INSTALLATION INSTRUCTION

TCP4000-H090

4000 W AC/DC Industrial PSU for Cold Plate

READ THIS CAREFULLY BEFORE INSTALLATION!	VOR DER INSTALLATION BITTE FOLGENDE SICHERHEITSHINWEISE BEACHTEN!	LEGGERE ATTENTAMENTE PRIMA DELL'INSTALLAZIONE!	A LIRE ATTENTIVEMENT AVANT L'INSTALLATION!
Before operating, read this document thoroughly and retain it for future reference. Non-respect of these instructions may reduce performances and safety of the devices and cause danger for people and property. The products must be installed, operated, serviced and maintained by qualified personnel in compliance with applicable standards and regulations. Do not open the device, it does not contain replaceable components, the tripping of the internal fuse (if included) is caused by an internal failure. Do not repair or modify the device, if malfunction or failure should occur during operation, send unit to the factory for inspection. No responsibility is assumed by Bel Power Solutions for any consequences deriving from the use of this material.	Lesen Sie dieses Dokument vor der Inbetriebnahme sorgfältig durch und bewahren Sie es zum späteren Nachschlagen auf. Die Nichtbeachtung dieser Anweisungen kann die Funktion und Sicherheit der Geräte beeinträchtigen und birgt Gefahren für Personen und Eigentum. Die Geräte müssen von qualifiziertem Personal unter Einhaltung der geltenden Normen und Vorschriften installiert, betrieben, gewartet und instand gehalten werden. Öffnen Sie das Gerät nicht, es enthält keine austauschbaren Komponenten, das Auslösen der internen Sicherung (falls vorhanden) ist stets auf tiefergehende Fehler im Schaltkreis zurück zu führen. Reparieren oder modifizieren Sie das Gerät nicht. Sollte während des Betriebs eine Fehlfunktion oder ein Defekt auftreten, schicken Sie das Gerät zur Überprüfung ins Werk. Bel Power Solutions übernimmt keine Haftung für die Folgen, die sich aus dem Einsatz dieses Gerätes ergeben.	Prima dell'installazione, leggere attentamente questo documento istruzioni e conservarle per future consultazioni. L'inosservanza delle presenti istruzioni può compromettere le caratteristiche e la sicurezza dell'apparecchio e causare pericolo per le persone e le cose. Il prodotto deve essere installato, utilizzato e riparato da personale qualificato e nel rispetto delle normative vigenti. Non aprire il prodotto, esso non contiene componenti sostituibili, il guasto del fusibile interno (se previsto) è causato da un guasto interno. Non tentare di riparare o modificare il prodotto, se durante il funzionamento si verificano guasti o anomalie, inviarlo al produttore per il controllo. Bel Power Solutions non si assume nessuna responsabilità per qualunque conseguenza derivante dall'uso di questo materiale.	Lire ces instructions avant l'installation, conserver ce manuel pour référence future. Défaut de se conformer à ces instructions peut affecter les caractéristiques et la sécurité du dispositif, et causer du danger aux personnes ou aux biens. Les produits doivent être installés, exploités et entretenus par du personnel qualifié et en conformité avec les règlements. N'ouvrez pas le produit, il ne contient aucune pièce réparable, le déclenchement du fusible interne (le cas échéant) est causé par un défaut interne. Ne pas essayer de réparer ou modifier le produit ; si des défaillances se produisent pendant le fonctionnement, retourner le produit au fabricant pour inspection. Bel Power Solutions n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation des produits.
CAUTION	**ACHTUNG**	**ATTENZIONE**	**AVVERTISSEMENT**
RISK OF BURNS, EXPLOSION, FIRE, ELECTRICAL SHOCK, PERSONAL INJURY. Never carry out work on live parts! Danger of fatal injury! The product's enclosure may be hot, allow time for cooling product before touching it. Do not allow liquids or foreign objects to enter into the products. To avoid sparks, do not connect or disconnect the device before having previously turned-off input power and wait for internal capacitors discharge (minimum 2 minutes).	**GEFAHR VON VERBRENNUNGEN, EXPLOSIONEN, FEUER, STROMSCHLAG, PERSONENSCHÄDEN.** Führen Sie niemals Arbeiten an spannungsführenden Teilen durch! Gefahr von tödlichen Verletzungen! Das Gehäuse des Gerätes kann heiß sein, lassen Sie Zeit zum Abkühlen des Gerätes, bevor Sie es berühren. Lassen Sie keine Flüssigkeiten oder Fremdkörper in die Geräte eindringen. Um Überschläge zu vermeiden, schließen Sie das Gerät nicht an oder trennen Sie es nicht ohne vorher die Eingangsspannung abgeschaltet zu haben, und warten Sie die Entladung der internen Kondensatoren ab (mindestens 2 Minuten).	**RISCHIO USTIONI, ESPLOSIONE, INCENDIO, SCOSSA, LESIONI GRAVI.** Non effettuare mai operazioni sulle parti sotto tensione! Pericolo di lesioni letali! Il contenitore può scottare, lasciar quindi raffreddare il dispositivo prima di toccarlo. Non far entrare liquidi o oggetti estranei nel dispositivo. Per evitare scintille, non collegare o scollegare l'apparecchiatura prima di avere tolto tensione di ingresso e prima che sia avvenuta la scarica dei condensatori interni (min. 2 minuti).	**RISQUE DE BRULURES, EXPLOSION, INCENDIE, ELECTROCUTION, DOMMAGE AUX PERSONNES.** Ne jamais effectuer des opérations sur les parties sous tension! Danger de mort! Le boîtier peut produire des brûlures, le laisser refroidir avant de toucher l'appareil. Ne faire pas pénétrer des liquides ou des corps étrangers dans l'appareil. Pour éviter des étincelles, ne pas connecter ou déconnecter l'équipement jusqu'à ce que la tension d'entrée a été supprimée et avant qu'il n'ait eut lieu la décharge des condensateurs internes (minimum 2 minutes).
INTENDED USE	**BESTIMMUNGSGEMÄßER BETRIEB**	**USO PREVISTO**	**UTILISATION**
These are isolated devices suitable for **ES1** and **ES2** circuitry and are designed to be mounted internally within a system. They are intended for general use such as in industrial control, communication, medical and instrumentation equipment. Do not use these devices in applications where malfunction may cause injury or death. Please see full spec of unit for further details.	Es handelt sich um galvanisch getrennte Geräte, die für **ES1**- und **ES2**-Anwendungen geeignet sind und für die Montage auf DIN-Schienen und die Installation in einem Schutzgehäuse konzipiert sind. Sie sind für den allgemeinen Gebrauch wie z.B. in industriellen Steuer-, Kommunikations- und Automatisierung-Anwendungen vorgesehen. Verwenden Sie diese Geräte nicht in Anwendungen, bei denen eine Fehlfunktion zu Verletzungen oder zum Tod führen kann.	I dispositivi sono isolati, adatti per applicazioni **ES1** e **ES2**, sono dotati di aggancio per il montaggio su guida DIN all'interno di quadri elettrici o contenitori di protezione, per l'utilizzo con controllori industriali, unità di comunicazione o apparecchi di misura. Non utilizzare in applicazioni in cui un eventuale guasto può comportare rischio di lesioni o di morte.	Les produits sont isolés, appropriés pour les circuits **ES1** et **ES2** et sont équipés d'un crochet pour montage sur rail DIN dans des armoires ou conteneurs de protection, pour utilisation avec les contrôleurs industriels, des modules de communication ou des unités de mesure. Ne pas utiliser ces dispositifs dans une application où un dysfonctionnement pourrait entraîner le risque des blessures ou de mort.
ENVIRONMENTAL CHARACTERISTICS	**UMGEBUNGSBEDINGUNGEN**	**CARATTERISTICHE AMBIENTALI**	**CARACTÉRISTIQUES ENVIRONMENTALES**
Installation in a Pollution Degree 2 environment. Do not use in wet area or subject to moisture. Carefully recycle the product and related batteries according to local regulations.	Installation in einer Umgebung mit Verschmutzungsgrad 2. Nicht in nassen Bereichen oder unter Feuchtigkeit verwenden. Das Gerät und die zugehörigen Batterien sind entsprechend den lokalen Vorschriften zu recyceln bzw. zu entsorgen.	Usare in ambienti con Grado di Inquinamento 2. Non far funzionare l'apparecchio in un ambiente umido o soggetto a formazione di condensa. Riciclare il prodotto e le batterie collegate, nel rispetto delle normative locali vigenti.	Utiliser les produits dans des environnements avec degré de pollution 2. Ne pas employer l'appareil dans un environnement humide ou soumis à la condensation. Recycler les produits et les batteries, conformément à la réglementation locale.

INSTALLATION INSTRUCTION

MODEL:

TCP4000-H090

AC INPUT: ~ 3 PHASE
VOLTAGE: 115–277V / 200–480V, 3W + PE
CURRENT: 12 – 5.6 A
FREQUENCY: 50 - 60 Hz

Note Input selection is automatic, no manual change is required.

DC OUTPUT: ⎓
VOLTAGE: adjustable 30 – 100 Vdc
CURRENT: 39A / 45A
POWER: MAX. 3500W/4000W

SAFETY APPROVALS

- UL/CSA 62368-1 3rd edition
- IEC 62368-1 3rd edition
- CE Mark for LVD

INSTALLATION REQUIREMENTS

1. For details and mechanical drawings, access the AC-DC Data Sheet/App Notes link on the Bel Power Solutions website at: belfuse.com/power-solutions and go to the respective TCP4000 listing.
2. Inside the power supply are 3 input fuses with rating 20A/500V. Recommended rating of upstream fuse or circuit breaker is 40A per phase.
3. If power supplies are connected in parallel and they are operating with pulse load, the termination resistor of value 10kΩ is required to be added across ACSH and SRTN pins (one for the whole parallel string of power supplies).

CAUTIONS

These component level power supplies are intended exclusively for installation within other equipment by an industrial assembly operation or by professional installers. These are Class 1 power supplies; the unit must be properly connected to earth ground in end use. A component power supply should be installed in end-use equipment according to the requirements of the safety standard used for that equipment. This power supply is not designed to be operated outside of an enclosure which provides a means of mechanical, electrical, and fire protection. Power supply does not meet ES1 requirements, maximal output voltage is 100VDC.

PROTECTIVE EARTHING

The Power Supply must be properly grounded to mains protective earth termination at end use.

ENVIRONMENTAL CONDITIONS:

TRANSPORTATION & STORAGE: Ambient Temperature Range -40 °C to +85 °C
Relative Humidity Range: 5% to 95% RH Non-Condensing
Altitude: to 12 192 m (40 000 feet) ASL

OPERATION: Ambient Temp. Range -20°C to +70°C (at 100% load)[1]
Relative Humidity Range: 10% to 90% RH Non-Condensing
Altitude: to 3048 m (10 000 feet) ASL

Note: [1] Cooling plate temperature range -20°C to +50°C (at 100% load).

WARNING

1. The equipment is for business use (Class A) and has acquired electromagnetic conformity registration. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
2. The AC Leakage Current exceeds 3.5mA at maximal input voltage and frequency (3 x 528Vac / 60Hz). Typical values are: ~1.8mA at input 3 x 200 – 208Vac (L-L) / 50 - 60Hz; ~3.0mA at 3 x 400Vac (L-L) / 50Hz and ~4.1mA at 3 x 528Vac (L-L) / 60Hz.
3. Switch-off the input AC power before doing any intervention or manipulation with the unit! Do not touch output contacts – discharging time is 2 minutes after turn-off!
4. In order to ensure maximal useful lifetime of the power supply, minimal time between SWITCH-OFF and SWITCH-ON of the input AC power is 10 seconds and maximally 10 SWITCH-OFF/SWITCH-ON cycles can happen after each other. It is not allowed more than 100 cycles within 120 minutes otherwise damage of power supply can occur.
5. Hot Surface – Do not touch the case when the machine is running or stopped for a period of time to prevent burns.

SERVICING

In case of failure, the Power Supply must be returned to a Bel Power Solutions Authorized Service Center. There are no user serviceable parts in the Power Supply.

LIMITED WARRANTY

Bel Power Solutions warrants each power supply of its manufacture for a period of two years from the date of original shipment. This warranty applies to defects in materials and workmanship that result in non-performance to published specifications. The product(s) must be returned to a Bel Power Solutions Authorized Service Center for repair with a Bel Power Solutions preassigned RMA number.
Bel Power Solutions assumes no liabilities for consequential damages of any kind through the use or misuse of its products by any user. No other obligations are expressed or implied.
Please note that the specifications, terms, and conditions stated are subject to change without notice.

NUCLEAR AND MEDICAL APPLICATIONS

Bel Power Solutions products are not designed, intended for use in, or authorized for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems without the express written consent of the respective divisional president of Bel Power Solutions.

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.

CONNECTORS POSITION

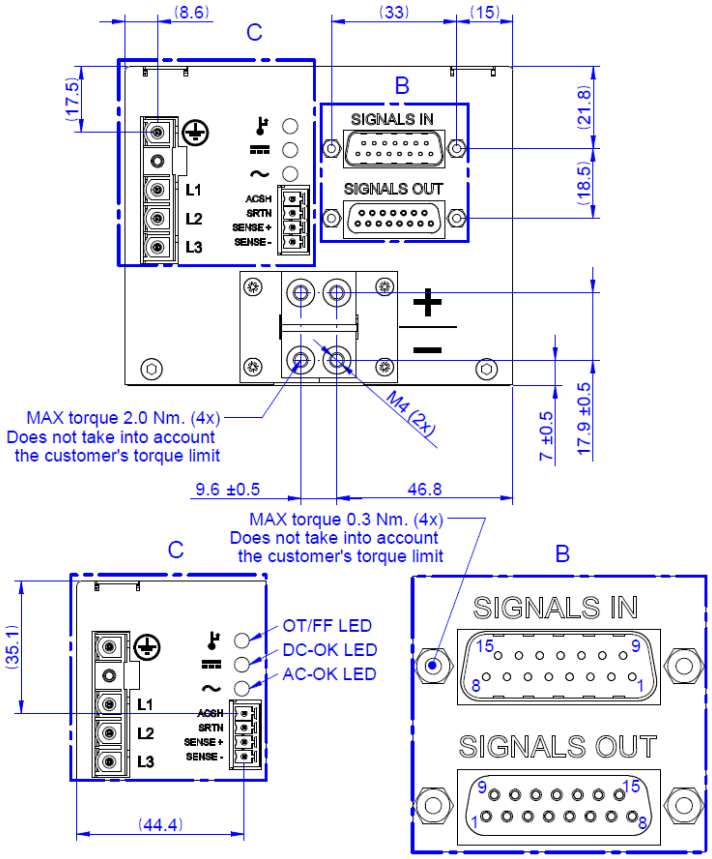

Fig. 1 Rear View - Connectors Position

INPUT POWER CONNECTOR: PINOUT

Connector type: *Weidmüller 1081850000*
Mating part: *Weidmüller 1173520000*

SIGNAL NAME	PIN #	TYPE	RECOMMENDED WIRES	V MAX I MAX
Earth	⏚	Earth / Chassis	Min. 2.5 mm²	
AC Line 1	L1	Input Power AC Fused	Min. 2.5 mm²	528 Vrms (line to line) 16 Arms (per line)
AC Line 2	L2	Input Power AC Fused	Min. 2.5 mm²	
AC Line 3	L3	Input Power AC Fused	Min. 2.5 mm²	

POWER OUTPUTS CONNECTOR – +/- BUS-BARS

Connector type: *Bus-bar see Fig.1*
Mating part: *Ring terminal for M4 screw, with appropriate cross section for wire.*

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
Vout+	+	Output Power DC	Vout-	-	100 VDC 45 ADC
Vout-	-	Output Power DC	-	-	

Note: Maximal mounting torque for the BUS-BARS is 2.0 Nm *(please see the Fig.1)*

SIGNAL OUTPUT CONNECTOR TCP4000-H090: PINOUT

Connector type: *Phoenix Contact, MC 1.5/ 4-G-3.81*
Mating part: *Phoenix Contact, MC 1.5/ 4-ST-3.81*

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
ACSH	1	Active Current Share	SRTN	-	-
SRTN [1]	2	Signal Return for Active Current Share	-	-	-
SENSE+	3	Sense line for Vout+ – voltage drop compensation for positive pole	Vout+	-	-
SENSE-	4	Sense line for Vout- – voltage drop compensation for negative pole	Vout-	-	-

[1] SRTN - Signal return on Active Current Share on 4-PIN connector (MC 1.5/ 4-G-3.81) is galvanically isolated from SRTN Signal (Internal Ground) on 15-pin D-SUB connector.

LED SIGNALING

LED NAME	COLOR	STATUS	OPERATING CONDITIONS
AC-OK	Green	ON	AC Input Voltage is within operation range
DC-OK	Green	ON	Output is Enabled and Operational
OT/FAIL	Orange	ON Blinking	Over Temperature conditions inside the unit or FAIL appeared (e.g. Overload) FW upgrade via RS485-1

SIGNAL INPUT CONNECTOR – PINOUT

Connector type: *Würth Elektronik, 61801529221*
Mating part: *Würth Elektronik, 61801529321*

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
RS485-1A[2]	1	RS485 Half Duplex, Differential pair 1	RS485-1B	+/-60 mA @ 60 Ω, 0 pF[2]	-7 to 12 VDC 8 mA
RS485-2A[2]	2	RS485 Half Duplex, Differential pair 2	RS485-2B	+/-60 mA @ 60 Ω, 50 pF[2]	-7 to 12 VDC 8 mA
ADDR-INIT IN	3	The unit's address change required	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
IN OK	4	AC Power Fail Warning - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 10 mA
OUT OK	5	Output Voltage Fault - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 10 mA
INHIBIT	6	Output Inhibit - Open circuit or "High" to SRTN shuts OFF Vout	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
ENABLE	7	Power Supply Enable pin – for unit enable short this pin to SRTN	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
SRTN[1]	8	Internal Ground (Signal Return)	-	-	-
RS485-1B[2]	9	RS485 Half Duplex, Differential pair 1	RS485-1B	+/-60 mA @ 60 Ω, 50 pF[2]	-7 to 12 VDC 8 mA
RS485-2B[2]	10	RS485 Half Duplex, Differential pair 2	RS485-2B	+/-60 mA @ 60 Ω,50 pF[2]	-7 to 12 VDC 8 mA
Not Connected	11	-	-	-	-
OT/FAIL	12	Over Temperature /PSU Fail, open collector, external pull-up needed to max. 7 VDC	SRTN	<0.4 VDC Pull up	7 VDC 10 mA
PS-PRESENT	13	Power Supply Seated – signal internally connected through 10 Ohm resistor to SRTN	SRTN	-	1 VDC 10 mA
ACSH	14	NC not connected	-	-	-
Margin	15	Optional – analog signal for Output Voltage adjustment – Not connected	-	-	-

[1] SRTN - Signal return on 15-pin D-SUB connector is galvanically isolated from Vout, SENSE +/- and ACSH.
[2] 120 Ω resistors connection required between RS485-xA and RS485-xB on both sides externally, pull up resistor 390 Ω must be connected to external +Vcc and RS485-xA, pull down resistor 390 Ω must be connected to RS485-xB and SRTN – both on the master communication unit *(please see the Fig. 2)*
[3] Maximal mounting torque for the screw locks of the signal connector is 0.3 Nm *(please see the Fig. 1)*

SIGNAL OUTPUT CONNECTOR – PINOUT

Connector type: *Würth Elektronik, 61801529321*
Mating part: *Würth Elektronik, 61801529221*

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
RS485-1A[2]	1	RS485 Half Duplex, Differential pair 1	RS485-1B	+/-60 mA @ 60 Ω, 50 pF[2]	-7 to 12 VDC 8 mA
RS485-2A[2]	2	RS485 Half Duplex, Differential pair 2	RS485-2B	+/-60 mA @ 60 Ω, 50 pF[2]	-7 to 12 VDC 8 mA
ADDR-INIT OUT	3	The unit's address change accepted	SRTN	<0.4 VDC Pull up	7 VDC 10 mA
IN OK	4	AC Power Fail Warning - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 10 mA
OUT OK	5	Output Voltage Fault - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 10 mA
INHIBIT	6	Output Inhibit - Open circuit or "High" to SRTN shuts OFF Vout	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
ENABLE	7	Power Supply Enable pin – for unit enable short this pin to SRTN	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
SRTN[1]	8	Internal Ground (Signal Return)	-	-	-
RS485-1B[2]	9	RS485 Half Duplex, Differential pair 1	RS485-1B	+/-60 mA @ 60 Ω, 50 pF[2]	-7 to 12 VDC 8 mA
RS485-2B[2]	10	RS485 Half Duplex, Differential pair 2	RS485-2B	+/-60 mA @ 60 Ω, 50 pF[2]	-7 to 12 VDC 8 mA
Not Connected	11	-	-	-	-
OT/FAIL	12	Over Temperature /PSU Fail, open collector, external pull-up needed to max.7 VDC	SRTN	<0.4 VDC Pull up	7 VDC 10 mA
PS-PRESENT OUT	13	Power Supply Seated – last unit in string will pull down this signal (external short to SRTN) and informs Master Controller that all units in string are seated and connected	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
ACSH	14	NC not connected	-	-	-
Margin	15	Optional – analog signal for Output Voltage adjustment - Not Connected	SRTN	-	-

1 SRTN - Signal return on 15-pin D-SUB connector is galvanically isolated from Vout, SENSE +/- and ACSH).
2 120 Ω resistors connection required between RS485-xA and RS485-xB on both sides externally, pull up resistor 390 Ω must be connected to external +Vcc and RS485-xA, pull down resistor 390 Ω must be connected to RS485-xB and SRTN – both on the master communication unit *(please see the Fig. 2)*
3 Maximal mounting torque for the screw locks of the signal connector is 0.3 Nm *(please see the Fig.1)*

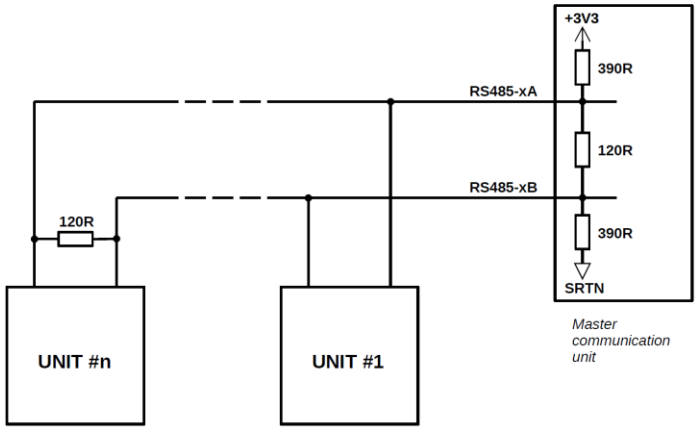

Fig. 2 RS485 connection

MECHANICAL DIMENSIONS

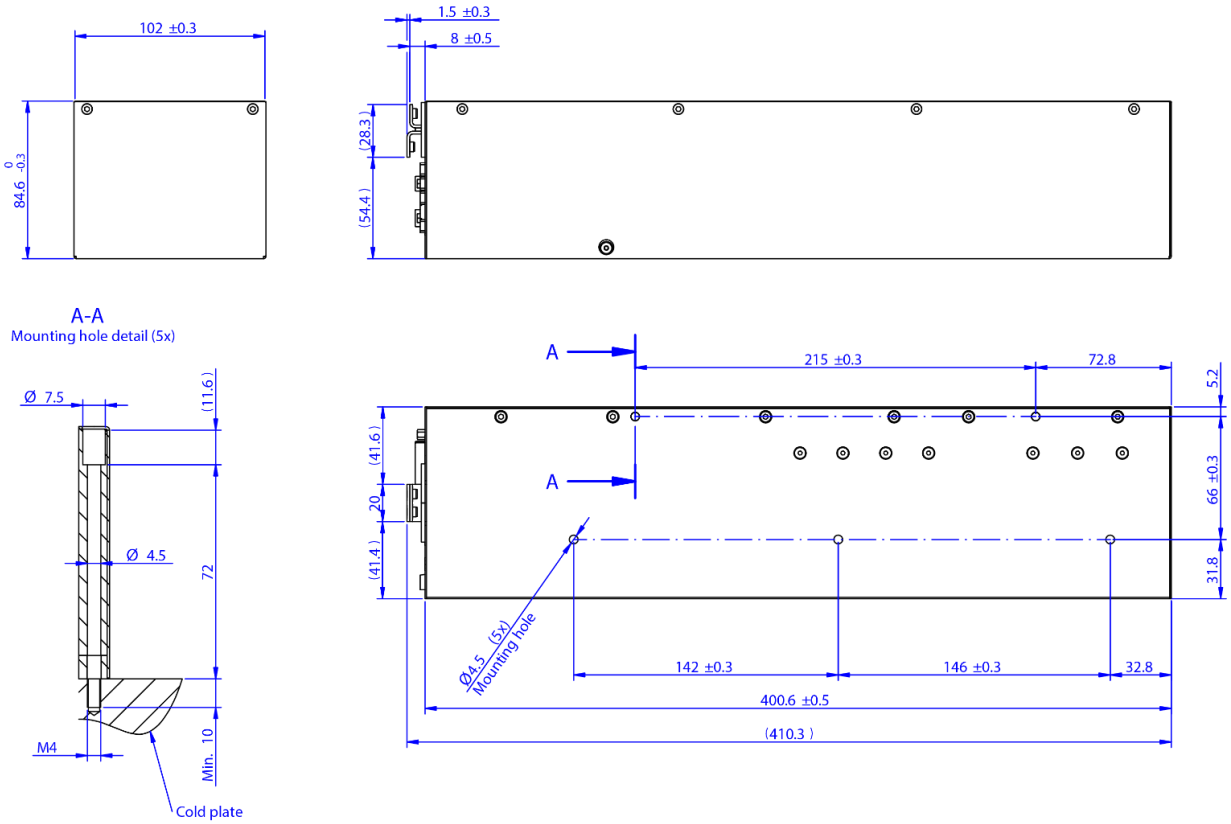

Fig. 3 Mechanical Dimensions

COOLING

The power supply should have thermal connection with low thermal resistance between aluminium plate of the power supply unit and liquid cooling cold plate. The temperature difference of contact area of cold plate and power supply should be <5°C at worst case (total power dissipation of each PSU max. 300W). Recommended is to use heat transfer paste with thermal conductivity 2.5 W/m.K between unit and cold plate (surface roughness Ra = 3.2 of the aluminium plate is acceptable).
Recommended tightening torque of M4 screws for assembling unit to aluminium cold plate is 3.5 - 4 Nm.[1)]

Note 1): Recommendation is for thread cut in aluminium plate, thread length 10mm. Tightening torque depends on the material hardness of the used aluminium cold plate and used screws.

TECHNICAL SUPPORT

In case you have issues with designing setup for pulse load operation (low inductance busbars, system capacitance etc.) please contact our technical support at: tech.support@psbel.com