

**DISTRIBUTION**

Air Circuit Breakers

# DW Series



# DW series ACB

**The standard for power circuit breakers around the world.**

Over the years, other major manufacturers have tried to keep up by developing products incorporating DW's most innovative features, including the breaking principle, modular design and the use of composite materials.

In addition to the traditional features of power circuit breakers (withdrawability, discrimination and low maintenance), DW ranges offer built-in communications and metering functions, all in optimised frame sizes.

DW incorporate the latest technology to enhance both performance and safety. Easy to install, with user-friendly, intuitive operation and environment-friendly design, DW are, quite simply, circuit breakers of their time.



# Covering all your applications

**DW meets the needs of all types of LV electrical distribution networks.**

## Building

Hotels  
Hospitals  
Offices  
Retail



## Data Centres and Networks

## Industry

Mining and minerals  
Automotive  
Food and beverage  
Chemical industry



## Energy and Infrastructures

Airports  
Oil and gas  
Water  
Electrical energy  
Marine



## An answer to specific applications

- Corrosion protection
- Earthing switches
- Automatic transfer switching equipment (ATSE) for emergency power systems
- High electrical endurance applications: DW series is a high performance device offering high breaking capacity (Icu: 50 kA/480 V) and a high level of discrimination, all in a small volume.

## All standards

DW is compliant with international standards IEC 60947-1 and 2, IEC 68230 for type 2 tropicalisation.

## One family and two frame sizes

- DW series, in two frame sizes, one from 800 to 4000 A and the other from 4000 A to 6300 A.

## 2 performance levels

- H1 - for industrial sites with high short-circuit levels or installations with two parallel-connected transformers.
- H2 - high-performance for heavy industry where very high short-circuits can occur.

# 2 sizes



DW 800 to 4000 A



DW 4000 to 6300 A

		DW08	DW10	DW12	DW16	DW20	DW25	DW32	DW40
H2	100kA	■	■	■	■	■	■	■	■
H1	65kA	■	■	■	■	■	■	■	■

		DW40b	DW50	DW63
H2	150kA	■	■	■
H1	100kA	■	■	■

# Optimised volumes and ease of installation

Aiming at standardising electrical switchboards at a time when installations are increasingly complex, DW provides an unequalled simplicity, both concerning choice and installation.

## Maximum security

The arc chutes absorb the energy released during breaking, thus limiting the stresses exerted on the installation. They filter and cool the gases produced, reducing effects perceptible from the outside.

## Optimised volumes

Up to 4000 A, DW circuit breakers are all the same size, From 4000 A to 6300 A, there is just one size.

## Standardisation of the switchboard

With optimised sizes, DW ranges simplify the design of switchboards and standardise the installation of devices:

- three connection layouts:
  - one from 800 to 3200 A
  - one for 4000 A
  - one up to 6300 A
- horizontal or vertical rear connections can be modified on-site by turning the connectors 90° or they can even be replaced by front connection terminals.
- identical connection terminals for the fixed or draw-out version for each rating.
- front connection requires little space because the connectors not increase the depth of the device.



## Practical installation solutions

The DW range further improves the installation solutions that have built the success of its predecessors:

- incoming connection to top or bottom terminals
- no safety clearance required
- connection:
  - horizontal or vertical rear connection
  - front connection with minimum extra space
  - mixed front and rear connections
- 115 mm pole pitch on all versions
- no derating up to 55 °C and 4000 A.



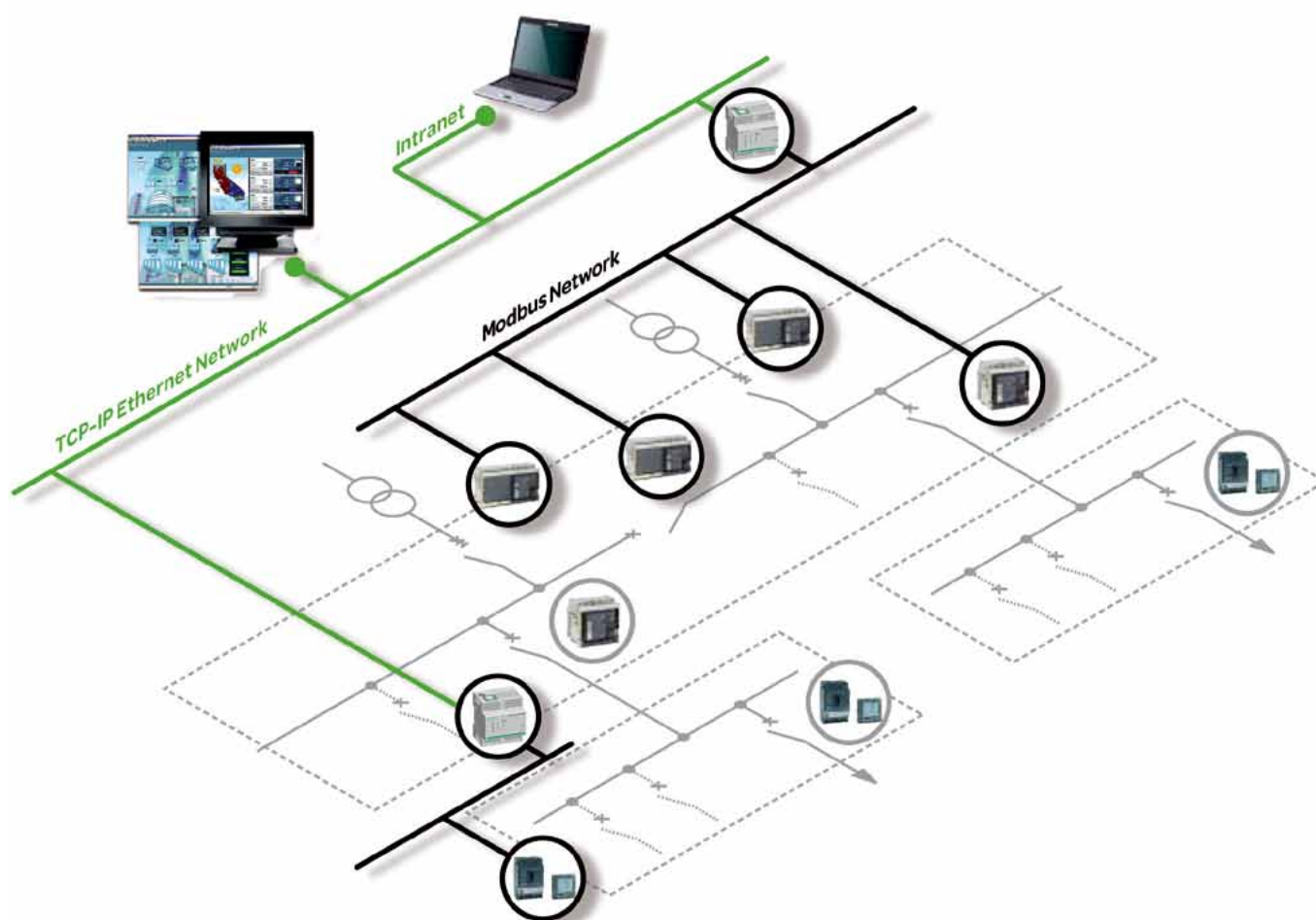
### Compliance with environmental requirements

The materials used for DW are not potentially dangerous to the environment and are marked to facilitate sorting for recycling.

Production facilities are non-polluting in compliance with the ISO 14001 standard.

# Monitoring and protecting your low voltage network

DW can be integrated in a general supervision system to optimise your electrical installation.



## Control units

All DW are equipped with an electronic control unit that offers a complete set of protections and state of the art measurements.

## Ensuring safety at any time

All DW circuit breakers are equipped with an electronic control unit that offers all types of current and advanced protection, measurement and communication. Protection functions are separated from the measurement functions and are managed by an ASIC electronic component. This independence guarantees immunity from conducted or radiated disturbances and ensures the highest degree of reliability.

## Maximising continuity of service

Because a LV power supply interruption is unacceptable especially in critical power applications, an automatic system is required for LV transfer switching. For your peace of mind, DW enables automatic control and management of power sources in your low voltage distribution network guaranteeing the hi-reliability of your installation.

**Measurement functions are controlled by an additional microprocessor.**

Protection functions are electronically managed independently of measurement functions.

An ASIC (Application-Specific Integrated Circuit) is common to all trip units, which boosts immunity to conducted or radiated interference and increases reliability.

## Presentation

This overview describes all the functions offered by DW devices. The two product families have identical functions implemented using the same or different components depending on the case.



## General overview

### Detailed contents

#### Specifications

page 12

- Ratings: 800 to 6300 A.
- Circuit breakers type H1, H2.
- 3 or 4 poles.
- Fixed or drawout versions.
- Protection derating.

#### Control units

page 16

##### Ammeter A and Energy E

- 2.0 basic protection
- 5.0 selective protection
- 6.0 selective + earth-fault protection
- 7.0<sup>(1)</sup> selective + earth-leakage protection

##### Power meter P

- 5.0 selective protection
- 6.0 selective + earth-fault protection
- 7.0 selective + earth-leakage protection

##### Harmonic meter H

- 5.0 selective protection
- 6.0 selective + earth-fault protection
- 7.0 selective + earth-leakage protection
- External sensor for earth-fault protection.
- Rectangular sensor for earth-leakage protection.
- Setting options (long-time rating plug):
  - low setting 0.4 to 0.8 x I<sub>r</sub>
  - high setting 0.8 to 1 x I<sub>r</sub>
  - without long-time protection.
- External power-supply module.
- Battery module.

(1) Only for ammeter A.

#### Operating assistance

page 29

Integration of measurement functions provides operators with operating assistance functions including alarms tripped by user-selected measurement values, time-stamped event tables and histories, and maintenance indicators.

#### Communication

page 33

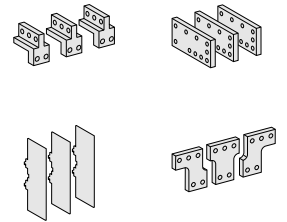
- COM option in DW.
- DW in a communication network.



## Connections

page 40

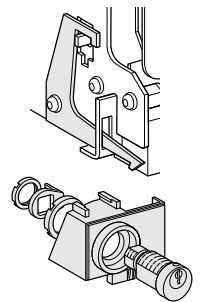
- Rear connection (horizontal or vertical).
- Front connection.
- Mixed connections.
- Optional accessories:
  - bare-cable connectors and connector shields
  - terminal shields
  - vertical-connection adapters
  - cable-lug adapters
  - interphase barriers
  - spreaders
  - disconnectable front-connection adapter
  - safety shutters, shutter locking blocks, shutter position indication and locking.



## Locking

page 42

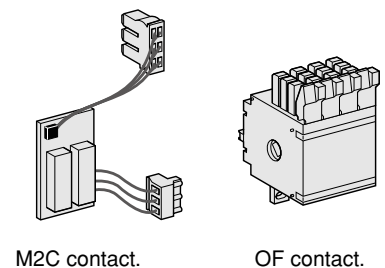
- Pushbutton locking by padlockable transparent cover.
- OFF-position locking by padlock or keylock.
- Chassis locking in disconnected position by keylock.
- Chassis locking in connected, disconnected and test positions.
- Door interlock (inhibits door opening with breaker in connected position).
- Racking interlock (inhibits racking with door open).
- Racking interlock between crank and OFF pushbutton.
- Automatic spring discharge before breaker removal.
- Mismatch protection.



## Indication contacts

page 44

- Standard or low-level contacts:
  - ON/OFF indication (OF)
  - "fault trip" indication (SDE)
  - carriage switches for connected (CE) disconnected (CD) and test (CT) positions.
- Programmable contacts:
  - 2 contacts (M2C)
  - 6 contacts (M6C).



M2C contact.

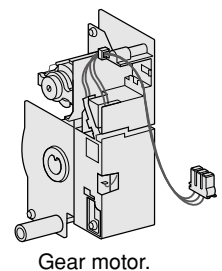
OF contact.



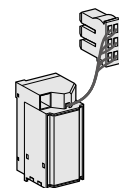
## Remote operation

page 46

- Remote ON/OFF:
  - gear motor
  - XF closing or MX opening voltage releases
  - PF ready-to-close contact
 options:
  - RAR automatic or RES electrical remote reset
  - BPF electrical closing pushbutton.
- Remote tripping function:
  - MN voltage release
    - standard
    - adjustable or non-adjustable delay
  - or second MX voltage release.



Gear motor.



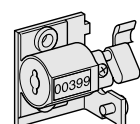
MX, XF and MN voltage releases.



## Accessories

page 50

- Auxiliary terminal shield.
- Operation counter.
- Escutcheon.
- Transparent cover for escutcheon.
- Escutcheon blanking plate.



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- Follow the regulations of industrial wastes when the product is to be discarded.
- For further questions, please contact your Fuji sales representative or Fuji Electric FA.

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# Air Circuit Breakers

## DW series

### Functions and characteristics

#### ■ Specifications

##### Selection criteria

	DW	
	Standard applications	
	DW08...DW40	
	H1	H2
Type of application	Circuit breaker for industrial sites with high short-circuit currents	High-performance circuit breaker for heavy industry with high short-circuit currents
Icu/Ics at 440 V	65 kA	100 kA
Position of neutral	Left or right	Left or right
Fixed	F	F
Drawout	D	D
Switch-disconnector version	Yes	Yes
Front connection	Yes up to 3200 A	Yes up to 3200 A
Rear connection	Yes	Yes
Type of Intelligent control unit	A, E, P, H	A, E, P, H

# Air Circuit Breakers DW series Functions and characteristics

## DW08 to DW63 installation characteristics

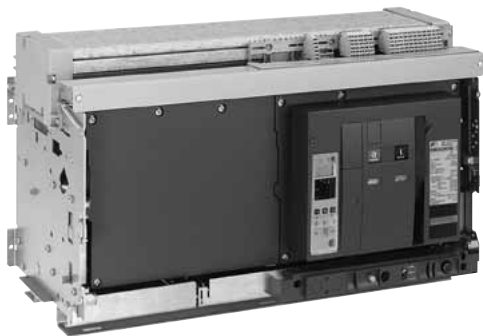
Circuit breaker		DW08, DW10, DW12, DW16		DW20		DW25, DW32, DW40		DW40b, DW50, DW63	
Type		H1	H2	H1	H2	H1	H2	H1	H2
Connection									
Drawout	FC	●	●	●	●	● <sup>(1)</sup>	● <sup>(1)</sup>	-	-
	RC		●	●	●	●	●	●	●
Fixed	FC	●	●	●	●	● <sup>(1)</sup>	● <sup>(1)</sup>	-	-
	RC	●	●	●	●	●	●	●	●
Dimensions (mm) H x W x D									
Drawout	3P	439 x 441 x 395						479 x 786 x 395	
	4P	439 x 556 x 395						479 x 1016 x 395	
Fixed	3P	352 x 422 x 297						352 x 767 x 297	
	4P	352 x 537 x 297						352 x 997 x 297	
Mass (kg) (approximate)									
Drawout	3P/4P	90/120						225/300	
Fixed	3P/4P	50/65						120/160	

Note: (1) Except 4000.


# Air Circuit Breakers

## DW series

### Functions and characteristics



#### Common characteristics

Number of poles		3/4
Rated insulation voltage (V)	<b>Ui</b>	1000   1250 for H10, HA10
Impulse withstand voltage (kV)	<b>Uimp</b>	12   12
Rated operational voltage (V AC 50/60 Hz)	<b>Ue</b>	690   1150 for H10, HA10
Suitability for isolation	IEC 60947-2	
Degree of pollution	IEC 60664-1	4 (1000 V) / 3 (1250 V)

#### Basic circuit-breaker

##### Circuit-breaker as per IEC 60947-2

Rated current (A)		at 40 °C / 50 °C <sup>(1)</sup>
Rating of 4th pole (A)		
Sensor ratings (A)		

##### Type of circuit breaker

Ultimate breaking capacity (kA rms) V AC 50/60 Hz	<b>Icu</b>	220/415/440 V 525 V 690 V 1150 V
Rated service breaking capacity (kA rms)	<b>Ics</b>	% Icu

##### Utilisation category

Rated short-time withstand current (kA rms) V AC 50/60 Hz	<b>Icw</b>	1 s 3 s
--	------------	------------

##### Integrated instantaneous protection (kA peak ±10 %)

Rated making capacity (kA peak) V AC 50/60 Hz	<b>Icm</b>	220/415/440 V 525 V 690 V 1150 V
--	------------	---

##### Break time (ms) between tripping order and arc extinction

##### Closing time (ms)

#### Mechanical and electrical durability as per IEC 60947-2/3 at In/Ie

Service life	Mechanical	with maintenance
C/O cycles x 1000		without maintenance

##### Type of circuit breaker

<b>Rated current</b>		<b>In (A)</b>	
C/O cycles x 1000	Electrical	without maintenance	440 V <sup>(2)</sup> 690 V 1150 V
IE C 60947-2			

##### Type of circuit breaker

<b>Rated operational current</b>		<b>Ie (A)</b>	<b>AC23A</b>
C/O cycles x 1000	Electrical	without maintenance	440 V <sup>(2)</sup> 690 V
IEC 60947-3			

##### Type of circuit breaker

<b>Rated operational current</b>		<b>Ie (A)</b>	<b>AC3 <sup>(3)</sup></b>
Motor power			380/415 V (kW) 440 V <sup>(2)</sup> (kW) 690 V (kW)

C/O cycles x 1000	Electrical	without maintenance	440/690 V <sup>(2)</sup>
IEC 60947-3 Annex M/IEC 60947-4-1			

Note: (1) 50 °C: rear vertical connected. Refer to temperature derating tables for other connection types.

(2) Available for 480 V NEMA.

(3) Suitable for motor control (direct-on-line starting).

(4) The use of DW08 to DW20 H1 in IT systems is limited to 500 V network voltage.

# Air Circuit Breakers DW series Functions and characteristics

## Sensor selection

Sensor rating (A)	400	630	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
Ir threshold setting(A)	160 to 400	250 to 630	320 to 800	400 to 1000	500 to 1250	630 to 1600	800 to 2000	1000 to 2500	1250 to 3200	1600 to 4000	2000 to 5000	2500 to 6300

	DW08	DW10	DW12	DW16	DW20	DW25	DW32	DW40	DW40b	DW50	DW63
	800	1000	1250	1600	2000	2500	3200	4000	4000	5000	6300
	800	1000	1250	1600	2000	2500	3200	4000	4000	5000	6300
	400 to 800	400 to 1000	630 to 1250	800 to 1600	1000 to 2000	1250 to 2500	1600 to 3200	2000 to 4000	2000 to 4000	2500 to 5000	3200 to 6300
	H1 <sup>(4)</sup>	H2			H1 <sup>(4)</sup> H2	H1	H2		H1	H2	
	65	100			65 100	65	100		100	150	
	65	85			65 85	65	85		100	130	
	65	85			65 85	65	85		100	100	
	-	-			-	-	-		-	-	
	100 %				100%	100 %			100 %		
	B				B	B			B		
	65	85			65 85	65	85		100	100	
	36	50			36 75	65	75		100	100	
	-	190			- 190	-	190		-	270	
	143	220			143 220	143	220		220	330	
	143	187			143 187	143	187		220	286	
	143	187			143 187	143	187		220	220	
	-	-			-	-	-		-	-	
	25	25			25 25	25	25		25	25	
	< 70				< 70	< 70			< 80		
	25				20				10		
	12.5				10				5		
	<b>H1/H2</b>				<b>H1/H2</b>	<b>H1/H2</b>			<b>H1</b>	<b>H2</b>	
	<b>800/1000/1250/1600</b>				<b>2000</b>	<b>2500/3200/4000</b>			<b>4000b/5000/6300</b>		
	10				8	5			1.5	1.5	
	10				6	2.5			1.5	1.5	
	-				-	-			-	-	
	<b>H1/H2</b>				<b>H1/H2</b>	<b>H1/H2</b>			<b>H1/H2</b>		
	<b>800/1000/1250/1600</b>				<b>2000</b>	<b>2500/3200/4000</b>			<b>4000b/5000/6300</b>		
	10				8	5			1.5		
	10				6	2.5			1.5		
	<b>H1/H2</b>				<b>H1/H2</b>						
	<b>800</b>	<b>1000</b>	<b>1250</b>	<b>1600</b>	<b>2000</b>						
	335 to 450	450 to 560	560 to 670	670 to 900	900 to 1150						
	400 to 500	500 to 630	500 to 800	800 to 1000	1000 to 1300						
	≤ 800	800 to 1000	1000 to 1250	1250 to 1600	1600 to 2000						
	6										

# Air Circuit Breakers

## DW series

### Functions and characteristics

#### ■ Control units

All DW circuit breakers are equipped with a Intelligent control unit that can be changed on site. Control units are designed to protect Power circuits and loads. Alarms may be programmed for remote indications. Measurements of current, voltage, frequency, power and power quality optimise continuity of service and energy management.

#### Unit name codes

**2.0 E**  
X Y Z

#### X: type of protection

- 2 for basic protection
- 5 for selective protection
- 6 for selective + earth-fault protection
- 7 for selective + earth-leakage protection.

#### Y: control-unit generation

Identification of the control-unit generation. "0" signifies the first generation.

#### Z: type of measurement

- A for "ammeter"
- E for "energy"
- P for "power meter"
- H for "harmonic meter".



#### Dependability

Integration of protection functions in an ASIC electronic component used in all Intelligent control units guarantees a high degree of reliability and immunity to conducted or radiated disturbances. On Unit A, E, P and H control units, advanced functions are managed by an independent microprocessor.

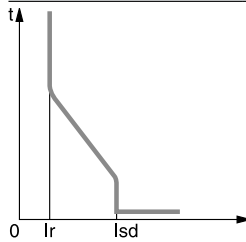
#### Accessories

Certain functions require the addition of Intelligent control unit accessories, described on page 31.

The rules governing the various possible combinations can be found in the documentation accessible via the Products and services menu of the [www.schneider-electric.com](http://www.schneider-electric.com) web site.

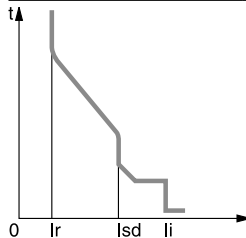
#### Current protection

##### Unit 2: basic protection



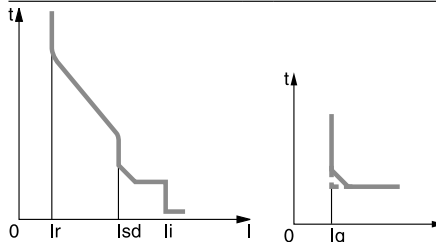
**Protection:**  
long time  
+ instantaneous

##### Unit 5: selective protection



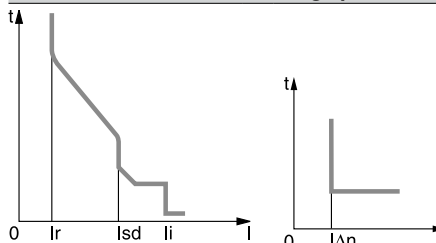
**Protection:**  
long time  
+ short time  
+ instantaneous

##### Unit 6: selective + earth-fault protection



**Protection:**  
long time  
+ short time  
+ instantaneous  
+ earth fault

##### Unit 7: selective + earth-leakage protection



**Protection:**  
long time  
+ short time  
+ instantaneous  
+ earth leakage up to 3200A



# Air Circuit Breakers DW series Functions and characteristics

## Measurements and programmable protection

### A: ammeter

- $I_1, I_2, I_3, N, I_{\text{earth-fault}}, I_{\text{earth-leakage}}$  and maximeter for these measurements
- fault indications
- settings in amperes and in seconds.

### E: Energy
















- incorporates all the rms measurements of Unit A, plus voltage, power factor, power and energy metering measurements
- calculates the current demand value
- "Quickview" function for the automatic cyclical display of the most useful values (as standard or by selection).

### P: A + power meter + programmable protection

- measurements of V, A, W, VAR, VA, Wh, VARh, VAh, Hz,  $V_{\text{peak}}, A_{\text{peak}}$ , power factor and maximeters and minimeters
- IDMTL long-time protection, minimum and maximum voltage and frequency, voltage and current imbalance, phase sequence, reverse power
- load shedding and reconnection depending on power or current
- measurements of interrupted currents, differentiated fault indications, maintenance indications, event histories and time-stamping, etc.

### H: P + harmonics

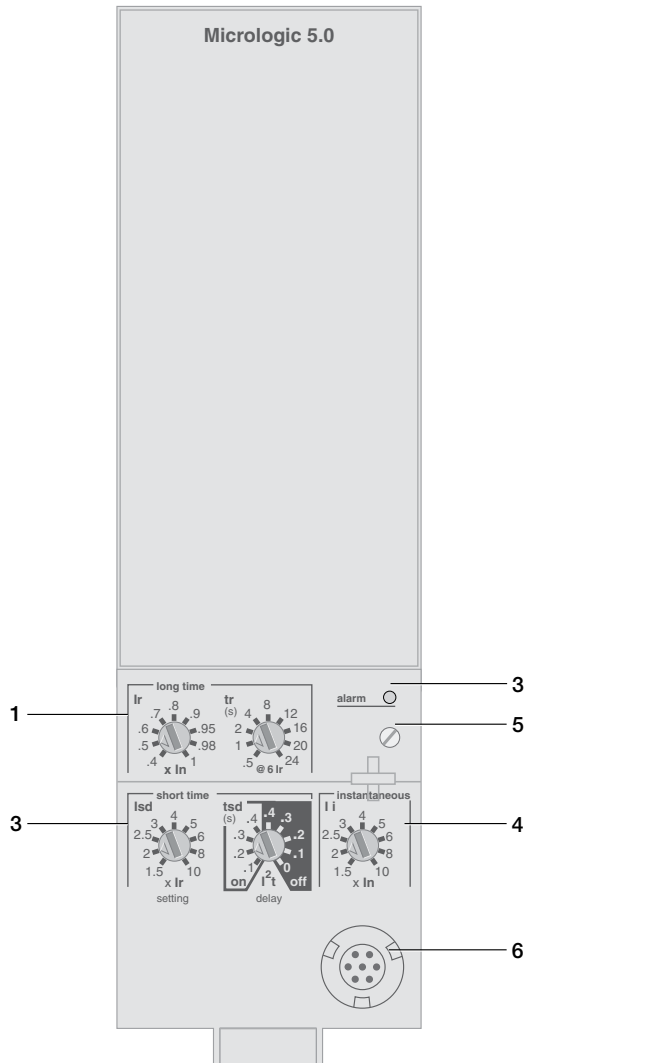
- power quality: fundamentals, distortion, amplitude and phase of harmonics up to the 31st order
- waveform capture after fault, alarm or on request
- enhanced alarm programming: thresholds and actions.

2.0		2.0 A		2.0 E					
5.0		5.0 A		5.0 E		5.0 P		5.0 H	
		6.0 A		6.0 E		6.0 P		6.0 H	
		7.0 A				7.0 P		7.0 H	

# Air Circuit Breakers

## DW series

### Functions and characteristics



- 1 Long-time threshold and tripping delay
- 2 Overload alarm (LED)
- 3 Short-time threshold and tripping delay (control unit 2.0 has no time delay dial switch: fixed at instantaneous protection)
- 4 Instantaneous trip threshold (control unit 2.0 has no dial)
- 5 Long-time rating plug screw
- 6 Test connector

Note: This product comes with a transparent lead-seal cover as standard.

#### Protection only

Control units 2.0/5.0 protect the main circuit. Control unit 5.0 can perform time co-ordination during a short circuit incident.

#### Protection

The dial can set up the trip current and time delay.

#### Overload protection

Adjust true effective value for long-time delay protection. Thermal memory: Stores thermal images before and after tripping.

The long-time optional rating plug enables you to set up a current in smaller increments in a narrow range. The OFF plug enables you to cancel the overload protection for long-time delay.

#### Short circuit protection

Short-time and instantaneous delay protection.

Possible to select definite or inverse time ( $I^2t$  OFF or ON) as the short-time delay characteristics.

#### Neutral protection

A three-pole circuit breaker cannot protect a neutral pole. For neutral pole protection, a four-pole circuit breaker can select none (4P3D), 50% (3D+N/2), or full (4P4D) by using a change-over switch.

#### Display

The LED on the front can indicate overload (by default). When the current exceeds a long-time trip threshold, the LED lights up.

#### Test

Connect a mini or portable test kit to the test connector to confirm the circuit breaker operation after mounting a control unit or accessory.

## Ammeter A

Unit A control units measure the true (rms) value of currents. They provide continuous current measurements from 0.2 to 1.2  $I_n$  and are accurate to within 1.5 % (including the sensors). A digital LCD screen continuously displays the most heavily loaded phase ( $I_{max}$ ) or displays the  $I_1$ ,  $I_2$ ,  $I_3$ ,  $I_N$ ,  $I_g$ ,  $I_{\Delta n}$ , stored-current (maximeter) and setting values by successively pressing the navigation button. The optional external power supply makes it possible to display currents  $< 20\%$   $I_n$ . Below 0.1  $I_n$ , measurements are not significant. Between 0.1 and 0.2  $I_n$ , accuracy changes linearly from 4 % to 1.5 %.

### Communication option

In conjunction with the COM communication option, the control unit transmits the following:

- settings
- all "ammeter" measurements
- tripping causes
- maximeter readings.

### Protection

Protection thresholds and delays are set using the adjustment dials.

#### Overload protection

True rms long-time protection. Thermal memory: thermal image before and after tripping. Setting accuracy may be enhanced by limiting the setting range using a different long-time rating plug. Overload protection can be cancelled using a specific LT rating plug "Off".

#### Short-circuit protection

Short-time (rms) and instantaneous protection.

Selection of  $I^2t$  type (ON or OFF) for short-time delay.

#### Earth-fault protection

Residual or source ground return earth fault protection.

Selection of  $I^2t$  type (ON or OFF) for delay.

#### Residual earth-leakage protection (Vigi).

Operation without an external power supply.

⊔ Protected against nuisance tripping.

⊔ DC-component withstand class A up to 10 A.

#### Neutral protection

On three-pole circuit breakers, neutral protection is not possible.

On four-pole circuit breakers, neutral protection may be set using a three-position switch: neutral unprotected (4P 3d), neutral protection at 0.5  $I_r$  (4P 3d + N/2), neutral protection at  $I_r$  (4P 4d).

#### Zone selective interlocking (ZSI)

A ZSI terminal block may be used to interconnect a number of control units to provide total discrimination for short-time and earth-fault protection, without a delay before tripping.

#### Overload alarm

A yellow alarm LED goes on when the current exceeds the long-time trip threshold.

#### Fault indications

LEDs indicate the type of fault:

- overload (long-time protection  $I_r$ )
- short-circuit (short-time  $I_{sd}$  or instantaneous  $I_i$  protection)
- earth fault or earth leakage ( $I_g$  or  $I_{\Delta n}$ )
- internal fault ( $A_p$ ).

#### Battery power

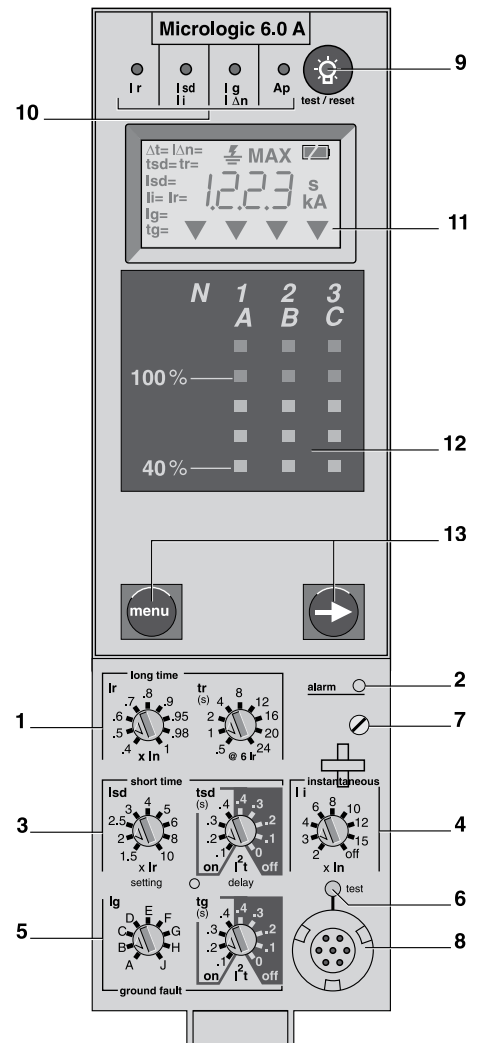
The fault indication LEDs remain on until the test/reset button is pressed. Under normal operating conditions, the battery supplying the LEDs has a service life of approximately 10 years.

#### Test

A mini test kit or a portable test kit may be connected to the test connector on the front to check circuit-breaker operation. For Unit 6.0 A and 7.0 A control units, the operation of earth-fault or earth-leakage protection can be checked by pressing the test button located above the test connector.

Unit A control units protect power circuits.

They also offer measurements, display, communication and current maximeters. Version 6 provides earth-fault protection, version 7 provides earth-leakage protection.



- 1 long-time threshold and tripping delay
- 2 overload alarm (LED) at 1,125  $I_r$
- 3 short-time pick-up and tripping delay
- 4 instantaneous pick-up
- 5 earth-leakage or earth-fault pick-up and tripping delay
- 6 earth-leakage or earth-fault test button
- 7 long-time rating plug screw
- 8 test connector
- 9 lamp test, reset and battery test
- 10 indication of tripping cause
- 11 digital display
- 12 three-phase bargraph and ammeter
- 13 navigation buttons

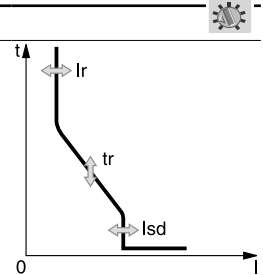
Note: Unit A control units come with a transparent lead-seal cover as standard.

# Air Circuit Breakers

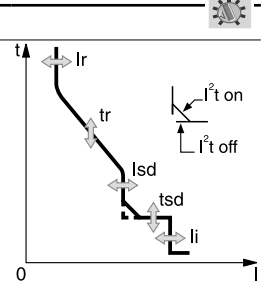
## DW series

### Functions and characteristics

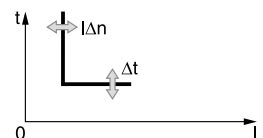
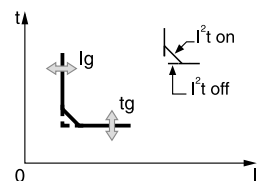
Protection		Unit 2.0 A											
<b>Long time</b>													
Current setting (A)		0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.98	1			
Tripping between 1.05 and 1.20 x Ir		Other ranges or disable by changing long-time rating plug											
Time setting		<b>tr (s)</b>											
Time delay (s)		1.5 x Ir	12.5	25	50	100	200	300	400	500	600		
	Accuracy: 0 to -30 %	6 x Ir	0.7 <sup>(1)</sup>	1	2	4	8	12	16	20	24		
	Accuracy: 0 to -20 %	7.2 x Ir	0.7 <sup>(2)</sup>	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6		
Thermal memory		20 minutes before and after tripping											
Note:		(1) 0 to -40 % - (2) 0 to -60 %											
<b>Instantaneous</b>													
Pick-up (A)	<b>Isd = Ir x ...</b>	1.5	2	2.5	3	4	5	6	8	10			
Accuracy: ±10 %													
Time delay		Max resettable time: 20 ms Max break time: 80 ms											



Protection		Unit 5.0 / 6.0 / 7.0 A											
<b>Long time</b>													
Current setting (A)	<b>Ir = In x ...</b>	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.98	1			
Tripping between 1.05 and 1.20 x Ir		Other ranges or disable by changing long-time rating plug											
Time setting		<b>tr (s)</b>											
Time delay (s)		1.5 x Ir	12.5	25	50	100	200	300	400	500	600		
	Accuracy: 0 to -30 %	6 x Ir	0.7 <sup>(1)</sup>	1	2	4	8	12	16	20	24		
	Accuracy: 0 to -20 %	7.2 x Ir	0.7 <sup>(2)</sup>	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6		
Thermal memory		20 minutes before and after tripping											
Note:		(1) 0 to -40 % - (2) 0 to -60 %											
<b>Short time</b>													
Pick-up (A)	<b>Isd = Ir x ...</b>	1.5	2	2.5	3	4	5	6	8	10			
Accuracy: ±10 %													
Time setting tsd (s)	Settings	I <sup>2</sup> t Off	0	0.1	0.2	0.3	0.4						
		I <sup>2</sup> t On	-	0.1	0.2	0.3	0.4						
Time delay (ms) at 10 x Ir (I <sup>2</sup> t Off or I <sup>2</sup> t On)	<b>tsd (max resettable time)</b>	20	80	140	230	350							
	<b>tsd (max break time)</b>	80	140	200	320	500							
<b>Instantaneous</b>													
Pick-up (A)	<b>Ii = In x ...</b>	2	3	4	6	8	10	12	15	off			
Accuracy: ±10 %													
Time delay		Max resettable time: 20 ms Max break time: 50 ms											



Earth fault		Unit 6.0 A											
Pick-up (A)	<b>Ig = In x ...</b>	A	B	C	D	E	F	G	H	J			
Accuracy: ±10 %		In ≤ 400 A	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1		
		400 A < In < 1250 A	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1		
		In ≥ 1250 A	500	640	720	800	880	960	1040	1120	1200		
Time setting tg (s)	Settings	I <sup>2</sup> t Off	0	0.1	0.2	0.3	0.4						
		I <sup>2</sup> t On	-	0.1	0.2	0.3	0.4						
Time delay (ms)	<b>tg (max resettable time)</b>	20	80	140	230	350							
at In or 1200 A (I <sup>2</sup> t Off or I <sup>2</sup> t On)	<b>tg (max break time)</b>	80	140	200	320	500							
<b>Residual earth leakage (Vigi)</b>													
<b>Unit 7.0 A</b>													
Sensitivity (A)	<b>IΔn</b>	0.5	1	2	3	5	7	10	20	30			
Accuracy: 0 to -20 %													
Time delay Δt (ms)	Settings	60	140	230	350	800							
	<b>Δt (max resettable time)</b>	60	140	230	350	800							
	<b>Δt (max break time)</b>	140	200	320	500	1000							



Ammeter		Unit 2.0 / 5.0 / 6.0 / 7.0 A	
<b>Type of measurements</b>		<b>Range</b>	<b>Accuracy</b>
Instantaneous currents	I1, I2, I3, IN	0.2 x In to 1.2 x In	±1.5 %
	Ig (6.0 A)	0.2 x In to In	±10 %
	IΔn (7.0 A)	0 to 30 A	±1.5 %
Current maximeters of	I1, I2, I3, IN	0.2 x In to 1.2 x In	±1.5 %

Note: all current-based protection functions require no auxiliary source.

The test / reset button resets maximeters, clears the tripping indication and tests the battery.

## Energy meter E

Unit E control units protect power circuits. They also offer measurements, display, communication and current maximeters. Version 6 provides earth-fault protection.

### In addition to the ammeter measurements of Unit A

Unit E control units measure and display:

- current demand
- voltages: phase to phase, phase to neutral, average<sup>(1)</sup> and unbalanced<sup>(1)</sup>
- instantaneous power: P, Q, S
- power factor: PF
- power demand: P demand
- energy: Ep, Eq<sup>(1)</sup>, Es<sup>(1)</sup>.

Accuracy of active energy Ep is 2 % (including the sensors). The range of measurement is the same as current with Unit A, depending of an external power supply module (24 V DC).

### Communication option

In conjunction with the COM communication option, the control unit transmits the following:

- settings
- all "ammeter" and "energy" measurements
- enable connection to FDM
- tripping causes
- maximeter / minimeter readings.

### Protection

Protection thresholds and delays are set using the adjustment dials.

#### Overload protection

True rms long-time protection.

Thermal memory: thermal image before and after tripping.

Setting accuracy may be enhanced by limiting the setting range using a different long-time rating plug. Overload protection can be cancelled using a specific LT rating plug "Off".

#### Short-circuit protection

Short-time (rms) and instantaneous protection.

Selection of I<sup>2</sup>t type (ON or OFF) for short-time delay.

#### Earth-fault protection

Source ground return earth fault protection.

Selection of I<sup>2</sup>t type (ON or OFF) for delay.

#### Neutral protection

On three-pole circuit breakers, neutral protection is not possible.

On four-pole circuit breakers, neutral protection may be set using a three-position switch: neutral unprotected (4P 3d), neutral protection at 0.5 Ir (4P 3d + N/2), neutral protection at Ir (4P 4d).

#### Zone selective interlocking (ZSI)

A ZSI terminal block may be used to interconnect a number of control units to provide total discrimination for short-time and earth-fault protection, without a delay before tripping.

#### Overload alarm

A yellow alarm LED goes on when the current exceeds the long-time trip threshold.

#### M2C programmable contacts

The M2C (two contacts) programmable contacts may be used to signal events (Ir, I<sub>sd</sub>, Alarm Ir, Alarm Ig, Ig). They can be programmed using the keypad on the Unit E control unit or remotely using the COM option (BCM ULP).

## Fault indications

LEDs indicate the type of fault:

- overload (long-time protection Ir)
- short-circuit (short-time I<sub>sd</sub> or instantaneous I<sub>i</sub> protection)
- earth fault (Ig)
- internal fault (Ap).

## Trip history

The trip history displays the list of the last 10 trips. For each trip, the following indications are recorded and displayed:

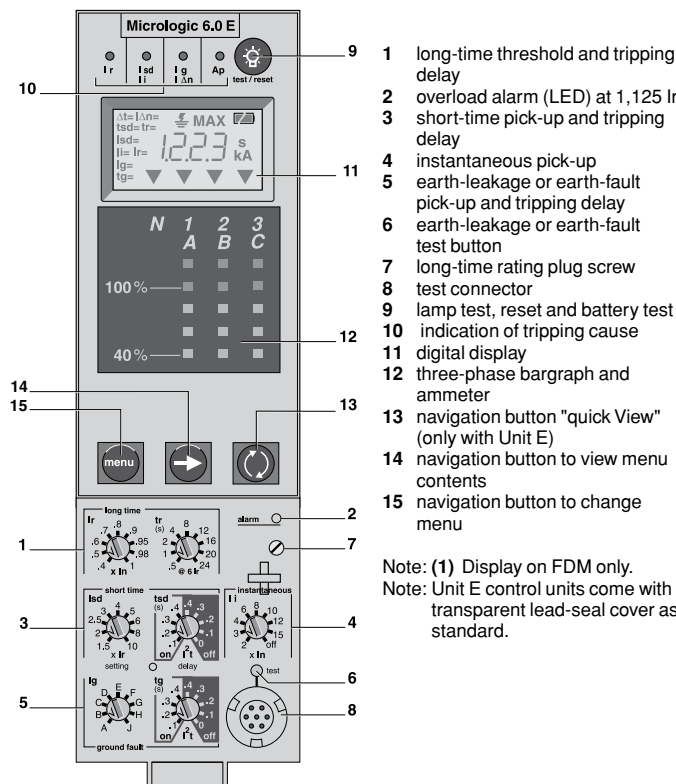
- the tripping cause: Ir, I<sub>sd</sub>, I<sub>i</sub>, Ig or Auto-protection (Ap) trips
- the date and time of the trip (requires communication option).

## Battery power

The fault indication LEDs remain on until the test/reset button is pressed. Under normal operating conditions, the battery supplying the LEDs has a service life of approximately 10 years.

## Test

A mini test kit or a portable test kit may be connected to the test connector on the front to check circuit-breaker operation. For Unit 6.0 E control units, the operation of earth-fault or earth-leakage protection can be checked by pressing the test button located above the test connector.

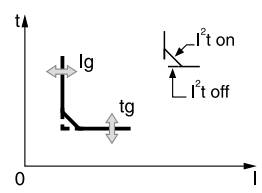
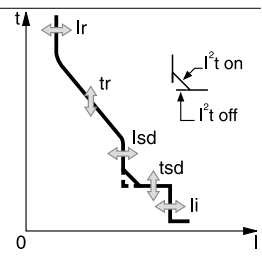
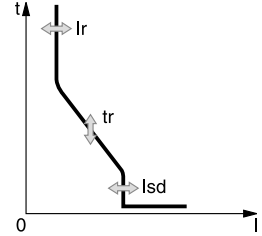


# Air Circuit Breakers

## DW series

### Functions and characteristics

Protection		Unit 2.0 E									
<b>Long time</b>											
Current setting (A)		0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.98	1	
Tripping between 1.05 and 1.20 x Ir		Other ranges or disable by changing long-time rating plug									
Time setting		tr (s)									
Time delay (s)	Accuracy: 0 to -30 %	1.5 x Ir	12.5	25	50	100	200	300	400	500	600
	Accuracy: 0 to -20 %	6 x Ir	0.7 <sup>(1)</sup>	1	2	4	8	12	16	20	24
	Accuracy: 0 to -20 %	7.2 x Ir	0.7 <sup>(2)</sup>	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6
Thermal memory		20 minutes before and after tripping									
Note:		(1) 0 to -40 % - (2) 0 to -60 %									
<b>Instantaneous</b>											
Pick-up (A)	Isd = Ir x ...	1.5	2	2.5	3	4	5	6	8	10	
Accuracy: ±10 %											
Time delay		Max resettable time: 20 ms Max break time: 80 ms									
Protection		Unit 5.0 / 6.0 E									
<b>Long time</b>											
Current setting (A)	Ir = In x ...	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.98	1	
Tripping between 1.05 and 1.20 x Ir		Other ranges or disable by changing long-time rating plug									
Time setting		tr (s)									
Time delay (s)	Accuracy: 0 to -30 %	1.5 x Ir	12.5	25	50	100	200	300	400	500	600
	Accuracy: 0 to -20 %	6 x Ir	0.7 <sup>(1)</sup>	1	2	4	8	12	16	20	24
	Accuracy: 0 to -20 %	7.2 x Ir	0.7 <sup>(2)</sup>	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6
Thermal memory		20 minutes before and after tripping									
Note:		(1) 0 to -40 % - (2) 0 to -60 %									
<b>Short time</b>											
Pick-up (A)	Isd = Ir x ...	1.5	2	2.5	3	4	5	6	8	10	
Accuracy: ±10 %											
Time setting tsd (s)	Settings	I <sup>2</sup> t Off	0	0.1	0.2	0.3	0.4				
		I <sup>2</sup> t On	-	0.1	0.2	0.3	0.4				
Time delay (ms) at 10 x Ir (I <sup>2</sup> t Off or I <sup>2</sup> t On)	tsd (max resettable time)		20	80	140	230	350				
	tsd (max break time)		80	140	200	320	500				
<b>Instantaneous</b>											
Pick-up (A)	Ii = In x ...	2	3	4	6	8	10	12	15	off	
Accuracy: ±10 %											
Time delay		Max resettable time: 20 ms Max break time: 50 ms									
Earth fault		Unit 6.0 E									
Pick-up (A)	Ig = In x ...	A	B	C	D	E	F	G	H	J	
Accuracy: ±10 %	In ≤ 400 A	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	
	400 A < In < 1250 A	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	
	In ≥ 1250 A	500	640	720	800	880	960	1040	1120	1200	
Time setting tg (s)	Settings	I <sup>2</sup> t Off	0	0.1	0.2	0.3	0.4				
		I <sup>2</sup> t On	-	0.1	0.2	0.3	0.4				
Time delay (ms) at In or 1200 A (I <sup>2</sup> t Off or I <sup>2</sup> t On)	tg (max resettable time)		20	80	140	230	350				
	tg (max break time)		80	140	200	320	500				
Energy		Unit 2.0 / 5.0 / 6.0 E									
<b>Type of measurements</b>		<b>Range</b>		<b>Accuracy</b>							
Instantaneous currents	I1, I2, I3, In	0.2 x In to 1.2 x In		±1.5 %							
	Ig (6.0 E)	0.05 x In to In		±10 %							
Current maximeters of	I1, I2, I3, In	0.2 x In to 1.2 x In		±1.5 %							
	Demand currents of I1, I2, I3, Ig	0.2 x In to 1.2 x In		±1.5 %							
Voltages	V12, V23, V31, V1N, V2N, V3N	100 to 690 V		±0.5 %							
Active power	P	30 to 2000 kW		±2 %							
Power factor	PF	0 to 1		±2 %							
Demand power	P demand	30 to 2000 kW		±2 %							
Active energy	Ep	-10 <sup>10</sup> GWh to 10 <sup>10</sup> GWh		±2 %							



Note: all current-based protection functions require no auxiliary source.  
The test / reset button resets maximeters, clears the tripping indication and tests the battery.

## Power meter P

### Protection..... +

#### Protection settings

The adjustable protection functions are identical to those of Unit A (overloads, short-circuits, earth-fault and earth-leakage protection).

#### Fine adjustment

Within the range determined by the adjustment dial, fine adjustment of thresholds (to within one ampere) and time delays (to within one second) is possible on the keypad or remotely using the COM option (BCM ULP).

#### IDMTL (Inverse Definite Minimum Time lag) setting

Coordination with fuse-type or medium-voltage protection systems is optimised by adjusting the slope of the overload-protection curve. This setting also ensures better operation of this protection function with certain loads.

#### Neutral protection

On three-pole circuit breakers, neutral protection may be set using the keypad or remotely using the COM option (BCM ULP), to one of four positions: neutral unprotected (4P 3d), neutral protection at 0.5 I<sub>r</sub> (4P 3d + N/2), neutral protection at I<sub>r</sub> (4P 4d) and neutral protection at 1,6 I<sub>r</sub> (4P 3d + 1,6N). Neutral protection at 1,6 I<sub>r</sub> is used when the neutral conductor is twice the size of the phase conductors (major load imbalance, high level of third order harmonics).

On four-pole circuit breakers, neutral protection may be set using a three-position switch or the keypad: neutral unprotected (4P 3d), neutral protection at 0.5 I<sub>r</sub> (4P 3d + N/2), neutral protection at I<sub>r</sub> (4P 4d). Neutral protection produces no effect if the long-time curve is set to one of the IDMTL protection settings.

#### Programmable alarms and other protection

Depending on the thresholds and time delays set using the keypad or remotely using the COM option (BCM ULP), the Unit P control unit monitors currents and voltage, power, frequency and the phase sequence. Each threshold overrun is signalled remotely via the COM option (BCM ULP). Each threshold overrun may be combined with tripping (protection) or an indication carried out by an optional M2C or M6C programmable contact (alarm), or both (protection and alarm).

#### Load shedding and reconnection

Load shedding and reconnection parameters may be set according to the power or the current flowing through the circuit breaker. Load shedding is carried out by a supervisor via the COM option (BCM ULP) or by an M2C or M6C programmable contact.

#### M2C / M6C programmable contacts

The M2C (two contacts) and M6C (six contacts) auxiliary contacts may be used to signal threshold overruns or status changes. They can be programmed using the keypad on the Unit P control unit or remotely using the COM option (BCM ULP).

#### Communication option (COM)

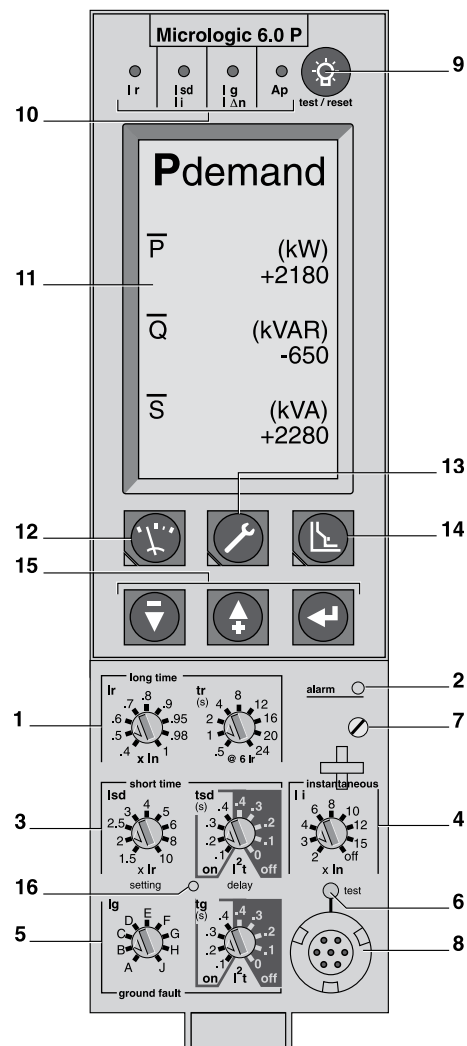
The communication option may be used to:

- remotely read and set parameters for the protection functions
- transmit all the calculated indicators and measurements
- signal the causes of tripping and alarms
- consult the history files and the maintenance-indicator register.
- maximeter reset.

An event log and a maintenance register, stored in control-unit memory but not available locally, may be accessed in addition via the COM option (BCM ULP).

Unit P control units include all the functions offered by Unit E. In addition, they measure voltages and calculate power and energy values.

They also offer new protection functions based on currents, voltages, frequency and power reinforce load protection in real time.



- 1 Long-time current setting and tripping delay.
- 2 Overload signal (LED).
- 3 Short-time pick-up and tripping delay.
- 4 Instantaneous pick-up.
- 5 Earth-leakage or earth-fault pick-up and tripping delay.
- 6 Earth-leakage or earth-fault test button.
- 7 Long-time rating plug screw.
- 8 Test connector.
- 9 Lamp + battery test and indications reset.
- 10 Indication of tripping cause.
- 11 High-resolution screen.
- 12 Measurement display.
- 13 Maintenance indicators.
- 14 Protection settings.
- 15 Navigation buttons.
- 16 Hole for settings lockout pin on cover.

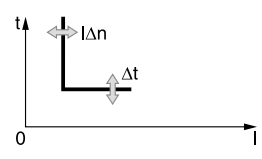
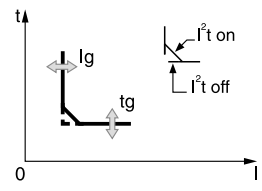
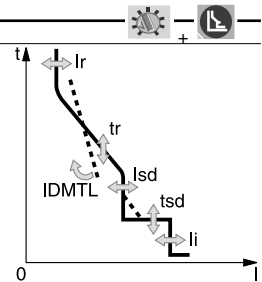
Note: Unit P control units come with a non-transparent lead-seal cover as standard.

# Air Circuit Breakers

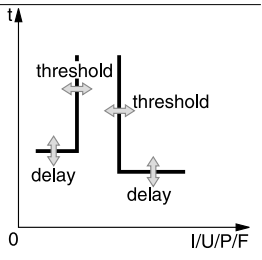
## DW series

### Functions and characteristics

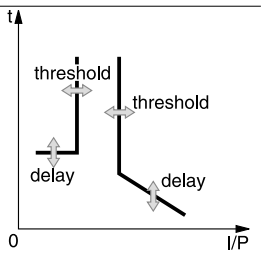
Protection		Unit 5.0 / 6.0 / 7.0 P										
<b>Long time (rms)</b>		<b>Unit 5.0 / 6.0 / 7.0 P</b>										
Current setting (A)	$I_r = I_n \times \dots$	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.98	1		
Tripping between 1.05 and 1.20 x $I_r$ Other ranges or disable by changing long-time rating plug												
Time setting		<b>tr (s)</b>	0.5	1	2	4	8	12	16	20	24	
Time delay (s)	Accuracy: 0 to -30 %	$1.5 \times I_r$	12.5	25	50	100	200	300	400	500	600	
	Accuracy: 0 to -20 %	$6 \times I_r$	0.7 <sup>(1)</sup>	1	2	4	8	12	16	20	24	
	Accuracy: 0 to -20 %	$7.2 \times I_r$	0.7 <sup>(2)</sup>	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6	
IDMTL setting	Curve slope		SIT	VIT	EIT	HV	Fuse	DT				
Thermal memory			20 minutes before and after tripping									
Note: (1) 0 to -40 % - (2) 0 to -60 %												
<b>Short time (rms)</b>												
Pick-up (A)	$I_{sd} = I_r \times \dots$	1.5	2	2.5	3	4	5	6	8	10		
Accuracy: ±10 %												
Time setting tsd (s)	Settings	$I^2t$ Off	0	0.1	0.2	0.3	0.4					
		$I^2t$ On	-	0.1	0.2	0.3	0.4					
Time delay (ms) at 10 $I_r$	$I^2t$ Off or $I^2t$ On	<b>tsd (max resettable time)</b>	20	80	140	230	350					
		<b>tsd (max break time)</b>	80	140	200	320	500					
<b>Instantaneous</b>												
Pick-up (A)	$I_i = I_n \times \dots$	2	3	4	6	8	10	12	15	off		
Accuracy: ±10 %												
Time delay		Max resettable time: 20 ms Max break time: 50 ms										
<b>Earth fault</b>		<b>Unit 6.0 P</b>										
Pick-up (A)	$I_g = I_n \times \dots$	A	B	C	D	E	F	G	H	J		
Accuracy: ±10 %	$I_n \leq 400$ A	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1		
	$400$ A < $I_n$ < $1250$ A	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1		
	$I_n \geq 1250$ A	500	640	720	800	880	960	1040	1120	1200		
Time setting tg (s)	Settings	$I^2t$ Off	0	0.1	0.2	0.3	0.4					
		$I^2t$ On	-	0.1	0.2	0.3	0.4					
Time delay (ms)	$I^2t$ Off or $I^2t$ On	<b>tg (max resettable time)</b>	20	80	140	230	350					
		<b>tg (max break time)</b>	80	140	200	320	500					
Residual earth leakage (Vigi)		<b>Unit 7.0 P</b>										
<b>Sensitivity (A)</b>	$I_{\Delta n}$	0.5	1	2	3	5	7	10	20	30		
Accuracy: 0 to -20 %												
Time delay $\Delta t$ (ms)	Settings	60	140	230	350	800						
	$\Delta t$ (max resettable time)	60	140	230	350	800						
	$\Delta t$ (max break time)	140	200	320	500	1000						



Alarms and other protection		Unit 5.0 / 6.0 / 7.0 P	
<b>Current</b>		<b>Threshold</b>	<b>Delay</b>
Current unbalance	<b>Iunbalance</b>	0.05 to 0.6 leverage	1 to 40 s
Max. demand current	<b>I<sub>max demand</sub></b> : I1, I2, I3, IN,	0.2 $I_n$ to $I_n$	15 to 1500 s
<b>Earth fault alarm</b>			
	$I_{\perp}$	10 to 100 % $I_n$ <sup>(3)</sup>	1 to 10 s
<b>Voltage</b>			
Voltage unbalance	<b>Uunbalance</b>	2 to 30 % x $U_{average}$	1 to 40 s
Minimum voltage	<b>Umin</b>	100 to $U_{max}$ between phases	1.2 to 10 s
Maximum voltage <sup>(4)</sup>	<b>Umax</b>	$U_{min}$ to 1200 between phases	1.2 to 10 s
<b>Power</b>			
Reverse power	<b>rP</b>	5 to 500 kW	0.2 to 20 s
<b>Frequency</b>			
Minimum frequency	<b>Fmin</b>	45 to $F_{max}$	1.2 to 5 s
Maximum frequency	<b>Fmax</b>	$F_{min}$ to 440 Hz	1.2 to 5 s
<b>Phase sequence</b>			
Sequence (alarm)	$\Delta\emptyset$	$\emptyset 1/2/3$ or $\emptyset 1/3/2$	0.3 s



Load shedding and reconnection		Unit 5.0 / 6.0 / 7.0 P	
<b>Measured value</b>		<b>Threshold</b>	<b>Delay</b>
Current	<b>I</b>	0.5 to 1 Ir per phases	20 % tr to 80 % tr
Power	<b>P</b>	200 kW to 10 MW	10 to 3600 s



Note: (3)  $I_n \leq 400$  A 30 %  
 $400$  A <  $I_n$  <  $1250$  A 20 %  
 $I_n \geq 1250$  A 10 %  
 (4) For 690 V applications, a step-down transformer must be used if the voltage exceeds the nominal value of 690 V by more than 10 %.

Note: all current-based protection functions require no auxiliary source.  
 Voltage-based protection functions are connected to AC power via a voltage measurement input built into the circuit breaker.



## Measurements.....

The Unit P control unit calculates in real time all the electrical values (V, A, W, VAR, VA, Wh, VARh, VAh, Hz), power factors and  $\cos \phi$  factors.

The Unit P control unit also calculates demand current and demand power over an adjustable time period. Each measurement is associated with a minimeter and a maximeter. In the event of tripping on a fault, the interrupted current is stored. The optional external power supply makes it possible to display the value with the circuit breaker open or not supplied.

### Instantaneous values

The value displayed on the screen is refreshed every second. Minimum and maximum values of measurements are stored in memory (minimeters and maximeters).

Currents					
I rms	A	1	2	3	N
	A	E-fault		E-leakage	
I max rms	A	1	2	3	N
	A	E-fault		E-leakage	
Voltages					
U rms	V	12	23	31	
V rms	V	1N	2N	3N	
U average rms	V	(U12 + U23 + U31) / 3			
U unbalance	%				
Power, energy					
P active, Q reactive, S apparent	W, Var, VA	Totals			
E active, E reactive, E apparent	Wh, VARh, VAh	Totals consumed - supplied			
		Totals consumed			
		Totals supplied			
Power factor	PF	Total			
Frequencies					
F	Hz				

### Demand metering

The demand is calculated over a fixed or sliding time window that may be programmed from 5 to 60 minutes. According to the contract signed with the power supplier, an indicator associated with a load shedding function makes it possible to avoid or minimise the costs of overrunning the subscribed power. Maximum demand values are systematically stored and time stamped (maximeter).

Currents					
I demand	A	1	2	3	N
	A	E-fault		E-leakage	
I max demand	A	1	2	3	N
	A	E-fault		E-leakage	
Power					
P, Q, S demand	W, Var, VA	Totals			
P, Q, S max demand	W, Var, VA	Totals			

### Minimeters and maximeters

Only the current and power maximeters may be displayed on the screen.

### Time-stamping

Time-stamping is activated as soon as time is set manually or by a supervisor.

No external power supply module is required (max. drift of 1 hour per year).

### Reset

An individual reset, via the keypad or remotely, acts on alarms, minimum and maximum data, peak values, the counters and the indicators.

### Additional measurements accessible with the COM option (BCM ULP)

Some measured or calculated values are only accessible with the COM communication option:

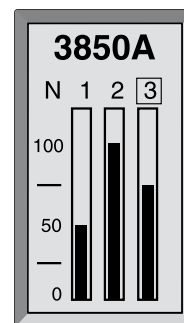
- I peak /  $\sqrt{2}$ ,  $(I1 + I2 + I3)/3$ , I unbalance
- load level in % Ir
- total power factor.

The maximeters and minimeters are available only via the COM option (BCM ULP) for use with a supervisor.

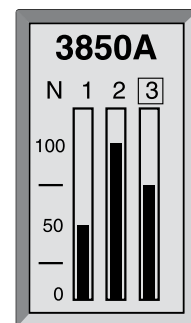
### Additional info

Accuracy of measurements (including sensors):

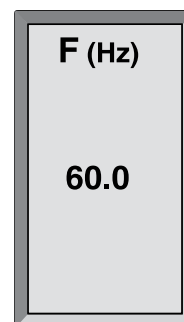
- voltage (V) 0.5 %
- current (A) 1.5 %
- frequency (Hz) 0.1 %
- power (W) and energy (Wh) 2 %.



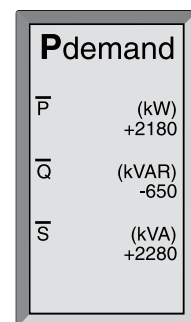
Display of a voltage.



Display of a power.



Display of a frequency.



Display of a demand power

# Air Circuit Breakers

## DW series

### Functions and characteristics

#### Histories and maintenance indicators

The last ten trips and alarms are recorded in two separate history files that may be displayed on the screen:

- tripping history:
  - type of fault
  - date and time
  - values measured at the time of tripping (interrupted current, etc.)
- alarm history:
  - type of alarm
  - date and time
  - values measured at the time of the alarm.

**All the other events are recorded in a third history file which is only accessible through the communication network.**

- Event log history (only accessible through the communication network)
  - modifications to settings and parameters
  - counter resets
  - system faults:
    - fallback position
    - thermal self-protection
    - loss of time
  - overrun of wear indicators
  - test-kit connections
  - etc.

Note: all the events are time stamped: time-stamping is activated as soon as time is set manually or by a supervisor. No external power supply module is required (max. drift of 1 hour per year).

#### Maintenance indicators with COM option (BCM ULP)

A number of maintenance indicators may be called up on the screen to better plan for device maintenance:

- contact wear
- operation counter:
  - cumulative total
  - total since last reset.

Additional maintenance indicators are also available through the COM network, and can be used as an aid in troubleshooting:

- highest current measured
- number of test-kit connections
- number of trips in operating mode and in test mode.

#### Additional technical characteristics

##### Safety

Measurement functions are independent of the protection functions.

The high-accuracy measurement module operates independently of the protection module.

##### Simplicity and multi-language

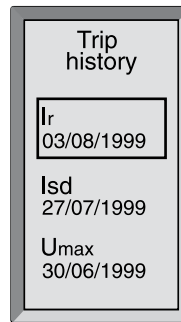
Navigation from one display to another is intuitive. The six buttons on the keypad provide access to the menus and easy selection of values. When the setting cover is closed, the keypad may no longer be used to access the protection settings, but still provides access to the displays for measurements, histories, indicators, etc.

Intelligent control unit is also multi-language, including the following languages: English, Spanish, Portuguese, Russian, Chinese, French, German...

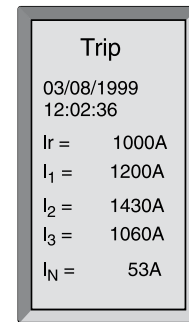
#### Intelligent measurement

Measurement-calculation mode:

- energies are calculated on the basis of the instantaneous power values, in two manners:
  - the traditional mode where only positive (consumed) energies are considered
  - the signed mode where the positive (consumed) and negative (supplied) energies are considered separately
- measurement functions implement the new "zero blind time" concept which consists in continuously measuring signals at a high sampling rate. The traditional "blind window" used to process samples no longer exists. This method ensures accurate energy calculations even for highly variable loads (welding machines, robots, etc.).



Display of a tripping history.



Display after tripping.

## Harmonics meter H

In addition to the Unit P functions, the Unit H control unit offers:

- in-depth analysis of power quality including calculation of harmonics and the fundamentals
- diagnostics aid and event analysis through waveform capture
- enhanced alarm programming to analyse and track down a disturbance on the AC power system.

### Measurements 🕒

The Unit H control unit offers all the measurements carried out by Unit P, with in addition:

- phase by phase measurements of:
  - power, energy
  - power factors
- calculation of:
  - current and voltage total harmonic distortion (THD)
  - current, voltage and power fundamentals
  - current and voltage harmonics up to the 31st order.

### Instantaneous values displayed on the screen

Currents							
$I_{rms}$	A	1	2	3	N		
	A	E-fault			E-leakage		
$I_{max\ rms}$	A	1	2	3	N		
	A	E-fault			E-leakage		
Voltages							
$U_{rms}$	V	12	23	31			
$V_{rms}$	V	1N	2N	3N			
$U_{average\ rms}$	V	$(U_{12} + U_{23} + U_{31}) / 3$					
$U_{unbalance}$	%						
Power, energy							
P active, Q reactive, S apparent	W, Var, VA	Totals	1	2	3		
E active, E reactive, E apparent	Wh, VARh, VAh	Totals consumed - supplied					
		Totals consumed					
		Totals supplied					
Power factor	PF	Total	1	2	3		
Frequencies							
F	Hz						
Power-quality indicators							
Total fundamentals		U	I	P	Q	S	
THD	%	U	I				
U and I harmonics	Amplitude	3	5	7	9	11	13

Harmonics 3, 5, 7, 9, 11 and 13, monitored by electrical utilities, are displayed on the screen.

### Demand measurements

Similar to the Unit P control unit, the demand values are calculated over a fixed or sliding time window that may be set from 5 to 60 minutes.

Currents					
$I_{demand}$	A	1	2	3	N
	A	E-fault			E-leakage
$I_{max\ demand}$	A	1	2	3	N
	A	E-fault			E-leakage
Power					
P, Q, S demand	W, Var, VA	Totals			
P, Q, S max demand	W, Var, VA	Totals			

### Maximeters

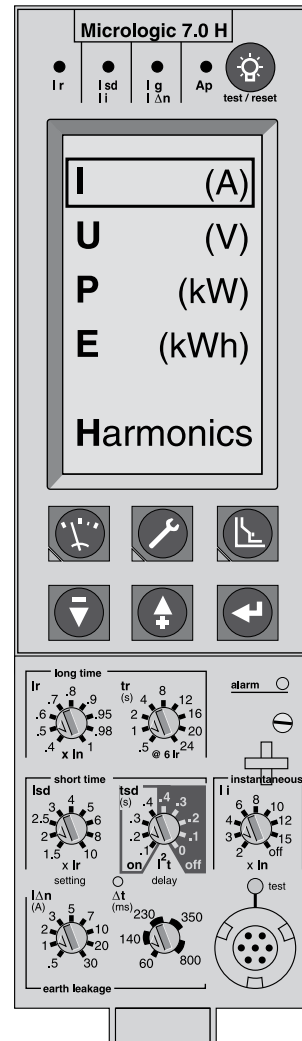
Only the current maximeters may be displayed on the screen.

### Histories and maintenance indicators

These functions are identical to those of the Unit P.

Unit H control units include all the functions offered by Unit P. Integrating significantly enhanced calculation and memory functions, the Unit H control unit offers in-depth analysis of power quality and detailed event diagnostics.

It is intended for operation with a supervisor.



Note: Unit H control units come with a non-transparent lead-seal cover as standard.

# Air Circuit Breakers

## DW series

### Functions and characteristics



Unit A/E/P/H integrated Power Meter functions			Type		Display
			A/E	P/H	Unit LCD
<b>Display of protection settings</b>					
Pick-ups (A) and delays	All settings can be displayed	Ir, tr, lsd, tsd, li, lg, tg	A/E	P/H	●
<b>Measurements</b>					
<b>Instantaneous rms measurements</b>					
Currents (A)	Phases and neutral	I1, I2, I3, IN	A/E	P/H	●
	Average of phases	$I_{avg} = (I1 + I2 + I3) / 3$	A/E	P/H	-
	Highest current of the 3 phases and neutral	I <sub>max</sub> of I1, I2, I3, IN	A/E	P/H	●
	Ground fault (Unit 6)	% I <sub>g</sub> (pick-up setting)	A/E	P/H	●
	Current unbalance between phases	% I <sub>avg</sub>	-/E	P/H	-
Voltages (V)	Phase-to-phase	V12, V23, V31	-/E	P/H	●
	Phase-to-neutral	V1N, V2N, V3N	-/E	P/H	●
	Average of phase-to-phase voltages	$V_{avg} = (V12 + V23 + V31) / 3$	-/E	P/H	-
	Average of phase-to-neutral voltages	$V_{avg} = (V1N + V2N + V3N) / 3$	-/E	P/H	-
	Ph-Ph and Ph-N voltage unbalance	% V <sub>avg</sub> and % V <sub>avg</sub>	-/E	P/H	-
Frequency (Hz)	Phase sequence	1-2-3, 1-3-2	-/-	P/H	●
	Power system	f	-/-	P/H	●
Power	Active (kW)	P, total	-/E	P/H	●
		P, per phase	-/E	P/H	● <sup>(2)</sup>
	Reactive (kVAR)	Q, total	-/E	P/H	●
		Q, per phase	-/-	P/H	● <sup>(2)</sup>
	Apparent (kVA)	S, total	-/E	P/H	●
		S, per phase	-/-	P/H	● <sup>(2)</sup>
	Power Factor	PF, total	-/E	P/H	●
PF, per phase		-/-	P/H	● <sup>(2)</sup>	
Cos.φ	Cos.φ, total	-/-	P/H	● <sup>(2)</sup>	
	Cos.φ, per phase	-/-	P/H	● <sup>(2)</sup>	
<b>Maximeters / minimeters</b>					
	Associated with instantaneous rms measurements	Reset via FDM121 display unit and Intelligent control unit keypad	A/E	P/H	●
<b>Energy metering</b>					
Energy	Active (kW), reactive (kVARh), apparent (kVAh)	Total since last reset	-/E	P/H	●
<b>Demand and maximum demand values</b>					
Demand current (A)	Phases and neutral	Present value on the selected window	-/E	P/H	●
		Maximum demand since last reset	-/E	P/H	● <sup>(2)</sup>
Demand power	Active (kWh), reactive (kVAR), apparent (kVA)	Present value on the selected window	-/E	P/H	●
		Maximum demand since last reset	-/E	P/H	● <sup>(2)</sup>
Calculation window	Sliding, fixed or com-synchronised	Adjustable from 5 to 60 minutes in 1 minute steps <sup>(1)</sup>	-/E	P/H	-
<b>Power quality</b>					
Total harmonic distortion (%)	Of voltage with respect to rms value	THDU, THDV of the Ph-Ph and Ph-N voltage	-/-	H	●
	Of current with respect to rms value	THDI of the phase current	-/-	H	●

Note: (1) Available via the communication system only.

(2) Available for Unit P/H only.

## ■ Operating assistance

### Histories.....

- Trip indications in clear text in a number of user-selectable languages.
- Time-stamping: date and time of trip.

### Maintenance indicators .....

Intelligent control unit have indicators for, among others, the number of operating cycles, contact wear P/H, load profile and operating times (operating hours counter) of the DW circuit breaker.

It is possible to assign an alarm to the operating cycle counter to plan maintenance.

The various indicators can be used together with the trip histories to analyse the level of stresses the device has been subjected to.

### Management of installed devices

Each circuit breaker equipped with a COM option (BCM ULP) can be identified via the communication system:

- serial number
- firmware version
- hardware version
- device name assigned by the user.

This information together with the previously described indications provides a clear view of the installed devices.

## Additional technical characteristics

### Contact wear

Each time DW opens, the Unit P/H trip unit measures the interrupted current and increments the contact-wear indicator as a function of the interrupted current, according to test results stored in memory.

Breaking under normal load conditions results in a very slight increment.

### Circuit breaker load profile

Unit A/E/P/H calculates the load profile of the circuit breaker protecting a load circuit.

The profile indicates the percentage of the total operating time at four current levels (% of breaker  $I_n$ ):

- 0 to 49 %  $I_n$
- 50 to 79 %  $I_n$
- 80 to 89 %  $I_n$
- $\geq 90$  %  $I_n$ .

This information can be used to optimise use of the protected equipment or to plan ahead for extensions.

Unit A/E/P/H operating assistance functions			Type		Display
			A/E	P/H	Unit LCD
<b>Operating assistance</b>					
<b>Trip history</b>					
Trips	Cause of tripping	$I_r, I_{sd}, I_i, I_g, I_{\Delta n}$	- / E	P/H	●
<b>Maintenance indicators</b>					
Counter	Mechanical cycles	Assignable to an alarm	A/E	P/H	-
	Electrical cycles	Assignable to an alarm	A/E	P/H	-
	Hours	Total operating time (hours) <sup>(1)</sup>	A/E	P/H	-
Indicator	Contact wear	%	- / -	P/H	-
Load profile	Hours at different load levels	% of hours in four current ranges: 0-49 % $I_n$ , 50-79 % $I_n$ , 80-89 % $I_n$ and $\leq 90$ % $I_n$	A/E	P/H	-

Note: (1) Also available via the communication system.



## External sensors

### External sensor for earth-fault and neutral protection

The sensors, used with the 3P circuit breakers, are installed on the neutral conductor for:

- neutral protection (with Unit P and H)
  - residual type earth-fault protection (with Unit A, E, P and H).
- The rating of the sensor (CT) must be compatible with the rating of the circuit breaker:

- DW08 to DW20: TC 400/2000
- DW25 to DW40: TC 1000/4000
- DW40b to DW63: TC 4000/6300.

For oversized neutral protection the sensor rating must be compatible with the measurement range:  $1.6 \times I_n$  (available up to DW40).

### Rectangular sensor for earth-leakage protection

The sensor is installed around the busbars (phases + neutral) to detect the zero-phase sequence current required for the earth-leakage protection. Rectangular sensors are available in two sizes.

Inside dimensions (mm)

- 280 x 115 up to 1600 A
- 470 x 160 up to 3200 A

### External sensor for source ground return protection (SGR)

The sensor is installed around the connection of the transformer neutral point to earth and connects to the control unit 6.0 via an MDGF module to provide the source ground return (SGR) protection.

### Voltage measurement inputs

Voltage measurement inputs are required for power measurements (Control unit P or H) and for earth-leakage protection (Control unit 7...).

As standard, the control unit is supplied by internal voltage measurement inputs placed downstream of the pole for voltages between 220 and 690 V AC. On request, it is possible to replace the internal voltage measurement inputs by an external voltage input (PTE option) which enables the control unit to draw power directly from the distribution system upstream of the circuit breaker. An 3 m cable with ferrite comes with this PTE option.

### Long-time rating plug

Four interchangeable plugs may be used to limit the long-time threshold setting range for higher accuracy.

The time delay settings indicated on the plugs are for an overload of  $6 I_r$  (for further details, see the characteristics on page 20 and page 24).

As standard, control units are equipped with the 0.4 to 1 plug.

### Setting ranges

Standard	$I_r = I_n$	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.98	1
	x...									
Low-setting option	$I_r = I_n$	0.4	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.8
	x...									
High-setting option	$I_r = I_n$	0.80	0.82	0.85	0.88	0.90	0.92	0.95	0.98	1
	x...									
Off plug	No long-time protection ( $I_r = I_n$ for $I_{sd}$ setting)									

Important: long-time rating plugs must always be removed before carrying out insulation or dielectric withstand tests.

### External 24 V DC power-supply module

The external power-supply module makes it possible to use the display even if the circuit breaker is open or not supplied (for the exact conditions of use, see the "electrical diagrams" part of this

catalogue).

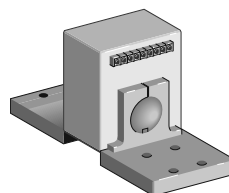
This module powers both the control unit (100 mA) and the M2C and M6C programmable contacts (100 mA).

If the COM communication option is used, the communication bus requires 24 V DC power supply. With the control unit A/E, this module makes it possible to display currents of less than 20 % of  $I_n$ .

With the control unit P and H, it can be used to display fault currents after tripping.

### Characteristics

- Power supply:
  - 110/130, 200/240, 380/415 V AC, 50/60 Hz (+10 % -15 %)
  - 24/30, 48/60, 100/125 V DC (+20 % -20 %).
- Output voltage: 24 V DC  $\pm 5$  %, 1 A.
- Ripple < 1 %.
- Dielectric withstand : 3.5 kV rms between input/output, for 1 minute.
- Overvoltage category: as per IEC 60947-1 cat. 4.



External sensor (CT).



Rectangular sensor.



External sensor for source ground return protection.



Long time rating plug.



External 24 V DC power supply module.

# Air Circuit Breakers

## DW series

### Functions and characteristics

#### Battery module

The battery module maintains display operation and communication with the supervisor if the power supply to the Intelligent control unit is interrupted. It is installed in series between the Intelligent control unit and the AD module.

#### Characteristics

- Battery run-time: 4 hours (approximately).
- Mounted on vertical backplate or symmetrical rail.



Battery module

#### M2C, M6C programmable contacts

These contacts are optional equipment for the Unit E, P and H control units.

They are described with the indication contacts for the circuit breakers.

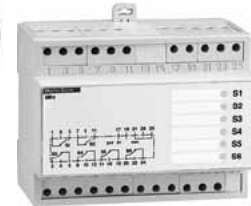
Intelligent control unit		Unit E	Units P, H
Characteristics		M2C	M2C/M6C
Minimum load		100 mA/24 V	100 mA/24 V
Breaking capacity (A) p.f.: 0.7	V AC 240	5	5
	380	3	3
V DC	24	1.8	1.8
	48	1.5	1.5
	125	0.4	0.4
	250	0.15	0.15

M2C: 24 V DC power supplied by control unit (consumption 100 mA).

M6C: external 24 V DC power supply required (consumption 100 mA).



M2C.



M6C.



Lead-seal cover.

#### Spare parts

##### Lead-seal covers

A lead-seal cover controls access to the adjustment dials.

When the cover is closed:

- it is impossible to modify settings using the keypad unless the settings lockout pin on the cover is removed
- the test connector remains accessible
- the test button for the earth-fault and earth-leakage protection function remains accessible.

##### Characteristics

- Transparent cover for basic Unit and Unit A, E control units
- Non-transparent cover for Intelligent control units P and H.

##### Spare battery

A battery supplies power to the LEDs identifying the tripping causes.

Battery service life is approximately ten years.

A test button on the front of the control unit is used to check the battery condition. The battery may be replaced on site when discharged.



## ■ Communication

All the DW devices can be fitted with the communication function thanks to the COM option. DW uses the Modbus communications protocol for full compatibility with the supervision management systems. An external gateway is available for communication on other networks: Eco COM is limited to the transmission of metering data and status. It is not used to communicate controls.

### For fixed devices, the COM option is made up of:

- a Modbus BCM ULP "device" communication module, installed behind the Intelligent control unit and supplied with its set of sensors (OF, SDE, PF and CH micro switches) its kit for connection to XF and MX1 communicating voltage releases and its COM terminal block (inputs E1 to E6).

### For drawout devices, the COM option is made up of:

- a Modbus BCM ULP "device" communication module, installed behind the Intelligent control unit and supplied with its set of sensors (OF, SDE, PF and CH micro switches) its kit for connection to XF and MX1 communicating voltage release and its COM terminal block (inputs E1 to E6).
- a "chassis" communication module supplied separately with its set of sensors (CE, CD and CT contacts) Modbus CCM. Status indication by the COM option is independent of the device indication contacts. These contacts remain available for conventional uses.

### Modbus BCM ULP "Device" communication module

This module is independent of the control unit. It receives and transmits information on the communication network. An infra-red link transmits data between the control unit and the communication module.

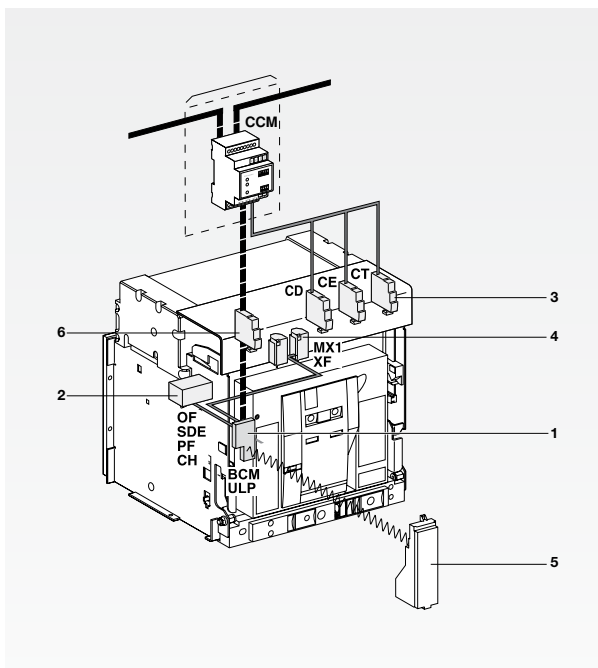
Consumption: 30 mA, 24 V.

### XF and MX1 communicating voltage releases

The XF and MX1 communicating voltage releases are equipped for connection to the "device" communication module. The remote-tripping function (MX2 or MN) are independent of the communication option. They are not equipped for connection to the "device" communication module.



Modbus BCM ULP "device" communication module.



- |   |   |   |              |
|---|---|---|--------------|
| 1 | Modbus BCM ULP "Device" communication module. | — | : Hard wire. |
| 2 | OF, SDE, PF and CH micro switches.            | — | : Modbus.    |
| 3 | CE, CD and CT contacts.                       |   |              |
| 4 | XF and MX1 communicating voltage releases.    |   |              |
| 5 | Intelligent control unit.                     |   |              |
| 6 | COM terminal block (E1 to E6).                |   |              |

# Air Circuit Breakers

## DW series

### Functions and characteristics

#### Four functional levels

The DW can be integrated into a Modbus communication environment.

There are four possible functional levels that can be combined.

	Switch-disconnectors	Circuit breaker			
<b>Status indications</b>					
ON/OFF (O/F)	●	A	E	P	H
Spring charged CH	●	A	E	P	H
Ready to close	●	A	E	P	H
Fault-trip SDE	●	A	E	P	H
Connected / disconnected / test position CE/CD/CT (CCM only)	●	A	E	P	H
<b>Controls</b>					
MX1 open	●	A	E	P	H
XF close	●	A	E	P	H
<b>Measurements</b>					
Instantaneous measurement information	●	A	E	P	H
Averaged measurement information	●		E	P	H
Maximeter / minimeter	●	A	E	P	H
Energy metering	●		E	P	H
Demand for current and power	●		E	P	H
Power quality	●				H
<b>Operating assistance</b>					
Protection and alarm settings				P	H
Histories			E	P	H
Time stamped event tables				P	H
Maintenance indicators		A	E	P	H

A: Unit with ammeter

E: Unit "Energy"

P: Unit "Power"

H: Unit "Harmonics"

Note: see the description of the Intelligent control units for further details on protection and alarms, measurements, waveform capture, histories, logs and maintenance indicators.



### Communication Modbus bus

The Modbus RS 485 (RTU protocol) system is an open bus on which communicating Modbus devices are installed. All types of PLCs and microcomputers may be connected to the bus.

#### Addresses

The Modbus communication parameters (address, baud rate, parity) are entered using the keypad on the Units A, E, P, H. For a switch-disconnector, it is necessary to use the RSU (Remote Setting Utility) Intelligent control unit utility.

Modbus addresses		
@xx	Circuit breaker manager	(1 to 47)
@xx + 50	Chassis manager	(51 to 97)
@xx + 200	Measurement manager	(201 to 247)
@xx + 100	Protection manager	(101 to 147)

The manager addresses are automatically derived from the circuit breaker address @xx entered via the Intelligent control unit (the default address is 47).

#### Number of devices

The maximum number of devices that may be connected to the Modbus bus depends on the type of device the baud rate (19200 is recommended), the volume of data exchanged and the desired response time. The RS 485 physical layer offers up to 32 connection points on the bus (1 master, 31 slaves).

A fixed device requires only one connection point (communication module on the device). A drawout device uses two connection points (communication modules on the device and on the chassis).

The number must never exceed 31 fixed devices or 15 drawout devices.

#### Length of bus

The maximum recommended length for the Modbus bus is 1200 meters.

#### Bus power source

A 24 V DC power supply is required (less than 20 % ripple, insulation class II).

# Air Circuit Breakers

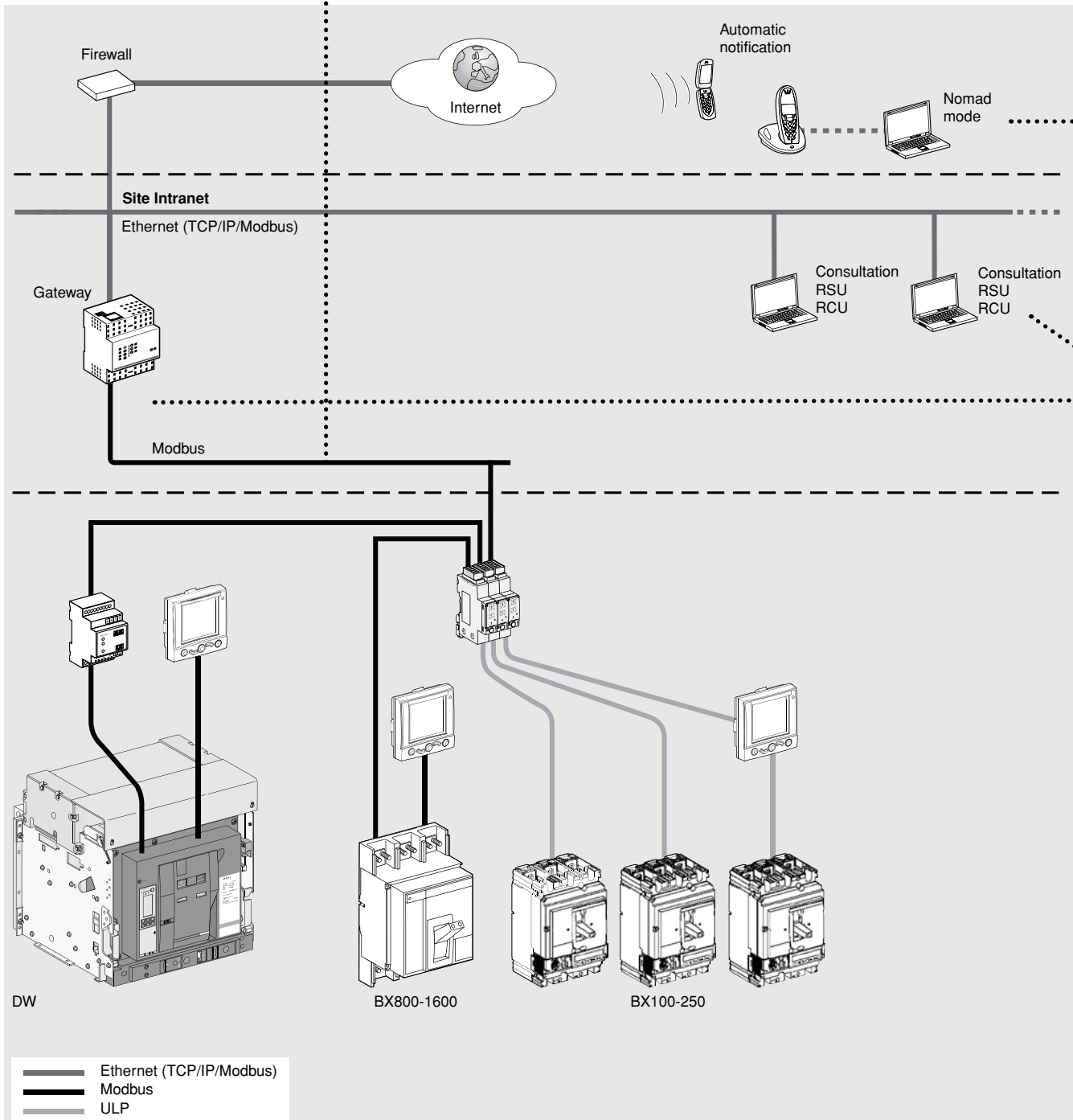
## DW series

### Functions and characteristics

DW uses the Modbus communication protocol, compatible with ION-E electrical engineering expert system software.  
 Two downloadable software (RSU, RCU) from [schneider-electric.com](http://schneider-electric.com) facilitate implementation of communication functions.

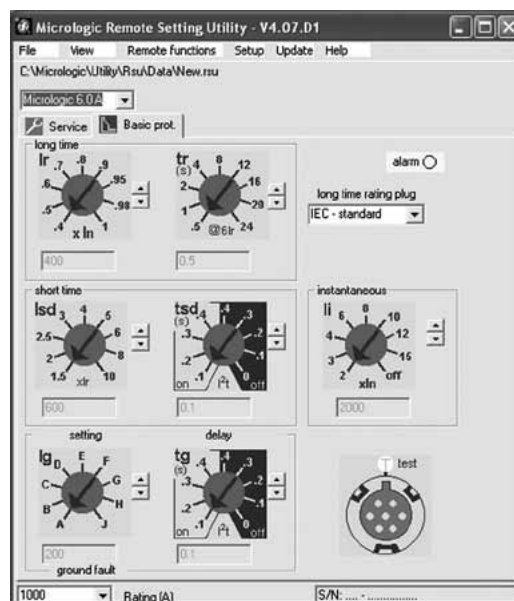
#### Modbus

Modbus is the most widely used communication protocol in industrial networks.  
 It operates in master-slave mode. The devices (slaves) communicate one after the other with a gateway (master).  
 DW, BX, PowerLogic and Sepam products all operate with this protocol. A Modbus network is generally implemented on an LV or MV switchboard scale. Depending on the data monitored and the desired refresh rate, a Modbus network connected to a gateway can serve 4 to 16 devices. For larger installations, a number of Modbus networks can be connected to an Ethernet network (TCP/IP/Modbus) via their gateways (EGX).

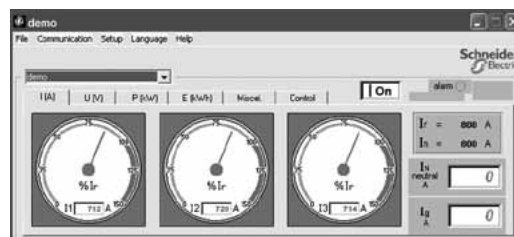


## Intelligent control unit utilities

- Two utilities, RSU and RCU, presented on the next page, are available to assist in starting up a communicating installation. Intended for DW, the software can be downloaded from the Schneider Electric internet site.
- The "Live update" function enables immediate updating to obtain the most recent upgrades. These easy-to-use utilities include starting assistance and on-line help. They are compatible with Microsoft Windows 2000, XP and Windows 7.



RSU configuration screen for a Intelligent control unit.



RCU mini-supervision screen for current measurements.

## Gateway

The gateway has two functions:

- access to the company intranet (Ethernet) by converting Modbus frames to the TCP/IP/Modbus protocol
- optional web-page server for the information from the devices.



Gateway

# Air Circuit Breakers

## DW series

### Functions and characteristics

Two utilities, RSU and RCU, are available to assist in starting up a communicating installation. They can be downloaded from the Schneider Electric internet site and include a "Live update" function that enables immediate updating.

#### RSU (Remote Setting Utility)

This utility is used to set the protection functions and alarms for each DW device. After connection to the network and entry of the circuit-breaker Modbus address, the software automatically detects the type of trip unit installed. There are two possible operating modes.

#### Off-line with the software disconnected from the communication network

For each selected circuit breaker, the user can do the following.

##### Determine the protection settings

The settings are carried out on a screen that shows the front of the trip unit. The control unit setting dials, keypad and screen are simulated for easy use of all control unit setting functions.

##### Save and duplicate the protection settings

Each configuration created can be saved for subsequent device programming. It can also be duplicated and used as the basis for programming another circuit breaker.

#### On-line with the software connected to the network

Similarly, for each selected circuit breaker, the user can do the following.

##### Display the current settings

The software displays the trip unit and provides access to all settings.

##### View the corresponding protection curves

A graphic curve module in the software displays the protection curve corresponding to the settings. It is possible to lay a second curve over the first for discrimination studies.

#### Modify settings in a secure manner

- There are different levels of security:
  - password: by default, it is the same for all devices, but can be differentiated for each device
  - locking of the Modbus interface module which must be unlocked before the corresponding device can be set remotely
  - maximum settings limited by the positions of the two dials on the trip unit.

These dials, set by the user, determine the maximum settings that can be made via the communication system.

- Settings are modified by:
  - either direct, on-line setting of the protection settings on the screen
  - or by loading the settings prepared in off-line mode. This is possible only if the positions of the dials allow the new settings.

All manual settings made subsequently on the device have priority.

#### Program alarms

- Up to 12 alarms can be linked to measurements or events.
- Two alarms are predefined and activated automatically:
  - Unit 5: overload (Ir)
  - Unit 6: overload (Ir) and ground fault (Ig).
- Thresholds, priorities and time delays can be set for 10 other alarms. They may be selected from a list of 91 alarms.

#### Set the outputs of the SDx relays

This is required when the user wants to change the standard configuration and assign different signals to the 2 outputs of the SDx relay.

#### RCU (Remote Control Utility)

The RCU utility can be used to test communication for all the devices connected to the Modbus network. It is designed for use with DW, BX, Advantys OTB and Power Meter devices. It offers a number of functions.

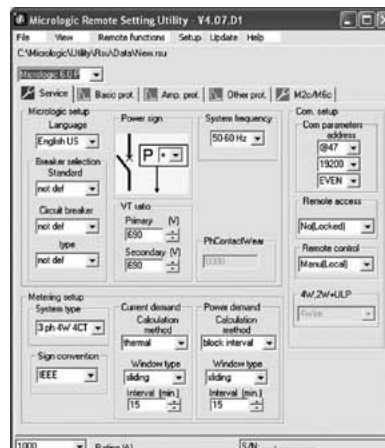
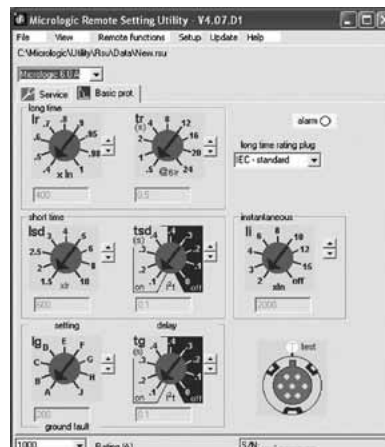
#### Mini supervisor

- Display of I, U, f, P, E and THD measurements for each device, via navigation.
- Display of ON/OFF status.

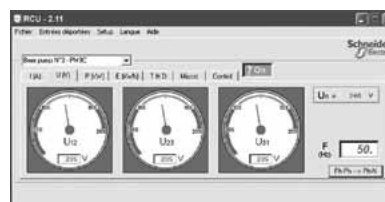
#### Open and close commands for each device

A common or individual password must first be entered.

When all functions have been tested, this utility is replaced by the supervision software selected for the installation.



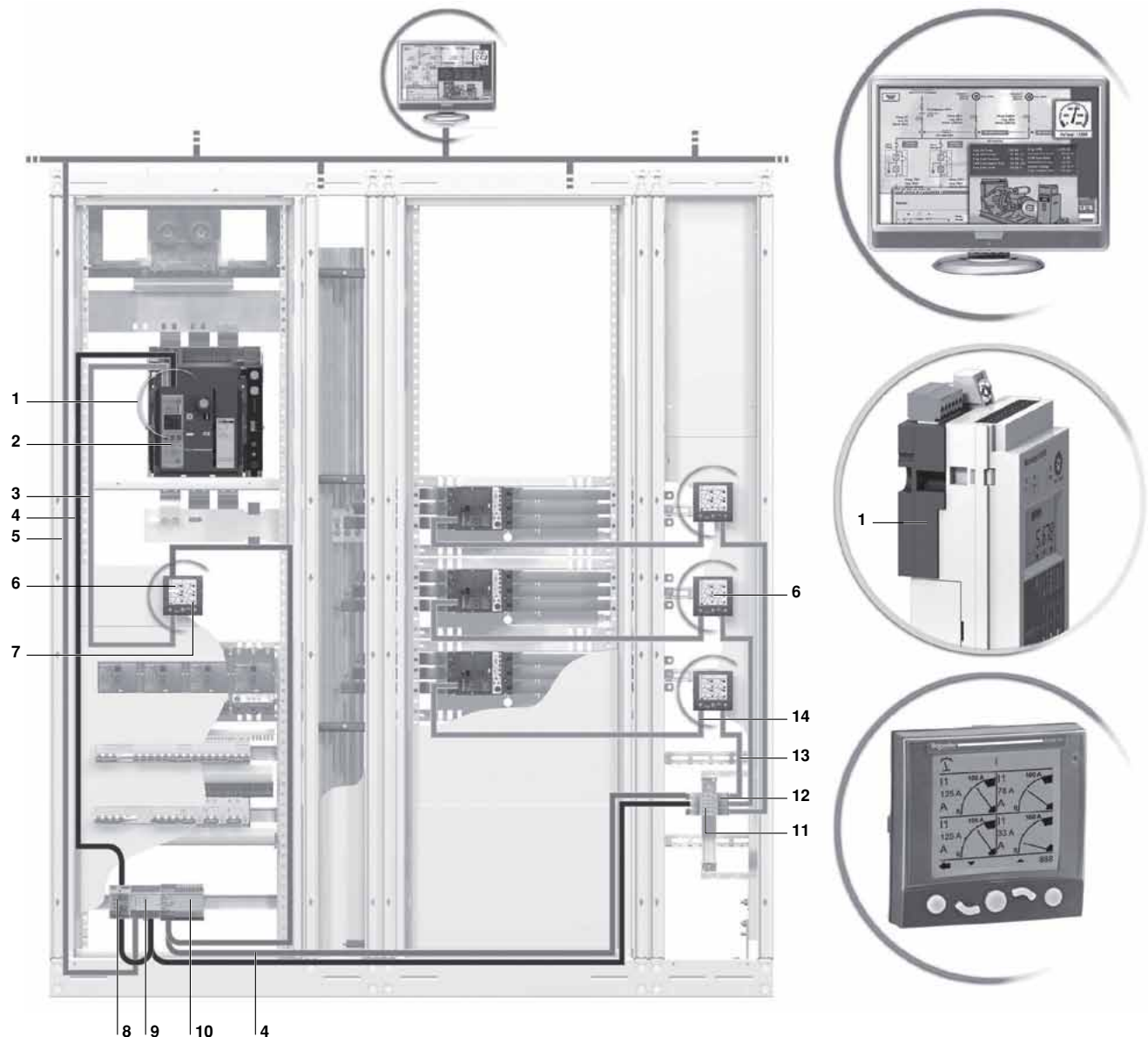
RSU: Control unit Remote Setting Utility.



RCU: Remote Control Utility for communication tests.

## Wiring system ULP

The wiring system is designed for low-voltage power switchboards. Installation requires no tools or special skills. The prefabricated wiring ensures both data transmission (ModBus protocol) and 24 V DC power distribution for the communications modules on the Intelligent control units.



- 1 BCM ULP: Breaker Communication Module with ULP port
- 2 Intelligent control unit
- 3 Breaker ULP cord
- 4 Modbus cable
- 5 Ethernet cable
- 6 Front Display Module
- 7 ULP line terminators
- 8 CCM: Chassis Communication Module
- 9 Ethernet gateway
- 10 External 24 V DC power supply module
- 11 Modbus interface
- 12 Stacking accessories
- 13 ULP cable                   0.3 m
- 0.6 m
- 14 BX cord

# Air Circuit Breakers

## DW series

### Functions and characteristics

#### ■ Connections

Three types of connection are available:

- vertical or horizontal rear connection
- front connection
- mixed connection.

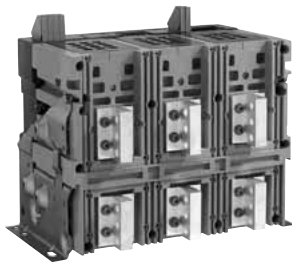
The solutions presented are similar in principle for all DW fixed and drawout devices.

#### Rear connection

Horizontal



Vertical



Simply turn a horizontal rear connector 90° to make it a vertical connector.

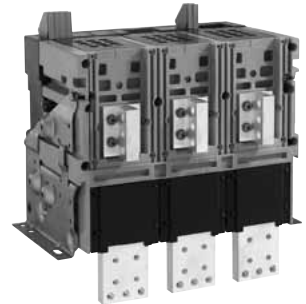
For the 6300 A circuit breaker, only vertical connection is available.

#### Front connection



Front connection is available for DW fixed and drawout versions up to 3200 A.

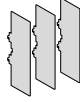
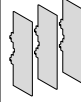
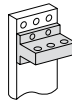
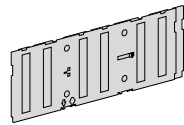
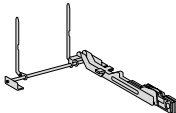
#### Mixed connection



Note: DW circuit breakers can be connected indifferently with bare-copper, tinned-copper and tinned-aluminium conductors, requiring no particular treatment.



# Air Circuit Breakers DW series Functions and characteristics

Type of accessory	DW08 to DW63			
	Fixed Front connection	Fixed Rear connection	Drawout Front connection	Drawout Rear connection
Interphase barriers		 (1)		 (1)
Disconnectable front-connection adapter				
Safety shutters with padlocking			 standard	
Shutter position indication and locking				

Note: (1) Except for the DW40 equipped with horizontal rear connections.

### Mounting on a switchboard backplate using special brackets

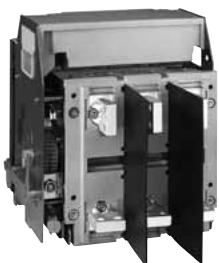
DW fixed front-connected circuit breakers can be installed on a backplate without any additional accessories. DW circuit breakers require a set of special brackets.

### Interphase barriers (option)

These barriers are flexible insulated partitions used to reinforce isolation of connection points in installations with busbars, whether insulated or not.

For DW devices (up to DW40), they are installed vertically between rear connection terminals.

They are not compatible with spreaders.



### Disconnectable front-connection adapter (option)

Mounted on a fixed front-connected device, the adapter simplifies replacement of a fixed device by enabling fast disconnection from the front.



### Safety shutters (VO standard)

Mounted on the chassis, the safety shutters automatically block access to the disconnecting contact cluster when the device is in the disconnected or test positions (degree of protection IP 20). When the device is removed from its chassis, no live parts are accessible.

The shutter-locking system is made up of a moving block that can be padlocked (padlock not supplied). The block:

- prevents connection of the device
- locks the shutters in the closed position.

### For DW08 to DW63

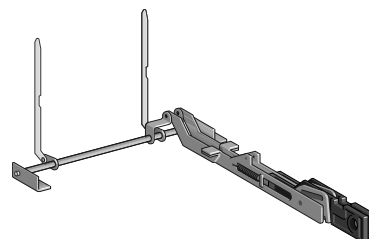
A support at the back of the chassis is used to store the blocks when they are not used:

- 2 blocks for DW08 to DW40
- 4 blocks for DW40b to DW63.



### Shutter position indication and locking on front face

This option located on the chassis front plate indicates that the shutters are closed. It is possible to independently or separately padlock the two shutters using one to three padlocks (not supplied).



# Air Circuit Breakers

## DW series

### Functions and characteristics

#### ■ Locking

##### Pushbutton locking VBP

The transparent cover blocks access to the pushbuttons used to open and close the device.

It is possible to independently lock the opening button and the closing button.

The locking device is often combined with a remote operating mechanism.

The pushbuttons may be locked using either:

- three padlocks (not supplied)
- lead seal
- two screws.



Access to pushbuttons protected by transparent cover.

##### Device locking in the OFF position VCPO by padlocks, VSPO by keylocks

The circuit breaker is locked in the OFF position by physically maintaining the opening pushbutton pressed down:

- using padlocks (one to three padlocks, not supplied), shackle diameter: 5 to 8 mm
- using keylocks (one or two different keylocks, supplied).

Keys may be removed only when locking is effective (Profalux or Ronis type locks).

The keylocks are available in any of the following configurations:

- one keylock
- one keylock mounted on the device + one identical keylock supplied separately for interlocking with another device
- two different key locks for double locking.

Profalux and Ronis keylocks are compatible with each other.

A locking kit (without locks) is available for installation of one or two keylocks (Ronis, Profalux, Kirk or Castell).

##### Accessory-compatibility

For DW: 3 padlocks and/or 2 keylocks.



Pushbutton locking using a padlock.



OFF position locking using a padlock.



OFF position locking using a keylock.

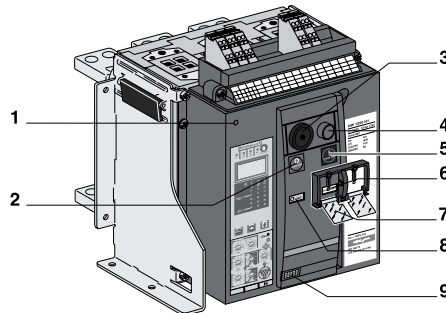
##### Cable-type door interlock IPA

This option prevents door opening when the circuit breaker is closed and prevents circuit breaker closing when the door is open.

For this, a special plate associated with a lock and a cable is mounted on the right side of the circuit breaker.

With this interlock installed, the source changeover function cannot be implemented.

This option is identical for fixed and drawout versions.



- 1 Reset button for mechanical trip indication.
- 2 OFF pushbutton.
- 3 OFF position lock.
- 4 Electrical closing pushbutton.
- 5 ON pushbutton.
- 6 Springs charged indication.
- 7 Pushbutton locking.
- 8 Contact position indication.
- 9 Operation counter.

## "Disconnected" position locking by padlocks (standard) or keylocks VSPD (option)

Mounted on the chassis and accessible with the door closed, these devices lock the circuit breaker in the "disconnected" position in two manners:

- using padlocks (standard), up to three padlocks (not supplied)
- using keylocks (optional), one or two different keylocks are available.

Profalux and Ronis keylocks are available in different options:

- one keylock
- two different keylocks for double locking
- one (or two) keylocks mounted on the device + one (or two) identical keylocks supplied separately for interlocking with another device.

A locking kit (without locks) is available for installation of one or two keylocks (Ronis, Profalux, Kirk or Castell).



"Disconnected" position locking by padlocks.



"Disconnected" position locking by keylocks.

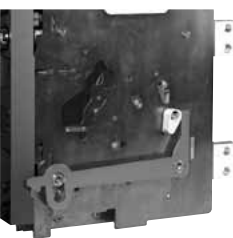
## "Connected", "disconnected" and "test" position locking

The "connected", "disconnected" and "test" positions are shown by an indicator and are mechanically indexed. The exact position is obtained when the racking handle blocks. A release button is used to free it.

As standard, the circuit breaker can be locked only in "disconnected position". On request, the locking system may be modified to lock the circuit breaker in any of the three positions: "connected", "disconnected" or "test".

### Door interlock catch VPEC

Mounted on the right or left-hand side of the chassis, this device inhibits opening of the cubicle door when the circuit breaker is in "connected" or "test" position. If the breaker is put in the "connected" position with the door open, the door may be closed without having to disconnect the circuit breaker.



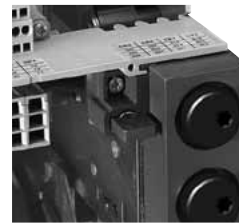
Door interlock.

### Racking interlock VPOC

This device prevents insertion of the racking handle when the cubicle door is open.

## Racking interlock between crank and OFF pushbutton IBPO

This option makes it necessary to press the OFF pushbutton in order to insert the racking handle and holds the device open until the handle is removed.



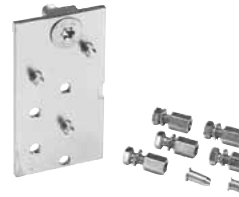
Racking interlock.

## Automatic spring discharge before breaker removal DAE

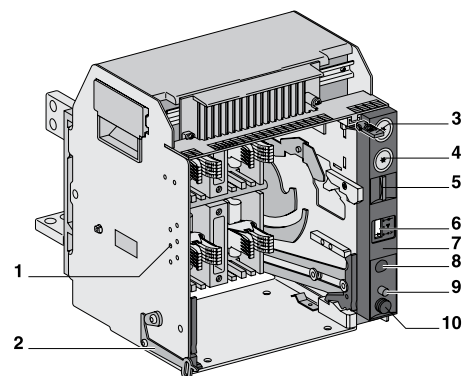
This option discharges the springs before the breaker is removed from the chassis.

## Mismatch protection VDC

Mismatch protection ensures that a circuit breaker is installed only in a chassis with compatible characteristics. It is made up of two parts (one on the chassis and one on the circuit breaker) offering twenty different combinations that the user may select.



Mismatch protection.



- 1 Mismatch protection.
- 2 Door interlock.
- 3 Racking interlock.
- 4 Keylock locking.
- 5 Padlock locking.
- 6 Position indicator.
- 7 Chassis front plate (accessible with cubicle door closed).
- 8 Racking-handle entry.
- 9 Reset button.
- 10 Racking-handle storage.

# Air Circuit Breakers

## DW series

### Functions and characteristics

#### ■ Indication contacts

Indication contacts are available:

- in the standard version for relay applications
- in a low-level version for control of PLCs and electronic circuits.

M2C and M6C contacts may be programmed via the Intelligent control units E, P and H.

#### ON/OFF indication contacts OF

Two types of contacts indicate the ON or OFF position of the circuit breaker:

- rotary type changeover contacts directly driven by the mechanism for DW. These contacts trip when the minimum isolation distance between the main circuit-breaker contacts is reached.

OF		DW	
Supplied as standard		4	
Maximum number		12	
Breaking capacity (A)	Standard	Minimum load: 100 mA/24 V	
	AC12/DC12	V AC	240/380 480 690
V DC	24/48 125 250	10/6 <sup>(1)</sup> 10/6 <sup>(1)</sup> 3	
		Minimum load: 2 mA/15 V	
		V AC	24/48 240 380
V DC	24/48 125 250	6 6 3	

Note: (1) Standard contacts: 10 A; optional contacts: 6 A.

#### "Fault-trip" indication contacts SDE

Circuit-breaker tripping due to a fault is signalled by:

- a red mechanical fault indicator (reset)
- one changeover contact SDE.

Following tripping, the mechanical indicator must be reset before the circuit breaker may be closed. One SDE is supplied as standard. An optimal SDE may be added.

This latter is incompatible with the electrical reset after fault-trip option (RES).

SDE		DW	
Supplied as standard		1	
Maximum number		2	
Breaking capacity (A)	Standard	Minimum load: 100 mA/24 V	
	AC12/DC12	V AC	240/380 480 690
V DC	24/48 125 250	3 0.3 0.15	
		Minimum load: 2 mA/15 V	
		V AC	24/48 240 380
V DC	24/48 125 250	3 0.3 0.15	

#### Combined "connected/closed" contacts EF

The contact combines the "device connected" and the "device closed" information to produce the "circuit closed" information. Supplied as an option for DW, it is mounted in place of the connector of an additional OF contact.

EF		DW	
Maximum number		8	
Breaking capacity (A)	Standard	Minimum load: 100 mA/24 V	
	AC12/DC12	V AC	240/380 480 690
V DC	24/48 125 250	2.5 0.8 0.3	
		Minimum load: 2 mA/15 V	
		V AC	24/48 240 380
V DC	24/48 125 250	2.5 0.8 0.3	



ON/OFF indication contacts (OF) (rotary type).



Additional "fault-trip" indication contacts (SDE)



Combined contacts.

# Air Circuit Breakers DW series Functions and characteristics

## "Connected", "disconnected" and "test" position carriage switches

Three series of optional auxiliary contacts are available for the chassis:

- changeover contacts to indicate the "connected" position CE
- changeover contacts to indicate the "disconnected" position CD. This position is indicated when the required clearance for isolation of the power and auxiliary circuits is reached
- changeover contacts to indicate the "test" position CT. In this position, the power circuits are disconnected and the auxiliary circuits are connected.

## Additional actuators

A set of additional actuators may be installed on the chassis to change the functions of the carriage switches.

		DW			
Contacts		CE/CD/CT			
Maximum number	Standard	3	3	3	
	with additional actuators	9	0	0	
		6	3	0	
		6	0	3	
		3	6	0	
Breaking capacity (A) p.f.: 0.3 AC12/DC12	Standard	Minimum load: 100 mA/24 V			
		V AC	240	8	
			380	8	
			480	8	
			690	6	
			24/48	2.5	
	V DC		125	0.8	
			250	0.3	
		Low-level	Minimum load: 2 mA/15 V		
			V AC	24/48	5
				240	5
				380	5
V DC	24/48		2.5		
	125		0.8		
	250	0.3			



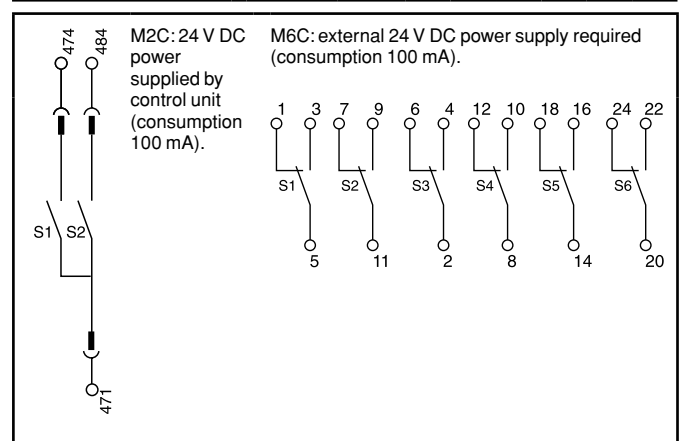
CE, CD and CT "connected/disconnected/test" position carriage switches.

## M2C / M6C programmable contacts

These contacts, used with the Intelligent control units E, P and H, may be programmed via the control unit keypad or via a supervisory station with the COM communication option. They require an external power supply module.

The M2C (two contacts) and M6C (six contacts) auxiliary contacts may be used to signal threshold overruns or status changes. They can be programmed using the keypad on the Unit P control unit or remotely using the COM option (BCM ULP).

Intelligent control unit	Type E		Types P, H	
Characteristics	M2C		M2C / M6C	
Minimum load	100 mA/24 V		100 mA/24 V	
Breaking capacity (A) p.f.: 0.7	V AC	240	5	5
		380	3	3
	V DC	24	1.8	1.8
		48	1.5	1.5
	125	0.4	0.4	
	250	0.15	0.15	



M2C programmable contacts: circuit-breaker internal relay with two contacts.



M6C programmable contacts: circuit-breaker external relay with six independent changeover contacts controlled from the circuit breaker via a three-wire connection. (maximum length is 10 meters).

# Air Circuit Breakers

## DW series

### Functions and characteristics

#### Remote operation

Two solutions are available for remote operation of DW devices:

- a point-to-point solution
- a bus solution with the COM communication option.



The remote ON / OFF function is used to remotely open and close the circuit breaker. It is made up of:

- an electric motor MCH equipped with a "springs charged" limit switch contact CH
- two voltage releases:
  - a closing release XF
  - an opening release MX.

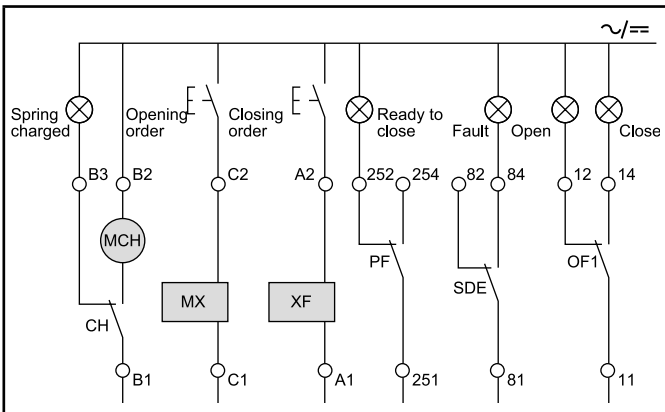
Optionally, other functions may be added:

- a "ready to close" contact PF
- an electrical closing pushbutton BPF
- remote RES following a fault.

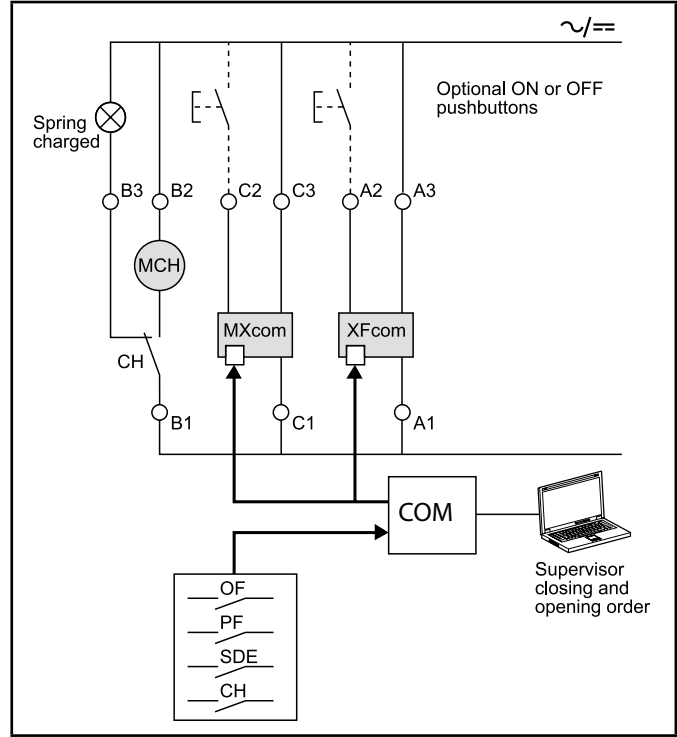
A remote-operation function is generally combined with:

- device ON / OFF indication OF
- "fault-trip" indication SDE.

#### Wiring diagram of a point-to-point remote ON / OFF function



#### Wiring diagram of a bus-type remote ON / OFF function



Note: an opening order always takes priority over a closing order.

If opening and closing orders occur simultaneously, the mechanism discharges without any movement of the main contacts. The circuit breaker remains in the open position (OFF).

In the event of maintained opening and closing orders, the standard mechanism provides an anti-pumping function by blocking the main contacts in open position.

Anti-pumping function. After fault tripping or intentional opening using the manual or electrical controls, the closing order must first be discontinued, then reactivated to close the circuit breaker.

When the automatic reset after fault trip (RAR) option is installed, to avoid pumping following a fault trip, the automatic control system must take into account the information supplied by the circuit breaker before issuing a new closing order or blocking the circuit breaker in the open position (information on the type of fault, e.g. overload, short-time fault, earth fault, earth leakage, short-circuit, etc.).

Note: MX communicating releases are of the impulse type only and cannot be used to lock a circuit breaker in OFF position. For locking in OFF position, use the remote tripping function (2nd MX or MN).

When MX or XF communicating releases are used, the third wire (C3, A3) must be connected even if the communication module is not installed. When the control voltage (C3-C1 or A3-A1) is applied to the MX or XF releases, it is necessary to wait 1.5 seconds before issuing an order. Consequently, it is advised to use standard MX or XF releases for applications such as source-changeover systems.

## Electric motor MCH

The electric motor automatically charges and recharges the spring mechanism when the circuit breaker is closed. Instantaneous reclosing of the breaker is thus possible following opening. The spring-mechanism charging handle is used only as a backup if auxiliary power is absent. The electric motor MCH is equipped as standard with a limit switch contact CH that signals the "charged" position of the mechanism (springs charged).

Characteristics	
Power supply	V AC 50/60 Hz 48/60 - 100/130 - 200/240 - 277-380/415 - 400/440 - 480 V DC 24/30 - 48/60 - 100/125 - 200/250
Operating threshold	0.85 to 1.1 Un
Consumption (VA or W)	180
Motor overcurrent	2 to 3 In for 0.1 s
Charging time	maximum 4 s
Operating frequency	maximum 3 cycles per minute
CH contact	10 A at 240 V

## Voltage releases XF and MX

Their supply can be maintained or automatically disconnected.

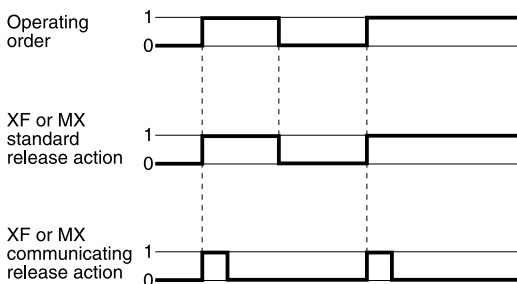
### Closing release XF

The XF release remotely closes the circuit breaker if the spring mechanism is charged.

### Opening release MX

The MX release instantaneously opens the circuit breaker when energised. It locks the circuit breaker in OFF position if the order is maintained (except for MX "communicating" releases).

Note: whether the operating order is maintained or automatically disconnected (pulse-type), XF or MX "communicating" releases ("bus" solution with "COM" communication option) always have an impulse-type action (see diagram).



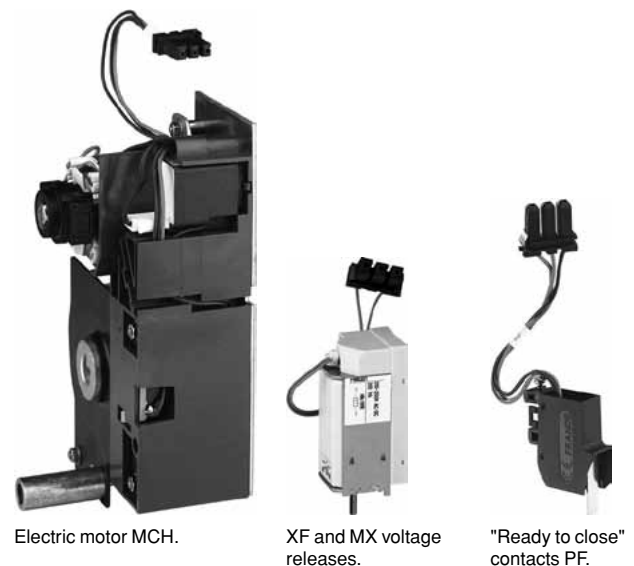
Characteristics	XF	MX
Power supply	V AC 50/60 Hz 24 - 48 - 100/130 - 200/250 - 277 - 380/480 V DC 12 - 24/30 - 48/60 - 100/130 - 200/250	
Operating threshold	0.85 to 1.1 Un	0.7 to 1.1 Un
Consumption (VA or W)	Hold: 4.5 Pick-up: 200 (200 ms)	Hold: 4.5 Pick-up: 200 (200 ms)
Circuit breaker response time at Un	70 ms ±10 (≤ 4000 A) 80 ms ±10 (> 4000 A)	50 ms ±10

## "Ready to close" contact PF

The "ready to close" position of the circuit breaker is indicated by a mechanical indicator and a PF changeover contact. This signal indicates that all the following are valid:

- the circuit breaker is in the OFF position
- the spring mechanism is charged
- a maintained opening order is not present:
  - MX energised
  - fault trip
  - remote tripping second MX or MN
- device not completely racked in
- device locked in OFF position
- device interlocked with a second device.

Characteristics		DW	
Maximum number			1
Breaking capacity (A)	Standard		Minimum load: 100 mA/24 V
p.f.: 0.3			
AC12/DC12	V AC	240/380	5
		480	5
		690	3
	V DC	24/48	3
		125	0.3
		250	0.15
	Low-level		Minimum load: 2 mA/15 V
	V AC	24/48	3
		240	3
		380	3
	V DC	24/48	3
		125	0.3
		250	0.15



# Air Circuit Breakers

## DW series

### Functions and characteristics

#### Electrical closing pushbutton BPFE

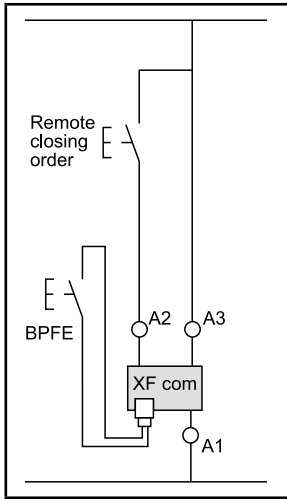
Located on the front panel, this pushbutton carries out electrical closing of the circuit breaker. It is generally associated with the transparent cover that protects access to the closing pushbutton.

Electrical closing via the BPFE pushbutton takes into account all the safety functions that are part of the control/monitoring system of the installation.

The BPFE connects to the closing release (XF com) in place of the COM module.

The COM module is incompatible with this option.

Different types of voltage exist and the XF electromagnet is compulsory if the BPFE option is selected.



Electrical closing pushbutton BPFE.

#### Remote reset after fault trip

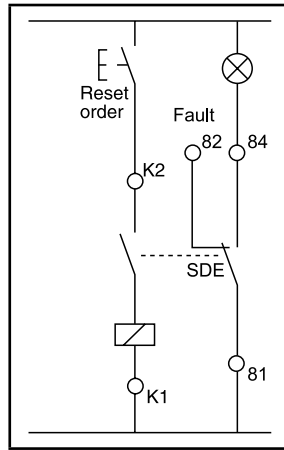
##### Electrical reset after fault trip RES

Following tripping, this function resets the "fault trip" indication contacts SDE and the mechanical indicator and enables circuit breaker closing.

Power supply: 110/130 V AC and 200/240 V AC.

The use of XF closing release is compulsory with this option.

The additional "Fault Trip" indication contact SDE2 is not compatible with RES.



##### Automatic reset after fault trip RAR

Following tripping, a reset of the mechanical indicator (reset button) is no longer required to enable circuit-breaker closing. The mechanical (reset button) and electrical SDE indications remain in fault position until the reset button is pressed.

The use of XF closing release is compulsory with this option.

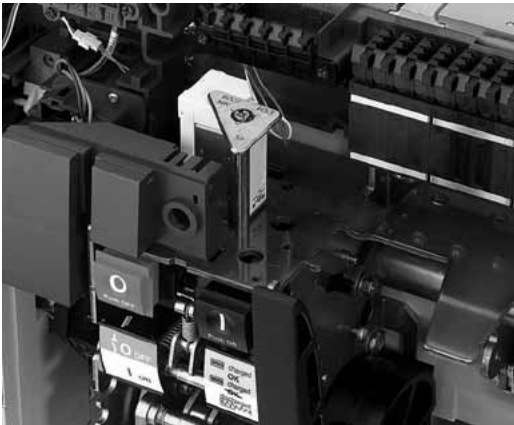


# Air Circuit Breakers DW series Functions and characteristics

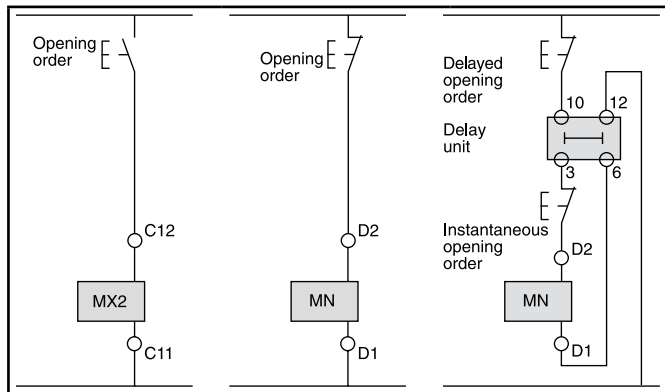
This function opens the circuit breaker via an electrical order. It is made up of:

- a shunt release second MX
  - or an undervoltage release MN
  - or a delayed undervoltage release MNR: MN + delay unit.
- These releases (2<sup>nd</sup> MX or MN) cannot be operated by the communication bus.

The delay unit, installed outside the circuit breaker, may be disabled by an emergency OFF button to obtain instantaneous opening of the circuit breaker.



**Wiring diagram for the remote-tripping function**



### Voltage releases second MX

When energised, the MX voltage release instantaneously opens the circuit breaker. A continuous supply of power to the second MX locks the circuit breaker in the OFF position.

#### Characteristics

Power supply	V AC 50/60Hz	24 - 48 - 100/130 - 200/250 - 277 - 380/480
	V DC	12 - 24/30 - 48/60 - 100/130 - 200/250
Operating threshold	0.7 to 1.1 Un	
Permanent locking function	0.85 to 1.1 Un	
Consumption (VA or W)	Pick-up: 200 (80 ms)	Hold: 4.5
Circuit breaker response time at Un	50 ms ±10	

### Instantaneous voltage releases MN

The MN release instantaneously opens the circuit breaker when its supply voltage drops to a value between 35 % and 70 % of its rated voltage. If there is no supply on the release, it is impossible to close the circuit breaker, either manually or electrically. Any attempt to close the circuit breaker has no effect on the main contacts. Circuit-breaker closing is enabled again when the supply voltage of the release returns to 85 % of its rated value.

#### Characteristics

Power supply	V AC 50/60 Hz	24 - 48 - 100/130 - 200/250 - 380/480
	V DC	24/30 - 48/60 - 100/130 - 200/250
Operating threshold	Opening	0.35 to 0.7 Un
	Closing	0.85 Un
Consumption (VA or W)	Pick-up: 200 (200 ms)	Hold: 4.5
MN consumption with delay unit (VA or W)	Pick-up: 200 (200 ms)	Hold: 4.5
Circuit breaker response time at Un	90 ms ±5	

### MN delay units

To eliminate circuit-breaker nuisance tripping during short voltage dips, operation of the MN release can be delayed. This function is achieved by adding an external delay unit in the MN voltage-release circuit. Two versions are available, adjustable and non-adjustable.

#### Characteristics

Power supply	Non-adjustable	100/130 - 200/250
	Adjustable	48/60 - 100/130 - 200/250 - 380/480
Operating threshold	Opening	0.35 to 0.7 Un
	Closing	0.85 Un
Delay unit consumption	Pick-up: 200 (200 ms)	Hold: 4.5
Circuit breaker response time at Un	Non-adjustable	0.25 s
	Adjustable	0.5 s - 0.9 s - 1.5 s - 3 s



MX or MN voltage release.

# Air Circuit Breakers

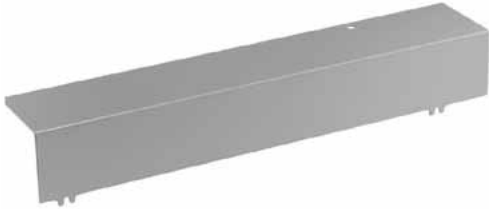
## DW series

### Functions and characteristics

#### ■ Accessories

##### Auxiliary terminal shield CB

Optional equipment mounted on the chassis, the shield prevents access to the terminal block of the electrical auxiliaries.



##### Operation counter CDM

The operation counter sums the number of operating cycles and is visible on the front panel. It is compatible with manual and electrical control functions.

This option is compulsory for all the source-changeover systems.



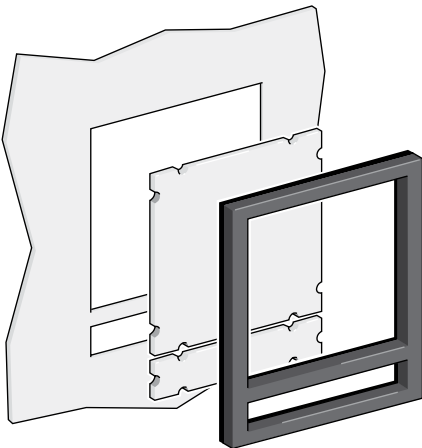
##### Escutcheon CDP

Optional equipment mounted on the door of the cubicle, the escutcheon increases the degree of protection to IP 40 (circuit breaker installed free standing: IP30).

It is available in fixed and drawout versions.

##### Blanking plate OP for escutcheon

Used with the escutcheon, this option closes off the door cut-out of a cubicle not yet equipped with a device. It may be used with the escutcheon for both fixed and drawout devices.



Escutcheon CDP with blanking plate.

##### Transparent cover CCP for escutcheon

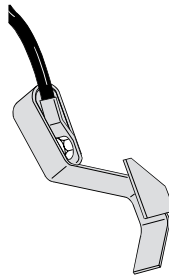
Optional equipment mounted on the escutcheon, the cover is hinged and secured by a screw. It increases the degree of protection to IP54, IK10. It adapts to drawout devices.



Transparent cover CCP for escutcheon.

##### Grounding kit KMT

This option allows the grounding of the breaker mechanism while the front cover is removed. The grounding is made via the chassis for the drawout version and via the fixation side plate for the fixed version.



Grounding kit KMT.

## Manual source-changeover system

This is the most simple type. It is controlled manually by an operator and consequently the time required to switch from the normal to the replacement source can vary. A manual source-changeover system is made up of two or three mechanically interlocked manually-operated circuit breakers or switch-disconnectors. The interlocks prevent any paralleling, even transient, of the two sources.



Commercial and service sector:

- operating rooms in hospitals
- safety systems for tall buildings
- computer rooms (banks, insurance companies, etc.)
- lighting systems in shopping centres...



Infrastructures:

- port and railway installations
- runway lighting systems
- control systems on military sites...



Industry:

- assembly lines
- engine rooms on ships
- critical auxiliaries in thermal power stations...

# Air Circuit Breakers

## DW series

### Functions and characteristics

#### Interlocking of two DW devices using connecting rods

The two devices must be mounted one above the other (either 2 fixed or 2 withdrawable/drawout devices).  
Combinations are possible between DW devices.

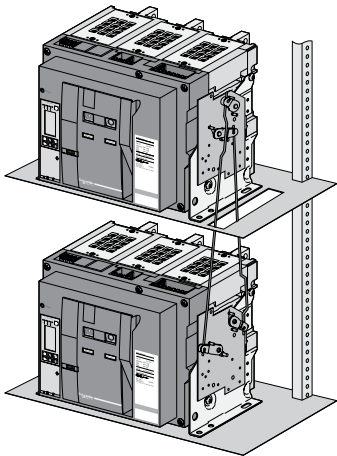
#### Installation

This function requires:

- an adaptation fixture on the right side of each circuit breaker or switch-disconnector
- a set of connecting rods with no-slip adjustments.

The adaptation fixtures, connecting rods and circuit breakers or switch-disconnectors are supplied separately, ready for assembly by the customer.

The maximum vertical distance between the fixing planes is 900 mm



Interlocking of two DW circuit breakers using connecting rods.

Electrical interlocking is used with the mechanical interlocking system.

An automatic controller may be added to take into account information from the distribution system.

Moreover, the relays controlling the "normal" and "replacement" circuit breakers must be mechanically and/or electrically interlocked to prevent them from giving simultaneous closing commands.

Electrical interlocking is carried out by an electrical control device.

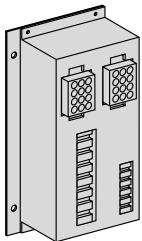
For DW, this function can be implemented in one of two ways:

- using the IVE unit
- by an electrician in accordance with the chapter "electrical diagrams" of the catalogue "source-changeover systems".

### Characteristics of the IVE unit

- External connection terminal block:
  - inputs: circuit breaker control signals
  - outputs: status of the SDE contacts on the "Normal" and "Replacement" source circuit breakers.
- 2 connectors for the two "Normal" and "Replacement" source circuit breakers:
  - inputs:
    - status of the OF contacts on each circuit breaker (ON or OFF)
    - status of the SDE contacts on the "Normal" and "Replacement" source circuit breakers
  - outputs: power supply for operating mechanisms.
- Control voltage:
  - 24 to 250 V DC
  - 48 to 415 V 50/60 Hz - 440 V 60 Hz.

The IVE unit control voltage must be same as that of the circuit breaker operating mechanisms.



IVE unit.

### Necessary equipment

**For DW, each circuit breaker must be equipped with:**

- a remote-operation system made up of:
  - MCH gear motor
  - MX or MN opening release
  - XF closing release
  - PF "ready to close" contact
  - CDM mechanical operation counter
- an available OF contact
- one to three CE connected-position contacts (carriage switches) on drawout circuit breakers (depending on the installation).

Types of mechanical interlocking	Possible combinations	Typical electrical diagrams								
<b>2 devices</b> 	<table border="1"> <thead> <tr> <th>QN</th> <th>QR</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> </tr> </tbody> </table>	QN	QR	0	0	1	0	0	1	<ul style="list-style-type: none"> <li>● electrical interlocking with lockout after fault:                             <ul style="list-style-type: none"> <li>• permanent replacement source (without IVE)</li> <li>• with EPO by MX (without IVE)</li> <li>• with EPO by MN (without IVE)</li> <li>• permanent replacement source (with IVE)</li> <li>• with EPO by MX (with IVE)</li> <li>• with EPO by MN (with IVE)</li> </ul> </li> <li>● automatic control without lockout after fault:                             <ul style="list-style-type: none"> <li>• permanent replacement source (without IVE)</li> <li>• engine generator set (without IVE)</li> </ul> </li> <li>● automatic control with lockout after fault:                             <ul style="list-style-type: none"> <li>• permanent replacement source (with IVE)</li> <li>• engine generator set (with IVE)</li> </ul> </li> <li>● BA/UA controller (with IVE)</li> </ul>
QN	QR									
0	0									
1	0									
0	1									

"Lockout after fault" option. This option makes it necessary to manually reset the device following fault tripping.

# Air Circuit Breakers

## DW series

### Installation recommendations

DW circuit breakers have been tested for operation in industrial atmospheres. It is recommended that the equipment be cooled or heated to the proper operating temperature and kept free of excessive vibration and dust.

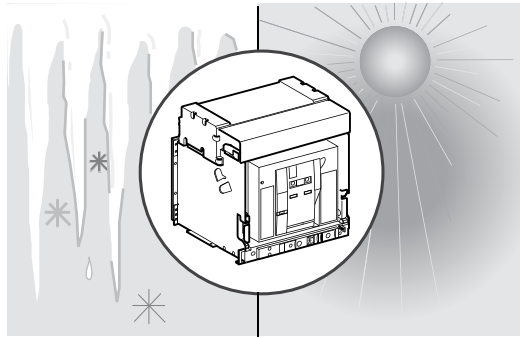
#### Ambient temperature

DW devices can operate under the following temperature conditions:

- the electrical and mechanical characteristics are stipulated for an ambient temperature of  $-25\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$
- circuit-breaker closing is guaranteed down to  $-35\text{ }^{\circ}\text{C}$  by manual operation (push button).

Storage conditions are as follows:

- $-40$  to  $+85\text{ }^{\circ}\text{C}$  for a DW device without its control unit
- $-25\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  for the control unit.



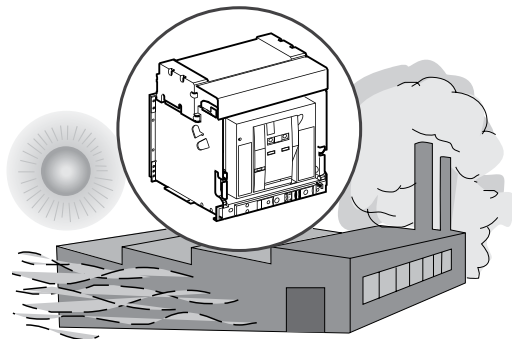
#### Extreme atmospheric conditions

DW devices have successfully passed the tests defined by the following standards for extreme atmospheric conditions:

- IEC 60068-2-1: dry cold at  $-55\text{ }^{\circ}\text{C}$
- IEC 60068-2-2: dry heat at  $+85\text{ }^{\circ}\text{C}$
- IEC 60068-2-30: damp heat (temperature  $+55\text{ }^{\circ}\text{C}$ , relative humidity 95 %)
- IEC 60068-2-52 level 2: salt mist.

DW devices can operate in the industrial environments defined by standard IEC 60947 (pollution degree up to 4).

It is nonetheless advised to check that the devices are installed in suitably cooled switchboards without excessive dust.



#### Vibrations

DW devices have successfully passed testing in compliance with IEC 60068-2-6 for the following vibration levels:

- 2 to 13.2 Hz: amplitude  $\pm 1\text{ mm}$

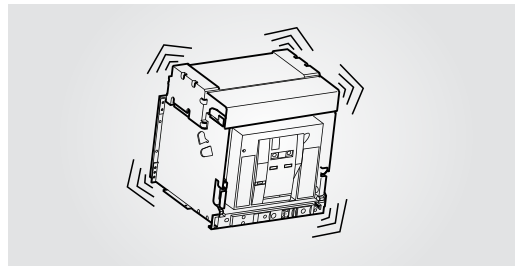
- 13.2 to 100 Hz: constant acceleration 0.7 g.

Vibration testing to these levels is required by merchant marine inspection organisations (Veritas, Lloyd's, etc).

Some applications have vibration profiles outside of this standard and require special attention during application design, installation, and use. Excessive vibration may cause unexpected tripping, damage to connections or to other mechanical parts. Please refer to the DW maintenance guide (causes of accelerated ageing / operating conditions / vibrations) for additional information.

Examples of applications with high vibration profiles could include:

- wind turbines
- power frequency converters that are installed in the same switchboard or close proximity to the DW circuit breaker
- emergency generators
- high vibration marine applications such as thrusters, anchor positioning systems, etc.

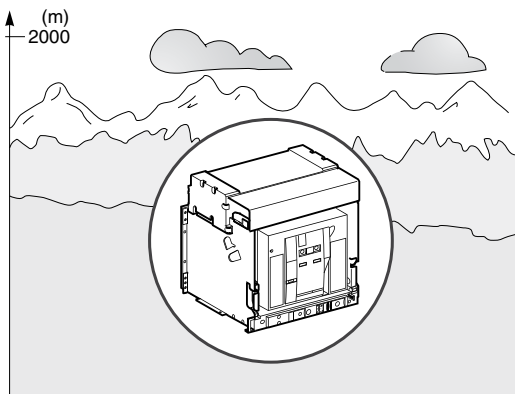


## Altitude

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
Impulse withstand voltage U <sub>imp</sub> (kV)	12	11	10	8
Rated insulation voltage (U <sub>i</sub> )	1000	900	780	700
Maximum rated operational voltage 50/60 Hz U <sub>e</sub> (V)	1000	890	795	700
Rated current 40 °C	1 x I <sub>n</sub>	0.99 x I <sub>n</sub>	0.96 x I <sub>n</sub>	0.94 x I <sub>n</sub>

Note: intermediate values may be obtained by interpolation.



## Electromagnetic disturbances

DW devices are protected against:

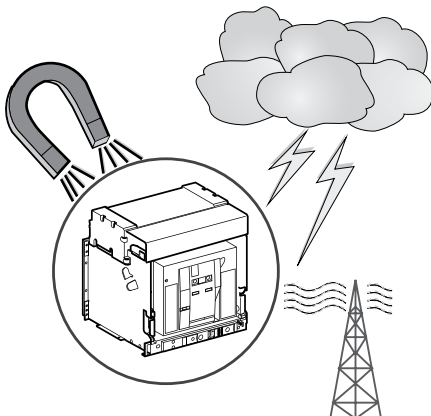
- overvoltages caused by devices that generate electromagnetic disturbances
- overvoltages caused by atmospheric disturbances or by a distribution-system outage (e.g. failure of a lighting system)
- devices emitting radio waves (radios, walkie-talkies, radar, etc.)
- electrostatic discharges produced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

DW 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.

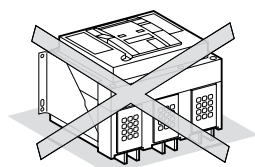
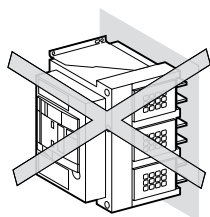
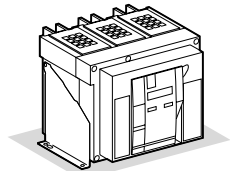


# Air Circuit Breakers

## DW series

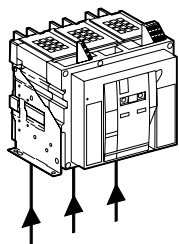
### Installation recommendations

#### Possible positions



#### Power supply

DW devices can be supplied either from the top or from the bottom without reduction in performance, in order to facilitate connection when installed in a switchboard.



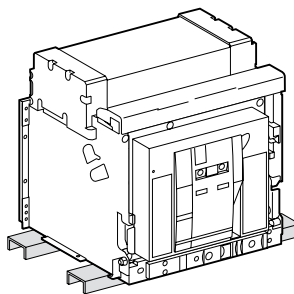
#### Mounting the circuit breaker

It is important to distribute the weight of the device uniformly over a rigid mounting surface such as rails or a base plate.

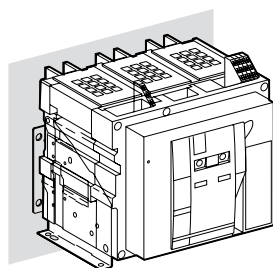
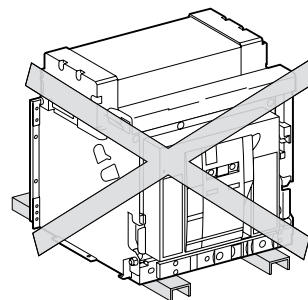
This mounting plane should be perfectly flat (tolerance on support flatness: 2 mm).

This eliminates any risk of deformation which could interfere with correct operation of the circuit breaker.

DW devices can also be mounted on a vertical plane using the special brackets.



Mounting on rails.

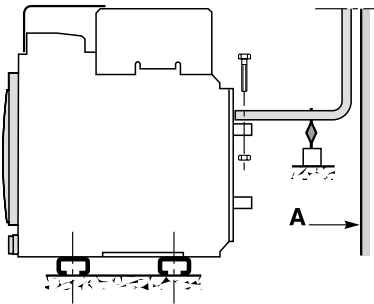


Mounting with vertical brackets.

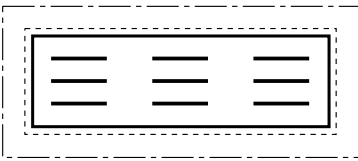


**Partitions**

Sufficient openings must be provided in partitions to ensure good air circulation around the circuit breaker; Any partition between upstream and downstream connections of the device must be made of non-magnetic material.  
 For high currents, of 2500 A and upwards, the metal supports or barriers in the immediate vicinity of a conductor must be made of non-magnetic material **A**.  
 Metal barriers through which a conductor passes must not form a magnetic loop.

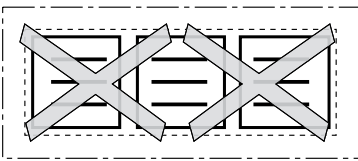
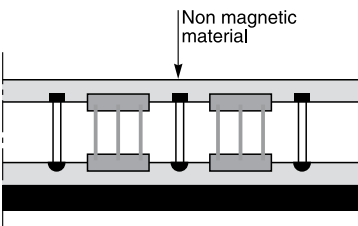


**A** : non magnetic material.



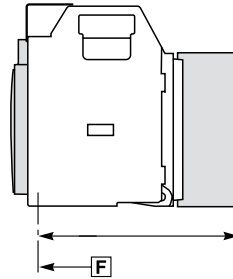
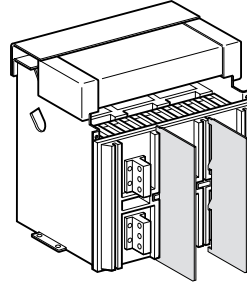
**Busbars**

The mechanical connection must exclude the possibility of formation of a magnetic loop around a conductor.



**Interphase barrier**

If the insulation distance between phases is not sufficient ( $\leq 14$  mm), it is advised to install phase barriers (taking into account the safety clearances).



# Air Circuit Breakers

## DW series

### Installation recommendations

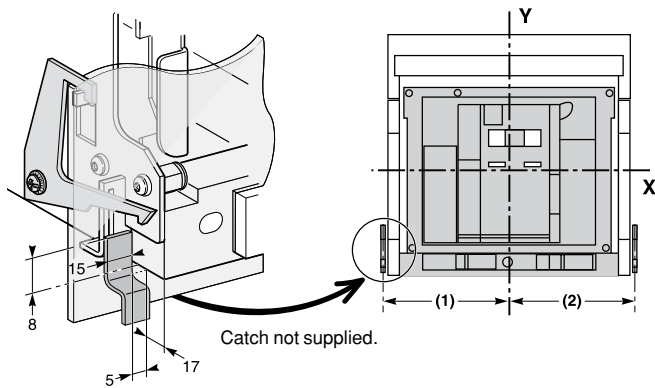
#### Door interlock VPEC

Mounted on the right or left-hand side of the chassis, this device inhibits opening of the cubicle door when the circuit breaker is in "connected" or "test" position.

If the breaker is put in the "connected" position with the door open, the door may be closed without having to disconnect the circuit breaker.

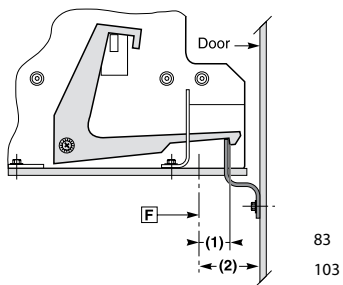
#### Dimensions (mm)

Type	(1)	(2)
DW08-40 (3P)	215	215
DW08-40 (4P)	330	215
DW40b-63 (3P)	660	215
DW40b-63 (4P)	775	215



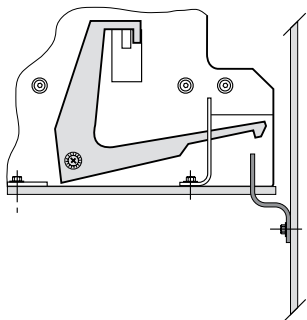
#### Breaker in "connected" or "test" position

Door cannot be opened



#### Breaker in "disconnected" position

Door can be opened

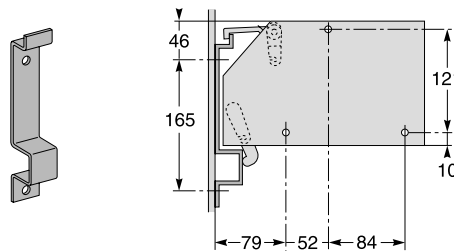
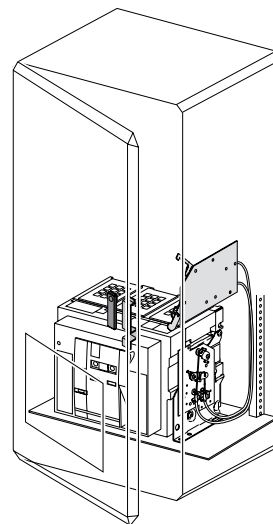
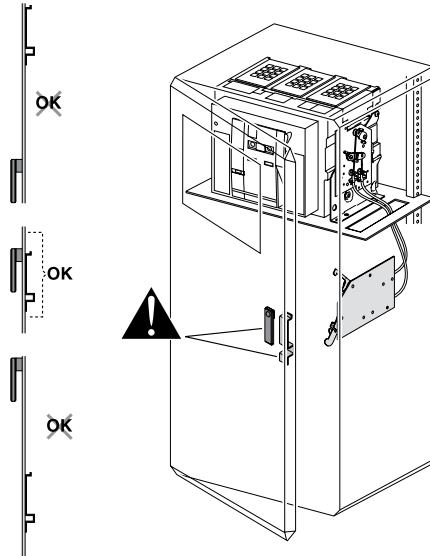


#### Cable-type door interlock IPA

This option prevents door opening when the circuit breaker is closed and prevents circuit breaker closing when the door is open.

For this, a special plate associated with a lock and a cable is mounted on the right side of the circuit breaker.

With this interlock installed, the source changeover function cannot be implemented.



Note: the door interlock can either be mounted on the right side or the left side of the breaker.

**F**: datum.

**Wiring of voltage releases**

During pick-up, the power consumed is approximately 150 to 200 VA. For low control voltages (12, 24, 48 V), maximum cable lengths are imposed by the voltage and the cross-sectional area of cables.

**Recommended maximum cable lengths (meter).**

		12 V		24 V		48 V	
		2.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>
MN	U source 100 %	–	–	58	35	280	165
	U source 85 %	–	–	16	10	75	45
MX-XF	U source 100 %	21	12	115	70	550	330
	U source 85 %	10	6	75	44	350	210

Note: the indicated length is that of each of the two wires.

**24 V DC power-supply module**

**External 24 V DC power-supply module for Intelligent control unit (F1-, F2+)**

- Do not connect the positive terminal (F2+) to earth.
- The negative terminal (F1-) can be connected to earth, except in IT systems.
- A number of Intelligent control units and M6C modules can be connected to the same 24 V DC power supply (the consumption of a Intelligent control unit or an M6C module is approximately 100 mA).
- Do not connect any devices other than a control unit or an M6C module if voltage > 480 V AC or in an environment with a high level of electromagnetic disturbance.
- The maximum length for each conductor is ten metres. For greater distances, it is advised to twist the supply wires together.
- The 24 V DC supply wires must cross the power cables perpendicularly. If this is difficult, it is advised to twist the supply wires together.
- The technical characteristics of the external 24 V DC power-supply module for Intelligent control units are indicated on page 34.

**Communication bus**

- Do not connect the positive terminal (E1) to earth.
- The negative terminal (E2) can be connected to earth.
- A number of “device” or “chassis” communication modules can be connected to the same 24 V DC power supply (the consumption of each module is approximately 30 mA).

Note: **wiring** of ZSI: it is recommended to use twisted shielded cable. The shield must be connected to earth at both ends.

# Air Circuit Breakers

## DW series

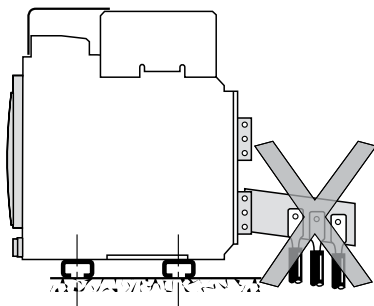
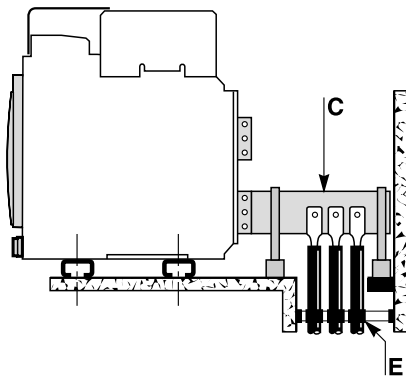
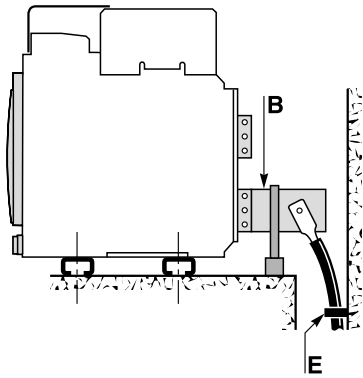
### Installation recommendations

#### Cables connections

If cables are used for the power connections, make sure that they do not apply excessive mechanical forces to the circuit breaker terminals.

For this, make the connections as follows:

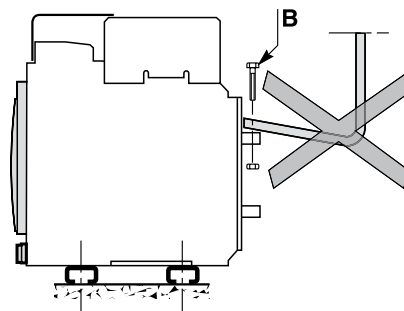
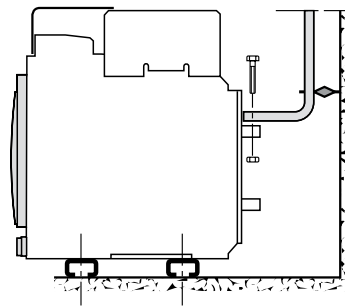
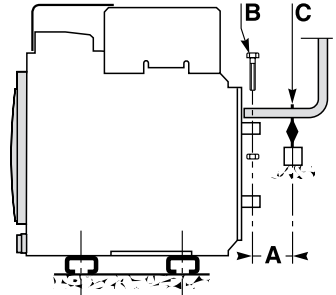
- extend the circuit breaker terminals using short bars designed and installed according to the recommendations for bar-type power connections:
  - for a single cable, use solution **B** opposite
  - for multiple cables, use solution **C** opposite
- in all cases, follow the general rules for connections to busbars:
  - position the cable lugs before inserting the bolts
  - the cables should be firmly secured to the framework **E**.



#### Busbars connections

The busbars should be suitably adjusted to ensure that the connection points are positioned on the terminals before the bolts are inserted **B**.

The connections are held by the support which is solidly fixed to the framework of the switchboard, such that the circuit breaker terminals do not have to support its weight **C** (this support should be placed close to the terminals).



#### Electrodynamic stresses

The first busbar support or spacer shall be situated within a maximum distance from the connection point of the breaker (see table below). This distance must be respected so that the connection can withstand the electrodynamic stresses between phases in the event of a short circuit.

Maximum distance A between busbar to circuit breaker connection and the first busbar support or spacer with respect to the value of the prospective short-circuit current.						
Isc (kA)	30	50	65	80	100	150
Distance A (mm)	350	300	250	150	150	150

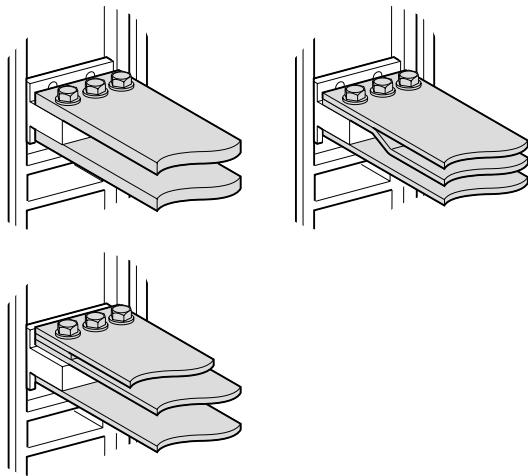
## Clamping

Correct clamping of busbars depends amongst other things, on the tightening torques used for the nuts and bolts. Over-tightening may have the same consequences as under-tightening.

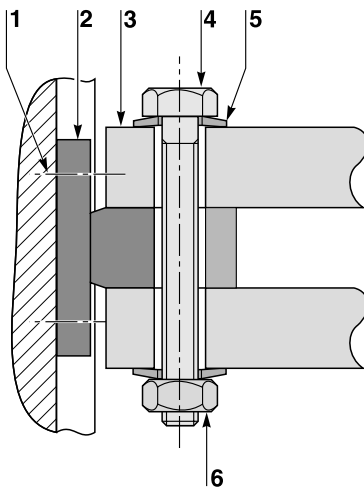
For connecting busbars (Cu ETP-NFA51-100) to the circuit breaker, the tightening torques to be used are shown in the table below.

These values are for use with copper busbars and steel nuts and bolts, class 8.8. The same torques can be used with AGS-T52 quality aluminium bars (French standard NFA 02-104 or American National Standard H-35-1).

## Examples



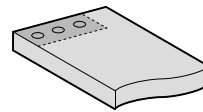
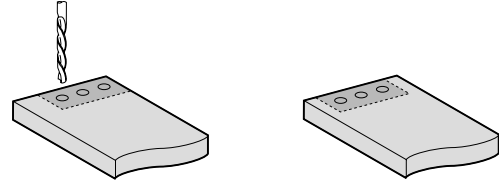
Tightening torques			
Ø (mm) Nominal	Ø (mm) Drilling	Tightening torques (Nm) with grower or flat washers	Tightening torques (Nm) with contact or corrugatec washers
10	11	37.5	50



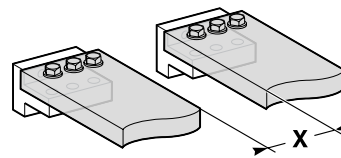
- 1 Terminal screw factory-tightened to 16 Nm.
- 2 Breaker terminal.
- 3 Busbar.
- 4 Bolt.
- 5 Washer.
- 6 Nut.

## Busbar drilling

### Examples



## Isolation distance

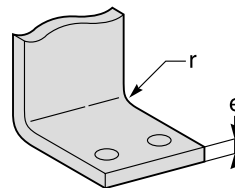


### Dimensions (mm)

Ui	X min
600 V	8 mm
1000 V	14 mm

## Busbar bending

When bending busbars maintain the radius indicated below (a smaller radius would cause cracks).



### Dimensions (mm)

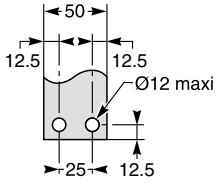
e	Radius of curvature r	
	Min	Recommended
5	5	7.5
10	15	18 to 20

# Air Circuit Breakers

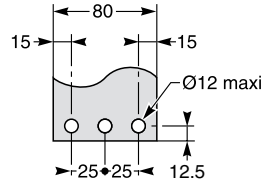
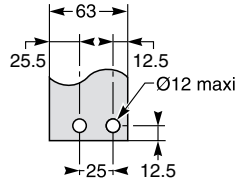
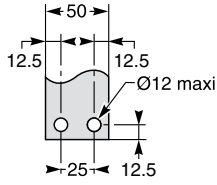
## DW series

### Installation recommendations

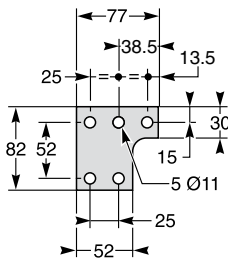
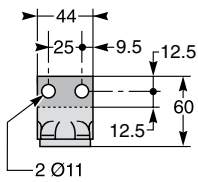
#### Rear connection



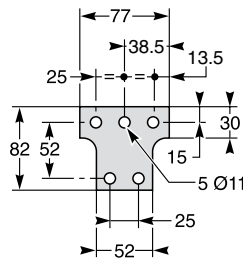
#### Rear connection with spreaders



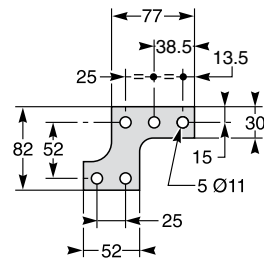
#### Middle left or middle right spreader for 4P



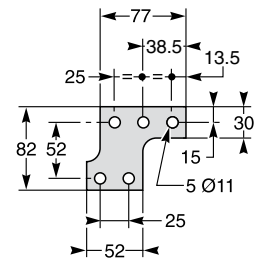
#### Middle spreader for 3P



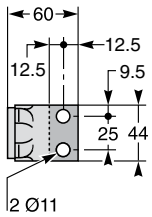
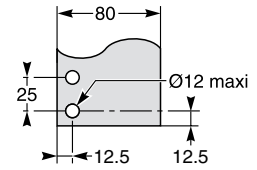
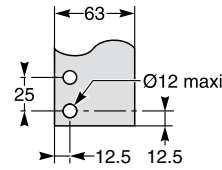
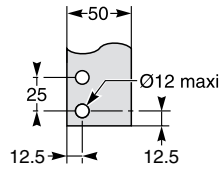
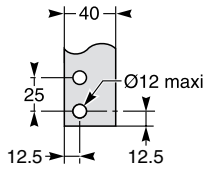
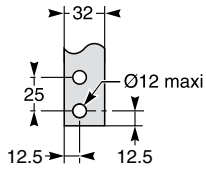
#### Left or right spreader for 4P



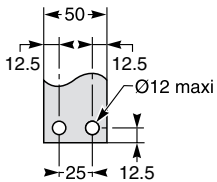
#### Left or right spreader for 3P



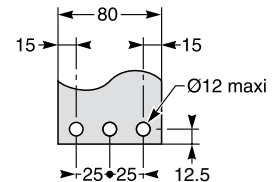
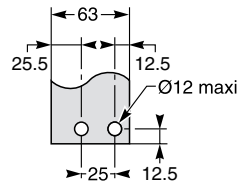
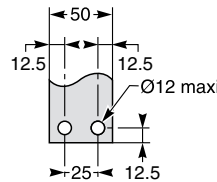
#### Vertical rear connection



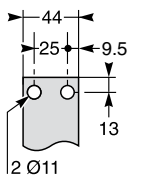
#### Front connection



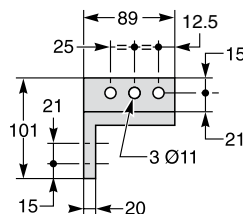
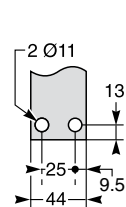
#### Front connection via vertical connection adapters



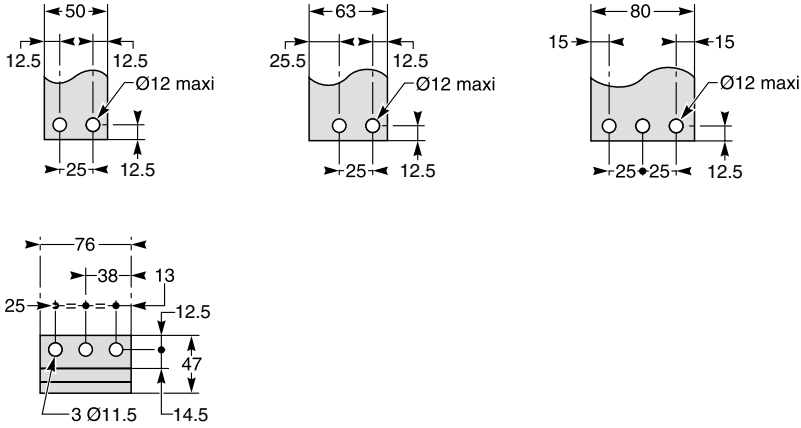
#### Top connection



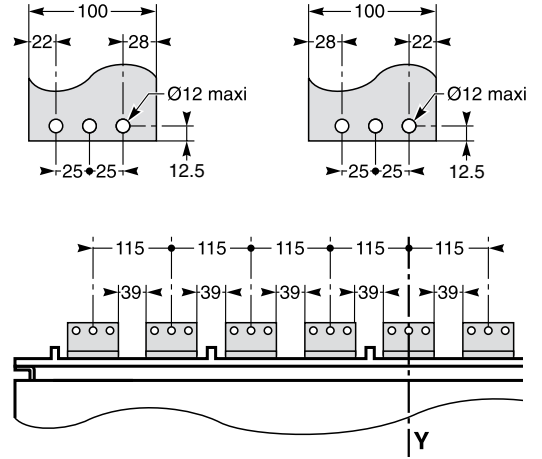
#### Bottom connection



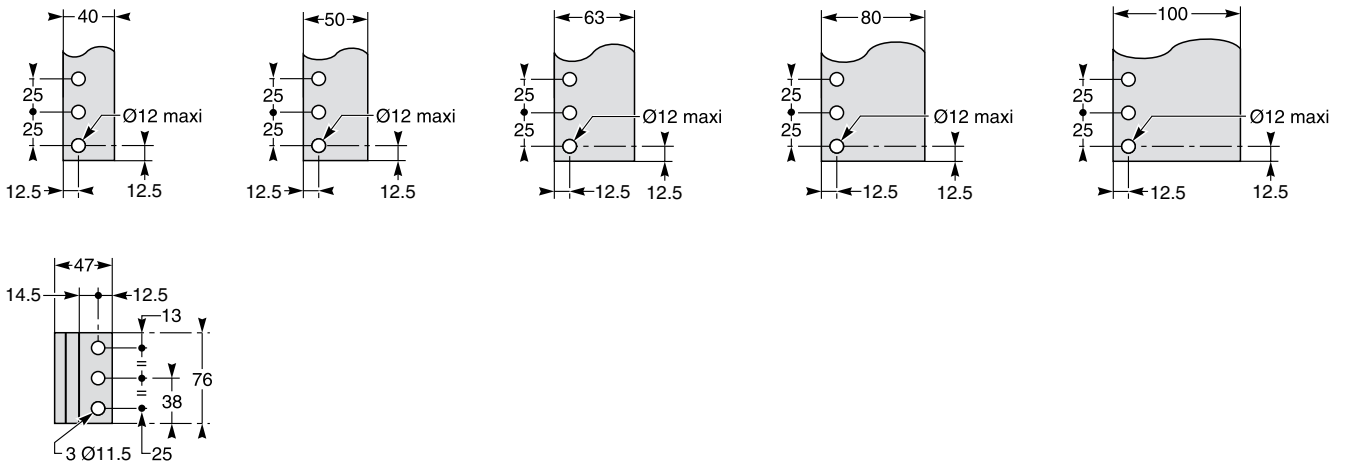
## Horizontal rear connection DW08 to DW32



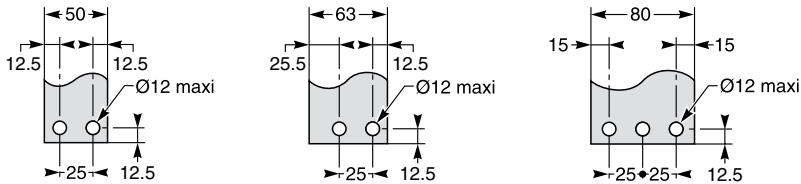
## DW40b to DW50



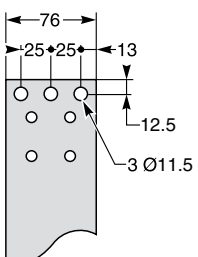
## Vertical rear connection DW08 to DW32, DW40b to DW50



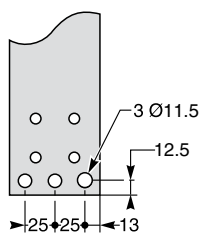
## Front connection DW08 to DW32



### Top connection



### Bottom connection



# Air Circuit Breakers

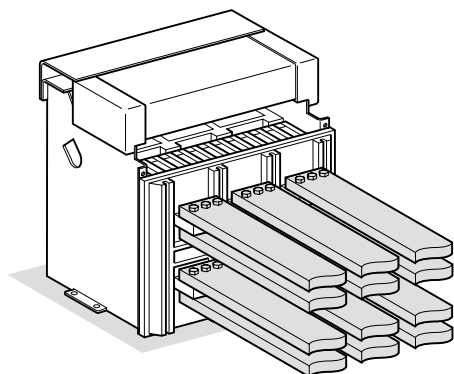
## DW series

### Installation recommendations

#### Basis of tables:

- maximum permissible busbars temperature: 100 °C
- Ti: temperature around the circuit breaker and its connection
- busbar material is unpainted copper.

#### Front or rear horizontal connection



ACB	Maximum service current	Ti : 40 °C		Ti : 50 °C		Ti : 60 °C	
		No. of 5 mm thick bars	No. of 10 mm thick bars	No. of 5 mm thick bars	No. of 10 mm thick bars	No. of 5 mm thick bars	No. of 10 mm thick bars
DW08	800	2b.50 x 5	1b.50 x 10	2b.50 x 5	1b.50 x 10	2b.50 x 5	1b.63 x 10
DW10	1000	3b.50 x 5	1b.63 x 10	3b.50 x 5	2b.50 x 10	3b.63 x 5	2b.50 x 10
DW12	1250	3b.50 x 5	2b.40 x 10	3b.50 x 5	2b.50 x 10	3b.63 x 5	2b.50 x 10
		2b.80 x 5	2b.40 x 10	2b.80 x 5			
DW16	1400	3b.63 x 5	2b.40 x 10	3b.63 x 5	2b.50 x 10	3b.80 x 5	2b.63 x 10
DW16	1600	3b.80 x 5	2b.63 x 10	3b.80 x 5	2b.63 x 10	3b.80 x 5	3b.50 x 10
DW20	1800	3b.80 x 5	2b.63 x 10	3b.80 x 5	2b.63 x 10	3b.100 x 5	2b.80 x 10
DW20	2000	3b.100 x 5	2b.80 x 10	3b.100 x 5	2b.80 x 10	3b.100 x 5	3b.63 x 10
DW25	2200	4b.100 x 5	2b.80 x 10	4b.100 x 5	2b.80 x 10	4b.100 x 5	2b.100 x 10
DW25	2500	4b.100 x 5	2b.100 x 10	4b.100 x 5	2b.100 x 10	4b.100 x 5	3b.80 x 10
DW32	2800	4b.100 x 5	3b.80 x 10	4b.100 x 5	3b.80 x 10	5b.100 x 5	3b.100 x 10
DW32	3000	5b.100 x 5	3b.80 x 10	6b.100 x 5	3b.100 x 10	8b.100 x 5	4b.80 x 10
DW32	3200	6b.100 x 5	3b.100 x 10	8b.100 x 5	3b.100 x 10		4b.100 x 10
DW40	3800		4b.100 x 10		5b.100 x 10		5b.100 x 10
DW40	4000		5b.100 x 10		5b.100 x 10		6b.100 x 10
DW50	4500		6b.100 x 10		6b.100 x 10		7b.100 x 10
DW50	5000		7b.100 x 10		7b.100 x 10		

#### Example

##### Conditions:

- drawout version
- horizontal busbars
- Ti: 50 °C
- service current: 1800 A.

##### Solution:

For Ti = 50 °C, use an DW20 which can be connected with three 80 x 5 mm bars or two 63 x 10 mm bars.

Note: the values indicated in these tables have been extrapolated from test data and theoretical calculations. These tables are only intended as a guide and cannot replace industrial experience or a temperature rise test.

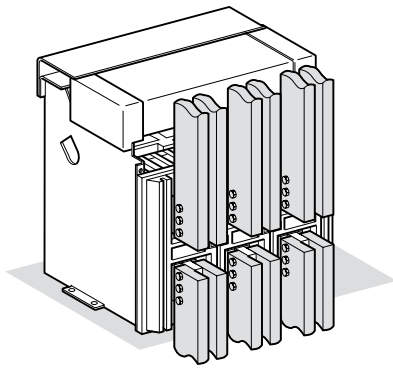


# Air Circuit Breakers DW series Installation recommendations

## Basis of tables:

- maximum permissible busbars temperature: 100 °C
- Ti: temperature around the circuit breaker and its connection
- busbar material is unpainted copper.

## Rear vertical connection



ACB	Maximum service current	Ti : 40 °C		Ti : 50 °C		Ti : 60 °C	
		No. of 5 mm thick bars	No. of 10 mm thick bars	No. of 5 mm thick bars	No. of 10 mm thick bars	No. of 5 mm thick bars	No. of 10 mm thick bars
DW08	800	2b.50 x 5	1b.50 x 10	2b.50 x 5	1b.50 x 10	2b.50 x 5	1b.50 x 10
DW10	1000	2b.50 x 5	1b.50 x 10	2b.50 x 5	1b.50 x 10	2b.63 x 5	1b.63 x 10
DW12	1250	2b.63 x 5	1b.63 x 10	3b.50 x 5	2b.40 x 10	3b.50 x 5	2b.40 x 10
DW16	1400	2b.80 x 5	1b.80 x 10	2b.80 x 5	2b.50 x 10	3b.63 x 5	2b.50 x 10
DW16	1600	3b.63 x 5	2b.50 x 10	3b.63 x 5	2b.50 x 10	3b.80 x 5	2b.63 x 10
DW20	1800	2b.100 x 5	1b.80 x 10	2b.100 x 5	2b.50 x 10	3b.80 x 5	2b.63 x 10
DW20	2000	3b.100 x 5	2b.63 x 10	3b.100 x 5	2b.63 x 10	3b.100 x 5	2b.80 x 10
DW25	2200	3b.100 x 5	2b.63 x 10	3b.100 x 5	2b.63 x 10	3b.100 x 5	2b.80 x 10
DW25	2500	4b.100 x 5	2b.80 x 10	4b.100 x 5	2b.80 x 10	4b.100 x 5	3b.80 x 10
DW32	2800	4b.100 x 5	2b.100 x 10	4b.100 x 5	2b.100 x 10	4b.100 x 5	3b.80 x 10
DW32	3000	5b.100 x 5	3b.80 x 10	6b.100 x 5	3b.100 x 10	5b.100 x 5	4b.80 x 10
DW32	3200	6b.100 x 5	3b.100 x 10	6b.100 x 5	3b.100 x 10		4b.100 x 10
DW40	3800		4b.100 x 10		4b.100 x 10		4b.100 x 10
DW40	4000		4b.100 x 10		4b.100 x 10		4b.100 x 10
DW50	4500		5b.100 x 10		5b.100 x 10		6b.100 x 10
DW50	5000		5b.100 x 10		6b.100 x 10		7b.100 x 10
DW63	5700		7b.100 x 10		7b.100 x 10		8b.100 x 10
DW63	6300		8b.100 x 10		8b.100 x 10		

## Example

### Conditions:

- drawout version
- vertical connections
- Ti: 40 °C
- service current: 1100 A.

### Solution :

For Ti = 40 °C use an DW12 which can be connected with two 63 x 5 mm bars or with one 63 x 10 mm bar.

Note: the values indicated in these tables have been extrapolated from test data and theoretical calculations. These tables are only intended as a guide and cannot replace industrial experience or a temperature rise test.

# Air Circuit Breakers

## DW series

### Installation recommendations

#### Temperature derating

The table below indicates the maximum current rating, for each connection type, as a function of  $T_i$  around the circuit breaker and the busbars.

Circuit breakers with mixed connections have the same derating as horizontally connected breakers.

For  $T_i$  greater than 60 °C, consult us.

$T_i$ : temperature around the circuit breaker and its connection.

Version Connection Temp. $T_i$	Drawout					Rear vertical					Fixed					Rear vertical				
	Front or rear horizontal					Rear vertical					Front or rear horizontal					Rear vertical				
	40	45	50	55	60	40	45	50	55	60	40	45	50	55	60	40	45	50	55	60
DW08 H1/H2	800					800					800					800				
DW10 H1/H2	1000					1000					1000					1000				
DW12 H1/H2	1250					1250					1250					1250				
DW16 H1/H2	1600					1600					1600					1600				
DW20 H1/H2	2000					1980 1890					2000					1920				
DW25 H1/H2	2500					2500					2500					2500				
DW32 H1/H2	3200					3100 3000 2900					3200					3200				
DW40 H1/H2	4000					3900 3750 3650					4000					3850				
DW40b H1/H2	4000					4000					4000					4000				
DW50 H1/H2	5000					5000					5000					5000				
DW63 H1/H2	-					-					6300					6200				

#### Power dissipation

Total power dissipation is the value measured at  $I_n$ , 50/60 Hz, for a 3 pole or 4 pole breaker.

Version	Drawout	Fixed
	Power dissipation (Watts)	Power dissipation (Watts)
DW08 H1/H2	100	42
DW10 H1/H2	150	70
DW12 H1/H2	230	100
DW16 H1/H2	390	170
DW20H1/H2	470	250
DW25 H1/H2	600	260
DW32 H1/H2	670	420
DW40 H1/H2	900	650
DW40b H1/H2	550	390
DW50 H1/H2	950	660
DW63 H1/H2	1200	1050

### **Factors affecting switchboard design**

#### **The temperature around the circuit breaker and its connections:**

This is used to define the type of circuit breaker to be used and its connection arrangement.

#### **Vents at the top and bottom of the cubicles:**

Vents considerably reduce the temperature inside the switchboard, but must be designed so as to respect the degree of protection provided by the enclosure.

For weatherproof heavy-duty cubicles, a forced ventilation system may be required.

#### **The heat dissipated by the devices installed in the switchboard:**

This is the heat dissipated by the circuit breakers under normal conditions (service current).

#### **The size of the enclosure:**

This determines the volume for cooling calculations.

#### **Switchboard installation mode:**

Free-standing, against a wall, etc.

#### **Horizontal partitions:**

Partitions can obstruct air circulation within the enclosure.

#### **Basis of tables**

- switchboard dimensions
- number of circuit-breakers installed
- type of breaker connections
- drawout versions
- ambient temperature outside of the switchboard:  $T_a$  (IEC 60439-1).

# Air Circuit Breakers

## DW series

### Installation recommendations

DW08-10 H1/H2 (switchboard 2300 x 800 x 900) - area of outlet vents: 350 cm<sup>2</sup>

Type	DW08 H1/H2					DW10 H1/H2			
Switchboard composition									
Connection type									
Busbar dimensions (mm)	2b. 50 x 5					3b. 63 x 5			

Ventilated switchboard (⇒ IP31)		2b. 50 x 5					3b. 63 x 5					
	$T_a = 35\text{ °C}$	4						800				
		3						800			800	1000
		2	800		800		800		1000		1000	
		1	800	800	800	800	800	1000	1000	1000	1000	
	$T_a = 45\text{ °C}$	4						800				
		3						800			800	1000
		2	800		800		800		1000		1000	
		1	800	800	800	800	800	1000	1000	1000	1000	
	$T_a = 55\text{ °C}$	4						800				
		3						800			800	1000
		2	800		800		800		1000		1000	
		1	800	800	800	800	800	1000	1000	1000	1000	

Note: (1) Area of outlet vents: 350 cm<sup>2</sup>.

(2) Area of inlet vents: 350 cm<sup>2</sup>.

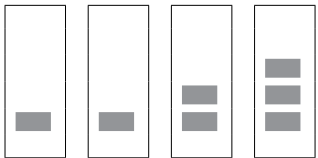













Non ventilated switchboard (⇒ IP54)		2b. 50 x 5					3b. 63 x 5					
	$T_a = 35\text{ °C}$	4						800				
		3						800			800	1000
		2	800		800		800		1000		1000	
		1	800	800	800	800	800	1000	1000	1000	1000	
	$T_a = 45\text{ °C}$	4						800				
		3						800			800	1000
		2	800		800		800		1000		1000	
		1	800	800	800	800	800	1000	1000	1000	1000	
	$T_a = 55\text{ °C}$	4						800				
		3						800			800	1000
		2	800		800		800		1000		1000	
		1	800	800	800	800	800	1000	1000	1000	1000	

Note: the values indicated in these tables have been extrapolated from test data and theoretical calculations. These tables are only intended as a guide and cannot replace industrial experience or a temperature rise test.

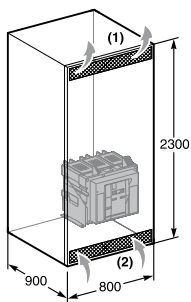
The values indicated for the cross-sectional area of the vents should be considered as general indications only given that the thermal performance of a switchboard with natural ventilation depends on many parameters, e.g. shape, porosity and location of vents and air flow within the switchboard.

# Air Circuit Breakers DW series Installation recommendations

**DW12-16 H1/H2** (switchboard 2300 x 800 x 900) - area of outlet vents: 350 cm<sup>2</sup>

Type	DW12 H1/H2				DW16 H1/H2		
<b>Switchboard composition</b>							
<b>Connection type</b>							
<b>Busbar dimensions (mm)</b>	3b. 63 x 5 3b. 50 x 5				3b. 80 x 5 3b. 63 x 5		

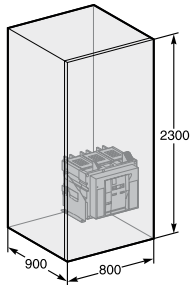
**Ventilated switchboard (⇒ IP31)**



$T_a = 35\text{ °C}$	4						
	3			1250			
	2		1250	1250			1600
	1	1250	1250	1250	1250	1600	1600
$T_a = 45\text{ °C}$	4						
	3			1250			
	2		1250	1250			1600
	1	1250	1250	1250	1250	1600	1600
$T_a = 55\text{ °C}$	4						
	3			1250			
	2		1250	1250			1470
	1	1250	1250	1250	1250	1520	1600

Note: (1) Area of outlet vents: 350 cm<sup>2</sup>.  
(2) Area of inlet vents: 350 cm<sup>2</sup>.

**Non ventilated switchboard (⇒ IP54)**



$T_a = 35\text{ °C}$	4						
	3			1250			
	2		1250	1250			1600
	1	1250	1250	1250	1250	1600	1600
$T_a = 45\text{ °C}$	4						
	3			1250			
	2		1250	1250			1500
	1	1250	1250	1250	1250	1500	1600
$T_a = 55\text{ °C}$	4						
	3			1250			
	2		1250	1250			1400
	1	1250	1250	1250	1250	1400	1520

Note: the values indicated in these tables have been extrapolated from test data and theoretical calculations. These tables are only intended as a guide and cannot replace industrial experience or a temperature rise test.  
The values indicated for the cross-sectional area of the vents should be considered as general indications only given that the thermal performance of a switchboard with natural ventilation depends on many parameters, e.g. shape, porosity and location of vents and air flow within the switchboard.

# Air Circuit Breakers

## DW series

### Installation recommendations

**DW20-40 H1/H2** (switchboard 2300 x 800 x 900) - area of outlet vents: 350 cm<sup>2</sup>

Type	DW20 H1/H2			DW25 H1/2		DW32 H1/2		DW40 H1/2					
<b>Switchboard composition</b>													
<b>Connection type</b>	≡			≡		≡		≡					
<b>Busbar dimensions (mm)</b>	3b. 100 x 5			4b. 100 x 5		3b. 100 x 10		4b. 100 x 10					
<b>Ventilated switchboard (⇒ IP31)</b>													
<b>T<sub>a</sub> = 35 °C</b>	4	2000			2375		2500	3040		3200	3320		3700
	3	2000			2250		2380	2880		3100	3160		3500
	2	2000	2000	2000	2100		2250	2690		2900	2960		3280
<b>T<sub>a</sub> = 45 °C</b>	4	2000			2250		2380	2880		3100	3160		3500
	3	2000			2100		2250	2690		2900	2960		3280
	2	2000	2000	2000	2100		2250	2690		2900	2960		3280
<b>T<sub>a</sub> = 55 °C</b>	4	2000			2125		2275	2650		2850	3040		3320
	3	1900			2000		2150	2550		2700	2880		3120
	2	1800	1920	1920	1900		2020	2370		2530	2720		2960
<b>Non ventilated switchboard (⇒ IP54)</b>	4	2000			2125		2275	2650		2850	3040		3320
	3	1900			2000		2150	2550		2700	2880		3120
	2	1800	1920	1920	1900		2020	2370		2530	2720		2960




Note: (1) Area of outlet vents: 350 cm<sup>2</sup>.  
 (2) Area of inlet vents: 350 cm<sup>2</sup>.

Note: the values indicated in these tables have been extrapolated from test data and theoretical calculations. These tables are only intended as a guide and cannot replace industrial experience or a temperature rise test.  
 The values indicated for the cross-sectional area of the vents should be considered as general indications only given that the thermal performance of a switchboard with natural ventilation depends on many parameters, e.g. shape, porosity and location of vents and air flow within the switchboard.

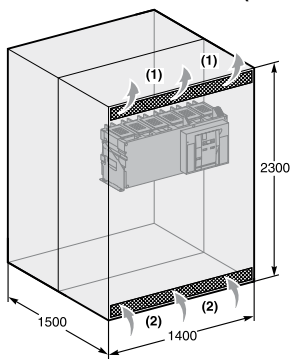
# Air Circuit Breakers DW series Installation recommendations

DW40b-63 H1/H2 (switchboard 2300 x 1400 x 1500) - area of outlet vents: 500 cm<sup>2</sup>

Type	DW40b H1/H2	DW50 H1/H2	DW63 H1/H2
<b>Switchboard composition</b>			

<b>Connection type</b>			
<b>Busbar dimensions (mm)</b>	5b. 100 x 10	7b. 100 x 10	8b. 100 x 10

**Ventilated switchboard (⇒ IP31)**

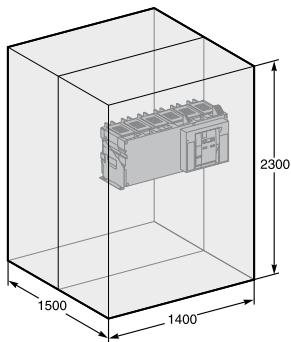


$T_a = 35\text{ °C}$	4					
	3					
	2	4000	4000	4700	5000	5850
	1					
$T_a = 45\text{ °C}$	4					
	3					
	2	4000	4000	4450	4850	5670
	1					
$T_a = 55\text{ °C}$	4					
	3					
	2	4000	4000	4200	4600	5350
	1					

Note: (1) Area of outlet vents: 500 cm<sup>2</sup>.

(2) Area of inlet vents: 500 cm<sup>2</sup>.

**Non ventilated switchboard (⇒ IP54)**



$T_a = 35\text{ °C}$	4					
	3					
	2	4000	4000	4350	4650	5290
	1					
$T_a = 45\text{ °C}$	4					
	3					
	2	4000	4000	4100	4400	5040
	1					
$T_a = 55\text{ °C}$	4					
	3					
	2	3840	3840	3850	4150	4730
	1					

Note: the values indicated in these tables have been extrapolated from test data and theoretical calculations. These tables are only intended as a guide and cannot replace industrial experience or a temperature rise test. The values indicated for the cross-sectional area of the vents should be considered as general indications only given that the thermal performance of a switchboard with natural ventilation depends on many parameters, e.g. shape, porosity and location of vents and air flow within the switchboard.

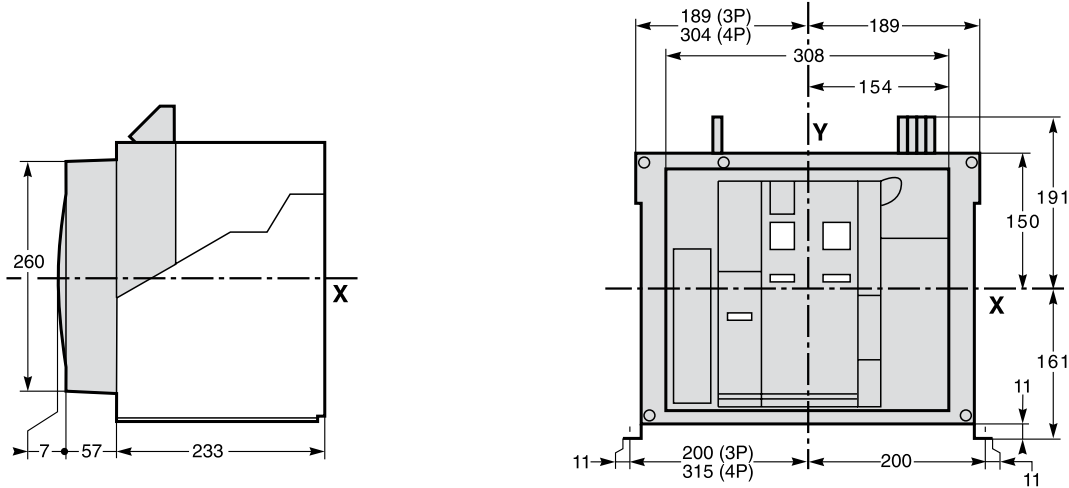
# Air Circuit Breakers

## DW series

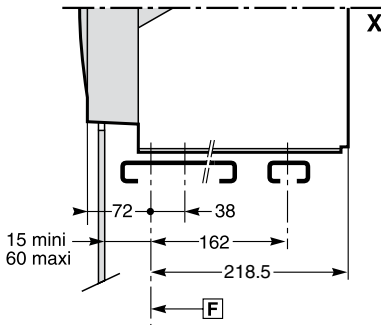
### Dimensions and connection

#### DW08 to DW32 Fixed 3/4 pole device

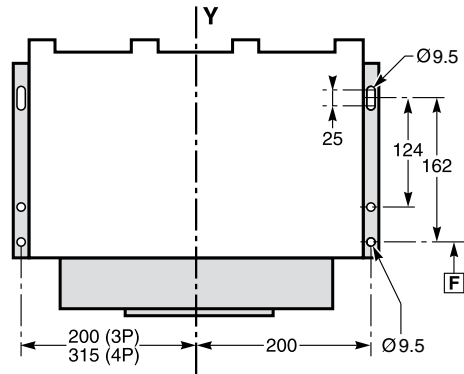
#### Dimensions



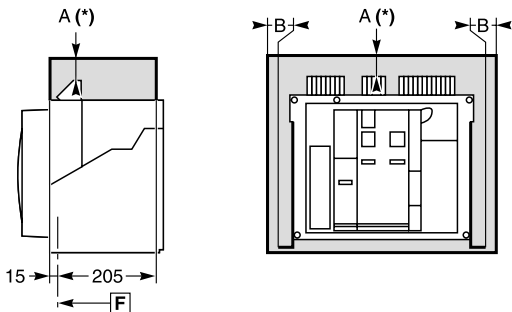
#### Mounting on base plate or rails



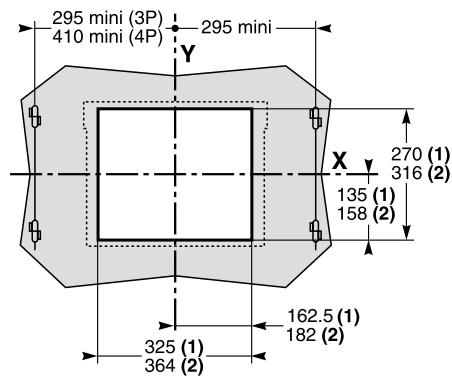
#### Mounting detail



#### Safety clearances



#### Door cutout



	Insulated parts	Metal parts	Energised parts
A	0	0	100
B	0	0	60

**F**: datum.

Note: (1) Without escutcheon.

(2) With escutcheon.

X and Y are the symmetry planes for a 3-pole device.

A (\*) An overhead clearance of 110 mm is required to remove the arc chutes.

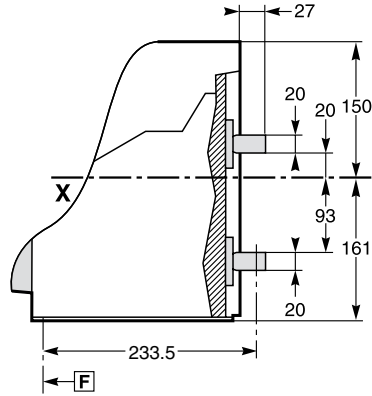
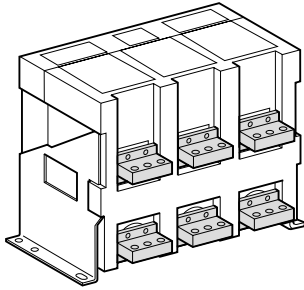
An overhead clearance of 20 mm is required to remove the terminal block.



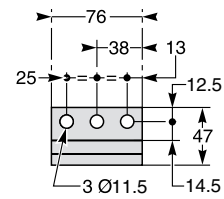
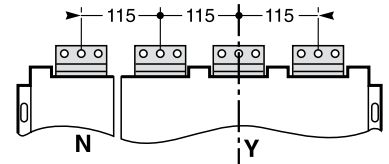
# Air Circuit Breakers DW series Dimensions and connection

## Connections

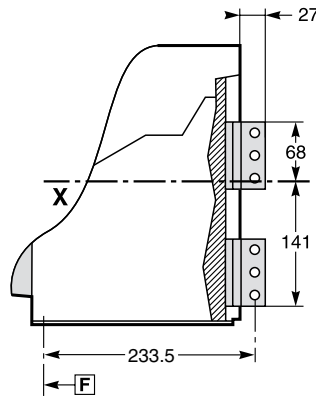
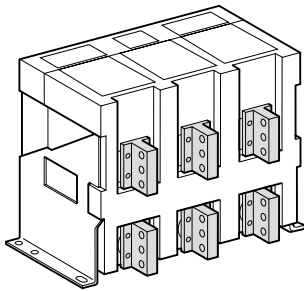
### Horizontal rear connection



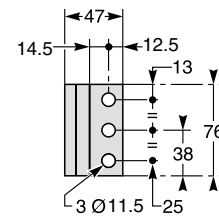
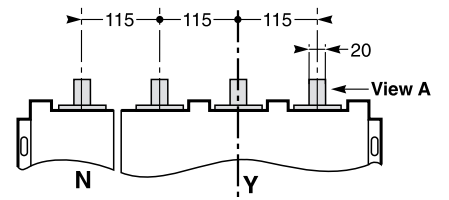
### Detail



### Vertical rear connection

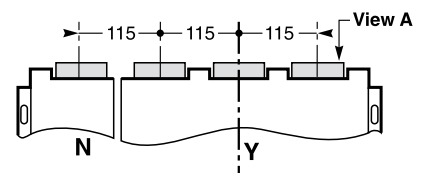


### Detail



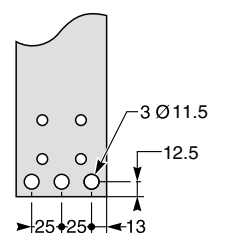
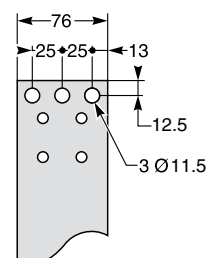
View A detail.

### Detail



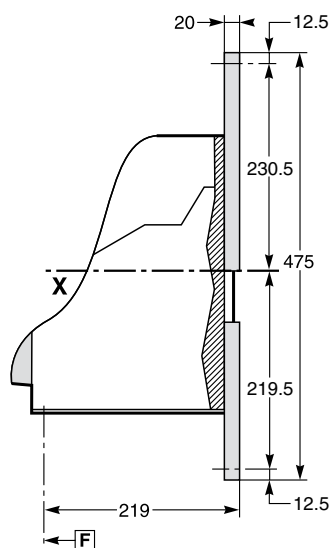
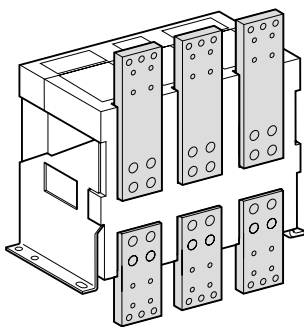
Top connection

Bottom connection



View A detail.

### Front connection



Note: recommended connection screws: **M10** class 8.8.  
Tightening torque: **50 Nm** with contact washer.

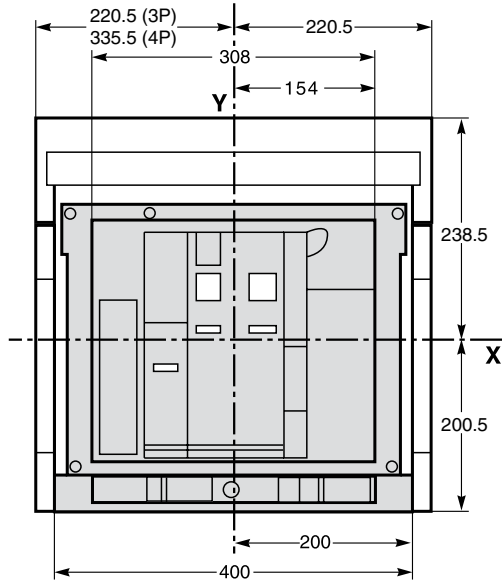
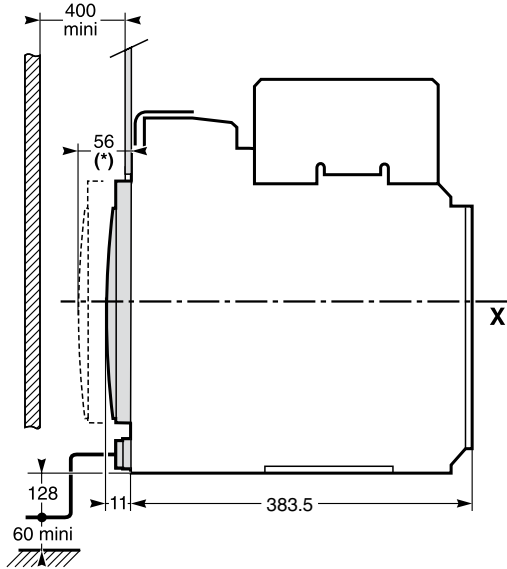
# Air Circuit Breakers

## DW series

### Dimensions and connection

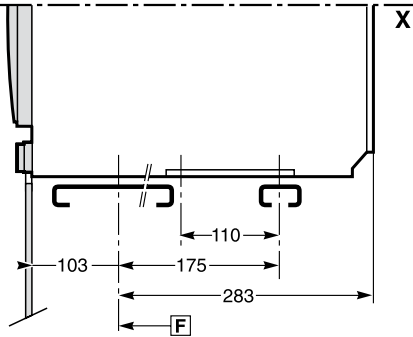
#### DW08 to DW32 Drawout 3/4 pole device

#### Dimensions

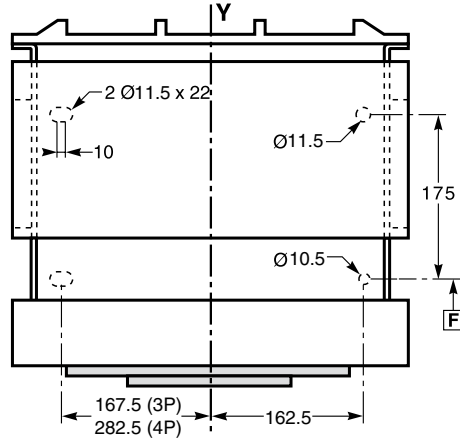


Note: (\*) Disconnected position.

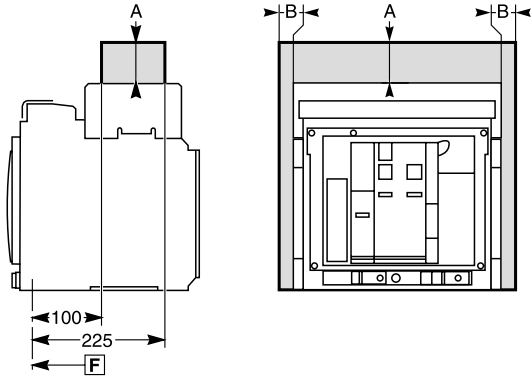
#### Mounting on base plate or rails



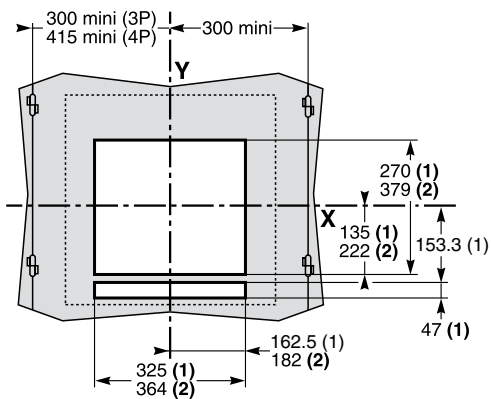
#### Mounting detail



#### Safety clearances



#### Door cutout



	Insulated parts	Metal parts	Energised parts
A	0	0	0
B	0	0	60

**F**: datum.

Note: (1) Without escutcheon.

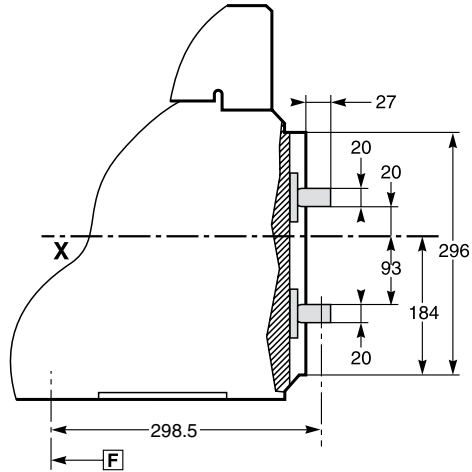
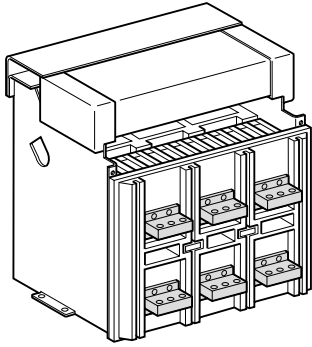
(2) With escutcheon.

X and Y are the symmetry planes for a 3-pole device.

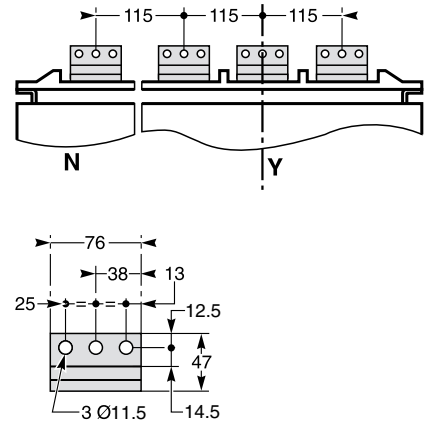
# Air Circuit Breakers DW series Dimensions and connection

## Connections

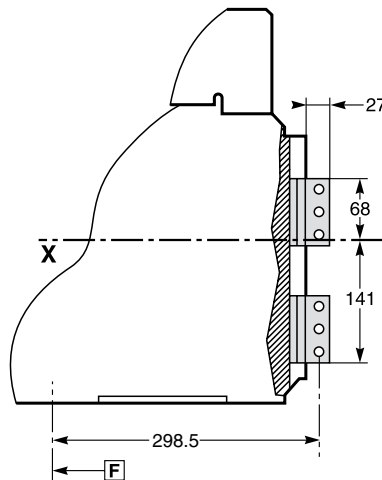
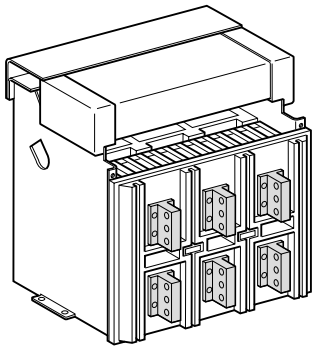
### Horizontal rear connection



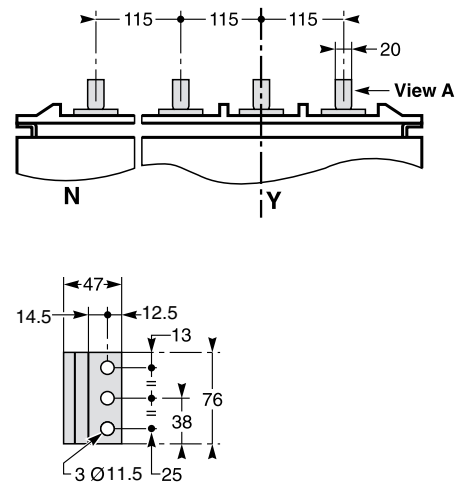
### Detail



### Vertical rear connection

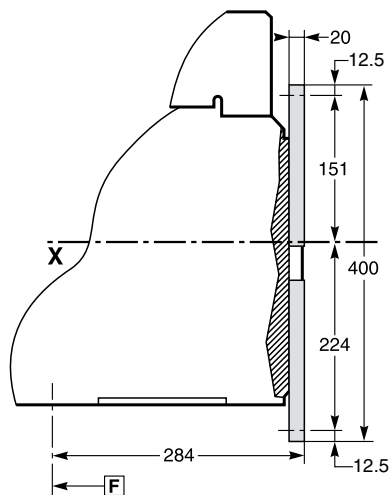
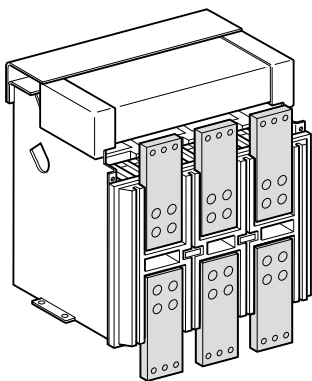


### Detail

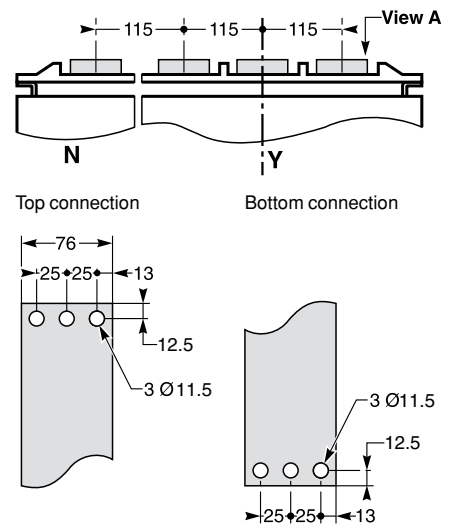


View A detail.

### Front connection



### Detail



View A detail.

Note: recommended connection screws: **M10** class 8.8.  
Tightening torque: **50 Nm** with contact washer.

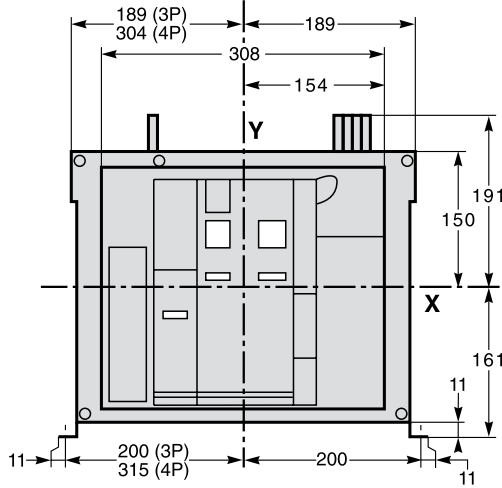
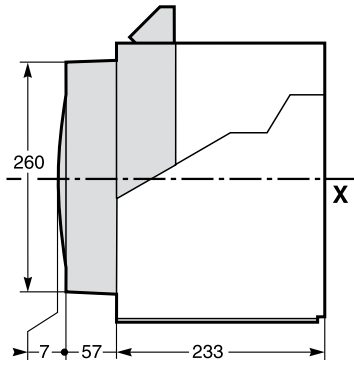
# Air Circuit Breakers

## DW series

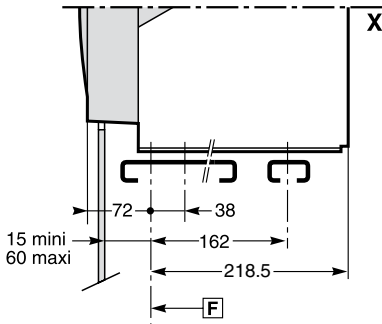
### Dimensions and connection

#### DW40 Fixed 3/4 pole device

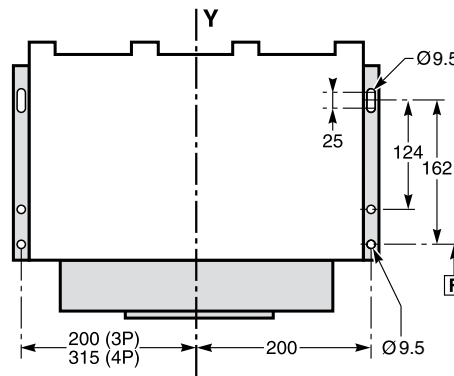
#### Dimensions



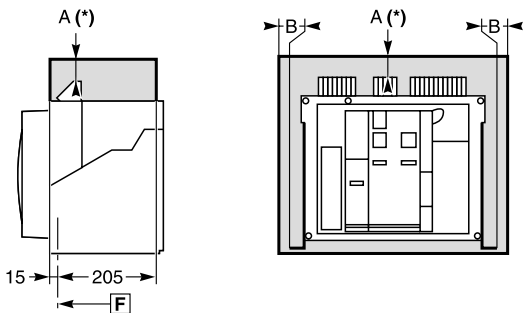
#### Mounting on base plate or rails



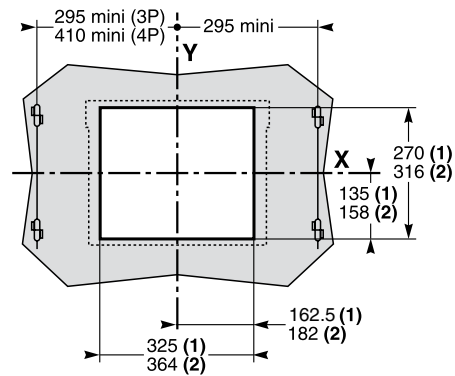
#### Mounting detail



#### Safety clearances



#### Door cutout



	Insulated parts	Metal parts	Energised parts
A	0	0	100
B	0	0	60

**F**: datum.

Note: (1) Without escutcheon.

(2) With escutcheon.

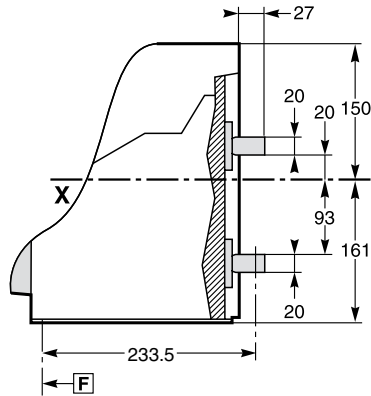
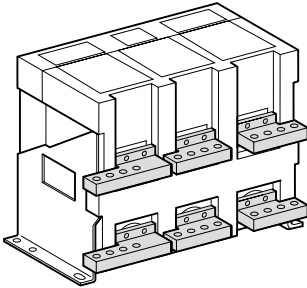
X and Y are the symmetry planes for a 3-pole device.

A (\*) An overhead clearance of 110 mm is required to remove the arc chutes.

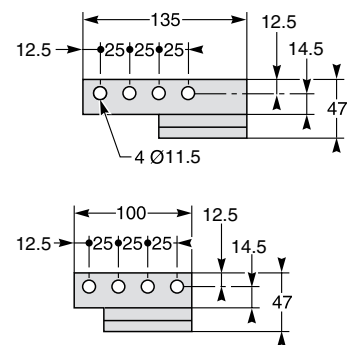
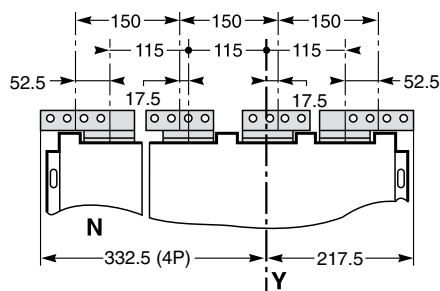
An overhead clearance of 20 mm is required to remove the terminal block.

**Connections**

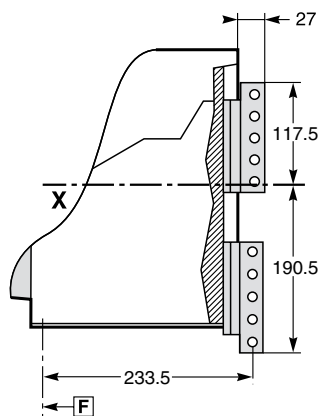
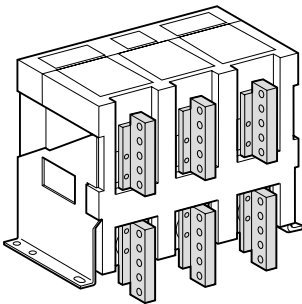
**Horizontal rear connection**



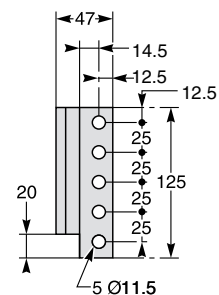
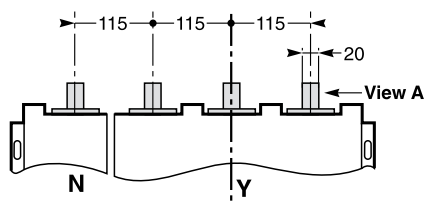
**Detail**



**Vertical rear connection**



**Detail**



Note: recommended connection screws: **M10** class 8.8.  
 Tightening torque: **50 Nm** with contact washer.

View A detail.

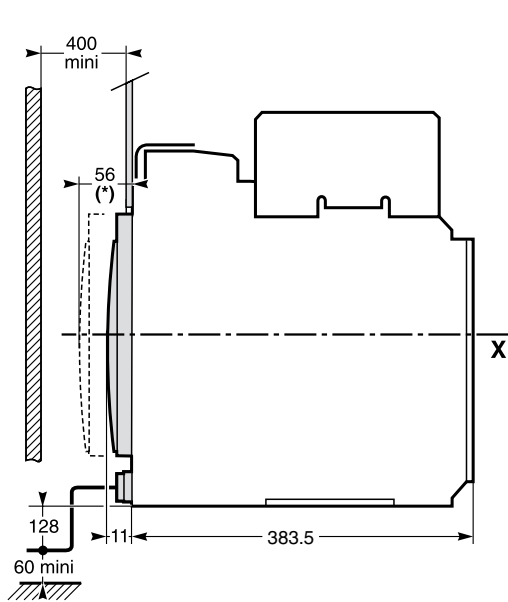
# Air Circuit Breakers

## DW series

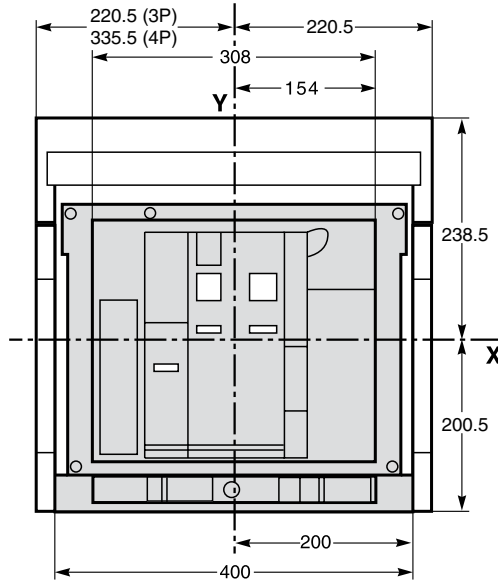
### Dimensions and connection

#### DW40 Drawout 3/4 pole device

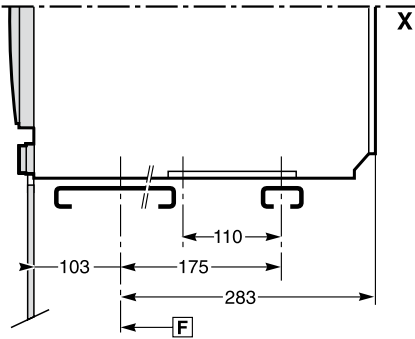
#### Dimensions



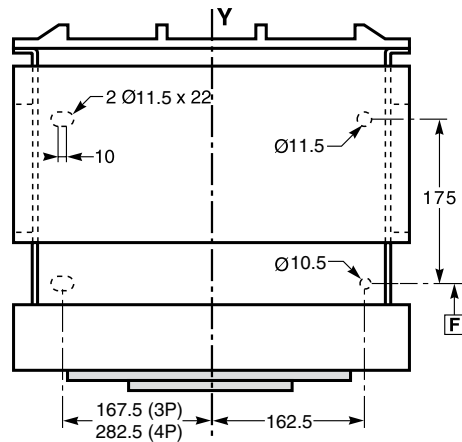
Note: (\*) Disconnected position.



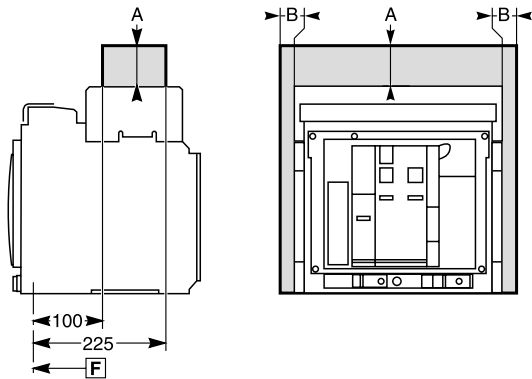
#### Mounting on base plate or rails



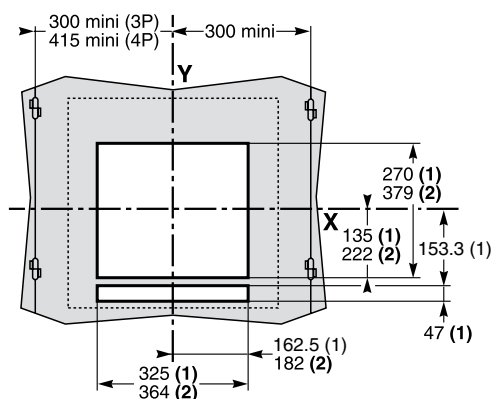
#### Mounting detail



#### Safety clearances



#### Door cutout



	Insulated parts	Metal parts	Energised parts
A	0	0	0
B	0	0	60

F: datum.

Note: (1) Without escutcheon.

(2) With escutcheon.

X and Y are the symmetry planes for a 3-pole device.

The safety clearances take into account the space required to remove the arc chutes.



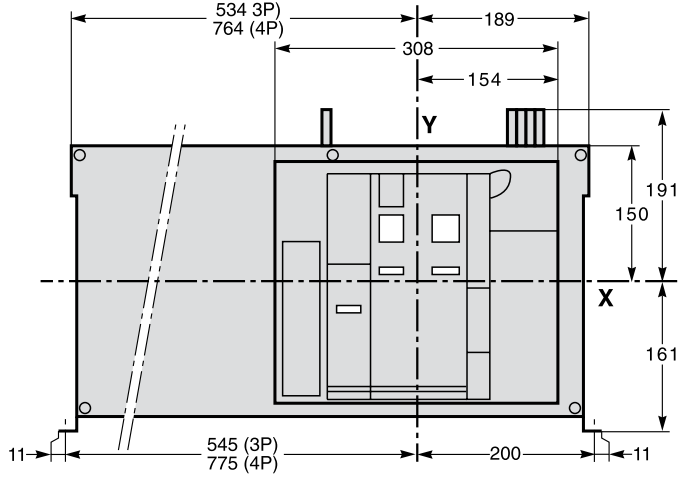
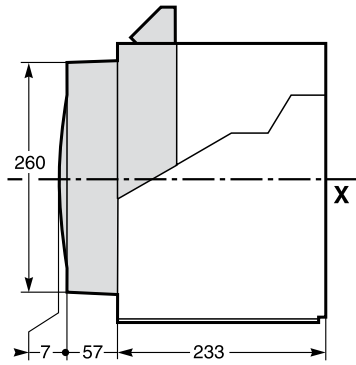
# Air Circuit Breakers

## DW series

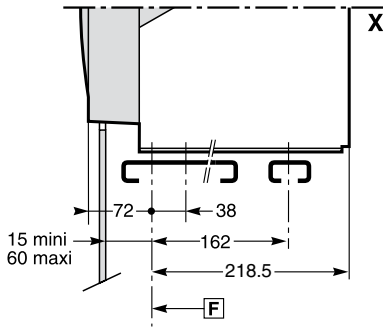
### Dimensions and connection

#### DW40b to DW63 Fixed 3/4 pole device

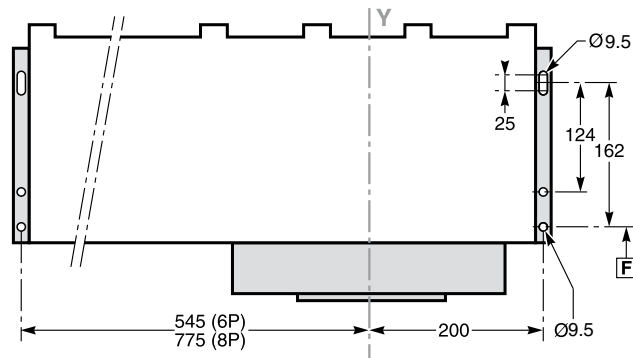
#### Dimensions



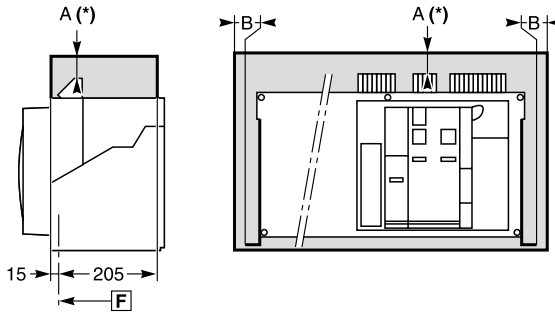
#### Mounting on base plate or rails



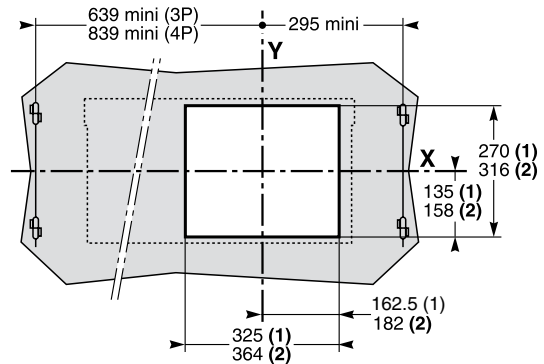
#### Mounting detail



#### Safety clearances



#### Door cutout



	Insulated parts	Metal parts	Energised parts
A	0	0	100
B	0	0	60

**F**: datum.

Note: (1) Without escutcheon.

(2) With escutcheon.

X and Y are the symmetry planes for a 3-pole device.

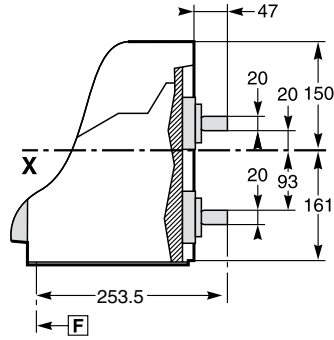
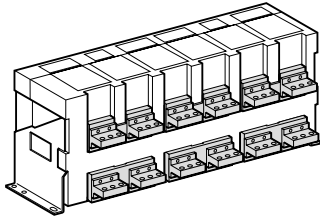
A(\*) An overhead clearance of 110 mm is required to remove the arc chutes.  
An overhead clearance of 20 mm is required to remove the terminal block.



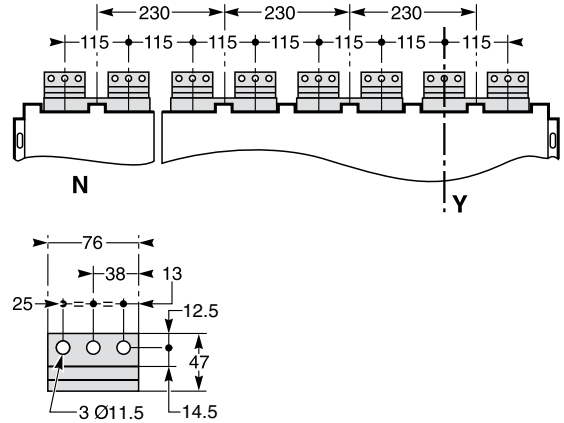
# Air Circuit Breakers DW series Dimensions and connection

## Connections

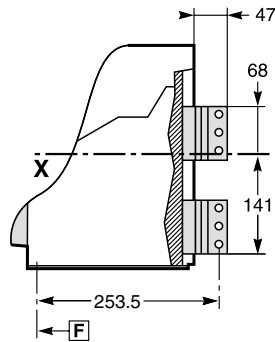
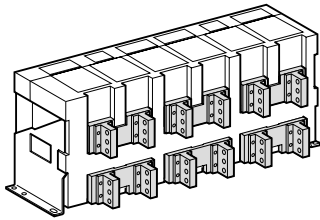
### Horizontal rear connection (DW40b - DW50)



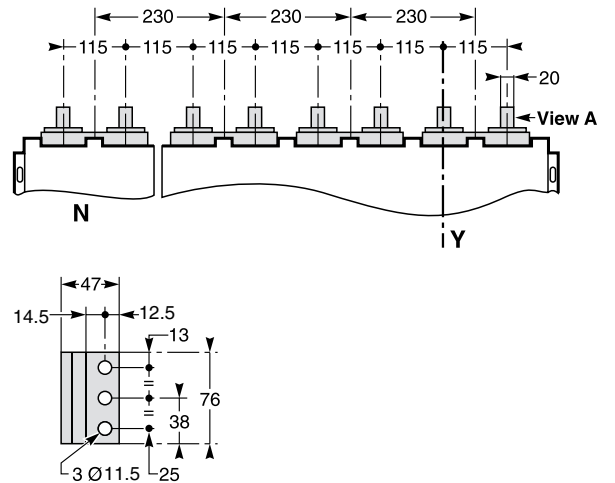
### Detail



### Vertical rear connection (DW40b - DW50)

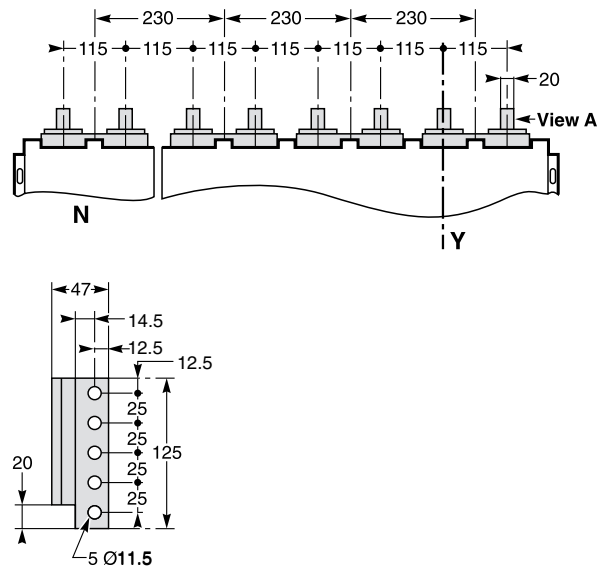


### Detail



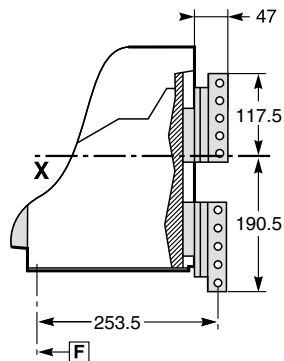
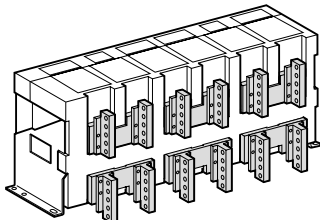
View A detail.

### Detail



View A detail.

### Vertical rear connection (DW63)



Note: recommended connection screws: **M10** class 8.8.  
Tightening torque: **50 Nm** with contact washer.

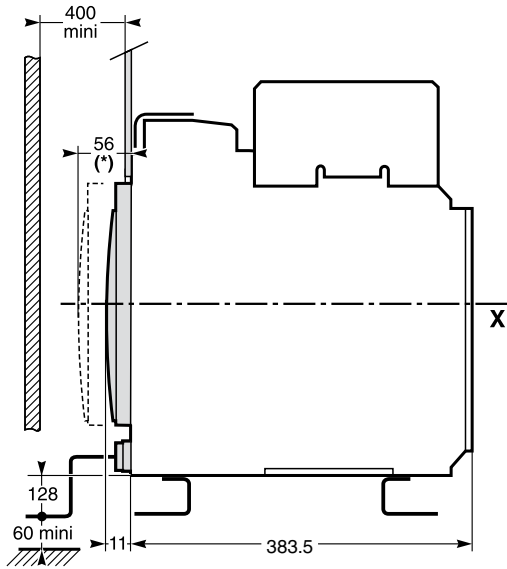
# Air Circuit Breakers

## DW series

### Dimensions and connection

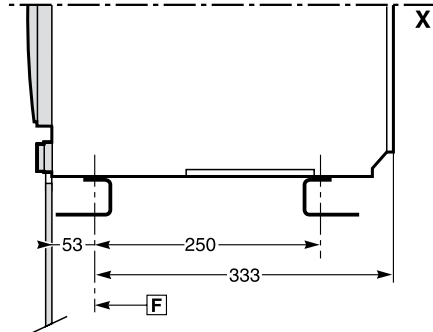
#### DW40b to DW63 Drawout 3/4 pole device

#### Dimensions

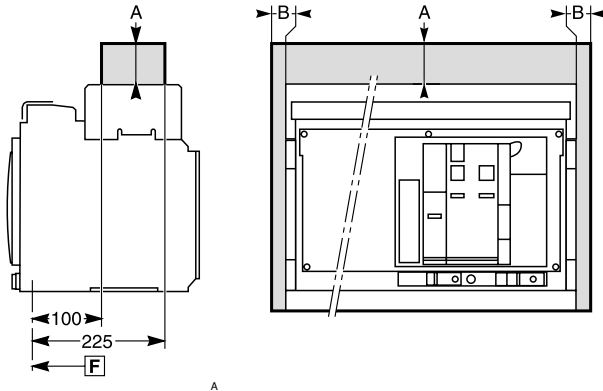


Note: (\*) Disconnected position.

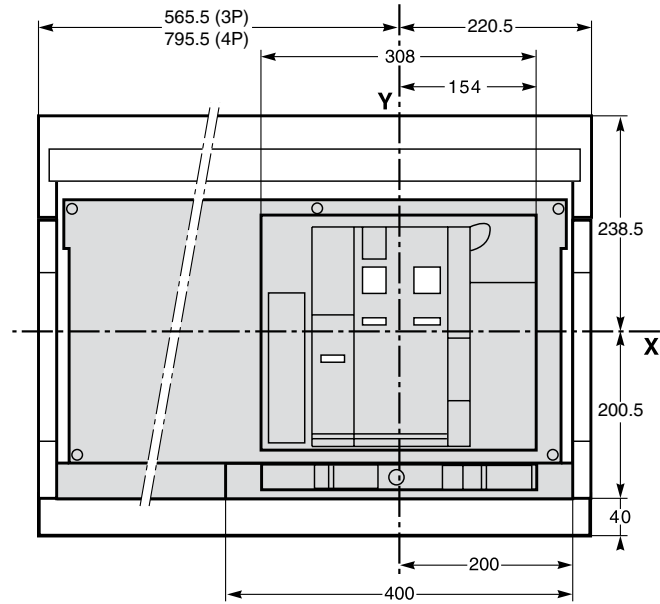
#### Mounting on base plate or rails



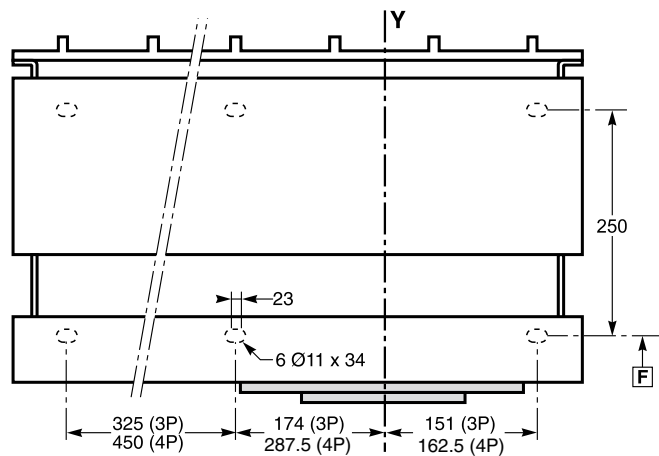
#### Safety clearances



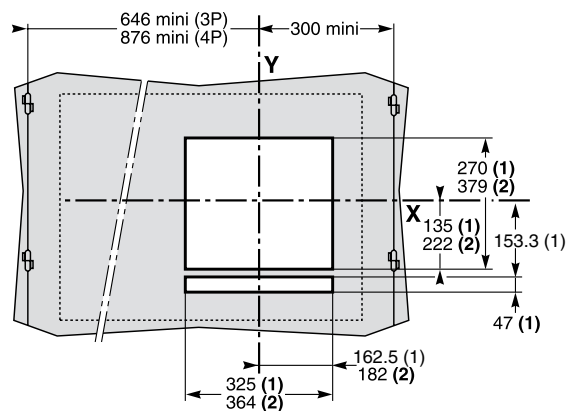
	Insulated parts	Metal parts	Energised parts
A	0	0	0
B	0	0	60



#### Mounting detail



#### Door cutout



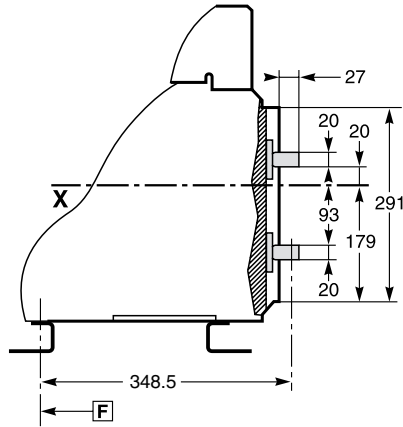
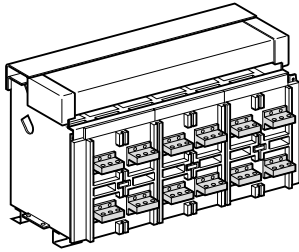
Note: (1) Without escutcheon.  
 (2) With escutcheon.  
 X and Y are the symmetry planes for a 3-pole device.

**F**: datum.

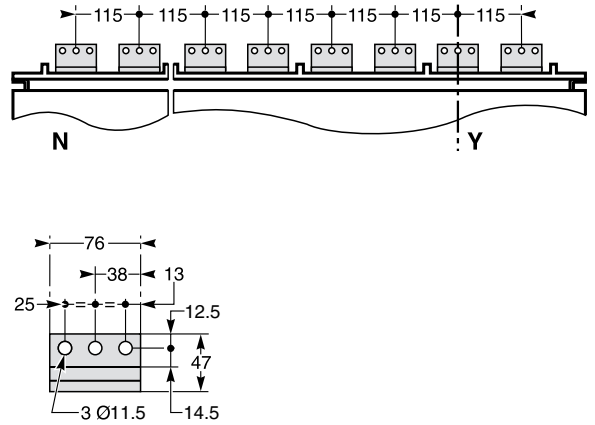
# Air Circuit Breakers DW series Dimensions and connection

## Connections

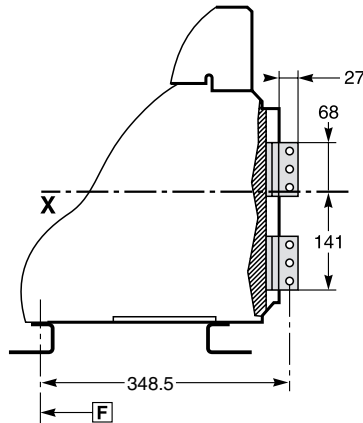
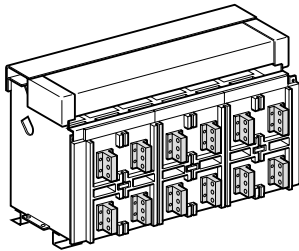
### Horizontal rear connection (DW40b - DW50)



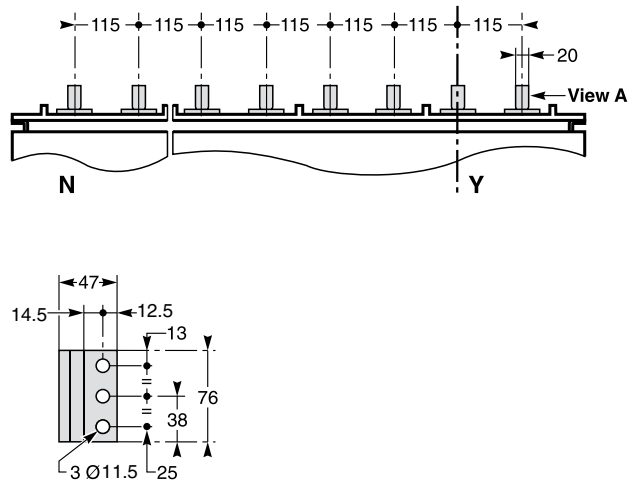
### Detail



### Vertical rear connection (DW40b - DW50)

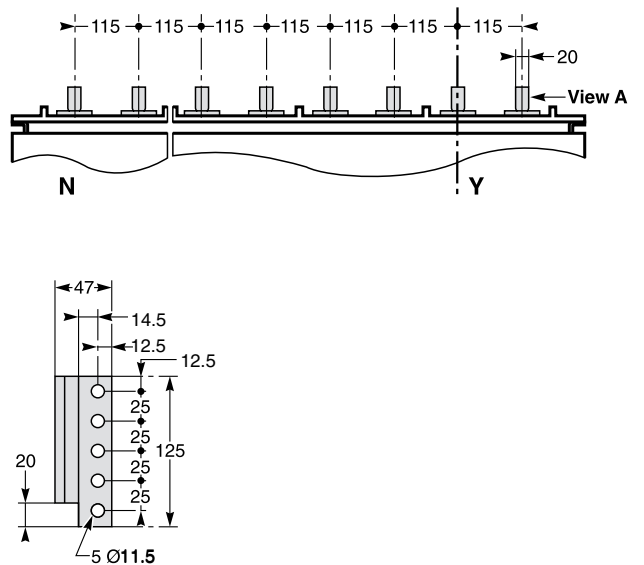


### Detail



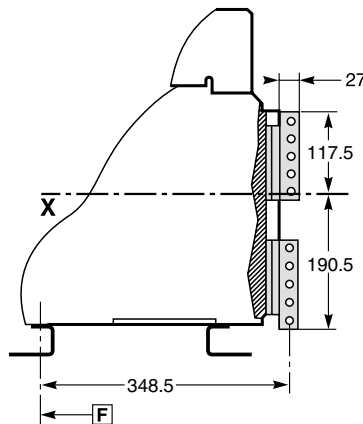
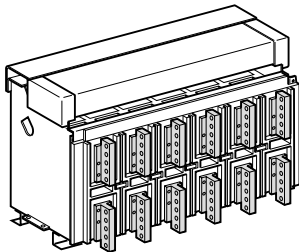
View A detail.

### Detail



View A detail.

### Vertical rear connection (DW63)



Note: recommended connection screws: **M10** s/s class A4 80.  
Tightening torque: **50 Nm** with contact washer.

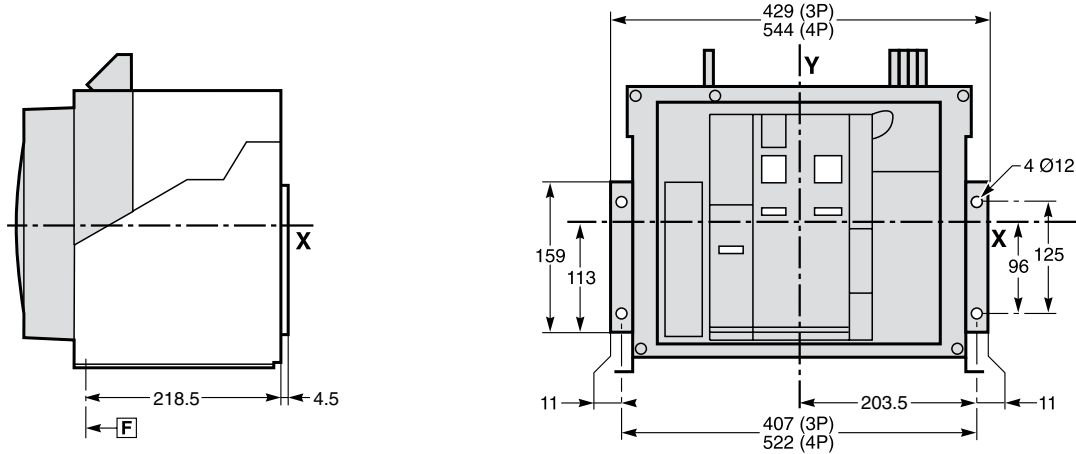
# Air Circuit Breakers

## DW series

### Dimensions and connection

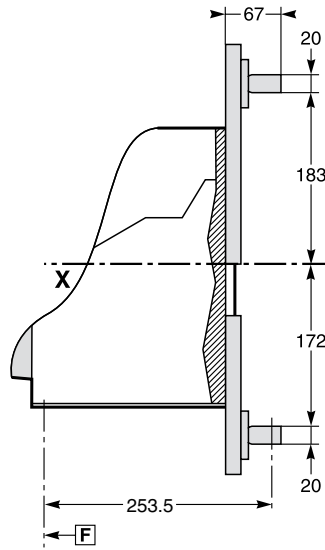
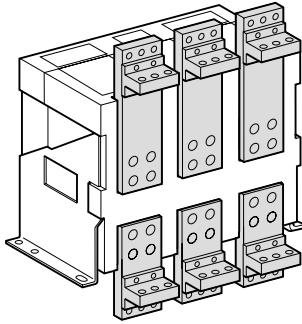
#### DW accessories

Mounting on backplate with special brackets (DW08 to 32 fixed)

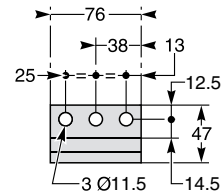
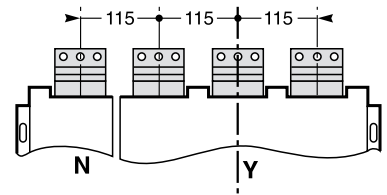


#### Disconnectable front-connection adapter (DW08 to 32 fixed)

Horizontal rear connection

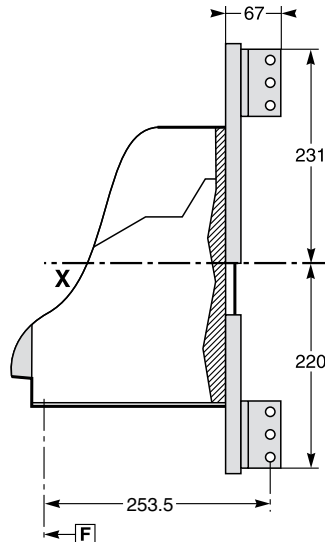
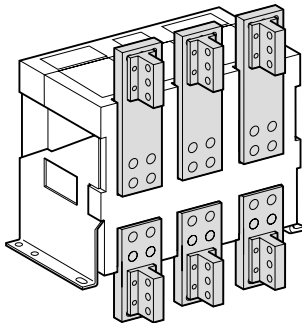


Detail

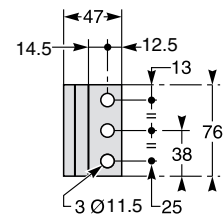
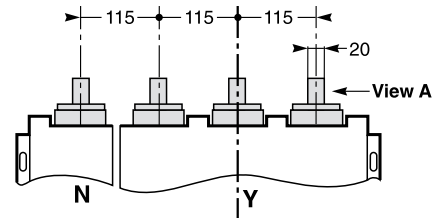


View A detail.

Vertical rear connection



Detail



View A detail.

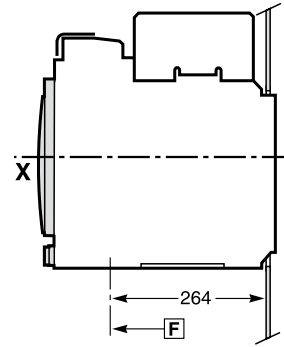
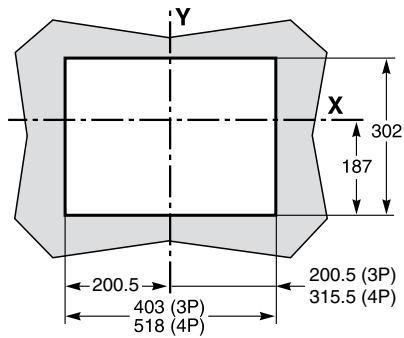
Note: recommended connection screws: **M10** class 8.8.  
Tightening torque: **50 Nm** with contact washer.

**F**: datum.

**Rear panel cutout (drawout devices)**

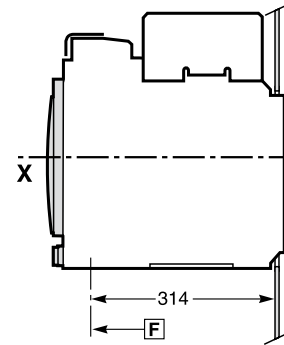
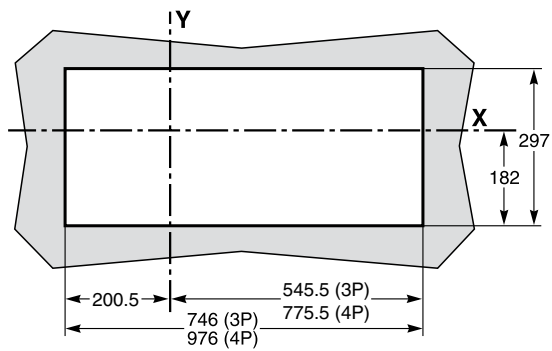
DW08 to DW40

Rear view



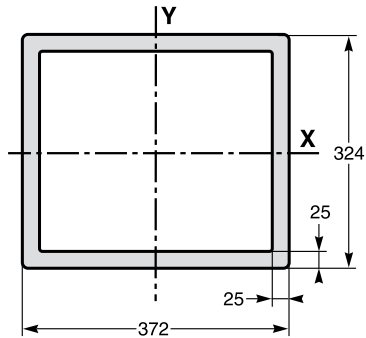
DW40b to DW63

Rear view

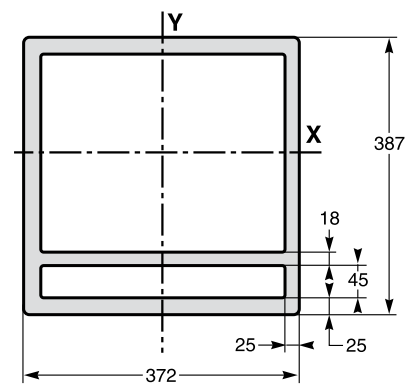


DW series

Fixed device



Drawout device



**F**: datum.


# Air Circuit Breakers


## DW series

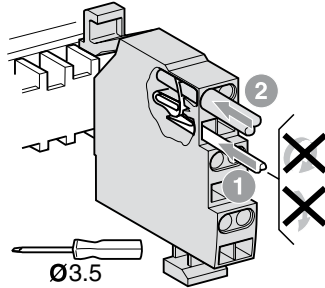
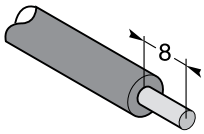
### Dimensions and connection

#### DW external modules

#### Connection of auxiliary wiring to terminal block

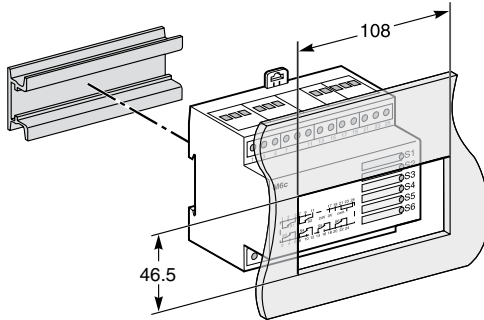
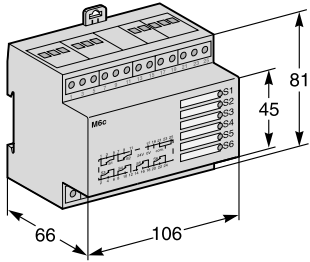
 S : 0.6 mm<sup>2</sup>

 S : 2.5 mm<sup>2</sup>

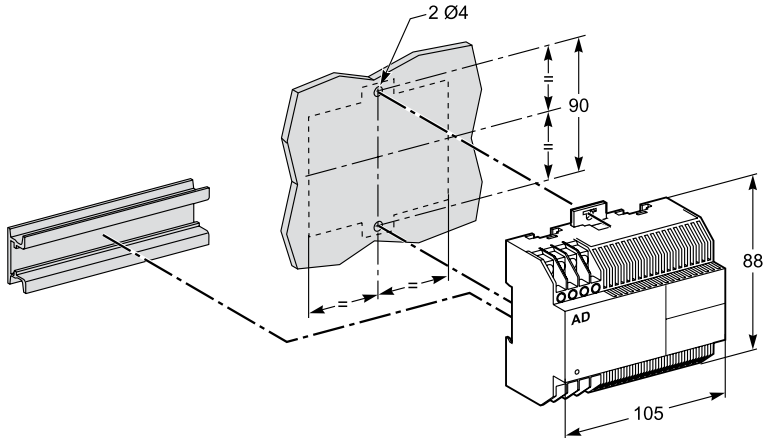
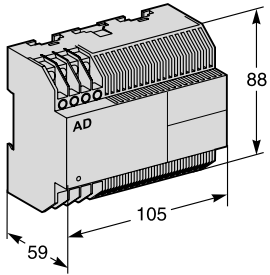


One conductor only per connection point.

#### M6C relay module

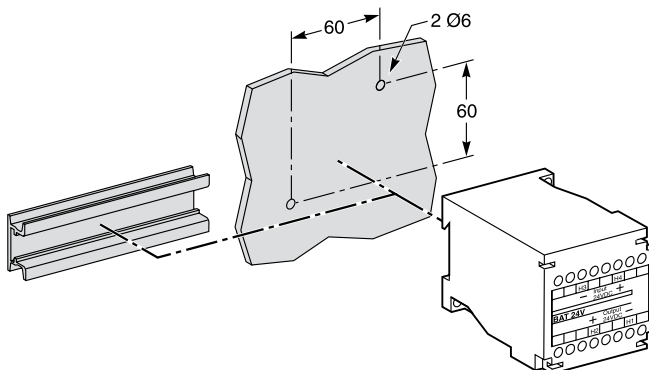
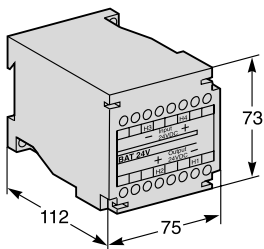


#### External power supply module (AD)

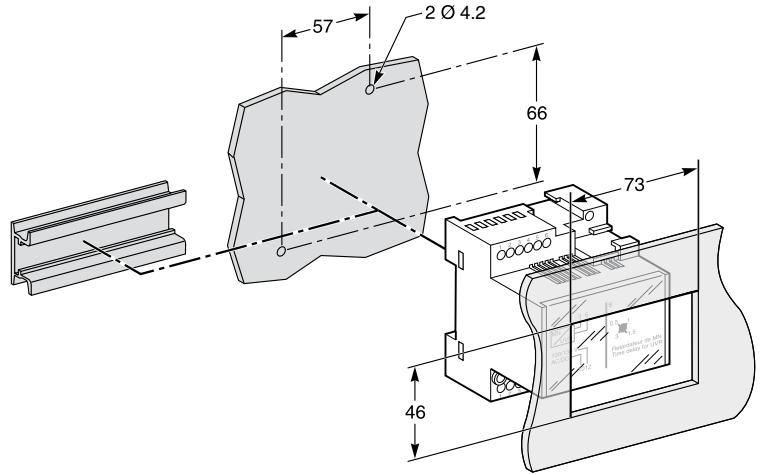
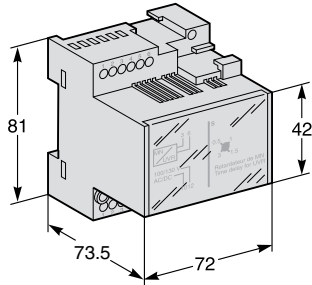


#### Battery module (BAT)

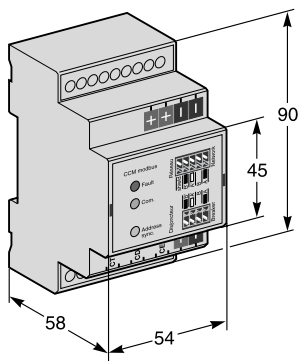
#### Mounting



**Delay unit for MN release**

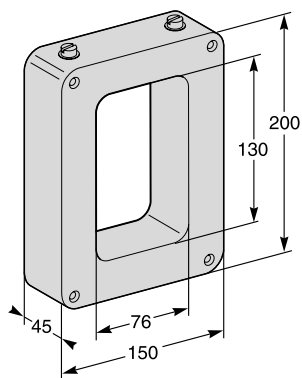


**"Chassis" communication module**  
**Modbus**

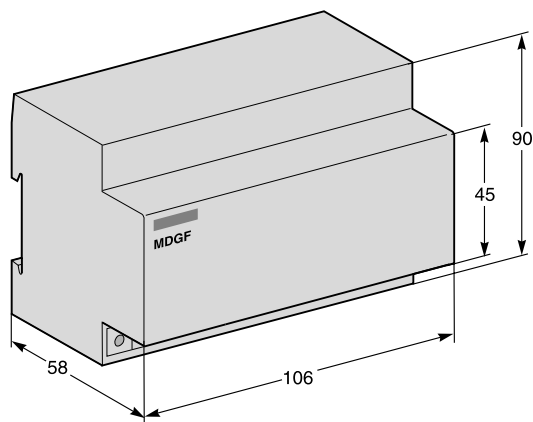


**External sensor for source ground return (SGR) protection**

**Sensor**



**"MGDF summer" module**



# Air Circuit Breakers

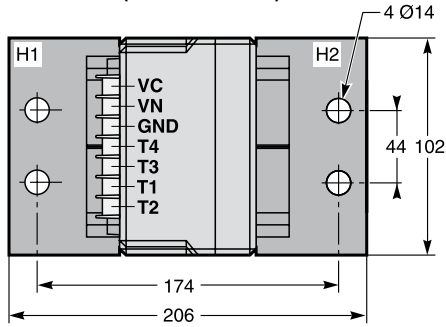
## DW series

### Dimensions and connection

#### External sensor for external neutral

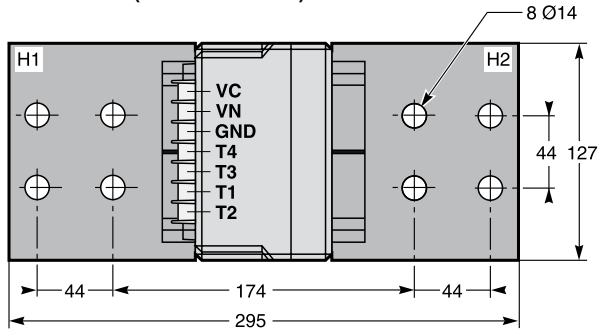
##### Dimensions

400/2000 A (DW08 to DW20)



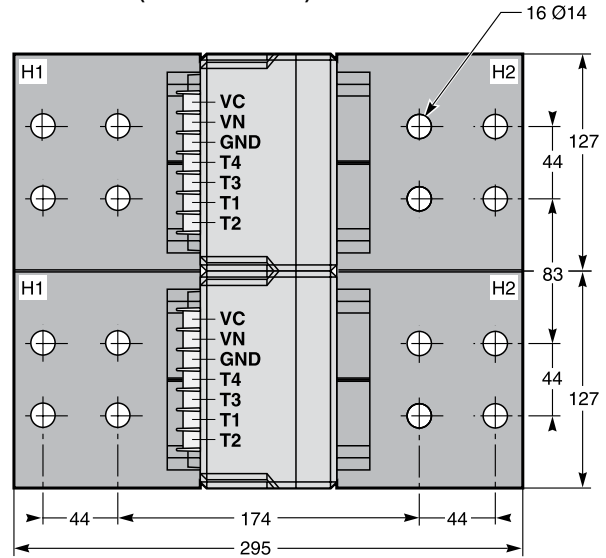
High: 162 mm.

1000/4000 A (DW025 to DW40)



High: 162 mm.

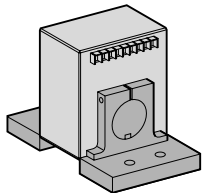
4000/6300 A (DW40b to DW63)



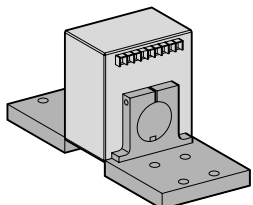
High: 168 mm.

#### Installation

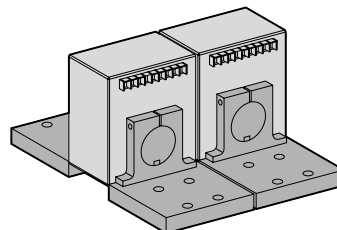
400/2000 A (DW08 to DW20)



1000/4000 A (DW025 to DW40)



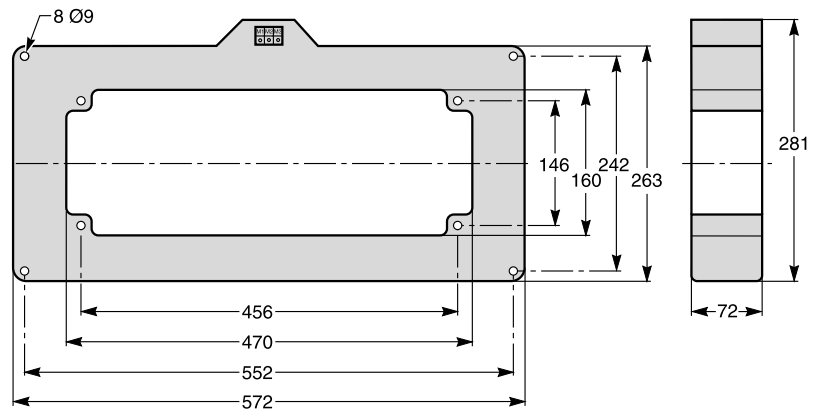
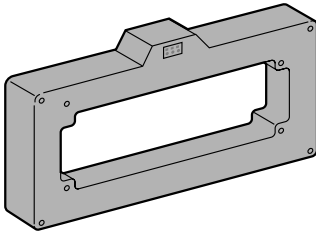
4000/6300 A (DW40b to DW63)





**Rectangular sensor for earth leakage protection (Vigi)**

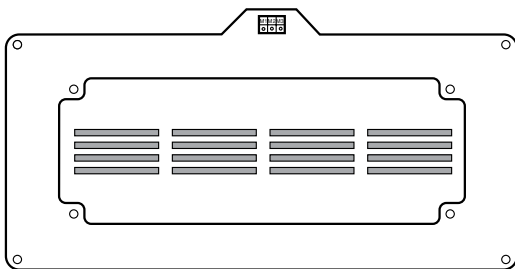
470 x 160 mm window



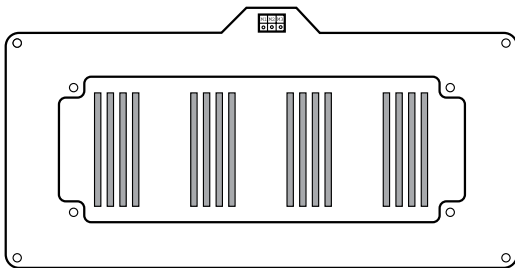
**Busbars path**

470 x 160 mm window

Busbars spaced 115 mm centre-to-centre



4 bars 100 x 5.



4 bars 125 x 5.

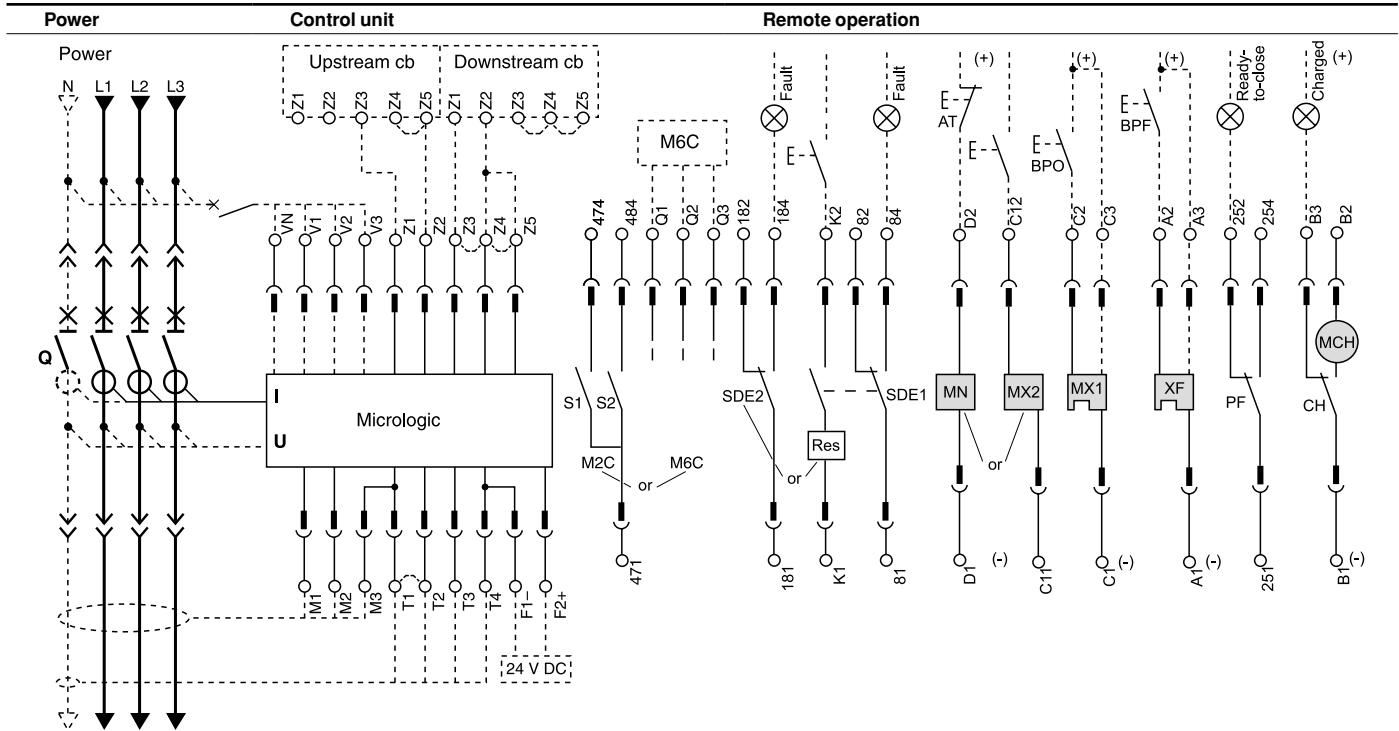
# Air Circuit Breakers

## DW series

### Electrical diagrams

#### DW08 to DW63 Fixed and drawout devices

The diagram is shown with circuits de-energised, all devices open, connected and charged and relays in normal position.



Terminal block marking		Control unit									
Com	UC1	UC2	UC3	UC4	M2C / M6C						
E5 E6	Z5 M1	M2 M3	F2+	V3	484 / Q3						
E3 E4	Z3 Z4	T3 T4	VN	V2	474 / Q2						
E1 E2	Z1 Z2	T1 T2	F1-	V1	471 / Q1						

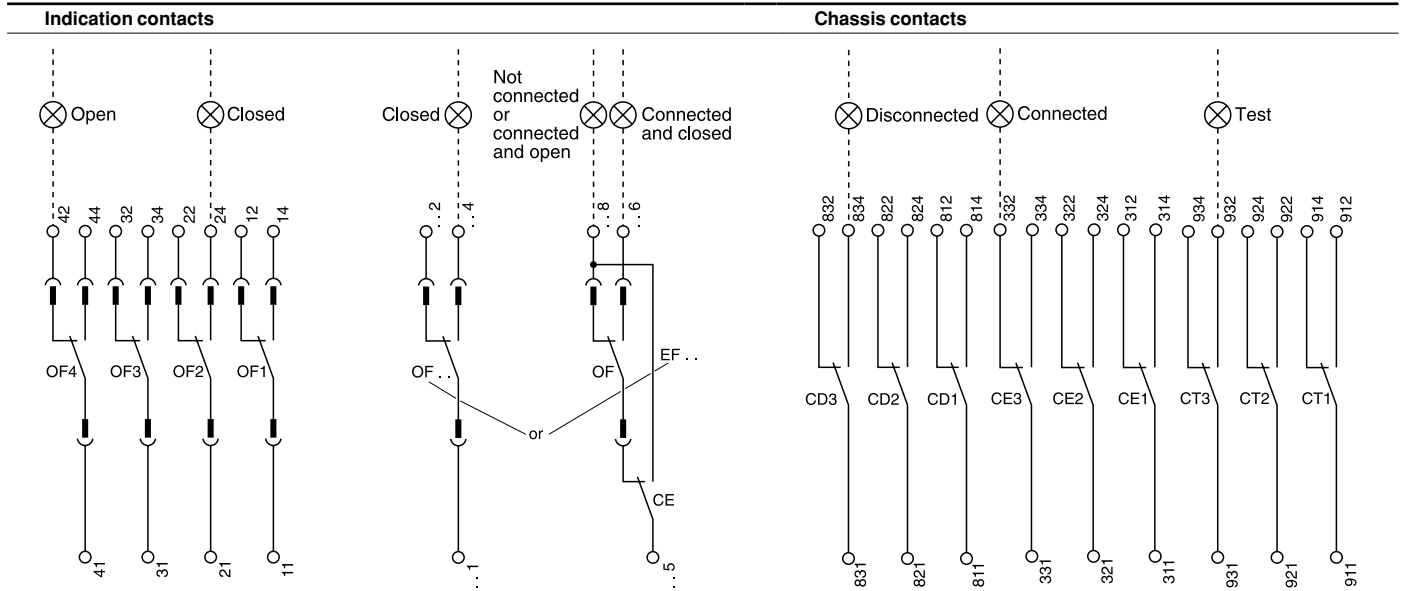
Remote operation									
SDE2 / Res	SDE1	MN / MX2	MX1	XF	PF	MCH			
184 / K2	84	D2 / C12	C2	A2	254	B2			
182	82		C3	A3	252	B3			
181 / K1	81	D1 / C11	C1	A1	251	B1			

A	E	P	H	Control unit
●	●	●	●	<b>Com</b> : E1-E6 communication
●	●	●	●	<b>UC1</b> : Z1-Z5 zone selective interlocking Z1 = ZSI OUT SOURCE Z2 = ZSI OUT ; Z3 = ZSI IN SOURCE Z4 = ZSI IN ST (short time) Z5 = ZSI IN GF (earth fault) M1 = Vigi module input (Unit 7)
●	●	●	●	<b>UC2</b> : T1, T2, T3, T4 = external neutral M2, M3 = Vigi module input (Unit 7)
●	●	●	●	<b>UC3</b> : F2+, F1- external 24 V DC power supply VN external voltage connector (must be connected to the neutral with a 3P circuit breaker)
● <sup>(1)</sup>	●	●	●	<b>UC4</b> : External Voltage Connector (PTE option)
●	●	●	●	<b>M2C</b> : 2 programmable contacts (internal relay) ext. 24 V DC power supply required
			●	or
			●	<b>M6C</b> : 6 programmable contacts (to be connected to the external module M6C) ext. 24 V DC power supply required

Remote operation									
<b>SDE2</b> : fault-trip indication contact									
or									
<b>Res</b> : remote reset									
<b>SDE1</b> : fault-trip indication contact (supplied as standard)									
<b>MN</b> : undervoltage release									
or									
<b>MX2</b> : shunt release									
<b>MX1</b> : shunt release (standard or communicating)									
<b>XF</b> : closing release (standard or communicating)									
<b>PF</b> : ready-to-close contact									
<b>MCH</b> : electric motor									
Note: when communicating MX or XF releases are used, the third wire (C3,A3) must be connected even if the communication module is not installed.									

Note: **A** : digital ammeter. **P** : A + power meter + additional protection.  
**E** : energy. **H** : P + harmonics.  
 (1) The PTE option with control unit E is not compatible with an external potential CT.

# Air Circuit Breakers DW series Electrical diagrams



Indication contacts											
OF4	OF3	OF2	OF1	OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11
44	34	24	14	244	234	224	214	144	134	124	114
42	32	22	12	242	232	222	212	142	132	122	112
41	31	21	11	241	231	221	211	141	131	121	111
				<b>or</b>	<b>or</b>	<b>or</b>	<b>or</b>	<b>or</b>	<b>or</b>	<b>or</b>	<b>or</b>
				EF24	EF23	EF22	EF21	EF14	EF13	EF12	EF11
				248	238	228	218	148	138	128	118
				246	236	226	216	146	136	126	116
				245	235	225	215	145	135	125	115

Chassis contacts									
CD3	CD2	CD1	CE3	CE2	CE1	CT3	CT2	CT1	
832	822	812	332	322	312	932	922	912	
834	824	814	334	324	314	934	924	914	
831	821	811	331	321	311	931	921	911	
			<b>or</b>				<b>or</b>		
			CE6	CE5	CE4				
			364	354	344				
			362	352	342				
			361	351	341				

Indication contacts		
<b>OF4 :</b>	ON/OFF indication contacts	<b>OF24 or EF24</b>
<b>OF3</b>		Combined "connected-deconnected" indication contacts
<b>OF2</b>		<b>OF23 or EF23</b>
<b>OF1</b>		<b>OF22 or EF22</b>
		<b>OF21 or EF21</b>
		<b>OF14 or EF14</b>
		<b>OF13 or EF13</b>
		<b>OF12 or EF12</b>
		<b>OF11 or EF11</b>

Chassis contacts		
<b>CD3</b>	disconnected position contacts	<b>CE3</b>
<b>CD2</b>		connected position contacts
<b>CD1</b>		<b>CE1</b>
		<b>CT3</b>
		test position contacts
		<b>CT2</b>
		<b>CT1</b>
<b>or</b>		<b>or</b>
<b>CE6</b>	connected position contacts	<b>CE9</b>
<b>CE5</b>		connected position contacts
<b>CE4</b>		<b>CE8</b>
		connected position contacts
		<b>CE7</b>
		connected position contacts
		<b>or</b>
		<b>CD6</b>
		disconnected position contacts
		<b>CD5</b>
		disconnected position contacts
		<b>CD4</b>
		disconnected position contacts

Key:

drawout device only.

**XXX** SDE1, OF1, OF2, OF3, OF4 supplied as standard.

interconnected connections (only one wire per connection point).

# Air Circuit Breakers

## DW series

### Electrical diagrams

#### Earth-fault and earth-leakage protection

#### Neutral protection

#### Zone selective interlocking

#### External sensor (CT) for residual earth-fault protection

#### Connection of current-transformer secondary circuit for external neutral

DW equipped with a Unit 6 A/E/P/H:

- shielded cable with 2 twisted pairs
- T1 twisted with T2
- maximum length 4 meters
- cable cross-sectional area 0.4 to 1.5 mm<sup>2</sup>
- recommended cable: Belden 9552 or equivalent.

For proper wiring of neutral CT, refer to instruction Bulletin 48041-082-03 shipped with it.

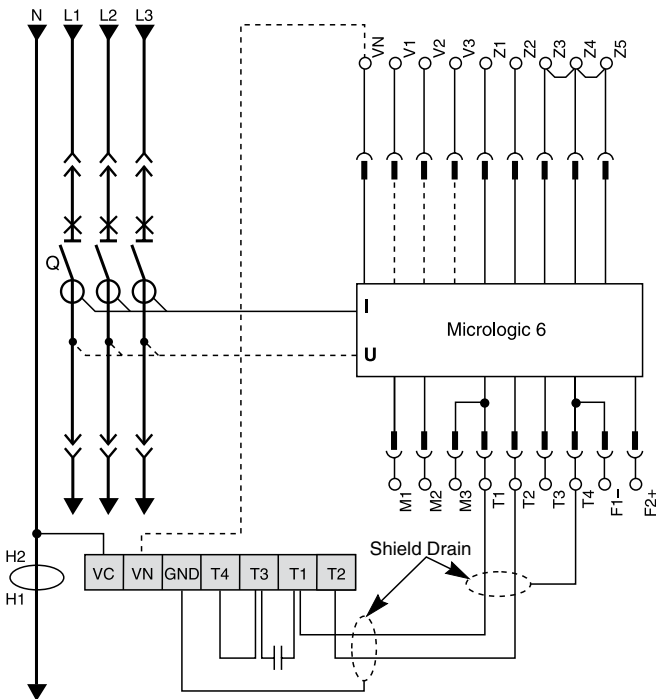
Do not remove Intelligent control unit factory-installed jumper between T1 and T2 unless neutral CT is connected.

If supply is via the top, follow the schematics.

If supply is via the bottom, control wiring is identical; for the power wiring, H1 is connected to the source side, H2 to the load side.

For four-pole versions, for residual earth-fault protection, the current transformer for the external neutral is not necessary.

Connection for signal VN is required only for power measurements (3 Ø, 4 wires, 4CTs).

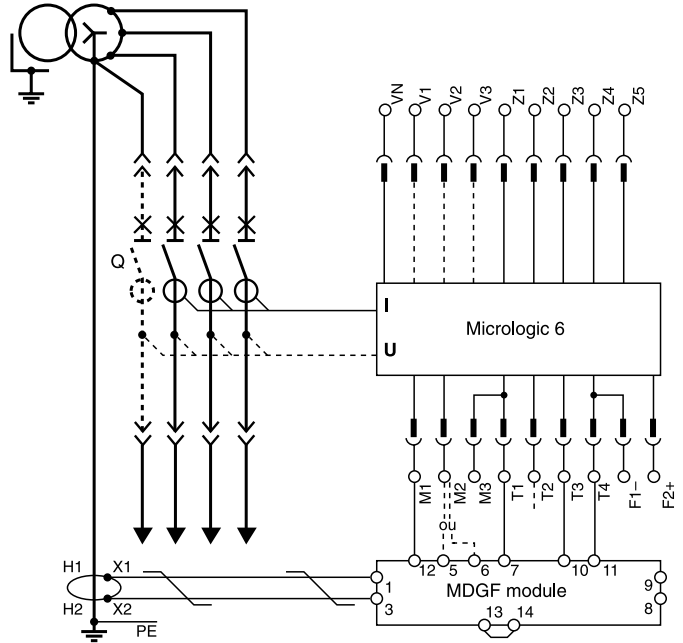


#### External transformer for source ground return (SGR) earth-fault protection

#### Connection of the secondary circuit

DW equipped with a Unit 6 A/E/P/H:

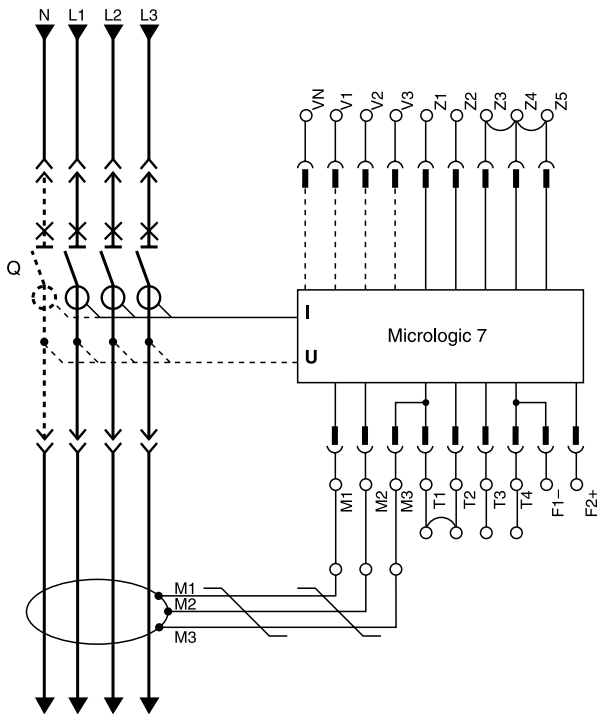
- unshielded cable with 1 twisted pair
- maximum length 150 meters
- cable cross-sectional area 0.4 to 1.5 mm<sup>2</sup>
- terminals 5 and 6 may not be used at the same time
- use terminal 5 for DW08 to 40
- use terminal 6 for DW40b to 63
- recommended cable: Belden 9409 or equivalent.



## Earth-leakage protection

### Connection of the rectangular-sensor secondary circuit

Use the cable shipped with the rectangular sensor.



### Neutral protection

- Three pole circuit breaker:
  - neutral protection is impossible with Units A, E
  - DW equipped with Units P or H
  - the current transformer for external neutral is necessary (the wiring diagram is identical to the one used for the residual earth-fault protection)
- Four pole circuit breaker:
  - DW equipped with Units A, E, P or H
  - the current transformer for external neutral is not necessary.

## Zone selective interlocking

Zone-selective interlocking is used to reduce the electrodynamic forces exerted on the installation by shortening the time required to clear faults, while maintaining time discrimination between the various devices.

A pilot wire interconnects a number of circuit breakers equipped with Intelligent control units A/E/P/H, as illustrated in the diagram above.

The control unit detecting a fault sends a signal upstream and checks for a signal arriving from downstream. If there is a signal from downstream, the circuit breaker remains closed for the full duration of its tripping delay. If there is no signal from downstream, the circuit breaker opens immediately, regardless of the tripping-delay setting.

### Fault 1.

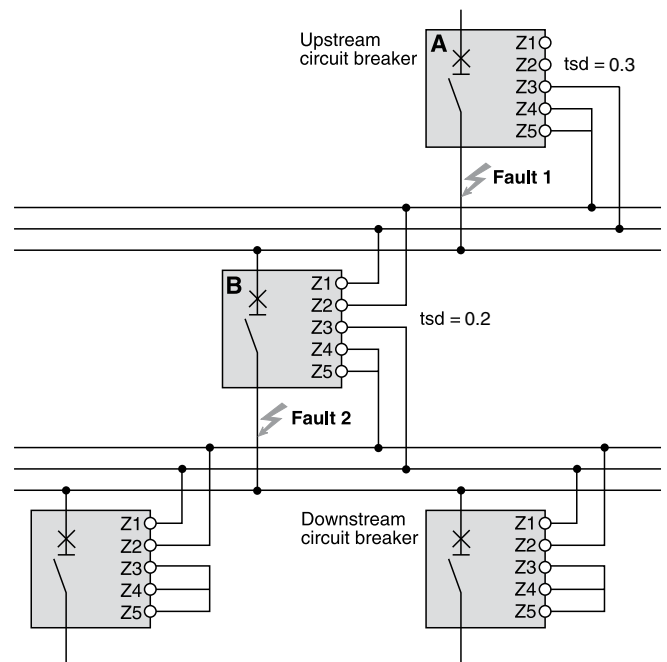
Only circuit breaker A detects the fault. Because it receives no signal from downstream, it opens immediately, regardless of its tripping delay set to 0.3.

### Fault 2.

Circuit breakers A and B detect the fault. Circuit breaker A receives a signal from B and remains closed for the full duration of its tripping delay set to 0.3. Circuit breaker B does not receive a signal from downstream and opens immediately, in spite of its tripping delay set to 0.2.

### Wiring

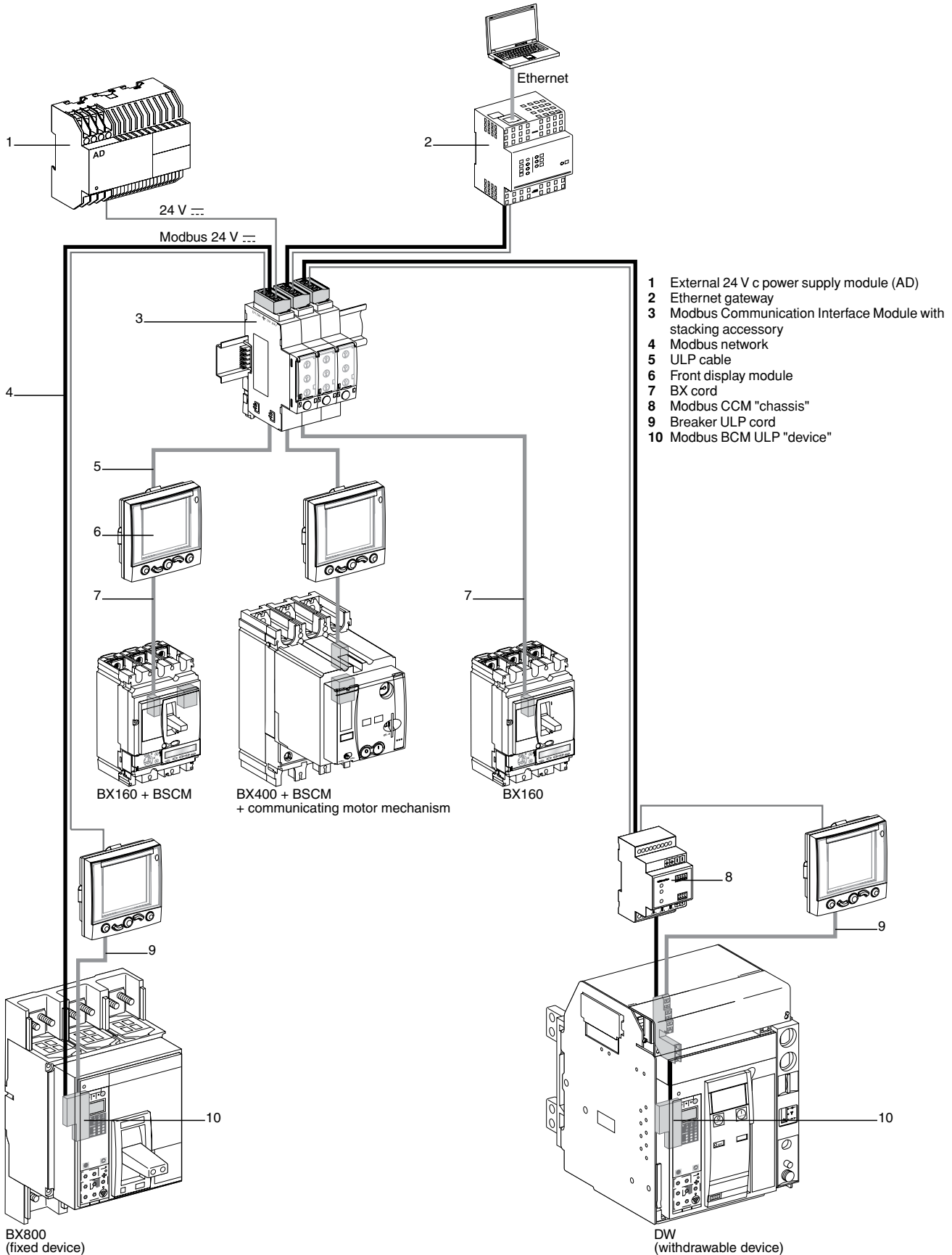
- Maximum impedance: 2.7Ω/ 300 m.
- Capacity of connectors: 0.4 to 2.5 mm<sup>2</sup>.
- Wires: single or multicore.
- Maximum length: 3000 m.
- Limits to device interconnection:
  - the common ZSI - OUT (Z1) and the output ZSI - OUT (Z2) can be connected to a maximum of 10 upstream device
  - a maximum of 100 downstream devices may be connected to the common ZSI - IN (Z3) and to an input ZSI - IN CR (Z4) or GF (Z5).



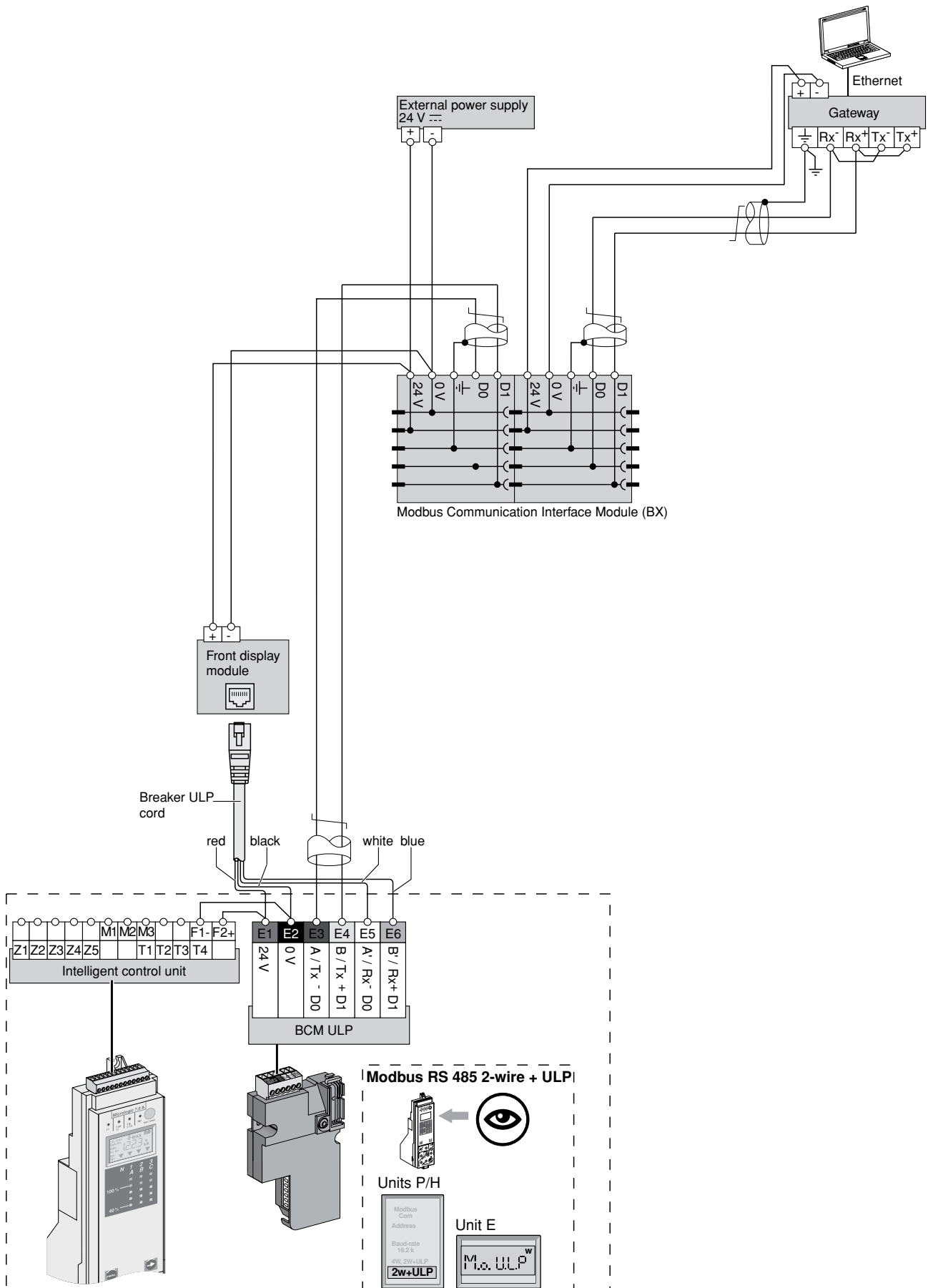
# Air Circuit Breakers DW series Electrical diagrams

## Communication

### Connection of circuit breakers to the Modbus communication network

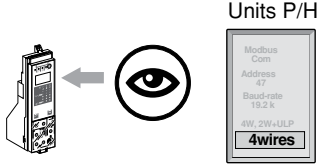


# Air Circuit Breakers DW series Electrical diagrams

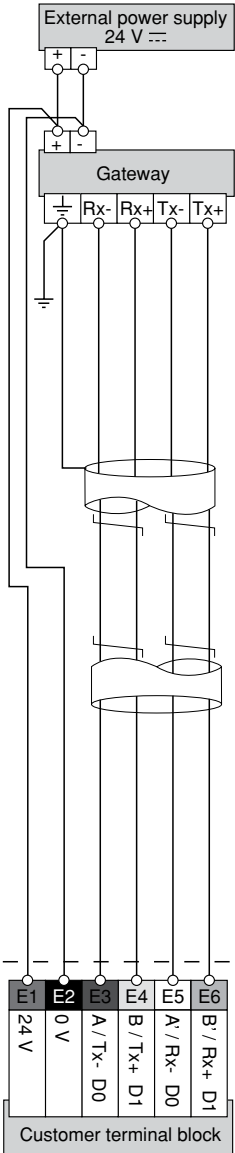


# Air Circuit Breakers DW series Electrical diagrams

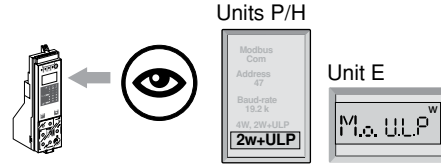
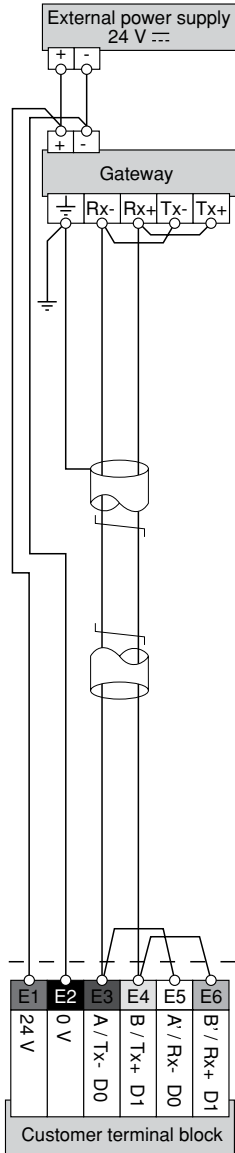
## Fixed, electrically operated DW Wiring of the COM option (with BCM ULP)



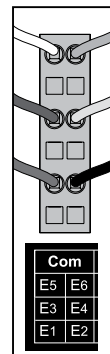
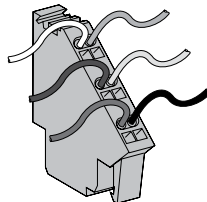
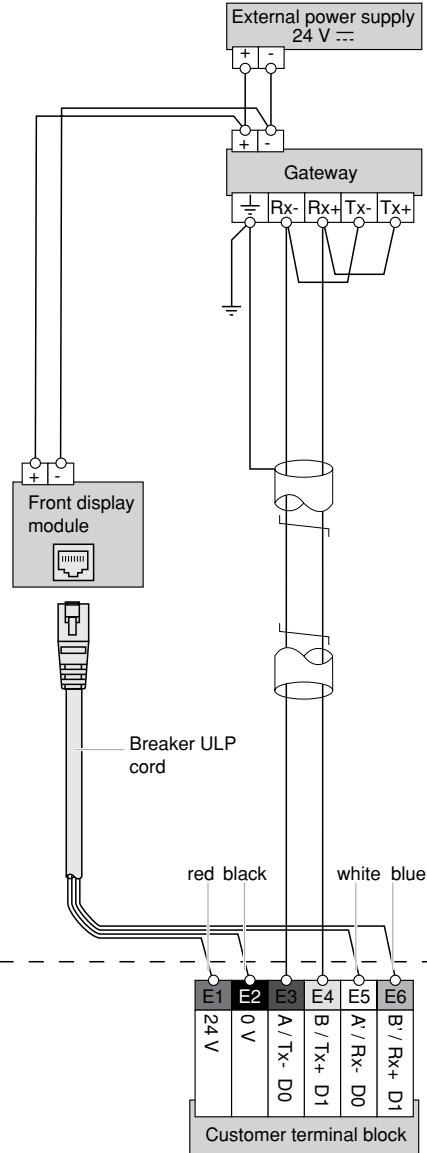
### A Modbus RS 485 4-wire without ULP module



### A Modbus RS 485 2-wire without ULP module

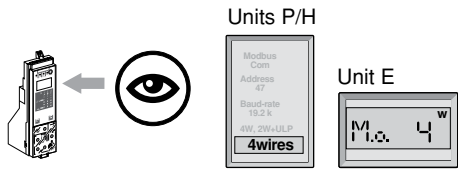


### B Modbus RS 485 2-wire + ULP with ULP module

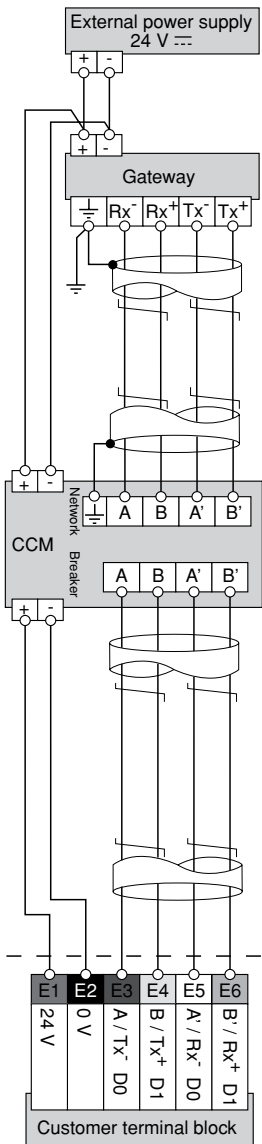




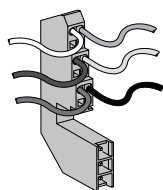
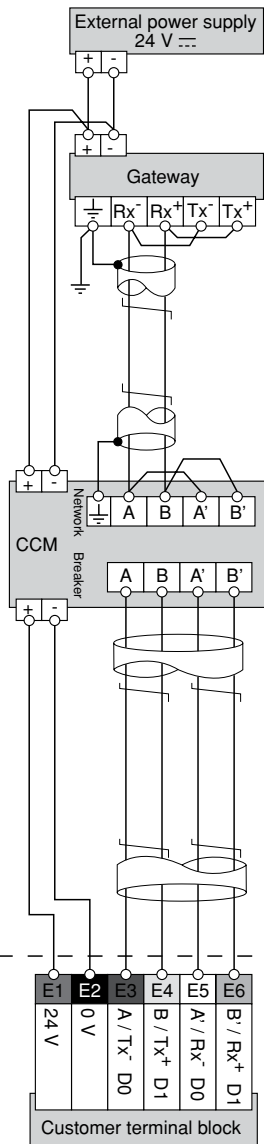
**Withdrawable DW**  
**Wiring of the COM option (with COM)**



**A Modbus RS 485 4-wire without ULP module**



**A Modbus RS 485 2-wire without ULP module**



# Air Circuit Breakers

## DW series

### Electrical diagrams

#### 24 VDC external power supply AD module

- The 24 V DC external power-supply (AD module) for the Intelligent control unit (F1- F2+) is not required for basic protections LSIG.
- The 24 V DC external power-supply (AD module) for the BCM ULP communication module (E1-E2) is required.
- The 24 V DC external power-supply (AD module) for the Front display module (0 V +24) is required.
- The 24 V DC external power-supply (AD module) for the programmable contact M2C/M6C is required.
- The same 24 V DC external power-supply (AD module) can be connected to Intelligent control unit, BCM ULP and Front display module, M2C/M6C.
  - If voltage > 480 V AC or in an environment with a high level of electromagnetic disturbances, use separate power supply: 1 power supply for Intelligent control unit (F1- F2+) and M2C/M6C, another power supply for BCM ULP and Front display module.
- With Units A/E, it is recommended to connect 24 V DC external power-supply (AD module) to the Intelligent control unit (F1- F2+) in order to keep available the display and the energy metering, even if Current < 20 % In.

Note: in case of using the 24 V DC external power supply (AD module), maximum cable length between 24 V DC (G1, G2) and the control unit (F1-, F2+) must not exceed 10 meters.

The BAT battery module, mounted in series upstream of the AD module, ensures an uninterrupted supply of power if the AD module power supply fails.

The internal voltage taps are connected to the bottom side of the circuit breaker.

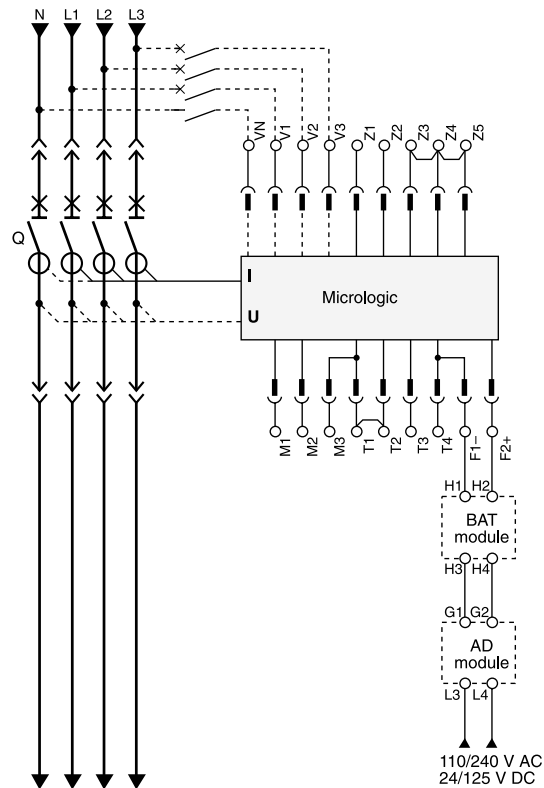
With Units P/H, external voltage taps are possible using the PTE option.

With this option, the internal voltage taps are disconnected and the voltage taps are connected to terminals VN, V1, V2, V3.

The PTE option is required for voltages less than 220 V and greater than 690 V (in which case a voltage transformer is compulsory). For three-pole devices, the system is supplied with terminal VN connected only to the control unit (Unit P).

When the PTE option is implemented, the voltage measurement input must be protected against short-circuits. Installed as close as possible to the busbars, this protection function is ensured by a P25M circuit breaker (1 A rating) with an auxiliary contact (cat. no. 21104 and 21117).

This voltage measurement input is reserved exclusively for the control unit and must not ever be used to supply other circuits outside the switchboard.



#### Connection

The maximum length for each conductor supplying power to the trip unit or M6C module is 10 m.

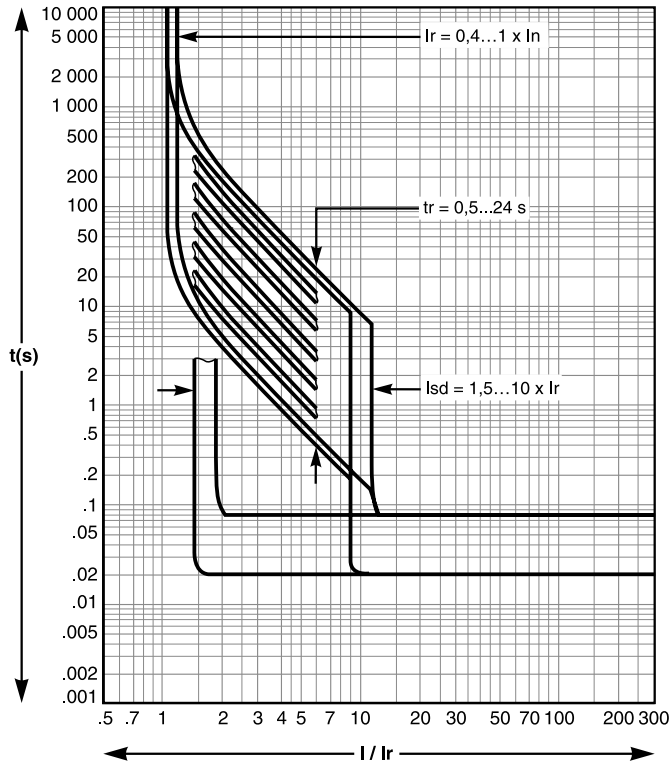
#### Do not ground F2+, F1-, or power supply output:

- the positive terminal (F2+) on the trip unit must not be connected to earth ground
- the negative terminal (F1-) on the trip unit must not be connected to earth ground
- the output terminals (- and +) of the 24 V DC power supply must not be grounded.

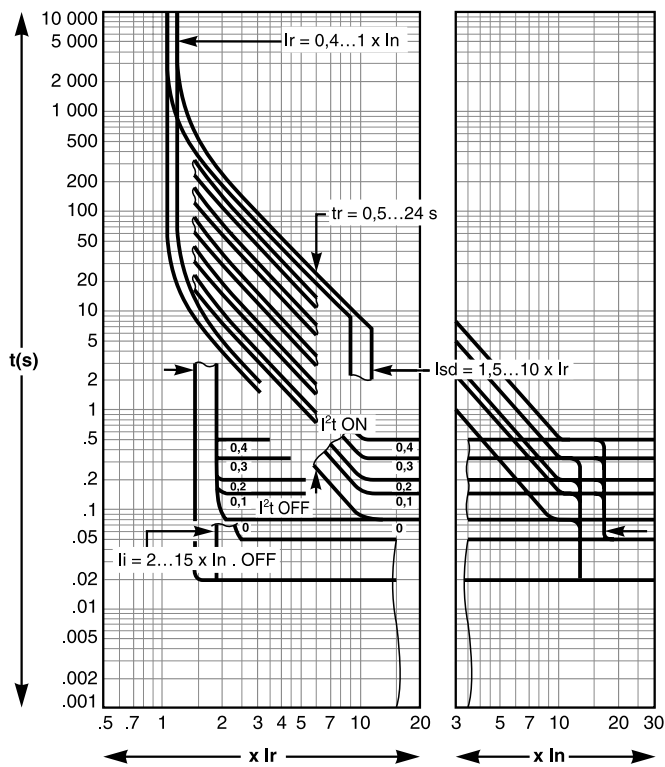
#### Reduce electromagnetic interference:

- the input and output wires of the 24 V DC power supply must be physically separated as much as possible
- if the 24 V DC power supply wires cross power cables, they must cross perpendicularly. If this is not physically possible, the power supply conductors must be twisted together
- power supply conductors must be cut to length. Do not loop excess conductor.

**Intelligent control unit 2.0**



**Intelligent control unit 5.0, 6.0, 7.0**

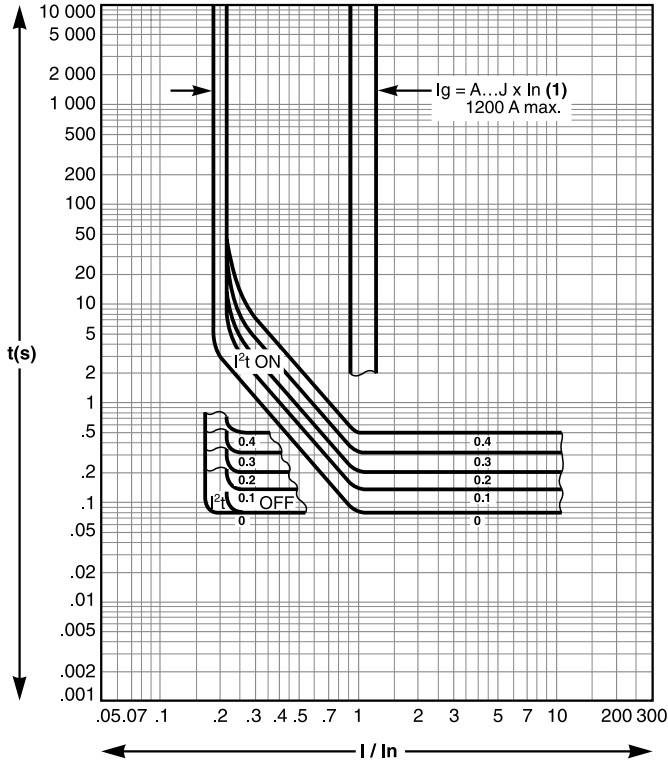


# Air Circuit Breakers

## DW series

### Additional characteristics

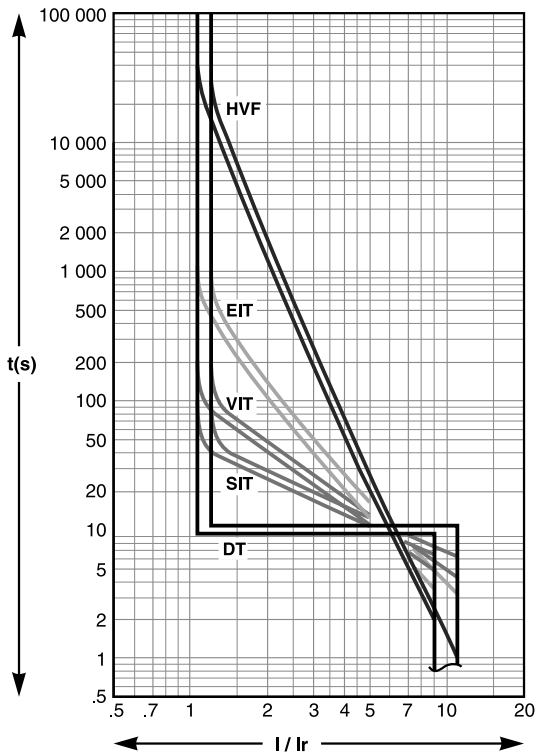
#### Earth fault protection (Intelligent control unit 6.0)



Note: (1)

$I_g = I_n \times \dots$	A	B	C	D	E	F	G	H	I
$I_n < 400 \text{ A}$	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
$400 \text{ A} \leq I_n \leq 1200 \text{ A}$	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
$I_n > 1200 \text{ A}$	500	640	720	800	880	960	1040	1120	1200

#### IDMTL curve (Intelligent control units P and H)





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URL <http://www.fujielectric.co.jp/fcs/eng>