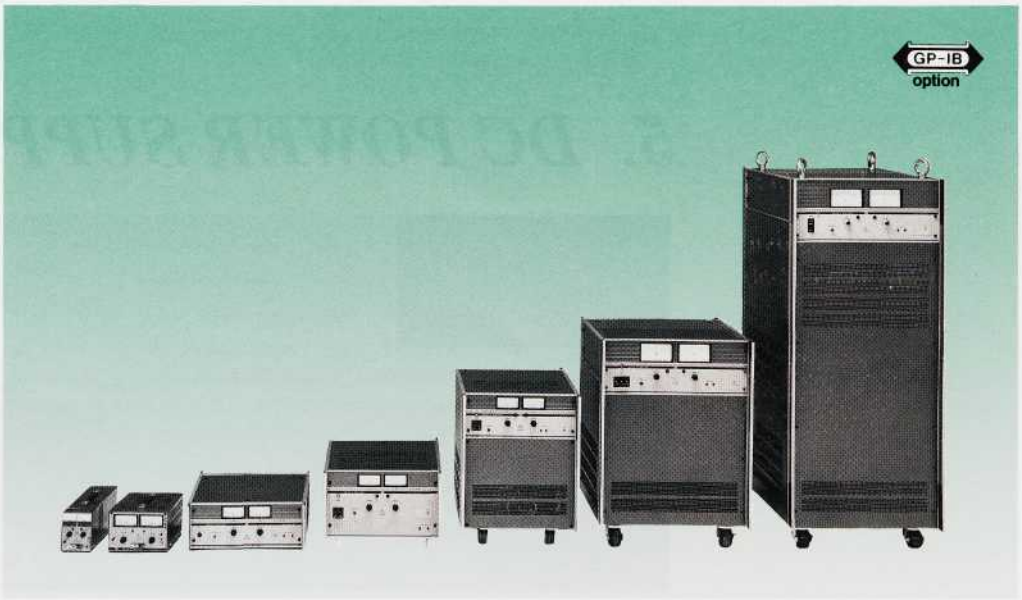
PAD-L/LP SERIES

DC POWER SUPPLIES



The PAD-L/LP Series are instruments with high operational reliability and excellent electrical performance. They are a universal-purpose industrial power supplies which can be used as a variable power source for research and development, or as a fixed power source for long-term aging tests.

PAD-L/LP SERIES

- Low input current, high reliability, higher efficiency, and less line distortion due to the choke input circuit.
- Excellent temperature coefficient and quick response (recovery) time.
- Over voltage protection unit (OVP) is equipped as standard equipment
  PAD-L Series: Power switch is turned off in 50 msec
  PAD-LP Series: Power switch is turned off at high velocity
  OVP of 0.2 msec
- Constant current may be checked or set during operation.
- Digital meter (DOM), high speed OVP function, and digital programming option (DPO2212A/PIA3200) ordered as options.
- Power supply may be shut off external signal.
  PAD-LP Series only: A CV/CC mode status contact signal and a power supply on/off status contact signal are provided

THE TWO MAJOR FEATURES

Low Higher Harmonic Wave Distortion for Minimal Effects in Other Instruments

The problem of higher harmonic wave distortion of commercial power supplies generated from electrical products has recently become a controversial social issue. It is said that this is the result of an increase in the number of rotary control devices using inverters as well as the proliferation of electrical devices having capacitor input type rectifying circuits typically represented by switching regulators commonly found in television sets. There is growing activity throughout the world in implementing restrictions to prevent the generation of odd-numbered higher harmonic wave current up to roughly the 40th order. Although these trends are different from measures against electromagnetic wave interference (EMI), in terms of taking into consideration other devices on the same production line, the way of thinking is basically the same. As such measures are becoming a new form of common sense with respect to the use of commercial power supplies. We at Kikusui have attempted to deal with this problem on the same level as efficiency and electrical characteristics through suppression of peak current using a choke input system (which reduces the higher order components of higher harmonic waves) and improvement of line distortion.

Compared to the capacitor input system, the choke input system employed in the PAD-L and PAD-LP series has fewer higher harmonic wave components (Fig. 1).

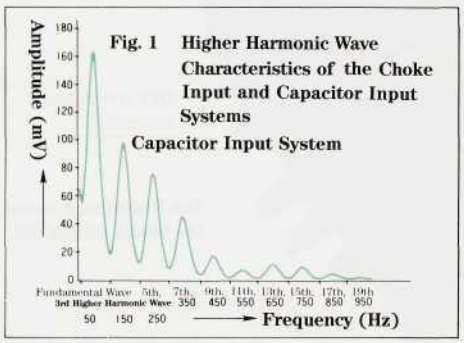
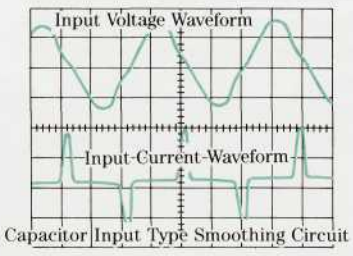
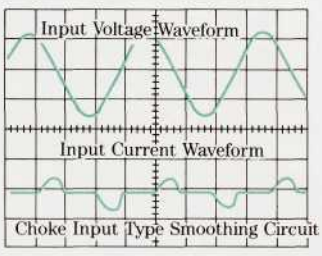


Fig. 1 Higher Harmonic Wave Characteristics of the Choke Input and Capacitor Input Systems

There is also no risk of the occurrence of resonance phenomena which is generated by phase advance capacitors and lead inductance connected on the same line. In addition, since the peak value of the current flowing in (charging current) is also low, waveform distortion of commercial power supplies due to voltage drops is also suppressed (Fig. 2).





Low Input Current Featuring Superior Reliability, Service Life and Efficiency

When considering the effective utilization of energy conservation, these is a greater demand for products that contribute to improved efficiency of the power supply the larger the capacity of such power supply. The choke input system is extremely favorable in terms of the point.

The PAD-L and PAD-LP series of power supplies are equipped in order to reduce the collector loss of the series control transistors. As a result, in comparison to capacitor input types, current consumption of approximately 74% (Kikusui product comparison) can be achieved even when fully loaded (Fig. 3).

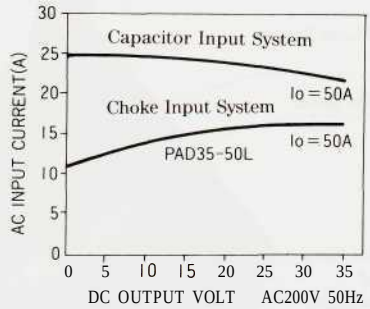


Fig. 3 Current Consumption Characteristics

This is because the "reactive current" that is a problem in conventional capacitor input systems, is stored with a choke coil and than re-used. This eliminates problems relating to abnormal generation of heat in the power transformer as well as those accompanying the increasing size of elements due to the excessive surge-on current in the thyristor. What is more, there is also no risk of allowing a large amount of ripple current to flow to the electrolytic capacitor, a factor which determines the service life of the power supply (Fig. 4 and 5).

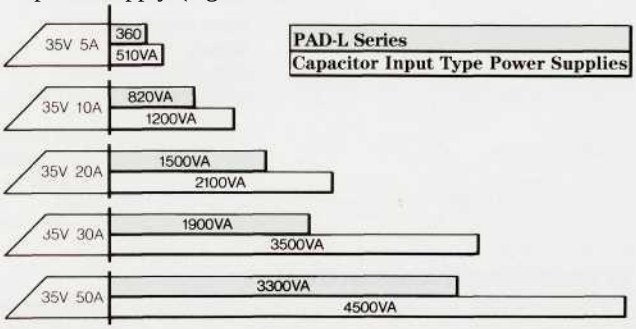


Fig. 4 Comparison of Input Current of the PAD-L Series and Capacitor Input Type Power Supplies

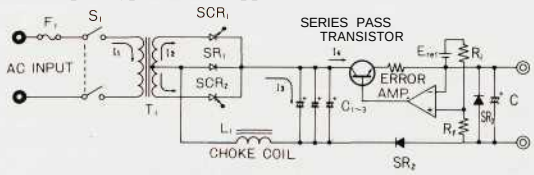
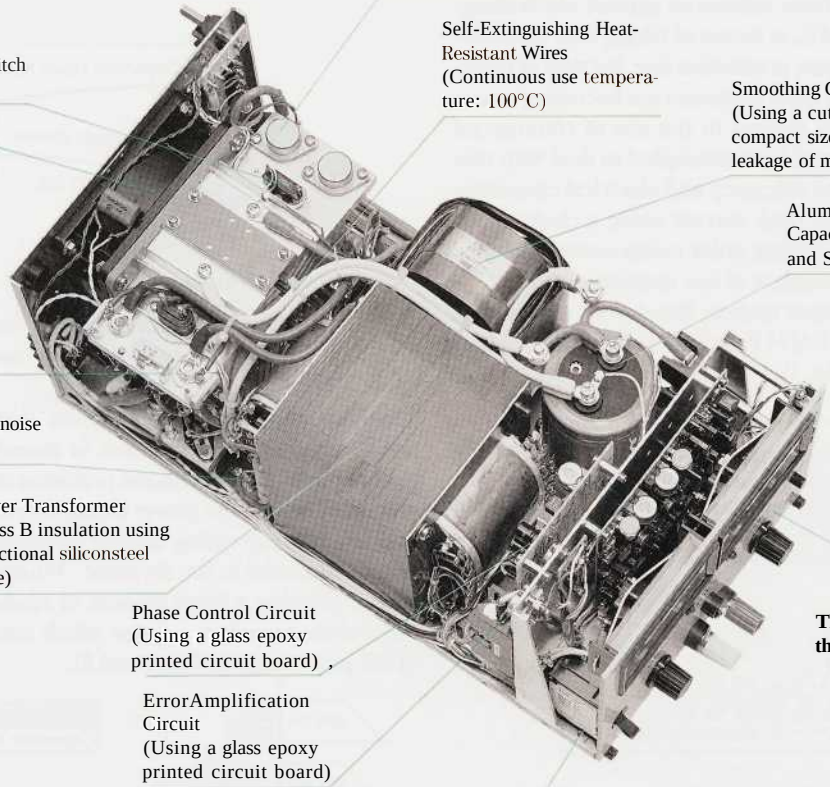


Fig. 5 Basic Circuitry of the PAD-L Series

SAFETY FUNCTIONS

Since accidents occur due to breakdown misoperation of power supplies lead to shutting down the entire system and damage to expensive loads, reducing the rate of occurrence of such accidents through solid reliability is extremely important. However, even if a breakdown should happen to occur, protective circuits for preventing the occurrence of an accident before it has a chance to occur are necessary in order to ensure safe operation. The PAD-L/LP Series of power supplies are provided with a variety of safety function as indicated below.



The Photograph shows the Model PAD35-20L

- **Overvoltage Protector(OVP)**

When excessive voltage is generated due to an operational error or accident, the power switch circuit protector is momentarily interrupted (the rectifying circuit is momentarily interrupted using a gate lock method in type 0 and I2) to protect the load. In particular, since the Overvoltage protector used in the LP Series is a pre-set type, setting of operating voltage can be made by pushing the pre-set button on the panel while viewing the voltage meter. In addition, the operating voltage can be checked without interrupting the operation of the OVP even during operation.

- The use of a high-velocity, thyristor crowbar type OVP having an operating pulse width of 200μs makes the LP Series recommended for use with semiconductors and other loads that are susceptible to excessive voltages.
- The OVP used in the L Series reliably protects the load with an operating pulse width of 50ms without any operational errors due to noise.

- **Flame-Proof Design**
- Class B insulation is used for main power transformer. The insulator uses a material which can withstand continuous use at a temperature of 130° C without any deterioration of the insulation.
- Fine-resistant glass epoxy and paper epoxy materials are used for the printed circuit boards.
- Heat-resistant wires processed by irradiating with accelerated electron beams are used for the wiring materials. These wires will not melt even at temperatures up to 250° C.

• Reverse Connection Prevention Circuit

This protects the power supply even when a voltage of the opposite polarity is applied to the output terminal.

• Overheat Protective Circuit

When the temperature of the heat sink inside the power supply exceeds the specified level, the power switch is interrupted. In particular, a temperature fuse is housed within the main transformer and sub-transformer of the 0, I2 and I3 types for added safety.

• Overheat Detection Circuit

A comparison amplifier provided separately from the constant current amplifier enables continuous monitoring of the output current. This protects against excessive current due to forgetting to install the short bar on the terminal board or similar operational errors, and also prevents the current from exceeding the rated value due to an excessive input during remote controlled operation.

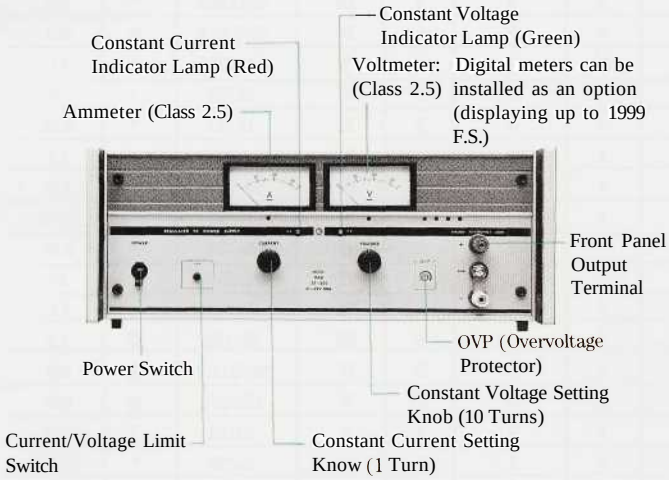
• Voltage Detection Circuit

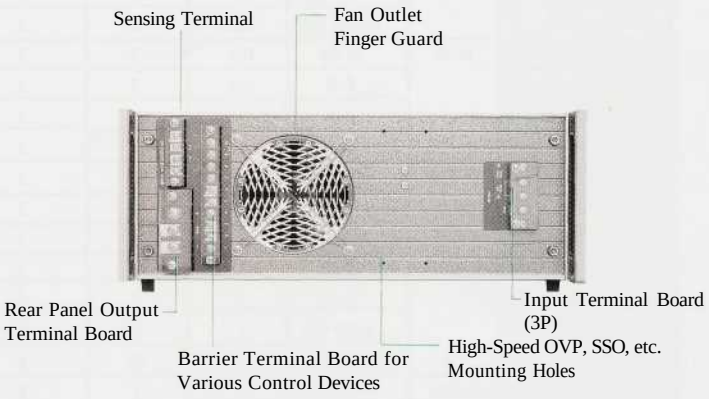
This circuit momentarily interrupts the rectifying circuit when the voltage of the smoothing electrolytic capacitor exceeds the rated voltage due to an operational error such as forgetting to attach the jumper of the rear terminal board or due to failure in the rectifying circuit.

• Surge Absorber

The body of the power supply is protected from surge voltages that are generated in the power line due to external factors such as lightning.

PANEL DESCRIPTION





• Current/Voltage Limit Switch (All Models)

When this switch is pushed, the set value of the constant voltage mode is displayed on the voltmeter and the set value of the constant current mode is displayed on the ammeter. This allows the operator to view the set values of the CV and CC limiters at a glance.

• Constant Current Setting Knob (All Models)

This is wound-wire type resistor having a small temperature coefficient and also featuring antioxidation treatment on all sliding surface.

Types 0~III : turn type

Types IV~V : 1 turn each for coarse fine adjustment (guard cap available)

• Voltmeter and Ammeter (DOM SERIES)

These can be modified to a 3-1/2 digit digital voltmeter and digital ammeter as an option (please refer to PAGE 8-16 for further details).

• Constant Voltage Setting Knob (All Models)

This is a 10-turn rotary helical potentiometer that features superior resistance to vibrations (can be modified to a locking knob through the use of a guard cap or a semilocking knob).

• Voltage Check Terminal

This terminal is used for accurately measuring the output voltage from the panel for those models not equipped with front panel output terminals (comes with protective fuse).

• Output Voltage and Output Offset Adjusment

SPECIFICATION

MODEL	Output		Ripple		line regulation		Load regulation		Type	Weight	Input power	
	CV	CC	CV	CC	CV	CC	CV	CC		Appox.	Appox.	
	V	A	mVrms	mArms	0.005%+mV	mA	0.005%+mV	mA		kg/Ibs		kVA
PAD 16-10L	0~16	0~10	0.5	2	1	1	1	3	0	11/24.2	*	0.41
PAD 16-18L/LP		0~18	0.5	5	1	1	1	3	I2	16/35.2	*	0.71
PAD 16-30L/LP		0~30	0.5	5	1	3	2	3	I3	25/55	*	1.1
PAD 16-50L		0~50	0.5	10	1	3	2	5	II1	33/72.6	*	1.7
PAD 16-100L		0~100 ©	0.5	100	1	3	2	5	III	63/138.6	©	3.3
PAD 16-200L		0~200	0.5	100	1	30	2	30	IV2	150/330	A	66
PAD 16-500L		0~500	1	500	1	30	2	100	VI	370/814	A	17
PAD 35-5L	0~35	0~5	0.5	1	1	1	1	2	0	11/24.2	*	0.36
PAD 35-10L/LP		0~10	0.5	2	1	1	1	3	I2	15/33	*	0.82
PAD 35-20L/LP		0~20	0.5	3	1	3	2	3	I3	24/52.8	*	1.5
PAD 35-30L/LP		0~30	0.5	5	1	3	1	5	II1	34/74.8	*	1.8
PAD 35-50L/LP		0~50	0.5	10	1	3	2	5	III	58/127.6	©	3.3
PAD 35-60L		0~60	0.5	10	1	3	2	5	III	61/134.2	©	3.8
PAD 35-100L		0~100 ©	0.5	50	1	3	2	5	IV	97/213.4	A	6.8
PAD 35-200L		0~200 ©	0.5	100	1	30	2	30	V	190/418	A	13
PAD 55-3L	0~55	0~3	0.5	1	1	1	1	2	0	10/22	*	0.35
PAD 55-6L		0-6	0.5	2	1	1	1	3	I2	15/33	*	0.67
PAD 55-10L		0~10	0.5	3	1	3	2	3	I3	24/52.8	*	1.1
PAD 55-20L		0~20	0.5	2	1	1	1	2	II1	33/72.6	*	1.9
PAD 55-35L		0~35	0.5	8	1	3	2	3	III	62/136.4	*	3.3
PAD 55-60L		0~60 ©	0.5	20	1	3	2	5	IV	99/217.8	A	6.0
PAD 55-120L		0~120 ©	0.5	50	1	15	2	15	V	175/385	A	11
PAD 70-2.5L	0~70	0~2.5	0.5	1	1	1	1	1	0	10/22	*	0.38
PAD 70-5L		0~5	0.5	2	1	1	1	2	I2	15/33	*	0.38
PAD 70-8L		0~8	1	2	1	1	2	3	II1	24/52.8	*	1.1
PAD 70-15L		0-15	1	5	1	1	1	3	II1	34/74.8	*	1.9
PAD 110-1.5L	0~110	0~1.5	0.5	1	1	1		1	0	10/22	*	0.39
PAD 110-3L		0~3	0.5	1	1	1	1	2	I2	15/33	*	0.72
PAD 110-5L		0~5	1	1	1	1	2	2	I3	24/52.8	*	10
PAD 110-10L		0~10	1	2	1	1	1	3	II	33/72.6	*	1.9
PAD 110-20L		0~20	1	4	1	1	2	3	III	60/132	©	3.8
PAD 110-30L		0~30 ©	1	10	1	3	2	5	IV	96/211.2	A	6.0
PAD 110-60L		0~60 ©	1	20	1	10	2	10	V	170/374	A	9.5
PAD 160-1L	0~160	0~1	1	1	1	1	1	1	0	10/22	*	0.34
PAD 160-2L		0~2	1	1	1	1	1	2	I2	15/33	*	0.59
PAD 160-3.5L		0~3.5	1	1	1	1	2	2	I3	24/52.8	*	1.0
PAD 160-7L		0~7	1	2	1	1	2	2	II1	36/79.2	*	1.9
PAD 250-2.5L	0~250	0~2.5	5	2	2	1	2	1	I3	24/52.8	*	1.1
PAD 250-4.5L		0~4.5	5	2	2	1	3	2	II2	34/74.8	*	1.8
PAD 250-8L		0~8	5	4	2	1	3	3	III	60/132	*	3.4
PAD 250-15L		0~15	5	5	2	1	3	3	IV	94/206.8	A	6.0
PAD 500-2L	0~500	0~2	1	0.5	0.002%+1	0.5	0.002%+1	1	II1	34/74.8	*	1.7
PAD 600-1.5L	0~600	0~1.5	1	0.5	0.002%+1	0.5	0.002%+1	1	II1	34/74.8	*	1.6

REMARKS (Input power)

* : 100V (110, 120, 220, 230, 240V on request)

© : 200V (110, 120, 220, 230, 240V on request)

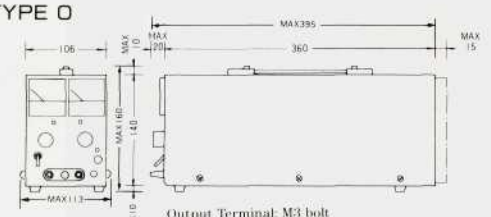
A : 200V only (220, 230, 240V on request)

(0) : Double-structured knob making coarse and fine adjustments.

* Production will commence following receipt of a formal order.

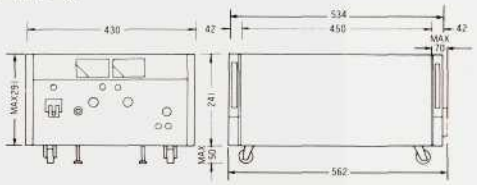
EXTERNAL DIMENSIONAL DIAGRAMS

TYPE O



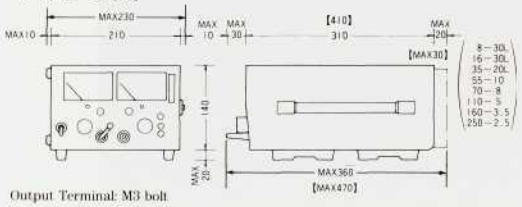
Output Terminal: M3 bolt
Input Terminal: M3 bolt
Accessory Power Cable: Double-core, 2.5m

TYPE III



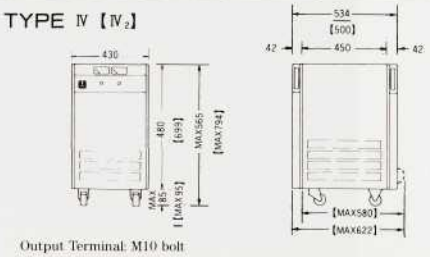
Output Terminal: M10 bolt
Input Terminal: M5 bolt
Accessory Power Cable: Triple-core, 3.5mm², 3m

TYPE I₂ 【I₃】



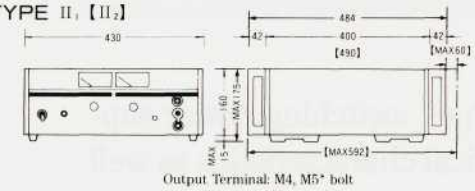
Output Terminal: M3 bolt
Input Terminal: M3 bolt
Accessory Power Cable: Double-core, 1.25mm², 2.5m
[Triple-core, 2mm², 2.5m]

TYPE IV 【IV₂】



Output Terminal: M10 bolt
Input Terminal: M5 bolt
Accessory Power Cable: Triple-core, 8mm², 4m

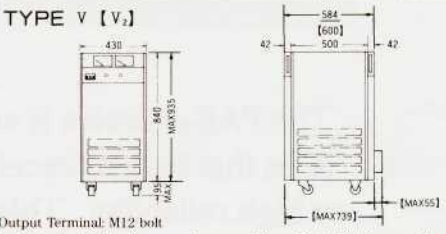
TYPE II₁ 【II₂】



Output Terminal: M4, M5* bolt
Input Terminal: M4 bolt
Accessory Power cable: Triple-core, 3.5mm², 3m

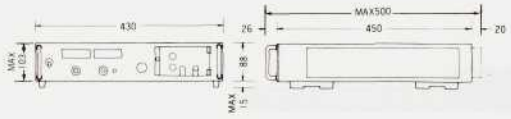
*8-50L and 16-50L comes with rear panel output terminal only with the front panel equipped with a check terminal.

TYPE V 【V₂】



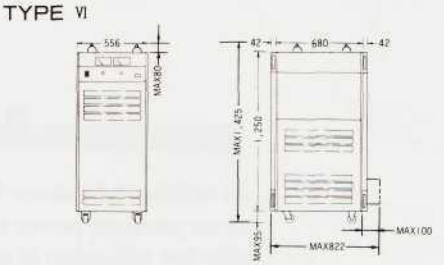
Output Terminal: M12 bolt
Iput Terminal: M8 bolt
(M6 for 3-phase type)
Accessory Power Cable: Triple-core, 14mm², 4m
(Four-core, 14mm², 4m cable for 3-phase type)

TYPE II₃



Output: High-Voltage Accessory Cable
Low-Voltage Accessory Cable
Input: Receptacle with 3P plug
Accessory Power Cable: 3m

TYPE VI



Output Terminal: M16 bolt
Input Terminal: M8 bolt
Accessory Power Cable: Triple-core, 22mm², 4m

COMMON SPECIFICATIONS

Temperature coefficient.....Typical value: 50ppm/°C for Type I3, II,III, IV, V

Transient response.....Typical value: 100ppm/°C for 0, I1, I2

Output voltage.....10-turns for full scale

Output current.....Continuous variation

Output terminals.....Fronts panel: Binding post
Back panel: Terminal board with the sensing terminals

Overload protection.....Overload voltage protection unit (OVP) is built in

Operation..... series or parallel, or one-control parallel operation
Remote programming operation

Ambient temperature.....0 to 40°C

Rack mounting..... Can be mounted in rack mount frame