Technical Data Sheet

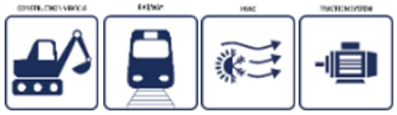
IA6000-I-X-600-400-7701
6000W / DC/AC INVERTER

FEATURES

- Sine Wave Output Voltage
- Suitable for Motors Control
- Adjustable Output Frequency
- Adjustable Output Voltage
- Input Voltage According to: EN50163: 2006 and EN50124-2: 2017
- High Input-Output Isolation 5400Vrms
- Remote Off Opto-Coupled
- Configurable Input: Reverse or Mid Power
- Remote Control Via RS232
- Alarms by Isolated Relay Contacts
- CAN BUS
- Railway Applications According to EN61287-1
- Fire and Smoke: EN45545-2 Pending



APPLICATION



EN50155

PAM Tool

SAFETY & EMC

RoHS² compliant 10 from 10 | Reach compliant | WARRANTY 3 YEARS | WARRANTY 5 YEARS

EN45545 fire & smoke

DESCRIPTION

The IA6000-I-X-600-400-7701 is a three-phase sine-wave DC-AC inverter designed not only to work within 400 to 900V input voltage range but also to withstand surges and over-voltages as described in EN50124-2.

The unit allows:

- Changing the output frequency by means of DIP-switch-7 of SW1. OFF: 50Hz or default programmed, ON: 60Hz
- Change local/remote (waiting RS-232 commands) by means of DIP-switch-6 of SW1. OFF: local, ON: remote
- Shutdown applying voltage output 15 to 143V on pins 3 and 4 of J4
- Start-up motors by means of a soft start. In the start-up, the output voltage rises linearly from 0V to set voltage and the frequency from the initial to the set one. The start-up ramp slope may be changed via RS-232
- Set the rotation speed of a motor according to the appropriate Voltage/Frequency ratio.
- Configurable input (pin 1 and 2 of J4):
    - Reverse mode: Changing the rotation direction for the next start-up of a motor by applying voltage between 15 and 143V.
    - Mid power mode: Changing the output frequency in V/F mode from nominal to a mid-power frequency by applying voltage between 15 and 143V.
- Monitoring the status of the input and output voltage through the contacts of two separate solid state relays.
- Set and monitor parameters via RS-232, CAN BUS.

The IA6000-I-X-600-400-7701 is equipped with maximum average power protection as well as maximum output peak current protection. This protects the semiconductors even when an output short-circuit occurs. It also features a disable function for input under-voltage, which allows protecting the batteries from harmful discharges.

MODELS

	Input Voltage	Output Voltage	Output Power
IA6000-I-X-600-400-7701	400…900VDC	400V Three Phase	6kW 6.4kVA 8kWpk

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IA6000-I-X-600-400-7701
6000W / DC/AC INVERTER

BASIC CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.
Input				
Nominal DC Input Voltage			600/750VDC	
Minimum DC Input Voltage		400V		
Maximum DC Input Voltage	Continuous 2800 VDC According to EN50124-2: 2017 4.2.2 and Annex A			900V
Input Voltage Standard	EN50163 (Supply Voltage of Traction System)			
Inrush Current			15A	
Output				
Output Type	AC 3ph			
Output Voltage			400V	
Output Voltage Range	Adjust Via Remote Control	20% Vout		100% Vout
Voltage Tolerance			±5%	
Output Frequency	Via DIP-switch		50/60H	
	Via RS232	5Hz		75Hz
Maximum Continuous Current (Irms)				9.24A
Maximum Peak Current 5s (Irms)				15.5A
Output Wave Distortion THD	Average of 16 Samples		<2%	
Output HF Ripple			<2.5%	
Line Regulation	ΔVin -25%…+25%		<2%	
Load Regulation			<4.5%	

ENVIRONMENTAL

Parameter	Conditions	Value
Operating Temperature Range	Full Load, SU3 Class, According to EN61287-1	-25°C to +55°C, 70°C 10 min
	62.5% Load	-25°C to 70°C
Storage Temperature		-25°C to +80°C
Cooling	Internal Forced Air Controlled	
Maximum Altitude	Full Load	2000m
	95% of Load	2500m
Relative Humidity	Without Condensation	5…95%
Environmental Regulations		RoHS & Reach According to Directive 2011/65/EU
Pollution Degree		PD2
Overvoltage Category		OV3
Shock and Vibration		EN61373 Pending
Service Life		20 Years
Life Cycle		20 Years
MTBF	40°C According to SN29500	>150.000h

SAFETY AND CERTIFICATION

Certification (Type)	Standard
Safety According	EN50124-1 Railway App. (Insulation Coordination)
Dielectric Strength: Input/Output	5400Vrms/50Hz/10s
Dielectric Strength: Output/Earth	1500Vrms/50Hz/1min
Dielectric Strength: Input/Earth	5400Vrms/50Hz/10s
Fire and Smoke	EN45545-2 Pending

EMC

	Conditions	Value
Immunity According		EN61000-6-2, EN50121-3-2
Emission According		EN61000-6-4, EN50121-3-2

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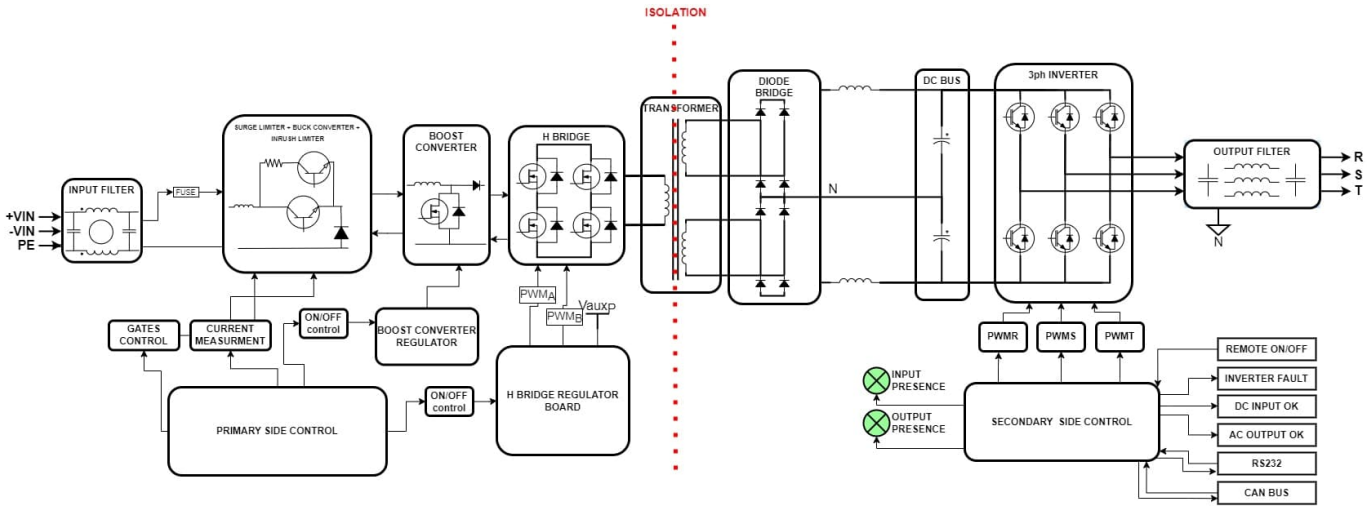
PROTECTIONS

Parameter	Type	Value
Against Overloads		Current and I^2T Limited (see overload protection curve)
Against Over-Temperature		Shutdown with Auto-Recovery

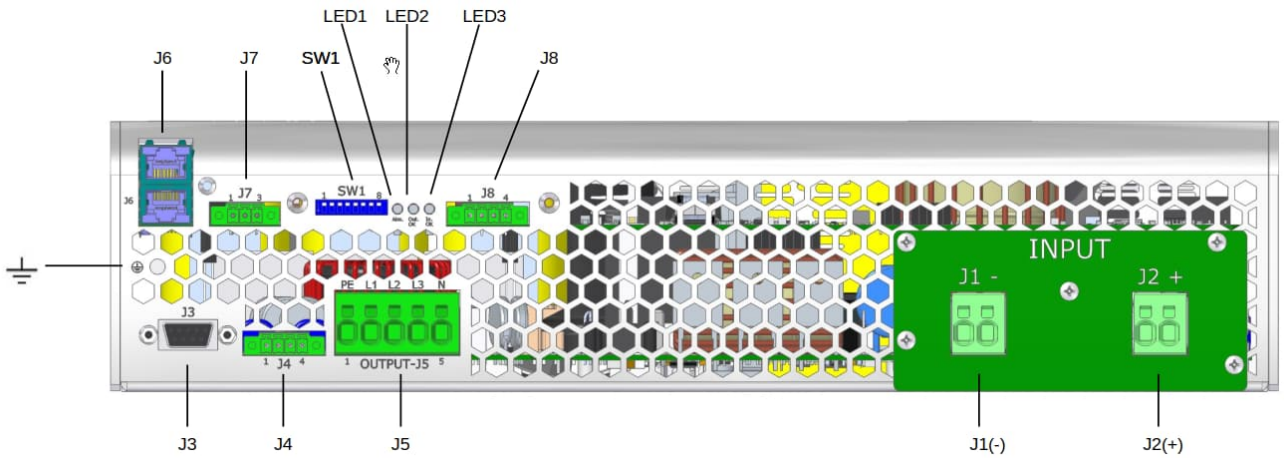
CONTROL

Type	Description
Output OK LEC	Green
Input OK LED	Green
Alam LED	Red
Input Alarm	Open when Alarm. Maximum Rating: 0.16A at 160VDC
Output Alarm	Open when Alarm. Maximum Rating: 0.16A at 160VDC
Remote OFF Input	OFF: Applying 15…143 VDC; Impedance >35kΩ
Configurable Input (reverse rotation or mid-power)	ON: Applying 15…143VDC; Impedance >35kΩ

BLOCK DIAGRAM



CONNECTIONS

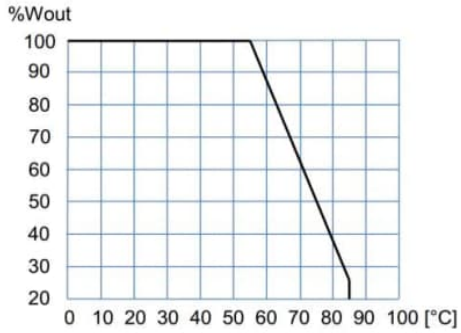


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CONNECTIONS

Connection	Terminal	Notes
J1	-Vin	Spring Clamp Terminals Cable 2.5…4mm²
J2	+Vin	
J5-1	Protective Earth	
J5-2	Output R	
J5-3	Output S	
J5-4	Output T	
J5-5	Output Neutral	
J4-1	+Configurable Input	Phoenix Contact MC1.5/4-GF-3.81 Recommended Female: Phoenix Contact MC1.5/4-STF-3.81
J4-2	-Configurable Input	
J4-3	+Remote ON/OFF	
J4-4	-Remote ON/OFF	
J8-1	Status Output	Phoenix Contact MC1.5/4-GF-3.81 Recommended Female: Phoenix Contact MC1.5/4-STF-3.81
J8-2	Status Output	
J8-3	Status Input	
J8-4	Status Input	
J7-1	CAN L (Optional Can Bus)	Phoenix Contact MC1.5/4-GF-3.81 Recommended Female: Phoenix Contact MC1.5/4-STF-3.81
J7-2	CAN H (Optional Can Bus)	
J7-3	GND CAN	
J3	RS-232	Female D-Sub DB9
J6A - J6B	Optional Parallel Operation	RJ45

POWER DERATING vs AMBIENT TEMPERATURE



START-UP

- The unit has 6 threaded holes for the fixation on a mounting surface.
- The unit has internal fans. For an appropriate cooling, the air input and output should be free of elements that cause and an air flow reduction (minimum recommended distance to other objects 90mm).
- Make connections as shown in the figure.
- The default output frequency is 50Hz. For 60Hz simply actuate the dip-switch as indicated in the figure.

For safety reasons, the following requirements must be met:

- Provide the equipment with some kind of protective enclosure that complies with the electrical safety directives in effect within the country where the equipment is installed.
  Include an input fuse with a rating immediately higher than the maximum input current.

RS232 COMMUNICATION PORT

It is possible to control and monitor de unit via RS232 by means a terminal emulator like “Tera Term” or “Putty”. Also, it is possible to control and monitor the unit directly using the protocol showed in table:
Protocol Configuration: ASCII Code, 57600Bauds, Parity None, 8Bits, 1Bit Stop

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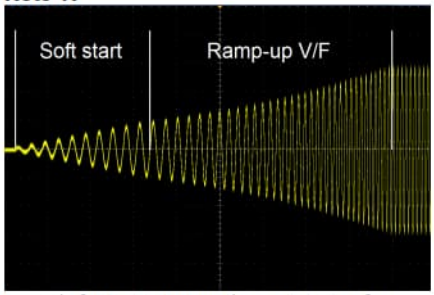
TABLE

Header		Function	Parameter		Returns	Description
P	R	L	V		PTV■■■.■	Input Voltage in Volts
			v		PTv■■■.■	Input Voltage Ripple in Volts
			Y		PTYRS=■■■■[13]YST=■■■■[13] YRT=■■■■	Output voltage in Volts RMS Phase-Neutral ([13]=Char 13 of ASCII Code)
			y		PTy■■■.■	Actual Output Voltage Set-Point in V
			I		PTIR=■■.■■[13]IS=■■.■■[13] IT=■■.■■	Output Current in Amps RMS ([13]=Char 13 of ASCII Code)
			T		PTT■■■.■	Internal Temperature 1 in K
			t		PTt■■■.■	Internal Temperature 2 in K
			F		PTF■■■.■	Nominal Output Frequency in Hz
			f		PTf■■■.■	Actual Output Frequency in Hz
			S		PTS■■■.■	Inverter Status 999.9 -> Enabled 000.0 -> Disabled 222.2 -> Blocked by Overload 111.1 -> Blocked by Overload or Short-Circuit
			M		PTM■■■■	Model Number
			R		PTR■■■■	Firmware Version
			Other Character		PTE	Command Not Supported
		G	1	■■■.■	OK/ERR	Set the Low Input Voltage Timed Shutdown in V
			2	■■■.■	OK/ERR	Set the Minimum Alarm Input Voltage in V
			3	■■■.■	OK/ERR	Change the Status Bit (After Start-Up Enabled with SW3=LOCAL and Disabled with SW3=REMOTE) 999.9 -> Inverter Enabled 000.0 -> Inverter Disabled
			4	■■■.■	OK/ERR	Set the Output Voltage Phase-Neutral in Vrms (Vo) (Output Must be Stopped) 040.0 ≤ ■■■.■ ≤ 230.0
			5	■■■.■	OK/ERR	Set the Maximum Output Current in Arms 20% Inom ≤ ■■■.■ ≤ 100% Inom
			6	■■■.■	OK/ERR	Set the Nominal output Frequency in Hz (Fo) (Output Must be Stopped) 005.0 ≤ ■■■.■ ≤ 075.0
			7	■■■.■	OK/ERR	Set the Alarm Maximum Output Current in Arms 0 ≤ ■■■.■ ≤ 100% Imax_warning
			8	■■■.■	OK/ERR	111.1 -> Reset the Inverter
			L	■■■.■	OK/ERR	Set the Minimum Input Starting Voltage in Volts
			O	■■■.■	OK/ERR	Set the Initial Frequency in the Start-Up (Fi) 005.0 ≤ ■■■.■ ≤ 075.0
			P	■■■.■	OK/ERR	Set the Ramp-Up in Increment of "N" Cycles per Hz in mode V/F, Frequency Charges or Start-Up 001.0 ≤ ■■■.■ ≤ 100.0
			Q	■■■.■	OK/ERR	Set the Ramp-Down in Decrement of "N" Cycles per Hz in mode V/F (Note-1) 002.0 ≤ ■■■.■ ≤ 100.0
			Y	■■■.■	OK/ERR	*Change the Working mode of the Input J4-1, J4-2 111.1 -> Input as Reverse Phase Control (Default) 222.2 -> Input as Mid-Power Control
			X	■■■.■	OK/ERR	*Set the Mid-Power Frequency for V/F mode by the Use of Input J4-1, J4-2 005.0 ≤ ■■■.■ ≤ 75.0
		M	1	■■■.■	OK/ERR	Set a New Output Frequency in Hz (Output must be Run and Not Stored in Memory) 005.0 ≤ ■■■.■ ≤ 075.0
			2	■■■.■	OK/ERR	Set a New Output Voltage in Volts (Output must be Run and Not Stored in Memory) 040.0 ≤ ■■■.■ ≤ 230.0
			3	■■■.■	OK/ERR	Set a New Output Frequency in Hz in mode V/F (Output must be Run and Not Stored in Memory) 005.0 ≤ ■■■.■ ≤ 075.0
			4	■■■.■	OK/ERR	Changes the Output Phase Order (Output must be Run and nor Stored in Memory) 111.1 -> Phase RST (Direct Phase) 222.2 -> Phase SRT (Reverse Phase)

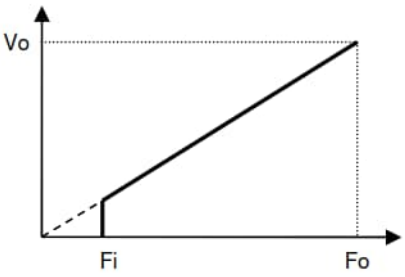
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OTHER PORTS PENDING

Note 1:

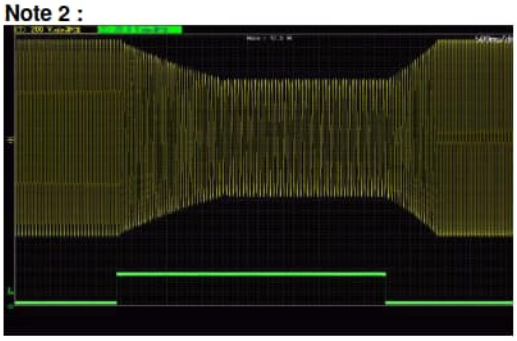


Example for N=1: start-up time = N x 1.7 s for changes from 16 Hz to 50 Hz



Mode V/F curve

Note 2 :



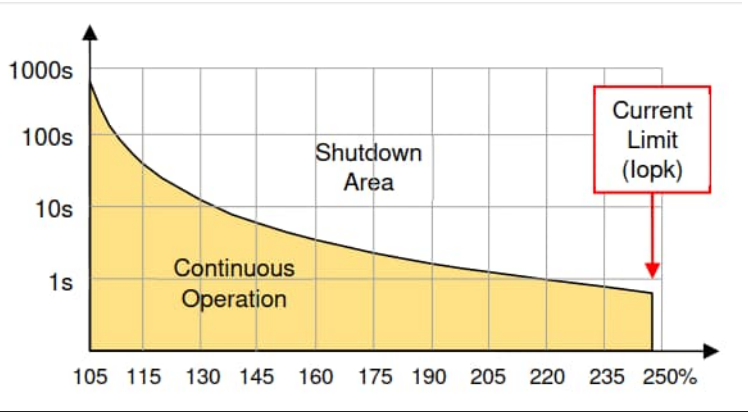
Example for change from 50Hz / 400 V to 30 Hz and 240 V with ramp-down of 2 cycles / Hz and ramp-up de 1 Cycle/Hz. Yellow: output voltage and Green: Mid-Power input signal

WORKING PARAMETERS	
Thermal Protection	
Internal Warning Temperature	88°C
Internal Shutdown Temperature	92°C
Internal Restart Temperature	75°C
Internal Temperature of Start-Up	45°C
Input Voltage Parameters	750VDC
High Input Voltage Shutdown Instantaneous	1300> VDC
High Input Voltage Timed Shutdown (t)	1270-1080VDC
Time to Shutdown (t)	Controlled Via Temperature Measurement (s)
Start-Up Voltage	390VDC
Low Input Voltage Instantaneous Shutdown	370VDC
Time to Shutdown (t)	500ms
Output Voltage Parameters	
Output Voltage	400VAC (Line to Line)
Output Under-Voltage Shutdown	<85% of Setting 1000ms
Warning Voltage (Output Alarm)	<90% of Setting 200ms
Initial Start-Up Frequency	5Hz
Soft Start Duration	1 Cycle
Ramp-Up V/F	1 Hz/Cycle
Output Current Parameters	
Maximum Continuous Output Current	9.24A
Warning Current (Output Alarm)	8.8A
Maximum Overload I^2t	See Figure Below
Time Between Restart Attempts	4000ms
Number of Attempts of Consecutive Overload	5
Working Failures and Reset	
Lock for Continuous Overload or Internal Failure	Unlimited Time
Reset Time by Input Disconnection	>2min

Configurable parameters underlined

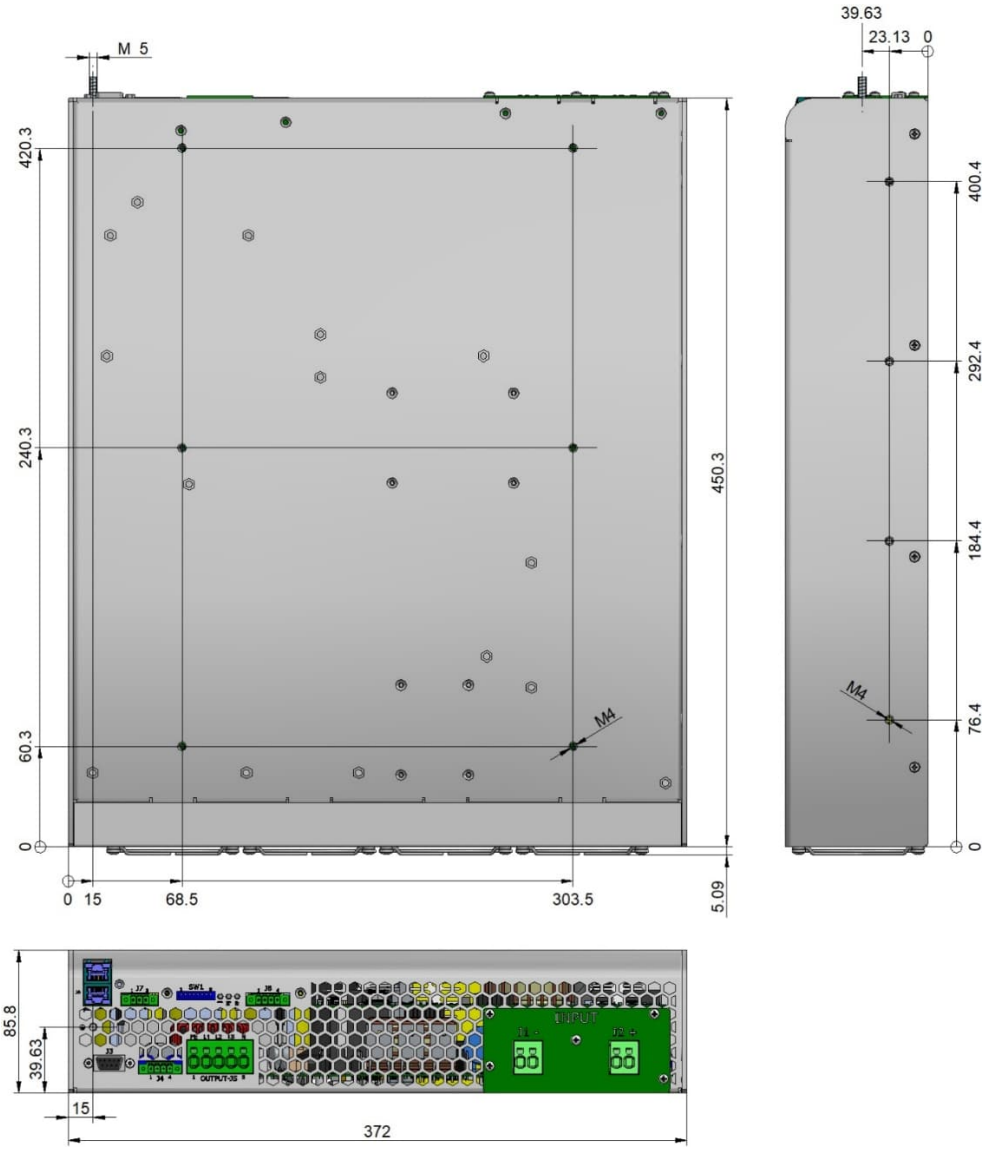
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OVERLOAD PROTECTION

Protection Against Overloads and Short-Circuit	By Current Limiting at Iopk By I^2t. The Unit Shutdown when the Current-Time is over the Continuous Operation Curve	
Overload Protection Recovery	Every 4 Seconds After Shutdown, the Unit tries to Restart Up to 5 Times. If the Overload Persists, the Unit Reminds Shutdown Until an Input Reconnection	

DIMENSION & PHYSICAL CHARACTERISTICS

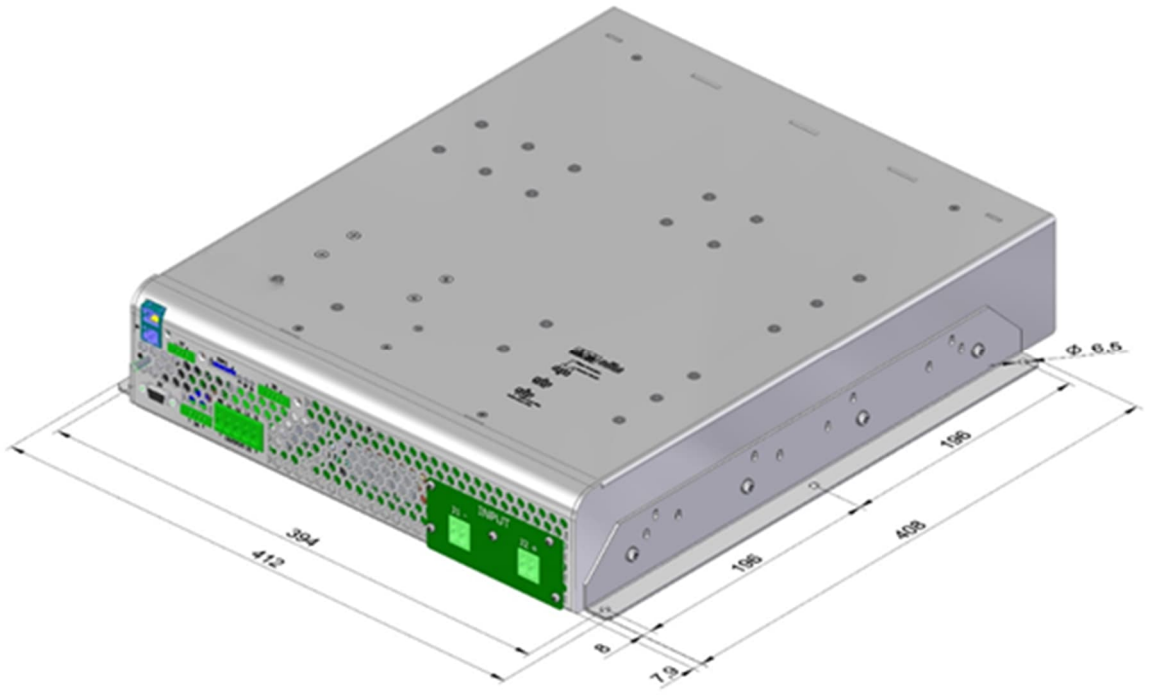
Parameter	Type	Value
Weight		<12000g
Dimensions (H x W x D)		85.8 x 372x 450.3 mm



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ACCESSORIES

Description	Notes	Code
Mounting Brackets Kit	Contains Two Brackets and Screws	NP-9282



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ANNEXE

Applicable values for the different sections of the norm 61287-1: 2015

4.2.2	Working altitude	Up to 2000m
4.2.3	Ambient temperature	Class T3 inside vehicle compartment (-25 to 55°C full load) Class T3 Inside cubicle (55 to 70°C load <62.5%)
4.2.5	Shocks and vibrations	According EN61373:2010 Category 1 class B

Test	Norm	Port	Frequency	Limits
Radiated emissions	IEC55016	Case	30MHz…230MHz	40dB(µV/m) Qpk at 10m
			230MHz…1GHz	47dB(µV/m) Qpk at 10m
			1…3GHz	Do not apply
			3…6GHz	Internal freq. < 108MHz
Conducted emissions	IEC55016	Input	150kHz…500kHz	99dB(µV) Qpk
			500kHz…30MHz	93dB(µV) Qpk

4.5.3.19 EMC Electromagnetic Compatibility

EN50121-3-2:2016
IEC62236-3-2:2018

Test	Norm	Port	Severity	Conditions	P
Electrostatic discharge	IEC61000-4-2	Case	±8kV	Air (isolated parts)	B
			±8kV	Contact (conductive parts)	
Radiated high frequency	IEC61000-4-3	X/Y/Z Axis	20V/m	0.08…1.0GHz M. 80% 1kHz	A
			10V/m	1.4…2.1GHz M. 80% 1kHz	
			5V/m	2.1…2.5GHz M. 80% 1kHz	
			3V/m	5.1…6Ghz M. 80% 1kHz	
Fast transients	IEC61000-4-4	Input	±2kV	Tr/Th: 5/50 ns	A
		Output	±2kV		
		Signal	±2kV		
		PE	±1kV		
Surge	IEC61000-4-5	Input L to L	±1kV	Tr/Th: 1.2/50µs	B
		Input L to PE	±2kV		
Conducted RF	IEC61000-4-6	Input	10V	0.15...80MHz M. 80% 1kHz	A
		Output	10V		
		Signal	10V		
		PE	10V		
Magnetic field	IEC61000-4-8	X/Y/Z Axis	300A/m	0Hz, 16.7Hz, 50/60Hz	A

P= Performance criteria, L= Line, PE= Protective Earth

4.5.2.3 Tests list

1 Visual Inspection	Routine
2 Verification of size and tolerance	Type
3 Weight	Type
4 Marking inspection	Routine
5 Functional test on refrigeration system	Type
6 Sealing test	N/A
7 Grade protection test	N/A
8 Dielectric strength test	Routine
9 Resistance to isolation test	Type
10 Test for mechanical and electrical protection and for the measurement equipment	N/A
11 Low load test	Type
12 Switching test	Routine
13 Measurement of acoustic noise	Routine
14 Heating test	Type
15 Power loss test	Type
16 Power overvoltage test and energy transients	Type
17 Fast changes in load test	Type
18 Inspection of safety requirements	Type
19 Shock and vibration test	Type
20 EMC test	Type
21 Step in power line test	Type
22 Interruption of voltage supply test	Type
23 Current Sharing	Type

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