

SM6

Modular units

Air insulated switchgear up to 36 kV



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In addition to its technical characteristics, SM6 meets requirements concerning safety of life and property as well as ease of installation, operation and protecting the environment.



SM6 units are designed for indoor installations.

Their compact dimensions are:

- 375 to 1500 mm width
- 1600 to 2250 mm height
- 840 to 1400 mm depth...

... this makes for easy installation in small rooms or prefabricated substations. Cables are connected via the front.

All control functions are centralised on a front plate, thus simplifying operation.

The units may be equipped with a number of accessories (relays, toroids, instrument transformers, surge arrester, control and monitoring, etc.).

Normal operating conditions

■ Ambient air temperature:

- 1) less than or equal to 40°C
- 2) less than or equal to 35°C on average over 24 hours
- 3) greater or equal to -5°C.

■ Altitude

- 1) less than or equal to 1000 m
- 2) above 1000 m, a derating coefficient is applied (please consult us).

■ Solar radiation

- 1) no solar radiation influence is permitted.

■ Ambient air pollution

- 1) no significant pollution by dust, smoke, corrosive and/or flammable gases, vapours or salt.

■ Humidity

- 1) average relative humidity over a 24 hour period, less than or equal to 95%
- 2) average relative humidity over a 1 month period, less than or equal to 90%
- 3) average vapor pressure over a 24 hour period, less than or equal to 2.2 kPa
- 4) average vapor pressure over a 1 month period, less than or equal to 1.8 kPa.

For these conditions, condensation may occasionally occur. Condensation can be expected where sudden temperature changes occur in periods of high humidity.

To withstand the effects of high humidity and condensation, such as breakdown of insulation, please pay attention on Civil Engineering recommendations for design of the building or housing, by suitable ventilation and installation.

Severe operating conditions (please consult us).

SM6 units meet all the following standards and specifications:

■ **IEC standards**

62271-200	High-voltage switchgear and controlgear - Part 200: A.C. metal-enclosed switchgear and controlgear for rated voltage above 1 kV and up to and including 52 kV.
62271-1	High-voltage switchgear and controlgear - Part 1: Common specifications.
60265-1	High voltage switches - Part 1: switches for rated voltages above 1 kV and less or equal to 52 kV.
62271-105	High-voltage switchgear and controlgear - Part 105: High voltage alternating current switch-fuse combinations.
60255	Electrical relays.
62271-100	High-voltage switchgear and controlgear - Part 100: High-voltage alternating current circuit breakers.
62271-102	High-voltage switchgear and controlgear - Part 102: High-voltage alternating current disconnectors and earthing switches.
60044-1	Instrument transformers - Part 1: Current transformers.
60044-2	Instrument transformers - Part 2: Voltage transformers.
60044-8	Instrument transformers - Part 8: Low Power Current Transducers.
61958	High-voltage prefabricated switchgear and controlgear assemblies - Voltage presence indicating systems.

■ **UTE standards for 24 kV**

NFC 13.100	Consumer substation installed inside a building and fed by a second category voltage public distribution system.
NFC 13.200	High voltage electrical installations requirements.
NFC 64.130	High voltage switches for rated voltage above 1 kV and less than 52 kV.
NFC 64.160	Alternating current disconnectors and earthing switches

■ **EDF specifications for 24 kV**

HN 64-S-41	A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 24 kV.
HN 64-S-43	Electrical independent-operating mechanism for switch 24 kV - 400 A.

The hereunder values are for working temperatures from -5°C up to +40°C and for a setting up at an altitude below 1000 m.



Electrical characteristics

Rated voltage	Ur	kV		7.2	12	17.5	24	36
Insulation level								
Insulation	Ud	50/60 Hz, 1 min (kV rms)		20	28	38	50	70
Isolation	Ud	50/60 Hz, 1 min (kV rms)		23	32	45	60	80
Insulation	Up	1.2/50 μs (kV peak)		60	75 ⁽¹⁾	95	125	170
Isolation	Up	1.2/50 μs (kV peak)		70	85	110	145	195
Breaking capacity								
Transformer off load		A		16				
Cables off load		A		31.5				
Rated current	Ir	A		400 - 630 -1250				
Short-time withstand current	Ik/tk ⁽²⁾	kA/1 s	25	630 - 1250				
			20 ⁽³⁾	630 - 1250				
			16	630 - 1250				
			12.5	400 - 630 - 1250				
				630-1250				
Making capacity (50 Hz)	Ima	kA	62.5	630			NA	
			50	630			630	
			40	630			630	
			31.25	400 - 630			630	
Maximum breaking capacity (Isc)								
Units IM, IMC, IMB, NSM-cables, NSM-busbars		A		630 - 800 ⁽⁴⁾				
QM, QMC, QMB		kA		25		20		20
PM		kA		25				20
CRM		kA		10	8	NA		
CRM with fuses		kA		25		NA		
CVM		kA		6.3	NA			
CVM with fuses		kA		25	NA			
SF6 circuit breaker range								
DM1-A, DM1-D, DM1-W, DM2		kA	25	630-1250				
			20	630-1250				
DM1-S		kA	25	630				
DM1-Z			25	1250				
DM2-W		kA	25	NA				
			20	NA				
Vacuum circuit breaker range								
DMV-A, DMV-D, DMV-S		kA	25	630-1250			NA	
DMVL-A		kA	20	630			NA	
DMVL-D		kA	25	630			NA	

NA: Non Available

(1) 60 kV peak for the CRM unit

(2) 3 phases

(3) In 20 kA/3 s, consult us

(4) In 800 A, consult us.

Endurance

Units		Mechanical endurance	Electrical endurance
Units IM, IMC, IMB, PM, QM ⁽⁵⁾ , QMC ⁽⁵⁾ , QMB ⁽⁵⁾ , NSM-cables, NSM-busbars		IEC 60265 1 000 operations class M1	IEC 60265-1 100 breaks at Ir, p.f. = 0.7, class E3
CRM	Disconnecter	IEC 62271-102 1 000 operations	
	Rollarc 400	IEC 60470 300 000 operations	IEC 60470 100 000 breaks at 320 A 300 000 breaks at 250 A
	Rollarc 400D	100 000 operations	100 000 breaks at 200 A
CVM	Disconnecter	IEC 62271-102 1 000 operations	
	Vacuum contactor	IEC 60470 2 500 000 operations 250 000 with mechanical latching	IEC 60470 250 000 breaks at Ir
SF6 circuit breaker range			
DM1-A, DM1-D, DM1-W, DM1-Z, DM1-S, DM2 DM2-W	Disconnecter	IEC 62271-102 1 000 operations	
	SF circuit breaker	IEC 62271-100 10 000 operations class M2	IEC 62271-100 30 breaks at 12.5 kA for 24 kV 25 breaks at 25 kA for 24 kV 40 breaks at 16 kA for 36 kV 15 breaks at 25 kA for 36 kV 10 000 breaks at Ir, p.f. = 0.7, class E2
Vacuum circuit breaker range			
DMV-A, DMV-D, DMV-S	Switch	IEC 60265 1 000 operations class M1	IEC 60265 100 breaks at Ir, p.f. = 0.7, class E3
	Evolis circuit breaker	IEC 62271-100 10 000 operations class M2	IEC 62271-100 10 000 breaks at Ir, p.f. = 0.7, class E2
DMVL-A DMVL-D	Disconnecter	IEC 62271-102 1 000 operations	
	Evolis circuit breaker	IEC 62271-100 10 000 operations class M2	IEC 62271-100 10 000 breaks at Ir, p.f. = 0.7, class E2

⁽⁵⁾ As per recommendation IEC 62271-105, three breakings at p.f. = 0.2
800 A under 36 kV; 1400 A under 24 kV; 1730 A under 12 kV; 2600 A under 5.5 kV.

Internal arc withstand (in accordance with IEC 62271-200):

- SM6 24 kV:
 - standard: 12.5 kA 1 s, IAC: A-FL
 - enhanced: 16 kA 1 s, IAC: A-FLR & IAC: A-FL
- SM6 36 kV:
 - standard: 16 kA 1 s, IAC: A-FL.

Protection index:

- classes: PI (insulating partition)
- loss of service continuity classes: LSC2A
- units in switchboard: IP3X
- between compartments: IP2XC
- Cubicle: IK08.

Electro-magnetic compatibility:

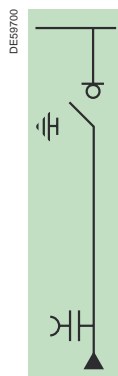
- relays: 4 kV withstand capacity, as per recommendation IEC 60801.4
- compartments:
 - electrical field:
 - 40 dB attenuation at 100 MHz
 - 20 dB attenuation at 200 MHz
 - magnetic field: 20 dB attenuation below 30 MHz.

Temperatures:

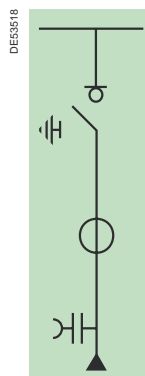
The cubicles must be stored and installed in a dry area free from dust and with limited temperature variations.

- for stocking: from – 40°C to +70°C
- for working: from – 5°C to +40°C
- other temperatures, consult us.

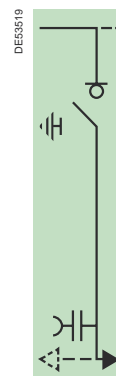
IM Switch unit



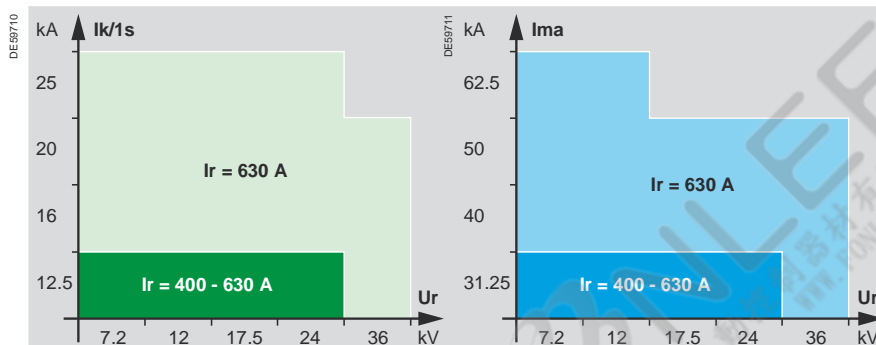
IMC Switch unit



IMB Switch unit **with** earthing switch Right or left outgoing



Electrical characteristics



Basic equipment:

- switch and earthing switch
- three-phase busbars
- CI2 operating mechanism
- voltage presence indicator
- 150 W heating element for 36 kV

- connection pads for dry-type cables

- one to three CTs for 24 kV
- three CTs for 36 kV

- three-phase bottom busbars for outgoing lines (right or left)

Versions:

- CI2 operating mechanism

- CI1 operating mechanism

- CI1 operating mechanism for 36 kV

- CI1 operating mechanism

- in 800 A version for 24 kV, consult us

Optional accessories:

- motor for operating mechanism
- auxiliary contacts
- key-type interlocks
- release units (coil)
- operation counter
- 1250 A three-phase upper busbars

- 630 A three-phase upper busbars for severe operating conditions for 24 kV
- visibility of main contacts for 24 kV
- pressure indicator device for 24 kV
- enlarged low-voltage control cabinet for 24 kV
- 50 W heating element for 24 kV
- cable connection by the top for 24 kV (no internal arc withstand if selected)

- fault indicators
- Connection pads for two dry-type single-core cables for 36 kV

- digital ammeter
- surge arresters (for 36 kV and for 24 kV in 500 mm wide cubicle)

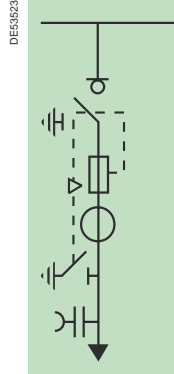
QM

Fuse-switch combination unit



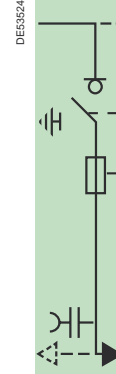
QMC

Fuse-switch combination unit

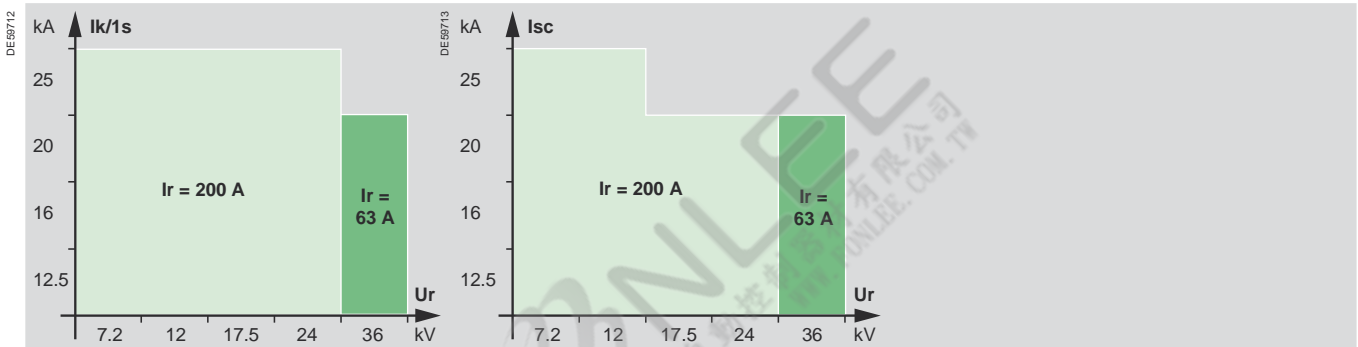


QMB

Fuse-switch combination unit
Outgoing line right or left



Electrical characteristics



Basic equipment:

- switch and earthing switch
- three-phase busbars
- CI1 operating mechanism
- voltage presence indicator
- equipment for three DIN striker fuses
- mechanical indication system for blown fuses
- 150 W heating element for 36 kV

- connection pads for dry-type cables
- downstream earthing switch 2 kA rms making capacity

- three-phase bottom busbars for outgoing lines (right or left)

- one to three CTs for 24 kV
- three CTs for 36 kV

Version:

- equipment for three UTE striker fuses for 24 kV

- CI2 operating mechanism

- CI2 operating mechanism for 36 kV

Optional accessories:

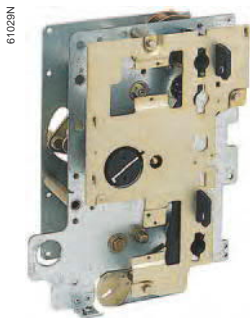
- motor for operating mechanism
- auxiliary contacts
- key-type interlocks
- auxiliary contact for blown fuses
- DIN striker fuses
- release units (coil)
- digital ammeter
- 1250 A three-phase upper busbars
- cable connection by the top for 24 kV (no internal arc withstand if selected)
- visibility of main contacts for 24 kV
- pressure indicator device for 24 kV
- 630 A three-phase upper busbars for severe operating conditions for 24 kV
- enlarged low-voltage control cabinet for 24 kV
- 50 W heating element for 24 kV

The control devices required for the unit operating mechanisms are centralised on the front panel. The different types of operating mechanism are presented in the table opposite. Operating speeds do not depend on the operator, except for the CS.

Units	Type of operating mechanism						
	Switch/disconnector					Circuit breaker	
	CIT	CI1	CI2	CS	CC	RI	P2
IM, IMB	■	□	□				
IMC	■		□				
PM	■						
QM		■	□				
QMC, QMB		■					
CM, CM2, CRM, CVM				■			
DM1-A, DM1-D, DM1-S, DM1-Z, DM2, DMVL-A, DMVL-D				■		■	
DM1-A(*), DM1-W, DM2-W				■	■	■	
DMV-A, DMV-D, DMV-S	■						■
NSM-cables, NSM-busbars			■				
GAM					■		
SM, TM				■			
EMB	■						

■ Provided as standard
□ Other possibility
(*) 1250 A version

Operating mechanism types	CIT		CI1		CI2			CS1	
Unit applications	Load-break switch Fused switch		Load-break switch Fuse switch combination		Load-break switch Fuse switch combination			Disconnector	
Main circuit switch	Closing	Opening	Closing	Opening	Mechanism charging	Closing	Opening	Closing	Opening
Manual operating mode	Hand lever	Hand lever	Hand lever	Push button	Hand lever	Push button	Push button	Hand lever	Hand lever
Electrical operating mode (option)	Motor	Motor	Motor	Coil	Motor	Coil	Coil	N/A	N/A
Speed of operation	1 to 2 s	1 to 2 s	4 to 7 s	35 ms	4 to 7 s	55 ms	35 ms	N/A	N/A
Network applications	Remote control network management		Remote control transformer protection		Remote control network management, need of quick reconfiguration (generator source, loop)			N/A	
Earthing switch	Closing	Opening	Closing	Opening	N/A	Closing	Opening	Closing	Opening
Manual operating mode	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever



Double-function operating mechanism CIT

■ Switch function

Independent-operation opening or closing by lever or motor.

■ Earthing-switch function

Independent-operation opening or closing by lever.

Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.

■ Auxiliary contacts

- switch (2 O + 2 C) *,
- switch (2 O + 3 C) and earthing switch (1 O + 1 C),
- switch (1 C) and earthing switch (1 O + 1 C) if motor option.

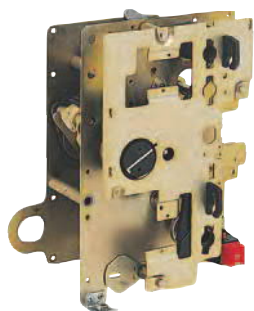
■ Mechanical indications

Fuses blown in unit PM.

■ Motor option

(*) Included with the motor option

61030N



Double-function operating mechanism CI1

■ Switch function

- ☐ independent-operation closing by lever or motor.
Operating energy is provided by a compressed spring which, when released, causes the contacts to open to close.
- ☐ independent-operation opening by push-button (O) or trip units.

■ Earthing-switch function

Independent-operation closing and opening by lever.
Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.

■ Auxiliary contacts

- ☐ switch (2 O + 2 C)*,
- ☐ switch (2 O + 3 C) and earthing switch (1 O + 1 C),
- ☐ switch (1 C) and earthing switch (1 O + 1 C) if motor option,
- ☐ fuses blown (1 C).

■ Mechanical indications

Fuses blown in units QM.

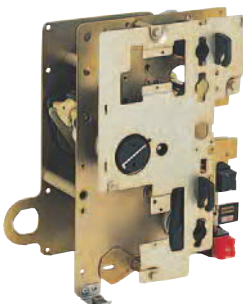
■ Opening releases

- ☐ shunt trip,
- ☐ undervoltage for unit QM.

■ Motor option

(*) Included with the motor option.

61031N



Double-function operating mechanism CI2

■ Switch function

- ☐ independent-operation closing in two steps:
1 - operating mechanism recharging by lever or motor,
2 - stored energy released by push-button (I) or trip unit.
- ☐ independent-operation opening by push-button (O) or trip unit.

■ Earthing-switch function

Independent-operation closing and opening by lever.
Operating energy is provided by a compressed spring which, when released, causes the contacts to open or close.

■ Auxiliary contacts

- ☐ switch (2 O + 2 C)*,
- ☐ switch (2 O + 3 C) and earthing switch (1 O + 1 C),
- ☐ switch (1 C) and earthing switch (1 O + 1 C) if motor option.

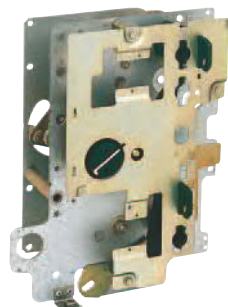
■ Opening release shunt trip

■ Closing release shunt trip

■ Motor option

(*) Included with the motor option.

61032N



Double-function operating mechanism CS

■ Switch and earth switch functions

Dependent-operation opening and closing by lever.

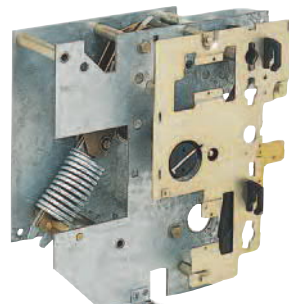
■ Auxiliary contacts

- ☐ disconnect (2 O + 2 C) for units DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, CVM and CRM without VT,
- ☐ disconnect (2 O + 3 C) and earthing switch (1 O + 1 C) for units DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D, CVM and CRM without VT,
- ☐ disconnect (1 O + 2 C) for units CM, CM2, TM, DM1-A, DM1-D, DM2, DMVL-A, DMVL-D, CVM and CRM with VT.

■ Mechanical indications

Fuses blown in units CM, CM2 and TM.

61033N



Single-function operating mechanism CC

■ Earthing switch function

Independent-operation opening and closing by lever.
Operating energy is provided by a compressed spring which, when released, provokes opening or closing of the contacts.

■ Auxiliary contacts

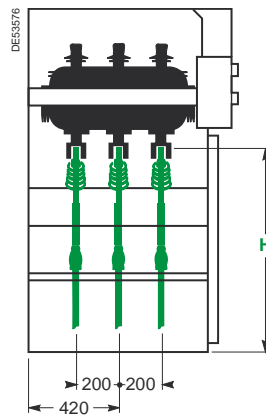
Earthing switch (1 O + 1 C).

Cable-connection from below for 24 kV Cable positions

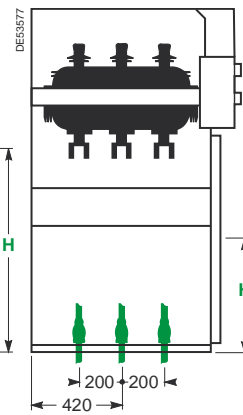
**Cable-connection height H
measured from floor (mm)**

	630 A	1250 A
IM, NSM-cables, NSM-busbars	945	
SM	945	945
IMC	400	
PM, QM	400	
QMC	400	
CRM, CVM	430	
DM1-A	430	320
DMVL-A	430	
DMV-S	320	
DM1-W	370	320
GAM2	760	
GAM	470	620
DMV-A	320	313
DM1-S	543	

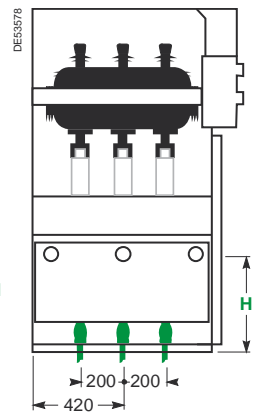
**IM, NSM-cables,
NSM-busbars, SM**



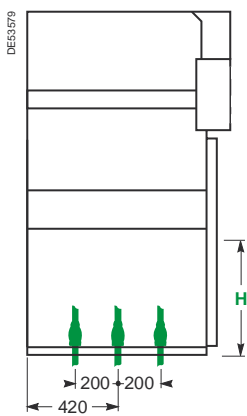
IMC, PM, QM, QMC



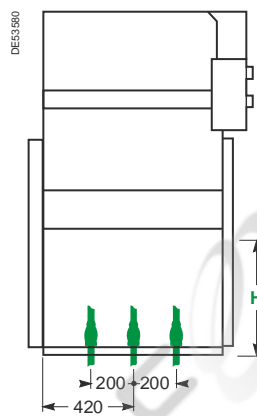
CRM, CVM



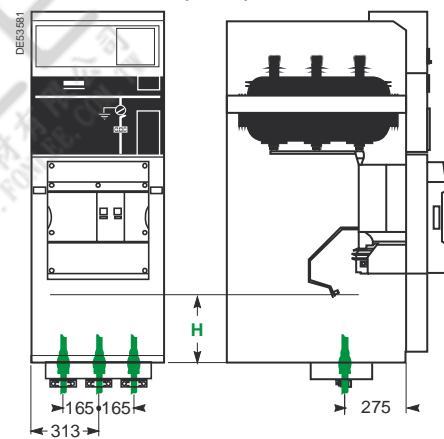
GAM2



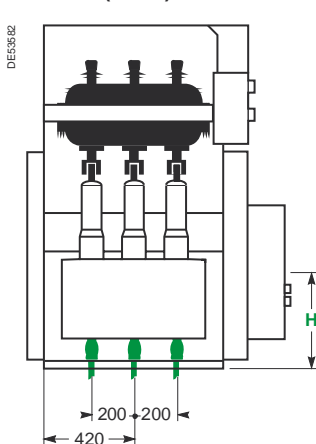
GAM



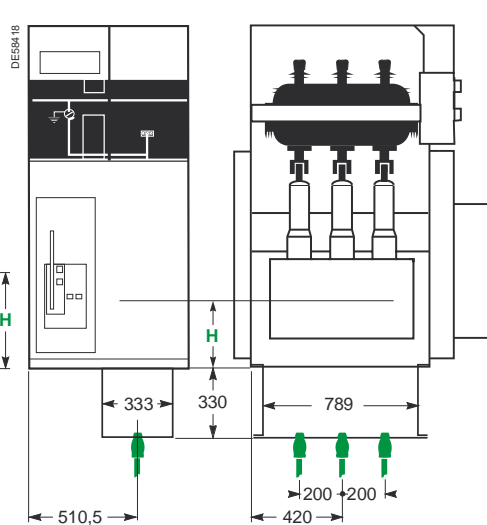
DMV-A, DMV-S (630 A)



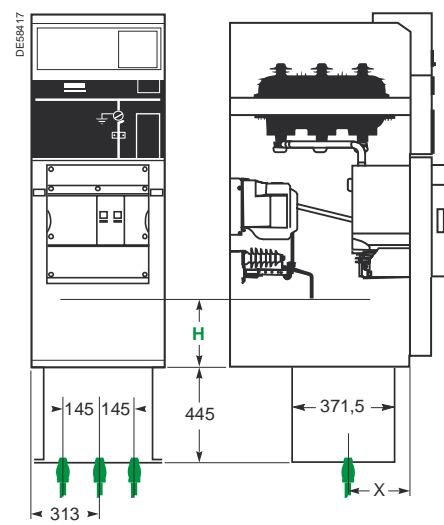
**DM1-A, DM1-S, DMVL-A
DM1-W (630 A)**



DM1-A, DM1-W (1250 A)



DMV-A (1250 A)



X = 330 : 1 single-core cable
X = 268 : 2 single-core cables
X = 299 : Three core cable

Dimensions and weights for 24 kV

Dimensions and weights

Unit type	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)
IM,IMB	1600 ⁽¹⁾	375/500	940	120/130
IMC	1600 ⁽¹⁾	500	940	200
PM, QM, QMB	1600 ⁽¹⁾	375/500	940	130/150
QMC	1600 ⁽¹⁾	625	940	180
CRM, CVM	2050	750	940	390
DM1-A, DM1-D, DM1-W, DM2, DMVL-A, DMVL-D	1600 ⁽¹⁾	750	1220	400
DM1-S	1600 ⁽¹⁾	750	1220	340
DMV-A, DMV-D	1695 ⁽¹⁾	625	940	340
DMV-S	1600 ⁽¹⁾	625	940	260
CM	1600 ⁽¹⁾	375	940	190
CM2	1600 ⁽¹⁾	500	940	210
GBC-A, GBC-B	1600	750	1020	290
NSM-cables, NSM-busbars	2050	750	940	260
GIM	1600	125	840	30
GEM ⁽²⁾	1600	125	920/1060 ⁽²⁾	30/35 ⁽²⁾
GBM	1600	375	940	120
GAM2	1600	375	940	120
GAM	1600	500	1020	160
SM	1600 ⁽¹⁾	375/500 ⁽³⁾	940	120/150 ⁽³⁾
TM	1600	375	940	200
DM1-A, DM1-D, DM1-W, DM1-Z (1250 A)	1600	750	1220	420

Add to height:

(1) 450 mm for low-voltage enclosures for control/monitoring and protection functions. To ensure uniform presentation, all units (except GIM and GEM) may be equipped with low-voltage enclosures.

(2) depending on the busbar configuration in the VM6 unit, two types of extension units may be used:

- to extend a VM6 DM12 or DM23 unit, use an extension unit with a depth of 1060 mm
- for all other VM6 units, a depth of 920 mm is required.

(3) for the 1250 A unit.

Ground preparation

Units may be installed on ordinary concrete ground, with or without trenches depending on the type and cross-section of cables.

Fixing of units

With each other

The units are simply bolted together to form the MV switchboard (bolts supplied). Busbar connections are made using a torque wrench set to 28 mN.

On the ground

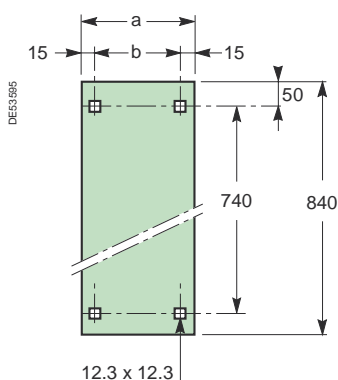
■ for switchboards comprising up to three units, the four corners of the switchboard must be secured to the ground with using:

- M8 bolts (not supplied) screwed into nuts set into the ground using a sealing pistol,
- screw rods grouted into the ground.

- for switchboards comprising more than three units, each unit may be fixed as necessary.

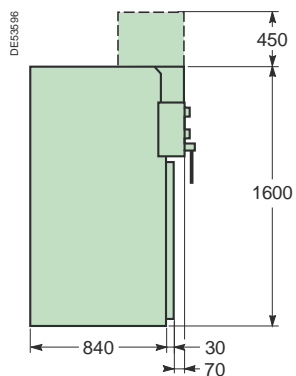
- position of fixing holes b depends on the width a of units:

a (mm)	125	375	500	625	750
b (mm)	95	345	470	595	720

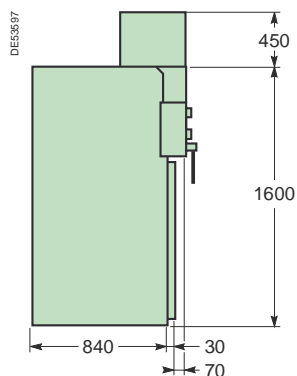


Note: in circuit-breaker or contactor units, fixing devices are installed on the side opposite the switchgear

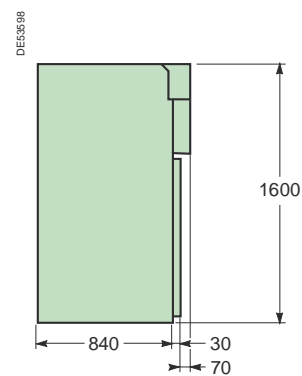
IM, IMB, PM, QM, QMB, SM, IMC, QMC, CM, CM2



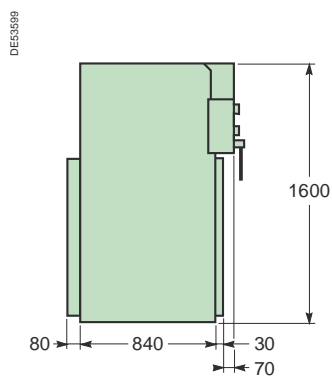
NSM-cables, NSM-busbars, CRM, CVM



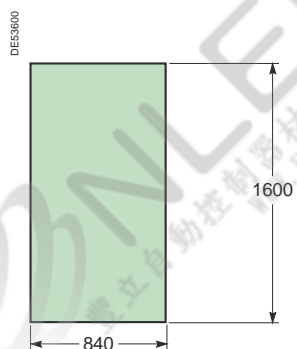
GBM, GAM2



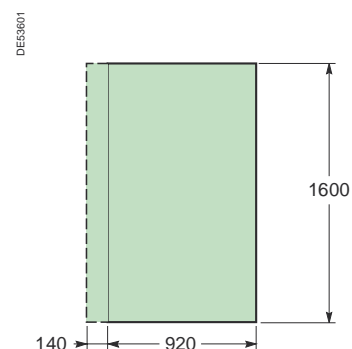
GAM



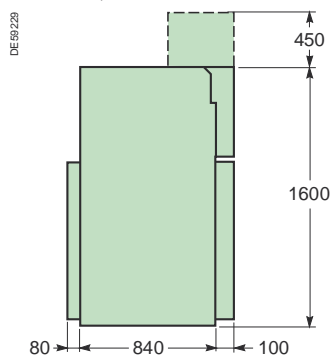
GIM



GEM



GBC-A, GBC-B



EMB

