

GUIDE

TECHNICAL

# LOGICAL SELECTIVITY



THE GLOBAL SPECIALIST IN ELECTRICAL AND  
DIGITAL BUILDING INFRASTRUCTURES

 **legrand**<sup>®</sup>

## LEGAL INFORMATION

Presentation pictures do not always include Personal Protective Equipment (PPE), but this is a legal and regulatory obligation that must be scrupulously respected.

In accordance with its continuous improvement policy, Legrand reserves the right to change the specifications and illustrations without notice. All illustrations, descriptions and technical information included in this document are provided as indications and cannot be held against Legrand.

## TABLE OF CONTENTS

DEFINITION .....	4
INSTALLATION	
Products concerned .....	5
Operating modes and permitted configurations .....	6
Rules of application .....	7
Technical data .....	7
Specific cases .....	8
CONNECTION	
Overview of the connection principle between ranges.....	9
Identification of the DMX <sup>3</sup> terminal blocks .....	10
External power supplies.....	12
CASE STUDIES	
Case n° 1.....	16
Case n° 2.....	16
Case n° 3.....	16
Schematic diagram .....	17
SUMMARY TABLE .....	18

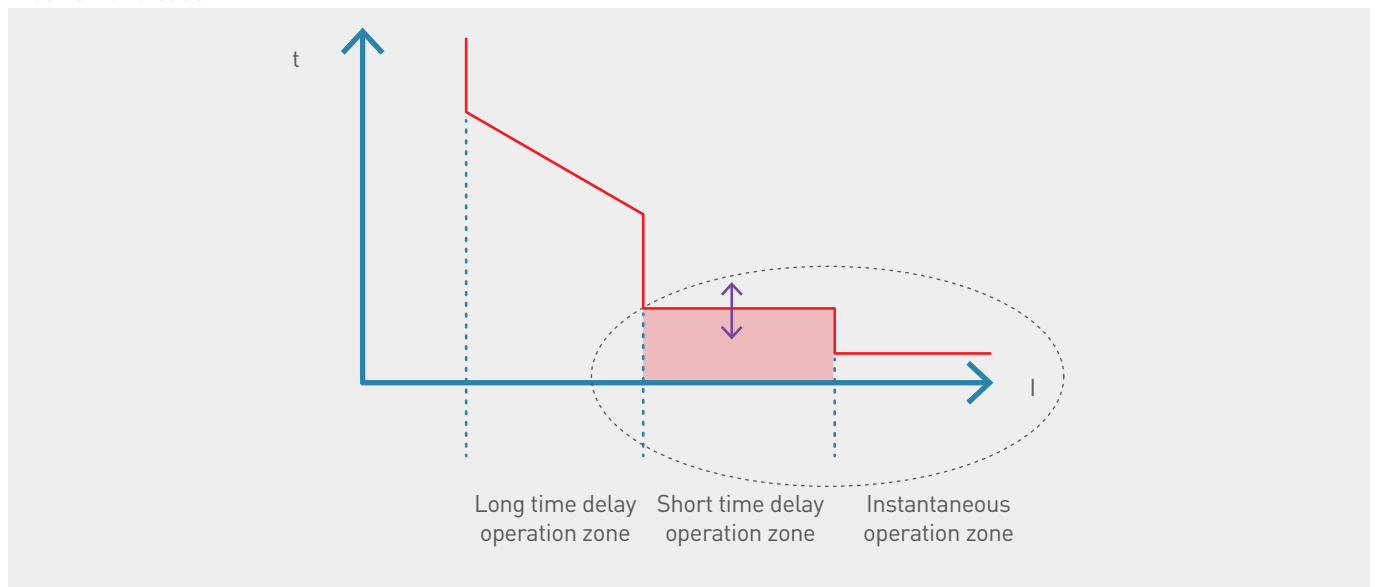
# LOGICAL SELECTIVITY DEFINITION

Logical selectivity is an «intelligent» selectivity that is achieved through communication between DPX<sup>3</sup>/DMX<sup>3</sup> electronic circuit breakers interconnected via an external power supply.

Logical selectivity is used for the short time delay and instantaneous operating zones of the tripping curve  $I = f(t)$ . It concerns short-circuits of medium and high intensity (energy part).

It does not affect the long time delay part of the curve (current sensing selectivity) dealing with overloads.

## Electronic release



In the event of a short circuit, the only part of the installation that is affected by the fault is identified and isolated by the circuit breaker placed immediately upstream. The protection and continuity of service of the installation are thus guaranteed.

In fact, the circuit breaker placed immediately upstream of the fault acts instantaneously by inhibiting the programmed settings, thus reducing to a minimum the time taken to eliminate the fault.

This allows to:

- achieve a good selectivity on several levels, regardless of the number of circuit breakers in the logical selectivity chain,
- to reduce thermal and electrodynamic stresses in the cables or busbars, while optimising the dimensions of the installation.

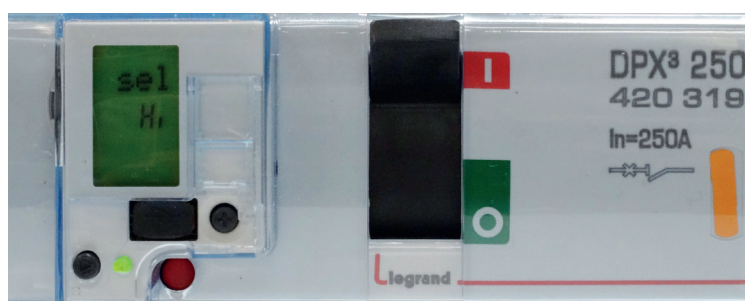
# INSTALLATION

Logical selectivity is achieved using:

- DMX<sup>3</sup> 1600/2500/4000/6300 air circuit breakers and/or electronic DPX<sup>3</sup> moulded case circuit breakers with dynamic selectivity (High/Low selector) and connected in cascade by a specific power supply,
- a external auxiliary power supply (for DPX<sup>3</sup>) Cat.No 4 210 83 or a communication interface (for DPX<sup>3</sup>) Cat.No 4 210 75 or a external auxiliary power supply (for DMX<sup>3</sup> 1600) Cat.No 0 281 72 or a external auxiliary supply (for DMX<sup>3</sup> 2500/4000/6300) Cat.No 0 288 06.



**Electronic DPX<sup>3</sup> 1600 S2**



**Electronic DPX<sup>3</sup> 250**

On each electronic moulded case circuit breaker [S2 or Sg version] there are:

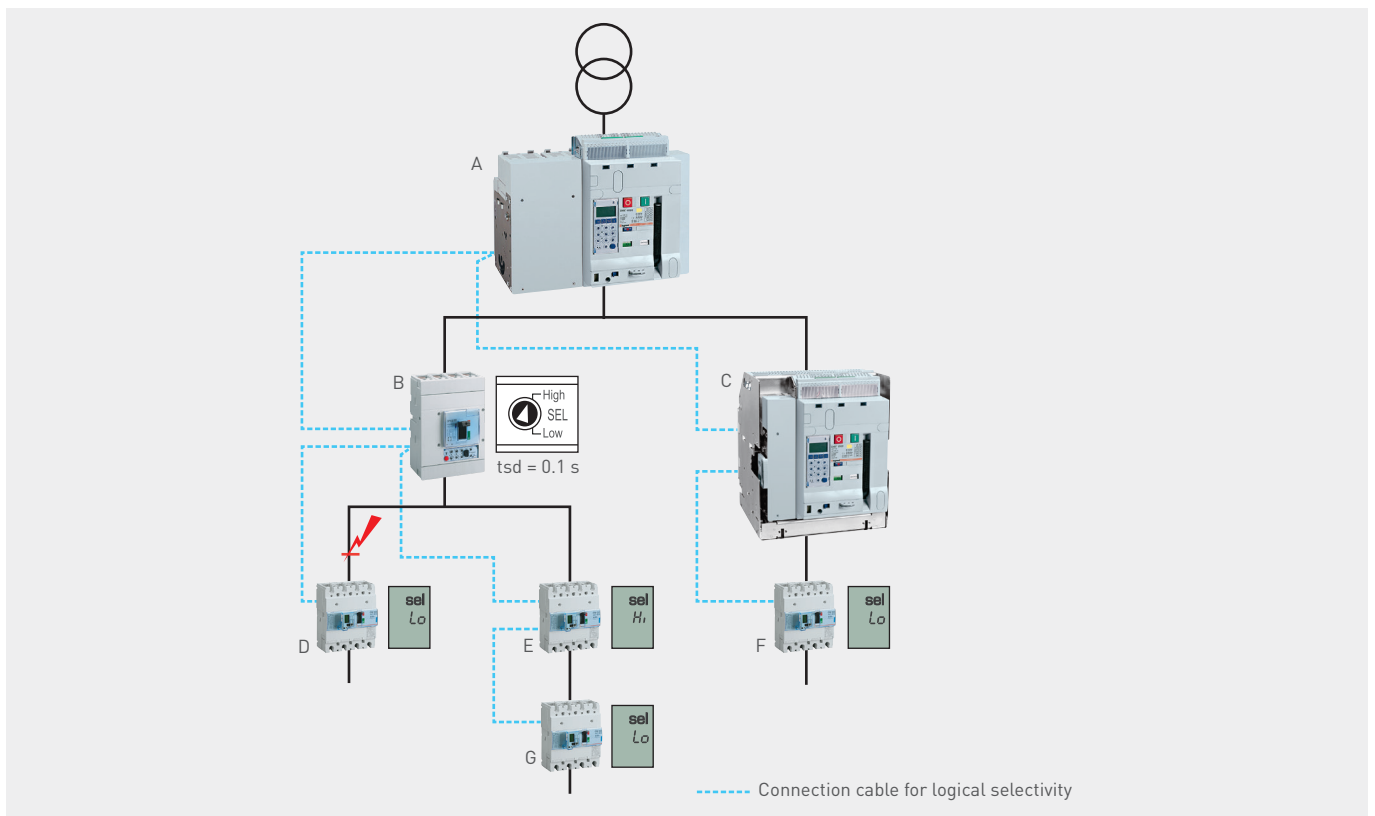
- a possible setting on two positions High or Low (dynamic selectivity) and available in the configuration of the DPX<sup>3</sup>.
- one (or two) draw-out terminal block on the side with:
  - o 2 logical selectivity input terminals for connection to the circuit breakers belonging to the downstream level (IN);
  - o 2 logical selectivity output terminals for connection to the circuit-breakers belonging to the upstream level (OUT);
  - o 2 terminals for auxiliary power supply.

On each air circuit breaker with this function, there is a terminal block «H» located on the upper side of the ACB including the terminals mentioned above.

# Operating modes and permitted configurations

In the event of a medium or high intensity short-circuit in the installation, the operating principle of logical selectivity is as follows:

- Circuit breakers which detect a short circuit current or a high inrush current send a signal via the connection cable to the circuit breaker(s) located upstream. At the same time, they also check for a signal from one or more circuit breakers located downstream;
- the circuit-breaker inside the logical selectivity chain, which detects the short-circuit and does not receive any signal from the downstream circuit-breakers, acts instantaneously, setting any programmed delays (Tsd and/or HIGH) to zero;
- the circuit breaker that detects the short circuit, and the presence of a signal from a downstream circuit breaker, remains closed while respecting the programmed timers (Tsd and/or HIGH).



# Rules of application

- In order to ensure the time selectivity of medium intensity short circuits, the I-t constant time (Tsd) tripping curve must be used. Using the constant I-t to I2t curve does not allow the correct operation of the logical selectivity.
- All circuit breakers located on the different levels of the logical selectivity chain, except the last level, must have the SEL (selector) set to High and with Tsd  $\geq$  100 ms.
- The Tsd of the releases on all the levels of the logical selectivity chain, except the last one, can be the same.
- All circuit breakers located at the last level of the logical selectivity chain must have the SEL (selector) set to Low and with a Tsd < than that of the circuit breakers on the higher levels.

# Technical data

TECHNICAL DATA	
Maximum number of electronic circuit breakers that can be connected	Unlimited
Maximum total length of the connection cable	Unlimited
Maximum length of the connection cable between two tripping units (downstream OUT / upstream IN connection)	30 meters
Cable type	Electrical cable 1 mm <sup>2</sup> or twisted shielded cable



The connection cable must be kept as far away as possible from electromagnetic interference (transformer, power circuit).



Maximum power supply output current  
Cat.No 4 210 83 : 250mA.

## Specific cases

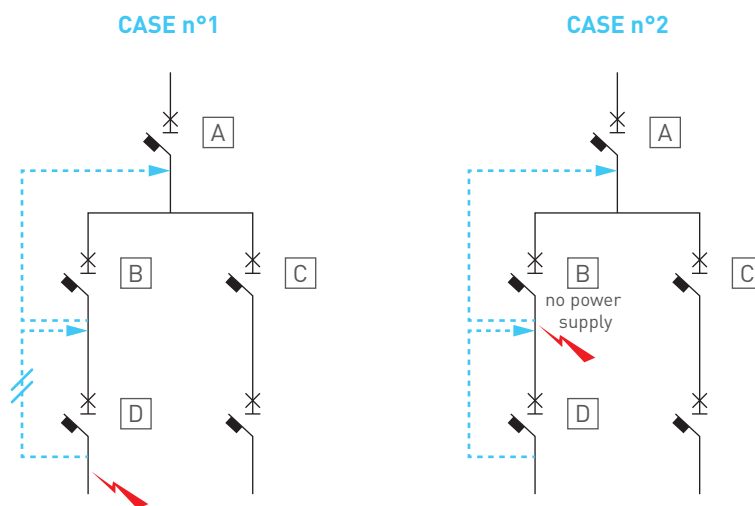
### CASE n°1 What happens if the connection cable is cut?

If there is an interruption (cut) in the logical selectivity connection cable between D and B, in the event of a short-circuit downstream of D, B trips by minimising any programmed delays (Tsd and/or High) and guarantees, in any case, the protection of the installation.

### CASE n°2 What happens if the auxiliary power supply is cut?

If there is an interruption of the auxiliary power supply from B, in the event of a short circuit downstream of B, A trips instantaneously and guarantees, in any case, the protection of the installation.

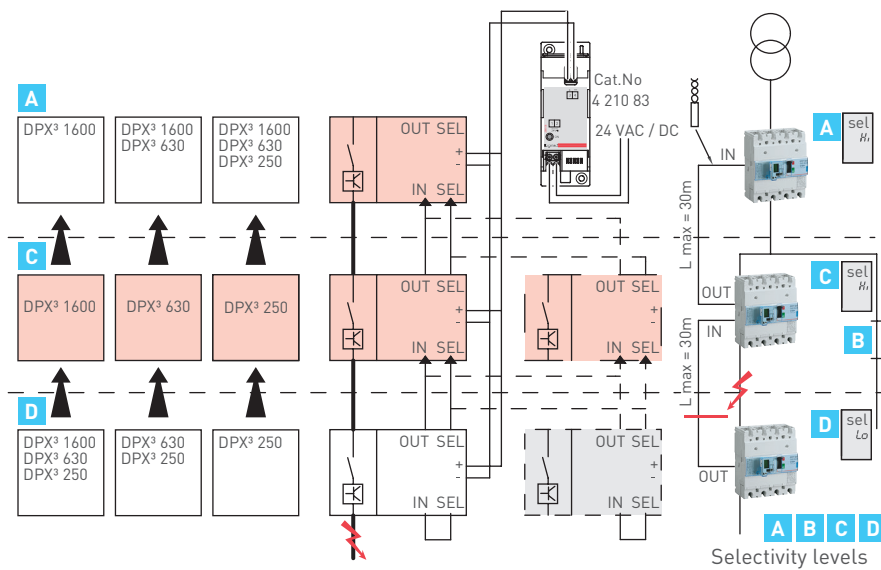
In both cases, selectivity between circuit breakers is therefore not ensured.



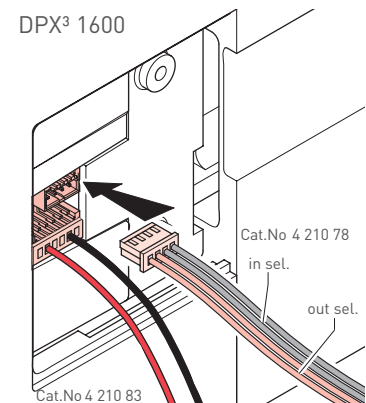
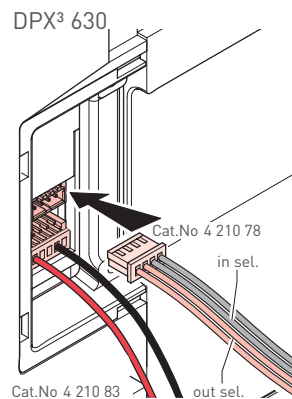
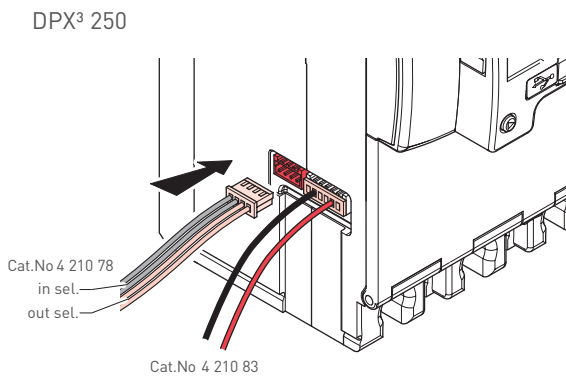


# CONNECTION

## Overview of the connection principle between ranges



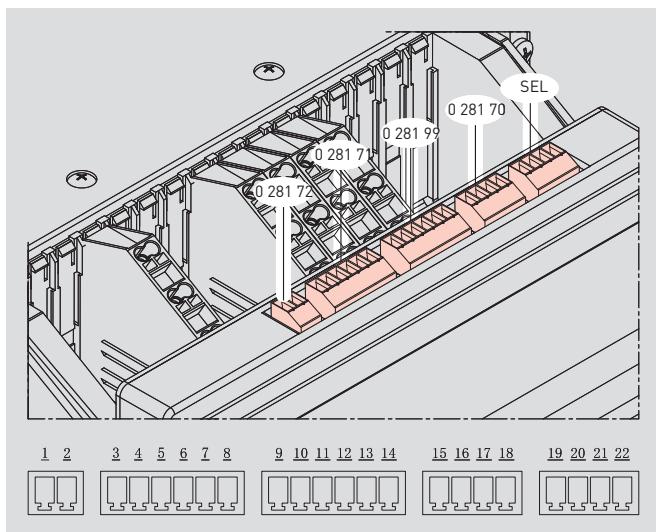
### Examples of DPX<sup>3</sup> connection:




Cables supplied with Cat.No 4 210 83.

# Identification of the DMX<sup>3</sup> terminal blocks

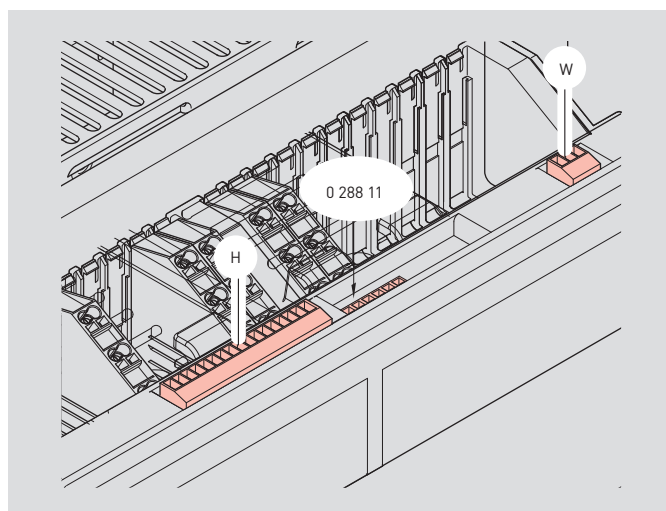
DMX<sup>3</sup> 1600



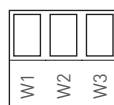
- 1/2 :External auxiliary power supply (H1-H2) Cat.No 0 281 72
- 3/4/5/6/7/8 : External neutral (6-way terminals) Cat.No 0 281 71
- 9/10 :Programmable contact Relay 1 (W1-W2) - Max. 230 V~/5 A; 110 V~/0.5A Cat.No 0 281 99
- 11/12 :Programmable contact Relay 2 (W3-W4) -Max. 230 V~/5 A; 110 V~/0.5A Cat.No 0 281 99
- 13/14 :Not available Cat.No 0 281 99
- 15/16/17 :RS485 supervision series port (H5-H6-H7) Cat.No 0 281 70
- 18 :Not available Cat.No 0 281 70
- 19/20 :SEL-IN (H11-H12)
- 21/22 :SEL-OUT (H15-H16)

 Only for MP4 protection unit.

DMX<sup>3</sup> 2500/4000/6300



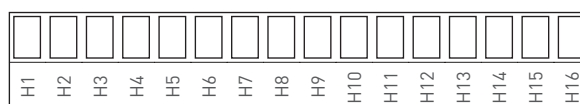
**W** : Local programmable relay (4A-230 VAC c.max)



W1: Normally open  
W2: Normally closed  
W3: Common

**0 288 11** : External Neutral - 6-way terminal block

**H** :



H1: } Auxiliary voltage Cat.No 0 288 06  
H2: }

H3: Series port "Programmable contacts module" - RS485 (-)

H4: Series port "Programmable contacts module" - RS485 (+)

H5: GND RS485

H6: Supervision series port - RS485 (-)

H7: Supervision series port - RS485 (+)

H8: -

H9: -

H10: -

H11: Logical selectivity input

H12: Logical selectivity input

H13: -

H14: -

H15: Logical selectivity output

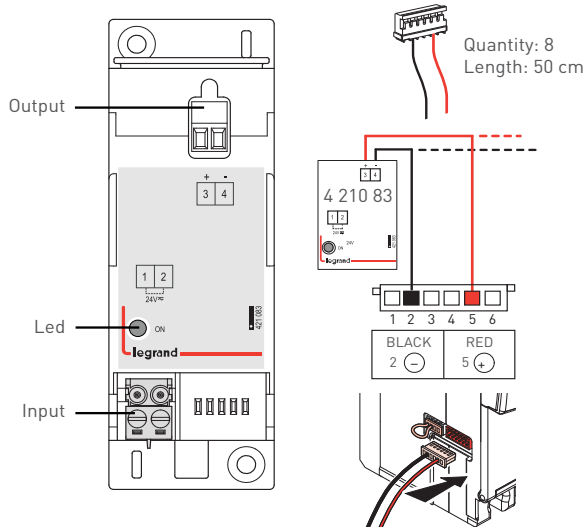
H16: Logical selectivity output



The last downstream level is indicated by the use of a strap (loop) between terminals H11 and H12.

# External power supplies

CONNECTION OF THE DPX<sup>3</sup> EXTERNAL POWER SUPPLY WITH CAT.NO 4 210 83

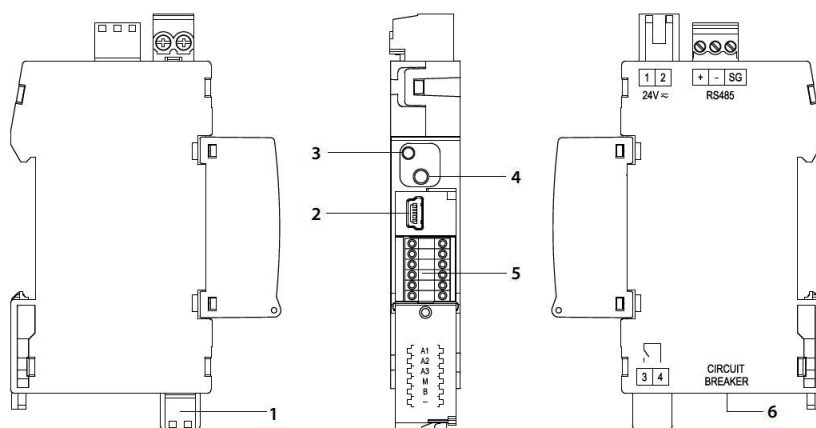


Cat.No 4 210 83	DPX <sup>3</sup> 250/630/1600	(mA)
Iout MAX = 250 mA	ELE (S2/Sg)	50
	ELE+RCD (S2)	50
	ELE+PMD (S2/Sg)	62,5
	ELE+PMD+RCD (S2)	62,5

ELE = Electronic Tripping Unit  
 RCD = Residual Current Device  
 PMD =Power Metering Device

**i** Cable supplied with Cat.No 4 210 83  
 For more details, please refer to the instruction sheet.

CONNECTION OF THE DPX<sup>3</sup> EXTERNAL POWER SUPPLY WITH CAT.NO 4 210 75



- 1 - Replication relay "circuit breaker tripped"  
(230 V AC - 200 mA - NO type)
- 2 - Mini -USB port (Legrand)
- 3 - User interface LED
- 4 - Relay test push-button
- 5 - Configurator housing
- 6 - Connection to the serial port of the protection device (with cable supplied)

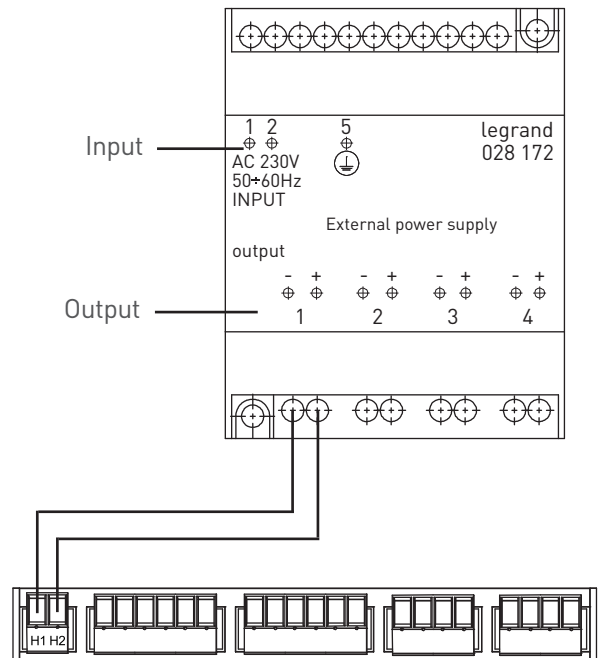
Cat.No 4 210 75	
U <sub>c</sub>	24 V AC ±10%, 50/60 Hz 24 V AC ±10%, 50/60 Hz
I	90 mA



For more details, please refer to the instruction sheet.

# CONNECTION

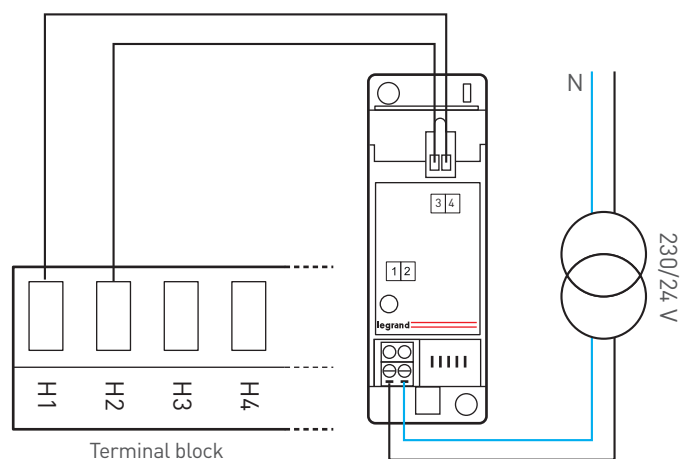
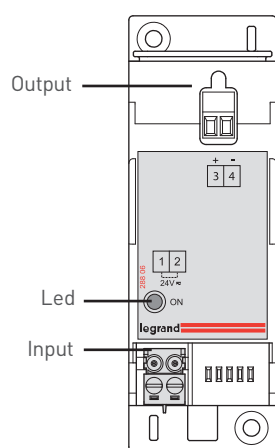
## CONNECTION OF THE DMX<sup>3</sup> 1600 EXTERNAL POWER SUPPLY WITH CAT.NO 0 281 72



Cat.No 0 281 72	
Input power supply	230 V AC $\pm$ 10%, 50/60 Hz
Output current	400 mA
Dissipated power (W/VA)	$\geq$ 9.6
Operating temperature (°C)	-10 to +55

**i** For more details, please refer to the instruction sheet.

CONNECTION OF THE DMX<sup>3</sup> 2500/4000/6300 EXTERNAL POWER SUPPLY WITH CAT.NO 0 288 06



Cat.No 0 288 06	
Input power supply	24V AC/DC ± 10%, 50/60 Hz
Output current	250 mA
Constant input power	5 W/VA



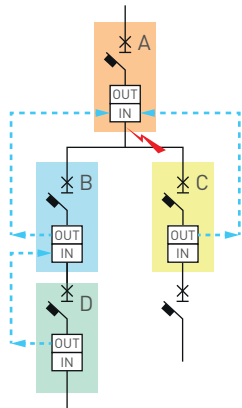
For more details, please refer to the instruction sheet.

# CASE STUDIES

## CASE N°1

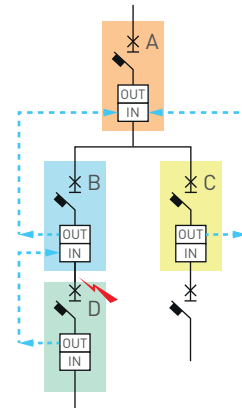
### Fault 1: short circuit downstream from A

Only circuit breaker A detects the fault. As it does not receive any signal from the circuit breakers present at the lower levels, A trips immediately, setting any programmed delays (Tsd and/or HIGH) to zero.



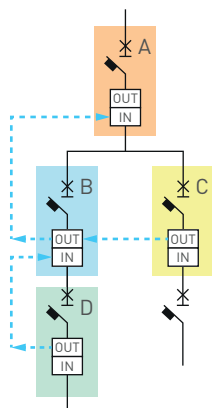
### Fault 2: short circuit downstream from B

Circuit breakers A and B detect the fault. Circuit breaker A receives a signal from the downstream circuit breaker B and therefore remains closed, respecting the programmed delays. As it does not receive a signal from the lower level circuit breakers, circuit breaker B trips immediately, setting any programmed delays (Tsd and/or HIGH) to zero.

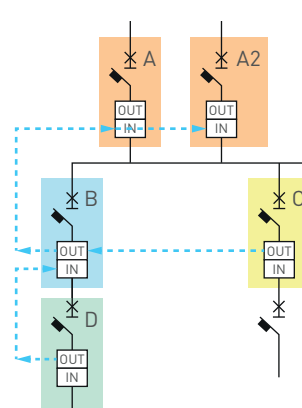


In the case of either fault 1 or fault 2, if you want to avoid connecting two cables to the IN terminal of the DPX<sup>3</sup> A, the following configurations are also possible:

### CASE N°2



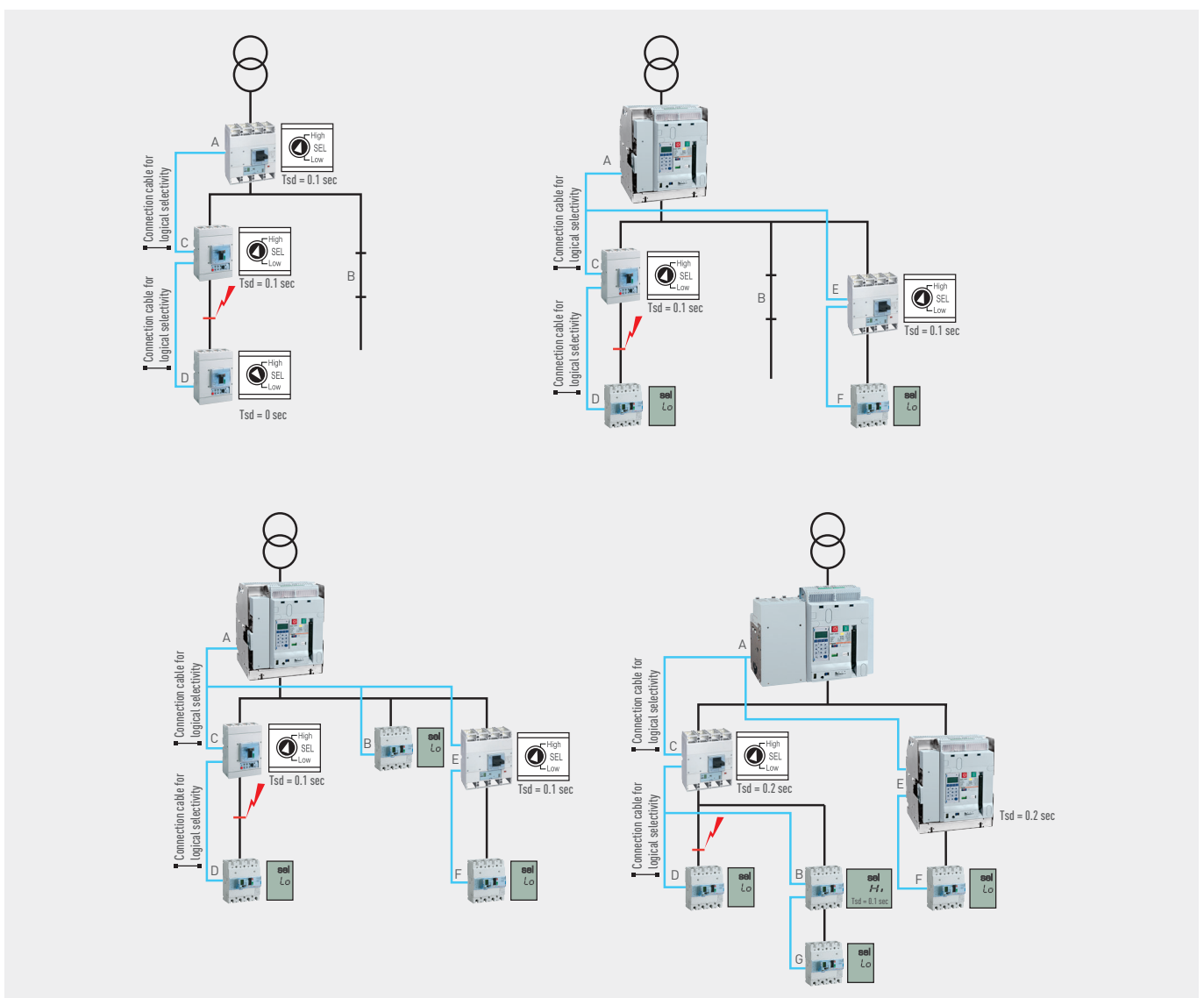
### CASE N°3





# Schematic diagram

For the 4 configurations (logical selectivity below), the circuit-breaker "C" concerned by the fault trips instantaneously without waiting for the delayed setting. The upstream circuit breaker "A" remains closed.



# SUMMARY TABLE

Logical selectivity is especially recommended for installations with high short-circuit current values and with high service continuity requirements.






Logical selectivity allows to achieve a selectivity on several levels.

BENEFITS	CONSTRAINTS
Reduce thermal and electrodynamic stresses on cables or busbars by optimising the dimensions of the installation.	Auxiliary power supply required
Achieve total selectivity between circuit breakers of the same size.	Wired connection between electronic DPX <sup>3</sup> or DMX <sup>3</sup> required
Achieve efficient selectivity on several levels, beyond the number of degrees of delay allowed by the time selectivity.	Not possible with electronic DPX that have a S1 type release, without a dynamic selector switch





## FOLLOW US ALSO ON

- @ legrand.com
-  youtube.com/user/legrand
-  facebook.com/Legrand
-  twitter.com/Legrand
-  pinterest.com/legrandgroup
-  instagram.com/legrandnews



**Head office**  
and International Department  
87045 Limoges Cedex - France  
Tel: + 33 (0) 5 55 06 87 87  
Fax: + 33 (0) 5 55 06 74 55