

TLP5000-1048

3-Phase Industrial AC-DC Power Supply



¹ Pending

The TLP5000-1048 is a 5 kW, 3-phase AC-DC converter with adjustable DC output.

The liquid cooling (no fan) makes this power supply suitable for a wide variety of high power industrial applications.

Emphasis is given on reliability and long life. Parallel operation is possible for up to 12 units (up to 60 kW).

The CAN bus communication interface is used for command, monitoring and diagnostic information that can be supplied to a system controller.

FEATURES

- 3-phase input voltage range (400 - 480 VAC L-L)
- Power factor >0.94
- High power density 21.4 W/in³
- Typical efficiency >94%
- Nominal DC output voltage 48 VDC
- Adjustable output voltage 39 - 57 VDC
- Parallel operation up to 12 units (up to 60 kW)
- Operating temperature range:
 - 0°C to 40°C coolant temperature
 - 0°C to 70°C ambient air temperature
- CAN bus communication interface
- Active current sharing
- Integrated liquid cooling connected via standard fittings:
 - No fan = less acoustic noise
 - The possibility to install in a dusty environment
 - Simple heat transfer in liquid form
- Safety switch-off of DC output without breaker
- Simple units exchange in system due to hot-plug connectors

APPLICATIONS

- High power laser cutting machines
- Spinning mill systems
- Winding machines
- Other automated industrial applications

1. MODEL SELECTION

MODEL	V _{IN} RANGE	V _{IN} FREQUENCY	V _{OUT} (NOM)	ADJUSTABLE V _{OUT} RANGE ¹	V _{OUT} CURRENT (MAX)	P _O (MAX)	AVAILABILITY
TLP5000-1048	350 – 528 Vrms	50/60 Hz	48 V	39 – 57 VDC	105 ADC	5000 W	Contact factory

¹ A possibility to adjust or preset output voltage via CAN bus interface or analog signal MARGIN

2. INPUT SPECIFICATIONS

All specifications are measured at Ta = 25°C, humidity <75 % nominal input voltage and rated output load unless otherwise specified.

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Input Voltage	3-phase (L-L), 3 wires + PE, 100% Po_nom	350		528	VAC
Input Frequency			50/60		Hz
Max. Phase Input Current				10	Arms
Power Factor		0.94			

3. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Output Voltage	Adjustable via CAN or V_MARGIN pin with formula $V_{o_Set} = 38.5V + 3.8 \cdot V_MARGIN$	39	48	57	VDC
Output Current	Adjustable via CAN or I_MARGIN pin with formula $I_{o_Set} = 5A + 20 \cdot I_MARGIN$	5	105	105	ADC
Output Power Rating			5000		W
Efficiency	Typical, Load above 40%		94		%
Voltage Setting Accuracy			±0.5		%
Line Regulation	$I_o = 0.5 \cdot I_{o_nom}$		±0.5		%
Load Regulation			±0.3		%
Thermal Drift			±0.02		%/°C
Transient Response	Load variation 10 - 100% / 100 - 10%: Recovery time:		±5	2 / 3	% ms
	Load variation 50 - 100% / 100 - 50%: Recovery time:		±3	1	% ms
	Load variation 0 - 100% / 100 - 0%: Recovery time:		6.25	2/1000	% ms
Ripple	Vout_nom (BW 20 MHz)			1	%
Output Start Up				2	s
Rise Time				300	ms
Hold Up Time	100% Load	10			ms

4. PROTECTIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Over Temperature Protection	Coolant medium		55		°C
Input Under Voltage Protection	3-phase (L-N / L-L)			350	V
Input Over Voltage Protection	3-phase (L-L / L-L)	528			V
Reversed Sense Output Protection	Latch type				
Output Under Voltage Protection	Latch type – Fixed SW, based on min. Vout		34		V
Output Over Voltage Protection	Latch type – Fixed HW, based on max. Vout	58.5	59	59.5	V
	Resettable – Floating SW, based on Vo_Set		Vo_Set + 4 V		
Output Over Current	PSU starts operating as a current source, based on Io_Set	5		105	A
	Latch type – Fixed SW, based on max.measured Iout	111		116	
Output Over Power		5292			W

5. SAFETY, REGULATORY & EMI SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS		CLASS / LEVEL / CRITERION
SAFETY		APPROVAL	
Certifications / Approvals	UL/CSA 62368-1 4th edition IEC 62368-1 4th edition CE Mark for LVD		(Pending)
EMISSION REQUIREMENTS		CLASS	
Radiated Emission	EN 55011		Class A
Conducted Emissions	EN 55011		Class A
IMMUNITY REQUIREMENTS		CRITERION	
Electrostatic Discharge (ESD)	EN 61000-4-2	Level 4: ±8 kV contact, ±15 kV air	Criterion A
Radiated Electromagnetic Field	EN 61000-4-3	80 MHz - 6 GHz, 10 V/m	Criterion A
Electrical Fast Transient (EFT) / Burst	EN 61000-4-4	±2 kV, 5 kHz, AC power ports	Criterion A
Surge Immunity	EN 61000-4-5	±1 kV DM, ±2 kV CM	Criterion A
RF Conducted Immunity	EN 61000-4-6	150 kHz - 80 MHz, 10 V/m, AC power ports	Criterion A
Voltage Harmonic & Inter Harmonic Immunity	EN 61000-4-13	Flat Curve Over Swing Sweep in Frequencies	Criterion A Class 3

6. ENVIRONMENTAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Humidity	Operating range acc. IEC 60068-2-78	10		90	RH
Operating Temperature	Coolant temperature	0		+40	°C
	Ambient air temperature	0		+70	
Storage Temperature		-40		+85	°C

7. MONITORING & CONTROL

7.1 GUI (GRAPHIC USER INTERFACE) AND CAN COMMUNICATION PROTOCOL

Bel Power Solutions provides a Windows 10 and Windows 11 compatible Graphical User Interface SW for TLP5000-1048
BEL CAN UTILITY is available for control and monitor via CAN Communication Interface.
For detailed information please contact Bel Power Solutions sales representative.

7.2 LED SIGNALING

LED NAME	COLOR	STATUS	OPERATING CONDITIONS
AC-OK	Green	ON Blinking	AC input voltage is within operation range FW upgrade via CAN
DC-OK	Green	ON	Output is enabled and operational
OT/FAIL	Orange	ON Blinking	Over temperature conditions inside the unit or FAIL appeared Over temperature warning

8. CONNECTORS

PARAMETER	CONNECTOR TYPE	MATING PART
AC input power connector	Amphenol 10106262-4000K02LF	to PCB: Amphenol 10106264-4000K02LF with cables: Amphenol 10129500-1ND1121LF
DC output power & signal connector	Amphenol 10106116-6005K02LF	to PCB: Amphenol 10106118-6005K02LF

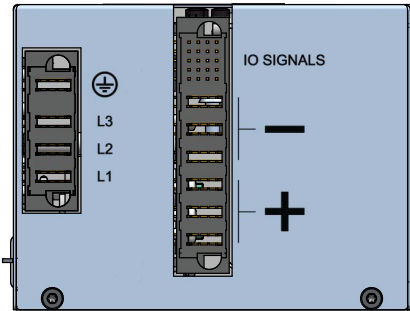


Figure 1. Connectors layout (rear view)

8.1 AC INPUT CONNECTOR

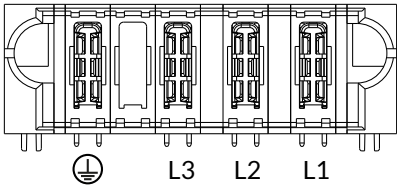


Figure 2. AC Input Connector - detail

SIGNAL NAME	PIN #	TYPE	RECOMMENDED WIRES	V MAX I MAX
Earth		Protective Earth	Min. 2.5 mm²	528 Vrms (line to line) 10 Arms (per line)
AC Line 3	L3	Input Power AC Fused	Min. 2.5 mm²	
AC Line 2	L2	Input Power AC Fused	Min. 2.5 mm²	
AC Line 1	L1	Input Power AC Fused	Min. 2.5 mm²	

8.2 DC OUTPUT CONNECTOR

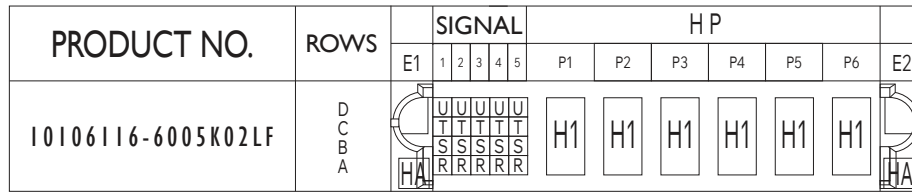


Figure 3. DC Output Connector - detail

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
+5V_AUX_RTN	U1	Auxiliary Output Ground (Return)	-	-	-
+5V_AUX	U2	Auxiliary Output +5 VDC, max. 0.5 A	AUX_RTN	4.8 VDC to 5.2 VDC	5.5 VDC 0.5 A
INHIBIT	U3	Output Inhibit - Open circuit or "High" to SRTN shuts OFF Vout	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
CAN_L	U4	Communication Data	CAN_H	—	-2 to 7 VDC 15 mA
CAN_H	U5	Communication Data	CAN_L	—	-2 to 7 VDC 15 mA
ACSH_RTN	T1	Active Current Share Ground (Return)	ACSH	—	—
ACSH	T2	Active Current Share	ACSH_RTN	0.2 VDC to 5.0 VDC	7 VDC 0.7 mA
ADDR_0	T3	CAN Bus Address	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
ADDR_1	T4	CAN Bus Address	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
ADDR_2	T5	CAN Bus Address	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
V_MARGIN	S1	Analog Signal for Output Voltage Adjustment	SRTN	—	5.5 VDC 0.2mA
SRTN	S2	Signal Ground (Return)	—	—	—
I_MARGIN	S3	Analog Signal for Output Current Adjustment	SRTN	—	5.5 VDC 0.2 mA
SENSE-	S4	Sense Line for Vout- – voltage drop compensation for negative pole	Vout+	—	—
SENSE+	S5	Sense Line for Vout+ – voltage drop compensation for positive pole	Vout-	—	—
PS_PRESENT_CHAIN	R1	Power Supply Seated – Input Signal	SRTN	—	1 VDC 100 mA
OUTPUT_OK	R2	Output Voltage Fault - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 20mA
INPUT_OK	R3	AC Power Fault or Warning - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 20mA
OTP/FAILURE	R4	Over Temperature / Over Load Fault - open collector, external pull-up needed to max. 7 VDC	SRTN	<0.4 VDC Pull up	7 VDC 20mA
STANDBY	E5	Power Supply Standby Pin – Open circuit or "High" to SRTN means Standby mode – Vout is disabled with low power consumption	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
Vout-	P1 P2 P3	Output Power DC	—	—	60 VDC 105 A
Vout+	P4 P5 P6	Output Power DC	Vout-	—	60 VDC 105 A

¹ SRTN and Vout- are connected together inside the power supply² 120 Ω resistors connection required between CAN_L and CAN_H on both sides externally

9. MECHANICAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Dimensions	See mechanical drawing		110 x 401.3 x 84.6 4.3 x 15.8 x 3.3		mm in
Insulation	Input to Output: Input to Chassis:	3536 1768			VAC
Enclosure	IP20				

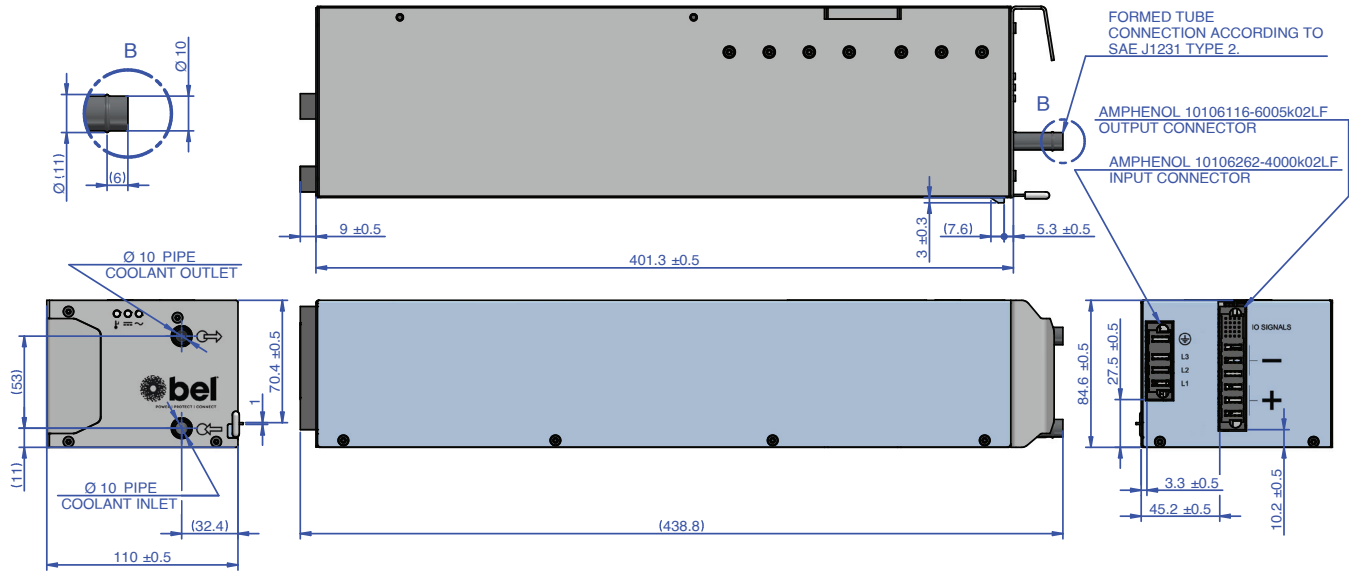


Figure 4. Mechanical Drawing

10. TLS-2-48 SHELF

A 10 kW shelf is designed to accommodate one or two TLP5000-1048 power supplies, providing a maximum output power of 10 kW at 50 V and 200 A. It allows for installation in either a vertical or horizontal position, facilitating flexibility in deployment. The design features hot-plug connectors that enable simple module replacement, enhancing maintenance efficiency. Additionally, TLS-2 shelves can be connected in parallel, allowing for a maximum total output power of 60 kW at 50 V. The shelf can be fixed from three sides using integrated nuts, additional accessories for even easier assembly are an option.



Figure 5. TLS-2-48 Shelf (front & rear view)

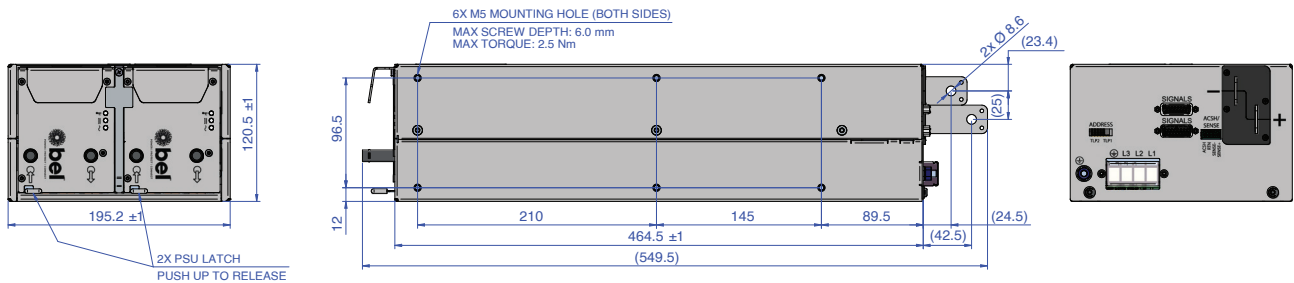


Figure 6. TLS-2-48 Shelf (mechanical drawing)

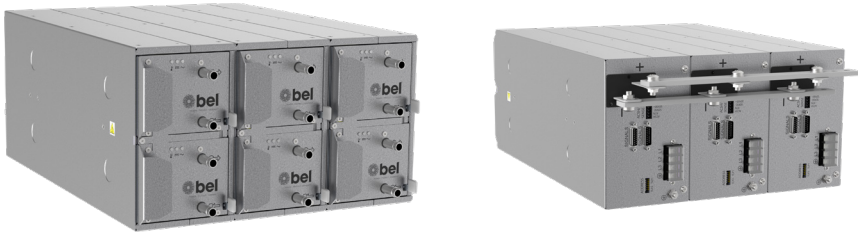


Figure 7. TLS-2-48 Shelf - Vertical position assembly (3 shelves)



Figure 8. TLS-2-48 Shelf - Horizontal position assembly (2 shelves)

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.