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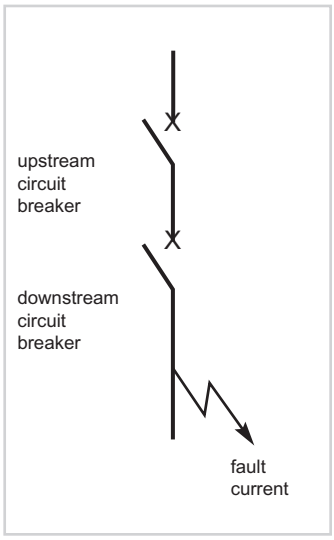
What Is Discrimination?

Discrimination, also called selectivity, is the co-ordination of protective devices such that a fault is cleared by the protective device installed immediately upstream of the fault, and by that device alone.



Total discrimination

Discrimination is said to be total if the downstream circuit breaker opens and the upstream circuit breaker remains closed. This ensures maximum availability of the system.

Partial discrimination

Discrimination is partial if the above condition is not fulfiled up to the prospective short-circuit current, but to a lesser value, termed the selectivity limit current (I_s).

Above this value both circuit breakers could open, resulting in loss of selectivity

How To Read The Discrimination Tables

Boxes containing the letter “T” indicate total discrimination between the relevant upstream and downstream circuit-breakers. Total discrimination applies for all fault levels up to the breaking capacity of the upstream or the downstream circuit breaker, whichever is the lesser.

For the other boxes, discrimination is either partial or there is no discrimination.

Worked Examples

Q (1) A main switchboard requires a 1600A ACB feeding a 400A MCCB.The fault level is 65kA. What combination of protective devices would provide total discrimination?

A (1) A ***TemPower2 ACB*** AR216S feeding a ***TemBreak2*** S400GJ would provide total discrimination up to 65kA. See page 69

Note: Discrimination would be total whether the ***TemPower2 ACB*** had an integral or external protection relay because I_{cw} (1s) = I_{cs} Most other ACBs have I_{cw}(1s) < I_{cs}.

Discrimination Table

Upsream: ***TemPower2 ACB*** with or without Integral Protection Relay

Downstream: ***TemBreak2 MCCB***

Upstream ACB

Downstream MCCB Frame	Model	Breaking Capacity	800A AR208S	1250A AR212S	1250A AR212H	1600A AR216S	1600A AR216H	2000A AR220S	2000A AR220H	2500A AR325S	2500A AR325H	3200A AR332S	3200A AR332H	4000A AR440SB	5000A AR650S	6300A AR663H
			65kA	65kA	80kA	65kA	80kA	65kA	80kA	85kA	100kA	85kA	100kA	100kA	120kA	135kA
125A	E125NJ	25kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S125NJ	36kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S125GJ	65kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	H125NJ	125kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	L125NJ	200kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
160A/ 250A	S160NJ	36kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S160GJ	65kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	E250NJ	25kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S250NJ	36kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S250GJ	65kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S250PE	70kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	H250NJ	125kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	L250NJ	200KA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
400A/ 630A	E400NJ	25kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S400CJ	36kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S400NJ	50kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S400NE	50kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S400GJ	70kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S400GE	70kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	H400NJ	125kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	H400NE	125kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	E630NE	36kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S630CE	50kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S630GE	70kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
800A	XS800NJ	65kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	XH800SE	65kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	XH800PJ	100kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	XS800SE	50kA	T	T	T	T	T	T	T	T	T	T	T	T	T	T
1250A/ 1600A	XS1250SE	65kA	-	T	T	T	T	T	T	T	T	T	T	T	T	T
	XS1600SE	85kA	-	-	-	T	T	T	T	T	T	T	T	T	T	T

Notes: 1. All ACB's have I_i set at NON, MCR ON.
2. Assuming ACB time settings are greater than MCCB.
3. The above table is in accordance with IEC 60947-2, Annex A.
4. External relay can be used - Contact Terasaki for further details.
5. All values shown at 415V AC.

T= Total Selectivity

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Discrimination with 'T' type fuses

The following table should be used as a guide when selecting Terasaki ***Tempower2*** Air Circuit Breakers and fuses (BS88/ IEC60269) which are immediately downstream from a transformer.

In and I_R are set to the full rated current of the transformer, and t_R, Isd and tsd are at standard transformer settings. Listed are the maximum fuse ratings that can be used when downstream from a given ACB at these settings.

Also included are the maximum fuse ratings that can be used downstream when t_R, Isd and tsd are at their maximum settings.

All information listed is based on a transformer secondary voltage of 415V.

TRANSFORMER	kVA	500	630	750	800	1000	1250	1600	2000
	F.L.C. (A)	696	876	1043	1113	1391	1739	2226	2782
TemPower2	Type	***AR208S***	***AR212S***	***AR212S***	***AR212S***	***AR216S***	***AR220S***	***AR325S***	***AR332S***
	C.T. (A)	800	1250	1250	1250	1600	2000	2500	3200
SETTINGS **(AGR-L)**	In	1	0.8	1	1	1	1	1	1
	I_R	0.9	0.9	0.85	0.9	0.9	0.9	0.9	0.9
	t_R (sec)	20	20	20	20	20	20	20	20
	Isd	6	6	6	6	6	6	6	6
	tsd (mcec)	400	400	400	400	400	400	400	400
Max.fuse rating with standard ACB settings	Note:1 (Amps)	355	400	500	500	500	630	800	1000
Max.fuse rating with maximum ACB settings	(Amps)	450	500	670	710	800	1000	1250	1250 Note:2

> The above 'In' settings are based on 100% of Rated Current (Ict).

> Table Reference : I_R - Long Time Delay Pickup Current, t_R - Long Time Delay Time Setting, Isd - Short Time Delay Pickup Current, tsd - Short Time Delay Time Setting.

Notes:

Note:1 It is possible to increase the maximum fuse rating by utilising the 'ramp' facility on the on the ***TemPower2*** Protection Relay (AGR).

Note:2 Information on fuses above 1250A rating was not available.

Note:3 All ACBs have Ii (Instantanious) set to NON. (MCR can be set to ON)

Please note the above table is meant only for guidance, individual installations should have a specific discrimination study undertaken.

Accessories For Dual Supply Changeover Systems Accessories

TemTransfer Automatic Changeover Controller

The ***TemTransfer*** is a fully configurable Automatic Changeover Controller (ACC). It is designed to monitor the incoming AC mains supply (1 or 3 phases) for under/over voltage and under/over frequency. Should these fall out of limits, the module will issue a start command to the generating set controller. Once the set is available and producing an output within limits the ACC will control the transfer devices and switch the load from the mains to the generating set. Should the mains supply return to within limits the module will command a return to the mains supply and shut down the generator after a suitable cooling run. Various timing sequences are used to prevent nuisance starting and supply breaks.

TemTransfer is compatible with ***TemPower2 ACB***s, ***TemBreak2 MCCB***s and ***TemContact*** contactors.

Terasaki can supply ***TemTransfer*** pre-configured to specification, or unconfigured with an optional interface kit.

Configuration is by PC based software and the interface kit using an FCC68 socket on the rear of the module. This allows rapid and secure configuration of the module. The FCC68 socket also provides full real-time diagnostics on the status of the ACC, its inputs and outputs.

Configuration and connection options allow for a wide range of higher functions such as *'Auto start inhibit', 'Manual restore to mains', 'Load inhibit'*(both mains and gen-set)*, 'Lamp test', Push-button transfer control, External mains or Gen-set failure inputs,* etc. The four position key-switch allows for mode selection:-

- Auto Mode
- Auto mode with manual return to Mains
- Run generator off load
- Run generator on load

A clear mimic diagram with 'International' symbols and LEDs provide clear indication of supply availability and load switching status. Further LED indication is provided for 'Start delay in progress' and 'Mains return timer active'. Two user configurable LED's are provided to allow the user to display specific states (defaulted to indicate that the closing procedure of the Mains or Generator circuit breaker has been started).

Five user configurable relays are provided to allow control of contactors, different circuit breaker types and engine control modules and alarm systems.

The controller features a self seeking power supply which will utilise power from the Mains AC supply or the Generator AC supply. A DC supply to the module is not essential for basic operation, though some 'higher' functions require it (such as system diagnostics).

The module is mounted in a robust plastic case, connection to the module is via plug and socket connectors.