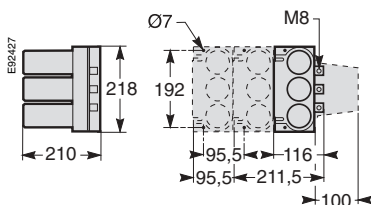


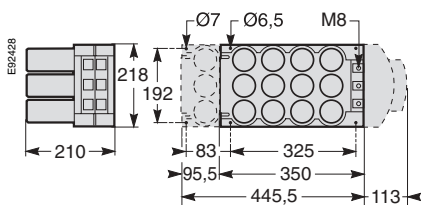
The range of Varplus M modular capacitors consists of the Varplus M1 and Varplus M4 capacitors, whose different assembly combinations cover power ratings from 5 to 100 kvar under 400 V/50 Hz. The range is available in different types according to the level of harmonic pollution.



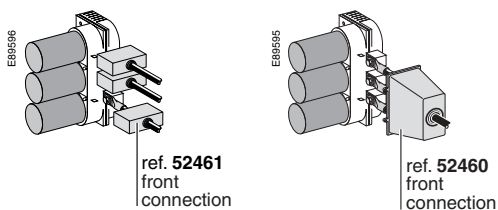
Varplus M1 and M4



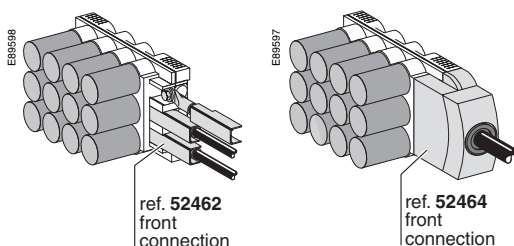
Weight of Varplus M1: 2.5 kg



Weight of Varplus M4: 10 kg



Accessories for Varplus M1



Accessories for Varplus M4

Standard type capacitors

No polluted network ($Gh/Sn \leq 15\%$)

Varplus M1			Varplus M4		
400/415 V (kvar)	Ref.		400 V (kvar)	415 V (kvar)	Ref.
5	52417		50	50	52422
7.5	52418		60	65	52423
10	52419				
12.5	52420				
15	52421				

Overrated type capacitors

Polluted network ($15\% < Gh/Sn \leq 25\%$)

Varplus M1			Varplus M4			
400 V (kvar)	470 V (kvar)	Ref.	400 V (kvar)	415 V (kvar)	470 V (kvar)	Ref.
4	6	52424	40	45	57.5	52429
5.5	8	52425	45	50	60	52430
7.5	10	52426				
10	14.5	52427				
11.5	16	52428				

Detuned type

Highly polluted network ($25\% < Gh/Sn \leq 50\%$)

On request.

Technical data

- capacitor rated voltage:
 - standard type: 415 V, three-phase 50 Hz
 - overrated type: 470 V, three-phase 50 Hz.
- maximum assembly power ratings:
 - several Varplus M1: 60 kvar
 - Varplus M4 and several Varplus M1: 100 kvar.
- Note: two Varplus M4 capacitors cannot be assembled together.**
- HQ protection system built into each single-phase element:
 - high current fault protection by an HRC cartridge fuse
 - low current fault protection by the combination of an overpressure disconnect device with an HRC fuse.
- capacitance value tolerance: -5, +10 %
- insulation level:
 - withstand 50 Hz 1 min: 6 kV
 - impulse wave withstand 1.2/50 μ s:
 - 25 kV if the rear panel is at least 15 mm away from all metal frames
 - 11 kV if the rear panel is up against a metal frame.
- maximum permissible current:
 - standard type: 1.31 In (400 V)
 - overrated type: 1.5 In (400 V).
- maximum permissible voltage (8 hours over 24 hours as in IEC 60831):
 - standard type: 456 V
 - overrated type: 517 V.
- internal discharge resistors: 50 V 1 min.
- losses (discharge resistors included):
 - from 400 to 690 V: ≤ 0.55 W/kvar
 - 230 V: ≤ 0.65 W/kvar
- temperature class (400 V): temperature of ambient air (min. -25 °C).

Power (kvar)	Max. (°C)	Highest average over all periods of	
		24 hrs	1 year
Up to 65	55	45	35
67.5 to 90	50	40	30
92.5 to 100	45	35	25

- lifetime: 130 000 hours (temperature class D).
- colour:
 - base and accessories: RAL 9002
 - elements: RAL 9005.
- standards: IEC 60831 1/2, NF C 54-104, VDE 0560 Teil 41, CSA 22-2 No190, UL 810.

Accessories for Varplus M1	Ref.
Three-phase cable entry box (IP42)	52460
Set of three terminal covers-front connection	52461

Accessories for Varplus M4	Ref.
Three-phase cable entry box (IP42)	52464
Set of three terminal covers-front connection	52462

Installation

Assembly on vertical support (elements must be horizontal).

For a lightning withstand of 25 kV, respect a distance of 15 mm between the rear panel and all metal frames.

The Varlogic N controllers permanently measure the reactive power of the installation and control connection and disconnection of capacitor steps in order to obtain the required power factor.



Varlogic NR6/NR12



Varlogic NRC12

Technical data

■ **general data**

- operating temperature: 0...60 °C
- storage temperature: -20° C...60 °C
- colour: RAL 7016
- standard:
 - EMC: IEC 61326
 - electrical: IEC/EN 61010-1.
- panel mounting
- mounting on 35 mm DIN rail (EN 50022)
- protection class in panel mounting:
 - front face: IP41
 - rear face: IP20.
- display:
 - NR6, NR12 type: backlighted screen 65 x 21 mm
 - NRC12 type: backlighted graphic screen 55 x 28 mm.
 - languages: English, French, German, Portuguese, Spanish
- alarm contact
- temperature internal probe
- separate contact to control fan inside the power factor correction bank
- access to the history of alarm.

■ **inputs**

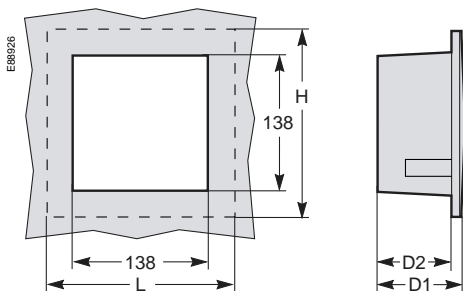
- phase to phase or phase to neutral connection
- insensitive to CT polarity
- insensitive to phase rotation polarity
- current input:
 - NR6, NR12 type: CT... X/5 A
 - NRC12 type: CT... X/5 A et X/1 A.

■ **outputs**

- potential free output contacts:
 - AC : 1 A/400 V, 2 A/250 V, 5 A/120 V
 - DC : 0,3 A/110 V, 0,6 A/60 V, 2 A/24 V.

■ **settings and parameters**

- target cos φ setting: 0,85 ind...0,9 cap
- possibility of a dual cos φ target (type NRC12)
- manual or automatic parameter setting of the power factor controller
- choice of different stepping programs:
 - linear
 - normal
 - circular
 - optimal.
- main step sequences:
 - 1.1.1.1.1.1
 - 1.2.2.2.2.2
 - 1.2.3.4.4.4
 - 1.1.2.2.2.2
 - 1.2.3.3.3.3
 - 1.2.4.4.4.4
 - 1.1.2.3.3.3
 - 1.2.4.8.8.8
- personalized sequences for NRC12 type
- delay between 2 successive switch on of a same step:
 - NR6, NR12 type: 10 ... 600 s
 - NRC12 type: 10 ... 900 s
- step configuration programming (fixed/auto/disconnected) (NRC12 type)
- 4 quadrant operation for generator application (NRC12 type)
- manual control for operating test.



Varlogic NR6, NR12, NRC12

Dimensions

Varlogic N	Dimensions (mm)				Weight (kg)
	H	L	D1	D2	
Varlogic NR6/NR12	150	150	70	60	1
Varlogic NRC12	150	150	80	70	1

Type	Number of step output contacts	Supply voltage (V) network 50-60 Hz	Measuring voltage (V)	ref.
NR6	6	110-220/240-380/415	110-220/240-380/415	52448
NR12	12	110-220/240-380/415	110-220/240-380/415	52449
NRC12	12	110-220/240-380/415	110-220/240-380/415-690	52450

Varlogic N accessories	ref.
Communication RS485 Modbus set for NRC12	52451
Temperature external probe for NRC12 type. In addition to internal probe, allows measurement at the hottest point inside the capacitor bank. Better tuning of alarm and/or disconnection level.	52452

Information supplied	NR6/NR12	NRC12
Cos ϕ	■	■
Connected steps	■	■
Switching cycles and connected time counter	■	■
Step configuration (fixed step, auto, disconnected)		■
Step output status (capacitance loss monitoring)		■
Network technical data: load and reactive currents, voltage, powers (S, P, Q)	■	■
Ambient temperature inside the cubicle	■	■
Total voltage harmonic distortion THD (U)	■	■
Total current harmonic distortion THD (I)		■
Capacitor current overload I_{rms}/I_1		■
Voltage and current harmonic spectrum (orders 3, 5, 7, 11, 13)		■
History of alarms	■	■

Alarms	Threshold	Action	NR6/NR12	NRC12
Low power factor		message and alarm contact	■	■
Hunting (unstable regulation)		message and alarm contact disconnection (2)	■	■
Abnormal cos ϕ	< 0.5 ind or 0.8 cap	message and alarm contact	■	■
Overcompensation		message and alarm contact	■	■
Overcurrent	> 115 % I_1	message and alarm contact	■	■
Voltage low	< 80 % U_0 within 1 s	message and alarm contact disconnection (2)	■	■
Overvoltage	> 110 % U_0	message and alarm contact disconnection (2)	■	■
Overtemperature	$\theta \geq \theta_0$ ($\theta_0 = 50$ °C max)(1)	message and alarm contact disconnection (2)	■	■
	$\theta \geq \theta_0 - 15$ °C	fan switch disconnection (2)	■	■
Total harmonic distortion	> 7 % (1)	message and alarm contact disconnection (2)	■	■
Capacitor current overload (I_{rms}/I_1)	> 1.5 (1)	message and alarm contact disconnection (2)		■
Capacitor capacitance loss	- 25 %	message and alarm contact disconnection (2)		■
Low current	< 2,5 %	message	■	■
High current	> 115 %	message	■	■
Under voltage	5 % U_0	message		■

U_0 : input voltage (measurement)

(1): alarm threshold values can be modified according to the installation

(2): capacitor steps are automatically reconnected after fault clearance and a safety delay

The detuned reactors (DR) are designed to protect capacitors and avoid harmonic amplification present on the network.



Detuned reactors (DR)

Detuned reactors 400 V - 50 Hz

Tuning order: 4.3 (215 Hz)

Power restored by the assembly reactor-capacitor	L (mH)	I ₁ (A)	Power losses (W)	Ref.
6.25 kvar/400 V - 50 Hz	4.71	9	100	51573
12.5 kvar/400 V - 50 Hz	2.37	17.9	150	52404
25 kvar/400 V - 50 Hz	1.18	35.8	200	52405
50 kvar/400 V - 50 Hz	0.592	71.7	320	52406
100 kvar/400 V - 50 Hz	0.296	143.3	480	52407

Tuning order: 3.8 (190 Hz)

Power restored by the assembly reactor-capacitor	L (mH)	I ₁ (A)	Power losses (W)	Ref.
6.25 kvar/400 V - 50 Hz	6.03	9.1	100	51568
12.5 kvar/400 V - 50 Hz	3	18.2	150	52352
25 kvar/400 V - 50 Hz	1.5	36.4	200	52353
50 kvar/400 V - 50 Hz	0.75	72.8	300	52354
100 kvar/400 V - 50 Hz	0.37	145.5	450	51569

Tuning order: 2.7 (135 Hz)

Power restored by the assembly reactor-capacitor	L (mH)	I ₁ (A)	Power losses (W)	Ref.
6.25 kvar/400 V - 50 Hz	12.56	9.3	100	51563
12.5 kvar/400 V - 50 Hz	6.63	17.6	150	51564
25 kvar/400 V - 50 Hz	3.14	37.2	200	51565
50 kvar/400 V - 50 Hz	1.57	74.5	400	51566
100 kvar/400 V - 50 Hz	0.78	149	600	51567

Technical data

- three phase, dry, with magnetic circuit, impregnated
- cooling: natural
- degree of protection: IP00
- class: H
- standard: IEC 60289, EN 60289
- rated voltage: 400/415 V three phase 50 Hz
- tuning order (relative impedance): 4.3 (5.4 %) ; 3.8 (6.9 %) ; 2.7 (13.7 %)
- tolerance on L per phase: - 5, +5 %

■ maximum permissible current: $I_{mp} = \sqrt{[(1.1 \cdot I_1)^2 + I_3^2 + I_5^2 + I_7^2 + I_{11}^2]}$

- $I_{mp} = 1.31 \cdot I_1$ for tuning order 4.3
- $I_{mp} = 1.19 \cdot I_1$ for tuning order 3.8
- $I_{mp} = 1.12 \cdot I_1$ for tuning order 2.7

- harmonic current spectrum:

in % of current (I ₁)	Tuning order 4.3	Tuning order 3.8	Tuning order 2.7
Current I ₃	2 %	3 %	6 %
Current I ₅	69 %	44 %	17 %
Current I ₇	19 %	13 %	6 %
Current I ₁₁	6 %	5 %	2 %

- insulation level: 1.1 kV
- thermal withstand I_{sc}: 25 x I_{rms}, 2 x 0.5 second
- dynamic withstand: 2.2 I_{sc} (peak value)
- dielectric test 50 Hz between windings and windings/earth: 3.3 kV 1 minute
- thermal protection connected on terminal block 250 V AC 2 A.

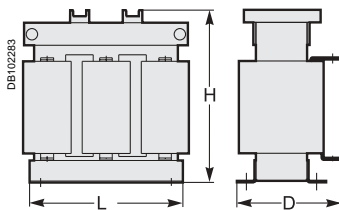
Conditions of use

- use: indoor
- storage temperature: -40 °C, +60 °C
- relative humidity in operation: 20 to 80 %
- withstand in salt mist: 250 h
- operating temperature/altitude:

Altitude (m)	Minimum (°C)	Maximum (°C)	Highest average over all periods of:	
			1 year	24 h
1000	0	55	40	50
> 1000 ≤ 2000	0	50	35	45

Installation

- forced cooling system compulsory
- windings of the detuned reactors fitted in upright position to ensure a good cooling system
- power connection :
 - screw type connector for detuned reactors 6.25 and 12.5 kvar
 - drilled terminals for detuned reactors 25, 50 and 100 kvar
- capacitors to be used in conjunction with detuned reactors must be rated at 470 V for a 400/415 V network.



Detuned reactors (DR)

Dimensions

Tuning order: 4.3 (215 Hz)

Power restored by the assembly reactor-capacitor	Fixing center distance (mm)	Dimensions maximum (mm)			Weight (kg)
		H	L	D	
6.25 kvar/400 V - 50 Hz	110 x 87	230	200	140	8.6
12.5 kvar/400 V - 50 Hz	205 x 110	230	245	140	12
25 kvar/400 V - 50 Hz	205 x 110	230	240	140	18.5
50 kvar/400 V - 50 Hz	(1)	270	260	160	25
100 kvar/400 V - 50 Hz	205 x 120	330	380	220	42

Tuning order: 3.8 (190 Hz)

Power restored by the assembly reactor-capacitor	Fixing center distance (mm)	Dimensions maximum (mm)			Weight (kg)
		H	L	D	
6.25 kvar/400 V - 50 Hz	110 x 87	230	200	140	8.5
12.5 kvar/400 V - 50 Hz	205 x 110	230	245	140	10
25 kvar/400 V - 50 Hz	205 x 110	230	240	140	18
50 kvar/400 V - 50 Hz	(1)	270	260	160	27
100 kvar/400 V - 50 Hz	205 x 120	330	380	220	42

Tuning order: 2.7 (135 Hz)

Power restored by the assembly reactor-capacitor	Fixing center distance (mm)	Dimensions maximum (mm)			Weight (kg)
		H	L	D	
6.25 kvar/400 V - 50 Hz	110 x 87	230	200	140	9
12.5 kvar/400 V - 50 Hz	205 x 110	230	245	145	13
25 kvar/400 V - 50 Hz	205 x 110	230	240	140	22
50 kvar/400 V - 50 Hz	(1)	270	260	160	32
100 kvar/400 V - 50 Hz	205 x 120	330	380	220	57

(1) 205 x 120 or 205 x 130 mm.