

FEDIII (FEDIII-h) CONTROLLER



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INTRODUCTION

Launched in the end of 1998, PEDIII & FEDIII generation three controllers have already obtained position and reputation of the best system for critical screw tightening control, with thousands of systems actually in operation throughout the world.

The state-of-the-art multiple feedback control technology of PEDIII & FEDIII guarantees reliable and efficient job of screw tightening control, regardless of joint characteristics and frictional differences, for any type of screw and for any type of work.

Many of control parameters and functions can be customized by use of Customizer software, to best suit any specific requirements or applications, without any hardware modification.

Model FEDIII and model FEDIII-h (equipped with High Speed control board) controllers, are both primarily designed for versatile control of screw tightening and reversing in robotics applications. They are also applicable for manual assembly applications requiring screw tightening and reversing control in mixed-with-auto arrangement or in switching-between-parameters arrangement.

For more simple control of screw tightening only, sister model PEDIII and PEDIII-h (equipped with High Speed control board) are available.

Model FEDIII (FEDIII-h) controller performs best when connected and used with any of model A family or S & M family drivers with memory on board, although previous version H series driver without the memory can also be connected and used together with.

MAIN FEATURES

- 1) **STATE-OF-THE-ART MULTIPLE FEEDBACK CONTROL**
Technart's state-of-the-art multiple feed back control technology makes best use of 32 bits RISC processor for real-time monitoring and control of screw tightening torque and process.
- 2) **RELIABLE CONTROL OF TIGHTENING TORQUE AND PROCESS**
FEDIII (FEDIII-h) monitors and controls motor current, motor voltage and motor rpm, to control screw tightening torque and process. It guarantees reliable repeatability of torque applied to screws, regardless of joint characteristics and frictional differences in actual applications.
- 3) **COMMUNICATION WITH DRIVER**
FEDIII (FEDIII-h), when powered on, automatically recognizes the connected driver and its individual mechanical characteristics. A particular matching of a controller and a driver does not need to be maintained.
- 4) **MEMORY FOR DRIVER TORQUE FAMILY DATA**
FEDIII (FEDIII-h) can contain three different data of driver torque family. When, for instance, FEDIII (FEDIII-h) contains torque family data of 3600/8500/12K, any of 3600, 8500 or 12K family driver can be connected and used with it right away, without any manipulation.
- 5) **DIGITAL TORQUE SETTING**
Set a tightening torque digitally, and all the rest are taken care by FEDIII (FEDIII-h) automatically, for best control of screw tightening at the torque for most applications.
- 6) **SELF-DIAGNOSTICS AND OVERHEAT PROTECTION**
FEDIII (FEDIII-h) protects herself from any damage caused by overheat due to repeated high load operations in too short an interval.
- 7) **COMPREHENSIVE ERROR MESSAGES**
Every part inside the system and every stages of screw tightening and reversing process are under comprehensive monitoring.
- 8) **TWO STANDARD INTERFACES**
Two interfaces are available in standard : a 24-pin photo-coupler interface and a serial RS-232C modular jack, for control and monitoring of the system from external PLC or PC.

9) CUSTOMIZING OF FUNCTIONS AND PARAMETERS

Many of functions and parameters can be customized, to best suit your specific applications, via RS-232C interface from Technart Customizer software running on your PC.

10) PRESET MEMORY

FEDIII (FEDIII-h) carries memory area for 8 different settings for each of screw tightening and reversing.

11) REVERSING ANGLE CONTROL

FEDIII (FEDIII-h) provides facility of reversing screw by specified angle.

10) HIGH SPEED TIGHTENING CONTROL

Model FEDIII-h carries High Speed control board (standard specification for export) and provides high speed screw tightening and reversing, effective for most applications.

MODEL NUMBER CONFIGURATION

FEDIII-h AC220V 3600/8500/12K

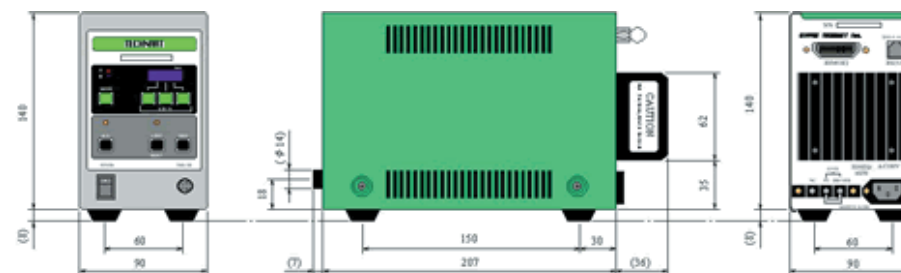
POWER SUPPLY VOLTAGE RATING
AC100V, 110V, 115V, 220V, 230V or 240V

THREE TORQUE FAMILY NUMBER
FEDIII (FEDIII-h) can contain three different data of driver torque family.

CONTROLLER MODEL
FEDIII = without high speed board
FEDIII-h = with high speed board (standard for export)

SPECIFICATION OUTLINE

CONTROL PROCESSOR : 32-bit single chip RISC processor
 POWER SUPPLY RATING : AC100V, 110V, 115V, 220V, 230V or 240V
 FREQUENCY : 50/60 Hz
 POWER CONSUMPTION : 160 W
 INSULATION RESISTANCE : 10 Mega Ohm or more at 500V Mega
 (between AC plug and controller frame)
 WITHSTANDING VOLTAGE : 1 second at AC1200V
 (between AC plug and controller frame)
 POWER SUPPLY TO DRIVER : DC35V (rectified from AC35V)
 TORQUE RANGE : in accordance with torque family data
 (see table below)
 FUSE : 1 Amp.
 AMBIENT TEMPERATURE : 0 to 50 deg. C
 AMBIENT HUMIDITY : 30 to 80 % RH (no condensation)
 WEIGHT : 3.2 kg
 OUTER DIMENSIONS : see below
 WARRANTY : 12 (twelve) months after delivery



TORQUE FAMILY NUMBER TABLE

TORQUE FAMILY NUMBER	1 200	2 200	3 600	8 500	12 K	15 K	20 K
TORQUE RANGE (kgf.cm)	0.3 - 1.2	0.6 - 2.2	1.0 - 3.6	2.0 - 8.5	3.0 - 12.0	4.0 - 15.0	5.0 - 20.0
SETTING TORQUE STEP (kgf.cm)	0.01	0.01	0.01	0.01	0.1	0.1	0.1

ACCURACY & REPEATABILITY

Accuracy and repeatability of driver's output torque powered by FEDIII (FEDIII-h) controller depends on the torque family of the driver as shown in the table below :

TORQUE FAMILY	ACCURACY	REPEATABILITY	
		AT MAX. TORQUE	AT MIN. TORQUE
1200	2 %	2.0 %	3.6 %
2200		7.5 %	7.5 %
3600		5.0 %	7.8 %
8500		7.5 %	9.0 %
12K		5.0 %	6.0 %
15K		8.0 %	10.0 %
20K		12.0 %	12.0 %

Definition of accuracy and repeatability adopted in the shipping test is as follows :

In the **ACCURACY** test, the controller is set to middle value of the setting torque range of the driver being tested. In case of the 8500 family driver, the setting torque value used for the test is 5.0 kgf.cm. The ACCURACY (unit : %) is then obtained from dividing average torque value of 50 times readings by setting torque value. It has to be within +/- 2 (two) percent to pass the test.

In the **REPEATABILITY** test, torque measurement is repeated 50 times for each setting torque of maximum, middle and minimum of the torque range of the driver being tested. In case of the 8500 family driver, tested torque settings are 8.5 kgf.cm, 5.0 kgf.cm and 2.0 kgf.cm.

The REPEATABILITY is then obtained from 3 x SIGMA (three sigma) divided by average torque value of 50 times readings (sigma : standard deviation).

When the repeatability turns out to be 10 percent, it means that the output torque goes within +/- 10 percent at the probability of more than 99.7 percent.

The **Technart method torque measurement** is used in the shipping test of ACCURACY and REPEATABILITY, as described below :

- 1) A square block (work-piece) with screw hole, made from stainless steel, is placed onto the socket of the torque meter.
- 2) A thin plastic sheet is placed between the square block and the socket of torque meter to eliminate any movement of the square block during measurement and also for the purpose of easy removal of the square block after usage.
- 3) The size of screw used in measurement is :
 M2 x 8 (Torx T6) for 0.5 to 2.4 kgf.cm
 M2.5 x 8 (Torx T8) for 2.5 to 3.9 kgf.cm
 M3 x 8 (Torx T10) for 4.0 to 10.9 kgf.cm
 M4 x 10 (Torx T20) for 11.0 to 20.9 kgf.cm
- 4) Ambient temperature for shipping test is 20 to 25 deg C.
- 5) Controller is turned on more than 30 minutes before measurement.
- 6) The same screw is used for 10 times measurements only. After 10 times measurements, it is exchanged with a new screw. It means that the 50 times measurements need 5 virgin screws.
- 7) A flat washer is used (simulation of hard joint).
- 8) After each measurement (each tightening), the tightened screw is reversed for next measurement.
 Also after each measurement (each tightening), the driver bit is taken out from screw and rotated by hand or by controller every time. The purpose of this manipulation is to change mechanical position of gear etc. inside the driver.

RPM SPEED OF DRIVER BIT

FEDIII (FEDIII-h) controller's multiple feedback technology monitors and controls motor current, motor voltage and motor rpm, in real-time, to control screw tightening process and torque, as outlined below :

- 1) Start signal is sent to the controller.
- 2) Voltage is applied to driver motor, and the motor starts rotating.
- 3) The motor rpm is monitored by encoder. If rpm is slow, higher voltage is applied. If rpm is fast, lower voltage is applied.
- 4) Screw seating is detected by monitoring of motor current.
- 5) After detection of screw seating, motor current is increased more and more, up to target current (=target torque).
- 6) After reaching target current (=target torque), the target current is held for 0.1 second (default) for stabilization of the torque.

During the whole process of screw tightening as above, the motor current to the driver motor is completely monitored and controlled. The motor current is equal to torque, and it can be said that the output torque is completely controlled, during the whole process of screw tightening, but except for one moment. That is the moment (instance) of screw seating, that is, the moment when the head of the screw being driven down hits the surface of work-piece and becomes seated.

When the head of the screw being driven down hits the surface of work-piece and becomes seated, the motor rotation, suddenly halted, causes impulsive force (= spike). How large the spike will be is determined by 1) total size of the mass comprised of motor, gear, shaft and bit, 2) rotation speed of motor and 3) joint characteristics.

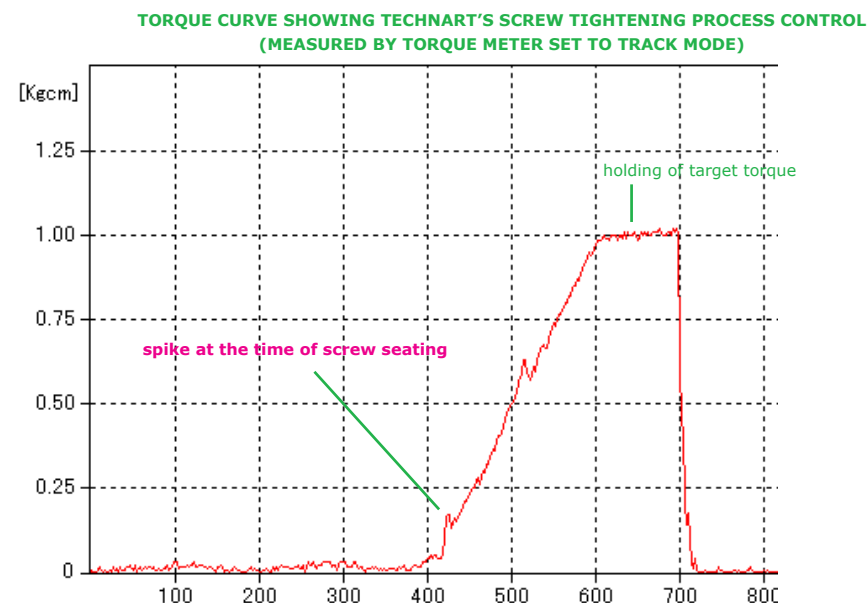
The factor 1) and 2) are known and are incorporated into control parameters, but the factor 3) is unknown as it is different in application by application.

In general, the harder the joint is, the larger the spike is.

The softer the joint is, the smaller the spike is.

The faster the rpm is, the larger the spike is.

The slower the rpm is, the smaller the spike is.



In the measurement of driver's output torque, by use of torque meter set to peak mode, the reading takes the height of the spike if it is higher than the holding torque (= target torque). The spike itself is, impulsive force of an instant, and it has little energy to rotate screw further after its seating, but the reading of the torque meter shows its peak height if it is higher than the holding torque.

The rpm speed of driver bit is one of parameters that can be customized (via Customizer software) within the range of the upper limit and the lower limit.

The upper limit represents the rpm speed any faster rpm than which may cause the spike higher than the target torque in peak height reading by the torque meter set to peak mode, when the joint characteristics is of the hardest conditions, as simulated by a flat washer only existing between screw head and stainless steel block placed into the socket of the torque meter.

In 12K, 15K and 20K family driver, part of the upper limit is determined by the output capacity limit of its motor and gear.

The upper limit and lower limit rpm set for each of torque family drivers is as shown in the graph below. In the graph, the x-axis shows setting torque, while the y-axis shows the rpm of the driver bit.

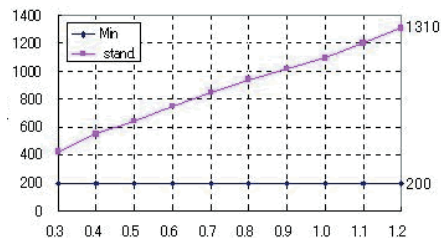
In the graph, HSO stands for High Speed, which is available when the driver is connected and used with PEDIII-h or FEDIII-h controller equipped with high speed control board (standard for export).

The High Speed control is effective for 3600 family or larger torque family driver only. It won't work for 1200 and 2200 family drivers.

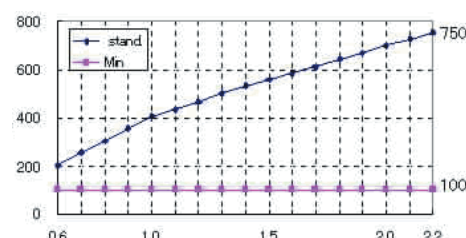
In the High Speed operation, detecting of screw seating is adjusted more sensitive and the brake is put on the motor upon detection of screw seating, to eliminate the risk of overtightening by the spike caused by inertia.

It has to be remembered that the rpm speed is always under the torque-sensitive control. When any load is detected, the rpm speed is adjusted accordingly in real-time. Shown in the graph below is the rpm speed when the driver motor is free from any load caused by friction between screw and screw hole etc..

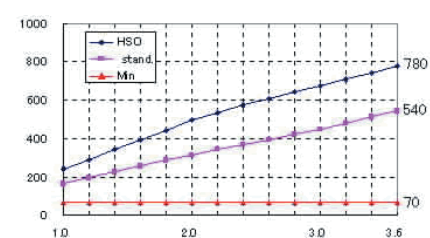
1200 family driver



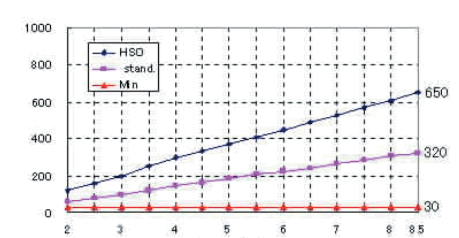
2200 family driver



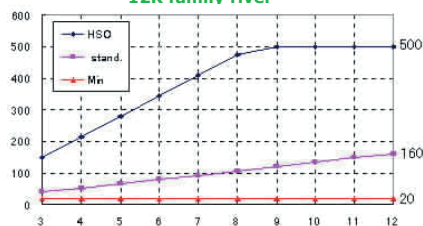
3600 family driver



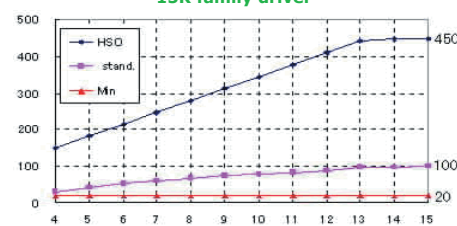
8500 family driver



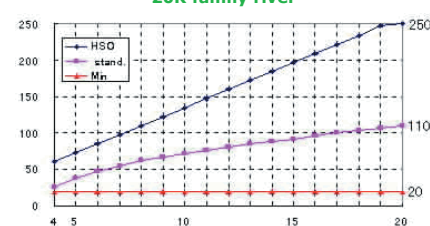
12K family driver



15K family driver



20K family driver



FRONT PANEL FACILITY

Illustrated on the right is the front panel of FEDIII (FEDIII-h) controller.

POWER switch

Press upper side (marked with white dot) of POWER switch, to turn on the controller.

Press lower side of POWER switch, to turn it off.

DRIVER connector

To the DRIVER connector, connect the connector of driver connection cable the other side of which is connected to the driver.

AUTO/MANU key

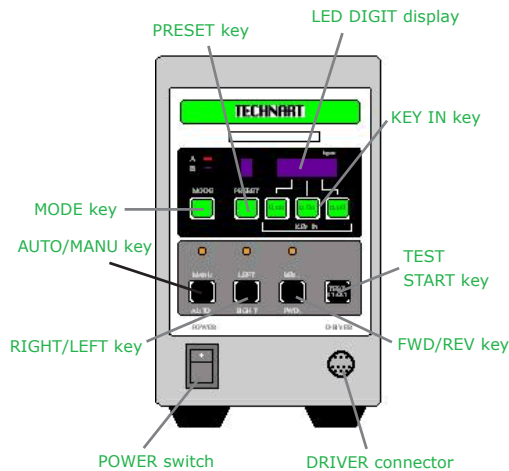
FEDIII (FEDIII-h) has two operation modes - AUTO mode and MANU (manual) mode. When AUTO mode is selected, the LED is off. When MANU mode is selected, the LED is on.

In AUTO mode, FEDIII (FEDIII-h) can be controlled remotely from external PLC etc.. In AUTO mode, all keys on the controller front panel, except for POWER switch, are invalidated. When model S & M family driver is connected to it, its switch lever is also invalidated in AUTO mode.

In MANU mode, all keys on the controller front panel are effective. Any signal from external PLC etc. is ignored.

RIGHT/LEFT key

This is to select direction of driver bit rotation to be applied for screw



tightening. RIGHT is for clockwise rotation for screw tightening. LEFT is for counterclockwise rotation for screw tightening. When RIGHT is selected, the LED is off. When LEFT is selected, the LED is on.

FWD/REV key

This is for selection of FWD mode (screw tightening) or REV mode (screw reversing). When the FWD mode is selected, the LED is off. When the REV mode is selected, the LED is on.

REMARK on FWD/REV :

When, after selecting of REV of FWD/REV toggle switch on model S & M family driver, the FWD/REV key on the controller is pressed, FWD mode is selected and the LED turns off.

When, after above, FWD of FWD/REV toggle switch on the driver is selected, the controller remains in FWD mode, with the LED off.

When FWD of FWD/REV toggle switch on the driver is selected and the FWD/REV key on the controller is pressed, REV mode is selected and the LED turns on.

When, after above, REV of FWD/REV toggle switch on the driver is selected, the controller remains in REV mode, with the LED on.

If FWD of FWD/REV toggle switch on the driver is selected, the controller then turns to FWD mode, with the LED off.

TEST START key

Press TEST START key to activate the connected driver.

Keep pressing it until the operation is completed.

If released off before completion of screw tightening, an error message number E12 or E13 (interruption of operation) is displayed in the LED digit display of the FEDIII (FEDIII-h) front panel.

MODE key

This is for selection of A mode or B mode.

A mode and B mode can contain different set of control parameters each other. In default specification, A mode and B mode contain same default control parameters, and selection of A mode or B mode does not make any difference.

Different set of control parameters can be stored in A mode and in B mode, via Customizer software.

KEY IN key

Press KEY IN key to input tightening torque value digitally, or to select reversing parameter.

Each digit is independent. Digit display blinks when the input figure is out of effective torque range of the connected driver.

PRESET key

FEDIII (FEDIII-h) carries memory area for 8 different setting values for each of screw tightening and reversing. Each setting value is stored under preset number 1 to 8. The FWD mode has its own preset numbers 1 to 8 and "P". The "P" stands for MULTI-SEQUENCE PROGRAM available in FEDIII (FEDIII-h) controller in standard.

The REV mode also has its own preset numbers 1 to 8, different from preset no. 1 to 8 for FWD mode.

Preset numbers for FWD mode can contain tightening torque value.

Preset numbers for REV mode can contain reversing angle or "L". The "L" stands for IDLE, which is actually idle rotation in screw tightening direction, not reversing direction, at low torque and slow speed, mainly used for engagement of the driver bit with a pre-tightened screw etc..

SCREW TIGHTENING MANUAL OPERATION

- 1) Connect FEDIII (FEDIII-h) controller with a driver by driver connection cable.
- 2) Turn on power supply by pressing POWER switch on the control-

ler front panel.

First user code and then setting torque value is displayed in the LED 3-digit display on the controller front panel.

- 3) Make sure that the controller is in MANU mode. The LED is on when it is in MANU mode. It is off when in AUTO mode.
- 4) Make sure that the correct direction (RIGHT/LEFT) is selected for rotating direction for screw tightening.
When model S & M family driver is connected to the controller, also make sure that the FWD is selected in FWD/REV toggle switch located on the driver body.
- 5) Press the switch lever to start screw tightening, when model S & M family driver is used.
Press the TEST START key on the controller front panel, when other type of driver is used.
Hold the switch lever or the TEST START key pressed down firmly until torque-up and completion of screw tightening.
If released off before the completion of screw tightening, an error message number E12 or E13 will be displayed in the LED digit display on the controller front panel.

SCREW REVERSING MANUAL OPERATION

- 1) Select REV mode by pressing FWD/REV key on the controller front panel. The LED is on when it is in REV mode. The LED is off when in FWD mode.
If the driver being connected to the controller is model S & M family driver, select REV of FWD/REV toggle switch on the driver. The last selection in the controller FWD/REV key or the driver FWD/REV toggle switch becomes effective.
- 2) Start screw reversing, by pressing down switch lever of the driver. Driver motor keeps rotating during the switch lever is pressed

on, and stops when released off.

- 3) If the screw could not be reversed, an error message number E32 (time-over for reversing) will be displayed in the LED digit display on the controller front panel.

GENERAL NOTE ON MANUAL SETTING

- 1) FEDIII (FEDIII-h) has two operation modes - AUTO mode and MANU (manual) mode.
When it is in MANU mode, the LED is on. In MANU mode, the controller can be manipulated manually.
When FEDIII (FEDIII-h) is in AUTO mode, the LED is off.
In AUTO mode, the controller can be controlled remotely from external PLC etc. via its interface. In AUTO mode, all keys on its front panel, except for POWER switch, are invalidated. When model S & M family driver is connected to it, its switch lever is invalidated but its FWD/REV selection switch is effective.
- 2) By RIGHT/LEFT key, the direction (clockwise or counterclockwise) can be selected, of the driver motor rotation to be applied to screw tightening. Clockwise rotation is more popular and the LED is off when the RIGHT is selected.
- 3) Tightening torque setting is by KEY IN keys. The figure goes up by pressing it. Each digit is independent each other. The figure shown in LED digit display blinks when the value goes out of effective torque range of the connected driver.
- 4) MODE key is for selection of A mode or B mode.
A mode and B mode can contain different set of control parameters each other, such as different rpm speed, different holding time etc. via Customizer software.
In default specification, A mode and B mode contain same set of control parameters, and selection of A mode or B mode does not

make any difference.

- 5) FEDIII (FEDIII-h) carries memory area for 8 different setting values for each of screw tightening and reversing. Each setting value is stored under preset number 1 to 8. The FWD mode has its own preset numbers 1 to 8 and also "P". The "P" stands for MULTI-SEQUENCE PROGRAM mode available in standard with FEDIII (FEDIII-h).
The REV mode also has its own preset numbers 1 to 8, different from preset no. 1 to 8 for FWD mode.
Preset numbers for FWD mode can contain tightening torque value. First select any of preset numbers 1 to 8 by pressing PRESET key. After the selection of a preset number, press KEY IN key to set tightening torque value.
Preset numbers for REV mode can contain reversing angle or "L". The "L" stands for IDLE, which is actually idle rotation in screw tightening direction, not reversing direction, at low torque and slow speed, mainly used for engagement of the driver bit with a pre-tightened screw etc..
After the selection of a preset number, press KEY IN key to select reversing angle or "L".
Press lower digit KEY IN key, and the displayed figure changes in the sequence of 1-4 (90 deg. reversing), 2-4 (180 deg.), 3-4, 4-4, 5-4, 6-4, 7-4, 8-4 (720 deg. reversing), C (continuous) and then L (IDLE). Press middle digit KEY IN key, and the displayed figure changes in the reversed sequence.
The step for reversing angle is 90 deg. in default specification. It can be changed via Customizer software.
When specific angle is set via Customizer software, the LED digit display shows the memory data bank number 1 to 8 only, in which specific reversing angle data is stored.

- 6) The rpm speed of the driver bit will be displayed in LED digit display when AUTO/MANU key is pressed during driver motor rotation at MANU mode.
The displayed rpm is approximate.

OVERHEAT PROTECTION

FEDIII (FEDIII-h) controller is protected by the following two arrangements, against possible damage due to the overheat caused by repeated operations at too short an interval.

MONITORING OF TEMPERATURE BY THERMOSTAT SENSOR

A thermostat sensor inside the controller monitors the inside temperature. When overheat is detected, the controller stops operation, displays an error message number E51 and outputs an ALARM signal. During the error, do not operate the driver anymore. The controller recovers from the error automatically after the inside temperature goes down below the upper limit temperature. Typically, it will take about 3 (three) minutes for the recovery, at ambient temperature of 25 deg. C.

RESTRICTION OF REPEATED OPERATIONS AT TOO SHORT AN INTERVAL

When screw tightening operation has been repeated at too short an interval of more than 10 (ten) times within 10 (ten) seconds, the controller stops operation, displays an error message number E52 and outputs an ALARM signal. This is precaution against sudden overheat that may not be detected by the thermostat sensor. During the error, operation is prohibited. The controller recovers from the error automatically after one minute and will accept START signal again.

GROUNDING SYSTEM

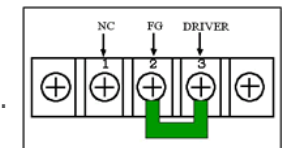
FEDIII (FEDIII-h) controller adopts an advanced grounding system, applicable for most critical ESD sensitive environments. In the grounding system, the controller frame grounding line is configured independent and separated internally from the grounding line of the connected driver.

A connection terminal block for grounding is located at the back of the controller, as shown below :

Pin No. 1 - NC is not used.

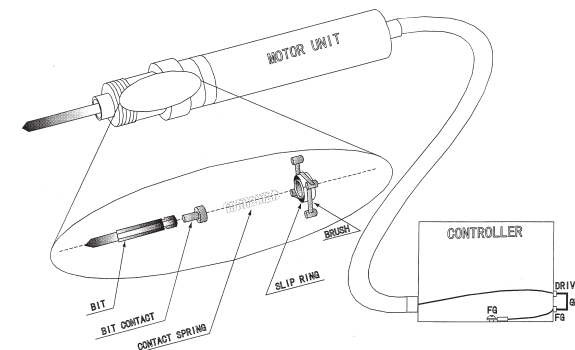
Pin No. 2 - FG is for controller frame grounding.

Pin No. 3 - DRIVER is for driver bit grounding.



Pin No. 2 is connected with Pin No. 3, by a short bar, in default specification. Take it off when the controller frame grounding shall be independent and separated from the driver grounding.

A combination of FEDIII (FEDIII-h) controller and model AG, SG or MG family driver equipped with continuous bit grounding mechanism, will provide the best solution for most critical ESD sensitive environments.



ERROR MESSAGE

FEDIII (FEDIII-h) controller issues an ERROR MESSAGE when the operation has not been completed successfully.

When an error takes place :

- 1) ERROR MESSAGE NUMBER is displayed in the LED digit display of the controller.
- 2) ALARM and an ERROR CODE NUMBER signals are output via the 24-pin photo-coupler interface located at the back of the controller.
- 3) A negative answer-back with ERROR MESSAGE NUMBER information is output via RS-232C interface located at the back of the controller.

REMARK :

Note that ERROR CODE NUMBER output at the 24-pin photo-coupler interface is different from ERROR MESSAGE NUMBER displayed in the LED digit display on the controller front panel and also output via RS-232C interface.

Meaning of each ERROR MESSAGE NUMBER is as below :

ERROR RELATED TO SCREW TIGHTENING & IDLE (automatic recovery)

- E11 out of effective torque range**
The torque setting is out of the effective torque range of the connected driver.
- E12 interruption of operation before screw seating**
The operation was interrupted before screw seating detection.
- E13 interruption of operation after screw seating**
The operation was interrupted after screw seating, before torque-

up and completion of the operation.

- E14 screw seating at speed without torque control**
Screw seating was detected while at high speed rotation without torque control (High Speed For Auto M/C)
- E15 screw head damage**
The driver motor rotated during holding of target torque.
- E21 too fast screw seating**
Screw seating was detected before T1 min. setting.
- E22 overtime for screw seating**
No screw seating was detected before T1 max. setting.
- E23 too fast torque-up after screw seating**
Torque-up was detected after screw seating, before T2 min. setting.
- E24 overtime for torque-up after screw seating**
No torque-up was detected after screw seating, before T2 max. setting.
- E25 too fast completion**
Operation was completed before T3 min. setting.
- E26 overtime for completion**
Operation was not completed before T3 max. setting.
- E27 little rotation before screw seating**
Screw seating was detected before rotation of A1 min. setting.
- E28 over rotation before screw seating**
No screw seating was detected before rotation of A1 max. setting.

ERROR RELATED TO SCREW REVERSING (automatic recovery)

- E31 interruption of reversing**
Reversing was interrupted before reaching specified angle.
- E32 overtime in reversing**
Screw could not be reversed within 2 seconds.

ERROR RELATED TO COMMUNICATION AND MULTI-SEQUENCE PROGRAM MODE

(automatic recovery)

E44 interface communication error

Error was found in preset data, control signal etc. during communication via interface.

E45 multi-sequence code error

Undefined code was found in multi-sequence program.

E46 multi-sequence format error

Error was found in multi-sequence program data.

ERROR RELATED TO OPERATIONAL CONDITIONS

(automatic recovery)

E51 too high temperature (overheat)

Too high temperature was detected inside the controller.
It is automatically recovered once the temperature is down.

E52 operations at too short an interval

Screw tightening was repeated at too short an interval of more than 10 times within 10 seconds.

It is automatically recovered one minute later.

REMARK on E51 & E52 :

When FEDIII (FEDIII-h) is in AUTO mode, the controller stays in NOT READY before above error is recovered. Any START signal won't be accepted before the recovery from the error.

ERROR RELATED TO DRIVER & CONTROLLER FRONT PANEL

E61 motor lock

No feedback signal is received from motor encoder at all after driver motor activation.

E62 no torque family data for driver

Torque family data was not found corresponding to the connected driver.

E63 no driver

No driver is connected to the controller.

E65 front panel data error

Writing of front panel data into EEPROM was failed.

REMARK on E61 :

If E61 was issued in spite that the screw should be driven with little torque before screw seating, most feasibly the driver may be defective.

REMARK on E62 & E63 :

If E62 or E63 was issued, first check the model of the connected driver and also the connection itself if properly connected.

If the connected driver is right and is connected properly, turn the controller off and turn it powered on again.

REMARK on E65 :

If E65 was issued, first check the rating of power supply to the controller. If correct, turn the controller off and turn it powered on again.

ERROR RELATED TO FATAL HARDWARE MALFUNCTION

E71 controller hardware error

Error was found in backup data in the controller.

E72 driver hardware error

Error was found in backup data in the driver.

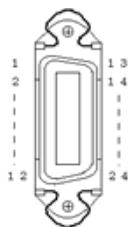
REMARK on E71 & E72 :

If E71 or E72 was issued, it is related to fatal hardware malfunction either in the controller or in the connected driver.

Contact the authorized distributor in your area.

24-PIN PHOTO-COUPLER INTERFACE

FEDIII (FEDIII-h) controller is, in standard, equipped with a 24-pin photo-coupler interface, located at the back of the controller. Your external PLC can control the operation via the interface.



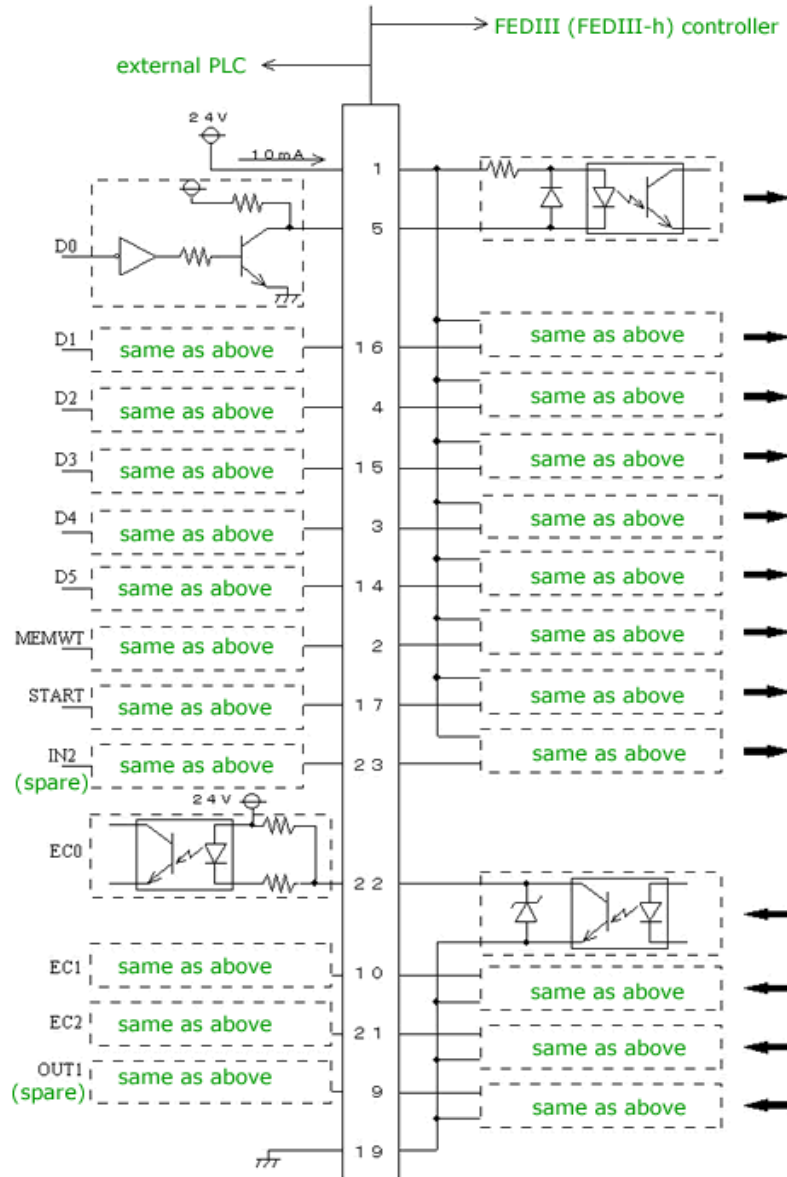
controller side connector :
DDK 57FE-40240-20S or equivalent
connection cable side connector :
DDK 54-30240 or equivalent

For full details of the interface configuration, see the table on the right and also the interface diagram on the next page :

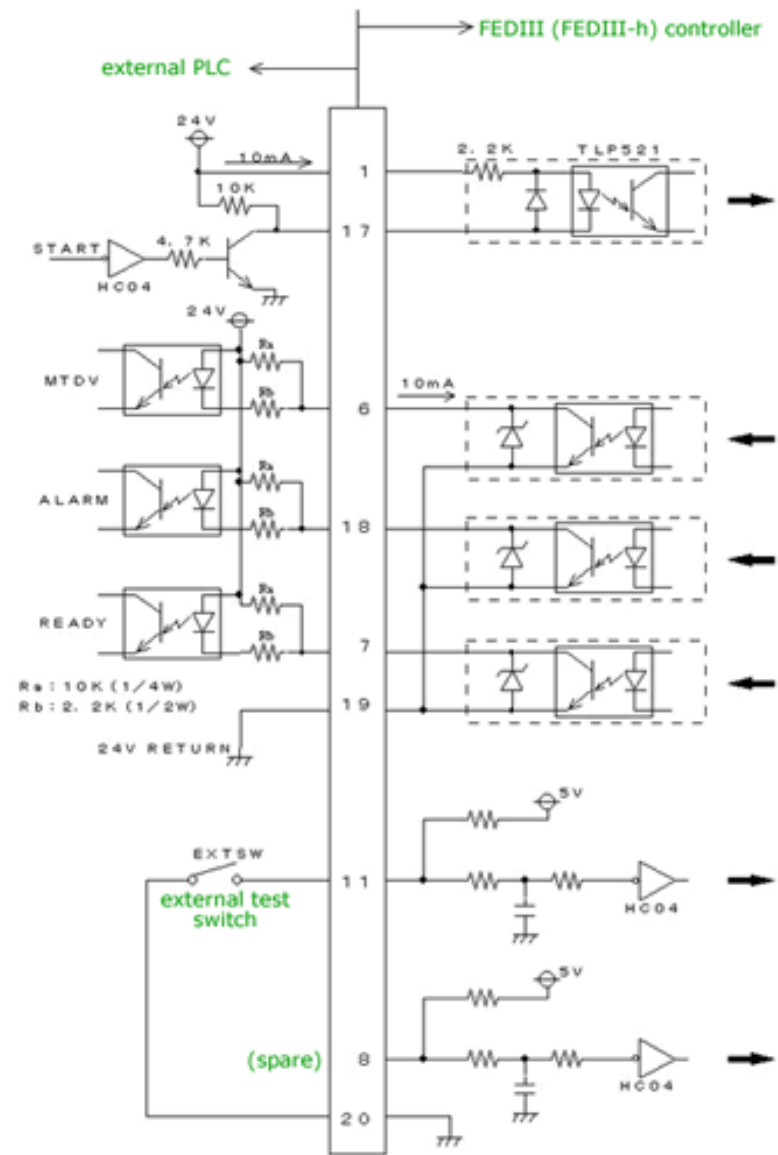
FEDIII & FEDIII-h INTERFACE SIGNAL TABLE

PIN NO.	FED III (FED III-h)	D I R E C T I O N	D E S C R I P T I O N
1	+ 24V	IN	power supply + 24V
2	MEMW T	IN	m em ory W R I T E signal
3	D 4	IN	data 4
4	D 2	IN	data 2
5	D 0	IN	data 0
6	M T D V	O U T	m otordrive signal
7	READY	O U T	READY signal
8	IN 1	IN	(spare) m ulti-sequence step clear
9	O U T1	O U T	(spare) m ulti-sequence external output
10	EC 1	O U T	em orcode 1
11	EXTSW	IN	external test sw itch
12	O U T2	O U T	(spare)
13	IN 4	IN	(spare)
14	D 5	IN	data 5
15	D 3	IN	data 3
16	D 1	IN	data 1
17	START	IN	START signal
18	ALARM	O U T	ALARM signal
19	RET	IN	24V return signal
20	GND	O U T	grounding
21	EC 2	O U T	em orcode 2
22	EC 0	O U T	em orcode 0
23	IN 2	IN	(spare) m ulti-sequence high speed for auto M /C : external input
24	IN 3	IN	(spare)

FEDIII & FEDIII-h INTERFACE DIAGRAM - 1/2



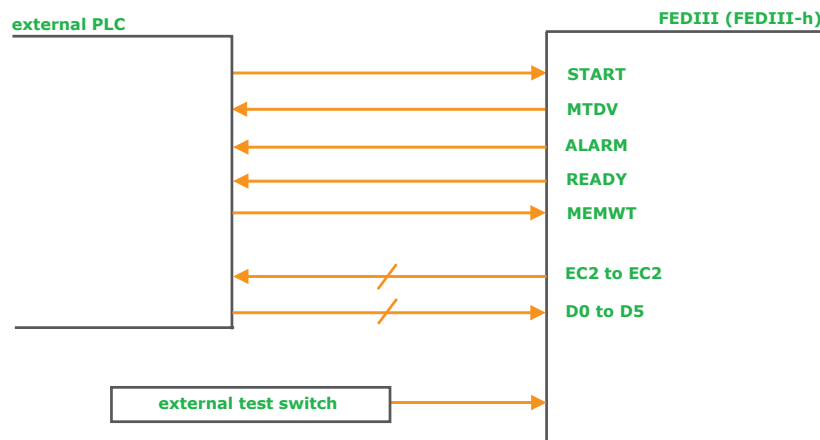
FEDIII & FEDIII-h INTERFACE DIAGRAM - 2/2



REMOTE CONTROL VIA 24-PIN PHOTO-COUPLER INTERFACE

Your external PLC can control the operation via the 24-pin photo-coupler interface located at the back of FEDIII (FEDIII-h) controller.

The outline of control signals for remote control of FEDIII (FEDIII-h) is as illustrated below :



The **START** signal from your external PLC activates the operation of FEDIII (FEDIII-h) controller.

The chattering of 10 (ten) milliseconds shall be applied.

The operation to be executed is specified by CONTROL CODE.

The **MTDV** signal is turned on during the driver motor is in operation.

The **ALARM** signal is turned on when any error took place during operation.

The **READY** signal is 0 (off) when FEDIII (FEDIII-h) is not powered on or when it is in MANU mode. It is 1 (on) when in AUTO

mode, and the controller is ready to accept remote control signals.

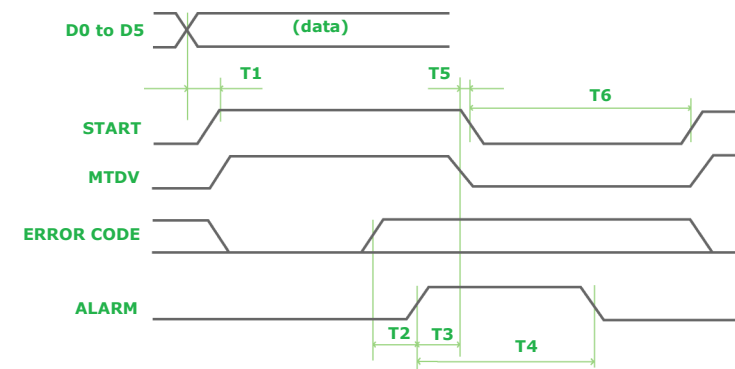
The **MEMWT** signal is 1 (on) during preset data is being sent to FEDIII (FEDIII-h) from external PLC, and 0 (off) otherwise.

The **EC0**, **EC1** and **EC2** signals represent ERROR CODE NUMBER.

The **D0**, **D1**, **D2**, **D3**, **D4** and **D5** signals are used to specify a operation to be executed and also to transfer preset data.

The **external test switch** (connected to a foot switch etc.) can also activate the operation of FEDIII (FEDIII-h) controller.

REMOTE CONTROL TIMING CHART



- T1** : minimum 1 milliseconds
- T2** : minimum 1 milliseconds
- T3** : minimum 1 milliseconds
- T4** : typically 300 milliseconds
- T5** : minimum 0 milliseconds
- T6** : minimum 10 milliseconds

REMARK :

The START signal can be sent to FEDIII (FEDIII-h) even during the ALARM signal is still on, but the minimum 1 (one) second of cycle time waiting is recommended to prevent possible over-heat.

ERROR CODE

An ERROR CODE is output in case of any error during operation. Note that ERROR CODE number here is different from ERROR MESSAGE NUMBER displayed in the LED digit display on the controller front panel and also output via RS-232C interface.

ERROR CODE TABLE

ERROR CODE	EC2	EC1	EC0	ERROR MESSAGE NUMBER	ERROR RELATED TO
1	0	0	1	E11 to E15	screw tightening and idle
2	0	1	0	E21 to E28	pattern error
3	0	1	1	E31 to E32	screw reversing
4	1	0	0	E41 to E46	communication / multi-sequence program
5	1	0	1	E51 to E52	operational conditions
6	1	1	0	E61 to E64	driver / front panel
7	1	1	1	E71 to E77	controller hardware

CONTROL CODE CONFIGURATION

The configuration of CONTROL CODE is as shown below :

CONTROL CODE CONFIGURATION

SIGNAL	D5	D4	D3	D2	D1	D0
SELECTION OF	R/L	A/B	F/R	preset number		

A combination of **D2**, **D1** and **D0** is used for selection of a preset number.

The **D3** is used for selection of FWD mode (D3 = 0) or REV mode (D3 = 1).

The **D4**, when in FWD mode, is used for selection of A mode (D4 = 0) or B mode (D4 = 1). The **D4**, when in REV mode, is used for selection of screw reversing (D4 = 0) or multi-sequence program (D4 = 1).

The **D5** is used for selection of RIGHT (D5 = 0) or LEFT (D5 = 1), which is rotating direction to be applied to screw tightening.

A combination of **D2**, **D1** and **D0** is used for selection of a preset number. Also a combination of **D2**, **D1** and **D0** is used for selection of multi-sequence program A or B. See tables that follows below, for details :

FWD (SCREW TIGHTENING) PRESET NUMBER SELECTION

D5	D4	D3	D2	D1	D0	SELECTION
1 = L 0 = R	1 = B 0 = A	0 (FWD)	0	0	0	preset no. 1
			0	0	1	preset no. 2
			0	1	0	preset no. 3
			0	1	1	preset no. 4
	1		0	0	preset no. 5	
	1		0	1	preset no. 6	
	1		1	0	preset no. 7	
	1		1	1	preset no. 8	

REV (SCREW REVERSING) PRESET NUMBER SELECTION

D5	D4	D3	D2	D1	D0	SELECTION
1 = L 0 = R	0	1 (REV)	0	0	0	preset no.1
			0	0	1	preset no.2
			0	1	0	preset no.3
			0	1	1	preset no.4
			1	0	0	preset no.5
			1	0	1	preset no.6
			1	1	0	preset no.7
			1	1	1	preset no.8

MULTI-SEQUENCE PROGRAM SELECTION

D5	D4	D3	D2	D1	D0	SELECTION
1 = L	1	1	0	0	0	multi-sequence A
0 = R			0	0	1	multi-sequence B

REMARK ON MULTI-SEQUENCE PROGRAM CONTROL STEP CLEAR SIGNAL

When STEP CLEAR SIGNAL is received at the interface pin no. 8, the next START signal executes the multi-sequence program from its first step command, after completion of the current step command.

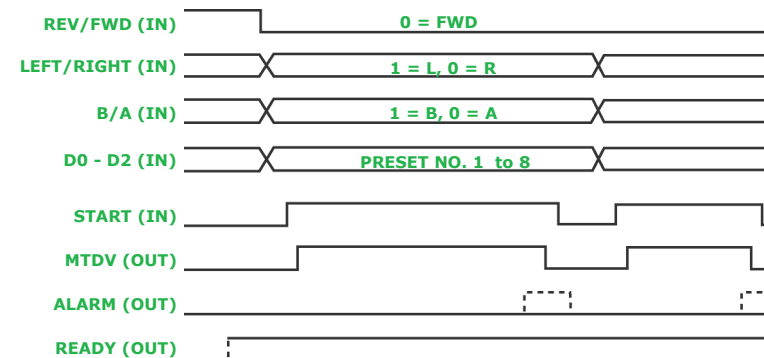
EXTERNAL SIGNAL INPUT

When EXTERNAL SIGNAL INPUT is received at the interface pin no. 23, the multi-sequence program command of "wait for external signal" is released.

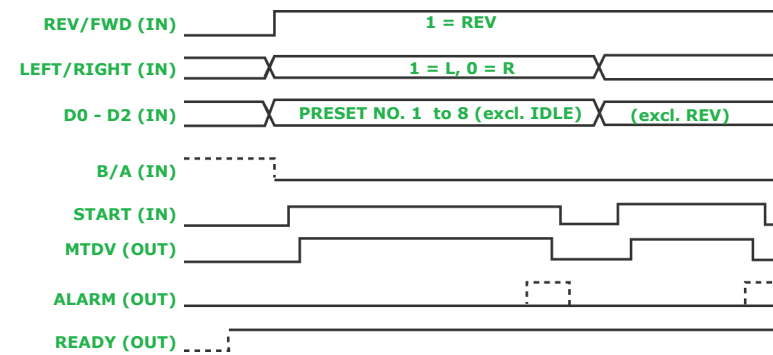
EXTERNAL SIGNAL OUTPUT

A signal is output at the interface pin no. 9, by multi-sequence program command of "output to external signal ON".

TIMING CHART FOR SCREW TIGHTENING



TIMING CHART FOR SCREW REVERSING



PRESET DATA TRANSFER

For sending of preset data for FWD to FEDIII (FEDIII-h), send data in the sequence of 1) preset number code, 2) upper digit figure of tightening torque value, 3) middle digit figure, and then 4) lower digit figure. Data representing decimal point is not required.

For sending of preset data for REV to FEDIII (FEDIII-h), send data in the sequence of 1) preset number code and then 2) reversing parameter code.

PRESET NUMBER CODE TABLE

MODE	PRESET NO.	D 3	D 2	D 1	D 0
FWD	1	0	0	0	0
	2	0	0	0	1
	3	0	0	1	0
	4	0	0	1	1
	5	0	1	0	0
	6	0	1	0	1
	7	0	1	1	0
	8	0	1	1	1
REV	1	1	0	0	0
	2	1	0	0	1
	3	1	0	1	0
	4	1	0	1	1
	5	1	1	0	0
	6	1	1	0	1
	7	1	1	1	0
	8	1	1	1	1

REMARK ON PRESET NUMBER CODE TABLE :

For preset number selection, D5 and D4 are not used. They can be any value.

REVERSING PARAMETER CODE TABLE

REVERSING PARAMETER	D 3	D 2	D 1	D 0
IDLE	0	0	0	0
reversing by 1/N	0	0	0	1
reversing by 2/N	0	0	1	0
reversing by 3/N	0	0	1	1
reversing by 4/N	0	1	0	0
reversing by 5/N	0	1	0	1
reversing by 6/N	0	1	1	0
reversing by 7/N	0	1	1	1
reversing by 8/N	1	0	0	0
C (continuous)	1	0	0	1

REMARK ON REVERSING PARAMETER CODE TABLE :

For reversing parameter selection, D5 and D4 are not used. They can be any value.

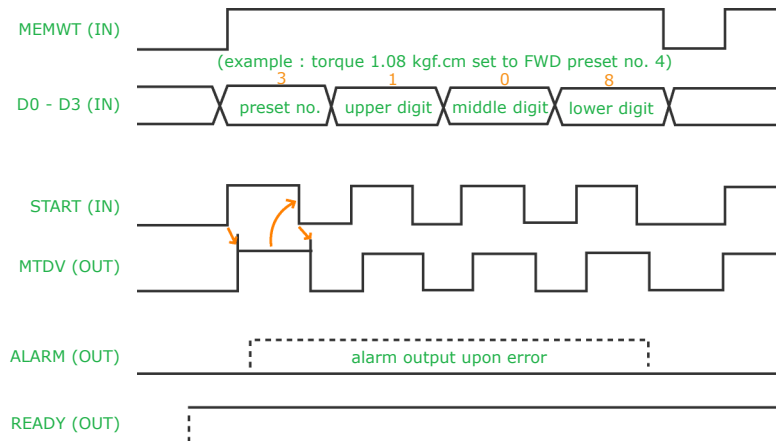
The value represented by "N" in above table varies depending on the setting of the step for reversing angle.

In default specification, the step for reversing angle is 90 degrees, and in this case the N = 4.

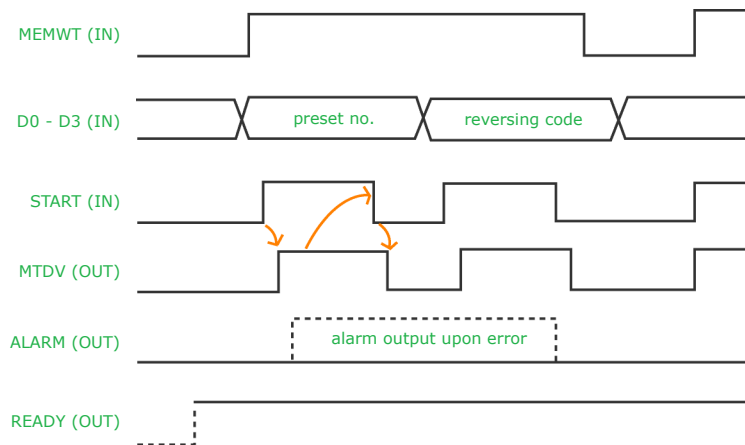
With the IDLE selected, the driver bit actually rotates in the direction of screw tightening, at low torque and slow rpm, although it shall be selected in REV mode.

Any code combination other than above will cause an error.

TIMING CHART FOR FWD PRESET DATA TRANSFER



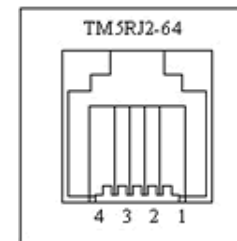
TIMING CHART FOR REV PRESET DATA TRANSFER



RS-232C INTERFACE

FEDIII (FEDIII-h) controller is, in standard, equipped with a 4-pin modular jack connector as RS-232C serial interface, located at the back of the controller. The RS-232C serial interface may be used for :

- 1) communication with Customizer software for customizing of control parameters and functions
- 2) remote control and monitoring of controller operation



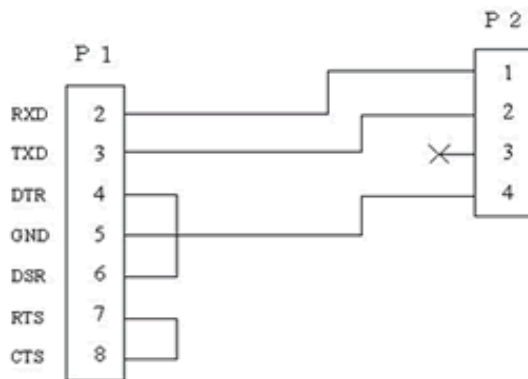
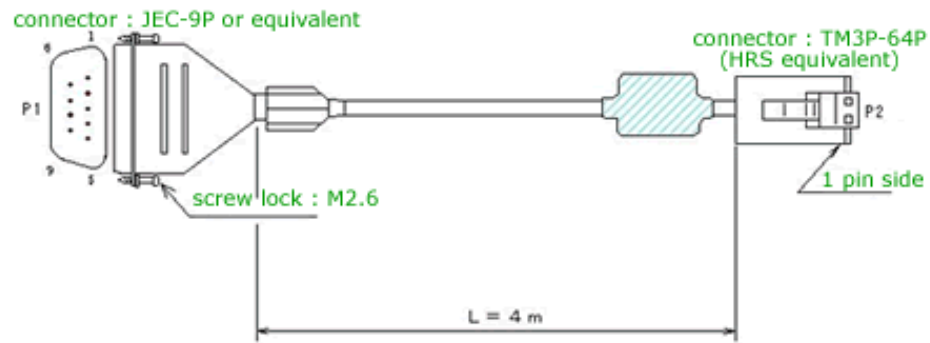
controller side connector : TM5RJ2-64
cable side connector : TM3P-64P or equivalent

PIN NO.	SIGNAL	DIRECTION	REMARK
1	TX0	OUT	OUTPUT DATA
2	RX0	IN	INPUT DATA
3	NC		NOT USED
4	GND		GROUNDING

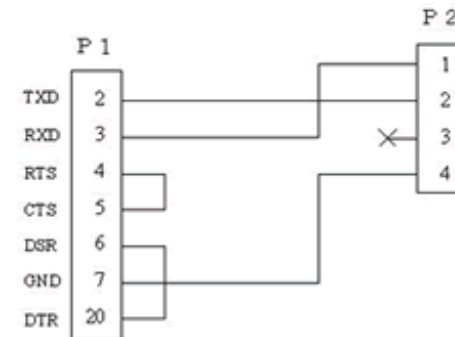
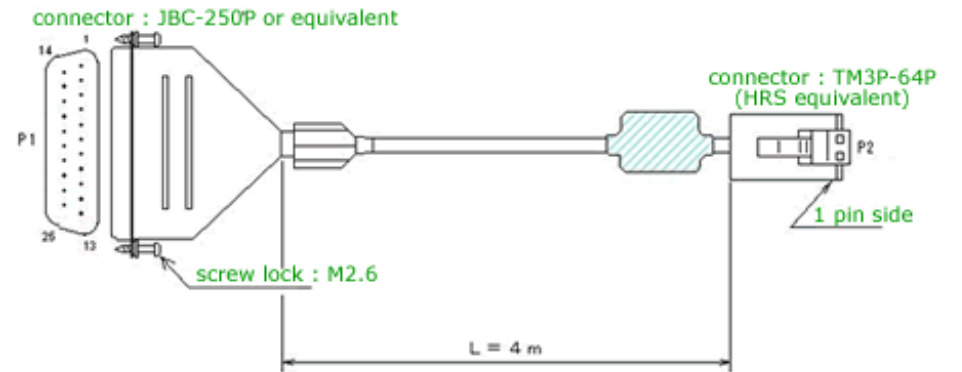
The RS-232C connection cable for connection between FEDIII (FEDIII-h) controller and your PC etc. is optional.

Two types of connection cables are available : order ref. RS232-D9 (with 9-pin D-cub connector) and ref. RS232-D25 (with 25-pin D-sub connector), as shown on the next page :

RS232-D9 cable (optional)
D-sub connector (9-pin) - modular plug (4-pin)



RS232-D25 cable (optional)
D-sub connector (25-pin) - modular plug (4-pin)



RS-232C COMMUNICATION

FEDIII (FEDIII-h) controller can be controlled and monitored remotely via RS-232C serial interface.

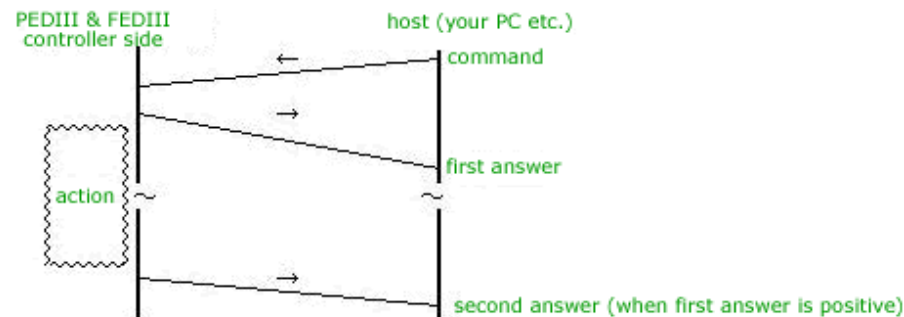
COMMUNICATION PROTOCOL

Baud Rate : 9600 bps
 Stop Bit : 1 (one) bit
 Byte Size : 8 (eight) bits
 Parity Check : none

COMMUNICATION OUTLINE

The communication between HOST (your PC etc.) and FEDIII (FEDIII-h) controller takes the course of :

- 1) The HOST sends a command to FEDIII (FEDIII-h).
- 2) FEDIII (FEDIII-h) returns the first answer-back confirming receipt of the command.
- 3) FEDIII (FEDIII-h) returns the second answer-back confirming completion of the command (when the first answer-back is positive).



COMMAND STRUCTURE

A command signal to FEDIII (FEDIII-h) takes the structure of :

STX + "CMD" + "LEN" + "parameter" + ETX + BCC

STX and **"parameter"** : ASCII code
 (exclusive OR is **BCC**)
CMD : one byte command
LEN : 2 (two) bytes number of characters between **STX** and **ETX**

example : STX + "Q" + "LEN" + ETX + BCC
 (02) (51) (30, 33) (04) (52)

answer back (positive) : ACK + "code" + EOT + BCC
 answer back (negative) : NAK + "code" + EOT + BCC

"code" : 3 bytes (exclusive OR is **BCC**)

COMMAND TO FEDIII (FEDIII-h)

A reversing by specified angle

STX + "A" + "LEN" + "xxxx" + ETX + BCC
 "xxxx" = specified angle

example : reversing by 360 degrees = "A070360"
 reversing by 10 turns (3600 deg.) = "A073600"

B compulsory stop

STX + "B" + "LEN" + ETX + BCC
 First answer-back only is returned.

example : compulsory stop = "B03"

C continuous reversing

STX + "C" + "LEN" + "xxx" + ETX + BCC

"xxx" = duration of time (unit : 100 milliseconds)

example : reversing for 4.5 seconds = "C06045"

D data setting

STX + "D" + "LEN" + "xx" + "xxx" + ETX + BCC

"xx" = 10 : current FWD preset

"xx" = 11 : FWD preset no. 1

"xx" = 12 : FWD preset no. 2

"xx" = 18 : FWD preset no. 8

"xx" = 20 : current REV preset

"xx" = 21 : REV preset no. 1

"xx" = 22 : REV preset no. 2

"xx" = 28 : REV preset no. 8

"xxx" in FWD = tightening torque value

"xxx" in REV = 001 to 008 : REV bank 1 to 8

"xxx" in REV = 000 : C (continuous reversing)

"xxx" in REV = 009 : L (IDLE)

example : set 0.98 kg in FWD preset no. 2 = "D0812098"
 set 4-4 in REV preset no. 2 = "D0823004"
 set C (continuous) in REV preset no. 4 = "D0824000"
 set L (IDLE) in REV preset no. 5 = "D0825009"

G start operation at existing data setting

STX + "G" + "LEN" + "xx" + ETX + BCC

"xx" = 00 : in current setting

"xx" = 10 : in current FWD setting

"xx" = 11 : in FWD preset no. 1

"xx" = 12 : in FWD preset no. 2

"xx" = 18 : in FWD preset no. 8

"xx" = 20 : in current REV setting

"xx" = 21 : in REV preset no. 1

"xx" = 22 : in REV preset no. 2

"xx" = 28 : in REV preset no. 8

"xx" = 30 : multi-sequence program A

"xx" = 31 : multi-sequence program B

example : start operation at current setting = "G0500"
 start operation at current FWD setting = "G0510"
 start operation at current REV setting = "G0520"
 start operation at FWD preset no. 2 = "G0512"
 start operation at REV preset no. 3 = "G0523"

I special IDLE

STX + "I" + "LEN" + "xxx" + "xxx" + ETX + BCC

"xxx" = torque value

"xxx" = driver bit rpm (unit : 10 rpm)

example : special IDLE at 0.25 kg & 500 rpm = "I09025050"

J special continuous reversing

STX + "J" + "LEN" + "xxx" + "xxx" + ETX + BCC

"xxx" = torque value

"xxx" = duration of time (unit : 100 milliseconds)

example : special continuous reversing at 0.55 kg
 for 2.5 seconds = "J09055025"

M change mode

STX + "M" + "LEN" + "xxxx" + ETX + BCC

"Nxxx" = A/B mode : 0 = A, 1 = B

`"xNxx"` = LEFT/RIGHT : 0 = RIGHT, 1 = LEFT
`"xxNx"` = FWD/REV : 0 = FWD, 1 = REV
`"xxxN"` = PRESET : 1 to 8 = preset
 0 = multi-sequence (in FWD only)

example : change to B mode = `"M071---"`
 change to RIGHT = `"M07-1--"`
 change to FWD preset no. 2 = `"M07--02"`
 change to REV preset no. 3 = `"M07--13"`
 change to multi-sequence A = `"M070-00"`
 change to multi-sequence B = `"M071-00"`

REMARK : "-" can be any value.

N change operation mode

`STX + "N" + "LEN" + "x" + ETX + BCC`
`"x"` = mode : 0 = MANU, 1 = AUTO

example : change to MANU mode = `"N040"`
 change to AUTO mode = `"N041"`

Q query

`STX + "Q" + "LEN" + ETX + BCC`
 First answer-back only is returned.

example : query = `"Q03"`

T screw tightening

`STX + "T" + "LEN" + "x" + "xxx" + ETX + BCC`
`"x"` = tightening mode : 0 = standard control
 1 = high speed control
`"xxx"` = tightening torque value

example : fastening at 0.51 kg = `"T070051"`

FIRST ANSWER-BACK FROM FEDIII (FEDIII-h)

ACK positive

The command was received and will be executed.
`ACK + CMD + "0" + "0" + EOT + BCC`

NAK negative

Not Ready (when not in REMOTE mode) :

`NAK + CMD + "0" + "0" + EOT + BCC`

during operation : `NAK + CMD + "0" + "1" + EOT + BCC`

incorrect format : `NAK + CMD + "0" + "A" + EOT + BCC`

invalid parameter :

`NAK + CMD + "0" + "B" + EOT + BCC`

SECOND ANSWER-BACK FROM FEDIII (FEDIII-h)

ACK positive

The command was completed successfully.
`ACK + CMD + "0" + "9" + EOT + BCC`

NAK negative

The command was not completed successfully (error).

`NAK + CMD + N1 + N2 + EOT + BCC`

NOTE : N1 & N2 = error message number in ASCII code
 (N1 = upper digit, N2 = lower digit)

CONTROL PARAMETERS & FUNCTIONS

Control parameters and functions of FEDIII (FEDIII-h) controller are optimized to be applicable for most of screw tightening and reversing applications. Many parameters are, however, adjustable. Should different setting of parameters and functions be required to suit your specific requirement, use Customizer software to change or adjust those parameters and functions when applicable, or specify accordingly at the time of order.

Full details of each parameter and function, its default setting, and adjustable range or alternative function, are as shown on tables that follow.

For full details of Customizer software, see a separate document titled PEDIII & FEDIII CUSTOMIZER.

TIGHTENING TORQUE RANGE

TORQUE FAMILY	TORQUE RANGE (kgf.cm)	UNIT
1200	0.30 to 1.20	0.01
2200	0.60 to 2.20	0.01
3600	1.00 to 3.60	0.01
8500	2.00 to 8.50	0.01
12K	3.0 to 12.0	0.1
15K	4.0 to 15.0	0.1
20K	5.0 to 20.0	0.1

REMARK ON TIGHTENING TORQUE RANGE :

The tightening torque range for each torque family driver is fixed as shown in above.

Consult with the authorized distributor in your area, when different tightening torque range setting should be required.

Note that any lower torque than the lower limit is difficult to control torque-sensitively, and therefore its accuracy and repeatability may not be guaranteed.

SCREW TIGHTENING

All of parameters (see table below) applied for screw tightening are adjustable via Customizer.

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
output torque adjustment (OTA)	0 %	within +/- 6 %	1 %
holding time of target torque	100 mSec.	0 to 200 mSec.	1 mSec.
rpm decrease	0 rpm	see table RPM RANGE	1 rpm
screw binding release	off	on/off	
waiting time Tw for screw binding release	50 mSec.	20 to 999 mSec.	1 mSec.
torque H for screw binding release	30 %	10 to 90 %	1 %
time Tr for screw binding release	60 mSec.	0 to 999 mSec.	1 mSec.
slow start	off	on/off	

REMARK ON OUTPUT TORQUE ADJUSTMENT (OTA) :

Each driver has its own individual mechanical characteristics.

The same power supply from a controller to a driver won't result in the same output with another driver. Here arises the necessity of automatic compensation or adjustment in order to guarantee the same output with any driver.

Model A family driver and also S & M family driver carries a memory chip on board the driver. The memory contains the data of its own individual mechanical characteristics, named OTA (Output Torque Adjust).

The controller reads the OTA of the driver connected to it, to adjust the driver's output automatically. Thus the accuracy is maintained with any driver connected to the controller.

Such mechanical characteristics of the driver may change as the usage goes by. It can be adjusted within the range of +/- 6 percent, via Customizer.

REMARK ON HOLDING TIME OF TARGET TORQUE :

The holding of target torque is the final and essential stage of Technart's screw tightening process control. It is known that relaxation of the joint

starts right after the tightening. The holding of target torque will work to eliminate such relaxation and also stabilize the joint against any familiarization between materials of the joint each other.

The default value for holding time is 100 mSec., which is the optimum value that is proven effective in most applications.

When, however, the purpose of the tightening is pre-torque tightening, followed by final torque tightening at later stage, the holding time can be zero.

REMARK ON SCREW BINDING RELEASE :

It sometimes happens that the driver bit and screw bind each other after tightening and the driver bit can not be released free from the screw. In such a case, applying reversing torque after tightening helps disengagement and release of the driver bit from screw.

REMARK ON SLOW START :

When the SLOW START is turned on, the driver bit rotates slowly at the initial stage of screw tightening, to make sure of the bit to be engaged with the screw hole smoothly and firmly.

RPM RANGE

See rpm graph on PAGE-6 for rpm range of each of torque family driver. The RPM is adjustable within the range, via Customizer.

REMARK ON RPM RANGE :

The rpm is one of the most important factors in torque control. The rpm range shown on PAGE-6 is optimum range within which precise torque control can be maintained even in screw tightening against the hardest joint characteristics.

Consult with the authorized distributor in your area, when any faster rpm than the given range should be required. In this case, the actual joint characteristics in your specific application shall be examined to see

if any faster rpm can be applicable without sacrifice of precise torque control.

Also consult with the authorized distributor in your area, when any slower rpm than the given range should be required, although in general any slower rpm than the given range may result in inadequate torque.

REVERSING

TORQUE FAMILY	REVERSING TORQUE (kgf.cm)	RPM
1200	1.35	460
2200	2.40	250
3600	4.20	180
8500	11.0	100
12K	14.0	60
15K	17.0	60
20K	23.5	60

REMARK ON REVERSING TORQUE & RPM :

In default setting, the max. torque that the motor with gear of the driver can output is applied for reversing. It is adjustable within the given torque range of the driver, via Customizer.

The rpm applied for reversing is also adjustable within the given rpm range of the driver, via Customizer.

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
holding time	100 mSec.	0 to 200 mSec.	1 mSec.
reversing angle	90 deg. step	45/90/180/specify	
reversing angle (specify)	360 x N (N = preset no.)	45 to 9,999 deg.	1 deg.

CONTINUOUS REVERSING

TORQUE FAMILY	REVERSING TORQUE (kgf.cm)	RPM
1200	1.35	460
2200	2.40	250
3600	4.20	180
8500	11.0	100
12K	14.0	60
15K	17.0	60
20K	23.5	60

REMARK ON CONTINUOUS REVERSING TORQUE & RPM :

In default setting, the max. torque that the motor with gear of the driver can output is applied for continuous reversing. It is adjustable within the given torque range of the driver, via Customizer.

The rpm applied for continuous reversing is also adjustable within the given rpm range of the driver, via Customizer.

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
holding time	100 mSec.	0 to 200 mSec.	1 mSec.
auto stop (SW)	no stop	timer/angle/no stop	
auto stop (I/F)	no stop	timer/angle/no stop	
auto stop (multi-sequence)	timer	timer/angle/no stop	
stop by timer	10 Sec.	0 to 60.0 Sec.	0.1 Sec.
stop by angle	3,600 deg.	45 to 9,999 deg.	15 deg.

IDLE

The IDLE is the operation that can be selected in REV mode.

It is actually same as screw tightening, but at low torque and slow rpm. It is useful for engagement of the driver bit with the screw that is already pre-tightened.

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
holding time of target torque	100 mSec.	0 to 200 mSec.	1 mSec.
slow start	off	on/off	

TORQUE FAMILY	TORQUE (kgf.cm)	ADJUSTABLE TORQUE RANGE (kgf.cm)	RPM
1200	0.15	0.10 to 0.30	450
2200	0.40	0.20 to 0.60	150
3600	0.50	0.40 to 1.00	170
8500	1.25	1.00 to 2.00	50
12K	1.5	1.2 to 3.0	30
15K	2.5	1.5 to 4.0	30
20K	3.0	2.5 to 5.0	20

MULTI-SEQUENCE PROGRAM

FEDIII (FEDIII-h) provides the facility to run a program stored inside herself. The program is a set of commands, composed on Customizer and uploaded to FEDIII (FEDIII-h).

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
wait		0 to 999 x 100 mSec.	100 mSec.
retry when error	on	on/off	

ERROR

If the driver bit rotates during the holding of target torque in screw tightening or in IDLE rotation, it is feasible that the screw head is damaged and the bit is running over it.

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
bit rotation during holding in IDLE	360 deg.	30 to 1,440 deg.	15 deg.
bit rotation during holding in tightening	360 deg.	30 to 1,440 deg.	15 deg.
timer for IDLE	off	on/off	

PATTERN ERROR

The PATTERN ERROR is a set of error parameters.

When the screw tightening operation has not been completed within parameters arranged for PATTERN ERROR, the operation is regarded

as an error. Parameters for PATTERN ERROR are written via Customizer.

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
T1 Time Min. (start to screw-seating)	0.00 Sec.	0 to 60.00 Sec.	0.01 Sec.
T1 Time Max. (start to screw-seating)	0.00 Sec.	0 to 60.00 Sec.	0.01 Sec.
T2 Time Min. (screw-seating to end)	0.00 Sec.	0 to 60.00 Sec.	0.01 Sec.
T2 Time Max. (screw-seating to end)	0.00 Sec.	0 to 60.00 Sec.	0.01 Sec.
T3 Time Min. (start to end)	0.00 Sec.	0 to 60.00 Sec.	0.01 Sec.
T3 Time Max. (start to end)	0.00 Sec.	0 to 60.00 Sec.	0.01 Sec.
A1 Angle Min. (start to screw-seating)	0 deg.	15 to 9,990 deg.	15 deg.
A1 Angle Max. (start to screw-seating)	0 deg.	15 to 9,990 deg.	15 deg.

When set to 0, the parameter is ignored for error detection.

RS-232C

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
timer	20 Sec.	0 to 120 Sec.	1 Sec.

When set to 0, the parameter is ignored for error detection.

CYCLE TIME

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
no activation after error	0.00 Sec.	0.00 to 9.99 Sec.	0.01 Sec.
no activation after OK	0.00 Sec.	0.00 to 9.99 Sec.	0.01 Sec.

START MODE

PARAMETER	DEFAULT	ADJUSTABLE RANGE
start mode	retrieve last setting when powered off	AUTO mode MANU mode retrieve last setting

ERROR MESSAGE NUMBER DISPLAY

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
automatic off	on	on/off	
duration of time for ON	1.5 Sec.	0.01 to 9.99 Sec.	0.01 Sec.

OK DISPLAY

When the operation has been completed successfully, “ooo” is shown in the LED digit display of the controller front panel.

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
automatic off	on	on/off	
duration of time for ON	0.6 Sec.	0.01 to 9.99 Sec.	0.01 Sec.

PARAMETERS FOR MODEL S & M FAMILY DRIVER

PARAMETER	DEFAULT	ADJUSTABLE RANGE	UNIT
LED function	on when ERROR	on when OK on when ERROR blink when ERROR & on when OK not used	
LED brightness	light	light/dark	
duration of time for ON/blink	1.0 Sec.	0.1 to 99.9 Sec.	0.1 Sec.
switch lever trigger	on	off/on	

DRIVER TORQUE FAMILY DATA

FEDIII (FEDIII-h) can contain three different data of driver torque family. When, for instance, FEDIII (FEDIII-h) contains torque family data of 3600/8500/12K, any of 3600, 8500 or 12K family driver can be connected and used with it right away, without any manipulation. Specify three different torque family data, at the time of order.

REAL-TIME MONITORING

There may be a need for real-time monitoring of T1, T2, T3, A1 etc. (see PAGE-27) of every single screw tightening operation, via RS-232C interface.

Consult with the authorized distributor in your area, as we are more than pleased to discuss further on your specific requirement.

MODEL S & M FAMILY DRIVER IN AUTO MODE

In default specification, FEDIII (FEDIII-h) shall be in MANU mode if screw tightening and reversing operation shall be activated from switch lever of model S & M family driver. In this case, FEDIII (FEDIII-h) in MANU mode won't accept any remote signal.

If you want HYBRID mode, such as manual operation with FEDIII (FEDIII-h) in AUTO mode, consult with the authorized distributor in your area, as we are more than pleased to discuss further on your specific requirement.

STANDARD SUPPLY SCOPE

When a FEDIII (FEDIII-h) controller is ordered, the standard supply scope is as listed below unless otherwise ordered. They are contained and delivered in a carton box of W 30 x D 15 x H 19 cm. :

- 1 pc of controller of ordered model
- 1 pc of power supply connection cable

A driver to be used with the controller shall be ordered separately. Any connection cable for remote control is not included in the shipment.

Specification and operational instruction in English (this document) is not included in the shipment.

Request a copy of the latest edition document to the authorized distributor in your area you are purchasing Technart controller from, and a PDF document or its printout copy will be provided upon request.

Technart Customizer software is not included in the shipment. Request a copy to the authorized distributor in your area you are purchasing Technart controller from, and a latest version software will be provided upon request.

GENERAL INSTRUCTIONS

- 1) Apply to the controller stable power supply of within +/- 10% from the rating.
- 2) Avoid repeated screw tightening operations in too short an interval. If screw tightening at maximum torque of the driver is repeated in short an interval of less than 5 (five) seconds, the driver may be damaged due to the overheat of its motor. Stop operation when noticed the overheat of the driver motor.
- 3) Do not operate the controller outdoors, as it is neither water-proof or dustproof.
- 4) Higher torque of the driver's torque range provides faster rpm and also better repeatability of output torque. Choose the best torque family driver accordingly, to obtain the best performance.
- 5) The setting torque value displayed in the LED digit display of the controller is for setting purpose only. It is not the reading of actual measurement of the driver's output torque. When the most critical torque setting is required, measure the actual output torque of the driver by calibrated torque meter and adjust the torque setting on the controller accordingly.
- 6) The controller won't require and is not designed for, any calibration.
- 7) A particular matching of a controller and a driver needs not to be maintained, when model A family or model S & M family driver with memory on board is used.
- 8) Do not disassemble the controller by yourself. Contact the authorized distributor in your area when repair is required.

ABOUT THIS DOCUMENT

This document is a part of ALL ABOUT TECHNART - the complete technical information in English on Technart Electric Torque Driver System.

ALL ABOUT TECHNART is prepared by KYOSO CO., LTD. in Japan, for global export marketing and distribution of the products, on behalf of and with full support by the manufacturer, NIPPON TECHNART, INC. in Japan.

For any further information on the products, either technical or commercial, please contact the authorized distributor in your area, or contact us directly :

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