PAT650-61.5TM/TMX (200 V input) specification

Unless specified otherwise, the specifications are for the following settings and conditions.

- The load is a pure resistance.
- The warm-up time is 30 minutes (with current flowing).
- After warm-up is complete, the PAT-TM/TMX series must be calibrated correctly according to the procedures given in the operation manual in a 23 °C ± 5 °C environment.
- TYP (typical) values do not guarantee the performance.
- rtg: Indicates the rated output.
- rdng: Indicates the reading.
- Rated load and no load are defined as follows.

During constant voltage operation (set the output current at the rated voltage output greater than equal to the rated output current)
- Rated load: Refers to a load with a resistance that makes the current that flows when the rated output voltage is applied to be 95 % to 100 % of the rated output current at the rated output voltage.
- No load: Refers to a load through which no output current flows or an open output terminal condition with no load connected.

During constant current operation (set the output voltage at the rated output current greater than equal to the rated output voltage)
- Rated load: Refers to a load with a resistance that makes the voltage drop when the rated output current is supplied to be 95 % to 100 % of the maximum output voltage at the rated output current.
  The output voltage of the PAT-TM/TMX series including the voltage drop in the load cable must not exceed the maximum output voltage at the rated output current.
- No load: Refers to a load with a resistance that makes the voltage drop when the rated output current is supplied to be 10 % of the maximum output voltage or 1 V, whichever is greater, at the rated output current.

AC input

Nominal input rating	200 V to 240 V, 50 Hz to 60 Hz, three-phase
Input voltage range	180 V to 250 V
Input frequency range	47 Hz to 63 Hz
Current (MAX) *1	160 A
Inrush current (MAX) *2	500 Apeak
Wattage (MAX) *1	50 kVA
Power factor (TYP) *3	0.95
Efficiency (MIN) *3	85 %

*1. At the rated load.
*2. Excluding the element of charging current flown into the capacitor of the internal circuit of the EMC filter approximately within 1 ms right after turning on the breaker switch of the PAT-TMX series or turning on the switch of the switch board while the POWER switch is turned on of each power supply unit of the PAT-TM series.
*3. Input voltage of 200 Vac, at the rated load.

Output

Rating	Output power	39.97 kW
	Output voltage	650.0 V
	Output current	61.50 A
Voltage	Maximum preset voltage (TYP)	105 % of rtg *1
	Setting accuracy	± (0.2 % of rtg +50 mV) *2
	Rise time (MAX)	200 ms (No load) *3
	Fall time (MAX)	4000 ms (No load) *4
Current	Maximum preset voltage (TYP)	105 % of rtg *1
	Setting accuracy	± (3.0 % of rtg +1 A) *2

*1. The maximum preset voltage and current are used to determine constant voltage or constant current operation when the activation point of the constant voltage or constant current operation is set to the rated output voltage or current. It does not guarantee power supply to the load exceeding the rated output voltage or current.
To establish a constant voltage operation at the activation point (rated output voltage or current), set the output current (I Set) so that rated output current < I Set ≤ maximum preset current. Likewise, to establish constant current operation, set the output voltage (V Set) so that rate output voltage < V Set ≤ maximum preset voltage.
*2. The difference between the actual output voltage or output current and the preset value under constant voltage or constant current operation.
*3. The time it takes for the output voltage to rise from 10 % to 90 % of the rating when the output is turned on.
*4. The time it takes for the output voltage to fall from 90 % to 10 % of the rating when the output is turned off.

Display function

Voltmeter	Maximum display	999.9 (fixed decimal point)
	Display accuracy	± (0.2 % of rdng +5 digits) at 23 °C ± 5 °C
Ammeter	Maximum display	99.99 (fixed decimal point)
	Display accuracy	± (0.6 % of rdng +15 digits) at 23 °C ± 5 °C
Operation display	OUTPUT ON/OFF	ON: OUTPUT LED illuminates (Green LED) OFF: OUTPUT LED turns off
	ALM operation	ALARM LED illuminates (Red LED) *1
	CV operation	CV LED illuminates (Green LED)
	CC operation	CC LED illuminates (Red LED)
	RMT operation	RMT LED illuminates during remote control (Green LED)
	EXT operation	EXT LED illuminates during external control (Green LED)
	LOCK operation	LOCK LED illuminates when the keys are locked (Green LED)

*1. Illuminates when the overvoltage protection (OVP), overcurrent protection (OCP), overheat protection (OHP), input open-phase protection (PHASE), fan failure protection (FAN), incorrect sensing connection protection (SENSE), overheat protection of the bleeder circuit (BOHP) and so on are activated.
Illuminates even when the breaker trips (even when the POWER switch is turned off). In this case, the LED illuminates for approximately 10 to 15 seconds.

Protection functions

Overvoltage protection (OVP)		Turns off the output or trips the breaker (turns the POWER switch off). ALARM LED illuminates.*1
	Selectable range	10 % to 111.5 % of the rated output voltage
	Setting accuracy	± 2 % of rtg
Overcurrent protection (OCP)		Turns off the output or trips the breaker (turns the POWER switch off). ALARM LED illuminates.*1
	Selectable range	10 % to 111.5 % of the rated output current
	Setting accuracy	± 3 % of rtg
Overheat protection (OHP)		Turns the output off. ALARM LED illuminates.
Input open-phase protection (PHASE)		Turns the output off. ALARM LED illuminates.
Fan failure protection (FAN)		Turns the output off. ALARM LED illuminates.
Incorrect sensing connection protection (SENSE)		Turns the output off. ALARM LED illuminates.
Overheat protection of the bleeder circuit (BOHP)		Turns the output off. ALARM LED illuminates.
Shut down (SD)		Turns off the output or trips the breaker (turns the POWER switch off). ALARM LED illuminates.*1

*1. Illuminates even when the breaker trips (even when the POWER switch is turned off). In this case, the LED illuminates for approximately 10 to 15 seconds.

Output signals

Monitor signal output*1	VMON (Voltage)	At rated voltage output	10.00 V ± 0.25 V
		At 0 V output	0.00 V ± 0.25 V
	IMON (Current)	At rated current output	10.00 V ± 0.25 V
		At 0 A output	0.00 V ± 0.25 V
Status signal output *1, *2	OUTON STATUS		Turns on when the output is on.
	CV STATUS		Turns on during CV operation.
	CC STATUS		Turns on during CC operation.
	ALM STATUS		Turns on when an alarm (OVP, OCP, OHP, BOHP, input open-phase protection, fan failure protection, incorrect sensing connection protection, or shutdown) is detected.
	PWR OFF STATUS		Stays on for approximately 10 to 15 seconds after the POWER switch turns off.
	PWR ON STATUS		Turns on when the POWER switch is on.

*1. J1 connector on the rear panel.
*2. Photocoupler open collector output, maximum voltage 30 V, maximum current (sink) 8 mA, insulated from the output and control circuits, and status signals are not mutually insulated.

Control functions

External control*1	EXT-V CV CONT *2 *3 (CV external voltage control)	0 % to 100 % of the rated output voltage in the range of 0 V to 10 V.
	EXT-V (FAST) CV CONT *2 *3 (CV external voltage control FAST)	0 % to 100 % of the rated output voltage in the range of 0 V to 10 V.
	EXT-R CV CONT *2 (CV external resistance control)	0 % to 100 % of the rated output voltage in the range of 0 kΩ to 10 kΩ.
	EXT-R (FAIL SAFE) CV CONT *2 (CV external resistance control FAIL SAFE)	100 % to 0 % of the rated output voltage in the range of 0 kΩ to 10 kΩ.
	EXT-V CC CONT *2 *3 (CC external voltage control)	0 % to 100 % of the rated output current in the range of 0 V to 10 V.
	EXT-V (FAST) CC CONT *2 *3 (CC external voltage control FAST)	0 % to 100 % of the rated output current in the range of 0 V to 10 V.
	EXT-R CC CONT *2 (CC external resistance control)	0 % to 100 % of the rated output current in the range of 0 kΩ to 10 kΩ.
	EXT-R (FAIL SAFE) CC CONT *2 (CC external resistance control FAIL SAFE)	100 % to 0 % of the rated output current in the range of 0 kΩ to 10 kΩ.
	OUTPUT ON/OFF CONT*4	Output on with a low TTL level signal/output on with a high TTL level signal.
	SHUT DOWN*5	POWER switch off with a low TTL level signal.

*1. J1 connector on the rear panel.
*2. Set EXT-V, EXT-V (FAST), EXT-R, and EXT-R (FAIL SAFE) in the CONFIG settings. The selected function is enabled.
*3. The input impedance EXT-V CV CONT, EXT-V (FAST) CV CONT and EXT-V CC CONT, EXT-V (FAST) CC CONT is approximately 100 kΩ.
    The setting accuracy is ±5 % of the rated output voltage or ±5 % of the maximum output current.
*4. Set the logic low/high using CONFIG settings.
*5. The output turns off even if the breaker trip setting of the CONFIG parameter is set so that the POWER switch does not turn off.

Interface

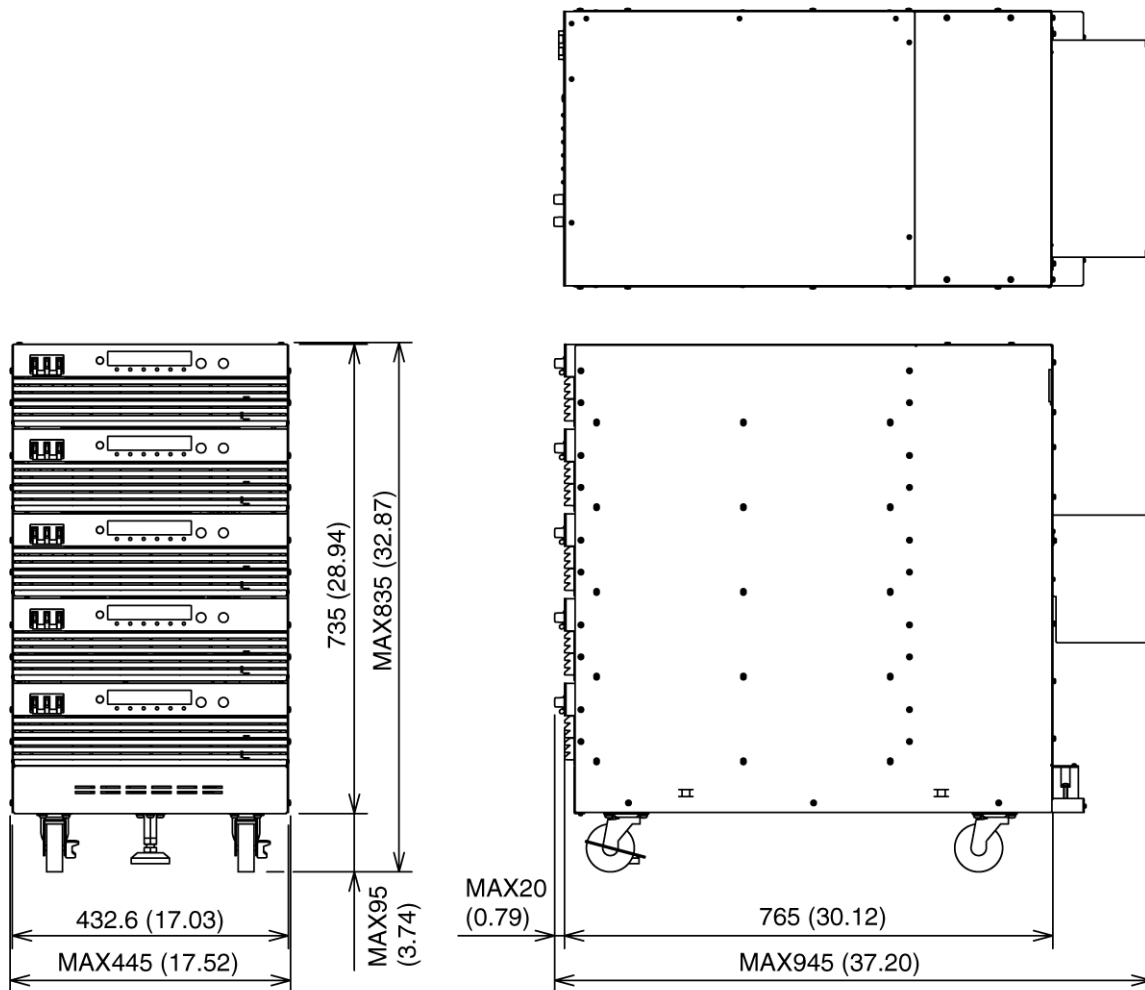| Common specifications	Software protocol	IEEE Std 488.2-1992
	Command language	Complies with the SCPI Specification 1999.0 specifications.
RS232C	Hardware	Complies with EIA232D.
		D-SUB 9-pin connector (male) *1
		Baud rate: 1200, 2400, 4800, 9600, 19200, and 38400 bps
		Data length: 7 bits or 8 bits. Stop bit: 1 bit or 2 bits. No parity.
		Flow control X-Flow or none.
	Program message terminator	LF during reception, CR/LF during transmission.
GPIB*2	Hardware	Complies with IEEE Std 488.1-1987.
		SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, and E1.
		24 pin connector (receptacle)
	Program message terminator	LF or EOI during reception, LF+EOI during transmission.
	Primary address	1 to 30
USB*2	Hardware	Complies with USB 2.0. Data rate: 12 Mbps (full speed).
		Socket B type
	Program message terminator	LF or EOM during reception, LF+EOM during transmission.
	Device class	Complies with the USBTMC-USB488 device class specifications.
LAN*2	Hardware	IEEE 802.3 100Base-TX/10Base-T Ethernet Complies with the LXI Class C, Specification 1.2.
		IPv4, RJ-45 connector *3
	Communications protocol	VXI-11
	Program message terminator	LF or END during reception, LF+END during transmission.

*1. Use a cross cable (null modem cable).
*2. Factory option.
*3. Category 5, use a straight cable.
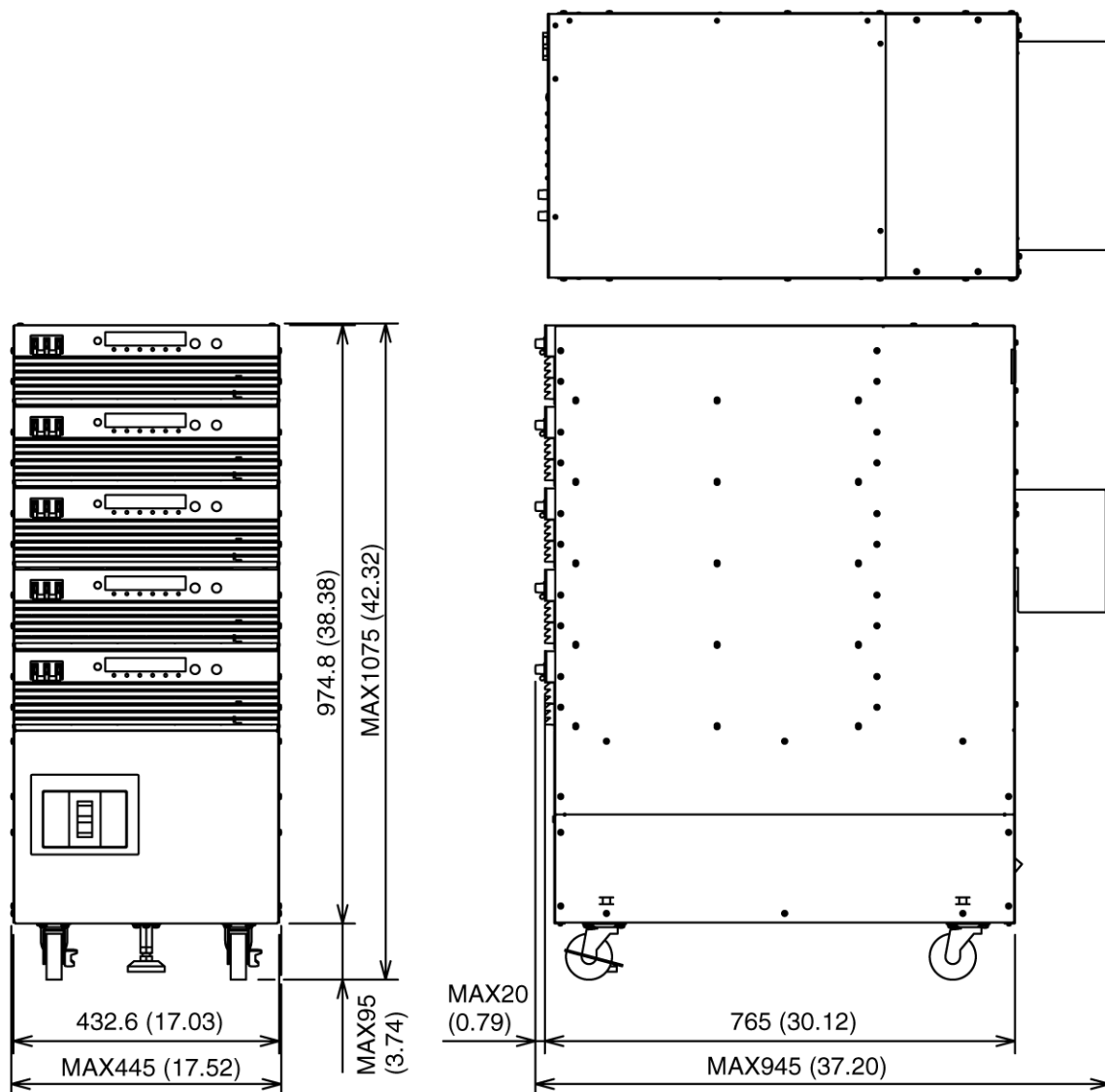
General specifications

Weight		Approx. 180 kg (396.83 lb) (PAT-TM: with no breaker) Approx. 200 kg (440.92 lb) (PAT-TMX: with breaker)
Dimensions		See the outline drawing
Environmental conditions	Operating conditions	Indoor use, Overvoltage Category II
	Operating temperature	0 °C to +40 °C (32 °F to +104 °F)
	Operating humidity	20 %rh to 85 %rh (no condensation)
	Storage temperature	-25 °C to +70 °C (-13 °F to +158 °F)
	Storage humidity	90 %rh or less (no condensation)
	Altitude	Up to 2000 m
Cooling system		Forced air cooling using a fan. (With fan control)
Grounding polarity		Negative grounding or positive grounding possible.
Isolation voltage		± 800 Vmax
Withstand voltage	Across the input terminals and chassis	No abnormalities at 1500 Vac, 90 mA for 1 minute.
	Across the input terminals and the output terminals	No abnormalities at 1500 Vac, 90 mA for 1 minute.
	Across the output terminals and chassis	No abnormalities at 800 Vdc for 1 minute.
Insulation resistance	Across the input terminals and chassis	800 Vdc, 30 MΩ or more. (at 70 %rh or less)
	Across the input terminals and the output terminals	800 Vdc, 30 MΩ or more. (at 70 %rh or less)
	Across the output terminals and chassis	800 Vdc, 30 MΩ or more. (at 70 %rh or less)
Accessories	Output terminal bolt set	4 sets (M10 × 30 mm bolts, nuts, and spring washers)
	Heavy object warning label	1 pc.
	J1/J2 connector kit	1 set (2 sets of protection covers, 2 sokets, and 30 pins)
	Chassis connection wire	1 set (with screws)
	Quick Reference (base model)	1 pc. (english), 1 pc. (japanese)
	Setup Guide	1 copy
	Safety Information	1 copy
	CD-ROM	1 pc.

Dimensions

735 (28.94)

MAX835 (32.87)

432.6 (17.03)

MAX445 (17.52)

MAX95 (3.74)

MAX20 (0.79)

765 (30.12)

MAX945 (37.20)

Unit: mm (inch)

PAT-TM Series 40 kW System Outline Drawing

974.8 (38.38)

MAX1075 (42.32)

432.6 (17.03)

MAX445 (17.52)

MAX95 (3.74)

MAX20 (0.79)

765 (30.12)

MAX945 (37.20)

Unit: mm (inch)

PAT-TMX Series 40 kW System Dimensions

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