300 Watt CHR Series
10:1 Chassis-Mount DC/DC Converter

FEATURES
- 16.8V – 160V steady state, with transient range of 14.4V – 168V for 100ms
- Output voltages of 12, 24 or 48 Volts
- Up to 300 Watts total output power
- Ruggedized and encased chassis-mount package 7.3” x 4.6” x 1.6” (185mm x 116mm x 40mm)
- Compliant to Railway standards EN 50155 and EN 50121-3-2
- High efficiency up to 93%, typical
- Tight Line and Load regulation
- Low Ripple and Noise
- Controlled inrush current 2A max
- Extensive self-protection shut down features, including over temperature shutdown
- Output voltage adjustable
- Green LED Power Indicator
- Remote On/Off and PUL
- Optional O-Ring feature for redundant or parallel operation with droop
- Optional Hold-up feature
- Optional mating connector kit
- Operating ambient temperature range -40 to +70°C (and +85°C for 10min)
- UL60950-1, 2nd Edition, EN60950-1 safety amendments provision

Optimized for harsh environments in industrial/railway applications, the CHR DC-DC converter series offer regulated outputs in a ruggedized, encased chassis-mount package.

PRODUCT OVERVIEW
The CHR series is a 300W stand alone, system level, chassis mount isolated DC-DC converter. The converter features an ultra wide input designed to accept nominal battery voltages from 24V to 110V in a single product.

The CHR is ideally suited for Railway applications, meeting EN50155 standard in a single package. The output voltage has a wide trim range up to -10%/+15% of Vnom, and features a constant current output profile ideally suited for high inductive/capacitive loading.

They feature Programmable Undervoltage Lockout (PUL) to prevent deep discharge of the input batteries, Remote On/Off control and an Open Collector DC Output Power Good Signal including a visual LED as standard.

The CHR offers additional options such as “Hold Up” capability for overriding input interruptions of 10ms and more (load dependent) not affecting the output. An “O-Ring FET” option is for redundancy or power share operation with a droop voltage. The standard self protection features include Overvoltage protection, Current limit/Short circuit protection, Over temperature protection and ensure safe and reliable power delivery.

SAFETY FEATURES
- Protected against fire and smoke to EN 45545
- 425Vdc input to output isolation
- UL 60950-1, 2nd Edition, EN60950-1 and CAN/CSA-C22.2 No. 60950-1 approvals pending
- CE approved
- RoHS compliant

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9/25/2019
### PERFORMANCE SPECIFICATIONS SUMMARY AND ORDERING GUIDE

<table>
<thead>
<tr>
<th>Root Model</th>
<th>V_{out} (V)</th>
<th>I_{out} (A, max.)</th>
<th>Power (W)</th>
<th>R/N (mV pk-pk)</th>
<th>Regulation (max.)</th>
<th>V_{in} Nom. (V)</th>
<th>Range (V)</th>
<th>I_{in} no load (mA)</th>
<th>I_{in} full load (A)</th>
<th>Efficiency</th>
<th>Package</th>
<th>Case (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>72WS12.300CHR</td>
<td>12</td>
<td>25</td>
<td>300</td>
<td>60</td>
<td>±0.5%</td>
<td>72</td>
<td>16.8-160</td>
<td>TBD</td>
<td>TBD</td>
<td>88.9%</td>
<td>92.9%</td>
<td>7.27 x 4.57 x 1.56</td>
</tr>
<tr>
<td>72WS24.300CHR</td>
<td>24</td>
<td>12.5</td>
<td>300</td>
<td>190</td>
<td>±0.5%</td>
<td>72</td>
<td>16.8-160</td>
<td>TBD</td>
<td>TBD</td>
<td>86.0%</td>
<td>90%</td>
<td>7.27 x 4.57 x 1.56</td>
</tr>
<tr>
<td>In Development</td>
<td>48</td>
<td>6.25</td>
<td>300</td>
<td>200</td>
<td>±0.5%</td>
<td>72</td>
<td>16.8-160</td>
<td>TBD</td>
<td>TBD</td>
<td>86.0%</td>
<td>90%</td>
<td>7.27 x 4.57 x 1.56</td>
</tr>
</tbody>
</table>

### PART NUMBER STRUCTURE

- **72** = Nominal Input Voltage (V_{dc})
- **W** = 10:1 Input Voltage Range (16.8-160V_{dc})
- **S** = Single Output Voltage
- **12** = Nominal Output Voltage (V_{dc})
- **300** = Nominal Output Power (W)
- **CHR** = Chassis-mount Ruggedized
- **H** = Hold-up capacitor
- **R** = O-ring FETs

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**ENVIRONMENTAL QUALIFICATION TESTING:**

<table>
<thead>
<tr>
<th>Test method</th>
<th>Standard</th>
<th>Test conditions</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ad</td>
<td>Low temperature start-up test</td>
<td>Temperature, duration: -40 °C, 2 h Performance test: +25 °C</td>
<td>Not operating</td>
</tr>
<tr>
<td>Be</td>
<td>Dry heat test cycle A</td>
<td>Temperature Duration: 70 °C 6 h</td>
<td>Operating perf. crit. A</td>
</tr>
<tr>
<td>Db 2</td>
<td>Cyclic damp heat test</td>
<td>Temperature Cycles (respiration effect) Duration: 55 °C and 25 °C 2 2x 24 h</td>
<td>Not operating</td>
</tr>
<tr>
<td>Ka</td>
<td>Salt mist test sodium chloride (NaCl) solution</td>
<td>Temperature Duration: 35 ±2 °C 48 h</td>
<td>Not operating</td>
</tr>
<tr>
<td>--</td>
<td>Functional random vibration test</td>
<td>Acceleration amplitude: 0.1 g = 1.01 m/s² Frequency band: 5 - 150 Hz Test duration: 30 min (10 min in each axis)</td>
<td>Operating perf. crit. A</td>
</tr>
<tr>
<td>--</td>
<td>Simulated long life testing</td>
<td>Acceleration amplitude: 0.58 g = 5.72 m/s² Frequency band: 5 - 150 Hz Test duration: 15 h (5 h in each axis)</td>
<td>Not operating</td>
</tr>
<tr>
<td>--</td>
<td>Shock test</td>
<td>Acceleration amplitude: 5.1g Bump duration: 30 ms Number of bumps: 18 (3 in each direction)</td>
<td>Operating perf. crit. A</td>
</tr>
<tr>
<td>--</td>
<td>Vibration sinusoidal</td>
<td>Acceleration amplitude: 0.3” (5 – 20 Hz) 15 g = 14.7 m/s² Frequency band: 10 – 200 Hz Test duration: 12 h (4 h in each axis)</td>
<td>Operating perf. crit. A</td>
</tr>
<tr>
<td>--</td>
<td>Mechanical shock</td>
<td>Acceleration amplitude: 10 g = 98 m/s² Bump duration: 11 ms Number of bumps: 18 (3 in each direction)</td>
<td>Operating perf. crit. A</td>
</tr>
</tbody>
</table>

1 Body mounted = chassis of a railway coach

**EN 50155:2017 STANDARD:**

<table>
<thead>
<tr>
<th>Nominal Input</th>
<th>Permanent Input Range (0.7 - 1.25 Vin)</th>
<th>Brownout 100ms (0.6 x Vin)</th>
<th>Transient 1s (1.4 x Vin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24V</td>
<td>16.8V – 30V</td>
<td>14.4V</td>
<td>33.6V</td>
</tr>
<tr>
<td>28V</td>
<td>19.6V – 35V</td>
<td>16.8V</td>
<td>39.2V</td>
</tr>
<tr>
<td>36V</td>
<td>25.2V – 45V</td>
<td>21.6V</td>
<td>50.4V</td>
</tr>
<tr>
<td>48V</td>
<td>33.6V – 60V</td>
<td>28.8V</td>
<td>67.2V</td>
</tr>
<tr>
<td>72V</td>
<td>50.4V – 90V</td>
<td>43.2V</td>
<td>100.8V</td>
</tr>
<tr>
<td>96V</td>
<td>67.2V – 120V</td>
<td>57.6V</td>
<td>134.4V</td>
</tr>
<tr>
<td>110V</td>
<td>77V – 137.5V</td>
<td>66V</td>
<td>154V</td>
</tr>
</tbody>
</table>
PUL Specification and Recommended External Fuse:

CHR300 Series PUL table and formula for PUL resistor selection and calculation of battery under voltage protection setup.

<table>
<thead>
<tr>
<th>Battery</th>
<th>R_PUL</th>
<th>VIN_ON</th>
<th>VIN_OFF</th>
<th>External Fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>24V</td>
<td>Not connected</td>
<td>16.0V</td>
<td>14.1V</td>
<td>TBD</td>
</tr>
<tr>
<td>36V</td>
<td>267kΩ</td>
<td>19.9V</td>
<td>17.9V</td>
<td>TBD</td>
</tr>
<tr>
<td>48V</td>
<td>82.5kΩ</td>
<td>28.7V</td>
<td>25.7V</td>
<td>TBD</td>
</tr>
<tr>
<td>72V</td>
<td>48.7kΩ</td>
<td>27.5V</td>
<td>33.8V</td>
<td>TBD</td>
</tr>
<tr>
<td>96V</td>
<td>22kΩ</td>
<td>62.7V</td>
<td>56.4V</td>
<td>TBD</td>
</tr>
<tr>
<td>110V</td>
<td>18.7kΩ</td>
<td>72.3V</td>
<td>65.2V</td>
<td>TBD</td>
</tr>
</tbody>
</table>

Input under voltage turn off could be setup by selecting PUL resistor given in the table above. The resistor value could also be calculated based on the preferred turn-off voltage that customers select for battery protection.

\[ R_{PUL} = \frac{953.62}{(VIN_{OFF}-14.4)} \]

Where \( R_{PUL} \) is PUL resistor in kΩ, \( VIN_{OFF} \) is the turn-off voltage in Volt. Corresponding turn-on voltage \( VIN_{ON} \) is

\[ VIN_{ON} = \frac{15.95(R_{PUL}+66.23)}{R_{PUL}} \]

When input voltage drops lower than \( VIN_{OFF} \), the converter will continue operating 100mS before turning off the output. When input voltage drops lower than 14.4V, the converter enters input interruption mode. The hold-up circuit will keep the output uninterrupted for no less than 10mS under nominal load output. The converter will be shut down if input voltage is not recovered to above 16V afterward.
MECHANICAL SPECIFICATIONS

IP30 (2.5mm Objects*)
(*Will not permit parts larger than a standard M3 flat washer to fall inside)
PIN FUNCTION & DESCRIPTION (J3 CONTROL)

PIN 1: VO_UP, for output voltage adjustment. When a resistor is connected between VO_UP and VO_ADJ (PIN 3), the output voltage will be set to a value that is higher than nominal voltage (12V for CHR800-12, 24V for CHR800-24). When the connected resistor is zero (short-circuiting PIN 1 and PIN 3), the output voltage is set to maximum (13.8V for 72WS123.300CHR, 36.6V for 72WS243.300CHR).

PIN 2: P_OK+, open collector output. When the output voltage is higher than 10.5V for 72WS123.300CHR (20.5V for 72WS243.300CHR), the voltage between P_OK+ (PIN 2) and V0UpPin (PIN 4) is pulled down to less than 0.8V.

PIN 3: VO_ADJ, for output voltage adjustment. Used with PIN 1 or PIN 5 to set the output voltage higher or lower than nominal voltage.

PIN 4: V0UpPin, used with P_OK+ (PIN 2) for output voltage status. This pin is internally connected to the negative terminal of the output connector.

PIN 5: VO_DOWN, for output voltage adjustment. When a resistor is connected between VO_DOWN and VO_ADJ (PIN3), the output voltage will be set to a value that is lower than nominal voltage. When the connected resistor is zero (short-circuiting pin5 and pin3), the output voltage is set to minimum (10.8V for 72WS123.300CHR, 21.6V for 72WS243.300CHR).

PIN 6: LL_EN, for units with output ORing feature. Connect this pin to V0UpPin (PIN 4) will enable output voltage drop with the increase of load current. This pin must be connected to VO_UP (PIN 4) before connecting outputs in parallel and enabling the ORing function.

PIN 7: and PIN 8: No connection

PIN 9: PUL1 and PIN 10: PUL2, for Programmable Under voltage Lockout (PUL).

PIN 11: ON/OFF+, for output inhibit. Output is OFF when this pin is pulled down to lower than 0.8V with reference to VINN (PIN 12). For output ON state, leave this pin open or connect and keep its voltage higher than 4V.

PIN 12: VINN, this pin is internally connected to the negative terminal of the input connector.

300CHR-MCK (MATING CONNECTOR KIT)

J1 MATE: WEIDMULLER #1060550000
J2 MATE: WEIDMULLER #1060580000
J3 MATE: WAGO #713-1106/037-000
MPQ = 4