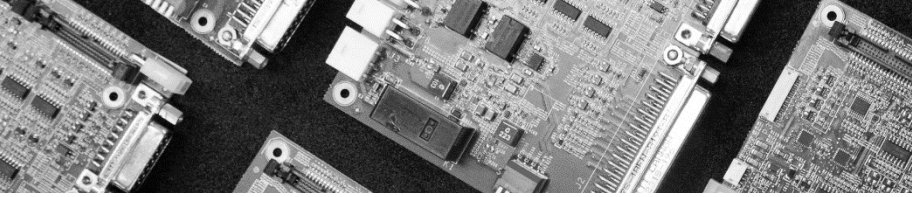


ASM400S/BSM400S

400W HIGH DENSITY MEDICAL/INDUSTRIAL GRADE OPEN FRAME POWER SUPPLIES

The Astrodyne ASM and BSM 400 Series are miniature open-frame power supplies designed for medical applications. The ASM400 is Class 1, and the BSM400 is Class 2 with 2 MOPP (method of patient protection) isolation and BF leakage current and have been certified by Underwriters Laboratories for compliance with the latest edition of the international medical safety standard, IEC 60601-1 3rd Edition using the CB reporting scheme. They are also certified to be compliant with the collateral standard 60601-1-2 for EMC and bear the UL Recognized component marks for North America and the EU and the CE mark.

HOW TO ORDER

A(B)SM400S-12

- AUX. OUTPUT CONFIGURATION (0, 1 OR 2 CHARACTERS)
  - BLANK: +5V AUX. AND +12V FAN OUTPUTS, BOTH PROVIDED
  - A1: +12V FAN OUTPUT PROVIDED, +5V AUX. NOT PROVIDED
  - 00: NEITHER AUX. OUTPUT PROVIDED
- VOLTAGE = 12 = 12VDC, 15 = 15VDC, 19 = 19VDC, 20 = 20VDC, 24 = 24VDC, 28 = 28VDC, 36 = 36VDC, 48 = 48VDC, 54 = 54VDC
- OUTPUT POWER: 400W
- INPUT CLASS/PRODUCT FAMILY (A OR B)
  - A: ASM CLASS I INPUT
  - B: BSM CLASS II INPUT

Note:
1. PS-ON: Connect this signal to DC_OUT_RTN to enable the main and FAN outputs. The 5V_AUX output is on when AC is applied.
2.PWR_OK: Open collector logic goes to high 160ms (typ.) after the main output is in regulation.

FEATURES

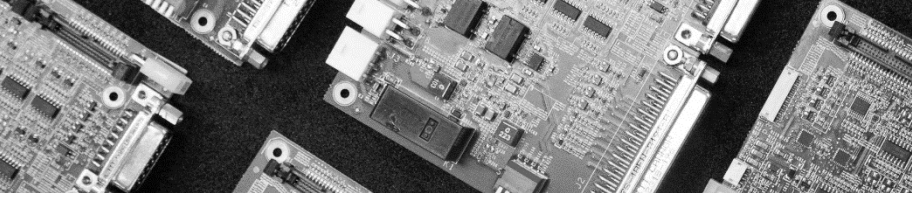
UNIVERSAL AC INPUT
90-264 VAC INPUT, 50/60 Hz

OUTPUT RANGE
400 Watts
230W rating with natural convection

OPERATING TEMPERATURE
-20 to +40°C at Full Load with derating

SAFETY APPROVALS
UL/cUL: AAMI ES60601-1: 2005 A1 2012/CSA 22.2 60601-1 2014
UL EU: EN60601-1: 2006 3rd Edition A1 2013, CB Scheme
IEC 60601-1: 2005 A1 2012
EMI: EN60601-1-2 Class B, EN55011/A1 Class B

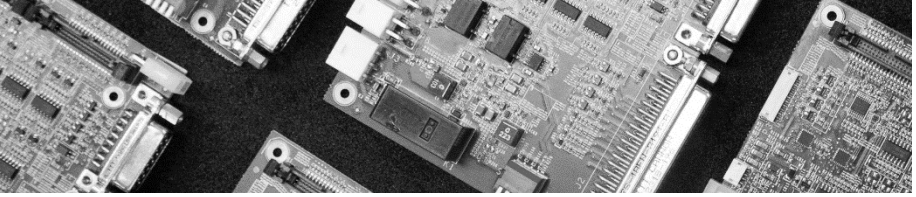
Amendment 1 – 2 MOPP – RoHS Compliant
Class 2 for home use medical applications (BSM400)
Single output with 5V Auxiliary and 12V fan output
High Efficiency, up to 92% @ 230Vac
High Power Density up to 19W/Inch^3



ASM400S/BSM400S

400W HIGH DENSITY MEDICAL/INDUSTRIAL GRADE OPEN FRAME POWER SUPPLIES

PARAMETERS	A(B)SM400S
Input Voltage Range	90-264 VAC
Range of Nominal Input Voltages	100-240 VAC
Input Frequency	47-63 Hz (50/60 Hz Nom.)
Input Current	4.5 A Max at 115VAC 2.5A Max at 230VAC
Inrush Current	30A Max at 115VAC, 60 Hz 60A Max at 230VAC, 50 Hz
Earth Leakage Current ASM400S	300uA Max at 264VAC, 50Hz
Patient Leakage Current BSM400S	100uA Max at 264VAC, 50Hz BF rating
Input Fusing	8A fuse in both L and N lines
Power Factor	0.95 min., 230VAC 50Hz
Output Voltage	12V, 15V, 19, 20V, 24V, 28V, 36V, 48V or 54V nominal
Output Power	400 W Continuous – See temp. & Airflow derating curves
Minimum Load	No minimum load required
Set Point Accuracy	± 1%
Load Regulation	± 1% Max, 0 to Full Load
Line Regulation	± 0.5% Max, 90 to 264 VAC
Temp. Drift	± 0.025 %/°C
Transient Response Excursion	Less than ± 5% 50 to 100% Load Step 1A/us Slew Rate
Transient Response Recovery Time	2ms Max 50 to 100% Load Step 1A/us Slew Rate
Ripple and Noise	1% pk-pk Max. 20MHz BW Measured with 47uF Alum and 0.1uF Ceramic at output
Efficiency	Refer to Ordering Information table
Standby Power	<1W 230 VAC
Start-up Delay	2s maximum
Start-up Rise Time	50ms maximum
Hold-up Time	16ms typ. Full Load, 115VAC
Power Density	19 W/in³
Switching Frequency	200 KHz typ.
MTBF	100K hrs. (typ.) per MIL-HDBK-217F
Input to Output	4000VAC, 2 MOPP
Input to Earth	1500VAC, 1 MOPP
Output to Earth	500VAC

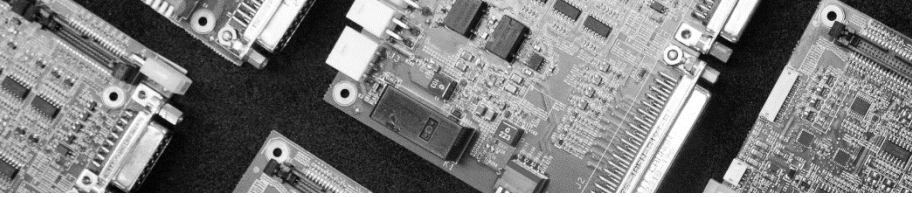


ASM400S/BSM400S

400W HIGH DENSITY MEDICAL/INDUSTRIAL GRADE OPEN FRAME POWER SUPPLIES

PARAMETERS	A(B)SM400S
Over Current Inception	105 to 135% Rated Current
Short Circuit	Hiccup Mode, Automatic recovery
Over Voltage Protection	130% Vo max. Latching, Recycle Input to Reset
Over Temperature Protection	Automatic recovery
Size	See Outline Drawings for mechanical options
Weight	1lbs. (453.6g)
Input Connector	Molex 41791
Input Mating Connector	Housing Molex 2139 Contact 2478
Output Connector	See Outline Drawings for mechanical options
Output Mating Connector	See Outline Drawings for mechanical options
Operating Temp. Range	-20 to +40°C at Full Load with derating
Storage Temp. Range	-40 to +85°C
Humidity	0 to 95%, non-condensing
Altitude	0 to 10,000 ft. 0 to 3048 m
Shock	30G pk. Half sine, 6 axis
Vibration	2 G RMS, 5 Hz to 500 Hz 3 axis, 30 min
Altitude	0 to 10,000 ft. 0 to 3048 m
Shock	30G pk. Half sine, 6 axis
Vibration	2 G RMS, 5 Hz to 500 Hz 3 axis, 30 min
UL/cUL	AAMI ES60601-1: 2005 A1 2012/CSA 22.2 60601-1 2014
UL EU	EN60601-1: 2006 3rd Edition A1 2013 CB Scheme IEC 60601-1: 2005 A1 2012
Conducted Emissions	EN60601-1-2 Class B EN55011/A1 Class B
Radiated Emissions	EN60601-1-2 Class B EN55011/A1 Class B
ESD Susceptibility Air Discharge	EN61000-4-2 Criteria A Level 3
ESD Susceptibility Contact Discharge	EN61000-4-2 Criteria A Level 2
Radiated Susceptibility	EN61000-4-3 Criteria A Level 2
EFT/Burst	EN61000-4-4 Criteria A Level 3
Surge	EN61000-4-5 Criteria A Level 2
Conducted Susceptibility	EN61000-4-6 Criteria A Level 2

All Specifications are typical at nominal input, full load, 25°C unless specified otherwise.
•For EMC Compliance, electrically bond 4 mounting holes to a conductive surface.



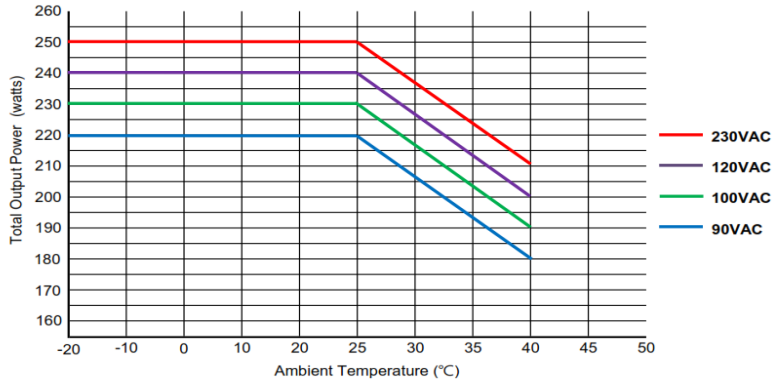
ASM400S/BSM400S

400W HIGH DENSITY MEDICAL/INDUSTRIAL GRADE OPEN FRAME POWER SUPPLIES

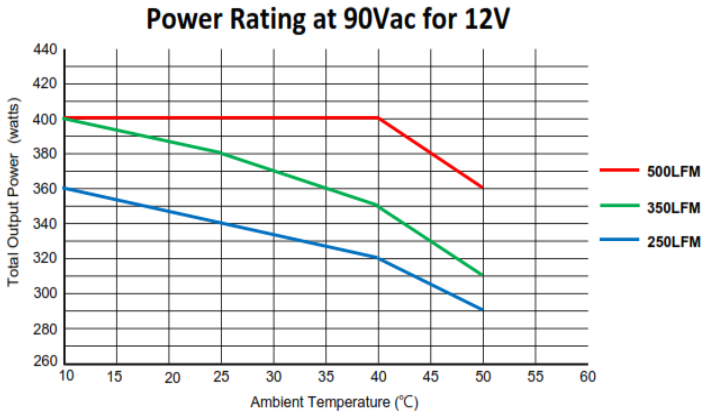
OUTPUT DERATING

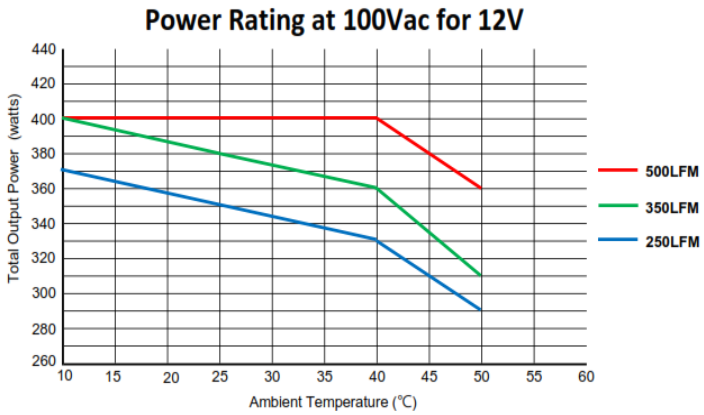
Output Power Derating Information

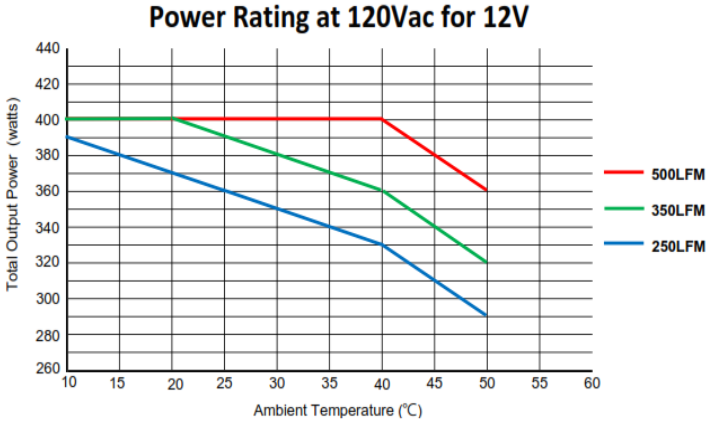
Natural Convection - Output Power vs. Ambient Temperature and Input Voltage for all models:

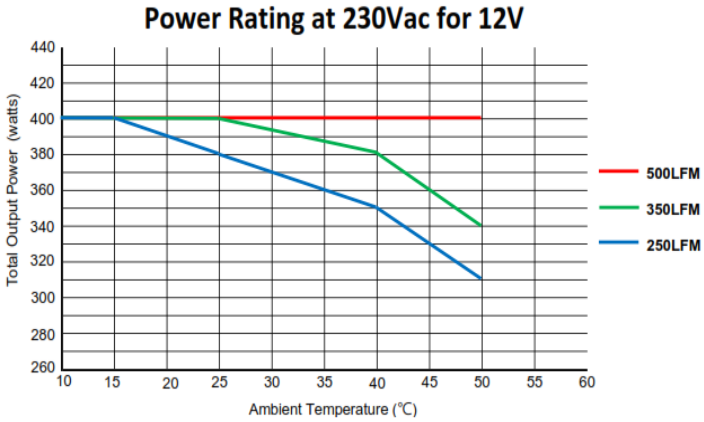


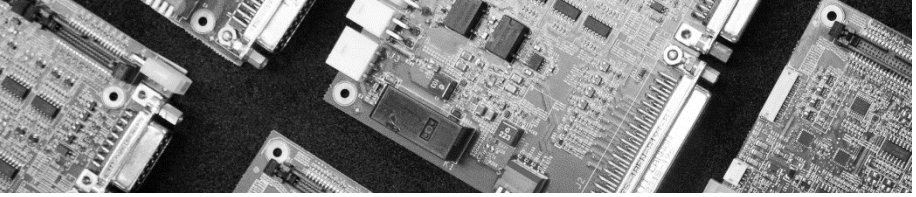
Forced Convection - Output Power vs. Ambient Temperature, Airflow and Input Voltage:







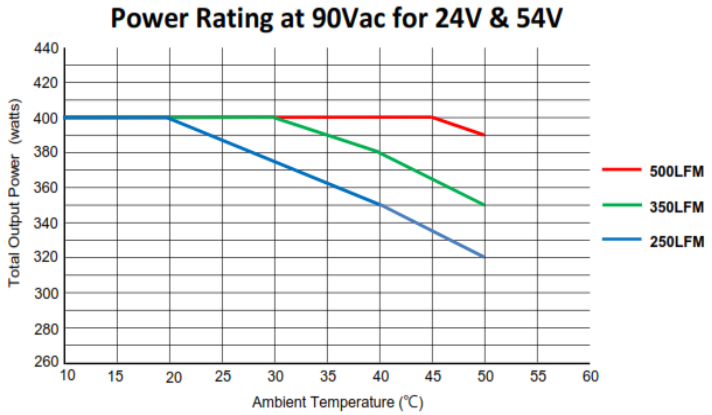


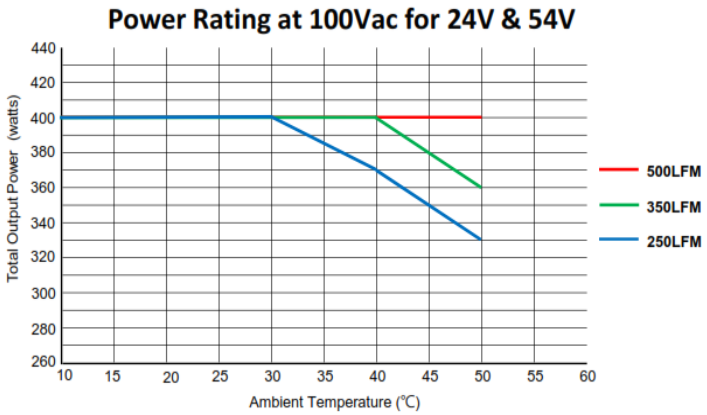


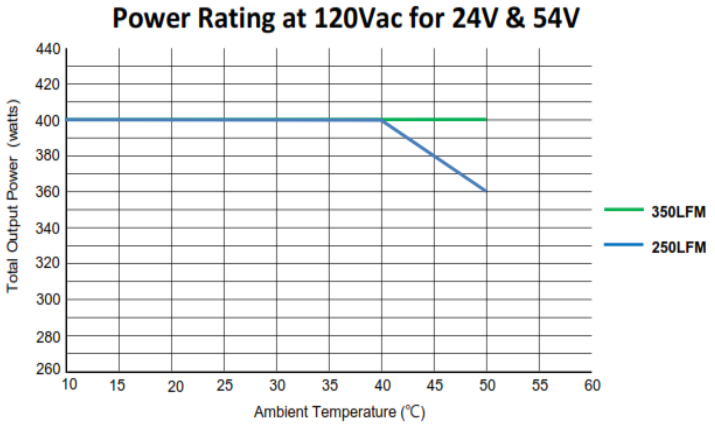
ASM400S/BSM400S

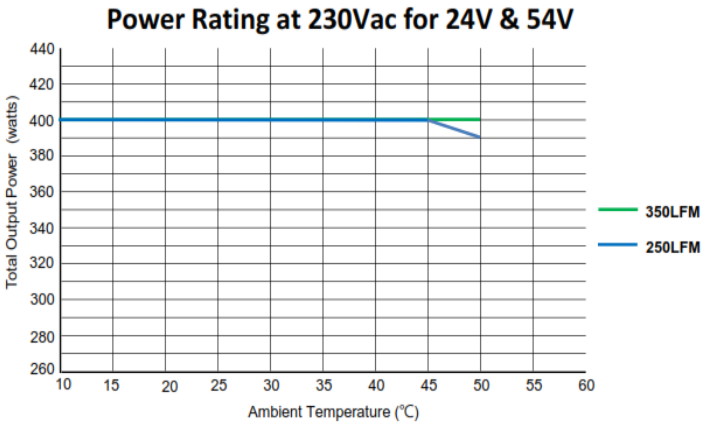
400W HIGH DENSITY MEDICAL/INDUSTRIAL GRADE OPEN FRAME POWER SUPPLIES

OUTPUT DERATING

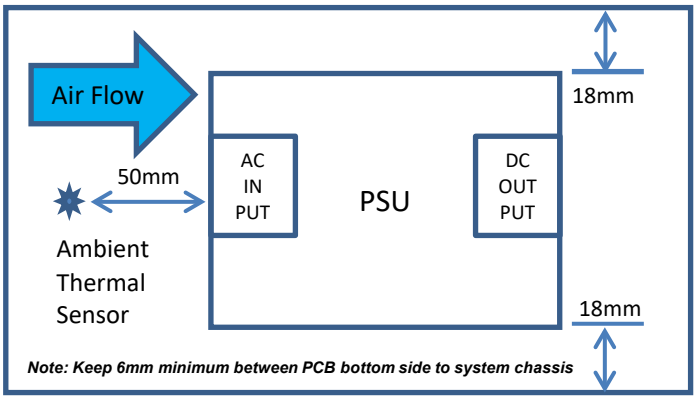


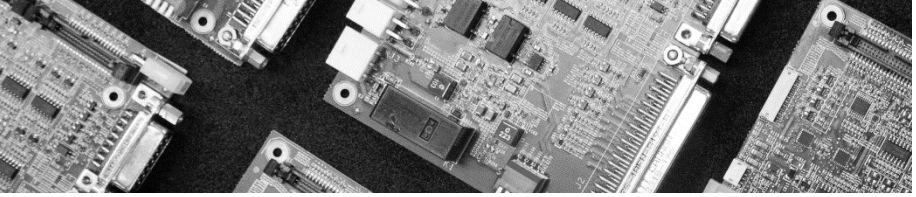






AIRFLOW GUIDELINES

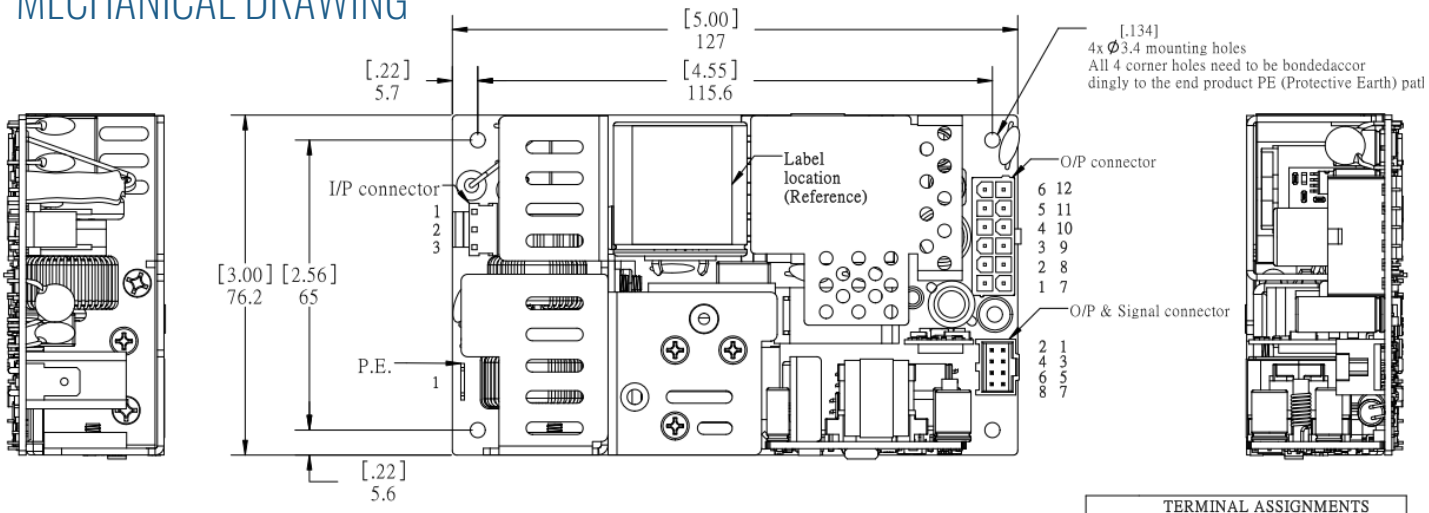




ASM400S/BSM400S

400W HIGH DENSITY MEDICAL/INDUSTRIAL GRADE OPEN FRAME POWER SUPPLIES

MECHANICAL DRAWING



Connector P/N info. for reference.	
I / P :Molex 41791 series or equivalent	Mating Connector :Molex 41695 series
O / P :Molex 5566 series or equivalent	Mating Connector :Molex 5557 series
O / P& Signal :Molex 90130 series or equivalent	Mating Connector :Molex 90142 series

TERMINAL ASSIGNMENTS		
CN1	1	ACL
	2	NC
	3	ACN
CN2	1	P.E.
CN3	1 - 6	DC_OUT
	7 - 12	DC_OUT_RTN
CN4	1	5V_AUX
	2	PWR_OK
	3	12V_AUX_RTN
	4	PS-ON
	5	+REMOTE_SENSE
	6	-REMOTE_SENSE
	7	12V_AUX
	8	5V_AUX_RTN

Notes:
1. All dimensions in mm (in.)
2. Maximum Dimensions:
   Length and Width Tolerance is ± 0.2 (0.008)
   Maximum Height: 36.1 (1.42)

MODEL	OUTPUT VOLTAGE	OUTPUT CURRENT, A FORCED/NATURAL CONVECTION	5V AUX, A FORCED/NATURAL CONVECTION	12V FAN, A FORCED/NATURAL CONVECTION	EFFICIENCY, TYP. 230/115VAC
A(B)SM400S-12	12 VDC	33.3/16.7	2A/1A	1A/0.5A	90/86
A(B)SM400S-15	15 VDC	26.7/13.3	2A/1A	1A/0.5A	90/86
A(B)SM400S-19	19VDC	21.1/10.5	2A/1A	1A/0.5A	91/86
A(B)SM400S-20	20 VDC	20/10	2A/1A	1A/0.5A	91/88
A(B)SM400S-24	24 VDC	16.7/8.3	2A/1A	1A/0.5A	91/88
A(B)SM400S-28	28 VDC	14.3/7.1	2A/1A	1A/0.5A	91/88
A(B)SM400S-36	36 VDC	11.1/5.5	2A/1A	1A/0.5A	91/88
A(B)SM400S-48	48 VDC	8.3/5.2	2A/1A	1A/0.5A	91/88
A(B)SM400S-54	54 VDC	7.4/4.6	2A/1A	1A/0.5A	91/88