●Specifications for Measuring Display Unit (2)

Applicable models
NF250-SEV with MDU, NF250-HEV with MDU

Table 3

Item		Specification
Data updating cycle		250 ms (harmonic current: 2 s)
Tolerances		Current and voltage: ±1.0% (to rating input) Electric power: ±1.5% (to rating input) Reactive power: ±2.5% (to rating input) Harmonic current: ±2.5% (to rating input) Power factor: ±5% Frequency: ±2.5% Electric energy: ±2.0% (voltage 100 V to 440 V, range from 5 to 100% of current rating, power factor 1) Reactive energy: ±3.0% (voltage 100 V to 440 V, range from 10 to 100% of current rating, power factor 0) Fault current: ±15% (*1)
Demand time limit setting range		0 to 15 min (1-min steps)
Rated input	Voltage circuit (1ϕ2W, 3ϕ3W)	440 V (only 4-pole breakers applicable to 3ϕ4W)
	Voltage circuit (1ϕ3W)	
	Voltage circuit (3ϕ4W)	
	Current circuit	Load current/harmonic current: 250 A
	Frequency	50 Hz/60 Hz (automatic discrimination of frequency)
Power failure compensation	(1) Wh (integrated value) (2) Max. value (3) Setting data	Stored in EEPROM (nonvolatile memory) * Wh and varh are stored upon occurrence of power failure and every 30 min. Max. value is stored every 30 min. Setting data are stored when they are set.
	Clock	No power failure compensation
Clock accuracy		Approx. 1 min/month
External dimensions (unit: mm)		See Characteristics and Dimensions.
Control power supply		Compatible with 100 to 240 V AC/DC, 50/60 Hz (allowable voltage range: 85% to 110%), 12 VA (*2)
Other functions		Function for switching phases to be measured to 1-3 and 3-1 PAL alarm, self-retention/automatic reset setting function (*3) Function for counting number of times of opening and closing of circuit breaker body (*4)

Notes: *1 The measurement of fault current of load is enabled when the AL switch for transmission with Measuring Display Unit (option) is installed in the Measuring Display Unit Breaker body.
*2 When the MDU unit control power is turned on, a rush current transitionally flows (maximum rush current: 2A, energizing time: 1ms (240V AC)
*3 The PAL functions are enabled when the MDU breaker with PAL module (option) is used.
*4 The function is enabled when the AX switch for transmission with Measuring Display Unit (option) is installed in the Measuring Display Unit Breaker body.

●Network Specifications for Measuring Display Unit

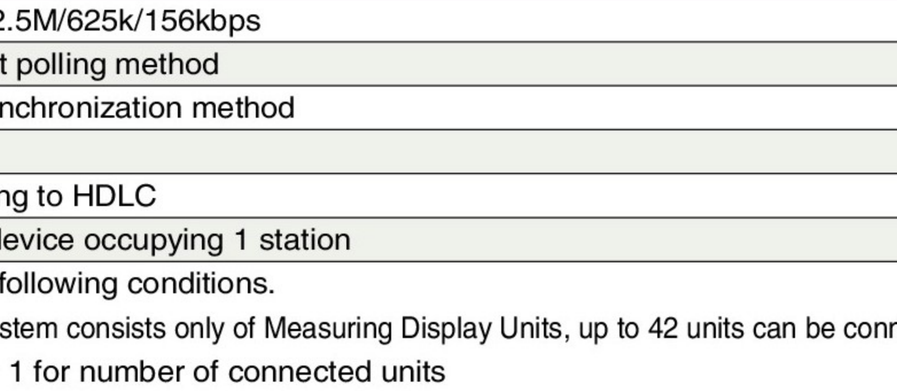
[Electric energy pulse output]

Table 4

Item	Specification
Output elements	Solid state relay (SSR), no voltage a contact (Ca and Cb terminals: no polarity)
Contact capacity	Compatible with 24V DC and 100 to 200 V AC, 20 mA
Output pulse unit	1, 10, 100, 1000 and 10000 kWh/pulse (settable)
Output pulse width	0.35 to 0.45 s
Max. wiring length	100m

[CC-Link communication]

Table 5

Item	Specification
Communication speed	10M/5M/2.5M/625k/156kbps
Communication method	Broadcast polling method
Synchronization method	Frame synchronization method
Encoding method	NRZI
Transmission format	Conforming to HDLC
Number of occupied stations	Remote device occupying 1 station
Number of connected units	Meet the following conditions. When a system consists only of Measuring Display Units, up to 42 units can be connected. Condition 1 for number of connected units $\{(1\times a) + (2\times b) + (3\times c) + (4\times d)\} \leqq 64$ a: Number of units occupying 1 station b: Number of units occupying 2 stations c: Number of units occupying 3 stations d: Number of units occupying 4 stations Condition 2 for number of connected units $\{(16\times A) + (54\times B) + (88\times C)\} \leqq 2304$ A: Number of units at 1 remote I/O station $\leqq 64$ B: Number of units at remote device station $\leqq 42$ C: Number of units at local station $\leqq 26$
Station number	Setting in range from 1 to 64 (Set the station number without fail.)
CC-Link version	CC-Link Ver.1.10
Max. total extension cable length and cable length between stations	 Cables applicable to CC-Link Ver. 1.10 (with use of 110-ohm terminal resistance)

Communication speed	156kbps	625kbps	2.5Mbps	5Mbps	10Mbps
Cable length between stations	0.2 m or more				
Max. total extension cable length	1200m	900m	400m	160m	100m

Connecting cable	Cables applicable to CC-Link Ver. 1.10 (shielded 3-core twisted pair cables) * Cables applicable to Ver. 1.10 supplied by different manufacturers can be used simultaneously.

Note: For more information, visit the website of CC-Link Partner Association (“http://www.cc-Link.org/”).

●Specifications for Measuring Display Unit (2)

Applicable models
NF400-SEP with MDU, NF400-HEP with MDU, NF630-SEP with MDU, NF630-HEP with MDU, NF800-SEP with MDU, NF800-HEP with MDU

Table 6

Item		Specification
Data updating cycle		250 ms (harmonic current: 2 s)
Tolerances		Current, voltage and Electric power: ±2.5% (to rating input) Power factor: ±5% Electric energy: ±2.5% (voltage 100 V to 440 V, range from 5 to 100% of current rating, power factor 1) Fault current: ±15%
Demand time limit setting range		0 to 15 min (1-min steps)
Rated input	Voltage circuit (1φ2W, 3φ3W)	440 V (only 4-pole breakers applicable to 3φ4W)
	Voltage circuit (1φ3W)	
	Voltage circuit (3φ4W)	
	Current circuit	Load current/harmonic current: 100 A/225 A/400 A/600 A/800 A (Automatic discrimination. Determined based on A frame of circuit breaker. 100 A when rated current of 225 A frame is 100 A or less) Leakage current: 500 mA
	Frequency	50 Hz/60 Hz (automatic discrimination of frequency)
Power failure compensation	(1) Wh (integrated value) (2) Max. value (3) Setting data	Stored in EEPROM (nonvolatile memory) * Wh is stored upon occurrence of power failure and every 2 hours The max. value is stored every 2 hours. The setting data is stored when it is set.
	Clock	No power failure compensation
Clock accuracy		Approx. 1 min/month
External dimensions (unit: mm)		W×D×H: 90×75×30
Control power supply		Compatible with 100 to 240 V AC/DC, 50/60 Hz (allowable voltage range: 85% to 110%), 12 VA
Other functions		Function for switching phases to be measured to 1-3 and 3-1 ECA/PAL alarm, self-retention/automatic reset setting function

Note: *1 When the MDU unit control power is turned on, a rush current transitionally flows (maximum rush current: 2A, energizing time: 1ms (240V AC)

●Network Specifications for Measuring Display Unit

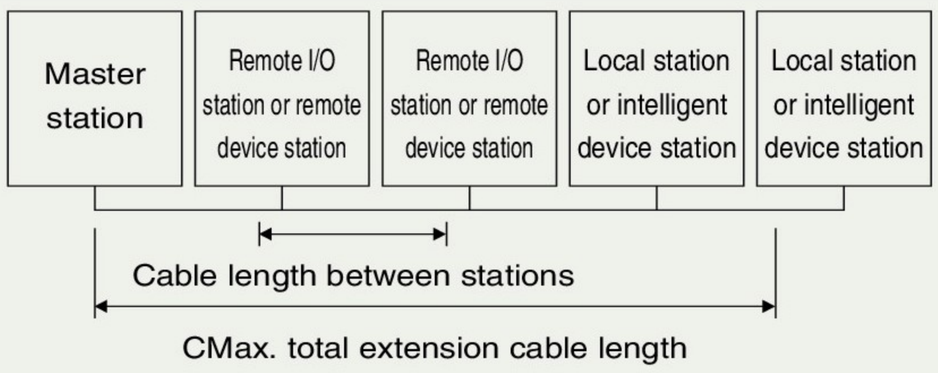
[Electric energy pulse output]

Table 7

Item	Specification
Output elements	Solid state relay (SSR), no voltage a contact (Ca and Cb terminals: no polarity)
Contact capacity	Compatible with 24V DC and 100 to 200 V AC, 20 mA
Output pulse unit	1, 10, 100, 1000 and 10000 kWh/pulse (settable)
Output pulse width	0.35 to 0.45 s
Max. wiring length	100m

[CC-Link communication]

Table 8

Item	Specification
Communication speed	10M/5M/2.5M/625k/156kbps
Communication method	Broadcast polling method
Synchronization method	Frame synchronization method
Encoding method	NRZI
Transmission format	Conforming to HDLC
Number of occupied stations	Remote device occupying 1 station
Number of connected units	Meet the following conditions. When a system consists only of Measuring Display Units, up to 42 units can be connected. Condition 1 for number of connected units {(1×a) + (2×b) + (3×c) + (4×d)} ≦ 64 a: Number of units occupying 1 station b: Number of units occupying 2 stations c: Number of units occupying 3 stations d: Number of units occupying 4 stations Condition 2 for number of connected units {(16×A) + (54×B) + (88×C)} ≦ 2304 A: Number of units at 1 remote I/O station ≦ 64 B: Number of units at remote device station ≦ 42 C: Number of units at local station ≦ 26
Station number	Setting in range from 1 to 64 (Set the station number without fail.)
CC-Link version	CC-Link Ver. 1.10
Max. total extension cable length and cable length between stations	 Cables applicable to CC-Link Ver. 1.10 (with use of 110-ohm terminal resistance) Communication speed: 156kbps / 625kbps / 2.5Mbps / 5Mbps / 10Mbps Cable length between stations: 0.2 m or more Max. total extension cable length: 1200m / 900m / 400m / 160m / 100m When the Measuring Display Unit is installed on the panel, the terminal block on the panel mounting plate and the terminal block on the Measuring Display Unit are connected with a CC-Link cable having a one-way length of 15 cm and an entire length of 30 cm. When connecting the unit in consideration of the following three points. (1) The one-way length of the CC-Link cable, 15 cm, is included in the distance between stations. (2) The entire length of the CC-Link cable, 30 cm, is included in the maximum transmission distance (total extension distance).
Connecting cable	Cables applicable to CC-Link Ver. 1.10 (shielded 3-core twisted pair cables) * Cables applicable to Ver. 1.10 supplied by different manufacturers can be used simultaneously.

Note: For more information, visit the website of CC-Link Partner Association (HYPERLINK "http://www.cc-Link.org/").

●Cautions when Using Measuring Display Unit Breakers (common instructions)

Measuring accuracy

(1) The accuracy of measurement of current or voltage is indicated as the percentage of error to the rated current or voltage for measurement by the Measuring Display Unit.
The measurement rated current is the maximum rated current of each ampere frame. For W & WS Series Measuring Display Unit Breakers, the accuracy is the max. rated current × ±2.5%. For WS-V Series Measuring Display Unit Breakers, the accuracy is the max. rated current × ±1%.
(For example, when the rated current of NF630-SEP with Measuring Display Unit is 350 A, the measurement rated current is 630 A, and the current accuracy is 630 A × ±2.5% = ±15 A.)
* The measurement rated voltage is 440 V. (Common to all A frames)
When the current is less than 1.0% of the measurement rated current in the case of WS-V Series Measuring Display Unit Breakers or less than 2.0% of the measurement rated current in the case of W & WS Series Measuring Display Unit Breakers or when the voltage is less than 5.0% of the measurement rated voltage in the case of WS-V Series Measuring Display Unit Breakers or less than 2.0% of the measurement rated current in the case of W & WS Series Measuring Display Unit Breakers, the current or voltage is cut off, and zero is displayed.

(2) When the current is cut off, the current is displayed as 0 A. However, if the current is 0.4% or more of the measurement rated current, the electric energy is measured.

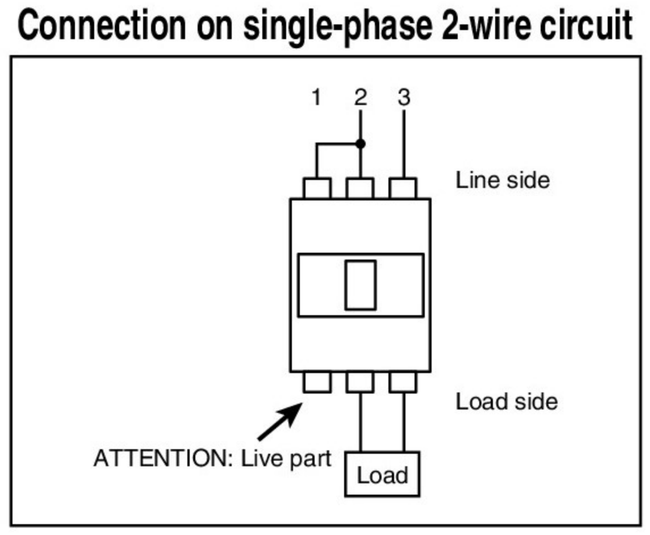
(3) The accuracy of power factor is the percentage to electrical angle of 90°. A power factor of 50% or less is displayed as a reference value.

(4) The accuracy of electric energy is ±2.0% of the true value in the case of WS-V Series Measuring Display Unit Breakers and ±2.5% of the true value in the case of W & WS Series Measuring Display Unit Breakers in the range of measurement rated voltage (100 V to 440 V) × current (measurement rated current of 5 to 100%).

How to use Measuring Display Unit Breaker on single-phase 2-wire circuity

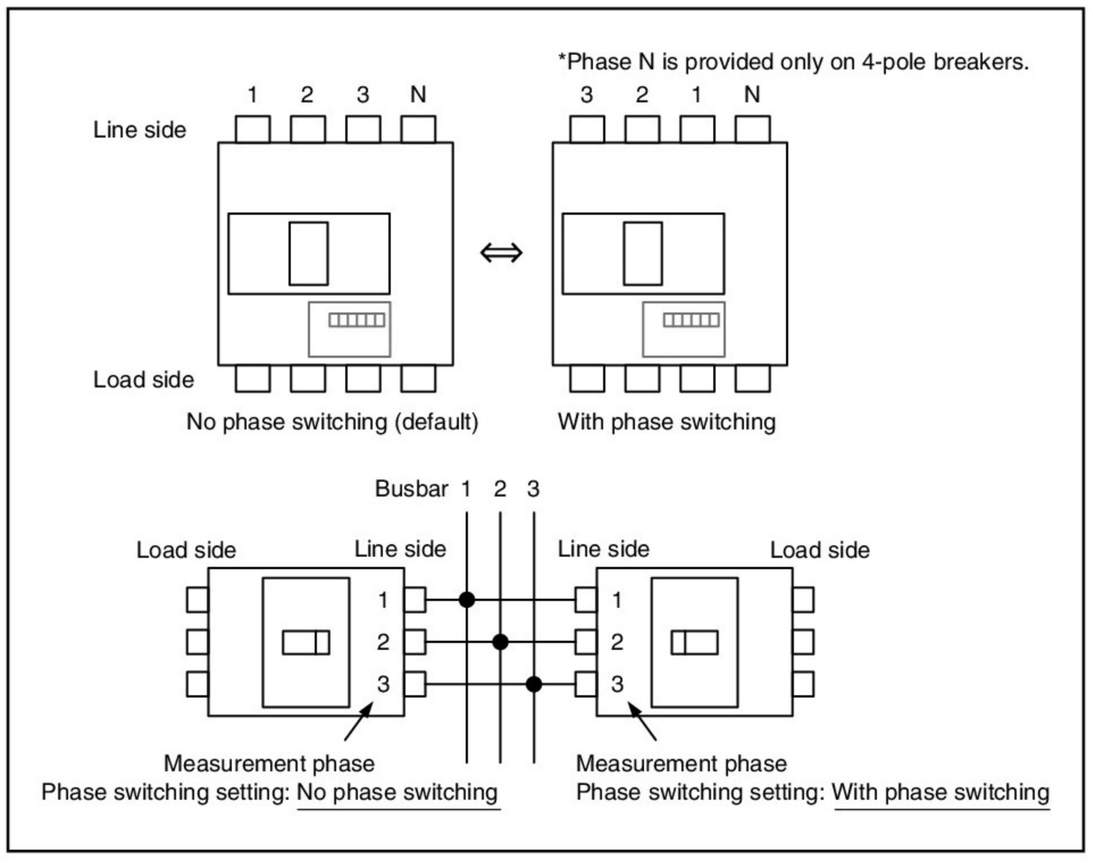
(1) Connect the breaker as shown in the right figure.
The phase 1 on the load side is charged. Insulate it.
As measurement data, use the current of the phases 2 and 3 and the voltage between the phases 2 and 3.
Although the current of the phase 1 and the voltage between the phases 1 and 2 and the phases 3 and 1 are measured, ignore the measurements. The Measuring Display Unit is designed for 3-phase 3-wire and single-phase and 3-wire circuits.
On W & WS Series Measuring Display Unit Breakers, the average values of load current and line voltage are calculated from the values of the phases 1, 2 and 3 (between the phases). Ignore these measurement values.
Also when the breaker is used on a single-phase 3-wire circuit, ignore these values.
When using any WS-V Series Measuring Display Unit Breaker, set the phase and wire type.

Connection on single-phase 2-wire circuit



Phase sequence of Measuring Display Unit Breaker

The phase sequence of Measuring Display Unit Breaker can be set by using the phase switching function as shown below.
When the breaker is installed vertically with the power supply side upward (see the right figure), the phase sequence is set as stated below.
No phase switching: 1, 2, 3 and N from the left (default)
With phase switching: 3, 2, 1, and N from the left
Set the phase sequence in accordance with the installation and wiring methods.
Notes (1) The phase N is provided only on 4-pole circuit breakers.
(2) Note that the position of the phase N is unchanged regardless of the phase switching setting.



Reverse connection of Measuring Display Unit Breaker

The Measuring Display Unit Breakers cannot be connected with the power supply and load sides set reversely.

Installation of Measuring Display Unit Breaker in close contact

The Measuring Display Unit Breakers must not be installed in close contact.
(1) In the case of 400, 630 or 800A frame, install the breaker body securing a wiring space of 30 mm or more on the right side of the breaker to connect the connecting cables and fitting the connecting cable connectors.
(2) In the case of WS-V Series Measuring display Unit Breaker, install the breaker body securing a wiring space of 40 mm or more on the right side of the breaker to connect the connecting cables.

●Cautions when using Measuring Display Unit Breaker (For Measuring Display Unit)

Transmission method

(1) One of No transmission, With pulse output and With CC-Link communication should be specified.
(2) W & WS Series Measuring Display Unit Breaker with CC-Link communication cannot be manufactured for installing the Measuring Display Unit on the breaker body.
(3) When With transmission is selected, data which can be transmitted depends on the function of the Measuring Display Unit Breaker body. The transmission options cannot be installed or changed later. Specify the options when issuing the initial order.
(4) For the maximum number of connected units and transmission distance for each transmission type, see the following tables.
<WS-V Measuring Display Unit Breakers>
Tables 4 and 5
<W & WS Measuring Display Unit Breakers>
Tables 7 and 8

Installation of Measuring Display Unit

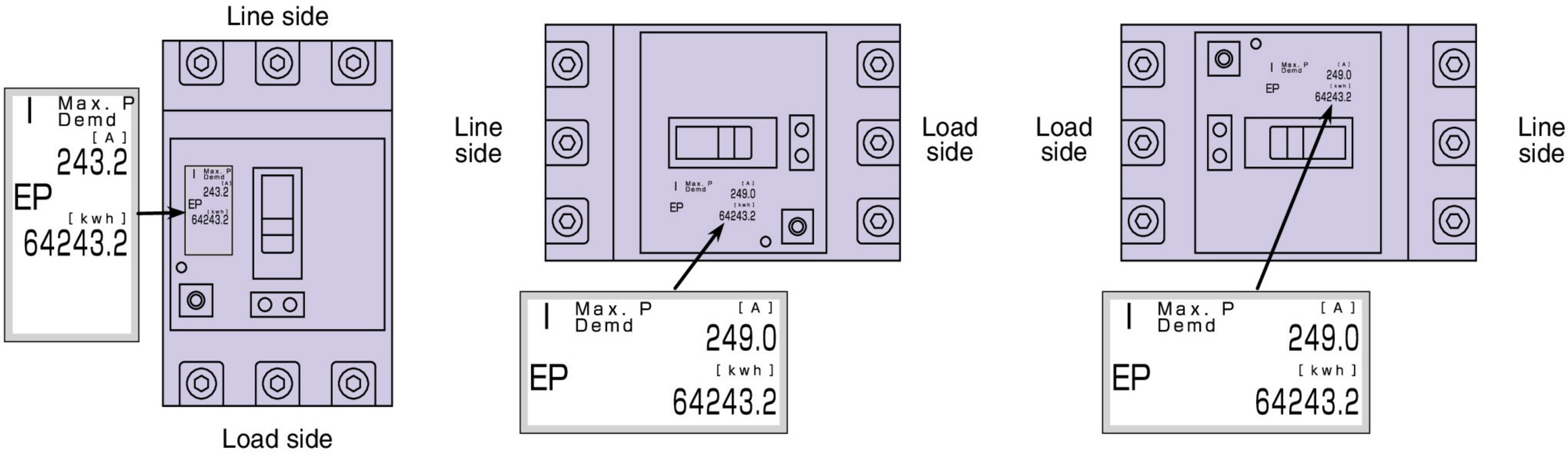
(1) When the installation of Measuring Display Unit on panel has been specified, the breaker will come with the panel mounting parts, mounting screws and 2-m connecting cable (standard).
(The 0.5-, 3-, 5- or 10-m connecting cable can be specified.)
(2) If the installation position of the Measuring Display Unit is changed from the panel to the body or vice versa, the Measuring Display Unit and the breaker body must be returned to the manufacturer for modification.

Measuring Display Unit Breaker with CC-Link communication (W & WS Series Measuring Display Unit Breakers)

(1) If you intend to use the circuit breaker with its pane out on the face board, specify the installation on panel.

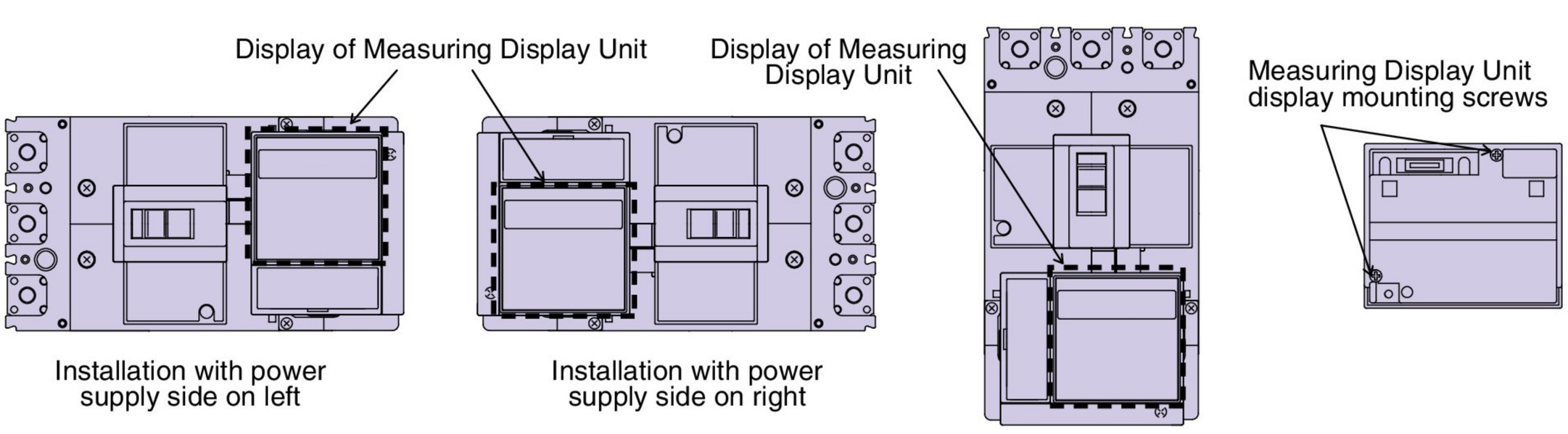
●Change of display direction for breaker mounting

<WS-V Series Measuring Display Unit Breaker>
(1) When installing the Measuring Display Unit on the breaker body installed in the horizontal direction, the direction of the display can be changed according to the installation direction.
(2) The display direction is set on the display unit.



Default display direction　　Installation with line side on left　　Installation with line side on right

<W & WS Series Measuring Display Unit Breaker>
(1) When installing the Measuring Display Unit on the breaker body installed in the horizontal direction, the direction of the display of Measuring Display Unit can be changed for ease in reading according to the installation direction.
(2) Remove the screws on the rear panel of the Measuring Display Unit, and change the direction according to the installation direction.



Installation with power supply side on left　　Installation with power supply side on right　　Default direction of Measuring Display Unit display