PSD 1220-098

SIL3 Power Supply PSD1220-098, 24Vdc, 20 A, Zone 2 / Div. 2 DIN Rail Mounting

Characteristics:

General Description:
The Power Supply type PSD1220-098 is an anodized aluminum unit.
The Power Supply provides 24Vdc, 20 A output. PSD1220-098 unit can be paralleled, with load sharing circuits, which distribute current load equally to each power supply to increase reliability and reduce internal power dissipation.
The Power Supply accepts AC power input sources with nominal voltage range 110 to 240 Vrms (± 10%). Therefore lower limit is 100 Vrms and upper limit is 264 Vrms.
PSD1220-098 unit has got the same AC, DC, Fault and Current Sharing connectors used in the PSD1210 power supply module, for easy model to model replacement.

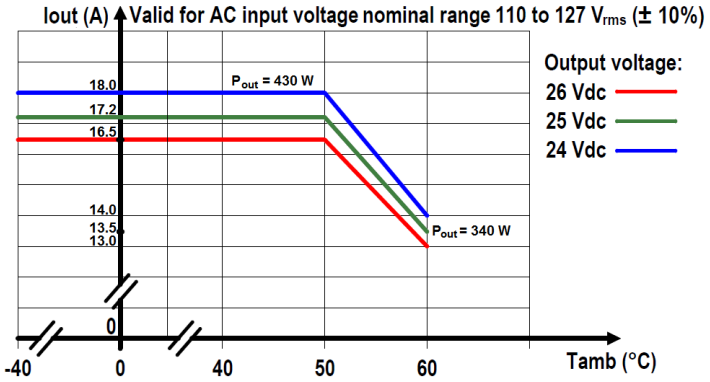
Overvoltage protection: 3 independent overvoltage protections:
1 voltage limiting loop at 28.5 Vdc and 1+1 crowbars at 29 Vdc.

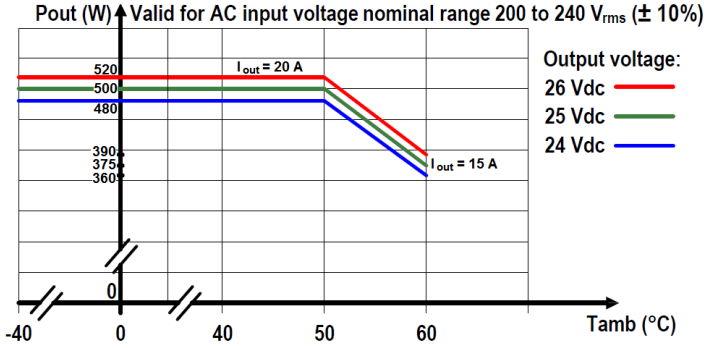
High load fuses breaking capability:
In case of short circuit on the load, the Power supply system delivers a very high peak current (about 500 Amp) for a duration of 0.5 ms. This characteristic ensures the instant breakage of the protective fuse or circuit breaker. Because of the very short peak current duration, other equipment connected to the load are not affected by the failure event and continue to operate without interruption.

Functional Safety Management Certification:
G.M. International is certified by TUV to conform to IEC61508:2010 part 1 clauses 5-6 for safety related systems up to and included SIL3.

FSM SIL 3

Maximum Output Current & Power vs. Ambient Operating Temperature





Features:

- SIL 3 for NE Load according IEC 61508:2010, with one PSD1220-098 module or more PSD1220-098 modules in redundant configuration (see ISM0371 for more information).
- SIL 2 / SIL 3 for ND Load according IEC 61508:2010, with two or more PSD1220-098 modules in redundant configuration (see ISM0371 for more information).
- Systematic capability SIL 3.
- Power factor correction.
- The same AC, DC, Fault and Current Sharing connectors used in the PSD1210 power supply module, for easy model to model replacement.
- Installation in Zone 2/Div. 2 hazardous locations.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- ATEX, IECEx, UL & C-UL, TÜV Certifications.
- TÜV Functional Safety Certification.
- Highly regulated output of 24 Vdc, 20 A.
- Under and over voltage alarm monitoring.
- 3 over voltage redundant protections.
- Redundant parallel connections with load sharing.
- Reduces Power dissipation (in parallel/redundant configuration) by replacing a Schottky diode with Mosfet Active Ideal Diode.
- Better than 93% efficiency @230 Vac input, full load and full output voltage range.
- High load fuse breaking capability without interrupting operations.
- Conformal coated on all boards for durability and protection.

Ordering Information:

Model:	PSD1220-098

Technical Data:

Supply:
AC Input voltage: nominal 110 to 240 Vrms (±10 %), with frequency range 48 to 62 Hz.
Power Factor Correction (AC input, full load): 0.97 typ.@230Vac, 0.995 typ.@115Vac
Efficiency (full load, full Vout range): better than 93% @230Vac and 91% @115Vac.
Efficiency (50% full load, full Vout range): better than 91% @230Vac, 90% @115Vac.
Max. internal power dissipation (full load, 24 Vout): 35W @230Vac, 43W @115Vac.
Max. internal power dissipation (50% full load): 24W @230Vac, 28W @115Vac.
Max. AC input current (sinusoidal at full load): 4.8A @ 100Vac & full Vout range; 4.4A @ 110Vac & full Vout range; 2.2A (24Vout), 2.3A (25Vout), 2.4A (26Vout) @ 240Vac.
Inrush current: 15.7 Apeak @ 264Vac, 13 Apeak @ 230Vac, 5.2 Apeak @ 115Vac.
AC connection: plug-in screw connection terminal block suitable for 4mm² wires.

Isolation:
Input to Output isolation: 2500 Vrms (routine test).
Input to Ground isolation: 1500 Vrms (routine test).
Ground to Output isolation: 500 Vrms (routine test).
Output or Ground to Fault contact isolation: 500 Vrms (routine test).

Output:
Voltage: 24 Vdc factory setting (adjustable range 23.6÷26.1 Vdc by front panel trimmer).
Regulation: 0.4% for a 100 % load change.
Stability: 0.03 % for a 20 % input line voltage change.
Max. Ripple: ≤ 300 mVpp.
Output current: 20 A (on full output voltage range and 230 Vac input). Parallel connection for redundancy with load sharing capability within ±2.5 % of output voltage setting.
Output current limitation: 22A @ 24Vout, 21A @ 25 & 26 Vout. Protected to short circuit.
Output power: up to 520 W @ 26 Vdc output and 230 Vac input.
Max. Output Rise Time (after AC Input supplying): ≤ 2.4 sec.
Dynamic Response: 1.5 ms for 10-90% load change (overshoot ±2% of Vout setting).
DC connection: plug-in screw connection terminal block suitable for 4mm² wires.
Hold-up time at full load: 20 msec (AC input).
Overheat protection: double overheat protection on the 1st and 2nd internal stages.
Over voltage protection: output limited to 28.5 Vdc plus two redundant crowbars for over voltage protection at 29 Vdc.

Power good signaling:
Output good: 22 V ≤ Vout ≤ 28 V (see page 2 for more information).
Signaling: voltage free SPST normally energized relay (contact closed), de-energize in over/under voltage conditions (contact open).
Contact Rating: 2 A 50 Vac 100 VA, 2 A 24 Vdc 48 W (resistive load).
Connection: plug-in screw connection terminal block suitable for 2.5mm² wires.

Compatibility:
CE mark compliant, conforms to Directive: 2014/34/EU ATEX, 2014/30/EU EMC, 2014/35/EU LVD, 2011/65/EU RoHS.

Environmental conditions:
Operating temperature limits: -40 to +60°C de-rated linearly 75-80% load above 50°C; see Output Current & Power vs. Ambient Operating Temperature diagrams on this page.
Relative humidity limits: 95%, up to 55°C.
Transport, storage temperature limits: - 45 to + 85 °C. ***Max altitude:*** 2000 m a.s.l.

Safety Description:
ATEX: II 3G Ex ec nC ic IIC T4 Gc. ***IECEx:*** Ex ec nC ic IIC T4 Gc.
UL: NI / I / 2 / ABCD / T4; ***C-UL:*** NI / I / 2 / ABCD / T4. ***CCC:*** Ex ec nC ic IIC T4 Gc
Approvals
BVS 18 ATEX E 004 X conforms to EN60079-0, EN60079-7, EN60079-11, EN60079-15.
IECEx BVS 18.0004X conforms to IEC60079-0, IEC60079-7, IEC60079-11, IEC60079-15.
CCC n. 2020322303000822 conforms to GB/T 3836.1, GB/T 3836.3, GB/T 3834.4, GB/T 3836.8
UL & C-UL E498342 conforms to UL 61010-1, UL 121201 for UL and CAN/CSA C22.2 No.61010-1-12, CSA C22.2 No. 213 for C-UL.
TUV Certificate No. TUV IT 25 SIL 0634 SIL 3 / SIL 2 conforms to IEC61508:2010 Ed. 2.
SIL 3 Functional Safety TÜV Certificate conforms to IEC61508:2010 Ed.2, for Management of Functional Safety.

Mechanical: ***Mounting:*** EN/IEC60715 TH 35 DIN-Rail, into a cabinet.
Weight: 1.8 Kg (2 Kg with packaging).
Location: installation in Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4 or Class I, Division 2, Group A,B,C,D, T4.
Protection class: IP 20, Open Type.
Dimensions: see drawings page 2.

Image:

Reasons for using an Ideal Diode-OR Controller circuit, in N+1 redundant power supply applications with high availability systems

High availability systems often employ power supply modules connected in parallel to achieve redundancy and enhance system reliability.
ORing diodes have been a popular means of connecting these supplies at a point of load. The disadvantage of this approach is the forward voltage drop and resulting efficiency loss. This drop reduces the available supply voltage and dissipates significant power.
Replacing Schottky diodes with N-channel MOSFETs reduces power dissipation and eliminates the need for expensive heat sinks or large thermal layouts in high power applications.
In the Ideal Diode-OR Controller circuit (*active ideal diode*), the voltage across source and drain is monitored by the IN and OUT pins, and GATE pin drives the MOSFETs to control their operation. In effect the MOSFET source and drain serve as the anode and cathode of an ideal diode.
In the event of a power supply failure, for example if the output of a fully loaded supply is suddenly shorted to ground, reverse current temporarily flows through the MOSFETs that are ON. This current is sourced from any load capacitance and from the other supplies. The active ideal diode quickly responds to this condition turning off the MOSFETs in about 0.5µs, thus minimizing disturbance and oscillations to the output bus.
Using ORing diodes, to parallel two, or more, 24VDC power supply modules for redundancy, one Schottky diode is used for each module. The voltage drop across the diode can reach about 0.8 V at 20 A, this means about 16 W dissipation for each module. Then, if two 20 A paralleled modules are used for full 20 + 20 A redundancy, a total power of about **32 W** is dissipated for this purpose. This reduces efficiency, reliability and increases space for heat sinks. Moreover, in case of module failure, diodes take time to recover and consequently they do not preserve the load from transients during the backup operation.
To avoid all these problems G.M. International has introduced, in the new PSD1220-098 Power Supply System, the use of *active ideal diodes*.
The MOSFETs resistance for *active ideal diodes* is about 1 mΩ resulting in 0.4 W dissipation for each power module. Then, if two 20 A paralleled modules are used for full 20 + 20 Amp redundancy, a total power of about **0.8 W** is dissipated for the purpose resulting in about **forty times less** dissipation compared to Schottky diodes solution.
This increases efficiency, reliability, availability and reduces space for heat sinks.
This circuit provides also very smooth voltage switchovers without oscillations with fast turnoff, minimizing reverse current transients.

Output voltage setting - Fault indications - Diagnostic information

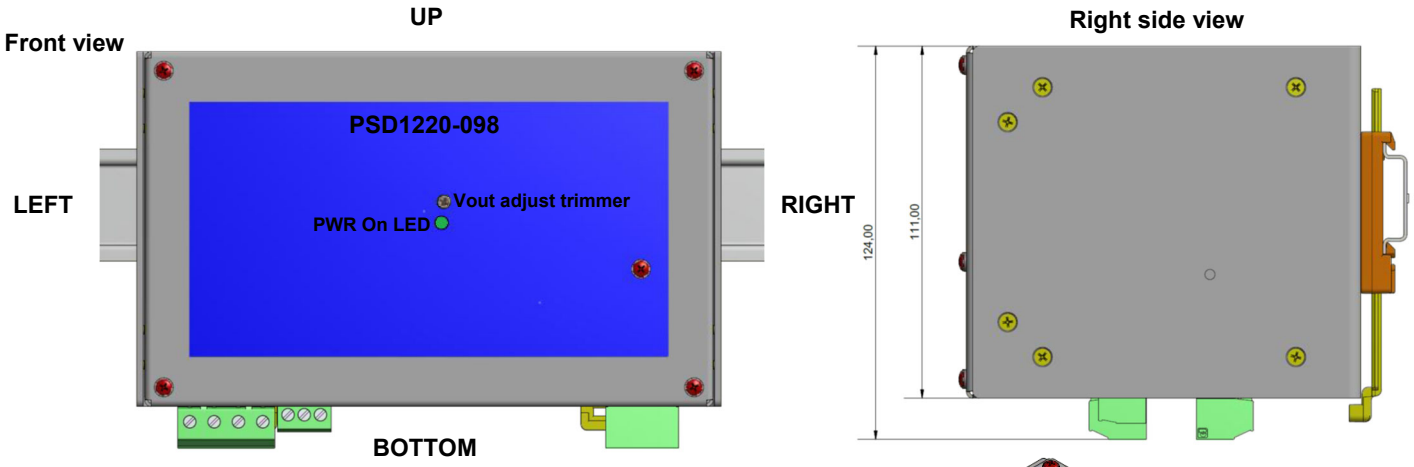
The output voltage can be set from 23.6 to 26.1 Vdc by a front panel trimmer.
Under voltage threshold is set to 22 V, while Over voltage threshold is set to 28 V.
A front panel power ON green LED signals that mains voltage is applied to the power module and normal DC output voltage is present on DC output terminal block.
Power module Fault conditions are signaled by opening contact of NE relay (in normal condition contact is closed) on the “Fault” terminal block. Faults can be:

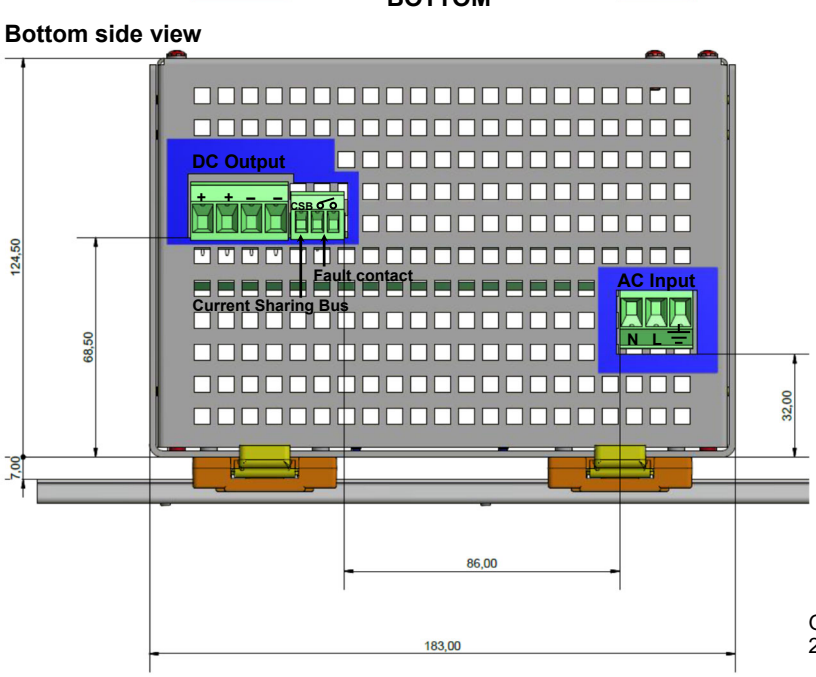
- Under voltage Vout < 22 V.
- Over voltage Vout > 28 V.

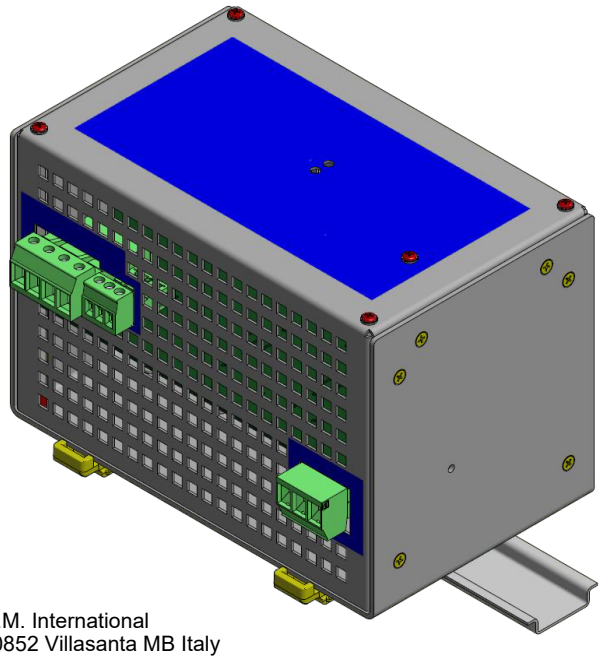
In absence of under / over voltage fault, the green Power ON LED is ON if output voltage is within 22 V - 28 V range
If output voltage goes below 22 V, the green Power ON LED blinks and remains steady for values lower than 22.5 V.
If output voltage goes over 28 V, the green Power ON LED is OFF and remains steady for values higher than 27.5 V.
After under / over voltage fault, coming back to normal condition, the green Power ON LED is ON if output voltage is within 22.5 V - 27.5 V range.

PSD1220-098 DIN Rail Mounting into a cabinet - overall dimensions (mm):

The PSD1220-098 is fixed to a DIN Rail as shown in the following drawing.
The PSD1220-098 must only be installed on a DIN-Rail as oriented in the following drawing.







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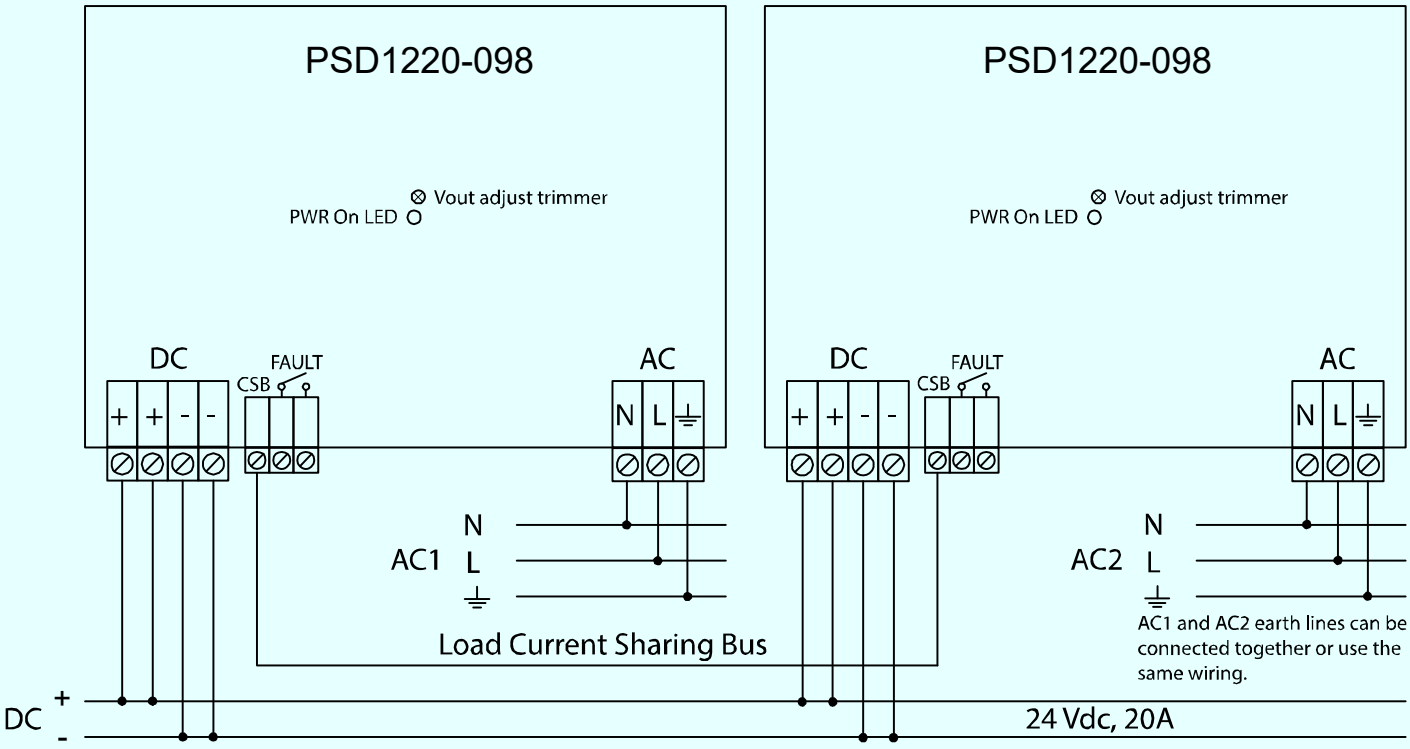
Function Diagram:

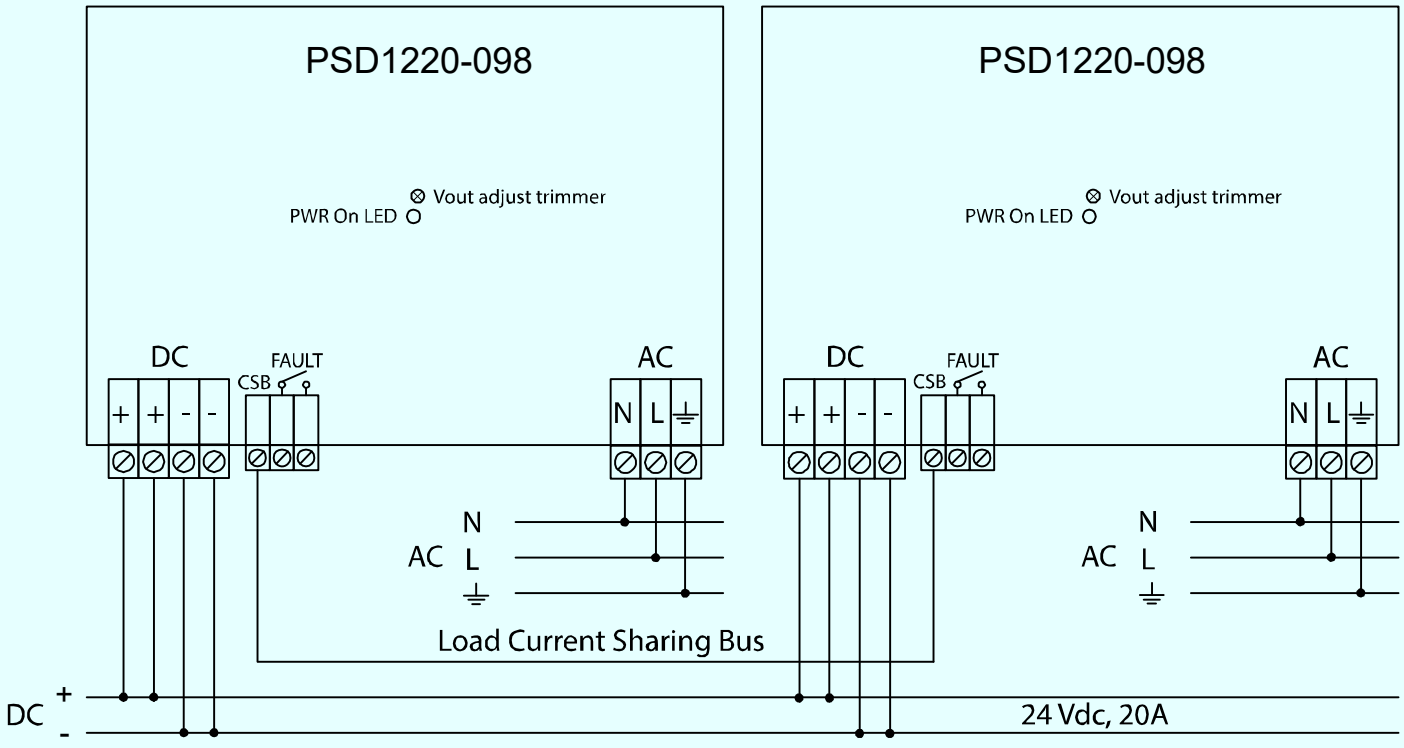
SAFE AREA or ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS or CLASS I, DIVISION 2, GROUPS A, B, C, D T-Code T4

PSD1220-098, dual AC supply, 1 redundant 20 A Output.
two modules connected in parallel to provide full redundancy on AC lines (AC1 and AC2) and one 20 A redundant output.



In this application, for each PSD1220-098, double wiring (on positive and negative output poles) is suggested between DC output connector and DC bus.

PSD1220-098, single AC supply, 1 redundant 20 A Output.
two modules connected in parallel to provide one 20 A redundant output.



In this application, for each PSD1220-098, double wiring (on positive and negative output poles) is suggested between DC output connector and DC bus.