

Model ML-850

File Number: E101073

COMPANY

SATO PARTS CO LTD

3-3-8 Sotokanda

Chiyoda-Ku, Tokyo 101-0021 Japan

MODEL INFO

ML-850 may be followed by a dash, followed by VAX, VBX, HAX, HBX, VBY, HBY, followed by additional numbers and or letters.

RATINGS																			
Side 1 or Side 2	Wire Range Min	Wire Range Max	Special Wire Class	Wire Type	Solid or Stranded	Factory and/or Field Wiring	Torque Min (lb-in)	Torque Max (lb-in)	Voltage (V)	Use Group	Current AL (A)	Current CU (A)	Steel as current carrying part	Temperature Rating RTI without impact (°C)	Stud or Wire Binding Screw Size No.	Investigated to UL 486E	Unprepared or Prepared Conductors	Spacings to UL 508 and UL 508C	Conditions of Acceptability
	16 AWG	12 AWG		Cu	SOL	2			250	B		20	--			--		--	2(105), 4

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Terminal Blocks - Component

The devices covered under this category are incomplete in certain constructional features or restricted in performance capabilities and are intended for use as components of complete equipment submitted for investigation rather than for direct separate installation in the field. THE FINAL ACCEPTANCE OF THE COMPONENT IS DEPENDENT UPON ITS INSTALLATION AND USE IN COMPLETE EQUIPMENT SUBMITTED TO UL.

GENERAL

This category covers assemblies of wiring terminals and supporting blocks intended to provide a means for the connection of wiring. These terminal blocks may employ terminal connectors, wire-binding screws, quick-connect terminals and similar friction fit terminals, which are intended for factory-wiring and/or field-wiring connections.

This category also covers protective conductor terminal blocks (PCTB) intended for connecting protective earthing (grounding) conductors to supports, such as mounting rails and the like. A PCTB is marked with the international symbol for ground, "G","GR","GND","Ground","Grounding" or the like. In addition, the insulation of a partially insulated PCTB is colored green or green/yellow.

This category also covers fuse terminal blocks that have a fuse carrier and are intended to accept supplemental fuses (miscellaneous, miniature and micro). Fuse terminal blocks provide supplemental protection in end-use equipment to provide protection for components or internal circuits. They are not suitable for branch or feeder circuit use.

USE

The following performance levels include ratings for voltage, current, wire size and type, torque (if applicable), suitability for factory wiring only or field wiring, and use group in order to facilitate investigation of their use in end-product applications. The following statements explain the tabular information:

Wire Range — The wire size or range of wire sizes for which a terminal block has been investigated. Unless clearly marked "Solid","SOL","Stranded" or "STR" for a given wire size, wire range or wire combination, conductors in the range 30-10 AWG are both solid and stranded, and 8 AWG and larger are for stranded wire only. Terminal blocks generally accommodate a single conductor under a clamping mechanism unless otherwise identified, such as with the number of conductors located parenthetically in front of the wire size or range. Some terminal blocks may have a single conductor wire range as well as a multiple conductor wire range. This may be identified by separate line items in the tabular information in the individual Recognitions. Terminal blocks, without insulation displacement connections, that are rated for solid copper conductors may also be used with stranded copper conductors of the same wire gauge when the stranded copper conductors are prepared by termination to a certified bare or covered ferrule.

Wire Type — The conductor material for which the terminal block has been investigated. "CU" represents copper wire only, "AL" represents aluminum wire only. "AL-CU" or "CU-AL" indicates use with aluminum and copper conductors, but not intermixed. The "7" or "9" associated with the wire type represents the temperature rating (75 or 90°C) of the wire connector.

Factory and/or Field Wiring (FW) — These terminal blocks are rated for: Code 1, factory wiring only, or Code 2, both factory and field wiring. The suitability of the connections (including spacings between factory connectors) shall be determined in the end-use application.

Unless noted with a "CA 4" in the last column, a terminal connector suitable for field wiring has been investigated to [UL 486A-486B](#), "Wire Connectors."

When Code 1 and Code 2 terminals are intermixed on the same terminal block, both codes will be used with suitable indication for which terminal each code applies, i.e., 1/2.

Torque (TQ) — The tightening torque(s) for a field-wiring pressure terminal connector other than a wire-binding screw, stud and nut type, or quick-connect type. If rated for factory wiring, this torque is only the manufacturer's recommended value.

Voltage (V) — Terminal blocks have voltage ratings for which they have been found acceptable. A terminal block may have several voltage ratings that relate to the different use groups and spacing levels as tabulated under "Use Group."

Current (A) — A maximum value of per-pole current for which the terminal block has been found acceptable.

Short-circuit-current Rating (SCCR) — Terminal blocks are considered suitable for use on a circuit capable of delivering not more than the stated SCCR at the maximum voltage specified when protected by the max ampere and Class of overcurrent protective device noted in the individual Recognitions. Short-circuit-current ratings may be marked on the terminal block or on instructions provided with the terminal block. Short-circuit-current ratings have been determined based on the terminal block's use within the minimum enclosure sizes as specified in Condition of Acceptability #6.

Use Group (UG) — The type of end-use application for which the specified voltage and spacing level applies.

Conditions of Acceptability (CA) — The limitations and conditions for end-product use based on the investigation of the terminal block. See additional details under **CONDITIONS OF ACCEPTABILITY** below.

Use Group	Application	V Rating	Spacings ^a , in.	
			Through Air	Over Surface
A	Service, including dead-front switchboards, panelboards, service equipment, and the like	51 - 150	1/2	3/4
		151 - 300	3/4	1-1/4
		301 - 600	1	2
B	Commercial appliances, including business equipment, electronic data processing equipment, and the like	51 - 150	1/16 ^b	1/16 ^b
		151 - 300	3/32 ^b	3/32 ^b
		301 - 600	3/8	1/2
C	Industrial, general	51 - 150	1/8 ^b	1/4
		151 - 300	1/4 ^b	3/8
		301 - 600	3/8	1/2
D	Industrial, devices having limited ratings ^c	51 - 300	1/16 ^b	1/8 ^b
		301 - 600	3/16 ^b	3/8

E	Greater than 600 V	601 - 1000	0.55	0.85
		1001 - 1500	0.70	1.20
F	Industrial, devices using the alternative approach to spacings ^d	51 - 1500	Refer to Condition of Acceptability #7 below ^b	
G	LED lighting equipment ^c	51 - 300	1/16 ^b	1/8 ^b
		301 - 600	1/16 - 3/16 ^{b, e}	1/8 - 3/8 ^e
f	50 V and less, at field wiring terminals	0 - 50	1/8	1/4
f	50 V and less, at other than field wiring terminals	0 - 50	1/16	1/16

^a Spacings between:

- (1) uninsulated live parts of opposite polarity, and
- (2) uninsulated live parts and a grounded part including any mounting surface or exposed metal part.

^b The spacing between field wiring terminals of opposite polarity and the spacing between a field wiring terminal and a grounded dead-metal part is not less than 1/4 in. where short-circuiting or grounding of such terminals may result from projecting strands of wire.

^c These spacings are applicable to a terminal block for use only in or with noted equipment types where the load on any single circuit of the terminal block does not exceed 15 A at 51 - 150 V, 10 A at 151 - 300 V, 5 A at 301 - 600 V, or the maximum amp rating, whichever is less.

^d These spacings are applicable to a terminal block for use only in or with industrial control equipment where an alternative spacing investigation is acceptable in accordance with [UL 508](#), "Industrial Control Equipment," and [UL 508C](#), "Power Conversion Equipment." Through-air and over-surface spacings are determined based on the requirements in these Sections of [UL 508](#) and [UL 508C](#), and are specified for each terminal block (refer to Condition of Acceptability #7 below).

^e These spacings may be determined by linear interpolation. The spacing range shown in the table represents the range of spacings permitted for voltages between 301 and 600 V.

^f These spacings are applicable to terminal blocks rated 50 V and less and to any Use Group. These spacings are applicable, provided the insulation and clearances between the circuit and any higher potential circuit are provided in accordance with the requirements that are applicable to the higher potential circuit.

CONDITIONS OF ACCEPTABILITY

Unless specified otherwise in the individual Reports, consideration is to be given to the following Conditions of Acceptability when these components are employed in end-use products. The following Conditions of Acceptability apply when the item number is specified in the last column. The number in parentheses following an item number is used in that Condition of Acceptability statement. Unique Conditions of Acceptability are indicated in the individual Recognition Reports.

1. This terminal block may be used only where steel is acceptable for current-carrying parts.
2. The insulating bodies are molded of materials having a maximum temperature rating of []°C. The use of these materials shall be judged in the end-use application.

3. These terminal blocks use a No. [] wire binding screw. The suitability of this size screw shall be considered during the end-use product investigation.
4. The field-wiring terminals of this terminal block have been investigated to [UL 486E](#), "Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors." The suitability of these terminals shall be determined in the end-use investigation.
5. The terminal block is intended to be used with certified pressure terminal connectors, such as ring and fork types, on the end of the conductor before attachment to the wiring terminals of the terminal block.
6. The terminal block short-circuit rating was determined based on testing in a minimum size enclosure measuring [] x [] x [] inches. The suitability of smaller enclosures shall be determined in the end-use investigation. Consult the SCCR tables in the individual Recognitions for maximum size and type of overcurrent protection.
7. The terminal block spacing requirements were determined based on use in circuits where an alternative spacing investigation is conducted in accordance with [UL 508](#), "Industrial Control Equipment," and [UL 508C](#), "Power Conversion Equipment." Terminal blocks were investigated for Pollution Degree 3, and Overvoltage Category []. Through-air (clearance) spacings are minimum [/] inches/mm; over-surface (creepage) spacings are minimum [/] inches/mm.

RELATED PRODUCTS

Power distribution blocks for field installation in a building to separate units, such as apartments, separate heaters and air conditioning, are covered under Power Distribution Blocks ([QPOS](#)).

Fuse terminal blocks may also be covered as a fuseholder under Fuseholders, Cartridge Fuse ([IZLT2](#)).

See Terminal Blocks Certified to IEC Standards ([XCHG2](#)).

REQUIREMENTS

The basic standard used to investigate products in this category is one of the following:

[UL 1059](#), "Terminal Blocks." Wire connectors that are an integral part of the terminal block are investigated to [UL 486A-486B](#), "Wire Connectors," or [UL 486E](#), "Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors."

[UL 60947-7-1](#), "Low-Voltage Switchgear and Controlgear - Part 7-1: Ancillary Equipment - Terminal Blocks for Copper Conductors"

[UL 60947-7-2](#), "Low-Voltage Switchgear and Controlgear - Part 7-2: Ancillary Equipment - Protective Conductor Terminal Blocks for Copper Conductors"

[UL 60947-7-3](#), "Low-Voltage Switchgear and Controlgear - Part 7-3: Ancillary Equipment - Safety Requirements for Fuse Terminal Blocks"

[UL 60947-7-4](#), "Low-Voltage Switchgear and Controlgear - Part 7-4: Ancillary Equipment - PCB Terminal Blocks for Copper Conductors"

The ANSI/UL 60947-7-x Standards are used in conjunction with [UL 60947-1](#), "Low-Voltage Switchgear and Controlgear - Part 1: General Rules."

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Terminal Blocks Certified for Canada - Component

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GENERAL

This category covers assemblies of wiring terminals and supporting blocks intended to provide a means for the connection of wiring. These terminal blocks may employ terminal connectors, wire-binding screws, quick-connect terminals and similar friction-fit terminals.

This category also covers protective conductor terminal blocks (PCTB) intended for connecting protective earthing (grounding) conductors to supports, such as mounting rails and the like. A PCTB is marked with the international symbol for ground, "G," "GR," "GND," "Ground," "Grounding" or the like. In addition, the insulation of a partially insulated PCTB is colored green or green/yellow.

This category also covers fuse terminal blocks that have a fuse carrier and are intended to accept supplemental fuses (miscellaneous, miniature and micro). Fuse terminal blocks provide supplemental protection in end-use equipment to provide protection for components or internal circuits. They are not suitable for branch or feeder circuit use.

USE

The following performance levels include ratings for voltage, current, wire size and type, torque (if applicable), and use group in order to facilitate investigation of their use in end-product applications. The following statements explain the tabular information:

Wire Range — The wire size or range of wire sizes for which a terminal block has been investigated. Unless clearly marked "Solid," "SOL," "Stranded" or "STR" for a given wire size, wire range or wire combination, conductors in the range 30-10 AWG are both solid and stranded, and 8 AWG and larger are for stranded wire only. Terminal blocks generally accommodate a single conductor under a clamping mechanism unless otherwise identified, such as with the number of conductors located parenthetically in front of the wire size or range. Some terminal blocks may have a single conductor wire range as well as a multiple conductor wire range. This may be identified by separate line items in the tabular information in the individual Recognitions. Terminal blocks, without insulation displacement connections, that are rated for solid copper conductors may also be used with stranded copper conductors of the same wire gauge when the stranded copper conductors are prepared by termination to a certified bare or covered ferrule.

Wire Type — The conductor material for which the terminal block has been investigated. "CU" represents copper wire only. "AL" represents aluminum wire only. "AL-CU" or "CU-AL" indicates use with aluminum and copper conductors, but not intermixed. The "7" or "9" associated with the wire type represents the temperature rating (75 or 90°C) and ampacity of the wire connector. The suitability of the connections (including spacings between factory connectors) shall be determined in the end-use application.

Torque (TQ) — The tightening torque(s) for the terminal block.

Voltage (V) — Terminal blocks have voltage ratings for which they have been found acceptable. A terminal block may have several voltage ratings that relate to the different use groups and spacing levels as tabulated under "Use Group."

Current (A) — A maximum value of per-pole current for which the terminal block has been found acceptable.

Short-circuit-current Rating (SCCR) — Terminal blocks are considered suitable for use on a circuit capable of delivering not more than the stated SCCR at the maximum voltage specified when protected by the max ampere and Class of overcurrent protective device noted in the individual Recognitions. Short-circuit-current ratings may be marked on the terminal block or on instructions provided with the terminal block. Short-circuit-current ratings have been determined based on the terminal block's use within the minimum enclosure sizes as specified in Condition of Acceptability #6.

Use Group (UG) — The type of end-use application for which the specified voltage and spacing level applies.

Conditions of Acceptability (CA) — The limitations and conditions for end-product use based on the investigation of the terminal block. See additional details under **CONDITIONS OF ACCEPTABILITY** below.

Use Group	Application	Max V Rating	Spacing* mm	
			Through Air or Oil	Over Surface
A	Service, including dead-front switchboards, panelboards, service equipment, and the like	150	12.5	19**
		300	19**	31**
		600	25	50**
B	Commercial appliances, including business equipment, electronic data processing equipment, and the like	150	1.6***	1.6***
		300	2.4***	2.4***
		600	9.5	12.5
C	Industrial, general	150	3.2***	6.3
		300	6.3***	9.5
		600	9.5	12.5
		1000	14	21.5
		1500	17.8	30.5

D	Industrial, devices having limited ratings+	300	1.5***	3***
		600	4.6***	9.4
E	Special Components++	150	1.6***	1.6***
		300	1.6***	3.2***
		600	4.7***	9.5

* Spacings between (1) uninsulated live parts of opposite polarity and (2) uninsulated live parts and uninsulated grounded parts other than the enclosure or exposed metal parts.

** The spacing through air and over surface between live parts and grounded metal parts including the enclosure is not less than 12.5 mm for 51-250 V and 25 mm for 251-600 V.

*** The spacing between wiring terminals of opposite polarity and the spacing between a wiring terminal and a grounded dead metal part is not less than 6.3 mm if short-circuiting or grounding of such terminals may result from projecting strands of wire.

+ These spacings are applicable to a terminal block for use only in or with industrial control equipment where the load on any single circuit of the terminal block does not exceed 15 A at 51-150 V, 10 A at 151-300 V, 5 A at 301-600 V, or the maximum amp rating, whichever is less.

++ The special components spacings for Use Group E are applicable to a terminal block for use in equipment of limited rating, as permitted by the applicable Part II Standard covering the end equipment in which the terminal block is used.

CONDITIONS OF ACCEPTABILITY

Unless specified otherwise in the individual Reports, consideration is to be given to the following Conditions of Acceptability when these components are employed in end-use products. The following Conditions of Acceptability apply when the item number is specified in the last column. The number in parentheses following an item number is used in that Condition of Acceptability statement. Unique Conditions of Acceptability are indicated in the individual Recognition Reports.

1. This terminal block may be used only where steel is acceptable for current-carrying parts.
2. The insulating bodies are molded of materials having a temperature index of []°C. The use of these materials shall be judged in the end-use application.
3. These terminal blocks use a No. [] wire binding screw. The suitability of this size screw shall be considered during the end-use product investigation.
4. Reserved for future use.
5. The terminal block is intended to be used with certified pressure terminal connectors, such as ring and fork types, on the end of the conductor before attachment to the terminal block.
6. The terminal block short-circuit rating was determined based on testing in a minimum size enclosure measuring [] x [] x [] mm. The suitability of smaller enclosures shall be determined in the end-use investigation. Consult the SC CR tables in the individual Recognitions for maximum size and type of overcurrent protection.

RELATED PRODUCTS

Power distribution blocks for field installation in a building to separate units, such as apartments, separate heaters and air conditioning, are covered under Power Distribution Blocks Certified for Canada ([QPQS7](#)).

Fuse terminal blocks may also be covered as a fuseholder under Fuseholders, Cartridge Fuse Certified for Canada ([JZLT8](#)).

Terminal blocks certified to IEC Standards are covered under Terminal Blocks Certified to IEC Standards ([XCHG2](#)).

REQUIREMENTS

The basic standard used to investigate products in this category is one of the following:

CSA-C22.2 No. 158, "Terminal Blocks"

CAN/CSA-C22.2 No. 60947-7-1, "Low-Voltage Switchgear and Controlgear - Part 7-1: Ancillary Equipment - Terminal Blocks for Copper Conductors"


CAN/CSA-C22.2 No. 60947-7-2, "Low-Voltage Switchgear and Controlgear - Part 7-2: Ancillary Equipment - Protective Conductor Terminal Blocks for Copper Conductors"

CAN/CSA-C22.2 No. 60947-7-3, "Low-Voltage Switchgear and Controlgear - Part 7-3: Ancillary Equipment - Safety Requirements for Fuse Terminal Blocks"

CAN/CSA-C22.2 No. 60947-7-4, "Low-Voltage Switchgear and Controlgear - Part 7-4: Ancillary Equipment - PCB Terminal Blocks for Copper Conductors"

The CAN/CSA-C22.2 No. 60947-7-x Standards are used in conjunction with CAN/CSA-C22.2 No. 60947-1, "Low-Voltage Switchgear and Controlgear - Part 1: General Rules."

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