Features & Benefits

- Single-Phase Universal AC input
- Rugged Unit for Military Applications
- 92% Efficiency at Full Load
- Wide Input Voltage Range
- Built-in Active PFC Function
- Charger for Lead-Acid Batteries (Flooded, GEL and AGM) and Li-Ion Batteries (Lithium Iron and Lithium Manganese)
- Internal ORing Diode
- Multiple Units in a Redundant or Parallel System
- Droop Current Sharing
- IP67 Sealed
- RS485 Communication
- Temperature Sensor
- Power Good Signal
- Input Under Voltage Protection
- Input/Output Over Voltage Protection
- Input Over Current Protection
- Short Circuit Protection
- Over Temperature Protection
- Reverse Battery Protection
- Two units can be mounted in 1U height 19" Rack
- On/Off Switch
- LED Indicators
- Forced Air Cooled
- Grounding Interface

Compliance

Module is designed to meet:

- MIL-STD-461G
- MIL-STD-810G
- MIL-STD-1275E

Typical Applications

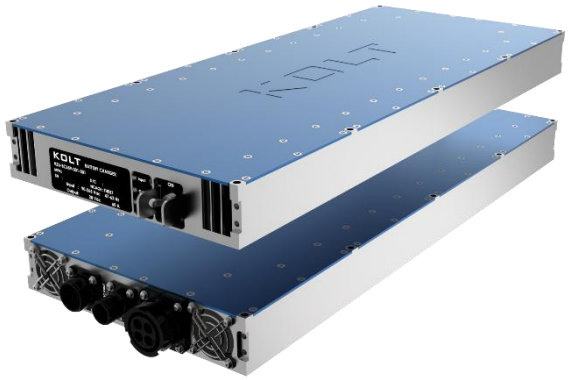
- Military/Defense Power Supplies
- Armored Vehicles
- Land Platforms
- Communications and Radar Systems

Product Ratings	
V_{IN}	90–265 V_{RMS} (Single-Phase)
V_{IN_NOM}	220 V_{RMS}
V_{OUT}	28 V_{DC}
I_{OUT}	60 A
P_{OUT}	1680 W

Product Description

Battery Charger is an advanced single-phase AC-DC battery charger unit with active PFC function. It operates in constant current (CC) and constant voltage (CV) modes effectively, providing best-in-class regulation and dynamic performance.

The unit is designed to guarantee high performance under extreme environmental conditions with superior protection features against external faults and disturbances while meeting the major military standards. KOLT's innovative engineering has enabled a compact design of the converter with high efficiency.



Size: 530 x 215.9 x 44 mm
(19"/2 form factor, 1U height)

Weight: 8 ± 0.5 kg

Electrical Characteristics

Input Characteristics					
Parameters	**Notes & Conditions**	**Min**	**Typ**	**Max**	**Unit**
Input Voltage		90	220	265	V_{RMS}
Input Voltage (non-working)	Withstanding input voltage	-	-	300	V_{RMS}
Input Frequency		47	50	63	Hz
Input Current THD	From half load to full load, nominal input voltage	9	-	15	%
No Load Input Power	Nominal input voltage	-	-	50	W
Inrush Current (peak)	Nominal input voltage	-	-	±40	A
Leakage Current to Ground	10% load, nominal input voltage	-	-	5	mA_{RMS}
AC Input Quiescent Current	When input switch is OFF	-	-	200	mA_{RMS}

Output Characteristics					
Parameters	**Notes & Conditions**	**Min**	**Typ**	**Max**	**Unit**
Output Voltage		-	28	-	V
Output Current		-	-	60	A
Output Power		-	-	1680	W
Output Ripple and Noise (pk-pk)	20 MHz Bandwidth	-	-	800	mV
Line Regulation	Over the full range of line input voltage	-	±0.1	-	V
Load Regulation	From 10% load to full load, nominal input voltage	-	±0.1	-	V
Battery Output Leakage Current	When input switch is OFF	-	-	5	mA

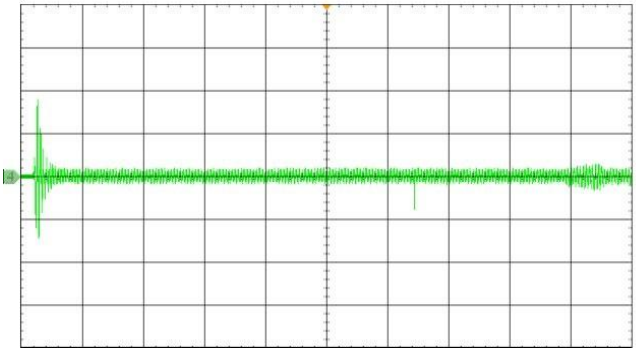
General Characteristics					
Parameters	**Notes & Conditions**	**Min**	**Typ**	**Max**	**Unit**
Efficiency	From half load to full load, nominal input voltage	87	-	92	%
Power Factor	From half load to full load, nominal input voltage	0.94	-	0.99	-
Soft-Start Time		-	1	-	s
Hold-up Time		10	15	-	ms
Weight		-	-	8	kg
Cooling	Forced air by temperature-controlled fans				
Built-in Test Feature	DC OK, Remote Error Sensing				

Protections					
Parameters	**Notes & Conditions**	**Min**	**Typ**	**Max**	**Unit**
Input Under Voltage Protection	When the voltage returns within the normal limits, unit resumes operation automatically	80	85	90	V_{RMS}
Input Over Voltage Protection		265	270	275	V_{RMS}
Output Over Current Protection	Fully electronic against over-load	-	80	-	A
Output Over Voltage Protection	-	-	32.4	-	V
Input Over Current Protection	Auto-retry				
Output Short Circuit Protection	Fully electronic against over-load and continuous short-circuit conditions				
Over Temperature Protection	Automatically resumes operation when temperature decreases				
Battery	Prevention of battery discharge when charger is off				
	Reverse polarity protection				

Isolation Characteristics					
Parameters	**Notes & Conditions**	**Min**	**Typ**	**Max**	**Unit**
Insulation Resistance	Input to Case	-	>100	-	MΩ
	Output to Case	-	>100	-	MΩ
Isolation Voltage	Input to Output	-	-	500	V_{DC}
	Input to Case	-	-	500	V_{DC}
	Output to Case	-	-	500	V_{DC}

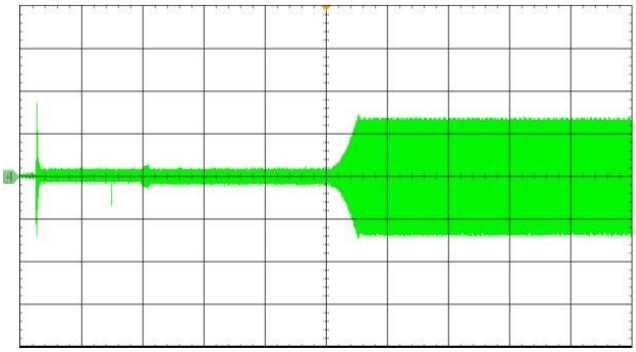
Environmental Characteristics						
Parameters	**Standard**	**Min**	**Typ**	**Max**	**Unit**	**Status**
Operational Temperature	MIL-STD-810G Method 501.5/502.5 Procedure II	-32	-	+50	°C	Passed
Storage / Transport Temperature	MIL-STD-810G Method 501.5/502.5 Procedure I	-40	-	+63	°C	Passed
Operational Low Pressure	MIL-STD-810G Method 500.5 Procedure II	-	-	10000	ft	Similarity*
Storage / Transport Low Pressure	MIL-STD-810G Method 500.5 Procedure I	-	-	15000	ft	Designed to Meet
Parameters	**Standard**	**Waveform**	**Peak Value**	**Pulse Duration**	**Axis**	**Status**
Shock	MIL-STD-810G Method 516.6 Procedure I	Sawtooth	20g	11 ms	±X, ±Y, ±Z	Similarity*
		Half-Sine	10g	11 ms	±X, ±Y, ±Z	Similarity*
Parameters	**Standard**	**Category**		**Platform**	**Vehicle**	**Status**
Vibration	MIL-STD-810G Method 514.6 Procedure I	Category 4		Secured Cargo	Truck Transportation and Composite Wheeled Vehicles	Similarity*
		Category 8		Aircraft	Propeller	Similarity*
		Category 11		Railroad	Train	Similarity*
		Category 20		Ground	Wheeled Vehicles	Similarity*
		Category 21		Watercraft	Marine Vehicles	Similarity*
Parameters	**Standard**	**Condition**				**Status**
Salt Fog	MIL-STD-810G Method 509.5	24 hours spray, 24 hours dry, applied 2 times				Designed to Meet
Sand and Dust	MIL-STD-810G Method 510.5 Procedure I/II	<150 µm Dust 150-850 µm Sand				Similarity*
Fungus	MIL-STD-810G Method 508.6	Analysis of the degree of inertness to fungus growth of the components.				Designed to Meet
Solar Radiation	MIL-STD-810G Method 505.5 Procedure I	A2				Designed to Meet
Humidity	MIL-STD-810G Method 507.5 Procedure II	≥ %95 Relative @30°C				Similarity*
Noise	MIL-STD-1474E	≤ 75 dB at a distance of 1 meter				Passed
Impermeability	IP67	Tested by immersion in 1 m water for 30 minutes				Passed
Parameters	**Standard**	**Test**				**Status**
EMI/EMC	MIL-STD-461G Ground Army	CE102	CS101 CS114 CS115 CS116 CS118	RE102	RS103	Similarity*

* Verified on similar unit with a height of 2U. Both units consist of identical converter modules



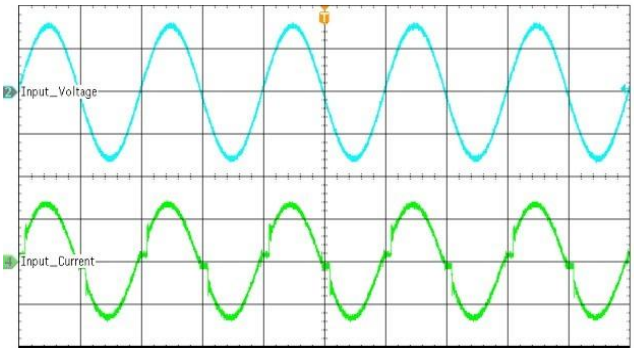
Input current (green) (10 A/div) Time base: 400 ms/div

Figure 1. Inrush current at nominal input voltage



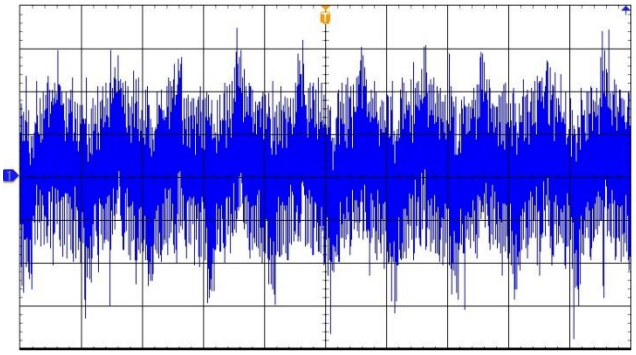
Input current (green) (10 A/div) Time base: 2 s/div

Figure 2. Input current for inrush and start-up stages at nominal input voltage



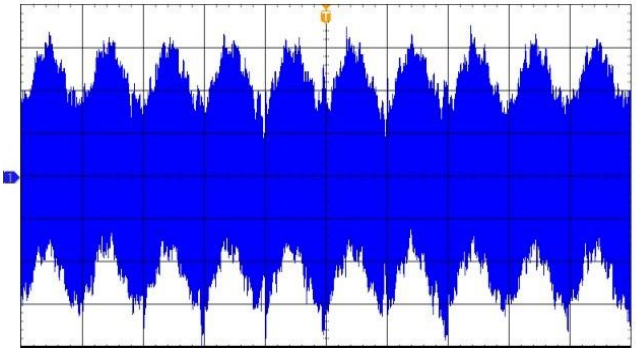
Input voltage (blue) (200 V/div) Time base: 10 ms/div
Input current (green) (10 A/div)

Figure 3. Typical input voltage and current waveforms at rated load current



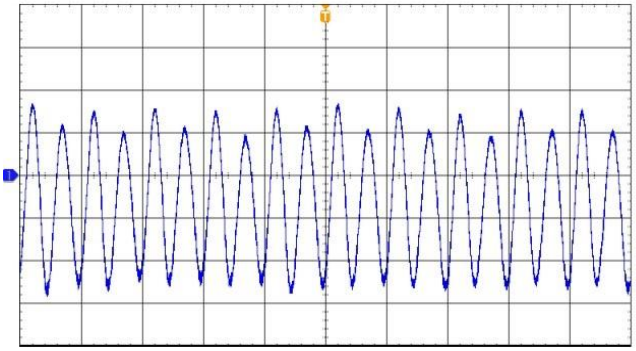
Leakage current (navy blue) (10 mA/div) Time base: 20 ms/div

Figure 4. Leakage current at nominal input voltage and 10% load current



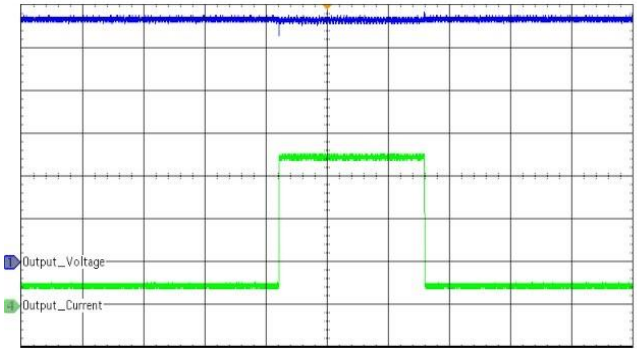
Output voltage (navy blue) (100 mV/div) Time base: 10 ms/div

Figure 5. Output voltage ripple at nominal input voltage and rated load current (AC Coupled), Bandwidth: 20 MHz



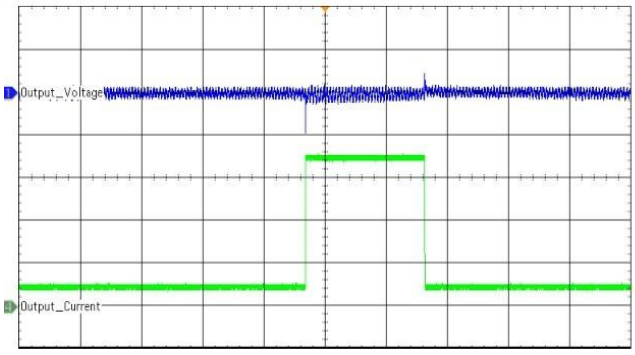
Output voltage (navy blue) (50 mV/div) Time base: 10 µs/div

Figure 6. Zoomed in view of output voltage ripple at nominal input voltage and rated load current (AC Coupled), Bandwidth: 20 MHz



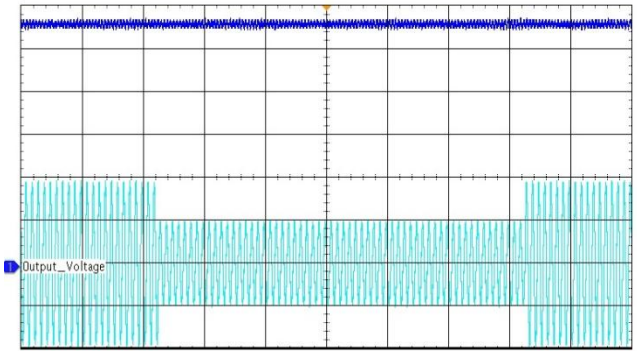
Output voltage (navy blue) (5 V/div) Time base: 200 ms/div
Output current (green) (25 A/div)

Figure 7. Load transient response: from 10% to 100% and back to 10% at nominal output voltage (DC Coupled)



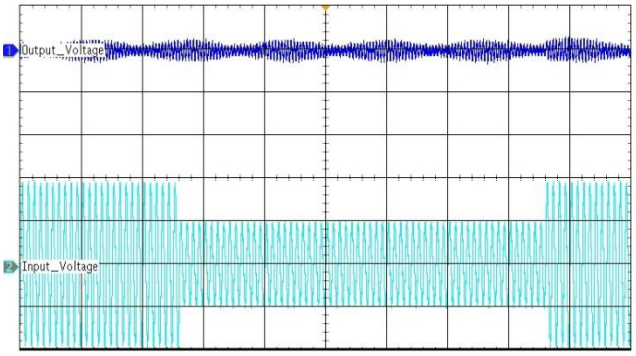
Output voltage (navy blue) (1 V/div) Time base: 100 ms/div
Output current (green) (20 A/div)

Figure 8. Zoomed in view of load transient response: from 10% to 100% and back to 10% at nominal output voltage (AC Coupled)



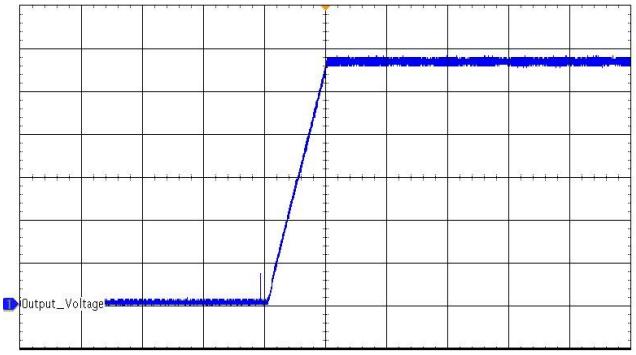
Output voltage (navy blue) (5 V/div) Time base: 200 ms/div
Input voltage (blue) (200 V/div)

Figure 9. Line transient response: from 265 V_{RMS} to 135 V_{RMS} and back to 265 V_{RMS} at nominal output voltage (DC Coupled)



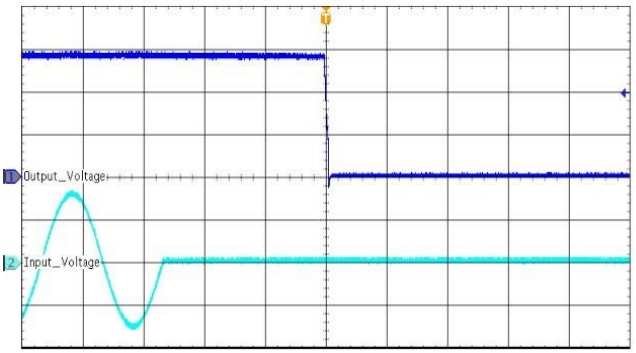
Output voltage (navy blue) (1 V/div) Time base: 200 ms/div
Input voltage (blue) (200 V/div)

Figure 10. Zoomed in view of line transient response: from 265 V_{RMS} to 135 V_{RMS} and back to 265 V_{RMS} at nominal output voltage (AC Coupled)



Output voltage (navy blue) (5 V/div) Time base: 1 s/div

Figure 11. Start-up waveform at rated load current and nominal output voltage



Output voltage (navy blue) (10 V/div) Time base: 10 ms/div
Input voltage (blue) (200 V/div)

Figure 12. Hold-up waveform at rated load current and nominal output voltage

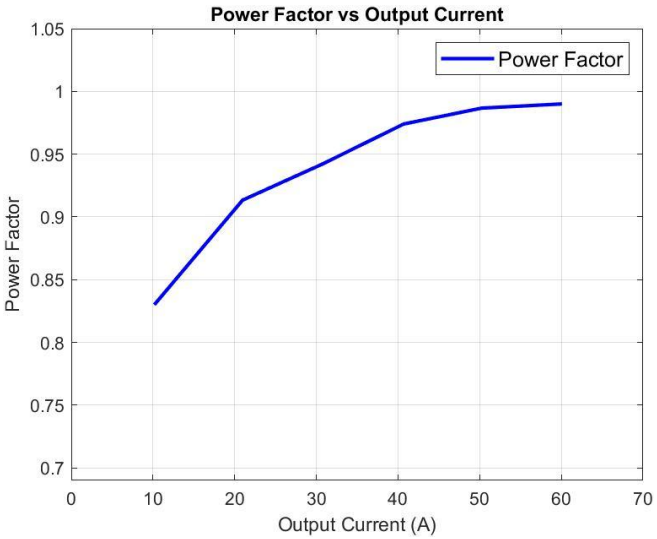


Figure 13. Power factor versus output current at nominal input voltage

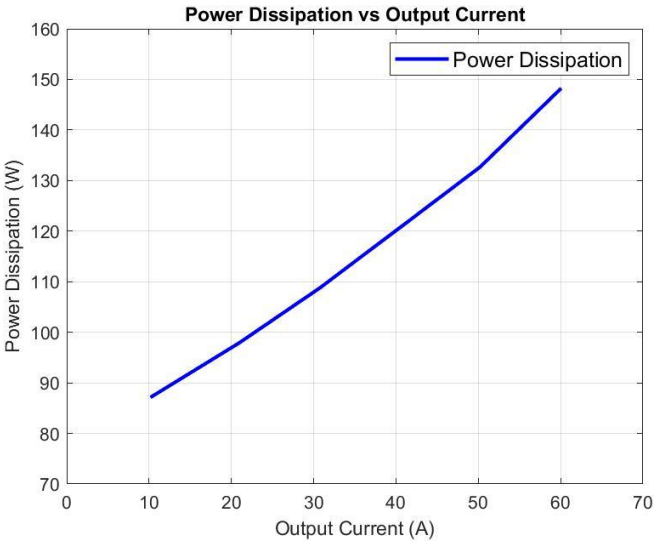


Figure 15. Power dissipation versus output current at nominal input voltage

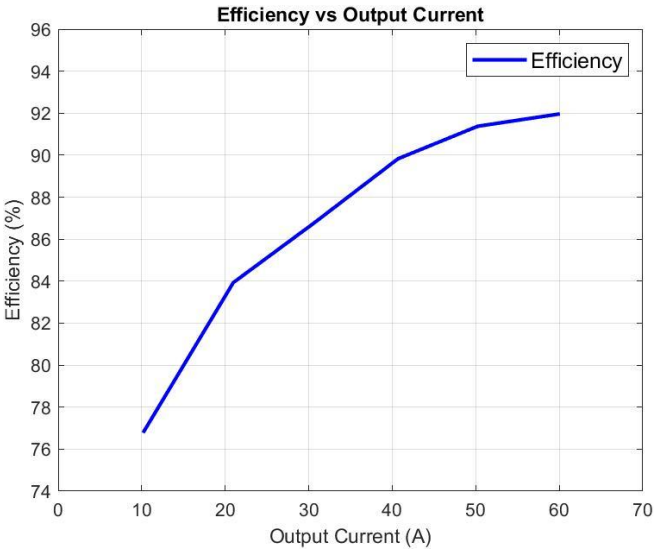


Figure 14. Efficiency versus output current at nominal input voltage

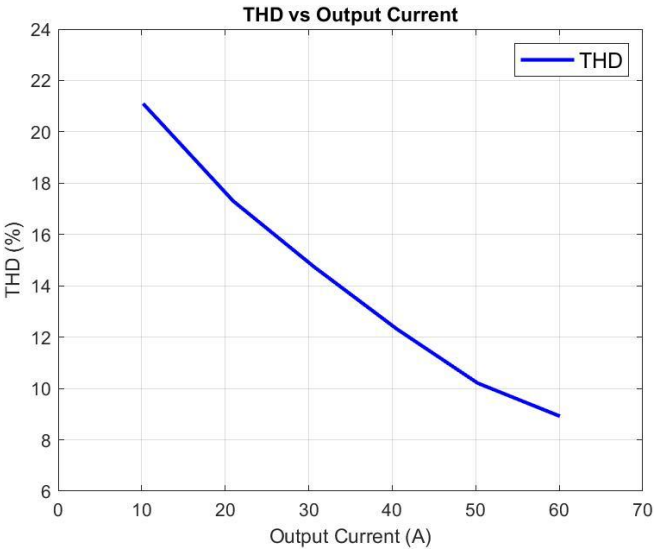


Figure 16. Total harmonic distortion (THD) versus output current at nominal input voltage

Connector Configuration

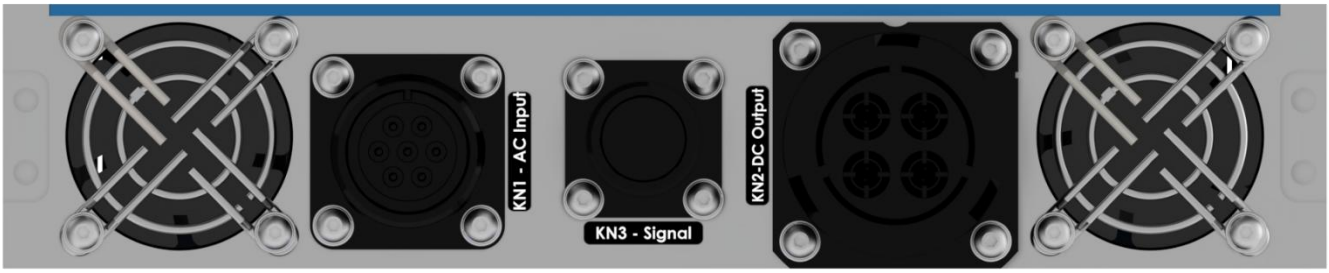


Figure 17. Connector Panel

AC Input Connector (KN1)

Part Numbers (interchangeable):

- Amphenol 97B-4102E-16S-1P
- ITT Cannon CA3102E16S-1P-B-F80

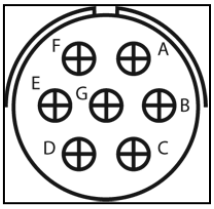


Figure 18. Input Connector View

Pin	Signal Name	Function
A	PHASE	AC Line Input (PHASE)
B	PHASE	AC Line Input (PHASE)
C	PHASE	AC Line Input (PHASE)
D	NEUTRAL	AC Line Input (NEUTRAL)
E	NEUTRAL	AC Line Input (NEUTRAL)
F	NEUTRAL	AC Line Input (NEUTRAL)
G	CHASSIS	AC Line Input (EARTH)

DC Output Connector (KN2)

Part Numbers:

- Amphenol 97B-3102E-22-22S

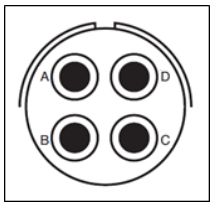


Figure 19. Output Connector View

Pin	Signal Name	Function
A	OUT	DC Output
B	OUT	DC Output
C	OUT_RTN	DC Output Return
D	OUT_RTN	DC Output Return

Signal Connector (KN3)

Part Numbers:

- D38999/20WC35SN

Figure 20. Signal Connector View

Pin	Signal Name	Function
1	DATA+	Factory service input
2	DATA-	Factory service input
3	DATA_RTN	Factory service return signal
4	-	-
5	ID0	Identification input
6	ID1	Identification input
7	ID2	Identification input
8	ID3	Identification input
9	ID_RTN	Identification return signal
10	-	-
11	CS_DATA+	Current share input
12	CS_DATA-	Current share input
13	CS_DATA_RTN	Current share return signal
14	-	-
15	-	-
16	NTC	Temperature sensor
17	NTC_RTN	Temperature sensor return signal
18	-	-
19	PGOOD	Power good signal
20	PGOOD_RTN	Power good return signal
21	-	-
22	-	-

Led Configuration

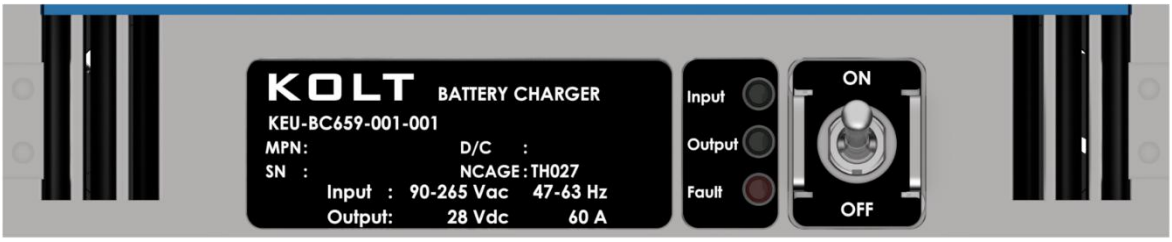


Figure 21. Front Panel

LED Name	Status	Description	Function
Input	Off	AC Input Passive	AC input is below 70 V_{RMS}
	Green	AC Input Active	AC input voltage is within the operating limit (90-265 V_{RMS})
	Red	AC Input Fault	• Input Under Voltage / Over Voltage • Input Over Current • Line Frequency not within limits

LED Name	Status	Description	Function
Output	Off	DC Output Passive	DC output is not active
	Green	DC Output Active	DC output is within the defined limits
	Red	DC Output Fault	• Output Over Voltage / Short Circuit • Output Reverse Voltage • Output Regulation Error

LED Name	Status	Description	Function
Fault	Off	Device OK	No fault is present
	Red	Device Fault	• Mid-Bus Over Voltage • Temperature • Critical Fault

Label Configuration

Figure 22. Turkish Label Option Front View

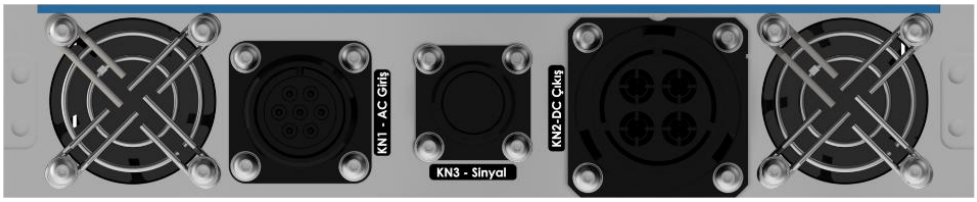


Figure 23. Turkish Label Option Back View

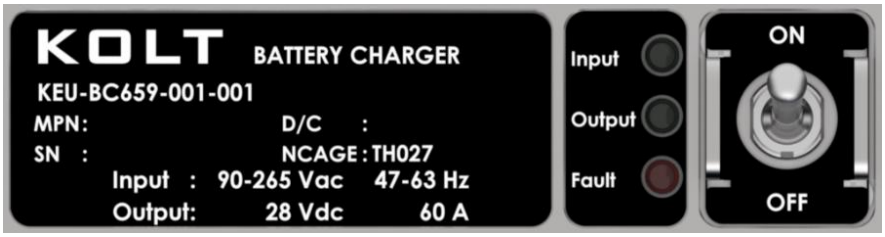


Figure 24. English Label Option Front View

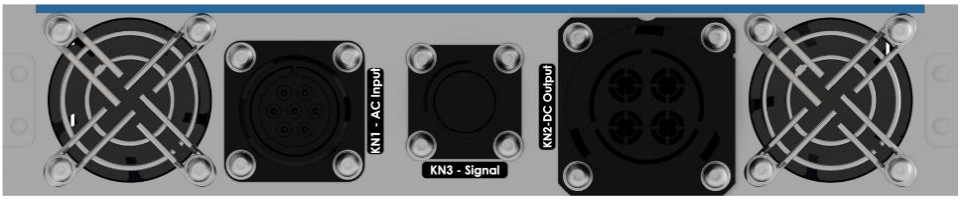


Figure 25. English Label Option Back View

Mechanical Drawings

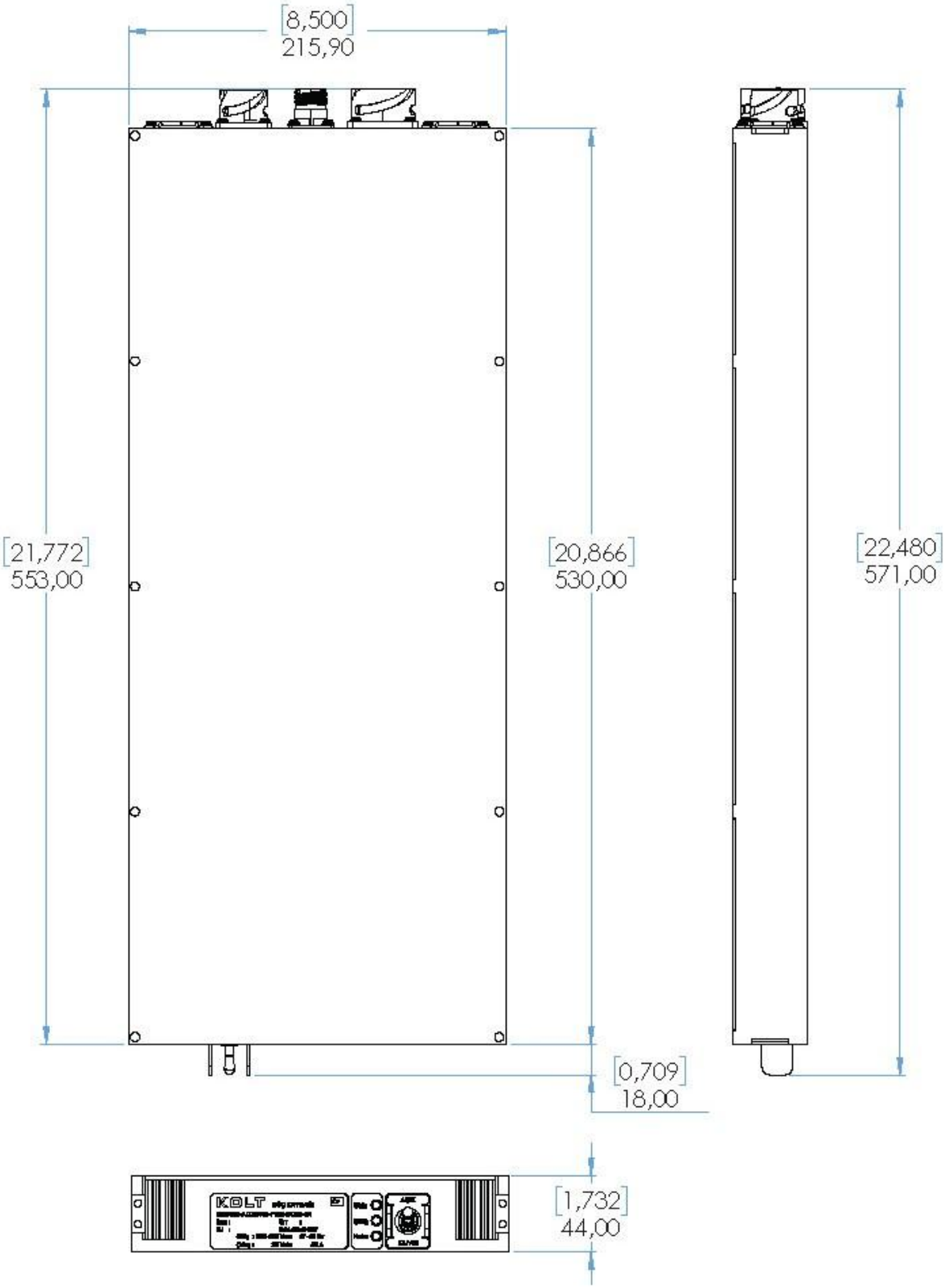


Figure 26. Mechanical Dimensions

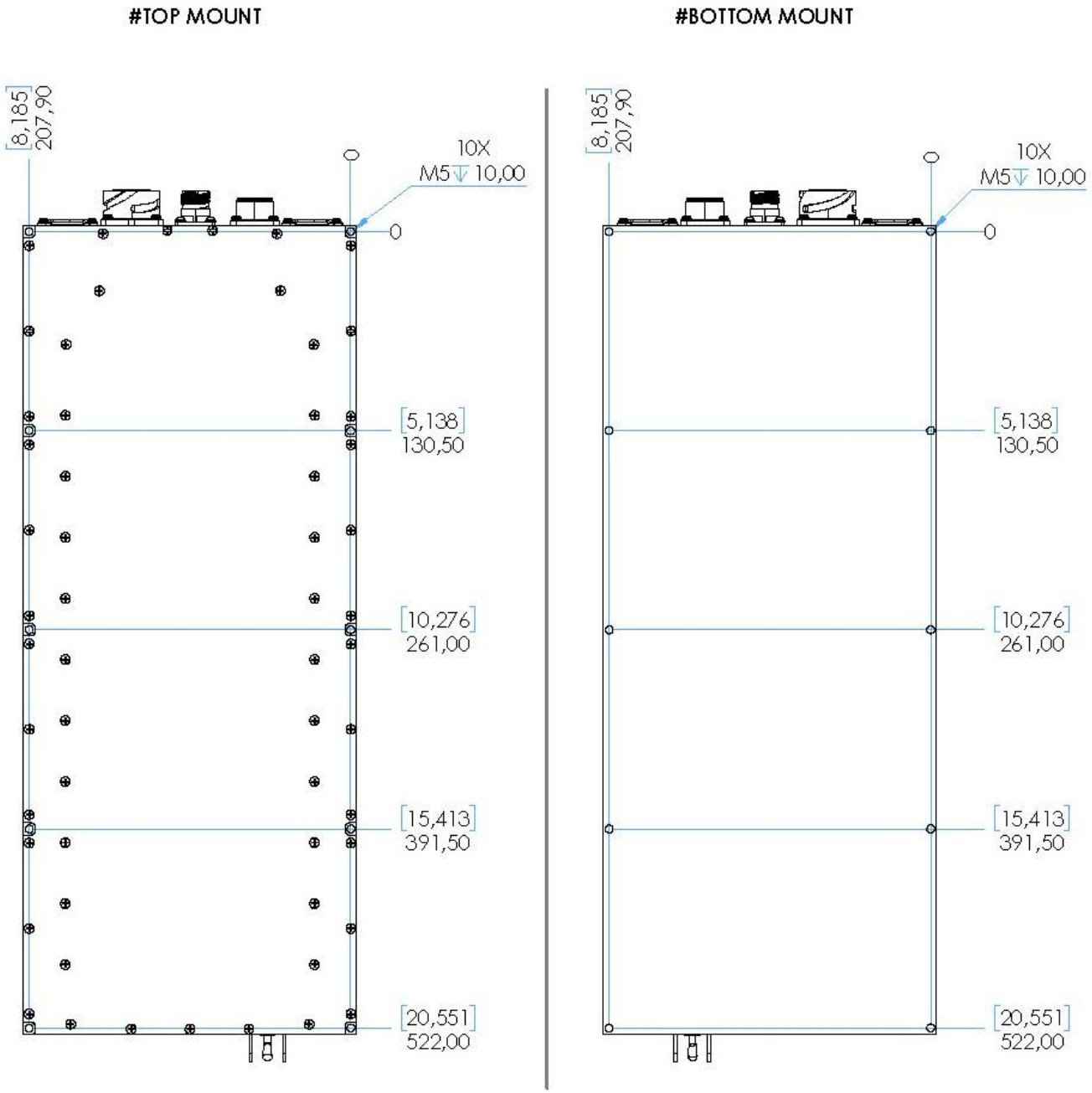


Figure 27. Mounting Details and Mounting Holes Coordinates

Material: Aluminum Alloy 6061-T6

Dimensions are in millimeters [inches].

Part Ordering Information

Family	Product Variant	Option Variant	Compliance
KEU-BC659	-	-	**R:** RoHS & REACH

Ordering Number	Color Option	Label Option	RoHS (Note*)
KEU-BC659-001-001	Aluminum Blue Anodized Coated Cover – MIL-C-5541E White Alodine Chassis	Turkish	RoHS compliant with exemptions
KEU-BC659-001-002	RAL 6014 Yellow Olive	Turkish	RoHS compliant with exemptions
KEU-BC659-001-003	RAL 9005 Jet Black	Turkish	RoHS compliant with exemptions
KEU-BC659-001-004	FED-STD-595C 34094 Green 383 Camouflage	Turkish	RoHS compliant with exemptions
KEU-BC659-001-005	FED-STD-595C 37030 Black Camouflage	Turkish	RoHS compliant with exemptions
KEU-BC659-001-006	RAL 9016 Traffic White	Turkish	RoHS compliant with exemptions
KEU-BC659-001-007	RAL 7001 Silver Grey	Turkish	RoHS compliant with exemptions
KEU-BC659-001-008	FED-STD-595C 30315 Desert Sand Camouflage	Turkish	RoHS compliant with exemptions
KEU-BC659-001-009	FED-STD-595C 33245 Earth Yellow Camouflage	Turkish	RoHS compliant with exemptions
KEU-BC659-001-010	Aluminum Blue Anodized Coated Cover – MIL-C-5541E White Alodine Chassis	English	RoHS compliant with exemptions
KEU-BC659-001-011	RAL 6014 Yellow Olive	English	RoHS compliant with exemptions
KEU-BC659-001-012	RAL 9005 Jet Black	English	RoHS compliant with exemptions
KEU-BC659-001-013	FED-STD-595C 34094 Green 383 Camouflage	English	RoHS compliant with exemptions
KEU-BC659-001-014	FED-STD-595C 37030 Black Camouflage	English	RoHS compliant with exemptions
KEU-BC659-001-015	RAL 9016 Traffic White	English	RoHS compliant with exemptions
KEU-BC659-001-016	RAL 7001 Silver Grey	English	RoHS compliant with exemptions
KEU-BC659-001-017	FED-STD-595C 30315 Desert Sand Camouflage	English	RoHS compliant with exemptions
KEU-BC659-001-018	FED-STD-595C 33245 Earth Yellow Camouflage	English	RoHS compliant with exemptions
KEU-BC659-001-001R	Aluminum Blue Anodized Coated Cover – MIL-C-5541E White Alodine Chassis	Turkish	RoHS-3 & REACH compliant
KEU-BC659-001-002R	RAL 6014 Yellow Olive	Turkish	RoHS-3 & REACH compliant
KEU-BC659-001-003R	RAL 9005 Jet Black	Turkish	RoHS-3 & REACH compliant
KEU-BC659-001-004R	FED-STD-595C 34094 Green 383 Camouflage	Turkish	RoHS-3 & REACH compliant

Ordering Number	Color Option	Label Option	RoHS (Note*)
KEU-BC659-001-005R	FED-STD-595C 37030 Black Camouflage	Turkish	RoHS-3 & REACH compliant
KEU-BC659-001-006R	RAL 9016 Traffic White	Turkish	RoHS-3 & REACH compliant
KEU-BC659-001-007R	RAL 7001 Silver Grey	Turkish	RoHS-3 & REACH compliant
KEU-BC659-001-008R	FED-STD-595C 30315 Desert Sand Camouflage	Turkish	RoHS-3 & REACH compliant
KEU-BC659-001-009R	FED-STD-595C 33245 Earth Yellow Camouflage	Turkish	RoHS-3 & REACH compliant
KEU-BC659-001-010R	Aluminum Blue Anodized Coated Cover – MIL-C-5541E White Alodine Chassis	English	RoHS-3 & REACH compliant
KEU-BC659-001-011R	RAL 6014 Yellow Olive	English	RoHS-3 & REACH compliant
KEU-BC659-001-012R	RAL 9005 Jet Black	English	RoHS-3 & REACH compliant
KEU-BC659-001-013R	FED-STD-595C 34094 Green 383 Camouflage	English	RoHS-3 & REACH compliant
KEU-BC659-001-014R	FED-STD-595C 37030 Black Camouflage	English	RoHS-3 & REACH compliant
KEU-BC659-001-015R	RAL 9016 Traffic White	English	RoHS-3 & REACH compliant
KEU-BC659-001-016R	RAL 7001 Silver Grey	English	RoHS-3 & REACH compliant
KEU-BC659-001-017R	FED-STD-595C 30315 Desert Sand Camouflage	English	RoHS-3 & REACH compliant
KEU-BC659-001-018R	FED-STD-595C 33245 Earth Yellow Camouflage	English	RoHS-3 & REACH compliant

RoHS & REACH Compliance*

All KOLT products ship by default with SnPb solder under EU RoHS Directive 2011/65/EU, utilizing lead Exemption 7(a).

To obtain a lead-free build that meets **RoHS-3** requirements and REACH compliancy, add the "-R" suffix to the part number. These units are CE marked.

Revision History

Document Number	Revision	Date	Description	Page Number(s)
109411	01	21.10.2024	Initial Release	-
109411	02	27.03.2025	Second Release	-
109411	03	11.08.2025	Part Number Updated	-

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