Technical Data Sheet

IAC3000 RANGE
2400…3000W / DC/AC INVERTER

FEATURES

- Sine Wave Output Voltage
- Suitable for Motors Control
- Selectable Output Frequency: 50/60Hz
- Adjustable Output Voltage
- High Input-Output Isolation 3000Vrms
- Remote Inhibit
- Configurable Input: Reverse or Mid Power
- Remote Control Via RS232
- Alarms by Isolated Relay Contacts
- Remote Off Opto-Coupled
- Optional Railway Version EN50155
- Fire and Smoke



APPLICATION



SAFETY & EMC

RoHS2 compliant 10 from 10 | Reach compliant | WARRANTY 3 YEARS | WARRANTY 5 YEARS | RAILWAY CERTIFIED EN50155 for use on rolling stock

DESCRIPTION

The IAC1500 consists of single phase sine-wave DC/AC inverts with galvanic isolation between input and output.
The unit allows:

- Select 50/60Hz by means of DIP-switch
- Select local / remote (RS-232) by means of DIP-switch
- Shutdown applying voltage on pins 3 and 4 of signal connector
- Local signalizations of Output OK by means of green LED
- Alarm. Open contacts when output voltage is not OK
- Set and monitor parameters via RS-232
- Local Alarm. Red LED ON when:
  - Output Voltage is not OK
  - Output current > output current alarm
  - Input voltage out of margins
  - Unit shutdown by over-current or remote OFF

The IAC1500 are equipped with maximum power protection as well as maximum output peak current protection. This protects the unit 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

	24VDC 16.8…30V	36VDC 25.2…45V	48VDC 33.6…60V	72VDC 50.4…90V	110VDC 77…138V
230VAC	IAC3000-7413 2400W	Available Under Request*	Available Under Request*	Available Under Request*	IAC3000-7417 3000W
400VAC	IAC3000-7403 2400W	IAC3000-7404* 3000W	IAC3000-7405 3000W	IAC3000-7406 3000W	IAC3000-7407 3000W

*References subject to special MOQs and lead times.

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IAC3000 RANGE
2400…3000W / DC/AC INVERTER

BASIC CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.
Input				
Input Voltage Range		-30% Vin nom		+25% Vin nom
Maximum Input Ripple	Vrms, 100Hz		5% Vin nom	
Output				
Nominal Output Voltage (Von)	See table			
Output Voltage Range	Models of 230VAC Output Via RS232	50VAC		230VAC
	Models of 400VAC Output Via RS232	50VAC		400VAC
Output Frequency	Via DIP-switch		50/60H	
	Via RS232	5Hz		75Hz
Output Wave Distortion THD	16 Samples Average		<2%	
Output HF Ripple			<2.5%	
Line Regulation	ΔVin -25%…+25%		<2%	
	ΔVin -30%…+25%		<10%	
	ΔVin -40%…+40%(100ms)		<20%	
Load Regulation			<4%	

ENVIRONMENTAL

Parameter	Conditions	Value	
		Option B and T	Option L
Operating Temperature Range	Full Load	-25°C to 55°C (EN50155 OT1)	-40°C to 55°C (EN50155 OT2)
	50% Load	-25°C to +70°C (EN50155 OT3)	-40°C to +70°C (EN50155 OT4)
	25% Load	-25°C to +85°C (EN50155 OT5)	-40°C to +85°C (EN50155 OT6)
Storage Temperature		-25°C to +80°C	-40°C to +80°C
Maximum Altitude	At Full Load	2000m	
	At 95% of Load	2500m	
Cooling	Controlled Internal Fan		
Relative Humidity		5…95%	
Shock and Vibration	According to EN61373:2010 + Corr 1: 2010 Category 1 Class B Body Mounted		
MTBF (MIL-HDBK-217-E; Gb, 25°C)		100.000h	

SAFETY AND CERTIFICATION

Certification (Type)	Standard	
	Option B and T	Option L
Dielectric Strength: Input / Output	3000Vrms/50Hz/1min	3000Vrms/50Hz/1min
Dielectric Strength: Output / PE	1500Vrms/50Hz/1min	2500Vrms/50Hz/1min
Dielectric Strength: Input / PE	1000Vrms/50Hz/1min	2500Vrms/50Hz/1min
Dielectric Strength: Signals (Note-2) / PE, Input	1500Vrms/50Hz/1min	1500Vrms/50Hz/1min
Dielectric Strength: Signals (Note-2) / Output	1500Vrms/50Hz/1min	2500Vrms/50Hz/1min
Safety According	EN62368-1	
Fire and Smoke	EN45545-2(only for options T and L, railway version)	

EMC

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

PROTECTIONS

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

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IAC3000 RANGE
2400…3000W / DC/AC INVERTER

CONTROL

Type	Description
Output OK LEC	Green
Input OK LED	Green
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…154 VDC (acc. to EN50155), Impedance >35kΩ
Configurable Input (reverse rotation or mid-power)	ON: Applying 15…154VDC (acc. to EN50155), Impedance >35kΩ

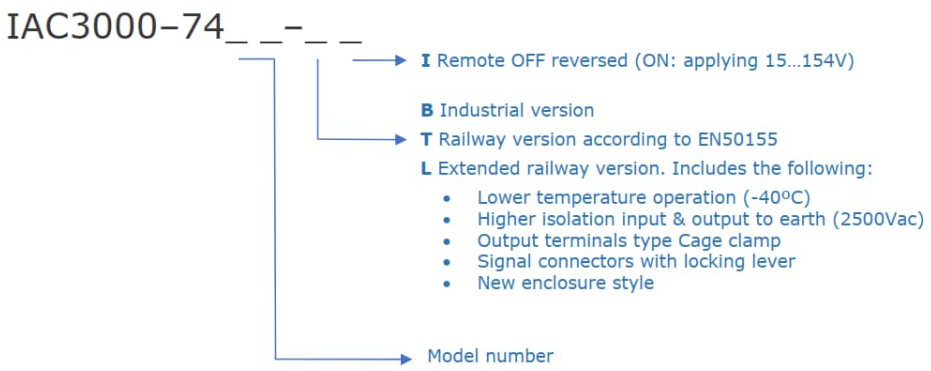
Note-1: Is not recommended to handle connectors below -25°C

Note-2: Signals include RS-232 port, control inputs and alarms outputs

ORDERING CODES

Model	Input Voltage DC [V]	Input Voltage Range [V]	Output Voltage AC [V]	Output Current [A]	Active Output Power [W]	Appar. Output Power [VA]	Output Peak Curr. 10ms		Efficiency [%] *	No Load Input Current [A]*
							5s [Arms]	(Iopk) 10ms [Apk]		
IAC3000-7403	24	16.8-30	400	3.46	2400	2400	5.25	11	89	<1.58
IAC3000-7404*	36	25.2-45	400	4.33	3000	3000	6.6	11	90	<1.05
IAC3000-7405	48	33.6-60	400	4.33	3000	3000	6.6	11	91	<0.79
IAC3000-7406	72	50.4-90	400	4.33	3000	3000	6.6	11	91	<0.52
IAC3000-7407	110	77-138	400	4.33	3000	3000	6.6	11	92	<0.34
IAC3000-7413	24	16.8-30	230	6.00	2400	2400	9.0	19	89	<1.58
IAC3000-7417	110	77-138	230	7.55	3000	3000	11.3	19	91	<0.34

*References subject to special MOQs and lead times



Options B and T

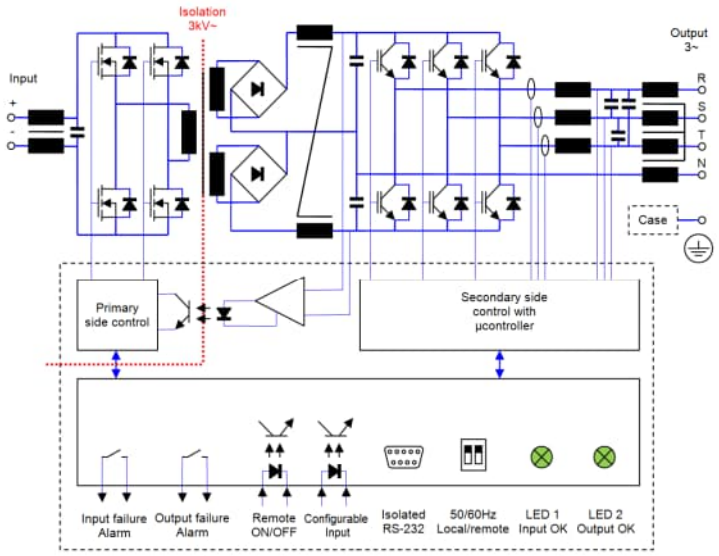


Option L

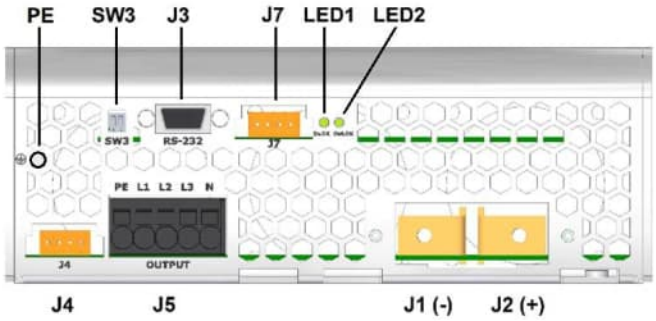


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BLOCK DIAGRAM



CONNECTIONS

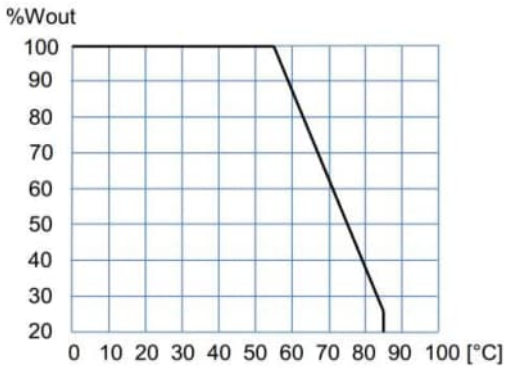


CONNECTIONS

Connection	Terminal	Notes
J1	-Vin	Terminals M6 (Rec. torque 6 Nm)
J2	+Vin	
PE	Protective Earth	Stud M5 (Rec. torque 3.8 Nm)
J5-1	Protective Earth	Cables 1.5…2.5mm²
J5-2	Output R	
J5-3	Output S	
J5-4	Output T	
J5-5	Output Neutral	
J4-1	+Configurable Input	Cables 0.25…1.5mm² Option B and T Phoenix Contact MC1.5/4-G-3.81 Includes Female: MC1.5/4-ST-3.81 Option L Wago 734-264 Includes Female: 734-204/037-000
J4-2	-Configurable Input	
J4-3	+Remote ON/OFF	
J4-4	-Remote ON/OFF	
J7-1	Output Alarm	
J7-2	Output Alarm	
J7-3	Input Alarm	
J7-4	Input Alarm	
J3-2	RS-232 Rx	Sub-DB9 Female
J3-3	RS-232 Tx	
J3-5	RS-232 GND	
J3 Rest	Not Connected	
SW3	Options Switch	ON is Position Down

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POWER DERATING vs AMBIENT TEMPERATURE



INSTALLATION

- The unit has 4 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 50mm).
- Make connection as shown in the figure
- The ground connection can be made through the terminal strip (J5-1) or the ground stud on the front side indistinctly
- 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
- Use cables of adequate cross-sections to connect inputs and outputs. The following table lists the maximum currents and the minimum cross-sections for the cables used for each power connection.

	Input 24V	Input 36V	Input 48V	Input 72V	Input 110V	Output 230V	Output 400V
Max. Current	140A	130A	100A	66A	44A	7.55A	4.4A
Cable Cross-Section	50mm²	50mm²	25mm²	16mm²	10mm²	1.5mm²	1.5mm²

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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, 19200Bauds, Parity None, 8Bits, 1Bit Stop

TABLE

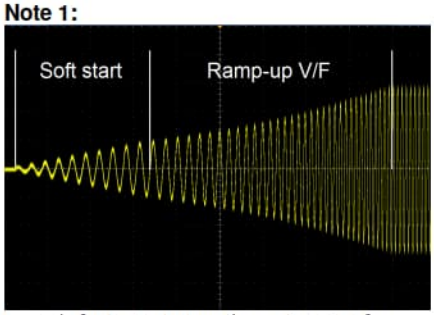
Header		Function	Parameter		Returns	Description
P	R	L	V		PTV■■■.■	Input Voltage in Volts
			v		PTv■■■.■	Input Voltage Ripple in Volts
			U		PTURS=■■■■[13]UST=■■■■[13] URT=■■■■	Output voltage in Volts RMS ([13]=Char 13 of ASCII Code)
			I		PTIR=■■.■■[13]IS=■■.■■[13] IT=■■.■■	Output Current in Amps RMS ([13]=Char 13 of ASCII Code)
			T		PTT■■■.■	Internal Temperature in K
			F		PTF■■■.■	Nominal Output Frequency in Hz
			f		PTf■■■.■	Actual Output Frequency in Hz
			u		PTu■■■.■	Actual Output Voltage Set-Point in V
			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 in Vrms (Vo) (Output Must be Stopped) 050.0 ≤ ■■■.■ ≤ 232.0 (Models of 230V Output) 050.0 ≤ ■■■.■ ≤ 405.0 (Models of 400V Output)
			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	*Charge 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

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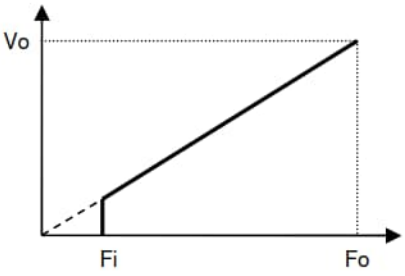
			2	■■■.■	OK/ERR	Set a New Output Voltage in Volts (Output must be Run and Not Stored in Memory) 050.0 ≤ ■■■.■ ≤ 232.0 (Models of 230V Output) 050.0 ≤ ■■■.■ ≤ 405.0 (Models of 400V Output)
			3	■■■.■	OK/ERR	Set a New Output Frequency in Hz in mode V/F (Output must be Run and Not Stored in Memory) 005.0 ≤ ■■■.■ ≤ 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)

*Parameters are only useful from version 6.0 of firmware

Note 1:

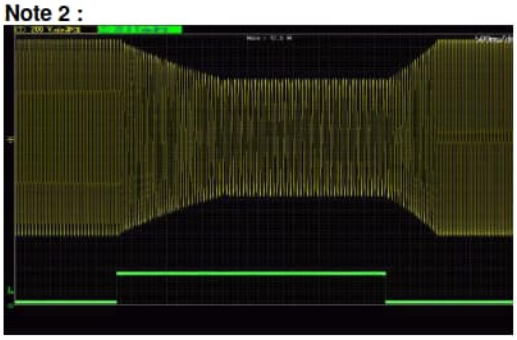


Example for N=1: start-up time = N x 1.7 s for changes from 16 Hz to 50 Hz



Mode V/F curve

Note 2 :



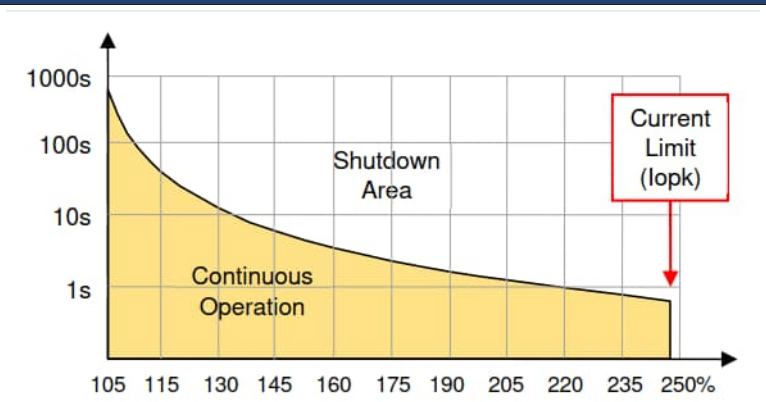
Example for change from 50Hz / 400 V to 30 Hz and 240 V with ramp-down of 2 cycles / Hz and ramp-up de 1 Cycle/Hz. Yellow: output voltage and Green: Mid-Power input signal

WORKING PARAMETERS					
Thermal Protection	7403…7417				
Internal Warning Temperature	82°C				
Internal Shutdown Temperature	98°C				
Internal Restart Temperature	87°C				
Internal Temperature of Start-Up	45°C				
Input Voltage Parameters	7403 7413	7404	7405	7406	7407 7417
High Input Voltage Shutdown Instantaneous	33.6Vdc	50.4 Vdc	67.2 Vdc	100.8 Vdc	154.0 Vdc
High Input Voltage Timed Shutdown (t) (Input Alarm)	31.2 Vdc	46.8 Vdc	62.4 Vdc	93.6 Vdc	143.0 Vdc
Low Start-Up Input Voltage	16.8 Vdc	25.2 Vdc	33.6 Vdc	50.4 Vdc	77.0 Vdc
Low Input Voltage Timed Shutdown (t) (Input Alarm)	<16.8 Vdc	<25.2 Vdc	<33.6 Vdc	<50.4 Vdc	<77.0 Vdc
Low Input Voltage Instantaneous Shutdown	<14.4 Vdc	<21.6 Vdc	<28.8 Vdc	<43.2 Vdc	<66.0 Vdc
Time to Shutdown (t)	500ms				
Output Voltage Parameters	7403…7407			7413…7417	
Output Voltage	400 VAC			230 VAC	
Output Under-Voltage Shutdown	<85% of Setting 1000ms				
Warning Voltage (Output Alarm)	<90% of Setting 200ms				
Initial Start-Up Frequency	16Hz				
Soft Start Duration	10 Cycles				
Ramp-Up V/F	1 Hz/Cycle				
Output Current Parameters	7403	7404…7407		7413	7414…7417
Maximum Continuous Output Current	3.46 A	4.33 A		6.30 A	7.55 A
Warning Current (Output Alarm)	3.46 A	4.33 A		6.30 A	7.55 A
Maximum Overload I^2t	See Figure Below				
Time Between Restart Attempts	4000ms				
Number of Attempts of Consecutive Overload	5				
Working Failures and Reset	7403…7417				
Lock for Continuous Overload or Internal Failure	Unlimited Time				
Reset Time by Input Disconnection	>2 min				

Configurable parameters underlined

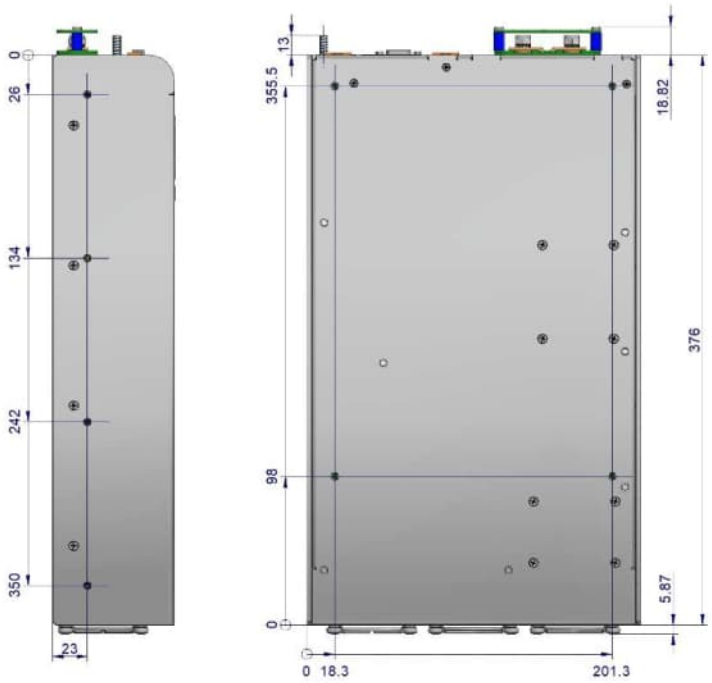
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OVERLOAD PROTECTION

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	

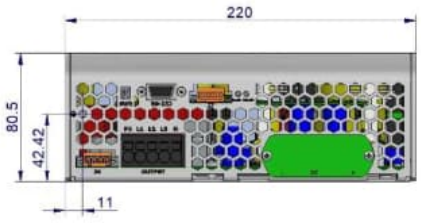
DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Weight		3800g



Remarks:

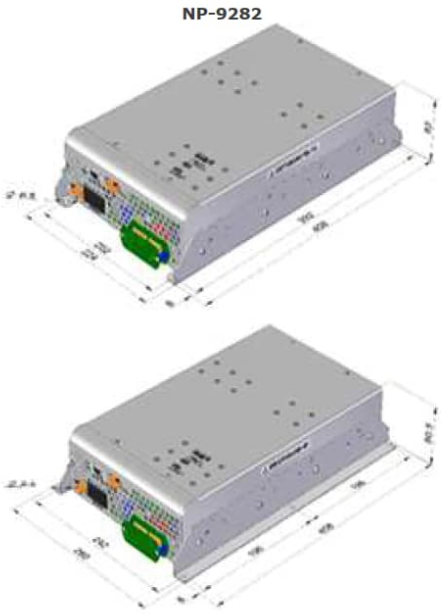
- The fixing holes are M4. Its maximum allowable depth penetration is 4.5mm.
- Elcosure of models B, T and L have the same

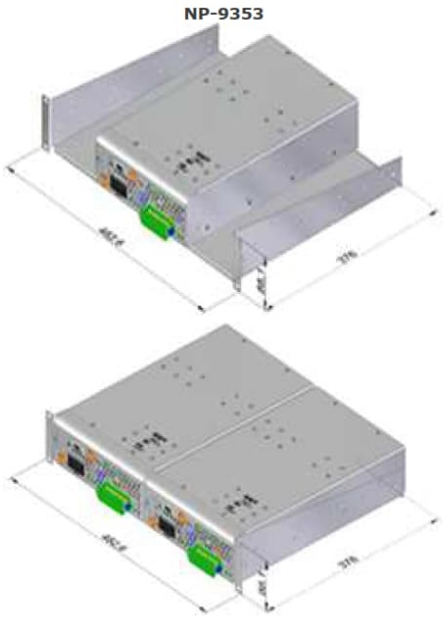


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ACCESSORIES

Description	Notes	Code
Mounting Brackets Kit	Contains Two Brackets and Screws	NP-9282
2U 19" Rackmount Tray Kit	It Allows to Install One or Two IAC3000	NP-9353





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ANNEX

Applicable values for the different sections of the norm EN50155: 2017

4.3.1	Working Altitude	Up to 2000m at full load Up to 2500m at 95% of load
4.3.2	Ambient Temperature	For options B and T: Class OT1 (-25 to 55 °C): load < 100 % For options B and T: Class OT3 (-25 to 70 °C): load <62.5 % For options B and T: Class OT5 (-25 to 85 °C): load <25 % For option L: Class OT2 (-40 to 55 °C): load < 100 % For option L: Class OT4 (-40 to 70 °C): load <62.5 % For option L: Class OT6 (-40 to 85 °C): load <25 %
4.3.3	Switch-On Extended Operating Temp.	ST1
4.3.4	Rapid Temperature Variation	H1
4.3.5	Shocks And Vibrations	According EN61373:2010 + Corr 1:2011 Category 1 class B
4.3.6	EMC Electromagnetic Compatibility EN50121-3-2:2016	

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 & Output	150kHz…500kHz	99dB(µV) Qpk
			500kHz…30MHz	93dB(µV) Qpk

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

4.3.7	Relative Humidity	Up to 95%	
5.1.1.2	DC Power Supply Range	From 0.70 to 1.25 Un continuous	
5.1.1.3	Temporary DC Power Supply Fluctuation	From 0.60 to 1.40 Un 0.1s From 1.25 to 1.40 Un 1s without damage	
5.1.1.4	Interruptions Of Voltage Supply	Class S1 (without interruptions)	
5.1.1.6	Input Ripple Factor	10% peak to peak with a DC Ripple Factor of 5 %	
5.1.3	Supply Change-Over	0,6 Un duration 100 ms (without interruptions). Performance criterion A	
7.2.7	Input Reverse Polarity Protection	By External fuse or using accessory ACI-3000	
10.7	Protective Coating For PCB Assemblies	Class PC2	
13.3	Tests List	1 Visual Inspection 2 Performance test 3 Power supply test 4 Insulation test 5 Low temperature storage test 6 Low temperature start-up test 7 Dry heat test 8 Cyclic damp heat test 9 Salt mist test 10 Enclosure protection test (IP code) 11 EMC test 12 Shocks and vibrations test 13 Equipment stress screening test 14 Rapid Temperature variation test	Routine Routine Routine Routine Type Type Type Type - - Type Type Routine: 24h at 40°C and load 100% -

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