



THYRISTOR SINGLE-PHASE POWER REGULATOR

MP11 SERIES

Cum Feedback Function



300A

100, 150, 200A

70A




50A

30A or less

Special Features

- Setting function by operating the keys on the front panel
- 7-segment LED display of setting contents, input/output values, etc.
- Control input signal: Multi-input of current, voltage, contact, and voltage pulse
- Feedback function is equipped as a standard (constant voltage, constant current, constant power, and voltage square)
- Many kinds of alarm outputs are equipped as a standard, such as alarm of current failure, alarm of snapped heater wires
- Switching over either to phase control method or to zero-cross switching cycle operation control method
- Control voltage: Free voltage of 100~240V AC
- Choice of RS485 communication: MODBUS or SHIMAX standard protocol (option)

Specification

- **Control Method** : Phase control with a feedback function
 — constant voltage, constant current, constant power, voltage square
 Control without a feedback function
 — angle, voltage square, ZC (*1)
 angle + ZC (*1), voltage square + ZC (*1)
- **Current-carrying Capacity** : 18 types : 1A~10A (1A calibration), 20A, 30A, 50A, 70A, 100A, 150A, 200A, 300A
- **Control Range of Output Voltage** : 0~98%
- **Lowest Load Capacit** : 0.5A (rated current 100A and below)
 1.0A (rated current 150A and above)
- **Applicable Load** : Phase control Resistive load, Inductive load (primary side of the transformer: magnetic flux density 1.25T and below)
 Phase-ZC control Resistive load
 ZC control Constant resistive load
- **Input Accuracy of Control value** : (1.0% 1 digit) 2% in case of 0~1V, 0~4mA range
- **Power Supply**
 Control circuit power voltage : 100~240V 10%AC 50/60Hz
 Main circuit power voltage : 15~240V 10%AC 50/60Hz
- **Power Supply Frequency** : 50/60Hz automatic discrimination
- **Control Input (Multi-input)** : Current 4~20, 0~20mA DC receiving impedance 165Ω
 Voltage 1~5, 0~5V DC input impedance 15kΩ
 No-voltage contact (open collector is chosen) sink load 1mA/5V
 Voltage pulse 12V (SSR drive voltage) input impedance 15kΩ
- **Input Sampling Cycle** : Current_voltage 1 / (power supply frequency x 2) s
 Contact_voltage pulse two-position control 2ms
 proportional control 0.5~120.0s
- **Display** : 7-segment green LED 1 digit red LED 4 digits (character height 10mm)
 Display light green (RUN) light-out-standby blinking-manua
 light-on - automatic
 Red (SYS) } Refer to Table of Alarm Function
 Red (OC) }
 Red (HB) }
- **Cooling** : 100A and below natural cooling
 150A and above compulsory air-cooling
- **Monitor** : Control (operation) input, control power supply frequency, load voltage, load current, load power, internal temperature, VR1~VR3 position, load impedance
- **Functions Equipped as Standard** : Power-on wait, soft-start, slow-up, slow-down, higher or lower limit of grade, manual current limit at the time of starting, input offset compensation, input gain compensation, alarm output 2 points, DI 2 points, many kinds of alarms
- **Alarm Type**
 Character Display : burnt-out fuse, frequency failure, stop of a fan, current failure, trouble of elements, voltage failure, abnormal internal temperature
 Light : Current limit, current alarm OC light-on, snapped heater wires HB light-on
- **Alarm Output** : 2 points in common, rating 1A 240V AC resistive load
- **Setting** : Operation by using three keys    on the front panel
- **Protection of elements** : Digital gate breaker circuit against current failure (120% of the rated value) or immediately-cut fuse (option)
- **Protection of internal Overheat** : Operation stops in response to the alarm of abnormal internal temperature
- **D I** : 2 points operation mode (RUN-STBY), control mode (AUTO-MANU), Control method (phase-ZC), key-lock (ON-OFF)

Option

- **Immediately-cut Fuse** : Cum alarm output
- **Variable Resistor** : 1~3 sets
- **Communication**
 Communication Type : EIA standard in conformity to RS-485
 Communication Mode : Two-channel half-duplex multi-drop (bus) mode
 Synchronous Mode : Start-stop synchronization
 Communication Distance : 500m max. (depending on environmental conditions)
 Communication Speed : 1200, 2400, 4800, 9600, 19200bps (default 9600)
- **Data format** : START / 1bit STOP/1.2bit DATA / 7.8bit
 PARITY / non.odd.eve (default 7N1)
- **Slave Address** : 1~255 (default 1)
- **Error Detection** : Chosen from the following:
 none, addition 2's complement, exclusive disjunction, CRC-16, LRC (default none)
- **Flow Control** : none
- **Delay** : 1~500ms step1 (default 20)
- **Communication Code** : ASCII code or binary code
- **Protocol** : SHIMAX standard protocol or MODBUS-ASCII, MODBUS-RTU protocol
- **Terminal Impedance** : 120Ω (external resistor termination)
- **Maximum Number of Units to be connected** : 32 units (a host included, depending on environmental conditions)
- **Isolation** : Isolated from any other input / output and power supply

General Specification

- **Data storage** : Non-volatile memory (EEPROM)
- **Use Environment condition** : Temperature -10~55°C (Guaranteed range for operation 0~40°C)
 Humidity 90%Rh or below (No condensation)
 Altitude 2000m above see level max.
 Category II
 Pollution degree 2
- **Storage Temperature** : -20~65°C
- **Input Noise Ratio of Rejection** : Normal 50dB and above Common 100dB and above
- **Insulation Resistance** : Between control-input and power supply 20M and above (500V DC)
 Between power supply and chassis 20M and above (500V DC)
 Between control-input and operation-output 20M and above (500V DC)
- **Withstand Voltage** : Between control-input and chassis 500V AC per minute
 Between power supply and chassis 2000V AC per minute
 Between control-input and operation output 2300V AC per minute
- **Withstand Impulse Noise** : Power supply normal/common mode 100ns/us 1500V or above
- **Reaction to Power failure** : Power failure of approx. 3ms or less is ignored. When it continues for more than 3ms, operation resumes by the function of soft-start after the output becomes 0%.
- **Set-up space** : 5mm or more on the right and left sides, 100mm or more on the up and bottom sides (No heaters should not be installed under this regulator.)
- **External Dimension** : Refer to Drawings of External Dimension
- **Mounting** : Vertical mounting
- **Weight** : Refer to Dimension Table

※1 Zero-cross switching cycle operation

Table of Alarm Function

Alarm Type	Control Method	Alarm Display		Alarm Output	Operational Condition at the time of Alarm Action	Causes of Alarm Action	Cancellation of Alarm
		Light	Character Display				
Burnt-out Fuse	Execution of All Methods	SYS	E01	Output from the allocated alarm terminal	Suspension of Operation	Burnt-out Fuse	The alarm is cancelled when control power is turned on or if the operation mode is changed.
Frequency failure		SYS	E02			Either of the following : The frequency of control power supply is 40Hz and less or 70Hz and more.	
Stop of a Fan		SYS	E03			A cooling fan is stopped.	
Current failure		SYS	E04			Output current is 120% or more of the rated current value.	
Trouble of an Element		SYS	E05			10% or more output when an output signal is 0%.	
Voltage failure		SYS	E06			Either of the following : Voltage is 120% and more of the set voltage or 70% and less of the calculated output value.	
Abnormal Internal Temperature		SYS	E11			The internal temperature is 90°C or over.	
Snapping of a Heater Wire		H.B	Normal screen			Operation is continued even after an alarm output	In the case of phase control : Output voltage is 15V or more. In the case of zero-cross switching cycle operation control : The resistance value of a heater is above the set value when output is 10% or more.
Current Limit	O.C	The higher limit value of output current is clipped to the set value.		The current level gets to the set value.	The alarm is turned on or off at the set point.		
Current Alarm		Operation is continued even after an alarm output		Above the set value			

Function and characteristics

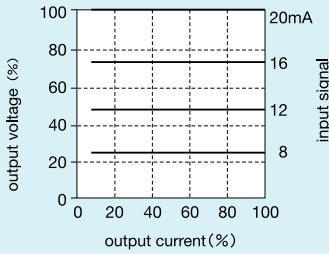
Control Method

Phase Control

- Voltage Feedback
- Non-feedback

This function corresponds to load (iron, chromium, nichrome, etc) whose temperature coefficient of electric resistance is small. Feedback type supplies voltage output proportional to control input regardless of power supply voltage changes / load changes.

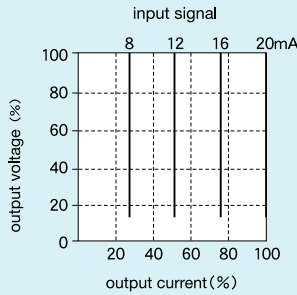
output characteristic



Current Feedback

This function corresponds to load (platinum, molybdenum, tungsten, etc) whose temperature coefficient of electric resistance goes up to 6~12 times in the normal temperature. It supplies current proportional to control input regardless of power supply voltage changes/load changes.

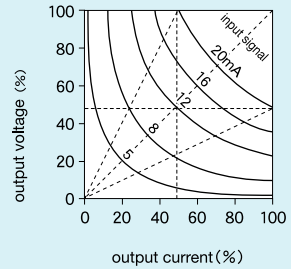
output characteristic



Electric Power Feedback

In the case that load is silundum (sic) luminous body, secular changes of resistance/electric resistance occurs due to generation of heat. This function supplies electricity output proportional to control input regardless of load resistance value. Output characteristic is that a curve connected between a point of output voltage 100% x output current 50% and a point of output voltage 50% x output current 100% is equivalent to 50% of output. So set output current capacity of this body to double the load capacity.

output characteristic



Zero-cross Switching Cycle Operation Control

This function enables THYRISTOR to do switching at around voltage 0 and to make less noise. The function makes THYRISTOR environment-friendly.

Phase Control + Zero-cross Switching Cycle Operation Control

This function combines merits of the two control methods. Phase control restrains initial current at the time of starting. When output current becomes stable, the control method changes to ZC control. In this way noise becomes less.

The Other Functions

Power-on Wait

This function control timing of control signals and the body at the time of starting

Soft-start

Slow-up

Slow-down

Higher limiter at the time of starting

Time limiter at the time of starting

Current limiter

Current alarm

DI

Alarm of snapped heater wires

These functions restrain a sudden output change to the load when control input is drastically changed, and control the subsequent output to a natural flow

These functions control the time or output value not to be over the ones that are set at the time of starting

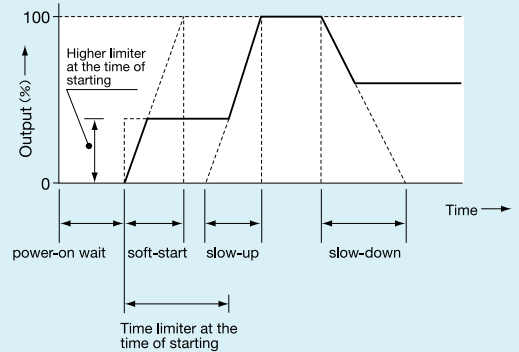
This function clip current to the set value when feedback function is used.

This function is used when feedback function is not used, and keep the operation running even at the time of alarm output

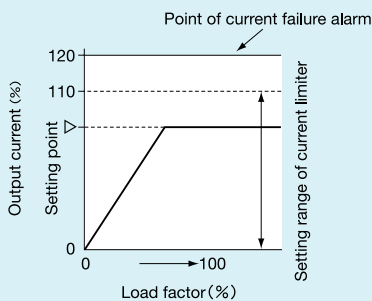
2 points This function is used to change settings from the outside

Refer to Table of Alarm Function

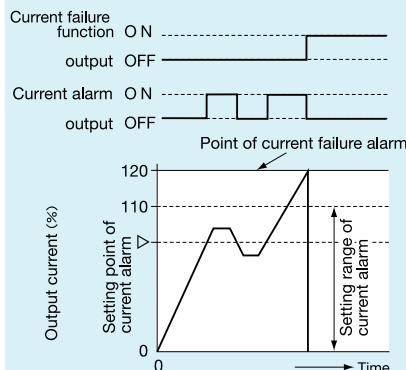
Power-on wait / higher limiter at the time of starting / time limiter at the time of Starting / soft-start / slow-up / slow-down functions



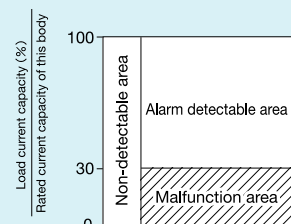
Current limiter function (when feedback function is used)



Current alarm / current failure function



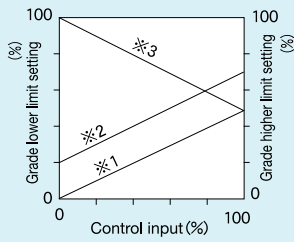
Snapped-heater-wire alarm function



Phase control → 0V 15V → Rated output voltage
ZC control → 0% 10% → 100% output value

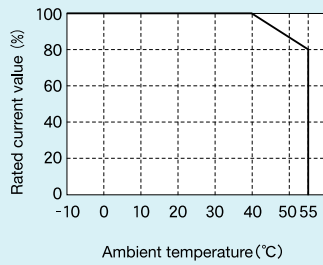
When this function is used, set the disparity to be small between the load capacity and the rated capacity of this body

● Grade Setting Function



- *1 Output characteristic when the grade lower limit is set to 0% (output value at the time of input 0%) and the grade higher limit is set to 50% (output value at the time of input 100%)
- *2 Output characteristic when the grade lower limit is set to 20% and the grade higher limit is set to 70%
- *3 Output characteristic when the grade lower limit is set to 100% and the grade higher limit is set to 50%

● Ambient Temperature Characteristic



● Internal Calorific Value

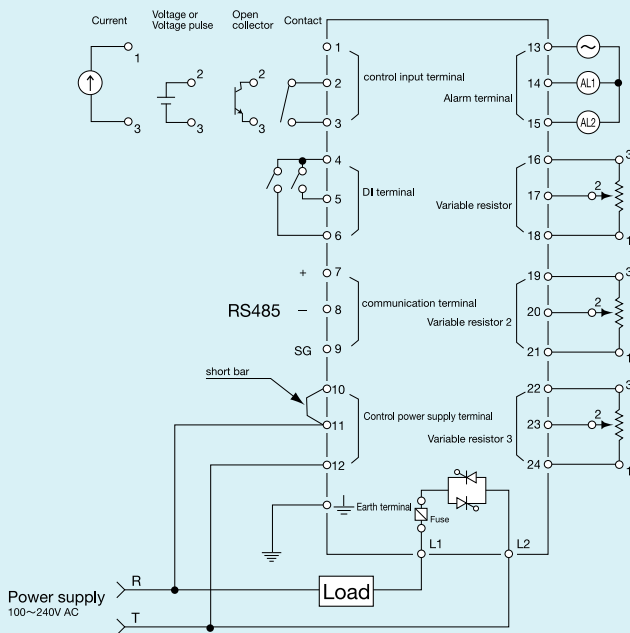
Current-carrying capacity	Element	Fuse
1~10A	12W	1.8W
20A	26W	3.1W
30A	42W	3.7W
50A	63W	6.5W
70A	86W	11.0W
100A	132W	14.0W
150A	198W	34.0W
200A	250W	45.0W
300A	381W	50.0W

Internal calorific value of MP11 is shown above. Follow the set-up space and refer to the use environment condition. The set-up site needs to be ventilated and the radiated heat needs to be relieved.

■ Wiring Examples

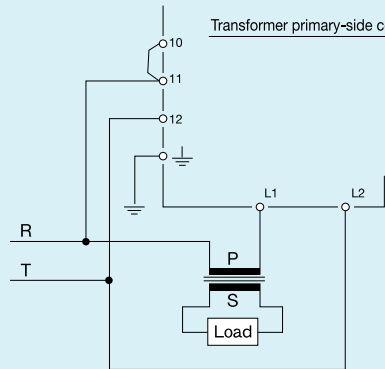
● An example of standard wiring

Load direct control

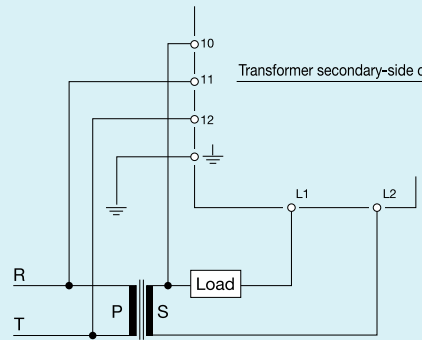


Note : Terminal No.12 and L2 should have the same phase. Load should be connected to L1.

Transformer primary-side control

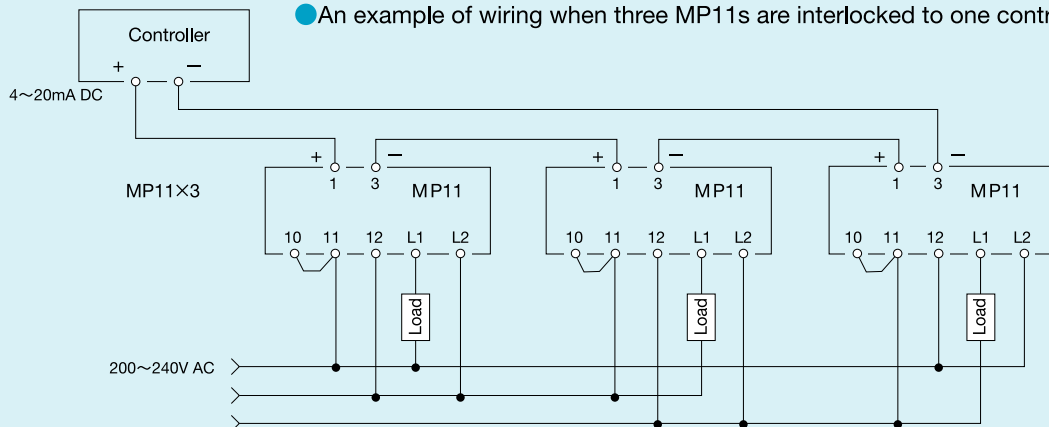


Transformer secondary-side control



Note : Do wiring after the short bar between Terminal No.10 and Terminal No.11 has been removed.

● An example of wiring when three MP11s are interlocked to one controller



Order Code Table

Item	Code	Specification	
1. Series	MP11—	Control Method	<ul style="list-style-type: none"> Feedback function is used. Phase Control (constant voltage, constant current, constant power, voltage square) Feedback function is not used. Phase Control (angle, voltage square) Zero-cross switching cycle operation control Phase Control (angle, voltage square) + Zero-cross switching cycle operation control
		Input	4~20mA DC Input impedance approx. 165Ω 0~20mA DC Input impedance approx. 165Ω 1~5V DC Input impedance approx. 15kΩ 0~5V DC Input impedance approx. 15kΩ No-voltage contact or open collector 5V 1mA DC Voltage pulse (SSR drive) 12V 1mA DC
2. Current-carrying Capacity	001~010	1A~10A Custom-made calibration in every 1A	
	020	20A	
	030	30A	
	050	50A	
	070	70A	
	100	100A	
	150	150A	
	200	200A	
3. Immediately-cut Fuse	0	0	Without
		1	Used for 1~10A
	1	1	Used for 20A
		2	Used for 30A
		3	Used for 50A
		4	Used for 70A
		5	Used for 100A
		6	Used for 150A
		7	Used for 200A
		8	Used for 300A
4. Communication	N	Without	
	R	RS485	
5. Special Mention	0	Without	
	9	With	

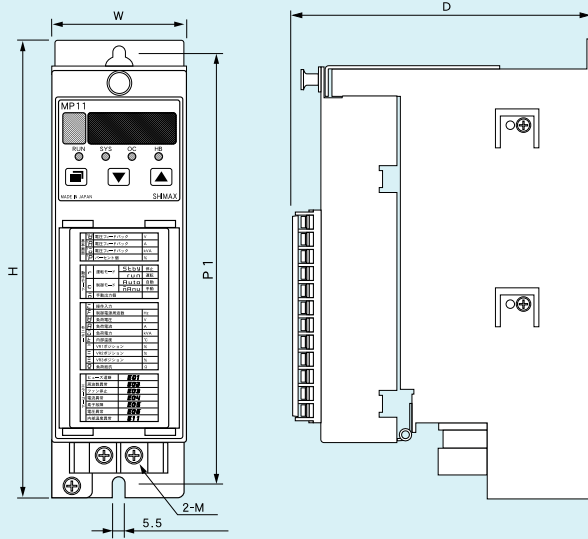
Parts Code Table

Item	Code	Specification
Immediately-cut Fuse	250GH-20S	Responding to Body 1~10A (20A)
	250GH-32S	Responding to Body 20A (32A)
	250GH-40S	Responding to Body 30A (40A)
	250GH-63S	Responding to Body 50A (63A)
	250GH-100S	Responding to Body 70A (100A)
	250GH-125S	Responding to Body 100A (125A)
	250GH-250S	Responding to Body 150A (250A)
	250GH-315S	Responding to Body 200A (315A)
	250GH-450S	Responding to Body 300A (450A)
A Set of Variable Resistor	ATT-03	Variable Resistor + Scale + Knob

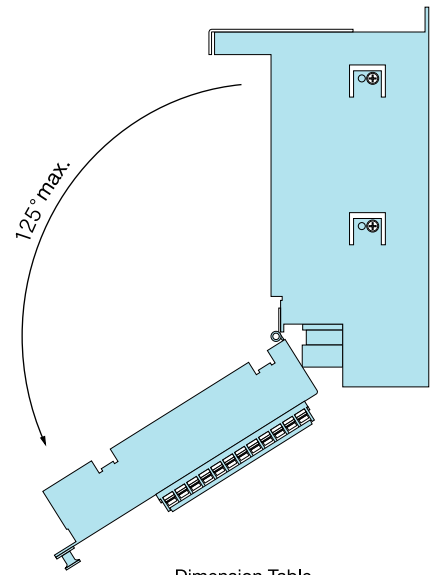
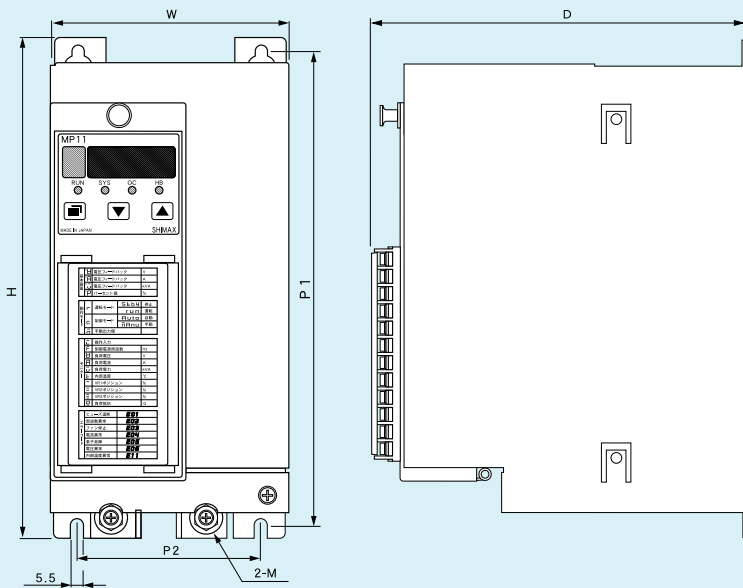
■ Drawings of External Dimension

● Body

1~20A, 30A, 50A



70A, 100A, 150A, 200A, 300A



Dimension Table

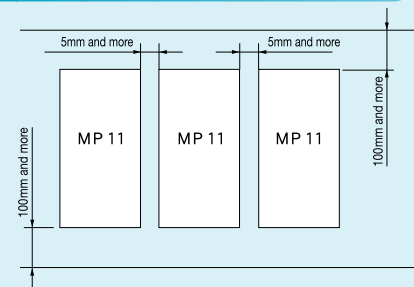
Unit:mm

Current-carrying Capacity	W	H	D	P1	M	Weight (kg)
1~20A	60	204	133	192	M4	1.2
30A	60	204	133	192	M4	1.4
50A	70	220	166	208	M5	2.2

Current-carrying Capacity	W	H	D	P1	P2	M	Weight (kg)
70A	105	220	166	208	81	M6	2.9
100A	121	240	195	228	97	M6	3.4
150A	121	240	195	228	97	M10	3.7
200A	121	240	195	228	97	M10	3.7
300A	134	273	247	261	110	M12	6.2

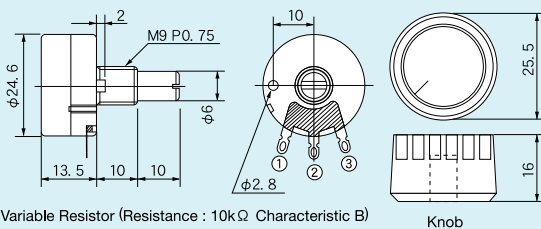
Note: Bolt with s hexagonal hold for M10 and M12

■ A drawing of Set-up Space



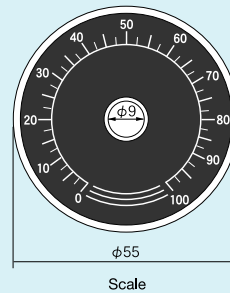
● A Set of Variable Resistor

Unit : mm

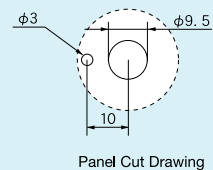


External Variable Resistor (Resistance : 10kΩ Characteristic B)

Knob



Scale



Panel Cut Drawing

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

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