Internal Arc Withstand

What is internal arc ?

Internal arc is composed of three main steps.
- Air ionization making it conductive.
- Explosion, creating a shock wave that can be lethal (=4kg of TNT).
- Projections of molten metal particles (easily reaching a temperature of 3000°C.)

Provide protection of people and equipments

- Intemal arc withstand, in compliance with the requirements of the international regulations (technical reports IEC 61641 Edition 3.0).
- Supply continuity limitation of harmful effects of the internal arc in the switchboard.
- Quick repair of the area where the arc was confined.
- Provide protection of people and equipment guaranteed during the occurrence of the fault.
- Insulated busbars reduce the risk of flashover and propagation of the arc.

How does an internal arc occur?

Internal arc occurs mainly when the insulation between two live parts does not any more fulfill the technical requirement(reduced distance, reduced dielectric strength).

The main origins of this reduced insulation are usually:
- faulty insulation or conductors overheating (insufficient section),
- bad protection by the circuit breaker,
- bad tightening of electrical connections,
- wear of the power sliding contacts,
- oxidation of connections between conductors,
- intrusion of animals in the switchboard (rat, snake, etc…),
- forgotten tools (used during maintenance or installation),
- presence of excessive moisture and/or dust in the switchboard,
- etc.

Performance

MB301M and MB401M performed 85KA/0.5s @690V according to internal arc standard IEC61641 Edition 3.0. Tests were done in horizontal and vertical busbar and also in the cable compartment of functional unit.

Characteristics

85kA – 0.5s @ 690V

Arcing class C

- Assembly providing personnel and ASSEMBLY protection under arcing conditions by arc tested zones conforming to arcing conditions with limited operation in IEC61641 Edition 3.0 Clause 8.7, criteria 1 to 7

Restricted access

- access to the location of the ASSEMBLY limited to authorized personnel only

Assembling internal arc column

In order to withstand the over pressure initiated by the 85kA arc fault, the enclosure shall be reinforced in order to satisfy the 7 criteria defined by IEC 61641 Edition 3.0, therein 5 criteria for people protection and 2 criteria for equipment protection.

For internal arc solution, the column should fulfill:
- IP22
- Form 4 for MB301M and for MB401M

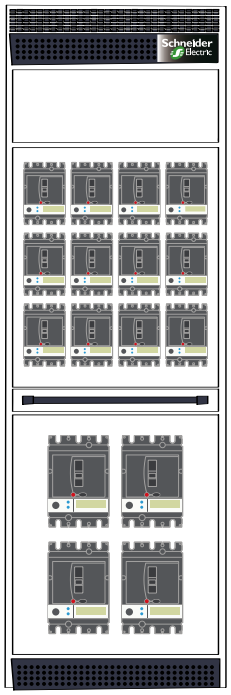
MB301M Rear Access Internal Arc Withstand

MB301M Rear Access Internal Arc Withstand B-2
Derating table B-2
Function Unit Masterpact B-5
Function Unit Compact NSX B-6
Framework B-9
Busbars B-13

Derating table

Derating table of Compact NSX for feeder

MBDD0162



Ambient temperature: 45ºC

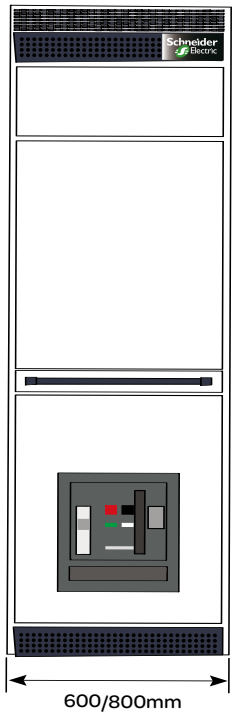
Circuit breaker	Current (A)		
	IP22	IP32	IP44
NSX100	75	75	75
NSX160	120	120	120
NSX250	180	180	180
NSX400	330	330	290
NSX630	430	430	420

Ambient temperature: 50ºC

Circuit breaker	Current (A)		
	IP22	IP32	IP44
NSX100	70	70	70
NSX160	120	115	115
NSX250	175	170	170
NSX400	295	290	285
NSX630	420	420	410

Derating table of Masterpact NT/MTZ1 for Feeder

MBDD0163



Ambient temperature: 45ºC

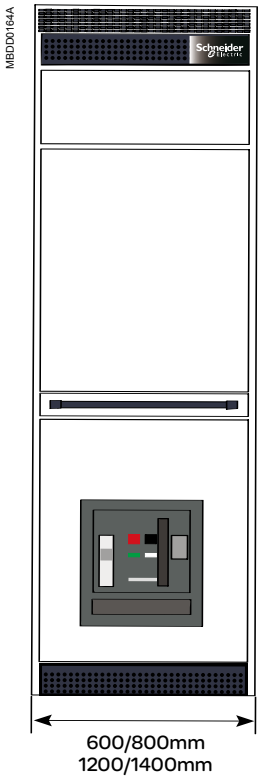
Circuit breaker	Current (A)		
	IP22	IP32	IP44
NT06/MTZ1 06	630	630	630
NT08/MTZ1 08	800	800	800
NT10/MTZ1 10	1000	1000	1000
NT12/MTZ1 12	1250	1250	1250
NT16/MTZ1 16	1360	1330	1300

Ambient temperature: 50ºC

Circuit breaker	Current (A)		
	IP22	IP32	IP44
NT06/MTZ1 06	630	630	630
NT08/MTZ1 08	800	800	800
NT10/MTZ1 10	1000	1000	1000
NT12/MTZ1 12	1250	1250	1250
NT16/MTZ1 16	1335	1300	1260

Derating table

Derating of Masterpact NW08-63/MTZ2 08-40/MTZ3 40-63 for feeder



Ambient temperature: 45ºC

Circuit breaker	Current (A)		
	IP22	IP32	IP44
NW08/MTZ2 08	735	710	700
NW10/MTZ2 10	920	885	870
NW12/MTZ2 12	1150	1105	1090
NW16/MTZ2 16	1330	1290	1260
NW20/MTZ2 20	1840	1790	1750
NW25/MTZ2 25	2020	1970	1920
NW32/MTZ2 32	2665	2600	2530
NW40/MTZ2 40	3080	3005	2930
NW40b/MTZ3 40	3575	3480	3400
NW50/MTZ3 50	4410	4295	4190
NW63/MTZ3 63	4805	4680	4570

Ambient temperature: 50ºC

Circuit breaker	Current (A)		
	IP22	IP32	IP44
NW08/MTZ2 08	705	680	670
NW10/MTZ2 10	885	850	840
NW12/MTZ2 12	1105	1065	1050
NW16/MTZ2 16	1285	1260	1220
NW20/MTZ2 20	1775	1730	1690
NW25/MTZ2 25	1955	1900	1860
NW32/MTZ2 32	2575	2515	2450
NW40/MTZ2 40	2975	2905	2830
NW40b/MTZ3 40	3460	3370	3290
NW50/MTZ3 50	4270	4160	4060
NW63/MTZ3 63	4650	4530	4420

Derating table

Derating table of 2xMasterpact NW40/ MTZ2 40 for feeder

Ambient temperature: 45°C

Bus tie solution	Current (A)		
	IP22	IP32	IP44
Double Horizontal Busbar bus tie with 2xNW40/2xMTZ2 40	6440	6285	6120

Ambient temperature: 50°C

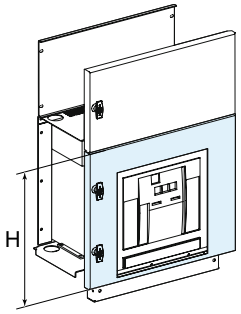
Bus tie solution	Current (A)		
	IP22	IP32	IP44
Double Horizontal Busbar bus tie with 2xNW40/2xMTZ2 40	6110	5945	5740

* For Incomer, refer to Part I: Blokset MB301M Rear access_ Funtional units derating table

Function Unit Masterpact

Front plate

MBDD0110



Device	H(Number of modules, 1M=50mm in height)
NT06-16/MTZ1 06-16	8M
NW08-32/MTZ2 08-32	10M
NW40/MTZ2 40	10M
NW40b-63/MTZ3 40-63	11M

For enclosure of width=500mm

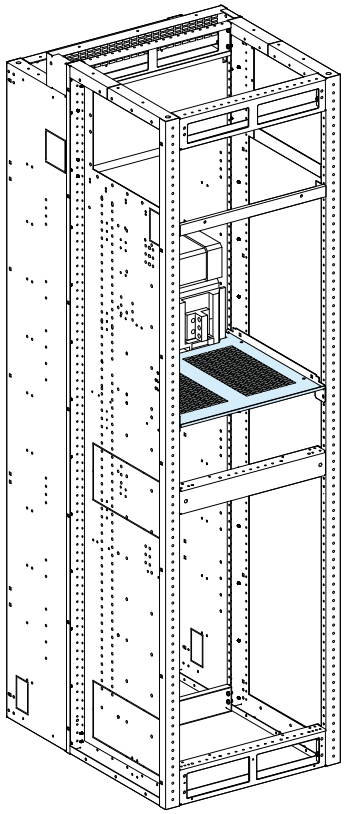
Circuit breaker	Front plate	Lock	Door stopper	Hinge	Door latch	Door's earthing
8M	NHA65975	2 x MB020004	HRB19276	2 x HRB19274	2 x HRB19273	07081

For enclosure of width=600mm

Circuit breaker	Front Door	Lock	Door stopper	Hinge	Door latch	Door's earthing
8M	PHA79479	2 x MB020004	HRB19276	2 x HRB19274	2 x HRB19273	07081
10M	PHA73117	3 x MB020004	HRB19276	3 x HRB19274	3 x HRB19273	07081
11M	PHA73113	3 x MB020004	HRB19276	3 x HRB19274	3 x HRB19273	07081

* Use polycarbonate sheet between incoming and outgoing bars of Masterpact, refer to drawing NHA37948

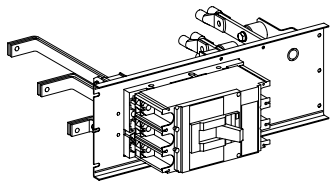
MBDD0181-00



* Other functional units and accessories related to Masterpact, Please refer to Part I: Blokset MB301M Rear access Function units Masterpact NT06-16/MTZ1 06-16, NW08-63/MTZ2 08-40/MTZ3 40-63.

Function Unit
Compact NSX

CDB500297



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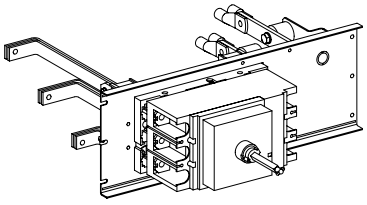
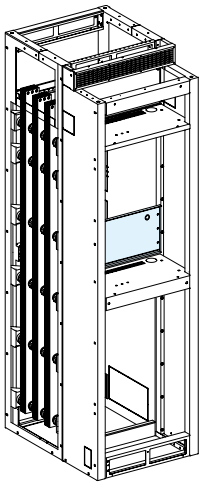


CDB500289



Horizontally installation

Function units

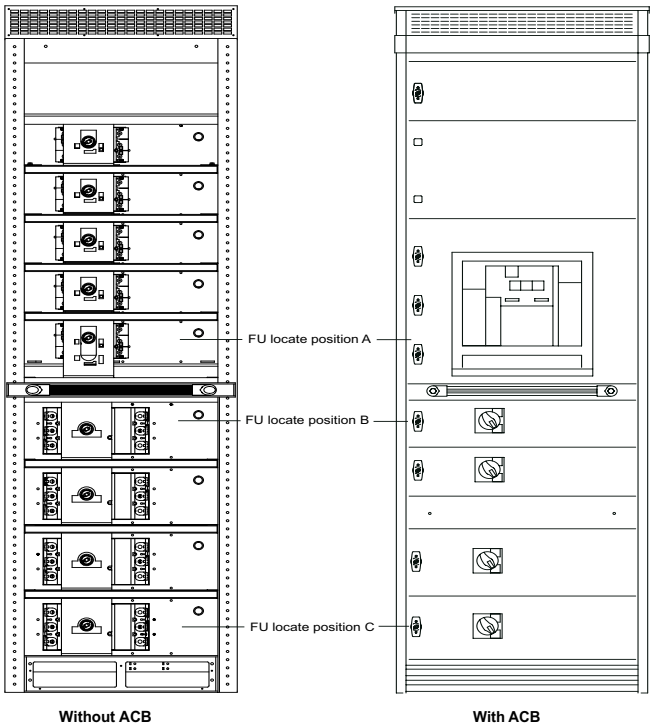
Circuit breaker	Modular	Mounting plate	Distribution bar	Insulator
NSX100/250	3	PHA45911(Position A) PHA46539(Position B) PHA45911(Position C) PHA46542(other position)	QGH35904	3 x 25278007
NSX400/630	4	PHA46545(position A) PHA45909(Position B) PHA46545(Position C) PHA45910(other position	QGH36317	3 x 25278007

Note:
(1) Epoxy painting is needed for incoming busbar of Compact NSX functional unit. Refer to Document: EAV7021700.
(2) It is mandatory to use rotary handle for close-door operation for Compact NSX functional unit for internal are withstand.

Spare space

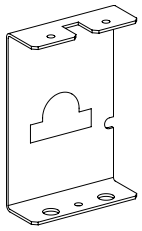
Module	Mounting plate
1M	QGH36776
2M	QGH36792
5M	QGH36794
16M	PHA79658

CDB500291



Function Unit
Compact NSX

CDB500290



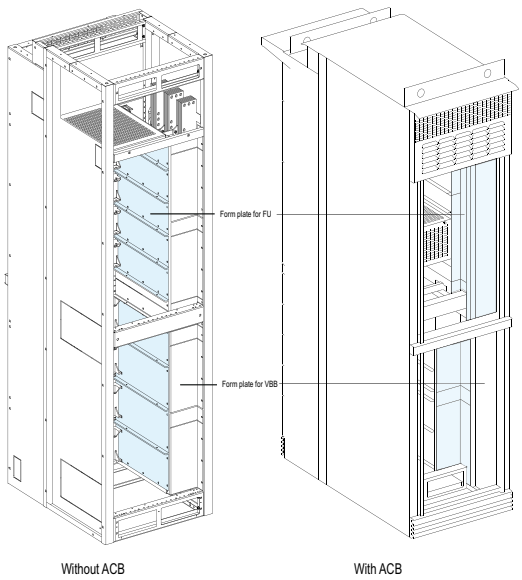
Front stopper (*Spare space don't need front stopper)

Position of FU	NSX100/250		NSX400/630	
	With ACB	Without ACB	With ACB	Without ACB
Position A	-	QGH36516	-	QGH36539
Position B	PHA46548	QGH36516	PHA45748	QGH36540
Position C	QGH36537	QGH36537	QGH36541	QGH36541
Other Position	QGH36538	QGH36538	QGH36539	QGH36539

Form plate for FU unit

Modular	Position A	Position B	Position C	Other Position
1M (Spare space)	PHA46552			
2M (Spare space)	QGH39029			
3M	QGH36543	QGH36543	PHA75142	QGH36543
4M	QGH36545	QGH36544	QGH36545	QGH36546
5M (Spare space)	QGH36883			
8M (Spare space)	PHA75140			
8M (Spare space)	PHA73182*(For half VBB,Replace it by PHA78115)			
10M (Spare space)	PHA73180*(For half VBB,Replace it by PHA78116)			

CDB500291

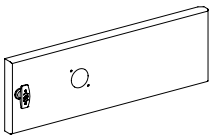


Form plate for VBB

	Full VBB		Half VBB	
	With ACB	Without ACB	With ACB	Without ACB
Single HBB	PHA45913	QGH36578	PHA45915	QGH36767
Double HBB	PHA45914	QGH36579	PHA45916	QGH36769

Function Unit
Compact NSX

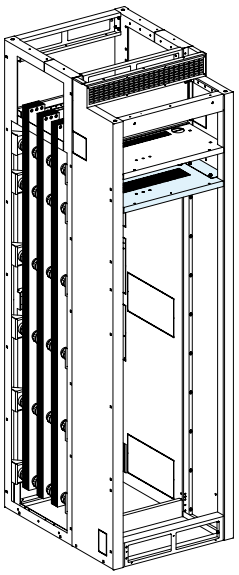
CDB500296



Front door

Module	Front Door	Lock	Door stopper	Hinge	Door latch	Door's earthing wire
1M (Spare space)	QGH37183	N/A	N/A	N/A	N/A	N/A
2M (Spare space)	QGH38686	N/A	N/A	N/A	N/A	N/A
3M	QGH35907	1 x MB02004	HRB20201	2x HRB19274	HRB19273	07081
4M	QGH35909	1 x MB02004	HRB20201	2x HRB19274	HRB19273	07081
5M (Spare space)	QGH38689	2 x MB02004	HRB20201	2x HRB19274	2x HRB19273	07081
16M(Spare Space)	NHA42924	3XMB02004	HRB19276	3XHRB19274	3XHRB19273	07081

CDB500293

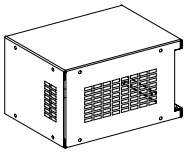


Form 3b

For NSX	QGH36548+PHA46557
For Spare Space	PHA79674*

** No need Form 3b when FU or spare space locate position A and C.*

CDB500295

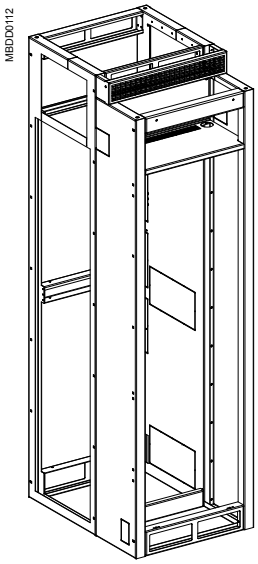


Form 4b (optional)

NSX100/250	QGH36550
NSX400/630	QGH36552

Framework

Main frame for feeder



Width 500mm

IP22		
Depth of cubicle	**Basic frame(D=800mm)**	**Rear extension(D=300mm)**
800mm	PHA81473	
1100mm	PHA81473	NHA66337
IP32		
Depth of cubicle	**Basic frame(D=800mm)**	**Rear extension(D=300mm)**
800mm	PHA81473+ NHA66288	
1100mm	PHA81473+ NHA66288	NHA66337
IP44		
Depth of cubicle	**Basic frame(D=800mm)**	**Rear extension(D=300mm)**
800mm	NHA66299	
1100mm	NHA66299	NHA66337

Width 600mm

IP22			
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**	**Rear extension (D=500mm)**
800mm	PHA81475		
1100mm	PHA81475	EVA88007	
1300mm	PHA81475		EVA88008
IP32			
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**	**Rear extension (D=500mm)**
800mm	PHA81475+NHA20216		
1100mm	PHA81475+NHA20216	EVA88007	
1300mm	PHA81475+NHA20216		EVA88008
IP44			
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**	**Rear extension (D=500mm)**
800mm	EAV87992		
1100mm	EAV87992	EAV88007	
1300mm	EAV87992		EAV88008

Width 800mm

IP22			
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**	**Rear extension (D=500mm)**
800mm	PHA81478		
1100mm	PHA81478	EAV88290	
1300mm	PHA81478		EAV88292
IP32			
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**	**Rear extension (D=500mm)**
800mm	PHA81478+NHA20222		
1100mm	PHA81478+NHA20222	EAV88290	
1300mm	PHA81478+NHA20222		EAV88292
IP44			
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**	**Rear extension (D=500mm)**
800mm	EAV88288		
1100mm	EAV88288	EAV88290	
1300mm	EAV88288		EAV88292

Main frame for Feeder

Width 1200mm

IP22			
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**	**Rear extension (D=500mm)**
1100mm	PHA81481	EAV88305	
1300mm	PHA81481		EAV88306
IP32			
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**	**Rear extension (D=500mm)**
1100mm	PHA81481+NHA20224	EAV88305	
1300mm	PHA81481+NHA20224		EAV88306
IP44			
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**	**Rear extension (D=500mm)**
1100mm	EAV88304	EAV88305	
1300mm	EAV88304		EAV88306

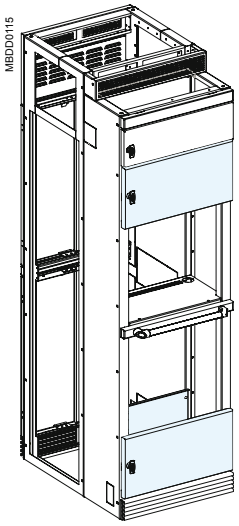
Width 1400mm

IP22		
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**
1100mm	PHA81485	EAV88308
IP32		
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**
1100mm	PHA81485+NHA20236	EAV88308
IP44		
Depth of cubicle	**Basic frame (D=800mm)**	**Rear extension (D=300mm)**
1100mm	EAV88310	EAV88308

* For Incomer Main frame, refer to Part I: Blokset MB301M Rear access_ Enclosures_Main Frame

Framework

Spare space

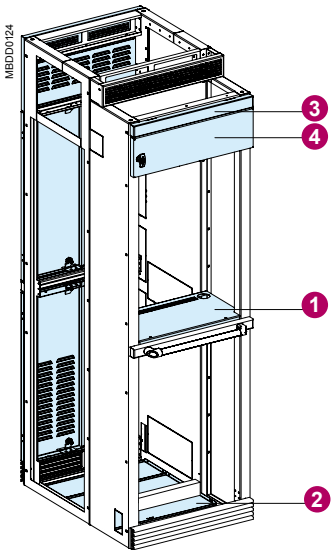


Front Door

Modular	Front Door	Lock	Door stopper	Hinge	Door Latch	Door's earthing wire
6M/8M (Spare Space)	NHA42923	2 x MB020004	HRB20201	2 x HRB19274	2 x HRB19273	07081
16M (Spare Space)	NHA42924	3 x MB020004	HRB19276	3 x HRB19274	3 x HRB19273	07081

Mounting Plate

Modular	Mounting Plate
6M(Spare Space)	PHA79642
8M(Spare Space)	PHA79653
16M(Spare Space)	PHA79658



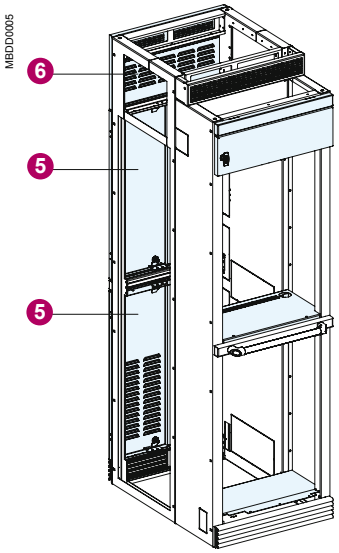
1. Front middle horizontal channel
2. Bottom plate
3. Front upper cover
4. Horizontal busbar compartment door

Horizontal busbar compartment door

Modular	Front Door	Lock	Door stopper	Hinge	Door Latch	Door's earthing wire
9M	PHA80411*	3XMB020004	HRB9276	3 x HRB19274	HRB19273	07081

** For W1400 use PHA80411+HRB21822*

Framework



5. Back door
6. Rear top cover

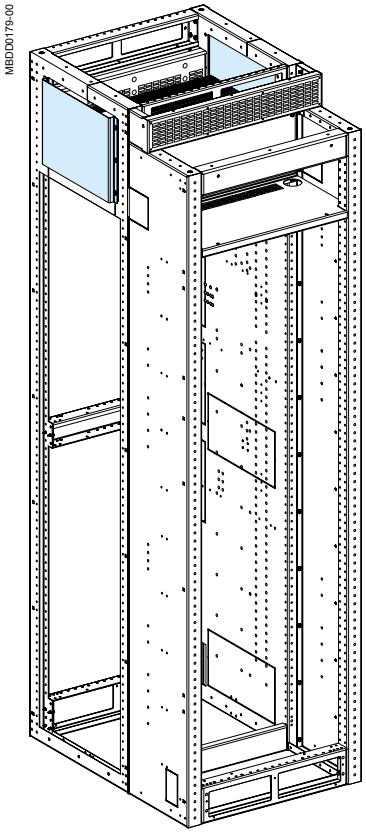
Back Door

Back Door	IP22	IP32	IP44
Incomer/Bustie Upper 16M	NHA42932		
Incomer/Bustie Lower 16M	PHA35474	PhA35474+PhA46157	NHA42932
Feeder Upper 16M	NHA42932		
Feeder Lower 16M	NHA42932		

Supplementary Plate

Back Door	IP22
Position B	PHA73639*
Position C	QGH36776

** Only for Mix solution*



Reinforcement at end of Horizontal Busbar

	End	Reinforcement
Single HBB	Left Side	NHA42938
	Right Side	NHA42939
Double HBB	Left Side	2*NHA42938
	Right Side	2*NHA42939

** Other related to Enclosure, Refer to the Part I: Blokset MB301M Rear access_ Enclosures*

Busbars

Admissible current in full vertical busbar

Table 2.4: admissible current (A) for bare copper in accordance with IEC61439-1

Size/Phase (bare copper)	IP22					IP32					IP44					Max.Icw (kA 1s)
	Ambient temperature					Ambient temperature					Ambient temperature					
	30°C	35°C	40°C	45°C	50°C	30°C	35°C	40°C	45°C	50°C	30°C	35°C	40°C	45°C	50°C	
1bx63x5	835	815	795	765	745	830	805	785	755	735	820	800	780	750	730	30
2bx63x5	1450	1405	1365	1325	1275	1435	1395	1355	1315	1265	1420	1380	1340	1300	1250	50/65
1bx80x5	1040	1010	980	950	915	1030	1000	970	940	910	1020	990	960	930	900	30/50/65
2bx80x5	1765	1715	1660	1615	1560	1750	1700	1650	1605	1545	1730	1680	1630	1587	1530	50/65/85
3bx80x5	2250	2190	2120	2060	1985	2235	2170	2100	2040	1970	2210	2150	2080	2020	1950	50/65/85
4bx80x5	2640	2570	2490	2405	2325	2595	2545	2465	2385	2305	2590	2520	2440	2360	2280	50/65/85
5bx80x5	2915	2835	2750	2660	2570	2890	2810	2730	2640	2545	2860	2780	2700	2610	2520	50/65/85
6bx80x5	3150	3060	2980	2875	2785	3125	3035	2950	2850	2760	3090	3000	2920	2820	2730	50/65/85

Admissible current in half vertical busbar

Table 2.4: admissible current (A) for bare copper in accordance with IEC61439-1

Size/Phase (bare copper)	IP22					IP32					IP44					Max.Icw (kA 1s)
	Ambient temperature					Ambient temperature					Ambient temperature					
	30°C	35°C	40°C	45°C	50°C	30°C	35°C	40°C	45°C	50°C	30°C	35°C	40°C	45°C	50°C	
1bx63x5	880	850	825	800	775	855	830	805	785	750	830	800	780	760	730	30
2bx63x5	1515	1470	1425	1380	1335	1475	1430	1385	1345	1300	1430	1390	1340	1300	1260	50/65
1bx80x5	1080	1050	1020	985	955	1050	1020	990	960	930	1020	990	960	930	900	30/50/65
2bx80x5	1845	1790	1740	1675	1625	1795	1745	1690	1630	1580	1740	1690	1640	1580	1530	50/65/85
3bx80x5	2345	2280	2210	2140	2070	2280	2220	2150	2085	2010	2210	2150	2080	2020	1950	50/65/85
4bx80x5	2775	2700	2615	2530	2445	2700	2625	2540	2460	2380	2620	2550	2470	2390	2310	50/65/85

** Other related to busbars refer to Part I: Blokset MB301M Rear access_Busbars*

MB301M Front Access Internal Arc Withstand