

Power Supply and Voltage Control

AC Power Regulators

APR-N Series



AC Power Regulators

APR-V series



3-phase, 20 to 600A (to 1200A)

RPNW



Single-phase, 20 to 600A (to 1200A)



APD-1 setting indicator

RPNE

- *Thyristor pure reverse parallel (6-arm) is standardized (3-phase).*
- *3-phase, 4-wire circuits supported (3-phase models with control method T or A)*
- *Switch between phase control and cycle control.*
- *Built-in high-precision feedback control (except models with control method T. This functionality requires a communications board and a setting indicator.)*

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AC Power Regulators APR-N Series

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AC Power Regulators

APR-N series

AC power regulators, APR-N series

■ Description

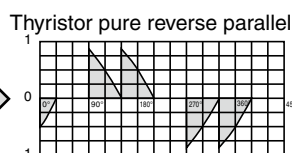
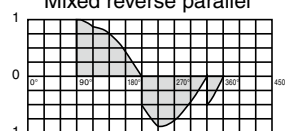
The APR-N series provides high functionality with improved functions and performance as a successor to the APR-MX2 series.

■ Features

• Thyristor pure reverse parallel (6-arm) is standardized (3-phase).

- Almost no even harmonic current is generated, and so countermeasures for harmonic current are easy compared with systems with mixed reverse parallel.
- Magnetic flux deviation in transformer primary control is unlikely to occur, and so the transformer can be more compact and highly efficient.
- Control characteristics are improved for unbalanced loads.

Load current waveform example
(phase angle $\alpha = 90^\circ$)
Mixed reverse parallel



• Imbalance compensation (3-phase)

Imbalance compensation can be performed by making settings using the setting indicator if there is a load imbalance or power supply imbalance.

• 3-phase, 4-wire circuits supported (3-phase models with control method T or A)

Linearity of $\pm 3\%$ FS is achieved for 3-phase, 4-wire circuits. (Optional specifications: Specify ZB4.) Also, connection of an external diode to the neutral phase is not required.

Note: The control phase angle is different from the standard 3-phase models.

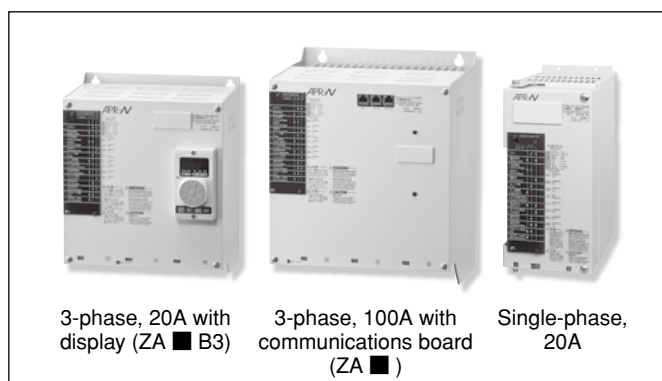
Do not use this for 3-phase, 3-wire circuits.

• Switch between phase control and cycle control.

- Flicker prevention cycle control (staggering the power application cycle of 50 units max.) enables distributed load operation. (Optional specifications: ZAP or ZAX is required.)
- Perform cycle control for loads with a large change in resistance value (e.g., pure metal) using inrush current automatic suppression control (composite control) independent of soft start time. (models with control method A only).
- Switch between phase control and cycle control during operation. (using a display device or network communications).

• Built-in high-precision feedback control (except models with control method T)

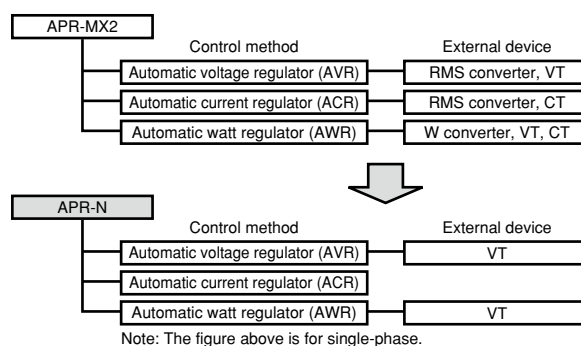
Control accuracy of $\pm 1\%$ FS for automatic current regulator, automatic voltage regulator, and automatic watt regulator. Built-in high accuracy control circuits improve temperature control accuracy, save space, reduce wiring, and help decrease total costs.



3-phase, 20A with display (ZA B3)

3-phase, 100A with communications board (ZA)

Single-phase, 20A



• Independent settings for soft start time and soft increase/decrease time

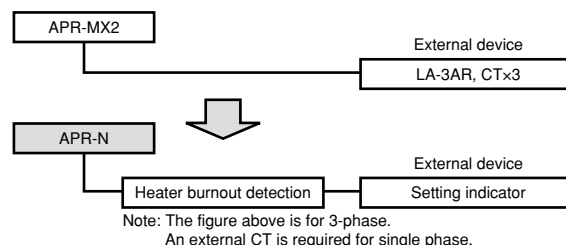
• Built-in advanced heater burnout detection (except models with control method T. This functionality requires a communications board and a setting indicator.)

Advanced heater burnout detection (equivalent to LA-3AR) enables detecting burnouts in 1 of 10 elements for single-phase operation.

Burnouts can be detected in 1 of 9 elements for 3-phase, 3-wire connections (line current detection).

Burnouts can be detected in 1 of 15 elements for 3-phase, 4-wire connections (line current detection).

Use in applications for heaters of the same material and same capacity (e.g., alloy, pure metal, or silicon carbide).



• Enhanced error detection

A total of 12 errors, including major failures and minor failures, are displayed using alarm LEDs.

- Thyristor error (except models with control method T)
- Current limit detection (except models with control method T)
- External setting input not connected (burnout)
- Cooling fan service life warning by monitoring the fan speed (models with fan only)

These and more have been added.

- **Enhanced optional accessories**

- The setting indicator enables a variety of monitoring, high-accuracy digital settings, and function settings.
- Adding a communications board enables a wide range of communications specifications.
- Easily perform operation or monitoring and change settings by linking to a PLC or touch panel.
- Finger guard (IP20)



These and more have been added.
Refer to pages 10/5 and 10/6 for details.

- **Full lineup of products compliant with international standards**



Note: Inquire about the status of compliance.

- **Compliance with RoHS Directive**

The APR-N provides compliance with the European Union's RoHS Directive on the restriction of use of hazardous substances as a standard feature.

The APR-N is ideal for environments in which the use of these six hazardous substances is restricted.

Six hazardous substances: Lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ether (PBDE)

AC Power Regulators

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■ Types and ratings, Single-phase

Type number (i.e., product code)	No. of phases	Input voltage (V)	Rated current (A)	Rated load capacity (kVA) (*1)	Built-in rapid fuse (*2)	
RPNE2020-T	Single-phase	100-240	20	2-4.8	CR2LS-30G	
RPNE2020-A						
RPNE2045-T			45	4.5-10.8	CR2LS-75G	
RPNE2045-A						
RPNE2060-T			60	6-14.4	CR2LS-100G	
RPNE2060-A						
RPNE2100-T			100	10-24	CR2L-150G	
RPNE2100-A						
RPNE2150-T			150	15-36	CR2L-200G	
RPNE2150-A						
RPNE2250-T			250	25-60	CS5F-350	
RPNE2250-A						
RPNE2350-T			350	35-84	CS5F-500	
RPNE2350-A						
RPNE2450-T			450	45-108	CS5F-600	
RPNE2450-A						
RPNE2600-T			600	60-144	CS5F-800	
RPNE2600-A						
RPNE2800-T, RPNE2800-A			800	80-192	CS5F-800	
RPNE2A00-T, RPNE2A00-A		1000	100-240	CS5F-1000		
RPNE2A20-T, RPNE2A20-A		1200	120-288	CS5F-1200		
RPNE2A50-T, RPNE2A50-A		1500	570-660	CS5F-1500		
RPNE4020-T		380-440	20	7.6-8.8	CR6L-30G	
RPNE4020-A						
RPNE4045-T				45	17.1-19.8	CR6L-75G
RPNE4045-A						
RPNE4060-T				60	22.8-26.4	CR6L-100G
RPNE4060-A						
RPNE4100-T				100	38-44	CR6L-150G
RPNE4100-A						
RPNE4150-T	150			57-66	CR6L-200G	
RPNE4150-A						
RPNE4250-T	250			95-110	CS5F-350	
RPNE4250-A						
RPNE4350-T	350			133-154	CS5F-500	
RPNE4350-A						
RPNE4450-T	450			171-198	CS5F-600	
RPNE4450-A						
RPNE4600-T	600			228-264	CS5F-800	
RPNE4600-A						
RPNE4800-T, RPNE4800-A	800			304-352	CS5F-800	
RPNE4A00-T, RPNE4A00-A	1000			380-440	CS5F-1000	
RPNE4A20-T, RPNE4A20-A	1200			456-528	CS5F-1200	
RPNE4A50-T, RPNE4A50-A	1500			987.3-1143.2	CS5F-1500	

■ Types and ratings, 3-phase

Type number (i.e., product code)	No. of phases	Input voltage (V)	Rated current (A)	Rated load capacity (kVA) (*1)	Built-in rapid fuse (*2)
RPNW2020-T	3-phase	200-240	20	6.9- 8.3	CR2LS-30G
RPNW2020-A					
RPNW2045-T			45	15.6-18.7	CR2LS-75G
RPNW2045-A					
RPNW2060-T			60	20.8-24.9	CR2LS-100G
RPNW2060-A					
RPNW2100-T			100	34.6-41.6	CR2L-150G
RPNW2100-A					
RPNW2150-T			150	52.0-62.4	CR2L-200G
RPNW2150-A					
RPNW2250-T			250	86.6-103.9	CS5F-350
RPNW2250-A					
RPNW2450-T			450	155.9-187.1	CS5F-600
RPNW2450-A					
RPNW2600-T			600	207.8-249.4	CS5F-800
RPNW2600-A					
RPNW2800-T, RPNW2800-A			800	277.1-332.6	CS5F-800
RPNW2A00-T, RPNW2A00-A			1000	346.4-415.7	CS5F-1000
RPNW2A20-T, RPNW2A20-A		1200	415.7-498.8	CS5F-1200	
RPNW2A50-T, RPNW2A50-A		1500	570-660	CS5F-1500	
RPNW4020-T	380-440	20	13.2-15.2	CR6L-30G	
RPNW4020-A					
RPNW4045-T			45	29.6-34.3	CR6L-75G
RPNW4045-A					
RPNW4060-T			60	39.5-45.7	CR6L-100G
RPNW4060-A					
RPNW4100-T			100	65.8-76.2	CR6L-150G
RPNW4100-A					
RPNW4150-T			150	98.7-114.3	CR6L-200G
RPNW4150-A					
RPNW4250-T			250	164.5-190.5	CS5F-350
RPNW4250-A					
RPNW4450-T			450	296.2-342.9	CS5F-600
RPNW4450-A					
RPNW4600-T			600	394.9-457.3	CS5F-800
RPNW4600-A					
RPNW4800-T, RPNW4800-A			800	526.5-609.7	CS5F-800
RPNW4A00-T, RPNW4A00-A			1000	658.2-762.1	CS5F-1000
RPNW4A20-T, RPNW4A20-A			1200	789.8-914.5	CS5F-1200
RPNW4A50-T, RPNW4A50-A			1500	987.3-1143.2	CS5F-1500

Note: *1 The value for the rated load capacity is calculated using the following equation.

Rated load capacity (single-phase) = Rated input voltage x Output current

Rated load capacity (3-phase) = $\sqrt{3}$ x Rated input voltage x Output current

*2 To replace only the built-in rapid fuse, use the type number that is listed. For models with a microswitch (CR2L, CR2IS, CR6L), replace G with S. If the unit is certified for UL standards, the built-in rapid fuse is also certified for UL standards.

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■ Specifications

Item		Specification								
Main circuit power supply	Single-phase	100 to 240V, 380 to 440V, 380 to 480V AC±10%, 50/60Hz ±2.5Hz (automatic frequency detection and switching)								
	3-phase	200 to 240V, 380 to 440V, 380 to 480V AC±10%, 50/60Hz±2.5Hz (automatic frequency detection and switching)								
Rated current (A)	Single-phase (ambient temperature of 50°C)	20	45	60	100	150	250	350	450	600
	3-phase (ambient temperature of 40°C)							—		
Cooling method		Self-cooled				Fan-cooled				
Control circuit power supply	Power supply voltage	Single-phase: 100 to 240V AC ±10% (*1.) 3-phase: 200 to 240V AC±10%								
	Power supply capacity (VA) single-phase	34			40		45			
	Power supply capacity (VA) 3-phase	39			58		72		78	
Internal heat generation (W)	Single-phase	47	74	89	133	203	294	377	510	700
	3-phase	90	170	210	330	560	840	—	1490	2070
Applicable load	Phase control	Resistive load, inductive load, transformer primary side, rectifier primary side								
	Cycle control	Resistive load, inductive load, transformer primary side (Applicable only for single-phase models with control method P.)								
Control	Waveform control	Thyristor pure reverse parallel connection (single-phase and 3-phase) Phase control or cycle control (single-phase: intermittent, 3-phase: continuous) (switched with DIP switch)								
	Output voltage adjustment range	0% to 100% (effective value) of main circuit power supply voltage (except thyristor voltage drop)								
	I/O characteristics	Effective value linear characteristics and linearity ±3% FS max. (for a resistive load and for a setting signal of 10 to 90%.)								
	Power supply voltage compensation	Compensation for output fluctuation to ±3% FS max. relative to ±10% fluctuation in power supply voltage (for a setting signal of 10% to 90%, applies to models with control method T or A.)								
	Power supply voltage compensation setting	Fine tuning of max. output voltage, built-in PVC knob (applies to models with control method T or A).								
Setting	Soft start time and soft up/down time setting	Built-in ST knob. 0.5 to 10s or 5 to 100s. Soft up/down time can be set to 0.5s (switched with DIP switch).								
	CLR (current limit) setting	Built-in CLR knob. 0% to 102% of rated current (not for models with control method T)								
	P adjustment	Built-in P knob. 0.1 to 0.5 times proportionate gain (not for models with control method T)								
	I adjustment	Built-in I knob. Integral time of 25ms to 125ms (not for models with control method T)								
	Gradient setting	0% to 100% of output voltage 1. External variable resistor: 1kΩ (B characteristics: 1/2W min.), 2. 1 to 5V DC signal (1 and 2 switched with DIP switch), 3. Built-in GRD knob (optional)								
	Base load setting	0% to 100% of output voltage. Built-in BL knob (optional). Reverse gradient characteristics are enabled using combination with gradient settings.								
	Manual setting	External variable resistor: 1kΩ (B characteristics 1/2W min.)								
	Automatic setting	Current signal: 4 to 20mA DC (Zin = 100Ω) Voltage signal: 0 to 5V DC, 1 to 5V DC (Zin = 10kΩ) (switched with DIP switch)								
Function	Run/stop switching signal (RUN)	No-voltage contact input (contact voltage: 12V DC, 10mA)								
	Auto/manual switching signal (AUTO)	No-voltage contact input (contact voltage: 12V DC, 10mA)								
	Alarm reset signal (RST)	No-voltage contact (momentary) input (contact voltage: 12V DC, 10mA)								
	Automatic inrush current suppression	Current is suppressed by switching the phase angle so that the current is 90% max. of the current limit setting value when cycle control is used. (Applies only to models with control method A.) Applicable load: Alloy, nichrome, pure metal, or silicon carbide.								
	Feedback enable/disable switching	DIP switch ON side: Purchased control method OFF side: Models with control method A (*2)								
	Parallel operation master/slave selection	DIP switch ON side: Master OFF side: Slave Max. number of connected slaves: 50 Communications board (RPN003-AP or RPN003-AX) and connection cable required (optional).(*3)								
	Network communications	Communications standard: RS-485 compliant 2-wire half-duplex asynchronous Protocol: Modbus RTU compliant, Max. number of connectable units: 31 Communications board (RPN003-AM), setting indicator (APD1), and connection cable for remote operation (RPN002-□) required (optional).								

■ Specifications

Item	Specification	
Display	1. Drive monitor display (green LED lit at output), 2. Alarms and errors displayed with red, yellow, and green LEDs, 3. Digital display using APD1 (optional).	
Alarm contact output	Relay contacts, major failure (SPST-NO contacts, 250V AC, 1A), minor failure (SPST-NO contacts, 250V AC, 1A)	
Error detection and protection	Overcurrent	Current at approx. 120% min. of rated current detected by built-in CT (except models with control method T)
	Thyristor error	Thyristor short-circuit failure detected at output stop or output at 0% (except models with control method T)
	Rapid fuse blowout	Detected at contact welding of built-in rapid fuse. Main element protection.
	Overheat error	Detected with temperature sensor (Single-phase: fan-cooled models only, 3-phase: all models)
	CPU memory error	Memory error detected at startup
	Communications error (optional)	Detected when communications cannot be performed correctly using the communications board (optional).
	Heater burnout	"Burnout detection determined by comparing the built-in HT knob (heater burnout judgment setting level 3 to 100%) and below the current value. (Standard function. Single-phase only.) (*4)"
	External setting input not connected	"Detected when 1. The current for the voltage setting signal is not connected or disconnected (4mA max. or 1V max. or 2. When the manual or gradient setting is not connected. (*5.)"
	Power supply error	Detected when the power supply frequency is not 45 to 65 Hz.
	Current limit detection	Detected when a load current that is the same as the current limit set value is detected.
	Undervoltage	Detected when the control power supply voltage drops below 80% of the rated voltage.
	Overvoltage	Detected when the control power supply voltage exceeds 115% of the rated voltage.
Cooling fan service life (fan-cooled models only)	Detected when the rated number of rotations drops below 70% to 200rpm by monitoring the number of revolutions of the cooling fan.	
Feedback control (phase control only)	AC CLR (models with control method A) AC ACR + AC CLR (models with control method B) AC AVR + AC CLR (control method type C) AC AWR + AC CLR (models with control method D) DC AVR + AC CLR (models with control method E) DC ACR + AC CLR (models with control method F) Control accuracy: $\pm 2\%$ FS for AC ACR, otherwise, $\pm 1\%$ FS AC CLR functionality has priority for models with control method B, C, D, E or F. Accuracy conditions: Power supply voltage fluctuation of $\pm 10\%$ with a constant load, or 1 to 4 times the load fluctuation at a constant power supply voltage.	
Environment	Ambient temperature	Single-phase: -5 to 50°C (decrease relative to rated current if ambient temperature is between 50 and 55°C) 3-phase: -5 to 40°C (decrease relative to rated current if ambient temperature is between 40 and 55°C)
	Storage temperature	-20 to 60°C
	Ambient humidity	30% to 90% RH (no condensation)
	Others	Free from corrosive gas, dust, or vibration. Indoor use. Altitude up to 1000 m.
Insulation	Withstand voltage (main circuit to ground)	2000V AC , 1 minute (200 to 240V models), 2500V AC , 1 minute (380 to 440V models)
	Insulation resistance (to ground)	$10\text{M}\Omega$ min. (500V DC megger)

- Note: ¹ Be sure to perform operation with a rated voltage of either 110V (100V system) or 220V (200V system).
Adjust the maximum output voltage using the PVC setting if the rated voltage is 115 to 120V (100V system) or 230 to 240V (200V system). (models with control method T or A only)
- ² Use for test operation (i.e., operation test with temporary load) with models with control method B, C, D, E, or F.
The control method will not change even if a model with control method T or A is used on the OFF side.
- ³ The RPN003-AX is compatible with the MX series and MX2 series.
- ⁴ Heater burnout detection operates for single-phase phase control except for models with control method T.
For cycle control, load open detection is used.
A setting indicator is required for advanced heater burnout detection (single-phase and 3-phase.)
- ⁵ The "external setting input not connected alarm" does not operate if the voltage signal is set to 0 to 5V DC .
- ⁶ Inquire about models with a rated current of 800A , 1000A , 1200A , or 1500A .

AC Power Regulators

APR-N series

■ Type number nomenclature



APR-N series

No. of phases

E: Single-phase thyristor pure reverse parallel

W: 3-phase thyristor pure reverse parallel

Input voltage

2: 100 to 240V (single-phase)
200 to 240V (3-phase)

4 (*2): 380 to 440V, 380 to 480V

9: Special voltage

A transformer is enclosed if the input voltage is not 100 to 240V.

Inquire about special voltage.

Note: *2 Specify UL or CE as the international safety standard for 380 to 480V.

Rated current

020: 20A

045: 45A

060: 60A

100: 100A

150: 150A

250: 250A

350: 350A (single-phase only)

450: 450A

600: 600A

800: 800A

A00: 1000A

A20: 1200A

A50: 1500A

Inquire about 800A, 1000A, 1200A, and 1500A.

Control method

Note: *1 In the type number, the white boxes are required items and the black boxes are optional items. For items with no specification, fill in the box with a hyphen or slash.

International safety standards

Blank: No specification

UL: Compliant with UL, cUL, and CE marking

CE: Compliant with CE marking

Inquire about the status of compliance.

Others

Blank: No specification

01: No operation transformer

02: Test report (Japanese and English) enclosed

03: No operation transformer, test report (Japanese and English) enclosed

The test report is in the Fuji Electric standard format.

The report can be made with special specifications if specified by the customer. This is not displayed in the unit type number.

Specification

Blank: Standard

Z (*3): Unit optional accessories

Setting device

Blank: No

1: Setting device, 1 set

2: Setting devices, 2 sets

3: Setting devices, 3 sets

4: Setting devices, 4 sets

Setting device type: RPN001 (variable resistor, nameplate, knob, and adhesive sheet)

This is not displayed in the unit type number.

Control method

Code	Control method	Required external devices (sold separately)	Control method overview
T	No feedback function	–	No built-in CT. (Functions such as overcurrent protection and heater burnout detection are not included.) This method applies to loads with small changes in resistance, such as alloy heaters.
A	Current CLR	–	CLR = Current Limit Regulator: Output voltage is limited so that the output current does not exceed the CLR setting. This method is used for applications (such as pure metal heaters) for which the maximum current that flows to the load must be limited.
B	AC ACR + AC CLR	–	ACR = Automatic Current Regulator: Control is performed so that the output current is proportional to the set value. This method is used for applications for which the current must be constant, such as pure metal heaters or direct power application heating.
C	AC AVR + AC CLR	VT (type number: PT-5S) single-phase: 1 VT (type number: PT-5S) 3-phase: 2	AVR = Automatic Voltage Regulator: Control is performed so that the output voltage is proportional to the set value. This method is used for applications that require output voltage accuracy.
D	AC AWR + AC CLR	VT (type number: PT-5S) single-phase: 1 VT (type number: PT-5S) 3-phase: 2	AWR = Automatic Watt Regulator: Control is performed so that the output power is proportional to the set value. This method is used for applications that require heat level control, such as silicon carbide heaters or sensorless operation.
E	DC (or AC) AVR + AC CLR (feedback input: 0 to 10V DC)	Isolating converter (high-speed response) or VT (type number: PT-5S) + RMS converter (type number: RMS-2)	AVR = Automatic Voltage Regulator: The functionality is the same as for current given above. This method is used for applications that require accuracy, such as the transformer secondary side or rectifier secondary side. Control is performed so that the feedback value is 10V when the set value is 100%.
F	DC (or AC) ACR + AC CLR (feedback input: 0 to 10V DC)	Isolating converter (high-speed response) or CT (type number: CT-5S) + RMS converter (type number: RMS-2)	ACR = Automatic Current Regulator: The functionality is the same as for current given above. This method is used for applications that require accuracy, such as the transformer secondary side or rectifier secondary side. Control is performed so that the feedback value is 10V when the set value is 100%.
P	Transformer primary control using cycle control	Enclosed CT (type number: CT-5S)	Single-phase only. This method can be applied to isolating transformers and resistive loads (resistance value changes of 20% max.). Output will stop due to load error if the load drops below 30% of the APR rated capacity.

Specify a model with control method E if connection is made to an already installed W converter (W-2).

Note: ³ Unit optional accessories

Main optional specification name	Description	Option specification number (*4.)
Soft start time 0.05s min.	Soft start time variable range: 0.05 to 10s/0.05 to 100s	RPN□□□□□-□■-Z06
Built-in base load setting	Base load setting included on control printed circuit board	RPN□□□□□-□■-Z07
Built-in gradient setting	Gradient setting included on control printed circuit board	RPN□□□□□-□■-Z43
Control power supply separation	Control power supply terminal block (L11-L21-L31) internal wiring deletion	RPNW□□□□□-□■-Z72
Communications board: Parallel operation supported (*5)	Flicker prevention and communications board for parallel operation	RPN□□□□□-□■-ZAP
Communications board: MX compatible parallel operation supported (*6)	MX and MX2-series compatible parallel operation communications board	RPN□□□□□-□■-ZAX
Communications board: Modbus RTU supported	Communications board for Modbus RTU	RPN□□□□□-□■-ZAM
APD1 + APD1 mounting bracket	APD1 and a connection cable are attached to the front of the unit.	RPN□□□□□-□■-ZA■B3
3-phase, 4-wire supported	Control board changed to 3-phase, 4-wire (models with control method T or A only)	RPNW□□□□□-□■-ZB4
Function code change (*7)	Shipment made with the specified function code	RPN□□□□□-□■-ZC■
Input voltage: Special voltage supported (*8)	TR1-70R/E1 operation transformer enclosed	RPNE9□□□□-□■-ZE1

Note: ⁴ To specify multiple unit option specifications, list the specification numbers after Z.
For example, the following is the order type number for a unit with the following options: Soft start time 0.05s min., communications board, parallel operation, and 3-phase, 4-wire.
Order type number: RPNW □□□□□ - □■ -Z06APB4
⁵ Not compatible with the MX series and MX2 series. Also, cycle control cannot be performed using both single-phase and 3-phase.
When parallel operation is used, heater burnout detection cannot be used with the setting indicator for the slave device.

⁶ Compatible with the MX series and MX2 series. Also, cycle control cannot be performed using both single-phase and 3-phase.
When parallel operation is used, heater burnout detection cannot be used with the setting indicator for the slave device.
⁷ Before shipment, settings are changed in-house using the setting indicator. A setting indicator is not enclosed at shipment. Each unit can be handled individually. Inquire for details.
⁸ The primary side tap voltage for the TR1-70R/E1 operation transformer is 250, 254, 260, 265, 277, or 305V AC.

AC Power Regulators

APR-N series

■ Other optional accessories (sold separately)

• Mounting bracket for external cooling installation

Single-phase (RPN004-E □□)

Type	Description
RPN004-E02	For RPNE□020-□
RPN004-E06	For RPNE□045-□ and RPNE□060-□
RPN004-E10	For RPNE□100-□
RPN004-E15	For RPNE□150-□
RPN004-E25	For RPNE□250-□
RPN004-E35	For RPNE□350-□
RPN004-E45	For RPNE□450-□
RPN004-E60	For RPNE□600-□

3-phase (RPN004-W □□)

Type	Description
RPN004-W02	For RPNW□020-□
RPN004-W06	For RPNW□045-□ and RPNW□060-□
RPN004-W10	For RPNW□100-□
RPN004-W15	For RPNW□150-□
RPN004-W25	For RPNW□250-□
RPN004-W45	For RPNW□450-□
RPN004-W60	For RPNW□600-□

• Main circuit terminal cover

3-phase (RPN006-W □□)

Type	Description
RPN006-W02	For RPNW□020-□
RPN006-W06	For RPNW□045-□ and RPNW□060-□
RPN006-W10	For RPNW□100-□
RPN006-W15	For RPNW□150-□
RPN006-W25	For RPNW□250-□
RPN006-W45	For RPNW□450-□
RPN006-W60	For RPNW□600-□

Note: The single-phase models are provided in standard models, and so there is no main circuit terminal cover available as an option.

• Setting indicator, communications board, and connection cable for remote operation

Item	Type	Name	Specification
Setting indicator	APD1	—	—
Cable	RPN002-1	Connection cable for remote operation	Length: 1m
	RPN002-3	Connection cable for remote operation	Length: 3m
	RPN002-5	Connection cable for remote operation	Length: 5m
Communications board	RPN003-AP	Flicker prevention and communications board for parallel operation	—
	RPN003-AX *	MX and MX2-series compatible parallel operation communications board	Factory mounted only.
	RPN003-AM	Communications board for Modbus RTU	—

Note: Only one communications board of any type can be mounted.

Specify ZA □ in the unit option specifications to have the board mounted and shipped.

* This board is not sold separately. To obtain it, specify ZAX in the unit option specifications when ordering.

• Finger guard

Single-phase (RPN005-E □□)

Type	Description
RPN005-E02	For RPNE□020-□
RPN005-E06	For RPNE□045-□ and RPNE□060-□
RPN005-E10	For RPNE□100-□
RPN005-E15	For RPNE□150-□
RPN005-E25	For RPNE□250-□
RPN005-E35	For RPNE□350-□
RPN005-E45	For RPNE□450-□
RPN005-E60	For RPNE□600-□

3-phase (RPN005-W □□)

Type	Description
RPN005-W02	For RPNW□020-□
RPN005-W06	For RPNW□045-□ and RPNW□060-□
RPN005-W10	For RPNW□100-□
RPN005-W15	For RPNW□150-□
RPN005-W25	For RPNW□250-□
RPN005-W45	For RPNW□450-□
RPN005-W60	For RPNW□600-□

• Feedback control CT and VT

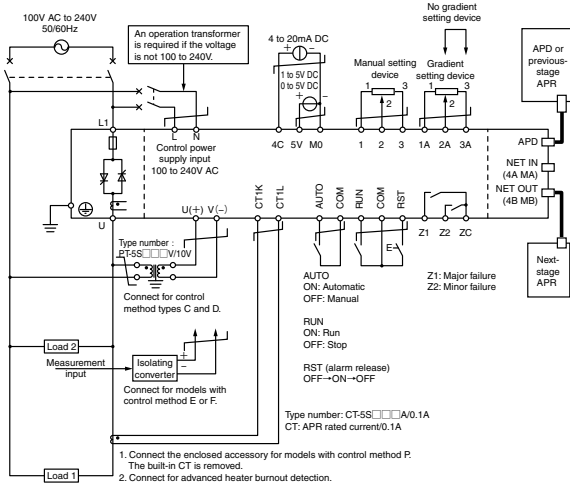
Item	Type	Rated primary input	Rated secondary output
CT	CT-5S	20A, 45A, 60A	0.1A 5VA and Class 1
		100A, 150A, 250A 350A, 450A, 600A	
VT	PT-5S	100V, 110V	10V 5VA and Class 1
		200V, 220V	
		380V	
		400V, 440V	
		420V, 460V	
		440V, 480V	

Note: Number of primary pass-through turns for CT-5S: 5 turns for 20A, 3 turns for 45A, 2 turns for 60A, and 1 turn otherwise.

The primary voltage for PT-5S is a 2-tap input except for 380V.

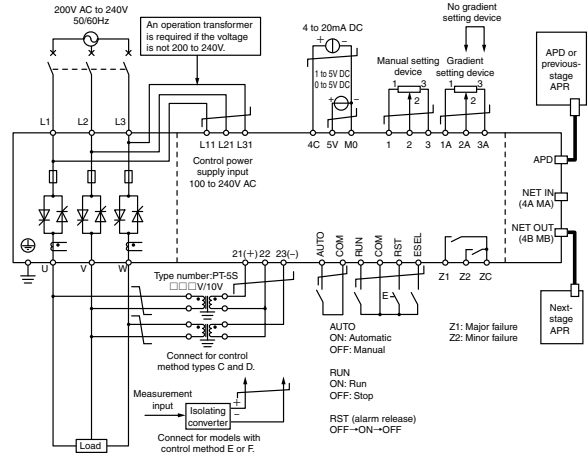
External connection

External connections (single-phase)



External connection (full connection with no function allocation changes)

External connection (3-phase)



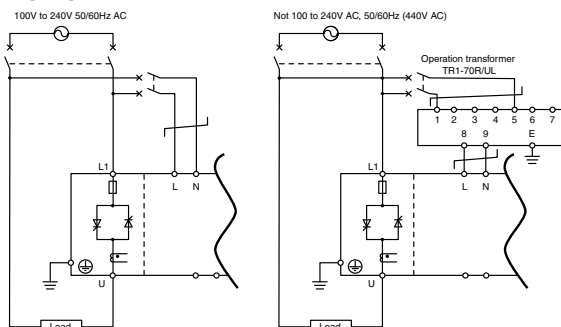
External connection (full connection with no function allocation changes)

Control terminal functions using setting indicator (SW8: ON)

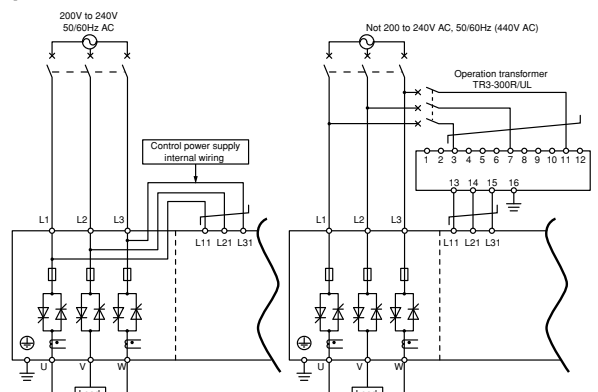
You can make function code settings using a setting indicator and delete external wiring or change functions using network communication.

Control terminals	Wiring	Remarks
RUN	Required	Operation is not performed when the RUN terminal is OFF. When the RUN terminal is ON, the unit will run or stop when the RUN/STOP key is pressed on the setting indicator. Operation using the RUN/STOP key on the setting indicator is recorded in non-volatile memory. If the last operation is RUN, the unit will run or stop according to the RUN terminal ON/OFF status. If the last operation is STOP, the unit will not run even if the RUN terminal is ON. The unit will run or stop only when the RUN terminal is turned ON or OFF if function code 1.b16 is set to OFF. The unit can be started or stopped using network communications if the RUN terminal is ON.
1, 2, 3 1A, 2A, 3A	Selectable	Settings can be made using a setting indicator for network communications, and so wiring is not required. The functions of the setting device (e.g., CLR and ST) for adjusting the APR unit can be allocated to an external setting device.
AUTO RST	Selectable	Operation can be performed using a setting indicator for network communications, and so wiring is not required. Alarms can also be reset using the RESET key on the setting indicator. Can be allocated HIGH setting/LOW setting switching input for two-position control.
4C, 5V, M0	Selectable	Control can be performed using network communications if control is made using PLC output.
Z1, Z2, ZC	Selectable	Alarm codes are displayed on the setting indicator. Network communications can be used to read alarm codes and check if there are major failures or minor failures.

Main circuit and control power supply connection (single-phase)



Main circuit and control power supply connection (3-phase)

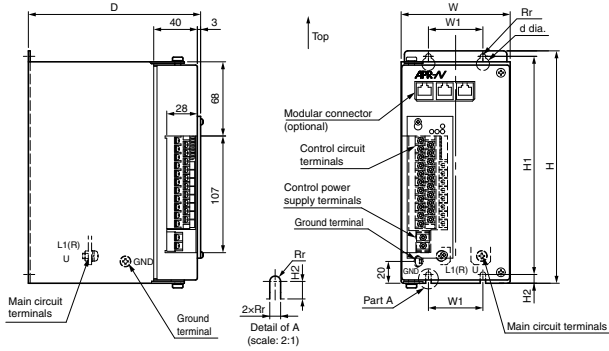


AC Power Regulators APR-N series

■ Dimensions, mm

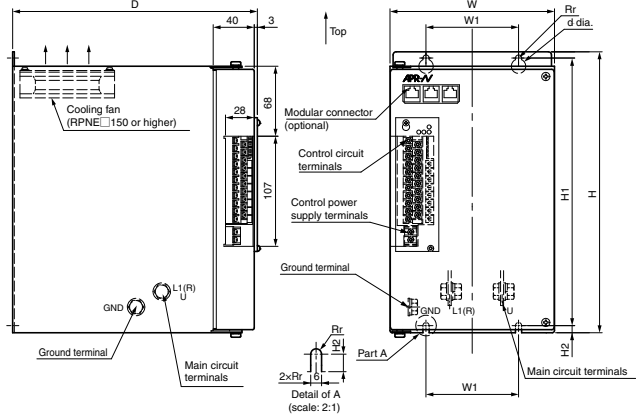
■ Single-phase

- RPNE □ 020, RPNE □ 045, RPNE □ 060



Type	W	H	D	W1	H1	H2	d	r	Mass (kg)
RPNE □ 020	100	213	158	50	200	8	12	2.5	2.6
RPNE □ 045	114	213	183	60	200	8	12	2.5	3.3
RPNE □ 060									

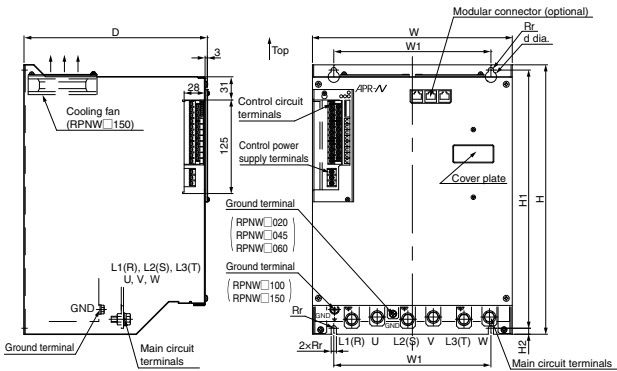
- RPNE □ 100, RPNE □ 150, RPNE □ 250, RPNE □ 350, RPNE □ 450, RPNE □ 600



Type	W	H	D	W1	H1	H2	d	r	Mass (kg)
RPNE □ 100	144	224	238	90	210	8	14	3	5.3
RPNE □ 150	160	273	238	90	260	7	14	3	6.4
RPNE □ 250	178	335	238	120	320	8	15	3.5	10.0
RPNE □ 350	200	345	263	150	330	8	15	3.5	13.0
RPNE □ 450									
RPNE □ 600	207	360	288	157	345	8	15	3.5	14.8

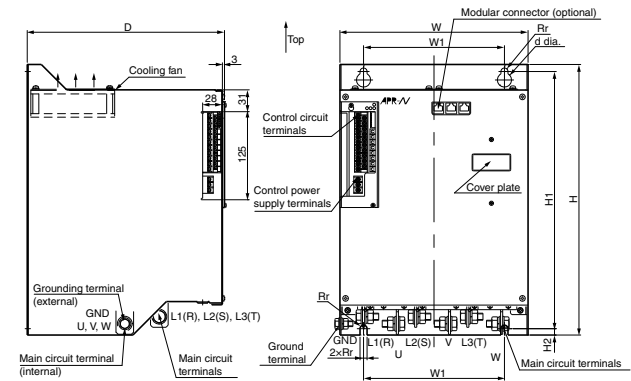
■ 3-phase

- RPNW □ 020, RPNW □ 045, RPNW □ 060, RPNW □ 100, RPNW □ 150



Type	W	H	D	W1	H1	H2	d	r	Mass (kg)
RPNW □ 020	230	273	160	200	260	6	14	3	5.0
RPNW2045	238	293	210	205	280	6	14	3	8.4
RPNW4045									9.1
RPNW2060	238	293	210	205	280	6	14	3	8.4
RPNW4060									9.1
RPNW □ 100	267	330	245	210	315	8	15	3.5	12.1
RPNW □ 150	267	360	245	210	345	8	15	3.5	13.0

- RPNW □ 250, RPNW □ 450, RPNW □ 600



Type	W	H	D	W1	H1	H2	d	r	Mass (kg)
RPNW □ 250	267	384	280	200	365	9	20	5	16.9
RPNW □ 450	372	442	300	280	420	12	20	5	30.6
RPNW □ 600	372	528	310	280	505	11	24	6	37.0

• **Enclosed items (if specified in order specifications)**

Setting device Type number: RPN001	Used for setting methods, such as variable resistance setting, two-position control, and gradient control.
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Rating: 1kΩJ 2.5W Type number: RA30YN20SB102J (manufacturer: Tokyo Cosmos)

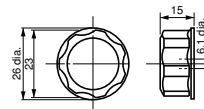
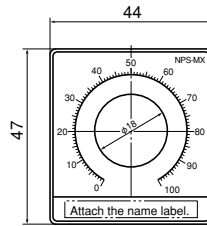
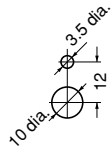
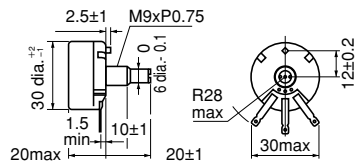
Variable resistor

Mounting holes

Nameplate

Knob

Name label sheet
(18 Japanese/English labels)

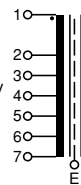
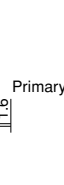
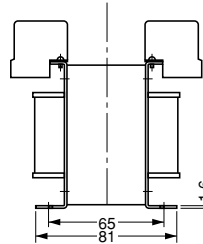
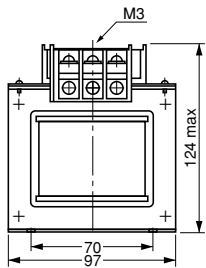


手動設定	MANUAL SET.
勾配設定	GRANDE SET.
CLR設定	CLR SET.
HIGH設定	HIGH SET.
LOW設定	LOW SET.
ソフトスタート時間設定	ST SET.
電源電圧補償設定	PVC SET.
ヒータ断線判定設定	HT SET.
ベースロード設定	BL SET.

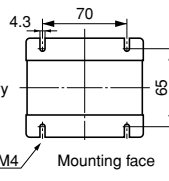
Note: Control circuit terminal block allocation using the setting indicator is required except for manual setting and gradient setting.

Operation transformer (single-phase)
Type number: TR1-70R/UL

Enclosed for input voltage code 4



Output current	20 to 600A
Rating	Single-phase, 380, 400, 415, 440, 460, 480/220V, 70VA
Type	TR1-70R/UL

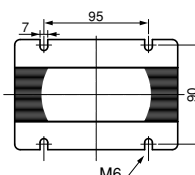
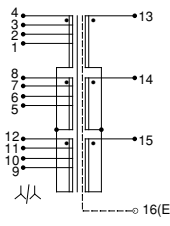
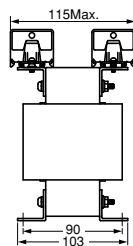
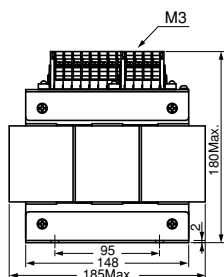


Primary voltage	Terminal number
380V	1-2
400V	1-3
415V	1-4
440V	1-5
460V (*1)	1-6
480V (*1)	1-7

Mass: 3.5g

Operation transformer (3-phase)
Type number: TR3-300R/UL

Enclosed for input voltage code 4



Output current	20 to 600A
Rating	3-phase, 380, 400, 440, 480/220V, 300VA
Type	TR3-300R/UL

Primary voltage	Terminal number (R-S-T)
380V	1-5-9
400V	2-6-10
440V	3-7-11
480V (*1)	4-8-12

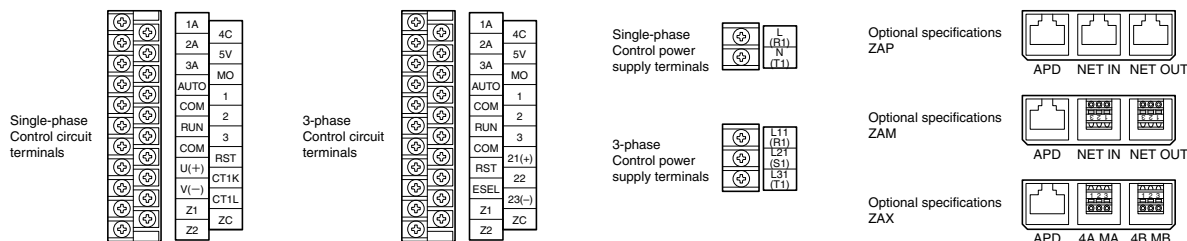
Mass: 8.5g

Note:*1 Do not use 460V or 480V if the voltage specifications of the unit are standard.

AC Power Regulators

APR-N series

• Terminal block details



Category	Name	Symbol	Not used	Function description
Control power supply	Control power supply terminals	L(R1), N(T1)	—	Control circuit power supply, single-phase, 100 to 240V input
		L11(R1), L21(S1), L31(T1)		Control circuit power supply, 3-phase, 200 to 240V input
Control circuit	Manual setting input	1, 2, 3	Open	Manual setting input and HIGH setting input using connection of variable resistor
	Gradient setting input	1A, 2A, 3A	2A to 3A short-circuit	Gradient setting input and LOW setting input using connection of variable resistor
	Automatic setting input	4C, 5V, M0	Open	Voltage and current signal input of controller
	Automatic/manual switching input	AUTO, COM	—	Automatic setting input using external contact closed Manual setting input using external contacts open
	Run/stop input	RUN, COM	Short-circuit	RUN status using external contact closed and output OFF using external contact open
	Alarm reset	RST, COM	Open	Alarm release for closing of external contacts
	Alarm contact output	Z1, ZC		Internal contacts turn ON when alarm occurs for major failure
	Alarm contact output	Z2, ZC		Internal contacts turn ON when alarm occurs for minor failure
	External detection input	U(+), V(-) U(+), V(-)		Feedback detection input with connection of VT and DC converters
	External CT input	CT1K, CT1L		CT connection using advanced heater burnout alarm
External selection input	ESEL, COM		Switching of internal selection switch using external input (optional)	
Parallel operation/Modbus RTU	APD I/O	APD		Sending and receiving set values with connection of a setting indicator (APD) Receiving parallel operation signals from previous-stage APR in parallel operation
	Parallel operation I/O	NET IN, NET OUT DXA: Pin No1 DXB: Pin No2		Sending and receiving set values from the host in network communications Sending parallel operation signals to next-stage APR in parallel operation
		4A-4B: Pin No1 MA-MB: Pin No3		MX and MX2-series compatible input terminal MX and MX2-series compatible output terminal

Note: The function description for the control circuit applies when there are no changes in function allocations.

APD1 setting indicator

■ Features

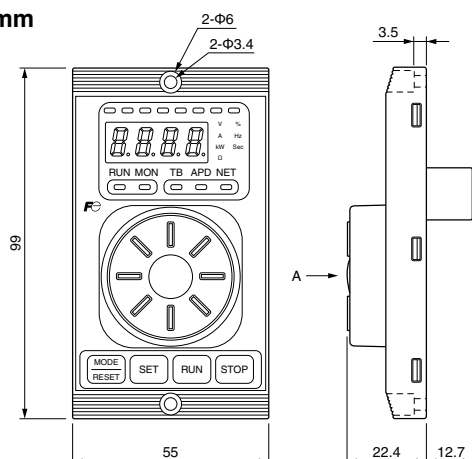
The APR-N series enables a wide variety of operations and settings.

- Fast selection and display switching using dial operation.
- Display two elements at the same time with the data display and multi-indicator.
- Perform unit diagnosis even with no data for the input signal check function.
- Error detection history display functionality.
- High-accuracy setting using digital display.
- Customize functionality by changing function codes.
(For example, allocate alarm outputs or allocate the terminal block for internal adjustment functionality.)
- Function code copy functionality.
- Compliance with EU RoHS Directive.
- Compliance with UL and cUL standards.
- Compliance with CE marking standards.

■ Specifications

Item	Specification
Type	APD1
Degree of protection	Panel surface: IP40, Back: (mounting surface): IP20
Operating location	Indoor
Ambient temperature	-5 to 50°C
Ambient humidity	30% to 90% RH (no condensation)
Environment	Location free from dust, corrosive gas (especially sulfidizing gas and ammonia gas), flammable gas, oil mist, water droplets, and direct sunlight. Location free from salt damage. Free from condensation due to sudden temperature changes.
Altitude	1000m max.
Ambient storage temperature	-20 to 60°C
Ambient storage humidity	30% to 90% RH (no condensation)
Installation method	Vertical installation (wall mounting)
Unit mounting tightening torque	
Mounting screws	M3 x 16
Tightening torque (±10%)	0.7N·m (7kgf·cm)
Mass	55g

■ Dimensions, mm

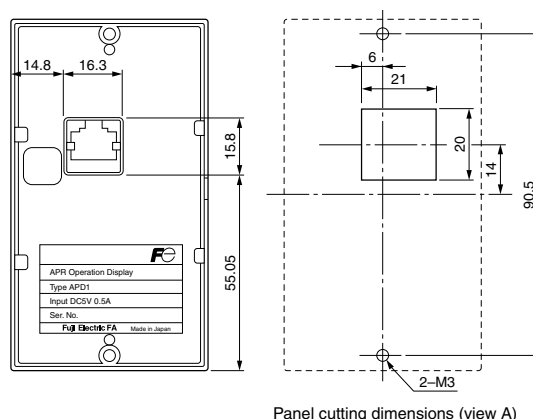


■ Hardware specifications

Item	Specification
Connection cable for remote operation	Satisfies standards of U.S. ANSI, TIA, and EIA-568A Category 5. Straight cable (straight cable for 10Base-T and 100Base-TX)
Max. communications distance	20m (non-insulated)
External connection terminal	RJ-45 connector (modular jack connector)

Note: ¹ If a setting indicator is used, a connection cable for remote operation (RPN002-□) and a communications board (RPN003-A□) are required.

² If a commercially available cable is used, do not use an STP (shielded) cable.



AC Power Regulators

APR-N series

■ Part names and functions of setting indicator

Multi-indicator

Display values are shown in eight segments on the LED monitor.
The indicators also display internal I/O monitors and communications monitors.

LED monitor

The monitor is a 7-segment LED display. The following items are displayed according to the operation.

- **Monitor mode**
Operation data (e.g., output voltage, output current, and load resistance values) is displayed. The alarm code is displayed if an alarm occurs.
- **Setting mode**
Function codes and function code data are displayed.

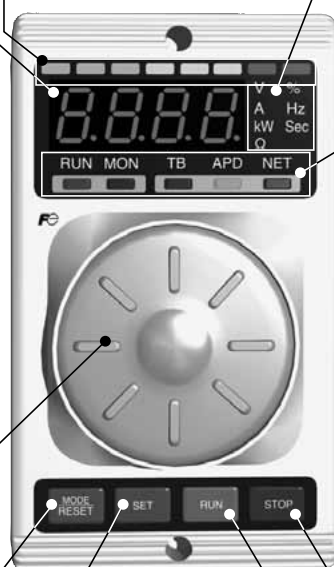
Dial

The dial is used to select setting items and detection values displayed on the LED monitor and to change function code data.

MODE/RESET key

This key is used to switch between operation mode, monitor mode, and setting mode.

- **Monitor mode**
Press this key to switch to setting mode.
- **Setting mode**
Press this key to switch to monitor mode.



Unit display LEDs (seven)

LEDs display the unit for data displayed on the LED monitor.

- V..... Voltage value display
- A..... Current value display
- kW..... Power value display
- Ω..... Resistance value display
- %..... Percentage display
- Hz..... Frequency display
- Sec..... Setting time display

Status display LEDs (five)

LEDs display the status.

- **RUN-LED (operation display)**
This LED is lit when the APR is operation status.
- **MON-LED (detection display)**
This LED is lit in monitor mode.
- **TB-LED (terminal block display)**
This LED is lit when APR operation is performed according to a command from the terminal block.
- **APD-LED (setting indicator)**
This LED is lit when APR operation is performed according to the setting of the terminal block.
- **NET-LED (network communications display)**
This LED is lit when APR operation is performed using a command from the host via network communications.

SET key

In setting mode, press this key to display function code data or enter data.

STOP key

This key is used to stop APR operation.

RUN key

This key is used to start APR operation.

■ Display and key operation

Display section and operation section		Operation mode		Setting mode		Monitor mode	
				Operation stopped	Operating	Operation stopped	Operating
Display section		Function	Displays operation data outputs for fixed display of multi-indicator.			Displays in 8 segments for operation data, internal I/O, and communications monitors.	
		Display	ON/flashing				
		Function	Displays function codes and function code data. Displays alarm code at alarm.			Displays output voltage, output current, output power, load resistance value, and output %. Displays alarm code at alarm.	
		Display	ON				
	Function	Displays the status.					
	Display	• RUN-LED OFF	• RUN-LED ON	• RUN-LED OFF	• RUN-LED ON		
		• MON-LED OFF		• MON-LED ON			
		• TB-LED ON when APR is selected at setting device. • APD-LED ON when APD is selected at setting device. • NET-LED ON when NET is selected at setting device.					
	Function	Displays unit for data displayed on LED monitor.					
	Display	• V-LED Voltage display					
		• A-LED Current display					
		• kW-LED Power display					
		• Ω-LED Resistance value display					
		• %-LED Percentage display					
		• Hz-LED Frequency display					
• Sec-LED Setting time display							
Operation section		Function	Increases and decreases function codes and function code data.			Switches display mode of operation data.	
		Function	Moves to monitor mode			Moves to setting mode Resets error after removing cause of error.	
		Function	Displays function code data and entering data.				
		Function	Starting operation	-		Starting operation	-
		Function	-	Operation stopped		-	Operation stopped

AC Power Regulators
APR-N series

■ MEMO

Safety Considerations

- Operate (keep) in the environment specified in the operating instructions and manual. High temperature, high humidity, condensation, dust, corrosive gases, oil, organic solvents, excessive vibration or shock might cause electric shock, fire, erratic operation or failure.
- For safe operation, before using the product read the instruction manual or user manual that comes with the product carefully or consult the Fuji sales representative from which you purchased the product.
- Products introduced in this catalog have not been designed or manufactured for such applications in a system or equipment that will affect human bodies or lives.
- Customers, who want to use the products introduced in this catalog for special systems or devices such as for atomic-energy control, aerospace use, medical use, passenger vehicle, and traffic control, are requested to consult with Fuji Electric FA.
- Customers are requested to prepare safety measures when they apply the products introduced in this catalog to such systems or facilities that will affect human lives or cause severe damage to property if the products become faulty.
- For safe operation, wiring should be conducted only by qualified engineers who have sufficient technical knowledge about electrical work or wiring.
- Follow the regulations of industrial wastes when the product is to be discarded.
- For further questions, please contact your Fuji sales representative or Fuji Electric FA.

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