

ZETTLER CONTROLS, INC.



HVAC/R PRODUCTS

Introduction



***T**hrough traditional craftsmanship and engineering excellence, the Zettler name has symbolized quality and reliability in relays for over 100 years in demanding applications such as telecommunication systems, computer peripherals, office automation equipment, home appliances, security systems, test and measurement devices, and industrial controls.*

***W**e also bring that same commitment to the HVAC/R market with an offering of relays, contactors, heat sequencers, temperature sensors, transformers, and fan center controls.*

***T**his group of products is used by the HVAC/R industry in both residential and commercial applications.*

***Z**ettler controls welcomes application challenges, stocks over one million units, delivers quick turn-around, and understands demanding service requirements. Our unique combination of 100% quality testing, first-class sales and technical support, cost-effective product design, and outstanding product availability offer a highly dependable and responsive resource for fulfilling all your HVAC/R needs.*

*Visit our website for additional product information and new product announcements.
www.zettlercontrols.com*

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Catalog Revision Date: 2/25/2015

UEB1-70 SERIES

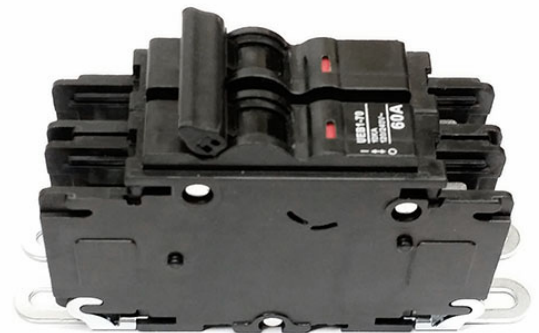
MINIATURE CIRCUIT BREAKER

DESCRIPTION

UEB1-70 series Miniature Circuit Breaker provides excellent over-current protection and control of on/off operation in AC electrical systems. It has a voltage rating of up to 240 VAC and current up to 60 A.

FEATURES

- New terminal design to allow multiple quick connect terminations.
- Removable metal brackets allow the breaker to be flush mounted/ surface mounted, or totally removed for din rail mounting.
- Mechanical switch for manual circuit disconnection.
- On/Off display indicator
- Performance unaffected by position mounting
- UL 489



GENERAL DATA

Rated Insulation Voltage	690 VAC
Agency Approvals	UL489
Operating Altitude	≤ 2000 meters (6562 feet)
Ambient Temperature	Operating: -10°C to 60°C (-14°F to 140°F)
	Storage: -40°C to 70°C (-40°F to 158°F)
Relative Humidity	90-95% RH (below 40°C / 104°F)
Torque	M8 Screw (Box terminal - Lead wire) 35 to 44 in-lbs
QC Wiring	The female connector should meet IEC 60760, necessary to ensure the reliability of connection between female connectors and QC terminals

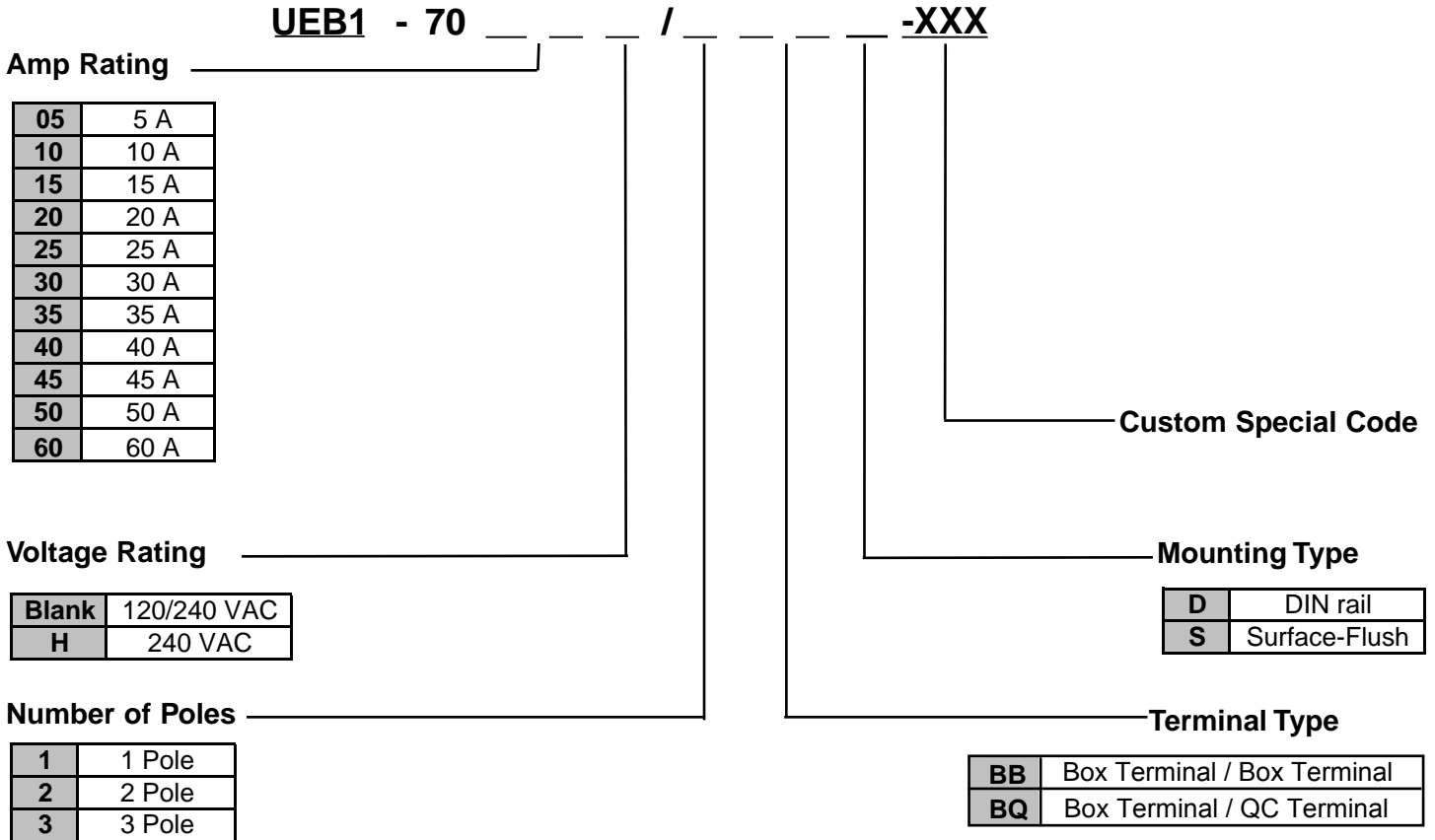
ELECTRICAL DATA

Rated Voltage	120/240 VAC, 240 VAC
Rated Frequency	50/60 Hz
Interrupting Capacity	10 KA
Electrical Endurance	6000 cycles
Mechanical Endurance	10000 cycles

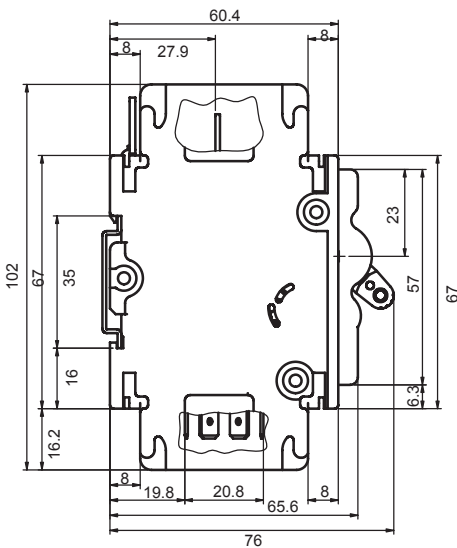
UEB1-70 SERIES

MINIATURE CIRCUIT BREAKER

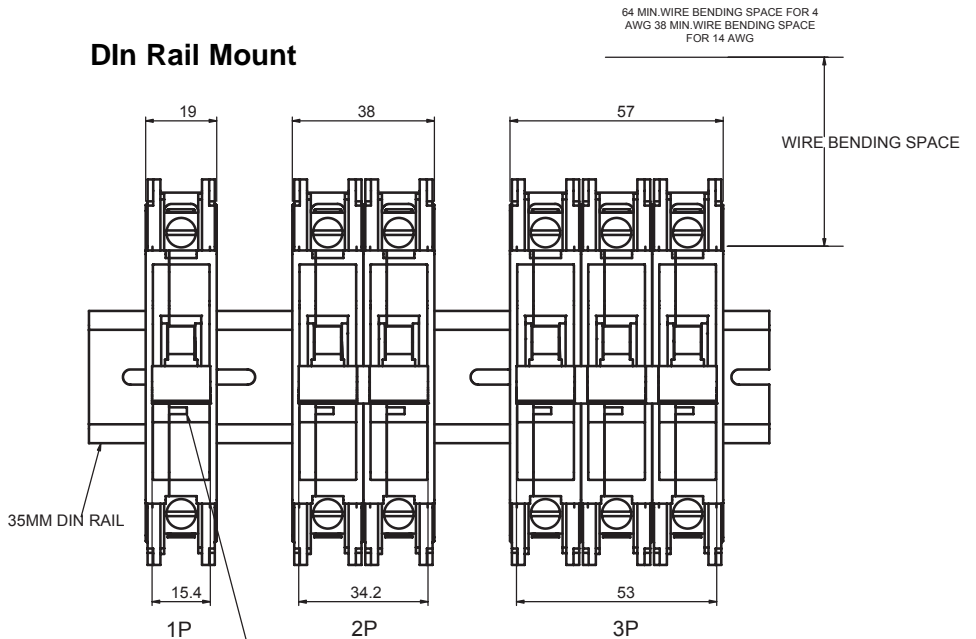
PART NUMBERING SYSTEM



MECHANICAL DATA



Din Rail Mount

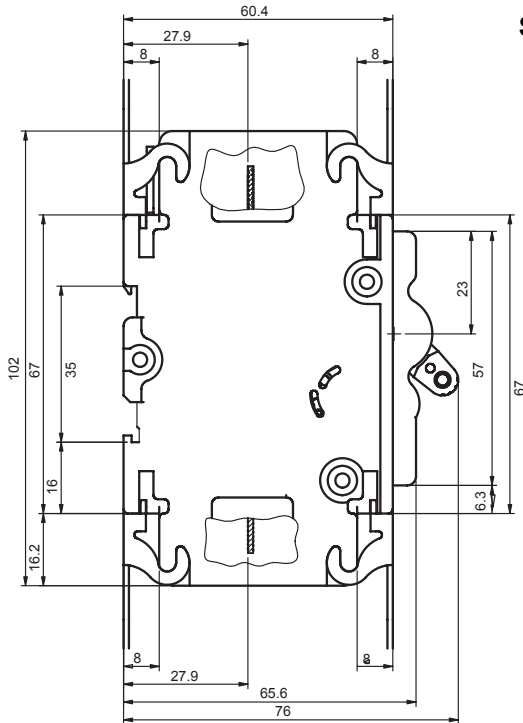


VISI-ON/OFF WINDOW:
SIMULTANEOUS OPENING OF ALL POLES TO HAVE THE GREEN LIGHT ON
AND CLOSING OF ALL POLES TO HAVE THE RED LIGHT ON.

UEB1-70 SERIES

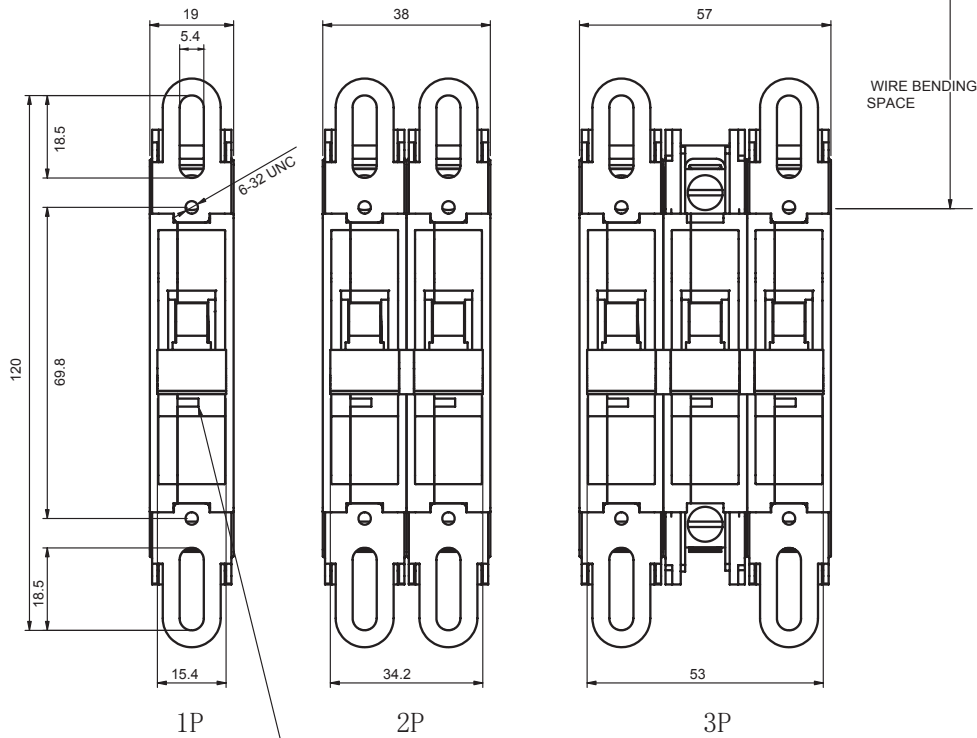
MINIATURE CIRCUIT BREAKER

SURFACE MOUNT / FLUSH MOUNT OPTION



**Metal
Bracket**

64 MIN. WIRE BENDING SPACE
FOR 4 AWG 38 MIN. WIRE
BENDING SPACE FOR 14 AWG



VISI-ON/OFF WINDOW:
SIMULTANEOUS OPENING OF ALL POLES TO HAVE THE GREEN
LIGHT ON AND CLOSING OF ALL POLES TO HAVE THE RED
LIGHT ON.

XMC0 Series

DEFINITE PURPOSE CONTACTORS

DESCRIPTION

Zettler Controls XMC0 series of Definite Purpose Contactors are electro-mechanical switching devices designed ideally for the HVAC industry. The most common applications of our contactors are found in refrigeration, air conditioning and heating. Other applications include elevators, food service equipment, cranes, hoists, welding machines, power supplies, vending machines, lighting, pumps and compressors. XMC0 contactors are built to the ARI 780/790 standard in our ISO 9001 manufacturing facility for high performance and great reliability. XMC0 is available in various pole configurations and load ratings up to 90 amps.



FEATURES

- A variety of termination options for specific application requirements
- Universal mounting plate: Easy replacement of competitor's contactors
- Heavy-duty contacts ensure long electrical life
- EE lamination (magnetic assembly) provides optimum performance while reducing power consumption
- Performance unaffected by position mounting
- Dust-free internal construction
- SCCR (short circuit current rating) 100kA, 600VAC
- Class F Coil Insulation
- UL, CUR file no. E222994
- Meets ARI 780/790 Guidelines

XMCO Series

DEFINITE PURPOSE CONTACTORS

PART NUMBERING SYSTEM

XMCO - 25 3 • E B B C - H 0 0 F G - XXXX *

Full Load Amp

25	25 FLA
32	32 FLA
40	40 FLA
50	50 FLA
63	63 FLA
75	75 FLA
90	90 FLA

Number of Poles

7	1 Pole - Compact
1	1 Pole + 1 Shunt - Compact
2	2 Pole - Compact
3	3 Pole - Standard
3A	2 Pole - Standard (3 Pole Frame)

Coil Voltage

	50Hz	60Hz
D	12 VAC	12 VAC
E	24 VAC	24 VAC
F	110-120 VAC	110-120 VAC
I	208-220 VAC	208-240 VAC
L	-	277 VAC
N	380-415 VAC	440-480 VAC
U	550-600 VAC	550-600 VAC

*550-600V coil not available in 50A or greater models.

Mounting Plate

A	Plastic Base
B	Metal Plate
C	Metal Plate with DIN Rail mounting *

* Available for 50 & 63 Amp versions only

Cover

A	Long Cover
B	Short Cover

Terminal with Quick Connects

A	Screw
B	Sems Clamp
C	Slotted & Hex Head Washer
D	Box Lug
E	Box Lug (Line) Slotted & Hex Head Washer (Load)
F	Box Lug (Load) Slotted & Hex Head Washer (Line)

Contact Material

Nil*	AgSnO ₂
H	AgCdO

*Contact option available in 40A version only. All other amperages use AgCdO

Custom Special Code

* N suffix - No coil cover

Power Terminals

Nil	1&2 Poles: Quad Terminals 3 Pole: Dual Terminals
D	1&2 Poles: Dual Terminals
G	Without Any Terminals
Q	3 Pole: Dual Terminals on the side near coil terminals. Quad Terminals on opposite side

Coil Terminals

Nil	1 & 2 Pole: Dual Terminals w/o screws 3 Pole: Single Terminal w/ screw
F	3 Pole: Dual Terminals w/ screws

Auxiliary Contacts & Microswitch

Right Side

Left Side

0	None (Standard)
1	1NC+1NO, pressure plate screws w/ QC
3	1NC, pressure plate screws w/ QC
4	1NO, pressure plate screws w/ QC
5	2NC, pressure plate screws w/ QC
6	2NO, pressure plate screws w/ QC
1P	1NC+1NO, pressure plate screws
3P	1NC, pressure plate screws
4P	1NO, pressure plate screws
5P	2NC, pressure plate screws
6P	2NO, pressure plate screws
L	Left 2 SPDT
L1	Left SPDT Position 1
L2	Left SPDT Position 2
R	Right 2 SPDT
R1	Right SPDT Position 1
R2	Right SPDT Position 2

XMCO Series

DEFINITE PURPOSE CONTACTORS

GENERAL DATA

Rated insulation voltage	690 Vrms
Di-electric strength	2500Vrms (coil to contact & contact to contact)
Designs/conforms to	IEC 60947-4-1, GB14048.4, EN60947-4, ARI780 / 790
Agency approvals	UL, CUR file E220475
Operating position	Vertical and Horizontal mounting recommended
Operating altitude	2000 meters without derating
Ambient temperature	Operating: -25°C to 70°C *
	Storage: -40°C to 70°C
Shock resistance (1/2 ~ wave) = 11ms	Contact Open: 6g ; Contact Closed: 15g
Vibration resistance (5-300Hz)	Contact Open: 2g ; Contact Closed: 4g
Weight	20-40A: 230-420g, 50/63A: 650g, 75/90A: 1550g
Torque	Screws 25 lb-in/Lugs 40 lb-in for 20-40FLA types
	Screws 45 lb-in/Lugs 50 lb-in for 50-63FLA types
	Screws 50 lb-in/Lugs 60 lb-in for 75-90FLA types
	Screws 8 lb-in for Auxiliary Contact Blocks
	Coil Screws 8 lb-in for 3-pole 30-40FLA and 12 lb-in for 50-90FLA types
QC Wiring	Main Screws 12 lb-in/Auxiliary Screws 8 lb-in/ Coil Screws 8 lb-in for small frame types
	The female connector should meet IEC 60760, necessary to ensure the reliability of connection between female connectors and QC terminals

* The overall combined temperature must not exceed the coil insulation max temperature of 155C.

ELECTRICAL DATA

Rated Operating Voltage	12-600VAC max
Make capacity (230V, cos Ø=0.45)	12 x FLA
Break capacity (230V, cos Ø=0.45)	10 x FLA
Switching Frequency	360 operations/hour
Electrical Endurance	250,000
Mechanical Endurance	1,000,000
SCCR (UL508)	100kA, 600VAC

AUXILIARY CONTACT DATA

Conventional thermal current (A)		10
Rated Insulation Voltage (V)		690
Rated Operational Current (A)	AC600 (AC-15) 230/380V	3/1.9
	N600(DC-13) 110/230V	2.2/1.1

XMCO Series

DEFINITE PURPOSE CONTACTORS

ELECTRICAL RATINGS

Size	Full Load Amps (FLA)	Resistive Load Amps (RLA)	Locked Rotor Amps (LRA)			Pole Form	Order Number
			240VAC	480VAC	600VAC		
Compact	25	32	150	125	100	1P	XMCO-257
						1P+1shunt	XMCO-251
						2P	XMCO-252
	32	40	180	150	120	1P	XMCO-327
						1P+1shunt	XMCO-321
						2P	XMCO-322
	40	50	240	200	160	1P	XMCO-407
						1P+1shunt	XMCO-401
						2P	XMCO-402
Standard	25	32	150	125	100	2P	XMCO-253A
						3P	XMCO-253
	32	40	180	150	120	2P	XMCO-323A
						3P	XMCO-323
	40	50	240	200	160	2P	XMCO-403A
						3P	XMCO-403
	50	63	300	250	200	3P	XMCO-503
	63	80	360	300	240	3P	XMCO-633
	75	95	450	375	300	3P	XMCO-753
	90	120	540	450	360	3P	XMCO-903

COIL DATA

Pole Form	Inrush VA		Sealed VA		Sealed (W)	Pickup Voltage	Dropout Voltage
	50Hz	60Hz	50Hz	60Hz			
1 pole, 1 pole + 1 shunt	33	31	8	6	3.5	≤ 0.8 Us*	≥ 0.2 Us*
2 pole	33	31	8	6	4		
3 pole, 2 pole standard (3A)	72.5	65	13	10	5		
3 pole -503 & 633	114	110	19	14	7		
3 pole -753 & 903	295	282	44	33	12		

*Us = nominal coil voltage. VA data at nominal coil voltage, ambient temperature 25C.

XMCO Series

DEFINITE PURPOSE CONTACTORS

MECHANICAL DATA

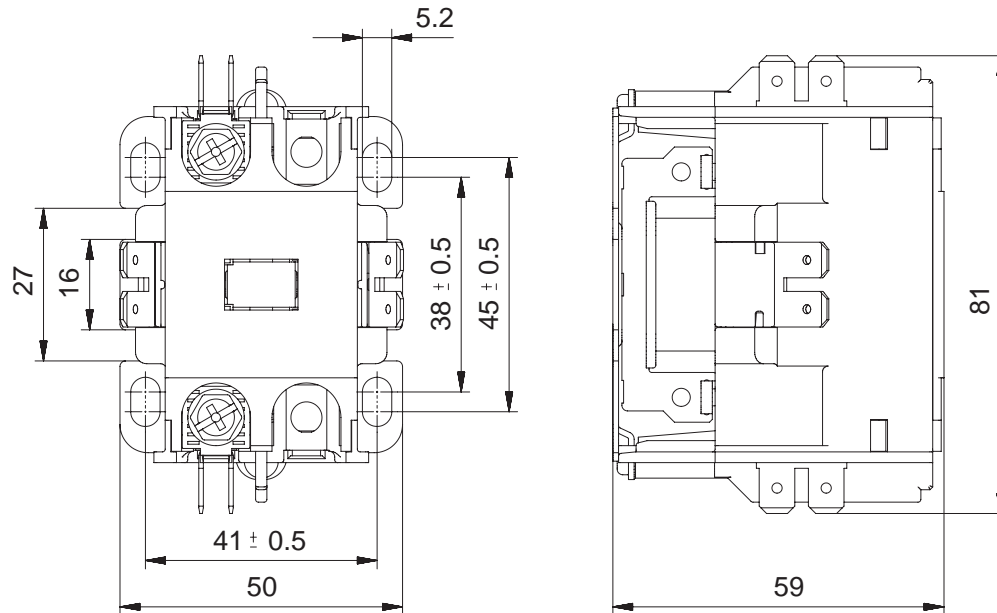


Figure 1 - 1 Pole Contactor (25-40FLA, metal base)

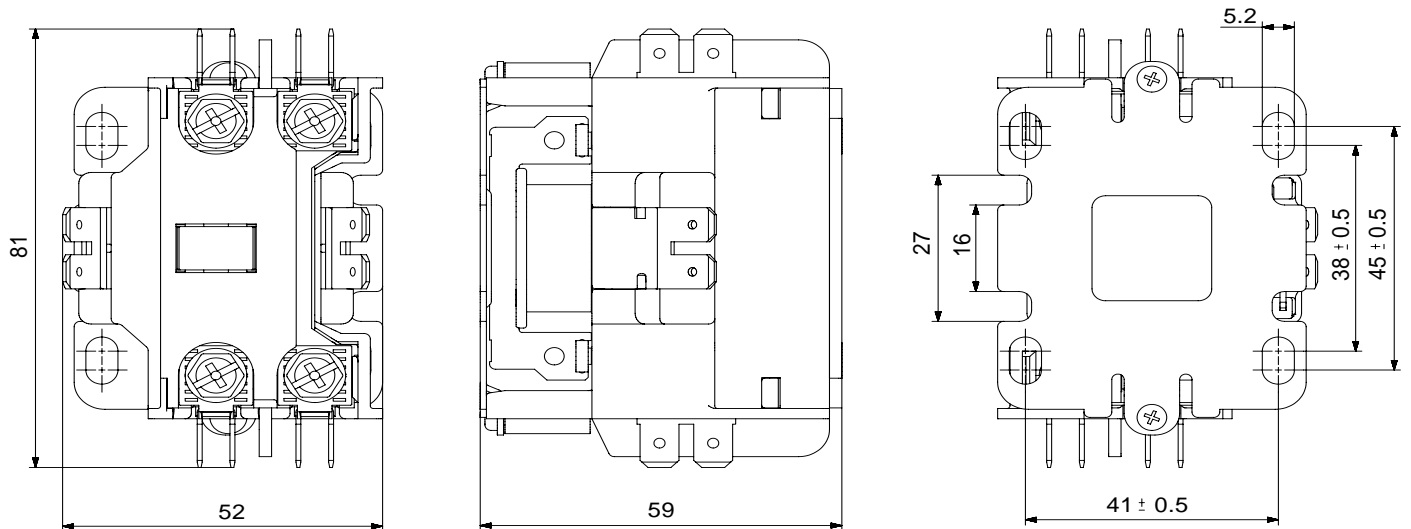


Figure 2 - 1 Pole + Shunt Contactor (25-40FLA, metal base)

XMCO Series

DEFINITE PURPOSE CONTACTORS

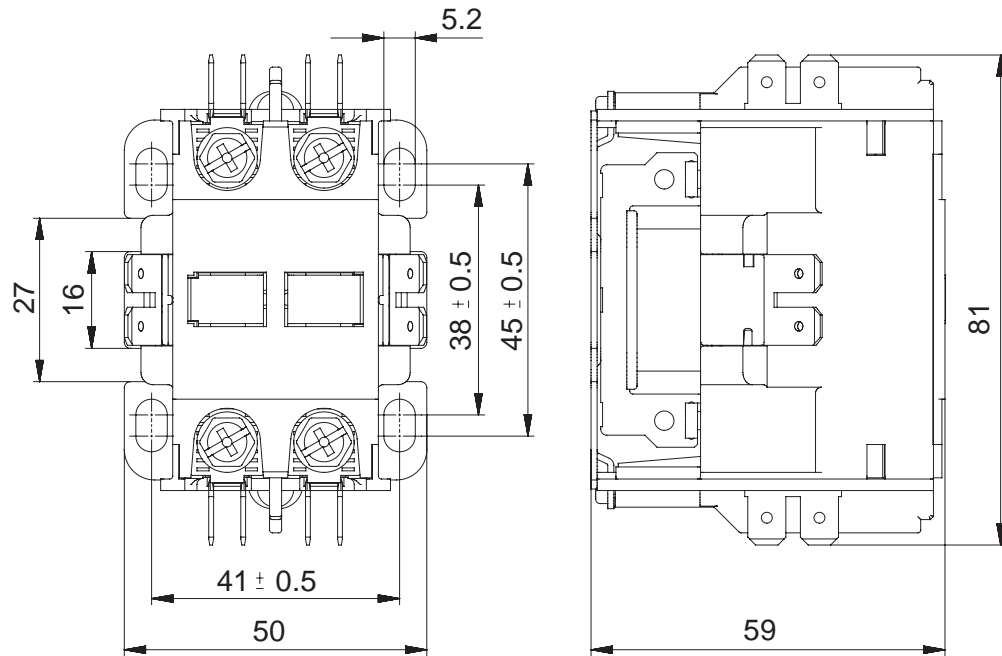


Figure 3 - 2 Pole Contactor (25-40FLA, metal base)

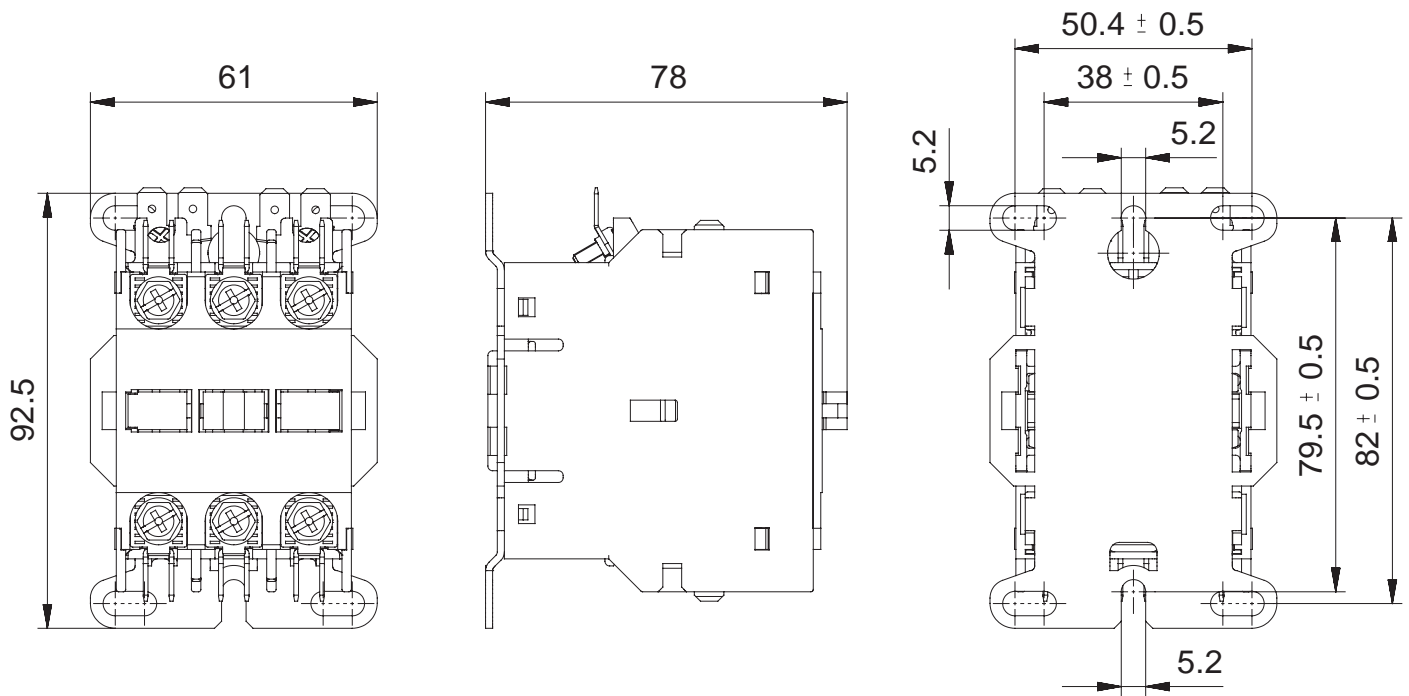


Figure 4 - 3 Pole Contactor (25-40FLA, metal base)

XMCO Series

DEFINITE PURPOSE CONTACTORS

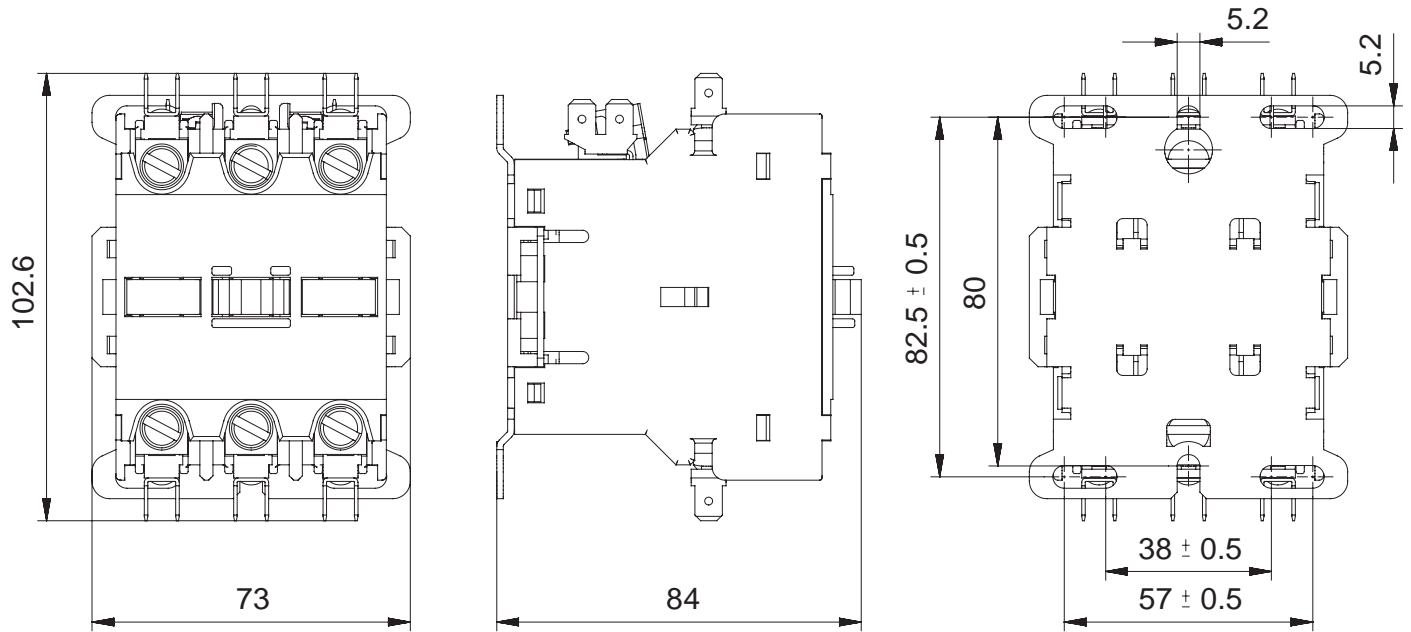


Figure 5 - 3 Pole Contactor (50-63FLA, metal base)

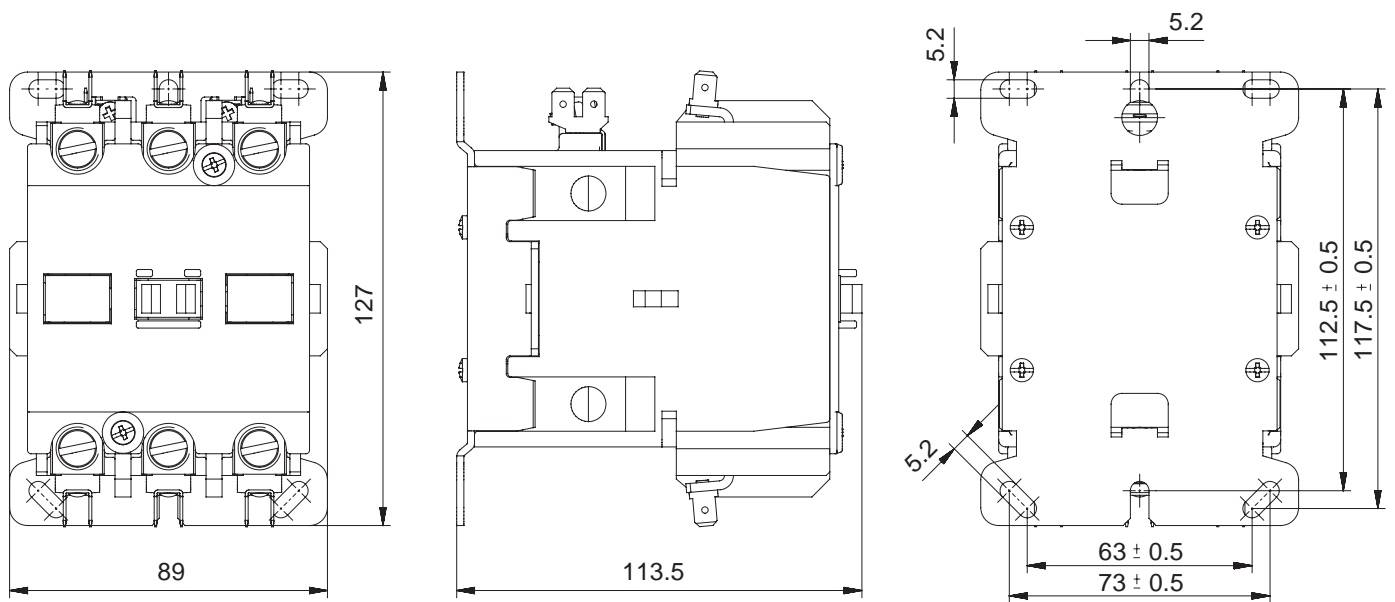
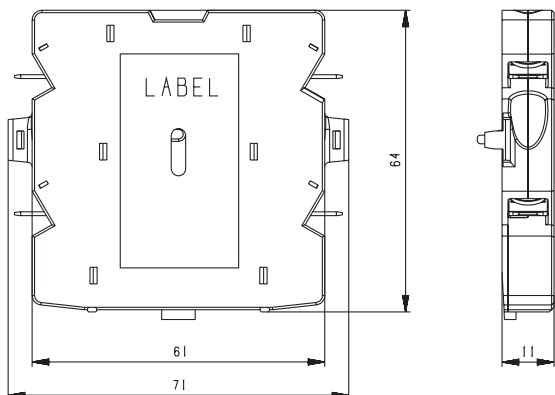


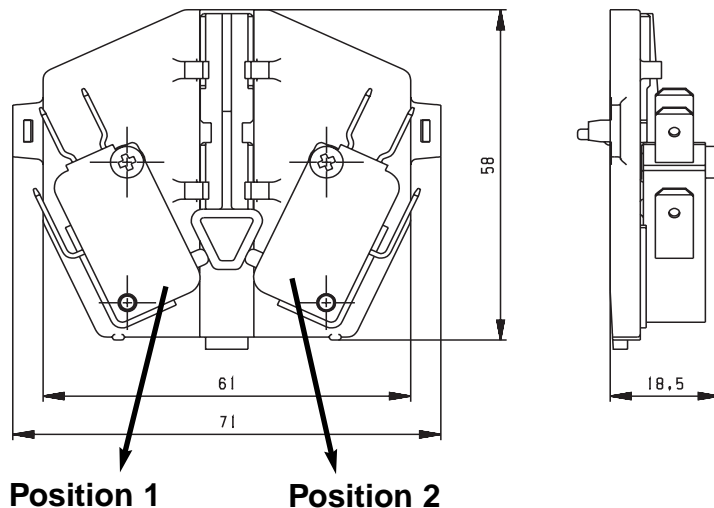
Figure 6 - 3 Pole Contactor (75-90FLA, metal base)

XMCO Series

AUXILIARY CONTACT



MICROSWITCH

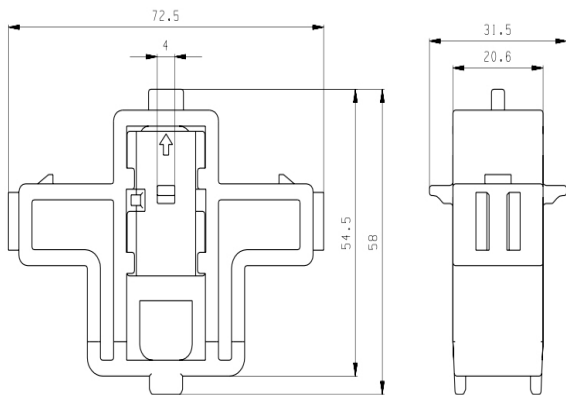


INTERLOCKS

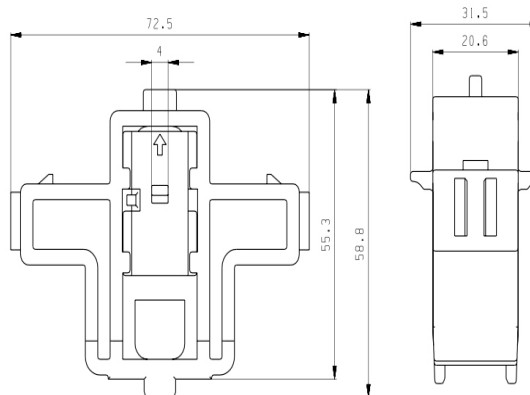
Ordering Information:

In XMCO Part Number, replace "Number of Poles" selection with **J22** (2 2P), **J23** (1 2P & 1 3P), **J32** (1 3P & 1 2P), or **J33** (2 3P). Interlock Pole Order is left to right for 2P or 3P.

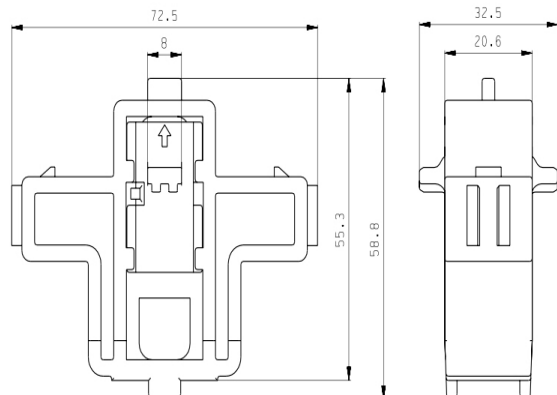
25-40A C03J0



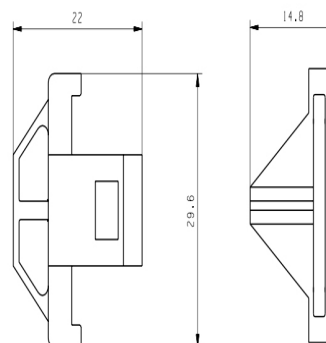
50-63A C03J1



75-90A C03J2



Interlock Block Fastener (2X)



AZ9401

16 AMP POWER RELAY

FEATURES

- Universal mounting bracket with break-away tabs
- Panel Mount
- 16 Amp switching
- 55 Amp inrush current
- Quick-connect terminals
- UL, CUR file E44211



CONTACTS

Arrangement	SPST (1 Form A) SPST (1 Form B) SPDT (1 Form C)
Ratings	Resistive load: Max. switched power: 4000 VA Max. switched current: 16 A Max. switched voltage: 250 VAC
UL, CUR	All models 8 FLA, 25 LRA at 250 VAC, 30k cycles 8 A at 250 VAC, General Purpose, 30k cycles 1 Form A 16 A at 250 VAC, resistive, 100k cycles 1 Form C 16 A at 250 VAC, resistive, 100k cycles
Material	Silver cerium
Resistance	< 50 milliohms initially (24 V, 1 A voltage drop method)

COIL

Power	
At Nominal Voltage (typical)	3.5 VA
Temperature Rise	60°C (108°F) at nominal coil voltage
Temperature	Max. 105°C (221°F)

NOTES

1. All values at 20°C (68°F).
2. Relay may pull in with less than "Must Operate" value.
3. Specifications subject to change without notice.

GENERAL DATA

Life Expectancy	Minimum operations
Mechanical	1×10^7
Electrical	1×10^5 at 16 A 240 VAC Res.
Operate Time (typical)	25 ms at nominal coil voltage
Release Time (typical)	25 ms at nominal coil voltage
Dielectric Strength (at sea level for 1 min.)	2500 Vrms coil to contact 1000 Vrms between open contacts
Insulation Resistance	500 megohms min. at 500 VDC, 20°C 50% RH
Dropout	Greater than 20% of nominal coil voltage
Ambient Temperature	At nominal coil voltage
Operating	-40°C (-40°F) to 65°C (149°F)
Storage	-40°C (-40°F) to 105°C (221°F)
Vibration	0.062" DA at 10–55 Hz
Shock Operating	15 g, 11 ms $1/2$ sine (no false operation)
Enclosure	Phenolic
Terminals	Quick-connect
Weight	75 grams

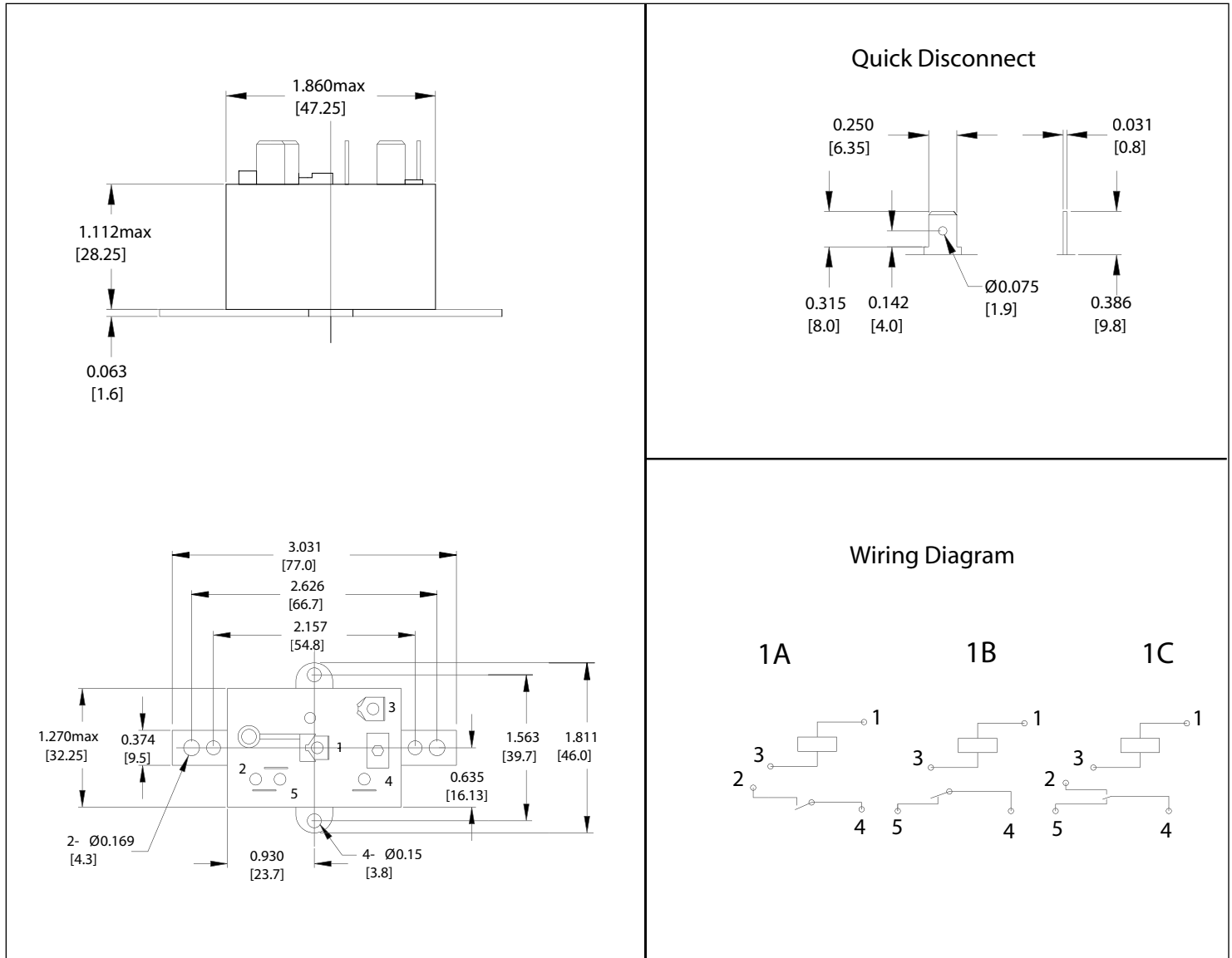
AZ9401

RELAY ORDERING DATA

COIL SPECIFICATIONS					ORDER NUMBER*
Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Coil Resistance $\pm 10\%$	Coil Current A	1 Form C
24	20.4	31.2	90	0.146	AZ9401-1C-24A
120	102	132	2000	0.029	AZ9401-1C-120A
240	204	264	7200	0.015	AZ9401-1C-240A

*For 1 Form A or 1 Form B, substitute "-1A" or "-1B" in place of "-1C".

MECHANICAL DATA



Dimensions in inches with metric equivalents in parentheses. Tolerance: $\pm .010$ "

AZ2900

25 AMP POWER RELAY

FEATURES

- Panel mount
- Universal mounting bracket with break-away tabs
- 25 Amp switching
- Quick-connect terminals
- UL, CUR file E44211



CONTACTS

Arrangement	SPST (1 Form A) SPST (1 Form B) SPST (1 Form A and 1 Form B) SPDT (1 Form C)
Ratings	Resistive load: Max. switched power: 6925 VA Max. switched current: 25 A Max. switched voltage: 277 VAC
UL, CUR	1 Form A 12 FLA, 60 LRA at 125 VAC, 30k cycles 8 FLA, 48 LRA at 250 VAC, 30k cycles 7 FLA, 42 LRA at 277 VAC, 30k cycles 25 A at 277 VAC, resistive, 50k cycles 3 A at 277 VAC, 30k cycles General Use 277 VA at 277 VAC, 30k cycles (Pilot duty) 1 Form C 14 FLA, 84 LRA at 125 VAC, 30k cycles 8 FLA, 48 LRA at 250 VAC, 30k cycles 7 FLA, 42 LRA at 277 VAC, 30k cycles 25 A at 277 VAC, resistive, 50k cycles 3 A at 277 VAC, 30k cycles General Use 277 VA at 277 VAC, 30k cycles (Pilot duty) 1 Form A & B 14 FLA, 84 LRA at 125 VAC, 30k cycles 8 FLA, 48 LRA at 250 VAC, 30k cycles 8 FLA, 48 LRA at 277 VAC, 30k cycles 18 A at 277 VAC, resistive, 100k 25A at 277 VAC, resistive, 50k cycles 3 A at 277 VAC, 30k cycles General Use 277 VA at 277 VAC, 30k cycles (Pilot duty)
Material	Silver cadmium oxide, Silver Cerium (Pilot)
Resistance	< 200 milliohms initially (24 V, 1 A voltage drop method)

NOTES

1. All values at 20°C (68°F).
2. Relay may pull in with less than "Must Operate" value.
3. Specifications subject to change without notice.

GENERAL DATA

Life Expectancy	Minimum operations
Mechanical	1 x 10 ⁶
Electrical	1 x 10 ⁵ at 25 A 277 VAC Res.
Operate Time (typical)	25 ms at nominal coil voltage
Release Time (typical)	25 ms at nominal coil voltage
Dielectric Strength (at sea level for 1 min.)	2500 Vrms coil to contact 1000 Vrms between open contacts
Insulation Resistance	500 megohms min. at 500 VDC, 20°C 50% RH
Dropout	Greater than 20% of nominal coil voltage
Ambient Temperature	At nominal coil voltage
Operating	-40°C (-40°F) to 65°C (149°F)
Storage	-40°C (-40°F) to 105°C (221°F)
Vibration	0.062" DA at 10–55 Hz
Shock	
Operating	10 g, 11 ms ¹ / ₂ sine (no false operation)
Enclosure	Phenolic
Terminals	Quick-connect
Weight	85 grams

COIL

Power	
At Nominal Voltage (typical)	4.0 VA
Temperature Rise	60°C (108°F) at nominal coil voltage
Temperature	Max. 105°C (221°F)

AZ2900

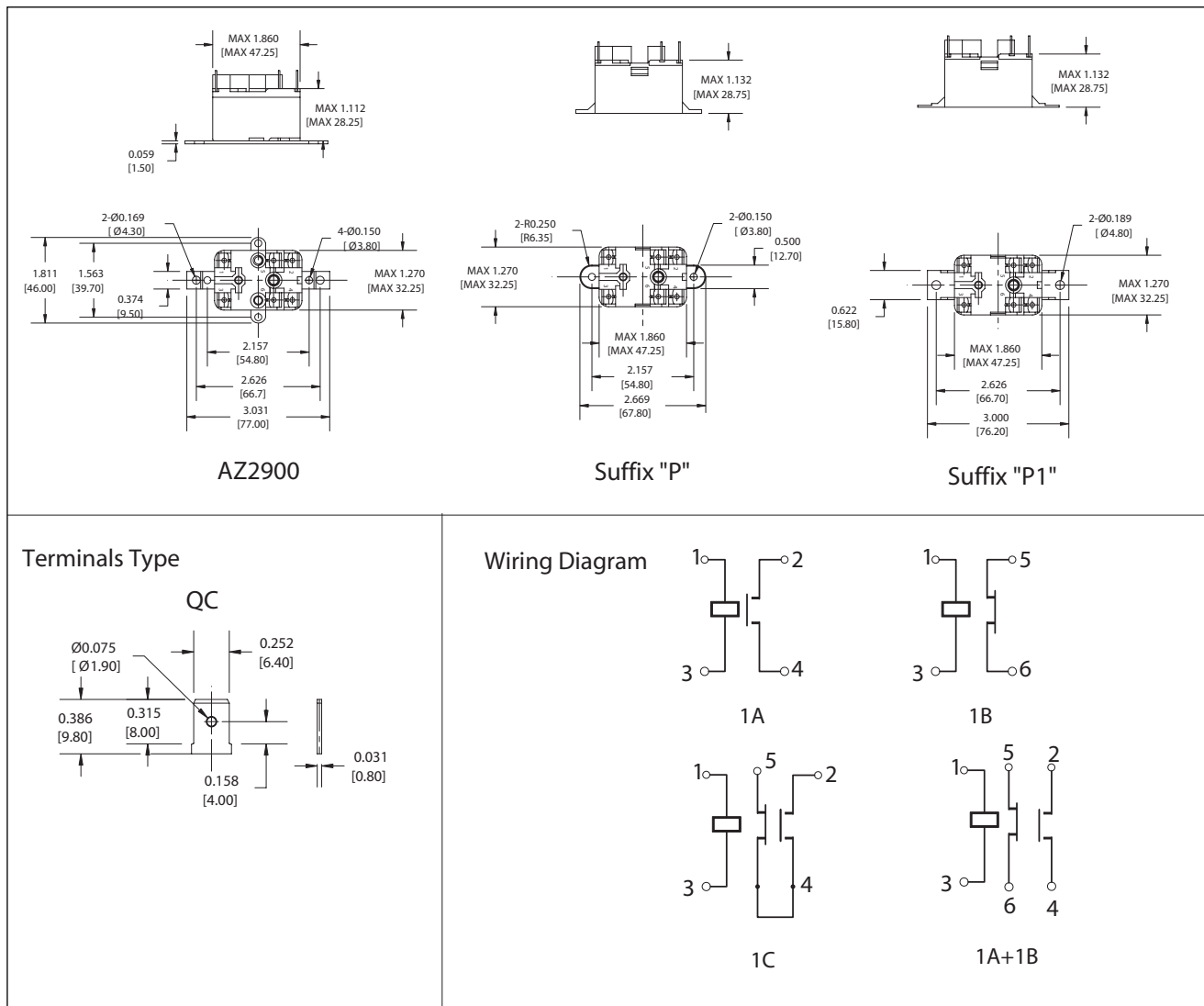
RELAY ORDERING DATA

COIL SPECIFICATIONS					ORDER NUMBER*
Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Coil Resistance $\pm 10\%$	Coil Current A	1 Form C**
24	20.4	31.2	77	0.167	AZ2900-1C-24A
120	102	132	2000	0.033	AZ2900-1C-120A
240	204	264	7250	0.017	AZ2900-1C-240A
277	235	305	11000	0.014	AZ2900-1C-277A

*For 1 Form A, 1 Form B, or 1 Form A & B, substitute "-1A", "-1B" or "-1AB" in place of "-1C". For Silver Cerium (AgCe) contact material add suffix "E". For permanent plastic mounting tabs on 2.15" (hole diameter .150") centers add suffix "P" or for 2.62" centers (hole diameter .189") add "P1".

**There is no terminal "6" on 1 Form C relays.

MECHANICAL DATA



Dimensions in inches with metric equivalents in parentheses. Tolerance: $\pm .010$ "

AZ2800

30 AMP MINIATURE POWER RELAY

FEATURES

- DPST-NO and DPDT configuration
- Meets 8 mm creepage, 4 kV dielectric
- Epoxy sealed versions available
- UL Class F (155°C) standard
- UL, CUR file E44211
- VDE certificate 40023442



CONTACTS

Arrangement	DPST (2 Form A) DPDT (2 Form C)
Ratings	Resistive load: Max. switched power: 560 W or 8310 VA Max. switched current: 30 A (N.O.), 3 A (N.C.) Max. switched voltage: 30 VDC* or 600 VAC *Note: If switching voltage is greater than 30VDC, special precautions must be taken. Please contact the factory.
Rated Load UL	Normally open contacts (N.O.) 30 A at 277 VAC General Use, 100k cycles [1][2] 10 A at 600 VAC, General Use, 6k cycles [1] 1 HP at 120 VAC, 100k cycles [1][2] 2.5 HP at 240 VAC, 100k cycles [1][2] 8 FLA / 26 LRA at 277, 480, 600 VAC, 30k cycles [1] Normally open contacts (N.O.), DC Coils only 25.3 FLA / 110 LRA at 240 VAC, 30k cycles [1][2] Normally closed contacts (N.C.) 3 A at 277 VAC, General Use, 100k cycles [1][2] 2 A at 480 VAC, General Use, 6k cycles [1] 1 A at 600 VAC, General Use, 6k cycles [1] 3 FLA / 3 LRA at 240 VAC, 30k cycles [1] 2 FLA / 2 LRA at 277, 480 VAC, 30k cycles [1] 1 FLA / 1 LRA at 600 VAC, 30k cycles [1]
VDE	Normally open contacts (N.O.) 20 A at 250 VAC, Resistive, 50k cycles [2] Normally closed contacts (N.C.) 3 A at 250 VAC, Resistive, 50k cycles [2]
Material	Silver cadmium [1], silver tin oxide [2]
Resistance	<50 milliohms initially (6 V, 1 A voltage drop method)

COIL

Power	
At Pickup Voltage (typical)	925 mW, DC coil 2.6 VA, AC coil
Max. Continuous Dissipation	5.0 W at 20°C (68°F) ambient, DC coil 7.0 VA at 20°C (68°F) ambient, AC coil
Temperature Rise	48°C (86°F) at nominal coil voltage, DC coil 68°C (122°F) at nominal coil voltage, AC coil
Temperature	Max. 155°C (311°F)

GENERAL DATA

Life Expectancy	Minimum operations
Mechanical	5 x 10 ⁷
Electrical	1 x 10 ⁵ at 30 A 277 VAC Res. (N.O.)
Operate Time	15 ms typical 25 ms maximum with bounce
Release Time	10 ms typical 25 ms maximum with bounce (with no coil suppression)
Dielectric Strength (at sea level for 1 min.)	1500 Vrms contact to contact 4000 Vrms contact to coil 2000 Vrms between contact sets
Insulation Resistance	10 ⁹ ohms minimum at 500 VDC
Dropout	DC: Greater than 10% of nominal coil voltage AC: Greater than 20% of nominal coil voltage
Ambient Temperature Operating	At nominal coil voltage DC: -40°C (-40°F) to 85°C (185°F) AC: -40°C (-40°F) to 65°C (149°F)
Storage	-40°C (-40°F) to 105°C (221°F)
Vibration	0.062" (1.5 mm) DA at 10–55 Hz
Shock	Operational, 10 g for 11 ms ¹ / ₂ sine pulse (no contact opening > 100usec) Non-destructive, 100 g for 11 ms ¹ / ₂ sine pulse
Enclosure	PB.T. polyester
Terminals	Quick connect tabs Note: Allow suitable slack on leads when wiring, and do not subject the terminals to excessive force.
Max. Solvent Temp.	80°C (176°F)
Max. Immersion Time	30 seconds
Weight	86 grams
Packing unit in pcs	20 per plastic tray / 100 per carton box

NOTES

1. All values at 20°C (68°F).
2. Relay may pull in with less than "Must Operate" value.
3. Specifications subject to change without notice.

AZ2800

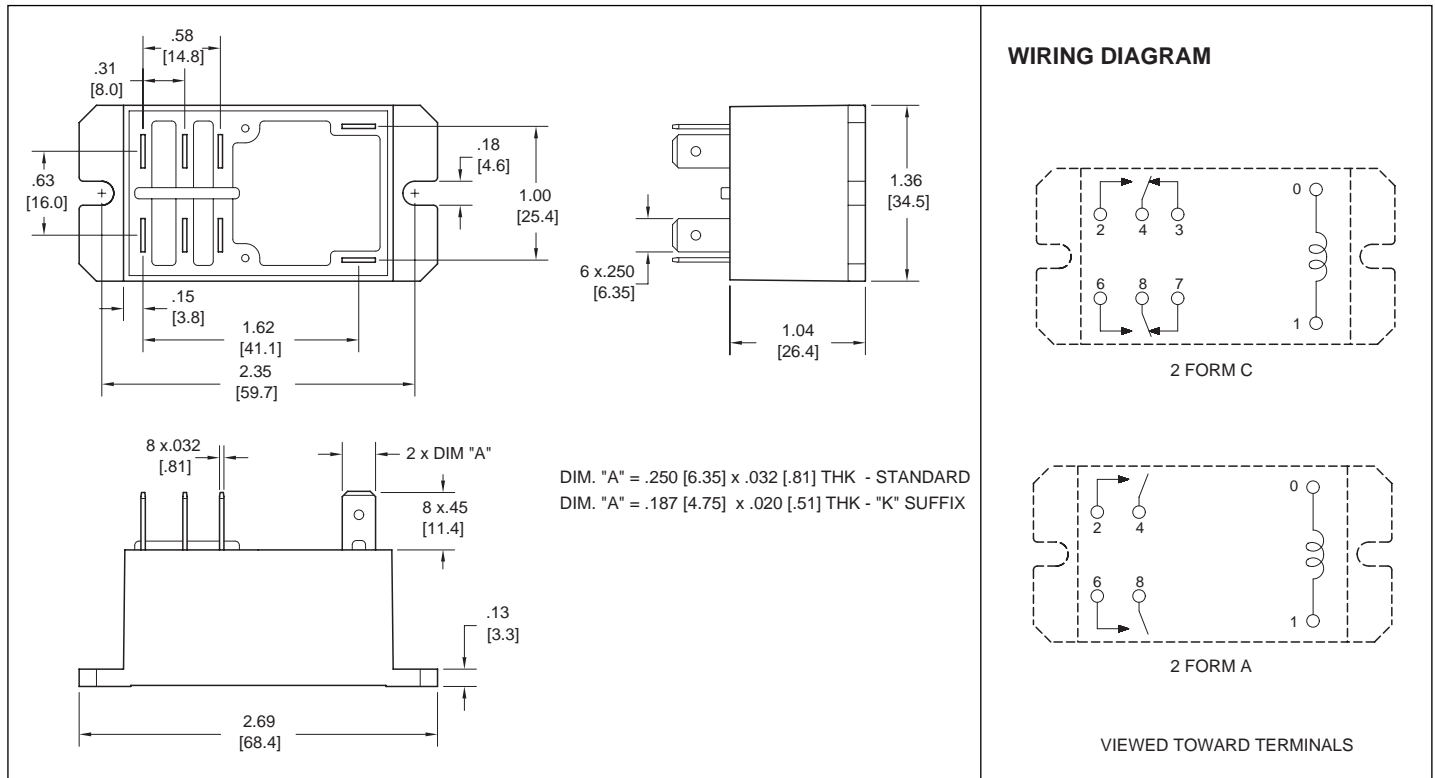
RELAY ORDERING DATA

COIL SPECIFICATIONS – DC Coil					ORDER NUMBER*
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Nominal Current mA $\pm 10\%$	Coil Resistance Ohm $\pm 10\%$	
6	4.5	10.5	272.0	22	AZ2800-2C-6D
12	9.0	20.7	140.0	86	AZ2800-2C-12D
24	18.0	41.8	68.5	350	AZ2800-2C-24D
48	36.0	83.4	34.5	1390	AZ2800-2C-48D
110	82.5	190.5	15.2	7255	AZ2800-2C-110D

COIL SPECIFICATIONS – AC Coil						ORDER NUMBER*
Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Nominal Current mA $\pm 10\%$	50Hz Coil Resistance Ohm $\pm 10\%$	60Hz Coil Resistance Ohm $\pm 10\%$	
12	9.6	15.6	340.0	9.5	8	AZ2800-2C-12A
24	19.2	31.2	166.0	45	35.7	AZ2800-2C-24A
120	96.0	156.0	33.3	1125	830	AZ2800-2C-120A
220	176.0	286.0	18.2	3800	2870	AZ2800-2C-220A
240	192.0	312.0	16.7	4500	3800	AZ2800-2C-240A
277	221.6	360.1	14.4	5960	4700	AZ2800-2C-277A

* Substitute "2A" in place of "2C" to indicate 2 Form A contacts.
 "2A" or "2C" denotes silver cadmium contacts.
 Add suffix "E" to "2A" or "2C" for silver tin oxide contacts.
 Add suffix "E" at the end of order number for sealed version.
 Add suffix "K" for 0.187" x 0.020" [4.8 mm x 0.5 mm] coil terminals.
 Add suffix "5" for 50Hz coil, AC coils only (Example: AZ2800-2C-24A5).

MECHANICAL DATA



Dimensions in inches with metric equivalents in parentheses. Tolerance: $\pm .010$ "

AZ2700

30 AMP POWER RELAY

FEATURES

- Low cost
- 30 Amp switching
- Class B insulation system standard, Class F available
- Quick connect terminals
- 4 kV dielectric
- Standard (2.4 mm) and wide contact gap (3.0 mm) available
- UL, CUR file E44211
- TÜV R50164753



CONTACTS

Arrangement	SPST (1 Form X) DPST (2 Form X)
Ratings	Resistive load: Max. switched power: 840 W or 8310 VA Max. switched current: 30 A Max. switched voltage: 150 VDC or 400 VAC
Rated Load UL, CUR	30 A at 277 VAC res. 30k cycles [1] 1.5 HP at 120 VAC [1] 3 HP at 240 VAC [1] TV-10 at 120 VAC [1] 30 A at 277 VAC res. 70k cycles [2] 3 HP at 240 VAC 100k cycles [2] 10 A at 120 VAC tungsten load, 10k cycles [2]
TÜV	27 A at 240 VAC, cos phi = .8, 50k cycles [1] silver cadmium oxide, [2] silver tin oxide
Material	Silver cadmium oxide, silver tin oxide
Resistance	< 100 milliohms initially (24 V, 1 A voltage drop method)

COIL

Power At Pickup Voltage (typical)	1.2 VA (AC)
Max. Continuous Dissipation	3.8 W at 20°C (68°F) ambient
Temperature Rise	50°C (90°F) at nominal coil voltage
Temperature	Max. 130°C (266°F) - Class B Max. 155°C (311°F) - Class F

GENERAL DATA

Life Expectancy	Minimum operations
Mechanical	1 x 10 ⁶
Electrical	1 x 10 ⁵ at 30 A 120 VAC Res.
Operate Time (max)	30 ms at nominal coil voltage
Release Time (max)	30 ms at nominal coil voltage (with no coil suppression)
Dielectric Strength (at sea level for 1 min.)	4000 Vrms coil to contact 2000 Vrms between open contacts
Insulation Resistance	1000 megohms min. at 20°C, 500 VDC, 50% RH
Dropout	Greater than 5% of nominal coil voltage (DC) Greater than 15% of nominal coil voltage (AC)
Ambient Temperature Operating Storage	At nominal coil voltage -40°C (-40°F) to 85°C (185°F) - Class B -40°C (-40°F) to 105°C (221°F) - Class F -40°C (-40°F) to 130°C (266°F) - Class B -40°C (-40°F) to 155°C (311°F) - Class F
Vibration	0.062" DA at 10–55 Hz
Shock	
Operating	10 g, 11 ms, 1/2 sine (no false operation)
Non-Operating	100 g, 11 ms, 1/2 sine (no damage)
Enclosure	PB.T. polyester
Terminals	Tinned copper alloy, Quick connect tabs Note: Allow suitable slack on leads when wiring, and do not subject the terminals to excessive force.
Weight	120 grams

NOTES

1. All values at 20°C (68°F).
2. Relay may pull in with less than "Must Operate" value.
3. Specifications subject to change without notice.

AZ2700

RELAY ORDERING DATA

COIL SPECIFICATIONS – DC COIL				ORDER NUMBER*	
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Coil Resistance $\pm 10\%$	1 Form X	2 Form X
3	2.25	3.3	4.7	AZ2700-1A-3D	AZ2700-2A-3D
6	4.50	6.6	18.8	AZ2700-1A-6D	AZ2700-2A-6D
12	9.00	13.2	75	AZ2700-1A-12D	AZ2700-2A-12D
24	18.00	26.4	300	AZ2700-1A-24D	AZ2700-2A-24D
48	36.0	52.8	1200	AZ2700-1A-48D	AZ2700-2A-48D
100	75.0	110.0	5200	AZ2700-1A-100D	AZ2700-2A-100D
110	82.5	121.0	6300	AZ2700-1A-110D	AZ2700-2A-110D
200	150.0	220.0	21000	AZ2700-1A-200D	AZ2700-2A-200D

COIL SPECIFICATIONS – AC COIL				ORDER NUMBER*	
Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Coil Current mA $\pm 10\%$	1 Form X	2 Form X
6	4.80	6.6	319	AZ2700-1A-6A	AZ2700-2A-6A
12	9.60	13.2	160	AZ2700-1A-12A	AZ2700-2A-12A
24	19.2	26.4	80	AZ2700-1A-24A	AZ2700-2A-24A
48	38.4	52.8	40	AZ2700-1A-48A	AZ2700-2A-48A
120	96.0	132.0	23	AZ2700-1A-120A	AZ2700-2A-120A
220	176.0	242.0	10	AZ2700-1A-220A	AZ2700-2A-220A
240	192.0	264.0	9.2	AZ2700-1A-240A	AZ2700-2A-240A

*For silver tin oxide add suffix "T." For wide contact gap add "W". For Class F add suffix "F".

MECHANICAL DATA

MOUNTING HOLE LAYOUT

AC OPERATING COIL

WIRING DIAGRAMS

Dimensions in inches with metric equivalents in parentheses. Tolerance: $\pm .010$ "

AZ2280

30 AMP MINIATURE POWER RELAY



FEATURES

- Quick-connect leads for contacts and coil
- 1 Form A, B and C contacts available
- AC and DC coils available
- Epoxy sealed versions available
- UL Class F (155°C) standard
- UL, CUR file E44211
- VDE 40027037 (DC coil only)

CONTACTS

Arrangement	SPST (1 Form A, or B) SPDT (1 Form C)
Ratings	Resistive load: Max. switched power: 840 W or 8310 VA Max. switched current: 30 A (Form A) 15 A (Form B) Max. switched voltage: 277 VAC, 28 VDC
UL, CUR	1 Form A 30 A at 277 VAC, General Use [1][2] 28 A at 277 VAC, General Use, 100k cycles [1] 2 Hp at 250 VAC [1][2] 1 HP at 125 VAC [1][2] 30 A at 28 VDC [1] 20/60 (FLA/LRA) at 277 VAC 30k cycles [1] 1 Form B 15 A at 277 VAC, General Use [1] 10 A at 28 VDC [1] 0.5 HP at 250 VAC [1] 0.25 HP at 125 VAC [1] 10/33 (FLA/LRA) at 277 VAC 30k cycles [1] 1 Form C 30/20 A (N.O./N.C.) at 277 VAC, General Use [1][2] 20/10 A (N.O./N.C.) at 28 VDC[1] 2/0.5 HP (N.O./N.C.) at 250 VAC[1][2] 1/0.25 HP (N.O./N.C.) at 125 VAC[1][2] 20/60 (FLA/LRA) at 277 VAC 30k cycles N.O. [1] 10/33 (FLA/LRA) at 277 VAC 30k cycles N.C. [1]
VDE	Contact factory for ratings
Material	Silver cadmium oxide [1], silver tin oxide [2]
Resistance	< 50 milliohms initially (24 V, 1 A voltage drop method)

COIL

Power	
At Pickup Voltage (typical)	DC: 500 mW AC: 1.4 VA
Max. Continuous Dissipation	DC: 1.7 W at 20°C (68°F) AC: 2.7 VA at 20°C (68°F)
Temperature Rise	38°C (68°F)
Temperature	Max. 155°C (311°F)

GENERAL DATA

Life Expectancy	Minimum operations
Mechanical	1 x 10 ⁷
Electrical	1 x 10 ⁵ at 30 A 120 VAC Res. N.O.
Operate Time	15 ms at nominal coil voltage
Release Time	10 ms at nominal coil voltage (with no coil suppression)
Dielectric Strength (at sea level for 1 min.)	1500 Vrms contact to contact 2500 Vrms contact to coil
Insulation Resistance	1000 megohms min. at 500 VDC, 20°C 50% RH
Dropout	DC: Greater than 10% of nominal coil voltage AC: Greater than 20% of nominal coil voltage
Ambient Temperature	At nominal coil voltage
Operating	-55°C (-67°F) to 85°C (185°F)
Storage	-55°C (-67°F) to 155°C (311°F)
Vibration	0.062" DA at 10–55 Hz
Shock	10 g
Enclosure	P.B.T. polyester
Terminals	Tinned copper alloy, Quick Connects Note: Allow suitable slack on leads when wiring, and do not subject the terminals to excessive force.
Max. Solder Temp.	270°C (518°F)
Max. Solder Time	5 seconds
Max. Solvent Temp.	80°C (176°F)
Max. Immersion Time	30 seconds
Weight	36 grams

NOTES

1. All values at 20°C (68°F).
2. Relay may pull in with less than "Must Operate" value.
3. Specifications subject to change without notice.

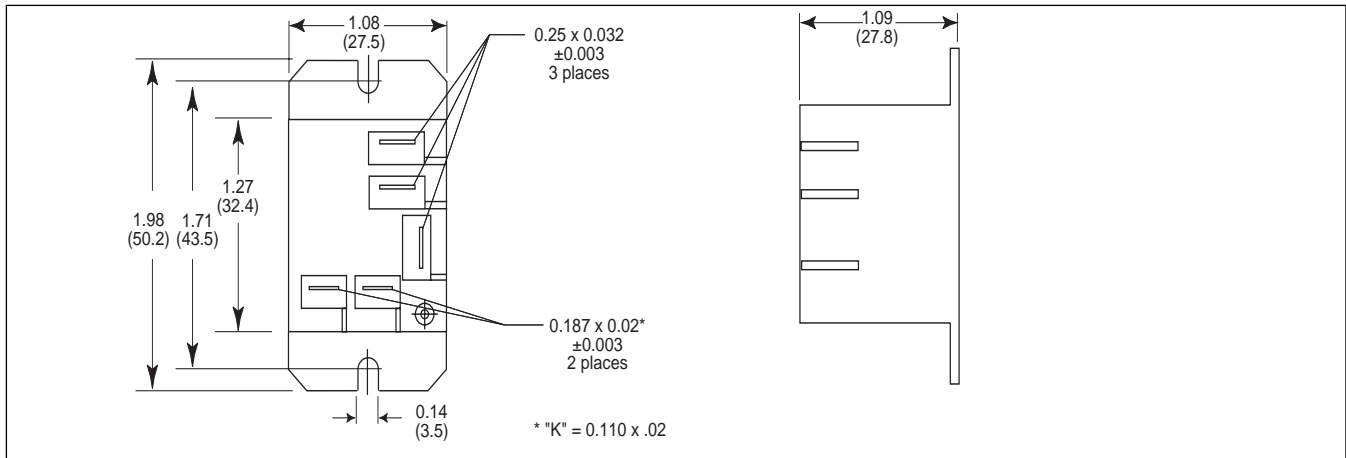
AZ2280

RELAY ORDERING DATA

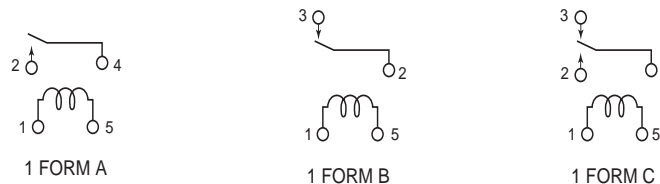
COIL SPECIFICATIONS – DC Coil					ORDER NUMBER*
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Nominal Current mA $\pm 10\%$	Coil Resistance $\pm 10\%$	
5	3.75	6.4	185	27	AZ2280-1A-5DF
6	4.50	7.8	150	40	AZ2280-1A-6DF
9	6.75	12.2	93	97	AZ2280-1A-9DF
12	9.00	15.4	77	155	AZ2280-1A-12DF
15	11.25	19.8	59	256	AZ2280-1A-15DF
18	13.5	24.1	47	380	AZ2280-1A-18DF
24	18.00	32.0	36	660	AZ2280-1A-24DF
48	36.00	62.6	19	2560	AZ2280-1A-48DF
110	82.5	146.6	8.2	13450	AZ2280-1A-110DF
COIL SPECIFICATIONS – AC Coil 50/60 Hz					ORDER NUMBER*
Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Nominal Coil Power VA	Coil Resistance $\pm 10\%$	
12	10.2	13.8	2.3	25	AZ2280-1A-12AF
24	20.4	27.6	2.1	100	AZ2280-1A-24AF
120	102.0	138.0	2.3	2,500	AZ2280-1A-120AF
208	176.8	239.0	2.2	11,000	AZ2280-1A-208AF
220/240	187.0	276.0	2.2/2.6	13,490	AZ2280-1A-240AF
277	235.4	318.5	2.2	15,000	AZ2280-1A-277AF

*Substitute "-1B" or "-1C" in place of "-1A" for 1 Form B or 1 Form C respectively. For silver tin oxide contacts substitute "-1AE" or "-1CE" in place of "-1A" or "-1C." Add "T" to "-1A", "-1AE", "-1B", "-1C" or "-1CE" for extended life contacts. Substitute "DEF" or "AEF" in place of "DF" or "AF" for epoxy sealed version. For 0.110 coil terminals change "F" to "KF".

MECHANICAL DATA



WIRING DIAGRAM (Top View)



Dimensions in inches with metric equivalents in parentheses. Tolerance: $\pm .010$ "

ZC9034 Series

2-POLE HVAC/R RELAYS

DESCRIPTION

The ZC9034 Series switching relays are intended for many applications in air conditioning, refrigeration and heating. Other uses include general purpose switching in appliances, fan controls and vending machines. Our relays are available in 24, 110/120 and 208/240 AC coil voltages with various combinations of power and pilot rated contacts.

FEATURES

- Replaces Honeywell, White-Rodgers/RBM, MARS, Products Unlimited
- Quick-connect terminals for termination
- 2.13 x 1.88 x 2.25 in.
- Base designed for easy replacement of competitive relays
- Molded terminal numbers and circuit diagram on top of relay
- Dual coil terminals available
- Temperature range -40°C to 130°C
- Insulation: 130°C Class B
- Mechanical life: 1,000,000 operations
- Electrical life: 250,000 operations
- UL, CUR file E222994
- Meets ARI 780 requirements*



COIL

Power	24-240 VAC at 50/60 Hz; 9.5 VA Max. sealed
Inrush Power	21.5 VA Max.

CONTACT RATING - (POWER/PILOT MAX.)

	125VAC	208VAC	250VAC	277VAC	480VAC	600VAC
Full Load Amps (FLA)	13.8	7.6	6.9	6.0	3.0	3.0
General Use Amps	15.0	15.0	15.0	15.0	10.0	—
Locked Rotor Amps (LRA)	82.8	45.6	41.4	36.0	18.0	15.0
Horsepower	3/4	3/4	3/4	3/4	3/4	—
Pilot Duty	—	—	—	831 VA	125 VA	—
Resistive	—	—	—	—	12.5	—

*Up to LRA rating for 36A @ 277VAC

ZC9034 Series

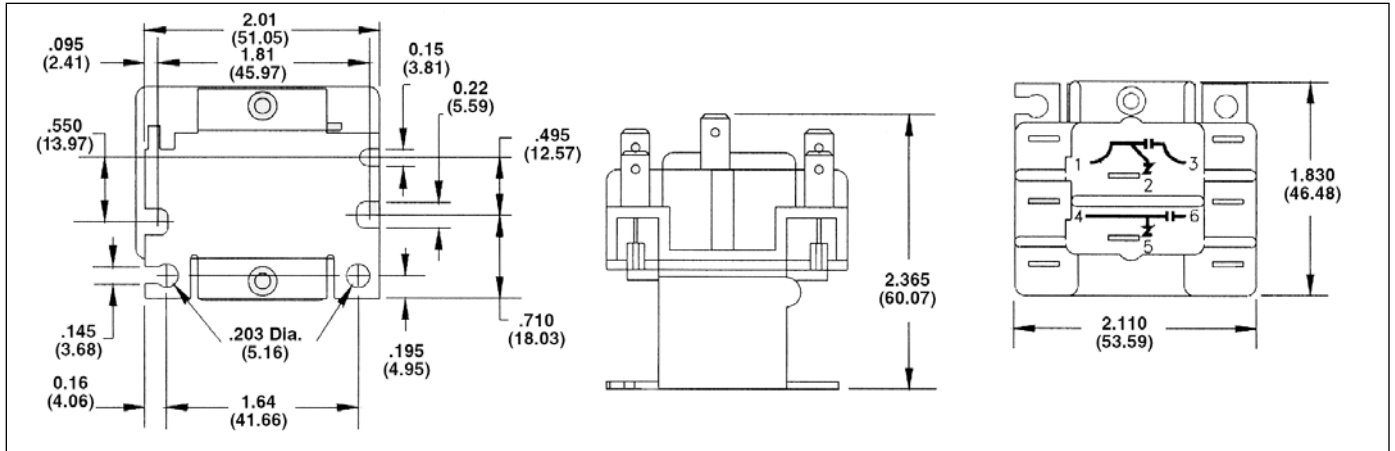
RELAY ORDERING INFORMATION

RELAY MODEL	COIL VOLTAGE (CONTACTS)	POLE CONFIGURATION	FORM
ZC9034	3	SP -	1A
ZC9034	0 - 24 VAC (Pwr/Pwr) 1 - 120 VAC (Pwr/Pwr) 2 - 240 VAC (Pwr/Pwr) 3 - 24 VAC (Pwr/Pilot)* 4 - 120 VAC (Pwr/Pilot)* 5 - 240 VAC (Pwr/Pilot)* 6 - 24 VAC (Pilot/Pilot) 7 - 120 VAC (Pilot/Pilot) 8 - 240 VAC (Pilot/Pilot)	Blank - DP (double pole) SP - SP (single pole)	Double Pole Blank - DPDT - N.O., N.C. 2A - DPST - N.O. 2B - DPST - N.C. 2AB - DPST - Pole 1-2-3 N.O - Pole 4-5-6 N.C. Single Pole (1-2-3) Blank - SPDT - N.O., N.C. 1A - SPST - N.O. 1B - SPST - N.C.

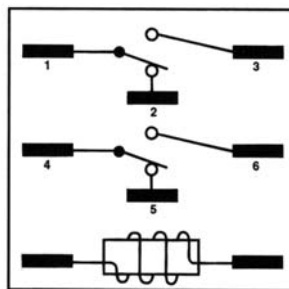
*Power Terminals 1-2-3, Pilot Terminals 4-5-6

Single coil terminals are standard. For dual coil terminals add suffix "-01"

MECHANICAL DATA



WIRING DIAGRAM



3ARR3, 3ARR22 Type

MOTOR START POTENTIAL RELAY

General Description

A voltage sensitive, electromagnetic type motor starting relay with normally closed snap-action contacts used to disconnect the start capacitor on capacitor-start, induction-run and capacitor-start, capacitor-run motors. The relay has a protective cover which eliminates the need for additional electrical and mechanical protection. A variety of mounting brackets are available. Terminals may be either Quick Connect Tab Type or Screw Type.

Typical Applications

- Central air conditioner compressors
- Submersible pump motors
- Motors generally over 1/3 HP with start capacitors

Operation

The relay is energized by a magnet coil electrically connected across the start winding of the motor and responds to the increase in start winding voltage as the motor accelerates from zero to the normal running speed. The relay contacts are actuated by the armature of the relay to disconnect the start capacitor at a speed where the motor has sufficient torque to bring it up to normal running speed. The relay remains energized during the run operation of the motor, keeping the relay contacts open. When the motor is de-energized, the relay contacts re-close for the next motor start. Each relay is designed for a specific application which includes the coil rating for continuous run voltage and the pickup and dropout calibration for proper motor starting.

Terminals

- Quick Connect Type
0.250" x 0.032" (6.3 mm x 0.8 mm)
- Screw Type, Tin Plated Brass
#8-32 Thread

Electrical Ratings

- Contacts
35 Amperes max, 50/60 Hz, break only (3ARR3)
50 Amperes max, 50/60 Hz, break only (3ARR22)
- Continuous Coil Rating
60 Hz; 130 to 500 Volts
50 Hz; 117 to 470 Volts

See Appendix "B" for Coil Groups and Ratings.

Potential Motor Start Relay 35A and 50A Rating



Endurance

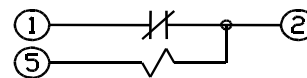
- 100,000 to 500,000 operations
(depending on load)

Mounting

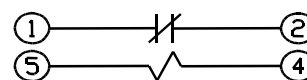
- Mounting Bracket
Select from available brackets in Appendix "C".
- Mounting Position
Each relay is calibrated in the intended mounting position. Specify desired mounting position from Appendix "D".

Circuits

If there is a terminal in position #6, it must be the same polarity as terminals #1, #2, and #4 to prevent possible flashover. If there is no terminal in #6 position, #4 can be either polarity.



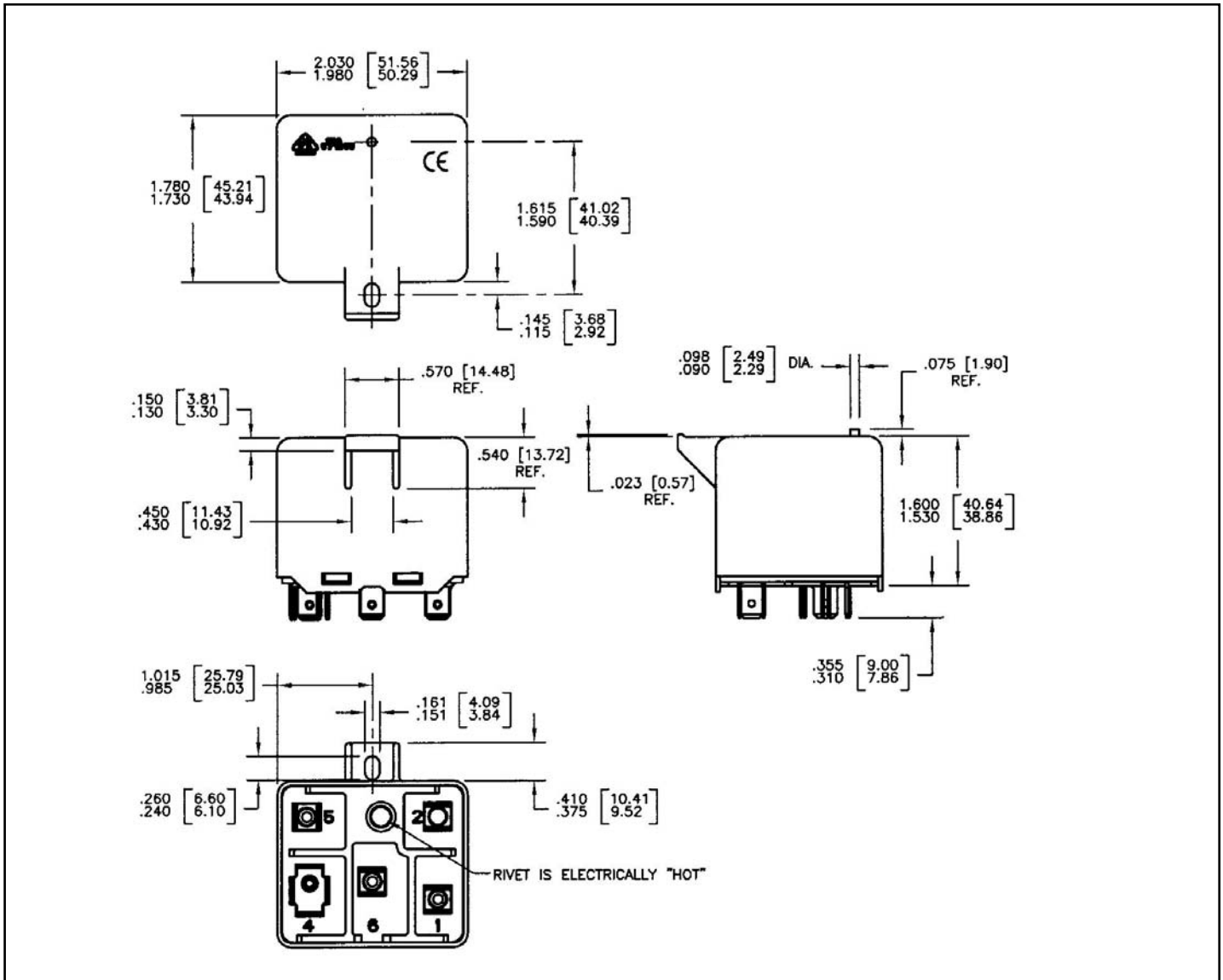
Common Coil Circuit



Isolated Coil Circuit

3ARR3, 3ARR22 Type

GENERAL OUTLINE DIMENSIONS



Application Procedure

Use the part number scheme from *Appendix "A"* to create part number requirements.

Calibration

Relay is factory calibrated for pickup and dropout voltages to match motor speed and torque curves for the specific application requirements. See *Appendix "B"* for calibrations available for each coil group.

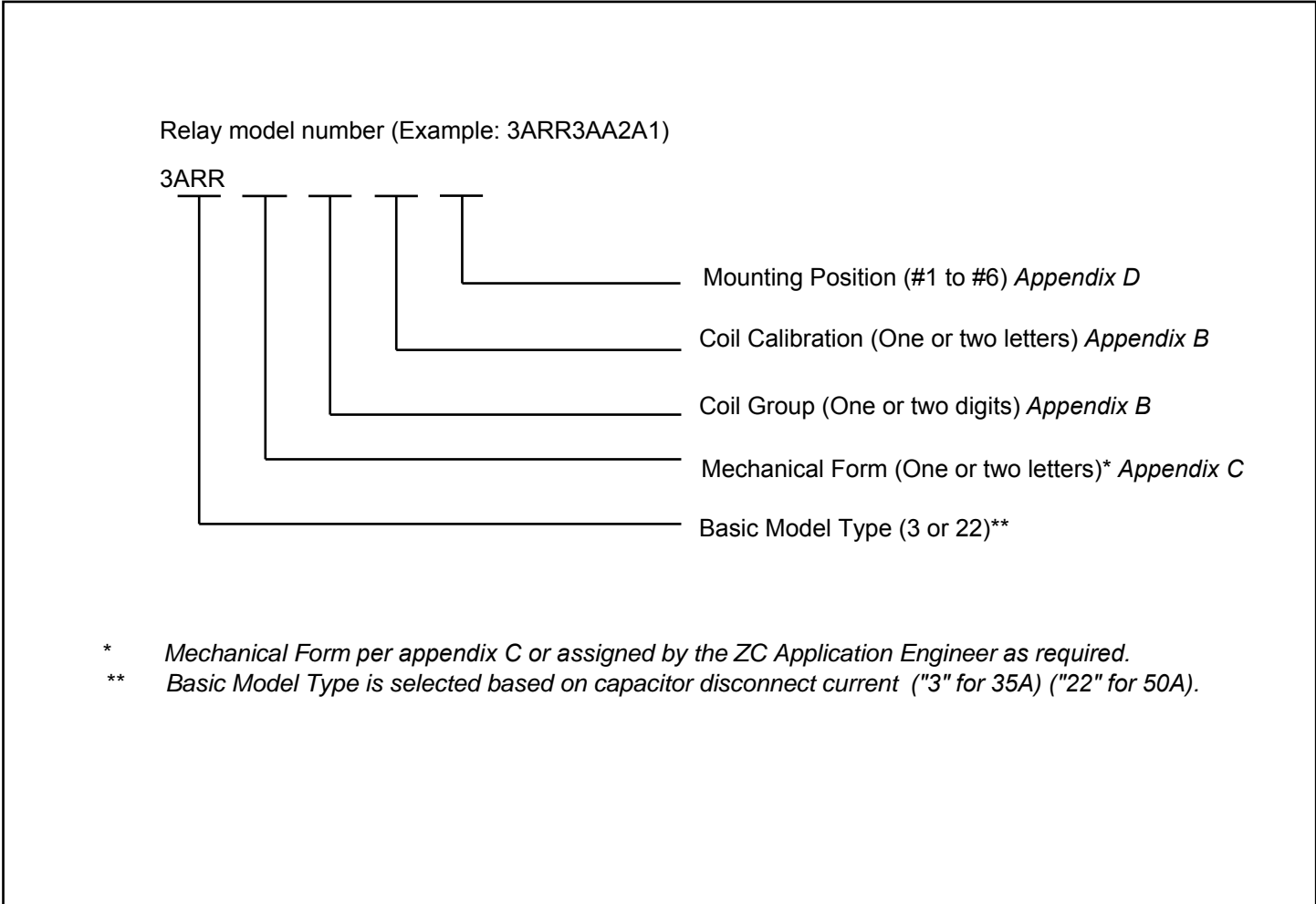
Agency Approvals

UL File #SA 44129
CSA included in UL

IEC 730-1, IEC 730-2-10, IEC 79-15
VDE License - (3ARR3 only)

3ARR3, 3ARR22 Type _____

APPENDIX A (Ordering Part Number)



APPENDIX B (Coil Group and Calibration)

74-407791 <small>CONT ON SH. 1 SHEET NO. A</small>	74-407791 <small>CONT ON SH. 1 SHEET NO. A</small>
TITLE POTENTIAL RELAY APPLICATION SELECTION OF THE PROPER COIL VOLTAGE RATING	
<small>FIRST MADE FOR 3ARR3, 3ARR22</small>	

THE CONTINUOUS DUTY VOLTAGE OF THE RELAY COIL MUST BE EQUAL TO OR GREATER THAN THE MAXIMUM VOLTAGE TO WHICH IT WILL BE EXPOSED. THIS VOLTAGE WILL BE THE VOLTAGE INDUCED IN THE MOTOR START WINDING WHEN THE MOTOR IS RUNNING AFTER THE START WINDING HAS BEEN DISCONNECTED. IT WILL BE THE GREATEST WHEN THE LINE VOLTAGE IS AT ITS MAXIMUM, WHEN THE MOTOR IS RUNNING AT ITS MAXIMUM SPEED (LIGHTLY LOADED), AND WHEN THE RUN CAPACITOR SIZE IS LARGEST.

THE EFFECT OF THE "EFFECTIVE AMBIENT TEMPERATURE" SURROUNDING THE RELAY MUST ALSO BE TAKEN INTO ACCOUNT.

THE EFFECTIVE AMBIENT TEMPERATURE IS NOT THE AMBIENT TEMPERATURE IN WHICH THE APPLIANCE OR EQUIPMENT IS INSTALLED, BUT IS THE AMBIENT TEMPERATURE SURROUNDING THE RELAY WHILE THE APPLIANCE IS OPERATING. OFTEN THE ENCLOSED CONTROL COMPARTMENT WILL BE SUBSTANTIALLY HIGHER IN TEMPERATURE THAN THE AREA AROUND THE APPLIANCE. IN SOME CASES OTHER HEAT SOURCES OR RADIANT EFFECTS ARE CONTRIBUTORS TO ITS TEMPERATURE.

THE MAXIMUM ALLOWABLE TEMPERATURE OF THE COIL WINDING IS 120° C, WHEN MEASURED BY CHANGE IN RESISTANCE METHOD.

THIS MEANS THAT THE COIL GROUP NUMBER SELECTED MUST NOT PRODUCE A HEAT RISE, WHICH WHEN ADDED TO THE EFFECTIVE AMBIENT TEMPERATURE, WILL RESULT IN THE COIL TEMPERATURE EXCEEDING THE MAXIMUM ALLOWABLE FOR THE SPECIFIC INSULATION CLASS.

IF THIS SHOULD OCCUR, A COIL GROUP SHOULD BE SELECTED WHICH WILL PRODUCE A LOWER HEAT RISE WITH THE MAXIMUM VOLTAGE APPLIED TO THE COIL. A GROUP WITH A HIGHER COIL RATING WILL PRODUCE A LOWER HEAT RISE AT A SPECIFIC APPLIED VOLTAGE.

IF THE COMPRESSOR/MOTOR MANUFACTURER IS NOT SURE OF THE ACTUAL EFFECTIVE AMBIENT IN THE APPLIANCE IN WHICH THE RELAY IS INSTALLED, A WORST CONDITION OF 40° C OR HIGHER SHOULD BE USED IN SELECTING THE PROPER COIL GROUP. FOR EXAMPLE, UNITS INSTALLED OUTDOORS OR IN TIGHTLY CONFINED SPACES.

TO PREDICT A HEAT RISE AT A NEW VOLTAGE, MULTIPLY THE KNOWN RISE AT A SPECIFIC VOLTAGE BY THE SQUARE OF THE RATIO OF THE NEW VOLTAGE OVER THE OLD.

TABLES OF COILS BY GROUP, ALONG WITH CALIBRATION IDENTIFICATION FOLLOW ON SHEETS 1 THRU 4. THE COIL RATINGS FOR SPECIFIC GROUPS FOR 50 HZ OPERATION ARE ON SEPARATE SHEETS. IT SHOULD BE NOTED THAT FOR A GIVEN COIL GROUP, THE VOLTAGE RATING AT 60 HZ IS HIGHER THAN FOR 50 HZ.

PROPRIETARY AND CONFIDENTIAL

THIS DOCUMENT IS THE PROPERTY OF ZETTLER CONTROLS COMPANY AND CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION OF ZETTLER CONTROLS COMPANY. THIS DOCUMENT IS LOANED ON THE EXPRESS CONDITION THAT NEITHER IT NOR THE INFORMATION CONTAINED THEREIN SHALL BE DISCLOSED TO OTHERS WITHOUT THE EXPRESS CONSENT OF ZETTLER CONTROLS AND THAT THE INFORMATION SHALL BE USED BY THE RECIPIENT ONLY AS APPROVED EXPRESSLY BY ZETTLER CONTROLS. ALSO, THIS DOCUMENT SHALL BE RETURNED TO THE COMPANY UPON ITS REQUEST.

	1	2	3	PRINTS TO
APPROVAL				
MADE BY				
ISSUED				
TRANSFER REL 1-1-14				
ZETTLER CONTROLS, INC.				74-407791 <small>CONT ON SH. 1 SHEET NO. A</small>

ZC MOTOR START RELAY (3ARR3, 3ARR22) DATA

74-407791
SH.1

CUSTOMER COLD PICK-UP AND DROP-OUT FOR EACH COIL GROUP

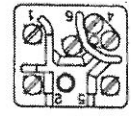
CALIBRATION VALUES ARE BASED ON AVERAGE COIL COPPER TEMPERATURES OF: COLD 35°C HOT 95°C.

COIL GROUPS ARE U.L. CLASS B RATINGS AND VDE RECOGNIZED. (U.L. FILE SA 44129)

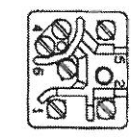
CALIBRATION IDENTIFICATION	FREQUENCY (HERTZ)	MAXIMUM COIL VOLTAGES FOR SPECIFIED MAXIMUM TEMPERATURE RISE												COIL RESISTANCE @ 25°C (OHMS) REFERENCE																							
		GROUP 2.12		GROUP 3.13		GROUP 4.14		GROUP 5.15		GROUP 6.16		GROUP 7.17			GROUP 8.18		GROUP 9.19		GROUP 10.20																		
		PICK-UP MIN	PICK-UP MAX	DROP-OUT MIN	DROP-OUT MAX	PICK-UP MIN	PICK-UP MAX	DROP-OUT MIN	DROP-OUT MAX	PICK-UP MIN	PICK-UP MAX	DROP-OUT MIN	DROP-OUT MAX		PICK-UP MIN	PICK-UP MAX	DROP-OUT MIN	DROP-OUT MAX	PICK-UP MIN	PICK-UP MAX	DROP-OUT MIN	DROP-OUT MAX															
A	60	260	280	243	271	40	90	239	266	60	135	240	269	35	77	242	272	60	121	238	266	25	65	243	271	40	90	239	270	50	110	375V-Δ 80°C	328V-Δ 60°C				
B	60	280	300	261	290	50	100	258	287	60	135	259	288	35	77	262	290	60	121	256	285	25	65	261	290	50	100	260	289	50	110						
C	60	300	320	280	309	55	100	277	305	60	135	278	306	35	77	280	310	60	121	275	303	25	65	280	309	55	100	279	308	50	110						
D	60	320	340	299	327	50	100	295	324	60	135	296	325	35	77	300	328	60	121	293	324	25	65	299	327	50	100	298	326	50	110						
E	60	340	360	317	345	50	100	314	342	60	135	315	343	35	77	318	347	60	121																		
F	60	350	370	326	354	50	100	323	352	60	135	323	352	35	77	328	356	60	121																		
G	60	360	380	335	364	50	100	332	361	60	135	333	363	35	77	337	366	60	121																		
H	60	365	395																																		
J	60	120	130	111	124	20	45																														
K	60	130	140	120	134	20	45																														
L	60	140	150	130	144	20	45	132	148	40	90																										
M	60	150	160	140	153	20	45	142	157	40	90																										
N	60	160	170	149	163	20	45	152	166	40	90																										
P	60	170	180	159	172	20	45	162	175	40	90																										
R	60	180	190	168	182	20	45	171	184	40	90																										
S	60	190	200	178	192	20	55	180	193	40	90																										
T	60	200	220	186	215	40	90																														
U	60	220	240	205	234	40	90																														
V	60	240	260	224	252	40	90																														
W	60	210	230	198	225	20	45																														
BD	60																																				
Y	60	70	80																																		
BE	60																																				
BA	60	290	310	268	298	50	100																														
BB	60	110	120																																		
TV	60	240	260																																		
TW	60	210	230																																		
TP	60	170	180	162	175	70	100																														
COIL RESISTANCE REFERENCE												1, 620	6, 050	14, 820	4, 080	11, 500	830	2, 600	5, 550	9, 400																	

PROPRIETARY AND CONFIDENTIAL

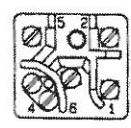
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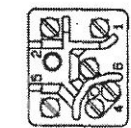
POS.6



POS.5



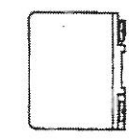
POS.4



POS.3



POS.2



POS.1



MOUNTING POSITIONS

74-407791
SHEET 1

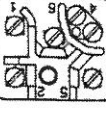
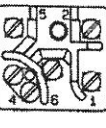
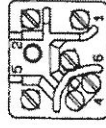
ZC MOTOR START RELAY (3ARR3, 3ARR22) DATA

CUSTOMER COLD PICK-UP AND DROP-OUT FOR EACH COIL GROUP
COIL GROUPS ARE U.L. CLASS B RATINGS AND VDE RECOGNIZED.

CALIBRATION VALUES ARE BASED ON AVERAGE COIL COPPER TEMPERATURES OF: COLD 35°C HOT 95°C.

CALIBRATION IDENTIFICATION	FREQUENCY (HERTZ)	HOT PICK-UP VOLTS	MAXIMUM COIL VOLTAGES FOR SPECIFIED MAXIMUM TEMPERATURE RISE																										
			GROUP 21.41		GROUP 22.42		GROUP 23.43		GROUP 24.44		GROUP 25.45		GROUP 26.46		GROUP 27.47		GROUP 28												
			PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX											
A	60	260	280			240	269	45	95	243	271	55	125	242	272	60	140	242	272	75	150	239	268	75	170	239	268	75	170
B	60	260	300			259	288	45	95	261	290	55	125	262	290	60	140	262	290	75	150	258	287	75	170	258	287	75	170
C	60	300	320			278	306	45	115	260	309	55	125	279	310	60	140	280	310	75	160	277	305	75	170	277	305	75	170
D	60	320	340			296	325	45	115	299	327	55	125	300	328	60	140	300	328	75	160	295	324	75	170	295	324	75	170
E	60	340	360			315	343	45	115	317	345	55	125	318	347	60	140	318	347	75	160	314	342	75	180	314	342	75	180
F	60	350	370			323	352	45	115	326	354	55	125	328	356	60	140	328	356	75	160	323	352	75	180	323	352	75	180
G	60	360	380			333	363	45	115	335	364	55	125	337	366	60	140	337	366	75	160	332	361	75	180	332	361	75	180
H	60	365	395							340	370	55	125	342	370	60	140	340	370	75	160								
J	60	120	130			111	125	20	50	111	124	30	65																
K	60	130	140			121	134	20	50	120	134	30	65																
L	60	140	150			130	143	20	55	130	144	30	65																
M	60	150	160			139	153	20	55	140	153	30	65	136	150	45	90												
N	60	160	170			149	163	20	55	149	163	30	65	150	163	45	90	153	165	55	115								
P	60	170	180			159	172	30	65	159	172	45	90	162	175	55	115												
R	60	180	190			168	182	30	65	168	182	45	95	171	185	55	115												
S	60	190	200			178	192	30	75	178	192	45	95	180	193	55	115	189	205	60	130								
T	60	200	220			185	213	45	95	186	215	55	115	189	211	60	130												
U	60	220	240			203	231	45	95	205	234	55	115	204	233	60	130	204	233	75	150								
V	60	240	260			221	250	45	95	224	252	55	125	223	252	75	150	223	252	75	150								
W	60	210	230														195	224	75	150									
X	60																												
Y	60	70	80			62	76	20	45																				
Z	60																												
BA	60	290	310																										
BB	60	110	120			101	115	20	45					267	297	55	125												
BB	60	110	120			101	115	20	45																				
BB	60	110	120			101	115	20	45																				
BB	60	110	120			101	115	20	45																				
BB	60	110	120			101	115	20	45																				
BB	60	110	120			101	115	20	45																				
BB	60	110	120			101	115	20	45																				
BB	60	110	120			101	115	20	45																				
BE	60					90	104	20	45																				
COIL RESISTANCE @ 25°C (OHMS) REFERENCE			1,350			2,200			5,220			8,000			11,600			13,260			15,900			17,660					

MOUNTING POSITIONS



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ZC MOTOR START RELAY (3ARR3, 3ARR22) DATA

CUSTOMER COLD PICK-UP AND DROP-OUT FOR EACH COIL GROUP

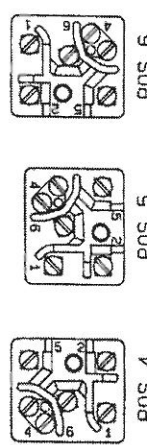
CALIBRATION VALUES ARE BASED ON
AVERAGE COIL COPPER TEMPERATURES
OF: COLD 35°C
HOT 95°C.

COIL GROUPS ARE U.L. CLASS B RATINGS AND VDE RECOGNIZED.

CALIBRATION IDENTIFICATION	FREQUENCY (HERTZ)	HOT PICK-UP VOLTS	MAXIMUM COIL VOLTAGES FOR SPECIFIED MAXIMUM TEMPERATURE RISE																	
			GROUP 21, 41		GROUP 22, 42		GROUP 23, 43		GROUP 24, 44		GROUP 25, 45		GROUP 26, 46		GROUP 27, 47		GROUP 28			
			PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX	PICK-UP MIN	PICK-UP MAX		
AA	50	260																		
AB	50	280																		
AC	50	300																		
AD	50	320																		
AE	50	340																		
AF	50	350																		
AG	50	360																		
AH	50	365																		
AJ	50	120	130	111	124	30	62													
AK	50	130	140	121	134	30	62													
AL	50	140	150	130	144	30	62													
AM	50	150	160	140	153	30	71	136	150	45	90									
AN	50	160	170	149	163	30	71	150	163	45	90									
AP	50	170	180	159	172	30	71	159	172	45	90	162	175	55	119					
AR	50	180	190	168	182	45	90	171	184	55	119									
AS	50	190	200	178	192	45	90	180	193	55	119	180	195	60	133					
AT	50	200	220	185	213	45	90	186	215	55	119	186	214	60	133					
AU	50	220	240	203	231	45	90	199	228	55	119	204	233	60	133	204	233	75	120	
AV	50	240	260	221	250	45	90	224	252	55	119	223	252	60	133	223	252	75	152	
AW	50	210	230													195	224	75	152	
AX	50																			
AY	50	70	80	62	76	20	48													
AZ	50																			
COIL RESISTANCE @ 25°C (OHMS) REFERENCE			1,350		2,200		5,220		8,000		11,600		13,260		15,900		17,660			



MOUNTING POSITIONS

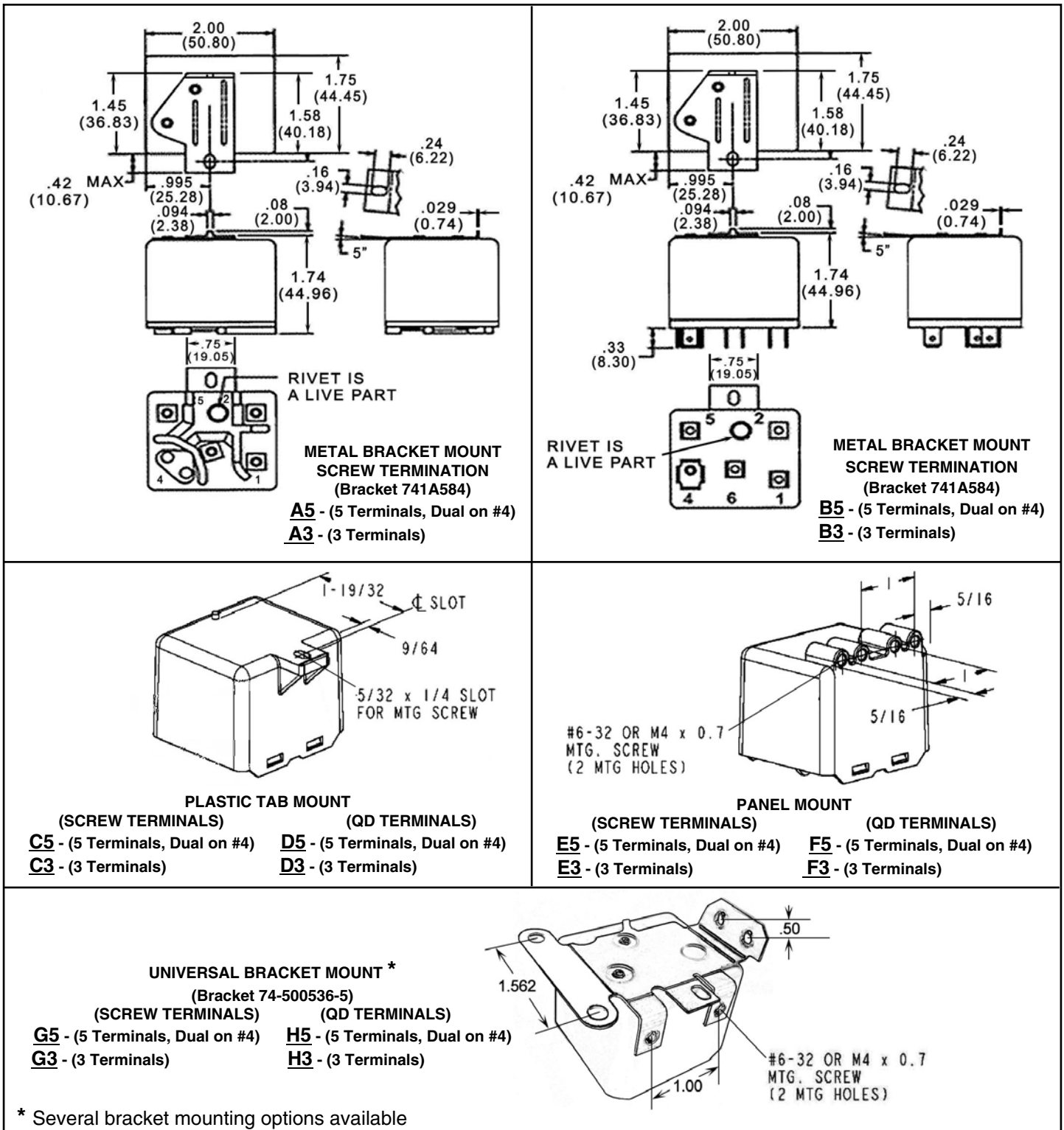


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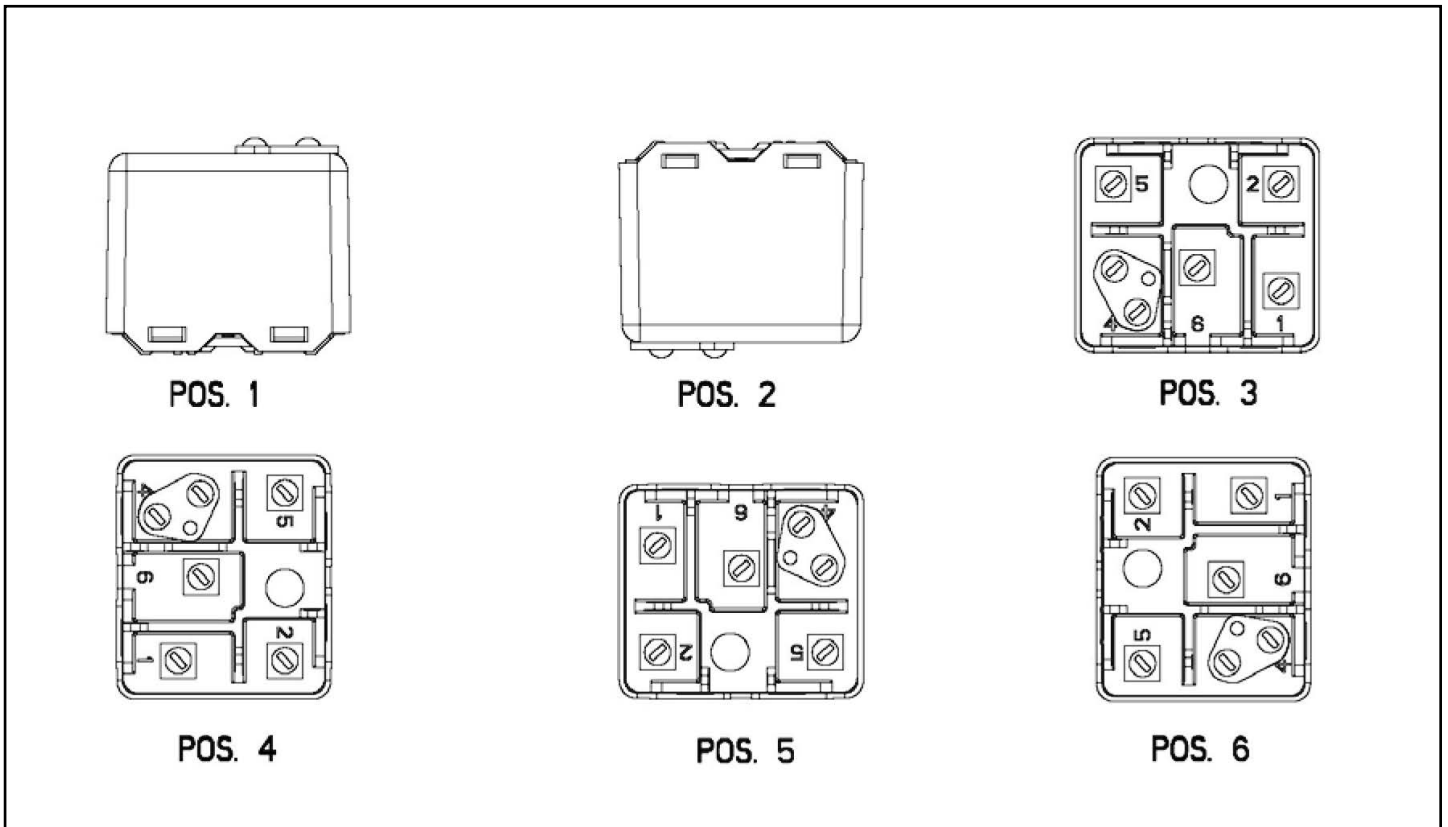
3ARR3, 3ARR22 Type

APPENDIX C (Mechanical Form)



3ARR3, 3ARR22 Type

APPENDIX D (Mounting Positions)



ZCPR Series

MOTOR START POTENTIAL RELAY

FEATURES

- 50A switching capability
- SPST-NC configurations
- .250" quick connect termination
- ISO 9001 certified
- Variety of mounting positions
- UL, CUR SA11095
- Non-position sensitive design*

GENERAL DATA

Life Expectancy	Minimum operations
Mechanical	7.5×10^5
Electrical	5×10^5 at 16A 400VAC 2×10^5 at 35A 400VAC (break only) 1×10^5 at 50A 400VAC (break only)
Dimensions (mm)	51.2 x 46.6 x 36.5
Construction	Unsealed
Weight	Approx. 110 grams
Ambient Operating Temp.	-20°C to 40°C

*Mounting position #3 is the only sensitive type.

CONTACTS

Arrangement	SPST-NC
Ratings	16A (make and break), 400 VAC, $\cos \phi = 0.7$ to 0.8 35A (break only), 400 VAC $\cos \phi = 0.7$ to 0.8 50A (break only), 400 VAC $\cos \phi = 0.7$ to 0.8
Material	Silver cadmium oxide
Resistance	< 50 milliohms at 1A 24VDC

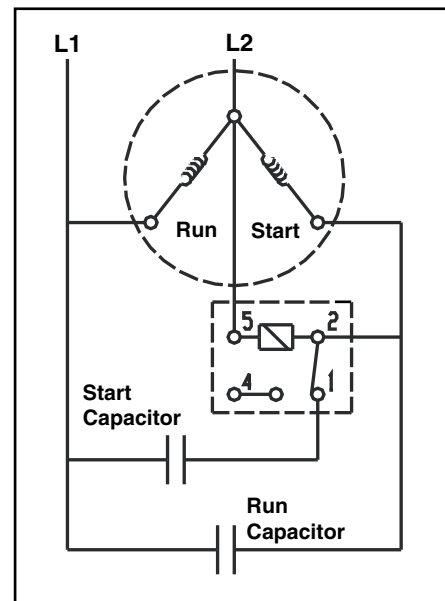
COIL

Coil Consumption	5VA
Coil Voltage	See table A & B
Coil Resistance	See table A & B
Insulation System	Class B (130°C)



(ZCPRA6AM6)

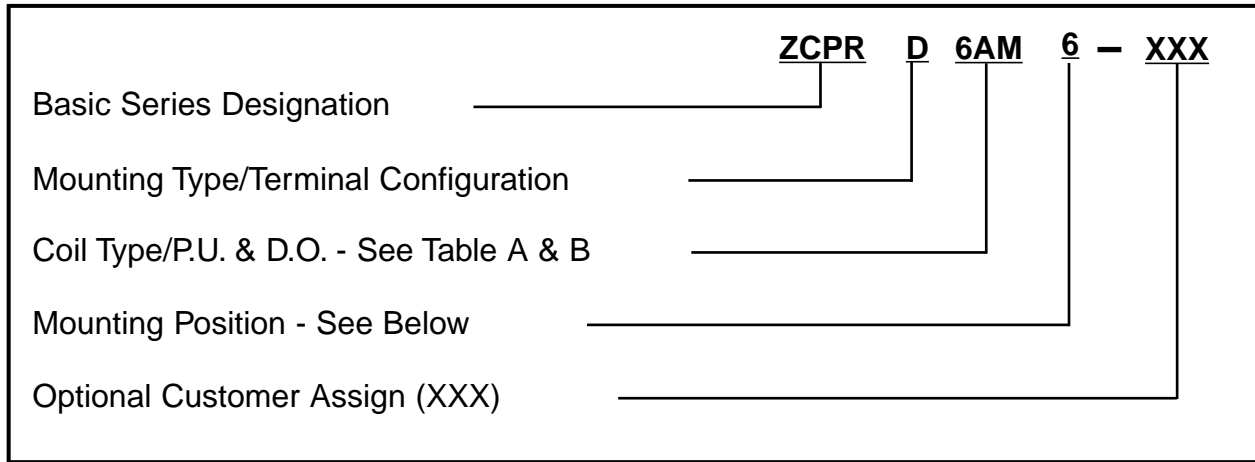
WIRING DIAGRAM



ZCPR Series

MOTOR START POTENTIAL RELAY

PART NUMBERING SYSTEM



MOUNTING TYPE/TERMINAL CONFIGURATION

B	Plastic Tab and Panel Mount, 5 dual QD (2 on #4)
D	Plastic Tab and Panel Mount, 3 dual QD (#1, 2, and 5)
M	Panel Mount, 5 dual QD (2 on #4)
P	Panel Mount, 3 dual QD (#1, 2, and 5)
U	Universal Metal Bracket Mount, 5 dual QD (2 on #4)
X	Metal Tab Mount, 5 dual QD (2 on #4)
Z	Metal Tab Mount, 3 dual QD (#1, 2, and 5)

*Universal Metal Bracket Mount not available in position 3

MOUNTING POSITION

	1	2	3 *	4	5	6
METAL TAB MOUNT						
PANEL MOUNT						
PLASTIC TAB & PANEL MOUNT						

* Position sensitive. Note: Custom mounting position configurations available upon request.

ZCPR Series

MOTOR START POTENTIAL RELAY

TABLE A - OPERATING CHARACTERISTICS AT 50HZ

Coil number	2		3		4		5		6		7		8		9		
V _{max} at 40° C (V)	299		338		378		356		452		151		530		228		
Resistance ±10% at 25°C (Ω)	5600		7500		10700		10000		13800		1500		19500		3900		
	H.P.U.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.
A	120-130											111-124	20-45			111-124	35-77
B	130-140											120-134	20-45			120-134	35-77
C	150-160	140-153	40-90									130-144	20-45			130-144	35-77
D	160-170	150-163	40-90	150-163	40-90							140-153	20-45			140-153	35-77
E	170-180	162-175	40-90	162-175	40-90											149-163	35-77
F	180-190	171-184	40-90	171-184	40-90			180-195	40-105							157-172	35-77
G	190-200	180-193	40-90	180-195	40-105	180-195	40-105	189-205	40-105							168-182	35-77
H	200-220	186-215	40-90	190-215	40-105	195-224	50-110	186-214	60-133							178-192	35-77
I	220-240	205-234	40-105	208-239	50-110	204-233	50-110	204-233	60-133							183-213	35-77
L	240-260	224-252	40-105	224-252	50-110	223-259	50-110	223-252	60-133	223-252	60-130					203-231	35-77
M	260-280	243-271	40-105	239-270	50-110	242-272	50-110	242-272	60-133	239-268	60-135			239-268	75-170		
N	280-300			260-289	50-110	262-290	60-121	262-290	60-133	258-287	60-135			258-287	75-170		
O	300-320					280-310	60-121	280-310	60-133	277-305	60-135			277-305	75-170		
P	320-340					300-328	60-121	300-328	60-154	295-324	60-135			295-324	75-170		
Q	340-360					318-347	60-121			314-342	60-135			314-342	75-180		
R	350-370													323-352	75-180		
S	360-380													332-361	75-180		

H.P.U. = Approximate pick up at 90°C, P.U. and D.O. values at 25°C

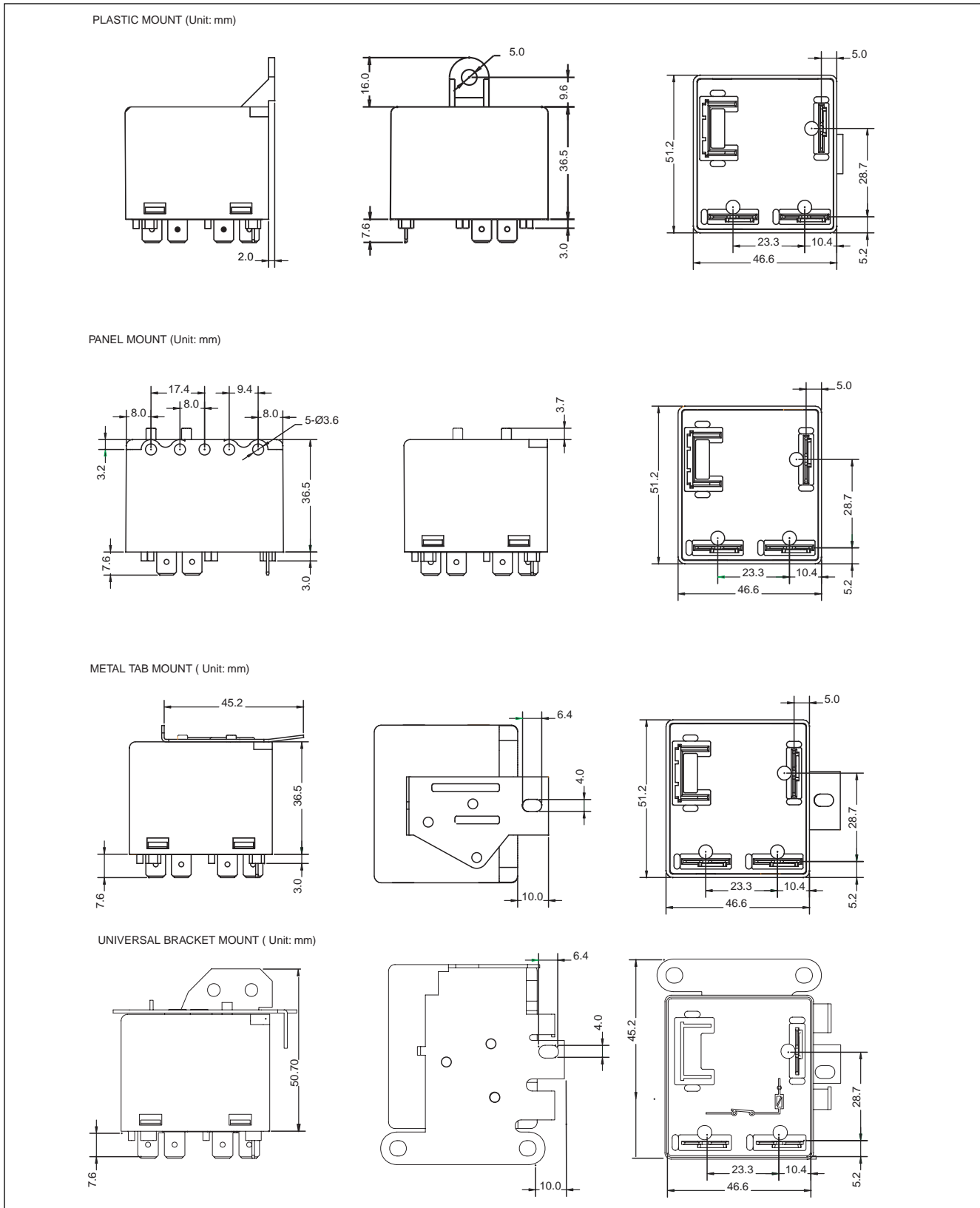
TABLE B - OPERATING CHARACTERISTICS AT 60HZ

Coil number	2		3		4		5		6		7		8		9		
V _{max} at 40° C (V)	332		375		420		395		502		168		588		253		
Resistance ±10% at 25°C (Ω)	5600		7500		10700		10000		13800		1500		19500		3900		
	H.P.U.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.	P.U.	D.O.
AA	120-130											111-124	20-45			111-124	35-77
AB	130-140											120-134	20-45			120-134	35-77
AC	150-160											130-144	20-45			130-144	35-77
AD	160-170	150-163	40-90									140-153	20-45			140-153	35-77
AE	170-180	162-175	40-90									149-163	20-45			149-163	35-77
AF	180-190	171-184	40-90					180-195	40-105							157-172	35-77
AG	190-200	180-193	40-90	180-195	40-105			189-205	40-105							168-182	35-77
AH	200-220	186-215	40-90	190-215	40-105	195-224	60-121	186-214	60-130							178-192	35-77
AI	220-240	205-234	40-90	208-239	50-110	204-233	60-121	204-233	60-130							183-213	35-77
AL	240-260	224-252	40-105	224-252	50-110	223-259	60-121	223-252	60-130							203-231	35-77
AM	260-280	243-271	40-105	239-270	50-110	242-272	60-121	242-272	60-140	239-268	60-135					221-250	35-77
AN	280-300			260-289	50-110	262-290	60-121	262-290	60-140	258-287	60-135			258-287	75-170		
AO	300-320					280-310	60-121	280-310	60-140	277-305	60-135			277-305	75-170		
AP	320-340					300-328	60-121	300-328	60-140	295-324	60-135			295-324	75-170		
AQ	340-360					318-347	60-121			314-342	60-135			314-342	75-180		
AR	350-370													323-352	75-180		
AS	360-380													332-361	75-180		

H.P.U. = Approximate pick up at 90°C, P.U. and D.O. values at 25°C

ZCPR Series

MECHANICAL DATA



ZC24A34 Series

ELECTRIC HEAT SEQUENCERS

DESCRIPTION

The positive temperature coefficient (PTC) heater element provides voltage compensation over a wide voltage range without danger of over-heating at high voltage. It is self-current limiting, and assures device actuation under low voltage conditions. The PTC has a unique feature of always stabilizing temperature, regardless of ambient temperature or voltage range.

KEY FEATURES

- Solid State PTC Heaters
- Replaces most Klixon & TOD Brands
- Quick-Connect Terminals
- Shock and Vibration Resistant
- Mounts in any position
- Contact Ratings - to 25 Amps at 120 or 240 Volts, and 12.5A at 480 Volts
- Full-Load Rated Auxiliary Contacts
- Standard Operating Ambience Between - 50° F (-45.5°C) and 165° F (73.8°C)
- Custom Timing's Available
- UL File E237660, UL873; CSA approved

APPLICATIONS

Sequencing of heater banks in:

- Electric Furnaces
- Baseboard Heaters
- Duct Heaters
- Suspension Heaters
- Recreational vehicle blower and element control
- Heat pump blower and heating element control
- Motor speed switching in air conditioning (high speed) / heating systems (low speed) where a single set of contacts handle combination motor and heater element loading in the heating function.
- Control circuits requiring definite sequence on both start up and shut down.



(ZC24A34-3)

ZC24A34 Series

ELECTRIC HEAT SEQUENCERS

COIL DATA

Coil Voltage	24VAC
Inrush Current	0.75A
Steady State Current	0.16-0.20A
Ambient Temperature	-46C(-50F) to 74C (165F)

STANDARD TIMINGS

Model Number	Timings	Switches	ON Timings					OFF Timings				
			M1-M2	M3-M4	M5-M6	M7-M8	M9-M10	M1-M2	M3-M4	M5-M6	M7-M8	M9-M10
ZC24A34-1	1	1	1-20	-	-	-	-	40-110	-	-	-	-
ZC24A34-2	1	1	-	30-90	-	-	-	-	-	1-30	-	-
ZC24A34-3 (1)	1	2	1-20	1-20	-	-	-	40-110	40-110	-	-	-
ZC24A34-4	1	2	-	-	30-90	30-90	-	-	-	1-30	1-30	-
ZC24A34-5 (1)	2	3	1-110	1-110	1-110	-	-	1-110	1-110	1-110	-	-
ZC24A34-6 (1)	2	4	1-110	1-110	1-110	1-110	-	1-110	1-110	1-110	1-110	-
ZC24A34-14 (1)(2)	4	5	1-160	1-160	1-160	1-160	1-160	1-160	1-160	1-160	1-160	1-160

CANADIAN TIMINGS

Model Number	Timings	Switches	ON Timings					OFF Timings				
			M1-M2	M3-M4	M5-M6	M7-M8	M9-M10	M1-M2	M3-M4	M5-M6	M7-M8	M9-M10
ZC24A34-3-021	1	1	1--20	-	-	-	-	1--60	-	-	-	-
ZC24A34-3-022	1	1	15-45	-	-	-	-	1--30	-	-	-	-
ZC24A34-3-023	1	1	25-60	-	-	-	-	15-45	-	-	-	-
ZC24A34-3-024	1	1	30-90	-	-	-	-	1--40	-	-	-	-
ZC24A34-3-025	1	1	30-90	-	-	-	-	1--30	-	-	-	-
ZC24A34-3-026	2	2	1--20	30-90	-	-	-	40--90	1--30	-	-	-
ZC24A34-6-027	2	2	1-160	1-160	-	-	-	1-160	1-160	-	-	-
ZC24A34-2-029	1	1	15-35	-	-	-	-	25-55	-	-	-	-
ZC24A34-3-036	2	2	1--20	30-90	-	-	-	45-110	1--30	-	-	-
ZC24A34-5-037	1	1	1-110	-	-	-	-	1-110	-	-	-	-

TABLE NOTES

- (1) M1-M2 and M3-M4 are always the first switches to turn ON and last to turn OFF. All other switches are random ON and random OFF.
 (2) 24A34-14 Switch contacts designated F1-F2 instead of M1-M2.

ON TIME - Elapsed time to make contacts after heater is energized (Min. to Max.)

OFF TIME - Elapsed time to make contacts after heater is de-energized (Min. to Max.)

OFF Timings determined after PTC heater has been electrified for a total of 5 minutes.

Standard Timings determined at 25° C . Timing's at temperatures above or below 25° will vary.

Canadian timings with CSA approval only.

- These contacts switch simultaneously

OPTIONAL CUSTOMER 4 DIGIT SUFFIX

Custom ON and OFF Timings are available. A four digit suffix code will be added to model number with the closest Timings. i.e DPDT sequencer with ON time of 1-60 and OFF time of 1-45 will be designated ZC24A34-3 XXXX. Please consult factory for further details.

ZC24A34 Series

ELECTRIC HEAT SEQUENCERS

ELECTRICAL RATINGS

Single Load Contact Ratings (Models -1 thru -14):

VAC	Resistive (Non-Inductive)		Motor Ratings (Inductive)		Pilot Duty	UL Endurance Cycles
	NO Contacts (Terminals 1-3)		Full Load	Locked Rotor		
	Watts	Amps				
120	3000	25.0	10.0A	60.0A	125VA	100K
240	6000	25.0	5.0A	30.0A	125VA	
480	6000	12.5	3.0A	18.0A	480VA	

Combined Load Contact Ratings (All Models):

VAC	Resistive (Non-Inductive)		Motor Ratings (Inductive)		Combined Amps
	Watts	Amps	Full Load	Locked Rotor	
240	5520	23.0	7	42	30

HEATER-SWITCH ACTIONS AND CONFIGURATIONS

The ZC24A34-1 (reference Figure 1), ZC24A34-2 (reference Figure 2) utilizes one bi-metal disc to achieve single-timing operation. They are available in SPST (reference Figure 3) switch actions. This configuration can be automatically reset and built to close a set of contacts on temperature rise within a specified time range.

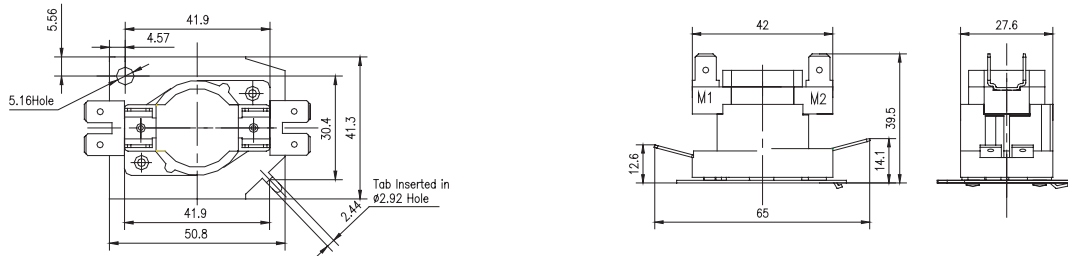


Figure 1

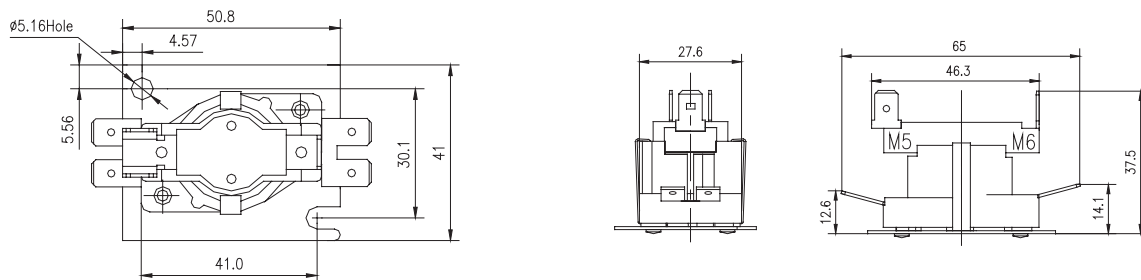


Figure 2

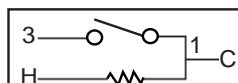


Figure 3 Single Pole Single Throw (SPST)

ZC24A34 Series

ELECTRIC HEAT SEQUENCERS

HEATER-SWITCH ACTIONS AND CONFIGURATIONS

The ZC24A34-3 (reference Figure 4), ZC24A34-4 (reference Figure 5) utilizes one bi-metal disc to achieve single-timing operation. They are available in DPST (reference Figure 6) switch actions. This configuration can be automatically reset and built to close a set of contacts on temperature rise within a specified time range.

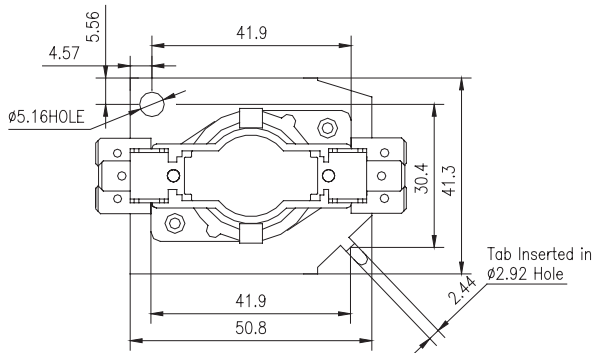


Figure 4

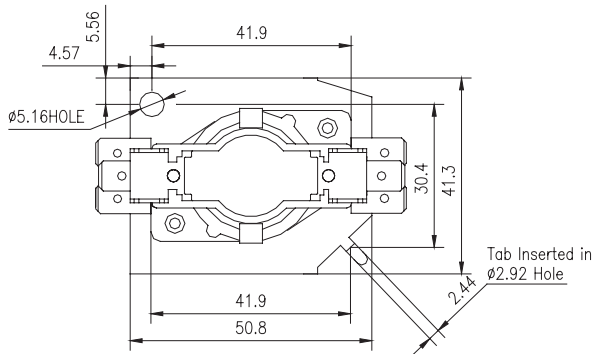
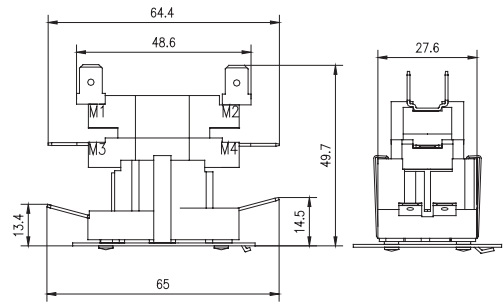


Figure 5

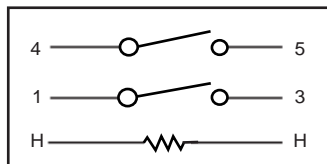
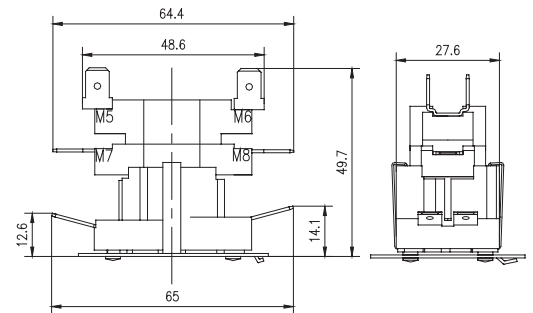


Figure 6 Double Pole Single Throw (DPST)

ZC24A34 Series

ELECTRIC HEAT SEQUENCERS

HEATER-SWITCH ACTIONS AND CONFIGURATIONS

The ZC24A34-5 (reference Figure 7) utilizes two bi-metal discs in conjunction with one SPST and one DPST switch action to achieve two independent timings. The ZC24A34-6 (reference Figure 8) utilizes two bi-metal discs in conjunction with two DPST switch actions to also achieve two independent Timings. This configuration can be automatically reset, and built to close three or four sets of contacts on temperature rise within a specified time range.

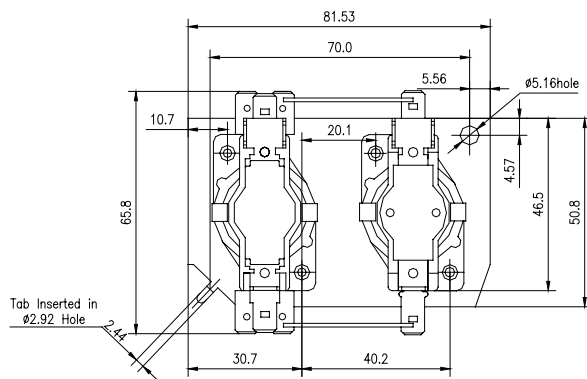


Figure 7

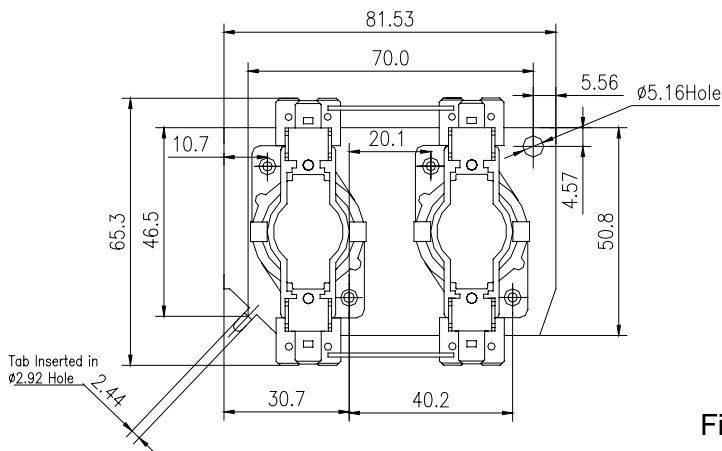
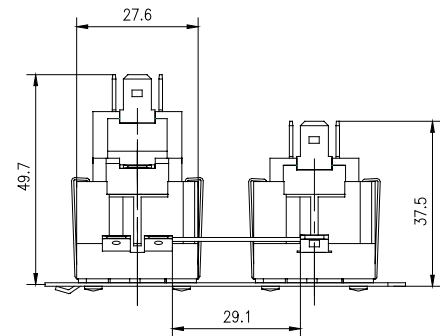
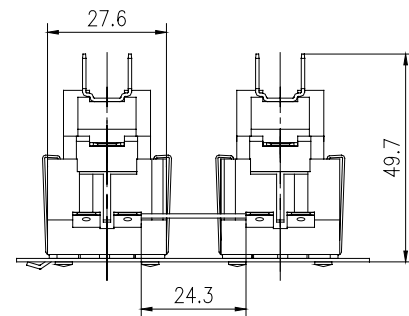


Figure 8



ZC24A34 Series

ELECTRIC HEAT SEQUENCERS

HEATER-SWITCH ACTIONS AND CONFIGURATIONS

The ZC24A34-14 (reference Figure 9), utilizes four bi-metal discs in conjunction with one SPST and two DPST switch actions to achieve four independent Timings. This configuration can be automatically reset, and built to close five sets of contacts on temperature rise within a specified time range.

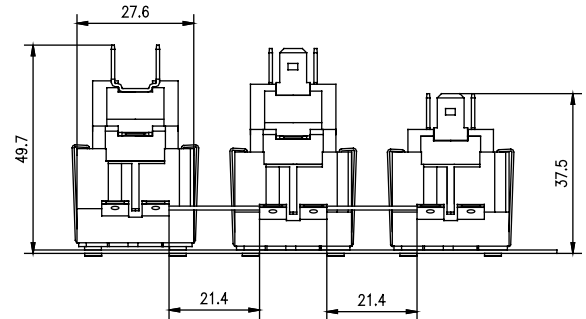
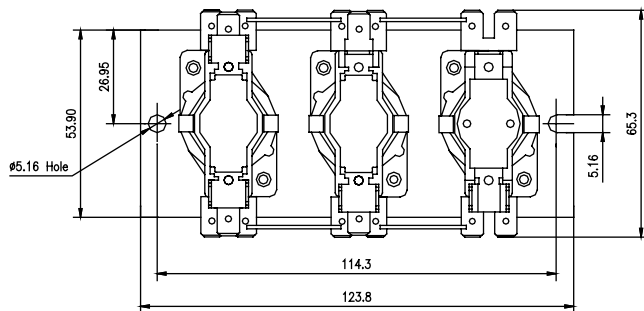


Figure 9

TERMINALS

Standard terminal types are listed below. Special switch terminals such as double quick connects and female quick connects may be available for a specific switch terminal. Consult sales for details.

SWITCH TERMINALS

1. Solder type
2. Screw type - 0.250" x 0.032" (6.35 x 0.81mm) Q.C.

HEATER-SWITCH ACTIONS AND CONFIGURATIONS

Standard heater terminals are 15° 0.250" x 0.032 (6.35 x 0.81mm), double brass male quick connects. The stage terminals are tin-plated brass.

1. Solder type
2. Screw type-0.250" x 0.032" Q.C (Double Q.C terminals available at additional cost)
Use 12 gauge or larger wire for loads greater than 15 amperes.

ZC24A34 Series

ELECTRIC HEAT SEQUENCERS

HEATER-SWITCH ACTION AND CONFIGURATION

The ZC24A34-15 (Figure10) utilizes a single bi-metal disc in a single pole double throw configuration. The SPDT switch action allows for a single set of timings. Mainly used in heat pump air handlers by providing a delay to the blower motor in cooling mode.



(ZC24A34-15)

STANDARD TIMINGS

Model Number	Timings	Switches	ON Timing	OFF Timing
ZC24A34-15	1	1	1-25	65-115

ELECTRICAL RATINGS

VAC	N.O. Contacts - Terminals 1, 3					N.C. Contacts - Terminals 1, 2			UL Endurance Cycles
	Non-Inductive (Resistive)		Inductive (Motor)		Pilot Duty (VA)	Non-Inductive (Resistive)		Pilot Duty (VA)	
	Amps	Watts	FLA	LRA		Amps	Watts		
120	25	3000	14	72	125	10	1200	125	30K
240	25	6000	7	42	125	5	1200	125	
480	25	6000	3	18	480	-	-	-	

MECHANICAL DATA

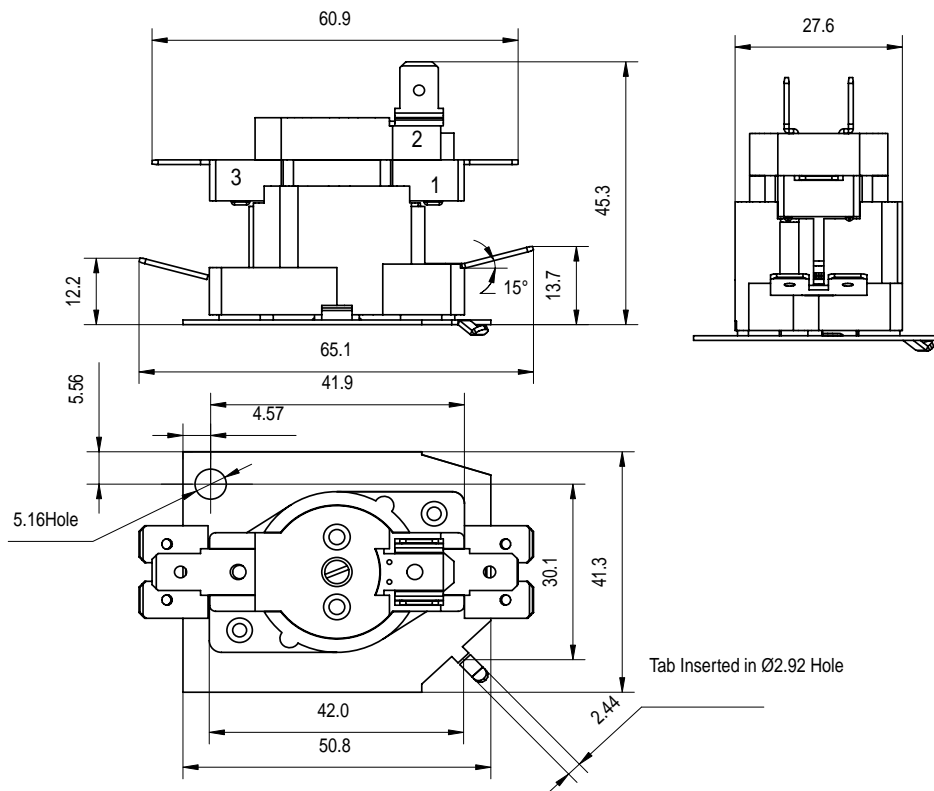


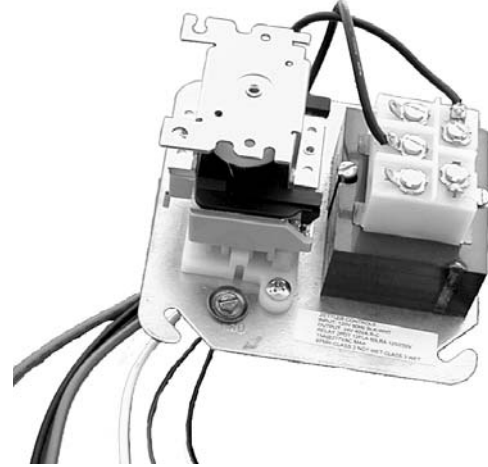
Figure 10

ZC9011 Series

RELAY/TRANSFORMER FAN CENTER ASSEMBLY

DESCRIPTION

Zettler Controls, Inc. fan center controls provide convenient low voltage for one and two speed fan motors and auxiliary circuits in heating, cooling or heating/cooling applications. Each ZC fan center control is a reliable, compact unit, consisting of a 24 volt control transformer and a plug-in switching relay mounted on a 4" square electrical junction box cover. All line voltage connections are made inside the box with color coded pre-stripped leads. Low voltage connections are made at a convenient terminal board mounted to the transformer.



FEATURES

- DPDT, DPST, SPDT, SPST configurations
- 24V coil voltage, power and duty rated contacts
- Color coded pre-stripped leads
- Low voltage terminal board
- Input voltage 120V, 208/240V or 120/208/240V
- Mounts directly to 4" electrical box
- UL, CUR file E237660

FAN CENTER CONFIGURATIONS

PART NO.	TRANSFORMER				FULL RELAY	RELAY CONTACT RATINGS			
	PRIMARY		SECONDARY			125 VAC		250 VAC	
	VOLTAGE	CONNECTIONS	VOLTAGE	CONNECTIONS		FULL LOAD AMPS (FLA)	LOCKED ROTOR AMPS (LRA)	FULL LOAD AMPS (FLA)	LOCKED ROTOR AMPS (LRA)
ZC90113	120	Color coded leads, pre-stripped	24	Terminal board with 5 screw terminals	DPDT	13.8	82.8	6.9	41.4
ZC90118	208/240	Color coded leads, pre-stripped	24	Terminal board with 5 screw terminals	DPDT	13.8	82.8	6.9	41.4
ZC90119	120/208/240	Color coded leads, pre-stripped	24	Terminal board with 5 screw terminals	DPDT	13.8	82.8	6.9	41.4

PART NUMBERING SYSTEM

FAN CENTER MODEL	INPUT TRANSFORMER COIL VOLTAGE	POLE CONFIGURATION	RELAY FORM
ZC9011	3	SP	-1A
ZC9011	3 - 120 VAC 8 - 208/240 VAC 9 - 120/208/240 VAC	Blank - DP (Double Pole) SP - SP (Single Pole)	<u>Double Pole</u> Blank - DPDT - N.O., N.C. 2A - DPST - N.O. 2B - DPST - N.C. 2AB - DPST - 1 Pole N.O. - 1 Pole N.C. <u>Single Pole</u> Blank - SPDT - N.O., N.C. 1A - SPST - N.O. 1B - SPST - N.C.

ZC9011 Series

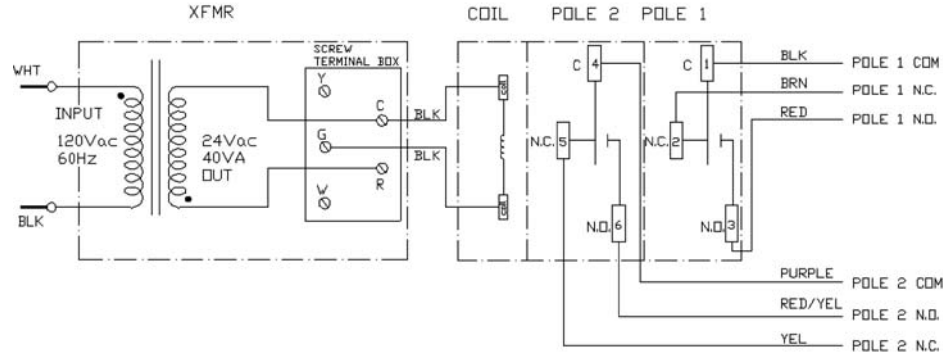
RELAY/TRANSFORMER FAN CENTER ASSEMBLY

WIRING DIAGRAM

ZC90113

XFMR 120Vac IN
24Vac OUT

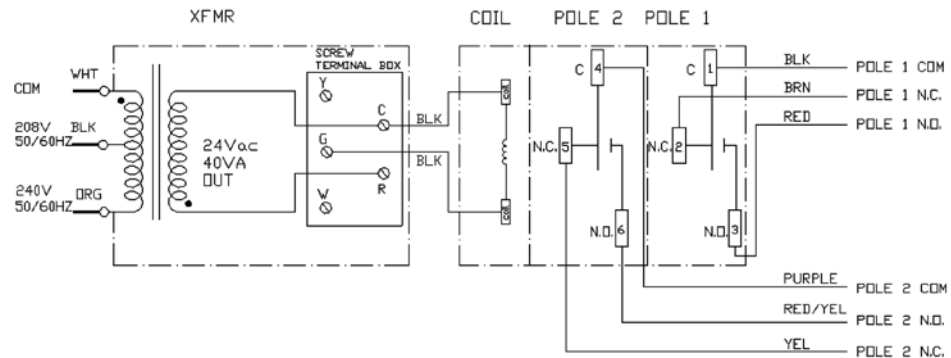
DPDT Relay



ZC90118

XFMR 208/240Vac IN
24Vac OUT

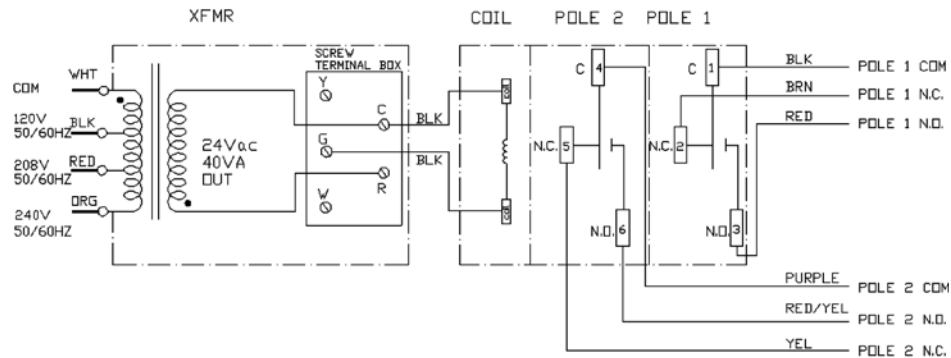
DPDT Relay



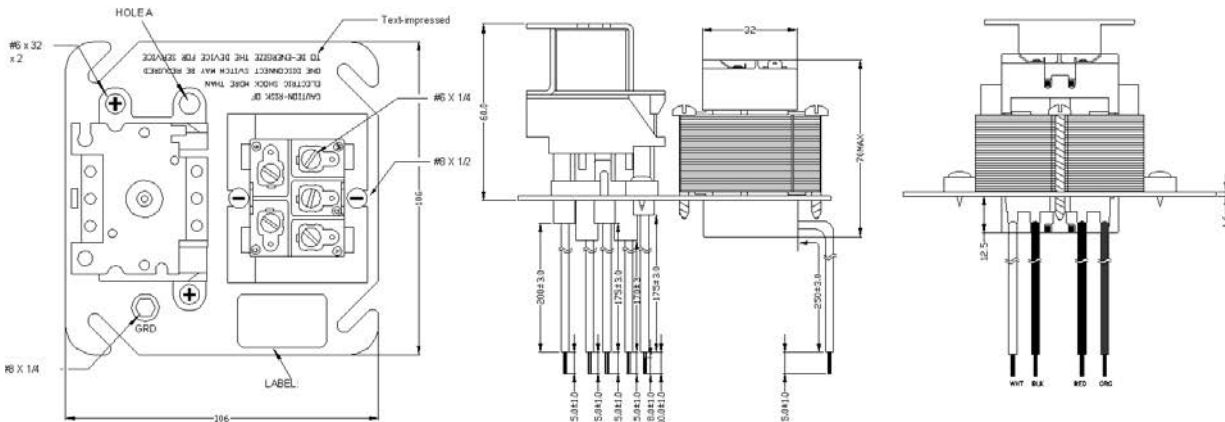
ZC90119

XFMR 120/208/240Vac IN
24Vac OUT

DPDT Relay



MECHANICAL DATA

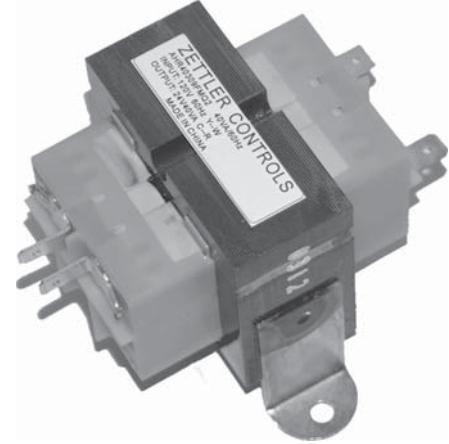


ZC AHR Series

30 VA - 50 VA QUICK CONNECT CLASS 2 UL 1585 TRANSFORMER

FEATURES

- 30VA - 50 VA Inherently energy limited
- Compact frame size
- No secondary fusing required
- Low heat rise
- 50/60 Hz
- Input voltages 120-575 V, output 24 V
- Terminations with quick-connect top, one side, or both sides
- Panel mount, foot-mount, adapter plate
- Customization for wire length, color, terminations and other customer requirements
- Split bobbin design
- Class B insulation system 130°C rated
- UL/CUR File E214561



GENERAL DATA

Mounting Options	Foot Mount, Bracket Multi Mount Adapter Plate (4x4) Panel Mount, Lam. Holes
Quick Connect Options	QT - Top mounted QD terminals Q1 - One Side QD terminals Q2 - Both Side QD terminals
Quick Connect	Standard male quick connect terminals measure 0.250" x 0.032"
Frequency	60Hz, 50/60Hz
Insulation System	130C, Class B
Weight	30 VA multi mount - 1.86 lbs 30 VA foot mount - 1.50 lbs 40 VA multi mount - 2.14 lbs 40 VA foot mount - 1.78 lbs 50 VA foot mount - 2.48 lbs

STANDARD MODELS AVAILABLE

Pri. - Sec. Voltage	30 VA Standard Model Designation	40 VA Standard Model Designation	50 VA Standard Model Designation
120 - 24	AHR30309	AHR40309	AHR50309
208/240 - 24	AHR30310	AHR40310	AHR50310
120 - 24	AHR30311	AHR40311	AHR50311
240 - 24	AHR30312	AHR40312	AHR50312
277 - 24	AHR30313	AHR40313	NA
480 - 24	AHR30314	AHR40314	NA
380/415 - 24	AHR30315	AHR40315	NA
575 - 24	AHR30316	AHR40316	NA
120/240 - 24	AHR30317	AHR40317	AHR50317
1208/208/240 - 24	AHR30318	AHR40318	AHR50318

NOTES

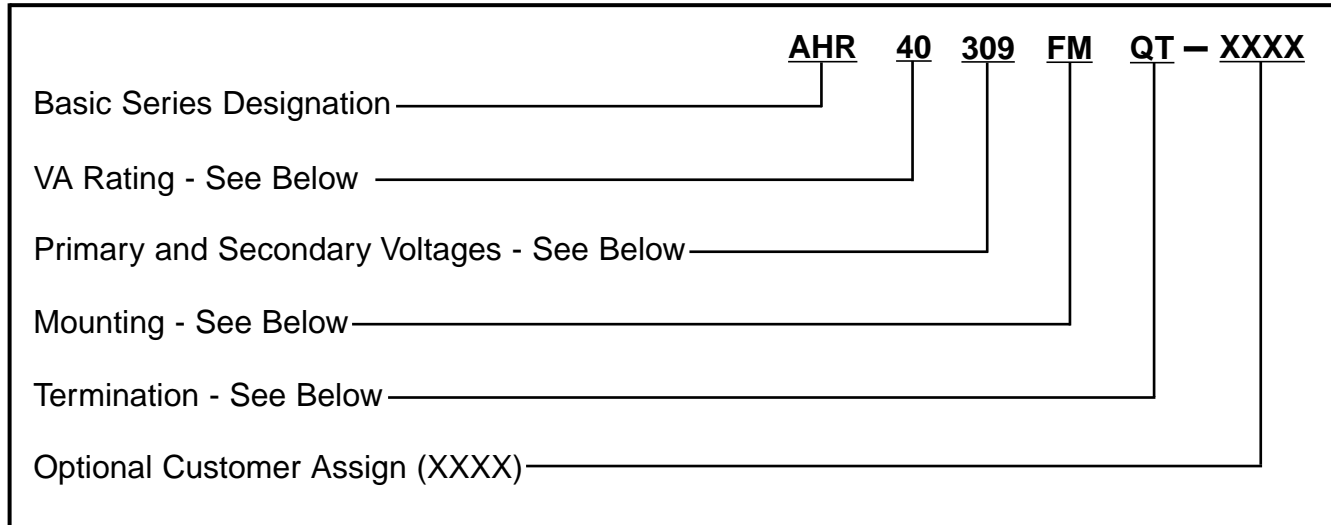
Zettler Controls, Inc. can custom build transformers to many different specifications. Contact Zettler Controls, Inc. directly for more information.

ZC AHR Series

30 VA - 50 VA CLASS 2 UL 1585

TRANSFORMER ORDERING INFORMATION

PART NUMBERING SYSTEM



VA RATINGS

Designator	Transformer VA
30	30 VA
40	40 VA
50	50 VA

MOUNTING

Designator	Mounting Type
FM	Foot Mount, Bracket
MM*	Multi Mount Adapter Plate
PM	Panel Mount, Lam. Holes
FC*	Fan Center Screw Terminals

* 30VA & 40VA only.

PRIMARY AND SECONDARY VOLTAGES

Designator	Primary Voltage	Secondary Voltage	Frequency (Hz)
309*	120	24	60
310*	208/240	24	50/60
311*	120	24	50/60
312*	240	24	50/60
313*	277	24	50/60
314	480	24	50/60
315	380/415	24	50/60
316	575	24	50/60
317*	120/240	24	50/60
318*	120/208/240	24	50/60

* 50VA models only available with these voltages.

TERMINATION

Designator	Terminal Type
NIL	No QD or Wires
QT	Top Quick Disconnect
Q1	One Side QD
Q1	Both Sides QD
QW	QD and Wires
W	Wire Leads

NOTES

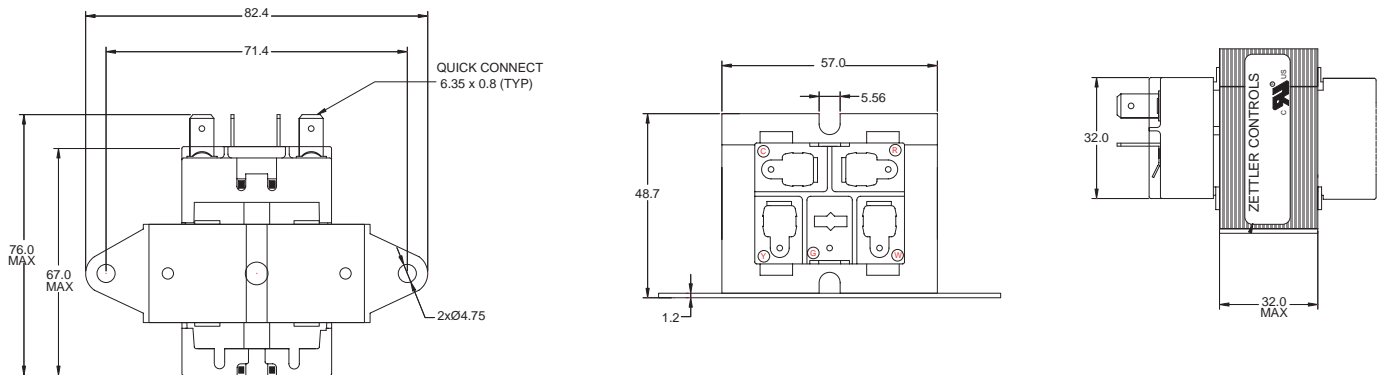
1. This is a partial listing only, consult factory for your specific requirements. All voltage & VA combinations may not be available.
2. Example: AHR-40309FMQT-5555. This part is a 40VA Class II transformer with a 120V Primary and 24V Secondary. This is a foot mount transformer with top mounted quick disconnect terminals.

ZC AHR Series

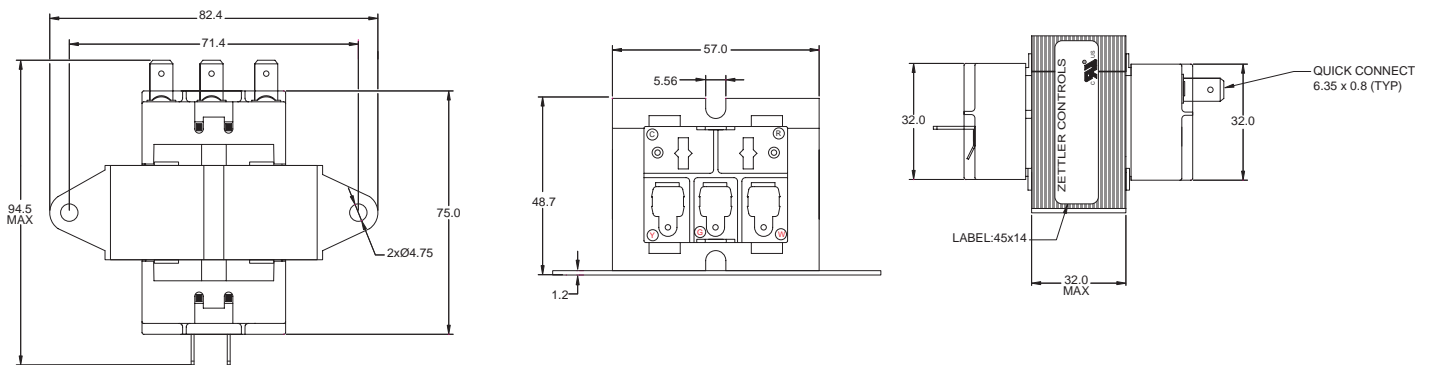
30 VA - 40 VA QUICK CONNECT CLASS 2 UL 1585 TRANSFORMER

MECHANICAL DATA

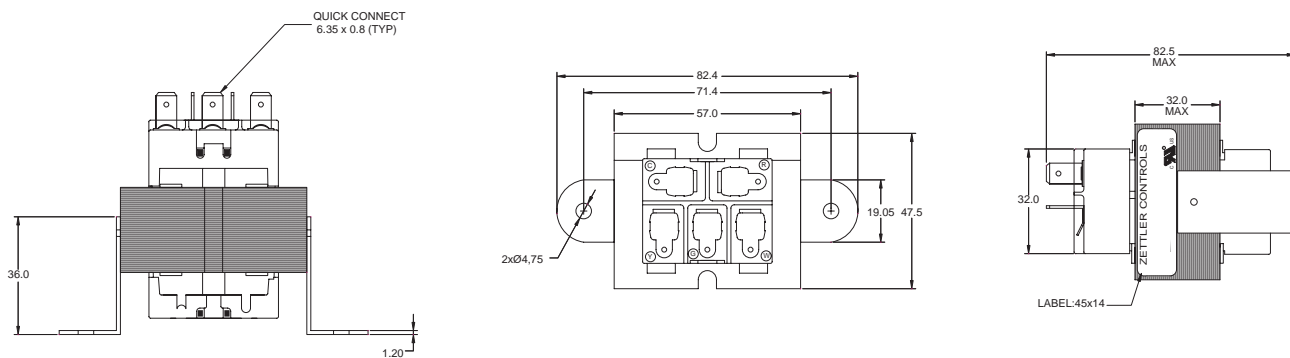
Type Q1 One Side Termination



Type Q2 Both Side Termination



Type QT Top Mount Termination



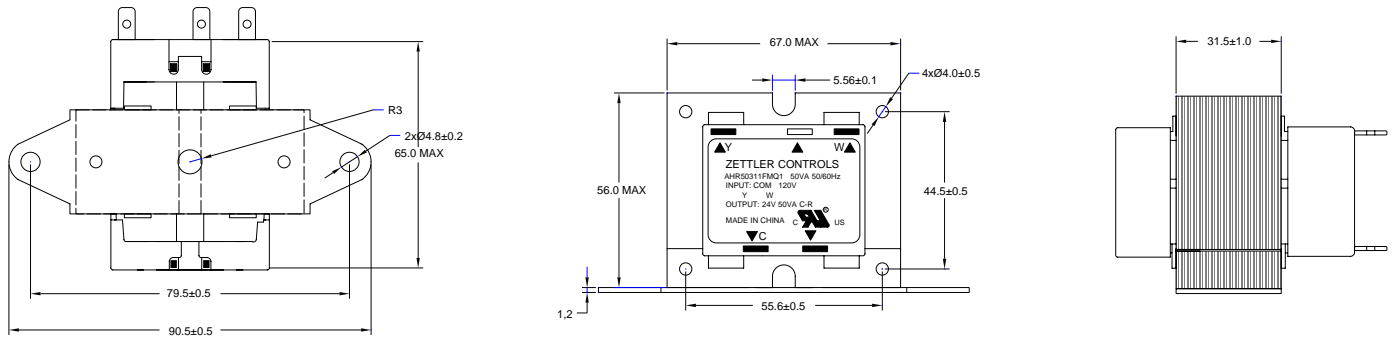
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ZC AHR Series

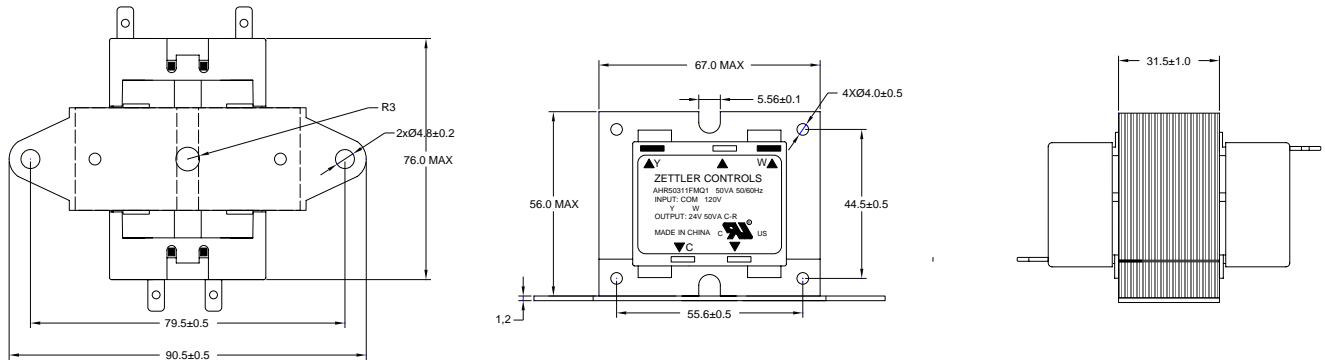
50 VA QUICK CONNECT CLASS 2 UL 1585 TRANSFORMER

MECHANICAL DATA

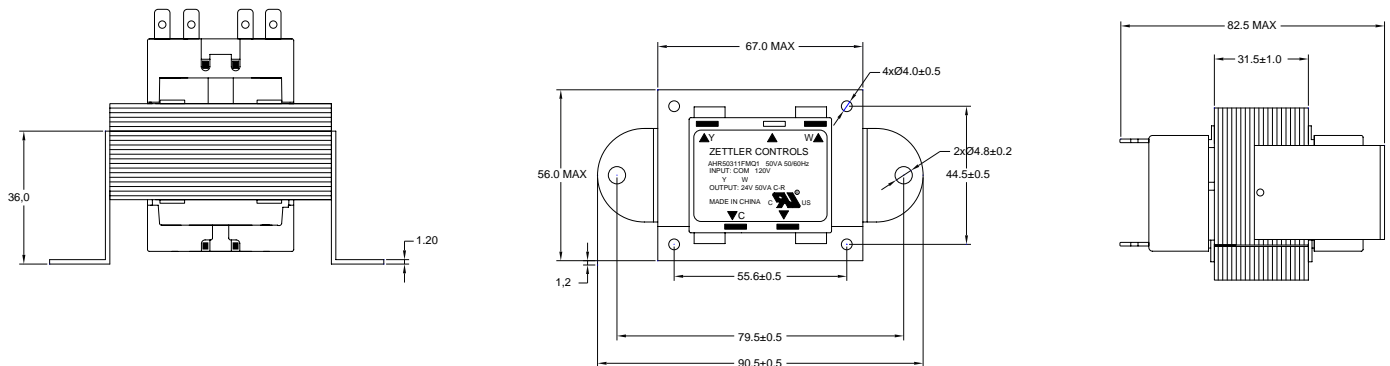
Type Q1 One Side Termination



Type Q2 Both Side Termination



Type QT Top Mount Termination



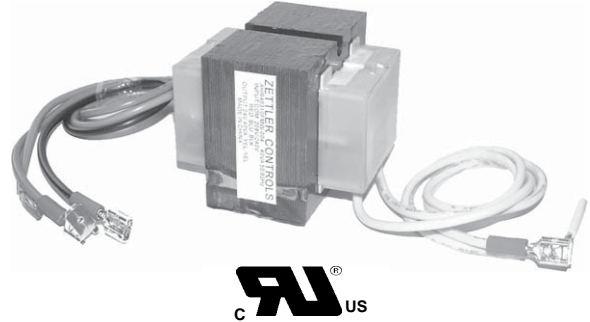
All dimensions are shown in millimeters.

ZC AHR Series

30 VA - 50 VA WIRE LEAD CONNECT CLASS 2 UL 1585 TRANSFORMER

FEATURES

- 30 VA - 50 VA Inherently energy limited
- Compact frame size
- No secondary fusing required
- Low heat rise
- 50/60 Hz
- Input voltages 120-575 V, output 24 V
- Terminations with screw, quick-connect or wires
- Panel mount, foot-mount, adapter plate
- Customization for wire length, color, terminations and other customer requirements
- Split bobbin design
- Class B insulation systems 130° C rated
- UL/CUR File E214561



GENERAL DATA

Mounting Options	Foot Mount, Bracket Multi Mount Adapter Plate Panel Mount, Lam. Holes Fan Center Screw Terminals
Wire Size	All leads are 18 AWG stranded, UL1015 Stranded wires have 300mm total length with 10mm stripped.
Frequency	60Hz, 50/60Hz
Insulation System	130C, Class B
Weight	30 VA multi mount - 1.86 lbs 30 VA foot mount - 1.50 lbs 40 VA multi mount - 2.14 lbs 40 VA foot mount - 1.78 lbs 50 VA foot mount - 2.16 lbs
Box Quantity	30 VA multi mount - 18 per box 30 VA foot mount - 30 per box 40 VA multi mount - 18 per box 40 VA foot mount - 30 per box 50 VA foot mount - 30 per box

NOTES

Zettler Controls, Inc. can custom build transformers to many different specifications. Contact Zettler Controls, Inc. directly for more information.

STANDARD MODELS AVAILABLE

Pri. - Sec. Voltage	30 VA Standard Model Designation	40 VA Standard Model Designation	50 VA Standard Model Designation
120 - 24	AHR30309	AHR40309	AHR50309
208/240 - 24	AHR30310	AHR40310	AHR50310
120 - 24	AHR30311	AHR40311	AHR50311
240 - 24	AHR30312	AHR40312	AHR50312
277 - 24	AHR30313	AHR40313	AHR50313
480 - 24	AHR30314	AHR40314	NA
380/415 - 24	AHR30315	AHR40315	NA
575 - 24	AHR30316	AHR40316	NA
120/240 - 24	AHR30317	AHR40317	AHR50317
120/208/240 - 24	AHR30318	AHR40318	AHR50318

WIRE LEAD DETAILS

	Voltage	Color *	Length (mm)	Strip Length (mm)
Primary	COM	Black	300	10
	120	White	300	10
	208	Red	300	10
	240	Orange	300	10
	277	Brown	300	10
	480	Black/Red	300	10
	575	Grey	300	10
Secondary	24	Blue	300	10
	COM	Yellow	300	10

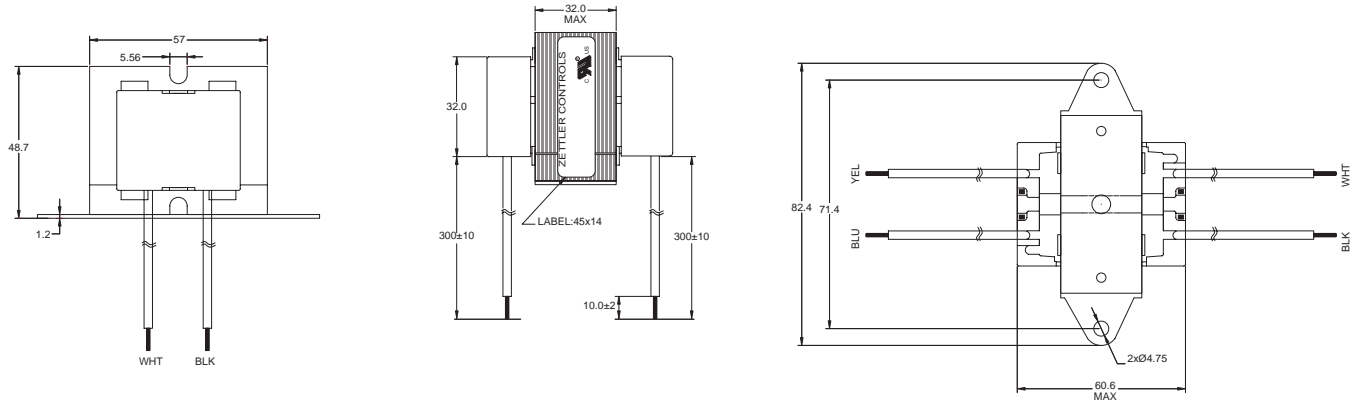
*Standard wire colors: consult factory for specific wire color requirements.

ZC AHR Series

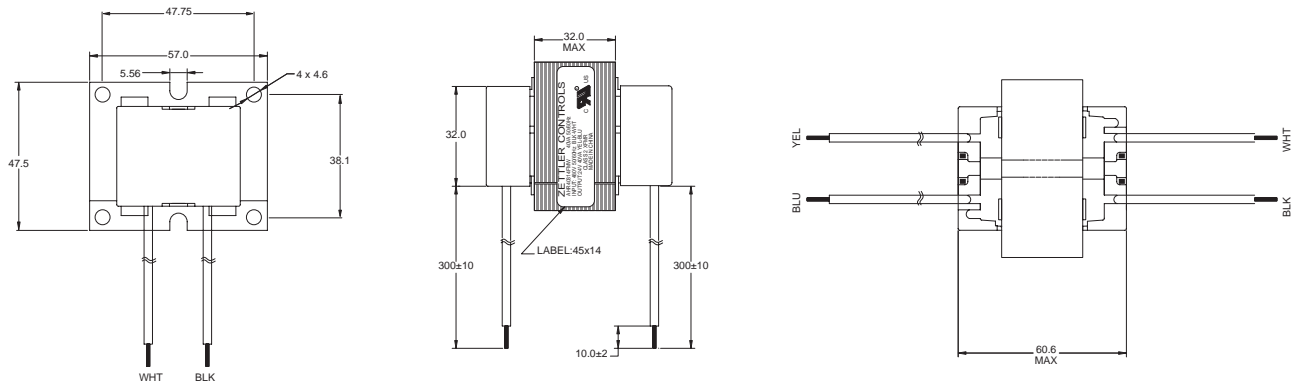
30 VA - 40 VA WIRE LEAD CONNECT CLASS 2 UL 1585 TRANSFORMER

MECHANICAL DATA

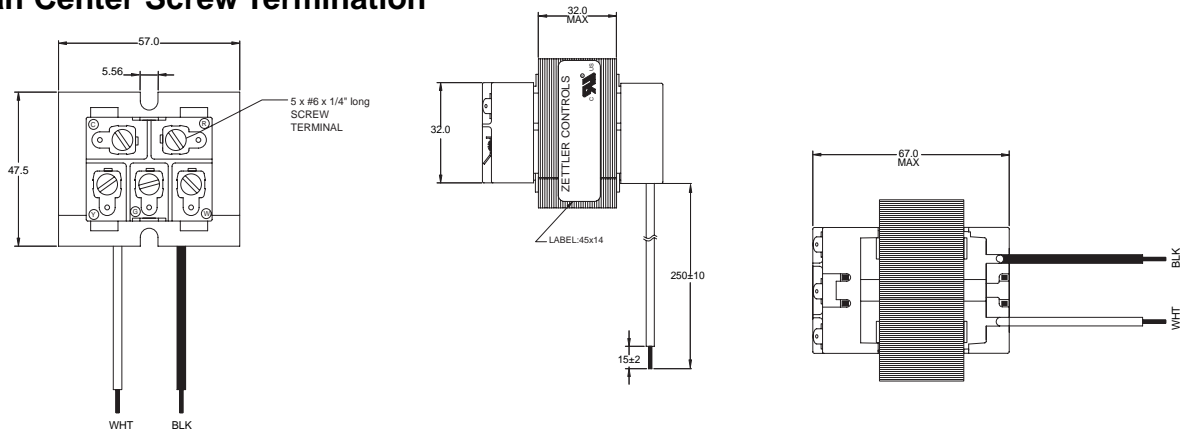
Type FM Foot Mount Bracket



Type PM Panel Mount



Type Fan Center Screw Termination



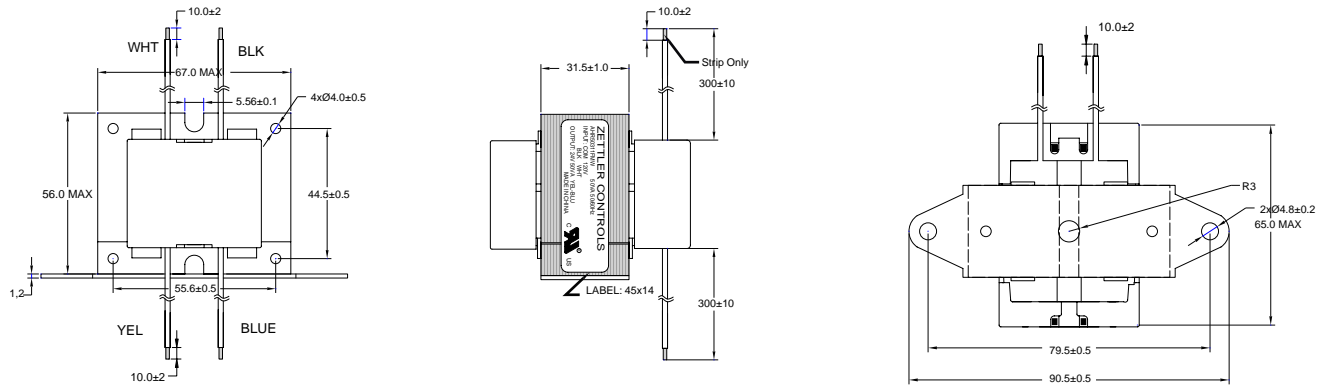
All dimensions are shown in millimeters.

ZC AHR Series

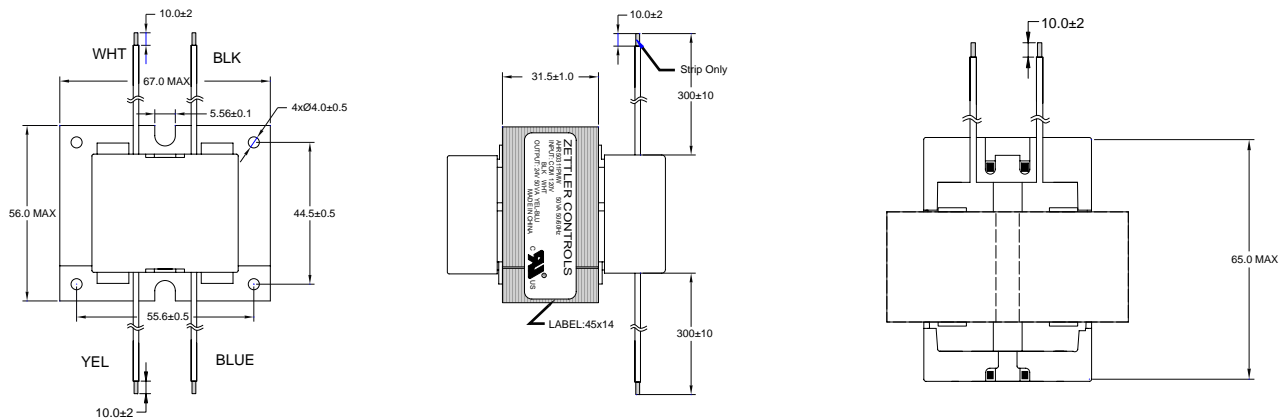
50VA WIRE LEAD CONNECT CLASS 2 UL 1585 TRANSFORMER

MECHANICAL DATA

Type FM Foot Mount Bracket



Type PM Panel Mount



All dimensions are shown in millimeters.

ZC AHRV Series

20 VA - 100 VA MULTI CONNECT WIRE AND QUICK CONNECT CLASS 2 UL 1585 TRANSFORMER

FEATURES

- 20VA - 100 VA
- Compact frame size
- 50/60 Hz
- Input voltages 115 - 575 VAC, output 2.5 - 24 V
- Terminations with quick-connect
- Foot-Mount, Panel-Mount, Multimount
- Customization for wire length, color, terminations and other customer requirements
- Internal and external circuit protection
- Split bobbin design
- Class B insulation system 130°C rated
- UL/CUR File E214561

GENERAL DATA

Mounting Options	Foot Mount, Panel-Mount, Bracket Multi Mount Adapter Plate
Quick Connect Options	QW - QC and Wire, Q1-QC One Side, Q2 - QC Both Sides, QT - QC Top
Quick Connect Size	Standard .250" x .032"
Frequency	50/60 Hz
Insulation System	130°C Class B

WIRE LEAD DETAILS

	Voltage	Color	Length (mm)	Strip(mm)
Primary	COM	Black	300	10
	120	White	300	10
	208	Red	300	10
	240	Orange	300	10
	277	Brown	300	10
	480	Black/Red	300	10
	575	Grey	300	10
Secondary	12	Violet	300	10
	24	Blue	300	10
	COM	Yellow	300	10

*Standard wire colors: consult factory for specific wire color and length requirements.



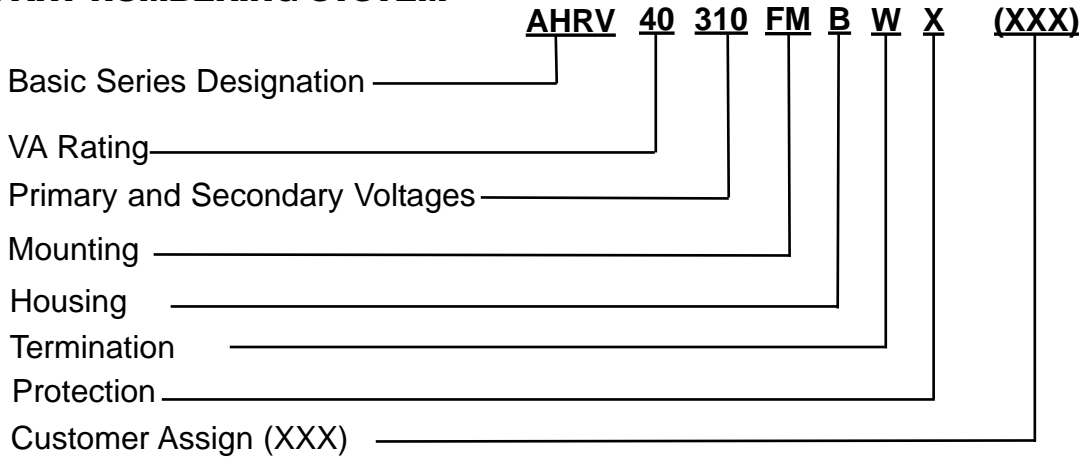
NOTES

Customization allowed for termination and mounting without affecting UL.

ZC AHRV Series

20 VA - 100 VA CLASS 2 UL 1585 TRANSFORMER

PART NUMBERING SYSTEM



VA RATINGS

Designator	VA
20	20
30	30
40	40
50	50
60	60
75	75
100	96

PRIMARY AND SECONDARY VOLTAGES

Designator	Primary	Secondary	Freq. HZ
309	115	24	50/60
310	208/240	24	50/60
311	120	24	50/60
312	240	24	50/60
313	277	24	50/60
314	480	24	50/60
315	208	24	50/60
316	240/480	24	50/60
317	120/240	24	50/60
318	120/208/240	24	50/60
319	120/208/240/480	24	50/60
320	120/208/240/277	24	50/60
321	120/208/240/277/480	24	50/60
322	208/240/480	24	50/60
323	120	2.5	50/60
324	120	12	50/60
325	208	2.5	50/60
326	208	12	50/60
327	240	2.5	50/60
328	240	12	50/60
329	120/208/240	2.5/12/24	50/60
330	115/208/240	24	50/60
331	120/208	24	50/60
332	120/277	24	50/60
333	120/480	24	50/60
334	208/277	24	50/60
335	208/480	24	50/60
336	240/277	24	50/60
337	277/480	24	50/60
338	120/208/277	24	50/60
339	120/208/480	24	50/60
340	120/240/277	24	50/60
341	120/240/480	24	50/60
342	208/240/277	24	50/60
343	208/277/480	24	50/60

344	240/277/280	24	50/60
345	120/240/277/280	24	50/60
346	575	24	50/60
347	208/240	12/24	50/60
348	120/208/240/480	12/24	50/60
349	115	12/24	50/60
350	208/240	120	50/60
351	230	120	50/60
352	460	120	50/60
353	380/415	24	50/60
354	230	24	50/60
355	460	24	50/60
356	277/480	120	50/60
357	347	24	50/60
358	460/575	24	50/60

This is a partial listing only. Consult factory for your specific requirements. All voltage & VA combinations may not be available.

MOUNTING

Designator	Type
FM	Foot Mount
MM	Multi Mount
PM	Panel Mount

HOUSING

Designator	Type
NULL	Open Frame
B	Bell Housing
C	Channel Frame

Protection

Designator	Type
NULL	None
F	External Fuse
X	Circuit Breaker

Termination

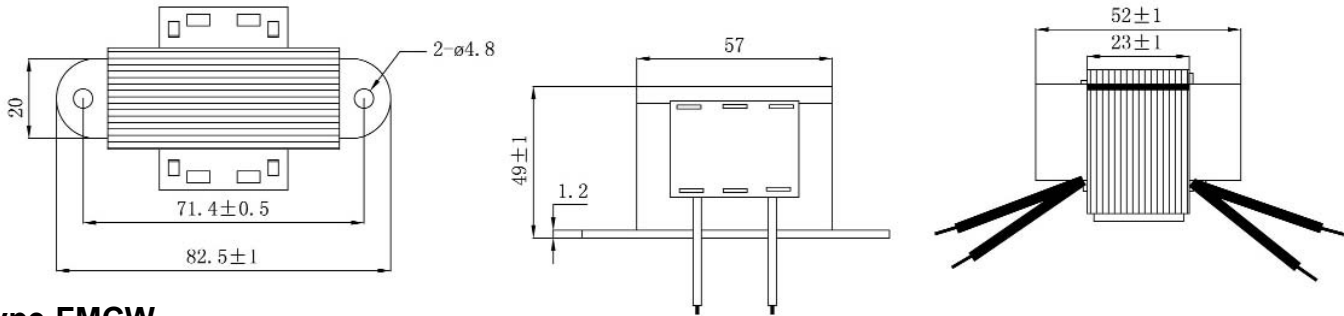
Designator	Type
W	Wire Leads
W1	One Side Wire
W2	Both Sides Wire
QW	QC and Wire
Q1	QC One Side
Q2	QC Both Sides
QT	QC Top
*A	Type A
*B	Type B
*C	Type C
*D	Type D
*E	Type E
*SW	Screw and Wire

**50VA, 75VA, 96VA Bell Housing Only. May be combined with other Terminations.*

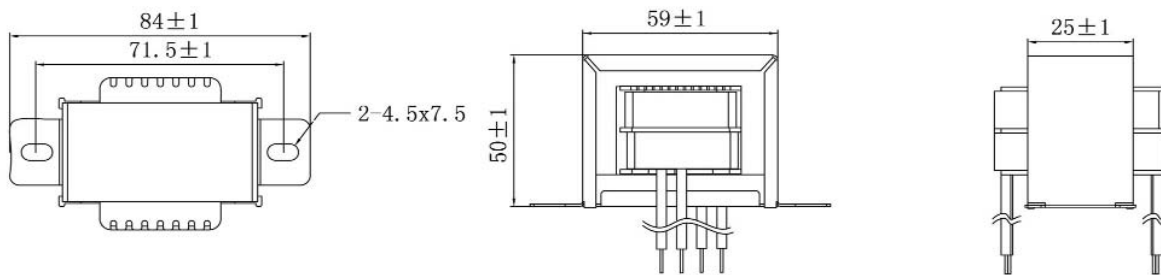
ZC AHRV Series

20 VA CLASS 2 TRANSFORMERS

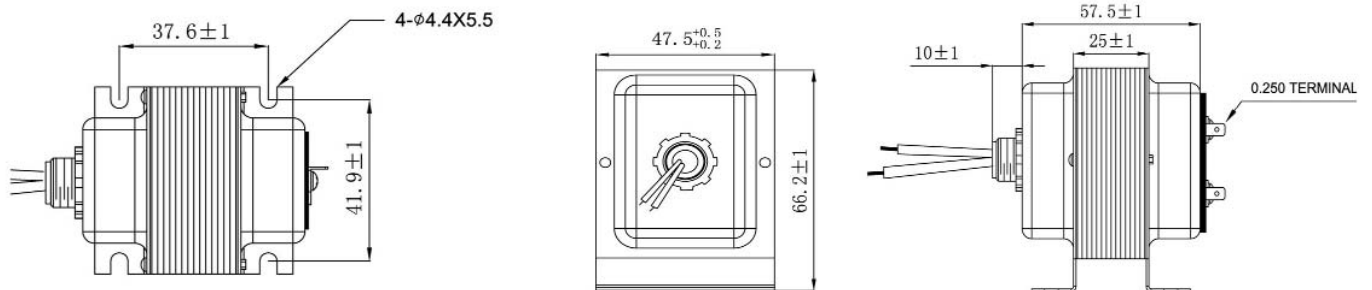
Type FMW



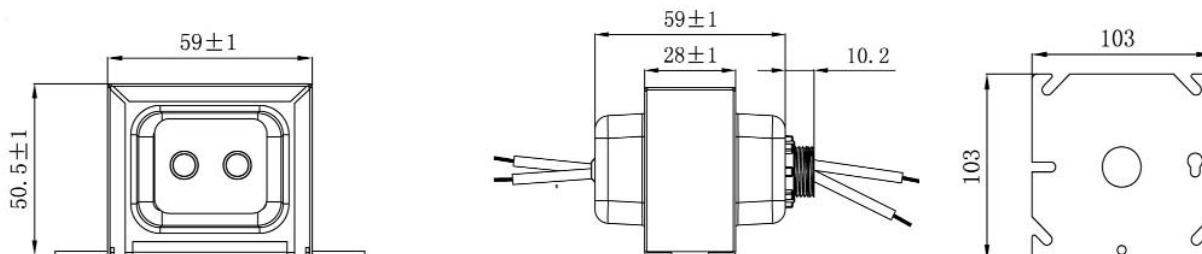
Type FMCW



Type FMBQW



Type MMBW2

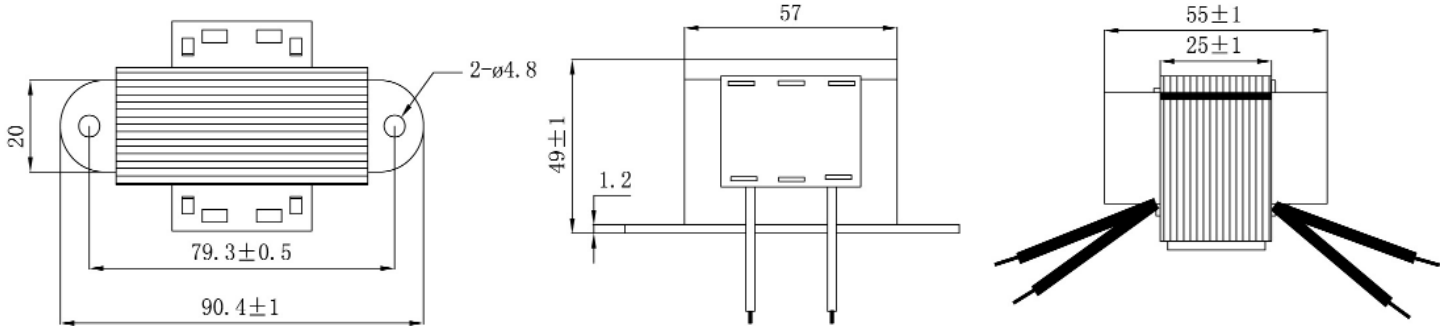


*Contact factory for specific mounting and terminal requirements. Tolerance ± 1mm unless specified otherwise.

ZC AHRV Series

30 VA CLASS 2 TRANSFORMERSS

Type FMW

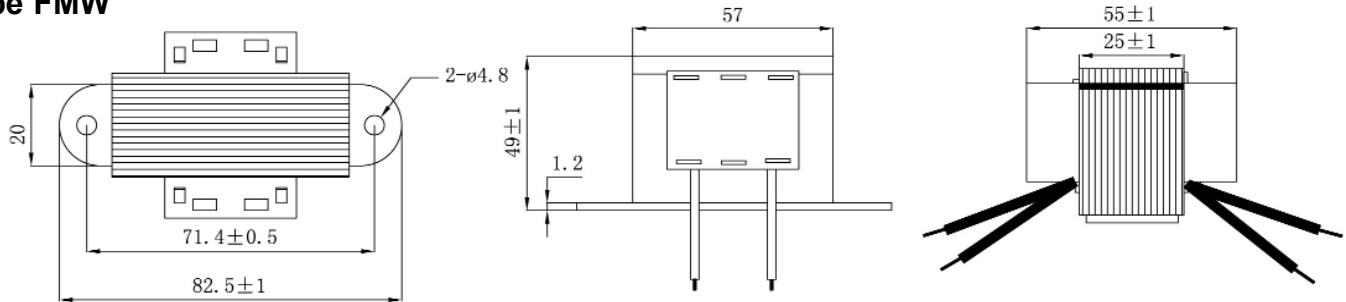


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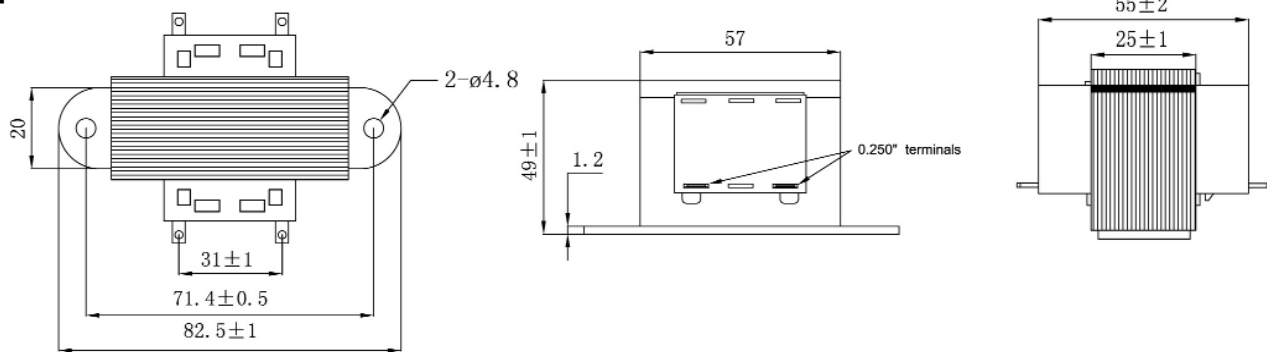
ZC AHRV Series

40 VA CLASS 2 TRANSFORMERS

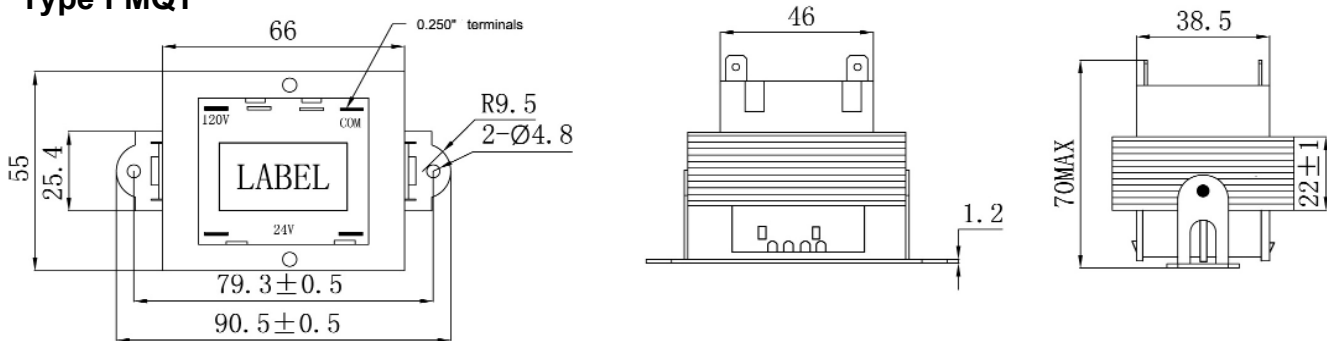
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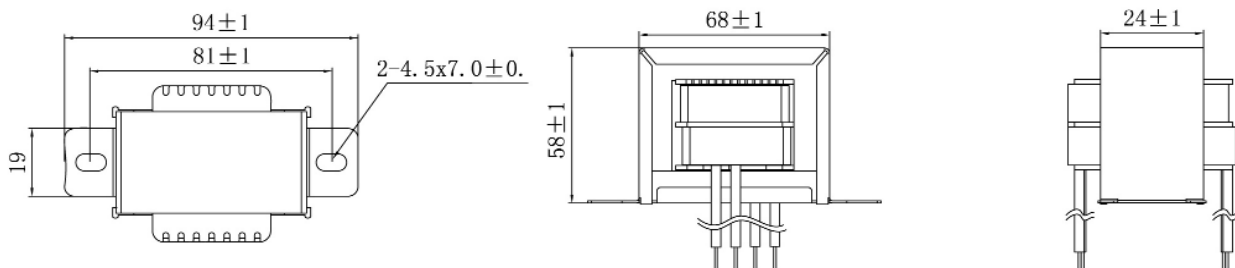
Type FMQ2



Type FMQT

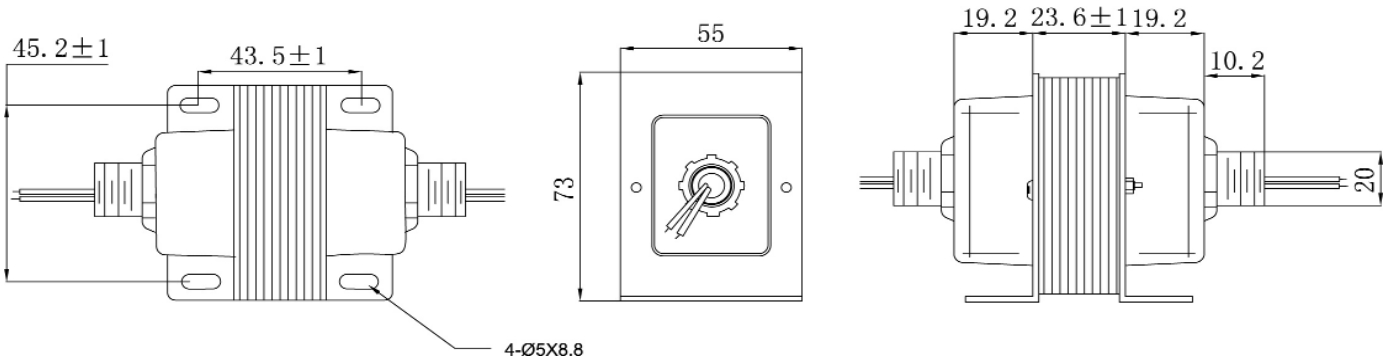


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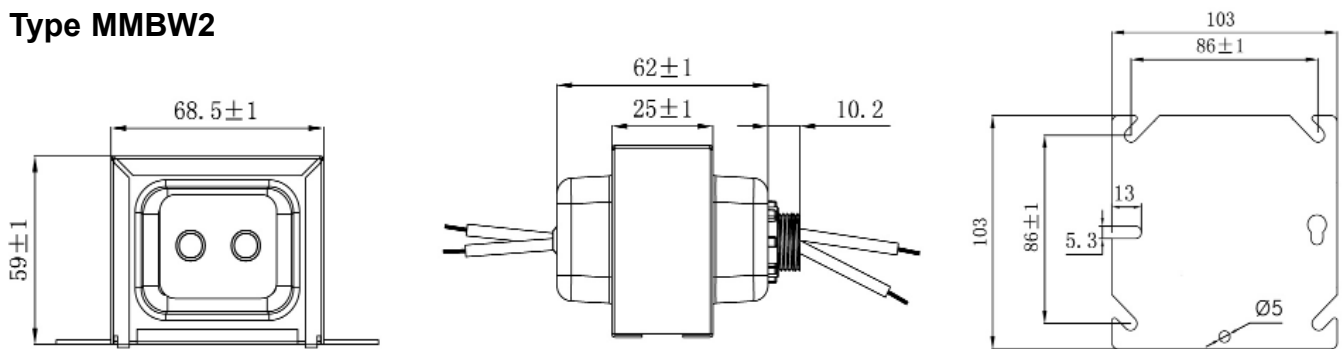


ZC AHRV Series

Type FMBW2



Type MMBW2

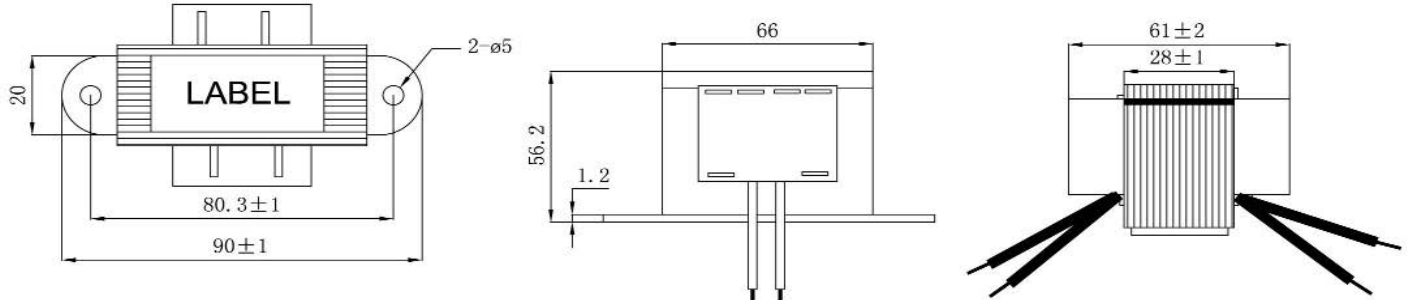


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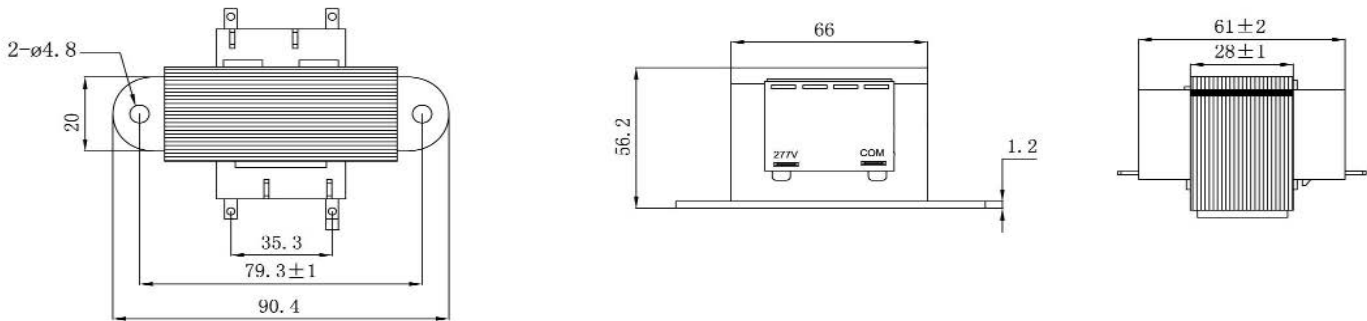
ZC AHRV Series

50 VA CLASS 2 TRANSFORMERS

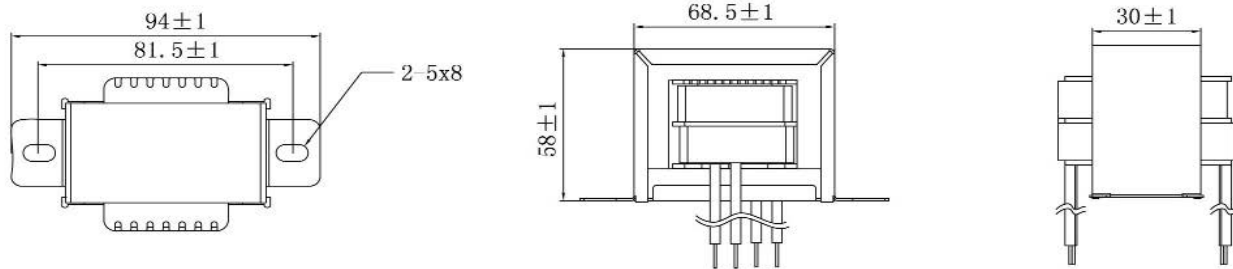
Type FMW



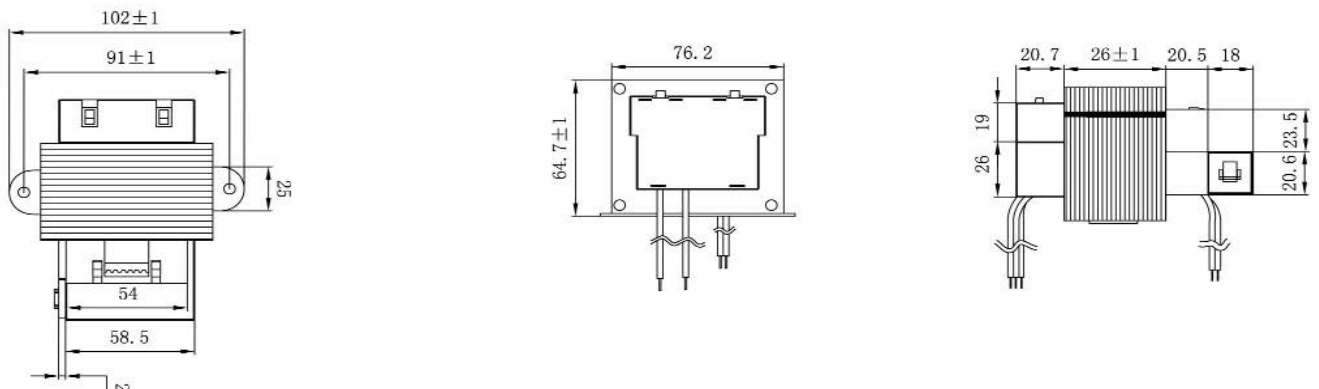
Type FMQ2



Type FMCW

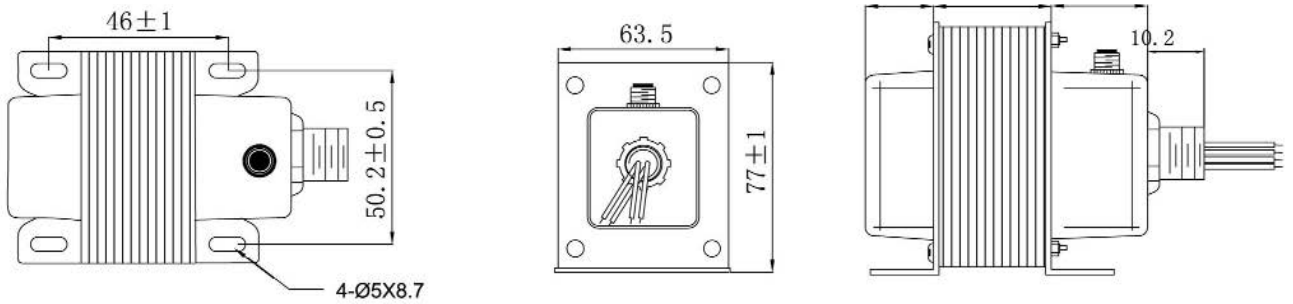


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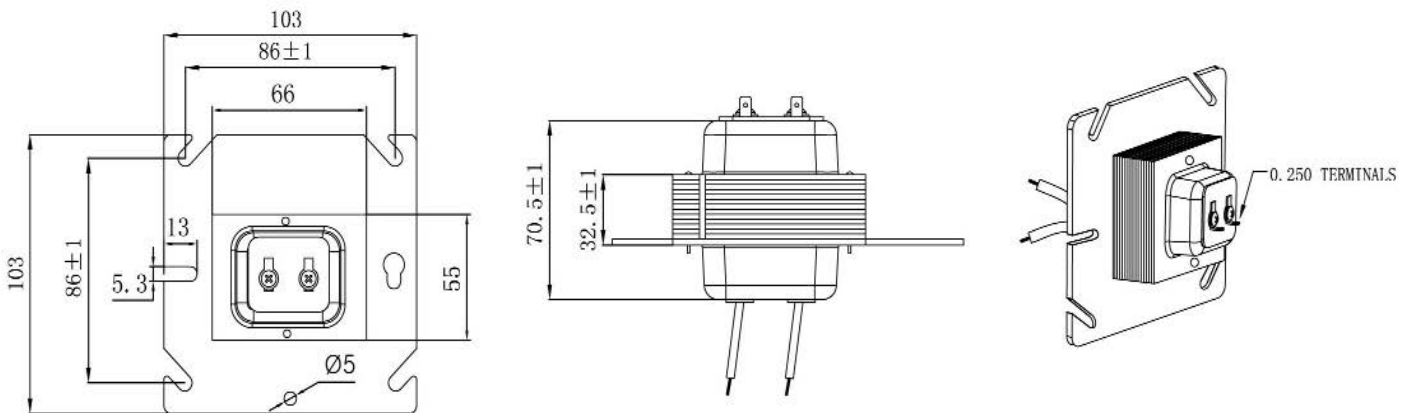


ZC AHRV Series

Type FMBAW1X



Type MMBQW

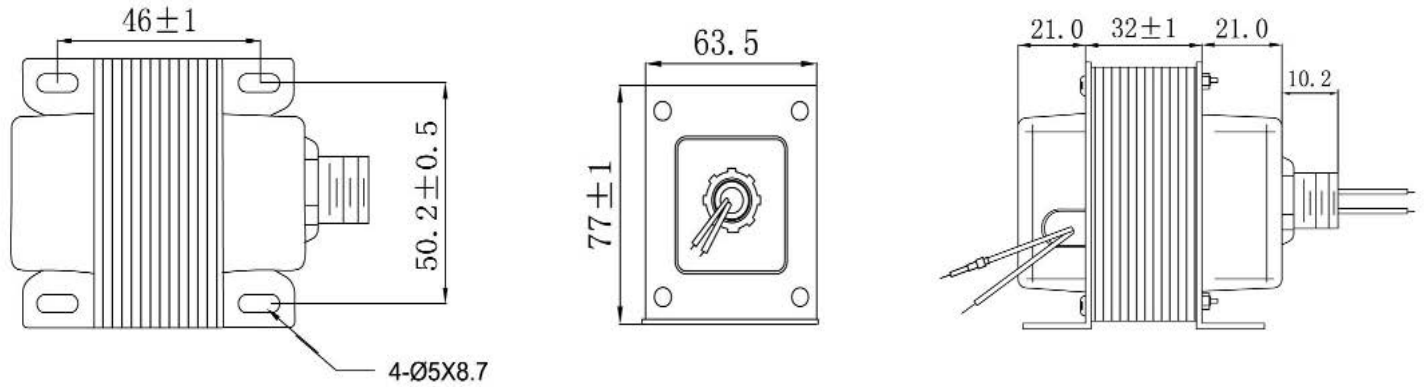


*Contact factory for specific mounting and terminal requirements. Tolerance ± 1 mm unless specified otherwise.

ZC AHRV Series

60 VA CLASS 2 TRANSFORMERSS

Type MMBQW

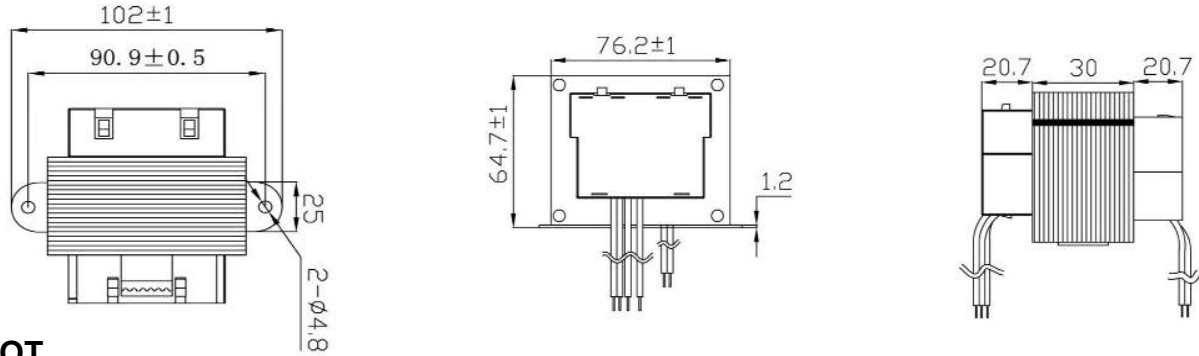


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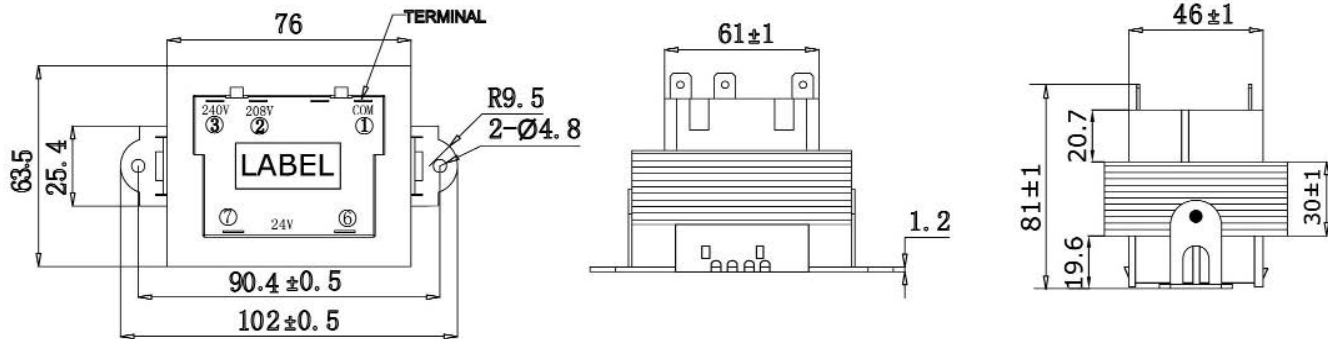
ZC AHRV Series

75 VA CLASS 2 TRANSFORMERS

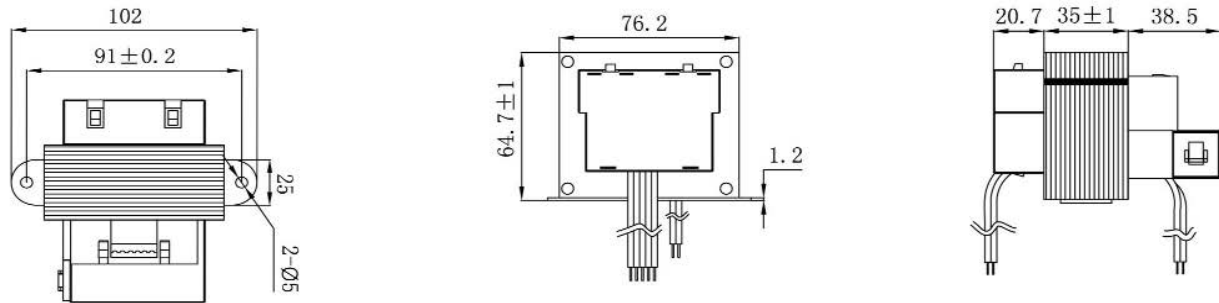
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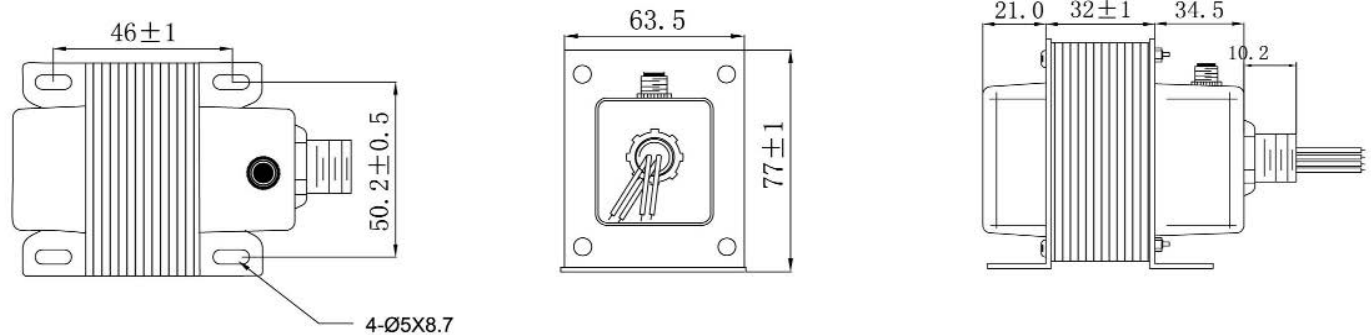
Type FMQT



Type FMWX

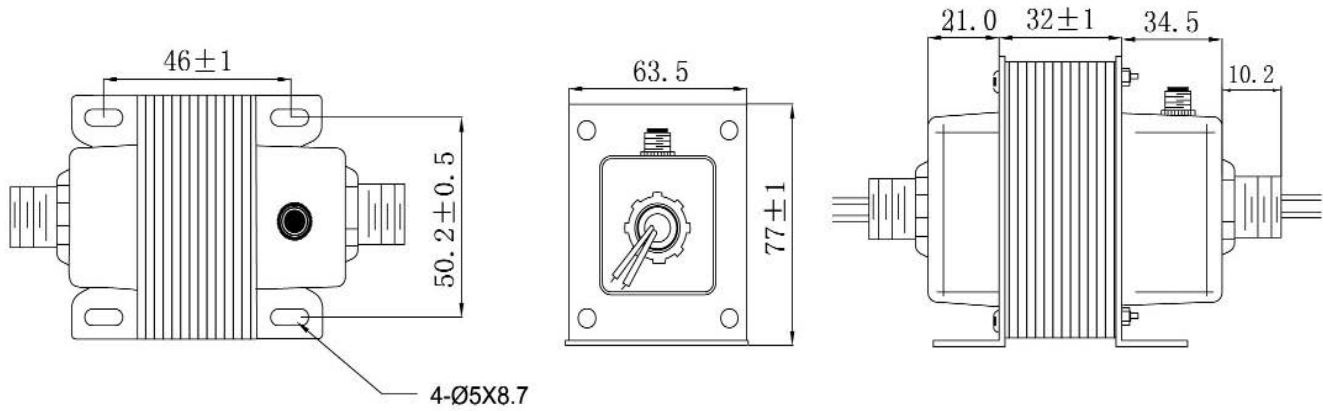


Type FMBAW1X

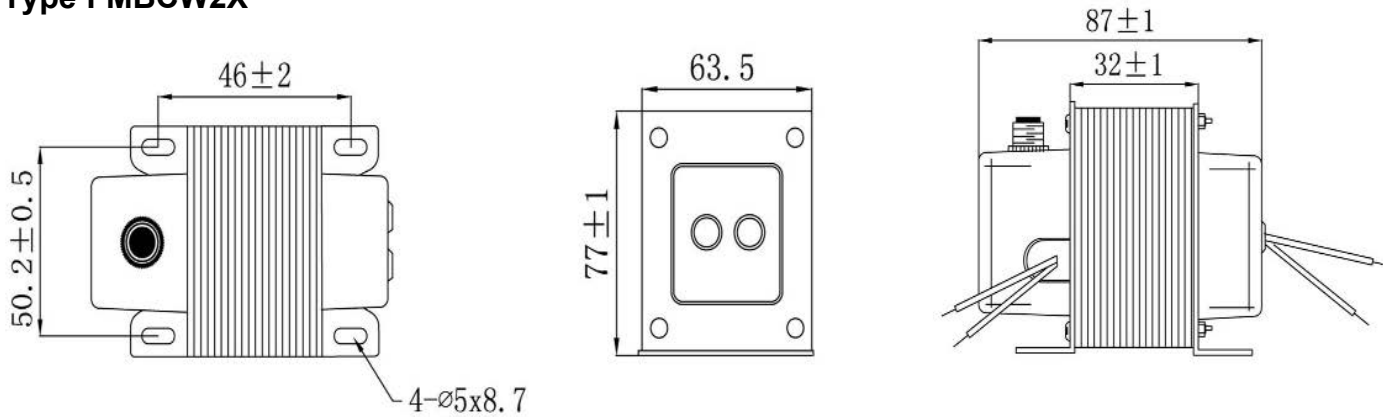


ZC AHRV Series

Type FMBBW2X



Type FMBCW2X

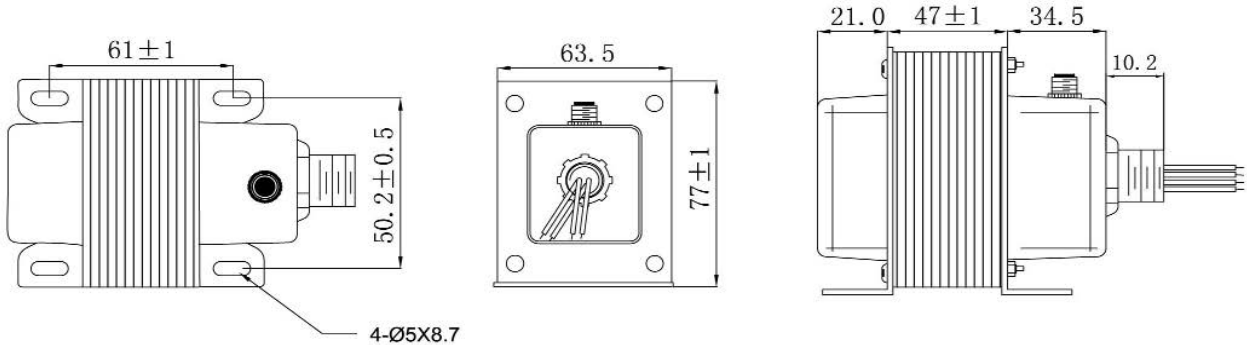


*Contact factory for specific mounting and terminal requirements. Tolerance $\pm 1\text{mm}$ unless specified otherwise.

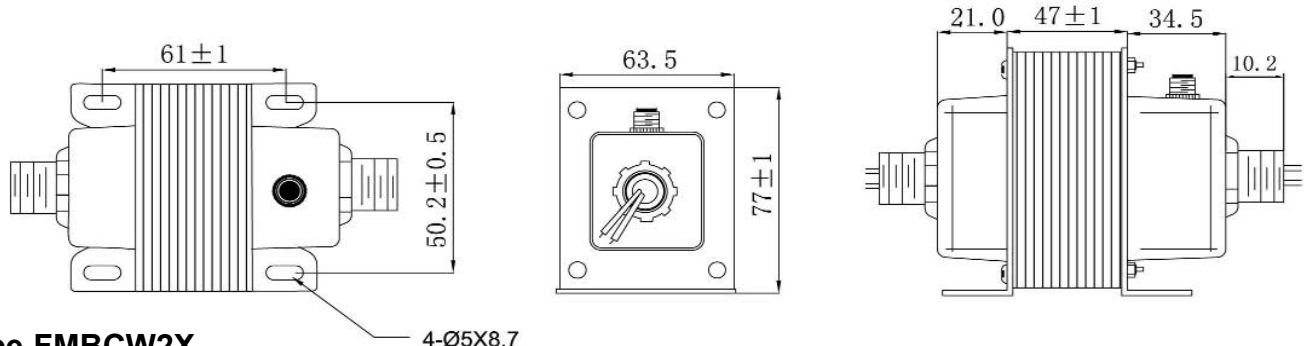
ZC AHRV Series

96 VA CLASS 2 TRANSFORMERS

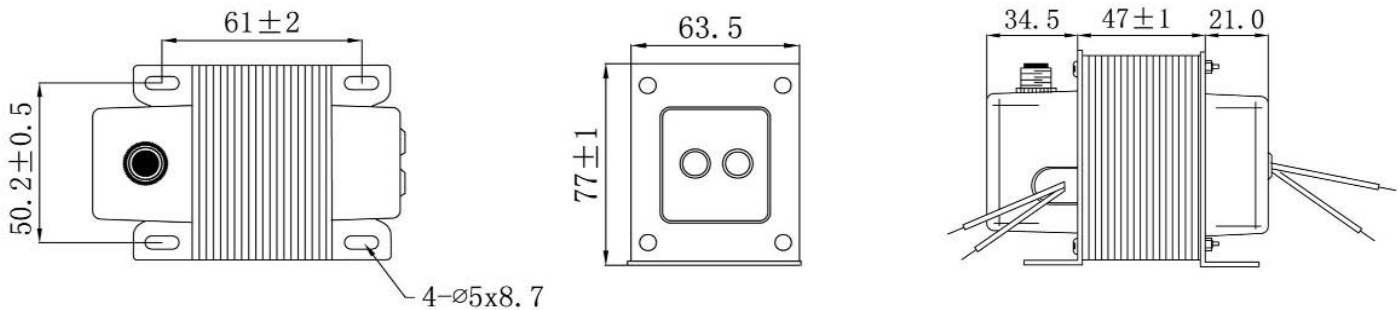
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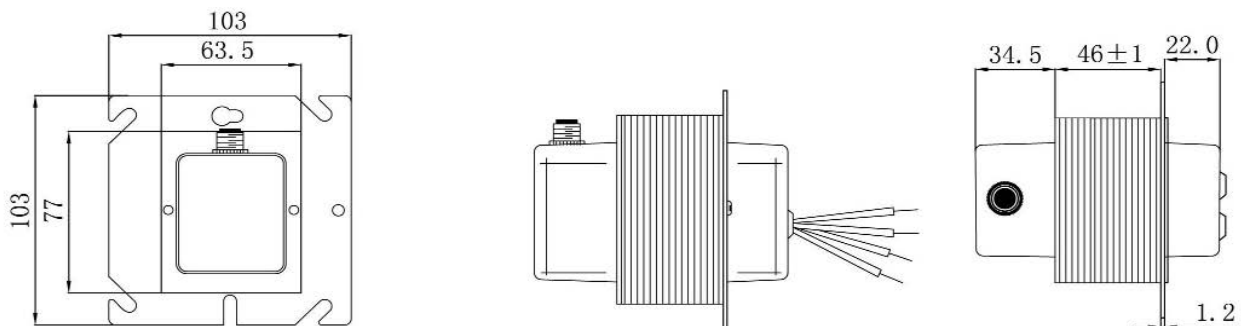
Type FMBBW2X



Type FMBCW2X

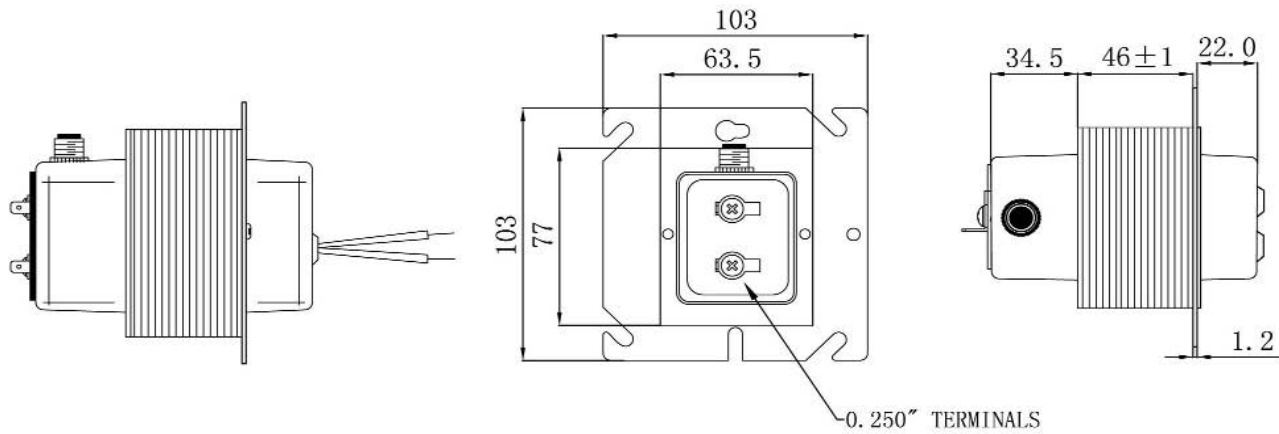


Type FMBDW1X



ZC AHRV Series

Type FMBEQWX



*Contact factory for specific mounting and terminal requirements. Tolerance ± 1 mm unless specified otherwise.

ZC2 Series

DELAY ON MAKE AND BREAK TIMER BOARDS

DESCRIPTION

ZC “delay on make” timer is ideal for compressor staging and starting multiple motors. This relay also helps reduce power surges in that it applies the load only after the delay period has ended. The ZC “delay on break” timer helps to protect air conditioning, refrigeration and other equipment from damage which may be caused by the short cycling of compressors. When power is lost, the load is de-energized and the delay period begins. The system will restart only after the delay period has ended.



FEATURES

- Compressor lockout/anti-short cycle timer
- Brownout protection
- Helps prevent scroll compressor reversal
- Fixed or adjustable timing
- 75C Ambient Operating Temperature
- UL 873, SA11095

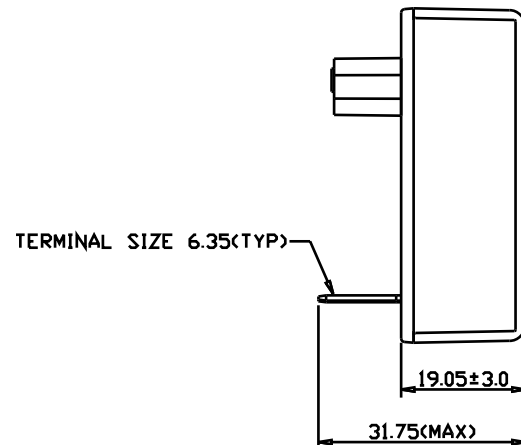
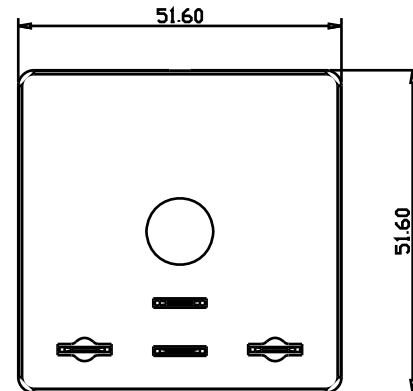
SPECIFICATIONS

Input Voltage	18-30 VAC
Current	1.5 A
Inrush	15 A

TIMER BOARDS TIMINGS

Model	Type	Time
ZC201	Break	30 sec. fixed
ZC204	Break	3 min. fixed
ZC205	Break	5 min. fixed
ZC206	Break	3-10 min. adjustable
ZC211	Make	30 sec. fixed
ZC214	Make	3 min. fixed
ZC215	Make	5 min. fixed
ZC216	Make	3-10 min. adjustable

PRODUCT OUTLINE



Dimensions are in millimeters.

ZC2 Series

DELAY ON MAKE AND BREAK MULTI-INPUT

FEATURES

- Compressor lockout/anti-short cycle timer
- Helps to protect compressors from damage caused by rapid short cycling
- Simple, 2 wire hook-up
- Adjustable timing
- Universal input voltage: 24 VAC, cut jumper for 120/240 VAC
- 75C Ambient Operating Temperature
- UL 873 Pending

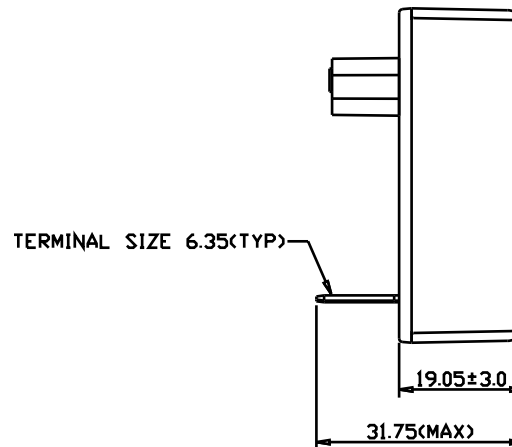
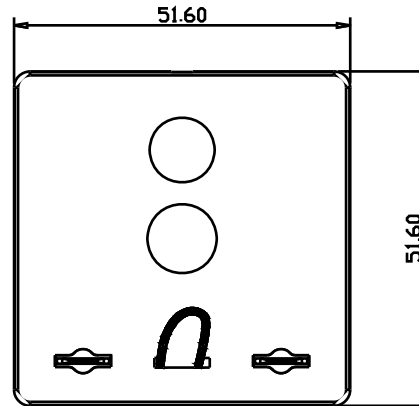
SPECIFICATIONS

Input Voltage	18-240 VAC
Current	1.5 A
Inrush	15 A

TIMER BOARDS TIMINGS

Model	Type	Time
ZC207	Break	Knob adjustable 0.03-10 minutes (1.8-600 seconds)
ZC218	Make	

PRODUCT OUTLINE



NTC Thermistors



DESCRIPTION

Through traditional craftsmanship and engineering excellence, the Zettler name has symbolized quality and reliability in electrical components for over 100 years in demanding applications such as telecommunications systems, computer peripherals, office automation equipment, home appliances, security systems, test and measurement devices, and industrial controls.

We also bring that same commitment to the HVAC/R market with an offering of relays, transformers, contactors, heat sequencers, temperature sensors, and fan centers. This group of products is used by the HVAC/R industry in both residential and commercial applications.

We welcome application challenges, stock over one million units, deliver quick turnaround, and understand demanding service requirements. Our unique combination of 100% quality testing, first-class sales and technical support, cost-effective product design, and outstanding product availability offer a highly dependable and responsive resource for fulfilling all your HVAC/R Components needs.

NTC Thermistors

THERMISTOR CHARACTERISTICS

CONTINUOUS TEMPERATURE SENSING

Zettler NTC Thermistor Sensors offer economical, accurate and reliable solutions to those applications requiring more extensive sensing than one or two temperature points. NTC thermistor sensors provide a change in resistance with temperature when combined with an electronic circuit and provide a means of continuously measuring temperature over a wide range.

NTC THERMISTOR SENSOR FEATURES

- Economical
- Long-term stability
- Custom sensors to fit customer requirements
- Custom sensor housings to fit customer requirements
- A wide variety of packaging options available

OPERATING PRINCIPLES OF NTC THERMISTOR SENSOR

An NTC thermistor is a ceramic semiconductor made with various metal oxides. Their electrical resistance decreases with increasing temperature. This resistance is processed by an electronic circuit to provide temperature measurement. The thermistor itself does not provide any control over heating elements, relays, etc. The thermistor is strictly a sensor and any electrical control would need to be implemented by the circuit utilizing the thermistor.

NTC Thermistors

THERMISTOR TERMINOLOGY

NEGATIVE TEMPERATURE COEFFICIENT (NTC)

An NTC thermistor is one in which the zero-power resistance decreases with an increase in body temperature.

ZERO-POWER RESISTANCE (RT)

The zero-power resistance is the DC resistance value of a thermistor measured at a specified temperature with power dissipated by the thermistor low enough that any further decrease in power will result in not more than 0.1 % (or one-tenth of the specified measurement tolerance, whichever is smaller) change in resistance.

RATED ZERO POWER RESISTANCE (R25)

The zero power resistance is measured under the standard temperature of 25°C.

B VALUE (UNIT: K)

The B value is a constant describing the physical characteristic of the NTC thermistor material, also called the thermistor coefficient.

That is: $B = \ln(R_1/R_2)/(1/T_1 - 1/T_2)$

R1-Resistance at Temperature T1

R2-Resistance at Temperature T2

B value is usually determined by zero-power resistance at 25°C / 85°C in American market and 25°C / 50°C in Asia market.

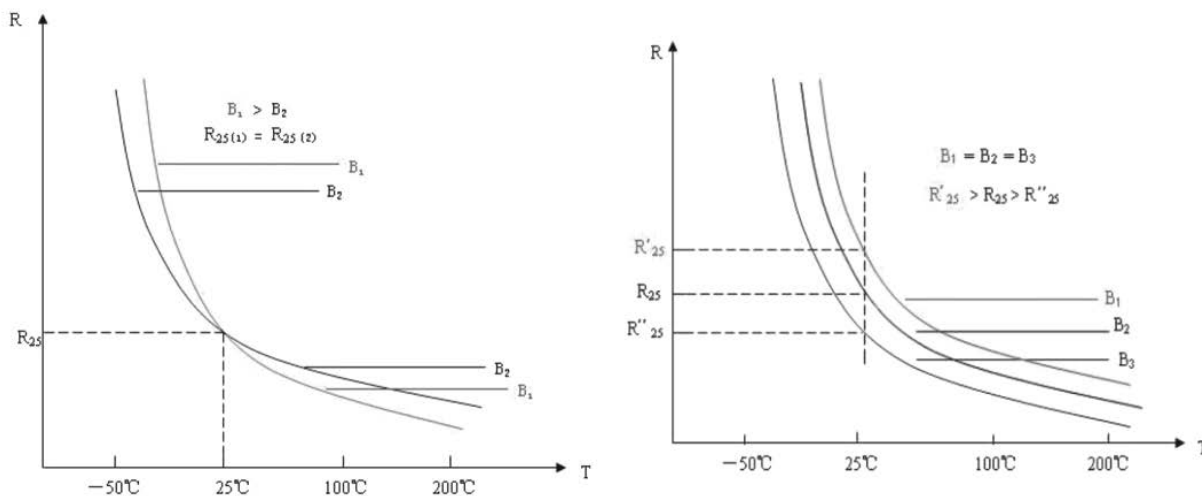


Chart 1 - NTC B-Value

NTC Thermistors

THERMISTOR TERMINOLOGY

MAXIMUM OPERATING TEMPERATURE

The maximum operating temperature of a thermistor is the maximum body temperature at which the thermistor will operate for an extended period of time with acceptable stability of its characteristics. This temperature can be the result of internal or external heating, or both, and should not exceed the maximum value specified.

MAXIMUM POWER RATING

The maximum power rating of a thermistor is the maximum power which a thermistor will dissipate for an extended period of time with acceptable stability of its characteristics.

DISSIPATION CONSTANT

The dissipation constant is the ratio, (expressed in milliwatts per degree C) at a specified ambient temperature, of a change in power dissipation in a thermistor to the resultant body temperature change.

THERMAL TIME CONSTANT

The thermal time constant is the time required for a thermistor to change 63.2 % of the total difference between its initial and final body temperature when subjected to a step function change in temperature under zero-power conditions.

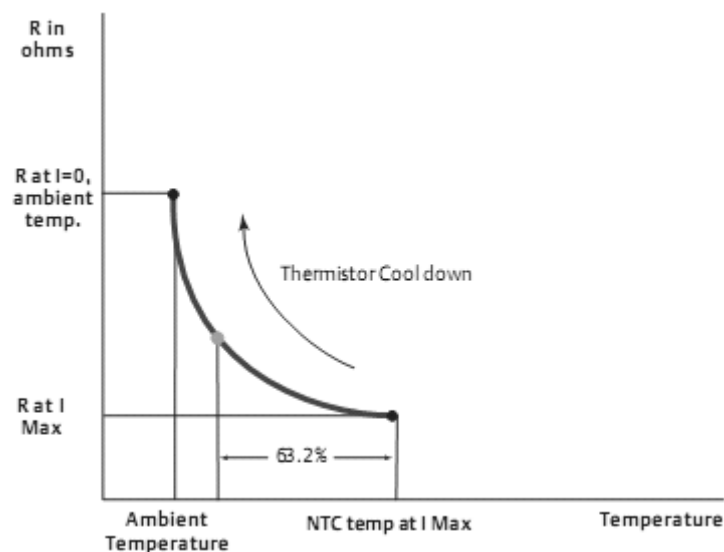


Chart 2 - Thermal Time Constant

NTC Thermistors

THERMISTOR TERMINOLOGY

ZERO-POWER TEMPERATURE COEFFICIENT OF RESISTANCE (ALPHA)

Zero-power temperature coefficient of resistance is the slope of the R-T curve at any given temperature is used to express the point. It is a measure of the rate of change in resistance of the thermistor at a specific temperature. Alpha is expressed in -%/°C. As the R-T curve is not linear, alpha is greater at lower temperatures than at higher temperatures.

$$\alpha_T = \frac{1}{R_T} \frac{(D R_T)}{(D T)}$$

Alpha is useful for determining what tolerances are required for an application. For example, the alpha value at 25°C for a particular NTC was -4.0%/°C, if the application requires a temperature accuracy ±0.5°C, then the NTC zero-power resistance at 25°C tolerance would need to be specified as ±2.0%. (4.0%*0.5)

TOLERANCE ON RESISTANCE

This is a method of measuring precision in NTC thermistors. Tolerance is the percentage of variation in resistance at a specific temperature. Tolerance is always stated as a percentage at a specified temperature. The industry standard is to use 25°C as the base temperature, unless another temperature is specified.

IMPORTANT NOTICE

The user must determine the suitability of our products for the application and assumes all risk and liability associated there with.

NTC Thermistors

THERMISTOR SENSOR TYPICAL APPLICATIONS

HVAC/R APPLIANCE

- Air conditioners
- Boiler heating system
- Washing machines
- Clothes dryers
- Electric water heaters
- Toasters
- Micro-wave oven
- Electronic thermometers
- Fire detectors
- Home weather stations
- Oven temperature controls
- Dishwashers
- Pool and spa controls
- Refrigerator and freezer temperature controls
- Electric blanket controls
- Small appliance controls
- Electrical thermostat
- Solar collector controls

AUTOMOTIVE

- Audio amplifiers
- Automatic climate controls
- Coolant sensors
- Electric coolant fan temperature controls
- Emission controls
- Engine oil temperature sensors
- Transmission oil temperature sensors
- Seat heating system control
- Intake air temperature sensors
- Water level sensors
- Outside air temperature sensors
- Engine block temperature sensors
- Oil level sensors

INDUSTRIAL ELECTRONICS

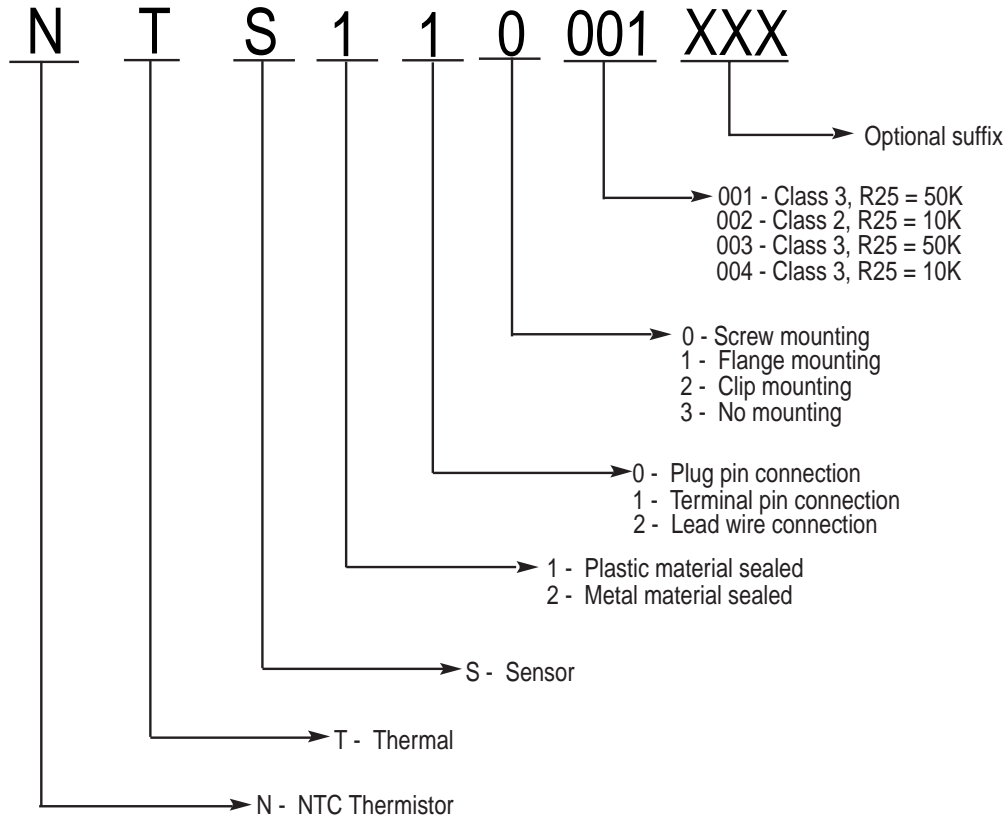
- Commercial vending machines
- Gas flow indicators
- HVAC equipment
- Industrial process controls
- Microwave power measurement
- Photographic processing equipment
- Plastic laminating equipment
- Solar energy equipment
- Thermoplastic molding equipment
- Thermostats
- Water purification equipment
- Welding equipment

FOOD HANDLING AND PROCESSING

- Coffee makers
- Deep fryers
- Fast food processing
- Temperature controlled food storage systems
- Thermometers for use in food preparation

NTC Thermistors

THERMISTOR SENSOR PART NUMBERING SYSTEM



Zettler NTS Thermistor sensor is designed according to UL 1434 or customer custom requirements. All components have excellent reliability and are RoHS compliant. Precision range term 1%, 2%, 3% and 5%.

FEATURES AND BENEFITS

THERMISTOR SENSOR BENEFITS INCLUDE:

- Engineered to specific application requirements
- Thermally responsive.
- Increased performance of the overall system in terms of energy consumption and ease of use.
- Reduced assembly cost and increased reliability.
- Rugged performance and long-term stability.

PLASTIC OVER-MOLDED SENSOR FEATURES AND BENEFITS INCLUDE:

- Plastic provides a much higher protection against moisture over time.
- Plastic probes can be made into more application-specific shapes.
- Plastic probes can eliminate multiple-part assemblies for customers and reduce their labor and combined material cost.
- Lower weight content than metal probes can benefit transportation costs.
- Piece price is typically more economical than metal-based probes

NTC Thermistors

THERMISTOR SENSOR VARIETIES

Zettler designed thermistor sensors use a variety of sensor types to further enhance their use in applications. The most common sensor is the axial glass encapsulated NTC thermistor which can be supplied with tight tolerances at multiple temperatures.

STANDARD PLASTIC MATERIALS

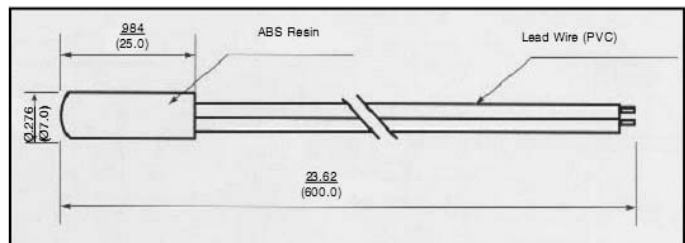
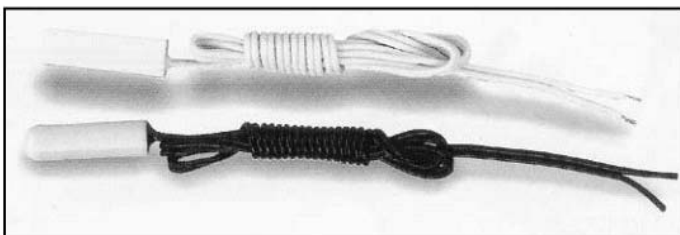
Standard plastic materials selections are based on use, probe shape, response time and cost. The most commonly used plastics are General Electric's Valox and Chevron Phillips Chemical's Ryton. The advantages of plastic are low cost, design shape flexibility and excellent moisture protection. Other protection methods are epoxy potted-metal housings and shrink tubing. Metal housings are typically brass, stainless steel or aluminum. The following are the most commonly used plastics. Customer-specified plastics can also be used.

- Valox - inexpensive, acceptable for use with food products
- Polypropylene - very inexpensive, low temperature rating
- Ryton - high temperature rating, good thermal conductivity, relatively expensive, harder but also more brittle than Valox or polypropylene.
- Other plastics used are Noryl and Ultem

Zettler can use all major brands of wire terminals and connector housings. The photos shown are just a small sampling of our capabilities. Please contact a Zettler Controls Applications Engineer for assistance in selecting the wire terminations and housings for your application.

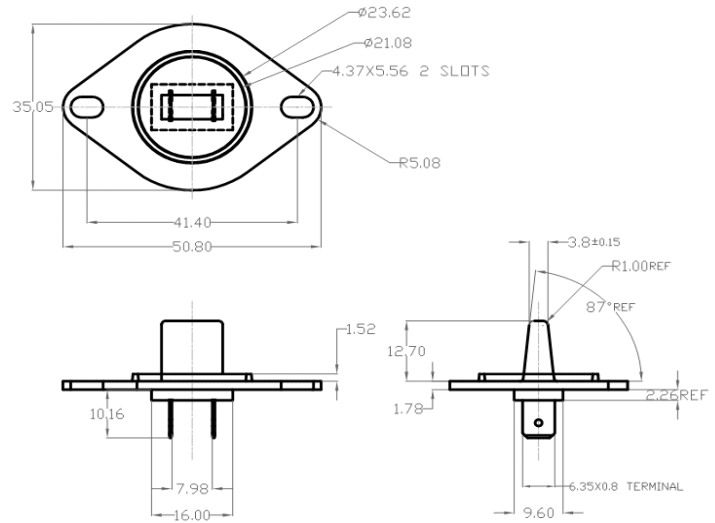
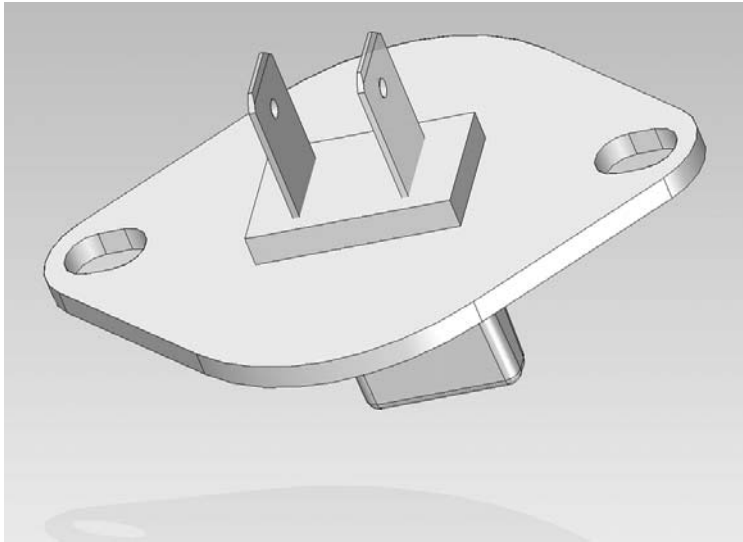
Temperature sensor typical package types : Plastic housing sealed, Metal housing sealed, Combined housing sealed, Simple housing packaged.

Plastic housing sealed temperature sensor housing materials include Valox PBT, Ryton PPS, PP, Nylon, Ultem. Use proper plastic material according to customer different shape, thermal time constant, cost and application requirements etc. Economical, shape complexity, moisture resistance, performance stability and light weight are the advantages of this kind of sensors. Normal material sealed sensors can be used in -40°C to +125°C environment, special plastic sealed sensors can be used up to +200°C.



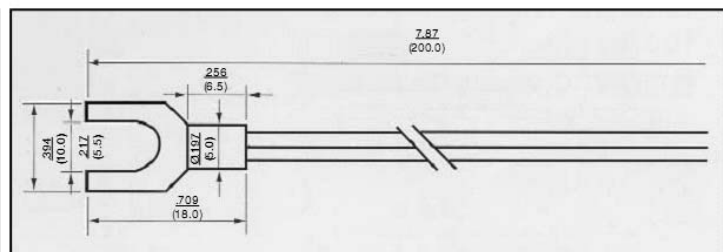
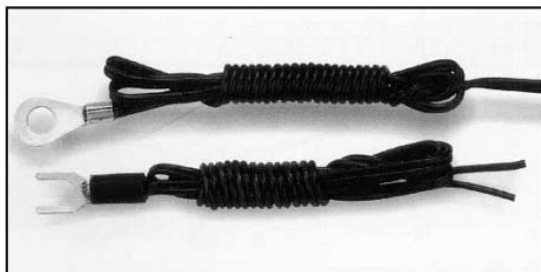
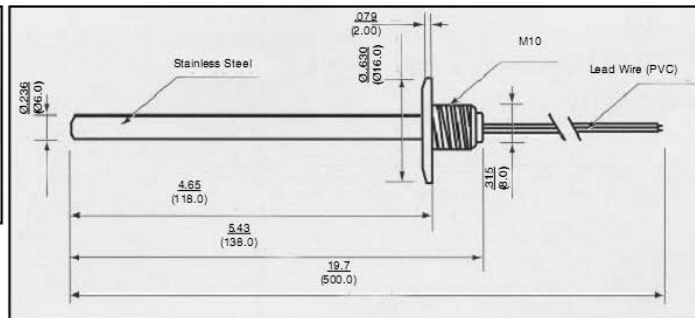
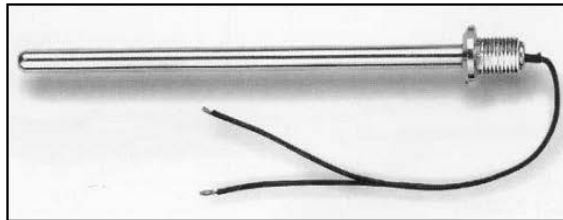
NTC Thermistors

THERMISTOR SENSOR VARIETIES



The NTC can be sealed completely in a plastic housing or can be exposed, this will be determined by customer's applications thermal response and dielectric strength requirement.

Metal housing sealed temperature sensor housing material options include Brass (copper), Stainless Steel, Aluminium etc. quick thermal response?strong construction, easy to fasten and high application environment temperature are the advantages. Some types can be used at -40°C to +250°C environment.

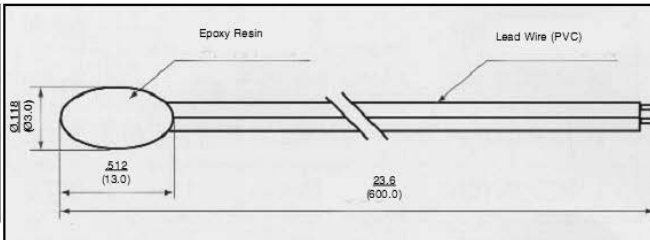
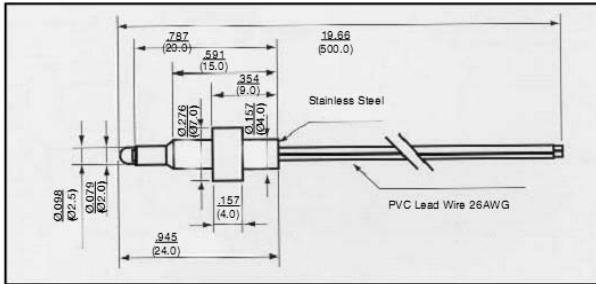
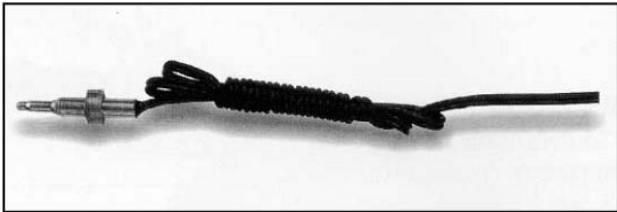
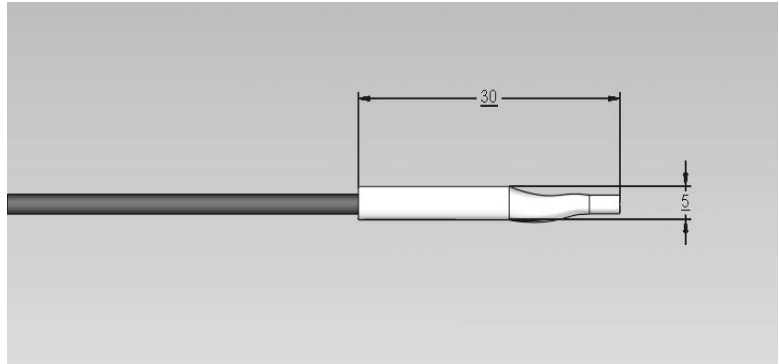
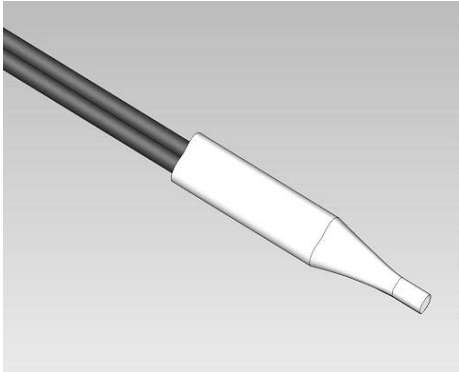
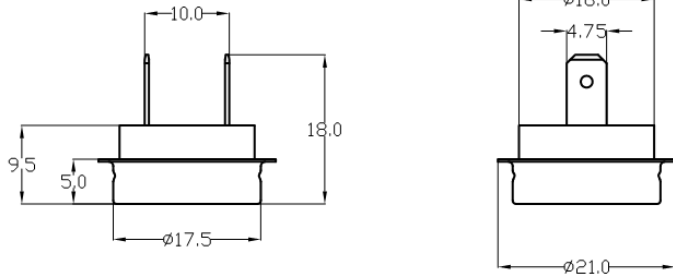
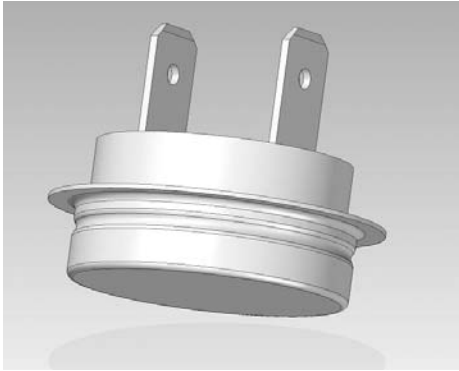


Combined housing sealed temperature sensor is normally housed by metal and plastic material together. It has the advantage of plastic housing sealed and metal housing sealed sensors, quick thermal response, strong construction, easy to have complex shape, easy to fasten, etc. to +250°C environment.

NTC Thermistors

THERMISTOR SENSOR VARIETIES

Simple housing packaged temperature sensor, the NTC normally is packaged by Teflon or PVC heat shrink sleeve or sealed by epoxy. This kind of sensor has simple construction, is economical and has good thermal response. They normally can be used in a clean application environment without strict environment conditions.



NTC Thermistors

WIDELY USED TEMPERATURE SENSING TECHNOLOGIES PERFORMANCE COMPARISON

SENSOR TYPE	NTC THERMISTOR	PLATINUM RESISTOR	THERMOCOUPLE	I.C. SENSOR
PARAMETER	Resistance vs. Temperature	Resistance vs. Temperature	Voltage vs. Temperature	Voltage or Current vs. Temperature
ADVANTAGES	<p>Large Change in Resistance vs. Temperature</p> <p>Fast Time Response</p> <p>High Resistance</p> <p>Eliminates the Need for Four Wire Measurement</p> <p>Small Size</p> <p>Inexpensive</p> <p>High Stability</p> <p>Interchangeable to Tight Tolerance</p>	<p>Linear</p> <p>High Stability</p> <p>Wide Operating Temperature Range</p> <p>Interchangeable Over Wide Temperature Range</p>	<p>Wide Operating Temperature Range</p> <p>Simple</p> <p>Inexpensive</p> <p>Rugged</p> <p>No External Power Supply Required</p>	<p>Linear High Output vs. Temperature</p> <p>Inexpensive</p>
DISADVANTAGES	<p>Non-Linear</p> <p>Operating Temperature Limited to Approximately -60 to +300 Degrees Celsius</p> <p>Interchangeable Over Relatively Narrow Temperature Ranges</p> <p>Current Source Required</p>	<p>Small Change in Resistance vs. Temperature</p> <p>Relatively Slow Time Response</p> <p>Low Resistance Requires Three or Four Wire Measurements</p> <p>Sensitive to Shock and Vibration</p> <p>Current Source Required</p> <p>Expensive</p>	<p>Non-Linear</p> <p>Relatively Low Stability</p> <p>Low Sensitivity</p> <p>Low Voltage Output can be affected by RFI and EMI</p> <p>Reference Junction Compensation Required</p>	<p>Limited Operating Temperature Range</p> <p>Current Source Required</p> <p>Subject to Self-Heating</p> <p>Limited Configurations</p>

NTC Thermistors

WIDELY USED TEMPERATURE SENSING TECHNOLOGIES PERFORMANCE COMPARISON

MODEL	Standard Resistance (R25) ohm	B(25/50 ° C)	Operating Temperature Range	US MODEL	Standard Resistance (R25) ohm	B(25/50 ° C)	Operating Temperature Range
TS110001	50K	3934	-40 - +125° C	NTS023001	5K	3470	-40 - +105° C
TS111001	50K	3934	-40 - +125° C	NTS123001	10K	3435	-40 - +105° C
TS111002	10K	3934	-40 - +125° C	NTS223004	10K	3470	-40 - +105° C
TS221002	50K	3950	-40 - +200° C	NTS223005	5K	3270	-40 - +105° C
TS221003	50K	3950	-40 - +200° C	NTS221007	10K	3380	-40 - +105° C
TS221001	40K	3950	-40 - +200° C	NTS221008	10K	3700	-40 - +105° C
TS221007	10K	3950	-40 - +200° C	NTS221009	10K	3700	-40 - +250° C
TS221008	10K	3950	-40 - +200° C	NTS123002	2K	3920	-40 - +60° C
TS221006	10K	3950	-40 - +200° C	NTS223006	10K	3950	-40 - +100° C
TS221004	10K	3934	-40 - +105° C	NTS221010	20K	3950	-40 - +105° C
TS223001	10K	4050	-40 - +105° C	NTS220001	50K	3950	-40 - +200° C
TS221005	10K	3380	-40 - +105° C	NTS220002	50K	4050	-40 - +105° C
TS023002	10K	3934	-40 - +105° C	NTS220003	23K	4200	-40 - +105° C
TS301001	50K	3934	-40 - +200° C	NTS123003	55K	4050	-40 - +80° C
TS223003	100K	4000	-40 - +105° C	NTS220004	23K	4200	-40 - +125° C

NOTES:

1. Custom orders are welcome.
2. If the model required is not listed, please submit the following information so our engineers can determine the correct product for you:
 - a. Operating temperature range, working criteria and dielectric requirements for the sensor (i.e.: air, water, oil, etc.).
 - b. Required temperature reaction time (thermal time constant).
 - c. Outline size (include drawing).
3. For your convenience, we have our own processing equipment for the terminations. Interface terminals can be processed and the guard sleeve can be assembled to your requirements.
4. We can develop temperature sensors with different types of specifications and outlines to meet your needs.

ZETTLER

CONTENT



KSD301A 1/2" (12.7mm) Series Snap-Action Temperature Controls _____ P84



KSD301B Series Temperature Controls _____ P93



KSD301C 3/4" (19mm) Series Temperature Controls _____ P98



KSD301C Heat Sequencers - Time Delay _____ P104



KSD301C Series Temperature Sensing Controls _____ P107

Catalog Revision A

This catalog features our most popular thermostats and temperature controls. This is a small sampling of the many configurations and variations that we offer. We welcome the opportunity to discuss any requirements that you may have. **Please send your inquiries to: sales@zettlercontrols.com**



KSD301A 1/2" (12.7mm) Series Snap-Action Temperature Controls

Similar to TOD Series 36T


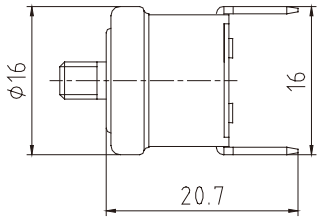
Specifications


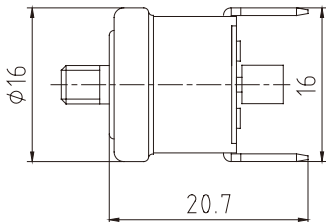
1. Electrical Ratings: AC120V 5A, 10A, 16A, AC250V 10A, 16A, 20A
2. OFF Temperature Range
 - a. Ceramic: -0°C ~ 250°C (-32F~ 482°F)
 - b. Bakelite: -30°C ~ 150°C (-22F~ 287°F)
3. Tolerance: Min ± 2°C Standard ± 5°C
4. A variety of terminal, switch case and mounting configurations are available for maximum design flexibility
5. NOTE: Please contact us to discuss specific custom requirements

Applications:


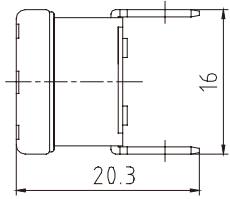
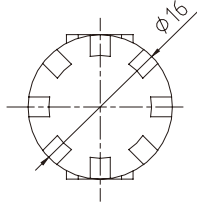

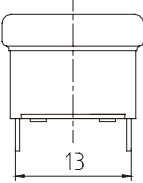
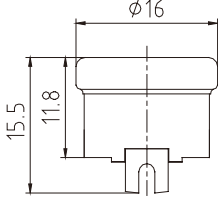

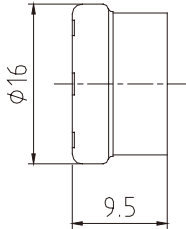
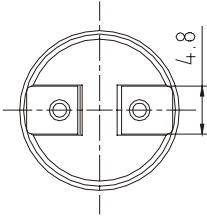

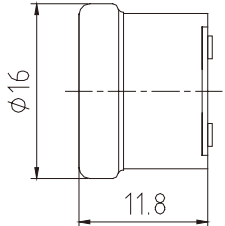
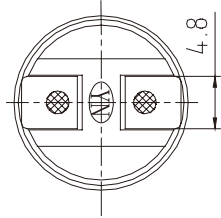

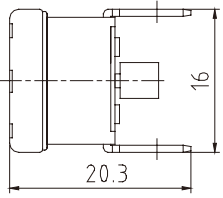
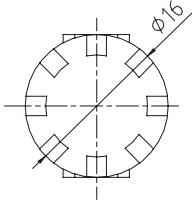
Boiler, Water Heater, Vacuum Cleaner, Copier, Electric Stove, Oven, Dryer, Refrigerator, Dish Washer, Air-Conditioning etc.


Approvals: UL CQC TUV VDE CUL CE

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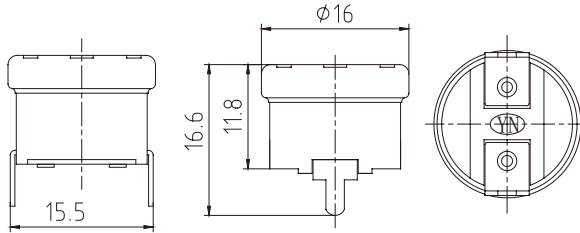
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 <p>A113</p>		 <p>Material: Bakelite Ceramic PPS</p>
 <p>A113B</p>		 <p>Material: Bakelite Ceramic PPS</p>
 <p>A113E</p>		 <p>Material: Bakelite</p>
 <p>A113F</p>		 <p>Material: Bakelite Ceramic PPS</p>
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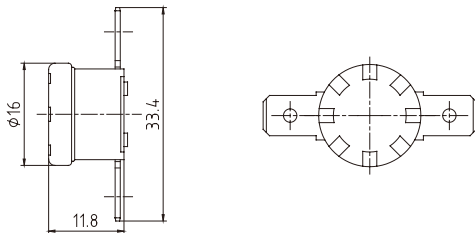
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Ceramic
PPS



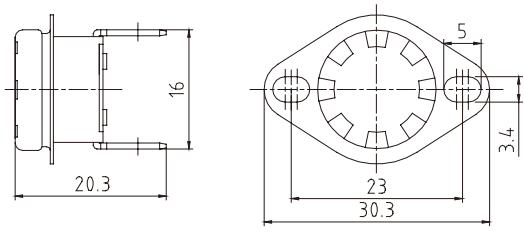
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Ceramic
PPS



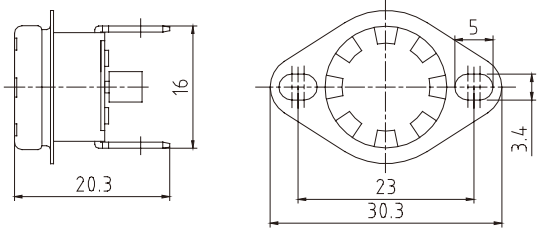
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Material:
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Ceramic
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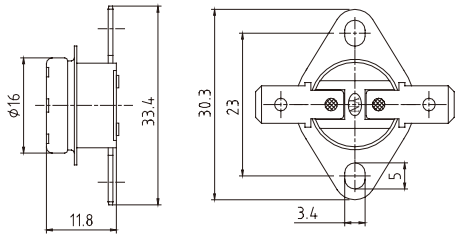
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Material:
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Ceramic




A314

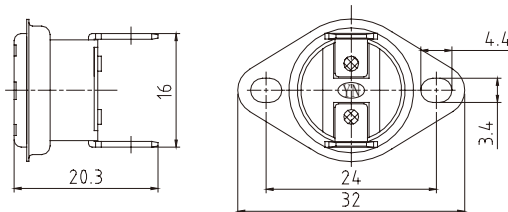


Material:
Bakelite
Ceramic
PPS






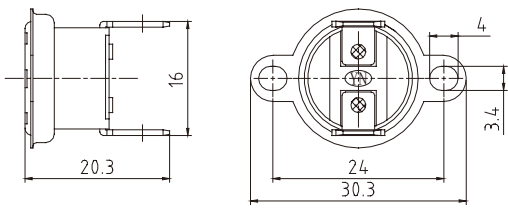
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Ceramic
PPS



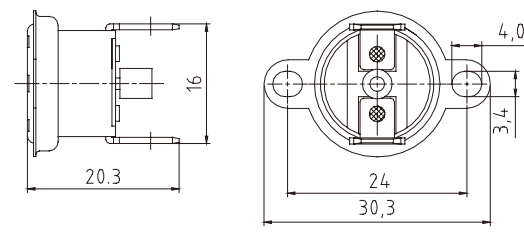
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Material:
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Ceramic
PPS



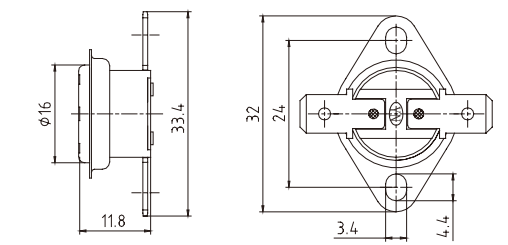
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Material:
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Ceramic



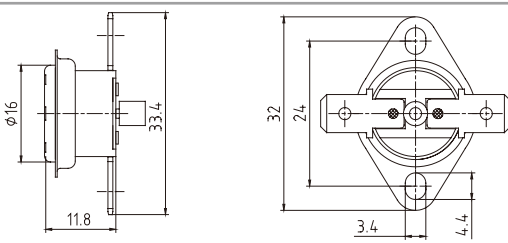
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Material:
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Ceramic
PPS



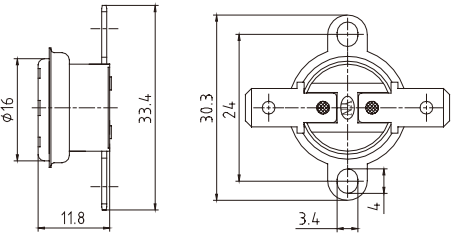
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Material:
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Ceramic



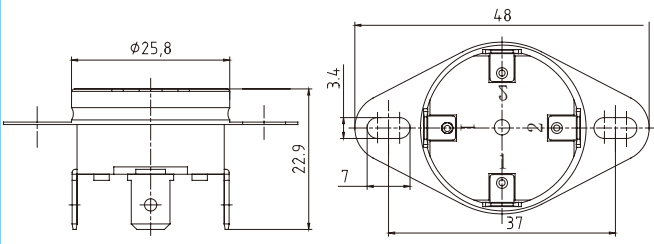
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Material:
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Ceramic
PPS



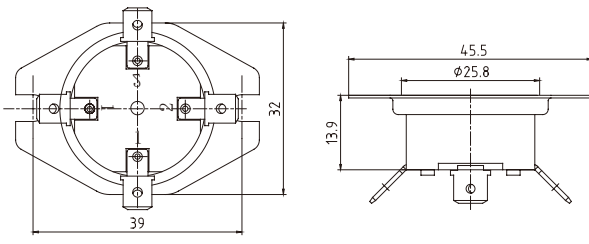
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Material:
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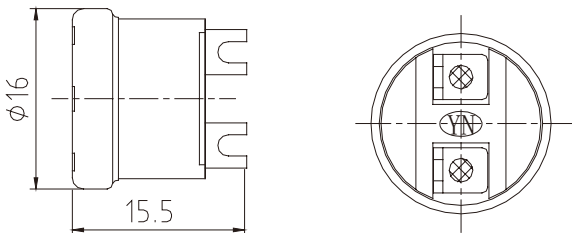
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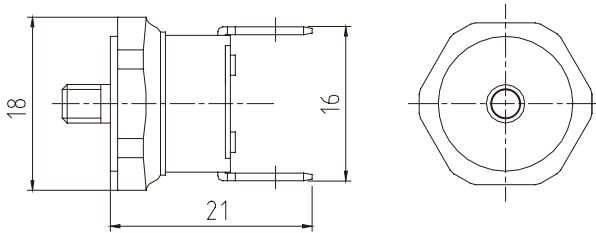
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Material:
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Ceramic
PPS



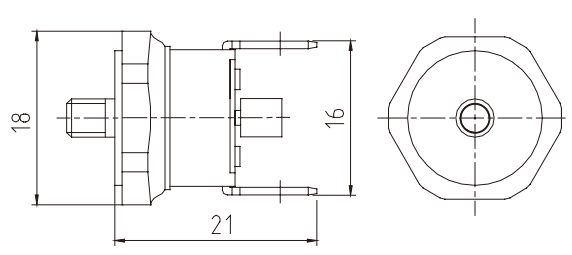
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Material:
Bakelite
Ceramic
PPS



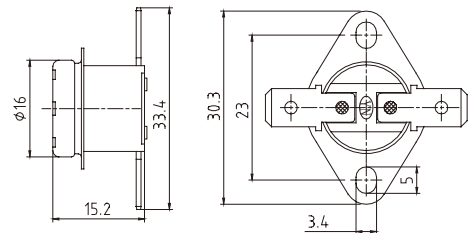
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Material:
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Ceramic
PPS



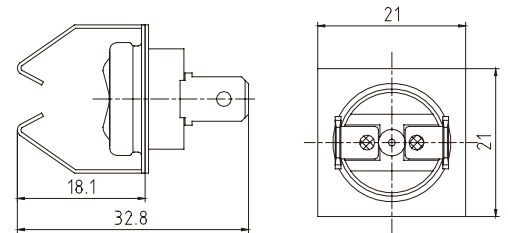
PTC




Material:
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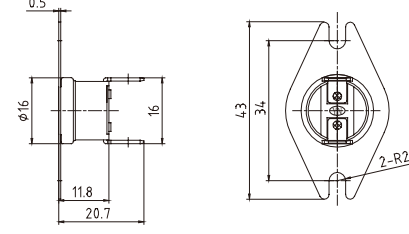
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Material:
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Ceramic



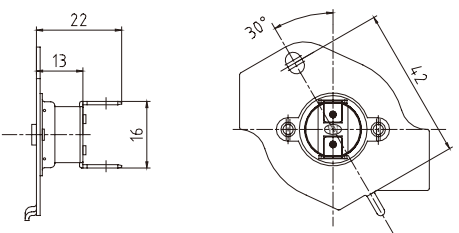
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Material:
Bakelite
Ceramic
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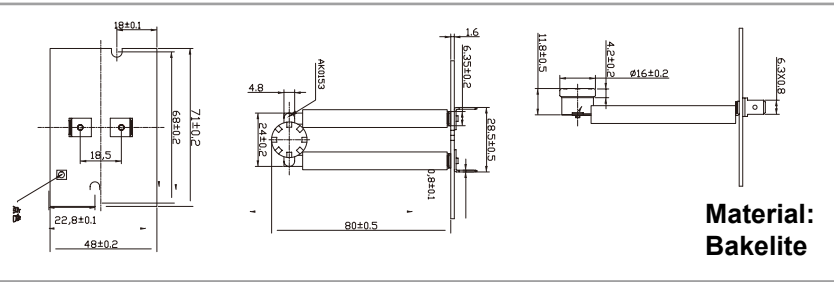
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Material:
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Ceramic



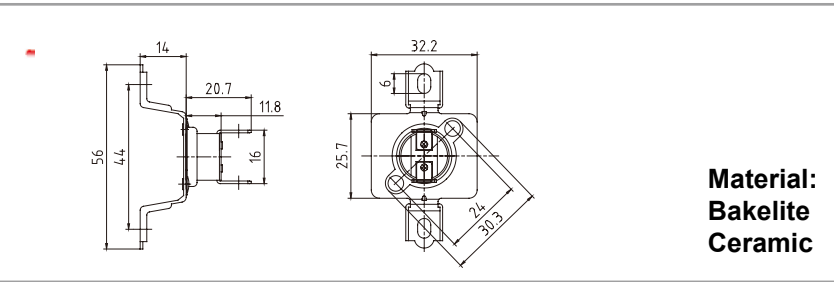
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A2-027



Material:
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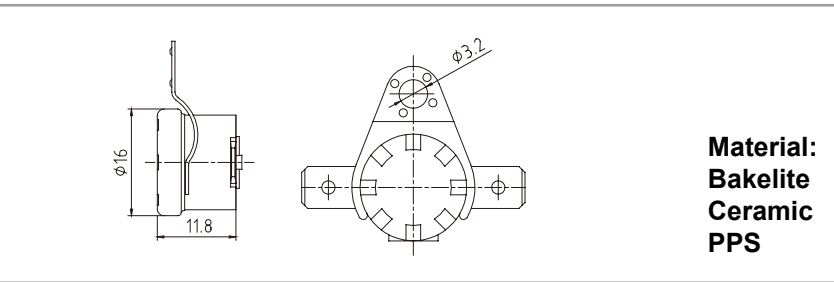
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Material:
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Ceramic



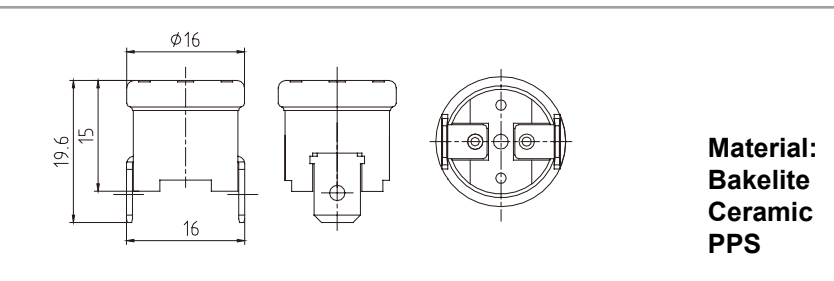
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Material:
Bakelite
Ceramic
PPS



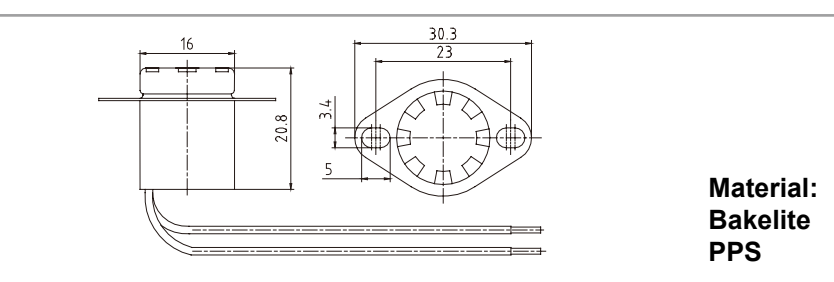
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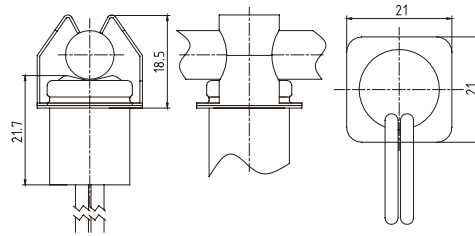
Material:
Bakelite
Ceramic
PPS



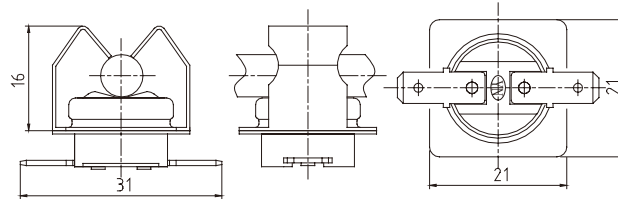
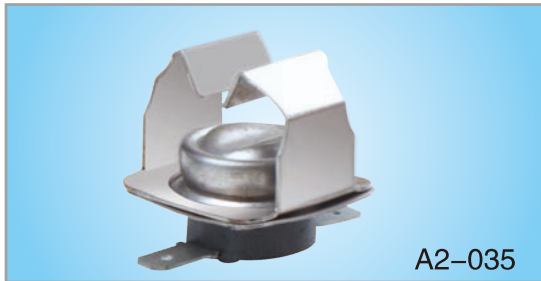
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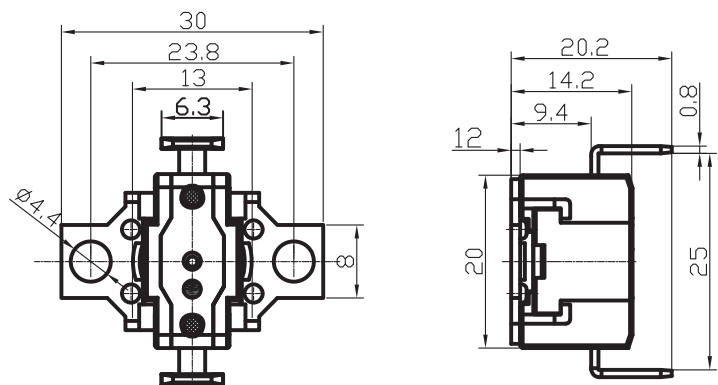
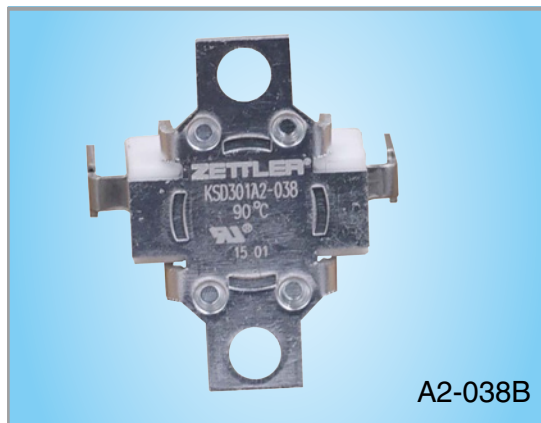
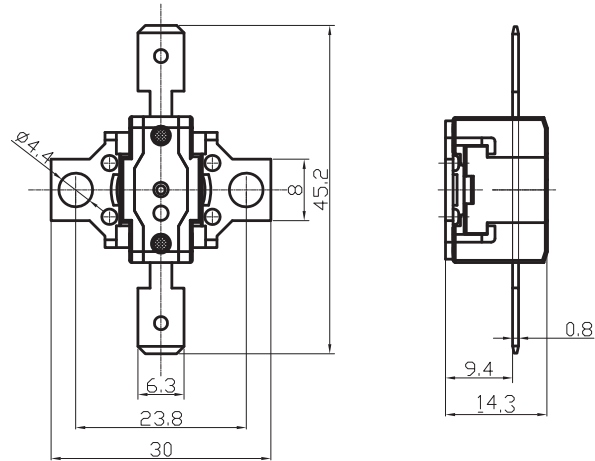
Material:
Bakelite
PPS

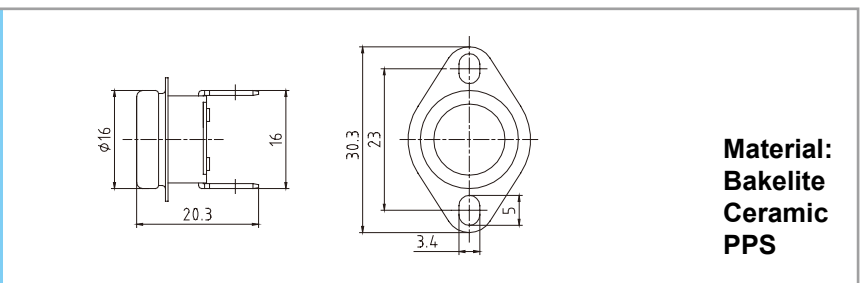
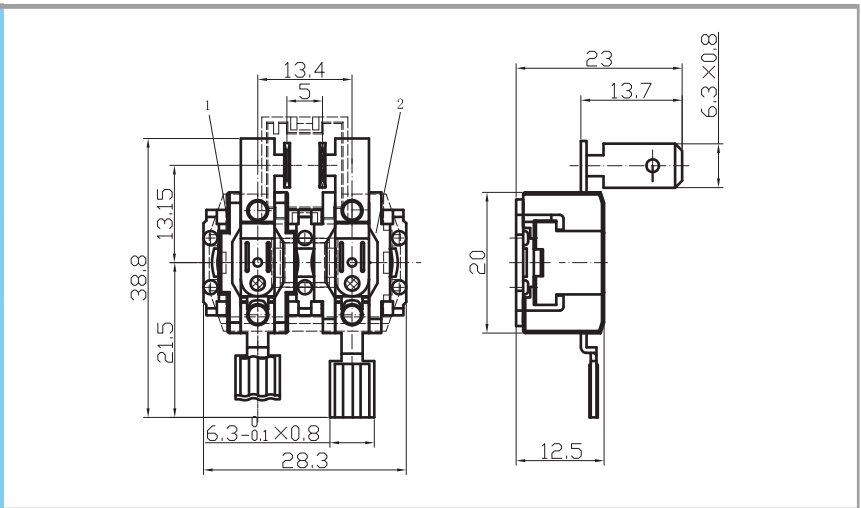
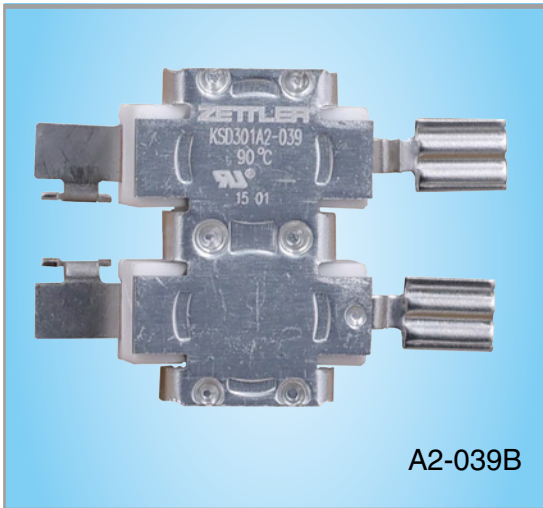
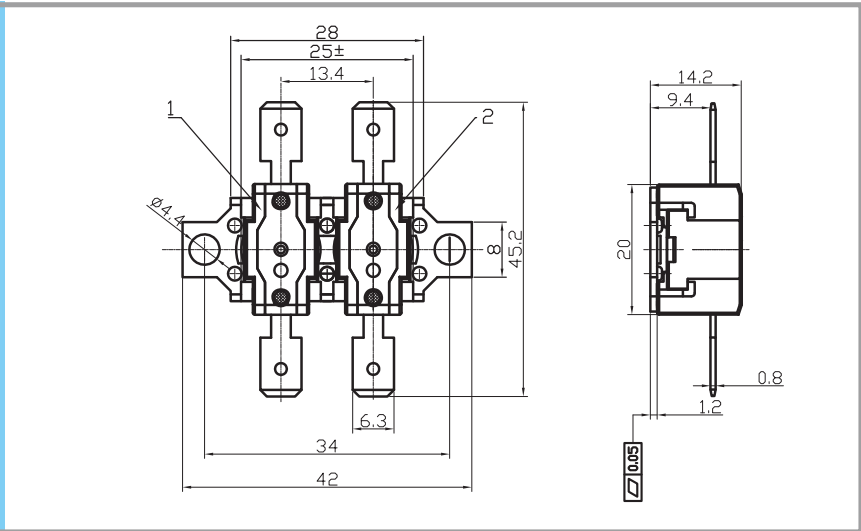


Material:
Bakelite
PPS



Material:
Bakelite
Ceramic
PPS





KSD301B Series Temperature Controls

Specifications

1. Electrical Ratings: AC120V/240V/277V 5A 15A, AC250V 10A 16A 25A
2. OFF Temperature Range -30°C ~ 105°C (-22°F~ 221°F)
3. Diff Temp: Min 5°C ; Standard 15~25°C
4. Tolerance: Min ± 3°C Standard ± 5°C
5. A variety of terminal, switch case and mounting configurations are available for maximum design flexibility
6. NOTE: Please contact us to discuss specific custom requirements

Applications:


Refrigerator, Air-Conditioning, Ice maker, Freezer, etc.

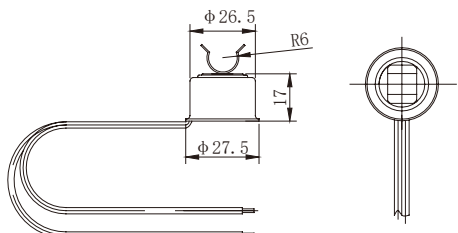
Approvals: UL CQC TUV VDE CUL CE






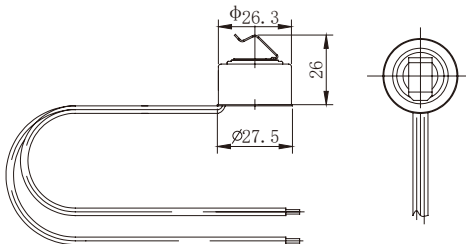
B-001




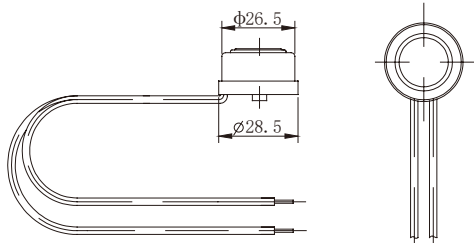

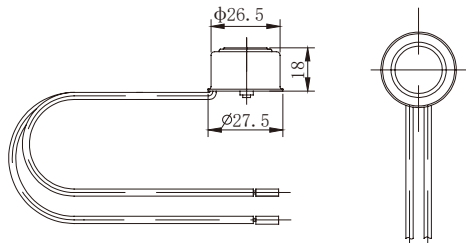

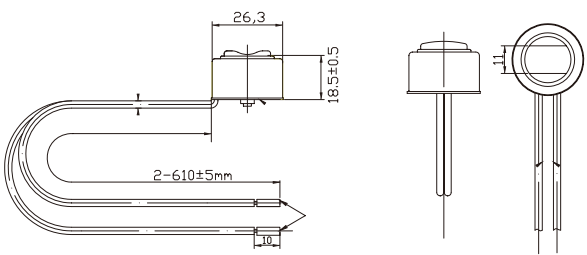

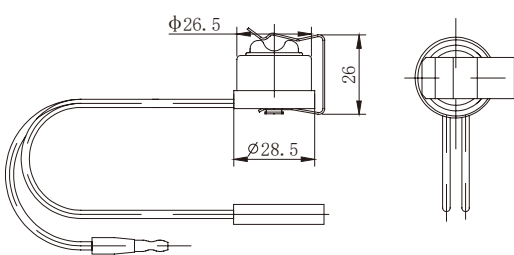

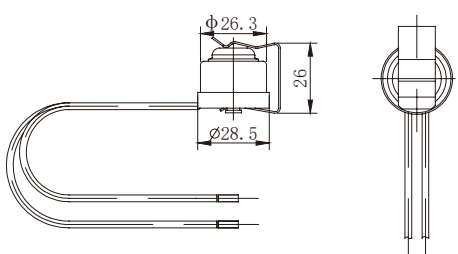


B-002






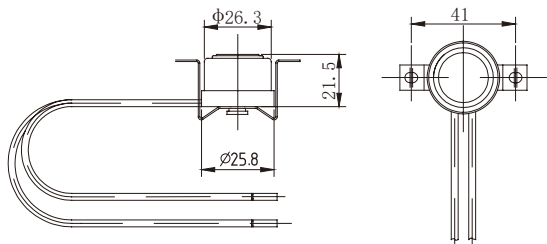
B-003A


 <p>B-004</p>	
 <p>B-006</p>	
 <p>B-006B (φ 16)</p>	
 <p>B-007</p>	
 <p>B-008</p>	



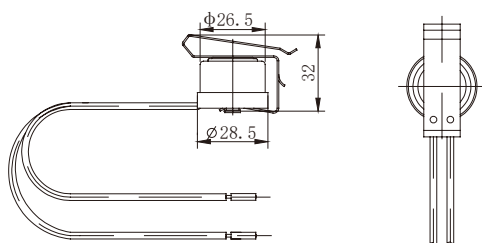



B-010



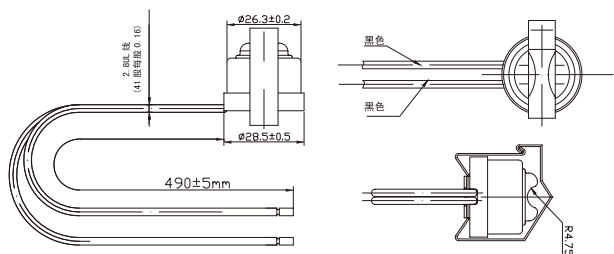



B-012



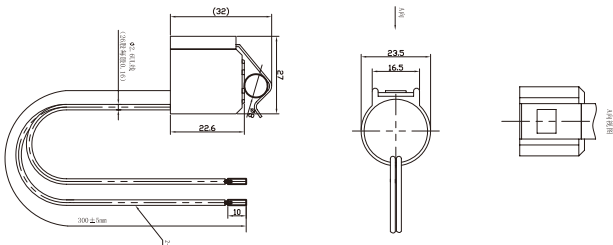



B-017



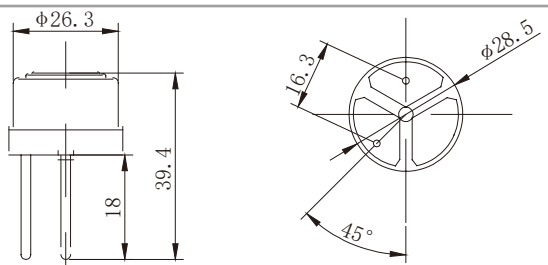


B-018



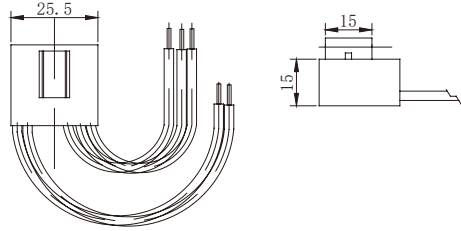


B-019

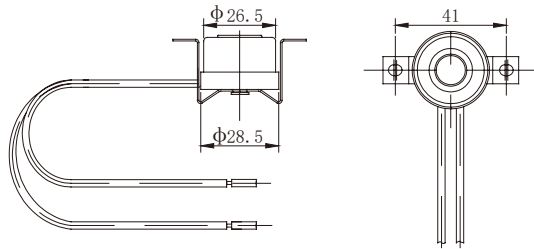




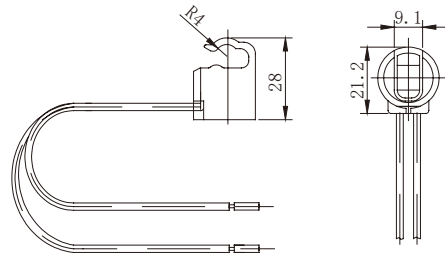
B-022



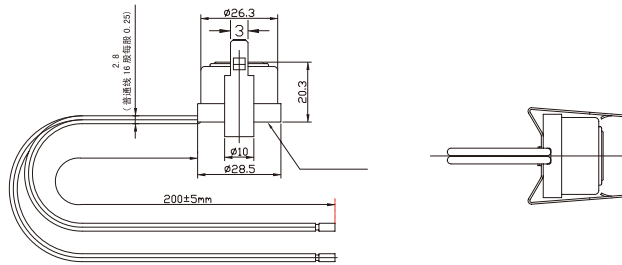
B-023



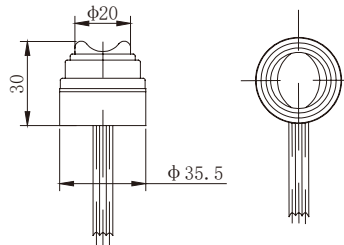
B-024

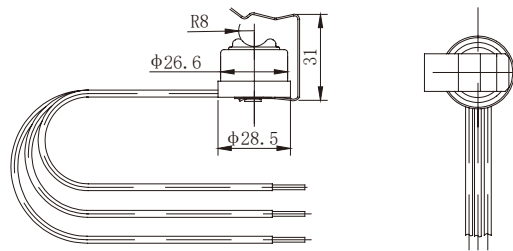
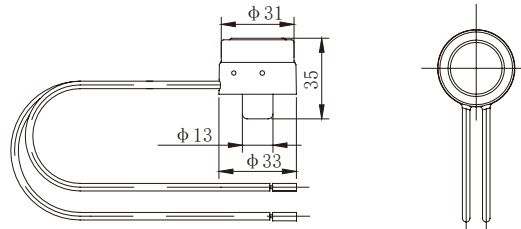
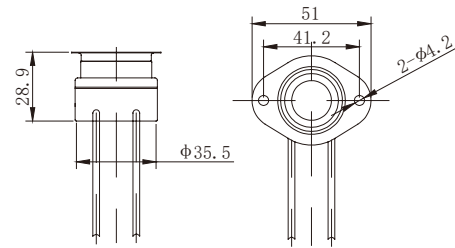
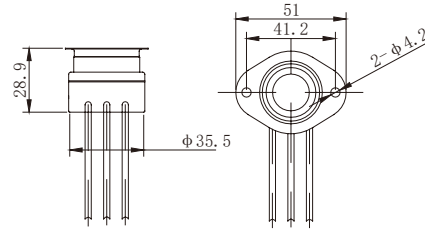
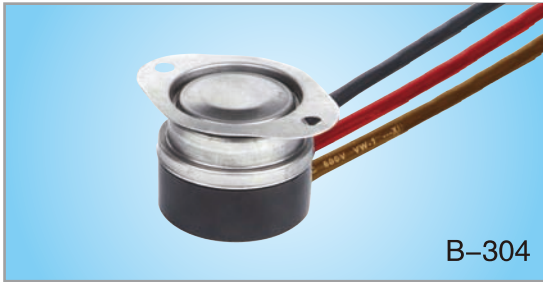


B-025



B-301





KSD301C 3/4" (19mm) Series Temperature Controls

Specifications

Similar to TOD Series 60T

1. Electrical Ratings: AC125V 5A 15A, AC250V 5A 10A 16A
2. OFF Temperature Range:
3. Bakelite: Automatic -30°C ~ 150°C; 30°C ~ 150°C
4. Tolerance: Automatic: Min ± 3°C Standard ± 5°C, Manual: Min ± 4°C Standard ± 5°C
5. A variety of mounting flanges are available to meet the insulation requirements.

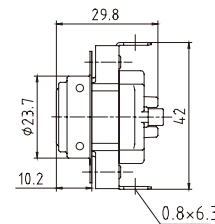
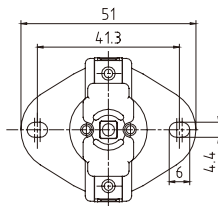
Applications:

Air Conditioners, heating and ventilating equipment, vending machines, dryers, unit heaters, tabletop appliances, etc.

Approvals: UL CQC TUV VDE CUL



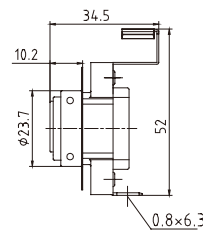
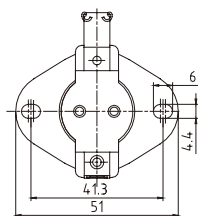
C-001R



Material:
a. Bakelite
Load:
250V / 25A
Switch Action:
SPST



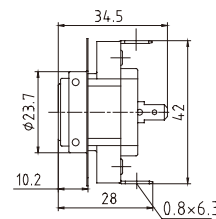
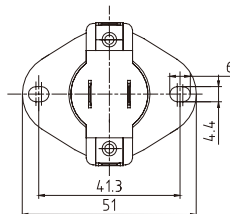
C-002



Material:
a. Bakelite
Load:
250V / 25A 600V / 15A
Switch Action:
SPST




C-003

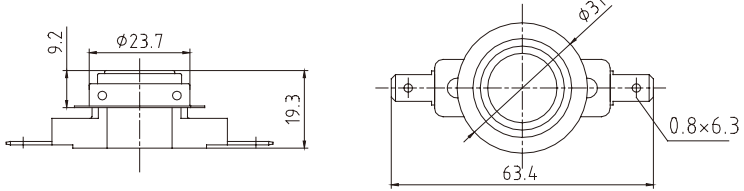


Material:
a. Bakelite
Load:
250V / 25A 600V / 15A
Switch Action:
SPST






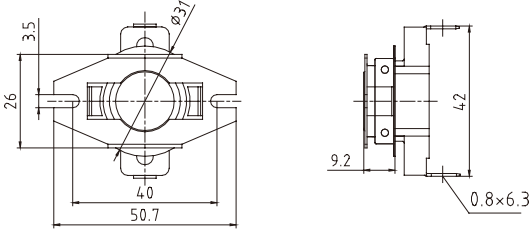
C-004




Material: a. Bakelite **Load:** 250V / 25A 600V / 15A **Switch Action:** SPST



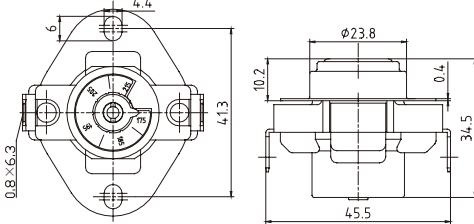
C-004A




Material:
a. Bakelite
Load:
250V / 25A
Switch Action:
SPST



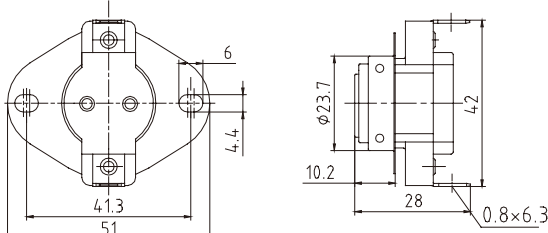
C-005




Material:
a. Bakelite
Load:
250V / 25A
Switch Action:
SPST



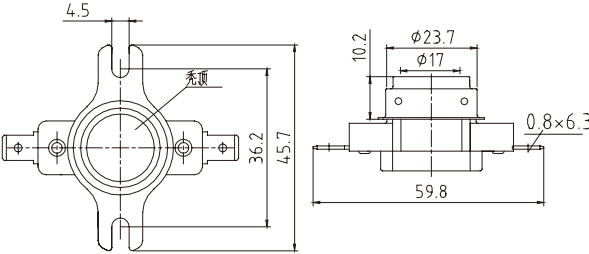
C-007



Material:
a. Bakelite
Load:
250V / 25A 600V / 15A
Switch Action:
SPST

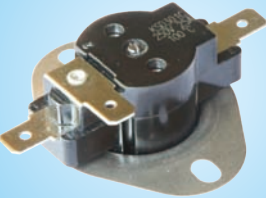


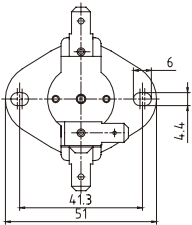
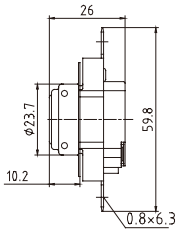
C-007S



Material:
a. Bakelite
Load:
250V / 25A 600V / 15A
Switch Action:
SPST









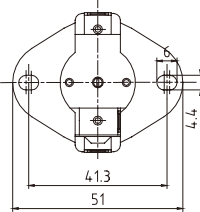
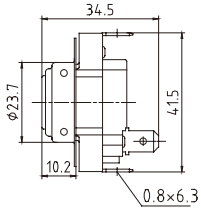
Material:
a. Bakelite

Load:
250V / 25A 600V / 15A

Switch Action:
SPDT

C-008







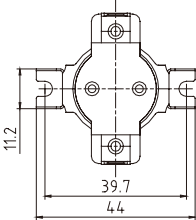
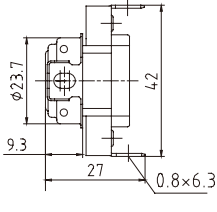
Material:
a. Bakelite

Load:
250V / 25A 600V / 15A

Switch Action:
SPDT

C-008B C-008C







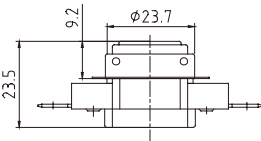
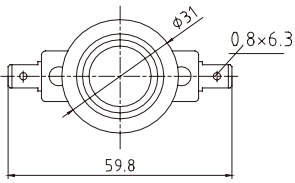
Material:
a. Bakelite

Load:
250V / 25A 600V / 15A

Switch Action:
SPST

C-009 C-009B







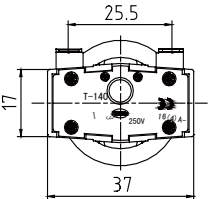
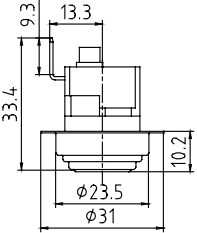
Material:
a. Bakelite, b. Ceramic

Load:
250V / 25A 600V / 15A

Switch Action:
SPST

C-011




Material:
a. Bakelite

Load:
250V / 25A

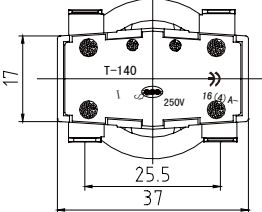
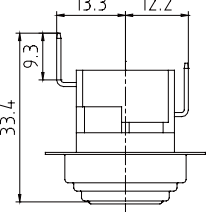
Switch Action:
SPST

C-013R C-013






C-014(4Pin)

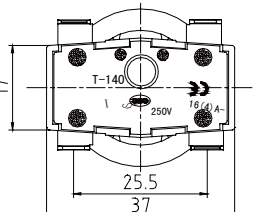
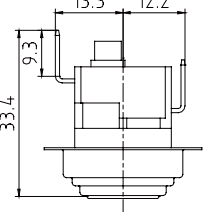
Material:
a. Bakelite

Load:
250V / 16A

Switch Action:
SPST DPST




C-014R(4Pin)

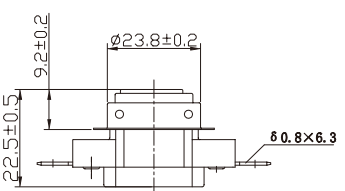
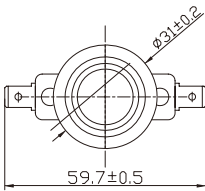
Material:
a. Bakelite

Load:
250V / 16A

Switch Action:
SPST DPST




C-017

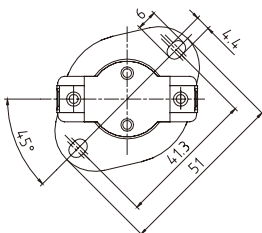
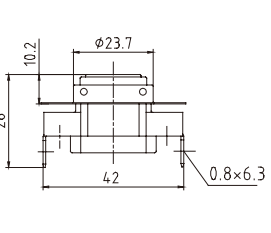
Material:
a. Bakelite b. Ceramic

Load:
250V / 25A 600V / 15A

Switch Action:
SPST




C-018

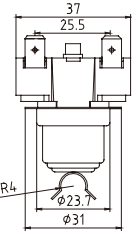
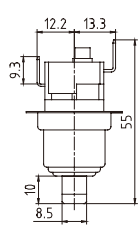
Material:
a. Bakelite b. Ceramic

Load:
250V / 25A 600V / 15A

Switch Action:
SPST



C-021R





Material:
a. Bakelite

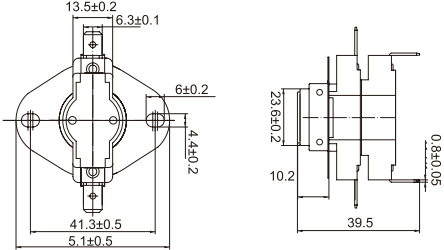
Load:
250V / 16A

Switch Action:
SPST DPST






C-022



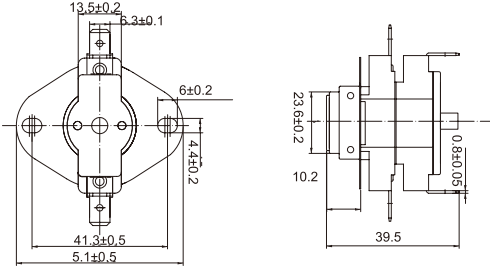
Material:
a. Bakelite

Load:
250V / 25A

Switch Action:
DPST 2SPST




C-022R



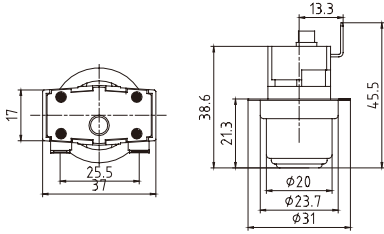
Material:
a. Bakelite

Load:
250V / 25A

Switch Action:
DPST 2SPST




C-023R



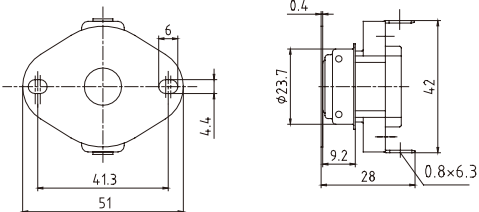
Material:
a. Bakelite

Load:
250V / 16A

Switch Action:
SPST




C-025



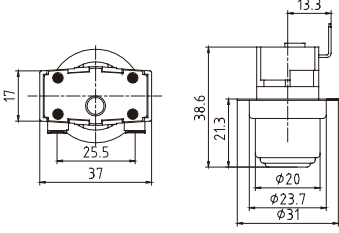
Material:
a. Bakelite b. Ceramic

Load:
250V / 25A 600V / 15A

Switch Action:
SPST



C-027




Material:
a. Bakelite

Load:
250V / 16A

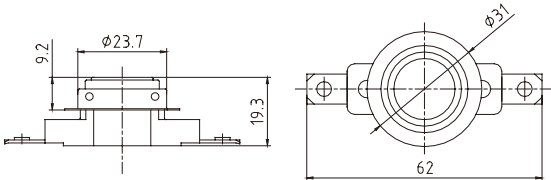
Switch Action:
SPST

Terminal:
Nickell plated Brass






C-301



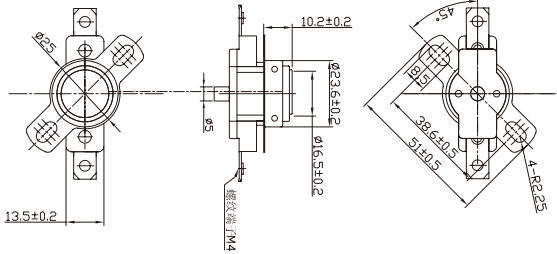
Material:
a. Bakelite

Load:
250V / 45A

Switch Action:
SPST




C-301R



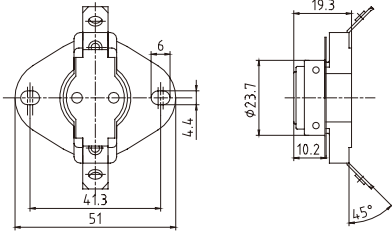
Material:
a. Bakelite

Load:
250V / 45A

Switch Action:
SPST




C-302



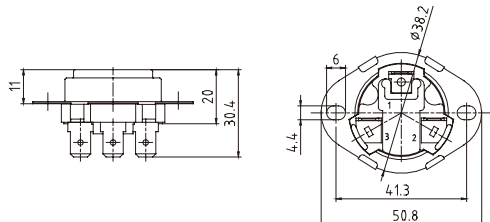
Material:
a. Bakelite

Load:
250V / 45A

Switch Action:
SPST



C-305



Material:
a. Bakelite

Load:
250V / 25A

Switch Action:
SPST

KSD301C Heat Sequencers - Time Delays

Features

Controls the delayed operation of heating elements or fans in electric furnaces and heat pumps

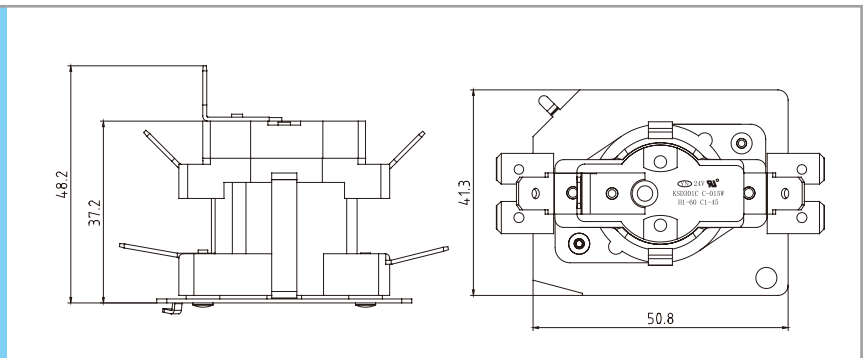
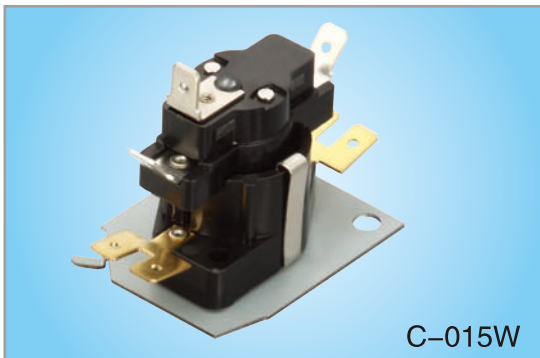
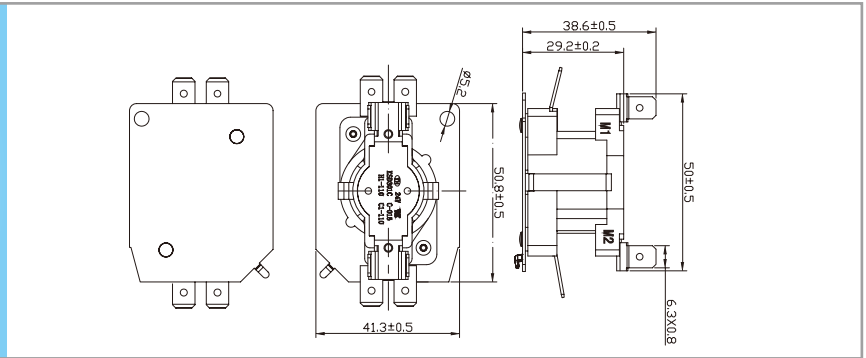
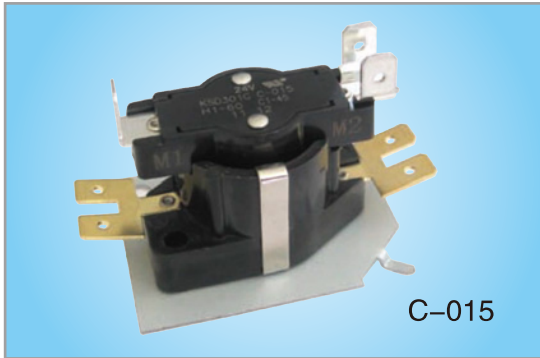
Combines a solid-state positive temperature coefficient (PTC) heater, Option of single, double, or three independent timing contacts.

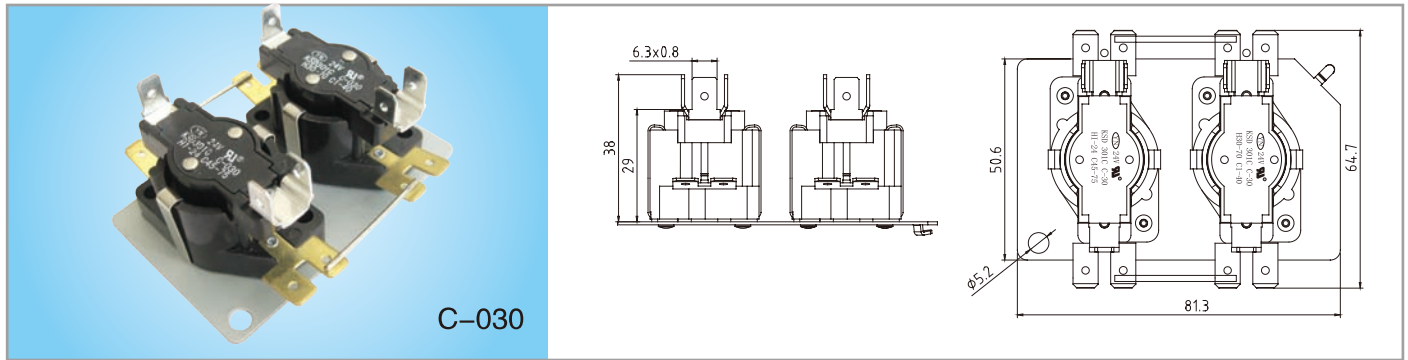
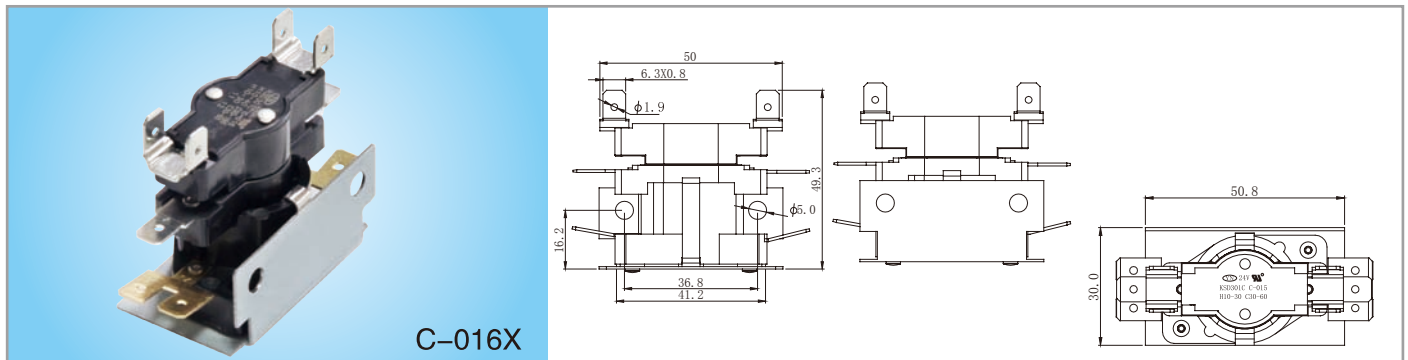
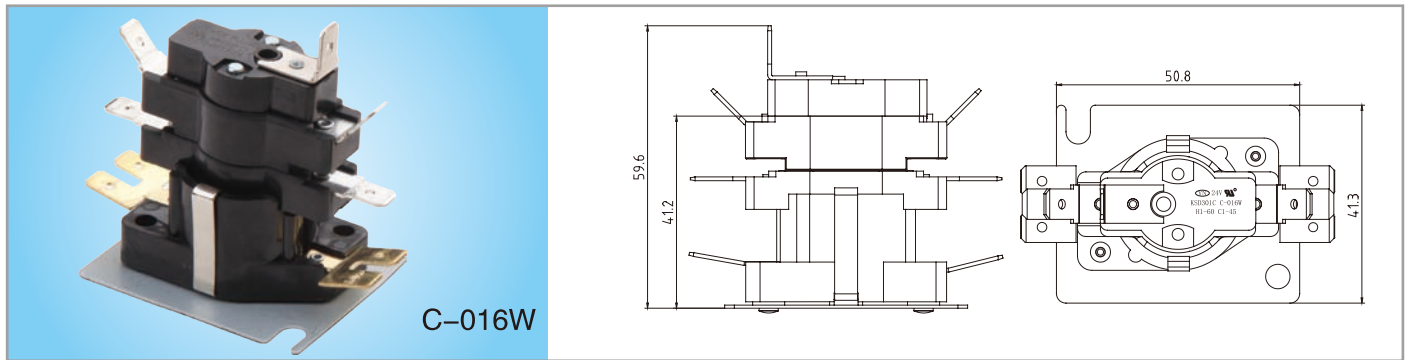
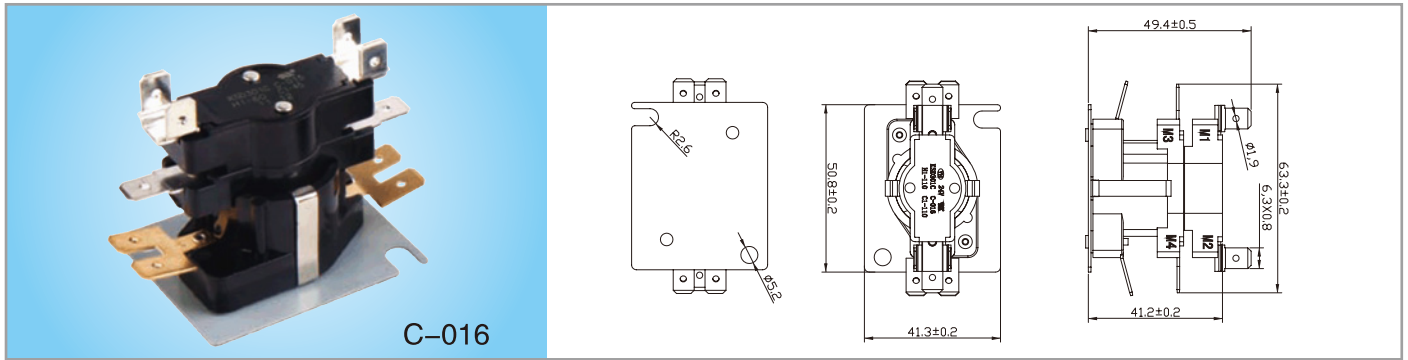
UL and CUL approval

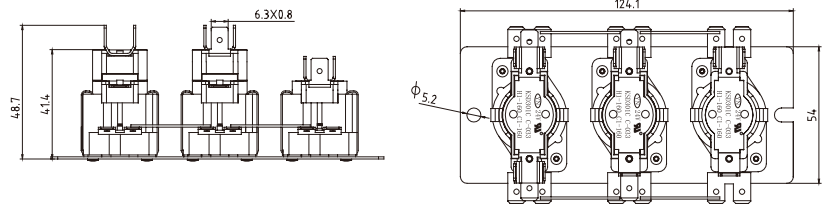
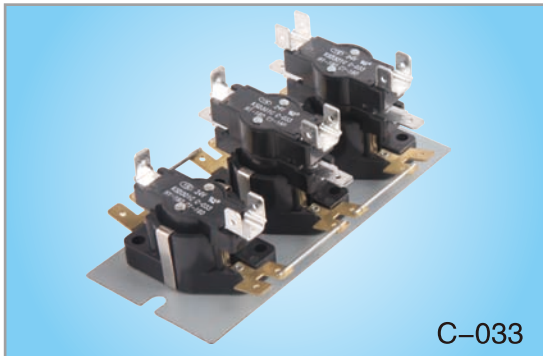
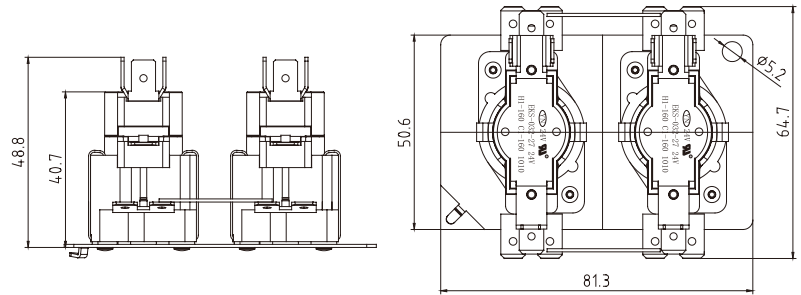
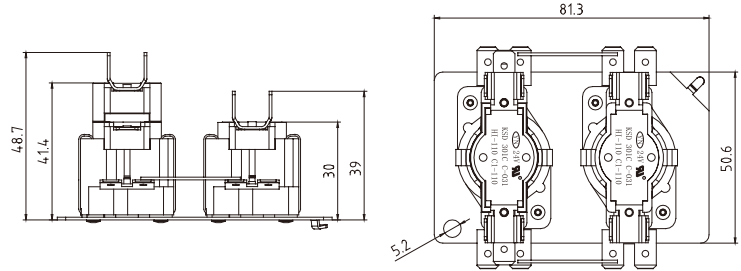
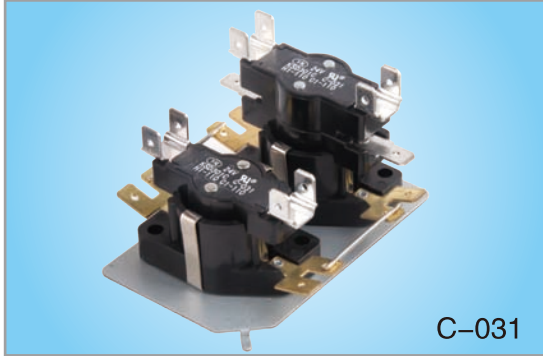
Applications

Electric Furnaces, Heat Pumps, Gas Furnaces, etc.

Approvals: UL CUL







KSD301C Series Temperature Sensing Controls

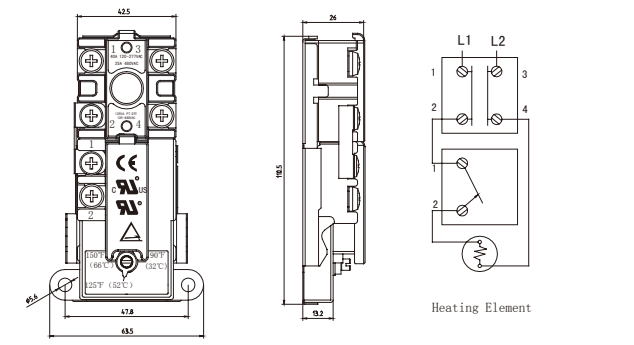
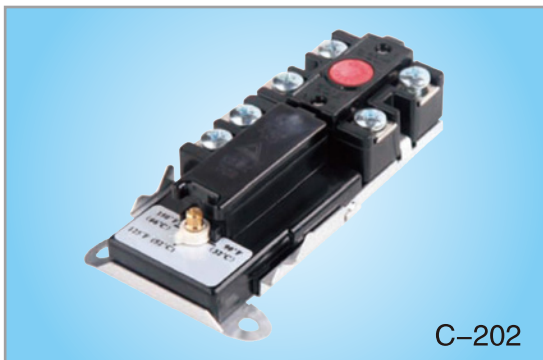
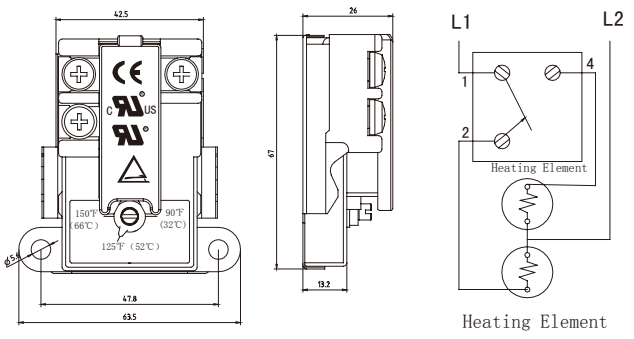
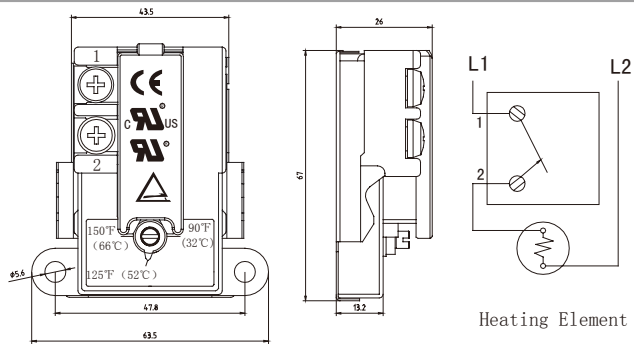
UNIVERSAL REPLACEMENTS FOR ELECTRIC WATER HEATER THERMOSTATS

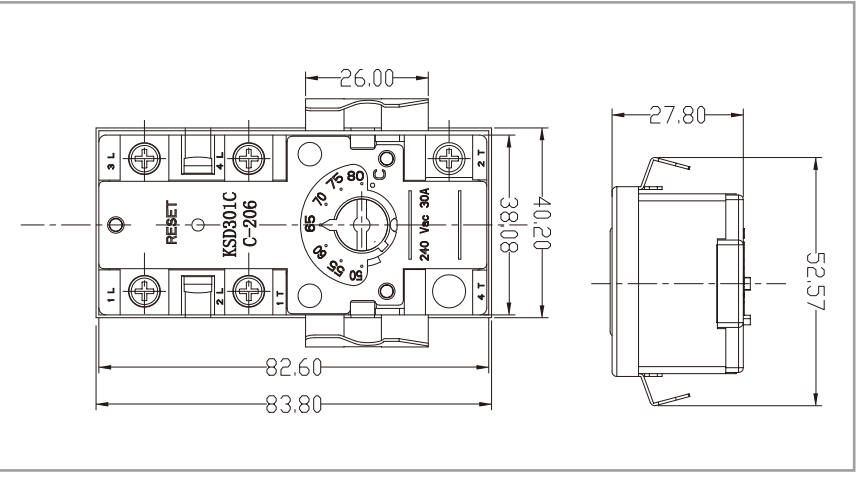
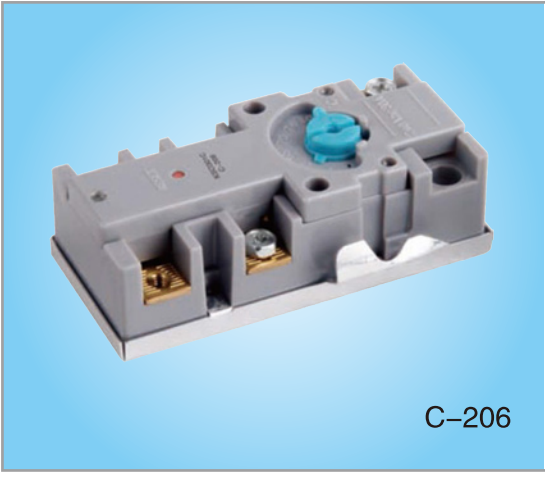
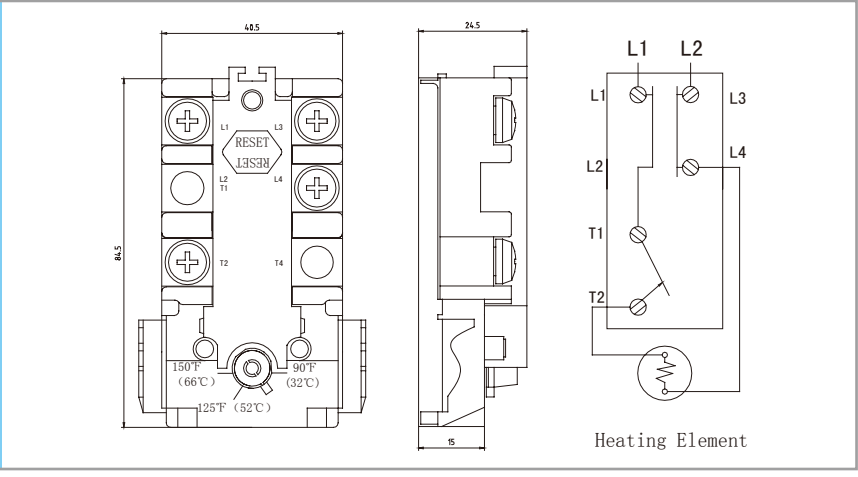
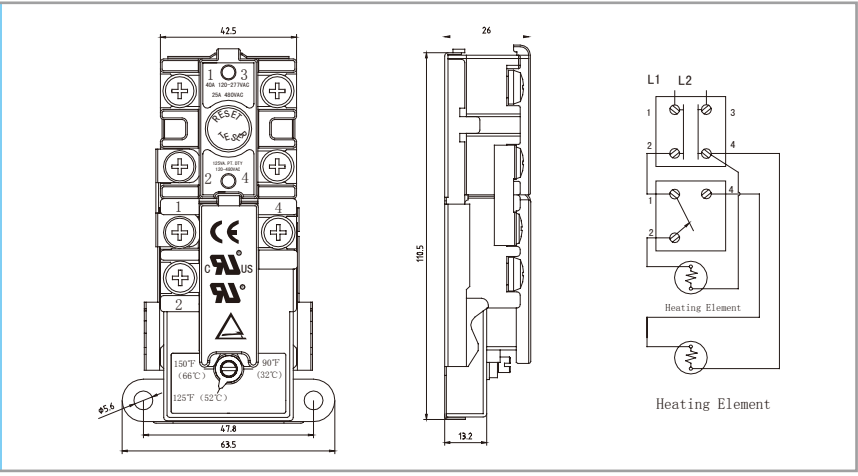
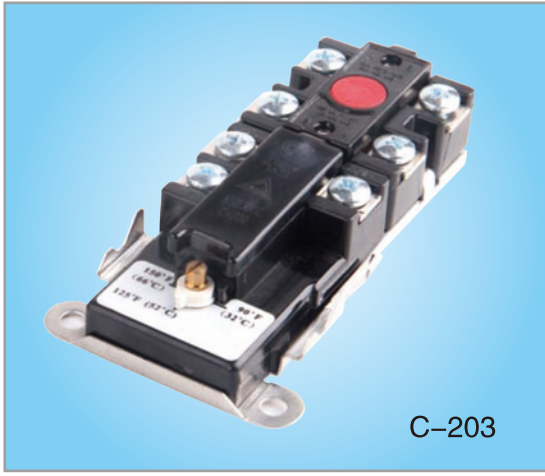
Panel Mount Temperature Sensing Controls

Features

1. High Electrical capacity
2. Snap-Action cont
3. Long life-proven reliability
4. Adjustable control or manual reset sty

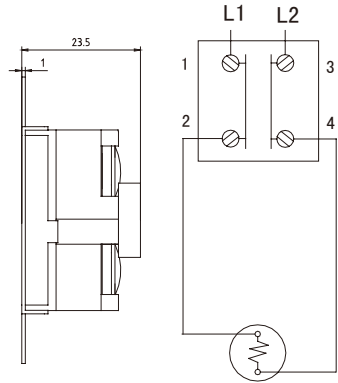
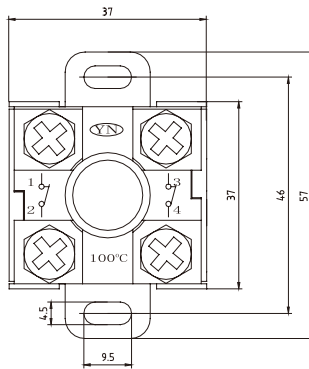
Approval: UL TUV CUL CE







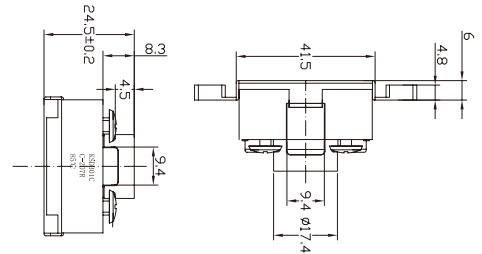
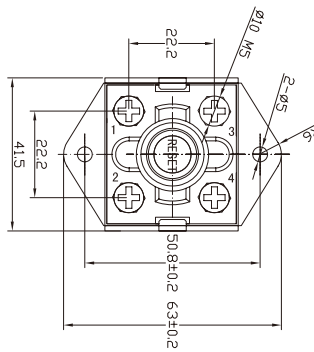
C-207



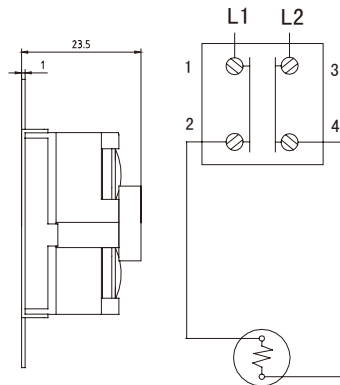
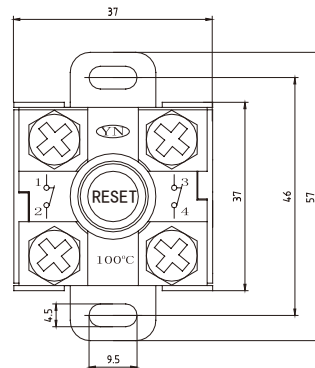
Heating Element



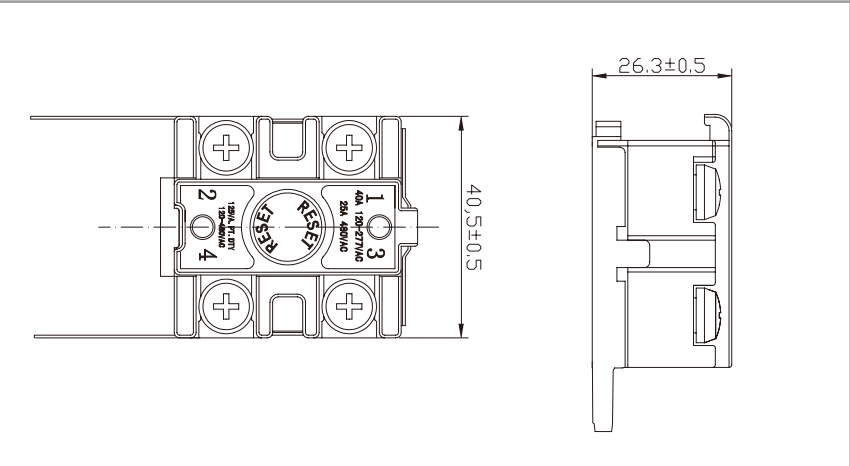
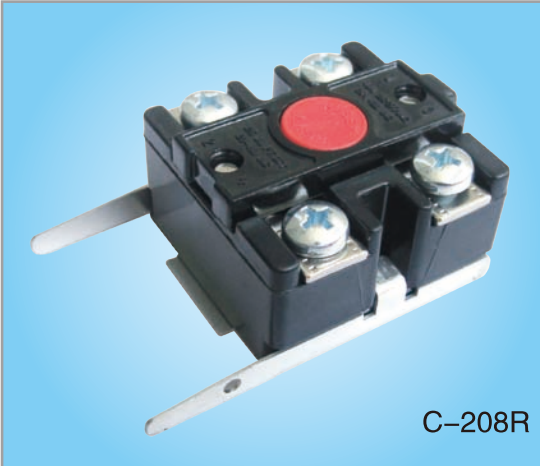
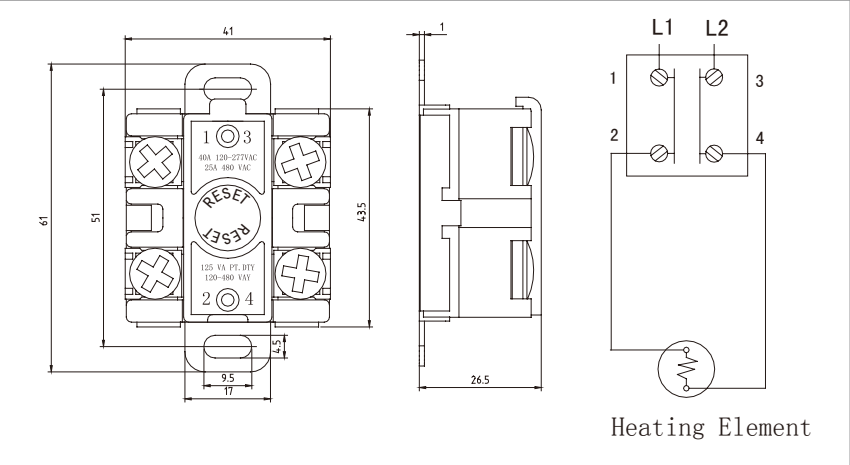
C-207C



C-207R



Heating Element



Notes

Notes

**ZETTLER COMPONENTS USA**

75 Columbia
 Aliso Viejo, CA 92656
 TEL: 949-831-5000
 FAX: 949-831-8548
 E-Mail: zc@zettler.com
 WEB: www.zettlercomp.com

AMERICAN ZETTLER, INC.

75 Columbia
 Aliso Viejo, CA 92656
 TEL: 949-831-5000
 FAX: 949-831-8642
 E-Mail: sales@zettler.com
 WEB: www.azettler.com

AZ DISPLAYS, INC.

75 Columbia
 Aliso Viejo, CA 92656
 TEL: 949-360-5830
 FAX: 949-360-5839
 E-Mail: sales@azdisplays.com
 WEB: www.azdisplays.com

ZETTLER MAGNETICS, INC.

75 Columbia
 Aliso Viejo, CA 92656
 TEL: 949-360-5838
 FAX: 949-360-5839
 E-Mail: sales@zettlermagnetics.com
 WEB: www.zettlermagnetics.com

ZETTLER CONTROLS, INC.

75 Columbia
 Aliso Viejo, CA 92656
 TEL: 949-360-5840
 FAX: 949-360-5839
 E-Mail: sales@zettlercontrols.com
 WEB: www.zettlercontrols.com

**ZETTLER ELECTRONICS GmbH - GERMANY**

Junkersstrasse 3
 82178 Puchheim
 Germany
 TEL: +49 89 800 97 0
 FAX: +49 89 800 97 200
 WEB: www.zettlerelectronics.com

**ZETTLER ELECTRONICS [HK] LTD.**

Unit 2A, Wing Tai Centre (Front Block)
 No. 12 Hing Yip Street Kwun Tong
 Kowloon, Hong Kong
 TEL: +852 2375 1288 FAX: +852 2375 7433
 WEB: www.zettlerhk.com

**ZETTLER ELECTRONICS NEDERLAND BV**

Dorpsstraat 51
 2761 AA Zevenhuizen
 The Netherlands
 TEL: +31 180 310 663
 FAX: +31 180 311 048
 WEB: www.zettlerelectronics.nl

**ZETTLER ELECTRONICS DONGGUAN**

Rm 203, 2/F Yingzhan Building
 12-18# Lian Feng Road
 Chang'an, Guang Dong
 Dong Guang 523850
 China
 TEL: +86 769 8532 0703
 FAX: +86 769 8532 0403
 WEB: www.zettlercn.com

**ZETTLER ELECTRONICS POLAND sp.z.o.o.**

Osadnikow Wojskowych 40
 68-200 Zary
 Poland
 TEL: +48 68 47 91 437
 FAX: +48 68 47 91 439
 WEB: www.zettlerelectronics.pl

**XIAMEN ZETTLER ELECTRONICS CO., LTD**

6-7/F Yinfeng Building, No. 48-50 Huli Ave
 Huli District
 Xiamen 361006
 China
 TEL: +86 592 2650 988
 FAX: +86 592 2650 900
 WEB: www.zettlercn.com

**NINGBO ZETTLER ELECTRONICS CO., LTD**

No. 5 Shuntai Road
 Yangming Technological Park
 Yuyao City
 China
 TEL: +86 574 6250 2178
 FAX: +86 574 6250 2177
 WEB: www.zettlernb.com

**ZETTLER ELECTRONICS SHANGHAI**

14/F , New Hongqiao Jieyun Building No.2
 Lane 600, Tianshan Rd. Changning District
 Shanghai 200051
 China
 TEL: +86 21 5100 1736
 FAX: +86 21 5206 6921
 WEB: www.zettlercn.com