

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

PRELIMINARY

CALEX

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 ORing 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)
- UL 60950-1, 2nd Edition, EN60950-1 safety approvals pending

SAFETY FEATURES

- Protected against fire and smoke to EN 45545
- 4250Vdc 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

Output Voltage (Vdc)	Output Current (A)	Input Voltage Range/100ms transient (Vdc)
12	25.0	16.8 – 160 / 14.4 - 168
24	12.5	16.8 – 160 / 14.4 - 168
48 In Development	6.25	16.8 – 160 / 14.4 - 168

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 Lock-out (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 "ORing 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.



Typical unit



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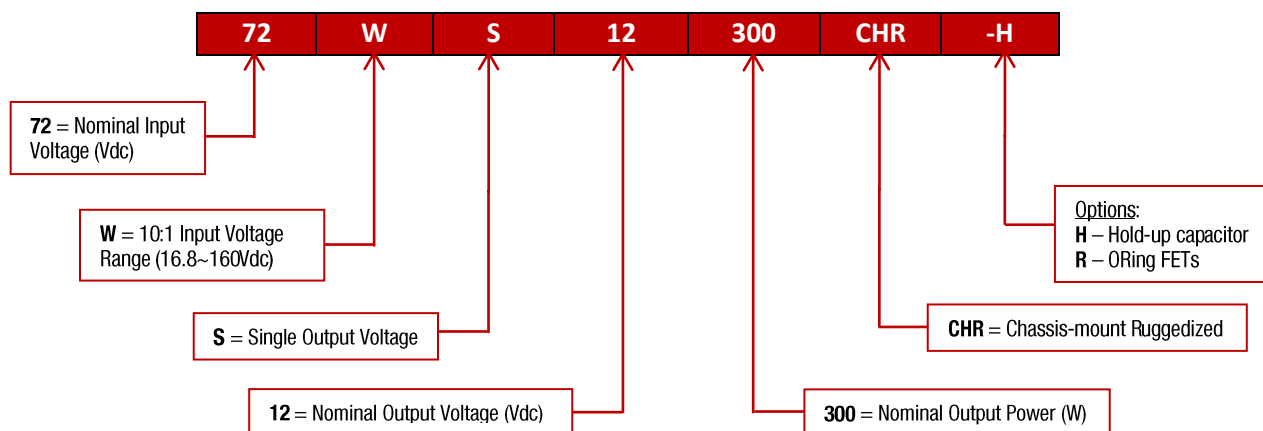
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PERFORMANCE SPECIFICATIONS SUMMARY AND ORDERING GUIDE ①②

Root Model	Output						Input				Efficiency		Package ④	
	V _{out} (V)	I _{out} (A, max.)	Power (W)	R/N (mV pk-pk)		Regulation (max.) ③		V _{in} Nom. (V)	Range (V)	I _{in} , no load (mA)	I _{in} , full load (A)	Min.	Typ.	Case (inches)
				Typ.	Max.	Line	Load							
72WS12.300CHR	12	25	300	60	120	±0.5%	±0.5%	72	16.8-160	TBD	3	88.5%	92.9%	7.27 x 4.57 x 1.56
72WS24.300CHR	24	12.5	300	190	240	±0.5%	±0.5%	72	16.8-160	TBD	TBD	86.0%	90%	7.27 x 4.57 x 1.56
In Development	48	6.25	300	200	480	±0.5%	±0.5%	72	16.8-160	TBD	TBD	86.0%	90%	7.27 x 4.57 x 1.56

PART NUMBER STRUCTURE



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ENVIRONMENTAL QUALIFICATION TESTING:

Test method		Standard	Test conditions		Status
Ad	Low temperature start-up test	EN 50155:2017, clause 13.4.4 IEC/EN 60068-2-1	Temperature, duration: Performance test:	-40 °C, 2 h +25 °C	Not operating
Be	Dry heat test cycle A	EN 50155:2017, clause 13.4.5 IEC/EN 60068-2-2	Temperature: Duration:	70 °C 6 h	Operating perf. crit. A
Db 2	Cyclic damp heat test	EN 50155:2017, clause 13.4.7 IEC/EN 60068-2-30	Temperature: Cycles (respiration effect) Duration:	55 °C and 25 °C 2 2x 24 h	Not operating
Ka	Salt mist test sodium chloride (NaCl) solution	EN 50155:2017, clause 13.4.10 IEC/EN 60068-2-11	Temperature: Duration:	35 ±2 °C 48 h	Not operating
--	Functional random vibration test	EN 50155:2017, clause 13.4.11.4 EN 61373:2010, clause 8, class B, body mounted ¹	Acceleration amplitude: Frequency band: Test duration:	0.1 g _n = 1.01 m/s ² 5 – 150 Hz 30 min (10 min in each axis)	Operating perf. crit. A
--	Simulated long life testing	EN 50155:2017, clause 13.4.11.2 EN 61373:2010, clause 9, class B, body mounted ¹	Acceleration amplitude: Frequency band: Test duration:	0.58 g _n = 5.72 m/s ² 5 – 150 Hz 15 h (5 h in each axis)	Not operating
--	Shock test	EN 50155:2017, clause 13.4.11.3 EN 61373:2010, clause 10, class B, body mounted ¹	Acceleration amplitude: Bump duration: Number of bumps:	5.1 g _n 30 ms 18 (3 in each direction)	Operating perf. crit. A
--	Vibration sinusoidal	AREMA Part 11.5.1 class C, D, E, I, J	Acceleration amplitude: Frequency band: Test duration:	0.3" (5 – 20 Hz) 1.5 g _n = 14.7 m/s ² 10 – 200 Hz 12 h (4 h in each axis)	Operating perf. crit. A
--	Mechanical shock	AREMA Part 11.5.1 class C, D, E, I, J	Acceleration amplitude: Bump duration: Number of bumps:	10 g _n = 98 m/s ² 11 ms 18 (3 in each direction)	Operating perf. crit. A

¹ Body mounted = chassis of a railway coach

EN 50155:2017 STANDARD:

EN 50155:2017 STANDARD			
Nominal Input	Permanent Input Range (0.7 - 1.25 Vin)	Brownout 100ms (0.6 x Vin)	Transient 1s (1.4 x Vin)
24V	16.8V – 30V	14.4V	33.6V
28V	19.6V – 35V	16.8V	39.2V
36V	25.2V – 45V	21.6V	50.4V
48V	33.6V – 60V	28.8V	67.2V
72V	50.4V – 90V	43.2V	100.8V
96V	67.2V – 120V	57.6V	134.4V
110V	77V – 137.5V	66V	154V

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PUL Specification and Recommended External Fuse:

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

Battery	R_PUL	VIN_ON	VIN_OFF	External Fuse
24V	Not connected	16.0V	14.1V	TBD
36V	267kΩ	19.9V	17.9V	TBD
48V	82.5kΩ	28.7V	25.7V	TBD
72V	48.7kΩ	27.5V	33.8V	TBD
96V	22kΩ	62.7V	56.4V	TBD
110V	18.7kΩ	72.3V	65.2V	TBD

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.

$$R_PUL = 953.62/(VIN_OFF-14.4)$$

Where R_PUL is PUL resistor in kΩ, VIN_OFF is the turn-off voltage in Volt. Corresponding turn-on voltage VIN_ON is

$$VIN_ON = 15.95(R_PUL+66.23)/R_PUL$$

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.

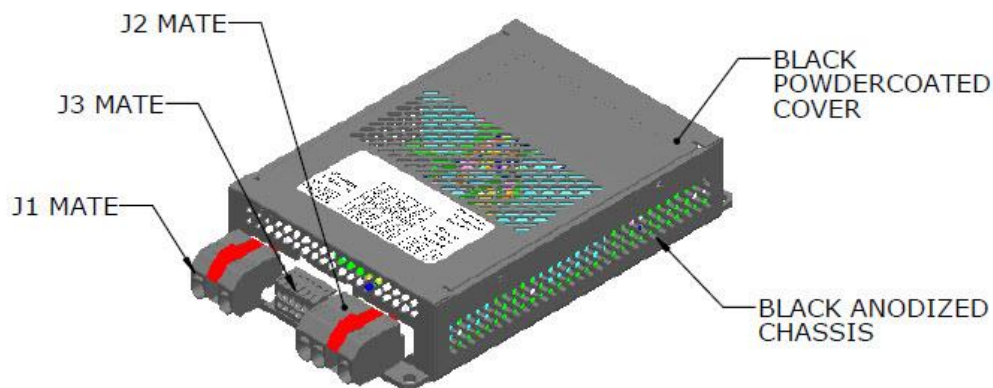
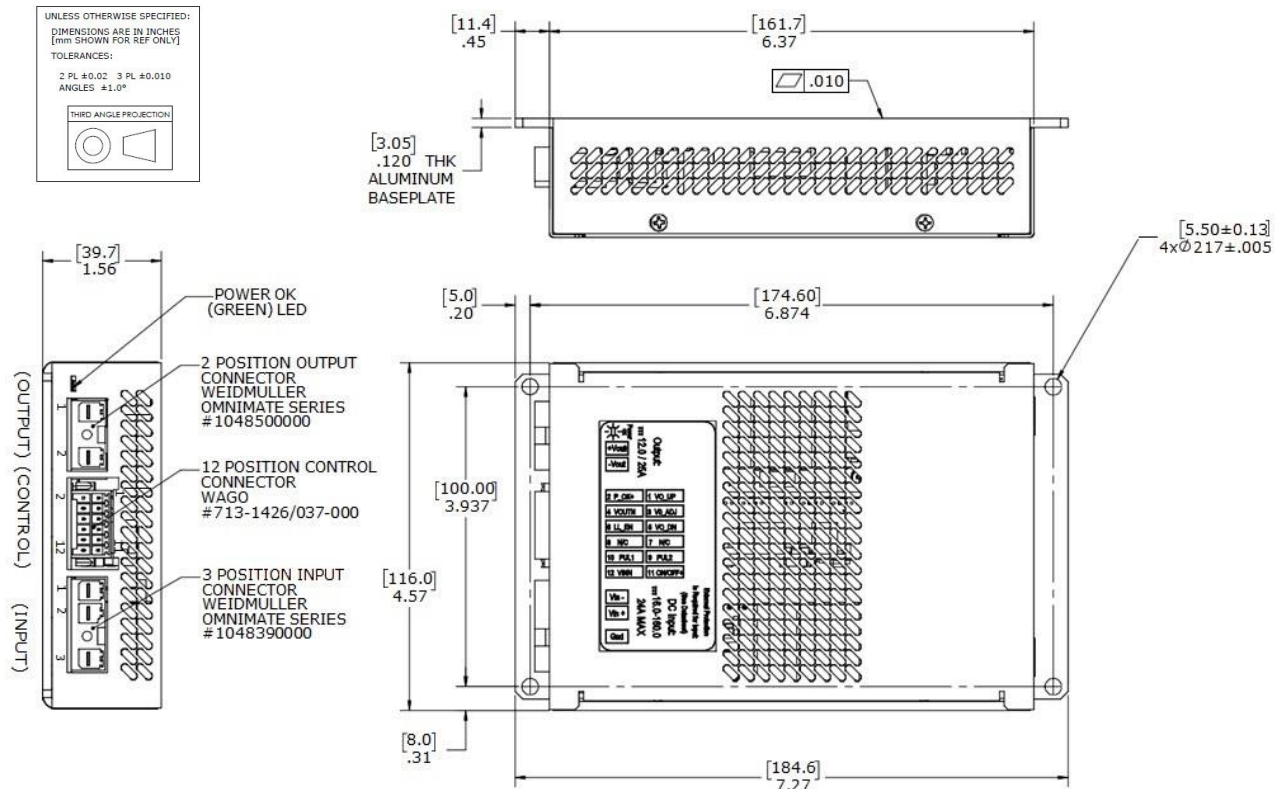
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MECHANICAL SPECIFICATIONS



IP30 (2.5mm Objects*)

(*Will not permit parts larger than a standard M3 flat washer to fall inside)

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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 CHR300-12, 24V for CHR300-24). When the connected resistor is zero (short-circuiting PIN 1 and PIN 3), the output voltage is set to maximum (13.8V for 72WS12.300CHR, 26.4V for 72WS24.300CHR).

PIN 2: P_OK+, open collector output. When the output voltage is higher than 10.5V for 72WS12.300CHR (20.5V for 72WS24.300CHR), the voltage between P_OK+ (PIN 2) and VOUTN (PIN 4) is pull 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: VOUTN, 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 (PIN 3), the output voltage will be set to a value that is lower than nominal voltage. When the connected resistor is zero (short-circuiting PIN 5 and PIN 3), the output voltage is set to minimum (10.8V for 72WS12.300CHR, 21.6V for 72WS24.300CHR).

PIN 6: LL_EN, for units with output ORing feature. Connect this pin to VOUTN (PIN 4) will enable output voltage droop with the increase of load current. This pin must be connected to VON (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 pull 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.

J1 OUTPUT	
PIN #	FUNCTION
1	+Vout
2	-Vout

J2 INPUT	
PIN #	FUNCTION
1	-Vin
2	+Vin
3	GND

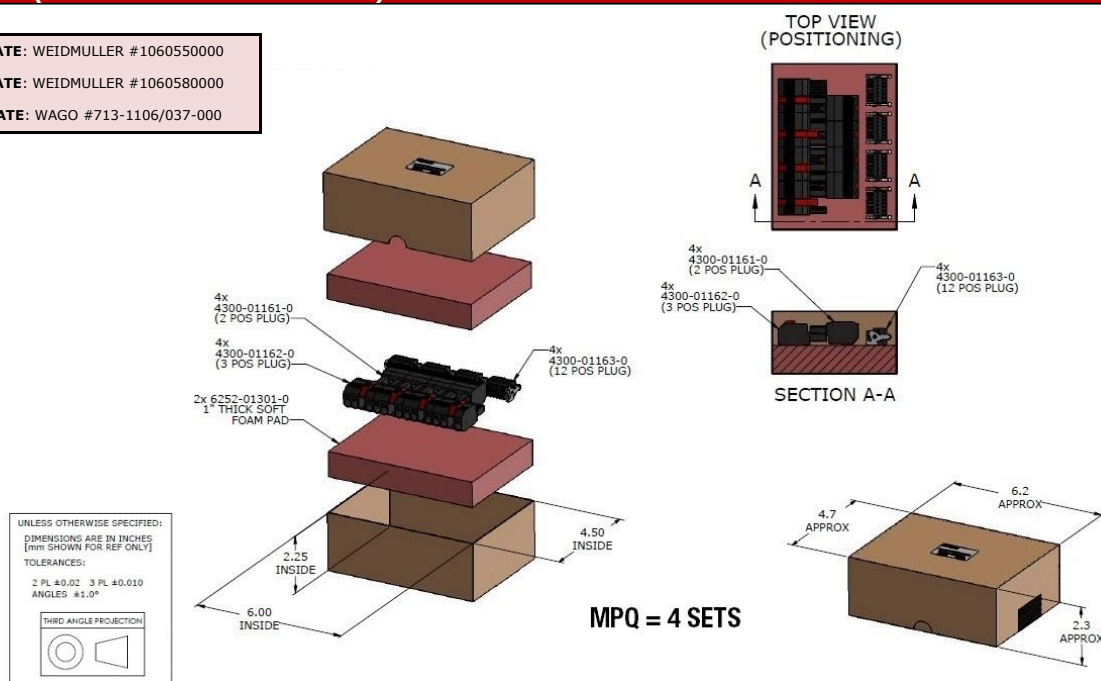
J3 CONTROL	
PIN #	FUNCTION
1	VO_UP
2	P_OK+
3	VO_ADJ
4	VOUTN
5	VO_DOWN
6	LL_EN
7	No Connection
8	No Connection
9	PUL1
10	PUL2
11	ON/OFF+
12	VINN

300CHR-MCK (MATING CONNECTOR KIT)

J1 MATE: WEIDMULLER #1060550000

J2 MATE: WEIDMULLER #1060580000

J3 MATE: WAGO #713-1106/037-000



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SHIPPING BOX

MPQ = 4

