

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
INPUT						
V_I	Input voltage working range	Continuous	87		264	V_{AC}
f	Line frequency		47		63	Hz
$V_{I,DC}$	Input voltage range DC	External DC-fuse recommended	125		375	V_{DC}
V_{on}	Converter turn on voltage	Sinusoidal input voltage 50Hz CF=1.41	88		94	V_{AC}
V_{off}	Converter turn off voltage	Sinusoidal input voltage 50Hz CF=1.41	72		80	V_{AC}
λ , PFC	Line Harmonic Distortion	$P_o \geq 50W, V_I = 110 VAC$	0.97			
		$P_o \geq 100W, V_I = 230 VAC$	0.95			
I_I	Input current	No load Nominal load Nominal load	$V_I = 375 VDC, P_o = 0$ $V_I = 110 VAC, P_o = 250 W$ $V_I = 88 VAC, P_o = 250 W$	0.019 2.5 3.1	0.025 2.6 3.3	A_{rms}
	Input current integral	$V_I = 265 V\sim$			3.8	A^2s
$I_{I,max}$	Max. inrush current	$P_o = 250 W, V_I = 240 V\sim$ $250\mu s \leq \Delta t \leq 100 ms$	11.5			A
C_I	Converter input capacity	Inrush protected capacitance		220		μF
	Reverse input protection at DC input	4x Diode IXYS DSI30-16AS 1.6kV type	Bridge Rectifier			
	Input fuse	bel 0697H6300-01 350VAC slow blow	6.3 AT			

OUTPUT: Power unit

$P_{O,nom}$	Output power		250		290	W
$V_{O,nom}$	Output voltage / cell	$T_{Batt} = 20^\circ C$ Factory adjust	2.22 / cell	2.23 / cell	2.24 / cell	V_{DC}
$V_{O,err}$	Output voltage / cell NTC missing	NTC error		2.0 / cell		V_{DC}
$V_{O,lo}$	Loading characteristic		V_o acc. DIN 41773 with temperature compensation			
TC	Temperature compensation	Connector 2-pin: orange	external NTC 10 kOhm			
V_o	Voltage stability ($\Delta V_o/V_{o,nom} * 100\%$)	$0 \leq P_o \leq 290 W$		0.5	1.0	%
$V_{O,pp}$	Ripple & Noise	$0 \leq P_o \leq 290 W$ BW 20 MHz		50	250	mV_{rms}
t_h	Holdup-time	$87 V\sim \leq V_I \leq 264 V\sim$ $0 \leq P_o \leq 290 W$	20			ms
t_h	Holdup-time	$87 V\sim \leq V_I \leq 264 V\sim$ $P_o = 250 W$		30		ms
	Over voltage shutdown V_o	$0 \leq P_o \leq 290 W$	Converter off: $1.25 \times V_{O,err}$ (2.5V per cell)			V
$I_{O,short}$	Output short circuit RMS current for $t < 2s$	M12 M24 M48		21.5 12.5 7.7	26 15 13	A
C_o	Output capacity	M12 M24 M48		9.8 5.2 2.3		mF

Communication

RJ45	Ethernet connection	galvanic isolated	UDP broadcast once per second		
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SIGNALS

V98	Output voltage	Output o.k. constant voltage charging	LED green ON
V98	Output voltage	Output o.k. constant current charging	LED green blinking
V99	Input voltage	Input o.k.	LED green ON
V100	Over temperature	NTC failure, battery over temperature	LED red ON
V101	Converter in redundancy mode	Redundant mode active	LED yellow ON
X5	Combines all errors except redundant mode	Relay, no error	PIN 1-2 closed

GENERAL SPECIFICATIONS

f_1	Switching frequency	PFC Boost		80		kHz
f_2	Switching frequency	DC/DC converter		105		kHz
η	Efficiency M24 + M48	$P_o \geq 0.7 \times P_{O,nom}, V_I > 100VAC$	90	91.5		%
	Efficiency M12	$P_o \geq 0.7 \times P_{O,nom}, V_I > 100VAC$	90	91.0		%
	MTBF (SN 29500)	$V_I = 230 V\sim, P_o \leq 250 W, T_A \leq +40^\circ C$		500 000		h
	No load, short circuit proof	Converter shuts down after 2s in short circuit condition	Continuously			
OTP	Internal over temperature protection	5°C hysteresis	board temperature $> 90^\circ C$			

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SAFETY / DIMENSIONS						
	Creepage / clearance distances PD2 PCB FR4, V0, TG = + 150°C	Input output Input case Output case Relay case and output Relay Input	6.0 / 4.7 4.0 / 2.2 1.3 / 1.3 4.0 / 4.0 6.0 / 4.7			mm mm mm mm mm
	Converter dielectric strength test every unit with ramp function: 2 s - 3 s - 2 s type test: 1 Minute	Input – output Input – case Output – case RJ45 / Relay – input RJ45 / Relay – output RJ45 / Relay – case	3000 2200 1250 3000 750 750			V _{DC} V _{DC} V _{DC} V _{DC} V _{DC} V _{DC}
	WAGO WAGO WAGO PHOENIX CONTACT	Input X1, Output X6, Temp. Sensor X3 Relay X5 Redundant connector X4 Safety Earth M4: additional bolt	831 – 3623, 831 – 3622 231-532/001-000 231-432/001-000 1787030			
	Protection class, protection system			I, IP 30		
	Dimensions with mounting plate <i>see drawing</i>	w x h x d Chassis mounting		225 x 353 x 44.5		mm
	Assembling	Chassis mounting with screws		6 x M5		
	Weight		1760	1810	1860	g

ENVIROMENTAL CONDITIONS						
T _A	Operating temperature range T _A	Continuous 110 V~ ≤ V _I ≤ 264 V~	- 25		+ 70	°C
T _{Storage}	Storage Temperature		- 25		+ 70	°C
	Cooling		free air convection			
	Humidity	EN 50155, IEC 60571	75% averaged year, 95% 30 days			
	Vibration / Shock valid only for chassis mounting	IEC 61373, IEC 68-2-27 Cat. I 3 Shocks per axis	50 m / s ² , 30 ms			

EMC			
Emission		Line conducted and radiated	EN 50121 - 3 - 2: 2016
Immunity		ESD EN 61000 - 4 - 2	6 kV / 8 kV Performance criteria - B -
		High frequency field EN 61000 - 4 - 3	20 V / m 80 MHz ... 6.0 GHz Performance criteria - A - *)
		Burst EN 61000 - 4 - 4	Level 3 asym., sym. Performance criteria - A -
		Surge EN 61000 - 4 - 5	2 kV asym. / 1 kV sym. R _i = 42 Ω, Perf. criteria - A -
		HF – Current injection EN 61000 - 4 - 6	10 V _{eff} , R _i = 150 Ω Performance criteria - A -

STANDARDS						
Applied Standards:	EN 50155: 2018	EN 60 950	EN 50124 - 1: 2006	EN 50121 - 3 - 2: 2016	IEC 60571-1	
	SN 29500	EN 50121 - 1	EN 50125 - 1	EN 60068 - 2 - 6, 2...27	EN 61000 - 4 - 2...6	
	EN 61131-2 :2007	EN 60721 - 3 - 5	EN 61373	EN 60529 : 1991	DIN 41773 T.1	
	EN 61000 - 3 - 2	EN 61000-3-3				

Technical specifications valid for: - 25° C ≤ T_A ≤ + 70° C and 87 V~ ≤ V_I ≤ 264 V~ unless otherwise noted.

*) 1400 MHz – 2000MHz 10V/m, 200MHz – 2500MHz 5V/m, 5100MHz – 6000MHz 3V/m

Pin Assignment

Input X1		
PIN		Recom. wire gauge
1	V _{In} (N)	1.5 mm ²
2	V _{In} (L)	1.5 mm ²
3	⊕	2.5 mm ² (optional)
Output Power X6 (M12 / M24 / M48)		
1	+ V _{Out}	6.0 / 4.0 / 2.5 mm ²
2	- V _{Out}	6.0 / 4.0 / 2.5 mm ²

Signal X3 Temp. Sensor		
PIN		Recom. wire gauge
1	NTC 10kΩ	1.0 mm ²
2		1.0 mm ²
Redundant connector X4		
1-6		0.5 or 1.0 mm ²
7-8		Cable screen
Signal X5: Input, Output and Temperature Fail		
PIN		Recom. Wire gauge
1-2 closed	OK	1.0 mm ²
1-2 open	Fail	1.0 mm ²

VI battery charging

I - Mode

When the charger in I-mode, the output current is limited to a fixed value. The output voltage of charger is then equal to battery voltage plus voltage drop across the cabling to battery.

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
I _{limit}	output current limit	M12		20.8	21.8	A
		M24		10.4	10.9	
		M48		5.2	5.45	

V-mode

The battery is charged to its optimal voltage level. The output voltage of charger is regulated according to the battery temperature. Maximum and minimum charging voltage levels are provided.

α	temperature compensation factor / cell			-3		mV/°C
V _O	charge voltage / cell		$2.23 + \alpha * (T_{batt} - 20^{\circ}C)$			V _{DC}
V _O	maximum charging voltage / cell			2.33		V _{DC}
V _O	minimum charging voltage / cell			1.5		V _{DC}
T _{limit 1} 5°C hysteresis	if battery temperature exceeds a predefined value, battery is protected from overheating	V _{Out} set to 22.8VDC	60		65	°C
T _{limit 2} 5°C hysteresis	if battery temperature exceeds a predefined value, battery is protected from overheating	V _{Out} disabled	65		70	°C

