

## Product Datasheet

### PSS Module

- Rated voltage 144VDC
- 63F capacitance
- High peak current due to ultra-low ESR
- Laser welded connections
- IP69, intrinsically safe
- Monitoring of all cell voltages, active cell balancing
- Evaluation of module data and adaptation of module parameters via CAN possible
- Fixation to equipment according customer request



#### ELECTRICAL SPECIFICATIONS

Type	M33W-144-P063
Rated Voltage $V_R$	144.00 V
Surge Voltage $V_S^1$	148.80 V
Rated Capacitance $C^2$	63 F
Capacitance Tolerance <sup>3</sup>	0% / +20%
DC ESR <sup>2</sup>	<9.5 mΩ
Leakage Current $I_L^4$	<30 mA
Maximum Continuous Current <sup>5</sup> ( $\Delta T = 15^\circ\text{C}$ )	175 A <sub>RMS</sub>
Maximum Continuous Current <sup>5</sup> ( $\Delta T = 40^\circ\text{C}$ )	280 A <sub>RMS</sub>
Max Current $I_{Max}^6$	2.8kA
Short Current $I_S^7$	15kA
Voltage balancing current at $V_R$	20... 400 mA
Stored Energy $E^8$	180 Wh
Energy Density $E_d^9$	2.7 Wh/kg
Usable Power Density $P_d^{10}$	4.1 kW/kg
Impedance Match Power Density $P_{dMax}^{11}$ , 1kHz ESR	9.3 kW/kg

#### THERMAL CHARACTERISTICS

Type	M33W-144-P063
Working Temperature	-40 ~ 65°C
Storage Temperature <sup>12</sup>	-40 ~ 70°C
Thermal Resistance $R_{Th}^{13}$ ; active air cooling	0.048°C/W
Thermal Capacitance $C_{Th}^{14}$	34 kJ/°C
Fan voltage $V_{FAN}$	24 VDC
Fan power, continuous $P_{FAN}$	60 W

#### LIFETIME CHARACTERISTICS

Type	M33W-144-P063
DC Life at High Temperature <sup>15</sup>	1500 hours
DC Life at RT <sup>16</sup>	10 years
Cycle Life <sup>17</sup>	1'000'000 cycles
Shelf Life <sup>18</sup>	4 years

## SAFETY & ENVIRONMENTAL SPECIFICATIONS

<b>Type</b>	<b>M33W-144-P063</b>
Protection degree	IP6k9k without fan, IP68 with fan; IEC 60529
Vibration	ISO 16750-3 Table 12
Shock	IEC 60068-2-27; test Ea / 15g; 11ms; 18x
Bump	IEC 60068-2-29; test Eb / 25g; 6ms; 6000x
EMC	EN 50121-3-2: 07.2016
Rated insulation voltage (maximum series voltage)	1500 Vdc

## INTERFACES

<b>Type</b>	<b>M33W-144-P063</b>
Control voltage for internal module electronics <sup>19</sup>	24 VDC
Control power permanent	5 W
Control voltage IO for error signal	≤24 VDC
Error signal, open-collector	≤10 mA
CAN	CAN Standard (CAN 2.0A)

## PHYSICAL PARAMETERS

<b>Type</b>	<b>M33W-144-P063</b>
Mass M (without / with fan)	63 / 66 kg
Dimensions Length (without / with fan)	662 / 753 mm
Width	510
Height	224 mm

## CONNECTORS – COMMUNICATION

Connector: M12 female 8 poles (A coded)

PIN	SIGNAL	DESCRIPTION
1	+24V IO	Control voltage power supply for error signal
2	Error signal	Open-collector, low: Error / high: OK, max 10mA
3	0V GND IO <sup>21</sup>	Reference ground for control voltage IO and error signal
4	CAN GND <sup>21</sup>	CAN GND
5	CAN Low	CAN Low
6	CAN High	CAN High
7	+24V	Control voltage power supply
8	0V GND <sup>21</sup>	Reference ground for control voltage

## CONNECTORS - CPOWER

Connectors: Amphenol SurLock Plus

PIN	SIGNAL	DESCRIPTION
1	Power connection (+)	Amphenol SLP IR C T P C O(R) 0
2	Power connection (-)	Amphenol SLP IR C T P C B 3
GND	Housing	M8 (max. 15Nm)

## CONNECTORS - FAN

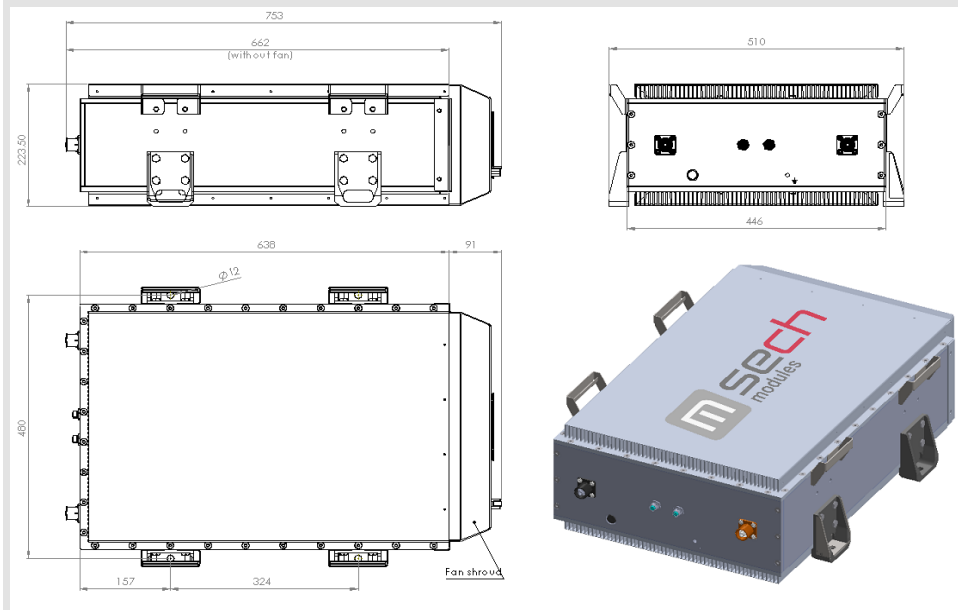
Connector: DT04-2P-L012

PIN	SIGNAL	DESCRIPTION
1	0V FAN	Reference ground for fan power supply
2	24V FAN	Fan power supply

## DESIGN AND DIMENSIONS:

Type

M33W-144-P063

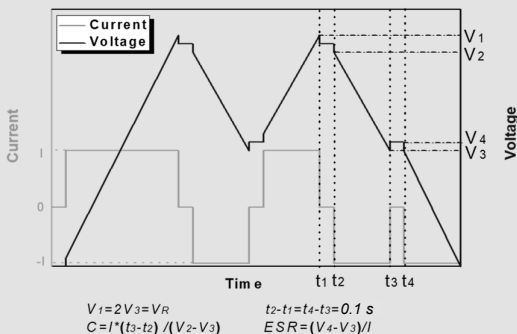


Standard markings:

- Name of manufacturer
- Part number and serial number
- Rated voltage and capacitance
- Negative and positive terminals
- Warning marking
- Stored energy in watt-hours

## NOTES:

1. Surge voltage  $V_S$ : Absolute maximum voltage, non-repetitive. The duration must not exceed 1 second.
2. Capacitance  $C$  and ESR DC: The test current is 100A.



3. Capacitance tolerance: Typical tolerance is +5%~+10%.
4. Leakage current measurement procedure: 1) Charge the capacitor to the  $V_R$  with a constant current of 100A. 2) Hold the voltage at  $V_R$  for 72h. 3) The current to maintain  $V_R$  after 72 h is the leakage current. Leakage current may be greater if balancing is activated.
5. Max constant working current:  $I_{MCC} = \sqrt{\Delta T / (ESR * R_{Th})}$

6. Max current:  $I_{Max} = 0.5C * V_R / (\Delta t + ESR * C)$ , discharge from  $V_R$  to  $V_R/2$  in 1 second.
7. Short current:  $I_S = V_R / ESR$
8. Stored energy:  $E = 0.5C * V^2 / 3600$
9. Energy density:  $E_d = E / M$
10. Usable power density:  $P_d = 0.125V_R^2 / (ESR * M)$
11. Impedance match power density:  $P_{dMax} = 0.25V_R^2 / (ESR * m)$
12. Storage temperature: Storage in discharge state.
13. Thermal resistance:  $R_{Th} = \Delta T / P$ , where  $P = ESR * I^2$
14. Thermal capacitance is indicated for the whole module.
15. DC life at high temperature: Hold the capacitor charged at rated voltage at 65°C for 1500h. The capacitance shall be >80% of the rated value, the ESR shall be <200% of the rated value.
16. DC life at RT: Hold the capacitor charged at rated voltage at room temperature RT, the capacitance shall be >80% of the rated value, the ESR shall be <200% of the rated value.
17. Cycle life: Charge and discharged the capacitor in the range between  $V_R$  and  $V_R/2$ . 5 seconds waiting period between charge and discharge. The constant test current is 100A).
18. Shelf life: Discharged and no load applied at RT.
19. See detailed CMS datasheet and user manual.
20. The electronics can alternatively be supplied from the module. In this case CAN and error output are not available.
21. Do not interconnect pins 2, 5, and 8; maximum permissible voltage between pins 2, 5, 8 and PE = 42V.

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