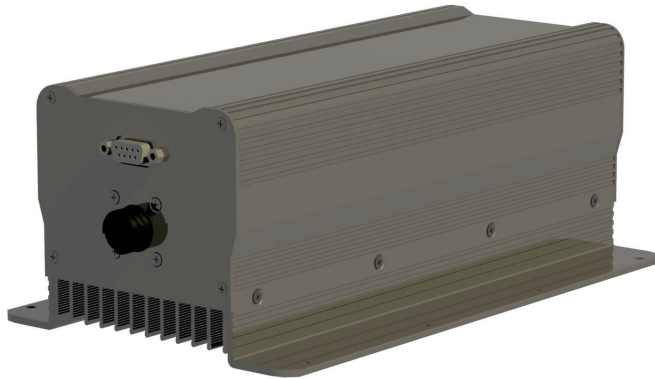


Versatile and Rugged Lithium Ion/LiPO Industrial Charger Series



- **California Energy Compliant**
- **Rugged and reliable design**
- **Capable of direct charge or BMS**
- **Power phase-back with temperature**
- **Wide operating temperature range**
- **Transient protected input/output**
- **Active I/O reverse polarity protection**
- **Informative LED display**
- **Optional wireless/digital interface**
- **Relay and discrete I/O signals**
- **Over temp protection with auto reset**
- **Overcurrent / overvoltage protected**
- **Four year warranty**

Description

The V-series is an environmentally robust and sophisticated battery chargers with models supporting Lithium or LiPo batteries. With a wide operating temperature range (-25°C to 65°C), a rugged mechanical design, and AC or DC input power options, this product is well suited for high end industrial applications. The charger complies with the California Energy Commission guidelines and with UL/CSA specifications.

The enclosure is sealed and impervious to pollutants, The unique mechanical design provides extremely high power density and environmental reliability.

The V-series optional external communications can be programmed with user specific firmware. The product may be ordered with an optional user defined set of discrete I/O signals, a wireless option, an RS-232 or

RS-485, CAN or other interfaces.

An informative LED display indicates state of charge, input power present, battery voltage and current, fault conditions and proper battery connection are standard. The V-series charger precisely controls the charging algorithm to insure a complete recharge while prolonging battery life. The charger can be programmed for direct pack charging, an SMBus interface or with a BMS (battery management system) equipped pack.

The V-series can be connected indefinitely making it ideal for remote and standby applications. It is mountable in any orientation and can be ordered with input and output power connectors per customer specification. Customized charging algorithms, power sequencing and control/monitoring options are available upon request.

AC input model specifications

| PARAMETER | DESCRIPTION / CONDITIONS |
|------------------------|---|
| AC input voltage range | 3 input ranges covering 85 VAC - 240 VAC |
| Input AC amps (max) | Measured at 85 VAC / 400 watts output: 8 Arms |
| AC input configuration | AC input: line, neutral , chassis ground |
| Connector | Nema 5-15P |

DC input model specifications

| PARAMETER | DESCRIPTION / CONDITIONS |
|------------------------|---|
| DC input voltage range | 8 input ranges covering 11 VDC to 500 VDC |
| Input DC amps (max) | Measured at 48 VDC / 400 watts output: 10 A |
| DC input configuration | DC input: DC Power, DC Return, Chassis ground |
| Connector | Ring terminals or user defined |

V-Series Model Specific Specifications

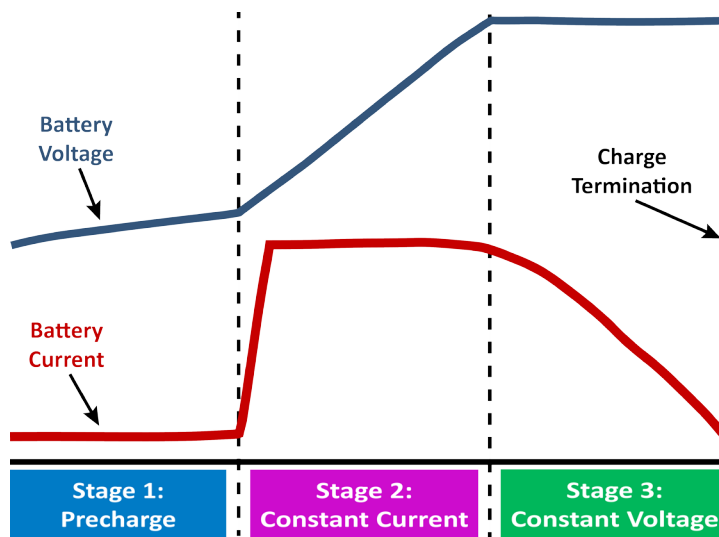
Lithium-ion/LiPO battery charging curve

A three stage charge routine which is recommended by lithium-ion and LiPO battery manufacturers is described below.

Stage 1: Precharge. If the battery is deeply discharged, a precharge of approximately 300mA is applied until the voltage is 2.8 volts/cell.

Stage 2: Constant current mode. The charger provides constant current until the battery voltage is V_{tpf} volts/cell.

Stage 3: Top off mode. This is the final stage of the charging routine. The battery voltage is maintained at approximately V_{tpf} volts/cell. When the charging current decreases to 300mA, the charge is terminated until the next discharge cycle.



Standard LED indicators

| PARAMETER | GREEN | RED/GREEN | RED | RED on/off | GREEN on/off |
|-------------------------|--------------------|-------------------------|-------------------------|--------------------|------------------|
| state of charge | Complete | Top Off | Constant Current | - | - |
| battery voltage (volts) | < 75% of V_{tpf} | 75% to 85% of V_{tpf} | 85% to 95% of V_{tpf} | > 95% of V_{tpf} | - |
| battery current (amps) | < 10% of I_{max} | 10% to 30% of I_{max} | 30% to 90% I_{max} | > 90% of I_{max} | - |
| fault indicator | Polarity OK | Short/Reversed | Battery < 2.7V/cell | Over Voltage | Over Temperature |
| input power | Power Good | - | - | - | - |

V-Series Lithium/LiPo Charger Common Specifications

| CHARGING PARAMETERS | DESCRIPTION |
|------------------------------------|---|
| Termination current (I_{tm}) | 500mA +/- 50mA |
| Termination transition timeout | 3 hours |
| Minimum battery start voltage | 2.5V/cell |
| Standby battery drain | <400uA with input power off |
| Termination V_{bat} rate (dv/dt) | $V_{bat} < 0.9 * V_{tpf}$, $I_{bat} > 0.5A$, dv/dt < 200mv/hour |
| Max charging time | Terminate if $> I_{max}/3 > 15$ hours |
| Overvoltage protection | Maximum Charging Voltage + 1.0V |
| Output noise and ripple (PARD) | <150mV, 100MHz BW |
| Regulation | $\pm 0.5\%$ |
| Efficiency | Minimum 80% at max load |

V-Series Lithium/LiPO Charger Ordering Guide, p/n abV-xyz-r

| P/N Field | Definition | Options | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|--|---|---|---------------------|--------------|---------------------|----|--------------|----|-------------|----|---------------|----|-------------|----|--------------|----|--------------|-----|-------------|-----|---------------|-----|-------------|-----|---------------|--|--|----|---------------|
| a | Battery Chemistry | T - Lithium L - LiPo | Battery Chemistry | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b | Input Power | A - AC input E - DC input | See description of field z in the part number for input voltage range options. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| x | Number of Series Cells Defines the output voltage. | The options are: 3S, 4S, 5S, 6S, 7S, 8S, 10S, 12S, 14S, and 18S | This option defines the Maximum Charging Voltage. For Lithium and LiPO based chargers the maximum output voltage is the number of cells multiplied by maximum cell voltage of 4.2V. For example, 3S would specify a 12.6V charger. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| y | Maximum Charging Current | Maximum Charging Current in amps. For standard model the maximum charging current is determined by the number of Series Cells, see tables to the right. If a lower maximum output current is desired then it is specified in this field as amps. For example a standard AC input Lithium 4S model is ordered as TAV-S420-1. If a charger with a maximum output current of 15 amps is needed the order number would be TAV-S415-1. | <table border="1"> <thead> <tr> <th colspan="2">Maximum Charging Current vs. Number of Series Cells</th> </tr> <tr> <th>Series Cells</th> <th>Max. Current</th> </tr> </thead> <tbody> <tr><td>3S</td><td>27 Amps</td></tr> <tr><td>4S</td><td>20 Amps</td></tr> <tr><td>5S</td><td>16 Amps</td></tr> <tr><td>6S</td><td>13 Amps</td></tr> <tr><td>7S</td><td>11 Amps</td></tr> <tr><td>8S</td><td>10 Amps</td></tr> <tr><td>10S</td><td>8 Amps</td></tr> <tr><td>12S</td><td>7 Amps</td></tr> <tr><td>14S</td><td>6 Amps</td></tr> <tr><td>18S</td><td>5 Amps</td></tr> </tbody> </table> | Maximum Charging Current vs. Number of Series Cells | | Series Cells | Max. Current | 3S | 27 Amps | 4S | 20 Amps | 5S | 16 Amps | 6S | 13 Amps | 7S | 11 Amps | 8S | 10 Amps | 10S | 8 Amps | 12S | 7 Amps | 14S | 6 Amps | 18S | 5 Amps | | | | |
| Maximum Charging Current vs. Number of Series Cells | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Series Cells | Max. Current | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3S | 27 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4S | 20 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5S | 16 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6S | 13 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7S | 11 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8S | 10 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10S | 8 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12S | 7 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14S | 6 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18S | 5 Amps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| z | Input voltage range | For AC input chargers, three options; 01, 02, and 03 are available For DC input chargers, eight options; 07, 08, 09, 10, 11, 12, 13, and 14 are available. | <p align="center">Input Voltage Range Options</p> <table border="1"> <thead> <tr> <th>Option</th> <th>Input Voltage Range</th> <th>Option</th> <th>Input Voltage Range</th> </tr> </thead> <tbody> <tr><td>01</td><td>85 - 140 VAC</td><td>09</td><td>30 - 50 VDC</td></tr> <tr><td>02</td><td>180 - 300 VAC</td><td>10</td><td>38 - 75 VDC</td></tr> <tr><td>03</td><td>85 - 300 VAC</td><td>11</td><td>72 - 140 VDC</td></tr> <tr><td>07</td><td>11 - 20 VDC</td><td>12</td><td>100 - 200 VDC</td></tr> <tr><td>08</td><td>18 - 36 VDC</td><td>13</td><td>150 - 300 VDC</td></tr> <tr><td></td><td></td><td>14</td><td>250 - 500 VDC</td></tr> </tbody> </table> | Option | Input Voltage Range | Option | Input Voltage Range | 01 | 85 - 140 VAC | 09 | 30 - 50 VDC | 02 | 180 - 300 VAC | 10 | 38 - 75 VDC | 03 | 85 - 300 VAC | 11 | 72 - 140 VDC | 07 | 11 - 20 VDC | 12 | 100 - 200 VDC | 08 | 18 - 36 VDC | 13 | 150 - 300 VDC | | | 14 | 250 - 500 VDC |
| Option | Input Voltage Range | Option | Input Voltage Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 | 85 - 140 VAC | 09 | 30 - 50 VDC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 | 180 - 300 VAC | 10 | 38 - 75 VDC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 | 85 - 300 VAC | 11 | 72 - 140 VDC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07 | 11 - 20 VDC | 12 | 100 - 200 VDC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 08 | 18 - 36 VDC | 13 | 150 - 300 VDC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 14 | 250 - 500 VDC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| r | Options | List of Available Options, listed separated by '-' characters, some options are mutually exclusive. An: External Interface Rxy: Internal Relay | An: External Interface, choose n as follows: 0 - RS-232, 1 - RS-485, 2 - Wired Ethernet, 3 - CAN, 5 - Wireless Ethernet, 99 - Special Rxy: Internal Relay, there can be up to 4 internal relays x = relay configuration; O for NO, C for NC y = function; 1 - Over voltage, 2 - Charging, 3 - Over temperature, 4 - AC On | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Example: TAV-S810-01-RA1-RC3-RO4 specifies a Lithium(T), AC input(A) charger with maximum output voltage set to charge 8-series cells (S8) at a maximum current of 10 amps (10) and the AC input range is 85-140 VAC (01). The chargers has options for an RS-485 interface (RA1) with two relays, NC Over Temperature (RC3) and NO AC On (RO4)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Certifications and Compliance (model dependant - consult factory)

| | |
|---|---|
| a | UL CSA |
| b | CE mark |
| c | California Energy Compliant |
| d | RF emissions: US FCC Part 15 Class A, CISPR 22:2009 |
| e | IEC 555, power factor |
| f | IEC 61000-4-5; Class 4 Severity Level, Surge |
| g | IEEE C2-2012 National Electrical Safety Code |
| h | NFPA 70-2014 National Electric Code |
| i | IEC 60950 Safety of IT Equipment; Pollution Degree 2 |
| j | WEEE and Restriction of Hazardous Substances (ROHS) Directives 2002/95/EC |
| k | T-Mark |

Workmanship specifications

| | |
|----------------|--|
| IPC-610 | Acceptability of electronic assemblies IPC J-STD-006 Requirements for electronic grade solder alloys and fluxed and non-fluxed solid solders for electronic soldering applications |
| IPC-2221 | FR4, 130C 94V-0 |
| IPC/WHMA-A-620 | Requirements and acceptance of wiring and cabling |

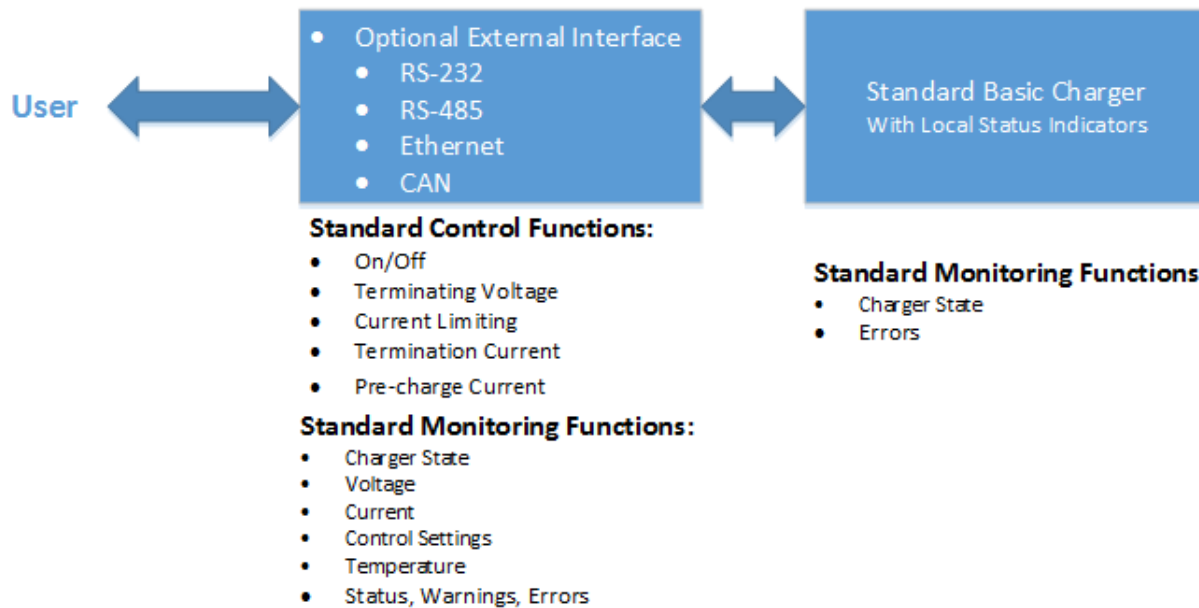
Mechanical specifications

| PARAMETER | (units are in inches and pounds) |
|---------------------------------|----------------------------------|
| Dimensions | 11.24 (L) x 6.02 (W) x 3.92 (H) |
| Chassis material | Aluminum |
| Chassis finish | Black anodized |
| Clearance | 12 inches all sides |
| Mounting | #6 screws at six locations |
| Output connector | Terminal lugs or user defined |
| Weight | Six pounds |
| Optional external fan connector | Please consult factory |
| Forced Air Rating | Please consult factory |

Environmental specifications

| PARAMETER | DESCRIPTION / CONDITIONS |
|-----------------------|---|
| Operating environment | Indoor/outdoor - IP67 -not submersible |
| Storage temp. | -40°C to +80°C |
| Operating temp. | -20°C to +50°C at maximum output over entire DC voltage range |
| Humidity | 0°C to +95°C relative humidity (non-condensing) |
| Operational altitude | 10,000 feet |
| Vibration | MIL-STD-810 or IEC60068-2-6 and -2-64 as applicable |
| Shock | MIL-STD-810 or IEC60068-2-27 as applicable |
| Isolation | Input - chassis: 2KVDC Input - output: 2KVDC Output - chassis: 500VDC |
| DC leakage current | Input - chassis: < 200uA at 2KVDC Input - output: < 100uA at 2KVDC |
| AC leakage current | < 3.5mA at 264VAC, 60Hz |

Control and Monitor Interfaces



Outline and mounting

Dimensions in inches (mm)

