



Types 2TJM 70, 71 & 72 Inverse Definite Minimum Time Lag Relays

2TJM

Description

2TJM70

The relay comprises a die-cast frame, which carries all the sub-assemblies of induction disc, electro-magnetic system, operating coil, plug bridge and the contact assembly. Instantaneous high-set and directional elements can be provided. The electro-magnetic system comprises primary and secondary magnets arranged with four air gaps each contributing to the driving torque. The primary coil energizes the primary magnet and a secondary winding which in turn energizes the secondary magnet. Tappings on the primary coil permit various fault settings to be made via a plug-bridge. The plug-bridge automatically selects the highest setting when the setting-plug is withdrawn.

Two normally open contacts are provided of the bridging type, the operating arm being driven by a cam track at the hub of the induction disc. This gives considerable mechanical advantage and ensure high contact pressures, even at low operating current levels, making the contact suitable for direct tripping. Relay operating time is determined by the starting position of the induction disc, this is set by the time multiplier dial calibrated from 0.1 to 1.0, there is also "T" mark, before the 0.1 setting, in this position the contacts are held closed, locked out. Setting are applied ampere.

2TJM71

The type 2TJM71 relay is basically similar to the type 2TJM70, the exception being the addition of a miniature instantaneous high-set over current element (type MCAA) which is fitted to the movement frame and has its operating coil connected in series with the relay primary coil. The element is of the attracted armature type and primarily designed for use with I.D.M.T.L. relays. The over current setting is continuously variable by means of the calibrated cam. This element may be 'locked out' by advancing the setting adjuster to its extremity, i.e. past the highest fault setting. The flag indicator shows on operation and is hand reset by a push fitted in the relay cover.

2TJM72

This relay comprises the I.D.M.T.L. element previously described and a directional element type 'ES'. The elements are vertically mounted on a mild steel back-plate with the directional element in the upper position; the composite relay is then housed in a 1 1/2 pole vertical case.

The directional element operates on the induction wattmeter principle and consists essentially of an aluminum sector mounted on a vertical spindle and arranged to rotate in the air gap between the magnetic fields derived from the line current and voltage transformers. The electro magnetic system with the three coils which provide loss of voltage compensation and hence reliable operation should the line voltage be reduced, under fault conditions, to values as low as 2% of nominal.

Under healthy system conditions or under fault conditions where the current flow is in the normal direction eddy currents induced in the sector produce a torque, the direction of which restrains relay operation. Should current reversal occur, then the direction of the torque reverses causing the moving system to rotate and thus close the contact, the latter being so connected that they complete the I.D.M.T.L. element operating coil circuit.

The maximum torque exerted on the movement occurs when the voltage and current in the coils are in phase. However, as the system power factor may be considerably removed from unity under fault conditions, depending on both the nature of the fault and system conditions, the element can be supplied with a phase-angle introduced by fault conditions. This is achieved by employing a suitable shading ring, the requisite value of resistance and the appropriate connection.



Type 2TJM70 Single Pole Relay

Phase-fault Relays: 45degree Lead Power Factor Characteristic: Relays supplied with the 45 degree lead power factor characteristic utilize the 90 degree connection, i.e. relays monitoring A-phase current are polarized by B-C voltage, thus the relay develops maximum torque with a 45 degree lagging fault current.



Earth-fault Relays : Earth-fault relays are normally supplied with 12 ½ degree lagging power factor characteristic. The current coil is connected in the residual circuit of the line current transformers and the voltage coil in the open delta tertiary winding of the line voltage transformer, the voltage coil being suitable for 190V and 63.5V on resistance and solidly earthed systems respectively.

Directional earth fault relays with a 45 lagging power factor characteristics are used in highly inductive earthling systems. The characteristic is achieved in the relay with a RC circuit in the ES element.

Features

- No standing drain on substation battery supplies
- Easy to test and maintain
- Extremely long service life
- Designed to comply with IEC 60255 specifications (where applicable)

The 2TJM range is as follows:

- 2TJM 70 Normal inverse IDMTL form 1.3/10 (1.3 secs for 10 times Current)
- 2TJM 71 IDMTL + High - set element
- 2TJM 72 Directional IDMTL

Technical Information 2TJM70

Rating

0.5 A , 1A, 2A or 5A

System Frequency :

50Hz

Current Settings

Setting Range	StepA	Rating in (A)			
		0.5	1	2	5
0.05-0.2	0.025	0.5	1	-	-
0.1-0.4	0.05	0.5	1	2	-
0.2-0.8	0.1	-	1	2	-
0.25-1	0.125	0.5	-	-	5
0.4-1.6	0.2	-	-	2	-
0.5-2	0.25	-	1	-	5
1-4	0.5	-	-	2	5
2.5-10	1.25	-	-	-	5

Pick-up current : Not greater than 130% of plug-setting

Reset current : Not less than 95% of plug-setting



Fig 2 : High-Set element MCAA

Time Settings

Time Multiplier : 0.1 to 1.0 continuously
Adjustable with 0.05 Calibrated Marking

Operating time : See Fig 7 for time/current characteristics
Short Term Overload (2TJM70 For 1.8 Sec)

	AC Nominal Burden	2TJM range
5A IDMTL element	2.5A to 10A 1A to 4A 0.5 to 2A	50 x setting - max of 250 A 50 x setting 50 x setting - max of 250 A
1A IDMTL	0.5A to 2A 0.2A to 0.8A 0.1 to 0.4A	50 x setting - max of 250 A 50 x setting 50 x setting

Burden

3 VA at current setting

Output Contacts

2 normally open self-reset
Carry continuously - 5A AC or DC

Make & carry

20 A AC or DC for 0.5 secs.
(Limit L/R = 50ms and 300 V)

Indication

Hand-Reset flag

2TJM71

As type 2TJM70 with the following additions referring to the high-set element:

Current Settings

Rating 1A	Rating 2A	Rating 5A
0.4-1.6A		2 - 8 A
2 - 8A		10-40A
4- 16A	8 - 32 A	20-80A
8-32A		40-160A
10-40A		50-200A

Operating Time

At 2 times setting : 20ms
At 5 times setting : 12ms

Burden

1.2VA over the setting range

Contacts

Arrangement : 2make, self-reset
Rating : 10A continuously, 30A for 3 seconds



Indication

Hand Reset flag

2TJM72

As type 2TJM70 with the following additions referring to the directional elements.

Rating Vn

Over current : 110V nominal
 Earthfault : 63.5V or 110V nominal

Current Settings

(Expressed as a percentage of IDMTL nominal current)

Over current : 15% at MTA (Maximum torque angle)
 Earth Fault : 7.5% at MTA

Phase - Angle Settings

Phase Fault : 45° leading
 Earth-fault : 12 1/2° lagging, 45° lagging

Operating Time

100 ms of rated current setting with 100% volts applied

Burden

Current Windings : 0.5 VA at setting
 Voltage Windings : 12 VA at rated voltage (110V)

Characteristics and Vector Diagrams

Vector diagrams (using A phase) : Fig 6
 Current / phase angle diagram : Fig 8
 Impedance / Current characteristics (1A relay) : Fig 9
 Impedance / Current characteristics (5A relay) : Fig 10

Cases

2TJM70 & 71 - Single pole - 2/3V, 1V;
 Three pole - 2V, 2VH, 3H
 2TJM72 - 1 1/2 V



Fig 3 : Directional Flamed Type ES

Ordering Information

(a) TYPES 2TJM70

1. Type
2. Rating
3. Setting range
4. Case size

(b) TYPE 2TJM71

Same as for 2TJM70 plus high-set element setting range.

(c) TYPES 2TJM72

Same as for 2TJM70 plus phase angle setting.

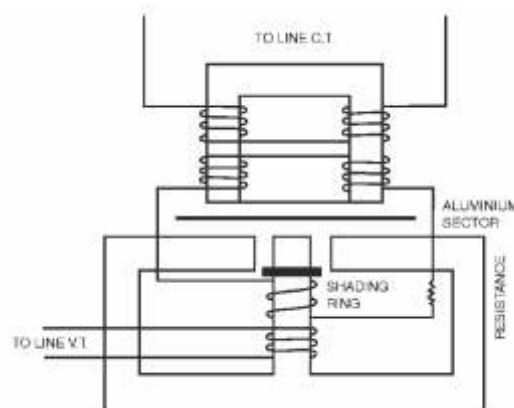


Fig 4 : Directional Element : Electro -magnetic system

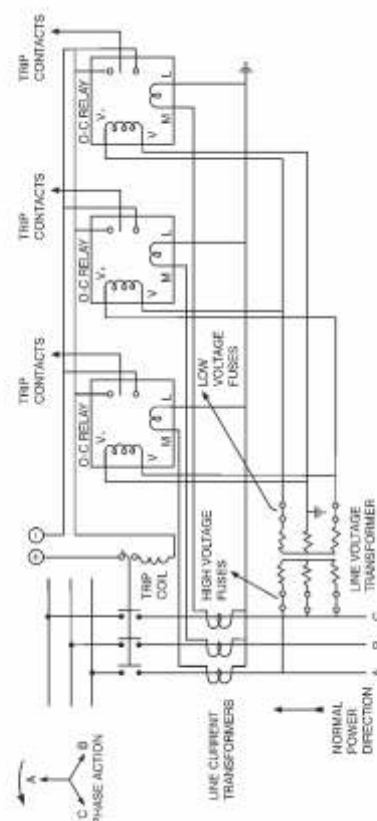


Fig 5 : 90° Connection Diagram : 45° leading Power Factor Relay

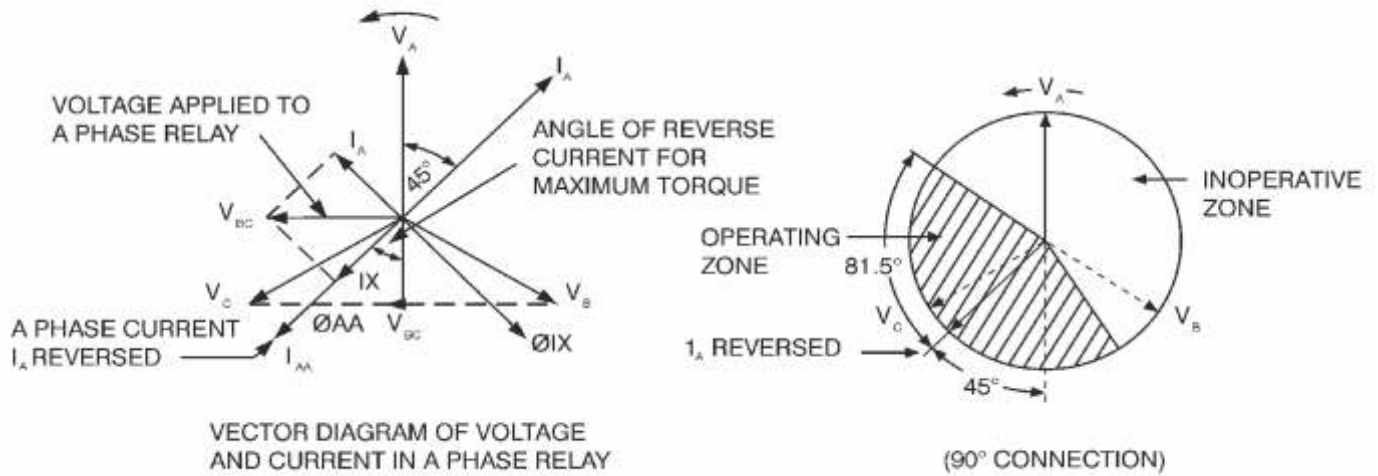


Fig 6 Vector diagrams : Type 2TJM72 Directional Element

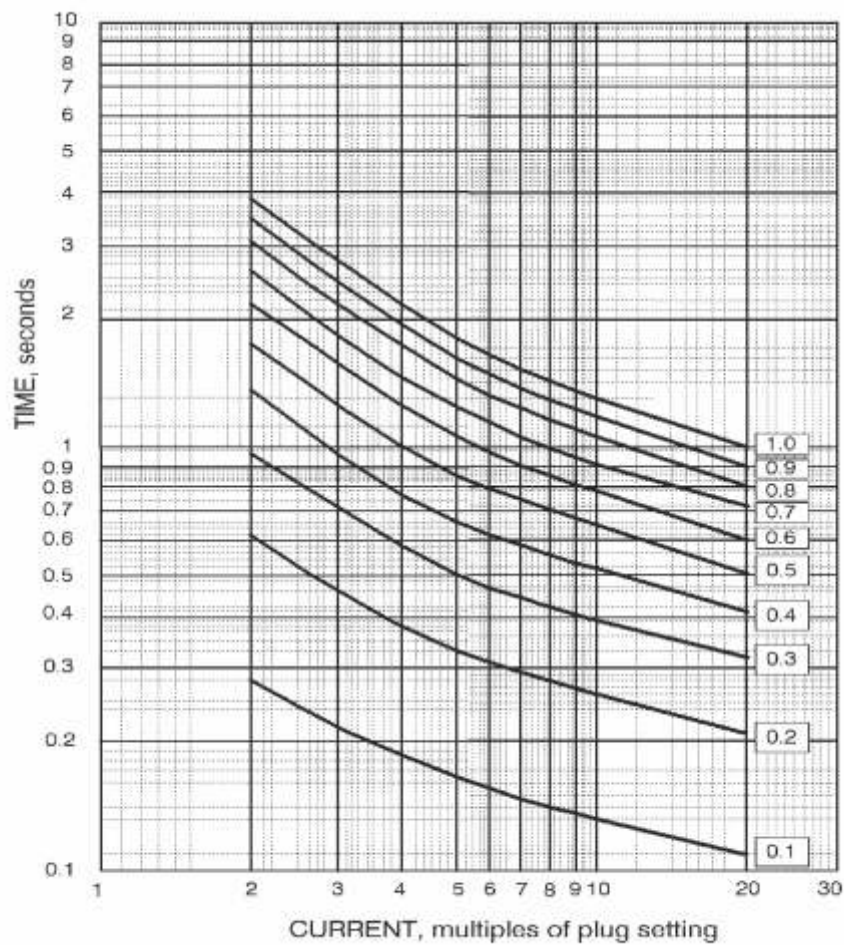


Fig 7 : Time / Current Characteristics

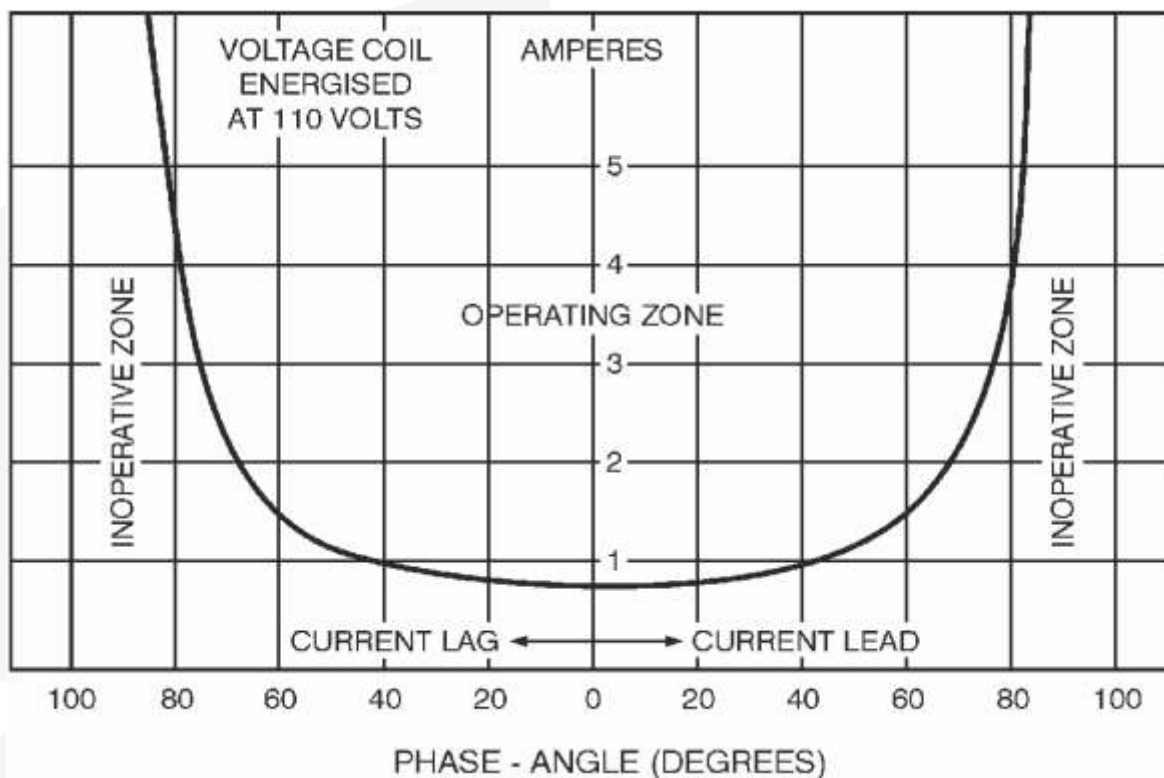


Fig 8 : Current / Phase Angle Diagram

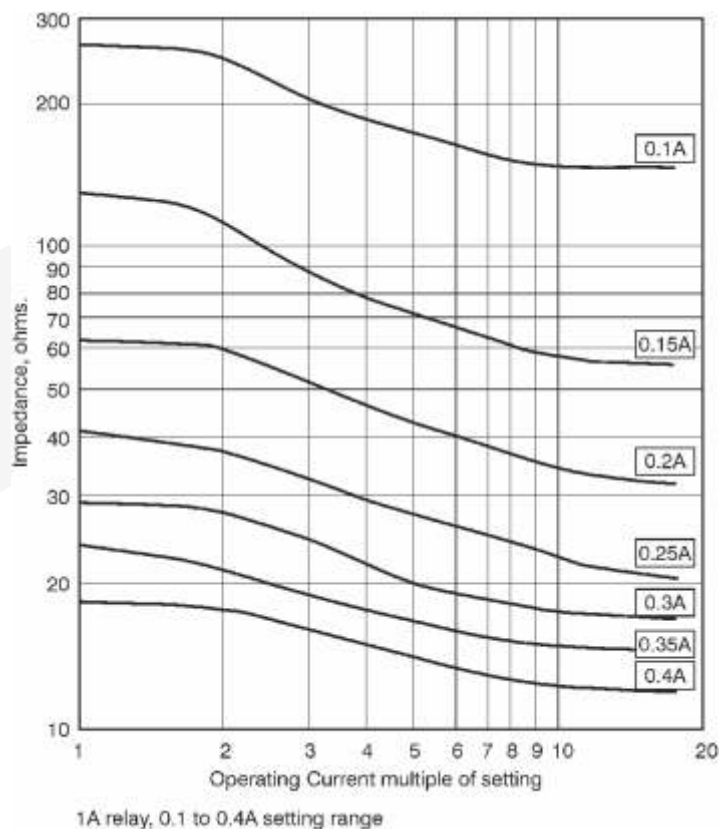


Fig 9 : Impedance / Current Characteristics, 1A relay 50Hz

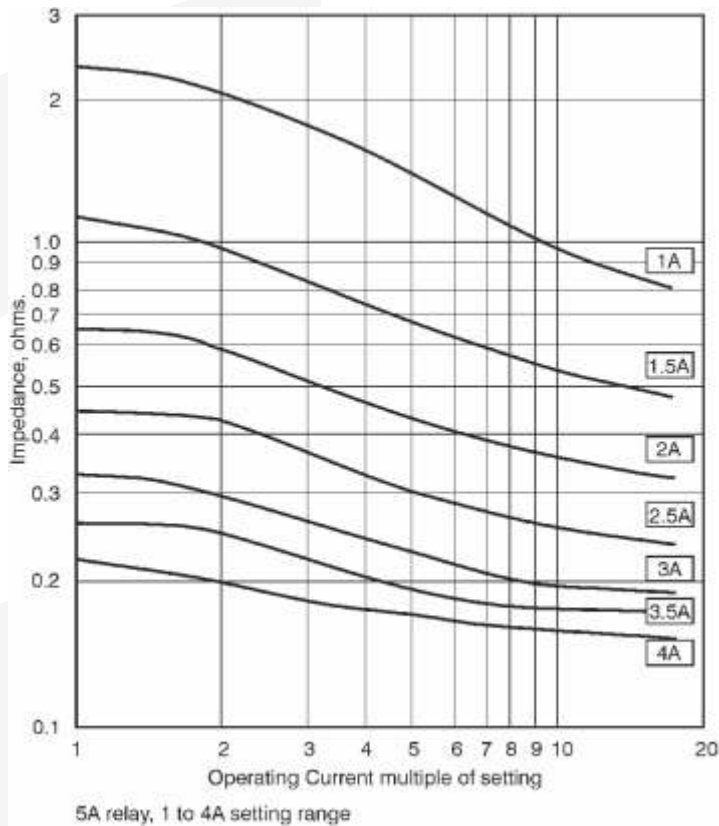


Fig 10 : Impedance / Current Characteristics, 5A relay 50Hz

Qualification

The policy of Easun Reyrolle is one of continuous improvement and development. The company therefore reserves the right to supply equipment which may differ slightly from that described and illustrated in this publication.

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