

Phase-balance protection of lines and machines; exciting winding protection of regulating transformers.



APPLICATION

THREE-PHASE MACHINES

The Type IJC51E relays are used for the protection of lines and of three-phase machines, especially motors and synchronous converters against damage that is caused by phase-unbalancing and single-phase operation.

This protection cannot usually be obtained satisfactorily by voltage relays because in three-phase machine, grounded-neutral, or four-wire circuits the opening of one phase conductor may not appreciably disturb the voltage phase relations or magnitude, especially under light load conditions. The machine, or other connected apparatus, will itself tend to maintain the three-phase voltage intact.

The relay compares the current in each phase with that in each of the other phases. An increase of current in the circuit, irrespective of the

magnitude of the current, will not cause the relay to operate, so long as the currents in the phases are not unbalanced by 25 percent or more.

Upon the occurrence of a fault or unbalance in the machine or line which will cause the current in one of the phases to exceed that in the others by 25 percent or more, the torque exerted by the operating coil will be greater than that of the restraining coil, and the relay will function to trip the breaker.

It is recommended practice to protect all polyphase AC machines in unattended installations, and all polyphase motors (with the usual exception of those used for essential power-station auxiliaries) against damage due to single-phase operation.

The IJC51E relay can be classed as a relay which protects against discontinuity of balanced system phase conditions, rather than as a fault-

IJC

Current Balance Relays

Application

- Lines and AC rotating machines
- Regulating transformer exciting windings
- Phase balance protection

Protection and Control

- Phase current unbalance
- Timed operation

Features

- Drawout case

protective relay. When used for protection against single phase operation of a machine it must have a time setting of such length that it will not trip off its machine on an external single-phase fault. Such a time delay will permit selective tripping by the relays protecting the faulty circuit.

REGULATING TRANSFORMERS (Exciting Winding)

Transformers with load-ratio control equipment (regulating transformers), like all power transformers, should be provided with differential relays to protect against faults within the transformer. In addition to the differential relays, regulating transformers require IJC current-balance relays to protect against faults that might occur in the exciting winding. Regulating-transformer windings are usually 10 to 12 percent of the kVa capacity of the main circuit, and therefore their reactance is such that a fault might occur in the exciting winding which would be several times the full-load current of the

APPLICATION

regulating unit, but not in excess of the normal load current of the main circuit. Under such conditions the differential relay will not provide sensitive protection to the exciting winding. The IJC52A relay should be used to protect these windings.

Under normal load conditions with maximum buck or boost, the current-transformer secondary current from the main line (series winding) is equal to the secondary current from the exciting winding, thus holding the relay contacts open. Under internal-fault conditions the current in the relay

operating coil, which is connected to the exciting-winding current transformers, increases to many times the restraining-coil current from the series circuit. The relay will operate when the secondary current from the exciting winding becomes 120 percent or more of the secondary current from the series winding, provided this exceeds the 3 A minimum pickup of the relay. The IJC52A relay is not affected by external faults because its pickup is automatically raised in proportion to the fault current.

The IJC52B is a single phase version of the IJC52A. It is used where panel layout could be a problem.

CONTACT RATING

The current-closing rating of the contacts is 30 A for voltages not exceeding 250 volts. The current-carrying rating is limited by the target (seal-in) and holding coils.

BURDENS — 60 HZ, 5A

IJC51E	1 Amp		5 Amp		10 Amp		20 Amp		40 Amp	
	Z	Pf	Z	Pf	Z	Pf	Z	Pf	Z	Pf
Operating Coil										
	0.74	0.32	0.62	0.32	0.50	0.279	0.335	0.30	0.225	0.39
Restraint Coil										
115% Slope	0.99	0.358	0.868	0.325	0.636	0.310	0.40	0.366	0.283	0.5
125% Slope	1.06	0.34	0.928	0.31	0.65	0.30	0.41	0.345	0.29	0.47
135% Slope	1.20	0.33	1.05	0.30	0.716	0.29	0.448	0.345	0.292	0.474
150% Slope	1.46	0.32	1.24	0.29	0.835	0.28	0.54	0.32	0.355	0.46

IJC52A, B	Circuit	Impedance	Power Factor	Volt/Amps
	Operating	0.38	0.38	9.5
	Restraint	0.54	0.34	13.5

SELECTION GUIDE

Three Phase

Freq. (Hz)	Rating (Amps)		Slope (Percent)	Operating Time (Secs.)	Contacts	T. & S.I. Rating (Dc Amps)	Model Number	Case Size	Approx. Wt. lb (kg)	
	Cont.	Min. P.U.							Net	Ship

For Protection of Ac Rotating Machines and Lines

Three Phase

60	5	1.1	115/125/135/150	2.5	1 N.O. (per phase)	0.2/2.0	12IJC51E2A E3A	L-1	44 (19.8)	55 (24.8)
50				3.5						

For Protection of Exciting Windings of Regulating Transformers

Three Phase

60	8.7	3	120	2 N.O.	0.2/2.0	12IJC52A2A	L-2	44 (19.8)	55 (24.8)
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Single Phase

50	8.7	3	120	2 N.O.	0.2/2.0	12IJC52B2A	S-1	12 (5.4)	18 (8.1)
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CONNECTION DIAGRAMS

Fig. 1. Typical external connections for Type IJC51E

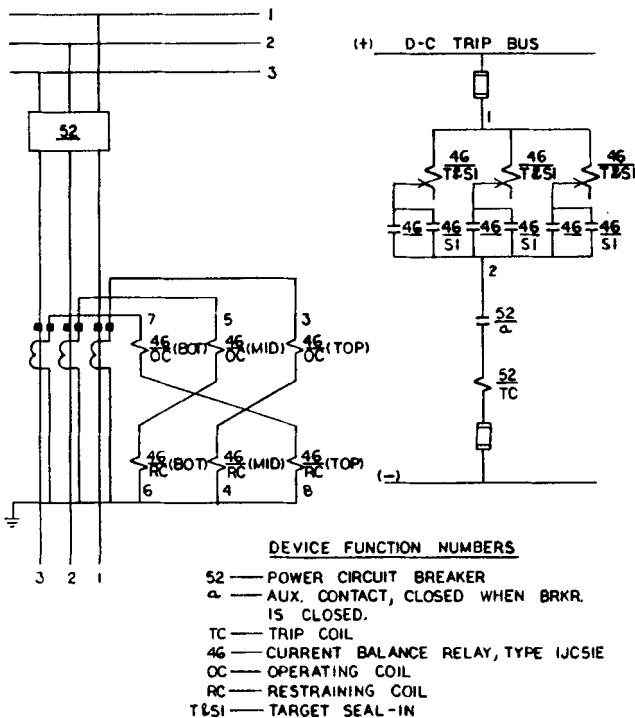


Fig. 2. Typical external connections for Type IJC52A relay

