

General characteristics of MasterPact NW DC - DC PV

MasterPact NW10 to NW40 DC

PB104917.eps



NW10 DC 3P.

PB105024_42.eps



NW10 DC 4P.

A

MasterPact NW DC circuit breaker

Poles coupling version	C or D (3 poles)
	E (4 poles)

Electrical characteristics as per IEC 60947-1/ 60947-2 and EN 60947-1 / 60947-2

Rated current at 40 °C / 50 °C ^[1]	I_n	(A)
Rated insulation voltage	U_i	(V)
Rated impulse withstand voltage	U_{imp}	(kV peak)
Rated operational voltage	U_e	(V DC)

Type of circuit breaker

Ultimate breaking capacity	L/R = 5 ms	I_{cu}	(kA)	V DC	500
					750
					900
	L/R = 15 ms	I_{cu}			500
					750
					900
	L/R = 30 ms	I_{cu}			500
					750
					900

Service breaking capacity	I_{cs}	% I _{cu}
Rated making capacity	I_{cm}	% I _{cu}
Short-time withstand current	I_{cw}	1 s
Utilisation category		
Breaking time		(ms)
Making time		(ms)
Suitability for isolation		
Pollution degree (as per IEC 60664-1)		

Protection against overcurrents (see trip-unit table page D-12)

Trip units	Built-in
Protection	Overloads
	Short-circuits

Durability

(O/C cycles)	Mechanical	With maintenance	
		Without maintenance	
	Electrical	Without maintenance	500 V DC
			900 V DC

Indication and control auxiliaries

Auxiliary contacts	
Voltage release	MX shunt release
	MN undervoltage release

Switch-disconnector as per IEC 60947-3 and EN 60947-3

Type of switch-disconnector

Rated making capacity	I_{cm}	(kA)
Rated short-time withstand current	I_{cw}	(kA) 1 s

Unprotected circuit breaker (500 V DC only)

Tripping by shunt trip as per IEC 60947-2

Type of unprotected circuit breaker

Ultimate breaking capacity	L/R = 6.5 ms	I_{cu}	(kA)	500 V DC
Short-time withstand current		I_{cw}	(kA)	1 s
Ultimate breaking capacity	L/R = 15 ms	I_{cu}	(kA)	500 V DC
Short-time withstand current		I_{cw}	(kA)	1 s
Service breaking capacity		I_{cs}	% I _{cu}	

Overload and short-circuit protection

External protection relay: short-circuit protection, maximum delay: 500 ms

Installation and connections

Connection	Drawout	3P	RC	Horizontal
		4P		Vertical
Fixed		3P	RC	Horizontal
		4P		Vertical

Dimensions and weight

Dimensions H x W x D (mm) connected in series	Drawout	3P
		4P
	Fixed	3P
		4P
Weight (kg) connected in series (approximate values)	Drawout	3P
		4P
	Fixed	3P
		4P

[1] 50 °C - see the derating table for the NW40 DC.

General characteristics of MasterPact NW DC - DC PV

MasterPact NW10 to NW40 DC



NW10 DC		NW20 DC		NW40 DC	
<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	
<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	
1000		2000		4000	
1000		1000		1000	
12		12		12	
500/900		500/900		500/900	
N	H	N	H	N	H
85	100	85	100	85	100
-	85	-	85	-	85
-	85	-	85	-	85
35	85	35	85	35	85
-	50	-	50	-	50
-	35	-	35	-	35
25	50	25	50	25	50
-	50	-	50	-	50
-	25	-	25	-	25
100 %					
100 %					
50	85	50	85	50	85
B					
30 to 75					
< 70					
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4					
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-	-	-	-	-	-
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20000					
10000					
8500		5000		2000	
-	2000	-	2000	-	1000
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-	HA	-	HA	-	HA
-	85	-	85	-	85
-	85	-	85	-	85

NW10 HADC-C 500V DC		NW20 HADC-C 500V DC		NW40 HADC-C 500V DC	
85		85		85	
85		85		85	
65		65		65	
65		65		65	
100 %					
-		-		-	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	-	-
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	-	-
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
439 x 441 x 494				439 x 441 x 594	
439 x 556 x 494				439 x 556 x 594	
352 x 422 x 427				352 x 422 x 527	
352 x 537 x 427				352 x 537 x 527	
90 to 116					
125 to 146					
60 to 86					
85 to 106					

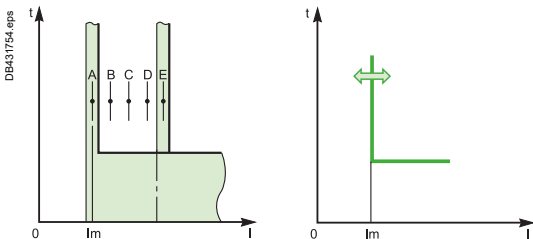
Trip-unit characteristics

Trip units for MasterPact NW DC

All MasterPact NW DC devices are equipped with a MicroLogic 1.0 DC control unit.

A

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Magnetic pick-up value.

Protection using the MicroLogic 1.0 DC control unit

MasterPact NW DC circuit breakers use MicroLogic 1.0 DC control units. These interchangeable units with instantaneous thresholds, operating with electromagnetic sensors, can be adjusted on site.

The circuit breakers can be used with the three versions of sensors, defined by their setting range.

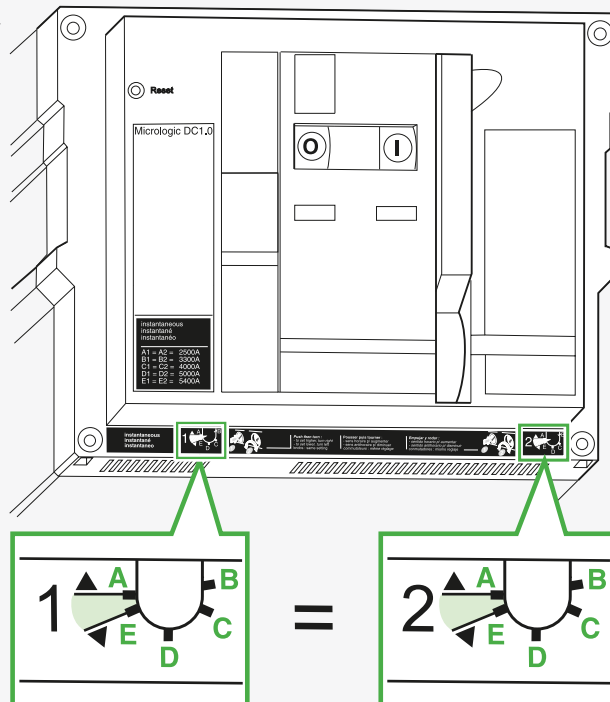
Type of sensor	1250/2500 A	2500/5400 A	5000/11000 A
MasterPact NW10 DC	●	●	●
MasterPact NW20 DC	-	●	●
MasterPact NW40 DC	-	-	●

Adjustments

Settings for MasterPact NW DC circuit breakers may be accessed from the front, with the switchboard door open.

- Settings are made for the input (+ pole) and the output (- pole).
- The setting range comprises eleven positions, plus five preferential settings marked **A, B, C, D** and **E**.
- The setting values for the two corresponding sensors must be identical.

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Two identical settings.

Setting values for magnetic pick-up I_m
 Settings marked A, B, C, D and E

Sensor versions	Minimum				Maximum
	Settings A1 and A2	Settings B1 and B2	Settings C1 and C2	Settings D1 and D2	Settings E1 and E2
1250/2500	1250 A	1500 A	1600 A	2000 A	2500 A
2500/5400	2500 A	3300 A	4000 A	5000 A	5400 A
5000/11000	5000 A	8000 A	10000 A	11000 A	11000 A
Tolerances	±8 %	±10 %	±10 %	±10 %	±10 %

instantaneous
 instantané
 instantaneo :

A₁ = A₂ = 2500A
B₁ = B₂ = 3300A
C₁ = C₂ = 4000A
D₁ = D₂ = 5000A
E₁ = E₂ = 5400A

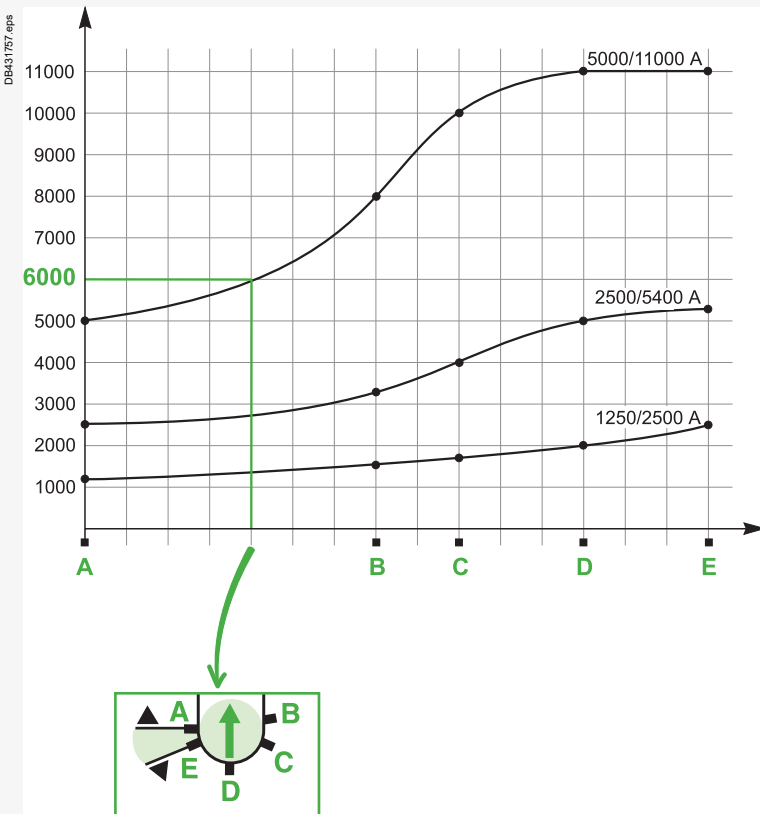
DB431756.eps

instantaneous
 instantané
 instantaneo :

A₁ = A₂ = 5000A
B₁ = B₂ = 8000A
C₁ = C₂ = 10000A
D₁ = D₂ = 11000A
E₁ = E₂ = 11000A

Intermediate settings

It is possible to set eleven other (unmarked) intermediate values.



Switch-disconnectors for PV application

MasterPact NW HADCD-PV

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MasterPact NW20 HADCD-PV.

A

DB416372.eps

Masterpact
NW20 HADCD-PV

Ui 1000V Uimp 12kV
 Ue 1000 V \Rightarrow 3P in series
 Icw 85kA/1s
 Icm 85kA

IEC 60947-3

 Ith 2000A 55°C


Ue (V) Ie (A)
 DC22A 1000 2000

MasterPact NW20 HADCD-PV rating plate.

DB416460.eps

Masterpact
NW40 HADCD-PV

Ui 1000V Uimp 12kV
 Ue 1000 V \Rightarrow 3P in series
 Icw 85kA/1s
 Icm 85kA

IEC 60947-3

 Ith 4000A 45°C

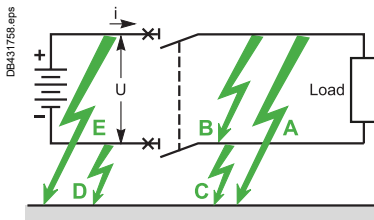
Ue (V) Ie (A)
 DC22A 1000 4000

MasterPact NW40 HADCD-PV rating plate.

MasterPact NW HADCD-PV switch-disconnectors for PV application		NW20 HADCD-PV	NW40 HADCD-PV		
Poles coupling version	D (3 poles)	○	○		
Electrical characteristics as per IEC 60947-1 / 60947-3 and EN 60947-1 / 60947-3					
Rated current at 40/45 °C	In (A)	2000	4000		
Rated insulation voltage	Ui (V)	1000	1000		
Rated impulse withstand voltage	Uimp (kV peak)	12	12		
Rated operational voltage	Ue (V DC)	1000 [1]	1000 [1]		
Switch-disconnector as per IEC 60947-3 and EN 60947-3					
Rated making capacity	Icm (kA)	85	85		
Rated short-time withstand current	Icw (kA/1 s)	85	85		
Utilization category		DC-22A	DC-22A		
Durability					
(O/C cycles)	Mechanical with maintenance	20000	20000		
	without maintenance	10000	10000		
	Electrical without maintenance	2000	1000		
	1000 V DC L/R = 2 ms				
Installation and connections					
Connection	Fixed	rear connections	Vertical	○	○
			Horizontal	○	-
Drawout	rear connections		Vertical	○	○
			Horizontal	○	-
Dimensions and weight					
Dimensions	Fixed	3P	352 x 422 x 427	352 x 422 x 527	
H x W x D (mm) with the series connection	Drawout	3P	439 x 441 x 494	439 x 441 x 594	
Weight (kg)	Fixed	3P	60 to 86		
with the series connection (approximate values)	Drawout	3P	90 to 116		

All the accessories of the standard NW HADC switch-disconnectors can be used.

[1] NW HADCD-PV switch-disconnectors for PV applications are designed and qualified to break the rated or the fault current under 1000 V DC with all the 3 poles in series and this is a mandatory condition whatever the type of fault. This comes to say that the PV systems using these switch-disconnectors must be isolated systems from the earth and that the double fault situation (A and D or C and E on the diagram below) must be absolutely avoided : insulation monitoring devices shall detect the first fault and the staff shall look for this first fault and clear it with no delay. These switch-disconnectors cannot be used in grounded systems as in this situation they may be expected to break the current under the full voltage (1000 V DC) with only 1 pole or 2 poles in series. These devices are not designed for that purpose and could sustain irremediable damage if used to break in these conditions.



Isolated system.

General characteristics of MasterPact NW DC - DC PV

MasterPact NW DC and DC PV

Altitude

At altitudes higher than 2000 metres, the modifications in the ambient air (electrical resistance, cooling capacity) lower the following characteristics as follows:

Altitude (m)	2000	3000	4000	5000	
NW DC					
Impulse withstand voltage U_{imp} (kV)	12	10.6	9.5	8.4	
Rated insulation voltage (U_i)	1000	900	800	700	
Maximum rated operationnal voltage 50/60 Hz U_e (V)	NW DC ≤ 500 V	500	450	390	350
	NW DC 500-900 V	900	800	700	630
Rated current (A) at 40 °C	1 x I_n	0.98 x I_n	0.96 x I_n	0.94 x I_n	
NW DC PV					
Impulse withstand voltage U_{imp} (kV)	12	10.6	9.5	8.4	
Rated insulation voltage (U_i)	1000	1000	950	850	
Maximum rated operationnal DC voltage	1000	1000	950	850	
Rated current (A) at 40 °C	1 x I_n	0.98 x I_n	0.96 x I_n	0.94 x I_n	

Intermediate values may be obtained by interpolation.

Electromagnetic disturbances

MasterPact NW DC devices are protected against:

- overvoltages caused by devices that generate electromagnetic disturbances
- overvoltages caused by atmospheric disturbances or by a distribution-system outage (e.g. failure of a lighting system)
- devices emitting radio waves (radios, walkie-talkies, radar, etc.)
- electrostatic discharges produced by users.

MasterPact NW DC devices have successfully passed the electromagnetic-compatibility tests (EMC) defined by the following international standards:

- IEC 60947-2, appendix F
- IEC 60947-2, appendix B (trip units with earth-leakage function).

The above tests guarantee that:

- no nuisance tripping occurs
- tripping times are respected.

Degree of protection

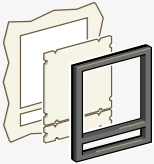
MasterPact NW DC circuit breakers offer the following protection characteristics depending on the installation conditions:

- IP: degree of protection (standard IEC 60529)
- IK: protection against external mechanical impacts (standard EN 50102).

MasterPact NW DC

Circuit breaker installed in a switchboard

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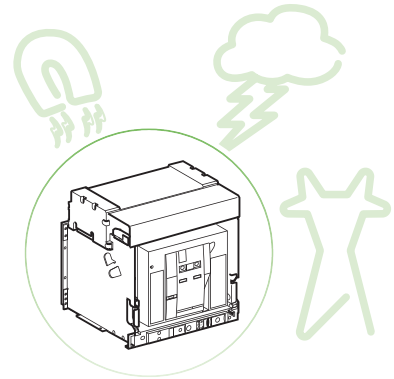
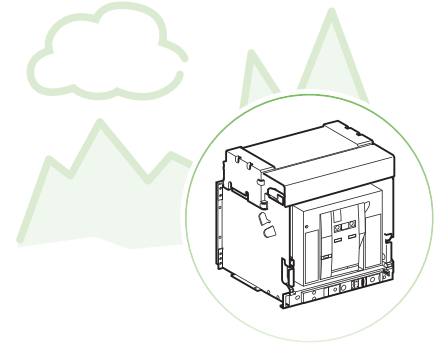


Bare circuit breaker	IP30	
Escutcheon (CDP) for fixed and drawout versions, with blanking plate	IP40	IK07

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Transparent cover (CCP) for escutcheon for drawout version	IP54	IK10
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MasterPact NW10 to NW40 DC - DC PV

Temperature derating - Power dissipation and input/output resistance

Temperature derating

The table below indicates the maximum current rating, for each connection type, as a function of the ambient temperature around the circuit breaker and the busbars. For ambient temperatures greater than 60 °C, consult us.

Ti: temperature around the circuit breaker and its connections.

Version	Drawout device										Fixed device															
	Rear horizontal					Rear vertical					Rear horizontal					Rear vertical										
temp. Ti	40	45	50	55	60	40	45	50	55	60	40	45	50	55	60	40	45	50	55	60						
NW DC																										
NW10	Version C	1000					1000					1000					1000									
	Version D	1000					1000					1000					1000									
	Version E	1000					1000					1000					1000									
NW20	Version C	2000					2000					2000					2000									
	Version D	2000					2000					2000					2000									
	Version E	2000					2000					2000					2000									
NW40	Version C	-					4000					-					4000									
	Version D	-					4000					3900 3750 3600					-					4000				
	Version E	-					4000					3800 3650 3500					-					4000				
NW DC PV																										
NW20	Version D	2000					2000					2000					2000									
NW40	Version D	-					4000					3900 3750 3600					-					4000				

Power dissipation and input/output resistance

Total power dissipation is the value measured at IN, for a 3 pole (version C, D ^[1]) or 4 pole (version E) breaker (values above the power $P = 3RI^2$).

[1] DC PV version D only.

Version	Drawout device			Fixed device		
	Power dissipation (Watt)			Power dissipation (Watt)		
Version	C	D	E	C	D	E
NW10 DC	45	75	105	25	40	60
NW20 DC	135	230	330	90	160	235
NW40 DC	460	800	1150	360	580	850

Version	Drawout device	Fixed device
	Power dissipation (Watt)	Power dissipation (Watt)
Version	D	D
NW20 HADCD-PV	230	160
NW40 HADCD-PV	800	580

Selection guide for DC circuit breakers

Solutions depending on the distribution system and the voltage

Series connection of poles

Type of distribution system				
Type	Earthed		Mid-point connected to earth	Isolated
Source	One polarity (negative here) connected to earth (or exposed conductive parts)		Mid-point connected to earth	Isolated polarities
Protected polarities	1 (disconnection of 1P)	2 (disconnection of 2P)	2	2
Diagrams (and types of faults)				
Selection of circuit breaker and connection				
24 V ≤ Un ≤ 50 V				
NSX100-600 250 V < Un ≤ 500 V				
NSX100-500 500 V < Un ≤ 750 V				
MasterPact NW DC				
Type N 24 V ≤ Un ≤ 500 V				
Type H 24 V ≤ Un ≤ 500 V				
500 V < Un ≤ 750 V				
750 V < Un ≤ 900 V				

[1] A 3P circuit breaker can be used if a 2P version does not exist. In this case, the central pole is not connected.
 [2] ComPact NSX DC circuit breakers (and switch disconnectors) are designed to break the rated current or fault current at the rated operational voltage (Ue) with all poles. To break the current at voltage > 500 V, three poles in series are required. In double earth fault situations (A + D or C + E), the circuit breaker (and Switch disconnectors) must break the current at full voltage with only half of the poles. ComPact NSX DC circuit breakers (and Switch disconnectors) are not designed for this purpose and could sustain irremediable damage if used to break the current in a double earth fault situation for voltage > 500 V.

Great flexibility in adapting to DC applications

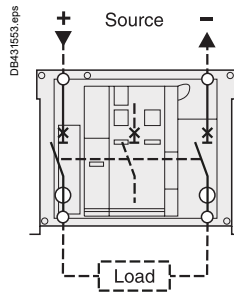
Overview of series connection of poles for MasterPact NW DC

MasterPact NW DC circuit breakers, with high ratings and installed as incoming devices, offer three coupling versions C, D and E ready for connection. The polarities "Line -", "Line +" indicated on the rear connections of the MasterPact NW DC circuit breakers have to be respected in order to ensure the magnetic threshold tolerances.

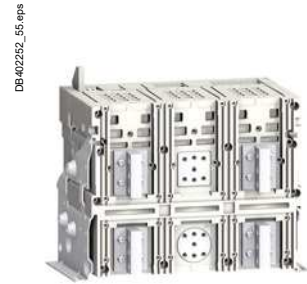
MasterPact NW DC

Three versions supplied ready for connection

Version C

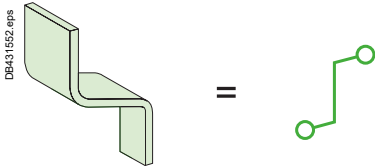


Front view: three-pole case - two poles in series.

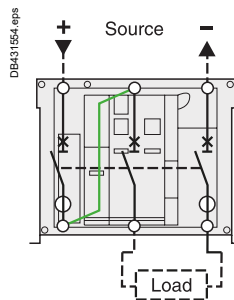


Rear view.

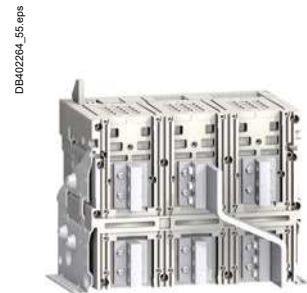
The safe prefabricated series connections are factory made due to the power ratings. They also dissipate heat.



Version D

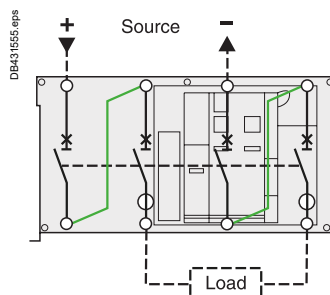


Front view: three-pole case - three poles in series.



Rear view with connections.

Version E



Front view: four-pole case - four poles in series.



Rear view with connections.