

Zone Selective Interlocking (ZSI)

Presentation

Zone-selective interlocking (ZSI), also called zone restraint, is a system designed to reduce the stress on electrical distribution equipment during short-circuit or ground-fault conditions.

ZSI works with a previously coordinated distribution system to limit stress on the system by reducing the time it takes to clear the electrical fault while maintaining system coordination between overcurrent and ground-fault protective devices.

ZSI allows MicroLogic X control units to communicate with each other so that a short-circuit or ground-fault can be isolated and cleared by the nearest upstream circuit breaker with no intentional time delay. Devices in all other areas of the system (including upstream) remain closed to maintain service to unaffected loads.

Without ZSI, a coordinated system results in the circuit breaker closest to the electrical fault clearing it, usually with an intentional delay. With ZSI, the device closest to the electrical fault ignores its preset short-time and ground-fault delays and clears the electrical fault with no intentional delay.

Zone-selective interlocking eliminates intentional delay without sacrificing coordination and it results in faster tripping times. This limits stress on the system by reducing the amount of let-through energy the system is subjected to during an overcurrent.

The coordination of the system must be correctly set up for zone-selective interlocking to work.

Availability

Zone-selective interlocking is available on:

- MicroLogic 5.0 X, 6.0 X, and 7.0 X control units for IEC standard
- MicroLogic 5.0 X and 6.0 X control units for UL standard

For zone-selective interlocking compatibility with other ranges of circuit breakers, consult the ZSI Interface Module instruction sheet on the Schneider Electric website: [NHA12883](#)

MasterPact MTZ circuit breakers with ZSI capability are shipped with self-restraint jumpers installed. Self-restraint jumpers must be in place unless zone selective interlocking is activated. If jumpers are removed and zone selective interlocking is not activated, the circuit breaker ignores its programmed delay and trips with no intentional delay.

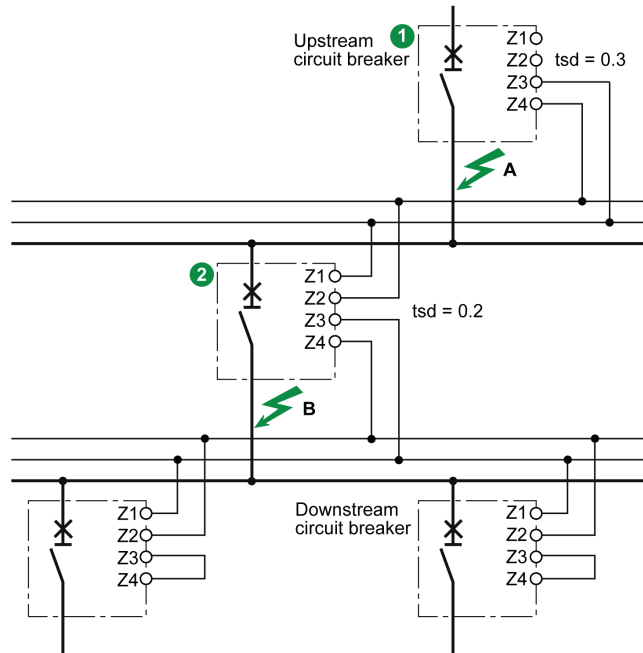
Operating Principle

A pilot wire interconnects a number of circuit breakers equipped with MicroLogic X control units, as illustrated in the following diagram.

The control unit detecting an electrical fault sends a signal upstream and checks for a signal arriving from downstream. If there is a signal from downstream, the circuit breaker remains closed for the full duration of its tripping delay. If there is no signal from downstream, the circuit breaker opens immediately, regardless of the tripping-delay setting.

Electrical Fault in A: Only circuit breaker 1 detects the electrical fault. Because it receives no signal from downstream, it opens immediately, regardless of its tripping delay set to 0.3 s.

Electrical Fault in B: Circuit breakers 1 and 2 detect the electrical fault. Circuit breaker 1 receives a signal from circuit breaker 2 and remains closed for the full duration of its tripping delay, set to 0.3 s. Circuit breaker 2 does not receive a signal from downstream and opens immediately, in spite of its tripping delay set to 0.2 s.



NOTE: On circuit breaker 1, the tsd and tg tripping delays must not be set to zero because this would make selectivity impossible.

Setting the Function

The following settings can be assigned to the ZSI input:

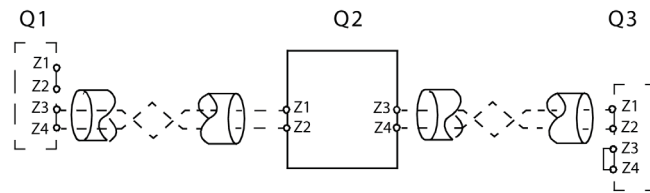
- Short-time overcurrent protection
- Ground-fault protection (MicroLogic 6.0 X)
- Both protections (MicroLogic 6.0 X)

Setting changes can be made as follows:

- With EcoStruxure Power Commission software
- By sending a setting command using the communication network (password-protected).

Connection Principles

The following figure explains how the signal wire is connected to the MicroLogic X control unit:

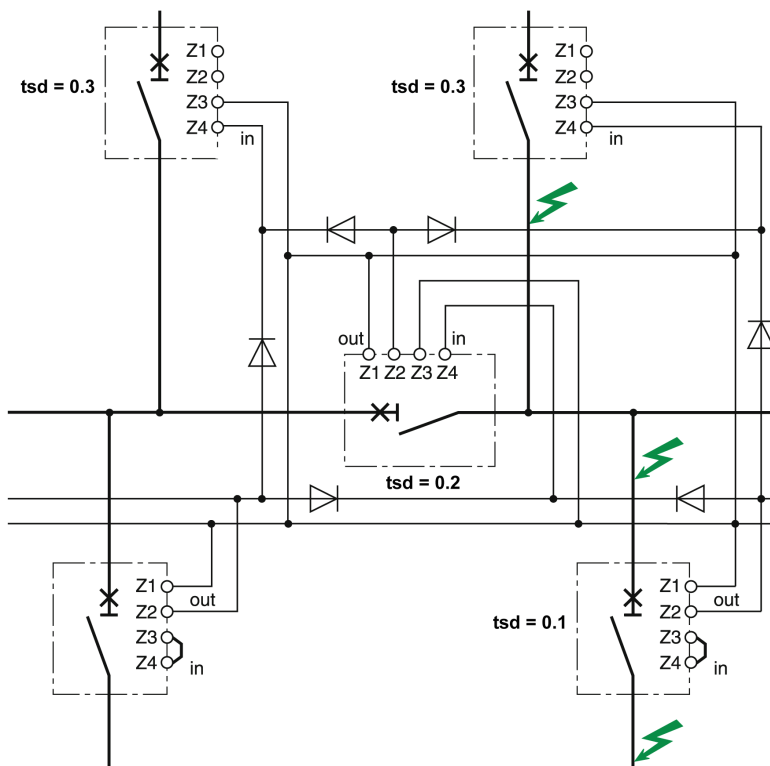


- Q1** Upstream circuit breaker
- Q2** Circuit breaker to be wired
- Q3** Downstream circuit breaker
- Z1** ZSI-OUT source
- Z2** ZSI-OUT
- Z3** ZSI-IN source
- Z4** ZSI-IN

NOTE: When ZSI is not used downstream, short circuit inputs Z3 and Z4. 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 (multi-source distribution), the same principles apply.



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	2.7 Ω per 300 m (1000 ft)
Maximum length	300 m (1000 ft)
Type of cable	Twisted pair
Permissible conductor cross-section	0.4–2.5 mm ² (20–14 AWG)
Interconnection limit on inputs Z3 and Z4 (to downstream devices)	15 devices
Interconnection limit on outputs Z1 and Z2 (to upstream devices)	5 or 15 devices, depending on the upstream device

Predefined Events

The function generates the following predefined event:

Code	Event	History	Severity
0x1305 (4869)	ZSI test	Diagnostic	Low

Recommended Actions

Code	Event	Recommended actions
0x1305 (4869)	ZSI test	Wait until the test is completed.