

Back-up protection

Back-up protection is the technique by which the breaking capacity of a circuit breaker is increased by coordinating it with another protection device, placed upstream. This coordination makes it possible to use a protection device with a breaking capacity which is lower than the maximum prospective short-circuit current at its installation point.

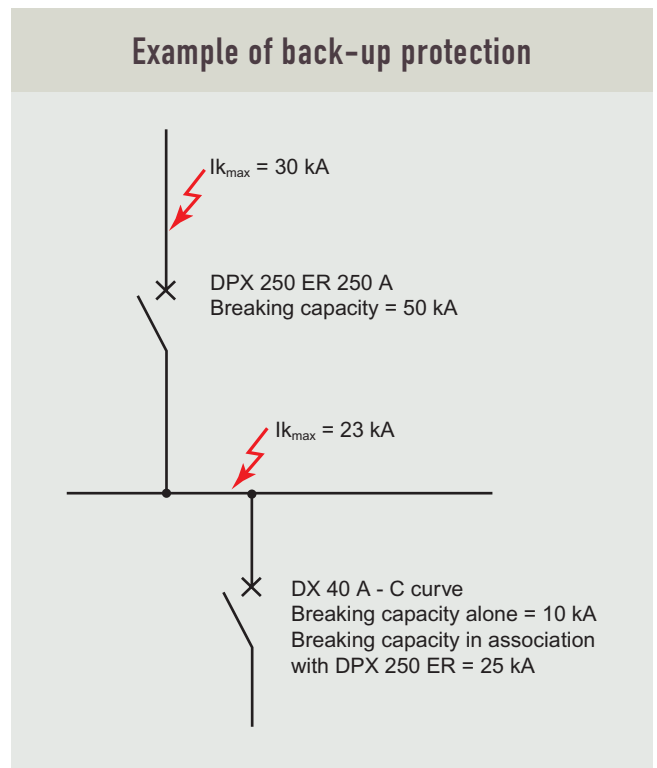
The breaking capacity of a protection device must be at least equal to the maximum short circuit which may occur at the point at which this device is installed. The breaking capacity of a device can be lower than the maximum prospective short circuit (see IEC 60364-4-435), provided that:

- It is combined with a device upstream that has the necessary breaking capacity at its own installation point,
- The downstream device and the protected trunking can withstand the energy limited by the combination of the devices.

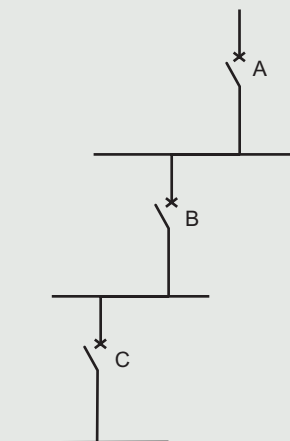
Substantial savings can therefore be made by combining devices.

The Back-up values given in the tables on the following pages are based on laboratory tests carried out in accordance with IEC 60947-2.

! For single phase circuits (protected by 1P+N or 2P circuit breakers) in a 380/415 supply, supplied upstream by a 3-phase circuit, it is advisable to use the combination tables for 230 V.



3-level back-up



A combination may be created on three levels if either of the following conditions is met:

- **Combination with the main device**

Upstream device A must have an adequate breaking capacity at its point of installation. Devices B and C are combined with device A. Simply check that the B + A and C + A combination values have the necessary breaking capacities. In this case, there is no need to check the combination of devices B and C.

- **Cascaded combination**

The combination is made between successive devices: upstream device A has an adequate breaking capacity at its point of installation. Device C is combined with device B, which is itself combined with device A. Simply check that the C + B and B + A combination values have the necessary breaking capacities.

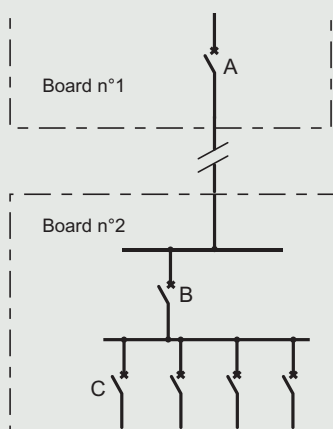
In this case, there is no need to check the combination of devices A and C.

Back-up between distribution boards

Combination applies to devices installed in the same distribution board and also in different boards.

It is therefore generally possible to benefit from the advantages of combining devices located, for example, in a main distribution board and in a secondary board. The upstream device must always have the necessary breaking capacity at its installation point.

It is also possible to benefit from the combination of device B (for example a DX with a breaking capacity of 10 kA) and the secondary devices C (1P+N DX with a breaking capacity of 6 kA) on distribution board no. 2. Under these conditions the DX + DNX combination has a breaking capacity of 25 kA.



Back-up in IT earthing systems

The values given in the tables on the following pages are only for use in TN and TT earthing systems. Although this practice is not widely used, these values may also be used for installations with IT systems. It is therefore advisable to check that each individual protection device can break the maximum double fault current at the point in question on a single pole.

BACK-UP BETWEEN ACBs AND MCCBs

In 3 phases networks

Downstream MCCB	Upstream ACB								
	DMX ³ -N			DMX ³ -H			DMX ³ -L		
	800 & 1000 A	1250 A	1600 to 4000 A	800 & 1000 A	1250 A	1600 to 4000 A	800 & 1000 A	1250 A	1600 to 4000 A
DPX 250	50	50	50	65	65	65	100	100	100
DPX 630	50	50	50	65	65	65	100	100	100
DPX 1250		50	50		65	65		100	100
DPX 1600			50			65			100

Back-up protection (continued)

BACK-UP BETWEEN MCCBs AND MCBs

In 3 phases networks with neutral - 400/415 V - according to IEC 60947-2

MCBs downstream		MCBs/MCCBs upstream							
		DX-H [10000] - 25 kA B and C curves			DX-L		DPX-E 125	DPX 125	DPX 160 DPX-H 160
		2 to 32 A	40 to 125 A	10 to 32 A	40 to 63 A	16 to 125 A	16 to 125 A	25 to 160 A	
DX [6000] - 10 kA B and C curves	1 to 20 A	25 ⁽¹⁾	12.5	50	25	16	25	25	
	25 A	25 ⁽¹⁾	12.5	50	25	16	25	25	
	32 A		12.5		25	16	25	25	
	40 A		12.5		25	16	25	25	
	50 A				25	16	25	20	
	63 A					16	25	15	
	80 A						20	25	
	100 A						20	25	
DX-H [10000] - 25 kA B and C curves DX 6000 - 15 kA D curve	1 to 16 A			50	25	16	25	25	
	20 A			50	25	16	25	20	
	25 A				25	16	25	15	
	32 A				25	16	25	20	
	40 A				25	16	25	20	
	50 A				25	16	25	15	
63 A					16	25	25		
DX-L - 50 kA - C curve	10 to 63 A			50	50			50	

In 3 phases networks with neutral - 230/240 V - according to IEC 60947-2

MCBs downstream		MCBs/MCCBs upstream							
		DX-H [10000] - 25 kA B and C curves			DX-L		DPX-E 125	DPX 125	DPX 160 DPX-H 160
		2 to 32 A	40 to 63 A	80 to 125 A	10 to 32 A	40 to 63 A	16 to 125 A	16 to 125 A	25 to 160 A
DX [6000] - 10 kA B and C curves	1 to 20 A	50	25	20	50	25	22	35	35
	32 & 40 A		25	20		25	22	35	35
	50 A					25	16	25	25
	63 A						16	25	15
	80 A						16	25	25
	100 A						16	25	25
	125 A								25
DX-H [10000] - 25 kA B and C curves DX [6000] - 15 kA D curve	1 to 40 A				50	25	22	35	35
	50 A					25	16	25	25
	63 A						16	25	25
DX-L - 50 kA - C curve	10 to 63 A				70	70			70

TT or TN earthing systems: for a 230/240 V supply, in order to determine the breaking capacity of a 2P MCB used as L+N (230 V) downstream a 2P or 4P circuit breaker use values indicated in the table for 230/240 V network

	DPX 250 ER				DPX/H/L 250		DPX/H/L 630	DPX/H/L 630 electronic		DPX/H/L 1250	DPX/H/L 1600
	63 A	100 A	160 A	250 A	160 A	250 A	250 to 400 A	160 & 400 A	630 A	500 to 1250 A	800 to 1600 A
	25	25	25	25	25	25	25	25	25	25	25
	25	25	25	25	25	25	25	25	25	20	20
	25	25	25	25	25	25	25	25	25	15	15
	25	25	25	25	25	20	20	20	20	15	15
	25	25	20	20	20	15	15	15	15	12.5	12.5
		20	15	15	15	15	15	15	15	12.5	12.5
			20	20	20	20	20	20	15		
			20	20	20	20	20	20	15		
			15	15	15	15	15	15	10		
	25	25	25	25	25	25	25	25	25	25	25
	25	25	25	25	25	25	25	25	25	25	25
	25	25	25	25	25	25	25	25	25	20	20
	25	25	25	25	25	25	25	25	25	15	15
	25	25	25	25	25	20	20	20	20	15	15
	25	25	20	20	20	15	15	15	15	12.5	12.5
	25	20	15	15	15	15	15	15	15	12.5	12.5
	50	50	50	50	50	50	50	50	50	50	50

	DPX 250 ER				DPX/H/L 250			DPX/H/L 630 electronic		DPX/H/L 1250	DPX/H/L 1600
	63 A	100 A	160 A	250 A	160 A	250 A	250 to 400 A	160 & 400 A	630 A	500 to 1250 A	800 to 1600 A
	50	50	50	50	50	50	50	50	50	50	50
	50	50	50	50	50	50	50	50	50	50	50
	36	36	36	36	36	30	30	30	25	25	25
		30	30	30	30	30	30	30	25	25	25
		25	25	25	25	25	25	25	20		
			25	25	25	25	25	25	20		
			25	25	25	25	25	25	20		
	50	50	50	50	50	50	50	50	50	50	50
	36	36	36	36	36	30	30	30	25	25	25
		30	30	30	30	30	30	30	25	25	25
	70	70	70	70	70	70	70	70	70	70	70

Back-up protection (continued)

BACK-UP BETWEEN FUSE CARTRIDGES AND MCBs

**In 3 phases network with neutral
400/415 V according to IEC 60947-2**

MCBs downstream		Fuses upstream gG type	
		20 to 32 A	63 to 160 A
DX [6000] - 10 kA C and D curves	1 to 40 A	100	100
	50 A to 125 A		100
DX-H [10000] - 25 kA B and C curves	2 A to 40 A	100	100
	50 A to 63 A		100
DX-L 50 kA C curve	10 A to 40 A	100	100
	50 A to 63 A		100

**In 3 phases network with neutral
230/240 V according to IEC 60947-2**

MCBs downstream		Fuses upstream gG type	
		20 to 32 A	63 to 160 A
DX [6000] - 10 kA C and D curves	1 to 40 A	100	100
	50 A to 125 A		100
DX-H [10000] - 25 kA B and C curves	2 A to 40 A	100	100
	50 A to 63 A		100
DX-L 50 kA C curve	10 A to 40 A	100	100
	50 A to 63 A		100

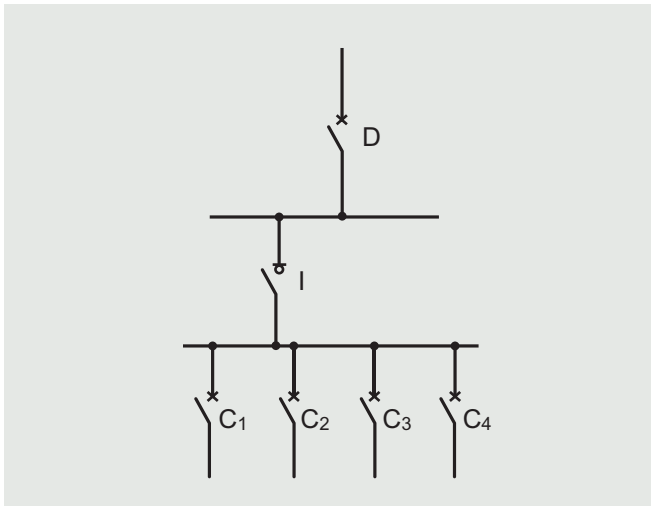
BACK-UP BETWEEN CIRCUIT BREAKERS AND SWITCHES

> Overloads

Switch I is considered to be protected against overloads if its rating is at least equal to that of the upstream circuit breaker D, or if the sum of the currents of the devices C is not greater than the rating of I. If this is not the case, the thermal stresses of the devices and the conductors must be checked.

> Short circuits

In principle, switches must be systematically protected by a circuit breaker placed upstream (see table below). However, it is possible for the protection to be provided by the devices placed downstream, by taking the necessary wiring precautions to prevent any risk of a short circuit between these devices and the switch, which must all be located in the same distribution board.



Back-up between DX circuit breakers and RCCBs (in kA)

Downstream RCCBs	Upstream circuit breakers						
	DX curve C						
	1P + N	< 40 A	50 and 63 A	DX-H ≤ 63 A	DX-H 80-125	DPX 125 A	
2-pole 230 V 4-pole 400 V	16 A	6	10	10	20	20	25
	25 A	6	10	10	20	20	25
	40 A	6	10	10	15	20	25
	63 A		10	10	12.5	12.5	25
	80 A				12.5	12.5	25

Back-up between DPX circuit breakers and DPX-I switches (in kA)

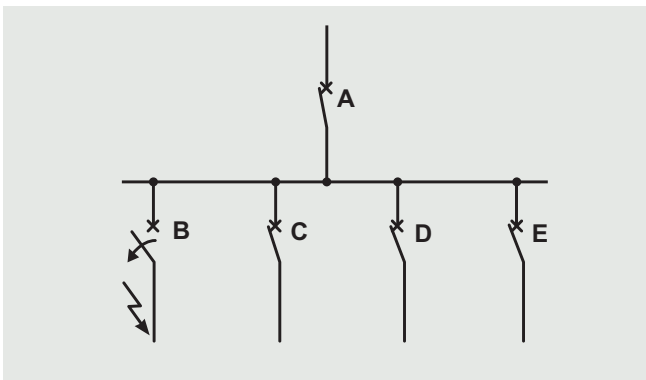
Downstream switch	Upstream circuit breaker														
	DPX 125			DPX 160		DPX 250 ER		DPX 250		DPX 630		DPX 1600 (MT)		DPX 1600 (EI)	
	16 kA	25 kA	36 kA	25 kA	50 kA	25 kA	50 kA	36 kA	70 kA	36 kA	70 kA	50 kA	70 kA	50 kA	70 kA
DPX-I 125	16	25	36	25	50	25	50	36	50	36	70	50	50		
DPX-I 160				25	50	25	50	36	50	36	70	36	50		
DPX-I 250 ER				25	50	25	50	36	50	36	70	36	50		
DPX-I 250								36	70	36	70	50	70		
DPX-I 630 In=400 A										36	70	50	70		
DPX-I 630 In=630 A												50	70		
DPX-I 1600 In=800 A												50	70		
DPX-I 1600 In=1250 A												50	70	20	20
DPX-I 1600 In=1600 A														20	20

Back-up between DPX circuit breakers and Vistop or DPX-I switches (in kA)

Downstream switch	Upstream circuit breaker														
	DPX 125			DPX 160		DPX 250 ER		DPX 250		DPX 630		DPX 1600 (MT)		DPX 1600 (EI)	
	16 kA	25 kA	36 kA	25 kA	50 kA	25 kA	50 kA	36 kA	70 kA	36 kA	70 kA	50 kA	70 kA	50 kA	70 kA
Vistop 63	16	25	36	25	36	25	36	36	50	36	50	36	36	36	36
Vistop 160				25	36	25	36	36	50	36	50	36	36	36	36
DPX-IS 250						25	36	36	50	36	50	36	36	36	36
DPX-IS 400										36	50	50	70	36	36
DPX-IS 630										36	50	50	70	36	50

Selectivity between protection devices

Selectivity is a technique which consists of coordinating the protection in such a way that a fault on one circuit only trips the protection placed nearest to the fault, thus avoiding the rest of the installation being put out of service. Selectivity improves continuity of service and safety of the installation



> Total Selectivity

Selectivity between A and B is said to be “total” if it is provided up to the value of the maximum prospective short circuit at the point at which B is installed. In the selectivity tables, total selectivity “T”, indicates that there is selectivity up to the breaking capacity of device B. When the selectivity tables do not give “T”, the value given must be compared with the prospective short-circuit value at the installation point to check whether the selectivity is total.

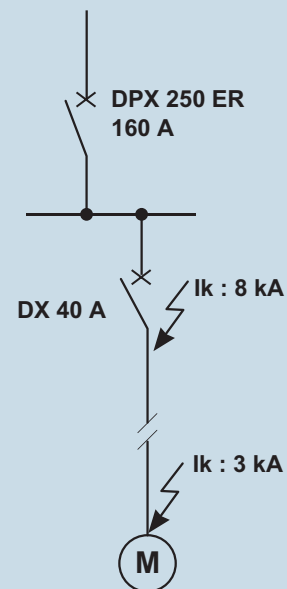
> Partial selectivity

Selectivity between A and B is said to be “partial” when the short-circuit level is higher than the value given in the selectivity tables. This value defines the selectivity limit below which only circuit breaker B will open and above which circuit breaker A will open as well. There are a number of techniques for implementing selectivity:

- Current sensing selectivity, used for terminal circuits which have low short-circuit levels
- Time selectivity, provided by a delay on the tripping of the upstream circuit breaker
- Dynamic selectivity, making optimum use of the characteristics of the Legrand devices
- Logical selectivity, making use of the communication possibilities between devices



Since almost all faults occur during use, partial selectivity may be adequate if the selectivity limit is higher than the value of the maximum short circuit which may occur at the point of use (or at the end of the trunking). This is referred to as “operating selectivity”. This technique is very often adequate, more economical and less restricting in terms of implementation.



The selectivity limit of the combination of the DPX 250 ER 25 kA (160 A) and the DX 10 kA (40 A - curve C) is 6 kA.

As the maximum short-circuit level ($I_{k \max}$) at the installation point is 8 kA, the selectivity is not total.

However, there is total selectivity at the point of use where the prospective short circuit is only 3 kA.

CURRENT SENSING SELECTIVITY

This technique is based on the difference in the intensity of the tripping curves of the upstream and downstream circuit breakers. It is checked by comparing these curves and ensuring that they do not overlap. It applies for the overload zone and the short-circuit zone, and the further apart the ratings of the devices, the better the selectivity.

• Overloads

To have selectivity in the overload zone, the ratio of the setting currents (I_r) must be at least 2.

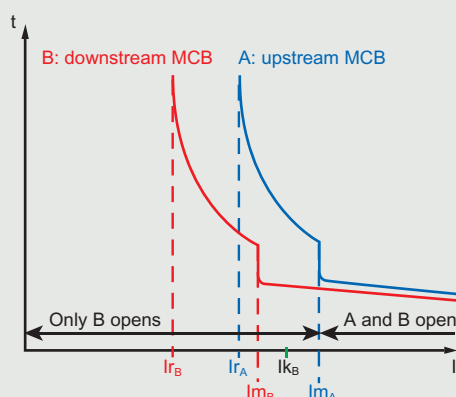
• Short circuits

To have selectivity in the short-circuit zone, the ratio of the magnetic setting currents (I_m) must be at least 1.5.

The selectivity limit is then equal to the magnetic tripping current I_{m_A} of the upstream circuit breaker. The selectivity is then total as long as I_{k_B} is lower than I_{m_A} .

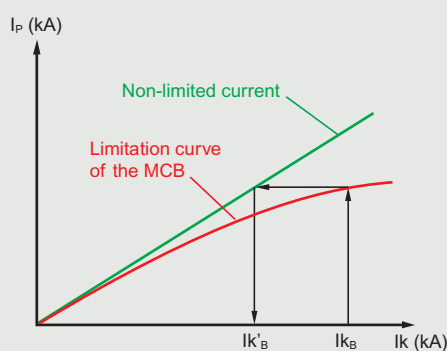
Current sensing selectivity is therefore very suitable for terminal circuits where the short circuits are relatively weak.

Current sensing selectivity



I_{k_B} : maximum short-circuit at the point at which MCB B is installed

The selectivity is total for I_{k_B}



I_{k_B} : prospective short-circuit at the point at which the device is installed
 $I_{k'_B}$: short-circuit limited by device B

When the downstream circuit breaker, B, is a limiting device, the short-circuit current is limited in terms of both time and amplitude. The Selectivity is therefore total if the limited current I_{k_B} which device B allows to pass is lower than the tripping current of device A.

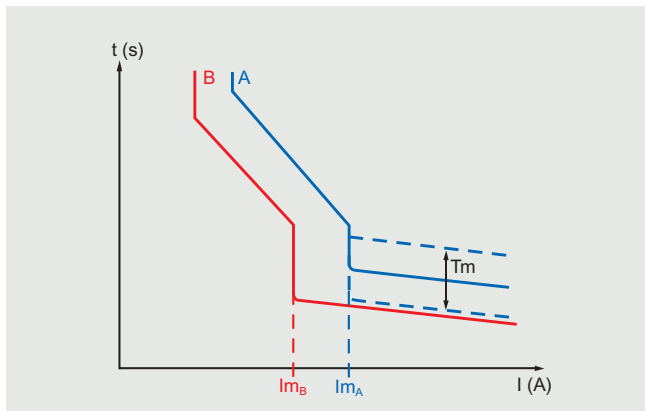
Selectivity between protection devices (continued)

TIME SELECTIVITY

This technique is based on the difference in the times of the tripping curves of the circuit breakers in series. It is checked by comparing the curves and is used for selectivity in the short-circuit zone. It is used in addition to current sensing selectivity in order to obtain selectivity beyond the magnetic setting current of the upstream circuit breaker (I_{m_A}). The following is therefore necessary:

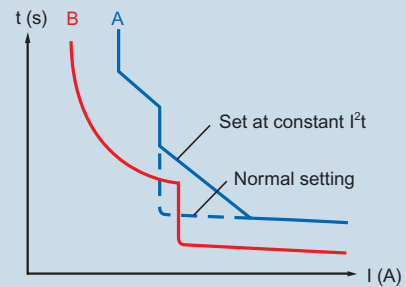
- It must be possible to set a time delay on the upstream circuit breaker
- The upstream circuit breaker must be able to withstand the short-circuit current and its effects for the whole period of the time delay
- The trunking through which the current passes must

be able to withstand the thermal stresses (I^2t). The non-tripping time of the upstream device must be longer than the breaking time (including any time delay) of the downstream device. DPX and DMX³ circuit breakers have a number of time delay setting positions for creating selectivity with a number of stages.



Electronic releases with constant I^2t setting

The use of circuit breakers with electronic releases on which a constant I^2t setting is possible improves the selectivity.



Removal of the unwanted short delay section of the tripping curve on the upstream circuit breaker avoids overlapping of the tripping curves. This option is available on DMX³ and S2 electronic DPX.

DYNAMIC SELECTIVITY

Dynamic selectivity is a particular type of selectivity developed by Legrand. It is based on making maximum use of the limitation characteristics of moulded case circuit breakers and extends the concept of time coordination to the highest short-circuit currents.

Dynamic selectivity is implemented between two levels of circuit breakers by installing:

- Upstream: electronic DPX circuit breakers with S1 or S2 type releases.
- Downstream: electronic DPX circuit breakers with S1

or S2 type releases, or thermal-magnetic DPX or even DX circuit breakers.

Each type S1 and S2 electronic release has a rotary selector switch SEL with two positions:

- High: to obtain high levels of selectivity
 - Low: to obtain standard levels of selectivity.
- The electronic DPX circuit breaker set to "SEL = High" inserts a short activation delay which enables high levels of selectivity to be achieved even for high intensity short-circuit currents.



This solution is particularly advisable for installations characterised by high short-circuit current values, where the circuit breakers concerned by the two levels of dynamic selectivity are in the same consumer unit, and when the line to be protected has one of the following characteristics:

- Length \leq 3 metres
- Double insulation (if the line to be protected is a cable).

Before studying the dynamic selectivity, the time selectivity in the medium intensity short-circuit intervention zone must be checked on the tripping curves. When this condition has been checked, the following rules must be applied:

- The SEL selector switch on the electronic DPX installed upstream of the selectivity system must be set to "High"
- The circuit breaker installed downstream of the selectivity system can be an electronic DPX with the SEL selector switch set to "Low", a thermal-magnetic DPX or a DX.



Advantages

- Higher selectivity limits (for high intensity short-circuit currents) than the conventional current sensing selectivity limits
- Better continuity of service and safer than with current sensing selectivity
- Flexible, simple and economical solution

Disadvantages

- Two-level selectivity only
- Introduction of a short activation delay with a consequence on the thermal stress limitation curves

Examples of dynamic selectivity between two levels

Upstream

- A: electronic DPX with "S2" release and the SEL selector switch set to High ($t_m = 0.2$, considered to be result of the previous time selectivity study on medium intensity short circuit)

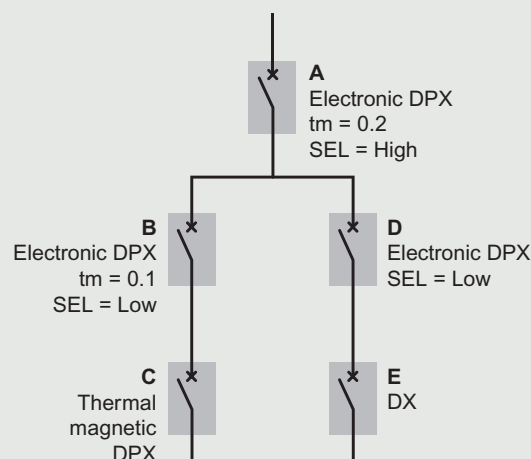
Downstream

- B: electronic DPX with "S2" release and the SEL selector switch set to Low ($t_m = 0.1$, considered to be result of the previous time selectivity study on medium intensity short circuit)

- D: electronic DPX with "S1" release and SEL selector switch set to Low.

It is possible to install other circuit breakers downstream of the two dynamic selectivity levels: C (thermal-magnetic DPX) and E (DX).

For high intensity short-circuit currents downstream of C or downstream of E, the selectivity with the upstream devices is no longer dynamic but current sensing.



Selectivity between protection devices (continued)

LOGICAL SELECTIVITY

Logical selectivity is an “intelligent” type of selectivity performed by exchanging data between electronic DPX or DMX³ linked by an external connection.

Logical selectivity concentrates on the medium and high intensity short-circuit zone.

Thus, if there is a short circuit, the part of the installation affected by the fault is immediately identified and isolated using the circuit breaker placed directly upstream.

This acts immediately, without taking account of the various time delay settings, which therefore reduces to the absolute minimum, the time taken to eliminate the fault. This enables the following:

- Selectivity on several levels, in addition to the various time delays
- Considerable reduction of the thermal and electrodynamic stresses in the cables or bars, and thus optimisation of the dimensions of the installation.

Logical selectivity can be implemented using:

- Electronic DPX circuit breakers with S2 protection unit, with a 12 V DC external auxiliary power supply.
- DMX³ circuit breakers with MP4 or MP6 electronic protection unit.

If there is a short circuit (medium or high intensity) in the installation, the logical selectivity operating principle is as follows:

- The circuit breaker that detects the short-circuit current sends a signal, via the connecting cable, to the circuit breaker located immediately upstream, while checking that there is no signal from a device located downstream.
- If the circuit breaker that detected the fault does not receive any command from a device downstream, it operates immediately without taking account of any programmed time delays (eg: T_m and/or $SEL = High$).
- However, if the circuit breaker in question receives a signal from a downstream device, it will remain closed, keeping to the programmed time delays (eg: T_m and/or $SEL = High$).



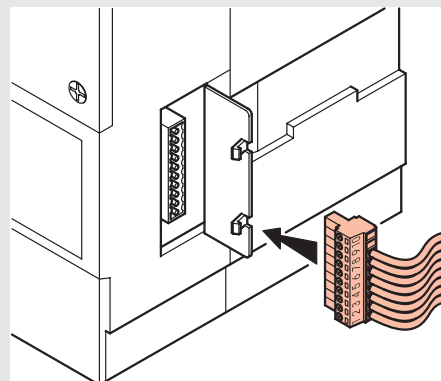
Application rules

- To ensure logical selectivity on medium intensity short circuits, the constant time tripping curve (T_m) must be used. Using the constant I^2t curve does not allow correct operation of the logical selectivity
- All the circuit breakers on the logical selectivity system, apart from the last device on the system, must have the SEL selector switch set to High, with T_m equal to or greater than 100 ms.
- The time delay settings T_m of the circuit breakers installed at the same level in the logical selectivity system (apart from the last level) can be identical.
- All the circuit breakers located at the last level of the logical selectivity system must have the SEL selector switch set to Low, with a T_m lower than that of the circuit breakers at higher levels.

Connection to electronic DPX

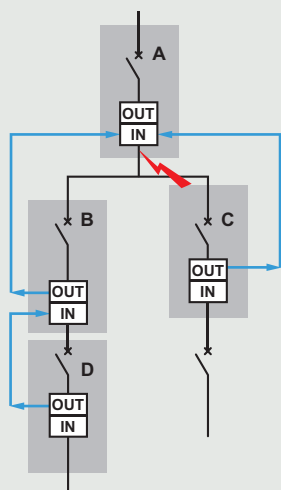
Each electronic DPX (version S2) has the following:

- On the front panel:
 - A two-position selector switch SEL, which can be set to High and Low
- On the side-mounted draw-out terminal block:
 - 2 logical selectivity inputs, intended for the link with the circuit breakers located downstream
 - 2 logical selectivity outputs, intended for the link with the circuit breakers located upstream



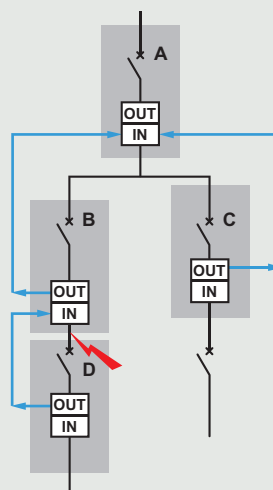
Examples of 3-level logical selectivity

■ Fault 1: short circuit downstream of A



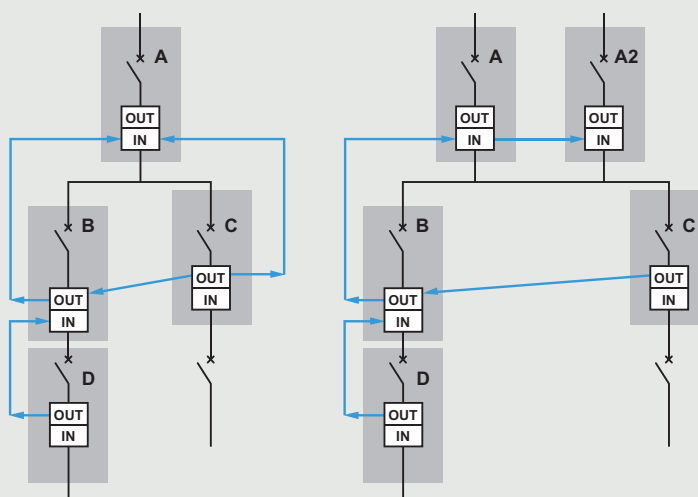
Only circuit breaker A detects the fault. Since it does not receive any signal from the circuit breakers downstream, it trips immediately, without taking account of the various programmed time delays.

■ Fault 2: short circuit downstream of B



Circuit breakers A and B detect the fault. Circuit breaker A receives a signal from the downstream circuit breaker B. It therefore remains closed, keeping to the programmed time delays. However, since circuit breaker B does not receive any signal from the circuit breakers downstream, it trips immediately, without taking account of the various programmed time delays.

In both the cases described above, to prevent a double connection to circuit breaker A, it is also possible to use the following wiring:



Selectivity between protection devices (continued)

Technical data	
Maximum number of electronic DPX that can be connected	unlimited
Maximum total length of the wired link	unlimited
Maximum length of the wired link between two devices	30 metres
Type of cable and installation	CU cable 1.5 mm ² or shielded cable

Logical selectivity is particularly suitable for installations characterised by high short-circuit current values and with high continuity of service requirements.



■ Advantages

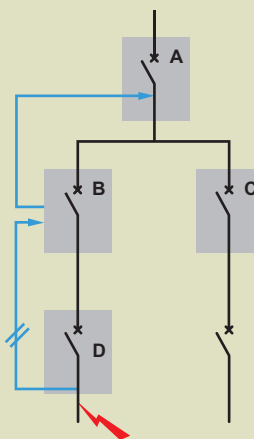
- Reduction of the thermal and electrodynamic stresses on the cables or bars, thus optimising the dimensions of the installation
- Creation of selectivity on a number of levels, in addition to the various time delays provided by the time selectivity.

■ Disadvantages

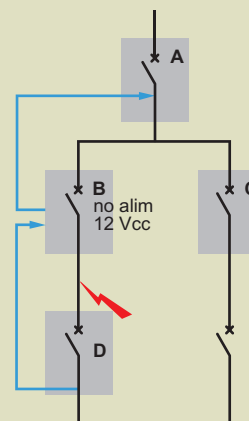
- Need for an auxiliary power supply and a wired link between the circuit breakers
- DPX must be fitted with type S2 electronic protection.

! What happens if there is a break in the wired link or the auxiliary power supply?

In both cases, there is no longer selectivity between the circuit breakers.



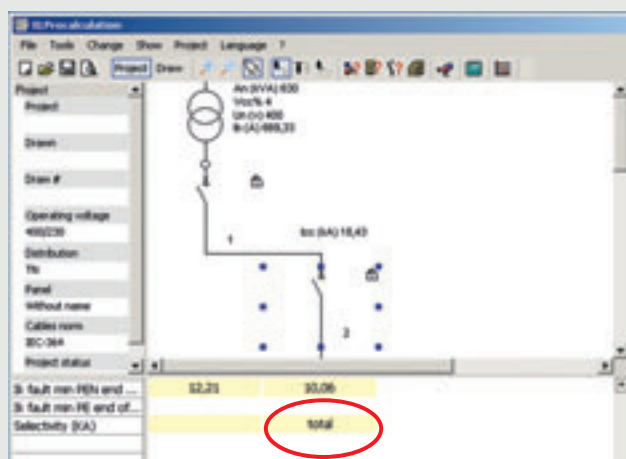
■ Situation 1: If there is a break in the logical selectivity wired link between D and B, in the event of a short circuit downstream of D, B will act immediately without taking account of any programmed time delays, thus ensuring the installation is protected.



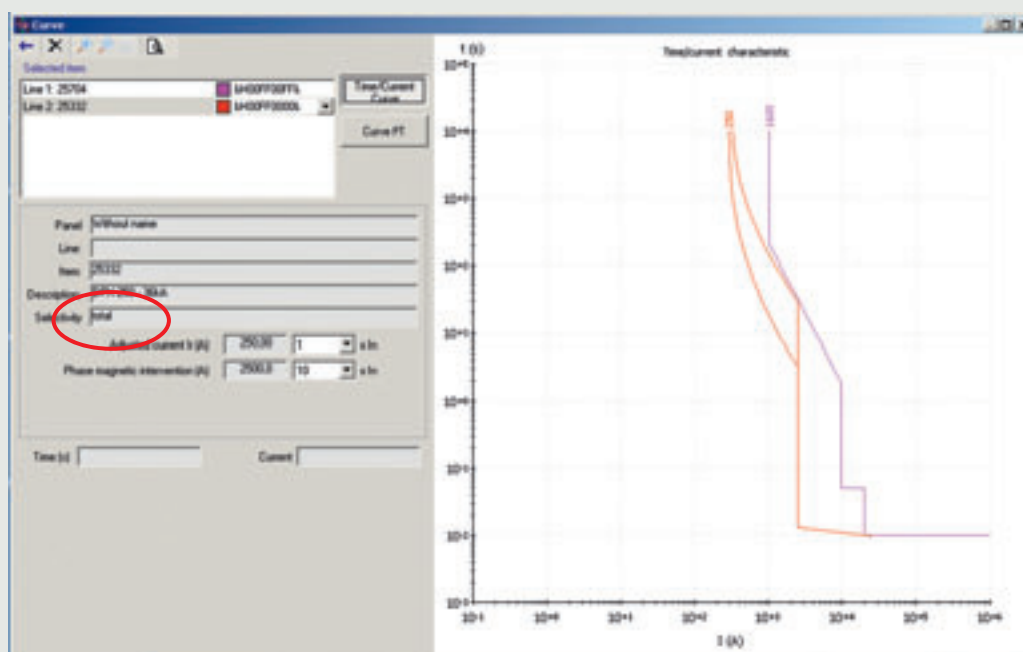
■ Situation 2: If there is a break in the 12 V DC auxiliary power supply of B, in the event of a short circuit downstream of B, A will act immediately, thus ensuring the installation is protected.

Checking selectivity with XL Pro² Calculation

Legrand software “XL Pro² Calculation” offers several ways to check the selectivity. In the example below, with a 630 kVA transformer, the selectivity is total between the upstream DPX 1600 breaker and the downstream DPX 630.



< The selectivity can be checked directly in the resulting data of the concerned line . . .



< . . . or drawing and comparing the tripping curves of the circuit breakers

Selectivity between protection devices (continued)

SELECTIVITY TABLES (3-phase network 400/415 V AC)

DMX ³ / DMX ³									
Downstream ACB		Upstream ACB							
		DMX ³ 2500					DMX ³ 4000		
		800 A	1000 A	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A
DMX ³ 2500	800 A		T	T	T	T	T	T	T
	1000 A			T	T	T	T	T	T
	1250 A				T	T	T	T	T
	1600 A					T	T	T	T
	2000 A						T	T	T
DMX ³ 4000	2500 A						T	T	T
	3200 A								T
	4000 A								

DMX ³ / DX and DMX ³ / DPX									
Downstream MCCB		Upstream ACB							
		DMX ³ 2500					DMX ³ 4000		
		800 A	1000 A	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A
DX/DX-H/DX-L		T	T	T	T	T	T	T	T
DPX 125/160/250 ER ⁽¹⁾		T	T	T	T	T	T	T	T
DPX 250 ⁽¹⁾		T	T	T	T	T	T	T	T
DPX 630 ⁽¹⁾		T	T	T	T	T	T	T	T
DPX 1250 ⁽¹⁾ thermal magnetic	630 A	T	T	T	T	T	T	T	T
	800 A		T	T	T	T	T	T	T
	1000 A			T	T	T	T	T	T
	1250 A				T	T	T	T	T
DPX 1600 ⁽¹⁾ electronic	630 & 800 A			T	T	T	T	T	T
	1000 A				T	T	T	T	T
	1250 & 1600 A				T	T	T	T	T

(1) All breaking capacity

DMX-E / DMX-E					
Downstream DMX-E	Upstream DMX-E				
	1600 A	2000 A	2500 A	3200 A	4000 A
800 A	T	T	T	T	T
1000 A		T	T	T	T
1250 A			T	T	T
1600 A				T	T
2000 A					T

DMX-E / DPX				
Downstream MCCB	Upstream DMX-E			
	800 & 1000 A	1250 A	1600 to 2500 A	3200 & 4000 A
DPX 125/160/250 ER	T	T	T	T
DPX 630	250 to 400 A	T	T	T
	630 A		T	T
DPX 1600	800 A		T	T
	1250 to 1600 A			T

Thermal-magnetic DPX / DPX																								
Upstream MCCB	DPX 125 (16, 25, 36 kA)				DPX 160/250 ER (25, 36, 50 kA)				DPX 250 DPX-H 250				DPX 630 DPX-H 630					DPX 1250 DPX-H 1250						
In (A)	40	63	100	125	63	100	160	250	63	100	160	250	250	320	400	500	630	800	1000	1250				
I _{st} ⁽¹⁾ (kA)	0.8	0.95	1.25	1.25	0.63	1	1.6	2.5	0.63	1	1.6	2.5	2.5	3.2	4	5	6.3	8	6	7.5				
Downstream MCCB																								
DPX 125 (16 kA)	16	0.8	1	1.2	1.2	0.63	1	1.6	2.5	0.63	1	1.6	2.5	6	6	6	6	8	T	T	T			
	25	0.8	1	1.2	1.2		1	1.6	2.5		1	1.6	2.5	6	6	6	6	8	T	T	T			
	40		1	1.2	1.2		1	1.6	2.5		1	1.6	2.5	6	6	6	6	8	T	T	T			
	63			1.2	1.2			1.6	2.5			1.6	2.5	6	6	6	6	8	T	T	T			
	100							1.6	2.5			1.6	2.5	4	4	4	4	6	8	T	T	T		
125							1.6	2.5			1.6	2.5	4	4	4	4	6	8	T	T	T			
DPX 125 (25, 36 kA)	16	0.8	1	1.2	1.2	0.63	1	1.6	2.5	0.63	1	1.6	2.5	6	6	6	6	8	16	16	16			
	25	0.8	1	1.2	1.2		1	1.6	2.5		1	1.6	2.5	6	6	6	6	8	16	16	16			
	40		1	1.2	1.2		1	1.6	2.5		1	1.6	2.5	6	6	6	6	8	16	16	16			
	63			1.2	1.2			1.6	2.5			1.6	2.5	6	6	6	6	8	16	16	16			
	100							1.6	2.5			1.6	2.5	4	4	4	4	6	8	16	16	16		
125							1.6	2.5			1.6	2.5	4	4	4	4	6	8	16	16	16			
DPX 160 DPX 250 ER (25, 36 kA)	63						1	1.6	2.5		1	1.6	2.5	4	4	4	4	6	8	16	16	16		
	100							1.6	2.5			1.6	2.5	2.5	3.2	4	5	6.3	16	16	16			
	160								2.5				2.5	2.5	3.2	4	5	6.3	16	16	16			
	250													3.2	4	5	6.3	16	16	16				
DPX 160 DPX 250ER (50 kA)	40				0.63	1	1.6	2.5	0.63	1	1.6	2.5	2.5	3.2	4	5	6.3	16	16	16				
	63					1	1.6	2.5		1	1.6	2.5	2.5	3.2	4	5	6.3	16	16	16				
	100						1.6	2.5			1.6	2.5	2.5	3.2	4	5	6.3	16	16	16				
	160							2.5				2.5	2.5	3.2	4	5	6.3	16	16	16				
250													3.2	4	5	6.3	16	16	16					
DPX 250 DPX-H 250 DPX-L 250	40								0.63	1	1.6	2.5	2.5	3.2	4	5	6.3	16	16	16				
	63									1	1.6	2.5	2.5	3.2	4	5	6.3	16	16	16				
	100										1.6	2.5	2.5	3.2	4	5	6.3	16	16	16				
	160											2.5	2.5	3.2	4	5	6.3	16	16	16				
	250													3.2	4	5	6.3	16	16	16				
DPX 250 DPX-H 250 DPX-L 250 elec S1/S2 ⁽²⁾	40													3.2	4	5	6.3	16	16	16				
	100													3.2	4	5	6.3	16	16	16				
	160													3.2	4	5	6.3	16	16	16				
	250													3.2	4	5	6.3	16	16	16				
DPX 630 DPX-H 630 DPX-L 630	250																	6.3	8	6	8			
	400																	6.3	8	6	8			
	500																		8	6	8			
	630																			10	6	7.5		
	630																				10	6	7.5	
DPX 630 elec S1/S2 ⁽²⁾	250																				6.3	8	6	8
	400																				6.3	8	6	8
	630																				8	6	8	
DPX-H 630 DPX-L 630 elec S1/S2 ⁽²⁾	400																				6.3	8	6	8
	630																				8	6	8	
DPX 1250 DPX-H 1250	800																					7.5	7.5	
	1000																						7.5	
	1250																							

(1) Standard factory setting of magnetic threshold I_m

(2) Selectivity low

Selectivity between protection devices (continued)

Electronic DPX (SEL: LOW) / DPX												
Upstream MCCB electronic SEL: LOW	DPX 250 S1/S2 DPX-H 250 S1/S2				DPX 630 DPX-H 630 S1/S2			DPX 1600 DPX-H 1600 S1	DPX 1600 DPX-H 1600 S2	DPX 1600 DPX-H 1600 S1/S2		
In (A)	40	100	160	250	250	400	630	800	800	1250	1600	
I _{st} ⁽¹⁾ (kA)	3.5	3.5	3.5	3.5	5	5	5	10	10	15	20	
Downstream MCCB												
DPX 125 (16 kA)	16	3.5	3.5	3.5	3.5	8	8	8	T	T	T	T
	25	3.5	3.5	3.5	3.5	8	8	8	T	T	T	T
	40		3.5	3.5	3.5	6	6	6	T	T	T	T
	63		3.5	3.5	3.5	6	6	6	T	T	T	T
	100			3.5	3.5	6	6	6	T	T	T	T
	125			3.5	3.5	6	6	6	T	T	T	T
DPX 125 (25 kA)	16	3.5	3.5	3.5	3.5	8	8	8	T	T	T	T
	25	3.5	3.5	3.5	3.5	8	8	8	T	T	T	T
	40		3.5	3.5	3.5	6	6	6	T	T	T	T
	63		3.5	3.5	3.5	6	6	6	T	T	T	T
	100			3.5	3.5	6	6	6	T	T	T	T
	125			3.5	3.5	6	6	6	T	T	T	T
DPX 125 (36 kA)	16	3.5	3.5	3.5	3.5	8	8	8	25	T	T	T
	25	3.5	3.5	3.5	3.5	8	8	8	25	T	T	T
	40		3.5	3.5	3.5	6	6	6	25	T	T	T
	63		3.5	3.5	3.5	6	6	6	25	T	T	T
	100			3.5	3.5	6	6	6	25	T	T	T
	125			3.5	3.5	6	6	6	25	T	T	T
DPX 160 DPX 250ER (25 kA)	63		3.5	3.5	3.5	6	6	6	20	T	T	T
	100			3.5	3.5	6	6	6	20	T	T	T
	160				3.5	6	6	6	20	T	T	T
	250					6	6	6	20	T	T	T
DPX 160 DPX 250ER (36 kA)	63		3.5	3.5	3.5	6	6	6	20	T	T	T
	100			3.5	3.5	6	6	6	20	T	T	T
	160				3.5	6	6	6	20	T	T	T
	250			3.5	3.5	6	6	6	20	T	T	T
DPX 160 DPX 250ER (50 kA)	40		3.5	3.5	3.5	8	8	8	20	T	T	T
	63		3.5	3.5	3.5	6	6	6	20	T	T	T
	100			3.5	3.5	6	6	6	20	T	T	T
	160				3.5	6	6	6	20	T	T	T
DPX 250 (36 kA)	250					6	6	6	20	T	T	T
	40		3.5	3.5	3.5	8	8	8	20	T	T	T
	63		3.5	3.5	3.5	8	8	8	20	T	T	T
	100			3.5	3.5	8	8	8	20	T	T	T
	160				3.5	8	8	8	20	T	T	T
DPX 250 S1/S2 (36 kA)	40		1	1.6	2.5	8	8	8	20	T	T	T
	100			1.6	2.5	6	8	8	20	T	T	T
	160				2.5	6	8	8	20	T	T	T
	250					6	6	6	20	T	T	T

[1] Standard factory setting of magnetic threshold I_m

Electronic DPX (SEL: LOW) / DPX (continued)												
Upstream MCCB electronic SEL: LOW	DPX 250 S1/S2 DPX-H 250 S1/S2				DPX 630 DPX-H 630 S1/S2			DPX 1600 DPX-H 1600 S1	DPX 1600 DPX-H 1600 S2	DPX 1600 DPX-H 1600 S1/S2		
In (A)	40	100	160	250	250	400	630	800	800	1250	1600	
Ist ⁽¹⁾ (kA)	3.5	3.5	3.5	3.5	5	5	5	10	10	15	20	
Downstream MCCB												
DPX-H 250 (70 kA)	40	3.5	3.5	3.5	8	8	8	20	30	30	36	
	63	3.5	3.5	3.5	8	8	8	20	30	30	36	
	100		3.5	3.5	8	8	8	20	30	30	36	
	160			3.5	8	8	8	20	30	30	36	
	250					6	6	20	30	30	36	
DPX-H 250 S1/S2 (70 kA)	40	1	1.6	2.5	8	8	8	20	30	30	36	
	100		1.6	2.5	6	6	6	20	30	30	36	
	160			2.5	6	6	6	20	30	30	36	
	250					6	6	20	30	30	36	
DPX 630 (36 kA)	250					6	6	15	20	20	T	
	400						6	15	20	20	T	
	500							10	20	20	T	
	630							10	20	20	T	
DPX-H 630 (70 kA)	250					6	6	15	20	20	36	
	320					6	6	15	20	20	36	
	400						6	15	20	20	36	
	500							10	20	20	36	
	630							10	20	20	36	
DPX 630 S1/S2 (36 kA) ⁽²⁾	250					5	5	15	20	20	T	
	400						5	15	20	20	T	
	630							15	20	20	T	
DPX-H 630 S1/S2 (70 kA) ⁽²⁾	400						5	15	20	20	36	
	630							15	20	20	36	
DPX 1250 (50 kA)	800									20	20	
	1000									20	20	
	1250										20	
DPX-H 1250 (70 kA)	500							15	20	20	20	
	630							15	20	20	20	
	800									20	20	
	1000									20	20	
	1250										20	
DPX/DPX-H 1600 S1 (50/70 kA) ⁽²⁾	800									15	20	
DPX/DPX-H 1600 S2 (50/70 kA) ⁽²⁾	800									15	20	
DPX/DPX-H 1600 S1/S2 (50/70 kA) ⁽²⁾	1250										20	
	1600											

(1) Standard factory setting of magnetic threshold Im

(2) Selectivity low

Selectivity between protection devices (continued)

Electronic DPX (SEL: HIGH) / DPX												
Upstream MCCB electronic SEL: HIGH	DPX 250 S1/S2 DPX-H 250 S1/S2				DPX 630 DPX-H 630 S1/S2			DPX 1600 DPX-H 1600 S1	DPX 1600 DPX-H 1600 S2	DPX 1600 DPX-H 1600 S1/S2		
In (A)	40	100	160	250	250	400	630	800	800	1250	1600	
I _{st} ⁽¹⁾ (kA)	3.5	3.5	3.5	3.5	5	5	5	10	10	15	20	
Downstream MCCB												
DPX 125 (16 kA)	16	T	T	T	T	T	T	T	T	T	T	T
	25	T	T	T	T	T	T	T	T	T	T	T
	40		T	T	T	T	T	T	T	T	T	T
	63		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	T	T	T
DPX 125 (25 kA)	16	T	T	T	T	T	T	T	T	T	T	T
	25	T	T	T	T	T	T	T	T	T	T	T
	40		T	T	T	T	T	T	T	T	T	T
	63		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	T	T	T
DPX 125 (36 kA)	16	25	25	25	25	T	T	T	T	T	T	T
	25	25	25	25	25	T	T	T	T	T	T	T
	40		25	25	25	T	T	T	T	T	T	T
	63		25	25	25	T	T	T	T	T	T	T
	100			25	25	T	T	T	T	T	T	T
	125			25	25	T	T	T	T	T	T	T
DPX 160 DPX 250ER (25 kA)	63		25	25	25	T	T	T	T	T	T	T
	100			25	25	T	T	T	T	T	T	T
	160				25	T	T	T	T	T	T	T
	250					T	T	T	T	T	T	T
DPX 160 DPX 250ER (36 kA)	63		25	25	25	T	T	T	T	T	T	T
	100			25	25	T	T	T	T	T	T	T
	160				25	T	T	T	T	T	T	T
	250					T	T	T	T	T	T	T
DPX 160 DPX 250ER (50 kA)	40		25	25	25	36	36	36	36	36	36	36
	63		25	25	25	36	36	36	36	36	36	36
	100			25	25	36	36	36	36	36	36	36
	160				25	36	36	36	36	36	36	36
	250					36	36	36	36	36	36	36
DPX 250 (36 kA)	40		36	36	36	T	T	T	T	T	T	T
	63		36	36	36	T	T	T	T	T	T	T
	100			36	36	T	T	T	T	T	T	T
	160				36	T	T	T	T	T	T	T
	250					T	T	T	T	T	T	T
DPX 250 S1/S2 (36 kA)	40		T	T	T	T	T	T	T	T	T	T
	100			T	T	T	T	T	T	T	T	T
	160				T	T	T	T	T	T	T	T
	250					T	T	T	T	T	T	T

[1] Standard factory setting of magnetic threshold I_m

Electronic DPX (SEL: HIGH) / DPX (continued)												
Upstream MCCB electronic SEL: HIGH	DPX 250 S1/S2 DPX-H 250 S1/S2				DPX 630 DPX-H 630 S1/S2			DPX 1600 DPX-H 1600 S1	DPX 1600 DPX-H 1600 S2	DPX 1600 DPX-H 1600 S1/S2		
In (A)	40	100	160	250	250	400	630	800	800	1250	1600	
Ist ⁽¹⁾ (kA)	3.5	3.5	3.5	3.5	5	5	5	10	10	15	20	
Downstream MCCB												
DPX-H 250 (70 kA)	40		36	36	36	36	36	36	36	36	36	36
	63		36	36	36	36	36	36	36	36	36	36
	100			36	36	36	36	36	36	36	36	36
	160				36	36	36	36	36	36	36	36
	250					36	36	36	36	36	36	36
DPX-H 250 S1/S2 (70 kA)	40				36	36	36	36	36	36	36	36
	100				36	36	36	36	36	36	36	36
	160				36	36	36	36	36	36	36	36
	250					36	36	36	36	36	36	36
DPX 630 (36 kA)	250							T	T	T	T	
	400							T	T	T	T	
	500							T	T	T	T	
	630							T	T	T	T	
DPX-H 630 (70 kA)	250					25	25	36	36	36	36	
	320					25	25	36	36	36	36	
	400						25	36	36	36	36	
	500						25	36	36	36	36	
	630							36	36	36	36	
DPX-H 630 S1/S2 (36 kA) ⁽²⁾	250							T	T ⁽²⁾	T ⁽²⁾	T ⁽²⁾	
	400							T	T ⁽²⁾	T ⁽²⁾	T ⁽²⁾	
	630							T	T ⁽²⁾	T ⁽²⁾	T ⁽²⁾	
DPX 630 S1/S2 (70 kA) ⁽²⁾	400					25		36	36 ⁽²⁾	36 ⁽²⁾	36 ⁽²⁾	
	630							36	36 ⁽²⁾	36 ⁽²⁾	36 ⁽²⁾	
DPX 1250 (50 kA)	800									36	36	
	1000									36	36	
	1250										36	
DPX-H 1250 (70 kA)	500							36	36	36	36	
	630							36	36	36	36	
	800									36	36	
	1000									36	36	
	1250										36	
DPX/DPX-H 1600 S1 (50/70 kA) ⁽²⁾	800									36	36	
DPX/DPX-H 1600 S2 (50/70 kA) ⁽²⁾	800									36 ⁽²⁾	36 ⁽²⁾	
DPX/DPX-H 1600 S1/S2 (50/70 kA) ⁽²⁾	1250										36 ⁽²⁾	
	1600											

(1) Standard factory setting of magnetic threshold Im

(2) Selectivity low

Selectivity between protection devices (continued)

MCCBs / MCBs													
		Upstream MCCBs											
		DPX 125 (16/25/36 kA)						DPX 160 (25/36/50 kA)			DPX 250 ER (25/36/50 kA)		
Downstream MCBs	In	16 A	25 A	40 A	63 A	100 A	125 A	63 A	100 A	160 A	100 A	160 A	250 A
LR 6000 DX 6000 6 kA DX 6000 10 kA DX-H 10 000 - 25 kA⁽¹⁾ B and C curves	1 A	T	T	T	T	T	T	T	T	T	T	T	T
	2 A	T	T	T	T	T	T	T	T	T	T	T	T
	3 A	T	T	T	T	T	T	T	T	T	T	T	T
	4 A	T	T	T	T	T	T	T	T	T	T	T	T
	6 A	6000	6000	6000	6000	T	T	T	T	T	T	T	T
	10 A	5000	5000	5000	5000	7500	7500	7500	7000	T	T	T	T
	16 A		4000	4000	4000	6000	6000	6000	6000	T	T	T	T
	20 A		3000	3000	3000	5000	5000	5000	5000	T	8000	T	T
	25 A			3000	3000	4500	4000	4500	4500	8500	6000	8500	T
	32 A				2000	4000	4000	4000	4000	7000	5000	7000	T
	40 A				2000	3000	3000	3000	3000	6000	4000	6000	T
	50 A					3000	3000	3000	3000	5500	4000	5500	7000
	63 A					3000	3000	3000	3000	5000	3000	5000	6000
80 A						2000	2000	2000	5000	2500	5000	6000	
100 A									4000		4000	5000	
125 A									2000		2000	3000	
DX 6000 D curve	1 A			T	T	T	T	T	T	T	T	T	T
	2 A			T	T	T	T	T	T	T	T	T	T
	3 A			T	T	T	T	T	T	T	T	T	T
	6 A			6000	6000	T	T	T	T	T	T	T	T
	10 A			5000	5000	7500	7500	7500	7500	T	T	T	T
	16 A			4000	4000	6000	6000	6000	6000	T	6000	T	T
	20 A			3000	3000	5000	5000	5000	5000	T	6000	T	T
	25 A			3000	3000	4500	4500	4500	4500	8500	5500	8500	T
	32 A				2000	4000	4000	4000	4000	7000	4500	7000	T
	40 A				2000	3000	3000	3000	3000	6000	4500	6000	T
	50 A					3000	3000	3000	3000	5500	3500	5500	T
	63 A					3000	3000	3000	3000	5000	3500	5000	6000
	80 A						1500			4000		4000	5000
100 A									3000		3000	4000	
125 A									1500		1500	2000	
DX-L 50 kA C curve	10 A							T	T	T	T	T	T
	16 A							T	T	T	T	T	T
	20 A							20000	20000	T	22000	T	T
	25 A							15000	15000	T	18000	T	T
	32 A							10000	10000	20000	13000	T	T
	40 A							7000	7000	17000	8000	20000	20000
	50 A							3000	3000	8000	4000	10000	20000
63 A							3000	3000	8000	4000	10000	15000	

(1) For breaking capacity of DX-H MCBs, according to IEC 60947-2

	DPX 250 (36 kA) DPX-H 250 (70 kA)				DPX 630 (36 kA) DPX-H 630 (70 kA)			DPX 1250/1600 (50 kA) DPX-H 1250/1600 (70 kA)			
	40 A	63 A	100 A	160 A	250 A	250 A	400 A	630 A	800 A	1000 A	1250 A
	T	T	T	T	T	T	T	T	T	T	T
	T	T	T	T	T	T	T	T	T	T	T
	T	T	T	T	T	T	T	T	T	T	T
	T	T	T	T	T	T	T	T	T	T	T
	6000	6000	T	T	T	T	T	T	T	T	T
	5000	5000	T	T	T	T	T	T	T	T	T
	4000	4000	T	T	T	T	T	T	T	T	T
	4000	4000	8000	T	T	T	T	T	T	T	T
	3000	3000	6000	T	T	T	T	T	T	T	T
		2000	5000	T	T	T	T	T	T	T	T
			5000	T	T	T	T	T	T	T	T
			4000	8000	T	T	T	T	T	T	T
			4000	8000	T	T	T	T	T	T	T
				8000	T	T	T	T	T	T	T
				7500	T	T	T	T	T	T	T
				3000	8000	T	T	T	T	T	T
		T	T	T	T	T	T	T	T	T	T
		T	T	T	T	T	T	T	T	T	T
		T	T	T	T	T	T	T	T	T	T
		6000	T	T	T	T	T	T	T	T	T
		5000	T	T	T	T	T	T	T	T	T
		4000	T	T	T	T	T	T	T	T	T
		4000	8000	T	T	T	T	T	T	T	T
		3000	6000	T	T	T	T	T	T	T	T
		2000	5000	T	T	T	T	T	T	T	T
		2000	5000	T	T	T	T	T	T	T	T
			4000	8000	T	T	T	T	T	T	T
			4000	8000	T	T	T	T	T	T	T
				7000	T	T	T	T	T	T	T
				6500	T	T	T	T	T	T	T
				2000	7000	T	T	T	T	T	T
		T	T	T	T	T	T	T	T	T	T
			40000	T	T	T	T	T	T	T	T
			33000	T	T	T	T	T	T	T	T
			28000	T	T	T	T	T	T	T	T
			20000	T	T	T	T	T	T	T	T
			13000	T	T	T	T	T	T	T	T
			8000	20000	T	T	T	T	T	T	T
			8000	20000	T	T	T	T	T	T	T

Fuses / MCCBs			
Downstream MCCBs	Upstream fuses gG type		
	250 A	400 A	1000 A
DPX 125	7500		
DPX 160		10 000	
DPX 250 ER		10 000	
DPX 250		10 000	
DPX 630			50 000