ZETTLER CONTROLS, INC.



HVAC/R + APPLIANCE Component Solutions

Through traditional craftsmanship and engineering excellence, the Zettler name has symbolized quality and reliability in relays 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.

Zettler Controls brings that same commitment to the HVAC/R and appliance markets with an offering of relays, thermostats, transformers, contactors, heat sequencers, temperature sensors, and fan centers. This group of products is used by the HVAC/R and appliance industries in both residential and commercial applications.

We welcome application challenges, stock over one million units, deliver quick turnaround, and excel at meeting the service level our customers require. 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 your component needs.

You can count on Zettler Controls, Inc.



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Catalog Revision Date: 7/15/2015

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



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)
Amplent Temperature	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-Ibs
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

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UEB1-70 SERIES

MINIATURE CIRCUIT BREAKER

PART NUMBERING SYSTEM



UEB1-70 SERIES

MINIATURE CIRCUIT BREAKER



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 THEGREEN LIGHT ON AND CLOSING OF ALL POLES TO HAVE THE RED LIGHT ON.

DEFINITE PURPOSE CONTACTORS

DESCRIPTION

Zettler Controls XMC0 series of Definite Purpose Contactors are electromechanical 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



PART NUMBERING SYSTEM



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		
	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		
QC Wiring	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

Conventio	onal thermal current (A)	10
Rated Ir	nsulation Voltage (V)	690
Datad	AC600 (AC-15)	
Rated	230/380V	3/1.9
Operational		
Current	N600(DC-13)	
(A)	110/230V	2.2/1.1

DEFINITE PURPOSE CONTACTORS

ELECTRICAL RATINGS

Size	Full Load Amps	Resistive Load Amps	Locked Rotor Amps (LRA)			Pole Form	Order Number
	(FLA)		240VAC 480VAC 600VAC				
						1P	XMC0-257
	25	32	150	125	100	1P+1shunt	XMC0-251
						2P	XMC0-252
						1P	XMC0-327
Compact	32	40	180	150	120	1P+1shunt	XMC0-321
						2P	XMC0-322
						1P	XMC0-407
	40	50	240	200	160	1P+1shunt	XMC0-401
			2P	XMC0-402			
	25	32	150	125 100 -		2P	XMC0-253A
	20	52	150			3P	XMC0-253
	30	40	180	150	120	2P	XMC0-323A
	52	40	100	150	120	3P	XMC0-323
	40	50	240	200	160	2P	XMC0-403A
	40		240	200	100	3P	XMC0-403
Standard	50	63	300	250	200	3P	XMC0-503
	63	75	360	300	240	3P	XMC0-633
	75	95	450	375	300	3P	XMC0-753
	90	120	540	450	360	3P	XMC0-903

COIL DATA

Pole Form	e Form VA		Sealed VA		Sealed	Pickup	Dropout
	50Hz	60Hz	50Hz	60Hz	(\v)	voltage	voltage
1 pole, 1 pole + 1 shunt	33	31	8	6	3.5		
2 pole	33	31	8	6	4		
3 pole, 2 pole standard (3A)	72.5	65	13	10	5	<u>≤</u> 0.8 Us*	≥ 0.2 Us*
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.

DEFINITE PURPOSE CONTACTORS

MECHANICAL DATA



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



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

DEFINITE PURPOSE CONTACTORS



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



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

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DEFINITE PURPOSE CONTACTORS



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



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

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AUXILIARY CONTACT



MICROSWITCH



INTERLOCKS

Ordering Information:

In XMC0 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.





75-90A C03J2





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50-63A C03J1



Interlock Block Fastener (2X)



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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 x 10 ⁷
Electrical	1 x 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 Operating Storage	At nominal coil voltage -40°C (-40°F) to 65°C (149°F) -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

ZETTLER Controls, Inc.

RELAY ORDERING DATA

COIL SPECIFICATIONS					ORDER NUMBER*
Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Coil Resistance ±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: ± .010"

ZETTLER Controls, Inc.

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 Mechanical Electrical	Minimum operations 1 x 10^6 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 mega-ohms min. at 500 VDC, 20°C 50% RH
Dropout	Greater than 20% of nominal coil voltage
Ambient Temperature Operating Storage	At nominal coil voltage -40°C (-40°F) to 65°C (149°F) -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)

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RELAY ORDERING DATA

	COIL SPECIFICATIONS					
Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Coil Resistance ±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: ± .010"

ZETTLER Controls, Inc.

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 HB et 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)

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GENERAL DATA

Life Expectancy	Minimum operations
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 Storage	At nominal coil voltage DC: -40°C (-40°F) to 85°C (185°F) AC: -40°C (-40°F) to 65°C (149°F) -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 pieces	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.

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RELAY ORDERING DATA

COIL SPECIFICA					
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Nominal Current mA ± 10%	Coil Resistance Ohm ± 10%	ORDER NUMBER*
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

Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Nominal Current mA ± 10%	50Hz Coil Resistance Ohm ± 10%	60Hz Coil Resistance Ohm ± 10%	ORDER NUMBER*
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: ± .010"

ZETTLER Controls, Inc.

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	30 A at 277 VAC res. 30k cycles [1]
UL, CUR	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]
ΤÜV	27 A at 240 VAC, cos phi = .8, 50k cycles
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 Mechanical Electrical	Minimum operations 1 x 10 ⁶ 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 Non-Operating	10 g, 11 ms, $\frac{1}{2}$ sine (no false operation) 100 g, 11 ms, $\frac{1}{2}$ sine (no damage)			
Enclosure	P.B.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.

ZETTLER Controls, Inc.

RELAY ORDERING DATA

COIL SPECIFIC	ATIONS – DC COIL	ORDER NUMBER*			
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Coil Resistance ± 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 SPEC	CIFICATIONS - A			ORDER NU	MBER*
Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Coil Current mA ± 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



Dimensions in inches with metric equivalents in parentheses. Tolerance: ± .010"

ZETTLER Controls, Inc.

www.zettlercontrols.com

75 Columbia • Aliso Viejo, CA 92656 • Phone: (949) 360-5840 • Fax:(949) 360-5839 • E-Mail: sales@zettlercontrols.com

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 Mechanical Electrical	Minimum operations 1 x 10^7 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 Operating Storage	At nominal coil voltage -55°C (-67°F) to 85°C (185°F) -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.

ZETTLER Controls, Inc.

RELAY ORDERING DATA

COIL SPECIFICATIONS – DC Coil					
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Nominal Current mA ± 10%	Coil Resistance ± 10%	ORDER NUMBER*
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					
Nominal Coil VAC	Must Operate VAC	Max. Continuous VAC	Nominal Coil Power VA	Coil Resistance ± 10%	ORDER NUMBER*
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



Dimensions in inches with metric equivalents in parentheses. Tolerance: ± .010"

ZETTLER Controls, Inc.

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



ZETTLER Controls, Inc.

ZC9034 Series

RELAY ORDERING INFORMATION

RELAY	COIL VOLTAGE	POLE	
MODEL	(CONTACTS)	CONFIGURATION	FORM
<u>ZC9034</u>	3	<u>SP</u>	<u>1A</u>
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)*	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
	5 - 240 VAC (Pwr/Pilot)* 6 - 24 VAC (Pilot/Pilot) 7 - 120 VAC (Pilot/Pilot) 8 - 240 VAC (Pilot/Pilot)		- Pole 4-5-6 N.C <u>Single Pole (1-2-3)</u> 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



ZETTLER Controls, Inc.

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



ZETTLER Controls, Inc.

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)

ZETTLER Controls, Inc.

3ARR3, 3ARR22 Type

APPENDIX A (Ordering Part Number)





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29

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

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

74-407791 SH.1

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74-407791 SHEET 1

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ZC MOTOR START RELAY (3ARR3, 3ARR22) DATA CUSTOMER COLD PICK-UP AND DROP-OUT FOR EACH COLL GROUP

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

74-407791 91.2

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ZC MOTOR START RELAY (3ARR3, 3ARR22) DATA CLISTOMER COLD PICK-LIP AND DROP-OLIT FOR EACH COLL GROUP

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ZC MOTOR START RELAY (3ARR3, 3ARR22) DATA CUSTOMER COLD PICK-UP AND DROP-OUT FOR EACH COIL GROUP

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ERAG HOO			Ĩ	PIC	D N	560	580	300	320	340	350	360	365	120	130	140	150	160	170	180	190	500	520	240	210		70		T		T	T	NCE	
QP OF	1711		10400	ירתו		-	0	0	_	0	0	0	0	0	0	0	0	0	0	6							_		+	-	+	+	ISTA	SMHO
	1211					5	2	20	5	ŝ	n I	מי	ŝ	ທີ	ທີ	ŝ	ຜົ	ŭ	ιñ	ហ៊	ភ្	ភ	ŝ	ŭ	ñ	ຫັ	ភ	ŭ			_		RES.	с С
	1		ITAR8	JEN.	40 11	A	AB	AC	P	AE	AF	AG	AH	A J	AK	AL	AM	AN	AP	AA	AS	AT	AU	AV	AW	AX	AY	AZ					COIL	8 25 9

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PROPRIETARY AND CONFIDENTIAL

8

Р

MOUNTING

P05.6

POS. 5

PDS.4

POS. 3

N P05.

POS. 1



33

3ARR3, 3ARR22 Type

APPENDIX C (Mechanical Form)



ZETTLER Controls, Inc.

3ARR3, 3ARR22 Type




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 Electrical	7.5 x 10 ⁵ 5 x 10 ⁵ at 16A 400VAC
	2 x 10 ⁵ at 35A 400VAC (break only) 1 x 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



ZETTLER Controls, Inc.

MOTOR START POTENTIAL RELAY

PART NUMBERING SYSTEM



MOUNTING TYPE/TERMINAL CONFIGURATION

В	Plastic Tab and Panel Mount, 5 dual QD (2 on #4)
D	Plastic Tab and Panel Mount, 3 dual QD (#1, 2, and 5)
М	Panel Mount, 5 dual QD (2 on #4)
Р	Panel Mount, 3 dual QD (#1, 2, and 5)
U	Universal Metal Bracket Mount, 5 dual QD (2 on #4)
Х	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



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

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MOTOR START POTENTIAL RELAY

TABLE A - OPERATING CHARACTERISTICS AT 50HZ

Co	l number	2		3		4		5		6		7		8		9	
	/max at 40°C (V)	299	9	33	8	37	В	35	6	45	2	15	1	530		228	
R	Aesistance ±10% at 5600 25°C ([]) 5600		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.
Α	120-130											111-124	20-45			111-124	35-77
в	130-140											120-134	20-45			120-134	35-77
С	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
Е	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
н	200-220	186-215	40-90	190-215	40-105	195-224	50-110	186-214	60-133							178-192	35-77
Т	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
Μ	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		
Ν	280-300			260-289	50-110	262-290	60-121	262-290	60-133	258-287	60-135			258-287	75-170		
0	300-320					280-310	60-121	280-310	60-133	277-305	60-135			277-305	75-170		
Ρ	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 4	max at 0° C (V)	33	2	37	5	42	0	39	5	50	2	16	8	588		253		
Re 2	esistance ±10% at 56 25°C (□)		5600		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

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MECHANICAL DATA



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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.

M1 M2 M3 M4

(ZC24A34-3)

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ZETTLER Controls, Inc.

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	Timingo	Switchoo		0	N Timir	ngs		OFF Timings					
Model Number Thinngs		Switches	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	Timingo	Switches		0	N Timir	igs		OFF Timings					
	Tinnings	Switches	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	120	-	-	-	-	160	-	-	-	-	
ZC24A34-3-022	1	1	15-45	-	-	-	-	130	-	-	-	-	
ZC24A34-3-023	1	1	25-60	-	-	-	-	15-45	-	-	-	-	
ZC24A34-3-024	1	1	30-90	-	-	-	-	140	-	-	-	-	
ZC24A34-3-025	1	1	30-90	-	-	-	-	130	-	-	-	-	
ZC24A34-3-026	2	2	120	30-90	-	-	-	4090	130	-	-	-	
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	120	30-90	-	-	-	45-110	130	-	-	-	
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.

ZETTLER Controls, Inc.

ELECTRIC HEAT SEQUENCERS

ELECTRICAL RATINGS

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

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

Combined Load Contact Ratings (All Models):

VAC	Resistive (N	Ion-Inductive)	Motor Rat	Combined	
VAC	Watts	Amps	Full Load	Locked Rotor	Amps
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 2

Figure 3 Single Pole Single Throw (SPST)

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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 6 Double Pole Single Throw (DPST)

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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.













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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.



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 0.0.32" Q.C (Double Q.C terminals available at additional cost) Use 12 gauge or larger wire for loads greater than 15 amperes.



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.

STANDARD TIMINGS

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



(ZC24A34-15)

ELECTRICAL RATINGS

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

MECHANICAL DATA



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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					RELAY CONTACT RATINGS				
	PRIMARY		SECONDARY		FULL	125 VAC		250 VAC		
	VOI TAGE	CONNECTIONS		CONNECTIONS	RELAY	FULL LOAD	LOCKED ROTOR	FULL LOAD	LOCKED ROTOR	
	VOEINGE	CONTECTIONS	VOEINGE	CONTECTION		AMPS (FLA)	AMPS (LRA)	AMPS (FLA)	AMPS (LRA)	
				Terminal board						
ZC90113	120	pre-stripped	24	with 5 screw	DPDT	13.8	82.8	6.9	41.4	
				terminals						
		8/240 Color coded leads, pre-stripped		Terminal board						
ZC90118	208/240		24	with 5 screw	DPDT	13.8	82.8	6.9	41.4	
				terminals						
		Color opdad laada		Terminal board						
ZC90119	120/208/240	/208/240 pre-stripped	24	with 5 screw	DPDT	13.8	82.8	6.9	41.4	
				terminals						

PART NUMBERING SYSTEM

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

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ZC9011 Series

RELAY/TRANSFORMER FAN CENTER ASSEMBLY

WIRING DIAGRAM



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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	Foot Mount, Bracket				
Options	Multi Mount Adapter Plate (4x4)				
	Panel Mount, Lam. Holes				
Quick	QT - Top mounted QD terminals				
Connect	Q1 - One Side QD terminals				
Options	Q2 - Both Side QD terminals				
Quick	Standard male quick connect				
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	40 VA Standard	50 VA Standard	
Th Sec. Voltage	Model Designation	Model Designation	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.

ZETTLER Controls, Inc.

30 VA - 50 VA CLASS 2 UL 1585 TRANSFORMER ORDERING INFORMATION

PART NUMBERING SYSTEM

	<u>AHR</u>	<u>40</u>	<u>309</u>	<u>FM</u>	<u>QT</u> – <u>XX</u>	<u>xx</u>
Basic Series Designation						
VA Rating - See Below —						
Primary and Secondary Voltages - See Below						
Mounting - See Below						
Termination - See Below						
Optional Customer Assign (XXXX)						

VA RATINGS

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

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.

MOUNTING

Designator	Mounting Type
FM	Foot Mount, Bracket
MM*	Multi Mount Adapter Plate
PM	Panel Mount, Lam. Holes
FC*	Fan Center Screw Terminals
* 00)// 0 40)//	- k -

* 30VA & 40VA only.

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.

ZETTLER Controls, Inc.

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

MECHANICAL DATA



All dimensions are shown in millimeters.

ZETTLER Controls, Inc.

50 VA QUICK CONNECT CLASS 2 UL 1585 TRANSFORMER

MECHANICAL DATA



All dimensions are shown in millimeters.



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	Foot Mount, Bracket				
Options	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	130C, Class B				
System					
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	30 VA multi mount - 18 per box				
Quantity	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

Dri Saa Valtaga	30 VA Standard	40 VA Standard	50 VA Standard	
Pri Sec. voltage	Model Designation	Model Designation	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)
	COM	Black	300	10
	120	White	300	10
Drimony	208	Red	300	10
Primary -	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.

ZETTLER Controls, Inc.

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

MECHANICAL DATA



All dimensions are shown in millimeters.



50VA WIRE LEAD CONNECT CLASS 2 UL 1585 TRANSFORMER

MECHANICAL DATA



All dimensions are shown in millimeters.



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, Multi-Mount
- 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)
	COM	Black	300	10
	120	White	300	10
Primary	208	Red	300	10
	240	Orange	300	10
	277	Brown	300	10
	480	Black/Red	300	10
	575	Grey	300	10
	12	Violet	300	10
Secondary	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.

ZETTLER Controls, Inc.

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	Туре
FM	Foot Mount
MM	Multi Mount
PM	Panel Mount

HOUSING

Designator	Туре
NULL	Open Frame
В	Bell Housing
С	Channel Frame

Protection

Designator	Туре
NULL	None
F	External Fuse
Х	Circuit Breaker

Termination

	-	
Designator	Туре	
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	Туре А	
*B	Туре В	
*C	Туре С	
*D	Type D	
*E	Type E	
*SW	Screw and Wire	
*50\/A 75\/A 06\/A Boll Housing Only		

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

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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.

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30 VA CLASS 2 TRANSFORMERSS

Type FMW



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



40 VA CLASS 2 TRANSFORMERS





Type FMQ2





Type FMQT







Type FMCW



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Type FMBW2



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

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50 VA CLASS 2 TRANSFORMERS

Type FMW













Type FMCW







Type FMWX







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Type FMBAW1X



Type MMBQW



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



60 VA CLASS 2 TRANSFORMERSS

Type MMBQW



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



75 VA CLASS 2 TRANSFORMERS

Type FMW







Type FMQT







Type FMWX







Type FMBAW1X







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Type FMBBW2X



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



96 VA CLASS 2 TRANSFORMERS

Type FMBAW1X







Type FMBBW2X







Type FMBCW2X

4-Ø5X8.7







Type FMBDW1X



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1.2

Type FMBEQWX



ZETTLER Controls, Inc.

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

CONTINOUS 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.

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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: $= \ln(R1/R2)/(1/T1-1/T2)$

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.



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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

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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.

$$\boldsymbol{\alpha}_{\mathrm{T}} = \frac{1}{\mathrm{R}_{\mathrm{T}}} \quad \frac{(\mathrm{D} \ \mathrm{R}_{\mathrm{T}})}{(\mathrm{D} \ \mathrm{T})}$$

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 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

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



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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

AUTOMOTIVE

- Audio amplifiers
- Automatic climate controls
- Coolant sensors
- Electric coolant fan temperature controls
- Emission controls
- Engine oil temperature sensors
- Transmission oil temperature sensors

INDUSTRIAL ELECTRONICS

- Commercial vending machines
- Gas flow indicators
- HVAC equipment
- Industrial process controls
- Microwave power measurement
- Photographic processing equipment

FOOD HANDLING AND PROCESSING

- Coffee makers
- Deep fryers
- Fast food processing

- 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
- Seat heating system control
- Intake air temperature sensors
- Water level sensors
- Outside air temperature sensors
- Engine block temperature sensors
- Oil level sensors
- Plastic laminating equipment
- Solar energy equipment
- Thermoplastic molding equipment
- Thermostats
- Water purification equipment
- Welding equipment
- Temperature controlled food storage systems
- Thermometers for use in food preparation

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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.

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- 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

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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.





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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 material options include Brass (copper), Stainless Steel, Aluminum etc. Quick thermal response, strong construction, easy to fasten, and high environment temperatures are some of 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.

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.



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WIDELY USED TEMPERATURE SENSING TECHNOLOGIES PERFORMANCE COMPARISON

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

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WIDELY USED TEMPERATURE SENSING TECHNOLOGIES PERFORMANCE COMPARISON

MODEL	Standard Resistance (R25) ohm	В(25/50 °С)	Operating Temperature Range	US MODEL	Standard Resistance (R25) ohm	В(25/50 °С)	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	$-40 - +105^{\circ}$ C	NTS221010	20K	3950	-40 - +105° C
TS223001	10K	4050	$-40 - +105^{\circ}$ C	NTS220001	50K	3950	-40 - +200° C
TS221005	10K	3380	$-40 - +105^{\circ}$ C	NTS220002	50K	4050	-40 - +105° C
TS023002	10K	3934	$-40 - +105^{\circ}$ C	NTS220003	23K	4200	-40 - +105° C
TS301001	50K	3934	-40 - +200° C	NTS123003	55K	4050	$-40 - +80^{\circ} C$
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

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	KSD301C Heat Sequencers - Time Delay	P104
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Catalog Revision A

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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 inquires 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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////_____ KSD301A



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RoHS Reach 🚑 🖳 📾 ເຈັ ເຈັ cB CE Mus CB CE



RoHS Reach 🚑 🖳 🗫 💿 c 🔊 us CB CE ////______**KSD301A**



RoHS Reach A mark and a construction of the co







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////____ KSD301A







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 \pm 3°C Standard \pm 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**







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

RoHS Reach A (A) (A) (B) (C)

Specifications

Similar to TOD Series 60T

MM KSD301C

- 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



RoHS Reach 🚑 🖳 🗫 🞯 🖓 us CB CE

______ **KSD301C**



RoHS Reach $A_{\overline{uv}} \stackrel{\wedge}{\longrightarrow} A \otimes c A_{\overline{us}} \subset B \subset C$

////____ KSD301C



RoHS Reach $A_{\text{tiv}} \stackrel{\wedge}{\cong} \mathbf{A} \otimes \mathbf{C} \mathbf{A}_{\text{us}} \mathbf{C} \mathbf{B} \mathbf{C} \mathbf{C}$

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RoHS Reach $A_{TUV} \xrightarrow{\mathbb{N}_{E}} \mathbb{N}$ @ $C \mathbb{N}_{US} \mathbb{C} \mathbb{C} \mathbb{C}$

////////KSD301C



RoHS Reach 🚑 🚈 🔊 🞯 c 🌒 us CB CE

////_____ **KSD301C**





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 interdependent timing contacts. UL and CUL approval

Applications

Electric Furnaces, Heat Pumps, Gas Furnaces, etc.

Approvals: UL CUL





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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



RoHS Reach $A_{uv} \stackrel{\wedge}{\longrightarrow} A \otimes c A_{uv} \subset B \subset C$

////____ KSD301C







RoHS Reach A \longrightarrow A \bigoplus A \bigoplus CB CE

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