

DX³ MCBs use with direct current



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The DX3 Legrand modular offer includes a range of miniature circuit breakers which are specifically designed for direct current applications, up to 500V.

Out of this offer, it is allowed to use in direct current the DX3 Legrand m.c.b.'s (1P/2P/3P/4P – Z, B, C curves) which are usually employed at 230/400 V~, by taking care to apply following recommendations and deratings.

1 – Magnetic tripping threshold (protection against short-circuit)

The maximum tripping threshold value is multiplied by 1.4.

For example, a C curve m.c.b. tripping threshold which is set between 5 and 10 x I_n in an AC network, becomes 7 to 14 x I_n in a DC network.

2 – Thermal tripping threshold (protection against overload)

The thermal tripping curve, time / current, in AC and in DC network are identical.

3 – Electrical endurance

Endurance is 2000 operations under I_n for 1 module per pole DX³ MCBs.

Endurance is 1500 operations under I_n for 1.5 modules per pole DX³ MCBs.

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4 – Operating voltage

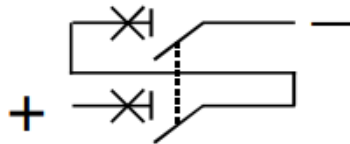
The minimum operating DC voltage is 12 V.

The maximum operating DC voltage is 60 V for 1 module single pole MCBs, or 90 V for 1.5 modules single pole MCBs.

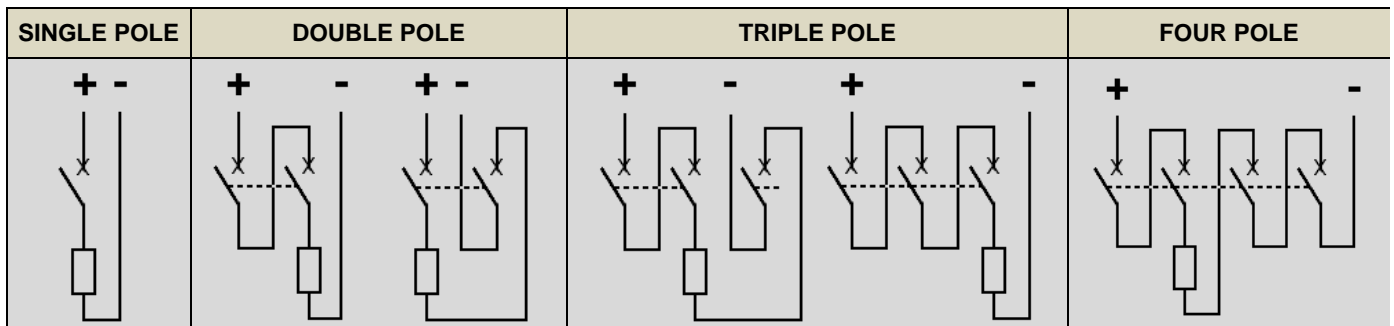
For higher voltages, several poles must be connected in series, in respect of the maximum operating voltages indicated in the following table.

Miniature circuit breaker		SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
Max. operating voltage	1 mod. / pole	60 V	110 V	150 V	180 V
	1,5 mod. / pole	90 V	150 V	200 V	250 V

For example, for a 110 V DC voltage, a 2- pole m.c.b. must be connected, the 2 poles in series.



5 – Connection mode



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6 – Breaking capacity

Breaking capacities are as follows :

DX ³ 4500/6 kA B,C curves ≤ 63 A		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC60947.2	Icu	12 to 60 V	4.5 kA	4.5 kA	4.5 kA	4.5 kA
		110 V		4.5 kA	4.5 kA	4.5 kA
		150 V			4.5 kA	4.5 kA
		180 V				4.5 kA
	Ics (1)	12 to 60 V	100%	100%	100%	100%
		110 V		100%	100%	100%
		150 V			100%	100%
		180 V				100%

DX ³ 6000/10 kA B,C curves ≤ 63 A		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC60947.2	Icu	12 to 60 V	6 kA	6 kA	6 kA	6 kA
		110 V		6 kA	6 kA	6 kA
		150 V			6 kA	6 kA
		180 V				6 kA
	Ics (1)	12 to 60 V	100%	100%	100%	100%
		110 V		100%	100%	100%
		150 V			100%	100%
		180 V				100%

DX ³ 10000/16 kA B,C curves ≤ 63 A		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC60947.2	Icu	12 to 60 V	10 kA	10 kA	10 kA	10 kA
		110 V		10 kA	10 kA	10 kA
		150 V			10 kA	10 kA
		180 V				10 kA
	Ics (1)	12 to 60 V	100%	100%	100%	100%
		110 V		100%	100%	100%
		150 V			100%	100%
		180 V				100%

DX ³ 10000/16 kA B,C curves 80 A - 125 A		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC60947.2	Icu	12 to 60 V	10 kA	10 kA	10 kA	10 kA
		110 V		10 kA	10 kA	10 kA
		150 V			10 kA	10 kA
		180 V				10 kA
	Ics (1)	12 to 60 V	100%	100%	100%	100%
		110 V		100%	100%	100%
		150 V			100%	100%
		180 V				100%

(1) : in % of Icu

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6 – Breaking capacity (continued):

DX ³ 25 kA B,C curves ≤ 25A		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC60947.2	Icu	12 to 60 V	16 kA	16 kA	16 kA	16 kA
		110 V		16 kA	16 kA	16 kA
		150 V			16 kA	16 kA
		180 V				16 kA
	Ics (1)	12 to 60 V	100%	100%	100%	100%
		110 V		100%	100%	100%
		150 V			100%	100%
		180 V				100%

(2) Up to 32 A

DX ³ 25 kA B,C curves 32 A - 125 A		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC60947.2	Icu	12 to 60 V	16 kA	16 kA	16 kA	16 kA
		110 V		16 kA	16 kA	16 kA
		150 V			16 kA	16 kA
		180 V				16 kA
	Ics (1)	12 to 60 V	100%	100%	100%	100%
		110 V		100%	100%	100%
		150 V			100%	100%
		180 V				100%

(3) Above 40 A

DX ³ 36kA C curve 10A-80A		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC60947.2	Icu	12 to 60 V	25 kA	25 kA	25 kA	25 kA
		110 V		25 kA	25 kA	25 kA
		150 V			25 kA	25 kA
		180 V				25 kA
	Ics (1)	12 to 60 V	100%	100%	100%	100%
		110 V		100%	100%	100%
		150 V			100%	100%
		180 V				100%

DX ³ 50 kA B,C curve 10 A - 63 A		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC60947.2	Icu	12 to 60 V	25 kA	25 kA	25 kA	25 kA
		110 V		25 kA	25 kA	25 kA
		150 V			25 kA	25 kA
		180 V				25 kA
	Ics (1)	12 to 60 V	100%	100%	100%	100%
		110 V		100%	100%	100%
		150 V			100%	100%
		180 V				100%

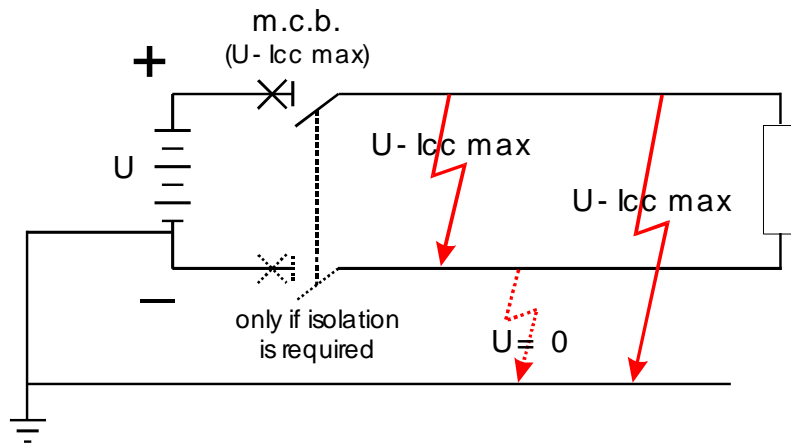
(1) : in % of Icu

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7 – Repartition of the breaking poles

It is necessary to know how the installation is connected to the earth in order to choose the proper m.c.b. and to connect to each polarity the required poles, depending on the voltage and the short-circuit value.

- If the network is connected to the earth by one polarity, all the poles required for the short circuit interruption must be connected to the other polarity. To create isolation, one more pole must be connected to the polarity connected to the earth.

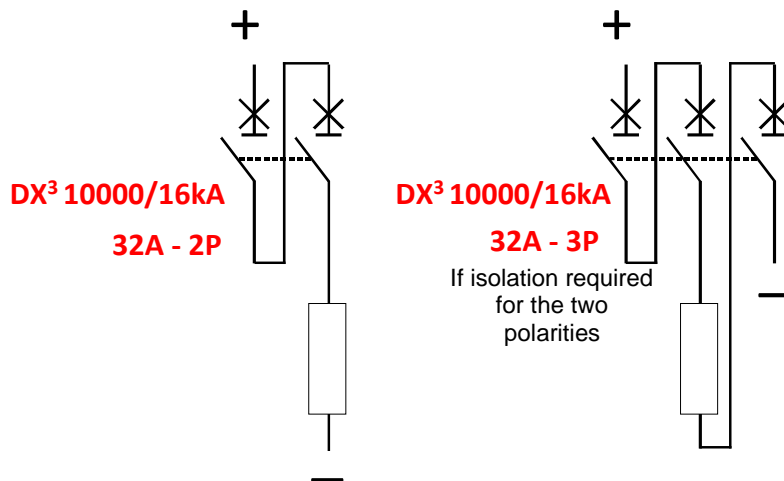


Example : installation connected to the earth by the negative polarity / $U = 110 \text{ V DC} / I_{cc} = 10 \text{ kA} / I_n = 32 \text{ A}$
 The positive polarity must be protected with a m.c.b. able to interrupt 10kA at 110 V DC.

A DX³ 10000/16kA 2P 32 A m.c.b. will be used with the 2 poles connected to the positive polarity.

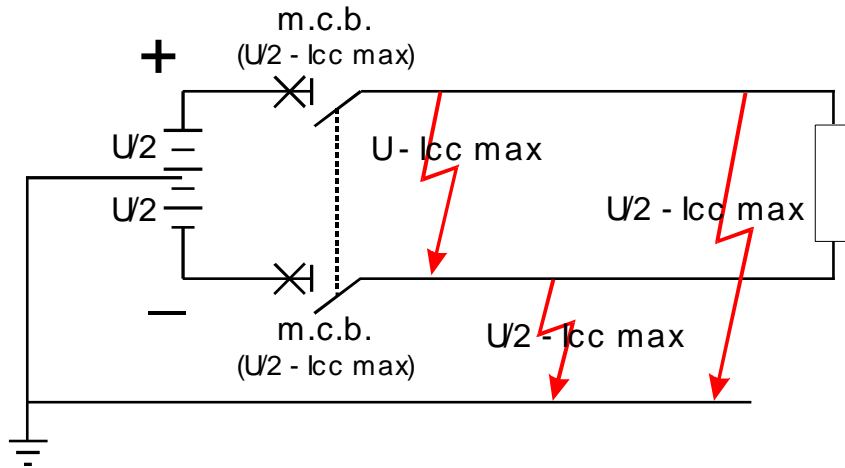
To get isolation, use a DX³ 10000/16kA 3P 32A m.c.b. with 2 poles connected to the positive polarity and one pole connected to the negative polarity.

DX ³ 10000/16 kA		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC 60947.2	Icu	12 to 60 V	10 kA	10 kA	10 kA	10 kA
		110 V		10 kA	10 kA	10 kA
		150 V			10 kA	10 kA
		180 V				10 kA



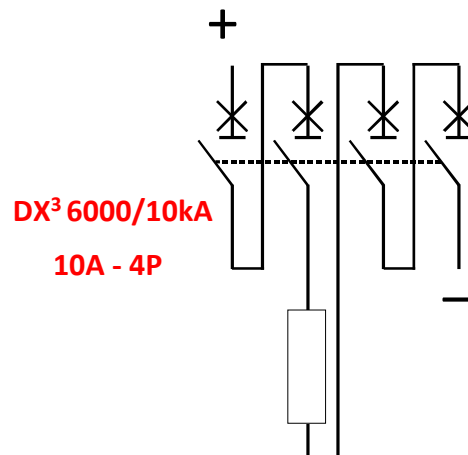
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Si le réseau est relié à la terre par un point milieu, il faut mettre sur chaque polarité le nombre de pôles nécessaire à la coupure de $I_{cc\ max}$ sous la demi-tension.



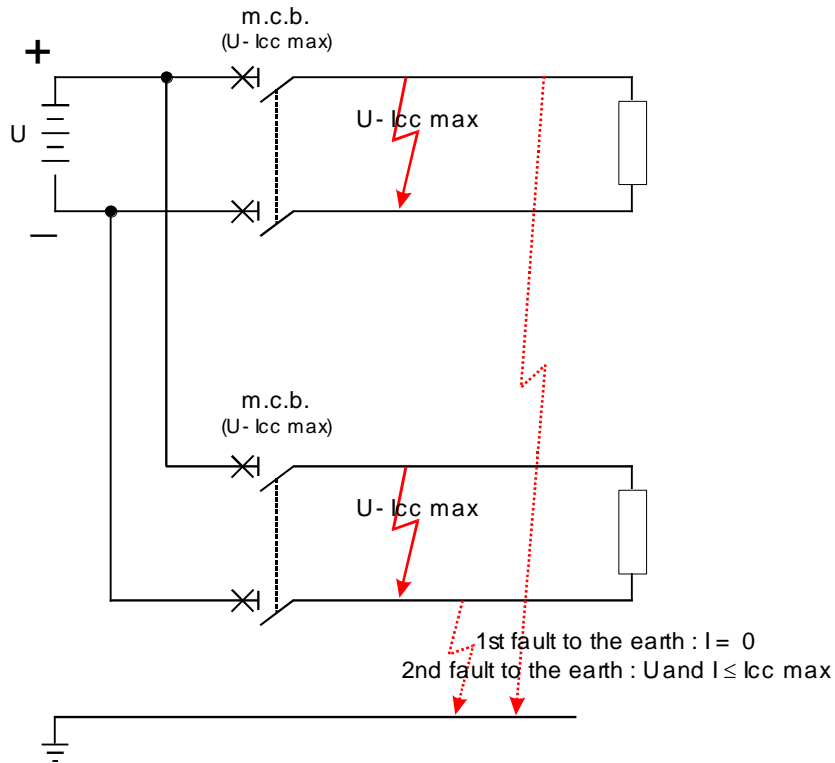
*Example : installation connected to the earth by the middle / $U = 180\ V\ DC$ / $I_{cc} = 6\ kA$ / $I_n = 10\ A$
 Each polarity must be protected by a m.c.b. able to interrupt $6\ kA$ with half the voltage, in this example $90V$.
 A DX³ 6000/10kA 4P 10 A m.c.b. will be used, with 2 poles connected to each polarity.*

DX ³ 6000/10 kA		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC 60947.2	Icu	12 to 60 V	6kA	6kA	6kA	6kA
		110 V		6kA	6kA	6kA
		150 V			6kA	6kA
		180 V				6kA



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- if the network is isolated from the earth, poles must be connected to both polarities in order to be properly protected even in case of a double fault to the earth (especially if several circuits are in parallel.).



*Example : installation isolated from the earth / $U = 48 \text{ V DC}$ / $I_{cc} = 6 \text{ kA}$ / $I_n = 40 \text{ A}$
A m.c.b. able to interrupt 6 kA at 48 V must be used. Each polarity must be protected.
A DX³ 6000/10kA 2P 40 A m.c.b. will be used, with one pole connected to each polarity.*

DX ³ 6000/10 kA		Voltage	SINGLE POLE	DOUBLE POLE	TRIPLE POLE	FOUR POLE
As per IEC 60947.2	Icu	12 to 60 V	6kA	6 kA	6 kA	6 kA
		110 V		6 kA	6 kA	6 kA
		150 V			6 kA	6 kA
		180 V				6 kA

