DOGA®
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TECHNOLOGY

User manual

COM OPEN PROTOCOL MDCv2/MDTC series

EN

60428-05/23

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INDEX

1. CONTROLLER FIRMWARE VERSION

Newer update MID40/41 applied since following firmware versions :

MDCv2 26 & 32 : MDC_v2.31.7_20230321.bin and newer

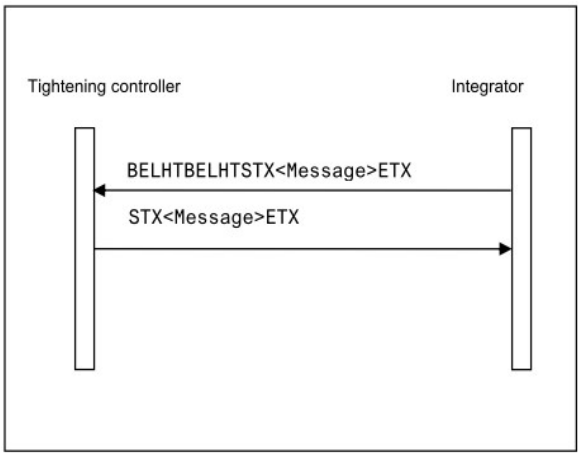
MDTC38 : MDTC_Normal_v1.31.5_230321.bin and newer

MDTC38 + : MDTC_Plus_v3.31.5_230321.bin and newer

2. COMMUNICATION TYPE

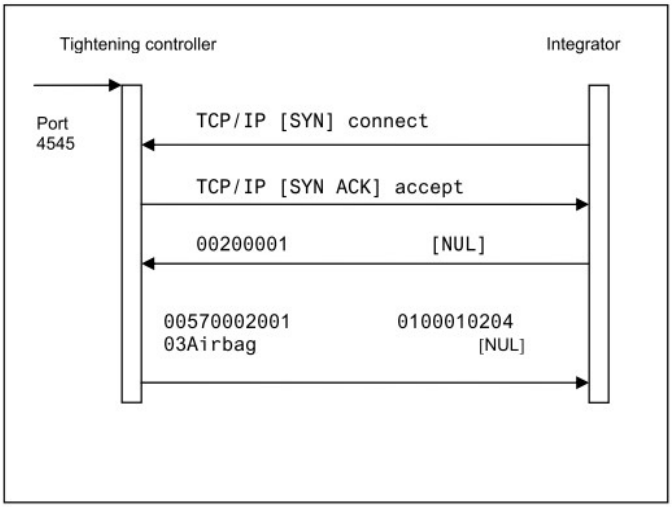
2.1 Serial Protocol

- Serial ASCII protocol
- Request message from Integrator to controller : Add BEL(0x07), HT(0x09), BEL(0x07), HT(0x09) as prefix.
- Respose message from controller to Integrator : Add STX (0x02) as prefix, ETX(0x03) as sufix.



2.2 Ethernet Protocol

- TCP/IP Protocol
- After TCP/IP connection confirmation, Message can be delivered.
- There is no Prefix and sufix as like BEL, HT in serial communication.



3. MESSAGE STRUCTURE

Header							Data Field	Message End
Length	MID	Revision	No ack flag	Station ID	Spindle ID	Spare	---	NUL (Hex 0x00)
20Byte							Max 1004Byte	

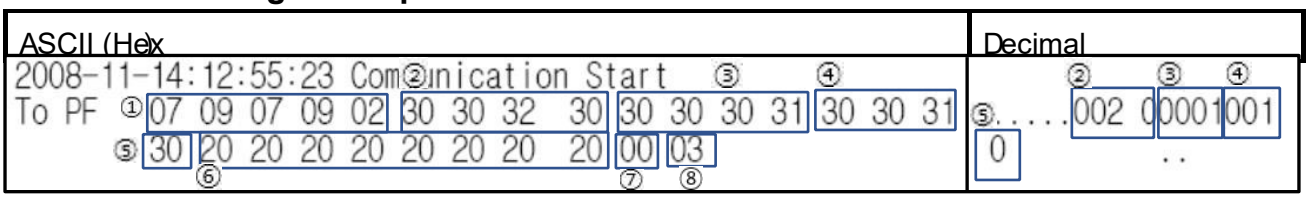
3.1 Header

Part	Bytes	Comment
Length	4	Total length of message except prefix and sufix (BEL, HT, STX, ETX) Range: 0000 ~ 9999
MID	4	Command message (Ex: Parameter save, Disable tool) Range: 0001 ~ 9999
Revision	3	Message version According to the MID, Data type and lenght is different.
No ack flag	1	Require Ack message as a response ? 0: YES 1: NO
Station ID	2	No use. Replace with 0x20(space)
Spindle ID	2	
Spare	4	Spare. No use. Replace with 0x20(space)

Note.

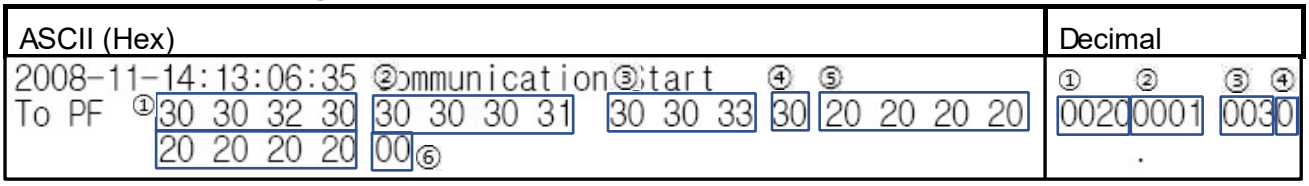
- The empty space Byte in Length and MID should be replaced with 0x30(0)

3.2 Serial message example



1. BEL, HT, BEL, HT, STX : Prefix of the message from Integrator to controller.
2. 0020(Decimal): Total message length is 20byte.
3. 0001(Decimal): MID (command) 1 is for communication start.
4. 001(Decimal): The current message version is 1st.
5. 0(Decimal): "0" requires ACK response.
6. 20 20...(hex): No use with Space(0x20).
7. 00(hex): NULL.
8. 03(hex): ETX. The end of Message.

3.3 Ethernet message example

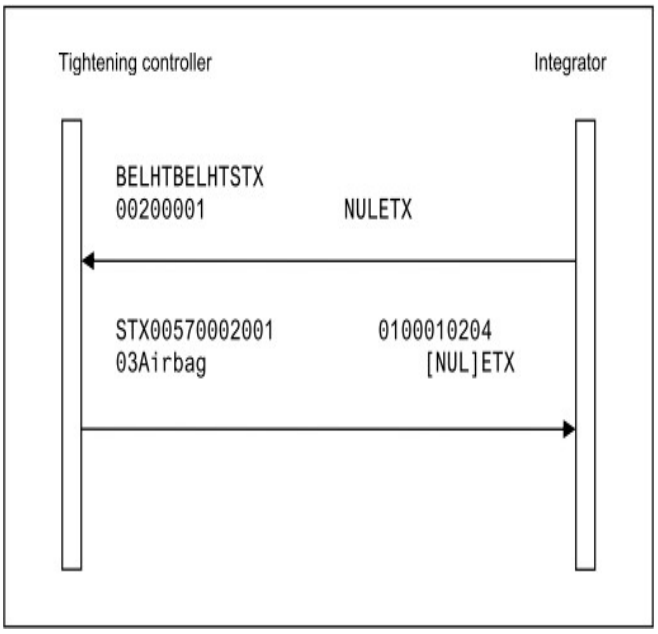


1. 0020: Total message length is 20byte.
2. 0001: MID (command) 1 is for communication start.
3. 003: Revision. The current message version is 3th.
4. 0: No ack flag. "0" requires ACK response.
5. 20 20...(hex): No use with Space(0x20).
6. 00(hex): NULL

4. COMMUNICATION FLOW

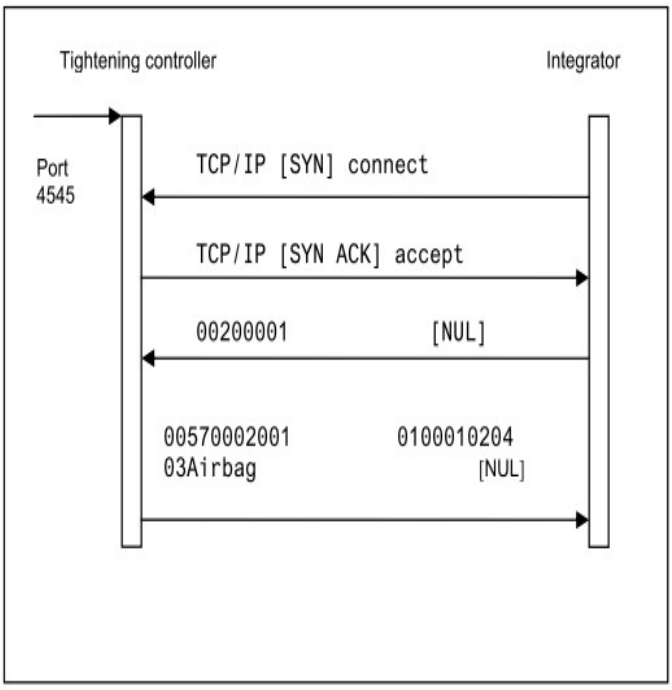
4.1 Serial Connection flow

1. Integrator send MID 0001 message to controller for communication start.
2. Controller response with MID 0002 ACK message which means communication start.

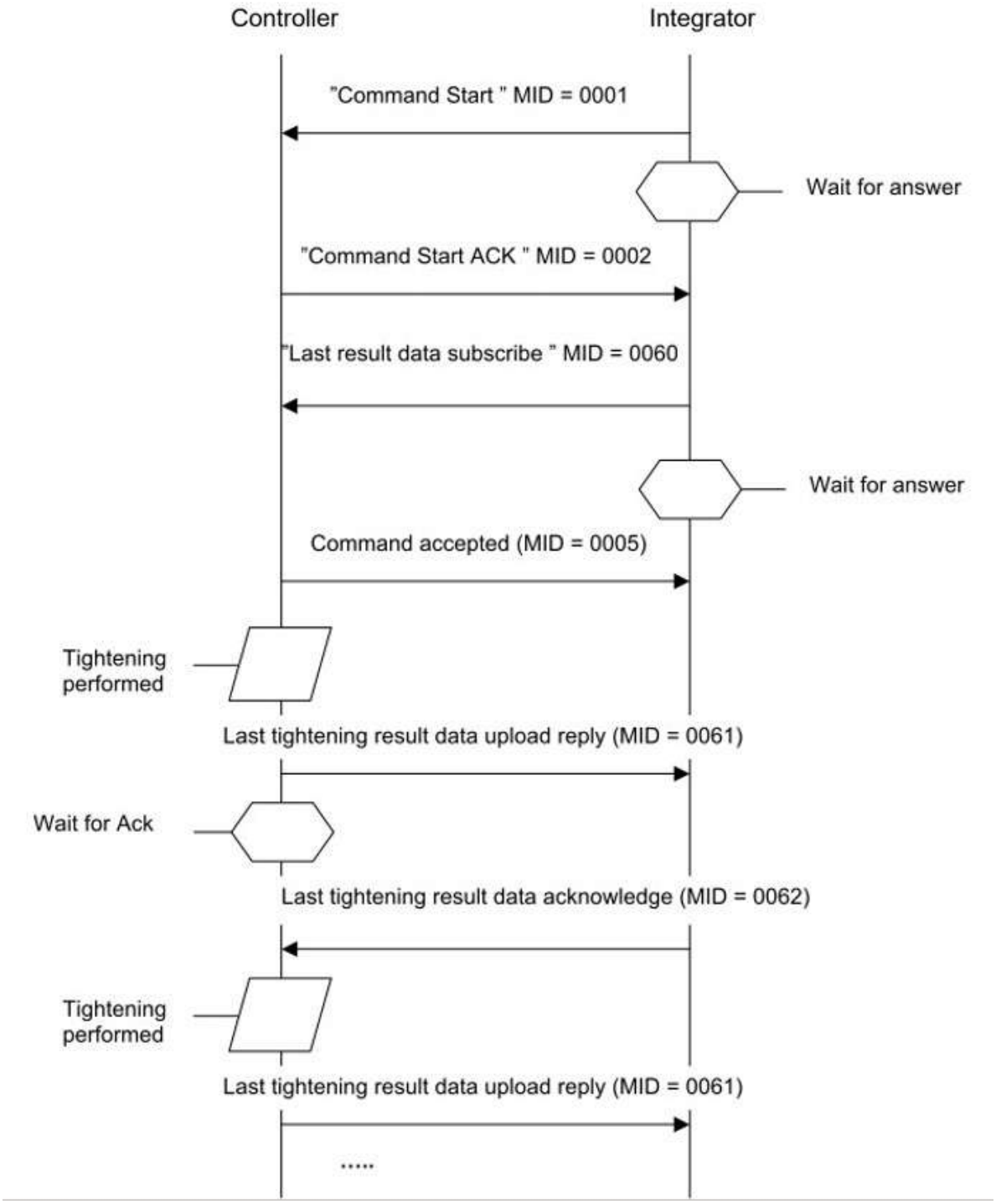


4.2 Ethernet Connection flow

1. Integrator request TCP connection to Controller.
2. Controller response TCP accept message.
3. Integrator send MID 0001 message to controller for communication start.
4. Controller response with MID 0002 ACK message which means communication start.



4.3 Communication flow chart example



Ex) Establish a connection and set result subscription

5. Communication messages

5.1 MID control type

ID	Description	Sent by
0001	Communication start	Integrator
0002	Communication start acknowledge	Controller
0003	Communication stop	Integrator
0004	Command error	Controller
0005	Command accepted	Controller
0010	Parameter set ID(Preset number) upload request	Integrator
0011	Parameter set ID(Preset number) upload reply	Controller
0012	Parameter set(Preset) data upload request	Integrator
0013	Parameter set(Preset) data upload reply	Controller
0018	Select Parameter set(Preset)	Integrator
0040	Tool data upload request	Integrator
0041	Tool data upload reply	Controller
0042	Disable Tool	Integrator
0043	Enable Tool	Integrator
0060	Last tightening result data subscribe	Integrator
0061	Last tightening result data	Controller
0062	Last tightening result data acknowledge	Integrator
0063	Last tightening result data unsubscribe	Integrator
0070	Alarm subscribe	Integrator
0071	Alarm	Controller
0072	Alarm acknowledge	Integrator
0073	Alarm unsubscribe	Integrator
1000	Read Parameter value	Integrator
1001	Read Parameter value acknowledge	Controller
1002	Write parameter value	Integrator
1003	Write parameter value acknowledge	Controller
9999	Keep alive open protocol communication	Integrator

5.1.1 MID 0001 Communication start

This message enables the communication. The controller does not respond to any other command before this

- Message sent by: Integrator
- Answers: **MID 0002 Communication start acknowledge** or **MID 0004 Command error**, **Client already connected** or **MID revision unsupported**

Example: Communication start with call for **MID 0002 Communication start acknowledge** revision 3.

```
00200001003        NUL
```

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0001
	Revision of MID 0002	9-11	Range: 001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A	0	N/A
Message end		21	NUL

5.1.2 MID 0002 Communication start acknowledge

When accepting the communication start the controller sends as reply, a Communication start acknowledge. This message contains some basic information about the controller, such as cell ID, channel ID, and name.

- Message sent by: Controller
- Answer: None

Example, revision 1: The connected controller belongs to cell 1, the channel ID is 1 and the name is Airbag1

```
00570002          010001020103Airbag1                  NUL
```

Message part	Parameter	Byte	Value
Header	Length	1-4	Rev 1: 0057
	MID	5-8	0002
	Revision	9-11	Range: 001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Controller information	21-length	See Table 1
Message end		Rev 1: 58	NUL

Table 1 MID 0002 Revision 1

Parameter	Byte	Value
Cell ID	21-22	01
	23-26	The cell ID don't use. (Fill with 0x30)
Channel ID	27-28	02
	29-30	The channel ID don't use. (Fill with 0x30)
Controller Name	31-32	03
	33-57	The controller name is 25 bytes long and specified by 25 ASCII

5.1.3 MID 0003 Communication stop

This message disables the communication. The controller will stop to respond to any commands except for **MID 0001 Communication start** after receiving this command.

- Message sent by: Controller:
- Answer: **MID 0005 Command accepted**

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0003
	Revision	9-11	00-01
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end		21	NUL

5.1.4 MID 0004 Command error

This message is used by the controller when a request for any reason has not been performed. The data field contains the message ID of the message request that failed as well as an error code.

- Message sent by: Controller:
- Answer: None

Example: The request **MID 0018 Select parameter set** failed, the parameter set number was not present in the controller.

```
00260004          001802NUL
```

Message part	Parameter	Byte	Value
Header	Length	1-4	0026
	MID	5-8	0004
	Revision	9-11	Range: 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	MID and error code	21-26	see Table 2.
Message end		27	NUL

Table 2 MID 0004 Data field (Error code description)

ID	Description
00	No Error
01	Invalid data
02	Parameter set : ID not present
03	Parameter set : can not be set.
04	Parameter set : not running
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	Parameter set selection subscription already exists
14	Parameter set selection subscription does not exist
16	Connection rejected protocol busy
58	No alarm present
79	Command failed
96	Client already connected
97	MID revision unsupported
98	Controller internal request timeout
99	Unknown MID

5.1.5 MID 0005 Command accepted

This message is used by the controller to confirm that the latest request sent by the integrator was accepted. The data field contains the MID of the request accepted.

- Message sent by: Controller.
- Answer: None.

Example: The request **MID 0018 Select parameter set** is accepted.

```
00240005      0018NUL
```

Message part	Parameter	Byte	Value
Header	Length	1-4	0024
	MID	5-8	0005
	Revision	9-11	Range: 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	MID accepted	21-24	Four ASCII digits
Message end		25	NUL

5.1.6 MID 0010 Parameter set ID (Preset number) upload request

A request to get the valid parameter set IDs from the controller.

- Message sent by: Integrator
- Answer: **MID 0011 Parameter set ID upload reply**

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0010
	Revision, MID 0011	9-11	Range: 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end		21	NUL

5.1.7 MID 0011 Parameter set ID (Preset number) upload reply

The transmission of all the valid parameter set IDs of the controller. The data field contains the number of valid parameter sets currently present in the controller, and the ID of each parameter set present.

- Message sent by: Controller
- Answer: None

Example: parameter set 1 and 2 are present in the controller.

```
00290011          002001002NUL
```

Message part	Parameter	Byte	Value
Header	Length	1-4	Length depends on the number of parameter sets. 23 + number of parameter sets x3
	MID	5-8	0011
	Revision	9-11	Range: 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field, part 1	The number of parameter sets in the controller	21-23	Three ASCII digits. Range: 001-015
Data field, part 2	The ID of each parameter set present	24 -	Three ASCII digits for each parameter set
Message end		Length +1	NUL

5.1.8 MID 0012 Parameter set (Preset) data upload request

Request to upload parameter set data from the controller.

- Message sent by: Integrator
- Answer: **MID 0013 Parameter set data upload reply**, or
  MID 0004 Command error, Parameter set not present

Example: Request to upload parameter set data for parameter set 1.

```
00230012          001NUL
```

Message part	Parameter	Byte	Value
Header	Length	1-4	0023
	MID	5-8	0012
	Revision, MID 0013	9-11	Range: 001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Parameter set ID	21-23	Three ASCII digits. Range: 001-015
Message end		24	NUL

5.1.9 MID 0013 Parameter set (Preset) data upload reply

Upload of parameter set data reply. The following tables show the revisions available:

- Message sent by: Controller
- Answer: None

Example: Upload parameter set data for parameter set 1 called Airbag 1.

```
01040013          0100102Airbag1                  031040305001200
060015000700140008003600900720100048ONUL
```

Message part	Parameter	Byte	Value
Header	Length	1-4	0104
	MID	5-8	0013
	Revision	9-11	Range: 001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Parameter set data	21-104	See Table 3
Message end		105	NUL

Table 3 MID 0013 Revision 1

Parameter	Byte	Value
Parameter set ID	21-22	01
	23-25	Three ASCII digits, range 001-015
Parameter set name	26-27	02
	28-52	Parameter set name don't use.
Rotation direction	53-54	03
	55	1=CW, 2=CCW
Batch size	56-57	04
	58-59	The batch size doesn't use. (Fill with 0x30)
Torque min	60-61	05
	62-67	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	68-69	06
	70-75	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	76-77	07

Parameter	Byte	Value
Torque final target	78-83	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	84-85	08
	86-90	The angle min value is five bytes long and is specified by five ASCII digits. Range: 00000-99999.
Angle max	91-92	09
	93-97	The angle max value is five bytes long and is specified by five ASCII digits. Range: 00000-99999.
Final Angle Target	98-99	10
	100-104	The target angle is specified in degrees. 5 ASCII digits. Range: 00000-99999.

5.1.10 MID 0018 Select Parameter set (Preset)

Select a parameter set.

- Message sent by: Integrator
- Answer: **MID 0005 Command accepted** or
  MID 0004 Command error, Parameter set can not be set

The Pset will then be automatically selected when the operator chooses the correct socket from the selector.

Subscription of the currently selected Pset via MID 0014 will show when the operator has selected the correct Pset.

Message part	Parameter	Byte	Value
Header	Length	1-4	0023
	MID	5-8	0018
	Revision	9-11	Range : 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Parameter set ID	21-23	Three ASCII digits, range 001-015
Message end		24	NUL

5.1.11 MID 0040 Tool data upload request

A request for some of the data stored in the tool. The result of this command is the transmission of the tool data.

Message sent by: Integrator
Answer: **MID 0041 Tool data upload reply**

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0040
	Revision, MID 0041	9-11	Range: 000-004
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end		21	NUL

5.1.12 MID 0041 Tool data upload reply

Upload of tool data from the controller.

Message sent by: Controller
Answer: None

Example: Tool data

00810041 01C341212 02548796 032001-05-07:13:24:5404670919 NUL

Message part	Parameter	Byte	Value
Header	Length	1-4	Revision 1: 0081 Revision 2: 0156
	MID	5-8	0041
	Revision	9-11	Range: 000-004
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Tool data	21-length	See Table 31,Table 32, Table 33
Message end	N/A	Rev 1: 82 Rev 2: 157	NUL

Table 31 MID 0041 Tool data, revision 1

Parameter	Byte	Value
Tool serial number	21-22	01
	23-36	14 ASCII characters
Tool number of tightening	37-38	02
	39-48	10 ASCII digits. Max 4294967295 - **N.A. on MD tools**
Last calibration date	49-50	03
	51-69	19 ASCII characters. YYYY-MM-DD:HH:MM:SS **N.A. on MD/MDT tools**
Controller serial number = Ford. RBU Serial = Normal	70-71	04
	72-81	10 ASCII characters **N.A. on MD/MDT tools**

Table 32 MID 0041 Tool data, additions for revision 2

Parameter	Byte	Value
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.
Last service date	90-91	06
	92-110	YYYY-MM-DD:HH:MM:SS - **N.A. on MD/MDT tools**
Tightenings since service	111-112	07
	113-122	The number of tightenings since last service is specified by 10 ASCII digits. Max 4294967295. - **N.A. on MD tools**
Tool type	123-124	08
	125-126	The tool type is specified by 2 ASCII digits: 00=No Tool, 01=S-tool, 02=DS-tool, 03=Ref. transducer, 04=STtool, 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=STwrench, 14 = ES-tool ***30 = MD (Doga)*** ***31= MDT (Doga)***
Motor size	127-128	09
	129-130	The motor size is specified by 2 ASCII digits,
		range 00-99. 00 = no motor, 01-99 = motor size xx in Atlas Copco nomenclature, or motor size = 10xx in Atlas Copco nomenclature (certain numbers correspond to 2 different motor sizes, for example 62 for both motor size 62 and motor size 1062)
Open end data	131-132	10
	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. **N.A. on MD/MDT tools**
Controller software version	136-137	11
	138-156	The software version is specified by 19 ASCII characters.

Table 33 MID 0041 Tool data, additions for revision 3

Parameter	Byte	Value
Tool max torque	157-158	12
	159-164	The tool max toque value is multiplied by 100 and sent as an integer (2 decimals truncated). Six ASCII digits.
Gear ratio	165-166	13
	167-172	The gear ratio value is multiplied by 100 and sent as an integer (2 decimals truncated). Six ASCII digits.
Tool full speed	173-174	14
	175-180	The tool full speed value is multiplied by 100 and sent as an integer (2 decimals truncated). Six ASCII digits.

5.1.13 MID 0042 Disable tool

Disable tool .

- Message sent by: Integrator
- Answer: **MID 0005 Command accepted**

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0042
	Revision	9-11	Range: 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end		21	NUL

5.1.14 MID 0043 Enable tool

Enable Tool.

- Message sent by: Integrator
- Answer: **MID 0005 Command accepted**

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0043
	Revision	9-11	Range: 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end		21	NUL

5.1.15 MID 0060 Last tightening result data subscribe

Set the subscription for the result tightenings. The result of this command will be the transmission of the tightening result after the tightening is performed (push function). The MID revision in the header is used to subscribe to different revisions of **MID 0061 Last tightening result data upload reply**.

- Message sent by: Integrator
- Answer: **MID 0005 Command accepted** or
  MID 0004 Command error, Last tightening subscription already exists or
  MID revision not supported

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0060
	Revision of MID 0061	9-11	Range: 001
	No Ack flag	12	0=Ack needed, 1=No ack needed
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end	N/A	21	NUL

5.1.16 MID 0061 Last tightening result data

Upload the last tightening result. The following tables show the revisions available:

- Message sent by: Controller
- Answer: **MID 0062 Last tightening result data acknowledge**

Example: **MID 0061 Last tightening result data upload reply**, revision 1

```
023100610010        010001020103airbag7
04 KPOL3456JKLO 897       0500060030700000800000901001111200084O

13001400140012001500073916000001709999180000O
```

Message part	Parameter	Byte	Value
Header	Length	1-4	Revision 001(0231), 002(0385)
	MID	5-8	0061
	Revision	9-11	Range: 001
	No Ack flag	12	0=Ack needed, 1=No ack needed
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Tightening data	21-length	Se e Table 4
Message end		Rev 1: 232	NUL

Table 4 MID 0061 Revision 1

Parameter	Byte	Value
Cell ID	21-22	01
	23-26	The cell ID don't use. (Fill with 0x30)
Channel ID	27-28	02
	29-30	The channel ID don't use. (Fill with 0x30)
Torque controller Name	31-32	03
	33-57	The controller name is 25 bytes long and is specified by 25 ASCII characters. (ex: 0000…003201)
VIN Number	58-59	04
	60-84	The VIN number don't use. (Fill with 0x30)
Job ID	85-86	05
	87-88	The Job ID don't use. (Fill with 0x30)
Parameter set ID	89-90	06
	91-93	The parameter set ID is three bytes long and specified by three ASCII digits. Range: 000-999.
Batch size	94-95	07

Parameter	Byte	Value
Batch size	96-99	The batch size doesn't use. (Fill with 0x30)
Batch counter	100-101	08
	102-105	The batch counter information doesn't use. (Fill with 0x30)
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 decimals 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 decimals 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 decimals 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 decimals truncated). It is six bytes long and is specified by six ASCII digits.
Angle Min	147-148	16
	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	161-162	18
target	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 don't use. (Fill with 0x30)

Parameter	Byte	Value
Date/time of last change in parameter set settings	196-197	21
	198-216	Time stamp for the last change in the current parameter set settings don't use.
Batch status	217-218	22
	219	The batch status doesn't use. (Fill with 0x30)
Tightening ID	220-221	23
	222-231	The tightening ID don't use. (Fill with 0x30)

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Parameter	Byte	Value
Cell ID	21-22	01
	23-26	The cell ID don't use. (Fill with 0x30)
Channel ID	27-28	02
	29-30	The channel ID don't use. (Fill with 0x30)
Torque controller Name	31-32	03
	33-57	The controller name is 25 bytes long and is specified by 25 ASCII characters. (ex: 0000…003201)
VIN Number	58-59	04
	60-84	The VIN number don't use. (Fill with 0x30)
Job ID	85-86	05
	87-88	The Job ID don't use. (Fill with 0x30)
Parameter set ID	89-90	06
	91-93	The parameter set ID is three bytes long and specified by three ASCII digits. Range: 000-999.
Strategy	96-97	07
	98-99	The strategy currently run by the controller. It is two bytes long and specified by two ASCII digits. Range: 00-99. The corresponding strategies are : 02=Torque control / angle monitoring, 04=Angle control / torque monitoring

Parameter	Byte	Value
Strategy options	100-101	08
	102-106	Five bytes long bit field. Bit 0 Torque Bit 1 Angle
Batch size	107-108	09
	109-112	The batch size doesn't use. (Fill with 0x30)
Batch counter	113-114	10
	115-118	The batch counter information doesn't use. (Fill with 0x30)
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 doesn't use. (Fill with 0x30)
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	Not use
Current Monitoring Status	134-135	16
	136	Not use
Selftap status	137-138	17
	139	Not use
Prevail Torque monitoring status	140-141	18
	142	Not use
Prevail Torque compensat e status	143-144	19
	145	Not use
Tightening error status	146-147	20
	148-157	Not use
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.

Parameter	Byte	Value
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
	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	Not use
Rundown angle Max	225-226	30
	227-231	Not use
Rundown angle	232-233	31
	234-238	Not use
Current Monitoring Min	239-240	32
	241-243	Not use
Current Monitoring Max	244-245	33
	246-248	Not use
Current Monitoring Value	249-250	34
	251-253	Not use
Selftap min	254-255	35
	256-261	Not use
Selftap max	262-263	36
	264-269	Not use
Selftap torque	270-271	37
	272-277	Not use

Parameter	Byte	Value
Prevail torque monitoring min	278-279	38
	280-285	Not use
Prevail torque monitoring max	286-287	39
	288-293	Not use
Prevail torque	294-295	40
	296-301	Not use
Tightening ID	302-303	41
	304-313	Not use
Job sequence number	314-315	42
	316-320	Not use
Sync tightening ID	321-322	43
	323-327	Not use
Tool serial number	328-329	44
	330-343	Not use
Time stamp	344-345	45
	346-364	Not use
Date/time of last change in parameter set settings	365-366	46
	367-385	Not use

5.1.17 MID 0062 Last tightening result data acknowledge

Acknowledgement of last tightening result data.

- Message sent by: Integrator
- Answer: None

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0062
	Revision	9-11	Range: 001-006, 998-999
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end	N/A	21	NUL

5.1.18 MID 0063 Last tightening result data unsubscribe

Reset the last tightening result subscription.

- Message sent by: Integrator
- Answer: **MID 0005 Command accepted** or
  MID 0004 Command error, Last tightening result subscription does not exist

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0063
	Revision	9-11	Range: 001-006, 998-999
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end	N/A	21	NUL

5.1.19 MID 0070 Alarm subscribe

A subscription for the alarms that can appear in the controller.

- Message sent by: Integrator
- Answer: **MID 0005 Command accepted** or
  MID 0004 Command error, Alarm subscription already exists

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0070
	Revision	9-11	Range: 000-001
	No Ack flag	12	0=Ack needed, 1=No ack needed
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end	N/A	21	NUL

5.1.20 MID 0071 Alarm

An alarm has appeared in the controller. The current alarm is uploaded from the controller to the integrator.

- Message sent by: Controller
- Answer: **MID 0072 Alarm acknowledge**

Example: MID 0071. Alarm E404 appeared on June 12, 2008. The controller and the tool have ready status.

```
00530071                01E404021031042008-06-
                        02:10:14:26NUL
```

Message part	Parameter	Byte	Value
Header	Length	1-4	0053
	MID	5-8	0071
	Revision	9-11	Range: 000-001
	No Ack flag	12	0=Ack needed, 1=No ack needed
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Alarm data	21-53	See Table 5
Message end	N/A	54	NUL

Table 5 MID 0070 Alarm data

Parameter	Byte	Value
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.
Controller ready status	27-28	02
	29	Controller ready status 1=OK, 0=NOK
Tool ready status	30-31	03
	32	Tool ready status 1=OK, 0=NOK
Time	33-34	04
	35-53	Time stamp don’t use. (Fill with 0x30)

5.1.21 MID 0072 Alarm acknowledge

Acknowledgement for **MID 0071 Alarm**.

- Message sent by: Integrator
- Answer: None

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0072
	Revision	9-11	Range: 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end	N/A	21	NUL

5.1.22 MID 0073 Alarm unsubscribe

Reset the subscription for the controller alarms.

- Message sent by: Integrator
- Answer: **MID 0005 Command accepted** or
  MID 0004 Command error, Alarm subscription does not exist

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	0073
	Revision	9-11	Range: 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end	N/A	21	NUL

5.1.23 MID 1000 Read parameter value

Read parameter value of parameter address.

- Message sent by: Integrator
- Answer: **MID 1001 Read parameter value ack** or **MID 4 Error, Data invalid**

Message part	Parameter	Byte	Value
Header	Length	1-4	0024
	MID	5-8	1000
	Revision	9-11	Range 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Parameter address	21-24	Range 0000 - parameter size (0874)
Message end	N/A	25	NUL

5.1.24 MID 1001 Read parameter value acknowledge

Acknowledgement of Read parameter value.

- Message sent by: Controller
- Answer: None

Message part	Parameter	Byte	Value
Header	Length	1-4	0029
	MID	5-8	1001
	Revision	9-11	Range 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Parameter address	21-24	Range 0000 - parameter size (0874)
	Parameter value	25-29	Range 00000 - 99999
Message end	N/A	30	NUL

5.1.25 MID 1002 Write parameter value

Write parameter value to controller.

- Message sent by: Integrator
- Answer: **MID 1003 Write parameter value ack** or **MID 4 Error, Data invalid**

Message part	Parameter	Byte	Value
Header	Length	1-4	0029
	MID	5-8	1002
	Revision	9-11	Range 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Parameter address	21-24	Range 0000 - parameter size (0874)
	Parameter value	25-29	Range 00000 - 99999
Message end	N/A	30	NUL

5.1.26 MID 1003 Write parameter value acknowledge

Acknowledgement of Write parameter value.

- Message sent by: Controller
- Answer: None

Message part	Parameter	Byte	Value
Header	Length	1-4	0029
	MID	5-8	1003
	Revision	9-11	Range 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	Parameter address	21-24	Range 0000 - parameter size (0874)
	Parameter value	25-29	Range 00000 - 99999
Message end	N/A	30	NUL

5.1.27 MID 9999 Keep alive message

The integrator sends a keep alive to the controller. The controller should only mirror and return the received keep alive to the integrator.

The controller has a communication timeout equal to 15s. This means that if no message has been exchanged between the integrator and the controller for the last 15s, then the controller considers the connection lost and closes it.

In order to keep the communication alive the integrator must send a keep alive to the controller with a time interval lower than 15s.

Note: An inactivity timeout is suggested to integrator i.e. if no message has been exchanged (sent or received) during the last 10s, send a keep alive.

- Message sent by: Integrator
- Answer: The same message mirrored by the controller.

Message part	Parameter	Byte	Value
Header	Length	1-4	0020
	MID	5-8	9999
	Revision	9-11	Range 000-001
	No Ack flag	12	N/A
	Station ID	13-14	N/A
	Spindle ID	15-16	N/A
	Spare	17-20	N/A
Data field	N/A		N/A
Message end	N/A	21	NUL

5.2 Event message

The controller can spontaneously send messages to the integrator after an event such as a tightening or an alarm. This service is only enabled after a subscription event message.

5.2.1 Event subscribe – unsubscribe messages

The subscription is made with the subscribe - unsubscribe message. The subscription can be cancelled at any time by the integrator by sending an unsubscribe message.

5.2.2 Event message acknowledge

The integrator should acknowledge the event messages by sending the corresponding acknowledge MID. If no acknowledge is received before the response timeout the controller will re-send the message up to three times. After three attempts the controller will consider the connection as lost.

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