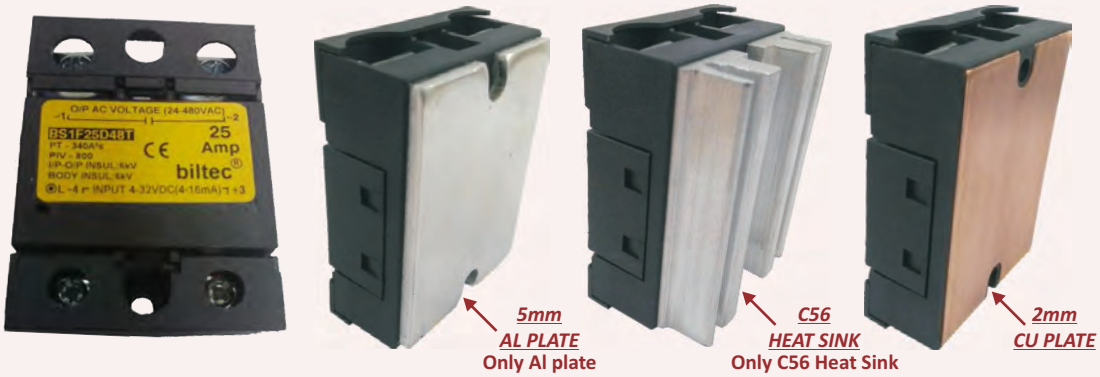
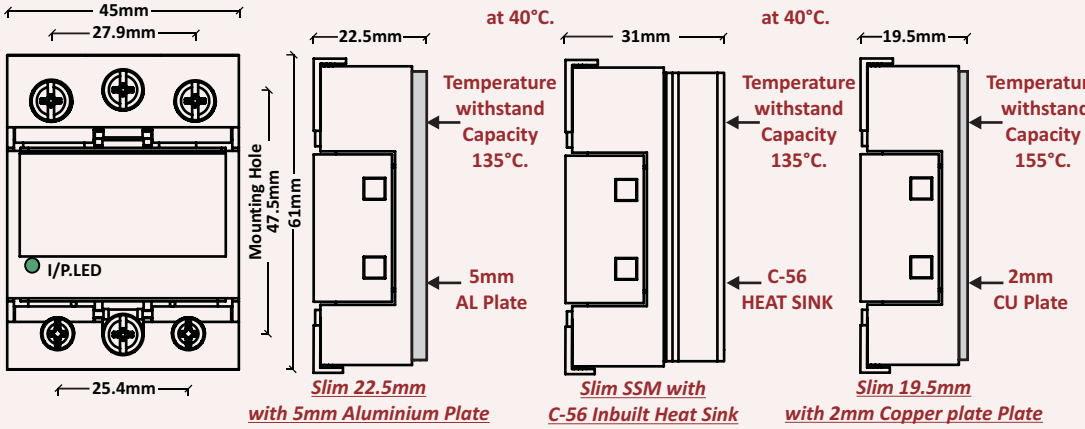
ISO 9001:2015 & ISO 14001:2015 CERTIFIED **by InterConformity GmbH**

MODEL BS

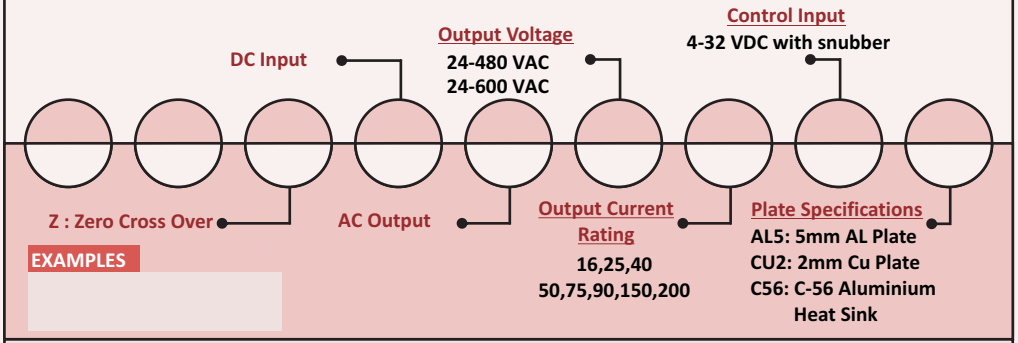




ZERO CROSS DETECTION
OUTPUT AC CONTROL
3Q TRIAC & BACK TO BACK SCR

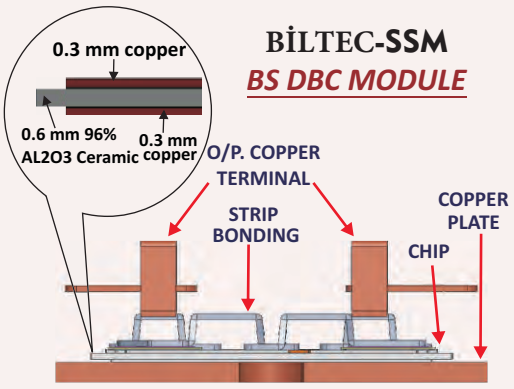
- Product Temperature withstand 150°C.
- "19.5 & 22.5 MM SLIM Height" SSM Design.
- "31 MM Height" Inbuilt "C-56" Heat sink SSM Design.
- With easy open & lock IP 20 protection Flaps on I/P & O/P Terminals.
- Zero Voltage Turn-On SSM.
- Rating from 16 Amp to 200 Amp @25°C 24-600 VAC.
- Short Circuit Protected SSM up to 115 Amp per phase current by help of suitable "B" curve MCB.
- No need to use semiconductor Fuse due to short circuit protected SSM.
- Fire Retardant Plastic as per UL94 VO GRADE.
- New improved SEMS Screw - Washers input & Output terminals.
- Improved Direct Bonded Copper (DBC) for higher Amp MODULEs.
- High resistance to aggressive chemicals and dust due to special Potting.
- Logic compatibility, Fast switching, Low coupling capacitance.
- Inbuilt transient voltage suppressor.

ORDERING FORMAT



NOTE 1 : 48: 24-480 VAC available for 16Amp to 40Amp.
60: 24-600 VAC available for 50Amp to 200Amp.

NOTE 2 : AL5 Plate available for 16Amp to 50Amp
CU2 Plate available for 75Amp to 200Amp
C56 Heat sink available for 16Amp to 50Amp



BİLTEC-SSM
BS DBC MODULE

Direct Copper Bonded (DCB) or Direct Bonded Copper (DBC) improves the conduction of heat from semiconductor chip to external heat sink as well as reduces mechanical stress in connection to major load changes. Here two layers of 0.3 mm copper is bonded to ceramic at temperature above 1020 °C. Coefficient of thermal expansion of copper is higher than ceramic (96% AL203) so a joint layer is generated between them at high temperature which will not cause thermal stress or fatigue on power output semiconductors.

ADVANTAGES OF SSM OVER CONTACTOR / MECHANICAL

- Zero voltage turn-on
- High resistance to shock, vibration and abrasion
- High resistance to aggressive chemicals and dust
- No electromechanical or acoustical noise
- Logic compatibility
- Low coupling capacitance
- Long life cycle . Up to 10^{11} cycles
- Increased system temperature accuracy
- Improved system reliability because SSMs have no moving parts or contacts to degrade
- No contact arcing, low electromagnetic interference, high surge capability
- Solid state MODULEs offer a very fast response time with absolutely NO contact bounce
- SSMs are typically smaller than EMRs, conserving valuable real estate in printed-circuit board applications
- SSMs can be provided as surface-mount technology (SMT)parts, which means lower cost and easier SMT printed-circuit board manufacture
- Do not generate electrical noise

Note : Specifications are subject to change without prior notice.

Web: www.biltekelektrik.com **Email** : info@biltekelektrik.com
Tel: +90-212-545-73-50, **Fax:** +90-212-545-73-50

General Specification

Max Barrier Layer Temperature (T_{max})	< 125 °C
Ambient Temperature Range (T_{amb})	0-85 °C
SSM Storage Temperature Range (T_{st})	-40°C to 80°C
Input Terminal Screw Torque Range	T = 1.6 N.m (Max.)
Output Terminal Screw Torque Range	T = 2.5 N.m (Max.)
Power Factor COSϕ @ Max. Load @ 480 VAC	> 0.55
Housing Material	UL-94 V0 Grade
Base Plate	5mm Aluminium, 2mm Copper, C-56 Heat Sink
SSM Weight	⩽ 120 grams
Control Input Electrical Wire Size (Max.)	Up to 2.1 sq mm(14 AWG)
Power Output Electrical Wire Size (Max.)	Up to 33.6 sq mm(2 AWG)
Test Standards:	ROHS,IP20
Pending Approvals:	UL 508,VDE ,TUV ,CSA 22-2 IEC 60947-5-1:2016 IEC 62314:2006

Digital Oscilloscope

SCR Parameter Tester

V_{TM} Tester

H.V. Insulation Break Down Tester

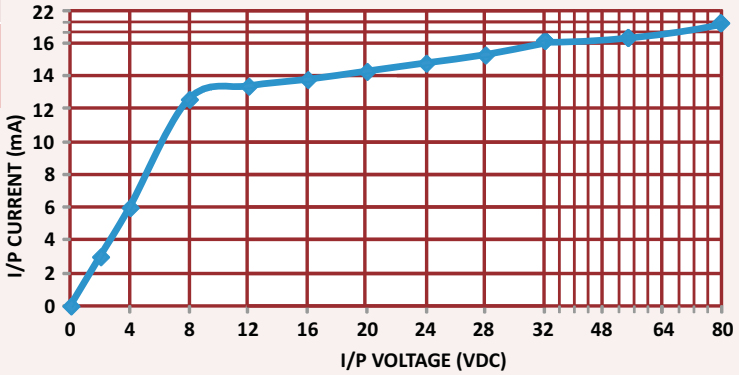
dv/dt Tester

I_{TSM} Tester

Input Technical Specifications

Parameters	Unit	BS Type Selection
Control Voltage Range	V	4-32 VDC
Input Frequency Range	Hz	-
Reverse Polarity Protection	-	YES
Control Supply Current Consumption	mA	4-16 mA
Input Impedance (Current Regulator Circuit Impedance)	Ω	1 kΩ - 2 kΩ
Minimum Turn ON Voltage	VDC	3.5 VDC
Turn OFF Voltage	VDC	< 3.25 VDC
Control Input Status Indication	-	GREEN LED Indication
Maximum Turn ON Time	mS	⩽ 1/2 Cycle (10 mS)
Maximum Turn OFF Time	mS	⩽ 1/2 Cycle (10 mS)

BS TYPE

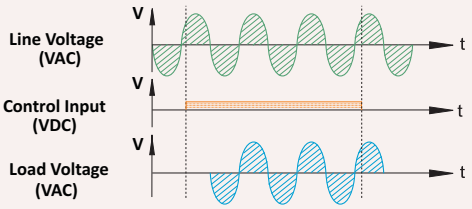


Output Technical Specifications @ 25°C Unless Specified

Parameters	Symbol	Unit	16 Amp	25 Amp	40 Amp	50 Amp	75 Amp	90 Amp	150 Amp	200 Amp
Operating Voltage Range	V_{AC}	V_{RMS}	24-480 VAC - 3Q TRIAC			24-600 VAC BACK TO BACK SCR				
Operating Frequency Range	f	Hz	47-63 Hz							
Peak Inverse Voltage	PIV	V_{PK}	800	800	800	1600	1600	1600	1600	1600
Max. Surge Voltage With Stand Capacity (<1 Second)	***V_{surge}***	***V_{RMS}***	***2700 V_{RMS} (3800 V_{PK})***							
Rated Operational Current AC51a @ 20°C (Resistive Load)	***I_T***	***Amp***	***16***	***25***	***40***	***50***	***75***	***90***	***150***	***200***
Maximum Load Short Circuit Protection Current @ 55°C	***I_{SC}***	***Amp***	***-***	***-***	***-***	***15***	***50***	***63***	***80***	***115***
"B" Curve D.P. MCB Rating for Short Circuit Protection	***-***	***Amp***	***-***	***-***	***-***	***16***	***50***	***63***	***80***	***125***
NON Repetitive Surge Peak ON-State Current @ Rated V_{RRM} applied for 1/2 Cycle t=10 mS / t=8.33 mS (50 Hz/60 Hz)	***I_{TSM} @ 50 Hz***	***A_P***	***120***	***260***	***420***	***800***	***1100***	***1200***	***1750***	***2250***
	I_{TSM} @ 60 Hz	A_P	126	273	441	840	1155	1260	1837	2360
Max. I^2t for Fusing @ t=10 mS (50Hz)	***I^2t***	***A^2s***	***72***	***340***	***880***	***3000***	***6000***	***7200***	***15000***	***25000***
Max. I^2t for Fusing @ t=8.33 mS (60Hz)	I^2t	A^2s	65	305	795	2750	5470	6510	13850	22880
Max. Peak ON-state voltage Drop at Full Control	V_{TM}	V_{RMS}	⩽1.2	⩽1.2	⩽1.2	⩽1.2	⩽1.2	⩽1.2	⩽1.2	⩽1.2
Minimum Isolation Resistance between Input Terminals (+3,-4) to Output Terminals (~1,~2) @ 500 VDC	Ω	GΩ	50	50	50	50	50	50	50	50
Isolation Voltage Input Terminals (+3,-4) to Output Terminals (~1,~2) for 1 Minute (ZDA Type)	V_{ISO}	kV	6	6	6	8	8	8	8	8
Isolation Voltage Input & Output Terminal (+3,-4,~1,~2) to Body Isolation for 1 Minute	V_{ISO}	kV	6	6	6	6	6	6	6	6
Max. Rate of Rise OFF-State Voltage	dV/dt	V/µS	400	400	500	600	600	1000	1000	1000
Max. Rate of Rise OFF-State Current	di/dt	A/µS	50	22	50	100	125	150	300	300
Max. Peak Repetitive Forward OFF-State Voltage	V_{DRM}	V	800	800	800	1200	1200	1600	1600	1600
Max. Peak Repetitive Forward OFF-State current	I_{DRM}	mA	0.05	0.05	0.05	0.1	0.1	0.05	0.3	0.3
Max. Peak repetitive reverse off-state Voltage	V_{RRM}	V	800	800	800	1200	1200	1600	1600	1600
Max. Peak repetitive reverse off-state current	I_{RRM}	mA	0.05	0.05	0.05	0.1	0.1	0.05	0.3	0.3
Max. DC Gate Trigger Voltage	V_{GT}	V	1.2	1.2	1.5	1.5	1.3	1.5	1.3	1.3
Max. DC Gate Trigger Current	I_{GT}	mA	50	50	50	8.8	10	20	150	150
Turn OFF Time	t_q	µS	25	20	35	120	150	200	100	100
Maximum Latching Current	I_L	mA	80	100	100	160	180	200	400	500
Maximum Holding Current	I_H	mA	60	75	60	150	150	150	200	250
Thermal Resistance Rè (Junction to case)	$R_{\theta(j-c)}$	°C/W	0.8	0.6	0.52	0.35	0.22	0.2	0.09	0.07
OFF State SSM Leakage Current @ Rated Voltage & Frequency (Snubber Leakage)	I_{leak}	mA	For 230 VAC < 1 mA For 440 VAC < 2 mA			For 230 VAC < 1.5 mA For 440 VAC < 3 mA				
SCCR Current Rating (less than 100 µS)	I_{SCCR}	kA	-	-	-	10 kA	10 kA	10 kA	10 kA	10 kA
Weight	W	gm	⩽ 110	⩽ 110	⩽ 110	⩽ 110	⩽ 120	⩽ 120	⩽ 120	⩽ 120

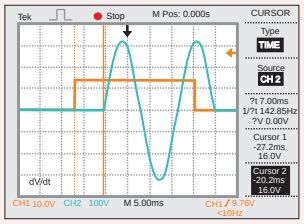
Note : Specifications are subject to change without prior notice.

Zero Cross Switching SSM (BS)

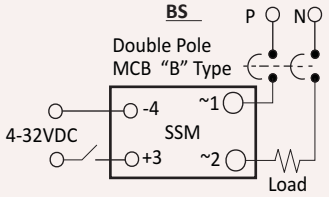


When control input is given to the SSM, irrespective of line voltage condition, output will be ON after zero crossing of sine wave. Zero cross switching SSMs are recommended when LOAD voltage gradually start to increase after zero crossing. It reduces chances of instant high voltage spike applied to the LOAD. Due to this characteristic, it reduces the surge current pass through LOAD during first conduction cycle. Load will be ON in less than 10mS duration for 50Hz line voltage & 8.33mS duration for 60Hz line voltage. These MODULEs are most suitable for industrial applications of heater loads, inductive loads, capacitor bank switching etc. When control input is removed, output of the SSM will be OFF after load current decreases to minimum holding current of the thyristor. This is due to the characteristic of thyristor. Above graph indicates functionality of zero switching SSM.

ZERO CROSSOVER Waveform

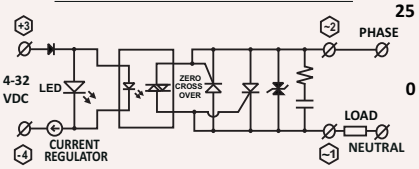


CONNECTION DIAGRAM

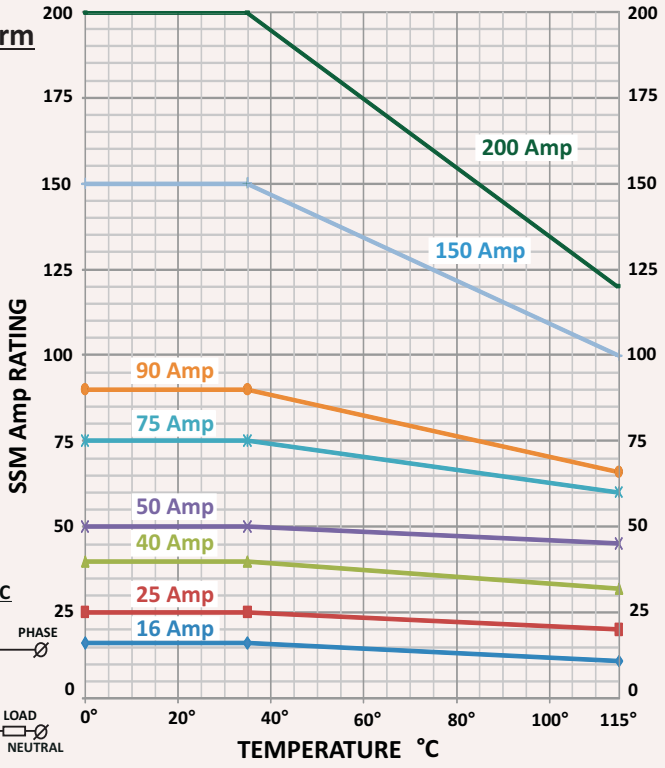


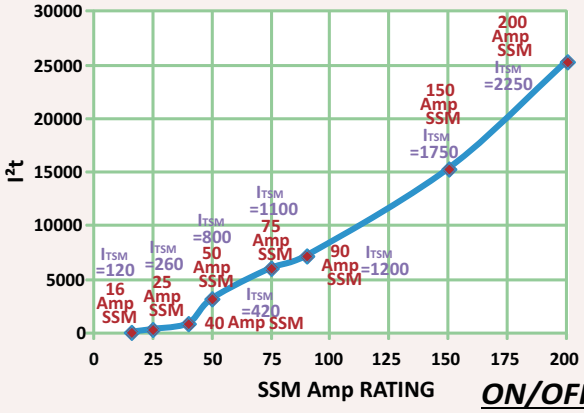
BLOCK DIAGRAM

BS - ZERO CROSS OVER DC TO AC

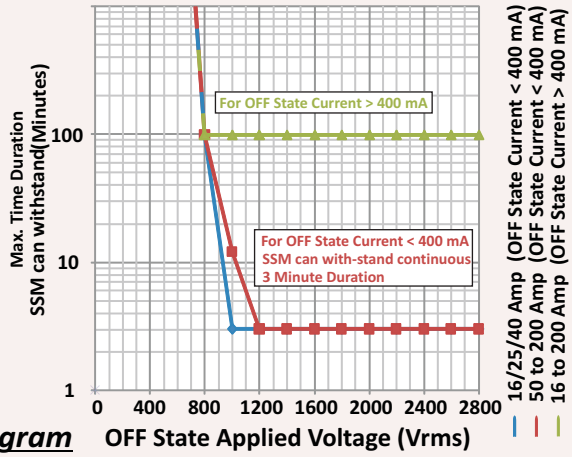


THERMAL DERATING CURVE WITH HEAT SINK



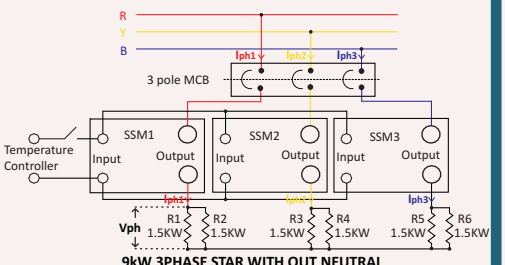


25AMP-MODEL



ON/OFF TYPE SSM Connection Diagram

Circuit diagram 1F model - ON/OFF type Star Connection without neutral



9kW 3PHASE STAR WITH OUT NEUTRAL

$W = \sqrt{3} \times V_L \times I_{ph} \cos\phi$

$9000W = 1.73 \times 440V_{rms} \times I_{ph} \times 0.99$

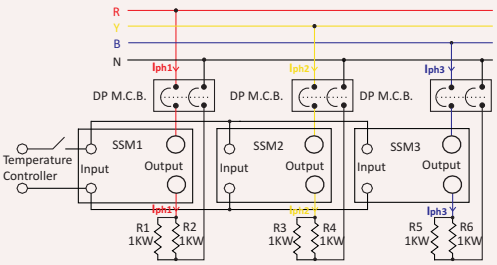
$I_{ph1} = \frac{9000}{1.73X440X0.99} = 11.94Amp/Phase\ Current$

$I_{ph2} = \frac{9000}{1.73X440X0.99} = 11.94Amp/Phase\ Current$

$I_{ph3} = \frac{9000}{1.73X440X0.99} = 11.94Amp/Phase\ Current$

$I_{ph1} = I_{ph2} = I_{ph3} = 11.94Amp$

Circuit diagram 1F model - ON/OFF type Star Connection with neutral



6kW 3PHASE STAR WITH NEUTRAL

R_L = 6kW Heater Load in three Phase with neutral so,

$Watt = \frac{6000}{3} = 2000W$ in each

$W = V_L \times I_{ph} \cos\phi$

$2000 = 230 \times I_{ph} \times 1$

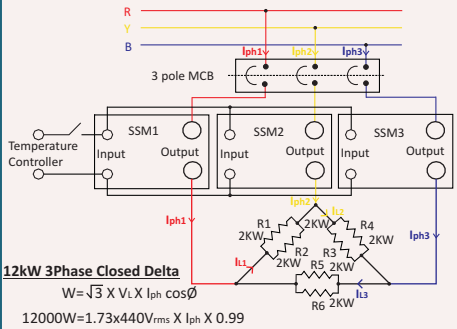
$I_{ph} = \frac{2000}{230} = 8.69Amp$

$I_{ph1} = 8.69Amp/Phase\ Current$

$I_{ph2} = 8.69Amp/Phase\ Current$

$I_{ph3} = 8.69Amp/Phase\ Current$

Circuit diagram 1F model - ON/OFF type Closed Delta Connection



12kW 3Phase Closed Delta

$W = \sqrt{3} \times V_L \times I_{ph} \cos\phi$

$12000W = 1.73 \times 440V_{rms} \times I_{ph} \times 0.99$

$I_{ph1} = \frac{12000}{1.73X440X0.99} = 15.92Amp/Phase\ Current$

$I_{ph2} = \frac{12000}{1.73X440x0.99} = 15.92Amp/Phase\ Current$

$I_{ph3} = \frac{12000}{1.73X440X0.99} = 15.92Amp/Phase\ Current$

$I_L = I_{L1} = I_{L2} = I_{L3}$

$I_L = \frac{15.92}{1.73}$

$I_L = 9.20Amp$

Note : Specifications are subject to change without prior notice.

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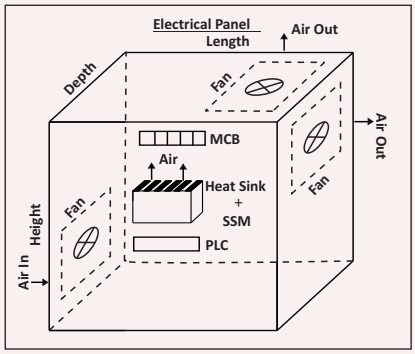
AIRFLOW FOR EFFICIENT HEAT TRANSFER



- Heat Sink Fins should be in Vertical Position So that Hot Air flow from Bottom to Top - Self Cooling.
- Our heat sinks are designed in such manner that horizontal & vertical convection both occurs properly.
- Keep 20mm Gap at Top and Bottom of Heat Sink.
- Apply Heat Sink Compound between SSM and Heat Sink.
- The Screw should be tightened properly so that total Exposed Aluminum is Sufficient to Dissipated One Watt of Heat Generated.
- **Advantages of using DBC Technology :**
  Copper has higher thermal conductivity So more heat dissipation of junction to case & case to sink.
  Due to this thermal resistance $R_{\theta JC}$ is very less.
  Reduction in thermal resistance increases thermal efficiency of whole system.

THERMAL CALCULATION	
$\Delta T = T_j - T_A$	= $P(R_{\theta JC}+R_{\theta CS}+R_{\theta SA})$
T_j	= Junction Temperature (°C) 125 °C
T_A	= Ambient Temperature(°C)
P_d	= Power Dissipation (Watts) Voltage Drop X Load Current
$R_{\theta JC}$	= Thermal Resistance Junction to Case°C/W
$R_{\theta CS}$	= Thermal Resistance of Heat Sink Compound (0.2°C/W Type)
$R_{\theta SA}$	= Thermal Resistance of External Heat Sink (°C/W) it depend upon Length, Width, Expose Aluminum (0.5 to 5)

NOTE : If SSM Current Capacity is high and it is mounted on lower capacity heat sink than maximum load current will also decrease as heat dissipation area decreases.
Example: 1) 50Amp SSM used for 26Amp Load Current than "G-68" Type of Heat Sink. **2)** 50Amp SSM used for 32Amp Load Current than "B-48" Type of Heat Sink.

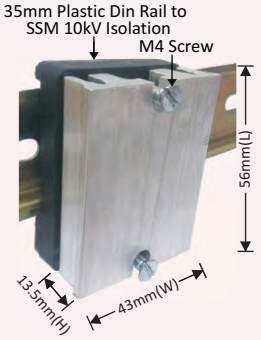
HEAT SINK SELECTION GUIDEHEAT SINK SELECTION GUIDE (Resistive LOAD)

1F MODEL / HEATSINK	HEATSINK RATING	16 AMP SSM	25 AMP SSM	40 AMP SSM	50 AMP SSM	75 AMP SSM	90 AMP SSM	150 AMP SSM	200 AMP SSM
AL5	12	8.5	10	12	12	-	-	-	-
C-56	16	10	12	14	16	-	-	-	-
G-68	26	-	16	18	26	-	-	-	-
B-48	36	-	-	-	32	36	36	-	-
B-72	60	-	-	-	-	55	60	-	-
A-100	80	-	-	-	-	-	65	75	80
A-190	Upto 115 A for 1 SSM	-	-	-	-	-	-	115*	115*
	Upto 132 A for 3 SSM	-	-	-	-	-	36 A x 3 = 108 A	40 A x 3 = 120 A	44 A x 3 = 132 A
A-190 WITH FAN	Upto 115 A for 1 SSM	-	-	-	-	-	-	115*	115*
	Upto 156 A for 3 SSM	-	-	-	-	-	40 A x 3 = 120 A	45 A x 3 = 135 A	52 A x 3 = 156 A
A-285	Upto 210 A for 3 SSM	-	-	-	-	-	-	65 A x 3 = 195 A	70 A x 3 = 210 A
A-285 WITH FAN	Upto 240 A for 3 SSM	-	-	-	-	-	-	75 A x 3 = 225 A	80 A x 3 = 240 A

* As per UL 508 2 AWG (33.6 Sq. mm) wire can draw 115 Amp at 40°C.

TYPE OF HEATSINKS / CURRENT RATING / RθSA / SURFACE AREA / MECHANICAL DIMENSIONS / WEIGHT

HEAT SINK TYPE "B-56" + DIN RAIL

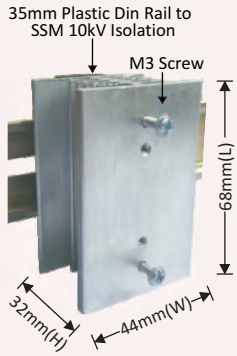


TYPE "C-56" Model 1F-1 Nos. Current upto 16Amp @40°C with Din Rail 42mm, Thermal Resistance RθSA = 4° C/W RθSA = 277.15 K/W ÄT= 75°C Surface Area: 353mm²x56mm

=19768mm³
43mm(W)x 56mm(L) x 13.5mm(H) + SSM

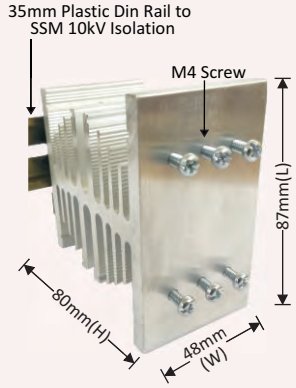
Inbuilt Heat Sink IN 901 SSM MODEL Weight : @ 57gms
No Separate Heat Sink available

HEAT SINK TYPE "B-68" + DIN RAIL



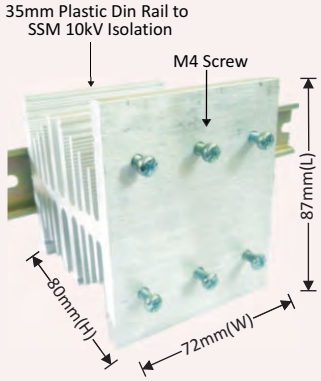
TYPE "G-68"
Model 1F-1 Nos.
Model 1F-1 Nos.
Current upto 26Amp @40°C with Din Rail 22.5mm, Thermal Resistance
RθSA = 2.5°C/W
RθSA = 275.65 K/W
ÄT= 75°C
Surface Area: 491mm²X68mm
=33388 mm³
44mm(W) X 68mm(L) X 32mm(H) + SSM
Weight : @ 95gms

HEAT SINK TYPE "B-48" + DIN RAIL



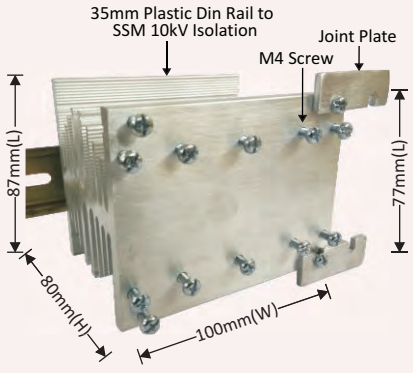
TYPE "B-48"
Model 1F-Upto 2 Nos.
Model 1F-1 Nos.
Current upto 36Amp @40 C with Din Rail 42mm Thermal Resistance
RθSA = 1.17°C/W
RθSA = 274.32 K/W
ÄT=°75 C
Surface Area: 2630mm²X48mm
=126240 mm³
48mm(W) X 87mm(L) X 80mm(H) + SSM
Weight : @ 310gms

HEAT SINK TYPE "B-72" + DIN RAIL



TYPE "B-72"
Model 1F-Upto 3 Nos.
Model 1F-1 Nos.
Current upto 60Amp @40 C with Din Rail 42mm Thermal Resistance
RθSA = 0.85°C/W
RθSA = 274 K/W
ÄT=°75 C
Surface Area: 2630mm²X72mm
=189360 mm³
72mm(W) X 87mm(L) X 80mm(H) + SSM
Weight : @ 500gms

HEAT SINK TYPE "B-100" + DIN RAIL

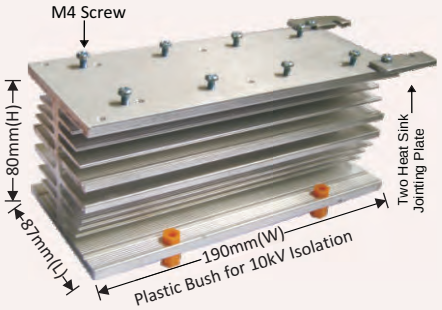


TYPE "A-100"
Model 1F-Upto 2 Nos.
Model 1F-Upto 1 Nos.
Current upto 80Amp @40 C with Din Rail 42mm Thermal Resistance
RθSA = 0.65°C/W
RθSA = 273.83 K/W
ÄT=°75 C
Surface Area: 2630mm²X100mm
=263000 mm³
100mm(W) X 87mm(L) X 80mm(H) + SSM
Weight : @ 690gms

Note : Specifications are subject to change without prior notice.

TYPE OF HEATSINKS / CURRENT RATING / RθSA / SURFACE AREA / MECHANICAL DIMENSIONS / WEIGHT

HEAT SINK TYPE "B-190" WITH OUT FAN

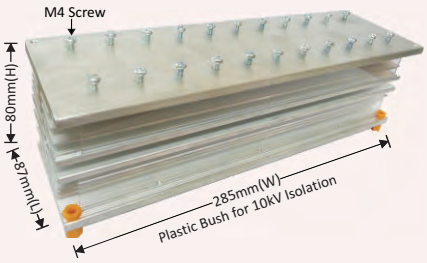


TYPE "A-190" WITH OUT FAN
Model 1F-Upto 4 Nos.
Model 1F-Upto 1 Nos.
Model 1F-Upto 4 Nos.
Current upto 132Amp @40°C
with Din Rail 42mm
Thermal Resistance
RθSA = 0.33°C/W
RθSA = 273.48 K/W
ÄT= 75°C
Surface Area:
2630mm²X190mm
=499700 mm³
190mm(W) X 87mm(L)
X 80mm(H) + SSM
Weight : @ 1300gms

HEAT SINK TYPE "B-190" WITH 230VAC FAN

TYPE "A-190" WITH 230VAC FAN
Model 1F-Upto 4 Nos.
Model 1F-Upto 1 Nos.
Model 1F-Upto 4 Nos.
Current upto 156Amp @40°C
with Din Rail 42mm
Thermal Resistance
RθSA = 0.22°C/W
RθSA = 273.37 K/W
ÄT= 75°C
Surface Area:
2630mm²X190mm
=499700 mm³
190mm(W) X 87mm(L)
X 80mm(H) + SSM
Weight : @ 1530gms

HEAT SINK TYPE "B-285" WITH OUT FAN



TYPE "A-285" WITH OUT FAN
Model 1F-Upto 6 Nos.
Model 1F -Upto 2 Nos.
Model 1F-Upto 11 Nos.
Current upto 210Amp @40°C
with Din Rail 42mm
Thermal Resistance
RθSA = 0.09°C/W
RθSA = 273.24 K/W
ÄT= 75°C
Surface Area:
2630mm²X285mm
=749550 mm³
285mm(W) X 87mm(L)
X 80mm(H) + SSM
Weight : @ 1950gms

HEAT SINK TYPE "B-285" WITH 230VAC FAN

TYPE "A-285" WITH 230VAC FAN
Model 1F-Upto 6 Nos.
Model 1F-Upto 2 Nos.
Model 1F-Upto 11 Nos.
Current upto 240Amp @40°C
with Din Rail 42mm
Thermal Resistance
RθSA = 0.04°C/W
RθSA = 273.19 K/W
ÄT= 75°C
Surface Area:
2630mm²X285mm
=749550 mm³
285mm(W) X 87mm(L)
X 80mm(H) + SSM
Weight : @ 2175gms

Note : Specifications are subject to change without prior notice.