

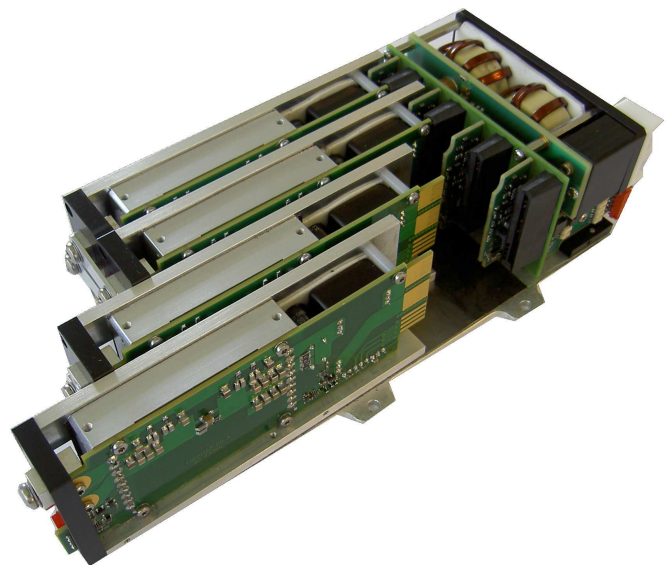
# GPAck Configurable Power Supply



- Plug and Play Configurable
- No fan for better reliability
- Compact size
- Wide input voltage range :
  - 9-45Vdc transient 60Vdc/100ms
  - 16-80Vdc transient 100Vdc/100ms
- Reverse polarity protected
- Up to 4 independent outputs
- Serial/Parallel outputs
- EMI compliant with MIL-STD-461
- No load to full load operation
- Up to 88% efficiency

# 1- Contents

- Section 1 : Contents
- Section 2 : Introduction
- Section 3 : GPack Part Numbering
- Section 4 : GPack Chassis Block and Input Specifications
  - 4-1 : General
  - 4-2 : Connectors and Pins Assignment
  - 4-3 : Pins Description
    - 4-3-1 Power Connector I
    - 4-3-2 Monitoring and Controls Connector J
  - 4-4 : Input Electrical Specifications
  - 4-5 : Output Power Derating versus Input Voltage
  - 4-6 : Description of Input Protections
    - 4-6-1 Fuse Protection
    - 4-6-2 Undervoltage Lock-out
    - 4-6-3 OTP Flag Operation
  - 4-7 Functional Description
    - 4-7-1 General On/Off Operation
    - 4-7-2 On/Off Channel Operation
    - 4-7-3 Synchronization Operation
- Section 5 : GPack Output Rail and Output Specifications
  - 5-1 : General
  - 5-2 : Connector and Pins Assignment
  - 5-3 : Pins Description
  - 5-4 : Output Electrical Specifications
    - 5-4-1 : Output Rail 5 VDC
    - 5-4-2 : Output Rail 12 VDC
    - 5-4-3 : Output Rail 15 VDC
    - 5-4-4 : Output Rail 24 VDC
  - 5-5 : Description of Output Rail Protections
    - 5-5-1 Output Over Current Protection
    - 5-5-2 Output Over Voltage Protection
    - 5-5-3 Over Temperature Protection
  - 5-6 : Functional Description
    - 5-6-1 Senses
    - 5-6-2 Trim
    - 5-6-3 Itrim
    - 5-6-4 Active Current Sharing
- Section 6 : GPack Thermal Characteristics
- Section 7 : GPack Environmental Qualification
  - 7-1 Electromagnetic Interference
  - 7-2 Climatic and Mechanical Qualifications
- Section 8 : GPack Output Configurations
  - 8-1 Self-Configured
    - 8-1-1 Self Configured Output in Parallel
    - 8-1-2 Self Configured Output in Series
    - 8-1-3 Self Configured Output s in Series and Parallel
- Section 9 : Overall Dimensions
- Section 10 : Product Marking



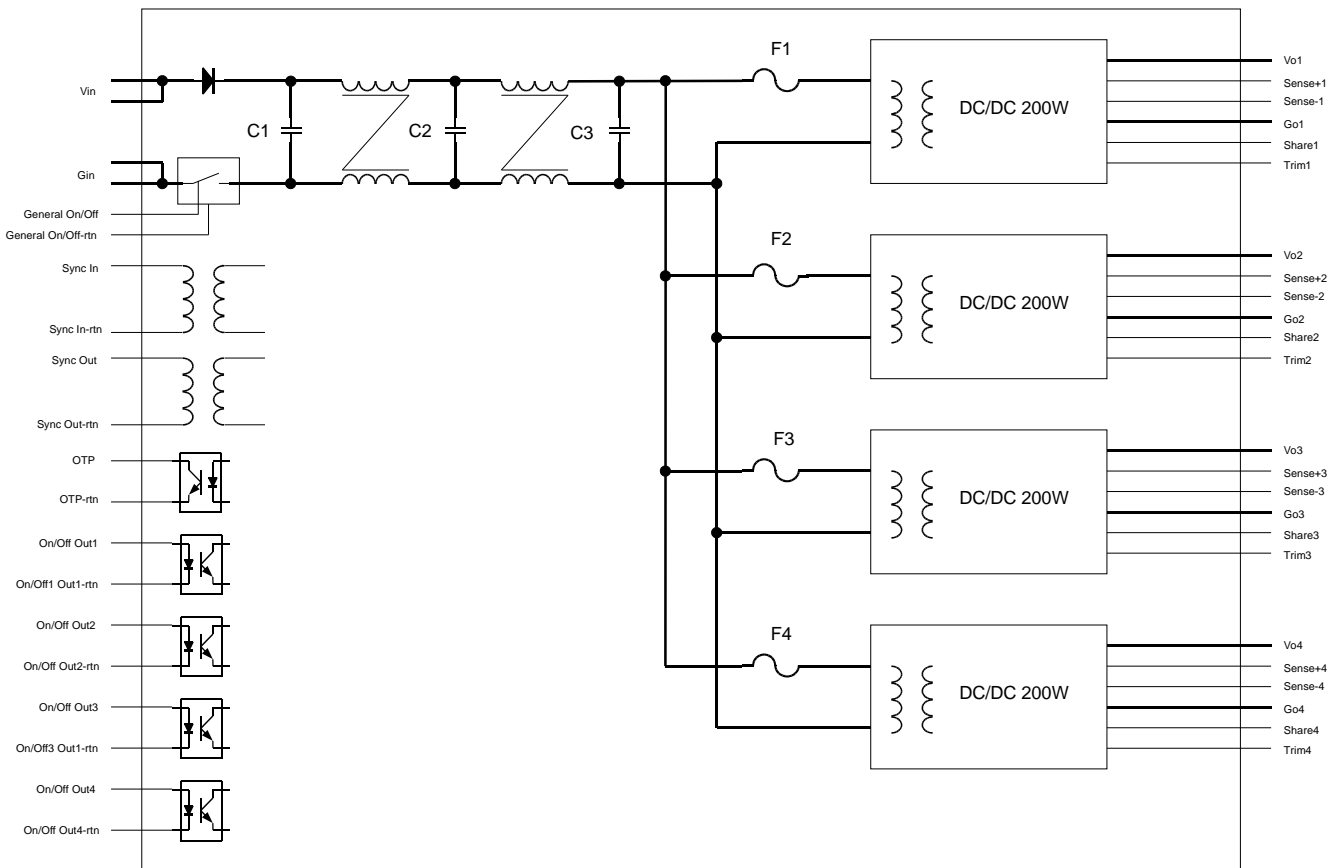
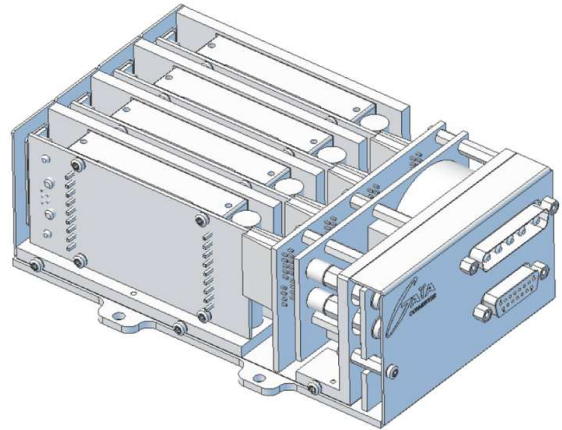
## 2- Introduction

The GPack family of power supply provides turnkey solution for 24/28/48Vdc applications in avionics, naval or military field in compliance with DO-160 and MIL-STD-704 standards. It provides up to 800W power in an extremely compact 200 x 100 x 60 mm package without fan.

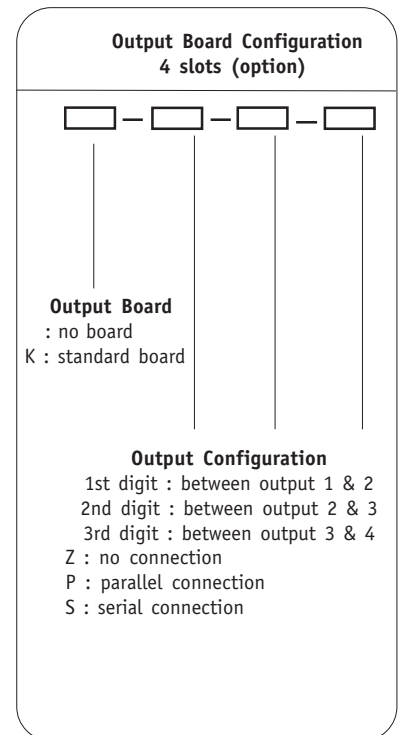
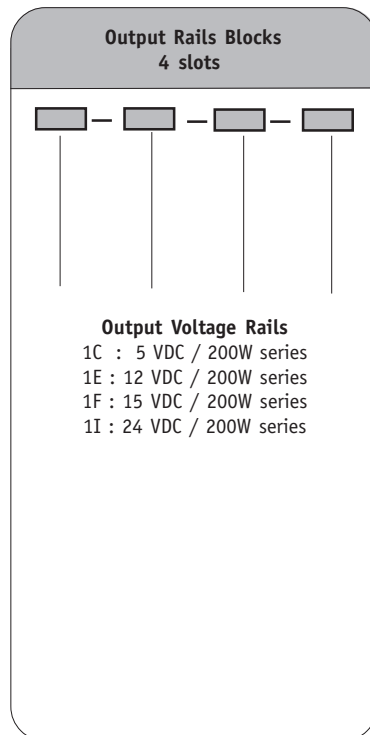
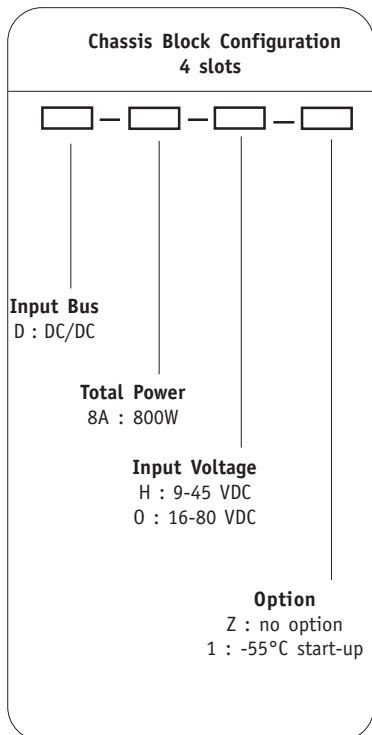
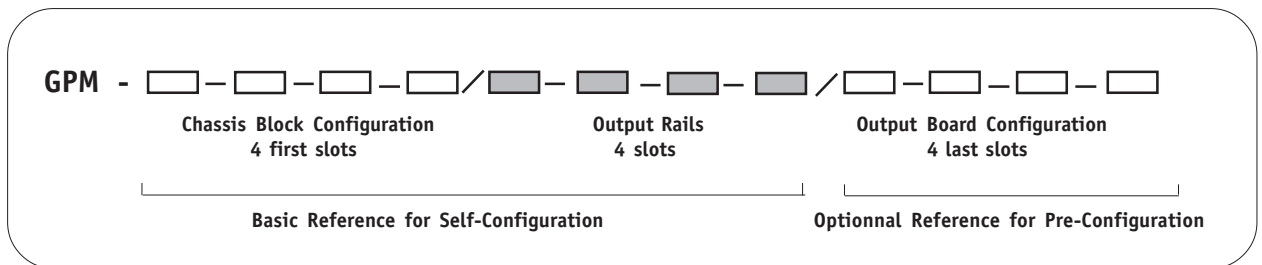
The Gpack can be fully configured with 4 x 200W slots using standard GAIA Converter DC/DC module which can be connected in parallel or in series directly by user or factory configured for maximum flexibility and versatility. Up to 3 Gpacks can be connected in parallel to build a 2.4KW power block.

The GPack includes a complete set of controls and monitoring functions : general remote on/off control, local on/off on each output for sequencing, synchronization function to external clock or for several Gpacks together.

Each output can be adjusted through a trim function or serialized or parallellized using sense, and share functions. A reverse polarity protection is also provided The following illustrations show the GPack internal hardware view and the block diagram.



### 3- GPack Part Numbering



4

Rails are sorted out from the lowest voltage on the left to the highest voltage on the right

Option Codes Description :  
1 : option for -55°C start up operation

Examples :

GPM - D - 8A - H - Z / 1C - 1C - 1E - 1F

for a Gpack total power 800W, input range 9-45 Vdc with 4 outputs 5Vdc, 5Vdc, 12Vdc and 15 Vdc with no output board configuration.

GPM - D - 8A - O - 1 / 1C - 1C - 1E - 1F / K - P - Z - Z

for a Gpack total power 800W, input range 16-80 Vdc, -55°C screening with 4 outputs 5Vdc 5Vdc, 12Vdc and 15Vdc with a standard output board configured with both 5Vdc connected in parallel to achieve 400W power, 12Vdc and 15Vdc independant.



## 4- GPack Chassis Block and Input Specifications

### 4-1 General

The GPack chassis block is a front-end mechanical receptacle designed to receive the different output rails in order to achieve the fully configurable power supply.

The GPack chassis block includes mechanical casing and electrical functions.

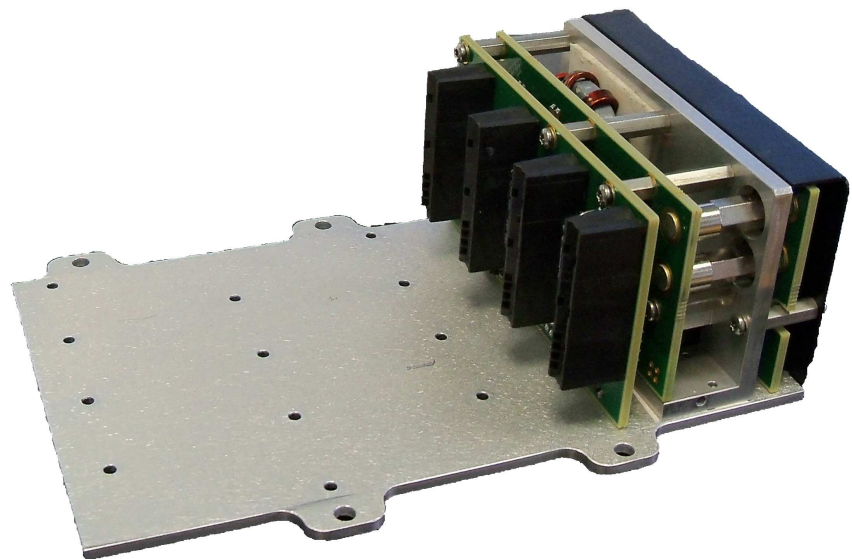


The GPack chassis block includes :

- A mechanical enclosure with an aluminium machined baseplate that provides the best condition for an optimum thermal management.
- Five interleaved holes to ease attachment with 4 mm screws and contribute to space optimization.
- A mechanical casing in black painting folded plate.

- 2 input connectors :
- A power connector I : SUB-D 5W5 with 5 pins male
- A monitoring & controls connector J : SUB-D with 15 pins female
- A low loss front-end board assembly including EMI filter, reverse polarity protection, soft start and global monitoring and controls

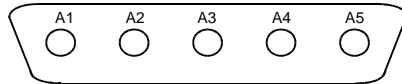
The following picture shows an internal view of the GPack chassis block.



## 4- Chassis Block and Input Specifications (continued)

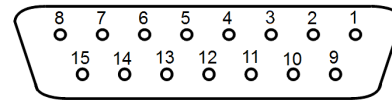
### 4-2 Connectors and Pins Assignment

Power Connector I



Pin	Pin Assignment
A1	+ Input (Vin)
A2	+ Input (Vin)
A3	- Input (Gin)
A4	- Input (Gin)
A5	Do not connect

Monitoring and Controls Connector J



Pin	Pin Assignment	Pin	Pin Assignment
1	General On/Off		
2	OTP flag	9	General On/Off return
3	On/Off output 1	10	OTP flag return
4	On/Off output 2	11	On/Off output 1 return
5	On/Off output 3 return	12	On/Off output 2 return
6	On/Off output 3	13	Synchro in
7	On/Off Output 4 return	14	Synchro return
8	On/Off Output 4	15	Synchro Out

### 4-3 Pins Description

#### 4-3-1 Power Connector I

Vin : (1),(2): Bus input pin, isolated from output and chassis. It is recommended to connect both pins.

Gin : (3),(4) : Bus return input pin, isolated from output and chassis. It is recommended to connect both pins.

#### 4-3-2 Monitoring and Controls Connector J

General On/Off (1) & Return (9): General On/Off used to disable the complete Gpack. It must be controlled by an external dry contact like a switch or relay contact.

secondary and chassis is 500Vdc. An appropriate current flowing through this pin to return pin will switch off channel number 3.

OTP flag (2) & Return (10): Over temperature Protection flag, is an active low open collector output. The pins are connected to the isolated phototransistor of an internal optocoupler. Insulation with respect to primary, secondary and chassis is 500Vdc.

On/Off Output 4 (8) & Return (7): Individual on/off control 4, gives access to the isolated LED anode of an internal opto-coupler. Insulation with respect to primary, secondary and chassis is 500Vdc. An appropriate current flowing through this pin to return pin will switch off channel number 4.

On/Off Output 1 (3) & Return (11): Individual on/off control 1, gives access to the isolated LED of an internal opto-coupler. Insulation with respect to primary, secondary and chassis is 500Vdc. An appropriate current flowing through this pin to return pin will switch off channel number 1.

Synchro in (13) & Return (14) : is an input used to synchronize the GPack to an external signal. It is isolated from internal circuitry with an isolating transformer. Return is common with Synchro Out. Insulation with respect to primary, secondary and chassis is 500Vdc.

On/Off Output 2 (4) & Return (12): Individual on/off control 2, gives access to the isolated LED anode of an internal opto-coupler. Insulation with respect to primary, secondary and chassis is 500Vdc. An appropriate current flowing through this pin to return pin will switch off channel number 2.

Synchro out (15) & Return (14) : is an output that delivers the internal clock that synchronizes the 4 channels of the Gpack. It is isolated from internal circuitry with an isolating transformer. Return is common with Synchro In. Insulation with respect to primary, secondary and chassis is 500Vdc.

On/Off Output 3 (6) & Return (5): Individual on/off control 3, gives access to the isolated LED anode of an internal opto-coupler. Insulation with respect to primary,

## 4- Chassis Block and Input Specifications (Continued)

### 4-4 Input Electrical Specifications

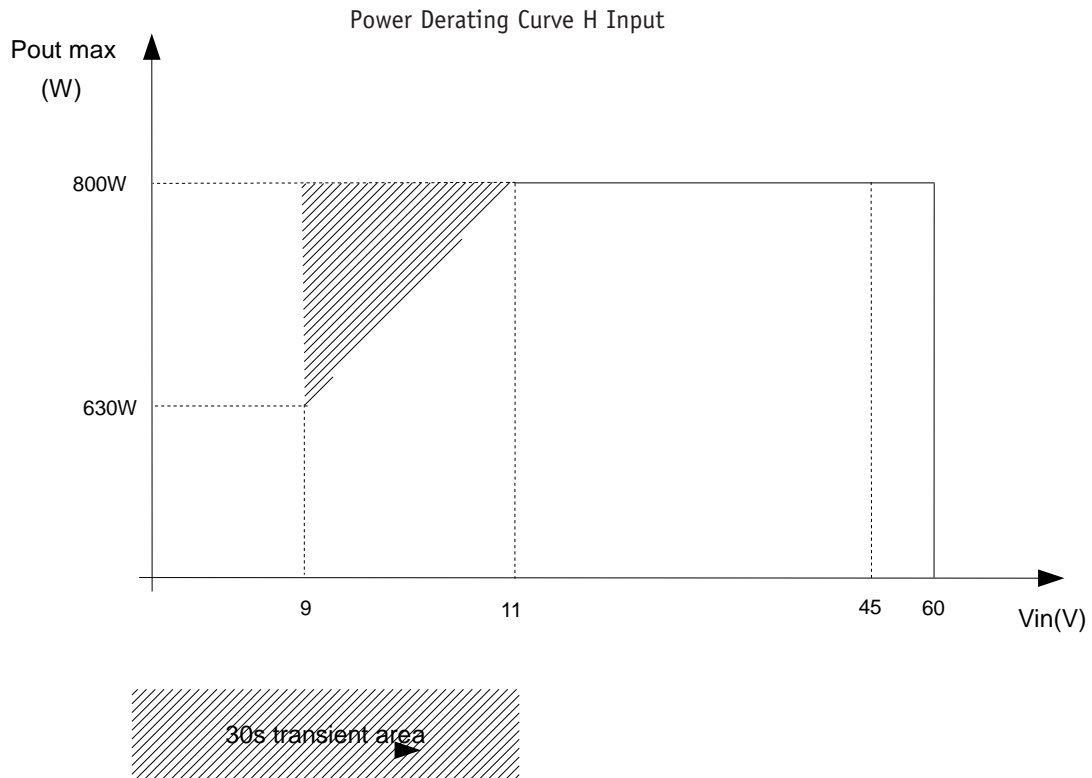
Data are valid at +25°C, unless otherwise specified.

Parameter	Conditions	Limit or typical	Units	H Input	O Input
<b>Main Power Input</b>					
Nominal input voltage	Full temperature range between phase and neutral	Nominal	VDC	20	28
Permanent input voltage range (Ui)	Full temperature range	Min. - Max.	VDC	9 - 45	16 - 80
Undervoltage lock-out	Turn on voltage	Maximum	VDC	TBD	TBD
	Turn off voltage	Maximum	VDC	TBD	TBD
Transient input voltage	Full temperature range compliant with : MIL-STD-704C/D/E/F DO-160C/D/E/F/G	Min. - Max.	VDC/ms	60 / 500	80 / 500
		80V or 50V/75ms 80V/100ms		/	Compliant
Spike input voltage	Full temperature range compliant with : MIL-STD-461C CS06 DO-160C/D/E/F/G	Min. Max. +200V/0,15µs +/-600V/10µs/50 Ohm		TBD	TBD
Maximum input current	Full temperature range Ui min. to max.	Permanent Mode Max.	A	70	70
		Transient Mode 30s	A	100	100
Start up time	Ui min. to max., at full load with resistive load	Maximum	ms	50	50
No load input current	Ui nominal, No load	Maximum	mA	100	100
Current in inhibit mode	Ui nominal, General on/off activated	Maximum	µA	200	200
Reverse voltage	Full temperature range between -Vin and +Vin	Maximum	VDC	50	100
Isolation	Input to output Input to Case	Nominal	VDC	1 500	1 500
		Minimum	VDC	500	500
<b>Monitoring &amp; Controls</b>					
General On/Off dry contact resistance	Ui min. to max., Full load	Maximum	Ohm	20	20
General On/Off voltage	Voltage across open contact	Maximum	VDC	20	20
On/Off rail 1, 2, 3, 4 input current	Biased input	Nominal	mA	10	10
		Maximum	mA	20	20
On/Off rail 1, 2, 3, 4 biased voltage	Biased input	Maximum	VDC	1,3	1,3
OTP flag max. pull-up voltage	Open state	Maximum	VDC	50	50
OTP flag sink current	Active state	Typical	mA	5	5
		Maximum	mA	10	10
OTP flag saturation voltage	Active state	Maximum	VDC	1	1
Synchro in voltage	Ui nominal, 25% to full load	Maximum	%	TBD	TBD
Synchro out current	Ui nominal, Full load	Typical	%	TBD	TBD

## 4- Chassis Block and Input Specifications (Continued)

### 4-5 Output Power Derating versus Input Voltage

As input current is limited to 70A in steady state, a global derating applies to the Gpack-800, depending on input voltage(see graph hereunder). The 70A limit is imposed by the current capability of the input filter. If it is exceeded, the 4 output rails will remain in operation and deliver full power, but the resulting overheating of the filter is likely to degrade it. It is recommended not to operate the GPack with an input current higher than 70A for more than 30s.





## 4- Input Specifications (Continued)

### 4-6 Description of Input Protections

#### 4-6-1 Fuse Protection

Each rail of the GPack is made with an independent MGDM-200 converter. A fuse is in series on the input line of each DC/DC in case of failure on the primary side of the converter. If a failure occurs there, the corresponding fuse will blow to disconnect the failed converter from the input bus and avoid an over current on the input line.

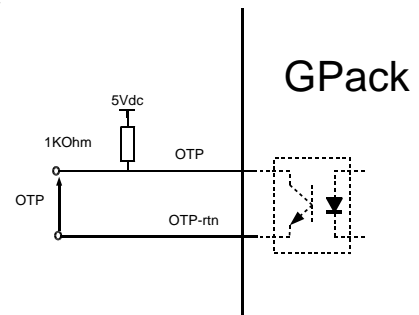
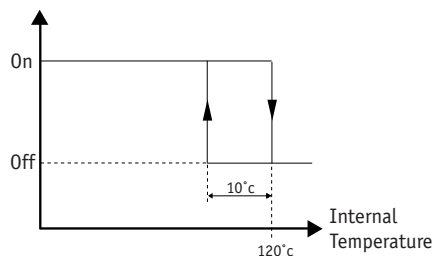
#### 4-6-2 Under Voltage Lock-out

The GPack incorporates a general UVLO protection. If one channel is in an undervoltage lock-out condition, all other channels will be turned off until the UVLO condition disappears.

#### 4-6-3 OTP Flag Operation

The GPack features a thermal protection which is set to shutdown all outputs if the internal temperature of at least one rail exceeds 120°C(+/-5%). The thermal hysteresis is 10°C, so that the GPack will resume operation automatically when the internal temperature has decreased by 10°C.

The thermal protection drives the phototransistor of an internal optocoupler which corresponds to the OTP flag. The phototransistor is floating with respect to primary and secondary and must be wired by the user. The OTP flag is an active low open collector output. If the internal temperature is >120°C, the phototransistor will be closed. Otherwise, it will be opened. When active low, the current flowing through the switch should not exceed 10mA.

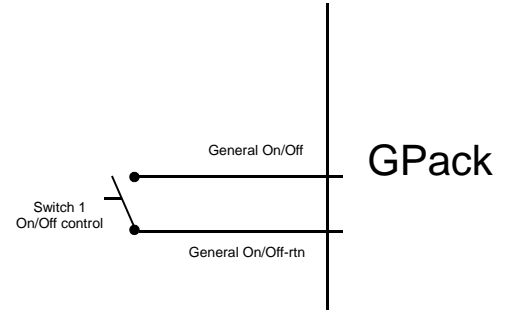


## 4- Chassis Block and Input Specifications (Continued)

### 4-7 Functional Description

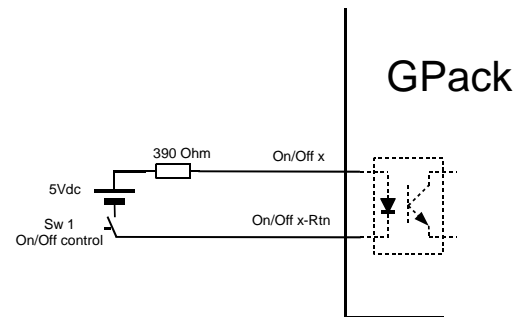
#### 4-7-1 General On/Off Operation

The GPAck incorporates a general On/Off that can be used to disable the complete GPAck. This input is not isolated from Vin and Gin and is connected to internal circuitry. Consequently, it is not possible to parallel the General On/Off of several GPAcks. It must be controlled by an external floating normally opened contact like a switch or a relay contact as per schematic below. Closing the switch will inhibit the complete GPAck. The current flowing across the contact will be lower than 1mA. An impedance lower than 20 Ohms connected across these pins will also stop GPAck operation. In inhibit mode, the total consumption will then be less 200uA. If starting time must be controlled accurately, it is recommended to use individual channel On/Off instead of General On/Off.



#### 4-7-2 On/Off Channel Operation

The GPAck incorporates 4 On/Off channels. These disable controls use optocoupler inputs and allow to switch-on or off each individual output rail. Sequencing of output voltages can then be achieved. The biasing of the optocoupler should be as per schematic hereafter. The biasing voltage and current limiting resistor can be different provided biasing current remains within specifications.



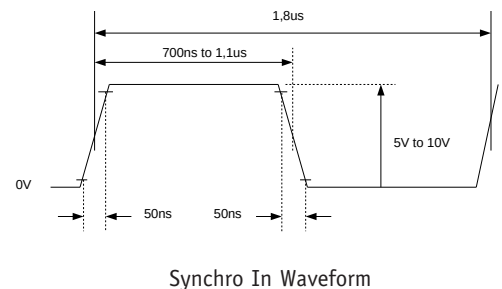
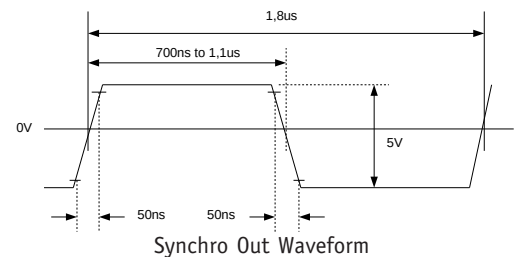
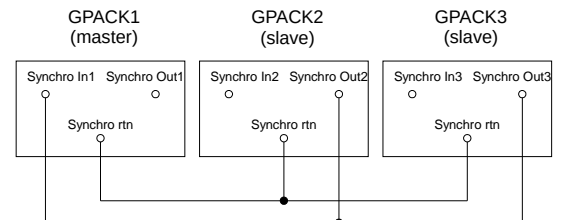
#### 4-7-3 Synchronization Operation

The GPAck features a synchronisation function that allows to synchronize one or several GPAcks to an external signal. This feature eliminates low frequency ripple on the input bus in multiple power blocks architectures and avoid systems interferences.

Synchro Out is a transformer-isolated output which is connected to the internal clock that synchronizes the output rails. It is a square wave at typically 560kHz. The characteristic of the pulse are described hereafter. It can be used to synchronize other GPAck units by connecting the Synchro Out pin of the master GPAck to the Synchro In pins of the slave units as per diagram hereafter.

It is recommended to use a twisted pair of AWG24 to connect the Synchro pins and their associated return together.

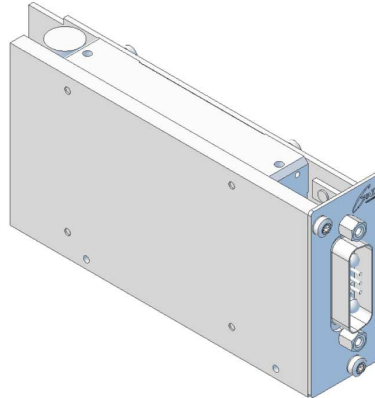
Synchro In is an isolated input which allows to synchronize the GPAck with an external signal. A signal applied between 280kHz to 300kHz will synchronize all output rails. The characteristic of the input signal are described hereafter. The duty cycle should be kept within 40 % to 60 %, while the magnitude should be between 5V and 10V. If no external signal is applied, the pin should be left unconnected.



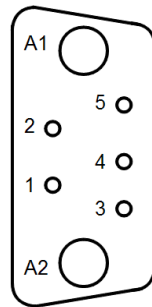
## 5- GPack Output Rail and Output Specifications

### 5-1 General

The GPACK features 4 output slots corresponding to the 4 output channels. Each of them features a SUB-D 7W2 male connector which gives access to the power and control signals of its corresponding channel. The 4 outputs are independant and isolated from each other. Their voltage can be selected by the user through the part numbering of the unit and each channel has a 200W output power capability. They may also be connected in parallel to increase the output power capability of a an output voltage rail, or in series to increase the output voltage.



### 5-2 Connector and Pins Assignment



Pin	Single Output
A1	Output + (Vo)
A2	Output -(Go)
1	Share
2	I-Trim
3	Sense - (S-)
4	Trim
5	Sense + (S+)

### 5-3 Pins Description

**Output + Vo : (A1) :** channel positive output voltage pin. This termination is isolated by galvanic isolation from case and from input section.

**Output - Go : (A2) :** channel negative output voltage pin. This termination is isolated by galvanic isolation from case and from input section.

**Share (1) :** Active current sharing. When several channels are paralleled, the Share function allows to balance the current between the channels. If not used, it should be left unconnected.

**I-Trim (2) :** Current limitation trim. Allows to reduce the output current limitation threshold by connecting an external resistor across this pin and S-. If not used, it should be left unconnected.

**Sense- (3) :** Output voltage sensing. When connected across the load, the Sense function can provide compensation for cable losses. If not used, it should be left unconnected.

**Trim (4) :** Output voltage trimming. A resistor connected between the pin and Sense+ or Sense- will allow to trim the output voltage up or down. If not used, it should be left unconnected.

**Sense+ (5) :** Output voltage sensing. When connected across the load, the Sense function can provide compensation for cable losses. If not used, it should be left unconnected.

## 5- GPack Output Rail and Output Specifications (Continued)

### 5-4 Electrical Specifications

#### 5-4-1 Output Rail 5 VDC

Data are valid at +25°C, unless otherwise specified.

Parameter	Conditions	Limit or typical	Units	H Input	O Input
<b>Output</b>					
Output voltage	Full temperature range Ui min. to max., Full load	Nominal	VDC	5	5
Set point accuracy	Ui nominal 75% load	Temperature 25°C Ui nominal, 75% load	%	+/-2	+/-2
Output power	Full temperature range Ui min. to max.	Maximum	W	175	175
Output current	Full temperature range Ui min. to max.	Maximum	A	35	35
Ripple output voltage	Ui nominal, Full load BW=20MHz	Maximum	mVpp	100	100
Line + Load regulation	Ui min. to max., 0% to full load	Maximum	%	+/-1	+/-1
Output voltage trim range	As function of output voltage	Minimum Maximum	% %	10 110	10 110
Switching frequency	Ui min. to max. 0% load to full load	Nominal, fixed	KHz	270	270
Isolation	Input to output	Nominal	VDC	1 500	1 500
Maximum admissible capacitive load	Ui nominal, 400Hz Full load	Maximum per output	μF	TBD	TBD

## 5- GPack Output Rail and Output Specifications (Continued)

### 5-4 Electrical Specifications

#### 5-4-2 Output Rail 12 VDC

Data are valid at +25°C, unless otherwise specified.

Parameter	Conditions	Limit or typical	Units	H Input	O Input
<b>Output</b>					
Output voltage	Full temperature range Ui min. to max., Full load	Nominal	VDC	12	12
Set point accuracy	Ui nominal 75% load	Temperature 25°C Ui nominal, 75% load	%	+/-2	+/-2
Output power	Full temperature range Ui min. to max.	Maximum	W	200	200
Output current	Full temperature range Ui min. to max.	Maximum	A	16,5	16,5
Ripple output voltage	Ui nominal, Full load BW=20MHz	Maximum	mVpp	250	250
Line + Load regulation	Ui min. to max., 0% to full load	Maximum	%	+/-1	+/-1
Output voltage trim range	As function of output voltage	Minimum Maximum	% %	10 110	10 110
Switching frequency	Ui min. to max. 0% load to full load	Nominal, fixed	KHz	270	270
Isolation	Input to output	Nominal	VDC	1 500	1 500
Maximum admissible capacitive load	Ui nominal, 400Hz Full load	Maximum per output	μF	TBD	TBD

## 5- GPack Output Rail and Output Specifications (Continued)

### 5-4 Electrical Specifications

#### 5-4-3 Output Rail 15 VDC

Data are valid at +25°C, unless otherwise specified.

Parameter	Conditions	Limit or typical	Units	H Input	O Input
<b>Output</b>					
Output voltage	Full temperature range Ui min. to max., Full load	Nominal	VDC	15	15
Set point accuracy	Ui nominal 75% load	Temperature 25°C Ui nominal, 75% load	%	+/-2	+/-2
Output power	Full temperature range Ui min. to max.	Maximum	W	200	200
Output current	Full temperature range Ui min. to max.	Maximum	A	13,5	13,5
Ripple output voltage	Ui nominal, Full load BW=20MHz	Maximum	mVpp	450	450
Line + Load regulation	Ui min. to max., 0% to full load	Maximum	%	+/-1	+/-1
Output voltage trim range	As function of output voltage	Minimum Maximum	% %	10 110	10 110
Switching frequency	Ui min. to max. 0% load to full load	Nominal, fixed	KHz	270	270
Isolation	Input to output	Nominal	VDC	1 500	1 500
Maximum admissible capacitive load	Ui nominal, 400Hz Full load	Maximum per output	µF	TBD	TBD



## 5- GPack Output Rail and Output Specifications (Continued)

### 5-4 Electrical Specifications

#### 5-4-4 Output Rail 24 VDC

Data are valid at +25°C, unless otherwise specified.

Parameter	Conditions	Limit or typical	Units	H Input	O Input
<b>Output</b>					
Output voltage	Full temperature range Ui min. to max., Full load	Nominal	VDC	24	24
Set point accuracy	Ui nominal 75% load	Temperature 25°C Ui nominal, 75% load	%	+/-2	+/-2
Output power	Full temperature range Ui min. to max.	Maximum	W	200	200
Output current	Full temperature range Ui min. to max.	Maximum	A	8,5	8,5
Ripple output voltage	Ui nominal, Full load BW=20MHz	Maximum	mVpp	500	500
Line + Load regulation	Ui min. to max., 0% to full load	Maximum	%	+/-1	+/-1
Output voltage trim range	As function of output voltage	Minimum Maximum	% %	10 110	10 110
Switching frequency	Ui min. to max. 0% load to full load	Nominal, fixed	KHz	270	270
Isolation	Input to output	Nominal	VDC	1 500	1 500
Maximum admissible capacitive load	Ui nominal, 400Hz Full load	Maximum per output	µF	TBD	TBD

## 5- GPack Output Rail and Output Specifications (continued)

### 5-5 Description of Output Rail Protections

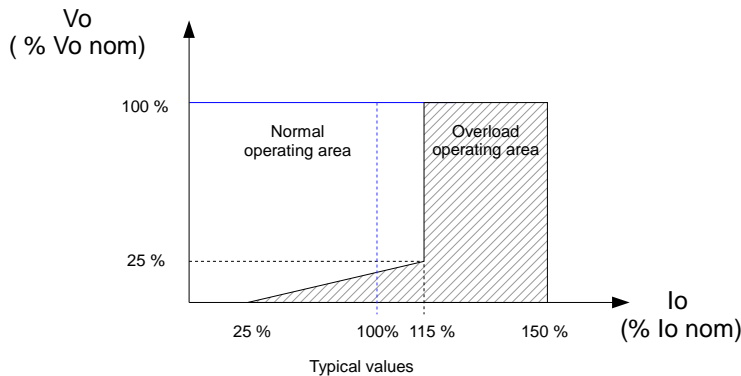
The GPack-800 output rails include 3 types of output protection devices that are powered and controlled by a fully independent power stage.

#### 5-5-1 Output Over Current Protection (OCP)

Each GPack output rail features an output over current protection that operates in 2 steps. During the first step of current limitation, the output current is limited at 150%(+/-30%) of its nominal value  $I_{o-nom}$  and the output voltage decreases as a consequence of current limitation. This phase may last up to 30ms and allows to charge large capacitors connected on the output.

If the overload condition is still present after the first step is completed, a second phase will be initiated in which the output current will then be limited at 115%(+/-30%) of its nominal value. If the output voltage resulting from the current limitation is higher than 25 % of  $V_{o-nom}$ (in case of light overload for example), the channel will restart automatically once the overload is removed.

If the output voltage resulting from the current limitation is lower than 25 % of  $V_{o-nom}$  as would be the case with a severe overload such as a short circuit, the output rail will enter a foldback limitation area where the output current will be limited between 115 % and 25 % of  $I_{o-nom}$ . This foldback protection feature reduces the dissipated power in case of severe overloads to improve the long term reliability of the unit. However, if the rail enters this foldback area, it is recommended to apply an On/Off cycle to restart the rail correctly once the overload condition is removed.



#### 5-5-2 Output Overvoltage Protection (OVP)

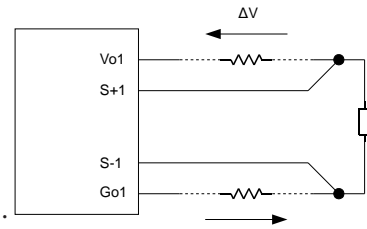
Each rail has an internal overvoltage protection circuit that monitors the voltage across the output power terminals. It will clamp the output voltage at 130 % of its nominal value in case of failure in the regulation loop.

## 5- GPack Output Rail and Output Specifications (continued)

### 5-6 Functional Description

#### 5-6-1 Senses

Each channel features a Sense+ and Sense- connection which can provide up to 10 % compensation of output voltage drop as can be caused by wiring losses in high current applications. To achieve compensation, both Senses must be connected at the regulation point, as per schematic. As an example, implementing the Senses connection will allow a 50mV compensation for a 5V output. If the compensation feature is not used, the Senses pins can either be left unconnected or directly connected to the Vo pin for S+, and Go pin for S-.



#### 5-6-2 Trim

The output voltage of each channel can be trimmed up or down by 10 %. Trim-up can be achieved by connecting a resistor across S+ and Trim, whereas trim-down is achieved by connecting a resistor across S- and Trim. An on-line calculator is available to determine the resistor value corresponding to the required output voltage.

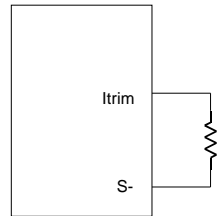
#### 5-6-3 Itrim

The output overload detection threshold can be trimmed down with an external resistor connected across Itrim and S- to reduce the current capability of the output rail. This feature allows to improve the level of protection of the load connected to the rail in applications in which the full output power capability of a rail is not used by limiting its overload detection threshold to a lower level than the typical value . It also improves the reliability of the rail in the event of an overload by reducing the dissipated power in overload condition.

The value of the trimming resistor can be determined using the formula hereunder :

$$R_{Itrim}(k) = \frac{30 \cdot k}{1 - \frac{k}{1,3}} - 0,27$$

where k is the % level of the nominal output current at which the threshold is set. When Itrim is unconnected, k=1,3=130 % of Ionom. For example, for a 5V, 40A output, the typical overload detection threshold is set a 1,3x40=52A. Setting the threshold at 20A(k=50%=0,5) would require a 24k resistor.

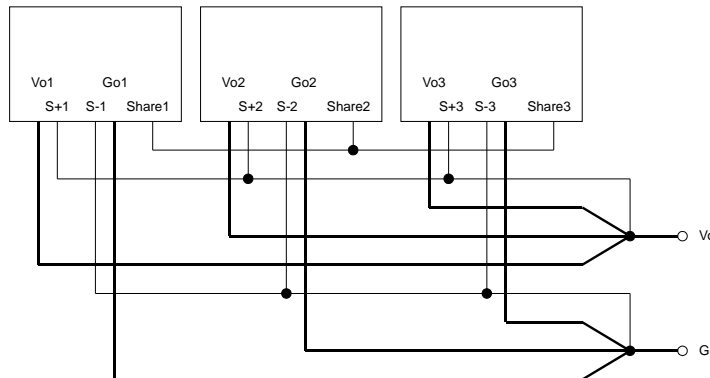


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#### 5-6-4 Active Current Sharing

Each rail features a Share connection to enable active current sharing when multiple outputs of several GPacks are paralleled to increase the total output power and supply a common load. The active current sharing will balance the current evenly between the paralleled outputs. The accuracy of the sharing will be superior to that of a combination of Oring diodes or balancing resistors and will avoid the associated wasted power as well as simplify the wiring. Up to 3 GPACK800s can be paralleled in such a way and allow the design of a compact 2,4kW power unit by paralleling 12 outputs.

When such a configuration is implemented, the Vo and Go output terminals of each rail must be connected in a star arrangement. The Senses signals may be wired together upstream and must also be connected to the star point, as shown in the schematic hereunder. It is recommended to use a twisted pair of AWG24 to connect the Share pins and their associated return together. The following diagram shows how to implement such a connection.

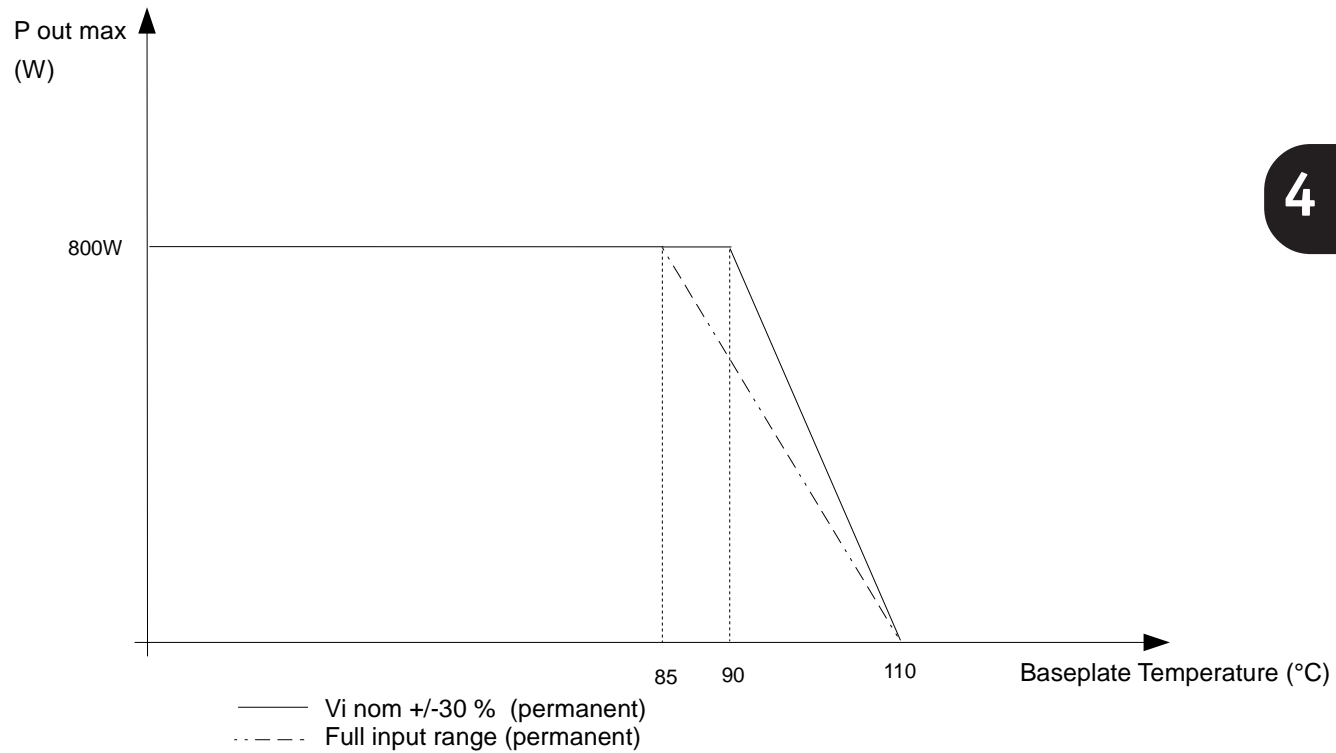


## 6- GPack Thermal Characteristics

Characteristics	Conditions	Limit or typical	Performances
Operating ambient temperature range	Ambient temperature	Minimum Maximum	- 40°C + 85°C
Operating baseplate temperature range	Baseplate temperature @ full load	Minimum Maximum	- 40°C + 85°C
Storage temperature range	Non functioning	Minimum Maximum	- 55°C + 125°C
Thermal resistance	Rth case to ambient in free air natural convection	Typical	TBD

Note \* : The upper temperature range depends on configuration, the user must assure a max. case temperature of + 85°C.

The following graph presents the thermal derating as a function of baseplate temperature and input voltage range.



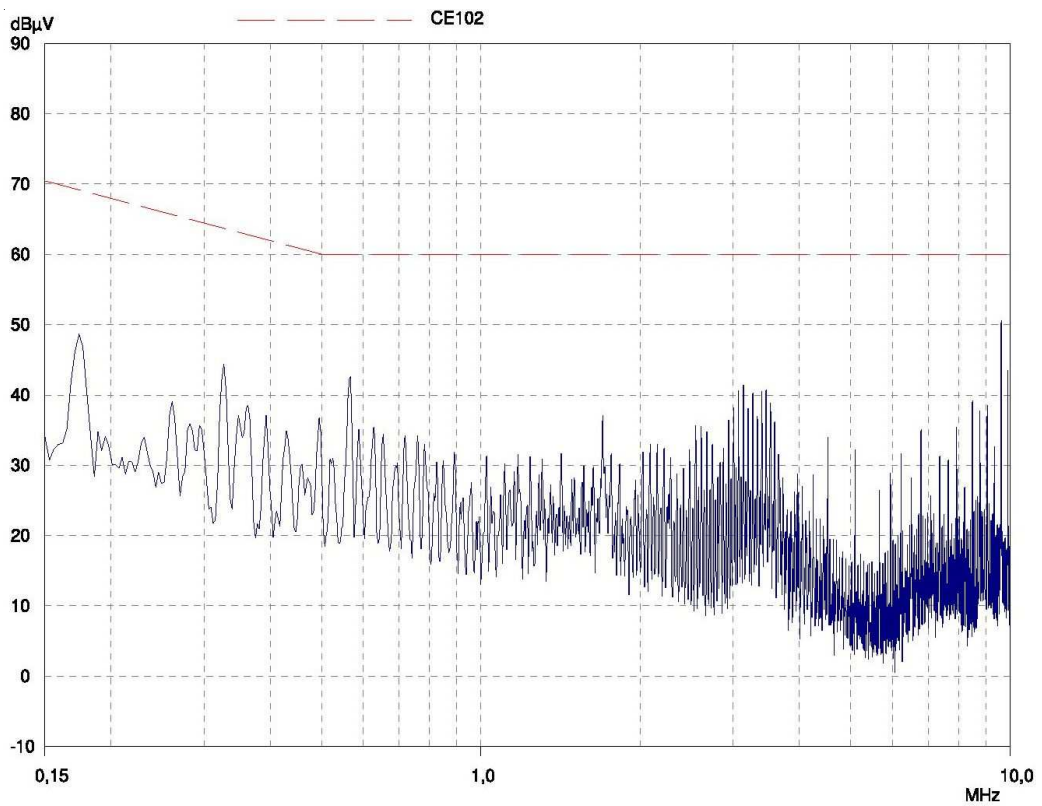
## 7- GPack Environmental Qualification

### 7-1 Electromagnetic Interference

The Gpack features an integrated input EMI filter to achieve compliance with MIL-STD-461 as follow.

Standards	DO-160D	MIL-STD-461E	Compliance
<b>Conducted emission (CE) :</b> Low frequency High frequency	Section 21	CE 101 CE 102	compliant stand alone compliant stand alone
<b>Conducted susceptibility (CS) :</b> low frequency High frequency	Section 20	CS 101 CS114	Consult Factory
<b>Radiated emission (RE) :</b> Magnetic field Electrical field	Section 21	RE 101 RE 102	Consult Factory
<b>Radiated susceptibility (RS) :</b> Magnetic field Electrical field	Section 20	RS 101 RS 013	Consult Factory

Fig : MIL-STD-461 Conducted Noise Emission





## 7- GPack Environmental Qualification (continued)

### 7-2 Climatic and Mechanical Qualifications

The GPack has been subjected to the following environmental qualifications.

Characteristics	Conditions	Severity	Test procedure
<b>Climatic Qualifications</b>			
Life at high temperature	Duration Temperature / status of unit	TBD	MIL-STD-202G Method 108A
Altitude	Altitude level C Duration Climb up Stabilization Status of unit	TBD	MIL-STD-810E Method 500.3
Humidity cyclic	Number of cycle Cycle duration Relative humidity variation Temperature variation Status of unit	TBD	MIL-STD-810E Method 507.3
Humidity steady	Damp heat Temperature Duration Status of unit	TBD	MIL-STD-202G Method 103B
Salt atmosphere	Temperature Concentration NaCl Duration Status of unit	TBD	MIL-STD-810E Method 509.3
Temperature cycling	Number of cycles Temperature change Transfert time Steady state time Status of unit	TBD	MIL-STD-202A Method 102A
Temperature shock	Number of shocks Temperature change Transfert time Steady state time Status of unit	TBD	MIL-STD-202G Method 107G
<b>Mechanical Qualifications</b>			
Vibration (Sinusoidal)	Number of cycles Frequency / amplitude Frequency / acceleration Duration Status of unit	TBD	MIL-STD-810D Method 514.3
Shock (Half sinus)	Number of shocks Peak acceleration Duration Shock form Status of unit	TBD	MIL-STD-810D Method 516.3
Bump (Half sinus)	Number of bumps Peak acceleration Duration Status of unit	TBD	MIL-STD-810D Method 516.3



## 8- GPack Output Configurations

The GPack can be self-configured or pre-configured.

- The self-configured option is a customer configuration implemented directly through the output rail by wiring
- The pre-configured option uses an additional pre-configured board to ease output connection

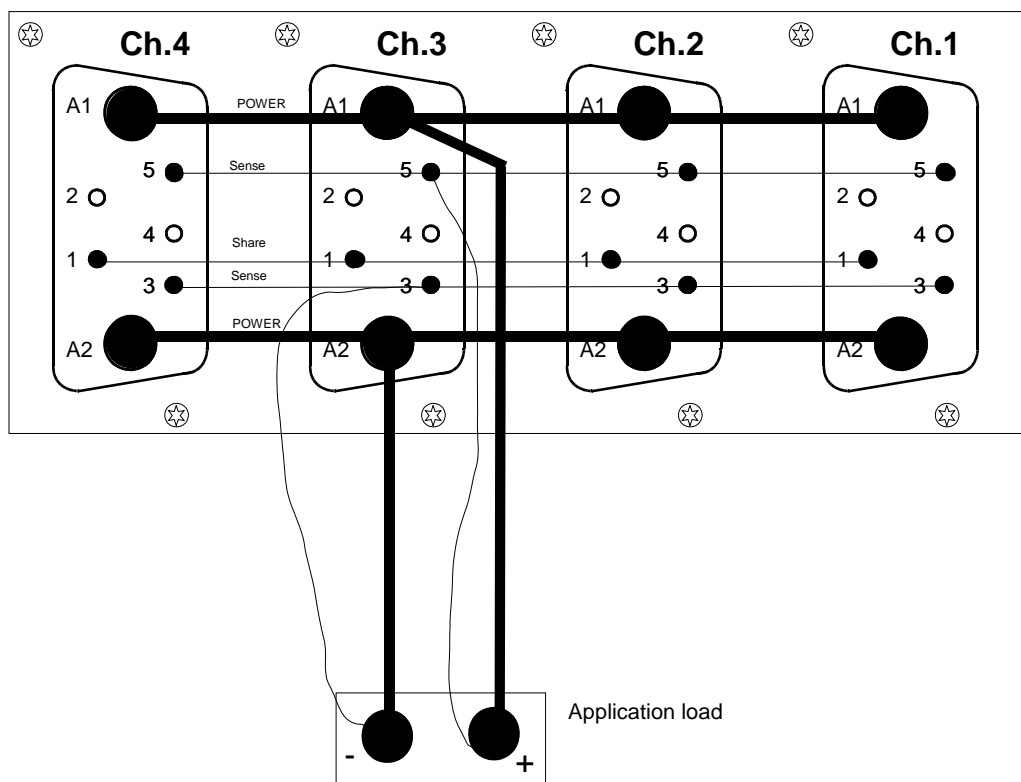
### 8-1 Self-Configured

For self-configured mode please use male sub-D connector such as Harting reference : 09 69 211 5072

#### 8-1-1 Self-Configured Outputs in Parallel

To connect outputs in parallel, it is recommended to follow the schematics below :

- lead #5 (Sense +) of each outputs need to be connected together
- lead #3 (Sense -) of each outputs need to be connected together
- lead #1 (Current share) of each outputs need to be connected together



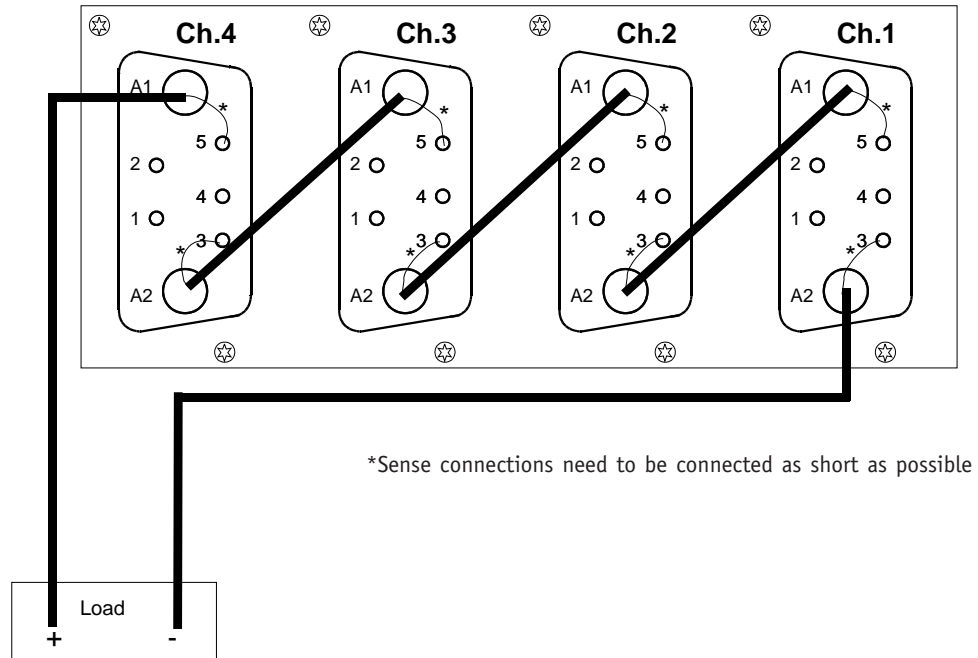
It is recommended to use Awg 24 minimum cable section for wiring low power signals.

Warning: Do not disconnect power line while sense remains connected because of risk of channel module destruction

## 8- GPack Output Configurations (Continued)

### 8-1-2 Self-Configured Outputs in Series

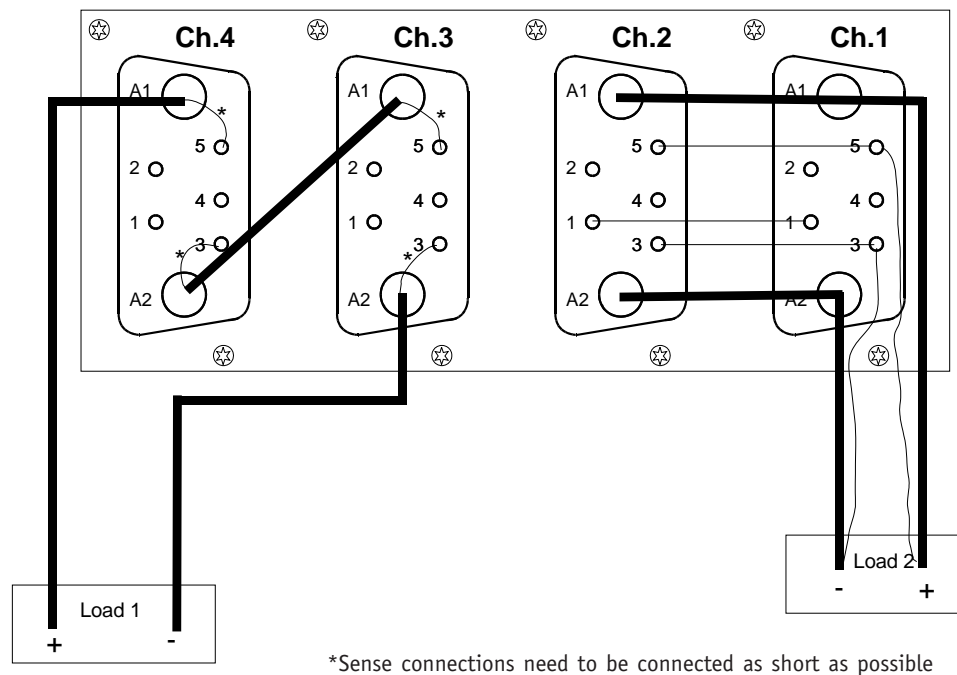
To connect outputs in series, it is recommended to follow the schematic below. It is not recommended to operate multi output GPack without connecting the sense. Consult factory for series implementation.



4

### 8-1-3 Self-Configured Outputs in Series and Parallel

The following diagram shows the connection for a configuration with the output 1 and 2 connected in series and the output 3 and 4 connected in parallel.



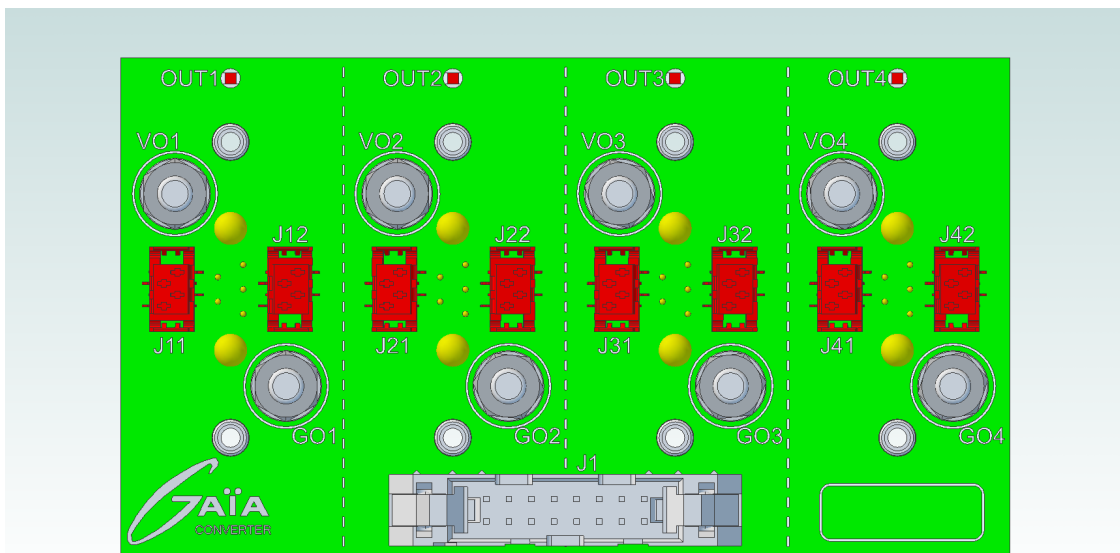
## 8- GPack Output Configurations (continued)

### 8-2 Pre-Configured

In pre-configured option an additional board is provided to ease output connections with external load. The GPack is delivered mounted and tested with it's standard board configured upon demand with bus bars. Bus bar connections are provided for output in series or in parallel.

The board also provides LEDs to monitor output presence.

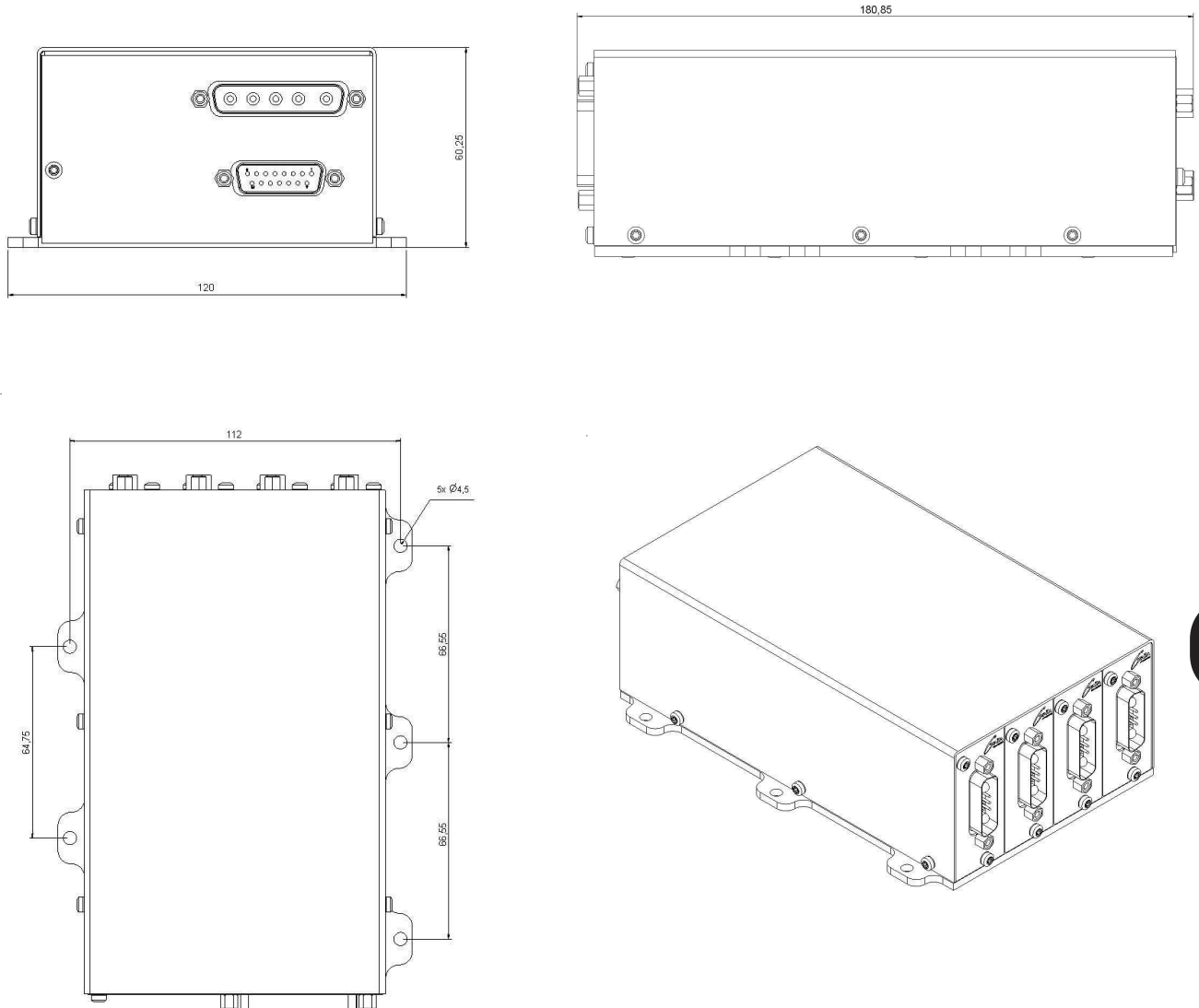
The following diagram shows the rear side.



Please consult factory for details.

### 9- Overall Dimensions

Dimension are given in mm (inches). Tolerance : +/- 0,2 mm (+/- 0.01 ") unless otherwise indicated.  
Weight : 1 800 grams



**4**

### 10- Product Marking

Front side : Company logo, module reference.



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