Appendix for

Power Focus 6000

Power Focus 6000 StepSync

PF6 FlexSystem

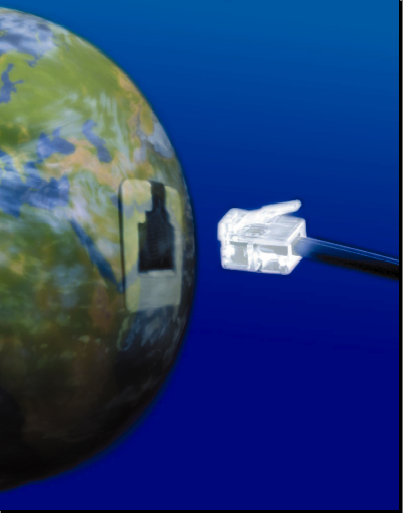
IxB

Power Focus 8

Power Focus 8 StepSync

Open Protocol

Atlas Copco Tools and Assembly Systems

****

Appendix Specification release 3.6

Copyright Atlas Copco Tools and Assembly Systems

Note! This manual can be altered without further notice.

For further information log in to Atlas Copco www.atlascopco.com

**Contents**

[1 Introduction 4](#_Toc59519424)

[2 Revision history 4](#_Toc59519425)

[3 MID support for Power Focus 6000, PF6 Flex System, Power Focus 6000 StepSync, IxB, Power Focus 8 and Power Focus 8 StepSync 4](#_Toc59519426)

[4 Revision Support 11](#_Toc59519427)

[5 Supported MID Relay and Digital Input Signal 14](#_Toc59519428)

[5.1 Supported Relay numbers 15](#_Toc59519429)

[5.2 Supported Digital Input numbers 25](#_Toc59519430)

[6 MID 64/65 – Old result data, special support removed 32](#_Toc59519431)

[7 Parameter set MIDs 33](#_Toc59519432)

[7.1 Usage of Tightening program (Pset) selection 33](#_Toc59519433)

[7.1.1 Power Focus 6000 and IxB 33](#_Toc59519434)

[7.1.2 PF6 Flex System and Power Focus 6000 StepSync 34](#_Toc59519435)

[8 Usage of Tightening program (Pset) batch size 34](#_Toc59519436)

[9 Usage of Sequence (Job) selection 34](#_Toc59519437)

[10 Multi Spindle Result 35](#_Toc59519438)

[11 MID 1000 Alarm 35](#_Toc59519439)

[12 Multistep Tightening Result Data 36](#_Toc59519440)

[12.1 MID 1201 “Operation result overall data” 36](#_Toc59519441)

[12.2 MID 1202 “Operation result object data” 37](#_Toc59519442)

[12.3 Tightening Error definition 39](#_Toc59519443)

[13 MID 0240-0245 User Data 40](#_Toc59519444)

[14 MID 2500 Tightening Program Message Download 41](#_Toc59519445)

[15 MID 2501 Tightening Program Message Upload 46](#_Toc59519446)

[15.1 Request for MID 2501 Extra data 46](#_Toc59519447)

[15.2 MID 2500 and MID 2501 47](#_Toc59519448)

[16 MID 0900 Trace curve data message 48](#_Toc59519449)

[16.1 MID 0900 Subscription 48](#_Toc59519450)

[16.2 MID 0900 Unsubscription 48](#_Toc59519451)

[17 Multiple identifiers 49](#_Toc59519452)

[17.1 MID 151 – 157 Multiple identifier and result parts 49](#_Toc59519453)

[17.2 MID 0035 Job info 49](#_Toc59519454)

[17.3 MID 0052 Vehicle ID number 49](#_Toc59519455)

[18 References 50](#_Toc59519456)

# 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 or IxB. Open Protocol supports Ethernet connection towards all these products.

# Revision history

| **Version** | **Date** | **Author** | **Change** |
| --- | --- | --- | --- |
| 3.4.0 | 2020-06-09 | Rickard Molin | First version |
| 3.4.0 | 2020-06-10 | Rickard Molin | Added information for ICB and ITB |
| 3.4.0 | 2020-06-24 | Christoffer Klarin | Merged ICB and ITB into IxB |
| 3.5 | 2020-11-06 | Karolina Majstrovic | ToolsNet connection lost relay number is available for MID0215 |
| 3.5 | 2020-12-04 | Karolina Majstrovic | Added basic information about the Power Focus 8 products |
| 3.5.1 | 2020-12-11 | Karolina Majstrovic | Relay numbers 357, 358, 359 and 360 in MID 0215-0219 are enabled for PF6 Flex System, PF6 StepSync and PF8 StepSync |
| 3.6 | 2020-12-22 | Karolina Majstrovic | Relay number 57 and Digital Input numbers: 39, 40 in MID 0215-0219 are enabled for PF6 Flex System, PF6 StepSync and PF8 StepSync |
| 3.6 | 2021-12-20 | Folke Bilare | Added PFXC to chapter 3 & 5 |

# MID support for Power Focus 6000, PF6 Flex System, Power Focus 6000 StepSync, IxB, Power Focus 8 and Power Focus 8 StepSync

This section lists MID and MIDs revision supported by Power Focus 6000, PF6 Flex System, Power Focus 6000 StepSync and IxB. 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 partly supported.

This table is valid for the following releases:

* Power Focus 6000 3.6
* PF6 FlexSystem 3.6
* Power Focus 6000 StepSync 3.6
* IxB 3.6
* Power Focus 8 3.6
* Power Focus 8 StepSync 3.6
* Power Focus XC 3.6

Table 1 Supported MIDs

| MID | Name | Power Focus XC | Power Focus 6000 | PF6 Step Sync | PF6 Flex System | IxB | Power Focus 8 | Power Focus StepSync | Note |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0001 | Communication start | 6 | 6 | 6 | 6 | 6 |  |  |  |
| 0002 | Communication start acknowledge | 6 p | 6 p | 6 p | 6 p | 6 p |  |  |  |
| 0003 | Communication stop | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0004 | Command error | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0005 | Command accepted | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0006 | Application data message request | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0008 | Application data message subscription | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0009 | Application Data Message unsubscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0010 | Parameter set ID upload request | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 7 |
| 0011 | Parameter set ID upload reply | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 7 |
| 0012 | Parameter set data upload request | 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 |  |  | See chapter 7 |
| 0014 | Parameter set selected subscribe | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 7 |
| 0015 | Parameter set selected | 1 p | 1 p | 1 p | 1 p | 1 p |  |  | See chapter 7 |
| 0016 | Parameter set selected acknowledge | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 7 |
| 0017 | Parameter set selected unsubscribe | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 7 |
| 0018 | Select Parameter set | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 7 |
| 0019 | Set Parameter set batch size | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 8 |
| 0020 | Reset Parameter set batch counter | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 8 |
| 0021 | Lock at batch done subscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0022 | Lock at batch done upload | 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 |  |  |  |
| 0024 | Lock at batch done unsubscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0025 | Download Pset. Toyota Appendix | - | - | - | - | - |  |  |  |
| 0030 | Job ID upload request | 2 | 2 | 2 | 2 | 2 |  |  |  |
| 0031 | Job ID upload reply | 2 | 2 | 2 | 2 | 2 |  |  |  |
| 0032 | Job data upload request | 2 | 2 | 2 | 2 | 2 |  |  |  |
| 0033 | Job data upload reply | 2 p | 2 p | 2 p | 2 p | 2 p |  |  |  |
| 0034 | Job info subscribe | 5 | 5 | 5 | 5 | 4 |  |  |  |
| 0035 | Job info | 5 p | 5 p | 5 p | 5 p | 4 p |  |  |  |
| 0036 | Job info acknowledge | 5 | 5 | 5 | 5 | 4 |  |  |  |
| 0037 | Job info unsubscribe | 5 | 5 | 5 | 5 | 4 |  |  |  |
| 0038 | Select Job | 2 | 2 | 2 | 2 | 2 |  |  | See chapter 9 |
| 0039 | Job restart | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0040 | Tool data upload request | 6 | 6 | 6 (only) | 6 (only) | 5 |  |  |  |
| 0041 | Tool data upload reply | 6 p | 6 p | 6 p (only) | 6 p (only) | 5 |  |  |  |
| 0042 | Disable tool | 2 p | 2 p | 2 p | 2 p | 1 |  |  |  |
| 0043 | Enable tool | 2 | 2 | 2 | 2 | 1 |  |  |  |
| 0044 | Disconnect tool request | - | - | - | - | - |  |  |  |
| 0045 | Set calibration value request | 2 | 2 | 2 (only) | 2 (only) | 1 |  |  |  |
| 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 |  |  |  |
| 0051 | Vehicle ID number subscribe | 2 | 2 | 2 | 2 | 2 |  |  |  |
| 0052 | Vehicle ID number | 2 | 2 | 2 | 2 | 2 |  |  |  |
| 0053 | Vehicle ID number acknowledge | 2 | 2 | 2 | 2 | 2 |  |  |  |
| 0054 | Vehicle ID number unsubscribe | 2 | 2 | 2 | 2 | 2 |  |  |  |
| 0060 | Last tightening result data subscribe | 9 | 9 | - | - | 7 |  |  |  |
| 0061 | Last tightening result data | 9 p | 9 p | - | - | 7 p |  |  |  |
| 0062 | Last tightening result data acknowledge | 9 | 9 | - | - | 7 |  |  |  |
| 0063 | Last tightening result data unsubscribe | 9 | 9 | - | - | 7 |  |  |  |
| 0064 | Old tightening result upload request | 9 | 9 | - | - | 7 |  |  |  |
| 0065 | Old tightening result upload reply | 9 p | 9 p | - | - | 7p |  |  |  |
| 0070 | Alarm subscribe | 3 | 3 | 3 | 3 | 3 |  |  |  |
| 0071 | Alarm | 3 p | 3 p | 3 p | 3 p | 2 |  |  |  |
| 0072 | Alarm acknowledge | 3 | 3 | 3 | 3 | 3 |  |  |  |
| 0073 | Alarm unsubscribe | 3 | 3 | 3 | 3 | 3 |  |  |  |
| 0074 | Alarm acknowledged on controller | 2 | 2 | 2 | 2 | 2 |  |  |  |
| 0075 | Alarm acknowledged on controller acknowledge | 2 | 2 | 2 | 2 | 2 |  |  |  |
| 0076 | Alarm status | 3 | 3 | 3 p | 3 p | 2 |  |  | Only active events that need acknowledgement are sent. |
| 0077 | Alarm status acknowledge | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0078 | Acknowledge alarm remotely on controller | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0080 | Read time upload request | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0081 | Read time upload reply | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0082 | Set time | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0090 | Multi-spindle status subscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0091 | Multi-spindle status | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0092 | Multi-spindle status acknowledge | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0093 | Multi-spindle status unsubscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0100 | Multi-spindle result subscribe | - | - | 1 | 1 | - |  |  |  |
| 0101 | Multi-spindle result | - | - | 1 p | 1 p | - |  |  | See section 10 |
| 0102 | Multi-spindle result acknowledge | - | - | 1 | 1 | - |  |  |  |
| 0103 | Multi-spindle result unsubscribe | - | - | 1 | 1 | - |  |  |  |
| 0105 | Last PowerMACS tightening result data subscribe | - | - | - | - | - |  |  |  |
| 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 |  |  |  |
| 0111 | Display user text on graph | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0113 | Flash green light on tool | 1 | 1 | 1 | - | 1 |  |  |  |
| 0120 | Job line control info subscribe | 1 | 1 | - | - | 1 |  |  |  |
| 0121 | Job line control started | 1 | 1 | - | - | 1 |  |  |  |
| 0122 | Job line control alert 1 | 1 | 1 | - | - | 1 |  |  |  |
| 0123 | Job line control alert 2 | 1 | 1 | - | - | 1 |  |  |  |
| 0124 | Job line control done | 1 | 1 | - | - | 1 |  |  |  |
| 0125 | Job line control info acknowledge | 1 | 1 | - | - | 1 |  |  |  |
| 0126 | Job line control info unsubscribe | 1 | 1 | - | - | 1 |  |  |  |
| 0127 | Abort Job | 1 | 1 | - | - | 1 |  |  |  |
| 0128 | Job batch increment | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0129 | Job batch decrement | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0130 | Job off | - | - | - | - | - |  |  |  |
| 0131 | Set Job line control start | 1 | 1 | - | - | 1 |  |  |  |
| 0132 | Set Job line control alert 1 | 1 | 1 | - | - | 1 |  |  |  |
| 0133 | Set Job line control alert 2 | 1 | 1 | - | - | 1 |  |  |  |
| 0140 | Execute dynamic Job request | 1 p | 1 p | 1 p | 1 p | 1 p |  |  |  |
| 0150 | Identifier download request | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0151 | Multiple identifiers work order subscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0152 | Multiple identifiers work order | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0153 | Multiple identifiers work order acknowledge | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0154 | Multiple Identifiers work order unsubscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0155 | Bypass identifier | 1 | 1 | 1 | 1 | - |  |  |  |
| 0156 | Reset latest identifier | 1 | 1 | 1 | 1 | - |  |  |  |
| 0157 | Reset all identifiers | 1 | 1 | 1 | 1 | - |  |  |  |
| 0200 | Set external controlled relays | 1 p | 1 p | 1 p | 1 p | 1 |  |  |  |
| 0210 | Status external monitored inputs subscribe | 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 |  |  |  |
| 0212 | Status external monitored inputs acknowledge | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0213 | Status external monitored inputs unsubscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0214 | IO device status request | 2 | 2 | 2 | 2 | - |  |  |  |
| 0215 | IO device status reply | 2 | 2 | 2 | 2 | - |  |  | See chapter 5 |
| 0216 | Relay function subscribe | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 5 |
| 0217 | Relay function | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 5 |
| 0218 | Relay function acknowledge | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0219 | Relay function unsubscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0220 | Digital input function subscribe | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 5 |
| 0221 | Digital input function | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 5 |
| 0222 | Digital input function acknowledge | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0223 | Digin function unsubscribe | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0224 | Set digital input function | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 5 |
| 0225 | Reset digital input function | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 5 |
| 0240 | User data download | 1 | 1 | 1 | 1 | - |  |  | See chapter 13 |
| 0241 | User data subscribe | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 13 |
| 0242 | User data | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 13 |
| 0243 | User data acknowledge | 1 | 1 | 1 | 1 | - |  |  | See chapter 13 |
| 0244 | User data unsubscribe | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 13 |
| 0245 | User data download with offset | 1 | 1 | 1 | 1 | - |  |  | See chapter 13 |
| 0250 | Selector socket info subscribe | 1 p | 1 p | - | - | 1 |  |  |  |
| 0251 | Selector socket info | 1 p | 1 p | - | - | 1 |  |  |  |
| 0252 | Selector socket info acknowledge | 1 | 1 | - | - | 1 |  |  |  |
| 0253 | Selector socket info unsubscribe | 1 | 1 | - | - | 1 |  |  |  |
| 0254 | Selector control green lights | 2 | 2 | - | - | 2 |  |  |  |
| 0255 | Selector control red lights | 2 | 2 | - | - | 2 |  |  |  |
| 0260 | Tool Tag ID request | 1 | 1 | - | - | - |  |  |  |
| 0261 | Tool Tag ID subscribe | 1 | 1 | - | - | - |  |  |  |
| 0262 | Tool Tag ID | 1 | 1 | - | - | - |  |  |  |
| 0263 | Tool Tag ID acknowledge | 1 | 1 | - | - | - |  |  |  |
| 0264 | Tool Tag ID unsubscribe | 1 | 1 | - | - | - |  |  |  |
| 0270 | Controller reboot request | - | - | - | - | 1 |  |  |  |
| 0400 | Automatic/Manual mode subscribe | 1 | 1 | - | - | 1 |  |  |  |
| 0401 | Automatic/Manual mode | 1 | 1 | - | - | 1 |  |  |  |
| 0402 | Automatic/Manual mode acknowledge | 1 | 1 | - | - | 1 |  |  |  |
| 0403 | Automatic/Manual mode unsubscribe | 1 | 1 | - | - | 1 |  |  |  |
| 0410 | AutoDisable settings request | - | - | - | - | - |  |  |  |
| 0411 | AutoDisable settings reply | - | - | - | - | - |  |  |  |
| 0420 | Open protocol commands disabled subscribe | 1 | 1 | - | 1 | 1 |  |  |  |
| 0421 | Open protocol commands disabled | 1 | 1 | - | 1 | 1 |  |  |  |
| 0422 | Open protocol commands disabled acknowledge | 1 | 1 | - | 1 | 1 |  |  |  |
| 0423 | Open protocol commands disabled unsubscribe | 1 | 1 | - | 1 | 1 |  |  |  |
| 500 | Motor tuning result data subscribe | 1 | 1 | - | - | 1 |  |  |  |
| 501 | Motor tuning result data | 1 | 1 | - | - | 1 |  |  | Event 2022 has to be configured to Display in Event configuration |
| 502 | Motor tuning result data acknowledge | 1 | 1 | - | - | 1 |  |  |  |
| 503 | Motor tuning result data unsubscribe | 1 | 1 | - | - | 1 |  |  |  |
| 504 | Motor tuning request | 1 | 1 | - | - | 1 |  |  |  |
| 0701 | Tool List Upload reply | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 0900 | Trace curve data message | 1 | 1 | - | - | 1 |  |  | See chapter 16 |
| 1000 | Alarm | 1 | 1 | 1 | 1 | 1 |  |  | See chapter 11 |
| 1001 | Alarm acknowledge | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 1201 | Operation result Overall data | 1 | 1 | 1 | 1 | - |  |  | See chapter 12 |
| 1202 | Operation result object data | 1 | 1 | 1 | 1 | - |  |  | See chapter 12 |
| 1203 | Operation result data acknowledge | 1 | 1 | 1 | 1 | - |  |  | See chapter 12 |
| 1601 | Dynamic identifier message | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 1602 | Dynamic identifier data acknowledge | 1 | 1 | 1 | 1 | 1 |  |  |  |
| 2500 | Tightening Program Message Download | 2 | 2 | - | - | 2 |  |  | Only Rev 2, Rev 0-1 not supported, see chapter 14 |
| 2501 | Tightening Program Message Upload | 2 | 2 | - | - | 2 |  |  | Only Rev 2, Rev 0-1 not supported, see chapter 15 |
| 2600 | Mode ID upload request | - | - | 1 | 1 | - |  |  |  |
| 2601 | Mode ID upload reply | - | - | 1 | 1 | - |  |  |  |
| 2602 | Mode data upload request | - | - | 1 | 1 | - |  |  |  |
| 2603 | Mode data upload reply | - | - | 1 | 1 | - |  |  |  |
| 2604 | Mode selected | - | - | 1 | 1 | - |  |  |  |
| 2605 | Mode selected acknowledge | - | - | 1 | 1 | - |  |  |  |
| 2606 | Select Mode | - | - | 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 |  |  |  |

# Revision Support

Table 2 Parameters not supported

| **MID** | **MID** | **Rev** | **Parameter** |
| --- | --- | --- | --- |
| All | All |  | Cell Id |
| 13 | Parameter set data upload reply | 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 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 |
| 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 | 8 | Start final angle not supported for multistep |
| 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 |
| 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 |
| 65 | Old tightening result upload reply | 8 | Start final angle not supported for multistep |
| 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. |

# 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.

## 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 | |
| 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 |  |  |  |  |  | |  | |
| 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 OK | |
| 70 | Sync spindle 1 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[1],Last cycle NOK | |
| 71 | Sync spindle 2 OK | Yes | - | + | + |  | 31026 | | Channel tightening status[2],Last cycle OK | |
| 72 | Sync spindle 2 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[2],Last cycle NOK | |
| 73 | Sync spindle 3 OK | Yes | - | + | + |  | 31026 | | Channel tightening status[3],Last cycle OK | |
| 74 | Sync spindle 3 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[3],Last cycle NOK | |
| 75 | Sync spindle 4 OK | Yes | - | + | + |  | 31026 | | Channel tightening status[4],Last cycle OK | |
| 76 | Sync spindle 4 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[4],Last cycle NOK | |
| 77 | Sync spindle 5 OK | Yes | - | + | + |  | 31026 | | Channel tightening status[5],Last cycle OK | |
| 78 | Sync spindle 5 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[5],Last cycle NOK | |
| 79 | Sync spindle 6 OK | Yes | - | + | + |  | 31026 | | Channel tightening status[6],Last cycle OK | |
| 80 | Sync spindle 6 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[6],Last cycle NOK | |
| 81 | Sync spindle 7 OK | Yes | - | + | + |  | 31026 | | Channel tightening status[7],Last cycle OK | |
| 82 | Sync spindle 7 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[7],Last cycle NOK | |
| 83 | Sync spindle 8 OK | Yes | - | + | + |  | 31026 | | Channel tightening status[8],Last cycle OK | |
| 84 | Sync spindle 8 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[8],Last cycle NOK | |
| 85 | Sync spindle 9 OK | Yes | - | + | + |  | 31026 | | Channel tightening status[9],Last cycle OK | |
| 86 | Sync spindle 9 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[9],Last cycle NOK | |
| 87 | Sync spindle 10 OK | Yes | - | + | + |  | 31026 | | Channel tightening status[10],Last cycle OK | |
| 88 | Sync spindle 10 NOK | Yes | - | + | + |  | 31026 | | Channel tightening status[10],Last cycle NOK | |
| 89 | Carrier in station | No |  |  |  | + |  | |  | |
| 90 | Enable scanner | Yes | - | - | - | + | 49 | | Scanner enabled[[1]](#footnote-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 | |
| 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 | | Open End in open 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 |  |  |  | + |  | |  | |
| 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 disabled | Yes | + | + | + | + | 10049 | | Disable Fieldbus[[2]](#footnote-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 |  |  |  | + |  | |  | |
| 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 disabled | 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 |  |  |  | + |  | |  | |
| 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]](#footnote-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 | |
| 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 |  |  |  |  |  |  |  | |  | |

## 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 |
| 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 |
| 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 |
| 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 |  |  |  |  |  |  |  |
| 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 |  |  |  |  |  |  |  |
| 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

# 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.

# 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

## Usage of Tightening program (Pset) selection

### Power Focus 6000 and IxB

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

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

If a Source Tightening is not selected, the Power Focus 6000 and IxB 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 and 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 for selected Tightening program, MID 0014-0017, the sent ID/index from the Power Focus 6000 or IxB will always be the index for the Tightening program found in the tightening menu. This implies that the configured “Identifier number” in the selected Source Tightening will never be sent with MID 0015. In all 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.

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.

### 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.

# Usage of Tightening program (Pset) batch size

In Power Focus 6000 or IxB 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 or IxB will not check if the reset command is for the current running Tightening Program.

# 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 or IxB will send an empty list back. If trying to use MID 0038 without a Source Batch configured with numbers, the Power Focus 6000 or IxB will respond with error MID 0004, status 20 – Job cannot be set.

# 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 bouth 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 |

# 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 |

# 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.

## 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 |

## 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 |
| 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 |
| 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. |
| 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 |

## 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 000**1** |
| TriggerLost | 0x0000 0000 0000 0000 0000 0000 0000 000**2** |
| ShuntFailed | 0x0000 0000 0000 0000 0000 0000 0000 000**4** |
| ZeroOffsetFailed | 0x0000 0000 0000 0000 0000 0000 0000 000**8** |
| EngageFailed | 0x0000 0000 0000 0000 0000 0000 0000 **1**000 |
| PeakTorque\_TorqueNotMeasured | 0x0000 0000 0000 0000 0000 0000 000**1** 0000 |
| PeakTorque\_TorqueLow | 0x0000 0000 0000 0000 0000 0000 000**2** 0000 |
| PeakTorque\_TorqueHigh | 0x0000 0000 0000 0000 0000 0000 000**4** 0000 |
| ShutOffTorque\_TorqueLow | 0x0000 0000 0000 0000 0000 0000 000**8** 0000 |
| ShutOffTorque\_TorqueHigh | 0x0000 0000 0000 0000 0000 0000 00**1**0 0000 |
| TorqueRate\_TorqueRateNotMeasured | 0x0000 0000 0000 0000 0000 0000 00**2**0 0000 |
| TorqueRate\_TorqueRateLow | 0x0000 0000 0000 0000 0000 0000 00**4**0 0000 |
| TorqueRate\_TorqueRateHigh | 0x0000 0000 0000 0000 0000 0000 00**8**0 0000 |
| TorqueRate\_TorqueRateDeviationTooBig | 0x0000 0000 0000 0000 0000 0000 0**1**00 0000 |
| TorqueRate\_TorqueRateDeviationNotMeasured | 0x0000 0000 0000 0000 0000 0000 0**2**00 0000 |
| StepMonitorAngle\_AngleNotMeasured | 0x0000 0000 0000 0000 0000 0000 0**4**00 0000 |
| StepMonitorAngle\_AngleLow | 0x0000 0000 0000 0000 0000 0000 0**8**00 0000 |
| StepMonitorAngle\_AngleHigh | 0x0000 0000 0000 0000 0000 0000 **1**000 0000 |
| TorqueInAngleWindow\_TorqueNotMeasured | 0x0000 0000 0000 0000 0000 0000 **2**000 0000 |
| TorqueInAngleWindow\_TorqueLow | 0x0000 0000 0000 0000 0000 0000 **4**000 0000 |
| TorqueInAngleWindow\_TorqueHigh | 0x0000 0000 0000 0000 0000 0000 **8**000 0000 |
| PostViewAverageTorqueHigh\_TorqueNotMeasured | 0x0000 0000 0000 0000 0000 000**1** 0000 0000 |
| PostViewAverageTorqueHigh\_TorqueHigh | 0x0000 0000 0000 0000 0000 000**2** 0000 0000 |
| PostViewAverageTorqueLow\_TorqueNotMeasured | 0x0000 0000 0000 0000 0000 000**4** 0000 0000 |
| PostViewAverageTorqueLow\_TorqueLow | 0x0000 0000 0000 0000 0000 000**8** 0000 0000 |
| YieldAngle\_AngleNotMeasured | 0x0000 0000 0000 0000 0000 00**1**0 0000 0000 |
| YieldAngle\_AngleLow | 0x0000 0000 0000 0000 0000 00**2**0 0000 0000 |
| YieldAngle\_AngleHigh | 0x0000 0000 0000 0000 0000 00**4**0 0000 0000 |
| StickSlipDetection\_DropBelowTrigger | 0x0000 0000 0000 0000 0000 00**8**0 0000 0000 |
| ShutOffCurrent\_CurrentLow | 0x0000 0000 0000 0000 0000 0**1**00 0000 0000 |
| ShutOffCurrent\_CurrentHigh | 0x0000 0000 0000 0000 0000 0**2**00 0000 0000 |
| PrevailingTorque\_TorqueNotMeasured | 0x0000 0000 0000 0000 0000 0**4**00 0000 0000 |
| PrevailingTorque\_TorqueLow | 0x0000 0000 0000 0000 0000 0**8**00 0000 0000 |
| PrevailingTorque\_TorqueHigh | 0x0000 0000 0000 0000 0000 **1**000 0000 0000 |
| StepMonitorTime\_TimeNotMeasured | 0x0000 0000 0000 0000 0000 **2**000 0000 0000 |
| StepMonitorTime\_TimeLow | 0x0000 0000 0000 0000 0000 **4**000 0000 0000 |
| StepMonitorTime\_TimeHigh | 0x0000 0000 0000 0000 000**1** 0000 0000 0000 |
| StepRestrictionTorqueHigh | 0x0000 0000 0000 000**1** 0000 0000 0000 0000 |
| StepRestrictionAngleHigh | 0x0000 0000 0000 000**2** 0000 0000 0000 0000 |
| StepRestrictionTimeHigh | 0x0000 0000 0000 000**4** 0000 0000 0000 0000 |
| StepRestrictionCrossThread\_AngleLow | 0x0000 0000 0000 000**8** 0000 0000 0000 0000 |
| StepRestrictionCrossThread\_AngleHigh | 0x0000 0000 0000 00**1**0 0000 0000 0000 0000 |
| StepRestrictionTorqueGradient\_GradientLow | 0x0000 0000 0000 00**2**0 0000 0000 0000 0000 |
| StepRestrictionTorqueGradient\_GradientHigh | 0x0000 0000 0000 00**4**0 0000 0000 0000 0000 |
| StepRestrictionTorqueLow | 0x0000 0000 0000 00**8**0 0000 0000 0000 0000 |
| ExcessiveAngularRotation\_PositiveReached | 0x0000 0000 0000 0**1**00 0000 0000 0000 0000 |
| ExcessiveAngularRotation\_NegativeReached | 0x0000 0000 0000 0**2**00 0000 0000 0000 0000 |
| CurrentDeviation | 0x0000 0000 0000 0**4**00 0000 0000 0000 0000 |
| StepRestrictionTorqueInAngleWindow\_TorqueHigh | 0x0000 0000 0000 0**8**00 0000 0000 0000 0000 |
| StepRestrictionTorqueInAngleWindow\_TorqueLow | 0x0000 0000 0000 **1**000 0000 0000 0000 0000 |
| Rehit | 0x0000 0000 0000 **2**000 0000 0000 0000 0000 |
| ProgramRestrictionTorqueHigh | 0x0000 000**1** 0000 0000 0000 0000 0000 0000 |
| ProgramRestrictionTimeHigh | 0x0000 000**2** 0000 0000 0000 0000 0000 0000 |
| ProgramMonitorAngle\_AngleNotMeasured | 0x000**1** 0000 0000 0000 0000 0000 0000 0000 |
| ProgramMonitorAngle\_AngleHigh | 0x000**2** 0000 0000 0000 0000 0000 0000 0000 |
| ProgramMonitorAngle\_AngleLow | 0x000**4** 0000 0000 0000 0000 0000 0000 0000 |

# 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.

# 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.

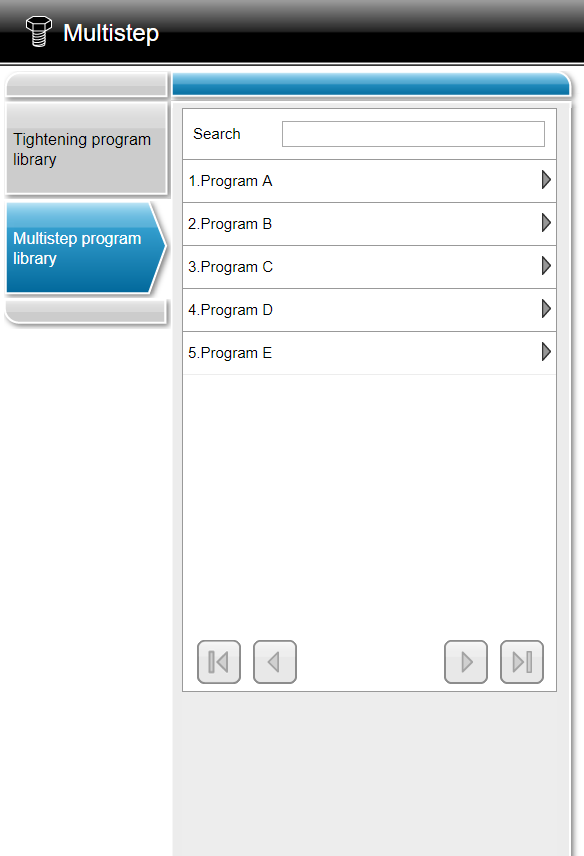


Figure 1 The numbers besides the tightening program names are called indexes.



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 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.

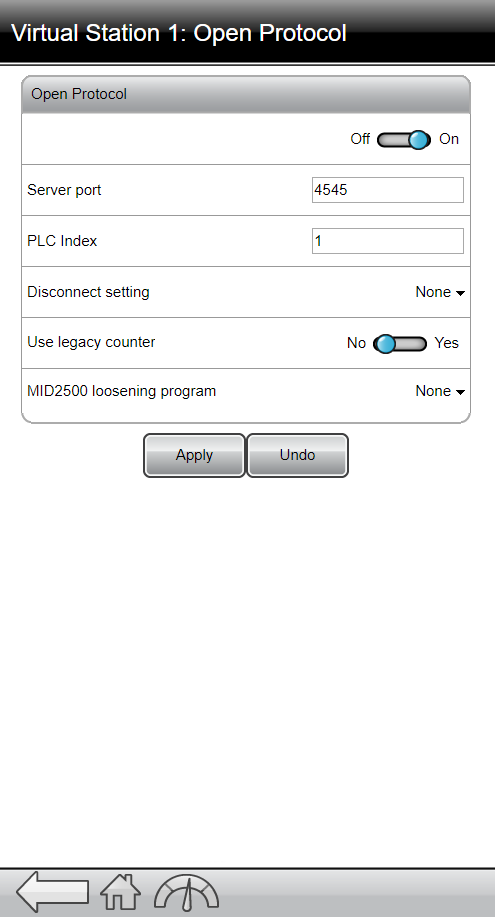


Figure 4 Screenshoot of how the menu with the MID2500 loosening program looks like

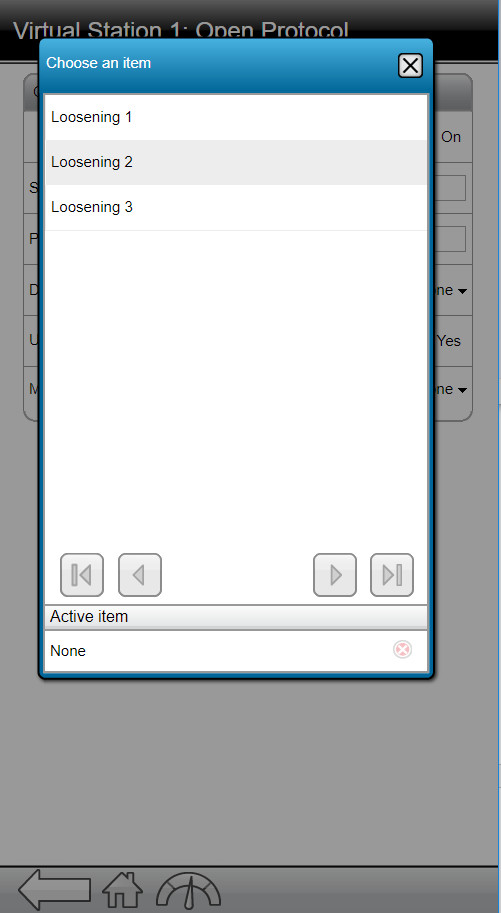


Figure 5 Screenshoot of menu with a list of available Default Loosening programs

Multistep

1.Multistep + L1

2.Multistep 2

3.Multistep 3 + L2

4.Multistep 4 + L1

5.Multistep 5 + L1

Loosening: L1

Loosening: L2

Virtual station 1

Default loosening L1

Virtual station 2

No Default loosening

Virtual station 3

Default loosening L2

OpenProtocol 1

OpenProtocol 2

OpenProtocol 3

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 ispart 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… |

201001010000040100000000008001601{"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":{"value":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,"nextInternalNumber":2,"stepPath":1,"type":10},{"internalNumber":2,"stepNumber":1,"nextInternalNumber":10,"stepPath":1,"type":13,"stepTightenToAngle":{"motorControlSpeedRamp":{"speedTarget":60,"acceleration":500,"speedRampType":1},"brake":true,"angleTarget":80,"speedRampChanges":[],"brakeConfig":{"brakeType":1,"configErgoStop":{"isBrakeRamptimeAdaptive":true,"rampTime":200}}}},{"internalNumber":10,"stepNumber":9,"nextInternalNumber":10,"stepPath":1,"type":11}],"syncPoints":[],"programRestrictions":[{"internalNumber":7,"type":2,"timeHigh":{"timeLimitHigh":30}},{"internalNumber":8,"type":1,"torqueHigh":{"torqueLimitHigh":10}}],"stepMonitors":[{"internalNumber":3,"startInternalStepNumber":2,"type":2,"peakTorque":{}},{"internalNumber":4,"startInternalStepNumber":2,"type":6,"angle":{"stopCondition":2}}],"stepRestrictions":[{"internalNumber":5,"startInternalStepNumber":2,"type":3,"timeHigh":{"timeLimitHigh":5}},{"internalNumber":6,"startInternalStepNumber":2,"type":1,"torqueHigh":{"torqueLimitHigh":10}}],"programMonitors":[{"internalNumber":9,"type":1,"angle":{"enabled":false,"stopCondition":2}}]}

# 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.



## Request for MID 2501 Extra data

The only Node Type supported is 201.

## 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). | | | |

# 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)

## 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.

## 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’.

# Multiple identifiers

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

## 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.

## 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.

## 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.

# References

|  |  |  |
| --- | --- | --- |
| Ref. | Doc id. | Doc. title |
| Ref. 1 | 4420059323 | OpenProtocol\_Specification\_R\_2\_13\_0\_9836 4415 01 |
|  |  |  |

1. Internal signal [↑](#footnote-ref-1)
2. Tracking input signal [↑](#footnote-ref-2)
3. Internal signal [↑](#footnote-ref-3)