Revised 2018

SAMUSCO

C-B109, 40 Imi-ro, Uiwang-si, Gyeonggi-do, Korea
tech@samusco.com

Sales Contact

SAMUSCO

New Solutions
for AC Motor Starters

Featuring : Electronic Centrifugal Switches for Capacitor Start (Capacitor Run) Motors / Digital Motor Starters for Three Phase Bidirectional (or Unidirectional) Motors / Solid State Rectifiers for DC Brake Coils / Surge Protection Devices for Telecom Lines / Phase Controllers for Shaded Pole (or PSC) Motors

www.samusco.com

New Solutions for AC Motor Starters

Welcome to Samusco Co., Ltd. We develop and manufacture innovative motor starters since 2008. Our unique and effective solutions for motor starting circuits have been successfully adopted in numerous industrial and commercial machine applications throughout the world. Please feel free to contact us regarding your motor applications and discover what our innovative solutions can do for your specific needs.

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and KFQ hereby certify that the organization

SAMUSCO

CONTENTS

New Solutions for AC Motor Starters

Electronic Centrifugal Switches for Capacitor Start (Capacitor Run) Motors

The conventional starting switches for capacitor start motors are usually calibrated to motor specifications, for example, number of poles, line frequency, coil impedance, low voltage tolerance, etc. This entails buyers studying various types of starting switches according to each and every specification. Without using a rotating part for detecting centrifugal force ECS's internal microprocessor monitors variations in motor starting torque as the motor speed increases to its rated speed. This unique feature helps to find the optimal time to cut off the starting capacitor from the auxiliary coil. ECS also uses a semiconductor device to break the circuit ensuring the life time of the switching contacts.

Digital Motor Starters for Three Phase (Bidirectional / Unidirectional) Motors

DMC09 incorporates hybrid switching devices in which semiconductor contacts and mechanical contacts are positioned in parallel for each phase input. The internal microprocessor turns on the semiconductor contacts to start and stop the induction motor before the mechanical contacts are making their movements and then it turns off immediately after the mechanical contact movements are stabilized allowing the most of breaking current passes through the semiconductor contacts. The main advantage of DMC09 is that there would be only the nominal current between the mechanical contacts preventing the excessive heat rise in the semi-conductor device during motor run time. This unique feature enables a huge improvement of the both contact life spans several times as many as switching operations than the conventional contactors.

Solid State Rectifiers for DC Brake Coils

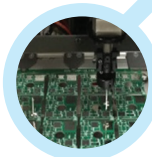
HREC03 is a half wave rectifier and is used to apply direct current (DC) to an electric brake coil. HREC combines a microprocessor and a MOSFET switch in order to ensure fast release time for the brake coil without any auxiliary contact in the rectified power line. The microprocessor monitors AC input voltage to energize or de-energize the brake coil eariest time possible using the MOSFET. The avalanche current in the MOSFET is also controlled by the microprocessor improving the breaking capacity several times more than traditional mechanical contacts.

Surge Protection Devices for Telecom Lines

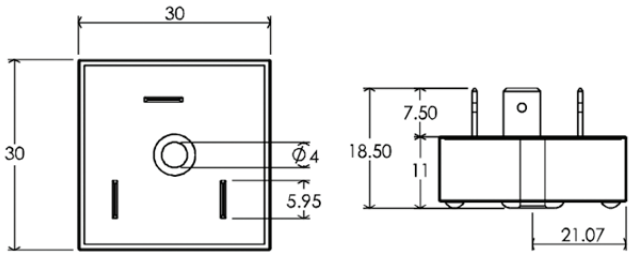
TSP is a surge suppression device that is designed to protect electrical devices in a communication line from unwanted voltage spikes including those caused by lightning. TSP uses bidirectional TVS diodes and PTC resistors in series to provide a complete protection for the protected devices. A typical surge voltage usually takes around several microseconds to milliseconds before rising up its peak voltage level, and TSP with nanoseconds response time would be fast enough to suppress the most damaging portion of the voltage spike.

Phase Controllers for Shaded Pole (or PSC) Motors

SCP is a AC line voltage controller in order to vary RMS values of the applied voltage to the motor load using a TRIAC located between the motor load and the AC power source. The alternating voltage to the load is chopped by triggering the TRIAC once in each half cycle according to an external sensor (resistance) value. SCP has many advantages for capacitor run motors such as fast voltage shifts, low voltage harmonics, a simplified speed control, and possibly energy savings for the lower motor speed



Model Name ECS112P
Operating voltage AC 110V, 50/60Hz
Application CSIR or CSCR Motors (0.18~1.1kW)



Approvals RoHS

IEC/ EN 60730-1 (Automatic electrical controls for household and similar use)
IEC/ EN 60730-2-10 (particular requirements for motor-starting relays)

Description

This model is a MCU embedded electronic switch that is designed to activate or deactivate a semiconductor device, TRIAC, as a function of the motor rotating speed and the corresponding motor starting torque.

Feature

Extended life span of switching contacts
High compatibility with various motor designs
Improved motor starting efficiency
Neither switching noise nor trembling of contacts
Protect auxiliary windings or start capacitors
Return immediately from unwanted reverse motor rotation
Mounted on either inside / outside motor frames
Discharge start capacitors with built-in resistors

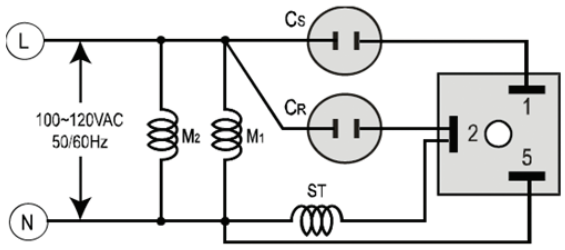
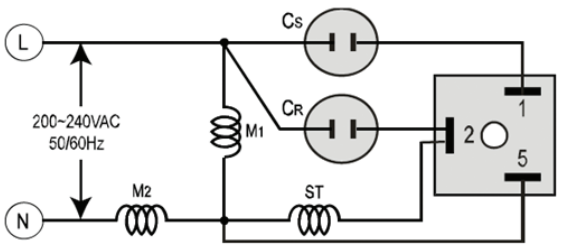
Electrical characteristics (Typical)

Parameter	Value	Unit
Line voltage	100~120	VAC
Non repetitive peak current @ half cycle, 50/60Hz	120	A
Thermal impedance @ 8.0sec	2.4	°C/W
Initial switch-on delay time	2.0	Cycle
* Discharge resistance	12	KΩ
** Forced switch-off locked rotor time, 60Hz (50Hz)	7.0 (8.4)	sec
** Maximum Number of successive restarts	9	-
Forced switch-off starting coil voltage	220~250	VAC
Dielectric strength, between case and pins	2500+	VDC
Insulation resistance, between case and pins	10+	MΩ
Ambient air temperature	-20~60	°C

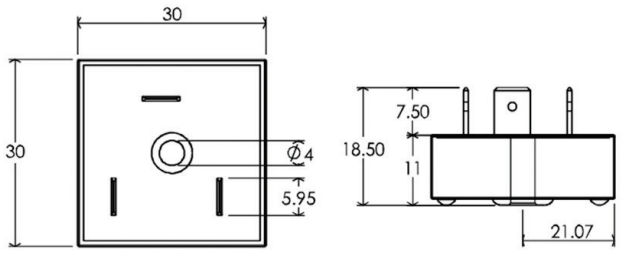
* For frequent (heavy duty) restarts, it is recommended to connect an additional discharging resistor in parallel with a starting capacitor.
** These are initialized by either a power interruption or a successful motor run state.

Wiring (Typical)

Cs: Start capacitor, Cr: Run capacitor, M1/M2: Main coil, ST: Auxiliary coil

100~120VAC 50/60Hz Motor Operation	200~240VAC 50/60Hz Motor Operation
	

Model Name ECS112PS
Operating voltage AC 110V, 50/60Hz
Application RSIR Motors (0.18~1.1kW)



Approvals RoHS

IEC/ EN 60730-1 (Automatic electrical controls for household and similar use)
IEC/ EN 60730-2-10 (particular requirements for motor-starting relays)

Description

This model is a MCU embedded electronic switch that is designed to activate or deactivate a semiconductor device, TRIAC, as a function of the motor rotating speed and the corresponding motor starting torque.

Feature

Extended life span of switching contacts
High compatibility with various motor designs
Improved motor starting efficiency
Neither switching noise nor trembling of contacts
Protect auxiliary windings or start capacitors
Return immediately from unwanted reverse motor rotation
Mounted on either inside or outside motor frames

Electrical characteristics (Typical)

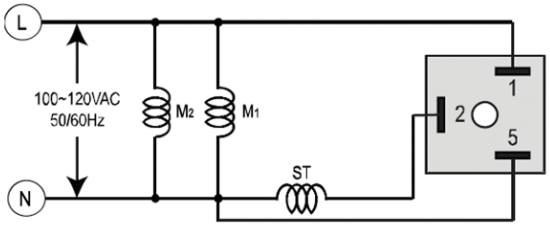
Parameter	Value	Unit
Line voltage	100~120	VAC
Non repetitive peak current @ half cycle, 50/60Hz	120	A
Thermal impedance @ 8.0sec	2.4	°C/W
Initial switch-on delay time	2.0	Cycle
* Forced switch-off locked rotor time, 60Hz (50Hz)	7.0 (8.4)	sec
Dielectric strength, between case and pins	2500+	VDC
Insulation resistance, between case and pins	10+	MΩ
Ambient air temperature	-20~60	°C

* This is initialized by either a power interruption or a successful motor run state.

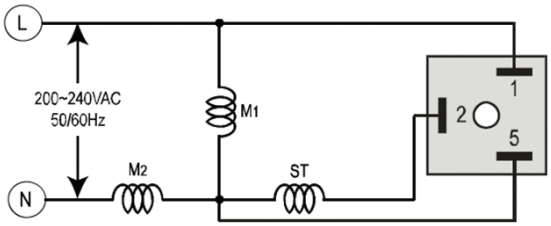
Wiring (Typical)

M1/M2: Main coil, ST: Auxiliary coil

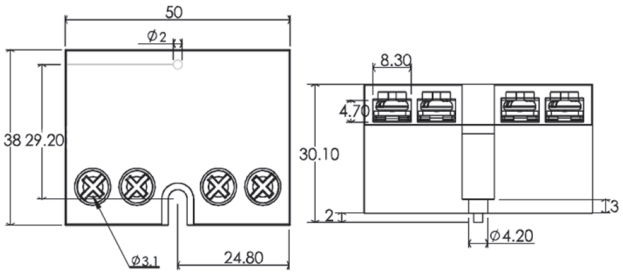
100~120VAC 50/60Hz Motor Operation



200~240VAC 50/60Hz Motor Operation



Model Name ECS125T
Operating voltage AC 110V, 50/60Hz
Application CSIR or CSCR Motors (0.18~2.2kW)



Approvals RoHS

IEC/ EN 60730-1 (Automatic electrical controls for household and similar use)
IEC/ EN 60730-2-10 (particular requirements for motor-starting relays)

Description

This model is a MCU embedded electronic switch that is designed to activate or deactivate a semiconductor device, TRIAC, as a function of the motor rotating speed and the corresponding motor starting torque.

Feature

Extended life span of switching contacts
High compatibility with various motor designs
Improved motor starting efficiency
Neither switching noise nor trembling of contacts
Protect auxiliary windings or start capacitors
Return immediately from unwanted reverse motor rotation
Mounted on either inside / outside motor frames
Discharge start capacitors with built-in resistors

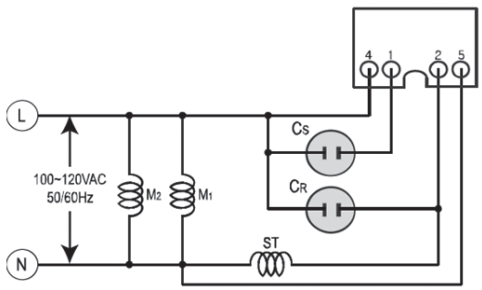
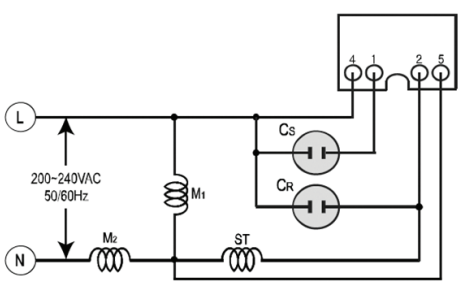
Electrical characteristics (Typical)

Parameter	Value	Unit
Line voltage	100~120	VAC
Non repetitive peak current @ half cycle, 50/60Hz	240	A
Thermal impedance @ 8.0sec	0.8	°C/W
Initial switch-on delay time	2.0	Cycle
* Discharge resistance	5.0	KΩ
** Forced switch-off locked rotor time, 60Hz (50Hz)	7.0 (8.4)	sec
** Maximum Number of successive restarts	9	-
Forced switch-off starting coil voltage	220~250	VAC
Dielectric strength, between case and pins	2500+	VDC
Insulation resistance, between case and pins	10+	MΩ
Ambient air temperature	-20~60	°C

* For frequent (heavy duty) restarts, it is recommended to connect an additional discharging resistor in parallel with a starting capacitor.
** These are initialized by either a power interruption or a successful motor run state.

Wiring (Typical)

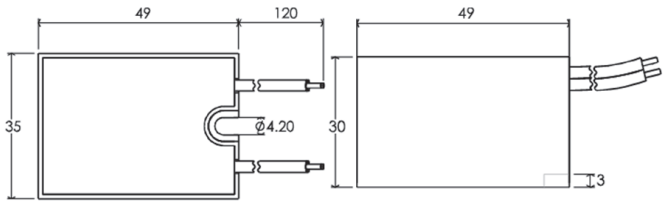
Cs: Start capacitor, Cr: Run capacitor, M1/M2: Main coil, ST: Auxiliary coil

100~120VAC 50/60Hz Motor Operation	200~240VAC 50/60Hz Motor Operation
	

ECS124L

Electronic Centrifugal Switches for Capacitor Start (Capacitor Run) Motors

Model Name ECS124L
Operating voltage AC 110V, 50/60Hz
Application CSIR or CSCR Motors (0.18~2.2kW)



Approvals RoHS

IEC/ EN 60730-1 (Automatic electrical controls for household and similar use)
IEC/ EN 60730-2-10 (particular requirements for motor-starting relays)

Description

This model is a MCU embedded electronic switch that is designed to activate or deactivate a semiconductor device, TRIAC, as a function of the motor rotating speed and the corresponding motor starting torque.

Feature

Extended life span of switching contacts
High compatibility with various motor designs
Improved motor starting efficiency
Neither switching noise nor trembling of contacts
Protect auxiliary windings or start capacitors
Return immediately from unwanted reverse motor rotation
Mounted on either inside / outside motor frames
Discharge start capacitors with built-in resistors

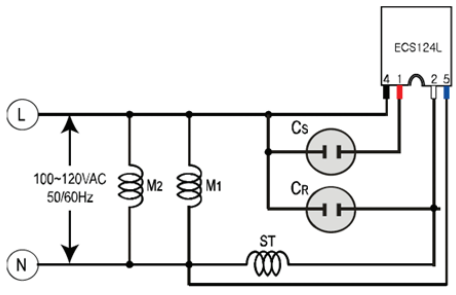
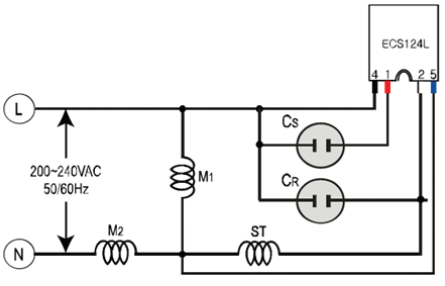
Electrical characteristics (Typical)

Parameter	Value	Unit
Line voltage	100~120	VAC
Non repetitive peak current @ half cycle, 50/60Hz	240	A
Thermal impedance @ 8.0sec	0.8	°C/W
Initial switch-on delay time	2.0	Cycle
* Discharge resistance	5.0	KΩ
** Forced switch-off locked rotor time, 60Hz (50Hz)	7.0 (8.4)	sec
** Maximum Number of successive restarts	9	-
Forced switch-off starting coil voltage	220~250	VAC
Dielectric strength, between case and pins	2500+	VDC
Insulation resistance, between case and pins	10+	MΩ
Ambient air temperature	-20~60	°C

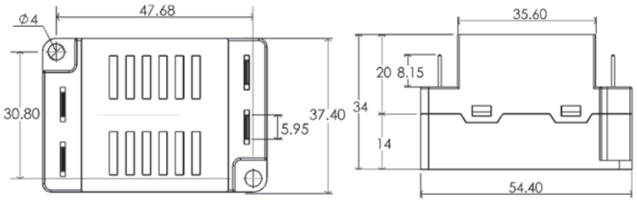
* For frequent (heavy duty) restarts, it is recommended to connect an additional discharging resistor in parallel with a starting capacitor.
** These are initialized by either a power interruption or a successful motor run state.

Wiring (Typical)

Cs: Start capacitor, Cr: Run capacitor, M1/M2: Main coil, ST: Auxiliary coil

100~120VAC 50/60Hz Motor Operation	200~240VAC 50/60Hz Motor Operation
	

Model Name ECS225P
Operating voltage AC 220V, 50/60Hz
Application CSIR or CSCR Motors (0.18~3.7kW)



Approvals RoHS

IEC/ EN 60730-1 (Automatic electrical controls for household and similar use)
IEC/ EN 60730-2-10 (particular requirements for motor-starting relays)

Description

This model is a MCU embedded electronic switch that is designed to activate or deactivate a semiconductor device, TRIAC, as a function of the motor rotating speed and the corresponding motor starting torque.

Feature

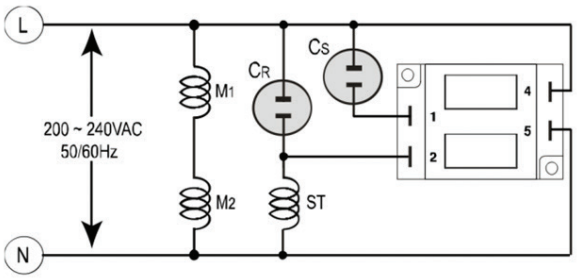
Extended life span of switching contacts
High compatibility with various motor designs
Improved motor starting efficiency
Neither switching noise nor trembling of contacts
Protect auxiliary windings or start capacitors
Return immediately from unwanted reverse motor rotation
Mounted on either inside / outside motor frames
Discharge start capacitors with built-in resistors

Electrical characteristics (Typical)

Parameter	Value	Unit
Line voltage	200~240	VAC
Non repetitive peak current @ half cycle, 50/60Hz	240	A
Thermal impedance @ 8.0sec	0.8	°C/W
Initial switch-on delay time	2.0	Cycle
* Discharge resistance	10.0	KΩ
** Forced switch-off locked rotor time, 60Hz (50Hz)	7.0 (8.4)	sec
** Maximum Number of successive restarts	9	-
Forced switch-off starting coil voltage	320~350	VAC
Dielectric strength, between case and pins	2500+	VDC
Insulation resistance, between case and pins	10+	MΩ
Ambient air temperature	-20~60	°C

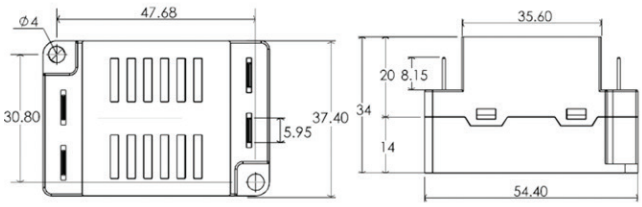
* For frequent (heavy duty) restarts, it is recommended to connect an additional discharging resistor in parallel with a starting capacitor.
** These are initialized by either a power interruption or a successful motor run state.

Wiring (Typical)



Cs: Start capacitor, Cr: Run capacitor, M1/M2: Main coil, ST: Auxiliary coil

Model Name ECS225PS
Operating voltage AC 220V, 50/60Hz
Application RSIR Motors (0.18~2.2kW)



Approvals

IEC/ EN 60730-1 (Automatic electrical controls for household and similar use)
IEC/ EN 60730-2-10 (particular requirements for motor-starting relays)

Description

This model is a MCU embedded electronic switch that is designed to activate or deactivate a semiconductor device, TRIAC, as a function of the motor rotating speed and the corresponding motor starting torque.

Feature

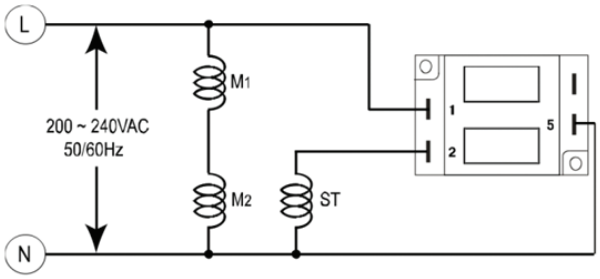
Extended life span of switching contacts
High compatibility with various motor designs
Improved motor starting efficiency
Neither switching noise nor trembling of contacts
Protect auxiliary windings or start capacitors
Return immediately from unwanted reverse motor rotation
Mounted on either inside / outside motor frames

Electrical characteristics (Typical)

Parameter	Value	Unit
Line voltage	200~240	VAC
Non repetitive peak current @ half cycle, 50/60Hz	240	A
Thermal impedance @ 8.0sec	0.8	°C/W
Initial switch-on delay time	2.0	Cycle
* Forced switch-off locked rotor time, 60Hz (50Hz)	7.0 (8.4)	sec
Dielectric strength, between case and pins	2500+	VDC
Insulation resistance, between case and pins	10+	MΩ
Ambient air temperature	-20~60	°C

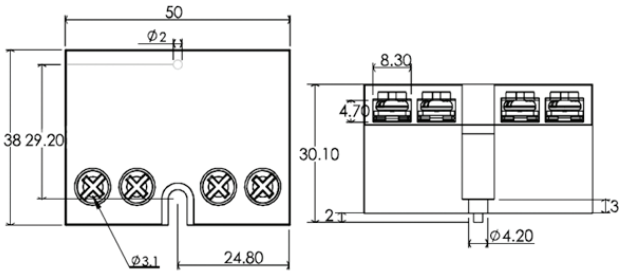
* This is initialized by either a power interruption or a successful motor run state.

Wiring



M1/M2: Main coil, ST: Auxiliary coil

Model Name ECS225T
Operating voltage AC 220V, 50/60Hz
Application CSIR or CSCR Motors (0.18~3.7kW)



Approvals RoHS

IEC/ EN 60730-1 (Automatic electrical controls for household and similar use)
IEC/ EN 60730-2-10 (particular requirements for motor-starting relays)

Description

This model is a MCU embedded electronic switch that is designed to activate or deactivate a semiconductor device, TRIAC, as a function of the motor rotating speed and the corresponding motor starting torque.

Feature

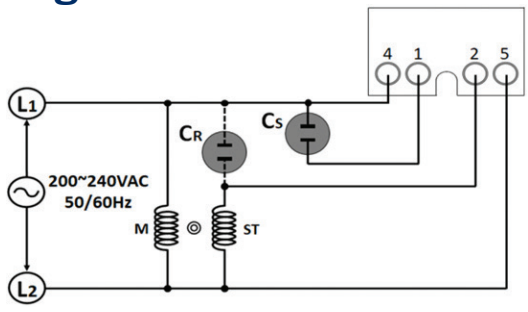
Extended life span of switching contacts
High compatibility with various motor designs
Improved motor starting efficiency
Neither switching noise nor trembling of contacts
Protect auxiliary windings or start capacitors
Return immediately from unwanted reverse motor rotation
Mounted on either inside / outside motor frames
Discharge start capacitors with built-in resistors

Electrical characteristics (Typical)

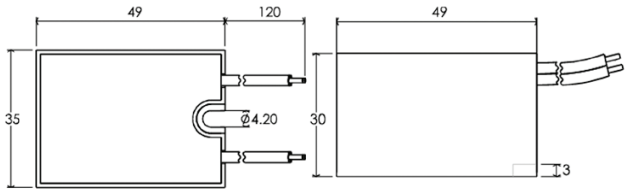
Parameter	Value	Unit
Line voltage	200~240	VAC
Non repetitive peak current @ half cycle, 50/60Hz	240	A
Thermal impedance @ 8.0sec	0.8	°C/W
Initial switch-on delay time	2.0	Cycle
* Discharge resistance	10.0	KΩ
** Forced switch-off locked rotor time, 60Hz (50Hz)	7.0 (8.4)	sec
** Maximum Number of successive restarts	9	-
Forced switch-off starting coil voltage	320~350	VAC
Dielectric strength, between case and pins	2500+	VDC
Insulation resistance, between case and pins	10+	MΩ
Ambient air temperature	-20~60	°C

* For frequent (heavy duty) restarts, it is recommended to connect an additional discharging resistor in parallel with a starting capacitor.
** These are initialized by either a power interruption or a successful motor run state.

Wiring



Model Name ECS224L
Operating voltage AC 220V, 50/60Hz
Application CSIR or CSCR Motors (0.18~3.7kW)



Approvals RoHS

IEC/ EN 60730-1 (Automatic electrical controls for household and similar use)
IEC/ EN 60730-2-10 (particular requirements for motor-starting relays)

Description

This model is a MCU embedded electronic switch that is designed to activate or deactivate a semiconductor device, TRIAC, as a function of the motor rotating speed and the corresponding motor starting torque.

Feature

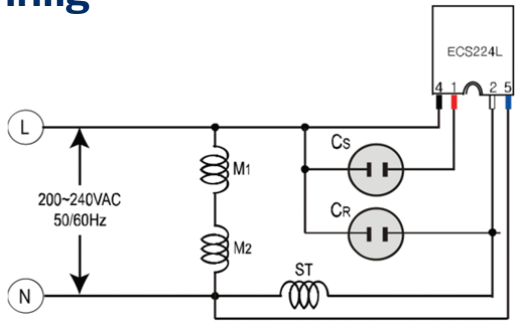
Extended life span of switching contacts
High compatibility with various motor designs
Improved motor starting efficiency
Neither switching noise nor trembling of contacts
Protect auxiliary windings or start capacitors
Return immediately from unwanted reverse motor rotation
Mounted on either inside / outside motor frames
Discharge start capacitors with built-in resistors

Electrical characteristics (Typical)

Parameter	Value	Unit
Line voltage	200~240	VAC
Non repetitive peak current @ half cycle, 50/60Hz	240	A
Thermal impedance @ 8.0sec	0.8	°C/W
Initial switch-on delay time	2.0	Cycle
* Discharge resistance	10.0	KΩ
** Forced switch-off locked rotor time, 60Hz (50Hz)	7.0 (8.4)	sec
** Maximum Number of successive restarts	9	-
Forced switch-off starting coil voltage	320~350	VAC
Dielectric strength, between case and pins	2500+	VDC
Insulation resistance, between case and pins	10+	MΩ
Ambient air temperature	-20~60	°C

* For frequent (heavy duty) restarts, it is recommended to connect an additional discharging resistor in parallel with a starting capacitor.
** These are initialized by either a power interruption or a successful motor run state.

Wiring



Cs: Start capacitor, Cr: Run capacitor, M1/M2: Main coil, ST: Auxiliary coil

Feature

- Hybrid switching contacts
  (Electronic and Mechanical contacts are connected in parallel)
- Change directions of motor rotation
- Easy wiring (built-in interlocks)
- Motor protections
- Trip diagnostics
- Compact sized
- MCU embedded

Application Tapping machines, Hoists, Doors, Conveyers

Approvals CE cULus RoHS

Specification

Parameter		Description		
Main power		3Ø 220-380VAC, 8A (MAX 9A) , 50/60Hz		
Control voltage		DMC09RL-110: 110VAC, 50/60Hz, 20mA		P1/P2
		DMC09RL-220: 220VAC, 50/60Hz, 20mA		
Set current		1.2 ~ 9.0A	Load(VR) knob	
Overload protection		See “Set current vs trip time”		
Abnormal wiring		See “Trip indication”		
LED display		Remain “On” state if motor current is bigger than set current		
Signal voltage		100 ~ 240VAC	F/A2 , R/A2	
Auxiliary contacts	NO	100-240VAC, 0.1 A	Forward run	13/14
	NO		Reverse run	07/08
	NC (NVR)		Stop	21/22
Insulation voltage		2kV	Between PCB and case	
Insulation resistance		500VDC MEGGER	> 10MΩ	
Temp. (Humidity)		-20℃ ~ 60℃ (85%RH)		
Dimensions (Weight)		118L X 55W X 74H (300g)		
Mounting		Din Rail (35mm) or Screw Mounting (M4)		

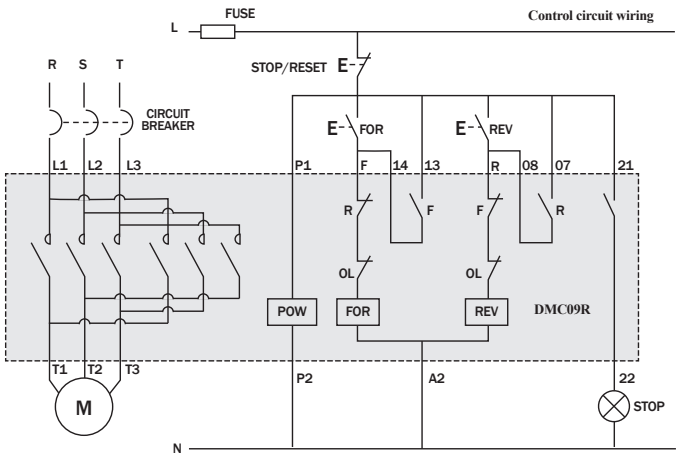
Trip indication

Protection type	Conditions	LED display	Reset
Phase loss (R or T)	0.01sec at start-up	Flicker 1 times	Control voltage interruption (P1/P2)
Reverse phase	0.01sec at start-up	Flicker 2 times	
Overload	See “Set current vs trip time”	Flicker 3 times	
Inrush current	0.01sec at start-up	Flicker 4 times	
Low voltage	0.02sec at start-up or running	Flicker 5 times	
Diagnostic error	Intrinsic failure	Flicker 6 times	

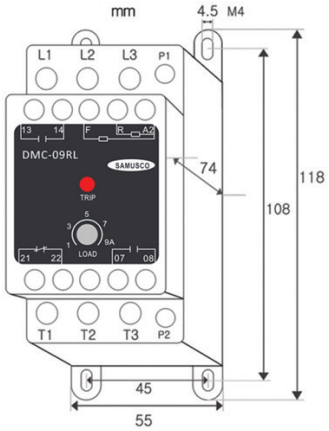
Set current vs trip time

Multiple of set current	X 7	X 6	X 5	X 4	X 3	X 2	X 1.2
Trip time (sec)	1.1	1.3	2.0	3.2	6.0	18.0	30..0

Wiring



Dimensions



Specification

Parameter		Description		
Main power		3Ø 220-380VAC, 8A (MAX 9A) , 50/60Hz		
Control voltage		DMC09AF-110: 110VAC, 50/60Hz, 20mA		P1/P2
		DMC09AF-220: 220VAC, 50/60Hz, 20mA		
Set current		0.5 ~ 9.0A	Tab buttons (SET, UP, DN)	
Overload protection		See “Set current vs trip time”		
Abnormal wiring		See “Trip indication”		
Signal voltage		100 ~ 240VAC	A1/A2	
Auxiliary contacts	NO	100-240VAC, 0.1 A	Run	13/14
	NO		Trip	07/08
	NC (NVR)		Stop	21/22
Insulation voltage		2kV	Between PCB and case	
Insulation resistance		500VDC MEGGER	> 10MΩ	
Temp. (Humidity)		-20℃ ~ 60℃ (85%RH)		
Dimensions (Weight)		118L X 55W X 74H (300g)		
Mounting		Din Rail (35mm) or Screw Mounting (M4)		

Setting

Parameter	Range	FND display
Standby	Measured current	0.0
Over current	0.5 ~ 9.0A	o 8.5
OC time	0.5 ~ 30.0sec	o.30.0
Under current	0.5 ~ 9.0A	u 6.0
UC time	0.5 ~ 30.0sec	u.25.0
Reset time	0.5sec ~ 60min	r.25.0
	Disabled (- - -)	

- Press “SET” (button) to go to next parameters
- Press “UP” (button) to increment range values
- Press “DN” (button) to decrement range values
- Return to “Standby” mode in 3 seconds without any button touched"

Approvals CE RoHS

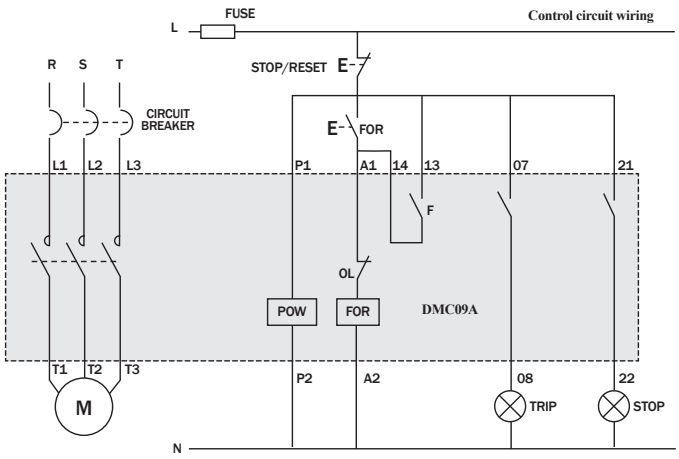
Trip indication

Protection type	Conditions	LED display	Reset
Over current	Measured current is bigger than set (over) current for OC time	o 9.0	Pushed “SET” (button) or elapse of reset time
Under current	Measured current is less than set (under) current for UC time	u 5.0	
Overload	See “Set current vs trip time”	L 30.0	Pushed “SET” (button) or Control voltage interruption
Inrush current	0.01sec at start-up	Ft-c	
Phase loss (R or T)	0.01sec at start-up	PL-r	
Reverse phase	0.01sec at start-up	Pt-r	
Low voltage	0.02sec at start-up or running	Ft-E	

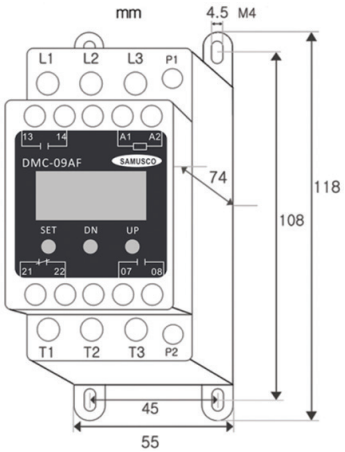
Set current vs trip time

Multiple of set current	X 7	X 6	X 5	X 4	X 3	X 2	X 1.2
Trip time (sec)	1.1	1.3	2.0	3.2	6.0	18.0	30..0

Wiring



Dimensions



Specification

Parameter		Description		
Main power		3Ø 220-380VAC, 8A (MAX 9A) , 50/60Hz		
Control voltage		DMC09RF-110: 110VAC, 50/60Hz, 20mA		P1/P2
		DMC09RF-220: 220VAC, 50/60Hz, 20mA		
Set current		0.5 ~ 9.0A	Tab buttons (SET, UP, DN)	
Overload protection		See “Set current vs trip time”		
Abnormal wiring		See “Trip indication”		
Signal voltage		100 ~ 240VAC	F/A2 , R/A2	
Auxiliary contacts	NO	100-240VAC, 0.1 A	Forward run	13/14
	NO		Reverse run	07/08
	NC (NVR)		Stop	21/22
Insulation voltage		2kV	Between PCB and case	
Insulation resistance		500VDC MEGGER	> 10MΩ	
Temp. (Humidity)		-20℃ ~ 60℃ (85%RH)		
Dimensions (Weight)		118L X 55W X 74H (300g)		
Mounting		Din Rail (35mm) or Screw Mounting (M4)		

Setting

Parameter	Range	FND display
Standby	Measured current	0.0
Over current	0.5 ~ 9.0A	o 8.5
OC time	0.5 ~ 30.0sec	o.30.0
Under current	0.5 ~ 9.0A	u 6.0
UC time	0.5 ~ 30.0sec	u.25.0
Reset time	0.5sec ~ 60min	r.25.0
	Disabled (- - -)	

- Press “SET” (button) to go to next parameters
- Press “UP” (button) to increment range values
- Press “DN” (button) to decrement range values
- Return to “Standby” mode in 3 seconds without any button touched

Approvals CE cULus RoHS

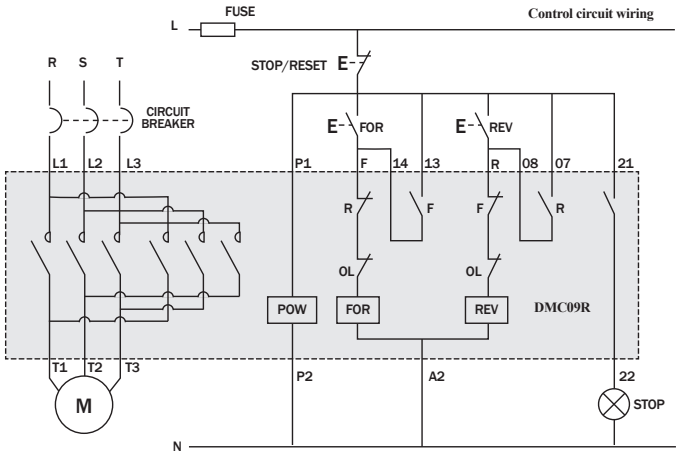
Trip indication

Protection type	Conditions	LED display	Reset
Over current	Measured current is bigger than set (over) current for OC time	o 9.0	Pushed “SET” (button) or elapse of reset time
Under current	Measured current is less than set (under) current for UC time	u 5.8	
Overload	See “Set current vs trip time”	L 30.0	Pushed “SET” (button) or Control voltage interruption
Inrush current	0.01sec at start-up	Ft-c	
Phase loss (R or T)	0.01sec at start-up	PL-r	
Reverse phase	0.01sec at start-up	Pt-r	
Low voltage	0.02sec at start-up or running	Ft-E	

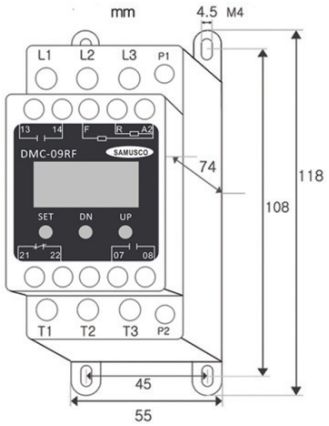
Set current vs trip time

Multiple of set current	X 7	X 6	X 5	X 4	X 3	X 2	X 1.2
Trip time (sec)	1.1	1.8	3.0	5.8	10.2	18.0	30.0

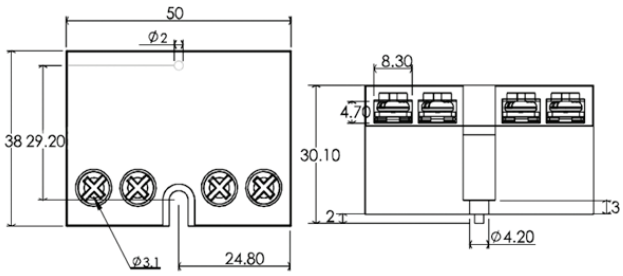
Wiring



Dimensions



Dimension



Feature

Solid state rectifiers using semiconductors
Fast release time using a power MOSFET
(No external contacts are necessary)
MCU embedded

Application Hoists, Doors, Conveyers

Approvals CE RoHS

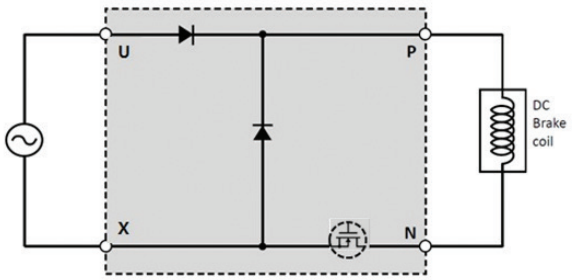
Selection guide

Rectifier mode	Operating current	-	Input voltage
HREC = Half wave	01 = 1.5A	-	220 = 220VAC
FREC = Full wave	03 = 3.0A		400 = 400VAC

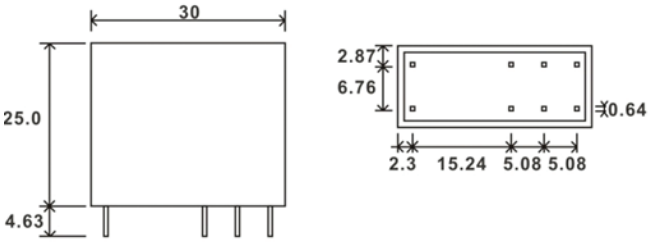
Electrical characteristics (Typical)

Parameter	HREC03-220	HREC03-400	Unit
Line voltage	200~240	360~440	VAC
DC output current	3.0	3.0	A
Cut-off voltage	160	300	VAC
Cut-off delay time (50Hz)	1.0	1.0	Cycle
Insulation voltage (between case and pins)	2500+	2500+	V
Insulation resistance (between case and pins)	10+	10+	MΩ
Protection rating	IP20	IP20	-
Ambient temperature	-20/+60°C	-20/+60°C	°C
Housing material	UL94-V0	UL94-V0	-

Wiring



Dimension



Feature

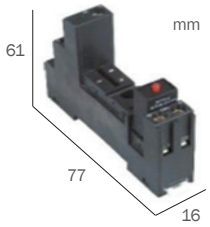
Surge voltage supression using bidirectional TVS diodes
Over current protection using a PTC resistor
Trip indication using a LED
Easy maintenance (Plug in and out)
Compact sized

Application Communication networks, DC power lines

Approvals CE RoHS

Selection guide

Protection mode	-	Input voltage	Terminal type
TSP3 = Common	-	12 = 12V	Blank = Pin headers only T = With a screw terminal socket
		24 = 24V	
TSP2 = Differential		34 = 34V	

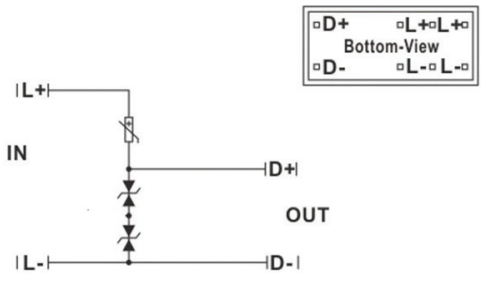


Electrical characteristics (Typical)

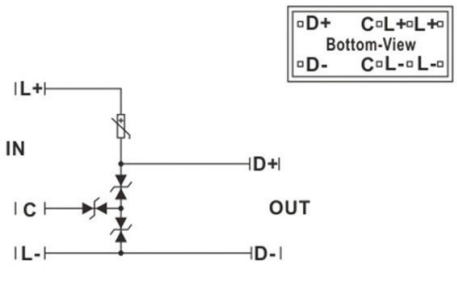
Parameter	TSP2-34	TSP3-24	TSP3-12	Unit
Line voltage	34	24	12	V
Max. DC operating voltage	38	27	14	V
Max. clamping voltage	55	40	20	V
Operating current (20°C)	1.8	0.5	0.5	A
Trip current (20°C)	3.7	1.0	1.0	A
Max. time to trip (8A)	2.0	0.15	0.15	sec
Nominal resistance (PTC)	0.15	1.0	1.0	Ω
ESD Power rating (8/20us)	60	40	40	kW
Protection rating	IP20	IP20	IP20	-
Ambient temperature	-40/+85	-40/+85	-40/+85	°C
Housing material	UL94-V0	UL94-V0	UL94-V0	-

Wiring

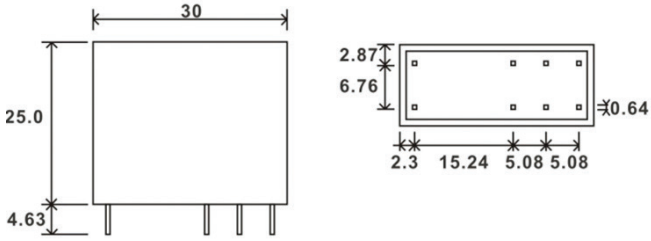
TSP2



TSP3



Dimension



Feature

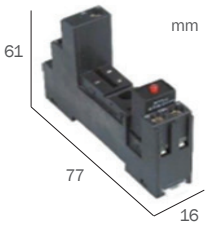
AC Phase control using a TRIAC
Respond to an external sensor (resistance)
Energy saving (applications dependent)
MCU embedded
Compact sized

Application Dimmers, Ovens, Pumps, Fans

Approvals CE RoHS

Selection guide

Motor type	-	Input voltage	Terminal type
SCB = Shaded pole	-	110 = 110VAC	Blank = Pin headers only
SCP = Capacitor run		220 = 220VAC	T = With a screw terminal socket



Electrical characteristics (Typical)

Parameter	SCP-110	SCP-220	Unit
Line voltage	100~120	200~240	VAC
Max. operating current (20°C)	1.0	1.0	A
DC output voltage (between '+' and '–')	3.6	3.6	VDC
External sensor resistance (between '+' and '-')	10~100	10~100	kΩ
Insulation voltage (between case and pins)	2500+	2500+	VDC
Insulation resistance (between case and pins)	10+	10+	MΩ
Protection rating	IP20	IP20	-
Ambient temperature	-20/+60°C	-20/+60°C	°C
Housing material	UL94-V0	UL94-V0	-

Wiring