Operation Manual

Re-Generative AC/DC Electronic Load

Ene-phant Series

NT-AA-10KE-L

KEISOKU GIKEN CO. LTD.

Warranty

If the initial purpose and specifications are not met due to a failure within one year after delivery, and the cause is our manufacturing responsibility, we will repair it free of charge. Contact the dealer where you purchased the product or us. We will repair it in our factory.
However, in the following cases, this warranty is not applied and we will repair it for a fee.

1. In case of failure or damage caused by handling contrary to the usage and precautions described in the instruction manual of this product.
2. When modified without our approval.
3. In the case of failure or damage caused by improper handling by the customer, for example, dropping, impact, etc. during transportation.
4. In the case of breakdown or damage caused by use in an environment with corrosive gases or by the intrusion of foreign matter such as dust or salt damage.
5. In the case of failure or damage due to a natural disaster such as a fire, earthquake, or flood.
6. In the case of breakdown or damage due to consumables or parts with a limited lifespan.
7. Any other malfunctions or damages that are not the responsibility of our company.
8. In the case of cosmetic damage (scratches, discoloration, deformation, etc.) that is confirmed after starting use.
9. Inspection and calibration within the free warranty period.
10. When a repair technician is dispatched.

*This warranty is valid only in Japan.

Copyrights

Operation Manual

Read the manual before using this product and follow the manual instructions.
After read through the manual, store the documentation carefully so that it will be accessible for reference when uncertainty is encountered in the future.
It should be attached when the product is moved.
The manual is described based on the available function when Ene-phant series has been shipped. The information contained in this document is subject to change without notice by specification update.

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Introduction

What's in This Manual

The following model of Ene-phant Series are described in this manual.
・NT-AA-10KE-L　Regenerative AC/DC Electronic load　Single phase model

The description in this manual is common for both models unless any specific notice.

How This Manual organized

This operation manual is organized as follows.

Chapter 1 Product Overview
Overview and features of Ene-phant Series are introduced.

Chapter 2 Getting Started
The notice of connection is described to use the instrument with adequate performance.

Chapter 3 Parts Description and Function
This chapter describes terminal block and switch etc. description and function on Front and rear panel.

Chapter 4 User Interface
This chapter describes user interface.

Chapter 5 Remote
This chapter describes command for remote control.

Chapter 6 Example of Applications
This chapter describes extended connection function.

Chapter 7 The Specification of NT-AA-10KE-L
Electrical, mechanical, and general specifications of the Ene-Phant series are described.

Chapter 8 Options
The options for Ene-Phant series are described.

Chapter 9 Maintenance and Calibration
The maintenance, service, and calibration of Ene-phant are described.

For your safety use

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument.
Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. KG (Keisoku Giken Ltd.) assumes no liability for the customer's failure to comply with these requirements.

Safety Symbols

The following symbols are used in this manual and this product for safely and correctly using the product. Please understand the meaning of symbols and keep safety precautions in mind while using the product.

Indicates areas or details involving warning, hazard or caution. Wherever these symbols are displayed on this product, please refer to the corresponding page in the manual for details.

WARNING

Indicates that incorrect operation of the product may cause severe damage to user (death, heavy injury etc). Fully understand the instructions mentioned and operate the product according to these instructions.

CAUTION

If not operated correctly, it may cause damage to the product and other connected devices, as well as may cause light physical damage to user. Fully understand the instructions mentioned and operate the product according to these instructions.

Prohibited acts.

Information

The supplemental description for operation procedure is described.

Note

Indicates things that you should know regarding product operation and performance.

■ Dismantling

Some of the parts inside the product uses high voltage that may be hazardous for human body. Do not remove cover or panel.

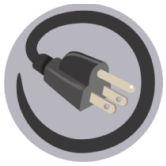
■ Installation Environment

Never place the products exposed to corrosive, explosive and flammable gases for the safety as well as under the noise of high electromagnetic field.

Avoid high temperature environment like sunny or hot place. Avoid high humidity place.
Operating Environment is specified as follows.
Temperatures: 0 °C ~ 40 °C.
Relative humidity: 20 % ~ 85 %
When condensation is formed, do not use this instrument until it becomes completely dry.

Avoid dusty and dirty place. Also select a flat place free from vibration. In addition, avoid places with poor ventilation.
When installing large equipment, fix it with caster locks or anchor bolts to prevent accidents caused by movement or tipping due to vibration including earthquakes. Do not cover the air supply and exhaust opening with keep enough space for surroundings not to disturb the role of air forced cooling system for the instrument.
Do not place anything on this instrument.

■ Input Power Supply

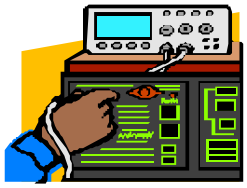


Input power supply voltage of the instrument must be within maximum rating.
Use appropriate cable fitting to the power.

■ Fuse

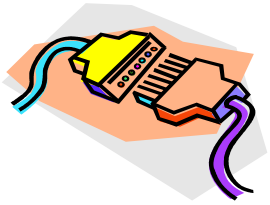
The fuses of the instrument cannot be replaced.

■ Operator



Use the instrument by appropriate electrical knowledge with good understanding of this document.
Junior operator who does not have enough electrical knowledge has to be supervised by senior operator who has appropriate electric knowledge when he uses the instruments.

■ Connection of the instrument



Power off the all related instruments when the instrument is connected to or removed from other devices.
The voltage may be remained after power off. Handle them after confirm that the voltage becomes low enough.

■ Transport

Turn off power switch and remove all cables to move the instrument. The operation manual has to be also attached it.

■ Maintenance, Inspection

In order to prevent electric shock when performing maintenance or inspection, ensure to remove the plug of power cord set.
Periodic maintenance, inspection and cleaning of the product is recommended for maintaining its safety.
Periodic calibration is recommended for maintaining the performance of the product.

■ Overload

Do not apply voltage outside the specified range in connectors and input terminals of the product.
Do not use connectors and input terminals of the product except for applications described in this manual.

■ Cleaning

Power off and remove cables for cleaning the dust of the instrument. The cleaning should be done by wiping lightly with soft cloth.

■ Calibration, Repair

Calibration and repair of the product is handled by KEISOKU GIKEN Co., Ltd.
When calibration or repair is required, please contact us or our agent.

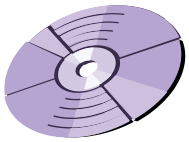
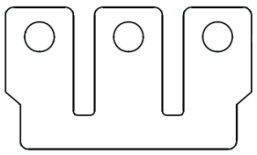
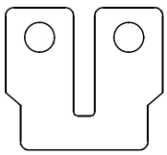
Contents

Unpacking check

Checking accessories

When you receive your Electronic Load, inspect it for any obvious damage that may have occurred during shipment and check whether accessories are attached or not. If there is damage or missing accessory, notify the carrier immediately and notify the nearest KG Sales Office or representative.

The following accessories are attached to this instrument.

Accessories	Quantity
CD-ROM (Operation Manual, Driver installation instructions, USB Driver etc.) 	1
Short Bar / Jumper  ×1  ×1	×1

Note Please check the contents as soon as it is unpacked.

- ◆ Check the product for damage during transportation.
- ◆ Make sure the accessories are delivered correctly.

Options

	Option	Model No.
1	1m cable for Master-Slave Configuration	AX-OP01
2	3m cable for Master-Slave Configuration	AX-OP02
3	Voltage-Current Monitoring	AX-OP03
4	GP-IB Interface	AX-OP04
5	Frequency 400 Hz seamless option (40-440 Hz)	AX-OP05
6	3m AC Cable	AX-OP07
7	Grid side power measurement	AX-OP08
8	Adjuster Metal	AX-OP09
9	Grid side single-phase 3-wire 200 V	AX-OP10
10	Load Mode Option for Generator (GCC / GCR)	AX-OP11
11	Frequency 400 Hz option (40-70 Hz / 380-420 Hz)	AX-OP15
12	Frequency 1,000Hz seamless option (5 to 1,000Hz)	AX-OP18

Notice for moving

Please follow the caution below when you move the instrument.

WARNING **The risk of electric shock.**

- The Power switch must be OFF, when the moving of the instrument for safety.
- Hazardous voltages can remain active inside the instrument after it has been turned off. Be sure that the voltage of instrument is low enough before further operation.

CAUTION It may damage the equipment.

- When transporting the product, use the special packing material supplied with the product. If you do not have the special packing material, adequately protect the product with shock-absorbing material.

Chapter 1. Product Overview

Overview

Ene-phant series is the Regenerative AC/DC electric load which can be used as AC electronic load or DC electronic load while regeneration to the grid.

NT-AA-10KE-L with Single phase 10kW model can be expanded to max. 50 kW by Master-Slave configuration.

Ene-phant Series is optimum for AC load testing in various types of inverters and generators
providing the capability of connection types with single phase 2-wire, single phase 3-wire (2 or 4 single phase models configuration), 3-phase 3-wire (3 single phase model l) as load input of AC electronic load.

It can be also adopt various type of testing like high power, high voltage DC/DC converters using maximum input voltage of 680V capability as DC electronic load.

Application

Elephant series can be used in various field but some of applications are as follows.

- AC loading test of power conditioner and various types of inverters.
- Loading test for various types of AC generators such as fuel cell power generator.
- DC loading test of high power AC/DC converters.
- DC loading test of Chargers and Quick charges.
- DC loading test and I/V characteristics test using MPPT feature for PV panels.
- Discharge test of stationary high power battery system.

General Notice for operation

Please read the following notice before starting Ele-phant series operation.

(1) Consideration for DUT

Ene-phant Series electronic load features regenerating power from DUT to grid using switching technology. It works as AC load simulating resistive operation and phase leading / lagging current like conductive/inductive load operation. It means it is possible to exchange power immediately.

It keeps as constant current operation regardless of phase leading / lagging current except in CR and CV mode. Accordingly, DUT may encounter to over voltage due to the operation of current injection from the instrument which is not happened in conductive operation. (There is possibility to supply internal voltage of Ene-phant to DUT.) In order to avoid those troubles, LOAD ON has to be done after supplying normal voltage.

In addition, the distortion of input voltage waveform may cause the distortion of current waveform. Don’t use this load for inverter with pulse output waveform which cannot be responded by this load.

If the Ene-phant Series is in LOAD ON state and the output of the test device is turned OFF, the maximum voltage of the specification (Low range ±360V, High range ±720V) may be output from the load terminal due to the characteristics of the regenerative electronic load. Be sure to turn the Ene-phant Series to LOAD OFF before turning the output of the test device OFF.
Also, to protect the test device, please refer to "Limit Settings" in "Chapter 4 User Interface" to set the voltage limit.

(2) Unsupported items for Grid-interconnection code

Ene-phant Series has regeneration capability to the grid but the following items are not supported.

① Electric Power Selling.

② Inverse power flow from in-plant.
(Use it when in- plant consumption>regeneration power).

③ Power grid protection of FRT(Fault Ride Through).

④ Power grid protection of synchronous high frequency injection method in islanding operation method.

⑤ Injecting Var (reactive power) Compensator for grid voltage.

(3) Generation of ripple current/voltage

Ene-phant Series generates ripple current/voltage to load side due to switching operation. It will be varied by impedance or input voltage condition of DUT.

(4) Notice for high voltage usage

When the instrument is used in high voltage very close to maximum voltage range, the alarm like OVP may be happened due to rush current to the filter circuit at LOAD ON. Please keep enough margins for the voltage to maximum voltage range.

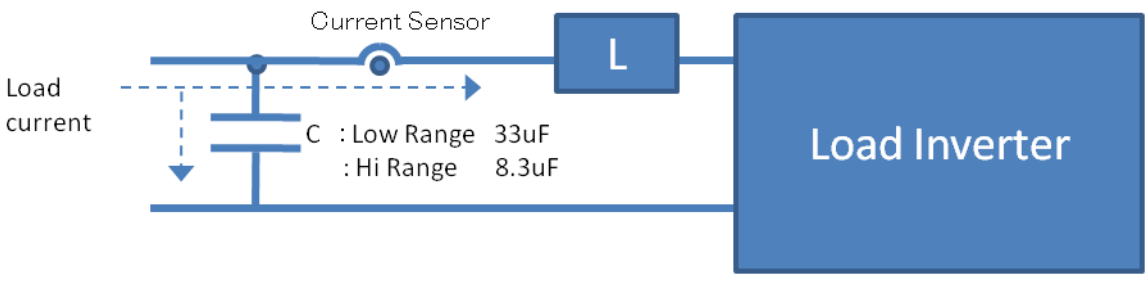
When the instrument is used in high voltage very close to maximum voltage range, the alarm like OCP may be happened due to internal voltage reduction caused by large reduction of power load. Please reduce the load step by step not to have OCP alarm.

(5) Current Measurement System

The current measurement system on load commonly uses current sensor with load inverter. LC filter is inserted between load terminal and load inverter, and a part of load current flows to capacitor of filter.

Large measurement error will be generated for current, apparent power, power factor in the small load current region. Please note that no large measurement error will not be generated for effective power measurement value because the current for capacitor is reactive current.

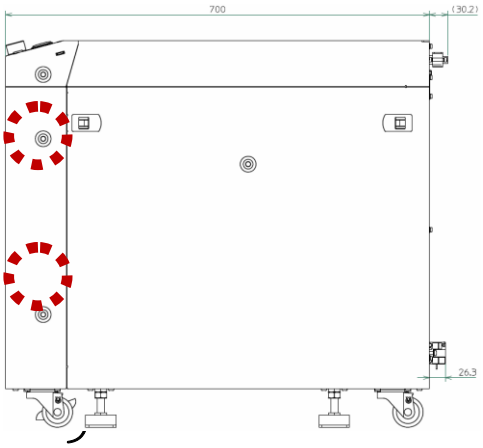
On the other hand, load setting has been compensated to minimize the influence of capacitor.



(6) Cleaning of filter

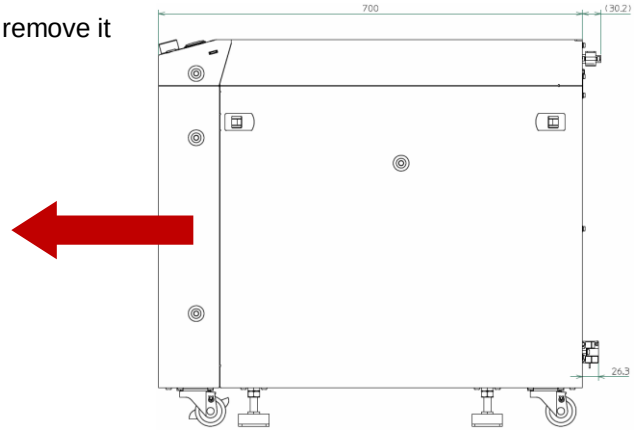
The dustproof filter of the instruments has to be checked periodically and has to be cleaned with following procedure when it becomes very dirty. Power has to be OFF and all connected cable has to be removed before cleaning.

① Remove four screws on side of front panel.(Remove screws in other side of the drawing.)



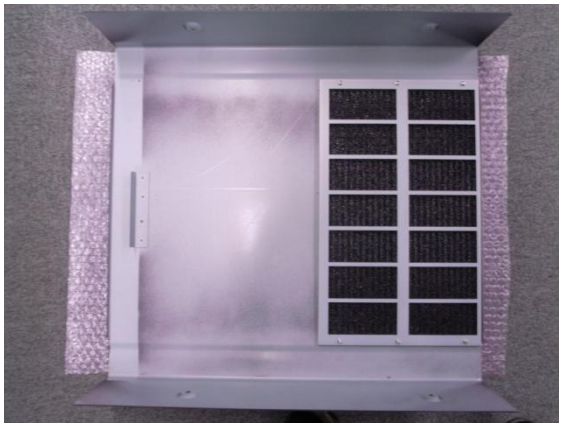
Screws on side of front panel

② Draw the front panel and remove it from the body.



Direction for front panel removal

③ Clean the dustproof filter inside of removed front panel using vacuum cleaner.



Dustproof filter

④ Attached the front panel to body and screw it using 4 removed screws.

Chapter 2. Getting Started

NT-AA-10KE-L grid side connection

CAUTION Precautions when connecting wiring

- Connect the ground to the input section on the grid side for use.
- Without ground the connection on the load side and use it floating.

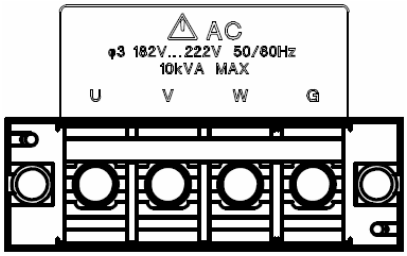
(1) Cable

Please connect AC terminal block on rear panel of the instrument and use the shortest cable considering current capacity. When the cables become longer, the cables must be twisted.

Wire size
8AWG (8 sq.) or more

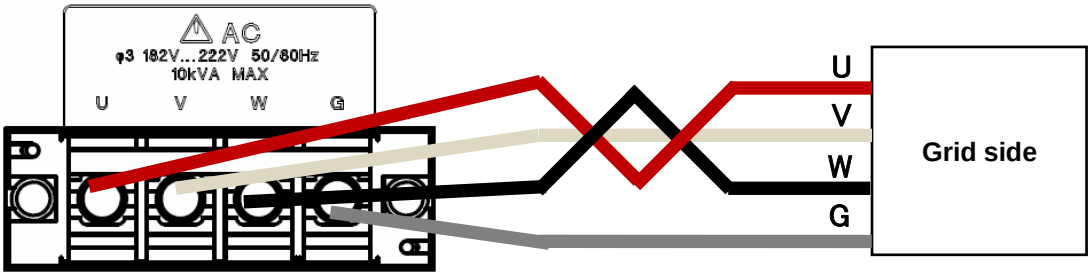
Recommended wire size for grid side (AC) connection cable

(2) Connection



Rear panel grid side terminal table (NT-AA-10KE-L)

Connect cable to UVWG without fail and terminal block cover has to be placed.



Connection between rear panel grid side terminal block and with 3-phase 3-wire AC (NT-AA-10KE-L)

Information Check before use.

- Refer to “
- Specifications (p.87~)” for the confirmation on grid voltage which should be within the specification of the instrument.
- The option grid cable is available. Refer to “List of options (p.95)” for details.
- The size of screw for terminal block is M6. Use the cable terminal fitting this size.
- Check the voltage is not remained between terminals by tester and so on before cable will be removed.
- Grounding should be done with class C.

WARNING **The risk of electric shock.**

- Do not touch DUT connection terminal when power is turned on to avoid the risk of electric shock.
- Drive a screw of short bar/jumper) connection tightly because the current will flow all terminals.

NT-AA-10KE-L Electronic Load side connection

(1) Cable

Please connect AC terminal block on rear panel of the instrument and use the shortest cable considering current capacity. When the cables become longer, the cables must be twisted.

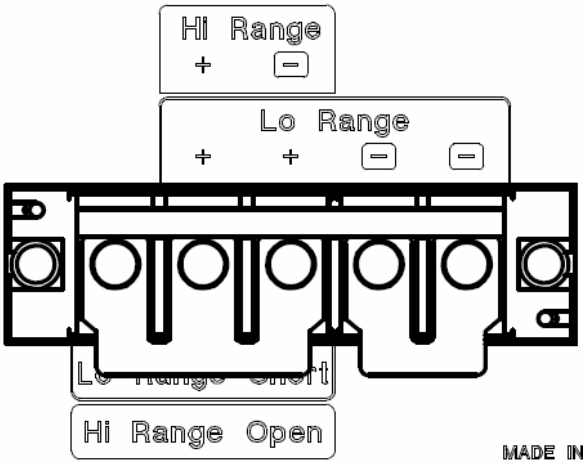
load current Io（A）	Wire size
Io≦8 A	15AWG (1.6 sq) or more
Io≦10 A	14AWG (2 sq) or more
Io≦20 A	10AWG (5.5 sq) or more
Io≦90 A	5AWG (14 sq) or more

Recommended wire size for electronic load side connection cable

Two ranges are available for NT-AA-10KE-L electronic load side.
The switching between Low range and High range is performed by short bar/jumper (accessory) location for terminal block.

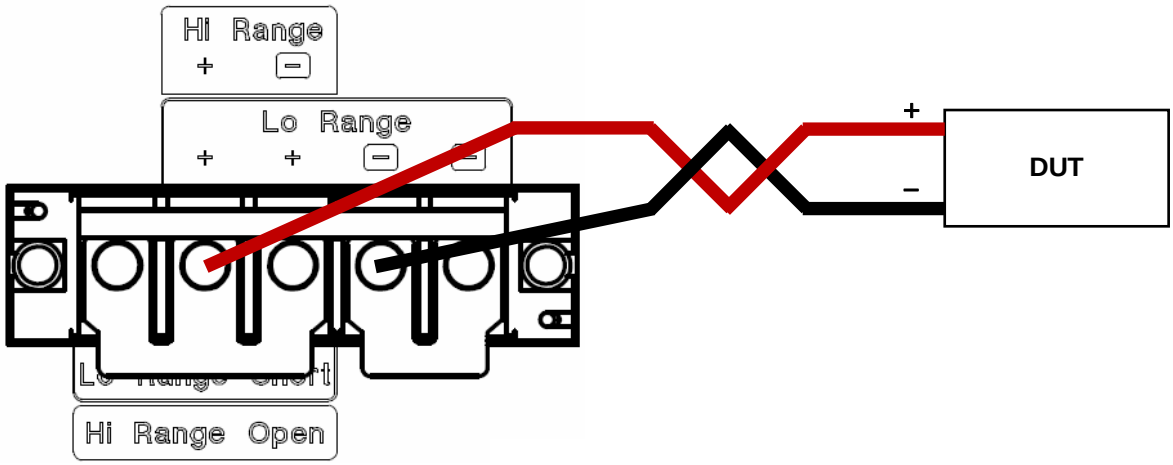
(2) Low range connection

Please follow the short bar/jumper placement below.



Rear panel electronic load side terminal block (Low range for NT-AA-10KE-L)

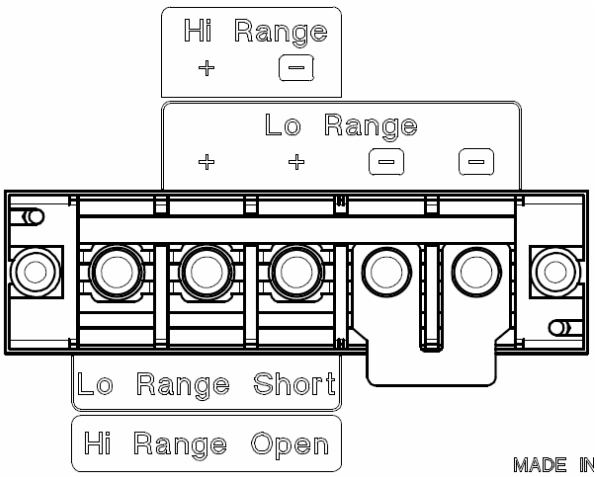
Be sure to connect the cables properly for the POSITIVE and NEGATIVE polarity. Place the terminal cover without fail.



Connection between terminal block on the rear panel of the electronic load and DUT. (When in Low range for NT-AA-10KE-L)

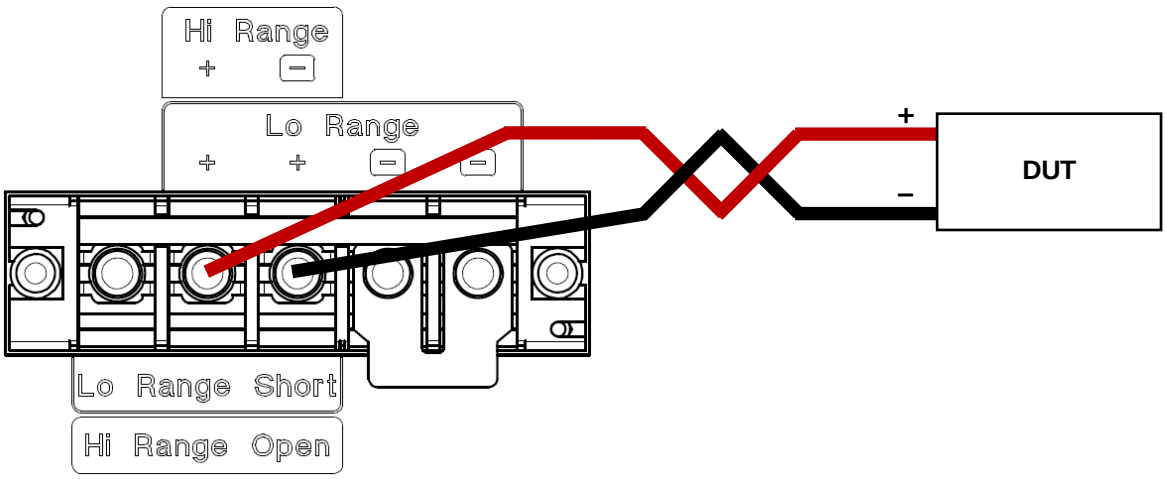
(3) High range connection

Please follow the short bar/jumper placement below.



Rear panel electronic load side terminal block (High range for NT-AA-10KE-L)

Be sure to connect the cables properly for the POSITIVE and NEGATIVE polarity. Place the terminal cover without fail.



Connection between the terminal block on the rear panel of electronic load and DUT (High range for NT-AA-10KE-L)

Information Check before use.

- Refer to "
- Specifications (p.87~)" for the confirmation on DUT voltage which should be within the specification of the instrument.
- The size of screw for terminal block is M6. Use the cable terminal fitting this size.
- Check the hazardous voltages which can remain active between terminals by tester etc. before cable will be removed.

WARNING The risk of electric shock.

- Do not touch DUT connection terminal when power is turned on to avoid the risk of electric shock.
- Drive a screw of short bar/jumper) connection tightly because the

current will flow all terminals.

Turn on and turn off the power supply

(1) Turn on the supply voltage
Turn on the power switch on the front panel on the instrument.

(2) Turn off the supply voltage
Turn off the power switch on the front panel on the instrument.

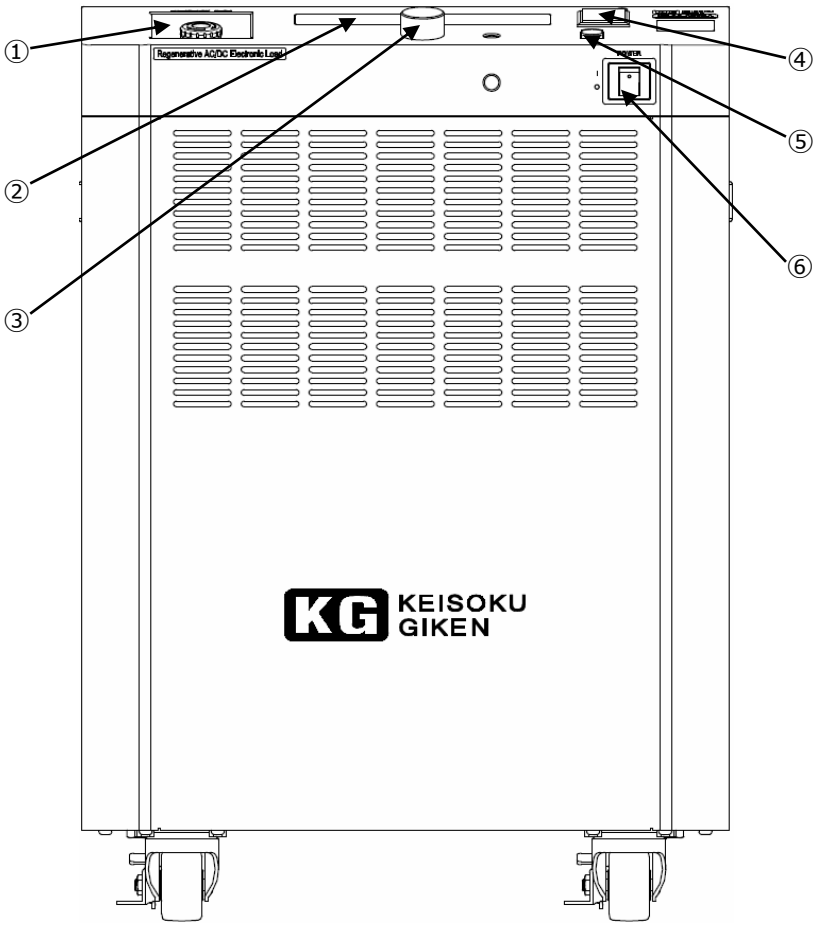
Information Be sure to confirm before turning the power on and off.

- DUT outputs must be OFF when turn on and turn off the power supply.

Chapter 3. Parts Description and Function

This chapter describes terminal block and switch etc. description and function on front and rear panel.

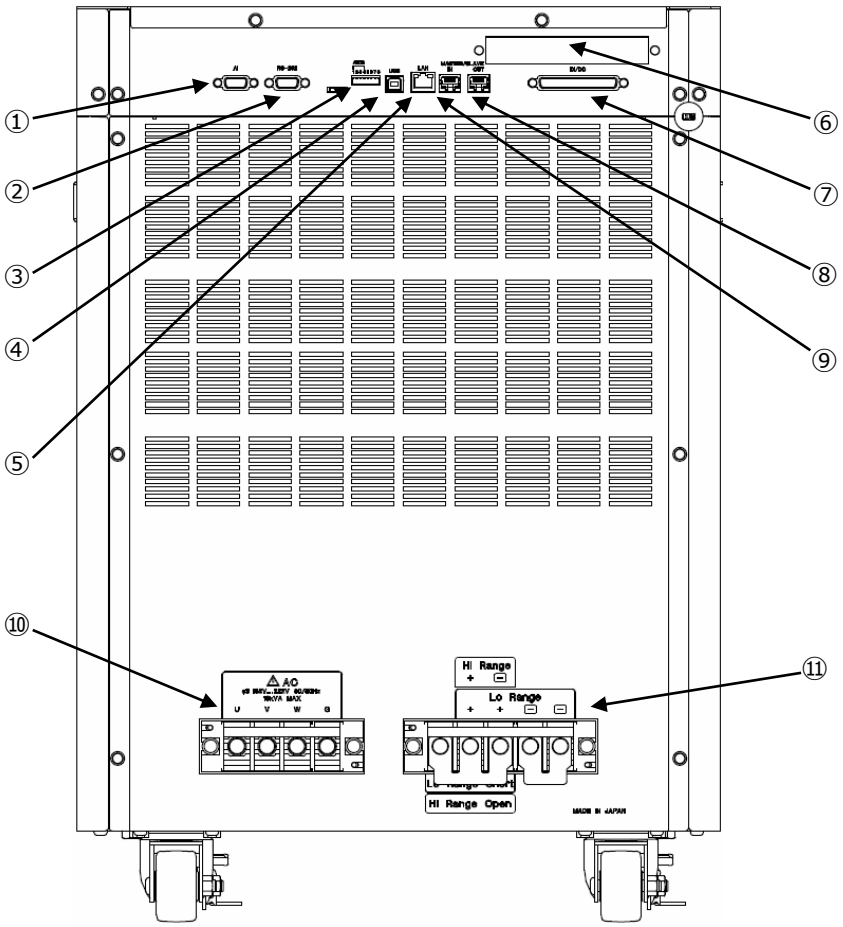
NT-AA-10KE-L Front panel



NT-AA-10KE-L Front panel

No.	Name	Function
①	Emergency stop switch	The emergency stop signal is sent to NT-AA-10KE-L by pushing this switch and NT-AA-10KE-L will be LOAD OFF, and then grid side parallel switch becomes parallel OFF. Rotate clockwise or pull the switch for returning to original status.
②	OLED display for User Interface.	It is OLED display for User Interface. Please refer to "Chapter 4 User Interface (p.22~)" for details.
③	Rotary knob for User Interface	It is Rotary knob for User Interface. The selecting item by indication pointer and changing value can be controlled by rotating rotary knob. The selection and execution of operation can be done by pushing rotary switch. Please refer to "Chapter 4 User Interface (p.22~)" for details.
④	Red LED for Alarm indication	Red LED will light at the alarm generation on NT-AA-10KE-L. The type of alarm will be displayed on OLED display for User Interface. Please refer to "Chapter 4 User Interface (p.22~)" for details.
⑤	LOAD ON/OFF Switch	The switch for LOAD ON /OFF status. Blue LED will light at LOAD ON status. Blue LED will turn off at LOAD OFF status.
⑥	Power switch	Power switch for main body.

NT-AA-10KE-L Rear Panel



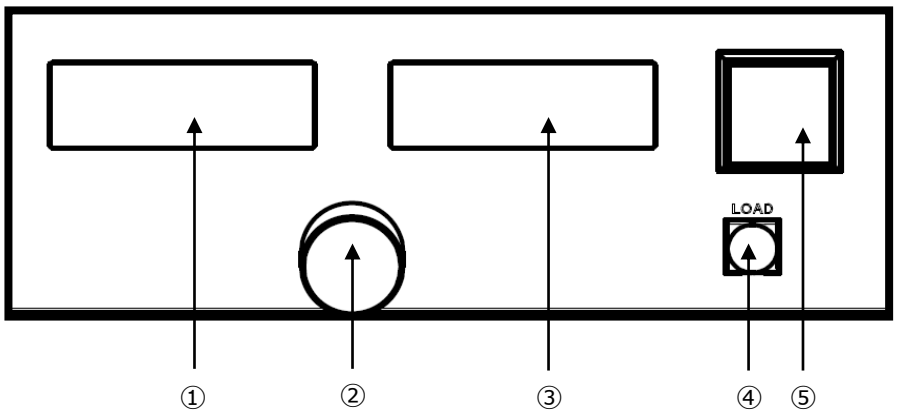
NT-AA-10KE-L Rear Panel

No.	Name	Function
①	External control (AI) I/F Connector	Interface for external control (AI). Please refer to "External Control (AI) Interface (p.78)" for details.
②	RS-232C I/F Connector	RS-232C interface connecting host PC. Please refer to "RS-232C Interface (p.58)" for details.
③	DIP switch	DIP switch for USB address setting. Please refer to "USB sample program (p.68)" for details.
④	USB I/F Connector	USB interface connecting host PC. Please refer to "USB sample program (p.68)" for details.
⑤	LAN(Ethernet) I/F Connector	LAN (Ethernet) interface connecting host PC. Please refer to "LAN (Ethernet) Interface (p.69)" for details.
⑥	AX-OP04(GP-IB Interface option) extended slot	The slot for AX-OP04 (GP-IB Interface option). Please refer to "GPIB Interface (Option) (p.72)" for details.
⑦	External Control(DIDO) I/F Connector	The DI/DO interface connecting host PC. Please refer to "External Control (DIDO) Interface (p.73)" for details.
⑧	MASTER/SLAVE IN Connector	Input connector for Master Slave connection with the same type of instruments. Please refer to "Master-Slave Configuration (p.79)" for details.
⑨	MASTER/SLAVE OUT Connector	Output connector for Master Slave connection with the same type of instruments. Please refer to "Master-Slave Configuration (p.79)" for details.
⑩	Grid side terminal block	Terminal block for 3-phase 3-wire AC grid side. Please refer to "NT-AA-10KE-L grid side connection (p.13)" for details.
⑪	Electronic load side terminal block	Terminal block for DC or Single Phase 2-wire AC electronic load. Please refer to "NT-AA-10KE-L Electronic Load side connection (p.14)" for details.

Chapter 4. User Interface

This chapter describes operation of user interface on the front panel.

User Interface Overview



User Interface Panel

No.	Name	Function
①	OLED1	Measurement Value, Alarm, Status are displayed.
②	Rotary knob and Switch	Rotary knob with switch function.
③	OLED2	Setting values are displayed.
④	LOAD Button	LOAD ON/OFF is switched. Blue LED will light when LOAD ON status.
⑤	LED Display	Red LED will light when Alarm occurs.

Power on status

Rotary knob and LOAD switch will not be valid until the following conditions below are reached even though the power is turning on.

The followings message is displayed on OLED1 and OLED2.

OLED1

```
MEAS 1P2W AC LO
VOLT      ±000.0V
CURR      ±000.0A
POWER   ±000000.0W
```

OLED2

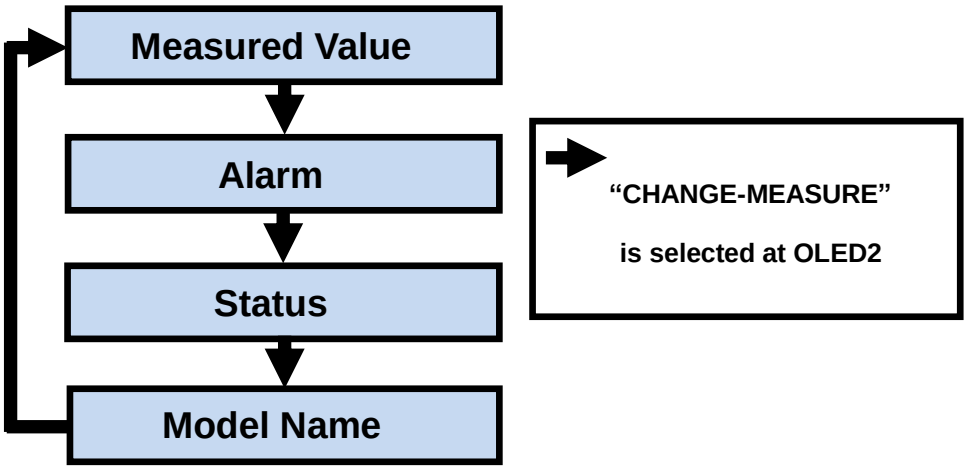
```
LOAD            AC
MODE            CC
VALUE       00.00A
  BACK  1/5   NEXT
```

Basic display of OLED1 and OLED2

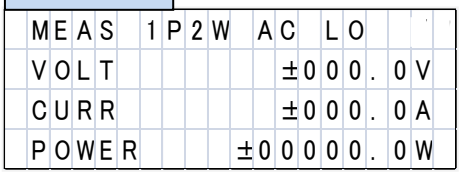
OLED Display

(1) OLED1 Display

The left side display (OLED1) of front panel is mainly used for measured value.
OLED1display item is switched through OLED2 display by the rotary knob switch.



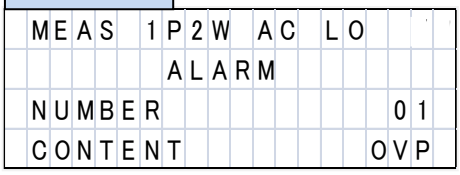
OLED1



Measured Value Display

The display for present measured value with multiple pages.

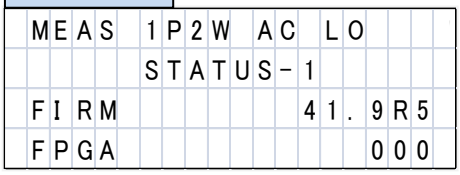
OLED1



Alarm Display

The display for Alarm content and number with one page.

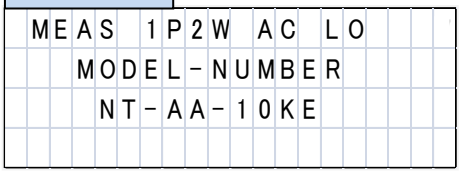
OLED1



Status Display

The display for status with 2 pages.

OLED1

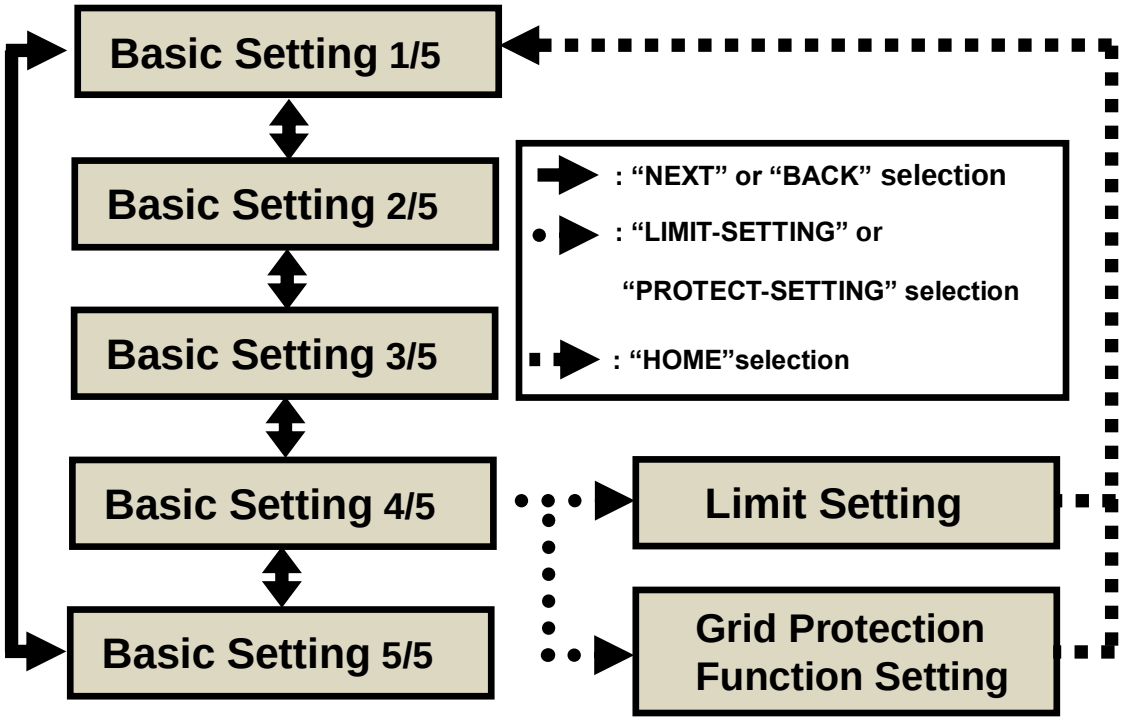


Model Name Display

The display for model name with 1 page.

(2) OLED2display

The right side display (OLED 2) of front panel is mainly used for setting.
OLED 2 display item (page) is switched by the rotary knob switch. The each display is defined as page and can switch OLED1 display using specific operation.



OLED2

L	O	A	D									A	C		
M	O	D	E									C	C		
V	A	L	U	E						0	0	.	0	0	A
		B	A	C	K		1	/	5			N	E	X	T

Basic Setting Display

The setting displays of the instrument are consists of 5 pages.
OLED1 switching can be controlled at 4 pages.
It can also transfer to Limit Setting and Grid Protection Function display.

OLED2

L	-	S	E	T			H	O	M	E			1	/	1
V	-	L	I	M	I	T				0	7	0	.	0	V
C	-	L	I	M	I	T				0	0	0	.	0	A
P	-	L	I	M	I	T				0	0	1	0	0	W

Limit Setting Display

The limit value of the instrument can be set.
It can be transferred from 4 page of basic setting display.

OLED2

P	-	S	E	T								H	O	M	E
I	D	A											O	F	F
I	D	P											O	F	F
		B	A	C	K		1	/	6			N	E	X	T

Grid Protection Function

The grid protection function of the instrument can be set.
It can be transferred from 4 page of basic setting display.
It has total 6 pages.

Measurement

(1) Overview

The electrical measurement value and alarm status of the instruments are displayed on OLED1 display at left side of front panel.

The electrical measured value item for OLED1 display is different between AC load and DC load. As previously mentioned, each items are in page level and divided by each page in both cases.

The range and resolution of each measured values are described in “_____

Specifications (p.87)".

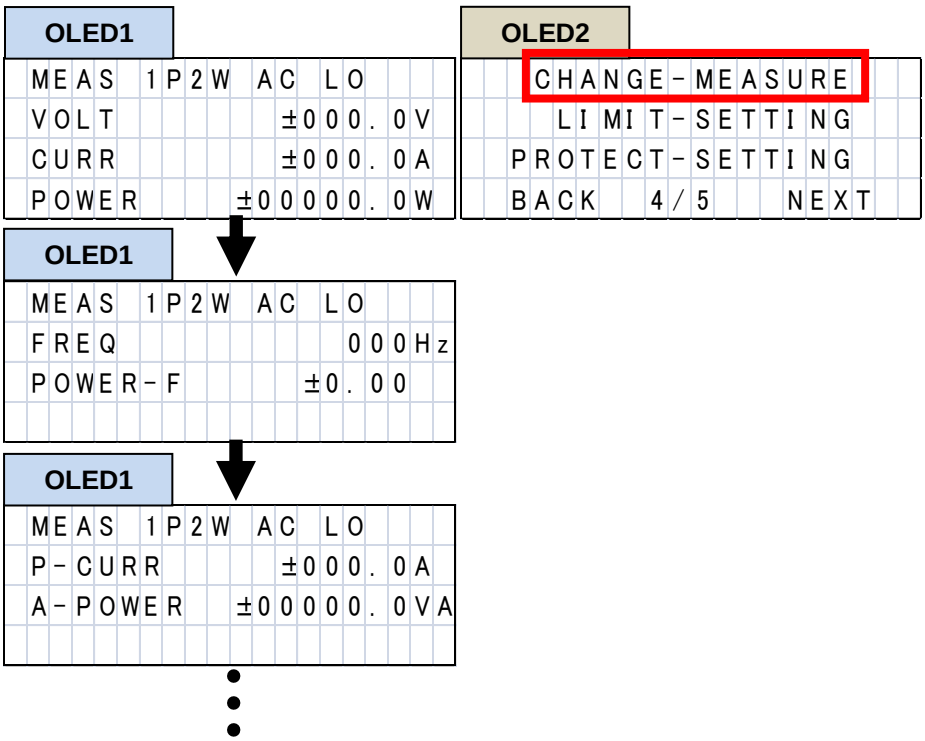
(2) Page Transfer of OLED1 Display

The page transfer of the measured value of OLED1 display is described.

(a) Select "BACK" or "NEXT" by rotary knob switch and select OLED2 page of 4/5.

(b) Rotate rotary knob switch and move < > position to **CHANGE-MEASURE.**

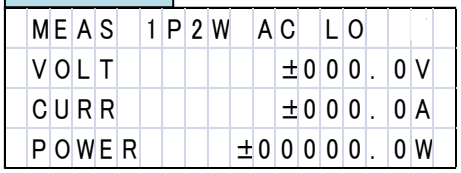
(c) Push rotary knob switch. The page of OLED1is transferred by each pushing of the rotary knob switch.



Operation with selection of "CHANGE-MEASURE"

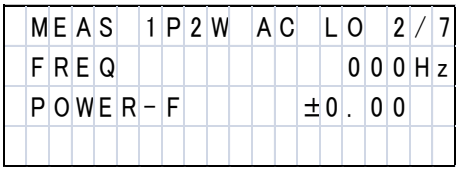
(3) The page displayed for AC load

OLED1



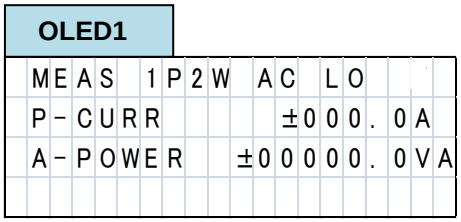
Measured value display (1/8)

OLED1



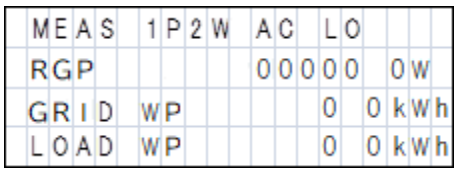
Measured value display (2/8)

OLED1



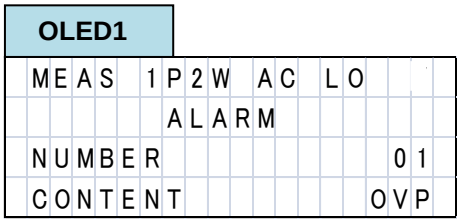
Measured value display (3/8)

OLED1



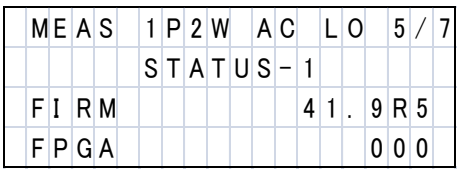
Measured value display (4/8)

OLED1



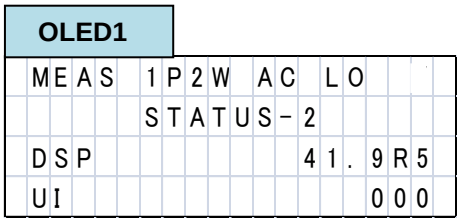
Alarm display (5/8)

OLED1



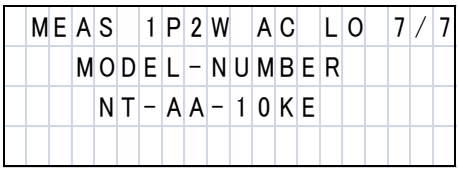
Status display (6/8)

OLED1



Status display (7/8)

OLED1



Model name display (8/8)

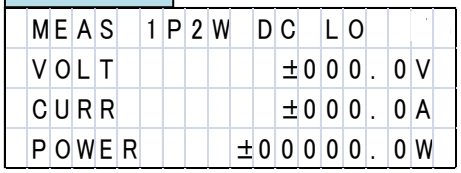
OLED1 display when in AC load

Item	Page	Description	Note
1P2W	ALL	Connection Method	1P2W/1P3W/3P3W P: Phase W:Wire
AC	ALL	Load input	AC / DC
LO	ALL	Range	LO: Low Range / HI: High Range
VOLT	1/8	Voltage measured value	
CURR	1/8	Current measured value	
POWER	1/8	Effective Power measured value	
FREQ	2/8	Frequency measured value	
POWER-F	2/8	Power factor measured value	
P-CURR	3/8	Peak current measured value	
A-POWER	3/8	Apparent power measured value	
RGP	4/8	Grid side effective power measured value	Only for power measurement option
GRID WP	4/8	Grid side accumulated effective power measured value	Only for power measurement option and accumulated power measurement ON. Refer to “Reading Command 2 (p.51)”
LOAD WP	4/8	Load side accumulated effective power measured value	Only for accumulated power measurement ON Refer to “Reading Command 2 (p.51)”
NUMBER	5/8	Alarm number	Refer to “Protection Function (Alarm) (p.29)”
CONTENT	5/8	Alarm description	Refer to “Protection Function (Alarm) (p.29)”
FIRM	6/8	Firmware version	
FPGA	6/8	FPGA version	
DSP	7/8	DSP version	
UI	7/8	UI version	
NT-AA-1xKE	8/8	Model name	NT-AA-10KE：single phase

OLED1display item when in AC load

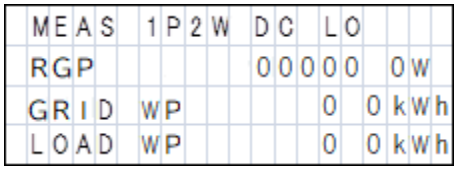
(4) The page displayed for DC load

OLED1



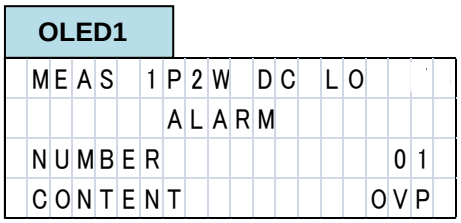
Measured value display (1/6)

OLED1



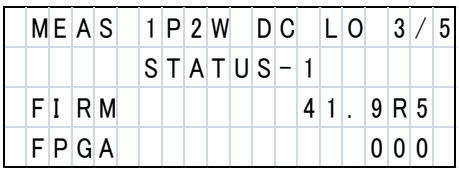
Measured value display (2/6)

OLED1



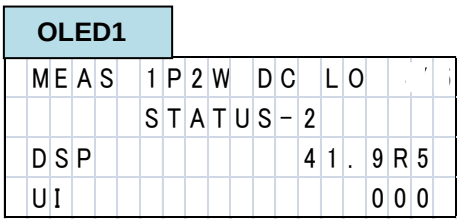
Alarm display (3/6)

OLED1



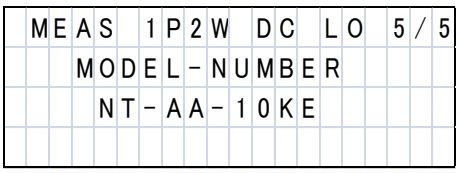
Status display (4/6)

OLED1



Status display (5/6)

OLED1



Model name display (6/6)

OLED1 display when in DC load

Item	Page	Description	Note
1P2W	ALL	Connection Method	1P2W/1P3W/3P3W, P: Phase W: Wire
DC	ALL	Load input	AC / DC
LO	ALL	Range	LO: Low Range / HI: High Range
VOLT	1/6	Voltage measured value	
CURR	1/6	Current measured value	
POWER	1/6	Effective Power measured value	
RGP	2/6	Grid side effective power measured value	Only for power measurement option
GRID WP	2/6	Grid side accumulated effective power measured value	Only for power measurement option and accumulated power measurement ON. Refer to “Reading Command 2 (p.51)”
LOAD WP	2/6	Load side accumulated effective power measured value	Only for accumulated power measurement ON Refer to “Reading Command 2 (p.51)”
NUMBER	3/6	Alarm number	Refer to “Protection Function (Alarm) (p.29)”
CONTENT	3/6	Alarm description	Refer to “Protection Function (Alarm) (p.29)”
FIRM	4/6	Firmware version	
FPGA	4/6	FPGA version	
DSP	5/6	DSP version	
UI	5/6	UI version	
NT-AA-1xKE	6/6	Model name	NT-AA-10KE: Single Phase

OLED1display item when in DC load

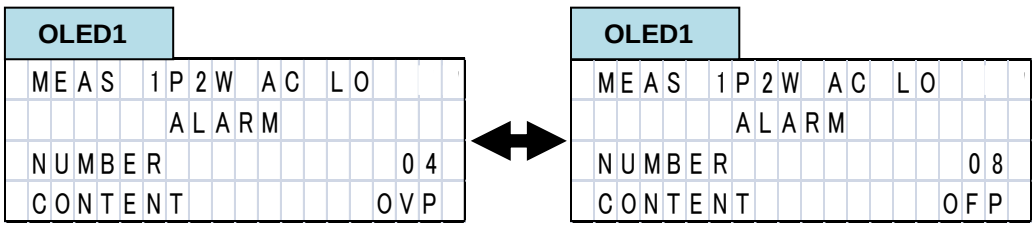
Protection Function (Alarm)

The Alarm number and description on OLED1 display are shown in the following Table.

Alarm Generated Part	No.	Description	Display
Emergency	0	Emergency Stop	EMERGENCY
Internal	1	Internal Over Voltage Protection	OVP
	2	System Power Detection	SPD
Load side	3	Under Voltage Protection	UVP
	4	Over Voltage Protection	OVP
	5	Over Current Protection	OCP
	6	Over Power Protection	OPP
	7	Under Frequency Protection	UFP
	8	Over Frequency Protection	OFP
Connection	9	DC Reverse Connect Protection	RCP
	10	FAN Stop Detection Overheat Detection	FSD&OHD
Input	11	Voltage Limit Protection	VLP
	12	None Alternating Current Input	NAI
Grid side	16	Under Voltage Relays	UVR
	17	Over Voltage Relays	OVR
	18	Over Current Relays	OCR
	19	Under Frequency Relays	UFR
	20	Over Frequency Relays	OFR
	21	Islanding Detection Passive	IDP
	22	Islanding Detection Active	IDA

List of alarms displayed in OLED1

If multiple alarms are generated simultaneously, the display items are changed approximately every 1 second.



The change of alarm items display

Information Releasing alarm

- Please refer to "(16)Release Alarm (p.38)" for releasing alarm.

Load Setting

(1) Overview

The various setting of the instrument is done by using OLED1and rotary knob switch on right side of front panel. The type of settings includes load value setting, limitation setting, and parallel operation setting.

As previously mentioned, the type of setting is structured by page and hierarchy of basic setting display, limit setting display, and grid protection setting display.

In addition, useful remote control setting by infrared remote controller is available as option. This section describes the setting by basic setting display.

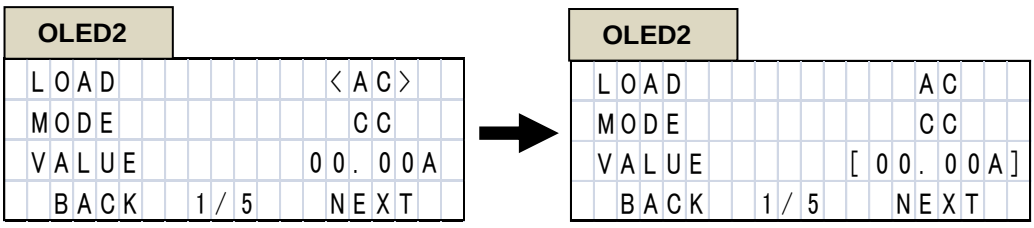
(2) Setting mode for OLED2 display

The setting display on OLED2 has two mode of “Change selecting item mode” and “Change setting value mode”.

(a) Change selecting item mode

Selected positions indicated by < > at change selecting item mode.

The position of < > is controlled by rotary knob switch in this mode.



Operation on Change setting position mode

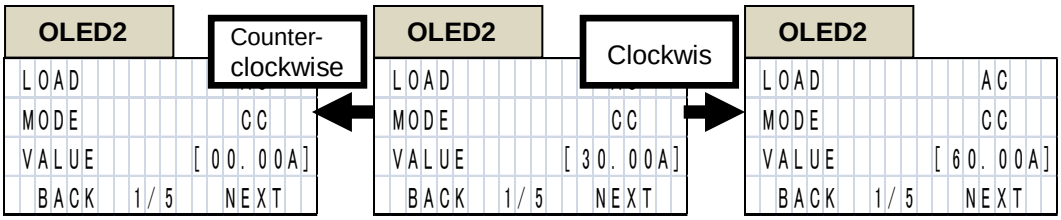
(b) Change setting value mode

Selected item is indicated by [ ] at change setting value mode.

The position of [ ] is controlled by rotary knob switch in change setting value mode.

The setting value will be decreased when rotary knob switch is rotated counterclockwise and increased when rotary knob switch is rotated clockwise.

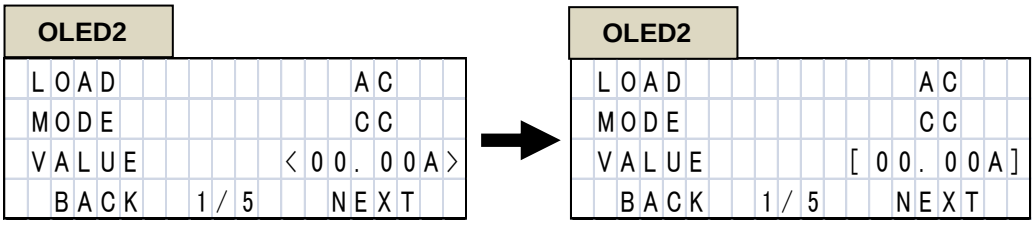
When the value become maximum or minimum, it cannot be changed by this operation.



Operation on change setting value mode

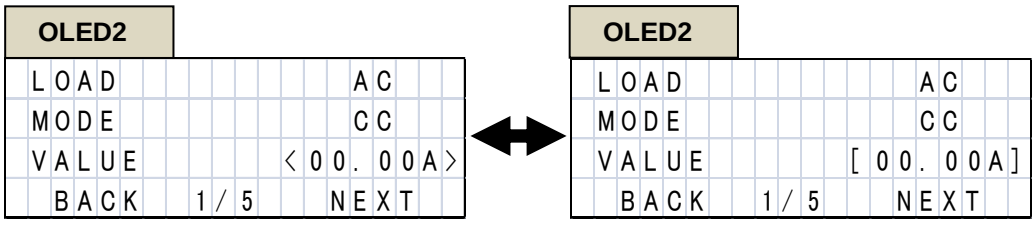
Push rotary knob switch when it become expected value so that the setting value become valid.

Change setting value mode becomes selecting item mode and [ ] is changed to < >.



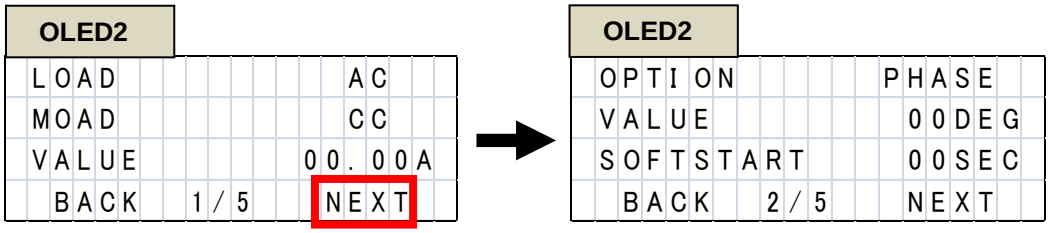
The setting value become valid

(c) Switching the mode
Push the rotary knob switch to switch between < > and [ ].

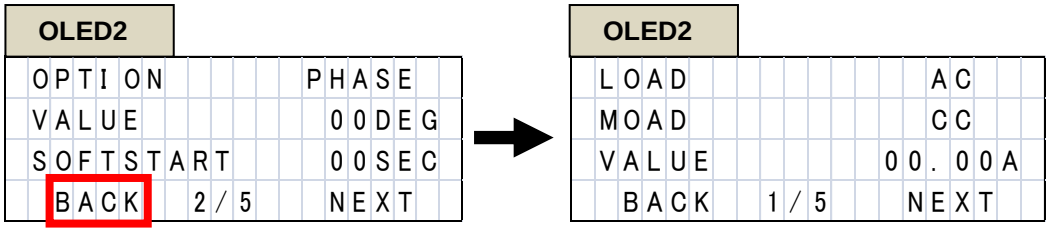


Selecting item mode (left) and setting value mode (right)

(3) Page transfer of OLED2 display
Page is transferred by selecting “BACK” or “NEXT” and pushing it using rotary knob switch.



Operation when “NEXT” is pushed.



Operation when “BACK” is pushed.

(4) Contents of each page in basic setting display

OLED2

```
LOAD                    AC
MODE                    CC
VALUE              00.00A
  BACK    1/5     NEXT
```

Basic setting display (1/5)

OLED2

```
OPTION                PHASE
VALUE                 000EG
SOFTSTART             000SEC
  BACK    2/5     NEXT
```

Basic setting display (2/5)

OLED2

```
PARALLEL                OFF
CABLE-CONNECT      1P2W


  BACK    3/5     NEXT
```

Basic setting display (3/5)

OLED2

```
    CHANGE-MEASURE
      LIMIT-SETTING
  PROTECT-SETTING
  BACK    4/5     NEXT
```

Basic setting display (4/5)

OLED2

```
      ALARM-CLEAR
REMOTE-CTLR             OFF
CR-DIMENSION            OHM
  BACK    5/5     NEXT
```

Basic setting display (5/5)

Basic setting display on OLED2

Please refer to "(2) OLED2display (p.24)" for the operation of page transfer

Displayed Item	Page	Description
LOAD	1/5	Setting input load
MODE	1/5	Setting load mode
VALUE	1/5	Setting value of load mode
OPTION	2/5	Phase/Power Factor switching
OP-VALUE	2/5	Phase/Power Factor value setting
SOFTSTART	2/5	Soft start setting value
PARALLEL	3/5	Parallel operation enable/disable
CABLE-CONNECT	3/5	Load connection setting
CHANGE-MEASURE	4/5	Transfer in OLED1display
LIMIT-SETTING	4/5	Transfer in limitation setting display
PROTECT-SETTING	4/5	Transfer in Grid protection function display
ALARM-CLEAR	5/5	Release Alarm
REMOTE-CTLR	5/5	Remote Control enable/disable (Discontinued. No longer supported.)
CR-DIMENSION	5/5	Switching of CR setting value

List of setting item in basic setting display

Information Setting change during LOAD ON

- The load mode settings are valid in LOAD ON status but other setting cannot be done at that status.
- Please refer to "

◆ Specifications (p.87~)" for the range and resolution for each setting value.

(5) Load input setting

Set the expected type of load for AC or DC. The appropriate short bar/jumper and load cables have to be connected property in advance. Please refer to "NT-AA-10KE-L Electronic Load side connection (p.14)" for the connection.

Setting Item
AC: AC load DC: DC load

Load input setting item

(a) Select page 1/5 for OLED2 display using "BACK" or "NEXT" function chosen by rotary knob switch operation.

(b) Select "LOAD" line by moving < > selecting indicator rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) Select AC/DC in [ ] by rotating rotary knob switch.

(e) Select expected item and push rotary knob switch to determine item.

(6) Setting of Load mode

Switch to load mode.

Setting Item	
CC	: Constant Current mode
CV	: Constant Voltage mode (DC only)
CP	: Constant Power mode
CR	: Constant Resistance mode
CF	: Crest Factor mode (AC only)※
MPPT	: MPPT mode (DC only)

List of setting mode in Load mode

(a) Select page 1/5 for OLED2 display using "BACK" or "NEXT" function chosen by rotary knob switch operation.

(b) Select "MODE" line by moving < > selecting indicator rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) Select mode in [ ] by rotating rotary knob switch.

(e) Select expected item and push rotary knob switch to determine item.

* About crest factor mode setting
Valid in CC mode.
1. First set the current value in CC mode.
2. Switch to CF mode and set the CF value.

(7) Setting of Load mode value

Set or revise the load mode values.

Setting Range	
Load CC setting range Load CR setting range Load CP setting range Load CV setting range Load CF setting range	• • • Refer to "Specifications (p.87~)"

Setting range of load value

(a) Select page 1/5 for OLED2 display using "BACK" or "NEXT" function chosen by rotary knob switch operation.

(b) Select "VALUE" line by moving < > selecting indicator rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) The value in [ ] increases when rotary knob switch is rotated clockwise and the value in [ ] decreases when rotary knob switch is rotated counterclockwise.

* The units are depending on the setting of "(6) Setting of Load mode (p.33)".

(e) Select expected item and push rotary knob switch to determine item.

(8) Switching of Phase and Power Factor

Select setting of unit by phase or power factor.
* Only be able to set for CC mode input load with AC.

Setting Item
PF: Power Factor PHASE: Phase

Setting item for Phase and Power Factor

(a) Select page 2/5 for OLED2 display using "BACK" or "NEXT" function chosen by rotary knob switch operation.

(b) Select "OPTION" line by moving < > selecting indicator rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) Select PF/PHASE in [ ] by rotating rotary knob switch.

(e) Select expected item and push rotary knob switch to determine item.

(9) Setting of Phase and Power Factor value

Set or revise the Phase and Power Factor values in AC and CC mode load input.

Setting Range	
Setting range of phase	• • • -90～90 deg
Setting resolution of phase	• • • 1 deg
Setting range of power factor	• • • -1～1
Setting resolution of power factor	• • • 0.01

Setting item of Phase and Power Factor value

(a) Select page 2/5 for OLED2 display using “BACK” or “NEXT” function chosen by rotary knob switch operation.

(b) Select “VALUE” line by moving < > selecting indicator rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) The value in [ ] increases when rotary knob switch is rotated clockwise and the value in [ ] decreases when rotary knob switch is rotated counterclockwise.

* The units are depending on the setting of “(8) Switching of Phase and Power Factor (p.34)”.

(e) Select expected item and push rotary knob switch to determine item.

(10) Setting of soft-start

Set or revise the soft-start setting value.

Setting Item
Refer to “ Specifications (p.87~) Common item for Load Mode”

Setting Item of soft-start

(a) Select page 2/5 for OLED2 display using “BACK” or “NEXT” function chosen by rotary knob switch operation.

(b) Select “SOFTSTART” line by moving < > selecting indicator by rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) Select 00SEC/01SEC/02SEC/05SEC/10SEC in [ ] by rotating rotary knob switch.

(e) Select expected item and push rotary knob switch to determine item.

(11) Enable/Disable Parallel operation

Set Master instrument for parallel operation.
Please refer to "Master-Slave Configuration (p.79)" and configurate the instruments for master slave connection in advance.

Setting Item
ON: Assigning Master Unit OFF: Unassigning Master Unit

Setting Item of Enable/Disable Parallel operation

(a) Select page 3/5 for OLED2 display using "BACK" or "NEXT" function chosen by rotary knob switch operation.

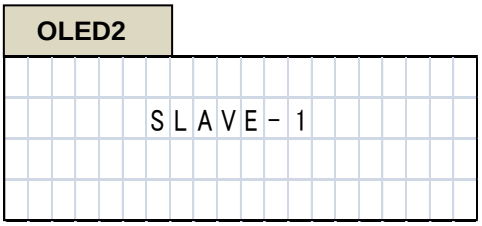
(b) Select "PARALLEL" line by moving < > selecting indicator by rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) Select ON/OFF in [ ] by rotating rotary knob switch.

(e) The Master unit is selected by setting ON, and others will be automatically become slave unit.

* The slave units will have the following OLED2 display and rotary knob switch operation will be disabled. When master unit setting is changed to OFF, master slave connection is released and the operation become valid.



Display on slave units

(12) Setting of Load connection system

The load connection system can be set for master unit when master slave system is configurated with plural units.

Setting Item
1P2W: Single phase 2-wire 1P3W: Single phase 3-wire 3P3W: 3-phase 3-wire

Setting Items of load connection system

(a) Select page 3/5 for OLED2 display using "BACK" or "NEXT" function chosen by rotary knob switch operation.

(b) Select "CABLE-CONNECT" line by moving < > selecting indicator by rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) Select 1P2W/1P3W/3P3W in [ ] by rotating rotary knob switch.

(e) Select expected item and push rotary knob switch to determine item.

(13) Switching OLED1 display

Transfer within page of OLED1display. Refer to "(2) Page Transfer of OLED1 Display (p.25)"

(14) Transfer to Limit Setting display

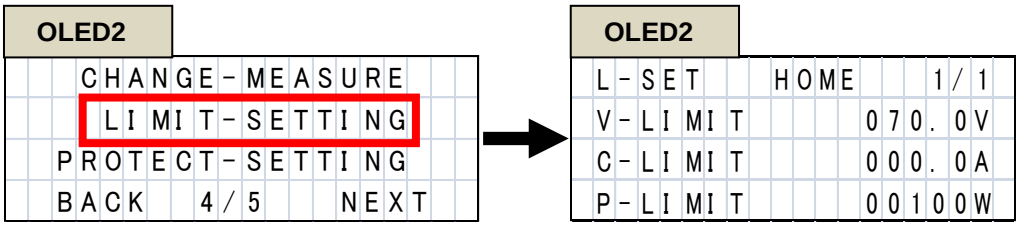
Change the hierarchy of OLED2 and transfer to Limit Setting display. Refer to "Limit Setting (p.40)" for setting limit.

(f) Select page 4/5 for OLED2 display using "BACK" or "NEXT" function chosen by rotary knob switch operation.

(a) Select "LIMIT-SETTING" line by moving < > selecting indicator by rotating rotary knob switch.

(b) Push rotary knob switch for transferring to Limit Setting display in OLED1 display.

* Push "HOME" in Limit Setting display to restore former display.



Operation on pushing "LIMIT-SETTING"

(15) Transfer to Grid Protection Function Setting display

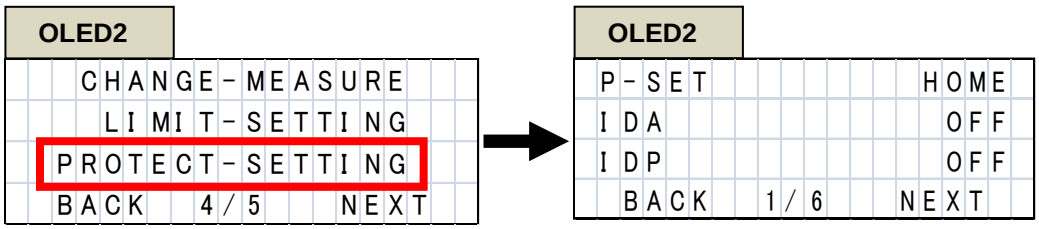
Change the hierarchy of OLED2 and transfer to Grid Protection Function Setting display. Refer to "Grid protection function setting (p.42)".

(a) Select page 4/5 for OLED2 display using "BACK" or "NEXT" function chosen by rotary knob switch operation.

(b) Select "PROTECT-SETTING" line by moving < > selecting indicator by rotating rotary knob switch.

(c) Push rotary knob switch for transferring to Grid Protection Function Setting display in OLED1 display.

* Push "HOME" in Grid Protection Function Setting display for restoring former display.



Operation on pushing "PROTECT-SETTING"

(16) Release Alarm

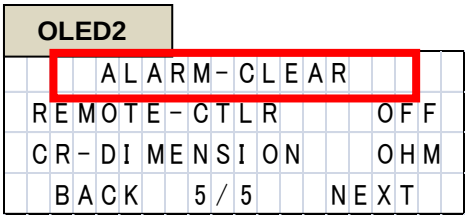
Release Alarm on main instrument.

(a) Select page 5/5 for OLED2 display using “BACK” or “NEXT” function chosen by rotary knob switch operation.

(b) Select “ALARM-CLEAR” line by moving < > selecting indicator by rotating rotary knob switch.

(c) Push rotary knob switch to release Alarm.

* Refer to “Protection Function (Alarm) (p.29)”.
* When alarm has been still detected, Alarm is generated again even though releasing alarm.
* Alarm cannot be released by above operation when grid side alarm is generated.
  Power on again for the instrument in this situation.



Operation on pushing “ALARM-CLEAR”

(17) Switching of prohibition on remote controller operation

Set to prohibition of operation for infrared remote controller which is the option of the instrument.

Setting Item
ON: remote is prohibited OFF: remote is enabled

Setting item for Switching of prohibition on remote controller operation

(a) Select page 5/5 for OLED2 display using “BACK” or “NEXT” function chosen by rotary knob switch operation.

(b) Select “REMOTE-CTLR” line by moving < > selecting indicator by rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) Select ON/OFF in [ ] by rotating rotary knob switch.

(e) Select expected item and push rotary knob switch to determine item.

Note About Remote controller option.

◆ Remote control operation option is discontinued and support is no longer available.

(18) Switching of unit for CR Setting Value

The unit of ohm or siemens can be selected when CR mode setting value is set or revised.

Setting Item
OHM: ohm MHO（S: siemens）

Setting item of switching CR setting value.

(a) Select page 5/5 for OLED2 display using “BACK” or “NEXT” function chosen by rotary knob switch operation.

(b) Select “CR-DIMENTION” line by moving < > selecting indicator by rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) Select OHM/S in [ ] by rotating rotary knob switch.

(e) Select expected item and push rotary knob switch to determine item.

Limit Setting

(1) Overview

The current limit, voltage limit, and power limit can be set for the instrument.
Once measured value violates either one of those limits, the alarm is generated and become LOAD OFF.

■Information Limit setting cannot be made while LOAD ON.

- Limit setting cannot be made while LOAD ON.
- Refer to "
- Specifications (p.87~) Common item for Load Mode" for the range and resolution in each setting value.

(2) Transfer to Limit Setting display

The Limit Setting display can be transferred from basic setting display.
Refer to "(14) Transfer to Limit Setting display (p.37)" for operation process.

(3) The contents of Limit Setting display

OLED2

L-SET	HOME	1/1
V-LIMIT		070.0V
C-LIMIT		000.0A
P-LIMIT		00100W

Limit Setting display

Item	Description
HOME	Return to basic setting display
V-LIMIT	Setting value of voltage limit value
C-LIMIT	Setting value of current limit value
P-LIMIT	Setting value of power limit value

Setting items list of Limit Setting display

(4) Returning to basic setting display

Return from limit setting display to basic setting display.

(a) Select "HOME" line by moving < > selecting indicator by rotating rotary knob switch.

(b) Push rotary knob switch.

(c) The OLED2 display returns to page 1 of basic setting display.

OLED2

L-SET	HOME	1/1
V-LIMIT		070.0V
C-LIMIT		000.0A
P-LIMIT		00100W

→

OLED2

LOAD		AC
MOAD		CC
VALUE		00.00A
BACK	1/5	NEXT

Operation when "HOME"is pushed

(5) Limit Values setting

Limit values are set or revised.

Setting Range
Refer to “ Specifications (p.87~) Common item for Load Mode”

Setting ranges for limit values

(a) Select “V-LIMIT/C-LIMIT/P-LIMIT” line which needs to change by moving < > selecting indicator using rotating rotary knob switch.

(b) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(c) The value in [ ] increases when rotary knob switch is rotated The value in [ ] increases when rotary knob switch is rotated rotated counterclockwise.

(d) Select expected item and push rotary knob switch to determine item.

Information When P-LIMIT is applied during AC CR mode or optional GCR mode.

◆ P-LIMIT is operated for instantaneous value of power under AC CR mode or GCR mode option. The twice value of P-LIMIT setting value is considered to be threshold.
This is derived from instantaneous value in sine wave become
√2×√2 = 2.
* The above operation is adopted only for sine wave AC input.

Grid protection function setting

(1) Overview

The instrument has grid observation and grid protection function compliant with grid-Interconnection code. The safety operation to adopt current grid status is performed by setting or revising grid protection function.
On the other hand, the instruments will not support FRT (Fault Ride Through) item, new islanding operation method, and multi parallel connection islanding operation method.

Information Limit setting while LOAD ON

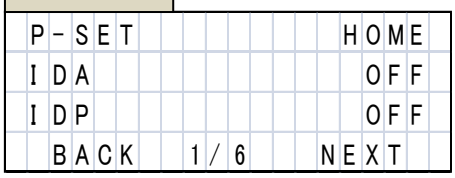
- ◆ Limit cannot be set while LOAD ON.

(2) Transfer to Grid protection setting display

Grid protection setting display can be transferred from basic setting display.
Refer to "(15) Transfer to Grid Protection Function Setting display (p.37)" for the operation.

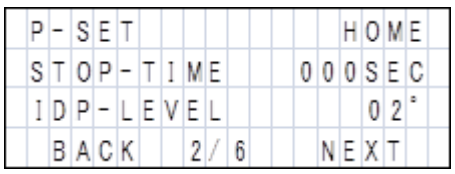
(3) Grid protection function setting display

OLED2



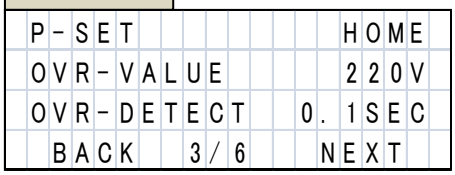
Grid Protection Setting (1/6)

OLED2



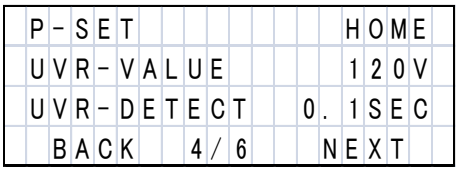
Grid Protection Setting (2/6)

OLED2



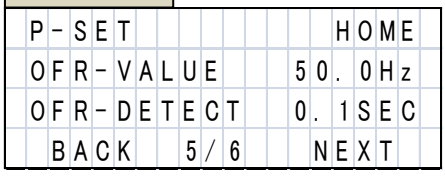
Grid Protection Setting (3/6)

OLED2



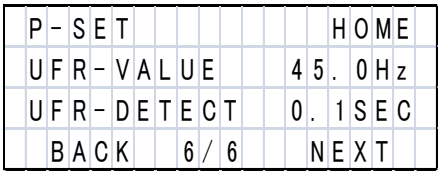
Grid Protection Setting (4/6)

OLED2



Grid Protection Setting (5/6)

OLED2



Grid Protection Setting (6/6)

Grid Protection Setting display on OLED2

tem	Page	Description
HOME	ALL	Return to basic setting display
IDA	1/6	Active islanding operation detection Switching enable/disable
IDP	1/6	Passive islanding operation detection Switching enable/disable
STOP-TIME	2/6	Grid recovery time setting value
IDP-LEVEL	2/6	Passive islanding operation Phase Jump level setting value
OVR-VALUE	3/6	Grid over voltage threshold setting value
OVR-DETECT	3/6	Grid over voltage detection time
UVR-VALUE	4/6	Grid lower voltage threshold setting value
UVR-DETECT	4/6	Grid lower voltage detection time
OFR-VALUE	5/6	Grid over frequency threshold setting value
OFR-DETECT	5/6	Grid over frequency detection time
UFR-VALUE	6/6	Grid lower frequency threshold setting value
UFR-DETECT	6/6	Grid lower frequency detection time

Grid Protection Setting item list

Information Enable islanding operation detection during normal use

- ◆ Disabling islanding operation detection is only for trouble check when It is installed. It should be normally enabled.

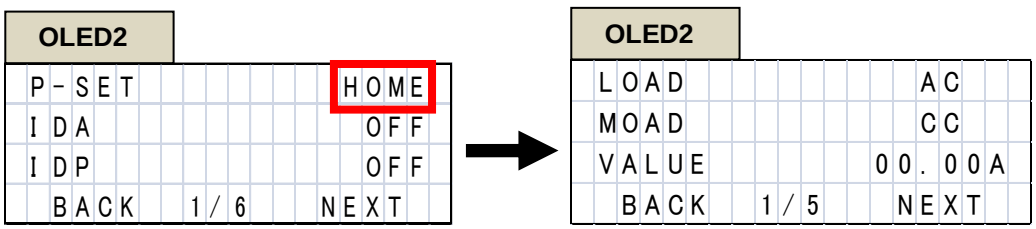
(4) Returning to basic setting display

Return from limit setting display to basic setting display.

(a) Select “HOME” line by moving < > selecting indicator by rotating rotary knob switch.

(b) Push rotary knob switch.

(c) The OLED2 display returns to page 1 of basic setting display.



Operation when HOME has been selected

(5) Setting each setting value

Set or revise grid Protection function setting value.

(a) Select necessary page for OLED2 display using “BACK” or “NEXT” function chosen by rotary knob switch operation.

(b) Select necessary line by moving < > selecting indicator by rotating rotary knob switch.

(c) Push rotary knob switch for transferring to setting value mode.
< > will become [ ].

(d) Select setting value in [ ] by rotating rotary knob switch.

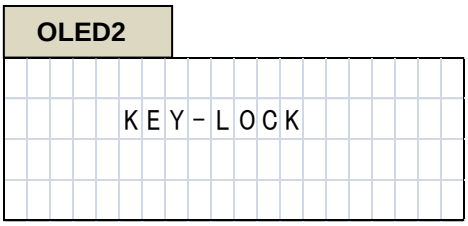
(e) Select expected item and push rotary knob switch to determine item.

(6) Recovery from islanding operation detection

The parallel Off for grid and Ene-phant main circuit is executed at islanding operation detection.
The power supply become automatically off in general case.
Note that all setting data will be lost when the instruments is rebooted.
To recover the status, the main power has to be powered on again.

Key-Lock

The key-lock becomes valid when rotary knob switch is pushed for 3 seconds.
OLED2 display becomes key-lock dedicated display and the rotary knob switch and LOAD button will become invalid.
Push rotary knob switch for 3 second to release from Key-Lock.



KEY-LOCK status

LOAD Button

The load current starts to flow when LOAD button is pushed to ON and blue LOAD button LED is lit.
The load current is cut when LOAD button is pushed again to OFF and blue LOAD button LED is turned off.

Information During the alarm generation, it always becomes LOAD OFF status.

- The load mode settings are valid in LOAD ON status but other setting cannot be done at that status.
- During the alarm generation, it always becomes LOAD OFF status. LOAD ON again after releasing alarm.

LED Indicator

The LED indicator turns on RED when any alarm is generated. It will turn off when every alarm get cleared.

Chapter 5. Remote Control

This chapter describes remote control capability for the instruments by sending the commands from external PC through communication cable.

Summary of remote control

The instruments provide Ethernet(LAN), USB（USB1.1 compliant）, and RS-232C as standard host interface. In addition, GPIB is optionally supported. The automatic test and measurement system can be easily configurated by setting any parameters and reading back of measured value using those interfaces.

Note Attention during remote control

- Note that the rotary knob and LOAD ON/OFF button are still active when remote control is valid.
- No change in user interface OLED display when remote control is valid.
- “L” has to be added to the head of command in Ethernet (LAN) interface.

Command List

How to read the command list.

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Read status information [STatus read]	ST {<address>} -> {<status>}	【address】Range:0~3 0:Status Register 0 1:Status Register 1/2 2:Status Register 1/2 3:Status Register 3 【status】Range: 16 bit	Read Status 0~3 Clear Alarm hold status when address=1/2 Read 32 bit data of status1/2 when address=1/2

Command list example

Each row is corresponding to each command in the list. The meaning of each column is described below.

(1) Function
[NT-AA-10KE]: The model name for this command.

(2) Command
{< >} : The enclosed parameter by triangle brackets must be used.
{ } : The enclosed parameter by this brace can be omitted by selected application.
-> : The arrow indicates query command. The head of arrow follows return value. When parameter data are more than two, these must be separated with a space.

(3) Operation and setting range
【 】: The enclosed strings by this brace is corresponding to the name of parameters and return values in ②command. This column describes range and meaning of parameters.
The setting range in Master-Slave operation control value is different from this table.
Please refer to “Master-Slave Configuration (p.79)”.

(4) Notes
Describe supplementary comments for command.

*** Command lists are provided from next page.**

(1) Control Command 1

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Load Control [LoaD on]	LD {<onoff>}	【onoff】Range:0~1 0: Load OFF 1: Load ON	
[**NT-AA-10KE]** AC/DC Switching Control [Ac Dc switch]	AD {<mode>}	【mode】Range:0~1 0: AC load mode 1: DC load mode	Valid only Load Control Command [LD] is OFF. Issued command is ignored when Load Control Command [LD] is ON.

(2) Control Command 2

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Load Mode Switching Control [Load Mode switch]	LM {<mode>}	【mode】Range:0~5 0: CV load mode (DC) 1: CC load mode (AC/DC) 2: CR load mode (AC/DC) 3: CP load mode (AC/DC) 4: MPPT load mode (DC) 5: CF load mode (AC)	Valid only Load Control Command [LD] is OFF. Issued command is ignored when Load Control Command [LD] is ON.
[NT-AA-10KE] Parallel Operation Switching Control [Master-Slave switch]	MS {<onoff>}	【onoff】Range:0~1 0: parallel operation OFF 1: parallel operation ON	[MS] command needs to be set for Master unit. Slave unit will be automatically recognized.
[**NT-AA-10KE]** Parallel Operation Mode Switching Control [Parallel Operation mode switch]	PO {<mode>}	【mode】Range:0~2 0: 1P2W parallel operation mode (2~4 units) 1: 1P3W parallel operation mode (2 units/4 units) 2: 3P3W parallel operation mode (3 units)	Valid only Load Control Command [LD] is OFF. Issued command is ignored when Load Control Command [LD] is ON.

(3) Setting Command 1

機能	コマンド	動作および設定範囲	備考
[NT-AA-10KE] Constant Voltage Value Setting [CV value set]	CV {<value>}	【value】Range: Low range DC: 70.0~340.0 High range DC: 140.0~680.0 Unit: V Resolution: Low Range DC: 0.5 V High Range DC: 1.0 V	[CV] is only valid for DC load mode.
[NT-AA-10KE] Constant Current Value Setting [CC value set]	CC {<value>}	【value】Range: Low range AC/DC: 0~60 High range AC/DC: 0~30 Unit：A Resolution: Low range AC/DC: 50 mA Low range AC/DC: 25 mA	

(4) Setting Command 2

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Constant Resistance Value Setting [CR value set]	CR {<value>}	【value】Range: Low range AC: 0.9~3400.0 Low range DC: 1.2~3400.0 High range AC: 3.4~6800.0 High range DC：4.7~6800.0 Unit: Ω Resolution: 10 S	
[NT-AA-10KE] Constant Power Value Setting [CP value set]	CP {<value>}	【value】Range: 0~10000 Unit: W Resolution: 20 W	

(5) Setting Command 3

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Crest Factor Setting [CFvalue set]	CF {<value>}	【value】Range: 1.4~4.0 Resolution: 0.1	[CF] is valid only for AC operation. Peak current is limited.
[NT-AA-10KE] Current Limit Value Setting [Current Limit value set]	CL {<value>}	【value】Range: Low range AC: 0~120 Low range DC: 0~60 High range AC: 0~60 High range DC: 0~30 Unit: A Resolution: Low range AC/DC: 1.0 A Low range AC/DC: 0.5 A	Limit value is for instantaneous value of AC or DC.

(6) Setting Command 4

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Phase Shift Setting [Phase Shift set]	PS {<data>}	【data】Range: -90~90 Unit: deg Resolution: 1deg	Only valid for [CC] operation
[NT-AA-10KE] Power Factor Setting [Power Factor set]	PF {<value>	【value】Range: -1.00~1.00 Unit: ---- Resolution: 0.01	Only valid for [CC] operation

(7) Setting Command 5

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Voltage Limit Value Setting [Voltage Limit value set]	VL {<value>}>	【value】Range: Low range AC: 50~240 Low range DC: 70~680 High range AC: 100~480 High range DC: 140~680 Unit: V Resolution: Low レンジ AC/DC: 0.5 V High レンジ AC/DC: 1.0 V	Limit is for AC/DC instantaneous value and the violation results in Alarm output and output OFF.
[NT-AA-10KE] Power Limit Value Setting [Power Limit value set]	PL {<value>}	【value】Range: 100~10000 Unit: W Resolution: 20 W	

(8) Setting Command 6

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Soft-Start Time Setting [Soft-Start time set]	SS {<time>}	【time】Range: 0, 1, 2, 5, 10 Unit: sec Resolution: ----	

(9) Reading Command 1

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Measurement Value Reading [Measure value Reading]	MR {<phase>} {<mode>} -> {<measure>}	【phase】Range: 0~2 0: DC/1φAC/3φAC R phase 1: 3φAC S phase 2: 3φAC T phase 【mode】Range: 0~8 0: Voltage measurement 1: Current measurement 2: Effective power measurement 3: Peak current measurement 4: Apparent power measurement 5: Power factor measurement 6: Frequency measurement 7: mode 0~6 Measurement 8: Integral power measurement 【measure】Range: 0~5 V (Analog Input) Resolution: 8192[14bit] mode=0: [<voltage>] mode=1: [<current>] mode=2: [<effective power>] mode=3: [<peak current>] mode=4: [<apparent power>] mode=5: [<power factor>] mode=6: [<frequency>] mode=7: [<voltage> <current> <effective power><peak current> <apparent power><power factor> <frequency>] mode=8: [<integral power>]	Measurement range is +10 % of each setting value. Resolution is 1 bit (sign) +13 bit. ※When A/D is overflowed, A/D value is hold with the maximum value of 0x3FFF or the minimum value of 0x0000. In case of power, the maximum value is 0xFFFFFFF and the Minimum value is 0x0000000.

(10) Reading Command 2

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Integral Power Mode Setting [Integral power Mode]	IM {<mode>}	【mode】Range：0~2 0: Integral power measurement OFF 1: Integral power measurement ON 2: Integral power measurement value CLEAR	The measurement for Integral power includes 2 types (+/-) of effective power. The number of accumulated measurement counting per 1 second is 2 types (+/-) of effective power.
[NT-AA-10KE] Status Information Reading [STatus read]	ST {<address>} -> {<status>}	【address】Range: 1~3 1, 2: Status Register 1/2 3: Status Register 3 【status】Range: 16 bit	Reading of Status1~3. When address=1/2, Alarm hold status is cleared. When address=1/2, 32 bit data will be read from status1/2.

(11) Reading Command 3

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Grid Power Measurement Optional Value Reading [option Power Measure value reading] * Valid when [AX-OP08/Grid Power Measurement Option] available.	PM {<mode>} -> {<measure>}	【mode】Range: 0~3 0: effective power measurement 1: apparent power measurement 2: measurement of mode 0 and mode 1 3: integral power measurement 【measure】Range: 0~5 V(Analog input) Resolution：8192[14bit] mode=0: [<effective power>] mode=1: [<apparent power>] mode=2: [<effective power> <apparent power>] mode=3: [<integral power>]	Measurement range is +10 % of each setting value. Resolution is 1 bit (sign) +13 bit. * When A/D is overflowed, A/D value is hold with the maximum value of 0x3FFF or the minimum value of 0x0000. In case of power, the maximum value is 0xFFFFFFF and the Minimum value is 0x0000000.

(12) Status Register 1

bit	Signal Name	Description
15	----	----
14	----	----
13	----	----
12	ALARM 12	No AC input detection/NAI (0: No Alarm, 1:Alarm)
11	ALARM 11	Voltage limit detection/VLP (0: No Alarm, 1:Alarm)
10	ALARM 10	FAN stopping detection/FSD (0: No Alarm, 1:Alarm)
9	ALARM 9	DC reverse polarity connecting protection /RCP (0: No Alarm, 1:Alarm)
8	ALARM 8	Over frequency detection/OFP (0: No Alarm, 1:Alarm)
7	ALARM 7	Under frequency detection/UFP (0: No Alarm, 1:Alarm)
6	ALARM 6	Over power detection/OPP (0: No Alarm, 1:Alarm)
5	ALARM 5	Over current detection/OCP (0: No Alarm, 1:Alarm)
4	ALARM 4	Over voltage detection/OVP (0: No Alarm, 1:Alarm)
3	ALARM 3	Under voltage detection/UVP (0: No Alarm, 1:Alarm)
2	ALARM 2	Internal over temperature detection/OHD (0: No Alarm, 1:Alarm)
1	ALARM 1	Internal over voltage detection/OVP (0: No Alarm, 1:Alarm)
0	ALARM 0	Emergency stop (0: No Alarm, 1:Alarm)

(13) Status Register 2

bit	Signal Name	Description
15	----	----
14	----	----
13	----	----
12	----	----
11	----	----
10	----	----
9	----	----
8	----	----
7	----	----
6	ALARM 22	Grid protection/Isolated operation detect- active /IDA (0: No Alarm, 1: Alarm)
5	ALARM 21	Grid protection/Isolated operation detect-passive/IDP (0: No Alarm, 1: Alarm)
4	ALARM 20	Grid protection/Over frequency detection/OFR (0: No Alarm, 1: Alarm)
3	ALARM 19	Grid protection/Under frequency detection/UFR (0: No Alarm, 1: Alarm)
2	ALARM 18	Grid protection/Over current detection/OCR (0: No Alarm, 1: Alarm)
1	ALARM 17	Grid protection/Over voltage detection/OVR (0: No Alarm, 1: Alarm)
0	ALARM 16	Grid protection/Under voltage detection/UVR (0: No Alarm, 1: Alarm)

(14) Status Register 3

bit	Signal Name	Description
15	INITIAL DONE	Initial done notice (0: Uncomplete, 1: Complete)
14	PARALLEL SLAVE	Slave operation (0: Inactive, 1: Active)
13	EMERGENCY SW	Emergency stop switch (0: Run, 1: Stop)
12	EMERGENCY DI	Emergency stop DI (0: Run, 1: Stop)
11	REMOTE	Remote control (0: Inactive, 1: Active)
10	EMERGENCY CMD	Emergency stop command (0: Run, 1: Stop)
9	AI SEL	AI input switching (0: Inactive, 1: Active)
8	DI SEL	DI input switching (0: Inactive, 1: Active)
7	PARALLEL MASTER	Master setting (0: Off, 1: On)
6	POWER/LOAD MODE 3	Mode bit 3
5	POWER/LOAD MODE 2	Mode bit 2
4	POWER/LOAD MODE 1	Mode bit 1
3	POWER/LOAD MODE 0	Mode bit0(parameter) 0: CV load mode(DC), 1: CC load mode(AC/DC), 2: CR load mode(AC/DC), 3: CP load mode(AC/DC), 4: MPPT load mode(DC), 5: CF load mode(AC) 6: GCC load mode(AC) 7: GCR load mode(AC)
2	RANGE SEL	Range selection (0: Low, 1: High)
1	AC/DC SEL	AC/DC selection (0: AC. 1: DC)
0	POWER/LOAD ON	Power/Load (0: Off, 1: On)

(15) I/O Command

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Digital Input Reading [Digital Input Reading]	DI ->{<data>}	【data】Range: 0x00~0xFF	Read 8bit data from DI input. bit 7 (MSB) is assigned for emergency stop input. bit0: DI switching control corresponding to [ds] bit 1: AI switching control corresponding to [ai] bit 2: Load control corresponding to [ld] bit 3: AC/DC switching control corresponding to [ad] bit 4~6: Load mode switching control corresponding to [lr] 0: CV load mode(DC) 1: CC load mode(AC/DC) 2: CR load mode(AC/DC) 3: CP load mode(AC/DC) 4: MPPT load mode(DC) 5: CF load mode(AC) bit 7: Emergency stop

(16) System Command

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] Version Reading [Version read]	V ->{<version>}	【version】Range: strings FW version, LCA version	
[NT-AA-10KE] Serial Number Information [Serial Number]	SN -> {<serialnumber>}	【serialnumber】 Range: 0~99999999 Setting: xxxx0001~xxxx9999 Reading: xxxx0001~xxxx9999	

(17) DSP Command

Function	Command	Operation and setting range	Notes
[NT-AA-10KE] DSP Function Setting [Dsp Function set]	DF {<cmd>} {<data>}	【cmd】 Range: 0~28 【data】 Range: 0~255	The value for【cmd】is CMD NO (decimal input) described in the following page “DSP Grid Monitor Relay Setting” and the function of “DSP Function Setting Command”.

(18) DSP Grid Monitor Protection Relay Setting Command 1

Function	Data	Operation and setting range	Notes
OVR Over Voltage Protection Threshold Setting [CMD NO: 0x1A]	bit 7-bit 3: Reserved bit 2-bit 0: Threshold Data	Range: 0x0~0x6 0: 220 V 1: 230 V 2: 240 V 3: 250 V 4: 260 V 5: 270 V 6: 280 V	
OVR Over Voltage Protection Detection Time Setting [CMD NO: 0x1B]	bit 7-bit 4: Reserved bit 3-bit 0: Time Data	Range: 0x0~0xB 0: 0.1 sec 1: 0.2 sec 2: 0.3 sec 3: 0.4 sec 4: 0.5 sec 5: 0.6 sec 6: 0.7 sec 7: 0.8 sec 8: 0.9 sec 9: 1.0 sec 10: 1.5 sec 11: 2.5 sec	
OVR Over Voltage Recovery Protection Time Setting [CMD NO: 0x1C]	bit 7-bit 0: Time Data (8bit)	Range: 0x00~0x96 (0~300 sec) Resolution: 2 sec	
UVR Under Voltage Protection Threshold Setting [CMD NO: 0x1D]	bit 7-bit 3: Reserved bit 2-bit 0: Threshold Data	Range: 0x0~0x7 0: 120 V 1: 130 V 2: 140 V 3: 150 V 4: 160 V 5: 170 V 6: 180 V 7: 190 V	
UVR Under Voltage Protection Detection Time Setting [CMD NO: 0x1E]	bit 7-bit 4: Reserved bit 3-bit 0: Time Data	Range: 0x0~0xE 0: 0.1 sec 1: 0.2 sec 2: 0.3 sec 3: 0.4 sec 4: 0.5 sec 5: 0.6 sec 6: 0.7 sec 7: 0.8 sec 8: 0.9 sec 9: 1.0 sec 10: 2.0 sec 11: 4.0 sec 12: 6.0 sec 13: 8.0 sec 14: 10.0 sec	
UVR Under Voltage Recovery Protection Time Setting [CMD NO: 0x1F]	bit 7-bit 0: Time Data (8 bit)	Range: 0x00~0x96 (0~300 sec) Resolution: 2 sec	

(19) DSP Grid Monitor Protection Relay Setting Command 2

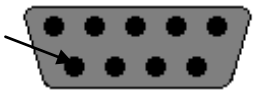
Function	Data	Operation and setting range	Notes
OFR Over Frequency Protection Threshold Setting [CMD NO: 0x20]	bit 7-bit 0: Threshold Data (8bit)	Range: 0x00~0x9F (50.0~65.9 Hz) Resolution: 0.1 Hz	
OFR Over Frequency Protection detection Time [CMD NO: 0x21]	bit 7: Reserved bit 6-bit 0: Time Data (7 bit)	Range: 0x00~0x63 (0.0~9.9 sec) Resolution: 0.1 sec	
OFR Over Frequency Recovery Protection Time Setting [CMD NO: 0x22]	bit 7-bit 0: Time Data	Range: 0x00~0x96 (0 ~ 300 sec) Resolution: 2 sec	
UFR Under Frequency Protection Threshold Setting [CMD NO: 0x23]	bit 7-bit 0: Threshold Data (8 bit)	Range: 0x00~0x9F (45.0~60.9 Hz) Resolution: 0.1 Hz	
UFR Under Frequency Protection detection Time [CMD NO: 0x24]	bit7：Reserved bit 6-bit 0: Time Data (7 bit)	Range: 0x00~0x63 (0.0 ~ 9.9 sec) Resolution: 0.1 sec	
UFR Under Frequency Recovery Protection Time [CMD NO: 0x25]	bit 7-bit 0: Time Data	Range: 0x00~0x96 (0~300 sec) Resolution: 2 sec	
OCR Over Current Protection Time [CMD NO: 0x26]	bit 7：Reserved bit 6-bit 0: Time Data (7 bit)	Range: 0x00~0x63 (0.0~9.9 sec) Resolution: 0.1 sec	
OCR Over Current Recovery Protection Time Setting [CMD NO: 0x27]	bit 7-bit 0: Time Data	Range: 0x00~0x96 (0~300 sec) Resolution: 2 sec	
Isolated Operation Recovery Protection Time Setting [CMD NO: 0x28]	bit 7-bit 0: Time Data	Range: 0x00~0x96 (0~300 sec) Resolution: 2 sec	

(20) DSP Function Setting Command

Function	Data	Operation and setting range	Notes
Isolated Operation Detect-Active Detect-Passive Stop Setting [CMD NO: 0x29]	bit 7-bit 2: Reserved bit 1-bit 0: Stop mode	Range: 0x0~0x3 0: Active Operation/Passive Operation 1: Active Stop/Passive Operation 2: Active Operation/Passive Stop 3: Active Stop/Passive Stop	
Isolated Operation Detection Voltage Phase Jump Level Setting [CMD NO：0x2A]	bit 7-bit 4: Reserved bit 3-bit 0: Jump level	Range: 0x0~0x8 0: 2 degree 1: 3 degree 2: 4 degree 3: 5 degree 4: 6 degree 5: 7 degree 6: 8 degree 7: 9 degree 8: 10 degree	

RS-232C Interface

(1) Interface Specification



Connector Outline

Model No.	17LE-13090-27(D3AB)-FA
Manufacturer	DDK
Pin Count	9

Female Connector Specification

* Please use male connector fitting to above female connector.
Example: DDK 17JE-13090-02(D1)

Communication Port Configuration	**Baud rate**	57600 Kbps
	Data bits	8
	Stop bit	1
	Parity	none
Interface		D-sub 9 pin(male)

RS-232C I/F Hardware Specifications

(2) Pin Assignment of connector

The Pin Assignment of connector is as follows, Please use cross cable for the connection.

Pin Number	Instruments Side	PC Side
1	NC	NC
2	RD	TD
3	TD	RD
4	NC	NC
5	GND	GND
6	NC	NC
7	NC	NC
8	NC	NC
9	NC	NC

RS-232C I/F Connector Signal Pin Assignment

⚠ CAUTION It may damage the equipment.

- ◆ The Instruments Power switch must be turned OFF prior to connect or remove connectors.

USB Interface

(1) Interface Specification

Communication Specification	USB1.1 Compliant

USB I/F Communication Interface

Information About USB driver setup

- Please refer to "USB Driver (p.60)" for details of USB setup.
- Please refer to "ActiveX control using Excel (p.67)" for the control method using Microsoft Excel.
- Please refer to "USB sample program (p.68)" for the control program sample using Microsoft Excel.

USB Driver

This instrument is controlled by ActiveX using VBA of Visual Basic or Excel etc. through the connection with PC (Microsoft Windows XP (SP3) (32bit) / 7 / 8 / 8.1 / 10 (32bit / 64bit) OS) with USB cable. Command set is similar to GPIB interface so that it can bear comparison with GPIB control.

Operation environment

OS
Microsoft WindowsXP (SP3) (32bit) Japanese version
Microsoft Windows 7 Japanese version
Microsoft Windows 8 Japanese version
Microsoft Windows 8.1 Japanese version
Microsoft Windows 10 Japanese version

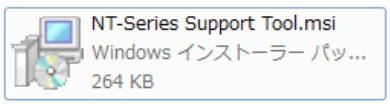
PC
IBM PC/AT compatible machine with USB interface with above mentioned OS.
* Only for Intel inside machine.

(1) ActiveX software installation

Please install USB device driver and ActiveX component for the control etc.
The old version has to be uninstalled prior to the installation.

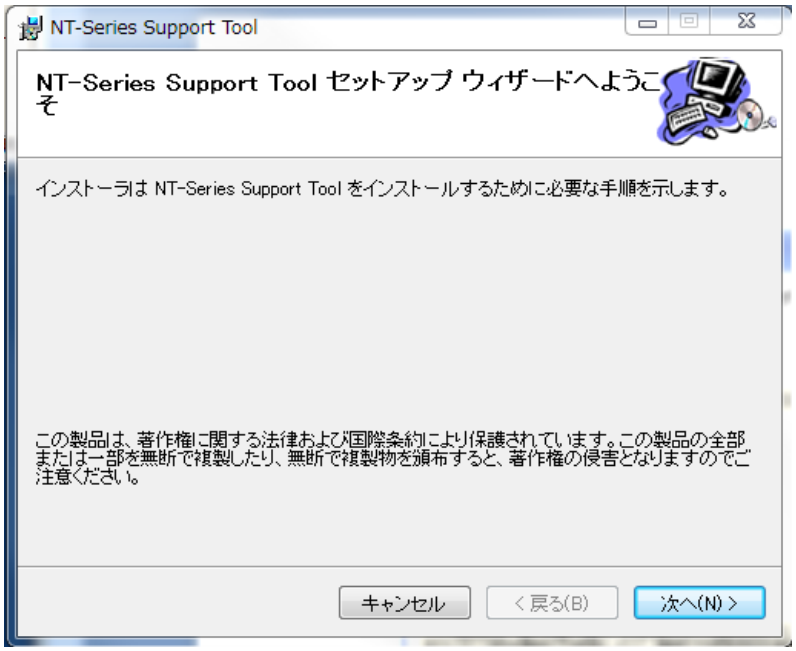
(a) Insert SUPPORT CD for AC/DC Electronic Load CD-ROM to CD-ROM drive. Connect between PC and this instrument with USB cable.

(b) After insert the CD-ROM, double-click “NT-Series Support Tool.msi” on ¥¥NT-Series¥OCX folder in CD-ROM using Explorer or the same function.

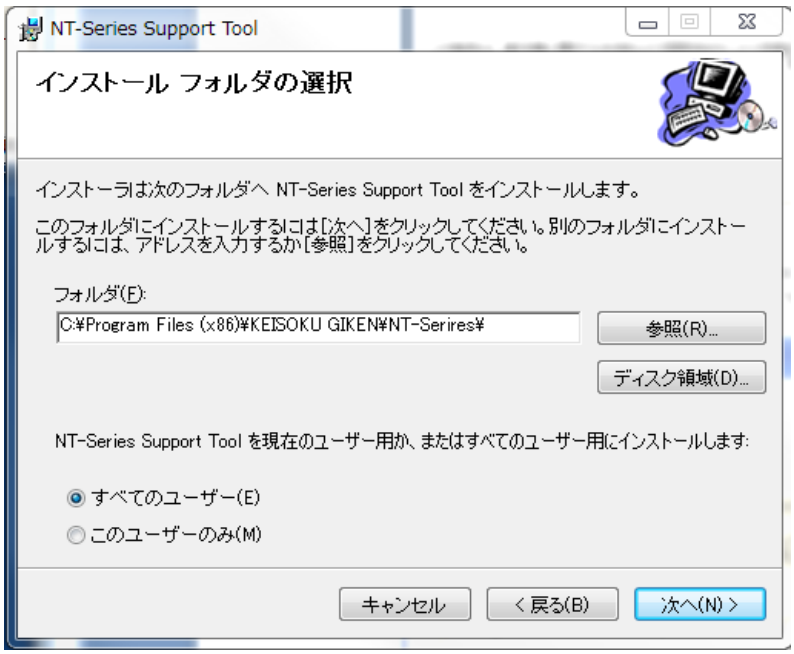


(c) The installer is booted up.

(d) Click “Next > (次へ(N) >)”.

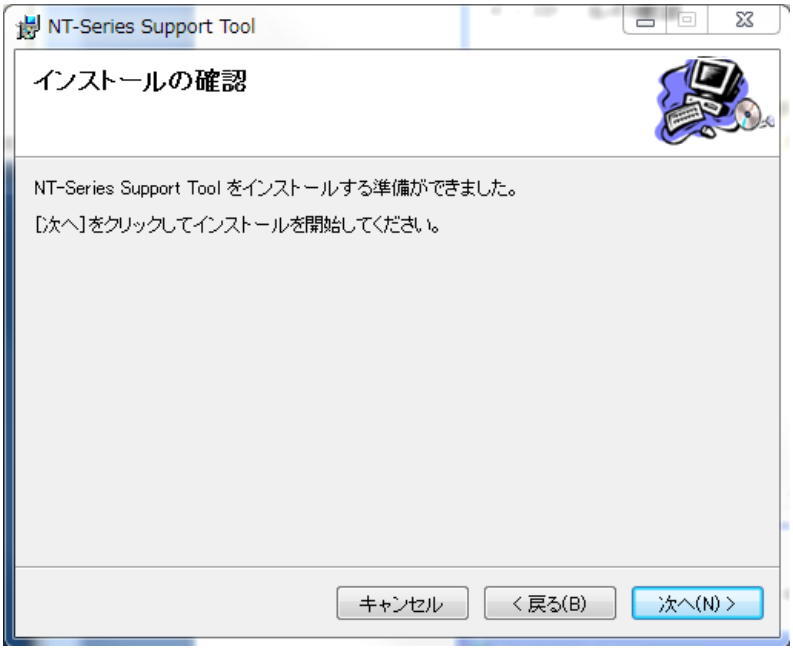


(e) Select the folder to install.
C:¥Program Files¥KEISOKU GIKEN¥NT-Series¥ will be the default.
Click “Next > (次へ(N) >)” after select the folder.



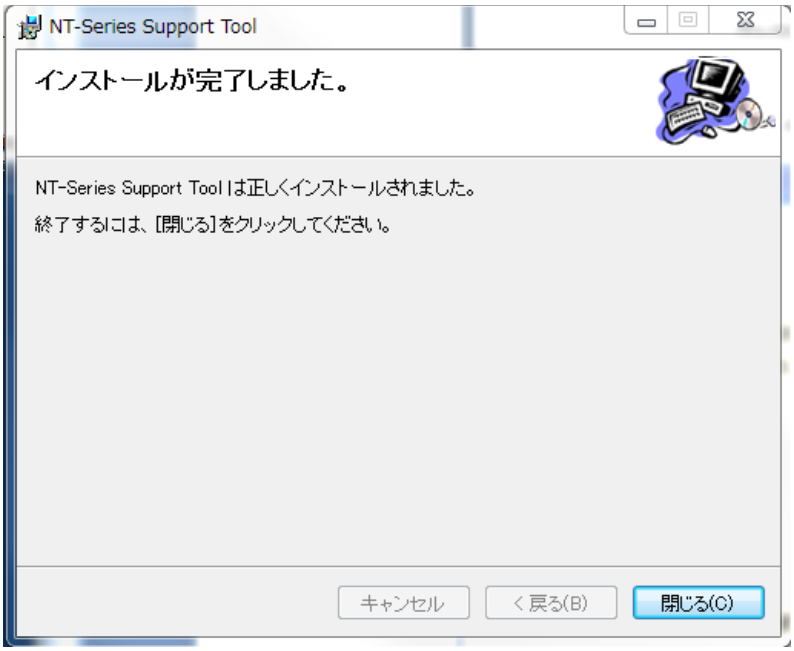
(f) Confirmation of installation

This screen is for final confirmation. Click “Next > (次へ(N) >)” when there is no problem in the setting.



(g) Complete installation

The following screen is appeared if no problem is found.



* To uninstall the program, please use Windows “Add / Remove Programs” or “Remove by Setup Wizard” on “Setup.exe” in SUPPORT CD for AC/DC Electronic Load CD-ROM.

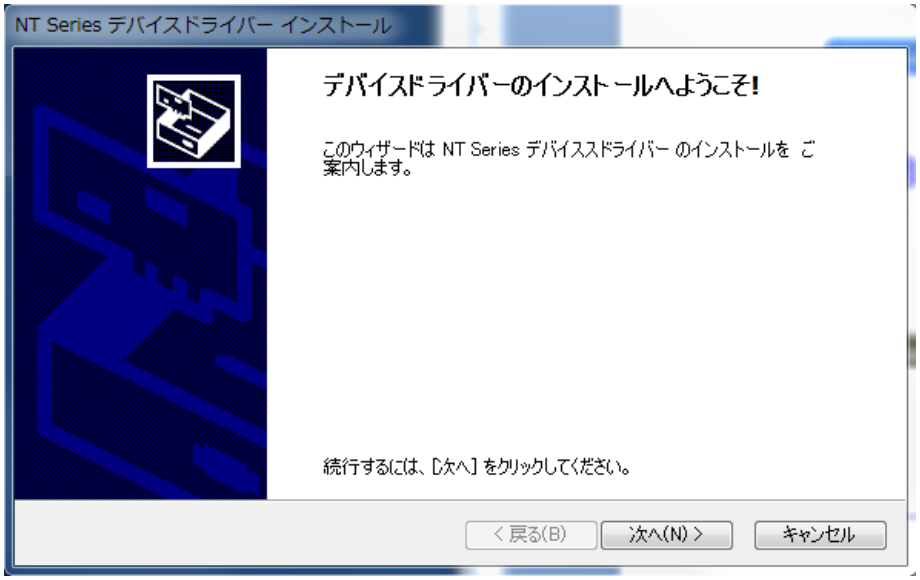
(2) Installation of device driver
Next, USB device driver should be installed.

(3) Installation of device driver for KG application

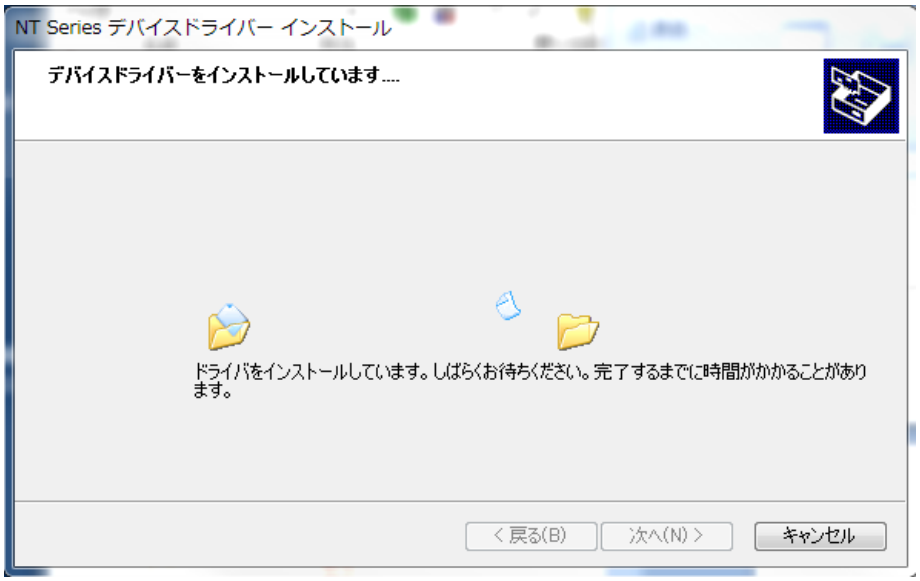
(a) Insert SUPPORT CD for AC/DC Electronic Load CD-ROM to CD-ROM drive. Connect between the PC and this instrument with USB cable.

(b) After insert the CD-ROM, double-click “dpinst.exe” on ¥¥NT-Series¥Driver¥32bit or 64bit folder in CD-ROM using Explorer or the same function.

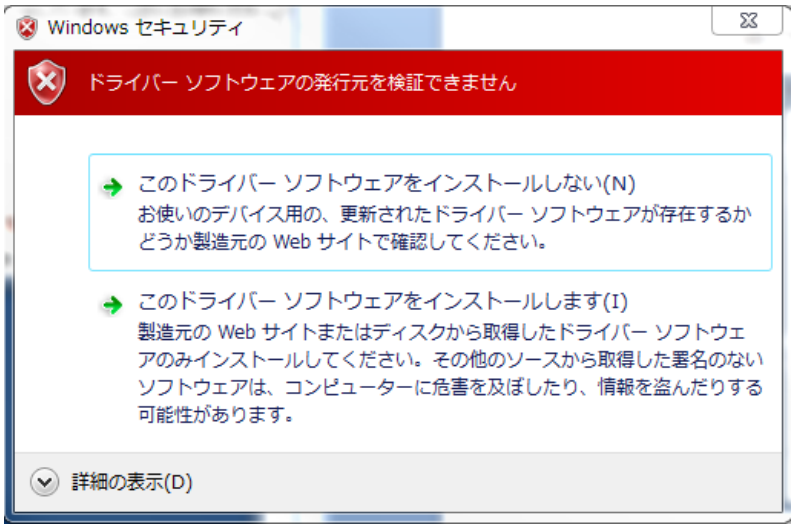
(c) The installer is booted up. Install it by the direction.
Click “Next > (次へ(N) >)”.



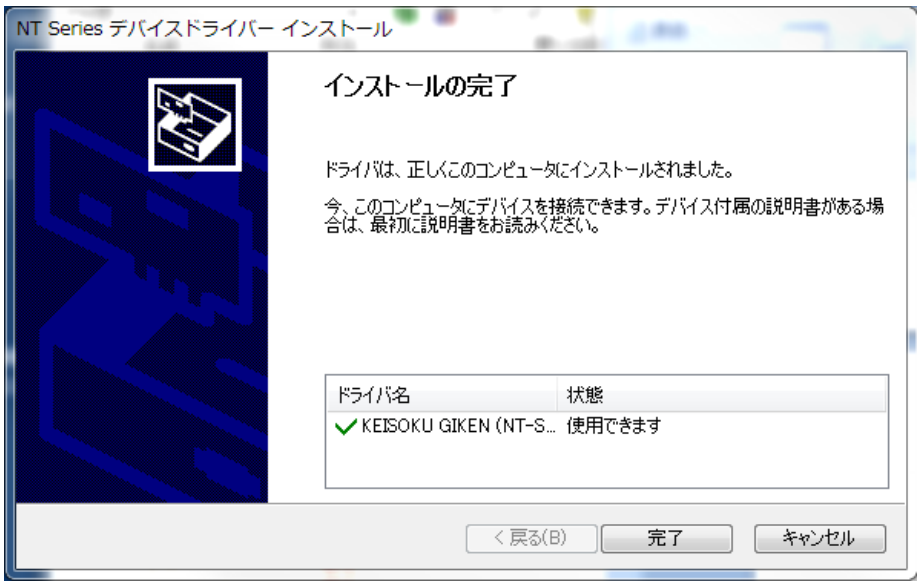
(d) The message "Installing device driver ...(デバイスドライバーをインストールしています....)" is displayed.



(e) When the following message is appeared, click "Install this driver software (I) (このドライバー ソフトウェアをインストールします(I))" for proceeding installation.

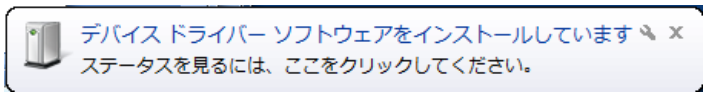


(f) If no problem is found, the installation is completed with the following screen. Click “Finish (完了)” for the finish.



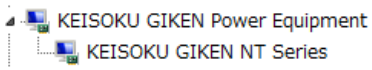
(g) Connection with this instruments
Connect between PC and this instrument with USB cable.

(h) The following message of “Installing device driver software” is displayed.



(i) If no problem is found, confirm the connection.

(j) Confirmation of connection
When the following is displayed in device manager, the installation is completed correctly.



(4) The reference of ActiveX control functions

Note This is a command for in-house testing, please avoid using it.

- The library include additional command to the following command but do not use those commands because it will cause unsatisfaction of the specification due to it is for just internal debugging.

The instrument can be controlled by USB similar to by GPIB control.

Useable Command

```
Cmdsend (devNo As Long. sndStr As String) As Long
CmdRcv (devNo As Long. rcvStr As String) As long
```

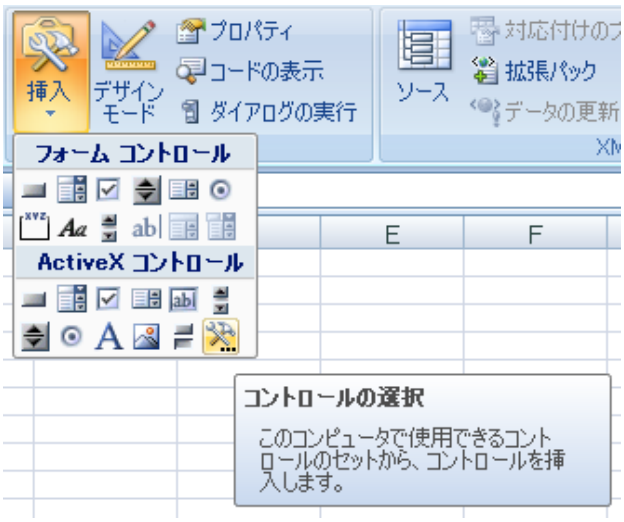
```
・Cmdsend (devNo As Long. sndStr As String) As Long
Send the command.
Example:CmdSend  1, "LD 1"              'LOAD ON
```

```
・CmdRcv(devNo As Long. rcvStr As String) As long
Receive the return value.
Example:Dim ret As Variant
        CmdRcv  1, rcv           'rcv = return value
```

ActiveX control using Excel

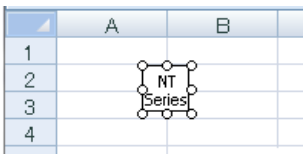
The selection of ActiveX from Excel using Visual Basic is described.

(1) Boot up Excel and select “Insert” > “Controls” in “Developer” tab.



(2) Select KEISOKU GIKEN NT-Series Control from control list.
Select KEISOKU GIKEN NT-Series Control from control list.
Select Lib¥ NT-Series.ocx in installation directory from 「Register Custom」 if it is not displayed.

(3) It becomes available when the small icon is appeared by pasting the control.

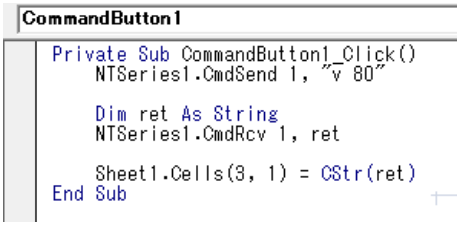


USB sample program

The examples of Visual Basic program using Excel are described.
Please refer to the technical book for details of Visual Basic.

Sample Program

Read the version of the firmware for this instrument and display on the work sheet.



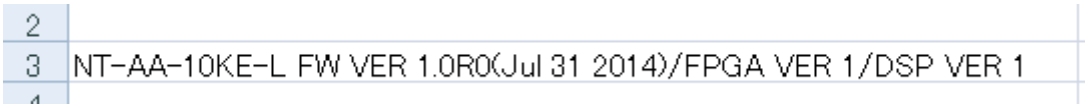
Visual Basic design window on Excel

```
Private Sub CommandButton1_Click( )
   Dim rcv As String
   NTSeries1.CmdSend    "v"
   NTSeries1.CmdRcv    rcv
   Sheet1.Cells(3, 1) = rcv
End Sub
```

- The event with click CommandButton1.

- Send command of reading version.
- Receive the reading value from this instrument.
- Reading value is displayed in cell A3.

The firmware version of this instrument is displayed on Excel work sheet after execution as follows.



Work sheet after sample program execution

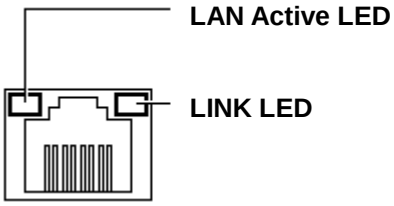
LAN (Ethernet) Interface

(1) Interface specification

Transmission Spec.	IEEE 802.3
LAN I/F Connector	RJ45
Data rate	10Base-T 100Base-TX

LAN I/F Transmission Specification

The communication status with the instrument can be detected by LED on LAN I/Fconnector.
Outline of LAN I/F and the description of LED indicator are as follows.



Outline of LAN I/Fconnector

LED	LED status	Description
LAN Active LED	Green light	Normal link connection
	No light	No link connection
Link LED	No light	No Transmission data
	Orange blinking	Under transmission

LAN I/F connector LED description

(2) IP address

Protocol	Ene-phant Series Default IP address	Port number
TCP/IP	172.29.130.40	10001

Default IP Address and Port number

Note Supported only multicast communication

- Only one-to-one multicast communication is supported.
- One-to-many broadcast communication is not supported.

(3) LAN(Ethernet) Connection Check

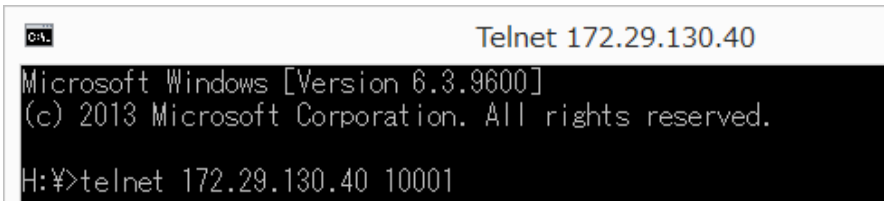
If telnet can be used, it is easy to confirm LAN I/F operation.

* telnet is the name of General Transmission Control Protocol mainly used in IP network. In general the terminal software which can handle this protocol is also called telnet.
  telnet is installed in Windows as standard.

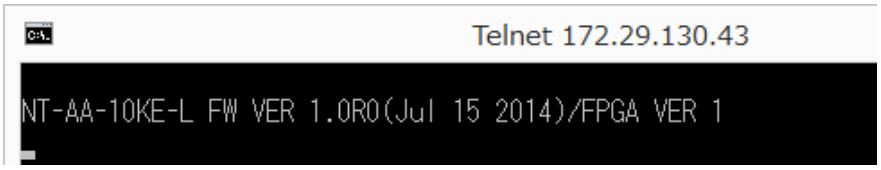
The following descriptions are the example of telnet for Windows.

(a) Boot up Command Prompt
In case of Windows 10, start it from the Start menu -> [Windows System Tools] -> [Command Prompt].

(b) Boot up telnet
Type “telnet” and “10001” for IP Address of this instrument and followed by Enter key. The display is temporary cleared when this instrument is connected.



(c) Input commands
The command to get version information is executed as example.
Input “lv” when no display appeared and push enter key.
The version information can be displayed as the following screen.



Then, it is confirmed that LAN I/F is operated correctly.

Note Precautions when sending commands

- The echo back is not performed unless sending the command with return value. “lv” command must to be sent after connection with telnet.
- No back space is allowed. The error of command input should be corrected by sending it once. Then please retry to input correct command.

(4) Search IP Address of this instrument

(a) Execute setup.exe in Device Installer and install Device Installer.

(b) Execute Device Installer.

(c) The IP Address of this instrument is displayed. If it is not displayed, execute search.

(5) Change to DHCP (XPort)

(a) Input IP Address of this instrument to internet browser (IE is recommended) address.

(b) Input User Name: “admin”, password: (none) for login display.

(c) Select left menu [Network]

(d) Select [Obtain IP address automatically] button.

(e) Select left menu [Apply Settings]. →The setting is saved.

(f) Close IE.

(g) Reboot this instrument.

(h) Confirm connection by telnet 172.29.130.xx 10001.
Confirm operation by [lv].

(6) Change to Fixed IP Address (XPort)

(a) Input IP Address of this instrument to internet browser (IE is recommended) address.

(b) Input User Name: “admin”, password: (none) for login display.

(c) Select left menu [Network].

(d) Select [Use the following configuration] button.

(e) Set [IP Address: 172.29.130.xx], then set [Subnet Mask: 255.255.255.0].

(f) Select left menu [Apply Settings]. →The setting is saved.

(g) Close IE.

(h) Reboot this instrument.

(i) Confirm connection by telnet 172.29.130.xx 10001.
Confirm operation by [lv].

(7) When forget IP Address

When IP Address of this instrument is forgotten, search it by executing “Search IP Address of this instrument”.
The networks which cannot be use “Search IP Address of this instrument”, please carefully change IP Address because it cannot be confirm for single instrument.
It is recommended taking memo of address when IP Address will be changed.

Note Be sure to take note of IP address when changing.

- Please note that no recovery is expected when IP Address setting and changing has been failed.

GPIB Interface (Option)

(1) Interface Specification

Transmission specification	IEEE 488.1

GPIB I/F Transmission specification

Information GPIB Interface is optional.

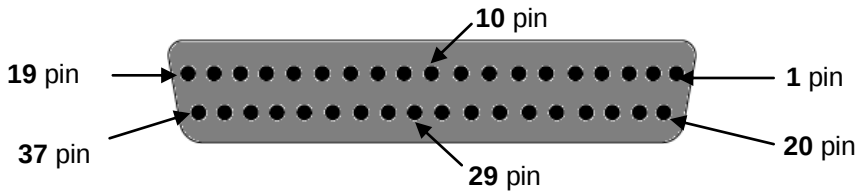
◆ GPIB Interface is optional. Please refer to “List of options: エラー! 参照元が見つかりません。”.

External Control (DIDO) Interface

(1) DIDO Overview

The control and status monitoring are available by using external switch in this instrument. DIDO has two signal value converted from voltage signal availability and use specific connector in rear panel.

(2) DIDO Interface Specification



Outline of Female Connector

Model No.	17LE-13370-27(D3AB)-FA
Manufacturer	DDK
Pin Count	37

Female Connector Specification

* Please use male connector fitting to above female connector.

	Circuit Ratings
Digital Input(DI)	5 V / 20 mA
Digital Output(DO)	Max. 30 V / 10 mA

DIDO Interface Circuit Ratings

Please provide external power supply for input and output which needs bias voltage to pull-up open terminals.

Note It may damage the equipment.

- ◆ Power switch must be OFF prior to connection and removal of connectors.
- ◆ DIDO control is not allowed for parallel operation with Master-Slave configuration.
- ◆ The power switch has to be ON after all digital inputs (DI) are in open status.

(3) DIDO Connector Pin Assignment

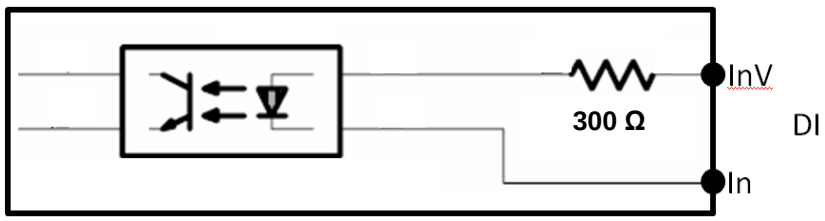
Refer to the table next page for signal description for each pin.

Pin	Signal Name	IN/OUT	Notes	Signal
1	DO[0]+/LOAD_ON	OUT	External load ON output+	Photocoupler open collector output (Pair with 20 pin)
2	DO[1]+/ACDC_SEL	OUT	External AC/DC selection output+	Photocoupler open collector output (Pair with 21 pin)
3	DO[2]+/LOAD_MODE_0	OUT	External load mode selection output 0+	Photocoupler open collector output (Pair with 22 pin)
4	DO[3]+/LOAD_MODE_1	OUT	External load mode selection output 1+	Photocoupler open collector output (Pair with 23 pin)
5	DO[4]+/LOAD_MODE_2	OUT	External load mode selection output 2+	Photocoupler open collector output (Pair with 24 pin)
6	DO[5]+/Reserved	-	Reserved	
7	DO[6]+/Reserved	-	Reserved	
8	DO[7]+/EMGC_STOP	OUT	External emergency stop output+	Photocoupler open collector output (Pair with 27 pin)
9	Reserved	-	Reserved	
10	DI[0]+/DI_SEL	IN	External digital input selection+ (Input available anytime)	Photocoupler input (Pair with 29 pin)
11	DI[1]+/AI_SEL	IN	External analog input selection+ (Input available anytime)	Photocoupler input Pair with 30 pin)
12	DI[2]+/LOAD_ON	IN	External load ON input+	Photocoupler input (Pair with 31 pin)
13	DI[3]+/ACDC_SEL	IN	External AC/DC selection output+	Photocoupler input (Pair with 32 pin)
14	DI[4]+/LOAD_MODE_0	IN	External load mode selection input 0+	Photocoupler input (Pair with 33 pin)
15	DI[5]+/LOAD_MODE_1	IN	External load mode selection input 1+	Photocoupler input (Pair with 34 pin)
16	DI[6]+/LOAD_MODE_2	IN	External load mode selection input 2+	Photocoupler input (Pair with 35 pin)
17	DI[7]+/EMGC_STOP	IN	External emergency stop input+ (Input available anytime)	Photocoupler input (Pair with 29 pin)
18	Reserved	-	Reserved	
19	Reserved	-	Reserved	
20	DO[0]-/LOAD_ON	OUT	External load ON output-	Photocoupler open collector output (Pair with 1 pin)
21	DO[1]-/ACDC_SEL	OUT	External AC/DC selection output-	Photocoupler open collector output (Pair with 2 pin)
22	DO[2]-/LOAD_MODE_0	OUT	External load mode selection output 0-	Photocoupler open collector output (Pair with 3 pin)
23	DO[3]-/LOAD_MODE_1	OUT	External load mode selection output 1-	Photocoupler open collector output (Pair with 4 pin)
24	DO[4]-/LOAD_MODE_2	OUT	External load mode selection output 2-	Photocoupler open collector output (Pair with 5 pin)
25	DO[5]-/Reserved	-	Reserved	
26	DO[6]-/Reserved	-	Reserved	
27	DO[7]-/EMGC_STOP	OUT	External emergency stop output-	Photocoupler open collector output (Pair with 8 pin)
28	Reserved	-	Reserved	
29	DI[0]-/DI_SEL	IN	External digital input selection- (Input available anytime)	Photocoupler input (Pair with 10pin)
30	DI[1]-/AI_SEL	IN	External analog input selection- (Input available anytime)	Photocoupler input (Pair with 11 pin)

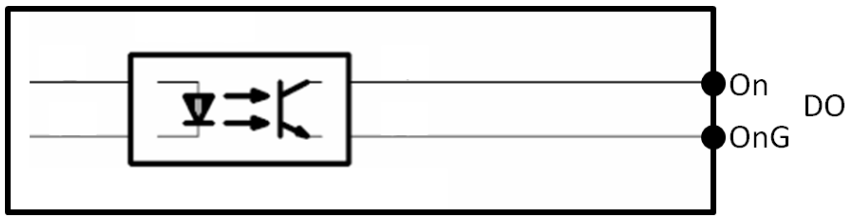
31	DI[2]-/LOAD_ON	IN	External load ON input-	Photocoupler input (Pair with 12 pin)
32	DI[3]-/ACDC_SEL	IN	External AC/DC selection output-	Photocoupler input (Pair with 13 pin)
33	DI[4]-/LOAD_MODE_0	IN	External load mode selection input 0-	Photocoupler input (Pair with 14 pin)
34	DI[5]-/LOAD_MODE_1	IN	External load mode selection input 1-	Photocoupler input (Pair with 15 pin)
35	DI[6]-/LOAD_MODE_2	IN	External load mode selection input 2-	Photocoupler input (Pair with 16 pin)
36	DI[7]-/EMGC_STOP	IN	External emergency stop input- (Input available anytime)	Photocoupler input (Pair with 17 pin)
37	Reserved	-	Reserved	

DIDO Interface Signal List

(4) Internal Circuit

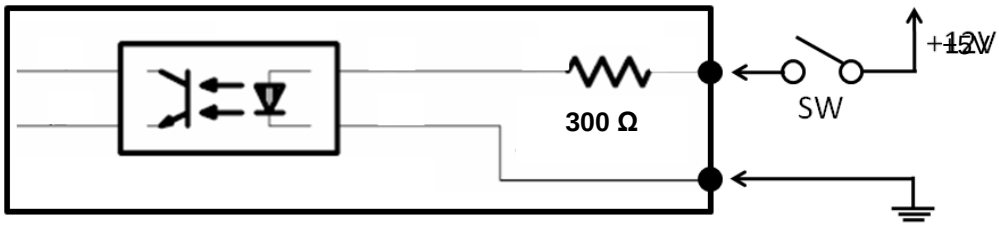


Digital Input (DI) Circuit



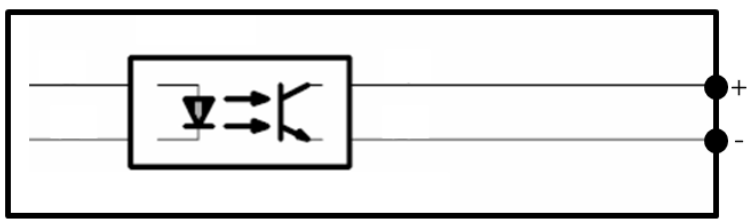
Digital Output (DO) Circuit

(5) Function



DI Input open and closed

* When SW is ON, it become closed and SW is OFF, it become open.



DO Output

① **DI Signal Enable/Disable Selection**

Enable DI signal pins which is not available anytime (③④⑤ on next page) .
External signal can be applied to 10 and 29 pin in DIDO connector.

DI Signal Input	DI_SEL Status of 10 and 29 pins
Disable	Open
Enable	Closed

DI signal enable/disable setting table

② **AI Signal Enable/Disable Selection**

Enable AI signal inputs. External signal can be applied to 11 and 30 pin in DIDO.
This signal is available anytime.

AI Signal Input	AI_SEL Status of 11 and 30 pin
Disable	Open
Enable	Closed

AI signal enable/disable setting table

③ **LOAD ON / OFF**

LOAD ON/OFF is controlled by external switch. External signal can be applied to 12 and 31 pin in DIDO. It is compatible with command “LD”.

LOAD	LOAD_ON Status of 12 and 31 pin
OFF	Open
ON	Closed

DI setting table for LOAD ON/OFF

④ **Switching of AC/DC for LOAD**

AC/DC of load input is selected by external switch. External signal can be applied to 13 and 32pin in DIDO. It is compatible with command “AD”.

Load Input Mode	ACDC_SEL Status of 13 and 32 pin
AC	Open
DC	Closed

DI setting table for AC/DC of load

⑤ **Load Mode Selection**

Load mode is controlled by external switch. External signal can be applied to 14 and 33 pin, 15 and 34, 14 and 33 in DIDO as 3 bit signal processing. It is compatible with command “LM”.

Load Mode	LOAD_MODE2 Status of 16 and 35 pin	LOAD_MODE1 Status of 15 and 34 pin	LOAD_MODE0 Status of 14 and 33 pin
CV (DC)	Open	Open	Open
CC (AC/DC)	Open	Open	Closed
CR (AC/DC)	Open	Closed	Open
CP (AC/DC)	Open	Closed	Closed
MPPT (DC)	Closed	Open	Open
CF (AC)	Closed	Open	Closed

DI Setting table for Load Mode

* Analog setting of load value is not allowed for CV,CR,CF load mode.

⑥ **Emergency Stop Signal control**

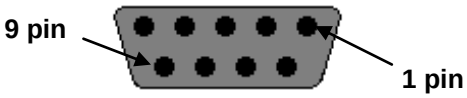
Emergency stop Signal load mode is controlled by external switch. External signal can be applied to 17 and 36 pin in DIDO.

Emergency stop signal	EMGC_STOP Status of 17 and 36 pin
Emergency stop release	Open
Emergency stop	Closed

DI Setting table for Emergency stop signal

External Control (AI) Interface

(1) Interface Specification



Outline of Female Connector

型名	17LE-13090-27(D3AB)-FA
Manufacturer	DDK
Pin Count	9

Female Connector Specification

* Please use male connector fitting to above female connector.
Example: DDK, 17JE-13090-02(D1)

Note It may damage the equipment.

- ◆ Power switch must be OFF prior to connection and removal of connectors.
- ◆ AI control is not allowed for parallel operation with Master-Slave configuration.

(2) AI Connector Pin Assignment

Refer to the table next page for signal description for each pin.

Pin	Signal Name	IN/GND	Notes	Signal
1	EXT_CC-	IN	External constant current Analog input-	0~10 V (Pair with 6 pin)
2	EXT_CP-	IN	External constant voltage Analog input-	0~10 V (Pair with 7 pin)
3	EXT_PHASE_SHIFT-	IN	External phase control Analog input-	0~10 V (Pair with 8 pin)
4	Reserved	-	Reserved	
5	GND	GND	Ground	GND
6	EXT_CC+	IN	External constant current Analog input+	0~10 V (Pair with 1 pin)
7	EXT_CP+	IN	External constant voltage Analog input+	0~10 V (Pair with 2 pin)
8	EXT_PHASE_SHIFT+	IN	External phase control Analog input+	0~10 V (Pair with 3 pin)
9	Reserved	-	Reserved	

AI Interface Signal list

Note It may damage the equipment.

- ◆ EXT_CP signal input is valid only for CP mode in this instrument load mode.
- ◆ EXT_CC and EXT_PHASE_SHIFT are valid only for CC mode in this instrument load mode.
- ◆ Do not use AI control for parallel operation with Master-Slave configuration.
- ◆ NT-AA-10KE-L has High range and Low range. Note that different constant current setting value of EXT_CC is adopted in each range even if the same signal value is applied.

Master-Slave Configuration

(1) Overview

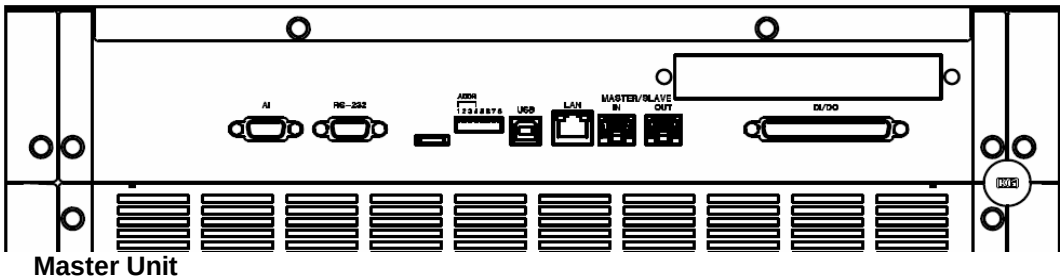
The simultaneous LOAD ON/OFF control and control value setting (broadcast) for the plural same models of Ene-phant Series can be performed for the parallel operation with Master-Slave configuration. In addition, PC will communicate only with Master unit for their interface so that the simplified wiring can be realized for plural units testing.

(2) Cable

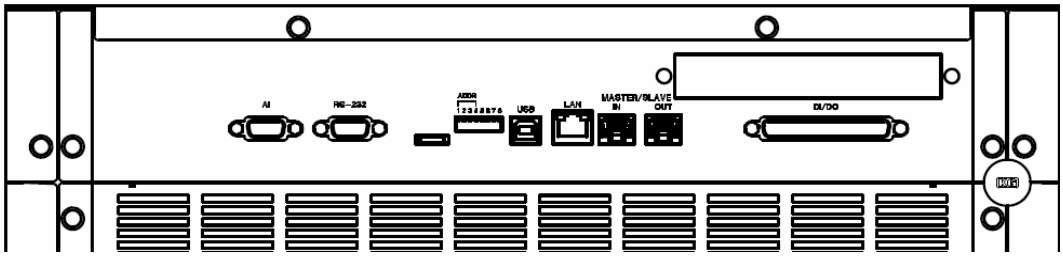
The cables for Master-Slave connection are option.
Please refer to “_____

Specifications (p.87~) エラー! 参照元が見つかりません。” for allowance of the number of Slave units.

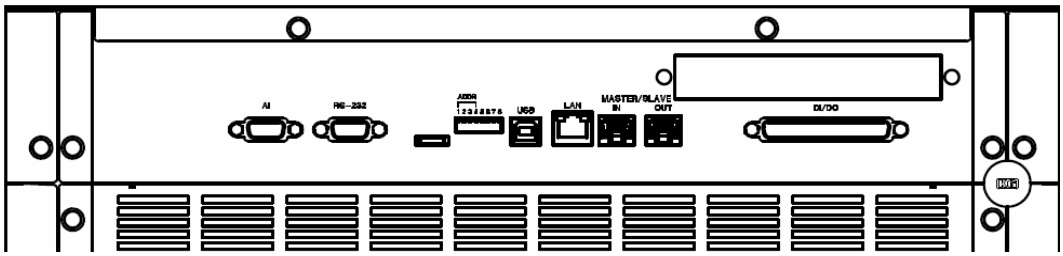
(3) The drawing of Master-Slave Configuration



Master Unit



Slave Unit



Slave Unit

The drawing of Master-Slave Configuration (for 3 units)

(4) Switch to parallel operation

Two ways of switching to parallel operation with Master-Slave configuration are described.

① Switching from UI operation on the front panel.
To enabling parallel operation, refer to "(11) Enable/Disable Parallel operation (p.36)" for detailed operation.
To specify wiring method for parallel operation, refer to "(12) Setting of Load connection system (p.36)" for details.

② Switching form PC by sending commands.
The same operation with previous way of ① can be performed by the command base
Refer to "(2) Control Command 2 (p.48)" for the description of the corresponding commands.
Also refer to "Phase 3-Wire AC Input (NT-AA-10KE-L) (p.84)" for the example of application using those commands.

(5) Setting Command for Parallel Operation

The setting control values to each unit with Master-Slave configuration are described below. The same commands can be set from UI operation on front panel.
The control setting range for Master unit will be changed.

Function	Command	Setting for 3P3W	Setting for non-3P3W
Constant Voltage Value Setting [CV value set]	CV {<value>}	①	①
Constant Current Value Setting [CC value set]	CC {<value>}	①	②
Constant Resistance Value Setting [CR value set]	CR {<value>}	①	③
Constant Power Value Setting [CP value set]	CP {<value>}	①	②
Crest Factor Value Setting [CFvalue set]	CF {<value>}	①	①
Phase Shift Setting [Phase Shift set]	PS {<data>}	①	①
Power Factor Setting [Power Factor set]	PF {<value>}	①	①
Current Limit Value Setting [Current Limit value set]	CL {<value>}	①	②
Voltage Limit Value Setting [Voltage Limit value set]	VL {<value>}	①	①
Power Limit Value Setting [Power Limit value set]	PL {<value>}	①	②
Soft-Start Time Setting [Soft-Start time set]	SS {<time>}	①	①

Each control value setting item andcommand

①: The value in {<value>}is set for all parallel units as it is.
* Example: 3 A is set for Master unit in CC mode
⇒The constant current value of 3 A is set for Master and all Slave units.

②: The value in {<value>} is set for all parallel units with divided by the number of parallel units. The setting range upper and lower limits for Master are multiplied by the number of parallel units.
* Example: 12 A is set for Master unit in CC mode with 3 parallel units.
⇒The constant current value of 4 A is set for Master and all Slave units.

③: The value in {<value>} is set for all parallel units with multiplied by the number of

parallel units. The setting range upper and lower limits for Master are divided by the number of parallel units.

* Example: 3 Ω is set for Master unit in CR mode with 3 parallel units.
  ⇒The constant resistance value of 9 Ω is set for Master and all Slave units.

(6) Measurement for Parallel Operation

The measurement for Master-Slave configuration is described below.
The measurement values for each unit are not able to obtain in operation with Master-Slave configuration.

Item	Read value from Master
Voltage	Measurement value of Master unit.
Current	The sum of all paralleled units.
Effective Power	The sum of all paralleled units.
Apparent Power	The sum of all paralleled units.
Frequency	Measurement value of Master unit.
Power Factor	Measurement value of Master unit.
Peak Current	The sum of all paralleled units.
Load side accumulated power	The sum of all paralleled units.
Grid side effective power	The sum of all paralleled units.
Grid side apparent power	The sum of all paralleled units.
Grid side accumulated power	The sum of all paralleled units.

Measurement item and description of read value

Note It may damage the equipment.

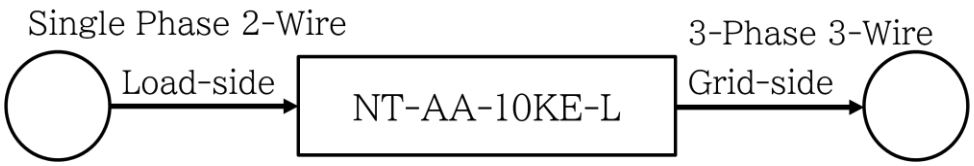
- Power switch must be OFF prior to connection and removal of connectors.
- The same model and method to attach short bar must be used for all units for Master-Slave configuration.
- Emergency stop status for all Master-Slave configurated units is activated by disconnect of Master-Slave linkage during parallel operation like removal of any cable. Emergency stop status is also activated when the parallel operation is finished by command or UI operation. To escape from this status to isolated operation, all units have to be powered off temporary.

Chapter 6. Example of Applications

This chapter describes the example of typical instrument usage with command level operation.

Single Phase 2 wire AC input (NT-AA-10KE-L)

(1) Configuration



The image of the connection

(2) Configuration

* All number using in command input has to be decimal.

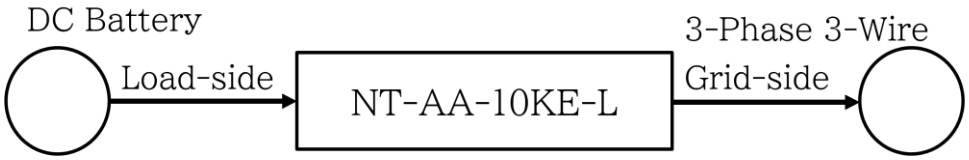
* For the control using LAN I/F、”L” must be added to the head of command.

Example: “V” → “LV”

	Command or Operation	Notes
1	Grid side connection	Connect 3P3W grid to grid terminal block.
2	Load side connection	Connect DUT to load terminal block.
3	Booting of NT-AA-10KE-L	Powered on for NT-AA-10KE-L.
4	[cmd] V	Obtain version information and confirm model name.
5	[cmd] AD 0	Specify AC load.
6	[cmd] LM 2	Specify CR load mode.
7	[cmd] CR <value>	Setting constant resistance value of load side.
8	[cmd] LD 1	Turn load ON.
9	[cmd] MR 0 7 [ret] Voltage/Current/Effective power/Peak current Apparent power/Power factor/Frequency	Measure Voltage/Current/Effective power/Peak current Apparent power/Power factor/Frequency.
10	[cmd] LD 0	Turn load OFF.
11	Stop NT-AA-10KE-L	Power off for NT-AA-10KE-L

Storage Battery DC Input (NT-AA-10KE-L)

(1) Configuration



The image of the connection

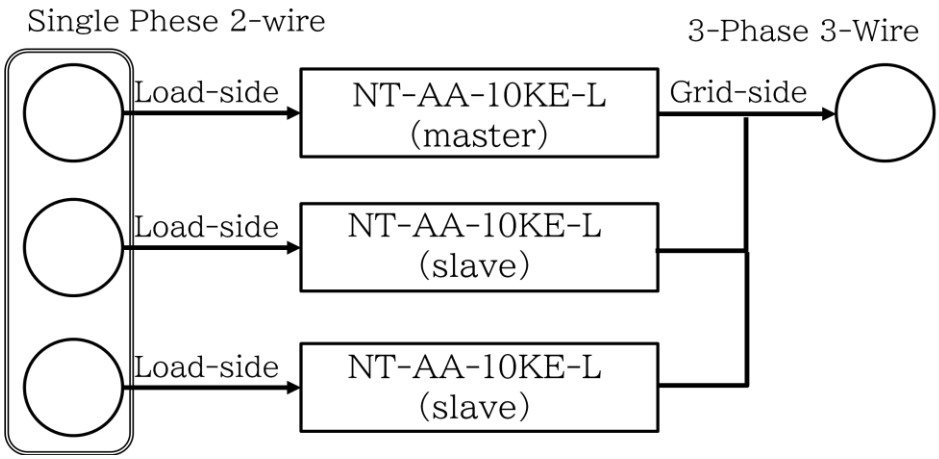
(2) Operation

* All number using in command input has to be decimal.
* For the control using LAN I/F、”L” must be added to the head of command.
Example: “V” → “LV”

	Command or Operation	Notes
1	Grid side connection	Connect 3P3W grid to grid terminal block.
2	Load side connection	Connect DUT to load terminal block.
3	Booting of NT-AA-10KE-L	Powered on for NT-AA-10KE-L.
4	[cmd] V	Obtain version information and confirm model name.
5	[cmd] AD 1	Specify DC load.
6	[cmd] LM 1	Specify CC load mode.
7	[cmd] CC <value>	Setting constant current value of load side.
8	[cmd] LD 1	Turn load ON.
9	[cmd] MR 0 7 [ret] Voltage/Current/Effective power/Peak current Apparent power/Power factor/Frequency	Measure Voltage/Current/Effective power/Peak current Apparent power/Power factor/Frequency.
10	DC Voltage Comparison	The control side (User program etc.) confirms whether measured DC voltage become expected discharge voltage or not. YES：to item 11 /NO：to item 9
11	[cmd] LD 0	Turn load OFF.
12	Stop NT-AA-10KE-L	Power off for NT-AA-10KE-L

Phase 3-Wire AC Input (NT-AA-10KE-L)

(1) Configuration



The image of the connection

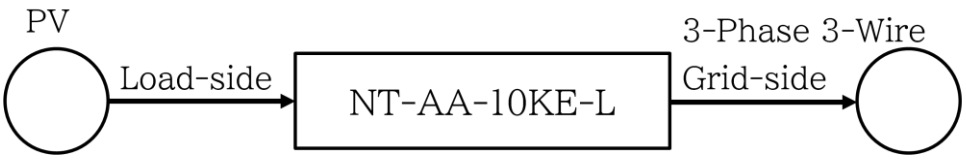
(2) Operation

* Connect each instruments for Master-Slave configuration.
* Connect communication cable (LAN/RS232C/USB/GPIB) to Master instruments.
* All number using in command input has to be decimal.
* For the control using LAN I/F、”L” must be added to the head of command.
  Example: “V” → “LV”

	Command or Operation	Notes
1	Grid side connection	Connect parallel 3P3W grid to each grid terminal block.
2	Load side connection	Connect DUT to load terminal block.
3	Booting of NT-AA-10KE-L	Powered on for NT-AA-10KE-L.
4	[cmd] V	Obtain Master version information and confirm model name.
5	[cmd] MS 1	Turn parallel operation control ON for the Master. The Slave will be automatically recognized through Master-Slave connection cable.
6	[cmd] PO 2	Specify 3P3W parallel operation mode from operation mode.
7	[cmd] AD 0	Specify AC load mode to the Master and the all Slaves. (Broadcast setting)
8	[cmd] LM 3	Specify CP load mode to the Master and the all Slaves. (Broadcast setting)
9	[cmd] CP <value>	Setting load side constant power setting value to the Master and the all Slaves. (Broadcast setting)
10	[cmd] LD 1	Turn load ON to the Master and the all Slaves. (Broadcast setting)
11	[cmd] MR 0 7 [ret] Voltage/Current/Effective power/Peak current Apparent power/Power factor/Frequency.	Measure Voltage/Current/Effective power/Peak current Apparent power/Power factor/Frequency.
12	[cmd] LD 0	Turn load OFF to the Master and the all Slaves. (Broadcast setting)
13	Stop NT-AA-10KE-L	Power off for each NT-AA-10KE-L

Photovoltaic cell (PV) DC Input (NT-AA-10KE-L)

(1) Configuration



The image of the connection

(2) Operation

* All number using in command input has to be decimal.

* For the control using LAN I/F、”L” must be added to the head of command.
Example: “V” → “LV”

	Command or Operation	Notes
1	Grid side connection	Connect 3P3W grid to grid terminal block.
2	Load side connection	Connect PV output to load terminal block.
3	Booting of NT-AA-10KE-L	Powered on for NT-AA-10KE-L.
4	[cmd] V	Obtain version information and confirm model name.
5	[cmd] AD 1	Specify DC load.
6	[cmd] LM 4	Specify MTTP load mode.
7	[cmd] LD 1	Turn load ON.
8	[cmd] MR 0 7 [ret] Voltage/Current/Effective power/Peak current Apparent power/Power factor/Frequency.	Measure Voltage/Current/Effective power/Peak current Apparent power/Power factor/Frequency.
9	[cmd] LD 0	Turn load OFF.
10	Stop NT-AA-10KE-L	Power off for NT-AA-10KE-L

Chapter 7. The Specification of NT-AA-10KE-L

The condition for the specification is as follows unless otherwise specified.

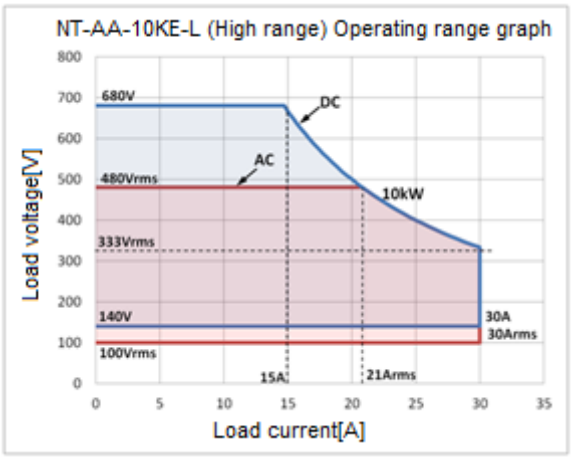
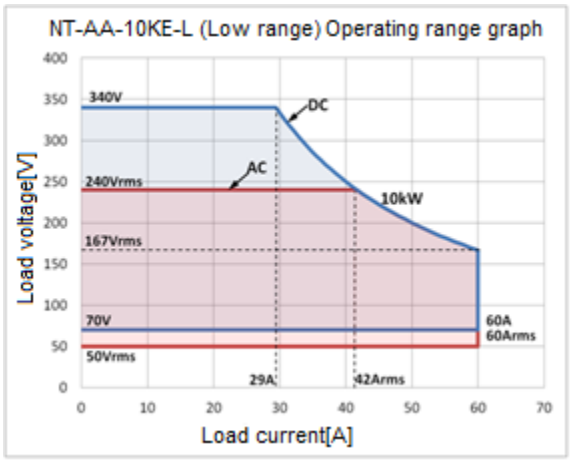
- Warm up time: more than 30 minutes
- Temperature: 23 °C ± 5 °C, Relative Humidity: less than 70 %

* All specifications indicate warranted accuracy in ambient temperature of 23 °C ± 5 °C and relative humidity of less than 70 %.

* Product specifications are subject to change without notice.

* The load current may become unstable when output inductance factor of DUT is over 100uH (like Generator) in AC mode. Furthermore frequency variation or waveform distortion close to zero cross may cause non-start of switching for internal inverter at LOAD ON stage. In this case, AX-OP11 (Load mode for generator option) is recommended to use which support stable load current control operation for CC and CR mode against inductance factor or frequency variation.

Specifications

Model name			NT-AA-10KE-L
Load Operating Range	High range		
	Low range		
DC Load Function			
DC Rating	Rated voltage	H	140 to 680 Vdc
		L	70 to 340 Vdc
	Rated current	H	30 Adc 10 kW > @330 V
		L	60 Adc 10 kW > @180 V
	Rated power		0 to 10 kW
	Efficiency		Power regeneration efficiency: 90% (at full load)
Constant Current (CC) Mode	Current setting range	H	0 to 30 Adc
		L	0 to 60 Adc
	Setting resolution	H	25 mA
		L	50 mA
	Setting accuracy (*1)		± 1.0 % ± 0.2 A (DC, 50 / 60 Hz) 5 A or less is outside the specification range
Constant Resistance (CR) Mode	Resistance setting range	H	4.7 to 6.8 kΩ
		L	1.2 to 3.4 kΩ
	Setting resolution		10 µMHO (Siemens)
	Setting accuracy (*2)		Converted current value ± 1.0 % ± 0.2 A 5 A or less is outside the specification range

Constant Voltage (CV) Mode	Voltage Setting range	H	140 to 680 V
		L	70 to 340 V
	Setting resolution	H	1.0 V
		L	0.5 V
	Setting accuracy	H	± 1.0 % of Setting ± 2.0 V
		L	± 1.0 % of Setting ± 1.0 V
Constant Power (CP) Mode	Power setting range		0 to 10 kW
	Resolution		20 W
	Setting accuracy (*2)		1.0 % of Setting ± 40 W 5 A or less is outside the specification range
MPPT Mode			Mountain climbing method
AC Load Function			
AC Rating	Rated voltage	H	100 to 480 Vrms
		L	50 to 240 Vrms
	Rated current	H	30 Arms 60 Apeak
		L	60 Arms 120 Apeak
	Rated power		0 to 10 kW
	Efficiency		Power regeneration efficiency: 90 % (at full load)
	Operating frequency		DC, 40 to 70 Hz (400 Hz optional)
	Apparent power		0 to 10 kVA
	Minimum operating voltage	H	100 Vrms
		L	50 Vrms
Constant Current (CC) Mode	Current setting range	H	0 to 30 Arms
		L	0 to 60 Arms
	Setting resolution	H	25 mA
		L	50 mA
	Setting accuracy (*1)		±1.0% ±0.2A (DC, 50/60 Hz) 5 A or less is outside the specification range
Constant Resistance (CR) Mode	Current setting range	H	3.4 to 6.8 kΩ
		L	0.9 to 3.4 kΩ
	Setting resolution		10 µMHO (Siemens)
	Setting accuracy (*2)		Converted current value ±1.0 % ±0.2 A 5 A or less is outside the specification range
Constant Power (CP) Mode	Current setting range		0 to 10 kW
	Setting resolution		20 W
	Setting accuracy (*2)		1.0 % of Setting ± 40 W 5 A or less is outside the specification range
Crest Factor (CF) Mode	Current setting range		1.4 to 4.0 (peak current limited)
	Setting resolution		0.1
DC Measurement Section (*3) (*4)			
DC Voltage Measurement	Voltage measurement range		0 to 748 V (680 V + 10 %)
	Measurement resolution		± 0.8 V
	Measurement accuracy		± 2.0 % of meas ± 1.0 V
DC Current Measurement	Current measurement range		0 to 66 A (60 A + 10 %)
	Measurement resolution		± 0.12 A
	Measurement accuracy		± 2.0 % of meas. ± 0.2 A

DC Power Measurement	Measurement range		0 to 11 kW (10 kW + 10 %)
	Measurement resolution		± 0.1 W
	Measurement accuracy		± 2 % of meas. ± 40 W
Grid Side Active Power Measurement	Measurement range		11 kW (10 kW + 10 %) (optional)
	Measurement accuracy		± 4 % of meas. ± 1 W (optional)
Grid Side Integrated Power Measurement	Measurement range		kWh (optional)
AC Measurement Section (*3) (*4)			
AC Voltage Measurement	Voltage measurement range		0 to 748 V (680 V + 10 %)
	Measurement resolution		± 0.8 V
	Measurement accuracy		± 2.0 % of meas ± 1.0 V
AC Current Measurement	Current measurement range		0 to 66 A (60 A + 10 %)
	Measurement resolution		± 0.12 A
	Measurement accuracy		± 2.0 % of meas. ± 0.2 A
Active Power Measurement	Measurement range		0 to 11 kW (10 kW + 10 %)
	Measurement accuracy		± 2 % of meas. ± 40 W
Power Factor Measurement	Measurement range		1 (rounded down to the third decimal place)
Frequency Measurement	Measurement range		40 to 70 Hz
Peak Current Measurement	Measurement range		0 to 132 A (120 A + 10 %) (*2)
Grid Side Active Power Measurement	Measurement range		11 kW (10 kW + 10 %) (optional)
	Measurement accuracy		± 4 % of meas. ± 1 W (optional)
Grid Side Integrated Power Measurement	Measurement range		kWh (optional)
Limit Function			
Current Limit	Current setting range	H	0 to 60 Aac / 0 to 30 Adc
		L	0 to 120 Aac / 0 to 60 Adc
	Resolution	H	0.5 A
		L	1.0 A
	Limit action		Limit operation for both AC and DC with instantaneous value
Voltage Limit	Setting range	H	100 to 480 Vrms / 140 to 680 V
		L	50 to 240 Vrms / 70 to 340 Vdc
	Resolution	H	1.0 V
		L	0.5 V
	Limit action		Alarm/Output OFF for both AC and DC instantaneous values
Power Limit	Setting range		100 W to 10 kW
	Setting resolution		20 W
Soft Start	Setting range		0, 1, 2, 5, 10 sec
Protection and Alarm Functions			
Protection Features	Emergency stop		Internal relay switch cutoff (stop operation by emergency stop button)
	Internal Overvoltage (IOVP)		Load shedding operation at internal HVDC 430 V and above

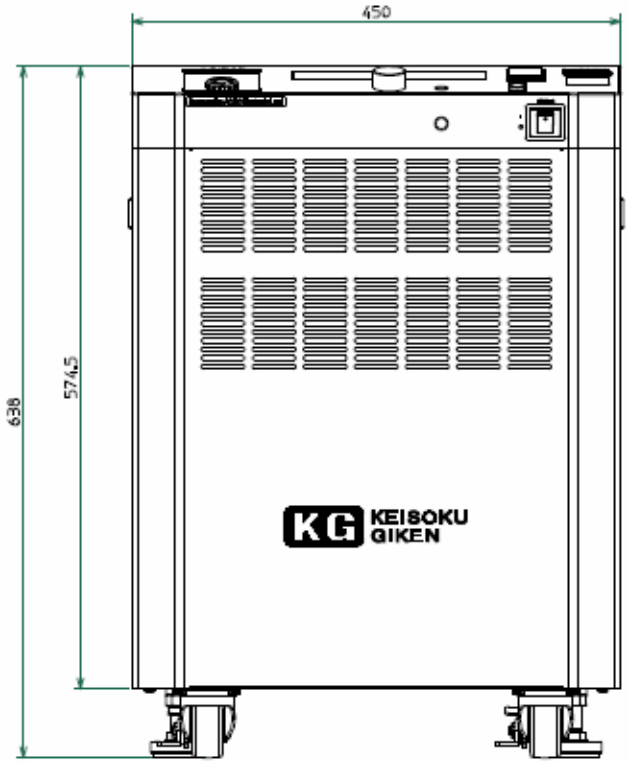
Protection Features	Overheat protection (internal overheat)		Switching device installation Heat sink operates at 90 °C or higher for load rejection
	Overcurrent protection (OCP)		Load shedding Setting resolution and accuracy are the same as CC mode (threshold set by current limit)
	Overvoltage protection (OVP)		Load shedding Setting resolution and accuracy are the same as for CV mode (threshold set at voltage limit)
	Under voltage (UVP)		Load shedding Setting resolution and accuracy are the same as in CV mode
	Overpower protection (OPP)		Load shedding for 10.5 kW or more
	DC side reverse connection (DRCP)		If the applied voltage is reversed, the LoadOn does not occur.
	Over frequency (OFP)		Load shedding above 75 Hz
	Under frequency (UFP)		Load shedding below 35 Hz
How to cancel the alarm			After removing the cause of the malfunction, operate the rotary encoder on the main unit to select ALARM-CLEAR.
Grid Protection Function	Overvoltage (OVR)		Setting: 220 to 280 V (10 V step) Detection time: 0.1 to 1.0 sec (0.1 sec/step) 1.5 sec/2.5 sec Automatic recovery after gate block operation Power recovery prevention time: 0 to 300 sec (2 sec/step)
	Under Voltage (UVR)		Setting: 120 to 190 V (10 V step) Detection time: 0.1 to 1.0 sec (0.1 sec/step) 1.0 to 10.0 sec (2 sec/step) Automatic recovery after gate block operation Power recovery prevention time: 0 to 300 sec (2 sec/step)
	Over Frequency (OFR)		Setting: 50.0 to 65.9 Hz (0.1 Hz step) Detection time: 0.0 to 9.9 sec (0.1 sec/step) Automatic recovery after gate block operation Power recovery prevention time: 0 to 300 sec (2 sec/step)
	Under Frequency (UFR)		Setting: 45.0 to 60.9 Hz (0.1 Hz step) Detection time: 0.0 to 9.9 sec (0.1 sec/step) Automatic recovery after gate block operation Power recovery prevention time: 0 to 300 sec (2 sec/step)
	Islanding Detection Passive (IDP)		Voltage phase jump setting range: 2 to 10° Detection time: 0.0 to 0.5 sec Gate block operation Automatic or manual return
	Islanding Detection Active (IDA)		Frequency shift detection Detection level: 2Hz Detection time: 0.5 to 1.0sec Gate block operation Automatic or manual recovery
	Islanding detection Active + Passive		Active and passive enabled. See above for specifications.
How to cancel the alarm			In case of a system protection alarm, restart the unit.
Other features			
Parallel Operation	Master / Slave	1P2W	1P2W: 1 to 5 units (using a dedicated cable)
		1P3W	1P3W: 2 / 4 units (using dedicated cable)
		3P3W	3P3W: 3 units (using dedicated cables)

Response Speed	Voltage		—
	Current	Direct current	200 usec or less (DC 200 V input, voltage low range)
		Exchange	400 usec or less (at DC 200 V input, low voltage range)
External control signal output/input			
DIDO	DI		Photocoupler Input
	DO		Photocoupler output (open collector)
	AI		0 to 10 V (CC/CP/phase setting)
Monitor Output (optional)	Voltage monitor		0 to 10 V / 0 to 1000 V, BNC / 50 Ω / isolated output (optional AX-OP03)
	Current monitor		0-10 V / 0-200 A, BNC / 50 Ω / isolated output (optional AX-OP03)
Interface			
USB			Standard, USB (1.1 compliant)
RS-232C			Standard
LAN (Ethernet)			Standard
GPIB (optional)			GP-IB (AX-OP04)
General Specifications			
Power Supply	Input rating		Three-phase, three-wire
	Input voltage/ frequency		202 V ± 20 V, 50/60 Hz
	Maximum grid current		31 A (when input voltage is 182V)
Input Power	At maximum load		200 VA or less (standby state)
Mass	Body only		171 kg
External Dimensions	Protrusions not included		W: 450 × H: 638 × D: 700 (mm)
Environmental Conditions	Operating area		Grid side input: 3Φ3W 202 V ± 20 V, 50/60 Hz Load side: 0 Arms to 60 Arms, 0 W to 10000 W/0 W to 12000 W
	Operating environment		Indoor
	Operating temperature		0 °C to +40 °C
	Operating humidity		20 % RH to 85 % RH (no condensation or corrosive gases)
	Storage temperature		0 °C to 50 °C
	Storage humidity		20 % RH to 85 % RH (no condensation or corrosive gases)
	Altitude		Up to 1000 m
	Cooling method		Forced-air cooling
Withstand Voltage			Between input and FG, between input and load terminals: 1500 V AC for 1 minute
Insulation Resistance			Between input and FG, between input and load terminal DC 500 V 30 MΩ or more
Ripple Current		H	1 A or less
		L	2 A or less
Switching Frequency			25 kHz
Accessories			
CD-ROM (instruction manual, driver installation manual, USB driver)			× 1
Short bar (terminal block mounting)			2 types, 1 of each

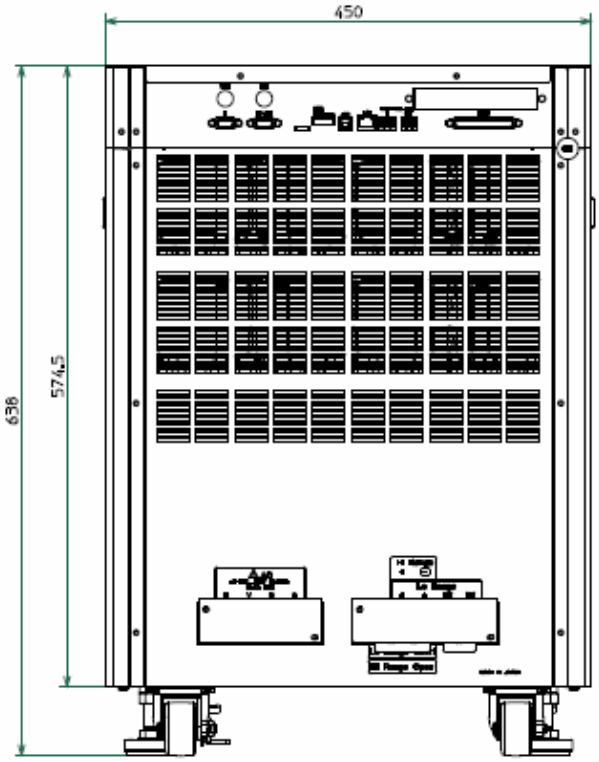
options	
Master-slave connection 1 m cable option	AX-OP01
Master-slave connection 3 m cable option	AX-OP02
Voltage/current monitor option	AX-OP03
GP-IB interface option	AX-OP04
400 Hz seamless frequency option (40 to 440 Hz)	AX-OP05
3 m AC cable option	AX-OP07
Grid side power measurement option	AX-OP08
Adjuster bracket option	AX-OP09
Option to convert grid side to single-phase three-wire 200 V	AX-OP10
Generator Load Mode Option (GCC/GCR)	AX-OP11
Frequency 400 Hz option (40 to 70 Hz / 380 to 420 Hz)	AX-OP15
Frequency 1000 Hz seamless option (for 5 to 1000 Hz / 10 kW)	AX-OP18

*1. Low range: 200 V, Hi range: 400 V. Accuracy is not guaranteed below 5 A.
*2. Low range: 200 V, Hi range: 400 V. Accuracy is not guaranteed below 5 A.
*3. Display is not guaranteed.
*4. The current measurement system is shared with the current sensor of the internal converter, so the current flowing through the filter circuit (approximately 15uF) will be an error.
* Product specifications are subject to change without notice.

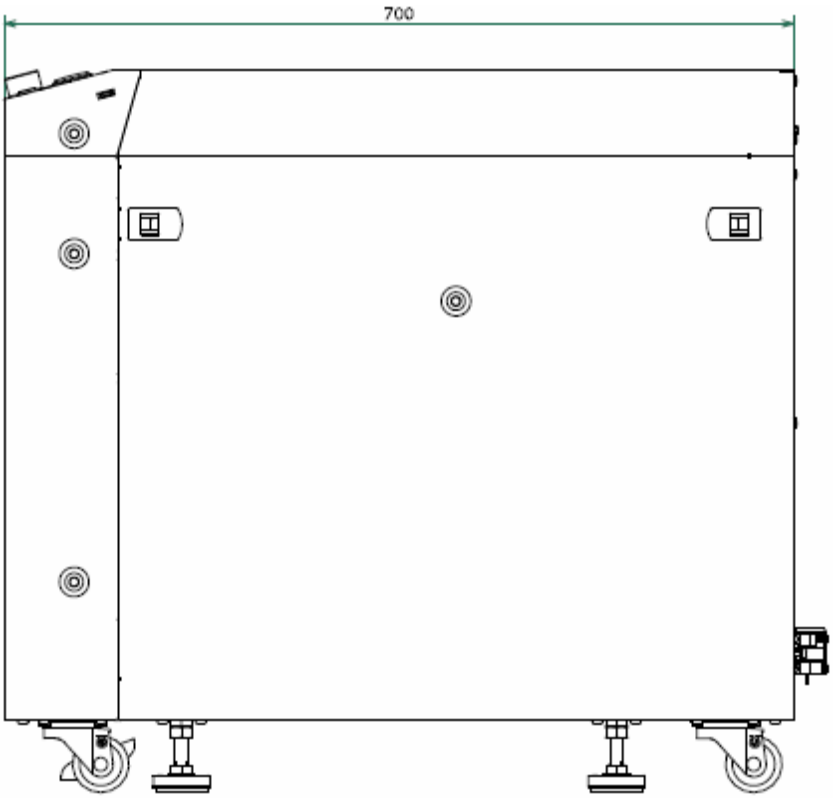
External dimensions NT-AA-10KE-L



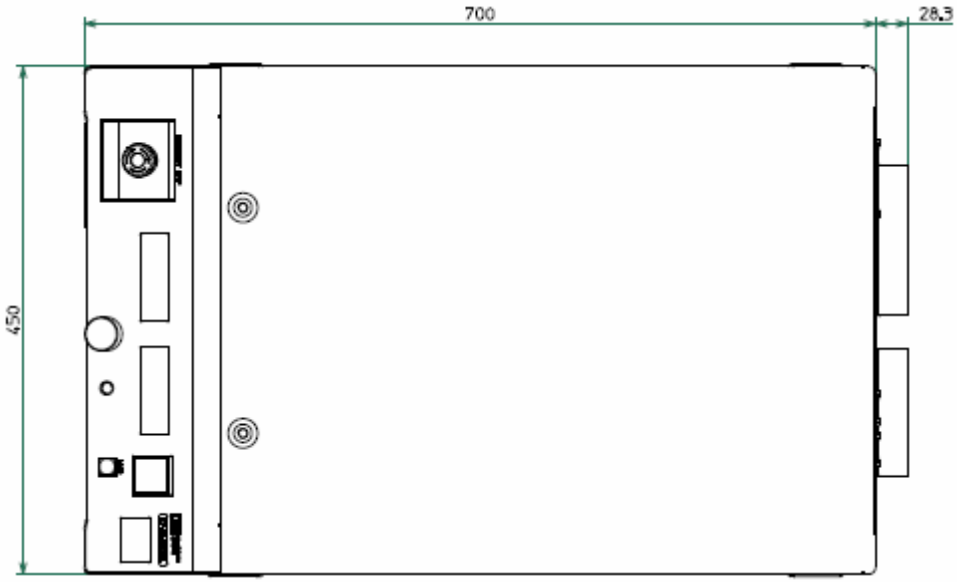
NT-AA-10KE-L External dimensions 1 Unit: mm



NT-AA-10KE-L External dimensions 2 Unit: mm



NT-AA-10KE-L External dimensions 3 Unit: mm



NT-AA-10KE-L External dimensions 4 Unit: mm

Chapter 8. Options

List of options

Name	Function	Description
AX-OP01	1m cable option for Master-Slave connection	1m cable for parallel control connection between units with the same model.
AX-OP02	3m cable option for Master-Slave connection	3m cable for parallel control connection between units with the same model.
AX-OP03	Voltage/Current Monitoring option	Option for output signal from BNC terminal on measurement value of current and voltage in this instrument.
AX-OP04	GP-IB interface option	Interface board option to enable remote control with GPIB from host PC etc. Refer to AX-0P04 operation manual for details.
AX-OP05	Load side frequency 400 Hz seamless option (40-440 Hz)	By specifying the option, seamless loading from 40-440 Hz is possible. This feature can be applied to the evaluation and testing of industrial motor inverters (smoothing inductance is required separately).
AX-OP07	3m AC cable option	It can be used for the connection between 3-phase 3-wire grid and the instrument.
AX-OP08	Grid side power measurement option	The measurement option of effective power, apparent power, and accumulated effective power for grid side of the instrument. The measurement results will be displayed to OLED in the front panel of the instrument. It is also possible to get those measurement values by command operation.
AX-OP09	Adjuster metal option	This option enables bolt fixing the instrument to the floor by attaching this metal to adjuster.
AX-OP10	Grid side single phase 3-wire 200 V	The input voltage can be changed to Single phase 3-wire connection (single phase, 2-wire possible) Also 3 phase 4-wire, 220 V, 230 V possible by order.
AX-OP11	Load Mode Option for Generator (GCC / GCR)	The option considering generator as DUT for this instruments. Two additional modes of GCC(Generator-CC) and GCR(Generator-CR) are added to CC and CR mode respectively.
AX-OP15	Frequency 400 Hz option (for 40-70 Hz / 380-420 Hz)	Standard frequency range is 40-70 Hz. By specifying option, AC 400 Hz (380-420 Hz) is available for use of aviation or ships.
AX-OP18	Frequency 1000 Hz seamless option (for 5 to 1000 Hz / 10 kW)	AC frequencies of 5 to 1000 Hz are supported.

Chapter 9. Maintenance and Calibration

Periodical maintenance and calibration are strongly recommended for long time use.

Cleaning

The cleaning for the instruments should be done timely by wiping lightly with soft or wet cloth.

CAUTION It may damage the equipment.

- Turn off power switch and remove all cables including power supply line and load wiring before cleaning.
- Do not use organic solvent (benzene, acetone et.) which may cause deterioration of plastic material and carefully avoid soaking of liquid like solvent into the instrument.
- Refer to "(6) Cleaning of filter (p.12)" for details of cleaning filter.

Input power cord

Please check and confirm that there is no tear for coated wire and crack or loose fitting for plug.

WARNING **The risk of electric shock.**

- The tear of coated wire may cause the risk of electric shock. Stop the operation immediately in this case.

Please contact representative or KG for purchase of attachment.

Calibration

Please contact representative or KG for calibration of the instrument.

Storage

Store the instruments in dry environment avoiding sunny and dust by covered by vinyl or packed in cardboard box. The storage temperature is 0 ~ 50 º C.

Re-Generative AC/DC Electronic Load
Ene-phant Series

NT-AA-10KE-L

Operation Manual

M-2387-02
Rev. 2.7

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Ene-phant Series
NT-AA-10KE-L
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