

# Electric Vehicle Relay

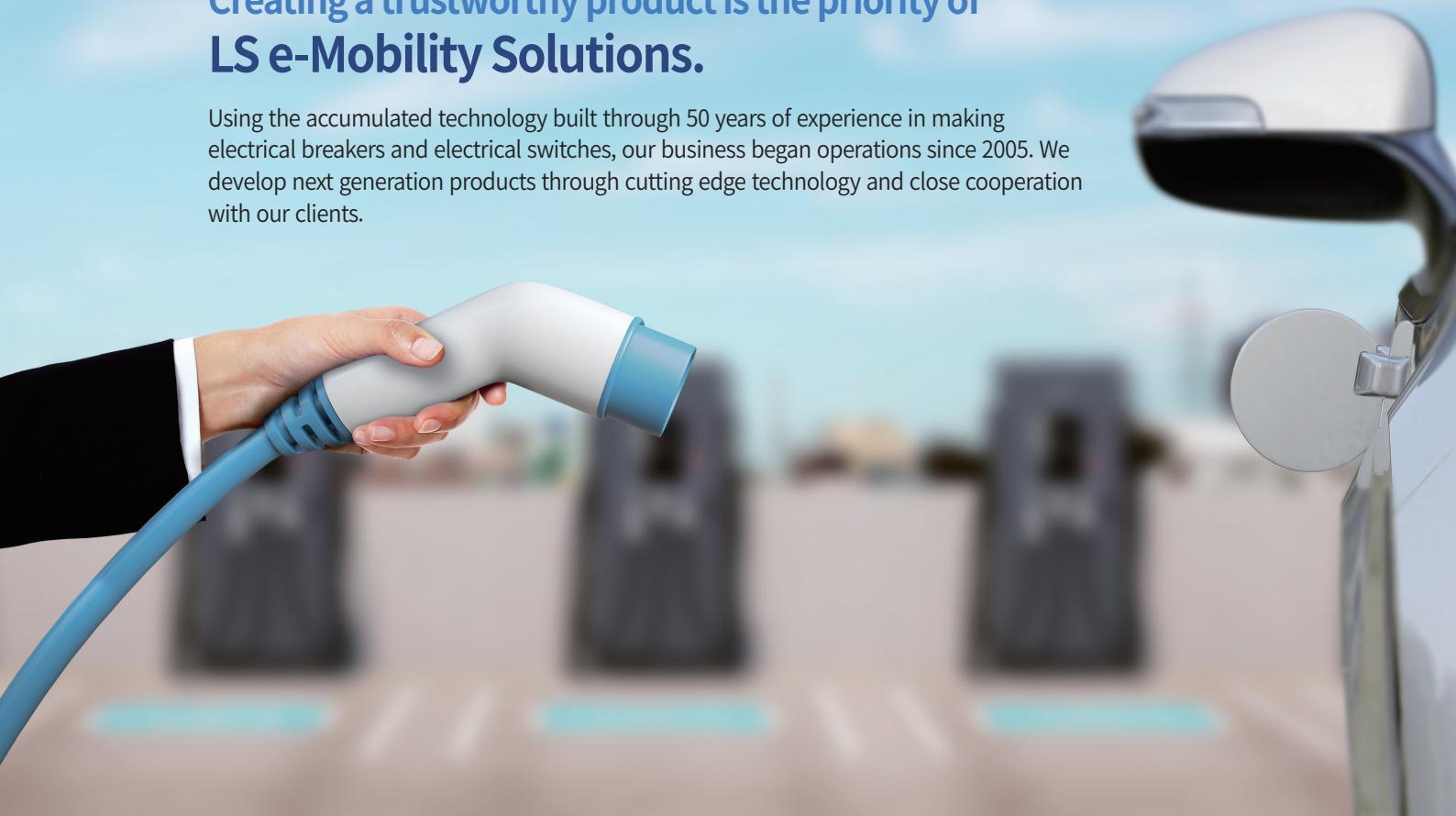


**LS** e-Mobility Solutions

# Features

## Creating a trustworthy product is the priority of LS e-Mobility Solutions.

Using the accumulated technology built through 50 years of experience in making electrical breakers and electrical switches, our business began operations since 2005. We develop next generation products through cutting edge technology and close cooperation with our clients.



### What is a LS EV Relay?

EV Relays are a essential part of electric vehicles and is placed between the battery and the inverter. EV Relays play the role of turning the batteries ON and OFF based on the instructions of the BMS while also turning external chargers ON and OFF. In short, it has a role in all aspects that involve a DC load.

EV Relays are the only vehicle parts among high voltage parts(above DC 450V) that operates mechanically. Thus, durability and quality control is of paramount importance since it is placed under great stress in a short amount of time due to high electrical currents and abnormal electrical currents. Our EV Relays have proven their strengths by maintaining long term business deals with a myriad of global vehicle companies.

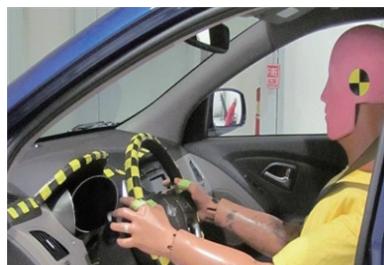
### Characteristics of LS EV Relay



Compact design



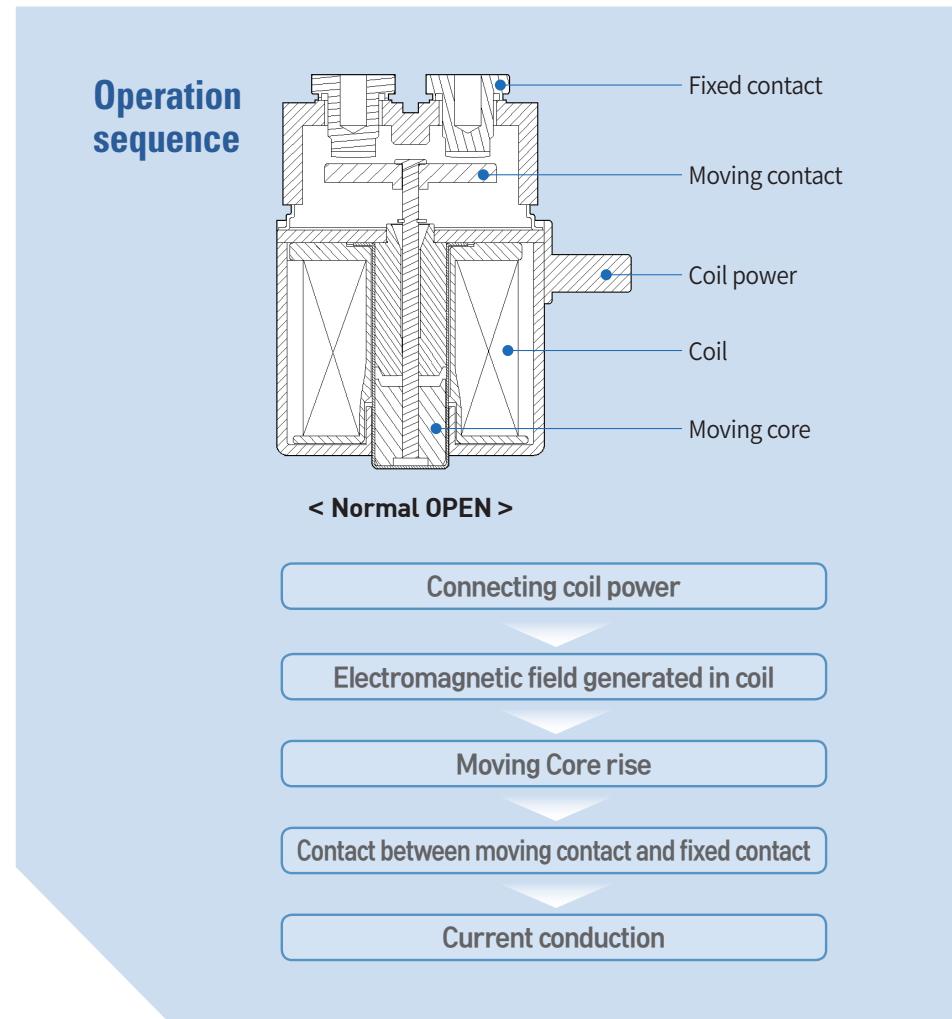
Proven safety



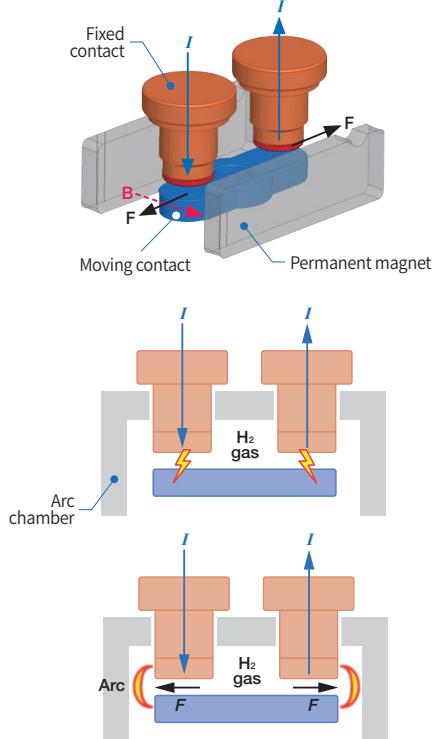
Superior reliability



Customizable



## Arc quenching



When contacts are separated, an arc is generated between contacts

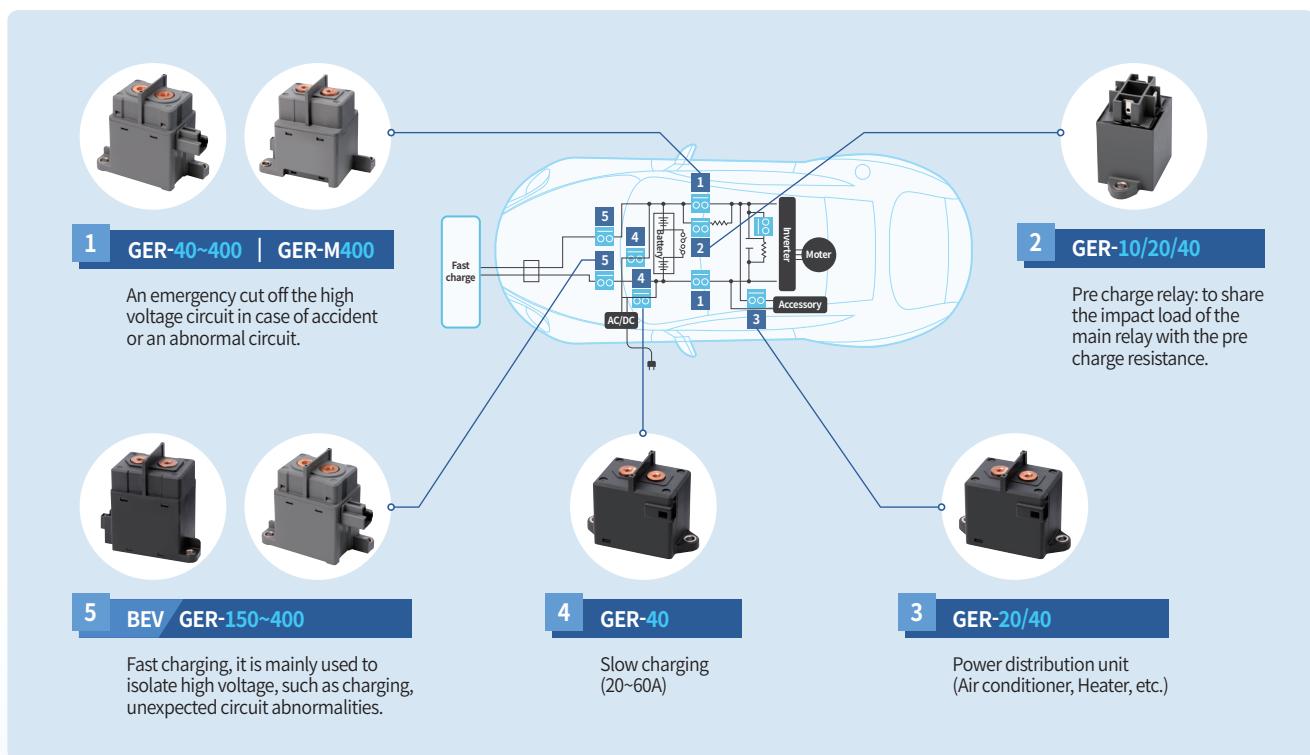
Due to magnetic field by permanent magnet, the arc can move toward the arc chamber by Fleming's left-hand law.

The arc would be quickly cooled and quickly quenched by H<sub>2</sub> gas.

**Minimized contact damage by reducing arc quenching duration**

# Field of application

## Electric vehicle field



## e-Mobility field

e-Bus



e-Industrial Vehicle



e-Truck



e-Ship



e-Train



UAM



e-Military Vehicle



Golf cart



AGV/AMR



## Industrial renewable energy field



## Ordering information

# GER-M10ST DC24V SM G2

1 2 3

4

5

6

**1 Operating voltage**

Blank~	450V
-M	450~1000V

**2 Conventional thermal current**

10	10A
20	20A
40	40A
...	...
400	400A

**3 Customer**

ST	Standard
00	Customer name

**4 Control voltage**

DC12V	DC12V
DC24V	DC24V

**5 Mounting type**

Blank	Bottom mounting
SM	Side mounting

**6 Type or characteristics**

Blank	None
SL	SLIM
G2	2nd generation
CN	China
BF	Black frame



# Specifications – Relays under 450V



## EV Relay Specifications

Model		GER-10ST	GER-20ST	GER-40ST	
Max. Operational Voltage		500V	500V	500V	
Continous Current		10A	20A	40A	
Width×Height×Depth (mm)		55.8×43.5×28.0	55.8×43.5×28.0	67.0×41.0×33.1	
Characteristics of Item		Specifications			
Contact	Contact form	SPST-NO			
	Contact structure	Double break, Single			
	Contact voltage drop (initial)	0.5V at 10A	0.5V at 10A	0.2V at 20A	
	Short-time current (Over current)	10A (continuously, 2mm <sup>2</sup> ) 15A (2min, 2mm <sup>2</sup> ) 30A (30s, 2mm <sup>2</sup> )	20A (continuously, 2.5mm <sup>2</sup> ) 30A (5min 2.5mm <sup>2</sup> ) 40A (1min 2.5mm <sup>2</sup> )	40A (continuously, 10mm <sup>2</sup> ) 60A (15min, 10mm <sup>2</sup> ) 100A (2min, 10mm <sup>2</sup> )	
	Max. Cut-off current	N/A	N/A	400A at 450VDC (1cycle)	
	Reverse direction cut-off	N/A	N/A	-40A 200VDC (1,000 cycles at 1200 cycles/h)	
	Switch-off life	N/A	N/A	120A at 450VDC (100 cycle)	
Coil	Rated voltage	12VDC	12VDC	12VDC, 24VDC	
	Pick-up voltage (at 20°C)	Max. 9VDC	Max. 9VDC	Max. 9VDC, 18VDC	
	Drop-out voltage (at 20°C)	Min. 1.2VDC	Min. 1.2VDC	Min. 1.2VDC, 2.4VDC	
	Coil resistance (at 20°C)	60.8Ω	60.8Ω	49.3Ω, 205Ω	
	Max power consumption	3.0W (at 12VDC)	3.0W (at 12VDC)	3.2W (at 12/24VDC)	
	Max. Allowable voltage	16VDC	16VDC	16VDC, 32VDC	
Electrical characteristics	Operating time (at 20°C)	Max. 50ms	Max. 50ms	Max. 50ms	
	Release time (at 20°C)	Max. 30ms	Max. 30ms	Max. 30ms	
	Insulation resistance (Initial)	Between coil and contacts	Min. 100MΩ (at 500VDC)		
	Dielectric strength (initial)	Between coil and contacts Between contacts of the same polarity	2,200Vrms/min (Detection Current: 10mA)		
	Shock resistance	Functional	2,500Vrms/min (Detection Current: 10mA)		
Mechanical characteristics	Destructive				
	Vibration resistance	Functional	196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine] 490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]		
	Destructive		10 to 1,000Hz at 1.0G [Time of vibration for each X, Y, Z direction: 8 hours]		
	Mechanical		10 to 200Hz in increments of 10 at min. 4.5G [Time of vibration for each X, Y, Z direction: 4 hours]		
Expected life	(at 3600 cycle/h)	Min. 150,000ops	Min. 150,000ops	Min. 200,000ops	
	Electrical (Resistive load)	10A, 450VDC 150,000 cycles (at 360 cycles/h)	10A, 450VDC 150,000 cycles (at 360 cycles/h)	40A, 450VDC 1,000 cycles (at 1200 cycles/h)	
		N/A	N/A	N/A	
Ambient operating temp.		-40 ~ 85°C			
Ambient operating humidity		5 ~ 95%R.H.			
Tightening torque	Mounting EV Relay	(M4): 1.8 to 2.7 N·m	(M4): 1.8 to 2.7 N·m	(M4): 1.8 to 2.7 N·m	
	Main terminal	N/A	N/A	(M4): 2.0N·m	
Weight (g)		80	85	146	
Option		N/A	N/A	N/A	



GER-100ST	GER-150ST	GER-200ST	GER-250ST	GER-400ST
500V	500V	500V	500V	500V
100A	150A	200A	250A	400A
76.5×63.6×39.0	76.5×63.6×39.0	76.5×63.6×39.0	89.0×78.5×45.0	100.0×84.0×58.0
Specifications				
SPST-NO				
Double break, Single				
0.01V at 20A	0.01V at 20A	0.01V at 20A	0.02V at 20A	0.02V at 20A
100A (continuously, 35mm <sup>2</sup> )	150A (continuously, 50mm <sup>2</sup> )	200A (continuously, 50mm <sup>2</sup> )	250A (continuously, 100mm <sup>2</sup> )	400A (continuously, 150mm <sup>2</sup> )
150A (15min, 35mm <sup>2</sup> )	225A (15min, 50mm <sup>2</sup> )	300A (2min, 50mm <sup>2</sup> )	350A (15min, 100mm <sup>2</sup> )	600A (15min, 150mm <sup>2</sup> )
225A (2min, 35mm <sup>2</sup> )	320A (2min, 50mm <sup>2</sup> )	400A (500sec 50mm <sup>2</sup> )	500A (2min, 100mm <sup>2</sup> )	900A (2min, 150mm <sup>2</sup> )
1,000A at 450VDC (1 cycle)	1,500A at 450VDC (1 cycle)	1,500A at 450VDC (1 cycle)	2,500A at 450VDC (1 cycle)	3,200A at 450VDC (1 cycle)
-100A 200VDC (1,000 cycles at 1200 cycles/h)	-150A 200VDC (500 cycles at 1200 cycles/h)	-150A 200VDC (500 cycles at 1200 cycles/h)	-250A 200VDC (100 cycles at 360 cycles/h)	-400A 200VDC (1,000 cycles at 60 cycles/h)
200A 450VDC (100 cycles)	300A 450VDC (100 cycles at 60 cycles/h)	300A 450VDC (100 cycles at 60 cycles/h)	400A 450VDC (100 cycles at 60 cycles/h)	800A 450VDC (200 cycles at 60 cycles/h)
12VDC	12VDC	12VDC	12VDC, 24VDC	12VDC, 24VDC
Max. 9VDC	Max. 9VDC	Max. 8VDC	Max. 9VDC, 18VDC	Max. 9VDC, 18VDC
Min. 1.2VDC	Min. 1.2VDC	Min. 1.2VDC	Min. 1.2VDC, 2.4VDC	Min. 1.2VDC, 2.4VDC
23.5Ω	23.5Ω	23.5Ω	38.9Ω, 157Ω	38.2Ω, 152.8Ω
6.5W (at 12VDC)	6.5W (at 12VDC)	6.5W (at 12VDC)	4W (*inrush current: 2.9/1.25A for 12/24V)	4W (*inrush current: 4.2/2.1A for 12/24V)
16VDC	16VDC	16VDC	16VDC, 32VDC	16VDC, 32VDC
Max. 50ms	Max. 50ms	Max. 50ms	Max. 30ms	Max. 30ms
Max. 30ms	Max. 30ms	Max. 30ms	Max. 10ms	Max. 10ms
Min. 100MΩ (at 500VDC)				
2,500Vrms/min (Detection Current: 10mA)				
196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine] 490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]				
10 to 1,000Hz at 1.0G [Time of vibration for each X, Y, Z direction: 8 hours]				
10 to 200Hz in increments of 10 at min. 4.5G [Time of vibration for each X, Y, Z direction: 4 hours]				
Min. 200,000ops	Min. 200,000ops	Min. 200,000ops	Min. 200,000ops	Min. 200,000ops
100A, 450VDC, 1,000 cycles (at 1200 cycles/h)	150A, 450VDC, 1,000 cycles (at 1200 cycles/h)	200A 450V 1,000 cycles (at 360 cycles/h)	250A, 450VDC, 1,000 cycles (at 360 cycles/h)	400A, 450VDC, 1,000ops. (at 360 cycles/h)
40A, 450VDC, 20,000ops. (at 1200 cycles/h)	15A, 450VDC, 50,000ops. (at 1200 cycles/h)	240A 50V 75,000ops. (at 360 cycles/h)	100A, 450VDC, 10,000ops. (at 360 cycles/h)	200A, 450VDC, 3,000ops. (at 720 cycles/h)
-40 ~ 85°C				
5 ~ 95%R.H.				
(M5): 3 to 4 N·m	(M5): 3 to 4 N·m	(M5): 3 to 4 N·m	(M6): 6 to 8 N·m	(M6): 6 to 8 N·m
[M6]: 3.5 to 4.5N·m	[M6]: 3.5 to 4.5N·m	[M6]: 3.5 to 4.5N·m	[M6]: 4 to 4.5 N·m	[M6]: 6 to 8 N·m
330	380	326	500	700
N / A	BUS BAR Type, Side Mounting Type	BUS BAR Type, Side Mounting Type	Side Mounting Type	N / A

# Specifications – Relays under 600~1000V



## EV Relay Specifications

Model		GER-M10ST	GER-M20ST	GER-M40ST	GER-M100ST
Max. Operational Voltage		600V	600V	1000V	1000V
Continous Current		10A	20A	40A	100A
Width×Height×Depth (mm)		55.8×43.5×28.0	55.8×43.5×28.0	67.0×41.0×35.3	76.5×63.6×39.0
Characteristics of Item					
Contact	Contact form	SPST-NO			
	Contact structure	Double break, Single			
	Contact voltage drop (initial)	0.5V at 10A	0.5V at 10A	0.2V at 20A	0.02V at 20A
	Short-time current (Over current)	30A (2min, 2mm <sup>2</sup> )	30A (2min, 2.5mm <sup>2</sup> )	100A (2min, 10mm <sup>2</sup> )	150A (2min.)
	Max. switching current	15A (15min, 2mm <sup>2</sup> )	15A (15min)	60A (15min, 10mm <sup>2</sup> )	225A (15min.)
	Reverse Direction Switch-off Life	N/A	N/A	100A at DC450V 50 cycle (6 cycles/h)	1,000A at DC450V 1 cycle (360 cycles/h)
Coil	Rated voltage	12VDC, 24VDC	12VDC, 24VDC	12VDC, 24VDC	12VDC, 24VDC
	Pick-up voltage (at 20°C)	Max. 9VDC, Max. 18VDC	Max. 9VDC, 18VDC	Max. 9VDC, Max. 18VDC	Max. 9VDC, 18VDC
	Drop-out voltage (at 20°C)	Min. 1.2VDC, 2.4VDC	Min. 1.2VDC, 2.4VDC	Min. 1.2VDC, 2.4VDC	Min. 1.2VDC, 2.4VDC
	Coil resistance (at 20°C)	60.8Ω ± 10% at 12VDC 212.6Ω ± 10% at 24VDC	60.8Ω ± 10% at 12VDC 212.6Ω ± 10% at 24VDC	49.3Ω ± 10% at 12VDC 205Ω ± 10% at 24VDC	34.6Ω ± 10% at 12VDC 139Ω ± 10% at 24VDC
	Power Consumption (at 20°C)	3.0W	3.0W	3.2W	6.5W
	Max. Allowable voltage	15VDC, 30VDC	15VDC, 30VDC	15VDC, 30VDC	15VDC, 30VDC
Electrical characteristics	Operating time (at 20°C)	Max. 50ms	Max. 50ms	Max. 50ms	Max. 50ms
	Release time (at 20°C)	Max. 30ms	Max. 30ms	Max. 30ms	Max. 30ms
	Insulation resistance (Initial)	Between coil and contacts Between contacts of the same polarity	Min. 100MΩ (at 1000VDC)	Min. 100MΩ (at 1000VDC)	Min. 100MΩ (at 1000VDC)
	Dielectric strength (initial)	Between coil and contacts Between contacts of the same polarity	3000Vrms/min (Detection current : 10mA)	3000Vrms/min (Detection current : 10mA)	3000Vrms/min (Detection current : 10mA)
	Shock resistance	Functional [Relay On: 11ms half sine] Min. 490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]	196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine] Min. 490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]	196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine] Min. 490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]	196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine] Min. 490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]
	Vibration resistance	Functional [Time of vibration for each X, Y, Z direction: 8 hours] 10 to 200Hz in increments of 10 at Min. 4.5G [ Time of vibration for each X,Y,Z direction: 4 hours]	10 to 1,000Hz at 1.0G [ Time of vibration for each X, Y, Z direction: 8 hours] 10 to 200Hz in increments of 10 at Min. 4.5G [ Time of vibration for each X,Y,Z direction: 4 hours]	10 to 1,000Hz at 1.0G [ Time of vibration for each X, Y, Z direction: 8 hours] 10 to 200Hz in increments of 10 at Min. 4.5G [ Time of vibration for each X,Y,Z direction: 4 hours]	10 to 1,000Hz at 1.0G [ Time of vibration for each X, Y, Z direction: 8 hours] 10 to 200Hz in increments of 10 at Min. 4.5G [ Time of vibration for each X,Y,Z direction: 4 hours]
Mechanical characteristics	Mechanical (at 3600 cycle/h)	Min. 200,000ops.	Min. 200,000ops.	Min. 200,000ops.	Min. 200,000ops.
	Electrical (Resistive load)	· 5A at DC600V 1,000 cycles · 10A at DC450V 75,000 cycles (Inrush current)	· 10A at DC450V 150,000Ops (120 cycle/Hr) · 20A at DC450V 3,000Ops (360 cycle/Hr) - Making & Breaking · 20A at DC450V 75,000Ops (360 cycle/Hr) · 30A at DC450V 400Ops (60 cycle/Hr) Only Breaking	· 20A at DC1000V 3000 cycles · 30A at DC800V 3000 cycles · 40A at DC600V 3000 cycles · 25A at DC1000V 1000 cycles	· 40A at DC1000V 3000 cycles · 50A at DC800V 3000 cycles · 60A at DC600V 3000 cycles · 50A at DC1000V 1000 cycles
Expected life	N/A	N/A	N/A	N/A	N/A
	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C
Tightening torque	5 ~ 95%R.H.	5 ~ 95%R.H.	5 ~ 95%R.H.	5 ~ 95%R.H.	5 ~ 95%R.H.
	(M4): 1.8 to 2.7 N·m	(M4): 1.8 to 2.7 N·m	(M4): 1.8 to 2.7 N·m	(M6): 3.0 to 4.0 N·m	(M6): 3.0 to 4.0 N·m
Weight (g)	80	85	145	330	
Option	N/A	N/A	N/A	N/A	N/A
Ambient operating temp.					
Ambient operating humidity					
Mounting EV Relay					
Main terminal					



	<b>GER-M150ST</b>	<b>GER-M250ST</b>	<b>GER-M400ST</b>	<b>GER-M300ST G2</b>	<b>GER-M400ST G2</b>
	1000V	1000V	1000V	1000V	1000V
	150A	250A	400A	300A	400A
	76.5×63.6×39.0	89.0×78.5×45.0	100.0×86.7×58.0	83.2×63.0×42.7	86.9×73.4×42.7
Specifications					
SPST-NO					
Double break, Single					
0.02V at 20A	0.02V at 20A	0.02V at 20A	0.02V at 20A	0.02V at 20A	0.02V at 20A
320A (2min, 50mm <sup>2</sup> )	500A (2min, 120mm <sup>2</sup> )	750A (2min, 120mm <sup>2</sup> )	300A (continuously, 75mm <sup>2</sup> ) 500A (340s, 75mm <sup>2</sup> )	400A (continuously, 120mm <sup>2</sup> ) 500A (100s, 120mm <sup>2</sup> )	
225A (2min, 50mm <sup>2</sup> )	350A (15min, 120mm <sup>2</sup> )	500A (15min, 120mm <sup>2</sup> )	600A (165s, 75mm <sup>2</sup> )	700A (30s, 120mm <sup>2</sup> )	
1,000A at DC450V 1 Cycle (360 Cycles/h)	2,000A at DC450V 1 cycle (60 cycles/h)	3200A at DC450V 1 cycle (360 cycles/h)	800A at 800VDC (1 cycle) 1800A at 500VDC (1 cycle)	1300A at 800VDC (1 cycle) 2000A at 500VDC (1 cycle)	
200A at DC300V 1000 cycles (360 cycles/h)	250A at DC200V 1000 cycles (360 cycles/h)	200A at DC300V 1000 Cycles (360 Cycles/h)	1800A at 500VDC (1 cycle)	2000A at 500VDC (1 cycle)	
12VDC, 24VDC	12VDC, 24VDC	12VDC, 24VDC	12VDC, 24VDC	12VDC	
Max. 9VDC, 18VDC	Max. 9VDC, 18VDC	Max. 9VDC, 18VDC	Max. 9VDC, 18VDC	Max. 9VDC	
Min. 1.2VDC, 2.4VDC	Min. 1.2VDC, 2.4VDC	Min. 1.2VDC, 2.4VDC	Min. 1.2VDC, 2.4VDC	Min. 1.2VDC	
23.5Ω ± 10% at 12VDC 93.1Ω ± 10% at 24VDC	4.78Ω/37Ω ± 10% at 12VDC 19.2Ω/156.3Ω ± 10% at 24VDC	3.4Ω/38.5Ω ± 10% at 12VDC 15.2Ω/157.3Ω ± 10% at 24VDC	20.5Ω, 80.9Ω	33.7Ω	
6.5W	4.5W	4.5W	7.5W (at 12VDC/24VDC)	6W (inrush current: 2.8A/for 12V)	
15VDC, 30VDC	15VDC, 30VDC	15VDC, 30VDC	16VDC, 32VDC	16VDC	
Max. 50ms	Max. 30ms	Max. 30ms	Max. 50ms	Max. 30ms	
Max. 30ms	Max. 10ms	Max. 10ms	Max. 30ms	Max. 10ms	
Min. 100MΩ (at 1000VDC)	Min. 100MΩ (at 1000VDC)	Min. 100MΩ (at 1000VDC)	Min. 100MΩ (at 1,000VDC)		
3000Vrms/min (Detection current : 10mA)	3000Vrms/min (Detection current : 10mA)	3000Vrms/min (Detection current : 10mA)	2,500Vrms/sec (Detection current: 10mA)	2,500Vrms/sec (Detection current: 10mA)	
196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine]	196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine]	196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine]	196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine]	196m/s <sup>2</sup> (20G) [Relay On: 11ms half sine]	
Min. 490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]	Min. 490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]	Min. 490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]	490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]	490m/s <sup>2</sup> (50G) [Relay On: 9ms half sine wave]	
10 to 1,000Hz at 1.0G [ Time of vibration for each X,Y,Z direction: 8 hours]	10 to 1,000Hz at 1.0G [ Time of vibration for each X,Y,Z direction: 8 hours]	10 to 1,000Hz at 1.0G [ Time of vibration for each X,Y,Z direction: 8 hours]	10 to 1,000Hz at 1.0G [ Time of vibration for each X,Y,Z direction: 8 hours]	10 to 1,000Hz at 1.0G [ Time of vibration for each X,Y,Z direction: 8 hours]	
10 to 200Hz in increments of 10 at Min. 4.5G [ Time of vibration for each X,Y,Z direction: 4 hours]	10 to 200Hz in increments of 10 at Min. 4.5G [ Time of vibration for each X,Y,Z direction: 4 hours]	10 to 200Hz in increments of 10 at Min. 4.5G [ Time of vibration for each X,Y,Z direction: 4 hours]	10 to 200Hz in increments of 10 at min. 4.5G [Time of vibration for each X, Y, Z direction: 4 hours]	10 to 200Hz in increments of 10 at min. 4.5G [Time of vibration for each X, Y, Z direction: 4 hours]	
Min. 200,000ops.	Min. 200,000ops.	Min. 200,000ops.	Min. 200,000ops.	Min. 200,000ops.	
· 75A at DC1000V 1000 cycles · 90A at DC800V 3000 cycles · 120A at DC600V 3000 cycles · 100A at DC1500V 3000 cycles (Inrush Current)	· 125A at DC1000V 1000 cycles · 150A at DC800V 3000 cycles · 200A at DC600V 3000 cycles · 250A at DC20V 100,000 cycles (600 cycles/h) (Inrush Current)	· 200A at DC1000V 1000 cycles · 250A at DC800V 3000 cycles · 300A at DC600V 3000 cycles · 400A at DC20V 30,000 cycles (Inrush Current)	· 250A, 500VDC, 100ops.	· 400A, 500VDC, 100ops	
N/A	N/A	N/A	N/A	N/A	
-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	-40 ~ 85°C	
5 ~ 95%R.H.	5 ~ 95%R.H.	5 ~ 95%R.H.	5 ~ 95%R.H.	5 ~ 95%R.H.	
(M6): 3.0 to 4.0 N·m	(M6): 6.0 to 8.0 N·m	(M6): 6.0 to 8.0 N·m	(M5): 3 to 4 N·m	(M5): 3 to 4 N·m	
(M8): 3.5 to 4.5N·m	(M6): 3.5 to 4.5 N·m	(M6): 3.5 to 4.5 N·m	[M6]: 3.5 to 4.5N·m, 9.0 to 10.0N·m, 3Time, 100rpm	[M6]: 3.5 to 4.5N·m, 9.0 to 10.0N·m, 3Time, 100rpm	
330	500	630	420	500	
Side Mounting Type	N/A	N/A	Side Mounting Type	1 coil Type, 1 coil External PWM	

# Coil rating / Connection and mounting

## Coil rating

Model	Rated voltage	Pick-up voltage (at 20°C)	Drop-out voltage (at 20°C)	Power consumption	Max. Allowable voltage
GER-10ST	12VDC	Max. 9VDC	Min. 1.2VDC	2.5W (at 12VDC)	16VDC
GER-20ST				3.0W (at 12VDC)	
GER-40ST	12VDC, 24VDC	Max. 9VDC, 18VDC	Min. 1.2VDC, 2.4VDC	3.2W (at 12/24VDC)	16VDC, 32VDC
GER-100ST	12VDC	Max. 9VDC	Min. 1.2VDC	6.5W (at 12VDC)	16VDC
GER-150ST		Max. 9VDC			
GER-200ST		Max. 8VDC			
GER-250ST	12VDC, 24VDC	Max. 9VDC, 18VDC	Min. 1.2VDC, 2.4VDC	4W (*inrush current: 2.9/1.25A for 12/24V)	16VDC, 32VDC
GER-400ST				4W (*inrush current: 4.2/2.1A for 12/24V)	
GER-M10ST	12VDC, 24VDC	Max. 9VDC, 18VDC	Min. 1.2VDC, 2.4VDC	3W	15VDC, 30VDC
GER-M20ST				3W	
GER-M40ST				3.2W	
GER-M100ST				6.5W	
GER-M150ST				6.5W	
GER-M250ST				4.5W	
GER-M400ST				4.5W	
GER-M300ST G2	12VDC, 24VDC	Max. 9VDC, 18VDC	Min. 1.2VDC, 2.4VDC	7.5W (at 12VDC/24VDC)	16VDC
GER-M400ST G2	12VDC	Max. 9VDC	Min. 1.2VDC	6W (*inrush current: 2.8A/ for 12V)	

## Connection and mounting

Model	Main terminal connection			Mounting		
	Screw	Allowed torque	Wire for main terminal (mm <sup>2</sup> )	Allowed SCREW	Allowed torque	
GER-10ST	N / A	N / A	2	M4	1.8~2.7 N·m	
GER-20ST			2.5			
GER-40ST	M4	1.5~2.0 N·m	10	M5	3~4 N·m	
GER-100ST		3~4 N·m	35			
GER-150ST	M6	3.5~4.5 N·m	50	M6	6~8 N·m	
GER-200ST			100			
GER-250ST	M6	4~4.5 N·m	150	M4	1.8 to 2.7 N·m	
GER-400ST		6~8 N·m	2			
GER-M10ST	N / A	N / A	2.5	M4	1.8 to 2.7 N·m	
GER-M20ST			2			
GER-M40ST	M4	1.5 to 2.0 N·m	10	M6	3.0 to 4.0 N·m	
GER-M100ST	M6	3.5 to 4.5 N·m	35			
GER-M150ST	M8		50			
GER-M250ST	M6		120			
GER-M400ST			120×2			
GER-M300ST G2	M6	4~4.5 N·m	75	M5	6.0 to 8.0 N·m	
GER-M400ST G2			120			

# Selection of relay type

Electric Vehicle Relay

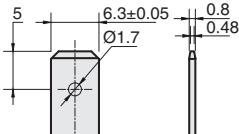
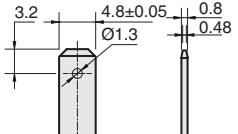
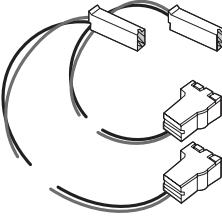
For the proper use of a relay, you must not only be well informed of the characteristics of the relay and service conditions to determine whether the selected one fits for the conditions for application, but also fully understand the specifications of coil and contact, operate time, mechanical characteristics, and other conditions for the relay to be used. Please refer to the table below for details and considerations for selection.

Items	Details	Considerations for selection
Coil	Pick-up voltage (Current)	The value at which a relay should function when increasing the voltage to an unoperated relay.
	Drop-out voltage (Current)	The value at which a relay should revert to the unoperated state when decreasing the voltage to an operated relay.
	Maximum continuous voltage	The maximum allowable voltage to be continuously applied to the coil without causing damage. Short duration spikes of a higher voltage can be tolerated, but you must consult with the manufacturer above all.
	Coil resistance	The DC resistance of the coil of DC type relays.
	Temperature rise	If power is supplied to coil, the coil's temperature is increased and saturated. Temperature rise refers to the difference between the temperatures before and after the power application to the coil.
Contact	Contact rating	The allowable rated voltage and current.
	Contact material	Material that forms contacts.
	Life	The minimum number of times a relay can be operated under the normal condition while contacts are switching specific load.
	Contact resistance	The value combined together the resistance produced when contacts touch each other, that of terminals, and that of contact spring.
Operate time	Operating time	The time elapsed since power is first supplied to the coil until the open contacts are normally closed, excluding bounce time.
	Release time	The time elapsed since power is cut off from the coil until the normally closed contacts are reclosed, excluding bounce time.
	Bounce time	The phenomenon that contacts intermittently switches on and off as movable parts and contacts collide.
	Switching frequency	The frequency of switching that repeats operations while satisfying the electrical life or mechanical life through the application of a pulse train to the operating coil at the rated voltage.
Mechanical characteristics	Vibration resistance	1) Functional: The vibration allowed to relay during operation, with contact not open for the specified time. 2) Destructive: The vibration the relay can endure in the process of shipment, installation or use without causing damage and change in the operating characteristics of the relay.
	Shock resistance	1) Functional: The acceleration allowed to relay during operation, with contact not open for the specified time. 2) Destructive: The acceleration a relay can endure in the process of shipment or installation without causing damage and change in the operating characteristics of the relay.
	Ambient Use temperature	The allowable temperature of the environment in which the relay is mounted.
	Life	The minimum number of times a relay can be operated under the normal condition without load on the contacts.
Other items	Breakdown voltage(Dielectric strength)	The maximum voltage tolerated by a relay without causing damage for a specific period, which is measured at the same points as insulation resistance.
	Mounting, connection	Mounting: Parallel type and vertical type Connection: Screw type and plug-in type used to connect to main circuit
	Size	Size of relay (Width, Height, Depth)

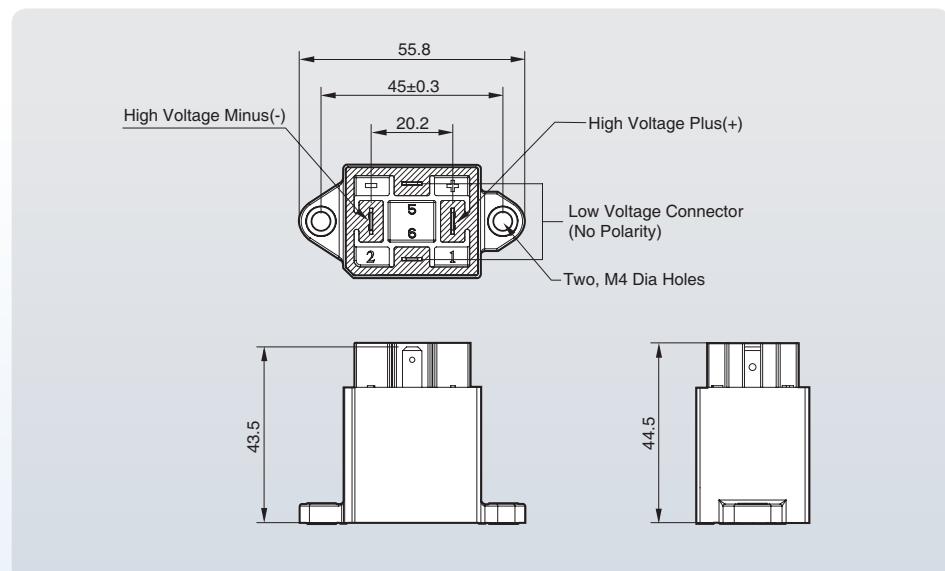
# GER-10ST / GER-M10ST

## Coil terminal accessory



Main Terminal	Coil Terminal	Accessory(Not included)
 <p><b>Pin Type Features</b></p> <ul style="list-style-type: none"> <li>Terminal Type = Tab</li> <li>Mating Area Interface</li> <li>Dimensions(mm) 6.3×0.80</li> <li>Material = Brass</li> </ul> <p><b>Applicable Connector</b></p> <ul style="list-style-type: none"> <li>Terminal Type = Receptacle</li> <li>Tyco 63445-2</li> </ul>	 <p><b>Pin Type Features</b></p> <ul style="list-style-type: none"> <li>Terminal Type = Tab</li> <li>Mating Area Interface</li> <li>Dimensions(mm) 4.8×0.80</li> <li>Material = Brass</li> </ul> <p><b>Applicable Connector</b></p> <ul style="list-style-type: none"> <li>Terminal Type = Receptacle</li> <li>Tyco 5-160429-1 61945-1</li> </ul>	 <p><b>Components</b></p> <ul style="list-style-type: none"> <li>Main Terminal accessory: 2EA</li> <li>Coil Terminal accessory: 2EA</li> <li>Wire length: 300mm</li> </ul>

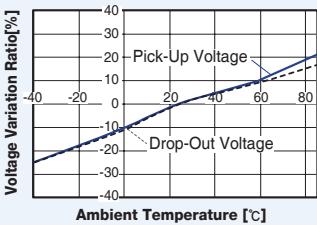
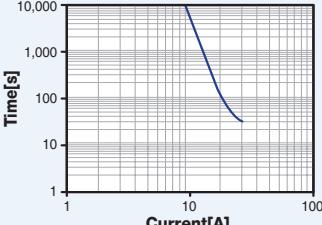
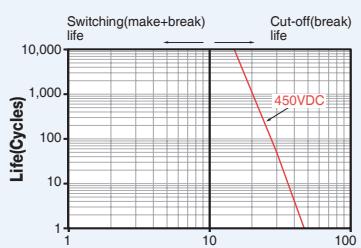
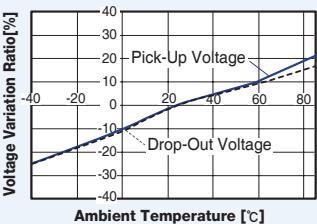
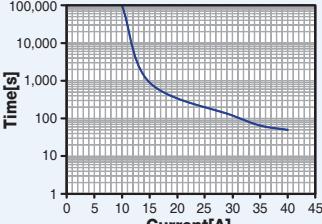
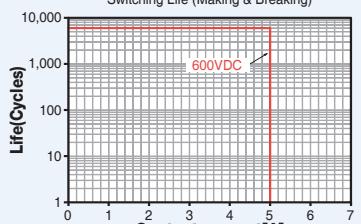
## Dimensions



### General Tolerance

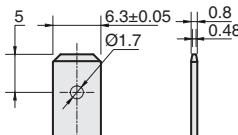
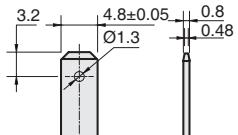
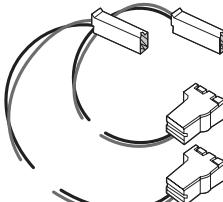
Less Than 10:  $\pm 0.3$ /10~50:  $\pm 0.5$   
More Than 50:  $\pm 0.8$

## Engineering data

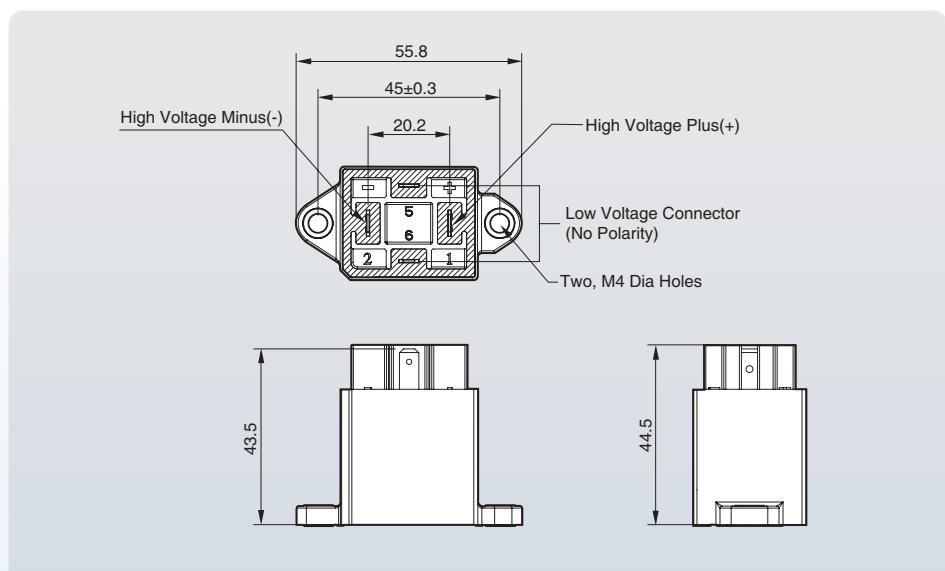
	Operating voltage characteristics	Current distribution	Switching life and cutoff curves
GER-10ST			
GER-M10ST			

### Coil terminal accessory



Main Terminal	Coil Terminal	Accessory(Not included)
 <p><b>Pin Type Features</b></p> <ul style="list-style-type: none"> <li>Terminal Type = Tab</li> <li>Mating Area Interface</li> <li>Dimensions(mm) 6.3×0.80</li> <li>Material = Brass</li> </ul> <p><b>Applicable Connector</b></p> <ul style="list-style-type: none"> <li>Terminal Type = Receptacle</li> <li>Tyco 63445-2</li> </ul>	 <p><b>Pin Type Features</b></p> <ul style="list-style-type: none"> <li>Terminal Type = Tab</li> <li>Mating Area Interface</li> <li>Dimensions(mm) 4.8×0.80</li> <li>Material = Brass</li> </ul> <p><b>Applicable Connector</b></p> <ul style="list-style-type: none"> <li>Terminal Type = Receptacle</li> <li>Tyco 5-160429-1 61945-1</li> </ul>	 <p><b>Components</b></p> <ul style="list-style-type: none"> <li>Main Terminal accessory: 2EA</li> <li>Coil Terminal accessory: 2EA</li> <li>Wire length: 300mm</li> </ul>

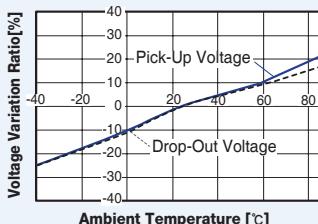
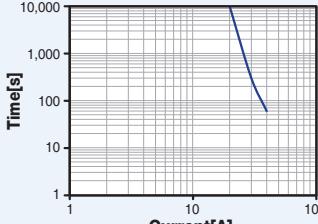
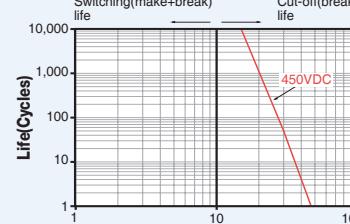
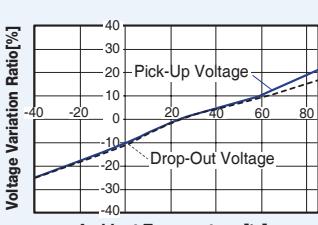
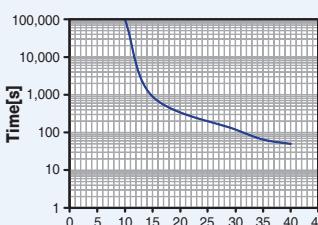
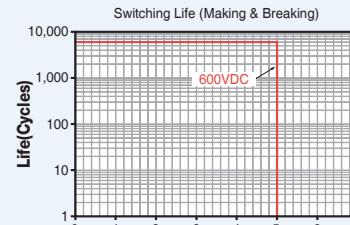
### Dimensions



#### General Tolerance

Less Than 10: ±0.3/10~50: ±0.5  
More Than 50: ±0.8

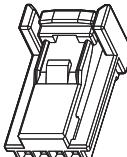
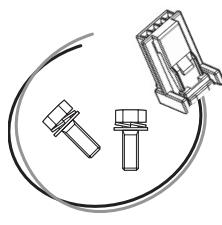
### Engineering data

	Operating voltage characteristics	Current distribution	Switching life and cutoff curves
GER-20ST			
GER-M20ST			

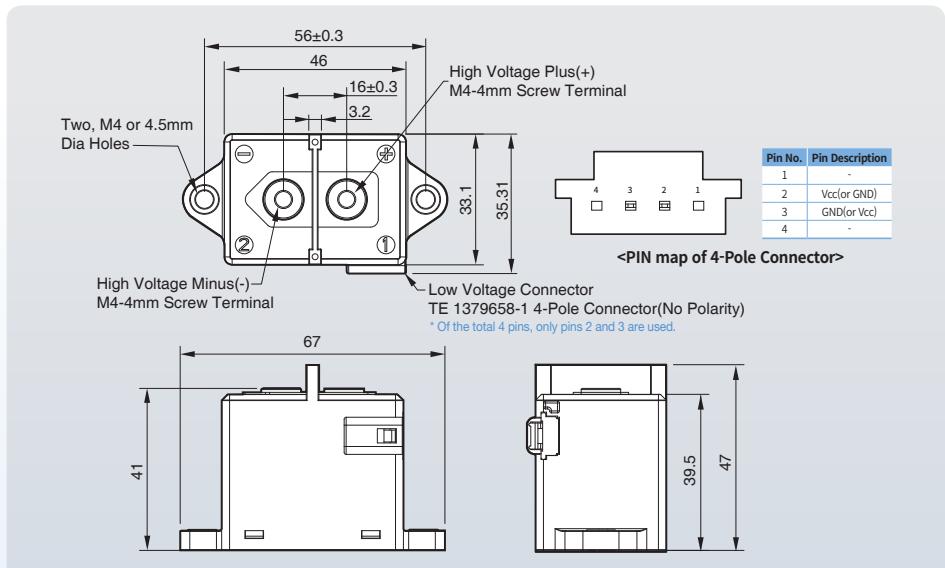
# GER-40ST / GER-M40ST

## Coil terminal accessory



Housing: 1379658-1	Terminal: 1123343-1	Accessory(Not included)
 <ul style="list-style-type: none"> <li>• Connector Style = Receptacle</li> <li>• Contact Type = Tab</li> <li>• Receptacle Configuration =025</li> </ul>	 <ul style="list-style-type: none"> <li>• Contact Type = Receptacle</li> <li>• Applies To Wire/Cable</li> <li>• Wire/Cable Type = Discrete Wire</li> <li>• Wire Range = 0.20-0.602 [24-20] mm [AWG]</li> </ul>	 <p><b>Components</b></p> <ul style="list-style-type: none"> <li>• Main Terminal accessory: 1EA</li> <li>• Flange Bolt M4-4 2EA</li> <li>• Wire length: 300mm</li> </ul>

## Dimensions



### General Tolerance

Less Than 10: ±0.3/10~50: ±0.5  
More Than 50: ±0.8

## Engineering data

	Operating voltage characteristics	Current distribution	Switching life and cutoff curves
GER-40ST			
GER-M40ST			

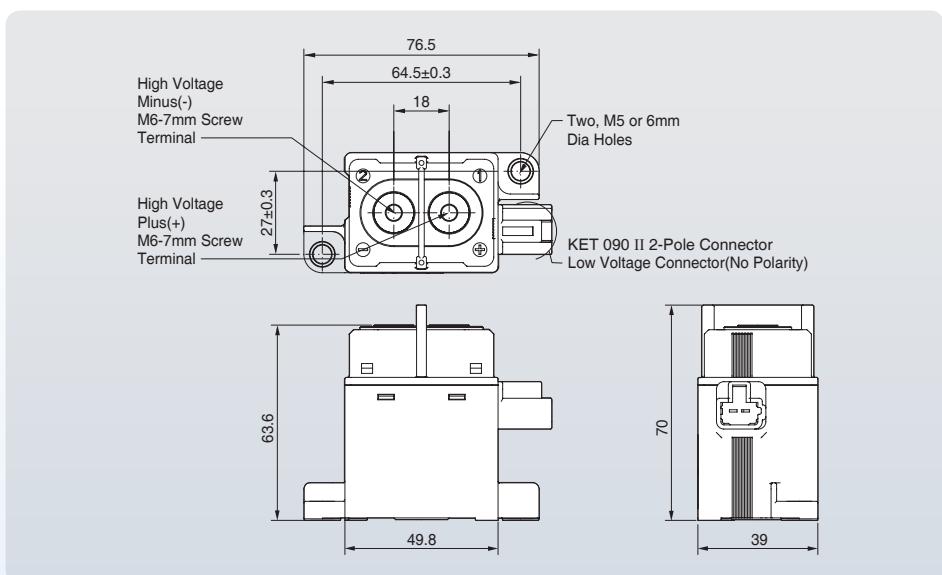
### Coil terminal accessory

Housing: MG651026(L)	Terminal: ST730676-3	Accessory(Not included)			
Part No.	Wire Range		Tab Thick	Material	
	AWG	mm <sup>2</sup>		Thick	Finish
ST730675-3	20	AVSS(CAVS) 0.5	0.64	0.25	Copper Alloy Pre-Tin

**Components**

- Main Terminal accessory: 1EA
- Flange Bolt M6-7 2EA
- Wire length: 300mm

### Dimensions



#### General Tolerance

Less Than 10:  $\pm 0.3$ /10~50:  $\pm 0.5$   
More Than 50:  $\pm 0.8$

### Engineering data

	Operating voltage characteristics	Current distribution	Switching life and cutoff curves
GER-100ST			
GER-M100ST			

# GER-150ST / GER-M150ST

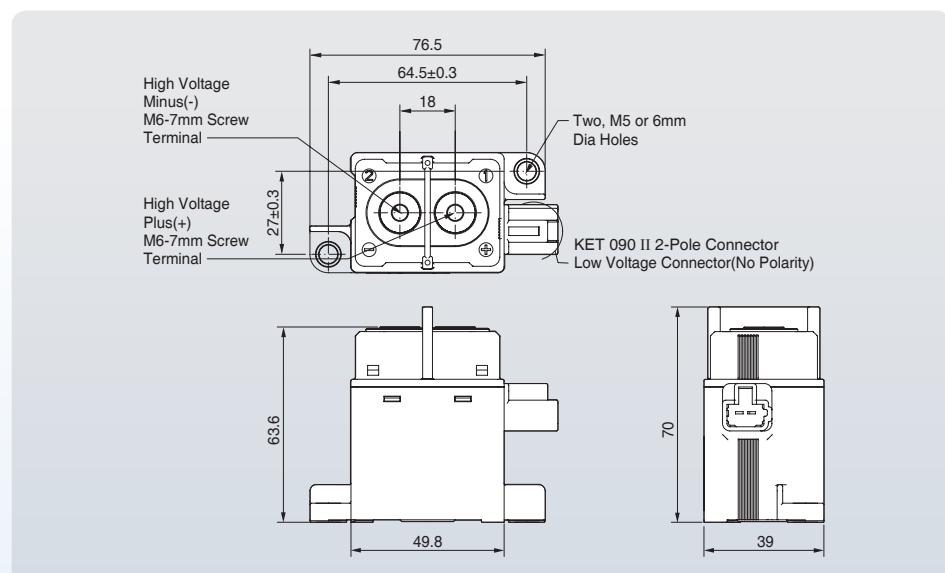
## Coil terminal accessory



Housing: MG651026(L)		Terminal: ST730676-3		Accessory(Not included)	
Part No.	Wire Range		Tab Thick	Material	
	AWG	mm <sup>2</sup>		Thick	Finish
ST730675-3	20	AVSS(CAVS) 0.5	0.64	0.25	Copper Alloy Pre-Tin

- Components**
- Main Terminal accessory: 1EA
  - Flange Bolt M6-7 2EA
  - Wire length: 300mm

## Dimensions



## General Tolerance

Less Than 10:  $\pm 0.3$ /10~50:  $\pm 0.5$   
More Than 50:  $\pm 0.8$

## Engineering data

GER-150ST	Operating voltage characteristics	Current distribution	Switching life and cutoff curves
GER-M150ST			

## Coil terminal accessory

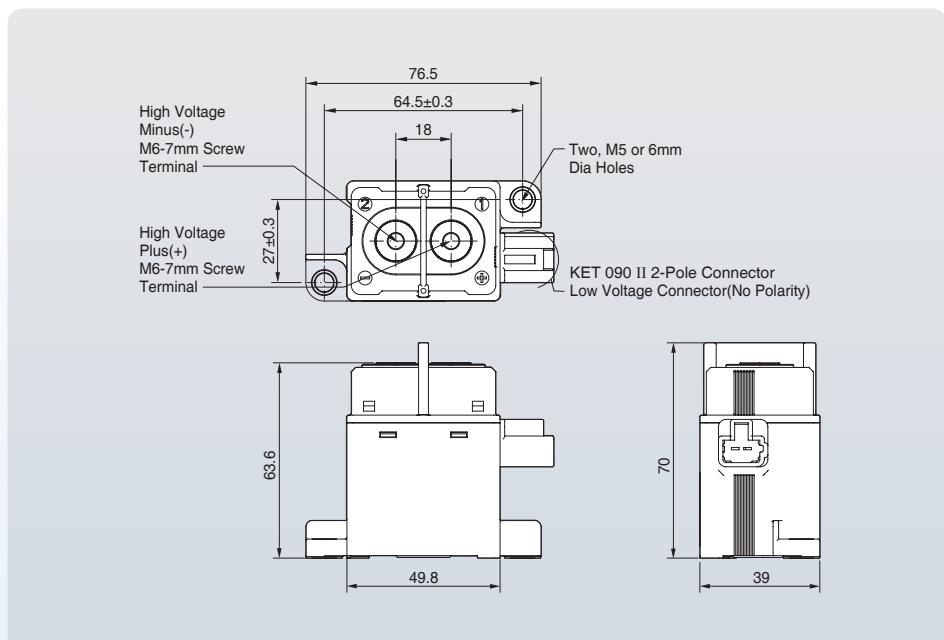


Housing: MG651026(L)		Terminal: ST730676-3		Accessory(Not included)
Part No.	Wire Range		Tab Thick	Material
	AWG	mm <sup>2</sup>		
ST730675-3	20	AVSS(CAVS) 0.5	0.64	0.25 Copper Alloy Pre-Tin

**Components**

- Main Terminal accessory: 1EA
- Flange Bolt M6-7 2EA
- Wire length: 300mm

## Dimensions



### General Tolerance

Less Than 10:  $\pm 0.3$ /10~50:  $\pm 0.5$   
More Than 50:  $\pm 0.8$

## Engineering data

	Operating voltage characteristics	Current distribution	Switching life and cutoff curves
GER-200ST			

# GER-250ST / GER-M250ST

## Coil terminal accessory

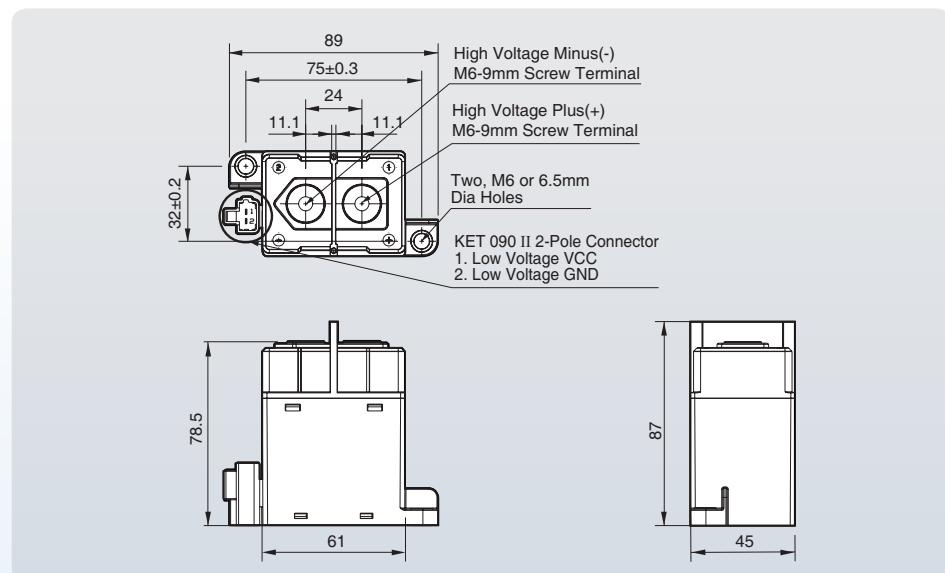


Housing: MG651026(L)		Terminal: ST730676-3		Accessory(Not included)	
Part No.	Wire Range		Tab Thick	Material	
	AWG	mm <sup>2</sup>		Thick	Finish
ST730675-3	20	AVSS(CAVS) 0.5	0.64	0.25	Copper Alloy Pre-Tin

**Components**

- Main Terminal accessory: 1EA
- Flange Bolt M6-9 2EA
- Wire length: 300mm

## Dimensions



### General Tolerance

Less Than 10: ±0.3/10~50: ±0.5  
More Than 50: ±0.8

## Engineering data

	Operating voltage characteristics	Current distribution	Switching life and cutoff curves
GER-250ST			
GER-M250ST			

### Coil terminal accessory

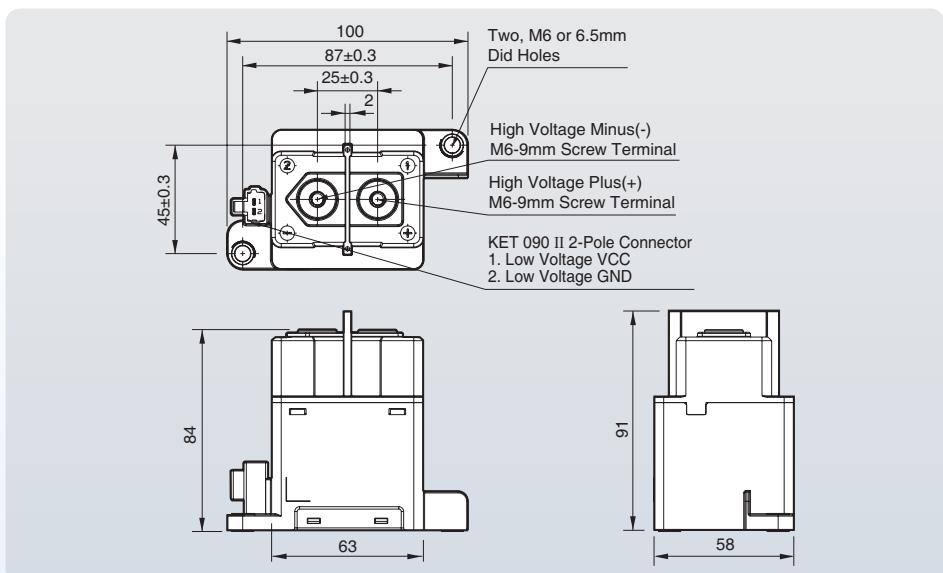


Housing: MG651026(L)		Terminal: ST730676-3		Accessory(Not included)	
Part No.	Wire Range		Tab Thick	Material	
	AWG	mm <sup>2</sup>		Thick	Finish
ST730676-3	18-16	AVSS(CAVS) 0.85~1.25	0.64	0.25	Copper Alloy Pre-Tin

**Components**

- Main Terminal accessory: 1EA
- Flange Bolt M6-9 2EA
- Wire length: 300mm

### Dimensions



#### General Tolerance

Less Than 10: ±0.3/10~50: ±0.5  
More Than 50: ±0.8

### Engineering data

GER-400ST	Operating voltage characteristics	Current distribution	Switching life and cutoff curves
GER-M400ST			

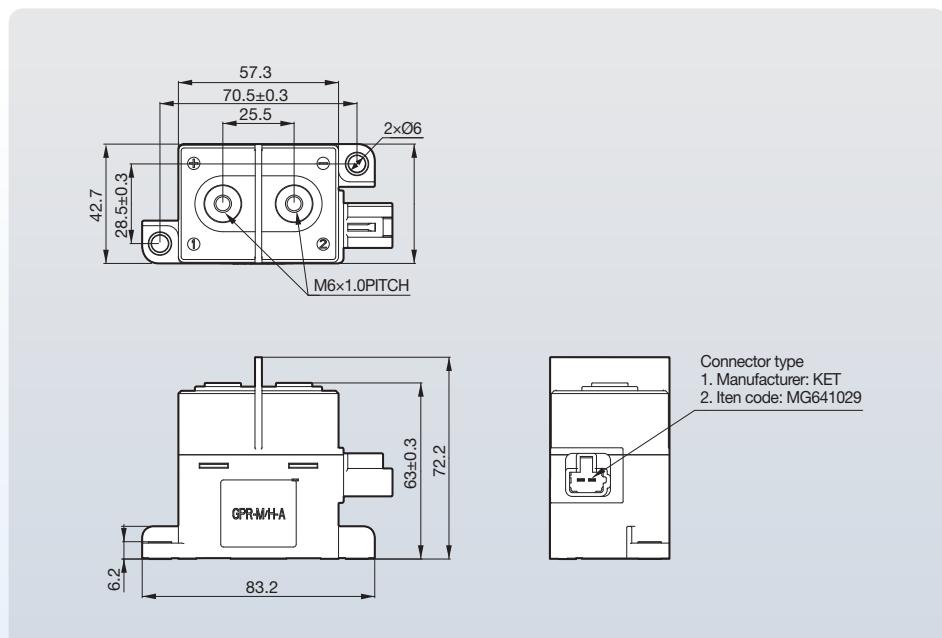
## Coil terminal accessory



Housing: MG651026(L)		Terminal: ST730676-3		Accessory(Not included)	
Part No.	Wire Range		Tab Thick	Material	
	AWG	mm <sup>2</sup>		Thick	Finish
ST730675-3	20	AVSS(CAVS) 0.5	0.64	0.25	Copper Alloy Pre-Tin

- Components**
- Main Terminal accessory: 1EA
  - Flange Bolt M6-7 2EA
  - Wire length: 300mm

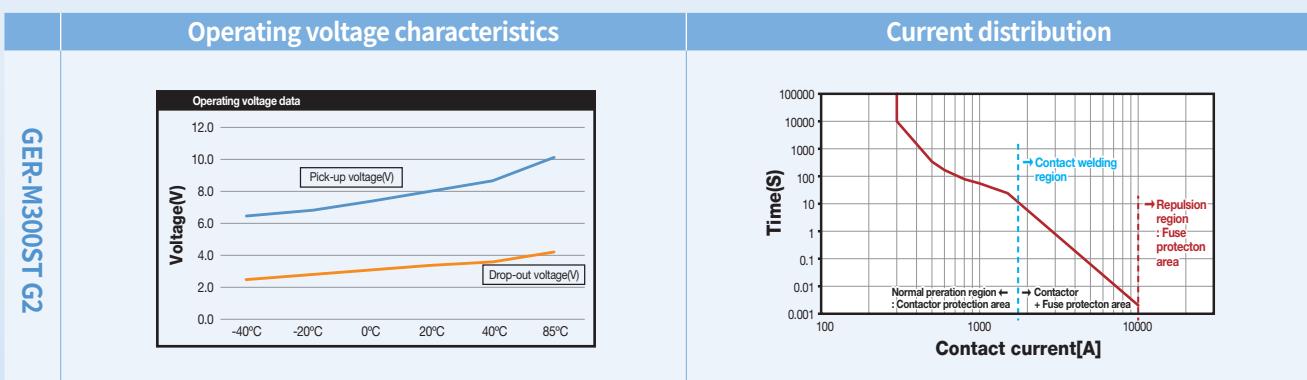
## Dimensions



### General Tolerance

Less Than 10:  $\pm 0.3$ /10~50:  $\pm 0.5$   
More Than 50:  $\pm 0.8$

## Engineering data



### Coil terminal accessory

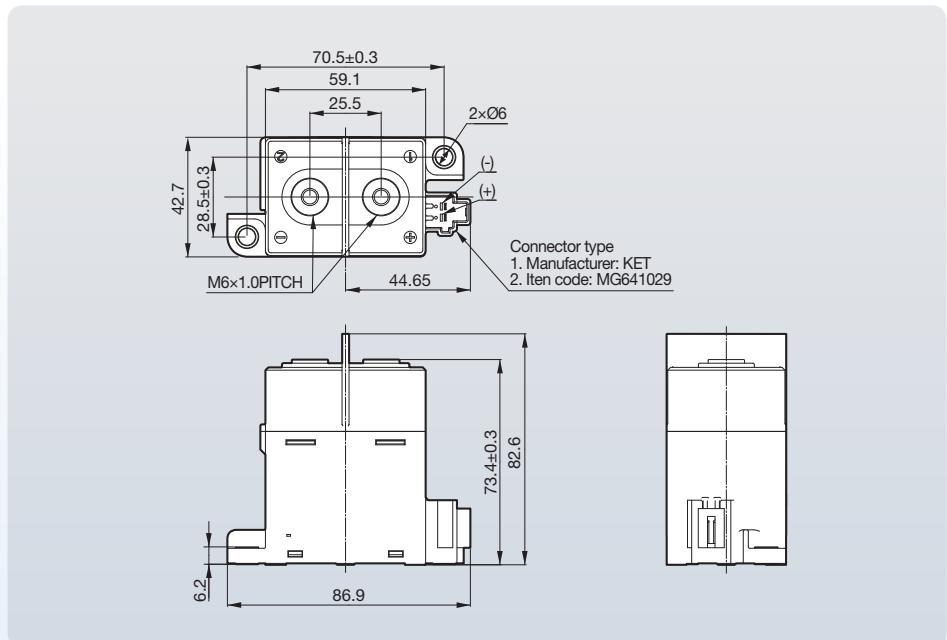


Housing: MG651026(L)		Terminal: ST730676-3		Accessory(Not included)	
Part No.	Wire Range		Tab Thick	Material	
	AWG	mm <sup>2</sup>		Thick	Finish
ST730675-3	20	AVSS(CAVS) 0.5	0.64	0.25	Copper Alloy Pre-Tin

**Components**

- Main Terminal accessory: 1EA
- Flange Bolt M6-7 2EA
- Wire length: 300mm

### Dimensions



#### General Tolerance

Less Than 10: ±0.3/10~50: ±0.5  
More Than 50: ±0.8

### Engineering data

GER-M400ST G2	Operating voltage characteristics	Current distribution																														
	<p><b>Operating voltage data</b></p> <table border="1"> <caption>Estimated data for Operating voltage characteristics</caption> <thead> <tr> <th>Temperature (°C)</th> <th>Pick-up voltage (V)</th> <th>Drop-out voltage (V)</th> </tr> </thead> <tbody> <tr><td>-40</td><td>6.5</td><td>2.5</td></tr> <tr><td>-20</td><td>7.0</td><td>2.8</td></tr> <tr><td>0</td><td>7.5</td><td>3.2</td></tr> <tr><td>20</td><td>8.0</td><td>3.5</td></tr> <tr><td>40</td><td>8.5</td><td>3.8</td></tr> <tr><td>85</td><td>10.0</td><td>4.0</td></tr> </tbody> </table>	Temperature (°C)	Pick-up voltage (V)	Drop-out voltage (V)	-40	6.5	2.5	-20	7.0	2.8	0	7.5	3.2	20	8.0	3.5	40	8.5	3.8	85	10.0	4.0	<p><b>Current distribution</b></p> <table border="1"> <caption>Regions of Current Distribution</caption> <thead> <tr> <th>Region</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>Contact welding region</td><td>Low current, high time (above 1000s)</td></tr> <tr><td>Repulsion region</td><td>Medium current, very low time (below 0.01s)</td></tr> <tr><td>Fuse protection area</td><td>Medium current, medium time (around 0.01-10s)</td></tr> <tr><td>Protector area</td><td>High current, very low time (below 0.01s)</td></tr> </tbody> </table>	Region	Description	Contact welding region	Low current, high time (above 1000s)	Repulsion region	Medium current, very low time (below 0.01s)	Fuse protection area	Medium current, medium time (around 0.01-10s)	Protector area
Temperature (°C)	Pick-up voltage (V)	Drop-out voltage (V)																														
-40	6.5	2.5																														
-20	7.0	2.8																														
0	7.5	3.2																														
20	8.0	3.5																														
40	8.5	3.8																														
85	10.0	4.0																														
Region	Description																															
Contact welding region	Low current, high time (above 1000s)																															
Repulsion region	Medium current, very low time (below 0.01s)																															
Fuse protection area	Medium current, medium time (around 0.01-10s)																															
Protector area	High current, very low time (below 0.01s)																															

# Precautions

## Application Notes

### Specification range

- Please use the product in accordance with the specification range above (E.g, coil rating, mounting information). Otherwise, the product may overheat or malfunction.

### Installation and maintenance

- Do not touch the Relay when power is connected to the main contact, it may cause electric shock. Power must be disconnected from the Relay during trouble-shooting, installation and maintenance.

### Connection

- Faulty connection may cause malfunction, overheating and/or fire.

### Fail-safe

- When checking if the Relay is operational, prepare a fail-safe. Relays that are jammed or welded may be dangerous to operate.

### Polarity

- Relays have polarity. Check the polarity indicated on the housing when connecting the Relay. The electrical durability can not be guaranteed when the Relay is connected to opposite polar.

### Magnetism

- If the relays are in close contact to each other or installed close to strong magnetic parts such as a motor or a speaker, their operating characteristics may change or malfunction. Therefore, check the influence magnetic effects during actual installation.

### Vibration/shock

- To maintain initial performance, do not apply physical shock or drop the relay. Do not use dropped products. Use shock absorbers during transportation.
- The relay is designed not to be separated under normal use conditions. To maintain initial performance, do not disassemble the case. If the case is removed, relay performance can not be guaranteed.

### Temperature

- Condensation may occur at the contact of the Relay when it is used at below 0°C environments or situation where rapid change in temperature occurs. This may delay or hinder the movement of the Relay.
- When the Relay is operated consecutively, the increased temperature of the coil may cause the operating voltage to increase.

### Coil voltage

- Applying coil voltage slowly may cause the Relay to malfunction. Therefore, apply coil voltage quickly.

### Mounting conditions

- When exposed to high temperature or high humidity or to an environment containing organic or sulphide gas for a long time (including shipping period), sulfide or oxide film may form on the surface of the contacts and cause faulty contact, and malfunction. Please check the environment when you transport the product.
- Do not use the product in an environment where the main terminals may be exposed to foreign substances such as organic solvents (eg alcohol, benzene, thinner) or strong alkalis (eg ammonia, caustic soda). It may cause abnormal heat at the terminal part.
- This product is not waterproof. If you install it in a place where waterproofing is required, please find a way to meet your requirements.

### Additional information

- The reverse surge voltage generated by the coil of the relay may cause burnout of the load element. Therefore, take measures to prevent reverse surge voltage. Do not use DIODE because the operation time of relay is delayed and electrical performance is degraded.
- When using a capacitive load (C-load), we recommend applying a precharge circuit so that the inrush current does not exceed the rated current.
- Electrical performance has been verified without L load, and electrical life can be shortened if you use L load.
- When checking the conduction of the main contact, apply the minimum voltage (DC24V) and current (1A) to the main contact.
- To check the auxiliary contact conduction, apply DC5V 1mA ~ DC30V 100mA.



## Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.  
Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

## LS e-Mobility Solutions

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