ENKO Electronic Control Systems

EBC Series Battery Chargers

(Technical Specifications and User Manual)

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Table of Contents

1- GENERAL OVERVIEW:

EBC Battery Chargers are designed and manufactured for charging standard VRLA type general purpose batteries (Wetted or Jell type) to be used in the industrial applications. EBC chargers are not suitable for home use. These chargers are designed with “wide input voltage range” and a set of protection functions such that; they can be safely used in all parts of the world, where utility power stability is poor. These chargers are designed for safe operation and automatic cut-off capability so that; the chargers can continuously remain connected to the battery terminals.

All chargers comply with European standards for EMC and LVD and intended to be used in industrial environments. EMC performance complies to “Light Industry Standards” where emission levels are better than normal industry standards.

There are five models in EBC family and these chargers cover a wide range of applications in the gen-set industry. This document covers full technical specifications of EBC family chargers and describes in detail, how they should be installed and used for reliable operation.

2- DEVICE DESCRIPTION:

EBC series battery chargers are based on “High Frequency Switching Mode” concept, where high overall efficiency can be achieved at relatively low cost. High efficiency yields low device operating temperatures and trouble-free long operating life-time.

These chargers are packed into an aluminum metal enclosure with panel mounting features. Device enclosure protection level is IP00 and it is designed to be used in an enclosed electric cabin. EBC series devices have various models, which cover a wide range of applications, ranging from 5A to 20A charge current for 12V and 24V batteries. Where single device output current rating is not enough, devices can be connected in parallel to increase the current rating and/or provide redundancy.

EBC chargers are equipped with basic control and protection functions for safe charging of the battery. Output charge current and battery terminal voltage is precisely controlled. These devices are “True Battery Chargers”, where each unit can deliver full rated charge current continuously into battery, independent of battery terminal voltage. It can deliver full rated current continuously even into a short circuit. This ensures that; even a “Dead Battery” can be recovered and charged with these chargers.

EBC series chargers are also equipped with a “Boost Charge” trigger input, which will adjust the battery terminal voltage to charge each cell to its maximum permissible charge level with safe current limiting.

These chargers also generate an alarm output, if the charger output fails to charge the battery. Depending on the model, alarm outputs are arranged as “Solid State” or “Relay” type output, which can be used to drive an external alarm relay or load. The alarm output status is normally “active” (Output_Healthy signal).

EBC chargers are also fitted with an internal fuse in series with the charge power output such that; if the battery is connected in reverse polarity, internal fuse blows, protecting the charger from being damaged. The fuse must be replaced before the charger can be used again. In high power model, the fuse is replaced with a “Solid State” switch for reverse power protection. In this model, no fuse is required and when the fault condition is removed, unit will commence operating as specified.

3- CHARGER MODELS:

EBC series battery charger family consists of five models, which cover a full range of applications in the Gen-Set market, as shown in table_1. The output voltage of the chargers is set at the factory to their "default" values. If specified at order, different output voltage settings can be possible during production, as per customer request. EBC2420 charger unit has adjustable output, where customer can set in the field as per their requirement.

	Model No:	Output Voltage	Output Current
1-	**EBC1205**	**12VDC** (factory set between 11Vdc and 15.5Vdc, default is 13.8Vdc)	**5.0ADC** (short circuit current >5.5ADC)
2-	**EBC1210**	**12VDC** (factory set between 11Vdc and 15.5Vdc, default is 13.8Vdc)	**10.0ADC** (short circuit current >11.0ADC)
3-	**EBC2405**	**24VDC** (factory set between 24Vdc and 30.0Vdc, default is 27.6Vdc)	**5.0ADC** (short circuit current >5.5ADC)
4-	**EBC2410**	**24VDC** (factory adjusted between 24Vdc and 30.0Vdc, default is 27.6Vdc)	**10.0ADC** (short circuit current >11.0ADC)
5-	**EBC2420**	**24VDC** (User adjustable between 26Vdc and 30.0Vdc, default is 27.6Vdc)	**20.0ADC** (short circuit current >22.0ADC)

Table 1: EBC series models

These chargers can deliver full rated current into the battery, even under "short circuit" conditions. This means that; if a deep discharged battery is connected to EBC series battery chargers, battery will be fully recovered in approximately 14 hours, if correct charger capacity is chosen for any given battery unit. Selected charger current rating should be ≥0.1C and ≤0.15C where C = Battery Ah Capacity.

All EBC series chargers comply with EMC emission and immunity standards. When connecting these chargers into the electric panel, ensure that; mains power cables are not laid side by side into the same cable duct. AC side power wires should be physically separated from the DC side wires as best as possible to avoid interference and provide safety between the two galvanically isolated sides of the chargers. If AC and DC wires have to be laid together, then necessary precaution should be taken for the wire insulation thickness and appropriate shielding of the DC side installation in order to maintain the EMC and LVD requirements of the standards.

4- FEATURES:

EBC series chargers are based on same design concept, with similar functions. But due to their wide ranging current ratings, high current models exhibit some different characteristics and user must pay attention to these differing specifications. Some features vary, depending on the model of the charger and these features are explained in the following chapters;

	FEATURE	EBC1205, 2405, 1210, 2410	EBC2420
1-	Output Voltage	Factory set. Custom V_{OUT} setting is possible, if specified during purchase order.	User adjustable. Can be set to required voltage level by trimmer potentiometer on the charger unit.
2-	Output current limiting	Fully protected and can work into direct short circuit continuously over rated operating temperature range. Short circuit current is >110% of rated output.	
3-	Input voltage range	Wide input voltage range, no derating at low level voltage input conditions. Continuous operation at 300Vac input conditions.	
4-	Input filtering	All models are equipped with an input noise filter and surge protection. Surge protection has limited energy absorption capacity and may be damaged, if the input surge voltage persists over 320Vac level.	
5-	Boost Charge function	Boost charging is built in all models with safe charging conditions. Function is activated by connecting the control input to V^+ terminal of the battery.	Boost charging is built in all models with safe charging conditions. Function is activated by connecting the control input to V^- terminal of the battery.
6-	Alarm Output	Solid State (SS) output with “sink” connection. An external alarm relay or load can be connected between “Alarm” output and V^+ battery terminal.	Potential-free relay contact provides an alarm output. The relay is N/O and is closed (energized) if there is “No-Alarm” condition.
7-	Output Power derating	No power-derating. All models operate at specified rating up to 60°C ambient temperature.	Device power-derating is activated at 60°C ambient and completely shut down at 70°C.
8-	Output Over-voltage protection	No output over-voltage protection	Output over-voltage protection is activated, if charger output voltage is increased due to an external power source.
9-	Reverse polarity protection	Protection is provided with an internally fitted diode and fuse combination.	Reverse power protection is provided with internal solid-state switch. No fuses required. Normal operation starts, if fault condition is removed.
10-	Packaging	IP00 case for panel mounting. Rail mounting is optional.	IP20 protection for panel mounting type case. Rail mounting is an option.

Table 2: Main features of EBC series chargers

5- TERMINAL CONNECTIONS:

The chargers have mains side “High Voltage” connection terminals and the battery side “Low Voltage” connection terminals arranged in two different groups. These two sets of connectors are separated from each other and galvanically isolated. Therefore; care must be taken to avoid the cables from these two sets of connectors to be laid in the same cable duct.

Terminal connections are shown in the table below. The connections of terminals are designed same for 5A and 10A units but it differs for 20A unit. Therefore; care must be taken when connecting different charger models together in an application.

EBC series Charger Terminal Connection Table

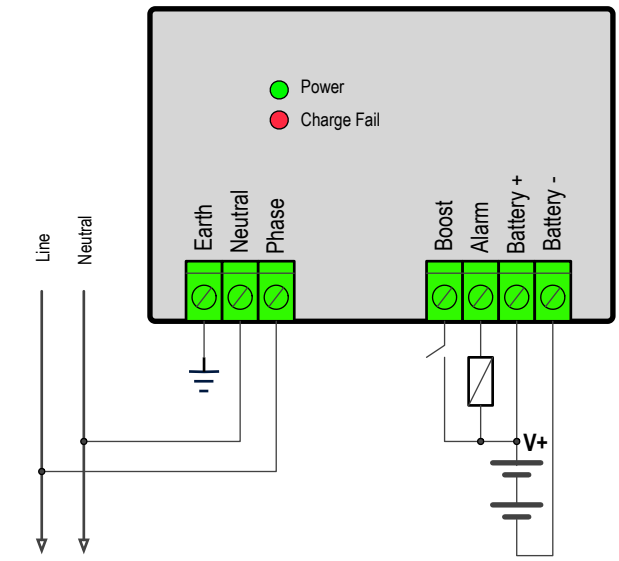
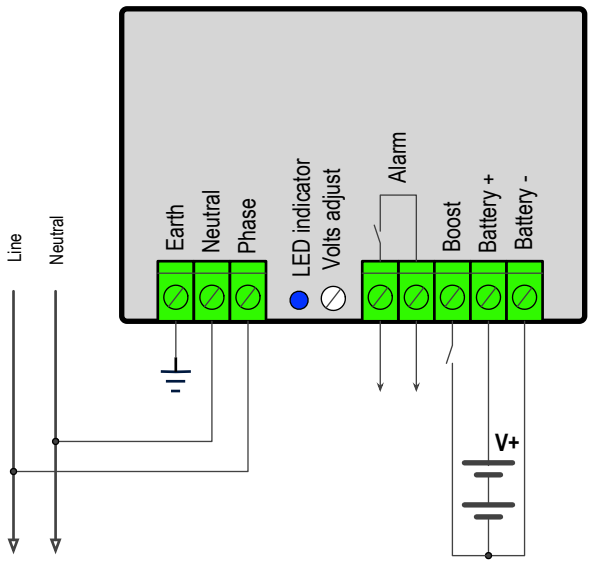
EBC1205, EBC2405, EBC1210, EBC2410	EBC2420
	

Table 3: Terminal identification of EBC series chargers

In all models, it is required that; Mains EARTH connection is made properly with correct wire gauge. Failing to make EARTH connection properly may cause serious personal injury and at the same time, reduce device performance for noise immunity and filtering. Ensure EARTH terminal is always connected firmly to UTILITY earth point and device should not be powered, unless EARTH is connected properly.

If ALARM output is not required, alarm output terminals should not be wired. Ensure BOOST terminal is connected in the correct polarity, as it differs for the 20A unit.

All chargers are equipped with male-female mating terminal sockets, except EBC2420 model. The terminal socket information is given in the table below:

Charger model	Terminal description	Terminal type
EBC1205, EBC2405, EBC1210, EBC2410	Mains side connection terminals	MSTB 2.5 / 3 (12Adc) Three pole socket &plug connector set
	Battery side connection terminals	MSTB 2.5 / 4 (12Adc) Four pole socket & plug connector set
EBC2420	Mains side connection terminals	MKDS 3 / 5 - 5.08
	Battery side connection terminals	GMKDS 3 / 3 - 7.62

Table 4: Terminal Types description

Use correct wire gauge size on all terminals and ensure wires are properly inserted into individual terminal holes and tightened properly. Failing to do so will cause danger and can device can be damaged beyond repair. All electrical installation precautions should be taken when installing the chargers. Only authorized technical personal should attend to install these chargers.

When connecting mains side wires, ensure that; proper wire gauge is used and wires are stripped according to their maximum strip length. Maximum wire stripping information is given in figure_2 for mains side terminal connection. For mains side wire connection, 18swg or 20swg size wire must be used.

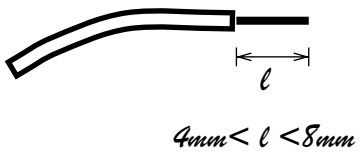


Figure 1: Mains side wire stripping length for EBC series chargers

When connecting wires to EBC series chargers, please ensure that; cables are stripped at right length and copper metal part of the wire is totally inserted into the terminal connector. Since case of EBC series chargers are made of aluminum, terminal wires may short to the case and cause danger and health risk.

When connecting the high power (high output current capacity) chargers, ensure that; correct wire thickness is observed. If thin wires are used, the performance of the chargers will reduce during bulk charging and due to the voltage drop across the wires, chargers may not be able to deliver full power during high current charge stage.

6- FUNCTIONAL DESCRIPTION:

The functions of EBC series battery chargers are explained below. Please ensure that; all charger functions are understood properly before attempting to use these functions in any application.

6-1- Mains voltage connection:

Mains connections are required for the charger to operate. All chargers are designed to operate from 230Vac/50Hz AC power source. This is "factory default" setting for all chargers for mains side connection. Since all chargers are designed to operate over a wide input voltage range, full output power can be maintained within the operating input voltage range.

Input voltage characteristics are shown in the graphics below:

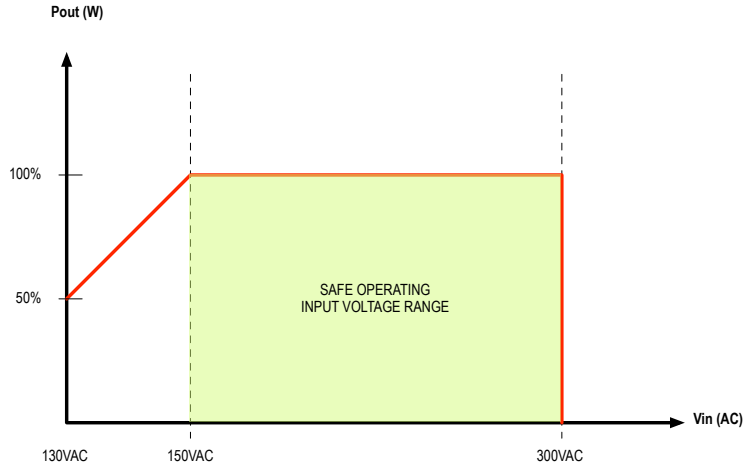


Figure 2: Safe Operating Voltage input range of EBC series chargers

Minimum operating voltage input is 150Vac and full rated power can be delivered at this voltage input. If input voltage goes below 150Vac, output power will reduce and no power can be produced below 130Vac. The upper limit is 300Vac and device cannot be operated above this voltage level. Input protection stage will be damaged above 320Vac and device will require service, if this level is exceeded.

When connecting the mains input voltage terminals, ensure that; LIVE and NEUTRAL lines are connected to their respective terminals. Failing to do so will jeopardize device safety and reduce protection level.

These devices also require EARTH connection for all applications. EARTH connection must be provided for safe operation and proper input protection function of the input stage.

EBC1205, EBC1210, EBC2405 and EBC2410 chargers are fitted with socket type terminals. EBC2420 charger is fitted with screw type terminals. When servicing EBC2420 charger, ensure that; mains power is disconnected and battery connection is removed, before removing the cables from charger terminals.

6-2- Battery terminal connection:

Battery terminals must be connected, using proper size wire gauge, depending on the model used. The battery connection wire size table is given below;

Charger current rating	Wire size up to 5m cable length	Wire size up to 10m cable length
5A	1.5 mm²	2.0 mm²
10A	2.0 mm²	2.5 mm²
20A	2.5 mm²	4.0 mm²

Table 5: Battery terminal wire size table for EBC series chargers

It is strongly recommended that; the wires from charger unit to the batteries do not exceed 10m cable length. Failing to do so will affect overall efficiency and reduce the performance of your charger unit.

6-3- Over voltage protection:

Over Voltage protection is only active on EBC2420 charger unit. The other charger models in EBC series are not equipped with over-voltage protection function. In EBC2420 model, output over-voltage alarm will be activated if charger output voltage exceeds 32Vdc. In this case, EBC2420 will switch its output off, protecting the battery form being damaged.

Alarm relay will be de-energized to indicate over-voltage alarm condition. When alarm condition is removed, the relay will automatically reset itself.

In all models, if charger output voltage is forced above 35Vdc by and external voltage source, the output stage may be damaged.

6-4- Reverse polarity protection:

All EBC series chargers are protected against reverse polarity connection. In EBC1205, EBC1210, EBC2405 and EBC2410 models, reverse polarity protection is activated with an integrated protection diode and an internally fitted protection fuse. Therefore; in these models, if reverse polarity connection is made, internal fuse will blow and fuse needs to be replaced before the charger can be used again.

Observe internal fuse ratings and do not use over-rated fuses for replacement, as this may not protect the charger anymore. Always use rated fuse values given in this manual.

In EBC2420 chargers, reverse polarity protection is activated by an internally fitted silicon switch, which will protect the charger if battery terminals are reverse connected. The charger will reset automatically, if reverse polarity condition is removed. The reverse connection fault is indicated on the front panel LED indicator.

Alarm LED indications are explained elsewhere in this manual and should be referred to understand the alarm indication status of the charger.

Charger Model	Internal fuse rating	Explanations
EBC1205, EBC2405	6A	Slow blow, glass fuse
EBC1210, EBC2410	12A	Slow blow, glass fuse
EBC2420	No fuse is required	Electronically protected

Table 6: Internal fitted fuse rating

6-5- Alarm output functions:

All models have built in alarm functions with an alarm output terminal. Alarm output connections and types differ according to charger model. Depending on the model, alarm output is configured as “Solid-State” (SS) or “Relay” contact configuration. For solid state alarm output, user can use this function as an input to their controller or connect an external relay. SS alarm output connection and application is shown in figure_3 to figure_5 below:

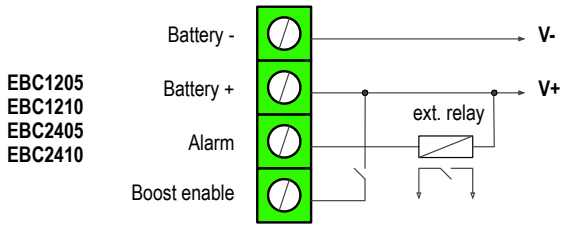


Figure 3: SS alarm output connection with external relay

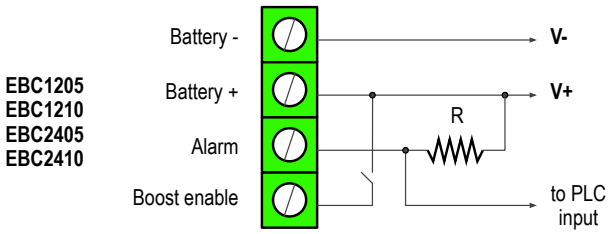


Figure 4: SS alarm output connection with "pull-up" resistor

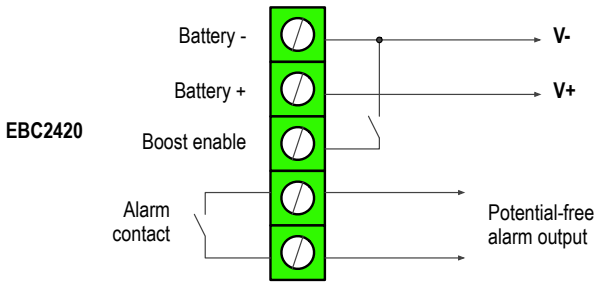


Figure 5: Relay alarm output connection

If SS output is used with a “Pull-up” resistor, a suitable value must be calculated for the pull-up resistor. For Ensure that; value of pull-up resistor “R” is selected as indicated below:

For 24V chargers: 4.7KΩ < R < 10KΩ

For 12V chargers: 2.2KΩ < R < 4.7KΩ

Alarm output is energized, if there is no alarm (“power good” status). If the unit fails to operate and generate an alarm signal, alarm output will de-energize (high impedance) and front panel RED alarm LED will indicate alarm condition. Alarm output functions and LED indicator status are described in the table below:

EBC1205, EBC1210, EBC2405, EBC2410 (solid-state type alarm output)				
Alarm function	**Alarm output type**	**LED**		**Operation**
		Green	**Red**	
Normal operation	continuous	ON	OFF	Energized
No utility power / no DC output with battery connected	continuous	OFF	ON	De-energized
Reverse connection or output fuse blown (internal o/p fuse blown)	continuous	ON	ON	De-energized

Table 7: Alarm indicator table for 5A and 10A units

EBC2420 (relay type alarm output)				
Alarm function	**Alarm output type**	**LED (RGB)**		**Relay Operation**
		Status	**Colour**	
Power-off	Contact open	OFF	----	De-energized
Normal operation	Contact closed	ON	GREEN	Energized
Over voltage on the output (battery connected)	Contact open	ON	Red	De-energized
Reverse connection (in protection mode)	ON-OFF intermittent	ON	GREEN RED	On-off oscillating
No input voltage / input under voltage	Contact open	ON	RED	De-energized
Short circuit on the output	Contact open	OFF	----	De-energized
Boost charging condition	Contact closed	ON	BLUE	Energized

Table 8: Alarm indicator table for 20A unit

Solid state alarm output is arranged to sink current from V^+ power rail. Therefore; a relay can be connected between this terminal and V^+ and the relay contacts can be used to drive any load. Alarm output can also be used with a “pull-up” resistor for PLC input connection.

6-6- Boost function (Cell Voltage Equalization):

Boost function is activated externally and can be used periodically to replenish the battery condition and charge hold capacity. Boost charging must be used as per battery manufacturers’ instructions.

Boost charging function activation is shown in the table below. During boost charging period, the charger terminal voltage will increase but the charge current will decrease to 50% of its rated output capacity, to protect the batteries from getting damaged. During boost charge period, boost charge control input must stay active.

MODEL	Boost input activation
EBC 1205 EBC 1210 EBC 2405 EBC 2410	Connect boost charge input terminal direct to battery **positive terminal**
EBC 2420	Connect boost charge input terminal direct to battery **negative terminal**

Table 9: Boost activation polarity

Boost charge characteristic is shown in the below diagram. Boost charge function acts as per battery manufacturers' specifications:

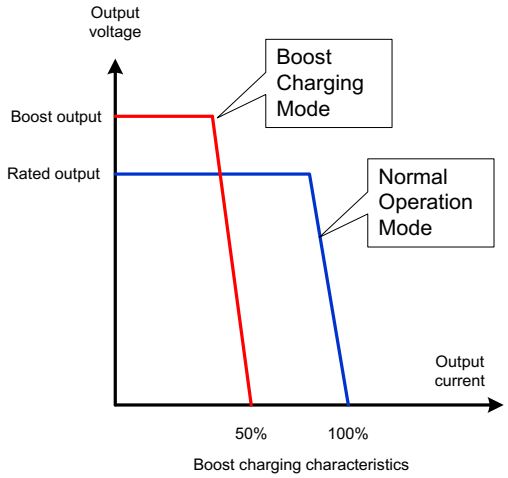


Figure 6: Boost function charge characteristics

6-7- Over-voltage protection:

Over-voltage protection is only applicable for EBC2420 chargers. When charger output increases to a level, where it can damage the batteries, control circuit trips an output over-voltage protection alarm and switches the output off.

Once the over-voltage condition is removed from the output, the charger will automatically reset itself back into normal operating condition. During over-voltage period, alarm output is de-energized, indicating an alarm condition.

6-8- Power Derating:

EBC series battery chargers are intended for “low-cost” applications with high reliability and long operating life time. Therefore; with models up to 10A output current rating (including 10A model), there is no power de-rating protection. These chargers can operate safely at full load up to 60°C ambient temperature. This is an adequate limit for most industrial applications.

EBC 2420 chargers are protected with power derating, starting at 60ºC ambient temperature and reducing to zero power at 70ºC. Power derating curve is shown in the below diagram:

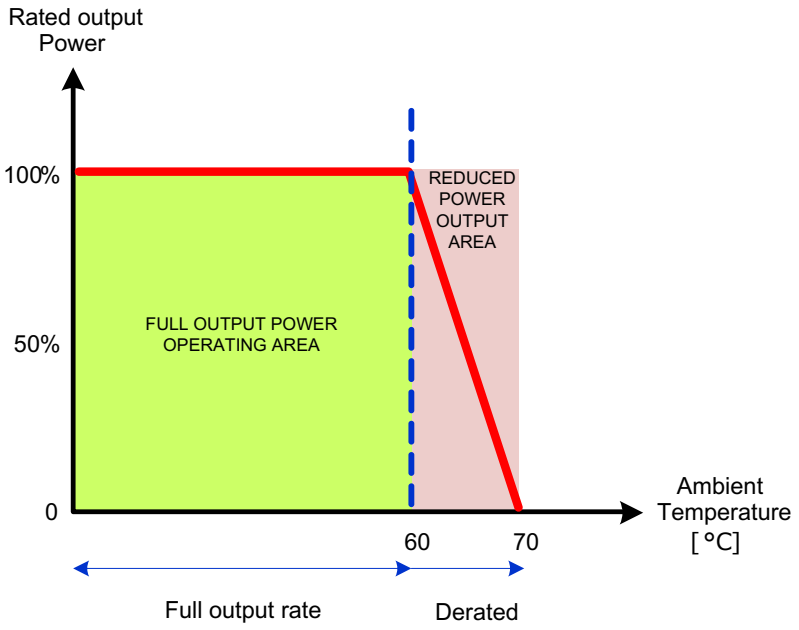


Figure 7: EBC2420 series power de-rating characteristics

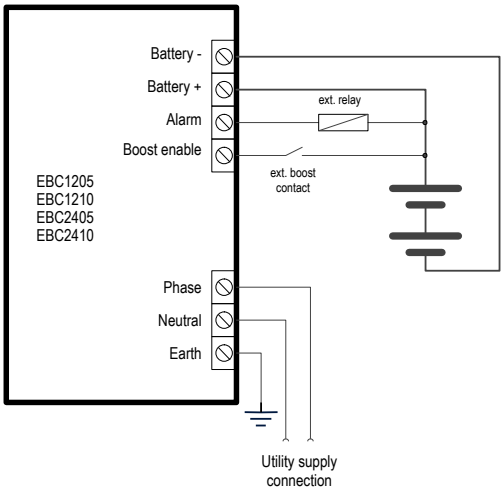
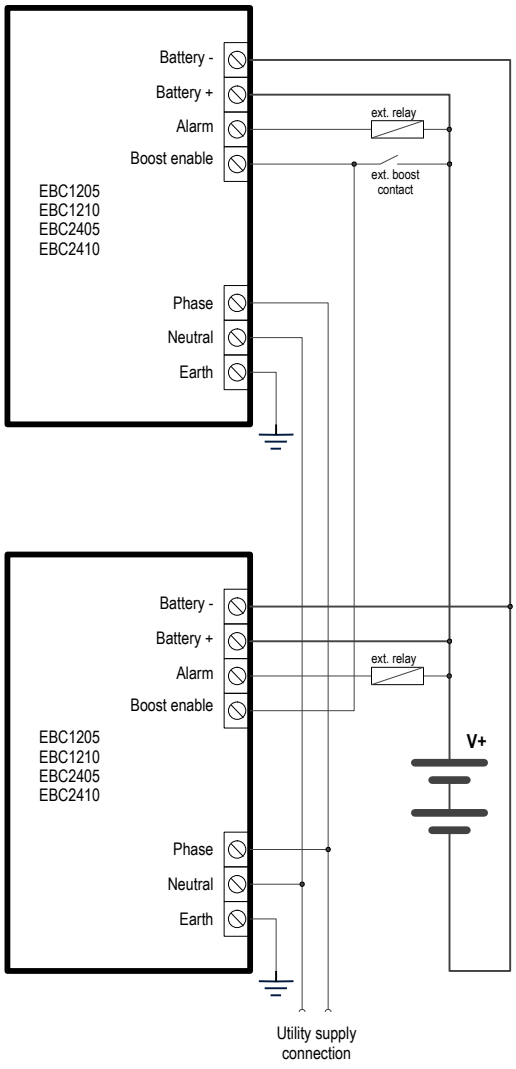
EBC series chargers are designed to be able to deliver full rated short circuit current into the battery, even if the battery terminal voltage is below healthy voltage levels. This is essential, if recovery from “deep discharged” condition is required in the field, which may be the case, when the generator is stored in non-operating conditions for prolonged times. This feature of EBC series is superior to many battery chargers, commercially available on the market today.

Therefore; the chargers may dissipate excess power under recovery conditions. When mounting EBC chargers up to 10A models (including 10A model), care should be taken to ensure proper mounting conditions, as described in this manual. Failing to do so will cause the chargers to heat up under severe conditions and fail to operate.

EBC2420 will carry on operating under severe heat conditions but the output power will reduce, if heat limits are exceeded.

6-9- Parallel operation:

EBC series battery chargers can be connected in parallel to increase the output current drive capacity. Different models cannot be connected in parallel, only same model chargers can be connected in parallel to increase the output capacity. While connecting the chargers in parallel, make sure to connect the alarm and boost terminals as shown in the table below;

MODEL	SINGLE CONNECITON	PARALLEL CONNECTION
EBC 1205 **EBC 1210** **EBC 2405** **EBC 2410**		

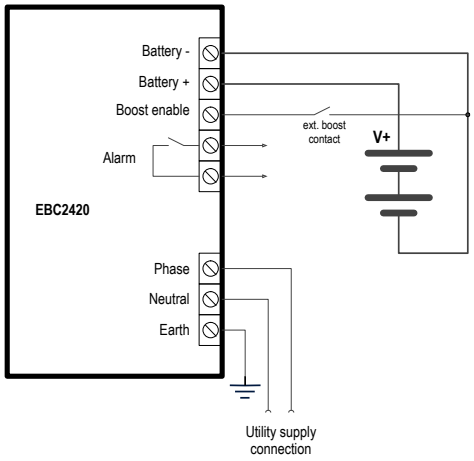
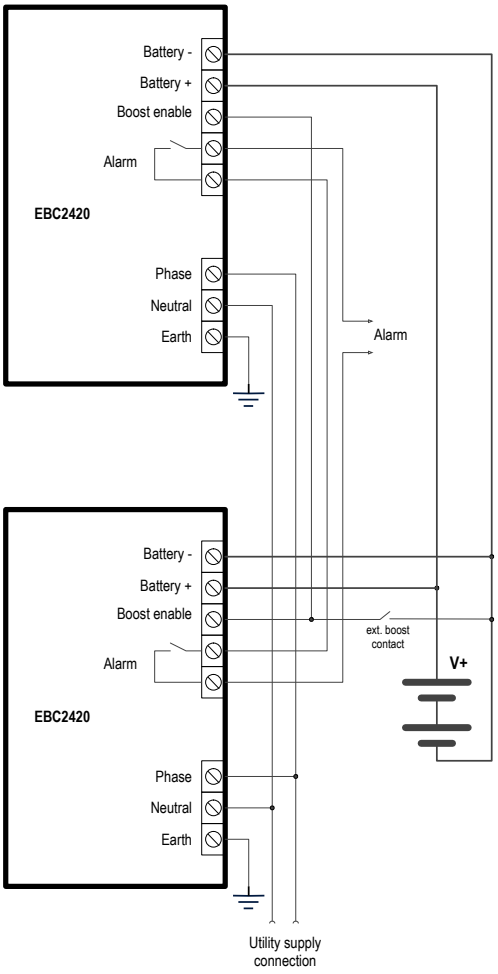
EBC 2420		
Output voltage	Output voltage value is same as given in device specifications.	Only same model chargers can be connected in parallel. The output voltage of the parallel combination does not change.
Output current	Output current value is same as given in device specifications.	Only same model chargers can be connected in parallel. The output current value of parallel combination is multiplied with the number of charger connected in parallel.
No-load and Full-load operation	All units can operate into no-load and full-load, when they are connected as single charger.	All units can operate into no-load and full-load, whether they are connected in parallel

Table 10: Single and Parallel application connection

6-10- Applicable Standards:

All units are designed and manufactured to comply with the following EN standards:

SAFETY **LVD directive 2006/95/EC**	EN61010-1 EN60529/EN60950
EMC **EMC directive 2004/108/EC**	Immunity: EN61000-6-2 Emission: EN61000-6-4 Burst: EN61000-4-4 Surge: EN61000-4-5 RF-Conducted: EN61000-4-6 Voltage fluctuation: EN61000-4-11

Table 11: EBC series charger standards compliance table

7- TECHNICAL SPECIFICATIONS:

The technical specifications for all EBC family of chargers are given in table below;

Specification	Description	
Input Specifications:		
AC Input Voltage range:	150Vac to 300Vac for single phase units (phase-neutral)	
Operating frequency range:	45Hz to 450Hz. (All models can operate at full capacity with DC input voltage feed, within their specified input voltage ranges)	
DC Input voltage range:	250Vdc to 400Vdc for 5A, 10A and 20A models (including the peak voltage of V_{RIPPLE})	
Continuous Input current at full load condition:	EBC1205 < 0.80 A at 230Vac input voltage EBC1210 < 1.50 A at 230Vac input voltage EBC2405 < 1.50 A at 230Vac input voltage EBC2410 < 2.50 A at 230Vac input voltage EBC2420 < 3.50 A at 230Vac input voltage	
Efficiency:	EBC1205 > 82% EBC1210 > 82% EBC2405 > 82% EBC2410 > 85% EBC2420 > 85%	
Input Power Factor:	Capacitive (no PFC compensation)	
Input fuse protection:	EBC 1205 EBC 1210 EBC 2405 EBC 2410	6.3A / slow blow Type: 5x20mm, glass type
	EBC 2420	6.3A / slow blow Type: T-LAG TR5 series

Inrush current at 230Vac cold start:	EBC 1205 EBC 1210 EBC 2405 EBC 2410	<100A	
	EBC 2420	<160A	
Input terminal type:	EBC1205, EBC1210, EBC2405, EBC2410	Mains	MSTB 2.5 / 3 (12Adc) Three pole socket &plug connector set
		Battery	MSTB 2.5 / 4 (12Adc) Four pole socket & plug connector set
	EBC2420	Mains	MKDS 3 / 5 - 5.08
		Battery	GMKDS 3 / 3 - 7.62
Output Specifications:			
Output voltage range:	12V models	Factory setting: 13.8Vdc Adjustable: 12.6 … 15.0 VDC (not user adjustable, set at production stage)	
	24V models	Factory setting: 27.6Vdc Adjustable: 25.5 … 30.0 VDC (not user adjustable, set at production stage)	
	EBC2420	Factory setting: 27.6Vdc (User adjustable between 23.5Vdc … 30Vdc)	
Output current and terminal types:	EBC 1205 EBC 2405	5.0A	Male-female socket type
	EBC 1210 EBC 2410	10.0A	Male-female socket type
	EBC 2420	20.0A	Screw type terminals
Short-circuit current:	>110% nominal current under short circuit conditions (can withstand short circuit continuously over full operating temperature range)		
Output ripple voltage:	<1.0% of nominal output voltage over 10Hz to 100KHz		
Output noise level:	<1V pk-pk		
Line regulation:	<1% over specified input voltage range at constant output load (not exceeding rated load)		
Load regulation:	<1.5% at constant input voltage, from no load to full load on the output, measured at the output terminals		
Remote sensing:	Not available on EBC series		

Reverse polarity protection:	EBC 1205 EBC 1210 EBC 2405 EBC 2410	Parallel diode fitted internally with internal fitted wire type fuse protection (fuse replaceable)
	EBC 2420	Resettable electronic protection. No external components are required.
Front panel indicators:	See “Alarm LED Indicator Status” table	
Environmental conditions:		
Operating temperature range:	-25ºC to +60ºC at full load and maximum input voltage. For EBC2420 model, output power is linearly de-rated starting at 60ºC to 70ºC down to zero and output is off for T_{amb} > 70ºC	
Storage temperature and humidity:	-30ºC to +80ºC, (10%rh to 90%rh, non-condensing)	
Cooling type:	Convection cooled (vertical mounted and no physical obstacles are allowed within 40mm from each side and 100mm above and below. See installation diagram before use)	
Humidity:	10%Rh to 95%Rh, non-condensing and connected to mains.	
Altitude:	1000mt at full rated load. De-rate linearly from full power to 50% power from 1000mt to 3000mt over the specified working temperature range.	
Galvanic isolation:	Input – output (with voltage input terminals shorted)	4KV
	Output – Earth (with output terminals shorted)	500Vac
ESD protection:	8kV free air discharge onto the metal case (metal case is internally connected to EARTH)	
EMC noise immunity:	IEC/EN 61000-6-2 IEC/EN61000-6-4	
Conducted and radiated EMI:	IEC/EN61000-6-2, IEC/EN61000-6-4, IEC/EN61000-4-4, IEC/EN61000-4-5, IEC/EN61000-4-6, IEC/EN61000-4-11	
Vibration (non-operating):	10 to 55Hz, 19.6m/s² constant sweep, for 1 hour X, Y, Z axis, each.	
Protection class:	IP20 all sides IP00 panel mounting side	
Output protection fuse:	EBC 1205 EBC 2405	10A / 140A²s, fast Size: 6.3 x 32mm
	EBC 1210 EBC 2410	15A / 350A²s fast Size: 6.3 x 32mm
	EBC 2420	25A / 900A²s, fast blow (external)

Additional functions:		
Alarm function:	All models are fitted with alarm function; alarm output is energized when operating at normal conditions. Alarm output specifications vary, depending on the model	
	EBC 1205 EBC 2405 EBC 1210 EBC 2410	Solid state alarm output, current sink to ground (200mA max, load to be connected between alarm output terminal and battery positive terminal)
	EBC 2420	Potential-free relay output, 1.0A / 250Vac contact rating, normally energized
Boost Charge:	All models are fitted with boost charge function; operation vary depending on the model	
	EBC 1205 EBC 2405 EBC 1210 EBC 2410	Boost charge input terminal must be connected to battery positive for activation
	EBC 2420	Boost charge input terminal must be connected to battery negative for activation.
Over-voltage protection:	EBC 2420	Active when Vo > 32Vdc
Power derating:	EBC 2420	Output power de-rating starts at 60ºC and linearly de-rated down to zero at 70ºC

Table 12: TECHNICAL SPECIFICATIONS

8- MECHANICAL DATA AND INSTALLATION:

Mechanical data is given in the drawings table below. Installation regulations must be observed for reliable operation. Mechanical clearances must also be provided for proper ventilation to operate over the specified temperature range.

When mounting chargers in series or parallel, make sure that; the combination is connected side by side as mounting one above the other will increase the working temperature of the one on top.

When mounting, make sure that the units are fixed tightly on the mounting panel. Failing to do so will cause damage in vibrating conditions. Make sure that; the terminal wires are tightened and secured properly and they are not loose in their sockets.

Do not obstruct the flow of air through the charger units. If cable ducts are used in the electric cabinet, please ensure that; there is at least 100mm free gap from the top and bottom side of the charger unit. These units are convection cooled units and care must be taken during installation.

The aluminum case of the chargers is used as heat-sink for the switching power devices. Therefore; when operating at full power, the case surface temperature may increase above safe contact temperatures. Users are warned to take necessary precautions when contacting aluminum case during operation. It may be too hot to touch and may cause injury.

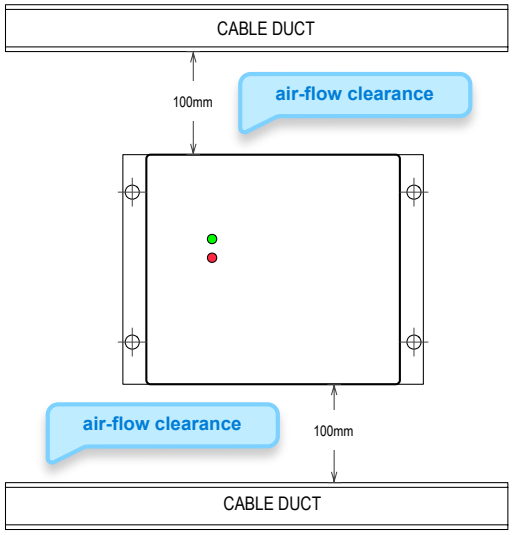
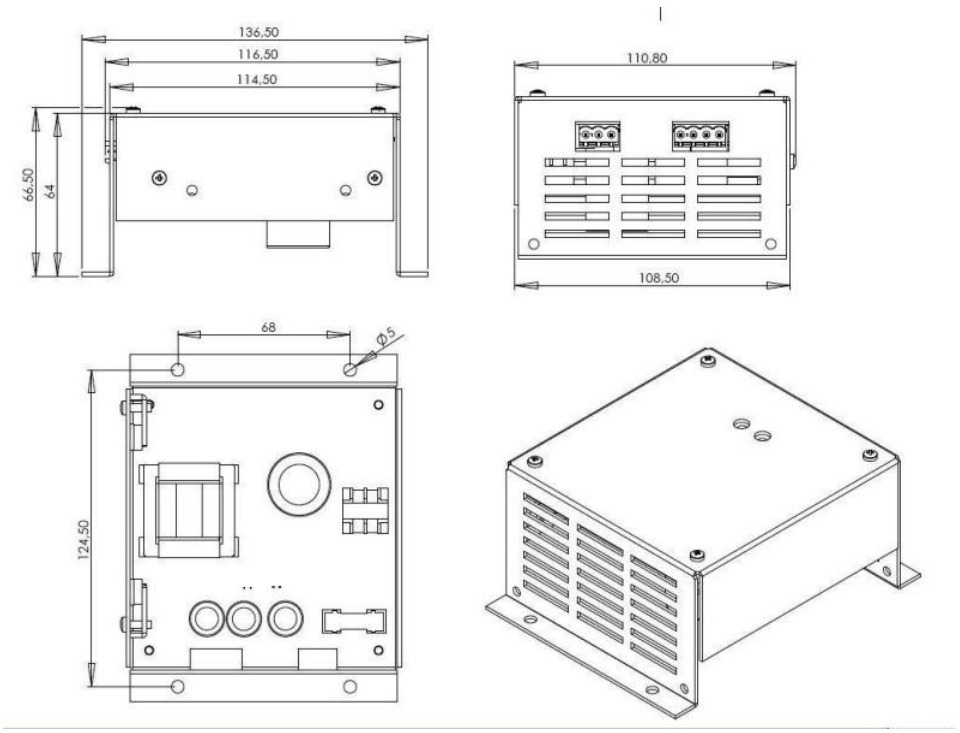
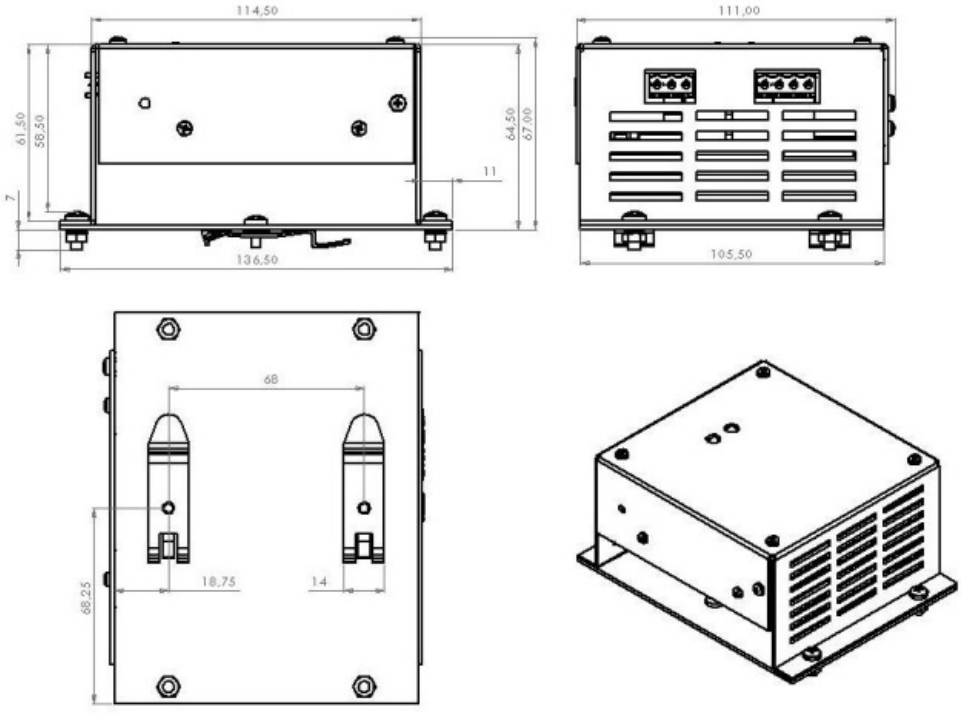


Figure 8: Panel mounting air-flow clearance mounting plan

When mounting the chargers onto the panel backplane chassis, ensure that; all 4 mounting holes are used and secured to the backplane tightly. If mounting is loose, this may increase the effective vibration of the charger case, which may result in component physical damaging, hence complete unit failure!

If rail mounting method is used, ensure that; the mounting rail is securely tightened to the panel backplane and charger mounting brackets are securely snapped onto the rail.

MODEL	MECHANICAL DATA
EBC 1205 **EBC 2405** **EBC 1210** **(Panel mounting case)**	
EBC 1205 **EBC 2405** **EBC 1210** **(Rail mounting case)**	

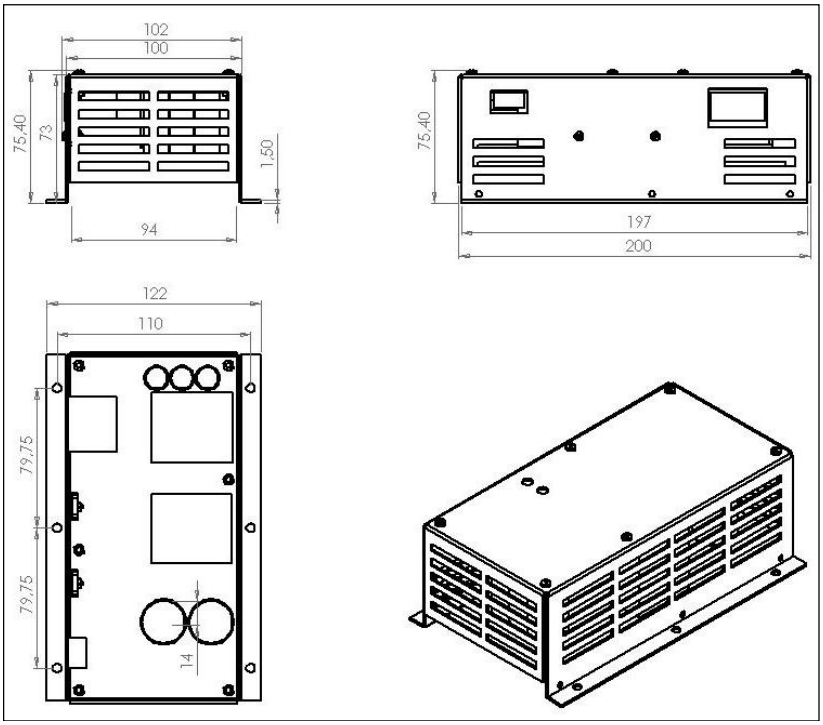
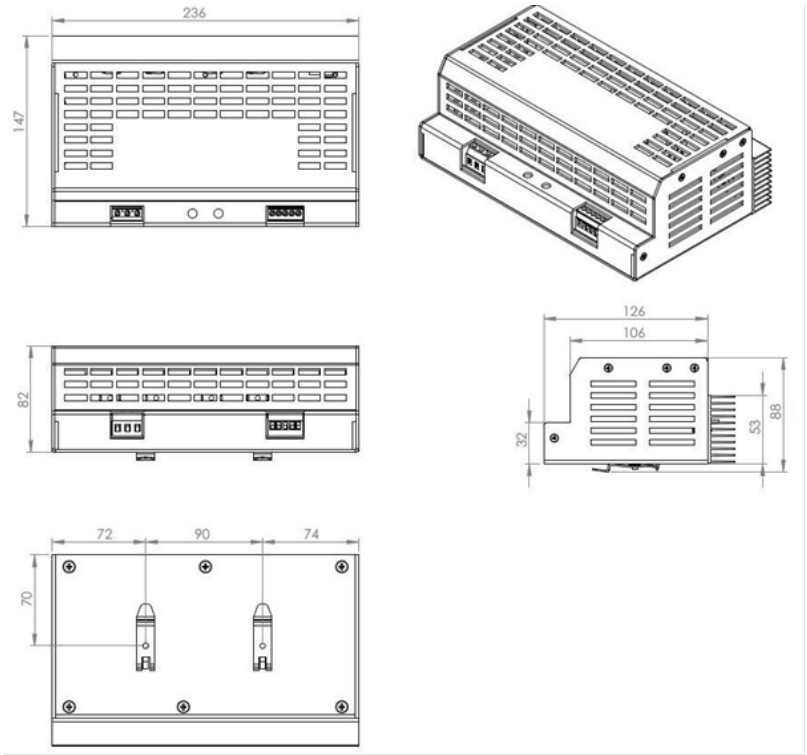
EBC 2410	
EBC 2420	

Table 13: Mechanical Dimensions

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