

LPM/LMM409 AC-DC Modular Power Supply

5V, 10V, 12V, 20V, 24V, 36V & 48V

Single-Output Modules;

10V, 20V Dual-Output Modules



Key Features & Benefits

- **Standard output voltages of 1.5 to 54 VDC**
- **Efficiencies up to 87% typical**
- **Extra-Low 1U profile: 1.6 inch**
- High power density design of 14 Watts/cubic inch
- 1 to 4 isolated output slots, fully user configurable
- Power Factor Correction (PFC) IEC 61000-3-2 compliant
- 700W @ 85 VAC or 900W @ 150VAC of total output power
- Zero-load operation
- Single-wire current sharing
- Universal input AC range
- Individual control signals on each module
- Auxiliary power 5V (1A)

Applications

LPM409 (Industrial)

- Industrial equipment
- Telecommunications
- Test and measurement
- Automation
- Peripherals
- Audio/broadcast
- Linear and rotary motion

LMM409 (Medical)

- Imaging Equipment
- Anesthesiology
- Surgical Devices
- Diagnostic Equipment
- Patient Beds
- Home Healthcare
- Ultrasound

The LPM/LMM409 Series is a modular 900-watt AC-DC power supply that provides a market-leading power density of 14 watts per cubic inch and has an extra low 1U profile. The LMM is the medically approved version. From here on only the LPM version will be discussed, differences for the LMM version will be noted. The LPM409 offers the flexibility of a modular architecture and the combination of high efficiency and high power density.

Designed for use where a unique set of voltage and current requirements is needed, the supply's four slots can be configured with PCB-based output modules to deliver up to eight outputs. The LPM output modules operate in any chassis position and can provide up to 900 watts total power from a 150 VAC input and 700 watts from an 85 VAC input. Forced-air cooling with airflow direction from input to output is provided by an internal fan.

For LPM409 supplies using less than the four-slot capability, blanking plates are installed for safety purposes and to optimize airflow within the chassis. The supplies are pre-set with default output module settings or with the customer's desired output settings prior to delivery.

The LPM409 chassis can be populated with the output modules listed in Module Selection table. Conformal coating is available on request, please consult with the factory.

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1. Module Selection

MODULE	P/N ³	NO. OF SLOTS REQUIRED	FACTORY-SET SINGLE- OUTPUT (VDC)	MODULE ADJUSTABLE RANGE (VDC)	MAX. OUTPUT CURRENT (AMPS)	MAX. OUTPUT POWER ² (WATTS)
E	LPM126-OUTA1-05	1	5	2.0 to 5.3	53	265
F	LPM126-OUTA1-12	1	12	5.2 to 15	22	265
G	LPM126-OUTA1-24	1	24	14 to 30	11	265
H	LPM126-OUTA1-36	1	36	29 to 44	7.4	265
J	LPM126-OUTA1-48	1	48	43 to 54	5,5	265
K	LPM109-OUTA1-10	1	15	1.5 to 15	6	90
L	LPM109-OUTA1-20	1	30	3 to 32	3	90
M	LPM118-OUTA2-10	1	15	2x 1.5 to 15	2x 6	2x 90
N	LPM118-OUTA2-20	1	30	2x 3 to 32	2x 3	2x 90
0	LPM100-BLAN	1	Blank Panel (Slot Cover)			

¹ To determine your desired power supply's part number, please refer to *Figure 2* for a detailed part number description. Use the **LPM Configurator** located in the Modular Section on our website, or use our contacts page to locate a distributor for further assistance.

² For the power derating specification please see section 1.4 below.

³ Add -C for Conformal coating option.

1.1. Output Voltage Adjustment

Each LPM409 module's output voltage is adjustable by means of a trimmer located on the module. For the modules E->J the trimmer is accessible through the adjustment hole located on the bottom of the power supply (*Figure 10*). For the modules K->N the trimmer is accessible from rear side of the power supply (*Figure 5*).

1.2. Parallel Connections

Depending on certain situations where current requirements exceed one module's capability, the configurator will process a solution using parallel connections. Paralleling busbars are available to make connections requiring higher current needs. For correct current sharing functionality it is necessary to interconnect Current Share pins of the modules that will operate in parallel using signal wires. Only E-J modules can be connected in parallel. For more details read section 10.3, see *Figure 15*.

1.3. Serial Connections

To increase output voltage it is possible to connect modules in series. Serial busbars are available (see section 10.4) to make connections requiring higher voltage needs. The output of LPM409 is rated as SELV circuit, so the output voltages are guaranteed to be less than 60V. The series combination of modules can exceed this SELV voltage, so in this case the users must take adequate precautions to prevent direct contact with conductive parts. The maximal total voltage **must not exceed 200V**. It is recommended to only connect the same modules with the same current rating in series. The voltage sense pins VS+, VS- available on LPM126 modules must be connected according to *Figure 17*.

1.4. Power Derating

When specifying an LPM409 power supply in an application it is necessary to ensure that LPM409-CHAS and modules (LPM126, LPM118 and LPM109) are operating within their power output capabilities, taking into account the temperature derating and input voltage derating. The maximum permissible output power that may be drawn from LPM409-CHAS and modules assembled in this chassis is given in *Figure 1*.

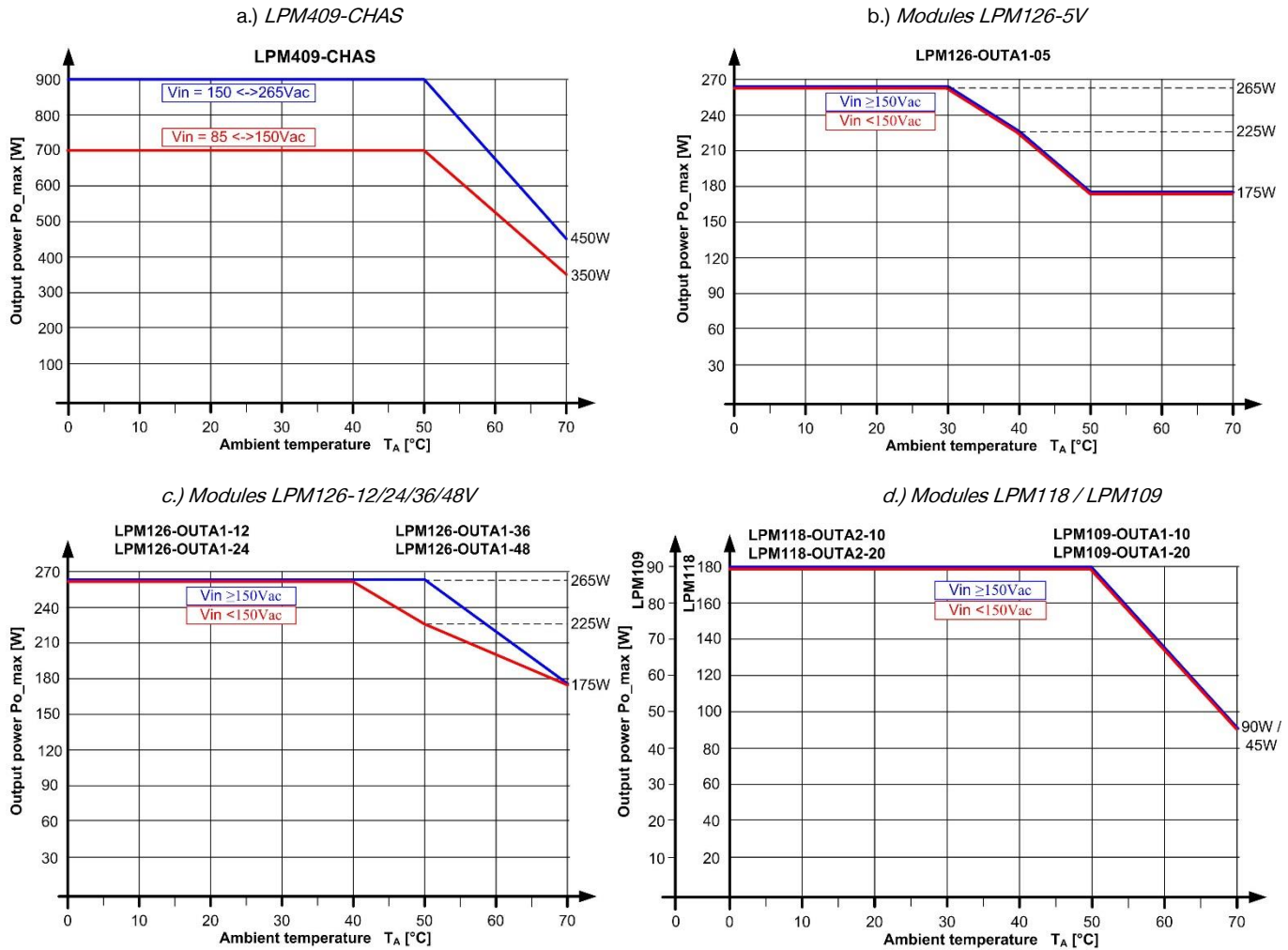
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Figure 1 - Power Derating Curves



2. Part Numbering and Ordering Information

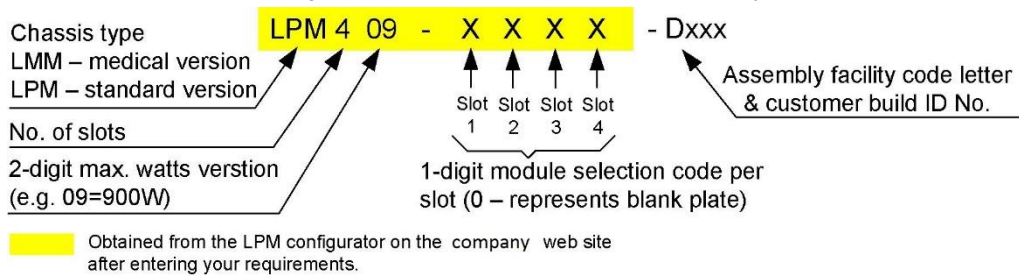
2.1. Chassis Identification Numbering

First left-to-right sequence of the part number (4 characters):

- LPM409 Low Profile Modular 4-slot, 900W, with single-phase AC input. (Figure 2)

NOTE: Chassis and modules are RoHS-6 compliant.

Figure 2 - LPM 4-Slot Model Part Number Description



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Example: After entering your requirements, the web Configurator could recommend the following optimized part number: LPM409-0HEG-DXXX which represents: Low Profile Modular Series with single-phase AC input, 4-slot, 900W chassis with modules of: blank panel "0" in slot 1 and modules H, E, G in slots 2 to 4, respectively. Besides the blanking panel in slots 1, the example's modules in this case would represent desired DC output voltages as follows: Slot 2 = H for 36V, Slot 3 = E for 3.3V and Slot 4 = G for 24V.

Assembly facility code and customer build ID No. are established during actual power supply assembly.

The slots numbering when viewing the unit from the rear, or output side is 1 - 6 from left to right.

3. Safety Specifications

3.1. Safety Approvals

LPM409 (Industrial)

- UL/CSA 60950-1 2nd
- IEC 60950-1 2nd
- EN 60950-1 2nd
- CE Mark for LVD

LMM409 (Medical)

- UL/CSA 60601-1, 3rd
- IEC 60601-1, 3rd
- EN 60601-1, 3rd



3.2. Insulation Safety Ratings

TEST POINTS	MINIMUM TEST VOLTAGE	INSULATION SAFETY RATING
Input-to-Chassis	2120 Vdc / min. 1s	Basic Insulation
Input-to-Output	4240 Vdc / min. 1s	Reinforced Insulation
Outputs-to-Chassis	200 Vdc / min. 1s	Functional Insulation
Output-to-Output	200 Vdc / min. 1s	Functional Insulation

4. Environmental and Reliability Specifications

4.1. Environmental Specification

PARAMETER	CONDITIONS / DESCRIPTION	MIN	NOM	MAX	UNITS
Cooling	Internal DC fan, air intake is from the AC connector side exiting at the DC module side				
Audible Noise	Single unit, 4 modules assembled and full loaded, on a table at 1m distance.			65	dBA
Operating Temperature	50°C at Full power and up to 70°C at 50% load (linearly derated, for details see section 1.4)	-20	25	50	°C
Storage Temperature		-40		75	°C
Humidity	95% relative humidity @ 25 °C, non-condensing				
Vibration	Operating: Swept 5-500-5Hz profile, 3 axis, 5 sweep cycles per axis Non-operating: Swept 5-500-5Hz profile, 3 axis, 5 sweep cycles per axis			1 4	Gpk Gpk
Shock	Operating: 11ms, half sine, 10 shocks per face Non-operating: 11ms, half sine, 3 shocks per face			20 40	Gpk Gpk

4.2. Reliability

PARAMETER	CONDITIONS / DESCRIPTION	MIN	NOM	MAX	UNITS
Calculated MTBF	According to MIL-HDBK217, Ground benign 30°C, NOTE: Calculation was done for LPM409-EFGH.	250,000			hours
Demonstrated MTBF	Tamb = 25°C	250,000			hours

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5. Fault Protection

PARAMETER	CONDITIONS / DESCRIPTION	MIN	NOM	MAX	UNITS
Input Fuse	One fuse, non-user serviceable, located on line leg of AC input, Fast Acting type		12.5		A
Inrush Current Limitation	Provided by NTC	See <i>Input Specification</i> section			
Short Circuit Protection	Provided by Current Limit circuit	105 ¹		125 ¹	% Io_nom
Output Overvoltage Protection	Latching (unit needs to be turned-off and on)	10		25	% Vo_nom
Over Temperature	OT with auto restart			70	°C amb

¹ 100-150% for K, M modules
100-200% for L, N modules

6. EMC Specifications

6.1. EMC Immunity

PARAMETER	CONDITIONS / DESCRIPTION	CRITERION
Electrostatic Discharge (ESD)	IEC/EN61000-4-2; GR-1089 R2-1, R2-2, R2-3 Level 4: contact: ± 8 kV, air: ± 15 kV	Perform, criterion B
RF Susceptibility	IEC/EN 61000-4-3; Level 3: 10 V/m; 80 MHz to 1000 MHz; AM 80%, 1 kHz radiated; RF electromagnetic field	Perform, criterion A
Fast transient / burst	IEC/EN 61000-4-4; Level 3; ± 2 kV, 5kHz electrical fast transient / burst immunity test	Perform, criterion B
Surge	IEC61000-4-5, level 3; line to earth: ± 2 kV, line to line: ± 1 kV surge immunity test	Perform, criterion B
RF Conducted Disturbance	IEC/EN 61000-4-6; Level 3; GR-108; 10V, 0.15 to 80MHz, AM 80%, 1kHz	Perform, criterion A
Voltage Dips / Short Interruptions	IEC/EN 61000-4-11; Voltage dips, interruptions and variations. (Interpretation: dip below Vi min with Po nom = hold-up time 10 ms)	
	1a: Dip 30%, 100ms	Perform, criterion B
	1a: Dip 30%, 200ms	Perform, criterion B
	1a: Dip 60%, 10ms	Perform, criterion A
	1a: Dip 60%, 100ms	Perform, criterion B
	1a: Dip >95%, 10ms (interruption)	Perform, criterion A
	1a: Dip >95%, 100ms (interruption)	Perform, criterion B

6.2. EMC Emission

PARAMETER	CONDITIONS / DESCRIPTION	CRITERION
Conducted Emission EN55022, FCC	EN 55022, FCC – EN 55022, and CISPR 22 Class B, FCC 47CFR15 unintentional radiators; standalone at all nominal input voltages and measured in Po1: 0, 50%, 100%; signal connections open	Class B; min. 3dB/ μ V margin
Radiated Emission EN55022, FCC	EN 55022, FCC – EN 55022, and CISPR 22 Class B, FCC 47CFR15 unintentional radiators; standalone at all nominal input voltages and measured in Po1: 0, 50%, 100%; signal connections open	Radiated Class B QSP / AVG min. 3 dB margin
Input Current Harmonics	EN 61000-3-2, sine wave input, Class D; measured standalone at all Vin nominal at power levels between 0 and rated	Pass

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7. Electrical Specifications

7.1. Input Specification

PARAMETER	CONDITIONS / DESCRIPTION	MIN	NOM	MAX	UNITS
Input AC Voltage Range	Continuous AC voltage Range Po=700W from 85-150 VAC Po=900W from 150-264 VAC	85	115/230	264	VAC
Input Overvoltage Range	At max. power, no input OVP shutdown			300	VAC
Ground continuity				0.1 ¹	Ohm
Leakage Current	@ 264 VAC, 60Hz, Commercial LPM / Medical LMM			1.5 / 0.5	mA
Frequency	AC line	47	50/60	63	Hz
Power Factor	Active PFC meets requirements of EN 61000-3-2 at full load ,120/230 VAC input	0.98			
Input Current	Steady state, 85 VAC at 700W			11	Arms
Inrush Current	180 VAC, Max Power, 25°C, acc. prETS300-132-1 230 VAC, Max Power, 25°C, acc. prETS300-132-1 (Repeat rate >1min)		40		A pk
Efficiency ²	Vi = 230 VAC 100% loading	86	87		%
	Vi = 230 VAC 30-80% loading	80	82		%
	Vi = 115 VAC 100% loading	83	84		%
	Vi = 115 VAC 30-80% loading	78	80		%

¹ For any combination of output modules, any valid load and voltage setting

² Efficiency typical for standard configuration EFGH and nominal output voltage settings

7.2. Output Specification

PARAMETER	CONDITIONS/DESCRIPTION	MIN	NOM	MAX	UNITS
Output Power	One fan for internal cooling		900		W
Output DC Voltages / Modules	All output modules work in any chassis position and are max 1U high PCB-based			-	
Current Share ³	Active single-wire current share (modules E-J) Max. difference in currents between two modules—percentage of one module nominal current			±10	%
Line Regulation	Input from 85 to 264 VAC , 80% load		1.0		% Vo_nom
Load Regulation	From 0-100% load, Input >180VAC, Vo_nom		1.0		% Vo_nom
Thermal Drift	After 15 minute warm-up period		0.02		%/°C
Total Regulation	Variation of line, load and temperature drift		2.0		% Vo_nom
Output Adjust. Range		See Module Selection Table 1			
Dynamic Response	Deviation for 10-90% or 90-10% load changes at a rate of 1A/μs, (constant current mode, Vo reach 1% band around Voset)			4% ^{1,2} 2000μs	-
	Deviation for 50-100% or 100-50% load steps with 1A/μs rate. (constant current mode, Vo reach 1% band around Voset)			3% ¹ 400μs	-
Output Ripple & Noise	BW = 20MHz; Filter 10nF/10uF; over line and load, 25°C			1% of Vo_nom ¹	mVpk-pk
CM Noise	Output to chassis, over line and load (Measured across 50 Ohms, with 10μH / 10nF in parallel)		220	500	mVpp
Overshoot	Output voltage overshoot at turn-on		4		% Vo_nom
Turn-On Characteristics	Turn ON at minimum and nominal output current	Monotonic characteristic			-
Turn-Off Characteristics	Turn OFF at minimum and nominal output current	Monotonic characteristic			-

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Turn-On Time	Time required for output within regulation after initial application of AC input	1.5	s
	Time required for output within regulation after removing inhibit	100	ms
Hold-up Time	Vo is required to stay within 95% regulation after AC is removed. Measured from the last AC peak, VAC min and full load.	10	ms
Remote Sense ³	Total compensation for cable losses	250	500 mV
Over-current Protection	Automatic recovery (Hiccup by K-N modules)	130 (180 for K-N)	%

¹ the E module dynamic deviation is less than 6%, the E, K, M module ripple is less than 2%

² the K and M module dynamic deviation is less than 7% and response time is below 1000us

³ except K-N modules

7.3. Input - Signals, Features and Indicators Description

SIGNAL NAME	PIN	DESCRIPTION
Auxiliary Output - 5V -	1,2 vs 3,4 (RTN_D)	Output is available when the AC input is over 85VAC. The output nominal output voltage is 5.0V at maximum current rating of 1.0A. Over current protection occurs above 1.5A. The output is referenced to logic return, RTN_D.
Input AC Indication - PFAIL -	5	Open Collector output with 20mA pull-down capability referenced to logic return RTN_D. PFAIL open or High state indicates the warning that the input is out of limits (the input voltage falls below 85Vac or rises over 264Vac) 5 ms before the output goes below the lower regulation limit. PFAIL will turn-off the green Input OK LED. PFAIL LOW state indicates that the input voltage is within the operating range.
Fan Fail / OTP Indication - FAN_FAIL -	6	Open Collector output pin with 20mA pull-down capability referenced to logic return RTN_D. FAN_FAIL OPEN OR HIGH state indicates a fan failure/over temperature protection (OTP) condition min. 100 ms before the unit shuts-down. A fan failure/OTP condition will turn-off the green FAN OK LED. FAN_FAIL LOW state indicates normal fan operation and no OTP condition.

7.4. Output - Signals, Features and Indicators Description

7.4.1. Modules E, F, G, H, J

SIGNAL NAME	PIN	DESCRIPTION
Positive Sense Wire - VS+ -	1	Output voltage sense wire. Internally connected to Vout+ via 51 Ω. It is recommended to connect sense wire at positive load point.
Negative Sense Wire - VS- -	2	Output voltage sense wire. Internally connected to Vout- via 51 Ω. It is recommended to connect sense wire at negative load point.
Current Share - CSH -	3	Common wire for parallel connected modules to achieve proper current sharing between the modules. Referenced to the Common pin. Interconnect CS pin on all parallel working modules. Active current share pin enables control of output voltage. Pulling-up this pin to 5V is possible to increase the output voltage. Pull-down of this pin has no effect. Voltage on this pin is 3.5V at nominal module current.
Common	4	Reference pin to CSH
N/C	5	
N/C	6	
Output Good Indication - PG_HI -	7	Open collector output with 20mA pull-down capability, max. 15V (recommended Rpull-up = 1k, Vcc = 5V). Referenced to PG_LO. PG_HI OPEN OR HIGH state indicates that the module output voltage is below lower regulation limit. A PG_HI fail state turns the GREEN DC OK LED to RED. PG_HI LOW state indicates the module output voltage is within normal operation limits.
- PG_LO -	8	Reference pin to PG_HI
Output Inhibit Function - INH_HI -	9	An opto-isolated input with 2-10mA current capability. Apply +(3-15)V on INH_HI and RTN on INH_LO (e.g. from the Auxiliary Output 5V) to activate the inhibit function. INH_HI OPEN OR LOW state ENABLES the module output. INH_HI HIGH state INHIBITES the module output.
- INH_LO -	10	Reference pin to INH_HI

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7.4.2. Modules K, L, M, N

SIGNAL NAME	PIN	DESCRIPTION
- INH_LO_B -	1	Reference pin to INH_HI_B
Output Inhibit Function - INH_HI_B -	2	An opto-isolated input with 2-10mA current capability. Apply +(3-15)V on INH_HI_B and RTN on INH_LO_B (e.g. from the Auxiliary Output 5V) to activate the inhibit function. INH_HI OPEN OR LOW state ENABLES the module output. INH_HI HIGH state INHIBIT the module output.
- PG_LO_B -	3	Reference pin to PG_HI_B
Output Good Indication - PG_HI_B -	4	Open collector output with 20mA pull-down capability, max. 15V (recommended Rpull-up=1k, Vcc=5V). Referenced to PG_LO_B. PG_HI open or High state indicates that the module output voltage is below lower regulation limit. A PG_HI fail state turns the GREEN DC OK LED to RED. PG_HI LOW state indicates that the module output voltage is within normal operation limits.
N/C	5	
N/C	6	
- INH_LO_A -	7	Reference pin to INH_HI_A
Output Inhibit Function - INH_HI_A -	8	An opto-isolated input with 2-10mA current capability. Apply +(3-15)V on INH_HI_A and RTN on INH_LO_A (e.g. from the Auxiliary Output 5V) to activate the inhibit function. INH_HI OPEN OR LOW state ENABLES the module output. INH_HI HIGH state INHIBIT the module output.
- PG_LO_A -	9	Reference pin to PG_HI_A
Output Good Indication - PG_HI_A -	10	Open collector output with 20mA pull-down capability, max. 15V (recommended Rpull-up=1k, Vcc=5V). Referenced to PG_LO_A. PG_HI open or High state indicates that the module output voltage is below lower regulation limit. A PG_HI fail state turns the GREEN DC OK LED to RED. PG_HI LOW state indicates that the module output voltage is within normal operation limits.

7.5. Visual Alarms Description

ALARM NAME	LED POSITION	DESCRIPTION
Input AC Good	Front panel – LED2 (see Fig. 7)	ON state LED indicates operation within specified input voltage range. GREEN LED indicator goes to an OFF condition on PFail signal failure state.
Fan Good	Front panel – LED1 (see Fig. 7)	ON state LED indicates normal fan operation and no OTP status. GREEN LED indicator goes to an OFF condition on FAN_FAIL / OTP signal failure state.
Output Good	Module connector / rear side (see Fig. 5 and Fig. 6)	GREEN LED indicates that module output voltage is over minimum regulation limit. GREEN LED indicator goes to RED on PG_HI signal failure state.

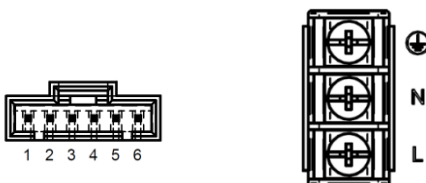
8. Connector Details

8.1. Input Connector Information

LPM409 front panel connectors pinout refers to Fig. 4 and chapter 8.2 and 8.3. The signal connector is Cvilux part number: CI3306P1H10, the mating part is Cvilux CI3306S0010, Molex 50-57-9406 or Taiwan King Pin P553L-06(LF).

NOTE: See chapter 10.1 Mating Connections and cables for Input cable information.

Figure 3 – LPM409 Front Panel Connectors Pinout View



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8.2. Input Power Connector - Pinout

SIGNAL NAME	PIN #	TYPE	RECOMMENDED WIRES	V MAX I MAX
Earth		Earth / Chassis	Min. 0,75 mm ² e.g. Interpower 86230120 Max. torque on screws (M4x6): 1,5 Nm	264 Vrms 10 Arms
AC Neutral	N	Input Power AC		
AC Line	L	Input Power AC Fused		

CAUTION:

The plastic cover must be in place when AC input voltage is applied to the unit! The cover may be removed (with the help of a screwdriver) only when the input cable is disconnected from the mains.

8.3. Input Signal Connector – Pinout

(Mating connector: Molex 50-57-9406, Pins: Molex 16-02-0082)

SIGNAL NAME	PIN #	WIRE COLOR	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
+5V	1	Red	Aux Output	RTN_D	-	5.0Vdc
+5V	2	Red	Aux Output	RTN_D	-	1.0Adc
RTN_D	3	Black	Logic Reference Potential	-	-	-
RTN_D	4	Black	Logic Reference Potential	-	-	-
PFAIL	5	Yellow	Open Collector Output + ZD 5.6V	RTN_D	<400mV@ 20mA Pull up	- 20mA
FAN_FAIL	6	Green	Open Collector Output + ZD 5.6V	RTN_D	<400mV@ 20mA Pull up	- 20mA

8.4. Module Power Outputs Pinout

8.4.1. Modules E, F, G, H, J - A, B Bus-Bar

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
Vout+	Vout+	Output Power DC	Vout-	-	See Module Selection Table 1
Vout-	Vout-	Output Power DC	-	-	See Module Selection Table 1

Connector type: Bus-bar see *Figure 4*

Mating part: Ring terminal for M4 screw, with appropriate cross section for wire.

8.4.2. Modules K, L, M, N

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
Vout1+	Vout1+	Output 1 Power DC	Vout1-	-	See Module Selection Table 1
Vout1-	Vout1-	Output 1 Power DC	-	-	See Module Selection Table 1
Vout2+ ¹	Vout2+	Output 2 Power DC	Vout2-	-	See Module Selection Table 1
Vout2- ¹	Vout2-	Output 2 Power DC	-	-	See Module Selection Table 1

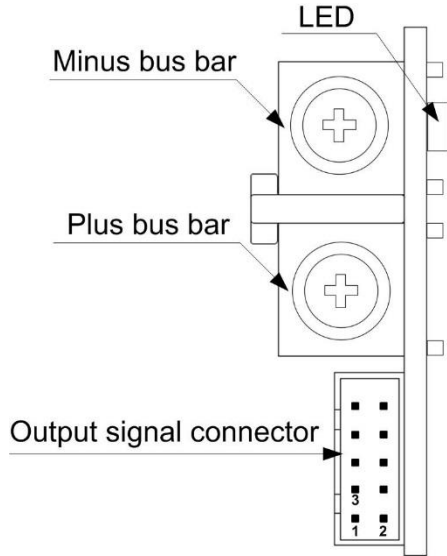
¹ valid only for two outputs modules M and N.

Connector type: Phoenix Contact 1803277

Mating part: Phoenix Contact 1850660

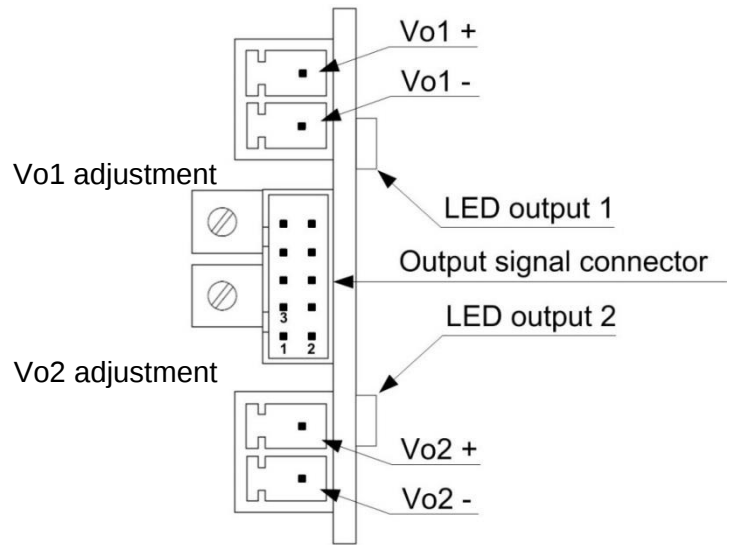
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Figure 4 - Modules E,F,G,H,J Power Output Connectors



Note: Bus bar screw M4x10mm,
max. torque 1.5Nm

Figure 5 - Modules K,L,M,N Power Output Connectors



8.5. Module Signal Output Connector Pinout

The output signal connector provides signal information across its 10-pin output, for position of the output signal connector please see *Figure 4* and *Figure 5*.

Connector type: JST S10B-PHDSS-B
Mating part: JST housing PHDR-10VS, pins SPHD-002T-P0.5 (AWG 28-24)
 or SPHD-001T-P0.5 (AWG 26-22)

Modules E, F, G, H, J

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
VS+	1	Output voltage sense wire. Internally connected to Vout+ via 51 Ω	Vout+	-	0.5V 10mA
VS-	2	Output voltage sense wire. Internally connected to Vout- via 51 Ω	Vout-	-	0.5V 10mA
CSH	3	Active Current Share pin	Common	-	5V -
Common	4	Reference pin to CSH	-	-	-
N/C	5	-	-	-	-
N/C	6	-	-	-	-
PG_HI	7	Open collector output	PG_LO	<400mV@5mA Pull up	15V 20mA
PG_LO	8	Reference for PG_HI	-	-	20mA
INH_HI	9	Input, protected by 18V Zener diode	INH_LO	LED with a serial resistor 2 kOhms	15V 10mA
INH_LO	10	Reference for INH_HI	-	-	- 10mA

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8.5.1. Modules K, L, M, N

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
INH_LO_B	1	Reference for INH_HI_B	-	-	- 10mA
INH_HI_B	2	Input, protected by 18V Zener diode	INH_LO_B	LED with a serial resistor 2 kOhms	15V 10mA
PG_LO_B	3	Reference for PG_HI_B	-	-	- 20mA
PG_HI_B	4	Open collector output	PG_LO_B	<400mV@5mA Pull up	15V 20mA
N/C	5	-	-	-	-
N/C	6	-	-	-	-
INH_LO_A	7	Reference for INH_HI_A	-	-	- 10mA
INH_HI_A	8	Input, protected by 18V Zener diode	INH_LO_A	LED with a serial resistor 2 kOhms	15V 10mA
PG_LO_A	9	Reference for PG_HI_A	-	-	- 20mA
PG_HI_A	10	Open collector output	PG_LO_A	<400mV@5mA Pull up	15V 20mA

9. Mechanical Drawings

Overall Dimensions: 11.9" x 3.6" x 1.6" (303.7 x 92 x 40.64mm)

Weight: 1.38 kg (including 4 modules)

All drawing dimensions are shown in millimeters, unless otherwise noted.

Figure 6 - Front View

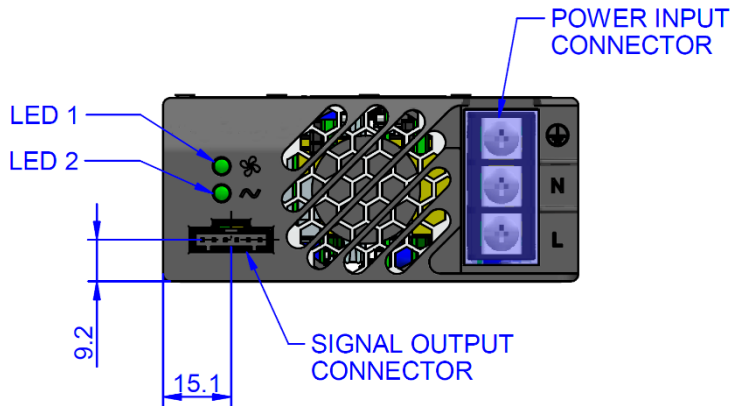


Figure 7 - Rear View

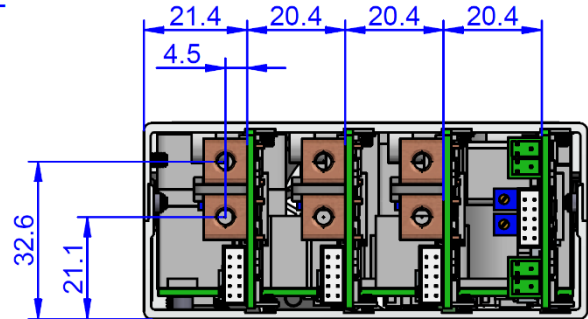
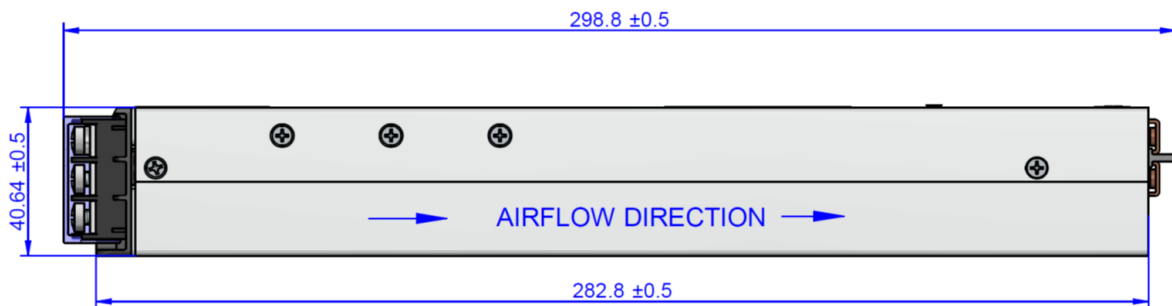


Figure 8 - Side View



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Figure 9 - Top View

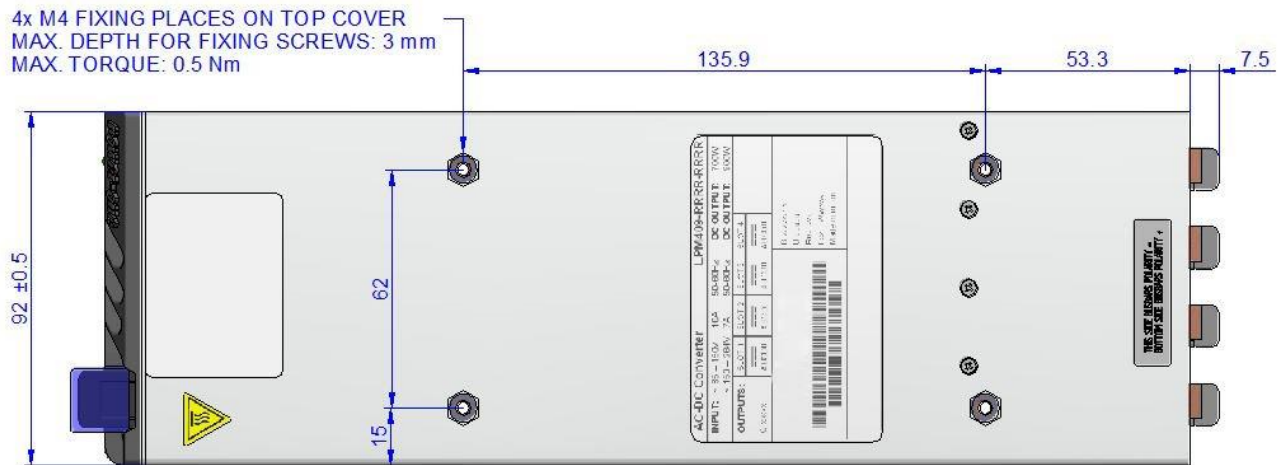
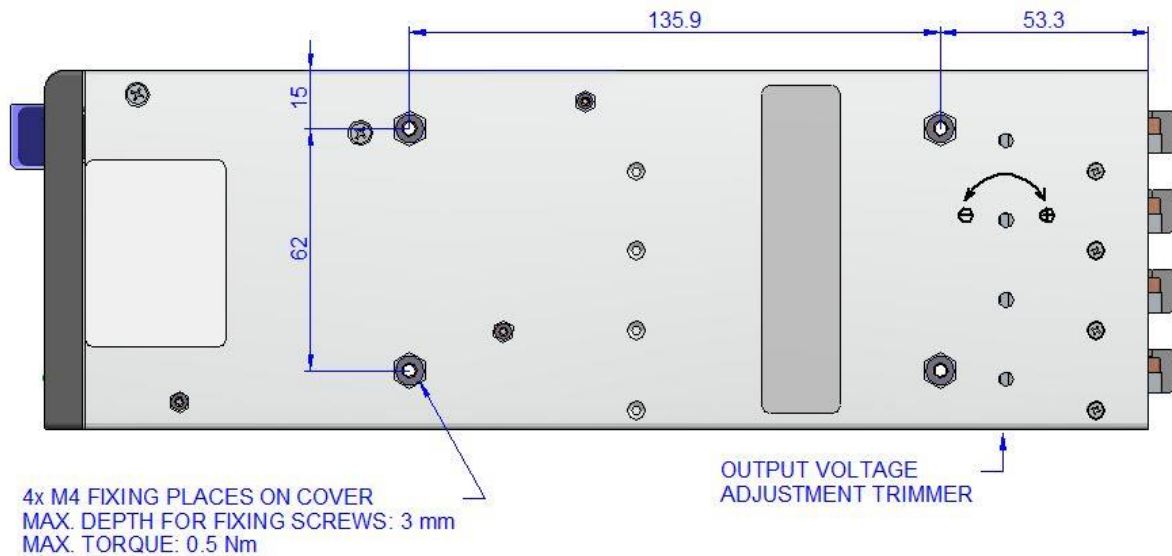


Figure 10 - Bottom View



10. Accessories

10.1. Mating Connections and Cables

All the power and signal cables and mating connectors are not included in the LPM616 standard package. These all need to be ordered extra.

Front panel signal cable:	Bel Power Solutions accessory LPM000-LEAD-03	see <i>Figure 11</i>
Output signal cable:	Bel Power Solutions accessory LPM000-LEAD-04	see <i>Figure 12a</i>
Mating connector:	JST, housing PHDR-10VS, pins SPHD-002T-P0.5 (AWG 28-24)	
Output power cable (for LPM126):	14AWG – 10AWG depend on the output current, min. thermal class 105°C, lug terminal 4mm 6mm ²	
Output power cable (for LPM109/118):	Bel Power Solutions accessory LPM000-LEAD-05,	see <i>Figure 12b</i>

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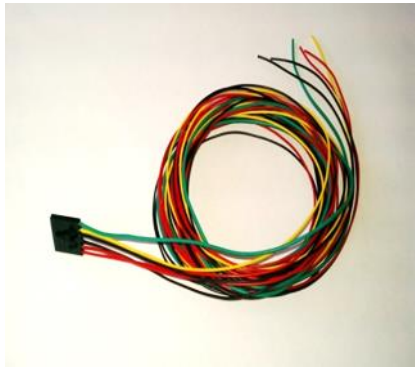


Figure 11 - LPM000-LEAD-03:
Front panel signal cable
(length of the cable 1.8m)



Figure 12a - LPM000-LEAD-04:
Output signal cable
(length of the cable 0.75m)



Figure 12b - LPM000-LEAD-05:
Output power cable for modules K-N (length
of the cable 0.75m)

10.2. Signal Output Wire Colors

PIN #	SIGNAL NAME BY MODULES E, F, G, H, J	SIGNAL NAME BY MODULES K, L, M, N	WIRE COLOR
1	VS+	PG_HI_A	Red
2	VS-	PG_LO_A	Blue
3	CSH	INH_HI_A	Yellow
4	Common	INH_LO_A	White
5	N/C	N/C	-
6	N/C	N/C	-
7	PG_HI	PG_HI_B	Violet
8	PG_LO	PG_LO_B	Brown
9	INH_HI	INH_HI_B	Black
10	INH_LO	INH_LO_B	Green

10.3. Paralleling Busbars (only for modules E-J)

ITEM	DESCRIPTION	MODEL
LPM000-BBAR-07	Busbar for parallel connection of two modules, central screw M5, max. 100A ¹ . Two pieces are in one package LPM000-BBAR-07.	
LPM000-BBAR-08	Busbar washer with 1 opening for odd module paralleling. Two pieces are in one package LPM000-BBAR-08.	

NOTES:

¹ For load current over 100A use two or more cables connected to separate busbars.

² By using busbars (paralleling modules) you will need also the signal output leads LPM000-LEAD-04, one for each connected module.
The interconnection is shown in *Figure 15* (especially all pins 3 - CSH and all pins 4 - Common must be reconnected).

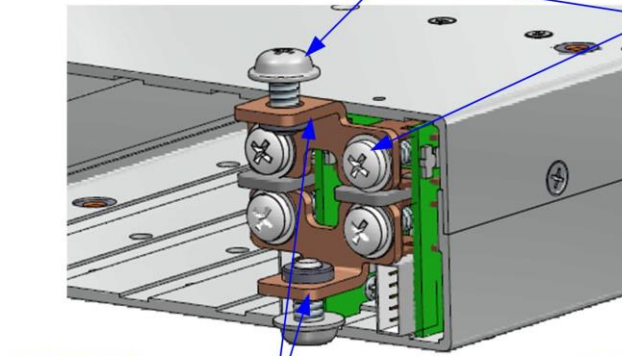
³ Modules K-N cannot be connected in parallel.

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The example of LPM409-00EE-DXXX assembly configuration (two modules in parallel) is shown in *Figure 13*. One set of busbars LPM000-BBAR-07 + 2x LPM-LEAD-04 is necessary for connection.

Figure 13 – LPM409-0000EE-DXXX Parallel Configuration

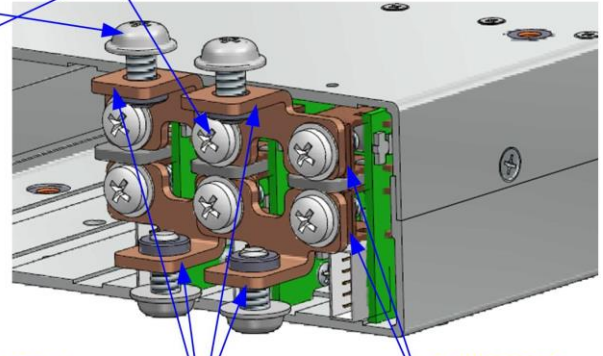
M5x10mm SCREW FOR CABLE LUG



2x XBB.00375.0
BUSBAR INTERCONNECTION

Figure 14 – LPM409-000EEE-DXXX Parallel Configuration

M4x10mm SCREW FOR BUSBAR INTERCONNECTION



4x XBB.00375.0
BUSBAR INTERCONNECTION

2x XWF.00028.0
BUSBAR WASHER

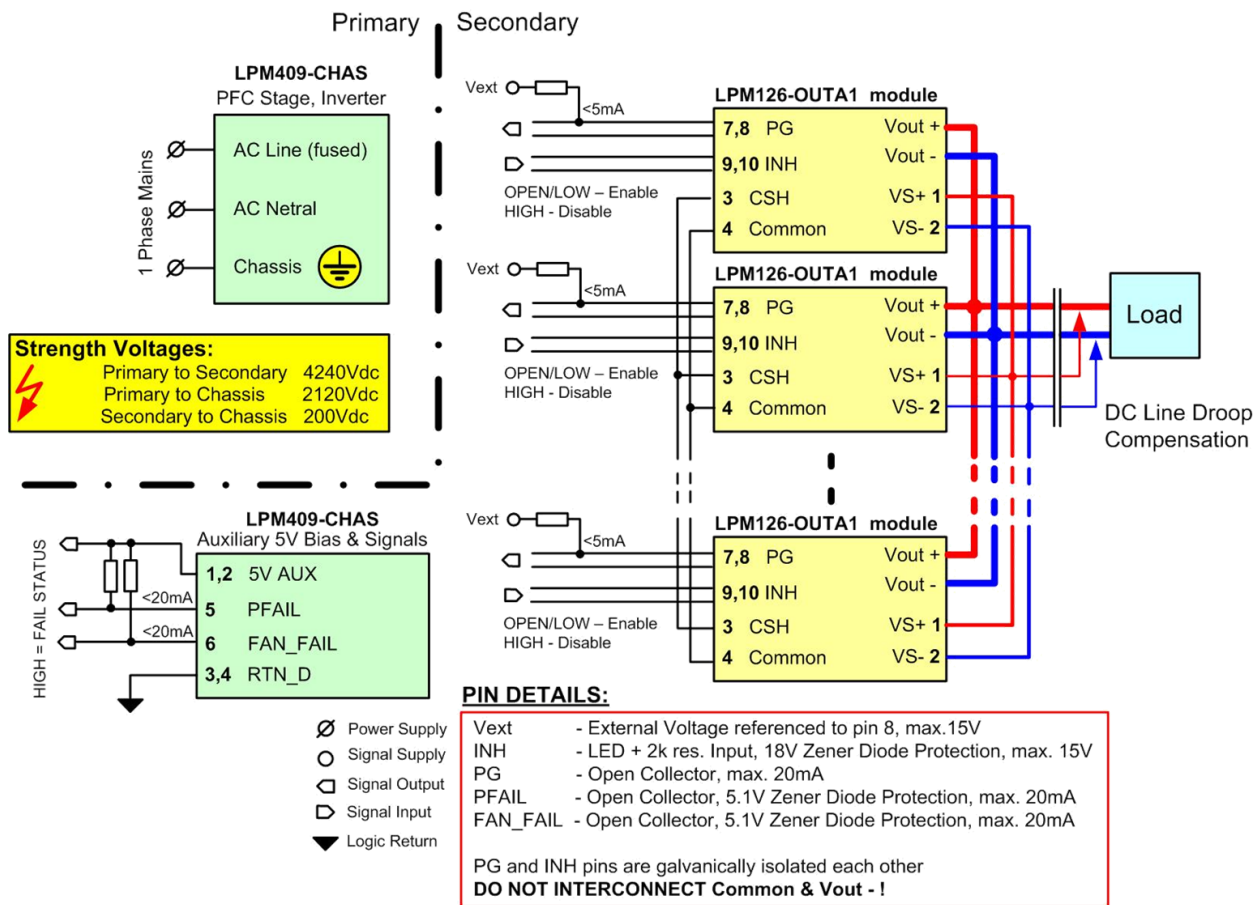
An example of an LPM409-0EEE-DXXX assembly configuration (three modules in parallel) is in *Figure 14*. Two sets of busbars LPM000-BBAR-07 + one set of LPM000-BBAR-08 + 3x LPM-LEAD-04 are necessary to make the interconnections.

Note, for odd number of modules in parallel it is necessary to also use one set of busbar washers LPM000-BBAR-08.

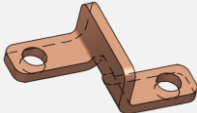
To connect the load for higher output currents use more cables for each pole. For example for 200A output current (LPM409-EEEE-DXXX) connect minimal two power cables for each pole (2x 42mm² for one pole). Use min. 105°C thermal class isolation.

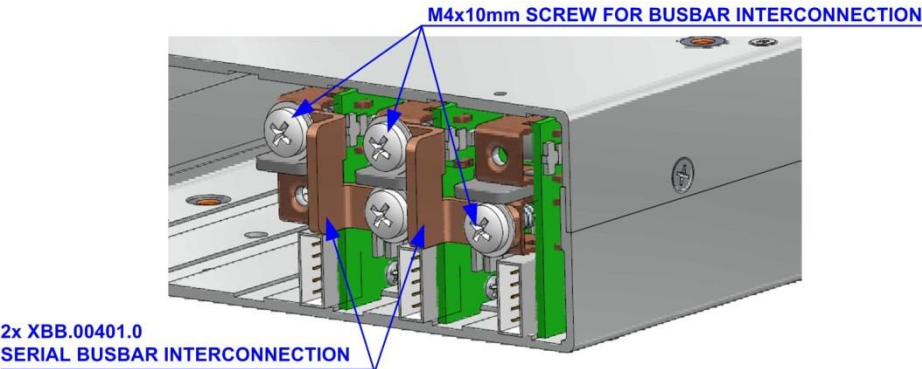
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Figure 15 – LPM409 - Paralleling Connection Diagram for LPM126 Modules



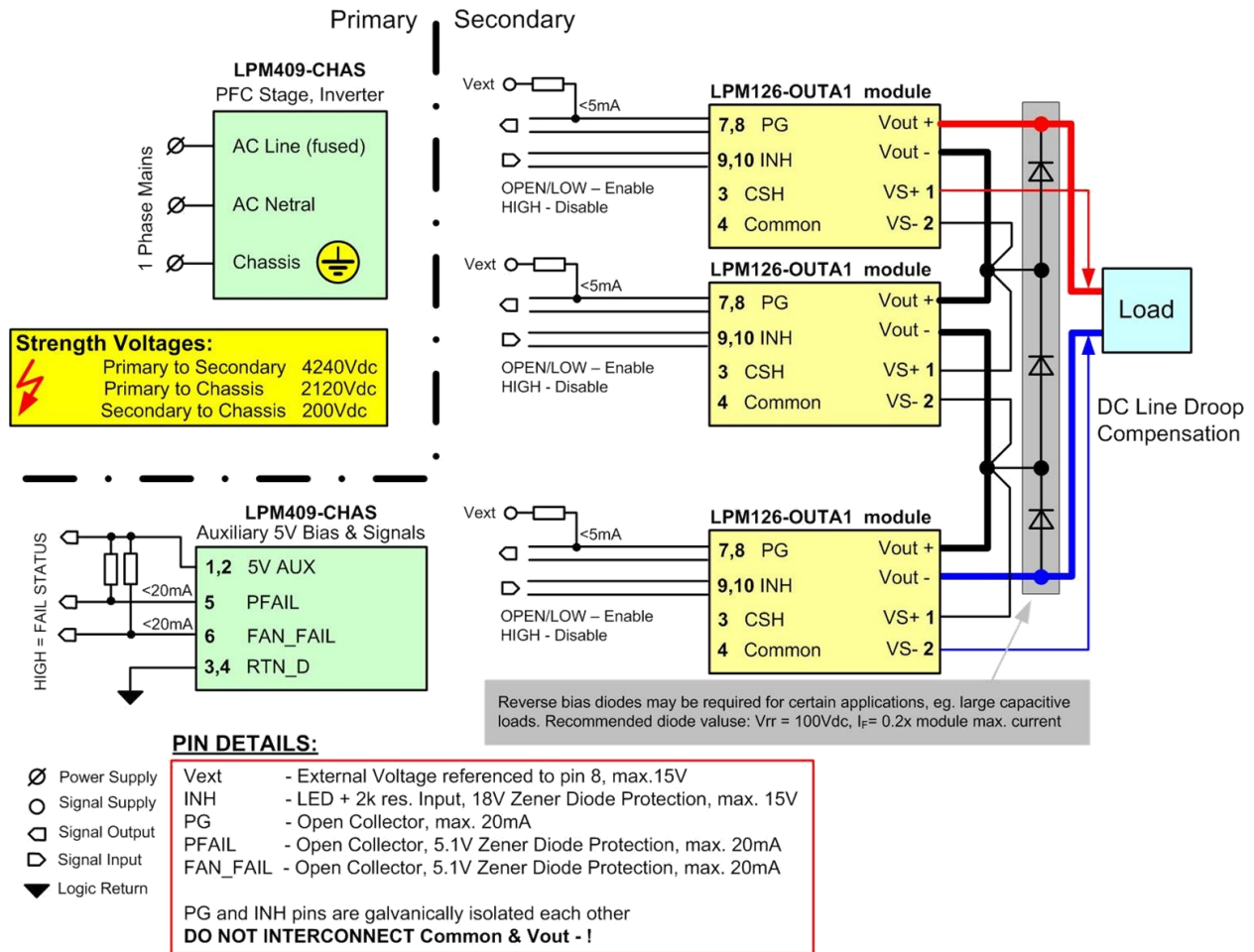
10.4. Serial Busbars (only for modules E-J)

ITEM	DESCRIPTION	MODEL
LPM000-BBAR-09	Busbar for serial connection of two modules.	



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Figure 17 – LPM409 – Serial Connection Diagram for LPM126 Modules



For more information on these products consult: tech.support@psbel.com

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