOK
Job Aborted	X	X		Running Job was aborted.
Job running			X	A Job is selected.
PF ready			X	The Power Focus controller is “healthy”. No errors needs to be acknowledged.
Tool ready			X	Power Focus is ready to do tightenings. A Valid Job and/or Pset is selected. The tool will start when the trigger is pressed.
Tool start switch			X	Relay that follows the tool start input. Follow the configured *Tool start input source*.
Dir. switch = CW			X	The Tool direction switch is set in its CW position.
Dir. switch = CCW			X	The Tool direction switch is set in its CCW position.
Tool tightening			X	Active when the tool rotates in tightening direction. Inactive when the target is reached or when start button/remote start is released.
Tool loosening			X	Active when the tool rotates in release direction. Inactive when start button or remote start is released.
Tool running			X	The tool is rotating CW or CCW.
Stat alarm	X	X		Follows the stat indicator on the Power Focus’ front. Active when some of the selected statistic limit or trend is outside of the approved limits.
Tool Locked			X	Active when the Tools is locked and is unable to do tightenings.
Received identifier	X	X		Active when an identifier string is received in Power Focus.

Running Pset bit 0 -7			X	Shows which Pset is selected. 0 = locked tool.
Running job bit 0 -6			X	Shows which job is selected. 0 = no running job.
Line control start	X	X		Indicates that the Line control start signal is received.
Line control done	X	X		Indicates that a Job with Line control have been done (without receiving Line control alert 2).
Line control alert 1	X	X		Line control warning.
Line control alert 2	X	X		Line control warning.
Service indicator			X	Active when the service indicator function is active and the service level is reached. On until the service indicator is reset.
FieldBus relay 1 - 4			X	The relay is controlled from FieldBus.
Tool_Red_Light			X	Relay follows tool red light (no flashing).
Tool_Green_Light			X	Relay follows tool green light. Also following the function Flash tool green light (no flashing).
Tool_Yellow_Light			X	Relay follows tool yellow light (no flashing).
Sync OK	X	X		Total OK on a Sync tightening.
Sync NOK	X	X		Total NOK on a Sync tightening.
Sync spindle 1-10 OK	X	X		Individual OK on a Sync spindle.
Sync spindle 1-10 NOK	X	X		Individual NOK on a Sync spindle.

24 Appendix D: FieldBus

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

24.1 Bit map select (Endian Mode)

Motorola Endian	Word															
	Byte 0								**Byte 1**							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Intel_16 Endian	Word															
	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 ProfiBusDP, InterBus and ModBusPlus.
Intel Endian is default setting for DeviceNet.

24.2 FieldBus data types

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

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

Data type	Description
Bit	One bit. Normally used for discrete I/O-data.
Bit Field	Length is 2 - 8 bits. All bits must be in the same byte. The left bit is the most significant bit and the right bit is the less significant bit, i.e. 0001 = 1, 1000 = 8.
Character	One byte ASCII code.
Character String Change	Character string. Each character uses one byte ASCII code. Range: 2 - 25 bytes.
Character String Input	Character string with an extra “counter” byte in front. The extra byte is an integer counter and must increase each time when the character string is entered to be able to detect a new input. If you want to enter the same value again (e.g. the same Job number), just change the counter.
Fixed Point Number	Two byte integer part and two byte decimal part. The first two bytes hold the integer part and the last two bytes hold the decimal part. Used to represent torque value.
Unsigned 16 (U16)	16-bit unsigned integer. Decimal 0 – 65 535.
Unsigned 32 (U32)	32-bit unsigned integer. Decimal 0 – 4 294 967 295.
U32_HNW	32-bit unsigned integer. MSW is the higher number word.

Important!

Common for all data types is that **a change must occur** to get the PLC or Power Focus to detect a new data entry. For example, if you want to select JOB number 3 two times in a row you must select 0 in between.

24.2.1 Most Significant Bit (MSB)

The Power Focus 3000 uses position format in all encoding and decoding data types.

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

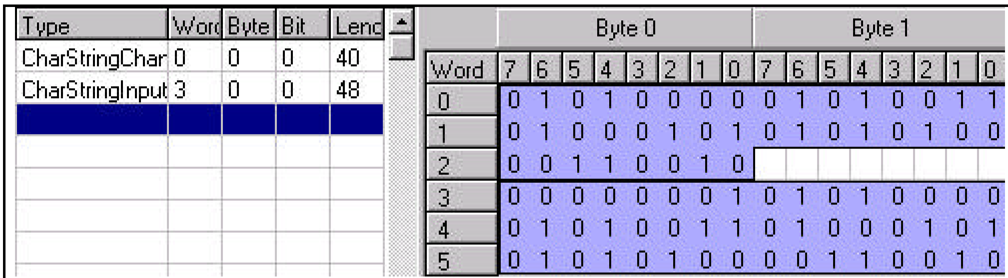
24.2.2 FieldBus data convert

To get a better understanding of converting FieldBus Data into Power Focus specific data type, some examples are given in this section, which contains Character String, Fixed Point Number and Integer.

Character String

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

Motorola Endian

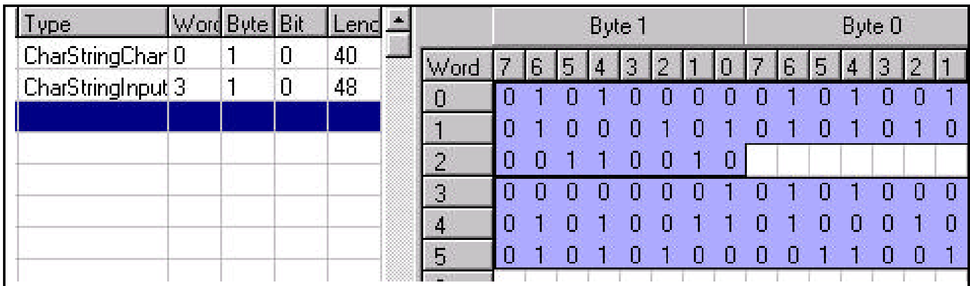


Type	Worc	Byte	Bit	Lenc
CharStringChar	0	0	0	40
CharStringInput	3	0	0	48

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

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

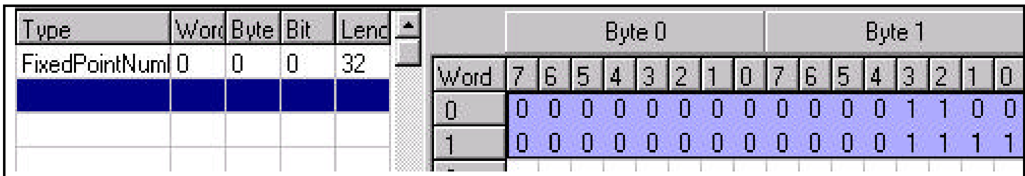
Fixed Point Number

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):

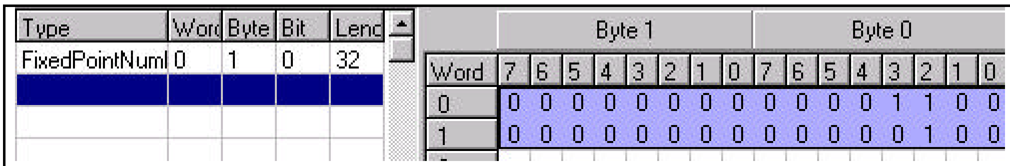
Integer part (in digits)	Decimal part (in digits)
1 or 2	2
3	1
4	0

Motorola Endian



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

Intel Endian

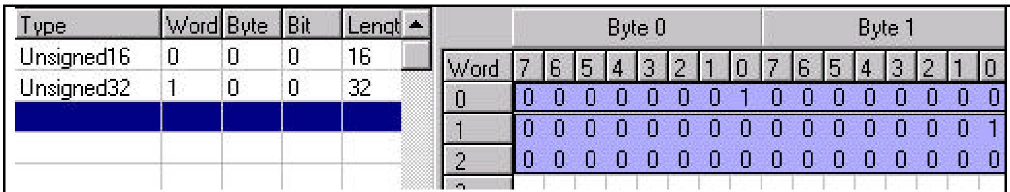


Data type	Word	Byte 1	Byte 0	Convert to PF data
FixedPointNumber	0	0	12	
	1	0	4	12.04

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.

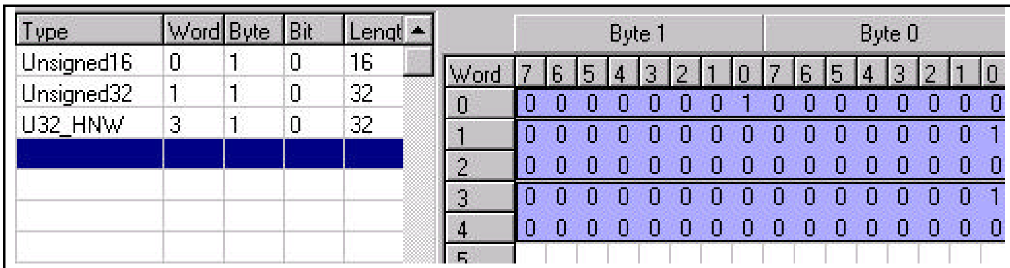
Motorola Endian



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

* MSB – Most Significant Byte; LSB – Least Significant Byte.

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

* MSB – Most Significant Byte; LSB – Least Significant Byte.

24.3 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

Angle Status

<table>
<tr><td colspan="5">Status Angle result</td></tr>
<tr><th>Data type</th><th>String length</th><th>Value</th><th>Set signal</th><th>Reset signal</th></tr>
<tr><td>Character</td><td>1 byte ASCII</td><td>O = OK
L = Low
H = High</td><td rowspan="2">Tightening result</td><td rowspan="2">Start new tightening or new Pset selected.</td></tr>
<tr><td>Bit Field</td><td>2 bits</td><td>00 = Not used
01 = OK
10 = High
11 = Low</td></tr>
</table>

Angle Status HIGH

<table>
<tr><td colspan="5">Angle result is above max limit</td></tr>
<tr><th>Data type</th><th>String length</th><th>Value</th><th>Set signal</th><th>Reset signal</th></tr>
<tr><td>Bit</td><td>1 bit</td><td>0 = Not used
1 = High</td><td>Tightening result</td><td>Start new tightening or new Pset selected</td></tr>
</table>

Angle Status LOW

<table>
<tr><td colspan="5">Angle result is below min limit</td></tr>
<tr><th>Data type</th><th>String length</th><th>Value</th><th>Set signal</th><th>Reset signal</th></tr>
<tr><td>Bit</td><td>1 bit</td><td>0 = Not used
1 = Low</td><td>Tightening result</td><td>Start new tightening or new Pset selected</td></tr>
</table>

Angle Status OK

<table>
<tr><td colspan="5">Angle result is within limits</td></tr>
<tr><th>Data type</th><th>String length</th><th>Value</th><th>Set signal</th><th>Reset signal</th></tr>
<tr><td>Bit</td><td>1 bit</td><td>0 = Not used
1 = OK</td><td>Tightening result</td><td>Start new tightening or new Pset selected</td></tr>
</table>

Batch Status

<table>
<tr><td colspan="5">Batch OK (done) or NOK (reset)</td></tr>
<tr><th>Data type</th><th>String length</th><th>Value</th><th>Set signal</th><th>Reset signal</th></tr>
<tr><td>Character</td><td>1 byte ASCII</td><td>O = OK
N = NOK</td><td rowspan="2">Batch done or reset</td><td rowspan="2">Start new tightening or new Pset selected</td></tr>
<tr><td>Bit Field</td><td>2 bits</td><td>00 = Not used
01 = OK
10 = NOK</td></tr>
</table>

Batch Status NOK

<table>
<tr><td colspan="5">Batch is NOK (batch aborted)</td></tr>
<tr><th>Data type</th><th>String length</th><th>Value</th><th>Set signal</th><th>Reset signal</th></tr>
<tr><td>Bit</td><td>1 bit</td><td>0 = Not used
1 = NOK</td><td>Batch reset</td><td>Start new tightening or new Pset selected</td></tr>
</table>

Batch Status OK (nxOK)

Batch is OK (nxOK)				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = OK	Batch done	Start new tightening or new Pset selected

Cycle Complete

Indicates that a tightening is finished. Do not care about the result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Cycle complete	Tightening done	Start new tightening or new Pset selected.

Dig In # [# = 1 – 4]

Mimic the status on a dig input in PF or I/O-expander. The input must be configured to FieldBus Dig In # X. There are four different Items.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Input Off 1 = Input On	Dig in # X On	Dig in # X Off

Dset Calibration Value

Shows the tool calibration value in selected engineering units.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Fixed Point Number	4 bytes	See final torque	DsetData	No signal

Error Code

Shows error code.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
U16	2 bytes	Binary representation (decimal 0-65535)	Error occur	Error Acc or Time out

Final Angle

The final angle result				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
U16	2 byte	Binary representation (Decimal 0-65 535)	Tightening done	Start new tightening or new Pset selected

Final Torque

The final torque result				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Fixed Point Number	4 byte	*	Tightening done	Start new tightening or new Pset selected

* A FixedPointNumber data type is used. 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.

Job Done Status

Job OK (done) or NOK (done) or aborted (reset)				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Character	1 byte ASCII	O =OK N = NOK A = Aborted	Job done or reset	Start new tightening
Bit Field	2 bits	00 = Not used 01 = OK 10 = NOK 11 = Aborted		

Job Done Status Job Aborted

Shows Job aborted				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 Bit	0 = Not used 1 = Job Aborted	Job aborted	Start new tightening

Job Done Status NOK

Job is NOK (Not all tightening OK)				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = NOK	Job done	Start new tightening

Job Done Status OK (nxOK)

Job is OK (nxOK)				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = OK	Job done	Start new tightening

Job ID

Gives the number on the selected JOB				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit Field	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		

Job Running

A job is selected and “running”				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Job done and no job selected 1 = Job is running	Job selected	Job done

Line Control Alerted 1

Indicates Line Control Alert1 received by PF				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 Bit	0 = Not used 1 = LineControlAlerted1	Line control alerted 1	Start new tightening

Line Control Alerted 2

Indicates Line Control Alert2 received by PF.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 Bit	0 = Not used 1 = LineControlAlerted2	Line control alerted 2	Start new tightening

Line Control Done

Indicates job with line control finished before line control alert2 inputted.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 Bit	0 = Not used 1 = LineControlDone	Line control done	Start new tightening

Line Control Started

Indicates Line Control Start set in PF.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 Bit	0 = Not used 1 = LineControlStart	Line control started	Start new tightening

New Pset selected

Running Pset number.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit Field	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		

New Pset Selected 0 Is 1

Running Pset number. Number 0 = Pset 1 number 1 = Pset 2 etc.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit Field	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.

PF Channel ID

Gives the channel ID number on the FieldBus PF.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit Field	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		

PF Ready

No severe errors in PF.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Errors in PF 1 = No errors in PF	PF ready (no errors)	PF not ready (errors)

Pset Final Angle Min / Final Angle Max / Step 1 Speed / Step 2 Speed

Shows Pset parameters from the running Pset				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
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.

Pset Final Target / Final Torque Min / Final Torque Max / Start Final Angle

Shows Pset parameters from the running Pset in selected engineering units.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Fixed Point	4 bytes	See final torque	New Pset selected or updated	No signal. On until new Pset is selected or current Pset updated.

PVT Mon status / Run Down Angle status / Self-tap status

Status on one of the result parameters PVT mon / rundown angle or SelfTap.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Character	1 byte ASCII	O = OK L = Low H = High	Tightening result	Start new tightening or new Pset selected.
Bit Field	2 bits	00 = Not used 01 = OK 10 = High 11 = Low		

PVT Mon Status- / Run Down Angle status- / Self-tap Status- HIGH

A result is above max limit. There are three different variables in the set-up.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = High	Tightening result	Start new tightening or new Pset selected.

PVT Mon Status- / Run Down Angle status- / Self-tap Status- LOW

A result is below min limit. There are three different items in the set-up.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Low	Tightening result	Start new tightening or new Pset selected.

PVT Mon Status- / Run Down Angle status- / Self-tap Status- OK

A result is within limits. There are three different variables in the set-up.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = OK	Tightening result	Start new tightening or new Pset selected.

Received Identifier

Indicates identifier has been received by PF				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 Bit	0 = not used 1 = Received identifier	Received Identifier	Start new tightening

Service Indicator Alarm

Indicates that the number of tightenings in the tool memory has reached the service interval limit.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Alarm Off 1 = Alarm On	Service indicator alarm on	Reset counter

Sync Channel # Green / Red / Yellow Led [# = 1 – 10]

A result from a sync channel. Follow tool light. There are 30 (3x10) different items in the set-up.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = green / red / yellow	Tightening result	Start new tightening or new Pset selected

Tightening Time

The tightening time taken from the most recent result. Format HH:MM:SS				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Character s tring change	64 bit (8 characters)	i.e. 08:15:08 (8 ASCII characters) 24 hour	Tightening result	Start new tightening or new Pset selected

Tightening Time Hour

The tightening time (hour part only) taken from the most recent result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
U16	16 bit (one word)	0 - 24 hour	Tightening result	Start new tightening or new Pset selected

Tightening Time Min

The tightening time (minutes only) taken from the most recent result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
U16	16 bit (one word)	0 - 60 min	Tightening result	Start new tightening or new Pset selected

Tightening Time Sec

The tightening time (seconds only) taken from the most recent result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
U16	16 bit (one word)	0 - 60 sec	Tightening result	Start new tightening or new Pset selected

Tightening Date

The tightening date taken from the most recent result. Format YYYY:MM:DD				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Character string change	80 bit (10 characters/ bytes)	i.e. 2000:05:07 (10 ASCII characters)	Tightening result	Start new tightening or new Pset selected

Tightening Date Day

The tightening date (day part only) taken from the most recent result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
U16	16 bit (one word)	1 – 31	Tightening result	Start new tightening or new Pset selected

Tightening Date Month

The tightening date (month part only) taken from the most recent result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
U16	16 bit (one word)	1 – 12	Tightening result	Start new tightening or new Pset selected

Tightening Date Year

The tightening date (year part only) taken from the most recent result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
U16	16 bit (one word)	Year number 4 digits	Tightening result	Start new tightening or new Pset selected

Tightening Status

Combined status for all tightening result parameters that is used. All results OK = OK. One or more NOK = NO				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Character	1 byte ASCII	OK = O NOK = N	Tightening result	Start new tightening or new Pset selected
Bit Field	2 bits	00 = Not used 01 = OK 10 = NOK		

Tightening Status NOK

Tightening result have one or more Not OK results.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = NOK	Tightening result	Start new tightening or new Pset selected

Tightening Status OK

All tightening result are OK.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = OK	Tightening result	Start new tightening or new Pset selected

Tool Disabled

Indicates if the tool is disabled or not.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Tool enabled 1 = Tool disabled	Tool disable	Tool enable

Tool Enabled

Indicates if the tool is enabled or not.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Tool disabled 1 = Tool enabled	Tool enable	Tool disable

Tool Green Light

This item follows the tool green light.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Green	Tightening result or flash green light	Start new tightening or Reset Led

Tool Red Light

This item follows the tool red light.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Red	Tightening result	Start new tightening

Tool Yellow Light

This item follows the tool yellow light.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Yellow	Tightening result or fatal error*	Start new tightening or error Ack*

* If ”PF_Control_3” is selected in Cset, yellow led shows the fatal error and reset when error acknowledged.

Tool Loosening

Indicates that the tool is loosening.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Tool is not loosening 1 = Tool is loosening	Tool is loosening	Tool is stopped

Tool Ready

Indicates that the tool is ready for tightening.				
Data type	**Data length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Tool is not ready 1 = Tool is ready	Tool is ready	Tool is not ready

Tool Running

Indicates that the tool is rotating CW or CCW.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Tool is not run 1 = Tool is running	Tool is running	Tool is stopped

Tool Tightening

Indicates that the tool is tightening.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Tool is not tighten 1 = Tool is tightening	Tool is tightening	Tool is stopped

Torque Status

Status torque result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Character	1 byte ASCII	O= OK L = Low H = High	Tightening result	Start new tightening or new Pset selected
Bit Field	2 bits	00 = Not used 01 = OK 10 = High 11 = Low		

Torque Status HIGH

Torque result is above max limit				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = High	Tightening result	Start new tightening or new Pset selected

Torque Status LOW

Torque result is below min limit				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Low	Tightening result	Start new tightening or new Pset selected

Torque Status OK

Torque result is within limits				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = OK	Tightening result	Start new tightening or new Pset selected

VIN Input

Shows the VIN number inputted from FieldBus, serial or Ethernet. Changes as soon as the number is given. This is not the VIN used in the tightening result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Character string input	24 – 208 bit (3-26 bytes)	One ASCII sign for each character.* First byte is counter.	New VIN input	No signal. On until new Vin is inputted
Character string change	16 – 200 bit (2-25 bytes)	One ASCII sign for each character *		

VIN Used In Tightening

Shows the VIN number used in a tightening. This is the VIN used in the tightening result.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Character string change	16 – 200 bit (2-25 bytes)	One ASCII sign for each character**	Tightening result	Start new tightening Or new Pset selected

* 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.

24.4 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.

Abort Job

Aborts the running Job.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Abort	Abort job	No signal
Character	8 bit (1 byte)	A = Abort		

Ack Error Message

Acknowledge error message				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not Used 1 = Ack Error	Ack error message	No signal

Batch Decrement

Decrement the batch counter with one.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Decrement	Batch decrement	No signal

Batch Increment

Increment the batch counter with one				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Increment	Batch increment	No signal

Bypass Pset In Job

Stop current Pset and jump to next Pset in the Job.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Bypass Pset in job	Bypass Pset	No signal

Identifier

Input the VIN number from the PLC. To get this working you must set identifier input source in PF to FieldBus.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Character string input	24 – 208 bit (3-26 bytes)	One ASCII sign for each character. First byte is counter.	New VIN input	No signal
Character string change	16 – 200 bit (2-25 bytes)	One ASCII sign for each character		
U16	2 bytes in the same word	*		
U32	4 bytes in two words	**		
U32_HNW	4 bytes in two words			

*U 16: If the value is less then 5 digits decimal, PF will fill with zeroes in front.

** U32: If the value is less then 10 digits decimal, PF will fill with zeroes in front.

Job Select

Select a Job. Job select source must be set to FieldBus. Job 0 = no job selected.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit Field	2 – 8 bits in the same byte.	0000 0001 = job 1 0001 0000 = job 16	Job select	No signal
U16	16 bits in one word	00….0001 = job 1 00….1000 = job 8		

Job Off

Gets off job mode and unlocks tool.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Job On 1 = Job Off	Job Off	Job On

Line Control Alert 1

Job not finished alarm 1				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not Used 1 = Line Control alert 1	Line control alert 1	No signal

Line Control Alert 2

Job not finished alarm2				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not Used 1 = Line Control alert 2	Line control alert 2	No signal

Line Control Start

Input signal to start the line control function				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not Used 1 = Line Control	Line control start	No signal

PSET Select

Select a PSET. PSET select source must be set to FieldBus. PSET0 = no Pset selected.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit Field	2 – 8 bits in the same byte.	0000 0001 = Pset 1 0001 0000 = Pset 16	PSET select	No signal
U16	16 bits in one word	00….0001 = Pset 1 00….1000 = Pset 8		

PSET select 0 Is 1

Select a PSET. PSET select source must be set to FieldBus. PSET0 = no Pset selected. Number 0 = Pset 1 number 1 = Pset 2 etc.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit Field	2 – 8 bits in the same byte.	0000 0001 = Pset 2 0001 0000 = Pset 17	PSET select	No signal

Relay Pos # [# = 1 – 4]

Control a relay from FieldBus. In I/O set-up the selected relay must be programmed to FieldBus relay x. There are four different items.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Rely OFF 1 = Relay ON	Set FieldBus relay x	Reset FieldBus relay x

Reset Batch

Reset the batch c ounter to 0.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Reset the batch	Reset batch	No signal

Reset Result Status

Reset all result status on relay, re-alarm and FieldBus.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not Used 1 = Reset result	Reset result status	No signal

Restart Job

Stop current job and restart the same job from 0.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Restart job	Restart job	No signal

Tool Disable

Disable the tool. To avoid conflicts this parameter shall not be selected if Tool Enable is used.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Enable tool 1 = Disable tool	Tool disable	Tool Enable

Tool Enable

Enable the tool. To avoid conflicts this parameter shall not be selected if Tool Disable is used.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Disable tool 1 = Enable tool	Tool enable	Tool disable

Tool Lights Flash Green

Starts to flash the tool green light. Resets any existing light pattern on the tool.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Tool light flash	Tool light flash green	No signal

Tool Start Loosening

Start the tool in loosening direction. Direction depends on CW / CCW in PF. Tool start input source must be set to FieldBus.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Stop tool 1 = Start loosening	Start loosening	Stop tool

Tool Start Tightening

Start the tool in tightening direction. Direction depends on CW / CCW in PF. Tool start input source must be set to FieldBus.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Stop tool 1 = Start tightening	Start tightening	Stop tool

Tool stop

Stops the tool.				
Data type	**String length**	**Value**	**Set signal**	**Reset signal**
Bit	1 bit	0 = Not used 1 = Stop tool	Stop tool	No signal

24.5 Profibus-DP

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

General technical questions regarding the FieldBus should be addressed to your local Profibus User Group in the first instance.

A contact address list is available on the Profibus Internet site; www.Profibus.com. For general help on Profibus, contact Profibus International on: Profibus_international@compuserve.com.

Power Focus Profibus DP description

Protocol & Supported Functions

- FieldBus type: PROFIBUS DP EN 50 170 (DIN 19245)
- Protocol version: ver. 1.10
- Protocol stack supplier: SIEMENS
- Auto baud rate detection supported. Baud rate range: 9.6 kbit-12Mbit

Physical Interface

- Transmission media: ProfiBus bus line, type A or B specified in EN50170
- Topology: Master-Slave communication
- FieldBus connectors: 9 pin female DSUB (standard)
- Cable: Shielded copper cable, Twisted pair
- Isolation: The bus is galvanically separated from the other electronics with an on board DC/DC converter. Bus signals (A-line and B-line) are isolated via optics couplers.
- Profibus DP communication ASIC: SPC3 chip from Siemens

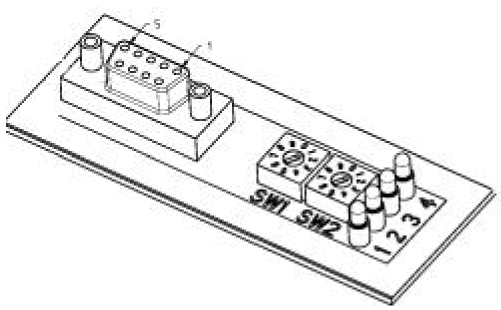
Facts in brief

The table below gives a brief summary of facts for Power Focus ProfiBus DP module.

Variable	Limits	Information
Node Address	1 – 124 (1-99 with HW setting)	Set Switches to 00 if you want to set the node address from SW (TTPF)
Number of nodes in a Profibus-DP network	Max 126	
Baud rate	Automatic (9.6 kbaud – 12 Mbaud)	Automatically set from PLC at connection
Data to PF length	0 - 122 bytes *	Must be the same in PF and PLC
Data from PF length	0 - 122 bytes *	Must be the same in PF and PLC
The module only supports cyclic I/O data transmission		

* The string length in PF is limited to 122 bytes. Profibus-DP standard allows 244 bytes.

Hardware



FieldBus Connectors

The Profibus-DP standard EN 50170 (DIN 19245) recommends the use of a 9 pin female D-sub connector. Depending on the protection class and type of application, other connector designs are also allowed.

Connector 9-pin female DSUB

Pin	Name	Function
Housing	Shield	Connected to PE
1	Not connected	
2	Not connected	
3	B-Line	Positive RxD/TxD according to RS485 specification
4	RTS	Request to send *
5	GND BUS	Isolated GND from RS484 side*
6	+5V BUS	Isolated +5V from RS484 side*
7	Not connected	
8	A-Line	Negative RxD/TxD according to RS485 specification
9	Not connected	

* +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.

Node Address

Node addresses are set with the two rotary switches on the FieldBus module, this enables address settings from 1-99 in decimal form.
Switch 1 x10
Switch 2 x1
(See switches on the top drawing)

Example:
Address = (Left Switch Setting x 10) + (Right Switch Setting x 1)
Left switch is set to 5 and right switch is set to 2. This gives a node address of 52.

If you want to set the node address from ToolsTalk the switches must be set to 00.

Note! The node address cannot be changed when the power is switched on.

Baud rate

The baud rate on a Profibus DP network 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, you will not have to configure the baud rate on the module.

Baud rates supported by the Power Focus Profibus-DP module are:		
9.6 kbit/s	19.2 kbit/s	93.75 kbit/s
187.5 kbit/s	500 kbit/s	1.5 Mbit/s
3 Mbit/s	6 Mbit/s	12 Mbit/s

Functionality of the indication LEDs

The module is equipped with four bicolour LEDs, used for debugging purposes. The function of the LEDs are described in the table and figure below.

Name	Colour	Function
FieldBus Diagnostics **(LED 4)**	Red	Indicates certain faults on the FieldBus side. **Flashing Red 1 Hz** - Error in configuration: IN and/or OUT length set during initialisation of the module is not equal to the Length set during configuration of the network. **Flashing Red 2 Hz** - Error in User Parameter data: The Length/contents of the User Parameter data set during initialisation of the module is not equal to the length/contents set during configuration of the network. **Flashing Red 4 Hz**– Error in initialisation of the Profibus communication ASIC. **Turned Off** - No diagnostics present
On-Line **(LED 2)**	Green	Indicates that the module is On-Line on the FieldBus. **Green** - Module is On-Line and data exchange is possible. **Turned Off** – Module is not On-Line
Off-Line **(LED 3)**	Red	Indicates that the module is Off-Line on the FieldBus. **Red** - Module is Off-Line and no data exchange is possible. **Turned Off** – Module is not Off-Line

Bus termination

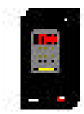
The end nodes in a Profibus DP network have to be terminated to avoid reflections on the bus line. Use cable connectors with built-in termination.

GSD file

Each device on a Profibus DP network is associated with a GSD file, containing all necessary information about the device. The network configuration program during configuration of the network uses this file.

Contact your local Atlas Copco company for a copy of the GSD file
File name: **pf3profb.gsd**

Icon file



Contact you local Atlas Copco representative to get a copy of the Icon file for Power Focus. This file can be used to have a PF Icon in PLC configuration SW. The file is a bitmap.
File name: **pf3profb.bmp**

24.6 DeviceNet

DeviceNet is used for industrial automation, normally for the control of valves, sensors and I/O units and other automation equipment. The DeviceNet communication link is based on a broadcast-oriented communications protocol, Controller Area Network (CAN). This protocol has I/O response and high reliability even for demanding applications, e.g. brake control.

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

The media for the FieldBus is a shielded copper cable composed of one twisted pair and two cables for the external power supply. The baud rate can be changed between 125k, 250k and 500kbit/s. This can be done in two different ways. The first is simply by using the DIP switch, second is via SW configuration.

There are several different DeviceNet Scanners available on the market, both for PLC systems and for PCs.

Power Focus DeviceNet description

Facts in brief

The table below provides a brief summary of facts for the Power Focus DeviceNet module.

Variable	Limits	Information
Node Address (Mac ID)	0-63	
Number of nodes in a DeviceNet network	Max 63	
Connection modes supported	Polled I/O Bit strobe I/O Change of status/ cyclic I/O	Use same as in PLC
Baud rate	125kbit/sec (Default) 250kbit/sec 500kbit/sec	
Data to PF length	0 – 122 bytes *	Must be the same in PF and PLC
Data from PF length	0 – 122 bytes *	Must be the same in PF and PLC

* The data string is in PF limited to 122 bytes. DeviceNet standard allows 255 bytes.

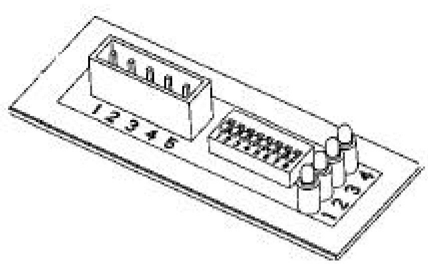
Configuration

In a DeviceNet network, each node has a Mac ID (the address in the network). The Mac ID is a number between 0 and 63. Each node's Mac ID has to be unique, since it is used to identify the node. In a DeviceNet network you can also set Baud rate, with the following baud rates being available: 125, 250 and 500 kbit / sec. All nodes in the network have to communicate at the same baud rate.

On the 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 TTPF. 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.

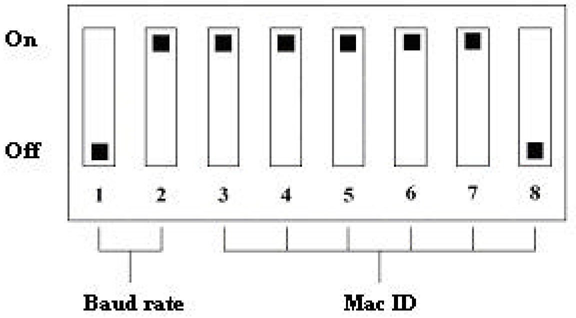
The Power Focus DeviceNet module is implemented in compliance with the ODVA specification for a Communication adapter (profile no 12). It acts as a "group two only server" on the DeviceNet network.

Hardware



LED 1: Not used
LED 2: Network status
LED 3: Module status
LED 4: Not used

Function	DipSwitch #
AD0	8
AD1	7
AD2	6
AD3	5
AD4	4
AD5	3
BD2	2
BD1	1
On = 1 Off = 0	



Bit/sec	
125k	00
250k	01
500k	10
Reserve (SW-setting)	11

0	000 000
1	000 001
2	000 010
3	000 011
…	…
62	111 110
63	111 111

Mac ID (Node Address)

If you want to set the Mac ID from TTPF all dip switches must be set to On (11 111 111).

Note! The Mac ID cannot be changed when the power is switched on.

FieldBus Connector

Connector 5-pin 5.08mm detachable screw terminal

Pin	Colour code	Description
1	Black	V-
2	Blue	CAN-L
3	Bare	Shield
4	White	CAN-H
5	Red	V+

Note! 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 sourced from a PF 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 you have a central power supply that feeds all nodes in the network.

Power consumption

Current consumption at 24 VDC (V- to V+) is max 70 mA at power up and 25-30 mA continuously.

Functionality of the indication LEDs

The module is equipped with four bicolour LEDs, used for debugging purposes. The function of the LEDs is described in the table and figure below.

LED #
1: Not used
2: Network status
3: Module status
4: Not used

LED#	Condition	Description
3: Module status	Off	No Power
3: Module status	Steady red	Unrecoverable fault
3: Module status	Steady green	Device operational
3: Module status	Flashing red	Minor fault
2: Network status	Off	Not powered / Not on line
2: Network status	Steady green	Link OK on line. Connected
2: Network status	Steady red	Critical link failure
2: Network status	Flashing green	On line not connected
2: Network status	Flashing red	Connection time out

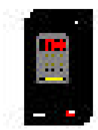
Bus termination

Termination of the FieldBus requires a terminating resistor at each end of the FieldBus. These resistors should have a value of 121 ohm.

EDS file

Each device on a DeviceNet network is associated with an EDS file, containing all necessary information about the device. The network configuration program during configuration of the network uses this file.
Contact your local Atlas Copco representative for a copy of the EDS file.
File name: **pf3devn.eds**

Icon file



Contact you local Atlas Copco representative to get a copy of the Icon file for Power Focus. This file can be used to have a PF Icon in PLC configuration SW. File name: **pf3devn.ico**

24.7 InterBus

Introduction to InterBus

The 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

Protocol & Supported Functions

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. One through fast cyclical I/O data, called process data. The other is a somewhat slower protocol called PCP, which is mainly used for configuring and setting the parameters of a device. The 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.

Note! 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.

Power Focus Interbus description

Physical Interface

Transmission media: InterBus two differential lines.
Topology: Ring Structure.
FieldBus connectors: 9 pin male DSUB.
Cable: Shielded copper cable, Three Twisted pair.
Isolation: The bus is galvanically separated from the other electronics with two DC/DC Converters. Bus signals are isolated via opto couplers.
ASICs and circuits: Module is based on SUPI 3 and SRE1 chip from Phoenix Contact.

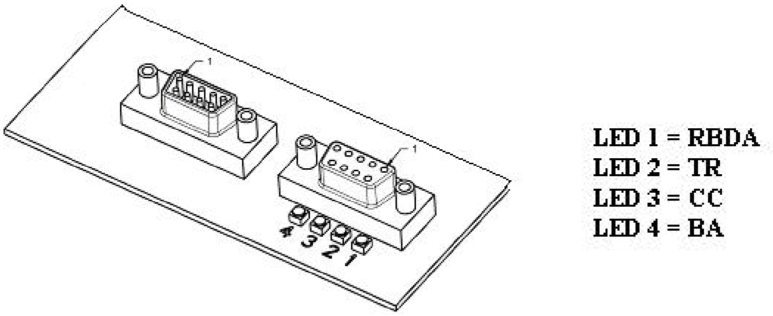
Facts in brief

The table below gives a brief summary of facts for Power Focus Interbus module.

Variable	Limits
Node Address	Auto select
Number of nodes in an Interbus network	
Baud rate	500 kbit/sec
Process string length	<= 20 bytes
Parameter string length (send with PCP)	122 byte – Process string length *
PCP length	0, 1, 2, 4 Words
Parameter data index	0x6000 R/W + I (I = 0, 1, …) 0x6040 RO + I (I = 0, 1, …)
ID code (in PLC side)	PCP 0 = 3 PCP 1 = 0xF3 PCP 2 = 0xF0 PCP 4 = 0xF1

* The string length in the Power Focus 3000 is limited to 122 bytes. Interbus standard allows 512 bytes.

Hardware



BUS-IN (9-pin Dsub male) BUS-OUT (9-pin Dsub female)

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

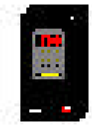
Pin	Name
Housing	PE
1	DO2
2	DI2
3	GND
4	Not used
5	GND
6	/DO2
7	/DI2
8	Not used
9	RBST

Note! 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 LEDs

LED#	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, Retriggerable).
3. CC	Cable Check	Active GREEN if the cable connection is good and the InterBus Master is not in RESET
4. BA	Bus Active	Active GREEN, is monitoring Layer 2

Icon file



Contact you local Atlas Copco representative to get a copy of the Icon file for Power Focus. This file can be used to have a PF Icon in the PLC configuration SW. File name: **pf3intb.ico**

24.8 ModBusPlus

ModBusPlus is a local area network system designed for industrial control and monitoring applications, developed by Modicon, Inc. The network enables programmable controllers, host computers and other devices to communicate throughout plants and substations. ModBusPlus transfers fast data for motor controllers, MMI, I/O units and other industrial equipment. ModBusPlus has an international user organisation called Modicon Inc.

General technical questions regarding the FieldBus should be addressed to your local ModBusPlus User Group in the first instance.

A contact address list is available from the ModBusPlus Internet site; www.modicon.com.

Power Focus ModbusPlus description

Physical Interface

- Transmission media: ModBusPlus one differential line (RS-485 twisted pair) and shield.
- Topology: Token Bus Structure, virtual token ring.
- FieldBus connectors: 9 pin female DSUB.
- Cable: Shielded copper cable, One Twisted pair
- Isolation: The bus signals are separated from the other electronics with a transformer according to ModBusPlus interface description.
- 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 ModBus 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.

Facts in brief

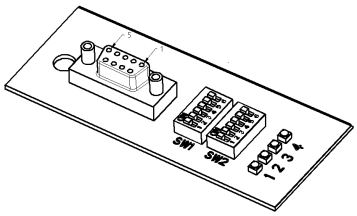
The table below shows a brief summary of facts for Power Focus ModBusPlus module.

Variable	Limits	Information
Node Address	1 - 64	The node address cannot be changed during operation.
Source Address	1 - 64	The node address cannot be changed during operation.
Number of nodes in a ModBusPlus network	Max 32 (with repeaters 64)	
Bus length	Max 2000 m with repeaters	
Bus cable length	Max 500 m	
Data address	40001+ I (I = 0, 1, …)* From PF 41025 + I (I = 0, 1, …)* To PF	This address is based on words.
Baud rate	Automatic (1Mbit/s)	Automatically set from PLC at connection.
Data to PF total length	0 - 122 bytes **	Must be the same in PF and PLC.
Data from PF total length	0 - 122 bytes **	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		

* 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.

** The string length is in PF limited to 122 bytes. ModBusPlus standard allows 64 bytes global data and 250 bytes point-to-point data.

Hardware



LED 1: Not used
LED 2: Error
LED 3: MBP Active
LED 4: MBP Init

Functionality of the indication LEDs

The module is equipped with four bi-colour LEDs, used for debugging purposes. The function of the LEDs is described in the table and figure below.

Name	Colour	Function
Error **(LED 2)**	Red	Indicates that the communication is not OK. **Turned Off** – communication OK
MBP Active **(LED 3)**	Green	Indicates different Node Status: **Flashing every 160 ms** – This node works normally, receiving and passing token. **Flashing every 1 s** – This node is in Monitor_Offline status. **2 Flashing, off 2 s** – This node is in MAC_IDLE never receiving-token status. **3 Flashing, off 1.7 s** – This node is not hearing any other nodes. **4 flashing, off 1.4 s** – This node has heard a valid packet that has a duplicated-node address sent from another node on the network, using the same Node ID.
MBP Init **(LED 4)**	Green	Indicates that the peer interface is initialised **Turned Off** – peer interface is not initialised

FieldBus Connectors

ModBusPlus recommends the use of a 9 pin female D-sub connector. Depending on the protection class and type of application, other connector designs may also be used.

Connector 9-pin female DSUB

Pin	Name
1	Cable shielding
2	Line-B
3	Line-A
4	PE

Node Address

Node address is set with the first dip switch on the FieldBus module, allowing address settings from 1-64 in binary format. If the set node address is from SW1, ModBusPlus takes SW node address regardless of hardware switch position.

1 MSB	2	3	4	5	6	Function LBS
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

Note! The node address cannot be changed during operation.

Source Address

Source address is set using the second dip switch (the one close to LED) on the FieldBus module, this enables address settings from 1-64 in binary format. If the set source address is from SW2, ModBusPlus takes SW source address regardless of hardware switch position.

1 MSB	2	3	4	5	6	Function LBS
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

Note! The source address cannot be changed during operation.

File and Icon

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

25 Appendix E: Statistics

25.1 Statistics in Power Focus 3000

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

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 x sigma
Cr	Cr is a calculated viability number. (capability). The lower value, the better process.
Cp	Cp is a viability factor. The higher value the better process.
Cpk	Cpk is a viability factor. The higher value the better process.
Cam	
Sub-group results	
Min	Lowest result in the latest completed subgroup
Max	Highest result in the latest completed subgroup
R	Range for the latest completed subgroup
$\overline{x}$	Average value for the latest completed subgroup
σ	Sigma for the latest completed subgroup
Other definitions	
$\overline{R}$	Average of subgroup range (number of subgroups)
$\overline{\overline{X}}$	Average of subgroup average (number of subgroups)

25.1.1 Statistical process control

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.

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.

25.1.2 Statistic alarm

$\bar{x}$ > UCL
$\bar{x}$ < LCL
R > UCL
R < LCL
Cp < 2.0
Cpk < 1.33

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

25.1.3 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 $\overline{R}$ $\pm$ 2 sigma (sigma for the whole population)

Point = subgroup

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

25.1.4 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.

25.1.5 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.

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

25.1.6 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 formula for the statistic parameters used by Power Focus are as follows:
X_i = value
n = number of tightenings
Min = minimum value from all the tightenings in the test series
Max = maximum value from all the tightenings in the test series
minl = minimum acceptable value
maxl = maximum acceptable value

$$Range = R = Max - Min$$

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

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

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

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

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

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

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

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

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

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.

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

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

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

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

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

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

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

25.1.7 Constants for calculation of SPC variables

Constants for Calculation of SPC Variables								
Subgroup Size	**Divisors for Estimation Of Standard Dev.**		**Factors for Control Limits**					
N	D_2	c_4	A_2	D_3	D_4	A_3	B_3	B_4
2	1.13	0.798	1.88	-	3.27	2.66	-	3.27
3	1.69	0.886	1.02	-	2.57	1.95	-	2.57
4	2.06	0.921	0.73	-	2.28	1.63	-	2.27
5	2.33	0.940	0.58	-	2.11	1.43	-	2.09
6	2.53	0.952	0.48	-	2.00	1.29	0.03	1.97
7	2.70	0.959	0.42	0.08	1.92	1.18	0.12	1.88
8	2.85	0.965	0.37	0.14	1.86	1.10	0.19	1.82
9	2.97	0.969	0.34	0.18	1.82	1.03	0.24	1.76
10	3.08	0.973	0.31	0.22	1.78	0.98	0.28	1.72
11	3.17	0.975	0.29	0.26	1.74	0.93	0.32	1.68
12	3.26	0.978	0.27	0.28	1.72	0.89	0.35	1.65
13	3.34	0.979	0.25	0.31	1.69	0.85	0.38	1.62
14	3.41	0.981	0.24	0.33	1.67	0.82	0.41	1.59
15	3.47	0.982	0.22	0.35	1.65	0.79	0.43	1.57
16	3.53	0.984	0.21	0.36	1.63	0.76	0.45	1.55
17	3.59	0.985	0.20	0.38	1.62	0.74	0.47	1.53
18	3.64	0.985	0.19	0.39	1.61	0.72	0.48	1.52
19	3.69	0.986	0.19	0.40	1.60	0.69	0.50	1.50
20	3.74	0.987	0.18	0.42	1.59	0.68	0.51	1.49
21	3.78	0.988	0.17	0.42	1.58	0.66	0.52	1.48
22	3.82	0.988	0.17	0.43	1.57	0.65	0.53	1.47
23	3.86	0.989	0.16	0.44	1.56	0.63	0.55	1.46
24	3.90	0.989	0.16	0.45	1.55	0.62	0.56	1.45
25	3.93	0.990	0.15	0.46	1.54	0.61	0.57	1.44

26 Abbreviations

$\bar{R}$	The centre line
$\bar{X}$	The mean
$\bar{\bar{X}}$	The mean of the average
<= =>	Arrow (button)
σ	Sigma (standard deviation)
a	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
Dig in	Digital input
DSP	Digital signal processor.
ft.lb	Foot pound
GFI	Ground Fault Interrupter
HW	Hardware
Hz	Hertz (unit of frequency)
I/O	Input/output

ID	Identification
in.lb	Inches pound
IR	Infra red
kpm	Kilo pound meter
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MC	Motor card
n	Number (of values)
Nm	Newton meter
No.	Number
NOK	Not approved (tightenings)
nxOK	Number of approved (tightenings)
OK	Approved (tightenings)
PF	Power Focus
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	FieldBus, serial communication link
S4/S7/S9	Motor sizes in Tensor-S tools
SM	Sync Reference
SPC	Statistic Parameter Control
STAT	Statistic (button)
SW	Software

Tq	Torque
Tq con	Torque control
Tq mon	Torque monitoring
TTPF	ToolsTalk 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

27 Parameter Tree

27.1 Parameter set

PxxxPset

P1xx Programming

P10x Control	P11x Torque	P12x Angle	P13x Speed & ramp	P14x Time	P15x Batch count
0 Control strategy	0 Cycle start	0 Start final angle	0 Soft start speed	0	0 Batch count
1 Tightening strategy	1 First target	1 Measure ang to	1 Step 1 speed	1 End time	1 Batch size
2 DS / S replace mode	2 Final tq min	2 Final angle min	2 Step 2 speed	2 Soft start time	2 Lock at batch OK
3 Xbar adaptive control	3 Final target	3 Target angle	3 Loosening speed	3 Tool idle time	
4 Rundown angle	4 Final tq max	4 Final angle max	4 Loosening ramp	4 Cycle abort timer	
5 Zoom step	5 Cycle complete	5 Rundown angle min	5 Step 1 ramp		
6 PF 2000 compatible	6 Rundown complete	6 Rundown angle max	6 Step 2 ramp		
7 Click wrench no			7 Ergoramp		
			8 Zoom step speed		

P2xx Programming +

P20x Current monitoring	P21x PVT self-tap	P22x PVT monitoring	P23x PVT compensate	P24x Options
0 Current monitoring	0 Self-tap	0 PVT monitoring	0 PVT comp	0 Tool tightening direction
1 CM min	1 Self-tap interval	1 PVT delay interval	1 PVT comp point	1 Soft stop
2 CM max	2 No of self-tap windows	2 PVT monitor interval		2 Alarm on rehit
	3 Self-tap min	3 No. of PVT windows		3 Alarm on Tq < target
	4 Self-tap max	4 PVT min limit		4 Alarm on lost trigger
		5 PVT max limit		5 DS tuning factor

P4xx Pset set-up

P40x Pset admin	P41x Reset
0 View existing Pset	0 Delete Pset results
1 Create New Pset	1 Delete All results
2 Name Pset	
3 Copy Pset	
4 Delete Pset	
6 Pset updated	

P5xx Statistic programming

P50x Statistic common	P51x SPC torque	P52x SPC angle	P53x SPC Rundown angle	P54x SPC Self-tap	P55x SPC PVT
0 Min valid stat tq limit	0 Tq (X) LCL	0 Ang (X) LCL	0 Rundown angle (X) LCL	0 Self-tap (X) LCL	0 PVT (X) LCL
1 Max valid stat tq limit	1 Tq (X) UCL	1 Ang (X) UCL	1 Rundown angle (X) UCL	1 Self-tap (X) UCL	1 PVT (X) UCL
2 Subgroup size	2 Tq R LCL	2 Ang R LCL	2 Rundown angle R LCL	2 Self-tap R LCL	2 PVT R LCL
3 No of subgroups	3 Tq R UCL	3 Ang R UCL	3 Rundown angle R UCL	3 Self-tap R UCL	3 PVT R UCL
4 Subgroup frequency	4 Tq (X-bar-bar)	4 Ang (X-bar-bar)	4 Rundown angle (X-bar-bar)	4 Self-tap (X-bar-bar)	4 PVT (X-bar-bar)
5 Latest n values	5 Tq (R-bar)	5 Ang (R-bar)	5 Rundown angle (R-bar)	5 Self-tap (R-bar)	5 PVT (R-bar)
6 SPC alarm tq					
7 SPC alarm angle					
8 SPC alarm CM					

P6xx Auto set
0 Final target

P7xx Quick prog.
0 Control strategy
1 Joint angle
2 Final target

Cxxx Config

C1xx System set-up

C10x Password & name	C11x Display set-up 1	C12x Display set-up 2	C13x Options	C15x Reset	C16x Printer set-up
0 Use password	0 Config run disp1	0 Language	0 Lock on reject	0 Delete all results	0 Printer type
1 Password entry scope	1 Config run disp2	1 Tq presentation unit	1 Disable loosening at OK	1 Total reset	1 Paper size
2 Config password		2 Viewing angle	2 Reset batch at Pset change		2 Continuous print
3 Network password		3 BackLight auto off			
5 Ch ID number		4 Soft key enabled			
6 PF name		6 Graph with angle offset			
7 Cell ID no.					
8 Cell name					
9 Set date & time					

C2xx I/O set-up

C20x I/O device 0-7	C21x I/O device 8-15	C22x Other I/Os
0 Internal I/O	0 Device 8	0 Tool start select source
1 Device 1	1 Device 9	1 Job select source
2 Device 2	2 Device 10	2 Pset select source
3 Device 3	3 Device 11	3 Tool light con source
4 Device 4	4 Device 12	4 Tool light mode
5 Device 5	5 Device 13	5 Tool light on timer
6 Device 6	6 Device 14	6 Selector confirm
7 Device 7	7 Device 15	7 Job Select Source Override

C3xx Communication

C30x Remote communication	C31x Advanced	C32x Serial ports set-up
1 IP address	0 Cell keep alive	0 Serial 1 baudrate
2 Subnet mask		1 Serial 1 protocol
3 Default router		2 Serial 2 baudrate
4 Netmaster IP address		
5 Cellmaster IP address		
6 Jobreference IP address		
7 Syncreference IP address		

C4xx Protocols

C40x Tools Talk set-up	C41x ToolsNet set-up	C42x Multicast set-up
0 Port	0 ToolsNet	0 Multicast
	1 IP address	1 IP address
	2 Port	2 Port
	4 Graphs	3 Results
		4 Graphs
		6 Sync status
		7 Event code

27.3 Diagnostics, Job, Multistage, Identifier and Sync

DxxxDiagnostics

D1xxTool configuration

D10xTool general info	**D11xTool calibration**	**D12xOpen end parameters**	**D13x Tool service**
0Tool type	0Calibration value	0Use open end	0 Total no of tightenings
1Motor size	1Calibration date	1Inverted motor rotation	1 Service indicator
2Tool serial no	2Set calibration value	2OE tightening direction	No of tightenings since 2 service
3Gear ratio	4Do motortuning	3Open end play	3 Service interval (x10000)
4Tool max tq	5Normalisation value	4Open end tune	4 Latest service date
5User tool message			Service counter reset
			5 Service counter reset

D2xxController diagnostics | **D3xxSystem diagnostics**

D20xSoftware information	**D21xHardware information**	**D30xTransducer Information**	**D31x System I/O diagnostics**
0Main code version	0PF3000 type	0Sensor tracking	0 I/O device 0-7
1Application-code version	5RBU type		1 I/O device 8-15
2Parameter-tree version	6RBU Serial no.		
3MC-code version			
4RBU-code version			
5Boot-code version			
6DSP-code version			

JxxxJob | MxxxMultistage

J1xxSetup | **J2xxJob programming** | **M1xxSetup** | **M2xx MS programming**

J10xAdmin	**J20xOptions**	**M10xAdmin**	**M20x Options**	**M21x Results**
0View existing Jobs	0Name	0View existing multistages	0 Name multistage	0 Torque result
1Create new job	1Forced order	1Create new multistage	1 Pset list	1 Angle result
2Copy Job	2Job list	2Copy multistage	2 Batch count	2 Rundown result
3Delete job	3Maxtime for first tightening	3Delete multistage	3 Batch size	3 SelfTap result
	4Maxtime to complete job		4 Lock at batch OK	4 PVT result
	5Batch count type		5 Stop between stages	5 CM result
	6Lock at job done			6 Trace
	7Use line control			
	8Repeat job			
	9Tool loosening			

IxxxIdentifier | SxxxSync

I1xxIdentifier set-up | **I2xxCard reader set-up** | **S1xxProgramming**

I10xGeneral set-up	**I20xCard reader set-up**	**S10xOptions**
0Identifier input source	0Card reader type	0Sync group list
1Significant numbers		1Tightening strategy
2Identifier set-up		2Loosening strategy
		3Continue if sync failed
		4Sync OK time