
BROCHURE

SACE Emax 2 VF

Air switch-disconnectors for variable frequency applications



ABB has always paid special attention to renewable energy generation, constantly collaborating with the major wind turbine manufacturers and anticipating market trends of variable frequency installations.

SACE Emax 2 VF

Range of switch-disconnectors for variable frequency applications

SACE Emax 2 VF range of switch-disconnector for variable frequency applications is composed by three versions: 900V for low frequency, 900V for mid-frequency, and the new /E12 at 1200V.

Due to lack of relevant standards for variable frequency applications, values are defined according to ABB's long experience in the market in close collaboration with key machine manufacturing partners with robust testing procedures.

The device, when in the open position, guarantees an isolating distance between the main contacts that is sufficient to ensure that the installation downstream is not live.

Switch disconnectors are derived from the corresponding automatic circuit breakers, and they have the same dimensions and accessory options.

VF Application	Frequency range	Switch-disconnector	Page
Low frequency	5Hz - 60 Hz	SACE Emax 2/E9/LF	2
Mid-frequency	50Hz - 210Hz	SACE Emax 2/E9/VF	4
Low and mid-frequency	3Hz - 160Hz	SACE Emax 2/E12/VF	5

This document contains main characteristics, ranges and ordering codes.

For information about accessories, installation, wiring diagrams and dimensions, consult the **SACE Emax 2 Technical Catalogue**.



For more information about Emax 2 over 690V, consult the **SACE Emax 2/E Catalogue**



SACE Emax 2/E9/LF MS

Switch-disconnectors for variable frequency applications, low frequency

The SACE Emax2/E9/LF switch disconnectors have been certified at 900V according to IEC 60947-3, including CCC approval. Variable frequency performance cover a range of frequency up to 50-60Hz.

The device is present in fixed and withdrawable versions, and can be fitted with a vast assortment of electrical and mechanical accessories already available for the standard SACE Emax 2 range.

Common data		
Rated service voltage Ue	[V]	900
Rated insulation voltage Ui	[V]	1000
Rated impulse withstand voltage Uimp	[kV]	12
Number of poles		3
Version	Fixed-Withdrawable	
Suitable for isolation according to	IEC 60947-3	



SACE Emax 2/E9			E4.2
Performance levels			H/E9/LF MS
Rated uninterrupted current Iu @ 40°C, 50Hz		[A]	2500
		[A]	3200
		[A]	4000
Rated short-time withstand current Icw	(1s)	[kA]	75
	(3s)	[kA]	75*
Rated short-circuit making capacity (peak value) Icm	900V	[kA]	165
Utilization category (according to IEC 60947-3)			AC-23A
Dimensions	H - Fixed/Withdrawable	[mm]	371/425
	W - Fixed/Withdrawable	[mm]	270/383
	D - Fixed/Withdrawable	[mm]	384/425

* 66 kA Icw(3s) up to 3200A

SACE Emax 2/E9			E4.2
Mechanical life*		[Iu]	≤ 3200
		[No. cycles x 1000]	20
	Frequency	[Oper./Hour]	60
Electrical life	900 V	[No. cycles x 1000]	1
	Frequency	[Oper./Hour]	10

* with regular ordinary maintenance prescribed by the manufacturer

Variable frequency performances ⁽¹⁾			E4.2	
Performance levels			H/E9/LF MS	
Supply side			top	bottom
Interruption ability current ⁽²⁾	353V 5.04Hz	[kA]	15	15
	643V 9.20Hz	[kA]	15	15
	750V 13.39 Hz	[kA]	15	15
	840V 25Hz	[kA]	15	12
	945V 25Hz	[kA]	15	12
	945V 50-60Hz	[kA]	75	75

(1) Note: Due to lack of relevant standards for variable frequency applications, these values are defined according to ABB evaluation and testing procedure, and must be confirmed according to the specific customer application.

(2) Table reports testing voltages and frequencies. Additional testing parameters: time setting 800ms, power factor = 0.1

Fixed version



SACE Emax E4.2H/E9/LF MS • Orientable rear terminals (HR)

Size	Iu	Type	3 Poles
			Code
E4.2H/E9/LF MS	2500	E4.2H/E9/LF MS 2500	1SDA119545R1
	3200	E4.2H/E9/LF MS 3200	1SDA119546R1
	4000	E4.2H/E9/LF MS 4000	1SDA119547R1

Withdrawable version



SACE Emax E4.2H/E9/LF MS • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Type	3 Poles
			Code
E4.2H/E9/LF MS	2500	E4.2H/E9/LF MS 2500	1SDA119551R1
	3200	E4.2H/E9/LF MS 3200	1SDA119552R1
	4000	E4.2H/E9/LF MS 4000	1SDA119553R1

Fixed parts



Size	Performance	Iu range	Type of terminal	Type	3 Poles
					Code
E4.2	N, S, H	3200	HR - HR	E4.2 W FP Iu=3200 HR HR	1SDA073913R1
E4.2	N, S, H	4000	HR - HR	E4.2 W FP Iu=4000 HR HR	1SDA073915R1

Phase separators are mandatory with Emax 2/E9 circuit breakers.

For withdrawable version, phase separators have to be ordered as loose part with code 1SDA076168R1.

For fixed version, they are provided as standard.

SACE Emax 2/E9/VF MS

Switch-disconnectors for variable frequency applications, mid-frequency

The SACE Emax2/E9/VF switch disconnectors have been certified at 800V according to IEC 60947-3, including CCC approval. Variable frequency performance cover a range of frequency up to 210Hz.

The device is present in fixed version only, and can be fitted with a vast assortment of electrical and mechanical accessories already available for the standard SACE Emax 2 range.

Common data		
Rated service voltage Ue	[V]	800
Rated insulation voltage Ui	[V]	1000
Rated impulse withstand voltage Uimp	[kV]	12
Number of poles		3
Version		Fixed
Suitable for isolation according to		IEC 60947-3



SACE Emax 2			E4.2
Performance levels			H/E9/VF MS
Rated uninterrupted current I _u @ 40°C, 50Hz	[A]		4000
Rated short-time withstand current I _{cw}	(1s)	[kA]	48
	(3s)	[kA]	24
Dimensions	H - Fixed	[mm]	371
	D - Fixed	[mm]	270
	W - Fixed 3p	[mm]	384

Variable frequency performances ⁽¹⁾			
Performance levels			
Interruption ability current	210V 20Hz	[kA]	5,2
	740V 110Hz	[kA]	26
	760V 150Hz	[kA]	7
	945V 210Hz	[kA]	5
	900 V 50-60Hz	[kA]	75

(1) Note: Due to lack of relevant standards for variable frequency applications, these values are defined according to ABB evaluation and testing procedure, and must be confirmed according to the specific customer application.

SACE Emax 2			E4.2
Mechanical life with regular ordinary maintenance prescribed by the manufacturer		[I _u]	≤ 4000
		[No. cycles x 1000]	15
Electrical life	Frequency	[Oper./Hour]	60
	800 V 50Hz	[No. cycles x 1000]	1
	690 V 20Hz	[No. cycles x 1000]	0,5
	Frequency	[Oper./Hour]	30

SACE Emax E4.2H/E9/VF MS • Orientable rear terminals (HR)

Size	Type	Code
E4.2	E4.2H/E9/VF MS 4000 3p FHR	1SDA114784R1



SACE Emax 2/E12/VF MS

Switch-disconnector for variable frequency applications up to 1200V

Switch disconnectors SACE Emax 2/E12/VF has been certified at 1200V according to IEC 60947-3 Standard and it has also achieved CCC approval. Variable frequency testing covers a range of frequency from few hertz up to 160Hz.

The device is present in fixed and withdrawable versions, and can be fitted with a vast assortment of electrical and mechanical accessories already available for the standard SACE Emax 2 range.

Common data		
Rated service voltage Ue	[V]	1200
Rated insulation voltage Ui	[V]	1500
Rated impulse withstand voltage Uimp	[kV]	15
Frequency	[Hz]	50-60
Number of poles		3
Version		Fixed- Withdrawable
Suitable for isolation according to		IEC 60947-3



SACE Emax 2/E12			E4.2
Performance levels			H/E12 MS
Rated uninterrupted current Iu @ 40°C		[A]	2500
		[A]	3200
		[A]	4000
Rated short-time withstand current Icw	(1s)	[kA]	85
	(3s)	[kA]	75
Rated short-circuit making capacity (peak value) Icm	1000V	[kA]	187
	1200V	[kA]	143
Utilization category (according to IEC 60947-3)			AC-23A

SACE Emax 2/E12			E4.2
		[Iu]	≤3200
			4000
Mechanical life*		[No. cycles x 1000]	20
	Frequency	[Oper./Hour]	60
Electrical life	1000V	[No. cycles x 1000]	1
	1150V	[No. cycles x 1000]	1
	1200V	[No. cycles x 1000]	1
	Frequency	[Oper./Hour]	10

(*) with regular maintenance prescribed by the manufacturer.

Variable frequency performances ⁽¹⁾				E4.2
Performance levels				H/E12/VF MS
Interruption ability current ⁽²⁾	220V	3Hz	[kA]	15
	370V	5Hz	[kA]	15
	500V	7Hz	[kA]	15
	740V	10Hz	[kA]	25
	1150V	15Hz	[kA]	25
	1050V	160Hz	[kA]	15

(1) Note: Due to lack of relevant standards for variable frequency applications, these values are defined according to ABB evaluation and testing procedure, and must be confirmed according to the specific customer application.

(2) Table reports testing voltages and frequencies. Additional testing parameters: time setting 800ms, power factor = 0.1

SACE Emax 2/E12/VF MS

Switch-disconnector for variable frequency applications up to 1200V

Fixed version



SACE Emax E4.2H/E12/VF MS • Orientable rear terminals (HR)*

Size	Iu	Type	3 Poles
			Code
E4.2H/E12/VF MS	2500	E4.2H/E12/VF MS 2500 FHR	1SDA121162R1
	3200	E4.2H/E12/VF MS 3200 FHR	1SDA121163R1
	4000	E4.2H/E12/VF MS 4000 F SVR	1SDA121164R1

Withdrawable version



SACE Emax E4.2H/E12/VF MS • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Type	3 Poles
			Code
E4.2H/E12/VF MS	2500	E4.2H/E12/VF MS 2500	1SDA121165R1
	3200	E4.2H/E12/VF MS 3200	1SDA121166R1
	4000	E4.2H/E12/VF MS 4000	1SDA121167R1

Fixed parts



Size	Performance	Iu range	Type of terminal	Type	3 Poles
					Code
E4.2 /E12	S, H, V	2500-3200	HR – HR	E4.2 /E12 W FP Iu=3200 HR HR	1SDA121088R1
		4000	SVR - SVR	E4.2 /E12 W FP Iu=4000 SVR SVR*	1SDA121089R1

Phase separators are mandatory with Emax 2/E circuit breakers.

For withdrawable version, phase separators have to be ordered as loose part.

For fixed version, they are provided as standard.

(*) SVR terminals are standard on Iu= 4000A versions. When using other terminal configurations assume a current derating to 3800A.

More information on Catalogue [1SDC200074B0201](#).

Standard supply and accessories

The fixed versions of SACE Emax 2 switch-disconnectors are always supplied as standard with the following accessories: IP30 protection for switchgear door, lifting plates, adjustable rear terminals mounted in HR – HR configuration.

The withdrawable versions of switch-disconnectors are always supplied as standard with the

following accessories: closed circuit-breaker racked-out mechanism lock, lifting plates, lever for racking in and racking out, anti-insertion lock. The fixed parts feature are: IP30 protection for switchgear door, anti-insertion lock, standard shutter lock – SL, adjustable rear terminals mounted in HR – HR configuration.

Accessory	Switch-disconnector	
	E4.2 /E9/LF E4.2 /E12/VF	E4.2 /E9/VF
Signalling		
Standard open/closed auxiliary contacts - AUX 4Q	○ / ○○	○
Open/closed auxiliary contacts - AUX 6Q	○ / ○○	○
Open/closed auxiliary contacts - AUX 15Q	○ / △	○
Auxiliary position contacts - AUP	△	-
Ready to close signalling contact - RTC	○ / ○○	○
Contact signalling loaded springs – S33 M/2 (supplied with Motor)	○ / ○○	○
Control		
Opening and closing release - YO/YC	○ / ○○	○
Second opening and closing release - YO2/YC2	○ / ○○	○
Undervoltage release - YU	○ / ○○	○
Electronic time-delay device for undervoltage release - UVD	○ / ○○	○
Motor - M	○ / ○○	○
Remote reset - YR	-	-
Opening and closing release test unit - YO/YC Test Unit	○ / △	○
Safety		
Key lock and padlock in open position - KLC and PLC	○ / ○○	○
Key lock and padlock in racked-in / test / racked-out position - KLP and PLP	○○	-
Shutter lock - SL	▲	-
Lock for racking-out mechanism with circuit-breaker in closed position	●●	-
Lock for racking in / racking out the mobile part when the door is open - DLR	△	-
Lock to prevent door opening when circuit-breaker is in racked-in / test position - DLP	△	-
Lock to prevent door opening when circuit-breaker is in closed position - DLC	○ / ○○	○
Anti-insertion lock	● / ●●	●
Mechanical operation counter - MOC	○ / ○○	○
Protection devices		
Protection device for opening and closing pushbuttons - PBC	○ / ○○	○
IP30 Protection	● / ▲	●
IP54 Protection	○ / △	○
Separators - PB	● / △	●
Connections		
Orientable rear terminal - HR/VR *	● / ▲	●
Other configurations	○ / △	-
● Standard accessory for fixed circuit-breaker ○ Accessory on request for fixed circuit-breaker ●● Standard accessory for mobile part ○○ Accessory on request for mobile part		
▲ Standard accessory for fixed part △ Accessory on request for fixed part (*) SVR for E4.2 /E12 4000A.		



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