Breaker selectivity update guide

Improved selectivity of NZM circuit breakers

Powering Business Worldwide

> Our most recent version of our NZM circuit breakers have improved selectivity capabilities. These models, available from 2024 (starting with NZM frame size 3, followed by frame size 2), do significantly improve the overall system designs. When a NZM3 breaker is used upstream with an NZM2 downstream, the total selectivity is achieved, enabling smarter switchgear than ever before.

The Digital NZM at a glance:

- Total selectivity between NZM3 and NZM2
- Significantly easier to install and operate due to the integrated features
- Integrated Arcflash Reduction Maintenance System™
- Zone selective interlocking
- Integrated display for readings and safety settings
- Sophisticated energy metering function to measure current and voltage with an accuracy of 0.5 %
- Integrated Class 1 energy metering
- External gateways for additional communication protocols such as Profinet, EtherCAT, Ethernet IP and Smartwire DT
- Integrated Life-Cycle Management to provide predictive maintenance information

? What is selectivity?

The purpose of selectivity is to minimize the impact of a failure on the electrical installation at large - if circuit breakers are equipped with this feature, the fault will be disconnected by the protective device located immediately before it, rather than one located further upstream.

? Why is selectivity important?

In applications where circuit breakers with high selectivity are connected in series, they safeguard system availability by ensuring that only the breaker closest to the fault will trip in case of an overload or short circuit. Without selectivity, a larger part of the application would be affected, potentially bringing it to a standstill (see Figure 1).

With the electrification of everything in full swing, there is a growing need for more reliable, resilient and secure power supply, notably in segments such as data centres, waste-water-treatment, commercial buildings and renewables, where selectivity can make an important contribution to reducing the impact of electrical faults.

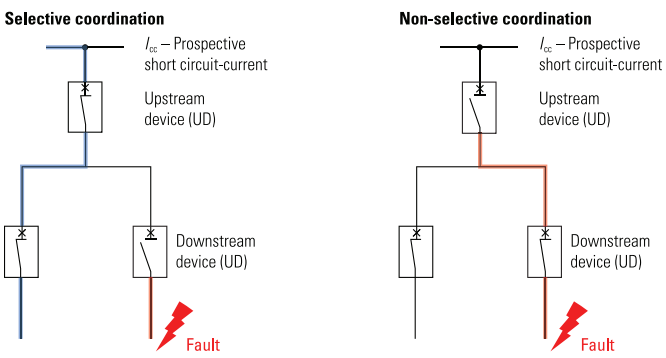


Figure 1: Example of selectivity in action

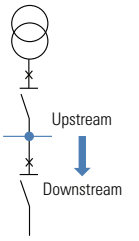
How to choose the right combination of circuit breakers?

To make the most of selectivity, the correct combination of circuit breakers is essential. We therefore publish selectivity tables for our circuit breakers to offer technical guidance on this topic. Our selectivity guide helps power system designers to select the right protective devices to ensure proper coordination between circuit breakers in upstream (main line) and downstream (branch load) circuits. Each table in the guide thus features selectivity between the various NZM models (see Figure 2). For more information please contact your Eaton sales representative.

Upstream device:

- type, type of trip unit
- tripping characteristics
- rated current

Downtream device:



		Upstream	NZM…3(-4)-AX(VX,PX)… I_{cu} = 50(70)(150) kA					
		I_n [A]	250		400		630	
Downstream	I_n [A]	$I_{cu(415V)}$ [kA]						
			Old*	New	Old*	New	Old*	New
NZM…1-A	20-40	25 - 100	12.5	36	25	36	25	36
	50	25 - 100	12.5	36	25	36	25	36
	63	25 - 100	11	36	20	36	20	36
	80	25 - 100	11	36	20	36	20	36
	100	25 - 100	11	36	20	36	20	36
	125	25 - 100	11	20	20	20	20	20
	160	25 - 100	11	20	20	20	20	20
NZM…2-A	20-40	25 - 150	11	150	20	150	20	150
	50	25 - 150	11	150	20	150	20	150
	63	25 - 150	11	150	20	150	20	150
	80	25 - 150	11	150	20	150	20	150
	100	25 - 150	11	150	20	150	20	150
	125	25 - 150	11	150	20	150	20	150
	160	50 - 150	11	150	15	150	15	150
	200	50 - 150	N/A	N/A	15	150	15	150
	250	50 - 150	N/A	N/A	15	150	15	150

Figure 2:
Sample selectivity table

NZM SELECTIVITY UPGRADE

The selectivity between two specific breakers is determined by the respective frame sizes. To illustrate this point, the image in Figure 3 provides a comparison of the improved selectivity between different NZM frame sizes such as between NZM3 and NZM2, NZM3 and NZM1, NZM2 and NZM2 and NZM2 and NZM1.

Figure 3: Comparison of selectivity between different frame sizes

Detailed overview of the improved selectivity between NZM frame sizes

	Upstream		NZM…3(-4)-AX(VX,PX)… I_{cu} = 50(70)(150) kA					
		I_n [A]	250		400		630	
Downstream	I_n [A]	$I_{cu(415V)}$ [kA]						
			Old*	New	Old*	New	Old*	New
NZM…1-A	20-40	25 - 100	12.5	36	25	36	25	36
	50	25 - 100	12.5	36	25	36	25	36
	63	25 - 100	11	36	20	36	20	36
	80	25 - 100	11	36	20	36	20	36
	100	25 - 100	11	36	20	36	20	36
	125	25 - 100	11	20	20	20	20	20
	160	25 - 100	11	20	20	20	20	20
NZM…2-A	20-40	25 - 150	11	150	20	150	20	150
	50	25 - 150	11	150	20	150	20	150
	63	25 - 150	11	150	20	150	20	150
	80	25 - 150	11	150	20	150	20	150
	100	25 - 150	11	150	20	150	20	150
	125	25 - 150	11	150	20	150	20	150
	160	50 - 150	11	150	15	150	15	150
	200	50 - 150	N/A	N/A	15	150	15	150
	250	50 - 150	N/A	N/A	15	150	15	150
NZM…1-M	40	25 - 100	11	36	20	36	20	36
	50	25 - 100	11	36	20	36	20	36
	63	25 - 100	11	36	20	36	20	36
	80	25 - 100	11	36	20	36	20	36
	100	25 - 100	11	36	20	36	20	36
NZM…2-M…	20-100	25 - 150	7	150	10	150	12	150
	125-160	25 - 150	7	150	10	150	12	150
	200	25 - 150	N/A	N/A	15	150	15	150
NZM…2-AX(VE)(VX)(PX)…	100	50 - 150	7	150	8	150	11	150
	160	50 - 150	7	150	8	150	11	150
	250	50 - 150	N/A	N/A	8	150	11	150
NZML2-VE…	100	150	N/A	150	N/A	150	N/A	150
	160	150	N/A	150	N/A	150	N/A	150
NZM…2-ME(MX)(PMX)…	90	50 - 150	5	150	10	150	12	150
	140	50 - 150	5	150	10	150	12	150
	220	50 - 150	N/A	N/A	10	150	12	150
NZML2-ME…	90	150	N/A	150	N/A	150	N/A	150
	140	150	N/A	150	N/A	150	N/A	150

* As in Coordination guide - Selectivity, Back-up and coordination of LV devices PS015002EN

• N/A - not applicable

	Upstream		NZM...2(-4)-AX(VX,PX)… N,H,S-Types I_{cu} = 50(70)(150) kA					
		I_n [A]	100		160		250	
Downstream	I_n [A]	$I_{cu(415V)}$ [kA]						
			Old*	New	Old*	New	Old*	New
NZM…1-A	20-40	25 - 100	1.5	10	1.5	10	3	10
	50	25 - 100	1.5	10	1.5	10	3	10
	63	25 - 100	1.5	10	1.5	10	3	10
	80	25 - 100	N/A	N/A	1.5	10	3	10
	100	25 - 100	N/A	N/A	1.5	10	3	10
	125	25 - 100	N/A	N/A	N/A	N/A	3	5
	160	25 - 100	N/A	N/A	N/A	N/A	3	5
NZM…2-A	20-40	25 - 150	0.8	10	1.2	10	2	10
	50	25 - 150	0.8	10	1.2	10	2	10
	63	25 - 150	0.8	10	1.2	10	2	10
	80	25 - 150	N/A	N/A	1.2	10	2	10
	100	25 - 150	N/A	N/A	1.2	10	2	10
	125	25 - 150	N/A	N/A	N/A	N/A	2	5
	160	50 - 150	N/A	N/A	N/A	N/A	2	5
	200	50 - 150	N/A	N/A	N/A	N/A	N/A	N/A
	250	50 - 150	N/A	N/A	N/A	N/A	N/A	N/A
NZM…1-M	40	25 - 100	0.8	10	1.2	10	2	10
	50	25 - 100	N/A	N/A	1.2	10	2	10
	63	25 - 100	N/A	N/A	1.2	10	2	10
	80	25 - 100	N/A	N/A	N/A	10	2	10
	100	25 - 100	N/A	N/A	N/A	N/A	2	10

* As in Coordination guide - Selectivity, Back-up and coordination of LV devices PS015002EN

Eaton's electrical business is a global leader with deep regional application expertise in power distribution and circuit protection; power quality, backup power and energy storage; control and automation; life safety and security; structural solutions; and harsh and hazardous environment solutions. Through end-to-end services, channel and an integrated digital platform & insights Eaton is powering what matters across industries and around the world, helping customers solve their most critical electrical power management challenges.

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