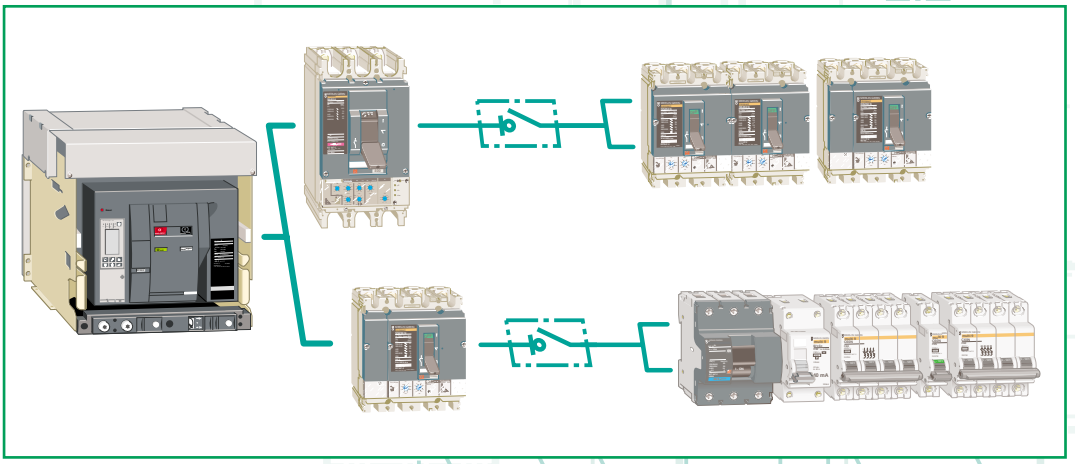
Merlin Gerin

Circuit breaker application guide



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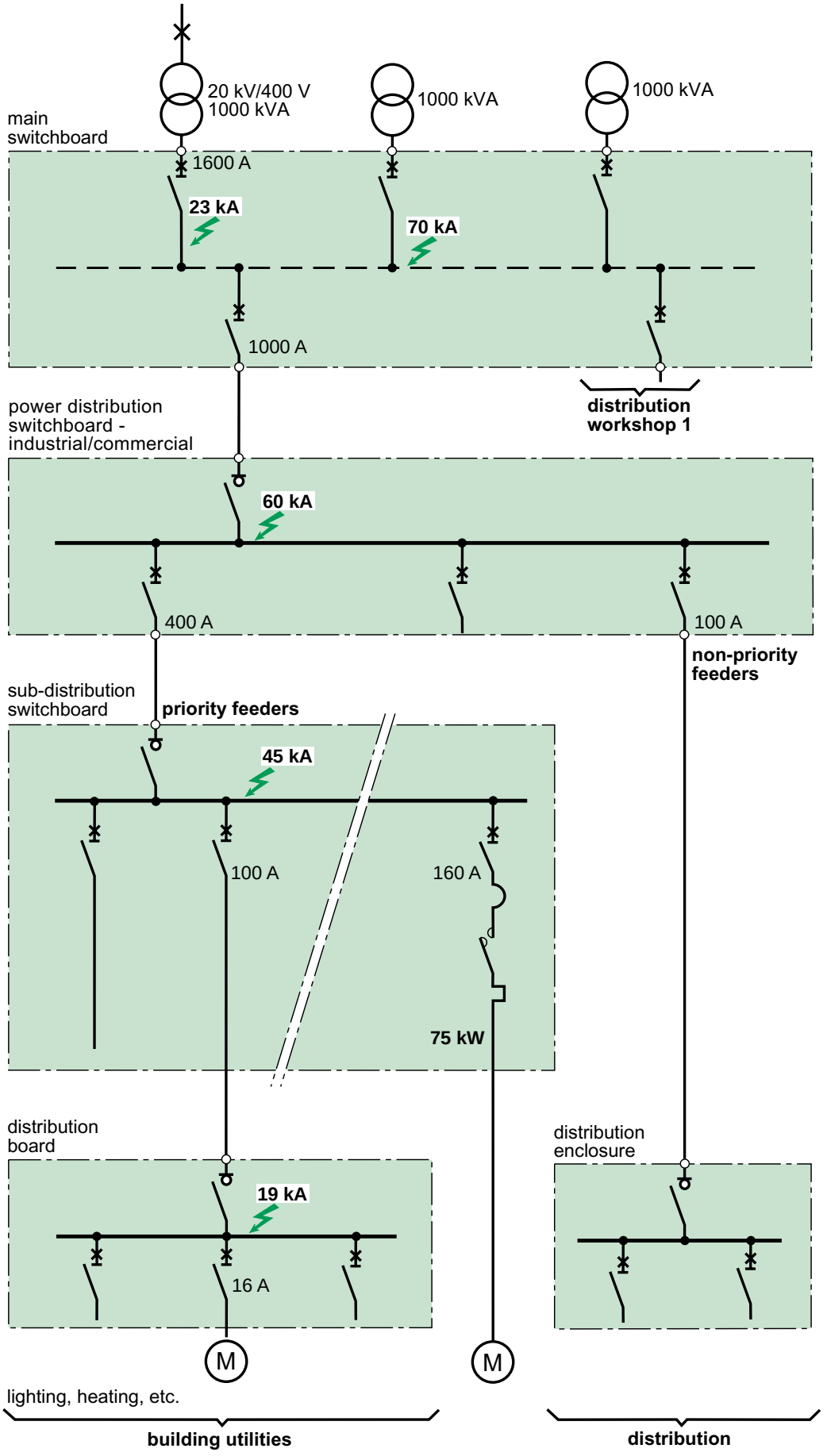

20 kV/400 V
1000 kVA
1000 kVA
1000 kVA
main
switchboard
1600 A
23 kA
70 kA
1000 A
distribution
workshop 1
power distribution
switchboard -
industrial/commercial
60 kA
400 A
100 A
non-priority
feeders
sub-distribution
switchboard
priority feeders
45 kA
100 A
160 A
75 kW
distribution
board
19 kA
16 A
distribution
enclosure
M
M
lighting, heating, etc.
building utilities
distribution

Section 1
System requirements

Circuit breakers and system design Page

Glossary

EDW:	ElectroDynamic Withstand
SCPD:	Short circuit protection device
IEC:	International Electrotechnical Commission
BS:	British Standard
CT:	Current transformers
CU:	control Unit
MSB:	Main Switchboard
BBT:	Busbar Trunking
MV:	Medium Voltage (1kV to 36kV)
Isc:	Short-circuit current
Isc(D1):	Short-circuit current at the point D1 is installed
Usc:	Short-circuit voltage
MCCB:	Moulded case circuit-breaker
BC:	Breaking Capacity
Icu(*):	Ultimate Breaking Capacity
IcuD1(*)	Ultimate Breaking Capacity of D1
Ue:	Rated operational voltage
Ui:	Rated insulation voltage
Uimp:	Rated impulse withstand voltage
In:	Rated operational current
Ith:	Conventional free air thermal current
Ithe:	Conventional enclosed thermal current
Iu:	Rated uninterrupted current
Icm:	Rated short-circuit making capacity
Icu:	Rated ultimate short-circuit breaking capacity
Ics:	Rated service breaking capacity
Icw:	Rated short time withstand current
Ir:	Adjustable overload setting current
1.05 x Ir:	Conventional non-tripping current
1.30 x Ir:	Conventional tripping current
Ii:	Instantaneous tripping setting current
Isd:	Short time tripping setting current

The requirements of electrical power distribution

Safety and availability of energy are the operator s prime requirements.
Coordination of protection devices ensures these needs are met at optimised cost.

The design of LV installations leads to basic protection devices being fitted for three types of faults:
- ***overloads***
- ***short-circuits***
- ***insulation faults.***

Safety and availability of energy

Operation of these protection devices must allow for:
- the statutory aspects, particularly relating to safety of people,
- technical and economic requirements.

The chosen switchgear must:
- withstand and eliminate faults at optimised cost with respect to the necessary performance,
- limit the effect of a fault to the smallest part possible of the installation in order to ensure continuity of supply.

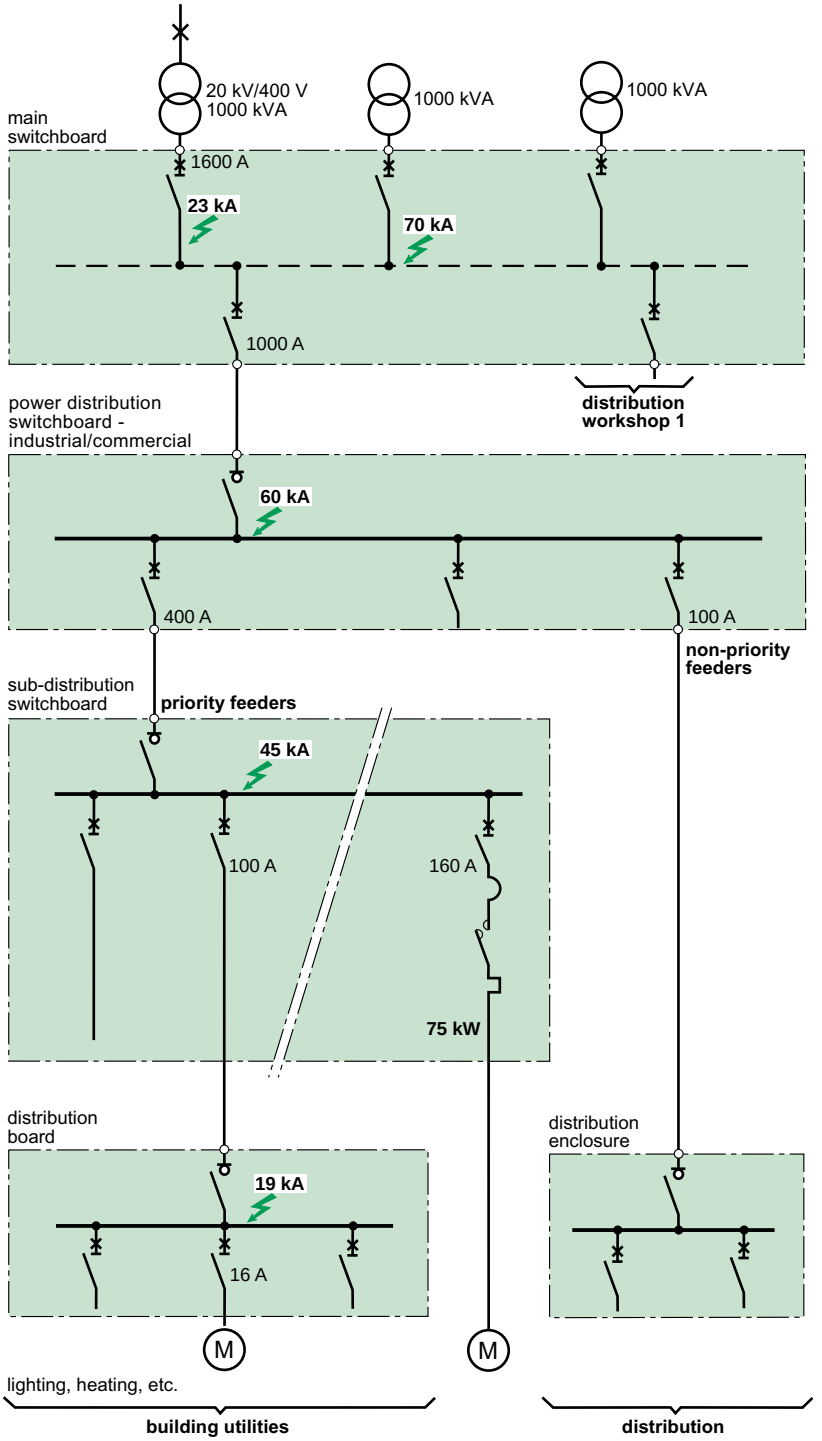
Achievement of these objectives requires coordination of protection device performance, necessary for:
- **managing safety** and increasing durability of the installation by limiting stresses,
- **managing availability** by eliminating the fault by means of the circuit-breaker immediately upstream

The circuit-breaker coordination means are:
- **cascading**
- **discrimination.**

If the insulation fault is specifically dealt with by earth fault protection devices, discrimination of the residual current devices (RCDs) must also be guaranteed.

The requirements of electrical power distribution

Structure of LV electrical power distribution



Simplified diagram of a standard installation covering most of the cases observed in practice.

The various levels of an LV electrical installation
Each of the three levels of the installation has specific availability and safety needs.

Functions and technologies of the protection devices

Protection devices and their coordination must be suited to the specific features of the installation.

- At the main switchboard, the need for energy availability is greatest,
- At the sub-distribution switchboards, limitation of stresses in event of a fault is important,
- At final distribution, user safety is essential.

Circuit-breaker functions

This connection device is able to close and break a circuit regardless of current up to its breaking capacity.
The functions to be performed are:

- close the circuit,
- conduct current,
- open the circuit and break the current,
- guarantee isolation.

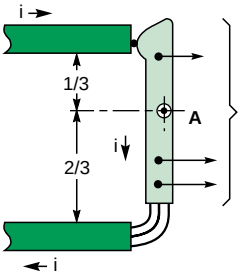
The requirements concerning installation, cost optimisation, management of availability and safety generate technological choices concerning the circuit-breaker.

Level A: the Main Switchboard (MSB)

This unit is the key to the entire electrical power distribution: availability of supply is essential in this part of the installation.

- Short-circuit currents are high due to:
  - the proximity of the LV sources,
  - amply sized busbars for conveying high currents.

- **This is the area of the power circuit-breakers**



Own current compensation diagram

These circuit-breakers are designed for high current electrical distribution:
- they are normally installed in the MSBs to protect high current incomers and feeders;
- they must remain closed in event of short-circuits so as to let the downstream circuit-breaker eliminate the faults. Their operation is normally time-delayed. ElectroDynamic Withstand (EDW) and high thermal withstand characterised by a short time withstand current Icw are essential.
EDW is designed to be as great as possible by an own current compensation effect.

- **Main data of these circuit-breakers:**
  - of industrial type, meeting standard BSEN 60947-2,
  - with a high breaking capacity Icu from 40 to 150 kA,
  - with a nominal rating of 1000 to more than 5000 A,
  - category B:
    - with a high Icw from 40 kA to 100 kA — 1 s
    - with a high electrodynamic withstand (EDW),
  - with a stored energy operating mechanism allowing source coupling.

Continuity of supply is ensured by total discrimination:
- upstream with the protection fuses of the HV/LV transformer **(*)**,
- downstream with all the feeders (time discrimination).

***(*)** The value of HV/LV discrimination lies above all in the fact that resumption of operation has fewer constraints in LV (accessibility, padlocking). This offers considerable advantages for continuity of supply.*

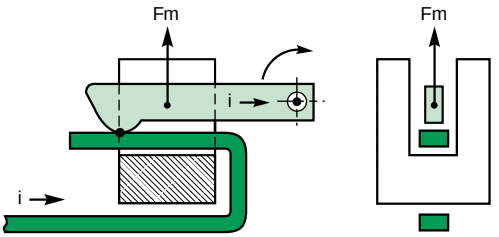
Level B: the subdistribution boards

These boards belong to the intermediate part of the installation:
- distribution is via conductors (BBT or cables) with optimised sizing,
- sources are still relatively close: short-circuit currents can reach 100 kA,
- the need for continuity of supply is still very great.

Protection devices must consequently limit stresses and be perfectly coordinated with upstream and downstream LV distribution.

This is the area of the moulded case circuit-breakers

These circuit-breakers must open and break the current as quickly as possible. The main need is to avoid as far as possible stresses at cable and connection level and even at load level. For this purpose, repulsion at contact level must be encouraged in order to eliminate the fault even as the current is rising.



The possible diagrams are:
- with a single repulsion loop,
- with double repulsion
- with an extractor, a magnetic core pushing or pulling the moving contact.

Example of a repulsion diagram Fm = magnetic force

The repulsion effects can be enhanced by implementation of magnetic circuits:
- with effects proportional to the current square (U-shaped attracting or expulsion circuit),
- with effects proportional to the current slope (di/dt) and thus particularly effective for high currents (Isc).

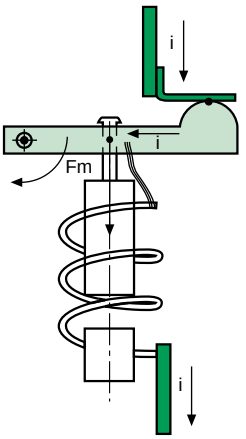
Main data of the moulded case circuit-breakers:
- of industrial type, meeting standard BSEN 60947-2,
- with a high breaking capacity (36 to 150 kA),
- with a nominal rating from 100 A to 1600 A,
- category B for high rating circuit-breakers (> 630 A),
- category A for lower rating circuit-breakers (< 630 A),
- with fast closing and opening and with three operating positions (ON/OFF/Tripped).

Continuity of supply is ensured by discrimination:
- partial, possibly, to supply non-priority feeders,
- total for downstream distribution requiring high energy availability.

Level C: Final distribution

The protection devices are placed directly upstream of the loads: discrimination with the higher level protection devices must be provided.
A weak short-circuit current (a few kA) characterises this level.

■ **This is the area of the Miniature Circuit-breaker**



These circuit-breakers are designed to protect final loads. The purpose is to limit stresses on cables, connections and loads.
The technologies for the miniature circuit-breakers, mainly used at this installation level, prevent such stresses from occurring.
In miniature circuit-breakers, limitation partly depends on the magnetic actuator. Once the mechanism has been released, it will strike the moving contact making it move at a high speed very early on. Arc voltage thus develops very quickly at a very early stage. For small rating circuit-breakers, specific pole impedance contributes to limitation.
The miniature circuit-breaker is ideal for domestic use and for the protection of auxiliaries; it then conforms to standard BSEN 60898.
On the other hand, if it is designed for industrial use, it must meet standard BSEN 60947-2.

Main data of these circuit-breakers:
- a breaking capacity to match needs (i.e. Below 10 kA on average),
- a nominal rating of 1.5 to 125 A according to the loads to be supplied,
- normally intended for domestic applications: conform to standard BSEN 60898.

The protection devices installed must provide:
- current limitation,
- operating convenience,
- absolute safety,

as these devices are handled by non-specialist users.

The requirements of electrical power distribution

Standard BSEN 60947.2 specifies the main data of Industrial Circuit-Breakers:
- the utilisation category,
- the setting data,
- the design measures,
- etc.

It draws up a series of very complete tests representative of circuit-breaker real operating conditions. In appendix A, it recognises and defines Coordination of Protection Devices — Discrimination and Cascading.
Conformity of a circuit-breaker with standard BSEN 60947-2 is a must for industrial BSEN switchgear.

Standard BSEN 60947-2

-Changes in dependability needs and technologies have led to a marked increase in standard requirements for industrial circuit-breakers. Conformity with standard IEC 947-2, renamed IEC 60947-2 in 1997 and BSEN60 947-2 can be considered as an all-risk insurance for use of circuit-breakers. This standard has been approved by all countries.

The principles

Standard BSEN 60947-2 is part of a series of standards defining the specifications for LV electrical switchgear:
- the general rules BSEN 60947-1, that group the definitions, specifications and tests common to all LV industrial switchgear,
- the product standards BSEN 60947-2 to 7, that deal with specifications and tests specific to the product concerned.

Standard BSEN 60947-2 applies to circuit-breakers and their associated trip units. Circuit-breaker operating data depend on the trip units or relays that control their opening in specific conditions.

This standard defines the main data of industrial circuit-breakers:
- their classification: utilisation category, suitability for isolation, etc.
- the electrical setting data,
- the information useful for operation,
- the design measures,
- coordination of protection devices.

The standard also draws up series of conformity tests to be undergone by the circuit-breakers. These tests, which are very complete, are very close to real operating conditions. Conformity of these tests with standard BSEN 60947-2 is verified by accredited laboratories.

Table of main data

Voltage data	**Ue**	rated operational voltage
	Ui	rated insulation voltage
	Uimp	rated impulse withstand voltage
Current data	**In**	rated operational current
	Ith	conventional free air thermal current
	Ithe	conventional enclosed thermal current
	Iu	rated uninterrupted current
Short-circuit data	**Icm**	rated short-circuit making capacity
	Icu	rated ultimate short-circuit breaking capacity
	Ics	rated service breaking capacity
	Icw	rated short time withstand current
Trip unit data	**Ir**	adjustable overload setting current
	1.05 x Ir	conventional non-tripping current
	1.30 x Ir	conventional tripping current
	Ii	instantaneous tripping setting current
	Isd	short time tripping setting current

Circuit-breaker category

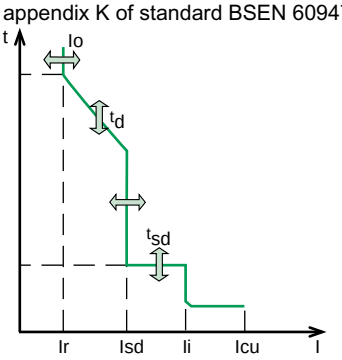
Category BSEN 60947-2 defines two circuit-breaker categories:
- category A circuit-breakers, for which no tripping delay is provided. This is normally the case of moulded case circuit-breakers.

These circuit-breakers can provide current discrimination.
- category B circuit-breakers, for which, in order to provide time discrimination, tripping can be delayed (up to 1 s) for all short-circuits of value less than the current Icw.

This is normally the case of power or moulded case circuit-breakers with high ratings. For circuit-breakers installed in the MSBs, it is important to have an Icw equal to Icu in order to naturally provide discrimination up to full ultimate breaking capacity Icu.

Reminders of standard-related electrical data

The setting data are given by the tripping curves.
These curves contain some areas limited by the following currents (defined in appendix K of standard BSEN 60947-2).



■ **Rated operational current (In)**
In (in A rms) = maximum uninterrupted current withstand at a given ambient temperature without abnormal temperature rise.
E.g. 125 A at 40 °C

■ **Adjustable overload setting current (Ir)**
Ir (in A rms) is a function of In. Ir characterises overload protection. For operation in overload, the conventional non-tripping currents Ind and tripping currents Id are:
- Ind = 1.05 Ir,
- Id = 1.30 Ir.

Id is given for a conventional tripping time.
For a current greater than Id, tripping by thermal effect will take place according to an inverse time curve. Ir is known as Long Time Protection (LTP).

■ **Short time tripping setting current (Isd)**
Isd (in kA rms) is a function of Ir. Isd characterises short-circuit protection. The circuit-breaker opens according to the short time tripping curve:
- either with a time delay tsd,
- or with constant I^2t,
- or instantaneously (similar to instantaneous protection).

Isd is known as Short Time Protection or Im.

■ **Instantaneous tripping setting current (Ii)**
Ii (in kA) is given as a function of In. It characterises the instantaneous short-circuit protection for all circuit-breaker categories. For high overcurrents (short-circuits) greater than the Ii threshold, the circuit-breaker must immediately break the fault current.
This protection device can be disabled according to the technology and type of circuit-breaker (particularly B category circuit-breakers).

The requirements of electrical power distribution

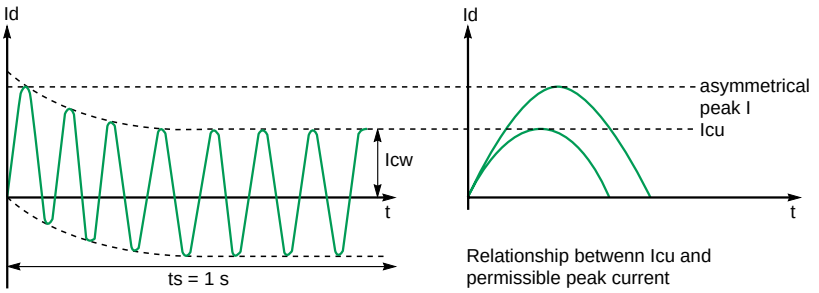


Table for calculation of asymmetrical short-circuits (BSEN 60947.2 para. 4.3.5.3.)

Isc: symmetrical assumed short-circuit kA (root mean square value)	asymmetry factor k
4,5 ⩽ I ⩽ 6	1,5
6 < I ⩽ 10	1,7
10 < I ⩽ 20	2,0
20 < I ⩽ 50	2,1
50 < I	2,2

■ **Rated short-circuit making capacity(*) (Icm)**
Icm (peak kA) is the maximum value of the asymmetrical short-circuit current that the circuit-breaker can make and break. For a circuit-breaker, the stress to be managed is greatest on closing on a short-circuit.

■ **Rated ultimate breaking capacity(*) (Icu)**
Icu (kA rms) is the maximum short-circuit current value that the circuit-breaker can break. It is verified according to a sequence of standardised tests. After this sequence, the circuit-breaker must not be dangerous. This characteristic is defined for a specific voltage rating Ue.

■ **Rated service breaking capacity(*) (Ics)**
Ics (kA rms) is given by the manufacturer and is expressed as a % of Icu. This performance is very important as it gives the ability of a circuit-breaker to provide totally normal operation once it has broken this short-circuit current three times. The higher Ics, the more effective the circuit-breaker.

■ **Rated short time withstand current(*) (Icw)**
Defined for B category circuit-breakers
Icw (kA rms) is the maximum short-circuit current that the circuit-breaker can withstand for a short period of time (0.05 to 1 s) without its properties being affected. This performance is verified during the standardised test sequence.

(*) *These data are defined for a specific voltage rating Ue.*

Circuit-breaker coordination

The term coordination concerns the behaviour of two devices placed in series in electrical power distribution in the presence of a short-circuit.

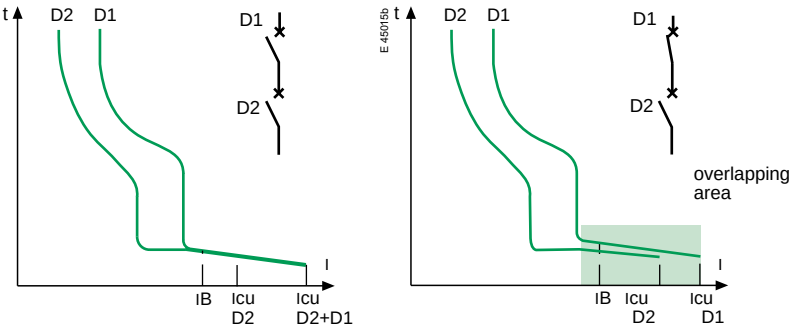
■ Cascading or back-up protection

This consists of installing an upstream circuit-breaker D1 to help a downstream circuit-breaker D2 to break short-circuit currents greater than its ultimate breaking capacity IcuD2. This value is marked IcuD2+D1.
BSEN 60947-2 recognises cascading between two circuit-breakers. For critical points, where tripping curves overlap, cascading must be verified by tests.

■ Discrimination

This consists of providing coordination between the operating characteristics of circuit-breakers placed in series so that should a downstream fault occur, only the circuit-breaker placed immediately upstream of the fault will trip.
BSEN 60947-2 defines a current value Is known as the discrimination limit such that:
- if the fault current is less than this value Is, only the downstream circuit-breaker D2 trips,
- if the fault current is greater than this value Is, both circuit-breakers D1 and D2 trip.

Just as for cascading, discrimination must be verified by tests for critical points.
Discrimination and cascading can only be guaranteed by the manufacturer who will record his tests in tables.



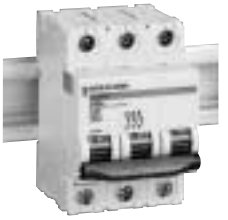
Cascading *Discrimination*

■ Glossary:

- Isc(D1): Short-circuit current at the point where D1 is installed,
- IcuD1: Ultimate breaking capacity of D1.

The requirements of electrical power distribution

Summarising table

	Main switchboard Level A	Subdistribution switchboard Level B	Final distribution switchboard Level C
Switchboard data			
nominal I	1000 to 6300 A	100 to 1000 A	1 to 100 A
Isc	50 kA to 150 kA	20 kA to 100 kA	3 kA to 10 kA
Thermal withstand Icw/EDW	***	*	*
Continuity of supply	***	***	**
Circuit-breaker type	High current power circuit-breaker or moulded case circuit-breaker	Moulded case circuit-breaker	Miniature circuit-breaker
			
Standard IEC 60947-2	■	■	■ (1)
Trip unit			
thermal magnetic		□ (2)	■
electronic	■	■	
product data			
standard In	800 to 6300 A	100 to 630 A	1 to 125 A
Icn	50 kA to 150 kA	25 kA to 150 kA	3 kA to 25 kA
Utilisation category	B	A	A
Limiting capacity	* (3)	***	***

■ recommended or compulsory
□ possible
*** important
** normal
* not very important

(1) for domestic use as per BSEN 60898
(2) possible up to 250 A
(3) Sizing of the switchboard at level A means that this characteristic is not very important for standard applications.

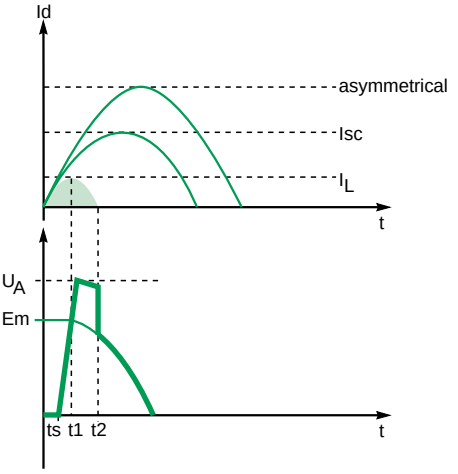
Limitation

Limitation is a technique that allows the circuit-breaker to considerably reduce short-circuit currents.
The advantages of limitation are numerous:
- attenuation of the harmful effects of short-circuits:
  - electromagnetic
  - thermal
  - mechanical
- base of the cascading technique.

Principles

The assumed fault current Isc is the short-circuit current Isc that would flow, if there were no limitation, at the point of the installation where the circuit-breaker is placed.

Since the fault current is eliminated in less than one half-period, only the first peak current (asymmetrical peak I) need be considered. This is a function of the installation fault cos φ.



Reduction of this peak I to limited I_L characterises circuit-breaker limitation.

Limitation consists of creating a back-electromotive force opposing the growth of the short-circuit current.

The three decisive criteria guaranteeing the effectiveness of this limitation are:
- intervention time, i.e. the time ts when the back-electromotive force (bemf) appears,
- the rate at which bemf increases,
- the value of bemf.

The back-electromotive force is the arc voltage Ua due to the resistance of the arc developing between the contacts on separation. Its speed of development depends on the contact separation speed.

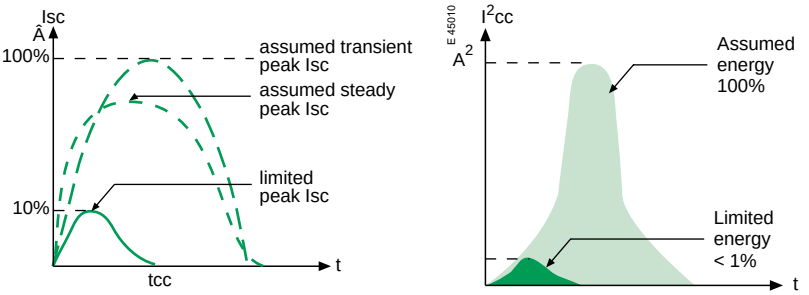
* As shown in the figure above, as from the time ts when the contacts separate, the back less than the assumed fault current flow through when a short-circuit occurs.

The implementation techniques

Circuit breaker limitation capacity

The circuit breaker limitation capacity defines the way it reduces the let through current under short-circuit conditions.

The thermal stress of the limited current is the area (shaded) defined by the curve of the square of the limited current I^2sc (t).
If there is no limitation, this stress would be the area, far larger, that would be defined by the curve of the square of the assumed current.
For an assumed short-circuit current Isc, limitation of this current to 10% results in less than 1% of assumed thermal stress.
The cable temperature rise is directly proportional to the thermal stress **(1)**.



Current and thermal stress limitation

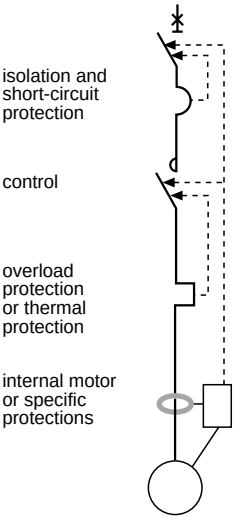
Advantages

■ **Application to electrical power distribution**
Limitation considerably reduces the harmful effects of short-circuits on the installation.

harmful effects of short-circuits	limitation effects
■ electromagnetic	Reduction of magnetic field, thus □ less risk of disturbing neighbouring measurement instruments.
■ mechanical	Peak current limited, thus: □ reduced electromagnetic forces, □ less risk of deformation or breakage at electrical contact level.
■ thermal	Limited thermal stress (reduction of amplitude and duration of current flow), thus: □ temperature rise of conductors less marked, □ increased lifetime of busbar trunking.

Consequently, limitation contributes to the **durability** of electrical installations.

Applications to motors Functions



Motor feeder

The following functions must be performed on a motor feeder:
- isolation
- control
- overload protection (specific)
- short-circuit protection
- additional protection

A motor feeder can be made up of 1, 2, 3 or 4 different items of switchgear.
Should a number of devices be associated —most common case — the various functions performed by the switchgear must be coordinated.

Coordination of motor feeder components
Thanks to limitation, the harmful effects of short-circuits on a motor feeder are greatly reduced. Proper limitation of circuit-breakers ensures easy access to a type 2 coordination as per BSEN 60947-4-1, without oversizing of components. This type of coordination guarantees users optimum use of their motor feeders.

type 1 **BSEN 60947-4-1**	**type 2** **BSEN 60947-4-1**
No risk for the operator. Elements other than contactors and the relay must not be damaged. Isolation must be maintained after an incident. Before restarting, the motor feeder must be repaired.	No damage or malfunctioning is allowed. Isolation must be maintained after an incident and the motor feeder must be able to operate after a short-circuit. The risk of contactor contact welding is accepted if contacts can be easily separated. Before restarting, a quick inspection is sufficient. Reduced maintenance and rapid resumption of operation.

Limitation curves

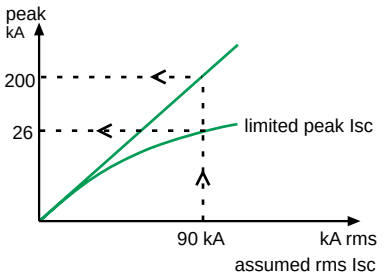
A circuit-breaker s limiting capacity is expressed by limitation curves that give:

■ **the limited peak current** as a function of the rms current of the assumed short-circuit current.

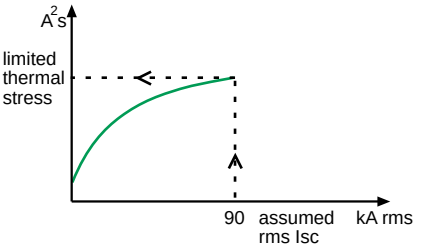
For example: on a 160 A feeder where the assumed Isc is 90 kA rms, the non-limited peak Isc is 200 kA (asymmetry factor of 2.2) and the limited Isc is 26 kA peak.

■ **the limited thermal stress** (in A^2s) as a function of the rms current of the assumed short-circuit current.

For example: on the previous feeder, the thermal stress moves from more than 100 10^6 A^2s to 6 10^6 A^2s.



Current limitation curve



Thermal stress limitation curve

Cascading

Cascading is used to:
- **make savings,**
- **simplify choice of protection devices,** by using circuit-breakers with standard performance.

Cascading provides circuit-breakers placed downstream of a limiting circuit-breaker with an enhanced breaking capacity. The limiting circuit-breaker helps the circuit-breaker placed downstream by limiting high short-circuit currents. Cascading makes it possible to use a circuit-breaker with a breaking capacity lower than the short-circuit current calculated at its installation point.

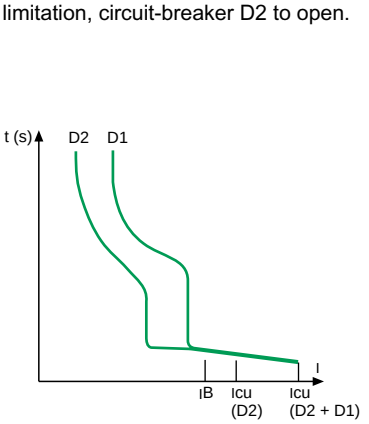
Area of application

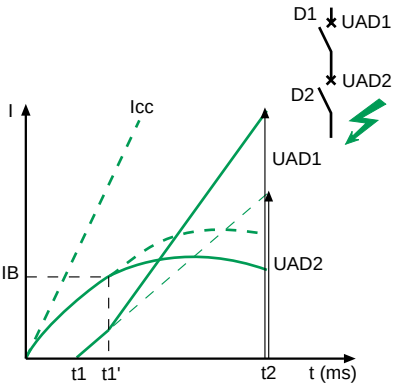
Cascading:
- concerns all devices installed downstream of this circuit-breaker,
- can be extended to several consecutive devices, even if they are used in different switchboards.

The installation standards (BS 7671 or IEC 364) stipulate that the upstream device must have an ultimate breaking capacity Icu greater than or equal to the assumed short-circuit current at the installation point.
For downstream circuit-breakers, the ultimate breaking capacity Icu to be considered is the ultimate breaking capacity enhanced by coordination.

Principles

As soon as the two circuit-breakers trip (as from point IB), an arc voltage UAD1 on separation of the contacts of D1 is added to voltage UAD2 and helps, by additional limitation, circuit-breaker D2 to open.

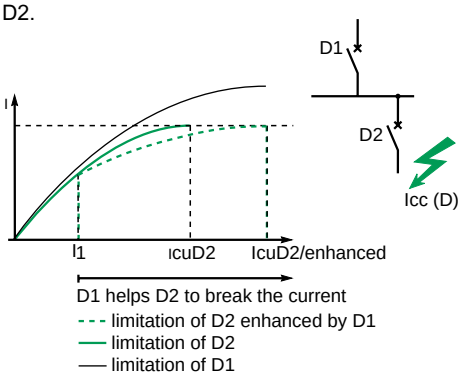




The implementation techniques

The association D1 + D2 allows an increase in performance of D2 as shown in figure 2:
- limitation curve D2,
- enhanced limitation curve of D2 by D1,
- Icu D2 enhanced by D1.

In actual fact, in compliance with the recommendations of BSEN 60947-2, manufacturers give directly and guarantee Icu enhanced by the association of D1 + D2.



Advantages

Cascading allows benefit to be derived from all the advantages of limitation. Thus, the effects of short-circuit currents are reduced, i.e.:
- electromagnetic effects,
- electrodynamic effects,
- thermal effects.

Installation of a single limiting circuit-breaker results in considerable simplifications and savings for the entire downstream installation:
- simplification of choice of devices by the cascading tables,
- savings on downstream devices. Limitation enables circuit-breakers with standard performance to be used.

Discrimination

Discrimination of protection devices is a key factor in continuity of supply.
Discrimination is:
- partial,
- or total,

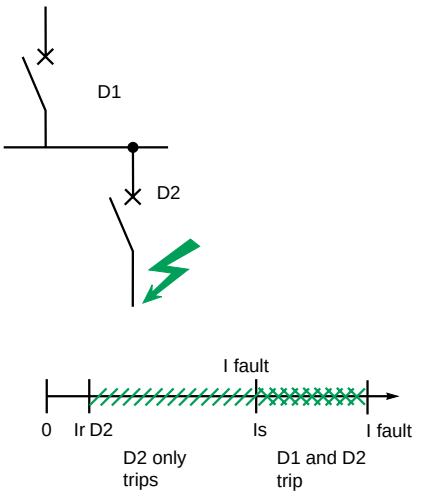
according to the characteristics of the association of protection devices.
The discrimination techniques implemented are:
- current
- time
- logic.

Discrimination can be optimised by use of current limiting downstream circuit-breakers.

General information

Principle

Reminder (see paragraph 1.4. "standard BSEN 60947-2").
Discrimination consists of providing coordination between the operating characteristics of circuit-breakers placed in series such that should a downstream fault occur, only the circuit-breaker placed immediately upstream of the fault will trip.
A discrimination current Is is defined such that:
Ifault > Is: both circuit-breakers trip,
Ifault < Is: only D2 eliminates the fault.



■ Discrimination quality
The value Is must be compared with assumed Isc(D2) at point D2 of the installation.
□ total discrimination: Is > Isc(D2); discrimination is qualified as total, i.e. whatever the value of the fault current, D2 only will eliminate it.
□ partial discrimination: Is < Isc(D2); discrimination is qualified as partial, i.e. up to Is, only D2 eliminates the fault. Beyond Is, both D1 and D2 open.

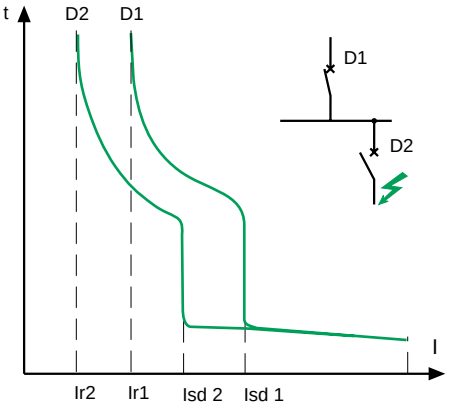
■ Manufacturer s data
In actual fact, manufacturers give discrimination quality intrinsically, i.e.:
□ total discrimination, if Is is equal to IcuD1 (the association will never be able to see a fault current greater than this value),
□ partial discrimination, limited to Is. This value Is can nevertheless be greater than Isc(D2). Seen by the user, discrimination is then total.

■ Glossary
□ Isc(D1): Short-circuit current at the point where D1 is installed,
□ IcuD1: Ultimate breaking capacity of D1.

Discrimination techniques

■ Current discrimination

This technique is directly linked to the staging of the Long Time (LT) tripping curves of two serial-connected circuit-breakers.



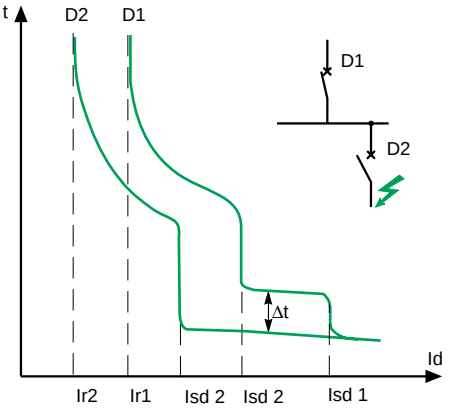
The discrimination limit Is is:
- Is = Isd2 if the thresholds Isd1 and Isd2 are too close or merge,
- Is = Isd1 if the thresholds Isd1 and Isd2 are sufficiently far apart.

As a rule, current discrimination is achieved when:
- Ir1 / Ir2 < 2
- Isd1 / Isd2 > 2
The discrimination limit is
- Is = Isd1.

Discrimination quality
Discrimination is total if Is > Isc(D2), i.e. Isd1 > Isc(D2).
This normally implies:
□ a relatively low level Isc(D2),
□ a large difference between the ratings of circuit-breakers D1 and D2.
Current discrimination is normally used in final distribution.

■ Time discrimination

This is the extension of current discrimination and is obtained by staging over time of the tripping curves. This technique consists of giving a time delay of t to the Short Time (ST) tripping of D1.

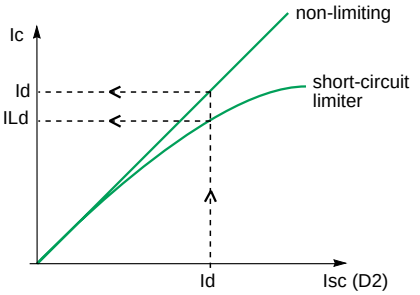


The thresholds (Ir1, Isd1) of D1 and (Ir2, Isd2) comply with the staging rules of current discrimination.
The discrimination limit Is of the association is at least equal to Ii1, the instantaneous threshold of D1.

Discrimination quality
There are two possible applications:
■ **on final and/or intermediate feeders.**
A category circuit-breakers can be used with time-delayed tripping of the upstream circuit-breaker. This allows extension of current discrimination up to the instantaneous threshold Ii1 of the upstream circuit-breaker: **Is ≥ Ii1**.
If Isc(D2) is not too high — case of a final feeder - total discrimination can be obtained.
■ **on the incomers and feeders of the MSB**
At this level, as continuity of supply takes priority, the installation characteristics allow use of B category circuit-breakers designed for time-delayed tripping. These circuit-breakers have a high thermal withstand (Icw ≥ 50% Icn for t = 1s): Is ≥ Icw1. Even for high Isc(D2), **time discrimination normally provides total discrimination: Icw1 > Isc(D2).**

NB: Use of B category circuit-breakers means that the installation must withstand high electrodynamic and thermal stresses.
Consequently, these circuit-breakers have a high instantaneous threshold Ii that can be adjusted and disabled in order to protect the busbars if necessary.

■ **enhancement of current and time discrimination**
□ limiting downstream circuit-breakers
Use of a limiting downstream circuit-breaker enables the discrimination limit to be increased.

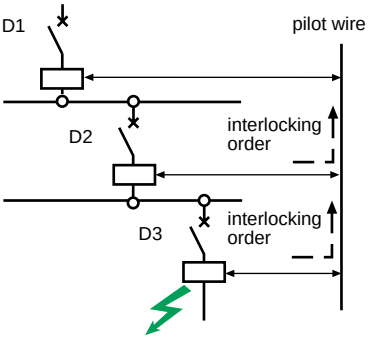


In fact, when referring to the figure, a fault current Id will be seen by D1:
□ equal to Id for a non-limiting circuit-breaker,
□ equal to ILd ≤ Id for a limiting circuit-breaker.
The limit of current and time discrimination Is of the association D1 + D2 is thus pushed back to a value that increases when the downstream circuit-breaker is rapid and limiting.

Discrimination quality
Use of a limiting circuit-breaker is extremely effective for achievement of total discrimination when threshold settings (current discrimination) and/or the instantaneous tripping threshold (time discrimination) of the upstream circuit-breaker D1 are too low with respect to the fault current Id in D2 — Isc(D2).

The implementation techniques

■ Logic discrimination or "Logic Discrimination Zone (ZSI)"



Logic discrimination

This type of discrimination can be achieved with circuit-breakers equipped with specially designed electronic trip units (Compact, Masterpact): only the Short Time Protection (STP) and Ground Fault Protection (GFP) functions of the controlled devices are managed by Logic Discrimination. In particular, the Instantaneous Protection function — inherent protection function — is not concerned.

Settings of controlled circuit-breakers
■ time delay: there are no rules, but staging (if any)of the time delays of time discrimination must be applied
(tD1 ≥ tD2 ≥ tD3)
■ thresholds: there are no threshold rules to be applied, but natural staging of the protection device ratings must be complied with (IcrD1 ≥ IcrD2 ≥ IcrD3).
NB: This technique ensures discrimination even with circuit-breakers of similar ratings.

Principles
Activation of the Logic Discrimination function is via transmission of information on the pilot wire:
■ ZSI input:
□ low level (no downstream faults): the Protection function is on standby with a reduced time delay (≤ 0.1 s).
□ high level (presence of downstream faults): the relevant Protection function moves to the time delay status set on the device.
■ ZSI output:
□ low level: the trip unit detects no faults and sends no orders.
□ high level: the trip unit detects a fault and sends an order.

Operation
A pilot wire connects in cascading form the protection devices of an installation (see figure showing logic discrimination). When a fault occurs, each circuit-breaker upstream of the fault (detecting a fault) sends an order (high level output) and moves the upstream circuit-breaker to its natural time delay (high level input). The circuit-breaker placed just above the fault does not receive any orders (low level input) and thus trips almost instantaneously.

Discrimination quality
Recommended and extensively used in the USA, this technique enables:
□ easy achievement as standard of discrimination on 3 levels or more,
□ elimination of important stresses on the installation, relating to time-delayed tripping of the protection device, in event of a fault directly on the upstream busbars. **All the protection devices are thus virtually instantaneous.**
□ easy achievement of downstream discrimination with non-controlled circuit-breakers.

The discrimination rules

General discrimination rules

Overload protection

For any overcurrent value, discrimination is guaranteed on overload if the non-tripping time of the upstream circuit-breaker D1 is greater than the maximum breaking time of circuit-breaker D2.
The condition is fulfilled if the ratio of Long Time (LT) and Short Time (ST) settings is greater than 2.
The discrimination limit Is is at least equal to the setting threshold of the upstream Short Time (ST) time delay.

Short-circuit protection

■ **time discrimination**

Tripping of the upstream device D1 is time delayed by t.
- The conditions required for current discrimination must be fulfilled.
- The time delay t of the upstream device D1 must be sufficient for the downstream device to be able to eliminate the fault.

Time discrimination increases the discrimination limit Is up to the instantaneous tripping threshold of the upstream circuit-breaker D1.
Discrimination is always total if circuit-breaker D1:
- is of category B,
- has an Icw characteristic equal to its Icu.

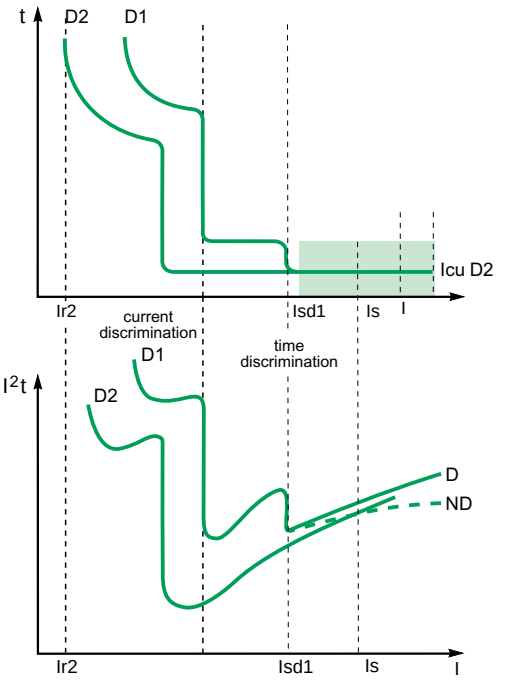
Discrimination is total in the other cases if the instantaneous tripping threshold of the upstream circuit-breaker D1 is greater than the assumed Isc in D2.

■ **logic discrimination**

Discrimination is always total.

■ **general case**

There are no general discrimination rules.
- The time/current curves clearly supply a value of Isc (limited or assumed) less than the Short Time tripping of the upstream circuit-breaker; discrimination is then total.



If this is not the case, only tests can indicate discrimination limits of coordination, in particular when circuit-breakers are of the limiting type. The discrimination limit Is is determined by comparison of curves:
- in tripping energy for the downstream circuit-breaker,
- in non-tripping energy for the upstream circuit-breaker.

The potential intersection point of the curves gives the discrimination limit Is.

The manufacturers indicate in tables the tested performance of coordination.

Earth leakage protection discrimination

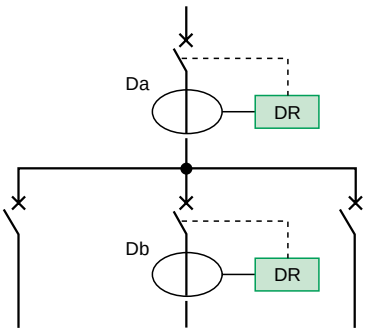
According to the Earthing System, discrimination only uses coordination of overcurrent protection devices. When the insulation fault is treated specifically by earth leakage protection devices (e.g. in the TT system), discrimination of the residual current devices (RCDs) with one another must also be guaranteed.

Discrimination of earth leakage protection devices must ensure that, should an insulation fault occur, only the feeder concerned by the fault is de-energised. The aim is to optimise energy availability.

There are two types of earth leakage protection discrimination.

Vertical discrimination

In view of requirements and operating standards, discrimination must simultaneously meet both the time and current conditions.



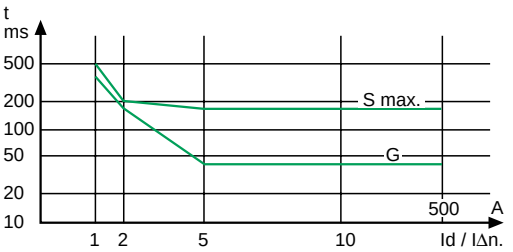
Vertical discrimination

Current condition:
The RCD must trip between In and In/2, where In is the declared operating current. There must therefore exist a minimum ratio of 2 between the sensitivities of the upstream device and the downstream device. In practice, the standardised values indicate a ratio of 3.

Time condition:
The minimum non-tripping time of the upstream device must be greater than the maximum tripping time of the downstream device for all current values.

NB: The tripping time of RCDs must always be less than or equal to the time specified in the installation standards to guarantee protection of people against indirect contacts.

For the domestic area (M9), standards IEC 61008 (residual current circuit-breakers) and IEC 61009 (residual current devices) define operating times.
The values in the table correspond to curves G and S.
Curve G (General) correspond to non-delayed RCDs and S (Selective) to those that are voluntarily delayed.



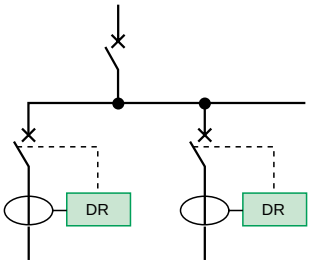
Operating time curves G and S

Standardised values of operating time

type	In A	IΔn A	standardised values of operating time and non-operating time (in seconds) at: IΔn	2IΔn	5IΔn	500 A	
general instan-taneous	all values	all values	0,3	0,15	0,04	0,04	maximum operating time
selective	>25	>0,030	0,5	0,2	0,15	0,15	maximum operating time
			0,13	0,06	0,05	0,04	minimum non operating time

Horizontal discrimination

Sometimes known **as circuit selection**, it allows savings at the supply end of the installation of an RCD placed in the cubicle if all its feeders are protected by RCDs. Only the faulty feeder is de-energised, the devices placed on the other feeders do not see the fault.



Horizontal discrimination

Coordination of protection devices and installation standards

Discrimination and cascading can only be guaranteed by the manufacturer who will record his tests in tables.

Installation standard IEC 364 governs electrical installations of buildings. BS7671 the British National standard, based on this IEC standard, recommend good coordination between the protection switchgear. They acknowledge the principles of cascading and discrimination of circuit-breakers based on product standard BSEN 60947-2.

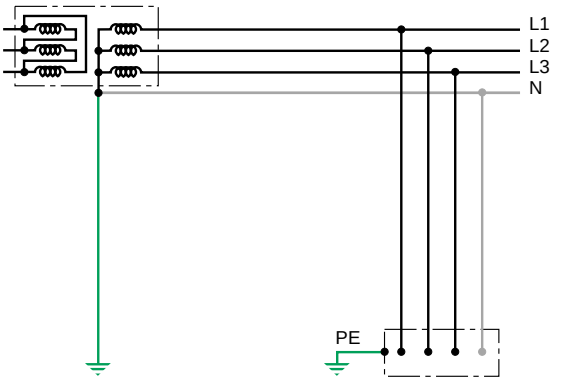
■ **Product standards BSEN 60947-2**
In appendix A, standard BSEN 60947-2 recognises and defines coordination between circuit-breakers (see paragraph 1.4 page 11). In particular, it defines the tests to be performed.
□ discrimination
This is normally studied on a theoretical level. For critical points where tripping curves overlap, it must be verified by tests. It is guaranteed by the manufacturer who will record the value of Is (discrimination limit) in tables.
□ cascading or coordination of the back-up protection device
The standard indicates the measurements to be taken to verify this coordination.
- Verification by comparison of characteristics
In practical cases, this type of verification is sufficient. It must be clearly proved that the IcuD2 of the association is compatible with the maximum energy I^2t acceptable by D2.
- Verification by tests
Cascading is normally verified by tests for critical points. The tests are performed with an upstream circuit-breaker D1 with a maximum overcurrent setting and a downstream circuit-breaker D2 with a minimum setting. The test results (breaking capacities enhanced by cascading) are in a table and guaranteed by the manufacturer.

■ **Installation standards**
BS 7671 national installation standards specify the implementation of these principles as per the Earthing System considered, in accordance with standard IEC 364.

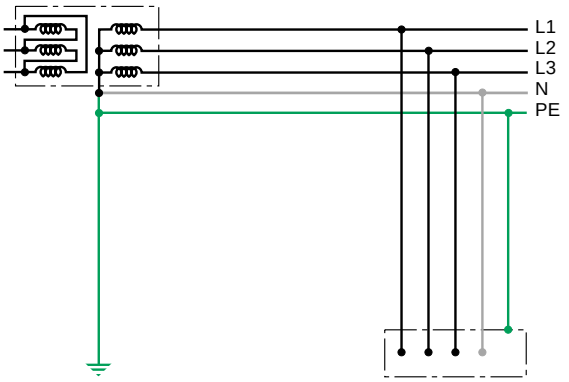
Discrimination
Discrimination **is defined and established for all Earthing Systems** used and types of fault (overload, short-circuit, insulation fault). However, in event of an insulation fault in the IT system, the advantage of continuity of supply is provided by the actual system that tolerates the 1st fault. This advantage must be maintained by a search and rapid elimination of this fault.

Cascading
On the other hand, **cascading rules are given for a TN or TT type earthing system.**

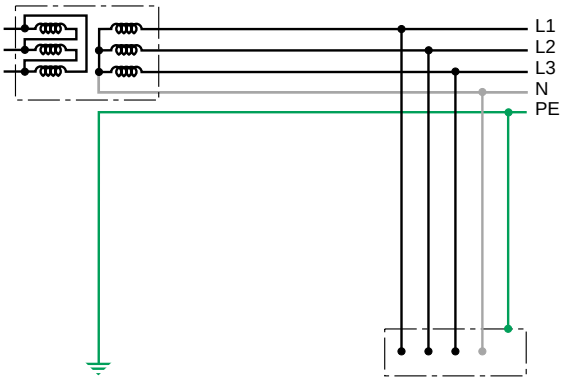
Basic rules in TT system:
Cascading rules cannot apply for an IT system due to the double insulation fault. The following rules must be implemented:
□ the circuit-breaker must have a breaking capacity that is greater than or equal to the three-phase short-circuit current at the point considered,
□ in event of a assumed double fault, it is laid down that the double fault short-circuit current will be at most:
- 15% of three-phase Isc for a three- phase Isc $\leq$ 10 000 A,
- 25% of three-phase Isc for a three-phase Isc > 10 000 A.



TT system



TN system



IT system

NB: Standard BS 7671 defines 3 types of earthing systems. In short:
- TT: The neutral point of the LV transformer is earthed. The equipment frames are connected to a separate earth.
- TN: The neutral point of the LV transformer and the equipment frames are connected to the same earth.
- IT: The neutral point of the LV transformer is unearthed. The equipment frames are earthed.

The earthing systems (and associated automatic breaking techniques) have been defined to guarantee protection of people against indirect contacts.

Range of circuit breakers

The Merlin Gerin and Telemecanique circuit-breaker ranges cover all the requirements of LV electrical power distribution from 0.5 to 6300 A, i.e.:
- the Merlin Gerin 630 to 6300 A Masterpact and power circuit-breaker ranges,
- the range of Compact moulded case circuit-breakers (MCCB):
  - Compact CM from 1250 to 3200 A,
  - Compact C from 800 to 1250 A,
  - Compact NS from 100 to 630 A,
- the 0.5 to 125 A Multi 9 NG125, C60, DPN miniature circuit-breaker ranges,
- the Telemecanique Integral/GV2/GV7 motor protection circuit-breaker ranges.

These products meet product standards BSEN 60947-2.

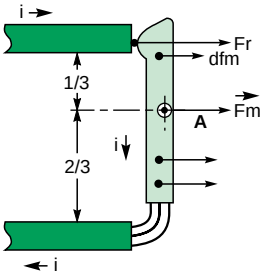
The Merlin Gerin and Telemecanique distribution and motor protection circuit-breaker ranges have been developed coherently. Their coordination has been tested as per BSEN 60947-2 and is guaranteed by Schneider Electric. The complete tables giving coordination, cascading and discrimination of circuit-breakers are available.

For power circuit-breakers

The technologies of Merlin Gerin Masterpact range ideally meets the discrimination needs at the supply end of the installation as well as specific limitation requirements relating to certain applications.

The selective pole technology

Important discrimination requires enhancement of the switchgear s electrodynamic withstand, using the own current compensation effect.



Contact pressure is proportional to I^2 in the loop.

Electromagnetic compensation

This technology is used in all the Masterpact NW.

The limiting pole technology

A high limiting capacity is enabled by:

- a fixed pole with current loop and magnetic U,
- one axis of the moving pole positioned at its end.

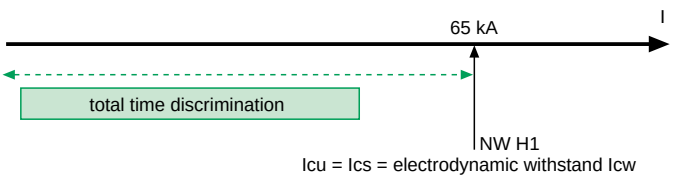
Masterpact and NW and H1

This performance is ideal on the most common industrial and large commercial sites (Isc < 65 kA). It guarantees total discrimination with the downstream Compact NS circuit-breakers.

For this performance, breaking capacity is equal to thermal withstand Ics = Icw.

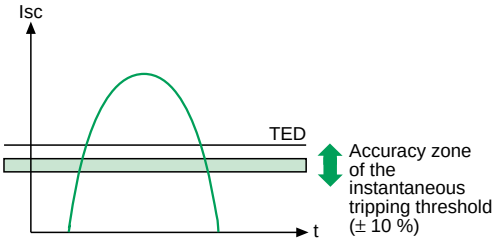
This allows the switchgear to withstand the maximum short-circuit current throughout the short time delay.

Masterpact NW H2

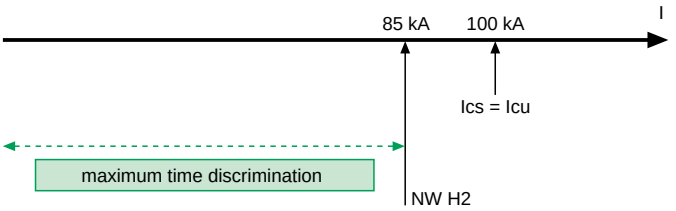


When the short-circuit level at the device installation point is greater than its thermal withstand, its breaking capacity must be greater than its thermal withstand Ics > Icw.

An internal protection is now required to prevent the switchgear being damaged. This is an instantaneous tripping device set in the factory to a threshold just below electrodynamic withstand (EDW).



Accuracy zone of the instantaneous tripping threshold (+/- 10%)



Icw = thermal withstand = self-protection DIN threshold

Limited time discrimination

Widespread use of air current transformers enables, thanks to more accurate measurement (no saturation) the thermal withstand threshold to be approached, thus markedly enhancing the discrimination level by delaying instantaneous tripping.

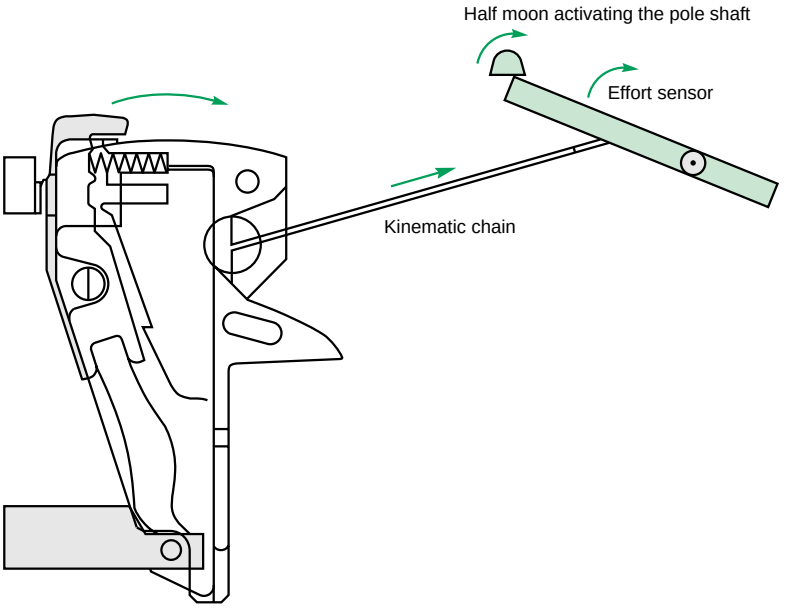
For large industrial sites (Isc < 100 kA), this performance guarantees total discrimination with the downstream Compact NS.

Masterpact NW H3
Just as for the Masterpact H2, the level of performance Ics > Icw also requires calibration of instantaneous tripping.

In order to break an assumed fault current of 150 kA, very early action is required. It is impossible to wait for passage of the first fault current wave as the device s thermal withstand is far lower.

The technology of the electronic measurement channel associated with the mechanical action of the tripping coil does not allow a sufficiently fast reaction. The technology used in Masterpact NW circuit-breakers has been patented.

When a high short-circuit current appears, it creates an electromagnetic force that pushes the pole and moves it apart. The pole movement activates a catch by means of a kinematic chain. The movement of this catch directly releases the pole shaft before intervention of the electronic measurement chain.



This tripping by mechanical system occurs at the same time as the electronic measurement chain that will confirm circuit-breaker opening and indicate the front face fault.
This system allows:
- a high thermal withstand to be maintained: Icw = 65 kA 1s,
- beyond Icw, an ultra fast tripping guaranteeing an Icu up to 150 kA.

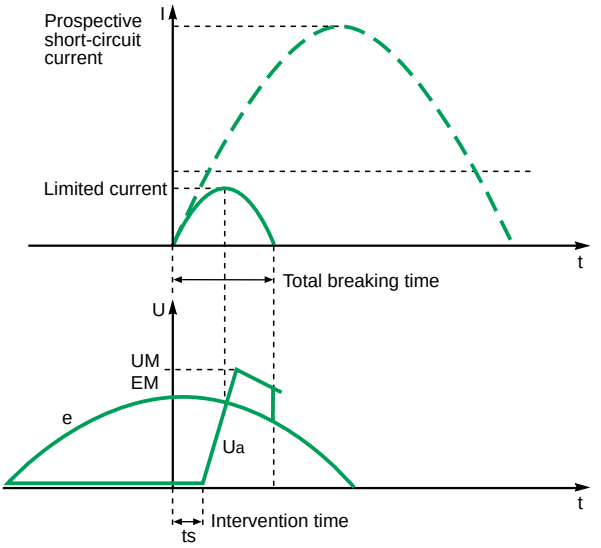
This performance is ideal for multisource installations with a high short-circuit current (> 100 kA) on the main busbar and for which continuity of supply is essential. Discrimination with the downstream Compact NS is total as standard.

Masterpact NW
The Masterpact NW L1 combines all performances:
- a breaking capacity up to 200 kA/400 V for the UL range,
- a thermal withstand of 37 kA/400 V,
- an important limiting capacity (NW L1 assumed Isc = 390 kA to 380/415 V, limited Isc = 170 kA).

It therefore uses the technologies described above:
- selective pole like the other switchgear in order to reach a thermal withstand of 30 kA/400 V,
- automatic unlatching of the circuit breaker operating mechanism to produce ultra fast tripping.

To obtain a high limiting capacity, the fixed pole has been modified. This modification has been patented.

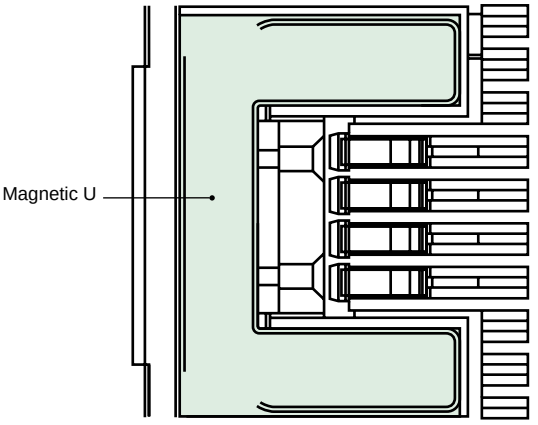
Limiting capacity depends on the arc voltage created between the fixed pole and the moving pole on opening. It must be established early on and quickly increase to a high value.

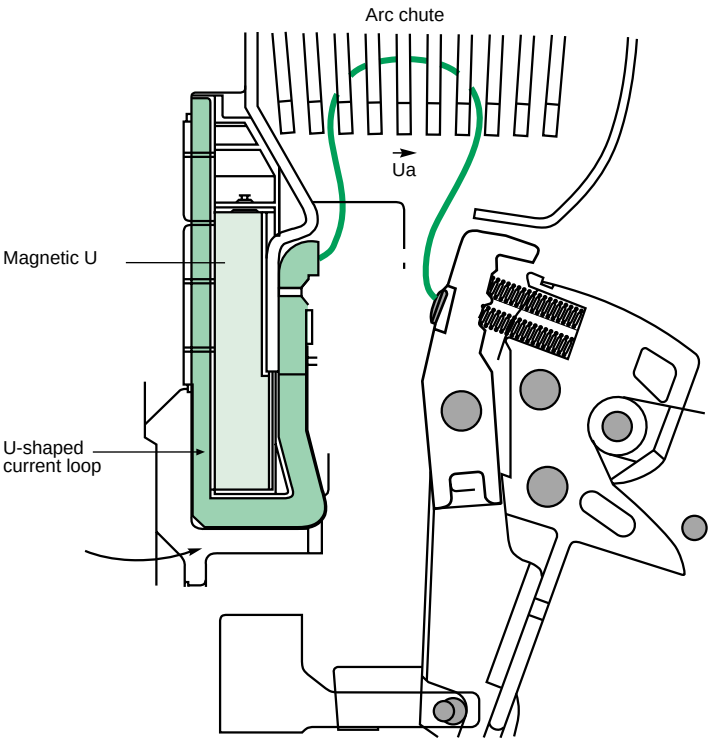


For this purpose, repulsion force must be increased and arc projection encouraged in the arc chute.

■ Use of a U-shaped current loop to increase the repulsion force.

■ Use of a magnetic U around the fixed pole to concentrate field lines and project the arc in the arc chute, early on, quickly and high.





On a high short-circuit, the poles open very slightly and the magnetic U then projects the arc in the arc chutes. The fault current is diverted. The automatic unlatching of the circuit breaker operating mechanism then quickly opens the circuit-breaker.

This performance meets the limitation needs of fault currents while at the same time guaranteeing an unmatched level of discrimination of 37 kA for this circuit-breaker type.

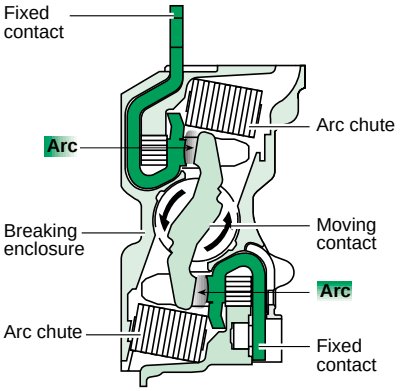
To enhance breaking performance and obtain a high short-circuit current limitation on devices theoretically not very limiting, a trip unit is used, not based on the instantaneous value of the current but on a drift whose peculiarity is not to trip on the first fault current half wave. When a short-circuit current appears, the downstream circuit-breaker opens as soon as the fault current is greater than its tripping threshold and eliminates the fault in less than one half-wave.

For moulded case circuit-breakers (MCCB)

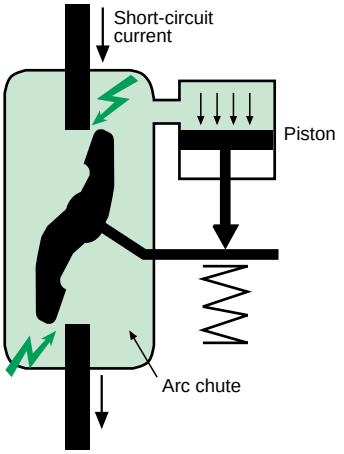
The Merlin Gerin and Telemecanique moulded case circuit-breaker (MCCB) ranges are designed to provide users with maximum energy availability. The MCCB:
- give an optimum response to discrimination problems,
- are very limiting, even on high short-circuits, in order to drastically reduce stresses on intermediate distribution.

The 100 to 630 A Compact NS range is mainly used:
- to protect intermediate distribution,
- to protect lines supplying large loads.

This range implements an innovating technique: **roto-active breaking.**



Roto-active breaking: repulsion of contacts



Roto-active breaking: tripping by pressure

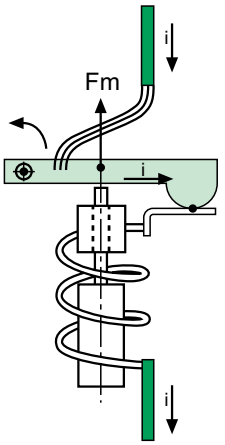
This high current limiting technique uses a new tripping energy, pressure, resulting from arc energy.
Its operation is described below:
- Each circuit-breaker pole has an enclosure in which a rotating contact generates, by electromagnetic repulsion, two serial arcs on occurrence of the short-circuit current.
- A piston and spring device uses the pressure from arc energy to cause — beyond a certain threshold (roughly 35 In) — a reflex tripping, roughly 3 ms after contact repulsion.
- Up to this threshold, pressure is not sufficient to cause tripping and arc impedance limits the short-circuit current.
- Beyond this threshold, breaking is very quick (1 ms) and limits still further the short-circuit current.

The enclosure parts are sized to match circuit-breaker size.
Consequently, limitation is greatest when rating is smallest.
This technique provides Compact NS **with an outstanding limiting capacity** and thus with increased **discrimination** possibilities.
This technique is also very useful for limiting stresses on electrical power distribution.

Trip units
The Compact NS are equipped with a thermal magnetic or electronic type trip unit.
Setting of the Long Time (LT) thresholds ensures current discrimination.
Short Time (ST) protection has as standard a mini time delay of 5 to 7 ms according to sizes allowing time discrimination for short-circuits of average value beyond the Short Time (ST) tripping threshold of the upstream circuit-breaker D1.

For miniature circuit-breakers

The Merlin Gerin C60H/NG125 Miniature circuit-breaker ranges have the necessary performance and characteristics to meet final distribution requirements:



- a nominal rating of 0.5 to 125 A,
- a breaking capacity of up to 50 kA as per BSEN 60947-2,
- tripping curves B, C, D and MA,
- simple, safe installation system on DIN rail,
- Vigi module can easily be clipped onto the protection devices,
- C60H is also available as a singe pole wide Rcbo,

The Multi 9 **circuit-breakers** are designed according to magnetic actuator principles, thus allowing very quick development of arc voltage.

The discrimination rules from 1 to 6300 A

The **Masterpact circuit-breakers** provide **total discrimination** with **all** the downstream circuit-breakers if the 4 following conditions are met:
- the ratio between Long Time settings of the 2 devices is 1.6,
- the ratio between Short Time settings is 1.5,
- the intentional time delay settings are compatible,
- setting of the instantaneous threshold, if any, must be on OFF.

General discrimination rules (in distribution)

■ **Overload protection**

□ upstream and downstream circuit-breakers equipped with a thermal magnetic trip unit.

The current discrimination of Merlin Gerin and Telemecanique circuit-breakers is provided if the ratio of the **tripping thresholds**:
- thermal is greater than **1.6**
- **magnetic** is greater than **2**.

□ upstream circuit-breaker equipped with an electronic trip unit and downstream . circuit-breaker equipped with a thermal magnetic trip unit.

Current discrimination of the Merlin Gerin and Telemecanique circuit-breakers is provided if the ratio of the **tripping thresholds:**
- **Long Time (LT) and thermal** is greater than **1.6(*) to 2.5,**
- **Short Time (ST) and magnetic** is greater than **1.5.**

□ upstream and downstream circuit-breakers equipped with an electronic trip unit.

Current discrimination of the Merlin Gerin and Telemecanique circuit-breakers is provided if the ratio of the **tripping thresholds:**
- **Long Time (LT)** is greater than **1.2(*) to 1.6,**
- **Short Time (ST)** is greater than **1.5.**

(*) Upstream trip unit equipped with a time-delayable LT threshold.

■ **Short-circuit protection**

□ **time discrimination**

Time discrimination of Merlin Gerin and Telemecanique circuit-breakers is provided as soon as there is a difference of one time delay band between the upstream and the downstream device.

□ **logic discrimination**

Discrimination is always total.

Discrimination rules for Masterpact NW

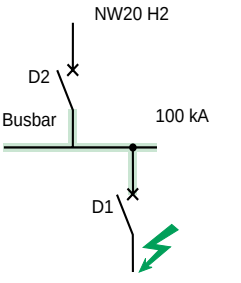
■ **Masterpact NW of the H1 type**

Time discrimination is always total with a Masterpact H1 upstream (Icw = Icu) regardless of the circuit-breaker placed downstream.

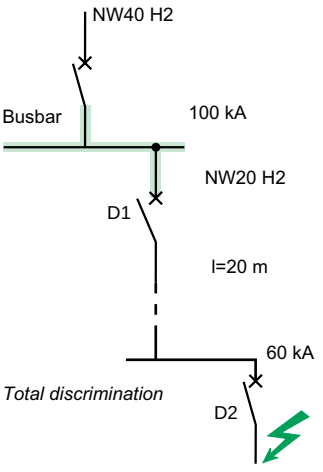
■ **Masterpact NW of the H2 and H3 type**

Time discrimination is provided up to the thermal withstand threshold, i.e.:
□ 86 kA for a Masterpact NW H2,
□ 65 kA for a Masterpact NW H3.

At the MSB:
- discrimination is partial (figure 1) between an incomer D1 and a feeder D2.
- discrimination is often total (figure 2) between a feeder D1 and a device D2 placed in a subdistribution switchboard at some distance.



Discrimination limited to 86 kA



Total discrimination

"Natural" discrimination rules between Compact NS

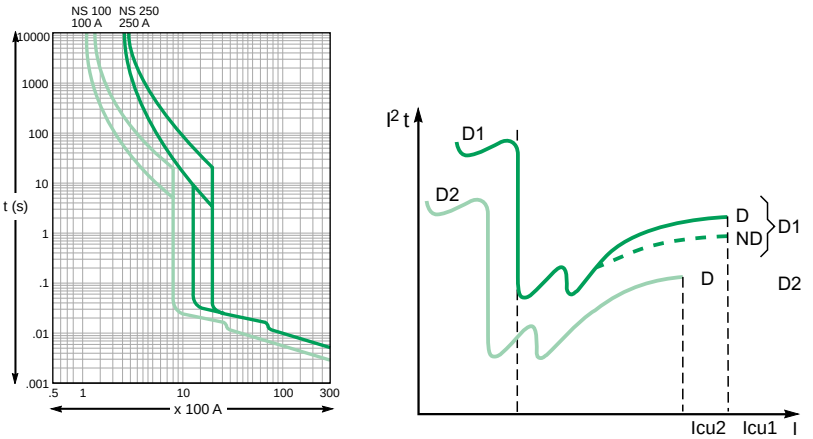
■ **Discrimination between distribution circuit-breakers**
With Compact NS, simple discrimination rules can be drawn up due to the new implementation techniques.

■ **Overload protection: current discrimination**
As in the general case, current discrimination between Compact NS circuit-breakers is provided if the ratio of the tripping thresholds:
- Long Time (LT) is greater than **1.2 to 2.5,**
- Short Time (ST) is greater than **1.5 to 2,**
according to the types of trip units equipping the devices.

■ **Low value short-circuit protection:**
time discrimination:
Tripping of the upstream device D1 is slightly time delayed up to reflex tripping. Consequently, as the downstream circuit-breaker is of a lower rating — current size — it will be far quicker and will break in a time less than the time delay of the upstream circuit-breaker.
This discrimination, of the time type, is applicable up to reflex tripping of the upstream device (roughly 35 In).
The protection between Compact NS is selective if the ratio between the **physical sizes (ratings)** of the circuit-breakers is greater than **2.5**.

■ **High value short-circuit protection: energy discrimination**
The breaking technique developed in Compact NS — outstanding limitation and reflex tripping- allows natural staging of D2 tripping and D1 non-tripping energy curves.

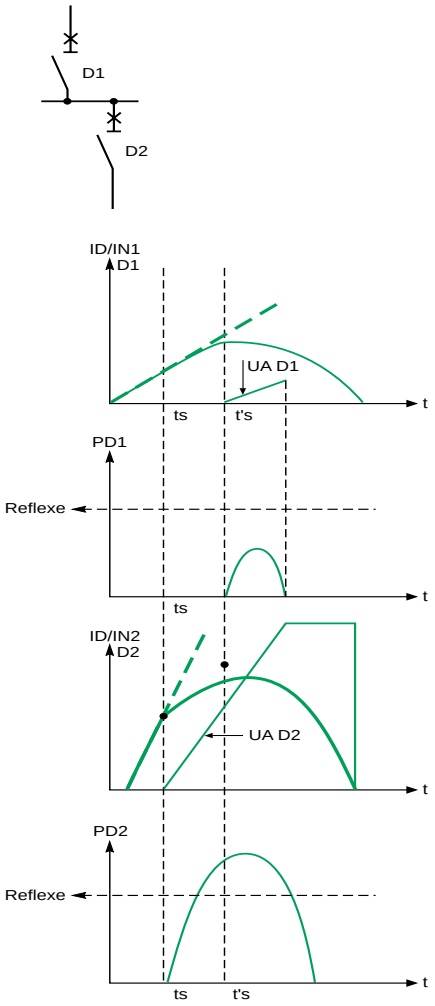
■ **Principle**
When a very high short-circuit is detected by circuit-breakers D1 and D2, the device contacts open slightly at the same time, thus limiting current.
■ The arc energy, high at D2, causes it to trip.
■ The arc energy, limited at D1, is not sufficient for it to trip.
As a result, as the downstream circuit-breaker is of a lower rating — current size — it will be more limiting. It will break with a current limitation such that the fault energy is markedly less than the tripping threshold of the upstream circuit-breaker.



Tripping curves of a Compact NS100 and 250 and discrimination types

This technique allows rules for discrimination between devices to be standardised. Protection between Compact NS is selective if the ratio between **physical sizes (ratings)** of the circuit-breakers is greater than **2.5**.

In the extension of current and time discrimination, this discrimination is known as **"energy discrimination"**.



Discrimination enhanced by cascading: principle

Discrimination enhanced by cascading with the Compact NS

With traditional circuit-breakers, when cascading is implemented between two devices, discrimination is obtained by tripping of the upstream circuit-breaker D1 to help downstream circuit-breaker D2 to break the current. The discrimination limit has a value Is at most equal to the breaking capacity IcuD2 of the downstream circuit-breaker.

In the case of Compact NS type circuit-breakers, the breaking technique implemented on high short-circuit currents increases the discrimination limit.

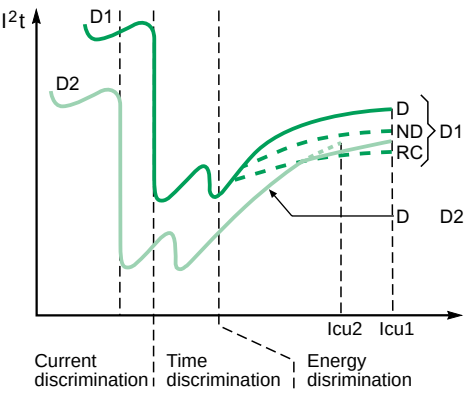
■ The Compact NS downstream D2 sees a very high short-circuit current. Reflex tripping causes it to trip very quickly (< 1 ms) with a very great limitation of the fault current.

■ The Compact NS upstream D1 sees a very limited fault current. This current generates repulsion of the contacts/RC curve, resulting in an arc voltage limiting still further the short-circuit current. However arc pressure is not sufficient to cause reflex tripping.

Thus the Compact NS D1 helps the Compact NS D2 to break the current without tripping.

The discrimination limit Is can exceed the breaking capacity IcuD2 of the downstream circuit-breaker and reach the breaking capacity enhanced by cascading.

Discrimination then becomes total with an optimised device cost



Discrimination enhanced by cascading: curves

Advantage of Total Discrimination as standard with Compact NS

The immediate advantage is making total discrimination with Compact NS natural as soon as:

□ staging of the LT and ST settings is greater than or equal to 1.5,

□ staging of the nominal device ratings is greater than or equal to 2.5.

The figure above illustrates the three types of discrimination.

Specific applications

Comparison with fuses

This rule can be compared with that used for fuse combinations when the ratio of the current ratings must be greater than 1.6.
However, compared with fuse combinations:

- distribution circuit-breaker,
- the enhanced discrimination tables, depending on test results, often make it possible to come down to comparable ratios,
- the possibility of obtaining discrimination and cascading with downstream circuit-breakers (enhanced discrimination),
- motor protection circuit-breaker,
- motor protection circuit-breakers are ideally sized for the motor rating, whereas the fuse must be oversized with respect to motor nominal rating.

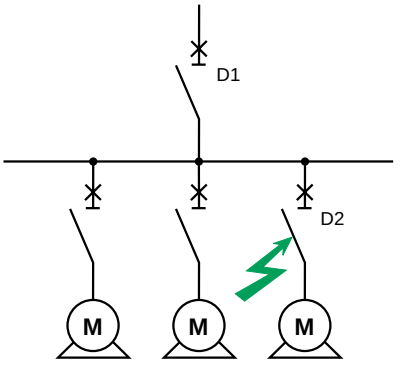
The combination benefits from all the possibilities offered by the additional integrated functions relating to circuit-breakers. The discrimination ratio is then equivalent.

In this sense, the Compact NS combine the following:

- qualities of fuses with respect to high short-circuits,
- qualities naturally greater for treating overload faults and low value short-circuits, discrimination rules,
- advantages relating to additional functions and the communication potential of circuit-breakers.

Discrimination between a distribution circuit-breaker and a protection circuit-breaker

The qualities of the Compact NS enable them to be used in motor protection.



Discrimination of circuit-breakers in motor protection

Summary

The following table summarises the conditions to be met to obtain total discrimination

D1	application	D2	ratio between the upstream and downstream settings thermal protection upstream Ir / downstream Ir	 magnetic protection upstream Im / downstream Im
TM…D	Distribution	TM…D	⩾ 1,6	⩾ 2
		STR…SE/GE	⩾ 1,6	⩾ 1,5
	Motor	MA + separate thermal relay	⩾ 3	⩾ 2
		motor thermal magnetic	⩾ 3	⩾ 2
		STR…ME	⩾ 3	⩾ 1,5
STR…2 or 3 fixed LT time delay	Distribution	TM…D	⩾ 2,5	⩾ 1,5
		STR…SE/GE	⩾ 1,6	⩾ 1,5
	Motor	MA + separate thermal relay	⩾ 3	⩾ 1,5
		motor thermal magnetic	⩾ 3	⩾ 1,5
		STR…ME	⩾ 3	⩾ 1,5
Micrologic 2.0, 5.0, 6.0 and 7.0 STR...4, 5 or 6 adjustable LT time delay shifted on the upper band with respect to the downstream protection	Distribution	TM…D	⩾ 1,6	⩾ 1,5
		STR…SE/GE, Micrologic	⩾ 1,2	⩾ 1,5
	Motor	MA + separate thermal relay	⩾ 3	⩾ 1,5
		motor thermal magnetic	⩾ 3	⩾ 1,5
		STR…ME, Micrologic	⩾ 3	⩾ 1,5

Implementation of discrimination and cascading

Discrimination tables

The tables in section 3 show the discrimination possibilities of the Merlin Gerin circuit-breakers with one another.
Depending on whether or not there is cascading, the results come from a comparison of characteristics or tests.

Conditions of use
Conditions of use are specified: circuit-breakers can be used in distribution or motor protection.

Reading the tables
The shaded boxes and boxes containing a **"T"** correspond to total discrimination between the relevant upstream and downstream circuit-breakersunder all fault conditions.
For the other boxes, discrimination is either partial (indicated discrimination limit) or there is no discrimination (boxes with no value mentioned).

Tables of discrimination enhanced by cascading with Compact NS
With Compact NS type circuit-breakers, the cascading implemented between two devices increases the discrimination limit.
This can consequently reach the breaking capacity enhanced by cascading and discrimination then becomes total.
This is expressed in enhanced discrimination tables with these circuit-breakers see page 45.

Cascading tables

The tables in section 3 give,in 220/240 V and 400/415 V phase-to-phase distribution and then in motor protection, the cascading possibilities according to BSEN 60947-2 between circuit-breakers:
- Multi 9 with Multi 9,
- Compact NS, Compact, Masterpact with Multi 9 and with one another.

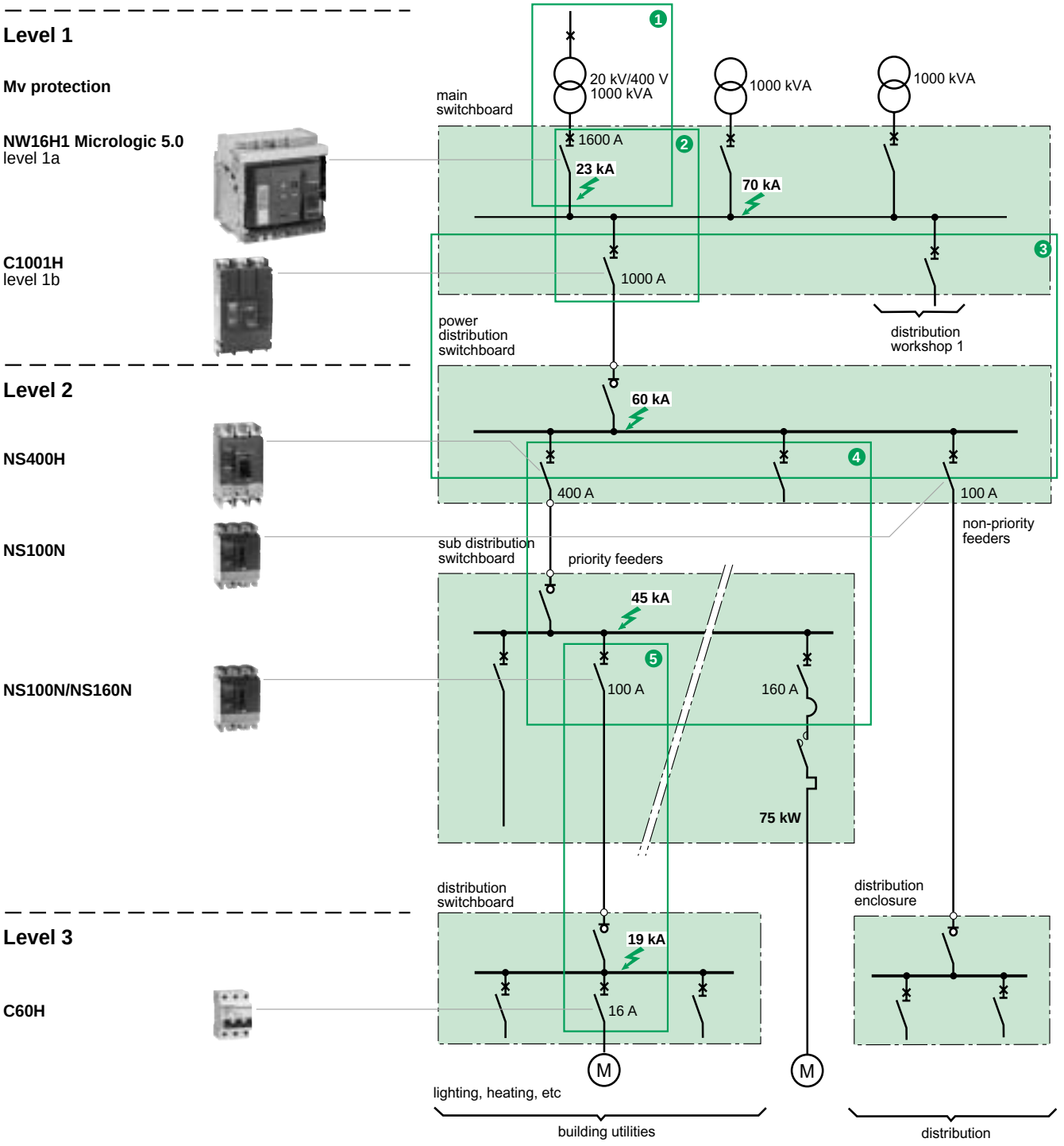
For circuit-breakers used in single-phase on a TN system, the 220/240 V table is used.

NB: The cascading tables are given for an earthing system of the TN or TT type. They do not apply to the IT systems.

Case of several parallel-connected transformers
In this case, specific tables must be used which give the types of circuit-breaker to be installed on the source feeders and on the main feeders in the case of 2 or 3 parallel-connected transformers.
They are drawn up with the following assumptions:
- short-circuit power of the upstream network of 500 MVA,
- coupled transformers are identical (20 kV/410 V) and have a standard short-circuit voltage,
- the short-circuit current on the busbar does not allow for link impedances (most unfavourable case),
- the conditions for parallel-connecting of transformers are met, i.e. the transformers have:
  - the same Usc,
  - the same ratio,
  - a ratio of powers ≤ 2.

Isc is given for information, it may vary according to the Usc as a % given by the transformer manufacturers. The values of the breaking capacities enhanced by cascading are thus given for higher values.

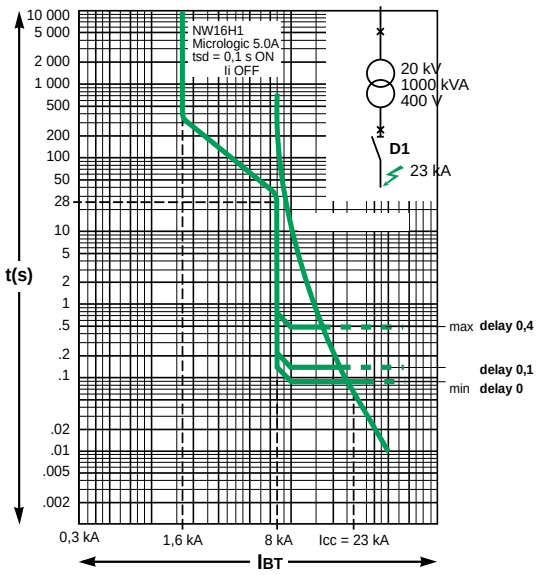
Study of MV/LV discrimination from 1 to 6300 A



Simplified diagram of a standard installation covering most of the cases observed in practice.

The figure shows the implementation of the coordination of the various protection devices in a HV/LV distribution.

Implementation of discrimination and cascading



At the Main switchboard Level

■ **Discrimination with the HV** ❶

The 2 protection devices are in "series". Consequently, the advantages of continuity of supply linked to discrimination between protection devices do not appear interesting. Nevertheless, the main advantage of HV/LV discrimination is that resumption of operation is less restrictive in LV (accessibility, padlocking).
Comparison of the tripping curves brought to the secondary of the HV/LV transformer shows that discrimination between the Masterpact NW16 and the upstream is:

□ **total:** if the Masterpact has a tripping without intentional time delay,

□ **almost total:** if the Masterpact NW has a tripping with intentional time delay at band 0,1 (Micrologic 5.0 A at 0.4 ON at 0.1 ON), at worst the discrimination limit is at 23 kA (1).

1) The parallel-connection of 2 transformers creates an Isc on the common BB of 70 kA, but each source transformer only sees an Isc of 23 kA.
NB: discrimination is total with an upstream HV circuit-breaker.

■ **Discrimination with the downstream LV part** ❷

According to the rule laid down on page 36, the Masterpact NW16H1 circuit-breaker at band 0.1 is completely selective with all the downstream circuit-breakers:

□ if they have an intentional time delay one band lower. In this case, they must not have an intentional time delay (band 0),

□ if the ratio of ratings is ≤ 1.3.

Consequently, the Masterpact NW16H1 is totally selective with the downstream C1001H.

Cascading

There is no cascading between the NW16H1 and C1001H circuit-breakers.

At the power distribution switchboard ❸

■ Cascading between the C1001H and the NS400/NS100, by enhancing the breaking capacity of the NS, enables use of N type NS.
■ The discrimination tables show that use of N type NS circuit-breakers is "totally selective" with the C1001H. This discrimination is limited to the intrinsic breaking capacity of the downstream device, i.e. respectively 25 kA for the NS100N and 45 kA for the NS400N.

At installation level (figure on page 41), the NS100 supplies non-priority feeders. Consequently, implementation of a Compact NS100 of the N type ensuring discrimination up to 25 kA is an optimised protection solution.
On the other hand, the NS400 supplies loads requiring a high electrical power availability. Total discrimination for the user, i.e. up to the assumed Isc level, is necessary. An H type NS400 must then be installed, that provides this performance due to the very great limiting capacity of this circuit-breaker.

At the subdistribution switchboard ❹

Downstream of the NS400H circuit-breaker, coordination with the NS160N circuit-breaker is provided thanks to enhanced cascading:
■ with enhancement of breaking capacity of the NS160N (up to 70 kA),
■ enhancement of discrimination (up to the enhanced breaking capacity of NS160N, i.e. 70 kA).
Discrimination is total.

Motor protection circuit-breaker
Coordination with upstream distribution
The motor power (75 kA) requires at 400 V a protection by an NS160 MA circuit-breaker set at 150 A. Coordination performance is identical to that established for distribution protection, i.e.
■ enhancement of breaking capacity of the NS160 MA,
■ with enhancement of discrimination (up to the enhanced breaking capacity of NS160 MA, i.e. 70 kA).

Coordination at motor feeder level
The limiting qualities of the NS160 circuit-breaker results in a type 2 coordination with standard components: Telemecanique contactors and thermal protection relay. This coordination is guaranteed by Schneider Electric.

NB: Protection by fuse results in oversizing of the motor feeder components to obtain a type 2 coordination.

At the final distribution switchboard ❺

Despite the Isc level, at this point of the installation, coordination performance between the Compact NS and M9 ranges ensures total discrimination using a standard C60H.

Total discrimination of this installation was provided between:
■ HV and LV,
■ on 5 stages of LV distribution

Schneider Electric also provides a software to assist with defining circuit-breakers, **Ecodial**. It optimises choice of circuit-breakers and their settings according to the installation type.

Cascading, and enhanced discrimination

Upstream: Compact NS100 to C1251H
Downstream: Circuit breaker Multi 9/Integral/GV2/Compact NS100 to 630

With traditional circuit breakers, cascading between two devices generally results in the look of discrimination.

With Compact NS circuit breakers, the discrimination characteristics in the tables remain applicable and are in some cases even enhanced. Protection discrimination is ensured for short-circuit currents greater than the rated breaking capacity of the circuit breaker and even, in some cases, for its enhanced breaking capacity. In the latter case, **protection discrimination Ia total**, i.e. only the downstream device trips for any and all possible faults at its point in the installation.

Example

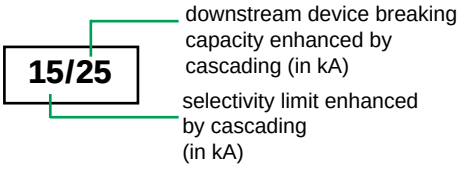
Consider a combination between:
- a Compact NS250N with trip unit TM250D
- a Compact NS100N with trip unit TM100D.

The discrimination tables indicate total discrimination. Protection discrimination is therefore ensured up to the breaking capacity of the NS100N, i.e. **25 kA**.
The cascading tables indicate an enhanced breaking capacity of **36 kA**.

The enhanced discrimination tables indicate that in a cascading configuration, discrimination is ensured up to **36 kA**, i.e. for any and all possible faults at that point in the installation.

Enhanced discrimination tables - 380/415 V

For each combination of two circuit breakers, the tables indicate the:

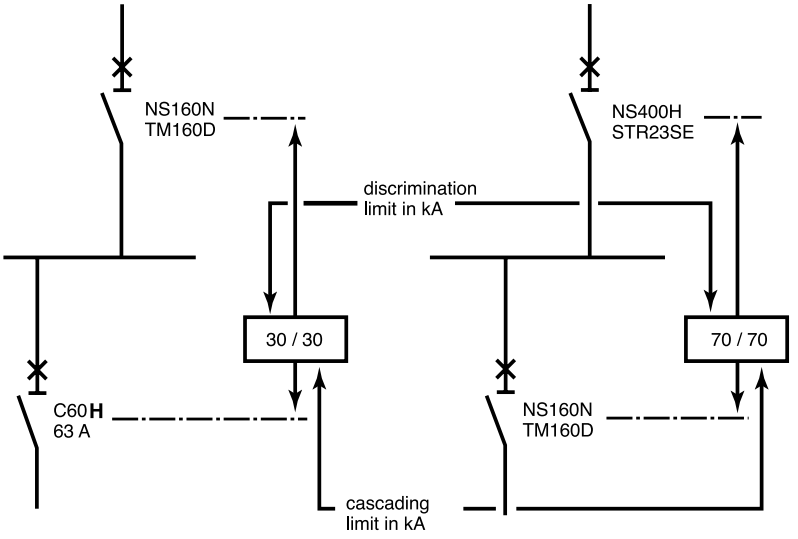


In a table, a box containing two equal values indicates that discrimination is provided up to the reinforced breaking capacity of the downstream device.

These tables apply only to cases with combined discrimination and cascading between two devices. For all other cases, refer to the normal cascading and discrimination tables.

Technical principle

Enhanced discrimination is the result of the exclusive Compact NS Roto-active breaking technique which operates as follows:
- due to the short-circuit current (electrodynamic forces), the contacts in both devices simultaneously separate. The result is major limitation of the short-circuit current
- the dissipated energy provokes the reflex tripping of the downstream device, but is insufficient to trip the upstream device.



Cascading, and enhanced discrimination

Upstream: Compact NS100 to NS250 Trip unit TM-D
Downstream: Multi 9

Upstream			NS160N		NS160H		NS160L		NS250N	NS250H	NS250L
Breaking capacity			36 kA		70 kA		150 kA		36 kA	70 kA	150 kA
Trip unit			TM-D		TM-D		TM-D		TM-D	TM-D	TM-D
Downstream		Rating	80	100/125/160	80	100/125/160	80	100/125/160	160/200/250	160/200/250	160/200/250
C60H	15 kA	≤ 16	30/30	30/30	40/40	40/40	40/40	40/40	30/30	40/40	40/40
		20	30/30	30/30	40/40	40/40	40/40	40/40	30/30	40/40	40/40
		25	30/30	30/30	40/40	40/40	40/40	40/40	30/30	40/40	40/40
		32	15/30	30/30	15/40	40/40	15/40	40/40	30/30	40/40	40/40
		40	15/30	30/30	15/40	40/40	15/40	40/40	30/30	40/40	40/40
		50	15/30	30/30	15/40	40/40	15/40	40/40	30/30	30/30	30/30
		63		30/30		40/40		40/40	30/30	30/30	30/30
NC100H	10 kA	50							25/25	30/30	30/30
		63							25/25	30/30	30/30
		80							25/25	30/30	30/30
		100							25/25	30/30	30/30
NC100LS	36 kA	≤ 16			70/70	70/70	100/100	100/100		70/70	100/100
		20 - 25			70/70	70/70	100/100	100/100		70/70	100/100
		32 - 40			70/70	70/70	100/100	100/100		70/70	100/100
		50 - 63			70/70	70/70	100/100	100/100		70/70	100/100
NC100LH	50 kA	≤ 16			70/70	70/70	150/150	150/150		70/70	150/150
		20 - 25			70/70	70/70	150/150	150/150		70/70	150/150
		32 - 40			70/70	70/70	150/150	150/150		70/70	150/150
		50 - 63			70/70	70/70	150/150	150/150		70/70	150/150
NG125N	25 kA	≤ 16	36/36	36/36	36/36	36/36	70/70	70/70	36/36	36/36	70/70
		20 - 25	36/36	36/36	36/36	36/36	70/70	70/70	36/36	36/36	70/70
		32 - 40	36/36	36/36	36/36	36/36	70/70	70/70	36/36	36/36	70/70
		50 - 63							36/36	36/36	70/70
		80							36/36	36/36	70/70
		100							36/36	36/36	70/70
		125							36/36	36/36	70/70
NG125H	36 kA	≤ 16			50/50	50/50	100/100	100/100		50/50	100/100
		20 - 25			50/50	50/50	100/100	100/100		50/50	100/100
		32 - 40			50/50	50/50	100/100	100/100		50/50	100/100
		50 - 63								50/50	100/100
		80								50/50	100/100

Note: *respect the basic overload and short-circuit discrimination rules*

Upstream: Compact NSC100 TM-D

Downstream: Multi 9

Upstream			NSC100N			
Breaking capacity			18 kA			
Trip unit			TM-D			
Downstream		Rating	63	70	80	100
C60H	10 kA	≤ 16	18/18	18/18	18/18	18/18
		20	18/18	18/18	18/18	18/18
		25	18/18	18/18	18/18	18/18
		32	6/18	6/18	6/18	8/18
		40		6/18	6/18	8/18
		50			6/18	6/18
		63				6/18

Cascading, and enhanced discrimination

Upstream: Compact NS160 to NS250 Trip unit STR
Downstream: Multi 9

Upstream			NS160N		NS160H		NS160L		NS250N	NS250H	NS250L
Breaking capacity			36 kA		70 kA		150 kA		36 kA	70 kA	150 kA
Trip unit			STR22SE		STR22SE		STR22SE		STR22SE	STR22SE	STR22SE
Downstream		Rating	80	160	80	160	80	160	250	250	250
C60H	15 kA	≤ 16	30/30	30/30	40/40	40/40	40/40	40/40	30/30	40/40	40/40
		20	30/30	30/30	40/40	40/40	40/40	40/40	30/30	40/40	40/40
		25	30/30	30/30	40/40	40/40	40/40	40/40	30/30	40/40	40/40
		32		30/30		40/40		40/40	30/30	40/40	40/40
		40		30/30		40/40		40/40	30/30	40/40	40/40
		50		30/30		40/40		40/40	30/30	30/30	30/30
		63		30/30		40/40		40/40	30/30	30/30	30/30
NC100H	10 kA	50							25/25	30/30	30/30
		63							25/25	30/30	30/30
		80							25/25	30/30	30/30
		100							25/25	30/30	30/30
NC100LS	36 kA	≤ 16			70/70	70/70	100/100	100/100		70/70	100/100
		20 - 25			70/70	70/70	100/100	100/100		70/70	100/100
		32 - 40				70/70		100/100		70/70	100/100
		50 - 63				70/70		100/100		70/70	100/100
NC100LH	50 kA	≤ 16			70/70	70/70	150/150	150/150		70/70	150/150
		20 - 25			70/70	70/70	150/150	150/150		70/70	150/150
		32 - 40				70/70		150/150		70/70	150/150
		50 - 63				70/70		150/150		70/70	150/150
NG125N	25 kA	≤ 16	36/36	36/36	36/36	36/36	70/70	70/70	36/36	36/36	70/70
		20 - 25	36/36	36/36	36/36	36/36	70/70	70/70	36/36	36/36	70/70
		32 - 40		36/36		36/36		70/70	36/36	36/36	70/70
		50 - 63							36/36	36/36	70/70
		80							36/36	36/36	70/70
		100							36/36	36/36	70/70
		125							36/36	36/36	70/70
NG125H	36 kA	≤ 16			50/50	50/50	100/100	100/100		50/50	100/100
		20 - 25			50/50	50/50	100/100	100/100		50/50	100/100
		32 - 40				50/50		100/100		50/50	100/100
		50 - 63								50/50	100/100
		80								50/50	100/100

Note: *respect the basic overload and short-circuit discrimination rules.*

Cascading, and enhanced discrimination

Upstream: Compact NS250 to NS630
Downstream: NSC100N, NS100 to NS250

Upstream: Compact NS250

Downstream: Compact NS100 to NSA160

Upstream			NS250N			NS250H			NS250L			NS250N	NS250H	NS250L
Breaking capacity			36 kA			70 kA			150 kA			36 kA	70 kA	150 kA
Trip unit			TM-D			TM-D			TM-D			STR22SE		
Downstream		Rating	160	200	250	160	200	250	160	200	250	250	250	250
NSC100N	18 kA	16 - 100	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	36/36	50/50	50/50
NS100N	25 kA	≤ 25	36/36	36/36	36/36	70/70	70/70	70/70	150/150	150/150	150/150	36/36	70/70	150/150
Trip unit TM-D		40 - 100	36/36	36/36	36/36	36/70	36/70	36/70	36/150	36/150	36/150	36/36	36/70	36/150
NS100H	70 kA	≤ 25							150/150	150/150	150/150			150/150
Trip unit TM-D		40 - 100							36/150	36/150	36/150			36/150
NS100N	25 kA	Trip unit STR22SE	36/36	36/36	36/36	36/70	36/70	36/70	36/150	36/150	36/150	36/36	36/70	36/150
		Trip unit STR22ME	36/36	36/36	36/36	36/70	36/70	36/70	36/150	36/150	36/150	36/36	36/70	36/150
NS100H	70 kA	Trip unit STR22SE							36/150	36/150	36/150			36/150
		Trip unit STR22ME							36/150	36/150	36/150			36/150

Note: *respect the basic overload and short-circuit discrimination.*

Upstream: Compact NS400 to C1251

Downstream: Compact NS100 to NS630

Upstream			NS400N	NS400H	NS400L	NS630N	NS630H	NS630L	C801N	C801H	C1001N	C1001H	C1251N	C1251H
			45 kA	70 kA	150 kA	45 kA	70 kA	150 kA	50 kA	70 kA	50 kA	70 kA	50 kA	70 kA
Trip unit			STR23SE or STR53UE			STR23SE or STR53UE			STR45AE		STR45AE		STR45AE	
Downstream		Rating	400	400	400	630	630	630	800	800	1000	1000	1250	1250
NSC100N	18 kA	16 - 100	36/36	50/50	50/50	36/36	50/50	50/50						
NS100N	25 kA	all TM-D-G-MA	45/45	70/70	150/150	45/45	70/70	150/150	50/50	70/70	50/50	70/70	50/50	70/70
NS100H	70 kA	all TM-D-MA			150/150			150/150						
NS160N	35 kA	all TM-D-MA	45/45	70/70	150/150	45/45	70/70	150/150	50/50	70/70	50/50	70/70	50/50	70/70
NS160H	70 kA	all TM-D-MA			150/150			150/150						
NS250N	35 kA	all TM-D-MA				45/45	70/70	150/150	50/50	70/70	50/50	70/70	50/50	70/70
NS250H	70 kA	all TM-D-MA						150/150						
NS100N	25 kA	trip STR22SE	45/45	70/70	150/150	45/45	70/70	150/150	50/50	70/70	50/50	70/70	50/50	70/70
		trip STR22ME	45/45	70/70	150/150	45/45	70/70	150/150	50/50	70/70	50/50	70/70	50/50	70/70
NS100H	70 kA	trip STR22SE			150/150			150/150						
		trip STR22ME			150/150			150/150						
NS160N	35 kA	trip STR22SE	45/45	70/70	150/150	45/45	70/70	150/150	50/50	70/70	50/50	70/70	50/50	70/70
		trip STR22ME	45/45	70/70	150/150	45/45	70/70	150/150	50/50	70/70	50/50	70/70	50/50	70/70
NS160H	70 kA	trip STR22SE			150/150			150/150						
		trip STR22ME			150/150			150/150						
NS250N	35 kA	trip STR22SE				45/45	70/70	150/150	50/50	70/70	50/50	70/70	50/50	70/70
		trip STR22ME				45/45	70/70	150/150	50/50	70/70	50/50	70/70	50/50	70/70
NS250H	70 kA	trip STR22SE						150/150						
		trip STR22ME						150/150						
NS400N	45 kA	trip STR23SE							35/50	35/70	50/50	70/70	50/50	70/70
		trip STR53UE							35/50	35/70	50/50	70/70	50/50	70/70
		trip STR43ME							35/50	35/70	50/50	70/70	50/50	70/70
NS630N	45 kA	trip STR23SE							28/50	28/70	50/50	70/70	50/50	70/70
		trip STR53UE							28/50	28/70	50/50	70/70	50/50	70/70
		trip STR43ME							28/50	28/70	50/50	70/70	50/50	70/70

Note: respect the basic overload short-circuit discrimination rules

Cascading, and enhanced discrimination

Upstream: Compact NS160 to NS400
Downstream: Integral 18 to Integral 63

Upstream			NS160H		NS160L		NS250H		NS250L	
Breaking capacity			70 kA		150 kA		70 kA		150 kA	
Trip unit			TM-D		TM-D		TM-D		TM-D	
Downstream	Thermal relay	Rating (A)	80	100/125/160	80	100/125/160	160	200/250	160	200/250
Integral 18	LB1-LB03P01	0.1 to 0.16	70/70	70/70	150/150	150/150				
LD1-LB030	LB1-LB03P02	0.16 to 0.25	70/70	70/70	150/150	150/150				
	LB1-LB03P03	0.25 to 0.40	70/70	70/70	150/150	150/150				
	LB1-LB03P04	0.40 to 0.63	70/70	70/70	150/150	150/150				
	LB1-LB03P05	0.63 to 1	70/70	70/70	150/150	150/150				
	LB1-LB03P06	1 to 1.6	70/70	70/70	150/150	150/150				
	LB1-LB03P07	1.6 to 2.5	70/70	70/70	150/150	150/150				
	LB1-LB03P08	2.5 to 4	70/70	70/70	150/150	150/150				
	LB1-LB03P10	4 to 6	70/70	70/70	150/150	150/150				
	LB1-LB03P13	6 to 10	70/70	70/70	150/150	150/150				
	LB1-LB03P17	10 to 16		70/70		150/150				
	LB1-LB03P21	12 to 18		70/70		150/150				
Integral 32	LB1-LC03M03	0.25 to 0.40	70/70	70/70	150/150	150/150	70/70	70/70	150/150	150/150
LD1-LC030	LB1-LC03M04	0.40 to 0.63	70/70	70/70	150/150	150/150	70/70	70/70	150/150	150/150
LD4-LC130	LB1-LC03M05	0.63 to 1	70/70	70/70	150/150	150/150	70/70	70/70	150/150	150/150
LD4-LC030	LB1-LC03M06	1 to 1.6	70/70	70/70	150/150	150/150	70/70	70/70	150/150	150/150
	LB1-LC03M07	1.6 to 2.5	70/70	70/70	150/150	150/150	70/70	70/70	150/150	150/150
	LB1-LC03M08	2.5 to 4	70/70	70/70	150/150	150/150	70/70	70/70	150/150	150/150
	LB1-LC03M10	4 to 6	70/70	70/70	150/150	150/150	70/70	70/70	150/150	150/150
	LB1-LC03M13	6 to 10		70/70	150/150	150/150	70/70	70/70	150/150	150/150
	LB1-LC03M17	10 to 16		70/70	150/150	150/150	70/70	70/70	150/150	150/150
	LB1-LC03M22	16 to 25		70/70	150/150	150/150	70/70	70/70	150/150	150/150
	LB1-LC03M53	23 to 32		70/70	8/150	150/150	70/70	70/70	150/150	150/150
Integral 63	LB1-LD03M16	10 to 13					70/70	70/70	150/150	150/150
LD1-LD030	LB1-LD03M21	11 to 18					70/70	70/70	150/150	150/150
LD4-LD130	LB1-LD03M22	18 to 25					70/70	70/70	150/150	150/150
LD4-LD030	LB1-LD03M53	23 to 32					70/70	70/70	150/150	150/150
	LB1-LD03M55	28 to 40					70/70	70/70	150/150	150/150
	LB1-LD03M57	35 to 50					70/70	70/70	150/150	150/150
	LB1-LD03M61	45 to 63					70/70	70/70		150/150

Note: *respect the basic overload and short-circuit discrimination rules.*

Upstream			NS160H		NS160L		NS250H	NS250L	NS400H	NS400L
Breaking capacity			70 kA		150 kA		70 kA	150 kA	70 kA	150 kA
Trip unit			STR22SE		STR22SE		STR22SE or STR53UE		STR22SE or STR53UE	
Downstream	Thermal relay	Rating (A)	80	160	80	160	250	250	400	400
Integral 18	LB1-LB03P01	0.1 to 0.16	70/70	70/70	150/150	150/150	70/70	150/150		
LD1-LB030	LB1-LB03P02	0.16 to 0.25	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P03	0.25 to 0.40	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P04	0.40 to 0.63	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P05	0.63 to 1	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P06	1 to 1.6	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P07	1.6 to 2.5	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P08	2.5 to 4	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P10	4 to 6	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P13	6 to 10	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P17	10 to 16	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LB03P21	12 to 18	70/70	70/70	150/150	150/150	70/70	150/150		
Integral 32	LB1-LC03M03	0.25 to 0.40	70/70	70/70	150/150	150/150	70/70	150/150		
LD1-LC030	LB1-LC03M04	0.40 to 0.63	70/70	70/70	150/150	150/150	70/70	150/150		
LD4-LC130	LB1-LC03M05	0.63 to 1	70/70	70/70	150/150	150/150	70/70	150/150		
LD4-LC030	LB1-LC03M06	1 to 1.6	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LC03M07	1.6 to 2.5	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LC03M08	2.5 to 4	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LC03M10	4 to 6	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LC03M13	6 to 10	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LC03M17	10 to 16	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LC03M22	16 to 25	70/70	70/70	150/150	150/150	70/70	150/150		
	LB1-LC03M53	23 to 32		70/70		150/150	70/70	150/150		
Integral 63	LB1-LD03M16	10 to 13		70/70		150/150	70/70	150/150	70/70	150/150
LD1-LD030	LB1-LD03M21	11 to 18					70/70	150/150	70/70	150/150
LD4-LD130	LB1-LD03M22	18 to 25					70/70	150/150	70/70	150/150
LD4-LD030	LB1-LD03M53	23 to 32					70/70	150/150	70/70	150/150
	LB1-LD03M55	28 to 40					70/70	150/150	70/70	150/150
	LB1-LD03M57	35 to 50					70/70	150/150	70/70	150/150
	LB1-LD03M61	45 to 63					70/70	150/150	70/70	150/150

Note: *respect the basic overload and short-circuit discrimination rules.*

Cascading, and enhanced discrimination

Upstream: Compact NS160
Downstream: GV2 M

Upstream			NS160N								NS160H/L							
Breaking capacity			36 kA								70/150 kA							
Trip unit			TM-D								TM-D							
Downstream	Thermal relay	Rating (A)	16	25	40	63	80	100	125	160	16	25	40	63	80	100	125	160
GV2 M01	integrated	0.1 to 0.16	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M02	integrated	0.16 to 0.25	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M03	integrated	0.25 to 0.40	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M04	integrated	0.40 to 0.63	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M05	integrated	0.63 to 1	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M06	integrated	1 to 1.6		36/36	36/36	36/36	36/36	36/36	36/36	36/36		50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M07	integrated	1.6 to 2.5			36/36	36/36	36/36	36/36	36/36	36/36			50/50	50/50	50/50	50/50	50/50	50/50
GV2 M08	integrated	2.5 to 4					36/36	36/36	36/36	36/36					50/50	50/50	50/50	50/50
GV2 M10	integrated	4 to 6.3					36/36	36/36	36/36	36/36					50/50	50/50	50/50	50/50
GV2 M14	integrated	6 to 10					36/36	36/36	36/36	36/36					50/50	50/50	50/50	50/50
GV2 M16	integrated	9 to 14					36/36	36/36	36/36	36/36					50/50	50/50	50/50	50/50
GV2 M20	integrated	13 to 18					36/36	36/36	36/36	36/36					50/50	50/50	50/50	50/50
GV2 M21	integrated	17 to 23					36/36	36/36	36/36	36/36					50/50	50/50	50/50	50/50
GV2 M22	integrated	20 to 25					36/36	36/36	36/36	36/36					50/50	50/50	50/50	50/50
GV2 M32	integrated	24 to 32						36/36	36/36	36/36						50/50	50/50	50/50

Upstream			NS160N								NS160H/L							
Breaking capacity			36 kA								70/150 kA							
Trip unit			STR22SE80					STR22SE160			STR22SE80					STR22SE160		
Downstream	Thermal relay	Rating (A)	32	40	50	63	80	100	125	160	32	40	50	63	80	100	125	160
GV2 M01	integrated	0.1 to 0.16	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M02	integrated	0.16 to 0.25	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M03	integrated	0.25 to 0.40	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M04	integrated	0.40 to 0.63	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M05	integrated	0.63 to 1	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M06	integrated	1 to 1.6	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M07	integrated	1.6 to 2.5	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M08	integrated	2.5 to 4	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M10	integrated	4 to 6.3	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M14	integrated	6 to 10	36/36	36/36	36/36	36/36	36/36	36/36	36/36	36/36	50/50	50/50	50/50	50/50	50/50	50/50	50/50	50/50
GV2 M16	integrated	9 to 14			36/36	36/36	36/36	36/36	36/36	36/36			50/50	50/50	50/50	50/50	50/50	50/50
GV2 M20	integrated	13 to 18				36/36	36/36	36/36	36/36	36/36				50/50	50/50	50/50	50/50	50/50
GV2 M21	integrated	17 to 23					36/36	36/36	36/36	36/36					50/50	50/50	50/50	50/50
GV2 M22	integrated	20 to 25					36/36	36/36	36/36	36/36					50/50	50/50	50/50	50/50
GV2 M32	integrated	24 to 32						36/36	36/36	36/36						50/50	50/50	50/50

Cascading, and enhanced discrimination

Upstream: Compact NS160
Downstream: GV2 P

Upstream			NS160H				NS160L			
Breaking capacity			700 kA				150 kA			
Trip unit			TM-D				TM-D			
Downstream	Thermal relay	Rating (A)	80	100	125	160	80	100	125	160
GV2 P01	integrated	0.1 to 0.16	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P02	integrated	0.16 to 0.25	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P03	integrated	0.25 to 0.40	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P04	integrated	0.40 to 0.63	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P05	integrated	0.63 to 1	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P06	integrated	1 to 1.6	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P07	integrated	1.6 to 2.5	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P08	integrated	2.5 to 4	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P10	integrated	4 to 6.3	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P14	integrated	6 to 10	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P16	integrated	9 to 14	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P20	integrated	13 to 18	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P21	integrated	17 to 23	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 P22	integrated	20 to 25	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150

Upstream			NS160H							
Breaking capacity			70 kA							
Trip unit			STR22SE80					STR22SE160		
Downstream	Thermal relay	Rating (A)	32	40	50	63	80	100	125	160
GV2 P01	integrated	0.1 to 0.16	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P02	integrated	0.16 to 0.25	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P03	integrated	0.25 to 0.40	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P04	integrated	0.40 to 0.63	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P05	integrated	0.63 to 1	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P06	integrated	1 to 1.6	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P07	integrated	1.6 to 2.5	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P08	integrated	2.5 to 4	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P10	integrated	4 to 6.3	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P14	integrated	6 to 10	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 P16	integrated	9 to 14			70/70	70/70	70/70	70/70	70/70	70/70
GV2 P20	integrated	13 to 18				70/70	70/70	70/70	70/70	70/70
GV2 P21	integrated	17 to 23					70/70	70/70	70/70	70/70
GV2 P22	integrated	20 to 25					70/70	70/70	70/70	70/70

Upstream			NS160L							
Breaking capacity			150 kA							
Trip unit			STR22SE80					STR22SE160		
Downstream	Thermal Relay	Rating (A)	32	40	50	63	80	100	125	160
GV2 P01	integrated	0.1 to 0.16	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P02	integrated	0.16 to 0.25	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P03	integrated	0.25 to 0.40	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P04	integrated	0.40 to 0.63	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P05	integrated	0.63 to 1	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P06	integrated	1 to 1.6	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P07	integrated	1.6 to 2.5	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P08	integrated	2.5 to 4	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P10	integrated	4 to 6.3	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P14	integrated	6 to 10	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 P16	integrated	9 to 14			150/150	150/150	150/150	150/150	150/150	150/150
GV2 P20	integrated	13 to 18				150/150	150/150	150/150	150/150	150/150
GV2 P21	integrated	17 to 23					150/150	150/150	150/150	150/150
GV2 P22	integrated	20 to 25					150/150	150/150	150/150	150/150

Cascading, and enhanced discrimination

Upstream: Compact NS160
Downstream: GV2 L

Upstream			NS160H				NS160L			
Breaking capacity			700 kA				150 kA			
Trip unit			TM-D				TM-D			
Downstream	Thermal relay	Rating (A)	80	100	125	160	80	100	125	160
GV2 L03	LR2 D13 03	0.25 to 0.40	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L04	LR2 D13 04	0.40 to 0.63	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L05	LR2 D13 05	0.63 to 1	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L06	LR2 D13 06	1 to 1.6	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L07	LR2 D13 07	1.6 to 2.5	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L08	LR2 D13 08	2.5 to 4	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L10	LR2 D13 10	4 to 6.3	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L14	LR2 D13 14	7 to 10	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L16	LR2 D13 16	9 to 13	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L20	LR2 D13 21	12 to 18	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150
GV2 L22	LR2 D13 22	17 to 25	70/70	70/70	70/70	70/70	150/150	150/150	150/150	150/150

Upstream			NS160H							
Breaking capacity			70 kA							
Trip unit			STR22SE80					STR22SE160		
Downstream	Thermal relay	Rating (A)	32	40	50	63	80	100	125	160
GV2 L03	LR2 D13 03	0.25 to 0.40	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 L04	LR2 D13 04	0.40 to 0.63	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 L05	LR2 D13 05	0.63 to 1	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 L06	LR2 D13 06	1 to 1.6	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 L07	LR2 D13 07	1.6 to 2.5	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 L08	LR2 D13 08	2.5 to 4	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 L10	LR2 D13 10	4 to 6.3	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 L14	LR2 D13 14	7 to 10	70/70	70/70	70/70	70/70	70/70	70/70	70/70	70/70
GV2 L16	LR2 D13 16	9 to 13			70/70	70/70	70/70	70/70	70/70	70/70
GV2 L20	LR2 D13 21	12 to 18				70/70	70/70	70/70	70/70	70/70
GV2 L22	LR2 D13 22	17 to 25					70/70	70/70	70/70	70/70

Upstream			NS160L							
Breaking capacity			150 kA							
Trip unit			STR22SE80					STR22SE160		
Downstream	Thermal relay	Rating (A)	32	40	50	63	80	100	125	160
GV2 L03	LR2 D13 03	0.25 to 0.40	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 L04	LR2 D13 04	0.40 to 0.63	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 L05	LR2 D13 05	0.63 to 1	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 L06	LR2 D13 06	1 to 1.6	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 L07	LR2 D13 07	1.6 to 2.5	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 L08	LR2 D13 08	2.5 to 4	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 L10	LR2 D13 10	4 to 6.3	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 L14	LR2 D13 14	7 to 10	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
GV2 L16	LR2 D13 16	9 to 13			150/150	150/150	150/150	150/150	150/150	150/150
GV2 L20	LR2 D13 21	12 to 18				150/150	150/150	150/150	150/150	150/150
GV2 L22	LR2 D13 22	17 to 25					150/150	150/150	150/150	150/150

Section 2
Supplementary data

Determination of short-circuit current

Isc at the receiving end of a feeder in terms of the Isc at its begining

The following tables, derived by the "method of composition" (mentioned in Chapter G Sub-clause 5.2) give a rapid and sufficiently accurate value of short-circuit current at a point in a network, knowing:

- the value of short-circuit current upstream of the point considered
- the length and compassion of the circuit between the point at which the short-circuit current level is known, and the point at which the level is to be determined.

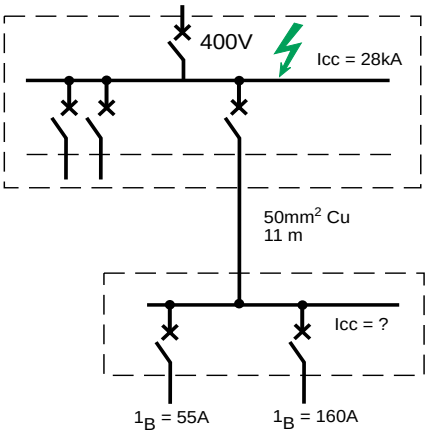
It is then sufficient to select a circuit breaker with an appropriate short circuit fault rating immeciately above that indicated in the tables.

If more precise values are required, it is possible to make a detailed calculation (see Sub-Clause 4.2 above) or to use a software package, such as Ecodial*.
In such a case, moreover, the possibility of using the cascading technique should be considered, in which the use of a current-limiting circuit breaker at the upstream position would allow all circuit breakers downstream of the limiter to have a short-circuit-current rating much lower than would otherwise be necessary.

*a Merlin Gerin product.

Example:
The network shown in typifies a case for the application of table. Select the c.s.a. of the conductor in the column for copper conductors (in this example the c.s.a. is 50 mm^2).
Search along the row corresponding to 50mm^2 for the length of conductor equal to that of the circuit concerned (or nearest possible on the low side).
Descend vertically the column in which the length is located, and stop at a row in the middle section (of the 3 sections of the table) corresponding to the known fault current level (or the nearest to it on the high side).
In this case 30 kA is the nearest to 28 kA on the high side. The value of short-circuit current at the downstream end of the 11 metre circuit is given at the intersection of the vertical column in which the length is located, and the horizontal row corresponding to the upstream Isc (or nearest to it on the high side).
This value in the example is seen to be 19 kA.
The procedure for aluminium conductors is similar, but the vertical column must be ascended into the middle section of the table. In consequence, a Din-rail-mounted circuit breaker rated at 63 A and Isc of 50 kA (such as a NC100LH unit*) can be used for the 55 A circuit.
A Compact* rated at 60 A with an Isc capacity of 25 kA (such as a NS160N unit*) can be used to protect the 160 A circuit.

*Merlin Gerin product.



Determination of downstream short-circuit current level Isc using table

Isc at the receiving end of a feeder in terms of the Isc at its sending end (continued)

copper 230V/ 400V	c.s.a. of phase conductors (in mm²)	length of circuit (in metres)																
	1.5													0.8	1	1.3	1.6	3
	2.5												1	1.3	1.6	2.1	2.6	5
	4											0.8	1.7	2.1	2.5	3.5	4	8.5
	6											1.3	2.5	3	4	5	6.5	13
	10										0.8	1.1	2.1	4	5.5	6.5	8.5	11	21
	16								0.9	1	1.4	1.7	3.5	7	8.5	10	14	17	34
	25							1	1.3	1.6	2.1	2.6	5	10	13	16	21	26	50
	35							1.5	1.9	2.2	3	3.5	7.5	15	19	22	30	37	75
	50						1.1	2.1	2.7	3	4	5.5	11	21	27	32	40	55	110
	70						1.5	3	3.5	4.5	6	7.5	15	30	37	44	60	75	150
	95				0.9	1	2	4	5	6	8	10	20	40	50	60	80	100	200
	120		0.9	1	1.1	1.3	2.5	5	6.5	7.5	10	13	25	50	65	75	100	130	250
	150	0.8	1	1.1	1.2	1.4	2.7	5.5	7	8	11	14	27	55	70	80	110	140	270
	185	1	1.1	1.3	1.5	1.6	3	6.5	8	9.5	13	16	32	65	80	95	130	160	320
	240	1.2	1.4	1.6	1.8	2	4	8	10	12	16	20	40	80	100	120	160	200	400
	300	1.5	1.7	1.9	2.2	2.4	5	9.5	12	15	19	24	49	95	120	150	190	240	
	2x120	1.5	1.8	2	2.3	2.5	5.1	10	13	15	20	25	50	100	130	150	200	250	
	2x150	1.7	1.9	2.2	2.5	2.8	5.5	11	14	17	22	28	55	110	140	170	220	280	
	2x185	2	2.3	2.6	2.9	3.5	6.5	13	16	20	26	33	65	130	160	200	260	300	
	3x120	2.3	2.7	3	3.5	4	7.5	15	19	23	30	38	75	150	190	230	300	380	
	3x150	2.5	2.9	3.5	3.5	4	8	16	21	25	33	41	80	160	210	250	330	410	
	3x185	2.9	3.5	4	4.5	5	9.5	20	24	29	39	49	95	190	240	290	390		
	Isc upstream (in kA)	**Isc downstream (in Ka)**																	
	100	94	94	93	92	91	83	71	67	63	56	50	33	20	17	14	11	9	5
	90	85	85	84	83	83	76	66	62	58	52	47	32	20	16	14	11	9	4.5
	80	76	76	75	75	74	69	61	57	54	49	44	31	19	16	14	11	9	4.5
	70	67	67	66	66	65	61	55	52	49	45	41	29	18	16	14	11	5	4.5
	60	58	58	57	57	57	54	48	46	44	41	38	27	18	15	13	10	8.5	4.5
	50	49	48	48	48	48	46	42	40	39	36	33	25	17	14	13	10	8.5	4.5
	40	39	39	39	39	39	37	35	33	32	30	29	22	15	13	12	9.5	8	4.5
	35	34	34	34	34	34	33	31	30	29	27	26	21	15	13	11	9	8	4.5
	30	30	329	29	29	29	28	27	26	25	24	23	19	14	12	11	9	7.5	4.5
	25	25	25	25	24	24	24	23	22	22	21	20	17	13	11	10	8.5	7	4
	20	20	20	20	20	20	19	19	18	18	17	17	14	11	10	9	7.5	6.5	4
	15	15	15	15	15	15	15	14	14	14	13	13	12	9.5	8.5	8	7	6	4
	10	10	10	10	10	10	10	9.5	9.5	9.5	9.5	9	8.5	7	6.5	6.5	5.5	5	3.5
	7	7	7	7	7	7	7	7	7	6.5	6.5	6.5	6	5.5	5	5	4.5	4	2.9
	5	5	5	5	5	5	5	5	5	5	5	5	4.5	4	4	4	3.5	3.5	2.5
	4	4	4	4	4	4	4	4	4	4	4	4	3.5	3.5	3.5	3	3	2.9	2.9
	3	3	3	3	3	3	3	3	3	2.9	2.9	2.9	2.8	2.7	2.6	2.5	2.4	2.3	1.9
	2		2	2	2	2	2	2	2	2	2	2	1.9	1.9	1.8	1.8	1.7	1.7	1.4
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	0.9	0.9	0.8
aluminium 230 V/ 400 V	**c.s.a of phase conductors (mm²)**	**length of circuit (in metres)**																	
	2.5													0.8	1	1.3	1.6	3
	4												1	1.3	1.6	2.1	2.6	5
	4											0.8	1.6	2	2.4	3	4	8
	10											1.3	2.6	3.5	4	5.5	6.5	13
	16										0.8	1.1	2.1	4	5.5	6.5	8.5	11	21
	25								0.8	1	1.3	1.7	3.5	6.5	8.5	10	13	17	33
	35							0.9	1.2	1.4	1.8	2.3	4.5	9	12	14	18	23	46
	50							1.3	1.7	2	2.6	3.5	6.5	13	17	20	26	33	65
	70						0.9	1.8	2.3	2.8	3.54	4.5	9	18	23	28	37	46	90
	95						1.3	2.5	3	4	5	6.5	13	25	32	38	50	65	130
	120					0.8	1.7	3	4	4.5	6.5	8	17	32	40	47	65	80	160
	150					0.9	1.7	3.5	4.5	5	7	8.5	17	34	43	50	70	85	170
	185				0.9	1	2	4	5	6	8	10	20	40	50	60	80	100	240
	240		0.9	1	1.1	1.3	2.5	5	6.5	7.5	10	13	25	50	65	75	100	130	250
	300	0.9	1	1.2	1.4	1.5	3	6	7.5	9	12	15	30	60	75	90	120	150	300
	2x120	0.9	1.1	1.3	1.4	1.6	3	6.6	8	9.5	13	16	32	65	80	95	130	160	320
	2x150	1	1.2	1.4	1.5	1.7	3.5	7	9	10	14	17	35	70	85	100	140	170	
	2x185	1.2	1.4	1.6	1.8	2	4.1	8	10	12	16	20	41	80	100	120	160	200	
	2x240	1.5	1.8	2	2.3	2.5	5	10	13	15	20	25	50	100	130	150	200	250	
	3x120	1.4	1.7	1.9	2.1	2.4	4.5	9.5	12	14	19	24	48	95	120	140	190	240	
	3x150	1.5	1.8	2.1	2.3	2.6	5	10	13	15	21	26	50	100	130	150	210	260	
	3x185	1.8	2.1	2.4	2.7	3	6	12	15	18	24	30	60	120	150	189	240	300	
	3X240	2.3	2.7	3	3.5	4	7.5	15	19	23	30	38	75	150	190	230	300	380	

Isc at a point downstream, in terms of a known upstream fault-current value and the length and c.s.a. of the intervening conductors, in a 230/400 V 3-phase system.

note: for a 3-phase system having 230 V between phases, divide the above lengths by $\sqrt{3} = 1.732$

Selecting circuit breakers supplied by one or more MV/LV transformers

maximum short-circuit current downstream of an MV/LV transformer

The values indicated in the table below correspond to a bolted 3-phase short-circuit accross the LV terminals of an MV/LV transformer connected to a network with a short-circuit power of of 500MVA.

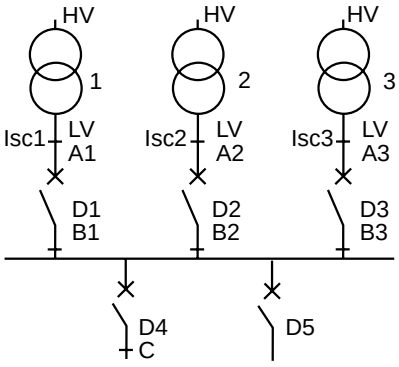
	transformer kVA rating																			
	16	**25**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**	**1600**	**2000**
415v																				
In (A)	22	53	56	70	88	112	140	174	223	278	348	438	556	696	877	1113	1391	1740	2226	2783
Isc (A)	450	700	1120	1390	1760	2230	2790	3490	4460	5580	6970	8790	11160	12950	17570	22320	27890	33120	38540	48180
Impedence usual (%)	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	5	5.5	5.5

selecting incoming or outgoing circuit breakers according to the number and kVA rating of source transformers

The selection of a circuit breaker protecting a circuit mainly depends on:

- the rated current of the source or of the load which determines the rating of the equipment.
- the maximum short-circuit current at the point of installation which determines the minimum breaking capacity of the equipment.

Case with several transformers



For the case involving several transformers in parallel[1]:
in the incoming circuit breaker D1 must have a breaking capacity higher than the larger of the following 2 values:

- ☐ either Isc1 (for a short-circuit in B1)
- ☐ or Isc2 + Isc3 (for a short-circuit in A1)
- the outgoing circuit breaker D4 must have a breaking capacity higher than Isc1 + Isc2 + Isc3.

See page 91

Energy let - through

Current limiting curves

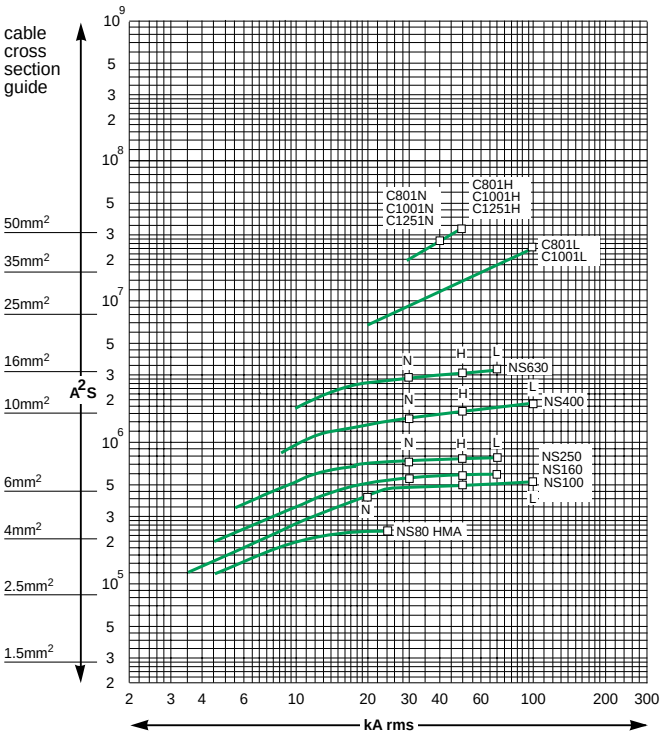
The current limiting capacity of a circuit breaker is expressed by two curves which give, as a function of the prospective short-circuit current (the current which would flow if no protection devices were installed):

- The actual peak current (limited current);
- The thermal stress (A^2s), i. e. the energy dissipated by the short-circuit in a conductor with a resistance of 1 Ω.

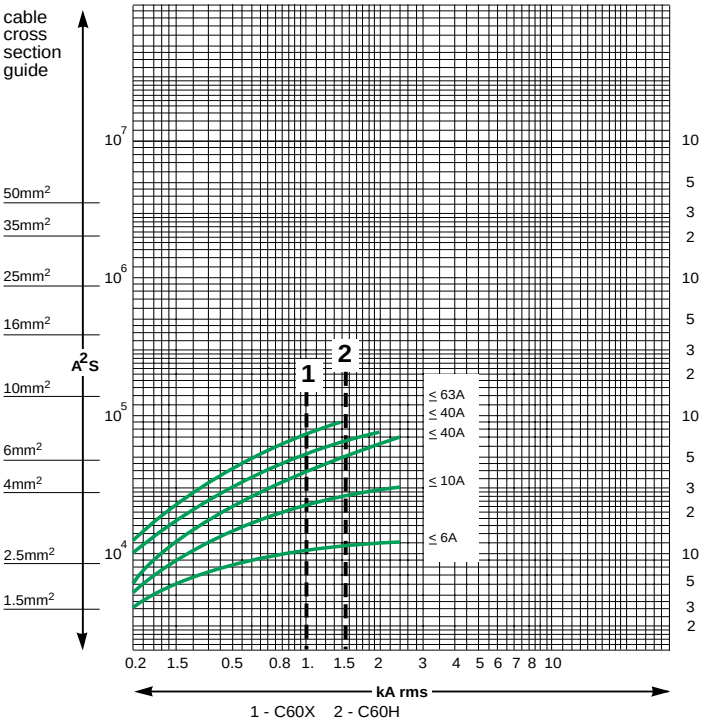
Is an Cu/PVC cable with a cross-section of 10 mm^2 adequately protected by an NS160N?

Answer:
The table below indicates that the permissible stress is 1.32 10^6 A^2s.
All short-circuit currents at the point where an NS160N (Icu = 35 kA) is installed are limited with a thermal stress less than 6 10^5 A^2s.
Cable protection is therefore ensured up to the limit of the breaking capacity of the circuit breaker.

Thermal Stress Limitation



Thermal Stress Limitation



Earth loop impedance values

Circuit Breaker		Max. Zs Ohms @ 230 Volts	
Type	Trip	0.4 secs	5 secs
NS100			
25kA	TM16G	2.99	2.99
	TM25G	2.40	2.40
	TM40G	2.40	2.40
	TM63G	1.83	1.83
NS100			
	TM16D	0.96	1.64
	TM25D	0.62	1.28
	TM32D	0.60	0.80
	TM40D	0.38	0.77
	TM50D	0.38	0.58
	TM63D	0.38	0.51
	TM80D	0.29	0.29
	TM100D	0.18	0.18
NS160			
	TM80D	0.23	0.23
	TM100D	0.18	0.18
	TM125D	0.18	0.18
	TM160D	0.15	0.15
NS250			
	TM200D	0.08	0.08
	TM250D	0.08	0.08
NS100			
STR22SE	25A	0.80	1.15
	40A	2.50	0.72
	63A	0.32	0.46
	100A	0.20	0.29
NS160			
STR22SE	100A	1.59	0.29
	160A	1.00	0.18
NS250			
STR22SE	160A	0.13	0.18
	250A	0.08	0.12
NS400			
STR23SE	400A	0.05	0.07
STR53SE	400A	0.05	0.52
NS630			
STR23SE	630A	0.05	0.07
STR53UE	630A	0.05	0.52
C801	800A	0.03	0.04
C1001	1000A	0.02	0.03
C1251	1250	0.02	0.02

Circuit Breaker		Max. Zs Ohms @ 230 Volts	
Type	Trip	0.4 secs	5 secs
MA Trip units			
NS80H			
MAX	MA1.5	9.13	9.13
	MA2.5	5.48	5.48
	MA6.3	2.17	2.17
	MA12.5	1.10	1.10
	MA25	0.55	0.55
	MA50	0.27	0.27
	MA80	0.17	0.17
NS100			
MAX	MA2.5	5.48	9.13
	MA6.3	2.17	2.17
	MA12.5	1.10	1.10
	MA25	0.55	0.55
	MA50	0.27	0.27
	MA100	0.14	0.14
NS160			
MAX	MA150	0.09	0.09
NS250			
MAX	MA220	0.05	0.05
NS400			
MAX	MA320	0.04	0.04
NS630			
MAX	MA500	0.03	0.03
Minipact			
	16A	0.32	2.74
	20A	0.32	2.40
	25A	0.32	2.40
	32A	0.32	1.28
	40A	0.32	1.01
	50A	0.19	0.77
	60A	0.19	0.64

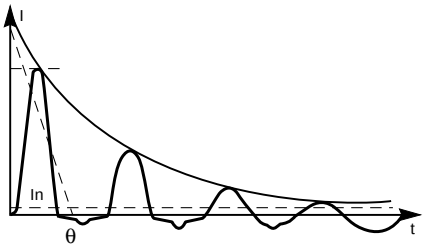
Circuit Breaker		Max. Zs Ohms @ 230 Volts	
Type	Trip	0.4 secs	5 secs
C60			
type B	1A	46.00	46.00
	2A	23.00	23.00
	3A	11.50	11.50
	6A	7.67	7.67
	10A	4.60	4.60
	16A	2.88	2.88
	20A	2.30	2.30
	25A	1.84	1.84
	32A	1.44	1.44
	40A	1.15	1.15
	50A	0.92	0.92
	63A	0.73	0.73
C60			
type C	1A	23.00	29.49
	2A	11.50	14.38
	3A	5.75	7.42
	6A	3.88	4.89
	10A	2.30	2.95
	16A	1.44	1.84
	20A	1.15	1.47
	25A	0.92	1.18
	32A	0.72	0.92
	40A	0.58	0.74
	50A	0.46	0.59
	63A	0.37	0.47
C60			
type D	1A	16.43	29.49
	2A	8.21	14.38
	3A	4.11	7.42
	6A	2,74	4.89
	10A	1.64	2.95
	16A	1.03	1.84
	20A	0.82	1.47
	25A	0.66	1.18
	32A	0.51	0.92
	40A	0.41	0.74
	50A	0.33	0.59
	63A	0.26	0.47

Circuit Breaker		Max. Zs Ohms @ 230 Volts	
Type	Trip	0.4 secs	5 secs
C120H			
type B	10A	4.60	4.60
	16A	2.88	2.88
	20A	2.30	2.30
	25A	1.84	1.84
	32A	1.44	1.44
	40A	1.15	1.15
	50A	0.92	0.92
	63A	0.73	0.73
	80A	0.57	0.57
	100A	0.46	0.46
	125A	0.36	0.36
C120H			
type C	10A	2.30	2.87
	16A	1.44	1.79
	20A	1.15	1.44
	25A	0.92	1.15
	32A	0.72	0.90
	40A	0.58	0.71
	50A	0.46	0.57
	63A	0.37	0.45
	80A	0.29	0.35
	100A	0.23	0.28
	125A	0.18	0.23
C120H			
type D	10A	1.64	2.87
	16A	1.03	1.79
	20A	0.82	1.44
	25A	0.66	1.15
	32A	0.51	0.90
	40A	0.41	0.71
	50A	0.33	0.57
	63A	0.26	0.45
	80A	0.21	0.35
	100A	0.16	0.28
	125A	0.13	0.23

Zs values are given with circuit breakers set at maximum

Protection of LV/LV transformers

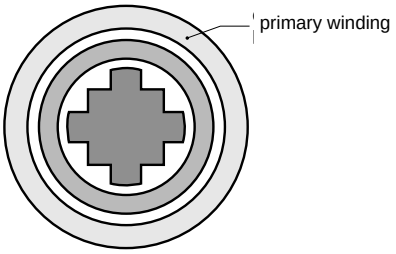
Inrush currents



When LV/LV transformers are switched on, very high inrush currents are produced which must be taken into account when choosing overcurrent protection devices.

The peak value of the first current wave often reaches 10 to 15 times the rated rms current of the transformer and may reach values of 20 to 25 times the rated current even for transformers rated less than 50 kVA.
This transient inrush current decays very quickly (in a few milliseconds).

Selecting the protection



Merlin Gerin has conducted an extensive test programme to optimise the protection of LV/LV transformers.
The Compact and Masterpact circuit breakers detailed in the following tables offer the following advantages:

- Protection of the transformer in the event of abnormal overloads;
- No nuisance tripping when the primary winding is energised;
- Unimpaired electrical endurance of the circuit breaker.

The transformers used for the tests are standard. The values in the tables have been calculated for a crest factor of 25. These tables indicated the circuit breaker and trip unit to be used depending on:

- The primary supply voltage (230 V or 400 V) ;
- The type of transformer (single-phase or three-phase).

They correspond to the most frequent case in which the primary is wound externally**(1)**.
The type of circuit breaker to be used (i.e. N, H or L) depends on the breaking capacity required at the point of installation.

Protection of LV/LV transformers

Protection using Compact circuit breakers

Compact NS100 to NS250 equipped with TM-D thermal-magnetic trip unit

Transformer rating (kVA)			Protective device	
230 V 1-ph	**230 V 3-ph/ 400 V 1-ph**	**400 V 3-ph**	Circuit breaker	Trip unit
3	**5 to 6**	**9 to 10**	NS100N/H/L	TM16D
5	**8 to 9**	**14 to 16**	NS100N/H/L	TM25D
7 to 9	**13 to 16**	**22 to 28**	NS100N/H/L	TM40D
12 to 15	**20 to 25**	**35 to 44**	NS100N/H/L	TM63D
16 to 19	**26 to 32**	**45 to 56**	NS100N/H/L	TM80D
18 to 23	**32 to 40**	**55 to 69**	NS160N/H/L	TM100D
23 to 29	**40 to 50**	**69 to 87**	NS160N/H/L	TM125D
29 to 37	**51 to 64**	**89 to 111**	NS250N/H/L	TM160D
37 to 46	**64 to 80**	**111 to 139**	NS250N/H/L	TM200D

Compact NS100 to C1251 equipped with STR electronic trip unit

Transformer rating (kVA)			Protective device		
230 V 1-ph	**230 V 3-ph/ 400 V 1-ph**	**400 V 3-ph**	Circuit breaker	trip unit	Ir max setting
4 to 7	**6 to 13**	**11 to 22**	NS100N/HL	STR22SE 40	0.8
9 to 19	**16 to 32**	**27 to 56**	NS100N/H/L	STR22SE 100	0.8
15 to 30	**25 to 52**	**44 to 90**	NS160N/H/L	STR22SE 160	0.8
23 to 46	**40 to 80**	**70 to 139**	NS250N/H/L	STR22SE 250	0.8
37 to 74	**64 to 128**	**111 to 222**	NS400N/H/L	STR23SE 400	0.8
58 to 115	**100 to 200**	**175 to 346**	NS630N/H/L	STR23SE 630	0.8
74 to 184	**127 to 319**	**222 to 554**	C801N/H	STR35SE 800	1
92 to 230	**159 to 398**	**277 to 693**	C1001N/H	STR35SE 1000	1
115 to 288	**200 to 498**	**346 to 866**	C1251N/H	STR35SE 1250	1

(1) For other windings, please consult us.
If a circuit breaker upstream of a transformer with a transformation ratio of 1 and a rated power of less than 5 kVA is subject to nuisance tripping, before choosing a circuit breaker with a higher rating, invert the input and the output of the transformer (the inrush current may be doubled if the primary is wound internally rather than externally).

Assumptions
The tables give recommended mcb ratings for single phase transformers up to 12500 VA and three phase transformers up to 30000 VA based on the following formula:

MCB rating =
15 x normal running current of transformer
min. instantaneous tripping coefficient of mcb

Table 3 - 3 phase transformers 415V AC supply

VA	**Primary In (A)**	**C60HB**	**C60HC**	**C60HD**	**NC100C**	**NC100D**
500	0.7	4	2	1	-	-
750	1.04	6	4	2	-	-
1000	1.39	10	6	4	-	-
2000	2.78	16	10	6	10	-
5000	6.95	40	25	16	25	16
10000	13.89	-	50	25	50	25
15000	20.84	-	63	32	63	32
20000	27.78	-	-	50	63	50
25000	34.73	-	-	63	80	63
30000	41.67	-	-	63	100	63

Table 4 - 1 phase transformers 240V AC supply

VA	**Primary In (A)**	**C60HB**	**C60HC**	**C60HD**	**NC100C**	**NC100D**
50	0.21	2	-	-	-	-
100	0.42	4	2	1	-	-
250	1.04	6	4	2	-	-
500	2.08	16	...10	4	-	-
1000	4.17	25	16	10	10	10
2500	10.42	63	32	16	25	16
5000	20.84	-	63	32	50	32
10000	52.08	-	-	63	80	63
12500	52.08	-	-	-	100	80

400 HZ applications

Tripping thresholds

The 400 Hz current settings are obtained by multiplying the 50 Hz values by the following coefficient:

- K1 for thermal trip units;
- K2 for magnetic trip units.

On adjustable trip units, these adaptation coefficients are independent of the unit adjustment knob position.

For thermal trip units, the current settings are lower at 400 Hz than at 50 Hz (K1 ⩽ 1).

For magnetic trip units, the current settings are conversely higher at 400 Hz than at 50 Hz (K2 ⩾ 1).

Adjustable trip units should be set to minimum, or use Compact circuit breakers equipped with low magnetic trip units (type G).

Electronic trip units

The use of electronics offers the advantage of greater operating stability when the frequency is varied. However, the devices are still subjected to frequency related temperature effects which may sometimes pose restrictions on their use.

Column K1 of the table below gives the maximum permissible current to be used for the current setting (knob position).

Thermal-magnetic trip units

Circuit breaker	Trip unit	Thermal setting at 40 °C	K1	Magnetic setting	K2
NS100N	TM16G	16	0.95	63	1.6
	TM25G	25	0.95	80	1.6
	TM40G	40	0.95	80	1.6
	TM63G	63	0.95	125	1.6
NS250N	TM16D	16	0.95	240	1.6
	TM25D	25	0.95	300	1.6
	TM40D	40	0.95	500	1.6
	TM63D	63	0.95	500	1.6
	TM80D	80	0.9	650	1.6
	TM100D	100	0.9	800	1.6
	TM125D	125	0.9	1000	1.6
	TM160D	160	0.9	1250	1.6
	TM200D	200	0.9	1000 (*)	1.6
	TM250D	250	0.9	1250 (*)	1.6

(*) for TM 200D and TM250D, Im must be set to its maximum

Electronic trip units

Adaptation coefficients

Compact Circuit breaker	Trip unit	Rating Ir at 50 Hz (A at 40 °C)	Long-time Ir maxi K1	Short-time Irm at 50 Hz (A)	K2
NS100N	STR22SE	40...100	0.4 to 1	2 to 10 Ir	1
NS250N	STR22SE	100...250	0.4 to 0.9	2 to 10 Ir	1
NS400N	STR23SE	400	0.4 to 0.8	1.5 to 10 Ir	1
NS630N	STR23SE	630	0.4 to 0.8	1.5 to 10 Ir	1
NS400N	STR53UE	400	0.4 to 0.8	1.5 to 10 Ir	1
NS630N	STR53UE	630	0.4 to 0.8	1.5 to 10 Ir	1
C801N	STR25DE	800	0.4 to 0.75	1.5 to 10 Ir	0.97
	STR35SE/GE	800	0.4 to 0.75	1.5 to 10 Ir	0.97
C1001N	STR25DE	1000	0.4 to 0.75	1.5 to 10 Ir	0.97
	STR35SE/GE	1000	0.4 to 0.75	1.5 to 10 Ir	0.97
C1251N	STR25DE	1250	0.4 to 0.75	1.5 to 10 Ir	0.97
	STR35SE/GE	1250	0.4 to 0.75	1.5 to 10 Ir	0.97

Breaking capacity of Compact NS and Compact C circuit breakers at 400 Hz

At 440 V, 400 Hz:

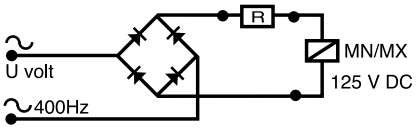
Circuit breaker	Breaking capacity
NS100N	12 kA
NS250N	4,5 kA
NS400N	10 kA
NS630N	10 kA
C801N	25 kA
C1001N	25 kA
C1251N	25 kA

auxiliary releases

For Compact NS100-630

For circuit breakers on 400 Hz systems, only 125 V DC rated releases can be used. The release must be supplied by the 400 Hz system via a rectifier bridge (to be selected from the table opposite) and an additional resistor with characteristics depending on the system voltage and the type of circuit breaker.

Connection



U (V) 400 Hz	Rectifier	Additional resistor
110/127 V	Thomson 110 BHz or General Instrument W06 or Semikron SKB at 1,2/1,3	10 kΩ-2 W
220/240 V	Thomson 110 BHz or General Instrument W06 or Semikron SKB at 1,2/1,3	22 kΩ-8 W
380/420 V	Semikron SKB at 1,2/1,3	33 kΩ-15 W

Note : other models of rectifier bridges can be used if their characteristics are at least equivalent to those stated above.

For Compact C801-1251

The following auxiliary releases are designed to operate at 400 Hz.

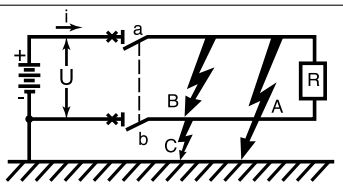
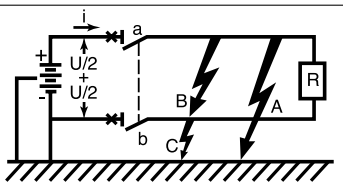
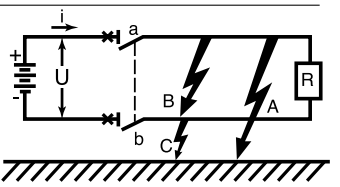
U (V) 400 Hz	Catalogue number
MN 110/130 V	**44925**
MN 208/250 V	**44926**
MN 380/415 V	**44932**
MX 380/415 V	**44914**

Circuit breaker selection for DC applications

Selection criteria

The selection of the type of circuit breaker most suitable for protection of a DC installation depends mainly on the following criteria:

- The rated current, which determines the rating of the equipment;
- The rated voltage, which determines the number of poles in series necessary for breaking;
- The maximum short-circuit current at the point of installation, which determines the breaking capacity;
- The type of network (see below).

Type of system		Earthed systems		Insulated systems
		One polarity of the DC supply is earthed	A centre point of the DC supply is earthed	
Diagrams and various cases of faults				
Fault effect	Fault **A**	Max. Isc the positive polarity is the only one involved	Isc close to max. Isc the positive polarity is the only one involved, voltage U/2	No effect
	Fault **B**	Max. Isc both polarities are involved	Max. Isc both polarities are involved	Max. Isc both polarities are involved
	Fault **C**	No effect	Same as fault A but this is the negative polarity which is involved	No effect
Most unfavorable case		Fault **A**	Faults **A** and **C**	Fault **B**
Distribution of the breaking poles		The poles required to perform the break are in series on the positive polarity	On each polarity there must be the number of poles required to perform the break of max. Isc at U/2	the poles required to perform the break are shared between the 2 polarities

Calculation the short-circuit current (Isc) across the terminals of a battery

When a short-circuit occurs across its terminals, a battery discharges a current given by Ohm's law:

$$Isc = \frac{Vb}{Ri}$$

Where Vb = the maximum discharge voltage (battery 100 % charged).

and Ri = the internal resistance equivalent to the sum of the cell resistances (figure generally given by the manufacturer according to the capacity of the battery).

Example

What is the short-circuit current at the terminals of a standing battery with the following characteristics:

- Capacity: 500 Ah;
- Max. discharge voltage: 240 V (110 cells of 2.2 V);
- Discharge current: 300 A;
- Autonomy: 1/2 hour;
- Internal resistance: 0.5 mΩ per cell.

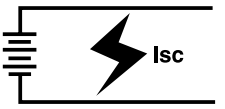
$Ri = 110 \times 0.5\ 10^{-3} = 55 \times 10^{-3}$

$$Isc = \frac{240}{55\ 10^{-3}} = 4.4kA$$

As the above calculation shows, the short-circuit current is relatively weak.

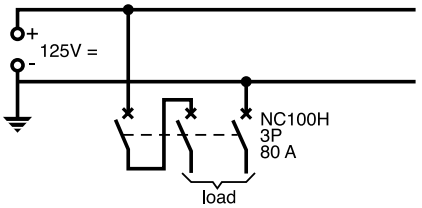
Note: If the internal resistance is not known, the following approximate formula can be used: Isc = kC, where C is the capacity of the battery expressed in Ampere-hours, and k is a coefficient close to 10 but in any case always lower than 20.

240 V DC
300 A
500 Ah
Ri = 0.5 mΩ/ cell



Example 1

Determine the protection required for a 80 A feeder on a 125 V DC network with an earthed negative pole and an Isc of 15 kA.



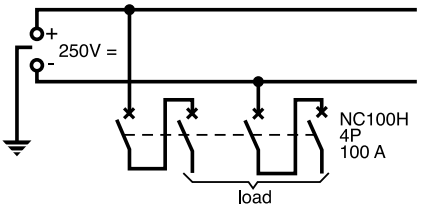
The table opposite indicates that a NC100H circuit breaker (30 kA, 2P, 125 V) should be used.

The table above indicates that both circuit breaker poles should be fitted on the positive pole of the network.

An additional circuit breaker pole can be fitted on the negative pole of the network for isolation purposes.

Example 2

Determine the protection required for a 100 A feeder on a 250 V DC network with an earthed middle point and an Isc of 15 kA.



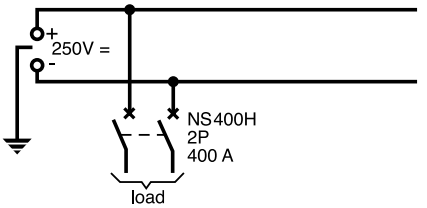
Each pole will be exposed to a maximum of U/2 = 125 V.

The table opposite indicates that NC100H (30 kA, 2P, 125 V), NS100N (50 kA, 1P, 125 V) or NS160N (50 kA, 1P, 125 V) circuit breakers should be used.

The table above indicates that both circuit breaker poles must take part in the breaking at a voltage of 125 V.

Example 3

Determine the protection required for a 400 A feeder on an unearthed 250 V DC network with an Isc of 35 kA.



The table opposite indicates that NS400H circuit breakers (85 kA, 1P, 250 V) should be used. At least 2 poles must take part in breaking. The table above indicates that the half the number of circuit breaker poles required for breaking should be fitted on the positive pole of the network and the other half on the negative pole.

Selection table of DC circuit breakers

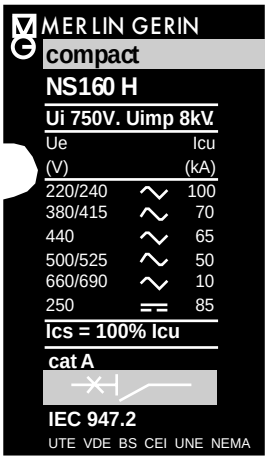
Type	Rated current (A) and trip units	Breaking capacity (kA) (L/R ⩽ 0.015 s) (and number of poles required to perform the break)					Protection against overloads (thermal)	Protection against short-circuits (mag)
		24/48 V	125 V	250 V	500 V	750 V		
NS100N	16-25-40-63-80-100	50(1p)	50 (1p)	50 (1p)	50 (2p)		Same as for trip units used on AC systems	
NS100H	16-25-40-63-80-100	85 (1p)	85 (1p)	85 (1p)	85 (2p)			
NS100L	16-25-40-63-80-100	100 (1p)	100 (1p)	100 (1p)	100 (2p)			
NS160N	80-100-125-160	50 (1p)	50 (1p)	50 (1p)	50 (2p)			
NS160H	80-100-125-160	85 (1p)	85 (1p)	85 (1p)	85 (2p)			
NS160L	80-100-125-160	100 (1p)	100 (1p)	100 (1p)	100 (2p)			
NS250N	160-200-250	50 (1p)	50 (1p)	50 (1p)	50 (2p)			
NS250H	160-200-250	85 (1p)	85 (1p)	85 (1p)	85 (2p)			
NS250L	160-200-250	100 (1p)	100 (1p)	100 (1p)	100 (2p)			
NS400H	MP1/MP2/MP3	85 (1p)	85 (1p)	85 (1p)	85 (2p)		No thermal protection:	Specially designed for DC
NS630H	MP1/MP2/MP3	85 (1p)	85 (1p)	85 (1p)	85 (2p)		An external relay	
C1251N-DC	P21/P41-1250	50 (1p)	50 (1p)	50 (2p)	50 (3p)	25 (3p)	must be provided	

Breaking capacity of miniature circuit-breakers on d.c.
(in brackets, the number of poles involved in breaking)

type of circuit breaker	D.C. breaking capacity(kA)-L/R < 0.015s (IEC 947-2 ,Icu) voltage	24/48V	125V	250V	500V
C60HB/HC		20 (1p)	25 (2p)	50 (4p)	-
C60HD		20 (1p)	25 (2p)	50 (4p)	-
NC100(10-63A)		36 (1p)	40 (2p)	36 (3p)	36 (3)
NC100(80+100A)		20 (1p)	30 (1p)	36 (1p)	-

Circuit breaker marking- Industrial

Conformity with standards



Standardised characteristics indicated on the rating plate

Ui: rated insulation voltage

Uimp: rated impulse withstand voltage

Icu: ultimate breaking capacity, for various values of the rated operational voltage Ue

cat: utilisation category

Icw: short-time withstand current

Ics: service breaking capacity

In: rated current

: suitable for isolation

Circuit breakers and auxiliaries comply with the following international recommendations:

- BSEN60 947-1: general rules;
- BSEN60 947-2: circuit breakers;
- BSEN60 947-3: switches, disconnectors, switch-disconnectors, etc;
- BSEN60 947-4: contactors and motors starters
- BSEN60 947-5.1 and following - control circuit devices and switching elements; automatic control components.

In that these recommendations are applied in most countries, Compact circuit breakers and auxiliaries comply with European (EN 60947-1 and EN 60947-2) and the corresponding national standards:

- France NF;
- Germany VDE;
- U.K BS;
- Austrialia AS;
- Italy CEI.

They also comply with the specifications of the marine classification companies (Veritas, Lloyd's Register of Shipping, Det Norske Veritas, etc).

Concerning the United States UL, Canadian CSA, Mexican NOM and Japanese JIS standards, please consult us.

pollution degree

Circuit breakers are certified for operation in pollution-degree III environments as defined by IEC standard 947 (industrial environments).

Tropicalisation

Circuit breakers comply with the following standards:

- IEC 68-2-30 damp heat;
- IEC 68-2-2 dry heat;
- IEC 68-2-11 salt spray;
- IEC 68-2-1 low temperatures.

Environmental protection

Circuit breakers take intoaccount current concerns for environmental protection. Most components are recyclable and parts are marked as specified in applicable standards.

Ambient temperature

- Circuit breakers can be used at temperatures ranging from -25°C to 70°C. Above 40°C (or 65°C for circuit breakers used to protect motor feeders), always take into account the derating coefficients indicated in the documentation;
- Wherever possible the circuit breakers should be put into service at their normal ambient operating temperature, however this can be done at temperatures between -35°C and -25°C as long as this condition does not last for an extended period;
- In their original pack, circuit breakers may be stored at temperatures ranging from -50° to +85°C.

Suitability for isolation positive contact indication

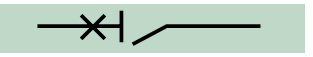
All Circuit breakers are suitable for isolation as defined in IEC standard 947-2/BS60947-2:

- The isolation position corresponds to the O (OFF position);
- The operating handle cannot indicate the ‘off’ position unless the contacts are effectively open;
- Padlocks may not be installed unless the contacts are open.

Installation of a rotary handle or a motor mechanism does not alter the reliability the position indication system.

The isolation function is certified by tests which guarantee:

- The mechanical reliability of the position indication system;
- The absence of leakage currents;
- Overvoltage withstand capacity between upstream and downstream connections.



Residual current earth fault protection

Rcd selection

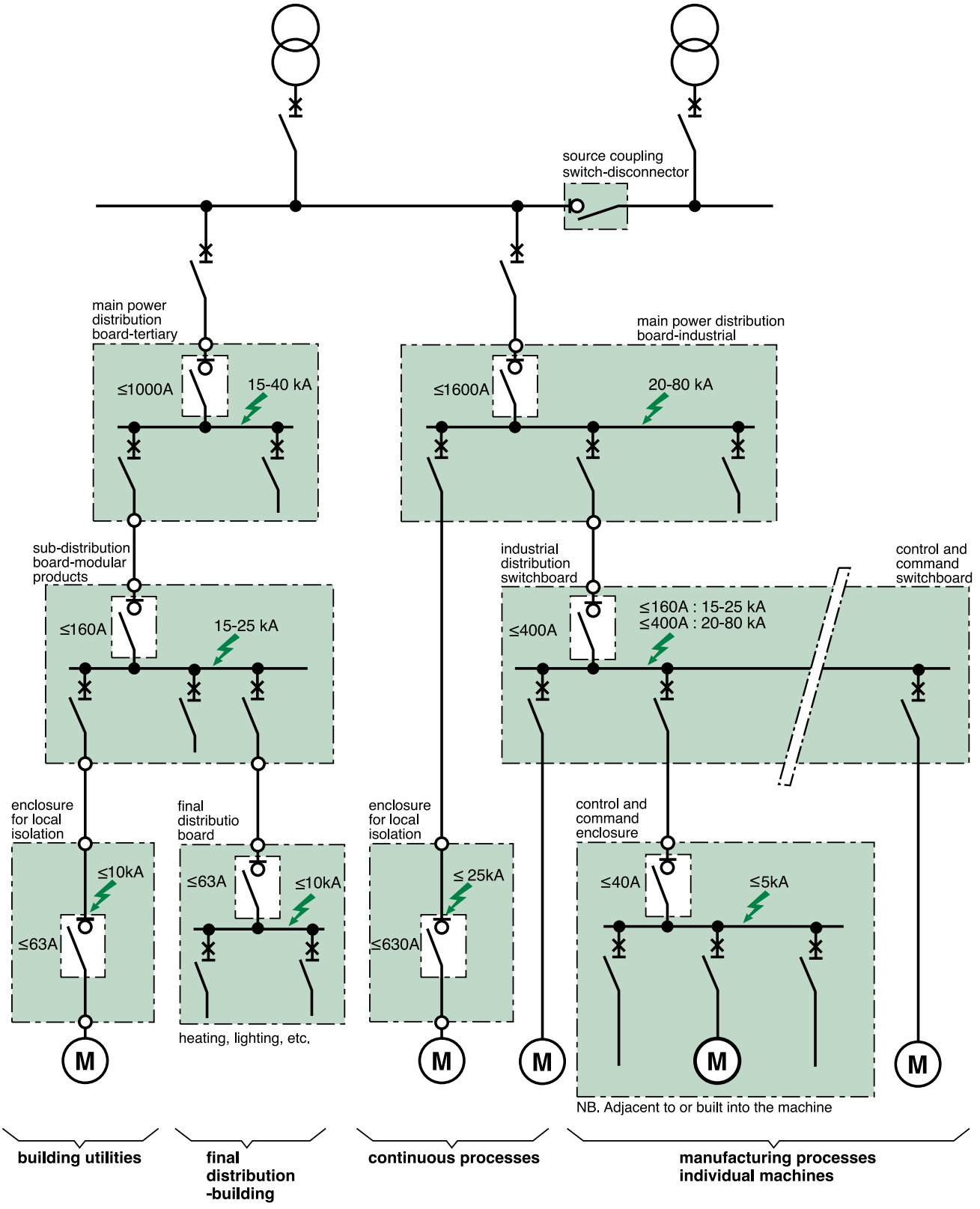
RCD Type	Rated Current	Rated AC Voltage	Number of Poles	Sensitivity	Time Delay
Added to Mcb					
C60H Vigi	1-63A	115-264V	1-2	0.03-0.3A	N/A
C60H Vigi	1-63A	220-456V	2-4	0.03-0.3A	N/A
NC100 Vigi	10-100A	115-264V	1-2	0.03-0.3A	50 to 70 mS
NC100 Vigi	10-100A	220-456V	2-4	0.03-0.3A	50 to 70 mS
C60X Sp Rcbo	6-45A	110-264V	1	0.03A	N/A
SPNX Sp + N	6-40A	110-264V	2	0.03	N/A
C60H Sp Rcbo	6-45A	110-264V	1	0.03A	N/A
DPN Vigi	6-40A	104-264V	2	0.03A	N/A
C120H Vigi	10-125A	230V-415V	2	.03-1A	N/A
C120H Vigi	10-125A	230V-415V	3	.03-1A	N/A
C120H Vigi	10-125A	230V-415V	4	.03-1A	N/A
NG125N Vigi	10-125A	110V-220V	2	.3-1A	N/A
NG125N Vigi	10-125A	415V-440V	3	.3-3A	N/A
NG125N Vigi	10-125A	110V-220V	4	.3-3A	N/A
Added to MCCB					
NS100-250 Vigi	16-250A	200-440V	3-4	0.03-10A	0-310mS
NS100-250 Vigi	16-250A	440-550V	3-4	0.03-10A	0-310mS
NS400-630 Vigi	400-630A	200-440V	3-4	.03-30A	0-310mS
Incorporated in MCCB					
NS400-630 Option T	400-630A	690V Max	3-4	.2-1 x In	0-0.4S
C801-C1251 Option T	800-1250A	690V Max	3-4	0.2-0.6 x In	0-0.4S
Incorporated in ACB (NW)					
Micrologic	600-6300A	220-690V	3-4	120-1200A	0.1-0.4S
Separate Relay					
RH10E	N/A*	1000V	1-4	0.03-.3A	N/A
RH240E	N/A*	1000V	1-4	0.03-25A	0-1S
RH248E	N/A*	1000V	1-4	0.03-25A	0-1S
RH10A	N/A*	1000V	1-4	0.03-.3A	N/A
RH10AP	N/A*	1000V	1-4	0.3-1A	200mS
RH320A	N/A*	1000V	1-4	0.03-250A	N/A
RH320AP	N/A*	1000V	1-4	0.03-250A	0-1S
RH328A	N/A*	1000V	1-4	0.03-250A	0-1S
RH328AP	N/A*	1000V	1-4	0.03-250A	0-1S
RCCB					
RMG16-100	16-100A	115-264V	2	0.03-0.3A	50-70mS
RMG25-100	25-100A	115-456V	4	0.03-0.3A	50-70mS

*Separate Toriod CT used.

Refer to relevant product catalogue for details.

Use of LV switches

Functions performed by switch



Use of LV switches

Functions and positions of LV switches

The switch is essentially a control device, (generally manual, possibly electrical on opening - termed a free tripping switch) capable of breaking and closing a normal service circuit. It does not use any electricity to remain open or closed (2 stable positions).

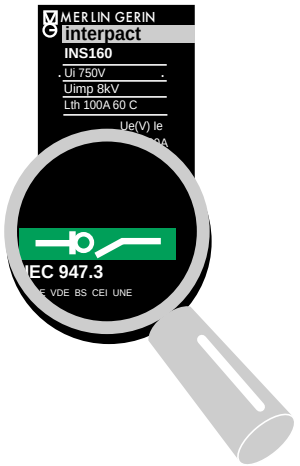
For safety reasons, in the majority of cases is suitable for isolation.

It must always be used in association with a device which protects against overloads and short-circuits.

6 applications have thus been identified:

- coupling and insolating switch in a power switchboard
- isolating switch in an industrial switchboard and automation cabinets
- isolating switch in a modular switchboard
- isolating switch in proximity units
- isolating switch in small commercial distribution units
- automation unit switch.

Suitable for isolation



Switch-disconnector

Isolation permits a circuit or a device to be disconnected from the rest of the electrical installation, in order to guarantee the safety of those who have to achieve repairs or maintenance.

Normally, all circuits in an electrical installation must be capable of being isolated. In practice, to ensure optimal continuity of service, an isolating device is installed at the start of every circuit distribution.

Certain switches allow this function to be achieved in addition to their circuit control function.

Therefore a switch-disconnector must display the symbol (illustrated opposite), visibly on the front face of the installed device.

Isolating function

Installation standards stipulate the requirements which must be respected in order for a device to carry out its isolating function.

It must:

- be with equipped with omnipolar isolation, that is to say that the live conductors, including the neutral (with the exception of the PEN conductor which must never be isolated) must be isolated simultaneously
- be lockable in the “open” position so as to prevent any risk of involontary reclosing ; this is imperative for industrial devices
- conform to a standard which guarantees its suitability for isolation
- It must also meet overvoltage withstand requirements. However, if the isolation is explicitly recognized by a manufacturing standard, for example IEC 60947-1/3 for industrial switch-disconnectors, a device which complies with this isolation standard is judged to comply fully with the conditions required by installation standards.

The manufacturing standard guarantees its use for isolation suitability for the user.

Switch standards and characteristics

Switch standards

Standards define:
- the frequency of operation cycles (with a maximum of 120 per hour)
- mechanical and electrical endurance
- operating breaking and making capacity
  - normal
  - occasional (closing on short-circuit for example)
- utilization categories.

The IEC standards 60947-3 (1) and 60669-1 (2) thus define the principal values which are given below.

Utilization category

Depending on the rated operating current and the A or B mechanical endurance, standards define the utilization categories shown in the table below.

Example:
A switch with a rating of 125 A, from the AC23 category must be able to:
- make a 10 In (1250 A) current with a cos φ of 0.35
- break a 8 In (1000 A) current with a cos φ of 0.35.

Its other characteristics are:
- to withstand a 12 In - 1 s short-circuit current, which defines the Icw = 1500 A r.m.s. thermal withstand during 1 s
- Icm (peak A) short-circuit making capacity which corresponds to the electrodynamic loads.

Utilization category		Characteristic applications
Frequent operations	**Non frequent operations**	
AC-21A	AC-21B	Resistive loads including moderate overloads (cos φ = 0,95)
AC-22A	AC-22B	Mixed resistive and inductive loads including moderate overloads (cos φ = 0,65)
AC-23A	AC-23B	Motors with cage winding or orther loads which are very inductive (cos φ = 0,45 or 0,35)

(1) *The industrial type of switch is defined by the IEC standard 60947-3.*
(2) *The domestic type of switch is defined by the IEC standard 60669-1.*

Choice of switch criteria

Network characteristics

Nominal voltage, nominal frequency and nominal current are determined in the same way as they are for a circuit breaker:
- nominal voltage = network nominal voltage
- frequency = network frequency
- nominal current = rated current with a value which is just above the downstream load current. It is to be noted that the rated current is defined for a given ambient temperature and that a derating may possibly have to be taken into account.

Localization and application

This determines the type and characteristics or major functions that the switch should include. There are 3 levels of functions (see the table opposite):

- basic functions

practically common to all types of switch: isolation, control, notice.

- functions with complementary characteristics.

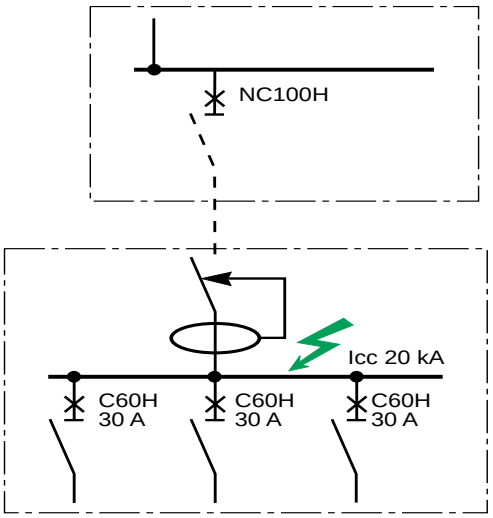
They are the direct translation of the user's needs and the environment in which the switch is located.

These are:
- □ industrial type performances
- □ Isc level
- □ type of locking
- □ type of control
- □ utilization category
- □ mounting system.

- ■ specific functions

They are linked to the operation and installation restrictions, which are:
- □ earth leakage protection
- □ electrical controls
- □ remote opening
- □ withdrawable capacity.

Circuit-breaker or fuse / switch coordination



Coordination

As a switch only has a limited breaking capacity and short-circuit withstand, it must be protected by a short-circuit protection device (SCPD) placed upstream.

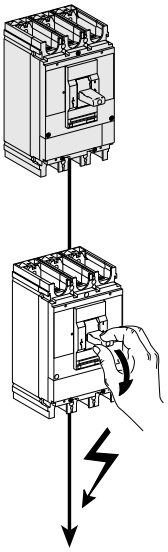
Tables show the SCPD (circuit-breaker or fuse) ensuring proper coordination with the switches in the event of a downstream short-circuit.

Warning: switches must be also protected against overloads. It's generally admitted that the protection against the overloads and short-circuit, is ensured by each downstream circuit-breakers as these circuit-breakers and these switches are located in the **same switchboard**, designed according to the electrical standards.

Modular switch

Example 1:
An enclosure feeder, with an Isc on the busbar of 20 kA, supplies loads with operational currents of 30 A, 20 A and 10 A respectiveldy in single-phase. The installation earthing system is the TT one. The feeder supplying this enclosure is placed in the upstream switchboard and protected by a two-pole NC100H circuit-breaker. Which residual current switch should you choose for the enclosure incomer?
As the feeders are placed in the same enclosure as the switch, cordination can be achieved with each enclosure feeder. Choice will thus be made of an RMG residual current switch of rating 63 A and of C60H type circuit-breakes for the feeders: the table above shows that the C60H withstands 20 kA in this case.

Switch-disconnectors protection



Compact switch-disconnectors
Upstream protection

By circuit breaker	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
By fuse	type aM **(1)** maximum rating (A)	
	Isc max. (500 V)	kA rms
	making capacity (500 V)	kA peak
	type gl **(2)** maximum rating (A)	
	Isc max. (500 V)	kA rms
	making capacity (500 V)	kA peak
	type gl **(1)** maximum rating (A)	
	Isc max. (500 V)	kA rms
	making capacity (500 V)	kA peak
	type BS **(2)** maximum rating (A)	
	Isc max. (500 V)	kA rms
	making capacity (500 V)	kA peak
	type BS **(1)** maximum rating (A)	
	Isc max. (500 V)	kA rms

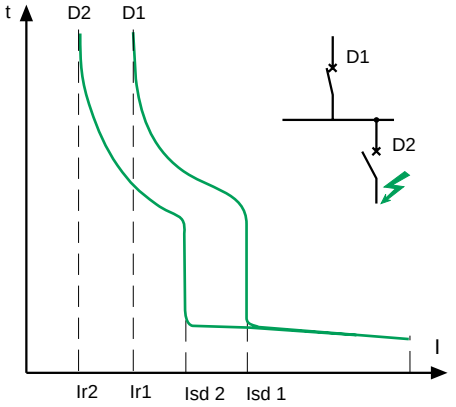
Compact switch-disconnectors
Upstream protection

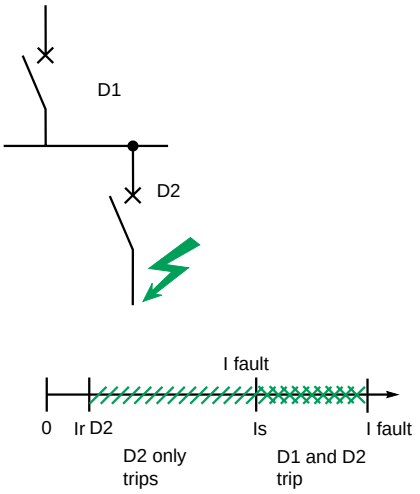
By circuit breaker	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
	type / maximum rating (A)	
	Isc max. (380/415 V)	kA rms
	making capacity (380/415 V)	kA peak
By fuse	type aM **(1)** maximum rating (A)	
	Isc max. (500 V)	kA rms
	making capacity (500 V)	kA peak
	type gl **(2)** maximum rating (A)	
	Isc max. (500 V)	kA rms
	making capacity (500 V)	kA peak
	type gl **(1)** maximum rating (A)	
	Isc max. (500 V)	kA rms
	making capacity (500 V)	kA peak
	type BS **(2)** maximum rating (A)	
	Isc max. (500 V)	kA rms
	making capacity (500 V)	kA peak
	type BS **(1)** maximum rating (A)	
	Isc max. (500 V)	kA rms
	making capacity (500 V)	kA peak

(1) Protection by external thermal relay obligatory.
(2) Without external thermal relay.

	NS100NA	NS160NA	NS250NA
	NS100N / 100 25 52	NS160-250N / 160 36 75	NS250N / 250 36 75
	NS160-250N / 100 36 75	NS160-250H / 160 70 154	NS250H / 250 70 154
	NS100-250H / 100 70 154	NS160-250L / 160 150 330	NS250L / 250 150 330
	NS100-250L / 100 150 330	NSA160N / 160 30 63	
	NSA160N / 100 30 63		
	100 80 176	160 33 69	250 100 220
	80 100 220	125 100 220	200 100 220
	160 100 220	160 100 220	250 100 220
	80 & 63M80 80 176	125 & 100M125 80 176	200 & 100M200 80
	160 & 100M160 80	160 & 100M160 80	250 & 200M250 80

	NS400NA	NS630NA	C801NI	C1251NI
	NS400-630N / 400 45 94	NS630N / 630 45 94	C801-1251N / 800 50 105	C1251N / 1250 50 105
	NS400-630H / 400 70 154	NS630H / 630 70 154	C801-1251H / 800 70 154	C1251H / 1250 70 154
	NS400-630L / 400 150 330	NS630L / 630 150 330	C801-1001L / 800 150 330	C1001L/1000 150 330
	400 100 220	500 100 220	630 100 220	1000 100 220
	315 100 220	500 100 220	630 100 220	1000 100 220
	400 100 220	630 100 220	800 100 220	1250 100 220
	315 & 200M315 80 176	450 & 400M450 80 176	630 80 176	1000 80 176
	355 & 315M355 80 176	500 80 176	670&630 M670 80 176	1250 80 176





upstream	NS100N	NS100H	NS100L	NS160N	NS160H	NS160L
breaking capacity kA eff	**85**	**100**	**150**	**85**	**100**	**150**
downstream	**breaking capacity (kA eff)**					
NS80HMA			150			150
NS100N		100	150		100	150
NS100H			150			150
NS160N					100	150
NS160H						150
GV2M ⩾ 23 A	85	100	100	85	100	100
Integral 18 ⩾ 10 A	85	100	150	85	100	150
Integral 32 ⩾ 25 A	85	100	150	85	100	150
Integral 63 ⩾ 32 A	85	100	150	85	100	150

Section 3
Technical tables

Technical data Page

Cascading

Summary

Application	Network	Upstream device	Downstream device
Distribution cascading	220/240 V	Multi 9	Multi 9
	380/415 V	Multi9	Multi 9
	220/240 V	Compact NS	Compact and Multi 9
		Compact NS and Masterpact	Compact and Multi 9
	380/415 V	Compact NS	Compact and Multi 9
		Compact NS and Masterpact	Compact
	440 V	Compact NS	Compact and Multi 9
		Compact NS and Masterpact	Compact
Motor protection cascading	220/240 V	Compact NS	Compact NS, Integral, GV
	380/415 V	Compact NS	Compact NS, Integral, GV
	440 V	Compact NS	Compact NS, Integral
Cascading for installations with 2 or 3 transformers in parallel			

What is cascading?

Cascading is the use of the current limiting capacity of circuit breakers at a given point to permit installation of lower-rated and therefore lower-cost circuit breakers downstream.

The upstream Compact circuit breakers acts as a barrier against short-circuit currents. In this way, downstream circuit breakers with lower breaking capacities than the prospective short-circuit (at their point of installation) operate under their normal breaking conditions.

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

General use of cascading

With cascading, the devices can be installed in different switchboards. Thus, in general, cascading refers to any combination of circuit breakers where a circuit breaker with a breaking capacity less than the prospective Isc at its point of installation can be used. Of course, the breaking capacity of the upstream circuit breaker must be greater than or equal to the prospective short-circuit current at its point of installation.

The combination of two circuit breakers in cascading configuration is covered by the following standards:

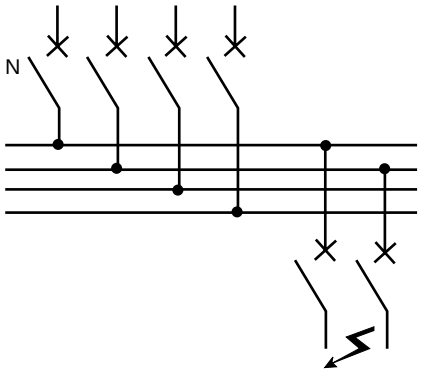
- BSEN 60947-2 (construction)
- IEC 364 & BS 7671 (installation).

Coordination between circuit breakers

The use of a protective device possessing a breaking capacity less than the prospective short-circuit current at its installation point is permitted as long as another device is installed upstream with at least the necessary breaking capacity.

In this case, the characteristics of the two devices must be coordinated in such a way that the energy let through by the upstream device is not more than that which can be withstood by the downstream device and the cables protected by these devices without damage.

Cascading can only be checked by laboratory tests and the possible combinations can be specified only by the circuit breaker manufacturer.



220/240 V network downstream from a 380/415 V network

For 1P + N or 2P circuit breakers connected between the phase and neutral on a 380/415 V network, with a TT or TNS neutral system, consult the 220/240 V cascading table to determinate cascading possibilities between upstream and downstream circuit breakers.

Cascading

Cascading and protection discrimination

In cascading configurations, due to the Roto-active breaking technique, discrimination is maintained and , in some cases, even enhanced. Consult the enhanced discrimination tables on pages 45 to 52 for data on discrimination limits

Economy by means of cascading

Thanks to cascading, circuit breakers with breaking capacities less than the prospective short-circuit current may be installed downstream from a current limiting circuit breaker.

It follows that substantial savings can be made on downstream switchgear and enclosures.

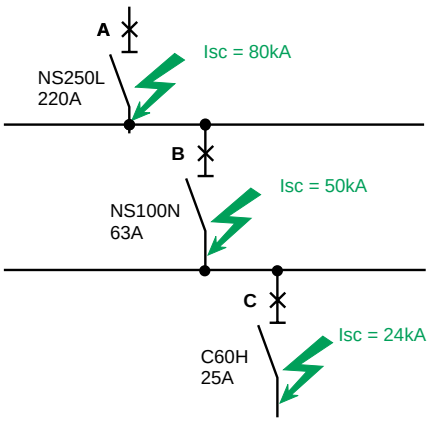
The example below illustrates this possibility.

Cascading tables

Merlin Gerin cascading tables are:

- drawn up on the basis of calculations (comparison between the energy limited by the upstream device and the maximum permissible thermal stress for the downstream device)
- verified experimentally in accordance with BS standard 60947-2.

For distribution systems with 220/240 V, 400/415 V and 440 V between phases, the tables of the following pages indicate cascading possibilities between upstream Compact and downstream Multi 9 and Compact circuit breakers as well as between upstream Masterpact and downstream Compact circuit breakers.



Example of three level cascading

Consider three circuit breakers **A**, **B** and **C** connected in series. The criteria for cascading are fulfilled in the following two cases:

- the upstream device A is coordinated for cascading with both devices B and C (even if the cascading criteria are not fulfilled between B and C). It is simply necessary to check that the combinations A + B and A + C have the required breaking capacity
- each pair of successive devices is coordinated, i.e. A with B and B with C (even if the cascading criteria are not fulfilled between A and C). It is simply necessary to check that the combinations A + B and B + C have the required breaking capacity.

The upstream breaker A is a NS250L (breaking capacity 150 kA) for a prospective Isc of 80 kA across its output terminals.

A NS100N (breaking capacity 25 kA) can be used for circuit breaker B for a prospective Isc of 50 kA across its output terminals, since the "reinforced" breaking capacity provided by cascading with the upstream NS250L is 150 kA.

A C60H (breaking capacity 10 kA) can be used for circuit breaker C for a prospective Isc of 24 kA across its output terminals since the "reinforced" breaking capacity provided by cascading with the upstream NS250L is 30 kA.

Note that the "reinforced" breaking capacity of the C60H with the NS100N upstream is only 25 kA, but:

- A + B = 150 kA
- A + C = 30 kA.

Cascading, network 220/240 V
Upstream: Multi 9
Downstream: Multi 9

Upstream	C60H
Breaking capacity kA rms	30
Downstream	Breaking capacity (kA rms)
C60H	
DPN	30
C45N	30
XC40	30
SC40	30

Upstream	NC100H	NC100LS	NC100LH
Breaking capacity kA rms	20	70	100
Downstream	Breaking capacity (kA rms)		
C60H		70	100
NC100H		70	100
NC100LS			100
DPN	20	70	100
SC40	20	70	100
XC40	20	70	100

Cascading, network 380/450 V(1)
Upstream: Multi 9
Downstream: Multi 9

Upstream	C60H
Breaking capacity kA rms	15
Downstream	Breaking capacity (kA rms)
C60H	
SC40	15
XC40	15

Upstream	NC100H	NC100LS	NC100LH
Breaking capacity kA rms	10	36	50
Downstream	Breaking capacity (kA rms)		
C60H	10	35	50
C60L	10	35	50
NC100H		35	50
NC100LS			50
SC40	10	35	50
XC40	10	35	50

(1) *With single pole, single pole + neutral and two pole circuit breakers, with TT or TNS systems, see cascading table for 220/240 V network.*

Cascading, network 220/240 V
Upstream: Compact NS
Downstream: Compact and Multi 9

Upstream	NSC100N	NS100N	NS100H	NS100L	NS160N	NS160H	NS160L
Breaking capacity kA rms	42	85	100	150	85	100	150
Downstream	Breaking capacity (kA rms)						
DPN/DPNN	15	15	15	15			
C60H	42	50	100	100	50	100	100
XC/SC40		40	40	40	40	40	40
PM25 ≥ 14 A		85	100	100	85	100	100
NC100H	42	65	100	100	65	100	100
NC100LS		85	100	150	85	100	150
NC100LH/LMA				150			150
NG125N		60	70	85	60	70	85
NG125H			85	100		85	100
NS80HMA				150			150
NSC100N		85	100	100	85	100	100
NS100N			100	150		100	150
NS100H				150			150
NS160N						100	150
NS160H							150

Upstream	NS250N	NS250H	NS250L	NS400N	NS400H	NS400L	NS630N	NS630H	NS630L
Breaking capacity kA rms	85	100	150	85	100	150	85	100	150
Downstream	Breaking capacity (kA rms)								
C60H	50	65	65						
XC/SC40	40	40	40						
PM25 ≥ 14 A									
NC100H/NC125H	65	100	100						
NC100LS	85	100	150						
NC100LH/LMA			150						
NG125N	60	70	85						
NG125H		85	100						
NS80HMA			150			150			150
NSC100N	85	100	100	85	100	100	85	100	100
NS100N		100	150		100	150		100	150
NS100H			150			150			150
NS160N		100	150		100	150		100	150
NS160H			150			150			150
NS250N		100	150		100	150		100	150
NS250H			150			150			150
NS400N					100	150		100	150
NS400H						150			150
NS630N								100	150
NS630H									150

Cascading, network 380/415 V(1)

Upstream: Compact NS
Downstream: Compact NS and Multi 9

Upstream	NSC100N	NS100N	NS100H	NS100L	NS160N	NS160H	NS160L
Breaking capacity kA rms	**18**	**25**	**70**	**150**	**36**	**70**	**150**
Downstream	**Breaking capacity (kA rms)**						
C60H	18	25	40	40	30	40	40
XC/SC40	18	25	30	30	25	30	30
PM25 ≥ 14 A	18	25	50	50	25	30	
NC100H	18	25	30	30	25	30	30
NC100LS			70	100		70	100
NC100LH/LMA			70	150		70	150
NG125N			36	70	36	36	70
NG125H			50	100		50	100
NS80HMA				150			150
NSC100N		25	50	50	36	50	50
NS100N			70	150	36	70	150
NS100H				150			150
NS160N						70	150
NS160H							150

Upstream	NS250N	NS250H	NS250L	NS400N	NS400H	NS400L	NS630N	NS630H	NS630L
Breaking capacity kA rms	**36**	**70**	**150**	**45**	**70**	**150**	**45**	**70**	**150**
Downstream	**Breaking capacity (kA rms)**								
C60H	30	30	30						
XC/SC40	25	30	30						
NC100H/NC125H	25	30	30						
NC100LS		70	100						
NC100LH/LMA		70	150						
NG125N	36	36	70						
NG125H		50	100						
NS80HMA			150			150			150
NSC100N	36	50	50	45	50	50	45	50	50
NS100N	36	70	150	45	70	150	45	70	150
NS100H			150			150			150
NS160N		70	150	45	70	150	45	70	150
NS160H			150			150			150
NS250N		70	150	45	70	150	45	70	150
NS250H			150			150			150
NS400N					70	150		70	150
NS400H						150			150
NS630N								70	150
NS630H									150

(1) *With single pole, single pole + neutral and two pole circuit breakers, with TT or TNS systems, see cascading table for 220/240 V network.*

Upstream: Compact C,CM
Downstream: Compact NS, C

upstream	C801N	C801H	C801L	C1001N	C1001H	C1001L	C1251N	C1251H	CMH	Mpact NW L1
breaking capacity kA eff	**85**	**100**	**150**	**85**	**100**	**150**	**85**	**100**	**125**	**150**
downstream	**breaking capacity (kA eff)**									
NS100N		100	150		100	150		100		
NS100H			150			150				
NS160N		100	150		100	150		100		
NS160H			150			150				
NS250N		100	150		100	150		100		
NS250H			150			150				
NS400N		100	150		100	150		100		100
NS400H			150			150				
NS630N		100	150		100	150		100		100
NS630H			150			150				
C801N		100	150		100	150		100	100	100
C801H			150			150				
C1001N					100	150		100	100	100
C1001H						150				
C1251N								100	100	100

Cascading, network 440V

Upstream: Compact NS
Downstream: Compact and Multi 9

Upstream	NS100N	NS100H	NS100L	NS160N	NS160H	NS160L
Breaking capacity kA rms	25	65	130	25	65	130
Downstream	Breaking capacity (kA rms)					
NC100L		50	70		50	70
NC100LS		65	100		65	100
NC100LH/LMA		65	130		65	130
NS80HMA			150			150
NSC100N	25	50	50	35	50	50
NS100N		65	130	35	65	130
NS100H			130			130
NS160N					65	130
NS160H						130

Upstream	NS250N	NS250H	NS250L	NS400N	NS400H	NS400L	NS630N	NS630H	NS630L
Breaking capacity kA rms	35	65	130	42	65	130	42	65	130
Downstream	Breaking capacity (kA rms)								
NC100L		50	70						
NC100LS		65	100						
NC100LH/LMA		65	130						
NS80HMA			150			150			150
NSC100N	35	50	50	42	50	50	42	50	50
NS100N	35	65	130	42	65	130	42	65	130
NS100H			130			130			130
NS160N		65	130	42	65	130	42	65	130
NS160H			130			130			130
NS250N		65	130	42	65	130	42	65	130
NS250H			130			130			130
NS400N					65	130		65	130
NS400H						130			130
NS630N								65	130
NS630H									130

Upstream: Compact CM,Masterpact
Downstream: Compact NS, C

upstream	C801N	C801H	C801L	C1001N	C1001H	C1001L	C1251N	C1251H	CMN	CMH	Mpact NW L1
breaking capacity kA eff	**42**	**65**	**100**	**42**	**65**	**100**	**42**	**65**	**65**	**85**	**150**
downstream	**breaking capacity (kA eff)**										
NS100N	42	65	100	42	65	100	42	65			
NS100H			100			100					
NS160N	42	65	100	42	65	100	42	65			
NS160H			100			100					
NS250N	42	65	100	42	65	100	42	65			
NS250H			100			100					
NS400N		65	100		65	100		65			
NS400H			100			100					
NS630N		65	100		65	100		65			
NS630H			100			100					
C801N		65	100		65	100		65	65	65	65
C801H			100			100					
C1001N					65	100		65	65	65	65
C1001H						100					
C1251N								65	65	65	65

Motor protection cascading

Upstream: Compact NS
Downstream: Compact NS Integral and GVM

Network 220/240 V

upstream	NS100N	NS100H	NS100L	NS160N	NS160H	NS160L
breaking capacity kA eff	**85**	**100**	**150**	**85**	**100**	**150**
downstream	**breaking capacity (kA eff)**					
NS80HMA			150			150
NS100N		100	150		100	150
NS100H			150			150
NS160N					100	150
NS160H						150
GV2M ⩾ 23 A	85	100	100	85	100	100
Integral 18 ⩾ 10 A	85	100	150	85	100	150
Integral 32 ⩾ 25 A	85	100	150	85	100	150
Integral 63 ⩾ 32 A	85	100	150	85	100	150

upstream	NS250N	NS250H	NS250L	NS400H	NS400L	NS630H	NS630L
breaking capacity kA eff	**85**	**100**	**150**	**100**	**150**	**100**	**150**
downstream	**breaking capacity (kA eff)**						
NS80HMA			150		150		150
NS100N		100	150	100	150	100	150
NS100H			150		150		150
NS160N		100	150	100	150	100	150
NS160H			150		150		150
NS250N		100	150	100	150	100	150
NS250H			150		150		150
NS400N				100	150	100	150
NS400H					150		150
NS630N						100	150
NS630H							150
Integral 18 ⩾ 10 A	85	100	150				
Integral 32 ⩾ 25 A	85	100	150				
Integral 63 ⩾ 32 A	85	100	150		150		

Network 380/415 V

upstream	NSC100N	NS100N	NS100H	NS100L	NS160N	NS160H	NS160L	
breaking capacity kA eff	**18**	**25**	**70**	**150**	**36**	**70**	**150**	
downstream	**breaking capacity (kA eff)**							
NS80HMA				150			150	
NS100N			70	150	36	70	150	
NS100H				150			150	
NS160N						70	150	
NS160H							150	
GV2M ⩾ 14 A	18	25	50	50				
GV2L ⩾ 18 A			70	150				
GV2P ⩾ 18 A			70	150				
GV3M			70	150	70	150	150	
Integral 18 ⩾ 10 A			70	150	70	150	150	
Integral 32 ⩾ 25 A			70	150	70	150	150	
Integral 63 ⩾ 32 A			70	150	70	150	150	

upstream	NS250N	NS250H	NS250L	NS400N	NS400H	NS400L	NS630N	NS630H	NS630L
breaking capacity kA eff	**36**	**70**	**150**	**45**	**70**	**150**	**45**	**70**	**150**
downstream	**breaking capacity (kA eff)**								
NS80HMA			150			150			150
NS100N	36	70	150	45	70	150	45	70	150
NS100H			150			150			150
NS160N		70	150	45	70	150	45	70	150
NS160H			150			150			150
NS250N		70	150	45	70	150	45	70	150
NS250H			150			150			150
NS400N					70	150		70	150
NS400H						150			150
NS630N								70	150
NS630H									150
GV3M		70	150						
Integral 18 ⩾ 10 A		70	150						
Integral 32 ⩾ 25 A		70	150						
Integral 63 ⩾ 32 A		70	150		70	150			

Upstream: Compact NS
Downstream: Compact NS, Integral

Network 440 V

upstream	NS100N	NS100H	NS100L	NS160N	NS160H	NS160L	
breaking capacity kA eff	**25**	**65**	**130**	**25**	**65**	**130**	
downstream	**breaking capacity (kA eff)**						
NS80HMA			150			150	
NS100N		65	130	35	65	130	
NS100H			130			130	
NS160N					65	130	
NS160H						130	
Integral 32 ⩾ 16 A		65	130		65	130	
Integral 63 ⩾ 25 A		65	130		65	130	

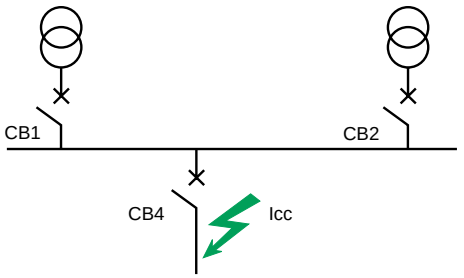
upstream	NS250N	NS250H	NS250L	NS400N	NS400H	NS400L	NS630N	NS630H	NS630L
breaking capacity kA eff	**35**	**65**	**130**	**42**	**65**	**130**	**42**	**65**	**130**
downstream	**breaking capacity (kA eff)**								
NS80HMA			150			150			150
NS100N	35	65	130	42	65	130	42	65	130
NS100H			130			130			130
NS160N		65	130	42	65	130	42	65	130
NS160H			130			130			130
NS250N		65	130	42	65	130	42	65	130
NS250H			130			130			130
NS400N					65	130		65	130
NS400H						130			130
NS630N								65	130
NS630H									130
Integral 32 ⩾ 16 A		65	130						
Integral 63 ⩾ 25 A		65	130		65	130			

Cascading for installations with several transformers in parallel

The following table indicates the types of circuit breakers to be installed on the source feeders and main feeders of an installation with 2 or 3 transformers connected in parallel (1).

The following assumptions are made:
- upstream network short-circuit power of 500 MVA
- the transformers are all identical, 20 kV/415 V and with a normal short-circuit voltage level
- the short-circuit current on the busbars does not take into account the connection impedances (the worst case)
- the equipment is installed in a switchboard with an ambient temperature of 30 °C
- to connect several transformers in parallel, the transformers must have:
  - the same Usc
  - the same transformation ratio
  - the same type of connection
  - a maximum power ratio of 2 between any two of the transformers
  - Isc is given only as a general indication and may vary depending on the percent Usc values given by the transformer manufacturers; the values for breaking capacities reinforced by cascading are therefore given for higher values.

E45068



Installations with 2 transformers in parallel

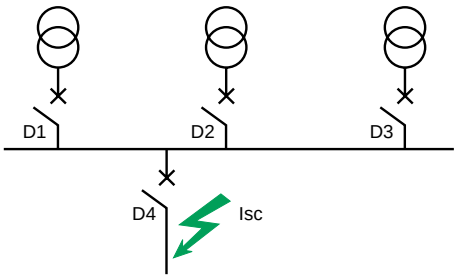
Example: Consider 2 parallel 800 kVA transformers. The source protection devices are two C1251N circuit breakers equipped with STR25DE trip units set at 1250 A. The installation has two feeders rated 125 A and 630 A respectively. Isc max downstream of CB4 is 44640.

The 630 A feeder will be protected by a NS630N circuit breaker (a breaking capacity of 50 kA with cascading).

The 125 A feeder will be equipped with a NS160H circuit breaker as cascading is not possible with an NS160N.

Transformer rating (kVA)	**250**	**315**	**400**	**500**	**500**	**630**	**630**	**800**	**800**
Icc maxi upstream from D4	**13970**	**17580**	**22320**	**25900**	**25900**	**35140**	**35140**	**44640**	**44640**
Nominal transformer current (kVA)	**352**	**444**	**564**	**704**	**704**	**887**	**887**	**1126**	**1126**
Circuit breaker D1 or D2	**NS400N**	**NS630N**	**NS630N**	**C801N**	**C801H**	**C1001N**	**C1001H**	**C1251N**	**C1251H**
Breaking capacity (kA)	**45**	**45**	**45**	**50**	**70**	**50**	**70**	**50**	**70**
Circuit breaker D4	**Reinforced breaking capacity (kA)**								
NS100N	45	45	45						
NS160N	45	45	45	50	50				
NS250N	45	45	45	50	70	50	50		
NS400N				50	70	50	70	50	70
NS630N				50	70	50	70	50	70

E45069



Installations with 3 transformers in parallel

Transformer rating (kVA)	**250**	**315**	**400**	**500**	**500**	**630**	**800**		
Icc maxi downstream form D4	**20910**	**26370**	**33480**	**38850**	**38850**	**52710**	**67080**		
Nominal transformer current (kVA)	**352**	**444**	**564**	**704**	**704**	**887**	**1126**		
Circuit breaker D1 or D2	**NS400N**	**NS630N**	**NS630H**	**C801N**	**C801H**	**C1001H**	**C1251H**		
Breaking capacity (kA)	**45**	**45**	**70**	**50**	**70**	**70**	**70**		
Circuit breaker D4	**Reinforced breaking capacity (kA)**								
NS160N	45	45	45						
NS250N	45	45	45						
NS400N			70	50	70	50	50		
NS630N				50	70	50	50		

For single transformers see page 57

Protection discrimination

Contents

Using the tables

Two circuit breakers offer total discrimination when the corresponding box in the discrimination table is shaded or contains the letter T.

When discrimination is partial for the combination, the corresponding box indicates the maximum value of the fault current for which discrimination is provided. For fault currents above this value, the two circuit breakers trip simultaneously.

Application	Upstream device		Downstream device
Discrimination: distribution circuit-breakers	C60 B, C curves		C60
			DPN, SC-XC40
	C60 D, K curves		C60
	NC100	B curve	C60
		C curve	C60
	NC100	B, C curves	DPN, SC-XC40
		D curve	C60
	NC100,	B, C curves	NC100
	NC100	D curve	NC100
		B, C curves	C60 and C45
	NSC100N		Multi 9
	Compact NS100 to 630		Multi 9
			Compact NS100 to 630
	Compact C, CM		Multi 9, Compact NS100 to 250
			Multi 9, Compact NS400 to 630
			Compact C, CM, Masterpact
	Masterpact NW		Multi 9, Compact NS100 to 630
			Compact C801 to 1001, CM
			Masterpact NW, Masterpact
	Masterpact		Multi 9, Compact NS100 to 630
			Masterpact NW
			Compact C, CM, Masterpact
Discrimininination: motor protection	Compact NS		GV2, Integral
	Compact NS100 to 630		Multi 9, Compact NS
Discrimininination reinforced by cascading distribution circuit-breakers	NSC100N to		Multi 9
	Compact NS100 to 250		Multi 9
	Compact NS250 to 630		NSC100N, NS100 to 250
			NSC100N, NS100 to 630
Discrimininination reinforced by cascading motor protection	Compact NS160 to 400		Integral 18 to 63
	Compact NS160		GV2 M
			GV2 P
			GV2 L

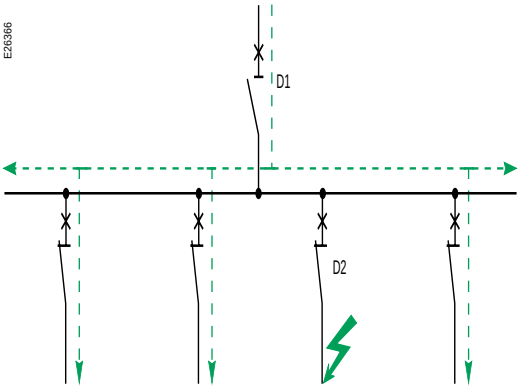
Protection discrimination

Protection discrimination is an essential element that must be taken into account starting at the design stage of a low voltage installation to ensure the highest level of availability for users.

Discrimination is important in all installations for the comfort of users, however it is fundamental in installations requiring a high level of service continuity, e.g. industrial manufacturing processes.

Industrial installations without discrimination run a series of risks of varying importance including:

- production deadline overruns
- interruption in manufacturing, entailing:
  - production or finished-product losses
  - risk of damage to production machines in continuous processes
- restarting of machines, one by one, following a general power outage
- shutdown of vital safety equipment such as lubrification pumps, smoke fans, etc.



What is discrimination?

Discrimination, also called selectivity, is the coordination of automatic protection devices in such a manner that a fault appearing at a given point in a network is cleared by the protection device installed immediately upstream of the fault, and by that device alone.

- **Total discrimination**

Discrimination is said to be total if, for all fault current values, from overloads up to the non-resistive short-circuit current, circuit breaker D2 opens and D1 remains closed.

- **Partial discrimination**

Discrimination is partial if the above condition is not respected up to the full short-circuit current, but only to a lesser value termed the selectivity limit current (Is).

- **No discrimination**

In the event of a fault, both circuit breakers D1 and D2 open.

Total discrimination as standard with the new Masterpact NW circuit breakers

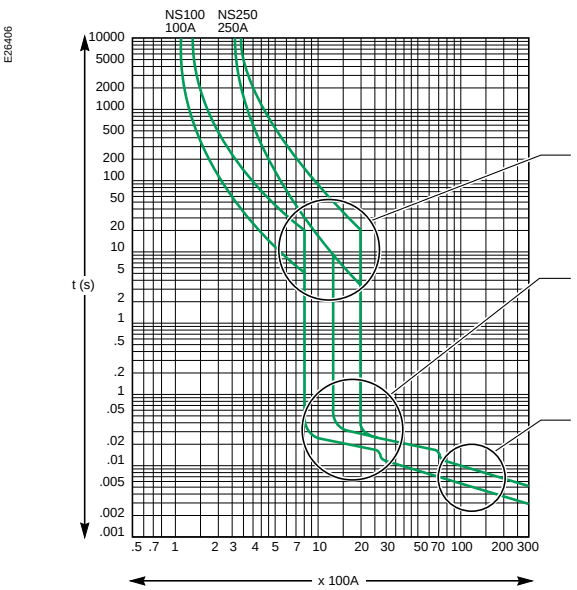
Thanks to their highly innovative design and the exeptional performance of their control units, the new Masterpact NT and NW circuit breakers offer total discrimination with downstream Compact NS devices up to 630 A as standard **(1)**.

Natural discrimination with Compact NS circuit breakers

Due to the Roto-active breaking technique employed by the Compact NS, the combined use of Merlin Gerin circuit breakers provides an exceptional level of protection discrimination.

This is the result of the implementation and optimisation of three different techniques:

- current discrimination
- time discrimination
- energy discrimination.



Overload protection: current discrimination
Discrimination is ensured if the ratio between setting thresholds is greater than 1.6 (for distribution circuit breakers).
Low short-circuit protection: current discrimination

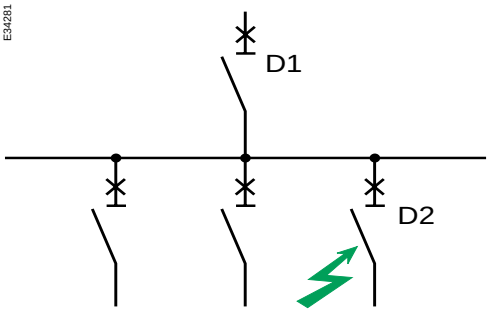
Tripping of the upstream device is slightly delayed to ensure that the downstream device trips first.
Discrimination is ensured if the ratio between the short-circuit thresholds is greater than 1.5.
High short-circuit protection: time discrimination

This protection system combines the exceptional *current limiting capacity of the Compact NS and the advantages of reflex tripping, sensitive to the energy dissipated in the device by the short-circuit. In the event of a high short-circuit detected by two circuit breakers, the downstream device limits it sharply. The energy dissipated in the upstream device is not sufficient to trip it, i.e. discrimination is total for all short-circuit currents.*
Discrimination is ensured if the ratio between the circuit breaker ratings is greater than 2.

(1) *Exept for the L1 performance level on Masterpact NT and subject to the discrimination rules on page 23.*

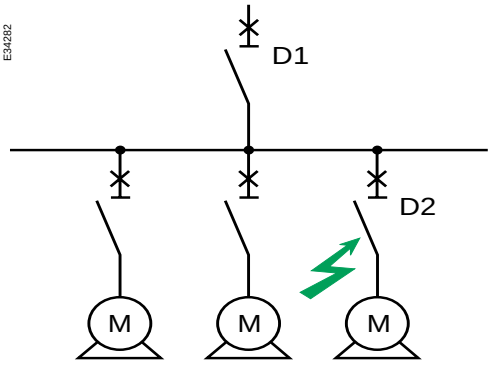
Protection discrimination

E34281



Discrimination between two distribution circuit breakers.

E34282



Discrimination between circuit breakers used for motor protection.

How to use the discrimination tables

■ **For discrimination between 2 distribution circuit breakers**

Combinations providing total discrimination are indicated by coloured zones or the symbol T on a coloured background.

If discrimination is partial, the table indicates the maximum fault current value for which discrimination is ensured. For fault currents above this value, the 2 circuit breakers trip simultaneously.

■ **For discrimination between a circuit breaker and a motor control and protection assembly**

If discrimination is partial, the table indicates the maximum fault current value for which discrimination is ensured. For fault currents above this value, the 2 devices trip simultaneously.

Requisite conditions

The values indicated in the tables (for 380, 415 and 440 V) are guaranteed if the following conditions are respected:

D1	Application	D2	Ratio between upstream and downstream settings	
			Thermal protection	Magnetic protection
			Ir up/ Ir down	Im up/ Im down
TM…D	Distribution	TM…D or Multi9	≥ 1.6	≥ 2
		STR…SE/GE	≥ 1.6	≥ 1.5
	Motor	MA + separate therm. relay	≥ 3	≥ 2
		Thermal-magnetic motor type	≥ 3	≥ 2
		STR…ME	≥ 3	≥ 1.5
STR2.. or 3.. fixed long time delay	Distribution	TM…D or Multi9	≥ 2.5	≥ 1.5
		STR…SE/GE	≥ 1.6	≥ 1.5
	Motor	MA + separate therm. relay	≥ 3	≥ 1.5
		Thermal-magnetic motor type	≥ 3	≥ 1.5
		STR…ME	≥ 3	≥ 1.5
Micrologic 2/5/6/7.0 STR5.. or 6.. with adjustable long time delay (1)	Distribution	TM…D or Multi9	≥ 1.6	≥ 1.5
		STR…SE/GE Micrologic 2/5/6/7.0	≥ 1.2	≥ 1.5
	Motor	MA + separate therm. relay	≥ 3	≥ 1.5
		Thermal-magnetic motor type	≥ 3	≥ 1.5
		STR…ME, Micrologic 2/5/6/7.0	≥ 3	≥ 1.5

(1) *When upstream and / or downstream control units have adjustable long time delays, adjustement must be such as upstream delay is longer than downstream delay (1 step difference).*

Protection discrimination

Upstream: C60 B curve
Downstream: C60

	Upstream	C60											
		B curve											
Downstream	**In (A)**	**2**	**3**	**4**	**6**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**
C60H	**(A)**	8	12	16	24	40	64	80	100	128	160	200	252
B curve	**0.5**												
	0.75												
	1												
	2												
	3												
	4												
	6												
	10												
	16												
	20												
	25												
	32												
	40												
C60H	**(A)**	8	12	16	24	40	64	80	100	128	160	200	252
C curve	**0.5**												
	0.75												
	1												
	2												
	3												
	4												
	6												
	10												
	16												
	20												
C60H	**(A)**		12	16	24	40	64	80	100	128	160	200	252
D curve	**0.5**												
	0.75												
	1												
	2												
	3												
	4												
	6												
	10												
	16												

Discrimination zone

Protection discrimination

Upstream: C60 C curve
Downstream: C60

	Upstream	C60H											
		C curve											
Downstream	**In (A)**	**2**	**3**	**4**	**6**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**
C60H	**(A)**	15	23	30	45	75	120	150	188	240	300	375	473
B curve	**0.5**												
	0.75												
	1												
	2												
	3												
	4												
	6												
	10												
	16												
	20												
	25												
	32												
	40												
	50												
C60H	**(A)**	15	23	30	45	75	120	150	188	240	300	375	473
C curve	**0.5**												
	0.75												
	1												
	2												
	3												
	4												
	6												
	10												
	16												
	20												
	25												
	32												
C60H	**(A)**	15	23	30	45	75	120	150	188	240	300	375	473
D curve	**0.5**												
	0.75												
	1												
	1.6												
	2												
	3												
	4												
	6												
	10												
	16												
	20												

Discrimination zone

Protection discrimination

Upstream: C60 B, C curves
Downstream: DPN, SC-XC40

	Upstream	C60a, N, H, L B curve											
Downstream	**In (A)**	**2**	**3**	**4**	**6**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**
DPN	**(A)**					40	64	80	100	128	160	200	252
SC-XC40	**6**												
B curve	**10**												
	16												
	20												
	25												
	32												
	40												
DPN	**(A)**	12	16	24	40	64	80	100	128	160	200	252	
	1												
SC-XC40	**2**												
C curve	**3**												
	4												
	5												
	6												
	10												
	16												
	20												
DPN	**(A)**					75	120	150	188	240	300	375	473
SC-XC40	**6**												
B curve	**10**												
	16												
	20												
	25												
	32												
	38												
DPN	**(A)**	15	23	30	45	75	120	150	188	240	300	375	473
	1												
SC-XC40	**2**												
C curve	**3**												
	4												
	5												
	6												
	10												
	15												
	20												
	25												
	32												

Discrimination zone

Protection discrimination

Upstream: C60 D

Downstream: C60 - DPN - SC40 - XC40

	Upstream	**C60H** D curve											
Downstream	**In (A)**	**2**	**3**	**4**	**6**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**
C60H	**(A)**	24	36	48	72	120	192	240	300	384	480	600	756
B curve	**0.5**												
	0.75												
	1												
	2												
	3												
	4												
	6												
	10												
	16												
	20												
	25												
	32												
	40												
	50												
C60H	**(A)**	24	36	48	72	120	192	240	300	384	480	600	756
C curve	**0.5**												
	0.75												
	1												
	2												
	3												
	4												
	6												
	10												
	16												
	20												
	25												
	32												
	40												
	50												
C60H	**(A)**	24	36	48	72	120	192	240	300	384	480	600	756
D curve	**0.5 / 0.75**												
	1												
	1.6												
	2												
	3												
	4												
	6												
	10												
	16												
	20												
	25												
	32												
	40												

	Upstream	**C60** D curve											
Downstream	**In (A)**	**2**	**3**	**4**	**6**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**
DPN	**(A)**					120	192	240	300	384	480	600	756
SX-XC40	**6 / 10**												
B curve	**16**												
	20												
	25												
	32												
	40												
DPN/DPN Vigi	**(A)**	24	36	48	72	120	192	240	300	384	480	600	756
	1												
SC-XC40	**2**												
C curve	**3**												
	4												
	5												
	6												
	10												
	16												
	20												
	25												
	32												

Discrimination zone

Protection discrimination

Upstream: NC 100, B curve
Downstream: C60

	Upstream	NC100H, LS, LH									
		B curve									
Downstream	**In (A)**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**
C60H	**(A)**	40	64	80	100	128	160	200	252	320	400
B curve	**1**										
	2										
	3										
	4										
	6										
	10										
	16										
	20										
	25										
	32										
	40										
	50										
	63										
C60H	**(A)**	40	64	80	100	128	160	200	252	320	400
C curve	**1**										
	2										
	3										
	4										
	6										
	10										
	16										
	20										
	25										
	32										
	40										
	50										
	63										
C60H	**(A)**	40	64	80	100	128	160	200	252	320	400
D curve	**1**										
	1.6										
	2										
	3										
	4										
	6										
	10										
	16										
	20										
	25										
	32										
	40										
	50										
	63										

Discrimination zone

Protection discrimination

Upstream: NC 100, C curve
Downstream: C60

	Upstream	NC100H, L, LS, LH C curve									
Downstream	**In (A)**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**
C60H	**(A)**	75	120	150	188	240	300	375	473	600	750
B curve	**1**										
	2										
	3										
	4										
	6										
	10										
	16										
	20										
	25										
	32										
	40										
	50										
	63										
C60H	**(A)**	75	120	150	188	240	300	375	473	600	750
C curve	**1**										
	2										
	3										
	4										
	6										
	10										
	16										
	20										
	25										
	32										
	40										
	50										
	63										
C60H	**(A)**	75	120	150	188	240	300	375	473	600	750
D curve	**1**										
	1.6										
	2										
	3										
	4										
	6										
	10										
	16										
	20										
	25										
	32										
	40										
	50										
	63										
C60LMA	**(A)**	75	120	150	190	240	300	375	470		
	1.6										
	2.5										
	4										
	6.3										
	10										
	12.5										
	16										
	25/40										

Protection discrimination

Upstream: NC 100, B, C, D curves
Downstream: DPN, SC-XC40

	Upstream	NC100H, LS, LH B curve										NC100H, LS, LH C curve									
Downstream	**In (A)**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**
DPN	**(A)**		64	80	100	128	160	200	252	320	400		120	150	188	240	300	375	473	600	750
SC40-XC40	**6**																				
B curve	**10**																				
	16																				
	20																				
	25																				
	32																				
	40																				
DPN	**(A)**	40	64	80	100	128	160	200	252	320	400	75	120	150	188	240	300	375	473	600	750
	1																				
SC40-XC40	**2**																				
C curve	**3**																				
	4	4										4									
	5		5										5								
	6																				
	10																				
	16																				
	20																				
	25																				
	32																				
	40																				

	Upstream	NC100 D curve									
Downstream	**In (A)**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**
DPN	**(A)**	20	192	240	300	384	480	600	756	960	1200
SC-XC40	**5**										
B curve	**10**										
	16										
	20										
	25										
	32										
	38										
DPN	**(A)**	120	192	240	300	384	480	600	756	960	1200
	1										
SC-XC40	**2**										
C curve	**3**										
	4										
	5										
	10										
	16										
	20										
	25										
	32										
	40										

Discrimination zone

Protection discrimination

Upstream: NC 100 D curve
Downstream: C60

	Upstream	NC100H, LS D curve									
Downstream	**In (A)**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**
C60H	**(A)**	120	192	240	300	384	480	600	756	960	1200
B curve	**1**										
	2										
	3										
	4										
	6										
	10										
	16										
	20										
	25										
	32										
	40										
	50										
	63										
C60H	**(A)**	120	192	240	300	384	480	600	756	960	1200
C curve	**1**										
	2										
	3										
	4										
	6										
	10										
	16										
	20										
	25										
	32										
	40										
	50										
	63										
C60H	**(A)**	120	192	240	300	384	480	600	756	960	1200
D curve	**1**										
	1.6										
	2										
	3										
	4										
	6										
	10										
	16										
	20										
	25										
	32										
	40										
	50										
	63										
C60LMA	**(A)**	120	190	240	300	384	480	600	756		
	1.6										
	2.5										
	4										
	6.3										
	10										
	12.5										
	16										
	25/40										

Protection discrimination

Upstream: NC 100, B, C, curves
Downstream: NC100;

	Upstream	NC100H,LS, LH B curve									
Downstream	**In (A)**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**
NC100H	**(A)**	40	64	80	100	128	160	200	252	320	400
NC100LS, LH	**10**										
B curve	**16**										
	20										
	25										
	32										
	40										
	50										
	63										
	80										
	100										
NC100H	**(A)**					128	160	200	252	320	400
NC100LS, LH	**10**										
C curve	**16**										
	20										
	25										
	32										
	40										
	50										
	63										
	80										
	100										
NC100H	**(A)**							200	252	320	400
NC100LS, LH	**10**										
D curve	**16**										
	20										
	25										
	32										
	40										
	50										
	63										
	80										
	100										

	Upstream	NC100H, LS, LH C curve									
Downstream	**In (A)**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**
NC100H	**(A)**		120	150	188	240	300	375	473	600	750
NC100LS, LH	**10**										
B curve	**16**										
	20										
	25										
	32										
	40										
	50										
	63										
	80										
	100										
NC100H	**(A)**			150	188	240	300	375	473	600	750
NC100LS, LH	**10**										
C curve	**16**										
	20										
	25										
	32										
	40										
	50										
	63										
	80										
	100										
NC100H	**(A)**					240	300	375	473	600	750
NC100LS, LH	**10**										
D curve	**16**										
	20										
	25										
	32										
	40/50										
	63										
	80/100										

Discrimination zone

Protection discrimination

Upstream: NC 100 D curve
Downstream: NC100

	Upstream	NC100H, LS, LH									
		D curve									
Downstream	**In (A)**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**
NC100H	**(A)**		192	240	300	384	480	600	720	960	1200
NC100LS, LH	**10**										
B curve	**16**										
	20										
	25										
	32										
	40										
	50										
	63										
	80										
	100										
NC100H	**(A)**		192	240	300	384	480	600	720	960	1200
NC100LS, LH	**10**										
C curve	**16**										
	20										
	25										
	32										
	40										
	50										
	63										
	80										
	100										
NC100H	**(A)**			240	300	384	480	600	720	960	1200
NC100LS, LH	**10**										
D curve	**16**										
	20										
	25										
	32										
	40										
	50										
	63										
	80										
	100										

Discrimination zone

Protection discrimination

Upstream: NC 100 B and C curves
Downstream: C60 and C45

	Upstream	NC100H, LS, LH										NC100H, LS, LH									
		B curve										C curve									
Downstream	**In (A)**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**
C60H	**(A)**	40	64	80	100	128	160	200	252	320	400	75	120	150	188	240	300	375	473	600	750
B curve	**1**																				
Type 2	**2**																				
	3																				
	4																				
	6																				
	10																				
	16																				
	20																				
	25																				
	32																				
	40																				
	50																				
	63																				
C60H	**(A)**	40	64	80	100	128	160	200	252	320	400	75	120	150	188	240	300	375	473	600	750
C curve	**1**																				
C45N-C60H	**2**																				
Type 3	**3**																				
	4																				
	6																				
	10																				
	16																				
	20																				
	25																				
	32																				
	40																				
	50																				
C60H	**(A)**	40	64	80	100	128	160	200	252	320	400	75	120	150	188	240	300	375	473	600	750
D curve	**1**																				
	2																				
	3																				
C60H	**4**																				
Type 4	**6**																				
C45AD	**10**																				
	16																				
	20																				
	25																				
	32																				

Discrimination zone

Discrimination

Upstream: NG125 N, H, L/C120 N, H, B, C curves
Downstream: DPN, DPN N, XC40

Upstream		NG125 N, H, B curve										
In (A)		10	16	20	25	32	40	50	63	80	100	125
downstream	rating											
discrimination limit (A)												
DPN	6		64	80	400	500	700	800	3000			
XC40	10			80	100	100	500	600	1800	300		
B curve	16				100	125	160	200	1000	2000	3300	3750
	20					125	160	200	1000	1600	2500	3700
	25						160	200	800	1300	2100	3700
	32							200	600	1000	1800	2700
	40									320	1600	2400
discrimination limit (A)												
DPN	1	300	500	700	1000	1500	2000	2500	T	T	T	T
TC16	2	150	300	500	700	1000	1500	2000	T	T	T	T
XC40	3	40	63	300	500	700	1000	1500	T	T	T	T
C curve	6		63	80	400	500	700	800	3000	T	T	T
	10				100	350	500	600	1800	3000	4000	T
	16					125	340	450	1000	2000	3300	3700
	20						160	200	1000	1600	2500	3700
	25							200	800	1300	2100	3700
	32								600	1000	1800	2700
	40									320	1600	2400

Upstream		NG125 N, H, C curve										
In (A)		10	16	20	25	32	40	50	63	80	100	125
downstream	rating											
discrimination limit (A)												
DPN	1	300	500	700	1000	1500	2000	2500	T	T	T	T
TC16	2	150	300	500	700	1000	1500	2000	T	T	T	T
XC40	3	80	140	300	500	700	1000	1500	T	T	T	T
B, C curves	6			170	400	500	700	800	3000	T	T	T
	10				200	350	500	600	1800	3000	T	T
	16					270	340	450	1250	2000	3300	3700
	20						320	400	1000	1600	2500	3700
	25							400	800	1300	2100	3700
	32								600	1000	1800	2700
	40									700	1600	2400

Upstream		NG125 N, H, C curve										
In (A)		10	16	20	25	32	40	50	63	80	100	125
downstream	rating											
discrimination limit (A)												
DPN	1	300	500	700	1000	1500	2000	2500	4500	4500	4500	4500
C curve	2	150	300	500	700	1000	1500	2000	4500	4500	4500	4500
	3	120	200	300	500	700	1000	1500	4500	4500	4500	4500
	6	120	200	240	400	500	700	800	3000	4500	4500	4500
	10		200	240	300	400	500	600	1800	3000	4500	4500
	16				300	400	500	600	1000	2000	3300	3700
	20						500	600	1000	1600	2500	3700
	25							600	800	1300	2100	3700
	32								800	1000	1800	2700
	40								800	1000	1600	2400

Upstream		NG125 N, H, C curve										
In (A)		10	16	20	25	32	40	50	63	80	100	125
downstream	rating											
discrimination limit (A)												
DPN	1	300	500	700	1000	1500	2000	2500	4500	4500	4500	4500
D curve	2	150	300	500	700	1000	1500	2000	4500	4500	4500	4500
	3	120	200	300	500	700	1000	1500	4500	4500	4500	4500
	6				400	500	700	800	3000	4500	4500	4500
	10						500	600	1800	3000	4500	4500
	16								1000	2000	3300	3700
	20								1000	1600	2500	3700
	25									1300	2100	3700
	32										1800	2700
	40											2400

Discrimination (short-circuit under 230V)
Upstream: NG125 N, H, C120 N, H, B curve
Downstream: C60, H, L-MA

Upstream		**NG125 N, H, L/C120 N, H,** B curve										
In (A)		**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
downstream	**rating**											
discrimination limit (A)												
C60N	0.5	T	T	T	T	T	T	T	T	T	T	T
B, C curves	0.75	T	T	T	T	T	T	T	T	T	T	T
	1	500	700	1500	2200	3100	3500	4000	T	T	T	T
	2	300	450	700	1500	2100	2500	2800	4500	T	T	T
	3	150	300	300	950	1500	1600	1800	4000	T	T	T
	4		150	200	600	1200	1300	1400	3400	T	T	T
	6			150	400	950	1000	1000	2800	5000	T	T
	10					600	600	750	2500	4000	T	T
	16							600	2100	3500	4500	5500
	20									2500	3500	4500
	25									1600	2500	3500
	32											2800
	40											2500
	50											
	63											
discrimination limit (A)												
C60 H, L	0.5	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
B, C, Z curves	0.75	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
	1	550	700	1500	2200	3100	3500	4000	6000	7000	10000	10000
	2	300	450	700	1500	2100	2500	2800	4500	6000	8000	10000
	3	150	350	300	950	1500	1600	1800	4000	6000	7000	10000
	4		150	200	600	1200	1300	1400	3400	6000	6000	8000
	6			150	400	950	1000	1000	2800	5000	6000	6500
	10					600	600	750	2500	4000	5500	600
	16							600	2100	3500	4500	5500
	20									2500	3500	4500
	25									1600	2500	3500
	32											2800
	40											2500
	50											
	63											
discrimination limit (A)												
C60N	0.5	T	T	T	T	T	T	T	T	T	T	T
D curves	0.75	T	T	T	T	T	T	T	T	T	T	T
	1	550	700	1500	2200	3100	3500	4000	T	T	T	T
	2		450	700	1500	2100	2500	2800	4500	T	T	T
	3			300	950	1500	1600	1800	4000	T	T	T
	4					1200	1300	1400	3400	T	T	T
	6							1000	2800	5000	T	T
	10									4000	5500	T
	16									3500	4500	5500
	20											4500
	25											3500
	32											
	40											
	50											
	63											
discrimination limit (A)												
C60H, L	1	550	700	1500	2200	3100	3500	4000	6000	7000	10000	10000
D, K. MA curves	2		450	700	1500	2100	2500	2800	4500	6000	8000	10000
	3			300	950	1500	1600	1800	4000	6000	7000	10000
	4					1200	1300	1400	3400	6000	6000	8000
	6							1000	2800	5000	6000	6500
	10									4000	5500	6000
	16									3500	4500	5500
	20											4500
	25											3500
	32											
	40											
	50											
	63											

Discrimination (short-circuit under 230V)
Upstream: NG125 N, H, C120 N, H, C curve
Downstream: C60, H, L-MA

Upstream		**NG125 N, H, L/C120 N, H,** C curve										
In (A)		**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
downstream	**rating**											
discrimination limit (A)												
C60 H	0.5	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
B, C curves	0.75	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
	1	800	1000	2000	3000	4500	5500	7000	10000	10000	10000	10000
	2	400	600	1000	2000	3000	3500	4000	6000	10000	10000	10000
	3	200	400	400	1300	2100	2300	2500	6000	10000	10000	10000
	4		200	300	900	1600	1800	2000	5000	8000	10000	10000
	6			200	500	1300	1400	1500	4000	6500	8500	10000
	10				300	800	900	1000	3500	6000	6500	8000
	16					500	650	800	3000	5000	6000	7000
	20						400	700	2000	3600	5500	6000
	25							500	1000	2200	3500	5000
	32								700	1500	2500	4000
	40									1300	1800	3600
	50										1500	2500
	60											2100
discrimination limit (A)												
C60 H	1	800	1000	2000	3000	4500	5500	7000	10000	10000	10000	10000
D curve	2		600	1000	2000	3000	3500	4000	6000	10000	10000	10000
	3			400	1300	2100	2300	2500	6000	10000	10000	10000
	4				900	1600	1800	2000	5000	8000	10000	10000
	6					1300	1400	1500	4000	6500	8500	10000
	10						900	1000	3500	6000	6500	8000
	16							800	3000	5000	6000	7000
	20								2000	3600	5500	6000
	25									2200	3500	5000
	32										2500	4000
	40											3600
	50											
	60											

Discrimination (short-circuit under 230V)
Upstream: NG125 N, H, L/C120 N, H, D curve
Downstream: C60, H

Upstream		**NG125 N, H, C120 N, H,** D curve										
In (A)		**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
downstream	**rating**											
discrimination limit (A)												
C60 N	0.5	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
B, C curves	0.75	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
	1	900	1100	2300	3400	5000	6000	7000	10000	10000	10000	10000
	2	450	700	1100	2300	3400	4000	4500	8000	10000	10000	10000
	3	250	450	450	1500	2400	2600	2800	7000	8000	10000	10000
	4		200	350	1000	1800	2000	2300	6000	6500	10000	10000
	6			250	600	1500	1600	1700	4500	6000	8500	10000
	10				350	900	1000	1200	4000	6000	6500	10000
	16					600	750	900	3400	5600	6000	8000
	20						500	800	2300	4000	6000	7000
	25							600	1200	2500	4000	5500
	32								800	1700	2800	4500
	40								600	1500	2200	4000
	50										1700	2800
	60											2300
discrimination limit (A)												
C60 N	1	900	1100	2300	3400	5000	6000	7000	10000	10000	10000	10000
D curve	2		700	1100	2300	3400	4000	4500	8000	10000	10000	10000
	3			450	1500	2400	2600	2800	7000	8000	10000	10000
	4				1000	1800	2000	2300	6000	6500	10000	10000
	6					1500	1600	1700	4500	6000	8500	10000
	10						1000	1200	4000	6000	6500	10000
	16							900	3400	5600	6000	8000
	20								2300	4000	6000	7000
	25								1200	2500	4000	5500
	32										2800	4500
	40											4000
	50											
	60											

Discrimination (short-circuit under 400V)
Upstream: NG125 N, H, C120 N, H, B curve
Downstream: C60, H

Upstream		**NG125 N, H, L/C120 N, H** B curve										
In (A)		**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
downstream	**rating**											
discrimination limit (A)												
C60 H	0.5	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
	0.75	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
	1	200	300	450	700	1000	1300	1600	2800	3500	5000	6000
B, C curves	2	100	220	300	450	550	900	1260	2500	3000	4500	6000
	3	60	150	220	350	450	700	1150	2300	2600	4000	4500
	4		100	150	250	400	650	1000	2000	2300	3300	4000
	6			120	200	300	500	700	1750	2000	3000	3500
	10					200	300	600	1100	1500	2600	3300
	16							450	700	1000	2300	2900
	20									800	1900	2500
	25									700	1700	2200
	32											1550
	40											1100
	50											
	63											
discrimination limit (A)												
C60 H	1	200	300	450	700	1000	1300	1600	2800	3500	5000	6000
D curves	2		220	300	450	550	900	1260	2500	3000	4500	6000
	3			220	350	450	700	1150	2300	2600	4000	4500
	4					400	650	1000	2000	2300	3300	4000
	6							700	1750	2000	3000	3500
	10									1500	2600	3300
	16									1000	2300	2900
	20											2500
	25											2200
	32											
	40											
	50											
	63											

Discrimination (short-circuit under 400V)
Upstream: NG125 N, H, C120 N, H, C curve
Downstream: C60, H,

Upstream		**NG125 N, H, L/C120 N, H** C curve										
In (A)		**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
downstream	**rating**											
discrimination limit (A)												
C60 H	0.5	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
B, C curves	0.75	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
	1	300	450	600	1000	1600	2000	2500	6000	6000	6000	6000
	2	150	300	450	600	800	1300	2000	6000	6000	6000	6000
	3	80	200	300	450	600	1000	1600	5000	6000	6000	6000
	4		160	250	350	500	1000	1600	4000	5000	6000	6000
	6			170	300	400	800	1200	2500	4000	6000	6000
	10				210	270	500	800	1000	3200	5000	6000
	16					270	400	600	1000	1600	3600	5500
	20						340	500	800	1200	3000	4000
	25							420	600	1000	2500	3200
	32								530	1000	1600	2500
	40									680	1000	1600
	50										850	1300
	63											1200
discrimination limit (A)												
C60 H	1	300	450	600	1000	1600	2000	2500	6000	6000	6000	6000
D curves	2		300	450	600	800	1300	2000	6000	6000	6000	6000
	3			300	450	600	1000	1600	5000	6000	6000	6000
	4				350	500	1000	1600	4000	5000	6000	6000
	6					400	800	1200	2500	4000	6000	6000
	10						500	800	1000	3200	5000	6000
	16							600	1000	1600	3600	5500
	20								800	1200	3000	4000
	25									1000	2500	3200
	32										1600	2500
	40											1600
	50											
	63											

Discrimination (short-circuit under 400V)
Upstream: NG125 N, H, C120 N,H, D curve
Downstream: C60, H

Upstream		**NG125 N, H, L/C120 N, H** D curve										
In (A)		**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
downstream	**rating**											
discrimination limit (A)												
C60 H	0.5	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
B, C curves	0.75	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
	1	400	550	900	1400	1900	2400	3000	6000	6000	6000	6000
	2	200	400	550	900	1200	1600	2100	6000	6000	6000	6000
	3	130	250	350	650	900	1300	1900	6000	6000	6000	6000
	4		140	270	450	700	1100	1700	4000	6000	6000	6000
	6			220	400	600	900	1300	3000	4300	6000	6000
	10				260	500	600	900	2000	3300	6000	6000
	16					370	500	700	1400	2000	4300	6000
	20						450	600	1100	1800	3500	4500
	25							500	1000	1300	3000	3600
	32								800	1300	1800	2600
	40								500	1000	1300	2200
	50										1100	1800
	63											1500
discrimination limit (A)												
C60 H	1	400	550	900	1400	1900	2400	3000	6000	6000	6000	6000
D curves	2	200	400	550	900	1200	1600	2100	6000	6000	6000	6000
	3		250	350	650	900	1300	1900	6000	6000	6000	6000
	4			270	450	700	1100	1700	4000	6000	6000	6000
	6				400	600	900	1300	3000	4300	6000	6000
	10					500	600	900	2000	3300	6000	6000
	16						500	700	1400	2000	4300	6000
	20								1100	1800	3500	4500
	25								1000	1300	3000	3600
	32									1300	1800	2600
	40										1300	2200
	50											1800
	63											

Discrimination

Upstream: NG125 N, H, C120 N,H, B, C curves
Downstream: NG125, C120

Upstream		**NG125 N, H, C120 N, H** D curve										
In (A)		**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
downstream	**rating**											
discrimination limit (A)		40	64	80	100	128	160	200	252	320	400	500
NG125	10	T	T	T	T	T	T	T	T	T	T	T
C120	16				T	T	T	T	T	T	T	T
B curve	20					T	T	T	T	T	T	T
	25						T	T	T	T	T	T
	32							T	T	T	T	T
	40								T	T	T	T
	50									T	T	T
	63										T	T
	80											T
	100											
discrimination limit (A)						128	160	200	252	320	400	500
NG125	10					T	T	T	T	T	T	T
C120	16							T	T	T	T	T
C curve	20								T	T	T	T
	25									T	T	T
	32										T	T
	40											T
	50											
	63											
	80											
	100											
discrimination limit (A)								200	252	320	400	500
NG125	10							T	T	T	T	T
C120	16									T	T	T
D curve	20										T	T
	25											
	32											
	40											
	50											
	63											
	80											
	100											

Upstream		**NG125 N, H, C120 N, H** C curve										
In (A)		**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
downstream	**rating**											
discrimination limit (A)		80	128	160	200	256	320	400	504	640	800	1000
NG125	10		T	T	T	T	T	T	T	T	T	T
C120	16				T	T	T	T	T	T	T	T
B curve	20					T	T	T	T	T	T	T
	25						T	T	T	T	T	T
	32							T	T	T	T	T
	40								T	T	T	T
	50									T	T	T
	63											T
	80											
	100											
discrimination limit (A)		80	128	160	200	256	320	400	504	640	800	1000
NG125	10		T	T	T	T	T	T	T	T	T	T
C120	16				T	T	T	T	T	T	T	T
C curve	20					T	T	T	T	T	T	T
	25						T	T	T	T	T	T
	32							T	T	T	T	T
	40								T	T	T	T
	50									T	T	T
	63											T
	80											
	100											
discrimination limit (A)						256	320	400	504	640	800	1000
NG125	10					T	T	T	T	T	T	T
C120	16						T	T	T	T	T	T
D curve	20								T	T	T	T
	25									T	T	T
	32										T	T
	40											T
	50											
	63											
	80											
	100											

Discrimination

Upstream: NG125 N, H, C120 N,H, D curve
Downstream: NG125, C120

Upstream		**NG125 N, H, C120 N, H** D curve										
In (A)		**10**	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
downstream	**rating**											
discrimination limit (A)			192	240	300	384	480	600	756	960	1200	1500
NG125	10		T	T	T	T	T	T	T	T	T	T
C120	16				T	T	T	T	T	T	T	T
B curve	20					T	T	T	T	T	T	T
	25						T	T	T	T	T	T
	32							T	T	T	T	T
	40								T	T	T	T
	50									T	T	T
	63										T	T
	80											T
	100											
discrimination limit (A)			192	240	300	384	480	600	756	960	1200	1500
NG125	10		T	T	T	T	T	T	T	T	T	T
C120	16				T	T	T	T	T	T	T	T
C curve	20					T	T	T	T	T	T	T
	25						T	T	T	T	T	T
	32							T	T	T	T	T
	40								T	T	T	T
	50									T	T	T
	63										T	T
	80											T
	100											
discrimination limit (A)			192	240	300	384	480	600	756	960	1200	1500
NG125	10		T	T	T	T	T	T	T	T	T	T
C120	16				T	T	T	T	T	T	T	T
D curve	20					T	T	T	T	T	T	T
	25						T	T	T	T	T	T
	32							T	T	T	T	T
	40								T	T	T	T
	50									T	T	T
	63										T	T
	80											T
	100											

Discrimination

Upstream: Compact NS
Downstream: DPN, C60, C120, NG125

Upstream		**NS100N/H/L**		**NS160N/HL**				**NS250N/H/L**			**NS100N/H/L -NS160N/H/L NS250N/H/L**			
		declencheur TM-D									declencheur STR22SE			
In (A)		**80**	**100**	**80**	**100**	**125**	**160**	**160**	**200**	**250**	**100**	**160**	**200**	**250**
downstream	rating (A)													
DPN N	<40		1.2	T	T	T	T	T	T	T	T	T	T	T
C60H	<25	1.2	1.2	T	T	T	T	T	T	T	1.2	T	T	T
	32/50	1.2	1.2		T	T	T	T	T	T	1.2	T	T	T
	63		1.2		T	T	T	T	T	T	1.2	T	T	T
C120H	63		1.2		T	T	T	T	T	T	1.2	T	T	T
	80					T	T	T	T	T		T	T	T
	100						T	T	T	T		T	T	T
	126							T	T	T		T	T	T
NG125H	25/32	1.2	1.2	T	T	T	T	T	T	T	1.2	T	T	T
	40	1.2	1.2	T	T	T	T	T	T	T	1.2	T	T	T
	50	1.2	1.2	7	7	7	7	T	T	T	1.2	2.5	2.5	2.5
	63		1.2		4	4	4	T	T	T	1.2	2.5	2.5	2.5
	80					2.5	2.5	T	T	T		2.5	2.5	2.5
	100						2.5	T	T	T		2.5	2.5	2.5
	125								T	T			2.5	2.5

Protection discrimination

Upstream: NSC100N
Downstream: DPN N, XC40, C60, NC100

	Upstream	NSC100N								
Downstream	**Rating (A) Setting Ir**	**16**	**25**	**32**	**40**	**50**	**63**	**70**	**80**	**100**
DPN N	**≤ 10**	0.6	0.6	0.6	0.6	T	T	T	T	T
C, D curves	**16**			0.6	0.6	T	T	T	T	T
	20			0.6	0.6	T	T	T	T	T
	25				0.6	T	T	T	T	T
	32						T	T	T	T
	40							T	T	T
XC40	**≤ 10**	0.6	0.6	0.6	0.6	3	3	3	3	3
L-U curves	**16**			0.6	0.6	3	3	3	3	3
	20			0.6	0.6	3	3	3	3	3
	25				0.6	3	3	3	3	3
	32						3	3	3	3
	38							3	3	3
	40							3	3	3
C60H	**≤ 10**	0.6	0.6	0.6	0.6	T	T	T	T	T
B, C, D curves	**16**			0.6	0.6	T	T	T	T	T
	20			0.6	0.6	T	T	T	T	T
	25				0.6	T	T	T	T	T
	32						6	6	6	8
	40							6	6	8
	50									6
	63									6
NC100H	**≤ 50**									1.25
B, C curves	**63**									1.25
	80									
	100									
NC100H	**≤ 50**									1.25
D curve	**63**									1.25
	80									
	100									
NC100LS	**20**			0.6	0.6	15	15	15	15	T
	25				0.6	15	15	15	15	T
	32						15	15	15	T
	40							8	8	T
	50									T
	63									T
NC100LH	**≤ 16**	0.6	0.6	0.6	0.6	T	T	T	T	T
C curve	**20**			0.6	0.6	15	15	15	15	T
	25				0.6	15	15	15	15	T
	32						15	15	15	T
	40							8	8	T
	50									T
	63									T

Protection discrimination

Upstream: NS100 to 250 - Trip unit TMD
Downstream: DPN N, XC40, C60, NC100

	Upstream	NS100N/H/L								NS160N/H/L				NS250N/H/L		
		Trip unit TM-D								Trip unit TM-D				Trip unit TM-D		
Downstream	**Rating (A)**	**16**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**80**	**100**	**125**	**160**	**160**	**200**	**250**
	Setting Ir															
DPN N	**≤ 10**	0.19	0.3	0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
C, D curves	**16**		0.3	0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	20			0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	25					0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	32						0.5	0.63	0.8	T	T	T	T	T	T	T
	40						0.5	0.63	0.8	T	T	T	T	T	T	T
XC40	**≤ 10**	0.19	0.3	0.4	0.5	0.5	0.5	0.63	0.8	4	5	5	5	T	T	T
L-U curves	**16**		0.3	0.4	0.5	0.5	0.5	0.63	0.8	4	5	5	5	T	T	T
	20			0.4	0.5	0.5	0.5	0.63	0.8	4	5	5	5	T	T	T
	25				0.5	0.5	0.5	0.63	0.8	4	5	5	5	T	T	T
	32						0.5	0.63	0.8	4	5	5	5	T	T	T
	38						0.5	0.63	0.8	4	5	5	5	T	T	T
	40						0.5	0.63	0.8	4	5	5	5	T	T	T
C60H	**≤ 10**	0.19	0.3	0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
B, C. D curves	**16**		0.3	0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	20			0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	25				0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	32						0.5	0.63	0.8	T	T	T	T	T	T	T
	40						0.5	0.63	0.8	T	T	T	T	T	T	T
	50							0.63	0.8	T	T	T	T	T	T	T
	63								0.8		T	T	T	T	T	T
NC100H	**≤ 50**							0.63	0.8	2.5	2.5	2.5	2.5	T	T	T
B, C curves	**63**								0.8		2.5	2.5	2.5	T	T	T
	80											2.5	2.5	T	T	T
	100												2.5	T	T	T
NC100H	**≤ 50**							0.63	0.8	2.5	2.5	2.5	2.5	T	T	T
D curve	**63**								0.8		2.5	2.5	2.5	T	T	T
	80											2.5	2.5	T	T	T
	100												2.5	T	T	T
NC100LS	**20**			0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	25					0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	32						0.5	0.63	0.8	T	T	T	T	T	T	T
	40						0.5	0.63	0.8	T	T	T	T	T	T	T
	50							0.63	0.8	T	T	T	T	T	T	T
	63								0.8		T	T	T	T	T	T
NC100LH	**≤ 16**			0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
C curve	**20**			0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	25					0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
	32						0.5	0.63	0.8	T	T	T	T	T	T	T
	40							0.63	0.8	T	T	T	T	T	T	T
	50							0.63	0.8	T	T	T	T	T	T	T
	63								0.8		T	T	T	T	T	T

Protection discrimination

Upstream: NS100 to 250, Trip unit TMD
Downstream: NG125

	Upstream	NS100N/H/L								NS160N/H/L				NS250N/H/L		
		Trip unit TM-D								Trip unit TM-D				Trip unit TM-D		
Downstream	**Rating (A)**	**16**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**80**	**100**	**125**	**160**	**160**	**200**	**250**
	Setting Ir															
NG125N, H	**≤ 20**			0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
B, C curves	**25, 32**						0.5	0.63	0.8	T	T	T	T	T	T	T
	40							0.63	0.8	T	T	T	T	T	T	T
	50							0.63	0.8	2.5	2.5	2.5	2.5	T	T	T
	63								0.8		2.5	2.5	2.5	T	T	T
	80												2.5	T	T	T
	100												2.5	T	T	T
	125														T	T
NG125N, H	**≤ 20**			0.4	0.5	0.5	0.5	0.63	0.8	T	T	T	T	T	T	T
D curve	**25, 32**						0.5	0.63	0.8	T	T	T	T	T	T	T
	40							0.63	0.8	T	T	T	T	T	T	T
	50								0.8	2.5	2.5	2.5	2.5	T	T	T
	63										2.5	2.5	2.5	T	T	T
	80												2.5	T	T	T
	100												2.5		T	T
	125														T	T

Protection discrimination

Upstream: NS 100 to 160 - Trip unit STR
Downstream: DPN N, XC40, C60, NC100

	Upstream	NS100N/H/L Trip unit STR22SE							NS160N/H/L Trip unit STR22SE									
Downstream	Rating (A)	40			100				80					160				
	Setting Ir	16	25	40	40	63	80	100	32	40	50	63	80	63	80	100	125	160
DPN N	**≤ 10**		0.4	0.4	1.2	1.2	1.2	1.2	T	T	T	T	T	T	T	T	T	T
C, D curves	**16**			0.4	1.2	1.2	1.2	1.2		T	T	T	T	T	T	T	T	T
	20					1.2	1.2	1.2			T	T	T	T	T	T	T	T
	25					1.2	1.2	1.2				T	T	T	T	T	T	T
	32						1.2	1.2					T		T	T	T	T
	40							1.2								T	T	T
XC40	**≤ 10**		0.4	0.4	1.2	1.2	1.2	1.2	T	T	T	T	T	T	T	T	T	T
L, U curves	**16**			0.4	1.2	1.2	1.2	1.2		T	T	T	T	T	T	T	T	T
	20					1.2	1.2	1.2			T	T	T	T	T	T	T	T
	25					1.2	1.2	1.2				T	T	T	T	T	T	T
	32						1.2	1.2					T		T	T	T	T
	38						1.2	1.2								T	T	T
	40							1.2								T	T	T
C60H	**≤ 10**		0.4	0.4	1.2	1.2	1.2	1.2	T	T	T	T	T	T	T	T	T	T
B, C, D curves	**16**			0.4	1.2	1.2	1.2	1.2		T	T	T	T	T	T	T	T	T
	20					1.2	1.2	1.2			T	T	T	T	T	T	T	T
	25					1.2	1.2	1.2				T	T	T	T	T	T	T
	32						1.2	1.2					T		T	T	T	T
	40							1.2								T	T	T
	50																T	T
	63																	T
NC100H	**≤ 50**																T	T
B, C curves	**63**																	T
	80																	
	100																	
NC100H	**≤ 50**																T	T
D curve	**63**																	T
	80																	
	100																	
NC100LS	**20**					1.2	1.2	1.2						T	T	T	T	T
	25					1.2	1.2	1.2						T	T	T	T	T
	32						1.2	1.2							T	T	T	T
	40							1.2								T	T	T
	50																T	T
	63																	T
NC100LH	**≤ 16**			0.4	1.2	1.2	1.2	1.2						T	T	T	T	T
C curve	**20**					1.2	1.2	1.2						T	T	T	T	T
	25					1.2	1.2	1.2						T	T	T	T	T
	32						1.2	1.2							T	T	T	T
	40							1.2								T	T	T
	50																T	T
	63																	T

Protection discrimination

Upstream: NS 250 to 630 - Trip unit STR
Downstream: DPN N, XC40, C60, NC100

	Upstream	NS250N/H/L					NS400N/H/L					NS630N/H/L				
		Trip unit STR22SE					Trip unit STR23SE/53UE					Trip unit STR23SE/53UE				
Downstream	Rating (A)	250					400					630				
	Setting Ir	100	125	160	200	250	160	200	250	320	400	250	320	400	500	630
DPN N	**≤ 10**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
C, D curves	**16**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	20	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	25	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
XC40	**≤ 10**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
L, U curves	**16**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	20	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	25	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	38	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
C60H	**≤ 10**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
B, C, D curves	**16**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	20	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	25	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50		T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63			T	T	T	T	T	T	T	T	T	T	T	T	T
NC100H	**≤ 50**		T	T	T	T	T	T	T	T	T	T	T	T	T	T
B, C curves	**63**			T	T	T	T	T	T	T	T	T	T	T	T	T
	80				T	T	T	T	T	T	T	T	T	T	T	T
	100				T	T	T	T	T	T	T	T	T	T	T	T
NC100H	**≤ 50**		T	T	T	T	T	T	T	T	T	T	T	T	T	T
D curve	**63**			T	T	T	T	T	T	T	T	T	T	T	T	T
	80				T	T	T	T	T	T	T	T	T	T	T	T
	100				T	T	T	T	T	T	T	T	T	T	T	T
NC100LS	**20**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	25	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50		T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63			T	T	T	T	T	T	T	T	T	T	T	T	T
NC100LH	**≤ 16**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
C curve	**20**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	25	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50		T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63			T	T	T	T	T	T	T	T	T	T	T	T	T

Protection discrimination

Upstream: NS 100 to 160 - Trip unit STR
Downstream: NG125

Downstream	Upstream	NS100N/H/L Trip unit STR22SE							NS160N/H/L Trip unit STR22SE									
	Rating (A)	40			100				80					160				
	Setting Ir	16	25	40	40	63	80	100	32	40	50	63	80	63	80	100	125	160
NG125N, H B, C curves	**≤ 20**					0.63	0.8	1						T	T	T	T	T
	25, 32						0.8	1							T	T	T	T
	40							1								T	T	T
	50																2	2.5
	63																	2.5
	80																	
	100																	
	125																	
NG125N, H D curve	**≤ 20**													T	T	T	T	T
	25, 32														T	T	T	T
	40															T	T	T
	50					0.63	0.8	1									2.5	2.5
	63						0.8	1										2.5
	80							1										
	100																	
	125																	

Protection discrimination

Upstream: NS 250 to 630 - Trip unit STR
Downstream: NG125

	Upstream	NS250N/H/L					NS400N/H/L					NS630N/H/L				
		Trip unit STR22SE					Trip unit STR23SE/53UE					Trip unit STR23SE/53UE				
Downstream	**Rating (A)**	**250**					**400**					**630**				
	Setting Ir	**100**	**125**	**160**	**200**	**250**	**160**	**200**	**250**	**320**	**400**	**250**	**320**	**400**	**500**	**630**
NG125N, H	**≤ 20**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
B, C curves	**25, 32**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50		T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63			T	T	T	T	T	T	T	T	T	T	T	T	T
	80				T	T		T	T	T	T	T	T	T	T	T
	100					T			T	T	T	T	T	T	T	T
	125									T	T		T	T	T	T
NG125N, H	**≤ 20**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
D curve	**25, 32**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50		T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63			T	T	T	T	T	T	T	T	T	T	T	T	T
	80				T	T		T	T	T	T	T	T	T	T	T
	100					T			T	T	T	T	T	T	T	T
	125									T	T		T	T	T	T

Protection discrimination

Upstream: NS 100 to 25 - Trip unit TMD
Downstream: NS100 to 250

	Upstream	NS100N/H/L Trip unit TM-D								NS160N/H/L Trip unit TM-D				NS250N/H/L Trip unit TM-D		
Downstream	**Rating (A) Setting Ir**	**16**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**80**	**100**	**125**	**160**	**160**	**200**	**250**
NS100N	**16**			0.4	0.5	0.5	0.5	0.63	0.8	1	2	2	2	T	T	T
Trip unit TM-D	**25**				0.5	0.5	0.5	0.63	0.8	1	2	2	2	T	T	T
	32						0.5	0.63	0.8	1	2	2	2	T	T	T
	40							0.63	0.8	1	2	2	2	T	T	T
	50							0.63	0.8	1	2	2	2	T	T	T
	63								0.8		2	2	2	T	T	T
	80											1.25	1.25	T	T	T
	100												1.25	T	T	T
NS100H	**16**				0.5	0.5	0.5	0.63	0.8	1	2	2	2	T	T	T
Trip unit TM-D	**25**					0.5	0.5	0.63	0.8	1	2	2	2	T	T	T
	32						0.5	0.63	0.8	1	2	2	2	36	36	36
	40							0.63	0.8	1	2	2	2	36	36	36
	50							0.63	0.8	1	2	2	2	36	36	36
	63								0.8		2	2	2	36	36	36
	80											1.25	1.25	36	36	36
	100												1.25	36	36	36
NS100L	**16**				0.5	0.5	0.5	0.63	0.8	1	2	2	2	T	T	T
Trip unit TM-D	**25**					0.5	0.5	0.63	0.8	1	2	2	2	T	T	T
	32						0.5	0.63	0.8	1	2	2	2	36	36	36
	40							0.63	0.8	1	2	2	2	36	36	36
	50							0.63	0.8	1	2	2	2	36	36	36
	63								0.8		2	2	2	36	36	36
	80											1.25	1.25	36	36	36
	100												1.25	36	36	36
NS160N	**≤ 63**											1.25	1.25	2.6	4	5
Trip unit TM-D	**80**											1.25	1.25	2.6	4	5
	100												1.25	2.6	4	5
	125														4	5
	160															5
NS160H	**≤ 63**											1.25	1.25	2.6	4	5
Trip unit TM-D	**80**											1.25	1.25	2.6	4	5
	100												1.25	2.6	4	5
	125														4	5
	160															5
NS160L	**≤ 63**											1.25	1.25	2.6	4	5
Trip unit TM-D	**80**											1.25	1.25	2.6	4	5
	100												1.25	2.6	4	5
	125														4	5
	160															5
NS250N	**≤ 100**													1.6	2	2.5
Trip unit TM-D	**125**														2	2.5
	160															2.5
	200															
	250															
NS250H/L	**≤ 100**													1.6	2	2.5
Trip unit TM-D	**125**														2	2.5
	160															2.5
	200															
	250															
NS100N	**40**							0.63	0.8	1	1.25	1.25	1.25	T	T	T
Trip unit STR22SE	**100**												1.25	T	T	T
NS100H/L	**40**							0.63	0.8	1	1.25	1.25	1.25	36	36	36
Trip unit STR22SE	**100**												1.25	36	36	36
NS160N	**40**							0.63	0.8	1	1.25	1.25	1.25	1.6	2	2.5
Trip unit STR22SE	**100**												1.25	1.6	2	2.5
	160															2.5
NS160H/L	**40**							0.63	0.8	1	1.25	1.25	1.25	1.6	2	2.5
Trip unit STR22SE	**100**												1.25	1.6	2	2.5
	160															2.5
NS250N	**≤ 100**													1.6	2	2.5
Trip unit STR22SE	**160**															2.5
	250															
NS250H/L	**≤ 100**													1.6	2	2.5
Trip unit STR22SE	**160**															2.5
	250															

Protection discrimination

Upstream: NS 100 to 250 - Trip unit TMD
Downstream: NSC100N

	Upstream	NS100N/H/L Trip unit TM-D								NS160N/H/L Trip unit TM-D				NS250N/H/L Trip unit TM-D		
Downstream	Rating (A)	16	25	32	40	50	63	80	100	80	100	125	160	160	200	250
	Setting Ir															
NSC100N	15		0.3	0.4	0.5	0.5	0.5	0.63	0.8	2	2	2	2	T	T	T
	20			0.4	0.5	0.5	0.5	0.63	0.8	2	2	2	2	T	T	T
	25					0.5	0.5	0.63	0.8	2	2	2	2	T	T	T
	32						0.5	0.63	0.8	2	2	2	2	T	T	T
	40							0.63	0.8	2	2	2	2	T	T	T
	50							0.63	0.8		2	2	2	T	T	T
	63								0.8		2	2	2	T	T	T
	70											2	2	T	T	T
	80											1.25	1.25	T	T	T
	100												1.25	T	T	T

Protection discrimination

Upstream: NS 100 to 160 - Trip unit STR
Downstream: NS100 to 160

	Upstream	NS100N/H/L							NS160N/H/L									
		Trip unit STR22SE							Trip unit STR22SE									
Downstream	Rating (A)	40			100				80					160				
	Setting Ir	16	25	40	40	63	80	100	32	40	50	63	80	63	80	100	125	160
NS100N	**16**					1.2	1.2	1.2						2	2	2	2	2
Trip unit TM-D	**25**					1.2	1.2	1.2						2	2	2	2	2
	32						1.2	1.2							2	2	2	2
	40							1.2								2	2	2
	50							1.2									2	2
	63																	2
	80																	
	100																	
NS100H	**16**					1.2	1.2	1.2						2	2	2	2	2
Trip unit TM-D	**25**					1.2	1.2	1.2						2	2	2	2	2
	32						1.2	1.2							2	2	2	2
	40							1.2									2	2
	50							1.2									2	2
	63																	2
	80																	
	100																	
NS100L	**16**					1.2	1.2	1.2						2	2	2	2	2
Trip unit TM-D	**25**					1.2	1.2	1.2						2	2	2	2	2
	32						1.2	1.2							2	2	2	2
	40							1.2									2	2
	50							1.2									2	2
	63																	2
	80																	
	100																	
NS160/N	**≤ 63**																	
Trip unit TM-D	**80**																	
	100																	
	125																	
	160																	
NS160H	**≤ 63**																	
Trip unit TM-D	**80**																	
	100																	
	125																	
	160																	
NS160L	**≤ 63**																	
Trip unit TM-D	**80**																	
	100																	
	125																	
	160																	
NS100N	**40**					1.2	1.2	1.2						2	2	2	2	2
Trip unit STR22SE	**100**																	2
NS100H/L	**40**					1.2	1.2	1.2						2	2	2	2	2
Trip unit STR22SE	**100**																	2
NS160N	**40**					1.2	1.2	1.2						2	2	2	2	2
Trip unit STR22SE	**100**																	2
	160																	
NS160H/L	**40**					1.2	1.2	1.2						2	2	2	2	2
Trip unit STR22SE	**100**																2	2
	160																	

Protection discrimination

Upstream: NS250 to 630, Trip unit STR
Downstream: NS100 to 160

	Upstream	NS250N/H/L					NS400N/H/L					NS630N/H/L				
		Trip unit STR22SE					Trip unit STR23SE/53UE					Trip unit STR23SE/53UE				
Downstream	Rating (A)	250					400					630				
	Setting Ir	100	125	160	200	250	160	200	250	320	400	250	320	400	500	630
NS100N	**16**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
Trip unit TM-D	**25**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50		T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63			T	T	T	T	T	T	T	T	T	T	T	T	T
	80				T	T		T	T	T	T	T	T	T	T	T
	100					T			T	T	T	T	T	T	T	T
NS100H	**16**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
Trip unit TM-D	**25**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	36	36	36	36	36	T	T	T	T	T	T	T	T	T	T
	40	36	36	36	36	36	T	T	T	T	T	T	T	T	T	T
	50		36	36	36	36	T	T	T	T	T	T	T	T	T	T
	63			36	36	36	T	T	T	T	T	T	T	T	T	T
	80				36	36		T	T	T	T	T	T	T	T	T
	100					36			T	T	T	T	T	T	T	T
NS100L	**16**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
Trip unit TM-D	**25**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	36	36	36	36	36	T	T	T	T	T	T	T	T	T	T
	40	36	36	36	36	36	T	T	T	T	T	T	T	T	T	T
	50		36	36	36	36	T	T	T	T	T	T	T	T	T	T
	63			36	36	36	T	T	T	T	T	T	T	T	T	T
	80				36	36		T	T	T	T	T	T	T	T	T
	100					36			T	T	T	T	T	T	T	T
NS160/N	**≤ 63**			3	3	3	T	T	T	T	T	T	T	T	T	T
Trip unit TM-D	**80**				3	3		T	T	T	T	T	T	T	T	T
	100					3			T	T	T	T	T	T	T	T
	125									T	T		T	T	T	T
	160										T		T	T	T	T
NS160H	**≤ 63**			3	3	3	T	T	T	T	T	T	T	T	T	T
Trip unit TM-D	**80**				3	3		T	T	T	T	T	T	T	T	T
	100					3			T	T	T	T	T	T	T	T
	125									T	T		T	T	T	T
	160										T		T	T	T	T
NS160L	**≤ 63**			3	3	3	T	T	T	T	T	T	T	T	T	T
Trip unit TM-D	**80**				3	3		T	T	T	T	T	T	T	T	T
	100					3			T	T	T	T	T	T	T	T
	125									T	T		T	T	T	T
	160										T		T	T	T	T
NS250N	**≤ 100**					3			5	5	5	T	T	T	T	T
Trip unit TM-D	**125**									5	5		T	T	T	T
	160										5			T	T	T
	200														T	T
	250															T
NS250H/L	**≤ 100**					3			5	5	5	T	T	T	T	T
Trip unit TM-D	**125**									5	5		T	T	T	T
	160										5			T	T	T
	200														T	T
	250															T
NS100N	**40**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
Trip unit STR22SE	**100**			T	T	T	T	T	T	T	T	T	T	T	T	T
NS100H/L	**40**	36	36	36	36	36	T	T	T	T	T	T	T	T	T	T
Trip unit STR22SE	**100**			36	36	36	T	T	T	T	T	T	T	T	T	T
NS160N	**40**	3	3	3	3	3	T	T	T	T	T	T	T	T	T	T
Trip unit STR22SE	**100**			3	3	3	T	T	T	T	T	T	T	T	T	T
	160					3		T	T	T	T	T	T	T	T	T
NS160H/L	**40**	3	3	3	3	3	T	T	T	T	T	T	T	T	T	T
Trip unit STR22SE	**100**			3	3	3	T	T	T	T	T	T	T	T	T	T
	160					3		T	T	T	T	T	T	T	T	T
NS250N	**≤ 100**			3	3	3	5	5	5	5	5	T	T	T	T	T
Trip unit STR22SE	**160**				3	3			5	5	5	T	T	T	T	T
	250										5		T	T	T	T
NS250H/L	**≤ 100**				3	3	5	5	5	5	5	T	T	T	T	T
Trip unit STR22SE	**160**				3	3			5	5	5	T	T	T	T	T
	250										5		T	T	T	T

Protection discrimination

Upstream: NS100 to 160, Trip unit STR
Downstream: NSC100N

	Upstream	NS100N/H/L							NS160N/H/L									
		Trip unit STR22SE							Trip unit STR22SE									
Downstream	Rating (A)	40			100				80					160				
	Setting Ir	16	25	40	40	63	80	100	32	40	50	63	80	63	80	100	125	160
NSC100N	15			0.4	0.4	0.63	0.8	1						2	2	2	2	2
	20					0.63	0.8	1						2	2	2	2	2
	25					0.63	0.8	1						2	2	2	2	2
	32						0.8	1							2	2	2	2
	40							1								2	2	2
	50																2	2
	63																	2
	70																	
	80																	
	100																	

Protection discrimination

Upstream: NS250 to 630, Trip unit STR
Downstream: NS400 to 630, NSC100N

	Upstream	NS250N/H/L					NS400N/H/L					NS630N/H/L				
		Trip unit STR22SE					Trip unit STR23SE/53UE					Trip unit STR23SE/53UE				
Downstream	Rating (A)	250					400					630				
	Setting Ir	100	125	160	200	250	160	200	250	320	400	250	320	400	500	630
NS400N	160											8	8	8	8	8
	200												8	8	8	8
	250													8	8	8
	320														8	8
	400															8
NS400H	160											8	8	8	8	8
	200												8	8	8	8
	250													8	8	8
	320														8	8
	400															8
NS400L	160											8	8	8	8	8
	200												8	8	8	8
	250													8	8	8
	320														8	8
	400															8
NS630N	250															
	320															
	400															
	500															
	630															
NS630H	250															
	320															
	400															
	500															
	630															
NS630L	250															
	320															
	400															
	500															
	630															

NSC100N	≤ 25	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50		T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63			T	T	T	T	T	T	T	T	T	T	T	T	T
	70				T	T		T	T	T	T	T	T	T	T	T
	80				T	T		T	T	T	T	T	T	T	T	T
	100					T			T	T	T	T	T	T	T	T

Protection discrimination

Upstream: C801 to C1251

Downstream: DPN N, XC40, C60, NC100, NG125, NS100 to 250

	Upstream	C801N/H/C1001N/H/C1251N/H							C801N/H					C1001N/H/C1251N/H					
		Trip unit STR25DE							Trip unit STR35SE/GE/ME/55UE					Trip unit STR35SE/GE/ME/55UE					
Downstream	Rating (A)	800					1000	1250	800					1000					1250
	Setting Ir	320	400	500	630	800	1000	1250	320	400	500	630	800	400	500	630	800	1000	1250
DPN N, C60		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NC100, NG125		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS100N	**16**	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
Trip unit TM-D	**25**	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
	32	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
	40	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
	50	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
	63	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
	80	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
	100	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
NS100H	**16**	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
Trip unit TM-D	**25**	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
	32	3.2	4	5	6.3	10	18	T	50	50	50	50	50	T	T	T	T	T	T
	40	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
	50	3.2	4	5	6.3	10	18	T	50	50	50	50	50	T	T	T	T	T	T
	63	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
	80	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
	100	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
NS100L	**16**	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
Trip unit TM-D	**25**	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
	32	3.2	4	5	6.3	10	18	T	50	50	50	50	50	T	T	T	T	T	T
	40	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
	50	3.2	4	5	6.3	10	18	T	50	50	50	50	50	T	T	T	T	T	T
	63	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
	80	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
	100	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
NS160N	**≤ 63**	3.2	4	5	6.3	10	18	30	T	T	T	T	T	T	T	T	T	T	T
Trip unit TM-D	**80**	3.2	4	5	6.3	10	18	30	T	T	T	T	T	T	T	T	T	T	T
	100	3.2	4	5	6.3	10	18	30	T	T	T	T	T	T	T	T	T	T	T
	125	3.2	4	5	6.3	10	18	30	T	T	T	T	T	T	T	T	T	T	T
	160		4	5	6.3	10	18	30	T	T	T	T	T	T	T	T	T	T	T
NS160H	**≤ 63**	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
Trip unit TM-D	**80**	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
	100	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
	125	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
	160		4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
NS160L	**≤ 63**	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
Trip unit TM-D	**80**	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
	100	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
	125	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
	160		4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
NS250N	**≤ 100**	3.2	4	5	6.3	8	15	24	T	T	T	T	T	T	T	T	T	T	T
Trip unit TM-D	**125**		4	5	6.3	8	15	24		T	T	T	T	T	T	T	T	T	T
	160			5	6.3	8	15	24		T	T	T	T	T	T	T	T	T	T
	200				6.3	8	15	24			T	T	T		T	T	T	T	T
	250					8	15	24				T	T			T	T	T	T
NS250H/L	**≤ 100**	3.2	4	5	6.3	8	15	24	40	40	40	40	40	T	T	T	T	T	T
Trip unit TM-D	**125**		4	5	6.3	8	15	24		40	40	40	40	T	T	T	T	T	T
	160			5	6.3	8	15	24		40	40	40	40	T	T	T	T	T	T
	200				6.3	8	15	24			40	40	40		T	T	T	T	T
	250					8	15	24				40	40			T	T	T	T
NS100N	**40**	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
Trip unit STR22SE	**100**	3.2	4	5	6.3	10	18	T	T	T	T	T	T	T	T	T	T	T	T
NS100H/L	**40**	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
Trip unit STR22SE	**100**	3.2	4	5	6.3	10	18	30	50	50	50	50	50	T	T	T	T	T	T
NS160N	**40**	3.2	4	5	6.3	10	18	30	T	T	T	T	T	T	T	T	T	T	T
Trip unit STR22SE	**100**	3.2	4	5	6.3	10	18	30	T	T	T	T	T	T	T	T	T	T	T
	160	3.2	4	5	6.3	10	18	30	T	T	T	T	T	T	T	T	T	T	T
NS160H/L	**40**	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
Trip unit STR22SE	**100**	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
	160	3.2	4	5	6.3	10	18	30	45	45	45	45	45	T	T	T	T	T	T
NS250N	**≤ 100**	3.2	4	5	6.3	8	15	24	T	T	T	T	T	T	T	T	T	T	T
Trip unit STR22SE	**160**	3.2	4	5	6.3	8	15	24	T	T	T	T	T	T	T	T	T	T	T
	250			5	6.3	8	15	24			T	T	T		T	T	T	T	T
NS250H/L	**≤ 100**	3.2	4	5	6.3	8	15	24	40	40	40	40	40	T	T	T	T	T	T
Trip unit STR22SE	**160**	3.2	4	5	6.3	8	15	24	40	40	40	40	40	T	T	T	T	T	T
	250			5	6.3	8	15	24			40	40	40		T	T	T	T	T

Protection discrimination

Upstream: C801 to C1251, CM
Downstream: DPN N, XC40, C60, NC100, NG125, NS100 to 250

	Upstream	C801N/H					C1001N/H/C1251N/H						C801L					C1001L					CM
		Trip unit STR45AE					Trip unit STR45AE						Trip unit STR35SE/GE/ME/55UE					Trip unit STR35SE/GE/ME/55UE					N/H (1)
Downstream	Rating (A)	800									1000	1250	800					1000					all
	Setting Ir	320	400	500	630	800	400	500	630	800	1000	1250	320	400	500	630	800	400	500	630	800	1000	
DPN N, XC40, C60		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NC100, NG125		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS100N	**16**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit TM-D	**25**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	32	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	40	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	50	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	63	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	80	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	100	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
NS100H	**16**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit TM-D	**25**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	32	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	40	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	50	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	63	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	80	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	100	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
NS100L	**16**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit TM-D	**25**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	32	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	40	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	50	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	63	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	80	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	100	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
NS160/N	**≤ 63**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit TM-D	**80**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	100	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	125		T	T	T	T	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	160			T	T	T	T	T	T	T	T	T			6.4	6.4	6.4	8	8	8	8	8	T
NS160H	**≤ 63**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit TM-D	**80**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	100	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	125		T	T	T	T	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	160			T	T	T	T	T	T	T	T	T			6.4	6.4	6.4	8	8	8	8	8	T
NS160L	**≤ 63**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit TM-D	**80**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	100	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	125		T	T	T	T	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	160			T	T	T	T	T	T	T	T	T			6.4	6.4	6.4	8	8	8	8	8	T
NS250N	**≤ 100**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit TM-D	**125**		T	T	T	T	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	160			T	T	T	T	T	T	T	T	T			6.4	6.4	6.4	8	8	8	8	8	T
	200			T	T	T	T	T	T	T	T	T			6.4	6.4	6.4	8	8	8	8	8	T
	250					T	T	T	T	T	T	T					6.4	8	8	8	8	8	T
NS250H/L	**≤ 100**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit TM-D	**125**		T	T	T	T	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	160			T	T	T	T	T	T	T	T	T			6.4	6.4	6.4	8	8	8	8	8	T
	200			T	T	T	T	T	T	T	T	T			6.4	6.4	6.4	8	8	8	8	8	T
	250					T	T	T	T	T	T	T					6.4	8	8	8	8	8	T
NS100N	**40**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit STR22SE	**100**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
NS100H/L	**40**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit STR22SE	**100**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
NS160N	**40**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit STR22SE	**100**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	160	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
NS160H/L	**40**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
Trip unit STR22SE	**100**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	160	T	T	T	T	T	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
NS250N	**≤ 100**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	3.2	4	5	6.3	8	T
Trip unit STR22SE	**160**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	3.2	4	5	6.3	8	T
	250		T	T	T	T	T	T	T	T	T	T		6.4	6.4	6.4	6.4	3.2	4	5	6.3	8	T
NS250H/L	**≤ 100**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	3.2	4	5	6.3	8	T
Trip unit STR22SE	**160**	T	T	T	T	T	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	3.2	4	5	6.3	8	T
	250		T	T	T	T	T	T	T	T	T	T		6.4	6.4	6.4	6.4	3.2	4	5	6.3	8	T

(1) *With trip unit STCM2-STCM3.*

Protection discrimination

Upstream: C801 to C1251

Downstream: DPN N, XC40, C60, NC100, NG125, NS400 to 630

	Upstream	C801N/H/C1001N/H/C1251N/H Trip unit STR25DE							C801N/H Trip unit STR35SE/GE/ME/55UE					C1001N/H/C1251N/H Trip unit STR35SE/GE/ME/55UE					
Downstream	Rating (A)	800					1000	1250	800					1000					1250
	Setting Ir	320	400	500	630	800	1000	1250	320	400	500	630	800	400	500	630	800	1000	1250
NS400N	160	3.2	4	5	6.3	8	10	12	12	12	12	12	12	T	T	T	T	T	T
	200	3.2	4	5	6.3	8	10	12	12	12	12	12	12	T	T	T	T	T	T
	250		4	5	6.3	8	10	12		12	12	12	12		T	T	T	T	T
	320			5	6.3	8	10	12			12	12	12			T	T	T	T
	400				6.3	8	10	12				12	12				T	T	T
NS400H	160	3.2	4	5	6.3	8	10	12	12	12	12	12	12	45	45	45	45	45	45
	200	3.2	4	5	6.3	8	10	12	12	12	12	12	12	45	45	45	45	45	45
	250		4	5	6.3	8	10	12		12	12	12	12		45	45	45	45	45
	320			5	6.3	8	10	12			12	12	12			45	45	45	45
	400				6.3	8	10	12				12	12				45	45	45
NS400L	160	3.2	4	5	6.3	8	10	12	12	12	12	12	12	45	45	45	45	45	45
	200	3.2	4	5	6.3	8	10	12	12	12	12	12	12	45	45	45	45	45	45
	250		4	5	6.3	8	10	12		12	12	12	12		45	45	45	45	45
	320			5	6.3	8	10	12			12	12	12			45	45	45	45
	400				6.3	8	10	12				12	12				45	45	45
NS630N	250		4	5	6.3	8	10	12		12	12	12	12	40	40	40	40	40	40
	320			5	6.3	8	10	12			12	12	12		40	40	40	40	40
	400				6.3	8	10	12				12	12			40	40	40	40
	500					8	10	12					12				40	40	40
	630						10	12										40	40
NS630H	250		4	5	6.3	8	10	12		12	12	12	12	40	40	40	40	40	40
	320			5	6.3	8	10	12			12	12	12		40	40	40	40	40
	400				6.3	8	10	12				12	12			40	40	40	40
	500					8	10	12					12				40	40	40
	630						10	12										40	40
NS630L	250		4	5	6.3	8	10	12		12	12	12	12	40	40	40	40	40	40
	320			5	6.3	8	10	12			12	12	12		40	40	40	40	40
	400				6.3	8	10	12				12	12			40	40	40	40
	500					8	10	12					12				40	40	40
	630						10	12										40	40
NSC100N	≤ 25	3.2	4	10	15	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	3.2	4	10	15	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	3.2	4	10	15	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50	3.2	4	10	15	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63	3.2	4	10	15	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	70	3.2	4	10	15	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	80	3.2	4	10	15	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	100	3.2	4	10	15	T	T	T	T	T	T	T	T	T	T	T	T	T	T

Protection discrimination

Upstream: C801 to C1251, CM
Downstream: DPN N, XC40, C60, NC100, NG125, NS400 to 630

	Upstream	C801N/H Trip unit STR45AE					C1001N/H/C1251N/H Trip unit STR45AE						C801L Trip unit STR35SE/GE/ME/55UE					C1001L Trip unit STR35SE/GE/ME/55UE					CM N/H (1)
Downstream	Rating (A)	800									1000	1250	800					1000					all
	Setting Ir	320	400	500	630	800	400	500	630	800	1000	1250	320	400	500	630	800	400	500	630	800	1000	
NS400N	160	35	35	35	35	35	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	200		35	35	35	35	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	250			35	35	35	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	320				35	35	T	T	T	T	T	T			6.4	6.4	6.4	8	8	8	8	8	T
	400					35			T	T	T	T				6.4	6.4		8	8	8	8	T
NS400H	160	35	35	35	35	35	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	200		35	35	35	35	T	T	T	T	T	T	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	250			35	35	35	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	320				35	35	T	T	T	T	T	T			6.4	6.4	6.4	8	8	8	8	8	T
	400					35			T	T	T	T				6.4	6.4		8	8	8	8	T
NS400L	160	35	35	35	35	35	70	70	70	70	70	70	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	200		35	35	35	35	70	70	70	70	70	70	6.4	6.4	6.4	6.4	6.4	8	8	8	8	8	T
	250			35	35	35	70	70	70	70	70	70		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	320				35	35	70	70	70	70	70	70			6.4	6.4	6.4	8	8	8	8	8	T
	400					35			70	70	70	70				6.4	6.4		8	8	8	8	T
NS630N	250	28	28	28	28	28	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	320		28	28	28	28		T	T	T	T	T			6.4	6.4	6.4		8	8	8	8	T
	400				28	28				T	T	T					6.4				8	8	T
	630					28					T	T										8	T
NS630H	250	28	28	28	28	28	T	T	T	T	T	T		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	320		28	28	28	28		T	T	T	T	T			6.4	6.4	6.4		8	8	8	8	T
	400			28	28	28			T	T	T	T				6.4	6.4			8	8	8	T
	500				28	28				T	T	T					6.4				8	8	T
	630					28					T	T										8	T
NS630L	250	28	28	28	28	28	65	65	65	65	65	65		6.4	6.4	6.4	6.4	8	8	8	8	8	T
	320		28	28	28	28		65	65	65	65	65			6.4	6.4	6.4		8	8	8	8	T
	400			28	28	28			65	65	65	65				6.4	6.4			8	8	8	T
	500				28	28				65	65	65					6.4				8	8	T
	630					28					65	65										8	T
NSC100N	≤ 25	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	70	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	80	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	100	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T

(1) *With trip unit STCM2-STCM3.*

Protection discrimination

Upstream: C801 to C1251

Downstream: C801 to C1251, CM, Masterpact

	Upstream	C801N/H/C1001N/H/C1251N/H							C801N/H					C1001N/H/C1251N/H					
		Trip unit STR25DE							Trip unit STR35SE/GE/ME/55UE					Trip unit STR35SE/GE/ME/55UE					
Downstream	**Rating (A)**	**800**					**1000**	**1250**	**800**					**1000**					**1250**
	Setting Ir	**320**	**400**	**500**	**630**	**800**	**1000**	**1250**	**320**	**400**	**500**	**630**	**800**	**400**	**500**	**630**	**800**	**1000**	**1250**
C801N	**320**				6.3	8	10	12.5				12	12			15	15	15	15
Trip unit STR25DE	**400**					8	10	12.5					12				15	15	15
	500					8	10	12.5					12				15	15	15
	630						10	12.5										15	15
	800																		
C801H	**320**				6.3	8	10	12.5				12	12			15	15	15	15
Trip unit STR25DE	**400**					8	10	12.5					12				15	15	15
	500					8	10	12.5					12				15	15	15
	630						10	12.5										15	15
	800																		
C801L	**320**																		
	400																		
	500																		
	630																		
	800																		
C1001N	**400**					8	10	12.5					12				15	15	15
Trip unit STR25DE	**500**					8	10	12.5					12				15	15	15
	630						10	12.5										15	15
	800																		
	1000																		
C1001H	**400**					8	10	12.5					12				15	15	15
Trip unit STR25DE	**500**					8	10	12.5					12				15	15	
	630						10	12.5										15	15
	800																		
	1000																		
C1001L	**400**																		
	500																		
	630																		
	800																		
	1000																		
C1251N	**500**					8	10	12.5					12				15	15	15
Trip unit STR25DE	**630**						10	12.5										15	15
	800																		
	1000																		
	1250																		
C1251H	**500**					8	10	12.5					12				15	15	15
Trip unit STR25DE	**630**						10	12.5										15	15
	800																		
	1000																		
	1250																		
CM	**1250**																		
	1600																		
	2000																		
	2500																		
	3200																		
Masterpact	**M08**																		
H1/H2	**M10**																		
STR28D	**M12**																		
	M16																		
	M20																		
	M25																		
	M32																		
	M40																		
	M50																		
	M63																		
Masterpact L	**M08**																		
STR28D	**M10**																		
	M12																		
	M16																		
	M20																		
	M25																		

Nota :

■ *C801N/H with trip unit STR45AE : no distrimination with the dowstream devices give, in this table*

■ *upstream values CM N/H are to be read with distrimination:*

□ *CM (trip unit STCM1)*

□ *Masterpact L (trip unit STR38S - 68U).*

Protection discrimination

Upstream: C801 to C1251, CM
Downstream: C801 to C1251, CM, Masterpact

	Upstream	C1001N/H/C1251N/H Trip unit STR45AE						C801L Trip unit STR35SE/GE/ME/55UE					C1001L Trip unit STR35SE/GE/ME/55UE					CM N/H Trip unit STCM2-STCM3				
Downstream	**Rating (A)**	**800**				**1000**	**1250**	**800**					**1000**					**1250**	**1600**	**2000**	**2500**	**3200**
	Setting Ir	**400**	**500**	**630**	**800**	**1000**	**1250**	**320**	**400**	**500**	**630**	**800**	**400**	**500**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3200**
C801N	**320**		15	15	15	15	15											45	45	45	45	45
Trip unit STR25DE	**400**			15	15	15	15											45	45	45	45	45
	500				15	15	15											45	45	45	45	45
	630					15	15											45	45	45	45	45
	800						15												45	45	45	45
C801H	**320**		15	15	15	15	15											45	45	45	45	45
Trip unit STR25DE	**400**			15	15	15	15											45	45	45	45	45
	500				15	15	15											45	45	45	45	45
	630					15	15											45	45	45	45	45
	800						15												45	45	45	45
C801L	**320**		15	15	15	15	15											80	80	80	80	80
	400			15	15	15	15											80	80	80	80	80
	500				15	15	15											80	80	80	80	80
	630					15	15											80	80	80	80	80
	800						15												80	80	80	80
C1001N	**400**			15	15	15	15											45	45	45	45	45
Trip unit STR25DE	**500**				15	15	15											45	45	45	45	45
	630					15	15											45	45	45	45	45
	800						15												45	45	45	45
	1000																			45	45	45
C1001H	**400**			15	15	15	15											45	45	45	45	45
Trip unit STR25DE	**500**				15	15	15											45	45	45	45	45
	630					15	15											45	45	45	45	45
	800						15												45	45	45	45
	1000																			45	45	45
C1001L	**400**			15	15	15	15											80	80	80	80	80
	500				15	15	15											80	80	80	80	80
	630					15	15											80	80	80	80	80
	800						15												80	80	80	80
	1000																			80	80	80
C1251N	**500**				15	15	15											45	45	45	45	45
Trip unit STR25DE	**630**					15	15											45	45	45	45	45
	800						15												45	45	45	45
	1000																			45	45	45
	1250																				45	45
C1251H	**500**				15	15	15											45	45	45	45	45
Trip unit STR25DE	**630**					15	15											45	45	45	45	45
	800						15												45	45	45	45
	1000																			45	45	45
	1250																				45	45
CM	**1250**																			35	35	35
	1600																				35	35
	2000																					35
	2500																					
	3200																					
Masterpact	**M08**																			35	35	35
H1/H2	**M10**																				35	35
STR28D	**M12**																					35
	M16																					
	M20																					
	M25																					
	M32																					
	M40																					
	M50																					
	M63																					
Masterpact L	**M08**																	40	40	40	35	35
STR28D	**M10**																		40	40	35	35
	M12																			40	35	35
	M16																				35	35
	M20																					35
	M25																					

Protection discrimination

Upstream: Masterpact NW
Downstream: Multi 9, NS100 to 630, NSC100N

	Upstream	Masterpact NW - H1 - H2									
	Trip unit	Micrologic 5.0 - 6.0 - 7.0 - Inst: 15 In									
		NW08	NW10	NW12	NW16	NW20	NW25	NW32	NW40	NW50	NW63
Downstream	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
DPN N		T	T	T	T	T	T	T	T	T	T
C60		T	T	T	T	T	T	T	T	T	T
XC40		T	T	T	T	T	T	T	T	T	T
NC100H		T	T	T	T	T	T	T	T	T	T
NS100N		T	T	T	T	T	T	T	T	T	T
NS100H		T	T	T	T	T	T	T	T	T	T
NS100L		T	T	T	T	T	T	T	T	T	T
NS160N		T	T	T	T	T	T	T	T	T	T
NS160H		T	T	T	T	T	T	T	T	T	T
NS160L		T	T	T	T	T	T	T	T	T	T
NS250N		T	T	T	T	T	T	T	T	T	T
NS250H/L		T	T	T	T	T	T	T	T	T	T
NS400N	**160**	T	T	T	T	T	T	T	T	T	T
STR23SE	**200**	T	T	T	T	T	T	T	T	T	T
STR53UE	**250**	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
NS400H	**160**	T	T	T	T	T	T	T	T	T	T
STR23SE	**200**	T	T	T	T	T	T	T	T	T	T
STR53UE	**250**	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
NS400L	**160**	T	T	T	T	T	T	T	T	T	T
STR23SE	**200**	T	T	T	T	T	T	T	T	T	T
STR53UE	**250**	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
NS630N	**250**	T	T	T	T	T	T	T	T	T	T
STR23SE	**320**	T	T	T	T	T	T	T	T	T	T
STR53UE	**400**	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
NS630H	**250**	T	T	T	T	T	T	T	T	T	T
STR23SE	**320**	T	T	T	T	T	T	T	T	T	T
STR53UE	**400**	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
NS630L	**250**	T	T	T	T	T	T	T	T	T	T
STR23SE	**320**	T	T	T	T	T	T	T	T	T	T
STR53UE	**400**	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T

NSC100N		T	T	T	T	T	T	T	T	T	T

Protection discrimination

Upstream: Masterpact NW
Downstream: Multi 9, NS100 to 630, NSC100N

	Upstream	Masterpact NW - H1 - H2									
	Trip unit	Micrologic 5.0 - 6.0 - 7.0 - Inst: OFF									
		NW08	NW10	NW12	NW16	NW20	NW25	NW32	NW40	NW50	NW63
Downstream	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
DPN N		T	T	T	T	T	T	T	T	T	T
C60		T	T	T	T	T	T	T	T	T	T
XC40		T	T	T	T	T	T	T	T	T	T
NC100H		T	T	T	T	T	T	T	T	T	T
NC125H		T	T	T	T	T	T	T	T	T	T
NS100N		T	T	T	T	T	T	T	T	T	T
NS100H		T	T	T	T	T	T	T	T	T	T
NS100L		T	T	T	T	T	T	T	T	T	T
NS160N		T	T	T	T	T	T	T	T	T	T
NS160H		T	T	T	T	T	T	T	T	T	T
NS160L		T	T	T	T	T	T	T	T	T	T
NS250N		T	T	T	T	T	T	T	T	T	T
NS250H/L		T	T	T	T	T	T	T	T	T	T
NS400N	160	T	T	T	T	T	T	T	T	T	T
STR23SE	200	T	T	T	T	T	T	T	T	T	T
STR53UE	250	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
NS400H	160	T	T	T	T	T	T	T	T	T	T
STR23SE	200	T	T	T	T	T	T	T	T	T	T
STR53UE	250	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
NS400L	160	T	T	T	T	T	T	T	T	T	T
STR23SE	200	T	T	T	T	T	T	T	T	T	T
STR53UE	250	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
NS630N	250	T	T	T	T	T	T	T	T	T	T
STR23SE	320	T	T	T	T	T	T	T	T	T	T
STR53UE	400	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630	T	T	T	T	T	T	T	T	T	T
NS630H	250	T	T	T	T	T	T	T	T	T	T
STR23SE	320	T	T	T	T	T	T	T	T	T	T
STR53UE	400	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630	T	T	T	T	T	T	T	T	T	T
NS630L	250	T	T	T	T	T	T	T	T	T	T
STR23SE	320	T	T	T	T	T	T	T	T	T	T
STR53UE	400	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630	T	T	T	T	T	T	T	T	T	T

NSC100N		T	T	T	T	T	T	T	T	T	T

Protection discrimination

Upstream: Masterpact NW
Downstream: Multi 9, NS100 to 630, NSC100

	Upstream	Masterpact NW H3				Masterpact NW H3			
	Trip unit	Micrologic 5.0 - 6.0 - 7.0				Micrologic 5.0 - 6.0 - 7.0			
		Inst: 15 In				Inst: OFF			
		NW20	NW25	NW32	NW40	NW20	NW25	NW32	NW40
Downstream	Rating (A)	2000	2500	3200	4000	2000	2500	3200	4000
	Setting Ir	2000	2500	3200	4000	2000	2500	3200	4000
DPN N		T	T	T	T	T	T	T	T
C60		T	T	T	T	T	T	T	T
XC40		T	T	T	T	T	T	T	T
NC100H		T	T	T	T	T	T	T	T
NS100N		T	T	T	T	T	T	T	T
NS100H		T	T	T	T	T	T	T	T
NS100L		T	T	T	T	T	T	T	T
NS160N		T	T	T	T	T	T	T	T
NS160H		T	T	T	T	T	T	T	T
NS160L		T	T	T	T	T	T	T	T
NS250N		T	T	T	T	T	T	T	T
NS250H/L		T	T	T	T	T	T	T	T
NS400N	**160**	T	T	T	T	T	T	T	T
STR23SE	**200**	T	T	T	T	T	T	T	T
STR53UE	**250**	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T
NS400H	**160**	T	T	T	T	T	T	T	T
STR23SE	**200**	T	T	T	T	T	T	T	T
STR53UE	**250**	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T
NS400L	**160**	T	T	T	T	T	T	T	T
STR23SE	**200**	T	T	T	T	T	T	T	T
STR53UE	**250**	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T
NS630N	**250**	T	T	T	T	T	T	T	T
STR23SE	**320**	T	T	T	T	T	T	T	T
STR53UE	**400**	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T
	630	T	T	T	T	T	T	T	T
NS630H	**250**	T	T	T	T	T	T	T	T
STR23SE	**320**	T	T	T	T	T	T	T	T
STR53UE	**400**	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T
	630	T	T	T	T	T	T	T	T
NS630L	**250**	T	T	T	T	T	T	T	T
STR23SE	**320**	T	T	T	T	T	T	T	T
STR53UE	**400**	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T
	630	T	T	T	T	T	T	T	T
NSC100N		T	T	T	T	T	T	T	T

Protection discrimination

Upstream: Masterpact NW
Downstream: Multi 9, NS100 to 630, NSC100

	Upstream	Masterpact NW L1					Masterpact NW L1				
	Trip unit	Micrologic 5.0 - 6.0 - 7.0					Micrologic 5.0 - 6.0 - 7.0				
		Inst: 15 In					Inst: OFF				
		NW08	NW10	NW12	NW16	NW20	NW08	NW10	NW12	NW16	NW20
Downstream	Rating (A)	800	1000	1250	1600	2000	800	1000	1250	1600	2000
	Setting Ir	800	1000	1250	1600	2000	800	1000	1250	1600	2000
DPN N		T	T	T	T	T	T	T	T	T	T
C60		T	T	T	T	T	T	T	T	T	T
XC40		T	T	T	T	T	T	T	T	T	T
NC100H		T	T	T	T	T	T	T	T	T	T
NS100N		T	T	T	T	T	T	T	T	T	T
NS100H		T	T	T	T	T	T	T	T	T	T
NS100L		T	T	T	T	T	T	T	T	T	T
NS160N		T	T	T	T	T	T	T	T	T	T
NS160H		T	T	T	T	T	T	T	T	T	T
NS160L		T	T	T	T	T	T	T	T	T	T
NS250N		T	T	T	T	T	T	T	T	T	T
NS250H/L		T	T	T	T	T	T	T	T	T	T
NS400N	**160**	T	T	T	T	T	T	T	T	T	T
STR23SE	**200**	T	T	T	T	T	T	T	T	T	T
STR53UE	**250**	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
NS400H	**160**	T	T	T	T	T	T	T	T	T	T
STR23SE	**200**	T	T	T	T	T	T	T	T	T	T
STR53UE	**250**	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
NS400L	**160**	T	T	T	T	T	T	T	T	T	T
STR23SE	**200**	T	T	T	T	T	T	T	T	T	T
STR53UE	**250**	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
NS630N	**250**	T	T	T	T	T	T	T	T	T	T
STR23SE	**320**	T	T	T	T	T	T	T	T	T	T
STR53UE	**400**	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
NS630H	**250**	T	T	T	T	T	T	T	T	T	T
STR23SE	**320**	T	T	T	T	T	T	T	T	T	T
STR53UE	**400**	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
NS630L	**250**	T	T	T	T	T	T	T	T	T	T
STR23SE	**320**	T	T	T	T	T	T	T	T	T	T
STR53UE	**400**	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
NSC100N		T	T	T	T	T	T	T	T	T	T

Protection discrimination

Upstream: Masterpact NW
Downstream: C801 to C1251, CM

Downstream	Upstream Trip unit	Masterpact NW - H1 - H2 Micrologic 5.0 - 6.0 - 7.0 - Inst: 15 In									
		NW08	NW10	NW12	NW16	NW20	NW25	NW32	NW40	NW50	NW63
	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
C801N	320	12.5	15	18.7	24	30	37.5	48	T	T	T
	400	12.5	15	18.7	24	30	37.5	48	T	T	T
	500	12.5	15	18.7	24	30	37.5	48	T	T	T
	630		15	18.7	24	30	37.5	48	T	T	T
	800			18.7	24	30	37.5	48	T	T	T
C801H	320	12.5	15	18.7	24	30	37.5	48	60	T	T
	400	12.5	15	18.7	24	30	37.5	48	60	T	T
	500	12.5	15	18.7	24	30	37.5	48	60	T	T
	630		15	18.7	24	30	37.5	48	60	T	T
	800			18.7	24	30	37.5	48	60	T	T
C801L	320	12.5	15	18.7	24	30	37.5	60	T	T	T
	400	12.5	15	18.7	24	30	37.5	60	T	T	T
	500	12.5	15	18.7	24	30	37.5	60	T	T	T
	630		15	18.7	24	30	37.5	60	T	T	T
	800			18.7	24	30	37.5	60	T	T	T
C1001N	400		15	18.7	24	30	37.5	48	T	T	T
	500		15	18.7	24	30	37.5	48	T	T	T
	630		15	18.7	24	30	37.5	48	T	T	T
	800			18.7	24	30	37.5	48	T	T	T
	1000				24	30	37.5	48	T	T	T
C1001H	400		15	18.7	24	30	37.5	48	60	T	T
	500		15	18.7	24	30	37.5	48	60	T	T
	630		15	18.7	24	30	37.5	48	60	T	T
	800			18.7	24	30	37.5	48	60	T	T
	1000				24	30	37.5	48	60	T	T
C1001L	400		15	18.7	24	30	37.5	48	T	T	T
	500		15	18.7	24	30	37.5	48	T	T	T
	630		15	18.7	24	30	37.5	48	T	T	T
	800			18.7	24	30	37.5	48	T	T	T
	1000				24	30	37.5	48	T	T	T
C1251N	500			18.7	24	30	37.5	48	T	T	T
	630			18.7	24	30	37.5	48	T	T	T
	800			18.7	24	30	37.5	48	T	T	T
	1000				24	30	37.5	48	T	T	T
	1250					30	37.5	48	T	T	T
C1251H	500			18.7	24	30	37.5	48	60	T	T
	630			18.7	24	30	37.5	48	60	T	T
	800			18.7	24	30	37.5	48	60	T	T
	1000				24	30	37.5	48	60	T	T
	1250					30	37.5	48	60	T	T
CM	1250										
N/H	1600										
	2000										
	2500										
	3200										

Protection discrimination

Upstream: Masterpact NW
Downstream: C801 to C1251, CM

	Upstream	Masterpact NW - H1 - H2									
	Trip unit	Micrologic 5.0 - 6.0 - 7.0 - Inst: OFF									
		NW08	NW10	NW12	NW16	NW20	NW25	NW32	NW40	NW50	NW63
Downstream	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
C801N	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T
C801H	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T
C801L	320	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T
	500	T	T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T
C1001N	400		T	T	T	T	T	T	T	T	T
	500		T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T
	1000				T	T	T	T	T	T	T
C1001H	400		T	T	T	T	T	T	T	T	T
	500		T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T
	1000				T	T	T	T	T	T	T
C1001L	400		T	T	T	T	T	T	T	T	T
	500		T	T	T	T	T	T	T	T	T
	630		T	T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T
	1000				T	T	T	T	T	T	T
C1251N	500			T	T	T	T	T	T	T	T
	630			T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T
	1000				T	T	T	T	T	T	T
	1250					T	T	T	T	T	T
C1251H	500			T	T	T	T	T	T	T	T
	630			T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T
	1000				T	T	T	T	T	T	T
	1250					T	T	T	T	T	T
CM	1250										
N/H	1600										
	2000										
	2500										
	3200										

Protection discrimination

Upstream: Masterpact NW
Downstream: C801 to C1251, CM

Downstream	Upstream Trip unit	Masterpact NW - H3 Micrologic 5.0-6.0-7.0 nst: 15In				Masterpact NW H3 Micrologic 5.0-6.0-7.0 Inst: OFF			
		NW20	NW25	NW32	NW40	NW20	NW25	NW32	NW40
	Rating (A)	2000	2500	3200	4000	2000	2500	3200	4000
	Setting Ir	2000	2500	3200	4000	2000	2500	3200	4000
C801N	320	30	37.5	48	T	T	T	T	T
	400	30	37.5	48	T	T	T	T	T
	500	30	37.5	48	T	T	T	T	T
	630	230	37.5	48	T	T	T	T	T
	800	30	37.5	48	T	T	T	T	T
C801H	320	30	37.5	48	60	T	T	T	T
	400	30	37.5	48	60	T	T	T	T
	500	30	37.5	48	60	T	T	T	T
	630	30	37.5	48	60	T	T	T	T
	800	30	37.5	48	60	T	T	T	T
C801L	320	30	37.5	60	T	T	T	T	T
	400	30	37.5	60	T	T	T	T	T
	500	30	37.5	60	T	T	T	T	T
	630	30	37.5	60	T	T	T	T	T
	800	30	37.5	60	T	T	T	T	T
C1001N	400	30	37.5	48	T	T	T	T	T
	500	30	37.5	48	T	T	T	T	T
	630	30	37.5	48	T	T	T	T	T
	800	30	37.5	48	T	T	T	T	T
	1000	30	37.5	48	T	T	T	T	T
C1001H	400	30	37.5	48	60	T	T	T	T
	500	30	37.5	48	60	T	T	T	T
	630	30	37.5	48	60	T	T	T	T
	800	30	37.5	48	60	T	T	T	T
	1000	30	37.5	48	60	T	T	T	T
C1001L	400	30	37.5	60	T	T	T	T	T
	500	30	37.5	60	T	T	T	T	T
	630	30	37.5	60	T	T	T	T	T
	800	30	37.5	60	T	T	T	T	T
	1000	30	37.5	60	T	T	T	T	T
C1251N	500	30	37.5	48	T	T	T	T	T
	630	30	37.5	48	T	T	T	T	T
	800	30	37.5	48	T	T	T	T	T
	1000	30	37.5	48	T	T	T	T	T
	1250	30	37.5	48	T	T	T	T	T
C1251H	500								
	630								
	800								
	1000								
	1250								
CM N/H	1250								
	1600								
	2000								
	2500								
	3200								

Protection discrimination

Upstream: Masterpact NW
Downstream: C801 to C1251, CM

	Upstream Trip unit	Masterpact NW L1 Micrologic 5.0-6.0-7.0 IInst: 15In					Masterpact NW L1 Micrologic 5.0-6.0-7.0 Inst: OFF				
		NW08	NW10	NW12	NW16	NW20	NW08	NW10	NW12	NW16	NW20
Downstream	Rating (A) Setting Ir	800 800	1000 1000	1250 1250	1600 1600	2000 2000	800 800	1000 1000	1250 1250	1600 1600	2000 2000
C801N	320	12	15	18.7	24	30	T	T	T	T	T
	400	12	15	18.7	24	30	T	T	T	T	T
	500	12	15	18.7	24	30	T	T	T	T	T
	630		15	18.7	24	30		T	T	T	T
	800			18.7	24	30			T	T	T
C801H	320	12	15	18.7	24	30	50	50	50	50	50
	400	12	15	18.7	24	30	50	50	50	50	50
	500	12	15	18.7	24	30	50	50	50	50	50
	630		15	18.7	24	30		50	50	50	50
	800			18.7	24	30			50	50	50
C801L	320	12	15	18.7	24	30	90	90	90	90	90
	400	12	15	18.7	24	30	90	90	90	90	90
	500	12	15	18.7	24	30	90	90	90	90	90
	630		15	18.7	24	30		90	90	90	90
	800			18.7	24	30			90	90	90
C1001N	400		15	18.7	24	30		T	T	T	T
	500		15	18.7	24	30		T	T	T	T
	630		15	18.7	24	30		T	T	T	T
	800			18.7	24	30			T	T	T
	1000				24	30				T	T
C1001H	400		15	18.7	24	30		50	50	50	50
	500		15	18.7	24	30		50	50	50	50
	630		15	18.7	24	30		50	50	50	50
	800			18.7	24	30			50	50	50
	1000				24	30				50	50
C1001L	400		15	18.7	24	30		90	90	90	90
	500		15	18.7	24	30		90	90	90	90
	630		15	18.7	24	30		90	90	90	90
	800			18.7	24	30			90	90	90
	1000				24	30				90	90
C1251N	500			18.7	24	30			50	50	50
	630			18.7	24	30			50	50	50
	800			18.7	24	30			50	50	50
	1000				24	30				50	50
	1250					30					50
C1251H	500										
	630										
	800										
	1000										
	1250										
CM N/H	1250										
	1600										
	2000										
	2500										
	3200										

Protection discrimination

Upstream: Masterpact NW
Downstream: Masterpact NW, Masterpact

Downstream	Upstream Trip unit	Masterpact NW - H1 - H2 Micrologic 5.0 - 6.0 - 7.0 - Inst: 15 In									
		NW08	NW10	NW10	NW16	NW20	NW25	NW32	NW40	NW50	NW63
	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
Masterpact NW H1	NW08			18.7	24	30	37.5	48	60	T	T
	NW10				24	30	37.5	48	60	T	T
	NW12					30	37.5	48	60	T	T
	NW16						37.5	48	60	T	T
	NW20							48	60	T	T
	NW25								60	T	T
	NW32									T	T
	NW40										T
	NW50										
	NW63										
Masterpact NW H2/H3	NW08			18.7	24	30	37.5	48	60	75	82
	NW10				24	30	37.5	48	60	75	82
	NW12					30	37.5	48	60	75	82
	NW16						37.5	48	60	75	82
	NW20							48	60	75	82
	NW25								60	75	82
	NW32									75	82
	NW40										82
	NW50										
	NW63										
Masterpact NW L1	NW08			18.7	24	30	37.5	48	60	75	94.5
	NW10				24	30	37.5	48	60	75	94.5
	NW12					30	37.5	48	60	75	94.5
	NW16						37.5	48	60	75	94.5
	NW20							48	60	75	94.5
Masterpact H1	NW08			18.7	24	30	37.5	48	60	T	T
	NW10				24	30	37.5	48	60	T	T
	NW12					30	37.5	48	60	T	T
	NW16						37.5	48	60	T	T
	NW20							48	60	T	T
	NW25								60	T	T
	NW32									T	T
	NW40										T
	NW50										
	NW63										
Masterpact H2	NW08			18.7	24	30	37.5	48	60	75	82
	NW10				24	30	37.5	48	60	75	82
	NW12					30	37.5	48	60	75	82
	NW16						37.5	48	60	75	82
	NW20							48	60	75	82
	NW25								60	75	82
	NW32									75	82
	NW40										82
	NW50										
	NW63										
Masterpact L1	NW08										
	NW10										
	NW12										
	NW16										
	NW20										

Protection discrimination

Upstream: Masterpact NW
Downstream: Masterpact NW, Masterpact

	Upstream Trip unit	Masterpact NW - H3 Micrologic 5.0-6.0-7.0 Inst: 15In				Masterpact NW H3 Micrologic 5.0-6.0-7.0 Inst: OFF			
		NW20	NW25	NW32	NW40	NW20	NW25	NW32	NW40
Downstream	Rating (A) Setting Ir	2000 2000	2500 2500	3200 3200	4000 4000	2000 2000	2500 2500	3200 3200	4000 4000
Masterpact NW H1	NW08	30	37.5	48	60	T	T	T	T
	NW10	30	37.5	48	60	T	T	T	T
	NW12	30	37.5	48	60	T	T	T	T
	NW16		37.5	48	60		T	T	T
	NW20			48	60			T	T
	NW25				60				T
	NW32								
	NW40								
	NW50								
	NW63								
Masterpact NW H2/H3	NW08	30	37.5	48	60	65	65	65	65
	NW10	30	37.5	48	60	65	65	65	65
	NW12	30	37.5	48	60	65	65	65	65
	NW16		37.5	48	60		65	65	65
	NW20			48	60			65	65
	NW25				60				65
	NW32								
	NW40								
	NW50								
	NW63								
Masterpact NW H2/H3	NW08	30	37.5	48	60	100	100	100	100
	NW10	30	37.5	48	60	100	100	100	100
	NW12	30	37.5	48	60	100	100	100	100
	NW16		37.5	48	60		100	100	100
	NW20			48	60			100	100
Masterpact H1	NW08		37.5	48	60		T	T	T
	NW10		37.5	48	60		T	T	T
	NW12		37.5	48	60		T	T	T
	NW16		37.5	48	60		T	T	T
	NW20			48	60			T	T
	NW25				60				T
	NW32								
	NW40								
	NW50								
	NW63								
Masterpact H2	NW08		37.5	48	60		65	65	65
	NW10		37.5	48	60		65	65	65
	NW12		37.5	48	60		65	65	65
	NW16		37.5	48	60		65	65	65
	NW20			48	60			65	65
	NW25				60				65
	NW32								
	NW40								
	NW50								
	NW63								
Masterpact H2	NW08								
	NW10								
	NW12								
	NW16								
	NW20								
	NW25								

Protection discrimination

Upstream: Masterpact NW
Downstream: Masterpact NW, Masterpact

	Upstream Trip unit	Masterpact NW L3 Micrologic 5.0-6.0-7.0 Inst: 15In					Masterpact NW L3 Micrologic 5.0-6.0-7.0 Inst: OFF				
		NW08	NW10	NW12	NW16	NW20	NW08	NW10	NW12	NW16	NW20
Downstream	**Rating (A)**	**800**	**1000**	**1250**	**1600**	**2000**	**800**	**1000**	**1250**	**1600**	**2000**
	Setting Ir	**800**	**1000**	**1250**	**1600**	**2000**	**800**	**1000**	**1250**	**1600**	**2000**
Masterpact NW	**NW08**			18.7	24	30			37	37	37
H1	NW10				24	30				37	37
	NW12					30					37
	NW16										
	NW20										
	NW25										
	NW32										
	NW40										
	NW50										
	NW63										
Masterpact NW	**NW08**			18.7	24	30			37	37	37
H2/H3	NW10				24	30				37	37
	NW12					30					37
	NW16										
	NW20										
	NW25										
	NW32										
	NW40										
	NW50										
	NW63										
Masterpact NW	**NW08**			18.7	24	30			37	37	37
L1	NW10				24	30				37	37
	NW12					30					37
	NW16										
	NW20										
Masterpact	**NW08**			18.7	24	30			37	37	37
H1	NW10				24	30				37	37
	NW12					30					37
	NW16										
	NW20										
	NW25										
	NW32										
	NW40										
	NW50										
	NW63										
Masterpact	**NW08**			18.7	24	30			37	37	37
H2	NW10				24	30				37	37
	NW12					30					37
	NW16										
	NW20										
	NW25										
	NW32										
	NW40										
	NW50										
	NW63										
Masterpact NW	**NW08**			18.7	24	30			37	37	37
L1	NW10				24	30				37	37
	NW12					30					37
	NW16										
	NW20										

Protection discrimination

Upstream: Masterpact
Downstream: Multi 9, NS100 to 630, NSC100N

Downstream	Upstream	Masterpact - H1 - H2 Trip unit STR28D										Masterpact - H1 - H2 Trip unit STR38S-58U-Inst:ON-position maxi									
	Rating (A)	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
DPN N		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
XC40		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
C60		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NC100		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NG125		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS100N/H/L		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS160N/H/L		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS250N/H/L		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS400N	**160**	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
	200	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
	250	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
	320	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
	400	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
NS400H	**160**	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
	200	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
	250	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
	320	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
	400	40	T	T	T	T	T	T	T	T	T	40	T	T	T	T	T	T	T	T	T
NS400L	**160**	40	70	70	T	T	T	T	T	T	T	40	70	70	T	T	T	T	T	T	T
	200	40	70	70	T	T	T	T	T	T	T	40	70	70	T	T	T	T	T	T	T
	250	40	70	70	T	T	T	T	T	T	T	40	70	70	T	T	T	T	T	T	T
	320	40	70	70	T	T	T	T	T	T	T	40	70	70	T	T	T	T	T	T	T
	400	40	70	70	T	T	T	T	T	T	T	40	70	70	T	T	T	T	T	T	T
NS630N	**160**	28	T	T	T	T	T	T	T	T	T	28	T	T	T	T	T	T	T	T	T
	200	28	T	T	T	T	T	T	T	T	T	28	T	T	T	T	T	T	T	T	T
	250	28	T	T	T	T	T	T	T	T	T	28	T	T	T	T	T	T	T	T	T
	320	28	T	T	T	T	T	T	T	T	T	28	T	T	T	T	T	T	T	T	T
	400	28	T	T	T	T	T	T	T	T	T	28	T	T	T	T	T	T	T	T	T
NS630H	**160**	28	45	45	T	T	T	T	T	T	T	28	45	45	T	T	T	T	T	T	T
	200	28	45	45	T	T	T	T	T	T	T	28	45	45	T	T	T	T	T	T	T
	250	28	45	45	T	T	T	T	T	T	T	28	45	45	T	T	T	T	T	T	T
	320	28	45	45	T	T	T	T	T	T	T	28	45	45	T	T	T	T	T	T	T
	400	28	45	45	T	T	T	T	T	T	T	28	45	45	T	T	T	T	T	T	T
NS630L	**160**	28	45	45	70	70	70	70	70	T	T	28	45	45	70	70	70	70	70	T	T
	200	28	45	45	70	70	70	70	70	T	T	28	45	45	70	70	70	70	70	T	T
	250	28	45	45	70	70	70	70	70	T	T	28	45	45	70	70	70	70	70	T	T
	320	28	45	45	70	70	70	70	70	T	T	28	45	45	70	70	70	70	70	T	T
	400	28	45	45	70	70	70	70	70	T	T	28	45	45	70	70	70	70	70	T	T
NSC100N		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T

Protection discrimination

Upstream: Masterpact
Downstream: Multi 9, NS100 to 630, NSC100N

Downstream	Upstream	Masterpact - H1 - H2 Trip unit STR68U-Inst:ON-position maxi										Masterpact - H1 - H2 Trip unit STR38S-58U-Inst:OFF									
	Rating (A)	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
DPN N		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
XC40		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
C60		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NC100		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NG125		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS100N/H/L		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS160N/H/L		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS250N/H/L		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS400N	160	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	200	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	250	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS400H	160	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	200	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	250	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS400L	160	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	200	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	250	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS630N	160	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	200	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	250	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS630H	160	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	200	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	250	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS630L	160	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	200	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	250	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	320	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	400	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NSC100N		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T

Protection discrimination

Upstream: Masterpact
Downstream: Multi 9, NS100 to 630, NSC100N

Downstream	Upstream	Masterpact H1 Trip unit STR68U-Inst:OFF										Masterpact L Trip unit STR38S-58U						Masterpact L Trip unit STR68U					
	Rating (A)	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M08	M10	M12	M16	M20	M25
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	800	1000	1250	1600	2000	2500
DPN N		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
XC40		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
C60		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NC100		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NG125		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS100N	**≤32**	T	T	T	T	T	T	T	T	T	T	7	9	9	T	T	T	25	25	25	T	T	T
Trip unit TM-D	**40**	T	T	T	T	T	T	T	T	T	T	7	9	9	T	T	T	25	25	25	T	T	T
	50	T	T	T	T	T	T	T	T	T	T	7	9	9	T	T	T	25	25	25	T	T	T
	63	T	T	T	T	T	T	T	T	T	T	7	9	9	T	T	T	25	25	25	T	T	T
	80	T	T	T	T	T	T	T	T	T	T	7	9	9	T	T	T	25	25	25	T	T	T
	100	T	T	T	T	T	T	T	T	T	T	7	9	9	T	T	T	25	25	25	T	T	T
NS100H/L	**≤≤32**	T	T	T	T	T	T	T	T	T	T	7	9	9	35	35	35	25	25	25	50	50	50
Trip unit TM-D	**40**	T	T	T	T	T	T	T	T	T	T	7	9	9	35	35	35	25	25	25	50	50	50
	50	T	T	T	T	T	T	T	T	T	T	7	9	9	35	35	35	25	25	25	50	50	50
	63	T	T	T	T	T	T	T	T	T	T	7	9	9	35	35	35	25	25	25	50	50	50
	80	T	T	T	T	T	T	T	T	T	T	7	9	9	35	35	35	25	25	25	50	50	50
	100	T	T	T	T	T	T	T	T	T	T	7	9	9	35	35	35	25	25	25	50	50	50
NS160N	**≤63**	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	T	18	18	18	T	T	T
Trip unit TM-D	**80**	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	T	18	18	18	T	T	T
	100	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	T	18	18	18	T	T	T
	125	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	T	18	18	18	T	T	T
	160	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	T	18	18	18	T	T	T
NS160H/L	**≤63**	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	50	18	18	18	40	40	40
Trip unit TM-D	**80**	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	50	18	18	18	40	40	40
	100	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	50	18	18	18	40	40	40
	125	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	50	18	18	18	40	40	40
	160	T	T	T	T	T	T	T	T	T	T	7	9	9	30	30	50	18	18	18	40	40	40
NS250N	**≤100**	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	T	16	16	16	T	T	T
Trip unit TM-D	**125**	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	T	16	16	16	T	T	T
	160	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	T	16	16	16	T	T	T
	200	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	T	16	16	16	T	T	T
	250	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	T	16	16	16	T	T	T
NS250H/L	**≤100**	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	36	16	16	16	36	36	36
Trip unit TM-D	**125**	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	36	16	16	16	36	36	36
	160	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	36	16	16	16	36	36	36
	200	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	36	16	16	16	36	36	36
	250	T	T	T	T	T	T	T	T	T	T	7	9	9	25	25	36	16	16	16	36	36	36
NS100N	**≤40**	T	T	T	T	T	T	T	T	T	T	8	10	10	T	T	T	25	25	25	T	T	T
Trip unit STR22E	**100**	T	T	T	T	T	T	T	T	T	T	8	10	10	T	T	T	25	25	25	T	T	T
NS100H/L	**≤40**	T	T	T	T	T	T	T	T	T	T	8	10	10	35	35	60	25	25	25	50	50	T
Trip unit STR22E	**100**	T	T	T	T	T	T	T	T	T	T	8	10	10	35	35	60	25	25	25	50	50	50
NS160N	**≤40**	T	T	T	T	T	T	T	T	T	T	8	10	10	30	30	T	18	18	18	T	T	T
Trip unit STR22E	**100**	T	T	T	T	T	T	T	T	T	T	8	10	10	30	30	T	18	18	18	T	T	T
	160	T	T	T	T	T	T	T	T	T	T	8	10	10	30	30	T	18	18	18	T	T	T
NS160H/L	**≤40**	T	T	T	T	T	T	T	T	T	T	8	10	10	30	30	50	18	18	18	40	40	40
Trip unit STR22E	**100**	T	T	T	T	T	T	T	T	T	T	8	10	10	30	30	50	18	18	18	40	40	40
	160	T	T	T	T	T	T	T	T	T	T	8	10	10	30	30	50	18	18	18	40	40	40
NS250N	**≤40**	T	T	T	T	T	T	T	T	T	T	8	10	10	25	25	T	16	16	16	T	T	T
Trip unit STR22E	**100**	T	T	T	T	T	T	T	T	T	T	8	10	10	25	25	T	16	16	16	T	T	T
	160	T	T	T	T	T	T	T	T	T	T	8	10	10	25	25	T	16	16	16	T	T	T
NS250H/L	**≤100**	T	T	T	T	T	T	T	T	T	T	8	10	10	25	25	36	16	16	16	36	36	36
Trip unit STR22E	**160**	T	T	T	T	T	T	T	T	T	T	8	10	10	25	25	36	16	16	16	36	36	36
	250	T	T	T	T	T	T	T	T	T	T	8	10	10	25	25	36	16	16	16	36	36	36
NS400N/H/L	**160**	T	T	T	T	T	T	T	T	T	T	8	10	10	12	12	18	8	10	10	12	12	12
	200	T	T	T	T	T	T	T	T	T	T	8	10	10	12	12	18	8	10	10	12	12	12
	250	T	T	T	T	T	T	T	T	T	T	8	10	10	12	12	18	8	10	10	12	12	12
	320	T	T	T	T	T	T	T	T	T	T	8	10	10	12	12	18	8	10	10	12	12	12
	400	T	T	T	T	T	T	T	T	T	T	8	10	10	12	12	18	8	10	10	12	12	12
NS630N/H/L	**250**	T	T	T	T	T	T	T	T	T	T		10	10	12	12	18	8	10	10	12	12	12
	320	T	T	T	T	T	T	T	T	T	T		10	10	12	12	18	8	10	10	12	12	12
	400	T	T	T	T	T	T	T	T	T	T		10	10	12	12	18	8	10	10	12	12	12
	500	T	T	T	T	T	T	T	T	T	T		10	10	12	12	18	8	10	10	12	12	12
	630	T	T	T	T	T	T	T	T	T	T		10	10	12	12	18	8	10	10	12	12	12
NSC100N		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T

Protection discrimination

Upstream: Masterpact
Downstream: Masterpact NW

	Upstream Trip unit	Masterpact H1 - H2 STR28D										Masterpact H1 - H2 STR38S/58U - Inst: ON - position maxi									
		M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63
Downstream	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
Masterpact NW H1/H2/H3	NW08			12.5	16	20	25	32	40	50	63			28	40	40	40	40	40	50	63
	NW10				16	20	25	32	40	50	63				40	40	40	40	40	50	63
	NW12					20	25	32	40	50	63					40	40	40	40	50	63
	NW16						25	32	40	50	63						40	40	40	50	63
	NW20							32	40	50	63							40	40	50	63
	NW25								40	50	63								40	50	63
	NW32									50	63									50	63
	NW40										63										63
	NW50																				
	NW63																				
Masterpact NW L1	NW08			12.5	16	20	25	32	40	50	63			30	70	70	70	70	70	T	T
	NW10				16	20	25	32	40	50	63				70	70	70	70	70	T	T
	NW12					20	25	32	40	50	63					70	70	70	70	T	T
	NW16						25	32	40	50	63						70	70	70	T	T
	NW20							32	40	50	63							70	70	T	T

	Upstream Trip unit	Masterpact H1 - H2 STR68U - Inst: ON - position maxi										Masterpact H1 STR38S/58U - Inst: OFF									
		M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63
Downstream	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
	réglage Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
Masterpact NW H1/H2/H3	NW08			40	40	65	65	65	65	65	65			T	T	T	T	T	T	T	T
	NW10				40	65	65	65	65	65	65				T	T	T	T	T	T	T
	NW12					65	65	65	65	65	65					T	T	T	T	T	T
	NW16						65	65	65	65	65						T	T	T	T	T
	NW20							65	65	65	65							T	T	T	T
	NW25								65	65	65								T	T	T
	NW32									65	65									T	T
	NW40										65										T
	NW50																				
	NW63																				
Masterpact NW L1	NW08			40	40	95	95	95	95	95	95			T	T	T	T	T	T	T	T
	NW10				40	95	95	95	95	95	95				T	T	T	T	T	T	T
	NW12					95	95	95	95	95	95					T	T	T	T	T	T
	NW16						95	95	95	95	95						T	T	T	T	T
	NW20							95	95	95	95							T	T	T	T

Protection discrimination

Upstream: Masterpact
Downstream: Masterpact NT, NW

	Upstream Trip unit	Masterpact H1 - H2 STR28D									
		M08	M10	M12	M16	M20	M25	M32	M40	M50	M63
Downstream	Rating (A) Setting Ir	800 800	1000 1000	1250 1250	1600 1600	2000 2000	2500 2500	3200 3200	4000 4000	5000 5000	6300 6300
Masterpact NW H1/H2/H3	NW08			T	T	T	T	T	T	T	T
	NW10				T	T	T	T	T	T	T
	NW12					T	T	T	T	T	T
	NW16						T	T	T	T	T
	NW20							T	T	T	T
	NW25								T	T	T
	NW32									T	T
	NW40										T
	NW50										
	NW63										
Masterpact NW L1	NW08			T	T	T	T	T	T	T	T
	NW10				T	T	T	T	T	T	T
	NW12					T	T	T	T	T	T
	NW16						T	T	T	T	T
	NW20							T	T	T	T

Protection discrimination

Upstream: Masterpact
Downstream: C801 to C1251, CM, Masterpact

Downstream	Upstream	Masterpact H1 - H2 Trip unit STR28D (1)										Masterpact H1 - H2 Trip unit STR38S-58U-Inst: ON - position maxi									
	Rating (A)	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
C801N	**320**		10	12	16	20	25	32	40	45	T		30	45	45	45	45	45	T	T	T
Trip unit	**400**		10	12	16	20	25	32	40	45	T		30	45	45	45	45	45	T	T	T
STR25DE,	**500**		10	12	16	20	25	32	40	45	T		30	45	45	45	45	45	T	T	T
35SE/GE, 55UE	**630**		10	12	16	20	25	32	40	45	T		30	45	45	45	45	45	T	T	T
	800			12	16	20	25	32	40	45	T			45	45	45	45	45	T	T	T
C801H	**320**		10	12	16	20	25	32	40	45	65		30	45	45	45	45	45	50	60	T
Trip unit	**400**		10	12	16	20	25	32	40	45	65		30	45	45	45	45	45	50	60	T
STR25DE,	**500**		10	12	16	20	25	32	40	45	65		30	45	45	45	45	45	50	60	T
35SE/GE, 55UE	**630**		10	12	16	20	25	32	40	45	65		30	45	45	45	45	45	50	60	T
	800			12	16	20	25	32	40	45	65			45	45	45	45	45	50	60	T
C801L	**320**		10	12	16	20	25	35	50	90	100		40	70	70	70	70	70	80	110	T
Trip unit	**400**		10	12	16	20	25	35	50	90	100		40	70	70	70	70	70	80	110	T
STR25DE,	**500**		10	12	16	20	25	35	50	90	100		40	70	70	70	70	70	80	110	T
35SE/GE, 55UE	**630**		10	12	16	20	25	35	50	90	100		40	70	70	70	70	70	80	110	T
	800			12	16	20	25	35	50	90	100			70	70	70	70	70	80	110	T
C1001N	**400**			12	16	20	25	32	40	45	T			45	45	45	45	45	T	T	T
Trip unit	**500**			12	16	20	25	32	40	45	T			45	45	45	45	45	T	T	T
STR25DE,	**630**			12	16	20	25	32	40	45	T			45	45	45	45	45	T	T	T
35SE/GE, 55UE	**800**			12	16	20	25	32	40	45	T			45	45	45	45	45	T	T	T
	1000				16	20	25	32	40	45	T				45	45	45	45	T	T	T
C1001H	**400**			12	16	20	25	32	40	45	65			45	45	45	45	45	50	60	T
Trip unit	**500**			12	16	20	25	32	40	45	65			45	45	45	45	45	50	60	T
STR25DE,	**630**			12	16	20	25	32	40	45	65			45	45	45	45	45	50	60	T
35SE/GE, 55UE	**800**			12	16	20	25	32	40	45	65			45	45	45	45	45	50	60	T
	1000				16	20	25	32	40	45	65				45	45	45	45	50	60	T
C1001L	**400**			12	16	20	25	32	50	90	100			70	70	70	70	70	80	110	T
Trip unit	**500**			12	16	20	25	32	50	90	100			70	70	70	70	70	80	110	T
STR25DE,	**630**			12	16	20	25	32	50	90	100			70	70	70	70	70	80	110	T
35SE/GE, 55UE	**800**			12	16	20	25	32	50	90	100			70	70	70	70	70	80	110	T
	1000				16	20	25	32	50	90	100				70	70	70	70	80	110	T
C1251N	**500**				16	20	25	32	40	45	T				45	45	45	45	T	T	T
Trip unit	**630**				16	20	25	32	40	45	T				45	45	45	45	T	T	T
STR25DE,	**800**				16	20	25	32	40	45	T				45	45	45	45	T	T	T
35SE/GE, 55UE	**1000**				16	20	25	32	40	45	T				45	45	45	45	T	T	T
	1250					20	25	32	40	45	T					45	45	45	T	T	T
C1251H	**500**				16	20	25	32	40	45	65				45	45	45	45	50	60	T
Trip unit	**630**				16	20	25	32	40	45	65				45	45	45	45	50	60	T
STR25DE,	**800**				16	20	25	32	40	45	65				45	45	45	45	50	60	T
35SE/GE, 55UE	**1000**				16	20	25	32	40	45	65				45	45	45	45	50	60	T
	1250					20	25	32	40	45	65					45	45	45	50	60	T
CM	**1250**					15	20	25	32	40	50					35	35	40	40	50	63
Trip unit ST	**1600**						20	25	32	40	50						35	40	40	50	63
CM1,2,3	**2000**							25	32	40	50							40	40	50	63
	2500								32	40	50								40	50	63
	3200									40	50									50	63
Masterpact	**M08**			12	16	20	25	32	40	50	63			30	35	35	35	40	40	50	63
H1, H2	**M10**				16	20	25	32	40	50	63				35	35	35	40	40	50	63
Trip unit	**M12**					20	25	32	40	50	63					35	35	40	40	50	63
STR28D	**M16**						25	32	40	50	63						35	40	40	50	63
	M20							32	40	50	63							40	40	50	63
	M25								40	50	63								40	50	63
	M32									50	63									50	63
	M40										63										63
	M50																				
	M63																				
Masterpact L	**M08**													50	50	50	50	50	55	60	80
Trip unit	**M10**														50	50	50	50	55	60	80
STR28D	**M12**															50	50	50	55	60	80
58U, 68U	**M16**																50	50	55	60	80
	M20																	50	55	60	80
	M25																		55	60	80

(1) Discrimination with Compact C trip unit STR25DE only

Protection discrimination

Upstream: Masterpact
Downstream: C801 to C1251, CM, Masterpact

Downstream	Upstream	Masterpact H1 - H2 Trip unit STR68U - Inst: ON - position maxi										Masterpact H1 - H2 Trip unit STR38S - 58U - Inst: OFFi									
	Rating (A)	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
C801N	**320**		T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
Trip unit	**400**		T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
STR25DE,	**500**		T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
35SE/GE, 55UE	**630**		T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
C801H	**320**		50	50	50	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
Trip unit	**400**		50	50	50	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
STR25DE,	**500**		50	50	50	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
35SE/GE, 55UE	**630**		50	50	50	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
	800			50	50	T	T	T	T	T	T			T	T	T	T	T	T	T	T
C801L	**320**		T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
Trip unit	**400**		T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
STR25DE,	**500**		T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
35SE/GE, 55UE	**630**		T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	T
	800			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
C1001N	**400**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
Trip unit	**500**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
STR25DE,	**630**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
35SE/GE, 55UE	**800**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
	1000				T	T	T	T	T	T	T				T	T	T	T	T	T	T
C1001H	**400**			50	50	T	T	T	T	T	T			T	T	T	T	T	T	T	T
Trip unit	**500**			50	50	T	T	T	T	T	T			T	T	T	T	T	T	T	T
STR25DE,	**630**			50	50	T	T	T	T	T	T			T	T	T	T	T	T	T	T
35SE/GE, 55UE	**800**			50	50	T	T	T	T	T	T			T	T	T	T	T	T	T	T
	1000				50	T	T	T	T	T	T				T	T	T	T	T	T	T
C1001L	**400**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
Trip unit	**500**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
STR25DE,	**630**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
35SE/GE, 55UE	**800**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
	1000				T	T	T	T	T	T	T				T	T	T	T	T	T	T
C1251N	**500**				T	T	T	T	T	T	T				T	T	T	T	T	T	T
Trip unit	**630**				T	T	T	T	T	T	T				T	T	T	T	T	T	T
STR25DE,	**800**				T	T	T	T	T	T	T				T	T	T	T	T	T	T
35SE/GE, 55UE	**1000**				T	T	T	T	T	T	T				T	T	T	T	T	T	T
	1250					T	T	T	T	T	T					T	T	T	T	T	T
C1251H	**500**				50	T	T	T	T	T	T				T	T	T	T	T	T	T
Trip unit	**630**				50	T	T	T	T	T	T				T	T	T	T	T	T	T
STR25DE,	**800**				50	T	T	T	T	T	T				T	T	T	T	T	T	T
35SE/GE, 55UE	**1000**				50	T	T	T	T	T	T				T	T	T	T	T	T	T
	1250					T	T	T	T	T	T					T	T	T	T	T	T
CM	**1250**					65	65	65	65	65	65					T	T	T	T	T	T
Trip unit ST	**1600**						65	65	65	65	65						T	T	T	T	T
CM1,2,3	**2000**							65	65	65	65							T	T	T	T
	2500								65	65	65								T	T	T
	3200									65	65									T	T
Masterpact	**M08**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
H1, H2	**M10**				T	T	T	T	T	T	T				T	T	T	T	T	T	T
Trip unit	**M12**					T	T	T	T	T	T					T	T	T	T	T	T
STR28D	**M16**						T	T	T	T	T						T	T	T	T	T
	M20							T	T	T	T							T	T	T	T
	M25								T	T	T								T	T	T
	M32									T	T									T	T
	M40										T										T
	M50																				
	M63																				
Masterpact L	**M08**			T	T	T	T	T	T	T	T			T	T	T	T	T	T	T	T
Trip unit	**M10**				T	T	T	T	T	T	T				T	T	T	T	T	T	T
STR38S	**M12**					T	T	T	T	T	T					T	T	T	T	T	T
58U, 68U	**M16**						T	T	T	T	T						T	T	T	T	T
	M20							T	T	T	T							T	T	T	T
	M25								T	T	T								T	T	T

Protection discrimination

Upstream: Masterpact
Downstream: C801 to C1251, CM, Masterpact

Downstream	Upstream	Masterpact H1 Trip unit STR68U-Inst:OFF										Masterpact L Trip unit STR38S-58U						Masterpact L Trip unit STR68U					
	Rating (A)	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M08	M10	M12	M16	M20	M25
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	800	1000	1250	1600	2000	2500
C801N	**320**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
Trip unit	**400**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
STR25DE	**500**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
35SE/GE,55UE	**630**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
	800			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
C801H	**320**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
Trip unit	**400**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
STR25DE	**500**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
35SE/GE,55UE	**630**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
	800			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
C801L	**320**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
Trip unit	**400**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
STR25DE	**500**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
35SE/GE,55UE	**630**		T	T	T	T	T	T	T	T	T		8	10	12	12	15		8	10	12	12	15
	800			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
C1001 N	**400**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
Trip unit	**500**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
STR25DE	**630**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
35SE/GE,55UE	**800**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
	1000				T	T	T	T	T	T	T				12	12	15				12	12	15
C1001 H	**400**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
Trip unit	**500**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
STR25DE	**630**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
35SE/GE,55UE	**800**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
	1000				T	T	T	T	T	T	T				12	12	15				12	12	15
C1001 L	**400**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
Trip unit	**500**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
STR25DE	**630**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
35SE/GE,55UE	**800**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
	1000				T	T	T	T	T	T	T				12	12	15				12	12	15
C1251 N	**500**				T	T	T	T	T	T	T				12	12	15				12	12	15
Trip unit	**630**				T	T	T	T	T	T	T				12	12	15				12	12	15
STR25DE	**800**				T	T	T	T	T	T	T				12	12	15				12	12	15
35SE/GE,55UE	**1000**				T	T	T	T	T	T	T				12	12	15				12	12	15
	1250					T	T	T	T	T	T					12	15					12	15
C1251 H	**500**				T	T	T	T	T	T	T				12	12	15				12	12	15
Trip unit	**630**				T	T	T	T	T	T	T				12	12	15				12	12	15
STR25DE	**800**				T	T	T	T	T	T	T				12	12	15				12	12	15
35SE/GE,55UE	**1000**				T	T	T	T	T	T	T				12	12	15				12	12	15
	1250					T	T	T	T	T	T					12	15					12	15
CM	**1250**					65	65	65	65	65	65					12	15					12	15
Trip unit ST	**1600**						65	65	65	65	65						15						15
CM1,2,3	**2000**							65	65	65	65												
	2500								65	65	65												
	3200									65	65												
Masterpact	**M08**			T	T	T	T	T	T	T	T			10	12	12	15			10	12	12	15
H1, H2	**M10**				T	T	T	T	T	T	T				12	12	15				12	12	15
Trip unit ST28D	**M12**					T	T	T	T	T	T					12	15					12	15
	M16						T	T	T	T	T						15						15
	M20							T	T	T	T												
	M25								T	T	T												
	M32									T	T												
	M40										T												
	M50																						
	M63																						
Masterpact	**M08**			T	T	T	T	T	T	T	T												
H1, H2	**M10**				T	T	T	T	T	T	T												
Trip unit ST28D	**M12**					T	T	T	T	T	T												
	M16						T	T	T	T	T												
	M20							T	T	T	T												
	M25								T	T	T												

Protection discrimination

Upstream: Masterpact
Downstream: Masterpact NW

	Upstream	Masterpact H1 - H2										Masterpact H1 - H2									
	Trip unit	STR28D										STR38S/58U - Inst: ON - position maxi									
		M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63
Downstream	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
	Setting Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
Masterpact NW H1/H2/H3	NW08			12	16	20	25	32	40	50	63			28	40	40	40	40	40	50	63
	NW10				16	20	25	32	40	50	63				40	40	40	40	40	50	63
	NW12					20	25	32	40	50	63					40	40	40	40	50	63
	NW16						25	32	40	50	63						40	40	40	50	63
	NW20							32	40	50	63							40	40	50	63
	NW25								40	50	63								40	50	63
	NW32									50	63									50	63
	NW40										63										63
	NW50																				
	NW63																				
Masterpact NW L1	NW08			12	16	20	25	32	40	50	63			30	40	40	40	40	40	60	T
	NW10				16	20	25	32	40	50	63				40	40	40	40	40	60	T
	NW12					20	25	32	40	50	63					40	40	40	40	60	T
	NW16						25	32	40	50	63						40	40	40	60	T
	NW20							32	40	50	63							40	40	60	T

	Upstream	Masterpact H1 - H2										Masterpact H1									
	Trip unit	STR68U - Inst: ON - position maxi										STR38S/58U - Inst: OFF									
		M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M32	M40	M50	M63
Downstream	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
	réglage Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
Masterpact NW H1/H2/H3	NW08			65	65	65	65	65	65	65	65			T	T	T	T	T	T	T	T
	NW10				65	65	65	65	65	65	65				T	T	T	T	T	T	T
	NW12					65	65	65	65	65	65					T	T	T	T	T	T
	NW16						65	65	65	65	65						T	T	T	T	T
	NW20							65	65	65	65							T	T	T	T
	NW25								65	65	65								T	T	T
	NW32									65	65									T	T
	NW40										65										T
	NW50																				
	NW63																				
Masterpact NW L1	NW08			95	95	T	T	T	T	T	T			T	T	T	T	T	T	T	T
	NW10				95	T	T	T	T	T	T				T	T	T	T	T	T	T
	NW12					T	T	T	T	T	T					T	T	T	T	T	T
	NW16						T	T	T	T	T						T	T	T	T	T
	NW20							T	T	T	T							T	T	T	T

Protection discrimination

Upstream: Masterpact
Downstream: Masterpact NW

	Upstream	Masterpact H1										Masterpact L						Masterpact L					
	Trip unit	STR68U - Inst: OFF										STR38S/58U						STR68U					
		M08	M10	M12	M16	M20	M25	M32	M40	M50	M63	M08	M10	M12	M16	M20	M25	M08	M10	M12	M16	M20	M25
Downstream	Rating (A)	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	800	1000	1250	1600	2000	2500
	réglage Ir	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	800	1000	1250	1600	2000	2500	800	1000	1250	1600	2000	2500
Masterpact NW H1/H2/H3	NW08			T	T	T	T	T	T	T	T												
	NW10				T	T	T	T	T	T	T												
	NW12					T	T	T	T	T	T												
	NW16						T	T	T	T	T												
	NW20							T	T	T	T												
	NW25								T	T	T												
	NW32									T	T												
	NW40										T												
	NW50																						
	NW63																						
Masterpact NW L1	NW08			T	T	T	T	T	T	T	T												
	NW10				T	T	T	T	T	T	T												
	NW12					T	T	T	T	T	T												
	NW16						T	T	T	T	T												
	NW20							T	T	T	T												

Motor protection discrimination

Upstream: Compact NSC100N
Downstream: GV2, Integral 18, 32

		Upstream	NSC100N									
			18 kA									
		Trip unit	TM-D									
Downstream	Thermal relay	Rating (A)	16	20	25	32	40	50	63	70	80	100
GV2 M01	integrated	0.1 to 0.16	T	T	T	T	T	T	T	T	T	T
GV2 M02	integrated	0.16 to 0.25	T	T	T	T	T	T	T	T	T	T
GV2 M03	integrated	0.25 to 0.40	T	T	T	T	T	T	T	T	T	T
GV2 M04	integrated	0.40 to 0.63	T	T	T	T	T	T	T	T	T	T
GV2 M05	integrated	0.63 to 1	T	T	T	T	T	T	T	T	T	T
GV2 M06	integrated	1 to 1.6	T	T	T	T	T	T	T	T	T	T
GV2 M07	integrated	1.6 to 2.5	T	T	T	T	T	T	T	T	T	T
GV2 M08	integrated	2.5 to 4	T	T	T	T	T	T	T	T	T	T
GV2 M10	integrated	4 to 6.3		0.6	0.6	0.6	0.6	1	1	1	1	T
GV2 M14	integrated	6 to 10				0.6	0.6	1	1	1	1	T
GV2 M16	integrated	9 to 14						1	1	1	1	T
GV2 M20	integrated	13 to 18							1	1	1	T
GV2 M21	integrated	17 to 23								1	1	T
GV2 M22	integrated	20 to 25									1	T
GV2 M32	integrated	24 to 32										T
GV2 P01	integrated	0.1 to 0.16	T	T	T	T	T	T	T	T	T	T
GV2 P02	integrated	0.16 to 0.25	T	T	T	T	T	T	T	T	T	T
GV2 P03	integrated	0.25 to 0.40	T	T	T	T	T	T	T	T	T	T
GV2 P04	integrated	0.40 to 0.63	T	T	T	T	T	T	T	T	T	T
GV2 P05	integrated	0.63 to 1	T	T	T	T	T	T	T	T	T	T
GV2 P06	integrated	1 to 1.6	T	T	T	T	T	T	T	T	T	T
GV2 P07	integrated	1.6 to 2.5	T	T	T	T	T	T	T	T	T	T
GV2 P08	integrated	2.5 to 4	T	T	T	T	T	T	T	T	T	T
GV2 P10	integrated	4 to 6.3		0.6	0.6	0.6	0.6	1	1	1	1	T
GV2 P14	integrated	6 to 10				0.6	0.6	1	1	1	1	T
GV2 P16	integrated	9 to 14						1	1	1	1	T
GV2 P20	integrated	13 to 18							1	1	1	T
GV2 P21	integrated	17 to 23								1	1	T
GV2 P22	integrated	20 to 25									1	T
GV2 L03	LR2 D13 03	0.25 to 0.40	T	T	T	T	T	T	T	T	T	T
GV2 L04	LR2 D13 04	0.40 to 0.63	T	T	T	T	T	T	T	T	T	T
GV2 L05	LR2 D13 05	0.63 to 1	T	T	T	T	T	T	T	T	T	T
GV2 L06	LR2 D13 06	1 to 1.6	T	T	T	T	T	T	T	T	T	T
GV2 L07	LR2 D13 07	1.6 to 2.5	T	T	T	T	T	T	T	T	T	T
GV2 L08	LR2 D13 08	2.5 to 4	T	T	T	T	T	T	T	T	T	T
GV2 L10	LR2 D13 10	4 to 6.3		0.6	0.6	0.6	0.6	1	1	1	1	T
GV2 L14	LR2 D13 14	7 to 10				0.6	0.6	1	1	1	1	T
GV2 L16	LR2 D13 16	9 to 13						1	1	1	1	T
GV2 L20	LR2 D13 21	12 to 18							1	1	1	T
GV2 L22	LR2 D13 22	17 to 25									1	T
Integral 18	LB1-LB03P01	0.1 to 0.16	T	T	T	T	T	T	T	T	T	T
LD1-LB030	LB1-LB03P02	0.16 to 0.25	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P03	0.25 to 0.40	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P04	0.40 to 0.63	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P05	0.63 to 1	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P06	1 to 1.6	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P07	1.6 to 2.5	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P08	2.5 to 4	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P10	4 to 6		0.6	0.6	0.6	0.6	1	1	1	1	T
	LB1-LB03P13	6 to 10				0.6	0.6	1	1	1	1	T
	LB1-LB03P17	10 to 16						1	1	1	1	T
	LB1-LB03P21	12 to 18							1	1	1	T
Integral 32	LB1-LC03M03	0.25 to 0.40	T	T	T	T	T	T	T	T	T	T
LD1-LC030	LB1-LC03M04	0.40 to 0.63	T	T	T	T	T	T	T	T	T	T
LD4-LC130	LB1-LC03M05	0.63 to 1	T	T	T	T	T	T	T	T	T	T
LD4-LC030	LB1-LC03M06	1 to 1.6	T	T	T	T	T	T	T	T	T	T
	LB1-LC03M07	1.6 to 2.5	T	T	T	T	T	T	T	T	T	T
	LB1-LC03M08	2.5 to 4	T	T	T	T	T	T	T	T	T	T
	LB1-LC03M10	4 to 6		0.6	0.6	0.6	0.6	1	1	1	1	T
	LB1-LC03M13	6 to 10				0.6	0.6	1	1	1	1	T
	LB1-LC03M17	10 to 16						1	1	1	1	T
	LB1-LC03M22	16 to 25									1	T
	LB1-LC03M53	23 to 32										T

Note: *respect the basic overload and short-circuit discrimination rules.*

Motor protection discrimination

Upstream: NS100 to 630
Downstream: GV2, GV3

		Upstream	NS100N/H/L						NS160N/H/L					
			Trip unit TM-D						Trip unit TM-D					
Downstream	Trip unit	Rating (A)	16	25	40	63	80	100	40	63	80	100	125	160
	or Th. relay	Setting Ir												
GV2 M01	integrated	0.1 to 0.16 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M02	integrated	0.16 to 0.25 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M03	integrated	0.25 to 0.40 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M04	integrated	0.40 to 0.63 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M05	integrated	0.63 to 1 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M06	integrated	1 to 1.6 A	2	T	T	T	T	T	T	T	T	T	T	T
GV2 M07	integrated	1.6 to 2.5 A	0.6	2	T	T	T	T	T	T	T	T	T	T
GV2 M08	integrated	2.5 to 4 A	0.2	0.8	4	4	4	10	4	4	T	T	T	T
GV2 M10	integrated	4 to 6.3 A		0.3	1	1	1	2	1	1	T	T	T	T
GV2 M14	integrated	6 to 10 A			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
GV2 M16	integrated	9 to 14 A				0.5	0.7	0.8		0.5	T	T	T	T
GV2 M20	integrated	13 to 18 A				0.5	0.7	0.8		0.5	T	T	T	T
GV2 M21	integrated	17 to 23 A					0.7	0.8			T	T	T	T
GV2 M22	integrated	20 to 25 A					0.7	0.8			T	T	T	T
GV2 P01	integrated	0.1 to 0.16 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P02	integrated	0.16 to 0.25 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P03	integrated	0.25 to 0.40 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P04	integrated	0.40 to 0.63 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P05	integrated	0.63 to 1 A	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P06	integrated	1 to 1.6 A	2	T	T	T	T	T	T	T	T	T	T	T
GV2 P07	integrated	1.6 to 2.5 A	0.6	2	T	T	T	T	T	T	T	T	T	T
GV2 P08	integrated	2.5 to 4 A	0.2	0.8	4	4	4	10	4	4	T	T	T	T
GV2 P10	integrated	4 to 6.3 A		0.3	1	1	1	2	1	1	T	T	T	T
GV2 P14	integrated	6 to 10 A			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
GV2 P16	integrated	9 to 14 A				0.5	0.7	0.8		0.5	T	T	T	T
GV2 P20	integrated	13 to 18 A				0.5	0.7	0.8		0.5	T	T	T	T
GV2 P21	integrated	17 to 23 A					0.7	0.8			T	T	T	T
GV2 P22	integrated	20 to 25 A					0.7	0.8			T	T	T	T
GV2 L03	LR2 D13 03	0.25/0.4	T	T	T	T	T	T	T	T	T	T	T	T
GV2 L04	LR2 D13 04	0.4/0.63	T	T	T	T	T	T	T	T	T	T	T	T
GV2 L05	LR2 D13 05	0.63/1	T	T	T	T	T	T	T	T	T	T	T	T
GV2 L06	LR2 D13 06	1/1.6	2	T	T	T	T	T	T	T	T	T	T	T
GV2 L07	LR2 D13 07	1.6/2.5	0.6	2	T	T	T	T	T	T	T	T	T	T
GV2 L08	LR2 D13 08	2.5/4	0.2	0.8	4	4	4	10	4	4	T	T	T	T
GV2 L10	LR2 D13 10	4/6		0.3	1	1	0.7	2	1	1	T	T	T	T
GV2 L14	LR2 D13 14	7/10			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
GV2 L16	LR2 D13 16	9/13				0.5	0.7	0.8		0.5	T	T	T	T
GV2 L20	LR2 D13 21	12/18				0.5	0.7	0.8		0.5	T	T	T	T
GV2 L22	LR2 D33 22	17/25					0.7	0.8			T	T	T	T
GV3 M06	integrated	1 to 1.6 A	0.2	0.3	T	T	T	T	T	T	T	T	T	T
GV3 M07	integrated	1.6 to 2.5 A	0.2	0.3	1	1	0.7	T	1	1	T	T	T	T
GV3 M08	integrated	2.5 to 4 A	0.2	0.3	0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
GV3 M10	integrated	4 to 6 A	0.2	0.3	0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
GV3 M14	integrated	6 to 10 A			0.5	0.5	0.7	0.8	0.5	0.5	2	3	3	3
GV3 M20	integrated	10 to 16 A				0.5	0.7	0.8		0.5	1.5	2	2	2
GV3 M25	integrated	16 to 25 A					0.7	0.8			1	2	2	2
GV3 M40	integrated	25 to 40 A											1.25	1.25
GV3 M63	integrated	40 to 63 A												
GV3 M80	integrated	63 to 80 A												

Note: *respect the basic overload and short-circuit discrimination rules*

Motor protection discrimination

Upstream: NS100 to 630
Downstream: GV2, GV3

		Upstream	NS250N/H/L Trip unit TM-D								NS100N/H/L STR22SE(*)		NS160N/H/L STR22SE(*)		NS250N/H/L STR22SE (*)		NS400N/H/L STR23SE /53UE (*)	NS630N/H/L STR23SE /53UE (*)
Downstream	Trip unit or Th. relay	Rating (A) Setting Ir	40	63	80	100	125	160	200	250	40	100	80	160	160	250	160 to 400	250 to 630
GV2 M01	integrated	0.1 to 0.16 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M02	integrated	0.16 to 0.25 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M03	integrated	0.25 to 0.40 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M04	integrated	0.40 to 0.63 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M05	integrated	0.63 to 1 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 M06	integrated	1 to 1.6 A	T	T	T	T	T	T	T	T	1	T	T	T	T	T	T	T
GV2 M07	integrated	1.6 to 2.5 A	T	T	T	T	T	T	T	T	1	4	T	T	T	T	T	T
GV2 M08	integrated	2.5 to 4 A	4	4	T	T	T	T	T	T	0.8	3	T	T	T	T	T	T
GV2 M10	integrated	4 to 6.3 A	1	1	T	T	T	T	T	T	0.5	2	T	T	T	T	T	T
GV2 M14	integrated	6 to 10 A	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
GV2 M16	integrated	9 to 14 A		0.5	T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 M20	integrated	13 to 18 A		0.5	T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 M21	integrated	17 to 23 A			T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 M22	integrated	20 to 25 A			T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 P01	integrated	0.1 to 0.16 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P02	integrated	0.16 to 0.25 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P03	integrated	0.25 to 0.40 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P04	integrated	0.40 to 0.63 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P05	integrated	0.63 to 1 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 P06	integrated	1 to 1.6 A	T	T	T	T	T	T	T	T	1	T	T	T	T	T	T	T
GV2 P07	integrated	1.6 to 2.5 A	T	T	T	T	T	T	T	T	1	4	T	T	T	T	T	T
GV2 P08	integrated	2.5 to 4 A	4	4	T	T	T	T	T	T	0.8	3	T	T	T	T	T	T
GV2 P10	integrated	4 to 6.3 A	1	1	T	T	T	T	T	T	0.5	2	T	T	T	T	T	T
GV2 P14	integrated	6 to 10 A	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
GV2 P16	integrated	9 to 14 A		0.5	T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 P20	integrated	13 to 18 A		0.5	T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 P21	integrated	17 to 23 A			T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 P22	integrated	20 to 25 A			T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 L03	LR2 D13 03	0.25/0.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 L04	LR2 D13 04	0.4/0.63	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 L05	LR2 D13 05	0.63/1	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV2 L06	LR2 D13 06	1/1.6	T	T	T	T	T	T	T	T	1	T	T	T	T	T	T	T
GV2 L07	LR2 D13 07	1.6/2.5	T	T	T	T	T	T	T	T	1	4	T	T	T	T	T	T
GV2 L08	LR2 D13 08	2.5/4	4	4	T	T	T	T	T	T	0.8	3	T	T	T	T	T	T
GV2 L10	LR2 D13 10	4/6	1	1	T	T	T	T	T	T	0.5	2	T	T	T	T	T	T
GV2 L14	LR2 D13 14	7/10	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
GV2 L16	LR2 D13 16	9/13		0.5	T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 L20	LR2 D13 21	12/18		0.5	T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV2 L22	LR2 D33 22	17/25			T	T	T	T	T	T		1.2	T	T	T	T	T	T
GV3 M06	integrated	1 to 1.6 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GV3 M07	integrated	1.6 to 2.5 A	1	1	T	T	T	T	T	T	1	T	T	T	T	T	T	T
GV3 M08	integrated	2.5 to 4 A	0.5	0.5	T	T	T	T	T	T	0.5	5	T	T	T	T	T	T
GV3 M10	integrated	4 to 6 A	0.5	0.5	T	T	T	T	T	T	0.5	2	T	T	T	T	T	T
GV3 M14	integrated	6 to 10 A	0.5	0.5	2	3	3	T	T	T	0.5	1.2	0.9	T	T	T	T	T
GV3 M20	integrated	10 to 16 A		0.5	1.5	2	2	T	T	T		1.2	0.9	T	T	T	T	T
GV3 M25	integrated	16 to 25 A			1	2	2	T	T	T		1.2	0.9	T	T	T	T	T
GV3 M40	integrated	25 to 40 A					1.25	T	T	T				T	T	T	T	T
GV3 M63	integrated	40 to 63 A							T	T						T	T	T
GV3 M80	integrated	63 to 80 A								T						T	T	T

(*) Note: *respect the basic overload and short-circuit discrimination rules.*

Motor protection discrimination

Upstream: NS100 to 630
Downstream: Integral 18, 32, 63

		Upstream	NS100N/H/L						NS160N/H/L					
			Trip unit TM-D						Trip unit TM-D					
Downstream	Trip unit	Rating (A)	16	25	40	63	80	100	40	63	80	100	125	160
	or Th. relay	Setting Ir												
Integral 18	LB1-LB03P01	0.1 to 0.16 A	T	T	T	T	T	T	T	T	T	T	T	T
LD1-LB030	LB1-LB03P02	0.16 to 0.25 A	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P03	0.25 to 0.40 A	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P04	0.40 to 0.63 A	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P05	0.63 to 1 A	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P06	1 to 1.6 A	0.2	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P07	1.6 to 2.5 A	0.2	0.3	1.5	1.5	4	T	1.5	1.5	T	T	T	T
	LB1-LB03P08	2.5 to 4 A	0.2	0.3	0.5	0.5	0.7	2	0.5	0.5	T	T	T	T
	LB1-LB03P10	4 to 6 A		0.3	0.5	0.5	0.7	1	0.5	0.5	T	T	T	T
	LB1-LB03P13	6 to 10 A			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
	LB1-LB03P17	10 to 16 A				0.5	0.7	0.8		0.5	4	T	T	T
	LB1-LB03P21	12 to 18 A				0.5	0.7	0.8		0.5	3	T	T	T
Integral 32	LB1-LC03M03	0.25 to 0.40 A	T	T	T	T	T	T	T	T	T	T	T	T
LD1-LC030	LB1-LC03M04	0.40 to 0.63 A	T	T	T	T	T	T	T	T	T	T	T	T
LD4-LC130	LB1-LC03M05	0.63 to 1 A	T	T	T	T	T	T	T	T	T	T	T	T
LD4-LC030	LB1-LC03M06	1 to 1.6 A	0.2	T	T	T	T	T	T	T	T	T	T	T
	LB1-LC03M07	1.6 to 2.5 A	0.2	0.3	1.5	1.5	1	T	1.5	1.5	T	T	T	T
	LB1-LC03M08	2.5 to 4 A	0.2	0.3	0.5	0.5	0.7	1	0.5	0.5	T	T	T	T
	LB1-LC03M10	4 to 6 A		0.3	0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
	LB1-LC03M13	6 to 10 A			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
	LB1-LC03M17	10 to 16 A				0.5	0.7	0.8		0.5	4	T	T	T
	LB1-LC03M22	16 to 25 A				0.5	0.7	0.8		0.5	3	T	T	T
	LB1-LC03M53	23 to 32 A						0.8				T	T	T
Integral 63	LB1-LD03M16	10 à13 A			0.5	0.5	0.65	0.8	0.5	0.5	1	1.25	1.25	1.25
LD1-LD030	LB1-LD03M21	13 à18 A				0.5	0.65	0.8		0.5	1	1.25	1.25	1.25
LD4-LD130	LB1-LD03M22	18 to 25 A					0.65	0.8			1	1.25	1.25	1.25
LD4-LD030	LB1-LD03M53	23 to 32 A						0.8				1.25	1.25	1.25
	LB1-LD03M55	28 to 40 A											1.25	1.25
	LB1-LD03M57	35 to 50 A												1.25
	LB1-LD03M61	45 to 63 A												

Note: *respect the basic overload and short-circuit discrimination rules.*

Motor protection discrimination

Upstream: NS100 to 630
Downstream: Integral 18, 32, 63

		Upstream	NS250N/H/L Trip unit TM-D								NS100N/H/L STR22SE(*)		NS160N/H/L STR22SE(*)		NS250N/H/L STR22SE (*)		NS400N/H/L STR23SE/ 53UE (*)	NS630N/H/L STR23SE/ 53UE (*)
Downstream	Trip unit or Th. relay	Rating (A) Setting Ir	40	63	80	100	125	160	200	250	40	100	80	160	160	250	160 to 400	250 to 630
Integral 18	LB1-LB03P01	0.1 to 0.16 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
LD1-LB030	LB1-LB03P02	0.16 to 0.25 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P03	0.25 to 0.40 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P04	0.40 to 0.63 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P05	0.63 to 1 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P06	1 to 1.6 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LB03P07	1.6 to 2.5 A	1.5	1.5	T	T	T	T	T	T	2	T	T	T	T	T	T	T
	LB1-LB03P08	2.5 to 4 A	0.5	0.5	T	T	T	T	T	T	0.5	3	T	T	T	T	T	T
	LB1-LB03P10	4 to 6 A	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
	LB1-LB03P13	6 to 10 A	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
	LB1-LB03P17	10 to 16 A		0.5	4	T	T	T	T	T		1.2	T	T	T	T	T	T
	LB1-LB03P21	12 to 18 A		0.5	3	T	T	T	T	T		1.2	T	T	T	T	T	T
Integral 32	LB1-LC03M03	0.25 to 0.40 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
LD1-LC030	LB1-LC03M04	0.40 to 0.63 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
LD4-LC130	LB1-LC03M05	0.63 to 1 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
LD4-LC030	LB1-LC03M06	1 to 1.6 A	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	LB1-LC03M07	1.6 to 2.5 A	1.5	1.5	T	T	T	T	T	T	0.5	T	T	T	T	T	T	T
	LB1-LC03M08	2.5 to 4 A	0.5	0.5	T	T	T	T	T	T	0.5	3	T	T	T	T	T	T
	LB1-LC03M10	4 to 6 A	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
	LB1-LC03M13	6 to 10 A	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
	LB1-LC03M17	10 to 16 A		0.5	1	T	T	T	T	T		1.2	T	T	T	T	T	T
	LB1-LC03M22	16 to 25 A		0.5	0.8	T	T	T	T	T		1.2	T	T	T	T	T	T
	LB1-LC03M53	23 to 32 A				T	T	T	T	T		1.2	T	T	T	T	T	T
Integral 63	LB1-LD03M16	13 to 13 A	0.5	0.5	1	1.25	1.25	T	T	T	0.5	1.2	T	T	T	T	T	T
LD1-LD030	LB1-LD03M21	13 to 18 A		0.5	1	1.25	1.25	T	T	T		1.2	0.9	35	35	T	T	T
LD4-LD130	LB1-LD03M22	18 to 25 A			1	1.25	1.25	T	T	T		1.2	0.9	35	35	T	T	T
LD4-LD030	LB1-LD03M53	23 to 32 A				1.25	1.25	T	T	T		1.2	0.9	35	35	T	T	T
	LB1-LD03M55	28 to 40 A					1.25	T	T	T				35	35	T	T	T
	LB1-LD03M57	35 to 50 A						T	T	T						T	T	T
	LB1-LD03M61	45 to 63 A							T	T						T	T	T

(*) Note: *respect the basic overload and short-circuit discrimination rules.*

Motor protection discrimination

Upstream: NS100 to 630
Downstream: C60LMA, NC100LMA, NS80HMA

		Upstream	NS100N/H/L Trip unit TM-D						NS160N/H/L Trip unit TM-D					
Downstream	Trip unit or Th. relay	Rating (A) Setting Ir	16	25	40	63	80	100	40	63	80	100	125	160
C60LMA 1.6	LR2 D13 06	1/1.6	0.2	T	T	T	T	T	T	T	T	T	T	T
C60LMA 2.5	LR2 D13 07	1.6/2.5	0.2	0.3	T	T	T	T	T	T	T	T	T	T
C60LMA 4	LR2 D13 08	2.5/4	0.2	0.3	0.5	0.5	3	T	0.5	0.5	T	T	T	T
C60LMA 6.3	LR2 D13 10	4/6		0.3	0.5	0.5	0.7	5	0.5	0.5	T	T	T	T
C60LMA 10	LR2 D13 12	5.5/8		0.3	0.5	0.5	0.7	2	0.5	0.5	T	T	T	T
C60LMA 10	LR2 D13 14	7/10			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
C60LMA 12.5	LR2 D13 16	9/13			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
C60LMA 16	LR2 D13 21	12/18				0.5	0.7	0.8		0.5	T	T	T	T
C60LMA 25	LR2 D13 22	17/25					0.7	0.8			T	T	T	T
C60LMA 40	LR2 D33 53	23/32						0.8				T	T	T
C60LMA 40	LR2 D33 55	30/40											T	T
NC100LMA 1.6	LR2 D13 06	1/1.6	0.2	T	T	T	T	T	T	T	T	T	T	T
NC100LMA 2.5	LR2 D13 07	1.6/2.5	0.2	0.3	T	T	T	T	T	T	T	T	T	T
NC100LMA 4	LR2 D13 08	2.5/4	0.2	0.3	0.5	0.5	10	T	0.5	0.5	T	T	T	T
NC100LMA 6.3	LR2 D13 10	4/6		0.3	0.5	0.5	0.7	10	0.5	0.5	T	T	T	T
NC100LMA 10	LR2 D13 12	5.5/8		0.3	0.5	0.5	0.7	2	0.5	0.5	T	T	T	T
NC100LMA 10	LR2 D13 14	7/10			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
NC100LMA 12.5	LR2 D13 16	9/13			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
NC100LMA 16	LR2 D13 21	12/18				0.5	0.7	0.8		0.5	T	T	T	T
NC100LMA 25	LR2 D13 22	17/25					0.7	0.8			T	T	T	T
NC100LMA 40	LR2 D33 53	23/32						0.8				T	T	T
NC100LMA 40	LR2 D33 55	30/40											T	T
NC100LMA 63	LR2 D33 57	37/50												
NC100LMA 63	LR2 D33 59	48/65												
NS80HMA 2.5	LR2 D13 06	1/1.6	T	T	T	T	T	T	T	T	T	T	T	T
NS80HMA 2.5	LR2 D13 07	1.6/2.5	T	T	T	T	T	T	T	T	T	T	T	T
NS80HMA 6.3	LR2 D13 08	2.5/4	0.2	0.3	0.5	0.5	0.7	10	0.5	0.5	T	T	T	T
NS80HMA 6.3	LR2 D13 10	4/6		0.3	0.5	0.5	0.7	2	0.5	0.5	T	T	T	T
NS80HMA 12.5	LR2 D13 12	5.5/8		0.3	0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
NS80HMA 12.5	LR2 D13 14	7/10			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
NS80HMA 12.5	LR2 D13 16	9/13			0.5	0.5	0.7	0.8	0.5	0.5	T	T	T	T
NS80HMA 25	LR2 D13 21	12/18				0.5	0.7	0.8		0.5	1	T	T	T
NS80HMA 25	LR2 D33 22	17/25					0.7	0.8			1	1.2	1.2	1.2
NS80HMA 50	LR2 D33 53	23/32						0.8				1.2	1.2	1.2
NS80HMA 50	LR2 D33 55	30/40											1.2	1.2
NS80HMA 50	LR2 D33 57	37/50												1.2
NS80HMA 80	LR2 D33 59	48/65												

Motor protection discrimination

Upstream: NS100 to 630
Downstream: C60LMA, NC100LMA, NS80HMA

		Upstream	NS250N/H/L Trip unit TM-D								NS100N/H/L STR22SE		NS160N/H/L STR22SE(*)		NS250N/H/L STR22SE(*)		NS400N/H/L STR23SE/ 53UE	NS630N/H/L STR23SE/ 53UE
Downstream	**Trip unit or Th. relay**	**Rating (A) Setting Ir**	**40**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**40**	**100**	**80**	**160**	**160**	**250**	**160 to 400**	**250 to 630**
C60LMA 1.6	**LR2 D13 06**	**1/1.6**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
C60LMA 2.5	**LR2 D13 07**	**1.6/2.5**	T	T	T	T	T	T	T	T	1	T	T	T	T	T	T	T
C60LMA 4	**LR2 D13 08**	**2.5/4**	0.5	0.5	T	T	T	T	T	T	0.5	T	T	T	T	T	T	T
C60LMA 6.3	**LR2 D13 10**	**4/6**	0.5	0.5	T	T	T	T	T	T	0.5	5	T	T	T	T	T	T
C60LMA 10	**LR2 D13 12**	**5.5/8**	0.5	0.5	T	T	T	T	T	T	0.5	2	T	T	T	T	T	T
C60LMA 10	**LR2 D13 14**	**7/10**	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
C60LMA 12.5	**LR2 D13 16**	**9/13**	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
C60LMA 16	**LR2 D13 21**	**12/18**		0.5	T	T	T	T	T	T		1.2	T	T	T	T	T	T
C60LMA 25	**LR2 D13 22**	**17/25**			T	T	T	T	T	T		1.2	T	T	T	T	T	T
C60LMA 40	**LR2 D33 53**	**23/32**				T	T	T	T	T		1.2	T	T	T	T	T	T
C60LMA 40	**LR2 D33 55**	**30/40**					T	T	T	T				T	T	T	T	T
NC100LMA 1.6	**LR2 D13 06**	**1/1.6**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NC100LMA 2.5	**LR2 D13 07**	**1.6/2.5**	T	T	T	T	T	T	T	T	1	T	T	T	T	T	T	T
NC100LMA 4	**LR2 D13 08**	**2.5/4**	0.5	0.5	T	T	T	T	T	T	0.5	15	T	T	T	T	T	T
NC100LMA 6.3	**LR2 D13 10**	**4/6**	0.5	0.5	T	T	T	T	T	T	0.5	2	T	T	T	T	T	T
NC100LMA 10	**LR2 D13 12**	**5.5/8**	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
NC100LMA 10	**LR2 D13 14**	**7/10**	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
NC100LMA 12.5	**LR2 D13 16**	**9/13**	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
NC100LMA 16	**LR2 D13 21**	**12/18**		0.5	T	T	T	T	T	T		1.2	T	T	T	T	T	T
NC100LMA 25	**LR2 D13 22**	**17/25**			T	T	T	T	T	T		1.2	T	T	T	T	T	T
NC100LMA 40	**LR2 D33 53**	**23/32**				T	T	T	T	T		1.2	T	T	T	T	T	T
NC100LMA 40	**LR2 D33 55**	**30/40**					T	T	T	T				T	T	T	T	T
NC100LMA 63	**LR2 D33 57**	**37/50**						T	T	T				T	T	T	T	T
NC100LMA 63	**LR2 D33 59**	**48/65**							T	T						T	T	T
NS80HMA 2.5	**LR2 D13 06**	**1/1.6**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
NS80HMA 2.5	**LR2 D13 07**	**1.6/2.5**	T	T	T	T	T	T	T	T	1	T	T	T	T	T	T	T
NS80HMA 6.3	**LR2 D13 08**	**2.5/4**	0.5	0.5	T	T	T	T	T	T	0.5	T	T	T	T	T	T	T
NS80HMA 6.3	**LR2 D13 10**	**4/6**	0.5	0.5	T	T	T	T	T	T	0.5	5	T	T	T	T	T	T
NS80HMA 12.5	**LR2 D13 12**	**5.5/8**	0.5	0.5	T	T	T	T	T	T	0.5	2	T	T	T	T	T	T
NS80HMA 12.5	**LR2 D13 14**	**7/10**	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
NS80HMA 12.5	**LR2 D13 16**	**9/13**	0.5	0.5	T	T	T	T	T	T	0.5	1.2	T	T	T	T	T	T
NS80HMA 25	**LR2 D13 21**	**12/18**		0.5	1	T	T	T	T	T		1.2	T	T	T	T	T	T
NS80HMA 25	**LR2 D33 22**	**17/25**			1	1.2	1.2	T	T	T		1.2	T	T	T	T	T	T
NS80HMA 50	**LR2 D33 53**	**23/32**				1.2	1.2	T	T	T		1.2		T	T	T	T	T
NS80HMA 50	**LR2 D33 55**	**30/40**					1.2	T	T	T				T	T	T	T	T
NS80HMA 50	**LR2 D33 57**	**37/50**						T	T	T				T	T	T	T	T
NS80HMA 80	**LR2 D33 59**	**48/65**							T	T						T	T	T

(*) Note: *respect the basic overload and short-circuit discrimination rules.*

Motor protection discrimination

Upstream: NS100 to 630
Downstream: NS100 to 630

		Upstream	NS100N/H/L Trip unit TM-D								NS160N/H/L Trip unit TM-D				NS250N/H/L Trip unit TM-D	
Downstream	Trip unit or Th. relay	Rating (A) Setting Ir	16	25	32	40	50	63	80	100	80	100	125	160	200	250
NS100N/H/LMA 2.5	LR2 D13 06	1/1.6	0.19	3	T	T	T	T	T	T	T	T	T	T	T	T
NS100N/H/LMA 2.5	LR2 D13 07	1.6/2.5	0.19	3	4	5	5	5	T	T	T	T	T	T	T	T
NS100N/H/LMA 6.3	LR2 D13 08	2.5/4	0.19	3	4	5	5	5	6.4	8	T	T	T	T	T	T
NS100N/H/LMA 6.3	LR2 D13 10	4/6		3	4	5	5	5	6.4	8	T	T	T	T	T	T
NS100N/H/LMA 12.5	LR2 D13 12	5.5/8		3	4	5	5	5	6.4	8	10	12.5	12.5	12.5	20	25
NS100N/H/LMA 12.5	LR2 D13 14	7/10			4	5	5	5	6.4	8	10	12.5	12.5	12.5	20	25
NS100N/H/LMA 12.5	LR2 D13 16	9/13				5	5	5	6.4	8	10	12.5	12.5	12.5	20	25
NS100N/H/LMA 25	LR2 D13 21	12/18						5	6.4	8	10	12.5	12.5	12.5	20	25
NS100N/H/LMA 25	LR2 D33 22	17/25							6.4	8	10	12.5	12.5	12.5	20	25
NS100N/H/LMA 50	LR2 D33 53	23/32								8		12.5	12.5	12.5	20	25
NS100N/H/LMA 50	LR2 D33 55	30/40											12.5	12.5	20	25
NS100N/H/LMA 50	LR2 D33 57	37/50												12.5	20	25
NS100N/H/LMA 100	LR2 D33 59	48/65													20	25
NS100N/H/LMA 100	LR2 D33 63	63/80														25
NS100N/H/LMA 100																
NS160N/H/LMA 150																
NS250N/H/LMA 220																
NS400N/H/LMA 320																
NS630N/H/LMA 500																

		Upstream	NS100N/H/L STR22SE(*)		NS160N/H/L NS250N/H/L STR22SE(*)			NS400N/H/L NS630N/H/L STR23SE(*) STR53SE	
Downstream	Trip unit or Thermal th.	Rating (A) Setting Ir	40	100	80	160	250	400	630
NS100N/H/LMA 2,5	LR2 D13 06	1/1,6	0,45	T	T	T	T	T	T
NS100N/H/LMA 2,5	LR2 D13 07	1,6/2,5	0,45	T	T	T	T	T	T
NS100N/H/LMA 6,3	LR2 D13 08	2,5/4	0,45	1,1	T	T	T	T	T
NS100N/H/LMA 6,3	LR2 D13 10	4/6	0,45	1,1	T	T	T	T	T
NS100N/H/LMA 12,5	LR2 D13 12	5,5/8	0,45	1,1	0,9	T	T	T	T
NS100N/H/LMA 12,5	LR2 D13 14	07/10	0,45	1,1	0,9	T	T	T	T
NS100N/H/LMA 12,5	LR2 D13 16	9/13	0,45	1,1	0,9	T	T	T	T
NS100N/H/LMA 25	LR2 D13 21	12/18		1,1	0,9	1,75	36	T	T
NS100N/H/LMA 25	LR2 D33 22	17/25		1,1	0,9	1,75	36	T	T
NS100N/H/LMA 50	LR2 D33 53	23/32		1,1		1,75	36	T	T
NS100N/H/LMA 50	LR2 D33 55	30/40				1,75	36	T	T
NS100N/H/LMA 50	LR2 D33 57	37/50				1,75	36	T	T
NS100N/H/LMA 100	LR2 D33 59	48/65					36	T	T
NS100N/H/LMA 100	LR2 D33 63	63/80					36	T	T
NS100N/H/LMA 100								T	T
NS160N/H/LMA 150									T
NS250N/H/LMA 220									T
NS400N/H/LMA 320									
NS630N/H/LMA 500									
NS100N/H/L	STR22ME40	24/40				1,75	3,6	T	T
NS100N/H/L	STR22ME50	30/50				1,75	3,6	T	T
NS100N/H/L	STR22ME80	48/80					3,6	T	T
NS100N/H/L	STR22ME100	60/100						T	T
NS160N/H/L	STR22ME150	90/150							
NS250N/H/L	STR22ME220	131/220							
NS400N/H/L	STR43ME320	190/320							

(*) Note: *respect the basic overload and short-circuit discrimination rules.*

Motor protection discrimination

Upstream: Masterpact NW
Downstream: NS630

Downstream		Upstream	NW16H1 Micrologic 5.0	NW20H1/H2/H3 Micrologic 5.0	NW25H1/H2/H3 Micrologic 5.0	NW32H1/H2/H3 Micrologic 5.0	NW40H1/H2/H3 Micrologic 5.0
NS630N/H/L	STR43ME	200...500	T	T	T	T	T

Protection of motor circuits
Circuit breaker/contactor coordination

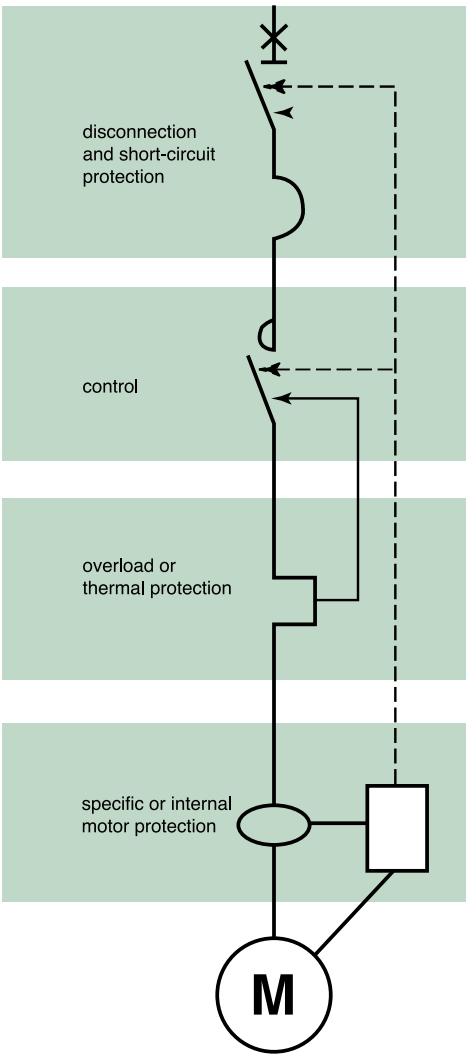
A circuit supplying a motor may include one, two, three or four switchgear or controlgear devices fulfilling one or more functions.

When a number of devices are used, they must be coordinated to ensure optimum operation of the motor.

Protection of a motor circuit involves a number of parameters that depend on:
- the application (type of machine driven, operating safety, starting frequency, etc.)
- the level of service continuity imposed by the load or the application
- the applicable standards to ensure protection of life and property.

The necessary electrical functions are of very different natures:
- protection (motor-dedicated for overloads)
- control (generally with high endurance levels)
- isolation

E34300



Protection functions

Disconnection functions:
Isolate a motor circuit prior to maintenance operations.

Short-circuit protection:
Protect the starter and the cables against major overcurrents (> 10 In).

Control:
Start and stop the motor, and, if applicable:
- gradual acceleration
- speed control.

Overload protection:
Protect the starter and the cables against minor overcurrents (< 10 In).

Additional specific protection:
- Limitative fault protection (while the motor is running)
- Preventive fault protection (monitoring of motor insulation with motor off).

Overloads (I < 10 In)
An overload may be caused by:
- an electrical problem, for instance on the mains (loss of a phase, voltage outside tolerances, etc.)
- a mechanical problem, for instance excessive torque due to abnormally high demands by the process or motor damage (bearing vibrations, etc.).

A further consequence of these two origins is excessively long starting.

Impedant short-circuit (10 < I < 50 In)
Deterioration of motor-winding insulation is the primary cause.

Short-circuit (I > 50 In)
This type of fault is relatively rare. A possible cause may be a connection error during maintenance.

Overload protection
Thermal relays provide protection against this type of fault. They may be:
- integrated in the short-circuit protective device
- separate.

Short-circuit protection
This type of protection is provided by a circuit breaker.

Protection against insulation faults
This type of protection may be provided by:
- a residual current device (RCD)
- an insulation monitoring device (IMD).

Protection of motor circuits
Circuit breaker/contactor coordination

Applicable standards

A circuit supplying a motor must comply with the general rules set out in IEC standard 60947-4-1 and in particular with those concerning contactors, motor starters and their protection as stipulated in IEC 60947-4-1, notably:
- coordination of the components of the motor circuit
- trip class for thermal relays
- contactor utilisation categories
- coordination of insulation.

Coordination of the components of the motor circuit

Two types of coordination

The standard defines tests at different current levels. The purpose of these tests is to place the switchgear and controlgear in extreme conditions. Depending on the state of the components following the tests, the standard defines two types of coordination.

- **Type 1**

Deterioration of the contactor and the relay is acceptable under two conditions:
- no danger to operating personnel
- no danger to any components other than the contactor and the relay;

- **Type 2**

Only minor welding of the contactor or starter contacts is permissible and the contacts must be easily separated.
- following type-2 coordination tests, the switchgear and controlgear functions must be fully operational.

Which type of coordination is needed?

Selection of a type of coordination depends on the operating conditions encountered.
The goal is to achieve the best balance between the user's needs and the running of the installation.

- **Type 2**
  - continuity of service is imperative
  - limited maintenance service
  - specifications stipulating type 2.

Our recommendation would be for Type 2 coordination as a standard requirement.

The different test currents

“Ic”, “r” and “Iq” test currents

To qualify for type-2 coordination, the standard requires three fault-current tests to check that the switchgear and controlgear operates correctly under overload and short-circuit conditions.

“Ic” current (overload I < 10 In)

The thermal relay provides protection against this type of fault, up to the Ic value (a function of Im or Isd) defined by the manufacturer.

IEC standard 60947-4-1 stipulates two tests that must be carried out to guarantee coordination between the thermal relay and the short-circuit protective device:
- at 0.75 Ic, only the thermal relay reacts
- at 1.25 Ic, the short-circuit protective device reacts.

Following the tests at 0.75 and 1.25 Ic, the trip characteristics of the thermal relay must be unchanged. Type-2 coordination thus enhances continuity of service. The contactor may be closed automatically following clearing of the fault.

“r” current
(Impedant short-circuit 10< I < 50 In)

The primary cause of this type of fault is the deterioration of insulation. IEC standard 60947-4-1 defines an intermediate short-circuit current “r”. This test current is used to check that the protective device provides protection against impedant short-circuits.

There must be no modification in the original characteristics of the contactor and the thermal relay following the test.

The circuit breaker must trip in i 10 ms for a fault current ≥ 15 In.

Operational current Ie (AC3) of the motor (in A)	“r” current (in kA)
Ie ≤ 16	1
16 < Ie ≤ 63	3
63 < Ie ≤ 125	5
125 < Ie ≤ 315	10
315 < Ie < 630	18

“Iq” current
(short-circuit I > 50 In)

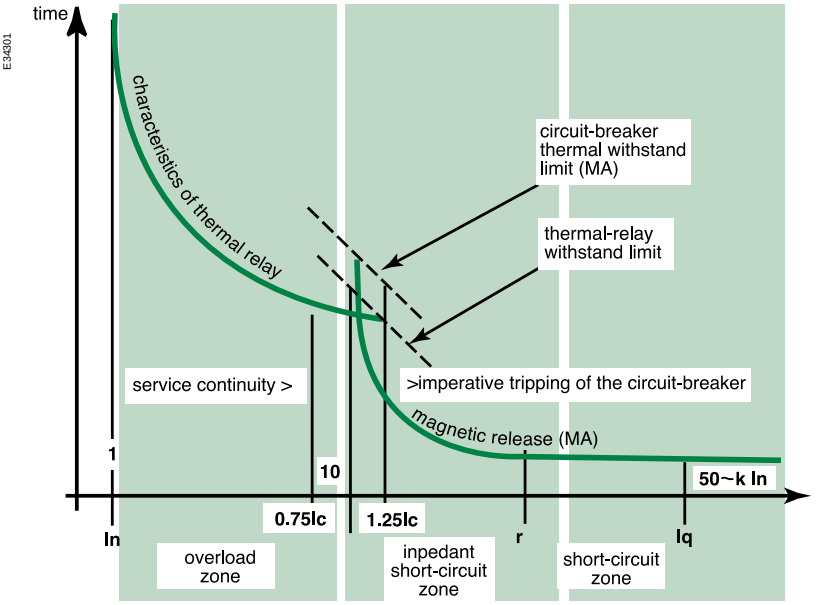
This type of fault is relatively rare. A possible cause may be a connection error during maintenance.

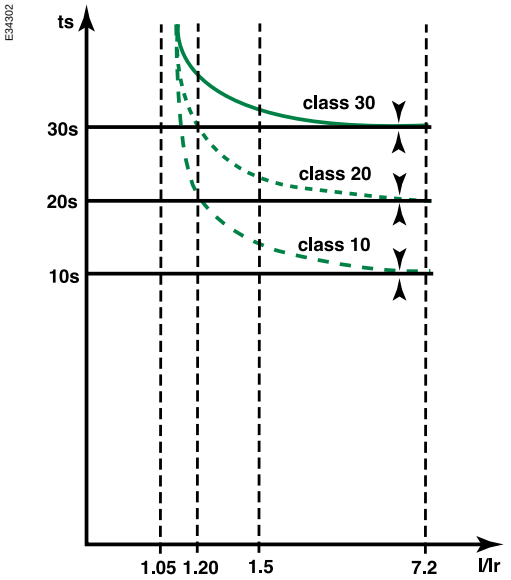
Short-circuit protection is provided by devices that open quickly.

IEC standard 60947-4-1 defines the “Iq” current as generally ≥ 50 kA.

The “Iq” current is used to check the coordination of the switchgear and controlgear installed on a motor supply circuit.

Following this test under extreme conditions, all the coordinated switchgear and controlgear must remain operational.





Trip class of a thermal relay.

Trip class of a thermal relay

The four trip class of a thermal relay are 10 A, 10, 20 and 30 (maximum tripping times at 7.2 Ir).

Classes 10 and 10 A are the most commonly used. Classes 20 and 30 are reserved for motors with difficult starting conditions.

The diagram and the table opposite can be used to select a thermal relay suited to the motor starting time.

Class	1.05 Ir	1.2 Ir	1.5 Ir	7.2 Ir
10 A	t > 2 h	t < 2 h	t < 2 min.	2 ≤ t ≤ 10 s
10	t > 2 h	t < 2 h	t < 4 min.	4 ≤ t ≤ 10 s
20	t > 2 h	t < 2 h	t < 8 min.	6 ≤ t ≤ 20 s
30	t > 2 h	t < 2 h	t < 12 min.	9 ≤ t ≤ 30 s

Protection of motor circuits
Circuit breaker/contactor coordination

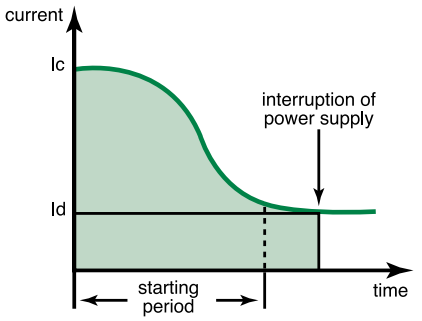
The four utilisation categories of contactors (AC1 to AC4)

The four utilisation categories of contactors (AC1 to AC4)The utilisation category determines the operating frequency and endurance of a contactor. The category depends on the type of load. If the load is a motor; the category also depends on the service classification.

Main characteristics of the controlled electrical circuits and applications

Category	Type of load	Contactor usage	typical applications
AC1	no-inductive (cos φ 0,8)	energisation	heating, distribution
AC2	slip-ring motors (cos φ 0,65)	starting switching off during running regenerative braking inching	wire drawing machines
AC3	squirrel-cage motors (cos φ 0,45 for Ie ≤ 100A) (cos φ 0,35 for Ie > 100A)	starting switching off during running	compressors, lifts, mixing pumps, escalators, fans, conveyers, air-conditioning
AC4	squirrel-cage motors (cos φ 0,45 for Ie ≤ 100A) (cos φ 0,35 for Ie > 100A)	starting switching off during running regenerative braking plugging inching	printing machines, wire drawing machines

E34303



AC3 ultilisation category. The contactor interrupts the rated current of the motor.

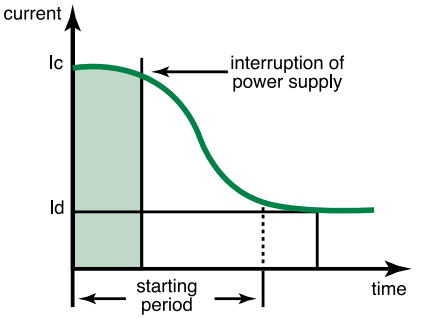
AC3 utilisation category

This category covers asynchronous squirrel-cage motors that are switched off during running. This is the most common situation (85% of all cases).

The control device establishes the starting current and interrupts the rated current at a voltage equal to approximately one-sixth of the rated value.

Current interruption is carried out with no difficulty.

E34304



AC4 ultilisation category. The contactor must be capable of interrupting the starting current id.

AC4 utilisation category

This category covers asynchronous squirrel-cage or slip-ring motors capable of operating under regenerative-braking or inching (jogging) conditions.

The control device establishes the starting current and is capable of interrupting the starting current at a voltage that may be equal to that of the mains.

Such difficult conditions require oversizing of the control and protective devices with respect to category AC3.

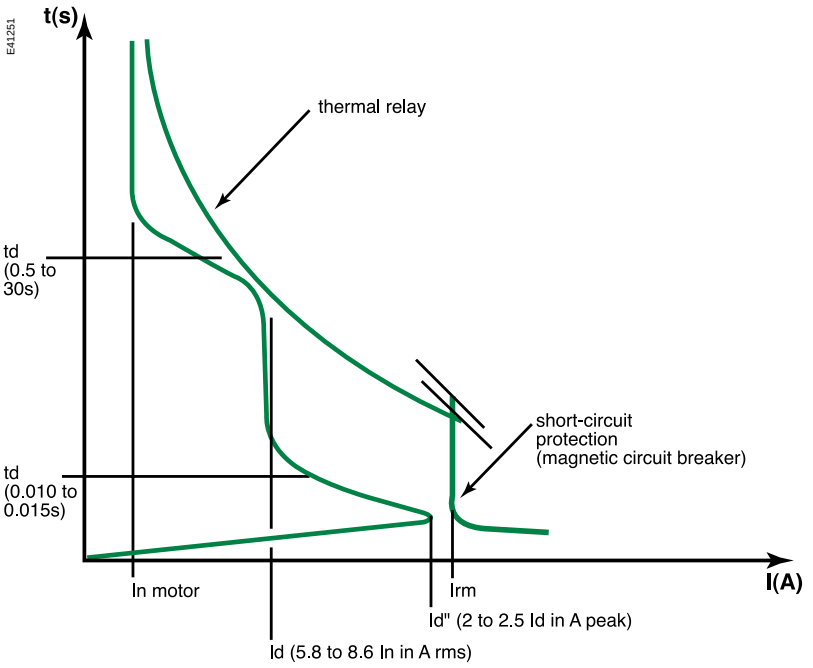
Subtransient phenomena related to direct on-line starting of asynchronous motors

Subtransient phenomena occurring when starting squirrel-cage motors:

A squirrel-cage motor draws a high inrush current during starting. This current is related to the combined influence of two parameters:

- the high inductance of the copper stator winding
- the magnetisation of the iron core of the stator.

In motor: current drawn by the motor at full rated load (in A rms)
Id: current drawn by the motor during starting (in A ms)
Id'': subtransient current generated by the motor when it is energised. This very short subtransient phenomenon is expressed as k x Id x r (in A peak).
td: motor starting time, from 0.5 to 30 seconds depending on the application.
td'': duration of the subtransient current, from 0.010 to 0.015 seconds when the motor is energised.
Irm: magnetic setting of the circuit breakers.



Typical upper and lower limits for these subtransient currents:

These values, not covered by standards, also depend on the type of motor technology used:

- ordinary motors Id''=2 Id to 2.1 Id (in A peak),
- high-efficiency motors Id''=2.2 Id to 2.5 Id (in A peak).
- variation of Id'' as a function of Id:

Type of motor	Id (in A rms)	Id'' (in A peak)
Ordinary motor	5,8 à 8,6 In motor	Id'' = 2 Id = 11,5 In (A peak) to Id'' = 2,1 Id = 18 In (A peak)
High-efficiency motor	5,8 à 8,6 In motor	Id'' = 2,2 Id = 12,5 In (A peak) to Id'' = 2,5 Id = 21,5 In (A peak)

Example: Upon energisation, a high-efficiency motor with an Id of 7.5 In produces a subtransient current with a value between (depending on its characteritics):

- *minimum = 16.5 In (in A peak),*
- *maximum = 18.8 In (in A peak).*

Protection of motor circuits
Using the circuit breaker/contactor coordination tables

Subtransient currents and protection settings:
■ as illustrated in the above table, subtransient currents can be very high.
If they approach their upper limits, they can trip short-cicuit protection devices (nuisance tripping)
■ Merlin Gerin and Telemecanique circuit breakers are rated to provide optimum short-circuit protection for motor starters (type 2 coordination with thermal relay and contactor)
■ combinations made up of Merlin Gerin circuit breakers and Telemecanique contactors and thermal relays are designed to allow starting of motors generating high subtransient currents (up to 19 In motor peak)
■ the tripping of short-circuit protective devices when starting with a combination listed in the coordination tables means:
□ the limits of certain devices may be reached.
□ the use of the starter under type 2 coordination conditions on the given motor may lead to premature wear of one of the components of the combination.

In event of such a problem, the ratings of the starter and the associated protective devices must be redesigned.

Using the coordination tables for Merlin Gerin circuit breaker and Telemecanique contactors:

■ **Ordinary motor:**
The starter components can be selected directly from the coordination tables, whatever the values of the starting current (Id from 5.8 to 8.6 In) and the subtransient current.

■ **High-efficiency motors with Id ⩽ 7.5 In:**
The starter components can be selected directly from the coordination tables, whatever the values of the starting current and the subtransient current.

■ **High-efficiency motors with Id > 7.5 In**
When Merlin Gerin circuit breakers are used for motor currents in the neighbourhood of their rated current, they are set to provide minimum short-circuit protection at **19 In motor (A peak).**

There are two possibilities:
■ The subtransient starting current is known (indicated by the motor manufacturer) and is less than **19 In motor (A peak).**

In this case, the starter components can be selected directly from the coordination tables, whatever the value of the starting current (for Id > 7.5 In).

Example: For a 110 kW 380/415 V 3-phase motor, the selected components are: NS250-MA220 / LC1-F225 / LR9-F5371.
■ The subtransient starting current is unknown or greater than 19 In motor (A peak).

In this case, the value used for the motor power in the coordination tables should be increased by 20% to satisfy optimum starting and coordination conditions.

Example: For a 110 kW 380/415 V 3-phase motor, the selected components are those for a motor power of 110+20%=132kW: NS400-MA320 / LC1-F265 / LR9-F5371.

Reversing starters and coordination:

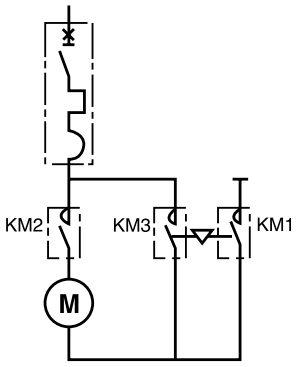
The starter components can be selected using the tables for direct-on-line starting.

Replace contactors LC1 by LC2.

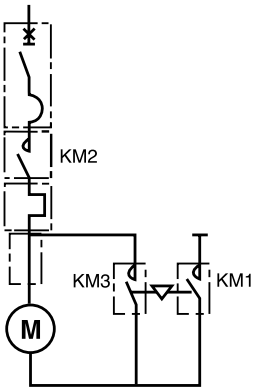
Start-delta starting and coordination:

■ The components should be sized according to the current flowing in the motor windings.
■ The mounting locations and connections of the various components of star-delta starters should be selected according to the type of coordination required and the protective devices implemented.

Protection of motor circuits
Using the circuit breaker/contactor coordination tables



Solution with thermal-magnetic motor circuit breaker



Solution with magnetic motor circuit breaker

Start-delta starting and type 2 coordination

Contactors KM1, KM2 and KM3 are sized for the line current.

The starter components are selected from the direct-on-line type 2 coordination tables.

Example: Consider the following case:
- 55 kW motor supplied at 415 V
- star-delta starting
- thermal protection built into the circuit breaker providing short-circuit protection
- short-circuit current of 45 kA at the starter
- type 2 coordination.

The starter components are selected using the tables
- circuit breaker: NS160H with STR22ME
- starter: LC1-F115A to be replaced by LC3-F115.

Starting class and thermal relays

The data in the tables corresponds to “normal” motor starting times. The associated thermal relays are either class 10 or 10 A (tripping time < 10 s).
■ for motors with long starting times, the class 10 or 10 A thermal relays must be replaced with class 20 thermal relays as indicated in the correspondence table opposite (for type 1 and type 2 coordination)
■ long starting times requiring a class 30 relay:
□ apply a derating coefficient (K = 0.8) to the circuit breaker and the contactor.

Example: E.g.NS100H MA 100 for 80 A maximum.LC1F115 for 92 A maximum;

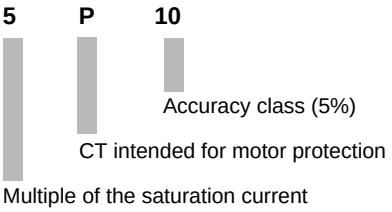
■ **these tables may also be used for standard thermal protection using current transformers.**

The required thermal relays are:
□ LR2-D1305 (0.63 to 1 A) for class 10
□ LR2-D1505 (0.63 to 1 A) for class 20 with terminal block LA7-D1064.

The current transformer ratings must be 5 VA per phase. The other characteristics are identical to those described below.
■ coordination tables with the multifunction protective relay LT6-P
□ three types of multifunction relays (see the corresponding catalogue for detailed characteristics) are available. They may be connected:
- directly to the motor power supply line;
- to the secondary winding of the current transformer.

Relay	Rating	Connecting	
		Direct	Using current transformers
LT6-P0M005 FM	0,2 to 1 A	■	■
	1 to 5 A	■	■
LT6-P0M025 FM	5 to 25 A	■	

□ the characteristics of the current transformers are the following (as defined by IEC 44-1 / 44-3):

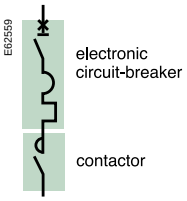


Protection of motor circuits
Circuit breaker/contactor coordination

Correspondence table for class 10/10 A and class 20 relays

Thermal relay		
Class 10/10 A	**Class 20**	**Setting range**
LR2-D1305		0.63 to 1
LR2-D1306		1 to 1.6
LR2-D1307		1.6 to 2.5
LR2-D1308	LR2-D1508	2.5 to 4
LR2-D1310	LR2-D1510	4 to 6
LR2-D1312	LR2-D1512	5.5 to 8
LR2-D1314	LR2-D1514	7 to 10
LR2-D1316	LR2-D1516	9 to 13
LR2-D1321	LR2-D1521	12 to 18
LR2-D1322	LR2-D1522	17 to 25
LR2-D2353	LR2-D2553	23 to 32
LR2-D2355		28 to 36
LR2-D3322	LR2-D3522	17 to 25
LR2-D3353	LR2-D3553	23 to 32
LR2-D3355	LR2-D3555	30 to 40
LR2-D3357	LR2-D3557	37 to 50
LR2-D3359	LR2-D3559	48 to 65
LR2-D3361	LR2-D3561	55 to 70
LR2-D3363	LR2-D3563	63 to 80
LR2-D3365		80 to 93
LR9-D5357	LR9-D5557	30 to 50
LR9-D5363	LR9-D5563	48 to 80
LR9-D5367	LR9-D5567	60 to 100
LR9-D5369	LR9-D5569	90 to 150
LR9-F5357	LR9-F5557	30 to 50
LR9-F5363	LR9-F5563	48 to 80
LR9-F5367	LR9-F5567	60 to 100
LR9-F5369	LR9-F5569	90 to 150
LR9-F5371	LR9-F5571	132 to 220
LR9-F7375	LR9-F7575	200 to 300
LR9-F7379	LR9-F7579	300 to 500
LR9-F7381	LR9-F7581	380 to 630
LR2-F7379	LR2-F7579	315 to 500
LR2-F7381	LR2-F7581	400 to 630
LR2-F8383	LR2-F7583	500 to 800
LR2-F8385	LR2-F7585	630 to 1000

Type 2 co-ordination (IEC 60947-4-1) 220/240 V



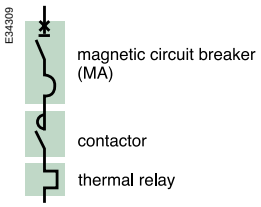
Merlin Gerin circuit breakers,Telemecanique contactors

Performance: U = 220/240 V			
Circuit breakers	**N**	**H**	**L**
NS100-STR22ME	85 kA	100 kA	130 kA
NS160-STR22ME	85 kA	100 kA	130 kA
NS250-STR22ME	85 kA	100 kA	130 kA
NS400-STR43ME	85 kA	100 kA	130 kA
NS630-STR43ME	85 kA	100 kA	130 kA

Starting:	**STR22ME**	**STR43ME**
Normal	class 10	class 10
Long	-	class 20

Motors				**Circuit-breakers**				**Contactors**
P (kW)	**I (A) 220 V**	**I (A) 240 V**	**Ie max (A)**	**Type**	**Trip unit**	**Irth (A)**	**Irm (A)**	**Type**
1.5	6.5	6	10	NS100	STR22ME	6/10	13 Irth	LC1-D80
2.2	9	8	10	NS100	STR22ME	6/10	13 Irth	LC1-D80
3	12	11	12.5	NS100	STR22ME	7.5/12.5	13 Irth	LC1-D80
4	15	14	20	NS100	STR22ME	7.5/20	13 Irth	LC1-D80
5.5	21	19	25	NS100	STR22ME	7.5/25	13 Irth	LC1-D80
6.3	24	22	25	NS100	STR22ME	7.5/25	13 Irth	LC1-D80
7.5	28	25	40	NS100	STR22ME	24/40	13 Irth	LC1-D80
10	36	33	40	NS100	STR22ME	24/40	13 Irth	LC1-D80
11	39	36	40	NS100	STR22ME	24/40	13 Irth	LC1-D80
15	52	48	80	NS100	STR22ME	48/80	13 Irth	LC1-D80
18.5	63	59	80	NS100	STR22ME	48/80	13 Irth	LC1-D80
22	75	70	100	NS100	STR22ME	60/100	13 Irth	LC1-D115 or LC1-F115
				NS400	STR43ME	60/120	13 Irth	LC1-F185
30	100	95	100	NS100	STR22ME	60/100	13 Irth	LC1-D115 or LC1-F115
				NS400	STR43ME	60/120	13 Irth	LC1-F185
37	125	115	150	NS160	STR22ME	90/150	13 Irth	LC1-D150 or LC1-F150
				NS400	STR43ME	100/200	13 Irth	LC1-F185
45	150	140	150	NS160	STR22ME	90/150	13 Irth	LC1-D150 or LC1-F150
				NS400	STR43ME	100/200	13 Irth	LC1-F185
55	180	170	185	NS250	STR22ME	131/220	13 Irth	LC1-F185
				NS400	STR43ME	100/200	13 Irth	LC1-F185
75	250	235	265	NS400	STR43ME	160/320	13 Irth	LC1-F265
90	300	280	320	NS400	STR43ME	160/320	13 Irth	LC1-F330
110	360	330	400	NS630	STR43ME	250/500	13 Irth	LC1-F400
132	430	400	500	NS630	STR43ME	250/500	13 Irth	LC1-F500
150	460	450	500	NS630	STR43ME	250/500	13 Irth	LC1-F500

Type 2 co-ordination (IEC 60947-4-1) 220/240 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 220/240 V

Circuit breaker	N	H	L
NS80-MA	-	100 kA	-

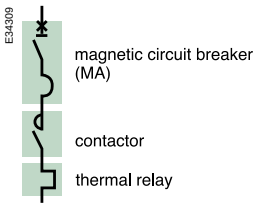
Starting (1): normal LRD2 class 10 A, LR9 class 10

Motors				Circuit breakers			Contactors (2)	Thermal relays	
P (kW)	I (A) 220 V	I (A) 240 V	Ie max (A)	Type	Cal. (A)	Irm (A)	Type	Type	Irth (1) (A)
0.09	0.7	0.6	1	NS80H-MA	1.5	13.5	LC1-D09	LR2-D13 05	0.63/1
0.12	0.9	0.8	1	NS80H-MA	1.5	13.5	LC1-D09	LR2-D13 05	0.63/1
0.18	1.2	1.1	1.6	NS80H-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
0.25	1.5	1.4	2.5	NS80H-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
0.37	2	1.8	2.5	NS80H-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
0.55	2.8	2.6	4	NS80H-MA	6.3	57	LC1-D18	LR2-D13 08	2.5/4
0.75	3.5	3.2	4	NS80H-MA	6.3	57	LC1-D18	LR2-D13 08	2.5/4
1.1	5	4.5	6	NS80H-MA	6.3	82	LC1-D25	LR2-D13 10	4/6
1.5	6.5	6	8	NS80H-MA	12.5	113	LC1-D32	LR2-D13 12	5.5/8
2.2	9	8	10	NS80H-MA	12.5	138	LC1-D32	LR2-D13 14	7/10
3	12	11	12.5	NS80H-MA	12.5	163	LC1-D32	LR2-D13 16	9/13
4	15	14	18	NS80H-MA	25	250	LC1-D32	LR2-D13 21	12/18
5.5	21	19	25	NS80H-MA	25	325	LC1-D40	LR2-D33 22	17/25
6.3	24	22	25	NS80H-MA	25	325	LC1-D40	LR2-D33 22	17/25
7.5	28	25	32	NS80H-MA	50	450	LC1-D40	LR2-D33 53	23/32
			50				LC1-D80	LR9-D53 57	30/50
10	36	33	40	NS80H-MA	50	550	LC1-D50	LR2-D33 55	30/40
			50				LC1-D80	LR9-D53 57	30/50
11	39	36	50	NS80H-MA	50	650	LC1-D50	LR2-D33 57	37/50
							LC1-D80	LR9-D53 57	30/50
15	52	48	63	NS80H-MA	80	880	LC1-D65	LR2-D33 59	48/65
			80				LC1-D80	LR9-D53 63	48/80
18.5	63	59	63	NS80H-MA	80	880	LC1-D65	LR2-D33 59	48/65
			80				LC1-D80	LR9-D53 63	48/80
22	75	70	80	NS80H-MA	80	1040	LC1-D80	LR2-D33 63	63/80
							LC1-D80	LR9-D53 63	48/80

(1) *For long starting (class 20), see the correspondence table for thermal relays, page 132.*

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 220/240 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 220/240 V

Circuit breakers	N	H	L
NS100-MA	85 kA	100 kA	130 kA
NS160/250-MA	85 kA	100 kA	130 kA
NS400/630-MA	-	100 kA	130 kA

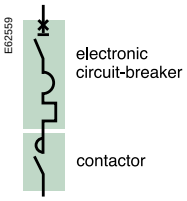
Starting (1): normal LR2 class 10 A, LR9 class 10

Motors				Circuit breakers			Contactors (2)	Thermal relays	
P (kW)	I (A) 220 V	I (A) 240 V	Ie max (A)	Type	Cal. (A)	Irm (A)	Type	Type	Irth (1) (A)
0.18	1.2	1.1	1.6	NS100-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
0.25	1.5	1.4	2.5	NS100-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
0.37	2	1.8	2.5	NS100-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
0.55	2.8	2.6	4	NS100-MA	6.3	57	LC1-D40	LR2-D13 08	2.5/4
0.75	3.5	3.2	4	NS100-MA	6.3	57	LC1-D40	LR2-D13 08	2.5/4
1.1	5	4.5	6	NS100-MA	6.3	82	LC1-D40	LR2-D13 10	4/6
1.5	6.5	6	8	NS100-MA	12.5	113	LC1-D40	LR2-D13 12	5.5/8
2.2	9	8	10	NS100-MA	12.5	138	LC1-D40	LR2-D13 14	7/10
3	12	11	12.5	NS100-MA	12.5	163	LC1-D40	LR2-D13 16	9/13
4	15	14	18	NS100MA	25	250	LC1-D40	LR2-D13 21	12/18
5.5	21	19	25	NS100-MA	25	325	LC1-D40	LR2-D33 22	17/25
6.3	24	22	25	NS100-MA	25	325	LC1-D40	LR2-D33 22	17/25
7.5	28	25	32	NS100-MA	50	450	LC1-D80	LR2-D33 53	23/32
			50			650		LR9-D53 57	30/50
10	36	33	40	NS100-MA	50	550	LC1-D80	LR2-D33 55	30/40
			50			650		LR9-D53 57	30/50
11	39	36	40	NS100-MA	50	550	LC1-D80	LR2-D33 55	30/40
			50			650		LR9-D53 57	30/50
15	52	48	63	NS100-MA	100	700	LC1-D80	LR2-D33 59	48/65
			80			1100		LR9-D53 63	48/80
18.5	63	59	63	NS100-MA	100	900	LC1-D80	LR2-D33 59	48/65
			80			1100		LR9-D53 63	48/80
22	75	70	80	NS100-MA	100	1100	LC1-D80	LR2-D33 63	63/80
								LR9-D53 63	48/80
30	100	95	100	NS100-MA	100	1300	LC1-D115	LR9-D53 67	60/100
							LC1-F115	LR9-F53 67	
37	125	115	150	NS160-MA	150	1950	LC1-D150	LR9-D53 69	90/150
							LC1-F150	LR9-F53 69	
45	150	140	150	NS160-MA	150	1950	LC1-D150	LR9-D53 69	90/150
							LC1-F150	LR9-F53 69	
55	180	170	185	NS250-MA	220	2420	LC1-F185	LR9-F53 71	132/220
			220	NS400-MA	320	2880	LC1-F265		
75	250	235	265	NS400-MA	320	3500	LC1-F265	LR9-F73 75	200/330
90	300	270	320	NS400-MA	320	4160	LC1-F330	LR9-F73 75	200/330
110	360	330	400	NS630-MA	500	5700	LC1-F400	LR9-F73 79	300/500
132	430	400	500	NS630-MA	500	6500	LC1-F500	LR9-F73 79	300/500
150	460	450	500	NS630-MA	500	6500	LC1-F500	LR9-F73 79	300/500

(1) *For long starting (class 20), see the correspondence table for thermal relays, page 132.*

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 380/415 V



Merlin Gerin circuit breakers,Telemecanique contactors

Performance: U = 380/415 V

Circuit breakers	N	H	L
NS100-STR22ME	25 kA	70 kA	130 kA
NS160-STR22ME	35 kA	70 kA	130 kA
NS250-STR22ME	35 kA	70 kA	130 kA
NS400-STR43ME	45 kA	70 kA	130 kA
NS630-STR43ME	45 kA	70 kA	130 kA

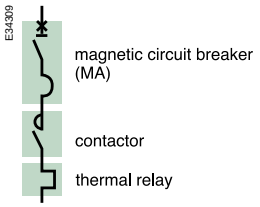
Starting: standard IEC 60947-4-1 , type 2

	STR22ME	STR43ME	Micrologic 5.0
Normal	class 10	class 10	class 10
Long	-	class 20	class 20

Motors				Circuit breakers				Contactors (2)
P(kW)	I(A) 380V	I(A) 415V	Ie max	Type	Trip unit/t.u.	Irth(A)	Irm(A)	Type
7.5	16	14	20	NS100	STR22ME	12/20	13Irth	LC1-D80
10	21	19	25	NS100	STR22ME	15/25	13Irth	LC1-D80
11	23	21	25	NS100	STR22ME	15/25	13Irth	LC1-D80
15	30	28	40	NS100	STR22ME	24/40	13Irth	LC1-D80
18.5	37	35	40	NS100	STR22ME	24/40	13Irth	LC1-D80
22	44	40	50	NS100	STR22ME	30/50	13Irth	LC1-D80
30	60	55	80	NS100	STR22ME	48/80	13Irth	LC1-D80
37	72	66	80	NS100	STR22ME	48/80	13Irth	LC1-D80
45	85	80	100	NS100	STR22ME	60/100	13Irth	LC1-D115 or LC1-F115
				NS400	STR43ME	60/120	13Irth	LC1-F185
55	105	100	115	NS160	STR22ME	90/150	13Irth	LC1-D115 or LC1-F115
				NS400	STR43ME	60/120	13Irth	LC1-F185
75	138	135	150	NS160	STR22ME	90/150	13Irth	LC1-D150 or LC1-F150
				NS400	STR43ME	100/200	13Irth	LC1-F185
90	170	165	185	NS250	STR22ME	131/220	13Irth	LC1-F185
				NS400	STR43ME	100/200	13Irth	LC1-F185
110	205	200	220	NS250	STR22ME	131/220	13Irth	LC1-F225
				NS400	STR43ME	160/200	13Irth	LC1-F225
132	250	240	265	NS400	STR43ME	160/320	13Irth	LC1-F265
160	300	280	320	NS400	STR43ME	160/320	13Irth	LC1-F330
200	370	340	400	NS630	STR43ME	250/500	13Irth	LC1-F400
220	408	385	500	NS630	STR43ME	250/500	13Irth	LC1-F500
250	460	425	500	NS630	STR43ME	250/500	13Irth	LC1-F500

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 380/415 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 380/415 V

Circuit breaker	N	H	L
NS80-MA	_	70 kA	-

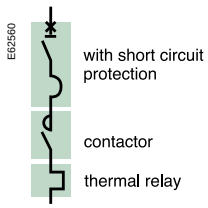
Starting (1): normal LR2 class 10 A, LR9 class 10

Motors				Circuit breakers			Contactors (2)	Thermal relays	
P (kW)	I (A) 380 V	I (A) 415 V	Ie max (A)	Type	Cal. (A)	Irm (A)	Type	Type	Irth (1) (A)
0.18	0.7	0.6	1	NS80H-MA	1.5	13.5	LC1-D09	LR2-D13 05	0.63/1
0.25	0.9	0.8	1	NS80H-MA	1.5	13.5	LC1-D09	LR2-D13 05	0.63/1
0.37	1.2	1.1	1.6	NS80H-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
0.55	1.6	1.5	2.5	NS80H-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
0.75	2	1.8	2.5	NS80H-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
1.1	2.8	2.6	4	NS80H-MA	6.3	57	LC1-D18	LR2-D13 08	2.5/4
1.5	3.7	3.4	4	NS80H-MA	6.3	57	LC1-D18	LR2-D13 08	2.5/4
2.2	5.3	4.8	6	NS80H-MA	6.3	82	LC1-D25	LR2-D13 10	4/6
3	7	6.5	8	NS80H-MA	12.5	113	LC1-D32	LR2-D13 12	5.5/8
4	9	8.2	10	NS80H-MA	12.5	138	LC1-D32	LR2-D13 14	7/10
5.5	12	11	12.5	NS80H-MA	12.5	163	LC1-D32	LR2-D13 16	9/13
7.5	16	14	18	NS80H-MA	25	250	LC1-D32	LR2-D13 21	12/18
10	21	19	25	NS80H-MA	25	325	LC1-D40	LR2-D33 22	17/25
11	23	21	25	NS80H-MA	25	325	LC1-D40	LR2-D33 22	17/25
15	30	28	32	NS80H-MA	50	450	LC1-D40	LR2-D33 53	23/32
							LC1-D80	LR9-D53 57	30/50
18.5	37	34	40	NS80H-MA	50	550	LC1-D50	LR2-D33 55	30/40
							LC1-D80	LR9-D53 57	30/50
22	43	40	50	NS80H-MA	50	650	LC1-D50	LR2-D33 57	37/50
							LC1-D80	LR9-D53 57	30/50
30	59	55	63	NS80H-MA	80	880	LC1-D65	LR2-D33 59	48/65
							LC1-D80	LR9-D53 63	48/80
37	72	66	80	NS80H-MA	80	1040	LC1-D80	LR2-D33 63	63/80
							LC1-D80	LR9-D53 63	48/80

***(1)** For long starting (class 20), see the correspondence table for thermal relays.*

***(2)** Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 380/415 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 380/415 V

Circuit breakers	N	H	L
NS100-MA	25 kA	70 kA	130 kA
NS160/250-MA	35 kA	70 kA	130 kA
NS400/630-MA	-	70 kA	130 kA

Starting (1): normal LRD2 class 10 A, autres class 10

Motors				Circuit breakers			Contactors (2)	Thermal relays	
P(kW)	I(A) 380V	I(A) 415V	Ie max	Type	Cal. (A)	Irm(A)	Type	Type	Irth (1)
0.37	1.2	1.1	1.6	NS100-MA	2.5	22.5	LC1-D09	LR2D13 06	1/1.6
0.55	1.6	1.5	2.5	NS100-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
0.75	2	1.8	2.5	NS100-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
1.1	2.8	2.6	4	NS100-MA	6.3	57	LC1-D40	LR2-D13 08	2.5/4
1.5	3.7	3.4	4	NS100-MA	6.3	57	LC1-D40	LR2-D13 08	2.5/4
2.2	5.3	4.8	6	NS100-MA	6.3	82	LC1-D40	LR2-D13 10	4/6
3	7	6.5	8	NS100-MA	12.5	113	LC1-D40	LR2-D13 12	5.5/8
4	9	8.2	10	NS100-MA	12.5	138	LC1-D40	LR2-D13 14	7 /10
5.5	12	11	12.5	NS100-MA	12.5	163	LC1-D40	LR2-D13 16	9/13
7.5	16	14	18	NS100-MA	25	250	LC1-D40	LR2-D13 21	12/18
10	21	19	25	NS100-MA	25	325	LC1-D40	LR2-D33 22	17/25
11	23	21	25	NS100-MA	25	325	LC1-D40	LR2-D33 22	17/25
15	30	28	32	NS100-MA	50	450	LC1-D80	LR2-D33 53	23/32
			50			650		LR9-F53 57	30/50
18.5	37	34	40	NS100-MA	50	550	LC1-D80	LR2-D33 55	30/40
			50			650		LR9-F53 57	30/50
22	43	40	50	NS100-MA	50	650	LC1-D80	LR2-D33 57	37/50
						650		LR9-F53 57	30/50
30	59	55	63	NS100-MA	100	900	LC1-D80	LR2-D33 59	48/65
			80			1100		LR9-F53 63	48/80
37	72	66	80	NS100-MA	100	1100	LC1-D80	LR2-D33 63	63/80
								LR9-F53 63	48/80
45	85	80	100	NS100-MA	100	1300	LC1-D115	LR9-D53 67	60/100
							LC1-F115	LR9-F53 67	
55	105	100	115	NS160-MA	150	1500	LC1-D115	LR9-D53 69	90/150
							LC1-F115	LR9-F53 69	
75	140	135	150	NS160-MA	150	1950	LC1-D150	LR9-D53 69	90/150
							LC1-F150	LR9-F53 69	
90	170	160	185	NS250-MA	220	2420	LC1-F185	LR9-F53 71	132/220
110	210	200	220	NS250-MA	220	2860	LC1-F225	LR9-F53 71	132/220
				NS400-MA	320	2880	LC1-F265		
132	250	230	265	NS400-MA	320	3500	LC1-F265	LR9-F73 75	200/330
160	300	270	320	NS400-MA	320	4160	LC1-F330	LR9-F73 75	200/330
200	380	361	400	NS630-MA	500	5700	LC1-F400	LR9-F73 79	300/500
220	420	380	500	NS630-MA	500	6500	LC1-F500	LR9-F73 79	300/500
250	460	430	500	NS630-MA	500	6500	LC1-F500	LR9-F73 79	300/500

(1) *For long starting (class 20), see the correspondence table for thermal relays.*

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 380/415 V

magnetic circuit breaker (MA)

contactor

thermal relay on TC

Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 380/415 V

Circuit breaker	N	H	L
NS80-MA	_	70 kA	-

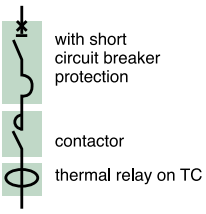
Starting (1): adjustable class 10A to 30

Motors				Circuit breakers			Contactors (2)	Thermal relays	
P (kW)	I (A) 380 V	I (A) 415 V	Ie max (A)	Type	rating(A)	Irm (A)	Type	Type	Irth (1) (A)
0.18	0.7	0.6	1	NS80H-MA	1.5	13.5	LC1-D40	LT6-POM	0.2/1
0.25	0.9	0.8	1	NS80H-MA	1.5	13.5	LC1-D40	LT6-POM	0.2/1
0.37	1.2	1.1	1.6	NS80H-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
0.55	1.6	1.5	2.5	NS80H-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
0.75	2	1.8	2.5	NS80H-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
1.1	2.8	2.6	4	NS80H-MA	6.3	70	LC1-D40	LT6-POM	1/5
1.5	3.7	3.4	4	NS80H-MA	6.3	70	LC1-D40	LT6-POM	1/5
2.2	5.3	4.8	6	NS80H-MA	6.3	82	LC1-D40	LT6-POM	5/25
3	7	6.5	8	NS80H-MA	12.5	163	LC1-D40	LT6-POM	5/25
4	9	8.2	10	NS80H-MA	12.5	163	LC1-D40	LT6-POM	5/25
5.5	12	11	12.5	NS80H-MA	12.5	163	LC1-D40	LT6-POM	5/25
7.5	16	14	18	NS80H-MA	25	325	LC1-D40	LT6-POM	5/25
10	21	19	25	NS80H-MA	25	325	LC1-D40	LT6-POM	5/25
11	23	21	25	NS80H-MA	25	325	LC1-D40	LT6-POM	5/25
15	30	28	50	NS80H-MA	50	650	LC1-D80	LT6-POM	on TC
18.5	37	34	50	NS80H-MA	50	650	LC1-D80	LT6-POM	on TC
22	43	40	50	NS80H-MA	50	650	LC1-D80	LT6-POM	on TC
30	59	55	80	NS80H-MA	80	1040	LC1-D80	LT6-POM	on TC
37	72	66	80	NS80H-MA	80	1040	LC1-D80	LT6-POM	on TC

(1) *Observe the recommendations for installations with class 30 relay and mounting of the thermal relay on the current transformer.*

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 380/415 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 380/415 V

Circuit breakers	N	H	L
NS100-MA	25 kA	70 kA	130 kA
NS160/250-MA	35 kA	70 kA	130 kA
NS400/630-MA		70 kA	130 kA

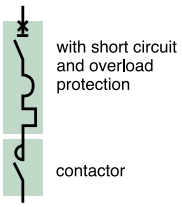
Starting (1): adjustable class 10A to 30

Motors				Circuit breakers			Contactors (2)	Thermal relays	
P (kW)	I (A) 380 V	I (A) 415 V	Ie max (A)	Type	rating(A)	Irm (A)	Type	Type	Irth (1) (A)
0.37	1.2	1.1	2.5	NS100-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
0.55	1.6	2.5	2.5	NS100-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
0.75	2	1.8	2.5	NS100-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
1.1	2.8	2.6	5	NS100-MA	6.3	70	LC1-D40	LT6-POM	1/5
1.5	3.7	3.4	5	NS100-MA	6.3	70	LC1-D40	LT6-POM	1/5
2.2	5.3	4.8	6.3	NS100-MA	6.3	82	LC1-D40	LT6-POM	5/25
3	7	6.5	12.5	NS100-MA	12.5	163	LC1-D80	LT6-POM	5/25
4	9	8.2	12.5	NS100-MA	12.5	163	LC1-D80	LT6-POM	5/25
5.5	12	11	12.5	NS100-MA	12.5	163	LC1-D80	LT6-POM	5/25
7.5	16	14	25	NS100-MA	25	325	LC1-D80	LT6-POM	5/25
10	21	19	25	NS100-MA	25	325	LC1-D80	LT6-POM	5/25
11	23	21	25	NS100-MA	25	325	LC1-D80	LT6-POM	5/25
15	30	28	50	NS100-MA	50	650	LC1-D80	LT6-POM	on TI
18.5	37	34	50	NS100-MA	50	650	LC1-D80	LT6-POM	on TI
22	43	40	50	NS100-MA	50	650	LC1-D80	LT6-POM	on TI
30	59	55	80	NS100-MA	100	1100	LC1-D80	LT6-POM	on TI
37	72	66	80	NS100-MA	100	1100	LC1-D80	LT6-POM	on TI
45	85	80	100	NS100-MA	100	1300	LC1-D115 LC1-F115	LT6-POM	on TI
55	105	100	115	NS160-MA	100	1500	LC1-D115 LC1-F115	LT6-POM	on TI
75	140	135	150	NS160-MA	150	1950	LC1-D115 LC1-F115	LT6-POM	on TI
90	170	160	185	NS250-MA	220	2420	LC1-D185	LT6-POM	on TI
110	210	200	220 265	NS250-MA NS400-MA	220 320	2860 3500	LC1-F225 LC1-F265	LT6-POM	on TI
132	250	230	265	NS400-MA	320	3500	LC1-F265	LT6-POM	on TI
160	300	270	320	NS400-MA	320	4000	LC1-F330	LT6-POM	on TI
200	380	361	400	NS630-MA	500	5700	LC1-F400	LT6-POM	on TI
220	420	380	500	NS630-MA	320	3500	LC1-F500	LT6-POM	on TI
250	460	430	500	NS630-MA	500	6300	LC1-F500	LT6-POM	on TI

(1) *Observe the recommendations for installations with class 30 relay and mounting of the thermal relay on the current transformer.*

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 440V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 440 V

Circuit breakers	N	H	L
NS100-STR22ME	25 kA	65 kA	130 kA
NS160-STR22ME	35 kA	65 kA	130 kA
NS250-STR22ME	35 kA	65 kA	130 kA
NS400-STR22ME	42 kA	65 kA	130 kA
NS630-STR22ME	42 kA	65 kA	130 kA

Starting (1): standard IEC 60947-4-1, type 2

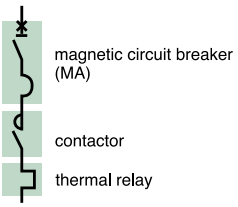
	STR22ME	STR43ME	Micrologic 5.0
Normal	class10	class10	class10
Long		class20	class20

Motors			Circuit breakers				Contactors (2)
P (kW)	I (A) 440 V	Ie max (A)	Type	Trip unit t.u.	Irth (A)	Irm(A)	Type
3	5.8	10	NS100	STR22ME	6/19	13Irth	LC1-D80
4	8	10	NS100	STR22ME	6/19	13Irth	LC1-D80
5.5	10.5	12.5	NS100	STR22ME	7.5/12.5	13Irth	LC1-D80
7.5	13.7	20	NS100	STR22ME	12/20	13Irth	LC1-D80
10	19	25	NS100	STR22ME	15/25	13Irth	LC1-D80
11	20	25	NS100	STR22ME	15/25	13Irth	LC1-D80
15	26.5	40	NS100	STR22ME	24/40	13Irth	LC1-D80
18.5	33	40	NS100	STR22ME	24/40	13Irth	LC1-D80
22	39	40	NS100	STR22ME	24/40	13Irth	LC1-D80
30	51	80	NS100	STR22ME	48/80	13Irth	LC1-D80
37	64	80	NS100	STR22ME	48/80	13Irth	LC1-D80
45	76	80	NS100	STR22ME	48/80	13Irth	LC1-D80
55	90	100	NS100	STR22ME	60/100	13Irth	LC1-D115 or LC1-F115
			NS400	STR43ME	60/120	13Irth	LC1-F185
75	125	150	NS100	STR22ME	90/150	13Irth	LC1-D150 or LC1-F150
			NS400	STR43ME	100/200	13Irth	LC1-F185
90	146	150	NS160	STR22ME	90/150	13Irth	LC1-D150 or LC1-F150
			NS400	STR43ME	100/200	13Irth	LC1-F185
110	178	185	NS250	STR22ME	131/220	13Irth	LC1-F185
			NS400	STR43ME	100/200	13Irth	LC1-F185
132	215	220	NS250	STR22ME	131/220	13Irth	LC1-F225
			NS400	STR43ME	160/3230	13Irth	LC1-F225
160	256	265	NS400	STR43ME	160/320	13Irth	LC1-F265
200	320	320	NS400	STR43ME	160/320	13Irth	LC1-F330
220	353	400	NS630	STR43ME	250/500	13Irth	LC1-F400
250	400	400	NS630	STR43ME	250/500	13Irth	LC1-F400
300	460	500	NS630	STR43ME	250/500	13Irth	LC1-F500

(1) *Valid for 480 V NEMA*

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 440 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 440 V

Circuit breaker	N	H	L
NS80-MA	_	65 kA	-

Starting (1): normal LR2 class 10A, LR9 class 10

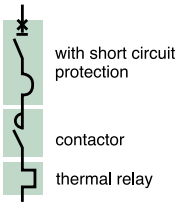
Motors			Circuit breakers			Contactors (3)	Thermal relays	
P (kW)	I (A) 440 V	Ie max (A)	Type	Rating (A)	Irm (A)	Type	Type	Irth (1) (A)
0.25	0.7	1	NS80H-MA	1.5	13.5	LC1-D09	LR2-D13 05	0.63/1
0.37	1	1.6	NS80H-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
0.55	1.4	1.6	NS80H-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
0.75	1.7	2.5	NS80H-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
1.1	2.4	2.5	NS80H-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
1.5	3.1	4	NS80H-MA	6.3	57	LC1-D18	LR2-D13 08	2.5/4
2.2	4.5	6	NS80H-MA	6.3	82	LC1-D25	LR2-D13 10	4/6
3	5.8	6	NS80H-MA	6.3	82	LC1-D25	LR2-D13 10	4/6
4	8	8	NS80H-MA	12.5	113	LC1-D32	LR2-D13 12	5.5/8
5.5	10.5	12.5	NS80H-MA	12.5	163	LC1-D32	LR2-D13 16	9/13
7.5	13.7	18	NS80H-MA	25	250	LC1-D32	LR2-D13 21	12/18
10	19	25	NS80H-MA	25	325	LC1-D40	LR2-D33 22	17/25
11	20	25	NS80H-MA	25	325	LC1-D40	LR2-D33 22	17/25
15	26.5	32	NS80H-MA	50	450	LC1-D40	LR2-D33 53	23/32
18.5	33	40	NS80H-MA	50	550	LC1-D50	LR2-D33 55	30/40
		50			650	LC1-D80	LR9-D53 57	30/50
22	39	40	NS80H-MA	50	550	LC1-D50	LR2-D33 55	30/40
		50			650	LC1-D80	LR9-D53 57	30/50
30	52	63	NS80H-MA	80	880	LC1-D65	LR2-D33 59	48/65
		80			1040	LC1-D80	LR9-D53 63	48/80
37	63	63	NS80H-MA	80	880	LC1-D65	LR2-D33 59	48/65
		80			1040	LC1-D80	LR9-D53 63	48/80
45	76	80	NS80H-MA	80	1040	LC1-D80	LR2-D3363	48/65
							LR9-D53 63	48/80

(1) *For long starting (class 20) see the correspondence table for thermal relays.*

(2) *Valid for 480 V NEMA.*

(3) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 440 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 440 V			
Circuit breaker	**N**	**H**	**L**
NS100-MA	25 kA	65 kA	130 kA
NS160/250-MA	35 kA	65 kA	130 kA
NS400/630-MA		65 kA	130 kA

Starting (1): normal LR2 class 10A, LR9 class 10

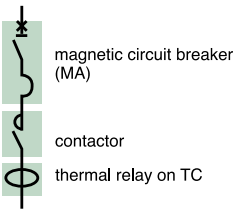
Motors			Circuit breakers			Contactors (3)	Thermal relays	
P (kW)	**I (A) 440 V**	**Ie max (A)**	**Type**	**Rating (A)**	**Irm (A)**	**Type**	**Type**	**Irth (1)**
0.37	1	1.6	NS100-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
0.55	1.4	1.6	NS100-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
0.75	1.7	2.5	NS100-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
1.1	2.4	2.5	NS100-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
1.5	3.1	4	NS100-MA	6.3	57	LC1-D18	LR2-D13 08	2.5/4
2.2	4.5	6	NS100-MA	6.3	82	LC1-D25	LR2-D13 10	4/6
3	5.8	6	NS100-MA	6.3	82	LC1-D25	LR2-D13 10	4/6
4	8	8	NS100-MA	12.5	113	LC1-D32	LR2-D13 12	5.5/8
5.5	10.5	12.5	NS100-MA	12.5	163	LC1-D32	LR2-D13 16	9/13
7.5	13.7	18	NS100-MA	25	250	LC1-D32	LR2-D13 21	12/18
10	19	25	NS100-MA	25	325	LC1-D40	LR2-D33 22	17/25
11	20	25	NS100-MA	25	325	LC1-D40	LR2-D33 22	17/25
15	26.5	32	NS100-MA	50	450	LC1-D40	LR2-D33 53	23/32
18.5	33	40	NS100-MA	50	550	LC1-D50	LR2-D33 55	30/40
		50			650	LC1-D80	LR9-D53 57	30/50
22	39	40	NS100-MA	50	550	LC1-D50	LR2-D33 55	30/40
		50			650	LC1-D80	LR9-D53 57	30/50
30	52	63	NS100-MA	100	900	LC1-D65	LR2-D33 59	48/65
		80			1100	LC1-D80	LR9-D53 63	48/80
37	63	63	NS100-MA	100	900	LC1-D65	LR2-D33 59	48/65
		80			1100	LC1-D80	LR9-D53 63	48/80
45	76	80	NS100-MA	100	1100	LC1-D80	LR2-D3363	48/65
							LR9-D53 63	48/80
55	90	100	NS100-MA	100	1300	LC1-D115	LR9-D53 67	60/100
						LC1-F115	LR9-F53 63	
75	125	150	NS160-MA	150	1950	LC1-D150	LR9-D53 69	90/150
						LC1-F150	LR9-F53 69	
90	140	150	NS160-MA	150	1950	LC1-D150	LR9-D53 69	90/150
						LC1-F150	LR9-F53 69	
110	178	185	NS250-MA	220	2420	LC1-D185	LR9-F53 71	132/220
132	210	220	NS250-MA	220	2680	LC1-D225	LR9-F53 71	132/220
		265	NS400-MA	320	3500	LC1-F265		
160	256	265	NS400-MA	320	3500	LC1-F265	LR9-F73 75	200/330
200	310	320	NS400-MA	320	4160	LC1-F330	LR9-F73 75	200/330
220	353	400	NS630-MA	500	5500	LC1-F400	LR9-F73 79	300/500
250	400	500	NS630-MA	500	6500	LC1-F500	LR9-F73 79	300/500
300	460	500	NS630-MA	500	6500	LC1-F500	LR9-F73 79	300/500
							LR2-F73 79	315/500

(1) *For long starting (class 20) see the correspondence table for thermal relays.*

(2) *Valid for 480 V NEMA.*

(3) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 440 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 440 V			
Circuit breaker	**N**	**H**	**L**
NS80-MA	-	65 kA	-

Starting (1): adjustable class 10A to 30

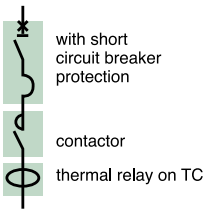
Motors			Circuit breakers			Contactors (3)	Thermal relays	
P (kW)	**I (A) 440 V**	**Ie max (A)**	**Type**	**Rating (A)**	**Irm (A)**	**Type**	**Type**	**Irth (1) (A)**
0.25	0.7	1	NS80H-MA	1.5	13.5	LC1-D40	LT6-POM	0.2/1
0.37	1	2.5	NS80H-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
0.55	1.4	2.5	NS80H-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
0.75	1.7	2.5	NS80H-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
1.1	2.4	2.5	NS80H-MA	2.5	32.5	LC1-D40	LT6-POM	1/5
1.5	3.1	4	NS80H-MA	6.3	82	LC1-D40	LT6-POM	1/5
2.2	4.5	5	NS80H-MA	6.3	82	LC1-D40	LT6-POM	1/5
3	5.8	6.3	NS80H-MA	6.3	82	LC1-D40	LT6-POM	5/25
4	8	12.5	NS80H-MA	12.5	163	LC1-D40	LT6-POM	5/25
5.5	10.5	12.5	NS80H-MA	12.5	163	LC1-D40	LT6-POM	5/25
7.5	13.7	12.5	NS80H-MA	25	325	LC1-D40	LT6-POM	5/25
10	19	25	NS80H-MA	25	325	LC1-D40	LT6-POM	5/25
11	20	25	NS80H-MA	25	325	LC1-D40	LT6-POM	5/25
15	26.5	50	NS80H-MA	50	550	LC1-D80	LT6-POM	on TC
18.5	33	50	NS80H-MA	50	550	LC1-D80	LT6-POM	on TC
22	39	50	NS80H-MA	50	550	LC1-D80	LT6-POM	on TC
30	52	80	NS80H-MA	80	1040	LC1-D80	LT6-POM	on TC
37	63	80	NS80H-MA	80	1040	LC1-D80	LT6-POM	on TC
45	76	80	NS80H-MA	80	1040	LC1-D80	LT6-POM	on TC

(1) *Observe the recommendations for installations with a class 30 relay and mounting of the thermal relay on the current transformer.*

(2) *Valid for 480 V NEMA.*

(3) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 440 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 440 V

Circuit breaker	N	H	L
NS100-MA	25 kA	65 kA	130 kA
NS160/250-MA	35 kA	65 kA	130 kA
NS400/630-MA		65 kA	130 kA

Starting (1): adjustable class 10 A to 30

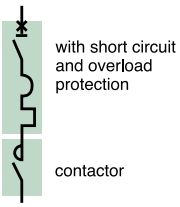
Motors			Circuit breakers			Contactors (3)	Thermal relays	
P (kW)	I (A) 440 V	Ie max (A)	Type	Rating (A)	Irm (A)	Type	Type	Irth (1)
0.37	1	2.5	NS100-MA	2.5	32.5	LC1-D40	LR6-POM	1/5
0.55	1.4	2.5	NS100-MA	2.5	32.5	LC1-D40	LR6-POM	1/5
0.75	1.7	2.5	NS100-MA	2.5	32.5	LC1-D40	LR6-POM	1/5
1.1	2.4	2.5	NS100-MA	2.5	32.5	LC1-D40	LR6-POM	1/5
1.5	3.1	5	NS100-MA	6.3	82	LC1-D40	LR6-POM	1/5
2.2	4.5	5	NS100-MA	6.3	82	LC1-D40	LR6-POM	1/5
3	5.8	6.3	NS100-MA	6.3	82	LC1-D40	LR6-POM	5/25
4	8	12.5	NS100-MA	12.5	163	LC1-D80	LR6-POM	5/25
5.5	10.5	12.5	NS100-MA	12.5	163	LC1-D80	LR6-POM	5/25
7.5	13.7	25	NS100-MA	25	325	LC1-D80	LR6-POM	5/25
10	19	25	NS100-MA	25	325	LC1-D80	LR6-POM	5/25
11	20	25	NS100-MA	25	325	LC1-D80	LR6-POM	5/25
15	26.5	50	NS100-MA	50	450	LC1-D80	LR6-POM	on TI
18.5	33	50	NS100-MA	50	550	LC1-D80	LR6-POM	on TI
22	39	50	NS100-MA	50	550	LC1-D80	LR6-POM	on TI
30	52	80	NS100-MA	100	1100	LC1-D80	LR6-POM	on TI
37	63	60	NS100-MA	100	1100	LC1-D80	LR6-POM	on TI
45	76	80	NS100-MA	100	1100	LC1-D80	LR6-POM	on TI
55	90	100	NS100-MA	100	1300	LC1-D115 LC1-F115	LR6-POM	on TI
75	125	150	NS160-MA	150	1950	LC1-D150 LC1-F150	LR6-POM	on TI
90	140	150	NS160-MA	150	1950	LC1-D150 LC1-F150	LR6-POM	on TI
110	178	185	NS250-MA	220	2420	LC1-D185	LR6-POM	on TI
132	210	220 265	NS250-MA NS400-MA	220 320	2680 3500	LC1-D225 LC1-F265	LR6-POM	on TI
160	256	265	NS400-MA	320	3500	LC1-F265	LR6-POM	on TI
200	310	320	NS400-MA	320	4000	LC1-F330	LR6-POM	on TI
220	353	400	NS630-MA	500	5500	LC1-F400	LR6-POM	on TI
250	400	500	NS630-MA	500	6500	LC1-F500	LR6-POM	on TI
300	460	500	NS630-MA	500	6500	LC1-F500	LR6-POM	on TI

(1) *Observe the recommendations for installations with a class 30 relay and mounting of the thermal relay on the current transformer.*

(2) *Valid for 480 V NEMA.*

(3) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 500/525 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 440 V

Circuit breakers	N	L
NS100-STR22ME	50/35 kA	70/50 kA
NS160-STR22ME	50/35 kA	70/50 kA
NS250-STR22ME	50/35 kA	70/50 kA
NS400-STR43ME	50/35 kA	70/50 kA
NS630-STR43ME	50/35 kA	70/50 kA

Starting (1): standard IEC 60947-4-1, type 2

	STR22ME	STR43ME	Micrologic 5.0
Normal	class10	class10	class10
Long		class20	class20

Motors				Circuit breakers				Contactors (2)
P (kW)	I (A) 500 V	I (A) 525 V	Ie max	Type	Trip unit t.u.	Irth (A)	Irm(A)	Type
4	6.5	6.5	10	NS100	STR22ME	6/10	13Irth	LC1-D80
5.5	9	9	12.5	NS100	STR22ME	7.5/12.50	13Irth	LC1-D80
7.5	12	12	12.5	NS100	STR22ME	7.5/12.50	13Irth	LC1-D80
10	15	15	20	NS100	STR22ME	12/20	13Irth	LC1-D80
11	18.4	18.4	20	NS100	STR22ME	6/10	13Irth	LC1-D80
15	23	23	25	NS100	STR22ME	24/40	13Irth	LC1-D80
18.5	28.5	28.5	40	NS100	STR22ME	24/40	13Irth	LC1-D80
22	33	33	40	NS100	STR22ME	24/40	13Irth	LC1-D80
30	45	45	50	NS100	STR22ME	30/50	13Irth	LC1-D80
37	55	55	80	NS100	STR22ME	48/80	13Irth	LC1-D80
45	65	65	80	NS100	STR22ME	48/80	13Irth	LC1-D80
55	75	75	75	NS100	STR22ME	60/100	13Irth	LC1-D115 or LC1-F115
				NS400	STR43ME	60/120	13Irth	LC1-F185
75	105	105	115	NS160	STR22ME	90/150	13Irth	LC1-D150 or LC1-F150
				NS400	STR43ME	60/120	13Irth	LC1-F185
90	130	130	150	NS160	STR22ME	90/150	13Irth	LC1-D150 or LC1-F150
				NS400	STR43ME	100/200	13Irth	LC1-F185
110	155	155	185	NS250	STR22ME	131/220	13Irth	LC1-F185
				NS400	STR400ME	100/200	13Irth	LC1-F185
132	185	185	220	NS250	STR22ME	131/220	13Irth	LC1-F265
				NS400	STR43ME	160/320	13Irth	LC1-F265
160	220	220	265	NS400	STR43ME	160/320	13Irth	LC1-F265
200	280	280	320	NS400	STR43ME	160/320	13Irth	LC1-F400
220	310	310	320	NS630	STR43ME	250/500	13Irth	LC1-F500
250	360	360	500	NS630	STR43ME	250/500	13Irth	LC1-F500
315	445	445	500	NS630	STR43ME	250/500	13Irth	LC1-F500

***(1)** Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 500/525 V

Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 500/525 V

Circuit breaker	H	L
NS80-MA	35 kA	-

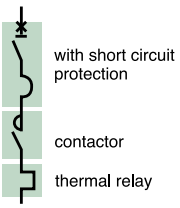
Starting (1): normal LR2 class 10 A, LR9 class 10

Motors				Circuit breakers			Contactors (2)	Thermal relays (1)	
P (kW)	I (A) 500 V	I (A) 525 V	Ie max (A)	Type	Rating(A)	Irm (A)	Type	Type	Irth (A)
0.25	0.6	0.6	1	NS80H-MA	1.5	13.5	LC1-D09	LR2-D13 05	0.63/1
0.37	0.9	0.9	1	NS80H-MA	1.5	13.5	LC1-D09	LR2-D13 05	0.63/1
0.55	1.2	1.2	1.6	NS80H-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
0.75	1.5	1.5	1.6	NS80H-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
1.1	2	2	2.5	NS80H-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
1.5	2.8	2.8	4	NS80H-MA	6.3	57	LC1-D18	LR2-D13 08	2.5/4
2.2	3.8	3.8	4	NS80H-MA	6.3	57	LC1-D18	LR2-D13 08	2.5/4
3	5	5	6	NS80H-MA	6.3	82	LC1-D25	LR2-D13 10	4/6
4	6.5	6.5	8	NS80H-MA	12.5	113	LC1-D32	LR2-D13 12	5.5/8
5.5	9	9	10	NS80H-MA	12.5	138	LC1-D32	LR2-D13 14	7/10
7.5	12	12	12.5	NS80H-MA	12.5	163	LC1-D32	LR2-D13 16	9/13
10	15	15	16	NS80H-MA	25	250	LC1-D32	LR2-D33 21	12/18
11	18.4	18.4	25	NS80H-MA	25	325	LC1-D40	LR2-D33 22	17/25
15	23	23	25	NS80H-MA	25	325	LC1-D40	LR2-D33 22	17/25
18.5	28.5	28.5	32	NS80H-MA	50	450	LC1-D40	LR2-D33 22	23/32
22	33	33	40	NS80H-MA	50	550	LC1-D50	LR2-D33 55	30/40
			50			650	LC1-D115	LR2-D53 57	30/50
							LC1-F115	LR2-F53 57	30/50
30	45	45	50	NS80H-MA	50	650	LC1-D50	LR2-D33 55	37/50
							LC1-D115	LR2-D53 57	30/50
							LC1-F115	LR2-F53 57	30/50
37	55	55	63	NS80H-MA	80	880	LC1-D65	LR2-D33 59	48/65
			80			1040	LC1-D115	LR2-D53 63	48/80
							LC1-F115	LR2-F53 63	48/80
45	65	65	80	NS80H-MA	80	1040	LC1-D115	LR2-D33 63	63/80
							LC1-F115	LR2-F53 63	48/80
55	75	75	80	NS80H-MA	80	1040	LC1-D115	LR2-D53 63	48/80
							LC1-F115	LR2-F53 63	48/80

(1) *For long starting (class 20), see the correspondence table for thermal relays.*

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 500/525 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 380/415 V

Circuit breakers	H	L
NS100-MA	50/35 kA	70/50 kA
NS160/250-MA	50/35 kA	70/50 kA
NS400/630-MA	50/35 kA	70/50 kA

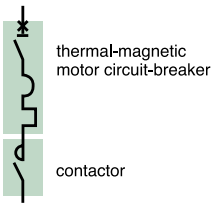
Starting (1): normal LRD2 class 10 A, to class 10

Motors				Circuit breakers			Contactors (2)	Thermal relays	
P (kW)	I (A) 500 V	I (A) 525 V	Ie max (A)	Type	Rating(A)	Irm (A)	Type	Type	Irth (1) (A)
0.55	1.2	1.2	1.6	NS100-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
0.75	1.5	1.5	1.6	NS100-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
1.1	2	2	2.5	NS100-MA	2.5	32.5	LC1-D09	LR2-D13 07	1.6/2.5
1.5	2.8	2.8	4	NS100-MA	6.3	57	LC1-D40	LR2-D13 08	2.5/4
2.2	3.8	3.8	4	NS100-MA	6.3	57	LC1-D40	LR2-D13 08	2.5/4
3	5	5	6	NS100-MA	6.3	82	LC1-D40	LR2-D13 10	4/6
4	6.5	6.5	4	NS100-MA	12.5	113	LC1-D40	LR2-D13 12	5.5/8
5.5	9	9	10	NS100-MA	12.5	138	LC1-D40	LR2-D13 14	7/10
7.5	12	12	12.5	NS100-MA	12.5	163	LC1-D40	LR2-D13 16	913
10	15	15	16	NS100-MA	25	250	LC1-D40	LR2-D13 21	1218
11	18.4	18.4	25	NS100-MA	25	325	LC1-D80	LR2-D33 22	17/25
15	23	23	25	NS100-MA	25	325	LC1-D80	LR2-D33 22	17/25
18.5	28.5	28.5	32	NS100-MA	50	450	LC1-D80	LR2-D33 55	23/32
22	33	33	40	NS100-MA	50	550	LC1-D80	LR2-D33 55	23/32
			50			650	LC1-D115	LR2-D33 57	30/50
							LC1-F115	LR2-D33 57	30/50
30	45	45	50	NS100-MA	50	650	LC1-D80	LR2-D33 55	30/40
							LC1-D115	LR2-D33 57	30/50
							LC1-F115	LR2-D33 57	30/50
37	55	55	63	NS100-MA	100	900	LC1-D80	LR2-D33 59	48/65
			80			1100	LC1-D115	LR9-D33 63	48/80
							LC1-F115	LR9-D33 63	48/80
45	65	65	80	NS100-MA	100	1100	LC1-D115	LR9-D53 63	48/80
							LC1-F115	LR9-D53 63	
55	75	75	80	NS100-MA	100	1300	LC1-D115	LR9-D53 67	60/100
							LC1-F115	LR9-D53 67	
75	105	105	115	NS160-MA	150	1500	LC1-D115	LR9-D53 67	90/150
							LC1-F115	LR9-D53 67	
90	130	130	150	NS160-MA	150	1950	LC1-D115	LR9-D53 69	90/150
							LC1-F115	LR9-D53 69	
110	156	156	185	NS250-MA	220	2420	LC1-F185	LR9-D53 71	132/220
132	187	187	220	NS250-MA	220	2860	LC1-F265	LR9-D53 71	132/220
160	230	230	320	NS400-MA	320	4160	LC1-F400	LR9-D73 75	200/330
200	280	280	320	NS400-MA	320	4160	LC1-F400	LR9-D73 75	200/330
220	310	310	330	NS630-MA	500	4500	LC1-F500	LR9-D73 75	200/330
250	360	360	500	NS630-MA	500	6500	LC1-F500	LR9-D73 79	300/500
315	445	445	500	NS630-MA	500	6500	LC1-F500	LR9-D73 79	300/500

(1) *For long starting (class 20), see the correspondence table for thermal relays./*

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 690 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 690V

Circuit breakers	L
NS100-STR22ME	75 kA
NS400-STR22ME	75kA

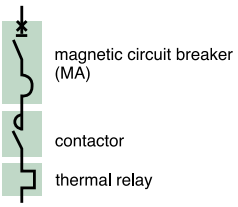
Starting (1): standard IEC 60947-4-1, type 2

	STR22ME	STR43ME
Normal	class10	class10
Long		class20

Motors			Circuit breakers				Contactors (2)
P (kW)	I (A) 440 V	Ie max (A)	Type	Trip unit t.u.	Irth (A)	Irm(A)	Type
5.5	6.6	10	NS100L	STR22ME	6/10	13Irth	LC1-D80
7.5	8.9	10	NS100L	STR22ME	6/10	13Irth	LC1-D80
10	11.5	13	NS100L	STR22ME	7.5/12.5	13Irth	LC1-D80
15	17	18	NS100L	STR22ME	12/20	13Irth	LC1-D80
18.5	20.2	25	NS100L	STR22ME	12/20	13Irth	LC1-D80
22	24.2	40	NS100L	STR22ME	24/40	13Irth	LC1-D80
30	33	50	NS100L	STR22ME	30/50	13Irth	LC1-D80
37	40	50	NS100L	STR22ME	30/50	13Irth	LC1-D80
45	47	50	NS100L	STR22ME	30/50	13Irth	LC1-D80
55	58	63	NS100L	STR22ME	48/80	13Irth	LC1-F115
75	76	80	NS100L	STR22ME	60/100	13Irth	LC1F-115
		165	NS400L	STR43ME	60/120	13Irth	LC1F-265
90	94	165	NS400L	STR43ME	60/120	13Irth	LC1F-265
110	113	165	NS400L	STR43ME	100/200	13Irth	LC1F-265
132	135	165	NS400L	STR43ME	100/120	13Irth	LC1F-265
160	165	165	NS400L	STR43ME	100/120	13Irth	LC1F-265
200	203	230	NS400L	STR43ME	160/320	13Irth	LC1F-330
220	224	230	NS400L	STR43ME	160/320	13Irth	LC1F-330
250	253	280	NS400L	STR43ME	100/320	13Irth	LC1F-400

(1) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Type 2 co-ordination (IEC 60947-4-1) 690 V



Merlin Gerin circuit breakers,Telemecanique contactors and thermal relays

Performance: U = 690 V

Circuit breaker	L
NS100L-MA	75 kA
NS400L-MA	75 kA

Starting (1): normal LRD2 class 10A, to class 10

Motors			Circuit breakers			Contactors (3)	Thermal relays	
P (kW)	I (A) 440 V	Ie max (A)	Type	Rating (A)	Irm (A)	Type	Type	Irth (1)
0.75	1.2	1.6	NS100L-MA	2.5	22.5	LC1-D09	LR2-D13 06	1/1.6
1	1.5	2	NS100L-MA	2.5	27.5	LC1-D09	LR2-D13 06	1.25/2
1.5	2	2.5	NS100L-MA	2.5	325	LC1-D09	LR2-D13 07	1.6/2.5
2.2	2.8	4	NS100L-MA	6.3	57	LC1-D40	LR2-D13 08	2.5/4
3	3.8	4	NS100L-MA	6.3	57	LC1-D40	LR2-D13 08	2.5/4
4	4.9	6	NS100L-MA	6.3	82	LC1-D40	LR2-D13 10	4/6
5.5	6.6	8	NS100L-MA	12.5	113	LC1-D80	LR2-D13 12	5.5/8
7.5	8.9	10	NS100L-MA	12.5	138	LC1-D80	LR2-D13 14	7/10
10	11.5	13	NS100L-MA	25	175	LC1-D80	LR2-D13 16	9/13
15	17	18	NS100L-MA	25	250	LC1-D80	LR2-D13 21	12/18
18.5	20.5	25	NS100L-MA	25	325	LC1-D80	LR2-D13 22	17/25
22	24.2	18	NS100L-MA	25	325	LC1-D80	LR2-D13 22	17/25
30	33	50	NS100L-MA	50	650	LC1-D80	LR9-D53 57	30/50
37	40	50	NS100L-MA	50	650	LC1-D80	LR9-D53 57	30/50
45	47	50	NS100L-MA	50	650	LC1-D80	LR9-D53 57	30/50
55	58	80	NS100L-MA	100	1100	LC1F-115	LR9-D53 63	48/80
75	76	80	NS100L-MA	100	1100	LC1F-115	LR9-D53 63	48/80
90	94	100	NS400L-MA	320	2880	LC1F-265	LR9-D53 67	60/100
110	113	150	NS400L-MA	320	2880	LC1F-265	LR9-D53 69	90/150
132	135	150	NS400L-MA	320	2880	LC1F-265	LR9-D53 69	90/150
160	165	165	NS400L-MA	320	2880	LC1F-265	LR9-D53 71	132/220
200	203	230	NS400L-MA	320	2880	LC1F-330	LR9-F73 75	200/330
220	224	230	NS400L-MA	320	2880	LC1F-330	LR9-F73 75	200/330
250	253	280	NS400L-MA	320	3520	LC1F-400	LR9-F73 75	200/330

(1) *For long starting (class 20) see the correspondence table for thermal relays.*

(2) *Reversers: replace LC1 with LC2; star-delta starter: replace LC1 by LC3.*

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking

When chosing a circuit breaker to protect a busbar trunking system, it is necessary to take into account:
■ the usual rules concerning the circuit breaker current settings:
Ib ⩽ Ir ⩽ Inc where
Ib = maximum load current
Ir = circuit breaker current setting
Inc = current rating of the busbar trunking

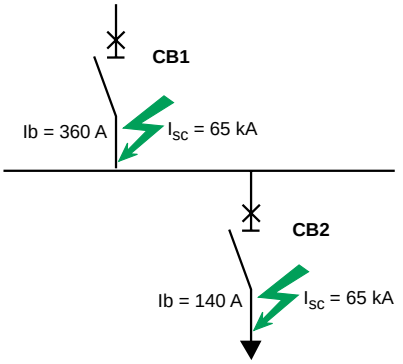
■ the electrodynamic withstand of the busbar trunking:
The peak current I limited by the circuit breaker must be less than the electrodynamic withstand capacity (or rated peak current) of the busbar trunking.

Coordination tables
The tables for coordinating Merlin Gerin Multi 9, Compact, Compact CM and Masterpact circuit breakers with respect to Telemecanique Canalis busbar trunking give directly, for the different types of trunking and circuit breakers, the maximum short-circuit current for which the trunking is protected.

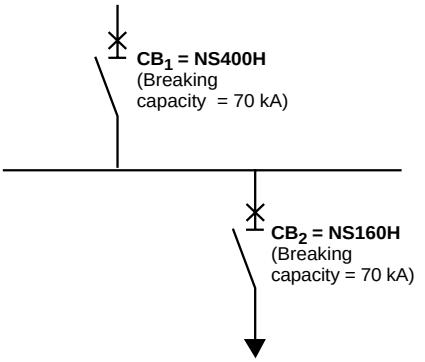
Traditional circuit breaker selection method

The circuit breaker used to protect a distribution circuit is chosen according to two fundamental criteria:
■ the maximum load current Ib flowing in the supply circuit;
■ the prospective short-circuit current Isc at a point where the circuit breaker is to be installed.
The circuit breaker is choosen such that:
□ In circuit breaker ⩾ Ib,
□ breaking capacity of the circuit breaker ⩾ Isc.

Installation example



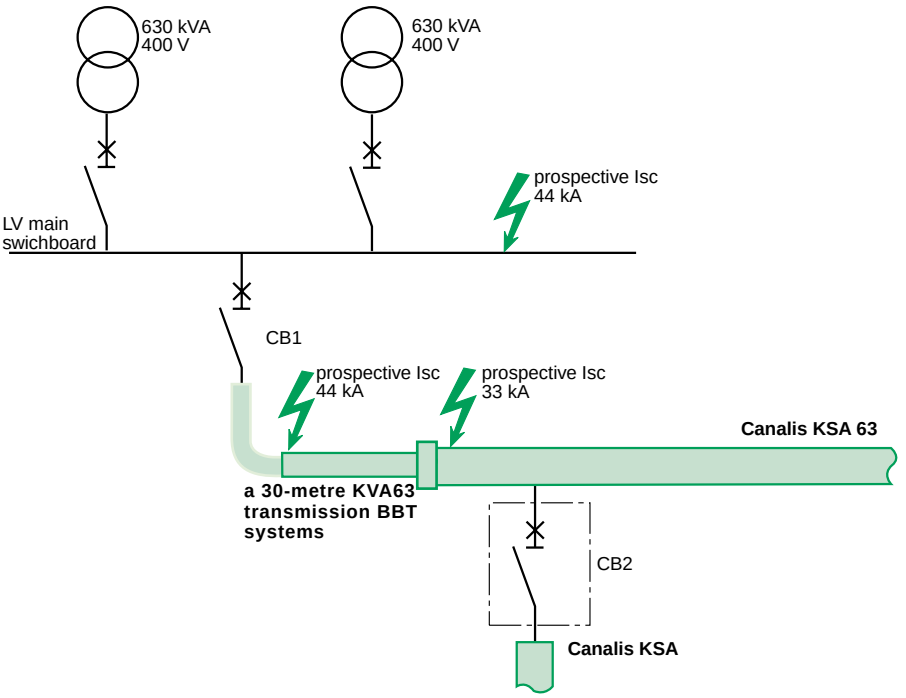
Application for Compact NS range



Example
Consider two 630 kVA/400 V transformer (Usc 4 %) supplying a main LV switchboard for which the prospective short-circuit current on the busbars is 44 kA.
From the switchboard, a 30-metre long Canalis KVA63 transmission busbar trunking system (630A) supplies a Canalis KSA63 trunking system (630A) for distribution with high-density tap-offs.
A tap-off on the KSA63 trunking supplies a Canalis KSA16 trunking system.
The short-circuit level are respectively:
■ 44 kA downstream of circuit-breaker CB1 and at the upstream connection of the KVA63 trunking.
■ 33 kA at the junction between the KVA63 transmission trunking and the KSA63 trunking for high-density tap-offs.

What circuit breakers should be chosen for CB1 and CB2 to protect the installation against short-circuits ?

	CB1	CB2
prospective Isc	44 kA	33 kA
circuit breakers	NS630N (45 kA breaking capacity)	NS160N (35 kA breaking capacity)
Isc protection level for KVA63 trunking	45 kA	
Isc protection level for KVA63 trunking	45 kA	
Isc protection level for KSA16 trunking		35 kA



Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

the different types of Telemecanique busbar trunking

Type of busbar trunking	Low power	Medium power	High power
Busbar trunking for transmission and distribution with low-density tap-offs		KVA 200 to 800 A KVC 200 to 800 A (380/415 V - 660/690 V)	KTA 1000 to 4000 A KTC 1000 to 4000 A (380/415 V - 660/690 V)
Busbar trunking for distribution with high-density tap-offs	KN 40 to 100 A (380/415 V)	KSA 100 to 800 A (380/415 V - 660/690 V)	KHF 1000 to 4500 A (380/415 V - 660/690 V)
Busbar trunking for lighting distribution and management	KLE, KBA, KBB		

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking
Voltage : 380/415 V

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KLE-16/20** 16/20	**KBA-25** 25	**KBB-25** 25	**KBA-40** 40	**KBB-40** 40	**KN-04** 40	**KN-06** 63	**KN-10** 100
type of circuit breaker **Isc max. in kA ms.**	Multi 9	C60H16/20	**15**							
		C60H25		**15**	**15**					
		C60L25		**25**	**25**					
		NC100LH25		**50**	**50**					
		C60H40				**15**	**15**	**15**		
		NC100LH40				**50**	**50**	**50**		
		C60H63							**15**	
		NC100LH63							**50**	
		NS100N (1)						**25**	**25**	**25**
		NS100H (1)						**25**	**25**	**25**
		NS100L (1)						**25**	**25**	**25**

(1) TM-D trip unit, rating 40 or 63 or 100 A and STR22SE rating 40 or 100 A

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KSA-10** 100	**KSA-16** 160	**KSA-25** 250	**KSA-40** 400	**KSA-50** 500	**KSA-63** 630	**KSA-80** 800
type of circuit breaker **Isc max. in kA ms.**	Compact	NS100N NS100H NS100L	**25** **25** **25**	**25** **70** **90**					
		NS160N NS160H NS160L	**20** **20** **20**	**36** **70** **70**	**36** **70** **150**				
		NS250N NS250H NS250L	**17** **17** **17**	**36** **55** **55**	**36** **70** **150**				
		NS400N NS400H NS400L		**30** **30** **30**	**45** **45** **45**	**45** **70** **150**			
		NS630N NS630H NS630L			**30** **30** **30**	**45** **70** **150**	**45** **70** **150**	**45** **70** **150**	**45** **70** **150**
		C801N C801H C801L				**26** **26** **30**	**30** **30** **40**	**40** **40** **55**	**50** **50** **80**
		C1001N C1001H C1001L						**40** **40** **55**	**50** **50** **80**
		C1251N C1251H							**50** **50**
		CMN				**24**	**26**	**32**	**38**
	Masterpact	M08H1 M10H1 M12H1				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**
		M08H2 M10H2 M12H2				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**
		M08L1 M10L1 M12L1				**24** **24** **24**	**32** **32** **32**	**40** **40** **40**	**50** **50** **50**
	Masterpact NW	NW08H1 NW10H1 NW12H1				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**
		NW08H2 NW10H2 NW12H2				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**
		NW08L1 NW10L1 NW12L1				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

voltage : 380/415 V

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KVA-20** 200	**KVA-20** 315	**KVA-31** 400	**KVA-40** 500	**KVA-50** 630	**KVA-63** 800	**KVA-80**
type of circuit breaker **Isc max. in kA ms.**	Compact	NS250N NS250H NS250L	**36** **70** **100**	**36** **70** **100**					
		NS400N NS400H NS400L	**35** **35** **35**	**45** **70** **150**	**45** **70** **150**	**45** **70** **150**	**45** **70** **150**	**45** **70** **150**	
		NS630N NS630H NS630L		**45** **70** **150**	**45** **70** **150**	**45** **70** **150**	**45** **70** **150**		
		C801N C801H C801L						**40** **40** **70**	**50** **60** **110**
		C1001N C1001H						**40** **40**	**50** **60**
	Masterpact	M08H1 M10H1						**33** **33**	**40** **40**
		M08H2 M10H2						**33** **33**	**40** **40**
		M08L1 M10L1						**40** **40**	**55** **55**
	Masterpact NW	NW08N1 NW10N1						**29** **29**	**35** **35**
		NW08H1 NW10H1						**29** **29**	**35** **35**
		NW08H2 NW10H2						**29** **29**	**35** **35**
		NW08L1 NW10L1						**29** **29**	**35** **35**

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KVC-20** 200	**KVC-31** 315	**KVC-40** 400	**KVC-63** 630	**KVC-80** 800
type of circuit breaker **Isc max. in kA ms.**	Compact	NS250N NS250H NS250L	**35** **70** **100**				
		NS400N NS400H NS400L	**35** **35** **35**	**45** **70** **150**	**45** **70** **150**	**45** **70** **150**	
		NS630N NS630H NS630L		**45** **70** **150**	**45** **70** **150**	**45** **70** **150**	
		C801N C801H C801L				**40** **40** **70**	**50** **60** **110**
		C1001N C1001H C1001L				**40** **40** **70**	**50** **60** **110**
	Masterpact	M08H1 M10H1				**36** **36**	**40** **40**
		M08H2 M10H2				**36** **36**	**40** **40**
		M08L1 M10L1				**40** **40**	**55** **55**
	Masterpact NW	NW08N1 NW10N1				**29** **29**	**35** **35**
		NW08H1 NW10H1				**29** **29**	**35** **35**
		NW08H2 NW10H2				**29** **29**	**35** **35**
		NW08L1 NW10L1				**29** **29**	**35** **35**

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

voltage : 380/415 V

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KTA-10**	**KTA-12** 1000	**KTA-16** 1200	**KTA-20** 1600	**KTA-25** 2000	**KTA-30** 2500	**KTA-40** 3000	4000
type of circuit breaker **Isc max. in kA ms.**	Compact	C1001N	**50**	**50**						
		C1001H	**55**	**70**						
		C1001L	**100**	**150**						
		C1251N	**50**	**50**						
		C1251H	**55**	**70**						
	Masterpact	M10H1	**40**	**50**	**60**	**65**				
		M12H1	**40**	**50**	**60**	**65**				
		M16H1	**40**	**50**	**60**	**65**				
		M20H1			**60**	**73**	**75**	**75**		
		M25H1			**60**	**73**	**75**	**75**		
		M32H1					**75**	**75**	**75**	
		M40H1					**75**	**75**	**75**	
		M50H1							**90**	
		M10H2	**40**	**50**	**60**	**73**				
		M12H2	**40**	**50**	**60**	**73**				
		M16H2	**40**	**50**	**60**	**73**				
		M20H2			**60**	**73**	**80**	**86**		
		M25H2			**60**	**73**	**80**	**86**		
		M32H2					**80**	**86**	**90**	
		M40H2					**80**	**86**	**90**	
		M50H2							**90**	
		M10L1	**55**	**85**	**130**					
		M12L1	**55**	**85**	**130**					
		M16L1		**65**	**105**	**130**	**130**			
		M20L1		**65**	**105**	**130**	**130**			
		M25L1		**65**	**105**	**130**	**130**			
	Masterpact NW	NW10H1	**40**	**50**	**60**	**65**				
		NW12H1	**40**	**50**	**60**	**65**				
		NW16H1	**40**	**50**	**60**	**65**	**65**	**65**		
		NW20H1			**60**	**65**	**65**	**65**		
		NW25H1			**60**	**65**	**65**	**65**		
		NW32H1					**65**	**65**	**65**	
		NW40H1					**65**	**65**	**65**	
		NW40bH1					**80**	**86**	**90**	
		NW50H1							**90**	
		NW10H2	**40**	**50**	**60**	**72**				
		NW12H2	**40**	**50**	**60**	**72**				
		NW16H2	**40**	**50**	**60**	**72**	**80**	**86**		
		NW20H2			**60**	**72**	**80**	**86**		
		NW25H2			**60**	**72**	**80**	**86**		
		NW32H2					**80**	**86**	**90**	
		NW40H2					**80**	**86**	**90**	
		NW40bH2					**80**	**86**	**90**	
		NW50H2							**90**	
		NW25H3			**60**	**72**	**80**	**86**		
		NW32H3					**80**	**86**	**90**	
		NW40H3					**80**	**86**	**90**	
		NW10L1	**40**	**55**	**80**					
		NW12L1	**40**	**55**	**80**					
		NW16L1			**80**	**140**	**150**			
		NW20L1			**80**	**140**	**150**	**150**		

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

voltage : 380/415 V

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KTC-10** 1000	**KTC-13** 1350	**KTC-16** 1600	**KTC-20** 2000	**KTC-25** 2500	**KTC-30** 3000	**KTC-40** 4000	**KTC-50** 5000
type of circuit breaker **Isc max. in kA ms.**	Compact	C1001N	**50**	**50**						
		C1001H	**55**	**70**						
		C1001L	**100**	**150**						
		C1251N	**50**	**50**						
		C1251H	**55**	**70**						
	Masterpact	M10H1	**40**	**50**	**60**	**65**				
		M12H1	**40**	**50**	**60**	**65**				
		M16H1	**40**	**50**	**60**	**65**				
		M20H1			**60**	**73**	**75**	**75**		
		M25H1			**60**	**73**	**75**	**75**		
		M32H1					**75**	**75**	**75**	
		M40H1					**75**	**75**	**75**	
		M50H1							**90**	**95**
		M63H1							**90**	**95**
		M10H2	**40**	**50**	**60**	**73**				
		M12H2	**40**	**50**	**60**	**73**				
		M16H2	**40**	**50**	**60**	**73**				
		M20H2			**60**	**73**	**82**	**82**		
		M25H2			**60**	**73**	**82**	**82**		
		M32H2					**82**	**82**	**90**	
		M40H2					**82**	**82**	**90**	
		M50H2							**90**	**95**
		M63H2							**90**	**95**
		M10L1	**55**	**85**	**130**					
		M12L1	**55**	**85**	**130**					
		M16L1		**65**	**105**	**130**	**130**	**130**		
		M20L1		**65**	**105**	**130**	**130**	**130**		
		M25L1		**65**	**105**	**130**	**130**	**130**		
	Masterpact NW	NW10H1	**40**	**50**	**60**	**65**				
		NW12H1	**40**	**50**	**60**	**65**				
		NW16H1	**40**	**50**	**60**	**65**	**65**	**65**		
		NW20H1			**60**	**65**	**65**	**65**		
		NW25H1			**60**	**65**	**65**	**65**		
		NW32H1					**65**	**65**	**65**	
		NW40H1					**65**	**65**	**65**	
		NW40bH1					**80**	**82**	**90**	
		NW50H1							**90**	**95**
		NW63H1							**90**	**95**
		NW10H2	**40**	**50**	**60**	**73**				
		NW12H2	**40**	**50**	**60**	**73**				
		NW16H2	**40**	**50**	**60**	**73**				
		NW20H2			**60**	**73**	**82**	**82**		
		NW25H2			**60**	**73**	**82**	**82**		
		NW32H2					**82**	**82**	**90**	
		NW40H2					**82**	**82**	**90**	
		NW40bH2					**82**	**82**	**90**	
		NW50H2							**90**	**95**
		NW63H2							**90**	**95**
		NW25H3			**60**	**73**	**82**	**82**		
		NW32H3					**82**	**82**	**90**	
		NW40H3						**82**	**90**	
		NW10L1	**40**	**55**	**80**					
		NW12L1	**40**	**55**	**80**					
		NW16L1		**55**	**80**	**140**	**150**	**150**		
		NW20L1		**55**	**80**	**140**	**150**	**150**		

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

voltage : 380/415 V

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KHF** 1000	**KHF** 1200/1450	**KHF** 2200/2500	**KHF** 3000/3400	**KHF** 4000/4500
type of circuit breaker **Isc max. in kA ms.**	Compact	C801N	**28**				
		C801H	**28**				
		C801L	**45**				
		C1001N	**28**	**50**			
		C1001H	**28**	**50**			
		C1001L	**45**	**80**			
		C1251N	**28**	**50**			
		C1251H	**28**	**50**			
		CMN	**28**	**38**	**70**	**70**	
		CMH	**28**	**38**	**85**	**85**	
	Masterpact	M08H1	**28**	**38**			
		M10H1	**28**	**38**			
		M12H1	**28**	**38**			
		M16H1	**28**	**38**	**65**		
		M20H1	**28**	**38**	**75**	**75**	
		M25H1	**28**	**38**	**75**	**75**	
		M32H1			**75**	**75**	**75**
		M40H1			**75**	**75**	**75**
		M50H1			**90**	**100**	**100**
		M63H1			**90**	**100**	**100**
		M08H2	**28**	**38**			
		M10H2	**28**	**38**			
		M12H2	**28**	**38**			
		M16H2	**28**	**38**	**90**		
		M20H2	**28**	**38**	**90**	**100**	
		M25H2	**28**	**38**	**90**	**100**	
		M32H2	**28**	**38**	**90**	**100**	**100**
		M40H2			**90**	**100**	**100**
		M50H2			**90**	**120**	**125**
		M63H2			**90**	**120**	**125**
		M08L1	**35**	**50**			
		M10L1	**35**	**50**			
		M12L1	**35**	**50**			
		M16L1	**28**	**42**	**130**		
		M20L1	**28**	**42**	**130**	**130**	
		M25L1	**28**	**42**	**130**	**130**	
	Masterpact NW	NW08N1	**28**	**38**			
		NW10N1	**28**	**38**			
		NW12N1	**28**	**38**			
		NW16N1	**28**	**38**	**42**		
		NW20N1	**28**	**38**	**42**	**42**	
		NW08H1	**28**	**38**			
		NW10H1	**28**	**38**			
		NW12H1	**28**	**38**			
		NW16H1	**28**	**38**	**65**		
		NW20H1	**28**	**38**	**65**	**65**	
		NW25H1	**28**	**38**	**65**	**65**	
		NW32H1			**65**	**65**	**65**
		NW40H1			**65**	**65**	**65**
		NW40bH1			**92**	**100**	**100**
		NW50H1			**92**	**100**	**100**
		NW63H1			**92**	**100**	**100**
		NW08H2	**28**	**38**			
		NW10H2	**28**	**38**			
		NW12H2	**28**	**38**			
		NW16H2	**28**	**38**	**92**		
		NW20H2	**28**	**38**	**92**	**100**	
		NW25H2	**28**	**38**	**92**	**100**	
		NW32H2			**92**	**100**	**100**
		NW40H2			**92**	**100**	**100**
		NW40bH2			**92**	**117**	**147**
		NW50H2			**92**	**117**	**147**
		NW63H2			**92**	**117**	**147**
		NW25H3	**28**	**38**	**92**	**117**	
		NW32H3			**92**	**117**	**147**
		NW40H3			**92**	**117**	**147**
		NW08L1	**28**	**38**			
		NW10L1	**28**	**38**			
		NW12L1	**28**	**38**			
		NW16L1	**28**	**38**	**150**		
		NW20L1	**28**	**38**	**150**	**150**	

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

voltage: 660/690 V

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KSA-10** 100	**KSA-16** 160	**KSA-25** 250	**KSA-40** 400	**KSA-50** 500	**KSA-63** 630	**KSA-80** 800
type of circuit breaker **Isc max. in kA ms.**	Compact	NS100N NS100H NS100L	**8** **10** **20**	**8** **10** **75**					
		NS160N NS160H NS160L	**8** **10** **20**	**8** **10** **75**	**8** **10** **75**				
		NS250N NS250H NS250L	**8** **10** **15**	**8** **10** **20**	**8** **10** **20**				
		NS400N NS400H NS400L		**10** **17** **14**	**10** **20** **28**	**10** **20** **35**			
		NS630N NS630H NS630L				**10** **20** **35**	**10** **20** **35**	**10** **20** **35**	**20** **20** **35**
		C801N C801H C801L				**25** **26** **26**	**25** **29** **30**	**25** **35** **45**	**25** **40** **60**
		C1001N C1001H C1001L						**25** **35** **45**	**25** **40** **60**
		C1251N C1251H							**25** **40**
		CMN				**24**	**26**	**32**	**38**
	Masterpact	M08H1 M10H1 M12H1				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**
		M08H2 M10H2 M12H2				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**
		M08L1 M10L1 M12L1				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**
	Masterpact NW	NW08H1 NW10H1 NW12H1				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**
		NW08H2 NW10H2 NW12H2				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**
		NW08L1 NW10L1 NW12L1				**24** **24** **24**	**26** **26** **26**	**32** **32** **32**	**38** **38** **38**

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KVA-20** 200	**KVA-31** 315	**KVA-40** 400	**KVA-50** 500	**KVA-63** 630	**KVA-80** 800
type of circuit breaker **Isc max. in kA ms.**	Compact	NS250N NS250H NS250L	**8** **10** **20**					
		NS400N NS400H NS400L	**10** **20** **20**	**10** **20** **75**	**10** **20** **75**	**10** **20** **75**	**10** **20** **75**	
		NS630N NS630H NS630L		**10** **20** **35**	**10** **20** **35**	**10** **20** **35**	**10** **20** **35**	
		C801N C801H C801L					**33** **33** **50**	**25** **40** **60**
		C1001N C1001H C1001L					**33** **33** **50**	**25** **40** **60**
	Masterpact	M08H1 M10H1					**33** **33**	**40** **40**
		M08H2 M10H2					**33** **33**	**40** **40**
		M08L1 M10L1					**33** **33**	**40** **40**
	Masterpact NW	NW08N1 NW10N1 NW08H1 NW10H1					**36** **36** **36** **36**	**40** **40** **40** **40**
		NW08H2 NW10H2					**33** **33**	**40** **40**
		NW08L1 NW10L1					**33** **33**	**40** **40**

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

voltage: 660/690 V

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KVC-20**	**KVC-31** 200	**KVC-40** 315	**KVC-63** 400	**KVC-80** 630 800
type of circuit breaker **Isc max. in kA ms.**	Compact	NS250N NS250H NS250L	**8** **10** **20**				
		NS400N NS400H NS400L	**10** **20** **20**	**10** **20** **75**	**10** **20** **75**	**10** **20** **75**	
		NS630N NS630H NS630L		**10** **20** **35**	**10** **20** **35**	**10** **20** **35**	
		C801N C801H C801L				**25** **36** **60**	**25** **40** **60**
		C1001N C1001H C1001L				**25** **36** **60**	**25** **40** **60**
	Masterpact	M08H1 M10H1				**36** **36**	**40** **40**
		M08H2 M10H2				**36** **36**	**40** **40**
		M08L1 M10L1				**36** **36**	**40** **40**
	Masterpact NW	NW08N1 NW10N1				**36** **36**	**40** **40**
		NW08H1 NW10H1				**36** **36**	**40** **40**
		NW08H2 NW10H2				**36** **36**	**40** **40**
		NW08L1 NW10L1				**36** **36**	**40** **40**

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

voltage: 660/690 V

type of Canalis busbar trunking trunking rating (in A at 35°C)			**KTA-10** 1000	**KTA-12** 1200	**KTA-16** 1600	**KTA-20** 2000	**KTA-25** 2500	**KTA-30** 3000	**KTA-40** 4000
type of circuit breaker **Icc maxi en kA eff.**	Compact	C1001N	**25**	**25**					
		C1001H	**40**	**40**					
		C1001L	**60**	**60**					
		C1251N	**25**	**25**					
		C1251H	**40**	**40**					
	Masterpact	M10H1	**40**	**50**	**60**	**65**			
		M12H1	**40**	**50**	**60**	**65**			
		M16H1	**40**	**50**	**60**	**65**			
		M20H1			**60**	**65**	**65**	**75**	
		M25H1			**60**	**65**	**65**	**75**	
		M32H1					**75**	**75**	**75**
		M40H1					**75**	**75**	**75**
		M50H1							**85**
		M10H2	**40**	**50**	**60**	**73**			
		M12H2	**40**	**50**	**60**	**73**			
		M16H2	**40**	**50**	**60**	**73**			
		M20H2			**60**	**73**	**80**	**85**	
		M25H2			**60**	**73**	**80**	**85**	
		M32H2					**80**	**85**	**85**
		M40H2					**80**	**85**	**85**
		M50H2							**85**
		M10L1	**40**	**50**	**65**				
		M12L1	**40**	**50**	**65**				
		M16L1		**50**	**65**	**65**	**65**		
		M20L1		**50**	**65**	**65**	**65**		
		M25L1		**50**	**65**	**65**	**65**		
	Masterpact NW	NW10H1	**40**	**50**	**60**	**65**			
		NW12H1	**40**	**50**	**60**	**65**			
		NW16H1	**40**	**50**	**60**	**65**	**65**	**65**	
		NW20H1			**60**	**65**	**65**	**65**	
		NW25H1					**65**	**65**	
		NW32H1					**65**	**65**	**65**
		NW40H1					**65**	**65**	**65**
		NW40bH1					**80**	**86**	**90**
		NW50H1							**90**
		NW10H2	**40**	**50**	**60**	**72**			
		NW12H2	**40**	**50**	**60**	**72**			
		NW16H2	**40**	**50**	**60**	**72**	**80**	**86**	
		NW20H2			**60**	**72**	**80**	**86**	
		NW25H2			**60**	**72**	**80**	**86**	
		NW32H2					**80**	**86**	**85**
		NW40H2					**80**	**86**	**85**
		NW40bH2					**80**	**86**	**90**
		NW50H2							**90**
		NW25H3			**60**	**72**	**80**	**86**	
		NW32H3					**80**	**86**	**90**
		NW40H3					**80**	**86**	**90**
		NW10L1	**40**	**50**	**65**				
		NW12L1	**40**	**50**	**65**				
		NW16L1			**65**	**100**	**100**		
		NW20L1			**65**	**100**	**100**		

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

voltage: 660/690 V

type of Canalis busbar trunking trunking rating (in A at 35 °C)			**KTC-10** 1000	**KTC-13** 1350	**KTC-16** 1600	**KTC-20** 2000	**KTC-25** 2500	**KTC-30** 3000	**KTC-40** 4000	**KTC-50** 5000
type of circuit breaker **Isc max. in kA ms.**	Compact	C1001N	**25**	**25**						
		C1001H	**40**	**40**						
		C1001L	**60**	**60**						
		C1251N	**25**	**25**						
		C1251H	**40**	**40**						
	Masterpact	M10H1	**40**	**50**	**60**	**65**				
		M12H1	**40**	**50**	**60**	**65**				
		M16H1	**40**	**50**	**60**	**65**				
		M20H1			**60**	**65**	**65**	**75**		
		M25H1			**60**	**65**	**65**	**75**		
		M32H1					**75**	**75**	**75**	
		M40H1					**75**	**75**	**75**	
		M50H1							**85**	**85**
		M63H1							**85**	**85**
		M10H2	**40**	**50**	**60**	**73**				
		M12H2	**40**	**50**	**60**	**73**				
		M16H2	**40**	**50**	**60**	**73**				
		M20H2			**60**	**73**	**80**	**82**		
		M25H2			**60**	**73**	**80**	**82**		
		M32H2					**80**	**82**	**85**	
		M40H2					**80**	**82**	**85**	
		M50H2							**85**	**85**
		M63H2							85	85
		M10L1	**55**	**65**	**65**					
		M12L1	**55**	**65**	**65**					
		M16L1		**50**	**65**	**65**	**65**			
		M20L1		**50**	**65**	**65**	**65**			
		M25L1		**50**	**65**	**65**	**65**			
	Masterpact NW	NW10H1	**40**	**50**	**60**	**65**				
		NW12H1	**40**	**50**	**60**	**65**				
		NW16H1	**40**	**50**	**60**	**65**				
		NW20H1			**60**	**65**	**65**	**65**		
		NW25H1			**60**	**65**	**65**	**65**		
		NW32H1					**65**	**65**		
		NW40H1					**65**	**65**	**65**	
		NW40bH1					**82**	**82**	**65**	
		NW50H1							**90**	**95**
		NW63H1							**90**	**95**
		NW10H2	**40**	**50**	**60**	**73**				
		NW12H2	**40**	**50**	**60**	**73**				
		NW16H2	**40**	**50**	**60**	**73**				
		NW20H2			**60**	**73**	**82**	**82**		
		NW25H2			**60**	**73**	**82**	**82**		
		NW32H2					**82**	**82**	**90**	
		NW40H2					**82**	**82**	**90**	
		NW40bH2					**82**	**82**	**90**	
		NW50H2							**90**	**95**
		NW63H2							**90**	**95**
		NW25H3			**60**	**73**	**82**	**82**		
		NW32H3					**82**	**82**	**90**	
		NW40H3					**82**	**82**	**90**	
		NW10L1	**40**	**50**	**65**					
		NW12L1	**40**	**50**	**65**					
		NW16L1		**50**	**65**	**100**	**100**	**100**		
		NW20L1		**50**	**65**	**100**	**100**	**100**		

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems (cont.)

voltage: 660/690 V

type of Canalis busbar trunking trunking rating (in A at 35 °C)			**KHF** 1000	**KHF** 1200/1450	**KHF** 2200/2500	**KHF** 3000/3400	**KHF** 4000/4500
type of circuit breaker **Isc max. in kA ms.**	Compact	C801N	**28**				
		C801H	**28**				
		C801L	**45**				
		C1001N	**28**	**28**			
		C1001H	**28**	**40**			
		C1001L	**30**	**60**			
		C1251N	**28**	**28**			
		C1251H	**28**	**40**			
		CMN	**28**	**38**	**50**	**50**	
		CMH	**28**	**38**	**50**	**50**	
	Masterpact	M08H1	**28**	**38**			
		M10H1	**28**	**38**			
		M12H1	**28**	**38**			
		M16H1	**28**	**38**	**65**		
		M20H1	**28**	**38**	**75**	**75**	
		M25H1	**28**	**38**	**75**	**75**	
		M32H1			**75**	**75**	**75**
		M40H1			**75**	**75**	**75**
		M50H1			**85**	**85**	**85**
		M63H1			**85**	**85**	**85**
		M08H2	**28**	**38**			
		M10H2	**28**	**38**			
		M12H2	**28**	**38**			
		M16H2	**28**	**38**	**85**		
		M20H2	**28**	**38**	**85**	**85**	
		M25H2	**28**	**38**	**85**	**85**	
		M32H2	**28**	**38**	**85**	**85**	**85**
		M40H2			**85**	**85**	**85**
		M50H2			**85**	**85**	**85**
		M63H2			**85**	**85**	**85**
		M08L1	**28**	**38**			
		M10L1	**28**	**38**			
		M12L1	**28**	**38**			
		M16L1	**28**	**38**	**65**		
		M20L1	**28**	**38**	**65**	**65**	
		M25L1	**28**	**38**	**65**	**65**	
	Masterpact NW	NW08H1	**28**	**38**			
		NW10H1	**28**	**38**			
		NW12H1	**28**	38			
		NW16H1	**28**	**38**	**65**		
		NW20H1	**28**	**38**	**65**	**65**	
		NW25H1	**28**	**38**	**65**	**65**	
		NW32H1			**65**	**65**	**65**
		NW40H1			**65**	**65**	**65**
		NW40bH1			**92**	**100**	**100**
		NW50H1			**92**	**100**	**100**
		NW63H1			**92**	**100**	**100**
		NW08H2	**28**	**38**			
		NW10H2	**28**	**38**			
		NW12H2	**28**	**38**			
		NW16H2	**28**	**38**	**85**		
		NW20H2	**28**	**38**	**85**	**85**	
		NW25H2	**28**	**38**	**85**	**85**	
		NW32H2			**85**	**85**	**85**
		NW40H2			**85**	**85**	**85**
		NW50bH2			**92**	**100**	**100**
		NW50H2			**92**	**100**	**100**
		NW63H2			**92**	**100**	**100**
		NW25H3	**28**	**38**	**92**	**100**	
		NW32H3			**92**	**100**	**100**
		NW40H3			**92**	**100**	**100**
		NW08L1	**28**	**38**			
		NW10L1	**28**	**38**			
		NW12L1	**28**	**38**			
		NW16L1	**28**	**38**	**100**		
		NW20L1	**28**	**38**	**100**	**100**	

Coordination between circuit breakers and Telemecanique Canalis busbar trunking systems
Cascading and reinforced discrimination

Circuit breaker selection taking coordination into account

The use of current-limiting circuit breakers makes it possible to implement coordination techniques. This improves circuit breaker performance in terms of breaking capacity and continuity of service.

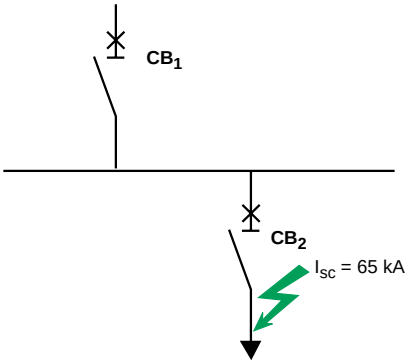
Coordination techniques are described and recognised by the following standards:
- product standards BSEN 60947-2;
- installation standards IEC 364,BS7671.

Cascading

The use of a current-limiting circuit breaker upstream to reinforce the breaking capacity of a downstream circuit breaker.

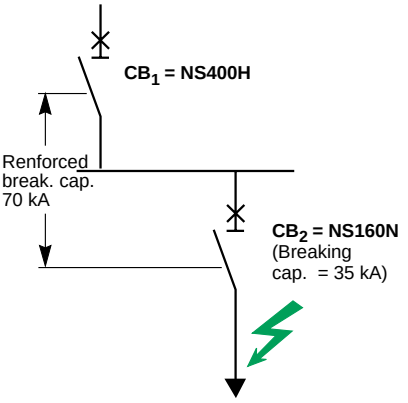
Principle

Cascading



Application for Compact NS range

Cascading

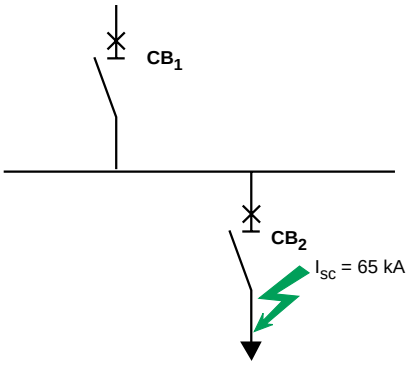


Discrimination

In the event of an electrical fault on one outgoing circuit, discrimination is the ability of the electrical installation to maintain the continuity of electrical power supplied to the other circuits not concerned by the fault.
As a general rule, cascading and discrimination techniques are applied independently.
Schneider has developed an exclusive system to conciliate cascading and discrimination.
This system ensures discrimination up to the reinforced breaking capacity of the association of circuit breakers CB_1 and CB_2.

Principle

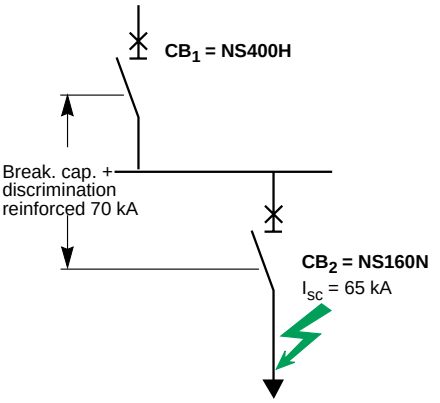
Cascading and reinforced discrimination



CB2 breaking capacity
Discrimination ensured up to the reinforced breaking capacity of **CB2**

Application for Compact NS range

Cascading and reinforced discrimination

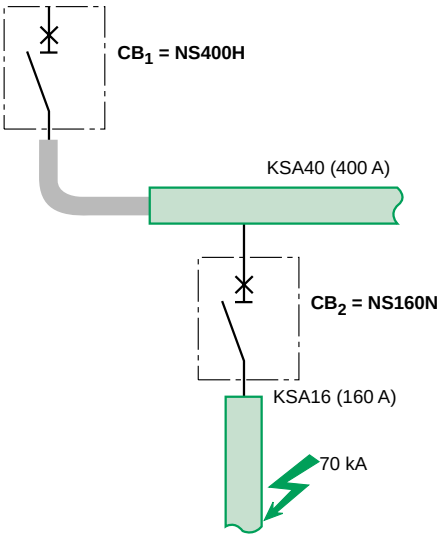


Coordination between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems Cascading and reinforced discrimination (cont.)

Cascading, reinforced discrimination and reinforced protection of busbar trunking systems (BTS)
This technique is the direct application of cascading and discrimination techniques to the protection of busbar trunking systems. For various upstream circuit breakers and upstream busbar trunking systems, the tables below give directly:
- the level of short-circuit protection of the busbar trunking;
- the downstream circuit breaker and associated busbar trunking;
- the cascading breaking capacity of the downstream circuit breaker;
- the level of reinforced discrimination of the upstream and downstream circuit breakers;
- the level of reinforced protection of the downstream busbar trunking.

Application to a Canalis distributed distribution system:
- reinforcement of the breaking capacity of the NS 160N (CB2) up to **70 kA**;

Source

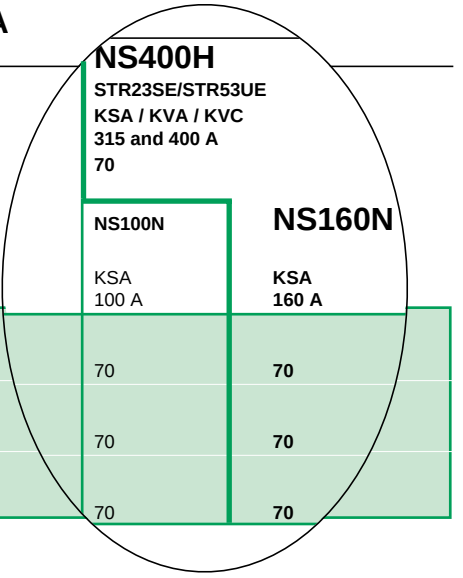


- discrimination between CB_1 and CB_2 ensured up to **70 kA**;
- protection of Canalis KSA 16 busbar trunking up to **70 kA**.

Example of a table corresponding to the above diagram.

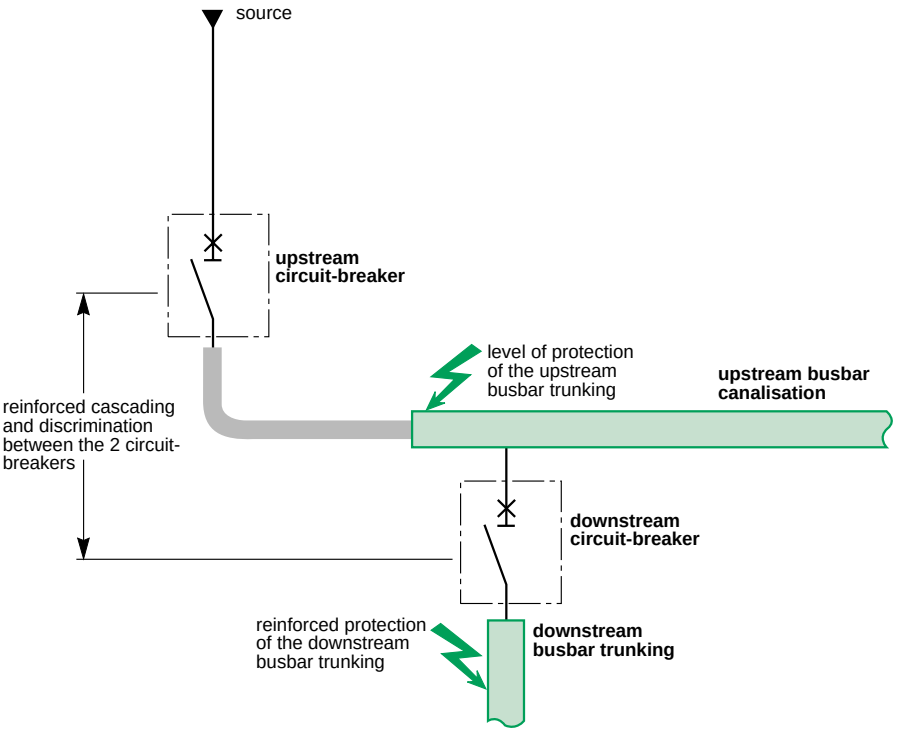
rated current of the upstream busbar trunking: 315 and 400 A

Upstream circuit breaker **Associated trip unit**	**NS400N** STR23SE/STR53UE		**NS400H** STR23SE/STR53UE	
Upstream busbar trunking	KSA / KVA / KVC 315 and 400 A		KSA / KVA / KVC 315 and 400 A	
Level of protection of the upstream busbar trunking (kA)	**45**		**70**	
Downstream circuit breaker **Associated trip unit**	**NS100N** TMD/STR22SE	**NS160N**	**NS100N** TMD/STR22SE	**NS160N**
Downstream busbar trunking	KSA 100 A	KSA 160 A	KSA 100 A	KSA 160 A
Discrimination limit between upstream and downstream circuit breakers (kA)	45	45	70	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	45	45	70	70
Reinforced protection of the downstream busbar trunking (kA)	45	45	70	70



Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems Cascading and reinforced discrimination (cont.)

voltage: 380/415 V



rated current of the upstream busbar trunking: 1200 and 1350 A

Upstream circuit breaker	C1251N					C1251N				
Associated trip unit	STR35SE / STR55UE					STR45AE				
Upstream busbar trunking	KTA-12 / KTC-13 1200 and 1350 A					KTA-12 / KTC-13 1200 and 1350 A				
Level of protection of the upstream busbar trunking (kA)	**50**					**50**				
Downstream circuit breaker	**NS100N**	**NS160N**	**NS250N**	**NS400N**	**NS630N**	**NS100N**	**NS160N**	**NS250N**	**NS400N**	**NS630N**
Associated trip unit	TMD / STR22SE			STR23SE / STR53UE		TMD / STR22SE			STR23SE / STR53UE	
Downstream busbar trunking	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	500 - 630 A	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	500 - 630 A
Discrimination limit between upstream and downstream circuit breakers (kA)	50	50	50	45	40	50	50	50	50	50
Reinforced breaking capacity of the downstream circuit breaker (kA)	50	50	50	50	50	50	50	50	50	50
Reinforced protection of the downstream busbar trunking(kA)	25	50	50	50	50	25	50	50	50	50

Upstream circuit breaker	C1251N			C1251N		
Associated trip unit	STR35SE / STR55UE			STR45AE		
Upstream busbar trunking	KTA-12 / KTC-13 1200 and 1350 A			KTA-12 / KTC-13 1200 and 1350 A		
Level of protection of the upstream busbar trunking (kA)	**50**			**50**		
Downstream circuit breaker	**NS100N** TMD / STR22SE			**NS100N** TMD / STR22SE		
Associated trip unit	40 A	63 A	100 A	40 A	63 A	100 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	50	50	50	50	50	50
Reinforced breaking capacity of the downstream circuit breaker (kA)	50	50	50	50	50	50
Reinforced protection of the downstream busbar trunking(kA)	50	50	50	50	50	50

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems Cascading and reinforced discrimination (cont.)

rated current of the upstream busbar trunking: 1200 and 1350 A (cont.)

Upstream circuit breaker **Associated trip unit**	**C1251H** STR35SE / STR55UE					**C1251H** STR45AE				
Upstream busbar trunking	KTA-12 / KTC-13 1200 and 1350 A					KTA-12 / KTC-13 1200 and 1350 A				
Level of protection of the upstream busbar trunking (kA)	**70**					**70**				
Downstream circuit breaker **Associated trip unit**	**NS100N** TMD / STR22SE	**NS160N** TMD / STR22SE	**NS250N** TMD / STR22SE	**NS400N** STR23SE / STR53UE	**NS630N** STR23SE / STR53UE	**NS100N** TMD / STR22SE	**NS160N** TMD / STR22SE	**NS250N** TMD / STR22SE	**NS400N** STR23SE / STR53UE	**NS630N** STR23SE / STR53UE
Downstream busbar trunking	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	KSA / KVA / KVC 500 - 630 A	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	KSA / KVA / KVC 500 - 630 A
Discrimination limit between upstream and downstream circuit breakers (kA)	70	70	70	45	40	70	70	70	70	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	70	70	70	70	70	70	70	70	70	70
Reinforced protection of the downstream busbar trunking(kA)	70	70	70	70	70	70	70	70	70	70

Upstream circuit breaker **Associated trip unit**	**C1251H** STR35SE / STR55UE			**C1251H** STR45AE		
Upstream busbar trunking	KTA-12 / KTC-13 1200 and 1350 A			KTA-12 / KTC-13 1200 and 1350 A		
Level of protection of the upstream busbar trunking (kA)	**70**			**70**		
Downstream circuit breaker **Associated trip unit**	**NS100N** TMD / STR22SE 40 A	63 A	100 A	**NS100N** TMD / STR22SE 40 A	63 A	100 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	70	70	70	70	70	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	70	70	70	70	70	70
Reinforced protection of the downstream busbar trunking(kA)	50	50	50	50	50	50

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems Cascading and reinforced discrimination (cont.)

rated current of the upstream busbar trunking: 1000 A

Upstream circuit breaker Associated trip unit	**C1001N** STR35SE / STR55UE					**C1001N** STR45AE				
Upstream busbar trunking	KTA-10 / KTC-10 1000 A					KTA-10 / KTC-10 1000 A				
Level of protection of the upstream busbar trunking (kA)	**50**					**50**				
Downstream circuit breaker Associated trip unit	**NS100N** TMD / STR22SE	**NS160N**	**NS250N**	**NS400N** STR23SE / STR53UE	**NS630N**	**NS100N** TMD / STR22SE	**NS160N**	**NS250N**	**NS400N** STR23SE / STR53UE	**NS630N**
Downstream busbar trunking	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	500 - 630 A	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	500 - 630 A
Discrimination limit between upstream and downstream circuit breakers (kA)	50	50	50	45	40	50	50	50	50	50
Reinforced breaking capacity of the downstream circuit breaker (kA)	50	50	50	50	50	50	50	50	50	50
Reinforced protection of the downstream busbar trunking(kA)	50	50	50	50	50	50	50	50	50	50

Upstream circuit breaker Associated trip unit	**C1001N** STR35SE / STR55UE			**C1001N** STR45AE		
Upstream busbar trunking	KTA-10 / KTC-10 1000 A			KTA-10 / KTC-10 1000 A		
Level of protection of the upstream busbar trunking (kA)	**50**			**50**		
Downstream circuit breaker Associated trip unit	**NS100N** TMD / STR22SE 40 A	63 A	100 A	**NS100N** TMD / STR22SE 40 A	63 A	100 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	50	50	50	50	50	50
Reinforced breaking capacity of the downstream circuit breaker (kA)	50	50	50	50	50	50
Reinforced protection of the downstream busbar trunking(kA)	50	50	50	50	50	50

Upstream circuit breaker Associated trip unit	**C1001H** STR35SE / STR55UE					**C1001H** STR45AE				
Upstream busbar trunking	KTA-10 / KTC-10 1000 A					KTA-10 / KTC-10 1000 A				
Level of protection of the upstream busbar trunking (kA)	**55**					**55**				
Downstream circuit breaker Associated trip unit	**NS100N** TMD / STR22SE	**NS160N**	**NS250N**	**NS400N** STR23SE / STR53UE	**NS630N**	**NS100N** TMD / STR22SE	**NS160N**	**NS250N**	**NS400N** STR23SE / STR53UE	**NS630N**
Downstream busbar trunking	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	500 - 630 A	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	500 - 630 A
Discrimination limit between upstream and downstream circuit breakers (kA)	70	70	70	45	40	70	70	70	70	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	70	70	70	70	70	70	70	70	70	70
Reinforced protection of the downstream busbar trunking(kA)	55	55	55	55	55	55	55	55	55	55

Upstream circuit breaker Associated trip unit	**C1001H** STR35SE / STR55UE			**C1001H** STR45UE		
Upstream busbar trunking	KTA-10 / KTC-10 1000 A			KTA-10 / KTC-10 1000 A		
Level of protection of the upstream busbar trunking (kA)	**55**			**55**		
Downstream circuit breaker Associated trip unit	**NS100N** TMD / STR22SE 40 A	63 A	100 A	**NS100N** TMD / STR22SE 40 A	63 A	100 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	70	70	70	70	70	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	70	70	70	70	70	70
Reinforced protection of the downstream busbar trunking(kA)	50	50	50	50	50	50

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems Cascading and reinforced discrimination (cont.)

rated current of the upstream busbar trunking: 800 A

Upstream circuit breaker	**C801N**				**C801N**			
Associated trip unit	STR35SE / STR55UE				STR45AE			
Upstream busbar trunking	KVA-80 / KVC-80 800 A				KVA-80 / KVC-80 800 A			
Level of protection of the upstream busbar trunking (kA)	**50**				**50**			
Downstream circuit breaker	**NS100N**	**NS160N**	**NS250N**	**NS400N**	**NS100N**	**NS160N**	**NS250N**	**NS400N**
Associated trip unit	TMD / STR22SE			STR23SE / STR53UE	TMD / STR22SE			STR23SE / STR53UE
Downstream busbar trunking	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A
Discrimination limit between upstream and downstream circuit breakers (kA)	50	50	50	35	50	50	50	35
Reinforced breaking capacity of the downstream circuit breaker (kA)	50	50	50	50	50	50	50	50
Reinforced protection of the downstream busbar trunking(kA)	50	50	50	50	50	50	50	50

Upstream circuit breaker	**C801N**			**C801N**		
Associated trip unit	STR35SE / STR55UE			STR45AE		
Upstream busbar trunking	KVA-80 / KVC-80 800 A			KVA-80 / KVC-80 800 A		
Level of protection of the upstream busbar trunking (kA)	**50**			**50**		
Downstream circuit breaker	**NS100N** TMD / STR22SE			**NS100N** TMD / STR22SE		
Associated trip unit	40 A	63 A	100 A	40 A	63 A	100 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	50	50	50	50	50	50
Reinforced breaking capacity of the downstream circuit breaker (kA)	50	50	50	50	50	50
Reinforced protection of the downstream busbar trunking(kA)	50	50	50	50	50	50

Upstream circuit breaker	**C801H**				**C801H**			
Associated trip unit	STR35SE / STR55UE				STR45AE			
Upstream busbar trunking	KVA-80 / KVC-80 800 A				KVA-80 / KVC-80 800 A			
Level of protection of the upstream busbar trunking (kA)	**60**				**60**			
Downstream circuit breaker	**NS100N**	**NS160N**	**NS250N**	**NS400N**	**NS100N**	**NS160N**	**NS250N**	**NS400N**
Associated trip unit	TMD / STR22SE			STR23SE / STR53UE	TMD / STR22SE			STR23SE / STR53UE
Downstream busbar trunking	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A	KSA 100 A	KSA 160 A	KSA 250 A	KSA / KVA / KVC 315 - 400 A
Discrimination limit between upstream and downstream circuit breakers (kA)	70	70	70	35	70	70	70	35
Reinforced breaking capacity of the downstream circuit breaker (kA)	70	70	70	70	70	70	70	70
Reinforced protection of the downstream busbar trunking(kA)	60	60	60	60	60	60	60	60

Upstream circuit breaker	**C801H**			**C801H**		
Associated trip unit	STR35SE / STR55UE			STR45AE		
Upstream busbar trunking	KVA-80 / KVC-80 800 A			KVA-80 / KVC-80 800 A		
Level of protection of the upstream busbar trunking (kA)	**60**			**60**		
Downstream circuit breaker	**NS100N** TMD / STR22SE			**NS100N** TMD / STR22SE		
Associated trip unit	40 A	63 A	100 A	40 A	63 A	100 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	70	70	70	70	70	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	70	70	70	70	70	70
Reinforced protection of the downstream busbar trunking(kA)	50	50	50	50	50	50

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems Cascading and reinforced discrimination (cont.)

rated current of the upstream busbar trunking: 500 and 630 A

Upstream circuit breaker Associated trip unit	**NS630N** STR23SE/STR53UE			**NS630H** STR23SE/STR53UE			**NS630L** STR23SE/STR53UE		
Upstream busbar trunking	KSA / KVA / KVC 500 and 630 A			KSA / KVA / KVC 500 and 630 A			KSA / KVA / KVC 500 and 630 A		
Level of protection of the upstream busbar trunking (kA)	**45**			**70**			**150**		
Downstream circuit breaker Associated trip unit	**NS100N** TMD / STR22SE	**NS160N** TMD / STR22SE	**NS250N** TMD / STR22SE	**NS100N** TMD / STR22SE	**NS160N** TMD / STR22SE	**NS250N** TMD / STR22SE	**NS100H** TMD / STR22SE	**NS160H** TMD / STR22SE	**NS250H** TMD / STR22SE
Downstream busbar trunking	KSA 100 A	KSA 160 A	KSA 250 A	KSA 100 A	KSA 160 A	KSA 250 A	KSA 100 A	KSA 160 A	KSA 250 A
Discrimination limit between upstream and downstream circuit breakers (kA)	45	45	45	70	70	70	150	150	150
Reinforced breaking capacity of the downstream circuit breaker (kA)	45	45	45	70	70	70	150	150	150
Reinforced protection of the downstream busbar trunking(kA)	45	45	45	70	70	70	70	70	70

Upstream circuit breaker Associated trip unit	**NS630N** STR23SE/STR53UE			**NS630H** STR23SE/STR53UE			**NS630L** STR23SE/STR53UE		
Upstream busbar trunking	KSA / KVA / KVC 500 and 630 A			KSA / KVA / KVC 500 and 630 A			KSA / KVA / KVC 500 and 630 A		
Level of protection of the upstream busbar trunking (kA)	**45**			**70**			**150**		
Downstream circuit breaker Associated trip unit	**NS100N** TMD / STR22SE 40 A	63 A	100 A	**NS100N** TMD / STR22SE 40 A	63 A	100 A	**NS100N** TMD / STR22SE 40 A	63 A	100 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	45	45	45	70	70	70	150	150	150
Reinforced breaking capacity of the downstream circuit breaker (kA)	45	45	45	70	70	70	150	150	150
Reinforced protection of the downstream busbar trunking(kA)	45	45	45	50	50	50	50	50	50

rated current of the upstream busbar trunking: 315 and 400 A

Upstream circuit breaker Associated trip unit	**NS400N** STR23SE/STR53UE		**NS400H** STR23SE/STR53UE		**NS400L** STR23SE/STR53UE	
Upstream busbar trunking	KSA / KVA / KVC 315 and 400 A		KSA / KVA / KVC 315 and 400 A		KSA / KVA / KVC 315 and 400 A	
Level of protection of the upstream busbar trunking (kA)	**45**		**70**		**150**	
Downstream circuit breaker Associated trip unit	**NS100N** TMD / STR22SE	**NS160N**	**NS100N** TMD / STR22SE	**NS160N**	**NS100H** TMD / STR22SE	**NS160H**
Downstream busbar trunking	KSA 100 A	KSA 160 A	KSA 100 A	KSA 160 A	KSA 100 A	KSA 160 A
Discrimination limit between upstream and downstream circuit breakers (kA)	45	45	70	70	150	150
Reinforced breaking capacity of the downstream circuit breaker (kA)	45	45	70	70	150	150
Reinforced protection of the downstream busbar trunking(kA)	45	45	70	70	70	70

Upstream circuit breaker Associated trip unit	**NS400N** STR23SE/STR53UE			**NS400H** STR23SE/STR53UE			**NS400L** STR23SE/STR53UE		
Upstream busbar trunking	KSA / KVA / KVC 315 and 400 A			KSA / KVA / KVC 315 and 400 A			KSA / KVA / KVC 315 and 400 A		
Level of protection of the upstream busbar trunking (kA)	**45**			**70**			**150**		
Downstream circuit breaker Associated trip unit	**NS100N** TMD / STR22SE 40 A	63 A	100 A	**NS100N** TMD / STR22SE 40 A	63 A	100 A	**NS100N** TMD / STR22SE 40 A	63 A	100 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	45	45	45	70	70	70	150	150	150
Reinforced breaking capacity of the downstream circuit breaker (kA)	45	45	45	70	70	70	150	150	150
Reinforced protection of the downstream busbar trunking(kA)	45	45	45	50	50	50	50	50	50

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems Cascading and reinforced discrimination (cont.)

rated current of the upstream busbar trunking: 200 and 250 A

Upstream circuit breaker	**NS250N**	**NS250H**	**NS250L**
Associated trip unit	TMD / STR22SE	TMD / STR22SE	TMD / STR22SE
Upstream busbar trunking	KSA / KVA / KVC 200 and 250 A	KSA / KVA / KVC 200 and 250 A	KSA / KVA / KVC 200 and 250 A
Level of protection of the upstream busbar trunking (kA)	**36**	**70**	**150**
Downstream circuit breaker	**NS100N**	**NS100N**	**NS100H**
Associated trip unit	TMD / STR22SE	TMD / STR22SE	TMD / STR22SE
Downstream busbar trunking	KSA-10 100 A	KSA-10 100 A	KSA-10 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	36	36	36
Reinforced breaking capacity of the downstream circuit breaker (kA)	36	70	150
Reinforced protection of the downstream busbar trunking(kA)	36	70	70

Upstream circuit breaker	**NS250N**			**NS250H**			**NS250L**		
Associated trip unit	TMD / STR22SE			TMD / STR22SE			TMD / STR22SE		
Upstream busbar trunking	KSA / KVA / KVC 200 and 250 A			KSA / KVA / KVC 200 and 250 A			KSA / KVA / KVC 200 and 250 A		
Level of protection of the upstream busbar trunking (kA)	**36**			**70**			**150**		
Downstream circuit breaker	**NS100N** TMD / STR22SE			**NS100N** TMD / STR22SE			**NS100N** TMD / STR22SE		
Associated trip unit	40 A	63 A	100 A	40 A	63 A	100 A	40 A	63 A	100 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A	KN 40 A	KN 63 A	KN 100 A
Discrimination limit between upstream and downstream circuit breakers (kA)	36	36	36	36	36	36	36	36	36
Reinforced breaking capacity of the downstream circuit breaker (kA)	36	36	36	70	70	70	150	150	150
Reinforced protection of the downstream busbar trunking(kA)	36	36	36	50	50	50	50	50	50

Upstream circuit breaker	**NS250N**			**NS250H**			
Associated trip unit	TMD / STR22SE			TMD / STR22SE			
Upstream busbar trunking	KSA / KVA / KVC 200 and 250 A			KSA / KVA / KVC 200 and 250 A			
Level of protection of the upstream busbar trunking (kA)	**36**			**70**			
Downstream circuit breaker	**C60H**	**C60H**	**NC100L**	**C60H**	**C60H**	**NC100L**	**NC100LH**
Associated trip unit (rating A)	16	25/40	25/40	16	25/40	25/40	25/40
Downstream busbar trunking	KLE 16 A	KBA / KBB 25 - 40 A	KBA / KBB 25 - 40 A	KLE 16 A	KBA / KBB 25 - 40 A	KBA / KBB 25 - 40 A	KBA / KBB 25 - 40 A
Discrimination limit between upstream and downstream circuit breakers (kA)	25	25	36	40	40	50	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	25	25	36	40	40	50	70
Reinforced protection of the downstream busbar trunking(kA)	25	25	36	40	40	50	50

Upstream circuit breaker	**NS250N**				**NS250H**					
Associated trip unit	TMD / STR22SE				TMD / STR22SE					
Upstream busbar trunking	KSA / KVA / KVC 200 and 250 A				KSA / KVA / KVC 200 and 250 A					
Level of protection of the upstream busbar trunking (kA)	**36**				**70**					
Downstream circuit breaker	**C60H**	**C60H**	**NC100L**	**NC100L**	**C60H**	**C60H**	**NC100L**	**NC100L**	**NC100LH**	**NC100LH**
Associated trip unit	40 A	63 A	40 A	63 A	40 A	63 A	40 A	63 A	40 A	63 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 40 A	KN 63 A	KN 40 A	KN 63 A	KN 40 A	KN 63 A	KN 40 A	KN 63 A
Discrimination limit between upstream and downstream circuit breakers (kA)	25	25	36	36	40	30	50	50	70	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	25	25	36	36	40	30	50	50	70	70
Reinforced protection of the downstream busbar trunking(kA)	25	25	36	36	40	30	50	50	50	50

Coordination tables between Merlin Gerin circuit breakers and Telemecanique Canalis busbar trunking systems Cascading and reinforced discrimination (cont.)

rated current of the upstream busbar trunking: 160 A

Upstream circuit breaker **Associated trip unit**	**NS160N** TMD / STR22SE			**NS160H** TMD / STR22SE			
Upstream busbar trunking	KSA 160 A			KSA 160 A			
Level of protection of the upstream busbar trunking (kA)	**36**			**70**			
Downstream circuit breaker **Associated trip unit (rating A)**	**C60H** 16	**C60H** 25/40	**NC100L** 25/40	**C60H** 16	**C60H** 25/40	**NC100L** 25/40	**NC100LH** 25/40
Downstream busbar trunking	KLE 16 A	KBA / KBB 25 - 40 A	KBA / KBB 25 - 40A	KLE 16 A	KBA / KBB 25 - 40 A	KBA / KBB 25 - 40 A	KBA / KBB 25 - 40 A
Discrimination limit between upstream and downstream circuit breakers (kA)	25	25	36	40	40	50	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	25	25	36	40	40	50	70
Reinforced protection of the downstream busbar trunking(kA)	25	25	36	40	40	50	50

Upstream circuit breaker **Associated trip unit**	**NS160N** TMD / STR22SE				**NS160H** TMD / STR22SE					
Upstream busbar trunking	KSA 160 A				KSA 160 A					
Level of protection of the upstream busbar trunking (kA)	**36**				**70**					
Downstream circuit breaker **Associated trip unit**	**C60H** 40 A	**C60H** 63 A	**NC100L** 40 A	**NC100L** 63 A	**C60H** 40 A	**C60H** 63 A	**NC100L** 40 A	**NC100L** 63 A	**NC100LH** 40 A	**NC100LH** 63 A
Downstream busbar trunking	KN 40 A	KN 63 A	KN 40 A	KN 63 A	KN 40 A	KN 63 A	KN 40 A	KN 63 A	KN 40 A	KN 63 A
Discrimination limit between upstream and downstream circuit breakers (kA)	25	25	36	36	40	40	50	50	70	70
Reinforced breaking capacity of the downstream circuit breaker (kA)	25	25	36	36	40	40	50	50	70	70
Reinforced protection of the downstream busbar trunking(kA)	25	25	36	36	40	40	50	50	50	50

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