

TEMBREAK 2

MOULDED CASE CIRCUIT BREAKERS

16A TO 630A

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TEMBREAK 2

MINI MOULDED CASE CIRCUIT BREAKERS

10A TO 100A

8. TemBreak 2 MINI Moulded Case Circuit Breakers

TEMBREAK

MOULDED CASE CIRCUIT BREAKERS

630A TO 1600A

9. TemBreak Moulded Case Circuit Breakers

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APPLICATION DATA

DISCRIMINATION

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.

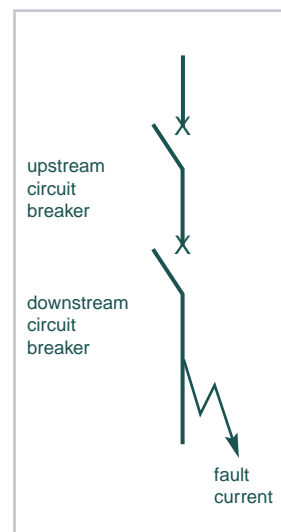
Total discrimination

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 fulfilled 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.

If discrimination is partial then the value of the selectivity limit current, I_S , is shown in the box.

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 S400-GJ would provide total discrimination up to 65kA. See page 47

Note: Discrimination would be total whether the TemPower 2 ACB had an integral or external protection relay because $I_{CW} (I_S) = I_{CS}$.

Most other ACBs have $I_{CW} (I_S) < I_{CS}$.

HOW TO READ THE DISCRIMINATION TABLES

Q (2) A Sub distribution board requires a 630A MCCB feeding a 250A MCCB. The fault level is 65kA. What combination of protective devices would provide total discrimination?

A (2) Using a TemBreak 2 S630-GE MCCB feeding a TemBreak 2 S250-GJ would provide total discrimination up to 65kA. See page 49

Q (3) A final distribution board contains a 125A MCCB incomer feeding a 32A Type B MCB. Is discrimination between these devices possible?

A (3) A TemBreak 2 MCCB type S160-NJ/125A feeding a TemDin 2 MCB would provide total discrimination. See page 48

Alternatively ANY OTHER MCB can be used provided it has energy limiting ability of class 3 in accordance with EN 60898.

APPLICATION DATA

DISCRIMINATION TABLES

Upstream: TemPower 2 ACB with or without Integral Protection Relay.
Downstream: TemBreak 2 MCCB.

SECTION 4

Downstream MCCB

			Upstream ACB														
Frame			800A		1250A		1600A		2000A		2500A		3200A		4000A	5000A	6300A
	Model		AR208S	AR208H	AR212S	AR212H	AR216S	AR216H	AR220S	AR220H	AR325S	AR325H	AR332S	AR332H	AR440S	AH50C	AH60C
		Breaking Capacity	65kA	80kA	65kA	80kA	65kA	80kA	65kA	80kA	85kA	100kA	85kA	100kA	100kA	100kA	120kA
125A	E125NJ	25kA	T	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	T
	S125GJ	65kA	T	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	T
	L125NJ	200kA	T	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	T
	S160GJ	65kA	T	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	T
	S250NJ	36kA	T	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	T
	S250PE	70kA	T	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	T
	L250NJ	200KA	T	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	T
	S400CJ	36kA	T	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	T
	S400NE	50kA	T	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	T
	S400GE	70kA	T	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	T
	H400NE	125kA	T	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	T
	S630CE	50kA	T	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	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	T
XH800PJ		100kA	T	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	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_n 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 400V AC.

T= Total Selectivity

APPLICATION DATA

DISCRIMINATION TABLES

Upstream: TemBreak 2 MCCB (thermal-magnetic)

Downstream: MCB

Downstream MCB		Upstream MCCB																									
		S125NJ (36kA) E125NJ (25kA)						S160NJ (36kA)						S250NJ (36kA) E250NJ (25kA)								S400NJ					
		In	20A	32A	50A	63A	100A	125A	20A	32A	50A	63A	100A	125A	160A	20A	32A	50A	63A	100A	125A	160A	200A	250A	250A	400A	
6A	260	T	T	T	T	T	260	T	T	T	T	T	T	260	T	T	T	T	T	T	T	T	T	T	T		
10A	260	420	T	T	T	T	260	420	T	T	T	T	T	260	420	T	T	T	T	T	T	T	T	T	T		
16A	260	420	650	T	T	T	260	420	650	T	T	T	T	260	420	650	T	T	T	T	T	T	T	T	T		
20A	260	420	650	1000	T	T	260	420	650	1000	T	T	T	260	420	650	1000	T	T	T	T	T	T	T	T		
25A	260	420	650	1000	T	T	260	420	650	1000	T	T	T	260	420	650	1000	T	T	T	T	T	T	T	T		
32A	260	420	650	1000	1500	2000	260	420	650	1000	1500	T	T	260	420	650	1000	1500	2000	T	T	T	T	T	T		
40A	260	420	650	1000	1500	2000	260	420	650	1000	1500	2000	T	260	420	650	1000	1500	2000	T	T	T	T	T	T		
50A	260	420	650	1000	1500	2000	260	420	650	1000	1500	2000	3000	260	420	650	1000	1500	2000	3000	T	T	T	T	T		
63A	260	420	650	1000	1500	2000	260	420	650	1000	1500	2000	3000	260	420	650	1000	1500	2000	3000	2600	T	T	T	T		

Notes: 1. MCBs can be of any manufacture provided they are Energy class three as defined in EN 60898.
2. Table based on type B MCBs
3. MCBs can be 6kA or 10kA at 400V

4. The above table is in accordance with IEC 60947-2, Annex A.
5. All values shown at 400V AC.
6. I_s expressed in A.

T= Total Selectivity

APPLICATION DATA

DISCRIMINATION TABLES

Upstream: TemBreak 2 MCCB (electronic).

Downstream: TemBreak 2 MCCB.

			Upstream MCCB											
Downstream MCCB	Frame		250A		400A			630A			800A		1250A	1600A
	Model		S250PE	H250NE	S400GE	H400NE	L400NE	E630NE	S630NE	S630GE	XS800SE	XH800SE	XS1250SE	XS1250SE
		Breaking Capacity	70kA	125kA	70kA	125kA	200kA	36kA	50kA	70kA	50kA	65kA	85kA	100kA
	50A	S50NF	T	T	T	T	T	T	T	T	T	T	T	T
	100A	E100NF	T	T	T	T	T	T	T	T	T	T	T	T
	125A	E125NJ	T	T	T	T	T	T	T	T	T	T	T	T
		S125NJ	T	T	T	T	T	T	T	T	T	T	T	T
		S125GJ	T	T	T	T	T	T	T	T	T	T	T	T
		H125NJ	T	T	T	T	T	T	T	T	T	T	T	T
	160A/ 250A	S160NJ	-	-	T	T	T	T	T	T	T	T	T	T
		S160GJ	-	-	T	T	T	T	T	T	T	50	T	T
		H160NJ	-	-	-	T	T	T	T	T	T	T	T	T
		E250NJ	-	-	T	T	T	T	T	T	T	T	T	T
		S250NJ	-	-	T	T	T	T	T	T	T	T	T	T
		S250GJ	-	-	T	T	T	T	T	T	T	50	T	T
		H250NJ	-	-	-	T	T	T	T	T	T	50	T	T
		S250PE	-	-	-	T	T	T	T	T	T	T	T	T
		H250NE	-	-	-	T	T	T	T	T	T	T	T	T
	400A/ 630A	E400NJ	-	-	-	-	-	10	10	10	T	T	T	T
		S400CJ	-	-	-	-	-	10	10	10	25	25	T	T
		S400NJ	-	-	-	-	-	10	10	10	25	25	T	T
		S400NE	-	-	-	-	-	10	10	10	25	25	T	T
		S400GJ	-	-	-	-	-	10	10	10	25	25	T	T
		S400GE	-	-	-	-	-	10	10	10	25	25	T	T
		H400NJ	-	-	-	-	-	10	10	10	25	25	T	T
		H400NE	-	-	-	-	-	10	10	10	25	25	T	T
		E630NE	-	-	-	-	-	-	-	-	25	25	T	T
		S630CE	-	-	-	-	-	-	-	-	25	25	T	T
		S630GE	-	-	-	-	-	-	-	-	-	-	T	T

- Notes: 1. All pick-up current and time delay settings are to be set at maximum for upstream MCCBs.
 2. The above table is in accordance with IEC 60947-2, Annex A.
 3. All values shown at 400V AC.
 4. I_s expressed in kA.

T= Total Selectivity

WHAT IS CASCADING?

Cascading is a technique where the current limiting capability of upstream circuit breakers is used to permit the installation of lower rated and therefore lower cost circuit breakers downstream.

The upstream TemBreak 2 circuit breaker acts as a resistance against short-circuit currents. With this assistance, downstream circuit breakers with breaking capacities lower than the prospective short-circuit at their point of installation can interrupt the reduced short-circuit current.

Since the current is limited downstream of the limiting circuit breaker, cascading applies to all switchgear in the downstream circuit. It is not restricted to two consecutive devices.

Cascading is recognised by the following standards related to electrical installations:

IEC 60364

BS 7671

AS/NZS 3000

The Advantages

Installation of a single limiting circuit-breaker results in considerable simplifications and savings for the entire downstream installation:

- Simplification of selection of devices using the cascading tables
- Savings on downstream devices. Cascading allows circuit-breakers with lower ratings to be used.

In addition the application of cascading will reduce both electrodynamic and thermal stress within the installation.

APPLICATION DATA

HOW TO READ THE CASCADE TABLES

The value shown in the table is the increased breaking capacity, expressed in kA, that can be achieved if the downstream MCCB is backed up by the appropriate upstream MCCB.

Worked Examples:

Q (1) A 36kA panelboard is required with a 400A incomer and 125A outgoing MCCBs. Can cascading be applied?

A (1) A cost effective solution would be to use an S400-CJ incomer rated at 36kA and E125-NJ MCCBs rated at 25kA downstream.

The upstream S400-CJ MCCB would back up the downstream E125-NJ to 36kA. If this was an 8 Way panelboard you have managed to save cost by installing eight 25kA MCCBs rather than eight 36kA MCCBs.

Q (2) If the same 8 way panelboard was to be used in an 80kA installation, what MCCBs could be used?

A (2) You could still use the E125-NJ provided it was backed up by an L400-NJ. The Current limiting capacity of the 400A MCCB would back up the E125A from 25kA to 85kA.

CASCADE TABLES

Upstream: TemBreak 2 MCCB.

Downstream: TemDin 2 MCB.

		Upstream MCCB							
Downstream MCB	Model	E125NJ (25kA)	S125NJ (36kA)	S125GJ (65kA)	S160NJ (36kA)	S160GJ (65kA)	E250NJ (25kA)	S250NJ (36kA)	S250GJ (65kA)
	In	125A	125A	125A	160A	160	250A	250A	250A
	DS (6kA)								
	6A	14	14	14	12	12	12	12	12
	10A	14	14	14	12	12	12	12	12
	16A	14	14	14	12	12	12	12	12
	20A	14	14	14	12	12	12	12	12
	25A	14	14	14	12	12	12	12	12
	32A	14	14	14	12	12	12	12	12
	40A	12	12	12	10	10	10	10	10
	50A	12	12	12	10	10	10	10	10
	63A	12	12	12	10	10	10	10	10

Notes: 1. All values shown at 400V AC.
2. Cascade fault level limit is expressed in kA.

		Upstream MCCB							
Downstream MCB	Model	E125NJ (25kA)	E125NJ (25kA)	E125NJ (25kA)	E125NJ (25kA)	E125NJ (25kA)	E125NJ (25kA)	E125NJ (25kA)	E125NJ (25kA)
	In	125A	125A	125A	160A	160	250A	250A	250A
	DH (10kA)								
	6A	25	30	30	25	25	25	25	25
	10A	25	30	30	25	25	25	25	25
	16A	25	30	30	25	25	25	25	25
	20A	25	30	30	25	25	25	25	25
	25A	25	30	30	25	25	25	25	25
	32A	25	30	30	25	25	25	25	25
	40A	25	30	30	23	23	23	20	23
	50A	25	30	30	23	23	23	23	23
	63A	25	30	30	23	23	23	23	23

Notes: 1. All values shown at 400V AC.
2. Cascade fault level limit is expressed in kA.

APPLICATION DATA

CASCADE TABLES

Upstream: TemBreak 2 MCCB.

Downstream: TemBreak 2 MCCB.

		Upstream MCCB															
Downstream MCCB	Frame	125A					160A/250A										
	Model	E125NJ	S125NJ	S125GJ	H125NJ	L125NJ	S160NJ	S160GJ	H160NJ	L160NJ	E250NJ	S250NJ	S250GJ	S250PE	H250NJ	H250NE	L250NJ
	Breaking Capacity	25kA	36kA	65kA	125kA	200kA	36kA	65kA	125kA	200kA	25kA	36kA	65kA	70kA	125kA	200kA	
50A	S50NF	10kA	25	25	25	25	15	15	25	25	15	15	15	15	25	25	
	E100NF	10kA	25	25	25	25	15	15	25	25	15	15	15	15	25	25	
125A	E125NJ	25kA	-	36	50	65	36	50	65	85	-	36	50	50	65	85	
	S125NJ	36kA	-	-	65	85	-	65	85	125	-	-	65	65	85	125	
	S125GJ	65kA	-	-	-	125	-	-	125	150	-	-	-	70	125	150	
	H125NJ	125kA	-	-	-	200	-	-	-	200	-	-	-	-	-	200	
160A/ 250A	S160NJ	36kA	-	-	-	-	-	65	85	125	-	-	65	65	85	125	
	S160GJ	65kA	-	-	-	-	-	-	125	150	-	-	-	70	125	150	
	H160NJ	125kA	-	-	-	-	-	-	-	200	-	-	-	-	-	200	
	E250NJ	25kA	-	-	-	-	-	-	-	-	-	36	50	50	65	85	
	S250NJ	36kA	-	-	-	-	-	-	-	-	-	-	65	65	85	125	
	S250GJ	65kA	-	-	-	-	-	-	-	-	-	-	-	70	125	150	
	S250PE	70kA	-	-	-	-	-	-	-	-	-	-	-	-	125	150	
	H250NJ	125kA	-	-	-	-	-	-	-	-	-	-	-	-	-	200	

Notes: 1. All values shown at 400V AC.
2. Cascade fault level limit is expressed in kA.

		Upstream MCCB																			
Frame			400A						630A				800A				1250A/1600A				
Downstream MCCB	Model		S400CJ	S400NJ	S400NE	S400GJ	S400GE	H400NJ	H400GE	L400NJ	L400NE	E630NE	S630CE	S630GE	TL630NE	XS800SE	XS800NJ	XH800SE	TL800NE	XS1250SE	XS1600SE
		Breaking Capacity	36kA	50kA	70kA	125kA	200kA	36kA	50kA	70kA	125kA	50kA	65kA	65kA	125kA	85kA	100kA				
	125A	E125NJ S125NJ S125GJ H125NJ	25kA 36kA 65kA 125kA	36 - - -	36 50 - -	50 65 70 -	65 85 125 -	85 125 150 200	36 - - -	36 50 - -	50 65 70 -	- - - -	- - - -	36 50 - -	36 50 - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
160A/ 250A	S160NJ S160GJ H160NJ	36kA 65kA 125kA	- - -	50 - -	65 70 -	85 125 200	125 150 200	- - -	50 - -	65 70 -	- - -	50 - -	65 - -	65 - -	65 - -	- - -	- - -	- - -	- - -	- - -	- - -
	E250NJ S250NJ S250GJ S250PE H250NJ	25kA 36kA 65kA 70kA 125kA	36 - - - -	36 50 - - -	50 65 70 -	65 85 125 125 -	85 125 150 150 200	36 - - - -	36 50 - -	50 65 70 -	- - - -	36 - - -	50 65 -	50 65 -	50 65 -	- - -	- - -	- - -	- - -	- - -	- - -
	400A	E400NJ S400CJ S400NJ S400GJ H400NJ	25kA 36kA 50kA 70kA 125kA	36 - - - -	36 50 - - -	50 65 70 -	65 70 85 125 -	85 100 125 150 200	36 - - -	36 50 - -	50 65 70 -	36 50 65 -	36 50 65 -	50 65 65 -	50 65 65 -	36 50 65 -	36 50 65 -	36 50 65 -	36 50 65 -	36 50 65 85 -	36 50 65 85 -

Notes: 1. All values shown at 400V AC.
2. Cascade fault level limit is expressed in kA.