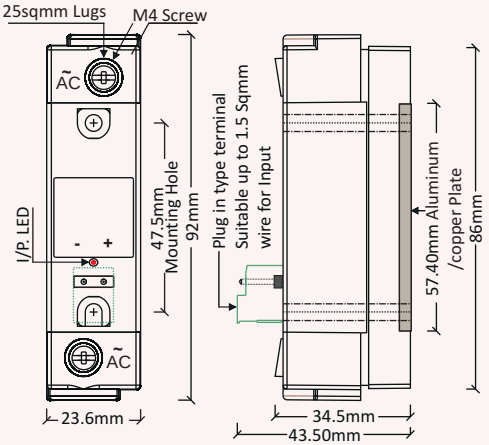
BİLTEK ELEKTRİK OTOMASYON MALZEMELERİ İMALAT DIŞ TİC. SAN

ÜRETİMLERİMİZ

BSH1 Monofaze SSR
DC&AC Model



Weight: 80gms SSR X 3nos. + 510gms Heat sink

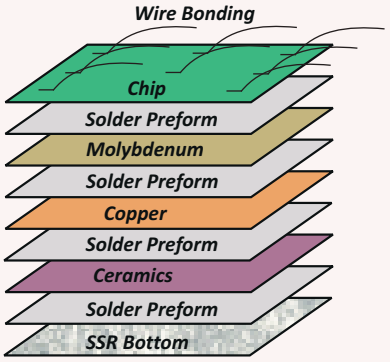
- **Rating from 16 Amp to 200 Amp @25°C 24-660 VAC SSR in 23.6 mm Width for Better space optimization**
- **Short Circuit Current Rating As Per UL508A.**
- **Short Circuit Protected SSR up to 100 Amp per phase current by help of suitable "B" curve MCB.**
- **No need to use semiconductor Fuse due to short circuit protected SSR.**
- **With IP 20 protection cover.**
- **Zero Voltage Turn-On / Random Turn-On.**
- **Fire Retardant Plastic as per UL VO GRADE.**
- **New improved SEMS Screw - Washers input & Output terminals.**
- **Improved Direct Bonded Copper (DBC) for higher Amp Relays.**
- **High resistance to aggressive chemicals and dust due to special PU Potting.**
- **Logic compatibility, Fast switching, Low coupling capacitance.**

Approved By
CE
EN-60947-5-1

LEAD - FREE RoHS COMPLIANT

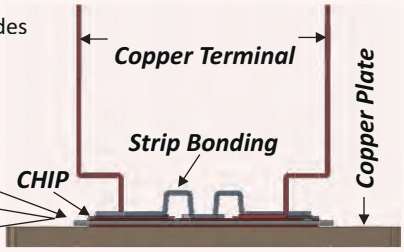
ADVANTAGES OF SSR OVER CONTACTOR / MECHANICAL

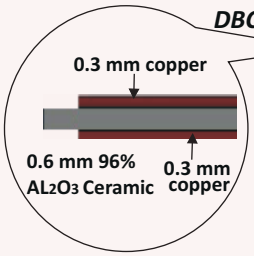
- ❖ Zero voltage turn-on
- ❖ High resistance to shock, vibration and abrasion
- ❖ High resistance to aggressive chemicals and dust
- ❖ No electromechanical or acoustical noise
- ❖ Logic compatibility
- ❖ Low coupling capacitance
- ❖ Long life cycle . Up to 10^{11} cycles
- ❖ Increased system temperature accuracy
- ❖ No contact arcing, low electromagnetic interference, high surge capability
- ❖ Solid state relays offer a very fast response time with absolutely NO contact bounce
- ❖ SSRs are typically smaller than EMRs, conserving valuable real estate in printed-circuit board applications
- ❖ No magnetic interaction
- ❖ Do not generate electrical noise
- ❖ Do not generate and are not sensitive to electro-magnetic interference (EMI)
- ❖ SSRs can be provided as surface-mount technology (SMT)parts, which means lower cost and easier SMT printed-circuit board manufacture
- ❖ Improved system reliability because SSRs have no moving parts or contacts to degrade
- ❖ SSR do not require driver electronics and it provides bounce-free switching. It improves system life - Cycle cost that reduces consumption of power supply and heat dissipation requirements.



Conventional SSR

VS





MODULES USE NEW IMPROVED LEAD FREE SOLDER PASTE RATHER THAN SOLDER PREFORMS.

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.

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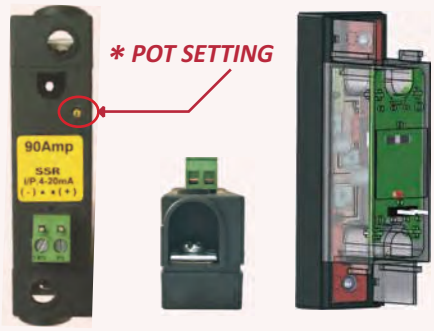
IP 20 PROTECTIVE COVER

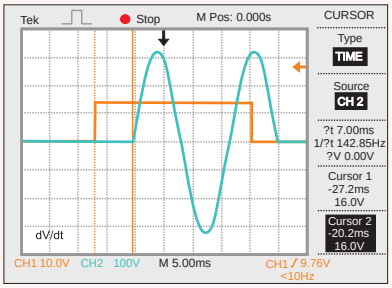
Slim SSR WITH 25 sq. mm Ring Terminal LUGS



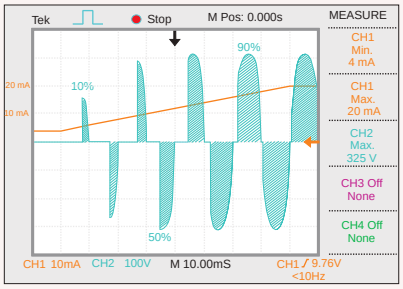
** POT SETTING*

EASY TO MOUNT

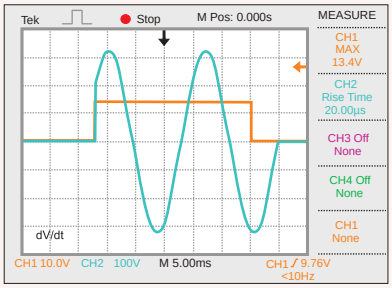
ZERO CROSSOVER Waveform



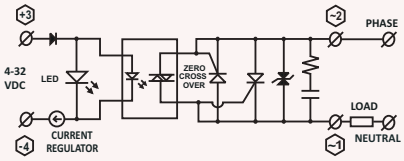
Phase Angle Controller Waveform



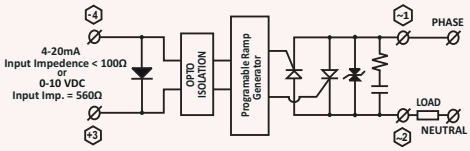
Random ON Waveform



ZDA- ZERO CROSS OVER DC TO AC

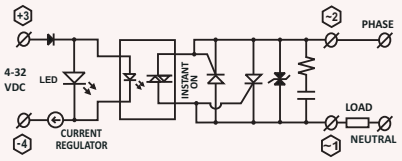


PHT- PHASE ANGLE CONTROLLER

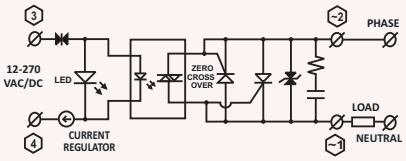


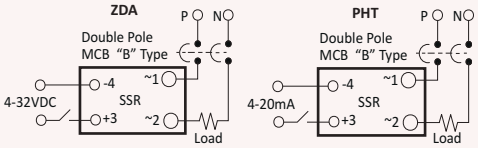
*Input 4-20mA & 0-10 VDC both are different.
Please see ordering format for differentiation.

RDA- RANDOM ON DC TO AC

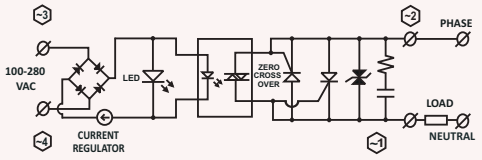


ZUA- ZERO CROSS OVER UNIVERSAL TO AC

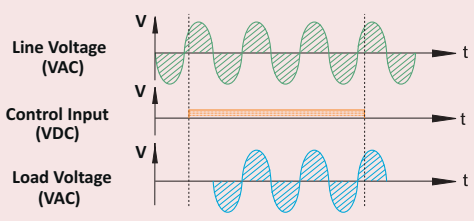




ZAA- ZERO CROSS OVER AC TO AC

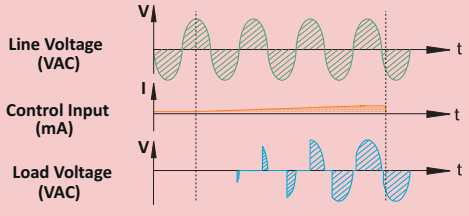


Zero Cross Switching SSR (Z)



When control input is given to the SSR, irrespective of line voltage condition, output will be ON after zero crossing of sine wave. Zero cross switching SSRs 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 relays are most suitable for industrial applications of heater loads, inductive loads, capacitor bank switching etc. When control input is removed, output of the SSR 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 SSR.

Phase Angle Control SSR - Analog Switching (PHT)

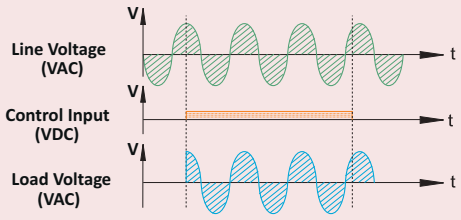


Phase angle control SSRs are used when proportional output is required with respect to control input. Two different input range available for control signal 4-20mA or 0-10VDC. Our 4-20mA input SSR's input impedance is less than 100E, so by single temperature controller our 6 Nos. 4-20mA SSRs can be driven. These SSRs are highly advantageous in closed application or when soft start of load is required to avoid inrush currents. It is also suitable where precise temperature should be maintained. Above waveforms shows functionality of phase angle control SSR.

* POT SETTING:

By Providing 50% Input value we can set the 50% Line Voltage by Pot setting.

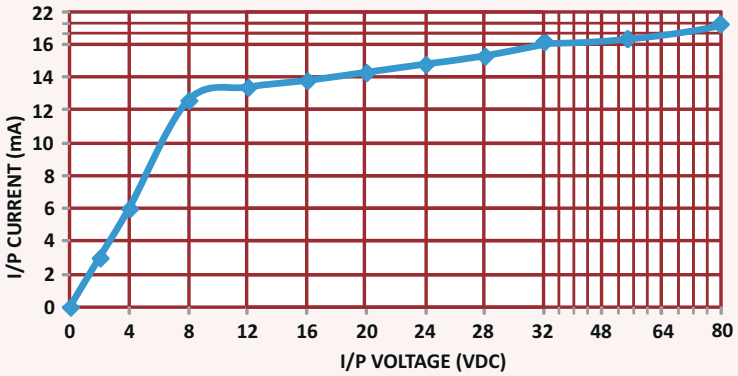
Instant ON Switching SSR - Random Turn ON(R)



When control input is given to the SSR, Output will be on within 50 µS duration. when you apply immediately control input, present line voltage will applied to the LOAD. These SSRs are used when fast switching is required or precise phase angle control is required. These SSRs are recommended to used for inductive LOAD. Because inductive load system consist phase difference between voltage & current. Above graph indicates functionality of instant on switching SSR.

BSH1 Monofaze SSR
DC&AC Model

Max Barrier Layer Temperature (T_{max})	< 125 °C
Ambient Temperature Range (T_{amb})	0-85 °C
SSR Storage Temperature Range (T_{st})	-40°C to 80°C
Input Terminal Screw Torque Range	T = 0.5 N.m (Max.)
Output Terminal Screw Torque Range	T = 2.5 N.m (Max.)
Power Factor COS ϕ @ Maximum Load @ 480 VAC	> 0.55
Housing Material	UL-94 V0 Grade
Base Plate	Aluminium , Copper (Nickel Plated)
SSR Weight	80 grams
Control Input Electrical Wire Size (Max.)	2.5 mm²
Power Output Electrical Wire Size (Max.)	25 mm²
Test Standards:	IEC 60947-5-1, ROHS,IP20
Pending Approvals:	UL,VDE ,TUV ,CSA
CE compliant :	IEC 61000-4-2/4-3/4-4/4-5/4-6, , CISPR-11



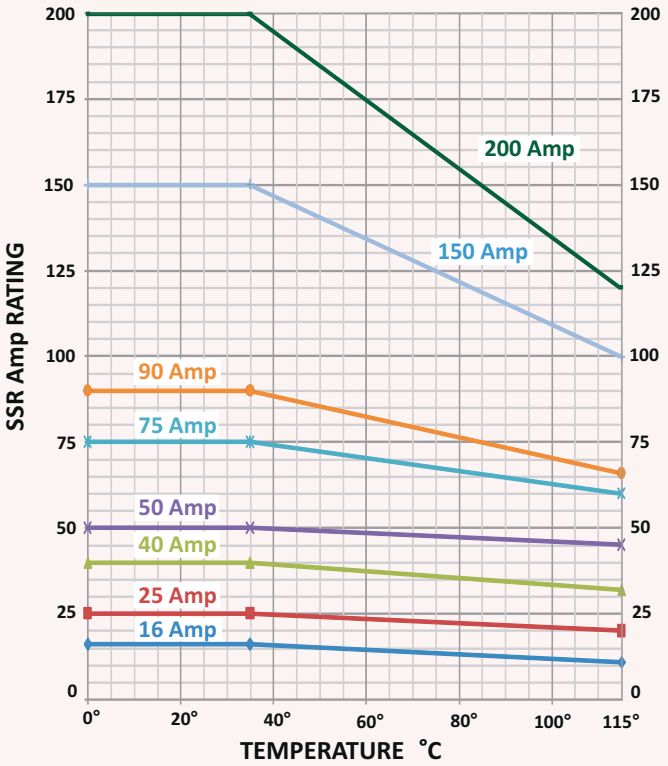
Input Technical Specifications

Parameters	Unit	Type Selection					
Control Voltage Range	V	4-32 VDC	100-280 VAC	12-270 VAC / VDC	4-32 VDC	4-20 mA*	0-10 VDC
Input Frequency Range	Hz	-	47-63 Hz	15 - 65 Hz	-		
Reverse Polarity Protection	-	YES	-	-	YES		
Control Supply Current Consumption	mA	4-16 mA	4-12 mA	5-10 mA	4-16 mA		
Input Impedance (Current Regulator Circuit Impedance)	Ω	1 kΩ - 2 kΩ	1 kΩ - 2.5 kΩ	2 kΩ - 27 kΩ	1 kΩ - 2 kΩ	⩽ 100 Ω	560 Ω
Minimum Turn ON Voltage	VDC	3.5 VDC	100 VAC	9.5 VAC/VDC	3.5 VDC	Phase Angle Control 50 Hz-10 mS Half Cycle 60 Hz-8.33mS Half Cycle	
Turn OFF Voltage	VDC	< 3.25 VDC	< 95 VAC	< 9 VAC/VDC	<2.5 VDC		
Control Input Status Indication	-	RED LED Indication					
Maximum Turn ON Time	mS	⩽ 1/2 Cycle (10 mS)	⩽ 20 mS	⩽ 20 mS	< 50 µS		
Maximum Turn OFF Time	mS	⩽ 1/2 Cycle (10 mS)	⩽ 20 mS	⩽ 20 mS	⩽ 1/2 Cycle (10 mS)		

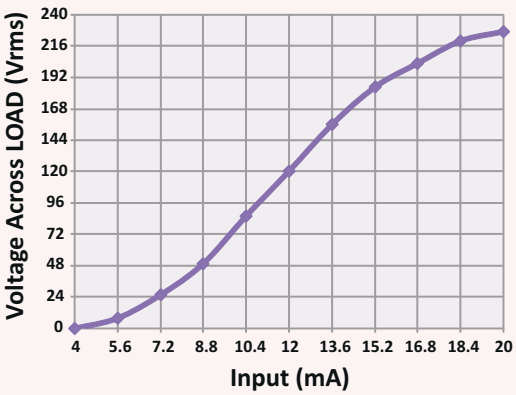
*** For Phase Angle Control SSR (PHT) 4 to 20 mA Input SSR & 0 to 10 VDC Input SSR both are different.**
Please Specify the Input by last 3 digits as per ordering format.

NOTE : Please do not give DC Voltage Input at 4-20 mA Input SSR, If DC voltage is given SSR control Input will be bad.

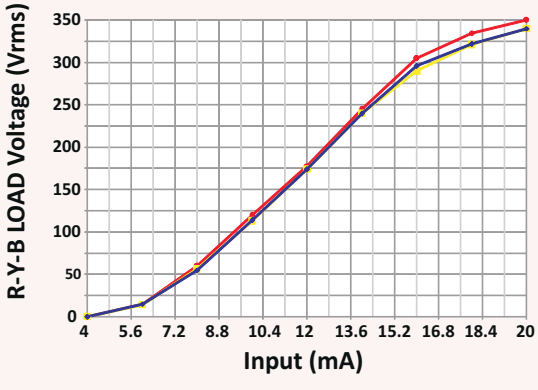
THERMAL DERATING CURVE WITH HEAT SINK



Phase Angle Control Waveform - Single Phase

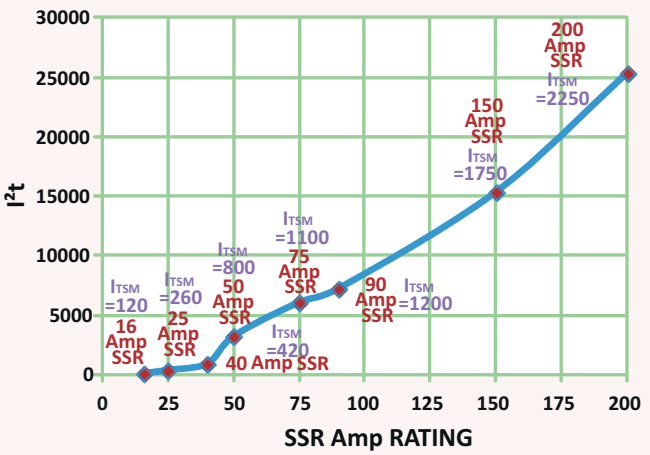


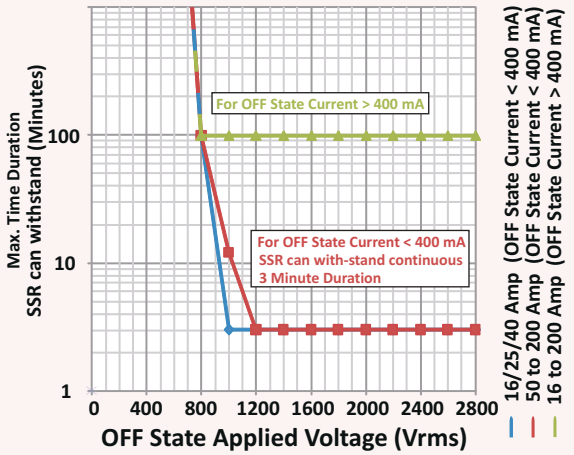
Phase Angle Control Waveform - 3 Phase R-Y-B



BSH1 Monofaze SSR
DC&AC Model

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			24-580 VAC/ 24-660 VAC - Back to Back SCR				
Operating Voltage Range (Phase Angle Control SSR)	V_{AC}	V_{RMS}	110 VAC/ 230 VAC/440 VAC * POT SETTING							
Operating Frequency Range	f	Hz	47-63 Hz							
Peak Inverse Voltage	PIV	V_{PK}	800	800	800	1400	1400	1400	1400	1400
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***
Rated Operational Current AC53a @ 55°C (Inductive Load-Motor)	I_T	Amp	2	6	9	15	20	25	30	35
Maximum Load Short Circuit Protection Current @ 55°C	***I_{SC}***	***Amp***	-	-	-	***15***	***30***	***50***	***80***	***100***
"B" Curve D.P. MCB Rating for Short Circuit Protection	-	***Amp***	-	-	-	***16***	***32***	***50***	***80***	***100***
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) Cycle	***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	V_{TM}	V_{RMS}	⩽1.2	⩽1.2	⩽1.2	⩽1.2	⩽1.2	⩽1.2	⩽1.2	⩽1.2
Max. Peak ON-state voltage Drop (Phase Angle Control SSR)	V_{TM}	V_{RMS}	⩽ 5 VAC							
Minimum Isolation Resistance between Input Terminals (+3,-4) to Output Terminals (~AC1,~AC2) @ 500 VDC	O	GΩ	50	50	50	50	50	50	50	50
Isolation Voltage Input Terminals (+3,-4) to Output Terminals (~AC1,~AC2) for 1 Minute (ZDA Type)	V_{ISO}	kV	6	6	6	8	8	8	8	8
Isolation Voltage Input Terminals (+3,-4) to Output Terminals (~AC1,~AC2) for 1 Minute (RDA/ZUA/ZAA/PHT Type)	V_{ISO}	kV	6	6	6	6	6	6	6	6
Isolation Voltage Input & Output Terminal (+3,-4,~AC1,~AC2) to Body Isolation for 1 Minute	V_{ISO}	kV	4	4	4	4	4	4	4	4
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	2	1.2	1.1	1	0.5	0.25	0.12	0.1
OFF State SSR Leakage Current @ Rated Voltage & Frequency (Snubber Leakage)	I_{leak}	mA	For 230 VAC < 1 mA			For 230 VAC < 1.5 mA				
			For 440 VAC < 2 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	80	80	80	80	80	80	80	80





Digital Oscilloscope

SCR Parameter Tester

VTM Tester

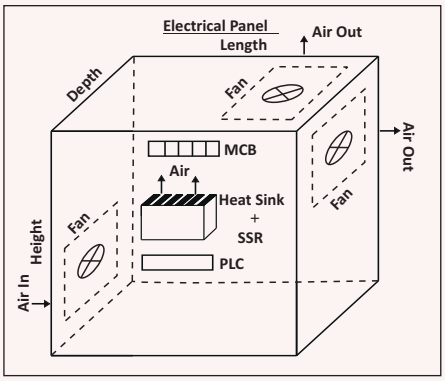
H.V. Insulation Break Down Tester

dv/dt Tester

ITSM Tester

BSH1 Monofaze SSR
DC&AC Model

AIRFLOW FOR EFFICIENT HEAT TRANSFER



- Heat Sink Fins should be in Vertical Position So that Hot Air Flow from Bottom to Top - Self Cooling.
- For thermal analysis of system horizontal convection & vertical both are important.
  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 SSR and Heat Sink.
- The Screw should Tight Properly so 1800 Square mm of 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°CW
$R_{\theta CS}$	= 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 SSR 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) 75Amp SSR used for 40Amp Load Current than "B-24" Type of Heat Sink. **2)** 75Amp SSR used for 25Amp Load Current than "V-87" Type of Heat Sink.

HEAT SINK SELECTION GUIDEHEAT SINK SELECTION GUIDE (Resistive LOAD) ZDA ON/OFF TYPE *PHT ANALOG TYPE*

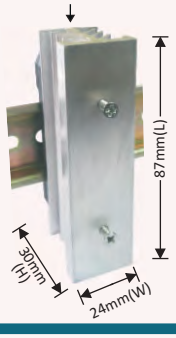
803 MODEL / HEAT SINK	HEAT SINK RATING	16 Amp		25 Amp		40 Amp		50 Amp		75 Amp		90 Amp		150 Amp		200 Amp	
		ON/OFF	ANALOG	ON/OFF	ANALOG	ON/OFF	ANALOG	ON/OFF	ANALOG	ON/OFF	ANALOG	ON/OFF	ANALOG	ON/OFF	ANALOG	ON/OFF	ANALOG
V-87	20 Amp	11 Amp	*10 Amp*	20 Amp	*18 Amp*	22 Amp	*20 Amp*	24 Amp	*22 Amp*	26 Amp	*24 Amp*	-	-	-	-	-	-
B-24	32 Amp	28 Amp	*25 Amp*	32 Amp	*27 Amp*	37 Amp	*35 Amp*	40 Amp	*38 Amp*	42 Amp	*40 Amp*	-	-	-	-	-	-
B-72	63 Amp	-	-	-	-	-	-	42 Amp	*40 Amp*	50 Amp	*45 Amp*	60 Amp	*55 Amp*	62 Amp	*58 Amp*	65 Amp	*63 Amp*
		-	-	-	-	20 x 2= 40 Amp	*16 x 2= 32 Amp*	25 x 2= 50 Amp	*22 x 2= 44 Amp*	32 x 2= 64 Amp	*30 x 2= 60 Amp*	35 x 2= 70 Amp	*32 x 2= 64 Amp*	-	-	-	-
		-	-	-	-	18 x 3= 54 Amp	*15 x 3= 45 Amp*	20 x 3= 60 Amp	*18 x 3= 54 Amp*	22 x 3= 66 Amp	*20 x 3= 60 Amp*	24 x 3= 72 Amp	*22 x 3= 66 Amp*	-	-	-	-
B-96	80 Amp	-	-	-	-	-	-	-	-	-	-	65 Amp	*60 Amp*	80 Amp	*70 Amp*	85 Amp	*80 Amp*
		-	-	-	-	-	-	32 x 2= 64 Amp	*30 x 2= 60 Amp*	38 x 2= 76 Amp	*36 x 2= 72 Amp*	40 x 2= 80 Amp	*38 x 2= 76 Amp*	42 x 2= 84 Amp	*40 x 2= 80 Amp*	-	-
		-	-	15 x 4= 60 Amp	*12 x 4= 48 Amp*	16 x 4= 64 Amp	*14 x 4= 56 Amp*	18 x 4= 72 Amp	*15 x 4= 60 Amp*	20 x 4= 80 Amp	*18 x 4= 72 Amp*	-	-	-	-	-	-

* All above SSR Rating & Heat Sink Selections are considered on environment temperature @ 55 °C. Green: ZDA ON/OFF TYPE, *Red: PHT ANALOG TYPE*

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

HEAT SINK TYPE "V-87" + DIN RAIL

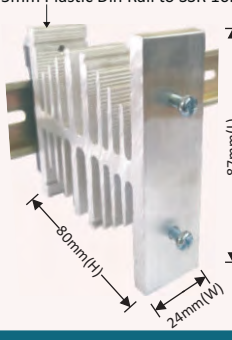
35mm Plastic Din Rail to SSR 10kV Isolation



TYPE "V-87 "
803 Model
Current up to 20Amp with Din Rail 22.5mm
Thermal Resistance
RθSA = 2.45°C/W
? T= 60°C
Surface Area:
500mm²X87mm
24mm(W) X 87mm(L) X 30mm(H) + SSR
Weight : @60gms

HEAT SINK TYPE "B-24" + DIN RAIL

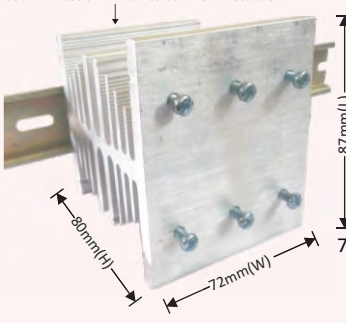
35mm Plastic Din Rail to SSR 10kV Isolation



TYPE "B-24 "
803 Model
Current up to 32Amp with Din Rail 22.5mm
Thermal Resistance
RθSA = 1.8°C/W
? T= 60°C
Surface Area:
2630mm²X24mm
24mm(W) X 87mm(L) X 80mm(H) + SSR
Weight : @ 170gms

HEAT SINK TYPE "B-72" + DIN RAIL

35mm Plastic Din Rail to SSR 10kV Isolation

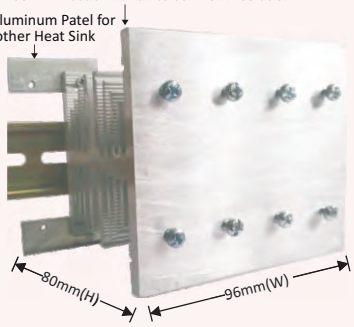


TYPE "B-72 "
803 Model- 3Nos.
Current up to 63Amp with Din Rail 45mm
Thermal Resistance
RθSA = 0.85°C/W
? T= 60°C
Surface Area:
2630mm²X72mm
72mm(W) X 87mm(L) X 80mm(H) + SSR
Weight : @ 510gms

HEAT SINK TYPE "B-96" + DIN RAIL

35mm Plastic Din Rail to SSR 10kV Isolation

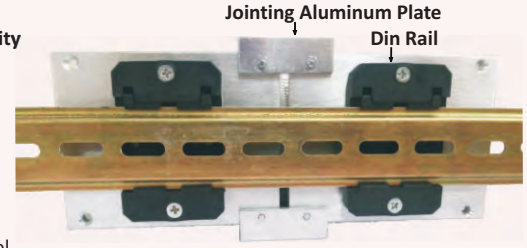
Jointing Aluminum Patel for Joint Another Heat Sink



TYPE "B-96"
803 Model- 4Nos.
Current up to 80Amp with Din Rail 45mm
Thermal Resistance
RθSA = 0.7°C/W
? T= 60°C
Surface Area:
2630mm²X96mm
96mm(W) X 87mm(L) X 80mm(H) + SSR
Weight : @ 660gms

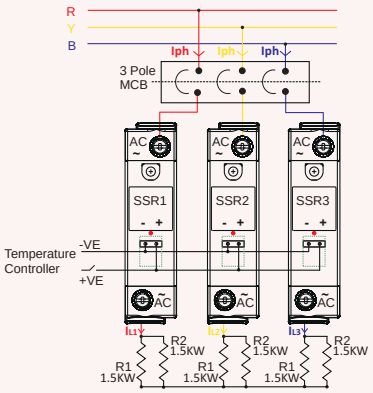
HEAT SINK TYPE "B-96" with joint Plate

Total Heat Sink Current Capacity
= 80 Amp X 2 Nos.
= 160 Amp
Heat Sink B-96 + Din Rail connected by Joint Al Plate for uniform heat dissipation. After mounting of SSR with Heat sink + Joint Al Plate you can fix it on 35 mm Din channel.



ON/OFF TYPE SSR Connection Diagram

Circuit diagram 803 model - ON/OFF type Star Connection without neutral



9KW 3PHASE STAR WITH OUT NEUTRAL

$W=\sqrt{3}$ X VL X IL cosØ

9000W=1.73x415Vrms X IL X 0.99

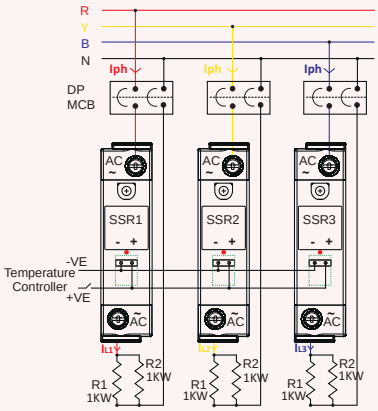
IL1 = $\frac{9000}{1.73X415X0.99}$ = 12.66Amp Per Phase Current

IL2 = $\frac{9000}{1.73X415X0.99}$ = 12.66Amp Per Phase Current

IL3 = $\frac{9000}{1.73X415X0.99}$ = 12.66Amp Per Phase Current

Iph = IL1 = IL2 = IL3 = 12.66Amp

Circuit diagram 803 model - ON/OFF type Star Connection with neutral



6KW 3PHASE STAR WITH NEUTRAL

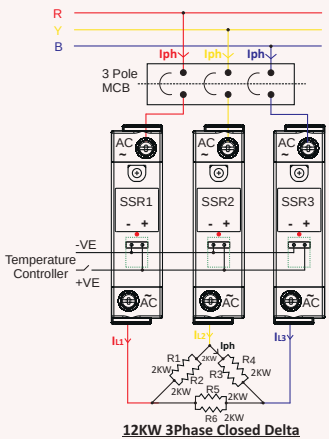
Current = $\frac{2000}{230}$ = 8.69Amp

IL1 = 8.69Amp (R) Phase Current

IL2 = 8.69Amp (Y) Phase Current

IL3= 8.69Amp (B) Phase Current

Circuit diagram 803 model - ON/OFF type Closed Delta Connection



12KW 3Phase Closed Delta

$W=\sqrt{3}$ X VL X IL cosØ

12000W=1.73x415Vrms X IL X 0.99

IL1 = $\frac{12000}{1.73X415X0.99}$ = 16.88Amp Per Phase Current

IL2 = $\frac{12000}{1.73X415}$ = 16.88Amp Per Phase Current

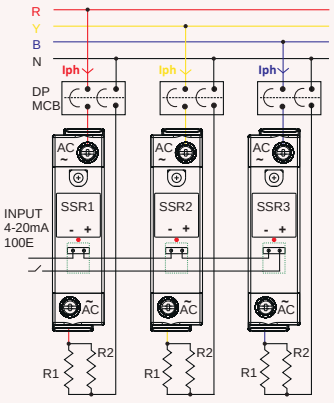
IL3 = $\frac{12000}{1.73X415X0.99}$ = 16.88Amp Per Phase Current

Iph = $\frac{16.88}{1.73}$

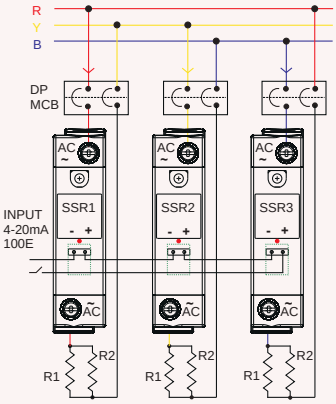
Iph = 9.75Amp

PHASE ANGLE CONTROL TYPE SSR Connection Diagram

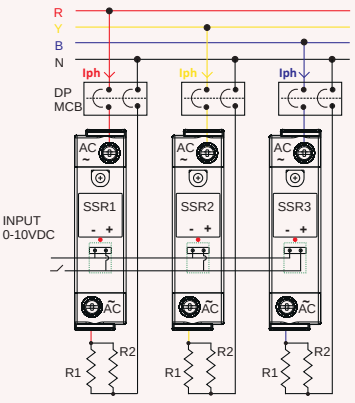
Connection Diagram Of 803 Model Input 4-20mA Three Phase Star With Neutral



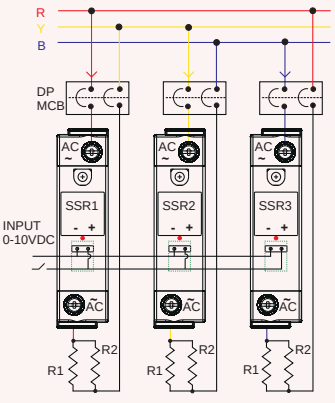
Connection Diagram Of 803 Model Input 4-20mA 440vac Load In Open Delta



Connection Diagram Of 803 Model Input 0-10VDC Three Phase Star With Neutral



Connection Diagram Of 803 Model Input 0-10VDC 440vac Load In Open Delta



*** Phase Angle Controller SSR will not work for star without neutral and close delta configuration**

Note : Specifications are subject to change without prior notice.

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