

CHECK MAN

Instruction manual

Ver.1.08

CM-8 Series



FUJI CONTROLS CO., LTD.

1-5-6, Iidabashi, Chiyoda-ku, Tokyo 102-0072

Website : <https://www.fujicon.net>

INTRODUCTION

Thank you for purchasing our CHECKMAN the CM-8 series.

This manual describes the functions, instructions on installing and wiring, operations etc.

Before using this product, please read this manual carefully and use the product correctly.

NOTES

- This manual is subject to change without notice for improvements of the product.
- Keep this manual with close reach of persons who use this product to provide for future use.

Table of contents

If you read this manual on a pc, you can jump to linked destination by clicking characters in blue.

1. PRECAUTIONS FOR USE	7
1-1. ENVIRONMENTS AND CONDITIONS OF USE	7
1-2. INSTALLATION AND CONNECTION	7
1-3. CHECKING BEFORE USE	8
1-4. CHECKING FOR ABNORMALITIES	8
1-5. MAINTENANCE AND INSPECTION	8
1-6. DISPOSAL OF THIS PRODUCT	8
2. WARRANTY.....	8
2-1. TERM OF WARRANTY	8
2-2. WARRANTY RANGE	8
2-3. LIMITATION OF LIABILITY	8
3. BEFORE USING THE PRODUCT	9
3-1. MODEL CODES	9
4. MOUNTING METHOD.....	10
4-1. EXTERNAL FORM DIMENSIONS	10
5. CONNECTING TERMINALS.....	11
5-1. WIRING TO TERMINALS.....	11
■ WIRING TO SCREWLESS TERMINALS	11
■ THE LOCATION OF EACH TERMINAL STAND	11
5-2. CONNECTION FOR LOWER ROW TERMINALS	12
■ COMPARATIVE OUTPUT(relay)/EXTERNAL CONTROL INPUT.....	12
5-3. CONNECTION FOR MIDDLE ROW TERMINALS	13
■ ANALOG OUTPUT	13
■ BCD OUTPUT (Option)	13
■ RS-232C MODBUS RTU (Option)	14
■ RS-485 MODBUS RTU (Option).....	14
6. NAMES OF EACH PART	15
6-1. NAMES OF EACH PART	15
6-2. EXPLANATION OF ICONS	16
■ DISPLAY ICONS ON THE MEASUREMENT DISPLAY	16
■ KEY OPERATION ICONS ON THE SETTING DISPLAY	16
7. MODES OF OPERATION	17
7-1. OPERATION ON MEASUREMENT DISPLAY	17
7-2. OPERATION ON SETTING	18
7-3. MEASUREMENT MODE SWITCHING	19
■ INPUT SETTING DISPLAYS ON EACH MEASUREMENT MODE	19
CORRESPONDENCE OF EACH MODE AND FUNCTION.....	20
7-4. OPERATION PATTERN SWITCHING	21
8. INPUT ADVANCED SETTING	22
8-1. PATTERNSELECT.....	22
8-2. STRAININPUT	22
■ AnalogFilter	22
■ SamplingRate	22
■ MoveAve	22
■ TrackingZero.....	23
■ DispLimit.....	23

■ DispLoCut	23
■ StableArea	23
■ StableTime	23
9. EXTERNAL CONTROL INPUT SETTING	24
9-1. OVERVIEW	24
■ External control function list.....	24
■ Terminal control	25
9-2. DETAILS OF FUNCTIONS	25
■ CompareReset(Default / WaveCompare /Multi mode only)	25
■ DispHold(Default mode only).....	25
■ MaxHold(Default mode only)	26
■ AmpHold(Default mode only)	26
■ HoldReset(Default / Multi mode only).....	27
■ DigitalZero(Default / WaveCompare mode only).....	27
■ PatternChange	27
■ WaveCompare(WaveCompare mode only).....	28
■ MultiHold(Multi mode only)	28
■ ResetSignal (Multi mode only)	28
■ ResetSignal (CM-5 mode only)	28
■ END Signal (CM-5 mode only)	28
9-3. HOLD	29
■ DispHoldMode(Applies only to the “DispHold” function).....	29
■ HoldOffDelay(Applies only to the “MaxHold”, “AmpHold” function).....	29
■ HoldMode(Applies only to the “DispHold” function).....	29
10. OUTPUT ADVANCED SETTING.....	30
10-1. COMPAREAL1~4.....	30
■ Act Condition (Defalut mode only)	30
10-2. COMPARISON OUTPUT FUNCTION.....	30
■ CompareMode(Defalut mode only)	31
■ Act Condition (Defalut mode only)	31
■ OnConditions(Defalut mode only).....	31
■ Threshold(Defalut mode only)	31
■ OutputMode(Defalut mode only)	32
■ OutputLogic	32
■ OnBgColors(Default / WaveCompare / CM-5mode only).....	32
10-3. ANALOG OUTPUT	33
■ OutputRange	33
■ OutputScale.....	33
10-4. BCD OUTPUT.....	33
■ DataSignalLogic	33
■ SynSignalLogic	33
10-5. RS-485 MODBUS RTU COMMUNICATION	34
■ SlaveAddress.....	34
■ Baudrate	34
■ Parity	34
10-6. RS-232C MODBUS RTU COMMUNICATION	34
■ Protocol	34
■ Baudrate	34
■ Parity	34
11. SHORTCUT	35
11-1. OVERVIEW	35
11-2. HOW TO REGIST.....	35
11-3. HOW TO EXECUTE	35
11-4. CONTROL FUNCTION LIST	36
12. DISPLAY SETTINGS	37
12-1. DISPLAY SELECT	37
■ Measurement display select	37

12-2. TRENDISP(DEFAULT / CM-5 MODE ONLY).....	37
■ DispValue Scale(Default / CM-5 mode only).....	38
■ AlarmSelect(Default mode only).....	38
■ TimeAxis(Default / CM-5 mode only)	38
13. SYSTEM SETTINGS.....	39
13-1. GENERAL	39
■ Brightness	39
■ PowerSavingTime.....	39
■ MeasureMode.....	39
■ D-ZeroRetention(Default / WaveCompare mode only).....	39
■ Language	39
■ DisplayDirection.....	40
■ SettingProtect	40
■ AdjustProtect.....	40
■ DisplayUpdateCycle	40
■ PatternCopy	41
■ SoftVersion	41
13-2. INITIALIZE.....	41
■ UserDefaultSave.....	41
■ UserDefaultLoad	41
■ FactoryDefaultLoad	41
14. DIAGNOSIS.....	42
14-1. INPUTDIAG.....	42
■ Strain Input	42
■ ExternalCtrl.....	42
14-2. OUTPUTTEST.....	42
■ CompareAL1 ~ AL4 (HI / GO / LO / Unique Output (set load arrival output) in CM-5 mode).....	42
■ GO JudgeOutput(Default / WaveCompare / Multi mode only)	43
■ AnalogOutput.....	43
■ BCD Output(DATA)	43
■ BCD Output (PC)	43
■ RS-485 ModbusRTU.....	44
■ RS-232C ModbusRTU	44
15. WAVE COMPARE MODE	45
15-1. OVERVIEW	45
■ Screen description.....	46
15-2. CREATECOMPWAVE	47
15-3. HOW TO MEASURE OF WAVE COMPARISON	49
15-4. WAVELOG.....	50
15-5. SETTINGS	50
■ StartCondition	50
■ Threshold.....	50
■ ThresholdOnDir.....	51
■ ThresholdTimeout.....	51
■ StartPosition	51
■ RefWaveCapture.....	51
■ CompWavePos	51
■ CreateCompWave	51
■ AutoScale	52
■ Scale.....	52
■ CompleteOutput	52
■ WaveSelect.....	52
■ Overwrite	52
■ OK/NG Wave View.....	52
■ OK/NG Wave Erase	52
16. MULTI HOLD MODE	53
16-1. OVERVIEW	53

■ Screen description.....	54
■ Multi hold icon	55
16-2. SECTION SWITCH.....	55
■ Level method	55
■ Edge method (initial value)	56
■ EdgeTimer	56
■ AutoTimer.....	57
■ HoldReset	57
■ Change number of section	57
16-3. HOLDSTARTCOND.....	58
■ Normal	58
■ Threshold.....	59
■ DelayTimer	59
16-4. COMPARISON JUDGEMENT	60
■ CompTiming	60
■ CompJudgementValue.....	60
■ CompAlarmCond.....	60
■ CompOutput.....	60
16-5. HOLD TYPE.....	61
■ Peak hold (initial value)	61
■ Amplitude hold.....	61
■ Maximal hold	62
■ Minimal hold.....	63
■ Difference hold.....	64
■ Inflection hold	65
16-6. HOW TO MEASURE OF MULTI HOLD FUNCTION	67
16-7. SETTING ITEMS	68
■ SectionSwitch.....	68
■ SectionTimerS1/S2/S3/S4.....	69
■ CompleteOutput	69
■ UniqueThreshold	69
■ UniqueOutput.....	69
■ AlarmColorS1~S4.....	69
■ Scale.....	69
■ TimeAxis	69
■ StartCondition	70
■ Threshold	70
■ Threshold Dir	70
■ ThresholdTimeout.....	70
■ TimeoutOutput	70
■ DelayTimer	70
■ HoldType	71
■ DifValue	71
■ DifMag	71
■ InfTimeA	71
■ InfTimeB	71
■ InfValueZ	72
■ CompOutput.....	72
■ CompAlarmCond.....	72
■ CompJudgeValue	72
■ CompTiming	72
■ NotDetected	72
■ MultiSelect.....	72
17. CM-5 MODE	73
17-1. OVERVIEW	73
■ Screen Description.....	74
■ CM-5 mode specific function.....	74
17-2. OPERATION SEQUENCE.....	75
■ HoldSelect: Instant ActCondition: OnHold.....	75
■ HoldSelect: Instant ActCondition: Always	76
■ HoldSelect: Peak ActCondition: OnHold.....	77

■ HoldSelect: Peak ActCondition: Always	78
■ UniqueOutput	79
17-3. SETTING ITEMS	79
■ HoldSelect	79
■ Threshold	79
■ ActCondition	80
■ UniqueThreshold	80
■ OutputLogic	80
■ OnBgColors(GO)	80
■ OnBgColors(H/L)	80
18. SPECIFICATIONS	81
18-1. BASIC SPECIFICATIONS	81
18-2. INPUT SPECIFICATIONS	81
18-3. OUTPUT SPECIFICATIONS	81
19. TROUBLESHOOTING	84
19-1. ERROR MODE	84
■ Display on occurrence of an error	84
■ List of error codes and recovery procedures	84
19-2. PHENOMENA AND MEASURES	85
19-3. INQUIRIES (RETURN ADDRESS)	86
20. APPENDIX	87
20-1. KEY OPERATION REFERENCE CHART	87
20-2. SETTING VARIABLES(DEFAULT, ANALOG OUTPUT)	88
20-3. SETTING VARIABLES(CM-5 MODE, ANALOG OUTPUT)	90
20-4. SETTING VALUE ADDITION TABLE(BCD, RS-232C,RS-485)	91
20-5. SHORTCUT SETTING	91
20-6. BEHAVIOR OF COMPARISON JUDGEMENT	92
■ LevelJudge	92
■ ZoneJudge	96
20-7. DATA FORMAT OF JUDGEMENT WAVEFORM AND WAVE LOG	99

1. PRECAUTIONS FOR USE

1-1. ENVIRONMENTS AND CONDITIONS OF USE

Please do not use the product under the following circumstances. It might cause malfunctions and shortening the life.

- 1) Ambient temperature of out of -5 to 50°C
- 2) Ambient humidity of out of 35 to 85%, or freezing condensing
- 3) High dust or metallic powder level
(Storing in a dust-proof chassis and a countermeasure against heat dissipation are required.)
- 4) Environment of corrosive gas, salty air or oily smoke
- 5) Environment of much vibration or impact
- 6) Environment of rain or water drops (except the front panel)
- 7) Environment of strong electromagnetical field or much exogenous noise

RESTRICTION FOR USE

- **Do not use this product as a part of equipment which aimed at life maintenance of human bodies.**
- **Please avoid usages of this product which bring physical accident or property damage when it breaks down.**

We do not take any responsibility about the special damage, the indirect damage and the passivity damage that occurred due to this product under any circumstance.

1-2. INSTALLATION AND CONNECTION

- 1) Please read this manual carefully before setting and connecting, be performed by a person having a specialized technique.
- 2) Do not wire the power supply line, input signal lines and output signal lines near noise sources or relay drive lines.
- 3) Bundling or containing in a same duct with lines including noises might cause malfunctions.
- 4) This product works functionally normally right after power activation, but requires 30 minutes' warming to satisfy all performance requirements.

CAUTION

- 1) This product is a precision measuring instrument. Please be careful not to add the strong shock to this product by falls and so on.
- 2) Paying attention to the circuit diagram, connect wires to this product carefully. An inappropriate connection may cause troubles of the product, a fire or an electric shock.
- 3) Please avoid live line works. It may cause an electric shock, troubles or a burnout of the product by the short circuit or a fire.
- 4) The FG terminal must be connected to ground. The grounding should be Class D grounding (previous class 3 grounding). An inappropriate grounding may cause malfunctions of the product.
- 5) Please use wire which has appropriate specifications. Inappropriate wire may cause a fire because of heat generation.
- 6) Please use crimp terminals which meet specifications of wire. Otherwise, it may cause breaking of wire, poor contact and may bring into a malfunction of the product, a breakdown, a burnout, or a fire.
- 7) After tightening screws, confirm that the screws do not loosen. A looseness of screws may cause a malfunction of the product, a fire or an electric shock.
- 8) An excessive tightening of screws may damage terminals or screws. A poor tightening of screws may cause a malfunction of the product, a fire or an electric shock.
- 9) Attach a terminal block cover to the product. Otherwise it may cause an electric shock.
- 10) Never attempt to disassemble or modify this product. It may cause a breakdown, an electric shock or a fire.

1-3. CHECKING BEFORE USE

Please install this product under the environments and conditions of use which meet requirements.

If you find any damage to the product by the transportation or any problem, please contact to your dealer or our company directly.

1-4. CHECKING FOR ABNORMALITIES

If you find strange sound, smell, smoke, heat from this product, shut down the power immediately.

And check followings before considering a breakdown of the product.

- 1) Power is supplied correctly.
- 2) Wires are connected correctly.
- 3) Wires have no breaking.
- 4) Settings are configured correctly.

1-5. MAINTENANCE AND INSPECTION

For the stain on the surface of the product, wipe it off using soft cloth. For heavy stain, turning off the power, wipe off it using cloth wrung out of water. Do not use organic solvents such as benzene and thinner.

For a trouble-free and long use of this product, give inspections of followings periodically.

- 1) Whether the product has damage.
- 2) Whether the display has abnormality.
- 3) Whether the product give out strange sound, smell, heat.
- 4) Mounting and connections of terminals have no looseness, check under power off condition.

1-6. DISPOSAL OF THIS PRODUCT

When you dispose this product, treat as a general industrial waste.

2. WARRANTY

2-1. TERM OF WARRANTY

The term of a warranty of this product is one year after delivery.

2-2. WARRANTY RANGE

If any failures found to be the responsibility of our company occurs within the term of warranty, the product shall be offered a replacement or repaired by retuning to us at no cost.

However, in the case that the cause of the failure corresponds to the followings, it is excluded from the warranty range.

- 1) Failure caused by being used under inappropriate conditions, circumstances and handlings which are written in this manual.
- 2) Failure caused by unapproved modifications or repair of structure, performance and specifications etc. which are performed not by our company.
- 3) Failure caused not by this product.
- 4) Failure caused by reasons unpredictable by standards of science and technology at time of the shipment from our company.
- 5) Failure caused by any other reasons that are found not to be the responsibility of our company including natural disasters, human disasters and accidental forces.

In addition, this warranty is limited to this product as a component; any other damages provoked by failure or defect of this product are out of this warranty range.

2-3. LIMITATION OF LIABILITY

Our company is not responsible for any consequential damage caused by this product.

3. BEFORE USING THE PRODUCT

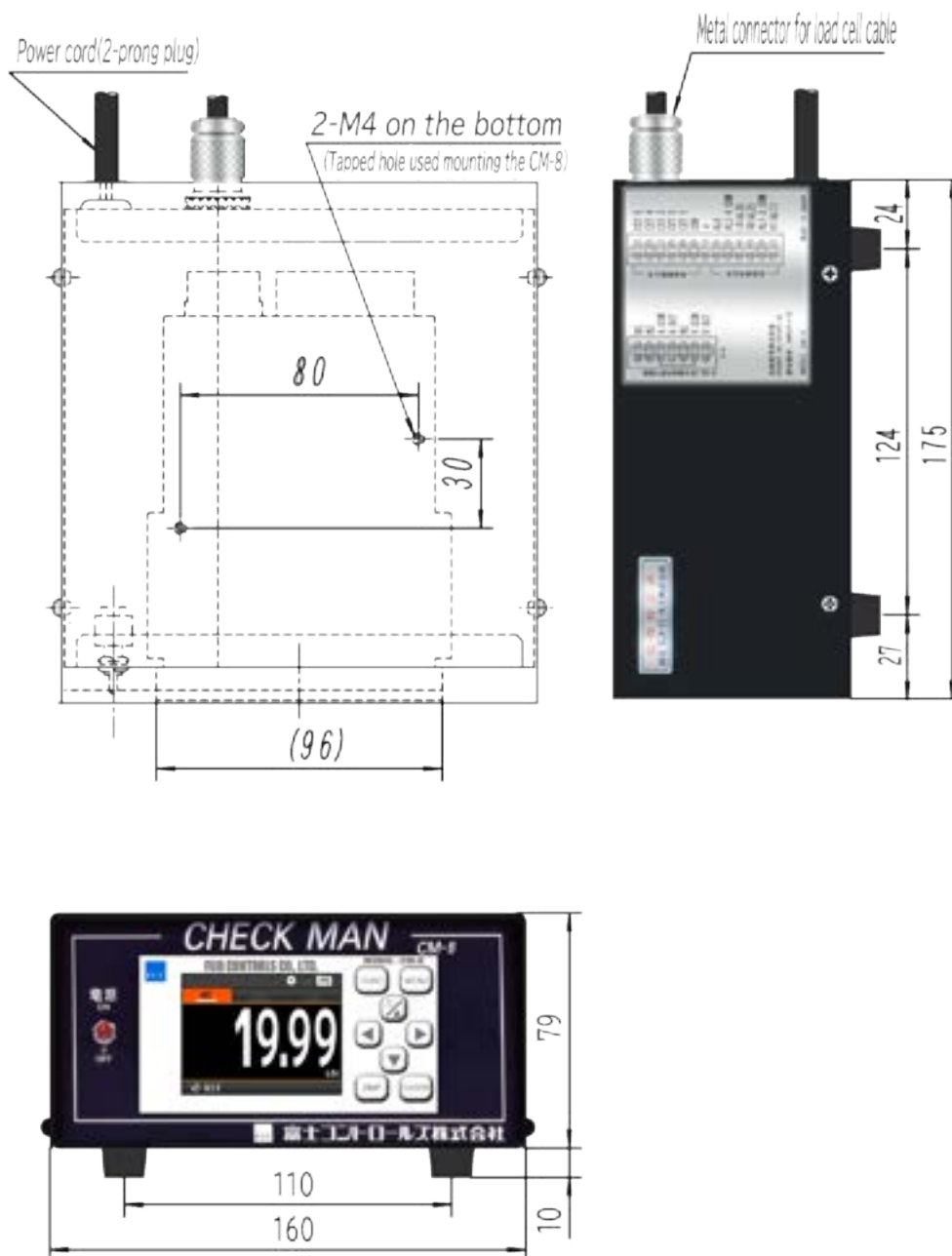
3-1. MODEL CODES

The model code of this product is shown as below. Check the product which has been delivered has a same model code you ordered.

Series name	Option	Description
CM-8	(None)	Analog output (standard equipment)
	-B	BCD output (open collector NPN)
	-2	RS-232C Modbus RTU
	-4	RS-485 Modbus RTU

4. MOUNTING METHOD

4-1. EXTERNAL FORM DIMENSIONS



CAUTION

- Prior to the installation of this product please read "1-1. ENVIRONMENTS AND CONDITIONS OF USE"
- In the case of installation or replacing of this product, please pay attention to the damage and accident by dropping.
- In the case of some wires are connected, do not install or replacing this product. It may cause shock, damage fire etc.

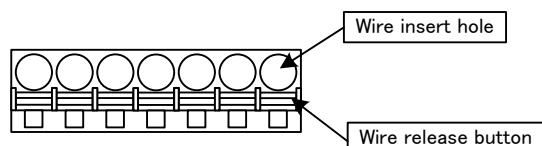
5. CONNECTING TERMINALS

5-1. WIRING TO TERMINALS

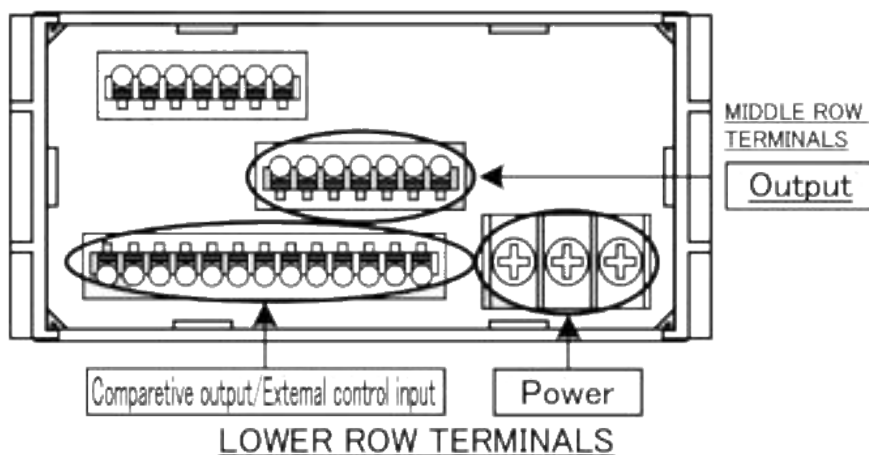
The connections to this product is connected to the screwless terminal block on the back side of the body. Show below for the method and precautions.

■ WIRING TO SCREWLESS TERMINALS

- ① Pushing the wire release button with a flat-blade screwdriver, open the wire insert hole.
(Flat-blade screwdriver: The point of a blade width 2.5mm)
- ② Wire is inserted in an expanded wire insertion hole and a flat-blade screwdriver is removed.
(Suitable wire:AWG24 to 16)



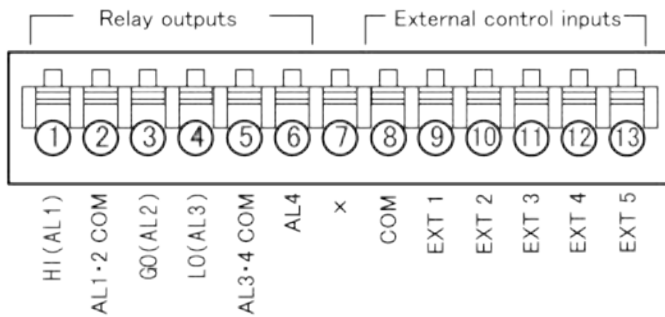
■ THE LOCATION OF EACH TERMINAL STAND



5-2. CONNECTION FOR LOWER ROW TERMINALS

■ COMPARATIVE OUTPUT(relay)/EXTERNAL CONTROL INPUT

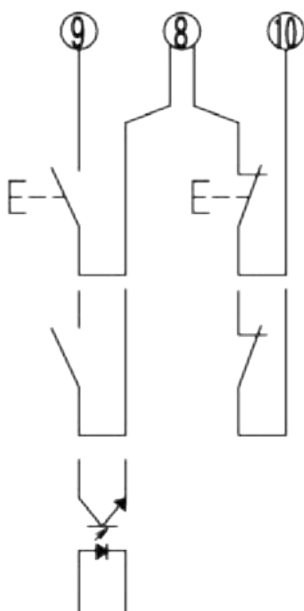
Screwless terminals



(Suitable wire:AWG24 to 16)

No.	Name	Description
1	HI(AL1)	HI(AL1) relay output
2	AL1•2 COM	Common terminal for outputs of AL1 and AL2
3	GO(AL2)	GO(AL2) relay output
4	LO(AL3)	LO(AL3) relay output
5	AL3•4 COM	Common terminal for outputs of AL3 and AL4
6	AL4	AL4 relay output
7	x	N.C. *1
8	COM	Common terminal for external control inputs
9	EXT CONTROL 1	External control input No.1
10	EXT CONTROL 2	External control input No.2
11	EXT CONTROL 3	External control input No.3
12	EXT CONTROL 4	External control input No.4
13	EXT CONTROL 5	External control input No.5

*1 Please do not wire to N.C. terminal.



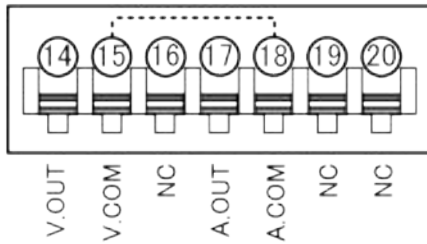
*Contact rating:AC250V 2A,DC30V 2A

5-3. CONNECTION FOR MIDDLE ROW TERMINALS

■ ANALOG OUTPUT

Screwless terminals

※15,18: connected internally



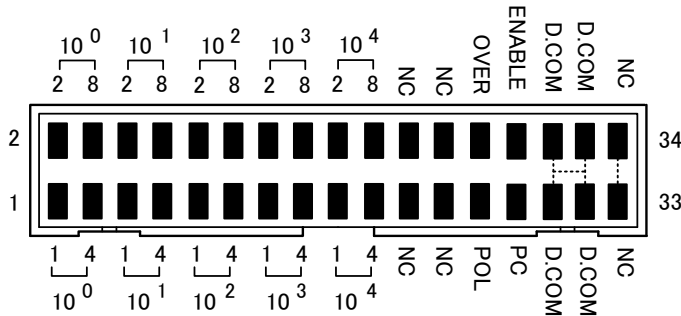
(Suitable wire:AWG24 to 16)

No.	Name	Description
14	V.OUT	Analog voltage output terminal (+)
15	V.COM	Analog voltage output terminal (-)
16	NC	No connection *Non-usable for a relay terminal
17	A.OUT	Analog current output terminal (+)
18	A.COM	Analog current output terminal (-)
19, 20	NC	No connection *Non-usable for a relay terminal

*1 “V.COM terminal” and “A.COM terminal” is connected internally and same voltage level.

■ BCD OUTPUT (Option)

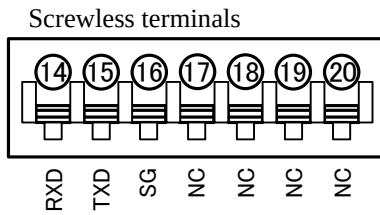
Crimp connector



Suitable wire : AWG#28 flat cable (7/0.127mm)

No.	Name	Description
1 to 4	10^0 1-8	Bit 1-8 of BCD 10^0 digit output terminals
5 to 8	10^1 1-8	Bit 1-8 of BCD 10^1 digit output terminals
9 to 12	10^2 1-8	Bit 1-8 of BCD 10^2 digit output terminals
13 to 16	10^3 1-8	Bit 1-8 of BCD 10^3 digit output terminals
17 to 20	10^4 1-8	Bit 1-8 of BCD 10^4 digit output terminals
21 to 24	NC	No connection *Non-usable for a relay terminal
25	POL	BCD polarity output terminal
26	OVER	BCD over output terminal
27	PC	BCD synchronous signal output terminal
28	ENABLE	BCD enable terminal
29 to 32	D.COM	Common terminal for BCD open collector NPN
33,34	NC	No connection *Non-usable for a relay terminal

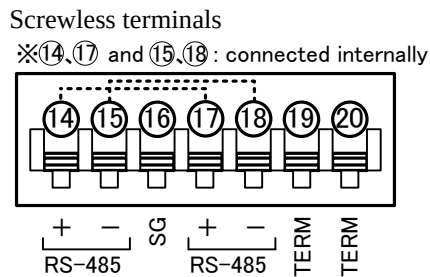
■ RS-232C MODBUS RTU (Option)



Suitable wire: AWG 24 to 16

No.	Name	Description
14	RXD	Receive data terminal
15	TXD	Transmit data terminal
16	SG	Common terminal for communication function
17 to 20	NC	No connection *Non-usable for a relay terminal

■ RS-485 MODBUS RTU (Option)



Suitable wire: AWG 24 to 16

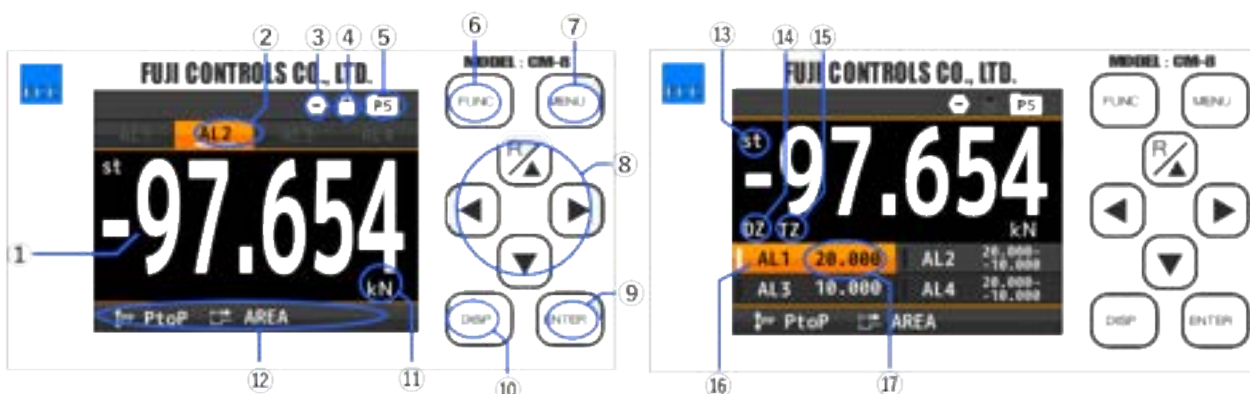
No.	Name	Description
14	+	Non-inverting signal
15	-	Inverting signal
16	SG	Signal ground
17	+	Non-inverting signal
18	-	Inverting signal
19, 20	TERM	Terminal resistance (120Ω) terminals * Short 33 and 34 to be enable the resistance.

* “14 terminal” and “17 terminal” is connected internally and same voltage level.

* “15 terminal” and “18 terminal” is connected internally and same voltage level.

6. NAMES OF EACH PART

6-1. NAMES OF EACH PART



*The measurement screen displayed depends on the measurement mode.

No.	Name	Function
①	Measured value display	Indicates display value.
②	Comparison result	Lights when the result of comparative output is ON.
③	Compare reset	Lights when the "CompareReset"function is ON.
④	Key lock	Lights when the key lock is effective.
⑤	Pattern	Indicates pattern No. in use.
⑥	FUNC key	Used for registering external control shortcut function.
⑦	MENU key	Used for moving to setting display and returning measurement display.
⑧	Cross keys	Used to move the cursor while setting and move other displays. *When the shortcut function is registered, the assigned function will be valid by holding down the Cross key (over 1 second).
⑨	ENTER key	Used to validate setting value.
⑩	DISP key	Used to switch measurement displays.
⑪	Display unit	Unit for 1st item display
⑫	Hold type	Indicate hold type by an icon. HOLD: DispHold MAX: MaxHold PtoP: AmpHold RST: HoldReset
	Hold mode	Indicate hold mode with icon. NORM: NormalHold AREA: AreaHold
⑬	st icon	Lights up during display value is stable. (Only when the "ActCondition" function is OnStable or OnStableExceptNearZero)
⑭	DZ icon	Lights up during digital zero operation.
⑮	TZ icon	Lights up during tracking zero operation.
⑯	Comparison result	Lights when the result of comparative output is ON.
⑰	Comparison judgement value	Displays comparison judgement value.

6-2. EXPLANATION OF ICONS

■ DISPLAY ICONS ON THE MEASUREMENT DISPLAY

Icon	Meanings
	Indicates comparative input reset function is effective.
	Indicates DispHold function is effective.
	Indicates MaxHold function is effective.
	Indicates AmpHold function is effective.
	Indicates HoldReset function is effective.

Icon	Meanings
	HoldMode/DispHoldMode is NormalHold/Normal.
	HoldMode/DispHoldMode is AreaHold/Normal.
	Indicates digital zero operation is effective.
	Indicates pattern No. in use.
	Indicates key lock function is effective.

* There are specific icons for multi hold mode, but they are not mentioned above. Please see the chapter on multi hold mode.

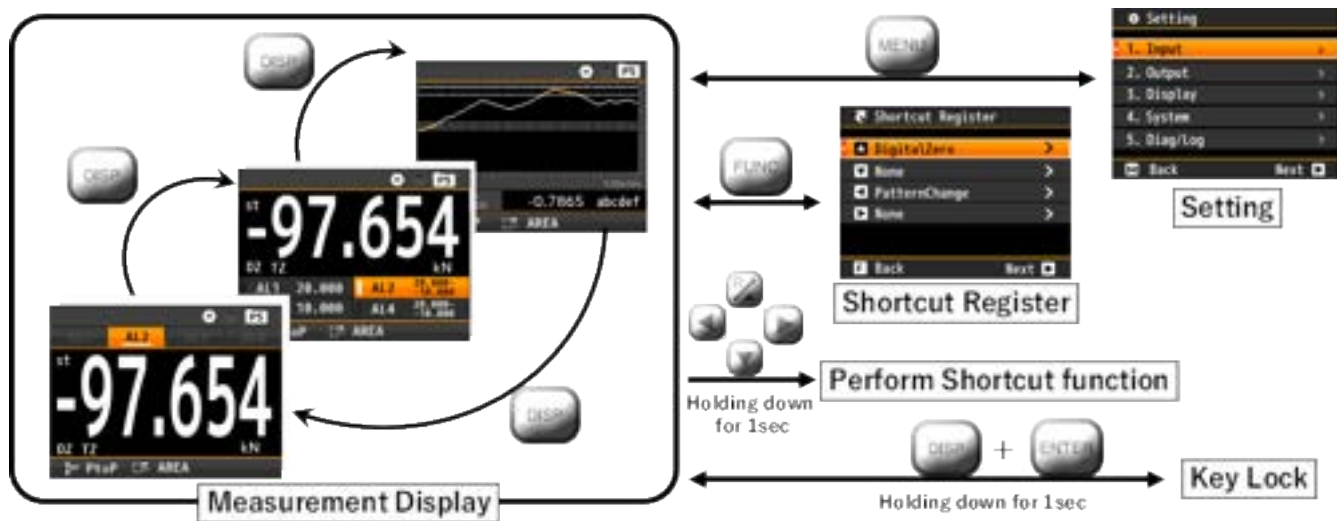
■ KEY OPERATION ICONS ON THE SETTING DISPLAY

Icon	Meanings	Icon	Meanings
	MENU Key		Cross key (LEFT)
	FUNC Key		Cross key (RIGHT)
	ENTER Key		Cross key (UP&DOWN)
	DISP key		Cross key (LEFT&RIGHT)
	Cross key (UP/RESET)		Cross key (ALL)
	Cross key (DOWN)		Pattern No. under setting

7. MODES OF OPERATION

7-1. OPERATION ON MEASUREMENT DISPLAY

The system starts up after power on, and works as shown below.



*The measurement screen displayed depends on the measurement mode.

【Measurement Display】

By pressing the DISP key, each measurement display including trend display is displayed in order.
The measurement displays to be displayed can be selected by "screen setting".

【Setting】

You can make various settings.

Press the "MENU" key to open the setting screen and press the "MENU" key again to return to the measurement display.

【Shortcut Register】

Register the shortcut function.

Press the "FUNC" key to open the Shortcut Register screen and press the "FUNC" key again to return to the measurement display.

【Perform Shortcut Register】

By holding down any of the four-way controller keys for 1sec, the shortcut function will be done.

* Shortcuts will not work if the same function is done via communication control or external control.

【Key Lock】

By holding down both "DISP" and "ENTER" keys for 1sec, the key lock function will be done.

If the key lock function is doing, the system will not accept any key operations except key lock.

* Since the measurement screen will change if the "DISP" key is pressed first, you should first press the "ENTER" key and then press the "DISP" key.

7-2. OPERATION ON SETTING

The setting procedure is shown below.



*Some setting value change numerical value or other value.

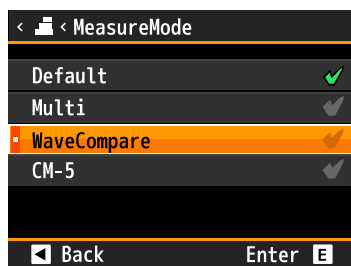
⚠ CAUTION

The timing at which the change of the set value is saved is the point when returning to the measurement screen from the setting screen.

Please keep in mind that setting change will not be saved if you turn off the power during setting screen.

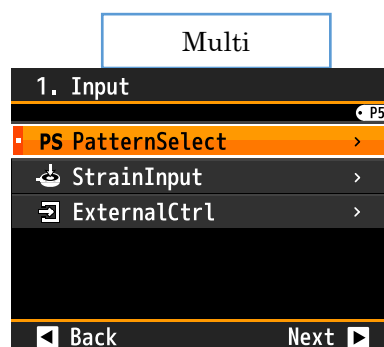
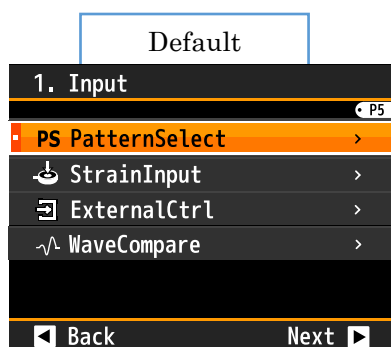
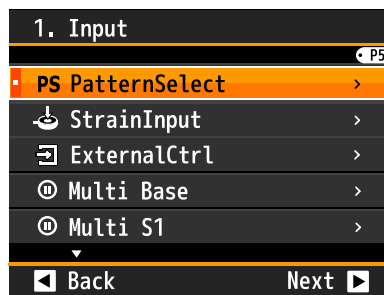
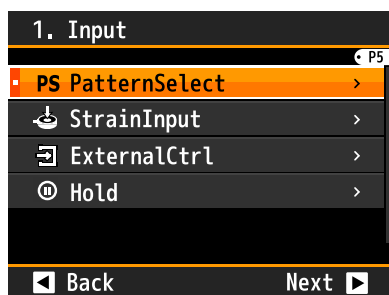
7-3. MEASUREMENT MODE SWITCHING

This system has “Multi mode”, “Wave Compare mode” and “CM-5 mode” besides “Default mode”. These modes are switched in “MeasureMode”. ([Setting]⇒[System]⇒[General]⇒[MeasureMode])



The input setting changes to a dedicate one for each mode after switching measurement mode. Please check a table on next page that shows correspondence of each mode and function.

■ INPUT SETTING DISPLAYS ON EACH MEASUREMENT MODE



【Multi】

Hold the inflection point and maximum / minimum points in the caulking process etc. for each specified section and make a judgment. Up to 4 sections can be specified for the section, and the judgment value can be set for each hold value. For details, see the chapter for “16.Multi Hold mode”.

【Wave Compare】

Input signal such as press fitting process is taken in as a waveform, and comparison judgment is carried out using judgment waveform. Unlike comparative judgment with a single value, good / bad judgment can be made for the whole process. For details, see the chapter for “15.Wave Compare mode”.

【CM-5】

For weight measurement, etc., GO is output when it is within the set range, and HI or LO is output when it is outside the set range.

You can monitor the current or maximum value, compare it to the set value, and hold the value by external control.

You can choose to perform the comparison all the time or hold it.

For details on the functions, see the section "17. CM-5 Mode".

CORRESPONDENCE OF EACH MODE AND FUNCTION

If you change measurement mode, settings of enable/disable of each functions switch automatically and disabled functions are disappeared. Correspondence table of each mode and function is below.

Functions		Default mode	Wave Compare mode	Multi Hold mode	CM-5 node
Input	Straingauge input	○	○	○	○
	External control function excluding hold	○	○	○	○
Hold functions	Normal hold function	○	×	×	×
	Multi hold function	×	×	○	×
	CM-5 hold function	×	×	×	○
Output	Analog output	○	○	○	○
	BCD output	○	○	○	○
	RS-485 communication	○	○	○	○
	RS232C communication	○	○	○	○
	Normal compare output	○	×	×	×
	Wave compare output	×	○	×	×
	Section comparison function in multi hold mode	×	×	○	×
	HI / GO / LO comparison judgement function	×	×	×	○
Display	Measurement value display	○	○	○	○
	Display with comparison judgement value	○	×	×	○
	Trend display	○	×	×	○
	Wave compare display	×	○	×	×
	Multi hold display	×	×	○	×
	Waveform log function	×	○	×	×

* You cannot change settings of disabled function by communication. (RS-485 and RS-232C Modbus RTU)

7-4. OPERATION PATTERN SWITCHING

With this instrument, each setting value can be stored and set in the operation pattern of the measurement screen up to 8 patterns. The operation pattern is switched as follows.

【Switching by external control terminals control】

Register "PatternChange1", "PatternChange2", and "PatternChange3" in the external control terminals, and perform pattern switching 1 to 3.

Depending on the combination, the pattern used for measurement can be switched from 1 to 8.

For details, see "PatternChange" function of section "9. EXTERNAL CONTROL INPUT SETTING".

【Switching with the shortcut function】

By registering the external control function "PatternChange" to one of the up, down, left, and right cross keys, you can switch the pattern used for measurement from 1 to 8 by key operation.

If any of "PatternChange1", "PatternChange2", and "PatternChange3" is registered in the external control terminals, the external control terminals have priority and the pattern cannot be switched by the shortcut.

For details, see the section "11. SHORTCUT".

【Switching from the setting screen】

Switch the pattern from [Input]⇒[PatternSelect] on the setting screen.

It will be reflected when you select a pattern in "PatternSelect" on the setting screen and return to the measurement screen.

* If any of "PatternChange1", "PatternChange2", and "PatternChange3" is registered in the external control terminal, the external control terminal has priority and the pattern cannot be switched from the setting screen.

【Switching from communication】

When the output option is RS-232C Modbus RTU or RS-485 Modbus RTU product, the pattern can be switched by communication.

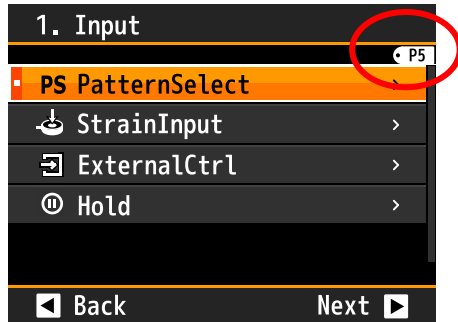
For details, please download and refer to "the Japanese version CM-8 Modbus Communication Instruction Manual".

8. INPUT ADVANCED SETTING

8-1. PatternSelect

You can store and set up 8 patterns (8 kinds) of various settings such as input and output with this unit, you can select the pattern to save the setting in "PatternSelect".

The pattern number being set is displayed as "P5" on the upper right of the setting screen as shown below.



Operation:[MENU]⇒[Input]⇒[PatternSelect]

Setting value:Pattern1,Pattern 2,.....Pattern 8

*At the time of opening the menu, the setting pattern is the value selected as operating on the measurement screen.

8-2. StrainInput

■ AnalogFilter

Select a low pass filter for removing high frequency noise of input signal.
Please set according to your environment.

Operation:[MENU]⇒[Input]⇒[StrainInput]⇒[AnalogFilter]

Setting value: OFF,30Hz,300Hz(Default),600Hz

*If this item is changed, measurement will be invalid for about 50 ms after back to measurement display.

■ SamplingRate

Select a sampling rate.

Operation:[MENU]⇒[Input]⇒[StrainInput]⇒[SamplingRate]

Setting value:4000sps (Default), 2000sps, 1000sps, 500sps, 200sps, 100sps, 50sps, 20sps, 10sps, 5sps, 2sps, 1sps

■ MoveAve

Select the number of moving average.

Operation:[MENU]⇒[Input]⇒[StrainInput]⇒[MoveAve]

Setting value: None, 2times, 4times, 8times, 16times, 32times(Default), 64times

■ TrackingZero

Tracking zero is a function that automatically corrects minute offset of display value over time. The judgment is made at each setting time, and if the display value is within $0 \pm \text{“ActiveArea”}$, offset correction is performed and the display value becomes 0. While the tracking zero function is in operation, the "TZ" mark will light.

* The tracking zero function operates only when the digital zero function operates, and it works automatically when the function is enabled and when the function of the digital zero function starts.

Operation:[MENU]⇒[Input]⇒[StrainInput]⇒[TrackingZero]

Setting value: Interval 0 to 9999[msec](Default is 0)

ActiveArea ±99999(Default is 0)

* If either of “Interval” or “ActiveArea” is 0, the tracking zero function is invalid.

* As the power is turned off, the offset value corrected by tracking zero becomes 0.

■ DispLimit

Set the upper and lower limits of the displayed value. Since the display value is limited, it is effective when you want to limit the output accordingly.

Example) When the analog output 0-10V is set for the display value 0-10000, by setting the upper limit of the display limit to 9000, the upper limit of the display value becomes 9000 and the analog output becomes the maximum 9V.

Operation : [MENU]⇒[Input]⇒[StrainInput]⇒[DispLimit]

Setting value : LowerLimit ±99999 (Default is -99999)

UpperLimit ±99999(Default is +99999)

■ DispLoCut

It is a function to cut floating input near zero. If the absolute value of the display value is less than the set value, the display value is set to zero.

Operation:[MENU]⇒[Input]⇒[StrainInput]⇒[DispLoCut]

Setting value: 0~99999 (Default is 0)

* Calculation processing of “DispLoCut” is performed after calculation processing of digital zero function.

■ StableArea

It judges whether the display value is stable or not and invalidates the comparison output function when it is not stable. If the variation of the display value at each specified time is within the set value, it is judged stable and the “st” mark will light.

It is effective when measuring the weight of the object caught with a crane when you want to make a comparison output function after the shake falls.

In this item, set the fluctuation range of the display value considered stable.

* Please set it together with “StableTime”. This function is invalid if either set value is 0.

Operation : [MENU]⇒[Input]⇒[StrainInput]⇒[StableArea]

Setting value : 0~99999 (Default is 0)

■ StableTime

Same function as “StableArea” and this item is a time parameter for detecting stability of display value.

* Please set it together with “StableArea”. This function is invalid if either set value is 0.

Operation : [MENU]⇒[Input]⇒[StrainInput]⇒[StableTime]

Setting value : 0~9999 * 10msec (Default is 0)

*You can set by 10ms steps.

9. EXTERNAL CONTROL INPUT SETTING

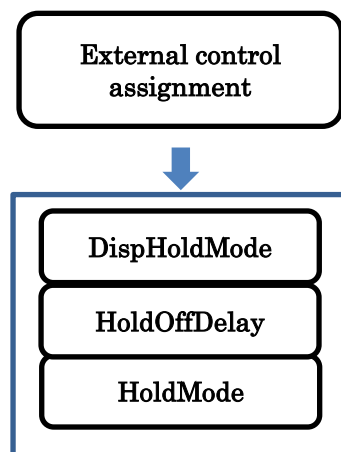
9-1. OVERVIEW

As the external control function, the functions of "CompareReset", "hold (various types of hold)", "HoldReset", "DigitalZero", "PatternChange1 to 3", "WaveCompare" start function, "MultiHold" start function, etc. These functions can be executed by assigning functions to external control terminals 1 to 5.

*In addition to terminal control, each external control can be assigned (registered) to 4 cross keys using the shortcut function, and the assigned shortcut function can be executed by pressing and holding the key for 1 second on the measurement screen.

Setting of external control function is proceed as follow.

Each setting items about external control assignment are set up at [Setting]⇒[Input]⇒[ExternalCtrl]⇒[ExtCtrl1Func], [ExtCtrl2Func], [ExtCtrl3Func], [ExtCtrl4Func], [ExtCtrl5Func], and about hold function are set up at [Setting]⇒[Input]⇒[Hold].



*Since external control assignment also includes pattern control, patterns cannot be registered.

【Setting for hold function】

*Set the items for hold function. If you do not use related holding function, you do not need to set it.

DispHoldMode: Used with "DispHold" function

HoldOffDelay: Used with "DispHold" function

HoldMode: Used in each holding function

* Each setting is saved and reflected at the timing of closing the menu and returning to the measurement screen. Please note that the contents will not be saved if the power is turned off before closing the menu.

■ External control function list

The list of functions that can be assigned to external control is as follows.

Details of each function and setting will be described on the following pages after this section.

Function	Operation
None	None
CompareReset	Function to turn off all comparison output function (Default / WaveCompare /Multi mode only)
DispHold	Function to hold display value (Default mode only)
MaxHold	Function to hold max value (Default mode only)
AmpHold	Function to hold difference between max and min (Default mode only)
HoldReset	Function to reset holding state (Default / Multi mode only)
DigitalZero	Function to zero display value as offset (Default / WaveCompare mode only)
PatternChange1/2/3	Function to switch operating pattern (Use 3 terminals max)
WaveCompare	Function to start/stop wave comparison function (WaveCompare mode only)
MultiHold	Function to control sections of multi hold function (Multi mode only)
ResetSignal	Controls ON / OFF of reset signal (Multi / CM-5 mode only)
END Signal	Controls ON / OFF of end signal (CM-5 mode only)

*Each fold function, "WaveCompare", "MultiHold", "ResetSignal", and "END Signal" are displayed only in the corresponding measurement mode.

- *If same function is assigned to some external control terminals, the function will operate regardless of which pin is used.
- *“DispHold” is independent of other holding functions.
- *When the function execution timings are simultaneous, it operates with the following priority order.
MaxHold > AmpHold

■ Terminal control

The control of assigned functions is performed by shorting each terminal to the com terminal or bringing to the “0” level

“0” level: 0 to 1.5V

“1” level: 3.5 to 5V

Input current: -1.2mA

* The control terminals 1 to 5 are isolated from Power and input as DC signals.

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

9-2. Details of functions

■ CompareReset(Default / WaveCompare /Multi mode only)

This function makes all of comparative judgement results and their outputs OFF.

When the measurement mode is "multi", operating the comparison reset forces the comparison result to be in an unconfirmed state.

The function becomes valid while the terminal which is assigned the function is shortened to the com terminal or brought to 0 level.

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

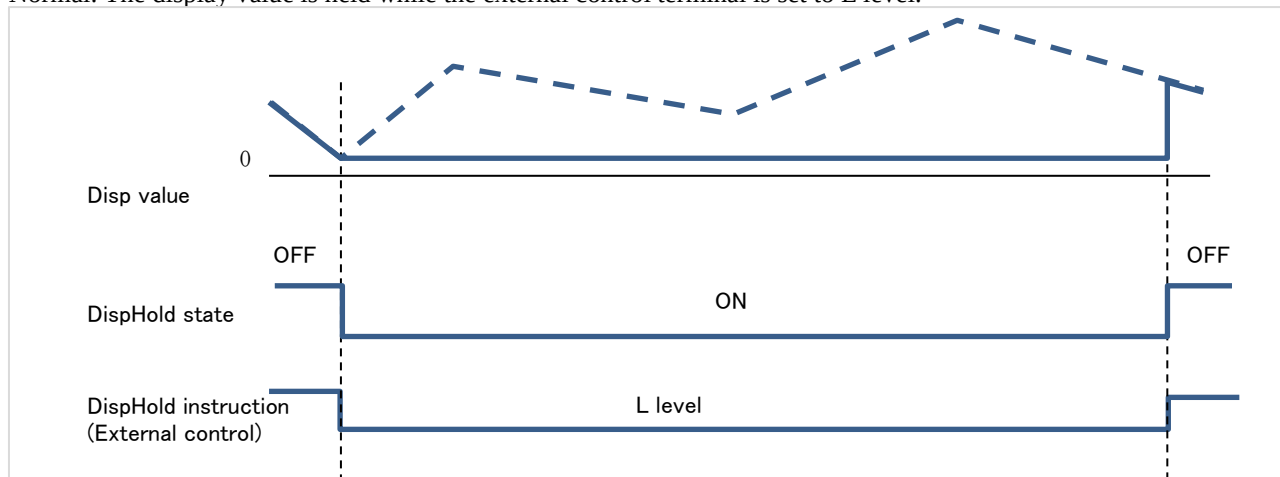
■ DispHold(Default mode only)

This function stops the display value update independently of other holding functions.

Measurement is continued internally during holding, and the latest display value including other holding operation such as maximum value holding is displayed at the time of release.

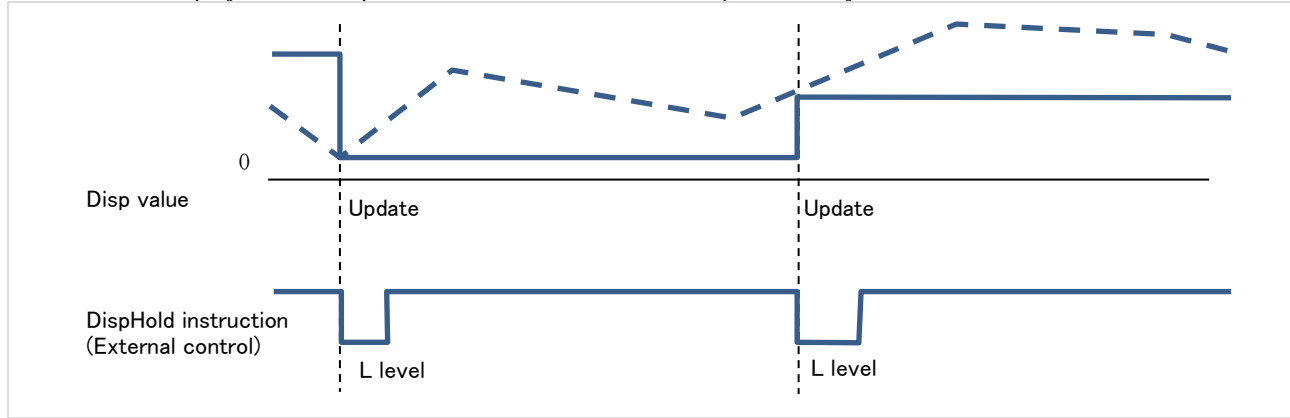
The function has two modes “Normal” and “OneShot”. You can change the mode with the “DispHoldMode”.

Normal: The display value is held while the external control terminal is set to L level.



*If "HoldOffDelay" is set, holding is canceled after the set time passed after the instruction is turned off.

OneShot: The display value is kept constant all the time, and it is updated every time the external control terminal falls.



*If "HoldOffDelay" is set, holding is canceled after the set time passed after the instruction is turned off.

*The operation of the current value retention function is not affected by the normal retention / interval retention setting in "retention mode".

■ MaxHold(Default mode only)

This function holds the maximum value of display value. There are two modes of "NormalHold" and "AreaHold", and the mode can be changed by the "HoldMode".

NormalHold: As long as the external control terminal is set to the L level, the display continues to be updated with the maximum value. By setting the pin to H level, holding is canceled and the latest display value is displayed.

AreaHold: As long as the external control terminal is set to the L level, the display continues to be updated with the maximum value. When the terminal is set to H level, it keeps holding at the maximum value at that point.

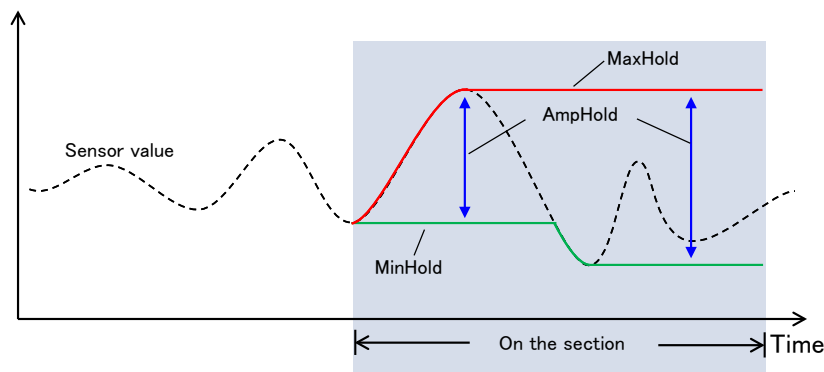
* When the display value becomes OVER during control of the maximum value holding function, the OVER display will not disappear unless control is canceled once.

* This is the operation when the input logic is "ON when short-circuited".

If "OFF when short-circuited" is set in the settings, the operation is reversed.

■ AmpHold(Default mode only)

This function holds the difference between maximum and minimum value.



There are two modes of "NormalHold" and "AreaHold", and the mode can be changed by the "HoldMode".

NormalHold: As long as the external control terminal is set to the L level, the display continues to be updated with the peak to peak value. By setting the pin to H level, holding is canceled and the latest display value is displayed.

AreaHold: As long as the external control terminal is set to the L level, the display continues to be updated with the peak to peak value. When the terminal is set to H level, it keeps holding at the peak to peak value at that point.

* When the display value becomes OVER during control of the peak to peak value holding function, the OVER display will not disappear unless control is canceled once.

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

■ HoldReset(Default / Multi mode only)

This is a function to cancel all holding state and display the latest display value during function ON.

In addition, when the measurement mode is “Multi”, if holding reset is executed during operation of sections 1 to 4, ends all sections immediately and moves to the result sequence.

While the function is active, the result sequence will be maintained and the next section will not be started.

For detailed operation of multi hold, please refer to the section on multi hold.

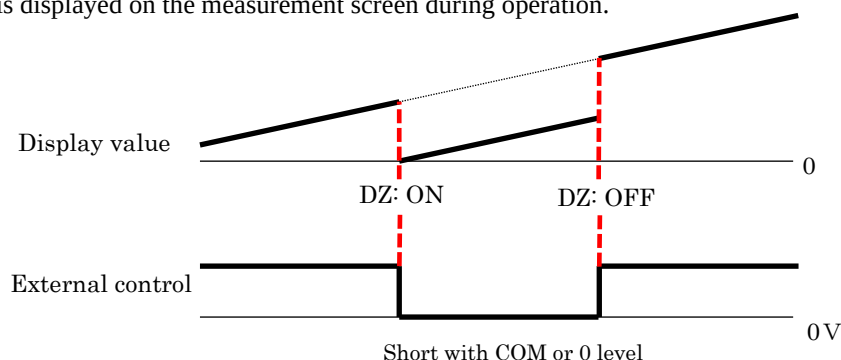
The function becomes valid while the terminal is "0" level or shorted with the COM terminal.

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

■ DigitalZero(Default / WaveCompare mode only)

The digital zero function (DZ) is a function to set the display value to zero when the DZ instruction is made. The display is offset during the DZ instruction, and the fluctuation width from the start of instruction is treated as the display value.

"DZ" icon is displayed on the measurement screen during operation.



In addition, when restarting after turning off the power, it is also possible to set the offset by the DZ function at last power off. For details, refer to the contents of “D-ZeroRetention” in the system setting.

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

⚠ Caution

- 1) If the DZ instruction is issued during execution of various holding functions, the digital zero function is executed immediately after the end of these holding.
- 2) If the DZ indication is issued during the display value is OVER or -OVER, the digital zero is executed immediately after OVER or -OVER is lost.

■ PatternChange

You can store and set up 8 patterns (8 kinds) of various settings such as input and output with this unit.

You can select a pattern by setting the terminals 1, 2, 3 to high or low.

Even if you only use one terminal, you can select pattern 1 or 2.

Even if you only use terminals 1 and 2, you can select pattern 1 or 2 or 3 or 4.

* Functions not assigned to external control terminals are treated as “open”.

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

Function	Selected Pattern							
	1	2	3	4	5	6	7	8
PatternChange1	Open	Short	Open	Short	Open	Short	Open	Short
PatternChange 2	Open	Open	Short	Short	Open	Open	Short	Short
PatternChange 3	Open	Open	Open	Open	Short	Short	Short	Short

Open: Open the terminal or set to “1” level.

Short: Short the terminal with “COM” terminal or set to “0” level.

* This is the operation when the input logic is "ON when short-circuited".

If "OFF when short-circuited" is set in the settings, the operation is reversed.

CAUTION

When the pattern is switched, the measurement data before switching is cleared and measurement starts from the switching point.

■ WaveCompare(WaveCompare mode only)

This is a function to start or stop measurement when “MeasureMode” is “WaveCompare”.

This function is invisible when “MeasureMode” is “Default” or “MultiHold”.

This function is executed by shorting the terminal for 1ms or more or setting it to "0" level (falling edge detection).

Please check [15. WAVE COMPARE MODE].

*Basically, it functions as a capture start indication, but when detecting a falling edge again during the detection wait state and capture operation, capture stops.

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

■ MultiHold(Multi mode only)

This is a function to switch sections in “MultiHold” mode.

This function is invisible when “MeasureMode” is “Default” or “WaveComp”.

This function is executed by shorting the terminal for 1ms or more or setting it to "0" level (falling edge detection).

Please check [16. MULTI HOLD MODE].

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

■ ResetSignal (Multi mode only)

This is a function (for Multi mode) to start multi hold section 1 and update digital zero at the same time.

If “Multi” is not selected in the “MeasureMode” setting item, it will not be displayed as a selection function.

For details on the operation, see the section “16. MULTI HOLD MODE”.

■ ResetSignal (CM-5 mode only)

This is a function (for CM-5 mode) to reset holding, reset comparison output, and update digital zero at the same time. If “CM-5” is not selected in the “MeasureMode” setting item, it will not be displayed as a selection function.

For details on the operation, see the section “17. CM-5 MODE”.

■ END Signal (CM-5 mode only)

This function is to end the measurement and hold the display value. If “CM-5” is not selected in the “MeasureMode” setting item, it will not be displayed as a selection function.

For details on the operation, see the section “17. CM-5 MODE”.

9-3. Hold

■ DispHoldMode(Applies only to the “DispHold” function)

You can switch the operating mode of DispHold either “Normal” or “OneShot”.

Normal: The display value is held while the external control terminal is set to low level.

OneShot: The display value is kept constant all the time, and it is updated every time the external control terminal falls.

For details, please refer the content about “DispHold”.

Operation: [MENU]⇒[Input]⇒[Hold]⇒[DispHoldMode]

Setting value: Normal (Default), OneShot

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

■ HoldOffDelay(Applies only to the “MaxHold”, “AmpHold” function)

You can set the delay about when the DispHold function is canceled.

There are differences in the delay operation for each “Normal” and “OneShot” shown below.

“Normal”: You can set the time from release of device to release of hold.

“OneShot”: You can set the time from release of device to update of display value.

This function is disable when the setting value is 0.

Operation: [MENU]⇒[Input]⇒[Hold]⇒[HoldOffDelay]

Setting value: 0~99.99[sec] (Default is 0)

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

CAUTION

Setting of retention cancellation delay is effective only for "DispHold".

No delay occurs when releasing other holding functions.

■ HoldMode(Applies only to the “DispHold” function)

You can switch the operation mode of each holding function except "DispHold" function to "NormalHold" or "AreaHold".

The basic operation of each mode is as follows.

"NormalHold": The hold function is executed while the terminal is short-circuited and released when the terminal is released

"AreaHold": The hold function is executed while the terminal is short-circuited, and the display value is fixed with the final holding value when the terminal is released

For details of operation of each holding function, please confirm the holding function explanation.

Operation: [MENU]⇒[Input]⇒[Hold]⇒[HoldMode]

Setting value: NormalHold(Default), AreaHold

* This is the operation when the input logic is "ON when short-circuited". If "OFF when short-circuited" is set in the settings, the operation is reversed.

CAUTION

Because it is a common setting, you can not specify the mode for each holding function.

It is possible to change the setting for each input channel.

10. OUTPUT ADVANCED SETTING

Since the output options differ depending on the model, the items that can be set change depending on the model.
The correspondence between model number and output option is as follows.

10-1. CompareAL1~4

■ Act Condition (Default mode only)

Select the condition of comparison output function.

Operation:[MENU]⇒[Output]⇒[CompareAL1], [CompareAL2], [CompareAL3], [CompareAL4]⇒[ActCondition]

Setting value: Always(Default), OnHold

* For CM-5 mode, refer to 17-3 setting items.

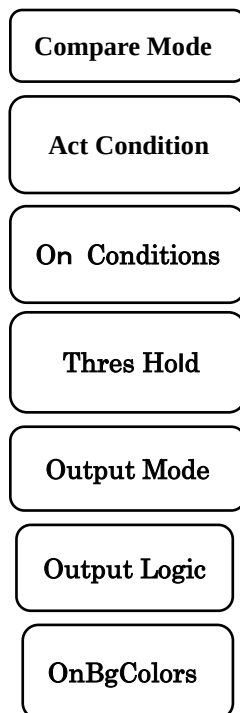
10-2. COMPARISON OUTPUT FUNCTION

The comparison output function compares the display value with a preset comparison judgment value, displays the judgment result on the comparison result monitor, and outputs according to the judgment result.

The output method is relay output.

Setting of comparison output function is proceed as follow.

Each setting items are set up at [Setting]⇒[Output]⇒[CompareAL1], [CompareAL2], [CompareAL3], [CompareAL4]



Descriptions of each setting item are described on the following pages after this section.

*1 Each setting and calibration value are saved and reflected at the timing when the menu is closed and returned to the measurement screen.

Note that the contents will not be saved if the power is turned off before closing the menu.

■ CompareMode(Defalut mode only)

Select compare mode: Leveljudge or Zonejudge or UniqueLeveljudge.

Compare mode	Function
LevelJudge	[Threshold] is set, and it is judged whether the displayed value is less than (or exceeded) the judgment value.
ZoneJudge	[ZoneLowerLimit] and [ZoneUpperLimit] are set, and it is judged whether or not the displayed value is within (or out of) the zone area.
UniqueLevelJudge	When the measured value exceeds the "Threshold", the comparison output is turned on. Unlike the level judgment, the judgment is made using the measured value instead of the displayed value, so even if the hold function works and the displayed value is fixed, the judgment is made using the value measured behind the scenes.

Operation: [MENU]⇒[Output]⇒[CompareAL1], [CompareAL2], [CompareAL3], [CompareAL4]
⇒[CompareMode]

Setting value: Leveljudge(Default), Zonejudge, UniqueLevelJudge

■ Act Condition (Defalut mode only)

Select the condition of comparison output function.

Operation:[MENU]⇒[Output]⇒[CompareAL1], [CompareAL2], [CompareAL3], [CompareAL4]⇒[ActCondition]
Setting value: Always(Default), OnHold

* For CM-5 mode, refer to 17-3 setting items.

■ OnConditions(Defalut mode only)

Select output ON condition.

Setting value of [OnConditions] changes by setting value of [CompareMode].

Operation: [MENU]⇒[Output]⇒[CompareAL1], [CompareAL2], [CompareAL3], [CompareAL4]
⇒[OnConditions]

[CompareMode] is "Leveljudge"

Setting value: Excess(Default), LessThan

[CompareMode] is "Zonejudge"

Setting value: InTheZone(Default), OutsideTheZone

[CompareMode] is "UniqueLevelJudge"

Setting value: Excess(Fixed)

■ Threshold(Defalut mode only)

Set threshold for comparison output.

Setting value of [Threshold] changes by setting value of [CompareMode].

Operation:[MENU]⇒[Output]⇒[CompareAL1], [CompareAL2], [CompareAL3], [CompareAL4]⇒[Threshold]

[CompareMode] is "Leveljudge", "UniqueLevelJudge"

Setting value: Threshold ±99999 (Default is 10000)

[CompareMode] is "Zonejudge"

Setting value: ZoneLowerLimit ±99999 (Default is 0)
ZoneUpperLimit ±99999 (Default is 10000)

■ OutputMode(Default mode only)

Select comparison output mode.

Output mode	Function
Normal	Outputs ON while the condition is satisfied.
Latch	When the comparison output condition is satisfied, it keeps ON until a reset signal is received. *Reset signal is controlled by [CompareReset] function of external control function.

Operation:[MENU]⇒[Output]⇒[CompareAL1], [CompareAL2], [CompareAL3], [CompareAL4]⇒[OutputMode]

Setting value: Normal(Default), Latch

■ OutputLogic

Select output logic of comparison output.

Setting value: NO(Default), NC

NO: A relay turns ON when comparison output ON.

NC: A relay turns OFF when comparison output ON.

Operation:[MENU]⇒[Output]⇒[CompareAL1], [CompareAL2], [CompareAL3], [CompareAL4]⇒[OutputLogic]

* For CM-5 mode, refer to 17-3 setting items.

■ OnBgColors(Default / WaveCompare / CM-5mode only)

Select back color that of comparison output ON.

*You can select only the back color, not the text color.

Operation:[MENU]⇒[Output]⇒[CompareAL1], [CompareAL2], [CompareAL3], [CompareAL4]⇒[OnBgColors]

Setting value: Black(Default), Red, Yellow, Green

***When the setting value is black, the back color does not change compared to normal operation.**

***If some comparison outputs are ON at the same time, priority of back color is given in following order.**

AL1 > AL2 > AL3 > AL4

* For CM-5 mode, refer to 17-3 setting items.

10-3. ANALOG OUTPUT

Setting of analog output is proceed as follow.

Each setting items are set up at [Setting]⇒[Output]⇒[AnalogOutput]

Output Range
Output Scale

*Each setting and calibration value are saved and reflected at the timing when the menu is closed and returned to the measurement screen.

Note that the contents will not be saved if the power is turned off before closing the menu.

■ OutputRange

Select output range of analog output.

*Be careful to connect output terminals. There are 2 terminals that one of it is for voltage output, and another is for current output.

Operation	:	[MENU]⇒[Output]⇒[AnalogOutput]⇒[OutputRange]
Setting value	:	0-10V (Default) (Load resistance of 2 kΩ or more) ±10V (Load resistance of 2 kΩ or more) 1-5V (Load resistance of 2 kΩ or more) 0-20mA (Load resistance of 550 Ω or less) 4-20mA (Load resistance of 550 Ω or less)

■ OutputScale

Select the display value that corresponding to output scale 0% and 100%.

Analog output is referred display value.

(ex: ["OutputRange" is 4-20mA and "0%DispValue" is 2000 and "100%DispValue" is 8000]

4mA is outputted when display value is 2000, and 20mA is outputted when display value is 8000)

Operation:[MENU]⇒[Output]⇒[AnalogOutput]⇒[OutputScale]

Setting value: 0% DispValue: ±99999 (Default is 0)

100% DispValue: ±99999 (Default is 10000)

10-4. BCD output

*In products that have no BCD output option, this setting item is invisible.

■ DataSignalLogic

Select output logic of BCD output data.

Operation:[MENU]⇒[Output]⇒[BCDOutput]⇒[DataSignalLogic]

Setting value: Negative(Default), Positive

■ SynSignalLogic

Select output logic of BCD output synchronized signal.

Operation:[MENU]⇒[Output]⇒[BCDOutput]⇒[DataSignalLogic]

Setting value: Negative(Default), Positive

*When acquiring data of BCD, when the synchronous signal (PC signal) is negative logic, please do it when the transistor is OFF (rising edge or 1 level of the synchronous signal). In the case of positive logic, please do it when the transistor is ON (falling edge of synchronous signal is 0 level).

10-5. RS-485 Modbus RTU Communication

This item is valid only for products with output option RS - 485 (Modbus RTU).

When using Modbus communication output, in addition to this setting item, please refer to "CM-8 Modbus communication instruction manual" from our website.

*In products that have no Modbus communication option, this setting item is invisible.

■ SlaveAddress

Select slave address of Modbus communication.

Operation:[MENU]⇒[Output]⇒[ModbusCom]⇒[SlaveAddress]

Setting value: 1~31(Default is 1)

■ Baudrate

Select baudrate of Modbus communication.

Operation:[MENU]⇒[Output]⇒[ModbusCom]⇒[Baudrate]

Setting value: 9600bps, 19200bps(Default), 38400bps

■ Parity

Select parity of Modbus communication.

Operation:[MENU]⇒[Output]⇒[ModbusCom]⇒[Parity]

Setting value: None, Even(Default), Odd

10-6. RS-232C Modbus RTU Communication

This item is valid only for products with output option RS-232C MODBUS RTU communication.

*In products that have no RS-232C MODBUS RTU communication option, this setting item is invisible.

■ Protocol

Select protocol of RS-232C MODBUS RTU communication.

•Modbus-RTU: Modbus communication

Operation:[MENU]⇒[Output]⇒[RS-232C MODBUS RTU Com]⇒[Protocol]

Setting value: Modbus-RTU (Fixed)

■ Baudrate

Select baudrate of RS-232C MODBUS RTU communication.

Operation:[MENU]⇒[Output]⇒[RS-232C MODBUS RTU Com]⇒[Baudrate]

Setting value: 9600bps, 19200bps(Default), 38400bps

■ Parity

Select parity of RS-232C MODBUS RTU communication.

Operation:[MENU]⇒[Output]⇒[RS-232C MODBUS RTU Com]⇒[Parity]

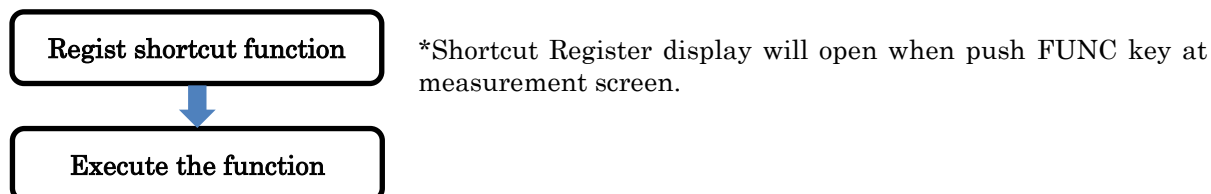
Setting value: None, Even(Default), Odd

11. SHORTCUT

11-1. OVERVIEW

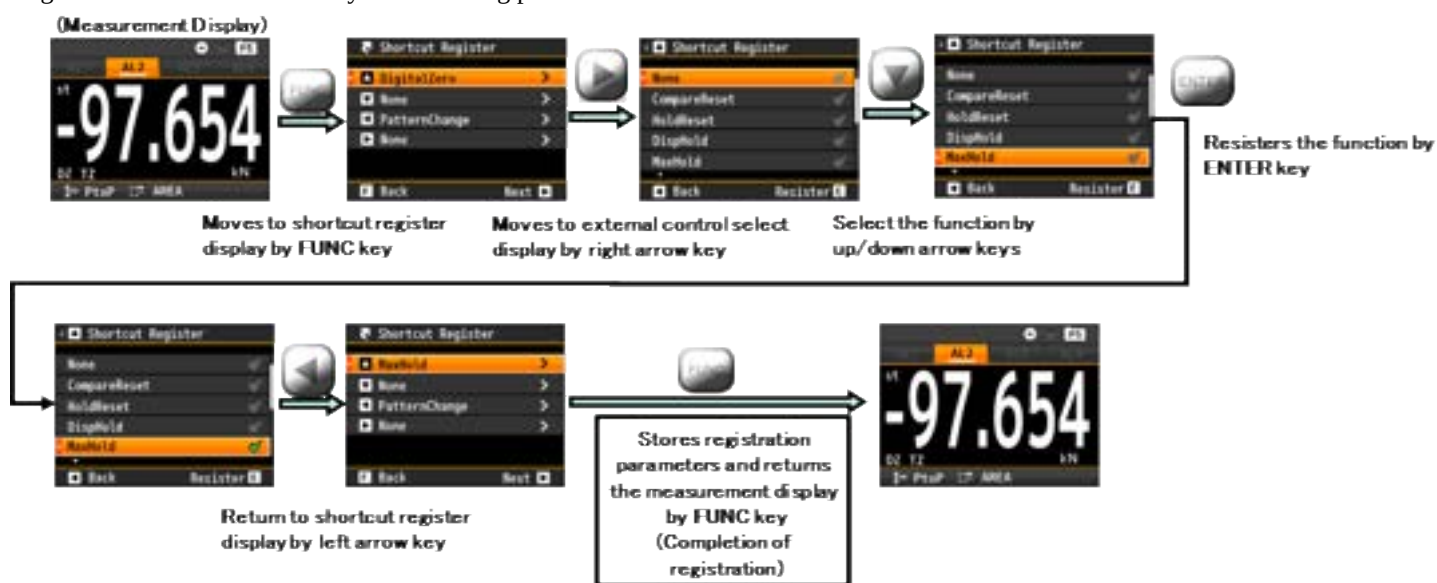
The shortcut function allows you to control the external control function by key operation. (CM-5 mode is fixed)

Register the function on the shortcut registration screen and execute the function by pressing and holding the corresponding cross key for 1 second on the measurement screen.



11-2. How to regist

Register the shortcut function by the following procedure.



*The above is the Default mode screen.

11-3. How to execute

The relationship between function execution operation and terminal control is as shown in the table below.

	Terminal control	Shortcut
ON/OFF operation	ON: Short with COM terminal (or input "L") OFF: Open the terminal (or input "H")	ON: Press and hold the key for 1sec OFF: Press and hold again the key for 1sec
Trigger Operation(*)	The function is executed at each falling edge when shorting with the COM terminal. (or input "L")	The function is executed at each pressing and holding the key for 1sec.

*The function to perform trigger operation is "DispHold (When DispHoldMode is "OneShot")", "WaveCompare", "MultiHold", "ResetSignal", "END Signal".

**"PatternChange" operates continuously switching when continuing long press.

There are three operation methods of external control function, terminal control, shortcut, and communication function, but there are the relationships shown in the table below as the operation at the time of simultaneous execution.

ON operation	If one of the control methods is ON, the function will be ON.
OFF operation	The function is canceled when both control states (terminal control and communication) are OFF. The function ON state by shortcut is automatically canceled by OFF operation either of terminal control or communication.
Trigger operation	It is possible to operate simultaneously by any control method. However, if each function is not ready for operation again, it cannot operate.

11-4. Control function list

Shows the list of functions that can be registered as a shortcut function.

Please check each function description for each operation details.

Function	Operation
None	None
CompareReset	Function to turn off all comparison output function (Default / WaveCompare / Multi mode only)
DispHold	Function to hold display value (Default mode only)
MaxHold	Function to hold max value (Default mode only)
AmpHold	Function to hold difference between max and min (Default mode only)
HoldReset	Function to reset holding state (Default / Multi mode only)
DigitalZero	Function to zero display value as offset (Default / WaveCompare mode only)
PatternChange	Function to switch operating pattern
WaveCompare	Function to start/stop wave comparison function (WaveCompare mode only)
MultiHold	Function to control sections of multi hold function (Multi mode only)
ResetSignal	Controls ON / OFF of reset signal (Multi / CM-5 mode only)
END Signal	Controls ON / OFF of end signal (CM-5 mode only)

* Each hold function, “WaveCompare”, “MultiHold”, “ResetSignal”, and “END Signal” are displayed only in the corresponding measurement mode.

* Only pattern change function, pattern is switched in order shown below. Pattern changing is carried out every seconds when you press and hold the button.

Pattern 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 1 → (continue)

12. DISPLAY SETTINGS

This section explains the items of the display setting.
The screen displayed on the measurement screen is as follows.

- DispValue: Displayed measurement value with numbers. It is a display method which is displayed with large letters and real values are easy to see.
- DispValue+Comp: The display value and threshold are displayed numerically.
- Trend: Displays the display value in a trend graph. It is a display method that makes it easy to understand the change with time of the display value.

When you press Disp key, the display is switched to next display. The order of displays is shown below.
DispValue ⇒ DispValue+Comp ⇒ Trend ⇒ DispValue (repeat).

12-1. Display select

■ Measurement display select

Select the screen to be displayed as measurement screen.

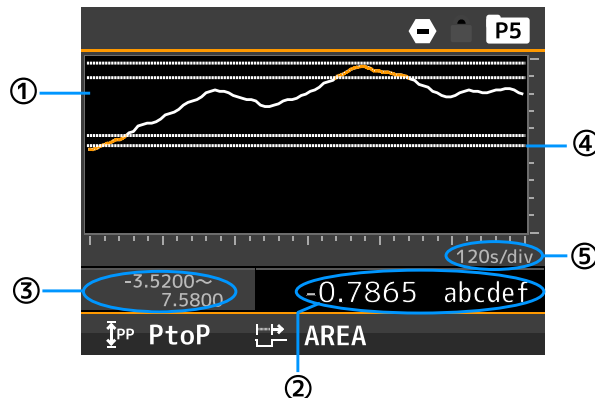
Operation:[MENU]⇒[Display]⇒[DispSelect]⇒[MeasureSelect]

Setting value (Multiple selection is possible.)

MeasureSelect	Operation	Initial display
DispValue	Screen shows only display value and comparison judgement result.	○
DispValue+Comp	Screen shows display value, threshold, and comparison judgement result.	○
Trend	Screen shows only trend graph of display value and threshold.	

12-2. TrendDisp(Default / CM-5 mode only)

The trend screen displays the display value as a trend from the right to the left of the screen, so you can easily check the past display value. It also displays the current value as a number.
In the trend display, the upper limit value (upper end), lower limit value (lower end) and time axis (time width) of the scale can be set, and the contents are also displayed.



項目	内容
①	Display trend graph. White line is trend graph. Orange line means overing the limit.
②	Shows display value and unit.
③	Display upper and lower limits.
④	White dash line means threshold of comparison output.
⑤	Display time scale of the graph.

Caution: Others except ① to ⑤ are listed in [6-1. NAMES OF EACH PART].



Caution

Thresholds are displayed only when the setting “CompareMode” is “LevelJudge”.

■ DispValue Scale(Default / CM-5 mode only)

Set upper limit and lower limit in Trend Display.

*This is not scaling for display value, but only set scale (display range) of the trend display.

Operation:[MENU]⇒[Display]⇒[TrendDisp]⇒[DispValue Scale]

Setting value: Lower limit: ± 99999 (Initial value is 0)

Upper limit: ± 99999 (Initial value is 10000)

■ AlarmSelect(Default mode only)

Set alarms(AL1~4) that should be display in Trend display.

Operation:[MENU]⇒[Display]⇒[TrendDisp]⇒[AlarmSelect]

Setting value : AL1 ON/OFF (Initial state is ON)
AL2 ON/OFF (Initial state is ON)
AL3 ON/OFF (Initial state is ON)
AL4 ON/OFF (Initial state is ON)

■ TimeAxis(Default / CM-5 mode only)

Set time axis of trend display.

Operation:[MENU]⇒[Display]⇒[TrendDisp]⇒[TimeAxis]

Setting value: 100ms/div,1s/div (Initial state),2s/div,5s/div,10s/div,30s/div,60s/div,120s/div

*When you change time scale, past graph is erased.

13. SYSTEM SETTINGS

This section explains the items of the system setting.

13-1. General

■ Brightness

Set screen brightness.

Operation:[MENU]⇒[System]⇒[General]⇒[Brightness]

Setting value: 5 Bright(Initial state), 4, 3, 2, 1 (Dark), 0 (Off)

***When the setting is 0(Off), screen lighting up only when you push MENU key or FUNC key.**

■ PowerSavingTime

Set the time to turn off the screen when there is no operation for a certain period of time.

***Screen turns ON when some key is operated.**

Operation:[MENU]⇒[System]⇒[General]⇒[PowerSavingTime]

Setting value: None (Initial state), 1min, 2min, 5min, 10min, 30min, 60min

■ MeasureMode

Select measure mode(Default / Multi / WaveCompare / CM-5).

Operation:[MENU]⇒[System]⇒[General]⇒[MeasureMode]

Setting: Default, Multi, WaveCompare, CM-5 (Initial state)

■ D-ZeroRetention(Default / WaveCompare mode only)

This function continuous D-Zero function even when re-power on.

(D-Zero function is reset at re-power on as default.)

Operation:[MENU]⇒[System]⇒[General]⇒[D-ZeroRetention]

Setting: Disable (Initial state), Enable

■ Language

Select menu language.

Operation:[MENU]⇒[System]⇒[General]⇒[Language]

Setting: Japanese「日本語」(Initial state), English

■ DisplayDirection

Select direction of display.

*When the direction is changed, the cross key is also changed and measured values are initialized.

Operation:[MENU]⇒[System]⇒[General]⇒[DisplayDirection]

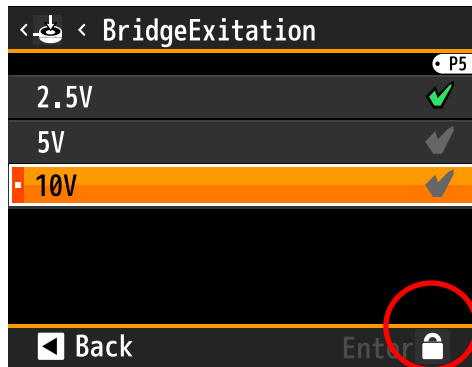
Setting: Horizontal (Initial state), Vertical

■ SettingProtect

This function forbids changing other settings. You need to disable this function to change other settings.

(You can check settings but can't change settings.)

*When this function is enabled, protecting icon is displayed as follows.



Operation:[MENU]⇒[System]⇒[General]⇒[SettingProtect]

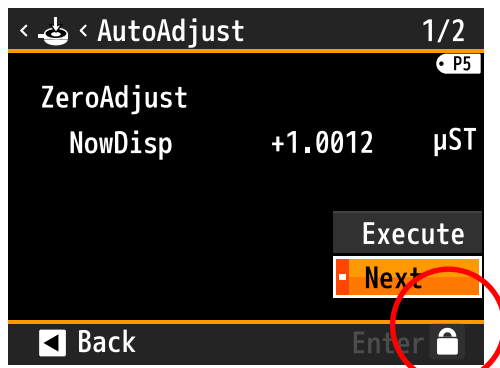
Setting: Disable (Initial state), Enable

■ AdjustProtect

This function forbids calibration. You need to disable this function to calibrate sensor.

(You can access calibration menu but can't carry out.)

*When this function is enabled, protecting icon is displayed as follows.



Operation:[MENU]⇒[System]⇒[General]⇒[AdjustProtect]

Setting: Disable (Initial state), Enable

■ DisplayUpdateCycle

Select a cycle of updating display.

Operation:[MENU]⇒[System]⇒[General]⇒[DisplayUpdateCycle]

Setting: 10 sps (Initial state), 1 sps

■ PatternCopy

Copy pattern to other pattern.

Operation:[MENU]⇒[System]⇒[General]⇒[PatternCopy]

Setting: Copy From Pattern1, 2, 3, 4, 5, 6, 7, 8

Copy To All patterns, Pattern1, 2, 3, 4, 5, 6, 7, 8

■ SoftVersion

Show soft version.

Operation:[MENU]⇒[System]⇒[General]⇒[SoftVersion]

13-2. Initialize

■ UserDefaultSave

Saves all current settings (except the configuration diagnostic log) as user values.

Operation:[MENU]⇒[System]⇒[Initialize]⇒[UserDefaultSave]

Setting: - - -

* If you save the user value here, the user setting value will be remembered even if you initialize it to the factory value.

* Since the calibration value is also saved, please refrain from inputting and saving the calibration value that is not appropriate.

■ UserDefaultLoad

Initialize all settings to the saved setting above.

Operation:[MENU]⇒[System]⇒[Initialize]⇒[UserDefaultLoad]

Setting: - - -

* User values must be saved in advance. If you initialize it before saving, the setting value will also be initialized.

* The diagnostic log is not initialized.

■ FactoryDefaultLoad

* Initialization for our company only. Please refrain from using it.

14. DIAGNOSIS

This section explains the items relate to diag setting of diag/log setting.

(The items related to log setting are in other section.)

- InputDiag: You can check whether the output of the sensor is performing normally or check ON / OFF of the external controls.
- OutputTest: You can try comparison judgment outputs, GO JudgeOutput and other option outputs for operation confirmation.

14-1. InputDiag

■ Strain Input

Display strainingauge input level in percentage and actual value.

Operation:[MENU]⇒[Diag/Log]⇒[InputDiag]⇒[StrainGaugeInput]

Display: InputRatingPercent: (Input level in percentage.)

InputActualValue: (Input level in actual value.)

■ ExternalCtrl

Display statuses of each external controls.

Operation:[MENU]⇒[Diag/Log]⇒[InputDiag]⇒[ExternalCtrl]

Setting: Terminal 1 ON / OFF
 Terminal 2 ON / OFF
 Terminal 3 ON / OFF
 Terminal 4 ON / OFF
 Terminal 5 ON / OFF

*Statuses are reflected in real time.

14-2. OutputTest

■ CompareAL1~AL4 (HI / GO / LO / Unique Output (set load arrival output) in CM-5 mode)

You can arbitrarily turn on / off the comparison judgment outputs in order to check connected device.

Operation:[MENU]⇒[Diag/Log]⇒[OutputTest]⇒[CompareAL1~AL4]

Setting: CompareAL1 TestOutput: Disable (Initial state) / Enable

 TerminalOutput: ON Output/ OFF Output (Initial state)

CompareAL2~4 Same as above.

*The output enable as soon as TestOutput turn on.

TestOutput is enabled until it is disabled or power off.

TestOutput automatically turn off when re-power on.

■ GO JudgeOutput(Default / WaveCompare / Multi mode only)

You can arbitrarily turn on / off the GO JudgeOutput in order to check connected device.

Operation:[MENU]⇒[Diag/Log]⇒[OutputTest]⇒[GO JudgeOutput]

Setting: GO JudgeOutput TestOutput: Disable (Initial state) / Enable

TerminalOutput: ON / OFF (Initial state)

*The output enable as soon as TestOutput turn on.

TestOutput is enabled until it is disabled or power off.

TestOutput automatically turn off when re-power on.

■ AnalogOutput

You can arbitrarily set analog output by 10% steps in order to check connected device.

Operation:[MENU]⇒[Diag/Log]⇒[OutputTest]⇒[AnalogOutput]

Setting: TestOutput: Disable (Initial state) / Enable

TerminalOutput: 0%(Initial state), 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%

*The output enable as soon as TestOutput turn on.

TestOutput is enabled until it is disabled or power off.

TestOutput automatically turn off when re-power on.

■ BCD Output(DATA)

You can arbitrarily turn on / off each bits of BCD output (DATA) in order to check connected device.

*This function is for only products that have BCD output option.

Operation:[MENU]⇒[Diag/Log]⇒[OutputTest]⇒[BCD Output(DATA)]

Setting: TestOutput: Disable (Initial state) / Enable

POL Output ON / OFF(Initial state)

OVER Output ON / OFF(Initial state)

10^4 -1 / 10^4 -2 / 10^4 -4 / 10^4 -8 Output ON / OFF(Initial state)

10^3 -1 / 10^3 -2 / 10^3 -4 / 10^3 -8 Output ON / OFF(Initial state)

10^2 -1 / 10^2 -2 / 10^2 -4 / 10^2 -8 Output ON / OFF(Initial state)

10^1 -1 / 10^1 -2 / 10^1 -4 / 10^1 -8 Output ON / OFF(Initial state)

10^0 -1 / 10^0 -2 / 10^0 -4 / 10^0 -8 Output ON / OFF(Initial state)

*The output enable as soon as TestOutput turn on.

TestOutput is enabled until it is disabled or power off.

TestOutput automatically turn off when re-power on.

■ BCD Output (PC)

You can arbitrarily turn on / off each bits of BCD output (PC) in order to check connected device.

*This function is for only products that have BCD output option.

Operation:[MENU]⇒[Diag/Log]⇒[OutputTest]⇒[BCD Output(DATA)]

Setting: TestOutput: Disable (Initial state) / Enable

PC Output ON / OFF(Initial state)

*The output enable as soon as TestOutput turn on.

TestOutput is enabled until it is disabled or power off.

TestOutput automatically turn off when re-power on.

■ RS-485 ModbusRTU

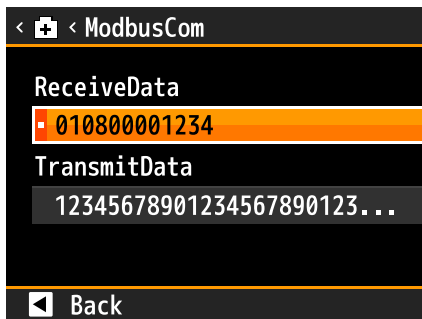
Display received data and transmitted data of Modbus communication.

*This function is for only products that have RS485 output option.

Operation:[MENU]⇒[Diag/Log]⇒[OutputTest]⇒[ModbusCom]

Setting: ReceiveData: (Data sent form host.)

TransmitData: (Data replied to host)



■ RS-232C ModbusRTU

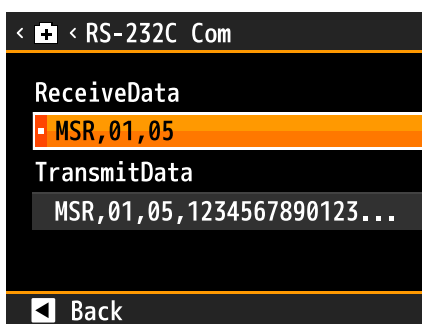
Display received data and transmitted data of RS-232C MODBUS RTU communication.

*This function is for only products that have RS-232C MODBUS RTU output option.

Operation:[MENU]⇒[Diag/Log]⇒[OutputTest]⇒[RS-232C MODBUS RTU Com]

Setting: ReceiveData: (Data sent form host.)

TransmitData: (Data replied to host)



15. WAVE COMPARE MODE

15-1. Overview

This is a mode to compare measurement waveform (white line in figure below) and comparison waveform (green lines in figure below). This mode outputs when alarming and log the waveform.

For stable measurement, using analog filter (only strain gauge input) and moving average are recommended.

See appendix to know about the data format of the waveform log that can be acquired by the communication function and the data format of the comparison waveform that can be created by the communication function.

To switch to wave compare mode, operate [MENU]⇒[System]⇒[General]⇒[MeasureMode]⇒[WaveCompare].

Main functions of this mode are below.

•Alarm Output

Display [OK] when measurement waveform is between comparison waveforms at all times.

Display [NG] when measurement waveform is out of comparison waveforms even once and output alarm output.

The alarm output destination is fixed to AL1.

OK judgement is done at finishing measurement.

NG judgement is done even during measurement, and in case of NG, alarm output is output immediately.

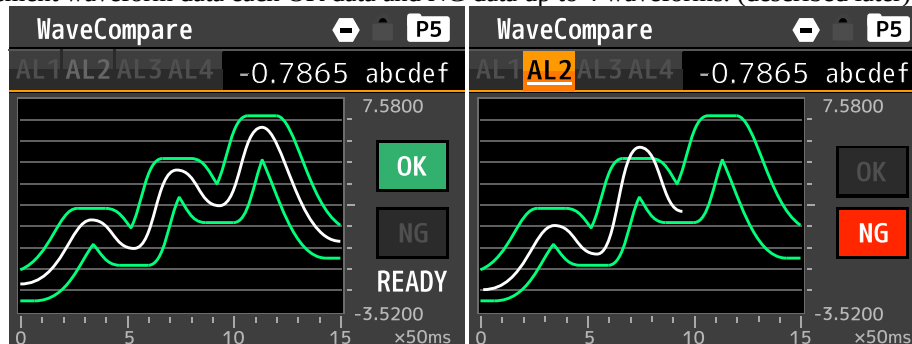
[GO JudgeOutput] is ON while judgement is [OK], and is OFF while other state.

•Create Compare Waveform

Comparison waveform is made by editing waveform that is an average of some waveforms that are measured for standard. (described later)

•Wave Log

You can log measurement waveform data each OK data and NG data up to 4 waveforms. (described later)



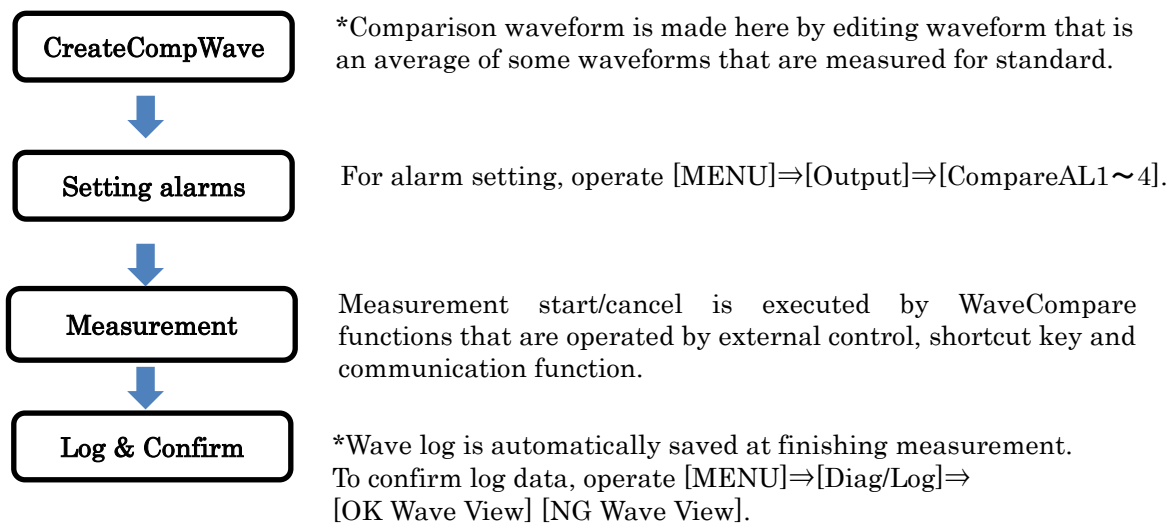
•About Measurement Time

Measurement data points are 1500 points.

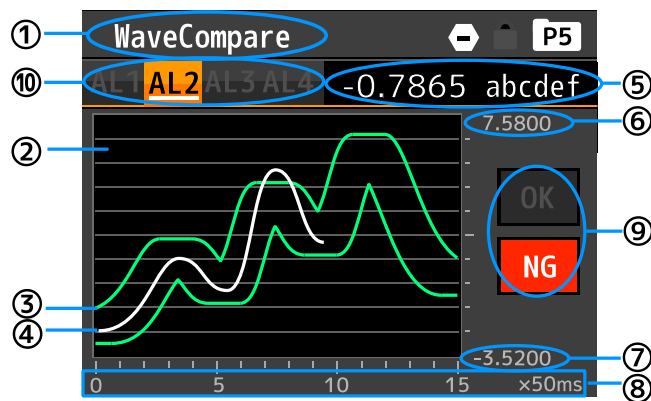
Measurement time varies depending on sampling speed shown below.

Setting		Coefficient of TimeAxis	Measurement time
Sampling Rate	4000 times/sec	×25ms	0.375sec
	2000 times/sec	×50ms	0.75sec
	1000 times/sec	×100ms	1.5sec
	500 times/sec	×200ms	3sec
	200 times/sec	×500ms	7.5sec
	100 times/sec	×1s	15sec
	50 times/sec	×2s	30sec
	20 times/sec	×5s	1min 15sec
	10 times/sec	×10s	2min 30sec
	5 times/sec	×20s	5min
	2 times/sec	×50s	12min 30sec
	1 times/sec	×100s	25min

The flowchart for using waveform compare mode is as follows.
To operate setting, operate [MENU]⇒[Input]⇒[WaveCompare].



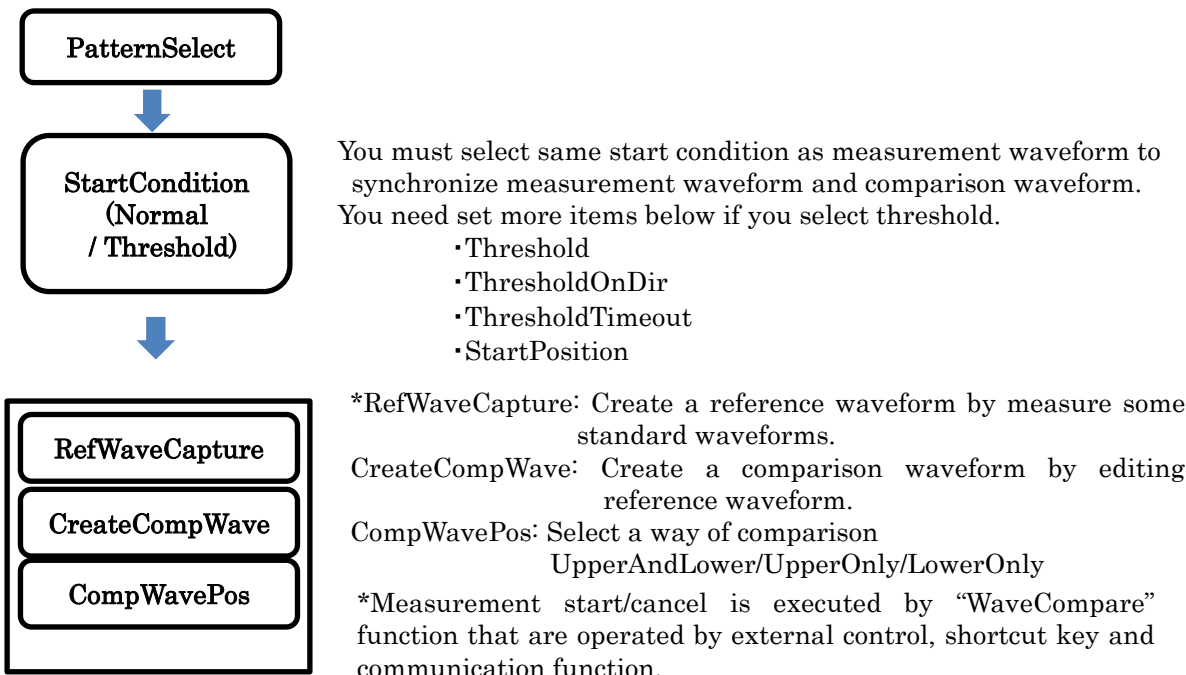
■ Screen description



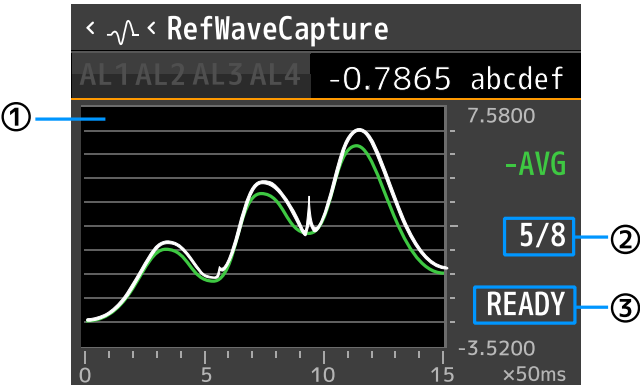
No.	Name	Function
①	Screen title	Display title of the screen.
②	Wave graph	Display measurement waveform and comparison waveform.
③	Comparison waveform	Green graphs are comparison waveform.
④	Measurement waveform	White graph is measurement waveform.
⑤	Display value	Display value and unit.
⑥	Upper limit of graph	Upper limit of graph.
⑦	Lower limit of graph	Lower limit of graph.
⑧	Time axis	Display scale and coefficient of the graph. In the above figure, the full scale of the time axis is $15 \times 50 \text{ ms} = 750 \text{ ms} = 0.75 \text{ sec}$
⑨	Comparison result	Display [OK] when the measurement finished and all data are between comparison waveform. Display [NG] when one or more measurement data is out of comparison waveform.
⑩	Alarm output	Alarms that are operating are orange color.

15-2. CreateCompWave

Comparison waveform is made here by editing waveform that is an average of some waveforms that are measured for standard. Saved data is 150 points data that is average from 1500 points data, so sharp edge might to be rough. The flowchart for using waveform compare mode is as follows.

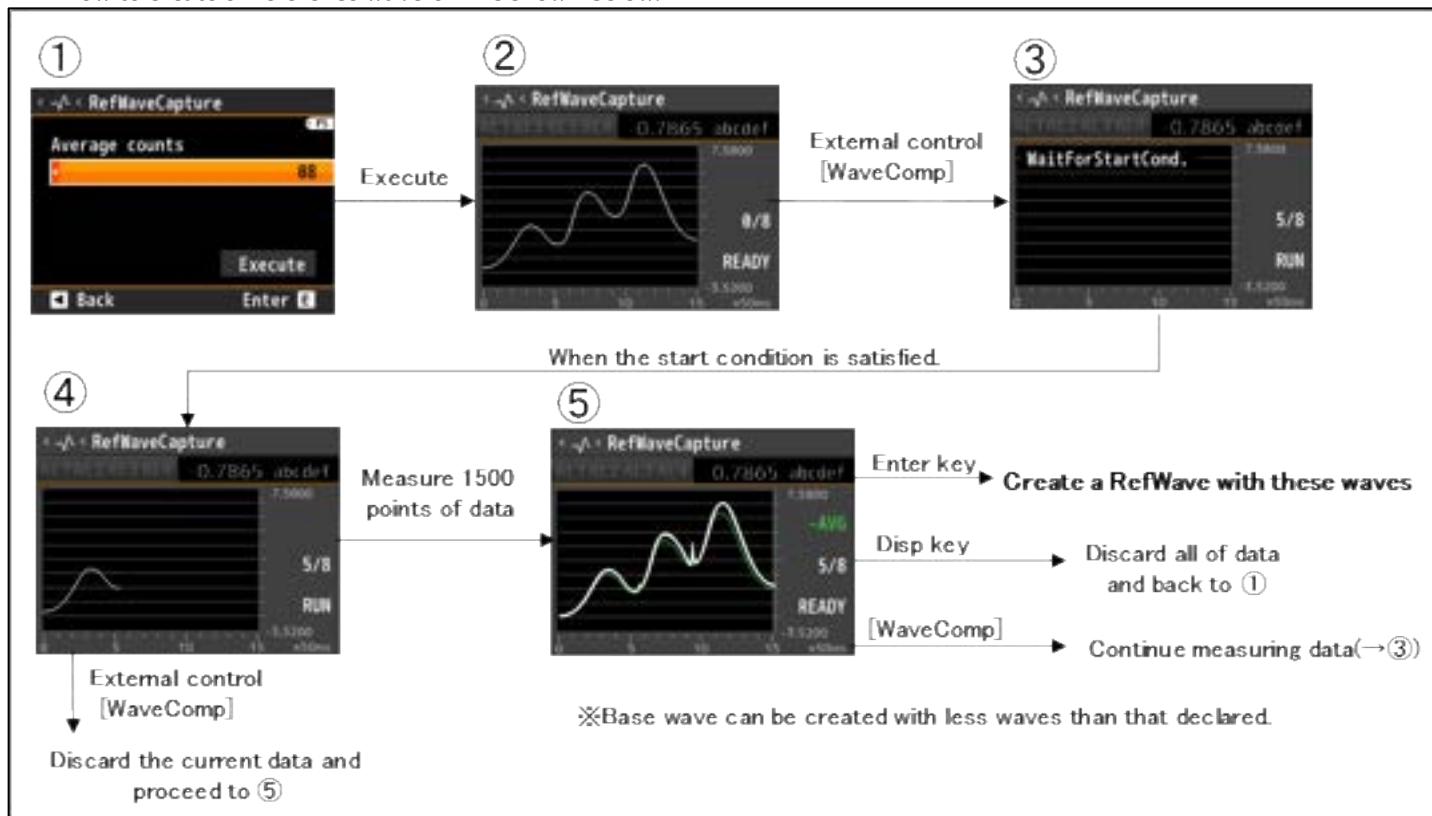


•RecWaveCapture
Get data for creating reference waveform. Measure waveforms as many times(1~99)as specified, and create reference waveform by average the measured data.
Measurement start/cancel is executed by “WaveCompare” function that are operated by external control and communication function.
How to read of the RefWaveCapture screen is shown below.



Items	Name	Function
①	Wave graph	Display latest waveform (White) and average waveform up to then (Green).
②	Average times	Display (measuring number)/(specified times)
③	Status	READY: Waiting for “WaveCompare” function RUN: Measuring FIN: Finished measuring

How to create of reference waveform is shown below.

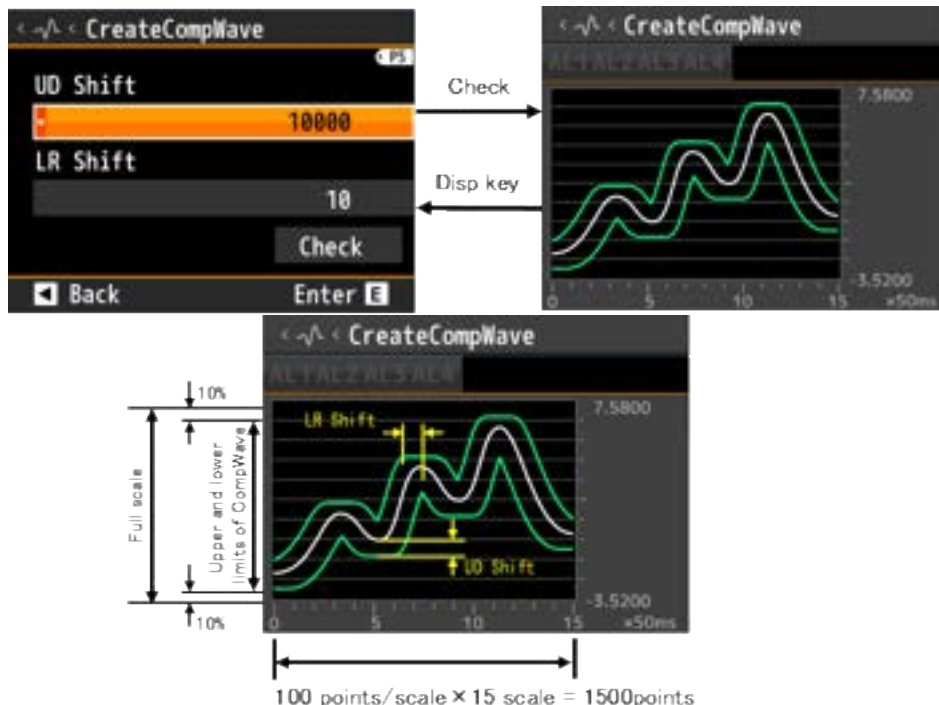


•CreateCompWave

Create comparison waveform based on reference waveform.

Set up/down shift (UD Shift) and left/right shift (LR Shift), check comparison wave.

The white line in the figure below is the reference waveform and the green lines are the comparison waveform.



UD Shift 0~99999[digit] (The decimal point position is reflected in the setting.)

LR Shift 0~99[points]

*The horizontal axis corresponds to 100 points per scale.

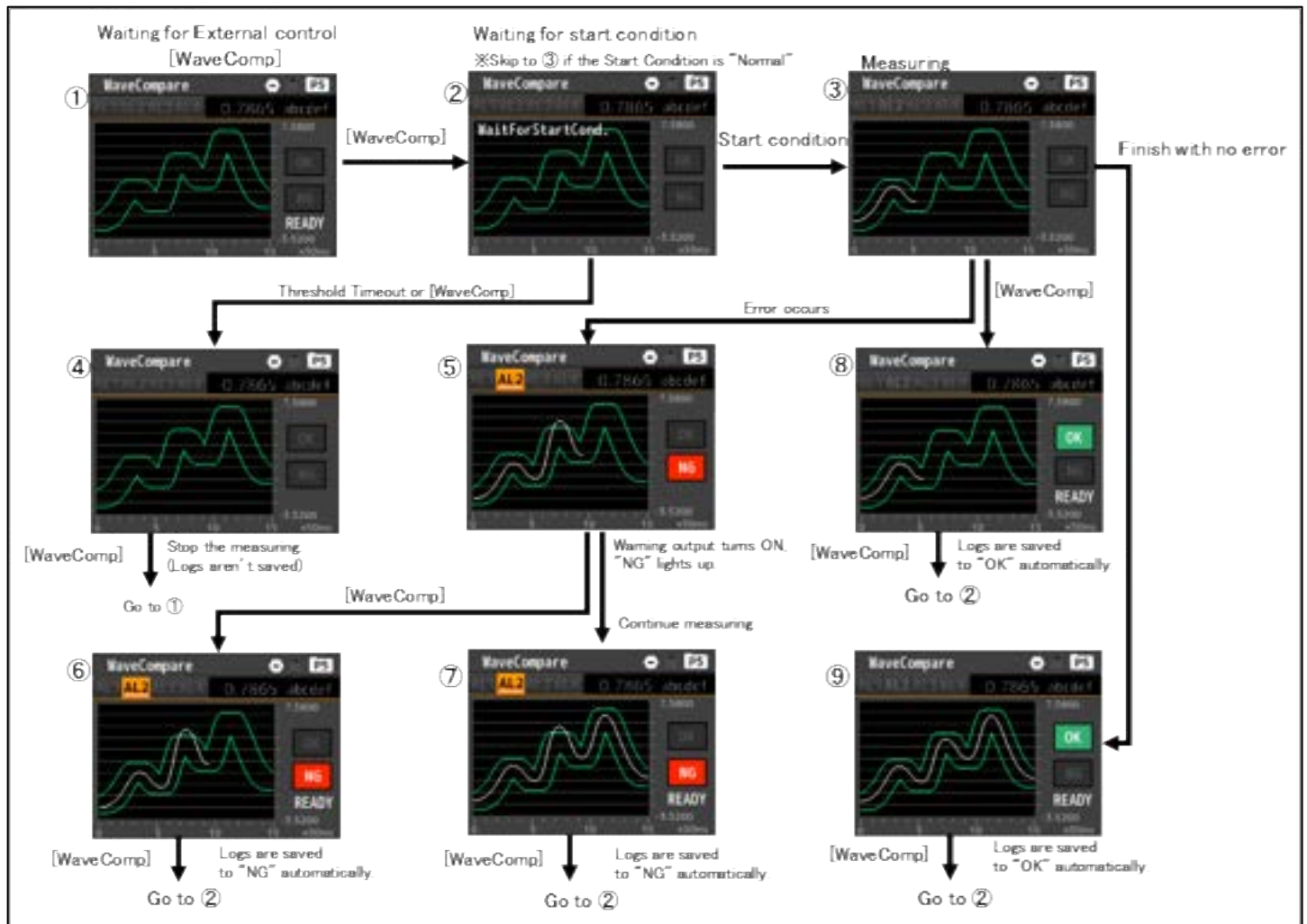
*When the automatic scaling function is ON, it is automatically adjusted so that ± 10% of the judgment waveform becomes full scale. (The automatic scaling function is on by default.)

15-3. How to measure of wave comparison

How to measure of wave comparison is shown below.

Measurement start is executed by WaveCompare function that are operated by external control, shortcut key and communication function.

Measurement cancel is executed by repeating WaveCompare function while measuring.



15-4. WaveLog

It is a function to keep the measurement data of waveform comparison. The data will be lost if you turn off the power or change to another measurement mode.

•Saving wave log

Measured waveform is logged when the measuring finished.

You can log measurement waveform data each OK data and NG data up to 4 waveforms.

If [Overwrite] is enable, 5th and later data are over written to the oldest data.

If [Overwrite] is disable, 5th and later data are discarded.

The data recorded in the log is time-stamped, such as [No.1 ○○minutes ago] and [No.2 △△ days ago].

* Saved data is 150 points data that is average from 1500 points data, so sharp edge might to be rough.

•Confirming wave log

You can confirm wave log by operating [MENU]⇒[Diag/Log]⇒[OK Wave View] [NG Wave View].

Operations in screen of confirming wave log are below.

- Right and left cursors: Moving cursor. (Blue dashed line in figure below.)

- *Display value of cursor is displayed on upper right.

- Disp key: Back to previous screen.



*If the product has communication output, you can send wave data by communication.
(Information of decimal point is discard like 12.345⇒12345.)

•Erasing wave log

You can erase all wave log data by operating [MENU]⇒[Diag/Log]⇒[OK/NG Wave Erase].

15-5. Settings

Settings related to wave comparison mode are shown below.

■ StartCondition

Select condition of start measuring.

Normal: Start measuring immediately after receiving instruction.

Threshold: Start measuring after excess or less than the threshold after receiving instruction.

*This threshold is not comparison waveform (Green lines).

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[StartCondition]

Setting: Normal (Initial state), Threshold

■ Threshold

Set threshold level when the [StartCondition] is "Threshold".

*This setting is enable when the [StartCondition] is "Threshold"

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[Threshold]

Setting value: ±99999 (Initial state is 10000)

■ ThresholdOnDir

Set threshold on direction when the [StartCondition] is “Threshold”.

*This setting is enable when the [StartCondition] is “Threshold”

Excess: Start measuring after display value excess the threshold after receiving instruction.

LessThan: Start measuring after display value less than the threshold after receiving instruction.

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[ThresholdOnDir]

Setting: Excess (Initial state), LessThan

■ ThresholdTimeout

Alarm and finish measurement when the [StartCondition] is “Threshold” and start condition is not satisfied for a certain time.

*This setting is enable when the [StartCondition] is “Threshold”

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[ThresholdTimeout]

Setting value: 0.00~99.99 [sec] (Initial state is 0.00)

*This function is disable if setting value is 0.00[sec].

■ StartPosition

Set delay for up to start measurement after satisfying start condition when the [StartCondition] is “Threshold”.

*This setting is enable when the [StartCondition] is “Threshold”

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[StartPosition]

Setting value: -100 to +1000 points (Initial state is 0)

*If setting value is less than 0, wave data contains data before satisfying start condition.

*Delay time is different by [SamplingRate].

example) [SamplingRate]:100times/sec, [StartPosition]:200 points

Delay time = $(1/100) \times 200 = 2[\text{sec}]$ (Start drawing graph after satisfied start condition and draw 1500 points.)

■ RefWaveCapture

Create reference waveform for making comparison waveform by measuring waveform.

Measure waveforms as many times as specified, and create reference waveform by average the measured data.

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[RefWaveCapture]

Setting value: Average 1~99

■ CompWavePos

Select which comparison waveform is used for judgement.

UpperAndLower: Set both upper and lower comparison waveforms for zone judgement.

UpperOnly: To judge whether or not it has exceeded, only the comparison waveform on the upper side is set.

LowerOnly: To judge whether or not it has less than, only the comparison waveform on the lower side is set.

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[CompWavePos]

Setting: UpperAndLower(Initial state), UpperOnly, LowerOnly

■ CreateCompWave

Create comparison waveform from reference waveform.

Specify the vertical shift amount and the left / right shift amount, execute confirmation each time and create a judgement waveform.

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[CreateCompWave]

Setting value: UD Shift 0~99999[digit]

LR Shift 0~99[×10points]

Check⇒You can check the comparison waveform.

■ AutoScale

Select auto scale enable/disable at [CheckCompWave] screen.
Autoscale function adjust screen scale to have 10% upper and lower margin.

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[AutoScale]

Setting Enable (Initial state), Disable

■ Scale

Set scale of vertical for [CheckCompWave] screen.
*This function is enable only when [AutoScale] is “Disable”.

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[Scale]

Setting value LowerLimit ±99999 (Initial state is 0)
 UpperLimit ±99999 (Initial state is 10000)

■ CompleteOutput

You can set output that is output when finished comparing waveform.
This output is ON when finished comparing waveform, and is reset when next comparing waveform start.

Operation:[MENU]⇒[Input]⇒[WaveCompare]⇒[CompareOutput]

Setting: None (Initial state), AL1, AL2, AL3, AL4

■ WaveSelect

Select screen displayed in measure screen.

Operation:[MENU]⇒[Display]⇒[DispSelect]⇒[WaveSelect]

Setting: WaveCompare ON (Initial state), OFF

■ Overwrite

Select overwrite enable/disable.

Operation:[MENU]⇒[System]⇒[WaveLog]⇒[Overwrite]

Setting: Enable (Initial state), Disable

■ OK/NG Wave View

You can check 8 waveforms log (4 OK logs and 4 NG logs).

Operation:[MENU]⇒[Diag/Log]⇒[OK/NG Wave View]

OK No.1	OK No.2	OK No.3	OK No.4
NG No.1	NG No.2	NG No.3	NG No.4

■ OK/NG Wave Erase

You can erase all OK waveforms log.
You can erase all NG waveforms log.

Operation:[MENU]⇒[Diag/Log]⇒[OK/NG Wave Erase]

16. MULTI HOLD MODE

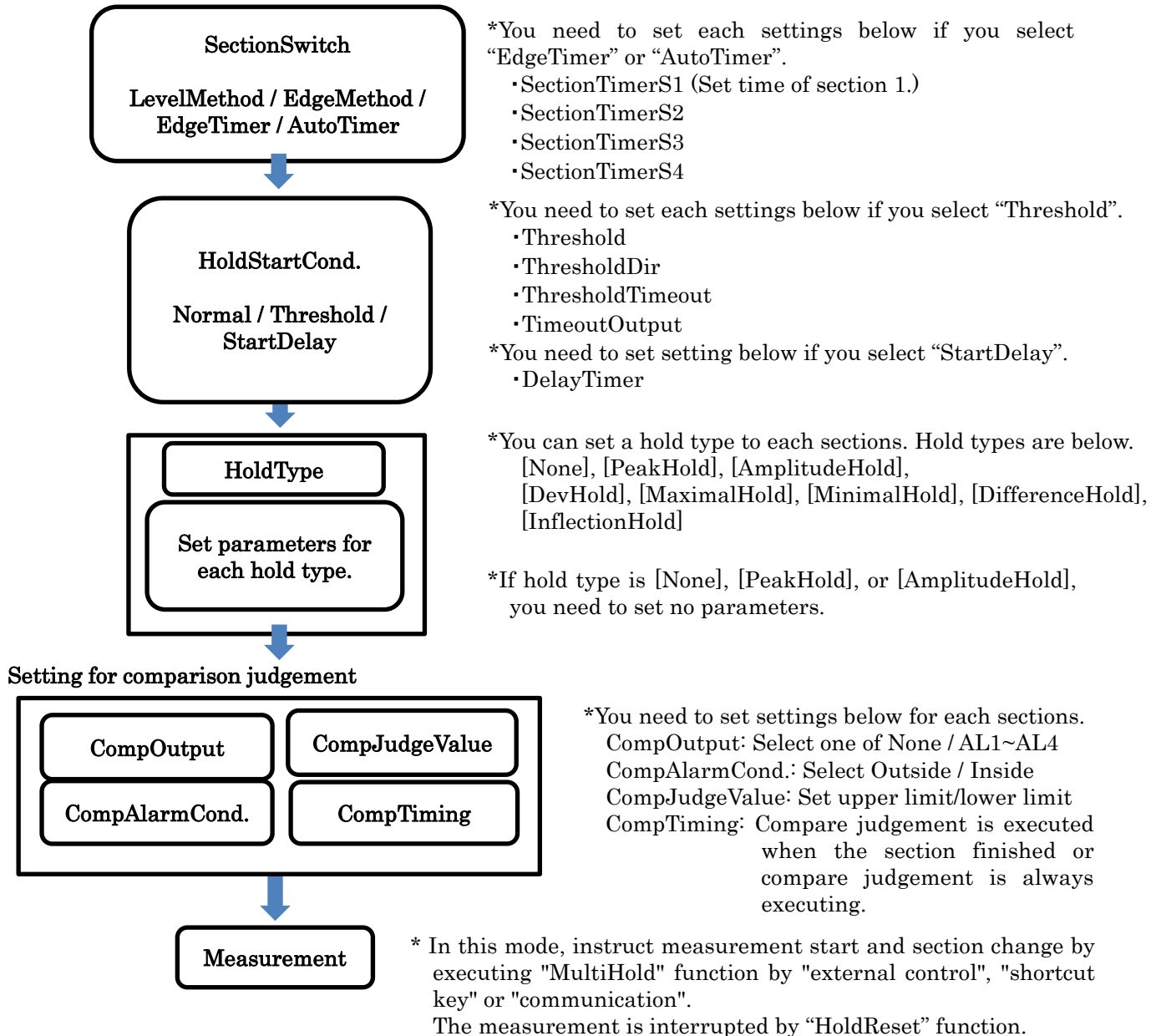
16-1. Overview

In the multi hold mode, measurements are divided into four sections of section 1 to section 4, arbitrary hold settings are set to each section, and comparison output is performed by hold value in each section and comparison judgment value set for each section, respectively.

To set this mode, operate[MENU]⇒[System]⇒[General]⇒[MeasureMode] ⇒[Multi].

How to use of multi hold mode is shown below.

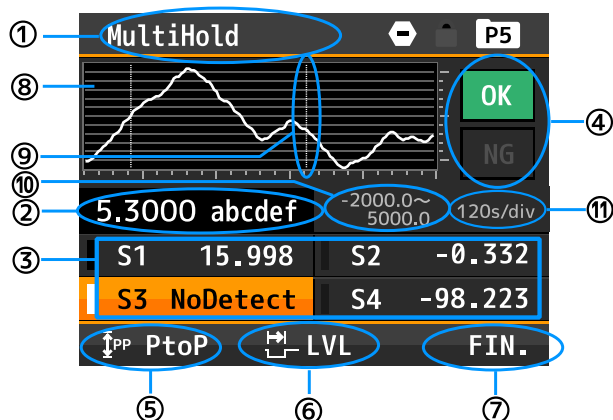
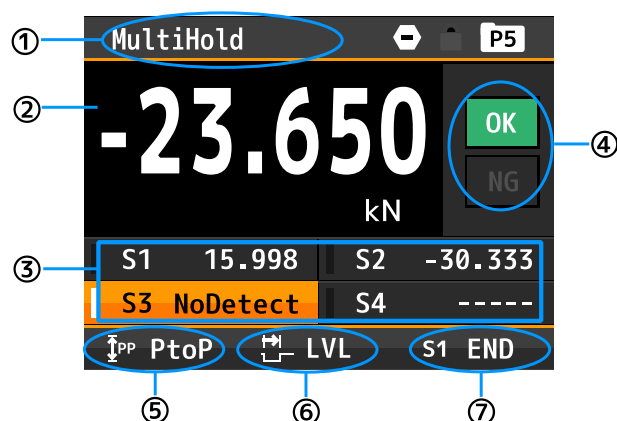
Each settings are set into [MENU]⇒[Input]⇒[Multi Base] , [Multi S1~S4].



■ Screen description

Left: Multi A measurement screen

Right: Multi A graph screen



No.	Name	Function
①	Screen title	Display title of measurement screen.
②	Display value	Display value and unit.
③	Section information	Display present hold value (running section) or last hold value (finished section). If the section is [NG], the section lights in orange.
④	Comparison result	Display [OK] or [NG] by result of the section.
⑤	Hold type	Display hold type of present section. *If it is 1ch product, more icon is displayed below. MAX: Peak hold PtoP: Amplitude hold MXML: Maximal hold MIML: Minimal hold MtoM: Difference hold INF: Inflection hold
⑥	Section switch	Display section switch by icon. *If it is 1ch product, more icon is displayed below. LVL: Level method EDG: Edge method EDGT: Edge timer AUTO: Auto timer
⑦	Section Information	Display present section number and state. READY: Waiting for start multi hold. FIN.: Finished multi hold. S1~S4: Section 1~4 WAIT: Waiting for section start. RUN: Section running. END: Finished section.
⑧	Graph	Display value as graph.
⑨	Section separation	White dashed line is separation of section.
⑩	Upper and lower limit	Upper limit and lower limit of graph.
⑪	Time scale	Display time scale of graph.

■ Multi hold icon

Icons are light up in accordance with hold type and section switch.

Icon	Mean
	Comparison reset ON
	Peak hold ON
	Amplitude hold ON
	Maximal hold ON
	Minimal hold ON
	Difference hold ON

Icon	Mean
	Inflection hold ON
	Section switch is level method
	Section switch is edge method
	Section switch is edge timer
	Section switch is auto timer

16-2. Section switch

There are 4 ways for switch section. There are [Level method] [Edge method] [Edge timer] [Auto timer].

You can start measurement or can switch section by [Multi] function executed by external control, shortcut and communication.

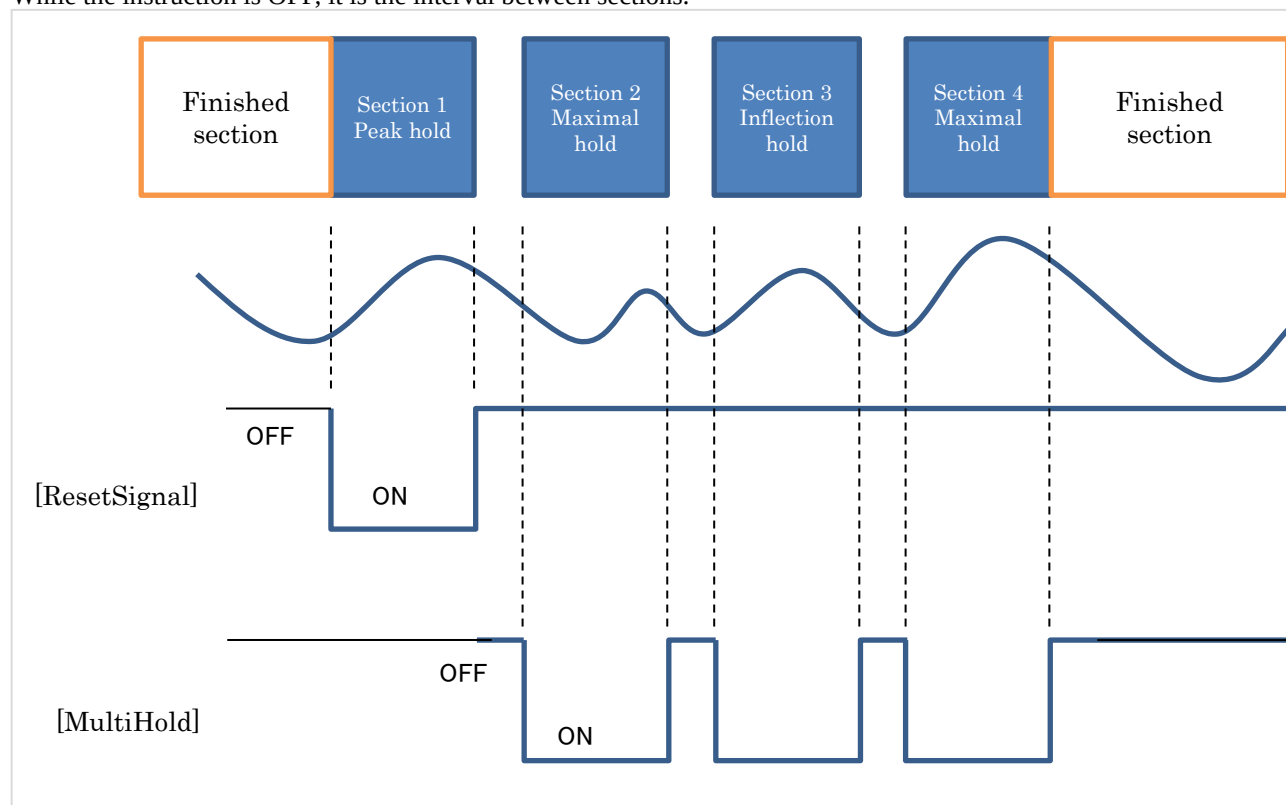
To set section switching, operate [MENU]⇒[Input]⇒[Multi Base]⇒[SectionSwitch].

The flow of measurement by section switching method is shown below.

■ Level method

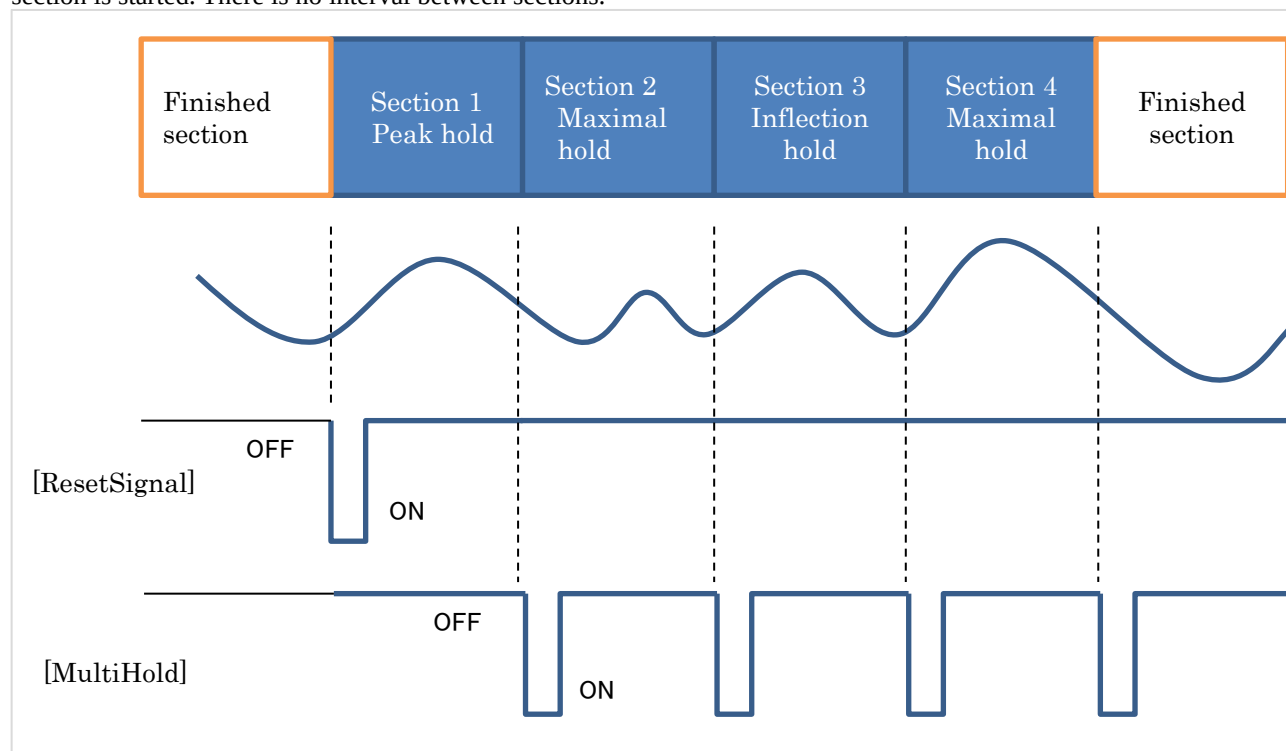
The section continues only while the "ResetSignal" or "MultiHold" instructions are ON.

While the instruction is OFF, it is the interval between sections.



■ Edge method (initial value)

When the "ResetSignal" instruction is turned on, section 1 is started, and when the "MultiHold" instruction is turned on, the next section is started. There is no interval between sections.

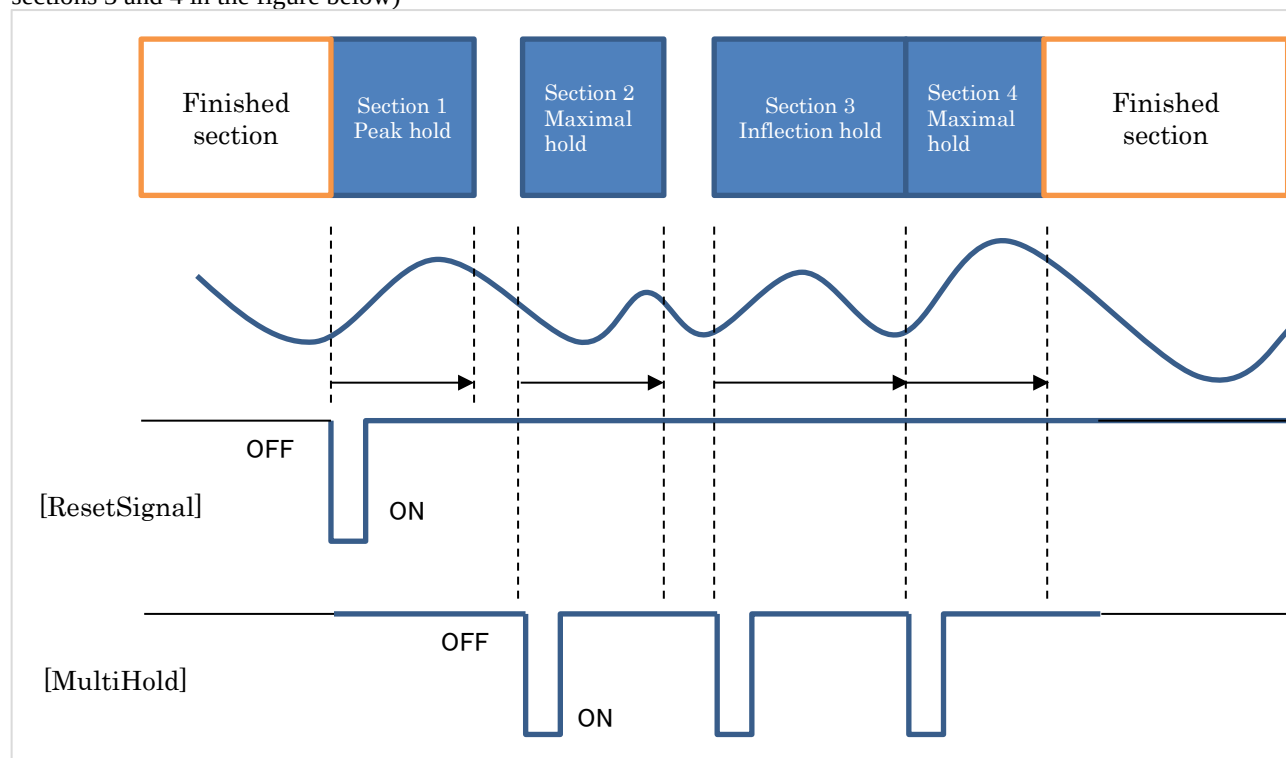


■ EdgeTimer

Section 1 starts when the "ResetSignal" instruction turns ON, the next section starts when the "MultiHold" instruction turns ON, and the section ends after the set time has elapsed.

There is an interval from the end of the section to the next "MultiHold" instruction.

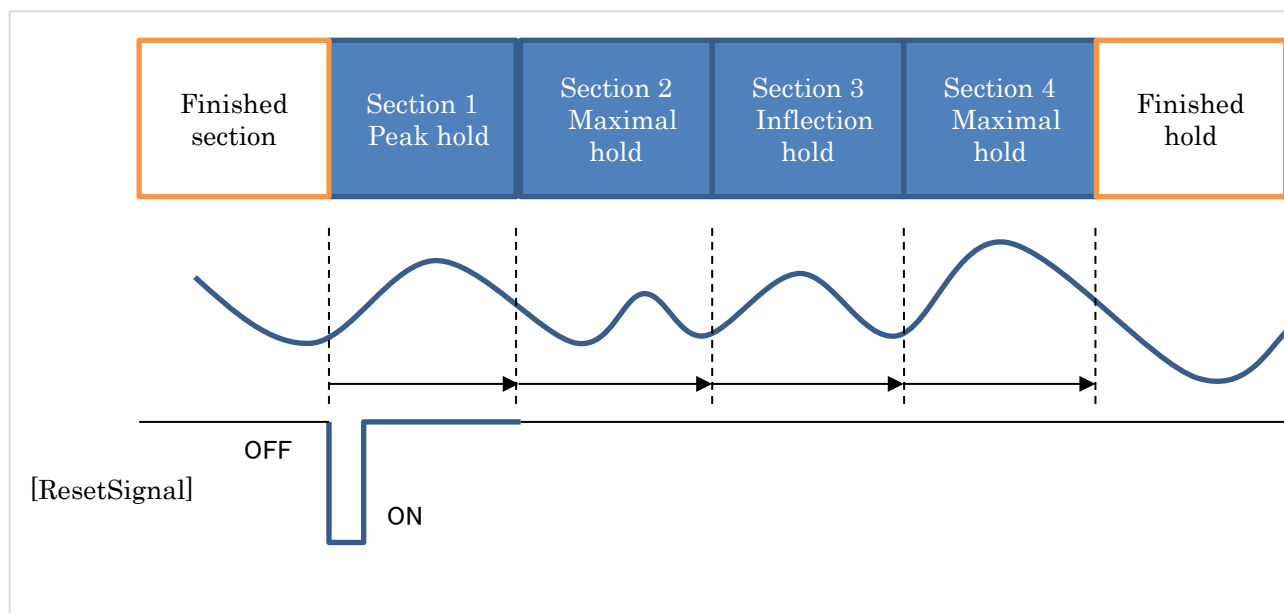
When the product received a "MultiHold" instruction in the middle of a section, next section starts immediately. (See between sections 3 and 4 in the figure below)



■ AutoTimer

Section 1 is started when the "ResetSignal" instruction is turned ON, and the next section is started after the set time has elapsed. There is no interval between sections.

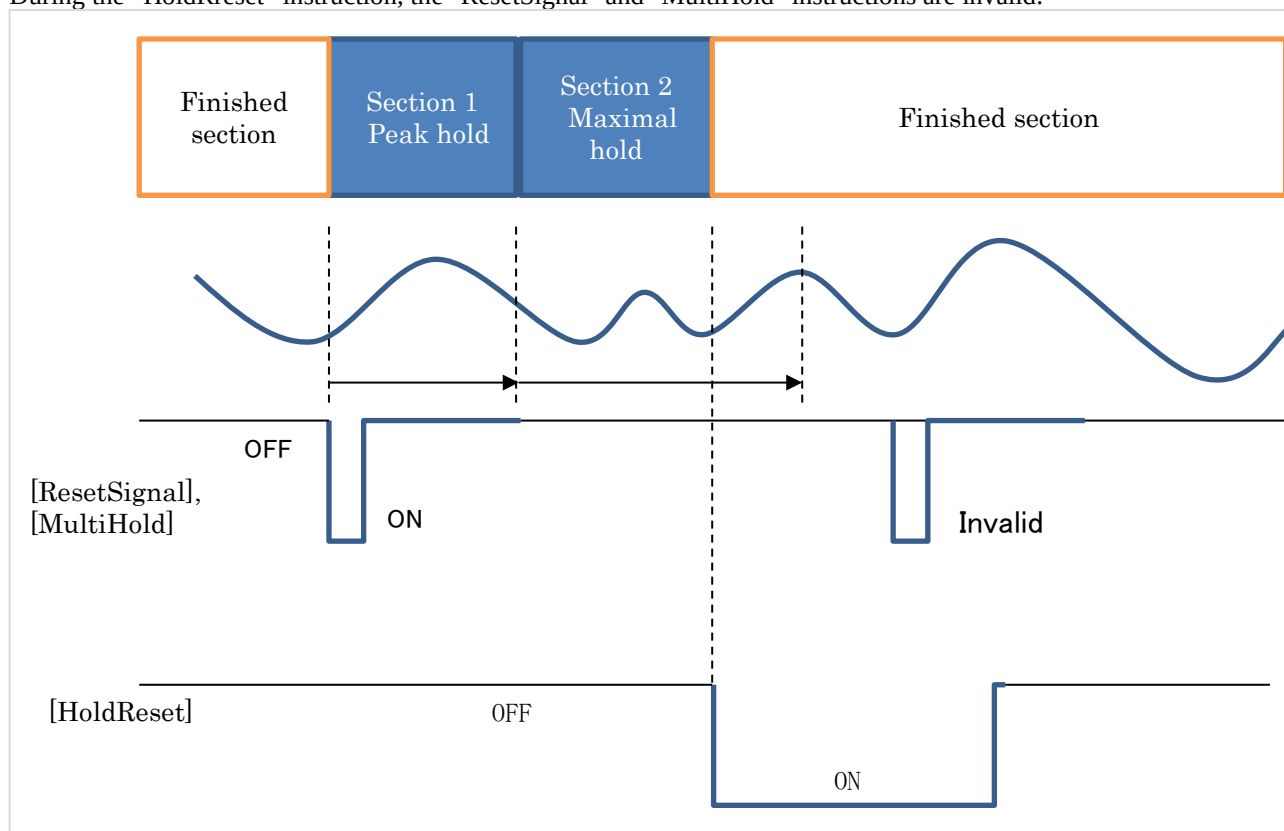
When the product received a "multi-hold" instruction in the middle of a section, the section end immediately.



■ HoldReset

If you want to end the multi hold immediately, execute the "HoldReset" instruction with any of external control, shortcut key, and communication to skip the current and subsequent sections and move to the end section. (Figure below)

During the "HoldReset" instruction, the "ResetSignal" and "MultiHold" instructions are invalid.



■ Change number of section

Section number of multi hold is 4, but you can pseudo change section number by using [HoldReset] and changing settings. How to

reduce of number of section is shown below.

- Level method, Edge method, Edge timer

(Method 1) You can finish unnecessary sections speedy by turning "Multi Holding" function ON / OFF at short intervals.
Then, to forbid alarm, set [CompareOutput: None], [CompareAlarmCond.: Outside], [CompJudgeValue: LowerLimit: -99999, UpperLimit: 99999].

(Method 2) Use [HoldReset] function to skip unnecessary sections.

- AutoTimer (You can also execute with EdgeTimer)

(Method 1) Set [SectionTimer: 0.00sec] to finish unnecessary sections immediately.

(Method 2) Use [HoldReset] function to skip unnecessary sections.

16-3. HoldStartCond.

Set condition of hold starting of each sections.

Set the conditions from the beginning of the section to the start of the hold.

Conditions are shown below.

- Normal

- Threshold

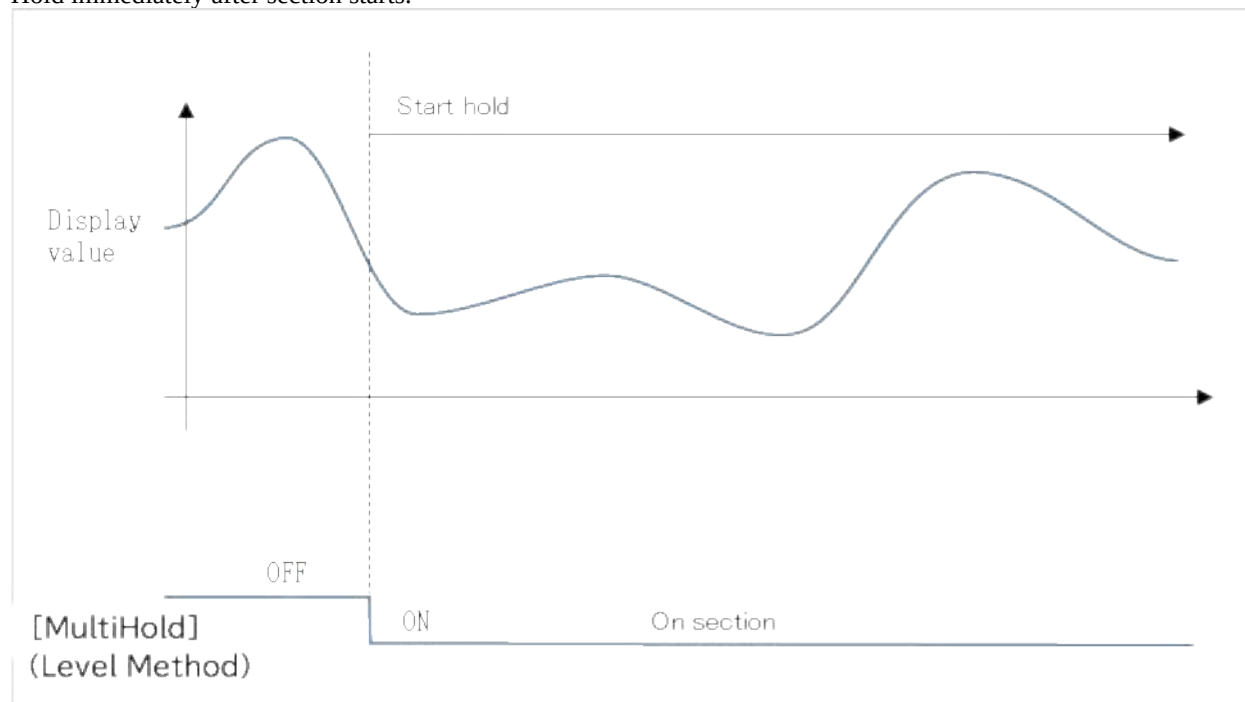
- DelayTime

These operations are independent from [SectionSwitch].

To set this function, operate [MENU]⇒[Input]⇒[Multi S1~S4]⇒[HoldStartCond.].

■ Normal

Hold immediately after section starts.



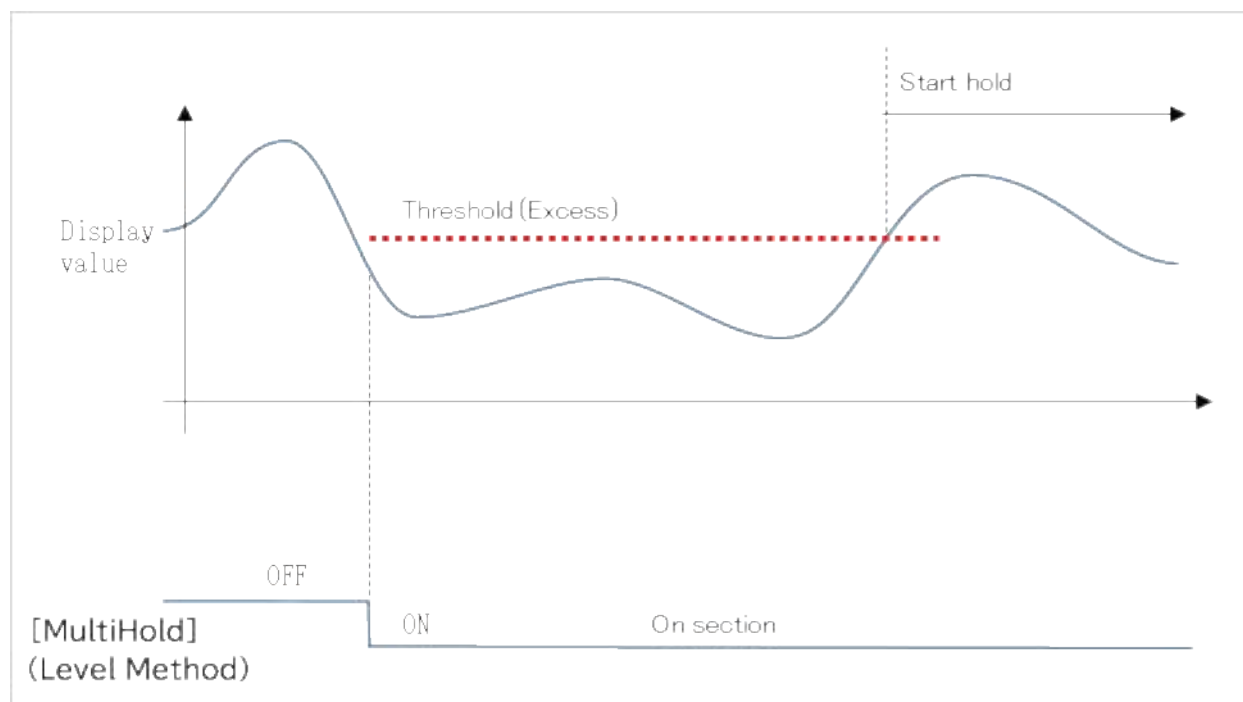
■ Threshold

After the section starts, when it exceeds (or falls below) the threshold, hold starts.

If the threshold is not exceeded (or does not go below) for a certain period of time after the section is started, the section ends as a timeout.

You need to set more settings below if [HoldStartCond.] is “Threshold”.

- Threshold: Set level of thresholds.
- ThresholdDir: Select whether the holding start exceeds the threshold or falls below.
- ThresholdTimeout: Set certain time as timeout.
- TimeoutOutput: Set which timeout output AL1～AL4 is used.

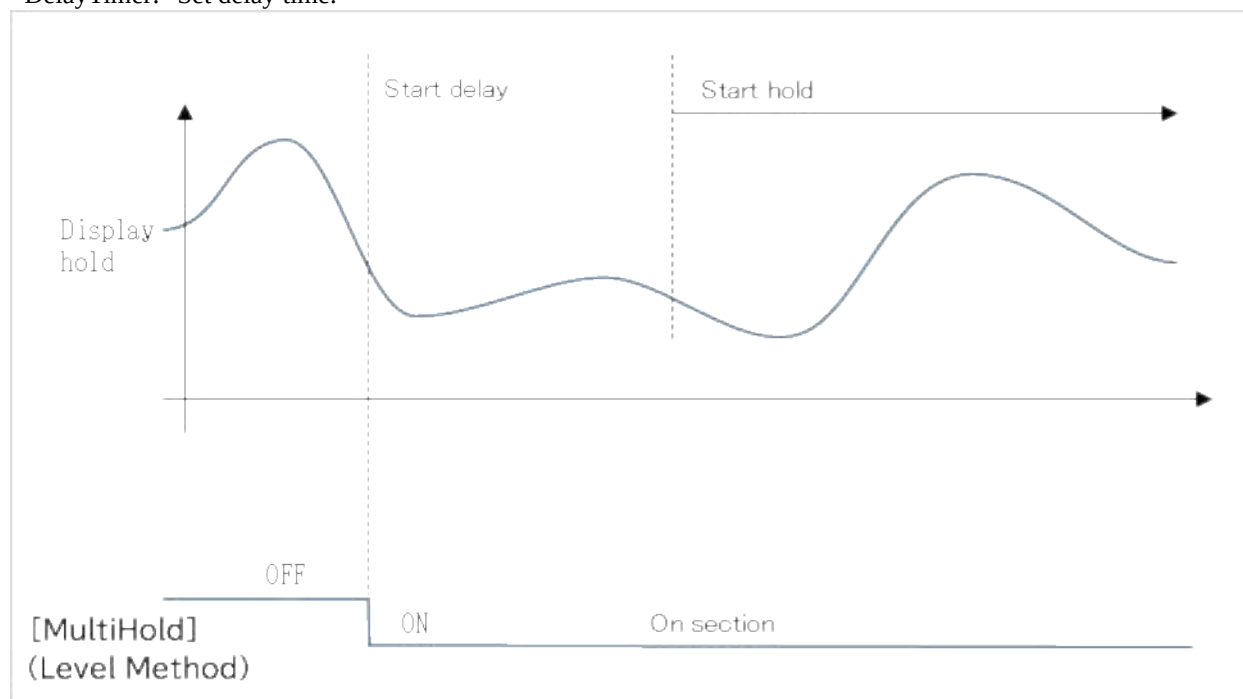


■ DelayTimer

Hold starts after certain time after section starts.

You need to set more settings below if [HoldStartCond.] is “DelayTimer”.

- DelayTimer: Set delay time.



16-4. Comparison judgement

About comparison judgement is mentioned below.

Comparison judgement is activated with hold value and comparison judgment value.

You can select always compare in section or compare once at end of section.

The comparison judgment values are set in the upper and lower limit zones, and it can be selected whether it is alarm when the hold value is outside the zone or alarm when inside the zone.

These settings are set per section.

■ CompTiming

Select always compare in section or compare once at end of section.

Default setting is always comparing in section.

■ CompJudgementValue

Set upper and lower limits of comparison judgement zone.

*If you want to use one of both, set the other value to +99999 or -99999.

■ CompAlarmCond.

Select whether it is alarm when the hold value is outside the zone or alarm when inside the zone.

By default, it is alarm when the hold value is outside the zone.

■ CompOutput

Select alarms which alarm. By default, no alarm is selected.

You can select same alarm which is selected at other section setting. Then, it alarms either sections.

16-5. Hold type

Hold types are shown below.

•None

Measure with no hold. This is normal comparison judgement.

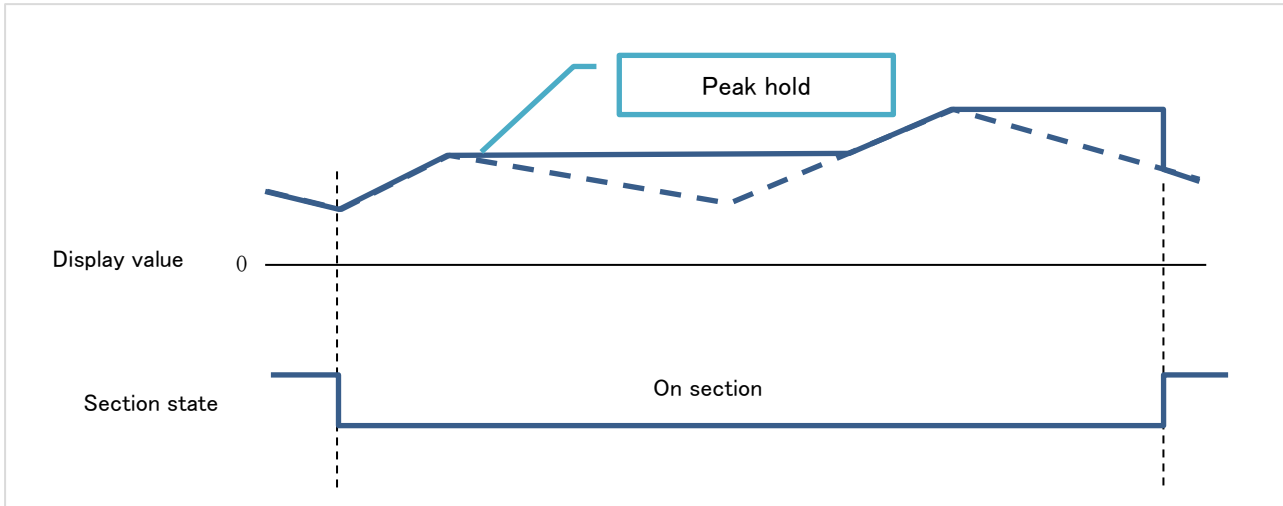
When “CompTiming” is “WithinSection”, use display value and compare always.

When “CompTiming” is “EndOfSection”, use final display value and compare.

■ Peak hold (initial value)

Hold the maximum value of the section.

If a plus over occurs, the maximum value is set as a plus over and $\pm$ OVER is maintained.

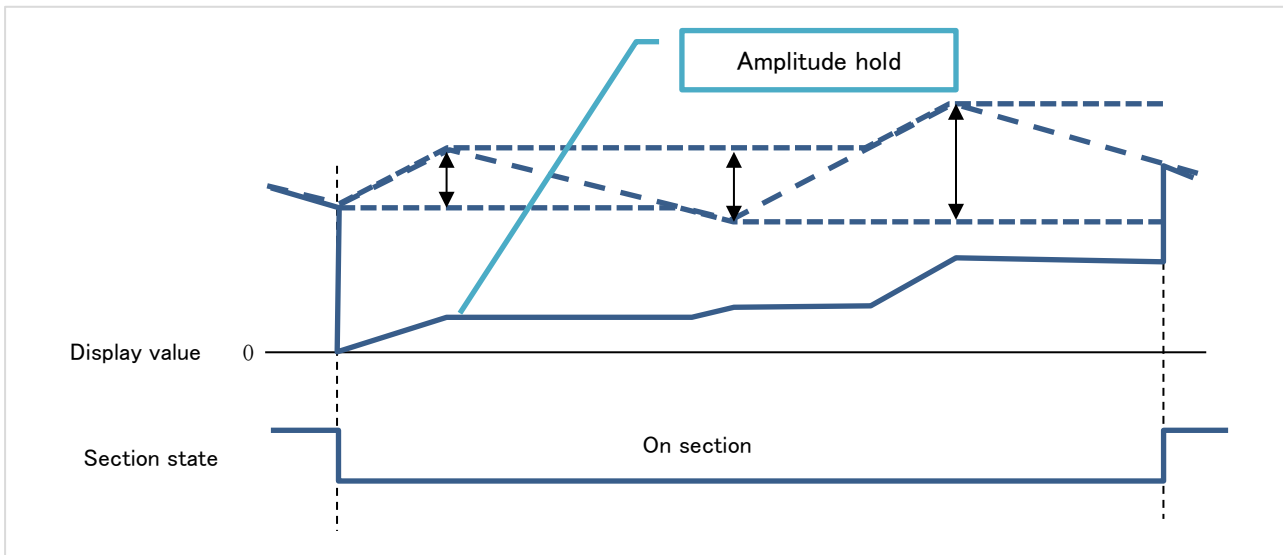


■ Amplitude hold

Hold amplitude (difference between maximum and minimum values) of the section.

If plus/minus over occurs, it is not hold.

When recovering from plus over or minus over, the amplitude value is updated and held with the value immediately after returning.



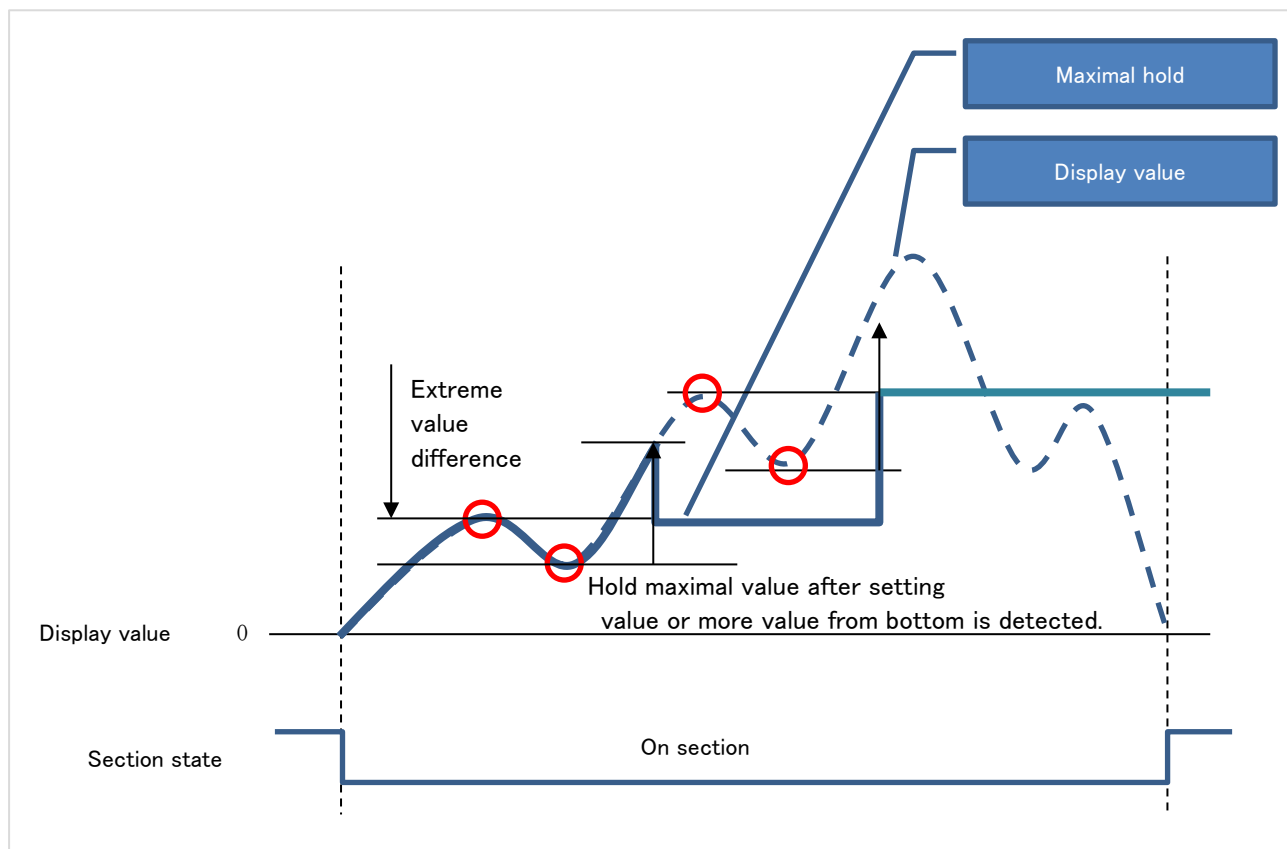
■ Maximal hold

Detect and hold maximal value. Maximal value is updated every detection and final maximal value is hold when section finished.
If plus/minus over occurs, maximal value is not detected.
When recovering from plus over or minus over, the maximal value is updated by the value after returning.

Maximal value detection is performed by sequentially detecting the maximum value and the minimum value as in the following procedure and hold at the timing of the minimum value detection.

- ① Maximum value detection
The maximum value is temporarily placed as a local maximal value when $(\text{maximum value} - \text{current value}) > \text{difference value}$ of maximum and minimum values.
- ② Minimum value detection
The minimum value is taken as a minimal value when $(\text{current value} - \text{minimum value}) > (\text{maximal value} - \text{minimum value}) \times \text{difference magnification}$, and hold the maximal value.

You need to set difference value (DifValue) and difference magnification (DifMag).



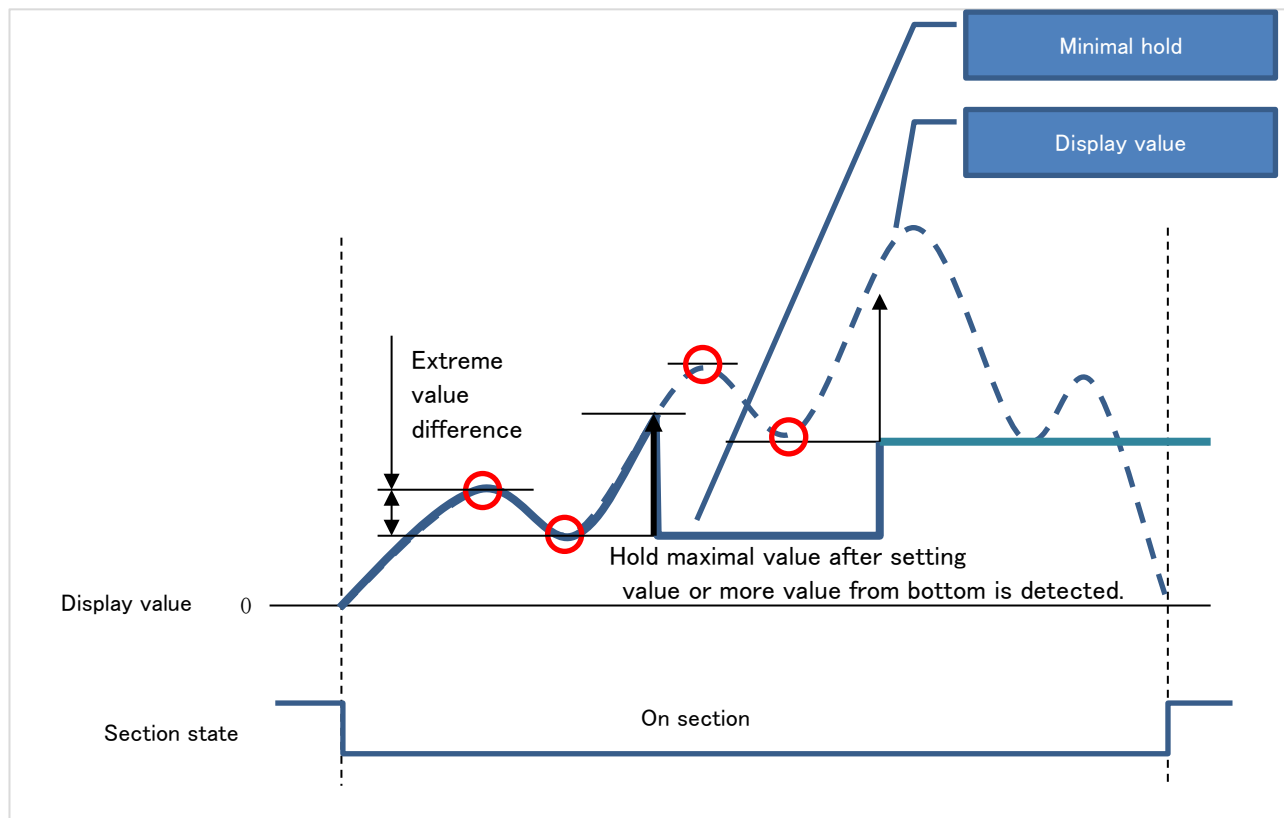
■ Minimal hold

Detect and hold minimal value. Minimal value is updated every detection and final minimal value is hold when section finished.
If plus/minus over occurs, minimal value is not detected.
When recovering from plus over or minus over, the minimal value is updated by the value after returning.

Minimal value detection is performed same as maximal value detection mentioned above.

- ① Maximum value detection
The maximum value is temporarily placed as a local maximal value when $(\text{maximum value} - \text{current value}) > \text{difference value}$ of maximum and minimum values.
- ② Minimum value detection
The minimum value is taken as a minimal value when $(\text{current value} - \text{minimum value}) > (\text{maximal value} - \text{minimum value}) \times \text{difference magnification}$, and hold the minimal value.

You need to set difference value (DifValue) and difference magnification (DifMag).



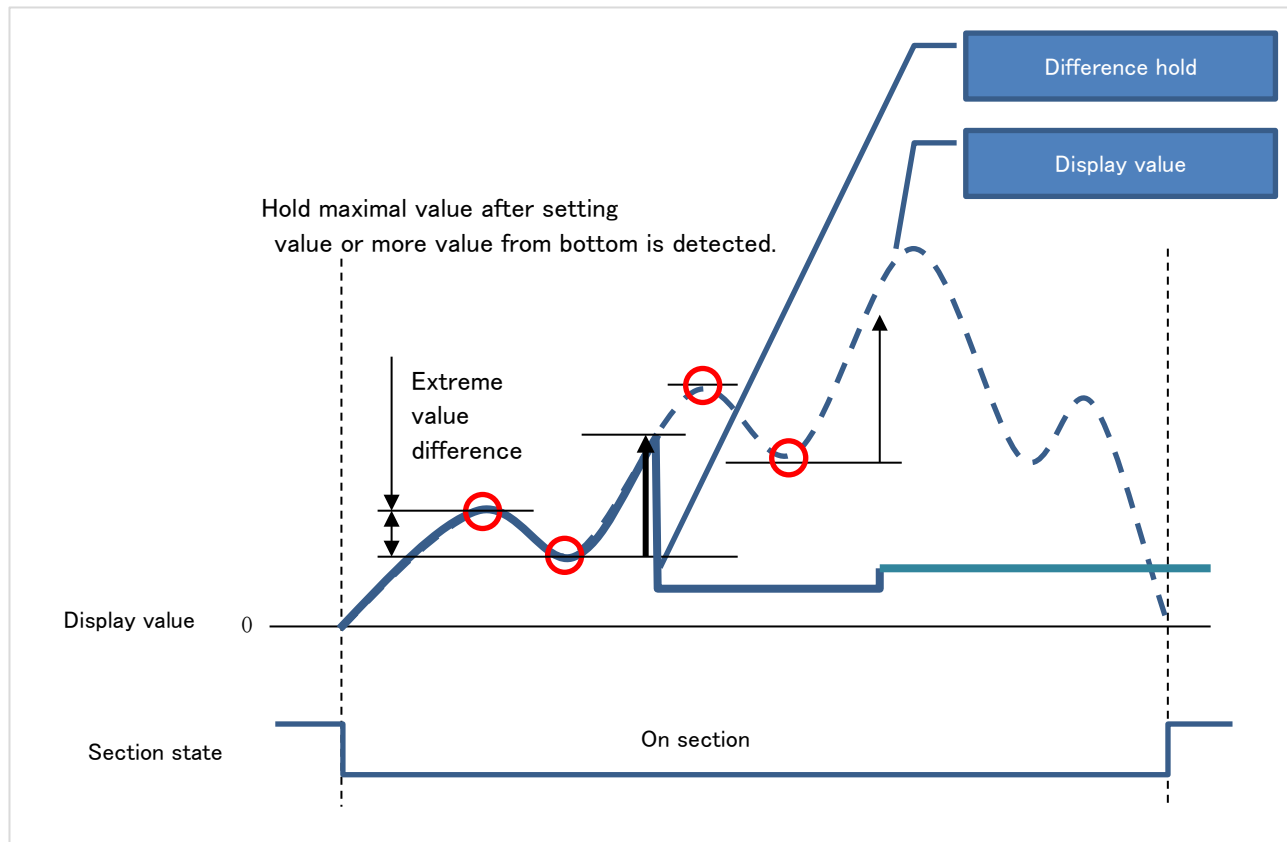
■ Difference hold

Detect and hold difference of maximal and minimal values.

If plus/minus over occurs, maximal and minimal values are not detected.

When recovering from plus over or minus over, the difference of maximal and minimal values is updated by the value after returning.

You need to set difference value (DifValue) and difference magnification (DifMag).



■ Inflection hold

Detect the point where the display value changed greatly and holds it as inflection point.

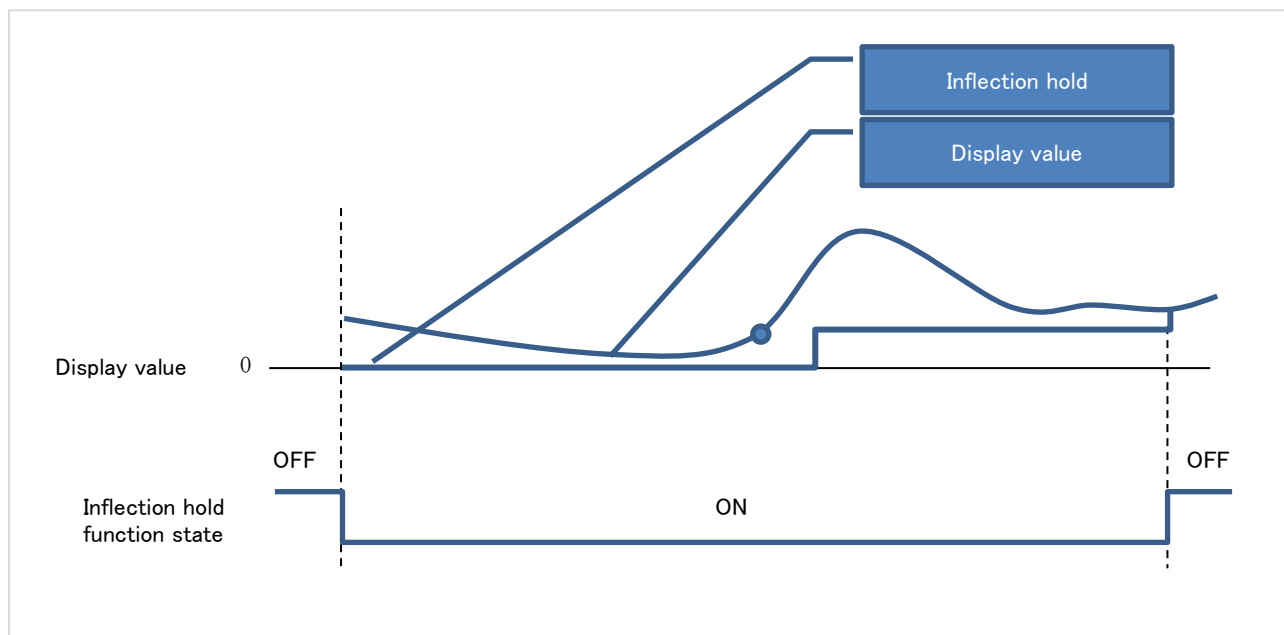
If plus/minus over occurs, inflection point is not detected.

When recovering from plus over or minus over, the inflection point is updated by the value after returning.

Flow of inflection point detection

- ① Inflection point is detected and hold when (Amount of change in “InfTimeB”) – (Amount of change in “InfTimeA”) > “InfValueZ”.
- ② Each values of formula of ① are updated per sampling.

You need to set inflection time A (InfTimeA) and inflection time B (InfTimeB) and inflection value Z (InfValueZ).



Since the sign of inflection value Z (InfValueZ) affects detection, the hold operation for each setting is described below.

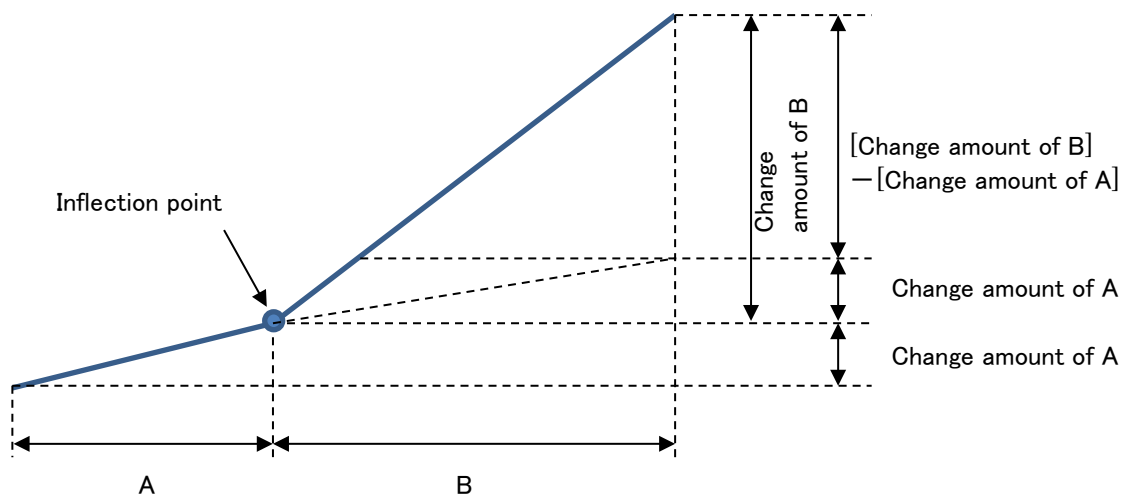
Case1. When inflection value Z is 0

Don't detect.

Case2. When inflection value Z is positive number

Inflection point is detected when

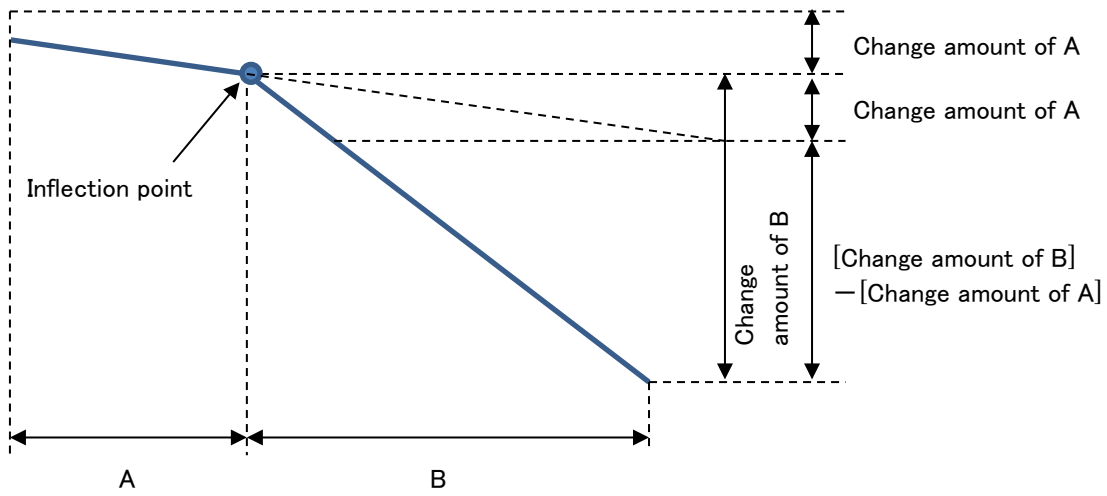
$$[\text{Amount of change in "InfTimeB"}] - [\text{Amount of change in "InfTimeA"}] \geq [\text{InfValueZ}]$$



Case3. When inflection value Z is negative number

Inflection point is detected when

$$[\text{Amount of change in "InfTimeB"}] - [\text{Amount of change in "InfTimeA"}] \leq [\text{InfValueZ}]$$



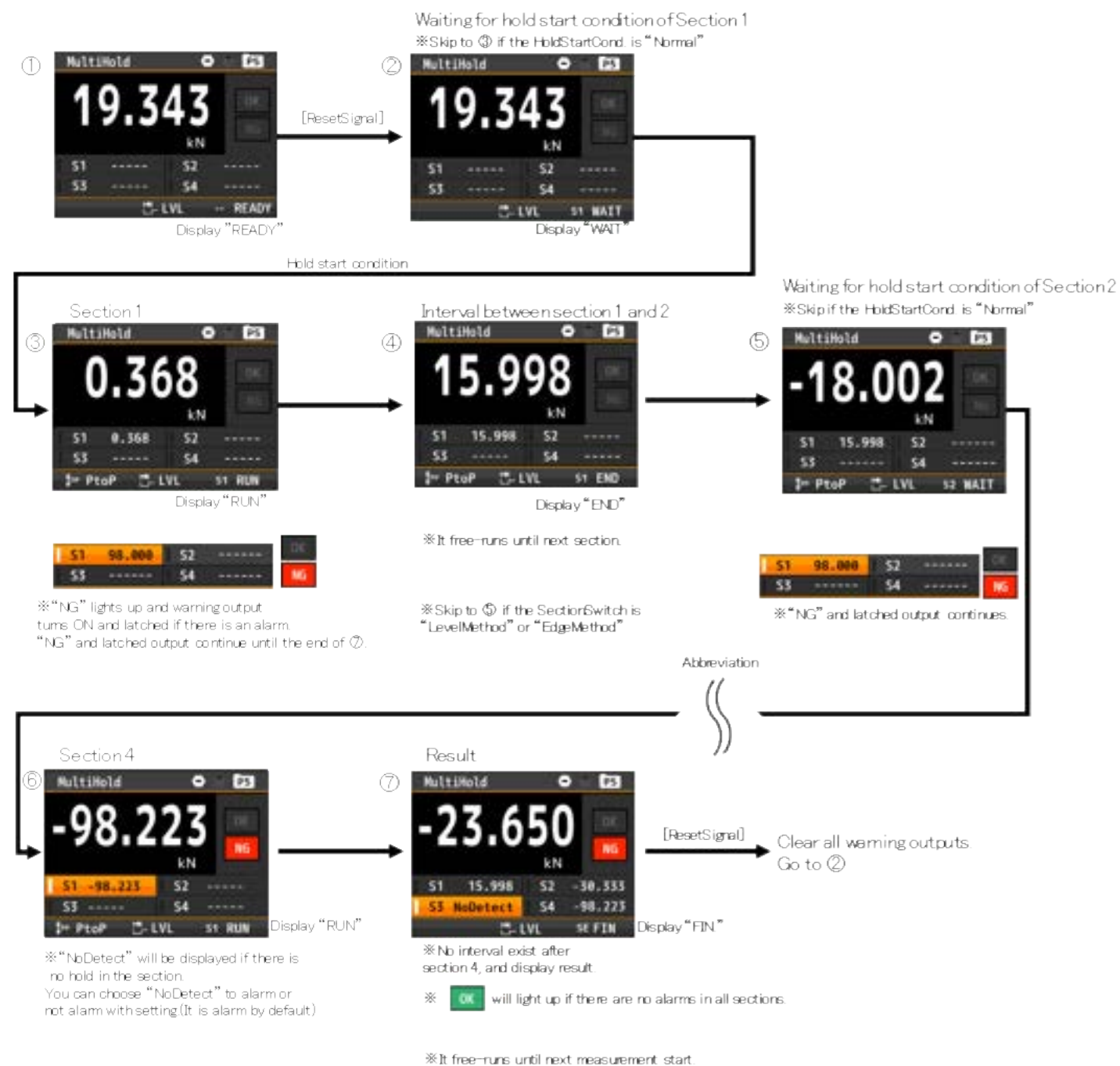
⚠ Caution

If there are some points that satisfy the condition of inflection point, hold point of the maximum of $[\text{Amount of change in "InfTimeB"}] - [\text{Amount of change in "InfTimeA"}]$.

16-6. How to measure of multi hold function

How to measure of multi hold function is shown below.

Measurement start is executed by “ResetSignal” function that are operated by external control, shortcut key and communication function.



16-7. Setting items

Settings related to multi hold are mentioned below. This is a table about settings unique to multi hold.

Setting Hierarchy	Setting Type *1	Setting Items	Overview	Minimum Required *2
【Input】 Multi Base	Section Switch	SectionSwitch	Select way of section switching.	◎
		SectionTimerS1～S4	(Set this if “SectionSwitch” is “EdgeTimer” or “AutoTimer”.)	△
	Alarm Output	CompleteOutput	Select alarm for when all sections finished.	
		UniqueThreshold	Set the judgement value of “UniqueOutput”.	
		UniqueOutput	set load arrival output	
		AlarmColorS1～S4	Select back ground color displayed at alarming.	
【Input】 Multi S1～S4	Start Condition	HoldStartCond.	Select start condition of section.	◎
		Threshold	(Set this if “HoldStartCond.” is threshold.)	△
		ThresholdOnDir	(Set this if “HoldStartCond.” is threshold.)	△
		ThresholdTimeout	(Set this if “HoldStartCond.” is threshold.)	△
		ThresholdTimeout Output	(Set this if “HoldStartCond.” is threshold.)	△
		DelayTimer	(Set this if “HoldStartCond.” is delay.)	△
	Hold	HoldType	Select hold type	◎
		DifValue	(Set this if “HoldType” is “Maximal/Minimal/DifferenceHold”.)	△
		DifMag	(Set this if “HoldType” is “Maximal/Minimal/DifferenceHold”.)	△
		InfTimeA	(Set this if “HoldType” is “InflectionHold”.)	△
		InfTimeB	(Set this if “HoldType” is “InflectionHold”.)	△
		InfValueZ	(Set this if “HoldType” is “InflectionHold”.)	△
	Alarm Output	CompOutput	Select alarm operated at alarm.	◎
		CompAlarmCond.	Select Outside / Inside.	◎
		CompJudgeValue	Set upper and lower comparison value.	◎
		CompTiming	Select WithInSection / EnfOfSection	◎
		NotDetected	Select alarm ON/OFF for when no hold detected in section.	
【Screen】 Disp Select	Other	MultiSelect	Select screens that are displayed by operating Disp key	

*1 Section

Switch: Settings about section switching

Start Condition: Settings about start condition of section.

Hold : Settings about holding.

Alarm Output: Settings about alarm output.

Other: Settings about other.

*2 ◎: Settings that are minimum required to use multi hold function.

△ : Settings that are required in some cases.

Detail descriptions of settings of multi hold is as follows.

■ SectionSwitch

Select a way of section switching.

Operation:[MENU]⇒[Input]⇒[Multi Base]⇒[SectionSwitch]

Settings: EdgeMethod (Initial state), LevelMethod, EdgeTimer, AutoTimer

■ SectionTimerS1/S2/S3/S4

Set timer of each sections.

*This setting is enable if “SectionSwitch” is “EdgeTimer” or “AutoTimer”.

Operation:[MENU]⇒[Input]⇒[Multi Base]⇒[SectionTimerS1/S2/S3/S4]

Setting value: 0.00~99.99[sec] (Initial state is 1.00[sec])

■ CompleteOutput

Select alarm that alarm when all sections finished. The alarm continues until next measurement starting.

*Alarm will be ON regardless of result of comparison judgement.

Operation:[MENU]⇒[Input]⇒[Multi Base]⇒[CompleteOutput]

Setting: AL2 (Initial state), AL1, AL3, AL4, None

■ UniqueThreshold

Set the judgement value of “UniqueOutput”.

Operation:[MENU]⇒[Input]⇒[Multi Base]⇒[UniqueThreshold]

Setting value: ±99999 (Initial state is +99999)

■ UniqueOutput

Set an alarm that turns ON when the measured value exceeds the judgment value set in “UniqueThreshold”. It keeps alerting all the time while it is exceeded.

*Judgement is made based on the measured value, not the section display value on which the hold function is working.

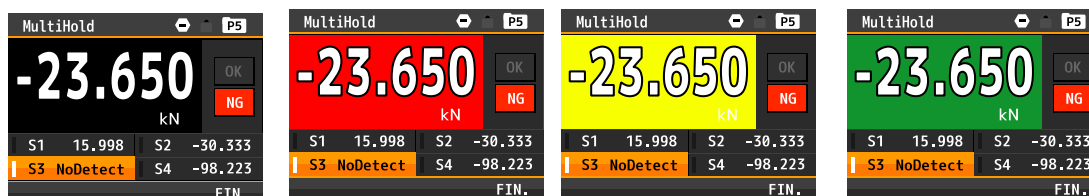
Operation:[MENU]⇒[Input]⇒[Multi Base]⇒[UniqueOutput]

Setting:None(Initial state), AL1, AL2, AL3, AL4

■ AlarmColorS1~S4

Select background colors that indicate alarm ON of each sections.

*You can set not color of number but color of background.



Operation:[MENU]⇒[Input]⇒[Multi Base]⇒[AlarmColorS1/S2/S3/S4]

Setting: Black, Red (Initial state), Yellow, Green

*If the setting is “Black”, background color of alarming is same as of not alarming.

■ Scale

Set vertical scale of graph of multi hold.

Operation:[MENU]⇒[Input]⇒[Multi Base]⇒[Scale]

Setting value: LowerLimit ±99999 (Initial state is 0)

UpperLimit ±99999 (Initial state is 03000)

■ TimeAxis

Set time axis of graph of multi hold.

Operation:[MENU]⇒[Input]⇒[Multi Base]⇒[TimeAxis]

Setting: 100ms/div, 1s/div (Initial state), 2s/div, 5s/div, 10s/div, 30s/div, 60s/div, 120s/div

■ StartCondition

Select starting condition that holding will start after satisfied it.

- Normal Hold immediately after section started.
- Threshold After the section starts, when it exceeds (or falls below) the threshold, hold starts.
- StartDelay After the section starts, Hold starts when the set time has elapsed.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[StartCondition]

Setting: Normal (Initial state), Threshold, StartDelay

■ Threshold

Set threshold level of “StartCondition”.

*This setting is enable when “StartCondition” is “Threshold”.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[Threshold]

Setting: ±99999 (Initial state is 1000)

■ Threshold Dir

Set the condition (excess or less) for the threshold when the “StartCondition” is "Threshold".

*This setting is enable when “StartCondition” is “Threshold”.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[Threshold Dir]

Setting: Excess (Initial state), LessThan

■ ThresholdTimeout

When the “StartCondition” is “Threshold”, if the hold start condition is not satisfied for a certain time, this is a function to end the section as "No Detect".

Set the threshold timeout time.

*This setting is enable when “StartCondition” is “Threshold”.

*Set “TimeoutOutput” together.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[ThresholdTimeout]

Setting value: 0.00~99.99[sec] (Initial state is 0.00)

*This function is disable when the setting value is 0.00[sec].

■ TimeoutOutput

Set alarm output that is output when threshold timeout occurred.

*This setting is enable when “StartCondition” is “Threshold”.

*This output is reset when the next multi hold started.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[TimeoutOutput]

Setting: None (Initial state), AL1, AL2, AL3, AL4

■ DelayTimer

Set the delay timer.

*This setting is enable when “Start Condition” is “Start Delay”.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[DelayTimer]

Setting: 0.01~99.99[sec] (Initial state is 0.10)

■ HoldType

Select hold type of section.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[HoldType]

Setting: PeakHold (Initial state), None, AmplitudeHold, MaximalHold, MinimalHold, DifferenceHold, InflectionHold

■ DifValue

Set reference value of difference hold.

*This setting is enable when “HoldType” is “DifferenceHold”.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[DifValue]

Setting value: 99999 (Initial state is 1000)

■ DifMag

Set difference magnification of maximal and minimal.

*This setting is enable when “HoldType” is “DifferenceHold”.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[DifMag]

Setting Value: 0.01~99.99[Times] (Initial state is 1.00)

■ InfTimeA

Set time of “InfTimeA” for inflection hold.

*This setting is enable when “HoldType” is “InflectionHold”.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[InfTimeA]

Setting value: 1~499[points] (Initial state is 200)

*Please be aware that the actual time varies depending on sampling rate.

Example) Sampling rate:2000 $\square$ /sec, InfTimeA:200

Actual inflection = $(1/2000) \times 200 = 0.1\text{sec}$

■ InfTimeB

Set time of “InfTimeB” for inflection hold.

*This setting is enable when “HoldType” is “InflectionHold”.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[InfTimeB]

Setting value: 1~499[points] (Initial state is 200)

*Please be aware that the actual time varies depending on sampling rate.

Example) Sampling rate:2000 $\square$ /sec, InfTimeA:200

Actual inflection = $(1/2000) \times 200 = 0.1\text{sec}$

■ InfValueZ

Set value of “InfValueZ” for inflection hold.

*This setting is enable when “HoldType” is “InflectionHold”.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[InfValueZ]

Setting: ±99999 (Initial state is 30)

■ CompOutput

Set output that will output if alarm of this section turns on.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[CompOutput]

Setting: AL1 (Initial state), AL2, AL3, AL4, None

■ CompAlarmCond.

Select a condition of comparison alarm.

Outside: Alarm turns on if hold value is outside of the zone.

Inside: Alarm turns on if hold value is inside of the zone.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[CompAlarmCond]

Setting: OutsideTheZone (Initial state), InsideTheZone

■ CompJudgeValue

Set values (zone) of comparison judgement.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[CompJudgeValue]

Setting value: LowerValue: ±99999 (Initial state is 0)

UpperValue: ±99999 (Initial state is 10000)

■ CompTiming

Select a condition of timing of activating comparison judgement.

WithinSection: In section, always compare hold value and comparison judgement value.

EndOfSection: At section end, compare last hold value of section and comparison judgement value.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[CompTiming]

Setting: EndOfSection (Initial state), WithinSection

■ NotDetected

You can alarm if hold condition is never satisfied even once in section.

*This alarm continues until the end of result screen.

Operation:[MENU]⇒[Input]⇒[Multi S1/2/S3/S4]⇒[NotDetected]

Setting: WithAlarm (Initial state), NoAlarm

■ MultiSelect

Select screens which are displayed at measurement screen.

Operation:[MENU]⇒[Display]⇒[DispSelect]⇒[MultiSelect]

Setting: MultiValue, MultiGraph (All state is ON at initial state.)

17. CM-5 MODE

17-1. OVERVIEW

CM-5 mode is a mode that compares and outputs HI if the displayed value exceeds the range, GO if it is within the range, and LO if it falls below the range for the judgment range of the zone judgment.

In addition, if “UniqueThreshold” is exceeded, the set load arrival output is performed.

There are two types of comparison output, one is to make a judgment at all times and the other is to make a judgment at the end of measurement.

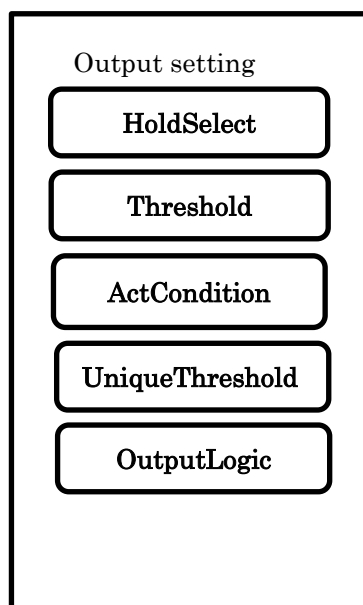
The end of measurement is managed by the END signal and controlled by external control, shortcut key, or communication. The display value during measurement is either free-run or retained at the maximum value (selection), and after the measurement is completed, the displayed value at the end of measurement is retained. To cancel the measurement end state, it is necessary to input the reset signal.

How to switch to CM-5 mode

[MENU]⇒[System]⇒[General]⇒[MeasureMode]⇒[CM-5]

The usage flow of CM-5 mode is as follows.

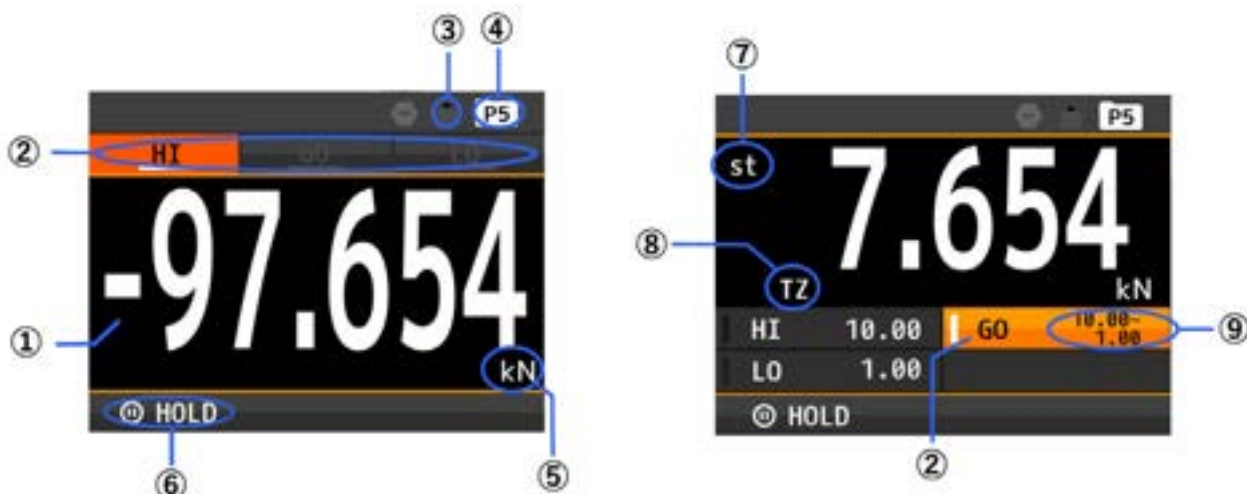
Operation:[MENU]⇒[Output]⇒[CM-5 Mode]



HoldSelect: Peak / Instant

ActCondition: Always / OnHold

■ Screen Description



No.	Name	Function
①	Measured value display	Show the display value.
②	Comparison result	Depending on the comparison test result, either HI / GO / LO lights up. *The result of “UniqueOutput” function is not displayed..
③	Key lock	Lights when the key lock function is ON.
④	Pattern number	Display the pattern number currently in use.
⑤	Display unit	Unit can be selected and set and displayed. No unit and custom unit (6 characters) are also available.
⑥	Hold contents	Display the content of the hold with an icon. HOLD: Instantaneous value retention MAX: Hold peak value
⑦	Stable detection	Lights when the displayed value is stable. (only when the stability detection function is ON)
⑧	Tracking zero	Lights when the tracking zero function is ON.
⑨	Comparison judgement value	Display the judgement value or judgement range of comparison judgement.

■ CM-5 mode specific function

• Comparison output function

In CM-5 mode, unlike other modes, the comparison output function is HI / GO / LO / set load arrival output instead of AL1 / AL2 / AL3 / AL4. The status of the set load arrival output is not displayed on the screen. For these operations, refer to “17-2. Operation sequence”

• External control function

In CM-5 mode, the functions assigned to the external control functions are fixed as follows.

- ExtCtrl1Func: ResetSignal
- ExtCtrl2Func: END Signal
- ExtCtrl3Func: None or PatternChange1
- ExtCtrl4Func: None or PatternChange2
- ExtCtrl5Func: None or PatternChange3

For details on how to use the “ResetSignal” and “END Signal”, refer to “17-2. Operation sequence”

• Shortcut function

In CM-5 mode, the functions assigned to the shortcut functions are fixed as follows.

- UP: ResetSignal
- DOWN: END Signal
- LEFT: PatternChange
- RIGHT: None

17-2. Operation sequence

This section describes the operation of CM-5 mode according to the settings.

- HoldSelect: Instant / Peak
- ActCondition: OnHold / Always

The above combination illustrates the operation of a total 4 patterns and the set load arrival output.

■ HoldSelect: Instant ActCondition: OnHold

① When END Signal is ON.

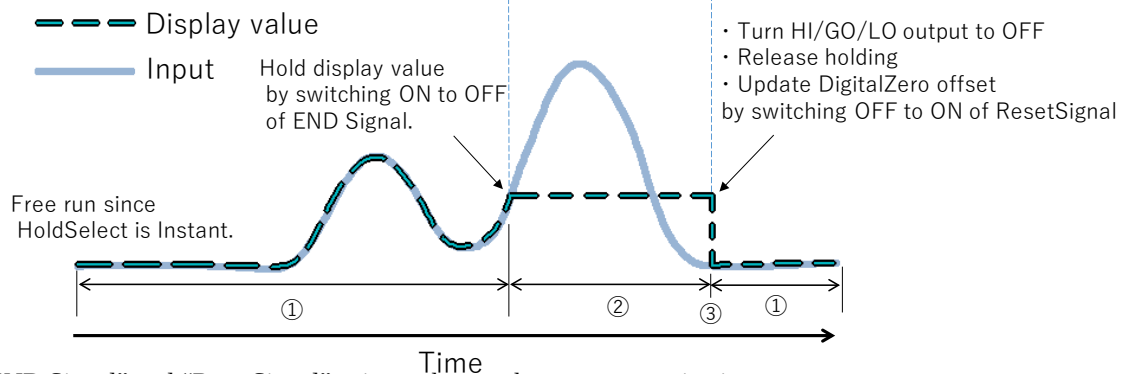
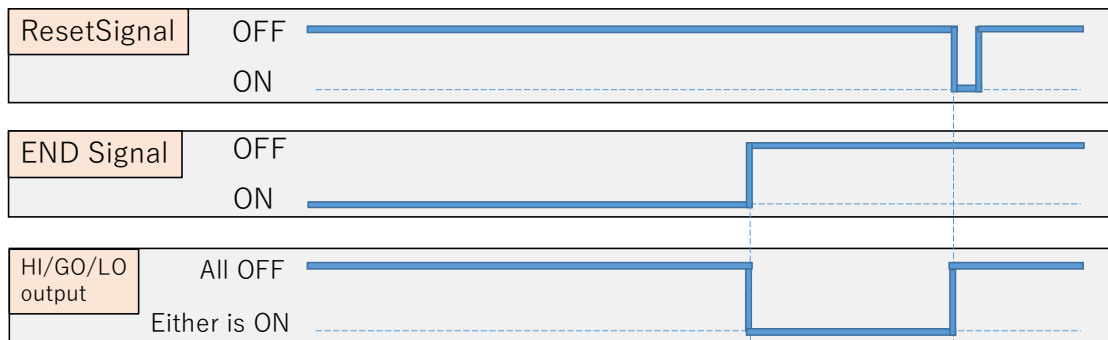
- Since “HoldSelect” is “Instant”, the display value will be free run.
- Since “ActCondition” is “OnHold”, all HI / GO / LO outputs are OFF.

② When END Signal changes from ON to OFF.

- Display value is fixed.
- Since “ActCondition” is “OnHold”, the judgement is made and either HI / GO / LO is turned ON.

③ When ResetSignal turns from OFF to ON.

- Since “ActCondition” is “OnHold”, all HI / GO / LO outputs are OFF.
- The fixed display value will be released and free run.
- The offset of the digital zero function is updated and display value becomes 0.



*When controlling the “END Signal” and “ResetSignal” using a shortcut key or communication, trigger control is used instead of ON / OFF control.

The display value can be fixed by executing the “END Signal” function using a shortcut key or communication.

■ HoldSelect: Instant ActCondition: Always

① When END Signal is ON.

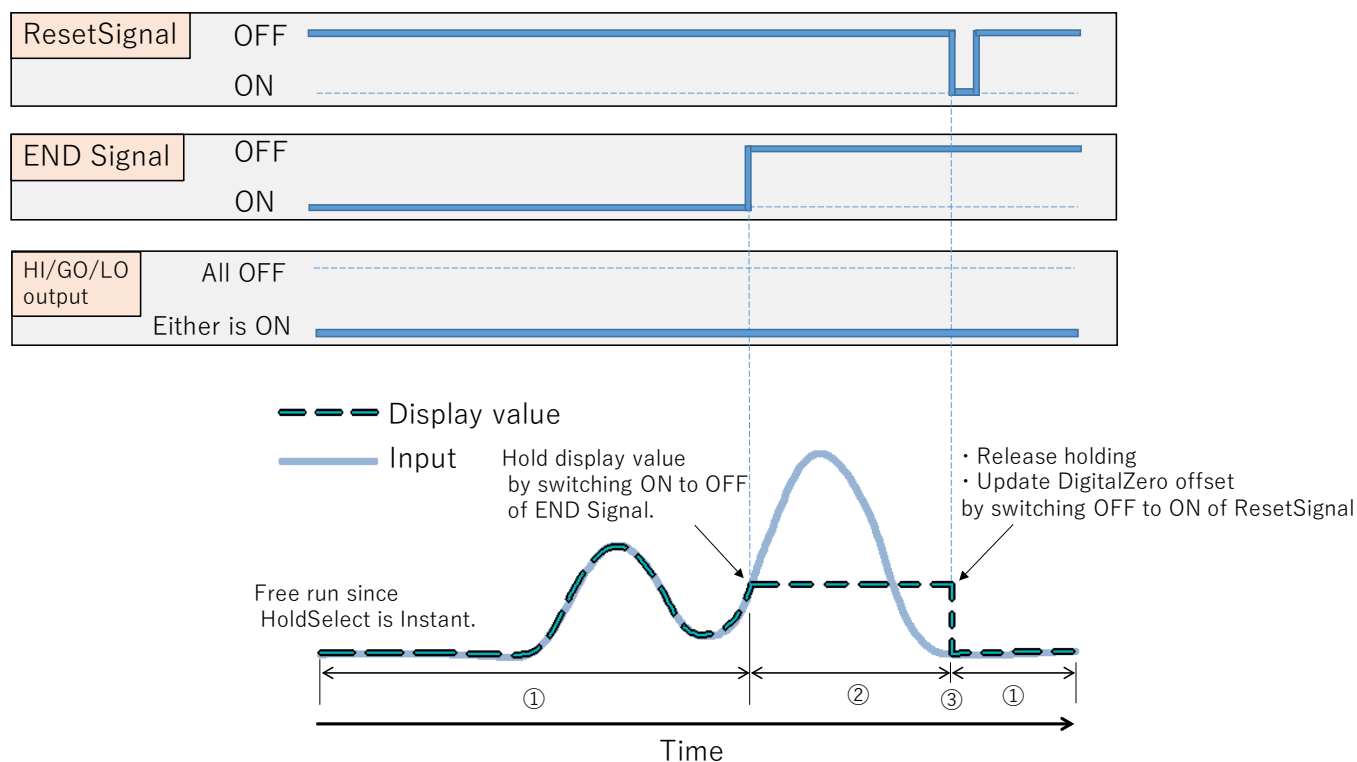
- Since “HoldSelect” is “Instant”, the display value will be free run.
- Since “ActCondition” is “Always”, the judgement is made and either HI / GO / LO is turned ON.

② When END Signal changes from ON to OFF.

- Display value is fixed.
- Since “ActCondition” is “Always”, the fixed display value is judged and HI / GO / LO is output.

③ When ResetSignal turns from OFF to ON.

- Since “ActCondition” is “Always”, the display value is judged and HI / GO / LO is output.
- The fixed display value will be released and free run.
- The offset of the digital zero function is updated and display value becomes 0.



*When controlling the “END Signal” and “ResetSignal” using a shortcut key or communication, trigger control is used instead of ON / OFF control.

The display value can be fixed by executing the “END Signal” function using a shortcut key or communication.

■ HoldSelect: Peak ActCondition: OnHold

① When END Signal is ON.

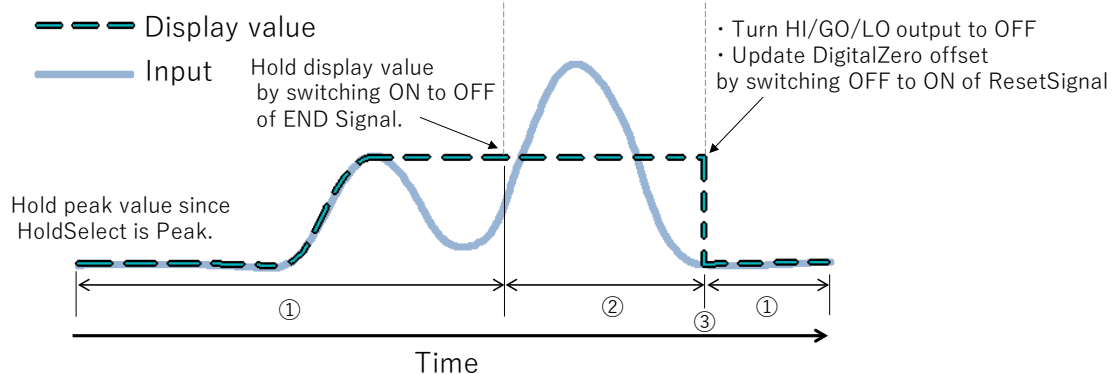
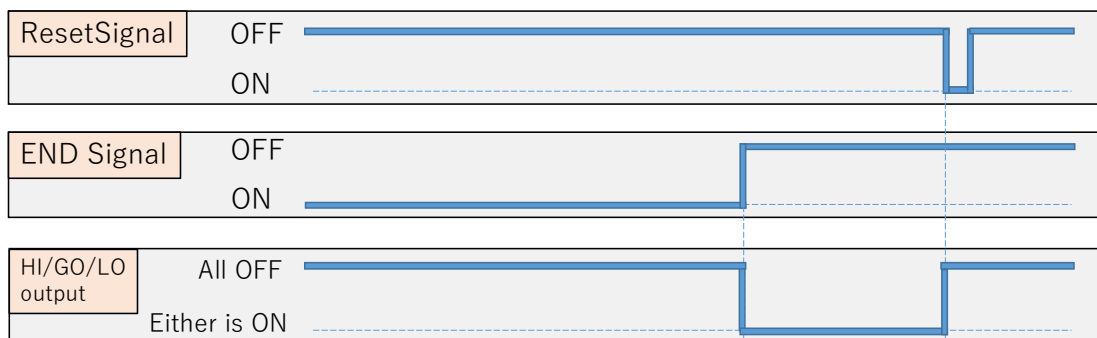
- Since “HoldSelect” is “Peak”, the display value holds the maximum value.
- Since “ActCondition” is “OnHold”, all HI / GO / LO outputs are OFF.

② When END Signal changes from ON to OFF.

- Display value is fixed.
- Since “ActCondition” is “OnHold”, the judgement is made and either HI / GO / LO is turned ON.

③ When ResetSignal turns from OFF to ON.

- Since “ActCondition” is “OnHold”, all HI / GO / LO outputs are OFF.
- The offset of the digital zero function is updated and display value becomes 0.



*When controlling the “END Signal” and “ResetSignal” using a shortcut key or communication, trigger control is used instead of ON / OFF control.

The display value can be fixed by executing the “END Signal” function using a shortcut key or communication.

■ HoldSelect: Peak ActCondition: Always

① When END Signal is ON.

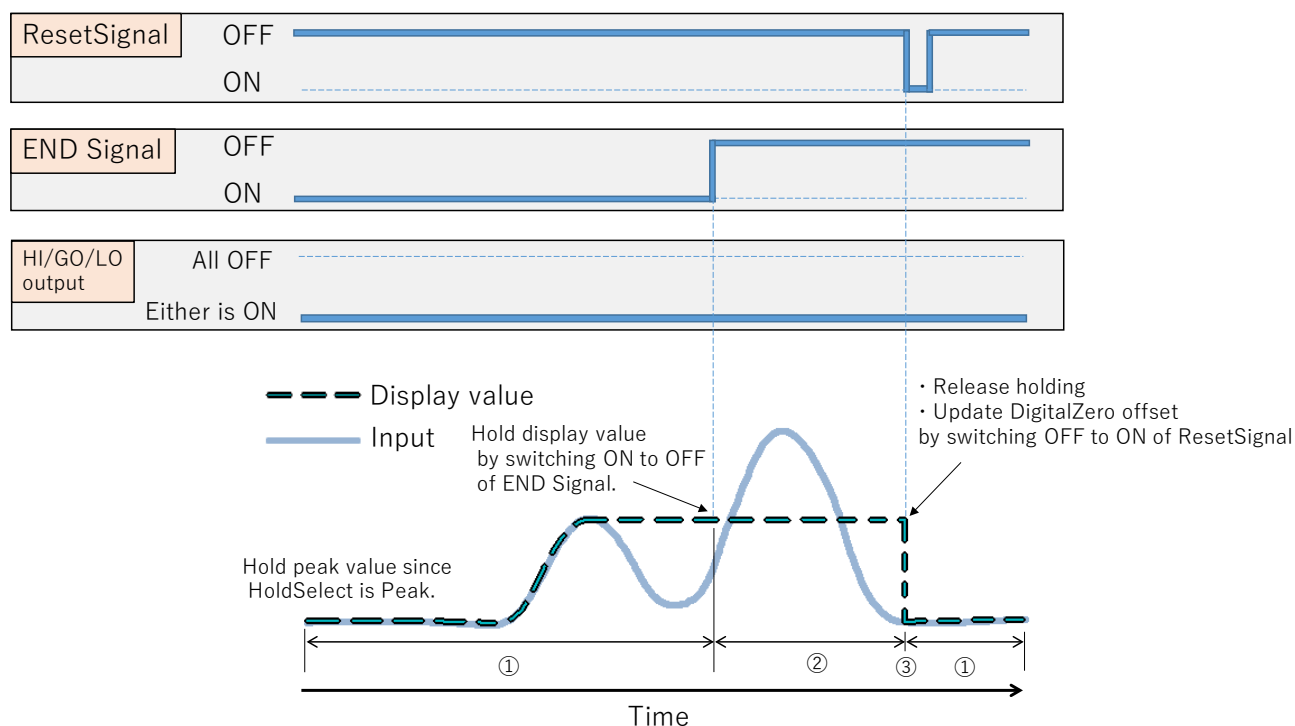
- Since “HoldSelect” is “Peak”, the display value holds the maximum value.
- Since “ActCondition” is “Always”, the display value is judged and HI / GO / LO is output.

② When END Signal changes from ON to OFF.

- Display value is fixed.
- Since “ActCondition” is “Always”, the fixed display value is judged and HI / GO / LO is output.

③ When ResetSignal turns from OFF to ON.

- Since “ActCondition” is “Always”, the display value is judged and HI / GO / LO is output.
- The offset of the digital zero function is updated and display value becomes 0.

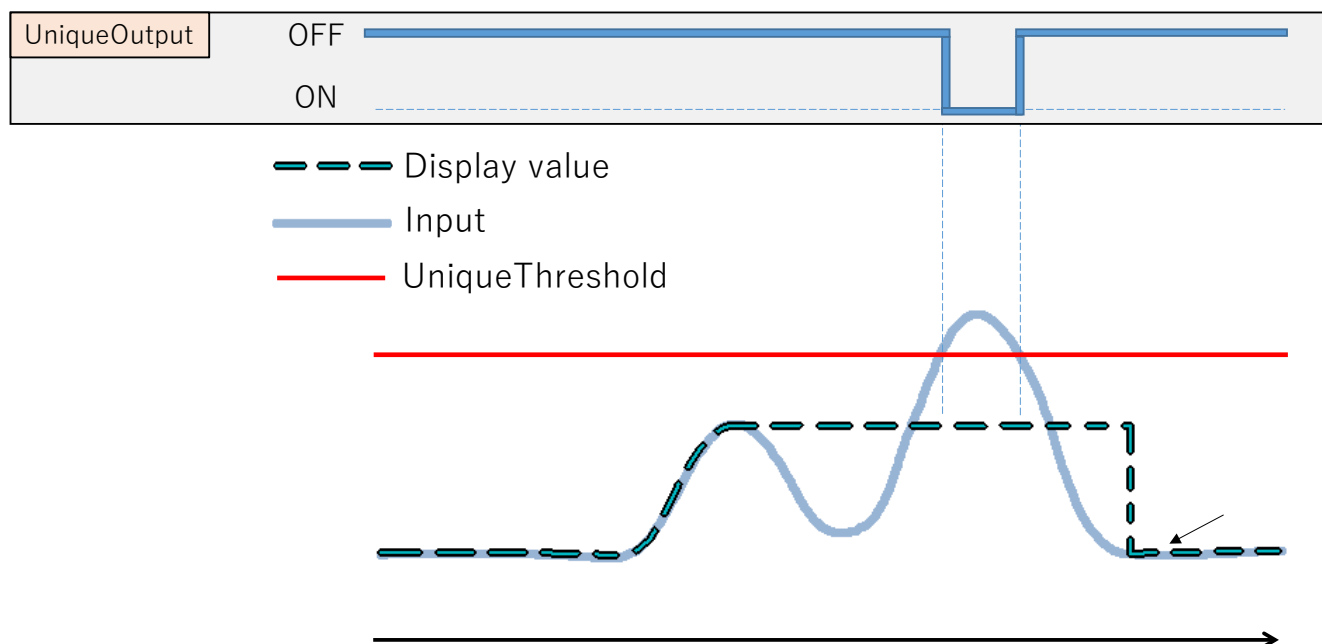


*When controlling the “END Signal” and “ResetSignal” using a shortcut key or communication, trigger control is used instead of ON / OFF control.

The display value can be fixed by executing the “END Signal” function using a shortcut key or communication.

■ UniqueOutput

“UniqueOutput” does not depend on the “HoldSelect” and “ActCondition”, and is always compared and output. It is also unaffected by the operation of the END Signal and ResetSignal. Even if the hold function works and the display value is fixed, the judgement is made based on the measurement value measured on the back, and when “UniqueThreshold” is exceeded, “UniqueOutput” is turned on.



17-3. Setting Items

This section describes the setting items related to CM-5 mode.

■ HoldSelect

Select the hold operation during measurement.

Peak: The maximum value is always held, and when the END Signal changes from the ON to OFF, display value at that time is held.

Instant: Continue the free run, and when the END Signal changes from the ON to OFF, display value at that time is held.

Operation: [MENU]⇒[Output]⇒[CM-5 Mode]⇒[HoldSelect]

Setting: Peak, Instant

■ Threshold

Set threshold of comparison output.

Operation: [MENU]⇒[Output]⇒[CM-5 Mode]⇒[Threshold]

Setting value: LowerValue ±99999 (Initial value is 100)
UpperValue ±99999 (Initial value is 1000)

■ ActCondition

Select the timing to make a comparison judgement.

Always: It constantly judges the display value during measurement and output either HI/ GO / LO comparison output.

OnHold: At the moment when the END Signal changes from ON to OFF, it is judged by the display value at that time and a comparison output is output. After that, when the ResetSignal is turned on, the comparison output is turned off.

Operation:[MENU]⇒[Output]⇒[CM-5 Mode]⇒[ActCondition]

Setting: Always , OnHold (Default)

■ UniqueThreshold

Set judgement value used to judge “UniqueOutput”.

Operation:[MENU]⇒[Output]⇒[CM-5 Mode]⇒[UniqueThreshold]

Setting value: UniqueThreshold ±99999 (Initial value is 99999)

■ OutputLogic

Set output logic of comparison output.

NO: A relay turns ON when comparison output ON.

NC: A relay turns OFF when comparison output ON.

Operation:[MENU]⇒[Output]⇒[CM-5 Mode]⇒[OutputLogic]

Setting: NO(Initial state), NC

■ OnBgColors(GO)

Set the screen background color (= alarm color) when the GO comparison output is ON.

*The color of the display value (number) cannot be changed.

Operation:[MENU]⇒[Output]⇒[CM-5 Mode]⇒[OnBgColors(GO)]

Setting: Black, Red, Yellow, Green (Initial state)

*If the setting is “Black”, background color of alarming is same as of not alarming.

■ OnBgColors(H/L)

Set the screen background color (= alarm color) when the HI / LO comparison output is ON.

*The color of the display value (number) cannot be changed.

Operation:[MENU]⇒[Output]⇒[CM-5 Mode]⇒[OnBgColors(H/L)]

Setting: Black, Red (Initial state), Yellow, Green

*If the setting is “Black”, background color of alarming is same as of not alarming.

18. SPECIFICATIONS

18-1. BASIC SPECIFICATIONS

Ambient temperature range	: -5 to 50°C	35 to 85%RH (Non condensing)
Storage temperature range	: -10 to 70°C	up to 60%RH
Supply power	: AC100~240V	AC adapter included DC24V (Body DC24~48V±10%)
Power consumption	: 11VA max (AC100V)	when using AC adapter (5W max when main unit DC24V)
External dimension's	: 158mm (W) × 89mm (H) × 175mm (D)	
Weight	: Approx. 1.3kg	

18-2. INPUT SPECIFICATIONS

【LOAD CELL】

●Input

Bridge voltage	: DC5V
	: DC10V
	: DC2.5V

●Display

Temperature characteristic	: 100ppm/°C
Input signal	: Single ended
Sampling rate	: Max. 4000times/sec
Display resolution	: 1/99999
Display updating period	: 10sps, 1sps
Zero display	: Reading zero suppress
Decimal point	: Settable freely
Display range	: -99999~99999

18-3. OUTPUT SPECIFICATIONS

【Comparison output】

Relay output	: Contact rating:AC250V 2A, DC30V 2A Mechanical life:20 million times Electrical life:100 thousand times or more 4 A contacts, AL1 and AL2, AL3 and AL4 share common
Setting condition	: Condition of comparison can be set to AL1 to AL4 independently. ●Level judgement mode The alarm is ON when display value exceeds judgement value (over alarm) The alarm is ON when display value underruns judgement value (under alarm)

Over alarm (upper limit judgement)

Condition of comparison	Judgement result
display value > AL1 judgement value	AL1
display value > AL2 judgement value	AL2
display value > AL3 judgement value	AL3
display value > AL4 judgement value	AL4

Under alarm (lower limit judgement)

Condition of comparison	Judgement result
AL1 judgement value > display value	AL1
AL2 judgement value > display value	AL2
AL3 judgement value > display value	AL3
AL4 judgement value > display value	AL4

●Zone judgement mode

The alarm is ON when display value between upper and lower judgement values (inside of zone alarm)
The alarm is ON when display value out of upper and lower judgement values (outside of zone alarm)

Inside of zone alarm

Condition of comparison	Judgement result
AL1 zone upper limit $\geq$ display value $\geq$ AL1 zone lower limit	AL1
AL2 zone upper limit $\geq$ display value $\geq$ AL2 zone lower limit	AL2
AL3 zone upper limit $\geq$ display value $\geq$ AL3 zone lower limit	AL3
AL4 zone upper limit $\geq$ display value $\geq$ AL4 zone lower limit	AL4

Outside of zone alarm

Condition of comparison	Judgement result
display value>AL1 zone upper limit or AL1 zone lower limit>display value	AL1
display value>AL2 zone upper limit or AL2 zone lower limit>display value	AL2
display value>AL3 zone upper limit or AL3 zone lower limit>display value	AL3
display value>AL4 zone upper limit or AL4 zone lower limit>display value	AL4

Comparison formula : 8 pattern memory
memory

【Analog output】

Conversion method : D/A conversion method
Resolution capability : Equivalent of 13bit
Scaling : Digital scaling
Output objective : An item can be selected from source displayable values
Circuit response : Up to 300 μ s (0 $\rightarrow$ 90% response)
Specifications for each output :

Up to 500ps (0.750% response)			
Output type	Load resistance	Accuracy (23±5°C 35 to 85%RH)	Ripple
0 to 10V	≥2kΩ	±(0.1% of FS)	±50mVp-p
-10 to 10V			
1 to 5V			
0 to 20mA	≤550Ω		±25mVp-p *Ripple is at load resistance 250Ω, 20mA output.
4 to 20mA			

【BCD output】

Corresponds to NPN

Output type : Open collector output NPN type
Measurement data : Negative logic transistor is ON at logical “1”
Polarity signal : Negative logic transistor is ON at minus display
Over signal : Negative logic transistor is ON at over display
Synchronized signal (PC) : Transistor is ON for a fixed period every time data becomes valid.
Transistor output capability : Voltage 30V max. Current 10mA max.
Output saturation voltage up to 1.2V at 10mA
Enable : By shorting the enable terminal to -D.COM or bringing to same voltage level, the BCD output transistors become OFF.

【RS-232C MODBUS RTU】

Communication protocol : Modbus-RTU
Communication protocol : Synchronous
Communication method : Full duplex
Baud rate : 9600bps,19200bps,38400bps
Data length : 8bit
Start bit : 1bit
Parity bit : None, Odd, Even
Stop bit : 1bit
Used signal names : TXD,RXD,SG
Number of connectable units : 1
Cable length : Max. 15m

【RS-485 MODBUS RTU 】

Communication protocol : Modbus RTU
Synchronization method : Synchronous
Communication method : 2-wire half- duplex
Baud rate : 9600bps,19200bps,38400bps
Data length : 8bit
Start bit : 1bit
Parity bit : None, Odd, Even
Stop bit : 1bit
Used signal names : Non-inverting (+), Inverting (-)
Number of connectable units : 31
Cable length : Max.1.2km (total) *Conforming CE mark, less than 30m

19. TROUBLESHOOTING

19-1. ERROR MODE

■ Display on occurrence of an error

When some malfunctions occur, error codes are displayed according to the factor of the error.



■ List of error codes and recovery procedures

When some malfunction occurs, an error code is displayed according to the factor of the error.

ERROR CODE	ERROR MESSAGE	RECOVERY PROCEDURE
E000	Program sum error	During the error mode, hold down the ENTER key for 1 second (long-press) to reset or power down and on. *If the CM-8 does not recover by this procedure, please contact your dealer or our company.
E002	Watchdog reset error	
E200 to 201	Errors associated with log	
E202 to 203	Errors associated with calibration values	
E204 to 205	Errors associated with setting values	
E206 to 209	Errors associated with initial values	
Other than above codes	Other errors	Please check the wiring of the sensor power supply. If there is no improvement, the response is the same as above.
E110 to 111	Error associated with sensor power short	

- If display value becomes out of displayable range, “OVER” is displayed.
- The strange input burns out even when the measurement terminals is open and display “+over”.

CAUTION

If error display is not recovered by system reset or power re-activation, please let us know the error code and situation.

During error mode, outputs are disabled.

19-2. Phenomena and measures

No.	Condition	Checkpoint	Action
1	The display does not light up.	Check the power is supplied correctly.	• Check the supplied power meets requirement of supply power specifications. • Using a circuit-tester, check voltage and wiring. Tighten up the screws of the terminals.
		Check the setting of “brightness” is set to “OFF”.	• When the screen turns on by pressing the MENU key and FUNC key, the screen brightness is set to "Off". * Set the screen brightness (Refer to 13. SYSTEM SETTINGS)
2	Display keeps indicating”0” or”-----”.	Check the input signal is applied adequately.	• Hold down the cross key (up / reset) of the key operation for 1second to Avoidance. • Check that the input specifications and input signal match. • Check the input wiring and continuity. • Check by input diagnosis of this instrument. • Check the status of the external control function. (Refer to 9. EXTERNAL CONTROL INPUT SETTING) • Check the DispLoCut setting. (Refer to 8.INPUT ADVANCED SETTING) • Initialize. (Refer to 13.SYSTEM SETTINGS)
3	OVER alarm display (-OVER alarm display)	Check the input logic of the END signal in CM-5 mode	• Check if the input logic of the END signal is correct. The initial value is OFF (b contact) when short-circuited.
		Confirm over input (Warning display with input of $\pm 110\%$ or more of the input range)	• Check the supplied input signal meets requirement of input specifications. • Check by using input diag function.
		Confirmation of disconnection (burn-up at the time of disconnection)	• Check the status of wiring and sensors. If phenomenon is not improved by above methods, please contact your dealer or our company.
		Effect of noise	• Application of shielded wire and wiring improvement • Perform input filter setting • Change the average number of times and add moving average
4	Comparative output does not turn OFF.	Check setting of “comparison judgement value” and “hysteresis”.	• Setting of ”comparison judgement value” (Refer to 10. OUTPUT ADVANCEDSETTIN) • Check whether output mode of comparative output is set to “Latch”. (Refer to 10. OUTPUT ADVANCEDSETTIN)
5	Can’t change settings.	Check “Setting Protect” function.	Check whether the function is ON. (Refer 13. SYSTEM SETTINGS)
6	Can’t execute calibration.	Check “Adjust Protect” function.	Check whether the function is ON. (Refer 13. SYSTEM SETTINGS)

No.	Condition	Checkpoint	Action
7	Can't operate by keys.	Check "Key Lock" function.	Check whether the function is ON. (Refer 7. MODES OF OPERATION)
8	Fluctuations of displayed value are wide.	Confirmation of measurement target and wiring status.	• Check for wobble factors such as vibration. • Make sure that the wiring is not close to a power line etc. with high noises.
		Measures to be taken when the input signal actually fluctuates.	• Consider to use analog filter. • Consider to use moving average. * Moving average setting (Refer to 8.INPUT ADVANCED SETTING) • Consider to change sampling rate. * Sampling rate change (Refer to 8.INPUT ADVANCED SETTING)
9	Analog output abnormal	Check connected load is suitable.	• Disconnect the load and check the output value.
		Check wiring.	• Check whether the load is connected to suitable terminal (current output or voltage output).
		Check settings.	• Check scaling setting for analog output. • Check selected displayable value for analog output. • Check output range of analog output.
10	BCD output abnormal	• Check connected device is suitable. (External pull-up etc.) • Check output logic setting is correct.	• Check by using "test output" function.
11	RS-232C MODBUS RTU communication abnormal	Check wiring, wire length are correct. Check setting such as baud rate is correct. Check communication command is correct.	• Check by using "test output" function.
12	RS-485 communication abnormal	Check wiring, wire length, termination, number of connected devices are correct. Check setting such as baud rate is correct.	• Check by using "test output" function.

19-3. Inquiries (return address)

Our company Engineering Division
 Address: 1-12-9 Iidabashi, Chiyoda-ku, Tokyo 102-0072
 E-mail: sales@fujicon.net

20. Appendix

20-1. KEY OPERATION REFERENCE CHART

The functions of keys are shown in the chart below.

Operation in “measurement mode”								
FUNC	MENU	DISP	ENTER					Action
○								Moves to entering shortcut function of external control.
	○							Moves to setting mode.
		○						Switches measurement display contents.
								Reset the system by press and hold for 1 second in error mode.
								When assigned shortcut functions, makes the function ON/OFF by press and hold for 1 second.
								Makes the key lock function ON/OFF by press and hold for 1 second.
Operation in “setting mode”								
FUNC	MENU	DISP	ENTER					Action
○								Moves from shortcut function entry display to measurement mode.
	○							Stores settings and moves to measurement mode.
		○						Return to the higher layer.
			○					Fixes setting parameters.
				○				Moves to other setting display / Moves cursors in setting displays / Modifying setting values.
					○			
						○		
							○	

*Note: ○ short-pressing ⊙ press and hold 1sec

20-2. SETTING VARIABLES(Default, Analog output)

1st Layer	2nd Layer	3rd Layer (setting items)	4th Layer (setting values)		Remarks
			Initial values	Settable values	
1.Input	PatternSelect	-	Pattern in use	Pattern 1/2/3/4/5/6/7/8	Select pattern No. to set.
	StrainInput	BridgeExcitation	10V	2.5V/5V/10V	Bridge power switching
		AnalogFilter	300Hz	OFF/30Hz/300Hz/600Hz	
		SamplingRate	4000 sps	4000 sps, 2000 sps, 1000 sps, 500, sps 200 sps, 100 sps, 20 sps, 10 sps, 5 sps, 2 sps, 1 sps,	Select sampling rate
		MoveAve	32	None/2/4/8/16/32/64times	Set moving average of input.
		ManuAdjust	Input : 2.0000 Display : 30.00	Go to screen of manual adjust.	
		AutoAdjust			Please refrain from automatic adjustment as it requires equipment and technology.
		DecPoint	###.##	#####/#####/###.###/###.###/#####	
		DispUnit	kN	None/N/kN/CustomUnit	
		TrackingZero	Interval: 0 ActiveArea: 0	Interval: 0~99.99[sec] ActiveArea: 0~99999	Disable if setting value is 0[sec]. Take over setting of [DecPoint].
		DispLimit	LowerLimit: -99999 UpperLimit: +99999	±99999 ±99999	Take over setting of [DecPoint].
		DispLoCut	0	0~99999	Cut both positive and negative.
		StableArea	0	0~99999[digit]	Disable if the value is 0[digit].
		StableTime	0	0~99.99[sec]	Disable if the value is 0[sec].
2. Output	ExternalCtrl	ExtCtrl 1 to 5 Func	None	None/CompareReset/HoldReset/DispHold/ MaxHold/AmpHold/DigitalZero/PatternChange1, 2,3/WaveComp/MultiHold	Select a function which is attached to each external control terminals.
		ExtCtrl 1 to 5 InputLogic	ON with Shorted	ON with Shorted / OFF with Shorted	
	Hold	DispHoldMode	Normal	Normal/OneShot	
		HoldOffDelay	0.00	0.00~99.99[sec]	
		HoldMode	NormalHold	NormalHold/AreaHold	Select a mode of DispHold.
	CompareAL1 CompareAL2 CompareAL3 CompareAL4	CompareMode	LevelJudge	LevelJudge/ZoneJudge/UniqueLevelJudge	
		ActCondition	Always	Always/OnHold	Select a condition of comparison.
		OnConditions	Excess	Excess/LessThan	LevelJudge, UniqueLevelJudge.
			InTheZone	InTheZone/OutsideTheZone	Only ZoneJudge.
		Threshold	100000	Threshold: ±99999	LevelJudge, UniqueLevelJudge.
			0	ZoneLowerLimit: ±99999 ZoneUpperLimit: ±99999	Only ZoneJudge.
			10000		
		OutputMode	Normal	Normal/Latch	Select an output mode.
3.Display	DispSelect	MeasureSelect	DispValue DispValue+Comp	DispValue/DispValue+Comp/Trend	*Selectable by check box.
		DispValue Scale	0 3000	LowerLimit: ±99999 UpperLimit: ±99999	Set scale of trend screen.
		AlarmSelect	AL1~AL4:ON	AL1/AL2/AL3/AL4	
		TimeAxis	1s/div	100ms/div, 1s/div, 2s/div, 5s/div, 10s/div, 30s/div, 60s/div, 120s/div	Set time scale of division time.
	TrendDisp	Brightness	5 Bright	5Bright/4/3/2/1Dark/0 Off	Off means that whole of screen is turned off.
		PowerSavingTime	None	None/1min/2min/5min/10min/30min/60min	Display is dark while power saving.
		MeasureMode	CM-5	Default/Multi/WaveCompare/CM-5	
		D-ZeroRetention	Disable	Disable/Enable	Whether remember D-Zero value or not.
		Language	Japanese	Japanese/English	Language.
		DisplayDirection	Horizontal	Horizontal/Vertical	Select a direction of screen.
		SettingProtect	Disable	Disable/Enable	
		AdjustProtect	Disable	Disable/Enable	
4.System	General	DisplayUpdateCycle	10 sps	10 sps/ 1 sps	
		PatternCopy	---	Go to screen of pattern copy.	Copy settings of pattern to other pattern.
		SoftVersion	---		
		UserDefaultSave	Save current settings as use initial values.		
		UserDefaultLoad	Initialize setting values to user initial values.		
		FactoryDefaultLoad			Please refrain from using it.
		InputDiag	StrainaugeInput	InputRatingPercent InputActualValue	Check input confirm existence. Display percent value or actual value.
		ExternalCtrl	---	---	Check ON/OFF of terminal.
		CompareAL1~AL4	---	---	Check ON/OFF Level of compare output.
		GO JudgeOutput	---	---	Check ON/OFF Level of pulse output.
5.Diag/Log	OutputTest	AnalogOutput	---	---	Output any value output. (Step by 10%)

■Settings related to wave compare mode

1st Layer	2nd Layer	3rd Layer (setting items)	4th Layer (setting values)		Remarks
			Initial values	Settable values	
1.Input	WaveCompare	StartCondition	Normal	Normal/Threshold	
		Threshold	+1000	±99999	Enable if StartCondition is Threshold.
		ThresholdOnDir	Excess	Excess/LessThan	Enable if StartCondition is Threshold.
		ThresholdTimeout	00.00	00.00~99.99[sec]	Enable if StartCondition is Threshold.
		StartPosition	0	-100~+1000[Sampling]	
		RefWaveCapture	---	Go to RefWaveCapture screen.	
		CompWavePos	UpperAndLower	UpperAndLower/UpperOnly/LowerOnly	
		CreateCompWave	-	UD Shift: 0~99999[digit] LR Shift: 0~99[×10 Sampling] Check→Go to CheckCompWave screen.	
		AutoScale	Enable	Disable/Enable	
3.Display	DispSelect	Scale	LowerLimit: 0 UpperLimit: 10000	LowerLimit: ±99999 UpperLimit: ±99999	Valid only when autoscale is disabled
		CompleteOutput	None	None/AL1/AL2/AL3/AL4	
4.System	WaveLog	WaveSelect	WaveCompare	WaveCompare	
		Overwrite	Enable	Disable/Enable	
5.Diag.Log	OK/NG Wave View	OK 1~4 NG 1~4		Go to screen of wave log confirmation.	
	OK/NG Wave Erase	---		Erase all wave log.	

■Settings related to multi hold mode

1st Layer	2nd Layer	3rd Layer (setting items)	4th Layer (setting values)		Remarks
			Initial values	Settable values	
1.Input	Multi Base	SectionSwitch	EdgeMethod	LevelMethod/EdgeMethod/EdgeTimer/AutoTimer	
		SectionTimerS1~S4	1.00	00.01~99.99[sec]	Enable if SectionSwitch is EdgeTimer or AutoTimer.
		CompleteOutput	AL2	None/AL1/AL2/AL3/AL4	
		UniqueThreshold	+99999	±99999	
		UniqueOutput	None	None/AL1/AL2/AL3/AL4	
		AlarmColorS1~S4	Red	Black/Red/Yellow/Green	
		Scale	LowerLimit: 0 UpperLimit: 10000	LowerLimit: ±99999 UpperLimit: ±99999	
	Multi S1~S4	TimeAxis	1s/div	100ms/div, 1s/div, 2s/div, 5s/div, 10s/div, 30s/div, 60s/div 120s/div	Set time scale of division time.
		HoldStartCond.	Normal	Normal/Threshold/StartDelay	
		Threshold	+1000	±99999	Enable if HoldStartCond. is Threshold.
		ThresholdOnDir	Excess	Excess/LessThan	Enable if HoldStartCond. is Threshold.
		ThresholdTimeout	00.00	00.00~99.99[sec]	Enable if HoldStartCond. is Threshold.
		TimeoutOutput	None	None/AL1/AL2/AL3/AL4	Enable if HoldStartCond. is Threshold.
		DelayTimer	00.10	00.01~99.99[sec]	Enable if HoldStartCond. is StartDelay.
		HoldType	PeakHold	None/PeakHold/AmpHold/MaximalHold/MinimalHold/DifferenceHold/InflectionHold	
		DifValue	1000	99999	Enable if HoldType is MaximalHold, MinimalHold, DifferenceHold.
		DifMag	1.00	0.01~99.99[Times]	Enable if HoldType is MaximalHold, MinimalHold, DifferenceHold.
		InfTimeA	200	1~499[Sampling]	Enable if HoldType is InflectionHold.
		InfTimeB	200	1~499[Sampling]	Enable if HoldType is InflectionHold.
		InfValueZ	30	±99999	Enable if HoldType is InflectionHold.
		CompOutput	AL1	None/AL1/AL2/AL3/AL4	
		CompAlarmCond.	Outside	Outside/Inside	
		CompJudgeValue	LowerValue:0 UpperValue:10000	LowerValue: ±99999 UpperValue: ±99999	
		CompTiming	EndOfSection	WithinSection/EndOfSection	
		NoDetected	WithAlarm	NoAlarm/WithAlarm	
3.Display	DispSelect	MultiSelect	ALL	MultiValue/MultiGraph	

20-3. SETTING VARIABLES(CM-5 mode, Analog output)

1st Layer	2nd Layer	3rd Layer (setting items)	4th Layer (setting values)		Remarks
			Initial values	Settable values	
1.Input	PatternSelect	-	Pattern in use	Pattern 1/2/3/4/5/6/7/8	Select pattern No. to set.
	StrainInput	BridgeExcitation	10V	2.5V/5V/10V	Bridge power switching
		AnalogFilter	300Hz	OFF/30Hz/300Hz/600Hz	
		SamplingRate	4000sps	4000sps/2000sps/1000sps/500sps/200sps/ 100sps/20sps/10sps/5sps/2sps/ 1sps	Select sampling rate
		MoveAve	32	None/2/4/8/16/32/64times	Set moving average of input.
		ManuAdjust	Input : 2.0000 Display : 30.00	Go to screen of manual adjust.	
		AutoAdjust			Please refrain from automatic adjustment as it requires equipment and technology.
		DecPoint	####.##	#####/ #.#####/ ###.###/ ####.###/ #####.#	
		DispUnit	kN	None/N/kN/CustomUnit	
		TrackingZero	Interval: 0 ActiveArea: 0	Interval: 0~99.99[sec] ActiveArea: 0~99999	Disable if setting value is 0[sec]. Take over setting of [DecPoint].
		DispLimit	LowerLimit: -99999 UpperLimit: +99999	±99999 ±99999	Take over setting of [DecPoint].
		DispLoCut	0	0~99999	Cut both positive and negative.
		StableArea	0	0~99999[digit]	Disable if the value is 0[digit].
		StableTime	0	0~99.99[sec]	Disable if the value is 0[sec].
	ExternalCtrl	ExtCtrl 1~5 Func	1 : ResetSignal 2 : END Signal 3 : None 4 : None 5 : None	terminal1 : ResetSignal *fixed terminal2 : END Signal *fixed terminal3 : None/PatternChange1 terminal4 : None/PatternChange2 terminal5 : None/PatternChange3	Select a function which is attached to each external control terminals.
		ExtCtrl 1 ~ 5 InputLogic	1 :ON with Shorted 2 :OFF with Shorted 3 :ON with Shorted 4 :ON with Shorted 5 :ON with Shorted	ON with Shorted / OFF with Shorted	
2. Output	CM-5 Mode	HoldSelect	Instant	Peak/Instant	
		Threshold	Lo : 100 Up : 1000	0~99999	Comparison output judgment value setting
		ActCondition	OnHold	Always/OnHold	Select a condition of comparison.
		UniqueThreshold	+99999	±99999	
		OutputLogic	NO	NO/NC	Select an output logic.
		OnBgColors (GO)	Green	Black/Red/Yellow/Green	
		OnBgColors (H/L)	Red	Black/Red/Yellow/Green	
	AnalogOutput	OutputRange	0-10V	0-10V/±10V/1-5V/0-20mA/4-20mA	Select a type of output range.
		OutputScale	0 3000	0%: ±99999 100%: ±99999	Scaling of analog output. Set 0% and 100% value.
3.Display	DispSelect	MeasureSelect	DicpValue DispValue+Comp	DispValue/DispValue+Comp/Trend	Selectable by check box.
	TrendDisp	DispValue Scale	0 3000	LowerLimit: ±99999 UpperLimit: ±99999	Set scale of trend screen.
		TimeAxis	1s/div	100ms/div, 1s/div, 2s/div, 5s/div, 10s/div, 30s/div, 60s/div 120s/div	Set time scale of division time.
4.System	General	Brightness	5 Bright	5Bright/4/3/2/1Dark/0 Off	Off means whole of screen is turned off.
		PowerSavingTime	None	None/1min/2min/5min/10min/30min/ 60min	Display is dark while power saving.
		MeasureMode	CM-5	Default/Multi/WaveCompare/CM-5	
		Language	Japanese	Japanese/English	Select Language.
		DisplayDirection	Horizontal	Horizontal/Vertical	Select a direction of screen.
		SettingProtect	Disable	Disable/Enable	
		AdjustProtect	Disable	Disable/Enable	
		DisplayUpdateCycle	10 sps	10 sps/ 1 sps	
		PatternCopy	---	Go to screen of pattern copy.	Copy settings of pattern to other pattern.
		SoftVersion	---	Indicate soft version.	
	Initialize	UserDefaultSave	Save current settings as use initial values.		
		UserDefaultLoad	Initialize setting values to user initial values.		
		FactoryDefaultLoad			Please refrain from using it.
5.Diag/Log	InputDiag	StraingaugeInput	—	InputRatingPercent InputActualValue	Check input confirm existence. Display percent value or actual value.
		ExternalCtrl	—	—	Check ON/OFF of terminal.
	OutputTest	HI/GO/LO Output	—	—	Check ON/OFF Level of compare output.
		UniqueOutput	—	—	Check ON/OFF Level.
		AnalogOutput	—	—	Output any value output. (Step by 10%)

20-4. Setting Value Addition Table(BCD, RS-232C,RS-485)

■BCD option related settings

1st Layer	2nd Layer	3rd Layer (setting items)	4th Layer (setting values)		Remarks
			Initial values	Settable values	
2. Output	BCD Output	DataSignalLogic	Negative	Positive/ Negative	Select data signal logic.
		SyncSignalLogic	Negative	Positive/ Negative	Select synchronous signal (PC) output logic.
5.Diag/Log	OutputTest	BCD Output(DATA)	—	—	ON or OFF level output for each bit.
		BCD Output(PC)	—	—	PC output

■RS-232C MODBUS RTU option related settings

1st Layer	2nd Layer	3rd Layer (setting items)	4th Layer (setting values)		Remarks
			Initial values	Settable values	
2. Output	RS-232C MODBUS RTU Com	Protocol	Modbus-RTU	Modbus-RTU	Set protocol.
		Baurate	19200bps	9600bps/19200bps/38400bps	Set baurate.
		Parity	Even	None/Even/Odd	Set parity bit.
5.Diag/Log	OutputTest	RS-232C MODBUS RTU Com	—	—	Display of received and transmitted data.

■RS-485 option related settings

1st Layer	2nd Layer	3rd Layer (setting items)	4th Layer (setting values)		Remarks
			Initial values	Settable values	
2. Output	ModbusCom	SlaveAddress	1	1~31	Device ID setting
		Baurate	19200bps	9600bps/19200bps/38400bps	Set baurate.
		Parity	Even	None/Even/Odd	Set parity bit.
5.Diag/Log	OutputTest	ModbusCom	—	—	Display of received and transmitted data.

20-5. Shortcut Setting

Can be assigned to any cross key from the set value.

Default Mode

Key	Initial values	Settable values
	DigitalZero	None/CompareReset/HoldReset/DispHold/ MaxHold/AmpHold/DigitalZero/PatternChange
	None	
	PatternChange	
	None	

Wave Compare Mode

Key	Initial values	Settable values
	DigitalZero	None/CompareReset/HoldReset/PatternChange/ MultiHold/ResetSignal
	None	
	PatternChange	
	None	

Multi Mode

Key	Initial values	Settable values
	ResetSignal	None/CompareReset/DigitalZero/PatternChange/ WaveCompare
	None	
	PatternChange	
	None	

CM—5 Mode

Key	Initial values	Settable values
	ResetSignal	ResetSignal *fixed
	END Signal	END Signal *fixed
	PatternChange	PatternChange *fixed
	None	None *fixed

20-6. BEHAVIOR OF COMPARISON JUDGEMENT

Behavior of each comparison modes (LevelJudge/ZoneJudge/DiffJudge) and output modes (Normal/Latch/OneShot) are mentioned below with some figures.

■ LevelJudge

Determine the magnitude relationship between the display value and the comparison judgment value.

Below, the comparison output operation is shown for each output mode.

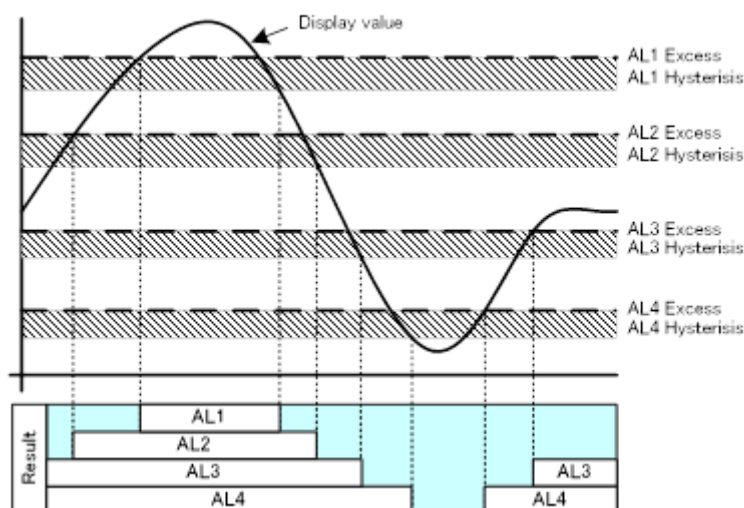
1) In case of upper limit determination 4 stages

To use in the upper limit judgment, set the “OnCondition” to “Excess”.

Output	OnCondition	Comparison condition	Result
AL1	Excess	Display value > Judgement value of AL1	AL1
AL2	Excess	Display value > Judgement value of AL2	AL2
AL3	Excess	Display value > Judgement value of AL3	AL3
AL4	Excess	Display value > Judgement value of AL4	AL4

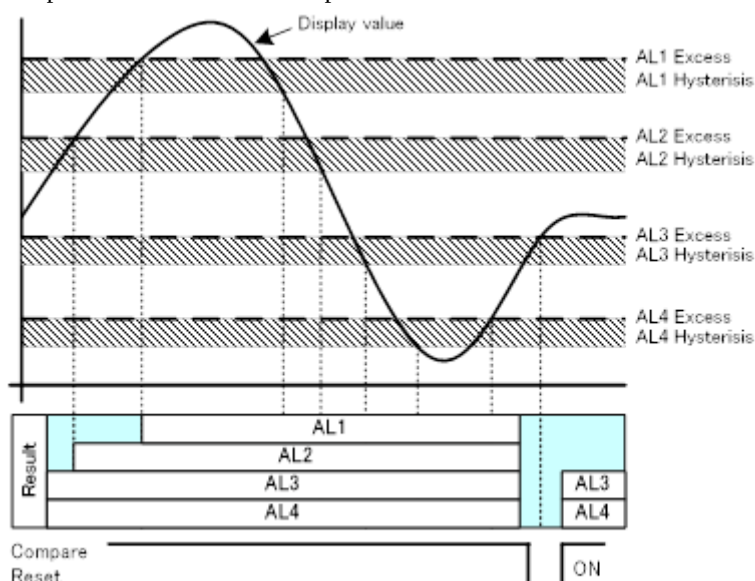
● Behavior of judgement when output mode is “Normal”.

“OutputMode” is “Normal”: Outputs while result is ON.



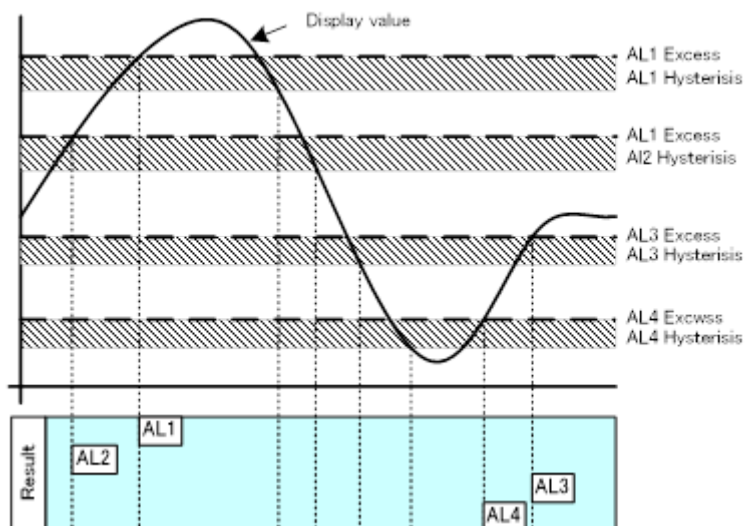
● Behavior of judgement when output mode is “Latch”.

“OutputMode” is “Latch”: Outputs after result turns on even if result turns off after that.



●Behavior of judgement when output mode is “OneShot”.

“OutputMode” is “OneShot”: Outputs certain time after result turns on.

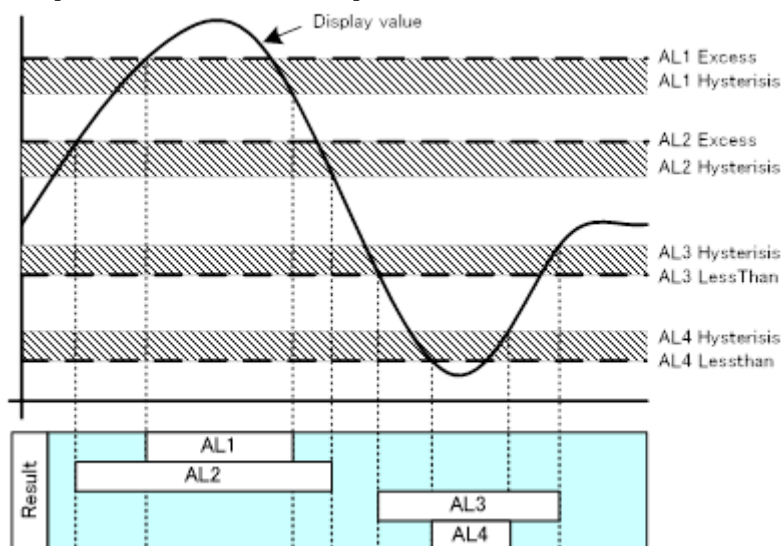


- 2) In case of upper limit 2 stages and the lower limit 2 stages (HH/HI/LO/LL)
Set the “OnCondition” to “Excess” for AL1, AL2, “LessThan” for AL3, AL4

Output	OnCondition	Comparison condition	Result
AL1	Excess	Display value > Judgement value of AL1	AL1
AL2	Excess	Display value > Judgement value of AL2	AL2
AL3	LessThan	Display value < Judgement value of AL3	AL3
AL4	LessThan	Display value < Judgement value of AL3	AL4

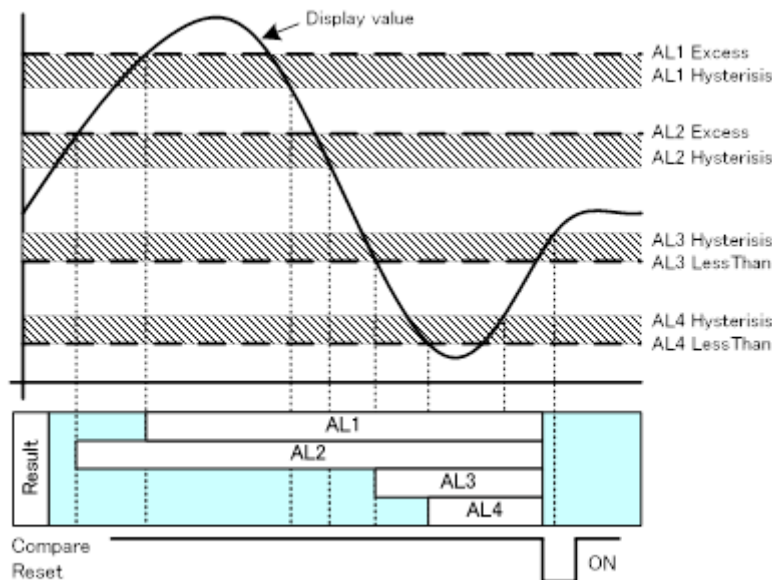
●Behavior of judgement when output mode is “Normal”.

“OutputMode” is “Normal”: Outputs while result is ON.



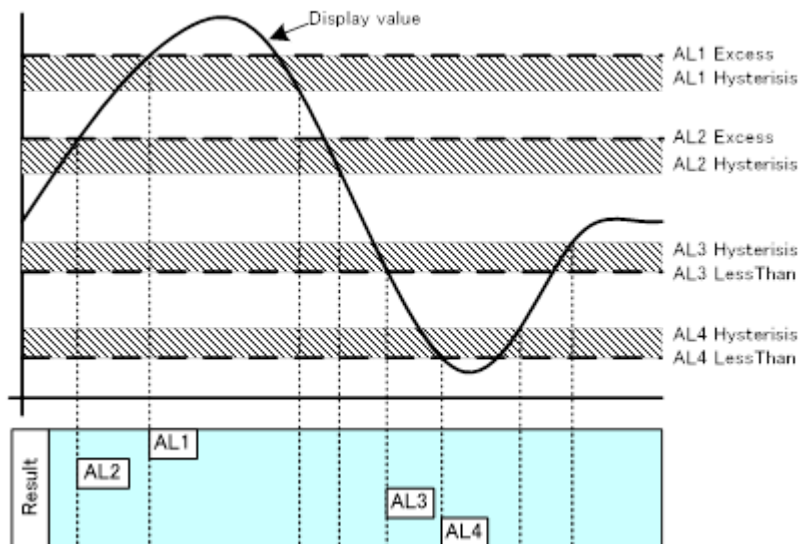
●Behavior of judgement when output mode is “Latch”.

“OutputMode” is “Latch”: Outputs after result turns on even if result turns off after that.



●Behavior of judgement when output mode is “OneShot”.

“OutputMode” is “OneShot”: Outputs certain time after result turns on.

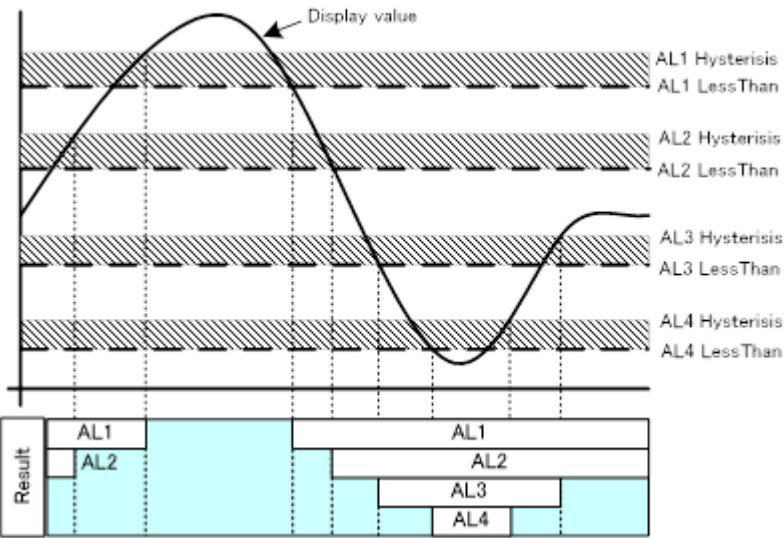


3) In case of lower limit 4 stages.

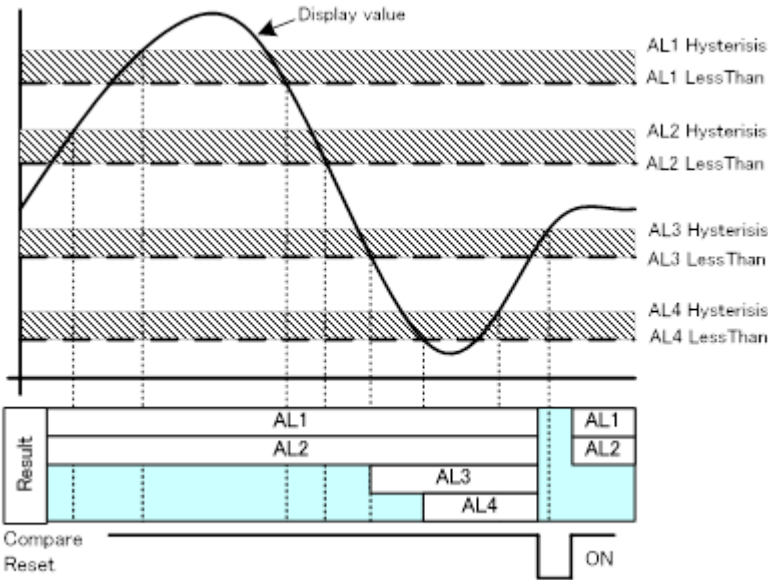
Set the “OnCondition” to “LessThan” for AL1, AL2, AL3, AL4.

Output	OnCondition	Comparison condition	Result
AL1	LessThan	Display value < Judgement value of AL1	AL1
AL2	LessThan	Display value < Judgement value of AL2	AL2
AL3	LessThan	Display value < Judgement value of AL3	AL3
AL4	LessThan	Display value < Judgement value of AL3	AL4

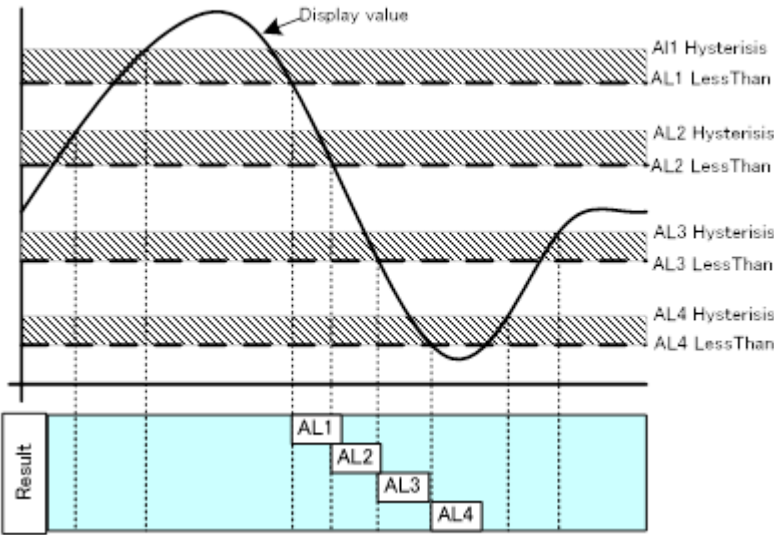
- Behavior of judgement when output mode is “Normal”.
 “OutputMode” is “Normal”: Outputs while result is ON.



- Behavior of judgement when output mode is “Latch”.
 “OutputMode” is “Latch”: Outputs after result turns on even if result turns off after that.



- Behavior of judgement when output mode is “OneShot”.
 “OutputMode” is “OneShot”: Outputs certain time after result turns on.



■ ZoneJudge

Determine the inclusion relation with the two comparison judgment values.
Below, the comparison output operation is shown for each output mode.

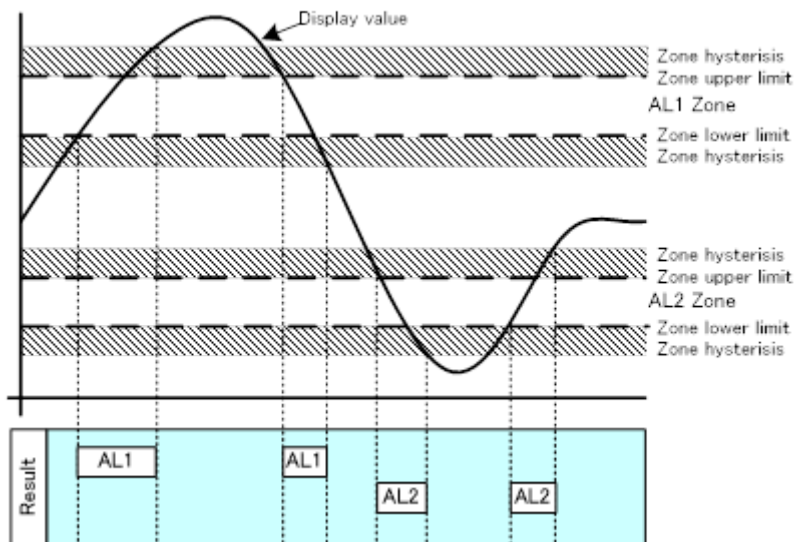
1) In case of OnCondition is InTheZone.

Comparison output turns on when display value is inside of the zone.

Output	OnCondition	Comparison condition	Result
AL1	InTheZone	Upper limit of AL1 $\geq$ Display value $\geq$ Lower limit of AL1	AL1
AL2		Upper limit of AL2 $\geq$ Display value $\geq$ Lower limit of AL2	AL2
AL3		Upper limit of AL3 $\geq$ Display value $\geq$ Lower limit of AL3	AL3
AL4		Upper limit of AL4 $\geq$ Display value $\geq$ Lower limit of AL4	AL4

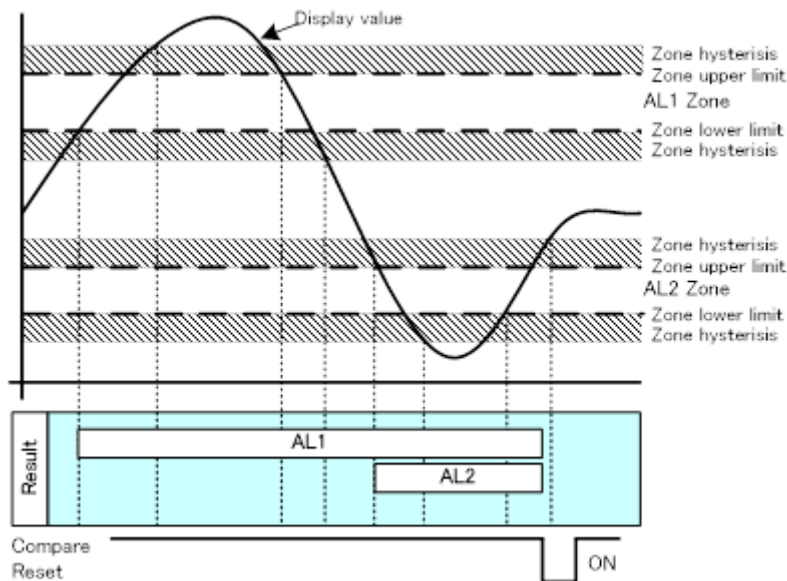
● Behavior of judgement when output mode is “Normal”.

“OutputMode” is “Normal”: Outputs while result is ON.



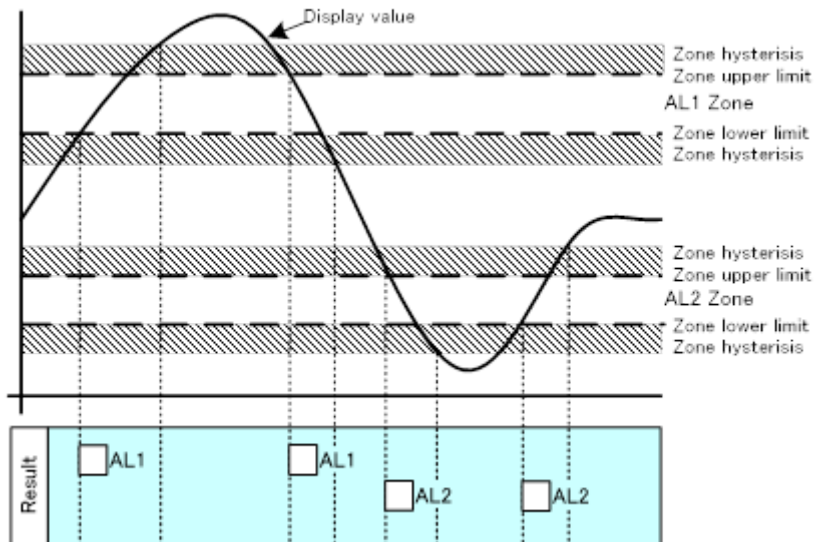
● Behavior of judgement when output mode is “Latch”.

“OutputMode” is “Latch”: Outputs after result turns on even if result turns off after that.



●Behavior of judgement when output mode is “OneShot”.

“OutputMode” is “OneShot”: Outputs certain time after result turns on.



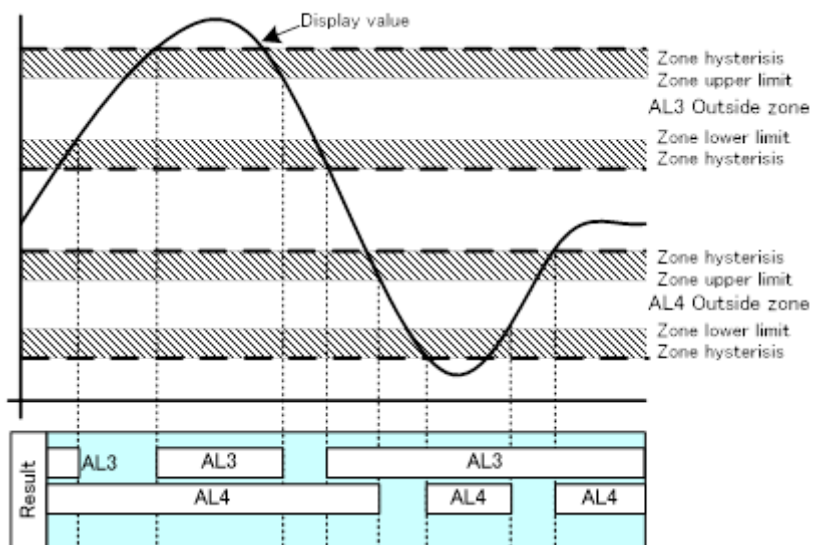
2) In case of OnCondition is OutsideTheZone.

Comparison output turns on when display value is outside of the zone.

Output	OnCondition	Comparison condition	Result
AL1	OutsideTheZone	Display value > Upper limit of AL1 or Lower limit of AL1 > Display value	AL1
AL2		Display value > Upper limit of AL2 or Lower limit of AL2 > Display value	AL2
AL3		Display value > Upper limit of AL3 or Lower limit of AL3 > Display value	AL3
AL4		Display value > Upper limit of AL4 or Lower limit of AL4 > Display value	AL4

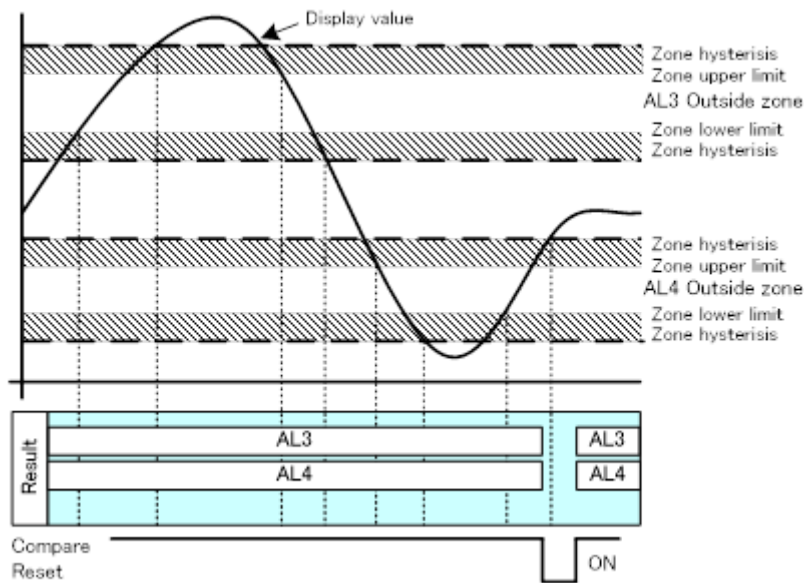
●Behavior of judgement when output mode is “Normal”.

“OutputMode” is “Normal”: Outputs while result is ON.



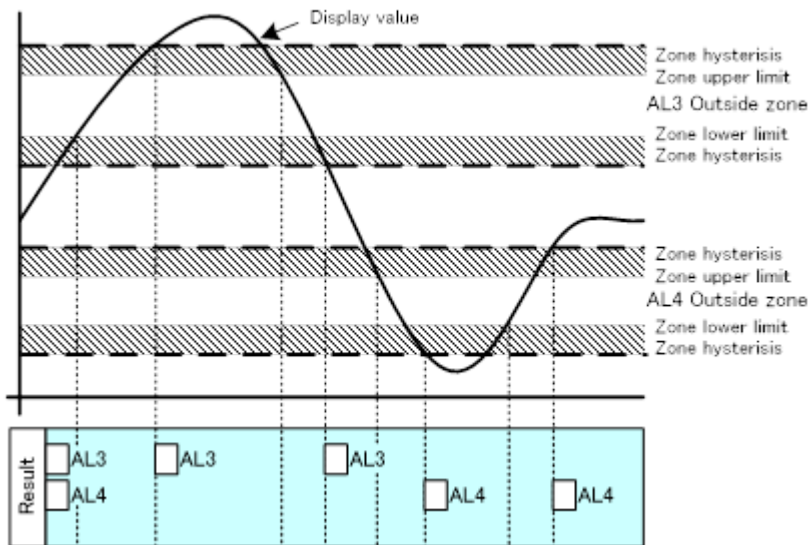
- Behavior of judgement when output mode is “Latch”.

“OutputMode” is “Latch”: Outputs after result turns on even if result turns off after that.



- Behavior of judgement when output mode is “OneShot”.

“OutputMode” is “OneShot”: Outputs certain time after result turns on.



20-7. DATA FORMAT OF JUDGEMENT WAVEFORM AND WAVE LOG

This section explains the saved data format of waveform log / judgement waveform in wave compare mode.

In the wave compare mode, 1500 points are sampled from the start of measurement, waveform comparison with the judgement waveform is performed, and wave log is saved. In this product, due to the storage area of data and the drawing on the screen, waveform comparison is performed by performing the following internal processing.

- Data processing in waveform comparison mode

- In "RefWaveCapture", the measured 1500 points are averaged every 10 points, compressed to 150 points, and saved as a reference waveform.

- In "CreateCompWave", shift the reference waveform according to the set up / down shift amount and left / right shift amount, and create 150 upper judgment waveform and lower judgment waveform, respectively.

- In "WaveCompare", creates a judgment value of 1500 points by linear interpolate between each point from 150 points of the upper and lower judgment waveforms and executes comparison judgment one point at a time with 1500 points of upper and lower judgment value and 1500 points of measurement data. The saved data is 150 points that are thinned out data of 1500 measurement data.

- Waveform log storage data

- "OK/NG Wave View" displays 150 judgment waveforms and 150 log data.

- Waveform acquisition data in communication

- The latest waveform data and waveform log can be read by "Modbus communication".

- To retrieve the latest data, select the acquisition data at the following address,

54302: "acquired waveform / upper judgment waveform / lower judgment waveform"

Address: It acquires 150 points for 54311 to 54440 (2 addresses / 1 data).

- When retrieving the waveform log data, select acquisition data at the following address,

55502: "Normal log / abnormal log"

55503: "Log No. 1/2/3/4"

55504: "acquired waveform / upper judgment waveform / lower judgment waveform"

Address: Acquire 150 points of data at 55514 to 55812 (2 addresses / 1 data).

The contents of this instruction manual are subject to change without prior notice.