

AUXILIARY | TRIPPING | SUPERVISION

Alpha AR

High performance electro-mechanical auxiliary relays for power utility protection and control applications.

- > Single and dual element versions
- > High visibility electro-mechanical flag
- > Draw out case
- > Flush panel or rack mount
- > Wide range of functions and options
- > US Patent – US 8,115,578 B2
- > Made in Australia



Description

Alpha AR Series

The Alpha AR Series represents a new generation of electro-mechanical tripping relays for power utility protection and control applications.

The AR is built on the Alpha relay platform and provides high performance and reliability while reducing production and supply lead times.

Application of the AR auxiliary relays ensures reliable multi-contact operation combined with a high visibility mechanical flag.

Model Designation

Five (5) contact version: AR5

Twelve (12) contact version: AR12

2x Five (5) contact version: AR25

Front Panel Layout

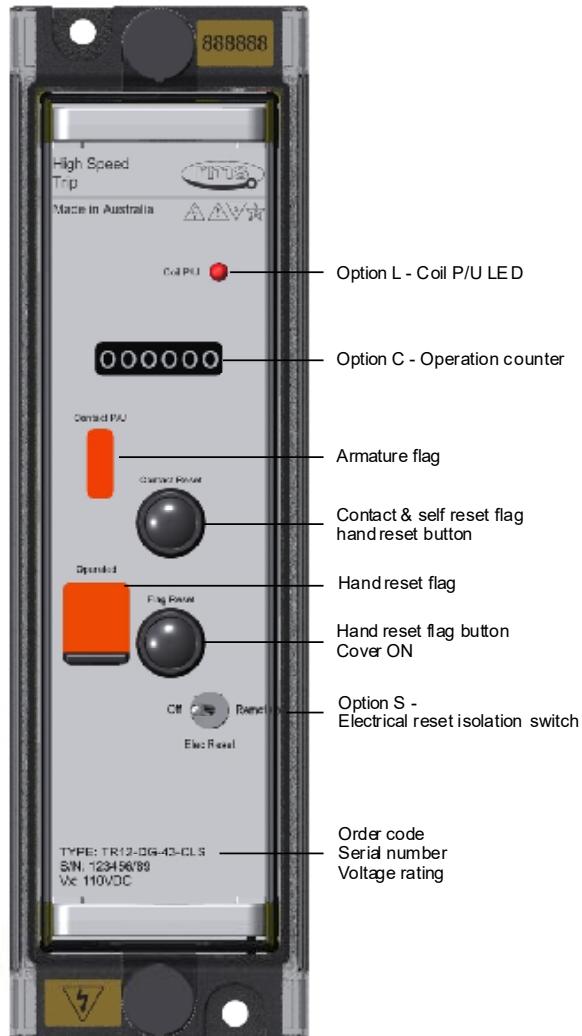


Figure 1:

Front panel layout depicting flags, resets & option positions

The flag and reset positions for the five contact AR5 version are set lower on the front panel.

Features



Features

- > <30ms operate time
- > Rugged modular construction
- > High reliability double action contacts for high operate speed and low bounce
- > 5 or 12 heavy duty contacts available in a wide range of Make and Break combinations
- > 2x elements with 5 contacts in a single case
- > Self-reset, hand reset and hand/electrical reset versions
- > Electrical reset interlock
- > High visibility electro-mechanical flag indication
- > Rated operate voltages available for 30/32, 48, 110, 125, 220, 240 or 250 Volts DC or 110 or 240 Volts AC nominal auxiliary supplies
- > M4 screw terminals
- > Optional relay operate LED
- > Simple to specify and order

Application

The effect of a fault on a power system is dependent on the speed with which the fault can be detected and isolated. Modern protection schemes incorporate ever increasing functionality through the application of digital techniques to protection relay technology. The requirement for highly reliable tripping and control relay elements does however remain and often constitutes a significant cost and space requirement when considering protection panel designs. The Alpha AR system fulfils this need by providing a compact, flexible and high performance solution, while at the same time reducing the cost and lead times normally associated with this class of device.

Alpha AR

The Alpha AR relay provides the interface between the protection system, the circuit breaker and control equipment.

The application of the Alpha AR multi-contact high-speed trip relays ensures fast operation of less than 30 ms. The unique patented design and topology ensures minimal contact bounce.

The AR range is packaged in a draw out case system and can be either flush panel or rack mounted.

For applications requiring a maximum of five contacts, refer to the ordering section to specify this version.

Where more than 12 contacts are required refer to the 6R MATRIX system Technical Bulletin.

Features

Construction

The Alpha Series represents a new generation of electro-mechanical relays designed specifically for application where high performance and reliability is paramount. While the fundamental and proven electro-mechanical mechanism has been maintained, the implementation of modern manufacturing techniques combined with an innovative architecture has provided a very flexible and competitive alternative to older generation auxiliary relays.

Figure 2 provides a snap shot of the major design innovations incorporated in the Alpha Series. Patent pending - 2007272292.

Inspection of the contacts is possible by drawing out the relay module from the case as shown in figure 3. The contacts, while protected and isolated at the rear terminal block of the module are readily visible so that they can be checked for any sign of burning, pitting or overheating.

Manual operation of the contacts is also possible with the module removed from the case. This allows checking of the contact alignment and over travel.

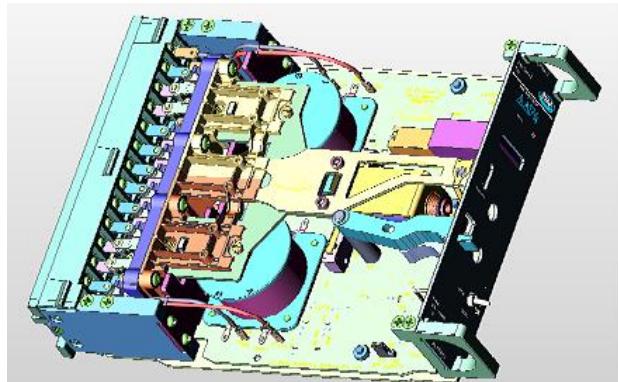


Figure 2: Alpha AR12 module construction
(Fiberglass side plate removed for clarity)

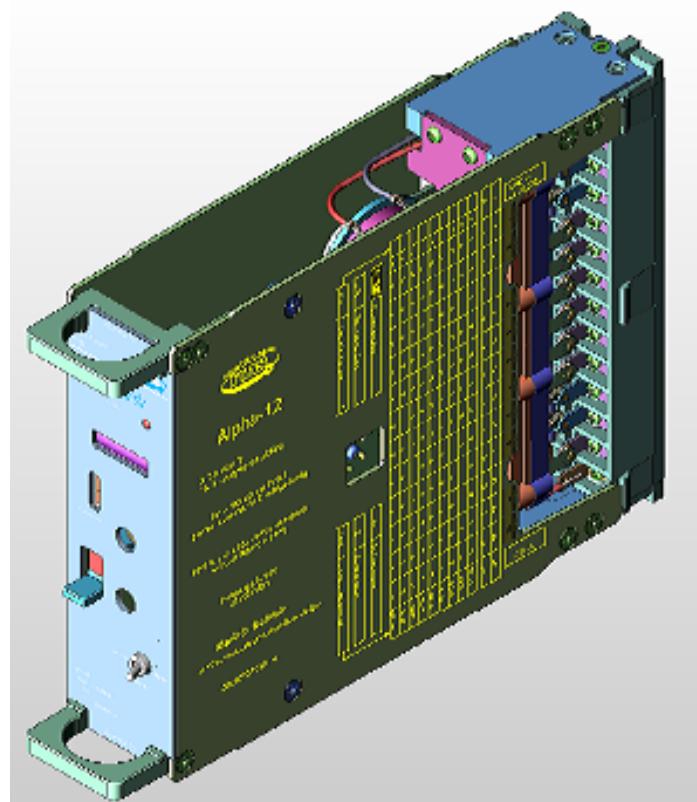


Figure 3: Alpha AR12 module depicting contact inspection window and terminal wiring chart

Functional Description

Electrical Reset Inhibit Switch

A front panel switch is available as an option to allow a local operator to isolate the electrical reset coil and disable the remote reset function. Care should be taken to ensure that this switch is not operated in the presence of a reset signal. Refer ordering code section.

Electrical Reset Interlock

Depending on overall protection scheme design, standard protection relays can be wired into a configuration where a 'race' condition is possible. If the reset circuit is held energized while the relay operate input also remains energized, the relay will oscillate between operated and reset states. The reset interlock feature eliminates this condition and protects the relay by locking out the reset command in the presence of a relay operate voltage.

Note: This feature adds a 1W burden after pick up to latching, 'zero burden' models.

Where this additional burden is not desirable the user can change a setting link to disable the electrical reset interlock function as depicted in figure 4.

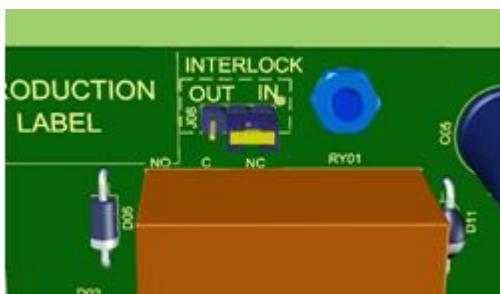


Figure 4: Configuration link for the Electrical Reset Interlock

The link is shown fitted in the 'IN' position.

IN = Electrical Reset Interlock in service
OUT = Electrical Reset Interlock out of service

The electrical reset interlock configuration setting link is located at the top front of the draw out module and is readily accessible to the user for checking and setting to meet specific system requirements. Unless otherwise specified all electrical reset relays are factory set to the 'IN' position.

Contact Operation

The Alpha AR relay contacts can be specified to reset in a number of ways:

Self-Reset Contacts

All contacts operate when a voltage in the specified range is applied to the relay coil and reset when this voltage is removed.

Hand Reset Contacts

All contacts operate and mechanically latch when a voltage in the specified range is applied to the relay coil and reset when the reset button located on the front of the relay is pressed.

Electrical and Hand Reset Contacts

All contacts operate and mechanically latch when a voltage in the specified range is applied to the relay coil and reset when the reset button located on the front of the relay is pressed. A voltage applied to the reset coil may also be used to reset the contacts.

Electrical Reset Contacts

All contacts operate and mechanically latch when a voltage in the specified range is applied to the relay coil and reset when a voltage applied to the reset coil.

Functional Description

Manual Reset Mechanism

For relays specified with manual reset functions, a reset mechanism is provided on the front panel and cover. Manual reset can be accomplished with the front cover fitted or removed.

Care should be taken to avoid holding the Contact and Armature Flag Hand Reset actuator in the reset position during the presence of a relay operate signal. This action will cause the relay to oscillate between drop-out and pick-up and if this condition is maintained may result in thermal and / or mechanical damage to the device.

Flag Indicators

The Alpha AR relay offers two types of mechanical flags (Armature and independent reset types available). These consist of a high visibility; solid, day glow orange indicator which become visible on energization of the relay coil. The relay can be ordered with either, both or no flags fitted. Reverse acting flags are also available.

Note: There is no impact on the contact operate speed or relay performance when these flags are fitted.

Armature Flag

The armature flag is connected to the relay armature and therefore always indicates the position of the contacts. The standard armature flag becomes visible when the relay is operated. If latching contacts are specified the self-reset flag will remain visible in the latched condition until the relay is reset.

Independent Hand Reset Flag

This flag is independent of the self-reset flag and operates when the contacts are first operated and remains visible until it is manually hand reset using the reset button located on the front of the relay. Note that this flag can only be reset once the relay has been reset.

Coil Operation LED

An optional front panel LED may be specified to indicate when a voltage is applied to the operate coil terminals. This feature can be useful during commissioning particularly for latching relays and where armature flags are not fitted to indicate the operate voltage status. Refer ordering code section.

Operation Counter

An optional 6 digit operation counter is available to record the number of contact pick up events. The displayed count cannot be reset.

Functional Description

Contact Performance

Contact bounce can present a problem in modern protection schemes where high speed status inputs are used for signalling purposes. Contact bounce can lead to multiple events being initiated.

A prominent factor in contact bounce is the kinetic energy of the contacts resulting from the high speed of operation and mass of the heavy duty contacts employed. To minimize bounce this energy must be dissipated. In the TR this is achieved through the damping effect of the contact over travel action (Refer self-cleaning contacts section) and specially designed speed shaping of the armature action.

The effectiveness of this method is enhanced by the double make contact geometry which allows the contact travel to be approximately halved without a reduction in the kV isolation across the open contact pairs. This has the effect of reducing the terminal velocity of the moving contacts and in turn the kinetic energy to be absorbed by the contact wiping action allowing a clean contact make with minimal bounce.

Self-Cleaning Contacts

Contacts are constructed from silver / copper alloy, specially shaped and positioned to ensure very reliable, low resistance operation. Over travel of the contacts during each operation causes a wiping action ensuring a clean 'make' with minimal bounce.

Standard Contact Configuration

AR5 Contact Version

4 N/O make (M) contacts plus 1 N/C break (B) contact

Alternative contact arrangements from 5M+0B to 1M+4B can be specified in the ordering information section. Contact terminal assignments are defined in table 1.

AR12 Contact Version

8 N/O make (M) contacts plus 4 N/C break (B) contacts

Alternative contact arrangements from 06M+06B to 12M+00B can be specified in the ordering information section. Contact terminal assignments are defined in table 2.

AR25 Contact Two Element Version

4 N/O make (M) contacts plus 1 N/C break (B) contacts for each of the two relay elements.

Alternative contact arrangements from 5M+0B to 1M+4B can be specified in the ordering information section. Contact terminal assignments are defined in table 3.

Double Make / Double Break Contacts

Each contact is made up of a double make or double break geometry to increase the isolation between open contacts and increase the current break rating.

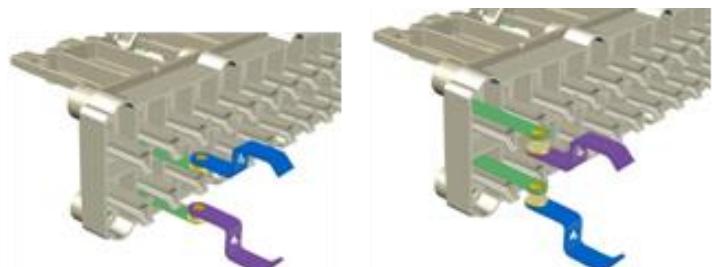


Figure 5: Contact geometry

This geometry also removes the need for internal wiring between case terminals and the relay contacts. This results in four (4) less electrical terminations per contact providing increased system security.

Technical Data

Operating Time

Make contacts: <30 ms to end bounce at nominal rated operating voltage.

Break contacts: <30 ms transition

Operating Burden

Average burden during pick-up at nominal	
Operate coil	7 W maximum +1W for electrical reset interlock +1 W for LED and or counter
Reset coil (where fitted)	40 W maximum

Operated Burden

Burden after pick-up at nominal	
Self-reset relays	7 W maximum +1 W for LED and or counter
Latching relays:	
32V dc	<0.12W
48V dc	<0.18W
110V dc	<0.40W
125V dc	<0.45W
220V dc	<0.80W
240V dc	<0.88W
250V dc	<0.90W +1W for electrical reset interlock +1 W for LED and or counter
Reset coils	Zero

Operating Voltage Range

Guaranteed operation between 70% and 120% of nominal rated DC operating voltage.

For 30/32 V DC rated models the operating range is from 70% of the lower rating to 120% of the higher rating.

Note: The 70% of nominal value allows for correct operation of the relay even when there is a loss of battery charger supply for considerable periods.

To ensure guaranteed operation at 70% of nominal voltage the relay is manufactured to operate at a lower level to guarantee operation if the voltage falls to 70% of nominal voltage. Consequently, it will be found that these relays will operate below 70% of nominal voltage to allow for manufacturing tolerance on devices, this is normal and correct.

The 70% of nominal voltage figure does not indicate the relay pickup voltage.

Reset Voltage

Self-reset relays will reset at not less than 5% of nominal rated operate voltage. Reset typically occurs at 20% of nominal.

Coil Thermal Rating

All operate, reset and time delayed circuits are designed to withstand continuous application of 120% of the nominal rated voltage.

Electrical Reset Relays

Reset voltage: As per operating voltage range.

Reset cut off: Instantaneous with main relay reset.

Contact Ratings

Operating Voltage	Voltage free
Isolation across open contacts	1 kV rms
Make and carry: Continuous	1,250 VA AC resistive 1,250 W DC resistive Limited at both 660 V and 8 A
Make and carry for 3s	7,500 VA AC resistive 7,500 W DC resistive Limited at both 660 V and 30 A
AC break capacity	1,250 VA AC resistive Limited at both 8 A and 250 V
DC break capacity	100W DC resistive 50W DC inductive Limited at both 8 A and 250 V

Compliance Data

Insulation

Standard	IEC 60255-27
Type	Level
Any Terminal and Earth	2.0kV ac rms for 1min
	5.0kV 1.2/50us 0.5J
Between Independent Circuits	2.0kV ac rms for 1min
	5.0kV 1.2/50us 0.5J
Across Normally Open Contacts	1.0kV ac rms for 1min

Temperature

Standard	IEC 60068-2-1/2
Operating Range	-10 to +55 degrees Celsius
Storage Range	-25 to +70 degrees Celsius

Humidity

Standard	IEC 680068-2-78
Operating Range	40 degrees Celsius and 93% RH non condensing

IP Rating

Standard	IEC 60529
Installed	IP5x

Vibration - Sinusoidal

Standard	IEC 60255-21-1 Class I	
Vibration Response	0.5gn	≤5%
Vibration Endurance	1.0gn	≤5%

Shock and Bump

Standard	IEC 60255-21-2 Class I	
Shock Response	5gn, 11ms	≤5%
Shock Withstand	15gn, 11ms	≤5%
Bump Test	10gn, 16ms	≤5%

Seismic

Standard	IEC 60255-21-3 Class I	
Seismic Response	1gn	≤5%

Mechanical Classification

Durability - 0.1 Hz maximum repetition rate	>10 ⁵ operations at no load
	>10 ⁴ operations at full load

Wiring Diagram AR5

Terminal Layout

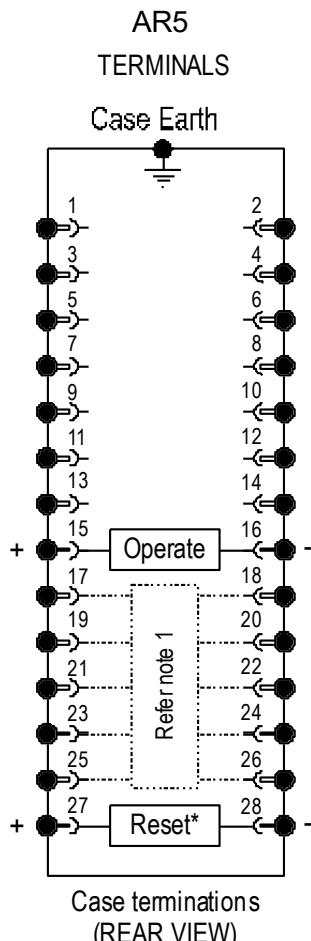


Figure 6: AR5 rear terminal layout

* Electrical reset only fitted where specified

Note: Refer contact configuration code & wiring table 1

Standard Wiring Configuration

The case termination diagrams in figure 6 depicts the rear screw terminals and position of the operate and reset coils for the AR5 version. Note the connection polarity for correct DC operation.

Terminals		
Operate coil	15+	16-
Reset coil	27+	28-

The contact function between each pairs of terminals is determined by the order code selected.

M Normally open Make (M) contact

This contact closes when the relay operate coil is energized.

B Normally closed Break (B) contact

This contact opens when the relay operate coil is energized.

Table 1 provides the terminal wiring assignment for each of the contact configurations available with the AR5 relay version.

This wiring table is also printed on the side panel of the draw out module for easy reference in the field.

Contact Configuration	AR5 Case Terminal Number Pairs				
	17-18	19-20	21-22	23-24	25-26
N 5M+0B	M	M	M	M	M
P 4M+1B	M	M	M	M	B
Q 3M+2B	B	M	M	M	B
R 2M+3B	B	M	M	B	B
S 1M+4B	B	B	M	B	B

Table 1

Wiring Diagram AR12

Terminal Layout

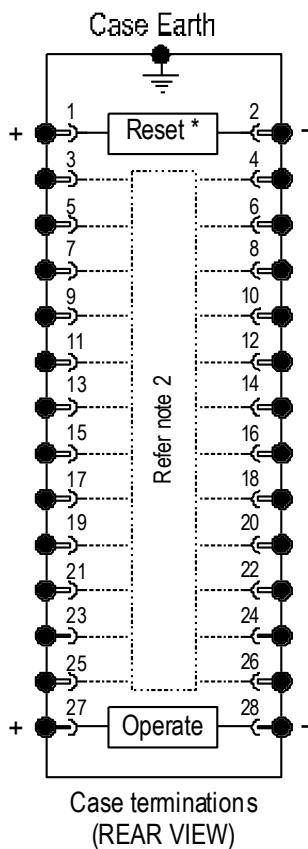


Figure 7: AR12 rear terminal layout

* Electrical reset only fitted where specified

Note: Refer contact configuration code & wiring table 2

Standard Wiring Configuration

The case termination diagrams in figure 7 depicts the rear screw terminals and position of the operate and reset coils for the AR12 version. Note the connection polarity for correct DC operation.

Terminals		
Operate coil	27+	28-
Reset coil	1+	2-

The contact function between each pairs of terminals is determined by the order code selected.

M Normally open Make (M) contact

This contact closes when the relay operate coil is energized.

B Normally closed Break (B) contact

This contact opens when the relay operate coil is energized.

Table 2 provides the terminal wiring assignment for each of the contact configurations available with the AR12 relay version.

This wiring table is also printed on the side panel of the draw out module for easy reference in the field.

Contact Configuration		AR12 Case Terminal Number Pairs											
		3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26
A	12M+00B	M	M	M	M	M	M	M	M	M	M	M	M
B	11M+01B	M	M	M	M	M	M	M	M	M	M	M	B
C	10M+02B	B	M	M	M	M	M	M	M	M	M	M	B
D	09M+03B	B	M	M	M	M	M	M	M	M	M	B	B
E	08M+04B	B	B	M	M	M	M	M	M	M	M	B	B
F	07M+05B	B	B	M	M	M	M	M	M	M	B	B	B
G	06M+06B	B	B	B	M	M	M	M	M	M	B	B	B

Table 2

Wiring Diagram AR25

Terminal Layout

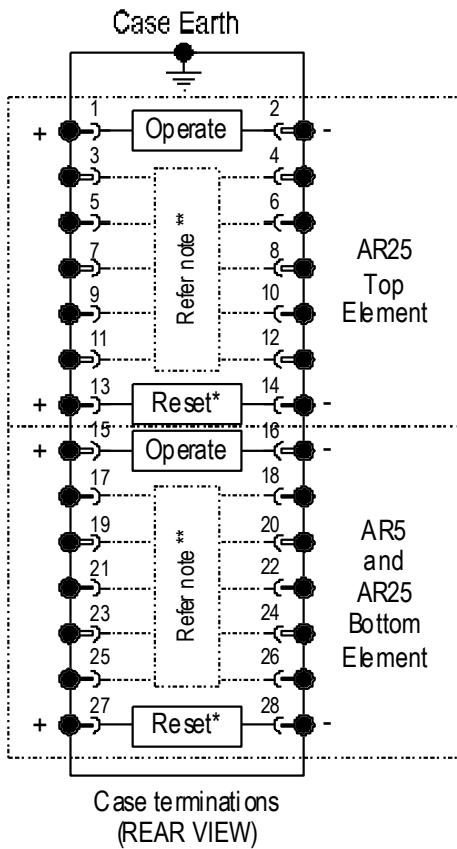


Figure 8: AR25 rear terminal layout

* Electrical reset only fitted where specified

Note: Refer contact configuration code & wiring table 3

Standard Wiring Configuration

The case termination diagrams in figure 8 depicts the rear screw terminals and position of the operate and reset coils for the AR25 version. Note the connection polarity for correct DC operation.

Terminals			
Top Element			
Operate coil	1+	2-	
Reset coil	13+	14-	
Bottom Element			
Operate coil	15+	16-	
Reset coil	27+	28-	

The contact function between each pairs of terminals is determined by the order code selected.

M Normally open Make (M) contact

This contact closes when the relay operate coil is energized.

B Normally closed Break (B) contact

This contact opens when the relay operate coil is energized.

Table 3 provides the terminal wiring assignment for each of the contact configurations available with the AR25 relay version.

This wiring table is also printed on the side panel of the draw out module for easy reference in the field.

Contact Configuration	AR5 and AR25 Case Terminal Number Pairs									
	AR25 Top Relay Element					AR5 and AR25 Bottom Relay Element				
	3-4	5-6	7-8	9-10	11-12	17-18	19-20	21-22	23-24	25-26
N 5M+0B	M	M	M	M	M	M	M	M	M	M
P 4M+1B	M	M	M	M	B	M	M	M	M	B
Q 3M+2B	B	M	M	M	B	B	M	M	M	B
R 2M+3B	B	M	M	B	B	B	M	M	B	B
S 1M+4B	B	B	M	B	B	B	B	M	B	B

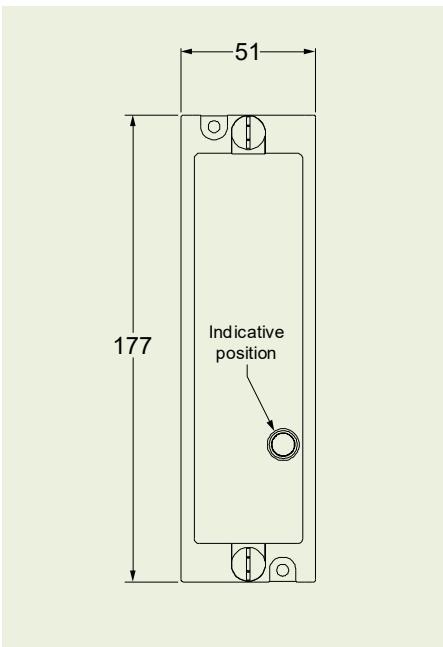
Table 3

Case Detail 2M28-S

Case Construction

The outer case is manufactured from zinc coated mild steel providing considerable strength and long term durability. The entire case surface is powder coated to provide corrosion protection and an attractive textured finish. Relay elements are mounted on fabricated fiberglass and acetal components to provide reliable electrical isolation.

Front View

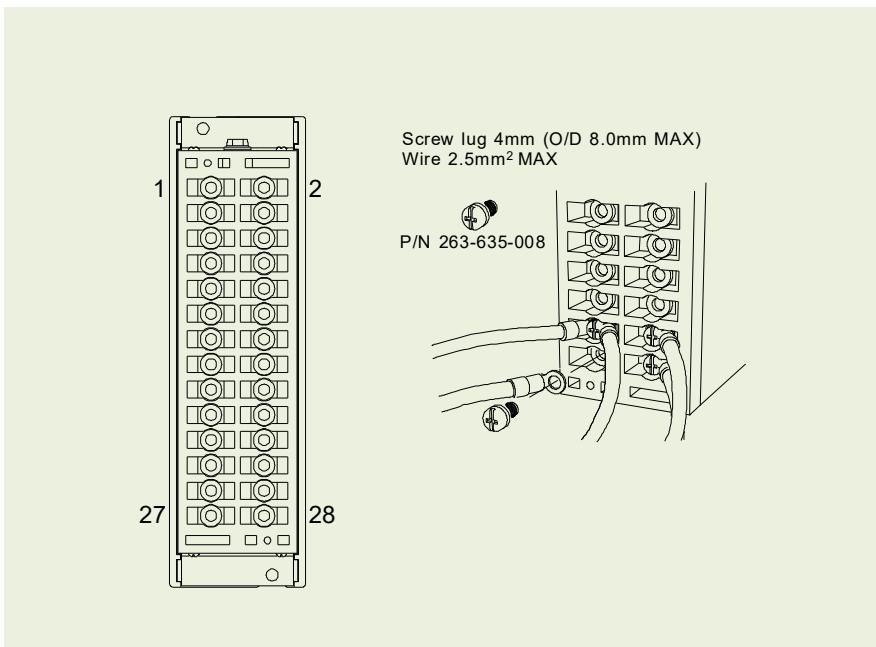


M Series Draw Out Case

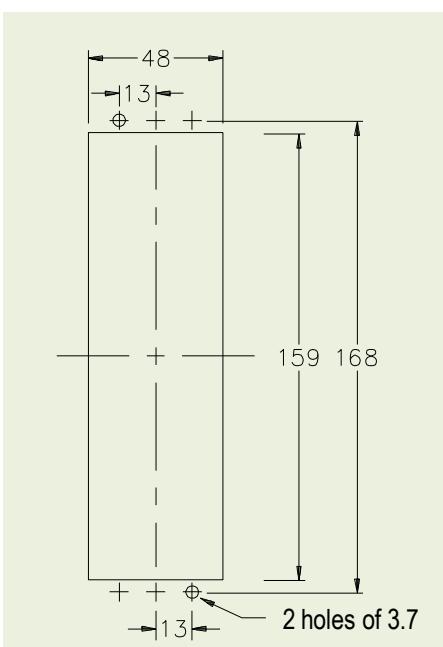
The M Series case range has been specifically designed to meet the demanding and varied requirements for applications in power utility sub-station environments. The standard 4U high 19 inch rack mounting modular configuration simplifies panel design and installation.

Mounting points and overall panel dimensions meet international standards such that the cases may be interchanged with other similar types available. Refer to the M Series Technical Bulletin for additional information on case mounting and wiring.

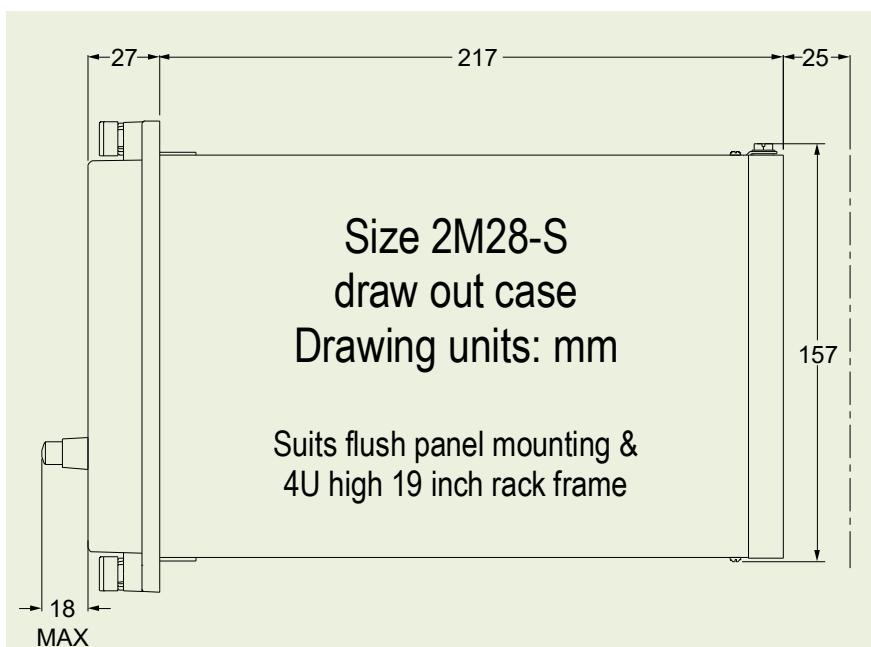
Rear View



Panel Cut-out



Side View



Order Codes AR5

Alpha AR5 Relay Order Code

AR5 -							
Nominal Operate Voltage	B					32 V dc	
	C					48 V dc	
	D					110 V dc	
	E					125 V dc	
	F					220 V dc	
	G					240 V dc	
	H					250 V dc	
	L					110 V ac	
	P					240 V ac	
Contact Configuration	N					5 Make + 0 Break	
	P					4 Make + 1 Break	
	Q					3 Make + 2 Break	
	R					2 Make + 3 Break	
	S					1 Make + 4 Break	
Contact Function	1					Self-reset contacts	
	2					Latching contacts	Hand reset
	3					Latching contacts	Electrical reset
	4					Latching contacts	Hand and electrical reset
Flag Function	1					Armature flag	Flag resets with contacts
	2					Hand reset flag	Flag resets with front panel reset
	3					Both flags fitted	Refer order codes 1 and 2
	4					No flags fitted	
	5					Reverse acting armature flag	Flag visible with armature reset
	6					Reverse acting hand reset flag	Flag visible with contacts reset
Options	-					No options required	
	C					Operation counter	
	L					Coil operation LED	
	S					Electrical reset inhibit switch	
Non-standard parameters	-					None	
	-IP2X					With IP2X terminal cover	

Refer to Appendix 1 for further detail on IP2X terminal covers.

Cross Reference

		Alpha AR Code
MVAA11	AR111	AR5-00-12
MVAA13	AR112	AR5-00-22
MVAA14	AR106	AR5-00-32
MVAA15	AR113	AR5-00-42

Order Codes AR12

Alpha AR12 Relay Order Code

AR12 -							
Nominal Operate Voltage	B					32 V dc	
	C					48 V dc	
	D					110 V dc	
	E					125 V dc	
	F					220 V dc	
	G					240 V dc	
	H					250 V dc	
	L					110 V ac	
	P					240 V ac	
Contact Configuration	A					12 Make + 00 Break	
	B					11 Make + 01 Break	
	C					10 Make + 02 Break	
	D					09 Make + 03 Break	
	E					08 Make + 04 Break	
	F					07 Make + 05 Break	
	G					06 Make + 06 Break	
Contact Function	1					Self-reset contacts	
	2					Latching contacts	Hand reset
	3					Latching contacts	Electrical reset
	4					Latching contacts	Hand and electrical reset
Flag Function	1					Armature flag	Flag resets with contacts
	2					Hand reset flag	Flag resets with front panel reset
	3					Both flags fitted	Refer order codes 1 and 2
	4					No flags fitted	
	5					Reverse acting armature flag	Flag visible with armature reset
	6					Reverse acting hand reset flag	Flag visible with contacts reset
Options	-					No options required	
	C					Operation counter	
	L					Coil operation LED	
	S					Electrical reset inhibit switch	
Non-standard parameters	-					None	
	-IP2X					With IP2X terminal cover	

Refer to Appendix 1 for further detail on IP2X terminal covers.

Cross Reference

		Alpha AR Code
MVAA11	AR111	AR12-00-12
MVAA13	AR112	AR12-00-22
MVAA14	AR106	AR12-00-32
MVAA15	AR113	AR12-00-42

Order Codes AR25

Alpha AR25 Relay Order Code

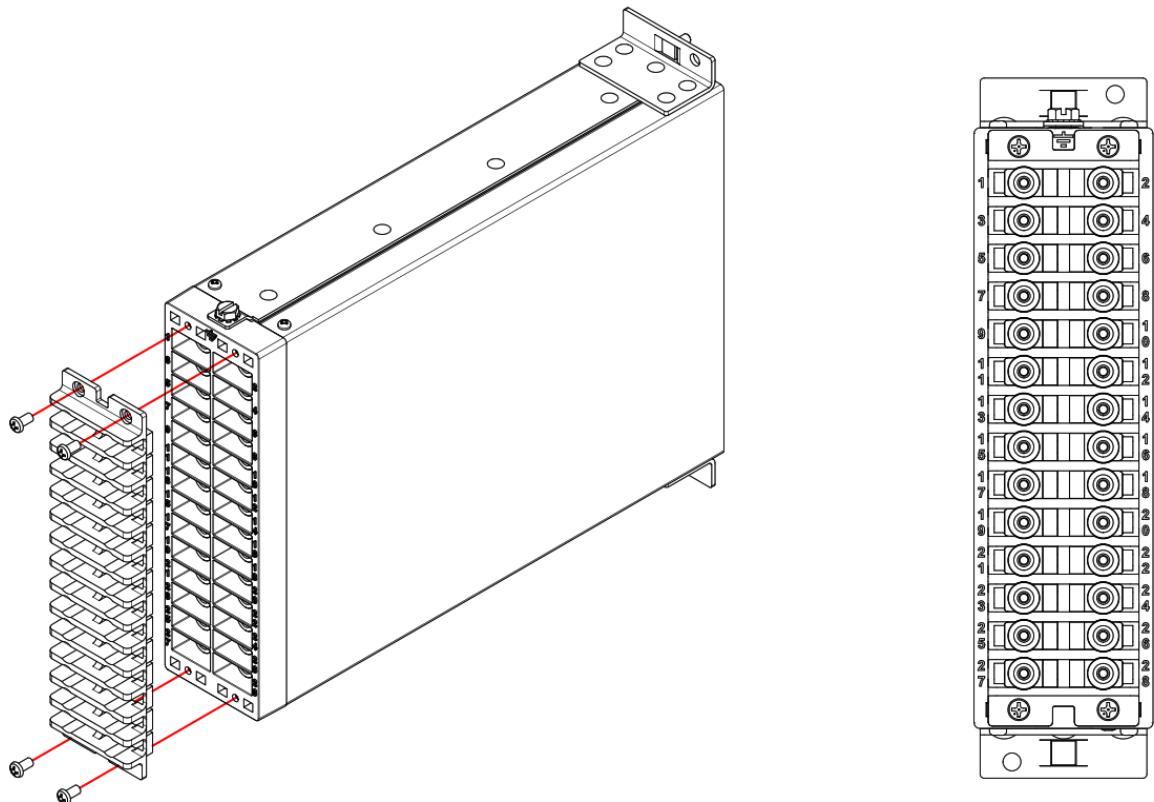
AR25 -			
Nominal Operate Voltage	B C D E F G H L P		32 V dc 48 V dc 110 V dc 125 V dc 220 V dc 240 V dc 250 V dc 110 V ac 240 V ac
Contact Configuration	N P Q R S		5 Make + 0 Break 4 Make + 1 Break 3 Make + 2 Break 2 Make + 3 Break 1 Make + 4 Break
Contact Function	1 2 3 4		Self-reset contacts Latching contacts Latching contacts Latching contacts
Flag Function	1 2 3 4 5 6		Armature flag Hand reset flag Both flags fitted No flags fitted Reverse acting armature flag Reverse acting hand reset flag
Options	- L		No options required Coil operation LED
Non-standard parameters	- -IP2X		None With IP2X terminal cover

Refer to Appendix 1 for further detail on IP2X terminal covers.

Cross Reference

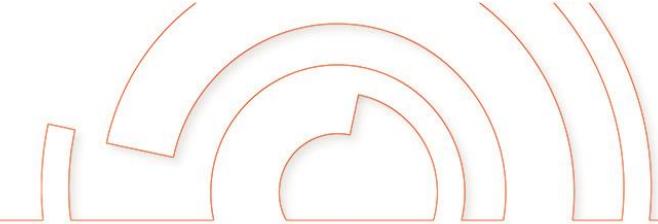
			Alpha AR Code
MVAA21		AR211	AR25-00-12
MVAA23		AR212	AR25-00-22

Appendix 1



2M28-S Case with IP2X cover

Note: IP2X terminal covers are fitted prior to relay wiring termination.



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