Appendix for
Power Focus 6000
Power Focus 6000 StepSync
PF6 FlexSystem
IxB
Power Focus 8
Power Focus 8 StepSync
PFXC
STRwrench

Open Protocol

Atlas Copco Tools and Assembly Systems

Appendix Specification release 3.10

Note! This manual can be altered without further notice.

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Contents

1 Introduction

Open Protocol is an interface for building applications for remote control or data subscription of controllers. It is platform independent and can be implemented on Linux, PLC, printers, and all Windows platforms for example.

This document specifies all the product specific considerations when using the Open Protocol together with Power Focus 6000, PF6 Flex System, Power Focus 6000 StepSync, PF8, PF8 StepSync, PF XC, IxB or STRwrench. Open Protocol supports Ethernet connection towards all these products.

2 Revision history

Version	Date	Author	Change
3.10	2023-03-01	Ahmad Mostafavi	Created first version for 3.10 (based on 3.9 version)

3 MID support

This section lists MID and MIDs revision supported by Power Focus 6000, PF6 Flex System, Power Focus 6000 StepSync, PF XC, IxB and STRwrench. The Revision figures in the columns means that the product has support for all revisions from 0 up to and inclusive the revision figure (with some exceptions as marked in the table)

Sign “-“means that the product hasn’t support for the MID and Revision.

Sign “p” means that at least one revision of the MID is only partly supported.

This table is valid for the 3.10 release for all the products.

Table 1 Supported MIDs

MID	Name	PF 6000	Power Focus XC	PF6 Step Sync	PF6 Flex System	IxB	PF 8	PF8 Step Sync	STRw	Note
0001	Communication start	6	6	6	6	6	6	6	6	
0002	Communication start acknowledge	6 p	6 p	6 p	6 p	6 p	6 p	6 p	6 p	
0003	Communication stop	1	1	1	1	1	1	1	1	
0004	Command error	1	1	1	1	1	1	1	1	
0005	Command accepted	1	1	1	1	1	1	1	1	
0006	Application data message request	1	1	1	1	1	1	1	1	
0008	Application data message subscription	1	1	1	1	1	1	1	1	
0009	Application Data Message unsubscribe	1	1	1	1	1	1	1	1	
0010	Parameter set ID upload request	1	1	1	1	1	1	1	1	See chapter 7
0011	Parameter set ID upload reply	1	1	1	1	1	1	1	1	See chapter 7
0012	Parameter set data upload request	4 p	4 p	4 p	4 p	4 p	4 p	4 p	4 p	See chapter 7
0013	Parameter set data upload reply	4 p	4 p	4 p	4 p	4 p	4 p	4 p	4 p	See chapter 7
0014	Parameter set selected subscribe	1	1	1	1	1	1	1	1	See chapter 7
0015	Parameter set selected	1 p	1 p	1 p	1 p	1 p	1 p	1 p	1 p	See chapter 7
0016	Parameter set selected acknowledge	1	1	1	1	1	1	1	1	See chapter 7
0017	Parameter set selected unsubscribe	1	1	1	1	1	1	1	1	See chapter 7
0018	Select Parameter set	1	1	1	1	1	1	1	1	See chapter 7
0019	Set Parameter set batch size	1	1	1	1	1	1	1	1	See chapter 8
0020	Reset Parameter set batch counter	1	1	1	1	1	1	1	1	See chapter 8
0021	Lock at batch done subscribe	1	1	1	1	1	1	1	1	
0022	Lock at batch done upload	1	1	1	1	1	1	1	1	**Note!** This signal indicates when locked by batch sequence completed
0023	Lock at batch done upload acknowledge	1	1	1	1	1	1	1	1	
0024	Lock at batch done unsubscribe	1	1	1	1	1	1	1	1	
0025	Download Pset. Toyota Appendix	-	-	-	-	-	-	-	-	
0030	Job ID upload request	2	2	2	2	2	2	2	2	

MID	Name	PF 6000	Power Focus XC	PF6 Step Sync	PF6 Flex System	IxB	PF 8	PF8 Step Sync	STRw	Note
0031	Job ID upload reply	2	2	2	2	2	2	2	2	
0032	Job data upload request	2	2	2	2	2	2	2	2	
0033	Job data upload reply	2 p	2 p	2 p	2 p	2 p	2 p	2 p	2 p	
0034	Job info subscribe	5	5	5	5	4	5	5	4	
0035	Job info	5 p	5 p	5 p	5 p	4 p	5 p	5 p	4 p	
0036	Job info acknowledge	5	5	5	5	4	5	5	4	
0037	Job info unsubscribe	5	5	5	5	4	5	5	4	
0038	Select Job	2	2	2	2	2	2	2	2	See chapter 9
0039	Job restart	1	1	1	1	1	1	1	1	
0040	Tool data upload request	6	6	6 (only)	6 (only)	5	6	6 (only)	5	
0041	Tool data upload reply	6 p	6 p	6 p (only)	6 p (only)	5	6 p	6 p (only)	5	
0042	Disable tool	2 p	2 p	2 p	2 p	1	2 p	2 p	1	
0043	Enable tool	2	2	2	2	1	2	2	1	
0044	Disconnect tool request	-	-	-	-	-	-	-	-	
0045	Set calibration value request	2	2	2 (only)	2 (only)	1	2	2 (only)	-	
0046	Set primary tool request	-	-	-	-	-	-	-	-	
0047	Pairing handling	-	-	-	-	-	-	-	-	
0048	Pairing status	-	-	-	-	-	-	-	-	
0049	Paring status acknowledge	-	-	-	-	-	-	-	-	
0050	Vehicle ID number download request	1	1	1	1	1	1	1	1	
0051	Vehicle ID number subscribe	2	2	2	2	2	2	2	2	
0052	Vehicle ID number	2	2	2	2	2	2	2	2	
0053	Vehicle ID number acknowledge	2	2	2	2	2	2	2	2	
0054	Vehicle ID number unsubscribe	2	2	2	2	2	2	2	2	
0060	Last tightening result data subscribe	11	11	11	11	11	11	11	11	
0061	Last tightening result data	11 p	11 p	11 p	11 p	11 p	11 p	11 p	11 p	

MID	Name	PF 6000	Power Focus XC	PF6 Step Sync	PF6 Flex System	IxB	PF 8	PF8 Step Sync	STRw	Note
0062	Last tightening result data acknowledge	9	9	-	-	7	9	-	7	
0063	Last tightening result data unsubscribe	9	9	-	-	7	9	-	7	
0064	Old tightening result upload request	11 p	11 p	11 p	11 p	11 p	11 p	11 p	11 p	
0065	Old tightening result upload reply	11 p	11 p	11 p	11 p	11 p	11 p	11 p	11 p	
0070	Alarm subscribe	3	3	3	3	3	3	3	-	
0071	Alarm	3 p	3 p	3 p	3 p	2	3 p	3 p	-	
0072	Alarm acknowledge	3	3	3	3	3	3	3	-	
0073	Alarm unsubscribe	3	3	3	3	3	3	3	-	
0074	Alarm acknowledged on controller	2	2	2	2	2	2	2	-	
0075	Alarm acknowledged on controller acknowledge	2	2	2	2	2	2	2	-	
0076	Alarm status	3	3	3 p	3 p	2	3	3 p	-	Only active events that need acknowledgement are sent.
0077	Alarm status acknowledge	1	1	1	1	1	1	1	-	
0078	Acknowledge alarm remotely on controller	1	1	1	1	1	1	1	-	
0080	Read time upload request	1	1	1	1	1	1	1	1	
0081	Read time upload reply	1	1	1	1	1	1	1	1	
0082	Set time	1	1	1	1	1	1	1	1	
0090	Multi-spindle status subscribe	1	1	1	1	1	1	1	-	
0091	Multi-spindle status	1	1	1	1	1	1	1	-	
0092	Multi-spindle status acknowledge	1	1	1	1	1	1	1	-	
0093	Multi-spindle status unsubscribe	1	1	1	1	1	1	1	-	
0100	Multi-spindle result subscribe	-	-	1	1	-	-	1	-	
0101	Multi-spindle result	-	-	4 p	4 p	-	-	4 p	-	See section 10
0102	Multi-spindle result acknowledge	-	-	1	1	-	-	1	-	
0103	Multi-spindle result unsubscribe	-	-	1	1	-	-	1	-	
0105	Last PowerMACS tightening result data subscribe	-	-	-	-	-	-	-	-	

MID	Name	PF 6000	Power Focus XC	PF6 Step Sync	PF6 Flex System	IxB	PF 8	PF8 Step Sync	STRw	Note
0106	Last PowerMACS tightening result Station data	-	-	-	-	-	-	-	-	
0107	Last PowerMACS tightening result Bolt data	-	-	-	-	-	-	-	-	
0108	Last PowerMACS tightening result data acknowledge	-	-	-	-	-	-	-	-	
0109	Last PowerMACS tightening result data unsubscribe	-	-	-	-	-	-	-	-	
0110	Display user text on compact	1	1	1	1	1	1	1	-	
0111	Display user text on graph	1	1	1	1	1	1	1	-	
0113	Flash green light on tool	1	1	1	-	1	1	1	-	
0120	Job line control info subscribe	1	1	-	-	1	1	-	-	
0121	Job line control started	1	1	-	-	1	1	-	-	
0122	Job line control alert 1	1	1	-	-	1	1	-	-	
0123	Job line control alert 2	1	1	-	-	1	1	-	-	
0124	Job line control done	1	1	-	-	1	1	-	-	
0125	Job line control info acknowledge	1	1	-	-	1	1	-	-	
0126	Job line control info unsubscribe	1	1	-	-	1	1	-	-	
0127	Abort Job	1	1	-	-	1	1	-	1	
0128	Job batch increment	1	1	1	1	1	1	1	1	
0129	Job batch decrement	1	1	1	1	1	1	1	1	
0130	Job off	-	-	-	-	-	-	-	-	
0131	Set Job line control start	1	1	-	-	1	1	-	-	
0132	Set Job line control alert 1	1	1	-	-	1	1	-	-	
0133	Set Job line control alert 2	1	1	-	-	1	1	-	-	
0140	Execute dynamic Job request	1 p	1 p	1 p	1 p	1 p	1 p	1 p	-	
0150	Identifier download request	1	1	1	1	1	1	1	1	
0151	Multiple identifiers work order subscribe	1	1	1	1	1	1	1	-	
0152	Multiple identifiers work order	1	1	1	1	1	1	1	-	

MID	Name	PF 6000	Power Focus XC	PF6 Step Sync	PF6 Flex Syste m	IxB	PF 8	PF8 Step Sync	STRw	Note
0153	Multiple identifiers work order acknowledge	1	1	1	1	1	1	1	-	
0154	Multiple Identifiers work order unsubscribe	1	1	1	1	1	1	1	-	
0155	Bypass identifier	1	1	1	1	-	1	1	-	
0156	Reset latest identifier	1	1	1	1	-	1	1	-	
0157	Reset all identifiers	1	1	1	1	-	1	1	-	
0200	Set external controlled relays	1 p	1 p	1 p	1 p	1	1 p	1 p	-	
0210	Status external monitored inputs subscribe	1	1	1	1	1	1	1	-	For initial 211, a device with configured External monitored signals is needed!
0211	Status external monitored inputs	1	1	1	1	1	1	1	-	
0212	Status external monitored inputs acknowledge	1	1	1	1	1	1	1	-	
0213	Status external monitored inputs unsubscribe	1	1	1	1	1	1	1	-	
0214	IO device status request	2	2	2	2	-	2	2	-	
0215	IO device status reply	2	2	2	2	-	2	2	-	See chapter 5
0216	Relay function subscribe	1	1	1	1	1	1	1	-	See chapter 5
0217	Relay function	1	1	1	1	1	1	1	-	See chapter 5
0218	Relay function acknowledge	1	1	1	1	1	1	1	-	
0219	Relay function unsubscribe	1	1	1	1	1	1	1	-	
0220	Digital input function subscribe	1	1	1	1	1	1	1	-	See chapter 5
0221	Digital input function	1	1	1	1	1	1	1	-	See chapter 5
0222	Digital input function acknowledge	1	1	1	1	1	1	1	-	
0223	Digital input function unsubscribe	1	1	1	1	1	1	1	-	
0224	Set digital input function	1	1	1	1	1	1	1	-	See chapter 5
0225	Reset digital input function	1	1	1	1	1	1	1	-	See chapter 5
0240	User data download	1	1	1	1	-	1	1	-	See chapter 13
0241	User data subscribe	1	1	1	1	1	1	1	-	See chapter 13
0242	User data	1	1	1	1	1	1	1	-	See chapter 13

MID	Name	PF 6000	Power Focus XC	PF6 Step Sync	PF6 Flex System	IxB	PF 8	PF8 Step Sync	STRw	Note
0243	User data acknowledge	1	1	1	1	-	1	1	-	See chapter 13
0244	User data unsubscribe	1	1	1	1	1	1	1	-	See chapter 13
0245	User data download with offset	1	1	1	1	-	1	1	-	See chapter 13
0250	Selector socket info subscribe	1 p	1 p	-	-	1	1 p	-	-	
0251	Selector socket info	1 p	1 p	-	-	1	1 p	-	-	
0252	Selector socket info acknowledge	1	1	-	-	1	1	-	-	
0253	Selector socket info unsubscribe	1	1	-	-	1	1	-	-	
0254	Selector control green lights	2	2	-	-	2	2	-	-	
0255	Selector control red lights	2	2	-	-	2	2	-	-	
0260	Tool Tag ID request	1	1	-	-	-	1	-	-	
0261	Tool Tag ID subscribe	1	1	-	-	-	1	-	-	
0262	Tool Tag ID	1	1	-	-	-	1	-	-	
0263	Tool Tag ID acknowledge	1	1	-	-	-	1	-	-	
0264	Tool Tag ID unsubscribe	1	1	-	-	-	1	-	-	
0270	Controller reboot request	-	-	-	-	1	-	-	-	
0400	Automatic/Manual mode subscribe	1	1	-	-	1	1	-	-	
0401	Automatic/Manual mode	1	1	-	-	1	1	-	-	
0402	Automatic/Manual mode acknowledge	1	1	-	-	1	1	-	-	
0403	Automatic/Manual mode unsubscribe	1	1	-	-	1	1	-	-	
0410	AutoDisable settings request	-	-	-	-	-	-	-	-	
0411	AutoDisable settings reply	-	-	-	-	-	-	-	-	
0420	Open protocol commands disabled subscribe	1	1	-	1	1	1	-	-	
0421	Open protocol commands disabled	1	1	-	1	1	1	-	-	
0422	Open protocol commands disabled acknowledge	1	1	-	1	1	1	-	-	
0423	Open protocol commands disabled unsubscribe	1	1	-	1	1	1	-	-	
500	Motor tuning result data subscribe	1	1	-	-	1	1	-	-	

MID	Name	PF 6000	Power Focus XC	PF6 Step Sync	PF6 Flex System	IxB	PF 8	PF8 Step Sync	STRw	Note
501	Motor tuning result data	1	1	-	-	1	1	-	-	Event 2022 has to be configured to Display in Event configuration
502	Motor tuning result data acknowledge	1	1	-	-	1	1	-	-	
503	Motor tuning result data unsubscribe	1	1	-	-	1	1	-	-	
504	Motor tuning request	1	1	-	-	1	1	-	-	
0701	Tool List Upload reply	1	1	1	1	1	1	1	1	
0900	Trace curve data message	1	1	1	1	1	1	1	1	See chapter 16, require license Open Protocol Extension
0901	Trace plot parameters message	1	1	1	1	1	1	1	1	See chapter 0, require license Open Protocol Extension
1000	Alarm	1	1	1	1	1	1	1	-	See chapter 11
1001	Alarm acknowledge	1	1	1	1	1	1	1	-	
1201	Operation result Overall data	1	1	1	1	-	1	1	-	See chapter 12
1202	Operation result object data	1	1	1	1	-	1	1	-	See chapter 12
1203	Operation result data acknowledge	1	1	1	1	-	1	1	-	See chapter 12
1601	Dynamic identifier message	1	1	1	1	1	1	1	-	
1602	Dynamic identifier data acknowledge	1	1	1	1	1	1	1	-	
2500	Tightening Program Message Download	2	2	-	-	2	2	-	2	Only Rev 2, Rev 0-1 not supported, see chapter 0, require license Open Protocol Extension
2501	Tightening Program Message Upload	2	2	-	-	2	2	-	2	Only Rev 2, Rev 0-1 not supported, see chapter 15, require license Open Protocol Extension
2600	Mode ID upload request	-	-	1	1	-	-	1	-	
2601	Mode ID upload reply	-	-	1	1	-	-	1	-	
2602	Mode data upload request	-	-	1	1	-	-	1	-	
2603	Mode data upload reply	-	-	1	1	-	-	1	-	

MID	Name	PF 6000	Power Focus XC	PF6 Step Sync	PF6 Flex System	IxB	PF 8	PF8 Step Sync	STRw	Note
2604	Mode selected	-	-	1	1	-	-	1	-	
2605	Mode selected acknowledge	-	-	1	1	-	-	1	-	
2606	Select Mode	-	-	1	1	-	-	1	-	
8000	Audi emergency status subscribe	-	-	-	-	-	-	-	-	
8001	Audi emergency status	-	-	-	-	-	-	-	-	
8002	Audi emergency status acknowledge	-	-	-	-	-	-	-	-	
8003	Audi emergency status unsubscribe	-	-	-	-	-	-	-	-	
9999	Keep alive open protocol communication	1	1	1	1	1	1	1	1	

4 Revision Support

Table 2 Parameters not supported

MID	MID	Rev	Parameter
All	All		Cell Id
13	Parameter set data upload	1	Batch size

Table 3 Parameters not supported or managed under special conditions

MID	MID	Rev	Parameter
2	Application Communication start acknowledge	2	Parameter 04 (Supplier code) is always set to ACT
2	Application Communication start acknowledge	3	Parameter 05 (Open Protocol Version) is always set to v2.0
2	Application Communication start acknowledge	3	Parameter 07 (Tool software version) is set to the software of one of the tools, undefined which
2	Application Communication start acknowledge	4	RBU Type
2	Application Communication start acknowledge	5	System subtype
12	Parameter set data upload request	3,4	Not supporting different Pset file versions, always interpret as 00000000
13	Parameter set data upload reply	3,4	Parameter 14, 19, 20 not supported. Parameter 17, angle used for calculating time
15	Parameter set selected	1	
33	Job Data	1	Max time for first tightening
33	Job Data	1	Use line control
33	Job Data	1	Repeat Job
33	Job Data	1	Tool loosening
33	Job Data	3	Job List
35	Job Info	1	Parameter 04 (Job batch size): Show batch size for current batch. If legacy counter mode is used, it will count as specified in OP Specification
35	Job Info	1	Parameter 05 (Job batch counter): Show batch count for current batch. If legacy counter mode is used, it will count as specified in OP Specification
35	Job Info	3	Job step type
35	Job info	5	Job sequence number
39	Job restart	1	No check if performed
41	Tool data upload reply	2	Parameter 09 (Motor size) is always set to 00
42	Disable tool	1	PF6 Flex System and Power Focus 6000 StepSync will treat revision 1 as “disable station”
42	Disable tool	2	Parameter 02 (Disable type) type: Power Focus 6000, IxB, STRwrench only support 00 “Disable” PF6 Flex System does not support 00 “Disable” Power Focus 6000 StepSync does not support 00 “Disable”
43	Enable tools	1	PF6 Flex System and Power Focus 6000 StepSync will treat revision 1 as “enable station”
61	Last tightening result data	1	Channel ID

MID	MID	Rev	Parameter
61	Last tightening result data	2	Strategy Options
61	Last tightening result data	2	current monitoring status
61	Last tightening result data	2	prevail torque monitoring status
61	Last tightening result data	2	prevail torque compensate status
61	Last tightening result data	2	tightening error status
61	Last tightening result data	2	rundown angle
61	Last tightening result data	2	current monitoring min
61	Last tightening result data	2	current monitoring max
61	Last tightening result data	2	current monitoring value
61	Last tightening result data	2	selftap torque
61	Last tightening result data	2	prevail torque monitoring min
61	Last tightening result data	2	prevail torque monitoring max
61	Last tightening result data	2	prevail torque
61	Last tightening result data	2	job sequence number
61	Last tightening result data	2	sync tightening id
61	Last tightening result data	5	Customer tightening error code
61	Last tightening result data	6	Prevail Torque compensate value
61	Last tightening result data	6	Tightening error status 2
61	Last tightening result data	10	Angle numerator scale
61	Last tightening result data	10	Angle denominator scale
61	Last tightening result data	10	Overall Angle Status
61	Last tightening result data	10	Overall Angle Min
61	Last tightening result data	10	Overall Angle Max
61	Last tightening result data	10	Overall Angle
61	Last tightening result data	10	Peak Torque
61	Last tightening result data	10	Residual Breakaway Torque
61	Last tightening result data	10	Rundown angle complete
61	Last tightening result data	998	Number of stages in multistage
61	Last tightening result data	998	Number of stage results
61	Last tightening result data	998	Stage result
64	Last tightening result data	10	Offline result
65	Old tightening result upload reply	2	Strategy options
65	Old tightening result upload reply	2	Current Monitoring Status
65	Old tightening result upload reply	2	Prevail Torque monitoring status
65	Old tightening result upload reply	2	Prevail Torque compensate status
65	Old tightening result upload reply	2	Tightening error status
65	Old tightening result upload reply	2	Current Monitoring Value
65	Old tightening result upload reply	2	Self-tap torque
65	Old tightening result upload reply	2	Prevail torque
65	Old tightening result upload reply	2	Job sequence number
65	Old tightening result upload reply	2	Sync tightening ID
65	Old tightening result upload reply	2	Tool serial number
65	Old tightening result upload reply	5	Customer tightening error code
65	Old tightening result upload reply	6	Prevail Torque compensate value
65	Old tightening result upload reply	6	Tightening error status 2

MID	MID	Rev	Parameter
65	Old tightening result upload reply	10	Angle numerator scale
65	Old tightening result upload reply	10	Angle denominator scale
65	Old tightening result upload reply	10	Overall Angle Status
65	Old tightening result upload reply	10	Overall Angle Min
65	Old tightening result upload reply	10	Overall Angle Max
65	Old tightening result upload reply	10	Overall Angle
65	Old tightening result upload reply	10	Peak Torque
65	Old tightening result upload reply	10	Residual Breakaway Torque
65	Old tightening result upload reply	10	Rundown angle complete
71	Alarm	1, 2, 3	Parameter 02 (Controller ready status) is always set to 1 for PF6 Flex System
71	Alarm	1, 2, 3	Parameter 03 (Tool ready status) is always set to 1 for PF6 Flex System
71	Alarm	3	Parameter 05 (Tool health) is always set to 0 (not applicable) for PF6 Flex System
76	Alarm status	1, 2, 3	Parameter 03 (Controller ready status) is always set to 1 for PF6 Flex System
76	Alarm status	1, 2, 3	Parameter 04 (Tool ready status) is always set to 1 for PF6 Flex System
76	Alarm status	3	Parameter 06 (Tool health) is always set to 0 (not applicable) for PF6 Flex System
140	Dynamic Job	1	Not supported Parameters: 5,6,7,8,10,11,12,14,15,16,17,18 Not checking if Pset exist.
200	Set externally controlled relays	1	Will set signals Generic IO 1-10
251	Selector socket info	1	Multiple selectors will be sent as device one. Configuration and mapping in VS important, socket 08 can be in selector 2 etc.

5 Supported MID Relay and Digital Input Signal

The Relay numbers and Digital input numbers are used in the following MIDs:

- 0215 IO device status reply
- 0216 Relay function subscribe
- 0217 Relay function
- 0219 Relay function unsubscribe
- 0220 Digital input function subscribe
- 0221 Digital input function
- 0223 Digin function unsubscribe
- 0224 Set digital input function
- 0225 Reset digital input function

The supported Relays and Digital Inputs vary depending on system type as described in the following sections.

5.1 Supported Relay numbers

Following Relay Functions are supported. For each of them is stated if they are of type “tracking” or not. “Yes” tracking means the signal is “State” type and “No” means the signal type is “Event”.

Table 4 Supported Relay numbers

Relay number	Relay function	Tracking event	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
00	Off							
01	OK	No	+	+	+	+	3	Tightening OK
02	NOK	No	+	+	+	+	4	Tightening NOK
03	Low	No				+		
04	High	No				+		
05	Low Torque	No	+	-	-	+	6	Low torque
06	High Torque	No	+	-	-	+	7	High torque
07	Low angle	No	+	-	-	+	9	Low angle
08	High angle	No	+	-	-	+	10	High angle
09	Cycle complete	Yes	-	+	+	+	77	Cycle complete
10	Alarm	Yes	+	+	+	+	161	Event present
11	Batch NxOK	No	+	+	+	+	36	Batch completed OK
12	Job OK	No	+	+	+	+	45	Batch sequence completed OK
13	Job NOK	No	+	+	+	+	46	Batch sequence completed NOK
14	Job running	Yes	+	+	+	+	47	Batch sequence running
15	Car is done	No				+		
16	Car is done status Ok	No				+		
17	Tool health OK	Yes	+	-	-	+	103	Tool health OK
18	POWER FOCUS ready	Yes	-	-	-	+	106	Virtual Station is ready for input
19	Tool ready	Yes	+	-	-	+	29	Ready to start

Relay number	Relay function	Tracking event	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
20	Tool start switch	Yes	+	-	-	+	11	Trigger pressed
21	Dir. switch = CW	Yes	+	-	-	+	12	Direction switch CW
22	Dir. switch = CCW	Yes	+	-	-	+	13	Direction switch CCW
23	Tightening direction CCW	No				+		
24	Tool tightening	Yes	+	+	+	+	21	Tool tightening
25	Tool loosening	Yes	+	+	+	+	22	Tool loosening
26	Tool running	Yes	+	-	-	+	23	Tool running
27	Tool running CW	Yes	+	-	-	+	24	Tool running CW
28	Tool running CCW	Yes	+	-	-	+	25	Tool running CCW
29	Statistic alarm	No				+		
30	Tool locked	Yes	+	-	-	+	158	Tool disabled
31	Received identifier	No	+	-	-	+	100	Identifier received
32	Running Pset bit 0	Yes	+	-	-	+	148	Selected tightening program bit 0
33	Running Pset bit 1	Yes	+	-	-	+	149	Selected tightening program bit 1
34	Running Pset bit 2	Yes	+	-	-	+	150	Selected tightening program bit 2
35	Running Pset bit 3	Yes	+	-	-	+	151	Selected tightening program bit 3
36	Running Job bit 0	Yes	+	+	+	+	139	Selected sequence bit 0
37	Running Job bit 1	Yes	+	+	+	+	140	Selected sequence bit 1
38	Running Job bit 2	Yes	+	+	+	+	141	Selected sequence bit 2
39	Running Job bit 3	Yes	+	+	+	+	142	Selected sequence bit 3
44	Line control OK	No	+	-	-		62	Line control done
45	Line control alert 1	Yes	+	-	-		64	Line control Alert 1
46	Line control alert 2	Yes	+	-	-		65	Line control Alert 2
47	Service indicator	Yes	+	+	+	+	137	Service indicator alarm
48	Fieldbus relay 1	No						

Relay number	Relay function	Tracking event	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
49	Fieldbus relay 2	No						
50	Fieldbus relay 3	No						
51	Fieldbus relay 4	No						
52	Tool red light	No	+	-	-	+	97	Tool Led Mirror Red
53	Tool green light	No	+	-	-	+	98	Tool Led Mirror Green
54	Tool yellow light	No	+	-	-	+	99	Tool Led Mirror Yellow
57	Bistable Relay	Yes	+	+	+		40	Bistable relay
59	Running Pset bit 4	Yes	+	-	-	+	152	Selected tightening program bit 4
60	Running Pset bit 5	Yes	+	-	-	+	153	Selected tightening program bit 5
61	Running Pset bit 6	Yes	+	-	-	+	154	Selected tightening program bit 6
62	Running Pset bit 7	Yes	+	-	-	+	155	Selected tightening program bit 7
63	Running Job bit 4	Yes	+	+	+	+	143	Selected sequence bit 4
64	Running Job bit 5	Yes	+	+	+	+	144	Selected sequence bit 5
65	Running Job bit 6	Yes	+	+	+	+	145	Selected sequence bit 6
66	Running Job bit 7	Yes	+	+	+	+	146	Selected sequence bit 7
67	Sync OK	Yes	-	+	+		75	Cycle OK
68	Sync NOK	Yes	-	+	+		76	Cycle NOK
69	Sync spindle 1 OK	Yes	-	+	+		31026	Channel tightening status[1],Last cycle
70	Sync spindle 1 NOK	Yes	-	+	+		31026	Channel tightening status[1],Last cycle
71	Sync spindle 2 OK	Yes	-	+	+		31026	Channel tightening status[2],Last cycle
72	Sync spindle 2 NOK	Yes	-	+	+		31026	Channel tightening status[2],Last cycle
73	Sync spindle 3 OK	Yes	-	+	+		31026	Channel tightening status[3],Last cycle
74	Sync spindle 3 NOK	Yes	-	+	+		31026	Channel tightening status[3],Last cycle
75	Sync spindle 4 OK	Yes	-	+	+		31026	Channel tightening status[4],Last cycle
76	Sync spindle 4 NOK	Yes	-	+	+		31026	Channel tightening status[4],Last cycle

Relay number	Relay function	Tracking event	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
77	Sync spindle 5 OK	Yes	-	+	+		31026	Channel tightening status[5],Last cycle
78	Sync spindle 5 NOK	Yes	-	+	+		31026	Channel tightening status[5],Last cycle
79	Sync spindle 6 OK	Yes	-	+	+		31026	Channel tightening status[6],Last cycle
80	Sync spindle 6 NOK	Yes	-	+	+		31026	Channel tightening status[6],Last cycle
81	Sync spindle 7 OK	Yes	-	+	+		31026	Channel tightening status[7],Last cycle
82	Sync spindle 7 NOK	Yes	-	+	+		31026	Channel tightening status[7],Last cycle
83	Sync spindle 8 OK	Yes	-	+	+		31026	Channel tightening status[8],Last cycle
84	Sync spindle 8 NOK	Yes	-	+	+		31026	Channel tightening status[8],Last cycle
85	Sync spindle 9 OK	Yes	-	+	+		31026	Channel tightening status[9],Last cycle
86	Sync spindle 9 NOK	Yes	-	+	+		31026	Channel tightening status[9],Last cycle
87	Sync spindle 10 OK	Yes	-	+	+		31026	Channel tightening status[10],Last
88	Sync spindle 10 NOK	Yes	-	+	+		31026	Channel tightening status[10],Last
89	Carrier in station	No				+		
90	Enable scanner	Yes	-	-	-	+	49	Scanner enabled[1]
91	Line Control Start					+		RESERVED
92	Job Aborted	No	+	+	+	+	160	Sequence aborted
93	External controlled 1	Yes	+	+	+	+	50	Generic IO 1
94	External controlled 2	Yes	+	+	+	+	51	Generic IO 2
95	External controlled 3	Yes	+	+	+	+	52	Generic IO 3
96	External controlled 4	Yes	+	+	+	+	53	Generic IO 4
97	External controlled 5	Yes	+	+	+	+	54	Generic IO 5
98	External controlled 6	Yes	+	+	+	+	55	Generic IO 6
99	External controlled 7	Yes	+	+	+	+	56	Generic IO 7
100	External controlled 8	Yes	+	+	+	+	57	Generic IO 8

[1] Internal signal

Relay number	Relay function	Tracking event	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
101	External controlled 9	Yes	+	+	+	+	58	Generic IO 9
102	External controlled 10	Yes	+	+	+	+	59	Generic IO 10
103	ToolsNet connection lost	Yes	+	+	+	+	133	ToolsNet connection lost
104	Open Protocol connection lost	Yes	+	-	-	+	95	Open Protocol Disconnected
105	FieldBus Offline	Yes	+	+	+	+	96	Fieldbus Disconnected
106	Home position	Yes	+ +	- +	- +	+ +	89 90	Open End in open position Tools in Zero position
107	Batch NOK	No	+	+	+	+	37	Batch completed NOK
108	Selected Channel in Job	No				+		
109	Safe to disconnect tool	No				+		
110	Running Job bit 8	Yes	+	+	+	+	147	Selected sequence bit 8
111	Running Pset bit 8	Yes	+	-	-	+	156	Selected tightening program bit 8
112	Calibration Alarm	Yes	+	-	-	+	138	Calibration alarm
113	Cycle start	No				+		
114	Low current	No				+		
115	High current	No				+		
116	Low PVT monitoring	No				+		
117	High PVT monitoring	No				+		
118	Low PVT selftap	No				+		
119	High PVT selftap	No				+		
120	Low tightening angle	No	+	-	-	+	165	Rundown angle low
121	High tightening angle	No	+	-	-	+	166	Rundown angle high
122	Identifier identified	No				+		
123	Identifier type 1 received	No				+		
124	Identifier type 2 received	No				+		
125	Identifier type 3 received	No				+		

Relay number	Relay function	Tracking event	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
126	Identifier type 4 received	No				+		
129	Ring button ack.	No				+		
130	DigIn controlled 1	No				+		
131	DigIn controlled 2	No				+		
132	DigIn controlled 3	No				+		
133	DigIn controlled 4	No				+		
134	Fieldbus carried signals	Yes	+	+	+	+	10049	Disable Fieldbus[2]
135	Illuminator	No				+		
136	New parameter set selected	No				+		
137	New Job selected	No				+		
138	Job OFF relay	No				+		
139	Logic relay 1	No				+		
140	Logic relay 2	No				+		
141	Logic relay 3	No				+		
142	Logic relay 4	No				+		
143	Max coherent NOK reached	Yes	+	+	+	+	35	Max consecutive NOK reached
144	Batch done	No	+	+	+	+	30	Batch completed
145	Start trigger active	No				+		
146	Final angle start	No				+		
251	Completed Batch bit 0	No				+		
252	Completed Batch bit 1	No				+		
253	Completed Batch bit 2	No				+		
254	Completed Batch bit 3	No				+		
255	Completed Batch bit 4	No				+		

[2] Tracking input signal

Relay number	Relay function	Tracking event	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
256	Completed Batch bit 5	No				+		
257	Completed Batch bit 6	No				+		
258	Completed Batch bit 7	No				+		
259	Remaining Batch bit 0	No				+		
260	Remaining Batch bit 1	No				+		
261	Remaining Batch bit 2	No				+		
262	Remaining Batch bit 3	No				+		
263	Remaining Batch bit 4	No				+		
264	Remaining Batch bit 5	No				+		
265	Remaining Batch bit 6	No				+		
266	Remaining Batch bit 7	No				+		
271	Next tight	No				+		
272	Power On	Yes	+	+	+	+	42	Controller switched on
273	Toyota fault	No				+		
274	Toyota fault or Ng	No				+		
275	Open Protocol commands	Yes	+	+	+	+	10060	Disable Open Protocol Commands
276	Cycle abort	No				+		
277	Effective loosening	No	+	+	+	+	70	Loosening OK
278	Logic relay 5	No				+		
279	Logic relay 6	No				+		
280	Logic relay 7	No				+		
281	Logic relay 8	No				+		
282	Logic relay 9	No				+		
283	Logic relay 10	No				+		
284	Lock at batch done	No				+		

Relay number	Relay function	Tracking event	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
285	User Id Ok	No				+		
286	Pin Ok	No				+		
287	Battery low	No	+	-	-	+	90	Tool battery low
288	Battery empty	Yes	+	-	-	+	20030	Tool battery empty[3]
289	Tool connected	No				+		
290	No tool connected	No				+		
291	Toyota fixed stop	No				+		
292	Tyota temp stop	No				+		
293	Function button	No	-	-	-	+	14	Function button
294	Rehit	No				+		
295	Tightening disabled	Yes	+	+	+	+	27	Tightening is locked
296	Loosening disabled	Yes	+	+	+	+	28	Loosening is locked
297	Positioning disabled	No				+		
298	Motor tuning disabled	No				+		
299	Open End tuning disabled	No				+		
300	Tracking disabled	No				+		
301	Pass authorized	No				+		
302	PLUS Automatic mode					+		RESERVED
303	PLUS Emergency mode	No				+		
304	Wear indicator	No				+		
305	Direction alert	No				+		
306	PLUS Bolt reworked	No				+		
307	Line stop	No				+		
308	Running pset bit 9	Yes	+	-	-	+	157	Selected tightening program bit 9

[3] Internal signal

Relay number	Relay function	Tracking event	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
309	Active XML Result Ack	No				+		
310	Tool in work space	Yes	+	-	-	+	92	Tool in work space
311	Tool in product space	Yes	+	-	-	+	93	Tool in production space
312	XML protocol active	No				+		
313	Tool enabled by XML	No				+		
314	Necking failure	No				+		
315	PLUS protocol not active	No				+		
316	PLUS No tightening	No				+		
351	Middle course trigger active	No				+		
352	Front trigger active	No				+		
353	Reverse trigger active	No				+		
354	Running Job bit 9	Yes	+	+	+		163	Selected sequence bit 9
355	Tool Unlocked	Yes	+	-	-		159	Tool enabled
356	License server connection lost	Yes	+	-	+		134	License server connection lost
357	Tightening externally enabled	Yes	+	+	+		183	Tightening enabled
358	Tightening externally disabled	Yes	+	+	+		182	Tightening disabled
359	Loosening externally enabled	Yes	+	+	+		185	Loosening enabled
360	Loosening externally disabled	Yes	+	+	+		184	Loosening disabled
361	Program end	No	+	+	+		168	Program end
362	Pulse tool alarm oil level empty	Yes	+	-	-		167	Pulse tool alarm oil level empty
363	Tightening time high	No	+	-	-		135	Tightening time high
364	Tightening time low	No	+	-	-		136	Tightening time low
365	Tool function button pressed	Yes	+	-	-		179	Function button
366								
367								

5.2 Supported Digital Input numbers

Table 5 Supported Digital Input numbers

DigIN number	DigIN function	Tracking	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
0	Off							
1	Reset batch	No	+	+	+	+	10003	Reset batch
2	Unlock tool					+		
3	Tool disable n.o.							
4	Tool disable n.c.							
5	Tool tightening disable	Yes	+	+	+	+	20002	Lock tightening
5	Tool tightening disable	Yes	+	+	+	+	20004	Lock tool active high
6	Tool loosening disable	Yes	+	+	+	+	20003	Lock loosening
7	Remote start pulse	No	+	+	+	+	10024	Start tightening, pulse
8	Remote start cont.	Yes	+	+	+	+	10010	Start tightening
9	Tool start loosening	Yes	+	+	+	+	10011	Start loosening
10	Batch increment	No	+	+	+	+	10001	Batch increment
11	Bypass Pset	No	+	+	+	+	10008	Bypass Tightening Program
12	Abort Job	No	+	+	+	+	10012	Abort sequence
13	Job off							
14	parameter set toggle							
15	Reset relays	No	+	-	-		10120	Reset relays
16	parameter set select bit 0	Yes	+	+	+	+	10016	Select Input bit 0
17	parameter set select bit 1	Yes	+	+	+	+	10017	Select Input bit 1
18	parameter set select bit 2	Yes	+	+	+	+	10018	Select Input bit 2
19	parameter set select bit 3	Yes	+	+	+	+	10019	Select Input bit 3

DigIN number	DigIN function	Tracking	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
20	Job select bit 0					+		
21	Job select bit 1					+		
22	Job select bit 2					+		
23	Job select bit 3					+		
24 – 27	Reserved							
28	Line control start					+		RESERVED
29	Line control alert 1					+		RESERVED
30	Line control alert 2					+		RESERVED
31	Ack error message	No	+	-	-	+	10004	Acknowledge events
32	Fieldbus digin 1							
33	Fieldbus digin 2							
34	Fieldbus digin 3							
35	Fieldbus digin 4							
36	Flash tool green light							
37	Reserved							
38	Reserved							
39	Reserved	No	+	+	+	+	10021	Set bistable relay
40	Reserved	No	+	+	+	+	10022	Reset bistable relay
41	Reserved							
42	Reserved							
43	Manual Mode							
44	Reserved							
45	parameter set select bit 4	Yes	+	+	+	+	10066	Select Input bit 4
46	parameter set select bit 5	Yes	+	+	+	+	10067	Select Input bit 5

DigIN number	DigIN function	Tracking	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
47	parameter set select bit 6	Yes	+	+	+	+	10068	Select Input bit 6
48	parameter set select bit 7	Yes	+	+	+	+	10069	Select Input bit 7
49	Job select bit 4							
50	Job select bit 5							
51	Job select bit 6							
52	Job select bit 7							
53	Batch decrement	No	+	+	+	+	10002	Batch decrement
54	Job restart	No	+	+	+		10053	Reset batch sequence
55	End of cycle							
56 – 61	Reserved							
62	Click wrench 1							
63	Click wrench 2							
64	Click wrench 3							
65	Click wrench 4							
66	ID Card							
67	Automatic mode					+		RESERVED
68	External monitored 1	Yes	+	+	+	+	10035	External monitored 1
69	External monitored 2	Yes	+	+	+	+	10036	External monitored 2
70	External monitored 3	Yes	+	+	+	+	10037	External monitored 3
71	External monitored 4	Yes	+	+	+	+	10038	External monitored 4
72	External monitored 5	Yes	+	+	+	+	10039	External monitored 5
73	External monitored 6	Yes	+	+	+	+	10040	External monitored 6
74	External monitored 7	Yes	+	+	+	+	10041	External monitored 7
75	External monitored 8	Yes	+	+	+	+	10042	External monitored 8

DigIN number	DigIN function	Tracking	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
76	Select next parameter set	No	+	+	+		10116	Select next identifier number
77	Select previous parameter set	No	+	+	+		10117	Select previous identifier number
78	Reserved							
79	Timer enable tool							
80	Master unlock tool	No	+	+	+	+	10005	Master unlock
81	ST Scan request							
82	Disconnect tool							
83	Job select bit 8							
84	Parameter set select bit 8	Yes	+	+	+	+	10070	Select Input bit 8
85	Request ST scan							
86	Reset NOK counter	No	+	+	+	+	10013	Reset Too Many NOK
87	Bypass identifier	No	+	+	+		10123	Bypass identifier
88	Reset latest identifier	No	+	+	+		10114	Reset latest identifier
89	Reset all identifier	No	+	+	+		10115	Reset all identifiers
90	Set home position							
91	DigOut monitored 1							
92	DigOut monitored 2							
93	DigOut monitored 3							
94	DigOut monitored 4							
95	Disable ST Scanner	Yes	+	+	+		10119	Disable tool scanner
96	Disable fieldbus carried signals	Yes	+	+	+		10049	Disable Fieldbus
97	Toggle CW/CCW							
98	Toggle CW/CCW for next run							
99	Set CCW							

DigIN number	DigIN function	Tracking	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
100 – 103	Reserved							
104	Open Protocol commands disable	Yes	+	+	+		10060	Disable Open Protocol Commands
105	Logic dig In 1							RESERVED
106	Logic dig In 2							
107	Logic dig In 3							
108	Logic dig In 4							
109	Logic dig In 5							
110	Logic dig In 6							
111	Logic dig In 7							
112	Logic dig In 8							
113	Logic dig In 9							
114	Logic dig In 10							
115 – 119	Reserved							
120	Forced CCW once							
121	Forced CCW toggle							
122	Forced CW once							
123	Forced CW toggle							
124 – 128	Reserved							
129	Pset select bit 9	Yes	+	+	+		10071	Select Input bit 9
130	Store current tightening program in the tool							
131	Active XML result send							
132	Tool in work space							
133	Tool in product space							

DigIN number	DigIN function	Tracking	Support				Signal ID	Signal name
			Power Focus 6000, Power Focus 8, PFXC	PF FlexSystem	Power Focus 6000 StepSync, Power Focus 8 StepSync	IxB		
134	Flash tool yellow light							
135	XML Emergency mode							
136	MFU Test							
137	Tool in park position							
138	Enable operation	Yes	-	+	+		10055	Enable operation
139	Stop tightening	Yes	+	+	+		10030	Pulse stop
140	Start loosening pulse	No	-	+	+		10072	Start loosening, pulse
141-149	Free to use							
150	Pulsor Tool enable							
151	Perform air hose test							
152	Last Digin							
150-200	Reserved for Pulsor							
201	Tool blue light IO controlled							
202	Tool blue light							
203	Tool green light IO controlled							
204	Tool green light							
205	Tool red light IO controlled							
206	Tool red light							
207	Tool yellow light IO controlled							
208	Tool yellow light							
209	Tool white light IO controlled							
210	Tool white light							
300-349	Reserved							

Note 1: The Digital Input 140 Start Loosening Pulse have changed number compared to the previous PF6 Flex System software release 2.1. It was number 150 but is now changed to 140

Note 2: The signals “parameter set select bit XX” is for a PF6 Flex System used for “Sync Mode select bit xx

6 MID 64/65 – Old result data, special support removed

Power Focus 6000 is assigning tightening IDs incremented by one to each result produced by a Virtual station. This means that two results can have tightening ID one, however, they belong to two different Virtual stations which are seprated by a unique connection (port number and IP address). For a MES system that have been used together with one or many Power Focus 4000 system(s) no differences will be seen.

If a MES system have used one connection to on one Virtual station to retrive all results in one controller, that will say, produced from multiple Virtual stations, this will no longer be possible! A result produed by a Virtual station can only be retrived through a connection to this specific Virtual station. If this Virtual station is deleted old results produced by this Virtual station will no loger be possible to retrive through Open Protocol. This is due to that the unique Virtual station is now deleted and instead a new Virtual station is created. Results produced by the deleted Virtual station is however not deleted from the system and can be retrived by the export function or the ToolsNet software.

7 Parameter set MIDs

The handling of the parameter set MIDs differ between Power Focus 6000 and PF6 Flex System. The MIDs in question are the following:

- 0010 Parameter set ID upload request
- 0011 Parameter set ID upload reply
- 0012 Parameter set data upload request
- 0013 Parameter set data upload reply
- 0014 Parameter set selected subscribe
- 0015 Parameter set selected
- 0016 Parameter set selected acknowledge
- 0017 Parameter set selected unsubscribe
- 0018 Select Parameter set

7.1 Usage of Tightening program (Pset) selection

7.1.1 Power Focus 6000, IxB and STRwrench

In order to be able to select tightening programs in Power Focus 6000, IxB and STRwrench the Virtual Station needs to use a Source Tightening as the task.

If using MID 0010 - 0011 with no task or any other task but Source Tightening, the Power Focus 6000, IxB, and STRwrench will send a list back containing indexes of all tightening programs from the Tightening menu.

If a Source Tightening is not selected, the Power Focus 6000, IxB, and STRwrench will not be able to use MID 0018 and will instead respond with error MID 0004, status 03 – Parameter set cannot be set.

When a Source Tightening is used the Tightening program list that will be sent by MID 0011 will consist of the list that is configured in the selected Source Tightening task. The ID/index in the message will be the same as the configured “Identifier number” in the Source Tightening. That will say, it will NOT be the Tightening program index found in the Tightening menu.

When selecting by MID 0018, the ID/index to send is the one that is received with MID 0011. This is the configured “Identifier number” in the selected Source Tightening. If trying to select an ID/index that is not configured as an “Identifier number”, even if there is a Tightening program with this index in the tightening menu, the error MID 0004, status 03 – Parameter set cannot be set, will be sent.

When subscribing to the selected Tightening program, MID 0014-0017, the sent ID/index from the Power Focus 6000, IxB, or STRwrench will either be the index for the Tightening program or the identifier number of the selected tightening program found in the tightening menu. The configuration of the "MID0015 Echo selected identifier number" toggle in the open protocol configuration of a virtual station decides which value will be sent. This implies that the configured “Identifier number” in the selected Source Tightening will be sent with MID 0015 if the toggle is set to “Yes”. In all other MIDs containing Tightening program info (like MID 0061), the ID/index will always be the one found in the tightening menu, not the configured “Identifier number” in the selected Source Tightening, even if the toggle is set to “Yes”.

When using MID 0012 to fetch Tightening program data, the ID/index to use shall always be the one found in the tightening menu and not the configured “Identifier number” in the selected Source Tightening.

7.1.2 PF6 Flex System and Power Focus 6000 StepSync

The handling of a tightening is done differently in a PF6 Flex System and Power Focus 6000 StepSync. Instead of selecting a tightening program a Sync Mode is selected. Therefore the functionality of the Parameter set MIDs will also differ:

Parameter set selection:

- 0014 Parameter set selected subscribe
- 0015 Parameter set selected
- 0016 Parameter set selected acknowledge
- 0017 Parameter set selected unsubscribe
- 0018 Select Parameter set

In all these “Parameter set” will be treated as “Sync Mode” in PF6 Flex System and Power Focus 6000 StepSync. For example “Select Parameter set” with number 3 will select Sync Mode with index number 3.

Parameter set upload:

- 0010 Parameter set ID upload request
- 0011 Parameter set ID upload reply

In these “Parameter set” is treated as “Sync Mode” in PF6 Flex System and Power Focus 6000 StepSync. If Parameter set ID upload request is received the controller will answer with Parameter set ID upload reply containing a list of all available Sync Modes.

8 Usage of Tightening program (Pset) batch size

In Power Focus 6000, IxB or STRwrench it is possible to run dynamic batch control on Tightening program level. To do so the Virtual Station need to run a Source Tightening task configured to use External Batch Control. It is then possible to send MID 0019 to select a batch size for a configured Tightening Program.

If a command request to set batch size for a non-existing Tightening Program, that is a non programmed identifier in the list in the Source Tightening configuration, a command error MID 0004 with status 79 will be returned.

It is possible to setup batch sizes for non selected Tightening Programs, but that is in the Source Tightening configuration list. However, if there is a configuration change of the running Source Tightening, the cached batch sizes will be reset and the client need to set all batch sizes again.

MID 0020 is now also supported to reset current running batch. However, the payload data will not have any effect. The Power Focus 6000, IxB or STRwrench will not check if the reset command is for the current running Tightening Program.

9 Usage of Sequence (Job) selection

The virtual station is required to run a Source Batch configured with number as selection input, to select Job, MID 0038 and get Job list, MID 0030-0031. If this requirement is not fulfilled, MID 0030-0031 and MID 0038 will not work. If using MID 0030-0031 without Source Batch configured with numbers, the Power Focus 6000, IxB or STRwrench will send an empty list back. If trying to use MID 0038 without a Source Batch configured with numbers, the Power Focus 6000, IxB or STRwrench will respond with error MID 0004, status 20 – Job cannot be set.

10 Multi Spindle Result

When using MID 0101 Multi Spindle Result with PF6 Flex System and Power Focus 6000 StepSync there are some limitations and special handling of the parameters as are described below:

Parameter	Usage
Job ID Parameter set ID	Index of the Sync Mode used in the tightening is used for both parameters
Torque Min limit Torque Max limit Torque final target Angle Min Angle Max Final Angle Target Date/time of last change in parameter set settings Batch size Batch counter Batch status	All these will contain data for the multistep tightening program ran on the first channel. The other channels may have used another program with other settings, but it is not possible to fit this data into the MID

11 MID 1000 Alarm

The data in MID 1000 Alarm is dynamic and sent as “Data fields” with PID as identifier. In Power Focus 6000, PF6 Flex System, Power Focus 6000 StepSync and IxB the PIDs listed below are supported. The ones actually sent depend on the type of the alarm.

Table 6 Parameter IDs

Parameter Id (PID)	Name
01700	Alarm text
01701	Alarm severity
01202	Tool serial number
01205	Tool number
01101	Torque controller Number
01104	Torque controller serial number
20010	Carrier number
20011	Serial number carrier

12 Multistep Tightening Result Data

The tightening results are sent using the MIDs 1201 “Operation result overall data” and 1202 “Operation result object data”.

These two MIDs are highly dynamic and in the following sections specify how the available data in multistep tightening result is mapped to PIDs in Open Protocol message.

12.1 MID 1201 “Operation result overall data”

A part of the MID is fixed, the data in this part is mapped according to the following table:

Table 7 Data Mapping with Fixed Data in MID 1201

Data Field in MID 1201	Mapping
Result Data Identifier	The identity of the result
Time	The timestamp of the result
Result status	The total tightening status of the result
Operation type	Always 1=Synchronized tightening for PF6 Flex System
Number of objects	The number of bolts included in the result
Object Id 1	Bolt number
Object Status 1	Status of bolt 1
Object Id 2	Bolt number
Object Status 2	Status of bolt 2

Table 8 Data Mapping with Variable Data in MID 1201

PID	Name	Mapping
00003	Station Name	The name of the Virtual Station that made the tightening
00010	VIN Number	The Vin Number of the result
00011	Identifier 1	Result MetaData identifierList[1].identifier
…		
00020	Identifier 10	Result MetaData identifierList[10].identifier
00100	Batch size	This parameter gives the total number of tightenings in the batch. Only used if this tightening was a part of a batch.
00101	Batch counter	The number for this tightening in the batch. Only used if this tightening was a part of a batch.
00102	Batch status	The current status of the batch. Only used if this tightening was a part of a batch.
00104	Increment on NOK	
00105	Batch tightening status	The current status of the batch. Only used if this tightening was a part of a batch.
00005	Tightening Status Additional Information	The tightening status additional info of the Result
01504	Sync Group ID	The index number of Sync Mode
01505	Sync Group Name	The name of the Sync Mode

12.2 MID 1202 “Operation result object data”

For MID 1202 “Operation result object data” the result for each bolt is used to get the values sent in the telegram. The data in this MID is mapped according to the following table:

Table 9 Data Mapping in MID 1202

PID	Name	Mapping
01000	Tightening program Number	The index number of the tightening program
01001	Tightening program Name	The name of the tightening program
01002	Control Tightening program Strategy	The tightening program strategy type
01039	Result type	The operation mode of the result Possible values are: TIGHTENING_RES = 1 LOOSENING_RES = 2
01400	Tightening Status	The total tightening status of each spindle
01401	Tightening error codes	The tightening errors of the result See 3.3 for a description of the field
01420	Tightening Status Additional Information	The additional info of the tightening status
01421	Primary Error	The tightening primary error of the result See 3.3 for a description of the field
01422	Failing Step	The number of the failed step
01300	Bolt Name	Bolt Name
01301	Bolt Number	Bolt Number
01205	Tool Number	Drive Channel Number
02000	Torque, final target	Target final torque value
02001	Torque, measured value	Measured final torque value
02002	Torque, final upper limit	Final torque upper limit value
02003	Torque, final lower limit	Final torque lower limit value
02008	Torque, Rundown start torque	Rundown start torque
02009	Torque, Final angle start torque	Final angle start torque
02010	Angle, target	Target final angle value
02011	Angle, measured value	Measured final angle value
02012	Angle, upper limit	Final angle upper limit value
02013	Angle, lower limit	Final angle lower limit value
02019	Torque, Rundown complete torque	Rundown complete torque
02124	Free Event Text	External Result Target Text
02170	Elapsed time	Measured elapsed time value
20001	Angle Compensation	Final angle compensation value
01403	Angle status	The status of the Angle in the tightening
01402	Torque status	The status of the Torque in the tightening
02072	Prevailing Torque upper limit	The max tightening torque value for the prevail measurement validation.
02073	Prevailing Torque lower limit	The min tightening torque value for the prevail measurement validation.
02093	Prevailing Torque measured	
01407	Prevailing Torque status	The status of the PVT monitoring in the tightening
02070	Self-tap Torque upper limit	The max tightening torque value for the self-tap measurement validation.
02071	Self-tap Torque lower limit	The min tightening torque value for the self-tap measurement validation.

PID	Name	Mapping
02092	Self-tap Torque measured	
01406	Self-tap Torque status	The status of the Self tap monitoring in the tightening
02021	Current measured	The measured current
02022	Current, upper limit	The upper limit for the measured current
02023	Current, lower limit	The lower limit for the measured current
01405	Current status	The status of the Current monitoring in the tightening
02016	Rundown angle upper limit	
02017	Rundown angle lower limit	
02044	Rundown angle measured	
01404	Rundown status	The status of the Rundown monitoring in the tightening
05000	Tightening step strategy	The type of the step result
05001	Step error codes	The tightening errors of the step result See 3.3 for a description of the field
05002	Step name	The name of the step. The step can for example be “Soft Start” or “Rundown” or a customized string. The value is sent as a string.
05003	Step Status	The tightening status of the step result
05004	Step Primary Error	The primary error of the step result See 3.3 for a description of the field
05101	Step Torque	The peak torque value of step monitor result
05112	Step Angle	The angle value of step monitor result
05121	Step Current	The shut off current value of step monitor result
05160	Step Shut Off Torque	The shut off torque value of step monitor result
05161	Step Torque Rate	Measured torque rate value of step monitor result
05162	Step Torque Rate Deviation	Measured torque rate deviation value of step monitor result
05163	Step Peak Torque in Window	Measured peak torque in window of step monitor result
05164	Step Low Torque in Window	Measured low torque in window of step monitor result
05165	Step Post View Torque High	Measured post view torque high value of step monitor result
05166	Step Post View Torque Low	Measured post view torque low value of step monitor result
05167	Step Yield Angle, measured value	Measured step yield angle value of step monitor result
05168	Step Prevailing Torque	Measured prevailing torque value of step monitor result
05169	Step Time	Measured time value of step monitor result
05170	Step Elapsed Time	Measured time value of step restriction result
05171	Cross Thread Angle	Measured cross thread angle value of step restriction result
05172	Step Post View Torque High Angle	Measured torque high angle value of step monitor result
05173	Step Post View Torque Low Angle	Measured torque low angle value of step monitor result

12.3 Tightening Error definition

In the fields Tightening Errors and Primary Tightening Errors on program level and step level the same definition of the errors are used.

The error code is laid out as a bit field there each bit represent one error according to Table 10 below. In Tightening errors all the errors that occurred in the program or step are sent together. In Primary Tightening Error only the most significant error is sent, i.e. the error that caused the NOK.

The definition is used in the following PIDs, there each PID is sent as a hexadecimal value:

- PID 01401 - Tightening error codes
- PID 01421 - Primary Error
- PID 05001 - Step error codes
- PID 05004 - Step Primary Error

Table 10 Defined error codes

Error Code	Value
BrakeFailed	0x0000 0000 0000 0000 0000 0000 0000 0001
TriggerLost	0x0000 0000 0000 0000 0000 0000 0000 0002
ShuntFailed	0x0000 0000 0000 0000 0000 0000 0000 0004
ZeroOffsetFailed	0x0000 0000 0000 0000 0000 0000 0000 0008
EngageFailed	0x0000 0000 0000 0000 0000 0000 0000 1000
PeakTorque_TorqueNotMeasured	0x0000 0000 0000 0000 0000 0000 0001 0000
PeakTorque_TorqueLow	0x0000 0000 0000 0000 0000 0000 0002 0000
PeakTorque_TorqueHigh	0x0000 0000 0000 0000 0000 0000 0004 0000
ShutOffTorque_TorqueLow	0x0000 0000 0000 0000 0000 0000 0008 0000
ShutOffTorque_TorqueHigh	0x0000 0000 0000 0000 0000 0000 0010 0000
TorqueRate_TorqueRateNotMeasured	0x0000 0000 0000 0000 0000 0000 0020 0000
TorqueRate_TorqueRateLow	0x0000 0000 0000 0000 0000 0000 0040 0000
TorqueRate_TorqueRateHigh	0x0000 0000 0000 0000 0000 0000 0080 0000
TorqueRate_TorqueRateDeviationTooBig	0x0000 0000 0000 0000 0000 0000 0100 0000
TorqueRate_TorqueRateDeviationNotMeasured	0x0000 0000 0000 0000 0000 0000 0200 0000
StepMonitorAngle_AngleNotMeasured	0x0000 0000 0000 0000 0000 0000 0400 0000
StepMonitorAngle_AngleLow	0x0000 0000 0000 0000 0000 0000 0800 0000
StepMonitorAngle_AngleHigh	0x0000 0000 0000 0000 0000 0000 1000 0000
TorqueInAngleWindow_TorqueNotMeasured	0x0000 0000 0000 0000 0000 0000 2000 0000
TorqueInAngleWindow_TorqueLow	0x0000 0000 0000 0000 0000 0000 4000 0000
TorqueInAngleWindow_TorqueHigh	0x0000 0000 0000 0000 0000 0000 8000 0000
PostViewAverageTorqueHigh_TorqueNotMeasured	0x0000 0000 0000 0000 0000 0001 0000 0000
PostViewAverageTorqueHigh_TorqueHigh	0x0000 0000 0000 0000 0000 0002 0000 0000
PostViewAverageTorqueLow_TorqueNotMeasured	0x0000 0000 0000 0000 0000 0004 0000 0000
PostViewAverageTorqueLow_TorqueLow	0x0000 0000 0000 0000 0000 0008 0000 0000
YieldAngle_AngleNotMeasured	0x0000 0000 0000 0000 0000 0010 0000 0000
YieldAngle_AngleLow	0x0000 0000 0000 0000 0000 0020 0000 0000
YieldAngle_AngleHigh	0x0000 0000 0000 0000 0000 0040 0000 0000
StickSlipDetection_DropBelowTrigger	0x0000 0000 0000 0000 0000 0080 0000 0000
ShutOffCurrent_CurrentLow	0x0000 0000 0000 0000 0000 0100 0000 0000
ShutOffCurrent_CurrentHigh	0x0000 0000 0000 0000 0000 0200 0000 0000

Error Code	Value
PrevailingTorque_TorqueNotMeasured	0x0000 0000 0000 0000 0000 0400 0000 0000
PrevailingTorque_TorqueLow	0x0000 0000 0000 0000 0000 0800 0000 0000
PrevailingTorque_TorqueHigh	0x0000 0000 0000 0000 0000 1000 0000 0000
StepMonitorTime_TimeNotMeasured	0x0000 0000 0000 0000 0000 2000 0000 0000
StepMonitorTime_TimeLow	0x0000 0000 0000 0000 0000 4000 0000 0000
StepMonitorTime_TimeHigh	0x0000 0000 0000 0000 0001 0000 0000 0000
StepRestrictionTorqueHigh	0x0000 0000 0000 0001 0000 0000 0000 0000
StepRestrictionAngleHigh	0x0000 0000 0000 0002 0000 0000 0000 0000
StepRestrictionTimeHigh	0x0000 0000 0000 0004 0000 0000 0000 0000
StepRestrictionCrossThread_AngleLow	0x0000 0000 0000 0008 0000 0000 0000 0000
StepRestrictionCrossThread_AngleHigh	0x0000 0000 0000 0010 0000 0000 0000 0000
StepRestrictionTorqueGradient_GradientLow	0x0000 0000 0000 0020 0000 0000 0000 0000
StepRestrictionTorqueGradient_GradientHigh	0x0000 0000 0000 0040 0000 0000 0000 0000
StepRestrictionTorqueLow	0x0000 0000 0000 0080 0000 0000 0000 0000
ExcessiveAngularRotation_PositiveReached	0x0000 0000 0000 0100 0000 0000 0000 0000
ExcessiveAngularRotation_NegativeReached	0x0000 0000 0000 0200 0000 0000 0000 0000
CurrentDeviation	0x0000 0000 0000 0400 0000 0000 0000 0000
StepRestrictionTorqueInAngleWindow_TorqueHigh	0x0000 0000 0000 0800 0000 0000 0000 0000
StepRestrictionTorqueInAngleWindow_TorqueLow	0x0000 0000 0000 1000 0000 0000 0000 0000
Rehit	0x0000 0000 0000 2000 0000 0000 0000 0000
ProgramRestrictionTorqueHigh	0x0000 0001 0000 0000 0000 0000 0000 0000
ProgramRestrictionTimeHigh	0x0000 0002 0000 0000 0000 0000 0000 0000
ProgramRestrictionAngle_AngleHigh	0x0000 0004 0000 0000 0000 0000 0000 0000
ProgramMonitorAngle_AngleNotMeasured	0x0001 0000 0000 0000 0000 0000 0000 0000
ProgramMonitorAngle_AngleHigh	0x0002 0000 0000 0000 0000 0000 0000 0000
ProgramMonitorAngle_AngleLow	0x0004 0000 0000 0000 0000 0000 0000 0000
ProgramMonitorTime_TimeNotMeasured	0x0008 0000 0000 0000 0000 0000 0000 0000
ProgramMonitorTime_TimeHigh	0x0010 0000 0000 0000 0000 0000 0000 0000
ProgramMonitorTime_TimeLow	0x0020 0000 0000 0000 0000 0000 0000 0000

13 MID 0240-0245 User Data

Since the Power Focus 6000, PF6 Flex System, Power Focus 6000 StepSync and IxB are all LITTLE ENDIAN systems compared to the PowerMACS the data exchanged will be in LITTLE ENDIAN ordering.

The hard coded available address range of the PowerMACS is not applicable on the Power Focus 6000 and PF6 Flex System.

14 MID 2500 Tightening Program Message Download

The purpose of the message is to store a multistep tightening program on the controller or tool. The controller or tool allows the client to choose a default loosening program for each Virtual station where an Open Protocol connection exists. Setting the default loosening program and how it works will be explained later in the document.

It is very important to understand the difference between the tightening program identifier and tightening program index because they can have different values. This is illustrated in the next two screen shots; an explanation of the differences is under the images.

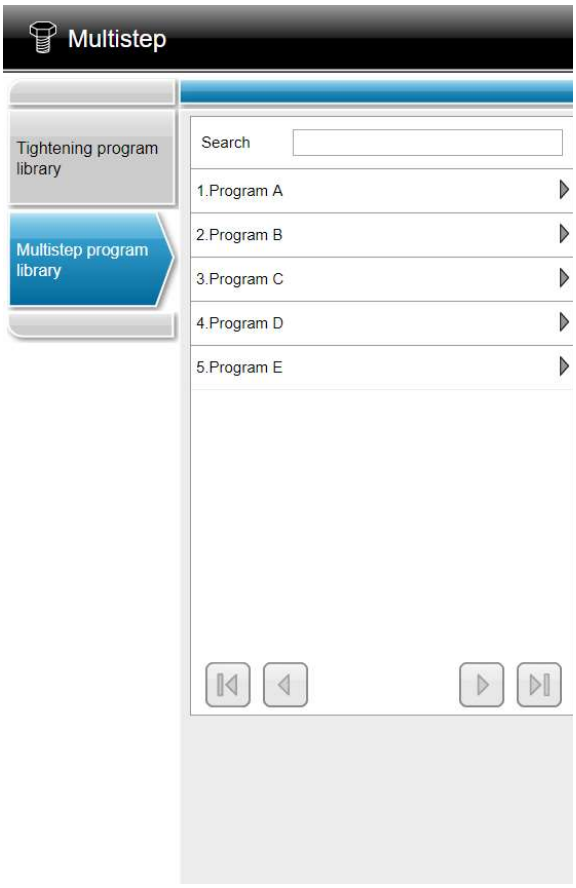


Figure 1 The numbers besides the tightening program names are called indexes.

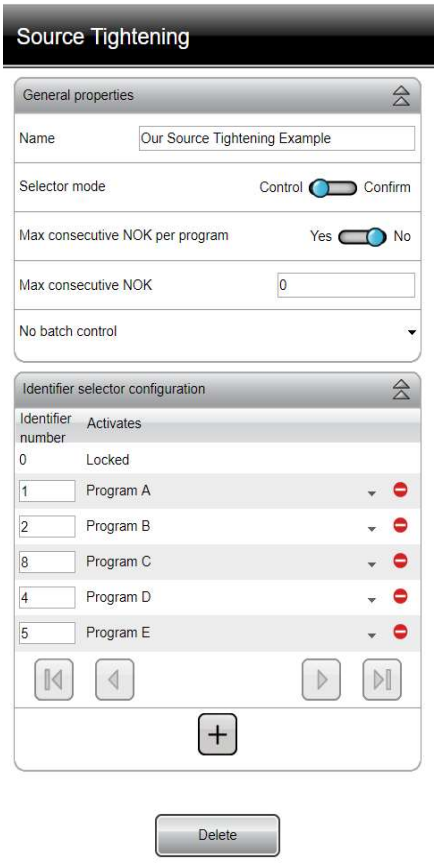


Figure 2 The numbers beside the tightening program names are called identifiers. The identifiers can be edited.

A MID 2500 message can contain PID 01000. Depending on the configuration of the system, PID 01000 can be interpreted as an identifier or an index. The interpretation is described in the diagram bellow.

The following diagram explains under which circumstances the multistep tightening program is stored on the controller and in which cases PID 01000 is interpreted as an identifier or an index. For clarity the diagram does not show the possibility of setting the Default loosening program for sent Multistep tightening programs.

Figure 3: The program flow

Note: MID 2500 does not need to contain PID 01000, but it is recommended. The program flow diagram shows an option where the part of the message with PID 01000 is missing, but creating a message like this is not recommended. The reason is that a user may need to understand in which part of the JSON string the identifier or index should be inserted.
Note: It is not recommended to use this MID together with system functions that may overwrite the stored programs such as the Global tightening feature of ToolsTalk. Doing so may result in unexpected behavior.

In cases where the user wants to have a loosening program assigned to the multistep tightening program, the following procedure has to be followed:

1. A loosening program has to be created through ToolsTalk2 or WebHMI.
2. Inside the Virtual station view under Open Protocol option a Default loosening program has to be chosen.

When these steps have been followed all the Multistep tightening programs sent via Open Protocol will have the default loosening program assigned to them.

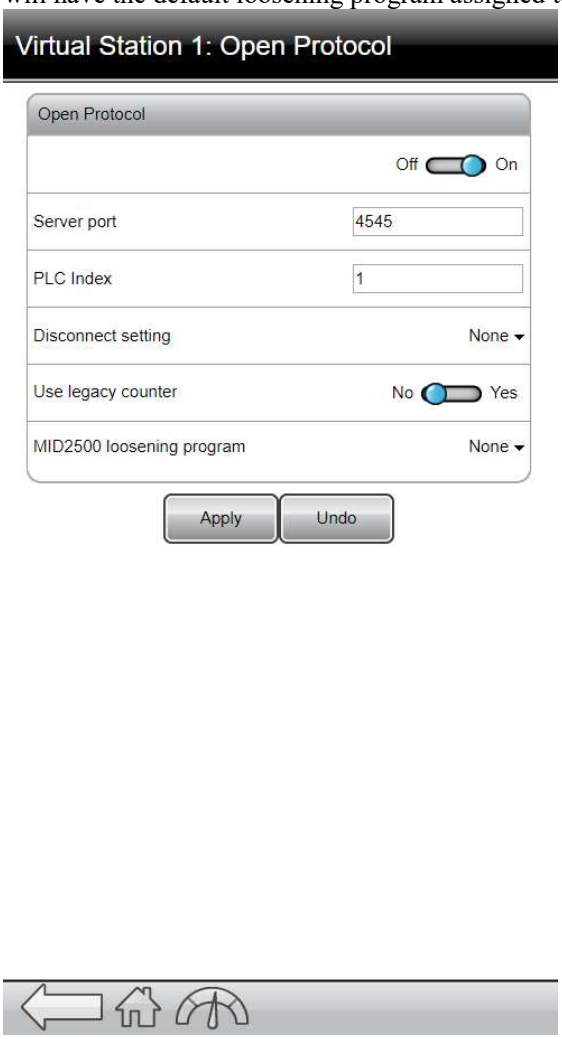


Figure 4 Screenshoot of how the menu with the MID2500 loosening program looks like

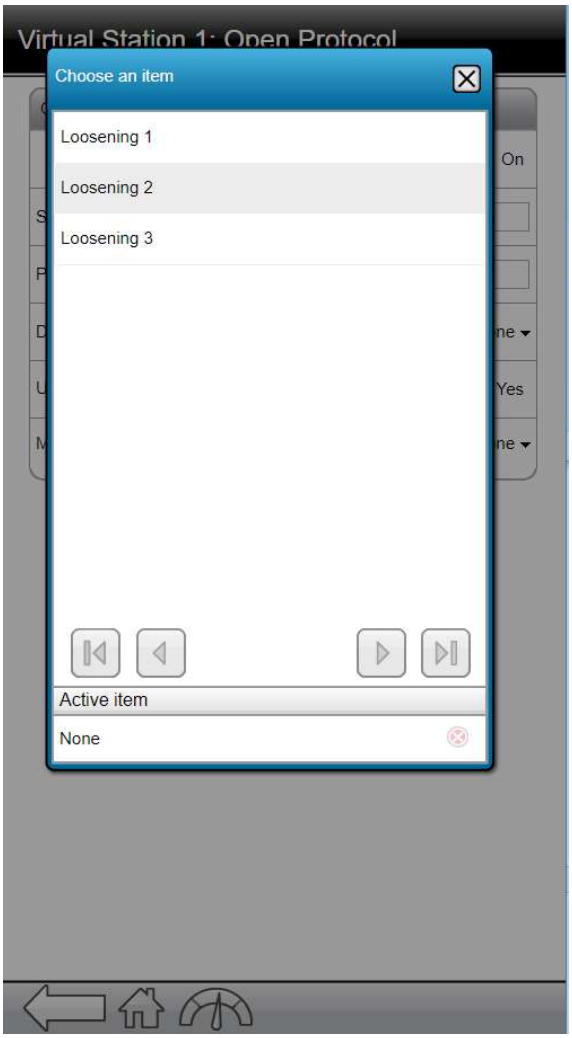


Figure 5 Screenshoot of menu with a list of available Default Loosening programs

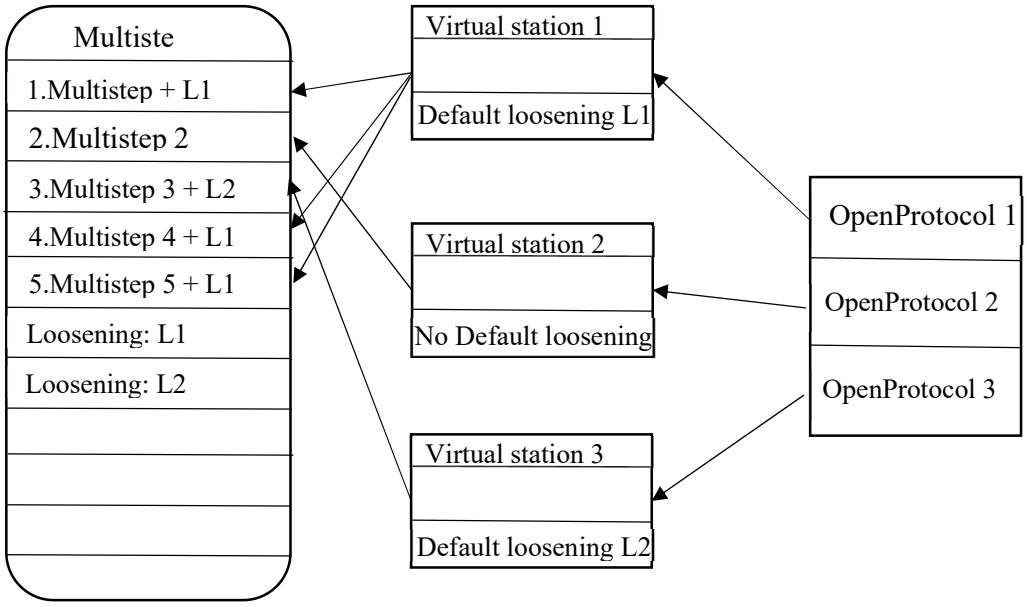


Figure 6 Possible misunderstanding when it comes to choosing the Task. Each virtual station sees all created Multistep programs with different loosening attached to them, which means despite the fact Virtual station 3 has Default loosening program 3 assigned, chosen Task can be "5. Multistep + L1"

Each Virtual station can have different loosening program assigned to it (Virtual Station 1 has Loosening 1, Virtual Station 2 doesn't have any loosening program and Virtual Station 3 has Loosening 2 assigned to it). Through Open Protocol a user can create many Multistep programs.
In the example on Figure 6:

- Through Virtual Station 1 the user creates programs on indexes 1, 4, 5 and each of them has loosening 1 assigned to them.
- Through Virtual Station 2 the user creates only one multistep program on index 2 (without loosening assigned, because of the settings in Virtual Station 2).
- Through Virtual Station 3 the user creates Multistep program with Loosening 2 assigned to it on index 3.

If the user wants to select the task Multistep on index 5 on Virtual Station 3, it will be possible, and the loosening which the tool will perform will be loosening program **1**, because that is part of the Multistep program. The reason is that default loosening option is considered only when the Multistep program is created.
The idea is to first create the multistep tightening program and after it is created in order to get the JSON export the settings

Message example:

Node type	Number of parameter data fields	Data fields						Number of children	JSON string length	JSON string data part
		PID	Length	Data Type	Unit	Step No.	Data value			
201	001	01000	004	01	000	0000	0008	00	1601	{"changeState":2…

2010010100000401000000000008001601{"changeState":2,"revision":43,"id"
:{"value":[207,5,207,152,224,99,74,44,136,52,224,208,238,183,216,17]
},"versionId":{"value":{"value":[135,165,107,190,250,248,69,229,136,
225,236,201,21,253,42,64]}},"user":"ExternalwebHMI","timestamp":{"va
lue":1557216299},"name":"Program","descr":"","indexId":{"value":5},"
threadDirection":1,"tighteningType":2,"operationMode":1,"looseningId
":{"value":[67,154,12,156,38,192,77,122,190,129,177,188,221,140,194,
196]},"steps":[{"internalNumber":1,"stepNumber":0,"nextInternalNumbe
r":2,"stepPath":1,"type":10},{"internalNumber":2,"stepNumber":1,"nex
tInternalNumber":10,"stepPath":1,"type":13,"stepTightenToAngle":{"mo
torControlSpeedRamp":{"speedTarget":60,"acceleration":500,"speedRamp
Type":1},"brake":true,"angleTarget":80,"speedRampChanges":[],"brakeC
onfig":{"brakeType":1,"configErgoStop":{"isBrakeRamptimeAdaptive":tr
ue,"rampTime":200}}}},{"internalNumber":10,"stepNumber":9,"nextInter
nalNumber":10,"stepPath":1,"type":11}],"syncPoints":[],"programRestr
ictions":[{"internalNumber":7,"type":2,"timeHigh":{"timeLimitHigh":3
0}},{"internalNumber":8,"type":1,"torqueHigh":{"torqueLimitHigh":10}
}],"stepMonitors":[{"internalNumber":3,"startInternalStepNumber":2,"
type":2,"peakTorque":{}},{"internalNumber":4,"startInternalStepNumbe
r":2,"type":6,"angle":{"stopCondition":2}}],"stepRestrictions":[{"in
ternalNumber":5,"startInternalStepNumber":2,"type":3,"timeHigh":{"ti
meLimitHigh":5}},{"internalNumber":6,"startInternalStepNumber":2,"ty
pe":1,"torqueHigh":{"torqueLimitHigh":10}}],"programMonitors":[{"int
ernalNumber":9,"type":1,"angle":{"enabled":false,"stopCondition":2}}
]}

15 MID 2501 Tightening Program Message Upload

Using MID 0006 is possible to request the JSON representation of the Multistep program as part of the MID 2501. To do this some conditions have to be fulfilled. In the cases when MID 2500 does not store a program (

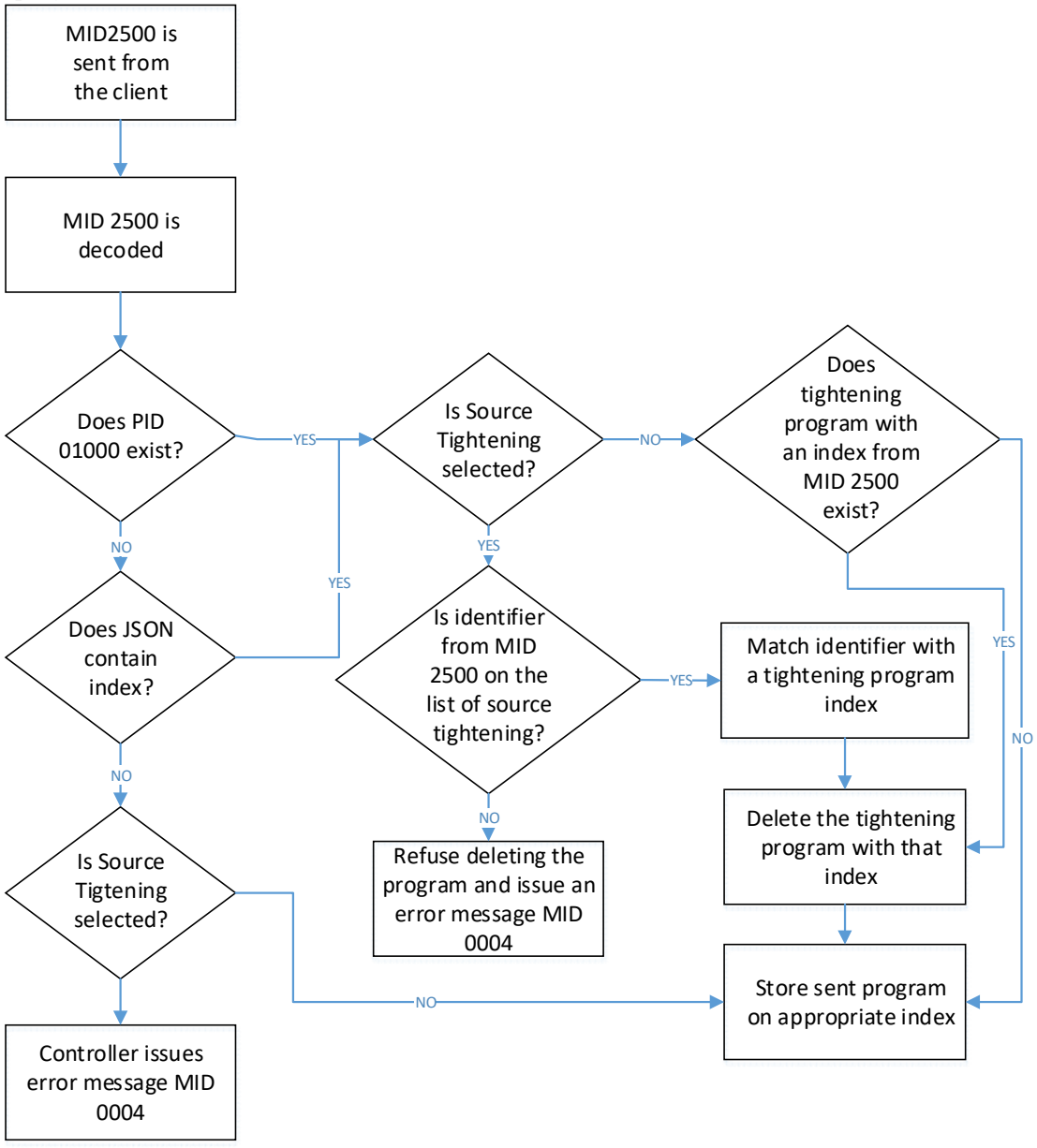


Figure 3), MID 2501 will not return any program.

15.1 Request for MID 2501 Extra data

The only Node Type supported is 201.
MMID 2501 supports only request MID 0006 and not the subscription with MID 0008.

15.2 MID 2500 and MID 2501

Table 11 Parameters for MID 2500 and MID 2501

Parameter	Size [byte]	Data type	Description
Node type	3	UI	The type of the node, see table 40 in Ref. 1.
Number of parameter data fields	3	UI	The number of variable data fields in this node
Data fields	Vary		This section is repeated "Number of data fields" times. If Number of data fields = 000, this section is not sent. . The structure is of variable parameter type, see Ref. 1.

Parameter	Size [byte]	Data type	Description
Parameter id (PID).	5	UI	The available PID's may vary depending on the system type.
Length	3	UI	Length of data value.
Data Type	2	UI	Data type of the data value.
Unit	3	UI	Unit of the data.
Step no.	4	UI	The step number. Sent as 0000 if not relevant
Data value	Length	UI	The data value.

Number of children	2	UI	
JSON string length	4	UI	The length of the JSON string in this node. **The length cannot be longer than the total allowed MID length minus additional date from header, variable data and node information of all nodes!**
JSON string data part	JSON sting length	String	This field contains a JSON string. The device defines the actual data, please consult the device documentation. If JSON string length is 0000, this section is not sent (empty).

16 MID 0900 Trace curve data message

MID 0900 is used to send only tightening result trace data over Open Protocol. The number of trace samples is less than or equal to 768.

MID 0900 response contains following parameters:

- PID 00010 VIN number
- PID 00051 Latest Result ID
- PID 00053 Latest Result Time
- PID 01000 Tightening Program Number
- PID 01202 Tool Serial Number
- PID 02214 Coefficient (multiplication)
- PID 00002 Station ID
- PID 01301 Bolt number (fixtured systems only)

16.1 MID 0900 Subscription

To subscribe to MID 0900 the client must send MID 0008 Application data message subscription message with a MID 0900 subscription data message.

The subscription data message contains:

- Send alternative
- Data identifiers (time stamp or index)
- Trace types

Supported “Send alternatives”:

- 0: Only new data generated after the subscription is done is sent to the subscriber. Old unsent data will not be sent to the subscriber.

Supported parameters for “Trace types” are:

- 1: Angle trace
- 2: Torque trace
- 3: Current trace

Note: Since results may not always contain all the requested types, only the actual trace types available in a result will be sent. For example, when subscribing to all types and running a CATLA/PSet program, only angle and torque traces will be sent even if all three types were subscribed.

16.2 MID 0900 Unsubscription

To unsubscribe to MID0900 trace types the client must send MID0009 (Application data message unsubscribe) with a MID0900 unsubscribe data message. The un-subscription data message contains the requested trace types for un-subscription.
If an un-subscription request is received for a trace type that is not subscribed to the controller will respond with error 72, ‘Subscription does not exist’.

17 MID 0901 Traces Plot Parameters Message

MID 0901 sends trace plotting parameters necessary for drawing of the limit figures in relation to the trace curve. It is not needed to subscribe to MID 0900 to subscribe to MID 0901.

MID 0901 response contains following parameters if available in the result:

- PID 02002 Torque High Limit
- PID 02003 Torque Low Limit
- PID 02012 Angle High Limit
- PID 02013 Angle Low Limit
- PID 05150 Step start time
- PID 05151 Step end time
- PID 01301 Bolt number (fixtured systems only)

17.1 Limits

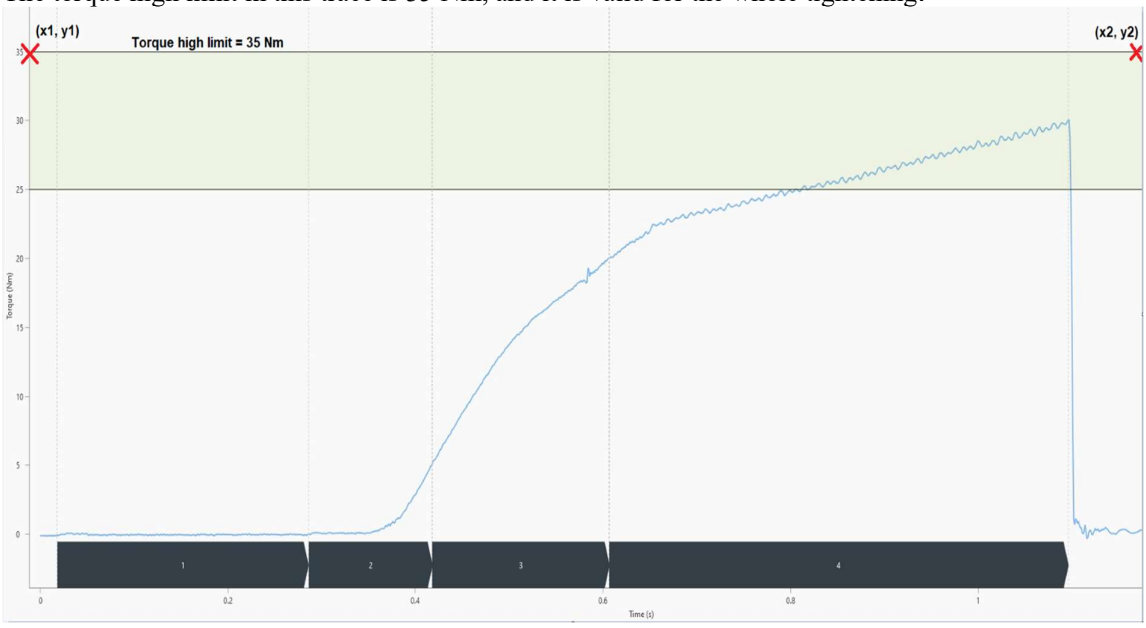
The PIDs for torque and angle limits are sent as , i.e. these:

- PID 02002 Torque High Limit
- PID 02003 Torque Low Limit
- PID 02012 Angle High Limit
- PID 02013 Angle Low Limit

Are sent as “Plot-point version 2” data

Data type:
The data is a PL2, “Plot-point version 2”, with identity 9.
This is a line between the two points (x1, y1) and (x2, y2).

Example:
The torque high limit in this trace is 35 Nm, and it is valid for the whole tightening.



The two points will when be x1 = 0 ms, y1 = 35 Nm and x2 = 1150 ms, y2 = 35 Nm

Data sent in the telegram will be structured like this:

Field	Value	Comment
Parameter Id	2002	Torque High limit
Length	032	The data part is 32 bytes long
Data Type	09	PL2, i.e. a line
Unit	900	Nm / ms
Step No	0000	0 => N/A, valid for whole tightening
Data	00035.00 00000000 00035.00 00001150	The values are sent as float, 8 byte each The order is y1, x1, y2, x2

17.2 MID 0901 Subscription

Subscription to MID 0901 is done through the MID 0008 Application data message subscription message.

18 Multiple identifiers

Handling of multiple identifiers is done with the goal of resembling behavior of PF4000 as much as possible.

18.1 MID 151 – 157 Multiple identifier and result parts

Support for MID 152 is introduced only when running Source batch with identifier method string. If running forced order scanning, MID is sent with each received identifier in scanning process and it is only including saved positions for each received identifier as well as their statuses. Available statuses of identifiers are: 0=Not accepted, 1=Accepted, 2=Bypassed, 3=Reset, 4=Next, 5=Initial. Since the concept of Work order is not supported, all strings that are configured to be scanned will be marked as a part of Work order and there can be no optional identifiers, even if significant positions are not configured.

Initially all identifiers are having status 5=Initial. If length of an identifier is accepted it will have status 1=Accepted and its saved positions will be sent. Following identifier will have status 4=Next. If length of an identifier is not accepted it will have status 0=Not accepted and it will be sent in raw format. Other identifiers in work order will have status 5=Initial. Status 0=Not accepted is only sent once. So in case of unsubscribing from MID 152 and then subscribing again, last identifier (in case it had status 0=Not accepted) will have status 4=Next or status it had directly before (for example 3=Reset). If last received identifier had status 0=Not accepted and Reset latest identifier command was received, Accepted or Bypassed identifier that was received before Not accepted identifier will be reset. If 2=Bypassed or 1=Accepted identifier has been reset it will have status 3=Reset and it will not include identifier part, string will be empty. If all identifiers are reset, then all configured identifiers included in scanning process will have status 3=Reset. If identifier is bypassed it will get status 2=Bypassed and following identifier will have status 4=Next. It is possible to reset bypassed identifier.

If running free order scanning this MID will be received on selection of a sequence and not before. In case of successful selection all identifiers will have status 1=Accepted. If no match has been found all identifiers will be received with status 0=Not accepted and they will be sent in the raw form, like they were received.

In case sequence has been selected before subscription to the MID 152, the current status of all identifiers included in selection will be sent directly on subscription.

18.2 MID 0035 Job info

When running Source batch with identifier method string, on successful sequence selection and for every job info status update MID 35 will be sent. Partial support for revision 5 is added (not supporting parameter 11) and parameters 12-15 of the MID are including saved positions of all received identifiers used for the selection. From revision 5 partial support for parameters 12-15 of the MID is added which are including saved positions of all received identifiers used for the selection.

18.3 MID 0052 Vehicle ID number

Revision 2 of MID 0052 is sent on selection which is resembling behavior of PF4000.

When running Source batch with the identifier method string and on selection of a sequence, MID will be sent including saved positions of all configured strings used in selection. In free mode, if no selection has been made, strings will be received in raw format as they were received. If revision 1 of MID 0052 is used, only the first identifier string is sent with its saved positions and not the full VIN with concatenated saved positions from all identifiers. In case of running any other task other than Source batch, this MID is sent directly after receiving new VIN number.

19 Inactivity timeout (keep alive)

The inactivity timeout can be changed on the controller whitin the range 15 - 60 seconds. Default value is 15 seconds.

20 References

Ref.	Doc id.	Doc. title
Ref. 1	4420065301	OpenProtocol_Specification_R_2.17.0