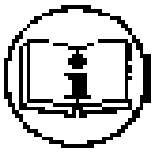
ParaMon Software

INSTRUCTIONS MANUAL

IMPORTANT

The tool delivered with this manual may have been modified for specific needs.
In that case, please give us the tool code number written on our shipping note or the approximate tool delivery date when you place an order for a new similar tool or for spare parts.
In that way, you will be sure to get the required tool and/or spare part.

WARNING



This information has to be kept in a location known by all users.

Each operator has to read carefully this manual before installing, using, and mending the product.

Be sure that the operator has understood using recommendations and the meaning of signs put on the product.

Most accidents could be avoided respecting this Manual Instructions. As a matter of fact, they were created according to European laws and norms regarding products.

In each case, please respect and follow safety national norms. Do not take off nor damage the stickers or advise put on the product and above all the details imposed by the law.

INDEX

1. Software installation

1.1 Required PC specification

- OS : Windows 7 or later version

- COM port : RS-232C, USB 2.0, Ethernet

1.2 Software

- Software file : ParaMon v0.00 yyyymmdd.zip

- Install file : setup.exe

The higher version of software will overwrite the lower version of ParaMon software.

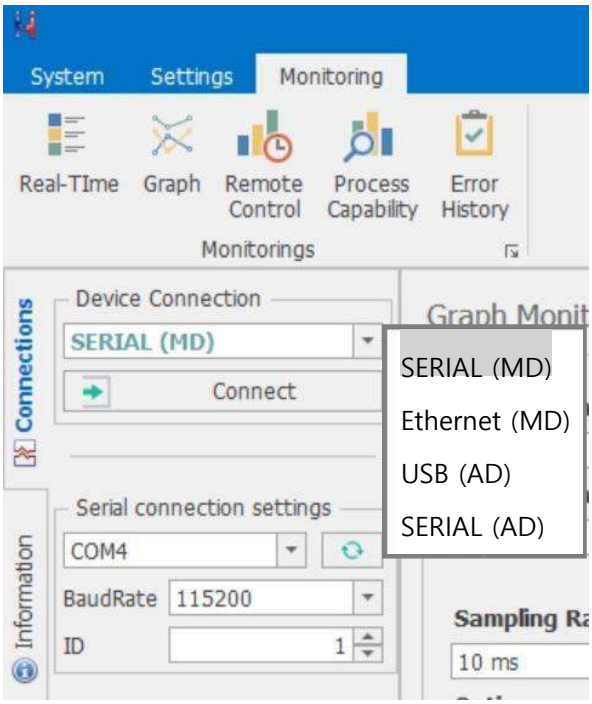
2. Operation

2.1 Connection

ParaMon pc software have 4 selectable connecting options to the MDC or ADC controller**.**

MDC controller : Serial RS232C or Ethernet

ADC controller : Serial RS422 or USB Serial COM port connection requires the information about COM port, Baud rate and the device ID



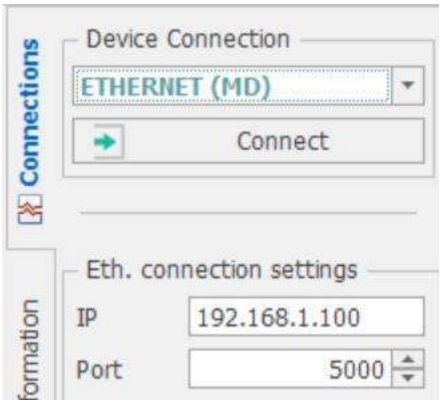
Ethernet connection requires IP and port address.

The followings are the factory setting address for the Ethernet connection

IP : 192.168.1.100

Port : 5000

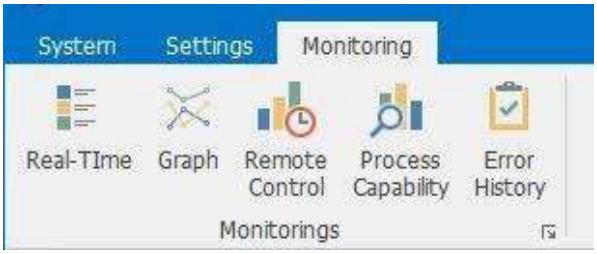
Use the IP address 192.168.1.1 or any other nearby address for your PC, avoiding conflict with other devices.

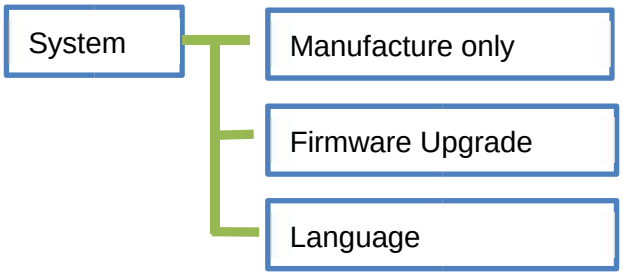


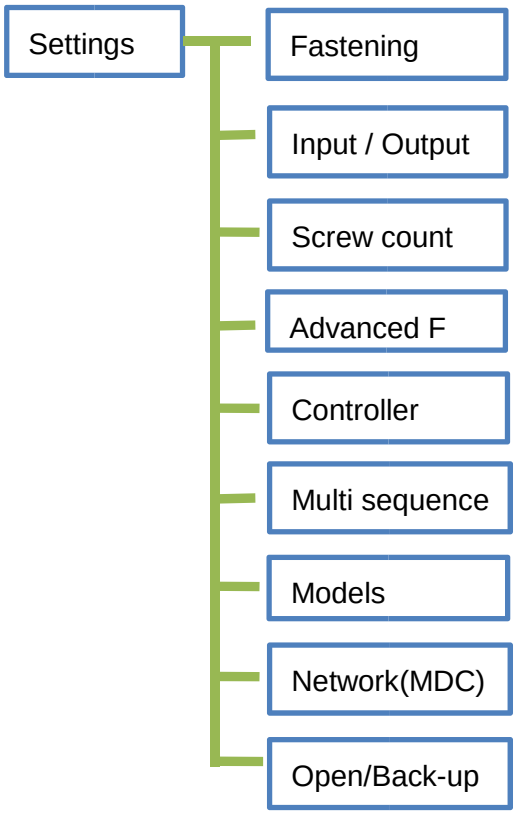
2.2 Menu

There are 3 main menu.

- System
- Settings
- Monitoring







Preset #1-15 (torque, speed, angle, soft start, etc)

I/O port definition

Number of screw, cycle start, complete signal

Free reverse, screw engaging detection, fastening sequence and angle after torque-up

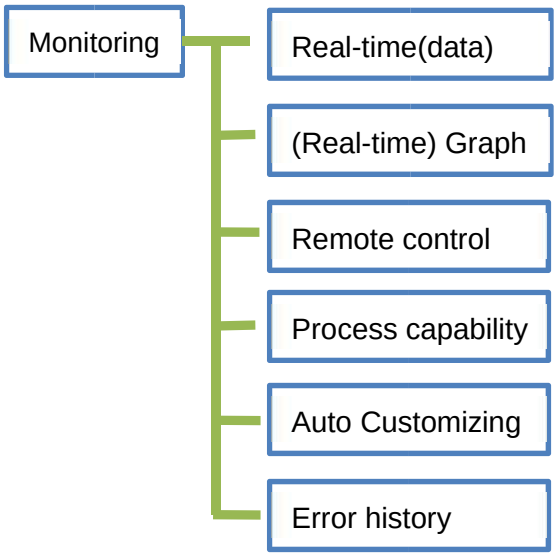
Time limit of run, motor stall, display, complete signal. And other settings of controller.

10 steps of multi sequence programing for 1 cycle

10 steps of sequence programing by managing preset#, input and output signals.

Ethernet port setting including IP address, gateway

Save parameter setting in a file. Or open the file into the Paramon



Fastening data output on any event

2 channel fastening data curve

Start, F/R remote control with I/O monitoring

STDV, CP and CPK with real-time CP curve

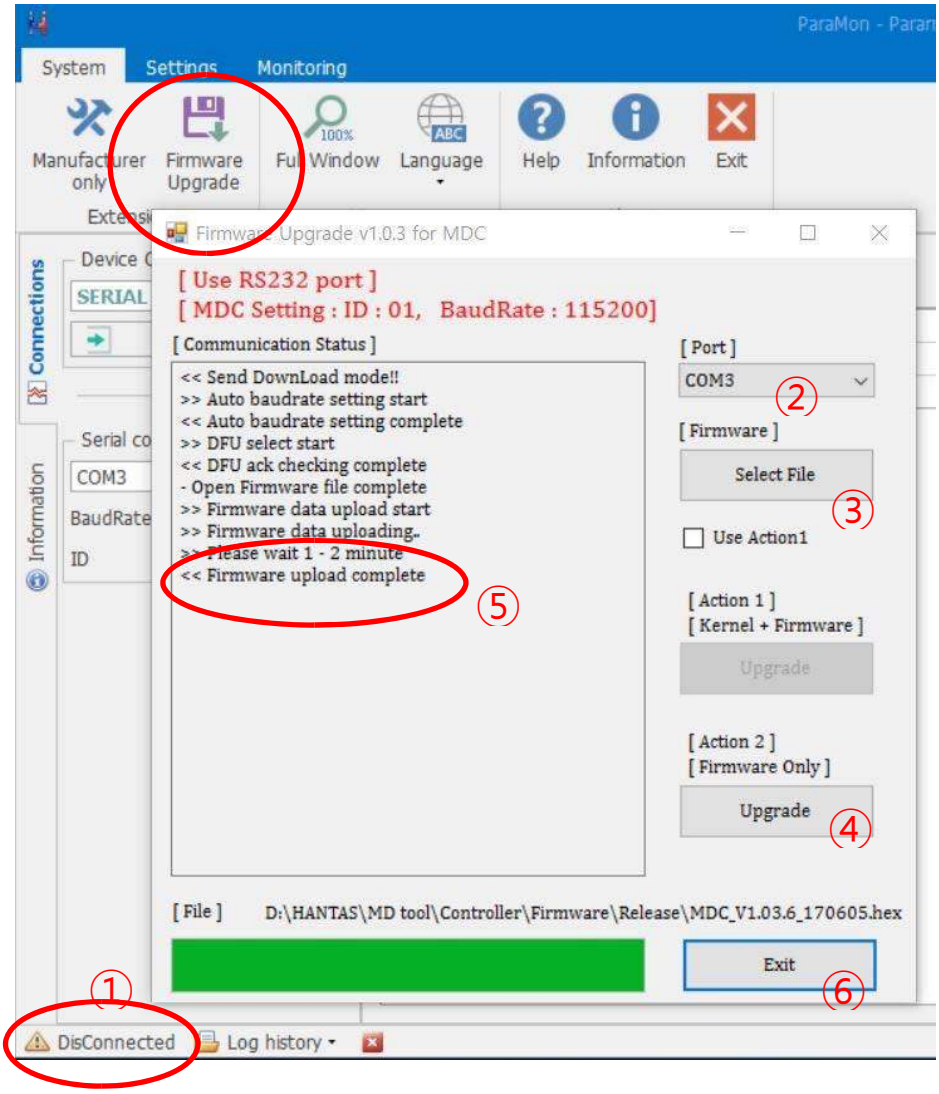
Find out the most fast fastening condtion without over torque by the speed

Latest 8 error history

2.3 Menu System

2.3.1 Firmware upgrade

Controller firmware is upgraded as below process. **Use RS232C port . Ethernet is not allowed for firmware upgrade.**



① Disconnect com port connection of PC

② Click " Firmware Upgrade "

③ Select the same COM port, and open firmware file in the PC

④ Click " Upgrade " for [Action 2, Firmware only]. If there is no existing firmware in the controller, refer " Firmware upgrade including Kernel data in next page

⑤ See the message " Firmware upload complete " in the message window, and click " Exit " to finish the process.

⑥ Turn the power of the controller OFF, and ON again to initialize the settings

2.3.2 Firmware upgrade including Kernel data

It is used when there is no existing or erased firmware in the controller.
Use RS232C port . Ethernet is not allowed for firmware upgrade.

① Disconnect com port connection of PC and power OFF the controller.

② Select “Firmware Upgrade” on the back panel of controller and power ON

③ Click “ Firmware Upgrade “

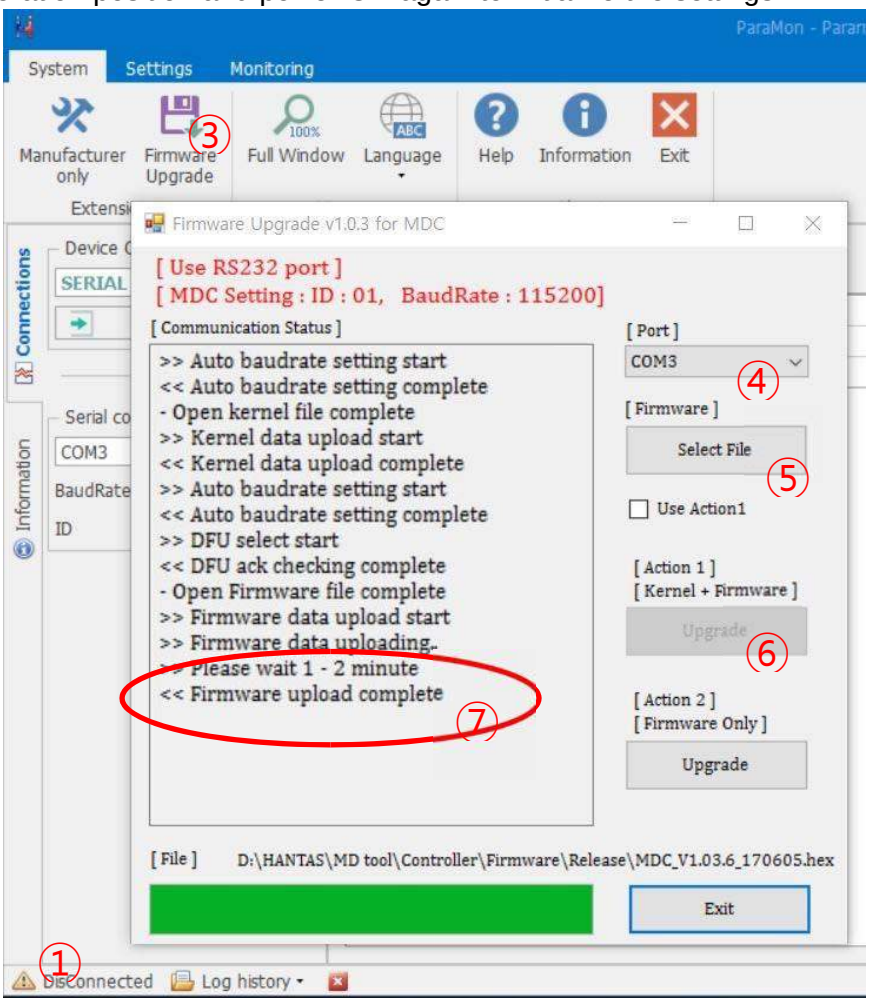
④ Select the same COM port, and open firmware file in the PC

⑤ Select the “Use Action1” Check button

⑥ Click “ Upgrade “ for [Action 1, Kernel+Firmware] and click “ Upgrade “

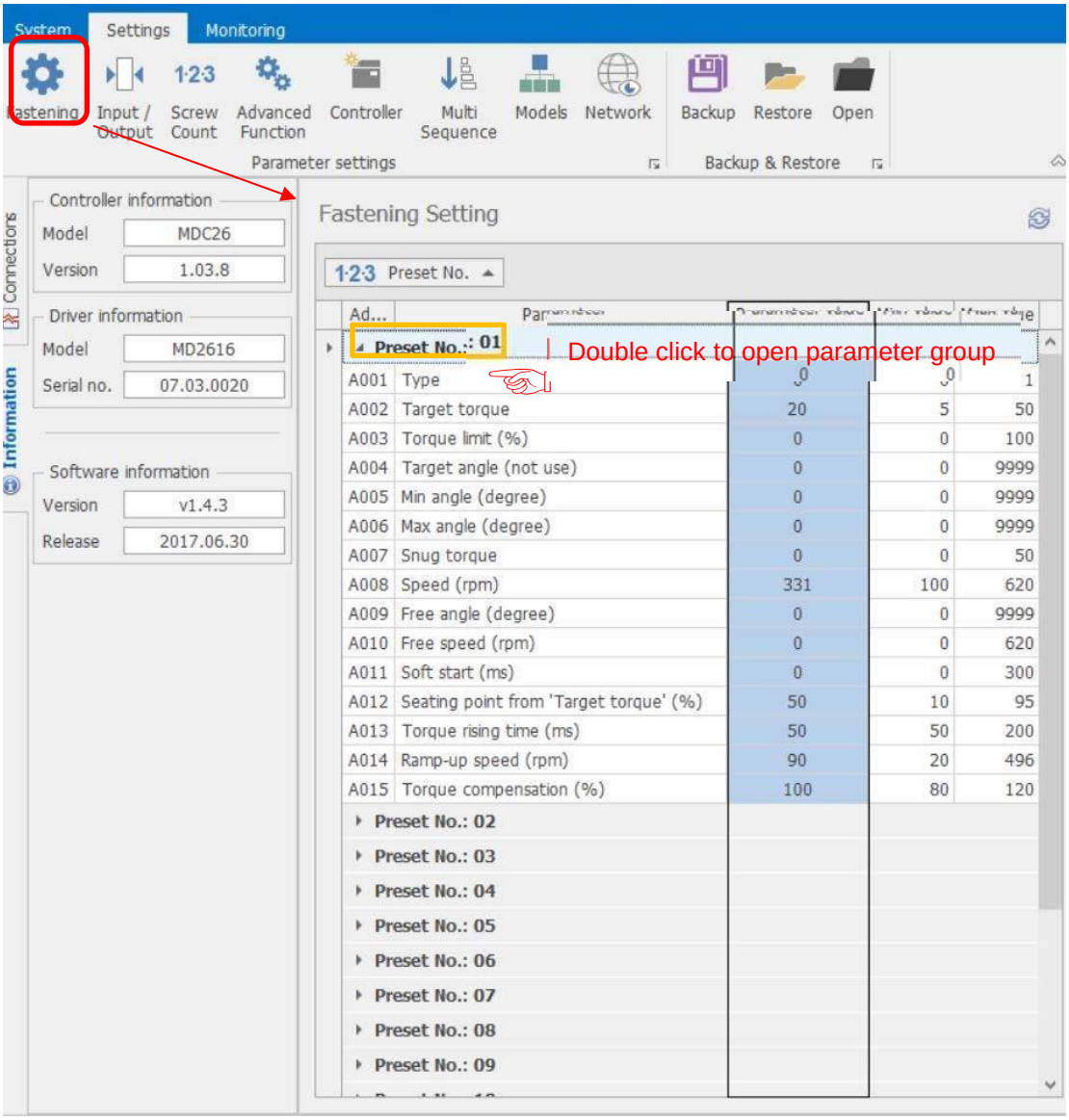
⑦ See the message “ Firmware upgrade complete “ in the message window, and click “ Exit “ to finish the process.

⑧ Turn the power of the controller OFF, return the Upgrade switch back to the original operation position and power ON again to initialize the settings



2.4 Settings

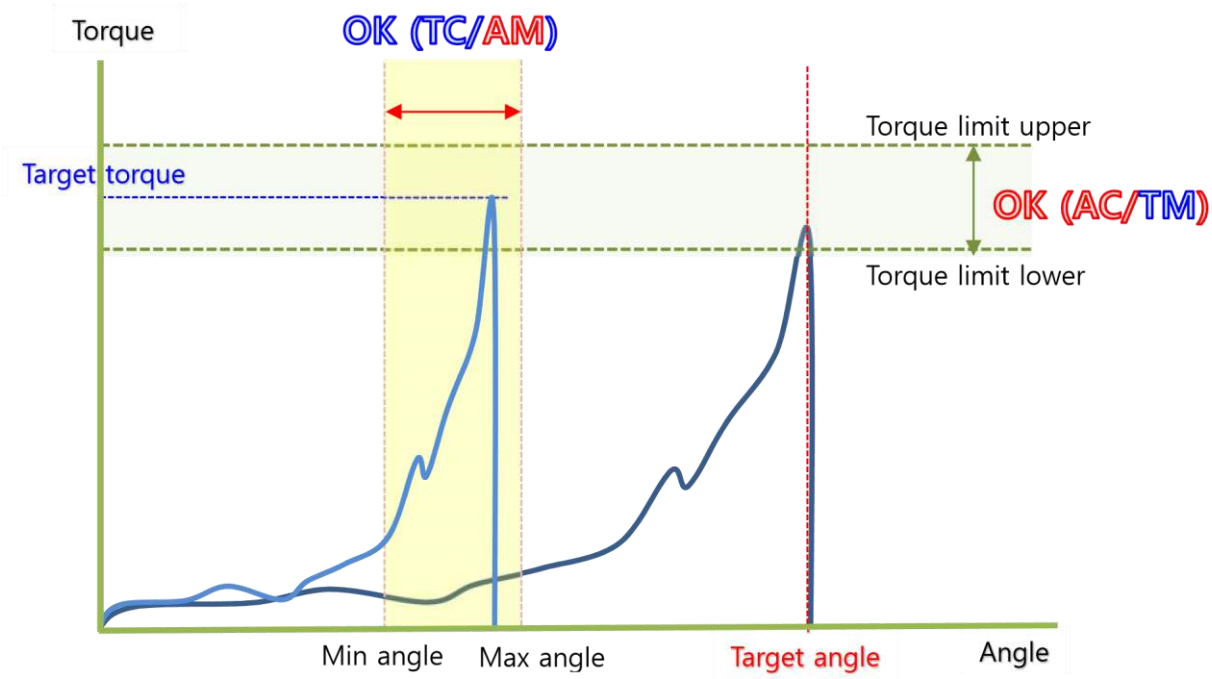
2.4.1 Fastening



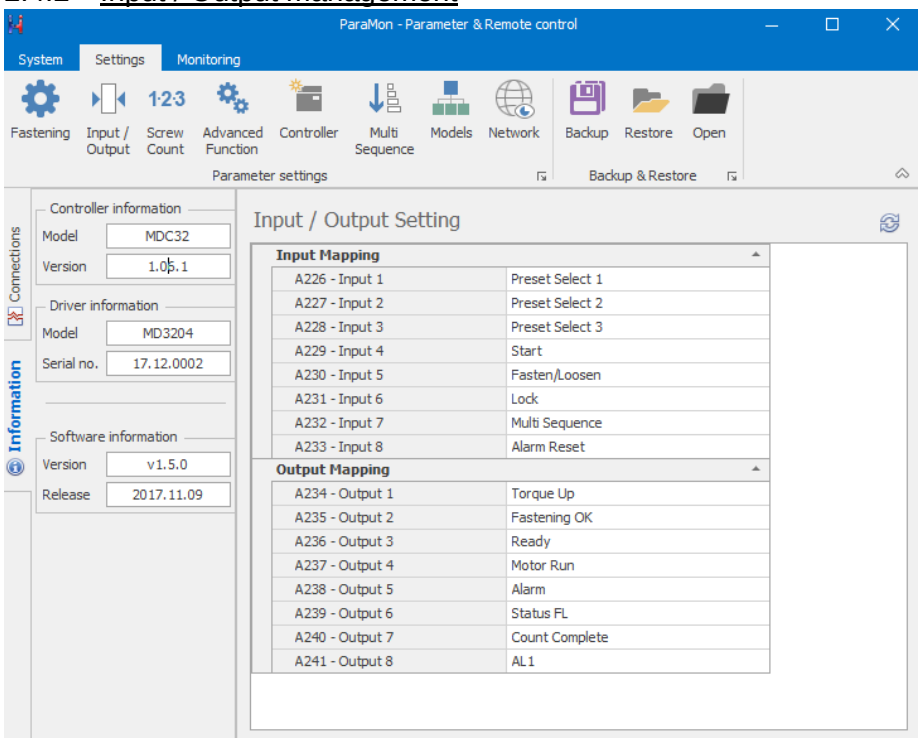
There are 15 preset groups for fastening setting. Each preset # consists of torque, speed, Min & Max angle for fastening OK range, soft start, Free speed before tightening.

- Control type : TC/AM or AC/TM
  (torque control angle monitoring or angle control torque monitoring)
- Torque : Target torque
- Torque limit (%) : OK torque range in AC/TM mode

- Target angle : Target angle in AC/TM mode
- Min angle (degree) : Minimum angle to be OK in TC/AM mode
- Max angle (degree) : Maximum angle to be OK in TC/AM mode
- Snug torque (torque unit) : Point to start monitoring angle in TC/AM mode
- Speed : Target speed. Speed is changed by torque setting automatically.
  To change manually, Auto Speed must be Disabled in Control 2
- Free speed : Manual setting speed. Shift back to the auto speed after the free angle running
- Free angle : Angle for Free speed.
- Soft start(mS) : Speed reach to the target in the setting time
- Seating point(%) : Auto speed slow down to ramp-up speed for torque control
- Torque rising time(mS) : Time setting from seating point to the target - Ramp-up speed(rpm) : Speed after seating to the end of tightening.
- Torque compensation(%) : Preset # has each torque compensation value.



2.4.2 Input / Output management



The digital I/O provide the free assignment feature for 8 Inputs and 8 Outputs.

Factory setting of I/O assignments are as following.

To validate changing I/O, turn the power OFF and ON again.

Description	Digital Input	Description	Digital Output
Preset select 1	Input 1	Torque up	Output 1
Preset select 2	Input 2	Fastening OK	Output 2
Preset select 3	Input 3	Ready	Output 3
Start	Input 4	Motor Run	Output 4
Fasten / Loosen	Input 5	Alarm	Output 5
Lock	Input 6	Status For/Rev	Output 6
Multi sequence	Input 7	Count Complete	Output 7
Alarm Reset	Input 8	Alarm 1	Output 8
Count Start	-	Alarm 2	
Count Reset	-	Alarm 3	
Count Out	-	Model Complete	
Preset select 4	-	Preset select 1	
Model Cancel	-	Preset select 2	
Model select 1	-	Preset select 3	
Model select 2	-	Preset select 4	
Model select 3	-		
Model select 4	-		

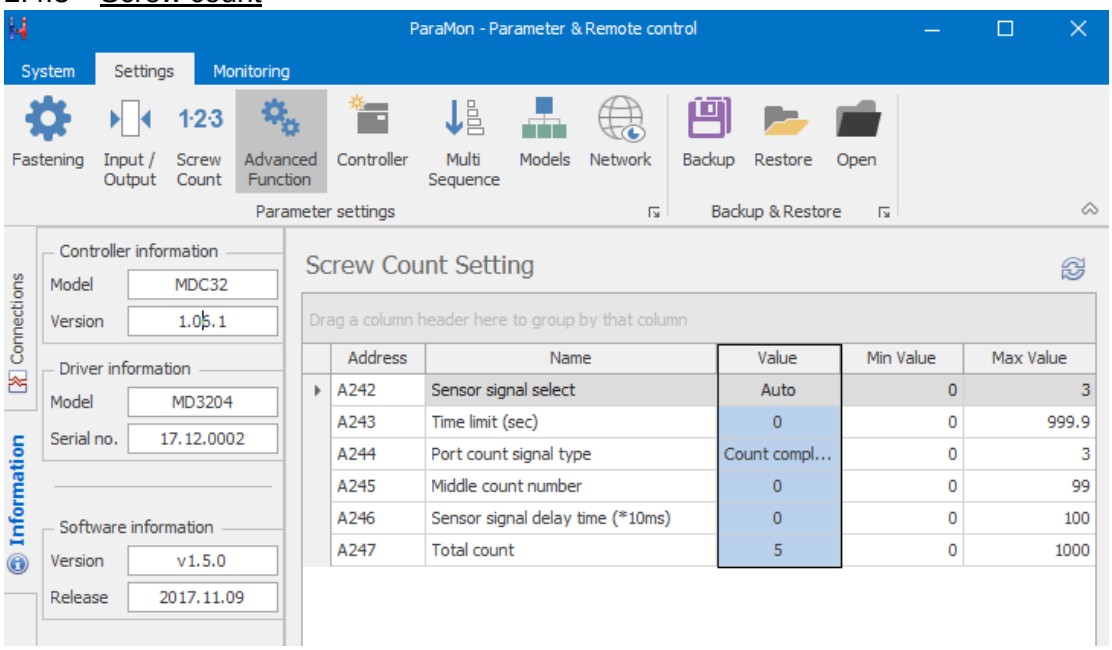
◆ Binary coding with 5 inputs to select preset #

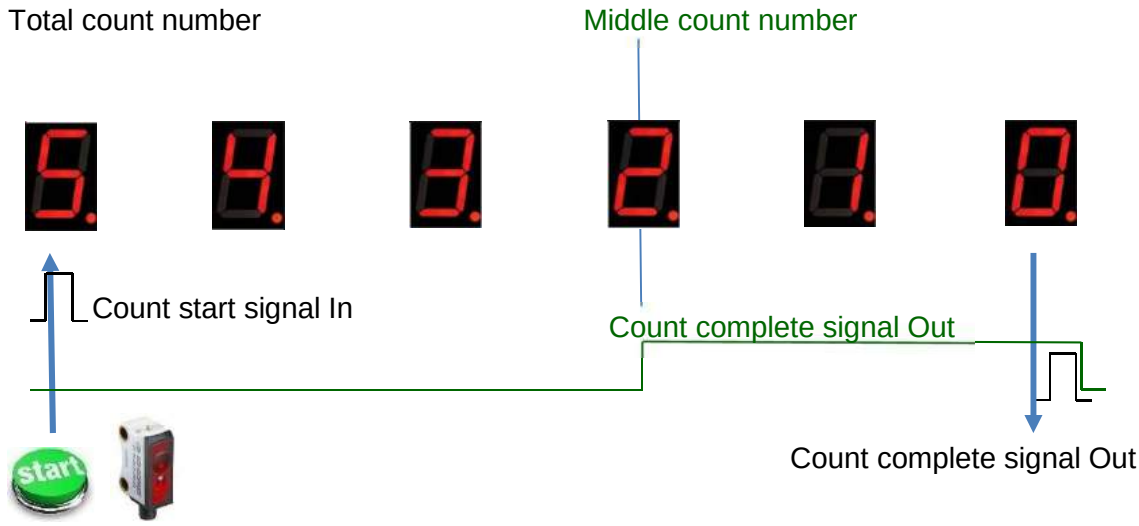
Preset #	Input				
	Torque select 4	Torque select 3	Torque select 2	Torque select 1	Multi sequence
1	0	0	0	1	
2	0	0	1	0	
3	0	0	1	1	
4	0	1	0	0	
5	0	1	0	1	
6	0	1	1	0	
7	0	1	1	1	
8	1	0	0	0	
9	1	0	0	1	
10	1	0	1	0	
11	1	0	1	1	
12	1	1	0	0	
13	1	1	0	1	
14	1	1	1	0	
15	1	1	1	1	
Multi A	0	0	0	0	1
Multi B	0	0	1	1	1

◆ Binary coding with 3 outputs for error codes in 7 groups

Error code	Alarm 3	Alarm 2	Alarm 1
110,111,112,113,114,115,116,118,200,201,220	0	0	1
300,301,302,303,304,309	0	1	0
310,311	0	1	1
330,331	1	0	0
332	1	0	1
333,334,335,336, 337	1	1	0
400,401,500	1	1	1

2.4.3 Screw count





◆ Count start signal (IN)

1) No signal, auto start (Auto) - auto reset to total number after “0”

2) Sensor or switch with one trigger pulse - Count starts with only trigger pulse. Counting is valid until complete or reset. Reset calls count NG

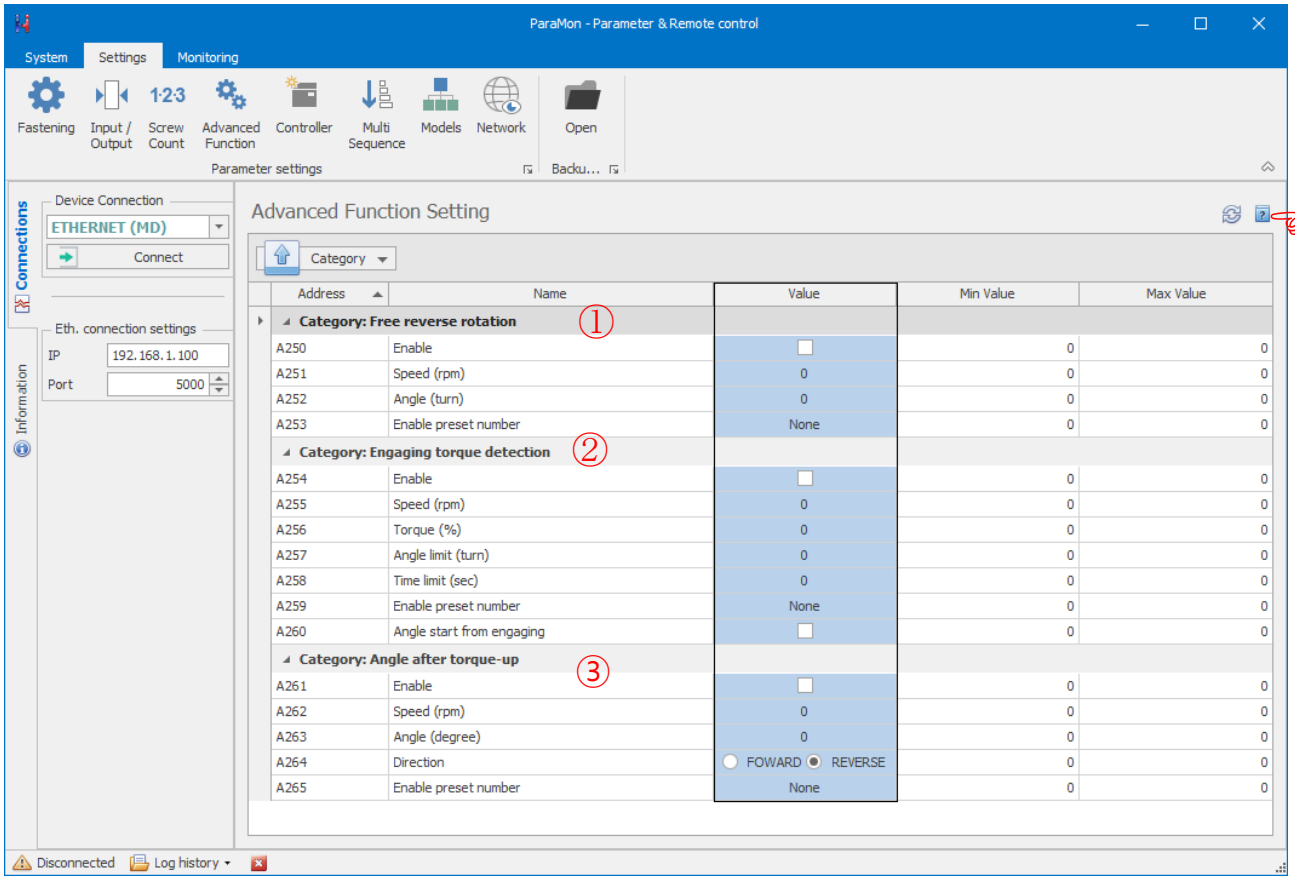
3) One trigger pulse with timer for counting - Counting should be completed within the time of timer from the trigger pulse, otherwise count NG

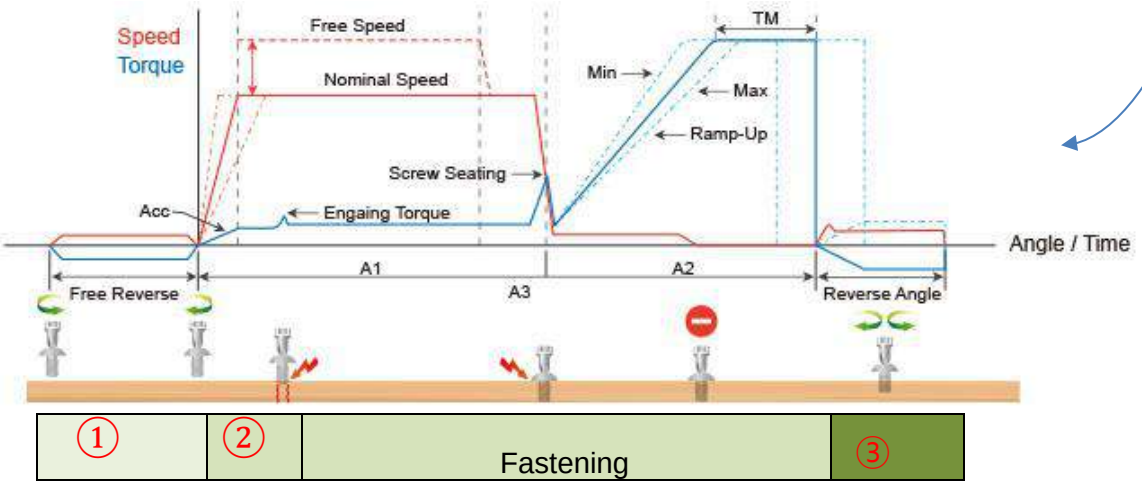
4) One trigger pulse to start counting, another trigger pulse to stop counting and evaluate OK or NG. Any remaining number calls count NG

◆ Count complete signal (OUT)

If mid count number is used, count complete signal out is provided on mid count number and reset on the cycle completed.

2.4.4 advanced functions





There are 3 steps of Advanced Function to customize the screw fastening process.

Step 1 (Option) : Free Reverse rotation to guide the screw into the screw hole smoothly with low speed

Step 2 (Option) : Engaging torque detection – The monitoring angle count is reset and start again from the engaging torque detection point which the screw start joining the thread. It is possible only when the screw engaging provide significantly higher torque than previous free run. Engaging torque setting is by percentage of target torque.

Fastening (Preset) :

Free Speed :

The system auto speed by torque setting can be manually replaced to have higher or lower speed than it's original auto speed during the limited angle setting. Be sure that the free speed run should stop before the screw seating point which screw start to tightening joint. To use this option, go the Fastening setting menu.

Fastening sequence

have the important parameter factors to the tightening quality.

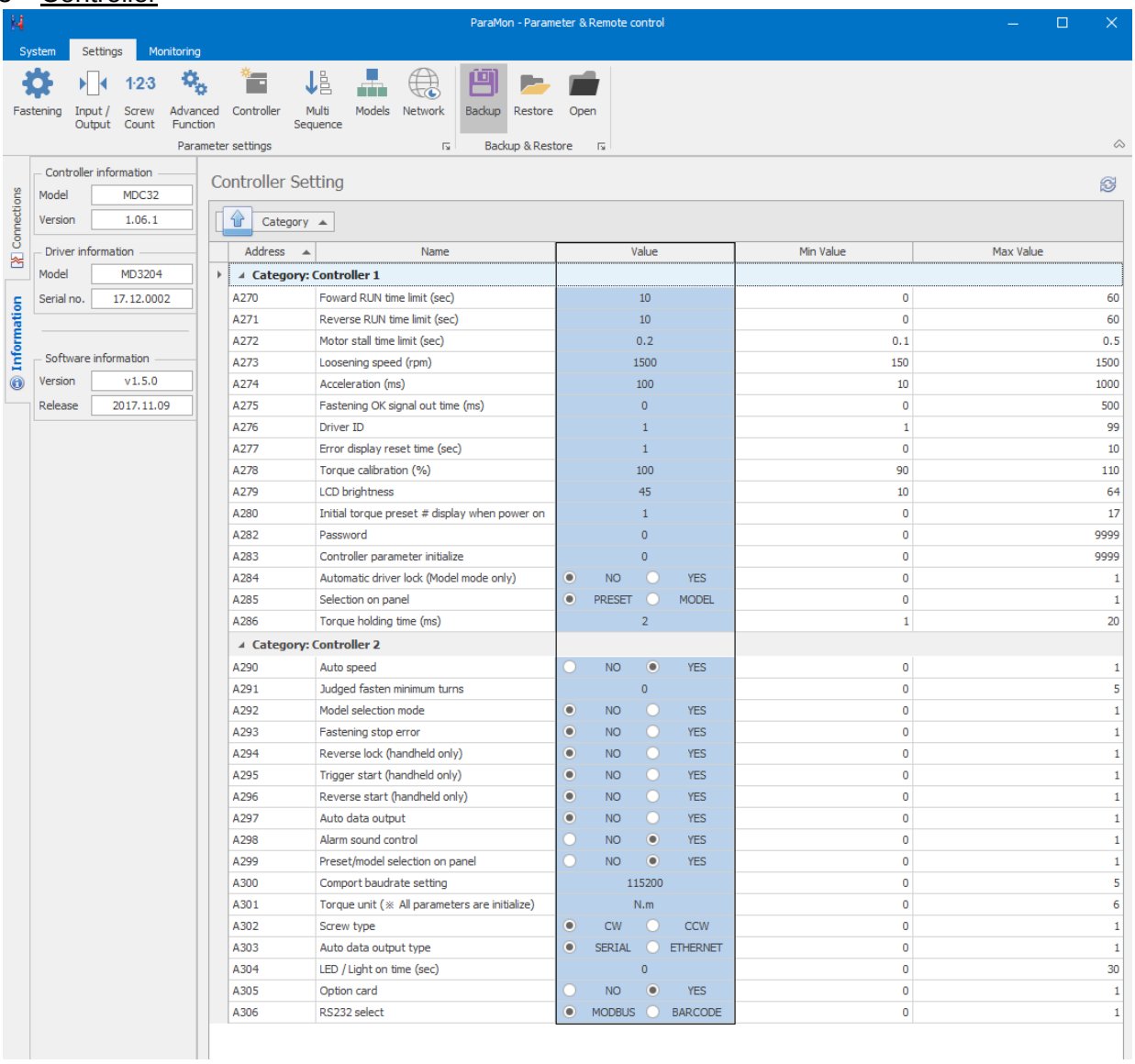
1-Seating point (%) : It is trash hold point at that the target speed is shifting to torque up process. The factory setting is guided from hard joint. If the it is soft joint, the setting can be higher percentage of the target torque.

2-Torque rising time(mS) : It is the speed and time during ramp-up to the target torque. Quick or slow speed to the target torque according to the condition.

3-Torque holding time(mS) : Tool holds the target torque for the time setting. It stabilizes the tightening condition.

Step 3 (Option) : Angle after torque-up(A261) : It manage extra angle control in both forward or reverse direction after tightening by torque.

2.4.5 Controller



Forward / Reverse motor RUN time, and motor stall time is limited for motor safety. The following parameters is ideally recommended to be kept with factory setting in

all application.

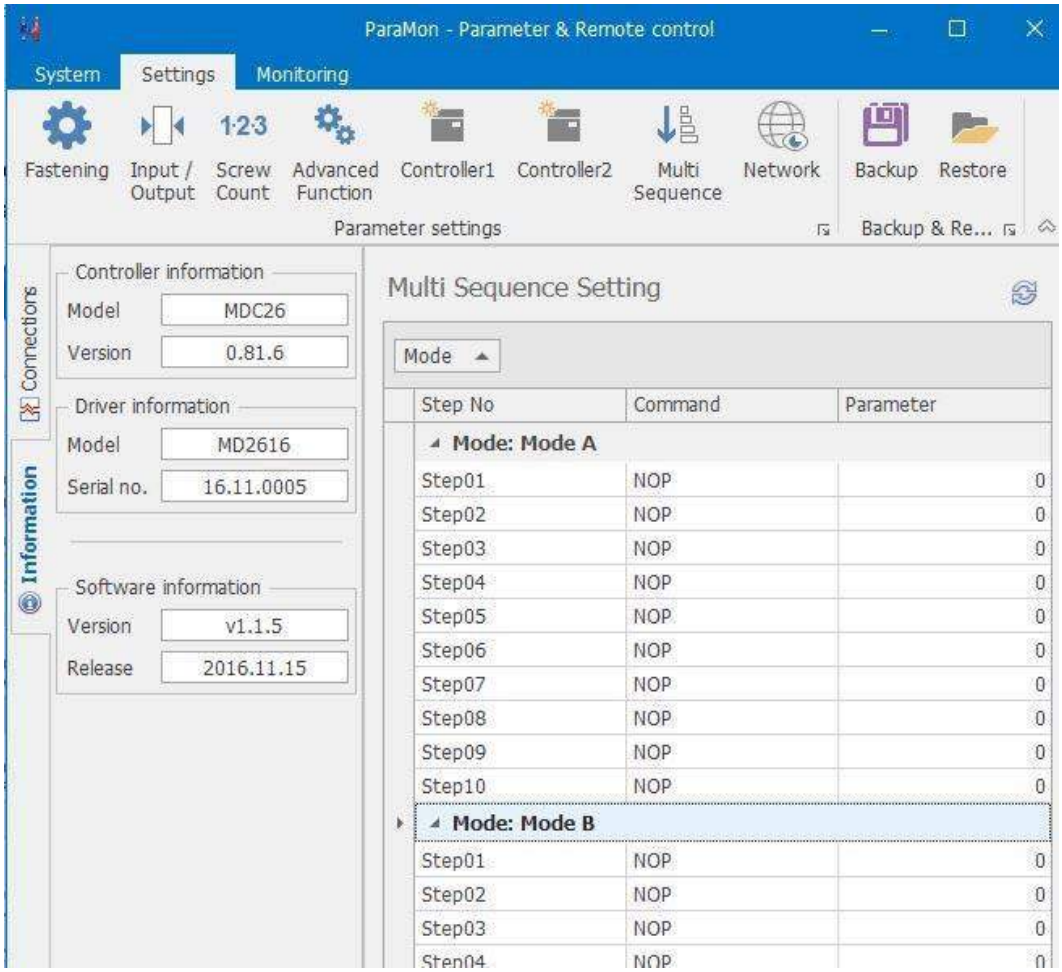
- Forward RUN time limit (A270) : Run limit to forward rotation
- Reverse RUN time limit (A271) : Run limit to reverse rotation
- Motor Stall time limit (A272) : Immediate stop when motor is stalled.
- Acceleration (A274) : Slow start of motor to the target speed
- Fastening OK signal time (A275) : Signal output time setting longer than 150mS which is factory setting. Shorter time than factory setting doesn't work.
- Torque compensation (A278) : It is master calibration of torque.

- Auto speed (A290) : ENABLE provide the safe speed on the torque setting
- Driver model no.(A281) : not changeable. Auto recognized

Other parameters are selectable and changeable for application requirements.

- Password (A282) : Factory setting is “ 0 “. Be careful not to lose the PW.
- Controller parameter initialize (A283) : Key in “ 77 “ to flash the parameters back to the factory settings.
- Automatic driver lock (A284) : Driver can be locked in out of the process when the Model mode is selected
- Judged fasten minimum turns (A291) : Turns out of judgement.
- Fastening stop error (A293) : DISABLE does not creat any NG when the tool stops without fully tightening by torque up.
- Auto data output (A297) : Fastening data output automatically on every events as like run, For/Rev change, torque up, preset change, etc.
- Torque unit (A301) : Kgf.cm / Kgf.m / cNm / Nm / ozf.in / lbf.in / lbf.ft
  Whenever the unit is changed, the controller should be reboot again.
- Lamp on time (A304) : LED lamp off timer from operation stop for sleep.
- Option card (A305) : Fastening data saving option with SD memory card is available by optional order with extra cost.

2.4.6 Multi sequence



◆ Command details

Command	Description
NOP	No operation
Fastening	tool start fastening process in forward rotation
Loosening	tool start loosening process in reverse rotation
Select preset#	Select preset #
Delay	time delay for setting time
Jump	Move to the setting step
Count value = A	Total number “A” to count
Sub if (A)	Subtract 1 from “A” and save the value replacing “A” . If the value “ A” is not “0”, then move to the next lower step. If the value “ A” is “0”, then move to 2nd lower step
End	Finish multi-sequence process

Multi sequence provide a cycle of fastening by a start signal.
Total 10 steps of programing is allowed in MA(Multi A) and MB(Multi B) presets To program, select the command and required parameter on each step.

To finish the multi sequence programing, last step command should be “END”

[Example of Multi sequence step program]

Setp no	Command	Parameter
Step 1	Count Value = A	10
Step 2	Select Preset#	1
Step 3	Fastening	
Step 4	Loosening	5
Step 5	Select Preset#	3
Step 6	Fastening	
Step 7	Sub if (A)	
Step 8	Jump	2
Step 9	End	

Step 1 : Total counting number is 10

Step 2 : Preset #1 selected and move to the next step

Step 3 : Start fastening and stop by torque or angle setting, and move to the next step

Step 4 : Loosen 5 turns and move to the next step

Step 5 : Preset #3 selected and move to the next step

Step 6 : Start fastening and stop by torque or angle setting, and move to the next step

Step 7 : Subtract 1 from “10” and save “9” by replacing “10”. If the value “ A” is not “0”, then move to the next lower step. If the value “ A” is “0”, then move to 2nd lower step

Step 8 : Jump to step no. 2

Step no.2 to Step no. 6 works for a cycle. Total 10 cycles are operated automatically by a start signal.

Any failure or NG on each step, Multi-sequence process stops and provide the alarm signal.

2.4.7 Models

It provides sequential screw tightening with screw counting feature together with I/O and time delay managing by programing in 10 steps.

There are 4 different type of command – Input, Output, Fastening and Time delay

Each step can have one of the above four commands with related setting value

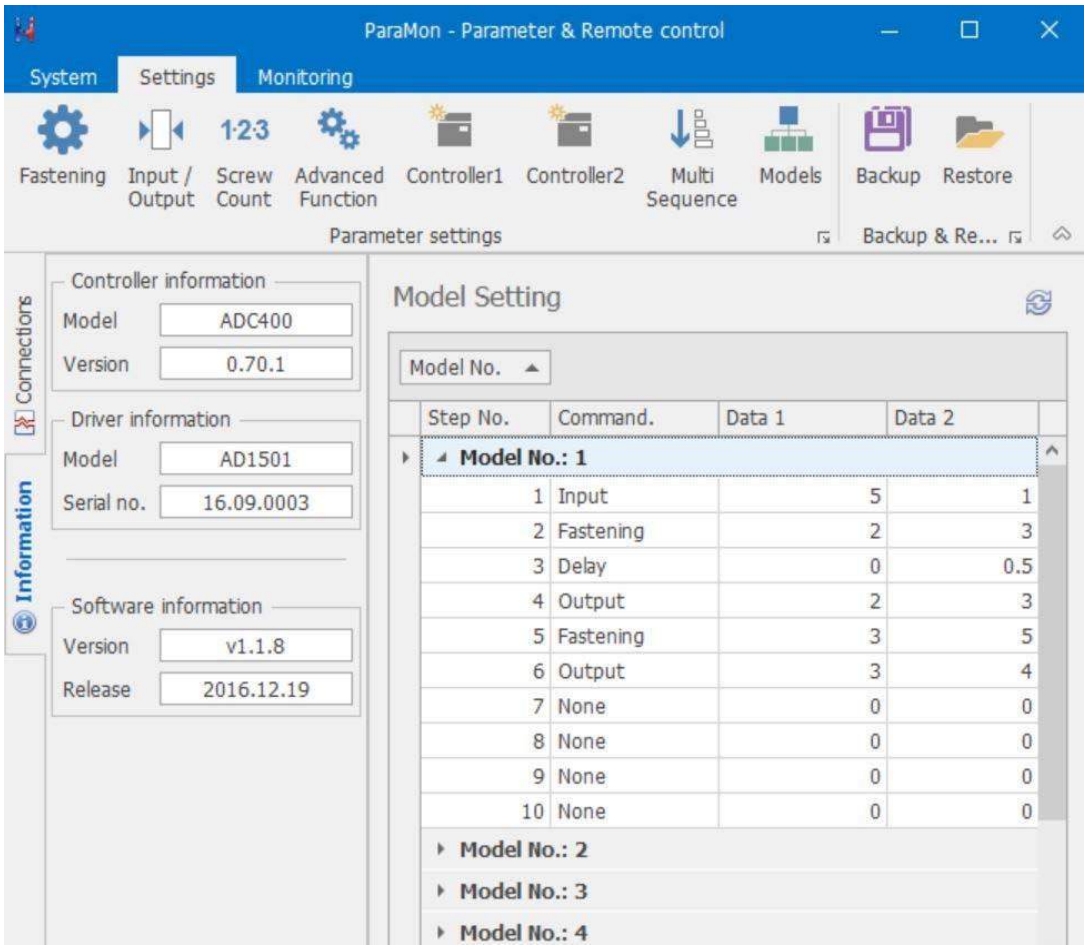
The fastening with counting number follows all settings and features in Screw Count menu except the number of screw.

There are total 15 programable Models.

Once Model is selected, the digital inputs for preset # select becomes model # select automatically.

To use Model feature,
select Enable on the menu of Controller 2 - Model select (A292).

The spindle can be locked automatically in all steps except Fastening step, by selecting Enable on the menu of Controller 1 – Automatic driver lock (A284)



◆ Command details

Command	Description	Data 1	Data 2
Input	Mapping digital Input	Input # select from 1 - 16	0 : No output → NG 1 : Active High 2 : Active Low 3 : High status 4 : Low status
Output	Mapping digital Output	Output # select from 1 - 8	0 : No Output → NG 1 : On 2 : Off 3 : On for 0.5s and Off 4 : On for 1.0s and Off
Fastening	Start fastening	Preset #1 to 13 & MA(14),MB(15)	Count number from 1 - 250
Delay	Delay time	-	0.1 - 25 sec. (unit: 0.1s)

[Example of Model programing]

Step	Command	Data 1	Data 2	Description
Step 1	Input	5	1	If there is input signal turning on in Input no.5, then move to the next step
Step 2	Fastening	2	3	Fastening total 3 screws with preset# 2. If fastening of all screws are completed, then moves to the next step. If there is the cycle start condition except “Auto” on the menu of Screw Count, counting will start only with the cycle start signal input. And if the workpiece is removed without complete of count number, Model process can be stopped by Model cancel (input). Refer 3) Screw Count on the manual
Step 3	Delay	-	0.5	Delay for 0.5 seconds. Then move to the next step
Step 4	Output	2	3	Provide 0.5s pulse ON signal output in Output # 2. Then move to the next step.
Step 5	Fastening	3	5	Fastening total 5 screws with preset# 3. Then moves to the next step. Screw counting condition is same as Step 2
Step 6	Output	3	4	Provide 1.0s pulse ON signal output in Output # 3. Then move to the next step.

Step 1 : Read the sensor signal when it detect the workpiece loading

- Connect sensor to Digital Input 5 (pin no.16)
- I/O setting Input 5 : None

Step 2 : Screw tightening with Preset #2

Number of screw = 3

Step 3 : Delay process 0.5sec

Step 4 : Provide output signal for 0.5 seconds

- Connect buzzer to Digital Output 2 (pin no. 37 & 38)
- I/O setting Output 2 : None

Step 5 : Screw tightening with Preset #3

Number of screw = 5

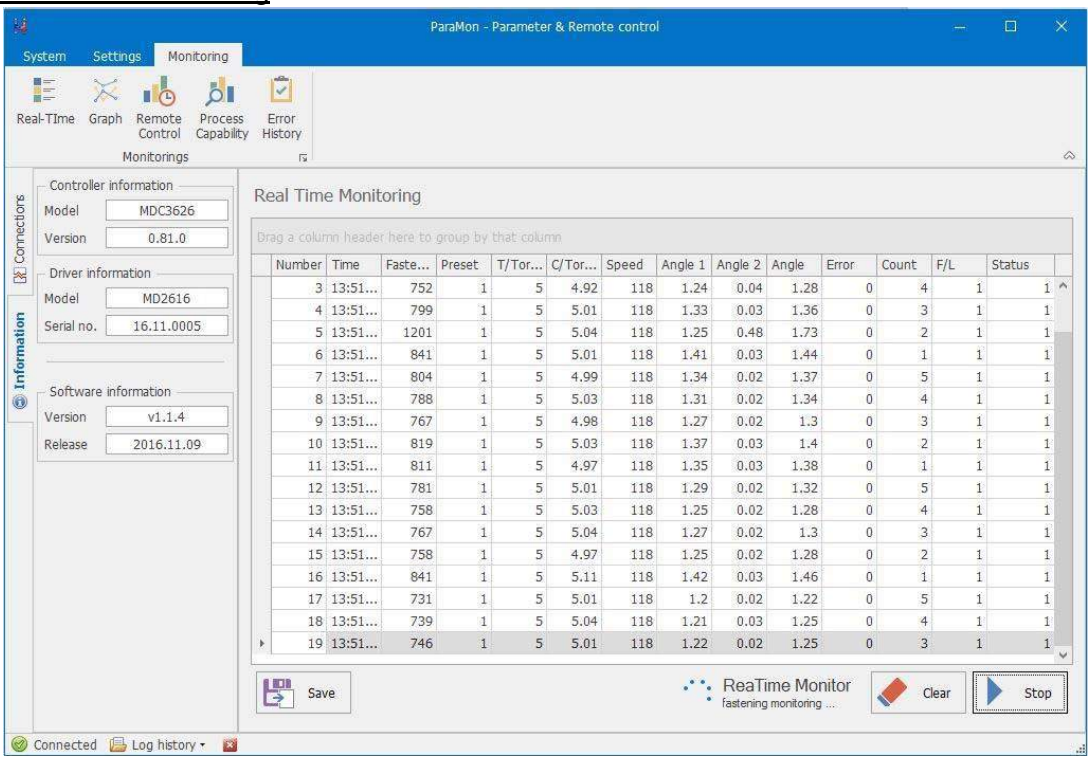
Step 6 : Provide output signal for 0.5 seconds

- Connect buzzer to Digital Output 3 (pin no. 39 & 40)
- I/O setting Output 3 : None

2.5 Monitoring

Setting of Auto Data Out (A297) should be “ Disable “ for Monitoring

2.5.1 Real-time monitoring



Number	Time	Faste...	Preset	T/Tor...	C/Tor...	Speed	Angle 1	Angle 2	Angle	Error	Count	F/L	Status
3	13:51...	752	1	5	4.92	118	1.24	0.04	1.28	0	4	1	1
4	13:51...	799	1	5	5.01	118	1.33	0.03	1.36	0	3	1	1
5	13:51...	1201	1	5	5.04	118	1.25	0.48	1.73	0	2	1	1
6	13:51...	841	1	5	5.01	118	1.41	0.03	1.44	0	1	1	1
7	13:51...	804	1	5	4.99	118	1.34	0.02	1.37	0	5	1	1
8	13:51...	788	1	5	5.03	118	1.31	0.02	1.34	0	4	1	1
9	13:51...	767	1	5	4.98	118	1.27	0.02	1.3	0	3	1	1
10	13:51...	819	1	5	5.03	118	1.37	0.03	1.4	0	2	1	1
11	13:51...	811	1	5	4.97	118	1.35	0.03	1.38	0	1	1	1
12	13:51...	781	1	5	5.01	118	1.29	0.02	1.32	0	5	1	1
13	13:51...	758	1	5	5.03	118	1.25	0.02	1.28	0	4	1	1
14	13:51...	767	1	5	5.04	118	1.27	0.02	1.3	0	3	1	1
15	13:51...	758	1	5	4.97	118	1.25	0.02	1.28	0	2	1	1
16	13:51...	841	1	5	5.11	118	1.42	0.03	1.46	0	1	1	1
17	13:51...	731	1	5	5.01	118	1.2	0.02	1.22	0	5	1	1
18	13:51...	739	1	5	5.04	118	1.21	0.03	1.25	0	4	1	1
19	13:51...	746	1	5	5.01	118	1.22	0.02	1.25	0	3	1	1

The following data are monitored automatically on every event as like motor run, torque up, Forward / Reverse change, preset # change, etc.

- Date & time
- Fastening time
- Preset #
- Target torque
- Converted torque
- Speed
- Angle 1 (angle from motor start to screw seating point)
- Angle 2 (angle from screw seating point to the end)
- Angle (Angle 1 + Angle 2)
- Snug Angle(degree) : angle from snug torque to the end
- Error code - Screw count no.
- Forward / Reverse status
- Status (Free run & others=0, Fastening OK=1, Fastening NG=2, F/R change=3, Preset# change=4, Alarm reset=5, Other error = 6)
  ** Fastening NG = E330, 332, 333, 334, 335, 336, 337

The monitoring data can be saved in CSV file. And it can open the file.

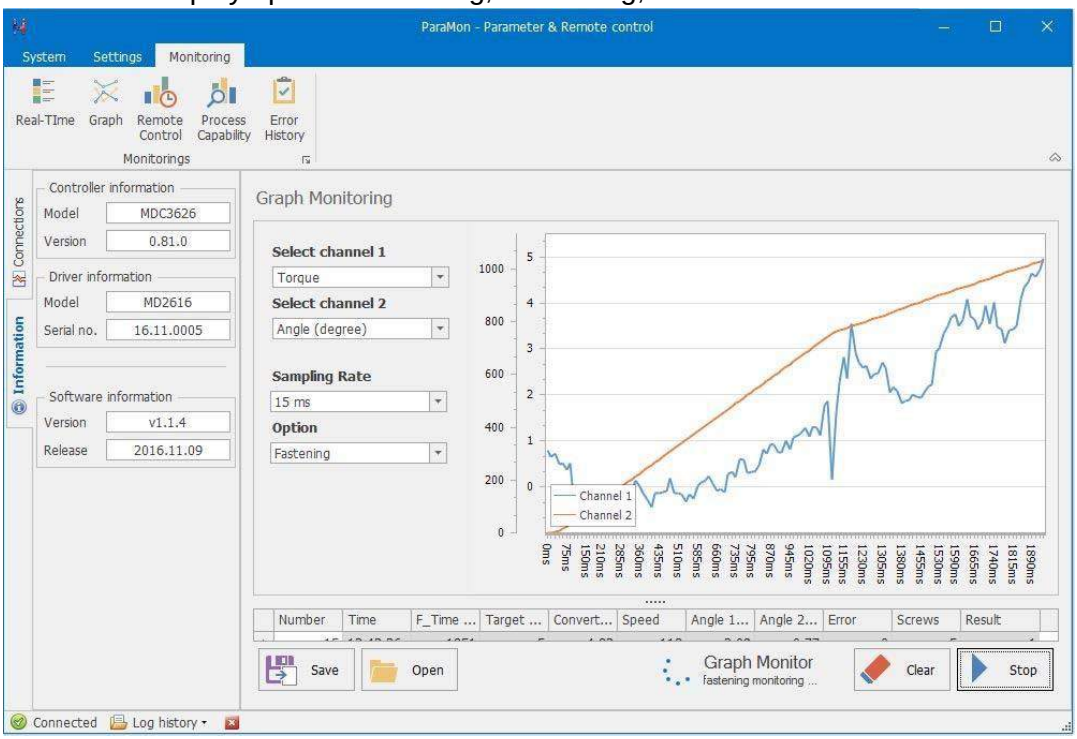
2.5.2 Graph monitoring

Total 200 real-time data are displayed with curve together in two channel.

- Torque, Speed, Angle(degree) and current

- Data sampling rate : 5ms, 10ms, 15ms

- Data display option : Fastening, Loosening, All



The monitoring data can be saved in CSV file. And it can open the file.

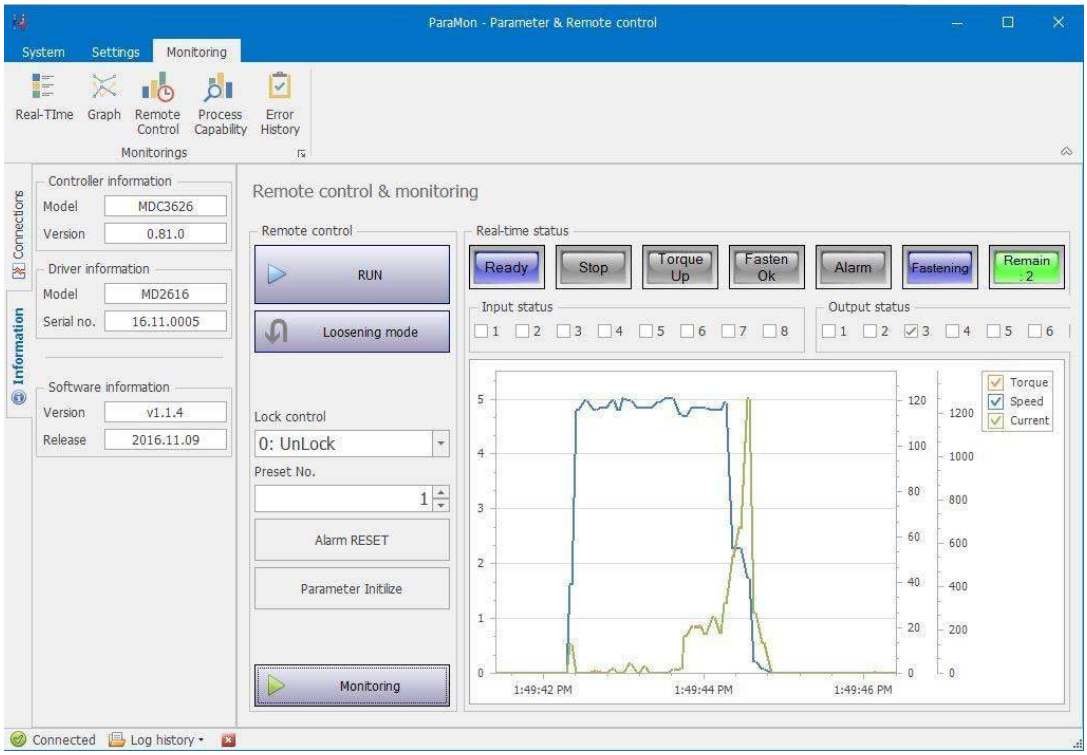
2.5.3 Remote control & I/O status monitoring

The tool is operated remotely for the followings.

- Fastening / loosening rotation,
- Tool Start
- Tool lock & unlock

The following main signal status and I/O are monitored and displayed together with torque, speed and current curves.

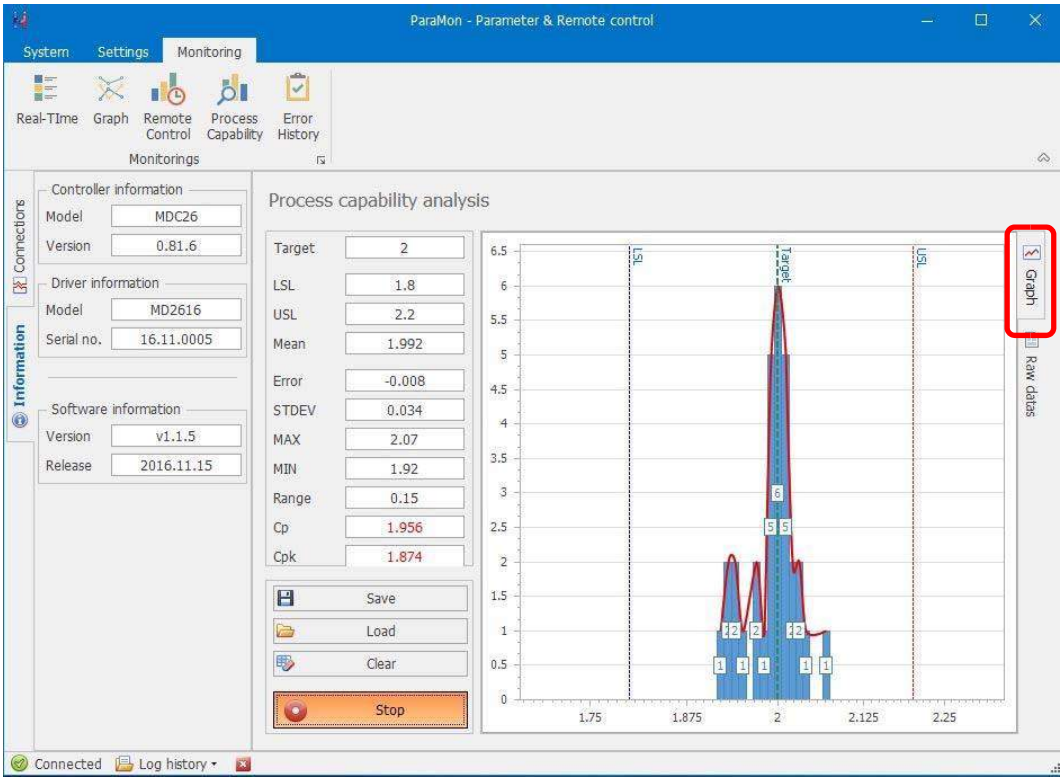
- Ready, Tool start/stop, Torque up, Fastening OK, Alarm, F/R, I/O

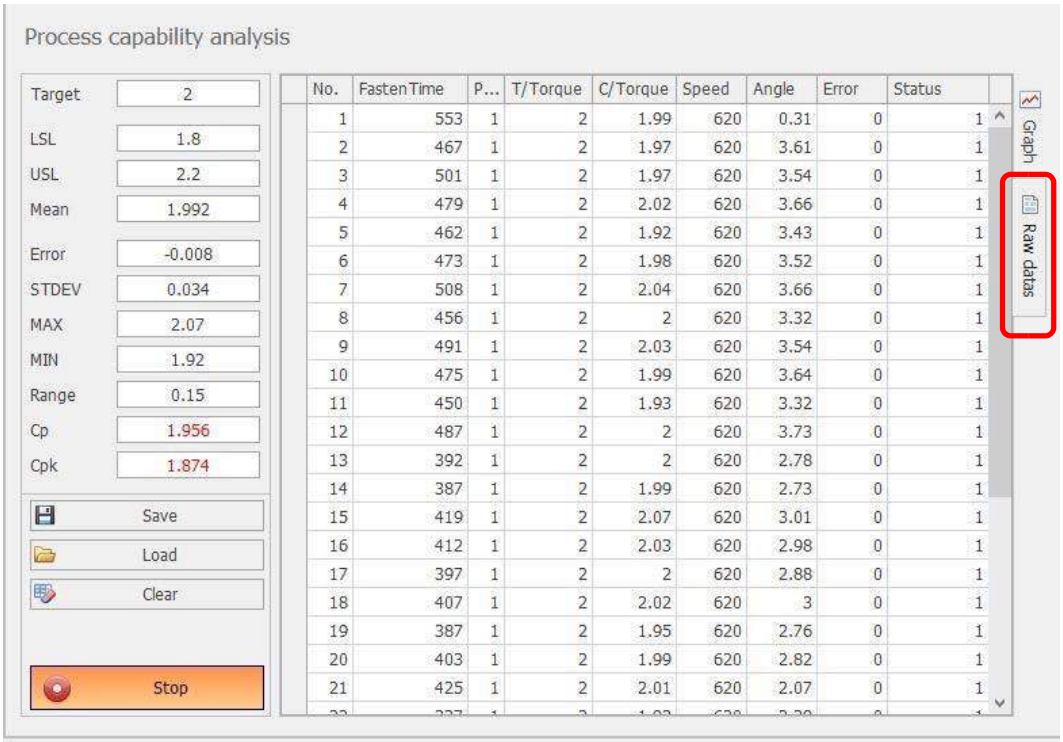


2.5.4 Process capability display

From real-time monitoring fastening torque data, the following statistical data are calculated and displayed. The data is updated automatically for every fastening until monitoring cancelled.

- Average, Standard deviation, CP, CPK

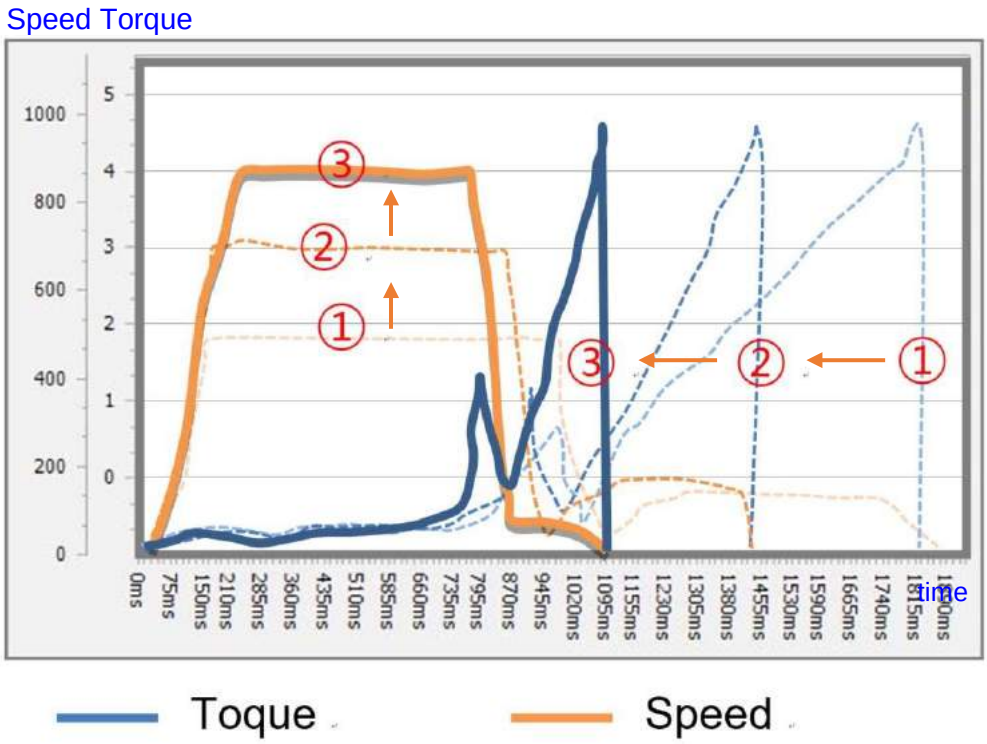




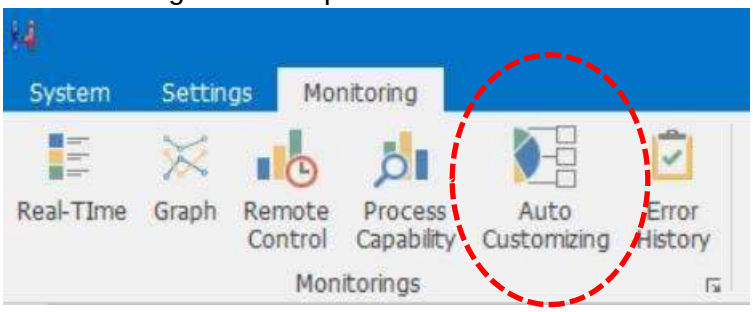
No.	FastenTime	P...	T/Torque	C/Torque	Speed	Angle	Error	Status
1	553	1	2	1.99	620	0.31	0	1
2	467	1	2	1.97	620	3.61	0	1
3	501	1	2	1.97	620	3.54	0	1
4	479	1	2	2.02	620	3.66	0	1
5	462	1	2	1.92	620	3.43	0	1
6	473	1	2	1.98	620	3.52	0	1
7	508	1	2	2.04	620	3.66	0	1
8	456	1	2	2	620	3.32	0	1
9	491	1	2	2.03	620	3.54	0	1
10	475	1	2	1.99	620	3.64	0	1
11	450	1	2	1.93	620	3.32	0	1
12	487	1	2	2	620	3.73	0	1
13	392	1	2	2	620	2.78	0	1
14	387	1	2	1.99	620	2.73	0	1
15	419	1	2	2.07	620	3.01	0	1
16	412	1	2	2.03	620	2.98	0	1
17	397	1	2	2	620	2.88	0	1
18	407	1	2	2.02	620	3	0	1
19	387	1	2	1.95	620	2.76	0	1
20	403	1	2	1.99	620	2.82	0	1
21	425	1	2	2.01	620	2.07	0	1

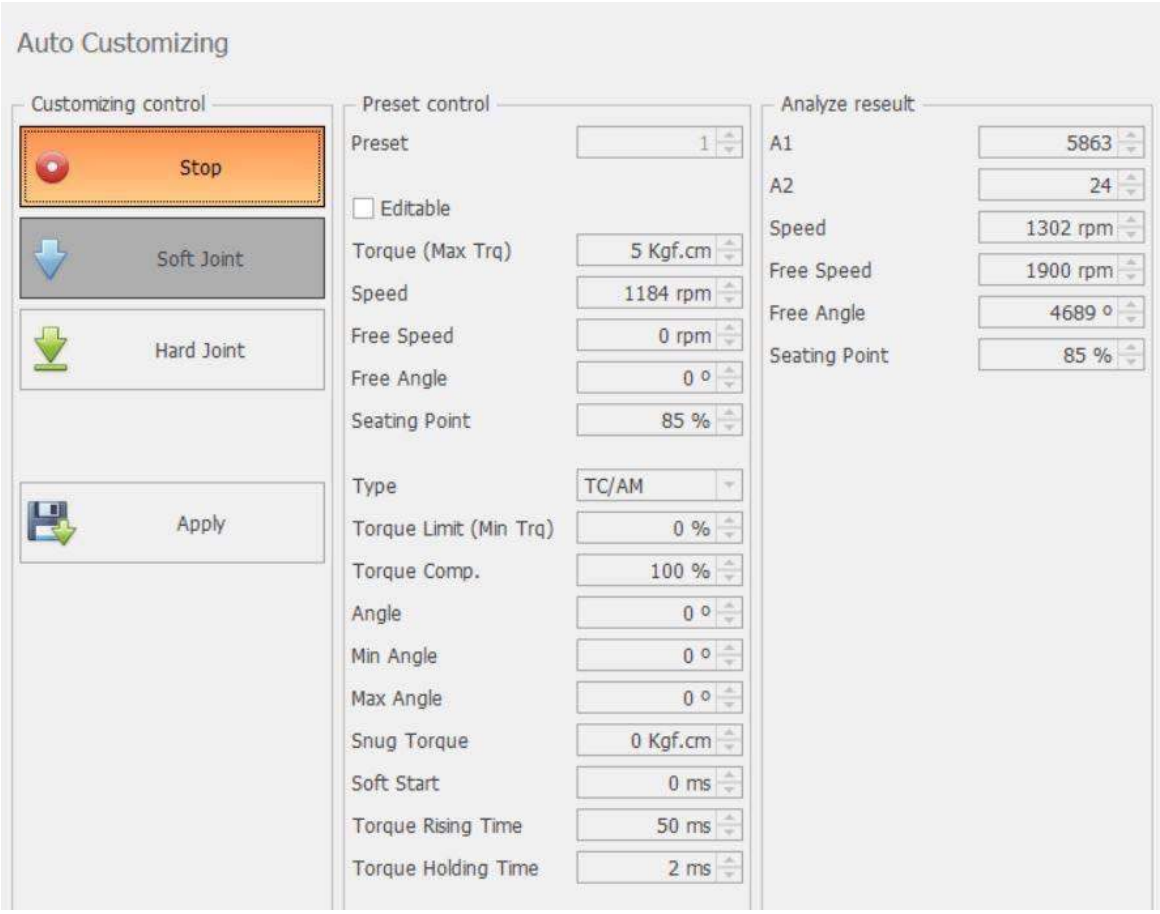
2.5.5 Auto customizing

MD tool has the auto speed feature against torque setting not to provide any over torque by speed shock. The auto speed is safe speed on the hard joint condition. On the real application, the settings can be changed manually. Auto customizing feature provides most optimized parameter settings for saving cycle time on the real application.



Click Auto Customizing menu to open the menu.





① Select Preset # to modify parameter settings

② Select one of Soft & Hard joint condition when it is obviously clear or both together when it is not clear to be clarified, then click START

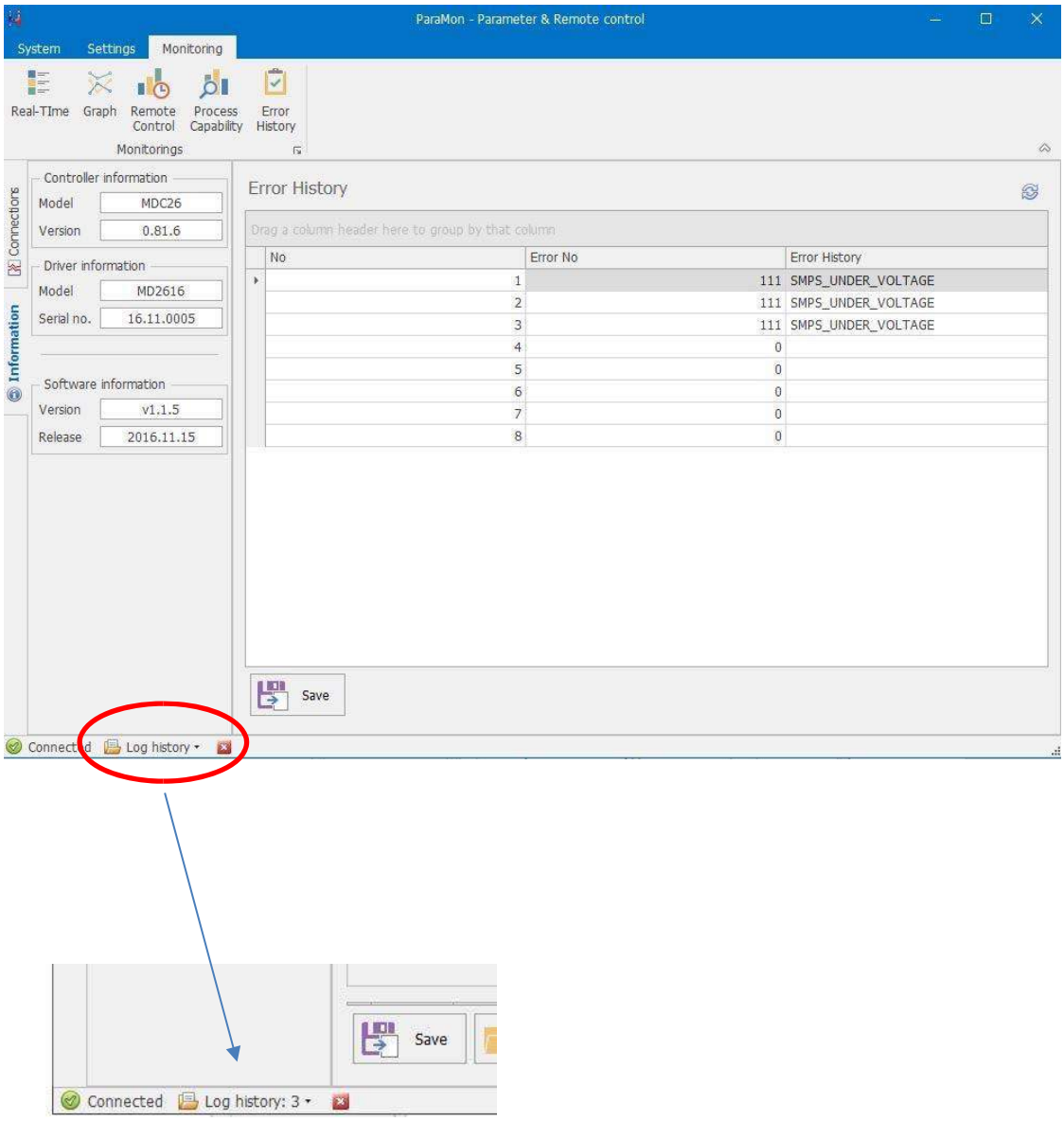
③ Apply screw tightening several times until there is no more parameter changing on the simulation & modification window. Be sure that the fastening condition should be same during the process. The system changes parameter values by the previous fastening data.

④ Once there is no more changes on the simulation & modification window, click STOP to finish testing.

⑤ Click APPLY to apply the settings on the simulation & modification window. The setting can be modified by manually before applying them.

2.5.6 Error history display

The latest 8 tool error histories which are saved in the controller



ATTENTION : communication is disconnected
ATTENTION : communication is disconnected
ATTENTION : communication is disconnected

Log history is information about the communication of PC to the tool.

3. Error code

3.1 System error

code	Error	Description	How to reset
110	AD offset error	When the power of controller is ON, the tool offset is out of range. Reset and retry booting. If failed, repair is required	RESET button
111	SMPS voltage error	SMPS power supply voltage is lower than the limit	RESET button
112	Over speed	Over rotation speed than the set value. Check the cable connection.	Auto reset
113	Driver parameter read error	Reading failure of screwdriver parameter	Power Off →On
114	Screwdriver connection error	The controller is not compatible with the connected screwdriver. The screwdriver is out of the capacity of the controller. Use the right range of screwdriver.	Replace driver
115	Controller recognition error	Program itself can not recognize the controller information.	Power Off →On
116	Com error to read I/O data	System failed to read the data from I/O port by communication issue	Power Off →On
118	No motor rotation error	When motor rotation is not monitored	RESET button
120	No option card	Option card is not detected but the parameter of Option card is enabled. It makes alarm every 20 seconds. Insert SD card or Disable the parameter A305	Auto reset
121	SD card damage	SD memory card is not available to read and write.	Replace SD card
122	Option card communication error	Communication failure with the Option card board	
200	Parameter reading failure	It failed to read parameter at all. Check the EEP-ROM damage or communication failure	Power Off →On
201	Parameter Checksum error	The read parameter is wrong by the checksum routine	Power Off →On
220	Multi-sequence program error	Multi-sequence program is wrong	RESET button

3.2 Fastening error by the pattern setting

code	Error	Description	How to reset
300	Forward run time over	Over run time limit (Forward) on A270	Auto reset after set time
301	Reverse run time over	Over run time limit(Reverse) on A271	Auto reset after set time
302	Model setting error	Failure in Model programing.	
303	Model cancel	The Model process is canceled	
304	Motor stall by loosening failure	Motor stall by loosening failure within time limit on A272	Auto reset after set time
309	Bit socket tray	Bit socket tray application error	
310	Time over in screw counting	Over the time limit of screw counting on A243	Auto reset after set time
311	Screw missing	When the work-piece moves out of the working area without complete number of fastening, it provide alarm for set time(A277) and display the latest number. It can be clear to "0" by pressing RESET button.	Auto reset after set time or RESET button
330	Min Angle error	Target torque reached before the Min angle	Auto reset after set time
331	Target angle setting error	Target angle setting is out of the range [AC/TM mode]	Auto reset after set time
332	Angle over	Target torque reached over the Max angle	Auto reset after set time
333	No torque complete	Operation stops before complete cycle of torque up by releasing lever trigger	Auto reset after set time
334	Engaging torque detection fail	The engaging torque is not detected in time or angle limit	Auto reset after set time
335	Converted torque error	Converted torque is out of OK range	Auto reset after set time

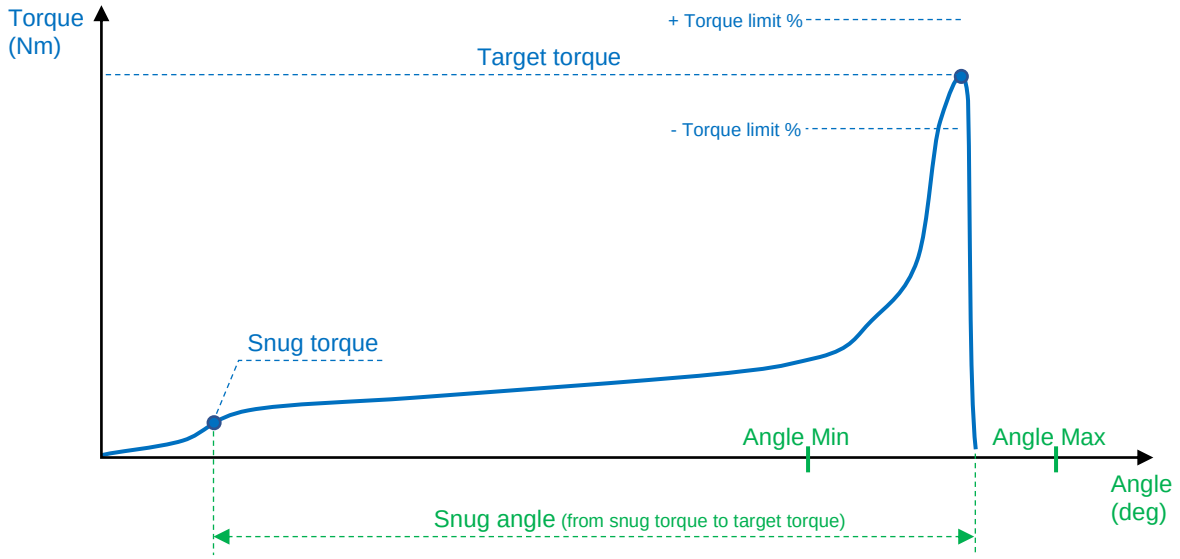
336	Over torque error	torque reached to the high limit of torque	Auto reset after set time
337	Torque up in free speed duration	Torque reach to the 110% of the target torque during free speed operation.	Auto reset after set time
400	Ethernet port fail	Ethernet device IC initializing fail	RESET button
401	Ethernet socket error	Ethernet communication error related with socket	RESET button
500	Over temperature	Overtemperature over 80°C	Auto reset under 80°C

4. ADDENDUM – Programming Guide

4.1 Tightening strategy selection

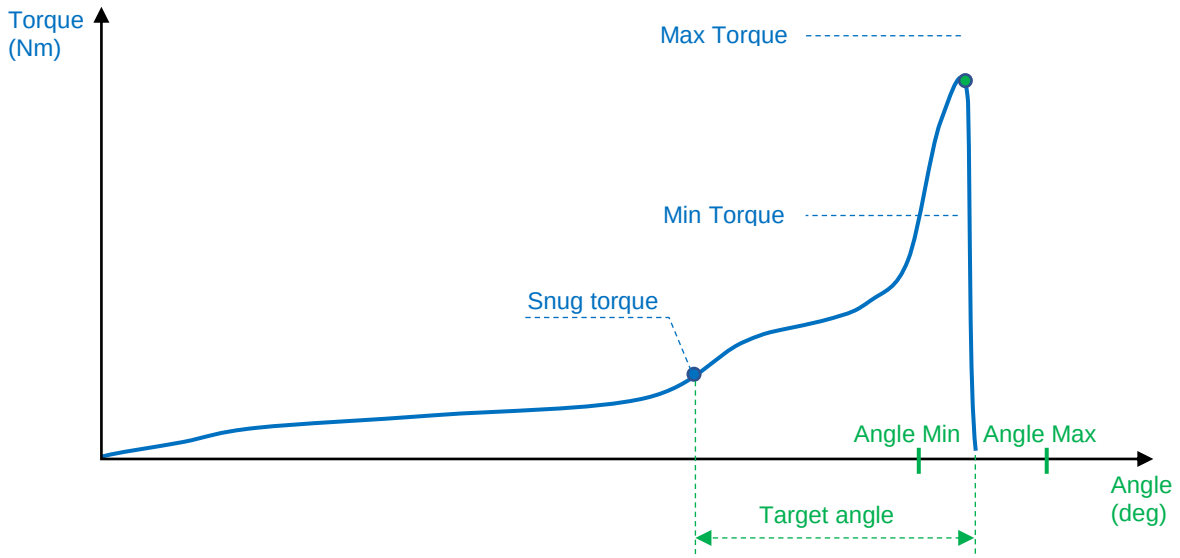
4.1.1 Torque Control / Angle Monitoring (TC/AM)

This strategy is used to tighten joints to target torque. Angle monitoring can be used to detect various tightening defects (cross-threading, thread stripping, not finished screw, wrong screw length, missing washer or other). Angle can be measured from the start of the tool or from the Snug Torque.



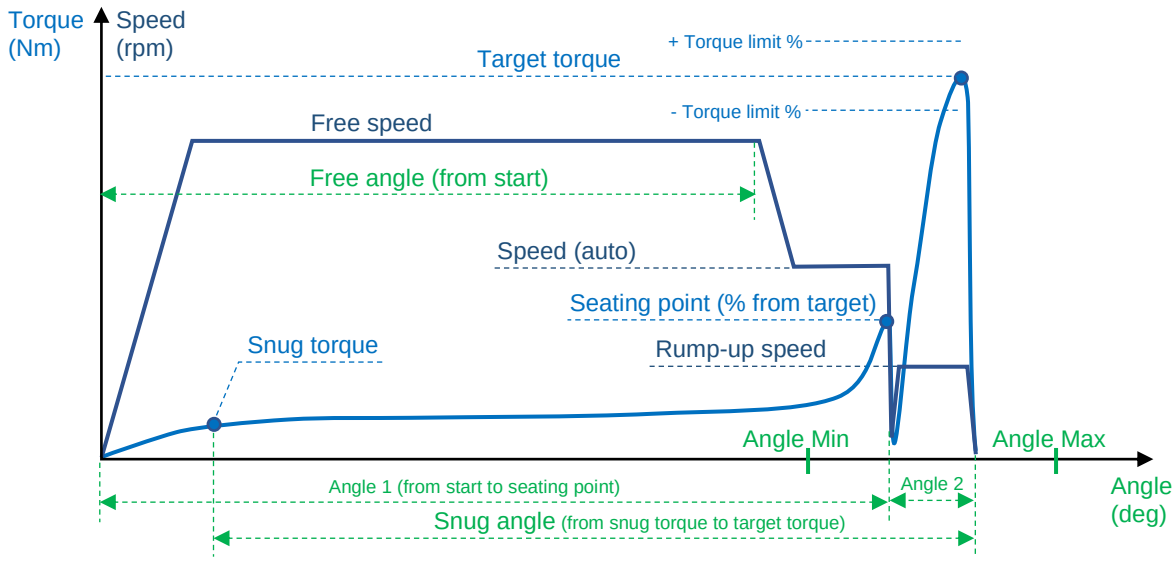
4.1.2 Angle Control / Torque Monitoring (AC/TM)

This strategy is used to tighten joints to target angle. Target angle is measured from the Snug torque. If Snug torque is equal to 0, then angle is measured from the moment the tool is started. Snug torque value and Target torque value have to be given by product design office. Torque monitoring can be used to avoid critical joint damage and to detect tightening defects.



4.2 Hard joint tightening

Typically represented by metric screws tightening without gaskets or spring washers. Torque is delivered very fast – it only takes about 30 degrees or less to reach the target torque once the torque starts rising.



<u>Recommended settings:</u>

Target torque and **Torque tolerance limit** are given by product design specification.

Speed value should be set automatically in case of hard joint (recommended for good precision). In order to do so, make sure that parameter A290 “Auto Speed” is set to «YES».

Seating point has to be set to a relatively low value (20-40% of the target torque). Optimal value of the seating point is when Angle 2 is close to 30 deg. Use real time monitoring to check Angle 2.

Snug torque (starting point of angle control) is usually defined experimentally and depends on application needs. For example, for screw length detection, the snug torque should be as low as possible – 0 Nm or slightly above idle turning torque of the tool. To detect missing washer, gasket, etc, it’s necessary to compare curves of OK and NOK fastenings and select a snug point from which the angle to the target will be different.

Angle Min and **Angle Max** are also defined experimentally. It is necessary to do several test rundowns and monitor the Snug angle value (it is shown on the LCD screen of MDC controller to the right from the target torque). Then according to its variation, min and max values are defined.

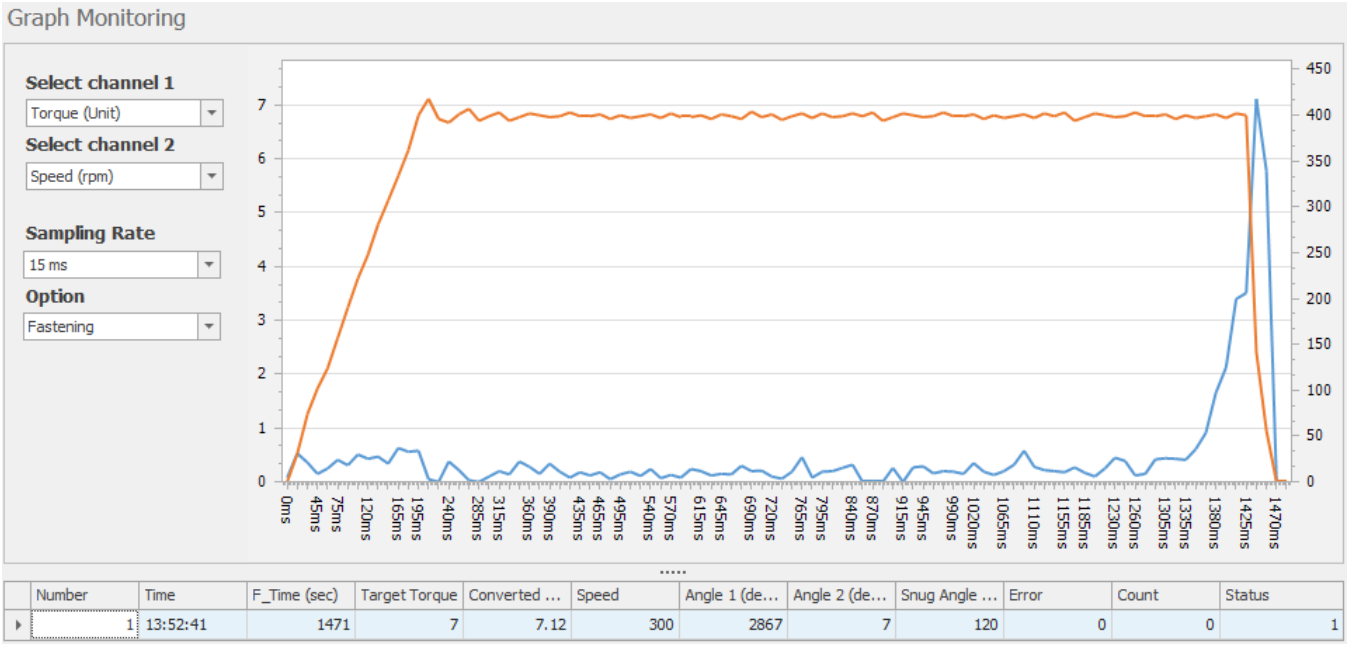
Free speed can be set to the max possible value to optimize production time.
Free angle has to be at least 360 deg less than Angle 1 to avoid torque overshooting.

Possible tightening issues

The main risk during hard joint tightening is torque overshoot. To avoid torque overshoot, it's necessary to monitor Angle 2 (between the Seating point and the Target). It has to be at least 30 degrees. Angle 2 can be increased by decreasing seating point value. If the seating point is already low and it's not possible increase Angle 2 by decreasing the seating point, then it is necessary to make sure that the speed before the seating point is less or equal to the Auto Speed (A290 "Auto Speed" is set to «YES»).

Example:

Below you may see an example of the curve with a high risk of torque overshoot. Angle 2 is very low (7 degrees) and the speed is not decreased before the seating point.

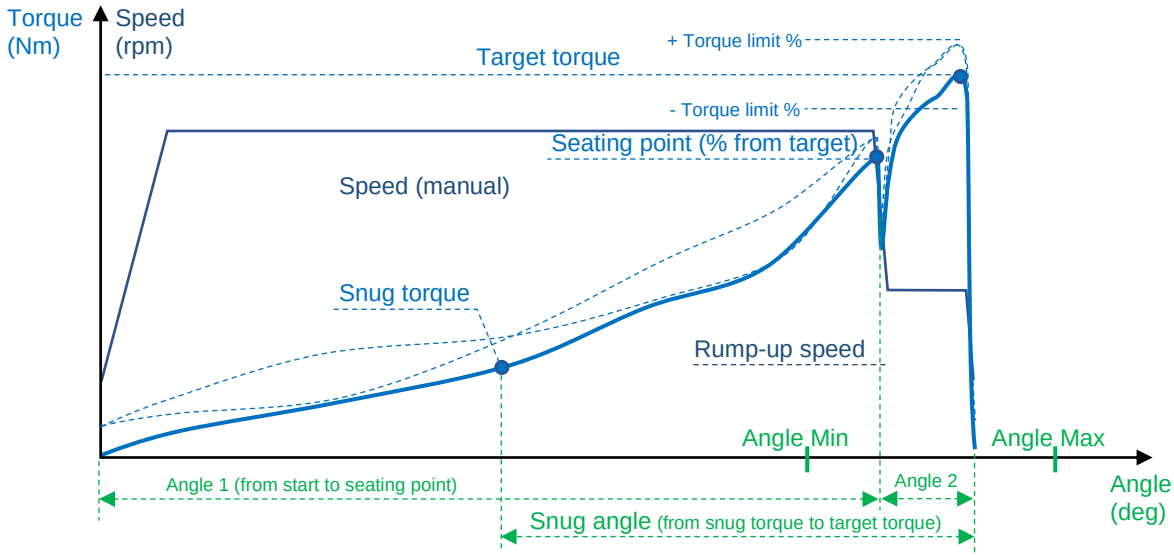


Possible solutions:

1. Decrease seating point to the beginning of torque rising process (approximately 1 Nm on the curve above – about 15% of the target). ATTENTION: if the seating point is too low, it can be wrongly detected in the beginning of the fastening due to thread imperfections etc.
2. Activate Auto Speed (A290 "Auto Speed" is set to «YES») and use it in combination with Free Speed and Free Angle to optimize total fastening time. ATTENTION: Free angle has to be approximately 360 deg less than Angle 1.

4.3 Soft joint or tapping screw tightening

Typically represented by tapping screws tightening or metric screws with elastic washers, gaskets etc. Torque is delivered during relatively long time – it takes 720 degrees or more to reach the target torque once the torque starts rising.



Recommended settings:

Target torque and **Torque tolerance limit** are given by product design specification.

Speed can be set manually to a high value in case of soft joint. In order to do so, make sure that parameter A290 “Auto Speed” is set to «NO».

Seating point has to be set to a relatively high value (75-95% of the target torque). Optimal value of the seating point is when Angle 2 is close to 30 deg. Use real time monitoring to check Angle 2.

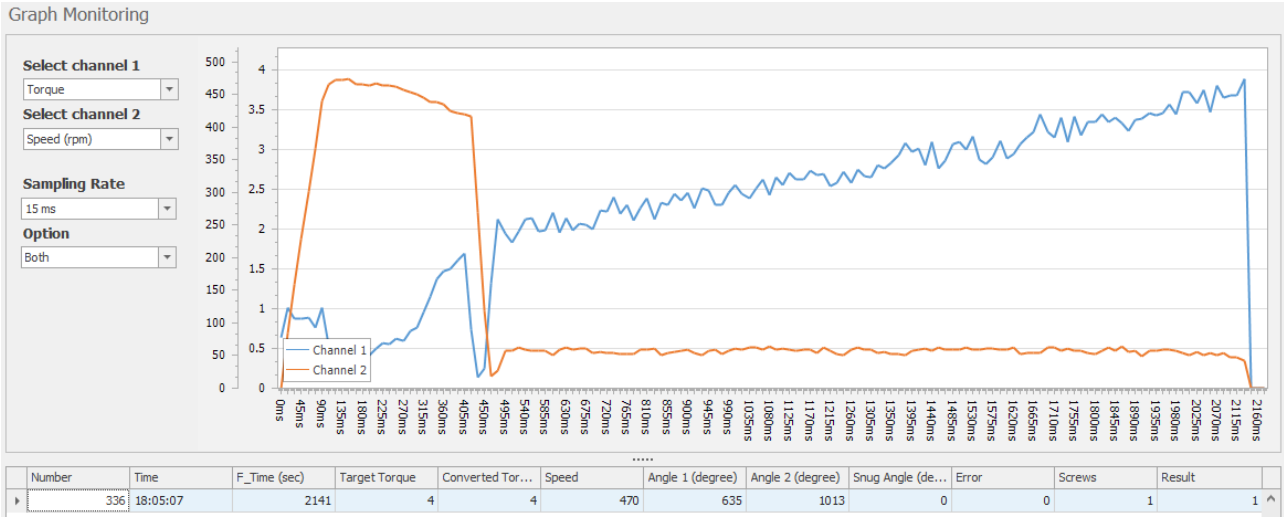
Snug torque (starting point of angle control) is usually defined experimentally and depends on application needs. It is advised to select a repeatable point on the curve (see above) from which the snug angle can be measured in a stable manner.

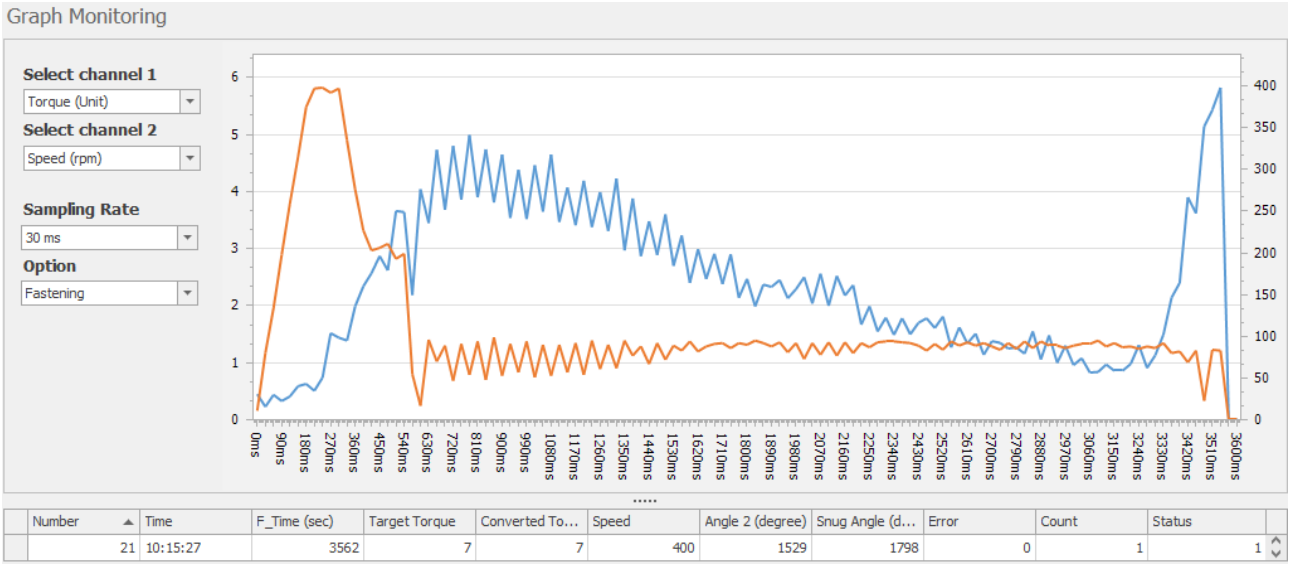
Angle Min and **Angle Max** are also defined experimentally. It is necessary to do several test rundowns and monitor the Snug angle value (it is shown on the LCD screen of MDC controller to the right from the target torque). Then according to its variation, min and max values are defined.

Free speed and **Free angle** can be used in case of high tapping torque. Setting is similar to hard joint condition.

Possible tightening issues

In some cases, it may happen that the seating point is prematurely detected and the tool slows down to the rump-up speed (see two sample curves below).





Possible solutions:

1. Increase the seating point to max but make sure that Angle 2 stays above 30 degrees.
2. Use Free speed and Free angle parameters. ATTENTION: During Free angle, the seating point is ignored, so make sure that Free angle is about 360 degrees less than Angle 1.
3. If the above doesn't help, it's possible to increase the Rump-up speed.
4. In case if tapping torque is close or higher than target torque, it is possible to divide the process into 2 steps and use a Muli Sequence A or B with 2 Fastening steps: 1st step with AC/TM strategy and high max torque value (target angle value in this case is same as Free angle for normal fastening), 2nd step with TC/AM strategy with relatively low speed to avoid torque overshoot.

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