

# Protection devices

We offer a wide range of protection devices, such as miniature circuit breakers, auxiliaries and accessories, RCD add-on blocks, single pole and switched neutral devices, 2 and 4 pole RCCBs, RCCB auxiliaries, RCBOs, HRC fuse carriers, motor starters, earth fault relays and surge protection devices.



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Miniature circuit breakers SP&N	4.2
Miniature circuit breakers for residential application	4.4
Miniature circuit breakers for commercial application	4.16
Residual Circuit Breakers with Overload (RCBO)	4.21
Residual Current Circuit Breakers (RCCB)	4.26
Auxiliaries and accessories	4.28
Remote control auxiliaries	4.30
Motor starters	4.31
HRC fuse carriers	4.33
HRC cartridge fuses	4.35
Supply busbars	4.39
Surge Protection Devices (SPD)	4.43
Technical guide	4.49

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Protection and control of circuits against overloads and short circuits.  
Allow to isolate circuits.



MHT716



**Miniature circuit breakers 1P+N type B, 4500 A, 6 kA**

- tripping curve: 3 to 5 I<sub>n</sub>
- voltage rating: 230 V AC
- current rating: 2 to 40 A
- frequency: 50/60 Hz

- connecting capacity:  
10 mm<sup>2</sup> flexible conductor  
16 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1 breaking capacity: 4.5kA (IEC 60898-1)  
6kA (IEC 60947-2)

In	Width in module 17.5 mm	Pack qty	Cat. ref.
6 A	1	12	<b>MHT706</b>
10 A	1	12	<b>MHT710</b>
16 A	1	12	<b>MHT716</b>
20 A	1	12	<b>MHT720</b>
25 A	1	12	<b>MHT725</b>
32 A	1	12	<b>MHT732</b>
40 A	1	12	<b>MHT740</b>



**Miniature circuit breakers 1P+N type C, 4500 A, 6 kA**

- tripping curve: 5 to 10 I<sub>n</sub>
- voltage rating: 230 V AC
- current rating: 2 to 40 A
- frequency: 50/60 Hz

- connecting capacity:  
10 mm<sup>2</sup> flexible conductor  
16 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1 breaking capacity: 4.5kA (IEC 60898-1)  
6kA (IEC 60947-2)

In	Width in module 17.5 mm	Pack qty	Cat. ref.
6 A	1	12	<b>MJT706</b>
10 A	1	12	<b>MJT710</b>
16 A	1	12	<b>MJT716</b>
20 A	1	12	<b>MJT720</b>
25 A	1	12	<b>MJT725</b>
32 A	1	12	<b>MJT732</b>
40 A	1	12	<b>MJT740</b>



MLN720



**Miniature circuit breakers 1P+N type C, 6000A, 7.5 kA**

- tripping curve: 5 to 10 I<sub>n</sub>
- voltage rating: 230 V AC
- current rating: 2 to 40 A
- frequency: 50/60 Hz

- connecting capacity:  
10 mm<sup>2</sup> flexible conductor  
16 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1 6kA (IEC 60898-1)  
7.5kA (IEC 60947-2)

In	Width in module 17.5 mm	Pack qty	Cat. ref.
6 A	1	12	<b>MLN706</b>
10 A	1	12	<b>MLN710</b>
16 A	1	12	<b>MLN716</b>
20 A	1	12	<b>MLN720</b>
25 A	1	12	<b>MLN725</b>
32 A	1	12	<b>MLN732</b>

**Miniature circuit breakers 1P+N type C, 6000A**

- tripping curve: 5 to 10 In
- voltage rating: 230 V AC
- current rating: 2 to 40 A
- frequency: 50/60 Hz

- connecting capacity:  
10 mm<sup>2</sup> flexible conductor  
16 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1  
6kA (IEC 60898-1)  
7.5kA (IEC 60947-2)



In	Width in module 17.5 mm	Pack qty	Cat. ref.
40 A	1	12	<b>MLN740A</b>

MLN740A

**Add-on blocks for MCB's 1P+N**

IΔn	In	Width in module 17.5 mm	Cat. ref. class AC	Cat. ref. class A / HI
30 mA	25 A	1	<b>BDC225F</b>	<b>BDH225F</b>
	40 A	1	<b>BDC240F</b>	<b>BDH240F</b>
300 mA	25 A	1	<b>BFC225F</b>	<b>BFH225F</b>
	40 A	1	<b>BFC240F</b>	<b>BFH240F</b>



BDC240F

**Add-on blocks for miniature circuit breakers selection chart**

	IΔn	Add-on blocks				
		class AC		class A and HI		
		30 mA	300 mA	30 mA	300 mA	
Miniature Circuit Breakers	B curve	MHT706	<b>BDC225F</b>	<b>BFC225F</b>	<b>BDH225F</b>	<b>BFH225F</b>
		MHT710				
		MHT716				
		MHT720				
	MHT725					
	MHT732	<b>BDC240F</b>	<b>BFC240F</b>	<b>BDH240F</b>	<b>BFH240F</b>	
MHT740						
C curve	MJT706	<b>BDC225F</b>	<b>BFC225F</b>	<b>BDH225F</b>	<b>BFH225F</b>	
		MJT710				
		MJT716				
		MJT720				
	MJT725					
	MJT732	<b>BDC240F</b>	<b>BFC240F</b>	<b>BDH240F</b>	<b>BFH240F</b>	
MJT740						

Protection and control of circuits against overloads and short circuits.  
Allow to isolate circuits.

### Miniature circuit breakers 3/4.5 kA, type B and C

- tripping curve:
  - B curve: 3 to 5 I<sub>n</sub>,
  - C curve: 5 to 10 I<sub>n</sub>
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 240/400V AC
- current rating: 6 to 40A
- frequency: 50/60Hz
- climate sealed: T2
- connecting capacity:
  - 16 mm<sup>2</sup> flexible conductor
  - 25 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1
- breaking capacity: 3kA (IEC 60898-1)
- 4.5kA (IEC 60947-2)
- **will not accept accessories**



MV116



In	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>Single pole miniature circuit breakers 3/4.5 kA</b>				
6 A	1	12	<b>MV106</b>	<b>MW106</b>
10 A	1	12	<b>MV110</b>	<b>MW110</b>
16 A	1	12	<b>MV116</b>	<b>MW116</b>
20 A	1	12	<b>MV120</b>	<b>MW120</b>
25 A	1	12	<b>MV125</b>	<b>MW125</b>
32 A	1	12	<b>MV132</b>	<b>MW132</b>
40 A	1	12	<b>MV140</b>	<b>MW140</b>



MV240



<b>Double pole miniature circuit breakers 3/4.5 kA</b>				
6 A	2	6	<b>MV206</b>	<b>MW206</b>
10 A	2	6	<b>MV210</b>	<b>MW210</b>
16 A	2	6	<b>MV216</b>	<b>MW216</b>
20 A	2	6	<b>MV220</b>	<b>MW220</b>
25 A	2	6	<b>MV225</b>	<b>MW225</b>
32 A	2	6	<b>MV232</b>	<b>MW232</b>
40 A	2	6	<b>MV240</b>	<b>MW240</b>



MV316



<b>Three pole miniature circuit breakers 3/4.5 kA</b>				
6 A	3	4	<b>MV306</b>	<b>MW306</b>
10 A	3	4	<b>MV310</b>	<b>MW310</b>
16 A	3	4	<b>MV316</b>	<b>MW316</b>
20 A	3	4	<b>MV320</b>	<b>MW320</b>
25 A	3	4	<b>MV325</b>	<b>MW325</b>
32 A	3	4	<b>MV332</b>	<b>MW332</b>
40 A	3	4	<b>MV340</b>	<b>MW340</b>



<b>Four pole miniature circuit breakers 3/4.5 kA</b>				
6 A	4	3	<b>MV406</b>	<b>MW406</b>
10 A	4	3	<b>MV410</b>	<b>MW410</b>
16 A	4	3	<b>MV416</b>	<b>MW416</b>
20 A	4	3	<b>MV420</b>	<b>MW420</b>
25 A	4	3	<b>MV425</b>	<b>MW425</b>
32 A	4	3	<b>MV432</b>	<b>MW432</b>
40 A	4	3	<b>MV440</b>	<b>MW440</b>

### Miniature circuit breakers 6 kA, type B and C

- tripping curve:
  - B curve: 3 to 5 I<sub>n</sub>,
  - C curve: 5 to 10 I<sub>n</sub>
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 240/400V AC
- current rating: 6 to 63A
- frequency: 50/60Hz
- climate sealed: T2
- connecting capacity:
  - 16 mm<sup>2</sup> flexible conductor
  - 25 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1
- breaking capacity: 6kA (IEC 60898-1)

In	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>Single pole miniature circuit breakers 6 kA</b>				
6 A	1	12	<b>MBN106A</b>	<b>MCN106A</b>
10 A	1	12	<b>MBN110A</b>	<b>MCN110A</b>
16 A	1	12	<b>MBN116A</b>	<b>MCN116A</b>
20 A	1	12	<b>MBN120A</b>	<b>MCN120A</b>
25 A	1	12	<b>MBN125A</b>	<b>MCN125A</b>
32 A	1	12	<b>MBN132A</b>	<b>MCN132A</b>
40 A	1	12	<b>MBN140A</b>	<b>MCN140A</b>
50 A	1	12	<b>MBN150A</b>	<b>MCN150A</b>
63 A	1	12	<b>MBN163A</b>	<b>MCN163A</b>
<b>Double pole miniature circuit breakers 6 kA</b>				
6 A	2	6	<b>MBN206A</b>	<b>MCN206A</b>
10 A	2	6	<b>MBN210A</b>	<b>MCN210A</b>
16 A	2	6	<b>MBN216A</b>	<b>MCN216A</b>
20 A	2	6	<b>MBN220A</b>	<b>MCN220A</b>
25 A	2	6	<b>MBN225A</b>	<b>MCN225A</b>
32 A	2	6	<b>MBN232A</b>	<b>MCN232A</b>
40 A	2	6	<b>MBN240A</b>	<b>MCN240A</b>
50 A	2	6	<b>MBN250A</b>	<b>MCN250A</b>
63 A	2	6	<b>MBN263A</b>	<b>MCN263A</b>
<b>Three pole miniature circuit breakers 6 kA</b>				
6 A	3	4	<b>MBN306A</b>	<b>MCN306A</b>
10 A	3	4	<b>MBN310A</b>	<b>MCN310A</b>
16 A	3	4	<b>MBN316A</b>	<b>MCN316A</b>
20 A	3	4	<b>MBN320A</b>	<b>MCN320A</b>
25 A	3	4	<b>MBN325A</b>	<b>MCN325A</b>
32 A	3	4	<b>MBN332A</b>	<b>MCN332A</b>
40 A	3	4	<b>MBN340A</b>	<b>MCN340A</b>
50 A	3	4	<b>MBN350A</b>	<b>MCN350A</b>
63 A	3	4	<b>MBN363A</b>	<b>MCN363A</b>
<b>Four pole miniature circuit breakers 6 kA</b>				
6 A	4	3	<b>MBN406A</b>	<b>MCN406A</b>
10 A	4	3	<b>MBN410A</b>	<b>MCN410A</b>
16 A	4	3	<b>MBN416A</b>	<b>MCN416A</b>
20 A	4	3	<b>MBN420A</b>	<b>MCN420A</b>
25 A	4	3	<b>MBN425A</b>	<b>MCN425A</b>
32 A	4	3	<b>MBN432A</b>	<b>MCN432A</b>
40 A	4	3	<b>MBN440A</b>	<b>MCN440A</b>
50 A	4	3	<b>MBN450A</b>	<b>MCN450A</b>
63 A	4	3	<b>MBN463A</b>	<b>MCN463A</b>



MBN116A



MBN232A



MBN320A



MBN440A



### Miniature circuit breakers 6/10kA, type B and C

- tripping curve:
  - B curve: 3 to 5 I<sub>n</sub>,
  - C curve: 5 to 10 I<sub>n</sub>
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 240/400V AC
- current rating: 6 to 63A
- frequency: 50/60Hz
- climate sealed: T2
- connecting capacity:
  - 16 mm<sup>2</sup> flexible conductor
  - 25 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1
- breaking capacity: 6kA (IEC 60898-1)
- 10kA (IEC 60947-2)
- **will not accept accessories**



MT116A



In	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
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#### Single pole miniature circuit breakers 6/10kA

6 A	1	12	MT106A	MU106A
10 A	1	12	MT110A	MU110A
16 A	1	12	MT116A	MU116A
20 A	1	12	MT120A	MU120A
25 A	1	12	MT125A	MU125A
32 A	1	12	MT132A	MU132A
40 A	1	12	MT140A	MU140A
50 A	1	12	MT150A	MU150A
63 A	1	12	MT163A	MU163A



MT216A



#### Double pole miniature circuit breakers 6/10kA

6 A	2	6	MT206A	MU206A
10 A	2	6	MT210A	MU210A
16 A	2	6	MT216A	MU216A
20 A	2	6	MT220A	MU220A
25 A	2	6	MT225A	MU225A
32 A	2	6	MT232A	MU232A
40 A	2	6	MT240A	MU240A
50 A	2	6	MT250A	MU250A
60 A	2	6	MT263A	MU263A



MT320A



#### Three pole miniature circuit breakers 6/10kA

6 A	3	4	MT306A	MU306A
10 A	3	4	MT310A	MU310A
16 A	3	4	MT316A	MU316A
20 A	3	4	MT320A	MU320A
25 A	3	4	MT325A	MU325A
32 A	3	4	MT332A	MU332A
40 A	3	4	MT340A	MU340A
50 A	3	4	MT350A	MU350A
63 A	3	4	MT363A	MU363A



#### Four pole miniature circuit breakers 6/10kA

6 A	4	3	-	MU406A
10 A	4	3	-	MU410A
16 A	4	3	-	MU416A
20 A	4	3	-	MU420A
25 A	4	3	-	MU425A
32 A	4	3	-	MU432A
40 A	4	3	-	MU440A
50 A	4	3	-	MU450A
63 A	4	3	-	MU463A

### Miniature circuit breakers 6/10 kA, type B and C

- tripping curve:
  - B curve: 3 to 5 I<sub>n</sub>,
  - C curve: 5 to 10 I<sub>n</sub>
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 240/400V AC
- current rating: 0.5 to 63A
- frequency: 50/60Hz
- climate sealed: T2
- connecting capacity:
  - 16 mm<sup>2</sup> flexible conductor
  - 25 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1
- breaking capacity: 6kA (IEC 60898-1)
- 10 kA (IEC 60947-2)

In	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
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#### Single pole miniature circuit breakers 6/10 kA

0.5 A	1	12	-	<b>MC100A</b>
1 A	1	12	-	<b>MC101A</b>
2 A	1	12	-	<b>MC102A</b>
3 A	1	12	-	<b>MC103A</b>
4 A	1	12	-	<b>MC104A</b>
6 A	1	12	<b>MB106A</b>	<b>MC106A</b>
10 A	1	12	<b>MB110A</b>	<b>MC110A</b>
16 A	1	12	<b>MB116A</b>	<b>MC116A</b>
20 A	1	12	<b>MB120A</b>	<b>MC120A</b>
25 A	1	12	<b>MB125A</b>	<b>MC125A</b>
32 A	1	12	<b>MB132A</b>	<b>MC132A</b>
40 A	1	12	<b>MB140A</b>	<b>MC140A</b>
50 A	1	12	<b>MB150A</b>	<b>MC150A</b>
63 A	1	12	<b>MB163A</b>	<b>MC163A</b>



MC132A



#### Double pole miniature circuit breakers 6/10 kA

0.5 A	2	6	-	<b>MC200A</b>
1 A	2	6	-	<b>MC201A</b>
2 A	2	6	-	<b>MC202A</b>
3 A	2	6	-	<b>MC203A</b>
4 A	2	6	-	<b>MC204A</b>
6 A	2	6	<b>MB206A</b>	<b>MC206A</b>
10 A	2	6	<b>MB210A</b>	<b>MC210A</b>
16 A	2	6	<b>MB216A</b>	<b>MC216A</b>
20 A	2	6	<b>MB220A</b>	<b>MC220A</b>
25 A	2	6	<b>MB225A</b>	<b>MC225A</b>
32 A	2	6	<b>MB232A</b>	<b>MC232A</b>
40 A	2	6	<b>MB240A</b>	<b>MC240A</b>
50 A	2	6	<b>MB250A</b>	<b>MC250A</b>
63 A	2	6	<b>MB263A</b>	<b>MC263A</b>



MC216A



#### Three pole miniature circuit breakers 6/10 kA

0.5 A	3	4	-	<b>MC300A</b>
1 A	3	4	-	<b>MC301A</b>
2 A	3	4	-	<b>MC302A</b>
3 A	3	4	-	<b>MC303A</b>
4 A	3	4	-	<b>MC304A</b>
6 A	3	4	<b>MB306A</b>	<b>MC306A</b>
10 A	3	4	<b>MB310A</b>	<b>MC310A</b>
16 A	3	4	<b>MB316A</b>	<b>MC316A</b>
20 A	3	4	<b>MB320A</b>	<b>MC320A</b>
25 A	3	4	<b>MB325A</b>	<b>MC325A</b>
32 A	3	4	<b>MB332A</b>	<b>MC332A</b>
40 A	3	4	<b>MB340A</b>	<b>MC340A</b>
50 A	3	4	<b>MB350A</b>	<b>MC350A</b>
63 A	3	4	<b>MB363A</b>	<b>MC363A</b>



MC320A





In	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>Four pole miniature circuit breakers 6/10 kA</b>				
0.5 A	4	3	-	<b>MC400A</b>
1 A	4	3	-	<b>MC401A</b>
2 A	4	3	-	<b>MC402A</b>
3 A	4	3	-	<b>MC403A</b>
4 A	4	3	-	<b>MC404A</b>
6 A	4	3	<b>MB406A</b>	<b>MC406A</b>
10 A	4	3	<b>MB410A</b>	<b>MC410A</b>
16 A	4	3	<b>MB416A</b>	<b>MC416A</b>
20 A	4	3	<b>MB420A</b>	<b>MC420A</b>
25 A	4	3	<b>MB425A</b>	<b>MC425A</b>
32 A	4	3	<b>MB432A</b>	<b>MC432A</b>
40 A	4	3	<b>MB440A</b>	<b>MC440A</b>
50 A	4	3	<b>MB450A</b>	<b>MC450A</b>
63 A	4	3	<b>MB463A</b>	<b>MC463A</b>



NGN116



### Miniature circuit breakers 6/10 kA, type D

- tripping curve: D curve: 10 to 20 In,
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 240/400V AC
- current rating: 0.5 to 63A
- frequency: 50/60Hz

- climate sealed: T2
- connecting capacity:  
25 mm<sup>2</sup> flexible conductor  
35 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1  
breaking capacity: 6kA (IEC 60898-1)  
10 kA (IEC 60947-2)

In	Width in module 17.5 mm	Pack qty	Cat. ref. D curve
<b>Single pole miniature circuit breakers 6/10 kA</b>			
0.5 A	1	1	<b>NGN100</b>
1 A	1	1	<b>NGN101</b>
2 A	1	1	<b>NGN102</b>
3 A	1	1	<b>NGN103</b>
4 A	1	1	<b>NGN104</b>
6 A	1	1	<b>NGN106</b>
10 A	1	1	<b>NGN110</b>
16 A	1	1	<b>NGN116</b>
20 A	1	1	<b>NGN120</b>
25 A	1	1	<b>NGN125</b>
32 A	1	1	<b>NGN132</b>
40 A	1	1	<b>NGN140</b>
50 A	1	1	<b>NGN150</b>
63 A	1	1	<b>NGN163</b>

In	Width in module 17.5 mm	Pack qty	Cat. ref. D curve
<b>Double pole miniature circuit breakers 6/10 kA</b>			
0.5 A	2	1	<b>NGN200</b>
1 A	2	1	<b>NGN201</b>
2 A	2	1	<b>NGN202</b>
3 A	2	1	<b>NGN203</b>
4 A	2	1	<b>NGN204</b>
6 A	2	1	<b>NGN206</b>
10 A	2	1	<b>NGN210</b>
16 A	2	1	<b>NGN216</b>
20 A	2	1	<b>NGN220</b>
25 A	2	1	<b>NGN225</b>
32 A	2	1	<b>NGN232</b>
40 A	2	1	<b>NGN240</b>
50 A	2	1	<b>NGN250</b>
63 A	2	1	<b>NGN263</b>
<b>Three pole miniature circuit breakers 6/10 kA</b>			
0.5 A	3	1	<b>NGN300</b>
1 A	3	1	<b>NGN301</b>
2 A	3	1	<b>NGN302</b>
3 A	3	1	<b>NGN303</b>
4 A	3	1	<b>NGN304</b>
6 A	3	1	<b>NGN306</b>
10 A	3	1	<b>NGN310</b>
16 A	3	1	<b>NGN316</b>
20 A	3	1	<b>NGN320</b>
25 A	3	1	<b>NGN325</b>
32 A	3	1	<b>NGN332</b>
40 A	3	1	<b>NGN340</b>
50 A	3	1	<b>NGN350</b>
63 A	3	1	<b>NGN363</b>
<b>Four pole miniature circuit breakers 6/10 kA</b>			
0.5 A	4	1	<b>NGN400</b>
1 A	4	1	<b>NGN401</b>
2 A	4	1	<b>NGN402</b>
3 A	4	1	<b>NGN403</b>
4 A	4	1	<b>NGN404</b>
6 A	4	1	<b>NGN406</b>
10 A	4	1	<b>NGN410</b>
16 A	4	1	<b>NGN416</b>
20 A	4	1	<b>NGN420</b>
25 A	4	1	<b>NGN425</b>
32 A	4	1	<b>NGN432</b>
40 A	4	1	<b>NGN440</b>
50 A	4	1	<b>NGN450</b>
63 A	4	1	<b>NGN463</b>



NGN232



NGN320



NGN440



### Miniature circuit breakers 10/15 kA, type B, C and D

- tripping curve:
  - B curve: 3 to 5 I<sub>n</sub>
  - C curve: 5 to 10 I<sub>n</sub>
  - D curve: 10 to 20 I<sub>n</sub>
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 240/400V AC
- current rating: 0.5 to 63A
- frequency: 50/60Hz
- climate sealed: T2
- connecting capacity:
  - 25 mm<sup>2</sup> flexible conductor
  - 35 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1
- breaking capacity: 10kA (IEC 60898-1)
- 15 kA (IEC 60947-2)



NCN116A



In	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve	D curve
<b>Single pole miniature circuit breakers 10/15 kA</b>					
0.5 A	1	12	-	NCN100A	NDN100A
1 A	1	12	-	NCN101A	NDN101A
2 A	1	12	-	NCN102A	NDN102A
3 A	1	12	-	NCN103A	NDN103A
4 A	1	12	-	NCN104A	NDN104A
6 A	1	12	NBN106A	NCN106A	NDN106A
10 A	1	12	NBN110A	NCN110A	NDN110A
16 A	1	12	NBN116A	NCN116A	NDN116A
20 A	1	12	NBN120A	NCN120A	NDN120A
25 A	1	12	NBN125A	NCN125A	NDN125A
32 A	1	12	NBN132A	NCN132A	NDN132A
40 A	1	12	NBN140A	NCN140A	NDN140A
50 A	1	12	NBN150A	NCN150A	NDN150A
63 A	1	12	NBN163A	NCN163A	NDN163A



NCN232A



In	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve	D curve
<b>Double pole miniature circuit breakers 10/15 kA</b>					
0.5 A	2	6	-	NCN200A	NDN200A
1 A	2	6	-	NCN201A	NDN201A
2 A	2	6	-	NCN202A	NDN202A
3 A	2	6	-	NCN203A	NDN203A
4 A	2	6	-	NCN204A	NDN204A
6 A	2	6	NBN206A	NCN206A	NDN206A
10 A	2	6	NBN210A	NCN210A	NDN210A
16 A	2	6	NBN216A	NCN216A	NDN216A
20 A	2	6	NBN220A	NCN220A	NDN220A
25 A	2	6	NBN225A	NCN225A	NDN225A
32 A	2	6	NBN232A	NCN232A	NDN232A
40 A	2	6	NBN240A	NCN240A	NDN240A
50 A	2	6	NBN250A	NCN250A	NDN250A
63 A	2	6	NBN263A	NCN263A	NDN263A

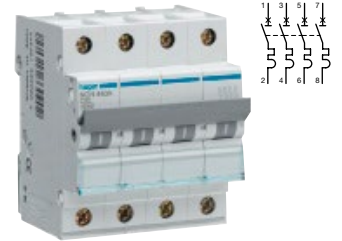


NCN320A



In	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve	D curve
<b>Three pole miniature circuit breakers 10/15 kA</b>					
0.5 A	3	4	-	NCN300A	NDN300A
1 A	3	4	-	NCN301A	NDN301A
2 A	3	4	-	NCN302A	NDN302A
3 A	3	4	-	NCN303A	NDN303A
4 A	3	4	-	NCN304A	NDN304A
6 A	3	4	NBN306A	NCN306A	NDN306A
10 A	3	4	NBN310A	NCN310A	NDN310A
16 A	3	4	NBN316A	NCN316A	NDN316A
20 A	3	4	NBN320A	NCN320A	NDN320A
25 A	3	4	NBN325A	NCN325A	NDN325A
32 A	3	4	NBN332A	NCN332A	NDN332A
40 A	3	4	NBN340A	NCN340A	NDN340A
50 A	3	4	NBN350A	NCN350A	NDN350A
63 A	3	4	NBN363A	NCN363A	NDN363A

In	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve	D curve
<b>Four pole miniature circuit breakers 10/15 kA</b>					
0.5 A	4	3	-	<b>NCN400A</b>	<b>NDN400A</b>
1 A	4	3	-	<b>NCN401A</b>	<b>NDN401A</b>
2 A	4	3	-	<b>NCN402A</b>	<b>NDN402A</b>
3 A	4	3	-	<b>NCN403A</b>	<b>NDN403A</b>
4 A	4	3	-	<b>NCN404A</b>	<b>NDN404A</b>
6 A	4	3	<b>NBN406A</b>	<b>NCN406A</b>	<b>NDN406A</b>
10 A	4	3	<b>NBN410A</b>	<b>NCN410A</b>	<b>NDN410A</b>
16 A	4	3	<b>NBN416A</b>	<b>NCN416A</b>	<b>NDN416A</b>
20 A	4	3	<b>NBN420A</b>	<b>NCN420A</b>	<b>NDN420A</b>
25 A	4	3	<b>NBN425A</b>	<b>NCN425A</b>	<b>NDN425A</b>
32 A	4	3	<b>NBN432A</b>	<b>NCN432A</b>	<b>NDN432A</b>
40 A	4	3	<b>NBN440A</b>	<b>NCN440A</b>	<b>NDN440A</b>
50 A	4	3	<b>NBN450A</b>	<b>NCN450A</b>	<b>NDN450A</b>
63 A	4	3	<b>NBN463A</b>	<b>NCN463A</b>	<b>NDN463A</b>



NCN440A

### Miniature circuit breakers 15 to 25 kA, type B, C and D

- tripping curve:
  - B curve: 3 to 5 I<sub>n</sub>
  - C curve: 5 to 10 I<sub>n</sub>
  - D curve: 10 to 20 I<sub>n</sub>
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 240/400V AC
- current rating: 0.5 to 63A
- frequency: 50/60Hz
- climate sealed: T2
- connecting capacity:
  - 25 mm<sup>2</sup> flexible conductor
  - 35 mm<sup>2</sup> rigid conductor
- comply to the standard IEC 60898-1, breaking capacity:
  - 25kA for 0.5 to 25A (IEC 60 947-2)
  - 20kA for 32 to 40A (IEC 60 947-2)
  - 15kA for 50 to 63A (IEC 60 947-2)

In	Breaking capacity (kA)	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve	D curve
<b>Single pole miniature circuit breakers 15 to 25 kA</b>						
0.5 A	80	1	1	-	<b>NRN100</b>	<b>NSN100</b>
1 A	80	1	1	-	<b>NRN101</b>	<b>NSN101</b>
2 A	80	1	1	-	<b>NRN102</b>	<b>NSN102</b>
3 A	50	1	1	-	<b>NRN103</b>	<b>NSN103</b>
4 A	50	1	1	-	<b>NRN104</b>	<b>NSN104</b>
6 A	30	1	1	<b>NQN106</b>	<b>NRN106</b>	<b>NSN106</b>
10 A	25	1	1	<b>NQN110</b>	<b>NRN110</b>	<b>NSN110</b>
16 A	25	1	1	<b>NQN116</b>	<b>NRN116</b>	<b>NSN116</b>
20 A	25	1	1	<b>NQN120</b>	<b>NRN120</b>	<b>NSN120</b>
25 A	25	1	1	<b>NQN125</b>	<b>NRN125</b>	<b>NSN125</b>
32 A	20	1	1	<b>NQN132</b>	<b>NRN132</b>	<b>NSN132</b>
40 A	20	1	1	<b>NQN140</b>	<b>NRN140</b>	<b>NSN140</b>
50 A	15	1	1	<b>NQN150</b>	<b>NRN150</b>	<b>NSN150</b>
63 A	15	1	1	<b>NQN163</b>	<b>NRN163</b>	<b>NSN163</b>



NRN116



NPN232



In	Breaking capacity (kA)	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve	D curve
<b>Double pole miniature circuit breakers 15 to 25 kA</b>						
0.5 A	80	2	1	-	<b>NRN200</b>	<b>NSN200</b>
1 A	80	2	1	-	<b>NRN201</b>	<b>NSN201</b>
2 A	80	2	1	-	<b>NRN202</b>	<b>NSN202</b>
3 A	50	2	1	-	<b>NRN203</b>	<b>NSN203</b>
4 A	50	2	1	-	<b>NRN204</b>	<b>NSN204</b>
6 A	30	2	1	<b>NQN206</b>	<b>NRN206</b>	<b>NSN206</b>
10 A	25	2	1	<b>NQN210</b>	<b>NRN210</b>	<b>NSN210</b>
16 A	25	2	1	<b>NQN216</b>	<b>NRN216</b>	<b>NSN216</b>
20 A	25	2	1	<b>NQN220</b>	<b>NRN220</b>	<b>NSN220</b>
25 A	25	2	1	<b>NQN225</b>	<b>NRN225</b>	<b>NSN225</b>
32 A	20	2	1	<b>NQN232</b>	<b>NRN232</b>	<b>NSN232</b>
40 A	20	2	1	<b>NQN240</b>	<b>NRN240</b>	<b>NSN240</b>
50 A	15	2	1	<b>NQN250</b>	<b>NRN250</b>	<b>NSN250</b>
63 A	15	2	1	<b>NQN263</b>	<b>NRN263</b>	<b>NSN263</b>



NPN320



In	Breaking capacity (kA)	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve	D curve
<b>Three pole miniature circuit breakers 15 to 25 kA</b>						
0.5 A	80	3	1	-	<b>NRN300</b>	<b>NSN300</b>
1 A	80	3	1	-	<b>NRN301</b>	<b>NSN301</b>
2 A	80	3	1	-	<b>NRN302</b>	<b>NSN302</b>
3 A	50	3	1	-	<b>NRN303</b>	<b>NSN303</b>
4 A	50	3	1	-	<b>NRN304</b>	<b>NSN304</b>
6 A	30	3	1	<b>NQN306</b>	<b>NRN306</b>	<b>NSN306</b>
10 A	25	3	1	<b>NQN310</b>	<b>NRN310</b>	<b>NSN310</b>
16 A	25	3	1	<b>NQN316</b>	<b>NRN316</b>	<b>NSN316</b>
20 A	25	3	1	<b>NQN320</b>	<b>NRN320</b>	<b>NSN320</b>
25 A	25	3	1	<b>NQN325</b>	<b>NRN325</b>	<b>NSN325</b>
32 A	20	3	1	<b>NQN332</b>	<b>NRN332</b>	<b>NSN332</b>
40 A	20	3	1	<b>NQN340</b>	<b>NRN340</b>	<b>NSN340</b>
50 A	15	3	1	<b>NQN350</b>	<b>NRN350</b>	<b>NSN350</b>
63 A	15	3	1	<b>NQN363</b>	<b>NRN363</b>	<b>NSN363</b>



NPN440



In	Breaking capacity (kA)	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve	D curve
<b>Four pole miniature circuit breakers 15 to 25 kA</b>						
0.5 A	80	4	1	-	<b>NRN400</b>	<b>NSN400</b>
1 A	80	4	1	-	<b>NRN401</b>	<b>NSN401</b>
2 A	80	4	1	-	<b>NRN402</b>	<b>NSN402</b>
3 A	50	4	1	-	<b>NRN403</b>	<b>NSN403</b>
4 A	50	4	1	-	<b>NRN404</b>	<b>NSN404</b>
6 A	30	4	1	<b>NQN406</b>	<b>NRN406</b>	<b>NSN406</b>
10 A	25	4	1	<b>NQN410</b>	<b>NRN410</b>	<b>NSN410</b>
16 A	25	4	1	<b>NQN416</b>	<b>NRN416</b>	<b>NSN416</b>
20 A	25	4	1	<b>NQN420</b>	<b>NRN420</b>	<b>NSN420</b>
25 A	25	4	1	<b>NQN425</b>	<b>NRN425</b>	<b>NSN425</b>
32 A	20	4	1	<b>NQN432</b>	<b>NRN432</b>	<b>NSN432</b>
40 A	20	4	1	<b>NQN440</b>	<b>NRN440</b>	<b>NSN440</b>
50 A	15	4	1	<b>NQN450</b>	<b>NRN450</b>	<b>NSN450</b>
63 A	15	4	1	<b>NQN463</b>	<b>NRN463</b>	<b>NSN463</b>

### Magnetic miniature circuit breakers

- Protection of smoke hatch motors against short circuit.
- tripping curve: 12 In
- breaking capacity:
  - 25kA  $\leq$  12.5A (EN 60 947-2)
  - 20kA  $>$  12.5A (EN 60 947-2)
- voltage rating: 230/400V AC
- current rating: 0.63 to 25A
- frequency: 50/60Hz
- climate sealed: T2
- connecting capacity:
  - 25 mm<sup>2</sup> flexible conductor
  - 35 mm<sup>2</sup> rigid conductor
- nominal voltage: 400 V AC
- comply with IEC 60 947-2



MMN216

In/A	Breaking capacity (kA)	Width in module 17.5 mm	Pack qty	Cat. ref.
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### Double pole magnetic miniature circuit breakers

0.63 A	25	2	1	<b>MMN200</b>
1.25 A	25	2	1	<b>MMN201</b>
1.6 A	25	2	1	<b>MMN202</b>
2.5 A	25	2	1	<b>MMN203</b>
4 A	25	2	1	<b>MMN204</b>
6.3 A	25	2	1	<b>MMN206</b>
10 A	25	2	1	<b>MMN210</b>
12 A	25	2	1	<b>MMN213</b>
16 A	20	2	1	<b>MMN216</b>
20 A	20	2	1	<b>MMN220</b>
25 A	20	2	1	<b>MMN225</b>

### Three pole magnetic miniature circuit breakers

0.63 A	25	3	1	<b>MMN300</b>
1.25 A	25	3	1	<b>MMN301</b>
1.6 A	25	3	1	<b>MMN302</b>
2.5 A	25	3	1	<b>MMN303</b>
4 A	25	3	1	<b>MMN304</b>
6.3 A	25	3	1	<b>MMN306</b>
10 A	25	3	1	<b>MMN310</b>
12 A	25	3	1	<b>MMN313</b>
16 A	20	3	1	<b>MMN316</b>
20 A	20	3	1	<b>MMN320</b>
25 A	20	3	1	<b>MMN325</b>



MMN310

Protection devices

### Accessories for Miniature Circuit Breakers

- for NGN, NBN, NCN, NDN, NGN, NQN, NRN and NSN

Description	Pack qty	Cat. ref.
terminal shields for MCBs, screw shield	4	<b>MZN120</b>
interphase barriers for MCBs, set of 3	1	<b>MZN121</b>



MZN120



MZN121

### Add-on blocks

When add-on block is associated with MCBs, the complete unit provides an earth fault protection and protects against electrical shocks by direct or indirect contacts. They are designed to be fitted to the right hand side of 2, 3, and 4 poles MCBs.

### Technical information

- AC type  
Ensured for residual sinusoidal alternating currents, whether suddenly applied or slowly rising. It incorporates a filtering device preventing the risk of nuisance tripping due to the transient voltages (lightening, line disturbance on other equipment...) and transient currents (from high capacitive circuits)

- A and HI type (reinforced immunity)

In addition to the characteristics of AC type, it ensured for residual pulsating direct currents, whether suddenly applied or slowly rising. They are used whenever fault currents are not sinusoidal. It reduces the unexpected tripping when they protect equipment generating disturbances like DC fault current (washing machines, speed drives, microprocessing, electronic ballast...).

### Compatible with the following miniature circuit breakers:

- MBNxxxA, MCNxxxA,
- MBxxxA, MCxxxA,
- NGN,
- NBNxxxA, NCNxxxA, NDNxxxA,
- NQN, NRN, NSN

### Add-on block

- sensitivity
  - high sensitivity: 10mA, 30mA instant tripping
  - medium sensitivity: 100mA, 300mA, 500mA instant tripping / 300mA, 500mA, 1A selective (time delay)
- voltage rating: 240/400V AC
- current rating: 25 to 63A
- frequency: 50/60Hz
- types: AC and A types
- mounting type: side mounted
- climate sealed: T2
- connecting capacity:
  - 25 A  
6 mm<sup>2</sup> flexible conductor  
10 mm<sup>2</sup> rigid conductor
  - 40 A and 63 A  
16 mm<sup>2</sup> flexible conductor  
25 mm<sup>2</sup> rigid conductor
- comply with IEC 61 009-1

IΔn	In/A	Width in module 17.5 mm	Pack qty	Cat. ref. class AC	class A and HI
<b>2 pole add-on blocks</b>					
10 mA	25	2	1	<b>BC226</b>	-
30 mA	25	2	1	<b>BD226</b>	<b>BD225</b>
	40	2	1	<b>BD241</b>	<b>BD240</b>
	63	2	1	<b>BD264</b>	<b>BD263</b>
100 mA	63	2	1	<b>BE264</b>	-
100 mA	63	2	1	<b>BN264</b>	-
300 mA	25	2	1	<b>BF226</b>	<b>BF225</b>
	40	2	1	<b>BF241</b>	<b>BF240</b>
	63	2	1	<b>BF264</b>	<b>BF263</b>
300 mA	63	2	1	<b>BP264</b>	-
500 mA	63	2	1	<b>BG264</b>	-
500 mA	63	2	1	<b>BR264</b>	-
1A	63	2	1	<b>BS264</b>	<b>BS263</b>
<b>3 pole add-on blocks</b>					
30 mA	25	2	1	<b>BD326</b>	<b>BD325</b>
	40	3	1	<b>BD341</b>	<b>BD340</b>
	63	3	1	<b>BD364</b>	<b>BD363</b>
300 mA	25	2	1	<b>BF326</b>	<b>BF325</b>
	40	3	1	<b>BF341</b>	<b>BF340</b>
	63	3	1	<b>BF364</b>	<b>BF363</b>
300 mA	63	3	1	<b>BP364</b>	-
500 mA	63	3	1	<b>BG364</b>	-
500 mA	63	3	1	<b>BR364</b>	-
1 A	63	3	1	<b>BS364</b>	<b>BS363</b>



BD226



BD364

I <sub>Δn</sub>	I <sub>n</sub> /A	Width in module 17.5 mm	Pack qty	Cat. ref. class AC	class A and HI
<b>4 pole add-on blocks</b>					
30 mA	25	2	1	<b>BD426</b>	<b>BD425</b>
	40	3	1	<b>BD441</b>	<b>BD440</b>
	63	3	1	<b>BD464</b>	<b>BD463</b>
100 mA	63	3	1	<b>BE464</b>	-
100 mA $\text{\textcircled{S}}$	63	3	1	<b>BN464</b>	-
300 mA	25	2	1	<b>BF426</b>	<b>BF425</b>
	40	3	1	<b>BF441</b>	<b>BF440</b>
	63	3	1	<b>BF464</b>	<b>BF463</b>
300 mA $\text{\textcircled{S}}$	63	3	1	<b>BP464</b>	-
500 mA	63	3	1	<b>BG464</b>	-
500 mA $\text{\textcircled{S}}$	63	3	1	<b>BR464</b>	-
1 A $\text{\textcircled{S}}$	63	3	1	<b>BS464</b>	<b>BS463N</b>
<b>4 pole add-on blocks double output</b>					
30 mA	25	3	1	<b>BDC825</b>	<b>BDH825</b>
	40	3	1	<b>BDC840</b>	<b>BDH840</b>
	63	3	1	<b>BDC863</b>	<b>BDH863</b>
300 mA	25	3	1	<b>BFC825</b>	<b>BFH825</b>
	40	3	1	<b>BFC840</b>	<b>BFH840</b>
	63	3	1	<b>BFC863</b>	<b>BFH863</b>
300 mA $\text{\textcircled{S}}$	63	3	1	<b>BPC863</b>	-
1 A $\text{\textcircled{S}}$	63	3	1	<b>BSC863</b>	-



BD463



BFC840



Protection and control of circuits against overloads and short circuits. Allow to isolate circuits. They can be used for installation in commercial building and industrial premises.

### Miniature circuit breakers 10 kA, type B and C

- breaking capacity:
  - 10 kA (IEC 60 898-1)
  - 10 kA (IEC 60 947-2)
- tripping curves
  - B curve: 3 to 5 In
  - C curve: 5 to 10 In
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 230/400V AC
- current rating: 80 to 125 A
- frequency: 50/60 Hz
- climate sealed: T2
- fast-on connection: no
- tightening comp. system: no
- lockable handle: no
- connection capacity
  - rigid conductors: 70 mm<sup>2</sup>
  - flexible conductors: 50 mm<sup>2</sup>
- comply with IEC 60898-1, 60947-2

In/A	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
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#### Single pole miniature circuit breakers 10 kA

80	1.5	1	<b>HLE180S</b>	<b>HLF180S</b>
100	1.5	1	<b>HLE190S</b>	<b>HLF190S</b>
125	1.5	1	<b>HLE199S</b>	<b>HLF199S</b>



HLF199S

#### Double pole miniature circuit breakers 10 kA

80	3	1	<b>HLE280S</b>	<b>HLF280S</b>
100	3	1	<b>HLE290S</b>	<b>HLF290S</b>
125	3	1	<b>HLE299S</b>	<b>HLF299S</b>



HLF299S

#### Three pole miniature circuit breakers 10 kA

80	4.5	1	<b>HLE380S</b>	<b>HLF380S</b>
100	4.5	1	<b>HLE390S</b>	<b>HLF390S</b>
125	4.5	1	<b>HLE399S</b>	<b>HLF399S</b>



HLF399S

#### Four pole miniature circuit breakers 10 kA

80	6	1	<b>HLE480S</b>	<b>HLF480S</b>
100	6	1	<b>HLE490S</b>	<b>HLF490S</b>
125	6	1	<b>HLE499S</b>	<b>HLF499S</b>



HLF499S

### Miniature circuit breakers 15 kA, type B, C and D

- breaking capacity:
  - 15 kA (IEC 60 898-1),
  - 15 kA (IEC 60 947-2)
- tripping curves
  - B curve: 3 to 5 I<sub>n</sub>
  - C curve: 5 to 10 I<sub>n</sub>
  - D curve: 10 to 20 I<sub>n</sub>
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 230/400V AC
- current rating: 80 to 125 A
- frequency: 50/60 Hz
- climate sealed: T2
- fast-on connection: yes
- tightening comp. system: yes
- lockable handle: yes
- connection capacity
  - rigid conductors: 70 mm<sup>2</sup>
  - flexible conductors: 50 mm<sup>2</sup>
- comply with IEC 60898-1, 60947-2

In/A	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve	D curve
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#### Single pole miniature circuit breakers 15 kA

80	1.5	1	<b>HMB180</b>	<b>HMC180</b>	<b>HMD180</b>
100	1.5	1	<b>HMB190</b>	<b>HMC190</b>	<b>HMD190</b>
125	1.5	1	<b>HMB199</b>	<b>HMC199</b>	<b>HMD199</b>



HMB180

#### Double pole miniature circuit breakers 15 kA

80	3	1	<b>HMB280</b>	<b>HMC280</b>	<b>HMD280</b>
100	3	1	<b>HMB290</b>	<b>HMC290</b>	<b>HMD290</b>
125	3	1	<b>HMB299</b>	<b>HMC299</b>	<b>HMD299</b>



HMB280

#### Three pole miniature circuit breakers 15 kA

80	4.5	1	<b>HMB380</b>	<b>HMC380</b>	<b>HMD380</b>
100	4.5	1	<b>HMB390</b>	<b>HMC390</b>	<b>HMD390</b>
125	4.5	1	<b>HMB399</b>	<b>HMC399</b>	<b>HMD399</b>



HMC399

#### Four pole miniature circuit breakers 15 kA

80	6	1	<b>HMB480</b>	<b>HMC480</b>	<b>HMD480</b>
100	6	1	<b>HMB490</b>	<b>HMC490</b>	<b>HMD490</b>
125	6	1	<b>HMB499</b>	<b>HMC499</b>	<b>HMD499</b>



HMC499

### Miniature circuit breakers 30 kA, type B and C

- breaking capacity:
  - 30 kA (IEC 60 898-1)
  - 30 kA (IEC 60 947-2)
- tripping curves
  - B curve: 3 to 5 I<sub>n</sub>
  - C curve: 5 to 10 I<sub>n</sub>
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 230/400V AC
- current rating: 80 to 125 A
- frequency: 50/60 Hz
- climate sealed: T2
- fast-on connection: yes
- tightening comp. system: yes
- lockable handle: yes
- connection capacity
  - rigid conductors: 70 mm<sup>2</sup>
  - flexible conductors: 50 mm<sup>2</sup>
- comply with IEC 60898-1, 60947-2



HMK199



HMK299



HMK399



HMK499

In/A	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>Single pole miniature circuit breakers 30 kA</b>				
80	1.5	1	<b>HMJ180</b>	<b>HMK180</b>
100	1.5	1	<b>HMJ190</b>	<b>HMK190</b>
125	1.5	1	<b>HMJ199</b>	<b>HMK199</b>

In/A	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>Double pole miniature circuit breakers 30 kA</b>				
80	3	1	<b>HMJ280</b>	<b>HMK280</b>
100	3	1	<b>HMJ290</b>	<b>HMK290</b>
125	3	1	<b>HMJ299</b>	<b>HMK299</b>

In/A	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>Three pole miniature circuit breakers 30 kA</b>				
80	4.5	1	<b>HMJ380</b>	<b>HMK380</b>
100	4.5	1	<b>HMJ390</b>	<b>HMK390</b>
125	4.5	1	<b>HMJ399</b>	<b>HMK399</b>

In/A	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>Four pole miniature circuit breakers 30 kA</b>				
80	6	1	<b>HMJ480</b>	<b>HMK480</b>
100	6	1	<b>HMJ490</b>	<b>HMK490</b>
125	6	1	<b>HMJ499</b>	<b>HMK499</b>



MZN130



MZN131

### Accessories for Miniature Circuit Breakers

- for HLE, HLF, HMB, HMC, HMD, HMK, HMJ and HMX

Description	Cat. ref.
terminal cover / screw cap, sealable screw cap	<b>MZN130</b>
phase separator, 1 set of 3 pieces	<b>MZN131</b>

### Miniature circuit breakers 50 kA, type C

- breaking capacity:  
50 kA (IEC 60 898-1),  
50 kA (IEC 60 947-2)
- tripping curves  
C curve: 5 to 10 I<sub>n</sub>
- poles: 1PP, 2PP, 3PP, 4PP (protected poles)
- voltage rating: 230/400V AC
- current rating: 80 to 125 A
- frequency: 50/60 Hz
- climate sealed: T2
- fast-on connection: yes
- tightening comp. system: yes
- lockable handle: yes
- connection capacity  
rigid conductors: 70 mm<sup>2</sup>  
flexible conductors: 50 mm<sup>2</sup>
- comply with IEC 60898-1, 60947-2

In/A	Width in module 17.5 mm	Pack qty	Cat. ref. C curve
<b>Single pole miniature circuit breakers 50 kA</b>			
10	1.5	1	<b>HMX110</b>
16	1.5	1	<b>HMX116</b>
20	1.5	1	<b>HMX120</b>
25	1.5	1	<b>HMX125</b>
32	1.5	1	<b>HMX132</b>
40	1.5	1	<b>HMX140</b>
50	1.5	1	<b>HMX150</b>
63	1.5	1	<b>HMX163</b>
<b>Double pole miniature circuit breakers 50 kA</b>			
10	3	1	<b>HMX210</b>
16	3	1	<b>HMX216</b>
20	3	1	<b>HMX220</b>
25	3	1	<b>HMX225</b>
32	3	1	<b>HMX232</b>
40	3	1	<b>HMX240</b>
50	3	1	<b>HMX250</b>
63	3	1	<b>HMX263</b>
<b>Three pole miniature circuit breakers 50 kA</b>			
10	4.5	1	<b>HMX310</b>
16	4.5	1	<b>HMX316</b>
20	4.5	1	<b>HMX320</b>
25	4.5	1	<b>HMX325</b>
32	4.5	1	<b>HMX332</b>
40	4.5	1	<b>HMX340</b>
50	4.5	1	<b>HMX350</b>
63	4.5	1	<b>HMX363</b>
<b>Four pole miniature circuit breakers 50 kA</b>			
10	6	1	<b>HMX410</b>
16	6	1	<b>HMX416</b>
20	6	1	<b>HMX420</b>
25	6	1	<b>HMX425</b>
32	6	1	<b>HMX432</b>
40	6	1	<b>HMX440</b>
50	6	1	<b>HMX450</b>
63	6	1	<b>HMX463</b>



HMX120



HMX225



HMX320



HMX440

### Add-on blocks

When add-on block is associated with MCBs, the complete unit provides an earth fault protection and protects against electrical shocks by direct or indirect contacts. They are designed to be fitted to the right hand side of 2, 3 and 4 poles MCBs.

### Technical information

#### - AC type

Ensured for residual sinusoidal alternating currents, whether suddenly applied or slowly rising. It incorporates a filtering device preventing the risk of nuisance tripping due to the transient voltages (lightening, line disturbance on other equipment...) and transient currents (from high capacitive circuits).

#### - A and HI type (reinforced immunity)

In addition to the characteristics of AC type, it ensured for residual pulsating direct currents, whether suddenly applied or slowly rising. They are used whenever fault currents are not sinusoidal. It reduces the unexpected tripping when they protect equipment generating disturbances like DC fault current (washing machines, speed drives, microprocessing, electronic ballast...).

#### - Adjustable block

The setting is done by actuating the thumb wheel on the front face. The setting thumb wheels are protected by a transparent sealable cover.

#### - Tightening compensation terminals

The circuit breakers block are equipped with screw terminals with tightening compensation, reinforced arch and cable holding jaws. These contributes to an effective tightening over time.

#### Compatible with the following miniature circuit breakers:

- HLE, HLF
- HMB, HMC, HMD
- HMJ, HMK
- HMX

### Add-on block

#### - sensitivity

- high sensitivity: 30mA instant tripping (fixed)
- medium sensitivity: 300mA instant tripping (fixed) / 300mA, 500mA, 1A adjustable (selective or time delay)

#### - time delay: 0ms, 60ms or 150ms

#### - current rating: 125A

#### - voltage rating: 240/400V AC

#### - poles: 2P, 3P, 4P

#### - types: AC and A/Hi types

#### - frequency: 50/60Hz

#### - mounting type: side mounted

#### - climate sealed: T2

#### - connecting capacity:

35 mm<sup>2</sup> flexible conductor

70 mm<sup>2</sup> rigid conductor

#### - comply with IEC 61 009-1

I $\Delta$ n	In/A	Width in module 17.5 mm	Pack qty	Cat. ref. class AC	class A and HI
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### 2 pole add-on blocks

fixed 30 mA

125

6

1

**BDC280E**

**BDH280E**

adjustable 0.3 - 0.5 - 1 A  
inst. - - 150 ms

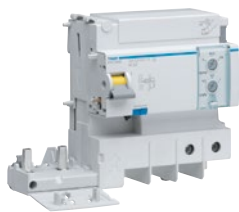
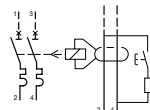
125

6

1

**BTC280E**

**BTH280E**



BTH280E

### 3 pole add-on blocks

fixed 30 mA

125

6

1

**BDC380E**

**BDH380E**

adjustable 0.3 - 0.5 - 1 A  
inst. - - 150 ms

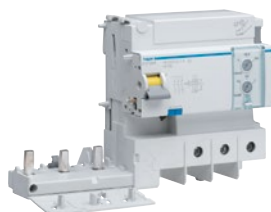
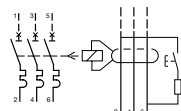
125

6

1

**BTC380E**

**BTH380E**



BTH380E

### 4 pole add-on blocks

fixed 30 mA

125

6

1

**BDC480E**

**BDH480E**

fixed 300 mA

125

6

1

**BFC480E**

**BFH480E**

adjustable 0.3 - 0.5 - 1 A  
inst. - - 150 ms

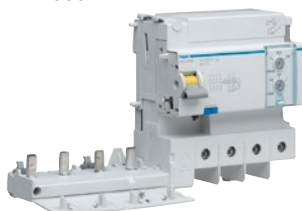
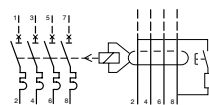
125

6

1

**BTC480E**

**BTH480E**



BDC480E

### Residual Circuit Breakers with Overload (RCBO)

Compact protection devices which provide MCB overload protection and RCD earth leakage protection (protect against electrical shocks by direct or indirect contacts).

#### Technical information

- AC type  
Ensured for residual sinusoidal alternating currents, whether suddenly applied or slowly rising.

- A type

In addition to the characteristics of AC type, it ensured for residual pulsating direct currents, whether suddenly applied or slowly rising. They are used whenever fault currents are not sinusoidal. It is able to detect DC fault current generated by loads like washing machines, speed drives, microprocessing, electronic ballast.

### SP RCBOs

- sensitivity:
  - high sensitivity: 10mA, 30mA instantaneous tripping (fixed)
  - medium sensitivity: 100mA, 300mA instantaneous tripping (fixed)
- current rating: 6 to 50A
- voltage rating: 230V AC
- poles: SP& passing N
- types: AC type

- frequency: 50Hz
- flying neutral lead length: 700mm
- connection capacity
  - outgoing:
    - rigid conductors: 16mm<sup>2</sup>
    - flexible conductors: 10mm<sup>2</sup>
  - incoming:
    - rigid conductors: 35mm<sup>2</sup>
    - flexible conductors: 25mm<sup>2</sup>
- approved according to IEC 61 009-1



AD124

In / A	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>RCBOs AC type - 30 mA - 6 kA</b>				
6	1	1	<b>AD104</b>	<b>AD119</b>
10	1	1	<b>AD105</b>	<b>AD120</b>
16	1	1	<b>AD107</b>	<b>AD122</b>
20	1	1	<b>AD108</b>	<b>AD123</b>
25	1	1	<b>AD109</b>	<b>AD124</b>
32	1	1	<b>AD110</b>	<b>AD125</b>
40	1	1	<b>AD111</b>	<b>AD126</b>
50	1	1	<b>AD113</b>	<b>AD128</b>
<b>RCBOs AC type - 30 mA - 10 kA</b>				
6	1	1	<b>ADB106</b>	<b>ADC106</b>
10	1	1	<b>ADB110</b>	<b>ADC110</b>
16	1	1	<b>ADB116</b>	<b>ADC116</b>
20	1	1	<b>ADB120</b>	<b>ADC120</b>
25	1	1	<b>ADB125</b>	<b>ADC125</b>
32	1	1	<b>ADB132</b>	<b>ADC132</b>
40	1	1	<b>ADB140</b>	<b>ADC140</b>
50	1	1	<b>ADB150</b>	<b>ADC150</b>
<b>RCBOs AC type - 100 mA - 6 kA</b>				
6	1	1		<b>AE106Z</b>
10	1	1		<b>AE110Z</b>
16	1	1		<b>AE116Z</b>
20	1	1		<b>AE120Z</b>
25	1	1		<b>AE125Z</b>
32	1	1		<b>AE132Z</b>
40	1	1		<b>AE140Z</b>
50	1	1		<b>AE150Z</b>
<b>RCBOs AC type - 100 mA - 10 kA</b>				
6	1	1		<b>AEC106</b>
10	1	1		<b>AEC110</b>
16	1	1		<b>AEC116</b>
20	1	1		<b>AEC120</b>
25	1	1		<b>AEC125</b>
32	1	1		<b>AEC132</b>
40	1	1		<b>AEC140</b>

In / A	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>RCBOs AC type - 300 mA - 6 kA</b>				
10	1	1	-	<b>AF110Z</b>
16	1	1	-	<b>AF116Z</b>
20	1	1	-	<b>AF120Z</b>
25	1	1	-	<b>AF125Z</b>
32	1	1	-	<b>AF132Z</b>
40	1	1	-	<b>AF140Z</b>
50	1	1	-	<b>AF145Z</b>
<b>RCBOs A type - 30 mA - 10 kA</b>				
6	1	1	-	<b>ADA156U</b>
10	1	1	-	<b>ADA160U</b>
16	1	1	-	<b>ADA160U</b>
20	1	1	-	<b>ADA170U</b>
25	1	1	-	<b>ADA175U</b>
32	1	1	-	<b>ADA182U</b>

**SP&N RCBOs**

- sensitivity:
  - high sensitivity: 30mA instant tripping (fixed)
  - medium sensitivity: 100mA, 300mA instant tripping (fixed)
- current rating: 6 to 40A
- curves: B and C
- voltage rating: 230V AC

- poles: SP&N
- types: AC and A types
- frequency: 50Hz
- connection capacity
  - rigid conductors: 70 mm<sup>2</sup>
  - flexible conductors: 50 mm<sup>2</sup>
- approved according to IEC 61 009-1

In / A	Breaking capacity (IEC 60 898-1)	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>RCBOs AC type - 30 mA - <u>4500</u> 6 kA *</b>					
6 A	4.5 kA	2	1	<b>AD806J</b>	<b>AD856J</b>
10 A	4.5 kA	2	1	<b>AD810J</b>	<b>AD860J</b>
16 A	4.5 kA	2	1	<b>AD816J</b>	<b>AD866J</b>
20 A	4.5 kA	2	1	<b>AD820J</b>	<b>AD870J</b>
25 A	4.5 kA	2	1	<b>AD825J</b>	<b>AD875J</b>
32 A	4.5 kA	2	1	<b>AD832J</b>	<b>AD882J</b>
40 A	4.5 kA	2	1	<b>AD840J</b>	<b>AD890J</b>
<b>RCBOs AC type - 30 mA - <u>6000</u></b>					
6 A	6 kA	2	1	<b>AD906B</b>	<b>AD956B</b>
10 A	6 kA	2	1	<b>AD910B</b>	<b>AD960B</b>
16 A	6 kA	2	1	<b>AD916B</b>	<b>AD966B</b>
20 A	6 kA	2	1	<b>AD920B</b>	<b>AD970B</b>
25 A	6 kA	2	1	<b>AD925B</b>	<b>AD975B</b>
32 A	6 kA	2	1	<b>AD932B</b>	<b>AD982B</b>
40 A	6 kA	2	1	<b>AD940B</b>	<b>AD990B</b>
<b>RCBOs AC type - 100 mA - <u>6000</u></b>					
6 A	6 kA	2	1	-	<b>AE956B</b>
10 A	6 kA	2	1	-	<b>AE960B</b>
16 A	6 kA	2	1	-	<b>AE966B</b>
20 A	6 kA	2	1	-	<b>AE970B</b>
25 A	6 kA	2	1	-	<b>AE975B</b>
32 A	6 kA	2	1	-	<b>AE982B</b>
40 A	6 kA	2	1	-	<b>AE990B</b>



AD816J

\* Will not accept auxiliaries

In / A	Breaking capacity (IEC 60 898-1)	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>RCBOs AC type - 300 mA - [6000]</b>					
6 A	6 kA	2	1	-	<b>AF956B</b>
10 A	6 kA	2	1	-	<b>AF960B</b>
16 A	6 kA	2	1	-	<b>AF966B</b>
20 A	6 kA	2	1	-	<b>AF970B</b>
25 A	6 kA	2	1	-	<b>AF975B</b>
32 A	6 kA	2	1	-	<b>AF982B</b>
40 A	6 kA	2	1	-	<b>AF990B</b>

<b>RCBOs A type - 30 mA - [6000]</b>					
6 A	6 kA	2	1	<b>AD906J</b>	<b>AD956J</b>
10 A	6 kA	2	1	<b>AD910J</b>	<b>AD960J</b>
16 A	6 kA	2	1	<b>AD916J</b>	<b>AD966J</b>
20 A	6 kA	2	1	<b>AD920J</b>	<b>AD970J</b>
25 A	6 kA	2	1	<b>AD925J</b>	<b>AD975J</b>
32 A	6 kA	2	1	<b>AD932J</b>	<b>AD982J</b>
40 A	6 kA	2	1	<b>AD940J</b>	<b>AD990J</b>



AD916J

<b>RCBOs A type - 300 mA - [6000]</b>					
6 A	6 kA	2	1	-	<b>AF956J</b>
10 A	6 kA	2	1	-	<b>AF960J</b>
16 A	6 kA	2	1	-	<b>AF966J</b>
20 A	6 kA	2	1	-	<b>AF970J</b>
25 A	6 kA	2	1	-	<b>AF975J</b>
32 A	6 kA	2	1	-	<b>AF982J</b>
40 A	6 kA	2	1	-	<b>AF990J</b>

\* Will not accept auxiliaries

### 4 poles RCBOs

- sensitivity:
  - high sensitivity: 30mA instant tripping (fixed)
  - medium sensitivity: 300mA instant tripping (fixed)
- current rating: 6 to 40A
- curves: B and C
- voltage rating: 230V AC
- poles: 4PP
- types: AC and A types
- frequency: 50Hz
- connection capacity
  - rigid conductors: 70 mm<sup>2</sup>
  - flexible conductors: 50 mm<sup>2</sup>
- approved according to IEC 61 009-1

In / A	Breaking capacity (IEC 60 898-1)	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>RCBOs AC type - 30 mA - 6 kA</b>					
6 A	6 kA	4	1	-	<b>ADP456H</b>
10 A	6 kA	4	1	-	<b>ADP460H</b>
16 A	6 kA	4	1	-	<b>ADP466H</b>
20 A	6 kA	4	1	-	<b>ADP470H</b>
25 A	6 kA	4	1	-	<b>ADP475H</b>
32 A	6 kA	4	1	-	<b>ADP482H</b>
40 A	6 kA	4	1	-	<b>ADP490H</b>



ADP466H

<b>RCBOs AC type - 300 mA - 6 kA</b>					
6 A	6 kA	4	1	-	<b>AFP456H</b>
10 A	6 kA	4	1	-	<b>AFP460H</b>
16 A	6 kA	4	1	-	<b>AFP466H</b>
20 A	6 kA	4	1	-	<b>AFP470H</b>
25 A	6 kA	4	1	-	<b>AFP475H</b>
32 A	6 kA	4	1	-	<b>AFP482H</b>
40 A	6 kA	4	1	-	<b>AFP490H</b>





ADH406H

In / A	Breaking capacity (IEC 60 898-1)	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>RCBOs A type - 30 mA - 6 kA</b>					
6 A	6 kA	4	1	-	<b>ADM456H</b>
10 A	6 kA	4	1	-	<b>ADM460H</b>
16 A	6 kA	4	1	-	<b>ADM466H</b>
20 A	6 kA	4	1	-	<b>ADM470H</b>
25 A	6 kA	4	1	-	<b>ADM475H</b>
32 A	6 kA	4	1	-	<b>ADM482H</b>
40 A	6 kA	4	1	-	<b>ADM490H</b>
<b>RCBOs A type - 300 mA - 6 kA</b>					
6 A	6 kA	4	1	-	<b>AFM456H</b>
10 A	6 kA	4	1	-	<b>AFM460H</b>
16 A	6 kA	4	1	-	<b>AFM466H</b>
20 A	6 kA	4	1	-	<b>AFM470H</b>
25 A	6 kA	4	1	-	<b>AFM475H</b>
32 A	6 kA	4	1	-	<b>AFM482H</b>
40 A	6 kA	4	1	-	<b>AFM490H</b>
<b>RCBOs HI type - 30 mA - 6 kA</b>					
6 A	6 kA	4	1	<b>ADH406H</b>	<b>ADH456H</b>
10 A	6 kA	4	1	<b>ADH410H</b>	<b>ADH460H</b>
16 A	6 kA	4	1	<b>ADH416H</b>	<b>ADH466H</b>
20 A	6 kA	4	1	<b>ADH420H</b>	<b>ADH470H</b>
25 A	6 kA	4	1	<b>ADH425H</b>	<b>ADH475H</b>
32 A	6 kA	4	1	<b>ADH432H</b>	<b>ADH482H</b>
40 A	6 kA	4	1	<b>ADH440H</b>	<b>ADH490H</b>
<b>RCBOs HI type - 300 mA - 6 kA</b>					
6 A	6 kA	4	1	<b>AFH406H</b>	<b>AFH456H</b>
10 A	6 kA	4	1	<b>AFH410H</b>	<b>AFH460H</b>
16 A	6 kA	4	1	<b>AFH416H</b>	<b>AFH466H</b>
20 A	6 kA	4	1	<b>AFH420H</b>	<b>AFH470H</b>
25 A	6 kA	4	1	<b>AFH425H</b>	<b>AFH475H</b>
32 A	6 kA	4	1	<b>AFH432H</b>	<b>AFH482H</b>
40 A	6 kA	4	1	<b>AFH440H</b>	<b>AFH490H</b>
<b>RCBOs AC type - 30 mA - 10 kA</b>					
6 A	10 kA	4	1	-	<b>ADQ456H</b>
10 A	10 kA	4	1	-	<b>ADQ460H</b>
16 A	10 kA	4	1	-	<b>ADQ466H</b>
20 A	10 kA	4	1	-	<b>ADQ470H</b>
25 A	10 kA	4	1	-	<b>ADQ475H</b>
32 A	10 kA	4	1	-	<b>ADQ482H</b>
40 A	10 kA	4	1	-	<b>ADQ490H</b>
<b>RCBOs AC type - 300 mA - 10 kA</b>					
6 A	10 kA	4	1	-	<b>AFQ456H</b>
10 A	10 kA	4	1	-	<b>AFQ460H</b>
16 A	10 kA	4	1	-	<b>AFQ466H</b>
20 A	10 kA	4	1	-	<b>AFQ470H</b>
25 A	10 kA	4	1	-	<b>AFQ475H</b>
32 A	10 kA	4	1	-	<b>AFQ482H</b>
40 A	10 kA	4	1	-	<b>AFQ490H</b>

In / A	Breaking capacity (IEC 60 898-1)	Width in module 17.5 mm	Pack qty	Cat. ref. B curve	C curve
<b>RCBOs A type - 30 mA - 10 kA</b>					
6 A	10 kA	4	1	<b>ADX406H</b>	<b>ADX456H</b>
10 A	10 kA	4	1	<b>ADX410H</b>	<b>ADX460H</b>
16 A	10 kA	4	1	<b>ADX416H</b>	<b>ADX466H</b>
20 A	10 kA	4	1	<b>ADX420H</b>	<b>ADX470H</b>
25 A	10 kA	4	1	<b>ADX425H</b>	<b>ADX475H</b>
32 A	10 kA	4	1	<b>ADX432H</b>	<b>ADX482H</b>
40 A	10 kA	4	1	<b>ADX440H</b>	<b>ADX490H</b>
<b>RCBOs A type - 300 mA - 10 kA</b>					
6 A	10 kA	4	1	<b>AFX406H</b>	<b>AFX456H</b>
10 A	10 kA	4	1	<b>AFX410H</b>	<b>AFX460H</b>
16 A	10 kA	4	1	<b>AFX416H</b>	<b>AFX466H</b>
20 A	10 kA	4	1	<b>AFX420H</b>	<b>AFX470H</b>
25 A	10 kA	4	1	<b>AFX425H</b>	<b>AFX475H</b>
32 A	10 kA	4	1	<b>AFX432H</b>	<b>AFX482H</b>
40 A	10 kA	4	1	<b>AFX440H</b>	<b>AFX490H</b>
<b>RCBOs HI type - 30 mA - 10 kA</b>					
6 A	10 kA	4	1	<b>ADR406H</b>	<b>ADR456H</b>
10 A	10 kA	4	1	<b>ADR410H</b>	<b>ADR460H</b>
16 A	10 kA	4	1	<b>ADR416H</b>	<b>ADR466H</b>
20 A	10 kA	4	1	<b>ADR420H</b>	<b>ADR470H</b>
25 A	10 kA	4	1	<b>ADR425H</b>	<b>ADR475H</b>
32 A	10 kA	4	1	<b>ADR432H</b>	<b>ADR482H</b>
40 A	10 kA	4	1	<b>ADR440H</b>	<b>ADR490H</b>
<b>RCBOs HI type - 300 mA - 10 kA</b>					
6 A	10 kA	4	1	<b>AFR406H</b>	<b>AFR456H</b>
10 A	10 kA	4	1	<b>AFR410H</b>	<b>AFR460H</b>
16 A	10 kA	4	1	<b>AFR416H</b>	<b>AFR466H</b>
20 A	10 kA	4	1	<b>AFR420H</b>	<b>AFR470H</b>
25 A	10 kA	4	1	<b>AFR425H</b>	<b>AFR475H</b>
32 A	10 kA	4	1	<b>AFR432H</b>	<b>AFR482H</b>
40 A	10 kA	4	1	<b>AFR440H</b>	<b>AFR490H</b>



ADR416H

Protection devices

### Residual Current Circuit Breakers (RCCBs)

Compact devices which provide RCD earth leakage protection (protect against electrical shocks by direct or indirect contacts). To open automatically in the event of an earth fault between phase and earth and/or neutral and earth.  
INC = 6kA with gG fuse

#### Technical information

- AC type  
Ensured for residual sinusoidal alternating currents, whether suddenly applied or slowly rising

- A and HI type (reinforced immunity)  
In addition to the characteristics of AC type, it ensured for residual pulsating direct currents, whether suddenly applied or slowly rising. They are used whenever fault currents are not sinusoidal.  
HI types only: It reduces the unexpected tripping when they protect equipment generating disturbances like DC fault current (washing machines, speed drives, microprocessing, electronic ballast...).

Nota: to fit auxiliaries contact, alarm contact, for all tripping auxiliaries we have to use the dedicated auxiliaries CZ001

#### RCCBs

- sensitivity:
  - high sensitivity: 10, 30mA instantaneous tripping (fixed)
  - medium sensitivity: 100mA, 300mA instantaneous or selective tripping (fixed)
- current rating: 16 to 100A
- voltage rating: 230V AC (2P) and 400V (4P)
- poles: 2P and 4P
- types: AC, A and HI types
- frequency: 50Hz
- connection capacity
  - 25 to 63A: rigid conductors: 25mm<sup>2</sup> flexible conductors: 16mm<sup>2</sup>
  - 80 and 100A: rigid conductors: 50mm<sup>2</sup> flexible conductors: 35mm<sup>2</sup>
- Comply with IEC 61008-1 and 61008-2-1

Current rating	Pack qty	Cat. ref. 2P	4P
<b>RCCBs AC type - 10 mA</b>			
16 A	1	<b>CC217J</b>	-
<b>RCCBs AC type - 30 mA</b>			
25 A	1	<b>CD226J</b>	<b>CD426J</b>
40 A	1	<b>CD241J</b>	<b>CD441J</b>
63 A	1	<b>CD264J</b>	<b>CD464J</b>
80 A	1	<b>CD281Z</b>	<b>CD480Z</b>
100 A	1	<b>CD285Z</b>	<b>CD485Z</b>
<b>RCCBs A type - 30 mA</b>			
25 A	1	<b>CD225J</b>	<b>CD425J</b>
40 A	1	<b>CD240J</b>	<b>CD440J</b>
63 A	1	<b>CD263J</b>	<b>CD463J</b>
<b>RCCBs HI type - 30 mA</b>			
25 A	1	<b>CH225J</b>	<b>CH425J</b>
40 A	1	<b>CH240J</b>	<b>CH440J</b>
63 A	1	<b>CH263J</b>	<b>CH463J</b>
<b>RCCBs AC type - 100 mA</b>			
25 A	1	<b>CE226J</b>	<b>CE426J</b>
40 A	1	<b>CE241J</b>	<b>CE441J</b>
63 A	1	<b>CE264J</b>	<b>CE464J</b>
80 A	1	<b>CE281Z</b>	<b>CE481Z</b>
100 A	1	<b>CE285Z</b>	<b>CE485Z</b>
<b>RCCBs AC type - 300 mA</b>			
25 A	1	<b>CF226J</b>	<b>CF426J</b>
40 A	1	<b>CF241J</b>	<b>CF441J</b>
63 A	1	<b>CF264J</b>	<b>CF464J</b>
80 A	1	<b>CF281Z</b>	<b>CF481Z</b>
100 A	1	<b>CF285Z</b>	<b>CF485Z</b>
<b>RCCBs AC type selective <math>\text{S}</math> - 300 mA</b>			
40 A	1	-	<b>CP441J</b>
63 A	1	-	<b>CP464J</b>



CD241J



CD441J

Current rating	Pack qty	Cat. ref. 2P	4P
<b>RCCBs A type - 300 mA</b>			
25 A	1	<b>CF225J</b>	<b>CF425J</b>
40 A	1	<b>CF240J</b>	<b>CF440J</b>
63 A	1	<b>CF263J</b>	<b>CF463J</b>
<b>RCCBs A type selective <math>\text{S}</math> - 300 mA</b>			
40 A	1	-	<b>CP440J</b>
63 A	1	-	<b>CP463J</b>
<b>RCCBs HI type selective <math>\text{S}</math> - 300 mA</b>			
40 A	1	-	<b>CQ440J</b>
63 A	1	-	<b>CQ463J</b>

**Auxiliaries and alarm contact**

- 6 V - 230 V

Description	Width in module 17.5 mm	Pack qty	Cat. ref.
1NO+1NC for auxiliary or alarm contact	1	1	<b>CZ001</b>



CZ001

**Sealable terminal covers**

- 1 set is composed of 2 terminal covers

Description	Pack qty	Cat. ref.
for RCCB 2 modules, 25 to 63 A	10	<b>CZN005</b>
for RCCB 4 modules, 25 to 63 A	10	<b>CZN006</b>
for RCCB 2 modules, 80 A	10	<b>CZ007</b>
for RCCB 4 modules, 80 to 100 A	10	<b>CZ008</b>



CZN006

### Auxiliaries and accessories for MCBs, RCCBs and RCBOs

Use of MZ203 - MZ212 on RCCBs requires the use of interface auxiliary CZ001.

All auxiliaries are common to both single and multi-pole circuit breakers. These auxiliaries are fitted to the left hand side of devices. Shunt trips, and under-voltage releases are fitted with a flag indicator that indicates the automatic/remote tripping of the device.

Connection capacity  
6 mm<sup>2</sup> rigid cables  
4 mm<sup>2</sup> flexible cables



MZ201

#### Auxiliary contacts

- indication of main contact status

Description	Width in module 17.5 mm	Cat. ref.
1NO + 1NC auxiliary contact	0.5	<b>MZ201</b>



MZ202

#### Alarm contacts

- SD contact indicates a fault overcurrent (e.g. MCB tripped) on overload or short-circuit

Description	Width in module 17.5 mm	Cat. ref.
alarm contact	0.5	<b>MZ202</b>



MZ203

#### Shunt trips

- allows remote tripping of the device

Description	Width in module 17.5 mm	Cat. ref.
24V - 415V AC / 12V - 130V DC	1	<b>MZ203</b>
24V - 48V AC / 12V - 48V DC	1	<b>MZ204</b>



MZ205

#### Undervoltage releases

- allows MCB to be closed only when voltage is above 70% of Un. MCB will automatically trip when voltage falls by 35% of Un

Description	Width in module 17.5 mm	Cat. ref.
48V DC	1	<b>MZ205</b>
230V AC	1	<b>MZ206</b>

**Overvoltage releases**

- monitors the voltage between phase and neutral in a network
- it opens the current circuit in case of over voltage by tripping the connected protection device (e.g. MCB or RCCB)

Description	Width in module	Cat. ref.
230V AC	1	<b>MZ212</b>



MZ212

**Over and undervoltage auxiliary**

- trip when the voltage decrease or increase out of the correct scale working voltage
- mechanical indicator of faults on the front face

Description	Width in module	Cat. ref.
over and undervoltage auxiliary	1	<b>MZ214</b>

**Locking kit**

- allows locking of the device dolly in the on/off position
- will accept two padlocks with hasps of 4.75 mm diameter max.

Description	Cat. ref.
locking kit	<b>MZN175</b>



MZN175

**Marking strip**

Description	Cat. ref.
13 modules for modular devices	<b>MZN177</b>



MZN177

These products are remote control auxiliaries for modular protection devices (MCB, RCCB, RCBO).

They allow:

- to operate by remote control the closing and opening contacts of the associated device (MCB, RCD and RCBO),
- to indicate the state of contacts and the tripping of the associated product.

The product MZ913, MZ915 has a further function which allows a second automatic tripping when fault current.

### Particular functioning modes

- power interruption

When the power is interrupted, the product saves its state (time delays, handle position and number of trippings) in order to reset when the power supply returns.

During the interruption, the indicator light and the contacts "a" and "b" are open.

If a control disappears during an interruption, it is not executed when there is supply.

- soldered contacts on the associated product

In this case, the handle of the remote auxiliary positions itself in the centre as the handle of the associated device.

This state is indicated by:

- "a" and "b" contacts opening,
- the indicator light is intermittent red.

- forced remote closing

When "on" or automatic reclosing are jammed, the controlled device has tripped 3 times or a time delay (3 mins or 30 secs) is present, it is possible to reactivate them.

To unjam "on" remotely, we must activate "reset".

To unjam locally, we must hold the side selector in "reset" position (for 5 s) until a green indicator light appears.

To reinitialise the automatic resetting remotely, activate "reset" and then "on".

To reinitialise locally, hold the side selector

- remote control impossible when tripping (overloads or short-circuits) It is impossible to impose a manual setting after tripping.

To reset, cable the contacts "a" and "b" in order and connect them on "reset" control (input n°6).

### Connection capacity

- Up

Rigid conductor: 1,5 to 10mm<sup>2</sup>

Flexible conductor: 1 to 6 mm<sup>2</sup>

- Down

Rigid conductor: 2 to 2.5mm<sup>2</sup>

Flexible conductor: 2 to 2.5mm<sup>2</sup>

Complies with EN 50-557

### Remote control auxiliaries

Description	Width in module 17,5 mm	Pack qty.	Cat. ref.
for 3, 4 pole MCBs, with or without add-on block	3	1	<b>MZ903</b>
for 1, 2 pole MCBs / RCBOs / RCCBs, with or without add-on block	3	1	<b>MZ905</b>

### Auto reclosing remote control auxiliaries

Description	Width in module 17,5 mm	Pack qty.	Cat. ref.
for 3, 4 pole MCBs, with or without add-on block	3	1	<b>MZ913</b>
for 1, 2 pole MCBs / RCBOs / RCCBs, with or without add-on block	3	1	<b>MZ915</b>



MZ913

### Selection guide

Designation	References	Remote control auxiliary	
		<b>MZ903</b> <b>MZ913</b>	<b>MZ905</b> <b>MZ915</b>
RCBOs 1P+E up to 40A	Ax1xx, Ax1xxZ		
RCBOs 1P+E up to 40A	Ax8xxB, Ax9xxB, Ax9xxJ		ok
RCCBs 2P and 4P up to 63A	Cx2xxJ, Cx4xxJ		ok
RCCBs 2P and 4P 80 to 100A	Cx4xxZ, Cx2xxZ		ok
MCBs 1P, 2P, 3P and 4P	MV, MW MBxxx, MCxxx		
MCBs 1P+E	MLN		ok
MCBs 1P, 2P, 3P and 4P	MBNxxxA, MCNxxxA		
MCBs 2P	NBNxxxA, NCNxxxA, NDNxxxA, NGN, NQN, NRN, NSN with or without add-on block		ok
MCBs 3P and 4P	NBNxxxA, NCNxxxA, NDNxxxA, NGN, NQN, NRN, NSN with or without add-on block	ok	
Magnetic MCBs 2P	MMN2xx with or without add-on block		ok
Magnetic MCBs 3P	MMN3xx with or without add-on block	ok	
MCBs 1,5 module	HLE, HLF		
	HMB, HMC, HMD		
	HMJ, HMK		
	HMX		

To ensure localised control and protection of single and three-phase motors.

The rated motor current is set on the motor starter units by means of a current dial (in the front).

### Technical data

- Adjustable thermal relay
- AC3 utilisation category
- Connection capacity: conductor cross-sections of the motor cables:
  - flexible 1 to 4 mm<sup>2</sup>
  - rigid 1 to 6 mm<sup>2</sup>

### Options

Undervoltage release: MZ528N, MZ529N

Auxiliary contacts: MZ520N, MZ522N

Alarm contact: MZ527N

Shunt trip: MZ523N

Comply with IEC/EN 60947 for low voltage switchgear.

The motor starter wiring should be implemented in compliance to IEC/EN 60947-1 table 9.

### Breaking capacity

	Ic (kA) 230V AC	Ic (kA) 400V AC
0.16 to 10 A	100	100
16 to 25 A	16	16

### Motor starters

current range Ie	Standard power rating of 3 phase motors 50/60 Hz (AC3)		Width in module 17.5 mm	Pack qty.	Cat. ref.
	230 V (kW)	400 V (kW)			
0.1 to 0.16 A	-	-	2.5	1	<b>MM501N</b>
0.16 to 0.25 A	-	0.06	2.5	1	<b>MM502N</b>
0.25 to 0.4 A	0.06	0.09	2.5	1	<b>MM503N</b>
0.4 to 0.63 A	0.09	0.12	2.5	1	<b>MM504N</b>
0.63 to 1 A	0.09	0.12	2.5	1	<b>MM505N</b>
1 to 1.6 A	0.25	0.55	2.5	1	<b>MM506N</b>
1.6 to 2.5 A	0.55	0.8	2.5	1	<b>MM507N</b>
2.5 to 4 A	0.8	1.5	2.5	1	<b>MM508N</b>
4 to 6.3 A	1.5	2.5	2.5	1	<b>MM509N</b>
6.3 to 10 A	2.5	4	2.5	1	<b>MM510N</b>
10 to 16 A	4	7.5	2.5	1	<b>MM511N</b>
16 to 20 A	5.5	9	2.5	1	<b>MM512N</b>
20 to 25 A	7.5	12.5	2.5	1	<b>MM513N</b>
25 to 32 A	7.5	12.5	2.5	1	<b>MM514N</b>



MM501N

### Auxiliary contact

- indicates ON/OFF position

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
1NO + 1NC, 3.5 A - 230 V AC / 2 A - 400 V AC	0.5	1	<b>MZ520N</b>



MZ520N

### Front auxiliary contact

- cannot be mounted behind a modular front plate

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
1NO, 1 A - 230 V AC / 400 V AC	0.5	1	<b>MZ522N</b>





MZ527N

**Alarm contact**

- mounting on the right side of the motor starter

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
1 NO: Short-circuit 1 NO: Short-circuit and overload 3,5 A - 230 V AC 2 A - 400 V AC	0.5	1	<b>MZ527N</b>

**Shunt trip**

- mounting on the left side of the motor starter

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
shunt trip, 230 V AC - 50 Hz	1	1	<b>MZ523N</b>



MZ528N

**Undervoltage releases**

- mounting on the left side of the motor starter

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
undervoltage release, 230 V AC - 50 Hz	1	1	<b>MZ528N</b>
undervoltage release, 400 V AC - 50 Hz	1	1	<b>MZ529N</b>



MZ521N

**Surface mounting enclosure**

- weatherproof IP55 with a external rotary handle  
- w. 80 x h. 158 x d. 125.5 mm

Description	Pack qty.	Cat. ref.
surface mounting enclosure	1	<b>MZ521N</b>



MZ530N

MZ531N

**External emergency stop buttons**

- ingress degree protection: IP65

Description	Pack qty.	Cat. ref.
external emergency stop button, 1NO + 1NC	1	<b>MZ530N</b>
external emergency stop button with key, 1NO + 1NC, 230 / 400 V	1	<b>MZ531N</b>



KD303M



KF30M



KZ058

**Connections**

- suitable also with an auxiliary

Description	Pack qty.	Cat. ref.
three pole insulated busbars for 2 motor starters	10	<b>KD302M</b>
three pole insulated busbars for 3 motor starters	10	<b>KD303M</b>
three pole insulated busbars for 4 motor starters	10	<b>KD304M</b>
three pole terminal block 63A to supply the insulated busbars KDxxxM	10	<b>KF30M</b>
terminal cover protection to insulate the spare parts (1 set = 10 end caps)	1 set	<b>KZ058</b>

Protection and control of circuits against overloads and short circuits.

**Technical data**

- sizes: L31, L38, L51, L58
- poles: 1P, 2P, 3P, 4P
- voltage rating: 500 V AC, 690V AC
- current rating: 25 to 125A
- frequency: 50/60Hz
- climate sealed: T2
- will accept accessories
- short circuit resistance with fuse link 8.5 x 31.5 mm: 80kA – 690V AC
- short circuit resistance with fuse link 10.3 x 38 mm: 80kA – 690V AC / 120kA – 500 V AC
- short circuit resistance with fuse link 14 x 51 mm: 100kA – 690V
- short circuit resistance with fuse link 22 x 58 mm: 100kA – 690V

**Connection capacity**

- L31 (8.5x31.5):  
rigid conductors: 25mm<sup>2</sup>  
flexible conductors: 16mm<sup>2</sup>
- L38 (10x38):  
rigid conductors: 25mm<sup>2</sup>  
flexible conductors: 16mm<sup>2</sup>
- L51 (14x51):  
rigid conductors: 35mm<sup>2</sup>  
flexible conductors: 25mm<sup>2</sup>
- L58 (22x58):  
rigid conductors: 50mm<sup>2</sup>  
flexible conductors: 35mm<sup>2</sup>

Comply with IEC 60 269-2 and IEC 60 269-2-1.

**L31 fuse carriers 500V - 25A**

- compatible with accessories

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
single pole	1	12	<b>LSN401</b>
two pole	2	6	<b>LSN402</b>
three pole	3	4	<b>LSN403</b>
3 phases + neutral link	4	3	<b>LSN404</b>
1 phase + neutral link	2	6	<b>LSN412</b>
single pole with signal light	1	12	<b>LSN431</b>



LSN401

Protection devices

**L38 fuse carriers 690V - 32A**

- compatible with accessories

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
single pole	1	12	<b>LSN501</b>
two pole	2	6	<b>LSN502</b>
three pole	3	4	<b>LSN503</b>
3 phases + neutral link	4	3	<b>LSN504</b>
1 neutral link	1	12	<b>LSN509</b>
1 phase + neutral link	2	6	<b>LSN512</b>
single pole with signal light	1	12	<b>LSN531</b>



LSN504

**L51 fuse carriers 690V - 50A**

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
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**Fuse carriers compatible with accessories**

single pole	1.5	1	<b>LS601</b>
two pole	3	1	<b>LS602</b>
three pole	4.5	1	<b>LS603</b>
3 phases + neutral link	6	1	<b>LS604</b>
1 phase + neutral link	3	1	<b>LS612</b>

**Fuse carriers accessory free**

single pole	1.5	10	<b>LR601</b>
two pole	3	5	<b>LR602</b>
three pole	4.5	3	<b>LR603</b>
3 phases + neutral link	6	2	<b>LR604</b>
1 phase + neutral link	3	5	<b>LR612</b>



LS601



LS703

**L58 fuse carriers 690V - 125A**

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
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**Fuse carriers compatible with accessories**

single pole	2	1	<b>LS701</b>
two pole	4	1	<b>LS702</b>
three pole	6	1	<b>LS703</b>
3 phases + neutral link	8	1	<b>LS704</b>
1 phase + neutral link	4	1	<b>LS712</b>

**Fuse carriers accessory free**

single pole	2	6	<b>LR701</b>
two pole	4	3	<b>LR702</b>
three pole	6	2	<b>LR703</b>
3 phases + neutral link	8	1	<b>LR704</b>
1 phase + neutral link	4	3	<b>LR712</b>



LS670

**Microswitches**

Description	Pack qty.	Cat. ref.
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**Microswitches for L51 fuse carriers**

single pole	1	<b>LS670</b>
three pole	1	<b>LS671</b>

**Microswitches for L58 fuse carriers**

single pole	1	<b>LS770</b>
three pole	1	<b>LS771</b>



LS672

**Signal lights 230V**

Description	Pack qty.	Cat. ref.
for L51 and L58 fuse carriers	1	<b>LS672</b>

Cylindrical gG fuse-links are intended for industrial applications. gG protection for general purpose applications against overload and short-circuits.

- Sizes:  
 - L 38: 10 x 38  
 - L 51: 14 x 51  
 - L 58: 22 x 58

Comply with IEC 60 269-1 and 60 269-2.

**Cartridge fuses type gG 10 x 38 mm**

- breaking capacity: 120kA

In	Cat. ref.
<b>Voltage 500 V AC</b>	
0.5 A	<b>LF300G</b>
1 A	<b>LF301G</b>
2 A	<b>LF302G</b>
4 A	<b>LF304G</b>
6 A	<b>LF306G</b>
8 A	<b>LF308G</b>
10 A	<b>LF310G</b>
12 A	<b>LF312G</b>
16 A	<b>LF316G</b>
20 A	<b>LF320G</b>
25 A	<b>LF325G</b>
<b>Voltage 400 V AC</b>	
32 A	<b>LF332G</b>



LF302G

**Cartridge fuses type gG 14 x 51 mm**

- breaking capacity: 80kA (2 to 25A), 120 kA (32 to 50 A)

In	Cat. ref.
<b>Voltage 690 V AC</b>	
2 A	<b>LF402G</b>
4 A	<b>LF404G</b>
6 A	<b>LF406G</b>
8 A	<b>LF408G</b>
10 A	<b>LF410G</b>
12 A	<b>LF412G</b>
16 A	<b>LF416G</b>
20 A	<b>LF420G</b>
25 A	<b>LF425G</b>
<b>Voltage 500 V AC</b>	
32 A	<b>LF432G</b>
40 A	<b>LF440G</b>
45 A	<b>LF445G</b>
<b>Voltage 400 V AC</b>	
50 A	<b>LF450G</b>



LF425G



LF563G

**Cartridge fuses type gG 22 x 58 mm**

- breaking capacity: 80kA (16 to 63 A), 120 kA (80 to 125 A)

In	Cat. ref.
<b>Voltage 690 V AC</b>	
16 A	<b>LF516G</b>
20 A	<b>LF520G</b>
25 A	<b>LF525G</b>
32 A	<b>LF532G</b>
40 A	<b>LF540G</b>
50 A	<b>LF550G</b>
63 A	<b>LF563G</b>
<b>Voltage 500 V AC</b>	
80 A	<b>LF580G</b>
100 A	<b>LF590G</b>
<b>Voltage 400 V AC</b>	
125 A	<b>LF599G</b>

Cylindrical aM fuse-links are intended for industrial applications.  
aM protection for motor protection applications against shortcircuits.

- Sizes:  
- L 38: 10 x 38  
- L 51: 14 x 51  
- L 58: 22 x 58

Comply with IEC 60 269-1 and 60 269-2.

**Cartridge fuses type aM 10 x 38 mm**

- breaking capacity: 120kA

In Cat. ref.



LF302M

**Voltage 500 V AC**

0.5 A	<b>LF300M</b>
1 A	<b>LF301M</b>
2 A	<b>LF302M</b>
4 A	<b>LF304M</b>
6 A	<b>LF306M</b>
8 A	<b>LF308M</b>
10 A	<b>LF310M</b>
12 A	<b>LF312M</b>
16 A	<b>LF316M</b>

**Voltage 400 V AC**

20 A	<b>LF320M</b>
25 A	<b>LF325M</b>
32 A	<b>LF332M</b>

Protection devices

**Cartridge fuses type aM 14 x 51 mm**

- breaking capacity: 80kA (2 to 25A), 120 kA (32 to 50 A)

In Cat. ref.



LF432M

**Voltage 690 V AC**

2 A	<b>LF402M</b>
4 A	<b>LF404M</b>
6 A	<b>LF406M</b>
8 A	<b>LF408M</b>
10 A	<b>LF410M</b>
12 A	<b>LF412M</b>
16 A	<b>LF416M</b>
20 A	<b>LF420M</b>
25 A	<b>LF425M</b>

**Voltage 500 V AC**

32 A	<b>LF432M</b>
40 A	<b>LF440M</b>
45 A	<b>LF445M</b>

**Voltage 400 V AC**

50 A	<b>LF450M</b>
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LF563M

**Cartridge fuses type aM 22 x 58 mm**

- breaking capacity: 80kA (16 to 63 A), 120 kA (80 to 125 A)

In	Cat. ref.
<b>Voltage 690 V AC</b>	
16 A	<b>LF516M</b>
20 A	<b>LF520M</b>
25 A	<b>LF525M</b>
32 A	<b>LF532M</b>
40 A	<b>LF540M</b>
50 A	<b>LF550M</b>
63 A	<b>LF563M</b>
<b>Voltage 500 V AC</b>	
80 A	<b>LF580M</b>
100 A	<b>LF590M</b>
<b>Voltage 400 V AC</b>	
125 A	<b>LF599M</b>

Connection type	Characteristics		
<b>MCB's Ph + N</b> 	63 A	KB163P or KB163N	- KF83A*: 1 x 25 mm <sup>2</sup> flexible conductors, side or top incoming.  - KF83B*: 2 x 25 mm <sup>2</sup> flexible conductors, side incoming. - KF82A: 2 x 10 mm <sup>2</sup> flexible conductors, top incoming.
<b>Single pole MCB's and fuse carriers</b>	100 A	KB190B or KB190C	- KF83C*: 1 x 25 mm <sup>2</sup> flexible conductors, side or top incoming. 
<b>Double output four poles add on block MCB's Ph + N</b> 	63 A	KBN663A or KBN663C	- KF83D*: 1 x 25 mm <sup>2</sup> flexible conductors, side or top incoming.  <b>Necessary for supplying directly through the busbar KBN663</b>
<b>Two poles MCB's</b> 	63 A	KB263A or KB263C	- KF83C*: 1 x 25 mm <sup>2</sup> flexible conductors, side or top incoming. 
	80 A	KB280B	
<b>Three poles MCB's</b>	63 A	KB463A or KB463C	- KF83C*: 1 x 25 mm <sup>2</sup> flexible conductors, side or top incoming. 
	80 A	KB380B	
<b>Four pole MCB's</b> 	63 A	KB463A or KB463C	- KF83C*: 1 x 25 mm <sup>2</sup> flexible conductors, side or top incoming. 
	80 A	KB480B	
			* KF83x are suitable with aluminium and copper conductors



### Insulated universal supply busbars

- blue for neutral,
- brown for live
- for MCB's and fuse carriers 1 module width

### Single, double, three and four pole busbars

- for multipolar MCB from 0,5 to 63A
- for multipolar, single pole fuse carriers and SB switches

### Supply busbars 3 Ph+N shifted terminal

- suitable to connect the double output add-on block with MCB's Ph+N (balance phases)

Comply with IEC 60947-7 and IEC 60439-1.



KB163P

### Single pole supply busbars

- 63 A are equipped with protection profiles



KB163N



KB190C

In	Section	Width in module	Pack qty.	Cat. ref.
63 A	10 mm <sup>2</sup>	13	50	<b>KB163P</b>
63 A	10 mm <sup>2</sup>	18	20	<b>KB163PG</b>
63 A	10 mm <sup>2</sup>	13	50	<b>KB163N</b>
63 A	10 mm <sup>2</sup>	18	20	<b>KB163NG</b>
100 A	20 mm <sup>2</sup>	24	10	<b>KB190C</b>
100 A	20 mm <sup>2</sup>	57 (1m)	10	<b>KB190B</b>



KB263A

### Double pole supply busbars

In	Section	Width in module	Pack qty.	Cat. ref.
63 A	10 mm <sup>2</sup>	12	10	<b>KB263A</b>
63 A	10 mm <sup>2</sup>	24	10	<b>KB263C</b>
80 A	16 mm <sup>2</sup>	56 (1m)	10	<b>KB280B</b>



KB363A

### Three pole supply busbars

In	Section	Width in module	Pack qty.	Cat. ref.
63 A	10 mm <sup>2</sup>	12	10	<b>KB363A</b>
63 A	10 mm <sup>2</sup>	24	10	<b>KB363C</b>
80 A	16 mm <sup>2</sup>	12	25	<b>KB380A</b>
80 A	16 mm <sup>2</sup>	57 (1m)	10	<b>KB380B</b>



KB463A

### Four pole supply busbars

- equipped with end caps

In	Section	Width in module	Pack qty.	Cat. ref.
63 A	10 mm <sup>2</sup>	12	10	<b>KB463A</b>
63 A	10 mm <sup>2</sup>	24	10	<b>KB463C</b>
80 A	16 mm <sup>2</sup>	56 (1m)	10	<b>KB480B</b>

**Supply busbars 3 Ph+N shifted terminal**

- 1 module width for neutral
- 3 modules width for live
- equipped with 2 end caps and protection profiles

- KBN863A and KBN863C 1 three pole bar + 1 single pole bar



KBN663A

In	Section	Width in module	Pack qty.	Cat. ref.
63 A	10 mm <sup>2</sup>	12	8	<b>KBN663A</b>
63 A	10 mm <sup>2</sup>	24	8	<b>KBN663C</b>
63 A	10 mm <sup>2</sup>	12	10	<b>KBN863A</b>
63 A	10 mm <sup>2</sup>	24	10	<b>KBN863C</b>

**End caps**

- to insulate the ends of the busbars

Description	Pack qty.	Cat. ref.
for single busbars KB163P, KB163N	1	<b>KZ021</b>
for double busbars KB263A, KB263C	1	<b>KZ022</b>
for double / three pole busbars KB280B, KB363A, KDN263B, KB363C, KB380B, KDN363B	1	<b>KZ023A</b>
for four pole busbars KB463A, KB463C, KB480B, KDN463B	1	<b>KZ024</b>
for 3 Ph+N busbars KBN663A, KBN663C	10	<b>KZN624</b>



KZ021



KZ023A



KZN624

**Protection profiles**

- to insulate the spare prongs

Description	Pack qty.	Cat. ref.
5 modules width protection profile	10	<b>KZ059</b>



KZ059

### Fork insulated busbars

For modular devices equipped with biconnect terminals  
- multipolar MCB's from 0.5 to 63A (except Ph+N) and RCCB's

KF83A, KF83C and KF83D are compatible with aluminium and copper conductors.

Comply with IEC 60947-2 and IEC 60439-1.

### Entry terminals

For all prongs and fork supply busbars



KD190B



KDN263B



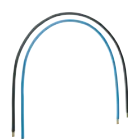
KDN363B



KDN463B

### Fork insulated busbars

Description	In	Section	Width in module	Pack qty.	Cat. ref.
single pole, 1 module width	100 A	20 mm <sup>2</sup>	57 (1 m)	10	<b>KD190B</b>
double pole, 2 modules width	63 A	10 mm <sup>2</sup>	56 (1 m)	20	<b>KDN263B</b>
three pole, 3 modules width	63 A	10 mm <sup>2</sup>	57 (1 m)	20	<b>KDN363B</b>
four pole, 4 modules width	63 A	10 mm <sup>2</sup>	56 (1 m)	10	<b>KDN463B</b>



KC416

### Set of 2 conductors with terminals swaged

- flexible cable H07VK  
- blue and black

Description	Pack qty.	Cat. ref.
<b>16 mm<sup>2</sup> for a 63A limited use</b>		
2 x 450 mm	1	<b>KC416</b>
2 x 650 mm	1	<b>KC616</b>
<b>25 mm<sup>2</sup> 16 mm<sup>2</sup> for a 90A limited use</b>		
2 x 450 mm	1	<b>KC025</b>



KF84A

### Fork connection terminals

- for fork busbars terminals  
- cable incoming: lateral  
- cable tightening with 2 screws

Description	Pack qty.	Cat. ref.
connection capacity: 1 x 25 mm <sup>2</sup>	10	<b>KF84A</b>



KF82A

### Prong connection terminals

- for devices with screw terminal  
- cable incoming: lateral  
- cable tightening with 2 screws

Description	Pack qty.	Cat. ref.
connection capacity: 1 x 16 mm <sup>2</sup>	10	<b>KF82A</b>



KF83A



KF83B



KF83C



KF83D

### Connection terminals

- cable incoming:  
for KF83A and KF83B: lateral  
for KF83C, KF83D and KF83E: lateral or top  
- cable tightening with 1 screw ( KF83A and KF83B only)

Description	Connection capacity	Pack qty.	Cat. ref.
for KB163P and KB83B	1 x 25 mm <sup>2</sup>	10	<b>KF83A</b>
for KB163P and KB83B	2 x 25 mm <sup>2</sup>	4	<b>KF83B</b>
for KB190B and KB263 to KB463	1 x 25 mm <sup>2</sup> for KB263 to KB463 (35 mm <sup>2</sup> rigid)	10	<b>KF83C</b>
for KBN663A to KBN663C	2 x 25 mm <sup>2</sup> flexible (35 mm <sup>2</sup> rigid)	4	<b>KF83D</b>
for KBN863A to KBN863C	2 x 25 mm <sup>2</sup> flexible (35 mm <sup>2</sup> rigid)	4	<b>KF83E</b>

**Risk of electrical surge**

Surge protective devices (SPD) assist in the protection of valuable electrical and electronic equipment against transients, originating from lightning and also from switching sources.

These transients can cause damage ranging from the premature ageing of equipment, logic failures and down time, to the complete destruction of equipment within the entire electrical installation.

Products such as LCD screens, data servers and industrial equipment such PLC's are critical to business activity. Protecting this equipment may now be a necessity.

Our SPD range of solutions may offer protection to prevent damage to this sensitive equipment by diverting the damaging transfer over-voltages. In the majority of cases this will eliminate equipment failures and reduce downtime.

The choice of a surge protective device depends on:

- the exposure of the building to lightning transients,
- the sensitivity and value of the equipment that requires protection (it is recommended that the contractor should discuss the installations requirements with the customer),
- the location and therefore the exposure level of the installation,
- the equipment used within the installation and whether this equipment could generate switching transients.

All our surge arrestor's are complying with IEC 61643-1

**Africa and Near-East lightning activity**



**Selection guide for type 2 surge arrestor's**

General protection and sensitive equipment

Environment	1 Ph	1Ph + N	3 Ph +N	Discharge current
Very highly exposed	-	<b>SPN265R*</b>	<b>SPN465R*</b>	Very important I max. 65 kA, waveform 8/20 µs
Highly exposed	<b>SPN140C</b>	<b>SPN240R*</b> <b>SPN240D</b>	<b>SPN440R*</b> <b>SPN440D</b>	Important I max. 40 kA, waveform 8/20 µs
Moderately exposed	-	<b>SPN215R*</b> <b>SPN215D</b> <b>SPN715D</b>	<b>SPN415R*</b> <b>SPN415D</b>	Moderate I max. 15 kA, waveform 8/20 µs

\* Surge arrestors equipped with cartridge with reserve status indicator and auxiliary contact for remote signaling

Protection for very sensitive electronic equipment

For protection of:	1Ph + N	3 Ph +N	Discharge current
Very sensitive electronic equipment (computer, alarm system, medical equipment, TV, Hi-fi system,...)	<b>SPN208D</b>	<b>SPN408D</b>	Very important I max. 8 kA, waveform 8/20 µs

Optimal coordination is obtained when cascaded with type 2 surge arrestors

**Selection guide for type 3 surge arrestor's**

Protection for telephone lines

Line types	analog	digital
Cat. ref.	<b>SPN505</b>	<b>SPN504</b>

### Surge protection devices type 1+2

The combined surge protection devices offer as an «all-in-one solution» protection against lightning and surge-voltage in one device.

They are in accordance with the requirement class type 1.

3 versions available, with or without auxiliary contact:

- SPN800 for TNC-Networks, 75kA (lighting impulse current)
- SPN801 for TNS-Networks, 100kA (lighting impulse current)
- SPN802 for TT-Networks, 100kA (lighting impulse current)

#### Product features

- Lightning and surge-voltage protection in one device
- Compliance with to EN 61643-11, requirement class type 1+2
- Replaceable plug-in modules
- Integrated fault indicator in the plug-in modules
- SPDs with separate auxiliary contact



SPN800R

#### Surge protection devices, type 1+2, for TNC-Networks

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
with auxiliary contact	3	1	<b>SPN800R</b>
without auxiliary contact	3	1	<b>SPN800</b>



SPN801R

#### Surge protection devices, type 1+2, for TNS-Networks

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
with auxiliary contact	4	1	<b>SPN801R</b>
without auxiliary contact	4	1	<b>SPN801</b>



SPN802

#### Surge protection devices, type 1+2, for TT-Networks

Description	Width in module 17.5 mm	Pack qty.	Cat. ref.
with auxiliary contact	4	1	<b>SPN802R</b>
without auxiliary contact	4	1	<b>SPN802</b>



SPN080

#### Cartridges

Description	Cat. ref.
phase - 25kA, for SPN8xxx	<b>SPN080</b>
neutral - 25kA class 1, for SPN802 and SPN802R	<b>SPN080N</b>

### Surge protection devices type 1

For main protection - type 1.

SPDs with higher discharge current ( $I_{max}$  10/350), to evacuate overvoltages, associated with lightning strikes.

#### Installation

The main protection SPDs are installed directly after the main incoming device.

SPD's can be used in any supply system e.g. TNC, TNCS, TNS, TT

#### Connection capacity

- rigid conductors: 25 mm<sup>2</sup>
- flexible conductors: 16 mm<sup>2</sup>

Comply with NF EN 61643-11

Comply with IEC61643-1



SPA412A

#### Surge arrester type 1

- limp. 12.5 kA
- waveform 10/350  $\mu$ s
- Up: 2.5 kV

Description	Width in module 17.5 mm	Cat. ref.
1 Ph + N	4	<b>SPA212A</b>
3 Ph + N	8	<b>SPA412A</b>

### Surge protection devices type 2

For main protection - type 2 SPDs with higher discharge current ( $I_{max}$  8/20), to evacuate as much of the transient to earth as possible, protection level ( $U_p \leq 1000V$ ).

#### Installation

The main protection SPDs are installed directly after the main incoming device.  
SPD's can be used in any supply system e.g. TNC, TNCS, TNS, TT

#### Connection capacity

- rigid conductors: 25 mm<sup>2</sup>
- flexible conductors: 16 mm<sup>2</sup>

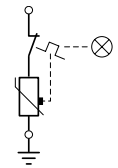
Comply with NF EN 61643-11

Comply with IEC61643-1

### Surge arrestors type 2 for very highly exposed area

- $I_{max}$ . 65 kA
- waveform 8/20  $\mu$ s
- $I_n$ : 20 kA -  $U_p$ : 1.5 kV

Description	Width in module 17.5 mm	Cat. ref. End of life indicator	Reserve status indicator
1 Ph + N	2	-	<b>SPN265R</b>
3 Ph + N	4	-	<b>SPN465R</b>



SPN265R

Protection devices

### Surge arrestors type 2 for highly exposed area

- $I_{max}$ . 40 kA
- waveform 8/20  $\mu$ s
- $I_n$ : 15 kA -  $U_{pw}$  1.2 kV except SPN140C  $U_p$ : 2 kV

Description	Width in module 17.5 mm	Cat. ref. End of life indicator	Reserve status indicator
1 Ph	1	<b>SPN140C</b>	-
1 Ph + N	2	<b>SPN240D</b>	<b>SPN240R</b>
3 Ph + N	4	<b>SPN440D</b>	<b>SPN440R</b>



SPN440R

### Surge arrestors type 2 for moderately exposed area

- $I_{max}$ . 40 kA
- waveform 8/20  $\mu$ s
- $I_n$ : 15 kA -  $U_{pw}$  1.2 kV except SPN140C  $U_p$ : 2 kV

Description	Width in module 17.5 mm	Cat. ref. End of life indicator	Reserve status indicator
1 Ph + N	2	<b>SPN215D</b>	<b>SPN215R</b>
3 Ph + N	4	<b>SPN415D</b>	<b>SPN415R</b>
1 Ph + N, self-protected	2	<b>SPN715D</b>	-



SPN415R



SPN715D

### Surge protection devices type 2, with low let through voltage levels

To protect very sensitive electronic equipment.  
This fine protection complements the main protection and can protect 1 or several electronic devices.

Optimal coordination is obtained when cascaded with type 2 surge arrester (lower  $U_p$ ).

Discharge current:  $I_{max}$ . 8kA (8/20 wave)  
A green LED on the front face indicates the status of the SPD  
SPN208D, connected in series with the equipment that needs to be protected (with a maximum line current of 25A).  
Protection is ensured in both common and differential modes

#### Connection capacity

Terminal blocks L, N & E

- rigid conductors: 16mm<sup>2</sup>
- flexible conductors: 10mm<sup>2</sup>

Comply with NF EN 61643-11 and -21



SPN408D

### Surge arrestors type 2 with low let through voltage levels, pluggable

- $I_{max}$ . 8 kA,
- 8/20 ms current wave,
- $U_p$  (Ph/ N => )  $\leq$  1.5 kV  
(Ph => N)  $\perp$  1 kV
- with end-of-life indicator

Description	Width in module 17.5 mm	Cat. ref.
1 Ph + N	2	<b>SPN208D</b>
3 Ph + N	3	<b>SPN408D</b>



SPN008D

### Cartridge for pluggable SPD

Description	Cat. ref.
for SPN208D	<b>SPN008D</b>
for SPN408D	<b>SPN008N</b>

**Surge protection devices type 3**

To protect telephone lines and data signal networks and multimedia applications.

**Surge arrestors type 3 for telephone lines**

Description	Un	Up	Width in module 17.5 mm	Cat. ref.
SPD for analog phone line	130 V	600 V AC	1.5	<b>SPN505</b>
SPD for digital phone line	40 V	600 V AC	1.5	<b>SPN504</b>



SPN504

**Surge arrestors type 3 for data signal networks and multimedia applications**

Description	Un	Up	Width in module 17.5 mm	Cat. ref.
SPD for ADSL2+ phone lines	180 V DC	≤ 550 V	2/3	<b>SPK102</b>
SPD for Ethernet RJ45	48 V	≤ 550 V	1	<b>SPK200</b>
SPD for coaxial TV/satellite	24 V	≤ 300 V	1.5	<b>SPK300</b>
SPD for weather stations and 4-20 mA loop lines, 1 pair	24 V	550 V AC	2/3	<b>SPK402</b>
SPD for weather stations and 4-20 mA loop lines, 2 pairs	24 V	550 V AC	2/3	<b>SPK404</b>
SPD for industrial buses (modbus, ...)	5 V	550 V AC	2/3	<b>SPK502</b>



SPK102



SPK200



SPK300



### Spare cartridges

These cartridges replace the cartridge in the main SPD. They allow simple replacement without the need to cut-off the power supply.

Cartridges are available for all discharge currents (15kA to 65kA) with and without condition indication.

A keying system exists to prevent a line cartridge being interchanged by mistake with a neutral one and vice versa. Neutral cartridges have a discharge current fo 65kA.

For Phase:

SPN140D = SPN040D  
 SPN215D = SPN015D  
 SPN415D = SPN015D  
 SPN215R = SPN015R  
 SPN415R = SPN015R

For Neutral / Earth:

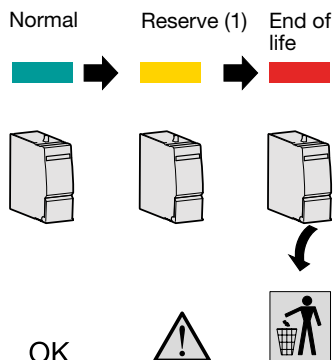
SPN215D = SPN040N  
 SPN415D = SPN040N  
 SPN215R = SPN040N  
 SPN415R = SPN040N

Auxiliary contact for remote signaling (R version only)

230V AC 1A  
 12V ... 10mA

### Reserve Status Indicator (R versions)

#### End of Life Indicator (D versionsw)



SPN040C

### Replacement cartridge phase

Description	Cat. ref.
65kA, 275V AC, for SPNx65R	<b>SPN065R</b>
40kA, 440V AC, for SPN140C	<b>SPN040C</b>
40kA, 275V AC, for SPNx40R	<b>SPN040R</b>
40kA, 275V AC, for SPNx40D	<b>SPN040D</b>
15kA, 275V AC, for SPNx40R	<b>SPN015R</b>
15kA, 275V AC, for SPNx40D	<b>SPN015D</b>



SPN040N

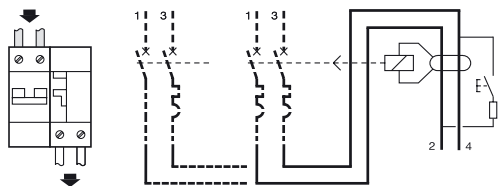
### Replacement cartridge neutral

Description	Cat. ref.
65kA, 255V AC, for SPNx65R	<b>SPN065N</b>
40kA, 255V AC, for SPNx40x and SPNx15x	<b>SPN040N</b>

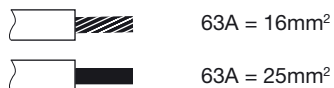
**RCCB add-ons**

3 sensitivities 30mA, 100mA and 300mA instantaneous.  
2 sensitivities 100mA and 300mA time delayed.  
RCCB add-ons can be associated with devices rated from 0.5 to 63A in 2 and 4 poles.

**Wiring diagram**



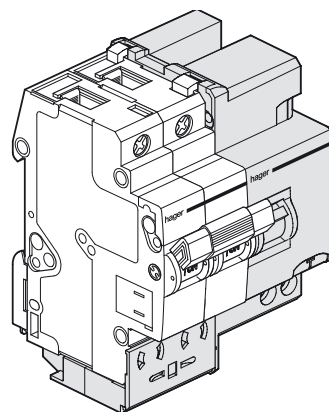
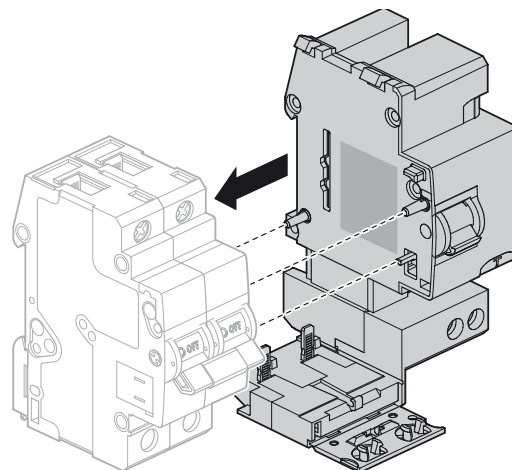
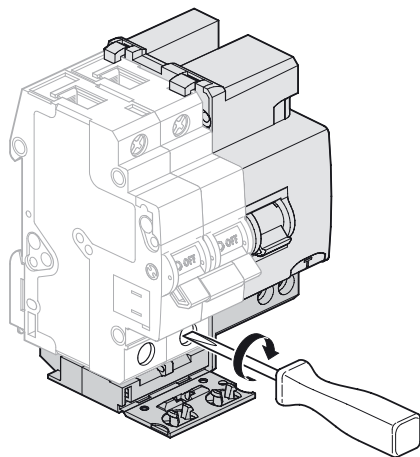
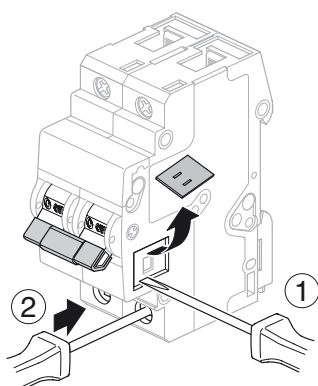
**Connection capacity**



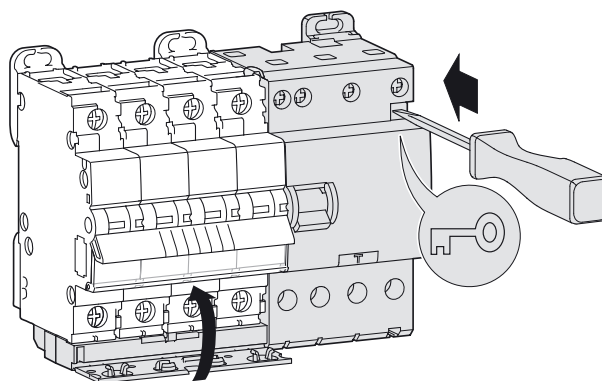
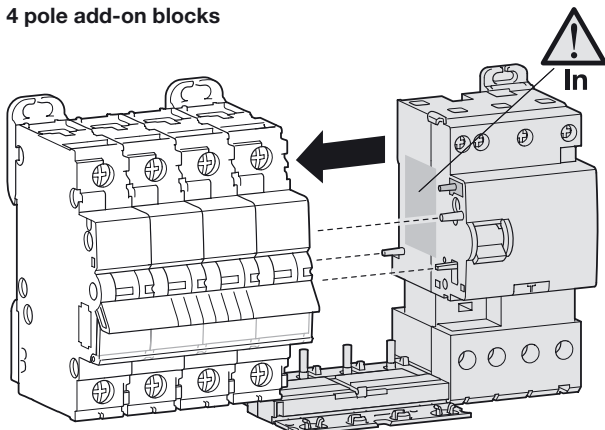
**Characteristics**

- Easy coupling (drawer system)
- Easy disassembly (without damage)
- Conforms to EN61009 appendix G

**Mounting  
2 pole add-on blocks**



**4 pole add-on blocks**



### Technical specifications

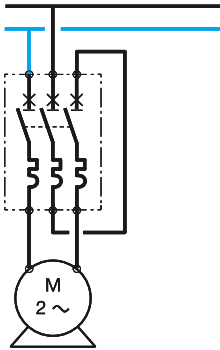
#### Electrical characteristics

- Electrical supply: 230/400/440/500/690V AC
- Ambient temperature range: -25°C to +55°C

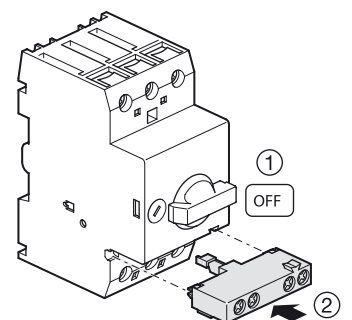
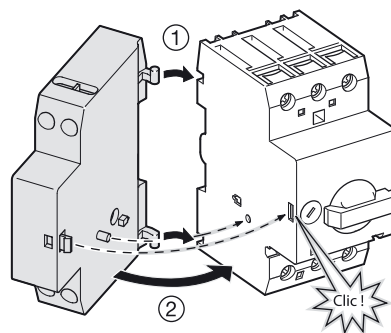
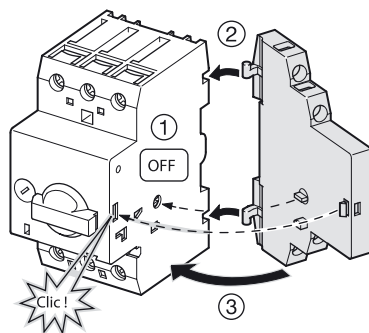
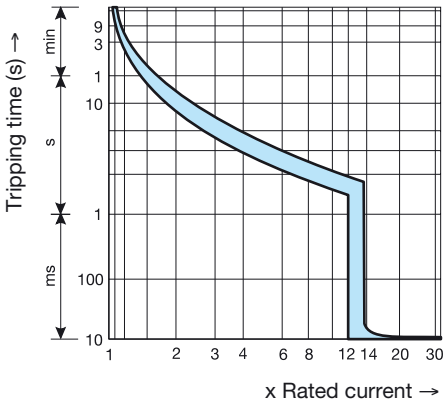
The influence of the ambient temperature on the deflection of the bimetallic releases is automatically compensated within a temperature range from -5 to +40°C by means of an additional current-free bimetallic release that continuously corrects the tripping range.

- Working life: 100,000 operations AC-3
- Maximum of 40 operations/hour
- Tropicalized for all climates
- Connection with clamp type, following conductor cross-sections of the motor cables:  
flexible: 1 to 4mm<sup>2</sup>  
rigid: 1 to 6mm<sup>2</sup>

### Electrical connection single phase



### Tripping characteristic



### Conditional rated short-circuit current (according to IEC / EN 60 947-4-1)

	230V Icu (kA)	⌘ (A) <sup>1)</sup>	400V Icu (kA)	⌘ (A) <sup>1)</sup>	440V Icu (kA)	⌘ (A) <sup>1)</sup>	500V Icu (kA)	⌘ (A) <sup>1)</sup>	690V Icu (kA)	⌘ (A) <sup>1)</sup>
<b>MM501N</b>	150	N	150	N	100	N	100	N	100	N
<b>MM502N</b>	150	N	150	N	100	N	100	N	100	N
<b>MM503N</b>	150	N	150	N	100	N	100	N	100	N
<b>MM504N</b>	150	N	150	N	100	N	100	N	100	N
<b>MM505N</b>	150	N	150	N	100	N	100	N	100	N
<b>MM506N</b>	150	N	150	N	100	N	100	N	100	N
<b>MM507N</b>	150	N	150	N	100	N	100	N	5	50
<b>MM508N</b>	150	N	150	N	100	N	100	N	3	50
<b>MM509N</b>	150	N	150	N	100	N	42	50	3	50
<b>MM510N</b>	150	N	150	N	42	50	42	50	3	50
<b>MM511N</b>	50	50	50	50	15	50	15	50	3	50
<b>MM512N</b>	50	50	50	50	10	50	6	50	3	50
<b>MM513N</b>	50	50	50	50	10	50	6	50	3	50
<b>MM514N</b>	50	50	50	50	10	50	-	50	3	50

□ no upstream protective device required, since this is an inherent stable range (100/150 kA)

N not required

1) primary fusing is required if the short-circuit current exceeds the conditional rated short-circuit current ( $I_{cc} > I_{cu}$ ). The conditional rated short-circuit current is determined by the primary fuse used:  
100A gG/gL,  $I_{cu} = 30kA$   
50A gG/gL,  $I_{cu} = 100kA$

### Under voltage release (no volt coil)

**MZ528N MZ529N**  
230V AC 400V AC

### Auxiliary contacts (Mounted inside starter)

**MZ520N**  
2A – 400V AC  
3.5A – 230V AC

### Alarm contact (Mounted under starter)

**MZ527N**  
2A – 400V AC  
1A – 230V AC

**Residual current devices**

A residual current device (RCCB) is the generic term for a device which simultaneously performs the functions of detection of the residual current, comparison of this value with the rated residual operating value and opening the protected circuit when the residual current exceeds this value.

For fixed domestic installations and similar applications we have two types:

- Residual current operated circuit-breaker without integral over-current protection (RCCBs) which should comply with the requirements of IEC 61 008
- Residual current operated circuit-breaker with integral over-current protection (RCBOs) which should comply with the requirements of IEC 61 009

Both RCCBs and RCBOs are further divided into types depending on their operating function:

Type AC For which tripping is ensured for residual sinusoidal alternating currents, whether suddenly applied or slowly rising. Marked with the symbol:



Type A For which tripping is ensured for residual sinusoidal alternating currents and residual pulsating direct currents, whether suddenly applied or slowly rising. Marked with the symbol:



Type S For selectivity, with time-delay. Marked with the symbol:



RCCBs must be protected against short-circuits by means of circuit-breakers or fuses. RCBOs have their own in built short-circuit protection, up to it's rated value.

The drawing opposite shows how a torroid is located around the line and neutral conductors to measure the magnetic fields created by the current flowing in these conductors. The sum of the magnetic fields set up by these currents (which takes into consideration both the magnitude and phase relationship of the currents) is detected by the torroid.

In a normal healthy circuit the vector sum of the current values added together will be zero. Current flowing to earth, due to a line earth fault, will return via the earth conductor, and regardless of load conditions will register as a fault. This current flow will give rise to a residual current (I<sub>res</sub>) which will be detected by the device.

It is most important that the line and neutral conductors are passed through the torroid. A common cause of nuisance operation is the failure to connect the neutral through the device.

RCCBs work just as well on three phase or three phase and neutral circuits, but when the neutral is distributed it must pass through the torroid.

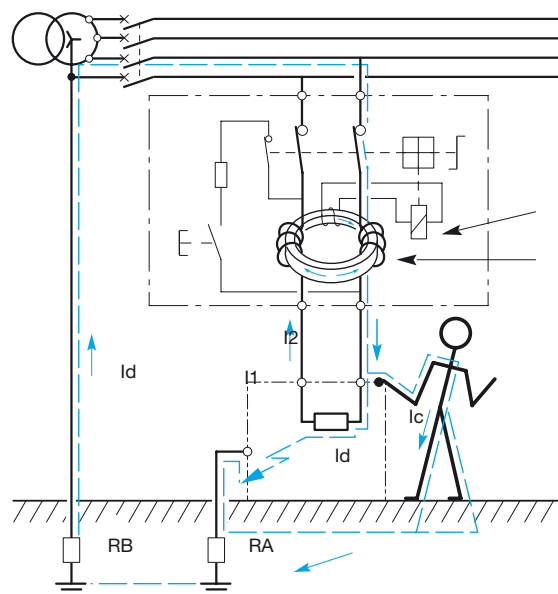
RCCBs are not suitable for use on DC systems and unearthed networks.

**RCCBs – domestic installation**

RCCBs can be installed in two ways:

1. whole house protection.
2. selective protection.

**Principle**



Current flowing through torroid in healthy circuit

$$I_{res} = I_1 - I_2 = 0$$

Current flowing through torroid in circuit with earth fault I<sub>3</sub>

$$I_{res} = I_1 - I_2 + I_3 = I_3$$

Whole house protection is provided typically by a consumer unit where the RCCB device serves as the main switch. Although very popular this suffers from a disadvantage: all circuits are disconnected in the event of fault. Selective protection can be provided by associating the RCCB with identified high risk circuits by adopting one or more of the following:

- Split busbar consumer unit:  
All circuits are fed via an overall isolator and selected circuits fed additionally via the RCCB. Typical circuits fed direct are lighting, freezer, storage heating; and circuits fed via the RCCB are socket outlets, garage circuits. This concept minimises inconvenience in the event of fault.

**Individual RCBO**

Each separate final circuit requiring protection by a RCD can be supplied through an RCBO. This method provides the best solution for minimising inconvenience.

**Nuisance tripping**

All Hager RCCBs incorporate a filtering device preventing the risk of nuisance tripping due to transient voltages (lightning, line disturbances on other equipment...) and transient currents (from high capacitive circuit).

**Pulsating DC fault current sensitive**

Increasingly, semi-conductors are also extensively used in computers, VDUs, printers, plotters... all of which may be fed from the mains electrical supply. The presence of semi-conductors may result in the normal sinusoidal AC waveform being modified. For example, the waveform may be rectified or, as in asymmetric phase control devices, the waveform may be chopped. The resulting waveforms are said to have a pulsating DC component.

In the event of an earth fault occurring in equipment containing semi-conductor devices, there is a probability that the earth fault current will contain a pulsating DC component.

Standard type AC may not respond to this type of earth fault current and the intended degree of protection will not be provided.

### Use of RCCBs

RCCBs offer excellent protection against earth fault currents; the main areas of application being as follows:

- **Zs value too high to allow disconnection in the required time**

Where the overcurrent protection or a circuit breaker cannot provide disconnection within the specified time because the earth fault loop impedance is too high the addition of RCCB protection may well solve the problem without any other change in the system. Because of its high sensitivity to earth fault current and its rapid operating time, in most cases the RCCB will ensure disconnection within the specified time. This is achieved without any detriment to overcurrent discrimination because, unlike the situation in a fuse based system, the increased sensitivity is obtained without increasing sensitivity to overcurrent faults. Use of RCCBs in this way can be particularly useful for construction sites and bathrooms where disconnection times are more stringent than for standard installations. (Construction sites - 0.2s at 220-277V, bathrooms - 0.4s).

The limitation to this technique is the requirement that the rated residual operating current multiplied by Zs should not exceed 50V. This is to avoid the danger of exposed conductive parts reaching an unacceptably high voltage level.

Residual current protection can even be added to a completed distribution system where the value of Zs is excessive, either because of a design oversight or subsequent wiring modification.

- **Protection against shock by direct contact**

So far we have considered shock by indirect contact only. Direct contact is defined thus:

**Direct contact** - contact of persons or livestock with live parts which may result in electric shock. The consideration here is not the hazard of parts becoming live as a result of a fault but the possibility of touching circuit conductors which are intentionally live.

RCCBs, although affording good protection against the potentially lethal effects of electric shock, must not be used as a the sole means of protection against shock by direct contact. The Electricity at Work Act recommends the use of RCCBs, "...danger may be reduced by the use of a residual current device but states that this should be "... considered as a second line of defence". The Wiring Regulations defines the other measures that should be taken i.e.

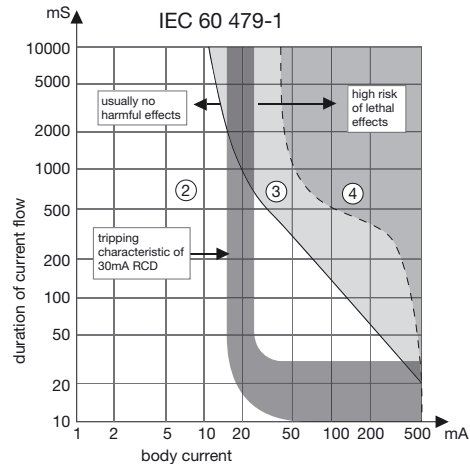
- insulation of live parts.
- barriers or enclosures.
- obstacles.
- placing live parts out of reach.

Additionally an RCCB used for this purpose should have:

- a sensitivity of 30mA
- an operating time not exceeding 40mS at a residual current of 150mA.

The specified sensitivity is based on research that has been carried out to estimate the effect various levels and duration of current can have on the human body. This experience is summarised in a graph shown in 'IEC 479-1: Effects of current passing through the human body'. A simplified version of this graph is shown opposite. It shows that very small currents can be tolerated for reasonably long periods and moderate currents for very short periods. It can be seen, for instance, that 100mA for 100mS or 20mA for 500mS will not normally cause any harmful effect. 200mA for 200mS or 50mA for 500mS which are in Zone 3, would be more dangerous; and shock levels in Zone 4 carry a risk of lethal consequences.

The tripping characteristic for a 30mA RCCB is also shown in the graph. It shows the level of current required to cause the RCCB to trip, for example; 50mA will cause a trip but not 10mA. Comparing its characteristic with the various zones on the graph it can be seen that the 30mA RCCB gives a very good measure of protection against the hazards associated with electric shock. Where a higher level of protection is required, for example in laboratories, 10mA devices are available.



**Note** : Although RCCBs are extremely effective devices they must never be used as the only method of protection against electric shock. With or without RCCBs protection all electrical equipment should be kept in good condition and should never be worked on live.

- **Protection against shock outside the equipotential bonding zone**  
Bonding conductors are used in an installation to maintain metallic parts, as near as possible, to the same potential as earth. Working with portable equipment outside this equipotential bonding zone, e.g. in the car park of a factory, introduces additional shock hazards. Socket outlets rated 32A or less 'which may be reasonably expected to supply portable equipment for use outdoors' should have at least one socket nominated for outdoor use. This socket should be equipped with 30 mA RCCB protection unless fed from an isolating transformer or similar device, or fed from a reduced voltage.
- **Protection in special situations**  
The use of RCCBs is obligatory or recommended in the following situations:
  - caravans: 30mA RCCB should be used.
  - TT systems.
  - swimming pools: 30mA RCCB for socket outlets in Zone B obligatory; recommended in Zone C.
  - agricultural and horticultural: 30mA RCCB for socket outlets and for the purpose of protection against fire, RCCB  $\leq$  0.5A sensitivity.
  - construction sites: 30mA RCCB recommended.
- **Portable equipment**  
With the exception mentioned above, where a socket is specifically designated for work outside the equipotential bonding zone, the Wiring Regulations demand the use of RCCBs to protect the users of portable equipment. It is widely recognised that their use has made a significant contribution to safety in the workplace and the home.
- **Protection against fire hazards**  
The provisions in the Wiring Regulations for protection against shock by indirect contact ensure rapid disconnection under earth fault assuming the fault has negligible impedance. Under such conditions the fault current, as we have seen, is sufficiently great to cause the overcurrent protection device to quickly disconnect the fault. However high impedance faults can arise where the fault current is sufficient to cause considerable local heat without being high enough to cause tripping of the overcurrent protective device. The heat generated at the point of the fault may initiate a fire long before the fault has deteriorated into a low impedance connection to earth.  
  
The provision of residual current protection throughout a system or in vulnerable parts of a system will greatly reduce the hazard of fire caused by such faults.
- **PEN conductors**  
The use of RCCBs with PEN conductors is prohibited. A PEN conductor is a single conductor combining the functions of neutral conductor and protective conductor. This being so, when the PEN conductor is taken through the toroid of an RCCB, earth faults will go undetected because the return path for the earth fault current is included in the residual sum.
- **Auxiliary contacts**  
A range of auxiliaries, alarm and shunt contacts are available for Hager RCCBs.
- **Supply entry**  
Top or bottom feed.

Electrical characteristics of RCCB from 25 to 125 A intended for business premises

RCCBs 2 poles

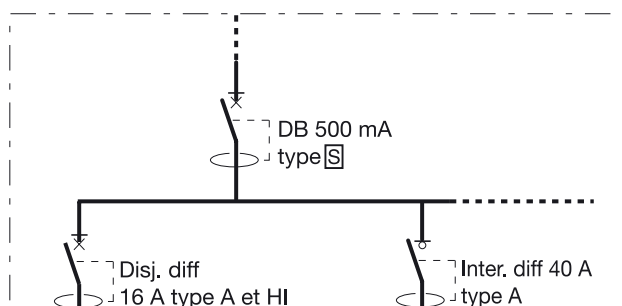
Nominal current I <sub>n</sub>	2 x 25 A	2 x 40 A	2 x 63 A	2 x 80 A
Nominal voltage U <sub>n</sub>	230 V (+10% /-15%) / 50 Hz			
Working voltage push-button test	230 V (+10% /-15%)			
Width in ■ (17.5 mm)	2			
Sensitivity IΔn in mA	10 mA type AC	30 mA type AC - A/HI 100 mA type AC 300 mA type AC - A/HI 500 mA type AC	300 mA - S type AC	30 mA type AC 300 mA - S type AC 300 mA type AC
Electrical and mechanical auxiliaries	CZ001 - MZ203 - MZ204 - MZ205 - MZ206 - MZ209 - MZ175			
Working temperature	type AC	-5 to + 40 °C	type A / HI	-25 to + 40 °C
Storage temperature		-25 to + 70 °C		-55 to + 70 °C
Connection capacity: - flexible wire - rigid wire	1.5 to 16 mm <sup>2</sup> 1.5 to 25 mm <sup>2</sup>			10 to 35 mm <sup>2</sup> 10 to 50 mm <sup>2</sup>

RCCBs 4 poles

Version	type AC and type A/HI						type B	
Nominal current I <sub>n</sub>	4 x 25 A	4 x 40 A	4 x 63 A	4 x 80 A	4 x 100 A	4 x 125 A	4 x 40 A	4 x 63 A
Nominal voltage U <sub>n</sub>	400 V (+10% /-15%) / 50 Hz							
Working voltage push-button test	400 V (+10% /-15%)							
Width in ■ (17.5 mm)	4							
Sensitivity IΔn in mA	30 mA type AC - HI 100 mA type AC 300 mA type AC - HI 500 mA type AC	300 mA - S type AC	300 mA type AC 300 mA - S type AC	300 mA, 500 mA	30 mA type B 300 mA type B			
Elec. and mechanic. auxiliaries	CZ001 - MZ203 - MZ204 - MZ205 - MZ206 - MZ209 - MZ175				CZ009		CZ009	
Working temperature	type AC	-5 to + 40 °C	type HI	-25 to + 40 °C	-15 to 40°C	-25 to 40°C		
Storage temperature		-25 to + 70 °C		-55 to + 70 °C	-15 to 40°C			
Connection capacity: - flexible wire - rigid wire	1.5 to 16 mm <sup>2</sup> 1.5 to 25 mm <sup>2</sup>			10 to 35 mm <sup>2</sup> 10 to 50 mm <sup>2</sup>		1,5 to 35 mm <sup>2</sup> 1,5 to 50 mm <sup>2</sup>		1.5 to 35 mm <sup>2</sup> 1.5 to 50 mm <sup>2</sup>

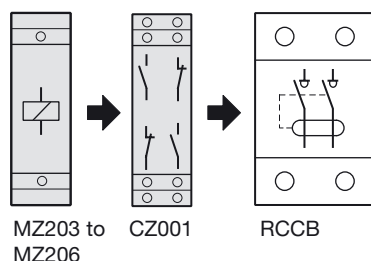
Electrical connection

Two-pole and three-pole use of four-pole RCCB  
Ph + N 3 Ph



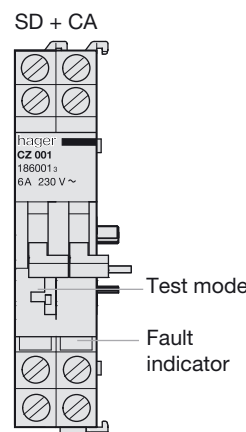
Combination of MZ auxiliaries

the auxiliary contact CZ001 is intended for RCCB of type AC and type A/HI. It is possible to combine other auxiliaries, MZ201 to MZ209. In that case, auxiliary CZ001 must be installed first. Auxiliaries MZ901, MZ902, MZ911 and MZ912 combine directly on the RCCB, without auxiliary CZ001.



Auxiliary CZ001

It is composed of: - an auxiliary contact (CA)  
- a fault indication contact (SD)



Test mode:

Used to check the operation of the auxiliary circuit. The test is performed by pressing the blue button:  
- for CA: In RCCB position OFF  
- for SD: independent of the lever position.

Fault indicator:

The red LED on the front of the product indicates tripping due to a fault.

Type B and auxiliary RCCB

The indicating auxiliary CZ009 is dedicated to type B RCCB. It is not possible to combine auxiliaries and MZ triggers on these RCCBs.



**Coordination between RCCBs and upstream protection**

In order to reduce the risk of deterioration of the RCCB due to short-circuits occurring downstream from them, it is combined with upstream devices protecting against short-circuits.

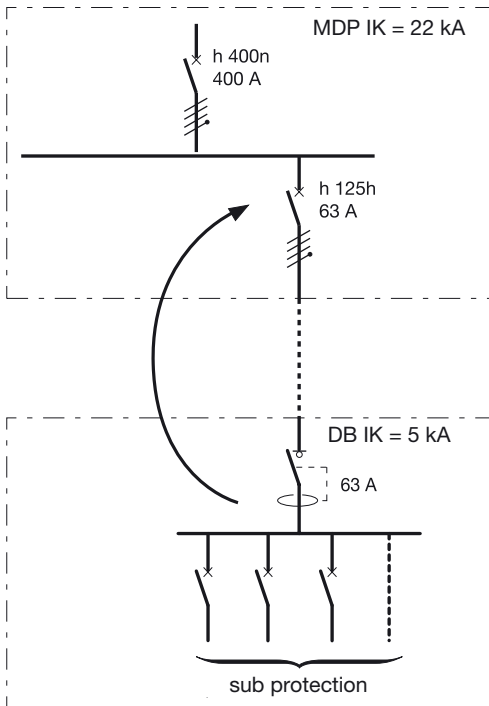
The table below indicates:

- the response to short-circuits of the RCCB only
- the ratings of the upstream protection devices which ensure good coordination with the RCCB
- the short-circuit response in combination with fuses or circuit breakers.

Upstream		Fuses gG type				MCBs						
		10,3 x 38 25 A	14 x 51 40 A	22 x 58 63 A	22 x 58 100 A	MBN, MCN	NGN, MMN	NBN, NCN, NDN, NQN, NRN, NSN	HMB, HMC, HLE, HLF, HMJ, HMK	HMD	HMX	x160
Downstream	In	Coordination										
2 poles RCCBs Network 230 V Breaking capacity RCCB (alone) 1500 Amps	25 A	100	40	16	16	6	7	10	6	5	8	5
	40 A	-	40	16	16	6	7	10	6	5	8	5
	63 A	-	-	16	16	6	7	10	6	5	8	6
	80 A	-	-	-	18	-	-	-	8	5	-	6
4 poles RCCBs Network 400 V Breaking capacity RCCB (alone) 1500 Amps	25 A	100	40	16	6	6	7	10	7.5	6	8	5
	40 A	-	40	16	6	6	7	10	7.5	6	8	5
	63 A	-	-	16	6	6	7	10	7.5	6	8	6
	80 A	-	-	-	6	-	-	-	8	6	-	6
	100 A	-	-	-	6	-	-	-	8	6	-	6
	125 A	-	-	-	-	-	-	-	8	6	-	6

The above values for response to short-circuits are given in kA eff.

In two different enclosures



- upstream protection:

- circuit breaker h400 with In = 400 A and a breaking capacity of 45 kA (greater than 22 kA),
- circuit breaker x160 with In = 63 A and a breaking capacity of 25 kA (greater than 22 kA).

The 63 A RCCB is coordinated with the x160 up to 6 kA (see table above).  
The coordinated response to short-circuits > 5 kA.

**RCCBs and RCBOs**

**Normalised values of the maximum operating time and the non-response time according to the standards NF EN 61008-1 and NF EN 61009-1**

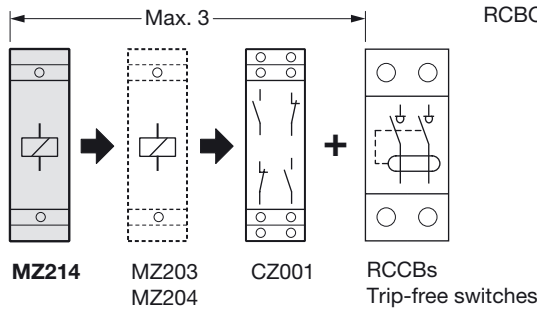
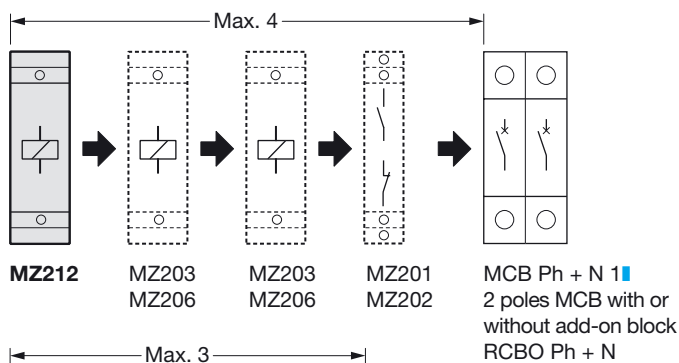
Characteristics of RCCB		Normalised values of the non-response operating time for a residual current (IΔn) equal to:					
type	In A	IΔn A	IΔn	2IΔn	5IΔn	500 A	
general	any value		0.3	0.15	0.04	0.04	maximum operating time
S	>25	>0.030	0.5	0.2	0.15	0.15	maximum operating time
			0.13	0.06	0.05	0.04*	minimum operating time

\* only for RCCBs

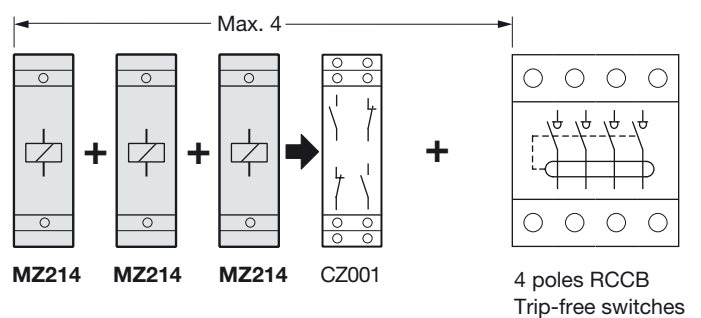
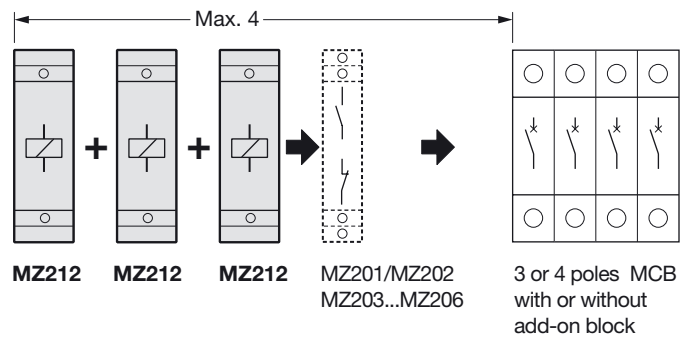
**Trip units electrical features**

MZ203	MZ204	MZ205	MZ206	MZ212	MZ214
Control voltage $U_n$ : 230 V to 415 V AC 110 V to 130 V DC	Control voltage $U_n$ : 24 V to 48 V AC 12 V to 48 V DC.	Control voltage $U_n$ : 48 V DC	Control voltage $U_n$ : 230 V AC	Tripping voltage: see tripping curve	Low voltage release $U_n$ : 230 V AC
peak power 15 VA	peak power 30 VA	tripping voltage between $0,2s U_n$ and $0,6s U_n$			
tolerance: AC DC -15% of $U_n$ with $T^\circ \leq 40^\circ C$		consumption: 2.4 VA	consumption: 3.5 VA	consumption: 0.7 VA	consumption: 0.7 VA

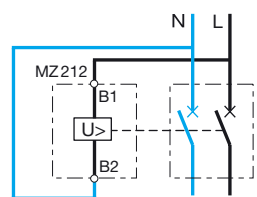
**Auxiliaries possibility combination**  
**2 poles**



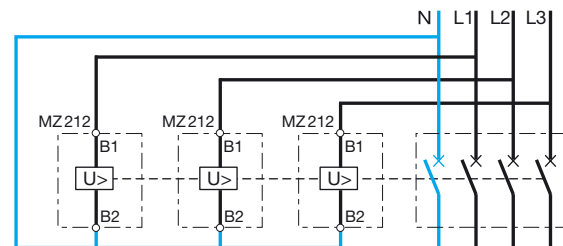
**4 poles**



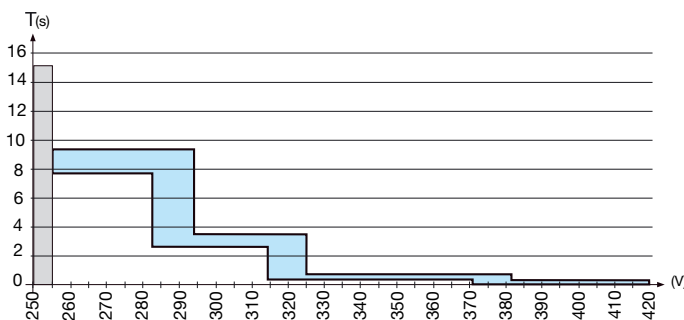
**Overvoltage tripping MZ212**  
**single-phase**



**three-phase**

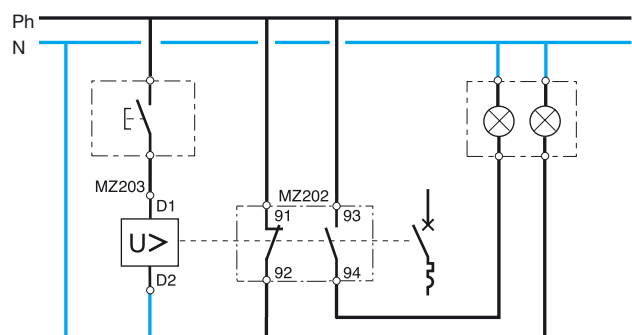


**Tripping curve**



**Shunt trip MZ203**

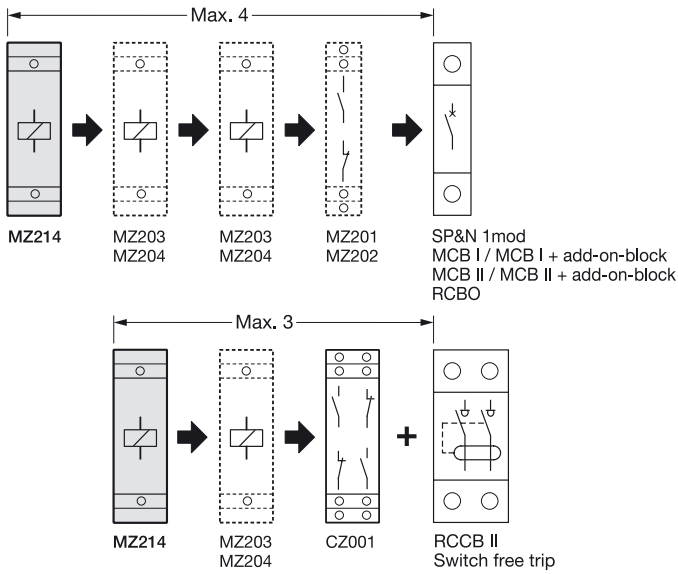
Diagram with an emergency stop button (NO) and a shunt trip



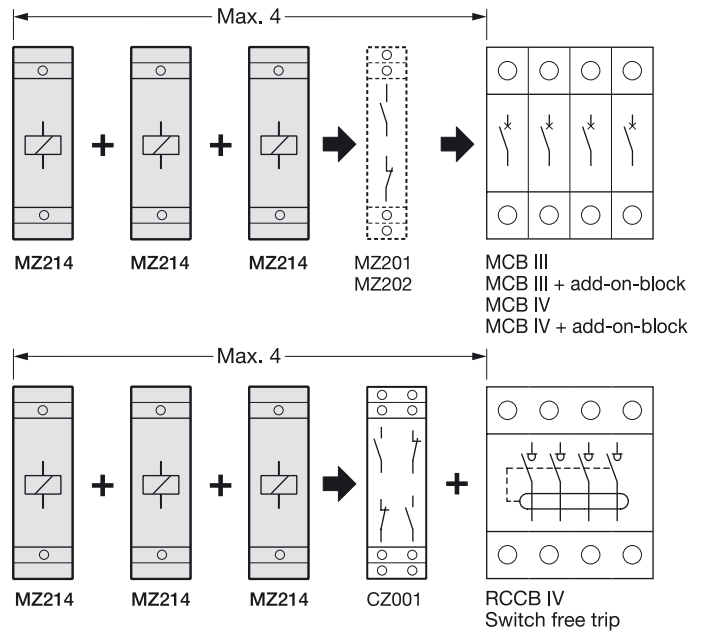


### Auxiliaries possibility combination

#### 2 poles

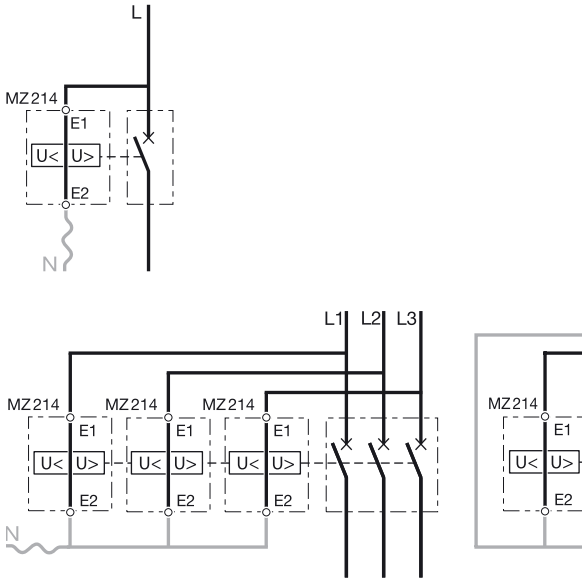


#### 4 poles

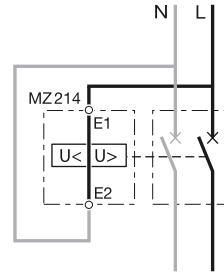


### Overvoltage tripping MZ214

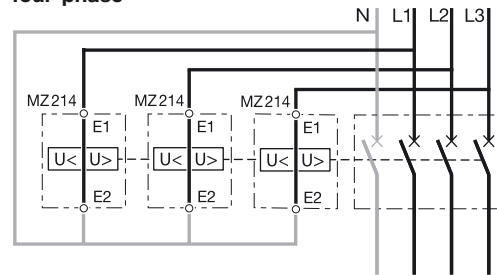
#### single-phase



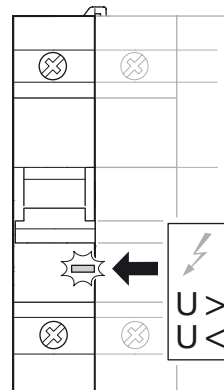
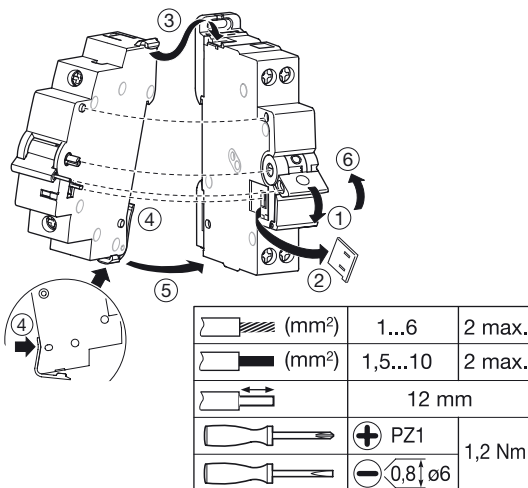
#### two-phase



#### four-phase



### Mounting




#### Low voltage release

< 60 VAC ±10 VAC	no tripping
60 VAC to 120 VAC	150 ms
120 VAC to 170 VAC	3 s
170 VAC to 195 VAC	8 s
tolerance on voltage	± 5 VAC
tolerance on tripping time	± 15%

#### Over voltage release


> 270 VAC	100 ms
-----------	--------

**Functioning modes**

For the front functioning modes “off & on” and “auto”, the remote controls “on”, “off”, “reset” and “

“on” remote control (input n°2)


It is jammed when:

- The selector or the controls activate “reset” or “

“off” remote control (input n°4)

Takes priority for “on” setting and automatic reclosing.

It is jammed when:


- Selector activates the “reset” or “

“reset” remote control (input n°6)

This control padlocks to the « on » position, the « off » position and reinitialises the product.

The initialisation consists of resetting the number of tripping and the time delay (3 mins or 30 secs).

This will remotely unjam the product.

“

This control locks “on” and automatic reclosing. “off” is available.

**The product does not operate if this control is not connected (minimum).**

Side selector “time set”

Time delay of 3 mins is recommended for associated products before activating either remote control setting “on” or automatic reclosing. Even if it the device is reset before 3 mins the action will be delayed. However, for specific installations, when a continuity of service is required, the side selector can be set at 30 secs (except for MCBs and RCBOs).


**Supervision**

“a” and “b” signal outputs

If “a” and “b” are closed (the position of the associated product or remote control auxiliary handles is down), the cause could be:

- short-circuit, an overload or an earth leakage fault (depending on the associated device),
- tripping = 3 (end of cycle).

If “a” and “b” are open (position of the handle down or central), the cause could be:

- padlocking “


Indicator light

The indicator light shows the state of the product and allows a diagnosis.

We can distinguish 3 general cases:

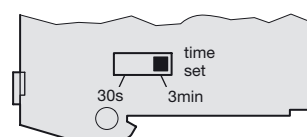
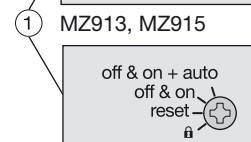
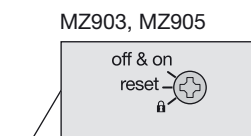
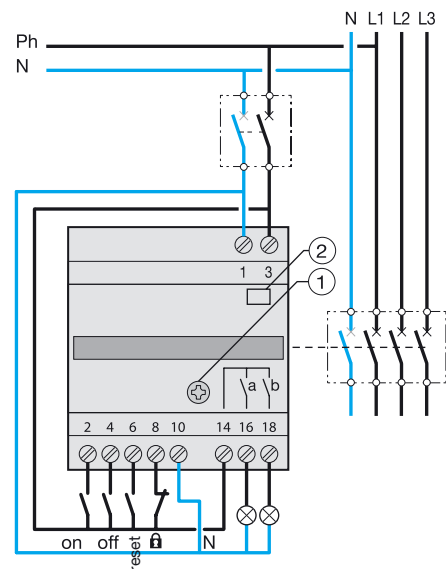
- indicator light on, the product is operational,
- indicator light off, the product is not supplied,
- indicator light intermittent, the remote controls or the automatic reclosing temporarily or permanently jammed.

Caused by

- Front selector padlocking position selected Remote control “reset” or “

If a red intermittent light is present, the controlled device is out of order.

**Connection diagram**



### Technical specifications

#### Electrical characteristics

- Supply voltage: 230 V -10% / +15%
- Frequency: 50/60 Hz
- Product consumption:
  - transitional switching between closing/opening: 5 A max. for 150 ms
  - permanent: 7 VA


#### Functional characteristics

- Controls:
  - minimum of control: 120 ms
  - max. distance: 200 m
- Signals outputs: 200 m
  - 2 dry contacts:
    - max. breaking capacity: 5 A 250 V AC
    - min. breaking capacity: 10 mA 5 V DC
- Handlings: 10 000
- Opening or closing length: < 270 ms

#### Environment

- Functioning temperature: -5 °C to + 40 °C
- Storage temperature: -25 °C to + 70 °C

### Operating principle

Position of front selector	Functioning	Indicator light
“off & on”	<ul style="list-style-type: none"> <li>• Remote controls “on”, “off”, “reset” and “ <p>4.58</p> </li></ul>	

**Withstand current correction table**

- (a) - depending on ambient temperature,
- (b) - depending on the proximity heating effect of the fuse carriers themselves when fully loaded and mounted together in groups.

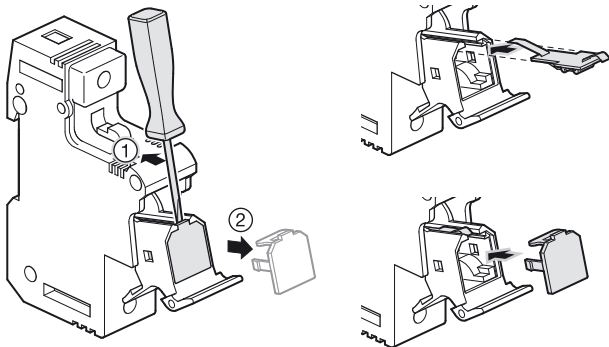
type		L 38	L 51	L 58
fuse size		10 x 38	14 x 51	22 x 58
In for Un 400 V AC		32 A	50 A	125 A
In for Un 500 V~		20 A	40 A	80 A
(a)	20°	1	1	1
	30°	0.95	0.95	0.95
	40°	0.90	0.90	0.90
	50°	0.80	0.80	0.80
(b)	1 à 3 Ph	1	1	1
	4 à 6 Ph	0.8	0.8	0.8
	7 à 9 Ph	0.7	0.7	0.7
	> 10 Ph	0.6	0.6	0.6

**Microswitches functions**

- Fuse melting: a fuse-carrier containing a fuse-link with a striker that sends out a signal when the fuse element melts
- Pre-cut: when the fuse-carrier opens
- Presence: sends a signal when the fuse-carrier is closed with no fuse in it

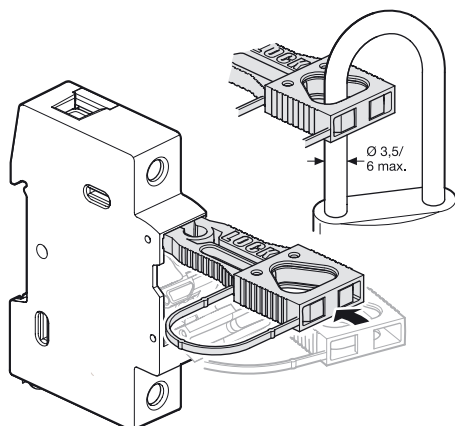
**Signal light**

**Mounting on L 51 and L 58**



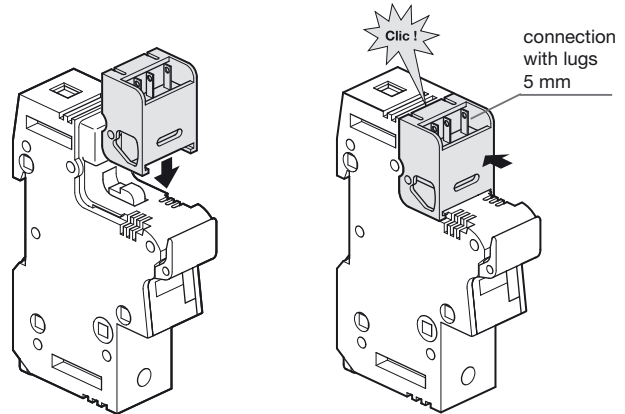
**Padlocking and sealing**

**LS4xx and LS5xx in «open» position**

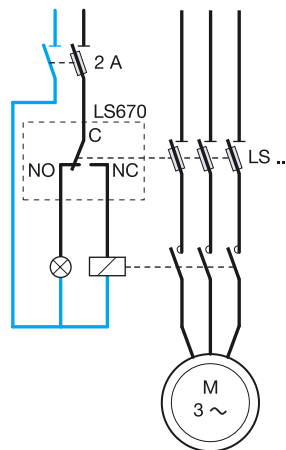


**Microswitch**

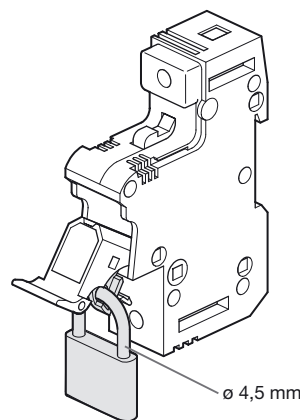
**mounting on L 51 et L 58, single pole or multi pole**



**Application**

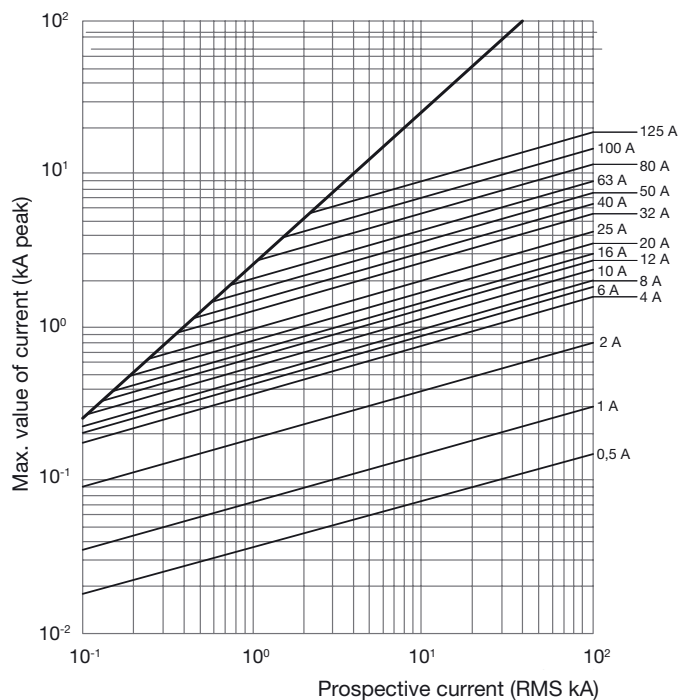


**Padlocking and sealing of the others fuse carriers in «open» position**

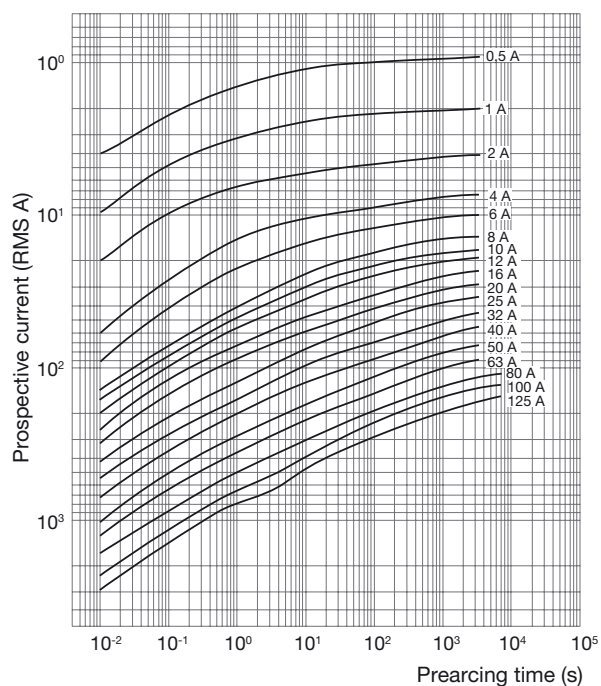


### Cartridge fuses - gG type

Cut-off characteristics current limitation



Time-current characteristics



Energy let through chart (A<sup>2</sup> s)

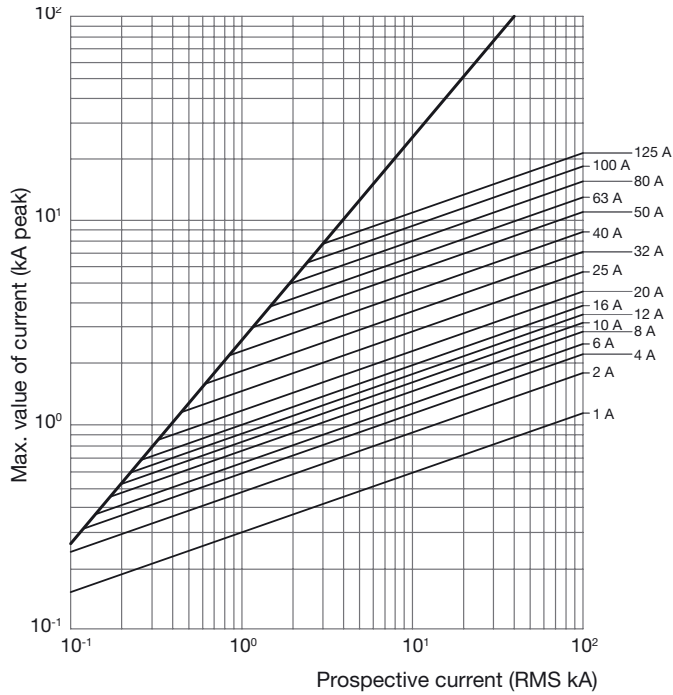
In	prearcing time I <sup>2</sup> t	I <sup>2</sup> t à 400 V	I <sup>2</sup> t à 500 V	I <sup>2</sup> t à 690 V
0.5	4.0	8.6	10.4	15.0
1	6.5	13.2	15.7	22.0
2	7.0	14.6	17.6	25.0
4	45	90	108	150
6	70	140	166	230
8	80	158	188	260
10	120	248	297	420
12	180	362	431	600
16	270	536	636	880
20	500	981	1162	1600
25	800	1688	2034	2900
32	1200	2412	2871	4000
40	2500	4907	5808	8000
45	2870	5603	6623	9100
50	5100	11262	13728	20000
63	7900	16451	19762	28000
80	16000	37242	46000	-
100	28000	68072	85000	-
125	40000	120000	-	-

Rated power dissipation (W)

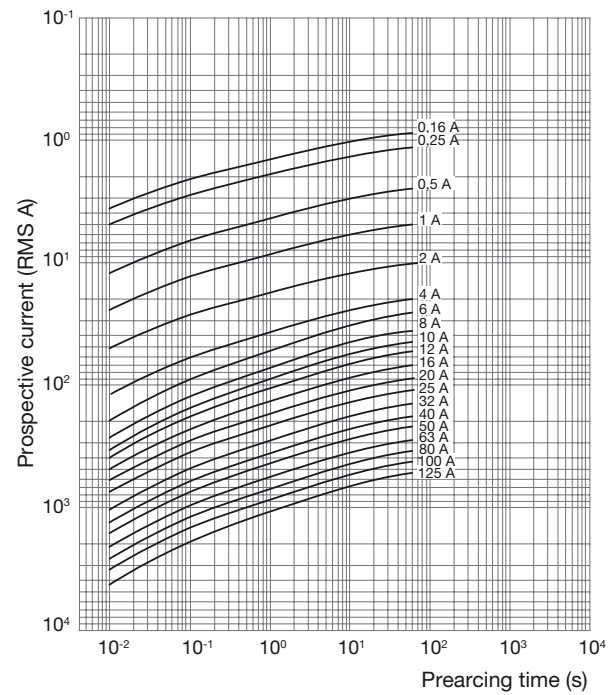
In (A)	size 10 x 38	size 14 x 51	size 22 x 58
0.5	1.43	-	-
1	2.77	3.90	-
2	0.60	0.90	1.00
4	0.70	1.00	1.10
6	0.85	1.15	1.30
8	0.75	1.00	1.10
10	1.00	1.30	1.50
12	1.30	1.70	1.80
16	1.60	2.00	2.10
20	2.00	2.50	2.70
25	2.60	3.30	3.30
32	2.90	3.50	3.50
40	-	4.75	4.00
45	-	4.80	-
50	-	4.80	5.50
63	-	-	6.90
80	-	-	7.80
100	-	-	9.00
125	-	-	11.4

Cartridge fuses - aM type

Cut-off characteristics current limitation



Time-current characteristics



Protection devices

Energy let through chart (A<sup>2</sup> s)

In (A)	prearcing time I <sup>2</sup> t	I <sup>2</sup> t à 400 V	I <sup>2</sup> t à 500 V	I <sup>2</sup> t à 630 V
0.5	6.5	13.2	15.7	22.0
1	9.5	18.5	21.9	30.0
2	40	83	99	140
4	90	181	215	300
6	120	250	300	425
8	220	448	535	750
10	300	733	916	1400
12	380	936	1173	1800
16	550	1608	2103	3500
20	950	2488	3165	5000
25	1300	3728	4851	8000
32	2500	6207	7791	12000
40	4500	10685	13263	20000
45	8000	16538	19831	28000
50	10000	19626	23230	32000
63	15000	31520	37950	54000
80	30000	59088	70000	-
100	50000	113945	140000	-
125	80000	200000	-	-

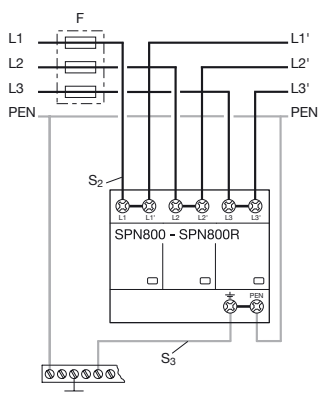
Rated power dissipation (W)

In (A)	size 10 x 38	size 14 x 51	size 22 x 58
0.5	0.49	0.69	-
1	0.10	0.14	-
2	0.18	0.24	0.29
4	0.31	0.45	0.48
6	0.32	0.42	0.47
8	0.52	0.70	0.73
10	0.55	0.53	0.74
12	0.63	0.88	0.83
16	0.92	1.16	1.21
20	0.96	1.23	1.29
25	1.40	1.46	1.53
32	1.80	2.04	2.13
40	-	2.60	3.40
45	-	2.85	-
50	-	2.90	3.48
63	-	-	4.46
80	-	-	5.86
100	-	-	6.61
125	-	-	8.42

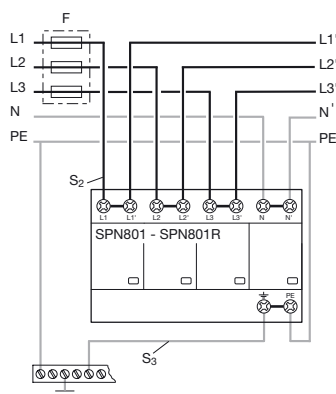
SPD references	SPN800	SPN801	SPN802
Standards / approval	EN61643-11	EN61643-11	EN61643-11
	L1/L2/L3 → PE	L1/L2/L3/N → PE	L1/L2/L3/N → PE   N → PE
Type / Class	T1/ I / B	T1/ I / B	T1/ I / B
Installation of SPD	in parallel	in parallel	in parallel
Earthing system	TN-C	TN-S	TT
Protection mode	common	common	common and differential
Nominal voltage (Un)	230/400 V AC	230/400 V AC	230/400 V AC
Max. continuous operating voltage (Uc)	255 V AC	255 V AC	255 V AC
Voltage protection level (Up)	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV
Temporary overvoltage (Ut)	440 V / 5 s	440 V / 5 s	440 V / 5 s   1200 V / 200 ms
Nominal current I (L)	315 Aeff	315 Aeff	315 Aeff
Nominal current I (L-L')	125 Aeff	125 Aeff	125 Aeff
Disconnection value (Ifi)	50 kAeff	50 kAeff	50 kA   100 kA
Discharge current capacity (8/20) nominal current (In)	75 kA	100 kA	25 kA   100 kA
Shock current (10/350) (Iimp)	75 kA	100 kA	25 kA   100 kA
Residual current IPE	≤ 100 µA	≤ 100 µA	≤ 100 µA
Max. upstream protection - fuse	125 A gL/gG in series or 315 A in parallel	125 A gL/gG in series or 315 A in parallel	125 A gL/gG in series or 315 A in parallel
Max. upstream protection - MCB	125 A in series or 160 A in parallel curve C	125 A in series or 160 A in parallel curve C	125 A in series or 160 A in parallel curve C
Max. short-circuit resistance with max. upstream protection - fuse	50 kA eff ac	50 kA eff ac	25 kA eff ac
Max. short-circuit resistance with max. upstream protection - MCB	50 kA eff ac	50 kA eff ac	25 kA eff ac
Response time (tA)	≤ 100 ns	≤ 100 ns	≤ 100 ns
Working temperature	-40°C to +60°C	-40°C to +60°C	-40°C to +60°C
Indication (disconnection device)	green - red light on L1, L2, L3	green - red light on L1, L2, L3, N	green - red light on L1, L2, L3, N
Connection capacity min. L1, L2, L3, PE - max. L1', L2', L3', PE'	10 mm <sup>2</sup> rigid / flexible	10 mm <sup>2</sup> rigid / flexible	10 mm <sup>2</sup> rigid / flexible
Connection capacity max. L1, L2, L3, PE	50 mm <sup>2</sup> multi-wired 35 mm <sup>2</sup> flexible	50 mm <sup>2</sup> multi-wired 35 mm <sup>2</sup> flexible	50 mm <sup>2</sup> multi-wired 35 mm <sup>2</sup> flexible
Connection capacity max. L1', L2', L3', PE'	50 mm <sup>2</sup> multi-wired 25 mm <sup>2</sup> flexible	50 mm <sup>2</sup> multi-wired 25 mm <sup>2</sup> flexible	50 mm <sup>2</sup> multi-wired 25 mm <sup>2</sup> flexible
Terminals tightening torque	7,0 Nm	7,0 Nm	7,0 Nm
Mounting on	DIN rail 35 mm (EN 60715)	DIN rail 35 mm (EN 60715)	DIN rail 35mm, conform to EN 60715
Case material	thermoplastic, grey color, UL 94V-0	thermoplastic, grey color, UL 94V-0	thermoplastic, grey color, UL 94V-0
Degree of protection	IP20	IP20	IP20
Size	6 ■, DIN 43880	6 ■, DIN 43880	8 ■, DIN 43880
Weight	970 g	1260 g	1272 g
Approval	VDE	VDE	VDE

Auxiliary contact references	SPN800R = SPN800 w/ aux. contact	SPN801R = SPN801 w/ aux. contact	SPN802R = SPN802 w/ aux. contact
Contact type	changeover	changeover	changeover
Electrical characteristics (Un/In)	AC: 250V/0.5A DC: 250V/0.1A ; 125V/0.2A ; 75V/0.5A	AC: 250V/0.5A DC: 250V/0.1A ; 125V/0.2A ; 75V/0.5A	AC: 250V/0.5A DC: 250V/0.1A ; 125V/0.2A ; 75V/0.5A
Min. connection capacity	0.25 mm <sup>2</sup> rigid / flexible	0.25 mm <sup>2</sup> rigid / flexible	0.25 mm <sup>2</sup> rigid / flexible
Max. connection capacity	1.5 mm <sup>2</sup> multi-wired / flexible	1.5 mm <sup>2</sup> multi-wired / flexible	1.5 mm <sup>2</sup> multi-wired / flexible

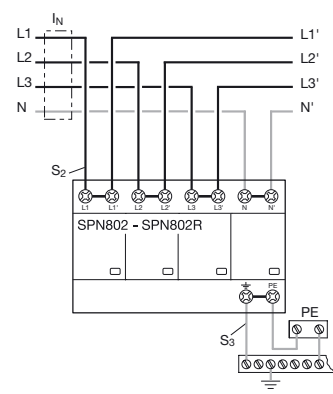
### Installation in parallel TN-C



### Installation in parallel TN-S



### Installation in parallel TT



	Class II - Overvoltage protection					
	High	Medium				Fine
Reference	SPN140D	SPN215D	SPN215R	SPN415D	SPN415R	SPN208S
Installation exposure level (risk)	high	medium	medium	medium	medium	low
Installation of SPD	parallel	parallel	parallel	parallel	parallel	series
Number of poles	1P	1P+N	1P+N	3P+N	3P+N	1P+N
Number of modules	1	2	2	4	4	2
Nominal current	-	-	-	-	-	-
Nominal voltage Un (V)	230	230	230	400	400	230/400
Frequency (Hz)	50/60	50/60	50/60	50/60	50/60	50/60
Operating temperature range	-40°C to +60°C	-40°C to +60°C	-40°C to +60°C	-40°C to +60°C	-40°C to +60°C	-40°C to +60°C
Storage temperature range	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C
Max. continuous operating voltage Uc (V)						
common mode	275	275	275	275	275	440
differential mode	-	-	-	-	-	255
Voltage protection level Up (kV)						
common mode	-	-	-	-	-	1.2
differential mode	1.2	1.0	1.0	1.0	1.0	1.0
Discharge current wave 8/20 µs (kA)						
nominal current In	15	5	5	5	5	2
maximum current I <sub>max</sub>	40	15	15	15	15	8
Short circuit withstand with max.						
backup fuse or MCB	20kA	10kA	10kA	10kA	10kA	6A
max. backup fuse	25A	10A	10A	10A	10A	25A
backup MCB (C curve)	25A	25A	25A	25A	25A	25A
End of life indication (fault indication)						
1. three stage indication - green. green/red. red (R versions)	yes	N/A	yes	N/A	yes	N/A
2. basic indication - green/red (D versions)	N/A	yes	N/A	yes	N/A	N/A
3. green LED is on when SPD is working	N/A	N/A	N/A	N/A	N/A	yes
Applications						
industrial and commercial buildings	yes	yes	yes	yes	yes	yes
domestic buildings	yes	yes	yes	yes	yes	yes

- I<sub>max</sub>** The maximum value of current that the SPD can withstand and remain operational.
- I<sub>n</sub>** The nominal value of current that the SPD can withstand at least 20 times and still be serviceable.
- U<sub>p</sub>** The residual voltage that is measured across the terminal of the SPD when I<sub>n</sub> is applied.
- U<sub>c</sub>** The maximum voltage which may be continuously applied to the SPD without conducting.
- U<sub>oc</sub>** Open circuit voltage under test conditions.
- I<sub>sc</sub>** Short circuit current under test conditions.
- U<sub>n</sub>** The nominal rated voltage of the installation
- MOV** Metal Oxide Varistor
- SPD** Surge Protective Device

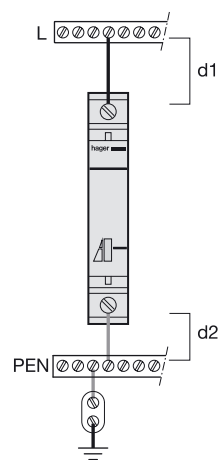


### How to choose your surge protection device

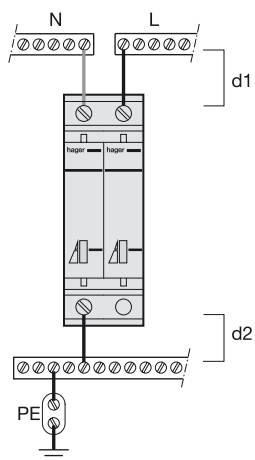
The choice of surge protection device depends on your supply arrangements and level of protection required.

Earthing system	Type of protection		connection	Products to be used in a	
				Single phase installation	Three phase installation
TN-C TN-C-S (P-M-E)	transient voltage surges (8/20ms)	class II main protection $I_{max} = 40kA$ or $15kA$ (depending on selection)	parallel	SPN140D 	1xSPN415D/SPN415R 
		class II fine protection $U_p < 1kV$	parallel	SPN208S 	
TN-S TT	transient voltage surges (8/20ms)	class II main protection $I_{max} = 15kA$ $I_{max} = 15kA$	parallel	SPN215D/SPN215R 	1xSPN415D/SPN415R 
		class II fine protection $U_p < 1kV$	parallel	SPN208S 	

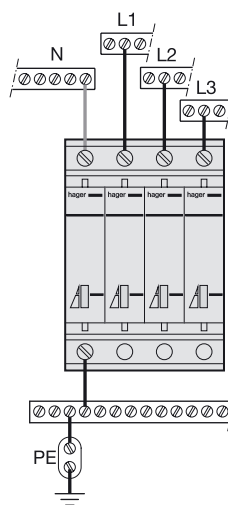
### Connections



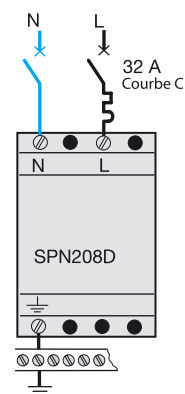
SPN140D



SPN265R



SPN415D/R



SPN208S

**Basic principles**

The proper selection of the correct circuit protective device requires an understanding of the potential hazards against which protection for safety is required. The Wiring Regulations identify several hazards:

- electric shock
- thermal effects
- overcurrent
- undervoltage
- isolation

**Electric shock**

Electric shock is divided into two parts:

- direct contact: contact with parts which result in an electric shock in normal service
- indirect contact: contact with exposed conductive parts which result in an electric shock in case of a fault.

To protect against direct contact the Wiring Regulations suggest the following basic measures should be taken:

- (1) by insulation of live parts
- (2) by enclosures or barriers
- (3) by obstacles
- (4) by placing out of reach

To protect against indirect contact the Wiring Regulations suggest the following basic measures should be taken:

- (1) earthed equipotential bonding and automatic disconnection of supply
- (2) use of class II equipment or equivalent insulation
- (3) non-conducting location
- (4) earth-free local equipotential bonding
- (5) electrical separation

Of these five measures, the first is by far the most commonly used:

- (1) earthed equipotential bonding and automatic disconnection of supply.

In each installation main equipotential bonding conductors shall connect the main earthing terminal of the installation; this metalwork comprises exposed conductive parts which are part of the electrical installation itself and extraneous conductive parts including the following:

- main water pipes
- gas installation pipes
- other service pipes and ducting
- risers of central heating and air conditioning systems
- exposed metal parts of the building structure

This bonding creates a zone within which any voltages appearing between exposed conductive parts and extraneous conductive parts, are minimised; the earth fault loop impedance must have a value low enough to allow sufficient current to flow for the circuit protective device to operate rapidly to disconnect the supply; disconnection must be sufficiently fast so that voltages appearing on the bonded metalwork cannot persist long enough to cause danger; depending on the operating characteristics of the protective device and the earth impedance, such disconnection may be achieved either by overcurrent devices, Fuses, Miniature Circuit Breakers, (i.e. MCBs) or by Residual Current Devices, (i.e. RCCBs).

**Thermal effect**

Refers to heat generated by the electrical equipment in normal use and under fault conditions. The proper selection of equipment complying with the latest product standards is essential in providing protection against thermal effects.

**Overcurrent**

Defined as a current exceeding the rated value of the circuit components. It may be caused by the overloading of a healthy circuit or it may take the form of a short-circuit current, defined as an «overcurrent resulting from a fault of negligible impedance between live conductors having a difference in potential under normal operating conditions». Overcurrent protection may be provided by using fuses or circuit breakers singly or in combination.

**Undervoltage**

Refers to the dangers that could be caused by the reduction or loss in voltage and the subsequent restoration, such as the unexpected re-starting of motors or the automatic closing of protective devices. The proper selection of control and protective devices must take the protection against undervoltage into consideration.

**Isolation**

Every circuit shall be provided with means of isolation (except in certain cases) to prevent or remove hazards associated with the installation, equipment and machines. The new standards for circuit breakers and switch-fuses now take this into account.

**Protection against shock by indirect contact**

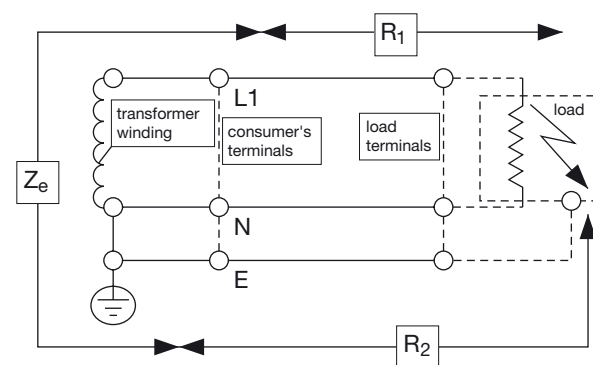
Indirect contact - is the contact of persons or livestock with exposed conductive parts made live by a fault and which may result in electric shock. An example would be where the insulation of an electric heater has broken down resulting in a live conductor internally touching the casing. This could result in the heater casing being raised to a hazardous voltage level, causing electric shock to a person touching it.

Two important measures must be taken to prevent this hazard:

- the impedance of circuit conductors is kept to a minimum. The earth fault loop impedance ( $Z_s$ ) is used as a measure of the circuit impedance under fault conditions.
- the overcurrent device protecting the circuit is selected to rapidly disconnect an earth fault.

The effect of these two measures is inter-related.

1. By ensuring that the circuit protective conductor is of a low impedance, the voltage to which the live casing is raised, under fault conditions, is kept to a minimum.
2. The low impedance path provided by the circuit conductors and the circuit protective conductor will result in a high level of current in the event of an earth fault. This high fault current ensures that the overcurrent protective device will disconnect the fault in a short time, reducing the interval during which the casing of the faulty equipment is live.



Components of earth fault loop impedance ( $Z_s$ ) in a system.

(Earth fault at load between conductor and casing).

$$Z_s = Z_e + (R_1 + R_2)$$

**Earth fault loop impedance ( $Z_s$ )**

To ensure the impedance of conductors in a circuit is sufficiently low the system designer has to establish the value of the earth fault loop impedance.

$Z_s$  - is a measure of the earth fault current loop, comprising the phase conductor and the earth conductor. It comprises the complete loop including the winding of the transformer from which the circuit is supplied as defined by the following:

$Z_e$  - is the part of the earth fault loop impedance external to the installation, its value can be measured or a nominal value can be obtained from the supply authority.

$(R_1 + R_2)$  - where  $R_1$  is the resistance of the phase conductor within the installation and  $R_2$  is the resistance of the circuit protective conductor. These two components constitute the loop impedance within the installation.

Therefore:  $Z_S = Z_e + (R_1 + R_2)$

Once the value of  $Z_S$  has been established a suitable overcurrent protective device has to be selected to ensure disconnection of an earth fault within the specified time. The times are:

- 5 seconds for fixed equipment.
- For portable equipment and for fixed equipment installed outside the equipotential bonding zone, the disconnection times are dependent on the nominal voltage to earth, i.e. 220 to 277 volts = 0.4 seconds.

### $Z_S$ by calculation

To establish whether the relevant disconnection time can be achieved a simple calculation must be made, based on Ohm's law:

$$I_f \text{ (fault current)} = \frac{U_0 \text{ (open circuit voltage)*}}{Z_S \text{ (earth fault loop)}}$$

\* voltage between phase and earth (240V)

The fault current ( $I_f$ ) must be high enough to cause the circuit protective device to trip in the specified time. This can be established by consulting the time/current characteristic for the protective device. If the maximum trip time for the fault current calculated is less than or equal to the relevant value (5s for fixed equipment; 0.4s for portable equipment) then compliance is achieved. It is important that when consulting the characteristic curve the worst case is used, i.e. the maximum tripping time including any tolerance. An example is shown in Figs 1 and 2.

### $Z_S$ by tables

The above procedure can be used for any type of protective device providing a time/current characteristic curve is available. Frequently, however, a much simpler method is available using tables listing maximum  $Z_S$  values which have been interpreted from the characteristic curves for the relevant devices. Providing the system  $Z_S$  is equal to or less than the value given in the table, compliance is achieved. Tables for a number of 'standard' devices (certain fuses and MCBs) are given in the Wiring Regulations.

### $Z_S$ too high

If the system  $Z_S$  value is too high to achieve rapid enough disconnection with the overcurrent protective devices available then it is necessary to use one of the two following methods:

- fit a cable with a larger cross-section and consequently a lower impedance. This may be a very expensive solution especially when the installation is complete before the problem is discovered.
- use a Hager residual current device (RCD). Subject to certain conditions being met this provides a simple and economical solution.

### Example

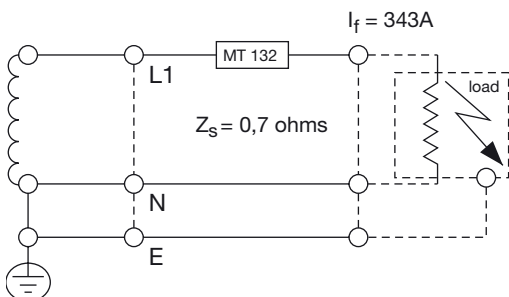
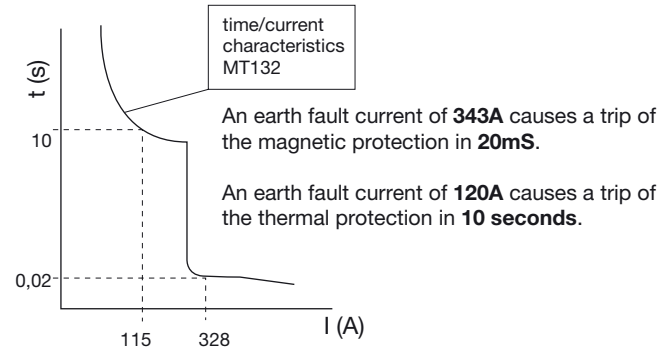


Diagram above shows a fixed circuit with an earth loop impedance  $Z_S$  of 0.7 ohms protected with an MT 132. The fault current ( $I_f$ ) will therefore be  $U_0/Z_S = 240/0.7 = 343A$

By referring to the characteristic for MT132 (see diagram below) it can be seen that the breaker will disconnect in 0.02 seconds for this current. The breaker therefore easily satisfies the requirement for disconnection in 5 seconds.

If the circuit  $Z_S$  was 2.0 ohms then the fault current would be:  $240/2 = 120A$  and the disconnection time would be 10 seconds, in which case compliance would not be achieved.



### Protection against overcurrent

Overcurrent - «A current exceeding the rated value. For conductors the rated value is the current-carrying capacity»

### Overload Current

«An overcurrent occurring in a circuit which is electrically sound»

### Short-Circuit Current

«An overcurrent resulting from a fault of negligible impedance between live conductors having a difference in potential under normal operating conditions.»

### Protection against Overload Current

For the protection against overload current, protective devices must be provided in the circuit to break any overload current flowing in the circuit conductors before it can cause a temperature rise which would be detrimental to insulation, joints, terminations or the surroundings of the conductors.

In order to achieve this protection the nominal current of the protective device  $I_n$  should be not less than the design current of the circuit  $I_b$  and that  $I_n$  should not exceed the current-carrying capacity of the conductors  $I_z$ , and that the current causing effective operation of the protective device  $I_2$  does not exceed 1.45 times the current-carrying capacity of the conductor  $I_z$ , expressed as

$$I_b \leq I_n \leq I_z$$

$$I_2 \leq 1.45 I_z$$

### Protection against Short-Circuit Current

Protective devices must be provided to break any short-circuit current before it can cause danger due to thermal and mechanical (electro-dynamic) effects produced in the conductors and connections. The breaking capacity of the protective device shall not be less than the prospective short-circuit current at the point at which the device is installed. However a lower breaking capacity is permitted provided that a properly co-ordinated back-up device having the necessary breaking capacity is installed on the supply side.

### Positioning of Overcurrent Devices

Devices for the protection against overload and short-circuit must be placed at the point where a reduction occurs in the current-carrying capacity of the conductors. This reduction could be caused by a change in the environmental conditions as well as the more obvious change in the cross-sectional area of the cable.

There are of course exceptions to this general rule which relate to a very few special applications. These are set out in detail in the the Wiring Regulations.

Both of the new International Standards covering Low Voltage Circuit Breakers provide the user with a better assurance of quality and performance by taking into account the actual operating conditions of the breaker. New definitions and symbols have been introduced which should be committed to memory. Some of those most frequently used are:

- $U_e$  : rated service voltage
- $U_i$  : rated insulation voltage ( $> U_e$ max)
- $U_{imp}$  : rated impulse withstand
- $I_{cm}$  : rated short circuit making capacity
- $I_{cn}$  : rated short circuit capacity
- $I_{CS}$  : rated service short circuit breaking capacity
- $I_{cu}$  : rated ultimate short circuit breaking capacity
- $I_{\Delta n}$  : rated residual operating current (often called residual sensitivity)
- $I_n$  : rated current = maximum value of current used for the temperature rise test
- $\Delta t$  : trip delay of residual current devices

In addition IEC 898 sets out to provide a greater degree of safety to the uninstructed users of circuit breakers. It is interesting to note that the description «miniature circuit breaker» or MCB is not used at all in this standard, but no doubt both manufacturers and users will continue to call circuit breakers complying with IEC 898 miniature circuit breakers or MCBs for some time to come.

The scope of this standard is limited to ac air break circuit breakers for operation at 50Hz or 60Hz, having a rated current not exceeding 125A and a rated short-circuit capacity not exceeding 25kA.

A rated service short-circuit breaking capacity  $I_{CS}$  is also included which is equal to the rated short-circuit capacity  $I_{cn}$  for short-circuit capacity values up to and including 6kA, and 50% of  $I_{cn}$  above 6kA with a minimum value of 7.5kA. As the circuit- breakers covered by this standard are intended for household and similar uses,  $I_{CS}$  is of academic interest only. The rated short-circuit capacity of a MCB ( $I_{cn}$ ) is the alternating component of the prospective current expressed by its r.m.s. value, which the MCB is designed to make, carry for its opening time and to break under specified conditions.  $I_{cn}$  is shown on the MCB label in a rectangular box without the suffix 'A' and is the value which is used for application purposes.  $I_{cn}$  (of the MCB) should be equal to or greater than the prospective short-circuit current at the point of application.

You will see from the curves that the inverse time delay characteristic which provides overload protection is the same on all three. This is because the Standards requires the breaker to carry 1.13 times the rated current without tripping for at least one hour and when the test current is increased to 1.45 times the rated current, it must trip within one hour, and again from cold if the last current is increased to 2.55 times the rated current the breaker must trip between 1 and 120 seconds. The inverse time delay characteristic of all MCBs claiming compliance with IEC 898 must operate within these limits.

The difference between the three types of characteristic curves designated 'B', 'C' and 'D' concerns only the magnetic instantaneous trip which provides short-circuit protection.

- For type 'B' the breaker must trip between the limits of 3 to 5 times rated current
- For type 'C' the breaker must trip between the limits of 5 to 10 times rated current, and
- For type 'D' the breaker must trip between the limits of 10 to 20 times rated current.

Often manufacturers publish their MCB tripping characteristics showing the limits set by the standard and guarantee that any breaker that you purchase will operate within these limits. So great care should be taken when working with characteristic curves showing lower and higher limits - on no account should you take a mean point for application design purposes.

For cable protection applications you should take the maximum tripping time and some manufacturers publish single line characteristic curves which show the maximum tripping time. If the design problem is nuisance tripping then the minimum tripping time should be used and for desk top co-ordination studies, both lower and upper limits have to be taken into account.

#### Energy limiting

Energy is measured in Joules. \*James Prescott Joule proved that thermal energy was produced when an electric current flowed through a resistance for a certain time, giving us the formula :

Joules =  $I^2 \times R \times t$  or because we know that watts =  $I^2 R$

Joules = watts x seconds

Therefore we can say that :

One Joule = one watt second

or energy = watts x seconds =  $I^2 R t$

If the resistance (R) remains constant or is very small compared with the current (I) as in the case of short-circuit current, then energy becomes proportional to  $I^2 t$ . Which is why the energy let-through of a protective device is expressed in ampere squared seconds and referred to as  $I^2 t$

$I^2 t$  (Joule Integral) is the integral of the square of the current over a given time interval ( $t_0, t_1$ )

The  $I^2 t$  characteristic of a circuit breaker is shown as a curve giving the maximum values of  $I^2 t$  as a function of the prospective current.

Manufacturers are required by the Standard to produce the  $I^2 t$  characteristic of their circuit breakers.

#### See previous page.

The energy limiting characteristics of modern MCBs greatly reduce the damage that might otherwise be caused by short-circuits. They protect the cable insulation and reduce the risk of fire and other damage. Knowledge of the energy limiting characteristic of a circuit breaker also helps the circuit designer calculate discrimination with other protective devices in the same circuit.

Because of the importance of the energy limiting characteristic the Standards for circuit breakers for household and similar installations suggests three energy limiting classes based on the permissible  $I^2 t$  (let-through) values for circuit breakers up to 32A; class 3 having the highest energy limiting performance.

All Hager MCBs are well within the limits of energy let-through set by IEC 898 for energy limiting class 3.

**Breaking capacity**

References	MLN	Ax8xxx	Ax9xxx
poles	Ph+N	Ph+N	Ph+N
nominal current In (A)	2 to 40	6 to 40	6 to 40
breaking capacity IEC/EN 60 898			
230V	6kA	4.5kA	6kA
400V	-	-	-
breaking capacity IEC/EN 60 947-2			
230V	7.5kA	6kA	10kA
400V	-	-	-

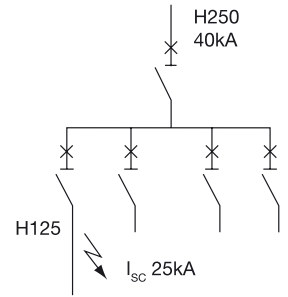
References	MV MW		MT MU		MBN MCN		MB MC		NGN				
poles	1	2, 3, 4	1	2, 3, 4	1	2, 3, 4	1	2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1	2, 3, 4
nominal current In (A)	6 to 40	6 to 40	6 to 40	6 to 40	6 to 63	6 to 63	0.5 to 63	0.5 to 63	0.5 to 2	3 to 6	6	10 to 63	10 to 63
breaking capacity IEC/EN 60 898													
230V	3kA	4.5kA	6kA	10kA	6kA	10kA	6kA	10kA	-	-	-	6kA	10kA
400V	-	3kA	-	6kA	-	6kA	-	6kA	-	-	-	6kA	6kA
breaking capacity IEC/EN 60 947-2													
230V	-	-	10kA	20kA	-	-	10kA	20kA	80kA	50kA	30kA	10kA	20kA
400V	-	-	3kA	10kA	-	-	3kA	10kA	80kA	50kA	30kA	3kA	10kA

References	NBN, NCN NDN					NQN, NRN, NSN						
poles	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1	2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4
nominal current In (A)	0.5 to 2	3 to 6	6	10 to 63	10 to 63	0.5 to 2	3 to 6	6	6 to 25	32 to 40	50 to 63	
breaking capacity IEC/EN 60 898												
230V	-	-	-	10000A	-	-	-	-	-	-	-	-
400V	-	-	-	-	10000A	-	-	-	-	-	-	-
breaking capacity IEC/EN 60 947-2												
230V	80kA	50kA	30kA	15kA	20kA	80kA	50kA	30kA	25kA	20kA	15kA	
400V	80kA	50kA	30kA	3kA	15kA	80kA	50kA	30kA	25kA	20kA	15kA	

References	HLE HLF		HMB, HMC HMD		HMJ HMK		HMX	
poles	1	2, 3, 4	1	2, 3, 4	1	2, 3, 4	1	2, 3, 4
nominal current In (A)	80 to 125	80 to 125	80 to 125	80 to 125	80 to 125	80 to 125	10 to 63	10 to 63
breaking capacity IEC/EN 60 898								
230V	15kA	10kA	-	15kA	-	-	-	-
400V	10kA	10kA	-	15kA	-	-	-	-
breaking capacity IEC/EN 60 947-2								
230V	15kA	15kA	-	30kA	-	60kA	-	100kA
400V	10kA	10kA	-	15kA	-	30kA	-	50kA

**Definition**

This allows circuit breakers of lower breaking capacity than the PSCC to be installed. The principle is that two breakers operating in series will clear a larger fault and that energy let through by the upstream breaker will not damage the down stream device.



**A. Coordination:** upstream MCB / downstream MCB, 1PP / 2PP / 3PP / 3PP+N / 4PP 400 - 415 V IEC60947

	Breaking capacity	Size	curve	Axx8xx	Axx9xx	MV, MW	NExxxA NFxxxA	MUxxxA MTxxxA MBxxxA MCxxxA	NGN	NBNxxxA NCNxxxA NDNxxxA	NQN, NRN, NSN			HLE HLF	HMB HMC HMD	HMJ HMK	HMX
				6 kA	10 kA	4.5 kA	10 kA	-	10 kA	15 kA	25 kA	20 kA	15 kA	10 kA	15 kA	30 kA	50 kA
				6 - 25 A	25 - 40 A	50 - 63 A	80 - 125 A	80 - 125 A	80 - 125 A	10 - 63 A	B, C, D	B, C, D	B, C, D	B, C, D	B, C, D	B, C, D	C
MUxxxA, MTxxxA, MBxxxA, MCxxxA	10 kA	B, C	-	-	-	-	-	-	-	15	25	20	15	-	15	30	50
NGN	10 kA	B, C, D	-	-	-	-	-	-	-	15	25	20	15	-	15	30	50
NBNxxxA, NCNxxxA, NDNxxxA	15 kA	B, C, D	-	-	-	-	-	-	-	-	25	20	15	-	-	30	50
NQN, NRN, NSN	25 kA	B, C, D	-	-	-	-	-	-	-	-	-	-	-	-	-	30	50
	20 kA	B, C, D	-	-	-	-	-	-	-	-	25	-	-	-	-	30	50
	15 kA	B, C, D	-	-	-	-	-	-	-	-	25	20	-	-	-	30	50
MMN 2xx, MMN 3xx	25-20 kA	magn.	-	-	-	-	-	-	-	-	25	-	-	-	-	30	50
HLE, HLF	10 kA	B, C	-	-	-	-	-	-	-	-	25	20	-	-	15	30	-
HMB, HMC, HMD	15 kA	B, C, D	-	-	-	-	-	-	-	-	25	20	-	-	-	30	-
HMJ, HMK	30 kA	B, C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HMX	50 kA	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Protection devices

**B. Coordination:** upstream MCCB / downstream MCB, 1PP / 2PP / 3PP / 3PP+N / 4PP 400 - 415 V IEC60947

	Breaking capacity	curve	x160 TM			x250 TM			h250 TM			h250 LSI		h400 TM		h630 LSI		h1000 LSI		h1600 LSI		
			HDA	HHA	HNA	HHB	HNB	HHG	HNG	HEG	HNC	HEC	HHD	HND	HND	HED	HNE	HEE	HNF	HEF	HNF	HEF
			18 kA	25 kA	40 kA	25 kA	40 kA	25 kA	50 kA	65 kA	50 kA	70 kA	25 kA	50 kA	50 kA	70 kA	50 kA	70 kA	50 kA	70 kA	50 kA	70 kA
Axx8xx, MGT, MHT	6 kA	C	8	8	8	6.5	6.5	5.8	5.8	5.8	6.5	6.5	-	-	-	-	-	-	-	-	-	
Axx9xx	10 kA	C	18	18	18	14	14	10	10	10	14	14	14	14	10	10	-	-	-	-	-	
MUxxxA, MTxxxA, MBxxxA, MCxxxA	10 kA	B, C	18	20	20	14	14	10	10	10	14	14	13.6	13.6	10.1	10.1	-	-	-	-	-	
NGN	10 kA	D	18	25	30	20	25	15	18	20	25	35	15	20	20	20	18	18	-	-	-	
NBNxxxA, NCNxxxA, NDNxxxA	15 kA	B, C, D	18	25	40	25	40	25	25	25	47	47	23	23	19	19	18	18	-	-	-	
NQN, NRN, NSN	25 kA	B, C, D	-	-	40	-	40	25	50	65	50	70	25	50	50	58	44	44	28	28	-	
	20 kA	B, C, D	-	25	40	25	40	25	50	55	50	70	25	44	29	29	30	30	20	20	-	
	15 kA	B, C, D	18	25	40	25	40	25	25	25	47	47	25	33	19	19	18	18	-	-	-	
MMN 2xx, MMN 3xx	25 kA	magn.	-	-	40	-	40	25	50	65	50	70	25	50	50	58	44	44	28	28	-	
MMN 2xx, MMN 3xx	20 kA	magn.	-	25	40	25	40	25	50	53.4	50	70	25	44	29	29	30	30	20	20	-	
HLE, HLF	10 kA	B, C	18	25	40	25	40	25	25	25	47	47	23	23	18.6	18.6	18	18	-	-	-	
HMB, HMC, HMD	15 kA	B, C, D	18	25	40	25	40	25	25	25	47	48	24	23	19	19	18	18	-	-	-	
HMJ, HMK	30 kA	B, C	-	-	40	-	40	-	50	65	50	70	25	50	50	70	50	65	34	34	-	
HMX	50 kA	C	18	25	40	25	40	25	50	65	50	70	25	50	50	70	70	70	50	70	-	

**C. Coordination:** upstream fuses / downstream MCB, 1PP / 2PP / 3PP / 3PP+N / 4PP 400 - 415 V IEC60947

	curve	≤ 50 A	63 A	80 A	100 A	125 A	160 A	200 A	250 A	315 A	400 A	500 A	630 A	800 A
		Fuse gG												
MUxxxA, MTxxxA, MBxxxA, MCxxxA	B, C	100	100	100	100	70	35	10	10	10	10	10	10	10
NGN	B, C, D	100	100	100	100	70	35	10	10	10	10	10	10	10
NBNxxxA, NCNxxxA, NDNxxxA	B, C, D	100	100	100	100	100	100	15	15	15	15	15	15	15
NQN, NRN, NSN	B, C, D	100	100	100	100	100	100	60	15	15	15	15	15	15
MMN 2xx, MMN 3xx	magn.	100	100	100	100	100	100	60	15	15	15	15	15	15
HLE, HLF	B, C	100	100	65	35	22	10	10	10	10	10	10	10	10
HMB, HMC, HMD	B, C, D	100	100	65	35	25	15	15	15	15	15	15	15	15
HMJ, HMK	B, C	100	100	100	100	100	70	50	30	30	30	30	30	30
HMX	C	100	100	100	100	100	100	70	50	50	50	50	50	50

**E. Coordination: upstream MCB / downstream MCB, 1PP / 2PP / 230V/240V IEC60947**

	Breaking capacity	Axx8xx	Axx9xx	MV, MW	MUxxxA MTxxxA MBxxxA MCxxxA	MBNxxxA MCNxxxA	NGN	NBNxxxA NCNxxxA NDNxxxA	NQN, NRN, NSN			HLE HLF	HMB HMC HMD	HMJ HMK	HMX
		6 kA	10 kA	10 kA	20 kA	-	20 kA	30 kA	50 kA	40 kA	30 kA	20 kA	30 kA	60 kA	100 kA
		Fuse							6 - 25 A	25 - 40 A	50 - 63 A	80 - 125 A	80 - 125 A	80 - 125 A	10 - 63 A
curve	B, C	B, C	B, C	B, C	B, C	B, C	B, C, D	B, C, D	B, C, D	B, C, D	B, C, D	B, C	B, C, D	B, C	C
Axx8xx, MGT, MHT	6 kA	B, C	-	10	-	20	20	20	20	20	20	15	15	15	15
Axx9xx	10 kA	B, C	-	-	-	20	20	20	20	20	20	15	15	15	15
MUxxxA, MTxxxA, MBxxxA, MCxxxA	20 kA	B, C	-	-	-	-	-	30	50	40	30	-	30	60	100
MLN	7.5 kA	B, C	-	10	-	20	20	20	20	20	20	15	15	15	15
NGN	20 kA	B, C, D	-	-	-	-	-	30	50	40	30	-	30	60	100
NBNxxxA, NCNxxxA, NDNxxxA	30 kA	B, C, D	-	-	-	-	-	-	50	40	30	-	-	60	100
NQN, NRN, NSN	50 kA	B, C, D	-	-	-	-	-	-	-	-	-	-	-	60	100
	40 kA	B, C, D	-	-	-	-	-	-	-	-	-	-	-	60	100
	30 kA	B, C, D	-	-	-	-	-	-	-	-	-	-	-	60	100
MMN 2xx, MMN 3xx	50-40 kA	magn.	-	-	-	-	-	-	-	-	-	-	-	60	100
HLE, HLF	20 kA	B, C	-	-	-	-	-	-	-	-	-	-	30	60	-
HMB, HMC, HMD	30 kA	B, C, D	-	-	-	-	-	-	-	-	-	-	-	60	-
HMJ, HMK	60 kA	B, C	-	-	-	-	-	-	-	-	-	-	-	-	-
HMX	100 kA	C	-	-	-	-	-	-	-	-	-	-	-	-	-

**E. Coordination: upstream MCCB / downstream MCB, 1PP / 2PP / 230V/240V IEC60947**

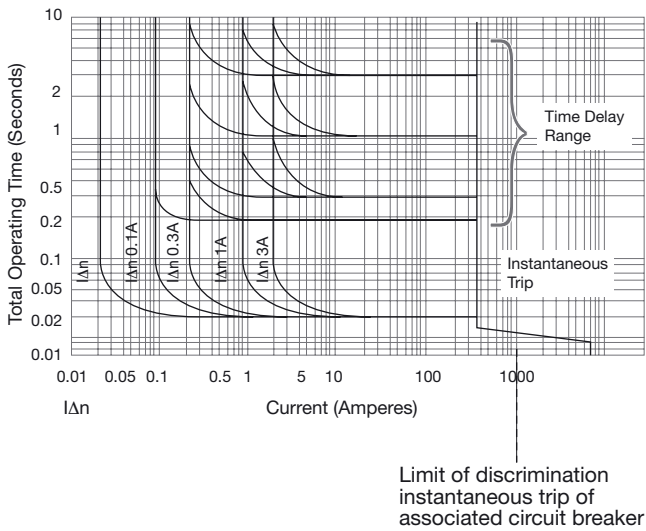
	Breaking capacity	x160 TM			x250 TM			h250 TM			h250 LSI		h400 TM		h630 LSI		h1000 LSI		h1600 LSI	
		HDA	HHA	HNA	HHB	HNB	HHG	HNG	HEG	HNC	HEC	HHD	HND	HND	HED	HNE	HEE	HNF	HEF	
		25 kA	35 kA	85 kA	35 kA	85 kA	35 kA	85 kA	85 kA	85 kA	100 kA	35 kA	85 kA	85 kA	100 kA	85 kA	100 kA	100 kA	100 kA	
curve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Axx8xx, MGT, MHT	6 kA	C	15	15	15	6.5	6	6	6	6	7	8.2	8.2	7.2	7.2	-	-	-	-	
Axx9xx	10 kA	C	45	45	45	15	18	18	18	18	40	19	19	15	15	-	-	-	-	
MLN	7.5 kA	B, C	24	24	24	9	9	9	9	9	12	13.5	13.5	10	10	-	-	-	-	
NGN	20 kA	D	25	35	85	35	85	35	85	85	100	35	64	63	63	40	40	21	21	
NBNxxxA, NCNxxxA, NDNxxxA	30 kA	B, C, D	25	35	85	35	85	35	85	85	100	35	85	85	100	85	85	37	37	
NQN, NRN, NSN	50 kA	B, C, D	25	35	85	35	85	35	85	85	100	35	85	85	100	85	100	85	85	
	40 kA	B, C, D	25	35	85	35	85	35	85	85	100	35	85	85	100	85	100	55	55	
	30 kA	B, C, D	25	35	85	35	85	35	85	85	100	35	85	85	100	85	100	37	37	
MMN 2xx, MMN 3xx	50 kA	magn.	25	35	85	35	85	35	85	85	100	35	85	85	100	85	100	85	85	
MMN 2xx, MMN 3xx	40 kA	magn.	25	35	85	35	85	35	85	85	100	35	85	85	100	85	100	55	55	
HLE, HLF	20 kA	B, C	25	35	85	35	85	35	85	85	100	35	85	85	100	85	100	37	37	
HMB, HMC, HMD	30 kA	B, C, D	25	35	85	35	85	35	85	85	100	35	85	85	100	85	100	37	37	
HMJ, HMK	60 kA	B, C	25	35	85	35	85	35	85	85	100	35	85	85	100	85	100	100	100	
HMX	100 kA	C	25	35	85	35	85	35	85	85	100	35	85	85	100	85	100	100	100	

**F. Coordination: upstream fuses / downstream MCB, 1PP / 2PP / 230V/240V IEC60947**

	curve	≤ 50 A	63 A	80 A	100 A	125 A	160 A	200 A	250 A	315 A	400 A	500 A	630 A	800 A
		Fuse gG												
Axx8xx, MGT, MHT	C	100	65	40	22	15	6.5	6	6	6	6	6	6	6
Axx9xx	C	100	100	65	40	25	11	10	10	10	10	10	10	10
MUxxxA, MTxxxA, MBxxxA, MCxxxA	B, C	100	100	100	100	70	35	20	20	20	20	20	20	20
MLN	B, C	100	100	65	40	25	11	7.5	7.5	7.5	7.5	7.5	7.5	7.5
NGN	B, C, D	100	100	100	100	70	35	20	20	20	20	20	20	20
NBNxxxA, NCNxxxA, NDNxxxA	B, C, D	100	100	100	100	100	100	70	30	30	30	30	30	30
NQN, NRN, NSN	B, C, D	100	100	100	100	100	100	70	30	30	30	30	30	30
MMN 2xx, MMN 3xx	magn.	100	100	100	100	100	100	70	30	30	30	30	30	30
HLE, HLF	B, C	100	100	100	70	45	20	20	20	20	20	20	20	20
HMB, HMC, HMD	B, C, D	100	100	100	70	50	30	30	30	30	30	30	30	30
HMJ, HMK	B, C	100	100	100	100	100	100	100	60	60	60	60	60	60
HMX	C	100	100	100	100	100	100	100	100	100	100	100	100	100



Typical RCCB time/current characteristics



Having decided on the type and the limit of discrimination of the circuit breakers in the system, it is very important to consider the discrimination between any add on RCCBs. In theory it is possible to achieve current discrimination between RCCBs but the limit of discrimination is too low for practical purposes. Time discrimination is by far the best method and is achieved by delaying the tripping of the upstream RCCB.

Note that the limit of discrimination is the instantaneous setting of the associated circuit breaker. In other words if the earth fault current is greater than the instantaneous trip setting of the associated circuit breaker, the circuit breaker will trip regardless of the time delay on the RCCB. The table below indicates how time discrimination may be achieved between RCCBs.

		Up-stream RCCB sensitivity $I_{\Delta n}$																					
		0.01A				0.03A				0.1A				0.3A				1.0A				3.0A	
Downstream RCCB sensitivity $I_{\Delta n}$	Time delay (sec.)	0	0	0	0.2	0	0.2	0.3	1.0	3.0	0	0.2	0.3	1.0	3.0	0	0.3	1.0	3.0	0	0.3	1.0	3.0
0.01A	0																						
	0.2																						
0.03A	0																						
	0.2																						
	0.3																						
	1.0																						
0.1A	0																						
	0.2																						
	0.3																						
	1.0																						
0.3A	0																						
	0.2																						
	0.3																						
	1.0																						
1.0A	0																						
	0.3																						
	2.0																						
	3.0																						
3.0A	0																						
	0.3																						
	1.0																						
	3.0																						

Discrimination achieved



### Co-Ordination between circuit protective devices

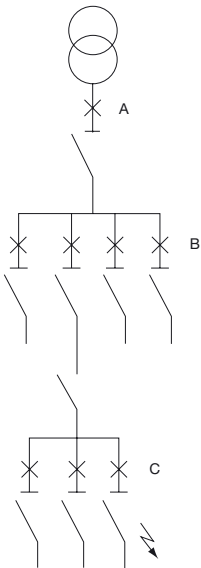
The proper co-ordination of two circuit protective devices is essential in all installations in order to fulfil the requirements of the Wiring Regulations which set out to ensure the safe continuity of supply of electrical current under all conditions of service. If a fault does occur, the circuit protective device nearest the fault should operate, allowing the device immediately upstream to continue to supply healthy circuits. This is called discrimination.

Sometimes the upstream device is selected to protect the downstream device(s) against high prospective short circuit currents and will operate to provide this protection should the actual short circuit current rise to a level which cannot be handled by the device nearest the fault. This is called back-up protection and devices should be so chosen as to allow discrimination up to the point the back-up device takes over.

### Discrimination

Discrimination, which is sometimes called selectivity, is the co-ordination of two automatic circuit protective devices in such a way that a fault appearing at any given point in an installation is cleared by the protective device installed immediately upstream of the fault and by that device alone.

#### Example



A fault occurs downstream of final sub-circuit device «C». All other protective devices remain closed ensuring continuity of supply to the rest of the installation.

When this ideal situation is achieved under all conditions it is called «total discrimination».

Discrimination between two protective devices can be based on either the magnitude of the fault which is called «current discrimination» or the duration of the time the upstream device can withstand the fault current; this is called «time discrimination».

### Current discrimination

In order to achieve «current discrimination» in a distribution system it is necessary for the downstream device to have a lower continuous current rating and a lower instantaneous tripping value than the upstream device. Current discrimination increases as the difference between the continuous current ratings of the upstream and downstream devices increases.

A simple way of checking current discrimination at both overload and short-circuit conditions is to compare the time/current characteristic curves of both devices plotted to the same scale. Transparency overlays, if available, make this task much easier (see diagram on

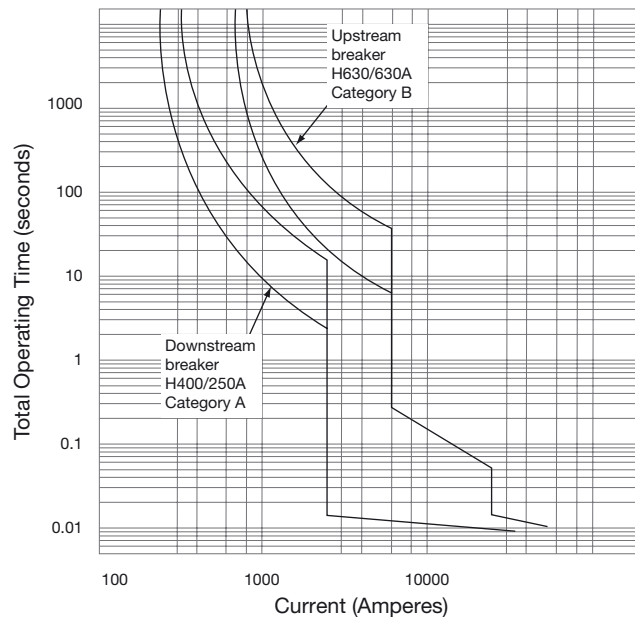
the right). For this example the time/current characteristics of a 32A type 'B' circuit breaker complying with BS EN 60898, with a 100A category 'A' circuit breaker to BS EN 60947 Part 2 are checked for current discrimination.

Because the thermal characteristic curve of the upstream circuit breaker clears the knee of the characteristic curve of the smaller downstream breaker, it can be said that overload discrimination is achieved under all conditions. However because the instantaneous characteristic curves cross at 0.01 sec, short-circuit discrimination is limited up to the point they cross, which in this case is approximately 2.7kA. The point at which the two time/current characteristics cross is called the limit of discrimination or selectivity. In this example the level of discrimination  $I_s$  is 2.7kA, so we only have partial discrimination between these two devices.

### Time discrimination

Time discrimination is achieved by delaying the opening of the upstream circuit breaker until the downstream circuit breaker has opened and cleared the fault. The total clearing time of the downstream circuit breaker must be less than the time setting of the upstream circuit breaker and the upstream circuit breaker must be able to withstand the fault current for the time setting period. Therefore the upstream circuit breaker must be a category 'B' breaker which has been designed and tested for this purpose.

To determine time discrimination it is only necessary to compare the time/current characteristic curves of the two devices to ensure that no overlap occurs.



### Short circuit discrimination

A more accurate way of checking the discrimination between two circuit protective devices at short circuit levels is to compare the energy let-through of the downstream device with the no-tripping or pre-arcing energy levels of the upstream device.

In order to check current discrimination at short circuit levels between:

Fuse Upstream - Fuse Downstream

It is only necessary to compare the  $I^2t$  values of each fuse. This information is usually available in very simple tabular form (see Table 1 page 4.73). If the total let-through energy ( $I^2t$ ) of the downstream fuse is less than the pre-arcing energy ( $I^2t$ ) of the upstream fuse, then total discrimination is achieved at short-circuit levels.

Fuse I<sup>2</sup>t characteristics

Rated current (A)	Pre-arcing I <sup>2</sup> t (kA <sup>2</sup> s)	Total I <sup>2</sup> t (kA <sup>2</sup> s)
10	0.07	0.25
16	0.17	0.45
20	0.31	0.90
25	0.62	1.90
32	1.00	3.0
40	2.1	8.0
50	7.0	17
63	11	30
80	22	70
100	39	100
125	62	170
160	101	300
200	190	500
315	480	1100
400	800	2100
500	1100	3100
630	1800	5000

Table 1

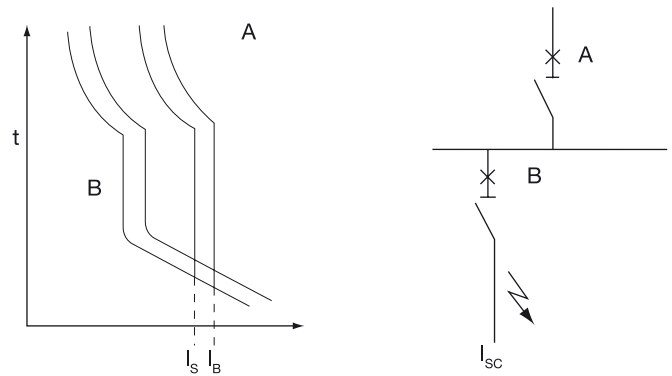
MCB total let-through energy

MCB In	Total let-through energy kA <sup>2</sup> s at PSCC		
	3kA	6kA	10kA
6	5.9	10.5	15
10	6.5	12.2	21.5
16	8.0	17.5	30
20	8.8	19.5	34
25	10	21	38
32	11	24	42
40	12.5	29	50
50	15	34	61
63	16	38	72

Table 2

Fuse Upstream - Circuit breaker downstream. The same procedure applies to fuse/circuit breaker as it does to fuse/fuse association to check current discrimination.

While for all practical purposes, a desk top study of time/current and let-through energy (I<sup>2</sup>t) characteristics are perfectly adequate, the British Standards for circuit breakers do recommend testing to confirm the results. With this in mind hager have prepared a complete list of discrimination levels for all its circuit protective devices.



Back-up protection co-ordination

Back-up Protection

Sometimes known as cascading, when the energy limiting capacity of an upstream breaker is used to allow the use of a downstream circuit breaker having a short circuit breaking capacity (I<sub>cu</sub>) lower than the prospective fault level at the point at which it is installed.

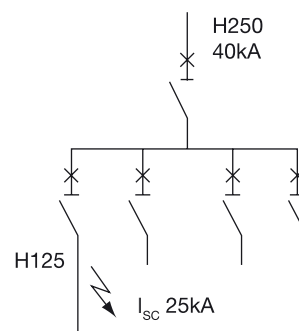
It should be noted that when two circuit protective devices are used in association to improve the short-circuit capacity of the downstream device, total selectivity can never be achieved up to the assigned breaking capacity of the association.

The upstream device must at some point operate to provide the necessary protection to the downstream circuit breaker. This point, which is known as the take-over current, must not be greater than the rated short-circuit capacity of the downstream circuit breaker alone. It therefore follows that the limit of selectivity I<sub>S</sub> will be less than the take-over current I<sub>B</sub>. See Diagram above.

Example

A panelboard is to be installed at a point where the prospective fault level is 25kA. 250A incoming and 16A TP outgoing circuits. Select the lowest cost circuit breakers which may be used. See diagram below.

Incoming - Hager H250 MCCB having an I<sub>cu</sub> of 40kA.



Discrimination chart: Upstream - MCCBs H3  
Downstream - MCBs and RCBOs

		Upstream	x160 TM 18 / 25 / 40 kA										x250 TM 25 / 40 kA					
Downstream		In (A)	16	20	25	32	40	50	63	80	100	125	160	100	125	160	200	250
MLN	Curve B	6	1.5	1.5	1.5	1.5	1.5	1.5	5.1	5.1	T	T	T	T	T	T	T	T
		10	1.2	1.2	1.2	1.2	1.2	1.2	3.6	3.6	T	T	T	5.7	T	T	T	T
		16	1.2	1.2	1.2	1.2	1.2	1.2	3.1	3.1	T	T	T	4.7	T	T	T	T
		20	-	1	1	1	1	1	2.6	2.6	T	T	T	3.9	T	T	T	T
		25	-	-	0.91	0.91	0.91	0.91	2.3	2.3	5.5	5.5	T	3.2	5.5	T	T	T
		32	-	-	-	0.82	0.82	0.82	1.8	1.8	4.4	4.4	5	2.7	4.4	T	T	T
		40	-	-	-	-	0.79	0.79	1.4	1.4	3	3	3.4	2	3	5.5	T	T
	Curve C	1	4.6	4.6	4.6	4.6	4.6	4.6	T	T	T	T	T	T	T	T	T	T
		2	4.6	4.6	4.6	4.6	4.6	4.6	T	T	T	T	T	T	T	T	T	T
		6	1.5	1.5	1.5	1.5	1.5	1.5	5.1	5.1	T	T	T	T	T	T	T	T
		10	1.2	1.2	1.2	1.2	1.2	1.2	3.6	3.6	T	T	T	5.7	T	T	T	T
		16	1.2	1.2	1.2	1.2	1.2	1.2	3.1	3.1	T	T	T	4.7	T	T	T	T
		20	-	1	1	1	1	1	2.6	2.6	T	T	T	3.9	T	T	T	T
		25	-	-	0.91	0.91	0.91	0.91	2.3	2.3	5.5	5.5	T	3.2	5.5	T	T	T
ADC ADH Axx8xx Axx9xx	Curve B	6	1.5	1.5	1.5	1.5	1.5	1.5	4.3	4.3	T	T	T	6.8	T	T	T	T
		10	1.2	1.2	1.2	1.2	1.2	1.2	3	3	7.5	7.5	8.3	4.4	7.5	T	T	T
		13	1.2	1.2	1.2	1.2	1.2	1.2	3	3	7.5	7.5	8.3	4.4	7.5	T	T	T
		16	1.1	1.1	1.1	1.1	1.1	1.1	2.4	2.4	5.8	5.8	6.5	3.5	5.8	T	T	T
		20	-	0.95	0.95	0.95	0.95	0.95	2.1	2.1	4.9	4.9	5.4	3	4.9	8.1	T	T
		25	-	-	0.92	0.92	0.92	0.92	1.8	1.8	4.1	4.1	4.5	2.6	4.1	6.6	T	T
		32	-	-	-	0.86	0.86	0.86	1.6	1.6	3.5	3.5	4	2.4	3.5	5.8	8.8	T
	Curve C	40	-	-	-	-	0.83	0.83	1.5	1.5	3.1	3.1	3.4	2.1	3.1	4.9	7.1	9.2
		1	4.7	4.7	4.7	4.7	4.7	4.7	T	T	T	T	T	T	T	T	T	T
		2	4.7	4.7	4.7	4.7	4.7	4.7	T	T	T	T	T	T	T	T	T	T
		3	1.5	1.5	1.5	1.5	1.5	1.5	4.3	4.3	T	T	T	6.8	T	T	T	T
		4	1.5	1.5	1.5	1.5	1.5	1.5	4.3	4.3	T	T	T	6.8	T	T	T	T
		6	1.5	1.5	1.5	1.5	1.5	1.5	4.3	4.3	T	T	T	6.8	T	T	T	T
		10	1.2	1.2	1.2	1.2	1.2	1.2	3	3	7.5	7.5	8.3	4.4	7.5	T	T	T
13	1.2	1.2	1.2	1.2	1.2	1.2	3	3	7.5	7.5	8.3	4.4	7.5	T	T	T		
16	1.1	1.1	1.1	1.1	1.1	1.1	2.4	2.4	5.8	5.8	6.5	3.5	5.8	T	T	T		
20	-	0.95	0.95	0.95	0.95	0.95	2.1	2.1	4.9	4.9	5.4	3	4.9	8.1	T	T		
25	-	-	0.92	0.92	0.92	0.92	1.8	1.8	4.1	4.1	4.5	2.6	4.1	6.6	T	T		
32	-	-	-	0.86	0.86	0.86	1.6	1.6	3.5	3.5	4	2.4	3.5	5.8	8.8	T		
40	-	-	-	-	0.83	0.83	1.5	1.5	3.1	3.1	3.4	2.1	3.1	4.9	7.1	9.2		

T = Total discrimination  
The value of the maximal current is in kA

	h250 TM 25 / 50 / 65 kA							h250 LSI 70 kA			h400 TM 25 / 50 kA		h630 LSI 50 / 70 kA			h1000 LSI 50 / 70 kA			h1600 LSI 50 / 70 kA	
	32	63	100	125	160	200	250	40	125	250	250	400	250	400	630	630	800	1000	1250	1600
	0.71	2.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.62	1.8	5.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.62	1.6	4.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.54	1.4	3.9	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.53	1.2	3.2	5.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.1	2.7	4.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1	2	3	5.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	1.3	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	1.3	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.71	2.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.62	1.8	5.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.62	1.6	4.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.54	1.4	3.9	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.53	1.2	3.2	5.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.1	2.7	4.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1	2	3	5.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.73	2.3	6.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.62	1.7	4.4	7.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.62	1.7	4.4	7.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.54	1.4	3.5	5.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.52	1.35	3	4.9	8.1	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.3	2.6	4.1	6.6	T	9.6	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.2	2.4	3.5	5.8	8.8	8	T	T	T	T	T	T	T	T	T	T	T	T	T
	-	1.1	2.1	3.1	4.9	7.1	6.8	T	T	T	T	T	T	T	T	T	T	T	T	T
	1.25	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	1.25	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.73	2.3	6.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.73	2.3	6.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.73	2.3	6.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.62	1.7	4.4	7.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.62	1.7	4.4	7.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.54	1.4	3.5	5.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.52	1.35	3	4.9	8.1	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.3	2.6	4.1	6.6	T	9.6	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.2	2.4	3.5	5.8	8.8	8	T	T	T	T	T	T	T	T	T	T	T	T	T
	-	1.1	2.1	3.1	4.9	7.1	6.8	T	T	T	T	T	T	T	T	T	T	T	T	T

Protection devices

Discrimination chart: Upstream - MCCBs H3  
Downstream - MCBs

		Upstream	x160 TM 18 / 25 / 40 kA										x250 TM 25 / 40 kA						
Downstream	In (A)	16	20	25	32	40	50	63	80	100	125	160	100	125	160	200	250		
MV MW MUxxxA MTxxxA MBxxxA MCxxxA	Curve B	6	1.3	1.3	1.3	1.3	1.3	1.3	2.7	2.7	5.9	5.9	6.6	3.7	5.9	9.8	T	T	
		10	1.1	1.1	1.1	1.1	1.1	1.1	2.3	2.3	4.9	4.9	5.3	3.1	4.9	8	T	T	
		13	0.96	0.96	0.96	0.96	0.96	0.96	0.96	2	2	4.2	4.2	4.8	2.7	4.2	6.9	T	T
		16	0.96	0.96	0.96	0.96	0.96	0.96	0.96	2	2	4.2	4.2	4.8	2.7	4.2	6.9	T	T
		20	-	0.9	0.9	0.9	0.9	0.9	0.9	1.8	1.8	3.6	3.6	4	2.4	3.6	5.6	8.5	9.3
		25	-	-	0.9	0.9	0.9	0.9	0.9	1.8	1.8	3.6	3.6	4	2.4	3.6	5.6	8.5	9.3
		32	-	-	-	0.83	0.83	0.83	0.83	1.5	1.5	3	3	3.3	2.1	3	4.6	7	7.8
		40	-	-	-	-	0.83	0.83	0.83	1.5	1.5	3	3	3.3	2.1	3	4.6	7	7.8
		50	-	-	-	-	-	0.8	0.8	1.4	1.4	2.6	2.6	2.8	1.8	2.6	3.7	5.4	6
	63	-	-	-	-	-	-	-	1.4	1.4	2.6	2.6	2.7	1.8	2.6	3.7	5.4	6	
	Curve C	0.5	5	5	5	5	5	5	T	T	T	T	T	T	T	T	T	T	
		1	1.7	1.7	1.7	1.7	1.7	1.7	4.8	4.8	T	T	T	7	T	T	T	T	
		2	1.7	1.7	1.7	1.7	1.7	1.7	4.8	4.8	T	T	T	7	T	T	T	T	
		3	1.4	1.4	1.4	1.4	1.4	1.4	3.5	3.5	8	8	9	4.1	8	T	T	T	
		4	1.4	1.4	1.4	1.4	1.4	1.4	3.5	3.5	8	8	9	4.1	8	T	T	T	
		6	1.3	1.3	1.3	1.3	1.3	1.3	2.7	2.7	5.9	5.9	6.6	3.7	5.9	9.8	T	T	
		10	1.1	1.1	1.1	1.1	1.1	1.1	2.3	2.3	4.9	4.9	5.3	3.1	4.9	8	T	T	
		13	0.96	0.96	0.96	0.96	0.96	0.96	0.96	2	2	4.2	4.2	4.8	2.7	4.2	6.9	T	T
		16	0.96	0.96	0.96	0.96	0.96	0.96	0.96	2	2	4.2	4.2	4.8	2.7	4.2	6.9	T	T
		20	-	0.9	0.9	0.9	0.9	0.9	0.9	1.8	1.8	3.6	3.6	4	2.4	3.6	5.6	8.5	9.3
		25	-	-	0.9	0.9	0.9	0.9	0.9	1.8	1.8	3.6	3.6	4	2.4	3.6	5.6	8.5	9.3
		32	-	-	-	0.83	0.83	0.83	0.83	1.5	1.5	3	3	3.3	2.1	3	4.6	7	7.8
	40	-	-	-	-	0.83	0.83	0.83	1.5	1.5	3	3	3.3	2.1	3	4.6	7	7.8	
	50	-	-	-	-	-	0.8	0.8	1.4	1.4	2.6	2.6	2.8	1.8	2.6	3.7	5.4	6	
	63	-	-	-	-	-	-	-	1.4	1.4	2.6	2.6	2.7	1.8	2.6	3.7	5.4	6	
	Curve D	0.5	4.3	4.3	4.3	4.3	4.3	4.3	T	T	T	T	T	T	T	T	T	T	
		1	1.7	1.7	1.7	1.7	1.7	1.7	4.6	4.6	T	T	T	6.8	T	T	T	T	
		2	1.7	1.7	1.7	1.7	1.7	1.7	4.6	4.6	T	T	T	6.8	T	T	T	T	
		3	1.4	1.4	1.4	1.4	1.4	1.4	3.2	3.2	7.6	7.6	8.6	4.6	7.6	T	T	T	
		4	1.4	1.4	1.4	1.4	1.4	1.4	3.2	3.2	7.6	7.6	8.6	4.6	7.6	T	T	T	
		6	1.2	1.2	1.2	1.2	1.2	1.2	2.4	2.4	5.5	5.5	6.1	3.4	5.5	9.1	T	T	
		10	1	1	1	1	1	1	2.1	2.1	4.3	4.3	5	2.7	4.3	7.2	T	T	
		13	0.93	0.93	0.93	0.93	0.93	0.93	0.93	1.8	1.8	3.8	3.8	4.2	2.5	3.8	6	9.2	T
16		0.93	0.93	0.93	0.93	0.93	0.93	0.93	1.8	1.8	3.8	3.8	4.2	2.5	3.8	6	9.2	T	
20		-	0.86	0.86	0.86	0.86	0.86	0.86	1.6	1.6	3.1	3.1	3.4	2.2	3.1	4.9	7.2	8	
25		-	-	0.86	0.86	0.86	0.86	0.86	1.6	1.6	3.1	3.1	3.4	2.2	3.1	4.9	7.2	8	
32		-	-	-	0.81	0.81	0.81	0.81	1.5	1.5	2.6	2.6	2.8	1.8	2.6	3.8	5.4	6	
40	-	-	-	-	0.81	0.81	0.81	1.5	1.5	2.6	2.6	2.8	1.8	2.6	3.8	5.4	6		
50	-	-	-	-	-	0.78	0.78	1.4	1.4	2.4	2.4	2.5	1.7	2.4	3.3	4.6	5		
63	-	-	-	-	-	-	-	1.4	1.4	2.4	2.4	2.5	1.7	2.4	3.3	4.6	5		

T = Total discrimination  
The value of the maximal current is in kA

	h250 TM 25 / 50 / 65 kA							h250 LSI 70 kA			h400 TM 25 / 50 kA		h630 LSI 50 / 70 kA			h1000 LSI 50 / 70 kA				h1600 LSI 50 / 70 kA	
	32	63	100	125	160	200	250	40	125	250	250	400	250	400	630	630	800	1000	1250	1600	
	0.65	1.7	3.7	5.9	9.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.59	1.5	3.1	4.9	8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.54	1.4	2.7	4.2	6.9	T	9.8	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.54	1.4	2.7	4.2	6.9	T	9.8	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.52	1.2	2.4	3.6	5.6	8.3	7.9	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.52	1.2	2.4	3.6	5.6	8.3	7.9	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.5	1.15	2.1	3	4.6	7	6.4	T	T	T	T	T	T	T	T	T	T	T	T	T	
	-	1.15	2.1	3	4.6	7	6.4	T	T	T	T	T	T	T	T	T	T	T	T	T	
	-	1.1	1.8	2.6	3.7	5.3	5	T	T	T	T	T	T	T	T	T	T	T	T	T	
	-	1.1	1.8	2.6	3.7	5.3	5	T	T	T	T	T	T	T	T	T	T	T	T	T	
	1.8	8.6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.84	2.6	7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.84	2.6	7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.7	2	4.1	8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.7	2	4.1	8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.65	1.7	3.7	5.9	9.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.59	1.5	3.1	4.9	8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.54	1.4	2.7	4.2	6.9	T	9.8	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.54	1.4	2.7	4.2	6.9	T	9.8	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.52	1.2	2.4	3.6	5.6	8.3	7.9	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.52	1.2	2.4	3.6	5.6	8.3	7.9	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.5	1.15	2.1	3	4.6	7	6.4	T	T	T	T	T	T	T	T	T	T	T	T	T	
	-	1.15	2.1	3	4.6	7	6.4	T	T	T	T	T	T	T	T	T	T	T	T	T	
	-	1.1	1.8	2.6	3.7	5.3	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T	
	-	1.1	1.8	2.6	3.7	5.3	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T	
	1.8	7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.84	2.6	6.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.84	2.6	6.8	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.7	1.9	4.6	7.6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.7	1.9	4.6	7.6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.62	1.5	3.4	5.5	9.1	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.57	1.4	2.7	4.3	7.2	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.54	1.3	2.5	3.8	6	9.2	8.4	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.54	1.3	2.5	3.8	6	9.2	8.4	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.52	1.2	2.2	3.1	4.9	7.1	6.7	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.52	1.2	2.2	3.1	4.9	7.1	6.7	T	T	T	T	T	T	T	T	T	T	T	T	T	
	0.5	1.1	1.8	2.6	3.8	5.4	5.1	T	T	T	9	T	T	T	T	T	T	T	T	T	
	-	1.1	1.8	2.6	3.8	5.4	5.1	T	T	T	9	T	T	T	T	T	T	T	T	T	
	-	1	1.7	2.4	3.3	4.6	4.3	T	T	T	7.2	T	T	T	T	T	T	T	T	T	
	-	1	1.7	2.4	3.3	4.6	4.3	T	T	T	7.2	T	T	T	T	T	T	T	T	T	

Discrimination chart: Upstream - MCCBs H3  
Downstream - MCBs

		Upstream	x160 TM 18 / 25 / 40 kA										x250 TM 25 / 40 kA							
Downstream		In (A)	16	20	25	32	40	50	63	80	100	125	160	100	125	160	200	250		
<b>MBNxxxA</b> <b>MCNxxxA</b>	Curve B	6	1.1	1.1	1.1	1.1	1.1	1.1	2.3	2.3	4.7	4.7	5.3	3.2	4.7	T	T	T		
		10	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4	4	4.5	2.6	4	T	T	T	
		13	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.7	1.7	3.4	3.4	4	2.4	3.4	9.4	T	T	
		16	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.7	1.7	3.4	3.4	4	2.4	3.4	9.4	T	T	
		20	-	0.82	0.82	0.82	0.82	0.82	0.82	1.5	1.5	3.1	3.1	3.4	2.1	3.1	4.7	T	T	
		25	-	-	0.82	0.82	0.82	0.82	0.82	1.6	1.6	3.1	3.1	3.4	2.1	3.1	4.7	T	T	
		32	-	-	-	0.81	0.81	0.81	1.5	1.5	2.7	2.7	3.1	1.9	2.7	4.1	T	T		
		40	-	-	-	-	0.81	0.81	1.5	1.5	2.7	2.7	3.1	1.9	2.7	4.1	T	T		
		50	-	-	-	-	-	0.8	1.4	1.4	2.4	2.4	2.8	1.7	2.4	3.7	9.3	9.3	9	
	63	-	-	-	-	-	-	1.4	1.4	2.4	2.4	2.8	1.7	2.4	3.7	9.3	9.3	9		
	Curve C	0.5	1.6	1.6	1.6	1.6	1.6	1.6	4.7	4.7	T	T	T	T	T	T	T	T	T	
		1	1.4	1.4	1.4	1.4	1.4	1.4	3.5	3.5	T	T	T	5.1	T	T	T	T	T	
		2	1.4	1.4	1.4	1.4	1.4	1.4	3.5	3.5	T	T	T	5.1	T	T	T	T	T	
		3	1.3	1.3	1.3	1.3	1.3	1.3	2.8	2.8	T	T	T	4	T	T	T	T	T	
		4	1.3	1.3	1.3	1.3	1.3	1.3	2.8	2.8	T	T	T	4	T	T	T	T	T	
		6	1.1	1.1	1.1	1.1	1.1	1.1	2.3	2.3	4.7	4.7	5.3	3.2	4.7	T	T	T	T	
		10	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4	4	4.5	2.6	4	T	T	T	
		13	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.7	1.7	3.4	3.4	4	2.4	3.4	9.4	T	T	
		16	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.7	1.7	3.4	3.4	4	2.4	3.4	9.4	T	T	
		20	-	0.82	0.82	0.82	0.82	0.82	0.82	1.5	1.5	3.1	3.1	3.4	2.1	3.1	4.7	T	T	
25		-	-	0.82	0.82	0.82	0.82	0.82	1.6	1.6	3.1	3.1	3.4	2.1	3.1	4.7	T	T		
32	-	-	-	0.81	0.81	0.81	1.5	1.5	2.7	2.7	3.1	1.9	2.7	4.1	T	T				
40	-	-	-	-	0.81	0.81	1.5	1.5	2.7	2.7	3.1	1.9	2.7	4.1	T	T				
50	-	-	-	-	-	0.8	1.4	1.4	2.4	2.4	2.8	1.7	2.4	3.7	9.3	9.3	9			
63	-	-	-	-	-	-	1.4	1.4	2.4	2.4	2.8	1.7	2.4	3.7	9.3	9.3	9			

	h250 TM 25 / 50 / 65 kA							h250 LSI 70 kA			h400 TM 25 / 50 kA		h630 LSI 50 / 70 kA			h1000 LSI 50 / 70 kA			h1600 LSI 50 / 70 kA	
	32	63	100	125	160	200	250	40	125	250	250	400	250	400	630	630	800	1000	1250	1600
	0.6	1.5	3.2	4.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.55	1.4	2.6	4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.52	1.3	2.4	3.4	9.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.52	1.3	2.4	3.4	9.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.2	2.1	3.1	4.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.2	2.1	3.1	4.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.1	1.9	2.7	4.1	T	9.6	T	T	T	T	T	T	T	T	T	T	T	T	T
	-	1.1	1.9	2.7	4.1	T	9.6	T	T	T	T	T	T	T	T	T	T	T	T	T
	-	1	1.7	2.4	3.7	9.3	9	T	T	T	T	T	T	T	T	T	T	T	T	T
	-	1	1.7	2.4	3.7	9.3	9	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.86	2.6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.75	2.1	5.1	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.75	2.1	5.1	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.66	1.7	4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.66	1.7	4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.6	1.5	3.2	4.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.55	1.4	2.6	4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.52	1.3	2.4	3.4	9.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.52	1.3	2.4	3.4	9.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.2	2.1	3.1	4.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.2	2.1	3.1	4.7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.1	1.9	2.7	4.1	T	9.6	T	T	T	T	T	T	T	T	T	T	T	T	T
	-	1.1	1.9	2.7	4.1	T	9.6	T	T	T	T	T	T	T	T	T	T	T	T	T
	-	1	1.7	2.4	3.7	9.3	9	T	T	T	T	T	T	T	T	T	T	T	T	T
	-	1	1.7	2.4	3.7	9.3	9	T	T	T	T	T	T	T	T	T	T	T	T	T



Discrimination chart: Upstream - MCCBs H3  
Downstream - MCBs and Magnetic MCBs

		Upstream	x160 TM 18 / 25 / 40 kA										x250 TM 25 / 40 kA							
Downstream	In (A)	16	20	25	32	40	50	63	80	100	125	160	100	125	160	200	250			
NGN NBNxxxA NCNxxxA NDNxxxA	Curve B	6	1.3	1.3	1.3	1.3	1.3	1.3	2.7	2.7	5.8	5.8	6.7	3.8	5.8	9.6	T	T		
		10	1.2	1.2	1.2	1.2	1.2	1.2	2.2	2.2	4.8	4.8	5.4	3.1	4.8	8	13	T		
		13	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4.3	4.3	4.8	2.8	4.3	6.9	11	12	
		16	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4.3	4.3	4.8	2.8	4.3	6.9	11	12	
		20	-	0.92	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.3	9.3	
		25	-	-	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.3	9.3	
		32	-	-	-	0.84	0.84	0.84	0.84	1.5	1.5	3	3	3.4	2.1	3	4.7	6.9	7.7	
		40	-	-	-	-	0.84	0.84	0.84	1.5	1.5	3	3	3.4	2.1	3	4.7	6.9	7.7	
		50	-	-	-	-	-	0.81	1.4	1.4	2.5	2.5	2.8	1.8	2.5	3.7	5.4	6		
	63	-	-	-	-	-	-	1.4	1.4	2.5	2.5	2.8	1.8	2.5	3.7	5.4	6			
	Curve C	0.5	5	5	5	5	5	5	T	T	T	T	T	T	T	T	T	T	T	
		1	1.6	1.6	1.6	1.6	1.6	1.6	4.8	4.8	12	12	14	7.1	12	T	T	T		
		2	1.6	1.6	1.6	1.6	1.6	1.6	4.8	4.8	12	12	14	7.1	12	T	T	T		
		3	1.4	1.4	1.4	1.4	1.4	1.4	3.5	3.5	8	8	9.2	5.1	8	14	T	T		
		4	1.4	1.4	1.4	1.4	1.4	1.4	3.5	3.5	8	8	9.2	5.1	8	14	T	T		
		6	1.3	1.3	1.3	1.3	1.3	1.3	2.7	2.7	5.8	5.8	6.7	3.8	5.8	9.6	T	T		
		10	1.2	1.2	1.2	1.2	1.2	1.2	2.2	2.2	4.8	4.8	5.4	3.1	4.8	8	13	T		
		13	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4.3	4.3	4.8	2.8	4.3	6.9	11	12	
		16	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4.3	4.3	4.8	2.8	4.3	6.9	11	12	
		20	-	0.92	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.3	9.3	
		25	-	-	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.3	9.3	
		32	-	-	-	0.84	0.84	0.84	0.84	1.5	1.5	3	3	3.4	2.1	3	4.7	6.9	7.7	
		40	-	-	-	-	0.84	0.84	0.84	1.5	1.5	3	3	3.4	2.1	3	4.7	6.9	7.7	
		50	-	-	-	-	-	0.81	1.4	1.4	2.5	2.5	2.8	1.8	2.5	3.7	5.4	6		
		63	-	-	-	-	-	-	1.4	1.4	2.5	2.5	2.8	1.8	2.5	3.7	5.4	6		
	Curve D	0.5	4.3	4.3	4.3	4.3	4.3	4.3	14	14	T	T	T	T	T	T	T	T	T	
		1	1.6	1.6	1.6	1.6	1.6	1.6	4.6	4.6	11	11	13	6.8	11	T	T	T		
		2	1.6	1.6	1.6	1.6	1.6	1.6	4.6	4.6	11	11	13	6.8	11	T	T	T		
		3	1.4	1.4	1.4	1.4	1.4	1.4	3.2	3.2	7.4	7.4	8.5	4.6	7.4	13	T	T		
		4	1.4	1.4	1.4	1.4	1.4	1.4	3.2	3.2	7.4	7.4	8.5	4.6	7.4	13	T	T		
		6	1.2	1.2	1.2	1.2	1.2	1.2	2.4	2.4	5.4	5.4	6.2	3.4	5.4	9	T	T		
		10	0.98	0.98	0.98	0.98	0.98	0.98	0.98	2	2	4.3	4.3	4.9	2.8	4.3	7.2	12	13	
		13	0.92	0.92	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.7	3.7	4.2	2.5	3.7	6	9.2	11	
		16	0.92	0.92	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.7	3.7	4.2	2.5	3.7	6	9.2	11	
		20	-	0.86	0.86	0.86	0.86	0.86	0.86	1.6	1.6	3.2	3.2	3.4	2.2	3.2	4.8	7.1	7.9	
		25	-	-	0.86	0.86	0.86	0.86	0.86	1.6	1.6	3.2	3.2	3.4	2.2	3.2	4.8	7.1	7.9	
		32	-	-	-	0.81	0.81	0.81	0.81	1.5	1.5	2.5	2.5	2.7	1.8	2.5	3.7	5.4	5.9	
		40	-	-	-	-	0.81	0.81	0.81	1.5	1.5	2.5	2.5	2.7	1.8	2.5	3.7	5.4	5.9	
		50	-	-	-	-	-	0.78	1.4	1.4	2.4	2.4	2.5	1.7	2.4	3.3	4.6	5		
		63	-	-	-	-	-	-	1.4	1.4	2.4	2.4	2.5	1.7	2.4	3.3	4.6	5		
	MMN 2xx. MMN 3xx range	0.63	1.3	1.3	1.3	1.3	1.3	1.3	3.1	3.1	7	7	7.9	4.4	7	12	19	21		
		1.25	1.3	1.3	1.3	1.3	1.3	1.3	3.1	3.1	7	7	7.9	4.4	7	12	19	21		
		1.6	1.1	1.1	1.1	1.1	1.1	1.1	2.5	2.5	5.3	5.3	6	3.5	5.3	8.9	14	16		
		2.5	1.1	1.1	1.1	1.1	1.1	1.1	2.5	2.5	5.3	5.3	6	3.5	5.3	8.9	14	16		
		4	0.9	0.9	0.9	0.9	0.9	0.9	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.4	9.3		
6.3		0.9	0.9	0.9	0.9	0.9	0.9	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.4	9.3			
10		0.84	0.84	0.84	0.84	0.84	0.84	1.6	1.6	2.8	2.8	3.1	2	2.8	4.2	6.1	6.8			
12.5		0.84	0.84	0.84	0.84	0.84	0.84	1.6	1.6	2.8	2.8	3.1	2	2.8	4.2	6.1	6.8			
16		0.81	0.81	0.81	0.81	0.81	0.81	1.5	1.5	2.6	2.6	2.8	1.8	2.6	3.8	5.4	6			
20		-	0.81	0.81	0.81	0.81	0.81	1.5	1.5	2.6	2.6	2.8	1.8	2.6	3.8	5.4	6			
25	-	-	0.81	0.81	0.81	0.81	1.5	1.5	2.6	2.6	2.8	1.8	2.6	3.8	5.4	6				

T = Total discrimination  
The value of the maximal current is in kA

	h250 TM 25 / 50 / 65 kA							h250 LSI 70 kA			h400 TM 25 / 50 kA		h630 LSI 50 / 70 kA			h1000 LSI 50 / 70 kA			h1600 LSI 50 / 70 kA	
	32	63	100	125	160	200	250	40	125	250	250	400	250	400	630	630	800	1000	1250	1600
	0.65	1.7	3.8	5.8	9.6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.58	1.5	3.1	4.8	8	13	12	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.55	1.4	2.8	4.3	6.9	11	9.7	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.55	1.4	2.8	4.3	6.9	11	9.7	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.53	1.3	2.4	3.6	5.5	8.3	7.7	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.53	1.3	2.4	3.6	5.5	8.3	7.7	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.2	2.1	3	4.7	6.9	6.4	T	T	T	12	T	T	T	T	T	T	T	T	T
	-	1.2	2.1	3	4.7	6.9	6.4	T	T	T	12	T	T	T	T	T	T	T	T	T
	-	1.1	1.8	2.5	3.7	5.4	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T
	-	1.1	1.8	2.5	3.7	5.4	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T
	1.8	8.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.85	2.6	7.1	12	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.85	2.6	7.1	12	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.7	2	5.1	8	14	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.7	2	5.1	8	14	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.65	1.7	3.8	5.8	9.6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.58	1.5	3.1	4.8	8	13	12	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.55	1.4	2.8	4.3	6.9	11	9.7	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.55	1.4	2.8	4.3	6.9	11	9.7	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.53	1.3	2.4	3.6	5.5	8.3	7.7	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.53	1.3	2.4	3.6	5.5	8.3	7.7	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.5	1.2	2.1	3	4.7	6.9	6.4	T	T	T	12	T	T	T	T	T	T	T	T	T
	-	1.2	2.1	3	4.7	6.9	6.4	T	T	T	12	T	T	T	T	T	T	T	T	T
	-	1.1	1.8	2.5	3.7	5.4	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T
	-	1.1	1.8	2.5	3.7	5.4	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T
	1.8	7	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.84	7	6.8	11	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.84	2.6	6.8	11	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.7	2.6	4.6	7.4	13	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.7	1.9	4.6	7.4	13	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.62	1.5	3.4	5.4	9	T	14	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.56	1.4	2.8	4.3	7.2	12	10.5	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.54	1.3	2.5	3.7	6	9.2	8.4	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.54	1.3	2.5	3.7	6	9.2	8.4	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.52	1.2	2.2	3.2	4.8	7.1	6.7	T	T	T	12	T	T	T	T	T	T	T	T	T
	0.52	1.2	2.2	3.2	4.8	7.1	6.7	T	T	T	12	T	T	T	T	T	T	T	T	T
	0.5	1.1	1.8	2.5	3.7	5.4	5.1	T	T	T	9	T	T	T	T	T	T	T	T	T
	-	1.1	1.8	2.5	3.7	5.4	5.1	T	T	T	9	T	T	T	T	T	T	T	T	T
	-	1	1.7	2.4	3.3	4.6	4.3	T	T	T	7.2	T	T	T	T	T	T	T	T	T
	-	1	1.7	2.4	3.3	4.6	4.3	T	T	T	7.2	T	T	T	T	T	T	T	T	T
	0.7	1.8	4.4	7	12	19	17	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.7	1.8	4.4	7	12	19	17	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.64	1.5	3.5	5.3	8.9	14	13	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.64	1.5	3.5	5.3	8.9	14	13	T	T	T	T	T	T	T	T	T	T	T	T	T
	0.53	1.3	2.4	3.6	5.5	8.4	7.8	T	T	T	15	T	T	T	T	T	T	T	T	T
	0.53	1.3	2.4	3.6	5.5	8.4	7.8	T	T	T	15	T	T	T	T	T	T	T	T	T
	0.51	1.15	2	2.8	4.2	6.1	5.7	T	T	T	11	T	T	T	T	T	T	T	T	T
	0.51	1.15	2	2.8	4.2	6.1	5.7	T	T	T	11	T	T	T	T	T	T	T	T	T
	0.5	1.1	1.8	2.6	3.8	5.4	5	T	T	T	9	T	T	T	T	T	T	T	T	T
	0.5	1.1	1.8	2.6	3.8	5.4	5	T	T	T	9	T	T	T	T	T	T	T	T	T
	0.5	1.1	1.8	2.6	3.8	5.4	5	T	T	T	9	T	T	T	T	T	T	T	T	T

Discrimination chart: Upstream - MCCBs H3  
Downstream - MCBs

		Upstream	x160 TM 18 / 25 / 40 kA										x250 TM 25 / 40 kA							
Downstream	In (A)	16	20	25	32	40	50	63	80	100	125	160	100	125	160	200	250			
NQN NRN NSN	Curve B	6	1.3	1.3	1.3	1.3	1.3	1.3	2.7	2.7	5.8	5.8	6.7	3.8	5.8	9.6	15	17		
		10	1.2	1.2	1.2	1.2	1.2	1.2	2.2	2.2	4.8	4.8	5.4	3.1	4.8	8	13	14		
		13	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4.3	4.3	4.8	2.8	4.3	6.9	11	12	
		16	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4.3	4.3	4.8	2.8	4.3	6.9	11	12	
		20	-	0.92	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.3	9.3	
		25	-	-	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.3	9.3	
		32	-	-	-	0.84	0.84	0.84	0.84	1.5	1.5	3	3	3.4	2.1	3	4.7	6.9	7.7	
		40	-	-	-	-	0.84	0.84	0.84	1.5	1.5	3	3	3.4	2.1	3	4.7	6.9	7.7	
		50	-	-	-	-	-	0.81	0.81	1.4	1.4	2.5	2.5	2.8	1.8	2.5	3.7	5.4	6	
	63	-	-	-	-	-	-	-	1.4	1.4	2.5	2.5	2.8	1.8	2.5	3.7	5.4	6		
	Curve C	0.5	5	5	5	5	5	5	17	17	T	T	T	T	T	T	T	T	T	
		1	1.6	1.6	1.6	1.6	1.6	1.6	4.8	4.8	12	12	14	7.1	12	20	T	T		
		2	1.6	1.6	1.6	1.6	1.6	1.6	4.8	4.8	12	12	14	7.1	12	20	T	T		
		3	1.4	1.4	1.4	1.4	1.4	1.4	3.5	3.5	8	8	9.2	5.1	8	14	22	T		
		4	1.4	1.4	1.4	1.4	1.4	1.4	3.5	3.5	8	8	9.2	5.1	8	14	22	T		
		6	1.3	1.3	1.3	1.3	1.3	1.3	2.7	2.7	5.8	5.8	6.7	3.8	5.8	9.6	15	17		
		10	1.2	1.2	1.2	1.2	1.2	1.2	2.2	2.2	4.8	4.8	5.4	3.1	4.8	8	13	14		
		13	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4.3	4.3	4.8	2.8	4.3	6.9	11	12	
		16	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2	2	4.3	4.3	4.8	2.8	4.3	6.9	11	12	
		20	-	0.92	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.3	9.3	
		25	-	-	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.6	3.6	4	2.4	3.6	5.5	8.3	9.3	
		32	-	-	-	0.84	0.84	0.84	0.84	1.5	1.5	3	3	3.4	2.1	3	4.7	6.9	7.7	
		40	-	-	-	-	0.84	0.84	0.84	1.5	1.5	3	3	3.4	2.1	3	4.7	6.9	7.7	
	50	-	-	-	-	-	0.81	0.81	1.4	1.4	2.5	2.5	2.8	1.8	2.5	3.7	5.4	6		
	63	-	-	-	-	-	-	-	1.4	1.4	2.5	2.5	2.8	1.8	2.5	3.7	5.4	6		
	Curve D	0.5	4.3	4.3	4.3	4.3	4.3	4.3	14	14	T	T	T	18	T	T	T	T		
		1	1.6	1.6	1.6	1.6	1.6	1.6	4.6	4.6	11	11	13	6.8	11	19	T	T		
		2	1.6	1.6	1.6	1.6	1.6	1.6	4.6	4.6	11	11	13	6.8	11	19	T	T		
		3	1.4	1.4	1.4	1.4	1.4	1.4	3.2	3.2	7.4	7.4	8.5	4.6	7.4	13	21	24		
		4	1.4	1.4	1.4	1.4	1.4	1.4	3.2	3.2	7.4	7.4	8.5	4.6	7.4	13	21	24		
		6	1.2	1.2	1.2	1.2	1.2	1.2	2.4	2.4	5.4	5.4	6.2	3.4	5.4	9	15	16		
		10	0.98	0.98	0.98	0.98	0.98	0.98	2	2	4.3	4.3	4.9	2.8	4.3	7.2	12	13		
		13	0.92	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.7	3.7	4.2	2.5	3.7	6	9.2	11		
		16	0.92	0.92	0.92	0.92	0.92	0.92	1.8	1.8	3.7	3.7	4.2	2.5	3.7	6	9.2	11		
		20	-	0.86	0.86	0.86	0.86	0.86	0.86	1.6	1.6	3.2	3.2	3.4	2.2	3.2	4.8	7.1	7.9	
		25	-	-	0.86	0.86	0.86	0.86	0.86	1.6	1.6	3.2	3.2	3.4	2.2	3.2	4.8	7.1	7.9	
		32	-	-	-	0.81	0.81	0.81	0.81	1.5	1.5	2.5	2.5	2.7	1.8	2.5	3.7	5.4	5.9	
		40	-	-	-	-	0.81	0.81	0.81	1.5	1.5	2.5	2.5	2.7	1.8	2.5	3.7	5.4	5.9	
	50	-	-	-	-	-	0.78	0.78	1.4	1.4	2.4	2.4	2.5	1.7	2.4	3.3	4.6	5		
	63	-	-	-	-	-	-	-	1.4	1.4	2.4	2.4	2.5	1.7	2.4	3.3	4.6	5		

T = Total discrimination  
The value of the maximal current is in kA

	h250 TM 25 / 50 / 65 kA							h250 LSI 70 kA			h400 TM 25 / 50 kA		h630 LSI 50 / 70 kA			h1000 LSI 50 / 70 kA			h1600 LSI 50 / 70 kA	
	32	63	100	125	160	200	250	40	125	250	250	400	250	400	630	630	800	1000	1250	1600
0.65	1.7	3.8	5.8	9.6	15	14	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.58	1.5	3.1	4.8	8	13	12	T	T	T	24	T	T	T	T	T	T	T	T	T	T
0.55	1.4	2.8	4.3	6.9	11	9.7	T	T	T	18	T	T	T	T	T	T	T	T	T	T
0.55	1.4	2.8	4.3	6.9	11	9.7	T	T	T	18	T	T	T	T	T	T	T	T	T	T
0.53	1.3	2.4	3.6	5.5	8.3	7.7	T	T	T	15	T	T	T	T	T	T	T	T	T	T
0.53	1.3	2.4	3.6	5.5	8.3	7.7	T	T	T	15	T	T	T	T	T	T	T	T	T	T
0.5	1.2	2.1	3	4.7	6.9	6.4	T	T	T	12	T	T	T	T	T	T	T	T	T	T
-	1.2	2.1	3	4.7	6.9	6.4	T	T	T	12	T	T	T	T	T	T	T	T	T	T
-	1.1	1.8	2.5	3.7	5.4	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T	T
-	1.1	1.8	2.5	3.7	5.4	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T	T
1.8	8.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.85	2.6	7.1	12	20	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.85	2.6	7.1	12	20	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.7	2	5.1	8	14	22	20	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.7	2	5.1	8	14	22	20	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.65	1.7	3.8	5.8	9.6	15	14	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.58	1.5	3.1	4.8	8	13	12	T	T	T	24	T	T	T	T	T	T	T	T	T	T
0.55	1.4	2.8	4.3	6.9	11	9.7	T	T	T	18	T	T	T	T	T	T	T	T	T	T
0.55	1.4	2.8	4.3	6.9	11	9.7	T	T	T	18	T	T	T	T	T	T	T	T	T	T
0.53	1.3	2.4	3.6	5.5	8.3	7.7	T	T	T	15	T	T	T	T	T	T	T	T	T	T
0.53	1.3	2.4	3.6	5.5	8.3	7.7	T	T	T	15	T	T	T	T	T	T	T	T	T	T
0.5	1.2	2.1	3	4.7	6.9	6.4	T	T	T	12	T	T	T	T	T	T	T	T	T	T
-	1.2	2.1	3	4.7	6.9	6.4	T	T	T	12	T	T	T	T	T	T	T	T	T	T
-	1.1	1.8	2.5	3.7	5.4	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T	T
-	1.1	1.8	2.5	3.7	5.4	5	T	T	T	9.2	T	T	T	T	T	T	T	T	T	T
1.8	7	18	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.84	7	6.8	11	19	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.84	2.6	6.8	11	19	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.7	2.6	4.6	7.4	13	21	19	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.7	1.9	4.6	7.4	13	21	19	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.62	1.5	3.4	5.4	9	15	14	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.56	1.4	2.8	4.3	7.2	12	10.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.54	1.3	2.5	3.7	6	9.2	8.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.54	1.3	2.5	3.7	6	9.2	8.4	T	T	T	T	T	T	T	T	T	T	T	T	T	T
0.52	1.2	2.2	3.2	4.8	7.1	6.7	T	T	T	12	T	T	T	T	T	T	T	T	T	T
0.52	1.2	2.2	3.2	4.8	7.1	6.7	T	T	T	12	T	T	T	T	T	T	T	T	T	T
0.5	1.1	1.8	2.5	3.7	5.4	5.1	T	T	T	9	T	T	T	T	T	T	T	T	T	T
-	1.1	1.8	2.5	3.7	5.4	5.1	T	T	T	9	T	T	T	T	T	T	T	T	T	T
-	1	1.7	2.4	3.3	4.6	4.3	T	T	T	7.2	T	T	T	T	T	T	T	T	T	T
-	1	1.7	2.4	3.3	4.6	4.3	T	T	T	7.2	T	T	T	T	T	T	T	T	T	T

Discrimination chart: Upstream - MCCBs H3  
Downstream - MCBs 1.5 module width/pole

		Upstream	x160 TM 18 / 25 / 40 kA										x250 TM 25 / 40 kA							
Downstream		In (A)	16	20	25	32	40	50	63	80	100	125	160	100	125	160	200	250		
<b>HLE, HLF, HMB, HMC, HMD</b>	Curve B	80	-	-	-	-	-	-	-	1.3	2.3	2.3	2.5	1.6	2.3	3.2	4.2	4.6		
		100	-	-	-	-	-	-	-	-	1.3	2.3	2.3	2.5	1.6	2.3	3.2	4.2	4.6	
		125	-	-	-	-	-	-	-	-	1.3	2.3	2.3	2.5	1.6	2.3	3.2	4.2	4.6	
	Curve C	80	-	-	-	-	-	-	-	-	1.3	2.3	2.3	2.5	1.6	2.3	3.2	4.2	4.6	
		100	-	-	-	-	-	-	-	-	-	2.3	2.3	2.5	1.6	2.3	3.2	4.2	4.6	
		125	-	-	-	-	-	-	-	-	-	-	2.3	2.5	-	2.3	3.2	4.2	4.6	
	Curve D	80	-	-	-	-	-	-	-	-	1.3	2	2	2.1	1.5	2	2.5	3.5	3.8	
		100	-	-	-	-	-	-	-	-	-	2	2	2.1	1.5	2	2.5	3.5	3.8	
		125	-	-	-	-	-	-	-	-	-	-	2	2.1	-	2	2.5	3.5	3.8	
	<b>HMJ, HMK, HMX</b>	Curve C	10	0.9	0.9	0.9	0.9	0.9	0.9	1.7	1.7	3	3	3.2	2.2	3	4.2	6	6.6	
			16	0.9	0.9	0.9	0.9	0.9	0.9	1.7	1.7	3	3	3.2	2.2	3	4.2	6	6.6	
			20	-	0.81	0.81	0.81	0.81	0.81	1.6	1.6	2.6	2.6	2.8	1.9	2.6	3.7	5	5.4	
25			-	-	0.84	0.84	0.84	0.84	1.6	1.6	2.6	2.6	2.8	1.9	2.6	3.7	5	5.4		
32			-	-	-	0.84	0.84	0.84	1.6	1.6	2.6	2.6	2.8	1.9	2.6	3.7	5	5.4		
40			-	-	-	-	0.78	0.78	1.4	1.4	2.3	2.3	2.4	1.6	2.3	3.1	4.2	4.6		
50			-	-	-	-	-	0.78	1.4	1.4	2.3	2.3	2.4	1.6	2.3	3.1	4.2	4.6		
63			-	-	-	-	-	-	1.4	1.4	2.3	2.3	2.4	1.6	2.3	3.1	4.2	4.6		
80			-	-	-	-	-	-	-	1.3	2.3	2.3	2.5	1.6	2.3	3.2	4.2	4.6		
100			-	-	-	-	-	-	-	-	2.3	2.3	2.5	1.6	2.3	3.2	4.2	4.6		
125			-	-	-	-	-	-	-	-	-	-	2.3	2.5	-	2.3	3.2	4.2	4.6	

T = Total discrimination  
The value of the maximal current is in kA

	h250 TM 25 / 50 / 65 kA							h250 LSI 70 kA			h400 TM 25 / 50 kA		h630 LSI 50 / 70 kA			h1000 LSI 50 / 70 kA			h1600 LSI 50 / 70 kA	
	32	63	100	125	160	200	250	40	125	250	250	400	250	400	630	630	800	1000	1250	1600
	0.5	1	1.6	2.3	3.2	4.2	4	T	T	T	7	T	T	T	T	T	T	T	T	T
	0.5	1	1.6	2.3	3.2	4.2	4	T	T	T	7	T	T	T	T	T	T	T	T	T
	0.5	1	1.6	2.3	3.2	4.2	4	T	T	T	7	T	T	T	T	T	T	T	T	T
	-	-	1.6	2.3	3.2	4.2	4	T	T	T	7	T	T	T	T	T	T	T	T	T
	-	-	1.6	2.3	3.2	4.2	4	T	T	T	7	T	T	T	T	T	T	T	T	T
	-	-	-	2.3	3.2	4.2	4	T	T	T	7	T	T	T	T	T	T	T	T	T
	-	-	1.5	2	2.5	3.5	3.3	T	T	T	5.5	T	T	T	T	T	T	T	T	T
	-	-	1.5	2	2.5	3.5	3.3	T	T	T	5.5	T	T	T	T	T	T	T	T	T
	-	-	-	2	2.5	3.5	3.3	T	T	T	5.5	T	T	T	T	T	T	T	T	T
	5.4	1.2	2.2	3	4.2	6	5.4	T	T	T	4.2	T	T	T	T	T	T	T	T	T
	5.4	1.2	2.2	3	4.2	6	5.4	T	T	T	4.2	T	T	T	T	T	T	T	T	T
	5.2	1.1	1.9	2.6	3.7	5	4.5	T	T	T	4.2	T	T	T	T	T	T	T	T	T
	5.2	1.1	1.9	2.6	3.7	5	4.5	T	T	T	4.2	T	T	T	T	T	T	T	T	T
	5.2	1.1	1.9	2.6	3.7	5	4.5	T	T	T	4.2	T	T	T	T	T	T	T	T	T
	-	1	1.6	2.3	3.1	4.2	4	T	T	T	4.2	T	T	T	T	T	T	T	T	T
	-	1	1.6	2.3	3.1	4.2	4	T	T	T	4.2	T	T	T	T	T	T	T	T	T
	-	1	1.6	2.3	3.1	4.2	4	T	T	T	4.2	T	T	T	T	T	T	T	T	T
	-	-	1.6	2.3	3.2	4.2	4	T	T	T	7	T	T	T	T	T	T	T	T	T
	-	-	1.6	2.3	3.2	4.2	4	T	T	T	7	T	T	T	T	T	T	T	T	T
	-	-	-	2.3	3.2	4.2	4	T	T	T	7	T	T	T	T	T	T	T	T	T







Discrimination chart: Upstream - Fuses type G  
Downstream - MCBs and magnetic MCBs

		Upstream : fuses type gG																			
		In	2 A	4 A	6 A	8 A	10 A	12 A	16 A	20 A	25 A	32 A	40 A	50 A	63 A	80 A	100 A	125 A	160 A	200 A	250 A
<b>NBNxxxA NQN</b>	Curve B	6 A	-	-	-	0.14	0.17	0.21	0.31	0.42	0.62	1	1.5	2.3	3.8	<u>7.1</u>	<u>14</u>	T	T	T	T
		10 A	-	-	-	-	-	0.19	0.28	0.38	0.55	0.9	1.3	2	3.3	6	<u>11</u>	<u>21</u>	T	T	T
		13 A	-	-	-	-	-	-	0.25	0.34	0.47	0.75	1.1	1.7	2.8	5	<u>8.9</u>	<u>16</u>	T	T	T
		16 A	-	-	-	-	-	-	-	0.34	0.47	0.75	1.1	1.7	2.8	5	<u>8.9</u>	<u>16</u>	T	T	T
		20 A	-	-	-	-	-	-	-	-	0.41	0.65	0.97	1.3	2.3	4	<u>6.8</u>	<u>12</u>	<u>21</u>	T	T
		25 A	-	-	-	-	-	-	-	-	-	0.65	0.97	1.3	2.3	4	<u>6.8</u>	<u>12</u>	<u>21</u>	T	T
		32 A	-	-	-	-	-	-	-	-	-	-	0.84	1.2	1.9	3.1	5.4	<u>9</u>	<u>15</u>	T	T
		40 A	-	-	-	-	-	-	-	-	-	-	-	1.2	1.9	3.1	5.4	<u>9</u>	<u>15</u>	T	T
		50 A	-	-	-	-	-	-	-	-	-	-	-	-	1.8	2.8	4.5	<u>6.8</u>	<u>10</u>	T	T
63 A	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	4.5	<u>6.8</u>	<u>10</u>	T	T		
<b>NCNxxxA NRN</b>	Curve C	0.5 A	0.07	0.12	0.16	0.22	0.24	0.34	0.61	1	1.6	3.2	6.3	13	T	T	T	T	T	T	
		1 A	0.055	0.09	0.12	0.15	0.19	0.23	0.38	0.57	0.9	1.5	2.7	4.8	<u>9.3</u>	<u>21</u>	T	T	T	T	
		2 A	-	0.09	0.12	0.15	0.19	0.23	0.38	0.57	0.9	1.5	2.7	4.8	<u>9.3</u>	<u>21</u>	T	T	T	T	
		3 A	-	-	0.105	0.13	0.16	0.2	0.32	0.46	0.7	1.1	1.9	3.2	5.9	<u>12</u>	T	T	T	T	
		4 A	-	-	-	0.13	0.16	0.2	0.32	0.46	0.7	1.1	1.9	3.2	5.9	<u>12</u>	T	T	T	T	
		6 A	-	-	-	-	-	0.18	0.29	0.42	0.62	1	1.5	2.3	3.8	<u>7.1</u>	<u>14</u>	T	T	T	
		10 A	-	-	-	-	-	-	0.26	0.37	0.55	0.9	1.3	2	3.3	6	<u>11</u>	<u>21</u>	T	T	
		13 A	-	-	-	-	-	-	-	0.33	0.46	0.75	1.1	1.7	2.8	5	<u>8.9</u>	<u>16</u>	T	T	
		16 A	-	-	-	-	-	-	-	-	0.46	0.75	1.1	1.7	2.8	5	<u>8.9</u>	<u>16</u>	T	T	
		20 A	-	-	-	-	-	-	-	-	-	0.65	0.97	1.3	2.3	4	<u>6.8</u>	<u>12</u>	<u>21</u>	T	
		25 A	-	-	-	-	-	-	-	-	-	-	0.97	1.3	2.3	4	<u>6.8</u>	<u>12</u>	<u>21</u>	T	
		32 A	-	-	-	-	-	-	-	-	-	-	-	1.2	1.9	3.1	5.4	<u>9</u>	<u>15</u>	T	
		40 A	-	-	-	-	-	-	-	-	-	-	-	-	1.9	3.1	5.4	<u>9</u>	<u>15</u>	T	
50 A	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	4.5	<u>6.8</u>	<u>10</u>	T			
63 A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	<u>6.8</u>	<u>10</u>	T			
<b>NDNxxxA NGN NSN</b>	Curve D	0.5 A	0.07	0.12	0.16	0.22	0.24	0.34	0.61	1	1.6	3.2	5.7	<u>11</u>	<u>24</u>	T	T	T	T		
		1 A	-	0.09	0.12	0.15	0.19	0.23	0.38	0.54	0.85	1.4	2.3	4	<u>6.9</u>	<u>13</u>	T	T	T		
		2 A	-	-	-	0.15	0.19	0.23	0.38	0.54	0.85	1.4	2.3	4	<u>6.9</u>	<u>13</u>	T	T	T		
		3 A	-	-	-	-	0.16	0.2	0.31	0.44	0.67	1.1	1.6	2.8	5	<u>9.2</u>	<u>19</u>	T	T		
		4 A	-	-	-	-	-	0.2	0.31	0.44	0.67	1.1	1.6	2.8	5	<u>9.2</u>	<u>19</u>	T	T		
		6 A	-	-	-	-	-	-	-	0.37	0.54	0.87	1.3	2.1	3.6	<u>6.4</u>	<u>11</u>	<u>23</u>	T		
		10 A	-	-	-	-	-	-	-	-	0.46	0.74	1.1	1.6	2.8	5	<u>8.6</u>	<u>15</u>	T		
		13 A	-	-	-	-	-	-	-	-	-	0.65	0.99	1.5	2.4	4	<u>6.8</u>	<u>11</u>	<u>24</u>		
		16 A	-	-	-	-	-	-	-	-	-	-	0.99	1.5	2.4	4	<u>6.8</u>	<u>11</u>	<u>24</u>		
		20 A	-	-	-	-	-	-	-	-	-	-	-	1.1	1.7	2.8	4.7	<u>7.4</u>	<u>14</u>		
		25 A	-	-	-	-	-	-	-	-	-	-	-	-	1.7	2.8	4.7	<u>7.4</u>	<u>14</u>		
		32 A	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	3.5	5.5	<u>9.1</u>		
		40 A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5	5.5	<u>9.1</u>		
50 A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	<u>7.2</u>	<u>13</u>				
63 A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<u>7.2</u>	<u>13</u>			
<b>MMN xxx range</b>		0.63 A	-	-	0.105	0.14	0.17	0.21	0.33	0.46	0.66	1.02	1.5	2.3	3.8	7	14	T	T		
		1.25 A	-	-	-	-	0.17	0.21	0.33	0.46	0.66	1.02	1.5	2.3	3.8	7	14	T	T		
		1.6 A	-	-	-	-	-	0.17	0.27	0.38	0.54	0.84	1.2	1.9	3	5.4	10	18	T		
		2.5 A	-	-	-	-	-	-	-	0.38	0.54	0.84	1.2	1.9	3	5.4	10	18	T		
		4 A	-	-	-	-	-	-	-	-	0.43	0.67	1	1.4	2.2	3.5	5.8	9	15		
		6.3 A	-	-	-	-	-	-	-	-	-	-	1	1.4	2.2	3.5	5.8	9	15		
		10 A	-	-	-	-	-	-	-	-	-	-	-	-	1.7	2.8	4.6	7.2	11		
		12.5 A	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	4.6	7.2	11		
		16 A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.6	5.6	9.2		
		20 A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.6	9.2		
25 A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.2				

T = Total discrimination

The value of the maximal current is in kA

Each underlined value must be read as T if it is over the breaking capacity range of the MCBs.

**Discrimination chart : Upstream - Fuses type G**  
**Downstream - MCBs 1 and 1.5 pole/width**

		Upstream : fuses type gG											
		In	80 A	100 A	125 A	160 A	200 A	250 A	315 A	400 A	500 A	630 A	800 A
<b>Downstream : MCBs</b>	Curve B	80 A	-	2.2	3.9	6.2	8.8	13	T	T	T	T	T
		100 A	-	-	3.9	6.2	8.8	13	T	T	T	T	T
		125 A	-	-	-	6.2	8.8	13	T	T	T	T	T
<b>HLE HLF HMB HMC HMD HMK</b>	Curve C	80 A	-	-	2.8	5.3	7.8	13	T	T	T	T	T
		100 A	-	-	-	5.3	7.8	13	T	T	T	T	T
		125 A	-	-	-	-	7.8	13	T	T	T	T	T
	Curve D	80 A	-	-	-	-	6.6	15	T	T	T	T	T
		100 A	-	-	-	-	-	12	T	T	T	T	T
		125 A	-	-	-	-	-	-	T	T	T	T	T

		Upstream : fuses type gG																		
		In	2 A	4 A	6 A	8 A	10 A	12 A	16 A	20 A	25 A	32 A	40 A	50 A	63 A	80 A	100 A	125 A	160 A	200 A
<b>Downstream : MCBs</b>	Curve B	6 A	-	-	-	0.14	0.17	0.21	0.31	0.42	0.62	1	1.5	2.3	3.8	7.1	T	T	T	T
		10 A	-	-	-	-	-	0.19	0.28	0.38	0.55	0.9	1.3	2	3.3	6	T	T	T	T
		13 A	-	-	-	-	-	-	0.25	0.34	0.47	0.75	1.1	1.7	2.8	5	8.9	T	T	T
		16 A	-	-	-	-	-	-	-	0.34	0.47	0.75	1.1	1.7	2.8	5	8.9	T	T	T
		20 A	-	-	-	-	-	-	-	-	0.41	0.65	0.97	1.3	2.3	4	6.8	T	T	T
		25 A	-	-	-	-	-	-	-	-	-	0.65	0.97	1.3	2.3	4	6.8	T	T	T
		32 A	-	-	-	-	-	-	-	-	-	-	0.84	1.2	1.9	3.1	5.4	9	T	T
		40 A	-	-	-	-	-	-	-	-	-	-	-	1.2	1.9	3.1	5.4	9	T	T
		50 A	-	-	-	-	-	-	-	-	-	-	-	-	1.8	2.8	4.5	6.8	T	T
		63 A	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	4.5	6.8	T	T
<b>Downstream : MCBs</b>	Curve C	0.5 A	0.07	0.12	0.16	0.22	0.24	0.34	0.61	1	1.6	3.2	6.3	T	T	T	T	T	T	
		1 A	0.055	0.09	0.12	0.15	0.19	0.23	0.38	0.57	0.9	1.5	2.7	4.8	9.3	T	T	T	T	
		2 A	-	0.09	0.12	0.15	0.19	0.23	0.38	0.57	0.9	1.5	2.7	4.8	9.3	T	T	T	T	
		3 A	-	-	0.105	0.13	0.16	0.2	0.32	0.46	0.7	1.1	1.9	3.2	5.9	T	T	T	T	
		4 A	-	-	-	0.13	0.16	0.2	0.32	0.46	0.7	1.1	1.9	3.2	5.9	T	T	T	T	
		6 A	-	-	-	-	-	0.18	0.29	0.42	0.62	1	1.5	2.3	3.8	7.1	T	T	T	T
		10 A	-	-	-	-	-	-	0.26	0.37	0.55	0.9	1.3	2	3.3	6	T	T	T	
		13 A	-	-	-	-	-	-	-	0.33	0.46	0.75	1.1	1.7	2.8	5	8.9	T	T	
		16 A	-	-	-	-	-	-	-	-	0.46	0.75	1.1	1.7	2.8	5	8.9	T	T	
		20 A	-	-	-	-	-	-	-	-	-	0.65	0.97	1.3	2.3	4	6.8	T	T	
		25 A	-	-	-	-	-	-	-	-	-	-	0.97	1.3	2.3	4	6.8	T	T	
		32 A	-	-	-	-	-	-	-	-	-	-	-	1.2	1.9	3.1	5.4	9	T	
		40 A	-	-	-	-	-	-	-	-	-	-	-	-	1.9	3.1	5.4	9	T	
		50 A	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	4.5	6.8	T	
63 A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	6.8	T			

Protection devices

		Upstream : fuses type gG																	
		In	2 A	4 A	6 A	8 A	10 A	12 A	16 A	20 A	25 A	32 A	40 A	50 A	63 A	80 A	100 A	125 A	160 A
<b>Downstream : MCBs</b>	Curve B	6 A	-	-	-	0.11	0.13	0.16	0.26	0.35	0.5	0.8	1.2	1.8	2.9	5.2	T	T	T
		10 A	-	-	-	-	-	0.14	0.22	0.31	0.43	0.68	1	1.5	2.4	4.1	T	T	
		13 A	-	-	-	-	-	-	0.19	0.27	0.37	0.57	0.85	1.2	2	3.4	5.7	T	
		16 A	-	-	-	-	-	-	-	0.26	0.36	0.57	0.85	1.2	2	3.4	5.7	T	
		20 A	-	-	-	-	-	-	-	-	0.31	0.46	0.7	1.05	1.7	2.8	4.7	T	
		25 A	-	-	-	-	-	-	-	-	-	0.46	0.7	1.05	1.7	2.8	4.7	T	
		32 A	-	-	-	-	-	-	-	-	-	-	0.61	0.97	1.5	2.6	4.3	T	
		40 A	-	-	-	-	-	-	-	-	-	-	-	0.97	1.5	2.6	4.3	T	
		50 A	-	-	-	-	-	-	-	-	-	-	-	-	1.4	2.4	3.9	T	
		63 A	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	3.9	T	
<b>MLN. MCNxxxA</b>	Curve C	0.5 A	0.07	0.11	0.15	0.19	0.23	0.28	0.44	0.63	0.96	1.5	2.7	5	T	T	T	T	
		1 A	0.055	0.09	0.12	0.16	0.19	0.23	0.35	0.48	0.73	1.1	1.8	3.2	5.9	T	T	T	
		2 A	-	0.08	0.12	0.15	0.19	0.23	0.35	0.48	0.73	1.1	1.8	3.2	5.9	T	T	T	
		3 A	-	-	0.11	0.13	0.16	0.19	0.29	0.4	0.59	0.94	1.4	2.3	4	T	T	T	
		4 A	-	-	-	0.12	0.15	0.19	0.29	0.4	0.59	0.94	1.4	2.3	4	T	T	T	
		6 A	-	-	-	-	-	0.16	0.25	0.35	0.5	0.8	1.2	1.8	2.9	5.2	T	T	
		10 A	-	-	-	-	-	-	0.22	0.3	0.43	0.68	1	1.5	2.4	4.1	T	T	
		13 A	-	-	-	-	-	-	-	0.26	0.37	0.57	0.85	1.2	2	3.4	5.7	T	
		16 A	-	-	-	-	-	-	-	-	0.36	0.57	0.85	1.2	2	3.4	5.7	T	
		20 A	-	-	-	-	-	-	-	-	-	0.46	0.7	1.05	1.7	2.8	4.7	T	
		25 A	-	-	-	-	-	-	-	-	-	-	0.7	1.05	1.7	2.8	4.7	T	
		32 A	-	-	-	-	-	-	-	-	-	-	-	0.97	1.5	2.6	4.3	T	
		40 A	-	-	-	-	-	-	-	-	-	-	-	-	1.5	2.6	4.3	T	
		50 A	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	3.9	T	
63 A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.9	T			

MCBs 1 module/pole: temperature correction factor according to ambient temperature (nominal values for ref. temperature: 30°C ; see the blue cells in the chart ).

Derating chart according to the ambient temperature for MCBs **1 module/pole**

In(A)	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C
0.5	0.54	0.52	0.5	0.48	0.46	0.44	0.42	-	-	-	-
1	1.08	1.04	1	0.96	0.92	0.88	0.84	0.8	0.76	0.72	0.68
1.5	1.62	1.56	1.5	1.44	1.38	1.32	1.26	1.2	1.14	1.08	1.02
1.6	1.73	1.66	1.6	1.54	1.47	1.41	1.34	1.28	1.22	1.15	1.09
2	2.16	2.08	2	1.92	1.84	1.76	1.68	1.6	1.52	1.44	1.36
3	3.24	3.12	3	2.88	2.76	2.64	2.52	2.4	2.28	2.16	2.04
3.5	3.78	3.64	3.5	3.36	3.22	3.08	2.94	2.8	2.66	2.52	2.38
4	4.32	4.16	4	3.84	3.68	3.52	3.36	3.2	3.04	2.88	2.72
5	5.4	5.2	5	4.8	4.6	4.4	4.2	4	3.8	3.6	3.4
6	6.48	6.24	6	5.76	5.52	5.28	5.04	4.8	4.56	4.32	4.08
7.5	8.1	7.8	7.5	7.2	6.9	6.6	6.3	6	5.7	5.4	5.1
8	8.64	8.32	8	7.68	7.36	7.04	6.72	6.4	6.08	5.76	5.44
10	10.8	10.4	10	9.6	9.2	8.8	8.4	8	7.6	7.2	6.8
13	14.0	13.5	13	12.5	12.0	11.4	10.9	10.4	9.9	9.4	8.8
15	16.2	15.6	15	14.4	13.8	13.2	12.6	12	11.4	10.8	10.2
16	17.3	16.6	16	15.4	14.7	14.1	13.4	12.8	12.2	11.5	10.9
20	21.6	20.8	20	19.2	18.4	17.6	16.8	16	15.2	14.4	13.6
25	27	26	25	24	23	22	21	20	19	18	17
30	32.4	31.2	30	28.8	27.6	26.4	25.2	24	22.8	21.6	20.4
32	34.6	33.3	32	30.7	29.4	28.2	26.9	25.6	24.3	23.0	21.8
35	37.8	36.4	35	33.6	32.2	30.8	29.4	28.0	26.6	25.2	23.8
40	44.8	41.6	40	38.4	36.8	35.2	33.6	32	30.4	28.8	27.2
45	50.4	46.8	45	43.2	41.4	39.6	37.8	36	34.2	32.4	30.6
50	56	52	50	48	46	44	42	40	38	36	34
63	-	-	63	60.5	58.0	55.4	52.9	50.4	47.9	45.4	42.8

Note: If the current of a circuit (Ib) is less than 0,85 x the nominal setting of the circuit breaker (In) don't take in account the below correction.

Nb of MCBs placed side by side	Factor correction
n = 2	1
3 ≤ n < 4	0.95
4 ≤ n < 6	0.9
6 ≤ n	0.85

Derating chart according to the ambient temperature for MCBs **HLE, HLF, HMB, HMC, HMD, HMK**

In(A)	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C
10	10.8	10.4	10	9.6	9.2	8.8	8.4	8	7.6	7.2	6.8
13	14.04	13.52	13	12.48	11.96	11.44	10.92	10.4	9.88	9.36	8.84
15	16.2	15.6	15	14.4	13.8	13.2	12.6	12	11.4	10.8	10.2
16	17.28	16.64	16	15.36	14.72	14.08	13.44	12.8	12.16	11.52	10.88
20	21.6	20.8	20	19.2	18.4	17.6	16.8	16	15.2	14.4	13.6
25	27	26	25	24	23	22	21	20	19	18	17
30	32.4	31.2	30	28.8	27.6	26.4	25.2	24	22.8	21.6	20.4
32	34.56	33.28	32	30.72	29.44	28.16	26.88	25.6	24.32	23.04	21.76
35	37.8	36.4	35	33.6	32.2	30.8	29.4	28	26.6	25.2	23.8
45	43.2	41.6	45	38.4	36.8	35.2	33.6	32	30.4	28.8	27.2
50	54	52	50	48	46	44	42	40	38	36	34
63	68.04	65.52	63	60.48	57.96	55.44	52.92	50.4	47.88	45.36	42.84
80	86.4	83.2	80	76.8	73.6	70.4	67.2	64	60.8	57.6	54.4
100	108	104	100	96	92	88	84	80	76	72	68
125	-	-	125	120	115	110	105	100	95	90	85

Derating chart according to the ambient temperature for MCBs **HMX**

In(A)	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C
10	11.6	11.2	10.8	10.4	10	9.6	9.2	8.8	8.4	8	7.6
16	18.56	17.92	17.28	16.64	16	15.36	14.72	14.08	13.44	12.8	12.16
20	23.2	22.4	21.6	20.8	20	19.2	18.4	17.6	16.8	16	15.2
25	29	28	27	26	25	24	23	22	21	20	19
32	37.12	35.84	34.56	33.28	32	30.72	29.44	28.16	26.88	25.6	24.32
40	46.4	44.8	43.2	41.6	40	38.4	36.8	35.2	33.6	32	30.4
50	58	56	54	52	50	48	46	44	42	40	38
63	73.08	70.56	68.04	65.52	63	60.48	57.96	55.44	52.92	50.4	47.88

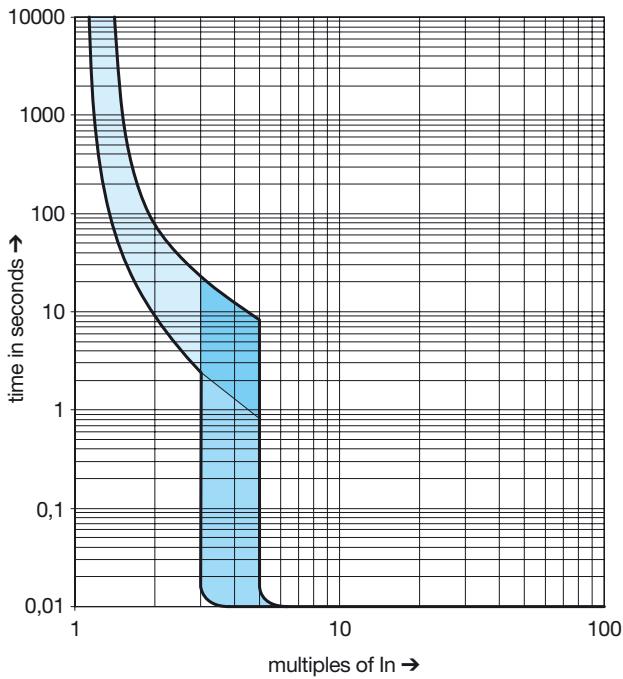
### Example of derating due to the temperature

5 MCBs NGN420 four poles, curve C, rated 20 A are placed side by side in a box which is situated in a local where the temperatures 40 °C.

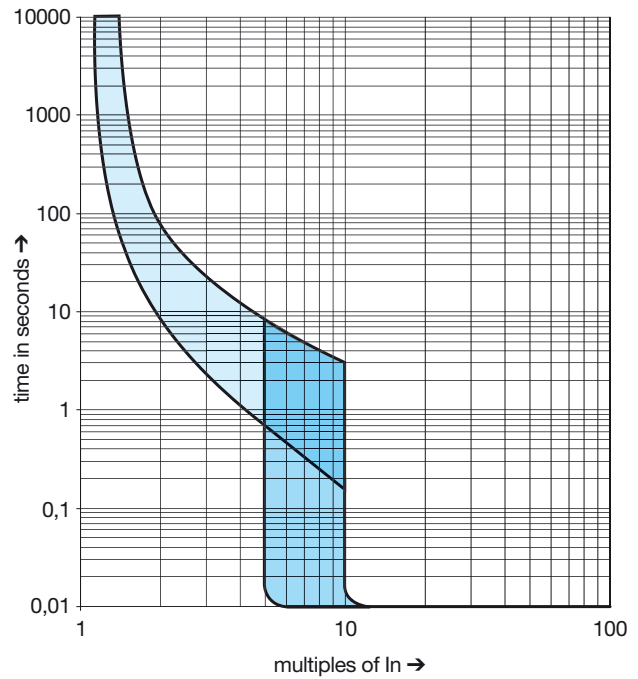
Derating due to the temperature 40 °C: 18.4 A.

Additional derating due to the juxtaposed MCBs: 18.4 x 0.9 = 16.5 A

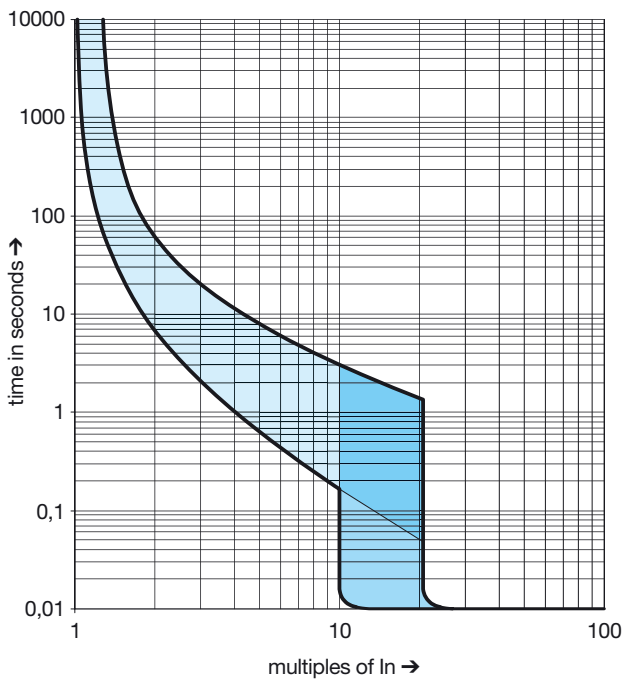
**B curve at 30°C (IEC 60 898-1) MCB:**  
MV, MTxxxA, MBxxxA, NBNxxxA, NQN,  
HLE, HMB, HMJ



**C curve at 30°C (IEC 60 898-1) MCB:**  
MLN, MW, MUxxxA, MCxxxA, MCNxxxA, NCNxxxA, NRN, HLF, HMC,  
HMK, HMX  
**RCBOs :** ACC, ADC, ADH, AFC, AFH



**D curve at 30°C (IEC 60 898-1) MCB:**  
NGN, NDNxxxA, NSN, HMD



### DC applications

Because of their quick make and break design and excellent arc quenching capabilities, Hager circuit breakers are suitable for use on DC. When selecting a circuit breaker for any DC application it is necessary to consider 2 main points:

#### a) system voltage

The system voltage and the type of system determines the number of poles required to provide the necessary breaking capacity and arc control. The table gives the maximum DC voltage and breaking capacity for one pole or two poles connected in the series: The positioning of these breaking poles in the system depends on whether the system is earthed or insulated and if it is earthed whether one polarity is earthed or the centre point is earthed.

#### b) type of DC systems: 3 different types

- Network connected to the earth - one polarity earthed (+ve or -ve):  
If -ve is earthed, all poles will be placed in series in the +ve leg.  
If the +ve is earthed, all poles will be placed in the -ve leg.  
Note: an extra pole will be needed on the earthed polarity to provide isolation.
- Network connected to the earth - middle point earthed:  
The number of poles required to break  $I_{sc}$  should be placed on each polarity.
- Network insulated to the earth:  
The number of poles required to break  $I_{sc}$  should be split between the two polarities.

#### Information

To disconnect under load, use a DC switch SB432PV (32A - 1000V DC).

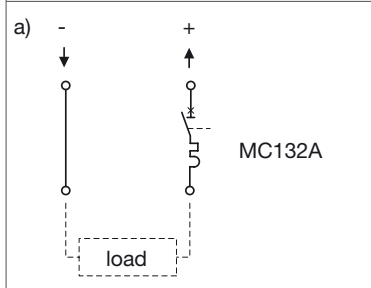
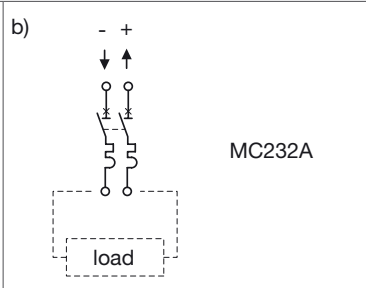
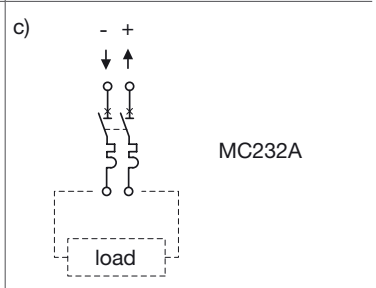
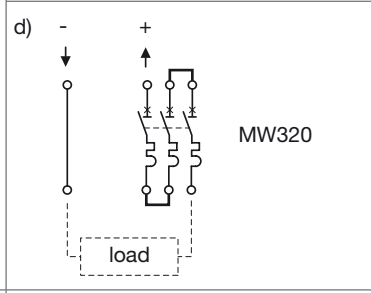
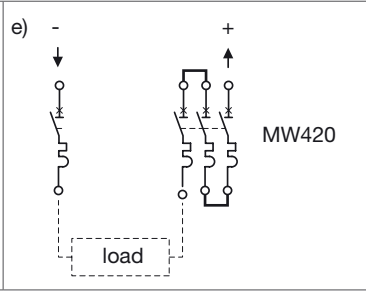
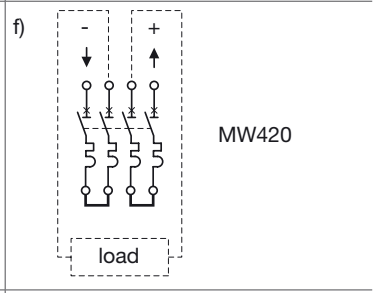
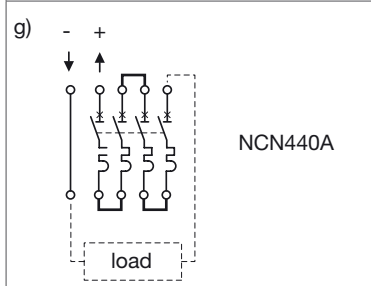
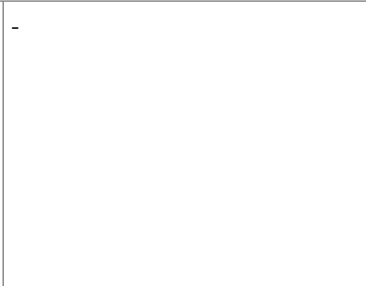
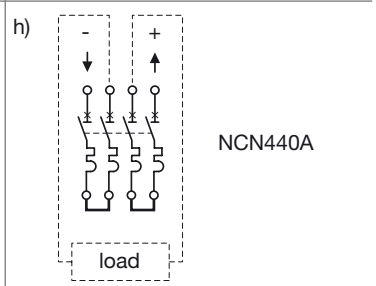
		①	②	③	④
		$I_{t1}$	$I_{t2}$	$I_{rm1}$	$I_{rm2}$
curve B	AC 50Hz	1.13 $I_n$	1.45 $I_n$	3 $I_n$	5 $I_n$
	DC	1.13 $I_n$	1.45 $I_n$	4 $I_n$	7 $I_n$
curve C	AC 50Hz	1.13 $I_n$	1.45 $I_n$	5 $I_n$	10 $I_n$
	DC	1.13 $I_n$	1.45 $I_n$	7 $I_n$	15 $I_n$
curve D	AC 50Hz	1.13 $I_n$	1.45 $I_n$	10 $I_n$	20 $I_n$
	DC	1.13 $I_n$	1.45 $I_n$	15 $I_n$	30 $I_n$

range	$I_n$	nb of poles in series needed for breaking	breaking capacity (kA)				
			$\leq 48V$	60V	125V	250V	500V
<b>MT, MU, MB, MC, MV, MW, MBNxxxA, MCNxxxA</b>	0.5 to 63A	1P	15	-	-	-	-
		2P	20	20	-	-	-
		3P	25	25	20	-	-
		4P	35	35	25	-	-
<b>NGN, NB-NxxxA, NCNxxxA, NDNxxxA</b>	0.5 to 63A	1P	15	15	10	-	-
		2P	20	20	15	6	-
		3P	25	25	20	10	-
		4P	35	35	25	15	10
<b>NRN, NSN, NQN</b>	0.5 to 20A	1P	25	25	20	-	-
		2P	35	35	25	15	-
		3P	40	40	35	20	-
		4P	45	45	40	25	10
<b>NRN, NSN, NQN</b>	25 to 40A	1P	20	20	15	-	-
		2P	25	25	20	10	-
		3P	30	30	30	15	-
		4P	35	35	35	20	10
<b>NRN, NSN, NQN</b>	50 and 63A	1P	15	15	10	-	-
		2P	20	20	15	6	-
		3P	25	25	20	10	-
		4P	35	35	25	15	10
<b>HMB, HMC, HMD, HMK, HMJ</b>	80 to 125A	1P	15	15	10	-	-
		2P	20	20	15	6	-
		3P	30	30	30	15	-
		4P	35	35	35	20	10
<b>HMX</b>	10 to 63A	1P	25	25	20	-	-
		2P	35	35	25	15	-
		3P	40	40	35	20	-
		4P	45	45	40	25	10
<b>HLFxxxS, HLExxxS</b>	80 to 125A	1P	12	12	8	-	-
		2P	15	15	10	4	-
		3P	25	25	25	10	-
		4P	30	30	30	15	5

#### c) earthing system types

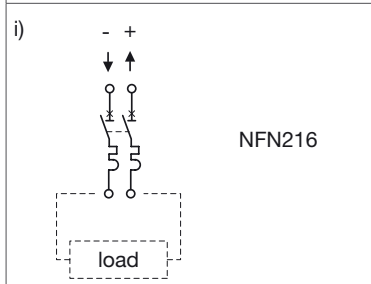
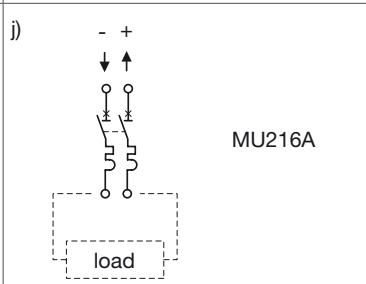
earthing diagrams TT, TNS, TNC		IT system isolated to the earth	
a polarity connected to earth	earthed center point		
<p>- Network connected to the earth - one polarity earthed (+ve or -ve): If -ve is earthed, all poles will be placed in series in the +ve leg. If the +ve is earthed, all poles will be placed in the -ve leg.</p>	<p>- Network connected to the earth - middle point earthed: The number of poles required to break <math>I_{sc}</math> should be placed on each polarity.</p>	<p>- Network insulated to the earth: The number of poles required to break <math>I_{sc}</math> should be split between the two polarities.</p>	<p>- Network connected to the earth - middle point earthed: The number of poles required to break <math>I_{sc}</math> should be placed on each polarity.</p>

Examples of TT, TNS, TNC earthing systems:

<p>24V DC ≤ U ≤ 48V DC</p>	<p>Protection of a 32A circuit under U = 48V DC voltage with earthed negative polarity and 15kA short circuit current (I<sub>cc</sub>). a) without negative polarity breaking b) with negative polarity breaking</p>	<p>Protection of a 32A circuit under U = 48V DC voltage with middle point earthed and 15kA short circuit current (I<sub>cc</sub>). c) I<sub>cc</sub> under U/2 = 24V</p>	
	<p>a) </p>	<p>b) </p>	<p>c) </p>
<p>48V DC ≤ U ≤ 125V DC</p>	<p>Protection of a 20A circuit under U = 125V DC voltage with earthed negative polarity and 15kA short circuit current (I<sub>cc</sub>). a) without negative polarity breaking b) with negative polarity breaking</p>	<p>Protection of a 20A circuit under U = 125V DC voltage with middle point earthed and 15kA short circuit current (I<sub>cc</sub>). c) I<sub>cc</sub> under U/2 = 72,5V</p>	
	<p>d) </p>	<p>e) </p>	<p>f) </p>
<p>125V DC ≤ U ≤ 500V DC</p>	<p>Protection of a 40A circuit under U = 500V DC voltage with earthed negative polarity and 10kA short circuit current (I<sub>cc</sub>). a) without negative polarity breaking</p>	<p>Protection of a 40A circuit under U = 500V DC voltage with middle point earthed and 10kA short circuit current (I<sub>cc</sub>). c) I<sub>cc</sub> under U/2 = 250V</p>	
	<p>g) </p>	<p>h) </p>	<p></p>

Protection devices

Examples of IT earthing system:

<p>24V DC ≤ U ≤ 125V DC</p>	<p>Protection of a 16A circuit under U = 120V DC voltage supplied by a 4kA I<sub>cc</sub> isolated battery.</p>	<p>Protection of a 16A circuit under U = 120V DC voltage supplied by an impedant middle point battery delivering 4kA short circuit current. U/2 = 60V</p>
	<p>i) </p>	<p>j) </p>

Power loss per pole (Watt)

In(A)	MLN	MV	MW	MBNxxxA	MCNxxxA	MTxxxA MBxxxA	MUxxxA MCxxxA	NGN	NBNxxxA	NCNxxxA	NDNxxxA	NQN	NRN	NSN	HLExxxS
0.5	-	-	-	-	1.2	-	1.2	1.2	-	1.2	1.2	-	1.2	1.2	-
1	-	-	-	-	1.3	-	1.3	1.3	-	1.3	1.3	-	1.3	1.3	-
2	1.7	-	-	-	1.5	-	1.5	1.5	-	1.5	1.5	-	1.5	1.5	-
3	-	-	-	-	2	-	2	2	-	2	2	-	2	2	-
4	-	-	-	-	1.8	-	1.8	1.8	-	1.8	1.8	-	1.8	1.8	-
6	1.8	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	-
10	2	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-
13	-	-	-	-	2.2	-	-	2.1	2.1	2.1	2.1	2.1	-	2.1	-
16	2.8	3	3	3	3	3	3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	-
20	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	-
25	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	-
32	3.6	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	-
40	-	4.5	4.5	4.5	4.5	4.5	4.5	4	4	4	4	4	4	4	-
50	-	-	-	5.1	5.1	5.1	5.1	4.5	4.5	4.5	4.5	4.5	4.5	4.5	-
63	-	-	-	6.4	6.4	6.4	6.4	5.1	5.1	5.1	5.1	5.1	5.1	5.1	-
80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.5
125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8

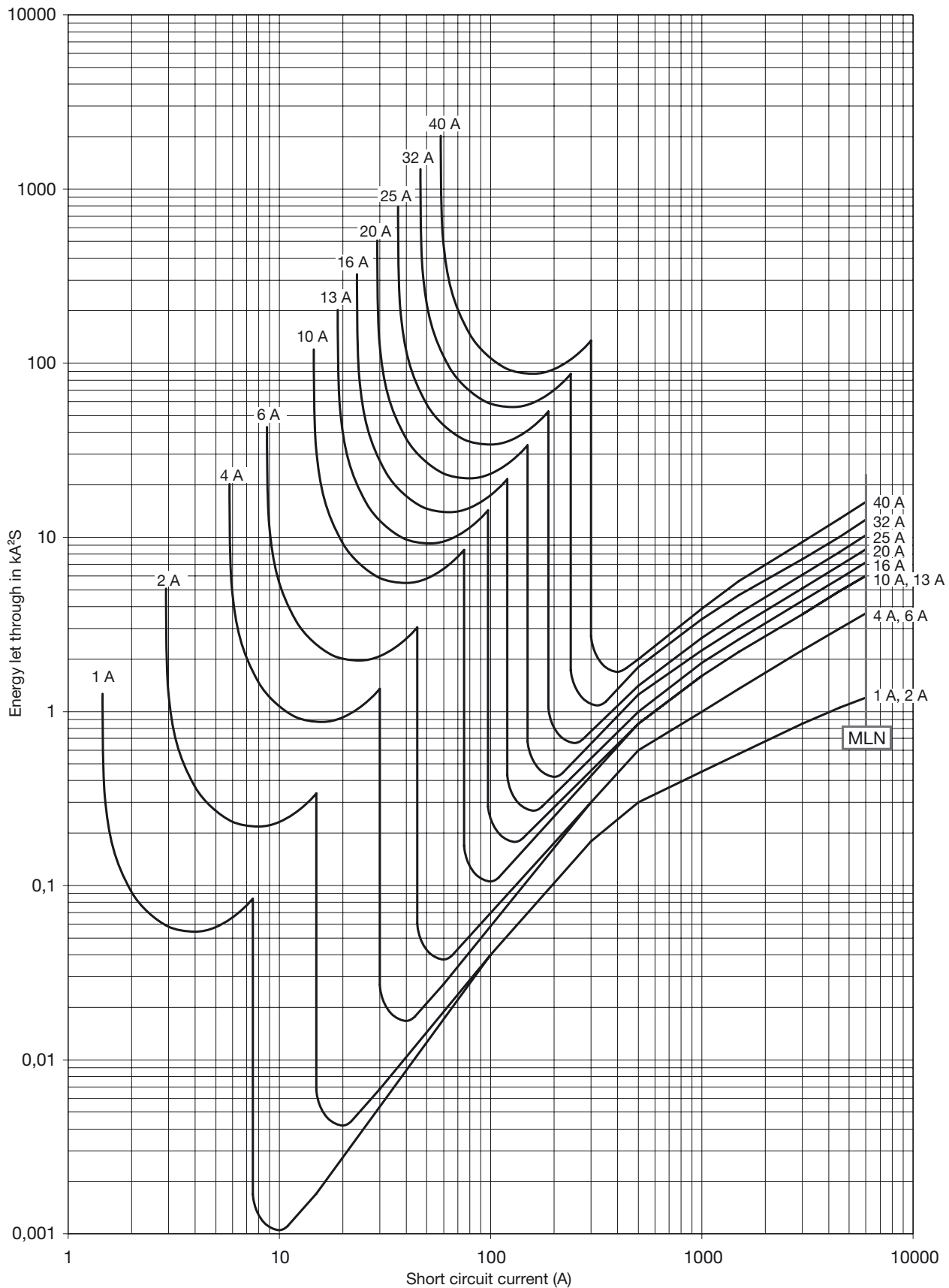
	HLFxxxA	HMB	HMC	HMD	HMJ	HMK	HMX	RCCB 2 poles					RCCB 4 poles				RCBO			
								10mA	30mA	100mA	300mA	500mA	30mA	100mA	300mA	500mA	10mA	30mA	300mA	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.8	1.7
-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	2.6	2.4
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	3.4	-	-	-	-	-	-	-	-	-	-	6.5	4.2	4
-	-	-	-	-	-	-	2.7	-	-	-	-	-	-	-	-	-	-	-	5.4	4.3
-	-	-	-	-	-	-	2.6	5.8	2.5	1	1	1	4.6	2	2	2	-	12.8	8.6	
-	-	-	-	-	-	-	3.5	-	-	-	-	-	-	-	-	-	-	7.3	6.8	
-	-	-	-	-	-	-	3.4	-	6.3	2.6	2.6	2.6	11.8	5	5	5	-	14.2	14.7	
-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	5	-	8.4	6.4	6.4	6.4	17.5	12.5	12.5	12.5	-	-	-	-
5	5	5	5	5	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5.5	5.5	5.5	5.5	5.5	5.5	5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	8	8	8	8	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Protection devices



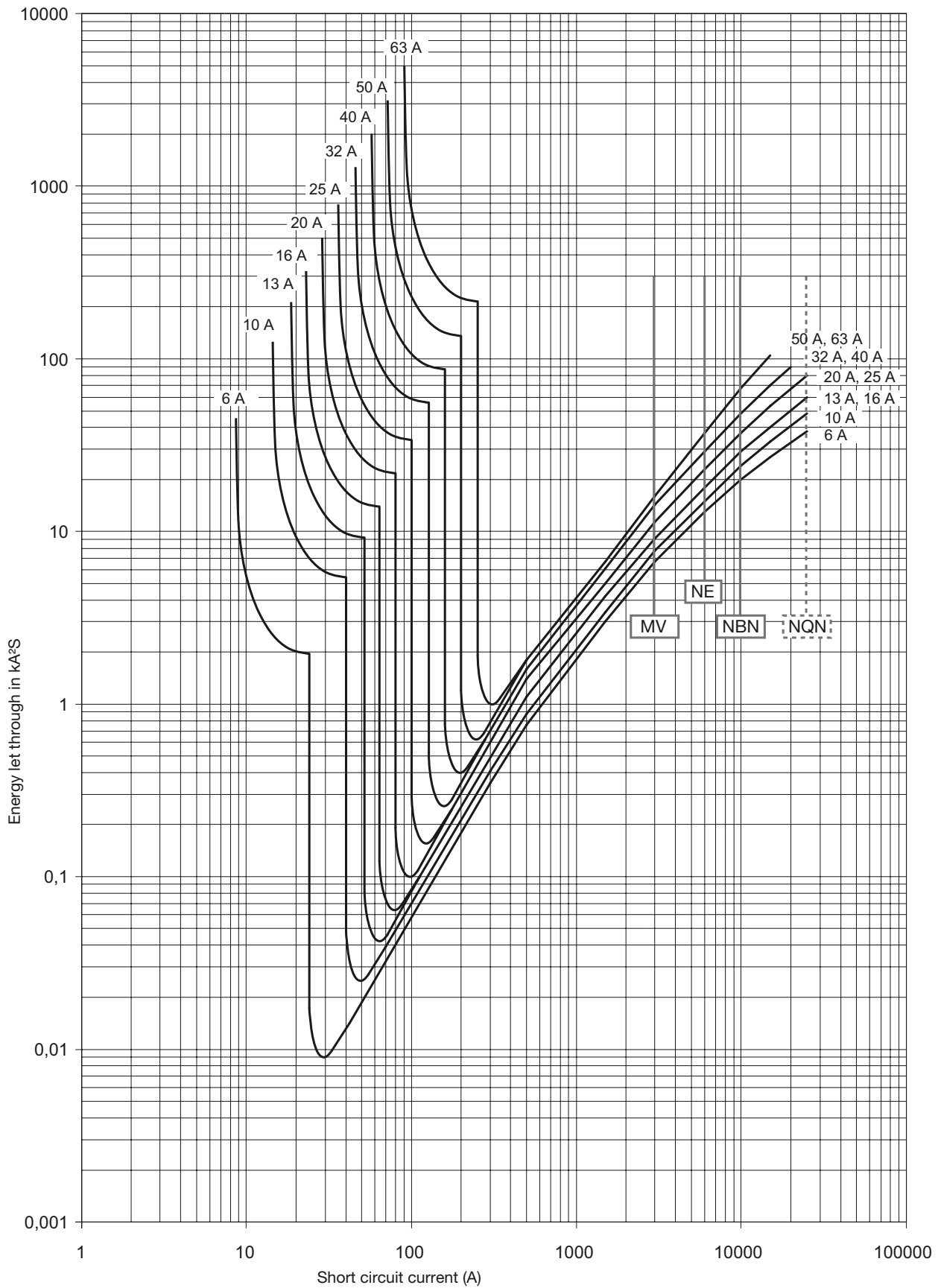
Energy let through at 230 V - IEC EN 60898

MCBs: MLN



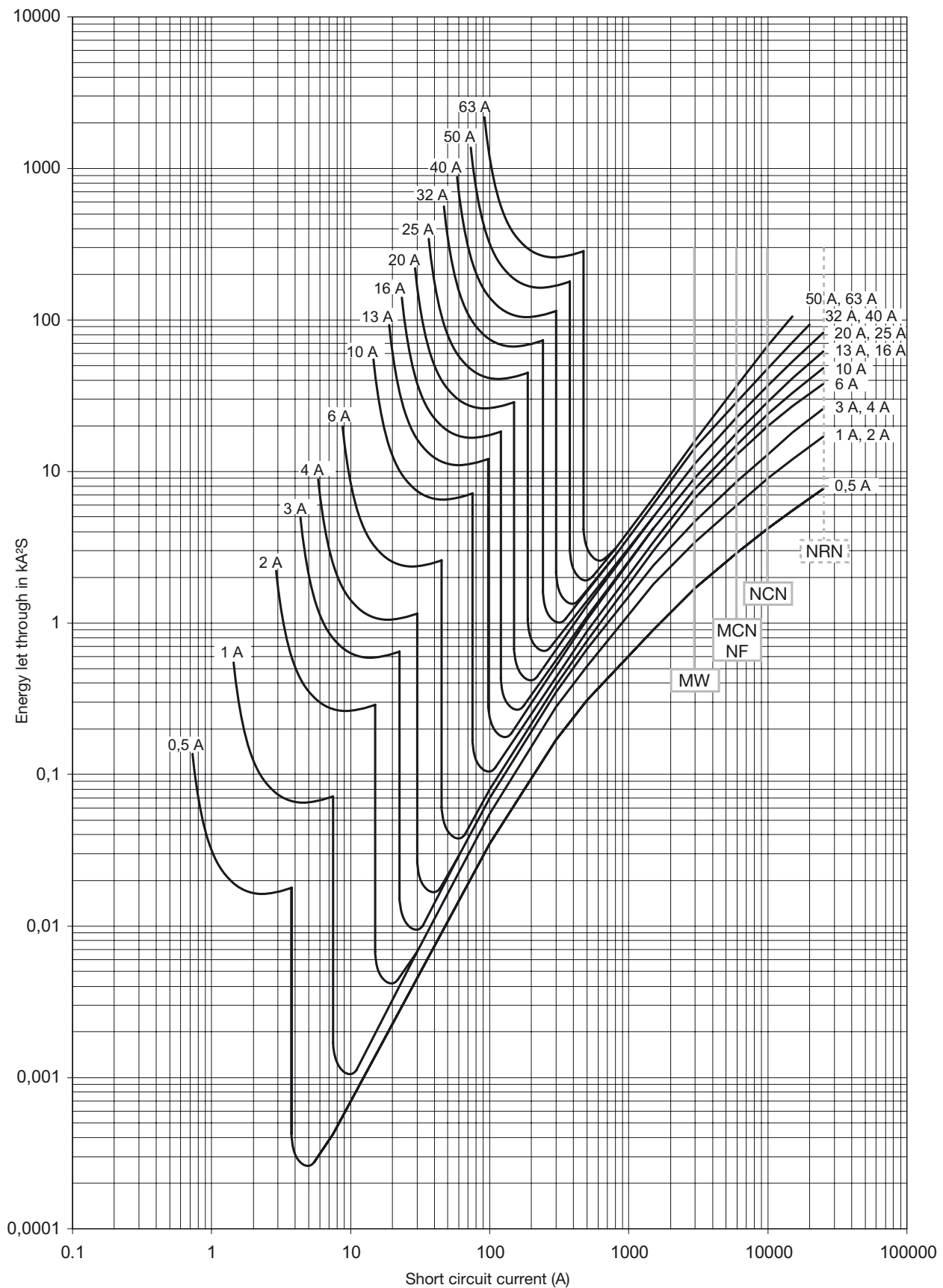
Energy let through at 400 V - IEC EN 60898

MCBs: MV, MBNxxxA, MTxxxA, MBxxxA, NBNxxA, NQN



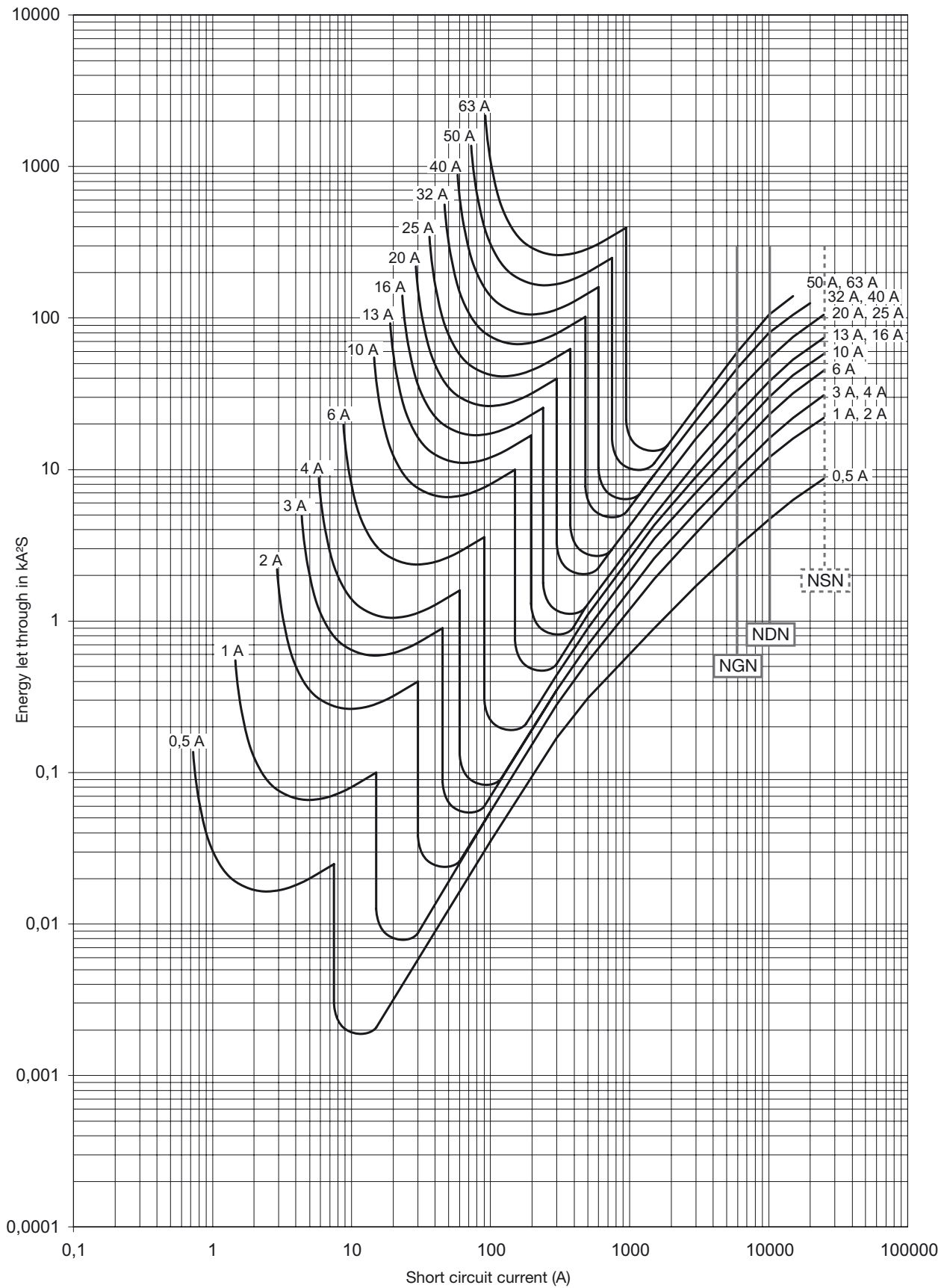
Energy let through at 400 V - IEC EN 60898

MCBs: MW, MCNxxxA, MUxxxA, MCxxxA, NCNxxxA, NRN



Energy let through at 400 V - IEC EN 60898

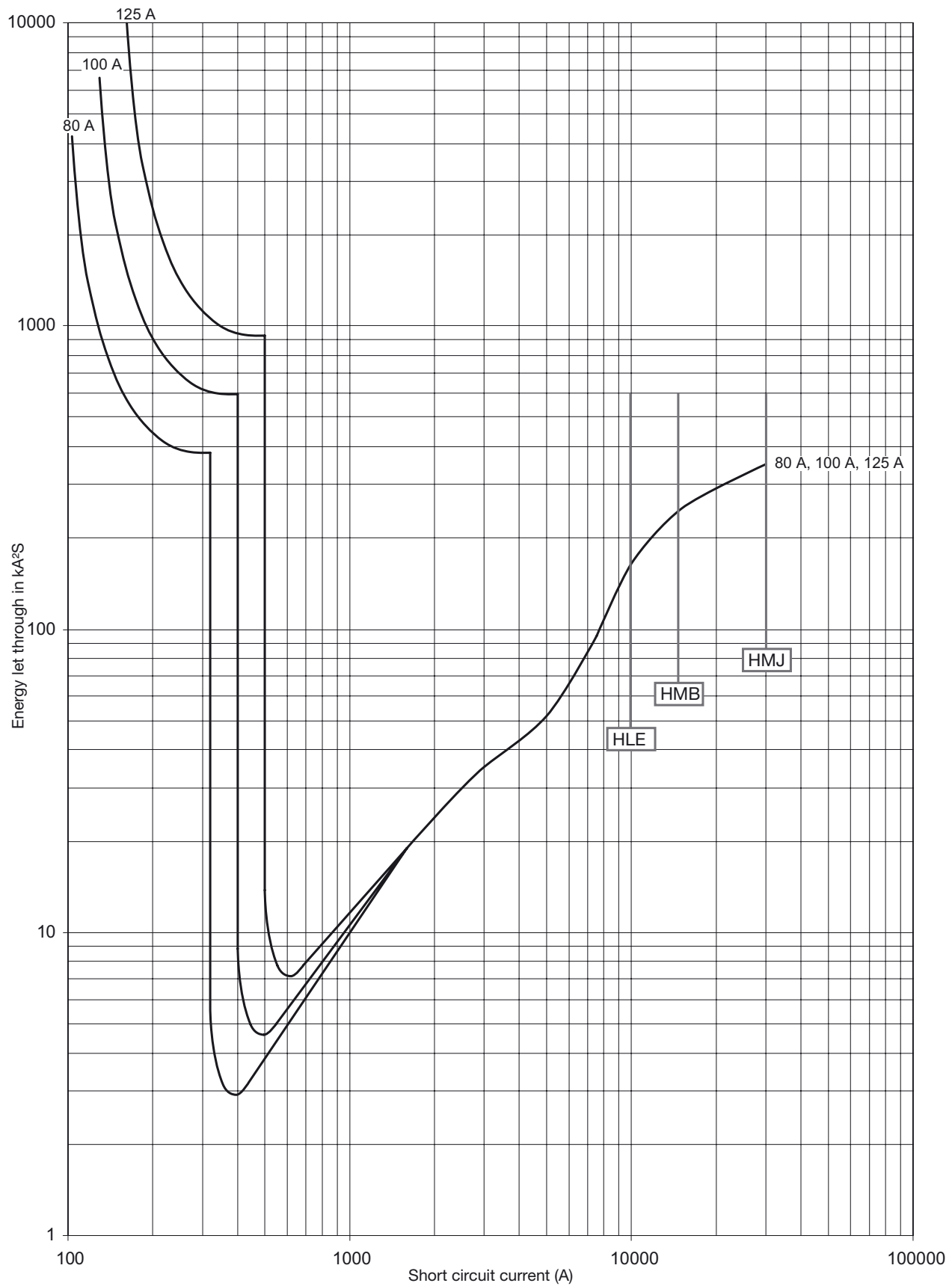
MCBs: NGN, NDN, NSN



Protection devices

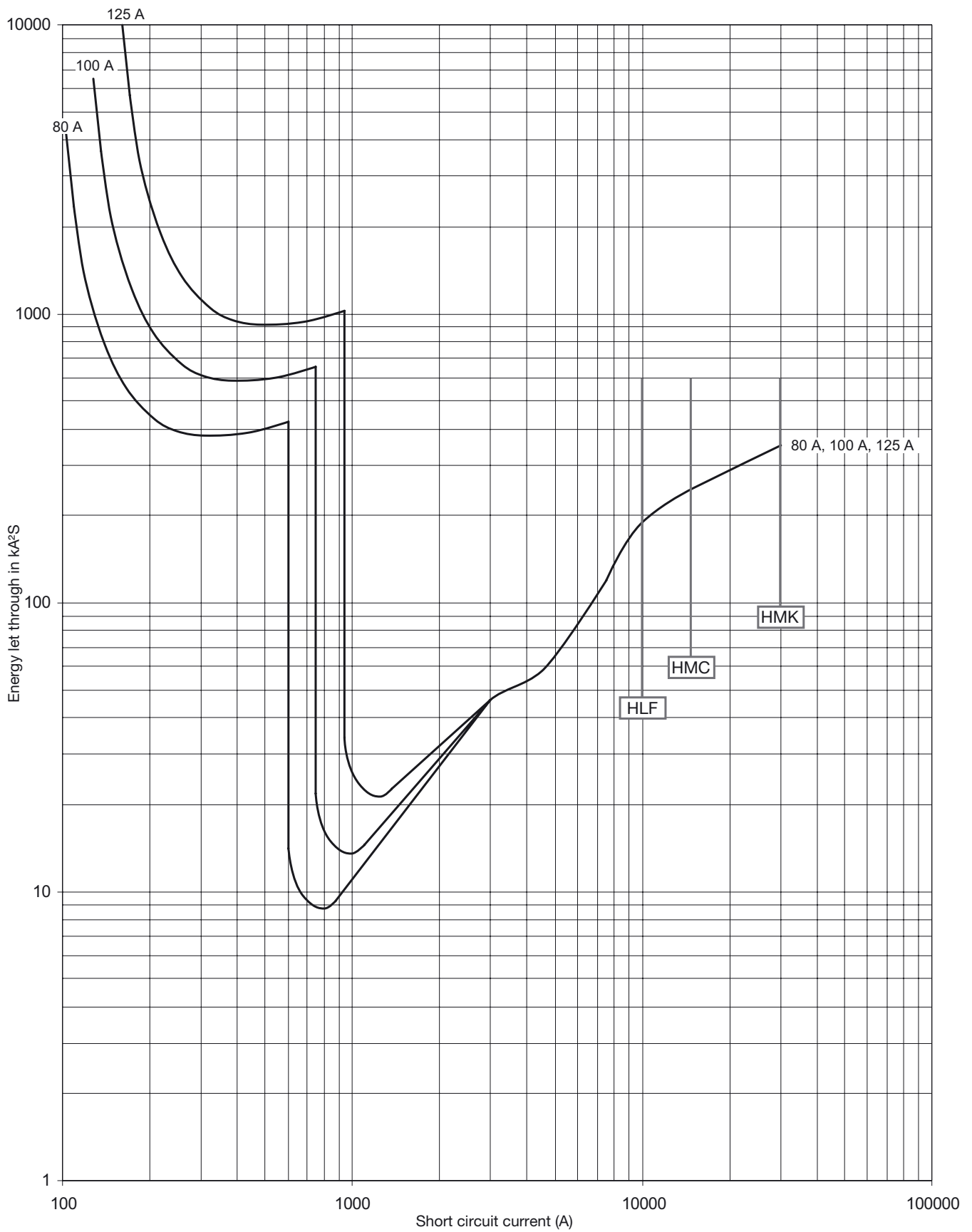
Energy let through at 400 V - IEC EN 60947-2

MCBs: HMB, HMJ, HLE



Energy let through at 400 V - IEC EN 60947-2

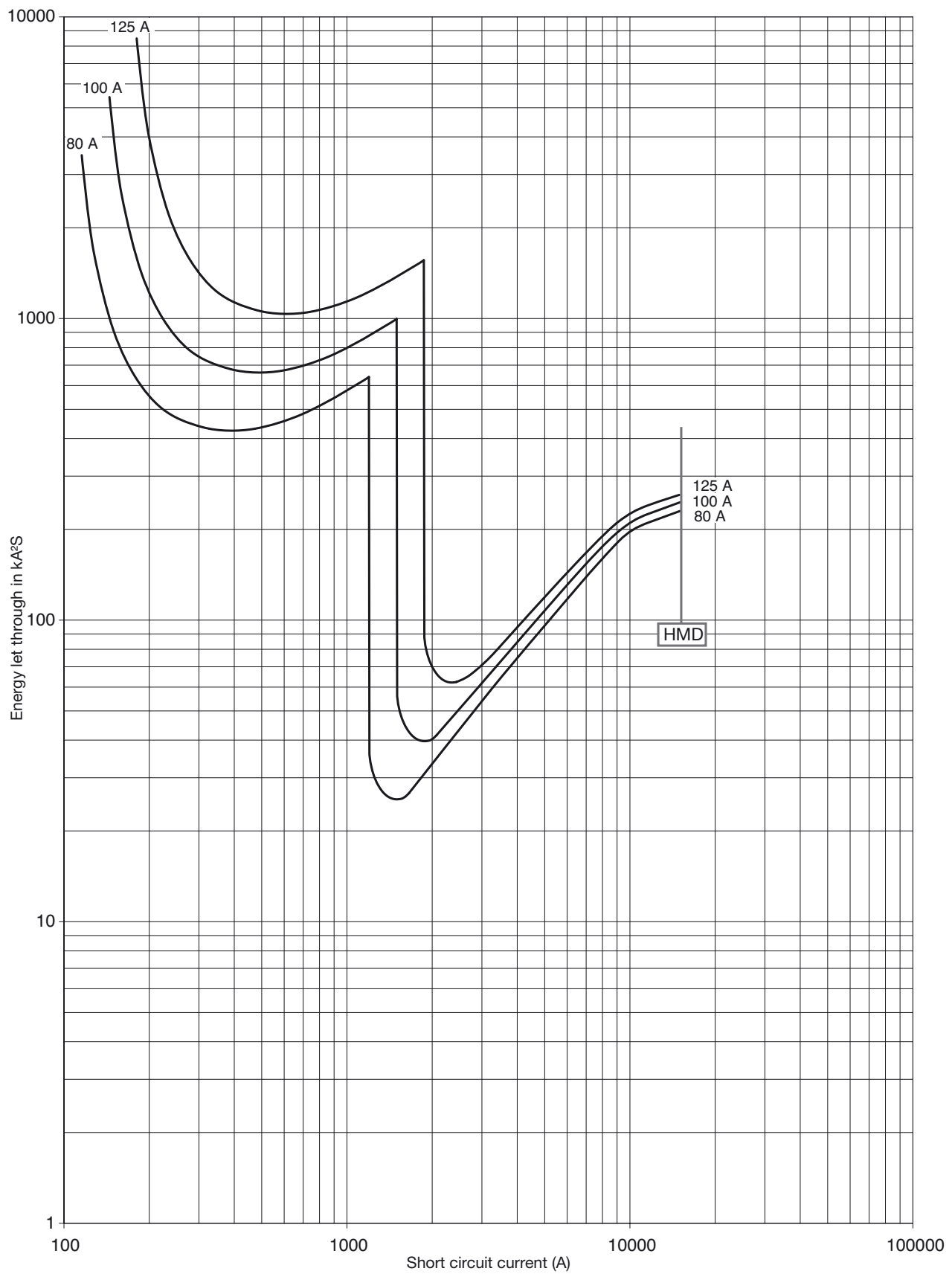
MCBs: HMC, HMK, HLF



Protection devices

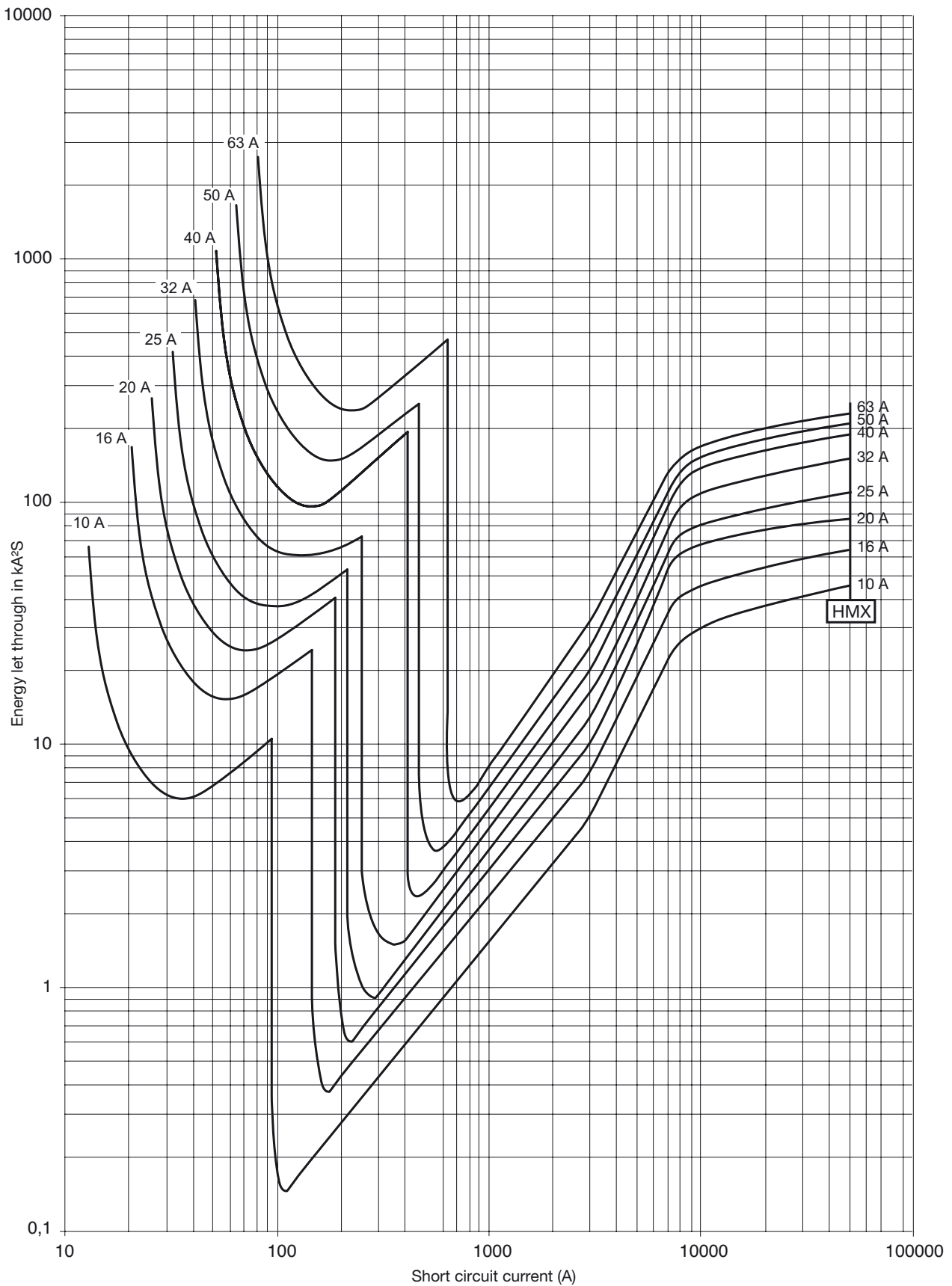
Energy let through at 400 V - IEC EN 60947-2

MCBs: HMD



Energy let through at 400 V - IEC EN 60947-2

MCBs: HMX

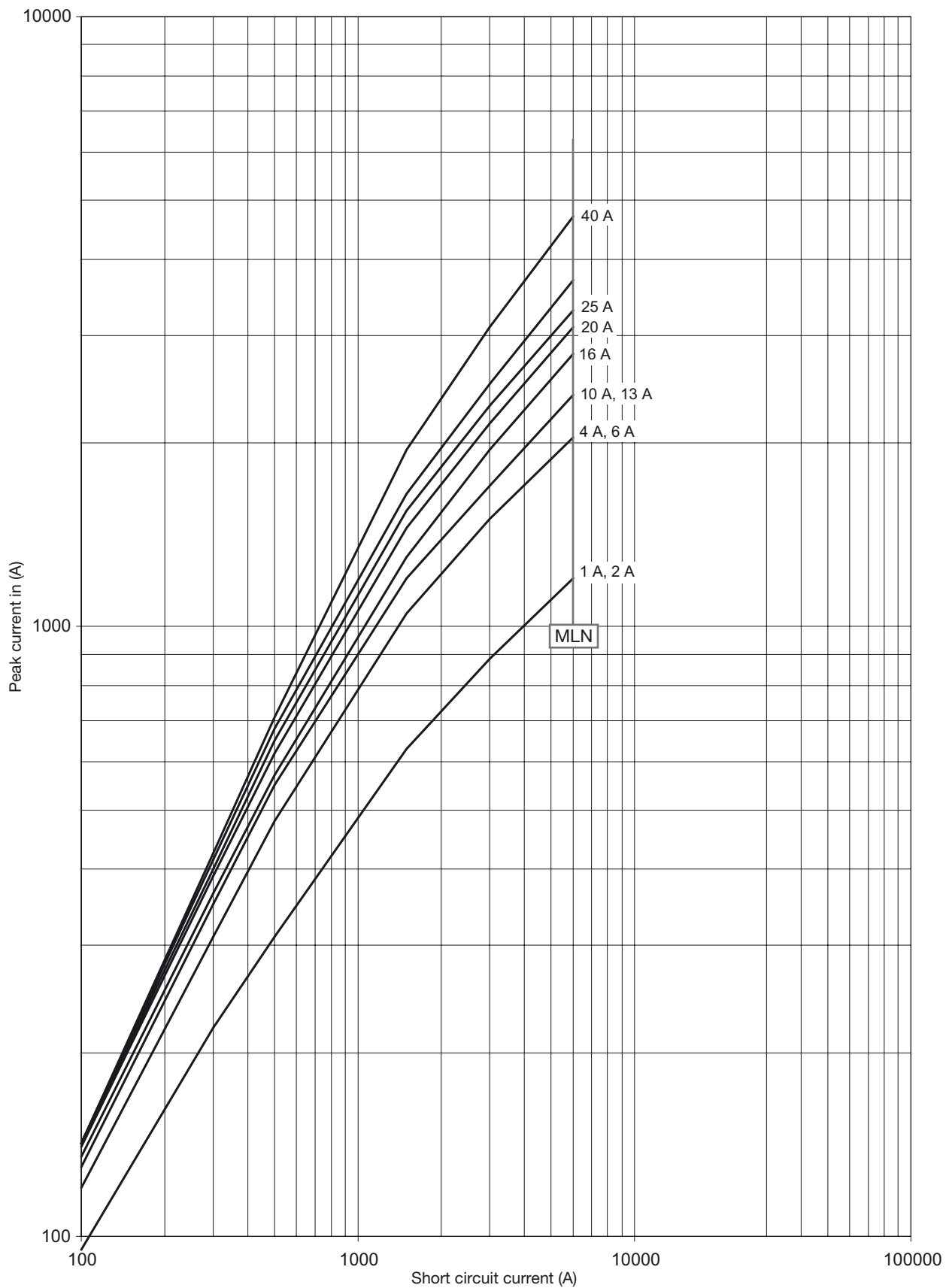


Protection devices



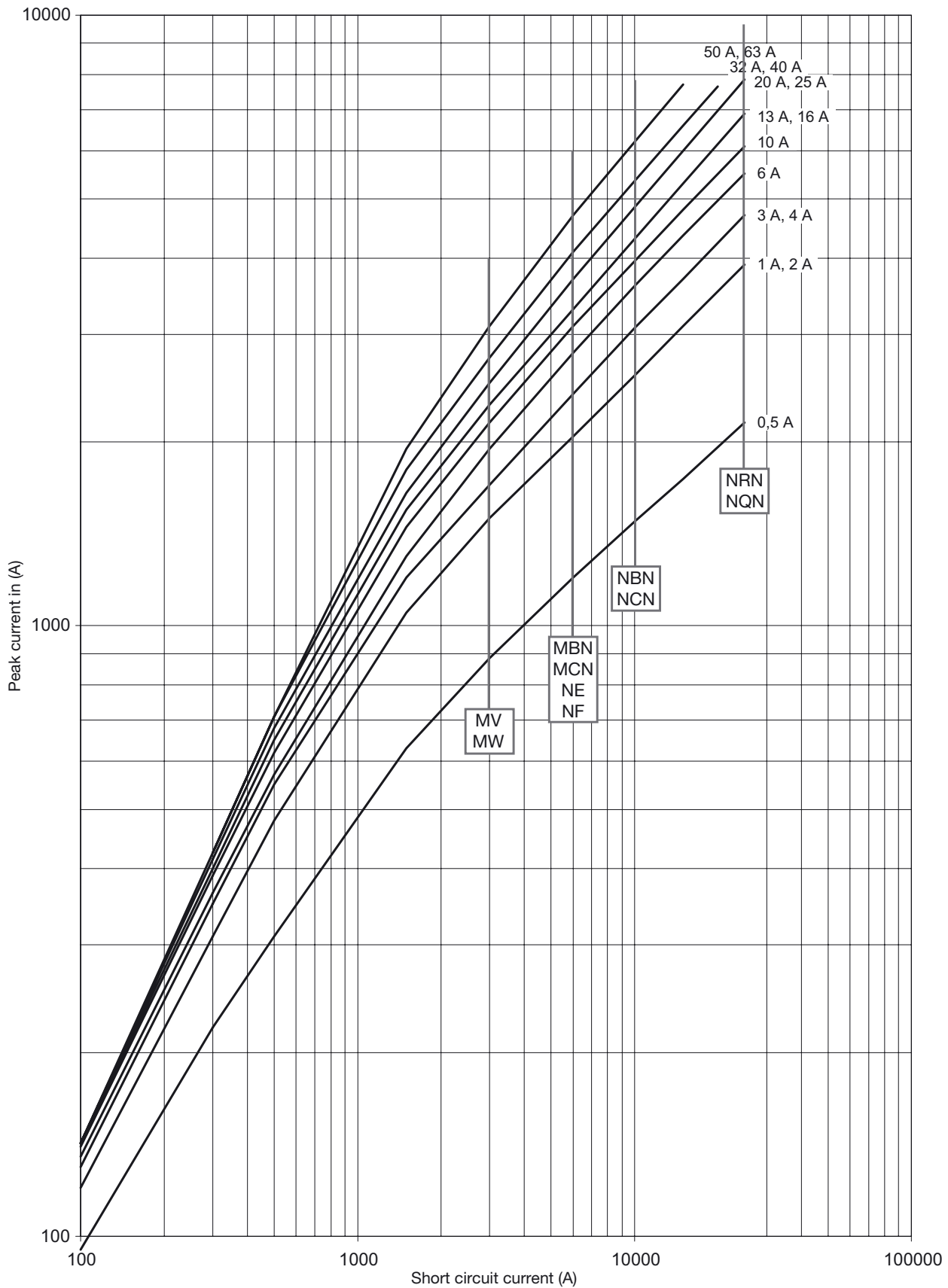
Current limiting at 230 V - EN 60898

MCBs: MLN



Current limiting at 400 V - EN 60898

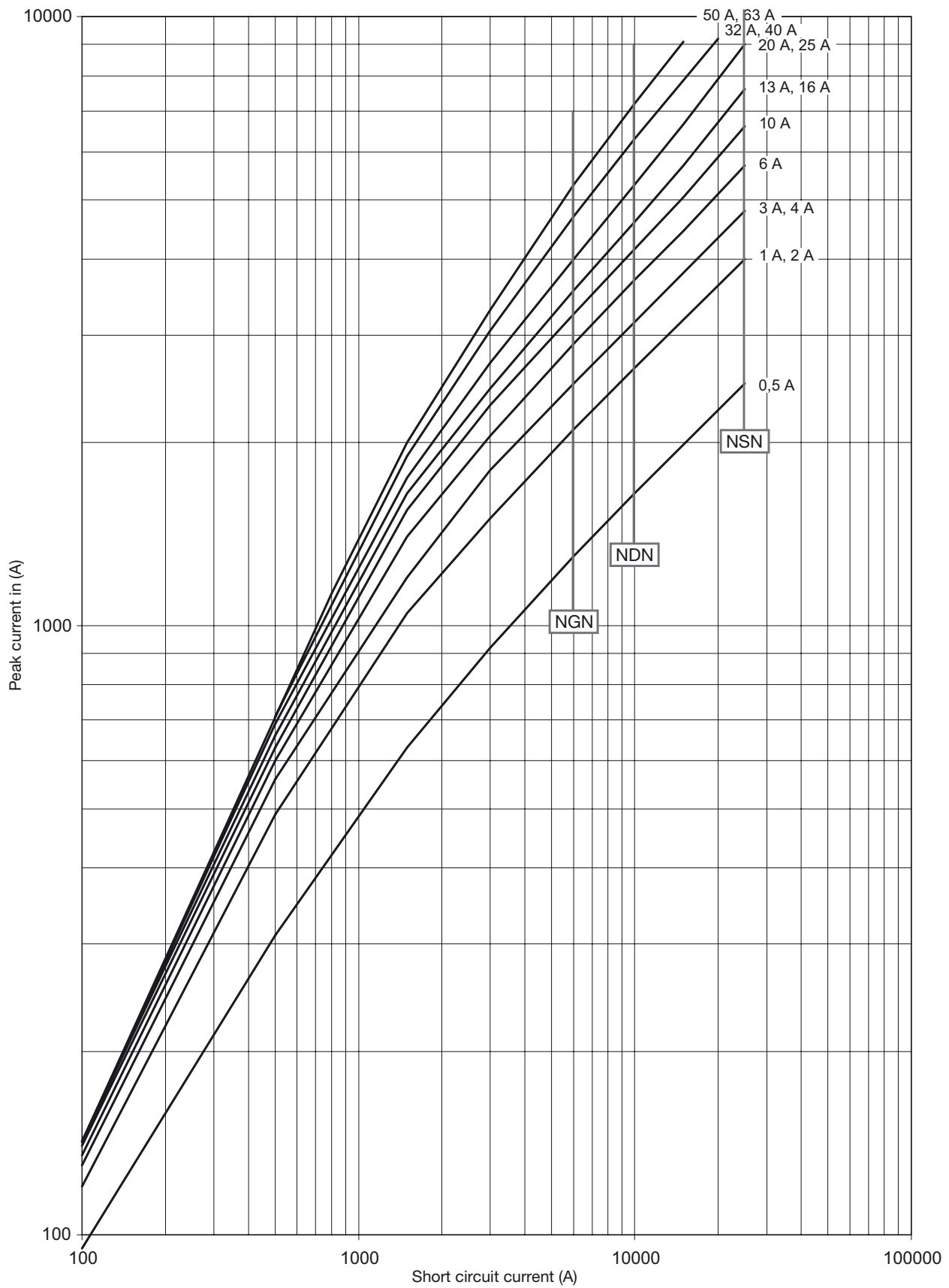
**MCBs:** MV, MW, MBNxxxA, MCNxxxA, MTxxxA, MUxxxA, MBxxxA, MCxxxA, NBNxxxA, NCNxxxA, NQN, NRN



Protection devices

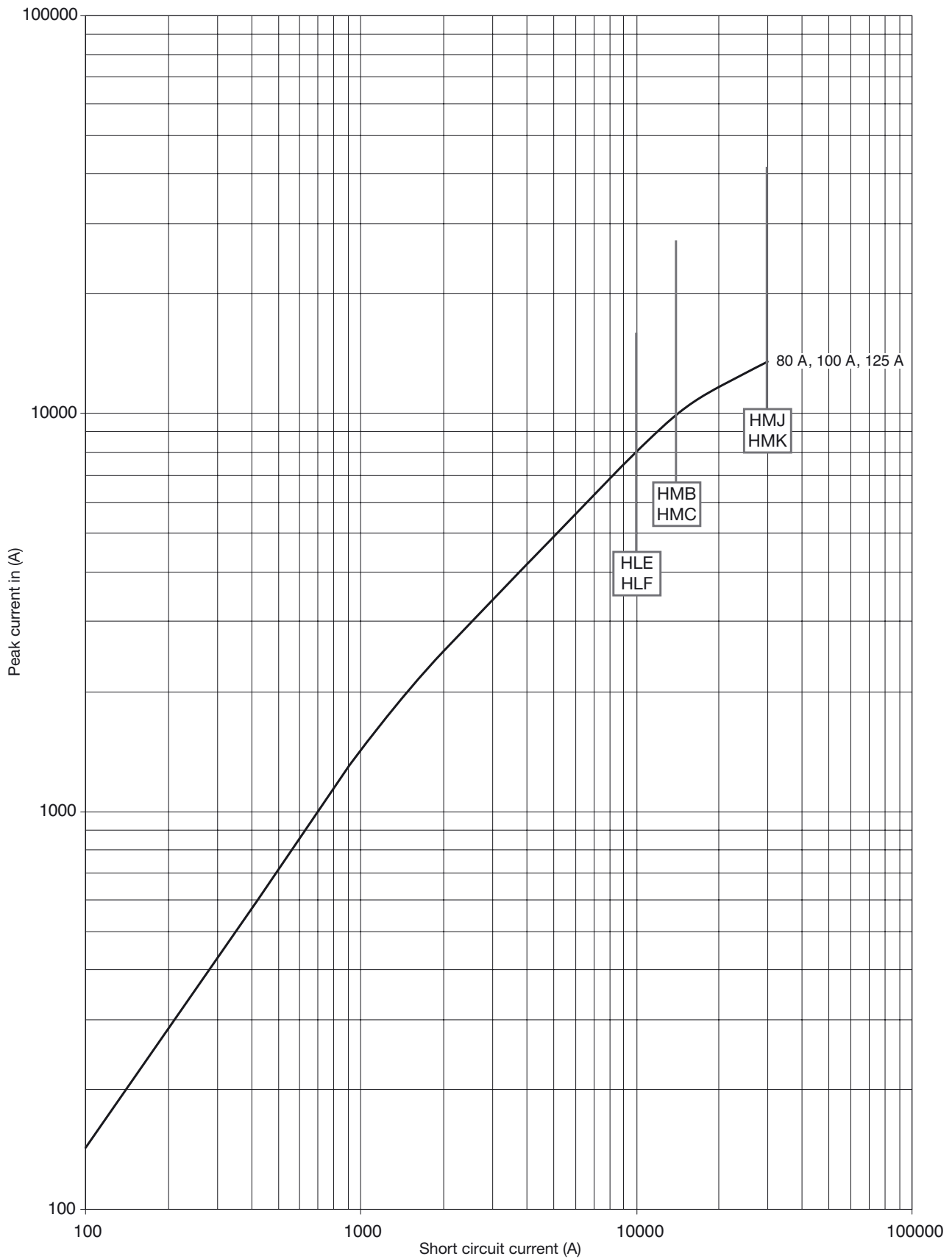
Current limiting at 400 V - EN 60898

MCBs: NGN, NDNxxxA, NSN



Current limiting at 400 V - EN 60947-2

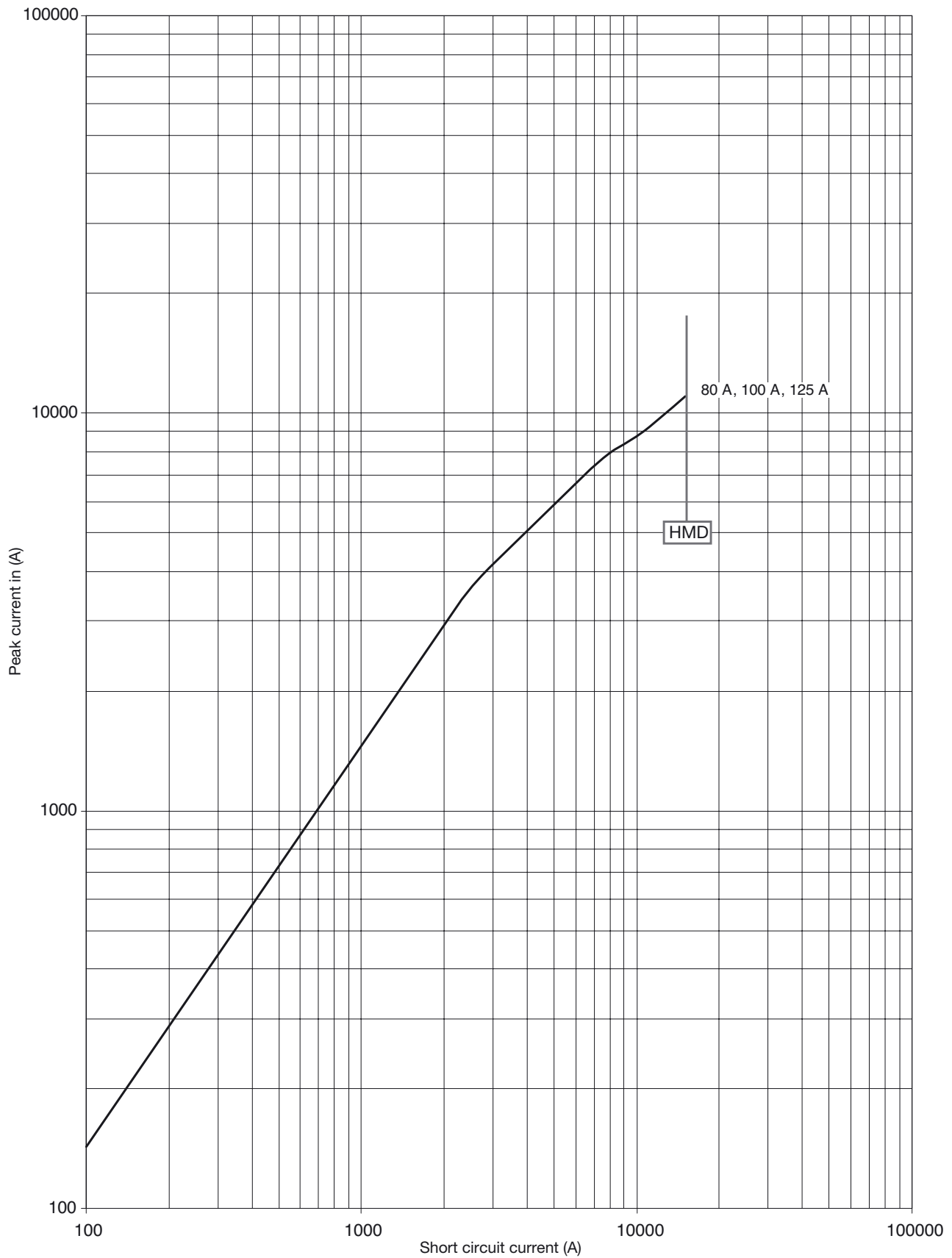
MCBs: HMB, HMC, HMK, HMJ, HLE, HLF



Protection devices

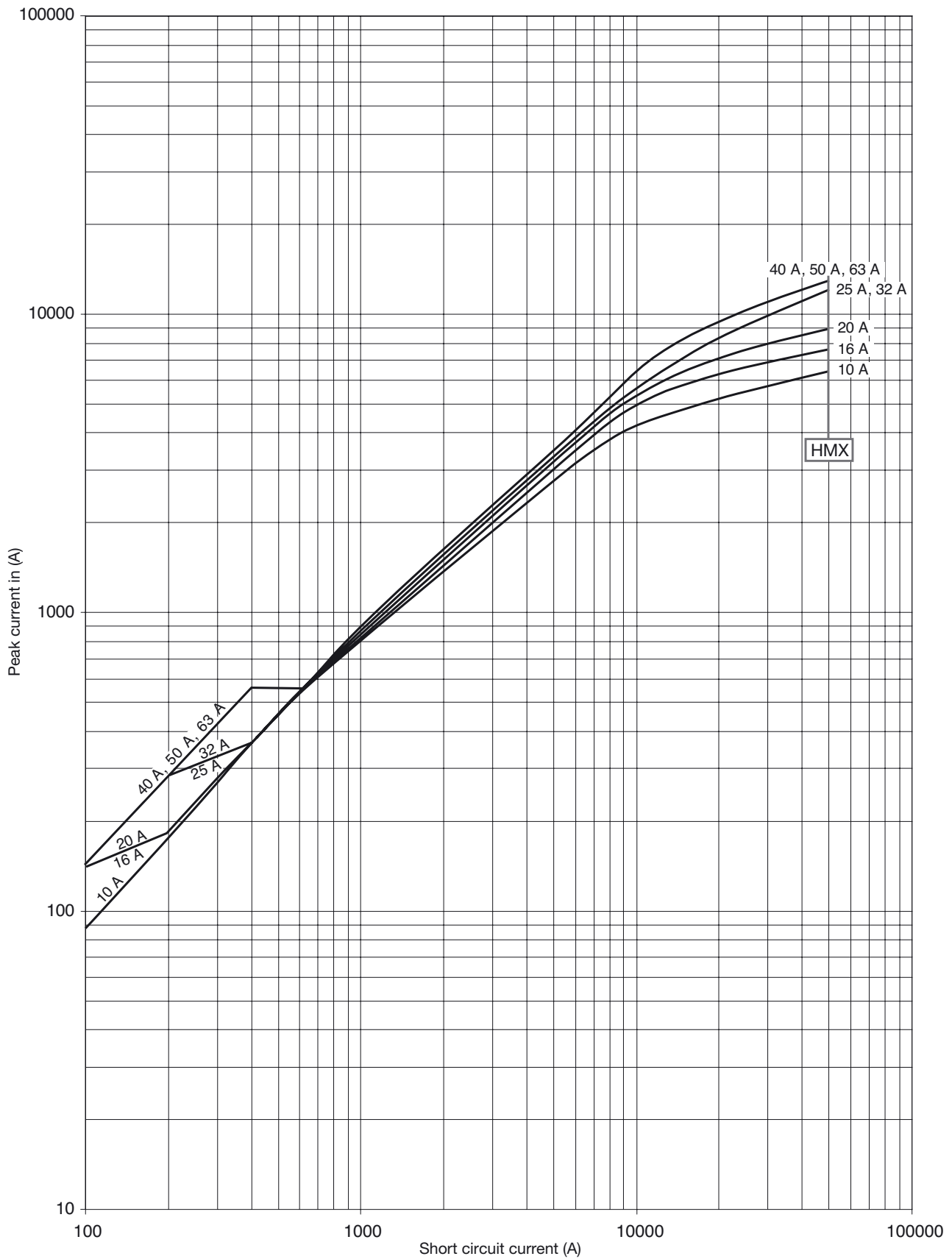
Current limiting at 400 V - EN 60947-2

MCBs: HMD



Current limiting at 400 V - EN 60947-2

MCBs: HMX



<b>References</b>		<b>MCN</b>			
number of poles		1P	2P	3P	4P
width in modules		1	2	3	4
rating current		0.5A - 1A - 2A - 4A - 6A - 10A - 16A - 20A - 25A - 32A - 40A - 50A - 63A			
overvoltage category		3			
standard		IEC 60898-1			
<b>Electrical characteristics</b>					
voltage rating in AC		240/415V	415V		
frequency		50/60Hz			
tripping curve		C			
AC thermal operation threshold - min/max	lth1	1.13 I <sub>n</sub>			
	lth2	1.45 I <sub>n</sub>			
AC thermal operation threshold - min/max	lrm1	5 I <sub>n</sub>			
	lrm2	10 I <sub>n</sub>			
rated insulation voltage		500V			
rated impulse withstand voltage	U <sub>imp</sub>	4kV			
breaking capacity IEC 60898-1	I <sub>cn</sub>	6000A			
short-circuit capacity IEC 60898 - 1	I <sub>cs</sub>	6000A			
electric endurance in number of cycles		10000 cycles			
mechanical endurance in number of operations		20000 operations			
operating temperature		-25°C to +70°C			
storage temperature		-25°C to +80°C			
protection index		IP20			
<b>Connecting</b>					
type of connection		bi-connect (cable and busbar)			
connection capacity with flexible cable		1 to 16 mm <sup>2</sup>			
connection capacity with rigid cable		1 to 25 mm <sup>2</sup>			
terminal torque		2.8 Nm			
<b>Installation</b>					
mounting		DIN rail EN50.022-35			
mounting position		installed vertically			
accept accessories		yes			
supply		feed either top or bottom			
DIN clip type		bottom rail clip plastic			
<b>Weight and dimensions</b>					
weight	g	118	237	357	475
width	mm	17.6	35.2	52.8	70
height	mm	83.5			
length	mm	73.6			
depth	mm	70			

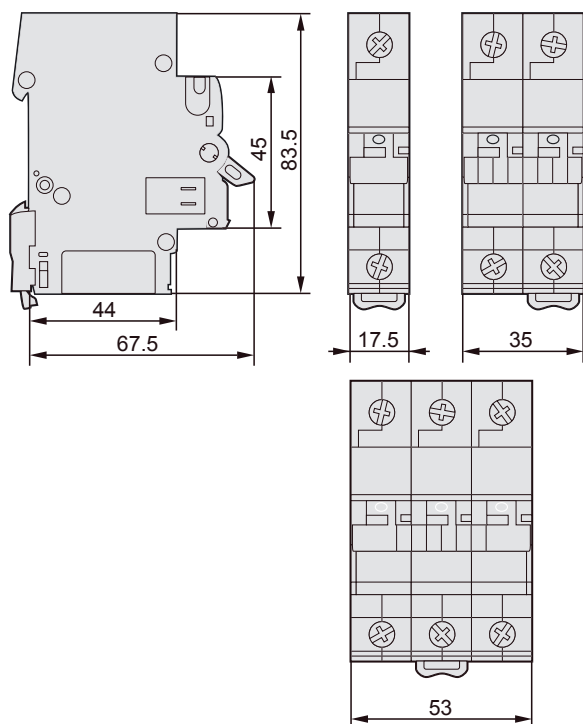
**Total power loss under IN**

IN	1P	2P	3P	4P
0.5A	0.11	2.18	3.42	4.48
1A	0.1	2.82	4.3	5.65
2A	1.34	2.74	4.09	5.4
3A	1.91	4.02	5.95	7.97
4A	1.92	3.78	5.65	7.7
6A	1.31	2.5	3.82	5.01
8A	1.99	4	6.1	-
10A	1.81	3.8	5.81	7.82
13A	2.21	4.57	6.7	9.1
16A	2.43	5.18	8.16	10.77
20A	2.7	5.57	8.86	11.71
25A	2.95	6	10.1	13.35
32A	4.35	8.99	13.01	17.6
40A	4.84	10.52	16.88	22.44
50A	5.2	9.2	16.3	19.75
63A	7.43	11.4	18.27	25.58

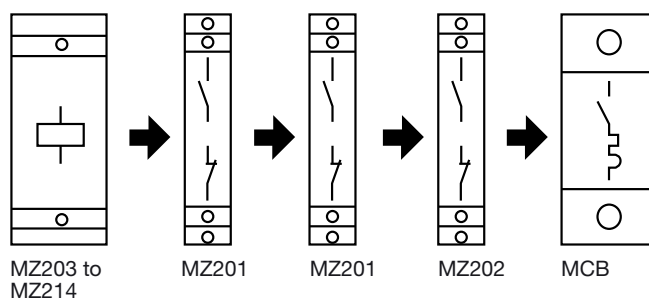
**Short circuit current: breaking capacity with DC current**

Number of poles in series	Breaking capacity (kA) L/R=15ms		
	≤ 60V	≤ 125V	≤ 250V
1	15	15	-
2	20	15	15
3	25	20	15
4	35	25	15

**Dimensions (in mm)**

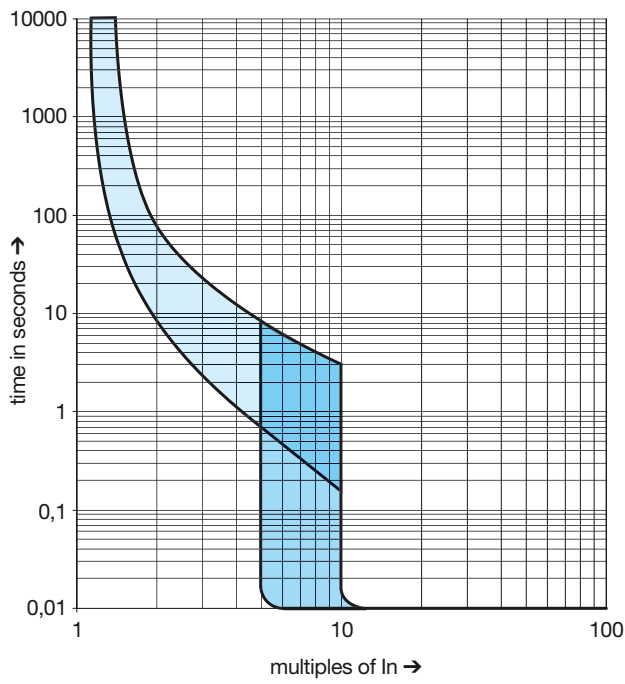


**Auxiliary possibilities**

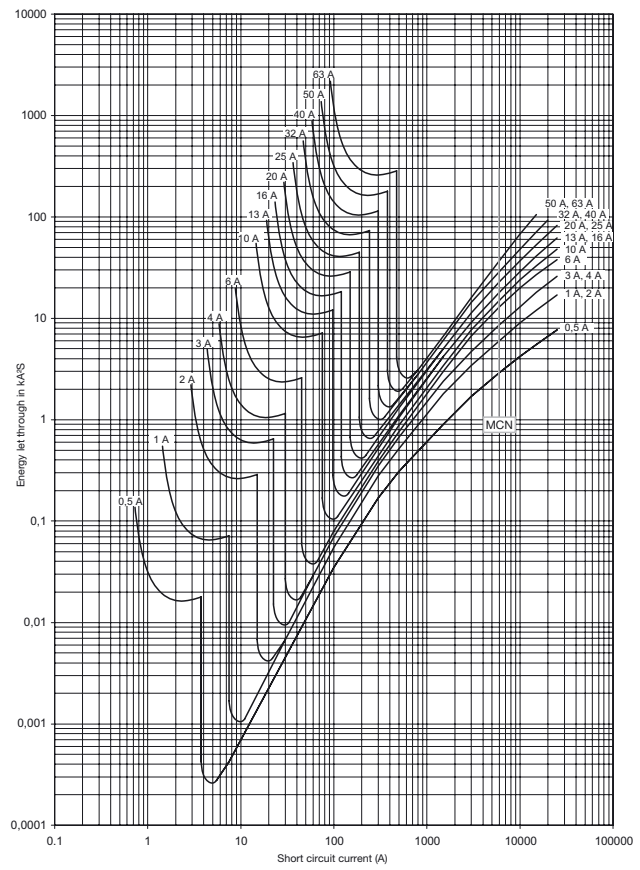




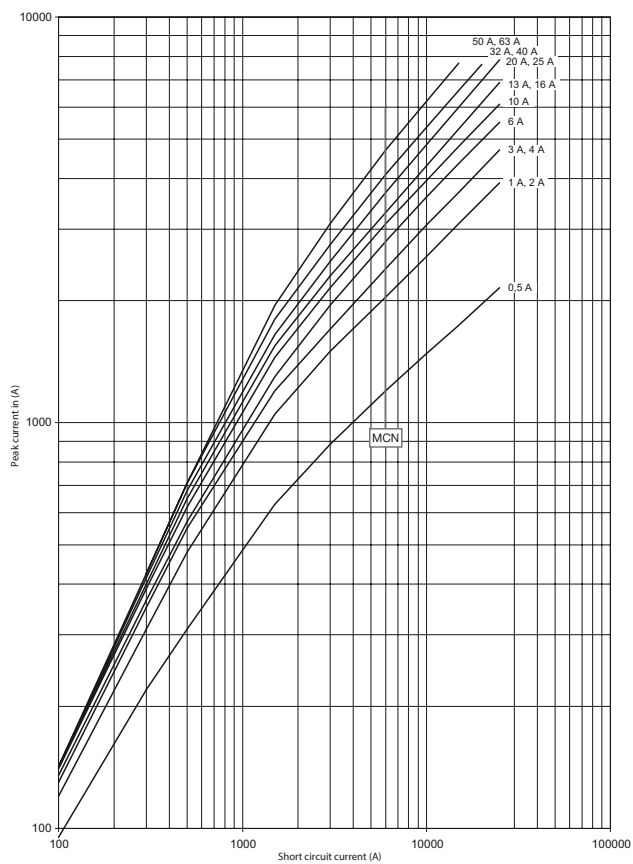
C curve (IEC 60898-1)



Energy let through at 400 V - IEC 60898

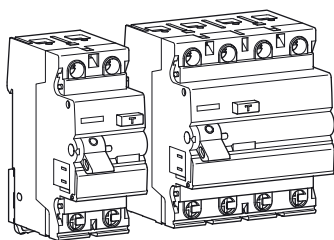


Current limiting at 400 V - IEC 60898

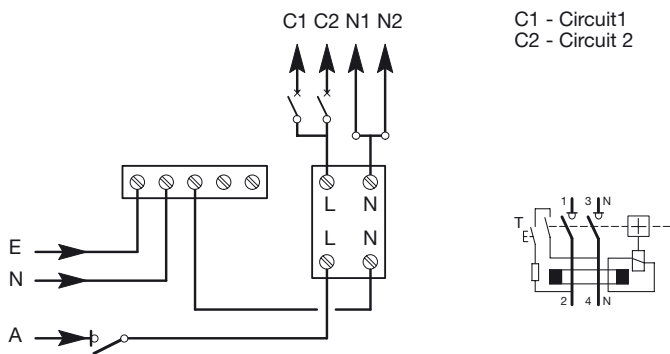


<b>References</b>	<b>CCCxxxJ</b> <b>CDCxxxJ</b> <b>CECxxxJ</b> <b>CFCxxxJ</b>	<b>CDxxxZ</b> <b>CExxxZ</b> <b>CFxxxZ</b>
	1P+N and 3P+N	
<b>Characteristics</b>		
residual current type	AC	
nominal rating I <sub>n</sub>	16A to 63A	80A and 100A
sensitivity	10mA - 30mA - 100mA - 300mA	30mA - 100mA - 300mA
storage temperature	-55°C to +70°C	
working temperature	-5°C to +40°C	
installation height	2000m max.	
front product labelling	yes	no
material	thermoplastic	
<b>Electrical characteristics</b>		
nominal voltage	240V (1P+N) 240V/415V (3P+N)	
degree of pollution	2	
protection index	IP20	
test button operating voltage	240V, +10%/-15% (2P) 240/415V, +10%/-15% (4P)	
rated impulse withstand current to wave 1.2/50µs	6.2kA at sea level	
peak withstand current to wave 8/20µs	250A (AC type)	
rated insulation voltage (U <sub>i</sub> )	500V according to IEC 61008-1	
rated impulse withstand voltage U <sub>imp</sub>	4kV	
rated frequency	50Hz	
breaking and opening capacity (I <sub>Δm</sub> =I <sub>m</sub> )	1500A	
rated conditional short-circuit current I <sub>nc</sub>	6kA	
number electrical endurance cycles	2000	
number mechanical endurance cycles	4000	
neutral position	right	
<b>Installation and connecting</b>		
bottom rail clip	plastic	metal
top rail clip	-	
fixing mode	DIN rail	
supply side	top or bottom	
cage clamp position	in line	
accept accessories	yes	
type of bottom supply	by cable	
type of top connection	with cable	
bottom terminal cover	option	
connection capacity	up to 16 mm <sup>2</sup> (flexible) up to 25 mm <sup>2</sup> (rigid)	up to 35 mm <sup>2</sup> (flexible) up to 50 mm <sup>2</sup> (rigid)
sealable	yes (OFF position only)	yes (OFF and ON position)
standard	IEC 61008-1	

## Safety switch (RCCBs), 20 - 40 - 63 A



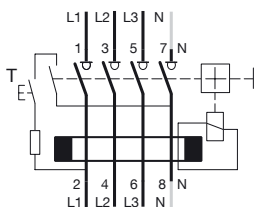
## Electrical connection - 2 poles, 20 - 40 - 63 A



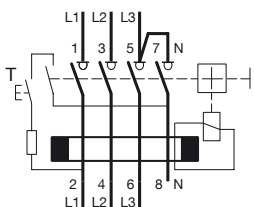
For a 2 pole 40A unit, where, for example, two power circuits are to be protected, the Hager neutral link KM03A may be connected to the N terminal for convenient splitting of the neutrals.

## Electrical connection - 4 poles, 20 - 40 - 63 A

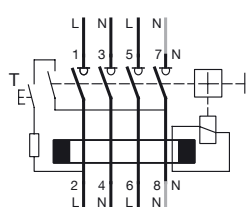
Three phase & neutral  
(unbalanced load)



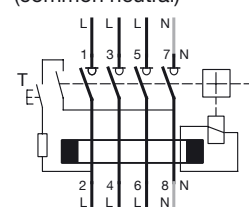
Three phase & neutral  
(balanced load)



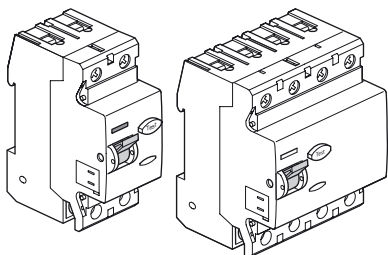
Single phase  
Two circuits



Single phase  
Three circuits  
(common neutral)

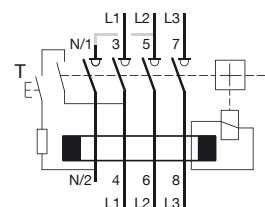
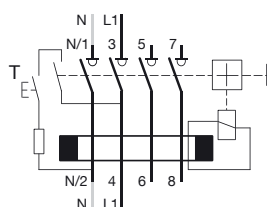
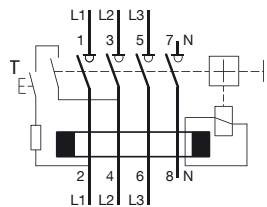
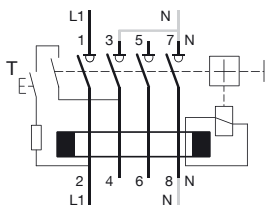


## Safety switch (RCCBs), 80 - 100 A

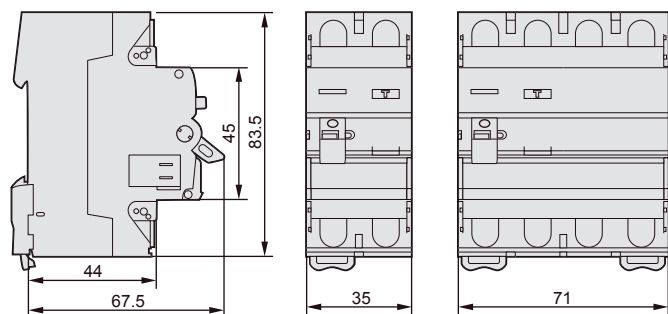


## Electrical connection - 4 poles, 80 - 100 A

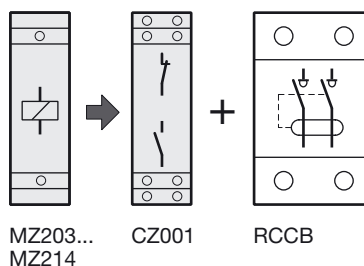
Three phase & neutral



## Dimensions (in mm)



## Auxiliary possibilities



References		<b>YZBxxx and YZCxxx</b>			
Number of poles		1P	2P	3P	4P
Width in 5		1	2	3	4
Rating current		6A - 10A - 16A - 20A - 25A - 32A - 40A - 50A - 63A			
Overvoltage category		3			
Standard		EN 60898-1			
<b>Electrical characteristics</b>					
Voltage rating in AC		240/415V 50/60Hz	415V 50/60Hz		
Tripping curve at 30°C		C	B		
AC thermal operation threshold - min/max	lth1	1.13 I <sub>n</sub>			
	lth2	1.45 I <sub>n</sub>			
AC thermal operation threshold - min/max	lrm1	5 I <sub>n</sub>	3 I <sub>n</sub>		
	lrm2	10 I <sub>n</sub>	5 I <sub>n</sub>		
Rated insulation voltage		500V			
Rated impulse withstand voltage		U <sub>imp</sub>	4kV		
Breaking capacity		I <sub>cn</sub>	6kA		
Electric endurance in number of cycles		10000 cycles			
Mechanical endurance in number of operations		20000 operations			
Operating temperature		-25°C to +60°C			
Storage temperature		-25°C to +80°C			
Calibration temperature		30°C			
Protection index		20			
<b>Connecting</b>					
Type of connection		screw			
Connection capacity with flexible cable		1 to 16 mm <sup>2</sup>			
Connection capacity with rigid cable		1 to 25 mm <sup>2</sup>			
Terminal torque		2.8 Nm			
<b>Installation</b>					
Mounting		DIN rail EN50.022-35			
Mounting position		installed vertically			
Accept accessories		no			
Supply		feed either top or bottom			
DIN clip type		bottom rail clip metal			
<b>Weight and dimensions</b>					
Weight	gr	118	226	338	475
Width	mm	17.4	35.2	52.8	70
Height	mm	85.1			
Length	mm	73.6			
Depth	mm	70			