

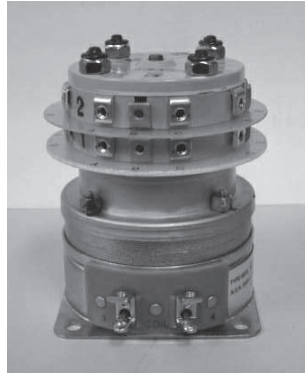
Table of Contents

MDR Series	12-2, 12-3
2100 Series	12-4 – 12-7
7000 Series	12-8 – 12-14
E7000 Series	12-15 – 12-20
EGP Series	12-21 – 12-27
EML Series	12-21 – 12-27
ETR Series	12-21 – 12-27
GP Series	12-28 – 12-30
ML Series	12-28, 12-29, 12-32
TR Series	12-28, 12-31, 12-32
VCA Series	12-33
VMA Series	12-34
SCB Series	12-35
SCC Series	12-35
SCE Series	12-36
SCF Series	12-37
SRC Series	12-38
SSC Series	12-39
SSF Series	12-40
SST Series	12-41
STA Series	12-42
VTM1 Series	12-43
VTM-1 Series	12-44
VTM2 Series	12-45
VTM3 Series	12-46
VTM4 Series	12-47
VTM7 Series	12-48
VTMA1 Series	12-49
VTMR1 Series	12-50

MDR Series, 10 Amp Rotary Relay For Demanding Shock & Vibration Applications

Product Facts

- AC and DC coils, latching and non-latching
- 4PDT through 24PDT contact arrangements
- Designed to withstand high impact shock per MIL-S-901



Small 8PDT



Medium 24PDT

Specifications

Contact Data

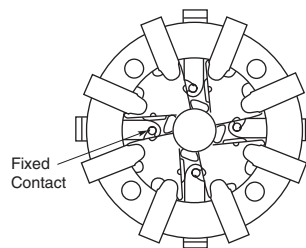
Arrangements — 4 Form C (4PDT) through 24 Form C (24 PDT).

Contact Ratings

Single Contacts	Two Contacts in Series
10 A, 115 VAC	3 A, 440 VAC
3 A, 28 VDC	15 A, 115 VAC
0.8 A, 125 VDC	1.5 A, 125 VDC

The above AC contact ratings are based on contact loads having a 50% power factor. The DC contact ratings are based on resistive loads.

Contact Section

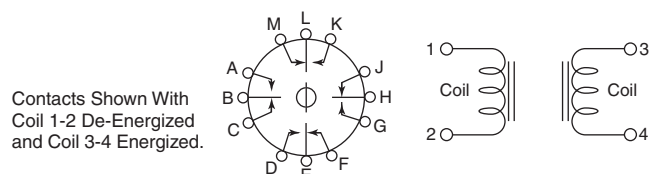


Operate Data @ 77°F [25°C]

Type	Typ. Operate Time (ms)	Typ. Release Time (ms)
Small AC Non-Latching	5 to 12	5 to 18
Small DC Non-Latching	15 to 30	5 to 15
Small AC Latching	6 to 12	N/A
Small DC Latching	10 to 16	N/A
Medium AC Non-Latching	6 to 12	6 to 20
Medium DC Non-Latching	65 to 90	10 to 30
Medium AC Latching	50 (max.)	N/A
Medium DC Latching	30 to 80	N/A

Latching Two-Position Types —

Except for the latching feature, MDR latching relays utilize the same general construction as non-latching types. They have two sets of coils and provide a latching two-position operation.



Coils Must be Energized Alternately, Not Simultaneously.

Environmental Data

Temperature Range —

Standard models — 0°F to +149°F
[0°C to +65°C]

Special order models — 0°F to +194°F
[0°C to +90°C]

Mechanical Data

Termination — #5-40 screw terminals supplied

Weight (Approx.) —

Small —
4 & 8PDT — 32 oz. [0.914 kg];
12PDT — 33 oz. [0.943 kg]
Medium —
16PDT — 72 oz. [2.04 kg];
24PDT — 74 oz. [2.10 kg]

MDR Series, 10 Amp Rotary Relay For Demanding Shock & Vibration Applications (Continued)

Ordering Information and Coil Characteristics — No models in this series are maintained in stock.

Type	Part Number	Contacts	Coil Voltage (60 Hz. for AC)	Coil Power* (Watts)	Breakdown (Volts RMS)
Small Non-Latching	MDR-131-1	4PDT	115 VAC	6.5	1,230
	MDR-131-2	4PDT	440 VAC	5.1	1,880
	MDR-135-1	4PDT	28 VDC	10.0	1,308
	MDR-137-8	4PDT	125 VDC	10.3	2,375
	MDR-134-1	8PDT	115 VAC	6.5	1,230
	MDR-134-2	8PDT	440 VAC	5.1	1,880
	MDR-136-1	8PDT	28 VDC	10.0	1,308
	MDR-138-8	8PDT	125 VDC	10.3	2,375
	MDR-163-1	12PDT	115 VAC	6.9	1,230
Medium Non-Latching	MDR-163-2	12PDT	440 VAC	6.3	1,880
	MDR-170-1	16PDT	115 VAC	17.0	1,230
	MDR-170-2	16PDT	440 VAC	17.0	1,880
	MDR-172-1	16PDT	28 VDC	18.7	1,308
	MDR-173-1	16PDT	125 VDC	16.0	2,375
	MDR-141-1	24PDT	115 VAC	17.0	1,230
	MDR-141-2	24PDT	440 VAC	17.0	1,880
	MDR-167-1	24PDT	28 VDC	18.7	1,308
	MDR-142-1	24PDT	125 VDC	16.0	2,375
Small Latching	MDR-67-2	4PDT	115 VAC	5.5	1,230
	MDR-4091	4PDT	440 VAC	3.0	1,880
	MDR-67-3	4PDT	28 VDC	21.8	1,308
	MDR-5060	4PDT	125 VDC	20.6	2,375
	MDR-4076	8PDT	115 VAC	5.5	1,230
	MDR-4092	8PDT	440 VAC	3.0	1,880
	MDR-5035	8PDT	28 VDC	21.8	1,308
	MDR-5061	8PDT	125 VDC	20.6	2,375
	MDR-6064	12PDT	115 VAC	12.0	1,230
Medium Latching	MDR-6065	12PDT	440 VAC	5.7	1,880
	MDR-7020	12PDT	28 VDC	8.8	1,308
	MDR-7035	12PDT	125 VDC	10.4	2,375
	MDR-66-4	16PDT	115 VAC	12.0	1,230
	MDR-6066	16PDT	440 VAC	5.7	1,880
	MDR-7025	16PDT	28 VDC	8.8	1,308
	MDR-7036	16PDT	125 VDC	10.4	2,375

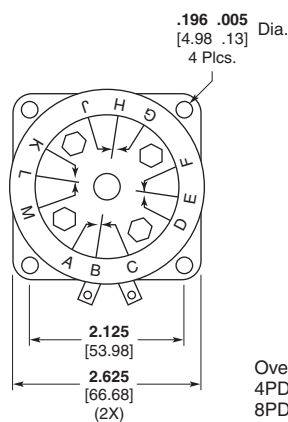
Note: All values are for reference, specific values may be different and subject to environmental factors such as temperature, humidity, pressure or variations in voltage.

*Actual Wattmeter readings.

Outline Dimensions

Tolerances: Decimals ± .010 [±.25] Unless Otherwise Specified.

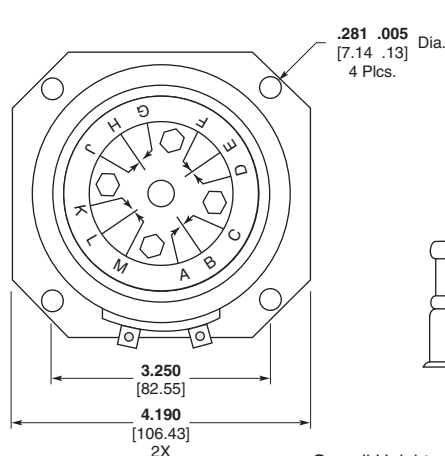
Small Models



Overall Height
4PDT 3.13 [79.5] Max.
8PDT 3.53 [89.7] Max.
12PDT 3.88 [98.6] Max.

Coil and Contact Terminal Screws
#5-40 Supplied.

Medium Models



Overall Height
12PDT 4.63 [117.6] Max.
16PDT 5.00 [127.0] Max.
24PDT 5.75 [146.1] Max.

Coil and Contact Terminal Screws #5-40 Supplied.

AGASTAT 2100 Series, Miniature Electropneumatic Timing Relay



Product Facts

- **High Repeat Accuracy over voltage and temperature extremes**
- **Hermetically sealed units are designed for high shock and vibration applications**
- **Instant recycling — easy linear adjustment**
- **Exclusive Dial Head adjustment — no needle valves**
- **Delay ranges from milliseconds to 3 minutes**
- **DPDT contacts**

Design & Construction

Sealed patented timing head — circulates air under controlled pressure through a variable orifice to provide adjustable timing. Circular-path Dial Head principle replaces traditional needle valve.

Snap-action switch assembly — provides sustained contact pressure during timing cycles. Specially designed over center mechanism assures flutter-free load transfer after extended delay periods.

Precision-wound solenoid assembly — supplies the basic motive force when the control circuit is closed.

These assemblies are mounted in a rigid self-supporting framework within a steel enclosure. This rugged construction assures permanent alignment of all operating members, the key to this unit's long trouble-free operation.

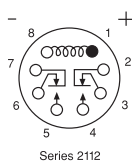
Users should thoroughly review the technical data before selecting a product part number. It is recommended that users also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.



Operation

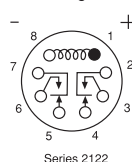
Series 2112 (On-Delay)

Applying rated voltage to the solenoid coil starts the preset time delay. At the end of the delay period the NC contacts break and the NO contacts make. Contacts remain in this position until the coil is de-energized, when the switch instantaneously returns to its original position. De-energizing the coil, either during or after the delay period, will immediately (within 25 msec.) recycle the unit. It will then provide another full delay period on re-energization.



Series 2122 (Off-Delay)

Applying rated voltage to the coil for at least 75 msec. (for accurate timing) will instantaneously transfer the switch, breaking the NC contacts and making the NO contacts. Contacts remain in this position as long as the coil is energized. The preset time delay period begins as soon as the coil is de-energized, at the end of which the switch returns to its original position. **No power is required during the timing period.** Re-energizing the coil, either during or after the delay period, will immediately start a new cycle with full delay period.



Operation (Listed values at nom. voltage, 25°C unless noted)

Operating Mode

2112 — On-delay (delay on pull-in);

2122 — Off-delay (delay on drop-out)

Timing Adjustment — All standard models offer easy linear adjustment over one of nine timing ranges listed below. For applications requiring frequent readjustment, the external knob model is recommended. For tamper-proof installation or where readjustment is infrequent, the internal key model may be preferred. This model requires removal of the cover plate for timing adjustment. Hermetically sealed models provide a slotted adjusting screw under the cap nut on the top cover.

Timing Ranges

Code	Range
A	.03 to .1 sec.
B	.1 to .3 sec.
C	.15 to 1.0 sec.
D	.375 to 3.0 sec.
E	.75 to 10.0 sec.
F	1.0 to 30.0 sec.
G	2.0 to 60.0 sec.
H	5.0 to 120.0 sec.
J	5.0 to 180.0 sec.
K	1.5 to 30.0 cycles
L	3.0 to 120.0 cycles

Repeat Accuracy — NORMAL VERTICAL POSITION

±5% at 25°C; ±7% at 85°C; ±8% at -55°C.

The average time between -55°C and 85°C will be within ±20% of the average @ 25°C with a proportionally reduced effect at lesser extremes.

In extremely short delay settings an additional 8 msec. variation may result on AC models due to "half cycle" alternating current effect.

Setting Tolerance — Factory time setting, when specified, subject to additional +5% tolerance.

Position Sensitivity

HORIZONTAL POSITION — Approximately 5% increase from the initial time in the vertical position.

INVERTED POSITION — Approximately 10% increase from the initial time in the vertical position.

Reset Time — 2112 Series: 25 msec.; 2122 Series: 75 msec.

Relay Release Time — 25 msec. (2112 Series)

Relay Operate Time — 75 msec. (2122 Series)

Operating Voltage — Coil Data

Code	Nominal Operating Voltage	Resistance Ohms ±10%
M	12VDC	30
N	28VDC	131
P	48VDC	500
R	110VDC	3200
S	120V 60 Hz	190 (2112 Series)
S	120V 60Hz	285 (2122 Series)
T	240V 60Hz	765
U	115V 400Hz	2600
Y	125VDC	3380

Transients — Insensitive to transients of ±1500 VAC for 10 milliseconds

Dielectric — 1000V RMS @ 60Hz between non-connected terminals.

Contact Rating (DPDT Contacts) —

	30V DC	110V DC	120V 60Hz	120V 400Hz	240V 60Hz
Inductive (Amps)	2	.75	3	2	1.5
Resistive (Amps)	10	1	10	10	5

Based on 100,000 operations electrical, 1,000,000 mechanical. Inductive and capacitive load should not have inrush currents that exceed five times normal operating load.

Ambient Temperature Range — -55°C to +85°C

Weight — Maximum, any unit - 17 ozs.

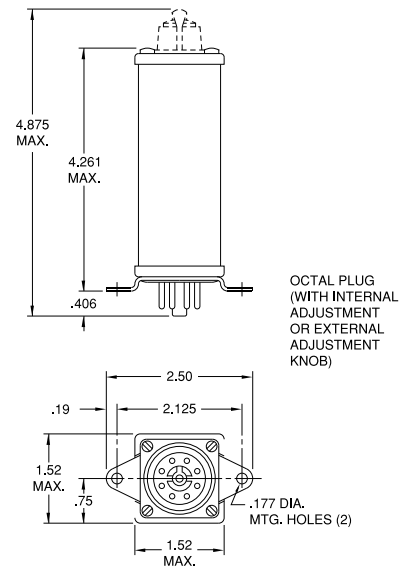
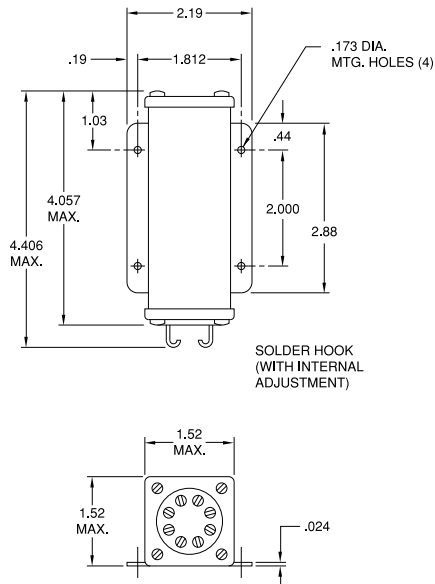
Mounting/Terminals — Chassis mounting tabs, octal plugs and external (-4) or internal (-5) adjustment. Panel mounting back plate, internal adjustment, and solder hook terminals (-9).



These are minimum standards; where more severe environmental conditions must be met, please consult the factory.

AGASTAT 2100 Series, Miniature Electropneumatic Timing Relay (Continued)

Outline Dimensions for Industrial Models (Dimensions in inches. Multiply by 25.4 to obtain millimeters.)



Ordering Information for Industrial Models

Typical Part No. ➤					21	1	2	D	4	N	B
1. Basic Series: 21 = 2100 Miniature electropneumatic timing relay											
2. Operation: 1 = On-delay 2 = Off-delay											
3. Contact Arrangement: 2 = DPDT (2 form C)											
4. Operating Voltage: A = AC D = DC											
5. Physical Characteristics:											
Code	Enclosure	Adjustment	Connector	Mounting							
4 =	Unsealed	External Knob	Octal Plug	Chassis Mount							
5 =	Unsealed	Internal Key	Octal Plug	Chassis Mount							
9 =	Unsealed	Internal Key	Solder Hook	Panel Mount Plate							
6. Coil Voltage:											
M = 12VDC		N = 28VDC	P = 48VDC	R = 110VDC	Y = 125VDC						
S = 120VAC, 50/60 Hz.		T = 240VAC, 60 Hz.									
7. Timing Range:											
A = .03 to .1 sec.		C = .15 to 1.0 sec.	E = .75 to 10.0 sec.	H = 5.0 to 120.0 sec.	K = 1.5 to 30.0 cycles						
B = .1 to .3 sec.		D = .375 to 3.0 sec.	F = 1.0 to 30.0 sec.	J = 5.0 to 180.0 sec.	L = 3.0 to 120.0 cycles						

Our authorized distributors are more likely to maintain the following items in stock for immediate delivery.

None at present.

AGASTAT 2100 Series, Miniature Electropneumatic Timing Relay (Continued)

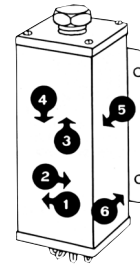
Specifications for Hermetically Sealed Models



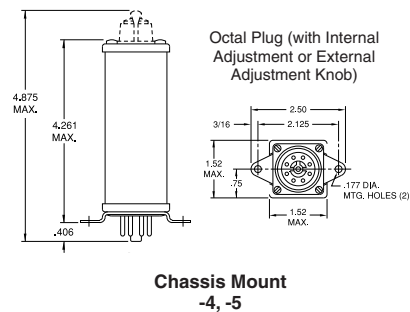
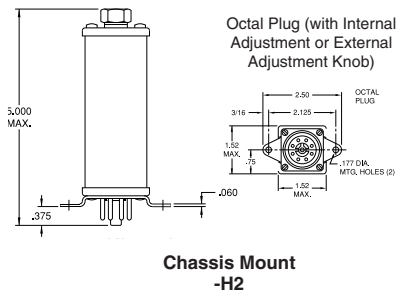
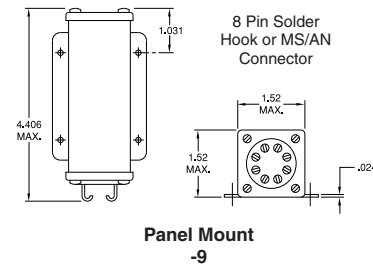
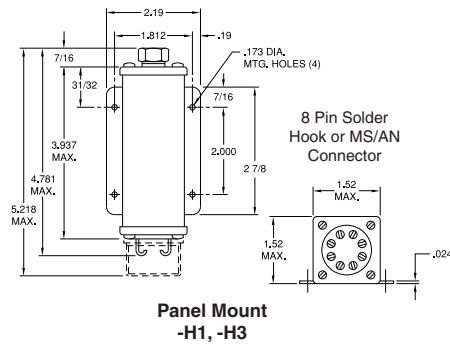
Dielectric — Withstands 1,000 Volts RMS at 60 Hz between non-connected terminals.

Other — AGASTAT Miniature Timing Relays also conform to applicable requirements covering:

Moisture	Ozone
Humidity	Sunshine
Sand/Dust	Acoustic Noise
Salt Spray	Prolonged Storage



Outline Dimensions for Hermetically Sealed Models (In inches. Multiply by 25.4 for millimeters.)



AGASTAT 2100 Series, Miniature Electropneumatic Timing Relay (Continued)

Ordering Information for Hermetically Sealed & Unsealed Models

Typical Part No. ➤					21	1	2	D	H1	N	B
1. Basic Series: 21 = 2100 Miniature electropneumatic timing relay											
2. Operation: 1 = On-delay 2 = Off-delay											
3. Contact Arrangement: 2 = DPDT (2 form C)											
4. Operating Voltage: A = AC D = DC											
5. Physical Characteristics:											
Code	Enclosure	Adjustment	Connector	Mounting							
H1 =	Hermetically Sealed	External Screw	Solder Hook	Panel Mount Plate							
H2 =	Hermetically Sealed	External Screw	Octal Plug	Chassis Mount							
H3 =	Hermetically Sealed	External Screw	"AN" Connector	Panel Mount Plate							
4 =	Unsealed	External Knob	Octal Plug	Chassis Mount							
5 =	Unsealed	Internal Key	Octal Plug	Chassis Mount							
9 =	Unsealed	Internal Key	Solder Hook	Panel Mount Plate							
6. Coil Voltage:											
M = 12VDC		N = 28VDC	P = 48VDC	R = 110VDC	Y = 125VDC						
S = 120VAC, 50/60 Hz.		T = 240VAC, 60 Hz.	U = 115VAC, 400 Hz.								
7. Timing Range:											
A = .03 to .1 sec.		C = .15 to 1.0 sec.	E = .75 to 10.0 sec.	H = 5.0 to 120.0 sec.	K = 1.5 to 30.0 cycles						
B = .1 to .3 sec.		D = .375 to 3.0 sec.	F = 1.0 to 30.0 sec.	J = 5.0 to 180.0 sec.	L = 3.0 to 120.0 cycles						

Our authorized distributors are more likely to maintain the following items in stock for immediate delivery.

None at present.

AGASTAT 7000 Series, Industrial Electropneumatic Timing Relay



Product Facts

- Available in on-delay, true off-delay, and on/off-delay
- Timing from 0.1 seconds to 60 minutes, in linear increments
- Oversize adjustment knobs, serrated with high-resolution markings visible from all angles makes the timer easy to set timers
- Inherent transient immunity
- Standard voltages from 6-550VAC and 12-550VDC (special voltages available)
- Available in 2-pole or 4-pole models
- Numerous enclosure options — explosion proof, dust tight, watertight, hermetically-sealed, NEMA 1
- Auxiliary timed and instantaneous switches can be added for greater switching flexibility
- Many mounting options — Surface mount, Panel mount, Octal plug-in mounting
- Options: quick-connect terminals, dial stops, and transient protection module
- Easy-to-reach screw terminals, all on the face of the unit, clearly identified
- Modular assembly — timing head, coil assembly and switchblock are all individual modules, with switches field-replaceable
- File E15631, File LR29186



Design & Construction

There are three main components of Series 7000 Timing Relays:

Timing Head circulates air through a variable length to provide linearly adjustable timing. Patented design provides easy adjustment and long service life under severe operating conditions.

Precision-Wound Potted Coil

Total sealing without external leads eliminates moisture problems, gives maximum insulation value.

Snap-Action Switch Assembly — custom-designed over-center mechanism provides snap action. Standard switches are DPDT arrangement.

Each of these subassemblies forms self-contained modules assembled at the factory with the other two to afford a wide choice of operating types, coil voltages, and timing ranges.

The squared design with front terminals and rear mounting permits the grouping of Series 7000 units side-by-side in minimum panel space. Auxiliary switches may be added in the base of the unit, without affecting the overall width or depth.

Operation

Two basic operating types are available.

"On-Delay" models provide a delay period on energization, at the end of which the switch transfers the load from one set of contacts to another. De-energizing the unit during the delay period immediately recycles the unit, readying it for another full delay period on re-energization.

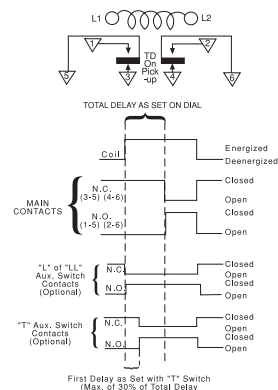
In "Off-Delay" models the switch transfers the load immediately upon energization and the delay period does not begin until the unit is de-energized. At the end of the delay period the switch returns to its original position. Re-energizing the unit during the delay period immediately resets the timing, readying it for another full delay period on de-energization.

No power is required during the timing period, providing a true off delay.

In addition to these basic operating types, "Double-Head" models offer sequential delays on pull-in and drop-out in one unit. With the addition of auxiliary switches the basic models provide two-step timing.

Note: Seismic & radiation tested E7000 models are available. Consult factory for detailed information.

On-delay model 7012 (delay on pickup)

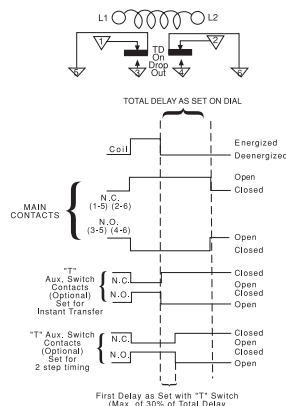


Applying voltage to the coil (L1-L2) for at least 50 msec starts a time delay lasting for the preset time. During this period the normally closed contacts (3-5 and 4-6) remain closed. At the end of the delay period the normally closed contacts break and the normally open contacts (1-5 and 2-6) make. The contacts remain in this transferred position until the coil is deenergized, at which time the switch returns to its original position.

De-energizing the coil, either during or after the delay period, will recycle the unit within 50 msec.

It will then provide a full delay period upon re-energization, regardless of how often the coil voltage is interrupted before the unit has been permitted to "time-out" to its full delay setting.

Off-delay model 7022 (delay on dropout)



Applying voltage to the coil (for at least 50 msec) will transfer the switch, breaking the normally closed contacts (1-5 and 2-6), and making the normally open contacts (3-5 and 4-6). Contacts remain in this transferred position as long as the coil is energized. The time delay begins immediately upon de-energization. At the end of the delay period the switch returns to its normal position.

Re-energizing the coil during the delay period will immediately return the timing mechanism to a point where it will provide a full delay period upon subsequent de-energization. The switch remains in the transferred position.

Note: 7032 types and certain models with accessories are not agency approved.

Users should thoroughly review the technical data before selecting a product part number. It is recommended that users also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Consult factory for ordering information.

AGASTAT 7000 Series, Industrial Electropneumatic Timing Relay (Continued)

Auxiliary Switch Options

To increase the versatility of the basic timer models, auxiliary switches may be added to either on-delay or off-delay types. They switch additional circuits, provide two-step timing action, or furnish electrical interlock for sustained coil energization from a momentary impulse, depending on the type selected and its adjustment. They are installed at the factory. All auxiliary switches are SPDT with UL listings of 10A @ 125, 250, or 480 VAC. A maximum of one Code T or two Code L auxiliary switches may be added to each relay. The L or LL switch is available with on-delay relays only. The T switch is available with both the on-delay and off-delay relays.

Auxiliary Switch Options for On-Delay

Instant Transfer (Auxiliary Switch Code L, maximum of 2 per relay.)

1. Energizing coil begins time delay and transfers auxiliary switch.
2. Main switch transfers after total preset delay.
3. De-energizing coil resets both switches instantly.

Auxiliary switch is nonadjustable.

Two-Step Timing (Auxiliary Switch Code T, maximum of 1 per relay.)

1. Energizing coil begins time delay.
2. After first delay auxiliary switch transfers.
3. Main switch transfers after total preset delay.

4. De-energizing coil resets both switches instantly. First delay is independently adjustable, up to 30% of overall delay. (Recommended maximum 100 seconds.)

Auxiliary Switch Options for Off-Delay

In these models the same auxiliary switch provides either two-step timing or instant transfer action, depending on the adjustment of the actuator.

Two-Step Timing (Auxiliary Switch Code T, maximum of 1 per relay.)

1. Energizing coil transfers main and auxiliary switches instantly.
2. De-energizing coil begins time delay.
3. After first delay auxiliary switch transfers.

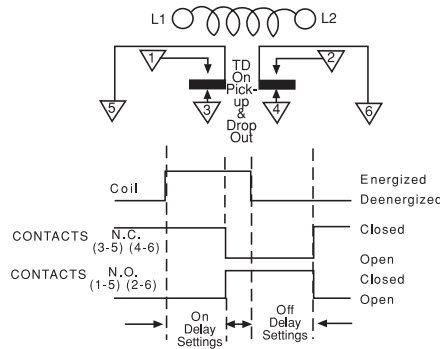
4. Main switch transfers after total preset delay. First delay is independently adjustable, up to 30% of overall delay. (Recommended maximum 100 seconds.)

Instant Transfer (Auxiliary Switch Code L, maximum of 1 per relay.)

1. Energizing coil transfers main and auxiliary switches instantly.
2. De-energizing coil resets auxiliary switch and begins time delay.
3. Main switch transfers after total preset delay.

Auxiliary switch is factory adjusted to give instant transfer operation. Two-step timing may be set at the factory to customer specification up to a 3:2 ratio.

On-delay, Off-delay Model 7032 (Double Head)

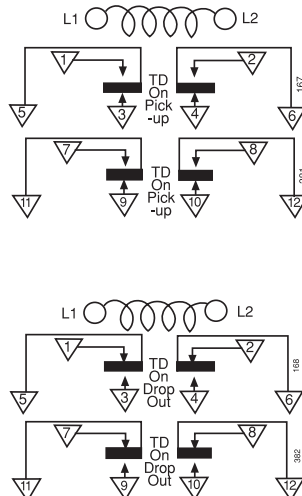
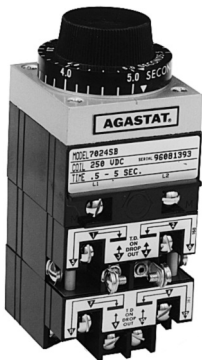


The Double Head model provides delayed switch transfer on energization of its coil, and delayed resetting upon coil de-energization. Each delay period is independently adjustable.

In new circuit designs or the improvement of existing controls now using two or more conventional timers, the Double Head unit offers distinct advantages.

Its compact design saves panel space, while the simplified wiring reduces costly interconnection.

On-delay Model 7014, Off-delay Model 7024



With the addition of an extra switch block at the bottom of the basic unit, this version of the Series 7000 offers four pole switch capacity with simultaneous timing or two-step timing. The two-step operation is achieved by factory adjustment to your specifications.

For two-step operation, a maximum timing ratio between upper and lower switches of 3:2 is recommended. Once adjusted at the factory, this ratio remains constant regardless of changes in dial settings. (Ex: If upper switch transfer is set on dial at 60 sec., minimum time on lower switch should be 40 sec.)

This Series 7000 unit offers many of the performance features found in basic models — voltage ranges, timing and switch capacities.

Four pole models add approximately 1-1/4" to the maximum height of the basic model, approximately 1/8" to the depth. They are designed for vertical operation only.

AGASTAT 7000 Series, Industrial Electropneumatic Timing Relay (Continued)

Surge/Transient Protection Option



Transient Suppressor
Option "V"

Product Facts

- Protect electronic control circuits from voltage transients generated by the timer coil
- Fast response to the rapidly rising back E.M.F.
- High performance clamping voltage characteristics
- UL recognized, (except varistor and coil together).
- Timer NOT polarity sensitive

The Surge/Transient Protection Option protects electronic control circuits from transients and surges which are generated when the timer coil is activated. The device is not polarity sensitive and permits the user to initiate, delay, sequence and program equipment actions over a wide range of applications under the most severe operating conditions. The varistor will not affect the operating characteristics of the 7000 Timer. The varistor has bilateral and symmetrical voltage and current characteristics.

Timing Specifications (All values shown are at nominal voltage and 25°C unless otherwise specified)

Operating Modes —

Model 7012/7014 — On-delay (delay on pick-up).

Model 7022/7024 — Off-delay (delay on drop-out).

Model 7032 — On-delay, off-delay (double head).

Timing Adjustment — Timing is set by simply turning the dial to the desired time value. In the zone of approximately 25° separating the high and low end of timing ranges A,D,E, and K, instantaneous operation (no time delay) will occur. All other ranges produce an infinite time delay when the dial is set in this zone.

Models 7014 and 7032 are available with letter dials only. The upper end of the time ranges in these models may be twice the values shown.

Linear Timing Ranges —

Code	Models 7012, 7022, 7024	Models 7014, 7032
A	.1 to 1 Sec.	.2 to 2 Sec.
B	.5 to 5 Sec.	.7 to 7 Sec.
C	1.5 to 15 Sec	2 to 20 Sec.
D	5 to 50 Sec.	10 to 100 Sec.
E	20 to 200 Sec.	30 to 300 Sec.
F	1 to 10 Min.	1.5 to 15 Min.
H	3 to 30 Min.	3 to 30 Min.
I	6 to 60 Min.	Not Avail.
J	3 to 120 Cyc.	Not Avail.
K	1 to 300 Sec.	Not Avail.

Repeat Accuracy —

For delays of 200 seconds or less:	7012*, 7022, 7024:	±5%
	7014*:	±10%
	7032:	±15%
For delays greater than 200 seconds:	7012*, 7022, 7014*, 7024:	±10%
	7032:	±15%

* The first time delay afforded by Model 7012 with H (3 to 30 min.) and I (6 to 60 min.) time ranges or Model 7014 with H time range will be approx. 15% longer than subsequent delays due to coil temperature rise.

Reset Time — 50 msec. (except model 7032)

Relay Release Time — 50 msec. for on-delay models (7012/7014)

Relay Operate Time — 50 msec. for off-delay models (7022/7024)

Operating Voltage Coil Data (for DPDT)

Coil Part #	Code Letter	Rated Voltage	Operating* Voltage Range @ 60Hz	Rated Voltage	Operating Voltage Range @ 50Hz
7000	A	120	102-132	110	93.5-121
	B	240	204-264	220	187-242
	C	480	408-528		
	D	550	468-605		
	E	24	20.5-26.5		
AC	F			127	108-140
	G			240	204-264
	H	12	10.2-13.2		
	I	6	5.1-6.6		
	J	208	178-229		
	K		Dual Voltage Coil (Combines A&B)		
	L		Special AC Coils (L1, L2, etc.)		
7010	M	28	22.4-30.8		
	N	48	38.4-52.8		
	O	24	19.2-26.4		
	P	125	100-137.5		
	Q	12	9.6-13.2		
	R	60	48-66		
	S	250	200-275		
	T	550	440-605		
	U	16	12.8-17.6		
	V	32	25.8-35.2		
DC	W	96	76.8-105.6		
	Y	6	4.8-6.6		
	Z	220	176-242		
	X		Special DC Coils (X1, X2, etc.)		

*Four pole Models: Operational voltage range 90% to 110% for AC units; 85% to 110% for DC units.

See next page for more coil data.

AGASTAT 7000 Series, Industrial Electropneumatic Timing Relay (Continued)

Timing Specifications (All values shown are at nominal voltage and 25°C unless otherwise specified)

Minimum operating voltages are based on vertically mounted 7012 units. 7012 horizontally mounted or 7022 vertically or horizontally mounted units will operate satisfactorily at minimum voltages approximately 5% lower than those listed.

AC units drop out at approximately 50% of rated voltage. DC units drop out at approximately 10% of rated voltage.

All units may be operated on intermittent duty cycles at voltages 10% above the listed maximums (intermittent duty - maximum 50% duty cycle and 30 minutes "on" time.)

Surge/Transient Protection Option Characteristics (DC Timers Only)

Coil Voltage Nominal (DC)	Max Excess Energy Capacity (Joule)	Max De-energization Transient Voltage
12 V	0.4 J	48 V
24 V	1.8 J	93 V
28 V	1.8 J	93 V
32 V	2.5 J	135 V
48 V	3.57 J	145 V
60 V	6 J	250 V
96 V	10 J	340 V
110 V	10 J	340 V
125 V	10 J	340 V
220 V	17 J	366 V
250 V	17 J	366 V

Surge Life —

Applied 100,000 times continuously with the interval of 10 seconds at room temperature. Below 68 VAC: 12A; Above 68 VAC: 35A

Temperature Range —

Operating — -22°F to +167°F (-30°C to + 75°C)

Storage — -40°F to +167°F (-40°C to +75°C)

Output/Life Contact Ratings — Contact Capacity in Amps (Resistive Load)

Contact Voltage	Min. 100,000 Operations	Min. 1,000,000 Operations
30 VDC	15.0	7.0
110 VDC	1.0	0.5
120 V 60Hz	20.0	15.0
240 V 60Hz	20.0	15.0
480 V 60Hz	12.0	10.0

10 Amps Resistive, 240 VAC

1/4 Horsepower, 120 VAC/240VAC (per pole)

15 Amps 30 VDC (per pole)

5 Amps, General Purpose, 600VAC (per pole)

Dielectric — Withstands 1500 volts RMS 60Hz between terminals and ground.

1,000 volts RMS 60 Hz between non-connected terminals. For dielectric specification on hermetically sealed models consult factory.

Insulation Resistance — 500 Megohms with 500VDC applied.

Temperature Range —

Operating — -20°F to +165°F (-29°C to 74°C)

Storage — -67°F to +165°F (-55°C to 74°C)

Temperature Variation — Using a fixed time delay which was set and measured when the ambient temperature was 77°F (25°C), the maximum observed shift in the average of three consecutive time delays was -20% at -20°F (-29°C) and +20% at 165°F (74°C).

Mounting/Terminals — Normal mounting of the basic unit is in a vertical position, from the back of the panel. **All units are tested for vertical operation.** Basic models (7012, 7022) may also be horizontally mounted, and will be adjusted accordingly **when Accessory Y1 is specified in your order.**

Standard screw terminals (8-32 truss head screws supplied) are located on the front of the unit, with permanent schematic markings. Barrier isolation is designed to accommodate spade or ring tongue terminals, with spacing to meet all industrial control specifications.

The basic Series 7000 may also be panel mounted with the addition of a panel mount kit, X option, that includes all necessary hardware and faceplate. This offers the convenience of "out-front" adjustment, with large dial skirt knob. The faceplate and knob blend with advanced equipment and console designs, while the body of the unit and its wiring are protected behind the panel.

Other mounting options include plug-in styles and special configurations to meet unusual installation requirements. Contact factory for details.

Power Consumption — Approximately 8 watts power at rated voltage.

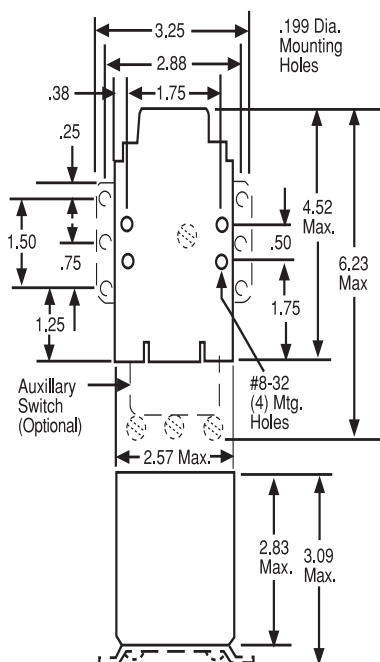
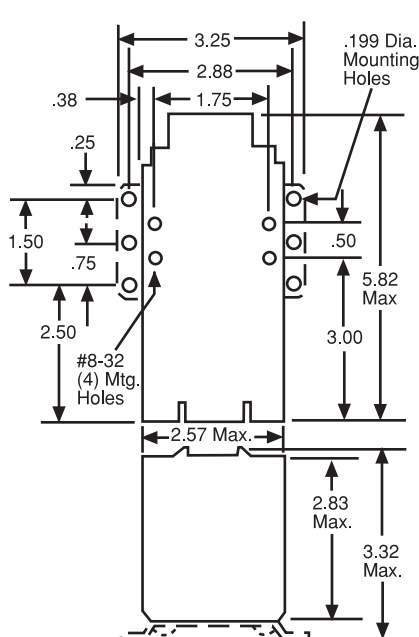
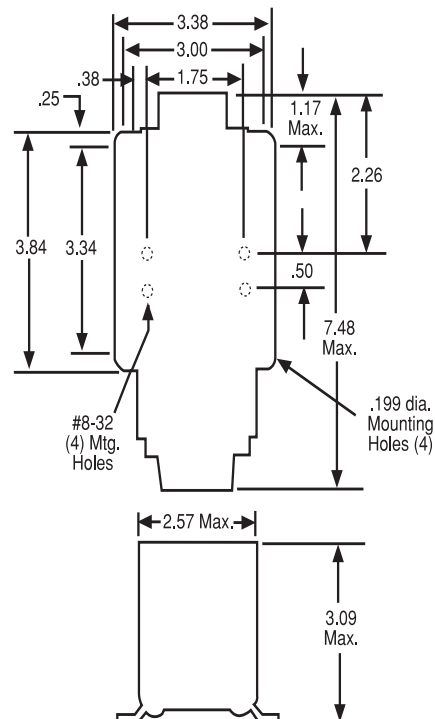
Approximate Weights —

Models	7012, 7022	2 lbs. 4 ozs.
	7014, 7024	2 lbs. 10 ozs.
	7032	3 lbs. 5 ozs.

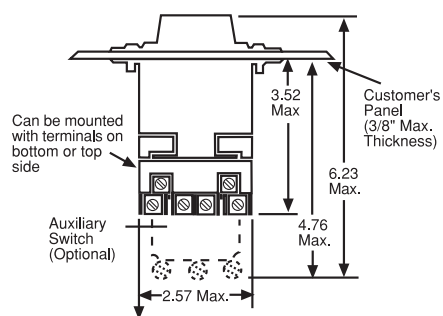
Weight may vary slightly with coil voltage.

AGASTAT 7000 Series, Industrial Electropneumatic Timing Relay (Continued)

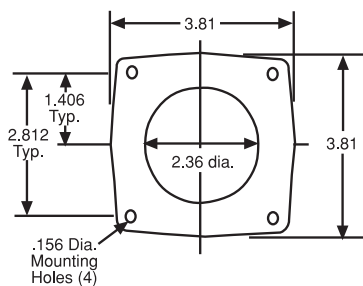
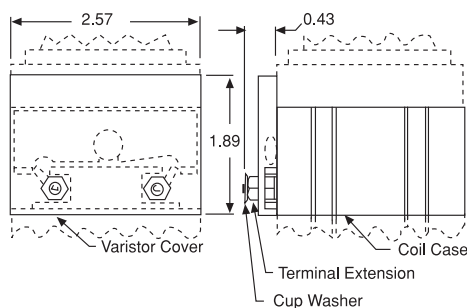
Outline Dimensions (Dimensions in inches)

Models 7012, 7022

Models 7014, 7024

Model 7032


Panel Mount Option "X"



Surge/Transient Protection Option



AGASTAT 7000 Series, Industrial Electropneumatic Timing Relay (Continued)

Ordering Information

Typical Part No. ►		70	1	2	A	D	GZ
1. Basic Series: 70 = 7000 series electropneumatic timing relay							
2. Operation: 1 = On-delay 2 = Off-delay 3 = On-delay, off-delay (double head)							
3. Contact Arrangement: 2 = 2PDT (2 form C) **4 = 4PDT (4 form C)							
4. Coil Voltage: AC Coils A = 120VAC, 60 Hz.; 110VAC, 50Hz. B = 240VAC, 60 Hz.; 220VAC, 50Hz. C = 480VAC, 60 Hz. D = 550VAC, 60 Hz. E = 24VAC, 60 Hz. F = 127VAC, 50 Hz. G = 240VAC, 50Hz. H = 12VAC, 60 Hz. K = Dual voltage (combines A & B) L = Special AC coils (L1, L2, etc.) DC Coils M = 28VDC N = 48VDC O = 24VDC P = 125VDC Q = 12VDC R = 60VDC S = 250VDC T = 550VDC U = 16VDC V = 32VDC W = 96VDC Y = 6VDC Z = 220VDC X = Special DC coils (X1, X2, etc.)							
5. Timing Range: Models 7012, 7022 & 7024 A = .1 to 1 sec. B = .5 to 5 sec. C = 1.5 to 15 sec. D = 5 to 50 sec. E = 20 to 200 sec. F = 1 to 10 min. H = 3 to 30 min. I = 6 to 60 min. J = 3 to 120 cyc. K = 1 to 300 sec. †Models 7014 & 7032 For model 7032 specify separate time range code for each head. Example: AB. Any two ranges may be selected. A = .2 to 2 sec. B = .7 to 7 sec. C = 2 to 20 sec. D = 10 to 100 sec. E = 30 to 300 sec. F = 1.5 to 15 min. H = 3 to 30 min.							
6. Options: A1 = Single quick-connect terminals (note 4). A2 = Double quick-connect terminals (note 4). B = Plug-in connectors (note 4). GZ = Enclosure with bottom knockouts (note 1). H2 = Hermetically sealed enclosure, 8 pin solder (notes 1 & 4). H3 = Hermetically sealed enclosure, 8 pin octal (notes 1 & 4). H4 = Hermetically sealed enclosure, 8 screw terminal block (notes 1 & 4). *H6 = Hermetically sealed enclosure, 11 pin solder (notes 1 & 4). *H7 = Hermetically sealed enclosure, 11 pin octal (notes 1 & 4). *H8 = Hermetically sealed enclosure, 11 screw terminal block (notes 1 & 4). I1 = Tamper-proof Cap, opaque black (Cannot be combined with Option X). I2 = Tamper-proof Cap, transparent (Cannot be combined with Option X). L = Auxiliary Switch, instant transfer. 7012 only (notes 2 & 6). LL = Two Aux. Switches, instant transfer. On Model 7014 Factory Installed Only. (notes 2 & 6). M = Dust-tight Gasketing (notes 4 & 5). P = Octal Plug Adapter. Can be combined only with options I1, I2, M, S, X, or Y1. (note 4). S = Dial Stops. T = Auxiliary Switch, two-step timing (notes 2 & 6). V = Transient/Surge Protection (for DC coil voltage only). X = Panelmount includes hardware and adjustment for horizontal operation (note 4). Y1 = Horizontal testing, for horizontal operation without panel mounting (note 4). Y2 = Horizontal testing, with Compensating Spring for vertical operation (note 4).							

Notes:

- Cannot be combined with B, P or X Options
 - Cannot be combined with B, P or Y2 Options
 - Cannot be combined with GZ, H, I1, I2, K, W or Y1 Options
 - Not Avail. on 4-Pole Models
 - Not Available with L, T or LL options.
 - Not Available on hermetically sealed units.
- * Sized to accommodate one L or T Auxiliary Switch
** Not available on 7032 model.

† Available with letter graduated dials only. Upper end of time range may be twice the value shown

†† 120 cycles = 2 sec.

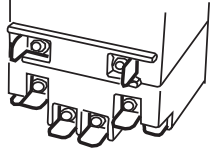
Our authorized distributors are more likely to maintain the following items in stock for immediate delivery.

7012AA	7012AE	7012ACL	7012PB	7012PJ	7022AA	7022AE	7022AJ	7022PA
7012AB	7012AF	7012BC	7012PC	7012PK	7022AB	7022AF	7022AKT	7022PB
7012AC	7012AH	7012NC	7012PD	7012PKX	7022AC	7022AH	7022BC	7022PC
7012AD	7012AK	7012PA	7012PF	7012PJX	7022AD	7022AI	7022BK	7022PK

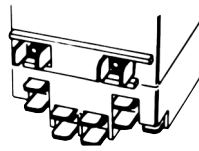
AGASTAT 7000 Series, Industrial Electropneumatic Timing Relay (Continued)

Ordering Options — Can only be ordered as factory installed options (Dimensions, where shown, are in inches)

A1 – Single Quick-Connect Terminals

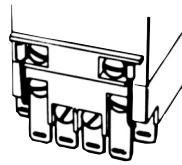


A2 – Double Quick-Connect Terminals



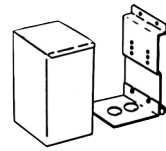
B – Plug-In Connectors

Use with Accessory "C" or "D" below.



GZ – Metal Enclosure

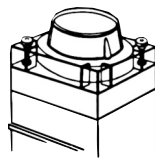
With knockouts for bottom connection.
3.16" W x 3.84" D x 7.63" H



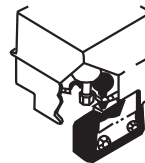
H – Hermetically Sealed Enclosure



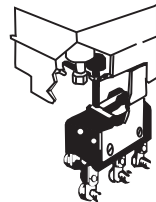
I – Tamper-Proof Cover



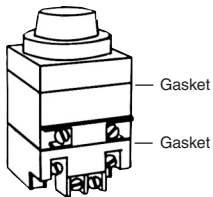
L – Auxiliary Switch



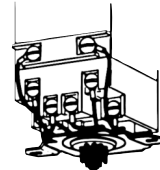
LL – Auxiliary Switch



M – Dust tight



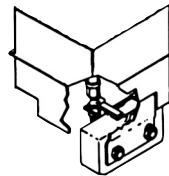
P – Octal Plug Adapter



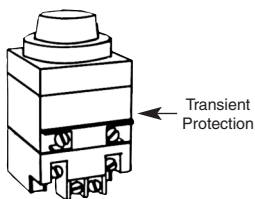
S – Dial Stops



T – Auxiliary Switch

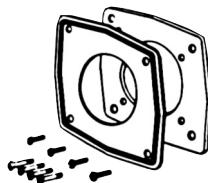


V – Transient/Surge Protection



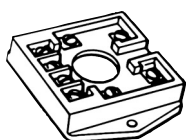
X – Panelmount Kit

Mounting hardware included.



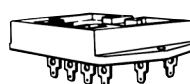
Accessories (Not available for 7032 models)

Plug-In Receptacle (Accessory C)



Screw Terminals
Catalog No. 700137.
For use with "B" Option.

Plug-In Receptacle (Accessory D)



Quick Connect Terminals
Catalog No. 700141.
For use with "B" Option.

Ordering options can only be ordered as factory installed options.

AGASTAT E7000 Series, Nuclear Qualified Time Delay Relays



Seismic and Radiation Tested

In order to satisfy the growing need for electrical control components suitable for class 1E service in nuclear power generating stations, AGASTAT timing relays have been tested for three applications. These E7000 Series electropneumatic devices have demonstrated compliance with the requirements of IEEE Standards 323-1974 (Standard for

Qualifying Class 1E Equipment for Nuclear Power Generating Stations) and IEEE Standard 344-1975 (Seismic Qualifications for Nuclear Power Generating Stations). Testing was also referenced to ANSI/IEEE C37.98 (formerly IEEE Standard 501-1978, Standard for Seismic Testing of Relays).

The present E7000 Series design has evolved over 40 years of continual field use in a wider range of industrial applications. On-Delay, Off-Delay and Four-Pole versions are available for use with a choice of 23 coil voltages, as well as time delay adjustment to as long as 60 minutes.

Test Procedure

Test Procedure

AGASTAT timing relay Models E7012, E7022, E7014 and E7024 were tested in accordance with the requirements of IEEE STD. 323-1974 (Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations), IEEE STD. 344-1975 (Seismic Qualification for Nuclear Power Generating Stations) and referenced to ANSI/IEEE C37.98 (formerly IEEE Standard 501-1978, Standard for Seismic Testing of Relays). The relays were tested according to parameters which in practice, should encompass the majority of applications. Documented data applies to timing relays which were mounted on rigid test fixtures. The following descriptions of the tests performed are presented in their actual sequence.

Baseline Performance

In addition to aging tests, a series of baseline tests were conducted before, and immediately after each aging sequence:

- Pull-in Voltage
- Drop-out Voltage
- Dielectric Strength at 1650V 60Hz
- Insulation Resistance

- Operate Time (milliseconds)
- Recycle Time (milliseconds)
- Time Delay (seconds)
- Repeatability (percent)
- Contact Bounce (milliseconds at 28VDC, 1 amp)
- Contact Resistance (milliohms at 28VDC, 1 amp)

Data was measured and recorded and used for comparison throughout the qualification test program in order to detect any degradation of performance.

Radiation Aging

Relays were subjected to a radiation dosage of 2.0×10^5 Rads, which is considered to exceed adverse plant operating requirements for such areas as auxiliary and control buildings.

Cycling with Load Aging

The radiated units were then subjected to 27,500 operations at accelerated rate, with one set of contacts loaded to 120VAC, 60Hz at 10 amps; or 125VDC at 1 amp, and the number of mechanical operations exceeding those experienced in actual service.

Temperature Aging

This test subjected the relays to a temperature of 100°C for 42 days, with performance measured before and after thermal stress.

Seismic Aging

Sufficient interactions were performed at levels less than the fragility levels of the devices in order to satisfy the seismic aging requirements of IEEE STD 323-1974 and IEEE STD 344-1975.

Seismic Qualification

Artificially aged relays were subjected to simulated seismic vibration, which verified the ability of the individual device to perform its required function before, during and/or following design basis earthquakes. Relays were tested in the non-operating, operating and transitional modes.

Hostile Environment

Since the timing relays are intended for use in auxiliary and control buildings, and not in the reactor containment areas, a hostile environment test was performed in place of the Loss of Coolant Accident (LOCA) test. Relays were subjected to combination extreme temperature/humidity plus under/over voltage testing to prove their ability to function under adverse conditions even after having undergone all the previous aging simulation and seismic testing. The devices were operated at minimum and maximum voltage extremes: 85 and 120 percent of rated voltage for AC units, and 80 and 120 percent of rated voltage for DC units, with temperatures ranging from 40°F to 172°F at 95 percent relative humidity.

The SRS shape (at 5 percent damping), is defined by four points:

- point A = 1.0 Hz and an acceleration equal to 25 percent of the Zero Period Acceleration
- point D = 4.0 Hz and 250 percent of the ZPA
- point E = 16.0 Hz and 250 percent of the ZPA
- point G = 33.0 Hz and a level equal to the ZPA

SPECIMEN 1 & 3 (E7012 SERIES)

RELAY STATE: TRANSITIONAL MODE (TD X 2)

AXIS (H + V):

TEST RUN NO. 41, 45, 60, 63

COMPOSITE OF FB/V-, SS/V-, SS/V+, FB/V+ X .707

DUE TO 45° INCLINATION OF TEST MACHINE.

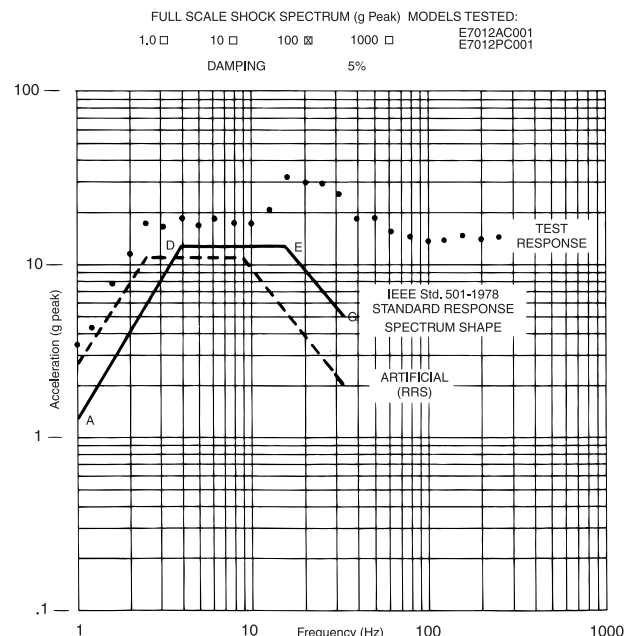


Figure 1. Response Spectrum, Transitional Mode

AGASTAT E7000 Series, Nuclear Qualified Time Delay Relays (Continued)



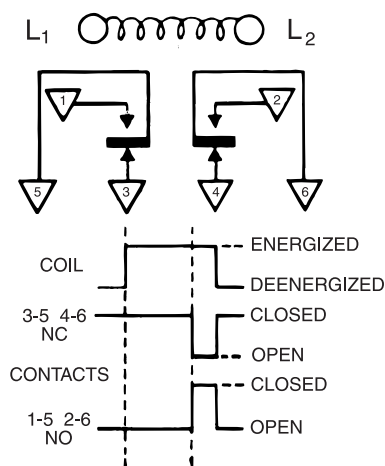
Operation

Two basic operating types are available: **On-delay** models provide a delay period on energization, at the end of which the switch transfers the load from one set of contacts to another. Deenergizing the unit during the delay period immediately recycles the unit, readying it for another full delay period on reenergization.

In **off-delay** models the switch transfers the load immediately upon energization, and the delay period does not begin until the unit is deenergized. At the end of the delay period the switch returns to its original position. Reenergizing the unit during the delay period immediately resets the timing, readying it for another full delay period on deenergization. No power is required during the timing period.

On-Delay Models, E7012

(Delay on pick-up)

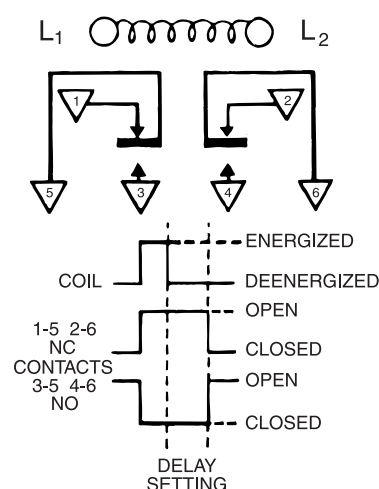


Applying for at least 50 msec voltage to the coil (L1-L2) starts a time delay lasting for the preset time. During this period the normally closed contacts (3-5 and 4-6) remain closed. At the end of the delay period the normally closed contacts break and the normally open contacts (1-5 and 2-6) make. The contacts remain in this transferred position until the coil is deenergized, at which time the switch instantaneously returns to its original position.

Deenergizing the coil, either during or after the delay period, will recycle the unit within .050 second. It will then provide a full delay period upon reenergization, regardless of how often the coil voltage is interrupted before the unit has been permitted to "time-out" to its full delay setting.

Off-Delay Models, E7022

(Delay on drop-out)



Applying voltage to the coil (for at least .050 second) will instantaneously transfer the switch, breaking the normally closed contacts (1-5 and 2-6), and making the normally open contacts (3-5 and 4-6). Contacts remain in this transferred position as long as the coil is energized. The time delay begins immediately upon deenergization. At the end of the delay period the switch returns to its normal position.

Reenergizing the coil during the delay period will immediately return the timing mechanism to a point where it will provide a full delay period upon subsequent deenergization. The switch remains in the transferred position.

Four Pole Models, E7014, E7024

With the addition of an extra switch block at the bottom of the basic units, this version of the E7000 Series offers four pole switch capacity with simultaneous timing or two-step timing. The two-step operation is achieved by factory adjustment to your specifications.

AGASTAT E7000 Series, Nuclear Qualified Time Delay Relays (Continued)



Time Delay Information

All units are furnished with dials in linear increments covering the range selected. (See "Catalog Number Code"). In addition, ranges B through K provide non-linear adjustment from .2 second to the beginning of the linear zone.

Repeat Accuracy

Repeat accuracy at any fixed temperature is defined as:

*The repeat accuracy deviation (A_R) of a time-delay relay is a measure of the maximum deviation in the time-delay that will be experienced in successive operations at any particular time setting of the relay and for any particular operating voltage or current.

Repeat accuracy is obtained from the following formula:

$$A_R = \pm 100 \frac{(T_1 - T_2)}{(T_1 + T_2)}$$

Where —

T_1 = Maximum time delay.

T_2 = Minimum time delay.

*NEMA part ICS 2-218.02

Repeat accuracy at any fixed temperature is $\pm 10\%$ of setting.

The first time delay afforded by units with H (3 to 30 minutes) and I (6 to 60 minutes) time ranges may be up to 15% longer than subsequent delays, due to coil temperature rise.

Dial position error is not included in the repeat accuracy specification above.

Delay Setting

Dial graduations are provided to minimize the time required to set the unit to a specific delay. Rotate the dial clockwise to increase the delay; counter-clockwise to decrease it.

The following procedure is recommended if the unit must be set to a very precise delay value:

1. Set dial to desired time delay. (On letter-graduated units, this requires an approximation of a percentage value between the arrowhead "▼" on the dial, which provides minimum time, and the letter "E," which provides maximum time.)
2. Record as many time delays as required to establish a stable average.
3. If the recorded average delay is shorter than the desired time, turn dial slightly clockwise; if it is longer, turn dial counter-clockwise.
4. Repeat step 2 after each adjustment, until required delay is recorded.

Because of the variety of environments in which time delay relays are applied, we recommend a re-check of the time delay after approximately three hours of operation. If any change from the initial time setting is apparent, the relay should be reset to the desired delay. The time delay accuracy should then be monitored on a monthly basis for several months, and if no substantial change in time delay has taken place, the frequency of checking may be reduced. It is recommended that this procedure be incorporated in the Operating Instructions for your equipment.

Contact Ratings — Nuclear

Resistive at 125 VDC 1.0 Amp
Resistive at 120 VAC 60 Hz. . . 10.0 Amp

Contact Ratings — Non-Nuclear

Contact Capacity in Amps
(Resistive Loads)

Contact Voltage	Min. 100,000 Operations
30VDC	15.0
110VDC	1.0
120V 60Hz	20.0
240V 60 Hz	20.0
480V 60 Hz	12.0

Four pole models add approximately 1-1/4" to the maximum height of the basic model, approximately 1/8" to the depth. They are designed for vertical operation only.

Timing Adjustment

The AGASTAT E7000 Series is the first electropneumatic timer to offer the ease of adjustment and resetting of a graduated dial head. Discrete ranges covering a total span from .1 second to 60 minutes are available. (See table on page 12-20.) Each has its own graduated, clearly identified dial. Timing is set by simply turning the dial to the desired time value. In the zone of approximately 25° separating the high and low ends of timing ranges A, D, E, and K, instantaneous operation (no time delay) will occur. All other ranges produce an infinite time delay when the dial is set in this zone.

AGASTAT E7000 Series, Nuclear Qualified Time Delay Relays (Continued)



Environmental Characteristics (Qualified Life) Parameter

Temperature —

Minimum — 40°F
Normal — 70°F - 104°F
Maximum — 156°F

Humidity (R.H. %) —

Minimum — 10%
Normal — 40-60%
Maximum — 95%

Pressure — Atmospheric

Radiation (rads) —
2.0 X 10⁵ Gamma max.

Operating Conditions (Normal Environment)

Coil Operating Voltage, Nominal (Rated) —

Pull-in (% of rated value) —
80% min. with DC; 85% min. with AC coils

Drop-out (% of rated value) —

10% approx. with DC coils;
50% approx. with AC coils
Power (Watts at rated value) —
8 approx. with DC or AC coils

Relay Operate Time —

Model E7012 — N/A
Model E7022 — 50 ms. max. with DC or AC coils

Relay Release (Recycle) Time —

Model E7012 — 50 ms max. with DC or AC coils
Model E7022 — N/A

Contact Ratings, Continuous —

(Resistive at 125 Vdc) —
1.0 amp with DC or AC coils
(Resistive at 120 Vac, 60 Hz) —
10.0 amp with DC or AC coils

Insulation Resistance

(In megohms at 500 Vdc) —
500 min. with DC or AC coils

Dielectric (Vrms, 60 Hz) —

Between Terminals and Ground —
1,500 with DC or AC coils
Between Non-connected
Terminals — 1,000 with DC or AC coils

Repeat Accuracy — ±10% with DC or AC coils

Operating Conditions (Abnormal Environment)

Adverse Operating Specifications	Normal	DBE "A"	DBE "B"	DBE "C"	DBE "D"
Temperature (°F)	70-104	40	120	145	156
Humidity (R.H. %)	40-60	10-95	10-95	10-95	10-95
Coil Operating Voltage * (% of Rated)					
Model E7012 (AC)	85-110	85-110	85-110	85-110	85-110
(DC)	80-110	80-110	80-110	90-110	90-110
Model E7022 (AC)	85-110	85-110	85-110	85-110	85-110
(DC)	80-110	80-110	80-110	80-110	80-110

*All coils may be operated on intermittent duty cycles at voltages 10% above listed maximums (Intermittent Duty = Maximum 50% duty cycle and 30 minutes "ON" time.)

REPLACEMENT SCHEDULE

The qualified life of this unit is 25,000 operations or 10 years from the date of manufacture, whichever occurs first.

Contact ratings as listed under the UL Component Recognition Program for 100,000 operations (Per pole) —

10 Amps, resistive, 240 VAC;
1/4 horsepower, 120 VAC/240 VAC;
15 Amps, 30 VDC;
5 Amps, General Purpose, 600 VAC

Coil Data —

All units draw approximately 8 watts power at rated voltage.

The operating voltage range for AC relays is 85 to 110 percent of nominal rated value.

AC units drop-out at approximately 50% of rated voltage.

The operating range of DC relays is 80 to 110 percent of nominal rated value.

DC units drop-out at approximately 10% of rated voltage.

All units may be operated on intermittent duty cycles (50% on/off, maximum 30 minutes on) at voltages 10% above the listed maximums.

Approximate Weight —

Model E7012 and E7022 with AC Coils — 2.13 lbs.

Model E7012 and E7022 with DC Coils — 2.25 lbs.

Model E7014 and E7024 with AC Coils — 2.43 lbs.

Model E7014 and E7024 with DC Coils — 2.57 lbs.

(Weight may vary slightly with particular coil voltage.)

Terminals —

Standard screw terminals (#8 – 32 truss head screws supplied) are located on the front of the unit, with permanent schematic markings. Barrier isolation is designed to accommodate spade or ring-tongue terminals with spacing to meet industrial control specifications.

Note: TE Connectivity Corporation cannot recommend the use of its products in the containment areas of Nuclear Power Generating Stations.

The date of manufacture can be found in the first four (4) digits of the serial number on the nameplate:

First two digits indicate XX XX
the year _____
Second two digits indicate _____
the week.

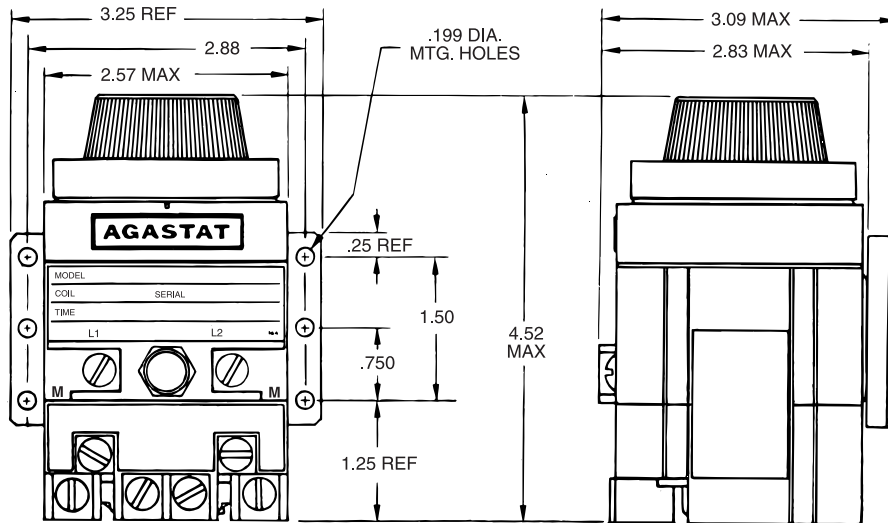
Example: Date code 8014: 80 indicates 1980; 14 indicates the week of April 2 through 8.

MODEL	E7012PC003
COIL	125VDC Serial 8014 –
TIME	1.5 TO 15 SEC.
	L1 L2

AGASTAT E7000 Series, Nuclear Qualified Time Delay Relays (Continued)

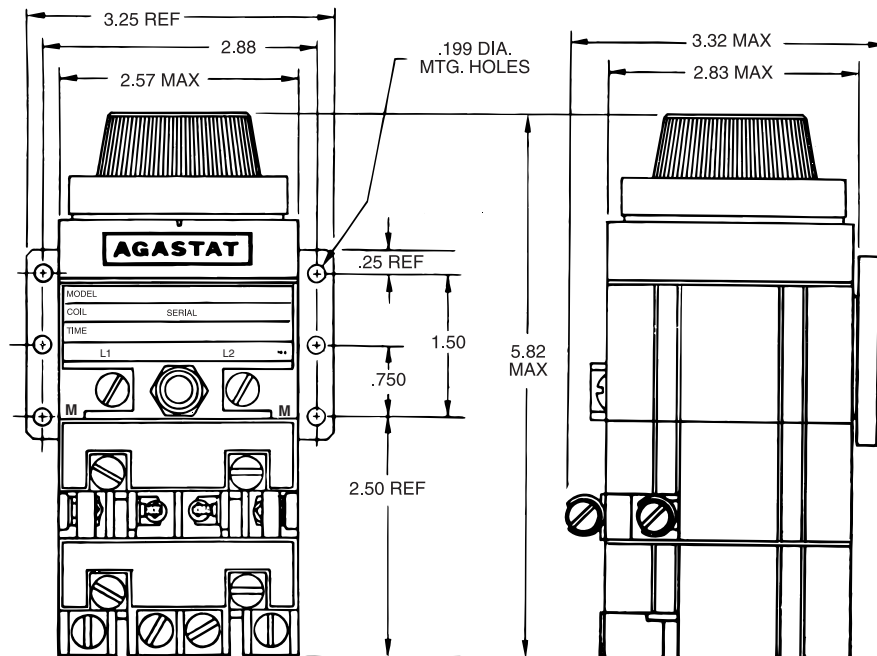
Dimensions and Mounting

MODEL E7012, E7022



QUALIFICATION TESTED FOR VERTICAL OPERATION ONLY

MODEL E7014, E7024



QUALIFICATION TESTED FOR VERTICAL OPERATION ONLY

Mounting Instructions

The E7000 Series relay must be mounted in the vertical position. All performance specifications of these units are valid only when they are mounted in this manner.

A bracket for mounting the device and the screws and lockwashers required to attach it to the relay are supplied with each unit. Four #8-32 tapped holes

are provided in the rear of the device for attaching the mounting bracket, or for mounting the relay directly to a panel, from the rear.

AGASTAT E7000 Series, Nuclear Qualified Time Delay Relays (Continued)

Ordering Information

Catalog Number Code

E

Nuclear
Safety
Related

70

AGASTAT
7000 Series
Timing Relay

1

Operation
1 – On-delay
2 – Off-delay

2

Contact Arrangement
2 – Double Pole
Double Throw
4 – Four Pole Double
Throw

A

Coil
Voltage

A

Time Range
E7012, E7022

****004**

Configuration
Code

AC		Code		Code	
AC	A	120V	60 Hz	A	.1 to 1 sec.
		110V	50 Hz	B	.5 to 5 sec.
		240V	60Hz	C	1.5 to 15 sec.
		220V	50Hz	D	5 to 50 sec.
		480V	60Hz	E	20 to 200 sec.
	D	550V	60Hz	F	1 to 10 min.
		24V	60Hz	H	3 to 30 min.
		127V	50Hz	I	6 to 60 min.
		240V	50Hz	K	1 to 300 sec.
		12V	60Hz		
DC	I	6V	60Hz	*E7014	
		208V	60Hz	A	.2 to 2 sec.
				B	.7 to 7 sec.
				C	2 to 20 sec.
				D	10 to 100 sec.
	M	28	VDC	E	30 to 300 sec.
		48	VDC	F	1.5 to 15 min.
		24	VDC	H	3 to 30 min.
		125	VDC	E7024	
		12	VDC	A	.1 to 1 sec.
DC	R	60	VDC	B	.5 to 5 sec.
		250	VDC	C	1.5 to 15 sec.
		550	VDC	D	5 to 50 sec.
		16	VDC	E	20 to 200 sec.
		32	VDC	F	1 to 10 min.
	U	96	VDC	H	3 to 30 min.
		6	VDC	I	6 to 60 min.
		220	VDC	K	1 to 300 sec.

* Model E7014 is available with letter-graduated dials only. The upper end of the time ranges in these models may be twice the values shown.

** Configuration Code

The Configuration Code is a suffix to the Model Number which provides a means of identification. When a significant product change is introduced, the Configuration code and specification sheets will be revised. (001, 002, 003, 004, etc.).

Relay Classifications Control Code Summary

Configuration Control

Product	Code – 001	Code – 002	Code – 003	Code – 004
E7000	Contains all materials present in original qualification testing.	Sept. 1981 — Elastomer gasket material change to improve thermal aging properties. Material changed for Buna-N or Neoprene to Neoprene only.	March 1989 — Paint change to timing head portion of relay. New paint: Sherwin-Williams E61YC37 primer and PPG W48392 silver polyester top coat.	Dec. 1991 — Paint change to timing head portion of relay. New paint: Prime coatings No. 28032 Enamel. No primer is used with this finish.

Configuration Code: The Configuration code is a suffix to the Model Number which provides a means of identification. When a significant product change is introduced, the Configuration code and specification sheets will be revised. (001, 002, 003, 004, etc.).

PPG is a trademark of PPG Industries.

Sherwin-Williams is a trademark of The Sherwin-Williams Company.

AGASTAT EGP/EML/ETR Series, Nuclear Qualified Control Relays



Seismic and Radiation Tested

In order to satisfy the need for electrical control components suitable for class 1E service in nuclear power generating stations, AGASTAT control relays have been tested for these applications. Series EGP, EML and ETR have demonstrated compliance with the requirements of IEEE Standards 323-1974 (Standard for

qualifying Class 1E Equipment for Nuclear Power Generating Stations) and IEEE Standard 344-1975 (Seismic Qualification for Nuclear Power Generating Stations). Testing was also referenced to ANSI/IEEE C37.98 (formerly IEEE Standard 501-1978, Standard for Seismic Testing of Relays).

The design of Series EGP, EML and ETR control relays has evolved over 20 years of continual use in a wide range of industrial applications. Control Relay, Magnetic Latch and Timing Relay versions are available for use with a choice of coil voltages, as well as an internal fixed or adjustable potentiometer in the Series ETR time delay version.

Test Procedure

Test Procedure

AGASTAT control relay Series EGP, EML and ETR were tested in accordance with the requirements of IEEE STD. 323-1974 (Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations), IEEE STD. 344-1975 (Seismic Qualification for Nuclear Power Generating Stations) and referenced to ANSI/IEEE C37.98 (formerly IEEE Standard 501-1978, Standard for Seismic Testing of Relays). The relays were tested according to parameters which in practice, should encompass the majority of applications. Documented data applies to relays which were mounted on rigid test fixtures. The following descriptions of the tests performed are presented in their actual sequence.

Baseline Performance

In addition to aging tests, a series of baseline tests were conducted before, and immediately after each aging sequence:

- Pull-in Voltage
- Drop-out Voltage
- Dielectric Strength at 1650V 60Hz
- Insulation Resistance
- Operate Time (milliseconds)

- Recycle Time (milliseconds)
- Time Delay (seconds) } Series ETR
- Repeatability (percent) } only
- Contact Bounce
- (milliseconds at 28VDC, 1 amp)
- Contact Resistance
- (milliohms at 28VDC, 1 amp)

Data was measured and recorded and used for comparison throughout the qualification test program in order to detect any degradation of performance.

Radiation Aging

Relays were subjected to a radiation dosage of 2.0×10^5 Rads, which is considered to exceed adverse plant operating requirements for such areas as auxiliary and control buildings.

Cycling with Load Aging

The radiated units were then subjected to 27,500 operations at accelerated rate, with one set of contacts loaded to 120VAC, 60Hz at 10 amps; or 125VDC at 1 amp, and the number of mechanical operations exceeding those experienced in actual service.

Temperature Aging

This test subjected the relays to a temperature of 100°C for 42 days, with performance measured before and after thermal stress.

Seismic Aging

Sufficient interactions were performed at levels less than the fragility levels of the devices in order to satisfy the seismic aging requirements of IEEE STD 323-1974 and IEEE STD 344-1975.

Seismic Qualification

Artificially aged relays were subjected to simulated seismic vibration, which verified the ability of the individual device to perform its required function before, during and/or following design basis earthquakes. Relays were tested in the non-operating, operating and transitional modes.

Hostile Environment

Since the timing relays are intended for use in auxiliary and control buildings, and not in the reactor containment areas, a hostile environment test was performed in place of the Loss of Coolant Accident (LOCA) test. Relays were subjected to combination extreme temperature/humidity plus under/over voltage testing to prove their ability to function under adverse conditions even after having undergone all the previous aging simulation and seismic testing. The devices were operated at minimum and maximum voltage extremes: 85 and 120 percent of rated voltage for AC units, and 80 and 120 percent of rated voltage for DC units, with temperatures ranging from 40°F to 172°F at 95 percent relative humidity.

The SRS shape (at 5 percent damping), is defined by four points:

- point A = 1.0 Hz and an acceleration equal to 25 percent of the Zero Period Acceleration (ZPA)
- point D = 4.0 Hz and 250 percent of the ZPA
- point E = 16.0 Hz and 250 percent of the ZPA
- point G = 33.0 Hz and a level equal to the ZPA

Specimen 13, 15 & 16 (EGP Series)
Relay State: Non-Operate Mode (De-ener.)
Test Run No. 318, 319, (205-206), (198-199)
Axis (H + V):
Composite of FB/V-, SS/V, FB/V+ X .707
Due to 45° inclination of test machine.

Additional Seismic Response Curves are available on request.

Relay State: Non-Operate Mode (De-ener.)
Test Run No. 318, 319, (205-206), (198-199)

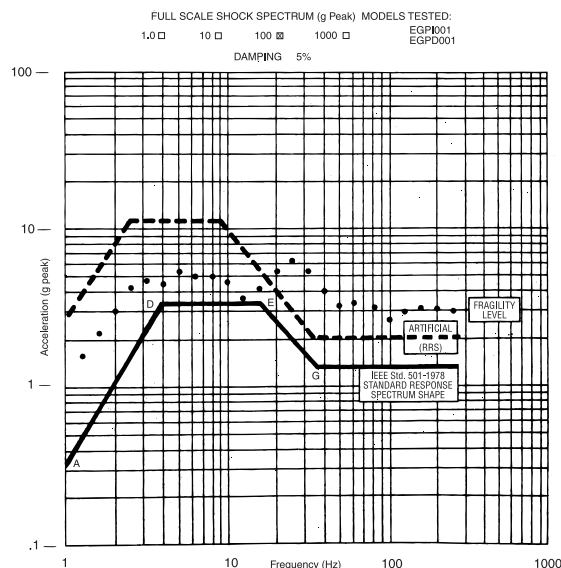


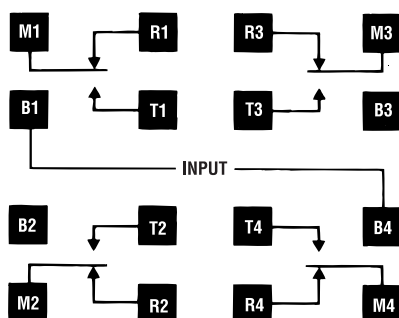
Figure 1. Model EGP, Response Spectrum, Non-Operate Mode

AGASTAT EGP/EML/ETR Series, Nuclear Qualified Control Relays (Continued)

Operation

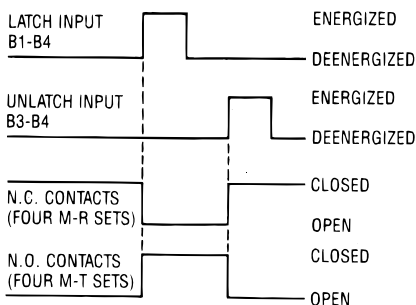
Series EGP Power Relay

Applying a voltage to the coil (B1-B4) for more than 50 msec energizes the coil and instantaneously transfers the switch, breaking the normally closed contacts (M1-R1, M2-R2, M3-R3, M4-R4) and making the normally open contacts (M1-T1, M2-T2, M3-T3, M4-T4). The contacts remain in this transferred position until the coil is deenergized, at which time the switch instantaneously returns the contacts to their original position.



Series EML Magnetic Latch

Application of a voltage to the latching input (B1-B4) will cause the relay to latch in (Make the N.O. Contacts, break the N.C. Contacts). When this voltage is removed, the relay will remain in this "Latched" condition. Application of a voltage to the unlatching input (B3-B4) will cause the relay to dropout (Break the N.O. Contacts, make the N.C. Contacts). When this voltage is removed, the relay will remain in this "Unlatched" condition.

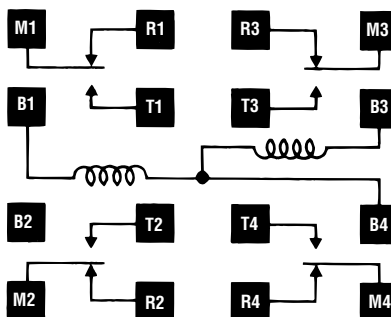


Wiring Diagram (Wiring and Connections)

The ML relay has three terminals for the windings: latching winding between terminals B1 and B4, un-latching winding between terminals B3 and B4.

The ML Relay is not symmetrical due to its three coil connections.

The relays are normally delivered polarized so that terminal B4 carries the negative voltage. To reverse the polarity, a deenergize/energize cycle should be carried out using a voltage 50% greater than the normal rating.



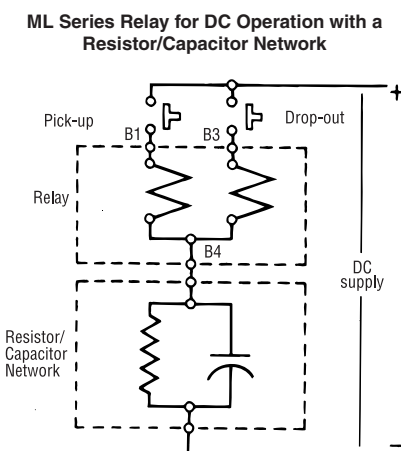
Continuous Duty Wiring

Since the double wound coil does not have a continuous duty rating, voltage pulses to the coils should not exceed a ratio of 40% on, to 60% off, with maximum power-on periods not to exceed 10 minutes.

If continuous energizing only is available, a resistor/capacitor network should be connected as shown below. In this case the shortest time between two operations must not be less than 5 seconds.

The relay will always assume the energized position in the event of both windings being energized simultaneously.

It is advisable not to put another load in parallel with the windings of the ML relay.

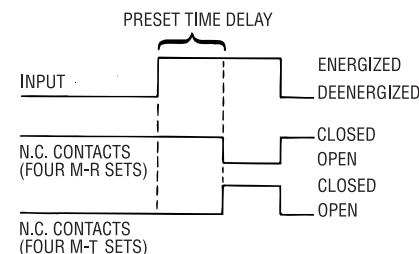
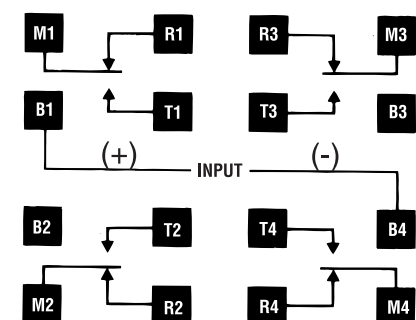


R-C Values

Nominal Voltage VDC	R		C	
	Ohms $\pm 5\%$	Watts	UF	VDC
12	62	2	5000	15
24	240	2	2000	50
48	1000	2	500	100
125	6200	2	150	150

Series ETR Time Delay Relay (Delay on Energization)

Applying a voltage to the input terminals (B1-B4) for more than 50 msec starts a time delay lasting for the preset time period. During this period the normally closed contacts (Four M-R sets) remain closed. At the end of the delay period, the normally closed contacts break and the normally open contacts (Four M-T sets) make. The contacts remain in this position until the relay is deenergized, at which time the contacts instantaneously return to their normal position. Deenergizing the relay, either during or after the delay period will recycle the unit within .075 second. It will then provide a full delay period upon reenergization, regardless of how often the voltage is interrupted before the unit has been permitted to "time-out" to its full delay setting.



AGASTAT EGP/EML/ETR Series, Nuclear Qualified Control Relays (Continued)



Specifications

Contact Ratings —

Series EGP/EML/ETR —

Contact Capacity in Amperes (Resistive)

Contact Voltage	Min. 1,000,000 Operations
24 Vdc	10.0 Amps
125 Vdc	1.0 Amp
120 Vac, 60 Hz	10.0 Amps
240 Vac, 60 Hz	7.5 Amps

Contact Ratings, UL —

Series EGP/EML Only —

Contact ratings as Listed under the Underwriters Laboratory Component Recognition Program. (Two poles per load):

1/3 Horsepower, 120 Vac
10 Amps, General Purpose, 240 Vac
120 Vdc, 1.0 Amp

Mechanical Life —

Series EGP/EML/ETR —

25,000 mechanical operations

Approximate Weight —

Series EGP/EML/ETR —

1 lb.

Transient Protection —

Series ETR Only — A 1500 volt transient of less than 100 microseconds, or 1000 volts of less than 1 millisecond will not affect timing accuracy

Timing Adjustment —

Series ETR Only —

Internal Fixed

Internal Potentiometer

Time Ranges — Series ETR Only —

A — .15 to 3 sec.

B — .55 to 15 sec.

C — 1 to 30 sec.

D — 2 to 60 sec.

E — 4 to 120 sec.

G — 10 to 300 sec.

I — 2 to 60 min.

N — 1 to 30 min.

Repeat Accuracy —

Series ETR Only —

The repeat accuracy deviation (A_R) of a time-delay relay is a measure of the maximum deviation in the time-delay that will be experienced in five successive operations at any particular time setting of the relay and over the operating voltage and temperature range specified. Repeat accuracy is obtained from the following formula:

$$A_R = \pm 100 \frac{(T_1 - T_2)}{(T_1 + T_2)}$$

Where —

T_1 = Maximum Time Delay

T_2 = Minimum Time Delay

The date of manufacture can be found in the first four (4) digits of the serial number on the nameplate:

First two digits indicate the year XX XX

Second two digits indicate the week.

Example: In the date code 7814 below:

"78" indicates the year 1978;

"14" indicates the 14th week

(or April 3 through April 7).

Model	
Coil	125 VDC
Serial	78140028

Note: TE Corporation does not recommend the use of its products in the containment areas of Nuclear Power Generating Stations.

REPLACEMENT SCHEDULE Series EGP/EML/ETR

The qualified life of these relays is 25,000 electrical operations or 10 years from the date of manufacture, whichever occurs first.

12

Specialty Relays

AGASTAT EGP/EML/ETR Series, Nuclear Qualified Control Relays (Continued)

Operating Characteristics

Environmental Conditions (Qualified Life) — Series EGP/EML/ETR

Parameter	Min.	Normal	Max.
Temperature (°F)	40	70-104	156
Humidity (R.H. %)	10	40-60	95
Pressure	—	Atmospheric	—
Radiation (rads)	—	—	2.0 x 10 ⁵ (Gamma)

Operating Conditions, Normal Environment — Series EGP/EML/ETR

Normal Operating Specifications	With DC Coils			With AC Coils	
	EGP	EML	ETR	EGP	ETR
Coil Operating Voltage, Nominal (rated) *	As Spec.	As Spec.	As Spec.	As Spec.	As Spec.
Pull-in (% of rated value)	80% Min.	85% Min.	80% Min.	85% Min.	85% Min.
Drop-out (% of rated value)	5-45%	85% Min.	5-45%	5-45%	5-50%
Continuous (% of rated value)	110% Max.	N/A	110% Max.	110% Max.	110% Max.
Power (Watts at rated value)					
Pull-in	6 Apprx.	15 Apprx.	6 Apprx.	6 Apprx.	6 Apprx.
Drop-out	N/A	13 Apprx.	N/A	N/A	N/A
Relay Operate Time	30 ms Max.	25 ms Max. With min. latch pulse of 30 ms.	N/A	35 ms Max.	N/A
Relay Release (Recycle) Time	25 ms Max.	20 ms Max. With min. latch pulse of 30 ms.	75 ms Max.	85 ms Max.	75 ms Max.
Contact Ratings, Continuous					
Resistive at 125 vdc	1.0 amp.	1.0 amp.	1.0 amp.	1.0 amp.	1.0 amp.
Resistive at 120 vac, 60 Hz	10.0 amp.	10.0 amp.	10.0 amp.	10.0 amp.	10.0 amp.
Insulation Resistance (In megohms at 500 vdc)	500 Min.	500 Min.	500 Min.	500 Min.	500 Min.
Dielectric (vrms, 60 Hz)					
Between Terminals and Ground	1,500	1,500	1,500	1,500	1,500
Between Non-connected Terminals	1,500	1,500	1,500	1,500	1,500
Repeat Accuracy	N/A	N/A	±5%	N/A	±5%

Operating Conditions, Abnormal Environment — Series EGP/EML

Adverse Operating Specifications	Normal	DB "A"	DB "B"	DB "C"	DB "D"
Temperature (°F)	70-104	40	120	145	156
Humidity (R.H. %)	40-60	10-95	10-95	10-95	10-95
Coil Operating Voltage (% of rated) *					
AC (Series EGP only)	85-110	85-110	85-110	85-110	85-110
DC (Series EGP only)	80-110	80-110	80-110	80-110	80-110
DC (Series EML only)	85-110	85-110	85-110	85-110	85-110
Relay Operate Time (ms)					
AC (Series EGP only)	35 Max.	35 Max.	35 Max.	35 Max.	35 Max.
DC (Series EGP, Series EML)	30 Max.	25 Max.	37 Max.	40 Max.	40 Max.

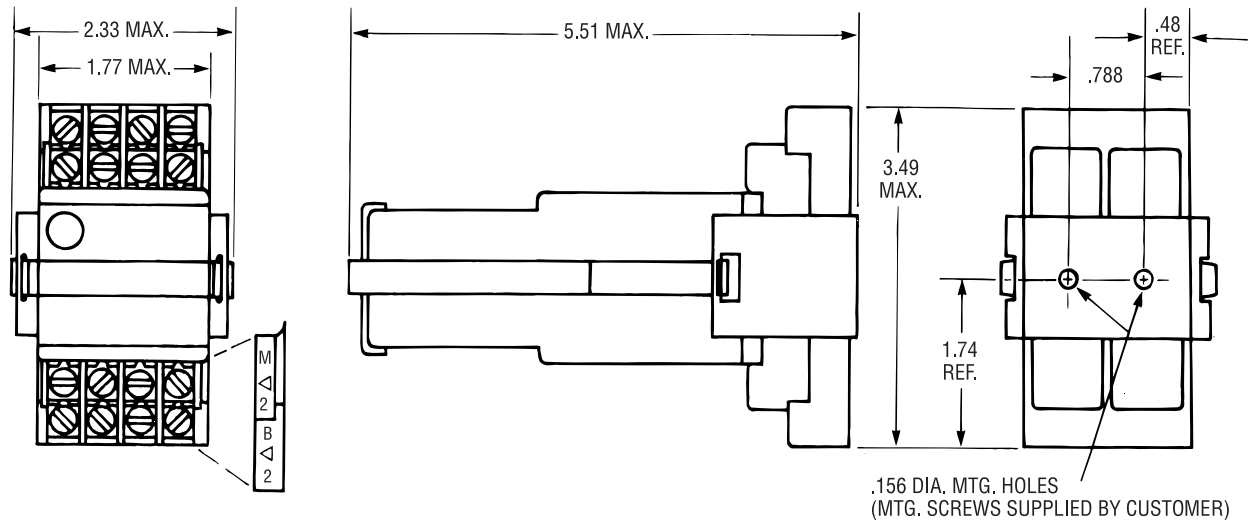
Operating Conditions, Abnormal Environment — Series ETR

Adverse Operating Specifications	With DC Coils	With AC Coils
Coil Operating Voltage (rated) *	As Spec.	As Spec.
Pull-in (% of rated value)	80% Min.	85% Min.
Continuous (% of rated value)	110% Max.	110% Max.
Drop-out (% of rated value)	5-45%	5-50%
Power (Watts at rated value)	6 Apprx.	6 Apprx.
Relay Release (Recycle) Time	75 ms Max.	75 ms Max.
Contact Ratings, Continuous		
Resistive at 125 vdc	1.0 amp.	1.0 amp.
Resistive at 120 vac, 60 Hz	10.0 amp.	10.0 amp.
Repeat Accuracy	±10%	±10%

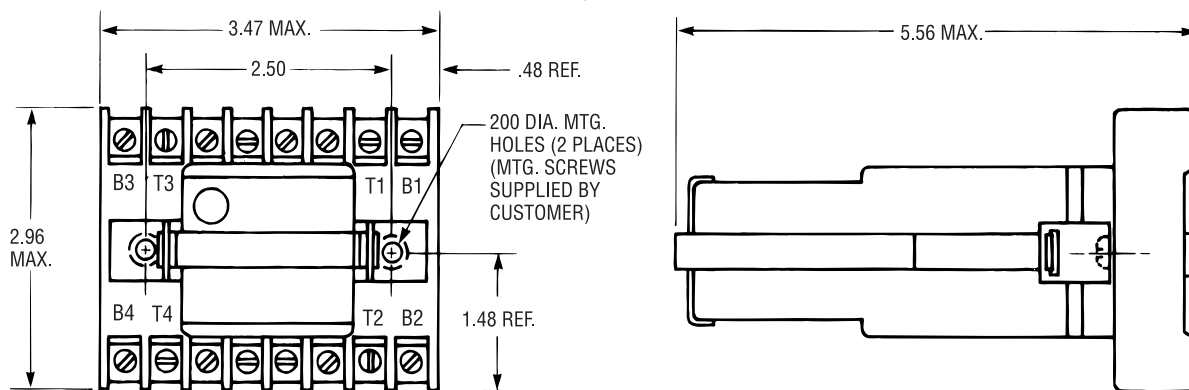
*All coils may be operated on intermittent duty cycles at voltages 10% above listed maximums (Intermittent Duty = Maximum 50% duty cycle and 30 minutes "ON" time.)

AGASTAT EGP/EML/ETR Series, Nuclear Qualified Control Relays (Continued)

Dimensions and Mounting



Qualification tested in the horizontal position, mounted in socket ECR0001-001 (captive clamp terminals) or in socket ECR0002-001 (screw terminals) with locking straps ECR0133.



Qualification tested in the horizontal position, mounted in socket ECR0095-001 (screw terminals) with locking strap ECR0155.

Series EGP, EML and ETR AGASTAT control relays must be mounted in the horizontal position; performance specifications of these units are valid only when they are mounted as indicated in either of the above drawings. All dimensions in inches.

AGASTAT EGP/EML/ETR Series, Nuclear Qualified Control Relays (Continued)

Ordering Information

Catalog Number Code —
Series EGP and EML

E

Nuclear
Safety
Related

Code
E

GP

AGASTAT
Control
Relay Model

Code
GP – Power
Relay
ML – Magnetic
Latch

A

Coil
Voltage

Code
A – 12 VDC
B – 24 VDC
C – 48 VDC
D – 125 VDC
E – 110 VDC
F – 250 VDC (Series EGP Only)

DC

G – 24 VAC 60 Hz (Series EGP Only)
H – 48 VAC 60 Hz (Series EGP Only)
I – 120 VAC 60 Hz (Series EGP Only)
J – 220 VAC 60 Hz (Series EGP Only)

AC

004

Configuration
Code*

Code
004

* Configuration Code

The Configuration Code is a suffix to the Model Number which provides a means of identification. When a significant product change is introduced, the Configuration code and specification sheets will be revised.

E

Nuclear
Safety
Related

Code
E

TR14

AGASTAT
Control
Relay Model

Code
TR14 – Time
Delay
Relay
(Delay
on
Pull-in)

B

Operating
Voltage

Code
B – 24 VDC
D – 125 VDC

DC

I – 120 VAC 60Hz

AC

1

Timing
Adjustment

Code
1 – Internal
Fixed
3 – Internal
Potentiometer

A

Time
Range

Code
A – .15 to 3 sec.
B – .55 to 15 sec.
C – 1 to 30 sec.
D – 2 to 60 sec.
E – 4 to 120 sec.
G – 10 to 300 sec.
I – 2 to 60 min.
N – 1 to 30 min.

****004**

Configuration
Code

Code
004

* Configuration Code

The Configuration Code is a suffix to the Model Number which provides a means of identification. When a significant product change is introduced, the Configuration code and specification sheets will be revised.

AGASTAT EGP/EML/ETR Series, Nuclear Qualified Control Relays (Continued)

Relay Classifications Control Code Summary

Configuration Control

Product	Code – 001	Code – 002	Code – 003	Code – 004
EGP	Contains all materials present in original qualification testing.	Nov. 1981 — Material change to coil wrapping tape and lead wire insulation to improve thermal life.	Dec. 1987 — Material change on leaf spring from nickel copper to beryllium copper.	Dec. 1995 — Material change on bobbin from Nylon ZYTEL 101 to RYNITE FR530. Material change on base from Melamine Phenolic to GRILON PMV-5HV0.
EML	Contains all materials present in original qualification testing.	Nov. 1981 — Material change to coil wrapping tape and lead wire insulation to improve thermal life.	Dec. 1987 — Material change on leaf spring from nickel copper to beryllium copper.	Dec. 1995 — Material change on bobbin from Nylon ZYTEL 101 to RYNITE FR530. Material change on base from Melamine Phenolic to GRILON PMV-5HV0.
ETR	Contains all materials present in original qualification testing.	Nov. 1981 — Material change to coil wrapping tape and lead wire insulation to improve thermal life.	Dec. 1987 — Material change on leaf spring from nickel copper to beryllium copper.	Dec. 1995 — Material change on bobbin from Nylon ZYTEL 101 to RYNITE FR530. Material change on base from Melamine Phenolic to GRILON PMV-5HV0.
ECR0001	Contains all materials present in original qualification testing.	June 1989 — Material change from NORYL N-225 std. black to NORYL SE-I-701AA black.		
ECR0002	Contains all materials present in original qualification testing.	June 1989 — Material change from NORYL N-225 std. black to NORYL SE-I-701AA black.		
ECR0095	Contains all materials present in original qualification testing.	June 1989 — Material change from NORYL N-225 std. black to NORYL SE-I-701AA black.		
ECR0133	Contains all materials present in original qualification testing.			
ECR0155	Contains all materials present in original qualification testing.			

Configuration Code: The Configuration code is a suffix to the Model Number which provides a means of identification. When a significant product change is introduced, the Configuration code and specification sheets will be revised. (001, 002, 003, 004, etc.)

GRILON is a trademark of EMS-Chemie AG.
NORYL is a trademark of SABIC Innovative Plastics.
RYNITE and ZYTEL are trademarks of E.I. du Pont de Nemours and Company.

AGASTAT GP/ML/TR Series, 10 Amp Control Relay, Non-latching, Latching & Timing Versions



Product Facts

- Occupies very small panel space
- May be mounted singly, in continuous rows or in groups
- Available with screw terminal molded socket.
- 4 SPDT contacts
- Magnetic blowout device option increases DC current carrying ability approximately ten times for both N.O. and N.C. contacts. In both AC and DC operation, the addition of the device will normally double the contact life, due to reduced arcing.
- File E15631, File LR29186



Users should thoroughly review the technical data before selecting a product part number. It is recommended that users also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

GP/ML/TR Design Features

Among the advances AGASTAT control relays offer over existing designs is a unique contact operating mechanism. An articulated arm assembly amplifies the movement of the solenoid core, allowing the use of a short stroke coil to produce an extremely wide contact gap. The long support arms used in conventional relays are eliminated. Both current capacity and shock/vibration tolerance are greatly increased, as well as life expectancy.

Design/Construction

AGASTAT control relays are operated by a moving core electromagnet whose main gap is at the center of the coil.

The coil provides a low mean turn length and also assists heat dissipation. Since the maximum travel of the electromagnet does not provide optimum contacts movement, an ingenious amplifying device has been designed.

This consists of a W-shaped mechanism, shown in Figure 1. When the center of the W is moved vertically the lower extremities move closer to each other as can be seen in the illustration. The center of the W mechanism is connected to the moving core of the electromagnet and the two lower points are connected to the moving contacts.

Two of these mechanisms are placed side-by-side to actuate the four contacts sets of the relay. These arms act as return springs for their corresponding contacts.

The mechanical amplification of the motion of the electromagnet permits a greater distance between the contacts, while the high efficiency of the electromagnet provides a nominal contact force in excess of 100 grams on the normally open contacts.

All the contacts are positioned well away from the cover and are well ventilated and separated from each other by insulating walls.

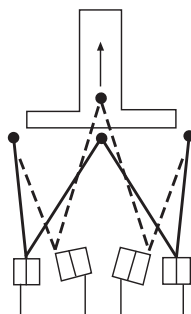
The absence of metal-to-metal friction, the symmetrical design of the contact arrangement and the lack of heavy impacts provides a mechanical life of 100,000,000 operations.

For use in AC circuits, the relay is supplied with a built-in rectification circuit, thus retaining the high DC efficiency of the electromagnet. The current peak on energizing is also eliminated and consequently the relay can operate with a resistance in series (e.g. for high voltages or for drop-out by shorting the coil). The use of the rectification circuit offers still other advantages. The same model can operate at frequencies ranging from 40 to 400 cycles. Operation of the relay is possible even with a low AC voltage.

The plastic dust cover has two windows to facilitate cooling and also to allow direct mounting of the relay.

**Figure 1 —
Illustration of Amplification**

This diagram illustrates amplification obtained by the articulated operating mechanism.



Note: Seismic & radiation tested EGP, EML and ETR models are available. Consult factory for detailed information.

AGASTAT GP/ML/TR Series, 10 Amp Control Relay, Non-latching, Latching & Timing Versions (Continued)

GP/ML Contact Data @ 25°C

Arrangements — 4 Form C (4PDT)

Material — Silver plated

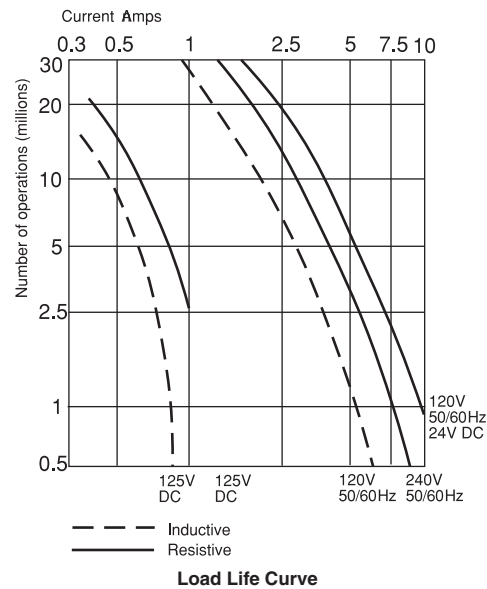
Expected Life —

Mechanical — 100 million operations

Electrical — See chart and graph

Contact Ratings and Expected Life

Voltage	Current (Amps)	Power Factor or Time Constant	Number of Electrical Operations	Remarks
540 VAC	3	COS Ø = 0.5	15,000	2 contacts in series
380 VAC	15	Resistive	10,000	2 contacts in parallel
380 VAC	10	Resistive	200,000	
380 VAC	3 x 3.3	COS Ø = 0.8	200,000	3hp motor
220 VAC	20	Resistive	20,000	2 contacts in parallel
220 VAC	15	COS Ø = 0.5	20,000	2 contacts in parallel
220 VAC	10	Resistive	400,000	
220 VAC	3 x 6	COS Ø = 0.8	200,000	3 hp motor
220 VAC	5		1,500,000	Filament lamps
220 VAC	5	Resistive	3,000,000	
220 VAC	2.5	COS Ø = 0.25	2,000,000	
220 VAC	2	Resistive	15,000,000	
220 VAC	1.25	Resistive	30,000,000	
120 VDC	1.5	Resistive	20,000,000	with blow-out device
48 VDC	10	Resistive	1,000,000	
48 VDC	1.5	5 ms	18,000,000	



Initial Dielectric Strength —

Between non-connected terminals — 2,000V rms, 60 Hz

Between non-connected terminals & relay yoke — 2,000V rms, 60 Hz

Initial Insulation Resistance —

Between non-connected terminals — 109 ohms at 500VDC

Between non-connected terminals & relay yoke — 109 ohms at 500VDC

Coil Data

Voltage — 24, 120 & 220VAC, 60 Hz;

Add series resistor for 380-440VDC; 12, 24, 48, 125 & 250VDC

Duty Cycle — Continuous

Nominal Coil Power —

6VA for AC coils; 6W for DC coils.

There is no surge current during operation.

Coil Operating Voltage

	DC					AC, 50/60Hz		
Nominal Coil Voltage	12	24	48	125	250	24	120	220
Minimum Pick-up								
Voltage at 20°C	9	18	36	94	187	19	92	175
Minimum Pick-up								
Voltage at 40°C	9.5	19	38	100	200	20	102	188
Maximum voltage for continuous use	13.5	27	53	143	275	27	137	245

For 380VAC — Use 6800 ohms 4 watt resistor in series with 220VAC relay.

For 440VAC — Use 8200 ohms 6 watt resistor in series with 220VAC relay.

Drop-out voltage is between 10% and 40% of the nominal voltages for both DC and AC (For example: in a 120 VAC unit, drop-out will occur between 12 and 48 volts.)

DC relays will function with unfiltered DC from a full-wave bridge rectifier.

Operate Data @ 20°C

Operate Time at Rated Voltage —

Between energizing and opening of normally closed contacts — less than 18 milliseconds on AC and less than 15 milliseconds on DC.

Release Time —

Between energizing and closing of normally open contacts — less than 35 milliseconds on AC and less than 30 milliseconds on DC.

Between de-energizing and opening of normally open contacts — less than 70 milliseconds on AC and less than 8 milliseconds on DC.

Between de-energizing and closing of normally closed contacts — less than 85 milliseconds on AC and less than 25 milliseconds on DC.

Environmental Data

Operating Temperature Range: 0°C to +60°C.

Vibration: Single axis fragility curve data are available on request at frequencies from 5 Hz. to 33 Hz.

Shock: The relay, when kept energized by means of one of its own contact sets, will withstand 40g shock load when operating on DC, and 150g shock load on AC.

Mechanical Data

Mounting Terminals —

16 flat base pins. Screw terminal sockets are available.

Wire Connection — The 16 flat pins are arranged in four symmetrical rows of four pins; the pitch in both directions being .394". Connection may be made to the relay by soldering. Sockets are available with screw terminals.

The internal wiring of the relay is also symmetrical as shown in the adjacent figure, allowing the relay to be inserted into the socket in either of two positions. Terminals B2 and B3 are provided as extra connections for special applications.

Weight —

10.9 oz. (308g) approximately

AGASTAT GP/ML/TR Series, 10 Amp Control Relay, Non-latching, Latching & Timing Versions (Continued)

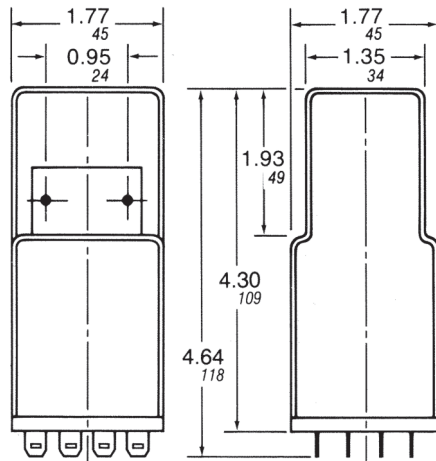
Ordering Information

Typical Part No. ➤		GP	I	N
1. Basic Series: GP = Non-latching Control Relay ML = Magnetic Latching Control Relay				
2. Coil Voltage: A = 12VDC B = 24VDC C = 48VDC D = 125VDC F = 250VDC G = 24VAC, 60 Hz. I = 120VAC, 60 Hz. J = 220VAC, 60 Hz.				
3. Options: N = Magnetic Blow-out Device Q = Light to indicate coil energization (GP only. 120VAC, 125VDC, 220VAC and 250VDC voltages only.) R = Internal diode to suppress coil de-energization transient. (GP only. When used on DC unit, relay release time increases to same value as AC unit).				

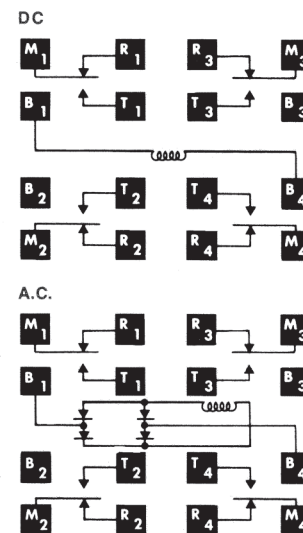
Our authorized distributors are more likely to maintain the following items in stock for immediate delivery.

GPD

GPDN



Outline Dimensions



Wiring Diagrams (Bottom Views)

AGASTAT GP/ML/TR Series, 10 Amp Control Relay, Non-latching, Latching & Timing Versions (Continued)

TR Series

Product Facts

- 8 timing ranges
- 4 SPDT contacts
- Magnetic blowout device option increases DC current carrying ability approximately ten times for both N.O. and N.C. contacts. In both AC and DC operation, the addition of the device will normally double the contact life, due to reduced arcing.

TR Design/Construction

Couples an advanced electromechanical design with a field-proven solid-state timing network, an adaptation of the circuit used in the AGASTAT premium grade SSC Timer.

This unique circuit also eliminates the need for supplementary temperature-compensation components, affording unusual stability over a realistically broad operating temperature range. It also provides transient protection and protection against premature switching of the output contacts due to power interruption during timing.

Timing Specifications

Operating Mode — On-Delay (Delay on energization)

Timing Adjustment — Internal fixed or internal potentiometer

Timing Ranges

.15 to 3 sec.
.55 to 15 sec.
1 to 30 sec.
2 to 60 sec.
4 to 120 sec.
10 to 300 sec.
1 to 30 min.
2 to 60 min.

Accuracy

Repeat — $\pm 2\%$ as fixed temperature and voltage

Overall — $\pm 5\%$ over combined rated extremes of temperature and voltage

Reset Time — 75ms.

Contact Data @ 25°C

Arrangements — 4 Form C (4PDT)

Nominal Rating — 10A @ 120VAC

Contact Pressure

Between movable and normally closed contacts — 30 g, typical.

Between movable and normally open contacts — 100 g, typical.

Expected Life

Mechanical — 100 million operations
Electrical — See load/life graph

Initial Dielectric Strength

Between terminals and case and between mutually-isolated contacts — 2,000VAC

Initial Insulation Resistance

Between non-connected terminals — 109 ohms at 500VDC
Between non-connected terminals & relay yoke — 109 ohms at 500VDC

Coil Data

Voltage — 120VAC, 50-60 Hz.; 24 & 125VDC

Transient Protection

1,500 volt transient of less than 100 microseconds, or 1,000 volts or less

Environmental Data

Operating Temperature Range — 0°C to +50°C

Mechanical Data

Mounting Terminals

16 flat base pins. Screw terminal sockets are available.

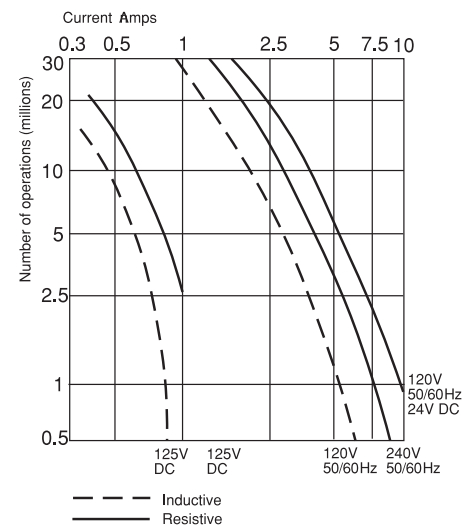
Weight — 11 oz. (311g) approximately.

Ordering Information

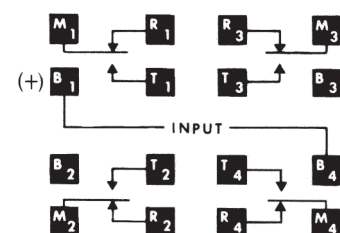
Typical Part No. ➤	TR	1	4	B	1	A	N
1. Basic Series: TR = Timing control relay							
2. Operation: 1 = On-delay							
3. Output: 4 = 4PDT (4 form C)							
4. Operating Voltage: B = 24VDC D = 215VDC I = 120VAC, 50/60 Hz.							
5. Timing Adjustment: 1 = Internal fixed. 3 = Internal potentiometer.							
6. Timing Range: A = .15 to 3 sec. C = 1 to 30 sec. E = 4 to 120 sec. I = 2 to 60 min. B = .55 to 15 sec. D = 2 to 60 sec. G = 10 to 300 sec. N = 1 to 30 min.							
7. Options: N = Magnetic blow-out device.							

Our authorized distributors are more likely to maintain the following items in stock for immediate delivery.

None at present.



Load Life Curve



Wiring Diagram (Bottom View)

For Outline Dimensions see page 12-30

VCA Series, Single Phase, Undervoltage Relay



Product Facts

- Automatic reset minimizes equipment downtime
- Fixed pickup point prevents low voltage start-up
- Adjustable dropout point protects against undervoltage operation
- Delayed dropout prevents nuisance tripping
- Compact, inexpensive design saves space, reduces cost
- Solid state circuitry for enhanced accuracy and long life
- LED indicates normal voltage condition
- File E60363



Function

Single phase undervoltage relay

Sensing Specifications

Voltage Set-Point Adjustment —

Internal potentiometer (screwdriver adjustable) with linear calibrated dial

Response Time — Depending on severity of undervoltage: 0.1 - 1 sec.

Accuracy —

Repeat Accuracy — $\pm 0.2\%$

Overall Accuracy — $\pm 1\%$

Output Data

Arrangement — 1 Form C (SPDT)

Rating — 7A @ 250VAC; 1/6 HP @ 250VAC; 300VA @ 120/240VAC; 3A @ 30VDC

Expected Mechanical Life —

10,000,000 operations

Expected Electrical Life — 100,000 operations at rated resistive load

Initial Dielectric Strength —

Between Terminals and Case — 1,480V

Between Relay Contacts and Active

Circuitry — 1,480V

Input Data

Voltage — 120VAC, 240VAC

Power Requirement — 4W max.

Transient Protection —

120VAC 30 joules

240VDC 30 joules

120VAC 10 joules

120VDC 10 joules

Environmental Data

Temperature Range —

Storage — -40°C to $+85^{\circ}\text{C}$

Operating — -23°C to $+55^{\circ}\text{C}$

Mechanical Data

Mounting — Panel mount with one #8 screw

Termination — 0.250 in (6.35) quick connect terminals

Status Indication — LED indicates normal voltage condition

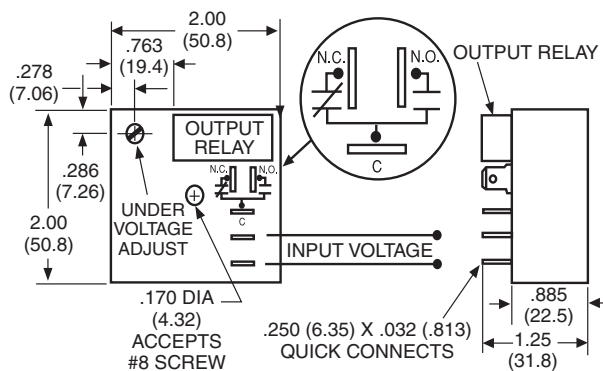
Weight — 3.2 oz. (90.7g) approximately

Ordering Information

Part Number	Operating Voltage
VCAA	120VAC
VCAB	240VAC

Authorized distributors are likely to stock the following:

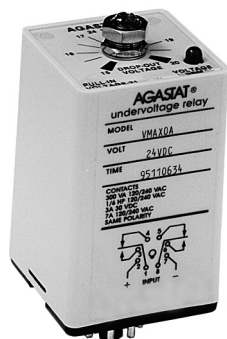
None at present.



Outline Dimensions and Wiring Diagram

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

VMA series, Single Phase, Plug-in, Undervoltage Relay



Product Facts

- Automatic reset minimizes equipment downtime
- Fixed pickup point prevents low voltage start-up
- Adjustable dropout point protects against undervoltage operation
- Locking potentiometer maintains selected set point
- Delayed dropout prevents nuisance tripping
- Plug-in mounting for easier installation
- Built-in protection against polarity reversal
- LED indicates normal voltage condition
- File E60363



Function

Single phase undervoltage relay

Sensing Specifications

Voltage Set-Point Adjustment — Locking potentiometer with calibrated dial

Response Time — Standard 0.5 sec. delay on dropout

Accuracy —
Repeat Accuracy — $\pm 0.5\%$ under fixed conditions
Overall Accuracy — $\pm 1\%$

Temperature Coefficient —
 $\pm 0.02\%/^{\circ}\text{C}$ (Max.)

Output Data

Arrangement — 2 Form C (DPDT)

Rating — 7A @ 250VAC; 1/6 HP @ 250VAC; 300VA @ 120/240VAC; 3A @ 30VDC

Expected Mechanical Life —
10,000,000 operations

Expected Electrical Life — 100,000 operations at rated resistive load

Initial Dielectric Strength

Between Terminals and Case — 1,480V
Between Relay Contacts and Active Circuitry — 1,480V

Input Data

Voltage — See ordering information.

Power Requirement — 4W max.

Transient Protection

24VAC 1.5 joules
24VDC 1.5 joules
48VDC 10 joules
120VAC 10 joules
125VDC 10 joules
240VDC 20 joules

Reverse Polarity Protection —
On DC models

Duty Cycle — Continuous

Environmental Data

Temperature Range —
Storage — -30°C to $+60^{\circ}\text{C}$
Operating — -10°C to $+55^{\circ}\text{C}$

Mechanical Data

Mounting — Octal plug. Fits 27E122 or 27E891 (snap-on) screw terminal socket. Order socket separately.

Enclosure — Nylon cover protects against particles.

Status Indication — LED indicates normal voltage condition.

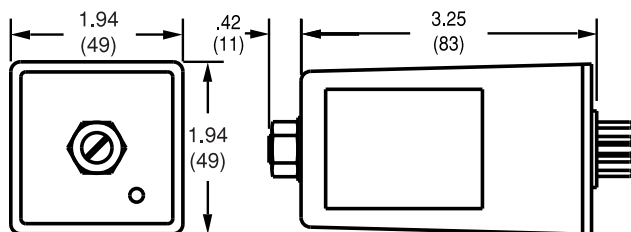
Weight — 6 oz. (168g) approximately.

Ordering Information

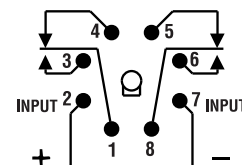
Part Number	Nominal Voltage	Pick-Up (V)	Drop-Out Range (V)
VMAXEA	24VAC	21	15 to 20
VMAXAA	120VAC	104	78 to 99
VMAXBA	240VAC	209	156 to 199
VMAXOA	24VDC	21	15 to 20
VMAXNA	48VDC	42	31 to 40
VMAXPA	125VDC	109	81 to 103

Authorized distributors are likely to stock the following:

None at present.



Outline Dimensions



Wiring Diagram
(Bottom View)

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

SCB/SCC Series, Specification Grade Discrete Plug-in, Time Delay Relay



Product Facts

- On-Delay, Off-Delay and Interval timing modes
- 13 timing ranges from 0.1 sec. to 60 min.
- 10A DPDT output contacts
- Knob, fixed or external timing adjustment.
- Rated for pilot duty
- Premium components
- File 3520, File E60363, File LR51332, File E60363 (SCC only)



Timing Specifications

Timing Modes —

On-Delay, Off-Delay and Interval

Timing Ranges — 6 to 180 cycles; 0.1 to 3 / 0.1 to 10 / 0.33 to 10 / 1 to 30 / 4 to 120 sec.; 0.33 to 10 / 1 to 30 / 2 to 60 min.; 0.33 to 10 hr. (All are +5%, -0% of maximum values).

Timing Adjustment —

Knob or fixed time (internal fixed resistor) — all models; customer supplied external potentiometer or resistor — On-Delay and Interval models only.

Accuracy —

Repeat Accuracy — $\pm 0.5\% \pm 0.004$ sec.
Overall Accuracy — $\pm 2\%$ max.

Reset Time — 25 ms.

Relay Operate Time —

Off-Delay mode — 30 ms;
Interval mode — 20 ms..

Relay Release Time —

On-Delay mode only — 15 ms.

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Contact Data @ 25°C

Arrangements — 2 Form C (DPDT)

Rating — 10A @ 28VDC or 120VAC, resistive; 1/3 HP @ 120/240VAC; 345VA. Same polarity.

Expected Mechanical Life —

10 million operations

Expected Electrical Life — 500,000

operations, min., at rated resistive load

Initial Dielectric Strength —

Between Terminals and Case — 1,000VAC plus twice the nominal voltage for one minute.

Input Data @ 25°C

Voltage — See Ordering Information section for details.

Power Requirement — 3W, max.

Transient Protection: Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
All except 12 & 24	3,000V	2,500
12 & 24	Consult Factory	

Environmental Data

Temperature Range —

Storage —
SCB and SCC — -40°C to +85°C

Operating —

SCB: -30°C to +65°C;
SCC: -30°C to +50°C

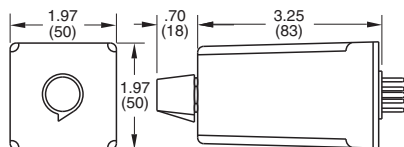
Mechanical Data

Mounting/Termination —

SCB — UL recognized. Optional 8- or 11-pin octal-type sockets may be ordered separately.

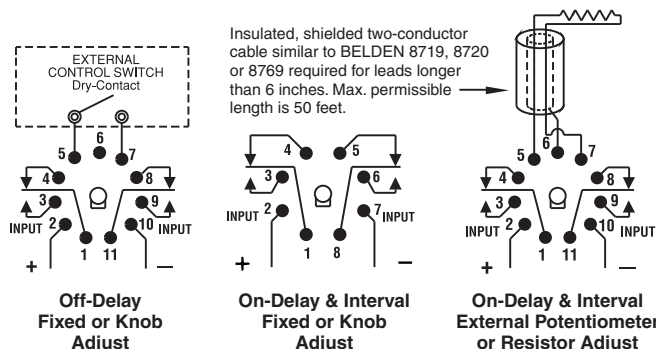
SCC — 8- or 11-pin octal type sockets supplied with timer. (Must be used to qualify as "UL Listed" device.)

Weight — SCB: 5.3 oz. (149g) approx.;
SCC: 7.5 oz. (210g) approx.



Outline Dimensions

Wiring Diagrams (Bottom Views)



Ordering Information (All "X"s must be included to complete part number)

SCB	RX	01	2XX	A	A	XA
Series SCB Discrete Industrial Timer		Operating Mode 01 = On-Delay 02 = Off-Delay 03 = Interval	Output 2XX = DPDT Relay		Timing Range A = 0.1 to 3 sec. B = 0.5 to 15 sec. C = 1 to 30 sec. D = 2 to 60 sec. E = 4 to 120 sec. F = 6 to 180 sec. G = 10 to 300 sec. I = 2 to 60 min. K = 3 to 180 cycles L = 0.33 to 10 min. M = 0.5 to 15 min. N = 1 to 30 min. P = 0.1 to 10 min.	Timing Adjustment XA = Knob Adjust XB = External Potentiometer or resistor (Operating modes 1 and 3 only). XF = Fixed Times —Specify time delay in seconds per the following examples: XF9.000 = 9 sec. XF99.00 = 99 sec. XF999.0 = 999 sec. XF1000 = 1000 sec.
Mounting Series SCB RX = 8- or 11-pin socket (order separately)						
Mounting Series SCC LA = 8-pin socket p/n BCSA08SC for operating mode 01 or 03 with knob adjust or fixed time. LC = 11-pin socket p/n BCSA11SC for operating mode 02; or 01 or 03 with external potentiometer or resistor.				Operating Voltage (+10%, -15%) A = 120VAC, 50/60 Hz. / 120VDC B = 240VAC, 50/60 Hz. E = 24VAC, 50/60 Hz. / 24VDC F = 48VAC, 50/60 Hz. / 48VDC Q = 12VDC		

Authorized distributors are likely to stock the following:

None at present.

BELDEN is a trademark of Belden Technologies, Inc.

SCE Series, Specification Grade Discrete Plug-in, True Off-Delay Time Delay Relay



Product Facts

- True Off-Delay timing modes
- Six time delays from 0.1 sec. to 10 min.
- 10A SPDT or 5A DPDT output contacts
- Excellent repeat accuracy — typically better than $\pm 1\%$
- 8-pin octal plug.
- File E15631, File LR51332



CAUTION: If unit has not been energized for several months, apply operating voltage for 20 minutes prior to initial time delay.

Timing Specifications

Timing Modes —

True Off-Delay — Upon application of operating voltage (min. 100ms), output relay contacts transfer. When operating voltage is removed, the time delay period is initiated. At the end of the delay period, output relay contacts release. If operating voltage is reapplied prior to expiration of the delay period, the delay will be cancelled and output relay contacts will remain transferred.

Timing Ranges —

0.1 to 3 / 0.5 to 15 / 1 to 30 / 4 to 120 / 10 to 300 sec.; 0.33 to 10 min.

Timing Adjustment —

Knob adjustment — Internal potentiometer with external knob adjustment. Maximum time calibrated with $+10\%$, -0% of values shown below at rated voltage, at 68°F .

Fixed time — internal fixed resistor.

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Accuracy —

Repeat Accuracy — ± 1
Overall Accuracy — $\pm 5\%$

Reset Time — 30 ms. min.

Relay Operate Time — 30 ms.

Contact Data @ 25°C

Arrangements — 1 Form C (SPDT) and 2 Form C (DPDT)

Rating —

1 Form C — 10A @ 120/240VAC, resistive; 1/3 HP @ 120VAC; 345VA @ 120VAC; 1/4 HP @ 240VAC; 275VA @ 240VAC. Same polarity.
2 Form C — 5A @ 28VDC or 120/240VAC, resistive; 1/6 HP @ 120/240VAC; 200VA @ 120/240VAC. Same polarity.

Expected Mechanical Life —

10 million operations

Expected Electrical Life — 200,000 operations, min., at rated resistive load

Initial Dielectric Strength —

Between Terminals and Case and relay contacts and active circuitry — 1,480VAC for one minute

Input Data @ 25°C

Voltage — See Ordering Information section for details

Power Requirement — 750mW

Transient Protection — 1,000V plus twice rated voltage for 0.1 ms

Environmental Data

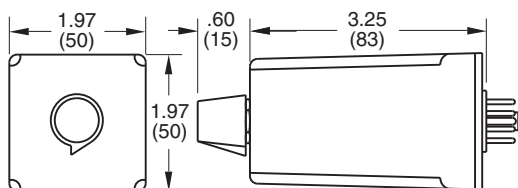
Temperature Range —

Storage — -40°C to $+85^\circ\text{C}$
Operating — -30°C to $+65^\circ\text{C}$

Mechanical Data

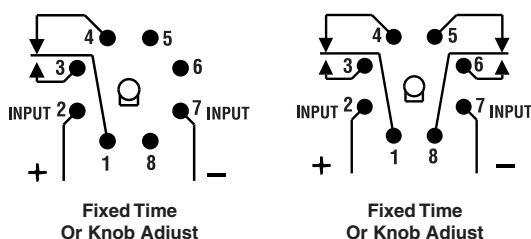
Mounting/Termination — 8-pin octal plug fits either 27E122 or 27E891 (snap-on) socket (order separately)

Weight — 4 oz. (112g) approximately



Outline Dimensions

Wiring Diagrams (Bottom Views)



Ordering Information (All "X's" must be included to complete part number)

SCE	R	X	2	2	A	C	A
Series SCE	Agency Recognition	Output Rating	Output	Operating Mode	Timing Range	Operating Voltage	Timing Adjustment
True Off-delay Timer	R = UL recognized	W = 10A (SPDT) X = 5A (DPDT)	1 = SPDT (W) 2 = DPDT (W)	2 = True Off-Delay	A = 0.1 to 3 sec. B = 0.5 to 15 sec. C = 1 to 30 sec. E = 4 to 120 sec. G = 10 to 300 sec. L = 0.33 to 10 min.	A = 120VAC, 50/60 Hz. / 125VDC E = 24VAC, 50/60 Hz. / 24VDC F = 48VAC, 50/60 Hz. / 48VDC	A = Knob Adjust F = Fixed Times —Specify time delay in seconds per the following examples: XF9.000 = 9 sec. XF99.00 = 99 sec. XF999.0 = 999 sec. XF1000 = 1000 sec.

Authorized distributors are likely to stock the following:

None at present.

SCF Series, Programmable, Time Delay Relay

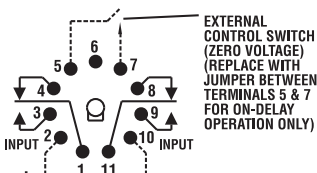


Product Facts

- 4 user-programmable timing modes
- 0.1 sec. to 10 hr. programmable timing range
- Parameters set with recessed dials
- Narrow width saves panel space
- 10A DPDT output relay
- Socket can be DIN-rail or back panel mounted
- File E15631(relay) and E140494 (socket)
- File LR29186 (relay) and LR29513M7 (socket)



Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.



NOTE: External wiring illustrated by broken lines

Wiring Diagram
(Bottom View)

Timing Modes

Modes are user selectable via screwdriver adjustment of recessed 4-position selector dial.

Modes offered are: On-Delay, Off-Delay, Interval and Latching Interval.

Timing Specifications

Timing Ranges — 0.1 to 3 / 0.33 to 10 / 1 to 30 / 4 to 120 sec.; 0.33 to 10 / 1 to 30 / 2 to 60 min.; 0.33 to 10 hr.

Timing Range Selection — Screwdriver select via recessed 8-position selector dial.

Timing Adjustment — External knob potentiometer adjustment with reference calibrations.

Accuracy — Repeat Accuracy — $\pm 1\% \pm 0.01$ sec. Overall Accuracy — $\pm 3\% \pm 0.01$ sec.

Reset Time — 30 ms.

Relay Operate Time — On-Delay and Interval mode: 55 ms.

Relay Release Time — Off-Delay, Interval and Latching Interval: 40 ms.

Contact Data @ 25°C

Arrangements — 2 Form C (DPDT).

Rating — 10A @ 28VDC or 120VAC, resistive; 1/3 HP @ 120/240VAC; 345VA.

Expected Mechanical Life — 10 million operations.

Expected Electrical Life — 500,000 operations, min., at rated resistive load.

Initial Dielectric Strength — Between Terminals and Case — 1,000VAC plus twice the nominal voltage for one minute.

Input Data @ 25°C

Voltage — See Ordering Information section for details.

Power Requirement — 2W, max.

Transient Protection — Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
12VDC	1,000V	240V*
24VAC/VDC	1,000V	240V*
48 VAC/VDC	1,000V	480V*
120 VAC, 125VDC	3,000V	2,500V*
240VAC/VDC	3,000V	2,500V*

*Minimum source impedance of 100 ohm

Environmental Data

Temperature Range — Storage — -40°C to $+85^{\circ}\text{C}$. Operating — -30°C to $+65^{\circ}\text{C}$.

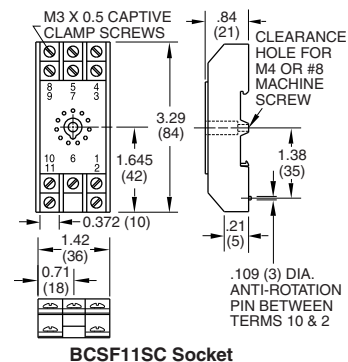
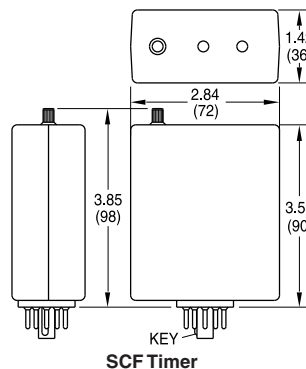
Mechanical Data

Mounting/Termination — 11-pin octal-type plug for use with mating socket. Mount relay in horizontal position (pins horizontal, knob down, LEDs up).

Status Indication — Power On LED and Output Contacts LED.

Weight — Relay: 3.5 oz. (156g) approx.; Socket: 1.7 oz. (48.3g) approx.

Outline Dimensions



Ordering Information (All "X"s must be included to complete part number)

SCF	RX	90	2	A	A
Series SCF Plug-In Programmable Timer		Operating Mode		Output Rating	
		90 = Multiple Modes On-Delay Off-Delay Interval Latching Interval		A = 10 Amp B = 5 Amp	
	Mounting		Output	Operating Voltage (+10%, -15%)	
	RX = Without Socket RF = With Socket		2 = DPDT Relay		
				A = 120VAC, 50/60 Hz. / 125VDC B = 240VAC, 50/60 Hz. § E = 24VAC, 50/60 Hz. / 24VDC F = 48VAC, 50/60 Hz. / 24VDC Q = 12VDC	

§ Voltage Option B is only available with 5 Amp output option.

Authorized distributors are likely to stock the following:

None at present.

SRC Series, Specification Grade Repeat Cycle, Plug-in Time Delay Relay

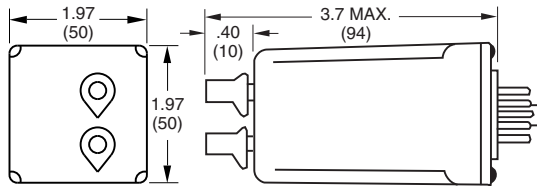


Product Facts

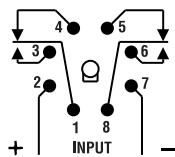
- Repeat Cycle timing mode
- Dual knobs for user adjustment of on and off times
- 13 timing ranges from 0.1 sec. to 60 min.
- 10A DPDT output contacts
- Exceptional immunity to line transients and noise
- Premium components enhance reliability
- Superior reset time of 24 msec.



Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.



Outline Dimensions



Wiring Diagram (Bottom View)

Timing Specifications

Timing Modes —

Repeat Cycle: Application of line voltage starts the pre-set OFF-time period. Upon expiration of the period, the output relay is energized, its contacts transfer, and the pre-set ON-time period begins. At the end of this period the output relay is deenergized, and a new cycle begins. The OFF and ON cycles continue until power is removed. To reset the timer, input voltage must be removed for at least 25 ms.

Timing Ranges — OFF time and ON time ranges need not be the same. 6 to 180 cycles; 0.1 to 3 / 1 to 10 / 0.5 to 15 / 1 to 30 / 2 to 60 / 4 to 120 / 6 to 180 / 10 to 300 sec.; 0.33 to 10 / 0.5 to 15 / 1 to 30 / 2 to 60 min. (All are +10%, -1% of maximum values).

Timing Adjustment — Two internal potentiometers with external knobs.

Accuracy —

Repeat Accuracy — $\pm 1\% \pm 0.004$ sec.
Overall Accuracy — $\pm 2.25\%$ max.

Reset Time — 25 ms. max. (between deenergization and reenergization without affecting accuracy.)

Relay Operate Time — 20 ms.

Relay Release Time — 15 ms.

Contact Data @ 25°C

Arrangements — 2 Form C (DPDT).

Rating — 10A @ 28VDC or 120VAC, resistive; 1/3 HP @ 120/240VAC.

Expected Mechanical Life — 10 million operations

Expected Electrical Life — 500,000 operations, min., at rated resistive load.

Initial Dielectric Strength —

Between Terminals & Case and Mutually Isolated Contacts — 1,480VAC.

Input Data @ 25°C

Voltage — See Ordering Information section for details.

Power Requirement — 3W max.

Transient Protection — Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
12VDC	1,000V	240V*
12VDC	1,000V	240V*
24VAC/VDC	1,000V	240V*
48 VAC/VDC	1,000V	480V*
120 VAC/VDC	3,000V	2,500V*
240VAC	3,000V	2,500V*

*Minimum source impedance of 100 ohm

Environmental Data

Temperature Range —

Storage — -40°C to +85°C

Operating — -30°C to +65°C

Mechanical Data

Mounting/Termination —

Quick connect terminals fit either 27E121 or 27E893 (snap-on) socket (order separately)

Weight — 5.3 oz. (149g) approximately

Ordering Information

SRC	7	2	A	C	C	A
Series SRC	Repeat Cycle Timer.	Output 2 = DPDT Relay	Timing Range Off-Time	Timing Range On-Time	Timing Adjustment	Timing Adjustment
Operating Mode	7 = Repeat Cycle		A = 0.1 to 3 sec. B = 0.5 to 15 sec. C = 1 to 30 sec. D = 2 to 60 sec. E = 4 to 120 sec. F = 6 to 180 sec. G = 10 to 300 sec. I = 2 to 60 min. K = 3 to 180 cycles L = 0.33 to 10 min. M = 0.5 to 15 min. N = 1 to 30 min. P = 0.1 to 10 sec.	A = 0.1 to 3 sec. B = 0.5 to 15 sec. C = 1 to 30 sec. D = 2 to 60 sec. E = 4 to 120 sec. F = 6 to 180 sec. G = 10 to 300 sec. I = 2 to 60 min. K = 3 to 180 cycles L = 0.33 to 10 min. M = 0.5 to 15 min. N = 1 to 30 min. P = 0.1 to 10 sec.	A = Dual Knob Adjust	
Operating Voltage (+10%, -15%)						
A = 120VAC, 50/60 Hz. / 120VDC						
B = 240VAC, 50/60 Hz.						
E = 24VAC, 50/60 Hz. / 24VDC						
F = 48VAC, 50/60 Hz. / 48VDC						
Q = 12VDC						

Authorized distributors are likely to stock the following:

None at present.

SSC Series, Specification Grade Discrete Plug-in, Time Delay Relay

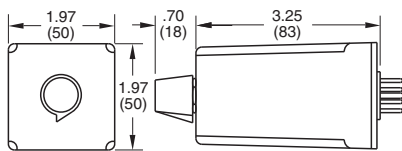


Product Facts

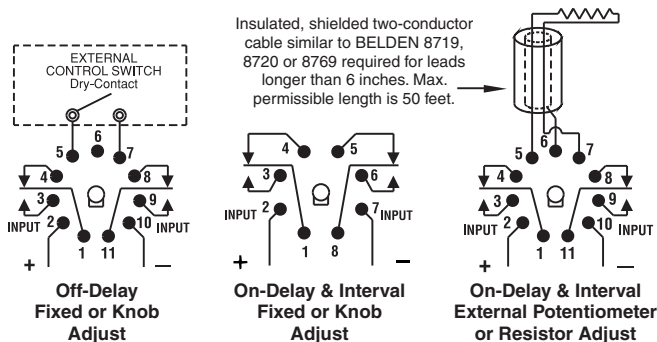
- On-Delay, Off-Delay and Interval timing modes
- 13 timing ranges from 0.1 sec. to 60 min.
- 10A DPDT output contacts
- Excellent repeatability of $\pm 1\%$ or better.
- Exceptional immunity to transients and noise.
- Wide operating temperature range.
- File 3520, File LR29186



Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.



Outline Dimensions



Wiring Diagrams (Bottom Views)

BELDEN is a trademark of Belden Technologies, Inc.

Contact Data @ 25°C

Arrangements — 2 Form C (DPDT).

Rating — 10A @ 28VDC or 120VAC, resistive; 1/3 HP @ 120/240VAC.

Expected Mechanical Life — 10 million operations

Expected Electrical Life — 500,000 operations, min., at rated resistive load.

Initial Dielectric Strength —

Between Terminals and Case — 1,000VAC plus twice the nominal voltage for one minute.

Input Data @ 25°C

Voltage — See Ordering Information section for details.

Power Requirement — 3W max.

Transient Protection —

Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
12VDC	1,000V	240V*
12VDC	1,000V	240V*
24VAC/VDC	1,000V	240V*
48 VAC/VDC	1,000V	480V*
120 VAC/VDC	3,000V	2,500V*
240VAC	3,000V	2,500V*

*Minimum source impedance of 100 ohm

Environmental Data

Temperature Range —

Storage — -40°C to +85°C

Operating — -30°C to +65°C

Mechanical Data

Mounting/Termination —

8- or 11-pin octal type plug. 8-pin types fit either 27E122 or 27E891, while 11-pin types fit 27E123 or 27E892.

Weight — 4 oz. (112g) approximately

Ordering Information

SSC	01	2	A	A	A
Series SSC Discrete Industrial Timer		Output 2 = DPDT Relay		Timing Range	
		Operating Mode 01 = On-Delay 02 = Off-Delay 03 = Interval		A = 0.1 to 3 sec. B = 0.5 to 15 sec. C = 1 to 30 sec. D = 2 to 60 sec. E = 4 to 120 sec. F = 6 to 180 sec. G = 10 to 300 sec. I = 2 to 60 min. K = 3 to 180 cycles L = 0.33 to 10 min. M = 0.5 to 15 min. N = 1 to 30 min. P = 0.1 to 10 min.	

Operating Voltage (+10%, -15%)

A = 120VAC, 50/60 Hz. / 120VDC
B = 240VAC, 50/60 Hz. / 24VDC
E = 24VAC, 50/60 Hz. / 24VDC
F = 48VAC, 50/60 Hz. / 48VDC
Q = 12VDC ($\pm 10\%$)

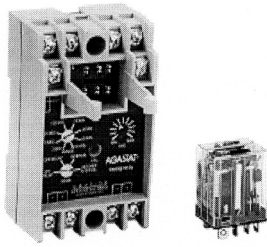
Timing Adjustment

A = Knob Adjust
B = External Potentiometer or resistor (Operating modes 1 and 3 only).
F = Fixed Times — Specify time delay in seconds per the following examples:
F9.000 = 9 sec.
F99.00 = 99 sec.
F999.0 = 999 sec.
F1000 = 1000 sec.

Authorized distributors are likely to stock the following:

SSC12AAA	SSC12ACA	SSC12AGA
SSC12ABA	SSC12ADA	SSC12ALA

SSF Series, Programmable Time Delay Relay



Product Facts

- 4 user-programmable timing modes
- 0.1 sec. to 10 hr. programmable timing range
- Parameters set with recessed screwdriver dials
- Universal voltage (plug-in relay dependent)
- 10A DPDT replaceable output relay minimizes downtime
- Front screw terminals
- DIN-rail, panel or machine tool track mount
- File E15631, File LR29186



Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Timing Specifications

Timing Modes —

Modes are user selectable via screwdriver adjustment of recessed 4-position selector dial. Modes offered are: On-Delay, Off-Delay, Interval and Latching Interval.

Timing Ranges — 0.1 to 3 / 0.33 to 10 / 1 to 30 / 4 to 120 sec.; 0.33 to 10 / 1 to 30 / 2 to 60 min.; 0.33 to 10 hr.

Timing Range Selection — Screwdriver select via recessed 8-position selector dial.

Timing Adjustment — Recessed potentiometer adjustment with reference calibrations.

Accuracy — Repeat Accuracy — $\pm 1\% \pm 0.01$ sec. Overall Accuracy — $\pm 3\% \pm 0.01$ sec.

Reset Time — 30 ms.

Relay Operate Time — On-Delay and Interval mode: 30 ms.

Relay Release Time — Off-Delay, Interval and Latching Interval: 30 ms. (with factory-installed relay).

Contact Data @ 25°C

Arrangements — 2 Form C (DPDT).

Rating — 10A @ 28VDC or 120VAC, resistive; 1/3 HP @ 120/240VAC 345VA.

Expected Mechanical Life — 10 million operations (with factory-installed relay).

Expected Electrical Life — 500,000 operations, min., at rated resistive load (with factory-installed relay).

Initial Dielectric Strength — Between Coil/Control Switch and Contacts — 1,500VAC for one minute.

Input Data @ 25°C

Voltage — See Ordering Information section for details.

Power Requirement — 2W max.

Transient Protection —

Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
24, 48 VAC/VDC	1,000V	480V
120, 240VAC/VDC	3,000V	2500V*

* Min. source impedance of 100 ohm@120/240VAC, 3000V <0.1 sec. Environmental Data

Environmental Data

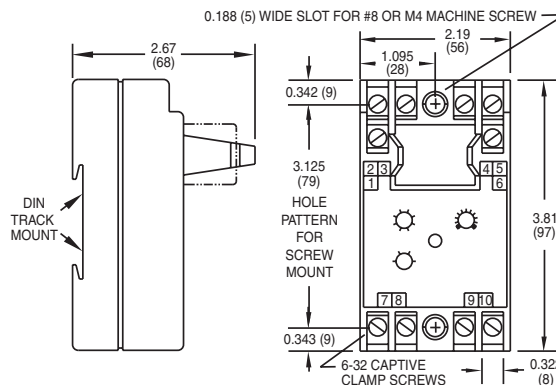
Temperature Range —

Storage — -40°C to +85°C
Operating — -30°C to +65°C

Mechanical Data

Mounting/Termination — Panel, DIN-rail, Machine Tool mounting track mounting case with screw terminals.

Weight — 5.5 oz. (156g) approximately



Outline Dimensions

Ordering Information

SSF

Series SSF
Universal
Timer

R

R = UL
Recognized
Component

90

Operating Mode 90
Multiple modes -
On-Delay
Off-Delay
Interval
Latching Interval

A

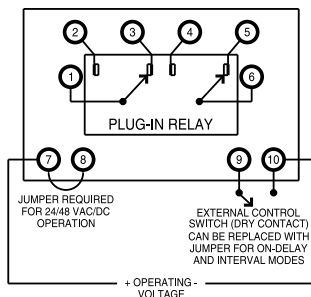
Operating Voltage
(+10%, -15%)
A = 120VAC, 50/60 Hz.
B = 240VAC, 50/60 Hz.
E = 24VAC, 50/60 Hz.
F = 48VAC, 50/60 Hz.
N = 48VDC
O = 24VDC
P = 125VDC

X = No factory-installed relay.†

† Voltage determined by customer-supplied relay. Only relays that operate on the above-listed voltages should be used. Timer operation using other relay voltages is not recommended.

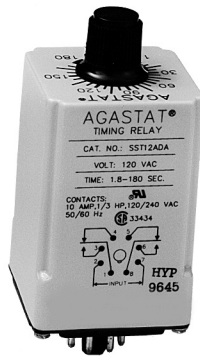
Authorized distributors are likely to stock the following:

SSFR90A
SSFR90X



Wiring Diagram (Top View)

SST Series, Industrial Grade Discrete Plug-in, Time Delay Relay



Product Facts

- On-Delay, Off-Delay, Interval, One Shot & Repeat modes
- Time delays to 120 min.
- Fast setting with time calibrated knobs
- Superior transient protection
- Rugged construction with 8- or 11-pin plug
- Flame retardant housing
- File E15631, File LR33434



Timing Specifications

Timing Modes —

On-Delay, Off-Delay, Interval, One Shot (Latching Interval) or Repeat Cycle.

Timing Ranges — Nine ranges spanning 0.1 sec. to 120 min.

Timing Adjustment — Knob adjust.

Accuracy —

Repeat Accuracy — $\pm 1\%$
Overall Accuracy — $\pm 5\%$

Reset Time — 50 ms., max., (25 ms typ.) for on-delay and interval; 300 ms, max., for off-delay and one shot; 500 ms, max., for repeat type.

Relay Operate Time — 50 ms.

Relay Release Time — 30 ms.

Contact Data @ 25°C

Arrangements — 2 Form C (DPDT)

Rating — 10A @ 120/240VAC, resistive; 1/3 HP @ 120/240VAC, 50/60 Hz.

Expected Mechanical Life —

10 million operations

Expected Electrical Life — 500,000 operations, min., at rated resistive load.

Initial Dielectric Strength —

Between Contacts, Line Inputs and Control Circuits — 1,500V RMS, minimum, at 60 Hz.

Input Data @ 25°C

Voltage — See Ordering Information section for details.

Power Requirement — 3W max.

Transient Protection —

Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
12VDC	1,000V	240V*
12 & 24 VAC/VDC	860V	208V*
120 VAC	2,580V	2,150V*

*Minimum source impedance of 100 ohm.

Environmental Data

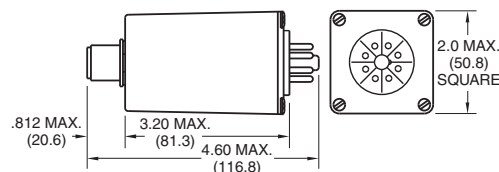
Temperature Range —

Storage — -23°C to $+71^{\circ}\text{C}$
Operating — -23°C to $+54^{\circ}\text{C}$

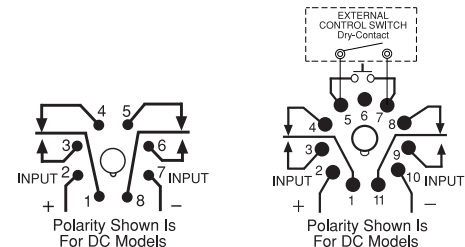
Mechanical Data

Mounting/Termination — On-Delay, Interval and Repeat types have 8- pin octal plug that fits either 27E122 or 27E891 socket. Off-Delay and One Shot types have 11-pin octal-type plug that fits 27E123 or 27E892. Sockets must be ordered separately.

Weight — 4 oz. (112g) approximately



Outline Dimensions



Wiring Diagrams (Bottom Views)

Ordering Information

SST1 – On Delay Types

Input	Time Range	Part No.
120 VAC	0.1 - 10 sec.	SST12AAA
	0.6 - 60 sec.	SST12ACA
	1.8 - 180 sec.	SST12ADA
	3 - 300 sec.	SST12AEA
	18 sec. - 30 min.	SST12AGA
24 VAC	36 sec. - 60 min.	SST12AHA
	0.1 - 10 sec.	SST12EAA
	1.8 - 180 sec.	SST12EDA
	3 - 300 sec.	SST12EEA
	18 sec. - 30 min.	SST12EAA
24 VDC	0.1 - 10 sec.	SST120AA
	1.8 - 180 sec.	SST120DA
	3 - 300 sec.	SST120EA
12 VDC	0.1 - 10 sec.	SST12QAA
	1.8 - 180 sec.	SST12QDA
	3 - 300 sec.	SST12QEA

SST2 – Off Delay Types

Input	Time Range	Part No.
120 VAC	0.1 - 10 sec.	SST22AAA
	1.8 - 180 sec.	SST22ADA
	3 - 300 sec.	SST22AEA
	18 sec. - 30 min.	SST22AGA
	36 sec. - 60 min.	SST22AHA
24 VAC	0.1 - 10 sec.	SST22EAA
	1.8 - 180 sec.	SST22EDA
24 VDC	0.1 - 10 sec.	SST220AA
	1.8 - 180 sec.	SST220DA
12 VDC	0.1 - 10 sec.	SST22QAA
	1.8 - 180 sec.	SST22QDA

SST3 – Interval Types

Input	Time Range	Part No.
120 VAC	0.1 - 10 sec.	SST32AAA
	1.8 - 180 sec.	SST32ADA
	3 - 300 sec.	SST32AEA
	36 sec. - 60 min.	SST32AHA
24 VAC	0.1 - 10 sec.	SST32EAA
	1.8 - 180 sec.	SST32EDA
24 VDC	0.1 - 10 sec.	SST320AA
	1.8 - 180 sec.	SST320DA
12 VDC	0.1 - 10 sec.	SST32QAA
	1.8 - 180 sec.	SST32QDA

SST4 – One Shot* Types

Input	Time Range	Part No.
120 VAC	0.1 - 10 sec.	SST42AAA
	1.8 - 180 sec.	SST42ADA
	3 - 300 sec.	SST42AEA
	18 sec. - 30 min.	SST42AGA
	36 sec. - 60 min.	SST42AHA
24 VAC	0.1 - 10 sec.	SST42EAA
	1.8 - 180 sec.	SST42EDA
24 VDC	0.1 - 10 sec.	SST420AA
	1.8 - 180 sec.	SST420DA
12 VDC	0.1 - 10 sec.	SST42QAA
	1.8 - 180 sec.	SST42QDA

* Also known as Latching Interval

SST7 – Repeat Cycle Types

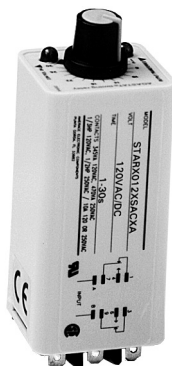
Input	Time Range	Part No.
120 VAC	0.1 - 10 sec.	SST72AAA
	1.8 - 180 sec.	SST72ADA
	3 - 300 sec.	SST72AEA
	18 sec. - 30 min.	SST72AGA
	36 sec. - 60 min.	SST72AHA
24 VAC	0.1 - 10 sec.	SST72EAA
	1.8 - 180 sec.	SST72EDA
24 VDC	0.1 - 10 sec.	SST720AA
	1.8 - 180 sec.	SST720DA
12 VDC	0.1 - 10 sec.	SST72QAA
	1.8 - 180 sec.	SST72QDA

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Authorized distributors are likely to stock the following:

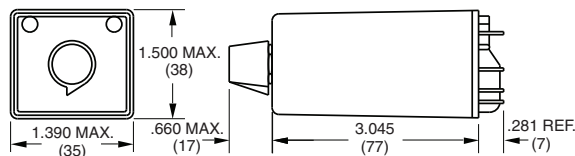
None at present.

STA Series, Specification Grade Discrete Plug-in, Time Delay Relay With QC Terminals

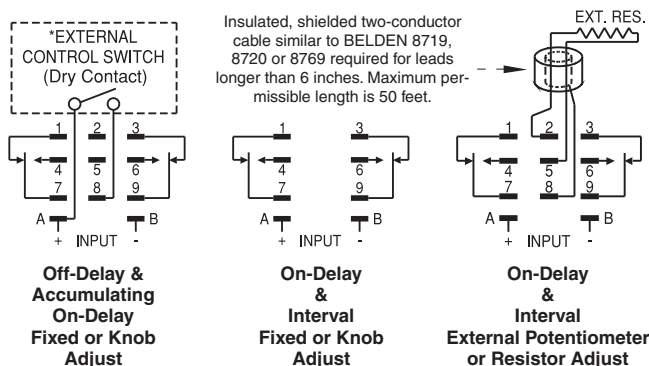


Product Facts

- On-Delay, Off-Delay, Interval and Accumulating On-Delay timing modes
- 13 timing ranges from 0.1 sec. to 48 hr.
- 10A DPDT output contacts
- Knob, fixed or external timing adjustment
- QC plug-in terminals save space, two LEDs show status
- File 3520, File E60363, File LR51332



Outline Dimensions



Wiring Diagrams (Bottom Views)

Timing Specifications

Timing Modes — On-Delay, Off-Delay, Interval and Accumulating On-Delay.

Timing Ranges — 6 to 180 cycles; 0.1 to 3 / 0.5 to 15 / 1 to 30 / 2 to 60 / 4 to 120 / 6 to 180 / 10 to 300 sec.; 0.33 to 10 / 0.5 to 15 / 1 to 30 min.; 1 to 6 / 2 to 48 hr. (All are +5%, -0% of maximum values).

Timing Adjustment — Knob or fixed time (internal fixed resistor) — all models; customer supplied external potentiometer or resistor — On-Delay and Interval models only.

Accuracy — Repeat Accuracy — $\pm 5\% \pm 0.004$ sec. Overall Accuracy — $\pm 2\%$ throughout operating temperature and voltage ranges.

Reset Time — 30 ms. min. (between deenergization and reenergization without affecting accuracy.)

Relay Operate Time — Off-Delay mode: 35 ms.; Interval mode — 20 ms.

Relay Release Time — On-Delay and Accumulating On-Delay modes — 20 ms

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Contact Data @ 25°C

Arrangements — 2 Form C (DPDT).

Rating — 10A @ 28VDC or 120VAC, resistive; 1/3 HP @ 120/240VAC; 345VA. Same polarity.

Expected Mechanical Life — 10 million operations

Expected Electrical Life — 500,000 operations, min., at rated resistive load.

Initial Dielectric Strength — 1,000VAC plus twice the nominal voltage for one minute.

Input Data @ 25°C

Voltage — See Ordering Information section for details.

Power Requirement — 3W max.

Transient Protection — Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
All except 12 & 24	3,000V	2,500
12 & 24	Consult Factory	

Environmental Data

Temperature Range —

Storage — -40°C to +85°C

Operating — -30°C to +65°C

Mechanical Data

Mounting/Termination —

Quick connect terminals fit either 27E121 or 27E893 (snap-on) socket (order separately).

Status Indication — Power On LED and Output Contacts LED (optional).

Weight — 4.2 oz. (119g) approximately.

Ordering Information (All "X"s must be included to complete part number)

STA	RX	01	2X	S	A	A	XA
Series STA Discrete Industrial Timer With Tab-type Terms.	Operating Mode 01 = On-Delay 02 = Off-Delay 03 = Interval 09 = Accumulating On-Delay	Status Indication S = LEDs X = No LEDs	Timing Range A = 0.1 to 3 sec. B = 0.5 to 15 sec. C = 1 to 30 sec. D = 2 to 60 sec. E = 4 to 120 sec. F = 6 to 180 sec. G = 10 to 300 sec. I = 2 to 60 min. J = 1 to 6 hr. K = 3 to 180 cycles L = 0.33 to 10 min. M = 0.5 to 15 min. N = 1 to 30 min. R = 2 to 48 hr.	Mounting Series RX = 11-pin tab-type header (order socket separately)	Output 2X = DPDT Relay	Operating Voltage (+10%, -15%) A = 120VAC, 50/60 Hz. / 120VDC E = 24VAC, 50/60 Hz. / 24VDC F = 48VAC, 50/60 Hz. / 48VDC Q = 12VDC	Timing Adjustment XA = Knob Adjust XB = External Potentiometer or resistor (Operating modes 1 and 3 only). XF = Fixed Times -Specify time delay in seconds per the following examples: XF9.000 = 9 sec. XF99.00 = 99 sec. XF999.0 = 999 sec. XF1000 = 1000 sec.

Authorized distributors are likely to stock the following:

None at present.

VTM1 Series, On-Delay, Timing Module



Product Facts

- On-delay timing mode
- Reliable solid state timing circuitry
- Excellent transient protection
- Compact design
- Flame retardant, solvent resistant housing
- File E60363, File LR33434



Timing Specifications

Timing Mode — On-Delay

Timing Ranges — 0.5 to 10 / 3 to 60 sec.; 0.5 to 10 / 3 to 60 min.

Timing Range Selection — Screwdriver select via recessed 8-position selector dial.

Timing Adjustment — External resistor or potentiometer. An external resistance of 1 megohm is required to obtain the maximum time for all ranges. To determine the actual resistance needed to obtain the required time delay, use the following formula:

$$R_T = \frac{(T_{REQ} - T_{MIN})}{T_{MAX} - T_{MIN}} \times 1,000,000 \text{ ohms}$$

Accuracy —

Repeat Accuracy — $\pm 1\%$
Overall Accuracy — $\pm 2\%$ at $R = 1 \text{ megohm}$

Reset Time — 100 ms, max., before time-out; 10 ms, max., after time-out.

Output Switch Data

Arrangement — Solid state 1 Form A (SPST-NO)

Rating — 1A, inductive, at nominal operating voltage.

Expected Electrical Life — 10,000,000 operations at rated load.

Initial Dielectric Strength — Between Terminals and Mounting — 3,000VAC rms.
Between Input and Output — 1,500VAC rms.

Input Data @ 25°C

Voltage — 12 VAC/VDC, 24VAC/VDC, 120 VAC/VDC.

Power Requirement — 3W max.

Transient Protection —

Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
12, 24 VAC/VDC	860V*	208V*
120 VAC/VDC	2,580V	2,150V*

* Min. source impedance of 100 ohm.

Environmental Data

Temperature Range —

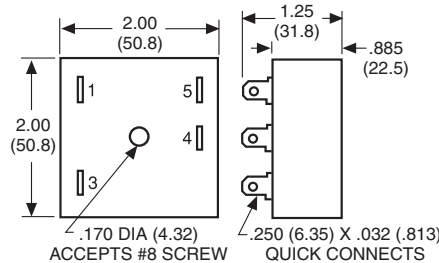
Storage — -40°C to $+85^\circ\text{C}$
Operating — -40°C to $+65^\circ\text{C}$

Mechanical Data

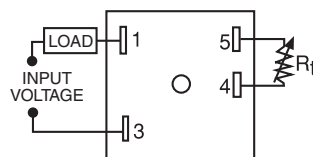
Mounting — Panel mount with one #8 screw.

Termination — 0.250 in (6.35) quick connect terminals.

Weight — 3 oz. (84g) approximately



Outline Dimensions



Wiring Diagram

An external resistance of 1 megohm is required to obtain the maximum time for all ranges. To determine the actual resistance needed to obtain the required time delay, use the following formula:

$$R_T = \frac{(T_{REQ} - T_{MIN})}{T_{MAX} - T_{MIN}} \times 1,000,000 \text{ ohms}$$

Ordering Information

VTM1

Series VTM1
On-Delay
Timing Module

A

Input Voltage
A = 120VAC/VDC
E = 24VAC/VDC
Q = 12VAC/VDC

CD

Time Range
CD = 0.5 - 10 sec.
DD = 3 - 60 sec.
FD = 0.5 - 10 min.
GD = 3 - 60 min.

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Authorized distributors are likely to stock the following:

VTM1ECD
VTM1EDD

VTM-1 Series, Specification Grade, On-Delay, Timing Module

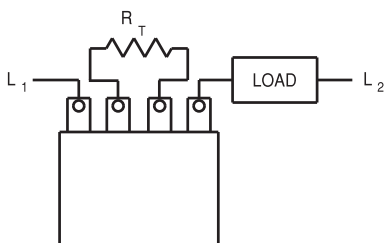


Product Facts

- On-delay timing mode
- Timing from 1 to 1000 sec.
- 1A solid state SPST-NO output
- 0.25" (6.35) quick connect terminals
- Universal voltage: 24 to 240VAC/VDC
- Rated to 10 million operations
- File E60363, File LR51332



Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.



Wiring Diagram

Timing Specifications

Timing Mode — On-Delay — VTM-1 in-line timing module is wired in series with the load circuit. Time delay is initiated when power is applied to the series network. Connecting a resistor across the center terminals provides tamper-proof setting of time delay from 1-1000 sec.

Timing Ranges — 1 to 1,000 sec.

Timing Adjustment — Time delay is set by connecting an appropriately rated resistor or potentiometer between the center two terminals. As supplied, the unit provides a nominal 1 second delay. Add 10k ohm of resistance for every additional second of delay required. For example: 5 seconds = 40k ohms; 10 seconds = 90k ohms.

Accuracy — Repeat Accuracy — $\pm 2\%$

Reset Time — 100 ms, max., in the timing or time-out condition.

Output Switch Data

Arrangement — 1 Form A (SPST-NO)

Rating — 5A, inductive, at nominal operating voltage.

Inrush — Not to exceed 10A for one cycle.

Max. Leakage Current — 4mA rms

Expected Electrical Life — 10,000,000 operations at rated load.

Initial Dielectric Strength — Between Active Terminals and Outside of Case — 1,480VAC for one min.

Input Data @ 25°C

Operating Voltage — Universal — 24-240VAC/VDC (19-288VAC/VDC).

Current — 2mA (max.) required to operate timer regardless of output state.

Power Requirement — 3W max.

Transient Protection — MOV across input 2,000V for 11 μ s on line side of load.

Environmental Data

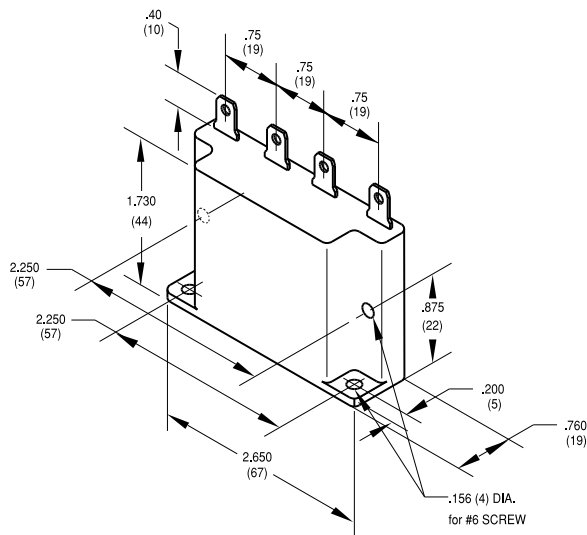
Temperature Range — Storage — -40°C to +85°C
Operating — -30°C to +65°C

Mechanical Data

Mounting — Screw mount in horizontal or vertical position through built-in mounting ears.

Termination — 0.250 in (6.35) quick connect terminals for input line, load output and timing resistor connection.

Weight — 3 oz. (84g) approximately



Outline Dimensions

Ordering Information

Part Number	Mode	Input Voltage
VTM-1	On-Delay	24-240VAC or VDC

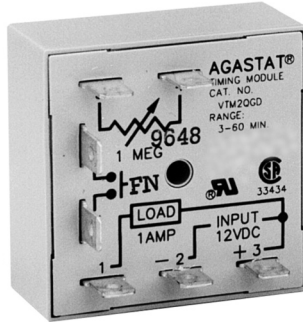
Notes:

1. Do not operate timer without connecting load in series with line voltage.
2. For a time delay of 1 second, connect a jumper across the center two terminals.

Authorized distributors are likely to stock the following:

VTM-1

VTM2 Series, Off-Delay, Timing Module



Product Facts

- Off-delay timing mode
- Reliable solid state timing circuitry
- Excellent transient protection
- Compact design
- Flame retardant, solvent resistant housing
- File E60363, File LR33434



Timing Specifications

Timing Mode — Off-Delay

Timing Ranges — 0.5 to 10 / 3 to 60 sec.; 3 to 60 min.

Timing Adjustment — External resistor or potentiometer. An external resistance of 1 megohm is required to obtain the maximum time for all ranges. To determine the actual resistance needed to obtain the required time delay, use the following formula:

$$R_T = \frac{(T_{REQ} - T_{MIN})}{T_{MAX} - T_{MIN}} \times 1,000,000 \text{ ohms}$$

Accuracy

Repeat Accuracy — $\pm 1\%$
Overall Accuracy — $\pm 2\%$ at $R = 1 \text{ megohm}$

Reset Time — 50 ms, max.

Output Switch Data

Arrangement — Solid state 1 Form A (SPST-NO)

Rating — 1A, inductive, at nominal operating voltage.

Expected Electrical Life — 10,000,000 operations at rated load.

Initial Dielectric Strength — Between Terminals and Mounting — 3,000VAC rms.
Between Input and Output — 1,500VAC rms.

Input Data @ 25°C

Voltage ($\pm 10\%$) — 12 VAC/VDC, 24VAC/VDC, 120 VAC/VDC.

Power Requirement — 4W with rated load

Transient Protection

Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
12, 24 VAC/VDC	860V*	208V*
120 VAC/VDC	2,580V	2,150V*

* Min. source impedance of 100 ohm.

Environmental Data

Temperature Range

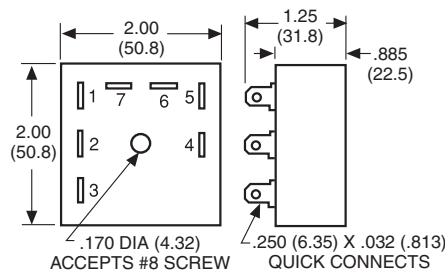
Storage — -40°C to $+85^\circ\text{C}$
Operating — -40°C to $+65^\circ\text{C}$

Mechanical Data

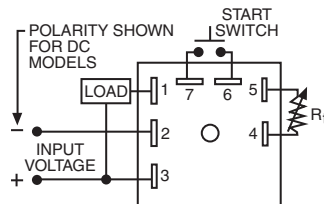
Mounting — Panel mount with one #8 screw.

Termination — 0.250 in (6.35) quick connect terminals.

Weight — 4 oz. (112g) approximately



Outline Dimensions



Wiring Diagram

An external resistance of 1 megohm is required to obtain the maximum time for all ranges. To determine the actual resistance needed to obtain the required time delay, use the following formula:

$$R_T = \frac{(T_{REQ} - T_{MIN})}{T_{MAX} - T_{MIN}} \times 1,000,000 \text{ ohms}$$

Ordering Information

VTM2

Series VTM2
Off-Delay
Timing Module

A

Input Voltage
A = 120VAC/VDC
E = 24VAC/VDC
Q = 12VAC/VDC

CD

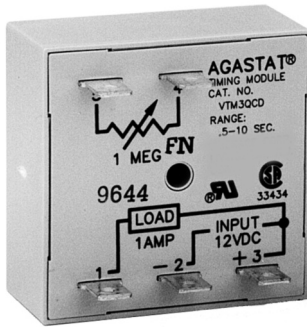
Time Range
CD = 0.5 - 10 sec.
DD = 3 - 60 sec.
GD = 3 - 60 min.

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Authorized distributors are likely to stock the following:

None at present.

VTM3 Series, Interval, Timing Module



Product Facts

- Interval timing mode
- Reliable solid state timing circuitry
- Excellent transient protection
- Compact design
- Flame retardant, solvent resistant housing
- File E60363, File LR33434



Timing Specifications

Timing Mode — Interval

Timing Ranges — 0.5 to 10 / 3 to 60 sec.; 3 to 60 min.

Timing Adjustment — External resistor or potentiometer. An external resistance of 1 megohm is required to obtain the maximum time for all ranges. To determine the actual resistance needed to obtain the required time delay, use the following formula:

$$R_T = \frac{(T_{REQ} - T_{MIN})}{T_{MAX} - T_{MIN}} \times 1,000,000 \text{ ohms}$$

Accuracy —

Repeat Accuracy — $\pm 1\%$
Overall Accuracy — $\pm 2\%$ at $R = 1 \text{ megohm}$

Reset Time — 50 ms, max.

Output Switch Data

Arrangement — Solid state 1 Form A (SPST-NO)

Rating — 1A, inductive, at nominal operating voltage.

Expected Electrical Life — 10,000,000 operations at rated load.

Initial Dielectric Strength —
Between Terminals and Mounting — 3,000VAC rms.
Between Input and Output — 1,500VAC rms.

Input Data @ 25°C

Voltage ($\pm 10\%$) — 12 VAC/VDC, 24VAC/VDC, 120 VAC/VDC.

Power Requirement — 4W with rated load

Transient Protection

Non-repetitive transients of the following magnitudes will not cause spurious operation or affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
12, 24 VAC/VDC	860V*	208V*
120 VAC/VDC	2,580V	2,150V*

* Min. source impedance of 100 ohms.

Current Drain — Less than 5mA.

Environmental Data

Temperature Range —

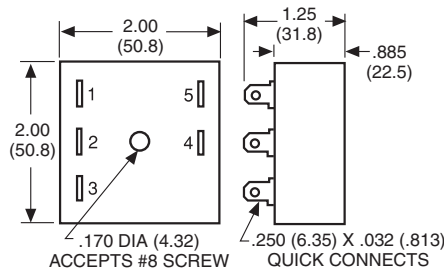
Storage — -40°C to $+85^\circ\text{C}$
Operating — -40°C to $+65^\circ\text{C}$

Mechanical Data

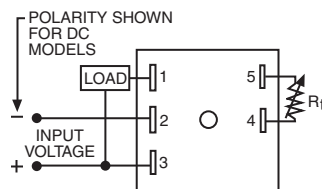
Mounting — Panel mount with one #8 screw.

Termination — 0.250 in (6.35) quick connect terminals.

Weight — 4 oz. (112g) approximately



Outline Dimensions



Wiring Diagram

An external resistance of 1 megohm is required to obtain the maximum time for all ranges. To determine the actual resistance needed to obtain the required time delay, use the following formula:

$$R_T = \frac{(T_{REQ} - T_{MIN})}{T_{MAX} - T_{MIN}} \times 1,000,000 \text{ ohms}$$

Ordering Information

VTM3

Series VTM3
Interval
Timing Module

A

Input Voltage
A = 120VAC/VDC
E = 24VAC/VDC
Q = 12VAC/VDC

CD

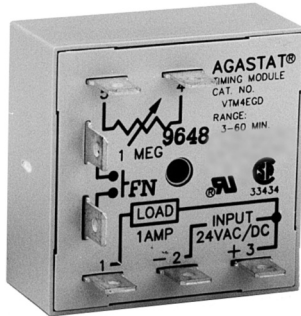
Time Range
CD = 0.5 - 10 sec.
DD = 3 - 60 sec.
GD = 3 - 60 min.

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Authorized distributors are likely to stock the following:

None at present.

VTM4 Series, One Shot (Latching Interval), Timing Module



Product Facts

- One shot (latching interval) timing mode
- Reliable solid state timing circuitry
- Excellent transient protection
- Compact design
- Flame retardant, solvent resistant housing
- File E60363, File LR33434



Timing Specifications

Timing Mode — One Shot (Latching Interval)

Timing Ranges — 0.5 to 10 / 3 to 60 sec.; 0.5 to 10 / 3 to 60 min.

Timing Adjustment — External resistor or potentiometer. An external resistance of 1 megohm is required to obtain the maximum time for all ranges. To determine the actual resistance needed to obtain the required time delay, use the following formula:

$$R_T = \frac{(T_{REQ} - T_{MIN})}{T_{MAX} - T_{MIN}} \times 1,000,000 \text{ ohms}$$

Accuracy

Repeat Accuracy — $\pm 1\%$
Overall Accuracy — $\pm 2\%$ at $R = 1 \text{ megohm}$

Reset Time — 50 ms, max.

Output Switch Data

Arrangement — Solid state 1 Form A (SPST-NO)

Rating — 1A, inductive, at nominal operating voltage.

Expected Electrical Life — 10,000,000 operations at rated load.

Initial Dielectric Strength —
Between Terminals and Mounting — 3,000VAC rms.
Between Input and Output — 1,500VAC rms.

Input Data @ 25°C

Voltage ($\pm 10\%$) — 12 VAC/VDC, 24VAC/VDC, 120 VAC/VDC.

Power Requirement — 4W with rated load

Transient Protection

Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
12, 24 VAC/VDC	860V*	208V*
120 VAC/VDC	2,580V	2,150V*

* Min. source impedance of 100 ohms.

Current Drain — Less than 5mA.

Environmental Data

Temperature Range —

Storage — -40°C to $+85^\circ\text{C}$

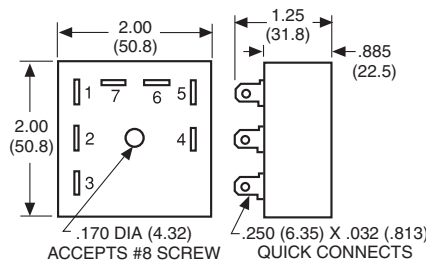
Operating — -40°C to $+65^\circ\text{C}$

Mechanical Data

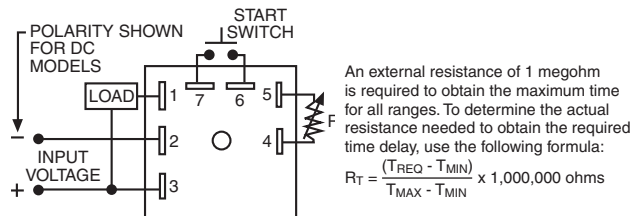
Mounting — Panel mount with one #8 screw.

Termination — 0.250 in (6.35) quick connect terminals.

Weight — 4 oz. (112g) approximately



Outline Dimensions



Wiring Diagram

Ordering Information

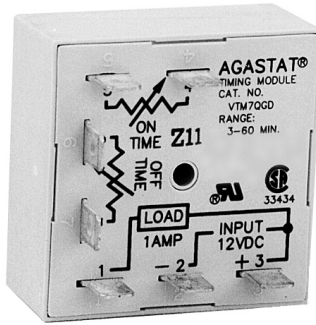
VTM4	A	CD
Series VTM4 One Shot (Latching Interval) Timing Module	Input Voltage A = 120VAC/VDC E = 24VAC/VDC Q = 12VAC/VDC	Time Range CD = 0.5 - 10 sec. DD = 3 - 60 sec. FD = 0.5 - 10 min. GD = 3 - 60 min.

Authorized distributors are likely to stock the following:

None at present.

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

VTM7 Series, Repeat Cycle, Timing Module



Product Facts

- Repeat cycle timing mode
- Independently adjustable On and Off times
- Reliable solid state timing circuitry
- Excellent transient protection
- Compact design
- Flame retardant, solvent resistant housing
- File E60363, File LR33434



Timing Specifications

Timing Mode — Repeat Cycle

Timing Ranges — 0.5 to 10 / 3 to 60 sec.; 3 to 60 min.

Timing Adjustment — External resistor or potentiometer. An external resistance of 1 megohm is required to obtain the maximum time for all ranges. To determine the actual resistance needed to obtain the required time delay, use the following formula:

$$R_T = \frac{(T_{REQ} - T_{MIN})}{T_{MAX} - T_{MIN}} \times 1,000,000 \text{ ohms}$$

Accuracy —

Repeat Accuracy — $\pm 1\%$
Overall Accuracy — $\pm 2\%$ at $R = 1 \text{ megohm}$

Reset Time — 500 ms

Output Switch Data

Arrangement — Solid state 1 Form A (SPST-NO)

Rating — 1A, inductive, at nominal operating voltage.

Expected Electrical Life — 10,000,000 operations at rated load.

Initial Dielectric Strength —
Between Terminals and Mounting — 3,000VAC rms.
Between Input and Output — 1,500VAC rms.

Input Data @ 25°C

Voltage ($\pm 10\%$) — 12 VAC/VDC, 24VAC/VDC, 120 VAC/VDC.

Power Requirement — 4W with rated load

Transient Protection —

Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
12, 24 VAC/VDC	860V*	208V*
120 VAC/VDC	2,580V	2,150V*

* Min. source impedance of 100 ohms.

Current Drain — Less than 5mA.

Environmental Data

Temperature Range —

Storage — -40°C to $+85^\circ\text{C}$

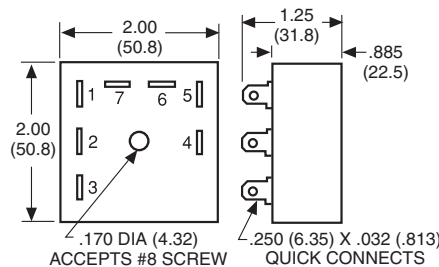
Operating — -40°C to $+65^\circ\text{C}$

Mechanical Data

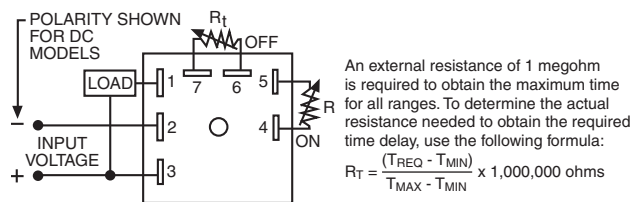
Mounting — Panel mount with one #8 screw.

Termination — 0.250 in (6.35) quick connect terminals.

Weight — 4 oz. (112g) approximately



Outline Dimensions



Wiring Diagram

Ordering Information

VTM7	A	CD
Series VTM7 Repeat Cycle Timing Module	Input Voltage A = 120VAC/VDC E = 24VAC/VDC Q = 12VAC/VDC	Time Range CD = 0.5 - 10 sec. DD = 3 - 60 sec. GD = 3 - 60 min.

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Authorized distributors are likely to stock the following:

None at present.

VTMA1 Series, On-Delay Timing Module, With Internal Potentiometer



Product Facts

- On-delay timing mode
- Discrete voltage or universal type
- Internal potentiometer for timing adjustment
- Reliable solid state timing circuitry
- Excellent transient protection
- Flame retardant, solvent resistant housing
- File E60363, File LR33434



Timing Specifications

Timing Mode — On-Delay

Timing Ranges —

VTMA1ULA only — 24 to 480 sec.
All others — 0.5 to 10 / 3 to 60 / 15 to 300 sec.; 3 to 60 min.

Timing Adjustment —

Internal potentiometer

Accuracy —

Repeat Accuracy — $\pm 5\%$

Overall Accuracy —

Max. Time: -0% , $+10\%$.

Min. Time: -30% , $+10\%$.

Reset Time — 250 ms, max., before time-out; 10 ms, max., after time-out.

Output Switch Data

Arrangement — Solid state 1 Form A (SPST-NO)

Rating — 1A, inductive, at nominal operating voltage.

Expected Electrical Life — 10,000,000 operations at rated load.

Initial Dielectric Strength — Between Terminals and Mounting — 3,000VAC rms.

Between Input and Output — 1,500VAC rms.

Input Data @ 25°C

Voltage ($\pm 10\%$) — 120VAC/VDC (unfiltered DC must be full-wave rectified) or 24 to 240 VAC/VDC.

Power Requirement — 250mW during timing; 3W, max. after time out.

Transient Protection —

Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
24 VAC/VDC	860V*	208V*
120/240 VAC/VDC	2,580V	2,150V*

* Min. source impedance of 100 ohms.

Current Drain — 2mA, Max.

Environmental Data

Temperature Range —

Storage — -40°C to $+85^{\circ}\text{C}$

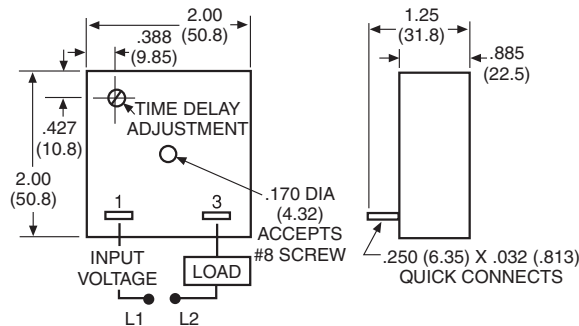
Operating — -40°C to $+65^{\circ}\text{C}$

Mechanical Data

Mounting — Panel mount with one #8 screw.

Termination — 0.250 in (6.35) quick connect terminals.

Weight — 4 oz. (112g) approximately



Outline Dimensions and Wiring Diagram

Ordering Information

Part Number	Time Range	Input Voltage
VTMA1ACA	0.5 to 10 sec.	120VAC or VDC
VTMA1ADA	3 to 60 sec.	
VTMA1ULA	24 to 480 sec.	24-240VAC or VDC

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.

Authorized distributors are likely to stock the following:

None at present.

VTMR1 Series, On-Delay Timing Module, With Internal Potentiometer, Relay Output



Product Facts

- On-delay timing mode
- 8A SPDT relay output
- Internal potentiometer for timing adjustment
- Reliable solid state timing circuitry
- Excellent transient protection
- Flame retardant, solvent resistant housing
- File E60363, File LR33434



Timing Specifications

Timing Mode — On-Delay

Timing Ranges — 15 to 300 sec.

Timing Adjustment —
Internal potentiometer

Accuracy

Repeat Accuracy —
±5% max. (0.25% typ.)

Overall Accuracy —

Max. Time: -0%, +10%.

Min. Time: -30%, +10%.

Reset Time — 250 ms, max.

Output Switch Data

Arrangement — 1 Form C (SPDT)

Rating — 8A, resistive, at nominal operating voltage.

Expected Mechanical Life —
10,000,000 operations

Expected Electrical Life —
100,000 operations

Initial Dielectric Strength —
Between Terminals and Mounting —
3,000VAC rms.

Between Input and Output —
1,500VAC rms.

Input Data @ 25°C

Voltage (±10%) — 120VAC/VDC

Power Requirement — 3.5VA max.
during timing; 3W, max. after time out.

Transient Protection

Non-repetitive transients of the following magnitudes will not cause spurious operation of affect function and accuracy.

Operating Voltage	<0.1 ms	<1 ms
120 VAC/VDC	2,580V	2,150V*

* Min. source impedance of 100 ohms.

Current Drain — 30mA, Max.

Environmental Data

Temperature Range —

Storage — -40°C to +70°C

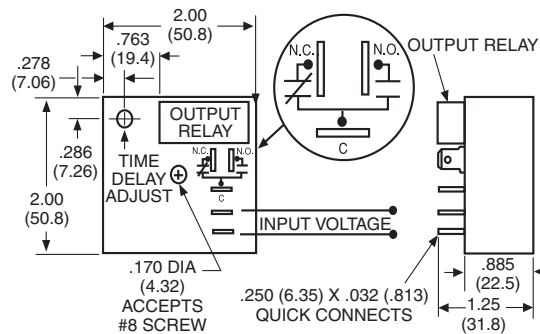
Operating — -40°C to +70°C

Mechanical Data

Mounting — Panel mount with one #8 screw.

Termination — 0.250 in (6.35) quick connect terminals.

Weight — 4 oz. (112g) approximately



Outline Dimensions and Wiring Diagram

Ordering Information

Part Number	Time Range	Input Voltage
VTMR1AEA	15 to 300 sec.	120VAC

Authorized distributors are likely to stock the following:

None at present.

Users should thoroughly review the technical data before selecting a product part number. It is recommended that user also seek out the pertinent approvals files of the agencies/laboratories and review them to ensure the product meets the requirements for a given application.