



TC80-D3V

OPERATION MANUAL

01DEC2022REV.1.03

UNIPULSE

Operation overview for TC80



Basic operation procedures

Please read "Setting/operation" on page **6**.

Calibration

Please read "Calibration procedures" on page **7**.

Measure according to purpose

Please read " Settings and Operations Related to Comparison " on page **20**,

" Settings and Operations Related to Hold " on page **22**.

Contents

1	Before getting started	1	8	D/A Converter Interface	40
1-1.	Product supporting RoHS2 Directive	2	8-1.	Names of components	40
1-2.	Package contents	2	8-2.	Settings related to D/A	40
1-3.	Connection with other devices	2	8-3.	D/A output fine adjustment	41
1-4.	Attaching/detaching the DIN rail	2	9	RS-485 Interface	43
1-5.	Front panel/terminal block	3	9-1.	Communication	
1-6.	Connection to the terminal blocks	5		specifications	43
1-6.	Connection to the D3V connector	5	9-2.	RS-485 connection	43
2	Settings/operations	6	9-3.	Settings related to RS-485	44
3	Calibration procedures	7	9-4.	UNI-Format	46
3-1.	Calibration	7	9-5.	UNI-Format message formats	46
3-2.	Calibration procedures for torque	8	9-6.	Modbus-RTU	52
3-3.	Settings/operations related to calibration for torque	8	9-7.	Modbus-RTU address map	53
3-4.	Settings/operations related to calibration for rotation speed	11	10	USB interface	59
3-5.	Settings/operations related to calibration for rotary encoder	14	10-1.	USB interface	59
4	Settings related to indicated values	17	10-2.	PC preparation	59
5	Settings and Operations Related to Comparison	20	11	Other functions	61
6	Settings and Operations Related to Hold	22	12	Troubleshooting	62
6-1.	Setting of hold	22	12-1.	Error message display (torque measurement)	62
6-2	Sample hold	24	12-2.	Error message display (rotation speed measurement)	63
6-3	Peak hold	25	12-3.	Error message display (power measurement)	63
6-4	Bottom hold	27	12-4.	Error message display (others)	63
6-5	Peak to peak hold	29	13	List of setting values	64
6-6	Average hold	31	14	Specifications	71
6-7	Peak hold (angle1)	32	14-1.	Analog section	71
6-8	Peak hold (angle2)	34	14-2.	Display section	72
7	External I/O signals	36	14-3.	Settings section	72
7-1	Terminal block pin assignment	36	14-4.	External signal input/output	72
7-2	Connecting an external control device	36	14-5.	Interface	73
7-3	Selection of external I/O signal functions	37	14-6.	General performance	73
7-4	Description of external I/O signal functions	38	14-7.	External dimensions	74
			14-8.	Block diagram	75
			14-9.	Compliance with EC directives	76

1 Before getting started

Be sure to read for safety.

Make sure that installation, maintenance, and inspection of the TC80 are performed by personnel with electrical knowledge. In this manual, precautions for safe use of the TC80 are described separately as and in the following text. The precautions described in this text are important content regarding safety. Use this product having understood the content accurately.

WARNING Events that may cause death or severe injury to persons in cases of misuse.

Design warning

- Prepare a safety circuit outside the TC80 so that the entire system functions safely.
- Be sure to contact our sales representative before use if the TC80 will be used in the following situations:
 - If the product is used in an environment not described in the operation manual;
 - If the product is used in a way that may have a substantial effect on human life and/or property, such as in medical devices, transportation equipment, entertainment devices, safety devices, etc..

Mounting precautions

- Do not disassemble, repair or alter the TC80.
- Do not install the product in the following environments:
 - Locations with corrosive gases or combustible gases;
 - Locations over which water, oil, or chemicals splash.

Wiring warning

- Do not connect commercial power supply directly to the signal I/O terminal.
- Be sure to perform class D grounding when installing the product.
- Be sure to check that the power is off before the following actions:
 - Wiring and connection of cables to a terminal block;
 - Connection to functional grounding terminals.
- Be sure to check signal names and pin assignment numbers before connecting to the signal I/O terminal in order to wire cables properly.
- No connection is necessary for unused terminals.
- Be sure to check the wiring and so on carefully before turning the power on.

Startup/maintenance warning

- Use power supply voltage and load within the specified range and rating.
- Do not touch the terminal while power is on. This may cause electric shock and malfunction.
- Do not open the main unit cover. Contact us for inspection and/or repair of internal parts.
- Turn power off immediately if smoke, abnormal smell, or abnormal noise is detected.

CAUTION Events that may cause injury to persons or material damage in cases of misuse.

Mounting precautions

- The TC80 must be incorporated into the control panel and so forth.
- Do not install the product in the following environments:
 - Locations where temperature or humidity exceeds specifications;
 - Locations subject to drastic temperature fluctuations or icing and condensation;
 - Outdoors or locations above 2,000m;
 - Locations exposed to direct sunlight;
 - Locations subject to dust accumulation;
 - Locations with poor ventilation;
 - Locations with a lot of salt and metal powder;
 - Locations where the main unit is subject to direct vibration and/or shock.
- Perform adequate shielding if the product is used in the following locations:
 - Near power lines;
 - Locations subject to strong electric and/or magnetic field;
 - Locations subject to noise such as static electricity and relays.
- Install the product as far away as possible from equipment generating high frequency, high voltage, large current, surge, etc. Moreover, perform wiring of cables separately from these power lines. Do not perform parallel wiring and identical wiring.
- Do not use the product if it is damaged.

Wiring precautions

- Use shielded cables for cables (UTM, rotary encoder, external I/O, D3V).
- Be sure to ground the frame ground terminal.
- Tighten terminal screws to the specified torque.
Tightening torque: 0.31 to 0.37 N·m

Startup/maintenance precautions

- Be sure to allow an interval of five seconds or longer between turning power ON and OFF.
- Use after warming up for 30 minutes or longer following the startup of power supply.
- Protective performance of the TC80 may be lost if it is not used as specified.
- Cleaning
 - Unplug the power supply when cleaning.
 - Do not wipe with a wet cloth, benzene, thinner, alcohol, etc. This may lead to discoloration and/or warping of the TC80. When dirty, clean using a well squeezed cloth soaked in diluted neutral detergent. Afterwards wipe with a soft, dry cloth.

Transportation precautions

- When sending the TC80 to us for repair and so on, pack it with sufficiently shock-absorbing materials.

Disposal precautions

- Handle this product as industrial waste when disposing.

1-1. Product supporting RoHS2 Directive

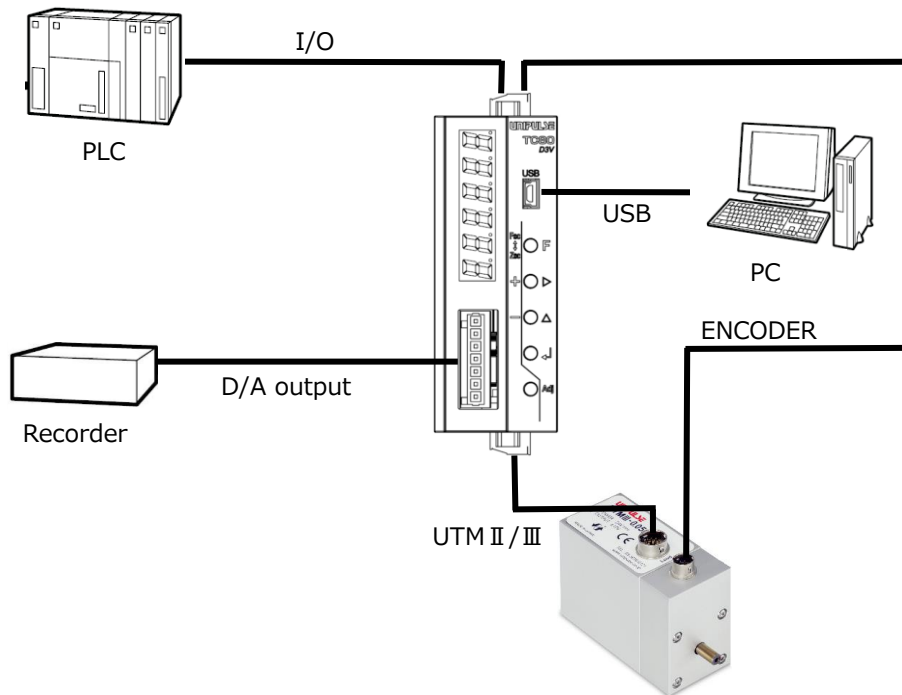
The parts and accessories used in this device (including the operation manual, package box and so on) correspond to the RoHS2 Directive which regulates the use of toxic substances that may have adverse effects on the environment as well as the human body.

1-2. Package contents

The following items are included in the package box. Be sure to check the contents before use.

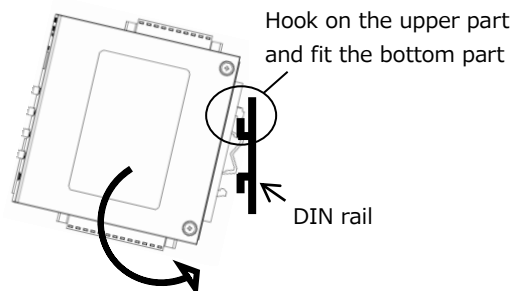
- TC80 main unit --- One unit
- Terminal block (10 pin) --- One piece
- Terminal block (13 pin) --- One piece
- Connector for D/A converter 3ch (D3V connector) --- One piece
- Operating tool (with D3V connector) --- One piece
- Small screwdriver for connection of terminal block --- One piece
- TC80 quick reference --- Two copies

1-3. Connection with other devices

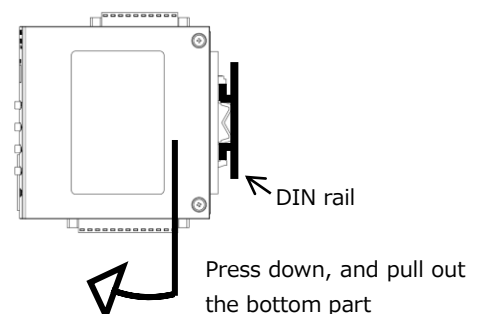


1-4. Attaching/detaching the DIN rail

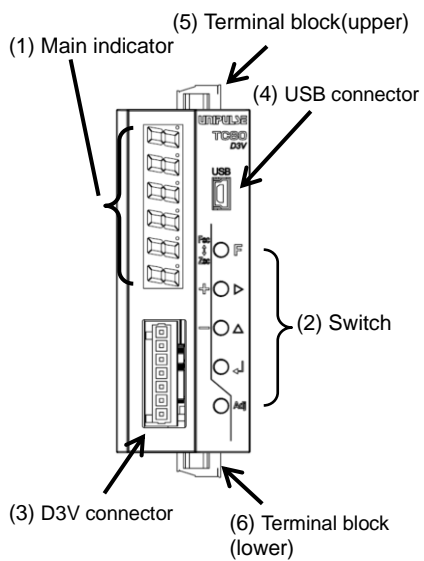
(Attaching)



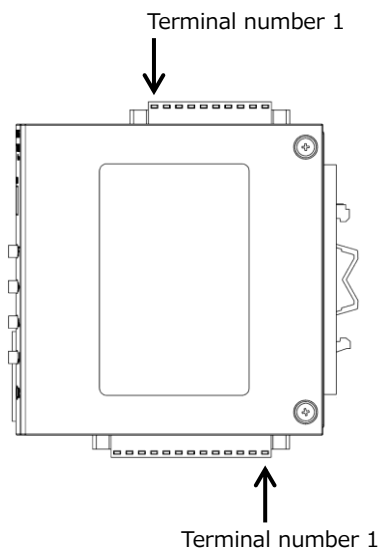
(Detaching)



1-5. Front panel/terminal block






Name	Description	
(1) Main indicator	1) Indicated value display 2) Over scale/error display 3) Setting value display	Displays indicated values (torque/rotation speed/power/angle) Displays over scale/other errors Displays various setting values
(2) Switch	F FNC ▷ HOLD △ ZERO ↶ ENT(tr / rp / Po/ An) Adj Adjust	Switches to the setting mode Hold operation/setting operations Digital zero/setting operations Display switching /setting operations Go into the D/A output adjustment mode
(3) D3V connector	Connects with a D3V cable.	
(4) USB connector	Connects with a USB cable.	
(5) Terminal block(upper)	Connects with external I/O and rotary encoder.	
(6) Terminal block(lower)	Connects with the power supply/signal input/pulse input/RS-485.	



Terminal block (upper)

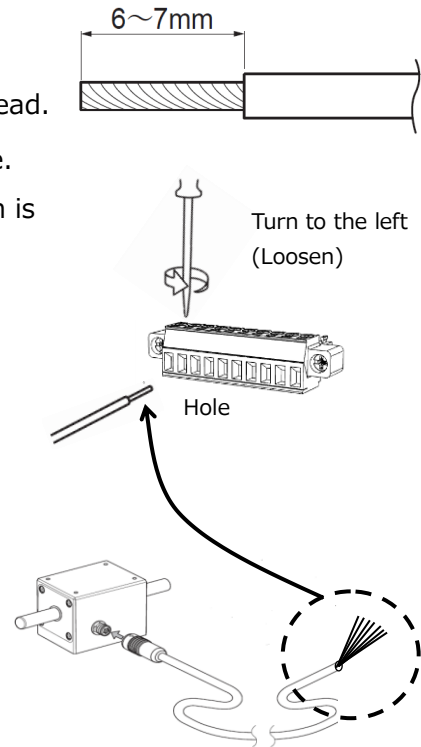
No	Use	Terminal name	Description	Cable color (UTMⅡ)	Cable color (UTMⅢ)
1	Input terminal	IN1	Terminal for input signals.		
2	Output terminal	OUT1	Terminals for output signals.		
3		OUT2			
4	Ground for I/O signals	COM	Common terminal of I/O signals.		
5	Power supply for rotary encoder(+5V)	PWR (+5V)	Power supply Terminals for rotary encoder.	Red	Red
6	Power supply for rotary encoder(Ground)	PWR (GND)		Green	Black
7	Encoder input (A phase)	A	Terminals for rotary encoder (A,B,Z phase).	Blue	Yellow
8	Encoder input (B phase)	B		Black	Green
9	Encoder input (Z phase)	Z		Transparent	
10	Shield	SLD	Terminal for SHIELD		Shield

Terminal block (lower)

No	Use	Terminal name	Description	Cable color (UTM II)	Cable color (UTM III)
1	RS-485	SG	Terminals for connecting with the RS-485 interface.		Blue
2		B+			Purple/Pink
3		A-			Gray/Sky blue
4	Unused	N.C.			
5	Analog input	-SIG(GND)	Terminals for Analog input.	White	White
6		+SIG		Green	Green
7	Pulse input	PULSE IN	Terminals for Pulse input for rotation speed.	Yellow	Yellow
8		PULSE GND		Brown	Brown
9	Power supply for UTM	PWR(+24V)	Drive power supply terminals for UTM.	Red	Red
10		PWR GND		Black	Black
11	Power supply input		Connects with the TC80 power supply (DC24V).		
12		+ 			
13		-  DC IN			

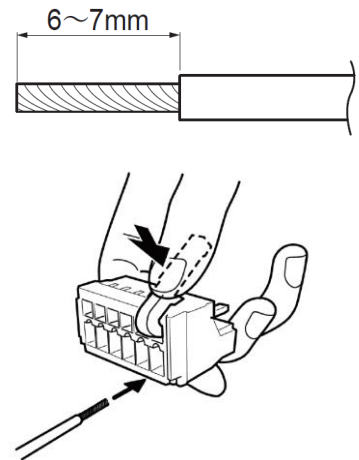
1-6. Connection to the terminal blocks

1. Peel off 6 to 7 mm of coating of the electric wire to be connected, and twist the tip enough so it does not spread.
 2. Loosen the screw with a screwdriver and open the hole.
A flathead screwdriver with a shaft diameter of 2.0mm is recommended. (Precision screwdrivers etc.)
 3. Check the wiring of the equipment to be connected in the pin assignment table in 1-5, and insert the electric wire into the hole, making sure that the tip does not spread.
 4. Tighten the screw with a screwdriver.
 5. Pull the electric wire slightly to check that it has been securely clamped.
- * Electric wires between 0.08 to 1.31mm² can be connected (AWG16 to 28). The recommended tightening torque value is 0.31 to 0.37 N·m.

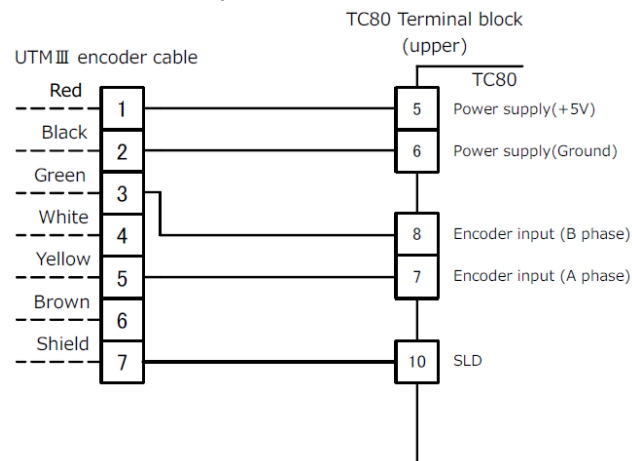


1-7. Connection to the D3V connector

1. Peel off 6 to 7 mm of coating of the electric wire to be connected, and twist the tip enough so it does not spread.
 2. Press the operating tool attached to the operation slot at the upper part with a finger and push down the spring.
 3. While pressing the operating tool, insert the electric wire into the insertion opening until it hits the wall.
 4. Pull the electric wire slightly to check that it has been securely clamped.
- * Electric wires between 0.08 to 1.5mm² can be connected (AWG14 to 28).



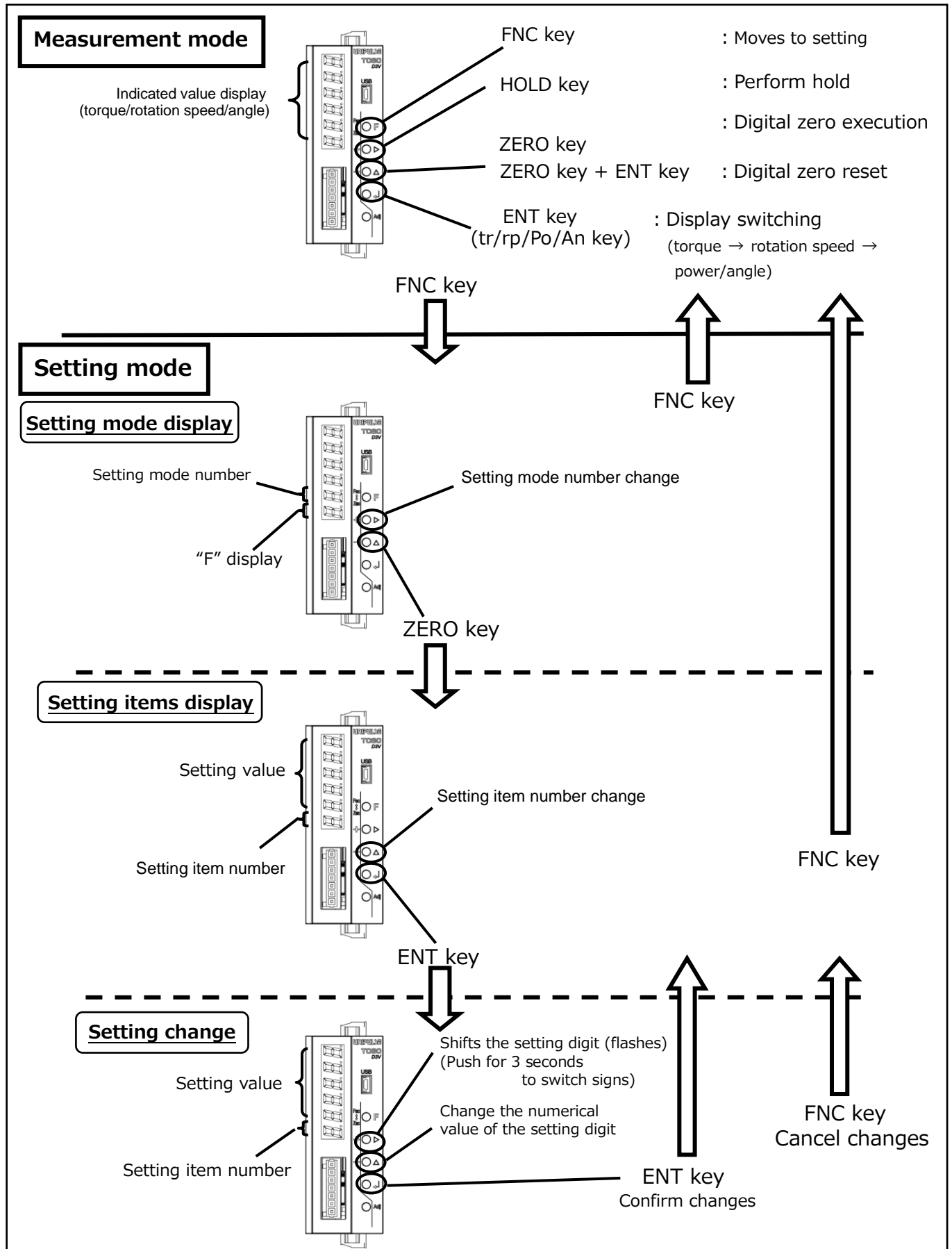
<Connection to UTMⅢ dedicated rotary encoder>



2 Settings/operations

Refer to the following and change the setting items for the required setting modes.

(Refer to the "List of Setting Items" at the end of this document for setting mode configurations.)



3 Calibration procedures

3-1. Calibration

"Calibration" means matching the TC80 with the torque meters. There are two methods of calibration, the "actual load calibration" and "equivalent input calibration".

<Actual load calibration>

A method of calibration involving applying actual load to torque meter

<Equivalent input calibration>

A method of calibration involving directly inputting electrical signals equivalent to the electrical signal changes generated when actual load is applied to the torque meter.

■ Equivalent input calibration

"Calibration" is performed without an actual load by entering the rated capacity (to be indicated) of the torque meter by the keys. Calibration is easily performed when no actual load is available. Rated output (V) is automatically decided according to selection of Setting item 1-5 Torque meter type.

*UTM/UTM II → 5V UTM III → 10V

For example,

for UTM II -100Nm : 5V – 100.00Nm

for UTM III -0.5Nm : 10V – 0.500Nm

Gain will be automatically decided by registering the values indicated as follows.

■ Actual load calibration

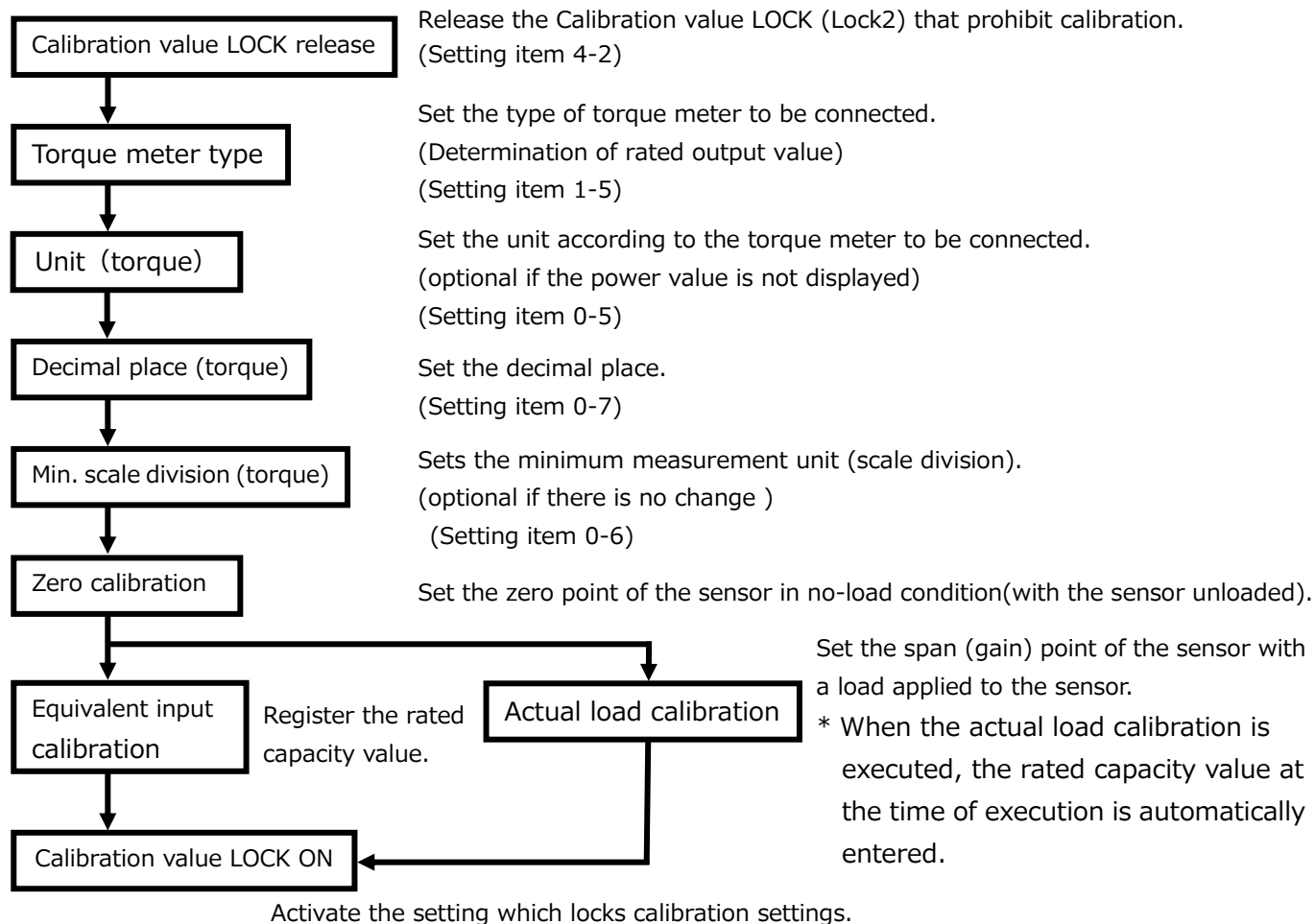
This approach provides calibration by applying an actual load to the torque meter.

This calibration is without little errors and more correct.

*Perform either actual load calibration or equivalent input calibration.

If an actual load cannot be applied, make sure to perform equivalent input calibration alone.

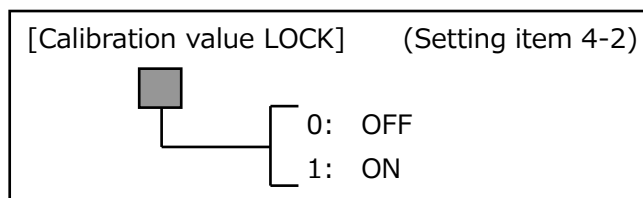
3-2. Calibration procedures for torque



3-3. Settings/operations related to calibration for torque

■ Calibration value LOCK

LOCKS can be enabled to prevent calibration and setting values from being changed due to operational errors.



■ Sign/Unit

- Sign(torque)

● NORMAL

Viewing the UTM from the drive side, the direction in which the load side is twisted counterclockwise is displayed as the positive direction.

● REVERSE

Viewing the UTM from the drive side, the direction in which the load side is twisted clockwise is displayed as the positive direction.

● ABSOLUTE

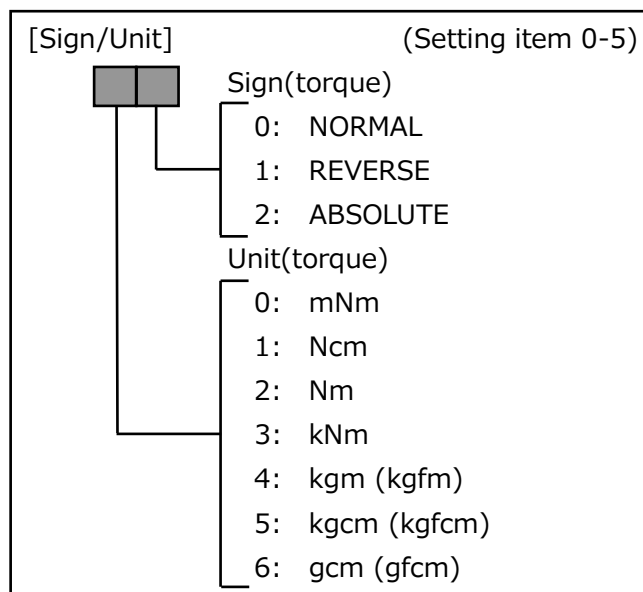
Shows the absolute value of torque without the direction of the load.

- Unit(torque)

Shows the unit for calibration.

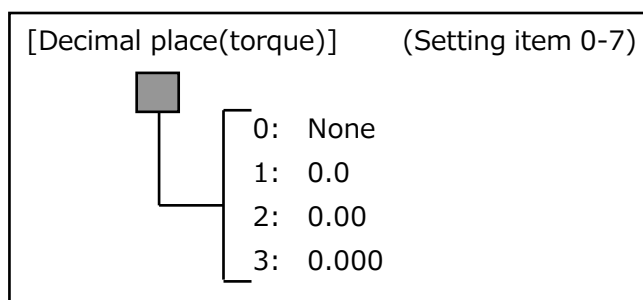
Be sure to calibrate if you change the settings. (It affects the calculation of the power value.)

Please refer to the Power unit conversion table when setting. (3-6)



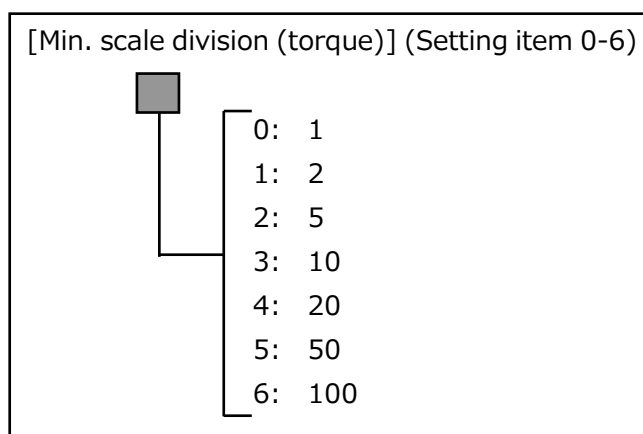
■ Decimal place (torque)

Set the common decimal place for displays, setting items etc. related to torque.



■ Min. scale division (torque)

Set the minimum measurement unit of torque.



■ Zero calibration

Register the default zero point.

- (1) Select setting item 9-1
- (2) Confirm that there is no unnecessary load applied to the torque meter
- (3) Press the ENT key to start zero calibration
- (4) "CAL-ZE" is displayed while calibration is in progress
- (5) Returns to indicated value display, and zero calibration is complete

[Zero calibration]

(Setting item 9-1)

0

No setting value input ("0" is displayed)

■ Actual load calibration

Apply the actual load to the torque meter and register the span (gain).

- (1) Select setting item 9-2
- (2) Apply the actual load to the torque meter
- (4) Press the ENT key to start actual load calibration
- (5) "CAL-SP" is displayed while calibration is in progress
- (6) Returns to indicated value display, and actual load calibration is complete

[Actual load calibration]

(Setting item 9-2)

(Input range : -99999 to 99999)

■ Equivalent input calibration

Register the value (rated capacity) to be displayed at the rated output.

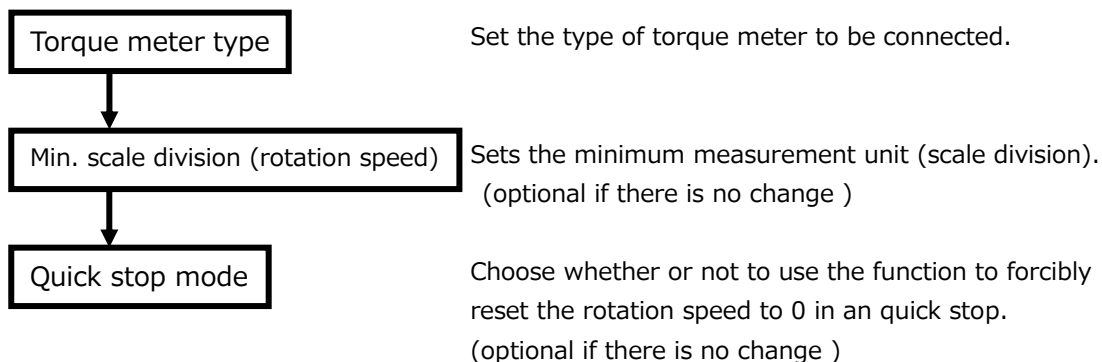
- (1) Select setting item 9-3
- (2) Set the rated capacity value.
- (3) Execute equivalent input calibration by confirming the input value
- (4) Returns to indicated value display, and equivalent input calibration is complete

* When the actual load calibration is executed, the rated capacity value at the time of execution is automatically entered.

[Equivalent input calibration](Setting item 9-3)

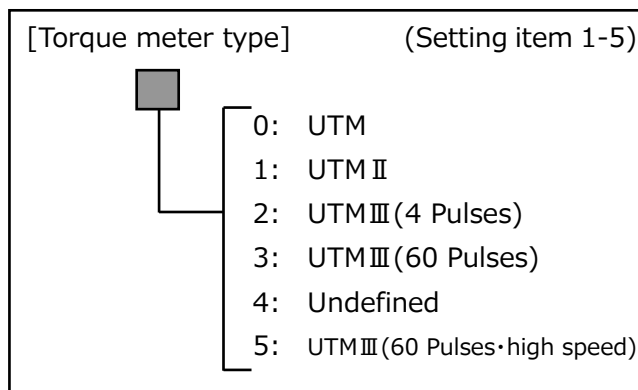
(Input range : 1 to 99999)

3-4. Settings/operations related to calibration for rotation speed



■ Torque meter type

Rated output value is set by selecting torque meter type to be connected. This setting also matches pulse rate of rotation speed.
(Depending on Torque meter type)

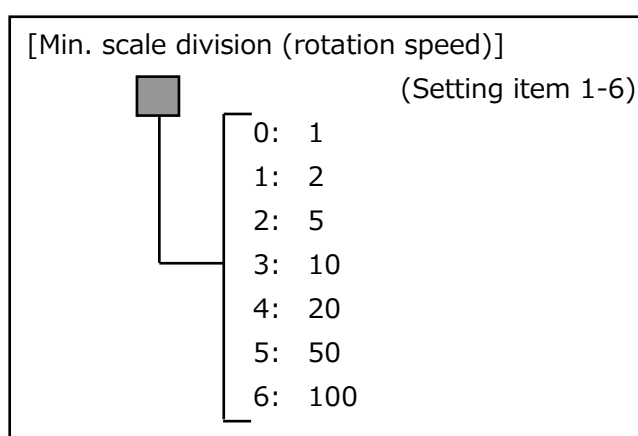


Key point

If "3:UTM III (60 Pulses)" is set, scale interval of rotation speed (high speed) will be higher than min.scale division.
(At approx. 5000 rpm, scale interval is 1 rpm or more)
By selecting "5: UTM III (60 Pulses·high speed)", min scale division can be displayed at high speed. However, response to rotation pulse input becomes slower and minimum input rotation speed becomes larger.
(Approx. 20 rpm)

■ Min. scale division (rotation speed)

Set the minimum measurement unit of rotation speed.



■ Minimum input rotation speed

Minimum input rotation speed that can be displayed is selectable.

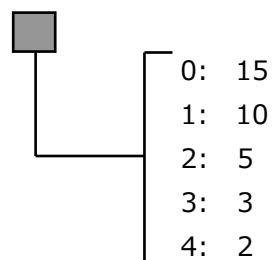
For UTMⅢ(60pulses), the values are as follows.

Max. detection time : 1sec

Minimum input rotation speed : 1rpm

[Minimum input rotation speed]

(Setting item 1-9)

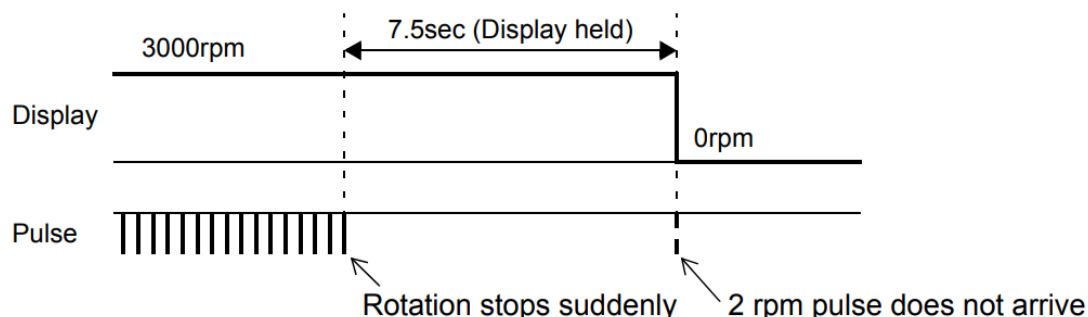


«Setting value»

Pulse rate	Minimum input rotation speed (frequency)				
4 pulses	0: 15 rpm	1: 10 rpm	2: 5 rpm	3: 3 rpm	4: 2 rpm
1 pulse	0: 60 rpm	1: 40 rpm	2: 20 rpm	3: 12 rpm	4: 8 rpm
Max. detection time	1 sec	1.5 sec	3 sec	5 sec	7.5 sec

Example) When set at “2rpm”

Since waiting for pulse detection for the duration of maximum detection time is required when rotation stops suddenly from high speed state, the previous rotation speed is not updated; therefore, the display will become 0 rpm after the display of the rotation speed that was last detected has held for 7.5 seconds.



■ Quick stop mode

Cut-off looks unclear when the rotation stops suddenly due to the constraint of maximum detection time corresponding to the minimum input rotation speed. For this reason, 0 rpm display can be forcibly set with “the cycle of the rotation speed last detected × a certain multiple”.

0 : OFF (invalid)

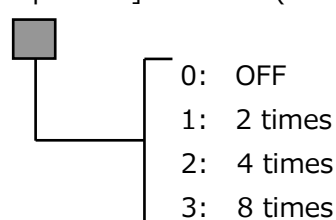
After detection is waited for the duration of the maximum detection time corresponding to the minimum input rotation speed, the display becomes 0 rpm.

1 : 2 times 2 : 4 times 3 : 8 times (valid)

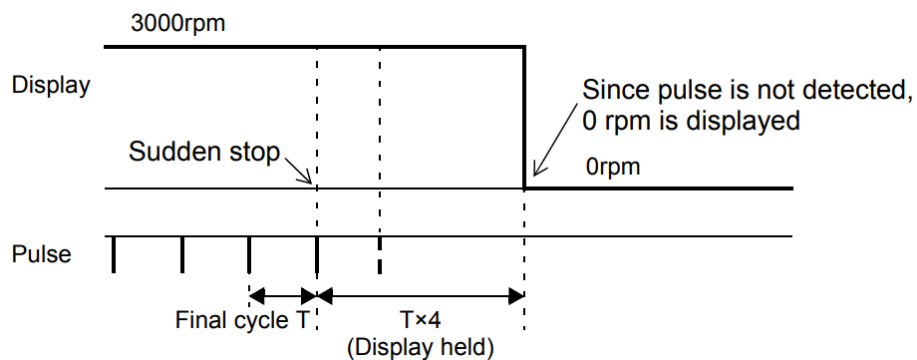
If pulse is not detected from the cycle of the rotation speed last detected to the cycle of the set multiple, the display becomes 0 rpm forcibly.

[Quick stop mode]

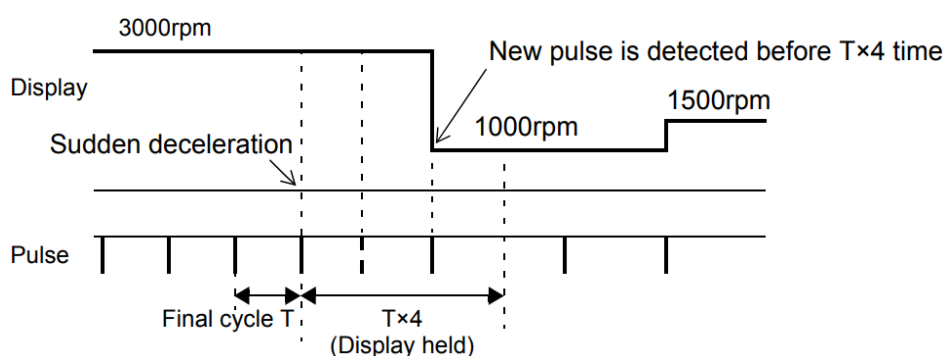
(Setting item 1-7)



Example) When stopped suddenly with the setting of "4 times"



Example) When decelerated suddenly with the setting of "4 times"

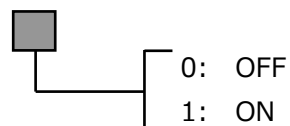


■ Low speed rotation mode (Only when using the rotary encoder)

The rotation speed can be displayed to one decimal place.

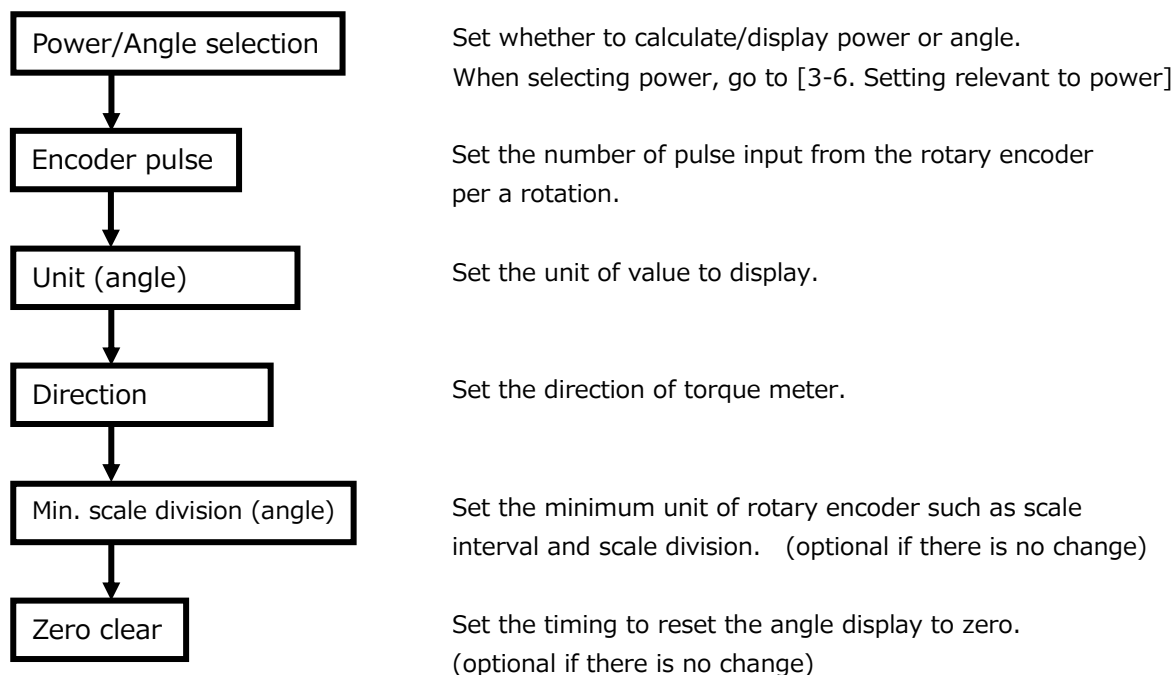
It can be enabled only when the following settings are made.

[Low speed rotation mode] (Setting item 2-8)



- (Setting item 1-5) Torque meter type : 1 to 3, 5
- (Setting item 2-2) Encoder pulse : 600 or more

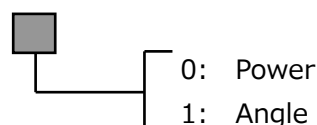
3-5. Settings/operations related to calibration for rotary encoder (Only when using the rotary encoder)



■ Power/Angle selection

Set whether to calculate/display power or angle.

[Power/Angle selection] (Setting item 2-1)



■ Encoder pulse

Set the number of pulse input from the rotary encoder per a rotation.

[Encoder pulse] (Setting item 2-2)
(Input range : 1 to 9999)

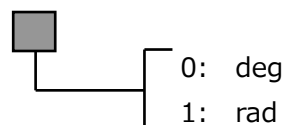


■ Unit (angle)

Set the unit of value display.

*No unit is displayed in the display area.

[Unit (angle)] (Setting item 2-3)



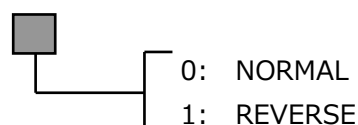
■ Direction

Set the rotation direction of torque meter.

-NORMAL : Select this option when using the torque meter counterclockwise viewing from the drive side.

-REVERSE : Select this option when using the torque meter clockwise viewing from the drive side.

[Direction] (Setting item 2-4)

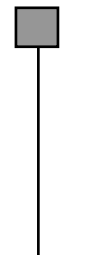


■ Min. scale division (angle)

Set the minimum unit of rotary encoder such as scale interval and scale division.

* When the Setting item 2-3 is set to "rad", the min. scale division will be 0.01.

[Min. scale division (angle)] (Setting item 2-5)



0:	0.1
1:	0.2
2:	0.5
3:	1
4:	2
5:	5
6:	10
7:	20
8:	50
9:	100

■ Zero clear

Set the timing to reset the angle display to zero. The angle display will be reset to zero at a specified number of revolutions.

[Zero clear] (Setting item 2-6)



(Input range : 1 to 550)

When "Min. scale division (angle)" is 0.1 to 0.5

→ (Input range : 1 to 55)

When "Unit(angle)" is [rad]

→ (Input range : 1 to 315)

3-6. Setting relevant to power

* If you want to display the power, set [Setting item 2-1 power/angle selection] to "0".

■ Power setting

Setting relevant to power value.

- Min. scale division (power)

Set the minimum unit of power value.

- Decimal place (power)

Set the decimal place of power.

- Unit (power)

Set the unit of power value.

Key point

Based on the settings of [Unit] and [Decimal place], the power value is calculated by converting internally.

For details on the units, refer to the table below.

[Power setting] (Setting item 2-9)



Min. scale division (power)

0:	1
1:	2
2:	5
3:	10

Decimal place (power)

0:	None
1:	0.0
2:	0.00
3:	0.000

Unit (power)

0:	mW
1:	W
2:	kW
3:	PS
4:	HP

■ Torque unit conversion table

	mNm	Ncm	Nm	kNm	kgm	kgcm	gcm
mNm	1	0.1	10^{-3}	10^{-6}	1.0197×10^{-4}	1.0197×10^{-2}	10.197
Ncm	10	1	10^{-2}	10^{-5}	1.0197×10^{-3}	0.10197	1.0197×10^2
Nm	10^3	10^2	1	10^{-3}	0.10197	10.197	1.0197×10^4
kNm	10^6	10^5	10^3	1	1.0197×10^2	1.0197×10^4	1.0197×10^7
kgm	9.8067×10^3	9.8067×10^2	9.8067	9.8067×10^{-3}	1	10^2	10^5
kgcm	98.067	9.8067	9.8067×10^{-2}	9.8067×10^{-5}	10^{-2}	1	10^3
gcm	9.8067×10^{-2}	9.8067×10^{-3}	9.8067×10^{-5}	9.8067×10^{-8}	10^{-5}	10^{-3}	1

■ Power unit conversion table

	mW	W	kW	PS	HP
mW	1	10^{-3}	10^{-6}	1.3596×10^{-6}	1.341×10^{-6}
W	10^3	1	10^{-3}	1.3596×10^{-3}	1.341×10^{-3}
kW	10^6	10^3	1	1.3596	1.341
PS	7.355×10^5	7.355×10^2	0.7355	1	0.9863
HP	7.457×10^5	7.457×10^2	0.7457	1.01387	1

4 Settings related to indicated values

Here, the functions that have been built in for ease of use when actually measurement etc. after completing calibration are described.

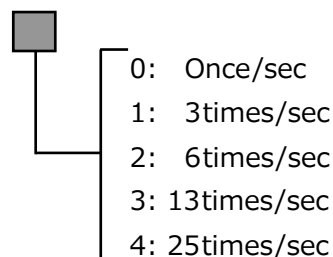
Select the most appropriate value in accordance with the type of measurement and the setting environment.

■ Display update rate

Set the rate at which the indicated value is updated per second.

Reduce the display update rate if the indicated value flickers.

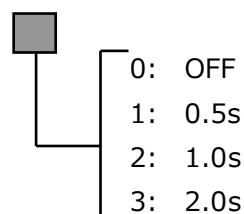
[Display update rate] (Setting item 4-4)



■ Visibility

This is a function to display the values for torque and rotation speed in a way that is easy to see by averaging the display values. Only the displayed values are averaged. The data stored inside the TC80 are not averaged.

[Visibility] (Setting item 4-5)



■ Digital high-pass filter(torque)

This high-pass filter is used to screen the A/D converted data and cancel unnecessary noise content. The cut-off frequency is set like the high-pass filter of an analog circuit.

[Digital high-pass filter (torque)]



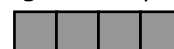
(Setting item 3-8)

(Input range : 0:PASS, 1 to 1000)

■ Digital low-pass filter (torque)

This low-pass filter is used to screen the A/D converted data and cancel unnecessary noise content. The cut-off frequency is set like the low-pass filter of an analog circuit.

[Digital low-pass filter (torque)]



(Setting item 4-6)

(Input range : 0:PASS, 1 to 1000)

Cut-off frequency 1 ⇔ 1000

Response speed Slow ⇔ Fast

Stability of indicated value Stable ⇔ Unstable

*You can only choose either digital low-pass filter or digital high-pass filter.

If you want to use digital high-pass filter, at digital low-pass filter set 0(PASS).

■ Moving average filter

This function takes the moving averages of the converted data and reduces fluctuation in the indicated values.

[Moving average filter (torque)]



(Setting item 4-7)

(Input range : 0:OFF, 2 to 999)

Average rate	2	⇔	999
Response speed	Fast	⇔	Slow
Stability of indicated value	Unstable	⇔	Stable

[Moving average filter (angle)]



(Setting item 4-9)

(Input range : 0:OFF, 2 to 999)

Average rate	2	⇔	999
Response speed	Fast	⇔	Slow
Stability of indicated value	Unstable	⇔	Stable

[Moving average filter (rotation speed)]



(Setting item 4-8)

(Input range : 0:OFF, 2 to 999)

Average rate	2	⇔	999
Response speed	Fast	⇔	Slow
Stability of indicated value	Unstable	⇔	Stable

■ Motion detection

Set the parameters to detect indicated value stability. If the indicated value change range is lower than the set range and this condition continues longer than the set time, indicated value is considered to be stable.

[Motion detection]

(Setting item 3-7)



Change range (00 to 99)

Compared time

(0.0 to 9.9sec)

Stability is detected by 0.1sec + MD (compared time).

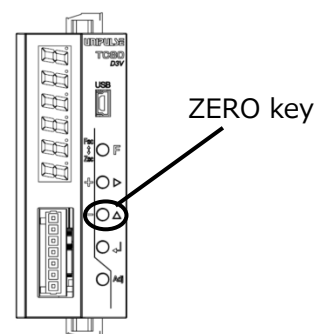
■ Digital zero (Designated key)

The torque value or angle is forcibly reset to zero when the ZERO key is pressed and digital zero is executed.

*Indicated torque value turns to zero by executing digital zero.

Indicated angle value turns to zero by executing digital zero.

*When turning off the power of TC80, the digital zero will be cleared.



■ Torque display/rotation speed display/angle display switch (Designated key)

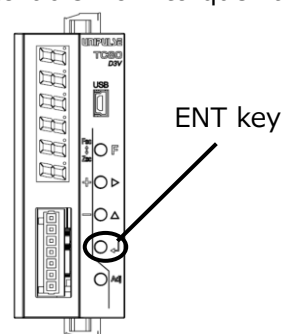
When ENT key(tr/rp/Po/An key) is pressed, indicated value is switchable from torque value to rotation speed followed by power or angle. At indicated power or angle, press ENT key again to display torque value.

When switching to torque : Torque value will display after "tr" is shown.

When switching to speed : Rotation speed will display after "rp" is shown.

When switching to power : Power will display after "Po" is shown.

When switching to angle : Angle will display after "An" is shown.



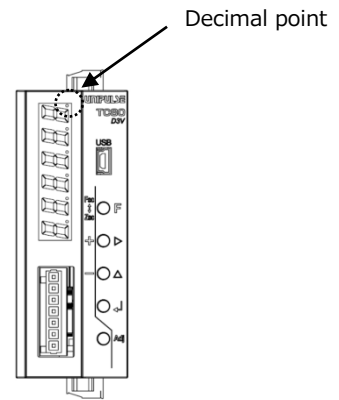
■ Hold value display

During hold detection, decimal point on the right blinks.

Blinking changes to lighting when a hold is confirmed.

If hold is released, the light goes "off".

It is useful to know if hold is being detected or confirmed.



5 Settings and Operations Related to Comparison

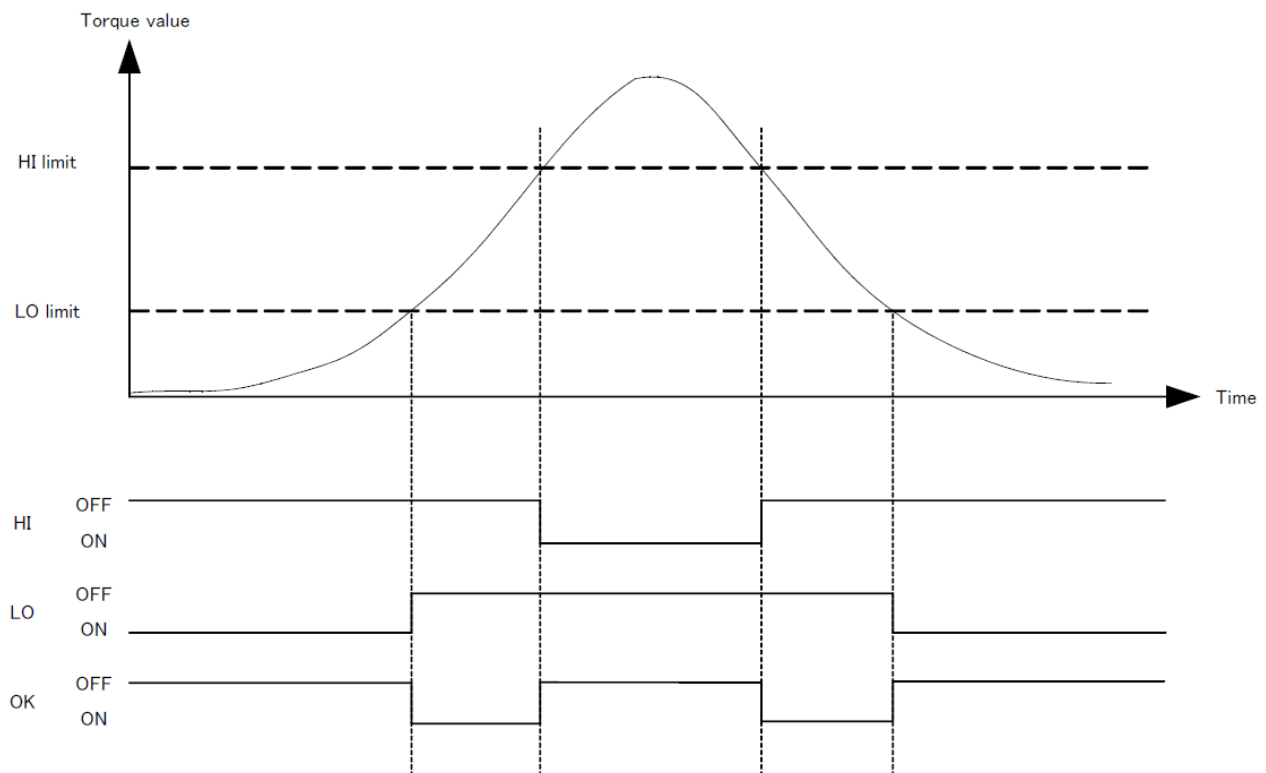
■ HI limit, LO limit (Hold synchronized)

This function sets the HI limit and LO limit, turns the HI output ON when an indicated value exceeds the HI limit value, and turns LO output ON when an indicated value falls below the LO limit value.

[HI limit (torque)]	(Setting item 0-1)
[LO limit (torque)]	(Setting item 0-2)
[HI limit (rotation speed)]	(Setting item 1-1)
[LO limit (rotation speed)]	(Setting item 1-2)

(Input range : -99999 to 99999)

● Output operations




■ HI/LO limit comparison mode

This function specifies the comparison timing.

[HI/LO limit comparison mode]	(Setting item 3-6)
<div style="background-color: #cccccc; width: 40px; height: 15px; margin-bottom: 5px;"></div> Undefined Comparison timing(rotation speed)	0: ALL 1: Interlocking with torque
<div style="background-color: #cccccc; width: 40px; height: 15px; margin-bottom: 5px;"></div> Undefined Comparison timing (torque)	0: ALL 1: MD 2: NZ OFF 3: MD+NZ OFF 4: Hold

■ Hysteresis

This function provides off timing range of HI/LO limit comparison. This function is effective for chattering prevention when signals fluctuate (vibrate) subtly.

[Hysteresis(torque)] (Setting item 0-9)
 [Hysteresis(rotation speed)](Setting item 1-8)

 (Input range : 0000 to 9999)

<Comparison conditions>

- HI limit

ON condition: Torque value > HI limit setting value

OFF condition: Torque value \leq (HI limit setting value - Hysteresis setting value)

ON condition : Rotation speed > HI limit setting value

OFF condition : Rotation speed \leq (HI limit setting value - Hysteresis setting value)

- LO limit

ON condition : Torque value < LO limit setting value

OFF condition : Torque value \geq (LO limit setting value + Hysteresis setting value)

ON condition : Rotation speed < LO limit setting value

OFF condition : Rotation speed \geq (LO limit setting value + Hysteresis setting value)


■ Alarm HI limit, Alarm LO limit

(Hold not synchronized)

The input value is always compared with the alarm HI limit and alarm LO limit.

If the input value exceeds alarm HI limit, the ALM HI output turns ON.

If the input value falls below alarm LO limit, the ALM LO output turns ON.

[Alarm HI limit(torque)] (Setting item 0-3)
 [Alarm LO limit(torque)] (Setting item 0-4)
 [Alarm HI limit (rotation speed)]
 (Setting item 1-3)
 [Alarm LO limit (rotation speed)]

 (Setting item 1-4)
 (Input range : -99999 to 99999)

■ Near zero

This function detects that an torque value is a value near zero.

[Near zero] (Setting item 0-8)

 (Input range : 00000 to 99999)

6 Settings and Operations Related to Hold

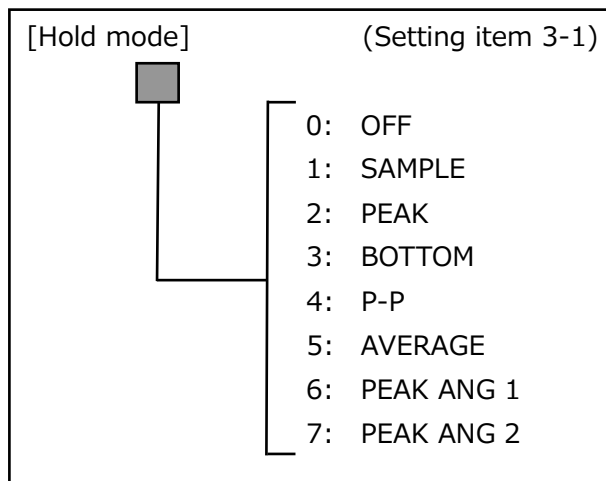
6-1. Setting of hold

■ Hold mode

There are six hold modes for the TC80.

When not using the hold function, be sure to turn OFF the hold mode and use the product.
(When turned OFF, the hold function does not operate and the input value is displayed at all times.)

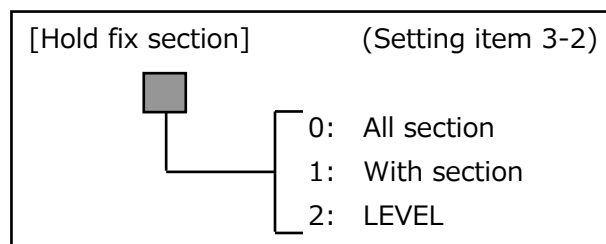
- **OFF** : Hold function OFF
- **Sample hold** : Holds an arbitrary point.
(torque, rotation speed, angle)
- **Peak hold** : Holds the maximum value
(peak value) of torque in the positive direction.
Does not hold rotation speed or angle.
- **Bottom hold** : Holds the maximum value (bottom value) of torque in the negative direction.
Does not hold rotation speed or angle.
- **Peak to peak hold** : The difference in the bottom and peak values of torque (range) is displayed. Does not hold rotation speed or angle.
- **Average hold** : Holds the torque average in the specified section.
Does not hold rotation speed or angle.
- **Peak hold (angle1)** : Holds the maximum value (peak value) of the positive angle and the torque value at that time.
Rotation speed will not hold.
- **Peak hold (angle2)** : Holds the maximum value (peak value) of torque in the positive direction and the maximum value (peak value) of angle in the positive direction. Rotation speed will not hold.



■ Hold fix section

Whether or not a fix section is inserted into hold motion can be selected.


For LEVEL : The torque value has passed the start level until it passes the stop level. After the torque value has passed the stop level, it waits until the value passes the start level again.



* If the hold mode is set as average hold setting, the start mode is ignored.


■ Start level

Set the level to start detection.

[Start level]	(Setting item 3-4)
	
(Input range : -99999 to 99999)	

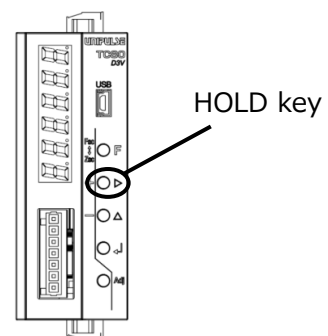
■ Stop level

Set the level to stop detection.

[Stop level]	(Setting item 3-5)
	
(Input range : -99999 to 99999)	

■ Hold control (dedicated key)

This key is used for hold function operation.

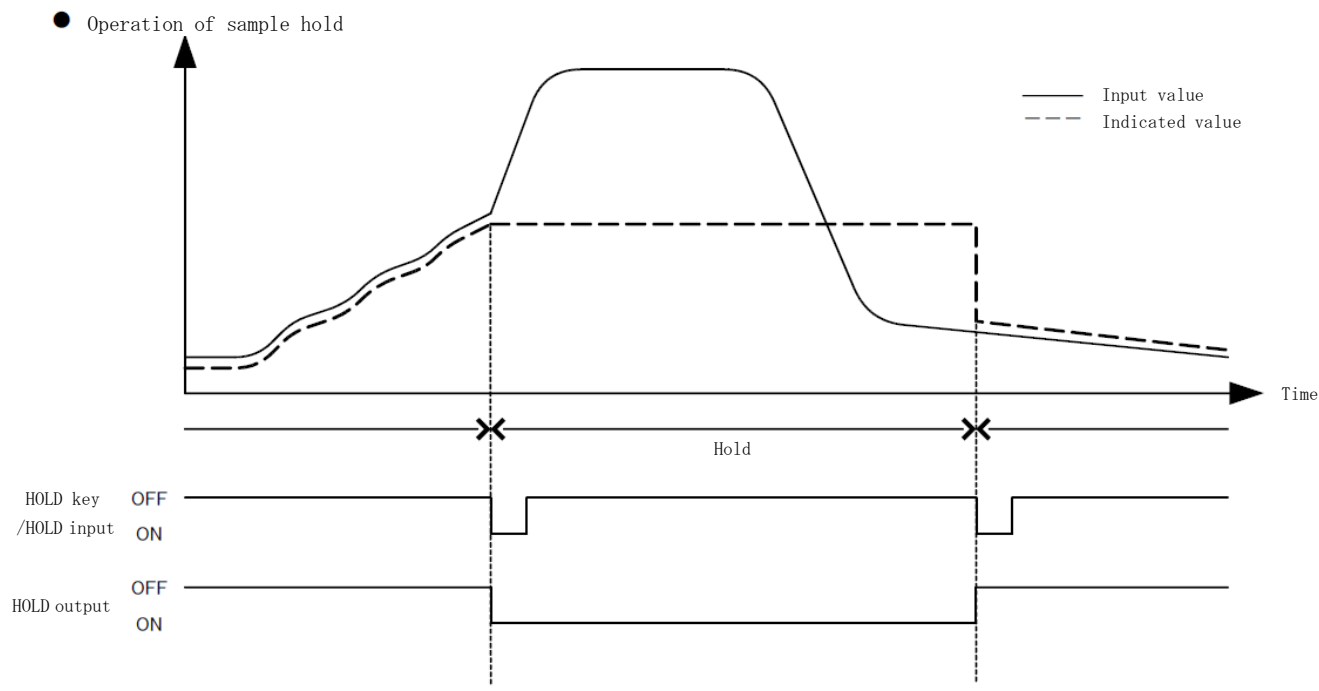


Key point

- When hold is turned ON with external signals, turn it OFF with external signals.
- When hold is turned ON with key inputs, turn it OFF with key inputs.

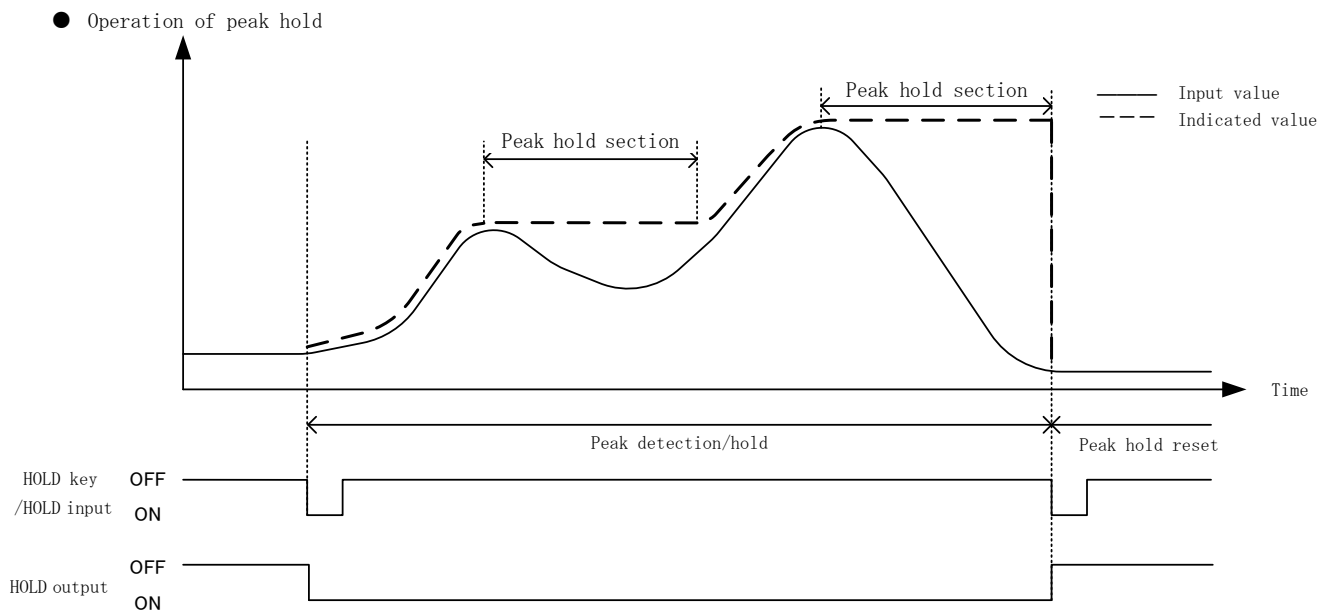
6-2.Sample hold (maintaining arbitrary points)

Regardless of the setting of Hold fix section, the operation is as follows.

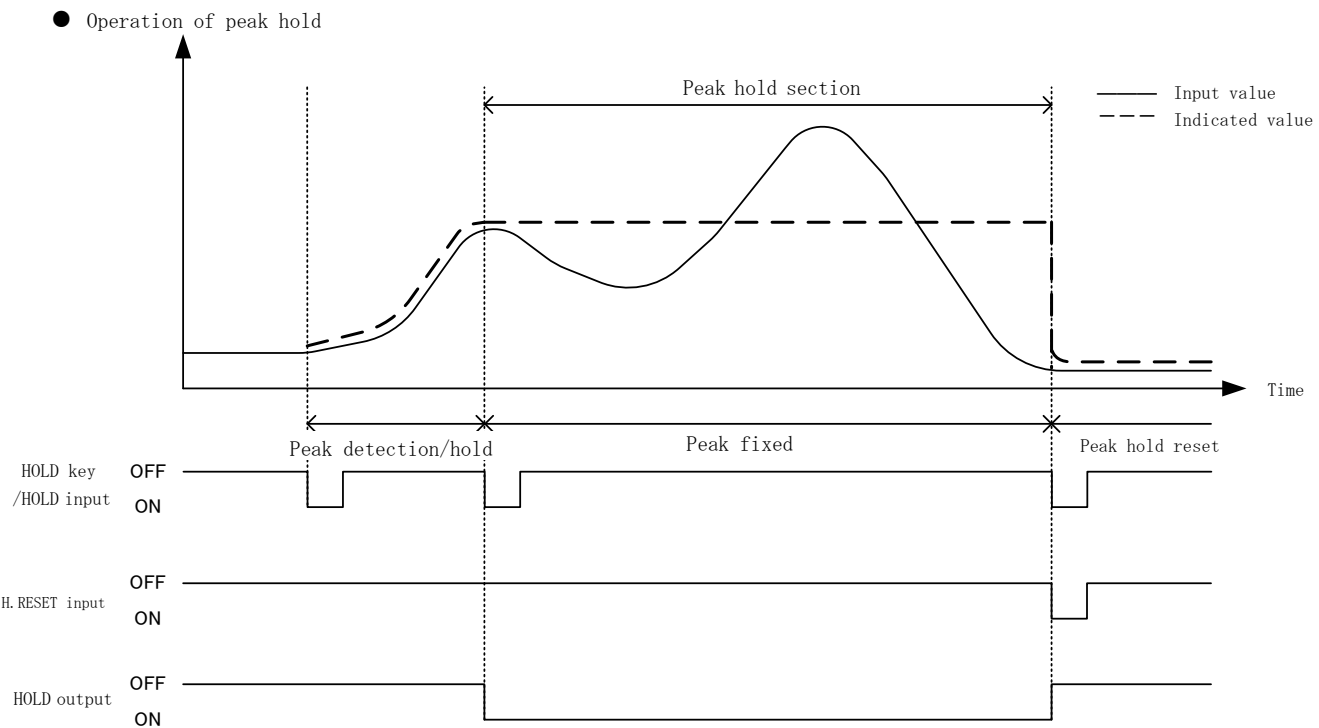


6-3. Peak hold (maintaining a maximum point)

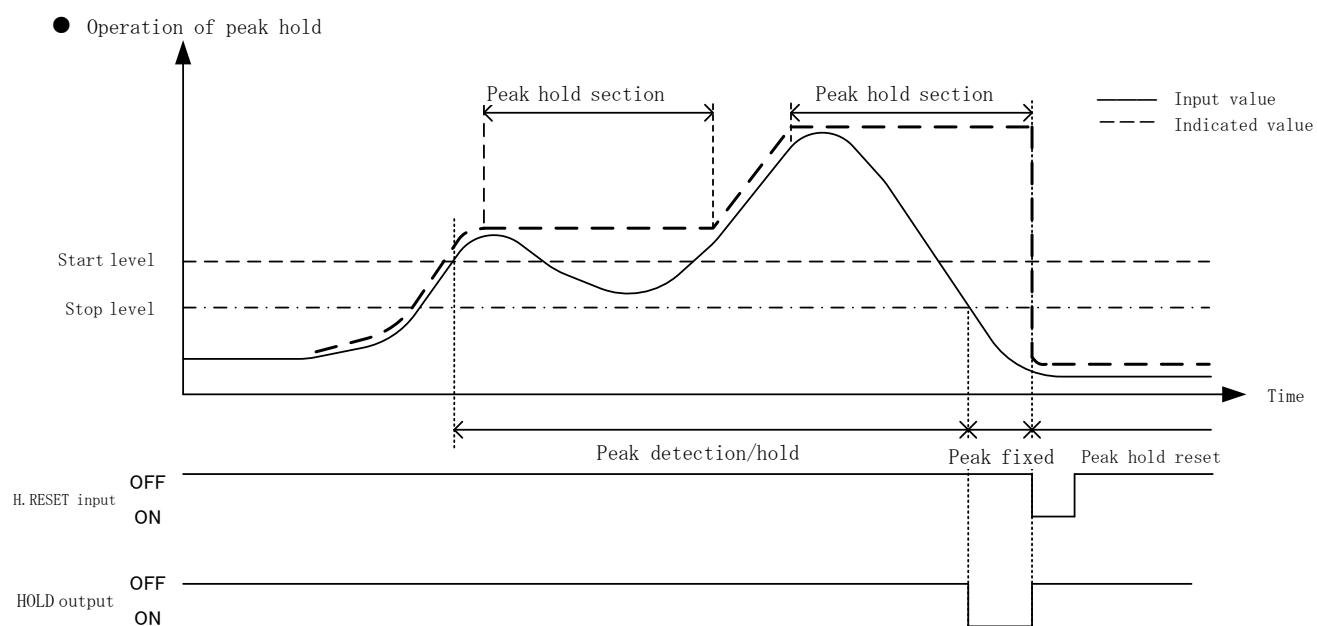
When hold fix section is 0: All section



When hold fix section is 1: With section

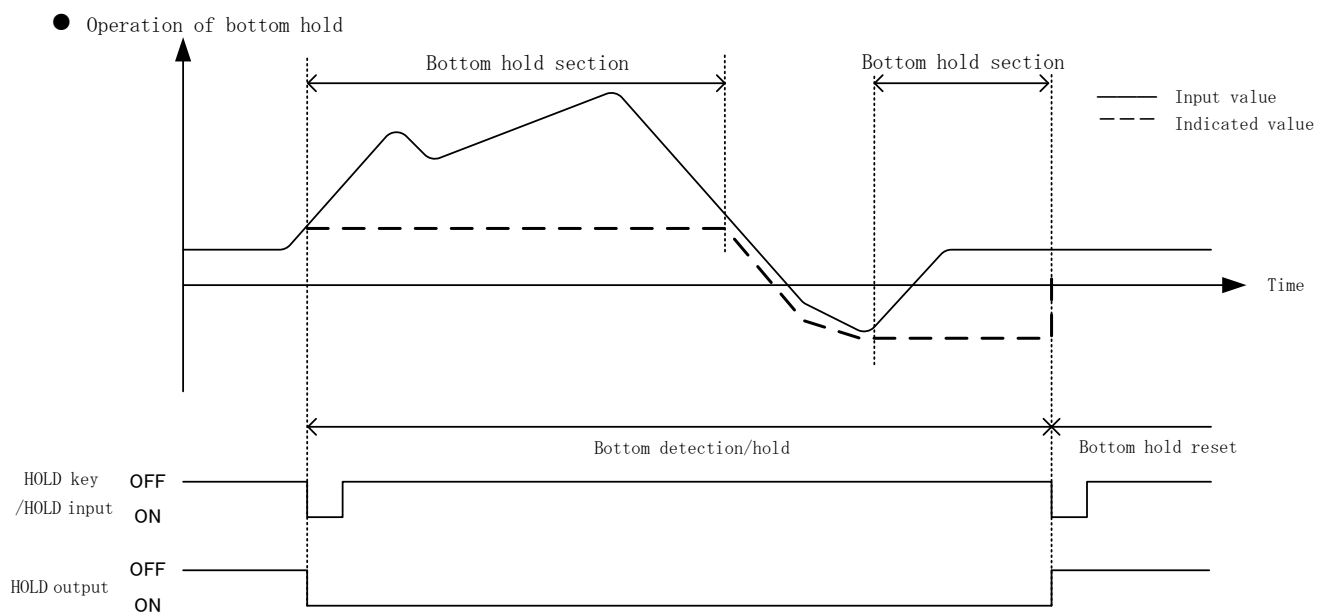


When hold fix section is 2: LEVEL

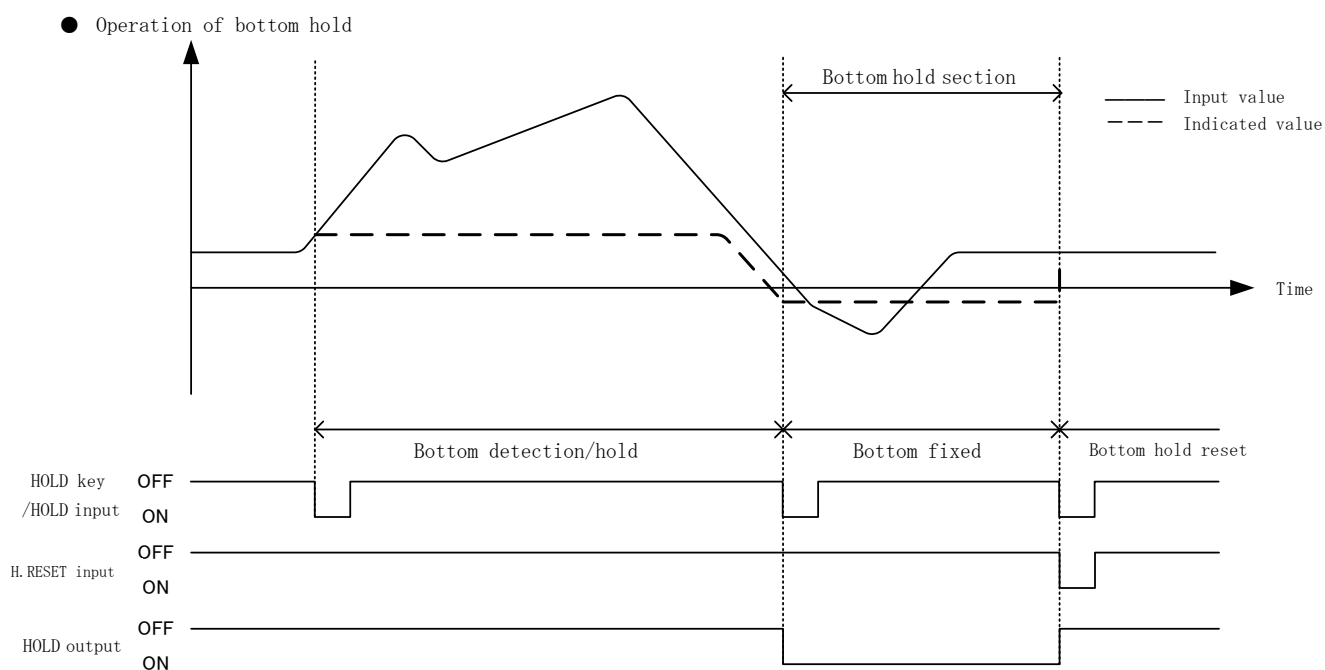


6-4. Bottom hold (maintaining a minimum point)

When hold fix section is 0: All section

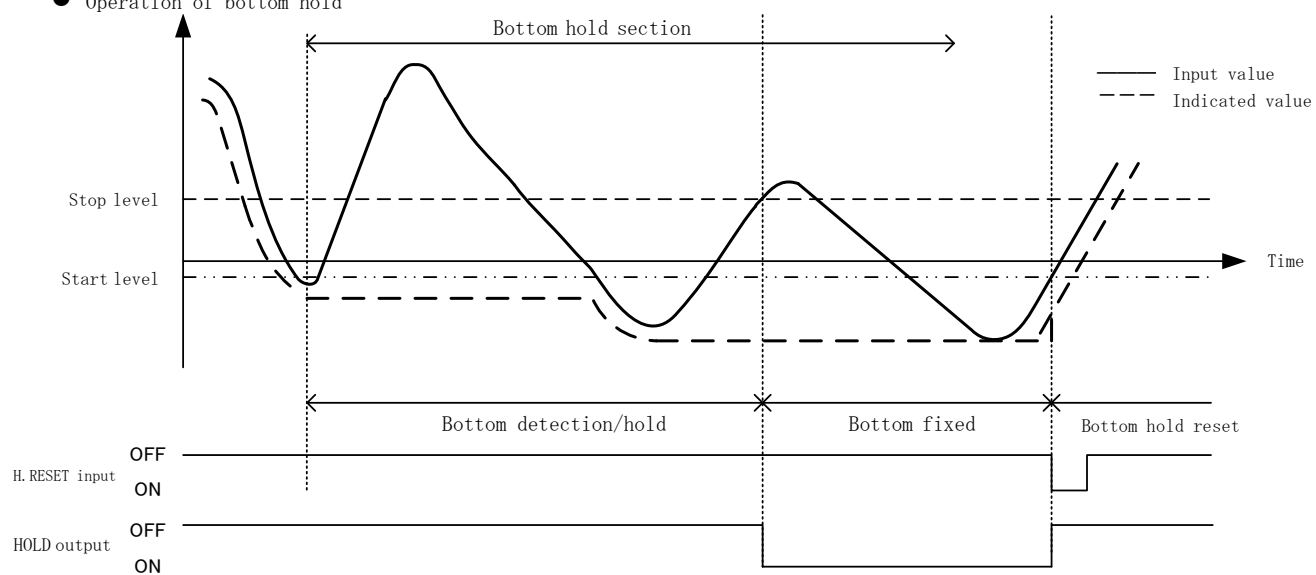


When hold fix section is 1: With section



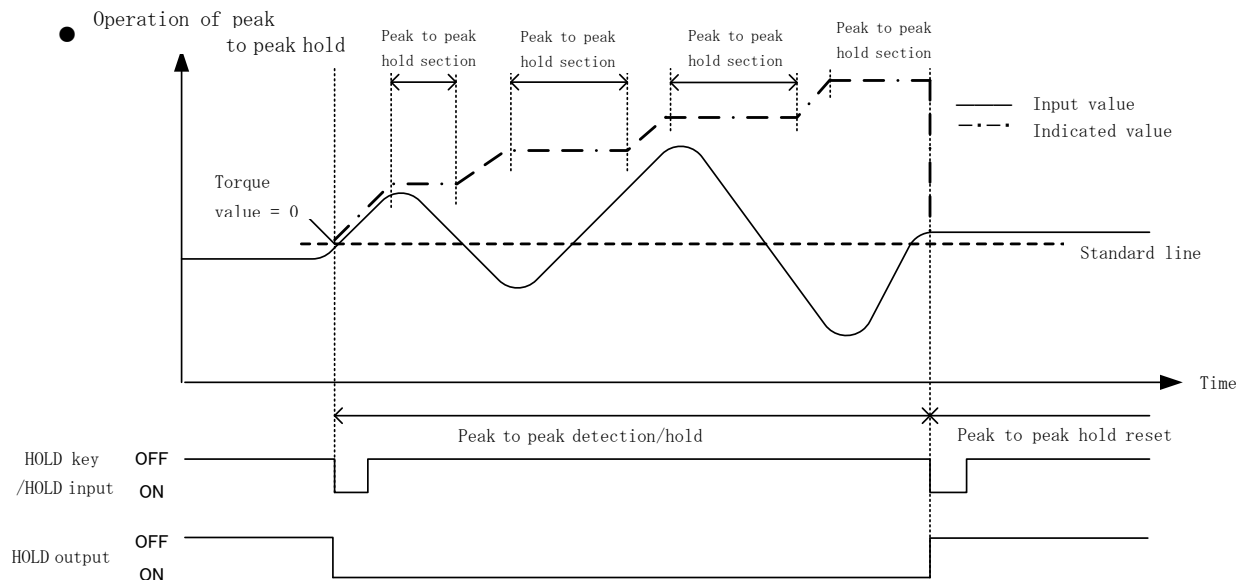
When hold fix section is 2: LEVEL

● Operation of bottom hold

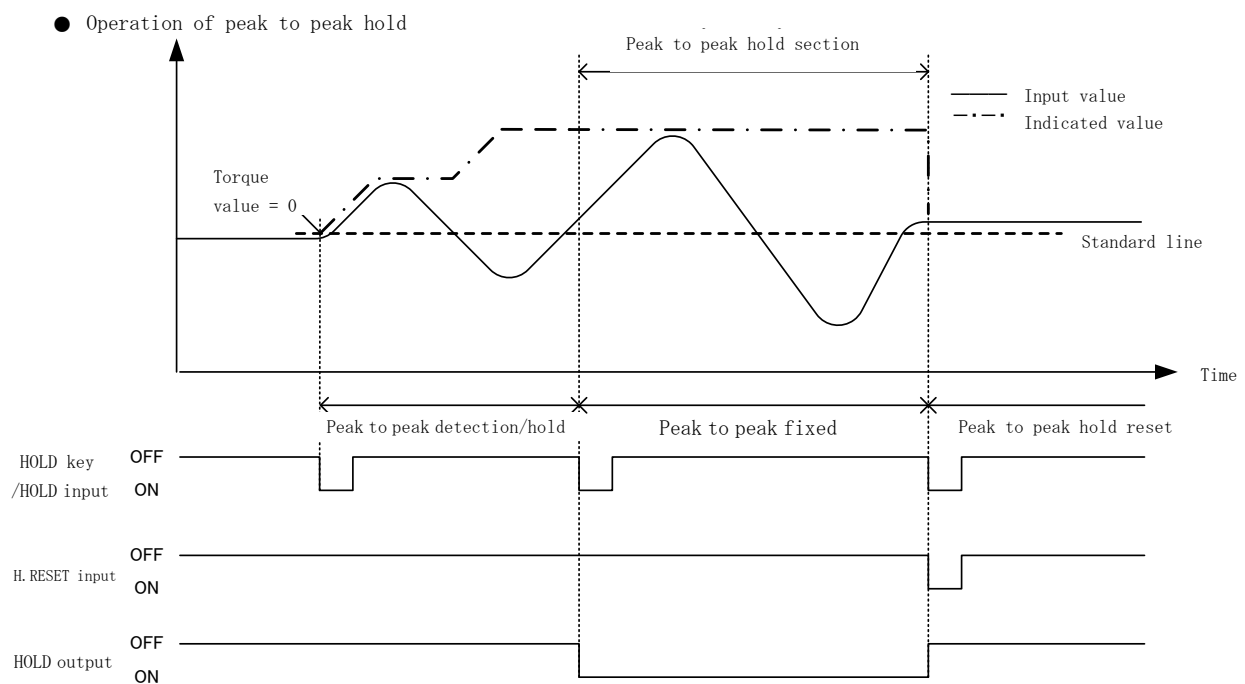


6-5. Peak to peak hold

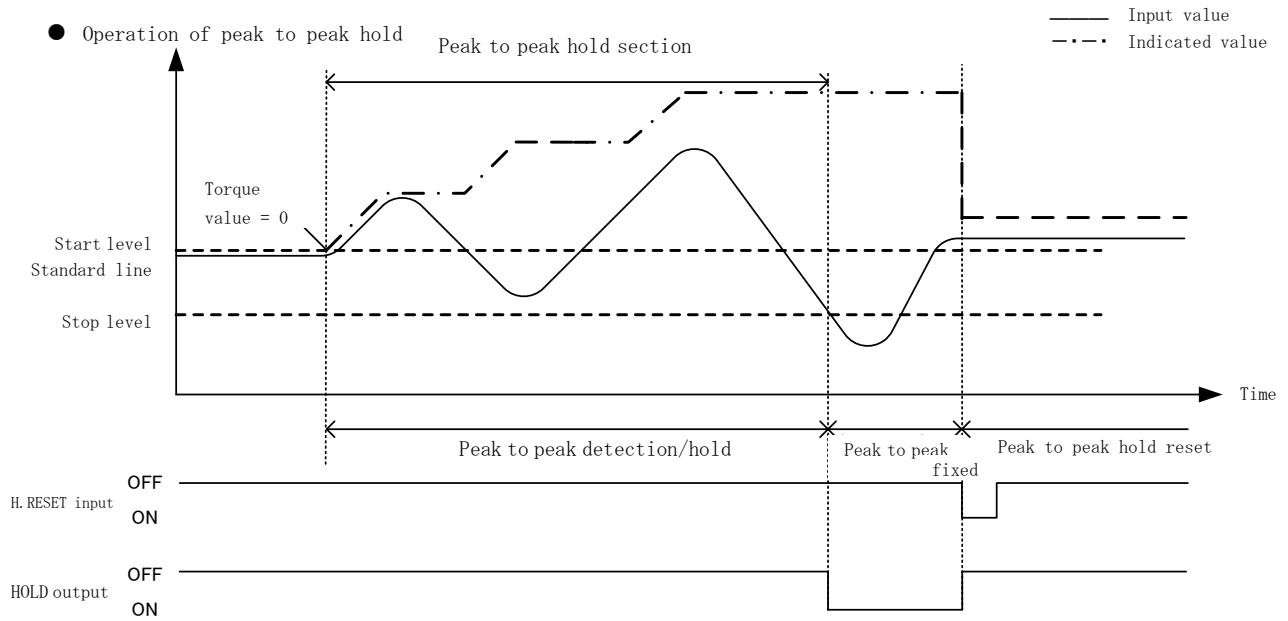
When hold fix section is 0: All section



When hold fix section is 1: With section

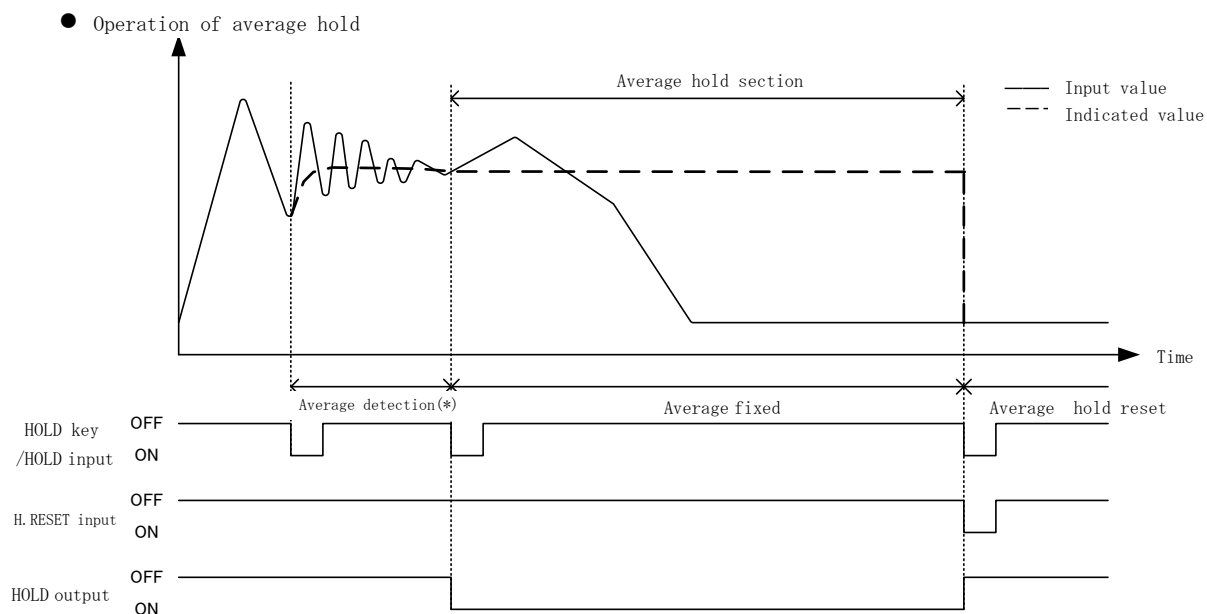


When hold fix section is 2: LEVEL

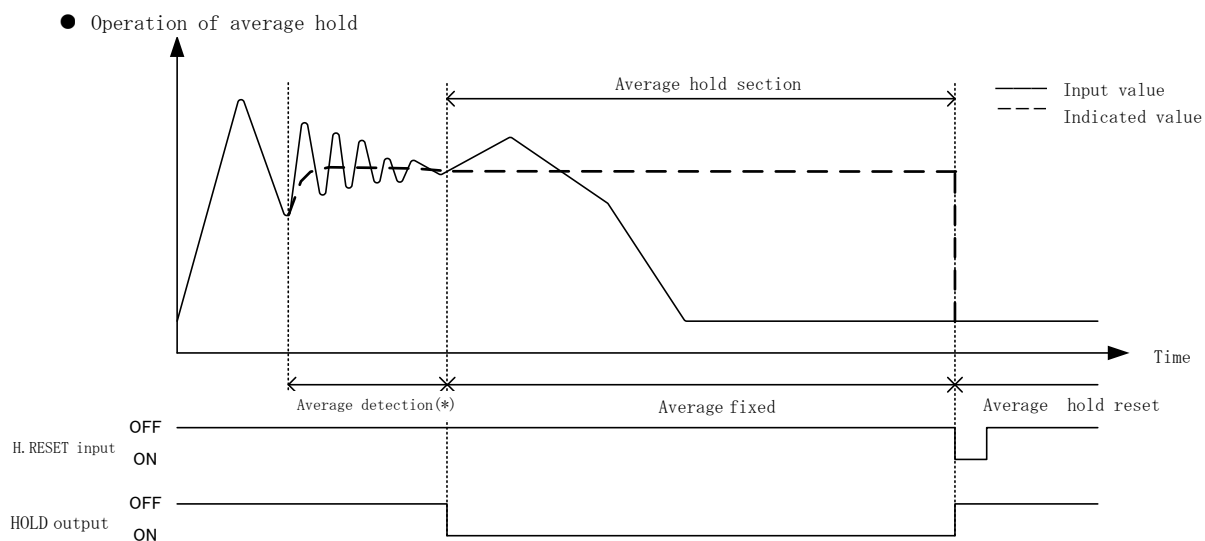


6-6. Average hold (maintaining an average point)

When hold fix section is 1: With section



When hold fix section is 2: LEVEL

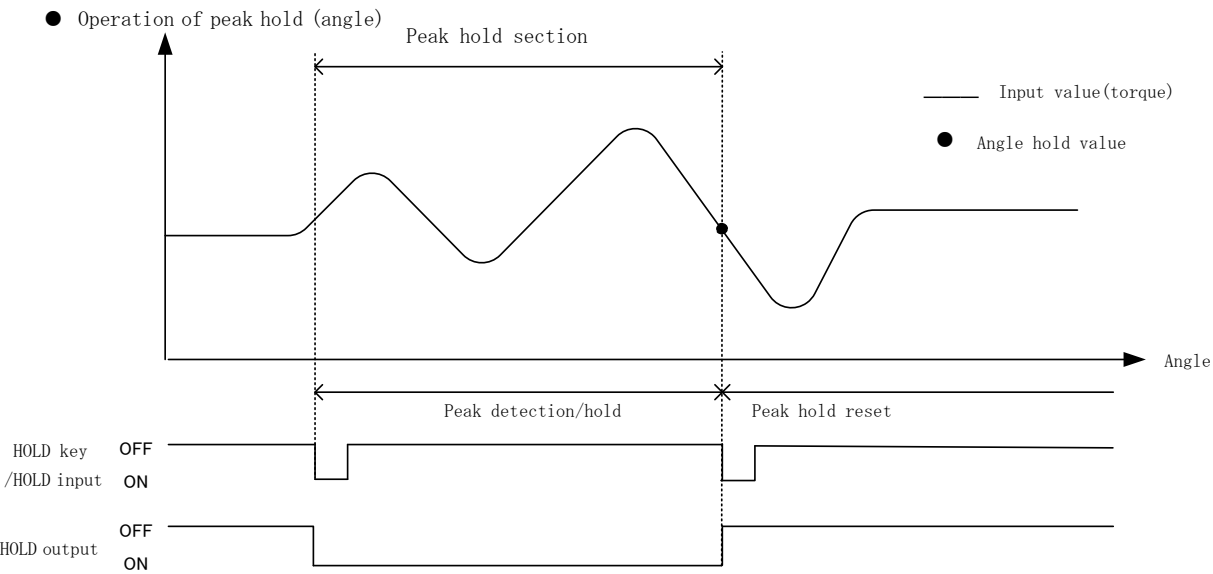


Key points

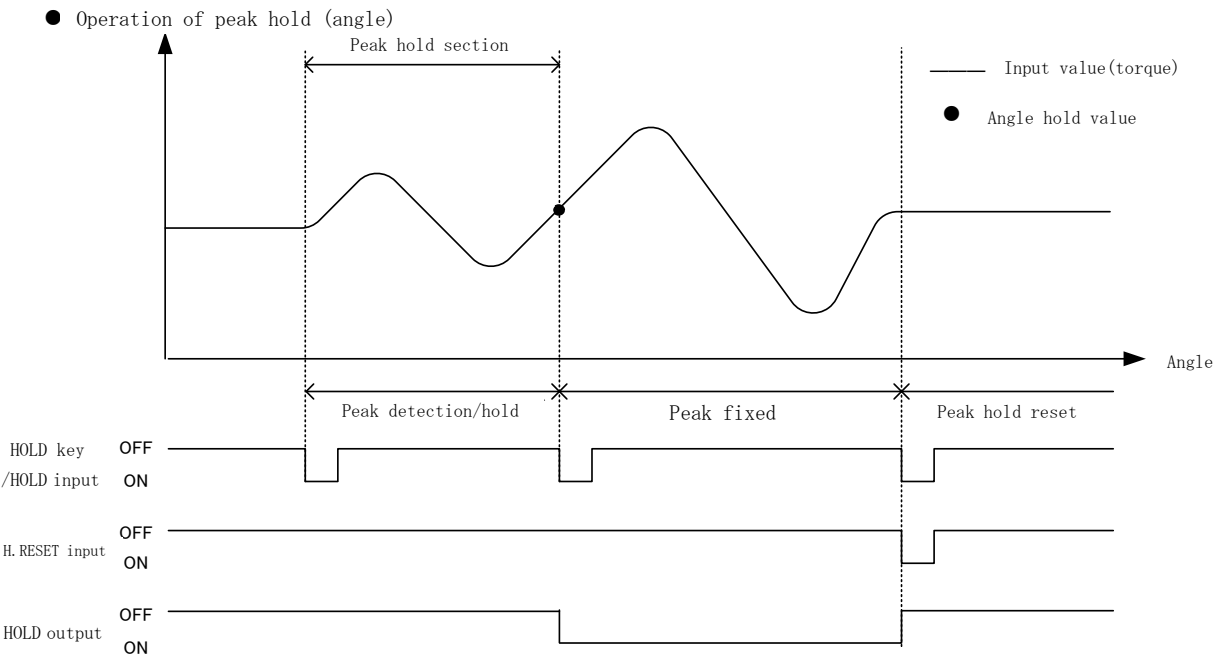
- *Maximum detection section is 9 sec (fixed).
- Detection more than 9 sec can not be made.

6-7. Peak hold (angle1)

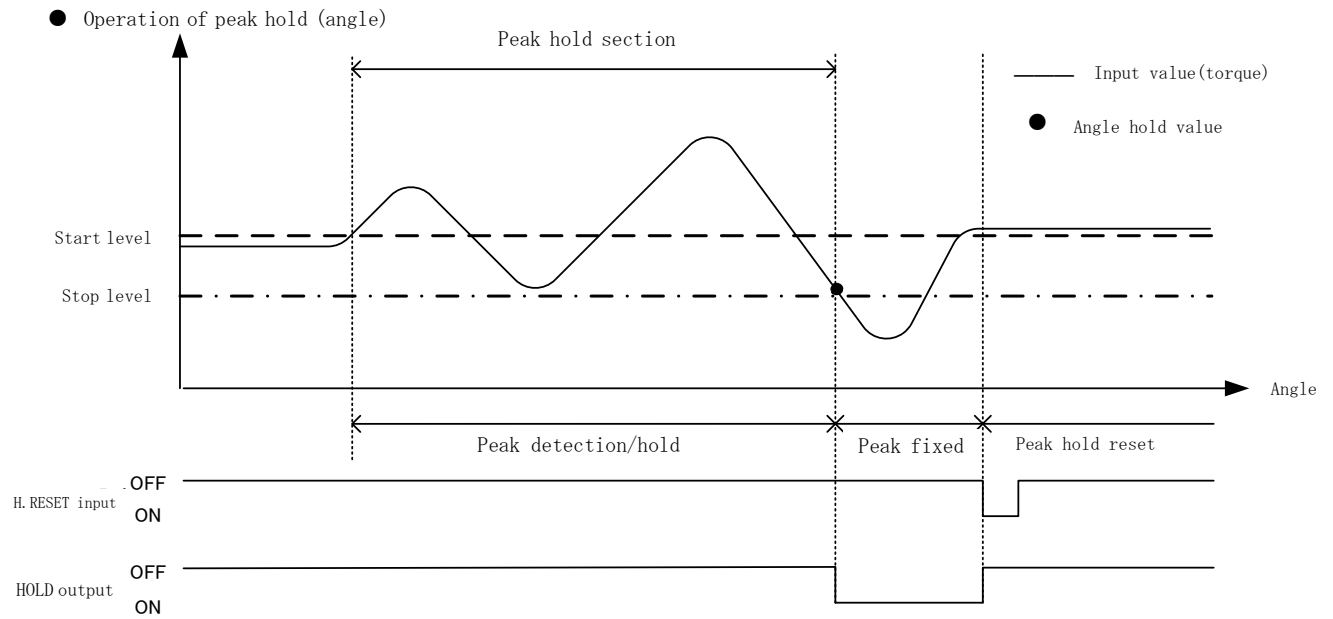
When hold fix section is 0: All section



When hold fix section is 1: With section

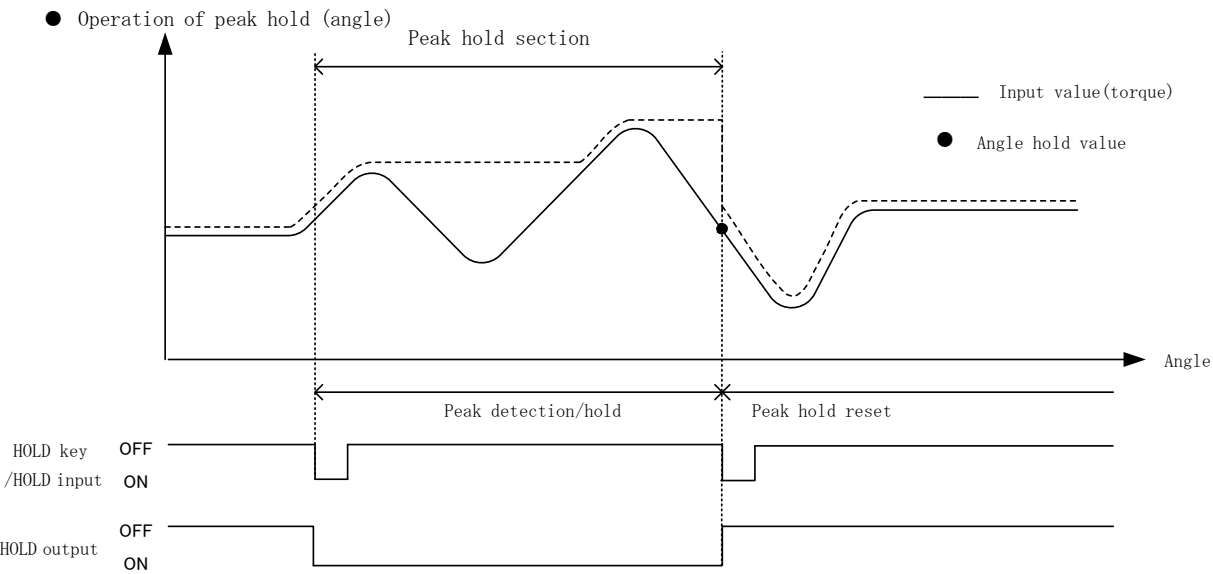


When hold fix section is 2: LEVEL

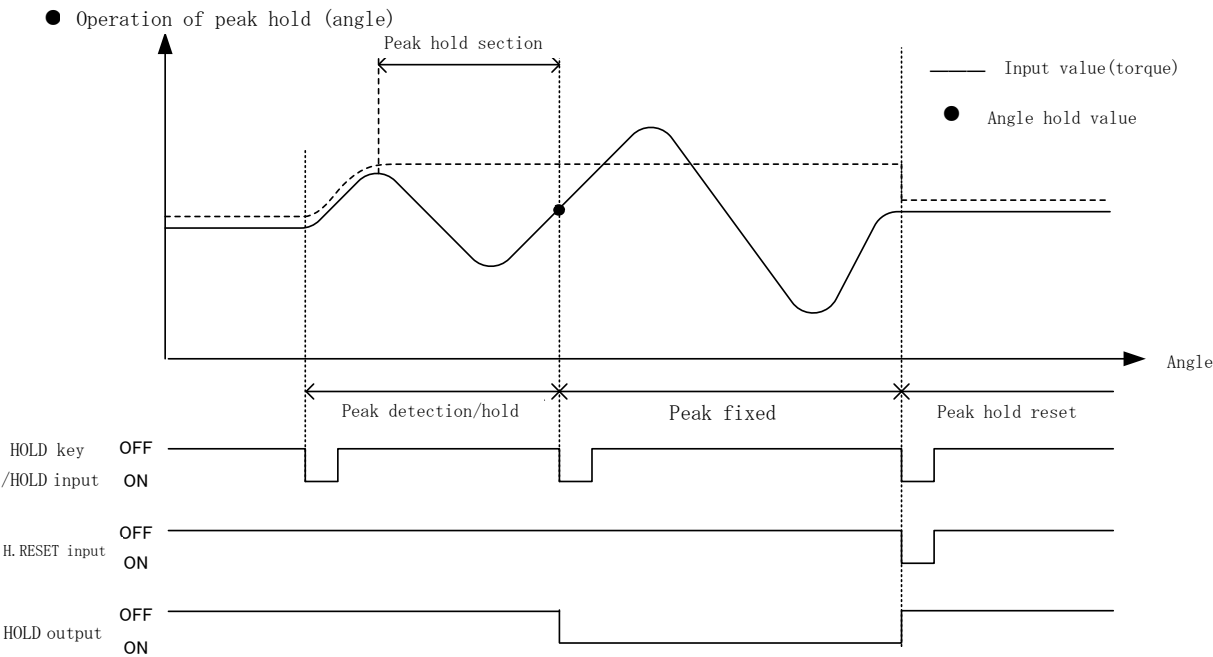


6-8. Peak hold (angle2)

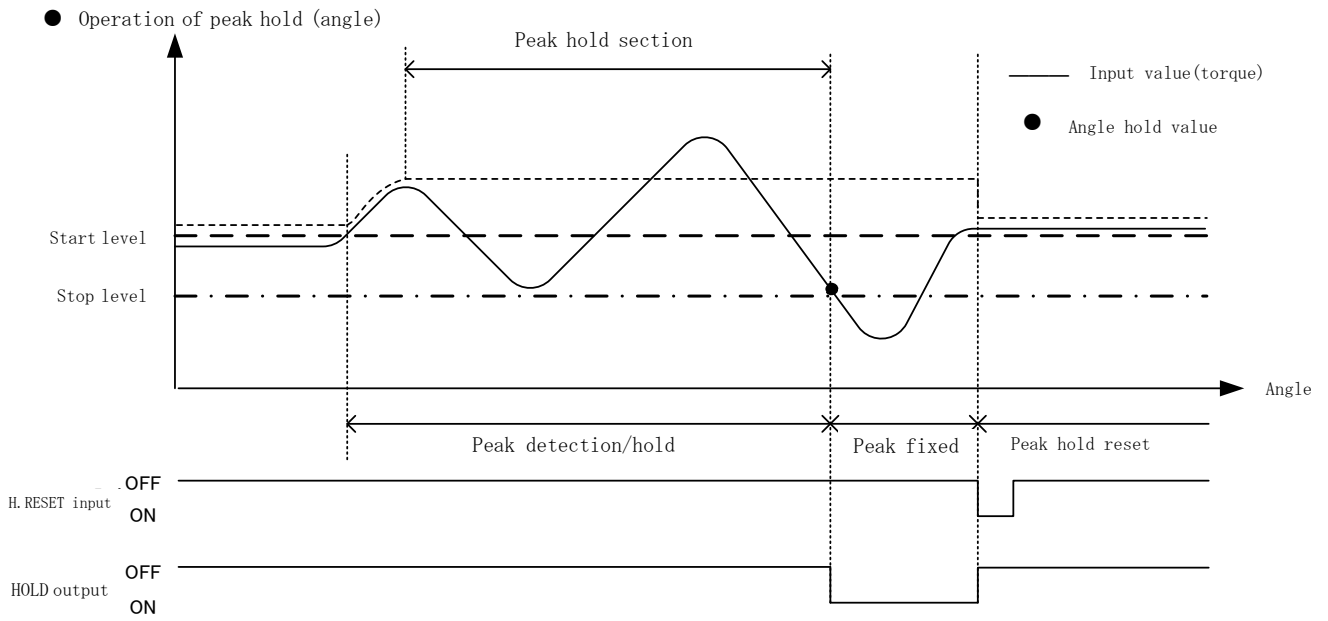
When hold fix section is 0: All section



When hold fix section is 1: With section

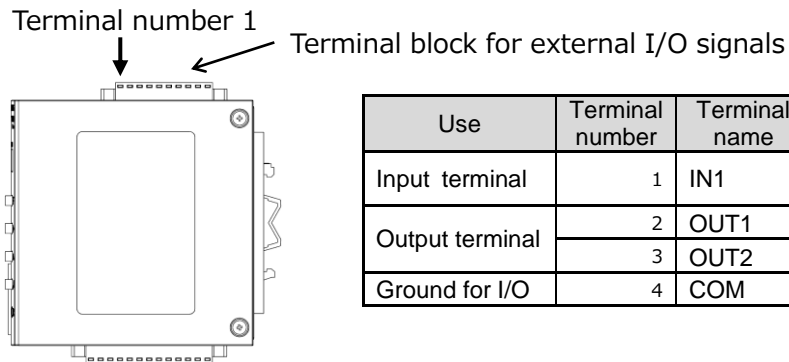


When hold fix section is 2: LEVEL



7 External I/O signals

7-1. Terminal block pin assignment



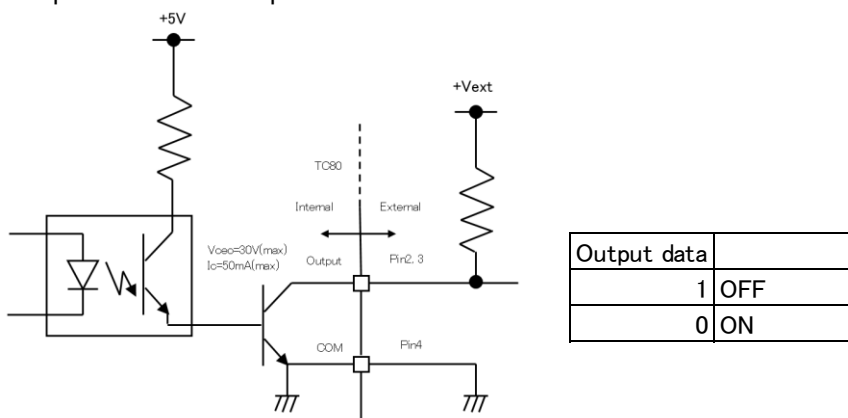
Use	Terminal number	Terminal name	Description
Input terminal	1	IN1	Terminals for input signals. (Functions selected through settings.)
Output terminal	2	OUT1	Terminals for output signals. (Functions selected through settings.)
	3	OUT2	
Ground for I/O	4	COM	A common terminal for I/O signals.

- I/O circuits and internal circuits are electrically insulated by a photo-coupler.

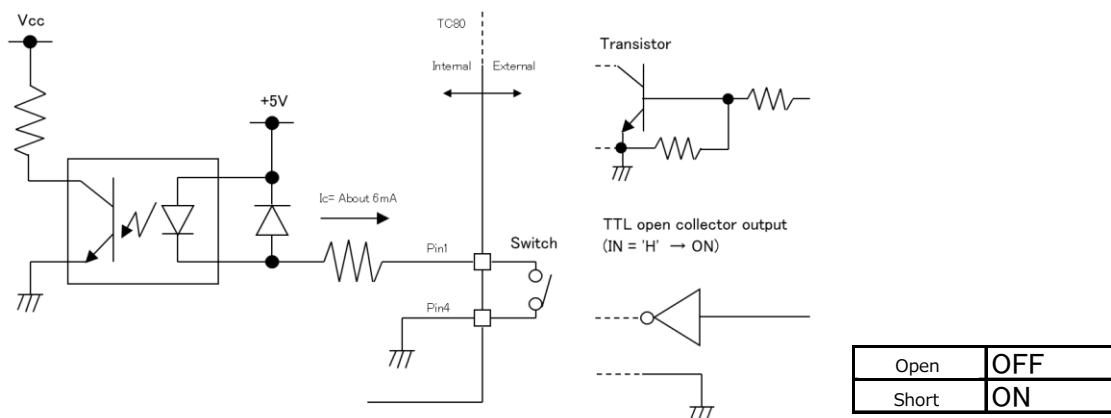
7-2. Connecting an external control device

● Output terminals

Open collector output for transistors.



● Input




7-3. Selection of external I/O signal functions

Functions can be selected for each I/O terminal.

■ Input selection 1

[Input selection 1] (Setting item 5-1)


 Input selection 1
(Sets IN1)

(Selection of functions)

- 0: Digital zero execution (torque)
- 1: HOLD
- 2: HOLD Reset
- 3: Digital zero execution (angle)
- 4: Digital zero execution (torque·angle)

■ Output selection 1, 2

[Output selection 1, 2] (Setting item 5-2, 5-3)

 Output selection 1, 2
(Sets OUT1, OUT2)


(Selection of functions)

0: HI(torque)	1: OK(torque)
2: LO(torque)	3: ALM HI(torque)
4: ALM LO(torque)	5: NZ(torque)
6: HI(rotation speed)	
7: OK(rotation speed)	
8: LO(rotation speed)	
9: ALM HI(rotation speed)	
10: ALM LO(rotation speed)	
11: HOLD	
12: DZ_OK(DZ response)	
13: RUN	

■ Input OFF detection wait time

Detection wait time of Input selection is set.
Changes of input selection will not be recognized within the set time of detection wait.

[Input OFF detection wait time] (Setting item 5-4)

 (Input range : 0.00 to 9.99)

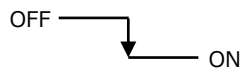
7-4. Description of external I/O signal functions

(Input signals)

Function	Input method	Description
Digital zero execution(torque)	Edge input	Torque value is reset to zero at ON edge.
HOLD	Edge input	Execute the hold control. Hold is detected, fixed, and released at ON edge.
HOLD Reset	Edge input	Reset the hold at ON edge.
Digital zero execution(angle)	Edge input	Angle value is reset to zero at ON edge.
Digital zero execution (torque·angle)	Edge input	Torque and angle values are reset to zero at ON edge.

<Edge input>

•ON edge (OFF→ON)



※Pulse width 1msec or more

(Output signals)

Function	Description
(Torque)	
HI	- HI : Outputs the torque HI limit signal.
OK	- OK : Outputs the torque OK signal.
LO	- LO : Outputs the torque LO limit signal.
ALM HI	- ALM HI : Outputs the torque Alarm HI limit signal.
ALM LO	- ALM LO : Outputs the torque Alarm LO limit signal.
NZ	- NZ : Outputs the torque Near zero signal.
	<p>< Conditions for each signal to turn ON ></p> <ul style="list-style-type: none"> - Indicated value(torque) > HI limit - LO limit < Indicated value(torque) < HI limit - Indicated value(torque) < LO limit - Indicated value(torque) > Alarm HI limit - Indicated value(torque) < Alarm LO limit - Indicated value(torque) < Near zero

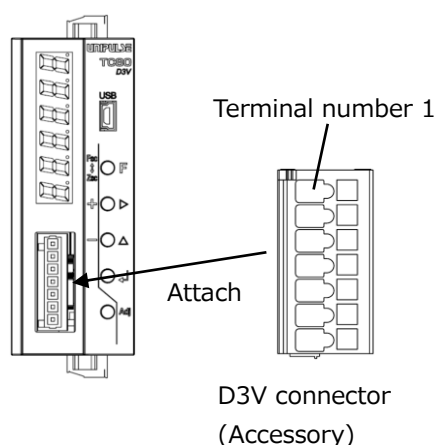
Function	Description
(Rotation speed)	
HI	- HI : Outputs the rotation speed HI limit signal.
OK	- OK : Outputs the rotation speed OK signal.
LO	- LO : Outputs the rotation speed LO limit signal.
ALM HI	- ALM HI : Outputs the rotation speed Alarm HI limit signal.
ALM LO	- ALM LO : Outputs the rotation speed Alarm LO limit signal.
	<p>< Conditions for each signal to turn ON ></p> <ul style="list-style-type: none"> - Indicated value(torque) > HI limit - LO limit < Indicated value(torque) < HI limit - Indicated value(torque) < LO limit - Indicated value(torque) > Alarm HI limit - Indicated value(torque) < Alarm LO limit

Function	Description
HOLD	- HOLD : Outputs hold signal during hold.
DZ_OK(response)	- DZ_OK(response):When Digital zero is recognized, the output turns on for 0.1sec.
RUN	- RUN : The output turns ON / OFF at 1 sec intervals.

8. D/A Converter Interface (D3V)

D/A converter is an interface to output the measurement value as an electrical signal.
The converter can output a voltage proportional to the measurement value.

8-1. Names of components

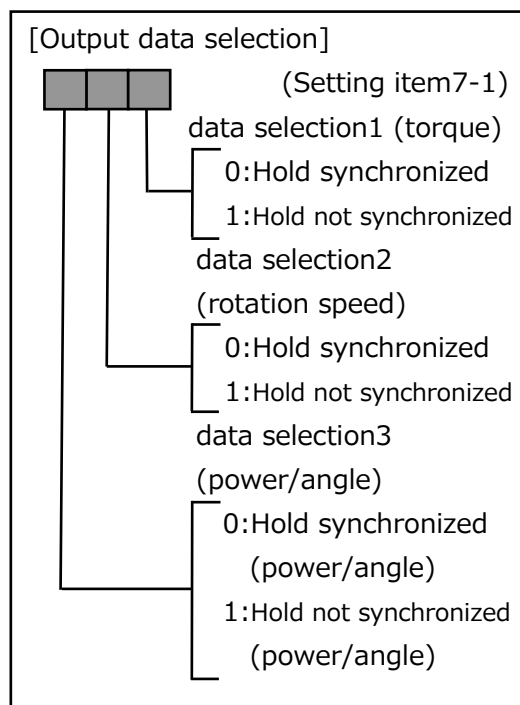


Terminal number	Terminal name	Description
1	ch1(+)	Voltage output terminal of ch1 (torque)
2	ch1(-)	Ground terminal of ch1 (torque)
3	ch2(+)	Voltage output terminal of ch2 (rotation speed)
4	ch2(-)	Ground terminal of ch2 (rotation speed)
5	ch3(+)	Voltage output terminal of ch3 (power/angle)
6	ch3(-)	Ground terminal of ch3 (power/angle)
7	SLD	Shield terminal

8-2. Settings related to D/A

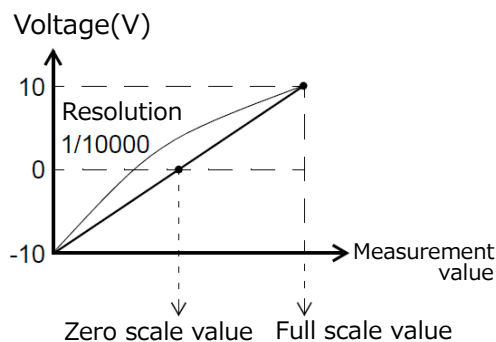
■ Output data selection

The output of each channel will be the output according to the data selection setting.



- Zero scale value1(torque)
- Full scale value1(torque)
- Zero scale value2(rotation speed)
- Full scale value2(rotation speed)
- Zero scale value3(power/angle)
- Full scale value3(power/angle)

Set the measurement value for when zero scale (0V) and full scale (+10V) are output.



[Zero scale value1(torque)]	(Setting item7-2)
[Full scale value1(torque)]	(Setting item7-3)
[Zero scale value2(rotation speed)]	(Setting item7-4)
[Full scale value2(rotation speed)]	(Setting item7-5)

(Input range : -99999 to 99999)

[Zero scale value3(power/angle)]	(Setting item7-6)
[Full scale value3(power/angle)]	(Setting item7-7)

- data selection3 : Angle
Angle analog output select : Number of rotations
(Input range -550 to 550)
*Can be specified within the setting value of setting item [2-6. Zero clear].
- data selection3 : Angle
Angle analog output select : Pulse rate
(Input range -9999 to 9999)
- data selection3 : Power
 (Input range-99999 to 99999)

■ Angle analog output select

Can specify zero/full scale for angle analog output.

0: Number of rotations → select number of rotations at encoder as standard.

1: Pulse rate → Select pulse rate at encoder as standard. Can set in small scale.

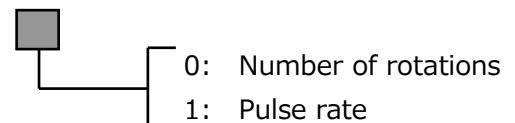
Example)

For 360°(1 rotation), set full scale value when outputting full scale at 10V

1 (0: When number of rotation is selected)

3600 (1: When pulse rate is selected, and encoder pulses are 3600)

[Angle analog output select](Setting item7-8)



8-3. D/A output fine adjustment

- Zero scale adjustment1(torque)
- Full scale adjustment1(torque)
- Zero scale adjustment2(rotation speed)
- Full scale adjustment2(rotation speed)
- Zero scale adjustment3(power/angle)
- Full scale adjustment3(power/angle)

Fine adjustments can be made to the voltage zero scale output (0V) and

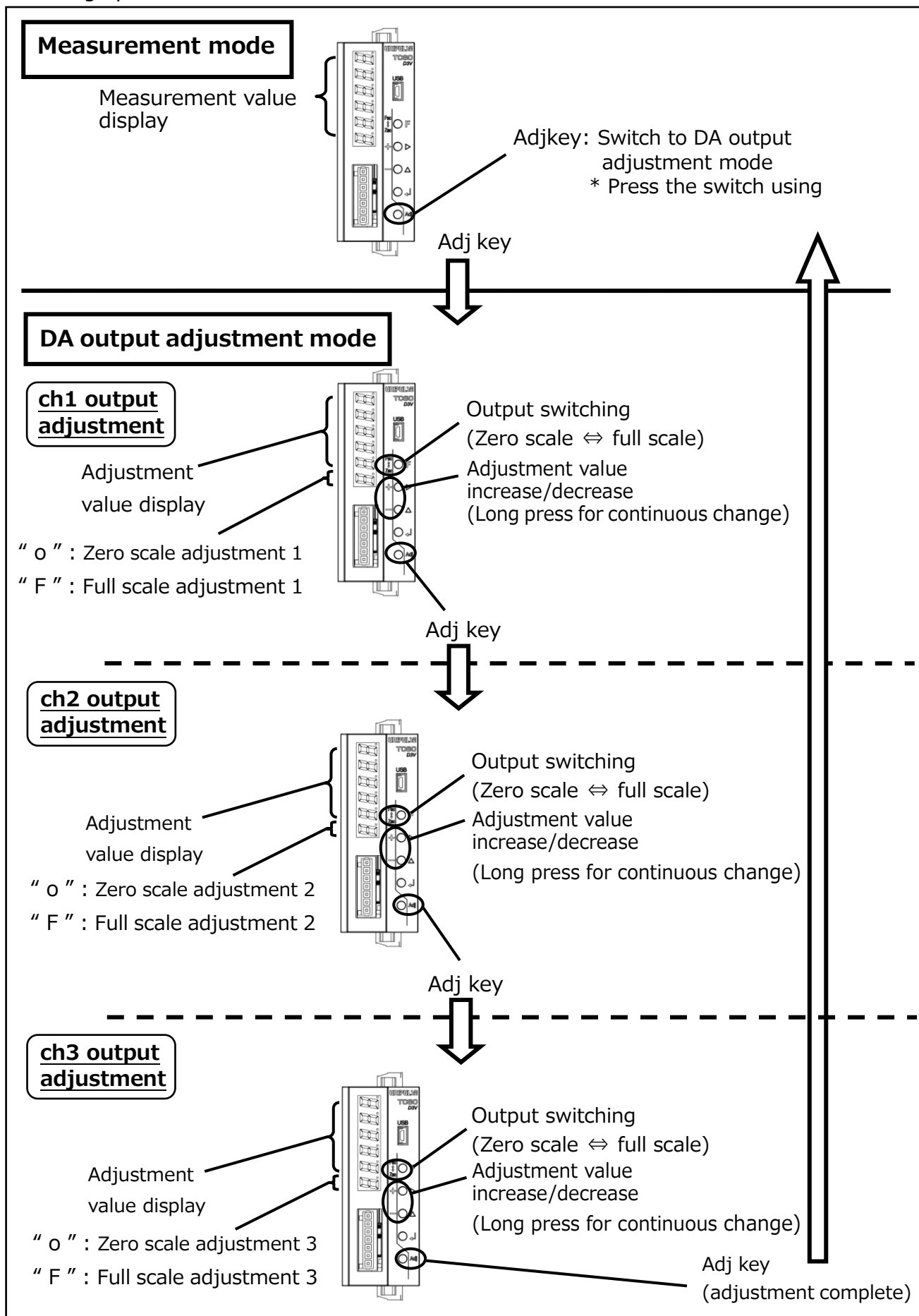
full scale output (+10V). (The adjustable range is about 8% of the full scale)

* Unlike the setting operations in other modes, press the Adj key to switch to adjustment mode.

[Zero scale adjustment1(torque)]
[Full scale adjustment1(torque)]
[Zero scale adjustment 2(rotation speed)]
[Full scale adjustment 2(rotation speed)]
[Zero scale adjustment 3(power/angle)]
[Full scale adjustment 3(power/angle)]

(Input range -5461~ 5461)

(Setting operation)



9 RS-485 Interface

RS-485 is an interface to read the indicated values and status of the TC80 and read and write setting values.

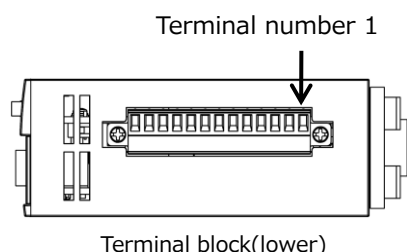
TC80 can be connected to PLC, HMI, our torque meter (UTM), etc.

Measurement can also be done through digital data of UTMⅢ.

9-1. Communication specifications

Message format	UNI-Format/Modbus-RTU	
Signal level	RS-485 compliant, 2-wire	
Transmitting distance	Approx. 1km	
Transmitting method	Asynchronous, half duplex	
Transmitting speed	9600/19200/38400/57600/115.2/230.4kbps	
	*When Modbus-RTU is selected, up to 115.2k	
Bit configuration	Start bit	1bit
	Character length	Select from 7 or 8bit (8bit for Modbus-RTU)
	Stop bit	Selectable from 1 or 2bit
	Parity bit	Select from none, odd or even
	Terminator	Select from CR, CR+LF
Communication mode	Hand shake/Auto/Continuous/Modbus-RTU	
Selection code ASCII (UNI-Format)/Binary (Modbus-RTU)		

9-2. RS-485 connection



Terminal number	Terminal name	Description
1	SG	Signal ground
2	B+	Signal wire B+ side
3	A-	Signal wire A- side

- Use twisted pair wires for connection cables. (Noise margin increases.) However, two-core parallel cables are sufficient for short-distance connection.
- SG terminal is a ground terminal (which protects circuits) used on the circuit. SG terminal does not normally need to be used if the main unit of the TC80 and connection counterpart device are class D grounded. However, if connection is necessary based on the on-site conditions, check the specifications of the counterpart device before connecting.
- Attach terminators on both the host and the TC80 sides.

It can be changed by "setting item 7-3. RS-485 terminal resistance ON/OFF"

Initial value is "1 : ON"

When connecting multiple TC80 units, **mount a terminator only to the terminal device.**

- Depending on the master device (PLC etc.), A and B may be indicated in reverse.
If communication is not possible, switch A and B.

* To connect RS-485 of UTMⅢ, connect TX+ & RX+ of torque meter to B+ of TC80, then connect TX- & RX- to A- of TC80.

9-3. Settings related to RS-485

■ RS-485 I/F settings

- Transmission data selection

Select the format to be used from the transmission data of 9-5.

- Communication mode selection

Select the communication mode.

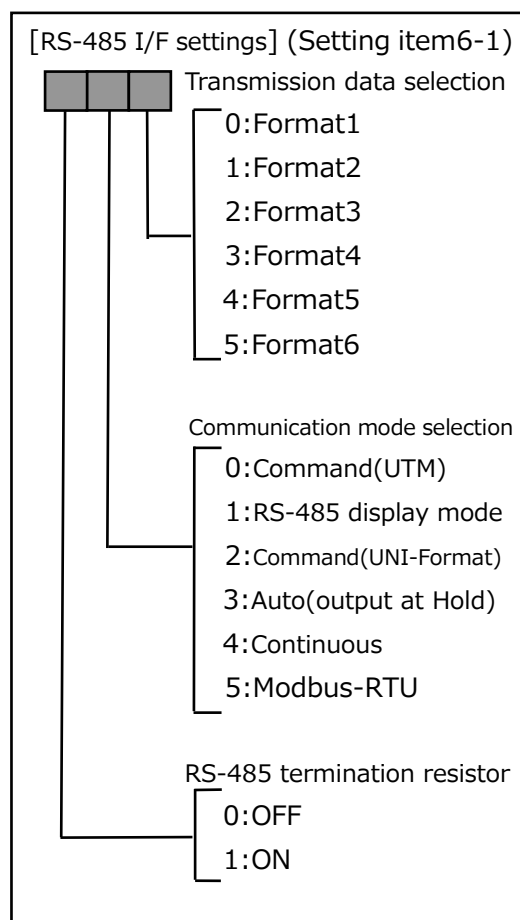
If you want to change setting value of UTMⅢ, must select "0: Command(UTM)" or "1:RS-485 display mode".

<Regarding RS-485 display mode>

- By using RS-485 display mode, torque & rotation speed is **displayed from digital data sent from UTMⅢ**. This data can be used as internal hold function. However signal input from encoder is not digital data.

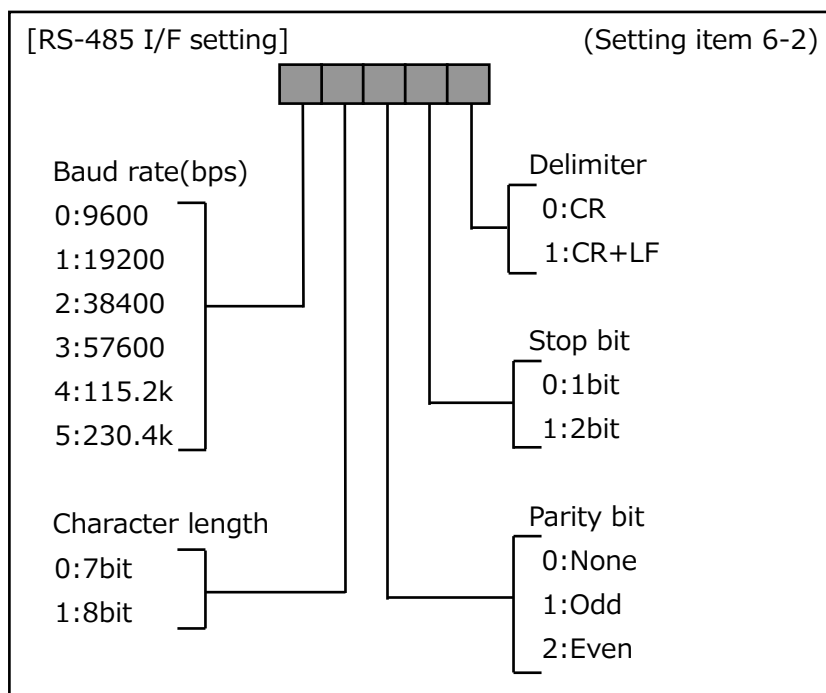
- RS-485 termination resistor

Set the presence or absence of the RS-485 terminating resistor.



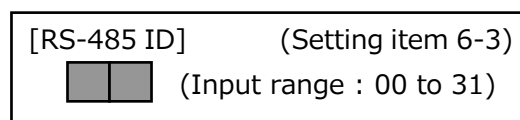
■ RS-485 I/F setting

These settings are for RS-485 communication. Use the same settings as the connecting device.



■ RS-485 ID

Set the RS-485 ID.



■ Transmission delay time

Adjust the time from when the TC80 receives a message from the master device to when it responds.

(For Modbus-RTU mode only)

Set the delay time when the master device cannot process a response.

[Transmission delay time] (Setting item 5-5)



(Input range: 00 to 99 msec)

■ RS-485 dedicated rated capacity

Set the RS-485 dedicated rated capacity.

The unit of the torque value obtained from UTMⅢ is "%FS", so the rated capacity value must be set.

[RS-485 dedicated rated value]



(Setting item 6-4)

(Input range : 0 to 99999)

■ Read setting value

Reads each setting value of UTMⅢ.

This can be selected when "Setting item 6-1. communication mode selection" is "0" or "1".

[Read setting value]

(Setting item 6-5)



- 0: Cancel
- 1: Digital filter (torque)
- 2: Moving average filter (rotation speed)
- 3: Minimum display rotation speed

Key point

E.g. To read filter setting, enter 1 & validate. After reading setting from UTM, Setting item 6-5 will return to 0. (Initial value)

If restart power, Setting item 6-5 will display 0. (Not value from UTM)
Please note that setting read from UTM will not be kept.

■ Digital filter(torque)

Writes/reads UTMⅢ digital filter settings.

Key point

If selected setting value is written, the value will be shown.
However, do use Setting item 6-5 to read setting value and check if it is written successfully.

[Digital filter(torque)]

(Setting item 6-6)



- 0: 1Hz
- 1: 3Hz
- 2: 10Hz
- 3: 30Hz
- 4: 100Hz
- 5: 300Hz
- 6: 1kHz
- 7: PASS

■ Moving average filter(rotation speed)

Writes/reads UTMⅢ moving average filter settings.

Key point

If selected setting value is written, the value will be shown.
However, do use Setting item 6-5 to read setting value and check if it is written successfully.

[Moving average filter(rotation speed)]

(Setting item 6-7)



- 0: OFF
- 1: 2 times
- 2: 4 times
- 3: 8 times
- 4: 16 times
- 5: 32 times

■ Minimum display rotation speed

Writes/reads UTMⅢ minimum display rotation speed settings.

Key point

If selected setting value is written, the value will be shown.
However, do use Setting item 6-5 to read setting value and check if it is written successfully.

[Minimum display rotation speed]



(Setting item 6-8)

(Input range : 0 to 99)

■ Operation instruction

Send operation command to UTMⅢ.

[Operation instruction]



(Setting item 6-9)

- 0: None
- 1: Digital zero
- 2: Digital zero reset

9-4. UNI-Format

There are the following three communication modes for the UNI-Format.

- UNI-Format command ... Responds or operates in accordance with the command from the master device.

The commands can be broadly divided into the following four types.

- | | |
|--|----------------------------------|
| - Reading commands | Read indicated values and status |
| - Setting value reading/writing commands | Read/write setting values |
| - Calibration commands | Execute calibration processes |
| - Execution commands | Execute other processes |

- UNI-Format auto ... Transmits a message in the UNI-Format upon completion.

- UNI-Format continuous ... Continuously transmits a message in the UNI-Format (Transmission intervals are as follows).

- 9600bps ... 25 times
- 19200bps ... 50 times
- 38400bps ... 100 times
- 57600bps ... 150 times
- 115.2kbps ... 300 times
- 230.4kbps ... 300 times

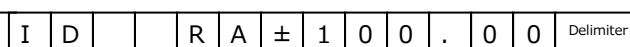
9-5. UNI-Format message formats

Reading command

- Reading indicated values
- Reading torque(display value)



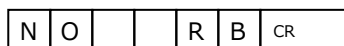
ID No.



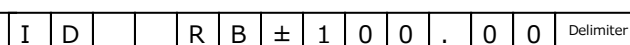
ID No.

Sign, 5digits, decimal point

- Reading torque(real-time value)



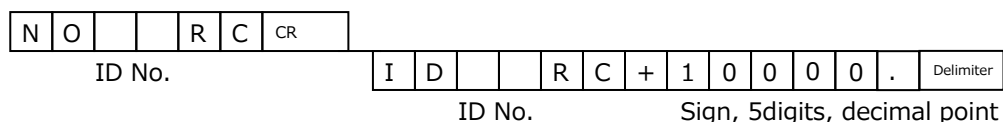
ID No.



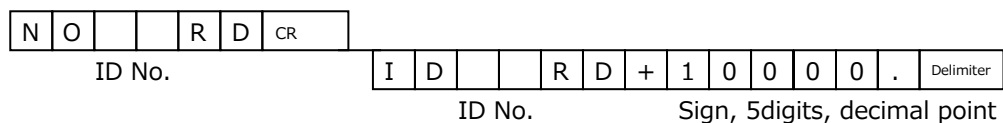
ID No.

Sign, 5digits, decimal point

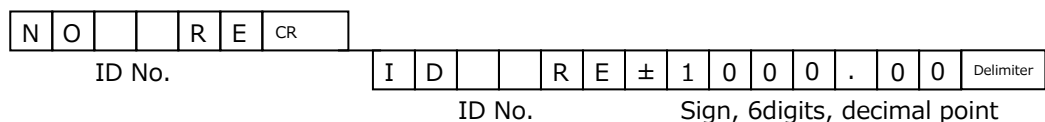
- Reading rotation speed(display value)



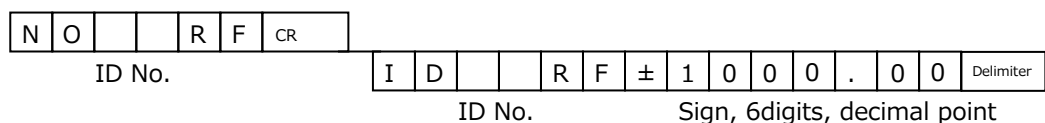
- Reading rotation speed(real-time value)



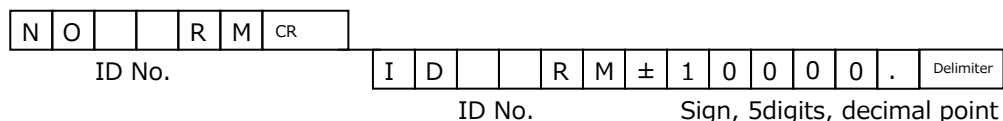
- Reading angle(display value)



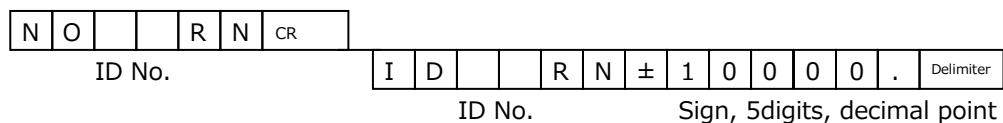
- Reading angle(real-time value)



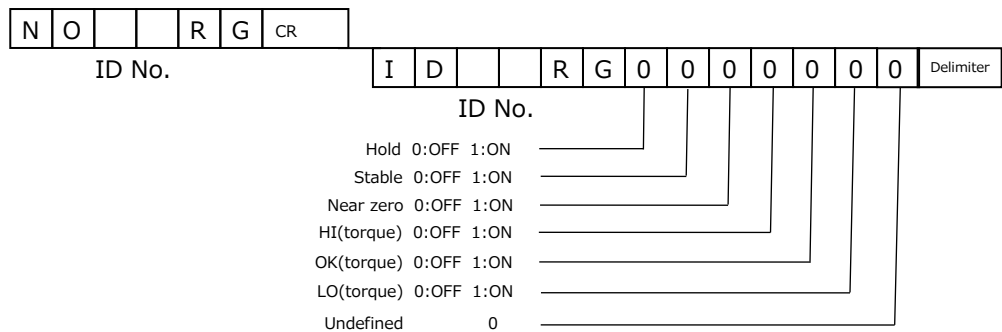
- Reading power(display value)



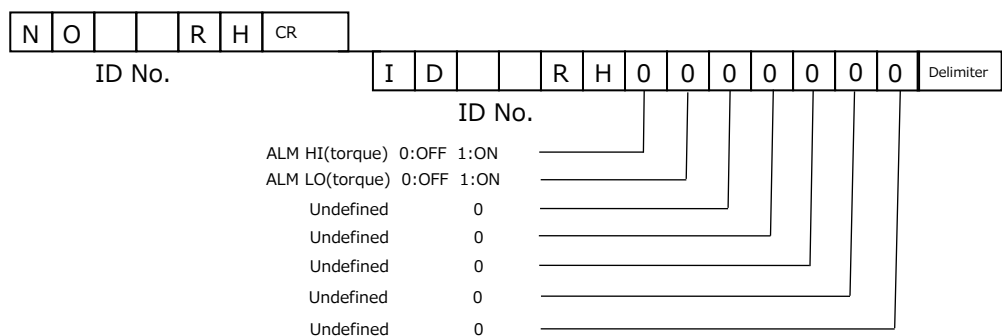
- Reading power(real-time value)



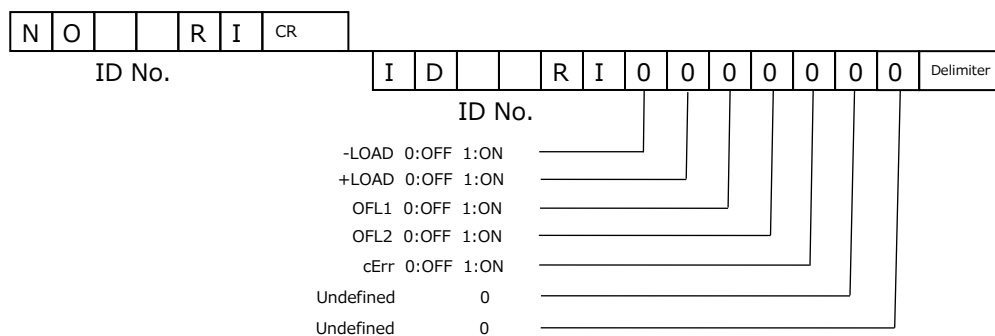
- Reading status 1



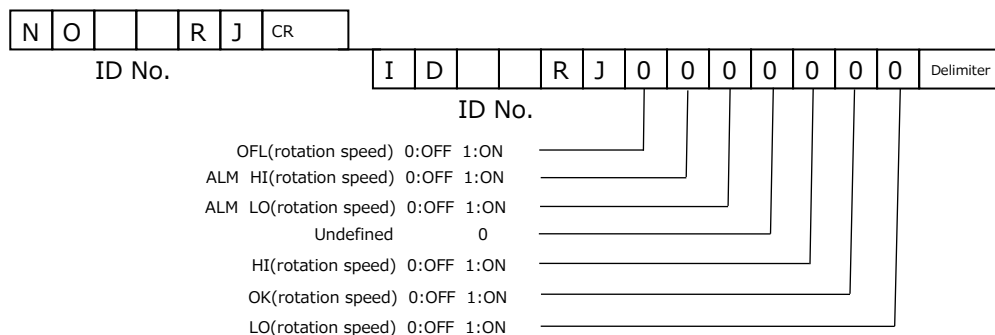
- Reading status 2



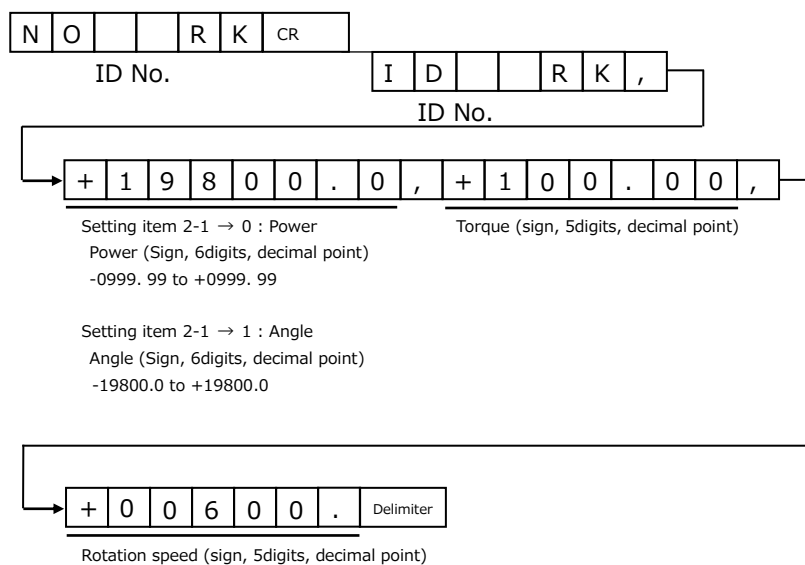
- Reading status 3



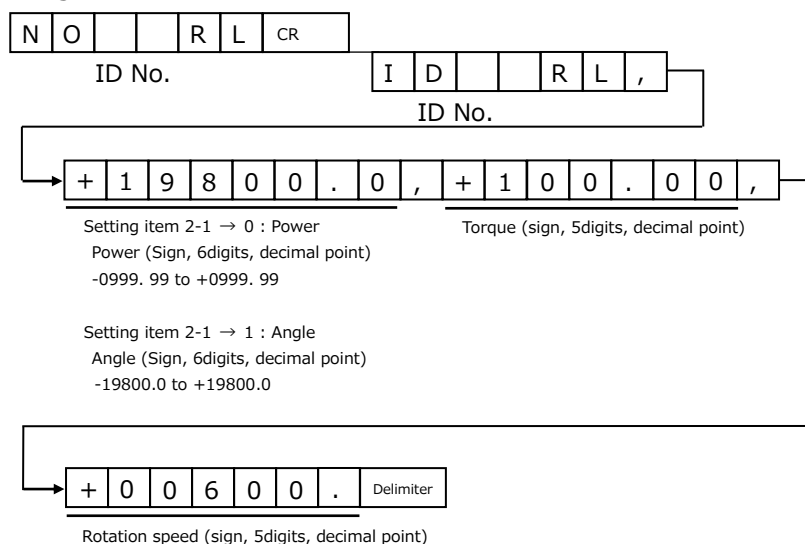
- Reading status 4 (rotation speed)



- Reading 3 display value

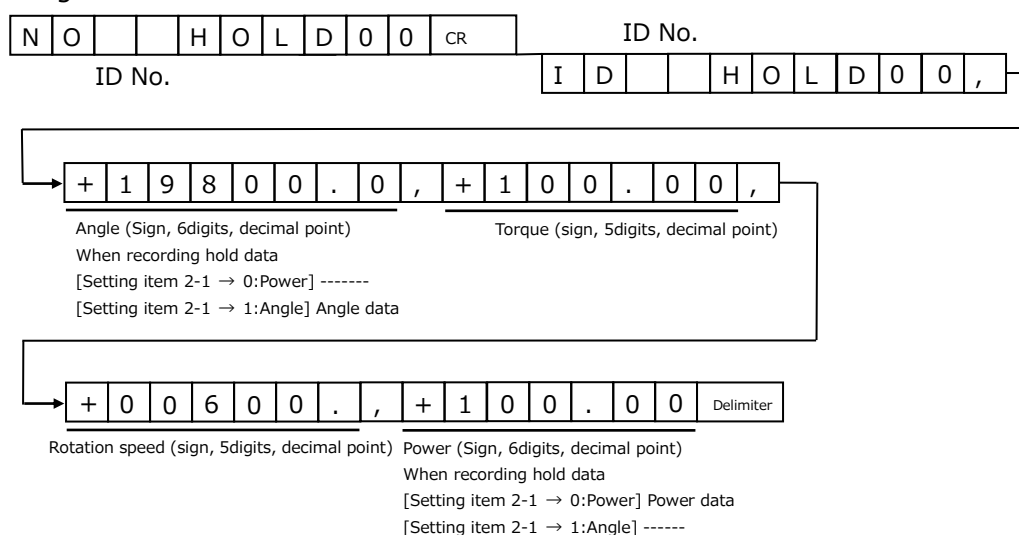


- Reading 3 real-time value



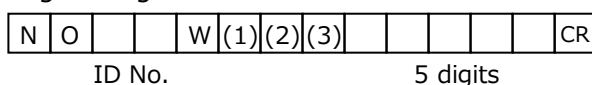
Data number
(00 to 99) *00 is the latest

- Reading hold data



Setting value reading/writing commands

- Writing setting values



* Higher digits are filled with 0 when the setting value is under 5 digits.

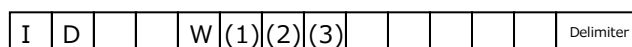
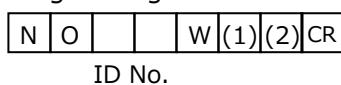
(1) Setting mode number, (2) Setting item number (3) Sign

* Refer to the list of setting values

No sign: 0

Sign: + or -

- Reading setting values



(1) Setting mode number, (2) Setting item number (3) Sign

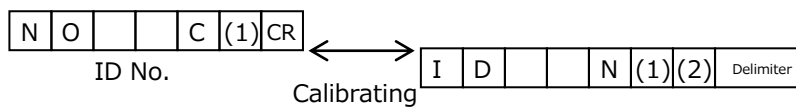
* Refer to the list of setting values

No sign: 0

Sign: + or -

Calibration commands

- Zero calibration/actual load calibration
- Equivalent input calibration



(1) Calibration mode

A: Zero calibration

B: Actual load calibration

V: Equivalent input calibration

(2) Calibration error

2 to 6, 0:No error

Execution command

N	O			C	(1)	CR
---	---	--	--	---	-----	----

ID No.

(1) Command

C:Display switching(torque)

D:Display switching(rotation speed)

E:Display switching(angle)

F:Hold

G:Hold reset

H:Digital zero(torque)

I:Digital zero reset(torque)

J:Digital zero(angle)

K:Display switching(power)

UNI-Format auto/continuous

- Format1

G	S	,	(1)	,	(2)	,	(3)	,	(4)	,	(5)	,	+	1	0	0	.	0	0	Delimiter
---	---	---	-----	---	-----	---	-----	---	-----	---	-----	---	---	---	---	---	---	---	---	-----------

GS:Display value(torque) Sign, 5digits, decimal point

- Format2

N	T	,	(1)	,	(2)	,	(3)	,	(4)	,	(5)	,	+	1	0	0	.	0	0	Delimiter
---	---	---	-----	---	-----	---	-----	---	-----	---	-----	---	---	---	---	---	---	---	---	-----------

NT:Real-time value (torque) Sign, 5digits, decimal point

- Format3

SOH	W	T	STX	①	②	③	④	⑤	+	1	0	0	0	0	+	0	0	6	0	0	ETX	BCC
-----	---	---	-----	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	-----	-----

WT:Display value Torque, sign, 5 digits Rotation speed, sign, 5 digits

- (1)O:LOAD/OFL(torque) S:Stable M:Unstable H:Hold (4)N:Near zero OFF Z:Near zero ON
 (2)O:OFL(rotation speed) P:OFL(power) 0:Undefined (5)H:HI ON L:LO ON G:HI and LO OFF
 (3)H:HI ON L:LO ON G:HI and LO OFF N:HI and LO ON
 N:HI and LO ON

- Format4

SOH	W	R	STX	①	②	③	④	⑤	+	1	0	0	0	0	+	0	0	6	0	0	ETX	BCC
WR: Real-time value									Torque, sign, 5 digits					Rotation speed, sign, 5 digits								

(1)O:LOAD/OFL(torque) S:Stable M:Unstable H:Hold (4)N:Near zero OFF Z:Near zero ON
 (2)O:OFL(rotation speed) P:OFL(power) 0:Undefined (5)H:HI ON L:LO ON G:HI and LO OFF
 (3)H:HI ON L:LO ON G:HI and LO OFF N:HI and LO ON
 N:HI and LO ON

- Format5

SOH	W	P	STX	+	0	0	0	0	0	0	,	±	1	0	0	0	0	,	+	0	0	6	0	0	ETX	BCC	
WP: 3 display (display value)				Setting item 2-1 0 : Power Power, sign, 5digits -099999 to +099999								Torque, sign, 5 digits								Rotation speed, sign, 5 digits							
				1 : Angle Angle, sign, 6 digits -199999 to +199999																							

•Format6

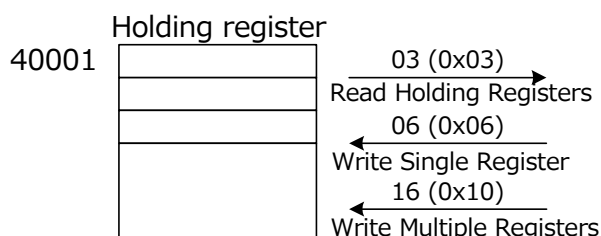
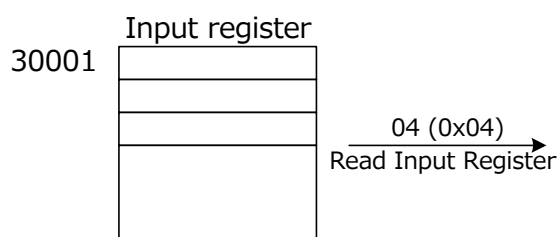
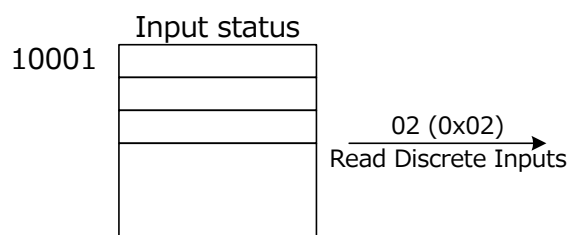
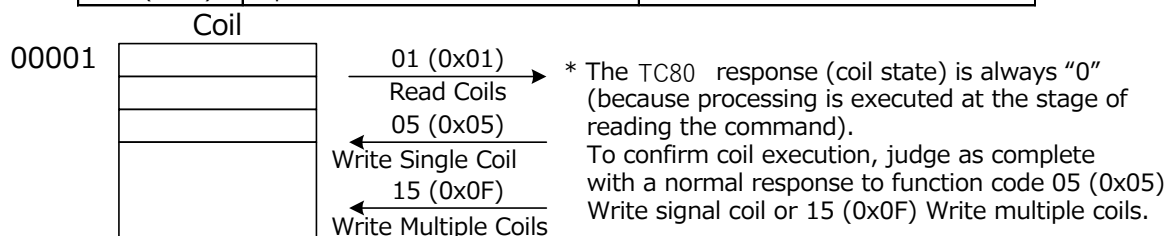
SOH	W	S	STX	+	0	0	0	0	0	0	,	±	1	0	0	0	0	,	+	0	0	6	0	0	ETX	BCC	
WS: 3 display (real-time value)				Setting item 2-1 0 : Power Power, sign, 5digits -099999 to +099999								Torque, sign, 5 digits								Rotation speed, sign, 5 digits							
				1 : Angle Angle, sign, 6 digits -199999 to +199999																							

9-6. Modbus-RTU

Introduction into a system with the same Modbus-RTU configuration can be easily performed by selecting Modbus-RTU for the communication mode. (Refer to the specifications for the Modbus protocol, which are open to the public.)

The TC80 operates as a slave to enable the following operations from the master side.

Code	Function name	Command
01 (0x01)	Read Coils	Read coils
02 (0x02)	Read Discrete Inputs	Read discrete inputs
03 (0x03)	Read Holding Registers	Read holding registers
04 (0x04)	Read Input Register	Read input register
05 (0x05)	Write Single Coil	Write to single coil
06 (0x06)	Write Single Register	Write to single holding register
15 (0x0F)	Write Multiple Coils	Write to multiple coils
16 (0x10)	Write Multiple Registers	Write to multiple holding registers
08 (0x08)	Diagnostics	Diagnostic mode
11 (0x0B)	Get Comm Event Counter	Read event counter
12 (0x0C)	Get Comm Event Log	Read communication events
17 (0x11)	Report Slave ID	Read slave ID information



The address number used on a message is a relative address.

The relative address is calculated by the following equation.

$$\text{Relative address} = \text{Last 4 digits of address No.} - 1$$

For example, it is 0010(0x0A) when input register 30011 is designated.

9-7. Modbus-RTU address map

*All data to be read/write is expressed without the decimal point.

Example) 100.00 → 10000

Data type	Address	Data name	Data format	LOCK	
				1	2
Coil 0XXXX	00001	Display switch (torque)	B1		
	00002	Display switch (rotation speed)			
	00003	Display switch (power)			
	00004	Display switch (angle)			
	00005	Digital zero (torque)			
	00006	Digital zero reset (torque)			
	00007	Digital zero (angle)			
	00008	Hold			
	00009	Hold reset			
	00010	Backup (not allocated)			
	00011				
	00012	Zero calibration			⊙
	00013	Actual load calibration			⊙
	00014	Equivalent input calibration			⊙
	00015	Reserved area (cannot be used)			
	to				
	09999				

Data type	Address	Data name	Data format	LOCK	
				1	2
Discrete input 1XXXX	10001	ALM HI (torque)	B1		
	10002	ALM LO (torque)			
	10003	HI (torque)			
	10004	OK (torque)			
	10005	LO (torque)			
	10006	Stable			
	10007	HOLD			
	10008	Near zero (torque)			
	10009	Setting value LOCK			
	10010	Calibration value LOCK			
	10011	LOAD			
	10012	-LOAD			
	10013	OFL1 (torque)			
	10014	OFL2 (torque)			
	10015	ALM HI (rotation speed)			
	10016	ALM LO (rotation speed)			
	10017	HI (rotation speed)			
	10018	OK (rotation speed)			
	10019	LO (rotation speed)			
	10020	OFL (rotation speed)			
	10021	P_OFL1 (power)			
	10022	P_OFL2 (power)			
	10022	Reserved area (cannot be used)			

	to				
	19999				

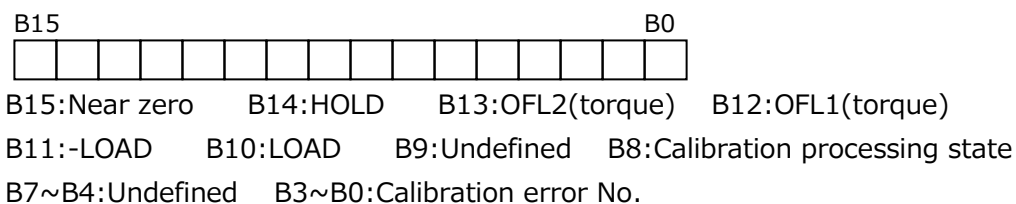
Data type	Address	Data name	Data format	LOCK	
				1	2
Input register 3XXXX	30001	Status 1 *1	I16		
	30002	Status 2 *2			
	30003	Status 3 *3			
	30004	Undefined			
	30005	Torque (Indicated value)(HI) *4	I32		
	30006	Torque (Indicated value)(LO) *4			
	30007	Torque (Hold value)(HI) *4			
	30008	Torque (Hold value)(LO) *4			
	30009	Rotation speed (Indicated value)(HI)			
	30010	Rotation speed (Indicated value)(LO)			
	30011	Rotation speed (Hold value)(HI)			
	30012	Rotation speed (Hold value)(LO)			
	30013	Power/Angle (Indicated value)(HI) *4			
	30014	Power/Angle (Indicated value)(LO) *4			
	30015	Power/Angle (Hold value)(HI) *4			
	30016	Power/Angle (Hold value)(LO) *4			
	30017	Reserved area (cannot be used)			
	to				
	39999				

Data type	Address	Data name	Data format	LOCK	
				1	2
Holding register 4XXXX	40001	HI limit (torque)(HI)	132	⊙	
	40002	HI limit (torque)(LO)		⊙	
	40003	LO limit (torque)(HI)		⊙	
	40004	LO limit (torque)(LO)		⊙	
	40005	Alarm HI limit (torque)(HI)		⊙	
	40006	Alarm HI limit (torque)(LO)		⊙	
	40007	Alarm LO limit (torque)(HI)		⊙	
	40008	Alarm LO limit (torque)(LO)		⊙	
	40009	Near zero (HI)		⊙	
	40010	Near zero (LO)		⊙	
	40011	HI limit (rotation speed)(HI)		⊙	
	40012	HI limit (rotation speed)(LO)		⊙	
	40013	LO limit (rotation speed)(HI)		⊙	
	40014	LO limit (rotation speed)(LO)		⊙	
	40015	Alarm HI limit (rotation speed)(HI)		⊙	
	40016	Alarm HI limit (rotation speed)(LO)		⊙	
	40017	Alarm LO limit (rotation speed)(HI)		⊙	
	40018	Alarm LO limit (rotation speed)(LO)		⊙	
	40019	Start level (HI)		⊙	
	40020	Start level (LO)		⊙	
	40021	Stop level (HI)		⊙	
	40022	Stop level (LO)		⊙	
	40023	Zero scale value 1 (torque)(HI)			⊙
	40024	Zero scale value 1 (torque)(LO)			⊙
	40025	Full scale value 1 (torque)(HI)			⊙
	40026	Full scale value 1 (torque)(LO)			⊙
	40027	Zero scale value 2 (rotation speed)(HI)			⊙
	40028	Zero scale value 2 (rotation speed)(LO)			⊙
	40029	Full scale value 2 (rotation speed)(HI)			⊙
	40030	Full scale value 2 (rotation speed)(LO)			⊙
	40031	Zero scale value 3 (power/angle)(HI)			⊙
	40032	Zero scale value 3 (power/angle)(LO)			⊙
	40033	Full scale value 3 (power/angle)(HI)			⊙
	40034	Full scale value 3 (power/angle)(LO)			⊙
	40035	Actual load calibration (HI)			⊙
	40036	Actual load calibration (LO)			⊙
	40037	Equivalent input calibration (HI)			⊙
	40038	Equivalent input calibration (LO)			⊙
	40039	Sign / Unit	116		⊙
	40040	Min. scale division (torque)			⊙
	40041	Decimal place (torque)			⊙
	40042	Hysteresis (torque)		⊙	
	40043	Torque meter type			⊙
	40044	Min. scale division (rotation speed)			⊙

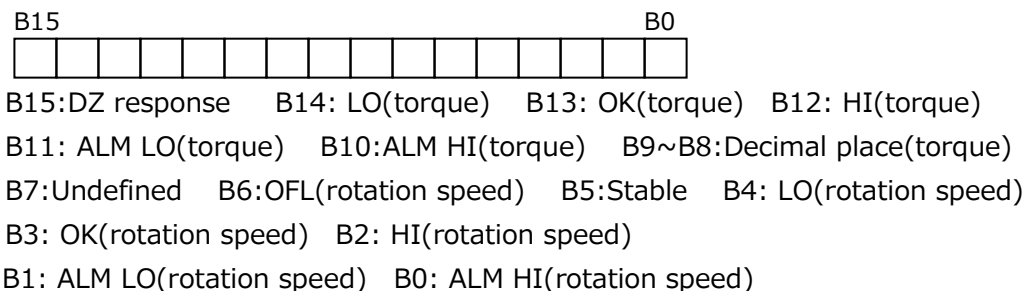
Holding register 4XXXX	40045	Quick stop mode	I16	<input type="radio"/>	<input type="radio"/>
	40046	Hysteresis (rotation speed)		<input type="radio"/>	<input type="radio"/>
	40047	Minimum input rotation speed		<input type="radio"/>	<input type="radio"/>
	40048	Power / Angle selection		<input type="radio"/>	<input type="radio"/>
	40049	Encoder pulse		<input type="radio"/>	<input type="radio"/>
	40050	Unit (angle)		<input type="radio"/>	<input type="radio"/>
	40051	Direction		<input type="radio"/>	<input type="radio"/>
	40052	Min. scale division (angle)		<input type="radio"/>	<input type="radio"/>
	40053	Zero clear		<input type="radio"/>	<input type="radio"/>
	40054	Undefined		<input type="radio"/>	<input type="radio"/>
	40055	Low speed rotation mode		<input type="radio"/>	<input type="radio"/>
	40056	Power setting		<input type="radio"/>	<input type="radio"/>
	40057	Hold mode		<input type="radio"/>	<input type="radio"/>
	40058	Hold fix section		<input type="radio"/>	<input type="radio"/>
	40059	HI / LO limit comparison mode		<input type="radio"/>	<input type="radio"/>
	40060	Motion detection *5		<input type="radio"/>	<input type="radio"/>
	40061	Digital high-pass filter (torque)		<input type="radio"/>	<input type="radio"/>
	40062	Setting value LOCK		<input type="radio"/>	<input type="radio"/>
	40063	Calibration value LOCK		<input type="radio"/>	<input type="radio"/>
	40064	Key invalid		<input type="radio"/>	<input type="radio"/>
	40065	Display update rate		<input type="radio"/>	<input type="radio"/>
	40066	Visibility		<input type="radio"/>	<input type="radio"/>
	40067	Digital low-pass filter (torque)		<input type="radio"/>	<input type="radio"/>
	40068	Moving average filter (torque)		<input type="radio"/>	<input type="radio"/>
	40069	Moving average filter (rotation speed)		<input type="radio"/>	<input type="radio"/>
	40070	Moving average filter (angle)		<input type="radio"/>	<input type="radio"/>
	40071	Input selection		<input type="radio"/>	<input type="radio"/>
	40072	Output selection 1		<input type="radio"/>	<input type="radio"/>
	40073	Output selection 2		<input type="radio"/>	<input type="radio"/>
	40074	Input OFF detection wait time		<input type="radio"/>	<input type="radio"/>
	40075	Output data selection		<input type="radio"/>	<input type="radio"/>
	40076	Angle analog output select		<input type="radio"/>	<input type="radio"/>
	40077	Zero scale adjustment (torque)		<input type="radio"/>	<input type="radio"/>
	40078	Full scale adjustment (torque)		<input type="radio"/>	<input type="radio"/>
	40079	Zero scale adjustment (rotation speed)		<input type="radio"/>	<input type="radio"/>
	40080	Full scale adjustment (rotation speed)		<input type="radio"/>	<input type="radio"/>
	40081	Zero scale adjustment (power/angle)		<input type="radio"/>	<input type="radio"/>
	40082	Full scale adjustment (power/angle)		<input type="radio"/>	<input type="radio"/>
	40083	Reserved area (cannot be used)		<input type="radio"/>	<input type="radio"/>
	to			<input type="radio"/>	<input type="radio"/>
	49999			<input type="radio"/>	<input type="radio"/>

B1: 1bit, I16: 16bit integer, I32: 32bit integer

*1: Status 1



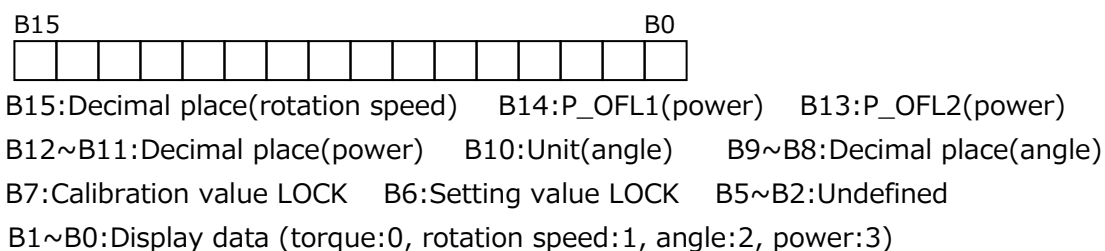
*2: Status 2



Decimal place(torque) : Indicates the decimal place of the torque.

0:#####, 1:####.#, 2:###.##, 3:##.###

*3: Status 3



Decimal place(rotation speed) : Indicates the decimal place of the rotation speed.

0:#####, 1:####.#

Decimal place(power) : Indicates the decimal place of the power.

0:#####, 1:####.#, 2:###.##, 3:##.###

Decimal place(angle) : Indicates the decimal place of the angle.

0:#####, 1:####.#, 2:###.##

*4 Negative numbers of the indicated value are represented in two's complement.

*5 Motion detection

Compared time : HI data

Change range : LO data

Example) When changing the setting value to "2.0-10".

1) Compared time "20" = "0x14"

Change range "10" = "0x0A"

2) Place "0x140A" in the change data and execute the message.

Key points

- When writing an I32 (32bit integer) setting value, write the HI words and LO words in one go using "write multiple registers".
- An error response is returned when the start address specifies LO words, or the end of the start address + number of registers specifies HI words.

10 USB interface

The USB interface is used to read the indicated values of the TC80 and to write setting values into the TC80. Reading/writing setting values, recording, and graph display are possible using a dedicated PC application for the TC80.

10-1. USB interface

Communication specifications

Communication standard USB Ver.2.0 compliant, full speed (12Mbps)

Connector mini-B TYPE

10-2. PC preparation

For a PC that is being used for the first time, the USB driver and the dedicated PC application must be installed.

PC operating environment

OS	Windows 7/10 Home Premium/Professional/Ultimate 32/64bit Japanese edition, English edition
Display	1024 × 768 pixel or above
USB port	One free port (USB 2.0 or above)
USB driver	Virtual COM Port (VCP) Drivers (manufactured by FTDI Limited)
Memory	2GB or above
Hard disk	15GB free space or more

USB driver installation

A driver will be installed automatically when a USB is connected in a network environment.

Connect the PC to the network.

Automatic download/installation will start when the device is connected to the PC with the optional USB cable.

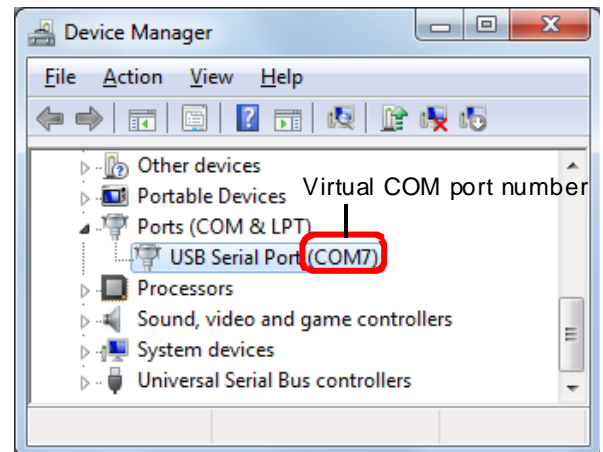
If automatic installation fails or the dedicated application does not start up, delete the drive and reconnect.

See the FTDI website if automatic installation does not work.

Guide (English)	http://www.ftdichip.com/Support/Documents/InstallGuides.htm
Driver (English)	http://www.ftdichip.com/Drivers/VCP.htm

Virtual COM port check

Check the virtual COM port number to which the device is connected from the PC device manager or when installing the driver.



Key point

If the COM port number of the TC80 cannot be identified due to multiple USB serial ports and so on, unplug the USB cable and confirm that one COM port is removed from the list of ports (COM and LPT). When the USB cable is reconnected to the previous connector, the number of COM ports displayed in the list will increase. This number represents the COM port number of the TC80.

Installation of the dedicated PC application

The dedicated application is used for setting the device, and is useful for managing and analyzing data.

Download and install the application from the UNIPULSE website. To download the application, user registration (free) is required.

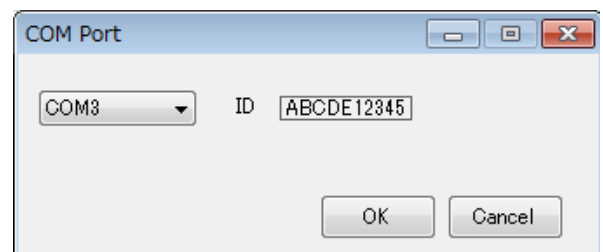
PC application startup

Double-click the TC80 shortcut on the desktop or click "UNIPULSE" → "TC80" → TC80 from the start menu.

Specifying the COM port

The COM port selection screen will appear when the PC application is activated for the first time after installation.

Once the COM port is selected and the "OK" button is clicked, it connects to the FTC80 and the screen will appear.

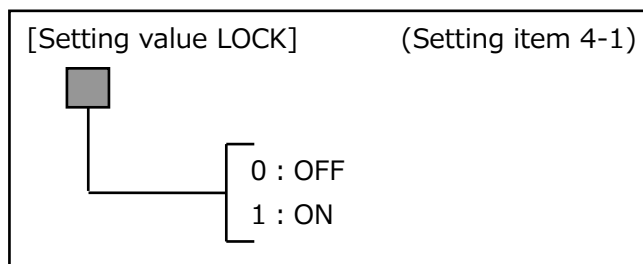


11 Other functions

■ Setting value LOCK

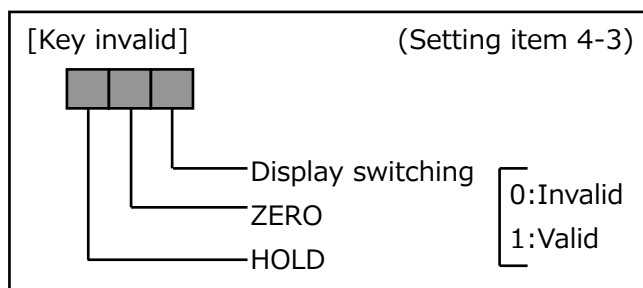
Protects the settings so that they cannot be changed.

To change the setting, set it to "OFF".



■ Key invalid

Makes key operations for Display switching, ZERO and HOLD switch invalid/valid.



12 Troubleshooting

12-1. Error message display (torque measurement)

Display	Error name	Error details and remedies
LoAd	Signal input range +10V over (UTMⅢ) + 5V over (UTMⅡ)	The input electric signal has greatly exceeded the signal input range. Confirm that the excessive torque is not applied to the sensor and that the cable connecting the TC80 to the torquemeter is not disconnected.
- LoAd	Signal input range -10V over (UTMⅢ) - 5V over (UTMⅡ)	
ALR	Above the Alarm HI limit	This occurs when a larger load is applied to the sensor than expected, or when calibrating below the measurement range. Check the calibration and measurement objects.
-ALR	Below the Alarm LO limit	
oFL1	Below -99999	This occurs when a larger load is applied to the sensor than expected, or when calibration is performed below the measurement range. Check the calibration and measurement objects.
oFL2	Above 99999	
err2	Zero calibration range plus over	It has greatly exceeded the signal input range when performing zero calibration. Confirm that the excessive torque is not applied to the sensor and that the cable connecting the TC80 to the torquemeter is not disconnected.
err3	Zero calibration range minus over	
err4	Rated output plus over Rated output minus over Over rated capacity	Significantly exceeded signal input range when calibrated. For the equivalent input calibration, check the rated output value. For the actual load calibration, Confirm that the excessive torque is not applied to the sensor and that the cable connecting the TC80 to the torquemeter is not disconnected.
err5	Rated capacity = 0	Check that the rated capacity setting is not set to 0 when performing calibration.
err6	When actual load calibration is executed, the rated output is -0.010 to +0.010V	Check that the load is not too light when performing the actual load calibration.
ALZE	Zero calibration in progress	<u>Not an error.</u> Indicates running.
ALSP	Actual load calibration in progress	
ALEP	Equivalent input calibration in progress	

12-2. Error message display (rotation speed measurement)

Display	Error name	Error details and remedies
$R_{L}R_{-}$	Above the Alarm HI limit	The rotation speed is faster or slower than expected. Check the rated speed and whether the rotation is locked.
$-R_{L}R_{-}$	Below the Alarm LO limit	
oFL	Above 99999	The rotation speed is out of the display range.

12-3. Error message display (power measurement)

Display	Error name	Error details and remedies
P_{oFL1}	Below -99999	The power is out of the display range.
P_{oFL2}	Above 99999	

12-4. Error message display (others)

Display	Error name	Error details and remedies
$I_{o}-AL$	External output error	External output is overloaded.(Over current) Please check if the wires are properly connected.
$485non$	RS-485 display mode communication error	In the RS-485 display mode, communication is being established or the format cannot be received periodically from UTMⅢ. Check that the RS-485 wiring is correct.

13 List of setting values

Setting mode 0

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	HI limit (torque)	999.99	-99999 to 99999	⊙		P20
2	LO limit (torque)	-999.99	-99999 to 99999	⊙		P20
3	Alarm HI limit (torque)	999.99	-99999 to 99999	⊙		P21
4	Alarm LO limit (torque)	-999.99	-99999 to 99999	⊙		P21
5	Sign/Unit	20			⊙	P 9
	Sign (torque)		0:NORMAL 1:REVERSE 2:ABSOLUTE			
	Unit (torque)		0:mNm 1:Ncm 2:Nm 3:kNm 4:kgm (kgfm) 5:kgcm (kgfcm) 6:gcm (gfcmm)			
6	Min. scale division (torque)	0	0 : 1, 1 : 2, 2 : 5, 3 : 10, 4 : 20, 5 : 50, 6 : 100		⊙	P 9
7	Decimal place (torque)	2	0 : None, 1 : 0.0, 2 : 0.00, 3 : 0.000		⊙	P 9
8	Near zero	0	00000 to 99999	⊙		P21
9	Hysteresis (torque)	0	0000 to 9999	⊙		P21

Setting mode 1

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	HI limit (rotation speed)	99999	0 to 99999	⊙		P20
2	LO limit (rotation speed)	0	0 to 99999	⊙		P20
3	Alarm HI limit (rotation speed)	99999	0 to 99999	⊙		P21
4	Alarm LO limit (rotation speed)	0	0 to 99999	⊙		P21
5	Torque meter type	2	0 : UTM, 1 : UTM II, 2 : UTM III (4Pulses), 3 : UTM III (60Pulses), 4 : Undefined, 5 : UTM III (60Pulses·high speed),		⊙	P11
6	Min. scale division (rotation speed)	0	0 : 1, 1 : 2, 2 : 5, 3 : 10, 4 : 20, 5 : 50, 6 : 100		⊙	P11
7	Quick stop mode	1	0 : OFF, 1 : 2times, 2 : 4times, 3 : 8times	⊙		P12
8	Hysteresis (rotation speed)	0	0000 to 9999	⊙		P21
9	Minimum input rotation speed	0	0 : 15, 1 : 10, 2 : 5, 3 : 3, 4 : 2	⊙		P12

Setting mode 2

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	Power/Angle selection	0	0 : Power, 1:Angle		⊙	P14
2	Encoder pulse	3600	1 to 9999		⊙	P14
3	Unit (angle)	0	0 : deg, 1 : rad		⊙	P14
4	Direction	0	0 : NORMAL, 1 : REVERSE		⊙	P14
5	Min. scale division (angle)	3	0 : 0.1, 1 : 0.2, 2 : 0.5, 3 : 1, 4 : 2, 5 : 5, 6 : 10, 7 : 20, 8 : 50, 9 : 100		⊙	P15
6	Zero clear	550	1 to 550 (1 to 55)		⊙	P15
7	Undefined	0				
8	Low speed rotation mode	0	0 : OFF, 1 : ON		⊙	P13
9	Power setting	100				
	Min. scale division (power)		0 : 1 1 : 2 2 : 5 3 : 10			
	Decimal place (power)		0 : None 1 : 0.0 2 : 0.00 3 : 0.000		⊙	P15
	Unit (power)		0 : mW 1 : W 2 : kW 3 : PS 4 : HP			

Setting mode 3

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	Hold mode	0	0 : OFF, 1 : SAMPLE, 2 : PEAK, 3 : BOTTOM, 4 : P-P, 5 : AVERAGE, 6 : PEAK ANG1, 7 : PEAK ANG2	⊙		P22
2	Hold fix section	0	0 : All section, 1 : With section, 2 : LEVEL	⊙		P22
3	Undefined	0				
4	Start level	10	-99999 to 99999	⊙		P23
5	Stop level	0	-99999 to 99999	⊙		P23
6	HI/LO limit comparison mode	0000				
	Undefined		0			
	Comparison timing (rotation speed)		0 : ALL 1 : Interlocking with torque			
	Undefined		0		⊙	P20
	Comparison timing (torque)		0 : ALL 1 : MD 2 : NZ OFF 3 : MD+NZ OFF 4 : HOLD			
7	Motion detection	1.5-05	0.0 – 00 to 9.9 – 99	⊙		P18
8	Digital high-pass filter (torque)	0	0 : PASS, 1 to 1000Hz	⊙		P17

Setting mode 4

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	Setting value LOCK	0	0 : OFF, 1 : ON			P61
2	Calibration value LOCK	0	0 : OFF, 1 : ON			P 8
3	Key invalid	111				P61
	Display switching key		0 : Invalid 1 : Valid			
	ZERO key		0 : Invalid 1 : Valid			
	HOLD key		0 : Invalid 1 : Valid			
4	Display update rate	4	0 : Once/sec, 1 : 3times/sec, 2 : 6times/sec, 3 : 13times/sec, 4 : 25times/sec	⊙		P17
5	Visibility	1	0 : OFF, 1 : 0.5s, 2 : 1.0s, 3 : 2.0s	⊙		P17
6	Digital low-pass filter (torque)	100	0 : PASS, 1 to 1000Hz	⊙		P17
7	Moving average filter (torque)	0	0 : OFF, 2 to 999	⊙		P18
8	Moving average filter (rotation speed)	0	0 : OFF, 2 to 999	⊙		P18
9	Moving average filter (angle)	0	0 : OFF, 2 to 999	⊙		P18

Setting mode 5

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	Input selection	0	0 : Digital zero(torque), 1 : HOLD, 2 : HOLD Reset, 3 : Digital zero(angle), 4 : Digital zero (torque•angle)	⊙		P37
2	Output selection 1	<u>00</u> └─	00 : HI (torque) 01 : OK (torque) 02 : LO (torque) 03 : ALM HI (torque) 04 : ALM LO (torque) 05 : NZ (torque) 06 : HI (rotation speed) 07 : OK (rotation speed) 08 : LO (rotation speed) 09 : ALM HI (rotation speed) 10 : ALM LO (rotation speed) 11 : HOLD 12 : DZ_OK (response) 13 : RUN	⊙		P37
3	Output selection 2	<u>02</u> └─	00 : HI (torque) 01 : OK (torque) 02 : LO (torque) 03 : ALM HI (torque) 04 : ALM LO (torque) 05 : NZ (torque) 06 : HI (rotation speed) 07 : OK (rotation speed) 08 : LO (rotation speed) 09 : ALM HI (rotation speed) 10 : ALM LO (rotation speed) 11 : HOLD 12 : DZ_OK (response) 13 : RUN	⊙		P37
4	Input OFF detection wait time	0.01	0.00 to 9.99	⊙		P37
5	Transmission delay time	00	00 to 99	⊙		P45

Setting mode 6

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	RS-485 communication mode	100				P44
	Transmission data selection		0 : Format1 1 : Format2 2 : Format3 3 : Format4 4 : Format5 5 : Format6	⊙		
	Communication mode selection		0 : Command(UTM) 1 : RS-485 display mode 2 : Command(UNI-Format) 3 : Auto 4 : Continuous 5 : Modbus-RTU			
	RS-485 termination resistor		0 : OFF, 1 : ON			
2	RS-485 I/F setting	51000				P44
	Delimiter (For UNI-Format)		0 : CR 1 : CR+LF			
	Stop bit		0 : 1bit 1 : 2bit			
	Parity bit		0 : None 1 : Odd 2 : Even	⊙		
	Character length		0 : 7bit 1 : 8bit			
	Baud rate		0 : 9600bps 1 : 19200bps 2 : 38400bps 3 : 57600bps 4 : 115.2Kbps 5 : 230.4Kbps			
3	RS-485 ID	01	00 to 31	⊙		P44
4	RS-485 dedicated rated capacity	100.00	00000 to 99999	⊙		P45
5	Read setting value	0	0 : Cancel, 1 : Digital filter (torque), 2 : Moving average filter (rotation speed), 3 : Minimum display rotation speed			P45
6	Digital filter (torque)	0	0 : 1, 1 : 3, 2 : 10, 3 : 30, 4 : 100, 5 : 300, 6 : 1k, 7 : PASS			P45
7	Moving average filter(rotation speed)	0	0 : OFF, 1 : 3, 2 : 4, 3 : 8, 4 : 16, 5 : 32			P45
8	Minimum display rotation speed	00	00 to 99			P46
9	Operation instruction	0	0 : None, 1 : Digital zero, 2 : Digital zero reset			P46

Setting mode 7

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	Output data selection	000		◎		P40
	Data selection1 (torque)		0 : Hold synchronized 1 : Hold not synchronized			
	Data selection 2 (rotation speed)		0 : Hold synchronized 1 : Hold not synchronized			
	Data selection 3 (power/angle)		0 : Hold synchronized 1 : Hold not synchronized			
2	Zero scale value1(torque)	0	-99999 to 99999		◎	P41
3	Full scale value1(torque)	10000	-99999 to 99999		◎	P41
4	Zero scale value2(rotation speed)	0	-99999 to 99999		◎	P41
5	Full scale value2(rotation speed)	10000	-99999 to 99999		◎	P41
6	Zero scale value3(power/angle)	0	-550 to 550 (When number of rotations is set)	◎		P41
			-9999 to 9999 (When pulse rate is set)			
			-99999~99999 (When power is set)			
7	Full scale value3(power/angle)	10000	-550 to 550 (When number of rotations is set)	◎		P41
			-9999 to 9999 (When pulse rate is set)			
			-99999~99999 (When power is set)			
8	Angle analog output select	0	0 : Number of rotations, 1 : Pulse rate	◎		P41

Setting mode 8

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	Zero scale adjustment (torque)(※)	0	-5461 to 5461		◎	P41
2	Full scale adjustment (torque)(※)	0	-5461 to 5461		◎	P41
3	Zero scale adjustment (rotation speed)(※)	0	-5461 to 5461		◎	P41
4	Full scale adjustment (rotation speed)(※)	0	-5461 to 5461		◎	P41
5	Zero scale adjustment (power/angle)(※)	0	-5461 to 5461		◎	P41
6	Full scale adjustment (power/angle)(※)	0	-5461 to 5461		◎	P41

※Adj key

Setting mode 9

Setting item	Name	Initial value	Setting range	LOCK		PAGE
				1	2	
1	Zero calibration	0			⊙	P10
2	Actual load calibration	100.00	-99999 to 99999		⊙	P10
3	Equivalent input calibration	100.00	1 to 99999		⊙	P10
4						
5						
6	Supported device display	---	Ut3			
7	Version display	***				
8	Checksum display	****				
9	Password	0000				

※LOCK1 → Setting value LOCK

LOCK2 → Calibration value LOCK

14 Specifications

14-1. Analog section

<u>Voltage input for torque</u>	
Signal input range	-10 to +10V (UTMⅢ) Input impedance : 1MΩ or more - 5 to +5V (UTMⅡ/UTMV) Input impedance : 1MΩ or more
Accuracy	Non-linearity within 0.02%FS ±1digit Zero drift within 0.2mV/°C RTI Gain drift within 0.01%/°C
Filter	Digital low-pass filter OFF, 1 to 1000Hz Digital high-pass filter OFF, 1 to 1000Hz *Only one of low-pass filter and high-pass filter can be enabled. (Can be switched by setting) Moving average filter OFF, 2 to 999times
A/D converter	Rate 16000times/sec Resolution 24bit(binary) Approx. 1/30000 against 10V
<u>Pulse input for rotation speed (open collector input/UTMⅡ/UTMV/UTMⅢ)</u>	
Max.rotation speed	Depend on UTMⅡ/UTMV/UTMⅢ
Min.rotation speed	Selectable from 15, 10, 5, 3, 2 rpm (when pulse rate is 4 ppr) Selectable from 60, 40, 20, 12, 8 rpm (when pulse rate is 1 ppr)
Min.pulse width	50μs
Circuit configuration	No-voltage contact input (minus common) Connectable to open collector (Ic = Approx. 10mA)
<u>Encoder input (open collector input/UTMⅡ/UTMV/UTMⅢ)</u>	
Max.frequency	Depend on UTMⅡ/UTMV/UTMⅢ
Circuit configuration	No-voltage contact input (minus common) Connectable to open collector (Ic = Approx. 10mA)

14-2. Display section

Display unit	Character height : 8mm Numerical display by 7-segment green LED
Display range	5digits (torque -99999 to 99999), (rotation speed 0 to 99999) (power -99999 to 99999) 6digits (angle -199999 to 199999)
Min. scale division (torque)	Selectable from 1, 2, 5, 10, 20, 50, 100
Decimal point (torque)	Selectable from 0, 0.0, 0.00, 0.000
Min. scale division (rotation speed)	Selectable from 1, 2, 5, 10, 20, 50, 100
Decimal point (rotation speed)	0 (For "Low speed rotation mode = ON" : 0.0)
Min. scale division (angle)	1, 2, 5, 10, 20, 50, 100 (Unit setting : rad) 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100 (Unit setting : deg)
Min. scale division (power)	Selectable from 1, 2, 5, 10
Decimal point (power)	Selectable from 0, 0.0, 0.00, 0.000

14-3. Settings section

Setting procedure	Settings made using four tact switches Settings can also be made using an interface (RS-485, USB)
Saving of setting values	Initial setting values saved in NOVRAM (non-volatile memory) Other settings saved in F-RAM (non-volatile memory)
Setting value protection	Protection possible through locking software

14-4. External signal input/output

Compatible plug	20020000-C101B01LF (10pin), 20020000-C131B01LF (13pin) (manufactured by FCI)
Input signal (1 point)	Each control input can be selected through settings Contact (relays, switches etc.) or non-contact (transistors, photo-couplers etc.)
Output signal (2 points)	Each control output can be selected through settings Open collector output for transistors ($V_{ceo} = 30\text{ V}$, $I_c = 50\text{ mA}$)

14-5. Interface

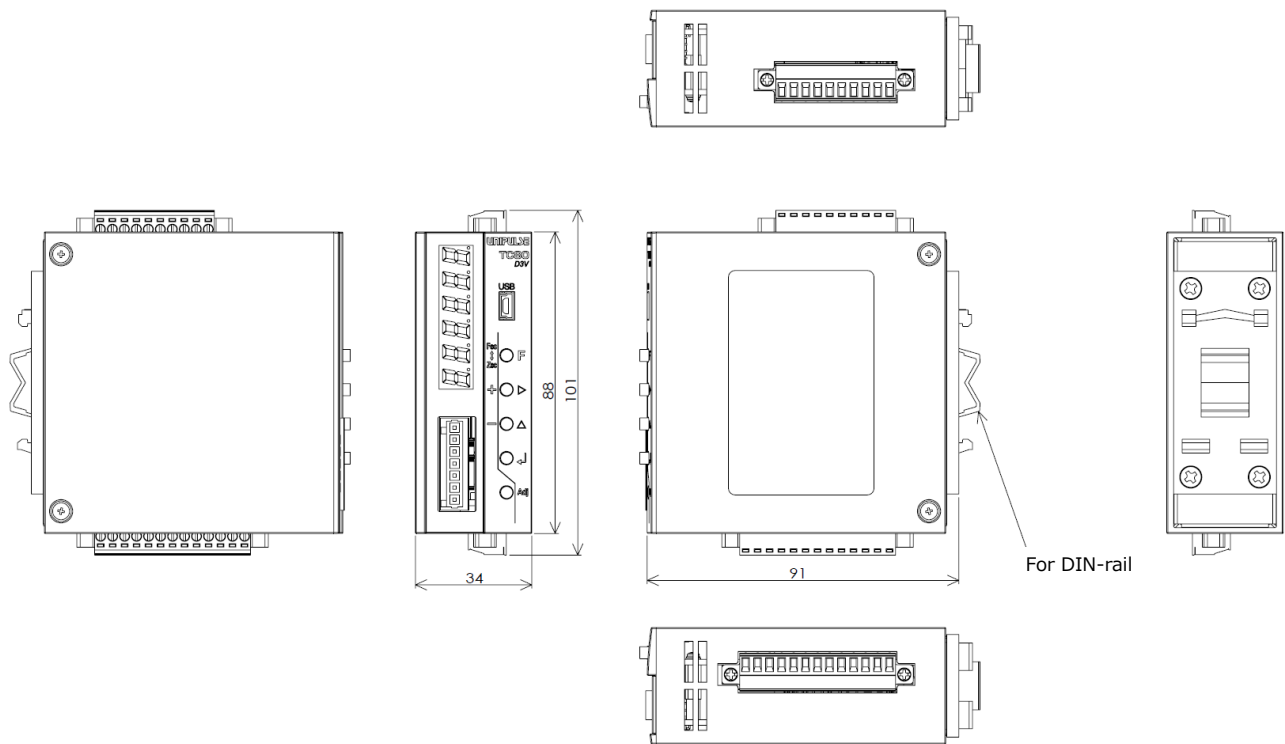
D/A converter interface (3ch) (D3V) * Specifications are common to each channel	
Output range	-10V to 10V
Load resistance	2k Ω or more
D/A conversion rate	8000 times/sec
Resolution	1/10000
Zero•Span adjustment range	Approx. $\pm 8\%$ FS
Non-linearity	$\pm 0.05\%$ FS
Output data	ch1 : Torque ch2 : Rotation speed ch3 : Either power or angle (Select in settings)

RS-485 communication interface	
Signal level	RS-485 compliant
Transmitting distance	Approx. 1 km
Transmitting method	Asynchronous, half duplex
Transmitting speed	Selectable from 9600, 19200, 38400, 57600, 115.2k, 230.4k *When Modbus-RTU is selected, up to 115.2k
Bit configuration	Start bit 1bit Character length Selectable from 7 or 8bit Stop bit Selectable from 1 or 2bit Parity bit Selectable from none, odd or even
Transmitting mode	Hand shake / Continuous / Auto
Code	ASCII (for UNI-Format) Binary(for Modbus-RTU)

14-6. General performance

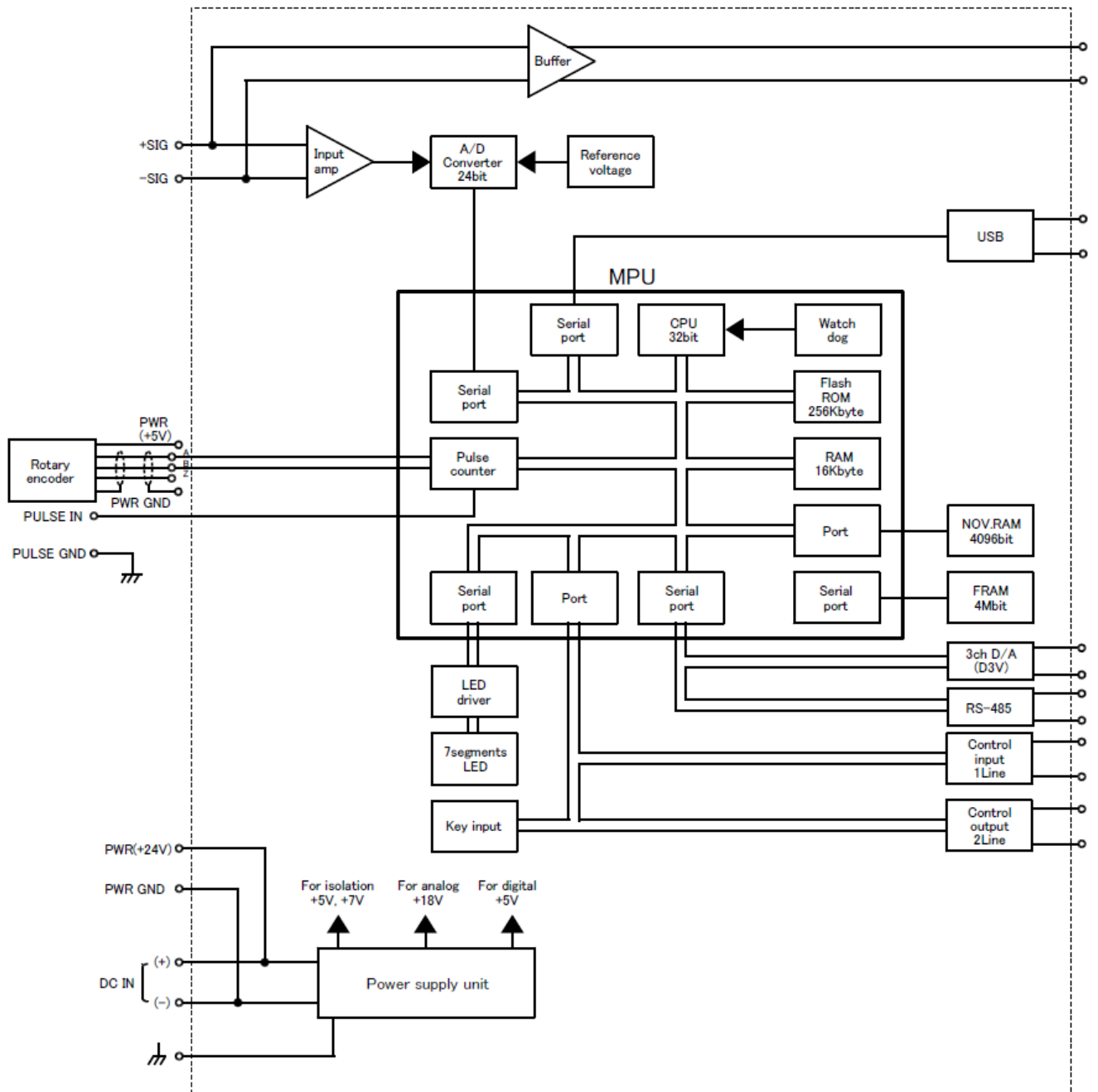
Power supply voltage	DC24V ($\pm 15\%$)
Power consumption	6W
Operating conditions	Temperatures temperature range -10 to 50 °C Storage temperature range -20 to 85 °C Humidity 85%RH or below (no condensation)
External dimensions	34 (W) \times 88 (H) \times 91 (D) mm (* not including protruding sections)
Weight	Approx. 230 g

14-7. External dimensions



Unit:mm

14-8. Block diagram



14-9. Compliance with EC directives

■ The TC80 is compliant with EC Directives (based on Council of the European Union) and CE-marked.

-EMC Directive EN61326-1:2013

EN55011:2009, A1:2010 Group1, ClassA

EN61000-4-2:2009

EN61000-4-3:2006, A1:2008, A2:2010


EN61000-4-4:2012

EN61000-4-5:2006

EN61000-4-6:2009

EN61000-4-8:2010

The following precautions should be taken for installation.

1. Since TC80 is defined as an open type (built-in device), it should be used to install and fix to a panel, etc.
2. Use shielded cable for connections other than power supply (UTM, encoder, external input/output, D3V).
3. Be sure to ground the frame ground terminal().

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