

Zone Selective Interlocking (ZSI)

Presentation

Use zone selective interlocking (ZSI) to reduce the electrodynamic stress on equipment when using selective coordination.

Principle of the ZSI Function

ZSI improves coordination by being selective about the position of the electrical fault. A signal wire links the installed circuit breaker trip units and manages the trip time delay for upstream circuit breaker Q1 according to the electrical fault position.

The trip units on circuit breakers Q1 and Q2 have the same time delay settings as with selective coordination.

Diagram 3

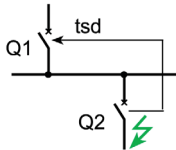
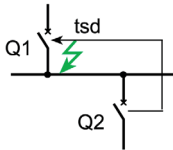


Diagram 4



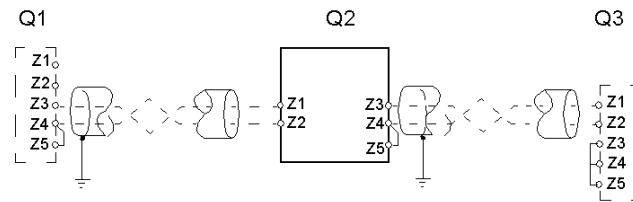
- If an electrical fault occurs downstream of downstream circuit breaker Q2 (diagram 3), the trip units on circuit breakers Q1 and Q2 detect the electrical fault simultaneously. The trip unit on circuit breaker Q2 sends a restraint signal to the trip unit on circuit breaker Q1, which remains set on its time delay t_{sd} . Circuit breaker Q2 trips and clears the electrical fault (instantaneously if circuit breaker Q2 is not delayed). The other users downstream of circuit breaker Q1 still have power, the energy availability is optimized.
- If an electrical fault occurs downstream of circuit breaker Q1 (diagram 4), the trip unit on circuit breaker Q1 does not receive a restraint signal from the trip unit on circuit breaker Q2. Time delay t_{sd} is therefore inhibited. Circuit breaker Q1 trips and clears the electrical fault on the equipment instantaneously. The electrodynamic stress created by the short-circuit current on the equipment is reduced to the minimum.

The ZSI function can be used to optimize the availability of energy (just like selective coordination) and reduce electrodynamic stress on the equipment. The ZSI function is applicable to both short-time and ground-fault protection.

Using the ZSI Function with Compact NSX Circuit Breakers

Description

The Micrologic 5 and 6 trip units support ZSI. The following figure explains how the signal wire is connected to the trip unit:



- Q1** Upstream circuit breaker
Q2 Circuit breaker to be wired
Q3 Downstream circuit breaker
Z1 ZSI-OUT source
Z2 ZSI-OUT
Z3 ZSI-IN source
Z4 ZSI-IN ST short-time protection
Z5 ZSI-IN GF ground-fault protection (Micrologic 6)

Outputs Z3, Z4, and Z5 are only available on Compact NSX400/630 circuit breakers.

The short-time and ground-fault protection time delay settings (Micrologic 6) for trip units using ZSI must comply with the rules relating to selective coordination.

Connection Principles

The following figures show the options for connecting devices together:

Protection	Connection diagram	
Ground-fault and short-time protection (Micrologic 6)		Connect output Z2 of the trip unit on the downstream circuit breaker Q2 to inputs Z4 and Z5 of the trip unit on the upstream circuit breaker Q1.
Short-time protection		<ul style="list-style-type: none"> Connect output Z2 of the trip unit on the downstream circuit breaker Q2 to input Z4 of the trip unit on the upstream circuit breaker Q1. Short circuit inputs Z3 and Z5.
Ground-fault protection (Micrologic 6)		<ul style="list-style-type: none"> Connect output Z2 of the trip unit on the downstream circuit breaker Q2 to input Z5 of the trip unit on the upstream circuit breaker Q1. Short circuit inputs Z4 and Z3.

NOTE: When ZSI is not used downstream, short circuit inputs Z3, Z4, and Z5. The setting of the short-time and ground-fault protection time delays can be inhibited if this principle is not applied.

Multi-Source Distribution

If a number of circuit breakers are installed upstream (as with multi-source distribution), the same principles apply.

Connect a downstream circuit breaker to all the circuit breakers installed directly upstream:

- Connect all the commons (outputs Z1/inputs Z2) to one another.
- Connect output Z2 simultaneously to inputs Z3, Z4, or Z5 of all the circuit breaker trip units installed upstream.

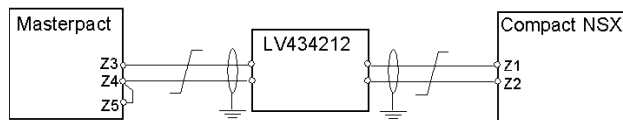
NOTE: Management of this configuration does not require any additional relays for ZSI to be controlled for the sources used.

Connection Wire Characteristics

The following table indicates the characteristics of the inter-device signal wire:

Characteristics	Values
Impedance	50 Ω per 300 m
Maximum length	300 m
Type of cable	Shielded twisted (Belden 8441 or equivalent)
Permissible conductor cross-section	0.4–2.5 mm ²
Interconnection limit on inputs Z3, Z4, and Z5 (to downstream devices)	15 devices
Interconnection limit on outputs Z1 and Z2 (to upstream devices)	5 devices

NOTE: When using the ZSI to connect Compact NSX circuit breakers with Masterpact or Compact NS circuit breakers, add an RC filter (part number LV434212) to the circuit by a Masterpact or Compact NS circuit breaker. For more information, refer to *Compact NSX & NSXm Catalogue* ([see page 7](#)). The following figure shows the connection of the RC filter (part number LV434212).



Testing the ZSI Function

Test connection and operation of ZSI using the USB maintenance interface and the LTU software.