MSR Series
Stationary Battery Chargers and Rectifiers
For Utility, Industrial, and Communications Applications

The MSR Series Delivers
High Performance and Reliability:
- Latest digital and power electronics technology
- Rugged industrial design
- User-definability control and alarm set-points
- New simplified control menu
- Simultaneous voltage and current readings
- CE safety and EMC standards tested and compliant
- Built to ISO 9000 QA standards
- NEMA PE-5 compliant
Control Display

The Digital Display delivers all charger information at your fingertips. The display menu is user friendly and is the standard link between the operator and all monitoring control and alarms. All set points for control and alarm parameters are user-definable.

The MSR Series design is solid state using SCR phase control to provide regulated DC output and limited current via a smoothing filter, and it can operate with or without batteries.

Standard Features

**Alarm Menu Indicators**
- Rectifier failure based on low volts and low output DC current
- High DC volts / Low DC volts
- Positive ground fault / Negative ground fault
- New ground fault isolation switch, standard
- AC fail

**Alarm Menu Functions (Password-Protected)**
- Adjustable alarm time delay
- Indications latch
- Alarm relay latch
- Alarm acknowledgement
- Alarm levels adjustment
- LED, LCD and relay test

**Remote Indications**
- Standard alarms are wired to a common voltage free N.O. and N.C. (form “C”) dry contact

**Metering and Timing**
- Simultaneous 0.5% accuracy DC voltage and current metering +/-1 digit
- Remaining and elapsed equalize time

**Control Modes**
- Manual float/equalize toggle
- Software high voltage shutdown
- Automatic load sharing

**Control Adjustments (Password-Protected)**
- Float and equalize voltage
- Current limit
- Equalize period 0-9999 hrs.
- Float period 0-9999 hrs.
- Equalize mode termination based on voltage and/or time event(s)

**Indicating LED’s**
- AC on green LED
- Common alarm flashing red LED

**Option List**
- Form C contacts for individual alarms
- RS232/485 isolated communication ports
- Modbus on serial ports, watchdog and major alarm
- DC output circuit breaker
- Battery circuit breaker
- Distribution panel
- High capacity interrupting current CBs
- Temperature compensation
- High temperature alarm and protection
- High voltage shutdown via the AC breaker trip
- AC input volts, amps and frequency readings
- High and low AC input voltage alarm
- Load sharing
- Power factor correction to 0.95 lagging
- Remote voltage sensing terminals
- Remote shutdown and equalize control
- Audible alarm
- Input harmonic filter to comply with CE
- 50 Hz or 400Hz Input frequency
- Low DC volts load disconnect (load shedding)
- Battery high temperature alarm and shutdown
- Battery ammeter and voltmeter
- Ampere-hour meter reading battery capacity (either % or AH)
- Integrated battery/charger cabinets
- Oversized cabinets to fit batteries in separate compartments
- Special paint and NEMA/IP protection
- Seismic design
- Fungus proofing
- Special Wiring
STANDARD ELECTRICAL SPECIFICATIONS

Basic Design Features

- UL/ANSI 1012 Listed, CSA 22.2 107.1 Certified and applicable IEC standard compliant
- ISO 9002-1994 Quality control compliant
- SCR (Thyristor) based rectifier includes double wound isolation transformer
- Electronic control, current limiting and voltage regulation
- Modular construction using the latest power and microelectronic devices
- Color coded PVC copper stranded wire for control and signals

Input

Available Voltages 110, 120, 208, 220, 240, 380, 400, 480, 550, 575, and 600 VAC
Phases 1O/ and / or 3 O/
Frequency 50 Hz or 60 Hz
Power Factor 0.75 (1 phase), 0.85 (3 phase) at full load when tested on battery and resistive load
Efficiency at Full Load Typical 90%

Output

Standard Nominal Voltages 12, 24, 36, 48, 72, 125, 250, 380, 480 and 600 VDC
Power From 60 W to 200+ kW
AC Ripple Voltage, Per NEMA PE-5
- Unfiltered units: <2% RMS typical (1 ph) and 3 ph when charger is connected to a battery capacity 4 times its current output
- Filtered: 30mV rms for 24 + 48VDC models, 100mV rms for 125VDC models when charger is connected to a battery capacity 4 times its current output. Additional filtering available.
- Eliminator: All MSR chargers operate as a battery eliminator, when connected to a resistive load without a battery
Static Regulation <0.5% for simultaneous variations of +10/-12% input voltage, +/- 5% input frequency and 0-100% load
Dynamic Regulation +/-6% from 10% - 90% and 90% - 10% load variation ( t<300msec)

Parallel Operation

- Random: Similar chargers can be operated in random parallel
- Load sharing

EMC (CE Marked Units Only)

- Conducted (150kHz - 30mHz) and radiated (30MHz -1GHz): en55011 class A
- Electrostatic discharge EN61000-4 -2 level 2/3 (4kV contact, 8kV air)
- Radiated susceptibility: EN61000-4-3 level 3 annex D (80MHz- 1GHz @ 10V/m)
- Electrical fast transient: EN61000-4-4 level 3 (2kV)
- Surge immunity: EN61000-4-5 level 3 (1kV I/I, 2 kV L/GND)
- Conducted susceptibility: EN61000-4-6 level 3 (150kHz to 80mHz, 10v)
- Voltage interrupt: EN61000-4-11 (30, 60 & 90%- 10-10 & 5000 ms)

Protection

Over-Current
- Soft start
- Automatic current limiting circuit, adjustable from 20% to 120% of nominal rating
- Input thermal-magnetic circuit breaker and DC output fuse standard

Voltage Transients Surge suppression on input and output reverse polarity
STANDARD MECHANICAL SPECIFICATIONS

Mechanical and Physical

Standard Enclosure
- CEMA/NEMA1 (IP20), 14GA (2mm) steel including hinged front access door
- Floor mounted models are provided with 3 in. (75 mm) clearance at the bottom to facilitate handling by lifting truck, pallet truck or slings
- Enclosure Options: All NEMA Standards

Finish
- Standard powder baked ASA61, light gray

Cooling
- Natural convection cooling up to 130A output current

Environmental

Audible Noise
- 45 to 65 dBa at 3 ft (1 m) rating dependent

Operating Temperature Range
- 32°F to +122°F (0°C to 50°C)

Storage Temperature Range
- –40°F to 185°F (–40°C to 85°C)

Temperature De-Rating
- 0.83% / °F from 122°F to 140°F (1.5% / °C from 50°C to 60°C)

Operating Humidity
- Up to 95% (non-condensing)

Altitude De-Rating
- 0% for first 3300ft (1000m), 7% per 3300ft (1000m) over 3300ft (1000m)

Charger Standard Adjustment Range

<table>
<thead>
<tr>
<th></th>
<th>12V</th>
<th>24V</th>
<th>48V</th>
<th>125V</th>
<th>250V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Float</td>
<td>10 -15</td>
<td>20 -30</td>
<td>40 - 60</td>
<td>100 -145</td>
<td>200 -290</td>
</tr>
<tr>
<td>Equalize</td>
<td>10 -16</td>
<td>20 -32</td>
<td>40 - 65</td>
<td>100 -150</td>
<td>200 -300</td>
</tr>
<tr>
<td>Single Level</td>
<td>10 -16</td>
<td>20 -32</td>
<td>40 - 65</td>
<td>100 -150</td>
<td>200 -300</td>
</tr>
</tbody>
</table>

MSR Typical Cabinet Dimensions

<table>
<thead>
<tr>
<th>Cabinet</th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
<th>Mounting*</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>20 in</td>
<td>17 in</td>
<td>13 in</td>
<td>wall, relay rack, floor</td>
</tr>
<tr>
<td></td>
<td>508 mm</td>
<td>431.8 mm</td>
<td>331 mm</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>30 in</td>
<td>21 in</td>
<td>15 in</td>
<td>wall, relay rack, floor</td>
</tr>
<tr>
<td></td>
<td>762 mm</td>
<td>533.4 mm</td>
<td>361 mm</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>39 in</td>
<td>24 in</td>
<td>20 in</td>
<td>wall, floor</td>
</tr>
<tr>
<td></td>
<td>991 mm</td>
<td>610 mm</td>
<td>508 mm</td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>51 in</td>
<td>24 in</td>
<td>20 in</td>
<td>wall, floor</td>
</tr>
<tr>
<td></td>
<td>1295</td>
<td>610 mm</td>
<td>508 mm</td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>60 in</td>
<td>36 in</td>
<td>25 in</td>
<td>floor</td>
</tr>
<tr>
<td></td>
<td>1524 mm</td>
<td>914 mm</td>
<td>635 mm</td>
<td></td>
</tr>
</tbody>
</table>
## CAPACITIES, DIMENSIONS, & WEIGHTS

### Single Phase, 48 - Volt Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Input Volts</th>
<th>AC amps</th>
<th>DC amps</th>
<th>Cabinet</th>
<th>Recommended DC cable size AWG</th>
<th>DC Circuit Breaker</th>
<th>approx. ship. wt. lbs.</th>
<th>kgs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSR X 48 1A 5F</td>
<td>120</td>
<td>6</td>
<td>5</td>
<td>300</td>
<td>10</td>
<td>10</td>
<td>85</td>
<td>39</td>
</tr>
<tr>
<td>MSR X 48 1B 5F</td>
<td>208</td>
<td>4</td>
<td>5</td>
<td>300</td>
<td>10</td>
<td>10</td>
<td>85</td>
<td>39</td>
</tr>
<tr>
<td>MSR X 48 1C 5F</td>
<td>240</td>
<td>3</td>
<td>5</td>
<td>300</td>
<td>10</td>
<td>10</td>
<td>85</td>
<td>39</td>
</tr>
<tr>
<td>MSR X 48 1A 10F</td>
<td>120</td>
<td>10</td>
<td>10</td>
<td>300</td>
<td>15</td>
<td>15</td>
<td>96</td>
<td>44</td>
</tr>
<tr>
<td>MSR X 48 1B 10F</td>
<td>208</td>
<td>6</td>
<td>10</td>
<td>300</td>
<td>15</td>
<td>15</td>
<td>96</td>
<td>44</td>
</tr>
<tr>
<td>MSR X 48 1C 10F</td>
<td>240</td>
<td>5</td>
<td>10</td>
<td>300</td>
<td>15</td>
<td>15</td>
<td>96</td>
<td>44</td>
</tr>
<tr>
<td>MSR X 48 1A 15F</td>
<td>120</td>
<td>15</td>
<td>15</td>
<td>400</td>
<td>20</td>
<td>20</td>
<td>141</td>
<td>64</td>
</tr>
<tr>
<td>MSR X 48 1B 15F</td>
<td>208</td>
<td>8</td>
<td>15</td>
<td>400</td>
<td>20</td>
<td>20</td>
<td>141</td>
<td>64</td>
</tr>
<tr>
<td>MSR X 48 1C 15F</td>
<td>240</td>
<td>7</td>
<td>15</td>
<td>400</td>
<td>20</td>
<td>20</td>
<td>141</td>
<td>64</td>
</tr>
<tr>
<td>MSR X 48 1A 20F</td>
<td>120</td>
<td>21</td>
<td>20</td>
<td>400</td>
<td>30</td>
<td>30</td>
<td>161</td>
<td>73</td>
</tr>
<tr>
<td>MSR X 48 1B 20F</td>
<td>208</td>
<td>12</td>
<td>20</td>
<td>400</td>
<td>30</td>
<td>30</td>
<td>161</td>
<td>73</td>
</tr>
<tr>
<td>MSR X 48 1C 20F</td>
<td>240</td>
<td>10</td>
<td>20</td>
<td>400</td>
<td>30</td>
<td>30</td>
<td>161</td>
<td>73</td>
</tr>
<tr>
<td>MSR X 48 1A 25F</td>
<td>120</td>
<td>25</td>
<td>25</td>
<td>400</td>
<td>40</td>
<td>40</td>
<td>177</td>
<td>80</td>
</tr>
<tr>
<td>MSR X 48 1B 25F</td>
<td>208</td>
<td>14</td>
<td>25</td>
<td>400</td>
<td>40</td>
<td>40</td>
<td>177</td>
<td>80</td>
</tr>
<tr>
<td>MSR X 48 1C 25F</td>
<td>240</td>
<td>13</td>
<td>25</td>
<td>400</td>
<td>40</td>
<td>40</td>
<td>177</td>
<td>80</td>
</tr>
</tbody>
</table>

### Single Phase, 125 - Volt Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Input Volts</th>
<th>AC amps</th>
<th>DC amps</th>
<th>Cabinet</th>
<th>Recommended DC cable size AWG</th>
<th>DC Circuit Breaker</th>
<th>approx. ship. wt. lbs.</th>
<th>kgs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSR X 125 1A 5F</td>
<td>120</td>
<td>13</td>
<td>5</td>
<td>300</td>
<td>10</td>
<td>10</td>
<td>104</td>
<td>47</td>
</tr>
<tr>
<td>MSR X 125 1B 5F</td>
<td>208</td>
<td>7</td>
<td>5</td>
<td>300</td>
<td>10</td>
<td>10</td>
<td>104</td>
<td>47</td>
</tr>
<tr>
<td>MSR X 125 1C 5F</td>
<td>240</td>
<td>6</td>
<td>5</td>
<td>300</td>
<td>14</td>
<td>10</td>
<td>104</td>
<td>47</td>
</tr>
<tr>
<td>MSR X 125 1A 10F</td>
<td>120</td>
<td>23</td>
<td>10</td>
<td>400</td>
<td>15</td>
<td>15</td>
<td>172</td>
<td>78</td>
</tr>
<tr>
<td>MSR X 125 1B 10F</td>
<td>208</td>
<td>13</td>
<td>10</td>
<td>400</td>
<td>15</td>
<td>15</td>
<td>172</td>
<td>78</td>
</tr>
<tr>
<td>MSR X 125 1C 10F</td>
<td>240</td>
<td>11</td>
<td>10</td>
<td>400</td>
<td>15</td>
<td>15</td>
<td>172</td>
<td>78</td>
</tr>
<tr>
<td>MSR X 125 1A/B/C 15F</td>
<td>120/208/240</td>
<td>35/20/18</td>
<td>15</td>
<td>400</td>
<td>20</td>
<td>20</td>
<td>243</td>
<td>110</td>
</tr>
<tr>
<td>MSR X 125 1A/B/C 20F</td>
<td>120/208/240</td>
<td>42/26/23</td>
<td>20</td>
<td>400</td>
<td>30</td>
<td>30</td>
<td>248</td>
<td>113</td>
</tr>
<tr>
<td>MSR X 125 1A/B/C 25F</td>
<td>120/208/240</td>
<td>63/36/31</td>
<td>25</td>
<td>500</td>
<td>40</td>
<td>40</td>
<td>322</td>
<td>146</td>
</tr>
<tr>
<td>MSR X 125 1B 30F</td>
<td>208</td>
<td>40</td>
<td>30</td>
<td>500</td>
<td>40</td>
<td>40</td>
<td>339</td>
<td>154</td>
</tr>
<tr>
<td>MSR X 125 1C 30F</td>
<td>240</td>
<td>34</td>
<td>30</td>
<td>500</td>
<td>40</td>
<td>40</td>
<td>339</td>
<td>154</td>
</tr>
<tr>
<td>MSR X 125 1E 30F</td>
<td>480</td>
<td>17</td>
<td>30</td>
<td>500</td>
<td>10</td>
<td>10</td>
<td>40</td>
<td>339</td>
</tr>
<tr>
<td>MSR X 125 1B 40F</td>
<td>208</td>
<td>53</td>
<td>40</td>
<td>500</td>
<td>8</td>
<td>60</td>
<td>368</td>
<td>167</td>
</tr>
<tr>
<td>MSR X 125 1C 40F</td>
<td>240</td>
<td>46</td>
<td>40</td>
<td>500</td>
<td>8</td>
<td>60</td>
<td>368</td>
<td>167</td>
</tr>
<tr>
<td>MSR X 125 1E 40F</td>
<td>480</td>
<td>23</td>
<td>40</td>
<td>500</td>
<td>8</td>
<td>60</td>
<td>368</td>
<td>167</td>
</tr>
<tr>
<td>MSR X 125 1B/C 50F</td>
<td>208/240</td>
<td>67/58</td>
<td>50</td>
<td>500</td>
<td>8</td>
<td>60</td>
<td>405</td>
<td>184</td>
</tr>
<tr>
<td>MSR X 125 1E 50F</td>
<td>480</td>
<td>29</td>
<td>50</td>
<td>500</td>
<td>8</td>
<td>63</td>
<td>405</td>
<td>184</td>
</tr>
</tbody>
</table>

### Three Phase, 125 - Volt Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Input Volts</th>
<th>AC amps</th>
<th>DC amps</th>
<th>Cabinet</th>
<th>Recommended DC cable size AWG</th>
<th>DC Circuit Breaker</th>
<th>approx. ship. wt. lbs.</th>
<th>kgs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSR X 125 3 B 40F</td>
<td>208</td>
<td>25</td>
<td>40</td>
<td>500</td>
<td>8</td>
<td>60</td>
<td>426</td>
<td>194</td>
</tr>
<tr>
<td>MSR X 125 3 E 50F</td>
<td>480</td>
<td>13</td>
<td>50</td>
<td>500</td>
<td>8</td>
<td>60</td>
<td>467</td>
<td>212</td>
</tr>
<tr>
<td>MSR X 125 3 E 75F</td>
<td>480</td>
<td>20</td>
<td>75</td>
<td>650</td>
<td>4</td>
<td>Optional</td>
<td>622</td>
<td>283</td>
</tr>
<tr>
<td>MSR X 125 3 E 100F</td>
<td>480</td>
<td>26</td>
<td>100</td>
<td>650</td>
<td>3</td>
<td>Optional</td>
<td>647</td>
<td>294</td>
</tr>
<tr>
<td>MSR X 125 3 E 125F</td>
<td>480</td>
<td>34</td>
<td>125</td>
<td>700</td>
<td>2</td>
<td>Optional</td>
<td>730</td>
<td>332</td>
</tr>
<tr>
<td>MSR X 125 3 E 150F</td>
<td>480</td>
<td>40</td>
<td>150</td>
<td>700</td>
<td>1</td>
<td>Optional</td>
<td>780</td>
<td>355</td>
</tr>
</tbody>
</table>