Programming Manual
P2565PM-EN
REV C | 2023-09

Open Protocol & FEP

Specification

Disclaimer

Apex Tool Group reserves the right to modify, supplement, or improve this document or the product without prior notice.

Trademark

Cleco® is a registered trademark of Apex Brands, Inc.

Apex Tool Group

670 Industrial Drive
Lexington, SC 29072
USA

Manufacturer
Apex Tool Group GmbH
Industriestraße 1
73463 Westhausen
Germany

Content

1 About this Document

This document is intended for qualified employees responsible for installation and maintenance (administrators, software developer, maintenance technician, service).
It contains information about the transmission protocols Open Protocol and FEP

The original language of this document is English.

1.1 Other Documents

1.2 Symbols in the Text

italic	Menu options (e.g., Diagnostics) input fields, check boxes, radio buttons or dropdown menus.
>	Indicates selection of a menu option from a menu, e.g., *File* > *Print*.
<...>	Specifies switches, pushbuttons or the keys of an external keyboard, e.g., <F5>.
`Courier`	Indicates Filenames and paths, e.g., `setup.exe`.
•	Indicates lists, level 1.
–	Indicates lists, level 2.
a) b)	Indicates options.
➢	Indicates results.
1. (...) 2. (...)	Indicates action steps.
►	Indicates single action steps.
Red	Difference from the original specification.
~~Crossed-out~~	Invalid entry from the original specification.

2 Messages

2.1 Communication Messages

2.1.1 Communication Start (MID 0001)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-1: Communication start (MID 0001)

This message enables the command link. The controller will not respond to any other commands before this. The controller answers with a command error “Already connected” if the link has already been enabled.

Possible answers:

- Communication start acknowledge (MID 0002)
- Command Error (MID 0004): “Client already connected”

Sent by: Integrator

Example

```
00000000   30 30 32 30 30 30 30 31 30 30 33 31 30 30 30 30   0020000100310000
00000010   20 20 20 20 00
```

2.1.2 Communication Start Acknowledge (MID 0002)

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-2: Communication start acknowledge (MID 0002)

This message is sent by the controller when it accepts the communication. The message provides some basic information about the controller (Cell ID, channel number, controller name).

Possible answer: None
Sent by: Controller

Example

```
00000000   30 31 32 35 30 30 30 32 30 30 33 30 30 30 30 30   0125000200300000
00000010   30 30 30 30 30 31 30 30 30 31 30 32 30 31 30 33   0000010001020103
00000020   4F 70 65 6E 50 72 6F 74 6F 63 6F 6C 20 53 65 72   OpenProtocol Ser
00000030   76 65 72 20 53 69 6D 75 6C 30 34 63 70 74 30 35   ver Simul04cpt05
00000040   4F 50 20 56 65 72 73 69 6F 6E 20 32 2E 35 20 20   OP Version 2.5
00000050   20 20 20 30 36 31 2E 30 2E 37 39 37 32 2E 31 37      061.0.7972.17
00000060   37 38 30 20 20 20 20 20 30 37 54 6F 6F 6C 20 53   780     07Tool S
00000070   57 20 56 65 72 73 69 6F 6E 20 31 2E 34 00         W Version 1.4.
```

Revision 1

Parameter	Bytes	Comment
Cell ID	21 – 22	01
	23 – 26	The cell number (cluster number) is four byte long and is specified by four ASCII digits (0 – 9). Range: 0000 – 9999
Channel ID	27 – 28	02
	29 – 30	The channel Id is two byte long and is specified by two ASCII digits (0 – 9). Range: 00 – 20

Controller Name	31 – 32	03
	33 – 57	The controller name is 25 byte long and is specified by 25 ASCII characters taken between 0x20 and 0x7F Hex. (X25).

Tab. 2-3: Data field revision 1 (MID 0002)

Additions for revision 2

Parameter	Bytes	ID/Comment
Supplier code	58 – 59	04
	60 – 62	ATG (supplier code for Apex Tool Group) specified by three ASCII characters.

Tab. 2-4: Data field revision 2 (MID 0002)

Additions for revision 3

Parameter	Bytes	Comment
Open Protocol version	63 – 64	05
	65 – 83	Open Protocol version is specified by 19 ASCII characters.
Controller software version	84 – 85	06
	86 – 104	The software version is specified by 19 ASCII characters.
Tool software version	105 – 106	07
	107 – 125	~~The software version is specified by19 ASCII characters.~~ Not Supported (default: All Spaces)

Tab. 2-5: Data field revision 3 (MID 0002)

2.1.3 Communication Stop (MID 0003)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-6: Communication stop (MID 0003)

This message disables the command link. When the controller receives the command, it will only respond to the *Communication start MID 0001* command.

Possible answer: Command accepted (MID 0005)
Sent by: Integrator

2.2 Request Answer

2.2.1 Command Error (MID 0004)

Header	Data Field	Message End
20 bytes	6 bytes	NUL (ASCII 0x0)

Tab. 2-7: Command error (MID 0004)

This message is used by the controller when a request for one reason could not have been performed. The data field contains the MID of the failed message request and an error code.

Possible answer: None
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
MID number	21 – 24	Message ID of the request rejected.
Error	25 – 26	Error code (00 – 99) for the sent message, see table below.

Tab. 2-8: Data field revision 1 (MID 0004)

Error	Description
00	No Error.
01	Invalid data.
02	Application number not present.
03	Application cannot be set.
04	Application not running.
06	VIN upload subscription already exists.
07	VIN upload subscription does not exist.
08	VIN input source not granted.
09	Last tightening result subscription already exists.
10	Last tightening result subscription does not exist.
11	Alarm subscription already exists.
12	Alarm subscription does not exist.
13	Application selection subscription already exists.
14	Application selection subscription does not exist.
15	Tightening Id requested not found.
16	Connection rejected protocol busy.
17	Linking Group number not present.
18	Linking Group info subscription already exists.
19	Linking Group info subscription does not exist.
20	Linking Group cannot be set.
21	Linking Group not running.
22	Not possible to execute dynamic Linking Group request.
23	Linking Group batch decrement failed.
24	Not possible to create Pset.
25	Programming control not granted.
26	Wrong tool type to Pset download connected.

Error	Description
27	Tool is inaccessible.
28	Job abortion is in progress.
29	Tool does not exist.
30	Controller is not a sync Master.
31	Multispindle status subscription already exists.
32	Multispindle status subscription does not exist.
33	Multispindle result subscription already exists.
34	Multispindle result subscription does not exist.
35	Other master client already connected.
36	Lock type not supported.
40	Linking Group line control info subscription already exists.
41	Linking Group line control info subscription does not exist.
42	Identifier input source not granted.
43	Multiple identifiers work order subscription already exists.
44	Multiple identifiers work order subscription does not exist.
50	Status “external monitored inputs” subscription already exists.
51	Status “external monitored inputs” subscription does not exist.
52	IO device not connected.
53	Faulty IO device number.
54	Tool Tag ID unknown.
55	Tool Tag ID subscription already exists.
56	Tool Tag ID subscription does not exist.
57	Tool Motor tuning failed.
58	No alarm present
59	Tool currently in use.
60	No histogram available.
61	Pairing failed.
62	Pairing denied.
63	Pairing or Pairing abortion attempt on wrong tool type.
64	Pairing abortion denied.
65	Pairing abortion failed.
66	Pairing disconnection failed.
67	Pairing in progress or already done.
68	Pairing denied. No Program Control.
69	Unsupported extra data revision.
70	Calibration failed.
71	Subscription already exists.
72	Subscription does not exist.
73	Subscribed MID unsupported, -answer if trying to subscribe on a non-existing MID.
74	Subscribed MID Revision unsupported, -answer if trying to subscribe on unsupported MID Revision.

Error	Description
75	Requested MID unsupported -answer if trying to request on a non-existing MID.
76	Requested MID Revision unsupported -response when trying to request unsupported MID Revision.
77	Requested on specific data not supported -response when trying to request data that is not supported.
78	Subscription on specific data not supported -answer if trying to subscribe for unsupported data.
79	Calibration failed.
80	Audi emergency status subscription exists.
81	Audi emergency status subscription does not exist.
82	Automatic/Manual mode subscribe already exist.
83	Automatic/Manual mode subscribe does not exist.
84	The relay function subscription already exists.
85	The relay function subscription does not exist.
86	The selector socket info subscription already exists.
87	The selector socket info subscription does not exist.
88	The dig in info subscription already exist.
89	The dig in info subscription does not exist.
90	Lock at batch done subscription already exist.
91	Lock at batch done subscription does not exist.
92	Open protocol commands disabled.
93	Open protocol commands disabled subscription already exists.
94	Open protocol commands disabled subscription does not exist.
95	Reject request, Power MACS is in manual mode.
96	Client already connected.
97	MID revision unsupported.
98	Controller internal request timeout.
99	Unknown MID.

Tab. 2-9: Error codes

2.2.2 Command Accepted (MID 0005)

Header	Data Field	Message End
20 bytes	4 bytes	NUL (ASCII 0x0)

Tab. 2-10: Command accepted (MID 0005)

With this message the controller confirms that the last request sent by the integrator was accepted. The data field contains the MID of the request accepted.

Possible answer: None
Sent by: Controller

Example

```
00000000   30 30 32 34 30 30 30 35 30 30 31 30 30 30 30 30   0024000500100000
00000010   30 30 30 30 30 30 30 38 00                        00000008.
```

Revision 1

Parameter	Bytes	Comment
MID number accepted	21 – 24	The requested MID number as the response of MID 0008 and MID 0009.

Tab. 2-11: Data field revision 1 (MID 0005)

2.3 Application Messages

2.3.1 Application Data Message Subscription (MID 0008)

Header	Data Field	Message End
20 bytes	See revision	NUL (ASCII 0x0)

Tab. 2-12: Application number upload request (MID 0008)

This message starts a subscription of data. This message is used for ALL subscription handling.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "MID revision unsupported" or "Invalid data"

Sent by: Integrator

Example

```
00000000   30 30 36 37 30 30 30 38 30 30 31 31 30 30 30 30   0067000800110000
00000010   20 20 20 20 30 39 30 30 30 30 31 33 38 30 20 20       0900001380
00000020   20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
00000030   20 30 30 30 30 30 30 30 30 30 30 32 30 30 31    000000000002001
00000040   30 30 32 00                                     002.
```

Revision 1

Parameter	Bytes	Comment
Subscription MID	21 – 24	The data MID ID to be unsubscribed for. Can be used for ALL subscription handling.
Wanted revision	25 – 27	The revision of the MID to subscribe for.
Extra data length	28 – 29	The length of the extra data field.
Extra data	300 – XX[1]	The “Extra data” definition can be found where the MID to unsubscribe is defined.

Tab. 2-13: Data field revision 1 (MID 0008)

2.3.2 Application Data Message Unsubscribe (MID 0009)

Header	Data Field	Message End
20 bytes	See revision	NUL (ASCII 0x0)

Tab. 2-14: Application data message unsubscribe (MID 0009)

This message unsubscribes the data. This message is used for ALL unsubscribe.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "MID revision unsupported" or "Invalid data"

Sent by: Integrator

Example

```
00000000   30 30 33 34 30 30 30 39 30 30 31 31 30 30 30 30   0034000900110000
00000010   20 20 20 20 30 39 30 30 30 30 31 30 35 30 31 39       090000105019
00000020   39 39 00                                        99.
```

[1] Value of “Extra data length”

Revision 1

Parameter	Bytes	Comment
Unsubscription MID	21 – 24	The data MID ID to be unsubscribed for. Can be used for ALL subscription handling.
Extra data revision	25 – 27	The revision of the MIDs Extra data that is subscribed for. This is needed so that the controller can determine the revision of the extra data in the unsubscription.
Extra data length	28 – 29	The length of the extra data field.
Extra data	300 – XX[1]	The “Extra data” definition can be found where the MID to unsubscribe is defined.

Tab. 2-15: Data field revision 1 (MID 0009)

2.3.3 Application Number Upload Request (MID 0010)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-16: Application number upload request (MID 0010)

This message requests all valid Application numbers of the controller. The result of this command will be the transmission of all the valid Application number of the controller (*Application numbers upload reply MID 0011*).

Possible answer: Application numbers upload reply (MID 0011)
Sent by: Integrator

Example

```
00000000   30 30 32 30 30 30 31 30 30 30 31 31 30 30 30 30   0020001000110000
00000010   20 20 20 20 00                                     .
```

2.3.4 Application Numbers Upload Reply (MID 0011)

Header	Data Field	Message End
20 bytes	See revision	NUL (ASCII 0x0)

Tab. 2-17: Application numbers upload reply (MID 0011)

This message transmits all valid Application numbers of the controller. The data field contains the number of valid Application currently present in the controller, and the number of each Application present.

Possible answer: None
Sent by: Controller

Example

```
00000000   30 30 35 36 30 30 31 31 30 30 30 30 30 30 30 30   0056001100000000
00000010   30 30 30 30 30 31 31 30 30 31 30 30 32 30 30 33   0000011001002003
00000020   30 30 34 30 30 35 30 30 36 30 30 37 30 33 38 30   0040050060070380
00000030   35 35 30 39 39 35 33 36 00                        55099536.
```

Revision 1

Parameter	Bytes	Comment
Number of valid Application	21 – 23	Each Application number is three byte long and is specified by three ASCII digits. Range: 000 – 999

[1] Value of “Extra data length”

Parameter	Bytes	Comment
The ID of each parameter set	24 – (3 × Number of valid Applications)	Three ASCII digits for each parameter set.

Tab. 2-18: Data field revision 1 (MID 0011)

2.3.5 Application Data Upload Request (MID 0012)

Header	Data Field	Message End
20 bytes	3 bytes	NUL (ASCII 0x0)

Tab. 2-19: Application number upload request (MID 0012)

This message sends a request to upload an Application data from the controller.

Possible answers:

- Application data upload reply (MID 0013)
- Command error (MID 0004): “Application number not present”

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Application Number	21 – 23	Application number is three byte long and is specified by three ASCII digits (0 – 9).

Tab. 2-20: Data field revision 1 (MID 0012)

2.3.6 Application Data Upload Reply (MID 0013)

Header	Data Field	Message End
20 bytes	84 bytes	NUL (ASCII 0x0)

Tab. 2-21: Application data upload reply (MID 0013)

This message uploads the Application data reply.

Possible answer: None
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
Application id	21 – 22	01
	23 – 25	Range: 0 – 999
Application name	26 – 27	02
	28 – 52	Fill with SPC if Application Name size < 25.
Rotation direction	53 – 54	03
	55	1 = CW 2 = CCW
Batch size	56 – 57	04
	58 – 59	Range: 0 – 99
Torque min	60 – 61	05
	62 – 67	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated).

Parameter	Bytes	Comment
Torque max	68 – 70	06
	71 – 76	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated.
Torque final target	77 – 78	07
	79 – 84	The torque final target is multiplied by 100 and sent as an integer (2 decimals truncated).
Angle min	85 – 86	08
	87 – 91	The angle min value has a specified range between 0 and 99999.
Angle max	92 – 93	09
	94 – 98	The angle max value is five byte long and is specified by five ASCII digits (0 – 9).
Final Angle Target	99 – 100	10
	101 – 105	The target angle has a specified range between 0 and 99999. The target angle is specified in degree.

Tab. 2-22: Data field revision 1 (MID 0013)

2.3.7 Application Selected Subscribe (MID 0014)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-23: Application selected subscribe (MID 0014)

This message sends a subscription for the Application selection. A message is sent to the integrator when a new Application is selected (*Application selected MID 0015*).

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): “Application selection subscription already exists”

Sent by: Integrator

2.3.8 Application Selected (MID 0015)

Header	Data Field	Message End
20 bytes	22 bytes	NUL (ASCII 0x0)

Tab. 2-24: Application selected (MID 0015)

This message selects a new Application in the controller. The message contains the number of the last Application selected as well as the date/time of the last change done in the Application settings.

Possible answer: New Application selected acknowledge (MID 0016)
Sent by: Controller

Revision 1

Parameter	Bytes	ID/Comment
Application Number	21 – 23	Three ASCII digits. Range: 000 – 999
Date of last change in parameter set setting	24 – 42	Date of any settings change to controller (one date for all apps): YYYY-MM-DD:HH:MM:SS

Tab. 2-25: Data field revision 1 (MID 0015)

2.3.9 Application Selected Acknowledge (MID 0016)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-26: Application selected acknowledge (MID 0016)

This message acknowledges a new Application selected.

Possible answer: None
Sent by: Integrator

2.3.10 Application Selected Unsubscribe (MID 0017)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-27: Application selected unsubscribe (MID 0017)

This message resets the subscription for the Application selection.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Application selection subscription does not exist"

Sent by: Integrator

2.3.11 Select Application (MID 0018)

Header	Data Field	Message End
20 bytes	3 bytes	NUL (ASCII 0x0)

Tab. 2-28: Select Application (MID 0018)

This message selects an application.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Application cannot be set"

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Application Number	21 – 23	Application number represented by 3 ASCII digits. Range: 001 – 999 App 0 is not possible. If PSET 0 is selected, command error (MID 0004): "Application cannot be set" is displayed.

Tab. 2-29: Data field revision 1 (MID 0018)

2.3.12 Set Application Batch Size (MID 0019)

Header	Data Field	Message End
20 bytes	5 bytes	NUL (ASCII 0x0)

Tab. 2-30: Set Application batch size (MID 0019)

This message gives the possibility to set the batch size of an Application in run time. This will set the maximum or required number of rundowns for the batch.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): “Tool currently in use” or “Invalid data”

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Application Number	21 – 23	Application number represented by 3 ASCII digits. Range: 000 – 999
Batch size	24 – 25	Size of the Application batch represented by 2 ASCII digits. Range: 00 – 99

Tab. 2-31: Data field revision 1 (MID 0019)

2.3.13 Reset Application Batch Size (MID 0020)

Header	Data Field	Message End
20 bytes	3 bytes	NUL (ASCII 0x0)

Tab. 2-32: Reset Application batch size (MID 0020)

This message gives the possibility to reset the batch accumulator of the running Application in run time.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): “Tool currently in use” or “Invalid data”

Sent by: Integrator

Revision 1

Parameter	Bytes	ID/Comment
Application Number	21 – 23	Application number represented by 3 ASCII digits. Range: 000 – 999

Tab. 2-33: Data field revision 1 (MID 0020)

2.3.14 Lock at Batch Done Subscribe (MID 0021)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-34: Lock at batch done subscribe (MID 0021)

This message sends a subscription for the “lock at batch done”. A message (*Lock at batch done upload MID 0022*) is sent to the station computer each time the “lock at batch done” status is changed. An acceptance message (*Command accepted MID 0005*) is sent as an immediate response to the subscribe message.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): "Lock at batch done subscription already exists”

Sent by: Integrator

2.3.15 Lock at Batch Done Upload (MID 0022)

Header	Data Field	Message End
20 bytes	1 byte	NUL (ASCII 0x0)

Tab. 2-35: Lock at batch done upload (MID 0022)

This message uploads the status of the “Lock at batch done”.

Possible answer: Lock at batch done upload acknowledge (MID 0023)
Sent by: Controller

Revision 1

Parameter	Byte	Comment
Relay status	21	The data field consists of one ASCII digit. 0 = “Lock at batch done” is false 1 = “Lock at batch done” is true

Tab. 2-36: Data field revision 1 (MID 0022)

2.3.16 Lock at Batch Done Upload Acknowledge (MID 0023)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-37: Lock at batch done upload acknowledge (MID 0023)

This message acknowledges the message *Lock at batch done upload (MID 0022)*.

Possible answers: None
Sent by: Integrator

2.3.17 Lock at Batch Done Unsubscribe (MID 0024)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-38: Lock at batch done unsubscribe (MID 0024)

This message unsubscribes the “lock at batch done”.

Possible answers:

- Command accepted (MID 0005)
- Command Error (MID 0004): “Lock at batch done subscription does NOT exist”

Sent by: Integrator

2.4 Linking Group Messages

2.4.1 Linking Group Numbers Upload Request (MID 0030)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-39: Linking Group numbers upload request (MID 0030)

This message requests all valid Linking Group numbers of the Tool. The result of this command will be the transmission of all the valid Linking Group numbers of the Tool (*Linking Group numbers upload reply MID 0031*).

Possible answer: Linking Group numbers upload reply (MID 0031)
Sent by: Integrator

2.4.2 Linking Group Numbers Upload Reply (MID 0031)

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-40: Linking Group numbers upload reply (MID 0031)

This message sends all valid Linking Group number of the controller.

Possible answer: None
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
Number of Linking Groups	21 – 22	Two ASCII digits. Range: 00 – 99
Linking Group ID of each Linking Group present in the controller	23 – (23 + number of valid Linking Group × 2 bytes)	Two ASCII digits for each Linking Group. Range: 00 – 99

Tab. 2-41: Data field revision 1 (MID 0031)

Revision 2

Parameter	Bytes	Comment
Number of Linking Groups	21 – 24	Four ASCII digits. Range: 0000 – 9999
Linking Group ID of each Linking Group present in the controller	25 – (24 + number of valid Linking Group × 4 bytes)	Four ASCII digits for each Linking Group. Range: 0000 – 9999

Tab. 2-42: Data field revision 2 (MID 0031)

2.4.3 Linking Group Data Upload Request (MID 0032)

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-43: Linking Group data upload request (MID 0032)

This message sends a request to upload the data from a specific Linking Group from the tool.

Possible answers:

- Linking Group data upload (MID 0033)
- Command error (MID 0004): “Linking Group Number not present”

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Linking Group Number	21 – 22	Linking Group Number is specified by two ASCII digits (0 – 9).

Tab. 2-44: Data field revision 1 (MID 0032)

Revision 2

Parameter	Bytes	Comment
Linking Group Number	21 – 24	Linking Group Number is specified by four ASCII digits (0 – 9).

Tab. 2-45: Data field revision 2 (MID 0032)

2.4.4 Linking Group Data Upload Reply (MID 0033)

Header	Data Field	Message End
20 bytes	71 + no of Applications in the Linking Group x 12 bytes.	NUL (ASCII 0x0)

Tab. 2-46: Linking Group data upload reply (MID 0033)

This message is sent as a reply to the *Linking Group data upload request (MID 0032)*.

Possible answers: None
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
Linking Group ID	21 – 22	01
	23 – 24	The Linking Group ID is specified by two ASCII characters. Range: 00 – 99
Linking Group name	25 – 26	02
	27 – 51	25 ASCII characters.
Forced order	52 – 53	03
	54	~~One ASCII character: 0 = free order, 1 = forced order, 2 = free and forced~~ Not Supported (default: 1)
Max time for first tightening	55 – 56	04
	57 – 60	~~Four ASCII digits, range 0000 – 9999, 0000 = not used~~ Not Supported (default: 0)
Max time to complete Linking Group	61 – 62	05
	63 – 67	~~Five ASCII digits, range 00000 – 99999, 00000 = not used~~ Not Supported (default: 0)
	68 – 69	06

Parameter	Bytes	Comment
Linking Group batch mode/ batch count type	70	~~The Linking Group batch mode is the way to count the tightening in a Linking Group; only the OK or both OK and NOK. One ASCII character.~~ ~~0 = only the OK tightenings are counted~~ ~~1 = both the OK and NOK tightenings are counted~~ Not Supported (default: 0)
Lock at Linking Group done	71 – 72	07
	73	~~One ASCII character: 0 = No, 1 = Yes~~ Not Supported (default: 0)
Use line control	74 – 75	08
	76	~~One ASCII character: 0=No, 1=Yes~~ Not Supported (default: 0)
Repeat Linking Group	77 – 78	09
	79	~~One ASCII character: 0=No, 1=Yes~~ Not Supported (default: 0)
Tool loosening	80 – 81	10
	82	~~Tool loosening. One ASCII character. 0 = Enable, 1 = Disable, 2 = Enable only on NOK tightening~~ Not Supported (default: 0)
Reserved	83 – 84	11
	85	~~Reserved for Linking Group repair. One ASCII character.~~ Not Supported (default: 0)
Number of Applica-tions	86 – 87	12
	88 – 89	The number of Applications in the Linking Group list defined by two ASCII characters. Range: 00 – 99
Linking Group list	90 – 91	13
	92 – N × 12	A list of Applications (N = value from parameter “Number of Applica-tions”, max 99). Each Application is defined by a number of parameters separated by “:” and terminated by “;” (12 bytes) according to: [Channel-ID]:[Type-ID]:[AutoValue]:[BatchSize]; Channel-ID = two ASCII characters, range 00 – 99 Type ID = Application ID or Multistage ID, three ASCII characters, range 000 – 999 ~~Auto Value = One ASCII character, 1 or 0, 1 = for Auto Next~~ Not Supported (default: 0) ~~Change, BatchSize = Two ASCII characters, range 00 – 99~~ Not Supported (default: 0) Example: 15:011:0:22;

Tab. 2-47: Data field revision 1 (MID 0033)

Revision 2

Parameter	Bytes	Comment
Linking Group ID	21 – 22	01
	23 – 26	The Linking Group ID is specified by two ASCII characters. Range: 0000 – 9999
Linking Group name	27 – 28	02
	29 – 53	25 ASCII characters.
Forced order	54 – 55	03

Parameter	Bytes	Comment
	56	~~One ASCII character:~~ ~~0=free order, 1=forced order, 2=free and forced~~ Not Supported (default: 1)
Max time for first tightening	57 – 58	04
	59 – 62	~~Four ASCII digits, range 0000-9999, 0000=not used.~~ Not Supported (default: 0)
Max time to complete Linking Group	63 – 64	05
	65 – 69	~~Five ASCII digits, range 00000-99999, 00000=not used.~~ Not Supported (default: 0)
Linking Group batch mode/ batch count type	70 – 71	06
	72	~~The Linking Group batch mode is the way to count the tightening in a Linking Group; only the OK or both OK and NOK. One ASCII character.~~ ~~0=only the OK tightenings are counted~~ ~~1=both the OK and NOK tightenings are counted~~ Not Supported (default: 0)
Lock at Linking Group done	73 – 74	07
	75	~~One ASCII character: 0=No, 1=Yes~~ Not Supported (default: 0)
Use line control	76 – 77	08
	78	~~One ASCII character: 0=No, 1=Yes~~ Not Supported (default: 0)
Repeat Linking Group	79 – 80	09
	81	~~One ASCII character: 0=No, 1=Yes~~ Not Supported (default: 0)
Tool loosening	82 – 83	10
	84	~~Tool loosening. One ASCII character.~~ ~~0=Enable, 1=Disable, 2=Enable only on NOK tightening~~ Not Supported (default: 0)
Reserved	85 – 86	11
	87	~~Reserved for Linking Group repair. One ASCII character. 0=E, 1=G~~ Not Supported (default: 0)
Number of Applications	88 – 89	12
	90 – 91	The number of Applications in the Linking Group list defined by two ASCII characters. Range: 00 – 99
Linking Group list	92 – 93	13
	94 – N × 12	A list of Applications (N = value from parameter “Number of Applications”, max 99). Each Application is defined by a number of parameters separated by “:” and terminated by “;” (12 bytes) according to: [Channel-ID]:[Type-ID]:[AutoValue]:[BatchSize] Channel-ID = two ASCII characters, range 00 – 99 Type ID = Application ID or Multistage ID, three ASCII characters, range 000 – 999 ~~Auto Value = One ASCII character, 1 or 0, 1=for Auto Next~~ Not Supported (default: 0) ~~Change, BatchSize = Two ASCII characters, range 00-99~~ Not Supported (default: 0) Example: 15:011:0:22;

Tab. 2-48: Data field revision 2 (MID 0033)

2.4.5 Linking Group Info/Selected Subscribe (MID 0034)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-49: Linking Group info/selected subscribe (MID 0034)

This message subscribes the Linking Group info. *Linking Group info (MID 0035)* is sent to the integrator when a new Linking Group is selected and after each tightening performed during the Linking Group.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): "Linking Group info subscription already exists"

Sent by: Integrator

2.4.6 Linking Group Selected Info (MID 0035)

Linking Group info Open Protocol implementation

Header	Data Field	Message End
20 bytes	42 bytes	NUL (ASCII 0x0)

Tab. 2-50: Linking Group selected info (MID 0035)

This message sends information of selected Linking Group on the controller.

Possible answer: Linking Group Info Acknowledge (MID 0036)
Sent by: Controller

Example:

```
00000000   30 30 36 33 30 30 33 35 30 30 31 31 20 20 20 20   006300350011
00000010   20 20 20 20 30 31 30 32 30 32 30 30 33 31 30 34   010202003104
00000020   30 30 30 32 30 35 30 30 30 30 30 36 32 30 32 31   0002050000062021
00000030   2D 31 30 2D 31 35 3A 31 31 3A 35 38 3A 30 31 00   -10-15:11:58:01
```

Revision 1

Parameter	Bytes	Comment
Linking Group number	21 – 22	01
	23 – 24	The Linking Group ID is specified by two ASCII characters. Range: 00 – 99
Linking Group status	25 – 26	02
	27	The Linking Group batch status is specified by one ASCII character. 0 = Linking Group not completed 1 = Linking Group OK 2 = Linking Group NOK 3 = Linking Group aborted
Linking Group batch mode	28 – 29	03
	30	~~The Linking Group batch mode is the way to count the tightening in a Linking Group only the OK or both OK and NOK. One ASCII character.~~ ~~0 = only the OK tightenings are counted~~ ~~1 = both the OK and NOK tightenings are counted~~ Always set to '1 = both the OK and NOK tightenings are counted'
Linking Group batch size	31 – 32	04
	33 – 36	This parameter gives the total number of tightening in the Linking Group. The Linking Group batch size is four bytes long. Four ASCII characters. Range: 0000 – 9999

Parameter	Bytes	Comment
Linking Group batch counter	37 – 38	05
	39 – 42	This parameter gives the current value of the Linking Group batch counter. The Linking Group is completed when the Linking Group batch counter is equal to the Linking Group batch size. The Linking Group batch counter is four bytes long. Four ASCII characters. Range: 0000 – 9999
Time stamp	43 – 44	06
	45 – 63	Time stamp for the Linking Group info. The time stamp is 19 bytes long and is specified by 19 ASCII characters: YYYY-MM-DD:HH:MM:SS.

Tab. 2-51: Data field revision 1 (MID 0035)

Revision 2

Parameter	Bytes	Comment
Linking Group number	21 – 22	01
	23 – 26	The Linking Group ID is specified by two ASCII characters. Range: 0000 – 9999
Linking Group status	27 – 28	02
	29	The Linking Group batch status is specified by one ASCII character. 0 = Linking Group not completed 1 = Linking Group OK 2 = Linking Group NOK
Linking Group batch mode	30 – 31	03
	32	The Linking Group batch mode is the way to count the tightening in a Linking Group only the OK or both OK and NOK. One ASCII character. 0 = Only the OK tightenings are counted 1 = Both the OK and NOK tightenings are counted
Linking Group batch size	33 – 34	04
	35 – 38	~~This parameter gives the total number of tightening in the Linking Group. The Linking Group batch size is four bytes long. Four ASCII characters, range 0000-9999.~~ Always set to '1= both the OK and NOK tightenings are counted'
Linking Group batch counter	39 – 40	05
	41 – 44	This parameter gives the current value of the Linking Group batch counter. The Linking Group is completed when the Linking Group batch counter is equal to the Linking Group batch size. The Linking Group batch counter is four bytes long. Four ASCII characters. Range: 0000 – 9999
Time stamp	45 – 46	06
	47 – 65	Time stamp for the Linking Group info. The time stamp is 19 bytes long and is specified by 19 ASCII characters YYYY-MM-DD:HH:MM:SS.

Tab. 2-52: Data field revision 2 (MID 0035)

Linking Group selected FEP implementation

Header	Data Field	Message End
20 bytes	2 bytes	NUL (ASCII 0x0)

Tab. 2-53: Linking Group Selected FEP implementation (MID 0035)

A new Linking Group is selected in the controller.

Possible answer: Linking Group selected Acknowledge (MID 0036)
Sent by: Integrator

Parameter	Bytes	ID/Comment
Linking Group Number	21 – 22	The Linking Group ID is specified by two ASCII characters. Range: 0000 – 9999

Tab. 2-54: Data field revision 1 FEP (MID 0035)

2.4.7 Linking Group Info/Selected Acknowledge (MID 0036)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-55: Linking Group info/selected acknowledge (MID 0036)

This message acknowledges a Linking Group info message.

Possible answer: None
Sent by: Integrator

2.4.8 Linking Group Info/Selected Unsubscribe (MID 0037)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-56: Linking Group info/selected unsubscribe (MID 0037)

This message resets the subscription for the Linking Group info.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Linking Group info subscription does not exist"

Sent by: Integrator

2.4.9 Select Linking Group (MID 0038)

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-57: Select Linking Group (MID 0038)

This message selects the Linking Group.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): “Linking Group cannot be set” or “Invalid data”

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Linking Group Number	21 – 22	Linking Group Number is two bytes long and is specified by two Ascii digits (0 – 9).

Tab. 2-58: Data field revision 1 (MID 0038)

Revision 2

Parameter	Bytes	Comment
Linking Group Number	21 – 24	Linking Group Number is four bytes long and is specified by four Ascii digits (0 – 9).

Tab. 2-59: Data field revision 2 (MID 0038)

2.4.10 Linking Group Restart (MID 0039)

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-60: Linking Group restart (MID 0039)

This message restarts the Linking Group.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): “Linking Group not running” or “Invalid data”

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Linking Group Number	21 – 22	Linking Group Number is two bytes long and is specified by two Ascii digits (0 – 9).

Tab. 2-61: Data field revision 1 (MID 0039)

Revision 2

Parameter	Bytes	Comment
Linking Group Number	21 – 24	Linking Group Number is four bytes long and is specified by four Ascii digits (0 – 9).

Tab. 2-62: Data field revision 2 (MID 0039)

2.5 Tool Messages

2.5.1 Tool data upload request (MID 0040)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-63: Tool data upload request (MID 0040)

This message requests some tool data and then transmits it (*Tool data upload reply MID 0041*).

Possible answer: Tool data upload reply (MID 0041)
Sent by: Integrator

Example

```
00000000   30 30 32 30 30 30 34 30 30 30 31 31 30 30 30 30   0020004000110000
00000010   20 20 20 20 00                                       .
```

2.5.2 Tool data upload (MID 0041)

Open Protocol implementation

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-64: Open Protocol implementation (MID 0041)

Upload of tool data from the controller.

Data:

- ASCII data representing the Application data.
- The data contains a list of parameters.

Possible answer: None
Sent by: Controller

Example

```
00000000   30 31 35 36 30 30 34 31 30 30 32 31 20 20 20 20   015600410021
00000010   20 20 20 20 30 31 43 45 30 30 36 39 20 20 20 20       01CE0069
00000020   20 20 20 20 30 32 30 30 30 30 31 33 35 33 35 30       020000135350
00000030   30 33 32 30 31 37 2D 30 35 2D 30 31 3A 30 30 3A   032017-05-01:00:
00000040   30 30 3A 30 30 30 34 43 37 31 30 32 34 20 20 20   00:0004C71024
00000050   20 30 35 30 30 31 33 36 39 30 36 20 20 20 20 20    0500136906
00000060   20 20 20 20 20 20 20 20 20 20 20 20 20 20 30 37                 07
00000070   30 30 30 30 31 33 35 33 35 30 30 38 20 20 30 39   000013535008  09
00000080   33 38 31 30 20 20 20 31 31 53 31 36 38 38 31 33   3810   11S168813
00000090   2D 31 38 32 20 4F 63 74 20 31 36 20 00            -182 Oct 16 .
```

Revision 1

Parameter	Bytes	Comment
Tool serial number	21 – 22	01
	23 – 36	The Tool serial number is specified by 14 ASCII characters Left justified.
Total number of tightening	37 – 38	02
	39 – 48	The Total number of tightening is specified by 10 ASCII digits, max 4294967295.
Last calibration date	49 – 50	03
	51 – 69	First calibration date of the transducer: YYYY-MM-DD:HH:MM:SS
	70 – 71	04

Parameter	Bytes	Comment
Controller Serial Number	72 – 81	The controller serial number is specified by 10 ASCII characters

Tab. 2-65: Data field revision 1 (MID 0041)

Additions for revision 2

Parameter	Bytes	Comment
Calibration value	82 – 83	05
	84 – 89	The tool calibration value is multiplied by 100 and sent as an integer (2 decimals truncated). Six ASCII digits. Torque values over 10,000 Nm results in a calibration value of 999999.
Last service date	90 – 91	05
	92 – 110	First calibration date of the transducer: YYYY-MM-DD:HH:MM:SS Example: Date: CW 18, 2021 ➢ 2021-05-03:00:00:00
Tightenings since service	111 – 112	06
	113 – 122	The number of tightenings since last service is specified by 10 ASCII digits, max 4294967295.
Tool type	123 – 124	07
	125 – 126	The tool type is specified by 2 ASCII digits. Not Supported (default: All Spaces)
Motor size	127 – 128	08
	129 – 130	The motor size is specified by 2 ASCII digits. Range: 00 – 99
Open end data	131 – 132	09
	133 – 135	The open end data is specified by 3 ASCII digits. The first digit represents the “use open end”: 1 = true, 0 = false. The second digit indicates the tightening direction: 0 = CW, 1 = CCW. The third digit indicates motor rotation: 0 = normal, 1 = inverted. Not Supported (default: 0)
Controller software version	146 – 137	10
	138 – 156	The software version is specified by 19 ASCII characters.

Tab. 2-66: Data field revision 2 (MID 0041)

Revision 500

When the data is not available or data is invalid, the fields are filled with Space or “0x20” character.

Parameter	Bytes	Comment
Original torque calibration value – transducer 1	21 – 22	01
	23 – 31	9 ASCII characters – Factor 10000 – sent as integer
Calibration TQ – transducer 1	32 – 33	02
	34 – 42	9 ASCII characters – Factor 10000 – sent as integer
	43 – 44	03

Parameter	Bytes	Comment
Angle factor – transducer 1	45 – 53	9 ASCII characters – Factor 10000 – sent as integer
Resolver factor – transducer 1	54 – 55	04
	56 – 64	9 ASCII characters – Factor 10000 – sent as integer
Torque constant – transducer 1	65 – 66	05
	67 – 75	9 ASCII characters – Factor 10000 – sent as integer
Servo PS – transducer 1	76 – 77	06
	78 – 82	5 ASCII characters
Tool speed – transducer 1	83 – 84	07
	85 – 93	9 ASCII characters – Factor 10000 – sent as integer
TQ factor – transducer 1	94 – 95	08
	96 – 104	9 ASCII characters – Factor 10000 – sent as integer
TQ capacity – transducer 1	105 – 106	09
	107 – 115	9 ASCII characters – Factor 10000 – sent as integer
Tool Type – transducer 1	116 – 117	10
	118 – 141	24 ASCII characters
Service Data – transducer 1	142 – 143	11
	144 – 146	3 ASCII characters (000 – 255)
Tool Ident Nr- transducer 1	147 – 148	12
	149 – 166	18 ASCII character
Tool Serial Nr – transducer 1	167 – 168	13
	169 – 177	9 ASCII character
Transducer Type – transducer 1	178 – 179	14
	180 – 191	12 ASCII character
Transducer Ident Nr – transducer 1	192 – 193	15
	194 – 211	18 ASCII character
Transducer Serial Nr – transducer 1	212 – 213	16
	214 – 222	9 ASCII character
Calibration date – transducer 1	223 – 224	17
	225 – 228	4 ASCII character – Date as Calender Week (YYWW)
Manufacturing date – transducer 1	229 – 230	18
	231 – 234	4 ASCII character – Date as Calender Week (YYWW)
Repair date – transducer 1	235 – 236	19
	237 – 240	4 ASCII character – Date as Calender Week (YYWW)
Total rundowns – transducer 1	241 – 242	20
	243 – 252	10 ASCII character
Rundowns since last service – transducer 1	253 – 254	21
	255 – 264	10 ASCII character
Overall Gear Ratio – transducer 1	265 – 266	22
	267 – 275	9 ASCII character – factor 10000 – sent as integer
Original torque calibration value - transducer 2	276 – 277	23
	278 – 286	9 ASCII character – factor 10000 – sent as integer

Parameter	Bytes	Comment
Calibration TQ – transducer 2	287 – 288	24
	289 – 297	9 ASCII character – factor 10000 – sent as integer
Angle factor - transducer 2	298 – 299	25
	300 – 308	9 ASCII character – factor 10000 -int
Tool Serial Nr – transducer 1	167 – 168	13
	169 – 177	9 ASCII character
Transducer Type – transducer 1	178 – 179	14
	180 – 191	12 ASCII character
Transducer Ident Nr – transducer 1	192 – 193	15
	194 – 211	18 ASCII character
Transducer Serial Nr – transducer 1	212 – 213	16
	214 – 222	9 ASCII character
Calibration date – transducer 1	223 – 224	17
	225 – 228	4 ASCII character – Date as Calender Week (YYWW)
Manufacturing date – transducer 1	229 – 230	18
	231 – 234	4 ASCII character – Date as Calender Week (YYWW)
Repair date – transducer 1	235 – 236	19
	237 – 240	4 ASCII character – Date as Calender Week (YYWW)
Total rundowns – transducer 1	241 – 242	20
	243 – 252	10 ASCII character
Rundowns since last service – transducer 1	253 – 254	21
	255 – 264	10 ASCII character
Overall Gear Ratio – transducer 1	265 – 266	22
	267 – 275	9 ASCII character – factor 10000 – sent as integer
Original torque calibration value - transducer 2	276 – 277	23
	278 – 286	9 ASCII character – factor 10000 – sent as integer
Calibration TQ – transducer 2	287 – 288	24
	289 – 297	9 ASCII character – factor 10000 – sent as integer
Angle factor - transducer 2	298 – 299	25
	300 – 308	9 ASCII character – factor 10000 -int

Tab. 2-67: Data field revision 500 (MID 0041)

Revision 501

All fields < 70 are the same as in revision 500.
When the data is not available or data is invalid, the fields are filled with Space or “0x20” character.

Parameter	Bytes	Value
Last calibration date	1792-1793	70
	1794-1812	(YYYY-MM-DD:HH:MM:SS)
Next calibration date	1813-1814	71
	1815-1833	(YYYY-MM-DD:HH:MM:SS)
Minimum Torque for Tool (Nm)	1834-1835	72
	1836-1844	9 ASCII character – factor 10000 - int[AM1]

Parameter	Bytes	Value
Torque Constant (Reference Value, Nm/A)	1845-1846	73
	1847-1855	9 ASCII characters – Factor 10000 - int
User Defined String – e.g. asset number	1856-1857	74
	1858-1877	20 ASCII characters
User of last SI data change	1878-1879	75
	1894-1895	16 ASCII characters (formerly used for filename)
Date of last SI data change	1896-1897	76
	1897-1916	(YYYY-MM-DD:HH:MM:SS)
Tool hardware revision	1917-1918	77
	1919-1922	4 ASCII characters
Tool hardware revision date	1923-1924	78
	1925-1943	~~(YYYY-MM-DD:HH:MM:SS)~~ Not Supported
Exact production date	1944-1945	79
	1946-1964	(YYYY-MM-DD:HH:MM:SS)

Tab. 2-68: Data field revision 501 (MID 0041)

FEP implementation

Header	Data Field	Message End
20 bytes	125 bytes	NUL (ASCII 0x0)

Tab. 2-69: FEP implementation (MID 0041)

Upload of tool data from the controller.

Data:

- ASCII data representing the Application data.
- The data contains a list of parameters.

Example

```
00000015  30 31 34 35 30 30 34 31  30 30 30 30 32 20 20 20   01450041 00002
00000025  20 20 20 20 30 31 54 41  33 31 33 39 20 20 20 20       01TA 3139
00000035  20 20 20 20 30 32 30 30  30 33 30 34 30 31 36 39       0200
03040169
00000045  30 33 32 30 30 38 2d 30  31 2d 30 31 3a 30 30 3a   032008-0 1-
01:00:
00000055  30 30 3a 30 30 30 34 42  37 30 30 32 36 20 20 20   00:0004B 70026
00000065  20 30 35 53 31 36 38 38  31 33 2d 31 31 33 32 20    05S1688 13-1132
00000075  44 65 63 20 31 20 30 36  20 20 20 20 20 20 20 20   Dec 1 06
00000085  20 20 20 20 20 20 20 20  20 20 20 30 37 20 20 20               07
00000095  20 20 20 20 20 20 20 20  20 20 20 20 20 20 20 20
000000A5  20 00
```

Parameter	Bytes	Comment
Tool serial number	21 – 22	01
	23 – 36	The Tool serial number is specified by 14 ASCII characters Left justified.
Total number of tightening	37 – 38	02
	39 – 47	The Total number of tightening is specified by 10 ASCII digits. Max 4294967295
	48 – 49	03

Parameter	Bytes	Comment
Last calibration date	50 – 68	YYYY-MM-DD:HH:MM:SS
Controller Serial Number	71 – 72	04
	73 – 80	The controller serial number is specified by 10 ASCII characters
Firmware Version 1	81 – 82	05
	83 – 102	~~The controller firmware version left justified.~~ Software Version Number
Firmware Version 2	103 – 104	06
	105 – 124	~~Auxiliary firmware version in the case there is a second firmware required~~ Software Version Number
Future	125 – 126	07
	127 – 146	Reserved for future (Blank)

Tab. 2-70: Data field FEP (MID 0041)

2.5.3 Disable tool (MID 0042)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-71: Disable tool (MID 0042)

This message disables the tool.
Possible answer: Command accepted (MID 0005)
Sent by: Integrator

Example

```
00000000   30 30 32 30 30 30 34 32 30 30 31 31 30 30 30 30   0020004200110000
00000010   20 20 20 20 00                                     .
```

2.5.4 Enable tool (MID 0043)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-72: Enable tool (MID 0043)

This message enables the tool.
Possible answer: Command accepted (MID 0005)
Sent by: Integrator

Example

```
00000000   30 30 32 30 30 30 34 33 30 30 31 31 30 30 30 30   0020004300110000
00000010   20 20 20 20 00                                     .
```

2.5.5 Set calibration value request (MID 0045)

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-73: Set calibration value request (MID 0045)

This message sets the calibration value of the tool. If write calibration fails, old values are restored.

For revision 1 and 6, to avoid timeout in OP client, acknowledgement (MID 0005) is sent soon after tool memory is written but before flash memory is yet to be written.
Please Make sure that, Calibration torque is within the range of 20% from “original torque calibration”. If this boundary is exceeded, *Calibration failed* or *Error code 70* is sent.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): "No Error", “Calibration failed”, "Tool is inaccessible" or "Invalid data"

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Calibration value Unit	21 – 22	01
	23	Unit for Calibration value: 1 = Nm 2 = Lbf.ft 3 = Lbf.In 4 = Kpm 5 = Ncm
Calibration Value	24 – 25	02
	26 – 31	6 ASCII character, factor 100, type: int

Tab. 2-74: Data field revision 1 (MID 0045)

Revision 5

Parameter	Bytes	Comment
Set Calibration Value Flag – Transducer 1	21 – 22	01
	23	1 ASCII characters: 0 = don't set next cal. date 1 = set
Calibration Value - Transducer 1	24 – 25	02
	26 – 34	9 ASCII character, factor 10000, sent as int (Nm).
Set Calibration Value Flag-Transducer 2	35 – 36	03
	37	1 ASCII characters: 0 = don't set next cal. date 1 = set
Calibration Value - Transducer 2	38 – 39	04
	40 – 48	9 ASCII character, factor 10000, sent as int (Nm).
Set Current Constant Flag – Transducer 1	49 – 50	05
	51	1 ASCII characters: 0 = don't set next cal. date 1 = set
Set Current Constant Value – Transducer 1	52 – 53	06
	54 – 62	9 ASCII character, factor 10000, sent as int (Nm/A).
Set Current Constant Flag – Transducer 2	63 – 64	07
	65	1 ASCII characters: 0 = don't set next cal. date 1 = set
Set Current Constant Value – Transducer 2	66 – 67	08
	68 – 76	9 ASCII character, factor 10000, sent as int (Nm/A).

Tab. 2-75: Data field revision 2 (MID 0045)

Revision 6

Testing of MFU data can be only done with special OP client which supports the following format. MFU Data should be sent as a single string of maximum 762 ASCII characters. It can contain many lines, but a single line can contain maximum of 50 ASCII characters. Each line must end with line feed character (0x0A). But the end of the string should be indicated by (0x0A 0x00), see below example.

In this version “Set MFU flag” is redundant. So fix the value of Byte 23 to “1” (flag is always set). In the future version it could be removed as this field is redundant.

Example
Machine Capability Data of 24 November 2009 (MfU)
Tool: 18EAES28AM3
SerNo: SJ3669

Certificate No : SJ3669c
Target Torque Values 28 Nm (hard 30%, +/- 7%):
12,60 Nm
Low: 11,72 Nm
High: 13,48 Nm
Cm 2,30 Cmk 2,00

Certificate No : SJ3669d
Target Torque Values 28 Nm (soft 80%, +/- 7%):
22,40 Nm
Low: 20,83 Nm
High: 23,97 Nm
Cm 4,01 Cmk 2,64

Examiner: CPT, Failla

```
00000000   30 32 33 31 30 30 34 35 30 30 36 30 30 30 30 30   0231004500600000
00000010   30 30 30 30 30 31 31 30 32 4D 61 63 68 69 6E 65   000001102Machine
00000020   20 43 61 70 61 62 69 6C 69 74 79 20 44 61 74 61    Capability Data
00000030   20 66 72 6F 6D 20 32 33 2E 30 32 2E 32 30 32 32    from 23.02.2022
00000040   20 28 4D 46 55 29 3A 0A 54 6F 6F 6C 20 43 54 42    (MFU):.Tool CTB
00000050   41 57 33 31 38 43 2D 34 35 30 30 32 0A 53 65 72   AW318C-45002.Ser
00000060   4E 6F 3A 20 31 30 31 35 31 30 38 0A 0A 43 65 72   No: 1015108..Cer
00000070   74 69 66 69 63 61 74 65 20 4E 6F 3A 20 31 30 31   tificate No: 101
00000080   35 31 30 38 41 0A 54 65 73 74 20 56 61 6C 75 65   5108A.Test Value
00000090   20 32 38 34 2C 30 30 20 4E 6D 20 28 2B 2F 2D 32    284,00 Nm (+/-2
000000A0   30 25 29 0A 4C 6F 77 3A 20 32 32 37 2C 32 30 20   0%).Low: 227,20
000000B0   4E 6D 20 48 69 67 68 3A 20 33 34 30 2C 38 30 20   Nm High: 340,80
000000C0   4E 6D 0A 43 6D 20 34 2C 34 30 20 43 6D 6B 20 34   Nm.Cm 4,40 Cmk 4
000000D0   2C 31 36 0A 0A 0A 45 78 61 6D 69 6E 65 72 3A 20   ,16...Examiner:
000000E0   46 61 69 6C 6C 61 0A 00                           Failla..
```

Parameter	Bytes	Comment
Set MFU flag	21 – 22	01
	23	1 ASCII character.
MFU Data	24 – 25	02
	26 – 787	762 ASCII character.

Tab. 2-76: Data field revision 6 (MID 0045)

Additional revision 7

Parameter	Bytes	Comment
Set Next calibration date flag	77 – 78	09
	79	1 ASCII characters: 0 = don't set next cal. date 1 = set
Next calibration date	80 – 81	10
	82 – 101	19 ASCII characters, date format.
	102 – 103	11

Parameter	Bytes	Comment
Set Customer data flag	104	1 ASCII characters: 0 = don't set next cal. date 1 = set
Customer data	105 – 106	12
	107 – 138	32 ASCII characters.

Tab. 2-77: Data field revision 7 (MID 0045)

2.6 VIN Messages

2.6.1 Vehicle Id Number download request (MID 0050)

Header	Data Field	Message End
20 bytes	25 bytes	NUL (ASCII 0x0)

Tab. 2-78: Vehicle Id Number download request (MID 0050)

With this message the integrator sends a VIN number to the controller.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): “VIN input source not granted” or “Tool currently in use”

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
VIN number	21 – max 45	The VIN number is represented by max 25 ASCII characters. If the VIN number length is lower than 25 characters, the VIN number field is filled with space SPC.

Tab. 2-79: Data field revision 1 (MID 0050)

2.6.2 Vehicle Id Number upload subscribe (MID 0051)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-80: Vehicle Id Number upload subscribe (MID 0051)

This message is used by the integrator to set subscription for the barcode received by the controller independently of the input source (serial, Ethernet, field bus…). The result of this command will be the transmission of all the barcode received by the controller to the subscriber independently of the input source.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): “VIN upload subscription already exists”

Sent by: Integrator

2.6.3 Vehicle Id Number upload (MID 0052)

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-81: Vehicle Id Number upload (MID 0052)

This message transmits the last barcode received by the controller to the subscriber.

Possible answer: Vehicle Id Number upload acknowledge (MID 0053)
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
VIN number	21 – 45	The VIN number is 25 bytes long and is specified by 25 ASCII characters.

Tab. 2-82: Data field revision 1 (MID 0053)

Revision 2

Parameter	Bytes	Comment
VIN number	21 – 22	01
	23 – 45	The VIN number is 25 bytes long and is specified by 25 ASCII characters.
Identifier result part 2	48 – 49	02
	50 – 74	The VIN number is 25 bytes long and is specified by 25 ASCII characters.
Identifier result part 3	75 – 76	03
	77 – 91	The identifier result part 2 is 25 bytes long and is specified by 25 ASCII characters.
Identifier result part 4	92 – 93	04
	94 – 128	The identifier result part 4 is 25 bytes long and is specified by 25 ASCII characters.

Tab. 2-83: Data field revision 2 (MID 0053)

2.6.4 Vehicle Id Number upload acknowledge (MID 0053)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-84: Vehicle Id Number upload acknowledge (MID 0053)

This message acknowledges the Vehicle Id Number upload.

Possible answer: None
Sent by: Integrator

2.6.5 Vehicle Id Number upload unsubscribe (MID 0054)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-85: Vehicle Id Number upload acknowledge (MID 0053)

This message resets the subscription for the barcode (VIN) received by the controller.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): “VIN upload subscription does not exist”

Sent by: Integrator

2.7 Tightening Result Messages

2.7.1 Last tightening result data subscribe (MID 0060)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-86: Last tightening result data subscribe (MID 0060)

This message defines the subscription of the rundown result. The command is used to transfer the run-down results after tightening.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): “Last tightening result subscription already exists” or “MID revision not supported”

Sent by: Integrator

2.7.2 Last tightening result data upload reply (MID 0061)

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-87: Last tightening result data upload reply (MID 0061)

This message uploads the last rundown result. This is currently only supported by specialized software versions. Refer to the programming manual.

Possible answer: Last tightening result acknowledge (MID 0062)
Sent by: Controller

Example

```
00000000   30 32 33 31 30 30 36 31 30 30 31 31 20 20 20 20   023100610011
00000010   20 20 20 20 30 31 30 30 30 30 30 32 30 31 30 33       010000020103
00000020   57 48 2F 35 31 32 31 20 4D 61 72 6B 75 73 20 48   WH/5121 Markus H
00000030   20 20 20 20 20 20 20 20 20 30 34 76 6E 62 20 20            04vnb
00000040   20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
00000050   20 20 20 20 30 35 30 32 30 36 30 30 32 30 37 30       050206002070
00000060   30 30 32 30 38 30 30 30 31 30 39 31 31 30 31 31   0020800010911011
00000070   31 31 31 32 30 30 30 30 30 30 31 33 30 30 32 38   1112000000130028
00000080   30 30 31 34 30 30 30 30 30 30 31 35 30 30 30 30   0014000000150000
00000090   30 34 31 36 30 30 30 38 30 31 37 30 30 31 30 30   0416000801700100
000000A0   31 38 30 30 30 39 30 31 39 30 30 30 39 30 32 30   1800090190009020
000000B0   32 30 32 31 2D 31 30 2D 31 35 3A 31 37 3A 33 39   2021-10-15:17:39
000000C0   3A 30 37 32 31 32 30 32 31 2D 31 30 2D 31 33 3A   :07212021-10-13:
000000D0   31 34 3A 34 34 3A 34 36 32 32 30 32 33 30 30 30   14:44:4622023000
000000E0   30 30 30 30 31 38 30 00                           0000180.
```

Revision 1

Parameter	Bytes	Comment
Cell ID	21 – 22	01
	23 – 26	The cell ID is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Channel ID	27 – 28	02
	29 – 30	The channel ID is two bytes long and specified by two ASCII digits. Range: 00 – 99
	31 – 32	03

Parameter	Bytes	Comment
Torque controller Name	33 – 57	The controller name is 25 bytes long and is specified by 25 ASCII characters.
VIN Number	58 – 59	04
	60 – 84	The VIN number is 25 bytes long and is specified by 25 ASCII characters.
Linking Group Number	85 – 86	05
	87 – 88	The Linking Group ID is two bytes long and specified by two ASCII digits. Range: 00 – 99
Application Number	89 – 90	06
	91 – 93	The Application ID is three bytes long and specified by three ASCII digits. Range: 000 – 999
Batch size	94 – 95	07
	96 – 99	This parameter gives the total number of tightening in the batch. The batch size is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Batch counter	100 – 101	08
	102 – 105	The batch counter information is four bytes long specifying and specified by four ASCII digits. Range: 0000 – 9999
Tightening Status	106 – 107	09
	108	The tightening status is one byte long and specified by one ASCII digit. 0 = Tightening NOK 1 = Tightening OK
Torque status	109 – 110	10
	111	0 = Low 1 = OK 2 = High
Angle status	112 – 113	11
	114	0 = Low 1 = OK 2 = High
Torque Min limit	115 – 116	12
	117 – 122	The torque min limit is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and is specified by six ASCII digits.
Torque Max limit	123 – 124	13
	125 – 130	The torque max limit is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and is specified by six ASCII digits.
Torque final target	131 – 132	14
	133 – 138	The torque final target is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and is specified by six ASCII digits.
Torque	139 – 140	15
	141 – 146	The torque value is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and is specified by six ASCII digits.
Angle Min	147 – 148	16

Parameter	Bytes	Comment
	149 – 153	The angle min value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Angle Max	154 – 155	17
	156 – 160	The angle max value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Final Angle Target	161 – 162	18
	163 – 167	The target angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Angle	168 – 169	19
	170 – 174	The turning angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Time stamp	175 – 176	20
	177 – 195	Time stamp for each tightening. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
Date/time of last change in Application settings	196 – 197	21
	198 – 216	~~Time stamp for the last change in the current Application settings. It is 19 bytes long and is specified by 19 ASCIIcharacters (YYYY-MM-DD:HH:MM:SS).~~ Date of any settings change to Controller (one date for all apps)
Batch status	217 – 218	22
	219	The batch status is specified by one ASCII character. 0 = Batch NOK (batch not completed) 1 = Batch OK 2 = Batch not used
Tightening ID	220 – 221	23
	222 – 231	The tightening ID is a unique ID for each tightening result. It is incremented after each tightening. 10 ASCII digits, max 4294967295.

Tab. 2-88: Data field revision 1 (MID 0061)

Revision 2

Parameter	Bytes	Comment
Cell ID	21 – 22	01
	23 – 26	The cell ID is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Channel ID	27 – 28	02
	29 – 30	The channel ID is two bytes long and specified by two ASCII digits. Range: 00 – 99
Torque controller Name	31 – 32	03
	33 – 57	The controller name is 25 bytes long and is specified by 25 ASCII characters.
VIN Number	58 – 59	04
	60 – 84	The VIN number is 25 bytes long and is specified by 25 ASCII characters.

Parameter	Bytes	Comment
Linking Group Number	85 – 86	05
	87 – 90	The Linking Group ID is two bytes long and specified by two ASCII digits. Range: 00 – 99
Application Number	91 – 92	06
	93 – 95	The Application ID is three bytes long and specified by three ASCII digits. Range: 000 – 999
Strategy	96 – 97	07
	98 – 99	The strategy currently runs by the controller. It is two bytes long and specified by two ASCII digits. Range: 00 – 99 Supported: 01 = Torque Control (Seq. 13, 11, 20) 02 = Torque Control/Angle Mon (Seq. 30, 31) 04 = Angle Control/Torque Mon (Seq. 50, 51) 07 = Reverse Angle (Seq. 41, 46, 48) 11 = Torque Control/Angle Control (OR) (Seq. 80) 13 = Home Position (Seq. 16) 15 = Yield (Seq. 63) 19 = Yield/Torque Control (Seq. 73, 78) 99 = No Strategy/Unsupported
Strategy options	100 – 101	08
	102 – 106	Five bytes long bit field. Supported: Bit 0 = Torque (Seq. 11, 13, 20, 30, 31, 63, 73, 78, 80) Bit 1 = Angle (Seq. 16, 41, 46, 48, 50, 51, 56, 75, 78, 80) Bit 3 = PVT monitoring (Seq. 13) Bit 4 = PVT compensate (Seq. 32)
Batch size	107 – 108	09
	109 – 112	This parameter gives the total number of tightening in the batch. The batch size is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Batch counter	113 – 114	10
	115 – 118	The batch counter information is four bytes long specifying and specified by four ASCII digits. Range: 0000 – 9999
Tightening Status	119 – 120	11
	121	The tightening status is one byte long and specified by one ASCII digit. 0 = Tightening NOK 1 = tightening OK
Batch status	122 – 123	12
	124	The batch status is specified by one ASCII character. 0 = Batch NOK (batch not completed) 1 = Batch OK 2 = Batch not used
Torque status	125 – 126	13
	127	0 = Low 1 = OK 2 = High

Parameter	Bytes	Comment
Angle status	128 – 129	14
	130	0 = Low 1 = OK 2 = High
Rundown angle status	131 – 132	15
	133	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Current Monitoring Status	134 – 135	16
	136	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Self tap status	137 – 138	17
	139	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Prevail Torque monitoring status	140 – 141	18
	142	0 = Low 1 = OK 2 = High
Prevail Torque compensate status	143 – 144	19
	145	0 = Low 1 = OK 2 = High
Tightening error status	146 – 147	20
	148 – 157	Ten bytes long bit field. Tightening error bits show what went wrong with the tightening, *_RS*. Supported: Bit 3 = Torque max shut off Bit 4 = Angle max shut off Bit 5 = Selftap torque max shut off Bit 6 = Selftap torque min shut off Bit 7 = Prevail torque max shut off Bit 8 = Prevail torque min shut off Bit 9 = Prevail torque compensate overflow Bit 10 = Current monitoring max shut off Bit 11 = Post view torque min torque shut off Bit 12 = Post view torque max torque shut off Bit 13 = Post view torque Angle too small Bit 14 = Trigger lost Bit 15 = Torque less than target Bit 17 = Multistage abort Bit 18 = Rehit (Seq. 31, 51) Bit 20 = Current limit reached Bit 21 = End Time out shutoff Bit 23 = Disable drive Bit 31 = Yield nut off (Seq. 31, 51) Bit 32 = Yield too few samples
Torque Min limit	158 – 159	21
	160 – 165	The torque min limit is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and is specified by six ASCII digits.
Torque Max limit	166 – 167	22
	168 – 173	The torque max limit is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and is specified by six ASCII digits.
Torque final target	174 – 175	23

Parameter	Bytes	Comment
	176 – 181	The torque final target is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and is specified by six ASCII digits.
Torque	182 – 183	24
	184 – 189	The torque value is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and is specified by six ASCII digits.
Angle Min	190 – 191	25
	192 – 196	The angle min value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Angle Max	197 – 198	26
	199 – 203	The angle max value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Final Angle Target	204 – 205	27
	206 – 210	The target angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Angle	211 – 212	28
	213 – 217	The turning angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Rundown angle Min	218 – 219	29
	220 – 224	~~The tightening angle min value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000-99999.~~ Not Supported (default: 0)
Rundown angle Max	225 – 226	30
	227 – 231	~~The tightening angle max value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000-99999.~~ Not Supported (default: 9999)
Rundown angle	232 – 233	31
	234 – 238	~~The tightening angle value reached in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000-99999.~~ Not Supported (default: 0)
Current Monitoring Min	239 – 240	32
	241 – 243	~~The current monitoring min limit in percent is three bytes long and is specified by three ASCII digits. Range: 000-999.~~ Not Supported (default: 0)
Current Monitoring Max	244 – 245	33
	246 – 248	~~The current monitoring max limit in percent is three bytes long and is specified by three ASCII digits. Range: 000-999.~~ Not Supported (default: 150)
Current Monitoring Value	249 – 250	34
	251 – 253	~~The current monitoring value in percent is three bytes long and is specified by three ASCII digits. Range: 000-999.~~ Not Supported (default: 0)
Self tap min	254 – 255	35

Parameter	Bytes	Comment
	256 – 261	~~The selftap min limit is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and specified by six ASCII digits.~~ Not Supported (default: 000105)
Self tap max	262 – 263	36
	264 – 269	~~The selftap max limit is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and specified by six ASCII digits.~~ Not Supported (default: 999900)
Self tap torque	270 – 271	37
	272 – 277	~~The selftap torque is multiplied by 100 and sent as an integer (2 decimal truncated). It is six bytes long and specified by six ASCII digits.~~ Not Supported (default:0)
Prevail torque monitoring min	278 – 279	38
	280 – 285	The PVT min limitis multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and specified by six ASCII digits. (Only Seq. 32 otherwise: 1.05)
Prevail torque monitoring max	286 – 287	39
	288 – 293	The PVT max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and specified by six ASCII digits. (Only Seq 32 otherwise: 1.05)
Prevail torque	294 – 295	40
	296 – 301	The prevail torque value is multiplied by 100 and sent as an integer (2 decimal truncated). The prevail torque is six bytes long and is specified by six ASCII digits. (Only Seq 32 otherwise: 0)
Tightening ID	302 – 303	41
	304 – 313	The tightening ID is a unique ID for each tightening result. It is incremented after each tightening. 10 ASCII digits, max 4294967295.
Linking Group sequence number	314 – 315	42
	316 – 320	The tightening ID is a unique ID. It is incremented after each tightening. It is ten bytes long and specified by ten ASCII digits, max 4294967295.
Sync tightening ID	321 – 322	43
	323 – 327	The Linking Group sequence number is unique for each Linking Group. All tightenings performed in the same Linking Group are stamped with the same Linking Group sequence number. It is specified by five ASCII digits. Range: 00000-65535.
Tool serial number	328 – 329	44
	330 – 343	The sync tightening ID is a unique ID for each sync tightening result. Each individual result of each spindle is stamped with this ID. The tightening ID is incremented after each sync tightening. It is specified by five ASCII digits. Range: 00000 – 65535
Time stamp	344 – 345	45
	346 – 264	Time stamp for each tightening. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
	365 – 366	46

Parameter	Bytes	Comment
Date/time of last change in Application settings	367 – 385	Time stamp for the last change in the current Application settings. It is19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).

Tab. 2-89: Data field revision 2 (MID 0061)

Torque values over 10,000 Nm and angle values over 10,000 deg results in a calibration value of 999999.

Exceptions for Revision 2 and higher

Parameter	Comment
Self Tap Max	Not Supported (default: 999900)
Self Tap Torque	Not Supported (default: 0)
Linking Group Sequence Number	Not Supported (default: 0)
Sync Tightening ID	Not Supported (default: 0)

Tab. 2-90: Exceptions for revision 2 and higher (MID 0061)

Additional revision 3

Parameter	Bytes	Comment
Application Name	386 – 387	47
	388 – 412	The Application name is 25 bytes long and is specified by 25 ASCII characters.
Torque values Unit	413 – 414	48
	415	The unit in which the torque values are sent. The torque values unit is one byte long and is specified by one ASCII digit. 1 = Nm 2 = FtLbs 3 = InLbs 4 = Kpm 5 = KgCm 6 = OzfIn 8 = Ncm 9 = daNm
Result type	416 – 417	49
	418 – 419	The result type is two bytes long and specified by two ASCII digits. Supported: 01 = Tightening 02 = Loosening

Tab. 2-91: Additional revision 3 (MID 0061)

Additional revision 4

Parameter	Bytes	Comment
Identifier result part 2	420 – 421	50
	422 – 446	The identifier result part 2 is 25 bytes long and is specified by 25 ASCII characters.
Identifier result part 3	447 – 448	51
	449 – 473	The identifier result part 2 is 25 bytes long and is specified by 25 ASCII characters.

Parameter	Bytes	Comment
Identifier result part 4	474 – 475	52
	476 – 500	The identifier result part 2 is 25 bytes long and is specified by 25 ASCII characters.

Tab. 2-92: Additional revision 4 (MID 0061)

Additional revision 5

Parameter	Comment
Customer Tightening Error Code	Not Supported (default: 0)

Tab. 2-93: Additional revision 5 (MID 0061)

Additional revision 6

Parameter	Comment
Prevail Torque Compensate Value (ID: 54)	Supported (only Seq 32, otherwise: 0)
Tightening Error Status 2	Not Supported (default: 0)

Tab. 2-94: Additional revision 6 (MID 0061)

Revision 40

These parameters are supported only by Apex Tool Group.
Released for S168813-1.4.4 (TC-003491, TC-003492).

Parameter	Bytes	Comment
Cell ID	21 – 22	01
	23 – 26	The cell ID is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Channel ID	27 – 28	02
	29 – 30	The channel ID is two bytes long and specified by two ASCII digits. Range: 00 – 99
Torque controller Name	31 – 32	03
	33 – 57	The controller name is 25 bytes long and is specified by 25 ASCII characters.
VIN Number	58 – 59	04
	60 – 84	The VIN number is 25 bytes long and is specified by 25 ASCII characters.
Linking Group ID	85 – 86	05
	87 – 90	The Linking Group ID is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Application ID	91 – 92	06
	93 – 95	The Application ID is three bytes long and specified by three ASCII digits. Range: 000 – 999
Strategy	96 – 97	07

Parameter	Bytes	Comment
	98 – 99	The strategy currently runs by the controller. It is two bytes long and specified by two ASCII digits. Range: 00 – 99 Supported: 01 = Torque control 02 = Torque control/angle monitoring 03 = Torque control/angle control AND 04 = Angle control/torque monitoring 05 = DS control 06 = DS control torque monitoring 07 = Reverse angle 08 = Reverse torque 09 = Click wrench 10 = Rotate spindle forward 11 = Torque control angle control OR 12 = Rotate spindle reverse 13 = Home position forward 14 = EP Monitoring 15 = Yield 16 = EP Fixed 17 = EP Control 18 = EP Angle shutoff 19 = Yield / torque control OR 20 = Snug gradient 21 = Residual torque/Time 22 = Residual torque/Angle 23 = Breakaway peak 24 = Loose and tightening 25 = Home position reverse 26 = PVT comp with Snug 99 = No strategy
Strategy options	100 – 101	08
	102 – 106	Five bytes long bit field. Supported: Bit 0 = Torque Bit 1 = Angle Bit 2 = Batch Bit 3 = PVT Monitoring Bit 4 = PVT Compensate Bit 5 = Selftap Bit 6 = Rundown Bit 7 = CM Bit 8 = DS control Bit 9 = Click Wrench Bit 10 = RBW Monitoring
Batch size	107 – 108	09
	109 – 112	This parameter gives the total number of tightening in the batch. The batch size is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Batch counter	113 – 114	10
	115 – 118	The batch counter information is four bytes long specifying and specified by four ASCII digits. Range: 0000 – 9999
Tightening Status	119 – 120	11

Parameter	Bytes	Comment
	121	The tightening status is one byte long and specified by one ASCII digit. 0 = Tightening NOK 1 = Tightening OK
Batch status	122 – 123	12
	124	The batch status is specified by one ASCII character. 0 = Batch NOK (batch not completed) 1 = Batch OK 2 = Batch not used
Torque status	125 – 126	13
	127	0 = Low 1 = OK 2 = High
Angle status	128 – 129	14
	130	0 = Low 1 = OK 2 = High
Rundown angle status	131 – 132	15
	133	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Current Monitoring Status	134 – 135	16
	136	~~0 = Low, 1 = OK, 2 = High~~ ~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Phase 2 status	137 – 138	17
	149	0 = NOK, 1 = OK status of Phase 2 when Seq 56 is used. If there is a NOK in Phase 2 then corresponding phase 3 and 4 are also set to NOK status.
Phase 3 status	140 – 141	18
	142	0 = NOK, 1 = OK status of Phase 3 when Seq 56 is used. If there is a NOK in Phase 3 then corresponding phase 4 is also set to NOK status.
Phase 4 status	143 – 144	19
	145	0 = NOK, 1 = OK status of Phase 4 when Seq 56 is used. For all other reasons where the rundown has completed phase 2 & 3 (which is possible only with OK status in their phase) and failed in phase 4 this status is set as NOK. If it did pass in phase 4 then it is implied that all the other phases were also OK.
	146 – 147	20

Parameter	Bytes	Comment
Tightening error status	148 – 157	Ten bytes long bit field. Tightening error bits show what went wrong with the tightening. Supported: Bit 1 = Rundown angle max shut off Bit 2 = Rundown angle min shut off Bit 3 = Torque max shut off Bit 4 = Angle max shut off Bit 5 = Selftap torque max shut off Bit 6 = Selftap torque min shut off Bit 7 = Prevail torque max shut off Bit 8 = Prevail torque min shut off Bit 9 = Prevail torque compensate overflow Bit 10 = Current monitoring max shut off Bit 11 = Post view torque min torque shut off Bit 12 = Post view torque max torque shut off Bit 13 = Post view torque Angle too small Bit 14 = Trigger lost Bit 15 = Torque less than target Bit 16 = Tool hot Bit 17 = Multistage abort Bit 18 = Rehit Bit 19 = DS measure failed Bit 20 = Current limit reached Bit 21 = EndTime out shutoff Bit 22 = Remove fastener limit exceeded Bit 23 = Disable drive Bit 24 = Transducer lost Bit 25 = Transducer shorted Bit 26 = Transducer corrupt Bit 27 = Sync timeout Bit 28 = Dynamic current monitoring min Bit 29 = Dynamic current monitoring max Bit 30 = Angle max monitor Bit 31 = Yield nut off Bit 32 = Yield too few samples
Torque Min limit	158 – 159	21
	160 – 165	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Torque Max limit	166 – 167	22
	168 – 173	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Torque final target	174 – 175	23
	176 – 181	The torque final target is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Torque	182 – 183	24
	184 – 189	The torque value is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Angle Min	190 – 191	25
	192 – 196	The angle min value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Angle Max	197 – 198	26

Parameter	Bytes	Comment
	199 – 203	The angle max value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Final Angle Target	204 – 205	27
	206 – 210	The target angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Angle	211 – 212	28
	213 – 217	The turning angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Phase 2 Torque minimum	218 – 219	29
	220 – 225	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 2 Torque maximum	226 – 227	30
	228 – 233	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 2 Torque angle	234 – 235	31
	236 – 240	The angle value in degrees. Each turn represents 360 degrees. It is six bytes long and specified by five ASCII digits. Range: 000000 – 999999
Phase 3 Torque minimum	241 – 242	32
	243 – 248	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 3 Torque maximum	249 – 250	33
	251 – 256	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 3 Torque angle	257 – 258	34
	259 – 263	The angle value in degrees. Each turn represents 360 degrees. It is six bytes long and specified by five ASCII digits. Range: 000000 – 999999
Phase 4 Torque minimum	264 – 265	35
	266 – 271	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 4 Torque maximum	272 – 273	36
	274 – 279	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 4 Torque angle	280 – 281	37
	282 – 284	The angle value in degrees. Each turn represents 360 degrees. It is six bytes long and specified by five ASCII digits. Range: 000000 – 999999
Tightening ID	285 – 286	38
	287 – 296	The tightening ID is a unique ID for each tightening result. It is incremented after each tightening. 10 ASCII digits, max 4294967295.
	297 – 298	39

Parameter	Bytes	Comment
Linking Group sequence number	299 – 303	The Linking Group sequence number is unique for each Linking Group. All tightenings performed in the same Linking Group are stamped with the same Linking Group sequence number. It is specified by five ASCII digits. Range: 00000 – 65535
Sync tightening ID	304 – 305	40
	306 – 310	The sync tightening ID is a unique ID for each sync tightening result. Each individual result of each spindle is stamped with this ID. The tightening ID is incremented after each sync tightening. It is specified by five ASCII digits. Range: 00000 – 65535
Tool serial number	311 – 312	41
	313 – 326	The tool serial number is a unique ID for each tool.
Time stamp	327 – 328	42
	329 – 347	Time stamp for each tightening. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
Date/time of last change in Application settings	348 – 349	43
	350 – 368	Time stamp for the last change in the current Application settings. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).

Tab. 2-95: Data field revision 40 (MID 0061)

Torque values over 10,000 Nm and angle values over 10,000 deg results in a calibration value of 999999.

Revision 41

These parameters are supported only by Apex Tool Group.
Tested for S168813-1.4.4 (TC-003493, TC-003494).

Parameter	Bytes	Comment
Cell ID	21 – 22	01
	23 – 26	The cell ID is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Channel ID	27 – 28	02
	29 – 30	The channel ID is two bytes long and specified by two ASCII digits. Range: 00 – 99
Torque controller Name	31 – 32	03
	33 – 57	The controller name is 25 bytes long and is specified by 25 ASCII characters.
VIN Number	58 – 59	04
	60 – 84	The VIN number is 25 bytes long and is specified by 25 ASCII characters.
Linking Group ID	85 – 86	05
	87 – 90	The Linking Group ID is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Application ID	91 – 92	06
	93 – 95	The Application ID is three bytes long and specified by three ASCII digits. Range: 000 – 999

Parameter	Bytes	Comment
Strategy	96 – 97	07
	98 – 99	The strategy currently runs by the controller. It is two bytes long and specified by two ASCII digits. Range: 00 – 99 Supported: 01 = Torque control 02 = Torque control/angle monitoring 03 = Torque control/angle control AND 04 = Angle control/torque monitoring 05 = DS control 06 = DS control torque monitoring 07 = Reverse angle 08 = Reverse torque 09 = Click wrench 10 = Rotate spindle forward, 11 = Torque control angle control OR 12 = Rotate spindle reverse 13 = Home position forward 14 = EP Monitoring 15 = Yield 16 = EP Fixed 17 = EP Control 18 = EP Angle shutoff 19 = Yield / torque control OR 20 = Snug gradient 21 = Residual torque/Time 22 = Residual torque/Angle 23 = Breakaway peak 24 = Loose and tightening 25 = Home position reverse 26 = PVT comp with Snug 99 = No strategy
Strategy options	100 – 101	08
	102 – 106	Five bytes long bit field. Supported: Bit 0 = Torque Bit 1 = Angle Bit 2 = Batch Bit 3 = PVT Monitoring Bit 4 = PVT Compensate Bit 5 = Selftap Bit 6 = Rundown Bit 7 = CM Bit 8 = DS control Bit 9 = Click Wrench Bit 10 = RBW Monitoring
Batch size	107 – 108	09
	109 – 112	This parameter gives the total number of tightening in the batch. The batch size is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Batch counter	113 – 114	10
	115 – 118	The batch counter information is four bytes long specifying and specified by four ASCII digits. Range: 0000 – 9999
Tightening Status	119 – 120	11

Parameter	Bytes	Comment
	121	The tightening status is one byte long and specified by one ASCII digit. 0 = Tightening NOK 1 = tightening OK
Batch status	122 – 123	12
	124	The batch status is specified by one ASCII character. 0 = Batch NOK (batch not completed) 1 = Batch OK 2 = Batch not used
Torque status	125 – 126	13
	127	0 = Low 1 = OK 2 = High
Angle status	128 – 129	14
	130	0 = Low 1 = OK 2 = High
Rundown angle status	131 – 132	15
	133	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Current Monitoring Status	134 – 135	16
	136	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Phase 2 status	137 – 138	17
	139	0 = Low 1 = OK
Phase 3 status	140 – 141	18
	142	0 = Low 1 = OK
Phase 4 status	143 – 144	19
	145	0 = Low 1 = OK
	146 – 147	20

Parameter	Bytes	Comment
Tightening error status	148 – 157	Ten bytes long bit field. Tightening error bits show what went wrong with the tightening. Supported: Bit 1 = Rundown angle max shut off Bit 2 = Rundown angle min shut off Bit 3 = Torque max shut off Bit 4 = Angle max shut off Bit 5 = Selftap torque max shut off Bit 6 = Selftap torque min shut off Bit 7 = Prevail torque max shut off Bit 8 = Prevail torque min shut off Bit 9 = Prevail torque compensate overflow Bit 10 = Current monitoring max shut off Bit 11 = Post view torque min torque shut off Bit 12 = Post view torque max torque shut off Bit 13 = Post view torque Angle too small Bit 14 = Trigger lost Bit 15 = Torque less than target Bit 16 = Tool hot Bit 17 = Multistage abort Bit 18 = Rehit Bit 19 = DS measure failed Bit 20 = Current limit reached Bit 21 = End Time out shutoff Bit 22 = Remove fastener limit exceeded Bit 23 = Disable drive Bit 24 = Transducer lost Bit 25 = Transducer shorted Bit 26 = Transducer corrupt Bit 27 = Sync timeout Bit 28 = Dynamic current monitoring min Bit 29 = Dynamic current monitoring max Bit 30 = Angle max monitor Bit 31 = Yield nut off Bit 32 = Yield too few samples
Torque Min limit	158 – 159	21
	160 – 165	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Torque Max limit	166 – 167	22
	168 – 173	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Torque final target	174 – 175	23
	176 – 181	The torque final target is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Torque	182 – 183	24
	184 – 189	The torque value is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Angle Min	190 – 191	25
	192 – 196	The angle min value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Angle Max	197 – 198	26

Parameter	Bytes	Comment
	199 – 203	The angle max value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits Range: 00000 – 99999
Final Angle Target	204 – 205	27
	206 – 210	The target angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Angle	211 – 212	28
	213 – 217	The turning angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Phase 2 Torque minimum	218 – 219	29
	220 – 225	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 2 Torque maximum	226 – 227	30
	228 – 233	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 2 Torque average	234 – 235	31
	236 – 241	The torque average limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 2 Torque angle	242 – 246	32
	247 – 251	The angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 000000 – 999999
Phase 3 Torque minimum	252 – 253	33
	254 – 259	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 3 Torque maximum	260 – 261	34
	262 – 267	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 3 Torque average	268 – 269	35
	270 – 275	The torque average limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 3 Torque angle	276 – 277	36
	278 – 282	The angle value in degrees. Each turn represents 360 degrees. It is six bytes long and specified by five ASCII digits. Range: 000000 – 999999
Phase 4 Torque minimum	283 – 284	37
	285 – 290	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 4 Torque maximum	291 – 292	38
	293 – 298	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.

Parameter	Bytes	Comment
Phase 4 Torque average	299 – 300	39
	301 – 306	The torque average limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Phase 4 Torque angle	307 – 308	40
	309 – 313	The angle value in degrees. Each turn represents 360 degrees. It is six bytes long and specified by five ASCII digits. Range: 000000-999999
Tightening ID	314 – 315	41
	316 – 325	The tightening ID is a unique ID for each tightening result. It is incremented after each tightening. 10 ASCII digits, max 4294967295.
Linking Group sequence number	326 – 327	42
	328 – 332	The Linking Group sequence number is unique for each Linking Group. All tightenings performed in the same Linking Group are stamped with the same Linking Group sequence number. It is specified by five ASCII digits. Range: 00000 – 65535
Sync tightening ID	333 – 334	43
	335 – 348	The sync tightening ID is a unique ID for each sync tightening result. Each individual result of each spindle is stamped with this ID. The tightening ID is incremented after each sync tightening. It is specified by 14 ASCII digits. Range: 00000 – 65535
Tool serial number	349 – 350	44
	351 – 364	The tool serial number is a unique ID for each tool.
Time stamp	365 – 366	45
	367 – 385	Time stamp for each tightening. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
Date/time of last change in Application settings	386 – 387	46
	388 – 406	Time stamp for the last change in the current Application settings. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).

Tab. 2-96: Data field revision 41 (MID 0061)

Additional revision 42 to revision 6

These parameters are supported only by Apex Tool Group.
Implemented for S168813-1.7.0 (REQ-00417).

Parameter	Bytes	Comment
Parameter set Shut-off gradient value	502 – 503	56
	504 – 509	Shut-off Gradient Parameter set value [%] (Only Seq. 63, otherwise: 0)
Parameter set minimum Gradient value	510 – 511	57
	512 – 517	Parameter set minimum Gradient value [Nm/°], 6 bytes long (Only Seq. 63, 73, 75, 78, otherwise: 0)
Parameter set maximum Gradient value	518 – 519	58
	520 – 525	Parameter set maximum Gradient value [Nm/°], 6 bytes long. (Only Seq. 63, 73, 75, 78, otherwise: 0)
	526 – 527	59

Parameter	Bytes	Comment
Shut-Off Gradient result value	528 – 533	Tightening result Shut-Off Gradient value [Nm/°], 6 bytes long. (Only Seq. 63, 73, 75, 78, otherwise: 0)
Minimum Gradient result value	534 – 535	60
	536 – 541	Tightening result minimum Gradient value [Nm/°], 6 bytes long. (Only Seq. 63, 73, 75, 78, otherwise: 0)
Maximum Gradient result value	542 – 543	61
	544 – 549	Tightening result maximum Gradient value [Nm/°], 6 bytes long. (Only Seq. 63, 73, 75, 78, otherwise: 0)
Out of tolerance Gradient result value	550 – 551	62
	552 – 557	Out of tolerance Gradient result value [Nm/°], 6 bytes long. (Only Seq. 63, 73, 75, 78, otherwise: 0)

Tab. 2-97: Data field additional revision 42 (MID 0061)

Trace Graph revision 500

Parameter	Bytes	Comment
Graph Type	527 – 528	56
	529 – 530	Type of Graph in Message, supported types: 0 = Torque over Angle (Default) 1 = Torque over Time 2 = Angle over Time
Torque Scale Factor	531 – 532	57
	533 – 542	Decimal value Divide by 1000000
Angle Offset	543 – 544	58
	545 – 550	Angle offset (Negative side of x axis)
Time Scale	551 – 552	59
	553 – 556	Milliseconds between each reading (Mode 1 or 2)
Binary offset	557 – 558	60
	559 – 568	Binary offset for trace as signed integer
Trace Length	569 – 570	61
	571 – 574	Trace Length in Bytes Max 9000
Data Blob	575 – 576	62
	577 – 9576	4500 signed (big endian) 16bit integers of Torque/Angle Data (If trace over 4,500 points, with be truncated to the Last 4,500 values of the rundown)[1]

Tab. 2-98: Trace Graph revision 500 (MID 0061)

Trace Graph revision 501

Parameter	Bytes	Comment
Graph Type	527 – 528	56
	529	Type of Graph in Message, supported types: 0 = Torque over Angle 1 = Torque over Time 2 = Angle over Time 3 = Torque and Time over Angle

[1] Float data is calculated with the following formula: Torque value = (dataBlob value – Binary Offset) × (Torque Scale Factor)

Parameter	Bytes	Comment
Torque Scale Factor	530 – 531	57
	532 – 541	Decimal value Divide by 1,000,000.
Reserve 1	542 – 543	58
	544 – 549	0 (Not used. It will be always zero)
Reserve 2	550 – 551	59
	552 – 555	1 (Not used. It will be always one)
Binary offset	556 – 557	60
	558 – 567	Binary offset for trace as signed integer
Trace Length	568 – 569	61
	570 – 573	Trace Length in bytes, max 9,000.
Data Blob	574 – 575	62
	576 – 9575	Each data point contains the Angle (2 bytes signed short data type) data, Toque (2 bytes unsigned short data type) data, and Time (2 bytes unsigned short data type) data in consecutive order. So, each data point size is 6 bytes. For the 2 bytes Angle data, MSB (Most Significant Bit) represents the sign of the number AND next 15 LSB (Least significant bit(s)) represents the actual Angle value. It can hold the data range from -32768 to 32767. Maximum Trace Length is 1,500 data points.

Tab. 2-99: Trace Graph revision 501 (MID 0061)

Redundancy Values revision 888

Parameter	Bytes	Comment
Torque 2	527 – 528	56
	529 – 534	Redundancy Torque specified by 6 ASCII character, factor 100, sent as int.
Torque Redundancy type	535 – 536	57
	537	Redundancy type for torque specified by 1 ASCII character. 0 = None 1 = Value from Transducer 2 2 = Value from Current Redundancy
Angle 2	538 – 539	58
	540 – 544	Redundancy Angle specified by 5 ASCII character.
Angle Redundancy type	545 – 546	59
	547	Redundancy type for angle specified by 1 ASCII character. 0 = None 1 = Value from Angler Encoder 2 2 = Value calculated from Resolver Angle

Tab. 2-100: Data field revision 888 (MID 0061)

Additional revision 998

Parameter	Bytes	Comment
Number of stages in multistage	527 – 528	56
	529 – 530	The total number of stages to be run for this tightening. It is two bytes long and specified by two ASCII digits.
	531 – 532	57

Parameter	Bytes	Comment
Number of stage results	533 – 534	Number of run stages. It is two bytes long and specified by two ASCII digits. For each completed stage the final torque and the final angle are reported.
Stage result	535 – 536	58
	537 – (537 + 11 × number of stage results)	Byte 1-6: The stage torque value. The torque is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and specified by six ASCII digits. Byte 7-11: The turning angle stage value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000-99999.

Tab. 2-101: Additional revision 998 (MID 0061)

FEP implementation

Parameter	Bytes	Comment
Cell Id	21 – 22	01
	23 – 26	The cell number is four bytes long and specified by four ASCII digits (0 – 9). Range: 0000 – 9999
Channel Id	27 – 28	02
	29 – 30	The channel Id is two bytes long and is specified by two ASCII digits (0 – 9). Range: 00 – 20
Torque controller Name	31 – 32	03
	33 – 57	The torque controller name is four bytes long and is specified by 25 ASCII characters taken between 0x20 and 0x7F Hex.
VIN Number	58 – 59	04
	60 – 84	The VIN number is 25 byte long and is specified by 25 ASCII characters taken between 0x20 and 0x7F Hex.
Job Number	85 – 86	05
	87 – 88	This is the job number that is currently run (Job Id), this information is sent with each tightening result. The job number is two bytes long and is specified by two ASCII digits (0 – 9). Range: 00 – 99
Pset number	89 – 90	06
	91 – 93	This is the pset number that is run (pset Id), this information is sent with each tightening result. The pset number is three bytes long and is specified by three ASCII digits (0 – 9). Range: 000 – 999
Batch Size	94 – 95	07
	96 – 99	This parameter gives the total number of tightening in the batch. The batch size is four bytes long. Range: 0000 – 9999
Batch counter	100 – 101	08
	102 – 105	This is the batch counter, this information is sent with each tightening result. The batch counter number is four bytes long and is specified by four ASCII digits (0 – 9). Range: 0000 – 9999
Tightening Status	106 – 107	09

Parameter	Bytes	Comment
	108	The tightening status is one byte long and is specified by one ASCII digit (0 – 5). 0 = Tightening NOK 1 = Tightening OK 2 = Loosening 3 = Rehit 4 = Lost trigger 5 = Torque less than target
Torque status	109 – 110	10
	111	0 = Low 1 = OK 2 = High
Angle status	112 – 113	11
	114	0 = Low 1 = OK 2 = High
Torque Min limit	115 – 116	12
	117 – 122	The torque min limit is sent with each tightening result. The torque min limit is multiplied by 100 and sent as an integer (2 decimal struncated). The torque min limit is six bytes long and is specified by seven ASCII digits (0 – 9).
Torque Max limit	123 – 124	13
	125 – 130	The torque max limit is sent with each tightening result. The torque max limit is multiplied by 100 and sent as an integer (2 decimal struncated). The torque max limit is six byte long and is specified by six ASCII digits (0 – 9).
Torque final target	131 – 132	14
	133 – 138	The torque final target is sent with each tightening result. The torque final target is multiplied by 100 and sent as an integer (2 decimal struncated). The torque final target is six bytes long and is specified by six ASCII digits (0 – 9).
Torque	139 – 140	15
	141 – 146	The torque value is sent with each tightening result. The torque is multiplied by 100 and sent as an integer (2 decimal struncated). The torque is six bytes long and is specified by six ASCII digits (0 – 9).
Angle Min	147 – 148	16
	149 – 153	The angle min value in degree is sent with each tightening result, each turn represents 360 degree. The angle min value has a specified range between 0 and 99999. The angle min value is five byte long and is specified by five ASCII digits (0 – 9). Range: 0 – 99999
Angle Max	154 – 155	17
	156 – 160	The angle max value in degree is sent with each tightening result, each turn represents 360 degree. The angle max value has a specified range between 0 and 99999. The angle max value is five bytes long and is specified by five ASCII digits (0 – 9).
Final AngleTarget	161 – 162	18
	163 – 167	The target angle value in degree is sent with each tightening result, each turn represents 360 degree. The target angle has a specified range between 0 and 99999. The target angle is five byte long and is specified by five ASCII digits (0 – 9). Range: 0 – 99999
Angle	168 – 169	19

Parameter	Bytes	Comment
	170 – 174	The turning angle value in degree is sent with each tightening result, each turn represents 360 degree. The turning angle has a specified range between 0 and 99999. The turning angle is five bytes long and is specified by five ASCII digits (0 – 9). Range: 0 – 99999
Time stamp	175 – 176	20
	177 – 195	Time stamp for each tightening sent to the integrator. The time stamp is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
Date/time of last change in Pset settings	196 – 197	21
	198 – 217	Time stamp for for the last change in the current pset settings. The time stamp is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
Batch status	218 – 219	22
	220	The batch status is specified by one ASCII character. 0 = Batch NOK (batch not completed)/ 1 = Batch OK 2 = Batch not used
Tightening Id	221 – 222	23
	223 – 232	The tightening Id is a unique Id for each tightening result. The tightening Id is incremented after each rundown. 10 ASCII digits, max 4294967295.

Tab. 2-102: Data field FEP (MID 0061)

Apex Tightening Error Bit Codes (MID 0061)

Open Protocol Tightening Error Bits	Apex Error
Bit 1 - Rundown angle max shut off	- NA -
Bit 2 - Rundown angle min shut off	- NA -
Bit 3 - Torque max shut off	MD>
Bit 4 - Angle max shut off	ANG>
Bit 5 - Selftap torque max shut off	MBO
Bit 6 - Selftap torque min shut off	MBU
Bit 7 - Prevail torque max shut off	P1M>, P2M>, or MBO>
Bit 8 - Prevail torque min shut off	MBU<, P2M<
Bit 9 - Prevail torque compensate overflow	ME>, MST>
Bit 10 - Current monitoring max shut off	IRED
Bit 11 - Post view torque min torque shut off	MBU
Bit 12 - Post view torque max torque shut off	MBO
Bit 13 - Post view torque Angle too small	AW<
Bit 14 - Trigger lost	SA
Bit 15 - Torque less than target	TQ<
Bit 16 - Tool hot	- NA -
Bit 17 - Multistage abort	ABBR or target stage = results target stage or ABL
Bit 18 - Rehit	BLOC
Bit 19 - DS measure failed	- NA -
Bit 20 - Current limit reached	IP

Open Protocol Tightening Error Bits	Apex Error
Bit 21 - EndTime out shutoff	TMS>
Bit 22 - Remove fastener limit exceeded	- NA -
Bit 23 - Disable drive	FLT
Bit 24 - Transducer lost	- NA -
Bit 25 - Transducer shorted	- NA -
Bit 26 - Transducer corrupt	- NA -
Bit 27 - Sync timeout	- NA -
Bit 28 - Dynamic current monitoring min	- NA -
Bit 29 - Dynamic current monitoring max	- NA -
Bit 30 - Angle max monitor	- NA -
Bit 31 - Yield nut off	NBBR, NECK
Bit 32 - Yield too few samples	AW<

2.7.3 Last tightening result data acknowledge (MID 0062)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-103: Last tightening result data acknowledge (MID 0062)

This message acknowledges the last tightening result data.

Possible answer: None
Sent by: Integrator

2.7.4 Last tightening result data unsubscribe (MID 0063)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-104: Last tightening result data unsubscribe (MID 0063)

This message resets the subscription for the barcode (VIN) received by the controller.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): “VIN upload subscription does not exist”

Sent by: Integrator

2.7.5 Old tightening result upload request (MID 0064)

Header	Data Field	Message End
20 bytes	10 bytes	NUL (ASCII 0x0)

Tab. 2-105: Old tightening result upload request (MID 0064)

This message is a request to upload a special rundown result from the controller. The result wanted is specified by its unique Id (tightening Id). This message can be useful after a failure of the network in order to retrieve the missing result during the communication interruption (the integrator can see the missing results by always comparing the last tightening Ids of the two last received rundowns packets (parameter 23 in the result message).

Requesting tightening ID zero is the same as requesting the latest rundown performed.

Possible answers:
- Old tightening result reply (MID 0065)
- Command error (MID 0004): “Tightening Id requested not found” or “MID revision not supported”

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Tightening ID	21 – 30	10 ASCII digits, max 4294967295.

Tab. 2-106: Data field revision 1 (MID 0064)

2.7.6 Old tightening result reply (MID 0065)

Header	Data Field	Message End
20 bytes	See revisions	NUL (ASCII 0x0)

Tab. 2-107: Old tightening result reply (MID 0065)

This message uploads old rundown results.

Possible answer: None
Sent by: Controller

Example

```
00000000   30 32 33 33 30 30 36 35 30 30 33 30 30 30 30 30   0233006500300000
00000010   30 30 30 30 30 31 30 31 31 31 31 35 38 36 33 32   0000010111158632
00000020   30 32 20 20 20 20 20 20 20 20 20 20 20 20 20 20   02
00000030   20 20 20 20 20 20 20 20 20 20 20 30 33 30 31 35              03015
00000040   4F 30 34 30 30 31 30 35 30 36 30 36 30 30 30 33   O040010506060003
00000050   32 30 37 30 30 30 35 30 38 30 30 30 32 30 39 30   2070005080002090
00000060   31 30 32 31 31 31 31 32 31 31 33 31 31 34 30 31   1021111211311401
00000070   35 31 31 36 32 31 37 31 31 38 30 30 30 30 30 30   5116217118000000
00000080   30 30 30 31 31 39 30 30 30 32 30 30 32 30 30 30   0001190002002000
00000090   30 30 31 32 31 30 30 31 39 30 32 32 30 30 32 32   0012100190220022
000000A0   33 30 30 30 38 30 30 32 34 30 30 31 30 30 30 32   3000800240010002
000000B0   35 30 30 34 35 36 32 36 30 30 30 30 31 32 37 54   5004562600001 27T
000000C0   6F 6F 6C 31 00 00 00 00 00 00 00 00 00 32 38 32   oo11.........282
000000D0   30 32 31 2D 31 31 2D 30 37 3A 31 36 3A 30 31 3A   021-11-07:16:01:
000000E0   35 33 32 39 31 33 30 30 31 00                     532913001.
```

Open Protocol implementation

Revision 1

Parameter	Bytes	Comment
Tightening ID	21 – 22	01
	23 – 32	The tightening ID is a unique ID for each tightening result. It is incremented after each tightening. 10 ASCII digits, max 4294967295
VIN Number	33 – 34	02
	35 – 59	The VIN number is 25 bytes long and is specified by 25 ASCII characters.
Application ID	60 – 61	03
	62 – 64	The Application ID is three bytes long and specified by three ASCII digits. Range: 000 – 999
Batch counter	65 – 66	04

Parameter	Bytes	Comment
	67 – 70	The batch counter information is four bytes long and specified by four ASCII digits. Range: 0000-9999.
Tightening Status	71 – 72	05
	73	The tightening status is one byte long and specified by one ASCII digit. 0 = Tightening NOK 1 = Tightening OK
Torque status	74 – 75	06
	76	0 = Low 1 = OK 2 = High
Angle status	77 – 78	07
	79	0 = Low 1 = OK 2 = High
Torque	80 – 81	08
	82 – 87	The torque value is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Angle	88 – 89	09
	90 – 94	The turning angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Time stamp	95 – 96	10
	97 – 115	Time stamp for the tightening. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
Batch status	116 – 117	11
	118	The batch status is specified by one ASCII character. 0 = Batch NOK (batch not completed) 1 = Batch OK 2 = Batch not used

Tab. 2-108: Data field revision 1 (MID 0065)

Revision 2

Parameter	Bytes	Comment
Tightening ID	21 – 22	01
	23 – 32	The tightening ID is a unique ID for each tightening result. It is incremented after each tightening. 10 ASCII digits, max 4294967295
VIN Number	33 – 34	02
	35 – 59	The VIN number is 25 bytes long and is specified by 25 ASCII characters.
Linking Group ID	60 – 61	03
	62 – 65	The Linking Group ID is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Application ID	66 – 67	04
	68 – 70	The Application ID (Application ID) is three bytes long and specified by three ASCII digits. Range: 000 – 999
Strategy	71 – 72	05

Parameter	Bytes	Comment
	73 – 74	The strategy currently runs by the controller. It is two bytes long and specified by two ASCII digits. Range: 00 – 99 Supported: 01 = Torque Control 02 = Torque Control/Angle Mon 04 = Angle Control/Torque Mon 07 = Reverse Angle 11 = Torque Control/Angle Control (OR) 13 = Home Position 99 = No Strategy
Strategy options	75 – 76	06
	77 – 81	Five bytes long bit field Supported: Bit 0 = Torque Bit 1 = Angle Bit 2 = Batch
Batch size	82 – 83	07
	84 – 87	This parameter gives the total number of tightening in the batch. The batch size is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Batch counter	88 – 89	08
	90 – 93	The batch counter information is four bytes long specifying and specified by four ASCII digits. Range: 0000 – 9999
Tightening Status	94 – 95	09
	96	The tightening status is one byte long and is specified by one ASCII digit. 0 = Tightening NOK 1 = Tightening OK
Batch status	97 – 98	10
	99	The batch status is specified by one ASCII character. 0 = Batch NOK (batch not completed) 1 = Batch OK 2 = Batch not used
Torque status	100 – 101	11
	102	0 = Low 1 = OK 2 = High
Angle status	103 – 104	12
	105	0 = Low 1 = OK 2 = High
Rundown angle status	106 – 107	13
	108	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Current Monitoring Status	109 – 110	14
	111	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Selftap status	112 – 113	15
	114	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
	115 – 116	16

Parameter	Bytes	Comment
Prevail Torque monitoring status	117	~~0 = Low, 1 = OK, 2 = High~~ Not Supported (default: 1)
Prevail Torque compensate Status	118 – 119	17
	120	~~0=Low, 1=OK, 2=High~~ Not Supported (default: 1)
Tightening error status	121 – 122	18
	123 – 132	Ten bytes long bit field. Tightening error bits show what went wrong with the tightening. Supported: Bit 3 = Torque max shut off Bit 4 = Angle max shut off Bit 15 = Torque less than target
Torque	133 – 134	19
	135 – 140	The torque value is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Angle	141 – 142	20
	143 – 147	The turning angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999.
Rundown angle	148 – 149	21
	150 – 154	~~The tightening angle value reached in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999.~~ Not Supported (default: 0)
Current Monitoring Value	155 – 156	22
	157 – 159	~~The current monitoring value in percent is three bytes long and is specified by three ASCII digits. Range: 000 – 999.~~ Not Supported (default: 0)
Selftap torque	160 – 161	23
	162 – 167	~~The selftap torque is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and specified by six ASCIIdigits.~~ Not Supported (default: 0)
Prevail torque	169 – 169	24
	170 – 175	~~The prevail torque value is multiplied by 100 and sent as an integer (2 decimals truncated). The prevail torque is six bytes long and is specified by six ASCII digits.~~ Not Supported (default: 0)
Linking Group sequence number	176 – 177	25
	178 – 182	~~The Linking Group sequence number is unique for each Linking Group. All tightenings performed in the same Linking Group are stamped with the same Linking Group sequence number. It is specified by five ASCII digits. Range: 00000 – 65535.~~ Not Supported (default: 0)
Sync tightening ID	183 – 184	26
	185 – 189	~~The sync tightening ID is a unique ID for each sync tightening result.~~ ~~Each individual result of each spindle is stamped with this ID.~~ ~~The tightening ID is incremented after each sync tightening. It is specified by five ASCII digits. Range: 00000 – 65535~~. Not Supported (default: 0)
Tool serial number	190 – 191	27

Parameter	Bytes	Comment
	192 – 205	The Tool serial number is specified by 14 ASCII characters.
Time stamp	206 – 207	28
	208 – 226	Time stamp for the tightening. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).

Tab. 2-109: Data field revision 2 (MID 0065)

Additional revision 3

Parameter	Bytes	Comment
Torque values Unit	227 – 228	29
	229	The unit in which the torque values are sent. The torque values unit is one byte long and is specified by one ASCII digit. 1 = Nm 2 = FtLbs 3 = Lbs
Result type	230 – 231	30
	232 – 233	The result type is two bytes long and specified by two ASCII digits. Supported: 01 = Tightening 02 = Loosening

Tab. 2-110: Data field additional revision 3 (MID 0065)

Additional revision 4

Parameter	Bytes	Comment
Identifier result part 2	234 – 235	31
	236 – 260	The identifier result part 2 is 25 bytes long and is specified by 25 ASCII characters.
Identifier result part 3	261 – 262	32
	263 – 287	The identifier result part 2 is 25 bytes long and is specified by 25 ASCII characters.
Identifier result part 4	288 – 289	33
	290 – 314	The identifier result part 2 is 25 bytes long and is specified by 25 ASCII characters.

Tab. 2-111: Data field additional revision 4 (MID 0065)

Additional revision 5

Parameter	Bytes	Comment
Customer Tightening Error Code	315 – 316	34
	317 – 320	Not Supported (default: 0)

Tab. 2-112: Data field additional revision 5 (MID 0065)

Additional revision 6

Parameter	Bytes	Comment
Prevail Torque Compensate Value	321 – 322	35
	323 – 328	Not Supported (default: 0)
Tightening Error Status 2	329 – 330	36
	331 – 340	Not Supported (default: 0)

Tab. 2-113: Data field additional revision 6 (MID 0065)

Revision 500

For the data field revision 500 *see Tab. 2-98: Trace Graph revision 500 (MID 0061), page 58*.

FEP implementation

Parameter	Bytes	Comment
Tightening ID	21 – 22	01
	23 – 32	The tightening ID is a unique ID for each tightening result. It is incremented after each tightening. 10 ASCII digits, max 4294967295
VIN Number	33 – 34	02
	35 – 59	The VIN number is 25 bytes long and is specified by 25 ASCII characters.
Application ID	60 – 61	03
	62 – 64	The Application ID is three bytes long and specified by three ASCII digits. Range: 000 – 999
Batch counter	65 – 66	04
	67 – 70	The batch counter information is four bytes long and specified by four ASCII digits. Range: 0000 – 9999.
Tightening Status	71 – 72	05
	73	The tightening status is one byte long and specified by one ASCII digit. 0 = Tightening NOK 1 = Tightening OK
Torque status	74 – 75	06
	76	0 = Low 1 = OK 2 = High
Angle status	77 – 78	07
	79	0 = Low 1 = OK 2 = High
Torque	80 – 81	08
	82 – 87	The torque value is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Angle	88 – 89	09
	90 – 94	The turning angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999.
Time stamp	95 – 96	10
	97 – 115	Time stamp for the tightening. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
Batch status	116 – 117	11
	118	The batch status is specified by one ASCII character. 0 = Batch NOK (batch not completed) 1 = Batch OK 2 = Batch not used

Tab. 2-114: Data field FEP (MID 0065)

2.8 Alarm Messages

2.8.1 Alarm subscribe (MID 0070)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-115: Alarm subscribe (MID 0070)

This message is a subscription for the alarm that can pop up on the controller.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Alarm subscription already exists"

Sent by: Integrator

2.8.2 Alarm upload reply (MID 0071)

Header	Data Field	Message End
20 bytes	33 bytes	NUL (ASCII 0x0)

Tab. 2-116: Alarm Upload reply (MID 0071)

This message replies the alarm upload.

Possible answer: None
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
Error code	21 – 22	01
	23 – 26	The error code is specified by 4 ASCII characters / The error code begins with E and is followed by three digits. Example E851 Apex Error Codes (See Appendix)
Controller ready status	27 – 28	02
	29	~~Controller ready status 1=OK, 0=NOK~~ Not Supported (default: 1)
Tool ready status	30 – 31	03
	32	Tool ready status: 0 = NOK 1 = OK
Time	33 – 34	04
	35 – 53	Time of the alarm. YYYY-MM-DD:HH:MM:SS

Tab. 2-117: Data field revision 1 (MID 0071)

2.8.3 Alarm upload acknowledge (MID 0072)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-118: Alarm upload acknowledge (MID 0072)

This message acknowledges the alarm data acknowledge.

Possible answer: None
Sent by: Integrator

2.8.4 Alarm unsubscribe (MID 0073)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-119: Alarm unsubscribe (MID 0073)

This message resets the subscription for the alarm on the controller.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): “Alarm subscription does not exist”

Sent by: Integrator

2.8.5 Alarm acknowledged on controller (MID 0074)

Header	Data Field	Message End
20 bytes	4 bytes	NUL (ASCII 0x0)

Tab. 2-120: Alarm acknowledged on controller (MID 0074)

This message is sent by the controller to inform the integrator that the current alarm has been acknowledged.

Possible answer: Alarm acknowledged on controller ack (MID 0075)
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
Error codes	21 – 24	Four ASCII characters.

Tab. 2-121: Data field revision 1 (MID 0074)

2.8.6 Alarm acknowledged on controller ack (MID 0075)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-122: Alarm acknowledged on controller ack (MID 0075)

Alarm acknowledged on controller acknowledgment.

Possible answer: None
Sent by: Integrator

2.8.7 Alarm status (MID 0076)

Header	Data Field	Message End
20 bytes	36 bytes	NUL (ASCII 0x0)

Tab. 2-123: Alarm status (MID 0076)

This message sends the alarm status after the subscription for the controller alarm has been accepted.

The aim of the alarm status is to eventually inform the integrator that an alarm is currently active on the controller at connection.

Possible answer: Alarm status acknowledge (MID 0077)
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
Alarm Status	21 – 22	01
	23	0 = No alarm is active 1 = An alarm is currently active
Error code	24 – 25	02
	26 – 29	The error code is specified by 4 ASCII characters. The error code begins with E and is followed by three digits. Example E851 Apex Error Codes (see appendix)
Controller ready status	30 – 31	03
	32	~~Controller ready status 1=OK, 0=NOK~~ Not Supported (default: 1)
Tool ready status	33 – 34	04
	35	Tool ready status: 0 = NOK 1 = OK
Time	36 – 37	05
	38 – 56	YYYY-MM-DD:HH:MM:SS

Tab. 2-124: Data field revision 1 (MID 0076)

2.8.8 Alarm status acknowledge (MID 0077)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-125: Alarm status acknowledge (MID 0077)

This message acknowledges the *Alarm status (MID 0076)*.

Possible answer: None
Sent by: Integrator

2.9 Time Messages

2.9.1 Read time upload request (MID 0080)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-126: Read time upload request (MID 0080)

This message reads the time request.

Possible answer: Time upload reply (MID 0081)
Sent by: Integrator

2.9.2 Time upload reply (MID 0081)

Header	Data Field	Message End
20 bytes	19 bytes	NUL (ASCII 0x0)

Tab. 2-127: Time upload reply (MID 0081)

This message replies to the time request from the controller (MID 0080).

Possible answer: None
Sent by: Controller

Revision 1

Parameter	Bytes	ID/Comment
Time	21 – 39	19 ASCII characters: YYYY-MM-DD:HH:MM:SS

Tab. 2-128: Data field revision 1 (MID 0081)

2.9.3 Set Time in Controller (MID 0082)

Header	Data Field	Message End
20 bytes	19 bytes	NUL (ASCII 0x0)

Tab. 2-129: Set Time in Controller (MID 0082)

This message sets the time in the controller.

Possible answer: Command accepted (MID 0005)
Sent by: Integrator

Revision 1

Parameter	Bytes	ID/Comment
Time	21 – 39	19 ASCII characters: YYYY-MM-DD:HH:MM:SS

Tab. 2-130: Data field revision 1 (MID 0082)

2.10 Multi-spindle Status Messages

2.10.1 Multi-spindle status subscribe (MID 0090)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-131: Multi-spindle status subscribe (MID 0090)

This message subscribes to the *Multi-spindle status (MID 0091)*.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Controller is not a sync Master" or "Multispindle status subscription already exists"

Sent by: Integrator

2.10.2 Multi-spindle status (MID 0091)

Header	Data Field	Message End
20 bytes	See revision 1	NUL (ASCII 0x0)

Tab. 2-132: Multi-spindle status (MID 0091)

This message sends the multi-spindle status after each synchronization of the rundown. The status contains the status of each individual spindle and the common status of the multi-spindles.

Possible answer: Multi-spindle status acknowledge (MID 0092)
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
Number of spindles	21 – 22	01
	23 – 24	Number of spindles running in the multiple. The number of spindles is two bytes long and specified by 2 ASCII digits. Range: 02 – 10
Sync tightening ID	25 – 26	02
	27 – 31	The sync tightening ID is a unique ID for each sync tightening result. Each individual result of each spindle is stamped with this ID. The tightening ID is incremented after each sync tightening. 5 ASCII digits. Range: 00000 – 65535
Time stamp	32 – 33	03
	34 – 52	Time stamp. 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
Sync overall status	53 – 54	04
	55	The status of all the spindles. OK if the individual status of each spindle is OK, NOK if at least one spindle status is NOK. One ASCII digit. 0 = NOK 1 = OK
Spindle status	56 – 67	05

Parameter	Bytes	Comment
	58 – (5 × number of spindles	Bytes 1-2: Spindle number in the same order as in the sync list. Range: 01 – 99 Bytes 3-4: Channel ID of the spindle. Range: 01 – 20 Byte 5: Individual overall status of the tightening of each spindle. 0 = NOK, 1 = OK

Tab. 2-133: Data field revision 1 (MID 0091)

2.10.3 Multi-spindle status acknowledge (MID 0092)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-134: Multi-spindle status acknowledge (MID 0092)

This message acknowledges the multiple spindle status (MID 0092).

Possible answer: None
Sent by: Integrator

2.10.4 Multi spindle status unsubscribe (MID 0093)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-135: Multi spindle status unsubscribe (MID 0093)

This message resets the subscription for the multi-spindle status.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Multi spindle status subscription does not exist"

Sent by: Integrator

2.11 Multi-spindle Result Messages

2.11.1 Multi-spindle result subscribe (MID 0100)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-136: Multi-spindle result subscribe (MID 0100)

This message subscribes to the multi-spindle status and result.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Controller is not a sync master/station controller" or "Multi-spindle result subscription already exists"

Sent by: Integrator

2.11.2 Multi-spindle result (MID 0101)

Header	Data Field	Message End
20 bytes	See table below	NUL (ASCII 0x0)

Tab. 2-137: Multi-spindle result (MID 0101)

This message sends the multi-spindle result after each synchronized rundown. The result contains the rundown result (torque and angle) of each individual spindle and the common status of the multi-spindles.

Torque variables transmitted in system configured torque units (Nm, FtLbs, InLbs). For any other configured torque unit is Nm used.

Possible answer: Multi-spindle result acknowledge (MID 0102)
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
Number of spindles	21 – 22	01
	23 – 24	Number of spindles running in the multiple. The number of spindles is two bytes long and specified by 2 ASCII digits. Range: 02 – 10
VIN Number	25 – 26	02
	27 – 51	The VIN number is 25 bytes long and is specified by 25 ASCII characters.
Linking Group ID	52 – 53	03
	54 – 55	The Linking Group ID is two bytes long and specified by two ASCII digits. Range: 00 – 99
Application ID	56 – 57	04
	58 – 60	The Application ID is three bytes long and specified by three ASCII digits. Range: 000 – 999
Batch size	61 – 62	05
	63 – 66	This parameter gives the total number of tightening in the batch. The batch size is four bytes long and specified by four ASCII digits. Range: 0000 – 9999
Batch counter	67 – 68	06
	69 – 72	The batch counter information is four bytes long specifying and specified by four ASCII digits. Range: 0000 – 9999.

Parameter	Bytes	Comment
Batch status	73 – 74	07
	75	The batch status is specified by one ASCII character. 0 = batch NOK (batch not completed) 1 = Batch OK 2 = Batch not used
Torque Min limit	76 – 77	08
	78 – 83	The torque min limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Torque Max limit	84 – 85	09
	86 – 91	The torque max limit is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Torque final target	92 – 93	10
	94 – 99	The torque final target is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Angle Min	100 – 101	11
	102 – 106	The angle min value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Angle Max	107 – 108	12
	109 – 113	The angle max value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Final Angle Target	114 – 115	13
	116 – 120	The target angle value in degrees. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999
Date/time of last change in parameter set settings	121 – 122	14
	123 – 141	~~Time stamp for the last change in the current parameter set settings. It is 19 bytes long and is specified by 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).~~ Date of any settings change to controller (one date for all apps)
Time stamp	142 – 143	15
	144 – 162	Time stamp. 19 ASCII characters (YYYY-MM-DD:HH:MM:SS).
Sync tightening ID	163 – 164	16
	165 – 169	The sync tightening ID is a unique ID for each sync tightening result. Each individual result of each spindle is stamped with this ID. The tightening ID is incremented after each sync tightening. 5 ASCII digits. Range: 00000 – 65535
Sync overall status	170 – 171	17
	172	The status of all the spindles. OK if the individual status of each spindle is OK, NOK if at least one spindle status is NOK. One ASCII digit: 0 = NOK 1 = OK
Spindle status	173 – 174	18

Parameter	Bytes	Comment	
	175 – (175 + 18 × number of spindles)	Bytes 1-2:	Spindle number in the same order as in the sync list. Range: 01 – 99
		Bytes 3-4:	Channel ID of the spindle. Range: 01 – 20
		Byte 5:	Individual overall status of the tightening of each spindle. 0 = NOK, 1 = OK
		Byte 6:	Individual torque status of each spindle. 0 = NOK, 1 = OK
		Byte 7-12:	The torque result of each spindle. The torque is multiplied by 100 and sent as an integer (2 decimals truncated). It is six bytes long and specified by six ASCII digits.
		Byte 13:	Individual angle status of each spindle. 0 = NOK, 1 = OK
		Byte 14-18:	The turning angle value in degrees for each spindle. Each turn represents 360 degrees. It is five bytes long and specified by five ASCII digits. Range: 00000 – 99999

Tab. 2-138: Data field revision (MID 0101)

2.11.3 Multi-spindle result acknowledge (MID 0102)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-139: Multi-spindle result acknowledge (MID 0102)

This message acknowledges the results of the multi-spindles.

Possible answers: None
Sent by: Integrator

2.11.4 Multi-spindle result unsubscribe (MID 0103)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-140: Multi-spindle result unsubscribe (MID 0103)

This message resets the subscription for the multi-spindle result.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Multi spindle result subscription does not exist"

Sent by: Integrator

2.12 Additional Linking Group Messages

2.12.1 Abort Linking Group (MID 0127)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-141: Abort Linking Group (MID 0127)

This message aborts the current Linking Group if one exists.

Possible answers: Command accepted (MID 0005)
Sent by: Integrator

2.12.2 Linking Group batch increment (MID 0128)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-142: Linking Group batch increment (MID 0128)

This message increases the Linking Group batch if there exists a current running Linking Group.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Tool currently in use"

Sent by: Integrator

2.12.3 Linking Group batch decrement (MID 0129)

Header	Data Field	Message End
20 bytes	9 bytes	NUL (ASCII 0x0)

Tab. 2-143: Linking Group batch decrement (MID 0129)

This message decreases the Linking Group batch if there exists a current running Linking Group.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Tool currently in use" or "Linking Group batch decrement failed"

Sent by: Integrator

Revision 1

The revision 1 (default revision) does not contain any data and always decrements the last rundown completed in a Linking Group.

Revision 2

Parameter	Bytes	Comment
Channel ID	21 – 22	01
	23 – 24	The channel ID to be decremented. In case of a Linking Group each controller member has a unique channel ID.
Application ID	25 – 26	02
	27 – 29	The Application ID to be decremented in the Linking Group.

Tab. 2-144: Data field revision 2 (MID 0129)

2.12.4 Linking Group off (MID 0130)

Header	Data Field	Message End
20 bytes	1 byte	NUL (ASCII 0x0)

Tab. 2-145: Linking Group off (MID 0130)

Possible answers:

- Command accepted (MID 0005)
- Command Error (MID 0004): "Linking Group batch decrement failed"

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Linking Group Status	21	Job off status is one byte long and specified by one ASCII digit: 0 = Set Job off 1 = Reset Job off

Tab. 2-146: Data field revision 1 (MID 0130)

2.13 VIN Messages

2.13.1 Vehicle Id Number download request (MID 0150)

Header	Data Field	Message End
20 bytes	100	NUL (ASCII 0x0)

Tab. 2-147: Vehicle Id Number download request (MID 0150)

This message is used by the station computer to send an identifier to the controller.

Possible answers:
- Command accepted (MID 0005)
- Command Error (MID 0004): "Identifier input source not granted"

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Identifier data	21 – max 120	Max 100 ASCII characters.

Tab. 2-148: Data field revision 1 (MID 0150)

2.13.2 Vehicle Id Number and result parts subscribe (MID 0151)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-149: Application number upload request (MID 0151)

This message subscribes the work order status, vehicle Id number (VIN) and result parts. The controller receives the VIN via input sources – e.g. scanner, Ethernet, serial or fieldbus.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Multiple identifiers work order subscription already exist"

Sent by: Integrator

2.13.3 Vehicle Id Number and result parts (MID 0152)

Header	Data Field	Message End
20 bytes	128	NUL (ASCII 0x0)

Tab. 2-150: Vehicle Id Number and result parts (MID 0152)

This message is sent by the controller and contains the work order status, the vehicle Id number (VIN) and result parts. The identifier is used to transmit the status of up to four result parts.

Possible answers: Vehicle Id Number and result parts acknowledge (MID 0153)
Sent by: Controller

Revision 1

Parameter	Bytes	Comment
	21 – 22	01

Parameter	Bytes	Comment
First identifier status	23 – 52	Byte 1: Identifier type number: Range 1 – 4 Byte 2 – 3: Included in work order: 0 = No 1 = Yes Byte 4 – 5: Status in work order: 0 = Not accepted 1 = Accepted 2 = Bypassed 3 = Reset 4 = Next 5 = Initial Byte 6 – 30: Result part 1
Second identifier status	53 – 54	02
	55 – 84	Byte 1: Identifier type number: Range 1 – 4 Byte 2 – 3: Included in work order: 0 = No 1 = Yes Byte 4 – 5: Status in work order: 0 = Not accepted 1 = Accepted 2 = Bypassed 3 = Reset 4 = Next 5 = Initial Byte 6 – 30: Result part 2
Third identifier status	85 – 86	03
	87 – 116	Byte 1: Identifier type number: Range 1 – 4 Byte 2 – 3: Included in work order: 0 = No 1 = Yes Byte 4 – 5: Status in work order: 0 = Not accepted 1 = Accepted 2 = Bypassed 3 = Reset 4 = Next 5 = Initial Byte 6 – 30: Result part 3
	117 – 118	04

Parameter	Bytes	Comment
Fourth identifier status	119 – 148	Byte 1: Identifier type number: Range 1 – 4 Byte 2 – 3: Included in work order: 0 = No 1 = Yes Byte 4 – 5: Status in work order: 0 = Not accepted 1 = Accepted 2 = Bypassed 3 = Reset 4 = Next 5 = Initial Byte 6 – 30: Result part 4

Tab. 2-151: Data field revision 1 (MID 0152)

2.13.4 Vehicle Id Number and result parts acknowledge (MID 0153)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-152: Vehicle Id Number and result parts acknowledge (MID 0153)

This message acknowledge the Vehicle Id Number and result parts upload.

Possible answers: None
Sent by: Integrator

2.13.5 Vehicle Id Number and result parts unsubscribe (MID 0154)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-153: Vehicle Id Number and result parts unsubscribe (MID 0154)

This message resets the subscription of the Vehicle Id Number and result parts.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Multiple identifiers work order subscription does not exist"

Sent by: Integrator

2.14 IO Messages

2.14.1 Set externally controlled relays (MID 0200)

Header	Data Field	Message End
20 bytes	10 bytes	NUL (ASCII 0x0)

Tab. 2-154: Set externally controlled relays (MID 0200)

With this message the station computer can control 10 relays (externally controlled relays). The relays can be set, reset or flash.

Possible answer: Command accepted (MID 0005)
Sent by: Integrator

Example

```
00000000   30 30 33 30 30 32 30 30 30 30 31 31 30 30 30 30   0030020000110000
00000010   20 20 20 20 33 33 33 33 33 33 33 33 33 33 00          3333333333.
```

Revision 1

Parameter	Bytes	Comment
Status relay 1	21	Set the status for relay 1. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing
Status relay 2	22	Set the status for relay 2. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing
Status relay 3	23	Set the status for relay 3. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing
Status relay 4	24	Set the status for relay 4. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing
Status relay 5	25	Set the status for relay 5. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing
Status relay 6	26	Set the status for relay 6. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing
Status relay 7	27	Set the status for relay 7. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing
Status relay 8	28	Set the status for relay 8. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing
Status relay 9	29	Set the status for relay 9. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing
Status relay 10	30	Set the status for relay 10. The relay status is one byte long and specified by 1 ASCII digit. Range: 0 – 3 0 = Off (reset), 1 = On (set, fast), 2 = Flashing

Tab. 2-155: Data field revision 1 (MID 0200)

2.14.2 Status externally monitored inputs subscribe (MID 0210)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-156: Status externally monitored inputs subscribe (MID 0210)

With this message, the station computer subscribes to the status monitoring of the eight externally monitored digital inputs. In this way, the stations computer receives a message every time the status of at least one of the inputs has changed.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): "Status externally monitored inputs subscription already exists"

Sent by: Integrator

2.14.3 Status externally monitored inputs (MID 0211)

Header	Data Field	Message End
20 bytes	8 bytes	NUL (ASCII 0x0)

Tab. 2-157: Status externally monitored inputs (MID 0211)

This message sends the status of the eight monitored digital inputs. Each time the status of at least one input changes, this message is sent.

Possible answer: Status externally monitored inputs acknowledge (MID 0212)
Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Status DIG/IN 1	21	The DIG/IN status is one byte long and specified by 1 ASCII digits. Range: 0 – 1 0 = Off 1 = On
Status DIG/IN 2	22	
Status DIG/IN 3	23	
Status DIG/IN 4	24	
Status DIG/IN 5	25	
Status DIG/IN 6	26	
Status DIG/IN 7	27	
Status DIG/IN 8	28	

Tab. 2-158: Data field revision 1 (MID 0211)

2.14.4 Status externally monitored inputs acknowledge (MID 0212)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-159: Status externally monitored inputs acknowledge (MID 0212)

This message acknowledges the status of the externally monitored inputs (MID 0211).

Possible answer: None
Sent by: Integrator

2.14.5 Status externally monitored inputs unsubscribe (MID 0213)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-160: Status externally monitored inputs unsubscribe (MID 0213)

This message resets the subscription for the externally monitored inputs.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Status externally monitored inputs subscription does not exist"

Sent by: Integrator

2.14.6 IO device status request (MID 0214)

Header	Data Field	Message End
20 bytes	2 bytes	NUL (ASCII 0x0)

Tab. 2-161: IO device status request (MID 0214)

This message requests the status of the relays and digital inputs on a device, e.g., an I/O expander. The device is specified by a device number (see table MID 0215).

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Faulty IO device ID" or "IO device not connected"

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Status relay 1	21 – 22	Two ASCII characters. Range: 00 – 15 00 = Internal device 01 – 15 = I/O expanders

Tab. 2-162: Data field revision 1 (MID 0214)

2.14.7 IO device status reply (MID 0215)

Header	Data Field	Message End
20 bytes	72 – depend on number of relays bytes	NUL (ASCII 0x0)

Tab. 2-163: IO device status reply (MID 0215)

This message answers to MID 0214. Relay and Input lists map to the physical IO (pins) on selected devices.

Possible answer: None
Sent by: Controller

Revision 1

Revision 1 should only be used to get the status of IO devices with max eight relays/digital inputs.

Parameter	Bytes	Comment
IO device ID	21 – 22	01

Parameter	Bytes	Comment
	23 – 24	The IO device ID specified with two ASCII characters. Range: 00 – 99. Supported Devices and associated addresses: Primary: 0 IO expansion Bridge: 1 – 32 (Arcnet Address: 101 – 132) Secondary: 50 – 65 (Arcnet Address: 1 – 16)
Relay list	25 – 26	02
	27 – 58	A list of 8 relays for the current device ID. Each relay is specified by four bytes. Byte 1 – 3: Digital input number, three ASCII characters. Range: 000 – 999 Byte 4: Relay status specified by one ASCII character; 0 = reset, 1 = set.
Digital Input list	59 – 60	03
	61 – 92	A list of 8 digital inputs for the current device ID. Each digital input is specified by four bytes. Byte 1 – 3: Digital input number, three ASCII characters. Range: 000 – 999 Byte 4: Digital input status specified by one ASCII character. 0 = low, 1 = high

Tab. 2-164: Data field revision 1 (MID 0215)

Revision 2

With revision 2 the status of IO devices with up to 32 relays/digital inputs can be retrieved. Both the relay and digital input lists will transmit a static list of 32 IO, with 0s for unused IO.

Parameter	Bytes	Comment
IO device ID	21 – 22	01
	23 – 24	The IO device number specified with two ASCII characters. Range: 00 – 99. Supported Devices and associated addresses: Primary: 0 IO expansion Bridge: 1 – 32 (Arcnet Address: 101 – 132) Secondary: 50 – 65 (Arcnet Address: 1 – 16)
Number of relays	25 – 26	02
	27 – 28	Number of relays present on the I/O-device (always: 32).
Relay list	29 – 30	03
	31 – X[1]	A list of relays for the current device ID. Each relay is specified by four bytes. Byte 1 – 3: Relay number, three ASCII characters. Range: 000 – 999 Byte 4: Relay status specified by one ASCII character. 0 = reset, 1 = set

[1] X = 31 + 4 × Number of relays present

Parameter	Bytes	Comment
Number of Inputs	(X + 1) – (X + 2)	04
	(X + 3) – (X + 4)	Number of Digital Inputs present on the I/O-device (always: 32).
Digital Input list	(X + 5) – (X + 6)	05
	(X + 7) – Y[1]	A list of digital inputs for the current device ID. Each digital input is specified by four bytes. Byte 1 – 3: Digital input number, three ASCII characters. Range: 000 – 999 Byte 4: Digital input status specified by one ASCII character. 0 = low, 1 = high

Tab. 2-165: Data field revision 2 (MID 0215)

Relay number (MID 0215)

Relay Number	Relay Function	Tracking Event
0	OFF	
1	OK	
2	NOK	
5	LOW TORQUE	
6	HIGH TORQUE	
7	LOW ANGLE	
8	HIGH ANGLE	
9	CYCLE COMPLETE	
12	LINKING GROUP OK	Yes
13	LINKING GROUP NOK	Yes
20	TOOL START	Yes
21	DIR SWITCH CW	Yes
22	DIR SWITCH CCW	Yes
26	TOOL RUNNING (Supported up from V 1.4.9)	Yes
93	OPEN PROTOCOL -> OUT 1	
94	OPEN PROTOCOL -> OUT 2	
95	OPEN PROTOCOL -> OUT 3	
96	OPEN PROTOCOL -> OUT 4	
97	OPEN PROTOCOL -> OUT 5	
98	OPEN PROTOCOL -> OUT 6	
99	OPEN PROTOCOL -> OUT 7	
100	OPEN PROTOCOL -> OUT 8	
101	OPEN PROTOCOL -> OUT 9	
102	OPEN PROTOCOL -> OUT 10	

Tab. 2-166: Relay number (MID 0215)

[1] Y = X + 8 + 4 × Number of digital inputs present

Input number (MID 0215)

Relay Number	Relay Function
0	OFF
1	RESET LINKING
2	TOOL ENABLE
8	External TOOL START
9	TOOL REVERSE
68	IN -> OPEN PROTOCOL 1
69	IN -> OPEN PROTOCOL 2
70	IN -> OPEN PROTOCOL 3
71	IN -> OPEN PROTOCOL 4
72	IN -> OPEN PROTOCOL 5
73	IN -> OPEN PROTOCOL 6
74	IN -> OPEN PROTOCOL 7
75	IN -> OPEN PROTOCOL 8
86	REJECT RELEASE
127	Tool Trigger

Tab. 2-167: Input number (MID 0215)

2.14.8 Relay function subscribe (MID 0216)

Header	Data Field	Message End
20 bytes	3 bytes	NUL (ASCII 0x0)

Tab. 2-168: Relay function subscribe (MID 0216)

This message subscribes one single relay function. The data field indicates with three ASCII digits the relay number (see table *Relay number (MID 0215)*) and the corresponding relay function. At a subscription of a tracking event, *Relay function (MID 0217)* immediately returns the current relay status to the subscriber.

Relay function subscribe (MID 0216) can only subscribe for one single relay function at a time, but still, Open Protocol supports keeping several relay function subscriptions simultaneously.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): "Relay function subscription already exists"

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Relay function number	21 – 23	Three ASCII digits, see table *Relay number (MID 0215)* and add 0 before the number in the list.

Tab. 2-169: Data field revision 1 (MID 0216)

2.14.9 Relay function (MID 0217)

Header	Data Field	Message End
20 bytes	8 bytes	NUL (ASCII 0x0)

Tab. 2-170: Relay function (MID 0217)

This message uploads one specific relay function status (see table *Relay number (MID 0215)*).

For tracking event functions, *Relay function (MID 0217)* is sent each time the relay status is changed. For relay functions which are not tracking events, the upload is sent only when the relay is set high, i.e., the data field *Relay function status* will always be 1 for such functions.

Possible answer: None
Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Relay no	21 – 22	01
	23 – 25	Three ASCII digits corresponding to a relay function. See table *Relay number (MID 0215)* above and add 0 before the number in the list.
Relay function status	26 – 27	02
	28	One ASCII digit representing the relay function status: 1 = Active 0 = Not active

Tab. 2-171: Data field revision 1 (MID 0217)

2.14.10 Relay function acknowledge (MID 0218)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-172: Relay function acknowledge (MID 0218)

This message acknowledges the message *Relay function upload*.

Possible answer: None
Sent by: Integrator

2.14.11 Relay function unsubscribe (MID 0219)

Header	Data Field	Message End
20 bytes	3 bytes	NUL (ASCII 0x0)

Tab. 2-173: Relay function unsubscribe (MID 0219)

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Relay function subscription does not exist"

Sent by: Integrator

Revision 1

Parameter	Bytes	ID/Comment
Relay function number	21 – 23	Three ASCII digits indicate the relays number which corresponds to the specific relay function.

Tab. 2-174: Data field revision 1 (MID 0219)

2.14.12 Digital input function subscribe (MID 0220)

Header	Data Field	Message End
20 bytes	3 bytes	NUL (ASCII 0x0)

Tab. 2-175: Digital input function subscribe (MID 0220)

This message subscribes one single digital input function. At a subscription of a tracking event, *Digital input function (MID 0221)* upload immediately returns the current digital input function status to the subscriber.

Digital input function subscribe (MID 0220) can only subscribe for one single digital input function at a time, but still, Open Protocol supports keeping several digital input function subscriptions simultaneously.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Digital input function subscription already exists"

Sent by: Integrator

Revision 1

Parameter	Bytes	ID/Comment
Digital input function number	21 – 23	The data field indicates with three ASCII digits the digital input function number (see table *Input number (MID 0215)*).

Tab. 2-176: Data field revision 1 (MID 0220)

2.14.13 Digital input function (MID 0221)

Header	Data Field	Message End
20 bytes	8 bytes	NUL (ASCII 0x0)

Tab. 2-177: Digital input function (MID 0221)

This message uploads the status of one specific input function status, see table *Input number (MID 0215)*.

For tracking event functions, *Digital input function (MID 0221)* is sent each time the digital input function's status (state) is changed. For digital input functions which are not tracking events, the upload is sent only when the digital input function is set high, i.e., the data field *Digital input function status* will always be 1 for such functions.

Possible answer: Digital input function acknowledge (MID 0218)
Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Digital input no	21 – 22	01
	23 – 25	The Three ASCII digits represent a digital input function, see table *Relay number (MID 0215)*.
Digital input function status	26 – 27	02
	28	The ASCII digit indicates the status of the digital input function: 1 = Active 0 = Not active

Tab. 2-178: Data field revision 1 (MID 0221)

2.14.14 Digital input function acknowledge (MID 0222)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-179: Digital input function acknowledge (MID 0222)

This message acknowledges the message *Digital input function* upload.

Possible answer: None
Sent by: Station computer

2.14.15 Digital input function unsubscribe (MID 0223)

Header	Data Field	Message End
20 bytes	3 bytes	NUL (ASCII 0x0)

Tab. 2-180: Digital input function unsubscribe (MID 0223)

This message unsubscribes the single digital input function. The three ASCII digits of the data field indicate the digital input number which corresponds to the specific digital input function.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): "Digital input function subscription does not exist"

Sent by: Integrator

Revision 1

Parameter	Bytes	ID/Comment
Digital input function number	21 – 23	Three ASCII digits, see table *Input number (MID 0215)* and add 0 before the number in the list.

Tab. 2-181: Data field revision 1 (MID 0223)

2.15 Selector Socket Messages

2.15.1 Selector socket info subscribe (MID 0250)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-182: Selector socket info subscribe (MID 0250)

This message subscribes the socket information of all sockets. At the subscription of a socket, *Selector socket info (MID 0251)* immediately returns the current status of each of the sockets to the subscriber.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Selector socket subscription already exists"

Sent by: Integrator

2.15.2 Selector socket info (MID 0251)

Header	Data Field	Message End
20 bytes	See revision 1	NUL (ASCII 0x0)

Tab. 2-183: Selector socket info (MID 0251)

If this message is subscribed, it will be sent every time when socket is lifted or put back.

Possible answer: Selector socket info acknowledge (MID 0252)
Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Device ID	21 – 22	01
	23 – 24	*Device ID* (Device ID of the selector socket) consists of 2 ASCII characters. Range: 00 – 99
Number of sockets	25 – 26	02
	27 – 28	Number of sockets.
Socket status	29 – 30	03
	31 – (31 + 1 × Number of sockets)	0 = Socket not lifted 1 = Socket lifted

Tab. 2-184: Data field revision 1 (MID 0251)

2.15.3 Selector socket info acknowledge (MID 0252)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-185: Selector socket info acknowledge (MID 0252)

This message acknowledges the selector socket info message.

Possible answer: None
Sent by: Integrator

2.15.4 Selector socket info unsubscribe (MID 0253)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-186: Selector socket info unsubscribe (MID 0253)

This message unsubscribes the socket info for all sockets.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Selector socket subscription does not exist"

Sent by: Integrator

2.15.5 Selector Control green light (MID 0254)

The message below only functions correctly using the programmed *EINS_X* and *AUS_X* when the option *Control Socket Tray Outputs using MID 0254* is enabled. Only the green light is supported.

Header	Data Field	Message End
20 bytes	14 bytes	NUL (ASCII 0x0)

Tab. 2-187: Selector Control green light (MID 0254)

Control of selector socket green lights depends on command sent through data field for each position (1 – 8).

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Wrong device ID"

Sent by: Integrator

Example

```
0000   30 30 33 34 30 32 35 34 30 30 31 30 20 20 20 20  00340254 0010
0010   30 30 20 20 30 31 30 30 30 32 30 30 30 30 30 30  00  0100 02000000
0020   30 30 00                                        00.
```

Revision 1

Parameter	Bytes	Comment
Device ID	21 – 22	01
	23 – 24	*Device ID* (Device ID of the selector socket) consists of 2 ASCII characters. Range: 00 – 99
Green light command	25 – 26	02
	27 – 34	For each position: 0 = Off 1 = Steady 2 = Flashing

Tab. 2-188: Data field revision 1 (MID 0254)

2.16 Additional Messages

2.16.1 Lock at batch done setting request (MID 0410)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-189: Lock at batch done setting request (MID 0410)

This message requests the current value of the setting *Lock at batch done*. Together with the setting, the current position within the batch is reported, if applicable.

Possible answers:
- Lock at batch done setting reply (MID 0411)
- Command error (MID 0004)

Sent by: Integrator

2.16.2 Lock at batch done setting reply (MID 0411)

Header	Data Field	Message End
20 bytes	4 bytes	NUL (ASCII 0x0)

Tab. 2-190: Lock at batch done setting reply (MID 0411)

This message provides information about the *Lock at batch done* setting and the current batch position.

Possible answer: None
Sent by: Integrator

Parameter	Bytes	Comment
Lock at Batch Done	21 – 22	00 = Disabled 01 = Enabled
Current Batch Position	23 – 24	Range: 00 – 99

Tab. 2-191: Data field (MID 0411)

2.17 Speed Test Messages

The Speed test messages are special functions. They are only available for an Apex-internal application.

2.17.1 Start speed test (MID 0888)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-192: Start speed test (MID 0888)

This message is used for start speed test.

Possible answers:
- Command accepted (MID 0005)
- Command error (MID 0004): "Calibration failed" or "MID revision unsupported"

Sent by: Controller

2.17.2 Stop speed test (MID 0889)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-193: Stop speed test (MID 0889)

This message is used for stopping the speed test.

Possible answers:
- Speed test result reply (MID 0890)
- Command error (MID 0004): "Programming control not granted", "Calibration failed" or "MID revision unsupported"

Sent by: Integrator

2.17.3 Speed test result reply (MID 0890)

Header	Data Field	Message End
20 bytes	7 bytes	NUL (ASCII 0x0)

Tab. 2-194: Speed test result reply (MID 0890)

This message is used for speed test result.

Possible answers: None
Sent by: Controller

Parameter	Bytes	Comment
Speed Test Result (rpm)	21 – 22	01
	23 – 27	5 ASCII character.

2.18 Tightening curve data message (MID 0900)

Header	Data Field	Message End
20 bytes	See revisions	Last parameter

Tab. 2-195: Tightening curve data message (MID 0900)

This message contains all measured values of a tightening curve.

Possible answers: Command accepted (MID 0005)
Sent by: Controller

Example

```
00000000   30 38 36 32 30 39 30 30 30 30 31 31 20 20 20 20   086209000011
00000010   20 20 20 20 30 30 30 30 30 30 30 32 32 36 32 30       000000022620
00000020   32 32 2D 30 35 2D 31 31 3A 30 37 3A 33 35 3A 35   22-05-11:07:35:5
00000030   36 30 30 30 30 32 30 31 30 30 31 30 30 31 30 32   6000020100100102
00000040   32 31 33 30 31 32 30 33 30 30 30 30 30 30 30 32   2130120300000002
00000050   37 38 2E 34 37 30 32 36 30 39 38 30 30 32 30 30   78.4702609800200
00000060   30 30 31 30 30 30 30 33 30 30 33 30 31 32 30 32   0010000300301202
00000070   30 30 36 30 30 30 30 33 30 30 33 36 30 30 30 33   0060000300360003
00000080   30 31 32 30 32 30 30 34 30 30 33 36 30 30 00 21   01202004003600..
00000090   00 27 00 24 00 2D 00 2F 00 2F 00 3D 00 3D 00 3D   (...)
```

Revision 1

Parameter	Byte length	Comment
Result Data Identifier	10	The Result Data Identifier is a unique ID for each operation result within the system.
Time stamp	19	Time stamp for each operation sent to the control station. The time is 19 byte long and is specified by 19 ASCII characters (YYYY-MMDD:HH:MM:SS)
Number of PID's (parameter data fields)	3	000 = No data field ~~The number of variable data fields in the telegram. If no data fields exist "000" will be sent. The parameters on this level are common for all traces~~, *see chapter 3.2 Parameter ID Number, page 106*.
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 of each Data field is of variable parameter type.~~

~~Parameter~~	~~Byte length~~	~~Comment~~
~~Parameter id (PID)~~	~~5~~	~~The available PID's may vary depending on the system type. (see Parameter ID numbers)~~
~~Length~~	~~3~~	~~Length of data value.~~
~~Data Type~~	~~2~~	~~Data type of the data value. (see Data Type definitions)~~
~~Unit~~	~~3~~	~~Unit of the data.~~
~~Step no.~~	~~4~~	~~The step number for the trace result variable. Sent as 0000 if not relevant (stage Index).~~
~~Data value~~	~~Vary~~	~~The data value.~~

Parameter	Byte length	Comment
CurveType	2	Type of the tightening curve 1 = Angle graph 2 = Torque graph ~~3 = Current graph~~ ~~4 = Gradient graph~~ ~~5 = Stroke graph~~ ~~6 = Force trace~~
Transducer Type	2	To identify the transducer used to produce the trace data for tools with multiple transducers. Sent as an integer value there 1 = transducer 1, 2 = transducer 2 etc.
Unit	3	Unit of trace curve, according to the table Units types (e.g. 001 = Nm etc.).
Number of parameter data fields	3	The number of variable data fields in the telegram. If no data fields exist “000” will be sent.
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 of each Data field is of variable parameter type.
Number of resolution fields	3	The number of different resolutions fields in this telegram. If no data fields exist “000” will be sent.
Resolution fields	Vary	This section is repeated Number of resolution fields. If Number of resolution fields = 000, this section is not sent. This field defines the time interval between two consecutive samples in the trace curve.
Number of trace samples	5	Number of samples in the trace
NUL character	1	To separate text and binary a NUL character (0x00) is sent here.
Trace sample	2	Repeated Number of trace samples times. Each point in the trace is sent as a 2 byte binary value. To calculate the physical values of the torque or angle trace data, it is needed to divide this values by the coefficient ”K”, parameter with PID 02213 in Data fields or bye doing multiplicity if PID 02214 is used.

Parameter	Byte length	Comment
First index	5	The first index in the trace data there this resolution is valid)
Last Index	5	The last index in the trace data there this resolution is valid.
Length	3	Length of the time value.
Data Type	2	Data type of the time value.
Unit	3	Unit of the time value.
Time value	Vary	The time between two consecutive samples.

Tab. 2-196: Data field revision 1 (MID 0900)

2.18.1 Tightening curve data subscribe (MID 0900) via MID 0008

Header	Data Field	Message End
20 bytes	5 bytes	Last parameter

Tab. 2-197: Tightening curve data subscribe (MID 0900) via MID 0008

This message subscribes the tightening curve data. For this MID 0900 is used with MID 0008.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): "Subscription already exists." or "Subscribed MID Revision unsupported." or "Subscription on specific data not supported." or "Invalid data."

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Send alternatives	21	~~Following alternatives are available. One ASCII digit 0=Only new data, 1= Stored data from given index, 2 Stored data from given time stamp, 3 Stored data between two indexes, 4 Stored data between two given time stamps in Unix time (Seconds since 1970-01-01).~~ If = 0 then only the new data generated after the subscription is done is sent to the subscriber. Old unsent data will not be sent to the subscriber. ~~If = 1 the data from given INDEX is sent inclusive the latest stored.~~ ~~If = 2 the data from given time stamp in Unix format is sent inclusive the latest stored.~~ ~~If = 3 the data between two given indexes is sent~~ ~~If = 4 the data between two given time stamps in Unix time is sent~~
Data Identifier Time Stamp type	22 – 40	The identifier is a Time stamp of the requested data. The first data sent will be the first data and inclusive this time stamp and forward up to and inclusive the last one. If the data is not found, rewind will be to oldest possible data. All data from this point up to the newest available will be sent directly on subscribe. If not used filled in with zeroes e.g at alternative 1. At alternative 2 it contains the Time Stamp ex. 2015.10.01:19:01:30.
Data Identifier Index type or unix time type	41 – 50	The Identifier INDEX or the UNIX time (at Alternative 2) of the data to rewind to. 10 bytes. Only used for old stored process data. The first data sent will be the data from and inclusive this point and forward up to and inclusive the last one. If the data is not found, or if the value is 0, rewind will be to oldest possible data. All data from this point up to the newest available will be sent directly on subscribe.
Number of curve types	51 – 52	The number of curve types subscribed for: 0 = Only new data
Curve type	53 – 55	Type of the curve subscribed for. This field is repeated the Number of curve types. 1 = Angle graph 2 = Torque graph ~~3 = Current graph~~ ~~4 = Gradient graph~~ ~~5 = Stroke graph~~ ~~6 = Force graph~~

Tab. 2-198: Data field revision 1 (MID 0900, subscribe)

2.18.2 Torque Graph data unsubscribe (MID 0900) via MID 0009

Header	Data Field	Message End
20 bytes	5 bytes	Last parameter

Tab. 2-199: Tightening curve data unsubscribe (MID 0900) via MID 0009

This message unsubscribe the Tightening curve data. For this MID 0900 is used with MID 0009.

Possible answers:

- Command accepted (MID 0005)
- Command error (MID 0004): "Subscription does not exist." or "Requested on specific data not supported." or "Invalid data."

Sent by: Integrator

Revision 1

Parameter	Bytes	Comment
Number of curve types	21 – 22	The number of curve types to unsubscribe
Cuve type	23 – 25	Type of the curve to unsubscribe. This field is repeated the Number of curve types. 1 = Angle graph 2 = Torque graph ~~3 = Current trace~~ ~~4 = Gradient trace~~ ~~5 = Stroke trace~~ ~~6 = Force trace~~ ~~999 = Unsubscribe on all~~

Tab. 2-200: Data field revision 1 (MID 0900, unsubscribe)

2.19 Keep-alive telegram (MID 9999)

Header	Data Field	Message End
20 bytes	0 bytes	NUL (ASCII 0x0)

Tab. 2-201: Keep-alive message (MID 9999)

The keep-alive message ensures that the communication between the integrator and the controller is maintained. If no messages are exchanged within a timeout of 15 seconds, the controller closes the connection to the integrator. To keep the communication alive, the integrator must send a keep-alive to the controller in a time interval of less than 15 seconds. The controller mirrors the received keep-alive and sends it back to the integrator.

If no message has been received or sent in the last ten seconds, the integrator is suggested to send a keep-alive message.

Possible answer: Same message mirrored by the controller.
Sent by: Integrator

Example

```
00000000   30 30 32 30 39 39 39 39 30 30 30 30 30 30 30 30   0020999900000000
00000010   30 30 30 30 00                                    0000.
```

3 Appendix

3.1 Error codes

Alarm Code	Cause	Measure
E100	Intermediate circuit of the power section is not supplied	► Check supply (fuses before the STMHE.3, isolating transformer, EMERGENCY STOP protection, etc.). ► Internal error, replace STMHE.3.
E101	Motor cable defective • Cable break in motor wires. • Interruption in connector board. • Motor phases interrupted. • Test current for cable monitoring is misdirected.	► Check the tool cables and connector board for breaks and short circuits. ► Check motor cable for breaks and short circuits. ► Check motor for short circuit for PE and phase impedances: 17E… approx. 7 Ω 18E… approx. 2.5 Ω 47E… approx. 4 Ω 48E… approx. 1.5 Ω 67E… approx. 2 Ω ► Replace handheld nutrunner. ► Internal error, replace STMHE.3.
E102	Short-circuit in motor-circuit • In the cable • In the motor • In the STMHE.3	► Check tool cables for short circuit. ► Check the motor for short circuits. ► Internal error, replace STMHE.3.
E103	Motor temperature too high • Measuring line is interrupted. • Measuring current is misdirected.	► Check XS2, pin 1 - 2 for connection. ► Internal error, replace STMHE.3.
E104	I2T monitoring • Motor power required is too high. • Handheld nutrunner is defective (i.e. gearing, bearings, motor).	► Check temperature of handheld nutrunner. If > 60 °C, shorten fastening time by increasing speed. ► Replace handheld nutrunner. ► Internal error, replace STMHE.3.
E105	Resolver error • The resolver signals are interrupted, short-circuited, unavailable. • The internal ±12 V power adapter is short-circuited.	► Make sure that the handheld nutrunner is connected. ► Check the tool cables for breaks and short circuits, particularly the +/-12 V and 0 V wires. ► Replace handheld nutrunner. ► Internal defect, replace STMHE.3.
E106	Intermediate circuit voltage too high The voltage of the intermediate power circuit is > 400 VDC.	Permanent error: ► Measure supply voltage. If > 255 VAC, reduce to 230 VAC. When braking: ► Condensers in intermediate circuit are "deaf". ► Braking chopper is defective, replace STMHE.3. Sporadic: ► The voltage supply is periodically too high; connect the next-highest tap to the primary side of the transformer (with 3-phase isolating transformer). ► Internal error, replace STMHE.3.

Alarm Code	Cause	Measure
E107	Intermediate circuit voltage too low The voltage of the intermediate power circuit is < 150 VDC.	Permanent error: ► Measure supply voltage. If < 200 VAC, increase to 230 VAC. During fastening: ► The supply is too "soft" or overloaded. Provide for more stable supply (e.g. larger isolating transformer). ► Condensers in intermediate circuit are "deaf", replace STMHE.3. ► Internal error, replace STMHE.3.
E110	Temperature in the power unit too high The temperature in the STMHE.3 is > 80 °C.	► Measure control cabinet inside temperature under the STMHE.3; if ϑ > 50 °C additional cooling measures are necessary (e.g. A/C unit). ► Cooling vents on the STMHE.3 must not be covered with a cable or the like. ► Internal error, replace STMHE.3.
E111	Start-up relay is does not open Due to an internal error, the contact in the start-up relay is stuck.	► Internal error, replace STMHE.3.
E112	Main relay is does not open Due to an internal error, the contact in the main relay is stuck.	► Internal error, replace STMHE.3.
E113	DC/DC converter supply undervoltage	► Internal error, replace STMHE.3.
E114	DC/DC converter supply undervoltage	► Internal error, replace STMHE.3.
E115	5 V supply in servo too low The 5 V power adapter for the internal supply to the servo amplifier is overloaded. U < 4.8 VDC.	► Internal error, replace STMHE.3.
E116	5 V supply in servo too high The 5 V power adapter for the internal supply to the servo amplifier is defective. U > 5.2 VDC.	► Internal error, replace STMHE.3.
E117	End stage driver supply too low The power adapter for the internal supply to the output section is overloaded or defective.	► Internal error, replace STMHE.3.
E118	Offset of the current measurement too high The zero point of the integrated motor current measurement has moved.	► Internal error, replace STMHE.3.
E120	5 V supply in measuring board too low The power adapter for the internal supply to the measuring board is overloaded or defective. U < 4.8 VDC.	► Internal error, replace STMHE.3.
E121	5 V supply in measuring board too high The 5 V power adapter for internal supply of the measuring board is defective. U > 5.2 VDC.	► Internal error, replace STMHE.3.
E122	Servo DPR error The dual port RAM for communication between servo and measuring board is defective.	► Internal error, replace STMHE.3.

Alarm Code	Cause	Measure
E123	Servo flash error The flash memory is defective.	► Internal error, replace STMHE.3.
E124	DPR - Communication to measuring board interrupted The communication between servo and measuring board, via the dual port RAM, is impaired.	► Internal error, replace STMHE.3.
E125	Error in order of start signals Communication error between measuring board and servo amplifier.	► Internal error, replace STMHE.3. ► Contact a Sales & Service Center.
E128	MOTID - error Error in motor identification mode.	► Internal error, replace STMHE.3.
E129	Mathematic error, illegal command etc. Error in the program execution.	► Internal error, replace STMHE.3. ► Contact a Sales & Service Center.
E130	Measuring board not ready The signal "Measuring board OK" isn't received by the servo.	► Make sure that the measuring board is connected. ► Make sure that the measuring board is screwed tight in STMHE.3. ► Internal error, replace STMHE.3.
E133	+12 V out of tolerance The +12 V supply to the measuring board is outside the limits of +11.8 V – +12.2 V.	Inspection of station controller in test mode – value outside the permissible limits: ► Check tool cables, particularly the +12 V, 0 V and resolver wires. ► Replace handheld nutrunner. ► Internal error, replace STMHE.3.
E134	-12 V out of tolerance The -12 V supply to the measuring board is outside the limits of -11.8 V – -12.2 V.	Inspection of station controller in test mode – value outside the permissible limits: ► Check tool cables, particularly the -12 V, 0 V and resolver wires. ► Replace handheld nutrunner. ► Internal error, replace STMHE.3.
E136	Communication error with transducer 1 The STMHE.3 is not connected with the ARCNET.	Check the ARCNET: ► Are there bus terminations? ► Are the networked devices with bus terminations turned on? ► All cables connected? ► Internal error, replace STMHE.3.
E137	Transducer 2 missing The transducer signals are interrupted, short-circuited or unavailable.	► Make sure that the transducer is connected. ► Check the transducer wiring for breaks and short circuits. ► Replace the transducer. ► Internal error, replace STMHE.3.
E140	Task cannot be created Software monitoring.	► Internal error, replace STMHE.3. ► Contact a Sales & Service Center.
E141	Flash error Program update not possible Station controller is to transfer the incorrect program.	► Check program selection. ► Internal error, replace STMHE.3. ► Contact a Sales & Service Center.
E142	Not enough RAM storage available	► Contact a Sales & Service Center. ► Internal error, replace STMHE.3.
E145	ARCNET global error	► Internal error, replace STMHE.3.

Alarm Code	Cause	Measure
E146	ARCNET reconfiguration Too many reconfigurations; network is unstable.	Check the ARCNET: ► Are there bus terminations? ► All ARCNET cables connected? ► Check address, i.e. switch settings, of the ARCNET. ► Are the networked devices with bus terminations turned on?
E147	Measuring board initialization error	► Internal error, replace STMHE.3. ► Contact a Sales & Service Center.
E148	Error in the program execution	► Internal error, replace STMHE.3. ► Contact a Sales & Service Center.
E149	Initialization error Initialization of the internal communication interfaces is NOK.	► Internal error, replace STMHE.3. ► Contact a Sales & Service Center.
E150	Communication error Communication interfaces are NOK.	► Internal error, replace STMHE.3. ► Contact a Sales & Service Center.
E151	ARCNET multiple address The address set for this STMHE.3 already exists.	► Check addresses, i.e. switch settings of the ARCNET; each networked device must possess a unique address. ► Internal error, replace STMHE.3.
E153	No pulse signal from servo There is no synchronization signal between servo and measuring board.	► Make sure that the measuring board is screwed tight in STMHE.3. ► Internal error, replace STMHE.3.
E159	ARCNET address incorrect The address set is not within the permissible range.	► Change address so that it is between 01 and 32. ► Internal error, replace STMHE.3.
E162	Servo parameter set doesn't match with servo The parameter set selected by the measuring board isn't found in the STMHE.3.	► Check system programming. ► Internal error, replace STMHE.3.
E166	Transducer 1 missing The transducer signals are interrupted, short-circuited orunavailable.	► Make sure that a handheld nutrunner is connected. ► Check the tool cables for breaks and short circuits. ► Replace handheld nutrunner. ► Internal error, replace STMHE.3.
E169	Transducer 1 offset error The zero-point voltage is outside the permissible range of -200 mV...+200 mV.	► Transducer defective or improperly installed. ► Inspection of station controller in test mode; if value outside the permissible limits, replace handheld nutrunner. ► Internal error, replace STMHE.3.
E170	Transducer 1 calibration voltage error The calibration voltage is outside the permissible range of +4.85 V...+5.15 V.	► Transducer defective or improperly installed. ► Inspection of station controller in test mode; if value outside the permissible limits, replace handheld nutrunner. ► In case of an extreme deviation, check tool cables, particularly the calibration wire. ► Internal error, replace STMHE.3.

Alarm Code	Cause	Measure
E173	Transducer 2 offset error The zero-point voltage is outside the permissible range of -200 mV...+200 mV.	► Transducer improperly installed. ► Inspection of station controller in test mode; if value outside the permissible limits, replace transducer. ► Internal error, replace STMHE.3.
E174	Transducer 2 calibration voltage error The calibration voltage is outside the permissible range of +4.85 V...+5.15 V.	► Transducer improperly installed. ► Inspection of station controller in test mode; if value outside the permissible limits, replace transducer. ► In case of an extreme deviation, check transducer wiring, particularly the calibration wire. ► Internal error, replace STMHE.3.
E176	Transducer 1 angle tracing NOK The angle signals are interrupted, short-circuited, unavailable or temporarily unavailable.	► Check station controller in test mode. ► No angle signals: Check transducer wiring, particularly the angle signal wires. Nutrunner turns beyond 360°: ► Check angle factor. ► Replace the transducer. ► Internal error, replace STMHE.3
E177	Transducer 2 angle tracing NOK The angle signals are interrupted, short-circuited, unavailable or temporarily unavailable.	► Check station controller in test mode. ► No angle signals: Check transducer wiring, particularly the angle signal wires. Nutrunner turns beyond 360°: ► Check angle factor. ► Replace the transducer. ► Internal error, replace STMHE.3
E185	ArcNet communication error	Check the ARCNET: ► Are there bus terminations? ► Are all networked devices with bus terminations turned on? ► All cables connected? ► Check address, i.e. switch settings, of the ARCNET. ► Internal error, replace STMHE.3. ► Contact a Sales & Service Center.
E192	24 volts NOK 24 V out of tolerance (20.4 V – 27.6 V).	► Check voltage.
E193	Measuring board temperature error Temperature of measuring board >95 °C.	► Check ambient and control cabinet temperature.

3.2 Parameter ID Number

Statuses

Parameter id (PID)	Name	Description
00001	Tightening Status	The overall status of all the tools in the tightening. 0 = NOK 1 = OK
00002	Station ID	The station id is a unique id for each station. In ASCII figures 0 – 9

Parameter id (PID)	Name	Description
00003	Station Name	The station name. In ASCII characters.
00005	Overall Tightening Status Additional Information	Additional information related to the Tightening Status Possible values are: 1 = Repaired 2 = Stopped 3 = Emergency Stopped 4 = Tool Error 5 = Drive Error 6 = Invalid Tightening Program 7 = PreStart Check Failed

Identifiers

Parameter id (PID)	Name	Description
00010	VIN Number	The VIN number for the tightening
00011	Identifier 1	Identifier 1 used for the tightening. Could for example be a pallet number, identity of the operator, identification for the part, etc…
00012	Identifier 2	…
00013	Identifier 3	…
00014	Identifier 4	…
00015	Identifier 5	…
00016	Identifier 6	…
00017	Identifier 7	…
00018	Identifier 8	…
00019	Identifier 9	…
00020	Identifier 10	Identifier 10 used for the tightening. Could for example be a pallet number, identity of the operator, identification for the part, etc…
00030	Tightening Identifier	Identifier for tightening 10 figures long.
00031	Identifier handling	Types of handling can be: 1 = Reset the latest identifier 2 = Reset all identifiers 3 = Bypass to next identifier in a list of identifiers to be used for next tightening
00050	Oldest result Id	Oldest result Id in a controller result database. 32 bit
00051	Latest result Id	Latest result Id in a controller result database. 32 bit
00052	Oldest result Time	Oldest result Time in a controller result database. Unix time
00053	Latest result Time	Latest result Time in a controller result database. Unix time

Event parameter

Parameter id (PID)	Name	Description
00040	Events	System common. But content unique for each system.

Batch parameters

Parameter id (PID)	Name	Description
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 complete status	The current status of the batch. Only used if this tightening was a part of a batch. 0 = Batch not completed 1 = Batch completed 2 = No batch
00103	Batch count	0 = Off 1 = Pset 2 = Fieldbus 3 = Ethernet/Serial
00104	Batch increment when NOK	0 = No 1 = Yes
00105	Batch Status	The current status of the batch. Only used if this tightening was a part of a batch. 0 = batch NOK 1 = batch OK 2 = batch not used 3 = batch running

Tightening program information

01000	Tightening program Number	The number or index of the tightening program or Pset that made the tightening
01001	Tightening program Name	The name of the tightening program or Pset that made the tightening

01002	Control Tightening program Strategy	The overall strategy used in the tightening program. Possible strategies are: 01 = Torque control 02 = Torque control / angle monitoring 03 = Torque control / angle control AND 04 = Angle control / torque monitoring 05 = DS control 06 = DS control torque monitoring 07 = Reverse angle 08 = Reverse torque 09 = Click wrench 10 = Rotate spindle forward 11 = Torque control angle control OR 12 = Rotate spindle reverse 13 = Home position forward 14 = EP Monitoring 15 = Yield 16 = EP Fixed 17 = EP Control 18 = EP Angle shutoff 19 = Yield / torque control OR 20 = Snug gradient 21 = Residual torque / Time 22 = Residual torque / Angle 23 = Breakaway peak 24 = Loose and tightening 25 = Home position reverse 26 = PVT comp with Snug 27 = Batch 28 = PVT Monitoring 29 = PVT Compensate 30 = Self-tap 31 = Rundown 32 = CM 33 = Four Stage tightening torque 34 = Four Stage tightening angle 35 = STW Loosening 36 = External result text
01003	Time of last change in tightening program settings	Date and time of last change in tightening program settings
01004	Number of steps	The number of steps in the tightening program
01005	Tightening Strategy	0 = One stage 1 = Two stage 2 = Quick step 3 = Ergo ramp
01006	Trace Tool Start	Start trace from 0 =Start 1 = Cycle Start
01007	Cycle Tool Start	Torque value from where the tightening cycle is considered as started.
01008	Remove fastener limit	Torque value for the limit at which the fastener shall be removed.
01009	Measure Torque at	Torque result measured at: 0 = Torque peak 1 = Angle peak 2 = Shut off angle
01010	Monitor Angle High limit	High limit for monitor Angle High Limit

01011	Measure Angle to	0 = Torque peak 1 = Angle peak 2 = Cycle complete 3 = Shut off 4 = Not used
01012	Re-hit Angle	Degree value for re-hit detection
01013	Zoom Step Speed	Can be in percent or RPM of tool maximal speed
01014	Ergo Ramp	Can be in percent or RPM of tool maximal speed
01015	Reserved	Reserved
01016	Tool Idle time	Time after rundown done until result is sent, especially used when Multistage tightening is used
01017	End Time	Time for slip off detection
01018	Monitor End Time from	When starting detection of End time. 0 = Cycle Start 1 = Rundown Complete
01019	Tight time out sec	Time out value in second before not finished Job is aborted.
01020	Max Coherent NOK	Max number of coherent NOK results allowed
01021	High Speed Rundown Used	0 = Not used 1 = Used
01022	High Speed Rundown Speed	Speed in percent of tool max
01023	High Speed Rundown Interval	Value in degrees for the interval of the first part of the rundown before snag
01024	High Speed Rundown Ramp at High Speed	Acceleration factor in percent
01025	High Speed Rundown Disable High Speed at NOK	0 = No 1 = Yes
01026	Options Used	0 = No 1 = Yes
01027	Options Soft Stop	0 = Yes 1 = No
01028	Options Re-hit Detect	0 = No 1 = Yes
01029	Options Torque < Target Detect	0 = No 1 = Yes
01030	Options Lost trigger detect	0 = No 1 = Yes
01031	Options Socket Release De-tect	0 = No 1 = Yes
01032	Self-Tap Monitoring Speed Rpm	
01033	Measured Delay Time	
01034	Ds Tuning value	
01035	Options Timeout detect	
01036	Used strategies	Used strategies as a bit field. Measured value
01037	Tightening error bits 1	
01038	Tightening error bits 2	

01039	Result type	1 = TIGHTENING_RE 2 = LOOSENING_RES 3 = SYNC_TIGHTENING_RES 4 = SYNC_LOOSENING_RES 5 = CLICK_WRENCH_RES 6 = INCREMENT_RES 7 = DECREMENT_RES 8 = RESET_BATCH_RES 9 = BYPASS_RES 10 = ABORT_JOB_RES 11 = EP_AUTOPROG_RES 12 = SYNC_NO_TIGHTENING_RES 13 = POSITIONING_RES 14 = EP_UNTUNED_RES 15 = LATE_RES 16 = TQ_WITH_NO_PSET_RES 17 = RADIO_WORK_ORDER_ABORT 18 = STW_LOOSENING_RES 19 = RESTART_JOB_RES
01040	Dynamic Pset Id	The Id of a dynamic Pset
01041	Dynamic Pset Name	The name of a dynamic Pset
01042	Tightening information bits	Device dependent tightening information.
01043	Disable loosening	0 = Disable loosening 1 = Enable loosening

Torque controller information

Parameter id (PID)	Name	Description
01100	Torque controller Name	The name of the torque controller that made the tightening
01101	Torque controller Number	The number of the torque controller that made the tightening.
01102	Torque controller type name	The type name of the controller that made the tightening.
01103	Torque controller article number	The article number of the torque controller that made the tightening. Will be sent as a string
01104	Torque controller serial number	The serial number of the torque controller that made the tightening. Will be sent as a string

Bolt information

Parameter id (PID)	Name	Description
01300	Bolt Name	The name of the bolt that was tightened
01301	Bolt Number	The number of the bolt that was tightened
01302	Bolt Status	The status of the bolt that was tightened

Error and status codes

Parameter id (PID)	Name	Description
01400	Tightening Status	The total status of the tightening 0 = Tightening NOK 1 = Tightening OK

Parameter id (PID)	Name	Description
01401	Tightening error codes	Error codes from the tightening. Is defined by a bit field and sent as a hexadecimal value, i.e. Data Type will be set to H in the telegram. The number of bits and their definition vary between the different systems.
01402	Torque status	The status of the Torque in the tightening Based on the parameter 02001 0 = Low 1 = OK 2 = High
01403	Angle status	The status of the Angle in the tightening Based on the parameter 02011 0 = Low 1 = OK 2 = High
01404	Rundown Monitor status	The status of the Rundown monitoring in the tightening Based on the parameters 02016-2018 0 = Low 1 = OK 2 = High
01405	Current Monitor status	The status of the Current monitoring in the tightening Based on the parameters 02020-02023 0 = Low 1 = OK 2 = High
01406	Self Tap Status	The status of the Self tap monitoring in the tightening Based on the parameters 02070-02071 0 = Low 1 = OK 2 = High
01407	PVT Monitor status	The status of the PVT monitoring in the tightening Based on the parameter 02078 0 = Low 1 = OK 2 = High
01408	PVT Comp status	The status of the PVT Comp monitoring in the tightening. Based on the parameters 02072-02073 0 = Low 1 = OK 2 = High
01420	Tightening Status Additional Information	Additional information related to the Tightening Status Possible values are: 1 = Repaired 2 = Stopped 3 = Emergency Stopped 4 = Tool Error 5 = Drive Error 6 = Invalid Tightening Program 7 = PreStart Check Failed 8 = Terminated By Reject Management 9 = Reject Management Termination Failed 10 = Inhibited 11 = Reject Management Repair Failed
01421	Primary Error	The primary error from the tightening. The definition varies between the different systems.
01422	Failing Step	The number of the step that made the tightening NOK

Job/Sync parameters

Parameter id (PID)	Name	Description
01500	Job ID	ID of a Job
01501	Job sequence number	Job result sequence
01502	Job stage number	Stage within a Job
01503	Job time stamp	The last time the Job configuration was changed
01504	Sync Group ID	Id of a sync group or station.
01505	Sync Group Name	Name of a sync group or station.
01506	Sync Group Status	Status of a sync group or station
01507	Sync Tightening Id	The Id of a result from a sync tightening
01508	Job Start Time	The time stamp of Job started
01509	Job Reference Mac address	The Reference Mac address for Job result when cell is used
01510	Job result Id	Identifier number of Job
01511	Auto Pset change	A Boolean. 0 = BY hand 1 = Auto change
01512	Pset/Mset type	
01513	Pset/Mset channel Id	Channel Id of Pset/Mset when cell is used
01514	Stop time	Time when the Job was ended or stopped
01515	First NOK Event	First NOK stage in Job
01516	Job done status	0 = Job off 1 = Running 2 = OK 3 = NOK 4 = ABORTED

Alarm information

Parameter id (PID)	Name	Description
01700	Alarm text	Alarm text, sent as String
01701	Alarm severity	Severity of the alarm, possible values are: 1 = Info 2 = Warning 3 = Error
01702	Maintenance alert	Maintenance alert, possible values are: 0 = No 1 = Yes

Tightening values

Parameter id (PID)	Name	Description
02000	Torque, final target	The target torque for the whole tightening program
02001	Torque, measured value	The measured torque for the whole tightening.
02002	Torque, final upper limit	The upper limit for the measured torque of the whole program.
02003	Torque, final lower limit	The lower limit for the measured torque of the whole program.

Parameter id (PID)	Name	Description
02004	Torque, first target	The first target in a two step
02005	Torque, cycle start	Torque value where the tightening measurement starts after tightening start
02006	Torque, cycle complete	Torque value where the tightening measurement starts before complete
02010	Angle, target	The target angle for the whole tightening program
02011	Angle, measured value	The measured angle for the whole tightening.
02012	Angle, upper limit	The upper limit for the measured angle, for the whole tightening
02013	Angle, lower limit	The lower limit for the measured angle, for the whole tightening
02014	Angle target threshold torque cycle start	The torque value at which the angle measurement start at the cycle start
02015	Angle target threshold torque cycle end	The torque value at which the angle measurement start at the cycle end
02016	Angle Max Rundown	The max allowed angle value target measured according to parameter 2043
02017	Angle Min Rundown	The min angle allowed value target measured according to parameter 2043
02018	Angle max to monitor	The max value of the angle to measure
02019	Torque, Rundown complete torque	
02020	Current, target	The target current for the whole tightening program
02021	Current, measured value	The measured current for the whole tightening.
02022	Current, upper limit	The upper limit for the measured current
02023	Current, lower limit	The lower limit for the measured current
02030	Torque 2nd, measured value	The measured torque for the whole tightening. Measured with a secondary torque transducer.
02031	Torque 2nd, upper limit	The upper limit for the measured torque 2nd.
02032	Torque 2nd, lower limit	The lower limit for the measured torque 2nd.
02040	Angle 2nd, measured value	The measured angle for the whole tightening. Measured with a secondary angle transducer.
02041	Angle 2nd, upper limit	The upper limit for the measured angle 2nd
02042	Angle 2nd, lower limit	The lower limit for the measured angle 2nd
02043	Rundown Angle	The rundown angle selection is: 0 = No 1 = From start 2 = From cycle start
02044	Rundown Angle measured value	
02050	Speed, target	The target speed for the whole tightening program
02051	Speed, measured	The measured speed for the whole tightening program

Parameter id (PID)	Name	Description
02052	Step Speed	The target speed for the each step
02053	Reserved	Reserved
02054	Soft start time	The time duration for the soft start in a tightening
02055	Soft start speed	The tightening speed during the soft start time duration either in ratio or percent of the tool max speed.
02056	Step Ramp	The tightening speed increase per time unit during the step.
02057	Reserved	Reserved
02058	Lock at batch done	0 = No 1 = Yes
02059	Necking shut off	Antinecking detection for angle control strategies. 0 = No 1 = Yes
02060	Rotate Direction	CW = CCW = 2
02061	Self-tap	Self-tap on or off 0 = Off 1 = On
02062	Number of self-tap windows	At least 1
02064	Necking drop torque from peak	
02070	Self-tap Max Torque	The max tightening torque value for the self-tap measurement validation.
02071	Self-tap Min Torque	The min tightening torque value for the self-tap measurement validation.
02072	Prevail Torque Max	The max tightening torque value for the prevail measurement validation.
02073	Prevail Torque Min	The min tightening torque value for the prevail measurement validation.
02074	Yield Max	
02075	Yield Min	
02076	Prevail	Prevail on or off 0 = Off 1 = On
02077	Prevail Comp	Prevail Comp on or off 0 = Off 1 = On
02078	Prevail comp point angle	Angle value
02079	Number of prevail windows	At least 1 is required
02080	Post View Torque Min Limit	Torque float value for the low limit in Torque trace
02081	Post View Torque Max Limit	Torque float value for the high limit inn Torque trace
02082	Prevail Comp Measured Torque	
02084	Self-tap monitor interval	The interval duration in degrees for self-tap measurements according to parameters 02070 and 02071
02085	Prevail Torque Delay Interval	Delay from cycle start to the start of Prevail Torque Monitor Interval

Parameter id (PID)	Name	Description
02086	Prevail Torque Monitor Interval	The interval duration in degrees for prevail measurements according to parameters 02072 and 02073
02087	Post View Torque Monitor Min Start	Post View Torque in Angle trace
02088	Post View Torque Monitor Min Interval	Post View Torque in Angle trace
02089	Post View Torque Monitor Max Start	Post View Torque in Angle trace
02090	Post View Torque Monitor Max Interval	Post View Torque in Angle trace
02091	Post View Torque	Post View Torque monitoring on or off 0 = off, 1= on
02092	Self-tap Torque measured value	
02093	Prevail Torque measured value	
02094	Attachment Gear ratio	
02095	Attachment tuning. Efficiency tuning	
02100	Loosening limit torque	Torque threshold for loosening detection
02101	Loosening speed	Speed according to parameter 02103
02102	Loosening ramp	Ramp according to parameter 02103
02103	Speed unit	Unit for speed in percent = 0 or rpm = 1
02110	Force, final target	The target force for the whole program
02111	Force, measured value	The measured force for the whole press.
02112	Force, final upper limit	The upper limit for the measured force, for the whole program
02113	Force, final lower limit	The lower limit for the measured force. for the whole program
02120	Stroke, target	The target stroke for the whole program
02121	Stroke, measured value	The measured stroke for the whole program.
02122	Stroke, upper limit	The upper limit for the measured stroke, for the whole program
02123	Stroke, lower limit	The lower limit for the measured stroke, for the whole program
02124	Free Event Text	User defined event text
02130	Four stage soft start angle	Starting value in degrees for an four stage tightening
02131	Four stage soft start angle torque max	Max value for soft start torque in Nm during soft start
02132	Four stage first target angle min	Min value in degrees for first target in an four stage tightening
02133	Four stage first target angle max	Max value in degrees for first target in an four stage tightening

Parameter id (PID)	Name	Description
02134	Four stage torque, measured value	The measured torque for one stage of a four stage tightening
02135	Four stage angle, measured value	The measured angle for one stage of a four stage tightening
02136	Four stage status angle, measured value	The status for one stage angle of a four stage tightening. Value = 0 = NOK. Value = 1 = OK.
02129	Four stage status torque measured value	The status for one stage torque of a four stage tightening. Value = 0 = NOK. Value = 1 = OK.
02137	Gradient monitoring	Gradient monitoring on or off 0 = off, 1= on
02138	Gradient torque min	Torque Value in Nm
02139	Gradient torque max	Torque Value in Nm
02140	Gradient Joint hardness	Angle value in degrees
02141	Gradient Start torque	Torque value in Nm
02142	Gradient Angle offset	Angle value in degrees
02143	Yield control Start torque	Torque value in Nm
02144	Yield control Step angle	Angle value in degrees for one step
02145	Yield control window angle	Angle value in degrees
02146	Yield slope ratio	In percent
02147	Yield control Extra Angle step	Angle extra value for one step
02150	Positioning Adjustable limit	Adjustable limit on or off. 0 = off, 1= on
02151	Positioning limit	Value in Nm
02152	Snug gradient delta angle	Value in degrees
02153	Snug gradient delta torque	Value in torque Nm
02154	Snug gradient Torque limit	Value in torque Nm
02155	Snug gradient PVT distance	Value in degrees
02156	Snug gradient PVT interval	Value in degrees
02157	Snug gradient Compensate	Value in degrees
02158	Snug PVT Monitoring min	Value in torque Nm
02159	Snug PVT Monitoring max	Value in torque Nm
02160	Delay monitoring after cycle start	Value in degrees
02161	Four stage soft start angle low limit	Min value in degrees for soft start angle in a four stage tightening
02162	Four stage soft start angle high limit	Max value in degrees for soft start angle in a four stage tightening
02163	Four stage rundown torque low limit	Min value in Nm for rundown torque in a four stage tightening
02164	Four stage rundown torque high limit	Max value in Nm for rundown torque in a four stage tightening
02165	Four stage first torque low limit	Min value in Nm for first torque in a four stage tightening
02166	Four stage first torque high limit	Max value in Nm for first torque in a four stage tightening
02167	Four stage soft start angle torque min	Min value for soft start torque in Nm during soft start
02170	Elapsed time	Total time to make the tightening [s]

Parameter id (PID)	Name	Description
02171	Turns for rundown	Number of turns for rundown

Tightening values for trace

Parameter id (PID)	Name	Description
02201	Trace type	Type of the trace curve 1 = Angle trace 2 = Torque trace 3 = Current trace 4 = Gradient trace 5 = Stroke trace 6 = Force
02213	Coefficient	Coefficient to convert 2 byte binary data to real physical values. Physical value = Binary value / Coefficient
02214	Coefficient	Coefficient to convert 2 byte binary data to real physical values. Physical value = Binary value * Coefficient
02215	Stage one number of samples	Number of samples for stage one at four stage tightening
02216	Stage two number of samples	Number of samples for stage two at four stage tightening
02217	Stage three number of samples	Number of samples for stage three at four stage tightening
02218	Stage four number of samples	Number of samples for stage four at four stage tightening

General download data status for Radio Connected Tools

Parameter id (PID)	Name	Description
04000	Tool latest Pset status	A Boolean 0 = Latest Pset failed to tool 1 = Latest Pset success to tool
04001	Tool latest Identifier status	A Boolean 0 = Latest Identifiers failed to tool 1 = Success to tool
04002	Tool lock/unlock status	A Boolean 0 = Tool unsuccessfully locked/unlocked 1 = Tool successfully locked/unlocked

Step information

Parameter id (PID)	Name	Description
05000	Tightening step strategy	The overall strategy used in the tightening program step Possible strategies are: 01 = Torque control 02 = Angle control 03 = Backlash correction 04 = Diagnostic 05 = DynaTork 06 = Engage 07 = JOG 08 = Run to position 09 = Run until snug 10 = Socket release 11 = Time control 12 = Wait 13 = Yield point 14 = Torque Or Angle control 15 = Torque Plus Angle control 16 = Torque And Angle control 17 = Rundown 18 = TurboTight 19 = Digital Input 20 = External Result
05001	Step error codes	Error codes from the tightening program step. Is defined by a bit field and sent as a hexadecimal value, i.e. Data Type will be set to H in the telegram. The number of bits and their definition vary between the different systems.
05002	Step name	Name of the tightening program step
05003	Step Status	The total status of the step 0 = Step NOK 1 = Step OK
05004	Step Primary Error	The primary error from the step tightening. The definition vary between the different systems.

Step Tightening values

Parameter id (PID)	Name	Description
05100	Step Torque, target	The target torque for the tightening program step
05101	Step Torque, measured value	The measured torque for the tightening program step
05102	Step Torque, upper limit	The upper limit for the measured step torque.
05103	Step Torque, lower limit	The lower limit for the measured step torque.
05110	Step Angle, target	The target angle for the tightening program step
05111	Step Angle target threshold torque	The torque value there the angle measurement start
05112	Step Angle, measured value	The measured angle for tightening program step
05113	Step Angle, upper limit	The upper limit for the measured step angle
05114	Step Angle, lower limit	The lower limit for the measured step angle
05120	Step Current, target	The target current for the tightening program step

Parameter id (PID)	Name	Description
05121	Step Current, measured value	The measured current for tightening program step
05122	Step Current, upper limit	The upper limit for the measured step current
05123	Step Current, lower limit	The lower limit for the measured step current
05130	Step Force, target	The target force for the tightening program step
05131	Step Force, measured value	The measured force for the tightening program step
05132	Step Force, upper limit	The upper limit for the measured step force.
05133	Step Force, lower limit	The lower limit for the measured step force.
05140	Step Stroke, target	The target stroke for the tightening program step
05141	Step Stroke target threshold force	The force value there the stroke measurement start
05142	Step Stroke, measured value	The measured stroke for tightening program step
05143	Step Stroke, upper limit	The upper limit for the measured step stroke
05144	Step Stroke, lower limit	The lower limit for the measured step stroke
05150	Step Start	Calculated from the Time Stamp
05151	Step Stop	Calculated from the Time Stamp
05160	Step Shut Off Torque, measured	The measured shut off torque for the step
05161	Step Torque Rate, measured	The measured torque rate for the step
05162	Step Torque Rate Deviation, measured	The measured torque rate deviation for the step
05163	Step Peak Torque in Window, measured	The measured peak torque in angle window for the step
05164	Step Low Torque in Window, measured	The measured low torque in angle window for the step
05165	Step Post View Torque High, measured	The measured post view torque high torque value for the step
05166	Step Post View Torque Low, measured	The measured post view torque low torque value for the step
05167	Step Yield Angle, measured	The measured yield point angle for the step
05168	Step Prevailing Torque, measured	The measured prevailing torque for the step
05169	Step Time, measured	The measured time for the step
05170	Step Elapsed Time	Time needed to execute the step
05171	Cross Thread Angle, measured	The measured cross thread angle for the step
05172	Step Post View Torque High Angle, measured	The measured angle at post view torque high
05173	Step Post View Torque Low Angle, measured	The measured angle at post view torque low

Tool Information

Parameter Id (PID)	Name	Description
01200	Tool type name	The type name of the tool that made the tightening. Could for example be “QST50-150CTT”
01201	Tool article number	The article number of the tool that made the tightening. Will be sent as a string
01202	Tool serial number	The serial number of the tool that made the tightening. Will be sent as a string
01203	Tool type	00=No Tool 01 = S-tool 02 = DS-tool 03 = Ref. transducer 04 = ST-tool 05 = EP-tool 06 = ETX-tool 07 = SL-tool 08 = DL-tool 09 = IRC Offline 10 = STB-tool 11 = QST-tool 12 = STT-tool 13 = ST wrench 14 = ES- tool 15 = ESB 16 = SB 17 = SB+ 18 = PST 19 = STR 20 = ETD M 21 = ETD MC 22 = ETD MT 23 = QMC 24 = QMT 25 = BCV-RE 26 = BCP-RE 27 = E-LIT
01204	Speed Factor	
01205	Tool number	The index or number of the tool
01210	Tool total number of tightenings	The total number of tightenings made with the tool
01211	Tool total number of tightenings since service	The total number of tightenings made with the tool since last service, possible values are: 0 = To do nothing 1 = Reset tightenings since last service
01212	Tool total number of tightenings to service	The total number of tightenings before the tool need to be serviced
01213	Tool Temperature	To read out the different tool temperatures

POWER TOOLS SALES & SERVICE CENTERS

Please note that all locations may not service all products.
Contact the nearest Cleco® Sales & Service Center for the appropriate facility to handle your service requirements.

Sales Center
Service Center

NORTH AMERICA | SOUTH AMERICA

DETROIT, MICHIGAN
Apex Tool Group
2630 Superior Court
Auburn Hills, MI 48236
Phone: +1 (248) 393-5644
Fax: +1 (248) 391-6295

LEXINGTON, SOUTH CAROLINA
Apex Tool Group
670 Industrial Drive
Lexington, SC 29072
Phone: +1 (800) 845-5629
Phone: +1 (919) 387-0099
Fax: +1 (803) 358-7681

MEXICO
Apex Tool Group
Vialidad El Pueblito #103
Parque Industrial Querétaro
Querétaro, QRO 76220
Mexico
Phone: +52 (442) 211 3800
Fax: +52 (800) 685 5560

EUROPE | MIDDLE EAST | AFRICA

FRANCE
Apex Tool Group SAS
25 Avenue Maurice Chevalier - ZI
77330 Ozoir-La-Ferrière
France
Phone: +33 1 64 43 22 00
Fax: +33 1 64 43 17 17

GERMANY
Apex Tool Group GmbH
Industriestraße 1
73463 Westhausen
Germany
Phone: +49 (0) 73 63 81 0
Fax: +49 (0) 73 63 81 222

HUNGARY
Apex Tool Group
Hungária Kft.
Platánfa u. 2
9027 GyörHungary
Phone: +36 96 66 1383
Fax: +36 96 66 1135

ASIA PACIFIC

AUSTRALIA
Apex Tool Group
519 Nurigong Street, Albury
NSW 2640
Australia
Phone: +61 2 6058 0300

CHINA
Apex Power Tool Trading
(Shanghai) Co., Ltd.
2nd Floor, Area C
177 Bi Bo Road
Pu Dong New Area, Shanghai
China 201203 P.R.C.
Phone: +86 21 60880320
Fax: +86 21 60880298

INDIA
Apex Power Tool Trading
Private Limited
Gala No. 1, Plot No. 5
S. No. 234, 235 & 245
Indialand Global
Industrial Park
Taluka-Mulsi, Phase I
Hinjawadi, Pune 411057
Maharashtra, India
Phone: +91 020 66761111

JAPAN
Apex Tool Group Japan
Korin-Kaikan 5F,
3-6-23 Shibakoen, Minato-Ku,
Tokyo 105-0011, JAPAN
Phone: +81-3-6450-1840
Fax: +81-3-6450-1841

KOREA
Apex Tool Group Korea
#1503, Hibrand Living Bldg.,
215 Yangjae-dong,
Seocho-gu, Seoul 137-924,
Korea
Phone: +82-2-2155-0250
Fax: +82-2-2155-0252

Cleco® Production Tools

Apex Tool Group, LLC
Phone: +1 (800) 845-5629
Phone: +1 (919) 387-0099
Fax: +1 (803) 358-7681
www.ClecoTools.com
www.ClecoTools.de