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Autonics
Sensors & Controllers

LCD Touchscreen Paperless Recorder
KRN1000 Series
USER MANUAL

$C \epsilon$

KRN1000 Series

Thank you for choosing our Autonics products.
Please read the following safety considerations before use.

Preface

Thank you for purchasing an Autonics product.

Please familiarize yourself with the information contained in the **Safety Considerations** section before using this product.

This user manual contains information about the product and its proper use, and should be kept in a place where it will be easy to access.

User Manual Guide

- Please familiarize yourself with the information in this manual before using the product.
- This manual provides detailed information on the product's features. It does not offer any guarantee concerning matters beyond the scope of this manual.
- This manual may not be edited or reproduced in either part or whole without permission.
- A user manual is not provided as part of the product package.
  Visit our web site (www.autonics.com) to download a copy.
- The manual's content may vary depending on changes to the product's software and other unforeseen developments within Autonics, and is subject to change without prior notice.
  Update notice is provided through out homepage.
- We contrived to describe this manual more easily and correctly. However, if there are any corrections or questions, please notify us these on our homepage.

User Manual Symbols

Symbol	Description
Note	Supplementary information for a particular feature.
⚠ Warning	Failure to follow instructions can result in serious injury or death.
⚠ Caution	Failure to follow instructions can lead to a minor injury or product damage.
Ex.	An example of the concerned feature's use.
※1	Annotation mark.

Safety Considerations

- Following these safety considerations will ensure the safe and proper use of the product and help prevent accidents, as well as minimizing possible hazards.

- Safety considerations are categorized as Warnings and Cautions, as defined below:

⚠ Warning	Warning	Failure to follow the instructions may lead to a serious injury or accident.

⚠ Caution	Caution	Failure to follow the instructions may lead to a minor injury or accident.

⚠ Warning

- Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
  Failure to follow this instruction may result in personal injury, fire, or economic loss.

- The unit must be installed on a device panel before use.
  Failure to follow this instruction may result in electric shock.

- Do not connect, repair, or inspect the unit while connected to a power source.
  Failure to follow this instruction may result in electric shock.

- Check the terminal numbers before connecting the power source.
  Failure to follow this instruction may result in fire or burning the unit.

- Lithium battery is used in the unit. Do not disassemble or burn the unit.
  Failure to follow this instruction may result in explosion.

- Do not touch the unit and terminals after cut off the power within 30 sec.
  Failure to follow this instruction may result in electric shock.

- Ground PE terminal individually and ground cable should be over AWG16 (1.25 mm^2).
  Failure to follow this instruction may result in electric shock.

- Do not insert any objects at the openings of the unit.
  Failure to follow this instruction may result in electric shock or personal injury.

- Do not disassemble or modify the unit. Please contact us if necessary.
  Failure to follow this instruction may result in personal injury, fire, or economic loss.

⚠ Caution

- Do not use the unit outdoors.
  Failure to follow this instruction may result in shortening the life cycle of the unit, or electric shock.

- When connecting the power input and relay output cables, use AWG20 (0.05mm^2) cables and make sure to tighten the terminal screw bolt above 0.74N·m to 0.90N·m.
  Failure to follow this instruction may result in fire due to contact failure.

- Use the unit within the rated specifications.
  Failure to follow this instruction may result in shortening the life cycle of the unit, or fire.

- Do not use loads beyond the rated switching capacity of the relay contact.
  Failure to follow this instruction may result in insulation failure, contact melt, contact failure, relay broken, or fire.

- When connecting magnet contact as relay contact output load, attach a surge absorber at contact coil.
  Failure to follow this instruction may result in product malfunction.

- Do not use water or oil-based detergent when cleaning the unit. Use dry cloth to clean the unit.
  Failure to follow this instruction may result in electric shock, or fire.

- Do not use the unit where flammable or explosive gas, humidity, direct sunlight, radiant heat, vibration, or impact may be present.
  Failure to follow this instruction may result in fire or explosion.

- Keep dust and wire residue from flowing into the unit.
  Failure to follow this instruction may result in fire or product damage.

- Check the polarity before connecting cables.
  Failure to follow this instruction may result in fire or explosion.

- Check the polarity of the measurement input contact before wiring the temperature sensor.
  Failure to follow this instruction may result in fire or explosion.

- Check the connection diagram of this manual before supplying power.
  Failure to follow this instruction may result in fire.

- Do not touch terminal during dielectric or insulation resistance test.
  Failure to follow this instruction may result in electric shock.

- Use insulation transformer and noise filter power for too much noise from the power. Attach noise filter on the grounded panel, etc. Use short cables for noise filter output part and power terminal of the unit.
  Failure to follow this instruction may result in product damage, malfunction by surge.

- If power line and input signal line are close each other, install line filter for noise protection at power line and use shielded input signal line.

- Do not control the alarm output or measure the data during firmware update. Failure to follow this instruction may result in malfunction. Alarm output, contact input, data measurement do not operate normally.

- After completing firmware update, check the complete message and turn OFF to ON the power.

- All parameter setting values are reset after firmware update. It may not operate as same way with before updating operation.

- Use voltage output of transmitter power output only for transmitter power. Failure to follow this instruction may result in output module damage.

- Do not press the touch screen by sharp or hard objects with excessive force.

- To prevent inductive noise, separate cables of the unit from high-voltage line, power line.

- Do not install inductive noise or power line closely. It may cause measurement error.

- Install the unit at well-ventilated place to prevent over-heat and give space over 30mm against wall.

- Install the unit vertically.

※ **The specifications and dimensions of user manual are subject to change and some models may be discontinued without notice.**

Table of Contents

1   Product Introduction

1.1   Features

KRN1000 is paperless recorder with LCD method to save recording data at SD / USB memory. It displays trend graph, bar graph, or digital figures at TFT Color LCD.

Via RS422/485, Ethernet or USB device communication, it is available to set parameters, transfer data as data logger functions for user convienent.
It supports several communication method and various input/output functions. It also provides easy and convient graphic user interface (GUI) applying graphic display.

- 5.6-inch color TFT LCD (640×480) touchscreen display with excellent readability and intuitive control interface

- Supports 27 input types (thermocouple, RTD, analog voltage and current[shunt])

- 4 / 8 / 12 / 16 input channel models available

- Various communication methods (RS422/485, Ethernet, USB) standard

- 25 to 250 ms high-speed sampling, 1 to 3600 s recording cycle

- 200 MB internal memory and external memory support (SD/USB up to 32 GB)

- Store and backup internal data to external memory (SD/USB)

- 9 different graph types available

- Various option input/output available: digital input (contact/non-contact), alarm output, transmitter power output

- Compact, space-saving design (rear length: 69.2 mm)

1.2   Components and accessories

1.2.1   Components
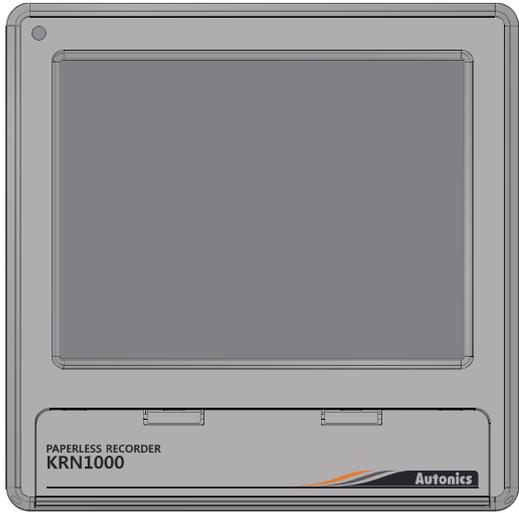
KRN1000

Rear cover
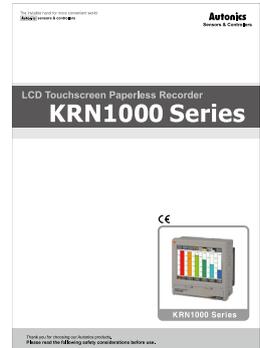
User manual
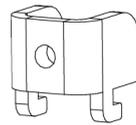
Brackets: 4

Resistance (250Ω)

![Note icon] **Note**

Before using KRN1000, check the components.
If any component is left out or damaged, contact our company or seller.
Autonics service center: +82-32-820-2356 to 7

1.2.2   Accessories

▪   Communication converter

SCM-38I (RS232C to RS485 converter)	SCM-US48I (USB to RS485 converter)
CE K	CE K

Use Autonics SCM-38I or SCM-US48I as communication converter.
SCM-38I (RS232C/RS485 converter) and SCM-US48I (USB/RS485 converter) are same appearance.

1.3   Ordering information

| KRN1000 | - | 04 | 0 | 1 | - | 0 | S |

①   ②   ③   ④   ⑤   ⑥

Category		Description	
①Item	KRN1000	Paperless recorder	
②Input channels	04	4 channels	
	08	8 channels	
	12	12 channels	
	16	16 channels	
③Option input/output	0	None	
	1	Alarm relay output 8 channels	
	2	Alarm relay output 6 channels + Digital input 2 channels	
	3	Alarm relay output 6 channels + 24VDC power output for transmitter	
	4	Alarm relay output 4 channels + Digital input 2 channels + 24VDC power output for transmitter	
④Communication output	1	RS422/485 + Ethernet + USB Device	
⑤Power supply	0	100-240VAC 50/60Hz	
⑥Case	S	Standard panel installation type	

1.4   Unit description

1.4.1   Front part
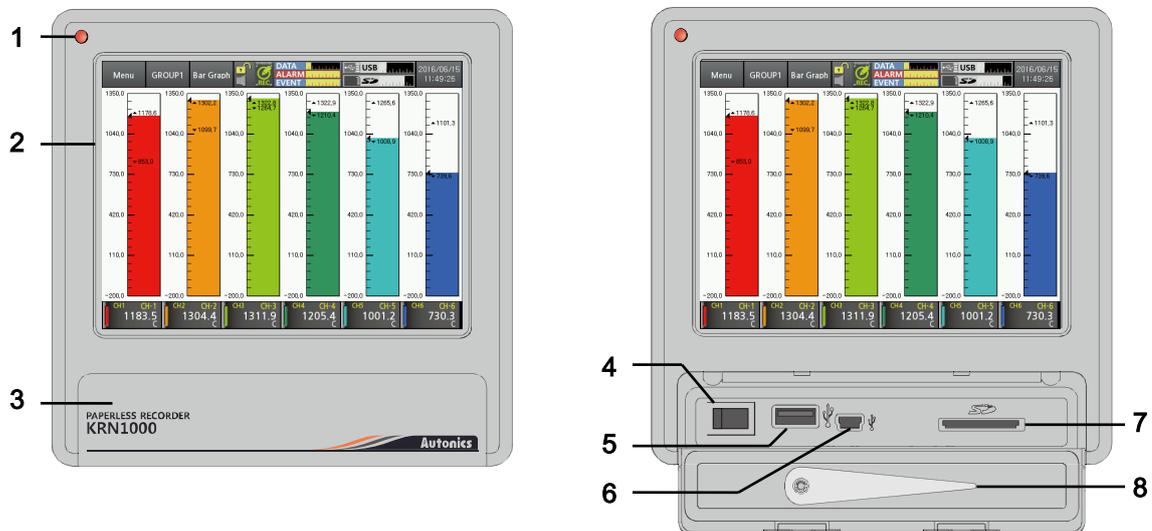
1. Power indicator: Power turns ON and the red LED turns ON.
2. Screen: Measrued value is displayed as trand graph, bar bar graph, digital figures. (Refer to '6 Screen')
3. Front cover: Open the front cover. There are power switch and, USB Host/Device, SD card slot.
4. Power switch: Turn ON/OFF the power of KRN1000.
5. USB host port: Connect the USB memory.
    It recognizes up to 32GB. When using extension cable, cable length should be up to 1.5m.
6. USB device port: Used for parameter settings.
7. SD card slot: SD card memory slot. It supports up to 32GB.
8. Stylus pen: Used for touching screen.

📝 **Note**

Do not connect the other USB devices except USB memory at USB host port.

1.4.2   Rear part
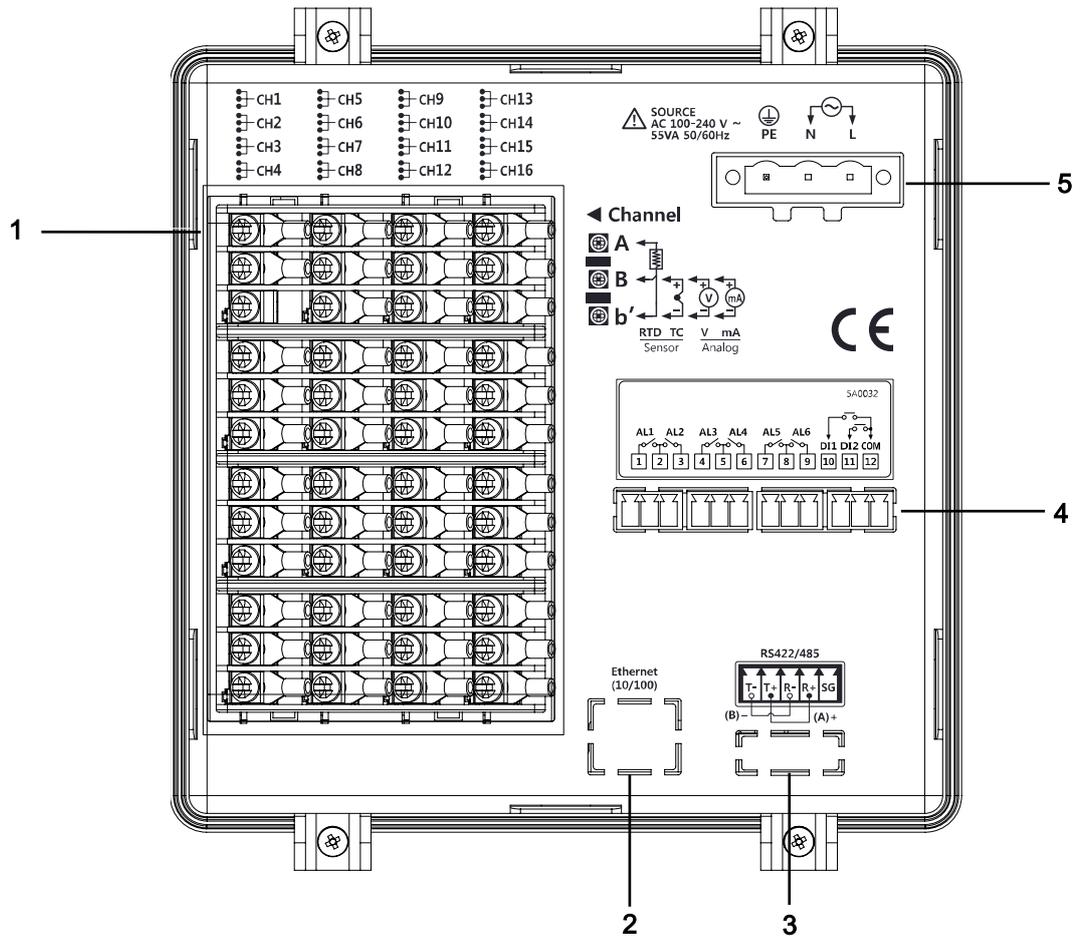
1. Sensor input terminal: Connects universal input.
2. Ethernet port: Connector for ethernet cable. It communicates Modbus TCP.
3. RS422/485 port: Connects RS422/485 for Modbus RTU communication.
4. Option input/output port: Connects for option input/output (digital input (non-contact/ contact), alarm output, power for transmitter).
5. Power input: Power connection (100-240VAC 50/60Hz)

2   Specifications

2.1   KRN1000

Power supply		100-240VAC∼ 50/60Hz
Allowable voltage range		85 to 110% of rated voltage
Power consumption		Max. 23VA
Screen	Display method	5.6 inch TFT Color LCD
	Resolution	640×480 pixels
	Adjusting brightness	3-level (Min/Standard/Max)
	Input method	Touch screen (Pressure sensitive type)
Number of input channels		4 / 8 / 12 / 16 channels
Universal input[1]		Temperature sensors (thermocouple, RTD), Analog (voltage, current (shunt))
Sampling period		1 to 4-CH: 25ms/125ms/250ms, 5 to 16-CH: 125ms/250ms (internal sampling period is average movement filter and alarm output operation unit time)
Recording period		1 to 3600 sec
Internal memory		Approx. 200MB
External memory		SD / USB memory max. 32GB
Dielectric strength		2300VAC 50/60Hz for 1 min (between power terminals and case) ※Except ethernet and USB device
Vibration	Mechanical	10 to 60Hz 4.9m/s^2 in each X, Y, Z direction for 1 hour
	Malfunction	10 to 60Hz 1m/s^2 in each X, Y, Z direction for 10 min
Insulation resistance		Over 20MΩ (at 500VDC megger)
Noise immunity		Square shaped noise by noise simulator (pulse width 1µs) ±2kV
Time accuracy		Within ±2 min/year (available up to 2099)
Protection structure		IP50 (front part)
Environment[2]	Ambient temperature	0 to 50℃, storage: -20 to 60℃
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH
Approval		C E
Weight[3]		Approx. 1290 to 1400g (approx. 590 to 700g)

※1. For more information of universal input, refer to '2.2 Input/Output'.

※2. Environment resistance is rated at no freezing or condensation.
※3. The weight includes packaing. The weight in parenthesis is for unit only.

2.2   Input/Output

Type	Input/Output type	Description	
Universal input	Input type	RTD	JPt100Ω, DPt100Ω, DPt50Ω, Cu100Ω, Cu50Ω (supplied current: approx. 190µA)
		Thermocouple	B, C (W5), E, G, J, K, L, L (Russia), N, P, R, S, T, U
		Analog	Voltage: ±60mV, ±200mV, ±2V, 1-5V, ±5V, -1V-10V Current: 0-20mA, 4-20mA (measureable when using 250Ω shunt resistance)[1]
	Input impedance		Voltage (V): Approx. 205kΩ RTD, Thermocouple, Voltage (mV): Min. 200kΩ
	Display accuracy[2]	RTD	Warm-up time: Max. 30 min
		Thermocouple	At room temperature (25℃±5℃): ±0.1% F.S.±1-digit
		Analog	Out of room temperature: ±0.2% F.S.±1-digit
	Resolution		16-bit
Option input/output[3]	Digital input	No-contact input	ON: Residual voltage max. 1VDC OFF: Leakage current max. 0.1mA
		Contact input	ON: Max. 1kΩ, OFF: Min. 100kΩ, Short-circuit: Approx. 4mA
	Alarm relay output	Capacity	250VAC∼ 3A, 30VDC⎓ 3A, 1 Form A (resistive load)
		Life cycle	Mechanical: Min. 20,000,000 operations Electrical: 100,000 operations (250VAC∼ 3A, 30VDC⎓ 3A)
	Power output for transmitter[4]		24±2VDC⎓, Max. 60mA ※Built-in over current protection circuit.
Comm. output[5]	RS422/485		Modbus RTU ※It is recommended to use shielded cable over AWG24.
	Ethernet		IEEE802.3 10 BASE-T / IEEE802.3U 100 BASE-TX (Modbus TCP)
	USB Device		USB V2.0 Full Speed (Modbus RTU)

※1. Current measurement and connection examples

Connect 250Ω shunt resistance and set analog input type 0-20mA (shunt) / 4-20mA (shunt).
It is available to measure 0-20mA / 4-20mA current.
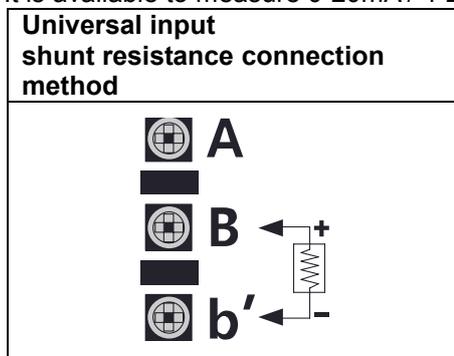
※2. ◎ At room temperature (23℃±5℃)

  • RTD Cu50Ω (-200≤T≤200): (±0.1% F.S. or ±1.5℃, select the higher one) ±1-digit

  • RTD DPt50Ω (-200≤T≤500): (±0.1% F.S. or ±1.5℃, select the higher one) ±1-digit

  • Thermocouple R, S, C, G type (0≤T≤100): (±0.1% F.S. or ±4.0℃, select the higher one) ±1-digit

  • Thermocouple U, T type (-100≤T≤400): (±0.1% F.S. or ±2.0℃, select the higher one) ±1-digit

  • Thermocouple B type, below 400℃: There is no accuracy standards.

  • All thermocouples, below -100℃: (±0.3% F.S. or ±4.0℃, select the higher one) ±1-digit

◎ Out of room temperature range

  • RTD Cu50Ω (-200≤T≤200): (±0.2% F.S. or ±3.0℃, select the higher one) ±1-digit

  • RTD DPt50Ω (-200≤T≤500): (±0.2% F.S. or ±3.0℃, select the higher one) ±1-digit

※3. Input/Output is different by option. Refer to '1.3 Ordering information'.
※4. For supplying power for transmitter, it is recommened to use shield cable to reduce noise.
※5. RS422/485, ethernet, USB device communication outputs are not used at the same time.
※If sensor input line is longer, it is recommended to use shield cable to reduce noise.

⚠ Caution

Before the wiring, turn OFF the unit.
Be sure that the polarity of power for transmitter. If not, it may cause product damage.
When supplying the over voltage at sensor input, it may cause product damage.

2.3 Input type and range

Input type		Display	Temperature range		
			℃	℉	K
Thermocouple	K (CA)	TC-K	-200.0 to 1350.0	-328.0 to 2462.0	73.2 to 1623.2
	J (IC)	TC-J	-200.0 to 800.0	-328.0 to 1472.0	73.2 to 1073.2
	E (CR)	TC-E	-200.0 to 800.0	-328.0 to 1472.0	73.2 to 1073.2
	T (CC)	TC-T	-200.0 to 400.0	-328.0 to 752.0	73.2 to 673.2
	B (PR)	TC-B	100.0 to 1800.0	212.0 to 3272.0	373.2 to 2073.2
	R (PR)	TC-R	0.0 to 1750.0	32.0 to 3182.0	273.2 to 2023.2
	S (PR)	TC-S	0.0 to 1750.0	32.0 to 3182.0	273.2 to 2023.2
	N (NN)	TC-N	-200.0 to 1300.0	-328.0 to 2372.0	73.2 to 1573.2
	C (TT)[1]	TC-C	0.0 to 2300.0	32.0 to 4172.0	273.2 to 2573.2
	G (TT)[2]	TC-G	0.0 to 2300.0	32.0 to 4172.0	273.2 to 2573.2
	L (IC)	TC-L	-200.0 to 900.0	-328.0 to 1652.0	73.2 to 1173.2
	L (Russian type)[3]	TC-L_R	0.0 to 600.0	32.0 to 1112.0	273.2 to 873.2
	U (CC)	TC-U	-200.0 to 400.0	-328.0 to 752.0	73.2 to 673.2
	Platinel Ⅱ	TC-P	0.0 to 1350.0	32.0 to 2462.0	273.2 to 1623.2
RTD	Cu50Ω	CU50	-200.0 to 200.0	-328.0 to 392.0	73.2 to 473.2
	Cu100Ω	CU100	-200.0 to 200.0	-328.0 to 392.0	73.2 to 473.2
	JPt100Ω	JPT100	-200.0 to 600.0	-328.0 to 1112.0	73.2 to 873.2
	DPt50Ω	DPT50	-200.0 to 600.0	-328.0 to 1112.0	73.2 to 873.2
	DPt100Ω	DPT100	-200.0 to 850.0	-328.0 to 1562.0	73.2 to 1123.2
Analog	Voltage	-60.00-60.00mV	±60mV	Resolution: 10µV	-99999 to 99999 (display range depends on the decimal point position.)
		-200.00-200.00mV	±200mV	Resolution: 10µV	
		-2.000-2.000V	±2V	Resolution: 1mV	
		1.000-5.000V	1-5V	Resolution: 1mV	
		-5.000-5.000V	±5V	Resolution: 1mV	
		-1.00-10.00V	-1V-10V	Resolution: 10mV	
	Current (shunt)	0-20mA	0-20mA (shunt)	—	
		4-20mA	4-20mA (shunt)	—	

※1. C (TT): Same as exisitng W5 (TT) type temperature sensor.
※2. G (TT): Same as existing W (TT) type temperature sensor.
※3. Russian L type temperature sensor is divided from general purpose L type.

3 Dimensions

3.1 KRN1000

(Unit: mm)

□144

11.5   69.2

□137.5

15

M4

14

10.4

3.2 Panel cut-out

Min.175

Min.175

$138^{+1.0}_{0}$

$138^{+1.0}_{0}$
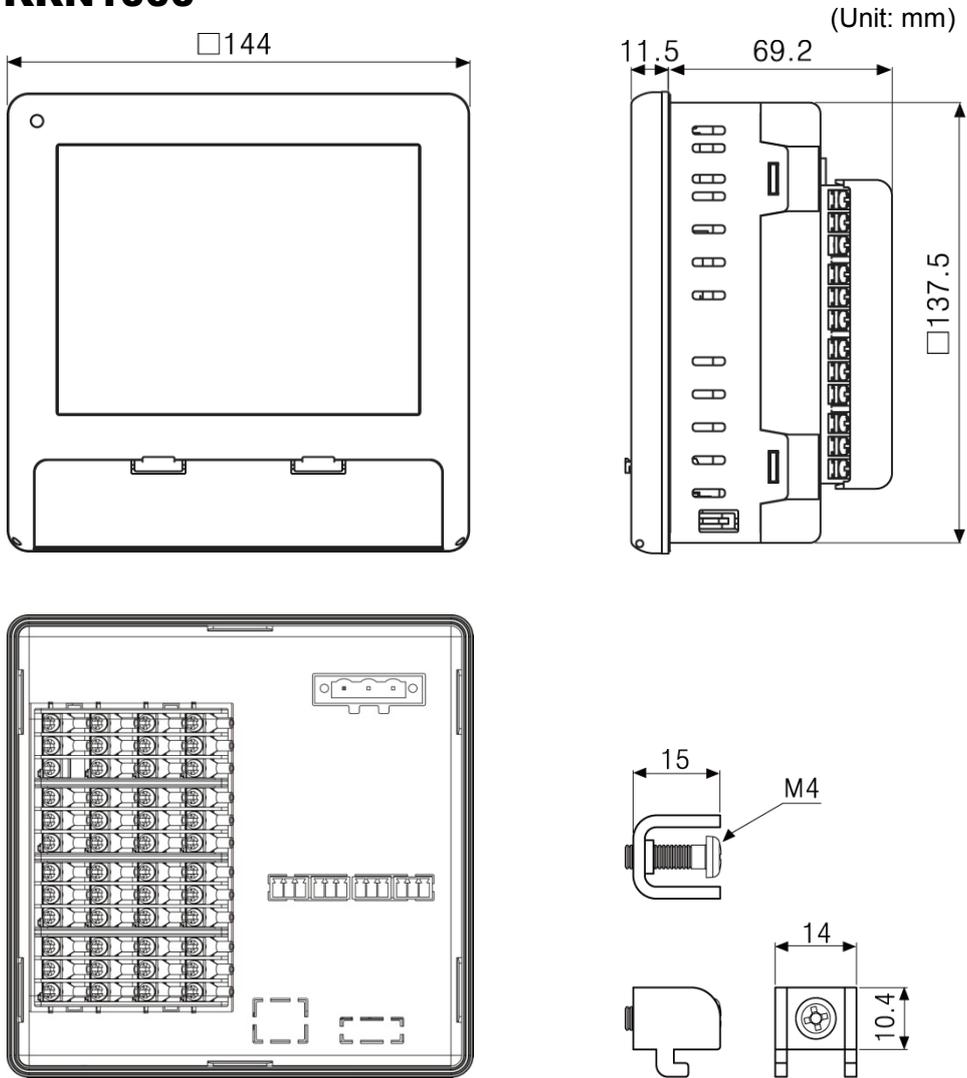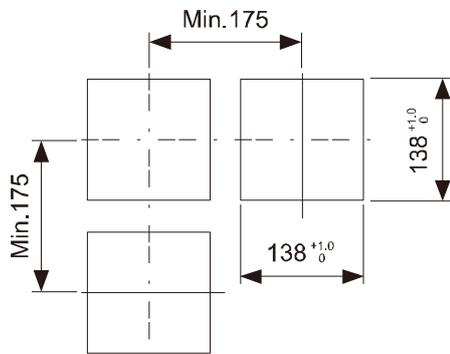
※Use panel which is 1 to 5mm thickness.

4 Connections

4.1 KRN1000

This figure is back side of KRN1000.
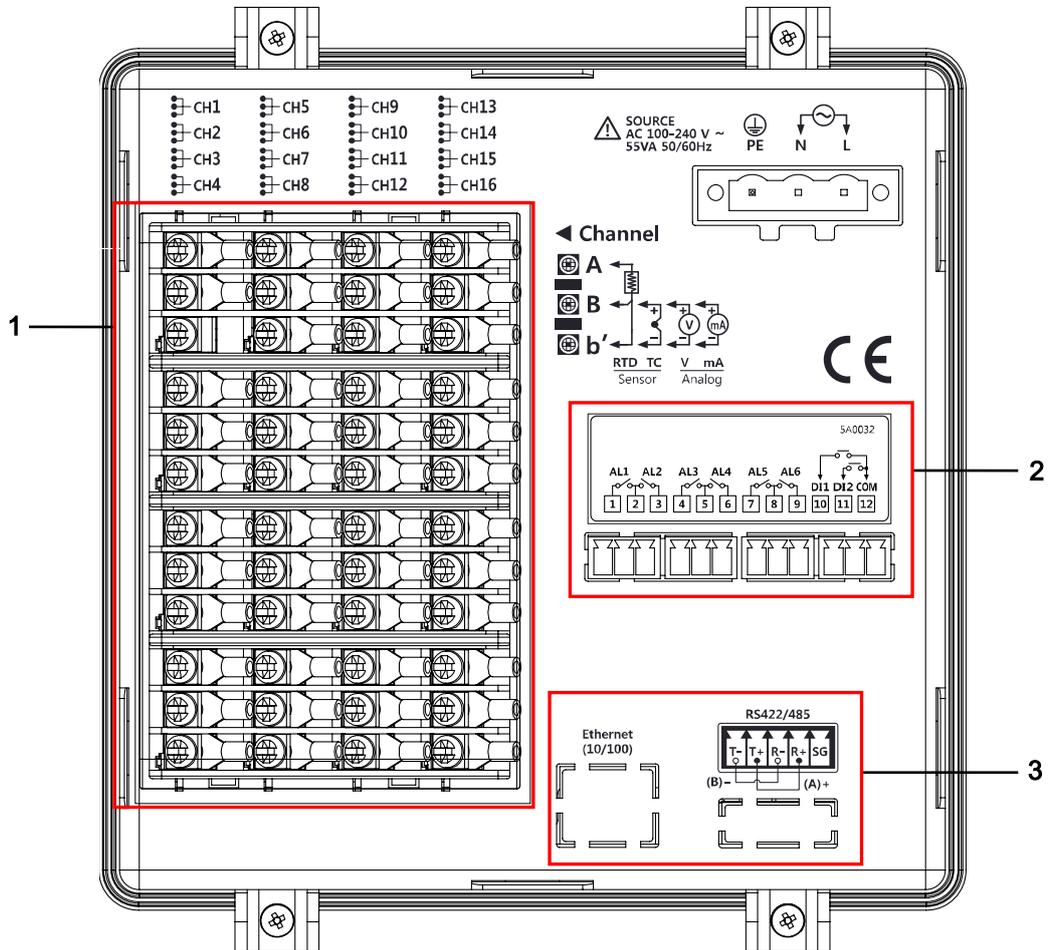
No	Descriptions
1	Connects universal input.
2	Connects option input/output (digital input (non-contact/contact), alarm output, power for transmitter).
3	Connects communication output.

4.2   Input/Output circuit

Universal input	Communication output

Option input/output 1 (alarm output 8 channels)

Option input/output 2 (alarm output 6 channels + digital input 2 channels)

Option input/output 3 (alarm output 6 channels + power for transmitter output)

Option input/output 4
(alarm output 4 channels + digital input 2 channels + power for transmitter output)

5   Installations

5.1   Environment

Install the unit in place where the below conditions are satisfied.

- Place where ventilation is well
  To prevent from malfunction and damage by overheating (use temperature range: 0 to 50℃), install this unit where ventilation is well.
  In case installing several KRN1000, space each other by panel cut-out.

- Place where vibration is not severe
  If there is too much vibration, it may cause malfunction such as print error. For more information about vibration, please refer to '2 Specifications'.

- In case of temperature measurement with thermocouple temperature sensor at the place where temperature is fluctuated, data error may occur. You should warm-up this unit over 30 min. to acquire accurate data before using it.

5.2   Installation Method

1st   Install KRN1000 on the processed panel as panel cut-out diagram. Mount fixing
brackets on upper/lower parts.
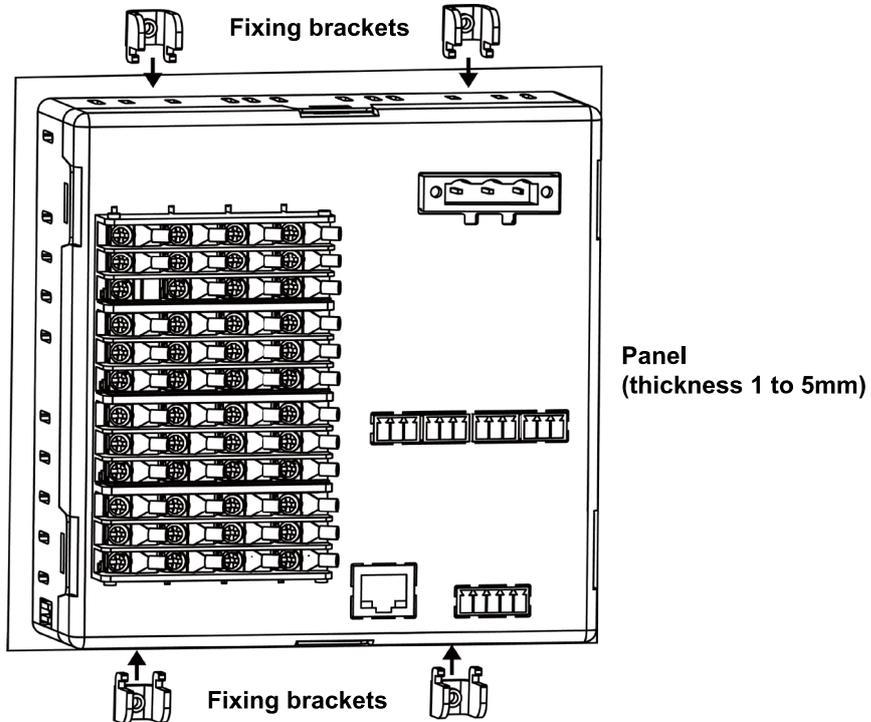
2nd Tighten fixing brackets on upper/lower parts to fix on the panel with screwdriver (+)
with 0.4N•m torque.
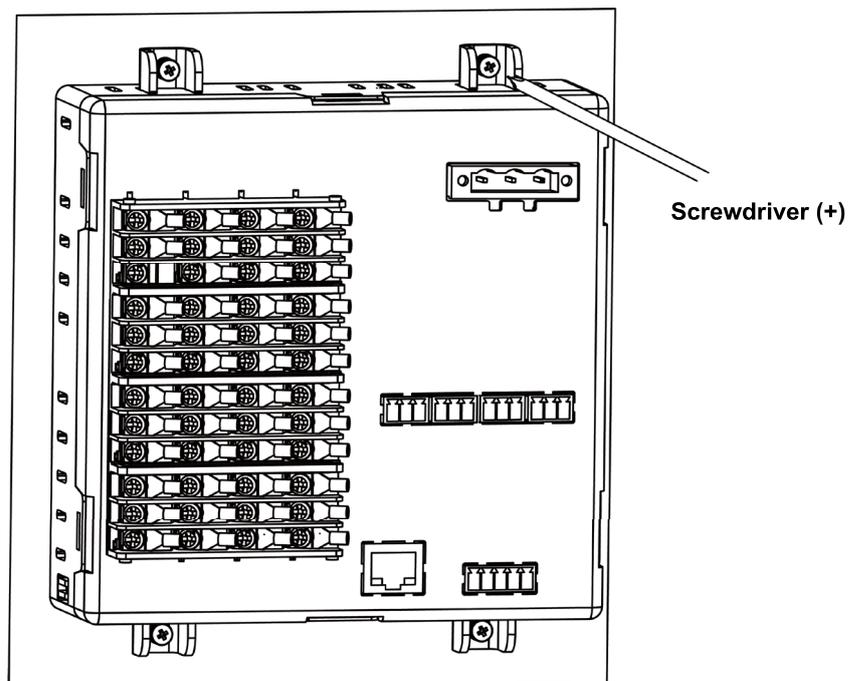
5.3   USB to Serial driver

Install USB to serial driver which is applied for KRN100 sereis and connect DAQMaster and you can set parameter setting.

Supporing operation system for USB to Serial driver is Windows XP, VISTA (32/64bit), 7 (32/64bit), 8 (32/64bit).

5.3.1   Driver installation

1st   Visit our web site www.autonics.com and download

'KRN1000_USB_To_Serial_Drivers.zip' or visit

http://www.ftdichip.com/Drivers/VCP.htm and download the dedicated OS driver.

2nd   Run CDM v2.xx.xx WHQL Certified.exe and install the driver.

(driver version may be different.)
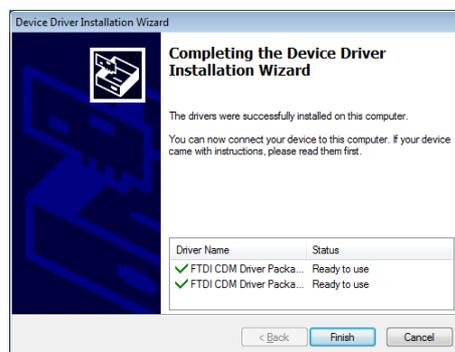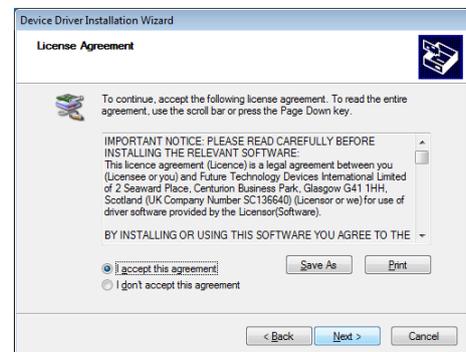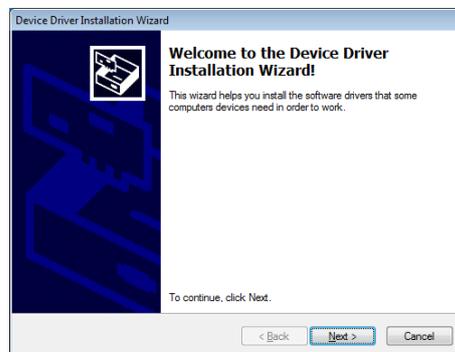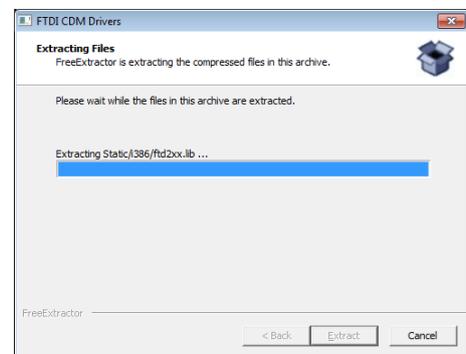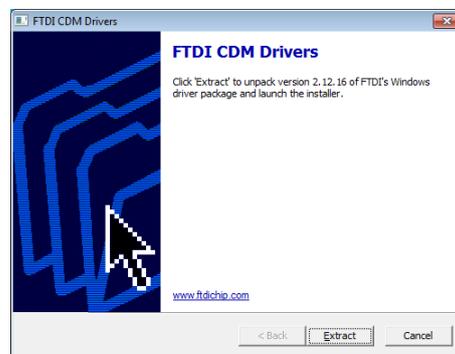
3rd   Connect the USB device port at KRN1000 front cover and PC USB port via USB cable (A-Mini B 5-pin, 1.5m).

USB A-Mini B
5-pin cable, 1.5m

Comm. output
USB Device Port
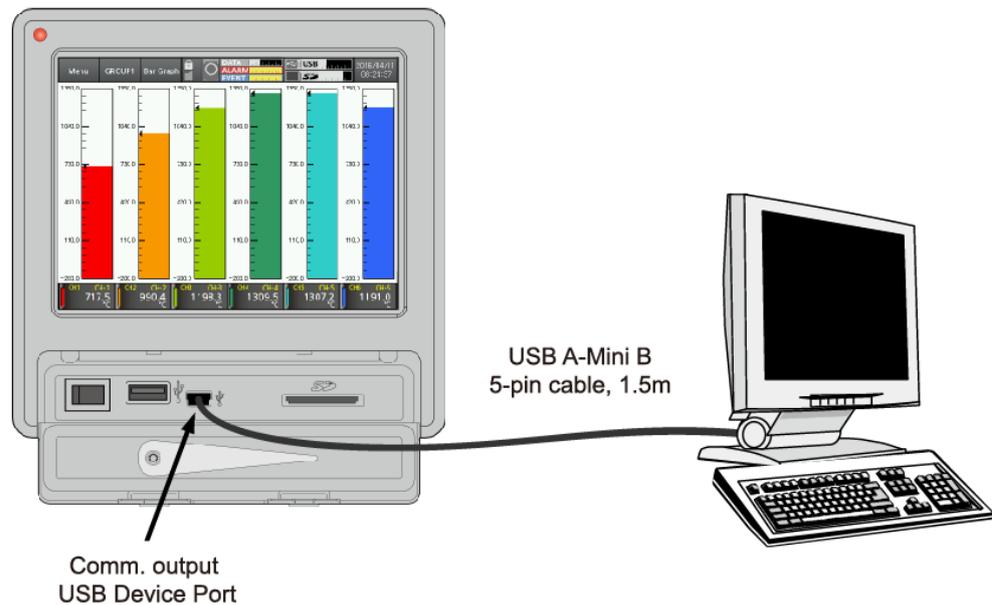
4th   After recognizing the driver, the driver is automatically installed.

5.3.2   Check the driver

To check the driver, right click 'My computer' and select 'Properties' on pop-up menu. 'Device Manager'' dialog appears. Check 'Ports (COM & LPT)' - 'USB To Serial Converter (COMx)'.
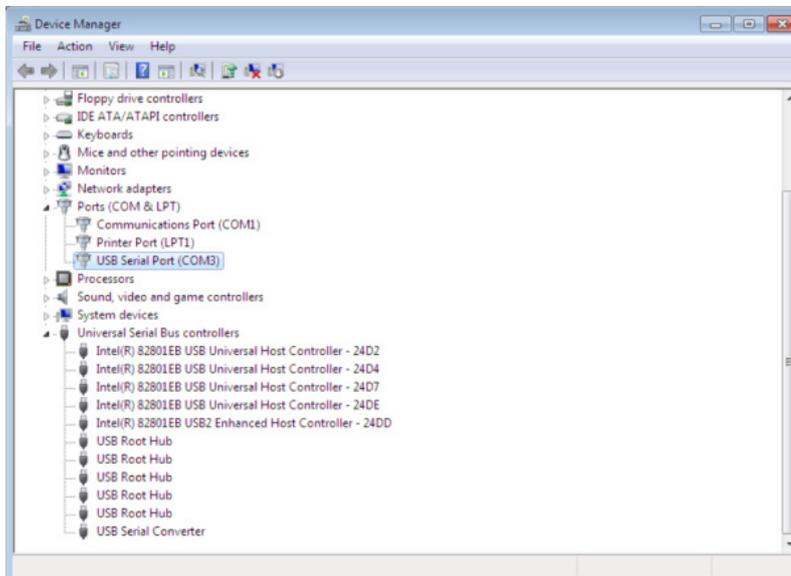
6   Screen

6.1   Initial booting screen

Below booting screens are initially displayed when power is supplied to KRN1000. These screens progresses initial settings for KRN1000 to operate normally and checks inner system memory.

If there is no error for inner system memory, booting is finished and KRN1000 operates normally.

▪ Initial screen: Checking initial system memory error and processing module reset
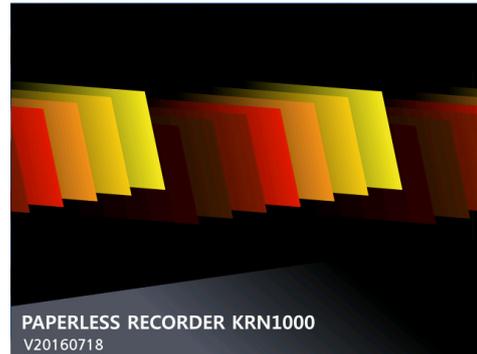
▪ If initial system memory error occurs,
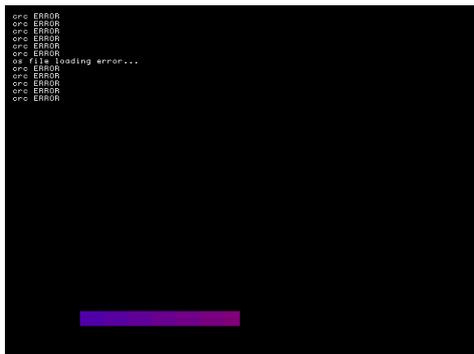
If initial system memory error occurs, it does not operate normally.
Contact our company or seller.

Autonics service center: +82-32-820-2356 to 7

6.2 Screen description

The screen consists of status display part and measurement value display part.

Status display part

Measurement value display part

6.2.1 Status display part

1	2	3	4	5	6	7	8

Section	Icon		Description
1	Menu	Menu	Displays menu.
	Esc	Esc	Moves from menu to current screen.
	Home	Home	Moves to main screen.
2	GROUP1	Group	Displays currently displayed group name. Touch the icon and select the group. You can set the group name and the set group name is displayed.
3※1	Bar Graph	Graph	Select the displayed graph at the current screen. Select one among bar graph, vertical/horizontal trend graph, divided vertical/horizontal trend graph, vertical/horizontal mixed graph, digital group/all.
4※2	(lock icon)	Lock	Displays at standard user mode. (activated log-in function or log off status)
	(lock setting icon)	Lock Setting	Displays at administor mode. (activated log-in function and log-in as administor mode)
	(unlock icon)	Unlock	Displays at unlock. (inactivated log-in function)

Section	Icon		Description
		No Alarm	Displays at no alarm.
		Alarm	Displays when alarm occurs.
5		Internal Memory Record	Displays when recording measurement value of each channel at internal memory.
		Internal Memory No Record	Displays when displaying measurement value and no recording it at internal memory.
6	DATA	Data Record Space	Displays usage details of data recording space.
	ALARM	Alarm Record Space	Displays empty space of alarm data memory.
	EVENT	Event Record Space	Displays empty space of event data memory.
7		USB Memory No Connection	Displays when USB memory is not connected.
	USB	USB Memory No Save	Displays when internal memory data does not save at USB memory.
	USB	USB Memory Save	Displays when internal memory data saves at USB memory.
		SD Card No Connection	Displays when SD card is not connected.
	SD	SD Card No Save	Displays when internal memory data does not save at SD card.
	SD	SD Card Save	Displays when internal memory data saves at SD card.
8	2015/09/24 14:31:39	Date/Time	Displays date and time.
	2015/09/24 (s)15:33:23		If summer time is set, "(s)" marks in front of time.
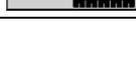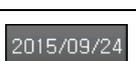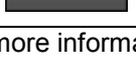
※1. For more information about screen graph, refer to '6.2.3 Graph'.
※2. For more information about lock and unlock, refer to '7.5.5 Log In'.

6.2.2 Measurement value display part

Measurement value of each channel is displayed as graph and digital number.

One screen displays 6 channels and channel roation is maually or automatically setable.

For more information about channel roation and time, refer to '7.1.3 Group Setting'.

No	Item	Descriptions
1	Measurement value graph of each channel	Displays the measurement value of each channel as graph.
2	Measurement value digital number of each channel	Displays the measurement value of each channel as digital number.

6.2.3   Graph

Select the display graph at current screen. Touch the red square area to select the graph style.
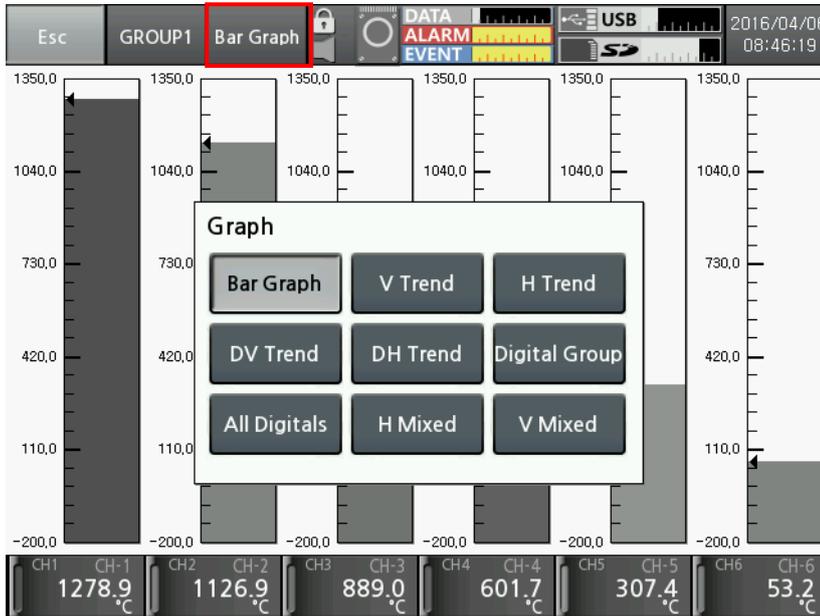
The supported graphs are as below.

- Bar graph
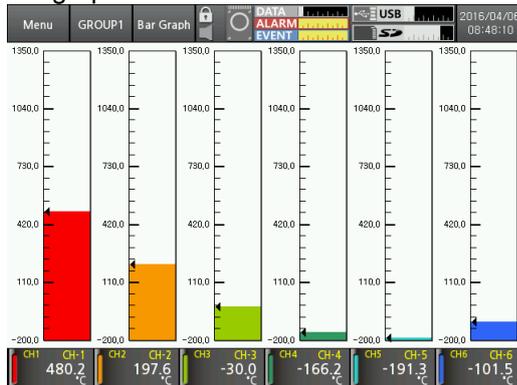
- Vertical trend graph (V Trend)

- Horizontal trend graph (H Trend)

- Divided vertical trend graph (DV Trend)
  The upper area is for real-time measurement value as vertical trend graph and the lower area is for all records from start as vertical trend graph.
  The lower area is available only when recording status.

- Divided horizontal trend graph (DH Trend)
  The right area is for real-time measurement value as horizontal trend graph and the left area is for all records from start as horizontal trend graph.
  The left area is available only when recording status.
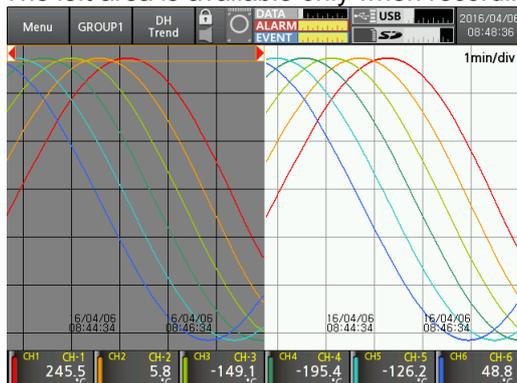
- Vertical mixed graph (V Mixed)
  Measurement value of each channel is displayed as bar graph and vertical trend graph.

- Horizontal mixed graph (H Mixed)
  Measurement value of each channel is displayed as bar graph and horizontal trend graph.
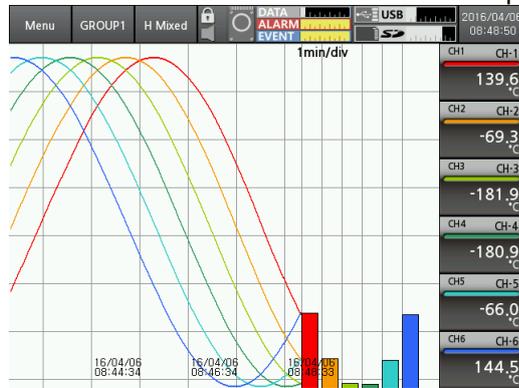
- Digital group
  One screen displays measurement values of 6 channels.
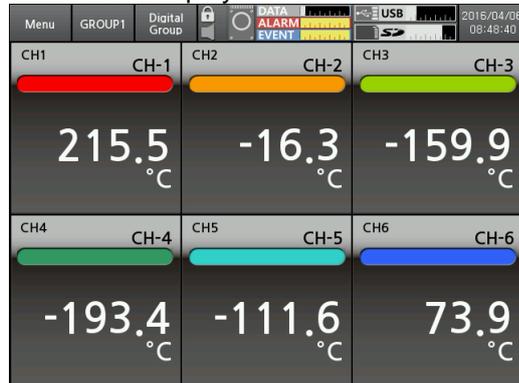
▪ All digitals
One screen displays measurement values of all channels.

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6.2.4   Pop-up menu

Touch the red square area at main screen and pop-up menu appears.
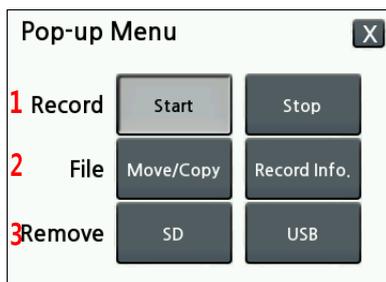
No	Item	Descriptions
1	Record	Starts recording the measurement value on the current screen. Touch the Stop to stop the recording. (when stop the recording during recording, data is not saved.)
2	File	- Move/Copy: Moves/Copies the saved log file of internal memory to extenral memory. -Record Info.: Displays saving path, log record period of currently recording data.
3	Remove	Remove the installed external SD/USB memory.

6.2.5 Virtual keyboard

You can enter setting value via vertual keyboard.
Virtual keyboard is activated automatically when setting value enters. For entering numbers, number virtual keyboard is activated.
Only English is supported to enter.

No	Icon	Descriptions
1	Tag Name (up to 8 char) / CH-1	Displays keyboard input status.
2	a A 1/*	Select English capital/small letter, number or sign.
3	←	Deletes the entered charaters.
4	Save	Saves the entered characters.
5	Esc	Cancels the entered characters.

Enterable characters are as below.

▪ English capital letters

▪ English small letters

▪ Signs and numbers

▪ Number virtual keyboard
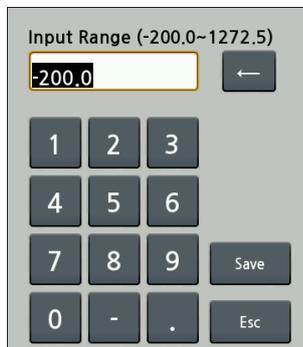
6.2.6   Color

Select the color.
KRN1000 supports 23 colors. Set the pen color, or background color of each group.
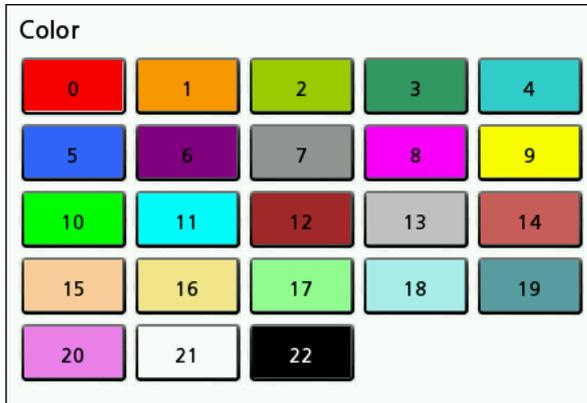
7 Menu

Touch the menu at top-left screen and menu displays. Menu consists as below.

Display	History		System Info.	Date/Time
	File History			Reservation
	Group Setting			Device
	Touch Calibration			File
				Log In
Status	Alarm List			System Info.
	Event List			
	AO/DI Status		Memory Info.	Memory Management
Input CH Info.	Input/Display			Internal Memory
	Input Option		Screen Capture	
	Alarm			
	User Unit		Log OFF/Power OFF	
Option Info.	Alarm Output			
	Digital Input			
	RS422/485			
	Ethernet/USB			

7.1   Display

7.1.1   History

You can open the log file which is recording to check the dedicated data history (measurement value and whole trend).

Move the history axis (vertical red line) at the desired time to check the dedicated data of each channel.
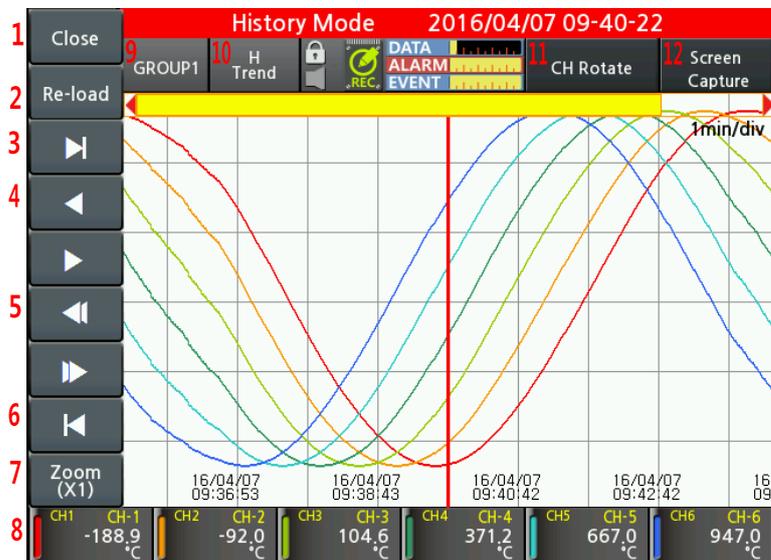
No	Item	Descriptions
1	Close	Moves to the main screen.
2	Re-load	Re-loads the measured data.It updates the latest data.
3	▶|	Moves to the latest data point of log file.
4	◀ , ▶	Moves the history axis to back/forward for 1 sec.
5	◀| , |▶	Moves the history log data to two-thirds back/forward of the screen.

No	Item	Descriptions
6	⏮	Moves the old data point of log file.
7	Zoom	Zooms in/out the screen from 1 to 1200 magnifications.
8	CH Display	Touch the desired channel not to be displayed. The data value of the channel is displayed as gray color.
9	GROUP□	Select the group. You can change the group name. Refer to '7.1.3 Group Setting '.
10	Graph	Displays the desired graph as horizontal trend (H Trend) → divided horizontal trend (DH Trend) →vertical trend (V Trend) → divided vertical trend (DV Trend) graph by touching the icon.
11	CH Rotate	Rotate the displayed 6 channels per one screen. CH1/2/3/4/5/6 → CH7/8/9/10/11/12 → CH13/14/15/16
12	Screen Capture	Save the current screen.
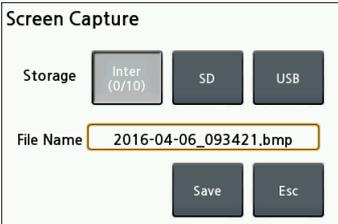
📝 **Note**

Check the currently recording data history.
When recording stops, error message appears.
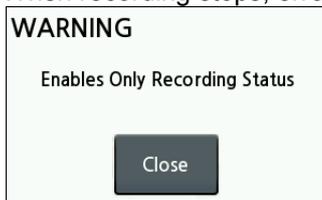
7.1.2 File History

You can open the saved log file to check the dedicated data history (measurement value and whole trend).

Move the history axis (vertical red line) at the desired time to check the dedicated data of each channel.

File history screen is added group setting, channel information from history screen.
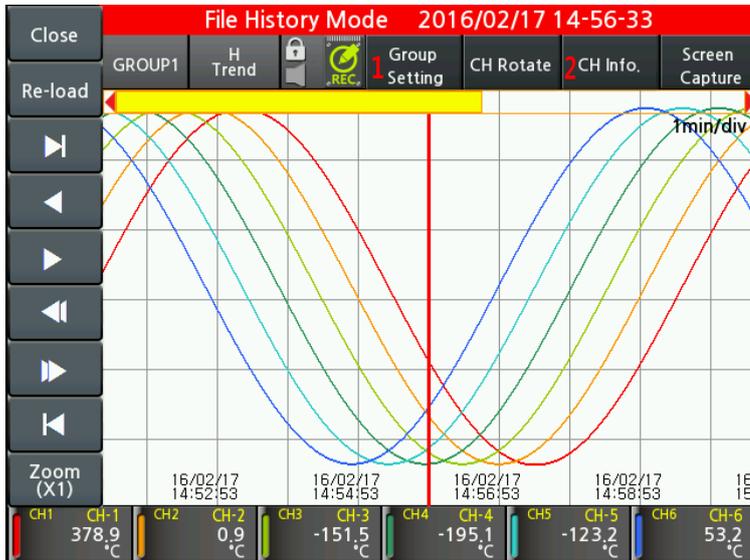
No	Item	Descriptions
1	Group	Set group and channel information of the saved log file. For more information about group setting, refer to '7.1.3 Group Setting'. Setting method and details are same.
2	Channel Info.	Displays each channel information such as tag name, input type, low/high-limit scale.

7.1.3　Group Setting

It sets for group and channel information.

You can set the max. 16 channels according to input channels.

Input channel is available to set duplicated to one or several groups. Set the channel to each group and pen color.

Groups are up to 6.

No	Item	Descriptions
1	Group	Moves group. Touch "Group 1" or 《 , 》 to select the desired group.
2	CH Rotation Time	Main screen graph displays only 6 channels' data. Set the channel automatical rotation time. Setting range: 0 to 3600s. (0: changing channels manually by touching the screen)
3	Name	Displays group name. Touch the name and change the group name via the virtual keyboard.
4	No. of CHs	Displays the set number of channels.
5	Background	Set the group background color via the color select dialog box.
6	Pen □	Set the channel, color, line style, min./max. value by each pen. Min./Max. value of each channel is input range of the input type. For more information, refer to '2.3 Input type and range'.
7	Pen1-4/ 5-8 /9- 12/13-16	

7.1.4   Touch Calibration

It corrects touch input via pointer calibration.
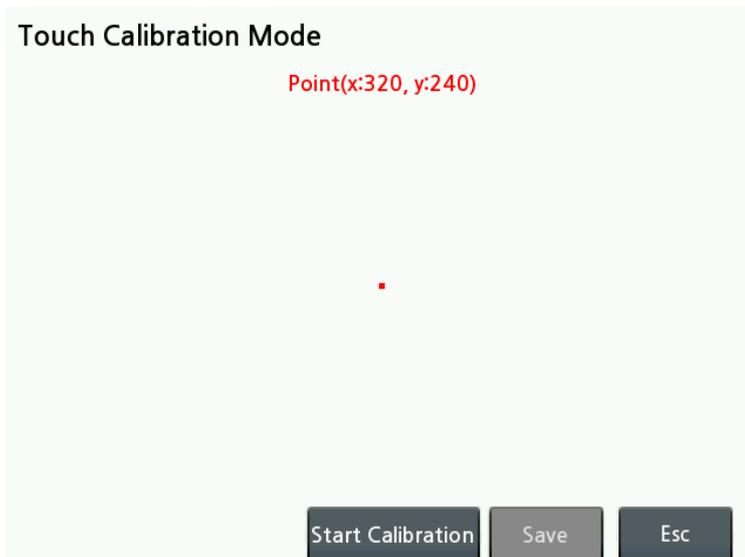
When starting touch calibration, total 5 points are displays one by one. Touch the point and calibrate it. For more accurate touch, it is recommended to use a stylus pen.

Note

If touch calibration is wrong, re-boot the unit as initial system value.

Touch the right-below area over than twice of the initial booting screen.

PAPERLESS RECORDER KRN1000
V20160718
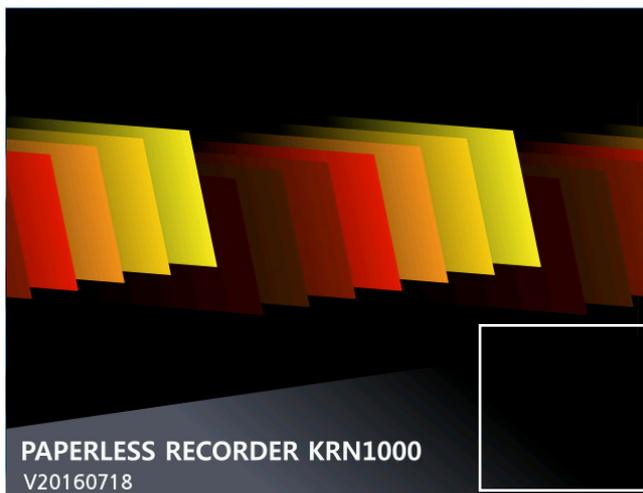
7.2   Status

7.2.1   Alarm List

It displays occurring alarm(channel, alarm type, relay, start/end time) during operation.

Alarm list displays alarm channel, type, relay, start/end time of occuring alarms. You can save or delete the alarm list. Alarm list is saved as *.csv file format.

When turing OFF power of KRN1000 while alarm occurs, end time is displayed as "0000-00-00 00:00:00".

Touch 'History' to check the data of alarm occuring point as horizontal trend/vertical trend/divided horizontal trend/divided vertical trend graph.

Divided trend graph is displays divided screen to compare and check different time of the one file.

When recording starts/stops several times from starting to completing alarm, several log files are created.

If there are several log files from starting alarm to end alarm, it displays the history of first log file which includes alarm start time.

7.2.2   Event List

It displays occurring event (event message, occurrence time) during operation.

You can save or delete the event list. Event list is saved as *.csv file format.

Event message displays occuring event during device operation such as device power ON/OFF, record start/stop, or external memory recognization, etc.

7.2.3   AO/DI Status

It displays alarm output and digital input status.
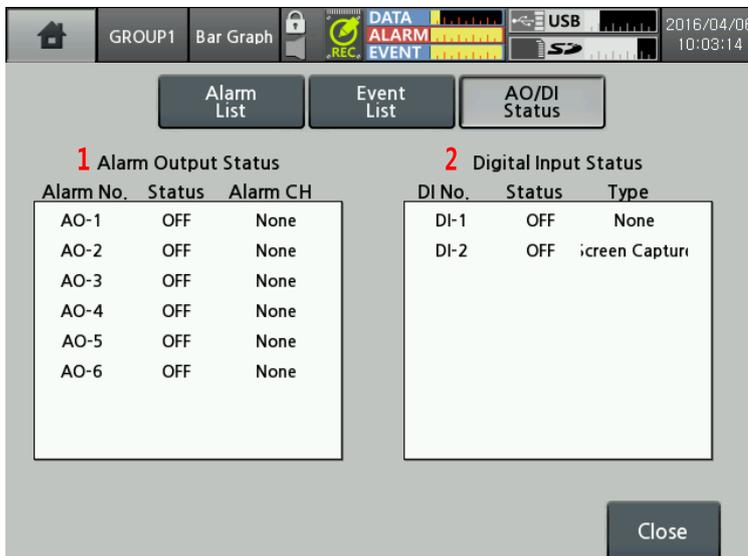
No	Item	Descriptions
1	Alarm Output Status	- Alarm No: Displays alarm output number. - Status: Displays alarm output ON, OFF status. - Alarm CH: Displays the channel occuring alarm. If alarms occur at several channels, it displays the number of occuring alarms.
2	Digital Input Status	- DI No.: Displays digital input number. - Status: Displays digital input ON, OFF status. - Type: Displays the set digital input. For more information about digital input, refer to '7.4.2 Digital Input'.

7.3   Input CH Info.

It sets input type of each channel, option, alarm, user unit.

During memory recording, you cannot set or change input channel settings.
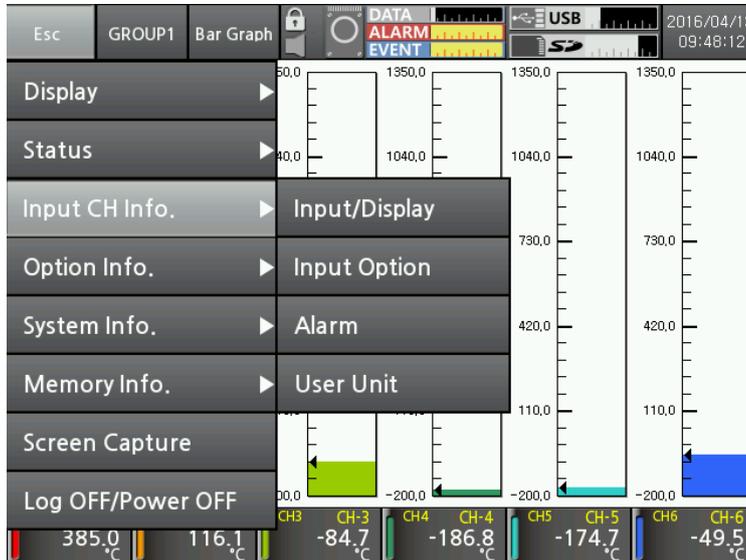
7.3.1   Input/Display

No	Item	Descriptions
1	Channel	Moves channel. Touch 'CH1' or ⟩⟩ to change the channel.
2	Copy	Copies the other channels parameters of the same group. Select the channel to be copy.
3	Input Type	Set the input type. Input types are total 27: thermocouple, RTD, voltage, current (shunt). For more information, refer to '2.3 Input type and range'.
4	Low-Limit Graph Scale/ Low-Limit Input	In case of temperature sensor input, set the low-limit graph scale value within the input range. Setting range: Min. value of input range to high-limit graph scale value–F.S. 5% E.g.) In case of TC-K input, -200.0 to 1350.0℃ of input range, and setting range is -200.0 to 1272.5℃. (-F.S.=77.5) In case of analog input, it displays low-limit input value.

No	Item	Descriptions
5	High-Limit Graph Scale/ High-Limit Input	In case of temperature sensor input, set the high-limit graph scale value within the input range. Setting range: Low-limit graph scale value+F.S. 5% to Max. value of input range E.g.) In case of TC-K input, -200.0 to 1350.0℃ of input range, and setting range is -122.5 to 1350℃. (+F.S.=77.5) In case of analog input, it displays high-limit input value.

6	Point	- Temperature sensor input: 0, 0.0
		  (set the decimal point for the measurement value)
		- Analog input: 0, 0.0, 0.00, 0.000, 0.0000
		  (set the decimal point position for the scale value)

7	Tag Name	Set the channel name.
8	Low-Limit Scale	Set the desired display value based on the measurement value.
9	High-Limit Scale	It is activated only for analog (voltage, current (shunt)) input type.[1]
10	Display Unit[2]	- Temperature senosr input: Temperature units, ℃, ℉, K are available. - Analog input: 72 display units are available. When not using unit, select blank.

※1. As below figure, for example, measured input values are 'a' and 'b' and the desired display values are 'A', and 'B'. In this case, about the input 'a' and 'b', it displays a=A, b=B as linearly.
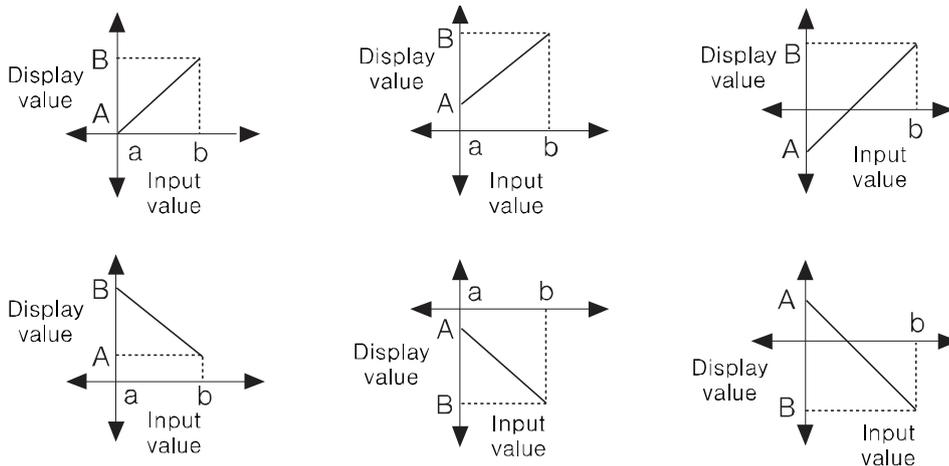
You can change display value about min./max. input value of the measurement value.

📖 **Ex.**

In case of input type, -60 to +60mV

▪ Low Scale (low-limit scale value)=0.0, High Scale (high-limit scale value)=Set as 10.0, 20.0, 30.0, -20.0
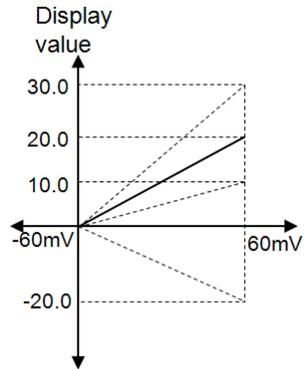
▪ Low Scale (low-limit scale value)=20.0, High Scale (high-limit scale value)=Set as -20.0
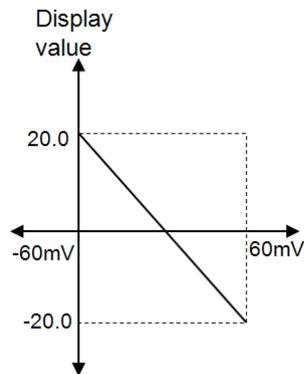
▪ Low Scale (low-limit scale value)=-20.0, High Scale (high-limit scale value)=Set as 20.0
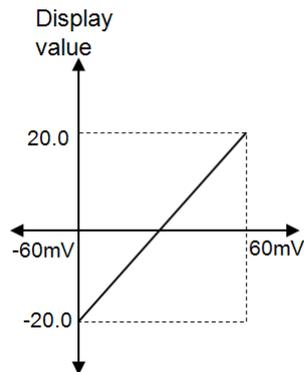
※2. Supported display unit

No	Unit	No	Unit	No	Unit	No	Unit	No	Unit
1	°C	17	%	33	V	49	mA	65	User1
2	°F	18	Wt%	34	mV	50	A	66	User2
3	K	19	mass%	35	µV	51	kg/cm^2	67	User3
4	Kcal/m^3	20	Vol%	36	kV	52	P	68	User4
5	Kcal	21	ppm	37	Ω	53	kPa	69	User5
6	cal	22	ppb	38	mΩ	54	MPa	70	User6
7	j	23	mol	39	µΩ	55	N/m^2	71	User7
8	Btu	24	Space	40	s	56	N/mm^2	72	User8
9	l	25	lx	41	µs	57	inH$_2$O	73	User9
10	ml	26	cd	42	VA	58	mmH$_2$O		
11	t	27	lm	43	W	59	bar		
12	Val	28	cd/m^2	44	kW	60	Torr		
13	lb	29	rpm	45	MW	61	mmHg		
14	oz	30	Hz	46	Var	62	mmAq		
15	barrel	31	m^2/s	47	kVar	63	psi		
16	-	32	cp	48	MVar	64	User0		

Note

In case of the complicated unit such as kg/cm^2, screen quality may not be good.

7.3.2   Input Option

No	Item	Descriptions
1	Channel	Moves channel. Touch 'CH1' or [»] to change the channel.
2	Special Func.※1	Displays the applied measurement value as the set special function. Depending on input type, applicable special functions are different. Setting range
3	Ref CH	- Temperature sensor input: None, Difference (deviation)
4	Two Unit	- Analog input: Linear, Root, Square, Two Unit Two Unit is activated only for 4-20mA (shunt) input type.
5	Input Bias	Corrects error from input (thermocouple, RTD, voltage, current (shunt)), not from the recorder. Setting range: -9999 to 9999, -999.9 to 999.9, -99.99 to 99.99, -9.999 to 9.999 -0.9999 to 0.9999 (depending on the set decimal point, the range is different.)
6	Span※2	Adjusts high-limit error by regulating display value which is about measurement value or applied scale.
7	Record Method	Set the recording method of measured data by each channel. <table><tr><td>**Setting value**</td><td>**Descriptions**</td></tr><tr><td>Instant</td><td>Saves measurement value at every recording cycle.</td></tr><tr><td>Average</td><td>Saves the average value of sampling measurement value during recording cycle.</td></tr><tr><td>Min</td><td>Saves the min. value of sampling measurement value during recording cycle.</td></tr><tr><td>Max</td><td>Saves the max. value of sampling measurement value during recording cycle.</td></tr></table>
8	Digital Filter	In some applications the fluctuating measured input causes the display value to fluctuate. In this case accurate display/record is disable. This function is able to make display value stable by input digital filter. Input digital filter uses moving average method. It does not affet to display period but display value may be different with input value.
9	No. of Digital Filters※3	Set the number of samplings which apply to digital filter. Set Filter type and this menu is activated. Setting range: 1 to 128

No	Item	Descriptions		
10	Burn-out Action	In case of temperature sensor input type, set the alarm type and option for input break. (it does not operate for analog (voltage, current (shunt)) input type.)		
		Setting value	**Descriptions**	
		None	When input break, it displays BURN.	
		Up Scale	Displays BURN after the display value increases as up scale when input break.	
		Down Scale	Displays BURN after the display value decreases as down scale when input break	

※1. Below pattern graph appears comparing the values which are appling liner, root, square for analog input.
Low-limit input: -5V, High-limit input: +5V, Low-limit scale: -1000, High-limit scale: 1000
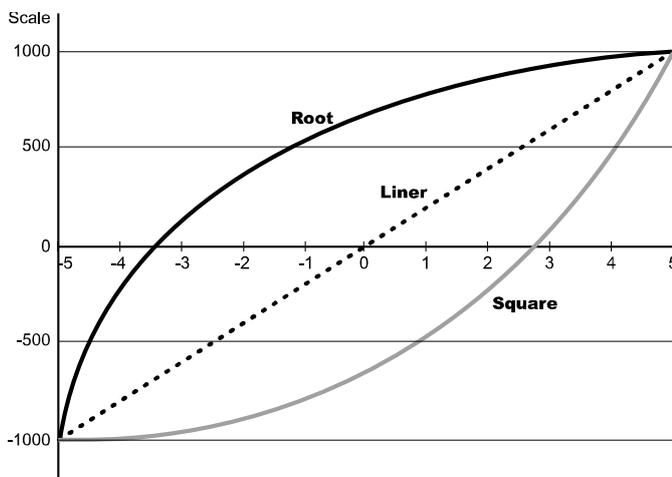
(a) Difference (deviation)

It is available to set for temperature sensor (Thermocouple, RTD) input type. It displays the deviation of the measurement value of reference channel.
(display value = the measurement value of standard channel –the measurement value of reference channel)
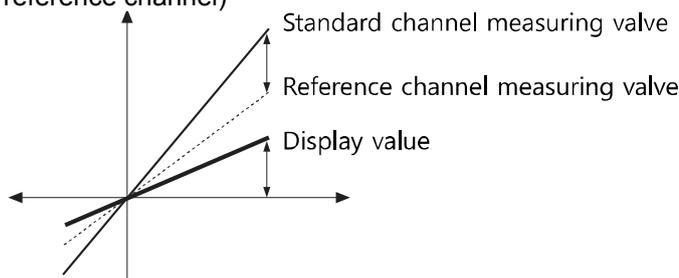
The channels which input type is analog (voltage, current (shunt)) cannot be as reference channel. If reference channel is not set, it displays the measurement value of standard channel.
If any one of reference channel, or standard channel is break (BURN), high-limit value (HHHH), low-limit value (LLLL) status, it displays as correspond value. If the set reference channel uses difference function, it displays the calcuated value based on actual measurement value, not display value of reference channel.

(b) Linear

It applies low-limit scale and high-limit scale to low-limit input value and high-limit input value and displays this values.

In case of low-limit input value: -5V, high-limit input value: +5V, low-limit scale: -1000, high-limit scale: 1000,

and current input value is 2V, display value is 400.

Display value

$$= \frac{\text{Input value} - \text{Low} - \text{limit input value}}{\text{High} - \text{limit input value} - \text{Low} - \text{limit input value}}$$
$$\times (\text{High} - \text{limit scale} - \text{Low} - \text{limit scale}) + \text{Low} - \text{limit scale}$$

$$400 \quad = \frac{7}{10} \times 2000 - 1000$$

(c) Root

In case voltage, current input type, this function calculates by Root ($\sqrt{\ }$) for the input value.

Differential pressure signal of differential pressure flow meter is calculated by Root ($\sqrt{\ }$) for the desired pressure flow. This function is used for measuring flux by input value.

In case of low-limit input value: -5V, high-limit input value: +5V, low-limit scale: -1000, high-limit scale: 1000,

and current input value is 2V, display value is approx. 673.32.

Display value

$$= \sqrt{\frac{\text{Input value} - \text{Low} - \text{limit input value}}{\text{High} - \text{limit input value} - \text{Low} - \text{limit input value}}}$$
$$\times (\text{High} - \text{limit scale} - \text{Low} - \text{limit scale}) + \text{Low} - \text{limit scale}$$

$$673.32 = \sqrt{\frac{7}{10} \times 2000 - 1000}$$

(d) Square

In case voltage, current input type, this function calculates by square for the input value. Reverse of Root, flux signal is calcualted by suqare for differential pressure signal.

In case of low-limit input value: -5V, high-limit input value: +5V, low-limit scale: -1000, high-limit scale: 1000,

and current input value is 2V, display value is -20.

Display value

$$= \left(\frac{\text{Input value} - \text{Low} - \text{limit input value}}{\text{High} - \text{limit input value} - \text{Low} - \text{limit input value}}\right)^2$$
$$\times (\text{High} - \text{limit scale} - \text{Low} - \text{limit scale}) + \text{Low} - \text{limit scale}$$

$$-20 \quad = \left(\frac{7}{10}\right)^2 \times 2000 - 1000$$

(e) Two Unit

For compound pressure, if input pressure is lower than atmospheric pressure (0), it displays the degree of a vacuum with mmHg unit. If input pressure is higher than or same as atmospheric pressure (0), it displays positive pressure with kg/cm^2 unit..

When using Two Unit function, low-limit value is fixed as -760mmHg and the setting range of kg/cm^2 is 1 to 35.

In case of Two Unit, decimal point position is limited among 0, 0.0, 0.00. When using Two Unit function, display unit is changed as mmHg or kg/cm^2 automatically.

This function has two different unit values and it is impossible to calcuate by recording method and digital filter and ignore it.

- Setting range: 1 to 35

- Two Unit function is available only when connecting shunt resistance 250Ω, and 4-20mA (shunt) input type.

Ex.

If pressure range is -760mmHg to 3kg/cm^2, pressure transmitter outputs 4 to 20mA, and it displays -760mmHg for 4mA input and 8mA is unit changing point. For 20mA input, it displays 3kg/cm^2.
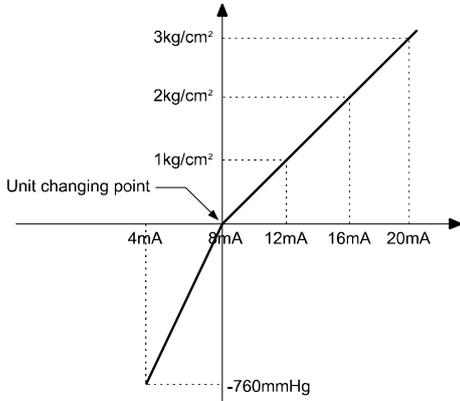
Range	Unit changing point (mA)
-760mmHg to 1kg/cm^2	12.130
-760mmHg to 5kg/cm^2	6.740
-760mmHg to 10kg/cm^2	5.498
-760mmHg to 15kg/cm^2	5.031
-760mmHg to 20kg/cm^2	4.786
-760mmHg to 25kg/cm^2	4.635
-760mmHg to 30kg/cm^2	4.533
-760mmHg to 35kg/cm^2	4.459

Unit changing point = $(\frac{16}{X+1.033} \times Y) + 4$

16	4-20mA output interval
X	Max. value of pressure range (E.g.: For -760mmHg to 3kg/cm^2, it means "3")
1.033	Converted value from 760 mmHg to kg/cm^2 unit value (same unit)
Y	Use pressure + 1.033 (E.g.: used pressure is '0', it is 1.033)
4	Min. value of output (when output is 0) 4.00mA

Ex.

※2. When fixing low-limit scale value and high-limit scale value and set gradient, input range is 0 to 10V, low-limit scale value is 0.00, high-limit scale value is 10.00, the display values are as below by changing gradient as 0.500, 1.000, 1.500.

Low-limit scale value	High-limit scale value	Gradient adjustment value	Display value range		Low-limit scale value	High-limit scale value	Gradient adjustment value
0.00	10.00	0.500	0.00 to 5.00	Same result =	0.00	5.00	1.000
0.00	10.00	1.000	0.00 to 10.00		0.00	10.00	1.000
0.00	10.00	1.500	0.00 to 15.00		0.00	15.00	1.000

When fixing low-limit scale value and high-limit scale value and set gradient (subtraction gradient), input range is 0 to 10V, low-limit scale value is 10.00, high-limit scale value is 0.00, the display values are as below by changing gradient as 0.500, 1.000, 1.500.

Low-limit scale value	High-limit scale value	Gradient adjustment value	Display value range		Low-limit scale value	High-limit scale value	Gradient adjustment value
10.00	0.00	0.500	10.00 to 5.00	Same result =	10.00	5.00	1.000
10.00	0.00	1.000	10.00 to 0.00		10.00	0.00	1.000
10.00	0.00	1.500	10.00 to -5.00		10.00	-5.00	1.000
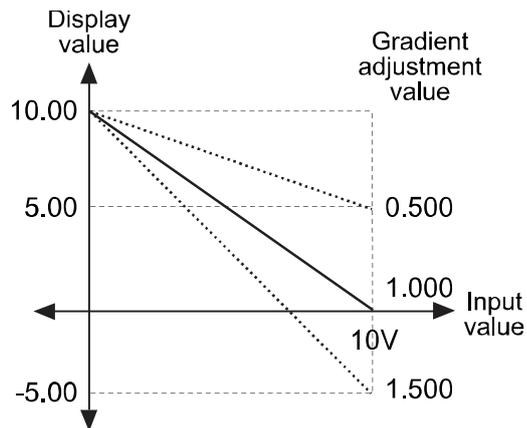
※3. Number of digital inputs

In case of 4 input digital filters and 25ms sampling setting, it displays input sampling value as moving average for 0.1 sec (100ms).

Sn: Sampling value
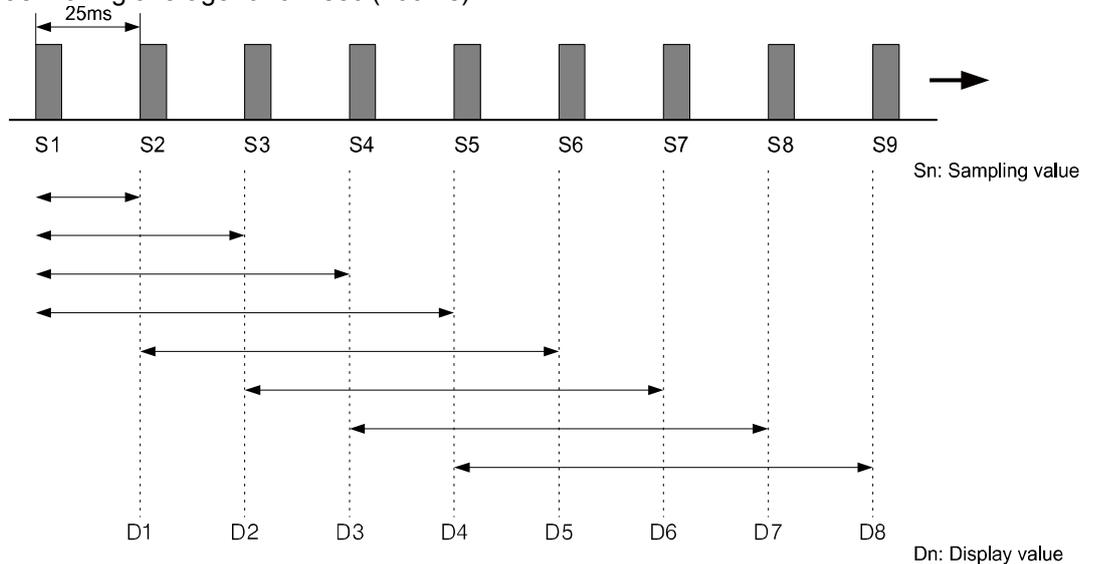
Dn: Display value

$$D1 = S1 \,, D2 = \frac{S1 + S2}{2} \,, D3 = \frac{S1 + S2 + S3}{3}$$

Display values of D1, D2, D3 are the initial operation before averaging 4 sampling values.

$$D4 = \frac{S1 + S2 + S3 + S4}{4} \,, D5 = \frac{S2 + S3 + S4 + S5}{4} \,,$$

$$D6 = \frac{S3 + S4 + S5 + S6}{4} \,, D7 = \frac{S4 + S5 + S6 + S7}{4} \,,$$

$$D8 = \frac{S5 + S6 + S7 + S8}{4}$$

7.3.3 Alarm

You can set alarm up to 4. Alarm 1 to 4 are same setting items.

No	Item	Descriptions
1	Channel	Moves channel. Touch 'CH1' or [»] to change the channel.
2	Type[1]	Set alarm type for operation. You can set alarm type for each channel. When alarm occurs, alarm icon appears and you can check alarm by channel.
3	Ref. CH	It activates when alarm type is deviation high-limit alarm (DV.Hi) or deviation low-limit alarm (DV.Lo). Set the reference channel for deviation high-limit alarm (DV.Hi) or deviationlow-limit alarm (DV.Lo). When the display value of the channel is smaller or larger than the display value of the set reference channel, deviation high-limit alarm or deviation low-limit alarm occurs.
4	Option[2]	Set alarm output operation for alarm type.
5	Setting Value	Set alarm setting value. Setting range: Within the input/display range of the set input type
6	Hys[3]	Set the interval between ON and OFF of alarm output.
7	ON/OFF Delay[4]	Set delay time (unit: sec.) to prevent alarm malfunction by wrong input from external disturbance and noise. - ON delay time: Even after standby the set time when alarm ON condition (alarm ON channel flashes on screen), if it is still alarm condition, alarm output turns ON. (Alarm ON channel flashes on screen). - OFF delay time: Even after standby the set time when alarm clear condition (alarm ON channel display is hold), if it is still alarm clear condition, alarm output turns OFF. (Alarm ON channel clears the display.)
8	Alarm No.	Set the output relay number to execute contact output by each alarm type. If setting as 'None' and when alarm occurs, it displays alarm at screen and saves alarm type and alarm occuring time but alarm does not output. If setting output relay for alarm, the set relay turns ON. Alarm output displays as Relay-□.
9	Save Event	Set as ON to save alarm information when alarm occurs at alarm event file.
10	Copy	Copies settings of the current channel to the other channel.

※1. Alarm type

	Type	Display	Alarm operation		Descriptions
1	No alarm	-	-		-
2	Absolute value high-limit alarm	PV.Hi (▲)	Alarm setting value: 90℃ OFF ↓ **H** ↑ ON 90℃　PV100℃		If display value is same or higher than alarm setting value, alarm output turns ON.
3	Absolute value low-limit alarm	PV.Lo (▼)	Alarm setting value: 90℃ ON ↑ **H** ↓ OFF 90℃　PV100℃		If display value is same or lower than alarm setting value, alarm output turns ON.
4	Deviation high-limit alarm	DV.Hi (△)	Alarm setting value: -10℃ OFF ↓ **H** ↑ ON PV 110℃　Reference channel PV 110℃	Alarm setting value: 10℃ OFF ↓ **H** ↑ ON Reference channel PV 90℃　PV 100℃	If the deviation between display value and the display value of reference channel is same or higher than alarm setting value, alarm output turns ON.
5	Deviation low-limit alarm	DV.Lo (▽)	Alarm setting value: 10℃ ON ↑ **H** ↓ OFF Reference channel PV 100℃　PV 110℃	Alarm setting value: -10℃ ON ↑ **H** ↓ OFF PV 90℃　Reference channel PV 100℃	If the deviation between display value and the display value of reference channel is same or lower than alarm setting value, alarm output turns ON.
6	Input break alarm	SBA (S)	In case input is not connected, or input cable is break during controlling, alarm output turns ON. You can check whether input cable is break by external contact of alarm output using buzzer or other devices.		
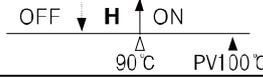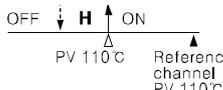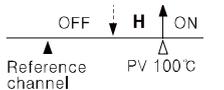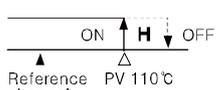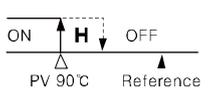
H: Alarm output hysteresis

※2. Option

Setting value		Descriptions
Normal	Standard alarm	If it is alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
Latch	Alarm latch	If it is alarm condition, alarm output is ON and maintains ON status.
StBy	Standby alarm	When power is supplied and it is alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates. When power is supplied and it is not alarm condition, from the first alarm, standard alarm operates. Condition of re-applied standby sequence: Power ON, change the alarm value setting or clear alarm forcedly
La+St	Alarm latch and standby sequence	If it is alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.

Note

In case of alarm by alarm latch, to clear alarm output, use digital input for alarm clear or turn OFF the power and turn ON it.

To clear alarm output by digital input, digital input function should be set as 'Alarm Reset'.

Clearing alarm output is only when alarm option is alarm latch and alarm latch and standby sequence, or alarm is out of operation range. Alarm output operates normally form the next alarm output ON.

※3. Example of hysteresis operation
Alarm type: Absolute value high-limit alarm, Setting value: 200, Hysteresis: 10
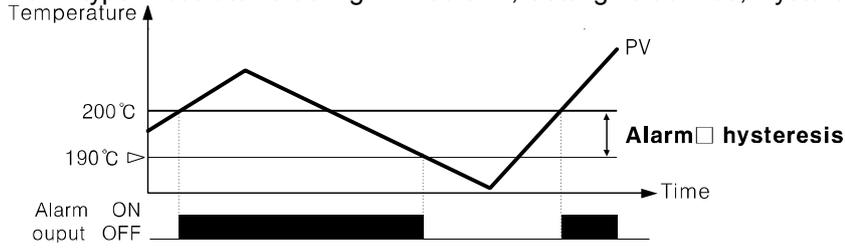
※4. ON/OFF delay time
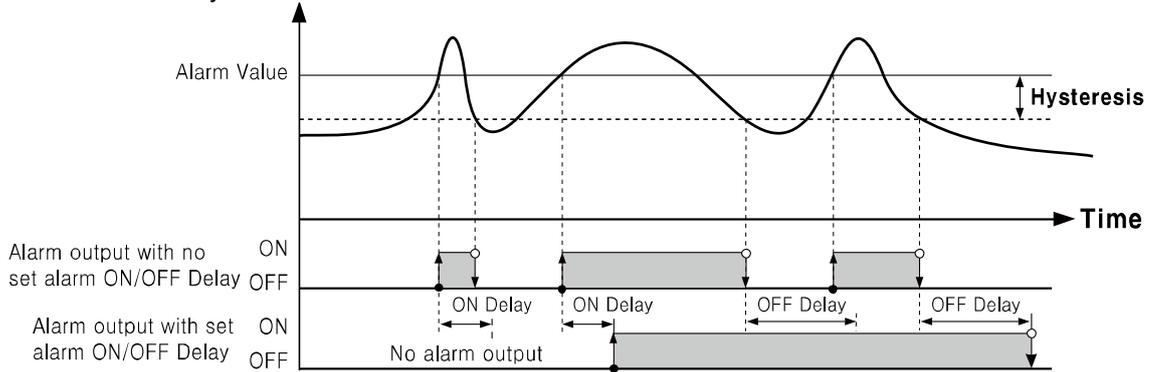
7.3.4 User Unit
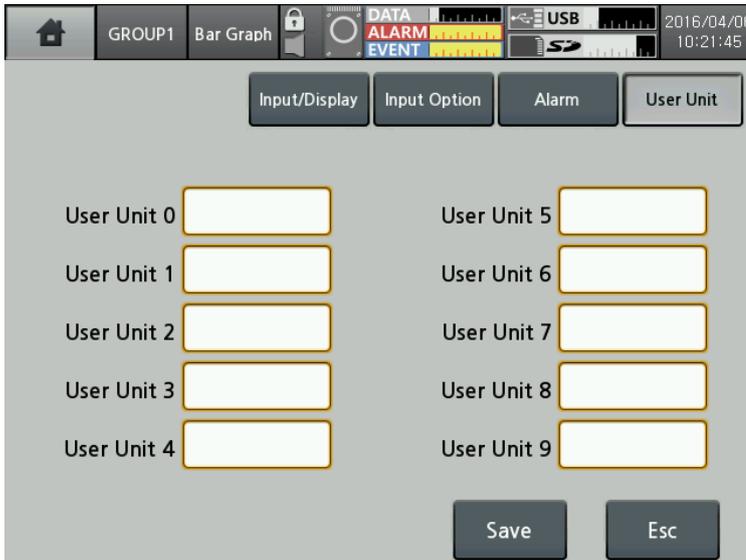
You can use additional units with standard units.
Number of characters is from 1 to 6 digits.

7.4 Option Info.

It sets alarm output, digital input, communication (RS422/485, Ethernet/USB).
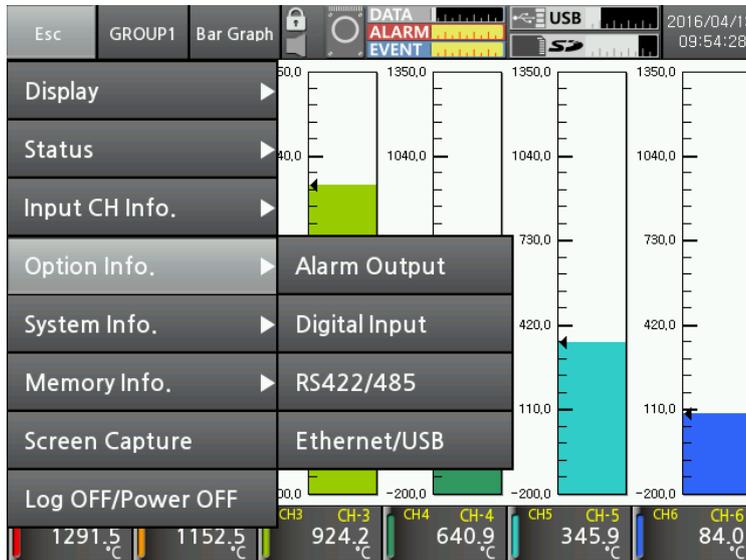
7.4.1 Alarm Output
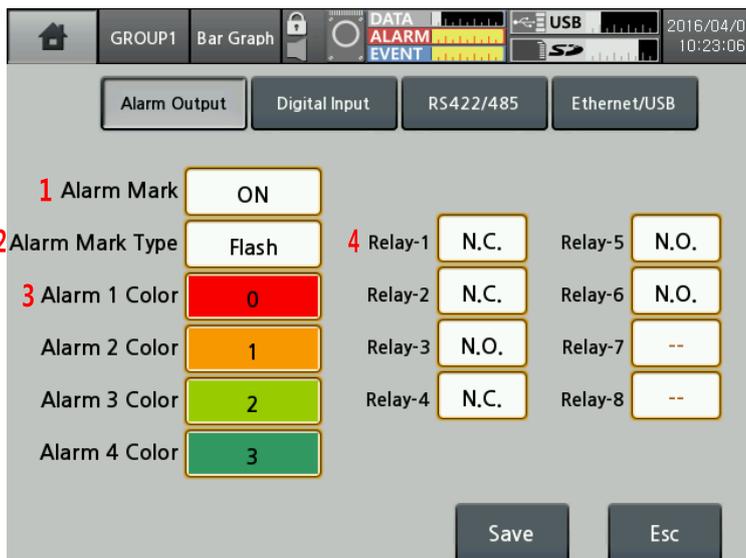
No	Item	Descriptions
1	Alarm Mark	Displays alarm information about occuring alarm. -PV-Hi: △, -PV-Lo: ▽, -DV-Hi: ▲, -DV-Lo: ▼, -SBA: Ⓢ
2	Alarm Mark Type	Set alarm display method. Setting range: None, Change Color, Flash
3	Alarm□ Color	Set alarm color when Alarm On Type is "Change".
4	Relay-□	Set alarm output method during occuring alarm. Setting range: N.O., N.C.

7.4.2   Digital Input

No	Item	Descriptions
1	DI-□ Type	Set the operation type for digital input. Setting range: None, Rec/Stop, Alarm Reset, Alarm ON, Capture
2	DI-□ Status	Set digital input operation status. (only when DI type is set as 'Record/Stop') - Edge: When supplying digital input over 0.3 sec, the recording starts. When re-supplying it, the recording stops. - Level: When shorting digital input over 0.3 sec, the recording starts. When opening it, the recording stops.
3	Alarm Reset	When DI type is set as 'Alarm Reset', select the desired relay to reset the alarm.
4	Alarm ON	When DI type is set as 'Alarm ON', select the desired relay to turn ON the alarm.
5	Relay-□	Set alarm relay enable or disable.

7.4.3   RS422/485

It sets about RS422/485 communication. Communication setting is available only at KRN1000 parameter. You can only check the items and by communication but cannot change the set.

RS422/485 communication makes set or monitor parameters at extenral upper system (PC or graphic panel, etc.) and uses transfer data.

It is recommended to use our dedicated software program DAQMaster for monitoring. If you want to develop monitoring program not using our DAQMaster program or to use the related Modbus program, please refer to user manual for communication.
Visit our homepage (www.autonics.com) to download DAQMaster program, and user manual for communication.

No	Item	Descriptions
1	Comm. Address	Set communication address. The set communication address is applied to RS422/485, Ethernet, USB device communication. Duplicated communication address setting is not available at the same communication line.
2	Buad Rate	Set communication speed, baud rate. Setting range: 2400, 4800, 9600, 19200, 38400 (unit: bps)
3	Parity Bit	Set communication parity bit. - Setting range: None, Odd, Even
4	Stop Bit	Set communication stop bit. - Setting range: 1, 2 (unit: bit)
5	Response Wait Time	To prevent possible error due to communicating with low speed Master (PC, PLC, etc), set communication response wait time. If setting too short communication response wait time, communication error may occur in Master. - Setting range: 5 to 99 (unit: ms)
6	Protocol	Set communication protocol. It supports only RTU.
7	Comm. Write	Set enable/disable writing parameter setting values of KRN1000 via RS422/485 communication. Reading parameter setting value is available regardless of communication write enable/disable setting.
8	RS422/485 Port	Set using/not using RS422/485 communication.

✎ Note

Over two communications among RS422/485, Ethernet, USB Device communication are not activated at the same time. Set one communication and the others are automatically not activated.

7.4.4   Ethernet/USB

This function is for remove transferring/managing data at the long distance via ethernet/USB communication.
You can manage each device data by assigning the fixed IP at the dedicated device.

No	Item	Descriptions
1	IP Address	Set the IP address to recognize deivce on the network. If there are same IP on the network, communication does not operate by IP conflict.
2	Subnet Mask	To recognize network ID part and host ID part of IP address, set 32-bit address allowing to IP packet receiver.
3	Default Gateway	Set IP address to connect Iprouter directly.
4	Comm. Write	Set enable/disable writing parameter setting values via ethernet communication. Reading parameter setting value is available regardless of communication write enable/disable setting.
5	Ethernet Port	Set enable/disable ethernet communication. When ethernet port is setting as enable, USB device is disable.
6	USB Comm. Write	Set enable/disable writing parameter setting values via USB communication. Reading parameter setting value is available regardless of communication write enable/disable setting.
7	USB Device	Set enable/disable USB communication. When USB device is setting as enable, ethernet port is disable.

Note

Interface

Item	RS485	Ethernet	USB Device
Applied standard	Compliance with EIA RS422/485	-	Compliance with USB V2.0
Max. connection	31units (address: 1 to 127)	1 unit (number of concurrent connection units)	1 unit
Communication distance※1	Within max. 1km (below 9600bps)	Single cable within 100m (recommended over CAT5E)	Single cable within 1.5m
Communication method	Full duplex / Half duplex	Full duplex	-
Communication synchronization method	Asynchronous	Asynchronous	Asynchronous
Communication speed	2400/4800/9600/19200 /38400bps	10/100Mbps	12Mbps (Full Speed)
Communication response wait time	5 to 99 ms	-	-
Start bit	1-bit (fixed)	-	-
Data bit	8-bit (fixed)	-	-
Parity bit	None, Odd, Even	-	-
Stop bit	1, 2-bit	-	-
Protocol	Modbus RTU	Modbus TCP	Modbus RTU

※1. In case of Ethernet connection, and connecting through the network such as network hub (HUB) and gateway, etc, there is no distance limit, but it is recommaned to use min. network. Please use communication cables which is satisfied the below conditions.

RS422/485 communication	Shield twisted pair wire over AWG 24, characteristic impedance 100Ω, capacity component 50pF/m, cable length max. 1km
Ethernet communication	Over CAT5E, cable length max. 100m
USB device communication	Single cable built-in ferrite core within 1.5m

Note

USB device is recognized as USB to Serial device and communication speed: 115200bps, start bit: 1-bit, data bit: 8-bit, parity bit: none, stop bit: 1-bit are fixed.

USB Device communication may cause recognition error by external noise and environment during connecting PC. If there is error, please re-connect this. Please use USB Device as for setting. During communication, if you chaging the communication settings, it may cause communication error.

Note

RS422/485 communication port of KRN1000 has 5 terminals; RXD0-, RXD0+, TXD0-, TXD0+, GND.
When using terminal resistance, connect the terminal resistance at the end of recordor at connected communication line and turn ON the terminal resistance which is connected with PC.

7.5 System Info.

It sets about KRN1000 system such as date, time, reservation recording, and option, etc.
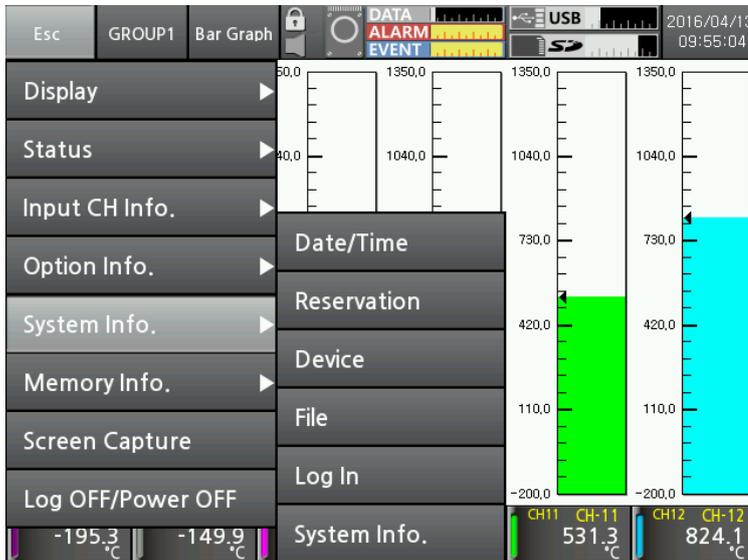
7.5.1 Date/Time

It sets system date, time of KRN1000. Based on the set date (year, month, day) and time (hour, min, sec), data is recorded and saved. You can check the record time based on the set time. Must set the current time before recording the data.

No	Item	Descriptions
1	Date Setting	Set the current date (year, month, day).
2	Apply	Apply the set date.
3	Time Setting	Set the current time (hour, min, sec).
4	Apply	Apply the set time.
5	Date Type	Set the data type to display KRN1000 system. Setting range: yyyy (year)/mm (month)/dd (day), mm (month)/dd (day)/yy (year), dd (day)/mm (month)/yy (year)
6	Summer Time	Set the summer time duration. Set enable to summer time and designate start date and end date of summer time.
7	Time	Set the summer time bias. Setting range: -1 hour, -30 min, 30 min, 1 hour

7.5.2   Reservation

It sets reservation recording time to start and finish recording.

No	Item	Descriptions
1	Reservation Date	Set the reservation recording period (start date, end date). Set Reservation Type as Repeat or Signel, you can set reservation date.
2	Reservation Time	Set the reservation recording time (start time, end time). Set Reservation Type as Repeat or Signel, you can set reservation date.
3	Reservation Type	Set reservation recording type. Setting range: Disable, Repeat, Single - Repeat※1: Records from the start time to end time at every day during start date to end date. If start time is later of end time, it records and saves until end of next day. - Single※2: Records from the start date and time to end date and time.

※1. Repeat

Set the date and time as above and it records as below chart.
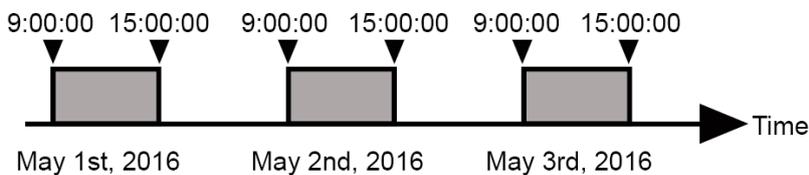
If start time is later of end time, it records and saves until end of next day.

Set the date and time as above and it records as below chart.
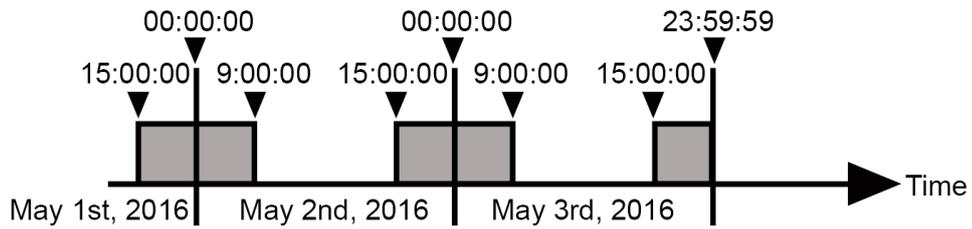
※2. Single

Set the date and time as above and it records as below chart.

7.5.3   Device

It sets initial setting and option of KRN1000.

No	Item	Descriptions
1	Device Name	Set KRN1000 device name. It supports English capital/small letter, sign and number up to 16 characters.
2	Language	Set KRN1000 display language. It supports Korean, English, Chinese (Simplified/Traditional) and Russian.
3	PWR ON Record	Set record status when supplying power or re-supplying power at power failure. - Hold: It maintains record status (recording/stop) of before power OFF. - Record: It records when power is ON. - Stop: It does not record regardless when power is ON.
4	Sampling	Set internal sampling period of measurement value. Setting range(varied by number of input channel connections) - Below 4CHs: 25, 125, 250ms - The others: 125, 250ms
5	Log Record Speed	Set log speed for recording measurement value at system memory. Setting range: 1 to 3600 sec E.g.) When setting as 3 sec, it records present value and the value after 3 sec.
6	Backlight	Set display backlight level. Setting range: Min., Standard, Max.
7	Screen Save	For saving LCD life cycle and power, screen can automatically turn OFF. Even though during screen save status, it maintains recording. Touch the screen and it turn ON the screen. Setting range: 0 to 360 min (0: disable screen save)
8	Alarm Sound	Set alarm sound volume. Setting range: OFF, Min., Standard, Max.
9	Touch Sound	Set touch sound volume when toucing the menu or button of screen. Setting range: OFF, Min., Standard, Max.

7.5.4   File

It manages parameter setting files which are saved at KRN1000 memory, resets parameters.
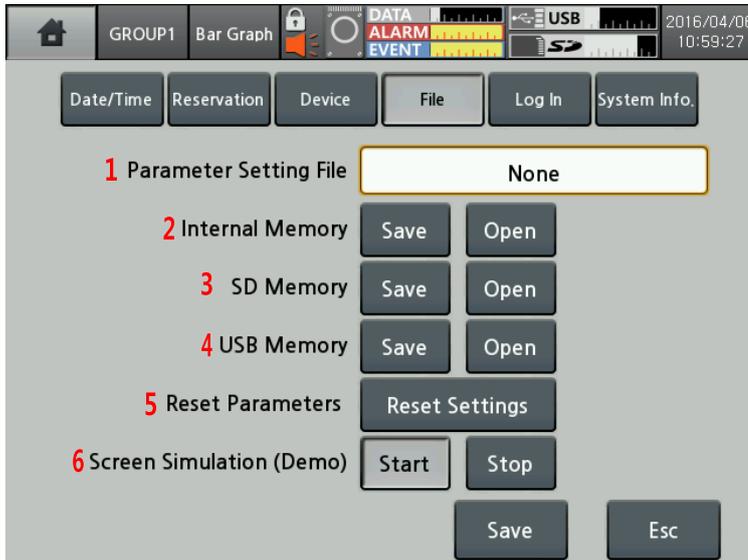
No	Item	Descriptions
1	Parameter Setting File	Displays parameter setting file name.
2	Internal Memory	Save the set parameter information at the dedicated memory or open it.
3	SD Memory	
4	USB Memory	
5	Reset Parameters	Reset parameter settings as factory default.
6	Screen Simulation (Demo)	Execute simulation the set parameters. Touch 'Start' and re-boot the unit and simulation mode starts. Touch 'Stop' to exit simulation mode and re-boot the unit.

7.5.5   Log In

It sets management permission of KRN1000 via administer mode.
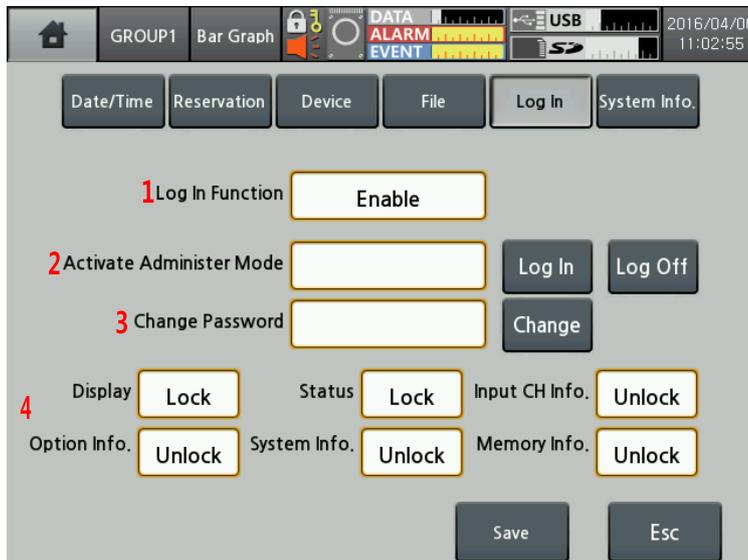
No	Item	Descriptions
1	Log In Function	Limits adjustment permission by dividing standard user mode and administor mode. Set adjustment permission of standard user at administor mode. You can check the current mode at status display part. Refer to 6.2.1 Status display part'.
2	Activate Administer Mode	Enter valid password and log-in to active administer mode. Initial password is "0000". When forgetting and entering unvaild password 3 times, "ASKey" appears with error message. Contact our service center with ASKey.
3	Change Password	Change password.
4	Adjustment Setting	Set adjustment permission (enable/disable) for standard user. Adjustment permission menu: Display, Status, Input CH Info., Option Info., System Info., Memory Info.

7.5.6 System Info.

It displays system information and executes firmware update and sets booting screen.

No	Item	Descriptions
1	System Info.	Displays model name, firmware version, memory usage, communication, slot information. If actually connected input/output slot information is different with the screen, check the connections and re-boot the recorder. If error is continued, contact our service center.
2	Update	Update firmware. Download the firmware at our web site (www.autonics.com). Save the downloaded firmware at the top-level folder on USB/SD memory and insert the memory KRN1000 and update it. Touch 'Update' and update setting menu displayed. Do not turn OFF the power during firmware update. When completes firmware update, re-boot the unit.
3	Booting Screen	Set the booting screen. Booting screen image name should be "boot.png". Save the image at the top-level folder on USB/SD memory and insert the memory KRN1000 and update it. Touch 'Booting Screen' and booting screen setting menu displayed. The supported image size is 640×480.
4	License	Displays open source license and download path of KRN1000.

7.6   Memory Info.

It manages internal/external memory of KRN1000 and sets internal memory allocation, storage option.
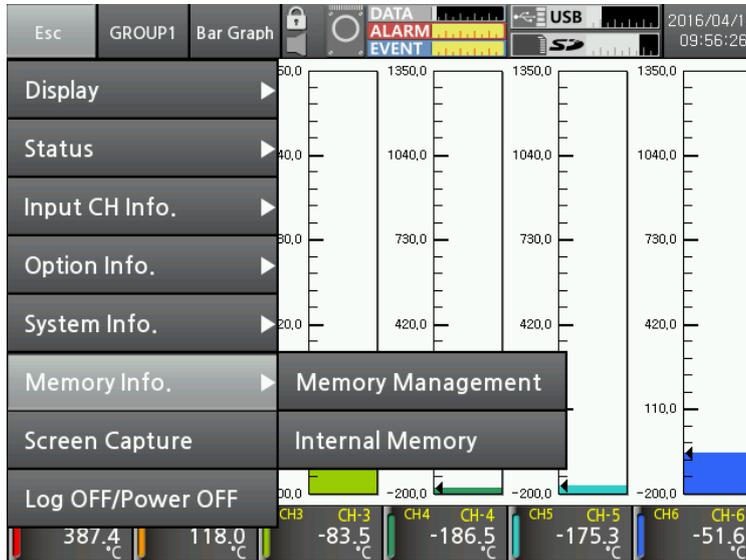
7.6.1   Memory Management

It manages internal/external memory. You can check memory usage and move and copy data files.
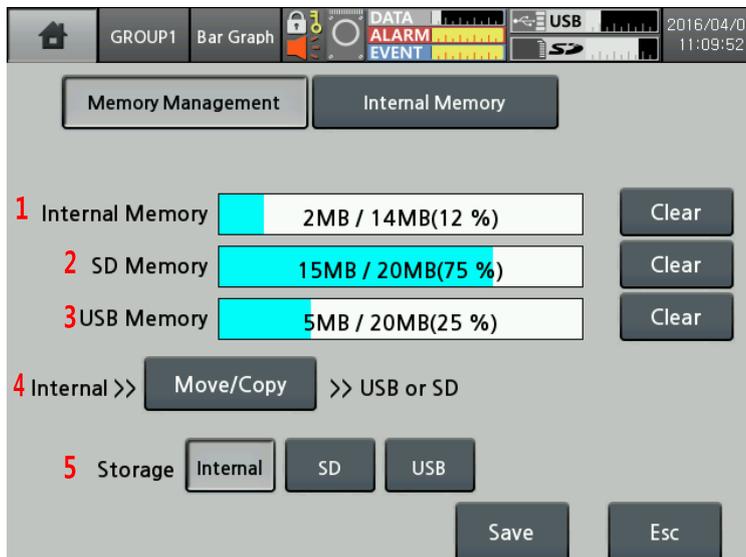
No	Item	Descriptions
1	Internal Memory	Displays each memory usage. Touch 'Clear' to initial the memory.
2	SD Memory	
3	USB Memory	

No	Item	Descriptions
4	Move/Copy	Moves/Copies files of internal memory to SD/USB memory. - Move: Moves the file to external memory and deletes the existing file at internal memory. - Copy: Moves the file to external memory and maintains the existing file at internal memory. - Delete: Deletes the file. - Move All: Moves all files to external memory and deletes the existing all files at internal memory. - Copy All: Moves all files to external memory and maintains the existing all files at internal memory. - Delete All: Deletes all files.
5	Storage	Select the memory to save the data.
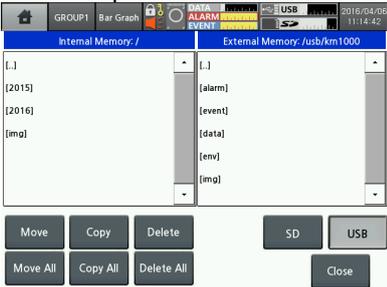
7.6.2   Internal Memory

It sets number of events, alarms, screen captures, and storage options at internal memory.
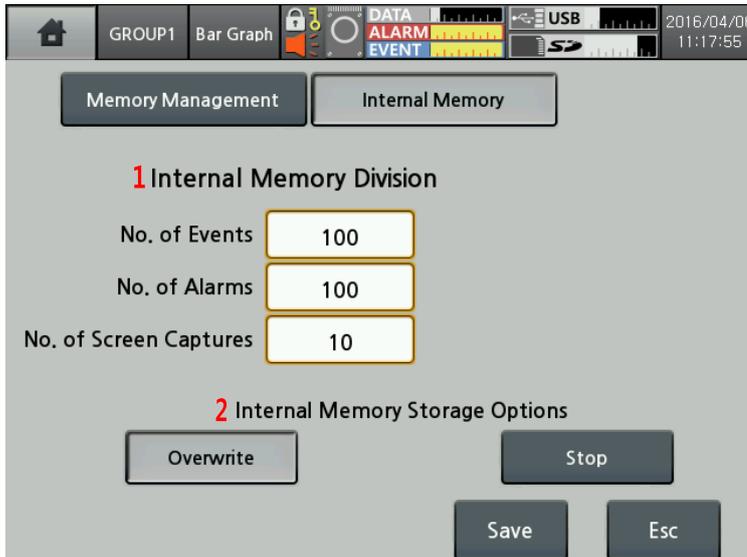
No	Item	Descriptions
1	Internal Memory Division	Set number of events, alarms, and screen captures. Setting range of number of events and alarms: 0 to 200 Setting range of number of screen captures: 0 to 20
2	Internal Memory Storage Options	When using all internal memory, set the storage option. - Overwrite: Deletes oldest data and save the date continuously. - Stop: Stops saving the data.

7.7   Screen Capture

It captures the current screen at internal, SD/USB memory as *.bmp file.
Internal memory saves the set number of screen captures at Menu > Memory Info. > Internal Memory.
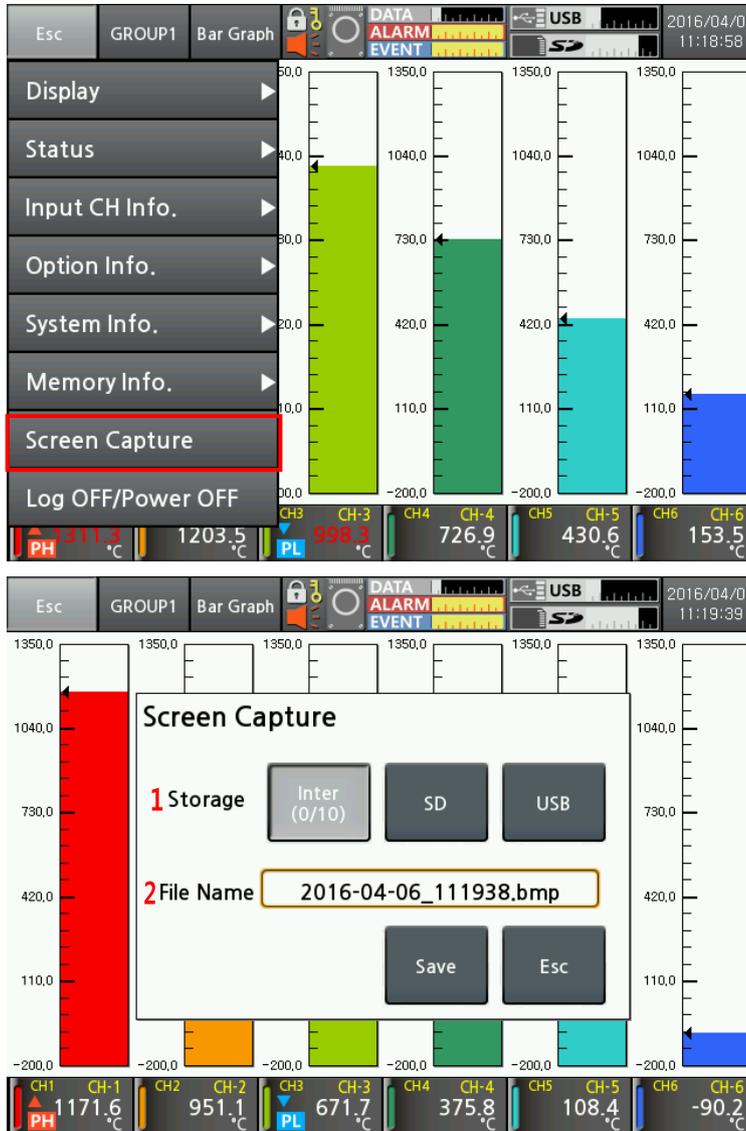
No	Item	Descriptions
1	Storage	Select the storage memory.
2	File Name	Set the captured screen file name.

7.8   Log OFF/Power OFF
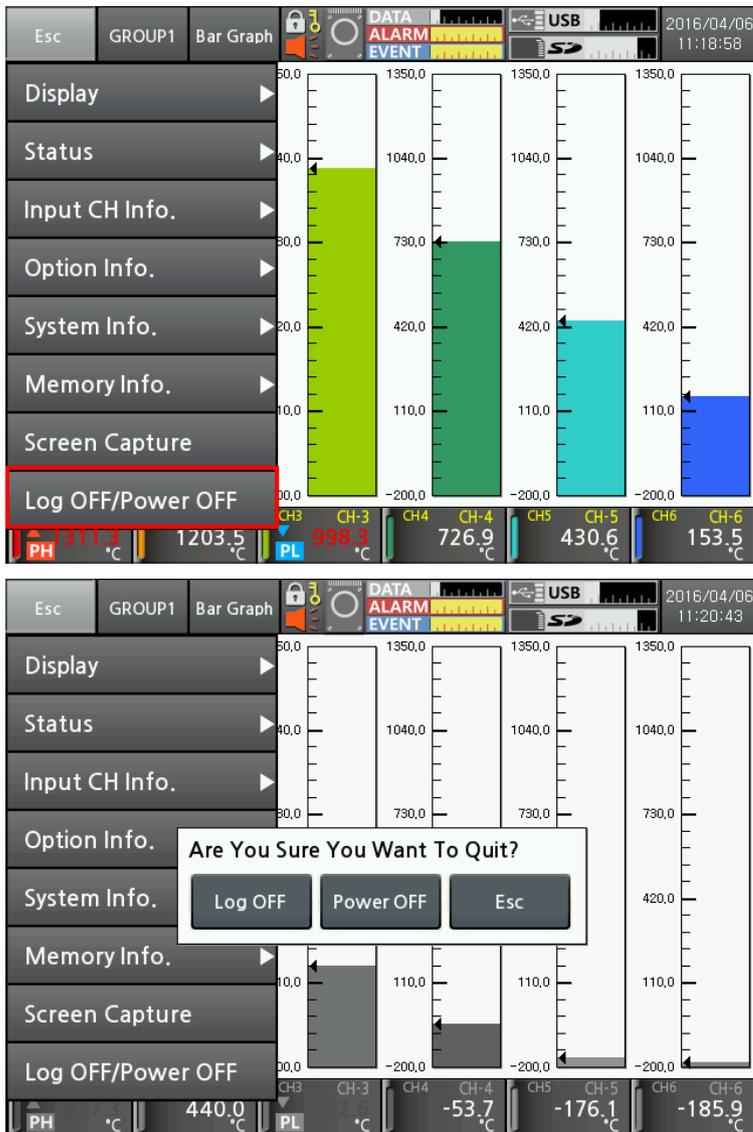
It turns log off, power off of KRN1000.

- Log OFF: Logs OFF the administer mode, and changes standard user mode.
  In case of standard user mode, it does not activated.

- Power OFF: Turns OFF the power.

8   Comprehensive device management program (DAQMaster)

8.1   Overview

DAQMaster is the comprehensive device management program and is able to utilize for temperature controller product line, meter product line, counter product line and recorder product line, etc.

DAQMaster provides graph user interface (GUI) for easy and convenient integrated several products' parameter setting and data monitoring.
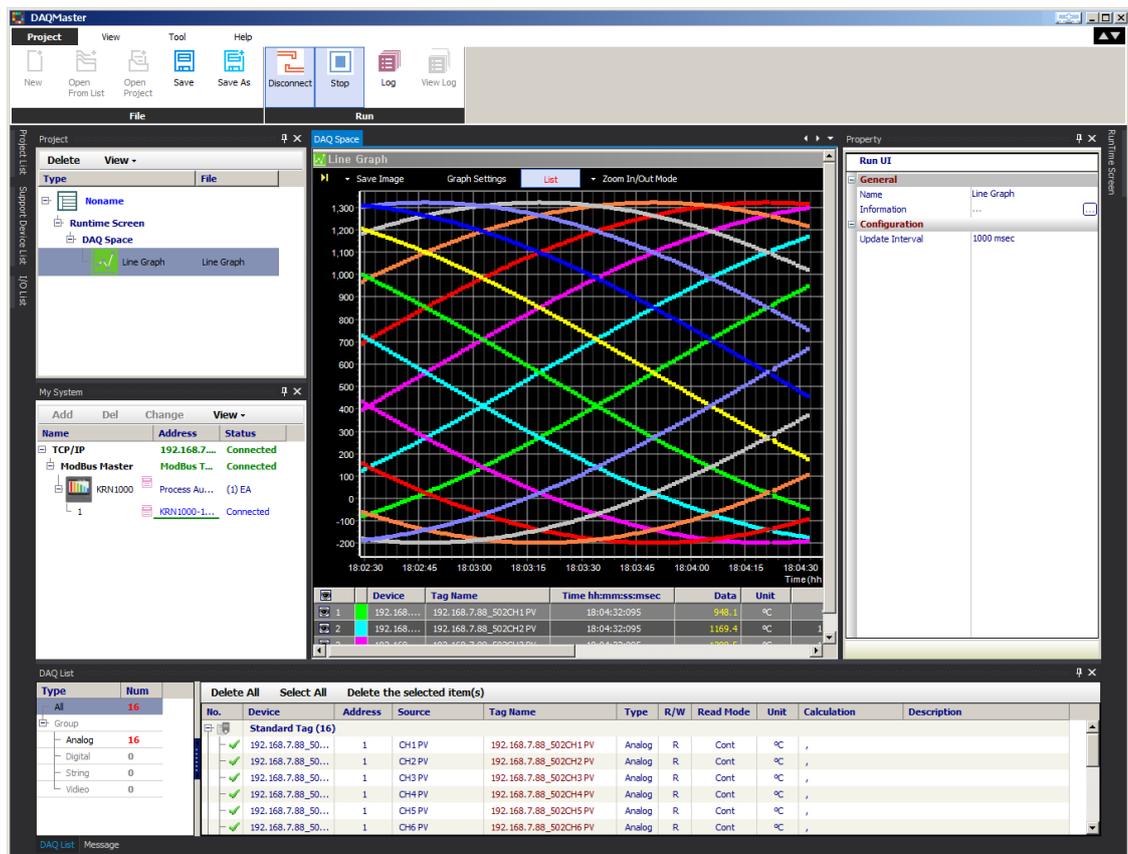
![Note icon] **Note**

Visit our homepage (www.autonics.com) to download 'DAQMaster user manual'.

This 'KRN1000 user manual' describes only for dedicated KRN1000 functions. For more information about DAQMaster, please refer to 'DAQMaster user manual'.

8.2   Features

DAQMaster has the following features.

- Supports multiple device

  DAQMaster is able to simultaneously monitor multiple devices and set parameters of the devices. The units with different addresses in a single device are connectable at the same time. In Modbus RTU communication, several RS232 port are available.

- Device scan

  In case multiple units (with different addresses) are connected together, use unit scan function to automatically search for units.

- Convenient user interface

  User can arrange windows, attributes, and project screens, etc to monitor the data as convenient. When saving the project, set screen is also saved.

- Project management

  You can save the setting of monitoring for added device and data, selection of I/O source, etc as the project. When loading the project, this file has the saved setting status. You can also construct project list for convenient project file management.

- Monitoring data log

  It logs the data during monitoring and is able to save it as one of DAQMaster data file (*.ddf) or CSV file (*.csv). You can load the saved CSV file in Microsoft Excel directly. You can also designate file name, storage rules, and storage folders for easy file management.

- Data analysis

  You can analyze data file (*.ddf) with DAQMaster's data analysis function as spread or graph. You can save the analysis as *.rtf, *.txt, *.html, or *.csv file on spread.

- Modbus map table reporting output

  It can output the registered Modbus device address map as report. You can save the report for Modbus map table as HTML file (*.html) or PDF file (*.pdf).

- Supports multi-language

  It supports Korean, English, Japanese and Simplified Chinese. To add a different language, modify the files in the Lang folder, rename, and save it.

- Supports script

  You can designate each other different I/O process by device using Lua script language.

8.3 Dedicated features for KRN1000

Among DAQMaster's functions, there are dedicated KRN1000 functions during communicating with DAQMaster.

8.3.1   Record Backup

You can download backup data which is saved in KRN1000 internal memory from "Record Backup" section.

Directory form is year, month, day. Click the relevant icon and check below list.

To download backup file, click the file name with right mouse button and select "Download Log File" menu.
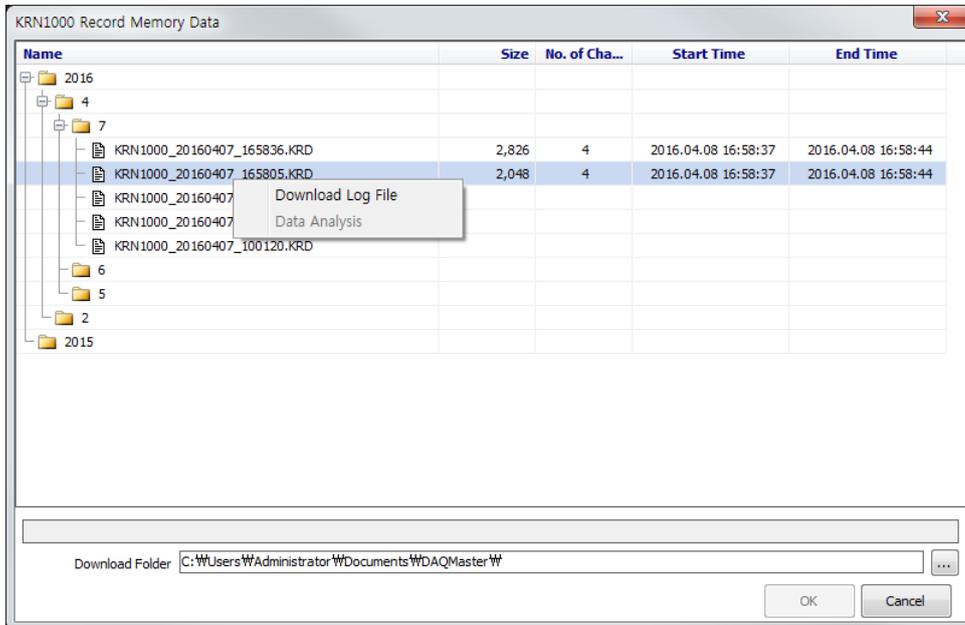
Backup files are strucured as tree type directory at KRN1000 internal memory. You can easily fine and download the desired file.

8.3.2   Check backup data

This function is output downloaded backup data by DAQMater or an USB memory.

1st   Execute Data Analysis. At taskbar, click [Start]-[Program]-[DAQMaster]-[Data Analysis] or at DAQMaster menu, click [Tool]-[Data Analysis].
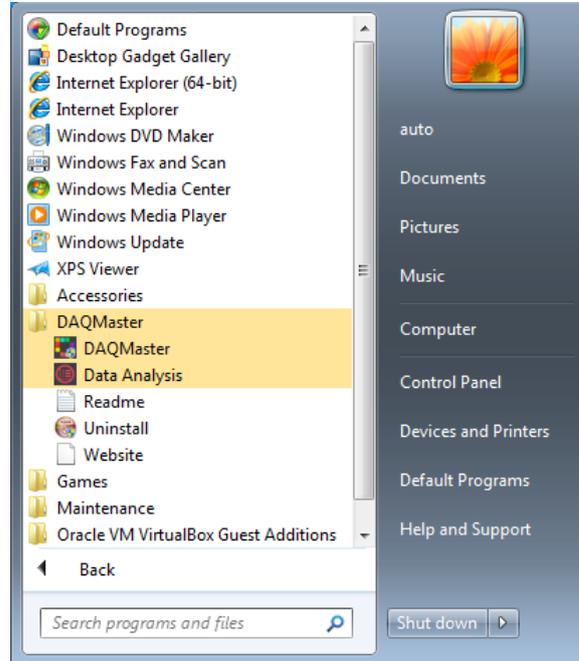
2nd   'Data Analaysis' program opens. Click open file icon and select downloaded ".KRD" file.
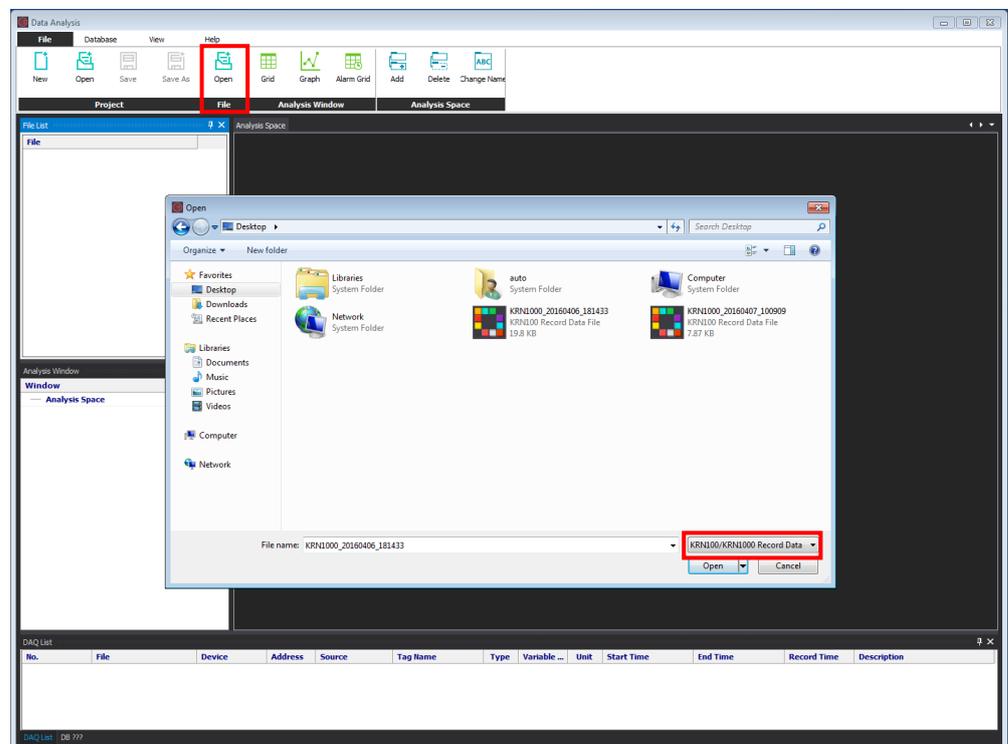
3rd Open chart and drag the desired channel to check waveforms or values.
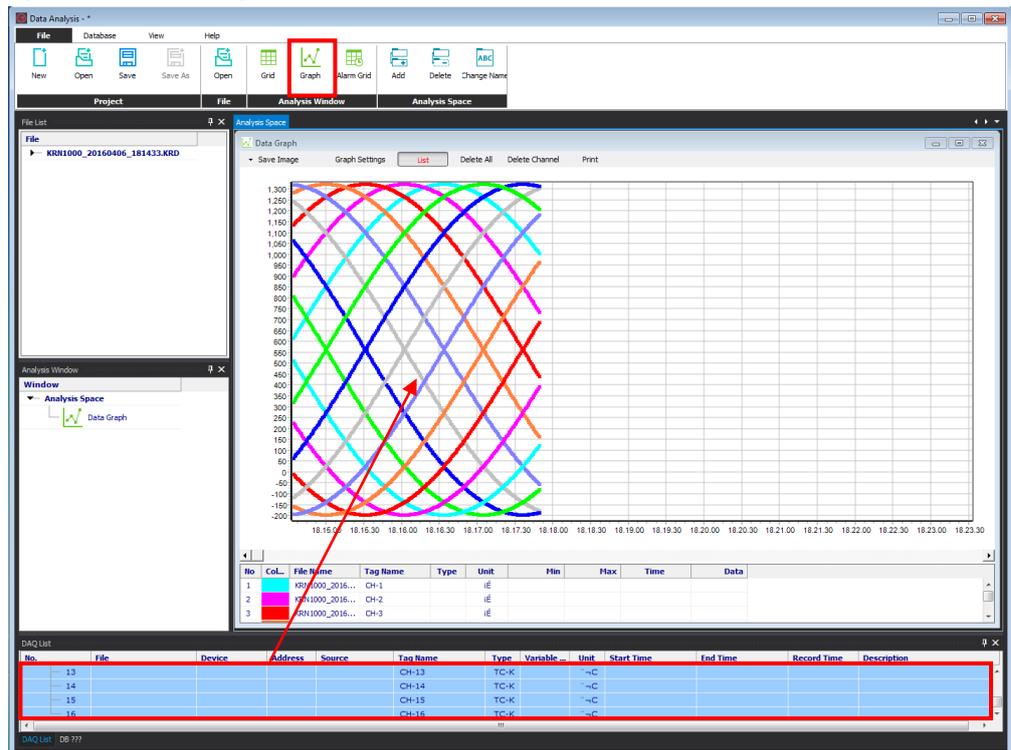
For more information, please refer to 'DAQMaster user manual'.

9   Troubleshooting

Check KRN1000 normal operation regularly.

No	Error	Troubleshooting
1	When power ON, KRN1000 does not display anything on LCD screen and operate.	Check power supply and power connector is connected normally.
2	Displayed date and time is not correct.	KRN1000 has date and time error within ±2min/year (Useable until in 2099). Set date and time again.
3	Sensor input value is not right.	Check sensor input settings are correct in input type setting.
4	When power ON, after booting screen, KRN1000 does not change normal operation screen.	Internal memory of KRN1000 may have error. Contact Autonics service center or seller.
5	SD/USB memory is not recognized.	USB memory's file system supports only FAT16 and FAT32. Format as FAT16 or FAT32.
		If partitions of an USB memory are divided, KRN1000 recognizes only first partition.
6	Communication connection via ethernet communication does not execute.	Check communication line connection and reset it as following '7.4.4 Ethernet/USB'.
7	Communication connection via RS422/485 communication does not execute.	Check signal polarity connection of RX+, RX-, TX+, TX- communication line. Reset it as following '7.4.3 RS422/485'.
8	Screen touch position is not correct.	Re-calibrate touch as following '7.1.4 Touch Calibration'. When touch calibration is wrong, reset the setting and re-calibrate touch as following '7.1.3 Touch Calibration'.
9	Current measurement is not correct.	In case of current, connect shunt resistance. Measure shunt resistance connection method as following '2.2 Input/Output'.

9.1   Error message

Displays error messages on screen and print data when error occurs.

Error message	Descriptions
HHHH	When input type is temperature sensor (Thermocouple, RTD) and the measurement value is higher than high-limit value of input range, it flashes HHHH. It is cleared when the measurement value is within the high-limit range.
	When input type is analog (voltage, current (shunt)) and the measurement value is over 10% of high-limit input range, it flashes HHHH. It is cleared when the measurement value is within 10% of high-limit input range.
LLLL	When input type is temperature sensor (Thermocouple, RTD) and the measurement value is lower than low-limit value of input range, it flashes LLLL. It is cleared when the measurement value is within the low-limit range.
	When input type is analog (voltage, current (shunt)) and the measurement value is over 10% of low-limit input range, it flashes LLLL. It is cleared when the measurement value is within 10% of low-limit input range.
BURN	When input type is temperature sensor (Thermocouple, RTD) and input is break, it flashes BURN. It is cleared when input is connected. Refer to Burn-out Action of '7.3.2 Input Option'.
ASKey	When forgetting and entering unvaild password 3 times, "ASKey" appears with error message. Contact our service center with ASKey.
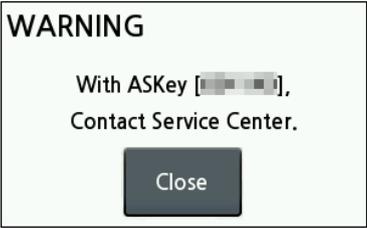
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AUM-E-0180C_20170126