Alpha - Electromechanical Relays

An extensive range of attracted armature relays which have been developed for most applications.
Relays may be 'instantaneous' or 'delayed', AC or DC operated, with an optional flag indicator.
Elements may be electrical, hand or self reset.

Delayed operation of DC relays is achieved by fitting a copper slug to either the front or rear of the operating coil, depending upon the required action, i.e. delayed pick-up or drop-off.

AC energised relays are fitted with a split core incorporating a copper shading ring.
This ensures positive, silent operation.

Relays are compliant with BS142 and IEC255 as required.

Heavy duty contacts with blow out magnets are available on many relays.

Principal devices within the range:

AR – Auxiliary Relays

The type AR is a range of electromechanical relays with up to eight contacts, a consistent positive action and a long service life.

These relays can be supplied in most combinations of flag arrangement, reset type and delayed operation or reset.

AR relays are voltage operated from either AC or DC supplies.

FR – Flag Relays

The type FR is a range of series connected relays to provide visual indication of protection operation and a number of output contacts for alarm and indication purposes.

Series connection ensures that indication is only given when the driven circuit operates correctly.
The trip relay or CB trip coil must carry the operating current of the auxiliary relay, if the main device is faulty the FR relay should not operate.
FR relays are current operated from DC supplies.

MR – Measuring Relays

The type MR relays are used in applications where a definite operating current is required – typically instantaneous overcurrent or earth fault protection.

The range includes both fixed and variable setting relays.

MR relays are current operated from AC supplies.

TR – Trip Relays

High speed multi-contact tripping relays, developed to allow the simultaneous operation of a number of circuits, typically CB tripping circuits.

The principal features of the TR relay are its robust construction, high speed of operation and flexibility in contact arrangement.
The relays are available in self, hand, electrical, and hand & electrical reset types.

TR relays are available with up to 10 contacts for electrically reset models. Self reset models may have up to 11 contacts.

TR relays are fitted with a hand reset flag indicator.

TR relays are available in both low and high burden designs, corresponding to EATS 48-4 classes EB1 and EB2 respectively.

TR-A relays are an alternative design, high burden only, and are fitted with 20 contacts.

Additional models are available for specific purposes:

TR312 – Low burden tripping relay designed to meet CEGB specification P15.
This device is used where the break duty of the protection relay may be of concern, additional external connections cater for this feature.

TR431- IN/OUT switching relay to allow the control of protection and auto reclose systems in line with CEGB

specification TDM 5/11.

TR512 - Protection unstabilising relay to CEGB Specification P11. No flag indicator fitted.

TR901 - High burden relay with two position flag indicator, typically used as a position follower relay for switchgear.

TR relays are voltage operated from DC supplies.

VR – Voltage Relays

The type VR relays are used in applications where a definite operating voltage is required – typically under or overvoltage protection.

The range includes both fixed and variable setting relays.

The relays are fitted with a flag indicator, reverse acting on undervoltage relays.

VR relays are voltage operated from either AC or DC supplies.

XR – Function Specific Relays

XR101 & XR102 – High speed, low burden relays for intertrip duty. No flag indicator is fitted.

XR105 & XR106 - Interposing relays for the remote control of switchgear & associated equipment. XR relays have a high level of AC immunity and are capable of operation on pilot circuits of up to 200Ohms loop resistance. A flag indicator is fitted to the XR106, the XR105 is not flagged.

XR152 & XR153 - DC supply supervision relays, typically used for supply & fuse supervision of protection systems -the element has a 100mS drop-off delay. Relays are fitted with a reverse acting flag, on XR152 this is self reset, on XR153 it is hand reset.

XR250 to XR351- Trip circuit supervision relays. Used to monitor the health of CB trip coils (or trip relays coils), there are a number of schemes which may be used with varying levels of supervision and complexity.

XR309 - Ferroresonance detector relay.
The XR309 relay provides detection of a system ferroresonant condition and is compliant with CEGB TPS 12/90 and NGTS 2.15.

Please refer to the individual product information for further details.

RELAY CASES

The standard enclosure for the above relays is a panel mount, 'Epsilon' type case.
Case widths will vary with the product.

Type AR 101, any type XR 105 Relays are available in a channel mounted plug-in case, specifically for use inside control & relay panels. These relays may have a maximum of four contact pairs and are not fitted with a flag indicator.

Multi-contact Auxiliary Relay 7PG11 - AR

FEATURES

- Consistent positive action
- Robust design for a long, reliable, service life

DESCRIPTION

Type AR relays are a range of electro-mechanical relays with up to 8 contacts and complying to BS142. They can be supplied in most combinations of contact, flag and reset arrangements and with a fixed time delay. Heavy duty contacts are available on most models.

The relays are identified by a series of numbers and letters which define important relay features as follows:

First Digit	Second Digit Type of flag		Third Digit Type of contact reset	
Number of identical elements	0	No flag	1	Self reset
	1	Hand reset flag	2	Hand reset
	2	Hand reset reverse acting	3	Electrical & hand
	3	Self reset flag	4	Hand & self
	4	Self reset reverse acting	6	Electrical reset

Suffix letters are used to identify further features:
Suffix D – indicates a relay fitted with a suppression diode across the coil to reduce the effects of the back emf which occurs on switch-off.
Suffix SB – identifies a relay with a series break contact to cut-off the operating coil, thus the relay burden becomes zero after operation of this contact. Only available with AR relays which have hand reset contacts.

Type	Number of Contacts	Flag Reset	Contact Reset
AR101	2, 4, 6 or 8	--	Self
AR103	4, 6 or 8	--	Elec & Hand
AR111	2, 4, 6 or 8	Hand	Self
AR112	2, 4, 6 or 8	Hand	Hand
AR113	4, 6 or 8	Hand	Elec & Hand
AR114	4 or 6	Hand	Hand & Self
AR121	2, 4, 6 or 8	Hand*	Self
AR124	4 or 6	Hand*	Hand & Self
AR131	2, 4 or 6	Self	Self
AR133	2, 4 or 6	Self	Elec & Hand
AR141	2,4 or 6	Self*	Self
AR101T	2, 4 or 6	--	Self
AR111T	2, 4 or 6	Hand	Self
AR112T	2, 4 or 6	Hand	Hand
AR121T	2, 4 or 6	Hand*	Self
AR131T	2 or 4	Self	Self
AR141T	2 or 4	Self*	Self

Table 1. Model range. *indicates a reverse acting flag (indication on de-energisation)

Suffix T – identifies time delayed relays. The reference is completed by adding a code number, see operating time.
The following comments are provided as a guide to the various features of type AR relays.

AR - 1 Up to 7 self reset contacts, flag follows contact operation , in any combination of normally open or normally closed as required.
AR - 2 Up to 8 self reset contacts, flag follows contact operation, in any combination of normally open or normally closed as required.
AR - 3 Electrical and hand set contacts supplied with a contact reset mechanism in the relay case cover.
AR - 4 Hand and self reset contacts, can be supplied with 2 hand reset contacts and a maximum of 4 self reset contacts. All the contacts may be either normally open or normally closed.
AR – 3 & 6 Reset coils are short time rated, we recommend that reset circuits include a normally open (cut-off) contact.

TECHNICAL INFORMATION

Rated voltage Vn Standard ratings:

12V, 24V, 30V, 50V, 125V, 240VAa.c.

63.5V, 110V, 220V, 240Vd.c.

Time delay relays are available for d.c. voltages.
Operating range:

D.C. 70% to 115% of rated voltage.

A.C. 80% to 110% of rated voltage.

Burden
Burden is 3 to 5W/VA depending upon the rating. In case of rectified a.c. relays the power factor is nominally 0.96.

Operating time
Instantaneous operation
Operating times can vary depending upon the number and configuration of the contacts and flag arrangement, typically 25ms at rated voltage, and a range of between 10ms and 50ms.
Time delay operation

Time delay relays, maximum numbers of contacts				
Delay on de-energisation				
Suffix	Nominal time	AR101T, AR111T, AR112T, AR121T	AR 131T	AR 141T
T1	up to 100ms	6	4	4
T2	101 to 200ms	6	4	4
T3	201 to 300ms	4	2	2
T4	301 to 400ms	2	NA	NA
Delay on energisation				
T6	50ms max	6	6	4

Delays are set at nominal voltage and within the range of 80% to 100% of nominal time.

*number of elements
Table 2. A guide to relay case accommodation

Contact arrangements
Normal duty contact Ratings

Make and carry continuously:
1250VA a.c. or 1250W d.c. with limits of 660V and 5A

Make and carry for 3 seconds:
7500VA a.c. or 7500W d.c. with limits of 660V and 30A

Break:
1250VA a.c. or 100W resistive d.c. or 50W inductive (L/R = 0.04) d.c. with limits of 250V and 5A
Maximum rate of operation, 600 per hour.

Heavy duty contacts
Heavy duty contacts are available for d.c. circuits, contact ratings and break duty curves are available on request.
Thermal withstand 1.15Vn continuously. Not less than 1.3Vn for 10 seconds

ENVIRONMENTAL

Temperature	IEC 68-2 and BS2011(1977)
Operating	-10ºC to +55ºC
Storage	-25ºC to +70ºC
Humidity	IEC 68-2-3 56 days at 95% RH and +40ºC
Vibration	IEC 255-21-1

Shock and bump IEC 255-21-2
Relays meet the requirements with respect to shock and bump testing for class 1 severity.

Operational/Mechanical life
Relays will withstand in excess of 10,000 operations
Insulation IEC 255-5

Relays will withstand: 5kV 1.2/50µs waveform as IEC255-4 Appendix E 2kV rms 50HZ for 1 minute (2.5kV for 1s) between all terminals and earth. 1kV rms 50HZ for 1 minute across normally open contacts to IEC255-5 and BS142

Flag Relay – FR

FEATURES

• Easy to test and maintain

• Comply with IEC255, BS142

APPLICATIONS

Type FR relays are intended for use in series with high burden tripping relays or circuit breaker trip coils to provide repeat contacts.

Instantaneous drop-off FR relays are intended for application with self reset and delayed drop-off (40 – 60ms characteristic) trip relays. Time delayed drop-off FR relays are intended for application with instantaneous cut-off trip relays, or with circuit breaker trip coils.

DESCRIPTION

Type FR relays have d.c. current operated coils, with a consistent, positive action, and long service life. Operating coils are selected to meet each application.

It is anticipated that most applications will be for one FR relay in series with one TR2** high burden trip relay.

Model range a.c. current

FR101 - Self reset contacts, no flag
FR101T - Self reset contacts, no flag, delay on drop-off
FR111 - Self reset contacts and hand rest flag
FR111T - Self reset contacts, hand reset flag and delay on drop-off
FR112 - 2 self reset and two hand reset contacts and hand resetflag
FR2** - 2 element versions of above models

TECHNICAL INFORMATION

Auxiliary supply Vx	As required
Operating range	50% to 120% of Vx
Burden	Dependant upon setting
Volts drop	FR111 5% of Vx, FR111T 13% of Vx
Thermal withstand	10 x Vx for 10 seconds FR111 4 x Vx FR111T continuous
Timing	Operating time at Vx typically

FR111 25ms, FR111T 8ms.Delay on drop-off (FR111T) 50ms max

Influence on trip relay, typical increases in operating times are FR111, 1ms, FR111T, 2ms

Accuracy Is ± 10%

Contact arrangements

Up to 4 contacts in any combination of normally closed, or, 2 self and 2 hand reset contacts either normally open or normally closed.

Contact Ratings

Make and carry continuously: 1250VA a.c. or 1250W d.c. with limits of 660V and 5A
Make and carry for 3 seconds: 7500VA a.c. or 7500W d.c. with limits of 660V and 30A
Break: 1250VA a.c. or 100W resistive d.c. or 50W inductive(L/R = 0.04) d.c. with limits of 250V and 5A
Indication:

ENVIRONMENTAL

Temperature	IEC 68-2-1 & 2
Operating	-10ºC to +55ºC
Storage	-25ºC to +70ºC
Humidity	IEC 68-2-3

56 days at 95% RH and +40ºC

Vibration	IEC 255-21-2

The relays comply with the requirements of BS142, section 1.5.1. 1989, class 1

Shock and bump	IEC 255-21-2

Relays meet the requirements with respect to shock and bump testing for class 1 severity.

Operational/Mechanical life

Relays will withstand in excess of 10,000 operations
Insulation IEC 255-5
Relays will withstand:

- 5kV 1.2/50µs 0.5j between all terminals and case earth and between adjacent terminals
- 2kV rms 50HZ for 1 minute between all case terminals connected together and the case earth and between independent circuits
- 1kV rms 50HZ for 1 minute across normally open contacts

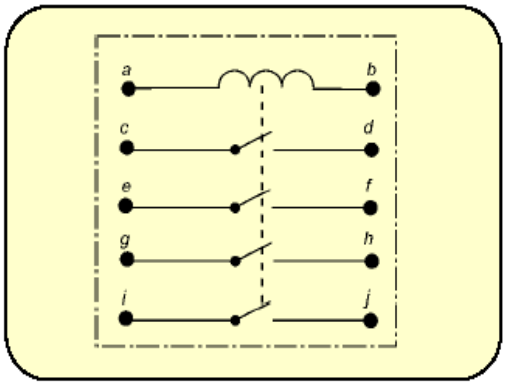

Fig.1. Typical single element relay wiring

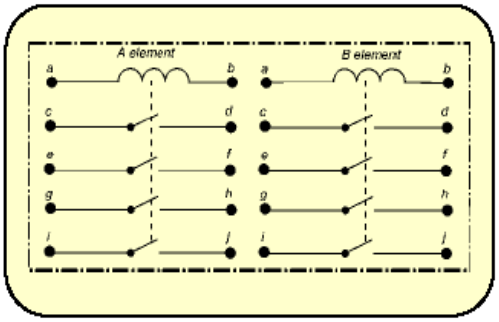

Fig.2. Typical two element relay wiring

Measuring Relay
7PG19 – MR

FEATURES

- Easy to test and maintain
- Fixed or plug bridge settings

APPLICATION

Type MR relays are intended for use where a precise level of a.c. current is required to operate the relay. Type MR relays are robust and reliable in operation, suitable for instantaneous overcurrent or earth fault protection and/or in conjunction with other protection systems or plant.

DESCRIPTION

Type MR relays use the same electro-mechanical assemblies as type AR family of relays with a specific operating point. Type MR relays have a consistent positive action, a long service life and comply with BS142.

Model range a.c. current
MR101 Single element, no flag, self reset contacts
MR111 Single element, hand reset flag, self reset contacts
MR102 Single element, no flag, self reset contacts
MR112 Single element, hand reset flag, self reset contacts
When three pole versions are required and supplied the type reference becomes MR3**.

TECHNICAL INFORMATION

Fixed settings (MR101, MR111) Is
Fixed setting relays are factory-set to a specific operating point
(Where a range is shown this indicates the relay coil operating range.)
0.1A 0.2A
0.25A to 0.33A 0.4A to 0.5A
0.8A to 1.0A 2A to 2.5A
5A
Variable setting (MR102 & MR112) Is
Adjustable using a 7 step plug bridge.
0.1A to 0.4A
0.5A to 2A

Burden – Typically 3VA at the setting.
Thermal withstand (continuous) 2 x Is
Accuracy Is ±5%
Contact arrangements
MR101 and MR111 2NO, 2NO + 2NC or 4NO
MR102 & MR112 2NO, 2NO +2NC or 4NO

Contact ratings
Make and carry continuously:
1250VAa.c or 1250Wd.c. with limits of 660V and 5A

Make and carry for 3 seconds:
7500VAa.c. with limits of 660V and 30A

Break:
1250VA a.c. or 100W resistive d.c. or 50W inductive (L/R = 0.04) d.c. with limits of 250V and 5A

Indication MR111 and MR112
The types MR111 and MR112 has a mechanically operated hand reset flag.

ENVIRONMENTAL

Temperature	IEC 68-2-1 & 2
Operating	-10ºC to +55ºC
Storage	-25ºC to +70ºC
Humidity	IEC 68-2-3

56 days at 95% RH and +40ºC

Vibration	IEC 255-21-2

The relays comply with the requirements of BS142, section 1.5.11 1989, class 1

Shock and bump	IEC 255-21-2

Relays meet the requirements with respect to shock and bump testing for class 1 severity.

Operational/Mechanical life
Relays will withstand in excess of 10,000 operations

Insulation:	IEC 255-5

Relays will withstand:

- 5kV 1.2/50µs 0.5j between all terminals and case earth and between adjacent terminals
- 2kV rms 50HZ for 1 minute between all case terminals connected together and the case earth and between independent circuits
- 1kV rms 50HZ for 1 minute across normally open contacts

High Speed Tripping Relays
7PG15 - TR

FEATURES

- High speed, positive action
- Can be supplied in modular and drawout type case
- Robust design for a long, reliable service life

DESCRIPTION

Type TR relays are a range of multi-contact attracted armature relays designed to both IEC 255-5 and to BS142. A wide range of models is available to meet the requirements of the electric supply industry.

TR1-- Low burden to ESI 48-4 EB1 & NGTS 3.6.15, ESI 1.
TR2-- High burden to ESI 48-4 EB2 & NGTS 3.6.15, ESI 2.
TR312 NGC (CEGB) P15. (low burden trip relay)
TR431 NGC (CEGB) TDM 5/11. (switching relay)
TR512 NGC (CEGB) P11 1978. (unstabilising relay)

Table 1 overleaf shows the standard relays available.

Low burden, TR1 series
Type TR1 relays are suitable for application for tripping and auxiliary duties where immunity to capacitance discharge is not required. These relays are not intended for use with current operated series follower relays.

High burden, TR2 series
High burden relays with immunity to capacitance discharge currents. They are also suitable for certain applications where they are remote from the initiation signal.

A high burden also permits reliable operation of current operated series repeat relays. TR relays can be provided with a time delayed economy feature, either instantaneous or time delayed, see Table1.

Low burden relay, TR312
Designed to meet the requirements of P15, this is an electrically reset relay (no flag indicator) with additional terminals in the economy circuit to enable a direct connection to the dc supply.

This arrangement allows a reduction in the break duty of the initiating contact.

Switching relay, TR431
Designed to meet the requirements of TDM 5/11, this is an electrically reset relay with a flag indicator which follows the contact operation. These relays are intended to switch protection and auto reclose equipment in and out of service when controlled over pilot wires from a remote point. They are intended to operate from a remote 50V d.c. battery with a pilot loop resistance of up to 200 ohms.

Protection unstabilising relay, TR512
Designed to meet the requirements of P11, this is a self reset relay without a flag indicator.

Special purpose relays, TR9 series
This designation identifies TR relays designed to meet a special purpose e.g. TR901 is a high burden repeat relay, a type TR231 with a 2 position flag indicator.

TECHNICAL INFORMATION

TR1 and TR2 relays

Operating time 10ms at rated voltage
Rated voltage Vn 24V, 30V, 48V, 125V, 240V d.c.
Note: 24V and 240V ratings are not part of ESI 48-4

Operating range 50% to 120% of rated voltage
Operating coils of self-reset and economy cut-off relays are rated at 120% of rated voltage. All other operate and reset coils are short time rated well in excess of the operating time of their cut-off contacts. Self-reset relays will reset at not less than 5% rated voltage.

Nominal burdens

Rated voltage V d.c.	TR1--	TR2--
30	43	43
48	46	52
125	47	127
Reset coil	50	50

Relays with economy circuits reduce to approximately 7W

Contacts - all models

Number of contacts see Table 1.

Ratings
Make and carry continuously:
1250VAa.c. or 1250Wd.c. within limits of 660V and 5A

Make and carry for 3 seconds:
7500VAa.c. or 7500Wd.c. within limits of 660V and 30A

Break:
1250VAa.c. or 100W (resistive) d.c. or 50W (inductive) d.c. within limits of 250V and 5A

Indication:
TR1 and TR2 relays have a hand reset mechanical flag indicator

Type	No. of Contacts	Contact Reset	Operating coil cut-off	Specification	Burden	Case Size
TR112	7 or 11	Self	Economy	EB1	Low	4
TR121	7 or 11	Hand	Instantaneous	EB1	Low	2
TR131	6 or 10	Electrical	Instantaneous	EB1	Low	2
TR141	6 or 10	Hand & Electrical	Instantaneous	EB1	Low	2
TR212	6 or 10	Self	Economy	EB2	High	4
TR214	5 or 10	Self	Economy 2s delay	EB2	High	4
TR221	7 or 11	Hand	Instantaneous	EB2	High	2
TR223	7 or 11	Hand	40/60ms delay	EB2	High	4
TR231	6 or 10	Electrical	Instantaneous	EB2	High	2
TR233	6 or 10	Electrical	40/60ms delay	EB2	High	4
TR241	6 or 10	Hand & Electrical	Instantaneous	EB2	High	2
TR243	6 or 10	Hand & Electrical	40/60ms delay	EB2	High	4
TR312	5	Self	Economy	NGC P15	Low	4
TR431	7	Electrical	Instantaneous	NGC TDM.5/11	Low	4
TR512	6	Self	Economy	NGC P11	High	4
TR901	10	Electrical	Instantaneous	EB2	High	2

Table 1

ENVIRONMENTAL

Temperature
IEC68-2-1/2 and BS2011 (1977)
Operating -10°C to +55°C
Storage -25°C to +70°C
Humidity IEC 68-2-3
56 days at 95% RH and 40°C
Vibration IEC 255-21-1 Class I.

Shock and bump
IEC 255-21-2 and BS142, 1.5.2 (1989)

Relays meet the requirements with respect to shock and bump testing for Class 1 severity.

Operational/mechanical life
Relays will withstand in excess of 10,000 operations, within the maximum contact loading specified.

Insulation
Relays will withstand:
- 5kV 1.2/50µs waveform as IEC 255-4
- 2kV rms 50Hz for 1minute (2.5kV for 1s) between all terminals and earth
- 1kV rms 50Hz for 1 minute across normally open contacts to IEC 255-5 and BS142

High Speed Tripping Relays
7PG15 - TR-A Series

FEATURES

- High speed, positive action
- Can be supplied in modular and drawout type case
- Robust design for a long, reliable, service life

DESCRIPTION

Type TR relays are a range of voltage operated multi-contact attracted armature relays designed to both IEC 255-5 and to BS142. A wide range of models is available to meet the requirements of the electric supply industry.

TR-A2 – High burden to ESI 48-4 EB2 & NGTS 3.6.15, ESI 2.

Table 1 shows the standard relays available.

High burden, TR-A2 series
High burden relays with immunity to capacitance discharge currents. They are also suitable for certain applications where they are remote from the initiation signal.

A high burden also permits reliable operation of current operated series repeat relays. TR relays can be provided with a time delayed economy feature, either instantaneous or time delayed, see Table1.

TECHNICAL INFORMATION

TR-A2 series relays

Operating time	10ms at rated voltage
Rated voltage Vn	24V, 30V, 48V, 125V, 240Vd.c Note. 24V and 240V ratings are not part of ESI 48-4
Operating range	50% to 120% of rated voltage

Operating coils of self-reset and economy cut-off relays are rated at 120% of rated voltage. All other operate and reset coils are short time rated well in excess of the operating time of their cut-off contacts. Self-reset relays will reset at not less than 5% rated voltage.

Nominal burdens

Rated Voltage V d.c	TR2 --
30	43
48	52
125	<150
Reset coil	50

Relays with economy circuits reduce to approximately 7W

Type	No. of Contacts	Contact Reset	Operating coil cut-off	Spec	Burden	Case Size
TR-A212	20	Self	Economy	EB2	High	4
TR-A214	20	Self	Economy 2s delay	EB2	High	4
TR-A221	20	Hand	Instantaneous	EB2	High	4
TR-A223	20	Hand	40/60sec delay	EB2	High	4
TR-A231	20	Electrical	Instantaneous	EB2	High	4
TR-A233	20	Electrical	40/60sec delay	EB2	High	4
TR-A241	20	Hand and electrical	Instantaneous	EB2	High	4
TR-A243	20	Hand and electrical	40/60sec delay	EB2	High	4

Table 1

Ratings
Make and carry continuously:
1250VA a.c. or 1250Wd.c.
within limits of 660V and 5A
Make and carry for 3 seconds:
7500VA a.c. or 7500Wd.c.
within limits of 660V and 30A

Break:
1250VA a.c. or 100W (resistive) d.c. or 50W (inductive) d.c. within limits of 250V and 5A
Maximum rate of operation, 600 per hour
Indication
TR-A2 relays have a hand reset mechanical flag indicator

ENVIRONMENTAL

Temperature
IEC68-2-1/2 and BS2011 (1977)

Operating	-10°C to +55°C
Storage	-25°C to +70°C
Humidity	IEC 68-2-3

56 days at 95% RH and 40°C
Vibration IEC 255-21-1 Class I.

Shock and bump
IEC 255-21-2 and BS142, 1.5.2 (1989). Relays meet the requirements with respect to shock and bump testing for Class 1 severity.

Operational/mechanical life
Relays will withstand in excess of 10,000 operations, within the maximum contact loading specified, at a rate of 600 operations per hour.

Insulation
Relays will withstand:

- 5kV 1.2/50μs waveform as IEC 255-4
- 2kV rms 50Hz for 1minute (2.5kV for 1s) between all terminals and earth
- 1kV rms 50Hz for 1 minute across normally open contacts to IEC 255-5 and BS142

Over and undervoltage Relay
7PG16 - VR

FEATURES

- Easy to test and maintain
- a.c. and d.c. models
- Plug bridge settings

APPLICATION

These VR relays provide instantaneous under and over voltage detection for a.c. and d.c. operation. They are suitable for under and over voltage protection in conjunction with protection systems or other plant. They provide reliable operation and cover a wide range of settings.

DESCRIPTION

Type VR relay use the same electro-mechanical assemblies as type AR relays but with the settings required for specific under/over voltage applications. Type VR relays have a consistent, positive action, a long service life and comply with BS 142. Details of the relay are given in Table 1.

TECHNICAL INFORMATION

Rating Measuring voltage
A.C. ranges, 50Hz or 60HZ:
63.5V to 69.2V 110V to 125V
220V to 250V 380V to 440V
D.C. ranges
24V to 27V 30V to 34V 48V to 54V
110V to 125V 220V to 250V

Rating auxiliary voltage Vx
(Required for VR116, VR121 and VR122)
Nominal ratings: 24V, 30V, 48V, 110V, 220Vd.c.

Auxiliary voltage operating range
80% to 125% of the nominal voltage
Settings Vs
Variable setting relays have a plug bridge permitting selection of pick-up or drop-off voltage in set steps, see table 1. Fixed setting relays have a factory-set operating voltage within the stated range.

Burdens
Measured supply, see table 1.
Auxiliary supply, typically 3 to 5W depending upon the value of Vx.

Thermal withstand (continuous)
Undervoltage 12Vn
Overvoltage 1.5Vn or 12Vs whichever is the greater
Auxiliary supply 1.25Vx

Operating time
Undervoltage relays:
Typically less than 40ms from Vn to switch-off
Overvoltage relays:
Typically less than 90ms, 110ms with follower relay at 1.1Vn
Accuracy Vs ±5%
Frequency range (a.c. relays)
50Hz 47Hz to 51Hz
60Hz 57Hz to 61Hz

Contact arrangements
VR115, VR117, VR121, VR123: 2 NO or 1 NO + 1 NC
VR116, VR122: 1 NO on the measuring element and 5 contacts on the repeat element in any combination of NO and NC.

Contact ratings
Normal duty contact Ratings
Make and carry continuously:
1250VA a.c. or 1250W d.c.
with limits of 660V and 5A
Make and carry for 3 seconds:
7500VA a.c. or 7500W d.c.
with limits of 660V and 30A

Break:
1250VA a.c. or 100W resistive d.c. or 50W inductive (L/R = 0.04) d.c. with limits of 250V and 5A

Indication
A hand reset flag indicator is provided. For undervoltage it indicates on de-energise, for overvoltage it indicates on energisation. Where an auxiliary element is used it also operates the flag.

ENVIRONMENT

Temperature IEC 68-2-1 & 2
Operating -10ºC to +55ºC
Storage -25ºC to +70ºC
Humidity IEC 68-2-3 56 days at 95% RH and +40ºC
Vibration IEC 255-21-2
The relays comply with the requirements of BS 142, section1.5.1. 1989, class 1

Shock and bump IEC 255-21-2
Relays meet the requirements with respect to shock and bump testing for class 1 severity.

Operational/Mechanical life
Relays will withstand in excess of 10,000 operations

Insulation IEC 255-5
Relays will withstand: 5kV 1.2/50µs between all terminals and case earth and between adjacent terminals.
2kV rms 50HZ for 1 minute between all terminals and earth and between independent circuits
1kV rms 50HZ for 1 minute across normally open contacts

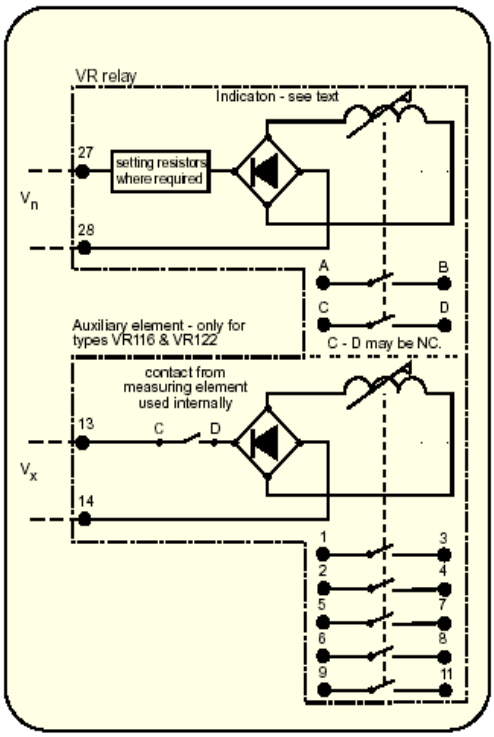

Fig. 1. Typical relay wiring diagram

Model	Duty	Setting range (Vn)	Steps		Burden at Vn (W or VA)	Resetting (Vn)	pick-up drop-off ratio
			No.	Value			
VR115	overvoltage	120%-150%	0	Fixed	0.8 - 4.8 **	≤ 50% Vs	≤ 50%
VR116	overvoltage	120%-150%	0	Fixed	0.1 - 0.7 †	108%-135%*	≥ 90%
VR117	overvoltage	120%-150%	7	5%	0.5 - 3.3 *	≤ 50% Vs	≤ 50%
		120%-180%	7	10%			
VR121	undervoltage	30% - 63%	0	Fixed	1.3 - 3.7 **	85% - 90%	33% - 74% *
VR122	undervoltage	62% - 81%	0	Fixed	0.26 - 0.7 †	68.8% - 90%*	≥ 90%
VR123	undervoltage	30% - 60%	7	5%	4 - 6 **	85% - 90% ††	33% - 71%*

Table 1. Model range and characteristics

* Indicates that the value varies with Vs
** Indicates that the value varies depending upon Vn
† Indicates that the value varies with Vn and Vx
†† Indicates that the value is at the highest setting

Intertripping Relay
7PG17 - XR101 & XR102

APPLICATION

Type XR101 and XR102 are intended for use as intertrip send and receive relays.
XR101 intertrip send complies with ESI 48-4 Class ES1
XR102 intertrip send complies with ESI 41-15 Part 5 (1988)

DESCRIPTION

Type XR relays are developments for specific applications from the AR relay range. They are electro-mechanical relays with a consistent positive action, a long service life and complying with BS142.

XR101 – This relay is supplied with a loose 1500 ohm resistor for wiring in series with the coil. The resistor should be mounted vertically on a steel cubicle or switchgear compartment side sheet.
XR102 – This relay requires a 200 ohm resistor to be wired in series with the coil. As the resistor is a requirement of the overall intertripping scheme detailed by ESI 41-15 Part 5, it is NOT SUPPLIED with the relay.

TECHNICAL INFORMATION

	XR101	XR102
Rating	125Vd.c.	48Vd.c.
Operating time	10ms	15ms
Minimum operate current	25mA	10mA
Continuous maximum withstand at 40°C ambient.	143V	60V
Maximum burden (including external resistors)	13W	10W

Operating Range 50% to 120% of rated voltage

Thermal withstand
Both relays will withstand 13 times rated voltage for 10 seconds

Contact arrangement
XR101 – 2 normally open self reset
XR102 – 3 normally open and 1 normally closed self reset

Contact rating
Make and carry continuously
1250VAa.c. or 1250Wd.c. within the limits of 660V and 5A

Make and carry for 3 seconds
7500VAa.c. or 7500Wd.c. within the limits of 660Vand 30A

Break:
1250VA a.c. or 100W (resistive) d.c. or 50W (inductive)L/R = 0.04 d.c. with limits of 250V and 5A

Indication
Both relays are fitted with hand reset flags

Insulation
2kV 50Hz rms for 1 minute:
Between contacts to earth and to the coil
Between any case terminal and earth
Between case terminals of independent circuits
1kV 50Hz rms for 1 minute across normally open contacts

Temptation
In service: -10ºC to 55ºC
Storage: -25ºC to 70ºC

Mechanical durability
Vibration, relays comply with BS142 section 2.1 category S2 Shock, relays will withstand a 20G shock or impact on the panel without operating

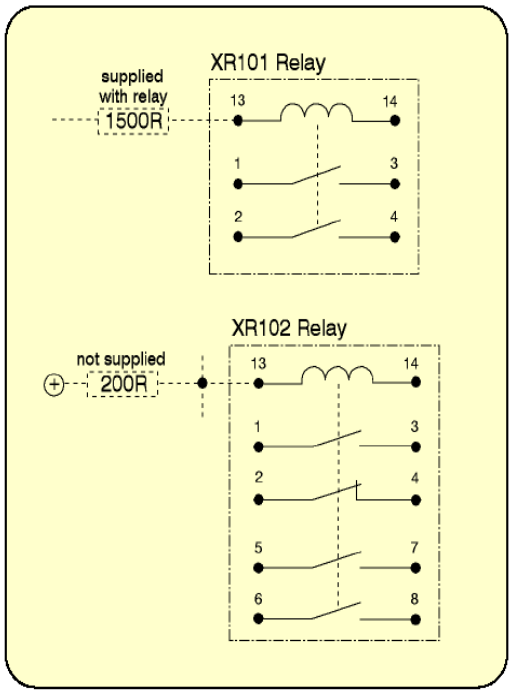

Fig.1. Connection details

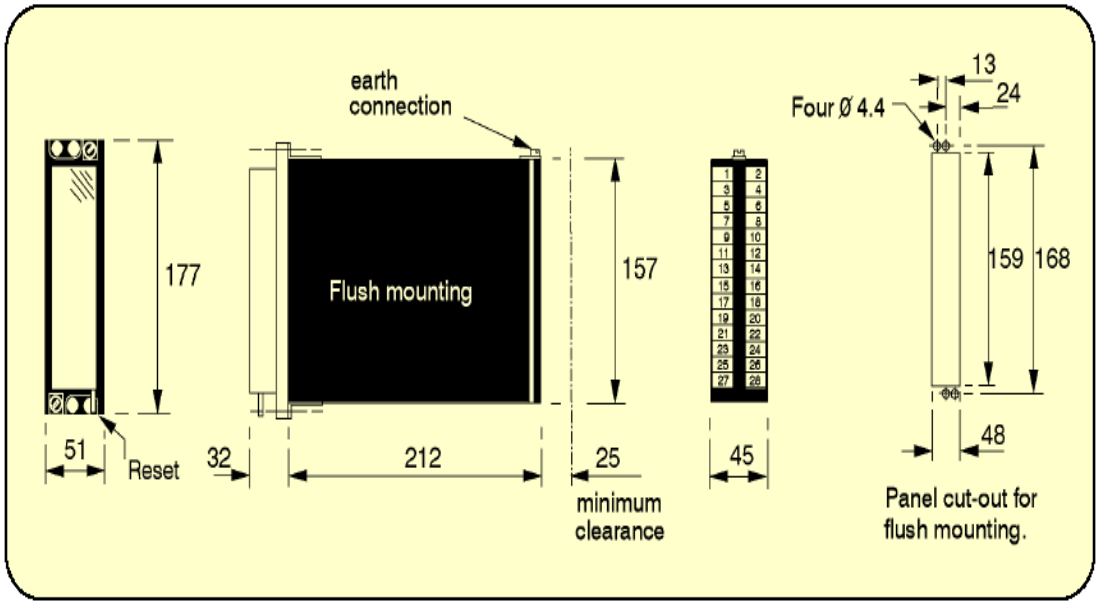

Fig. 2. Dimensions of E2 cases (All dimensions are in mm)

Interposing Relays – 7PG17
XR105 & XR106, XR205 & XR206

APPLICATION

Types XR105 and XR106 are intended for the remote control of switchgear and associated equipment over pilot wires with a maximum resistance of 200 ohms. These relays are designed so that they are not susceptible to certain a.c. voltage levels which may be induced onto the pilots wires.

DESCRIPTION

Type XR205 and XR206 are two element versions of the XR105 and XR106 respectively with the same performance. Type XR relays are developments for specific applications from the type AR relay range. They are electro-mechanical relays with a consistent positive action, a long service life and complying with BS142. Type XR105 has no flag indicator, type XR106 has a hand reset flag. Both types are available with a suppression diode across the coil to reduce the effects of the back emf which occurs on switch-off.

TECHNICAL INFORMATION

Rated operating voltage 48V or 125Vd.c.
External resistor required for 125Vd.c. operation
Operating range. With zero pilot resistance
78 to 125% of nominal rated voltage
With a maximum pilot loop resistance of 200ohm 92 to 125% of nominal rated voltage.
Burden Typically 3.7W for a relay with 4 normally open contacts.

A.C. Rejection
For a 48Vd.c. rated relay, typically 110V 50Hz a.c.
Operating time
For a relay rated 48Vd.c. with 4 normally open contacts at rated voltage typically 30ms. With 200ohms pilot resistance less than 80ms. Reset time is less than 35ms

Contacts
2 normally open, 4 normally open or 2 normally open and 2 normally closed self reset. Up to two contacts can have a heavy duty rating by fitting blow-out magnets
Normal duty, contact ratings
Make and carry continuously
1250VAa.c. or 1250Wd.c. within the limits of 660V and 5A

Make and carry for 3 seconds
7500VAa.c. or 7500Wd.c.
within the limits of 660V and 30A

Break:
1250VAa.c. or 100W (resistive) d.c. or 50W (inductive)
L/R = 0.04, d.c. within the limits of 250V and 5A

Heavy duty contact ratings
Make and carry continuously
1250W d.c. within the limits of 660V and 5A
Make and carry for 3 seconds
7500Wd.c. within the limits of 660V and 30A
Break, see duty curves over the page
Indication XR106, hand reset flag
Insulation
2kV 50Hz rms for 1 minute
between contacts to earth and to the coil
between any case terminal and earth
between case terminals of independent circuits
1kV 50Hz rms for 1 minute across normally open contacts

Temperature
In service: -10ºC to 55 ºC
Storage -25 ºC to 70ºC

Mechanical durability
Vibration, relays comply with BS142, Section 2.1 Category S2.
Shock, relays will withstand a 20G shock or impact on the panel without operating.
Operational/mechanical life, relays will withstand in excess of 10,000 operations with the contact rating stated.

Epsilon case	Plug-in no. 13 case	Small surface mtg case
1	S2A	1
2	S1A	2
3	S2B	3
4	S1A	4
5		5
6		6
7		7
8		8
13	DC	13
14	DC	14

Table 1. case terminal numbers

Normally closed contact location (Epsilon case terminal numbers)				
	1 - 3	2 - 4	5 - 7	6 - 8
1 NC		NC		
2 NC	NC	NC		
3 NC	NC	NC		NC
4 NC	NC	NC	NC	NC

Table 2. normally closed contact location

Contact arrangement	Epsilon case terminal numbers			
	1	3	2	4
2 NO HD		+ ve		+ ve
1 NO HD+ 1 NC std	Heavy duty		Standard duty	
		+ ve		
1 NO std+ 1 NC HD	Standard duty		Heavy duty	
			+ ve	
1 NO HD+ 1 NC HD	Normally open		+ ve	
		+ ve		
2 NC HD	+ ve		+ ve	

Table 3. polarity of heavy duty contacts

Heavy duty contacts are fitted with blowout magnets and are polarity conscious. In Table 3' +ve' indicates the terminal which must be connected to the supply positive.

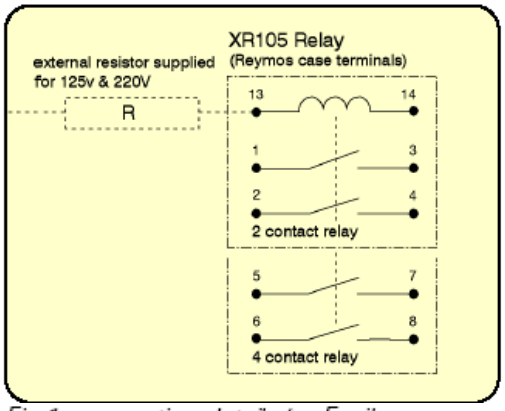

Fig.1. connection details for Epsilon case

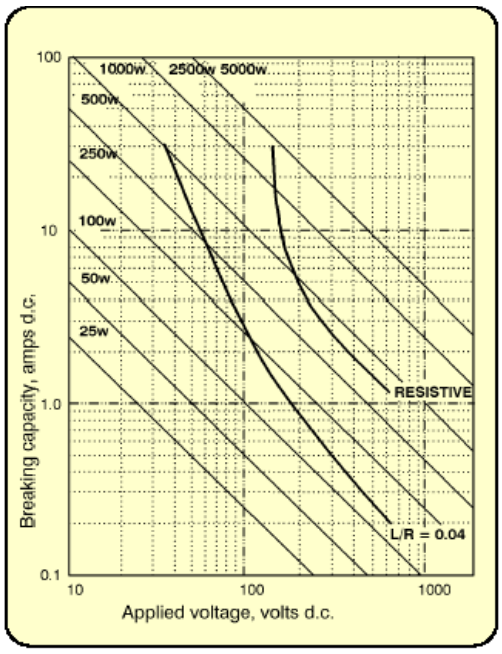

Fig.2. rating of heavy duty contacts