

Advanced retrofitting kit solution

Direct Replacement Emax/New Emax to Emax 2



With few modifications to your existing switchgear, retrofitting kits are a sustainable solution to upgrade your electrical system. The Direct Replacement retrofitting kit allows a very fast and reliable upgrade of the old Emax and New Emax circuit breakers and switch-disconnectors with Emax 2.

Air circuit breakers put into service many years ago might not provide the reliability and safety assurances required today. Making certain that people, equipment and processes are properly protected is a growing concern. When maintenance is no longer sufficient owing to lack of materials or when components are out of production, retrofit kits are the best solution. ABB Low Voltage Service offers a unique way to upgrade installed hardware and software to the next generation, by changing the worn or outdated parts while maintaining the original plant and equipment configuration. The kits are tested in the ABB SACE Division Lab, accredited by ACCREDIA and acknowledged by important international certification bodies such as ACAE / LOVAG, ANCE, ASTA, ETL SEMKO, UL, CSA and Naval Registers.

Safety and Service continuity

- Safety improvement
- Service continuity guaranteed
- Ease of installation
- Reduction of the cost of maintenance
- Long availability of the product and its spare parts
- Factory tested solution
- Wide range of mechanical and electrical accessories with Emax 2.

From Circuit-Breaker to Power Manager

SACE Emax 2 improves the efficiency of electrical plants, creating the new standard of:

- Control: Ekip PowerController to improve energy efficiency and saving
- Connectivity: integration into systems with integrated communication modules with different protocols: Modbus RS-485, Modbus TCP, Profibus, DeviceNet, EtherNet/IP, IEC61850, Bluetooth
- Ease of use: creation of efficiency and simplicity. Power measurement with Emax 2 advanced trip units
- Easy to Maintain: Diagnosis and installation with Ekip Connect Software. Automatic notifications to remind maintenance activities. ABB Ability EDCS is also available with Emax 2 for Predictive Maintenance.

Sustainable solutions

Retrofitting kits allow to extend the lifespan of your electrical system, keeping it live and efficient as long as possible, minimizing CO2 emissions and raw materials usage.

How to retrofit a Emax or a New Emax?

ABB offers a complete range of solution to upgrade Emax and New Emax circuit breakers with Emax2 retrofit solutions:

- **Hard bus retrofit (RF):** it is the traditional retrofit kit for which the complete Emax and New Emax circuit breakers needs to be dismantled. The kit consists in a new Emax 2 breaker equipped with special terminals to fit the existing busbars. This solution is available for both Fixed and Withdrawable versions.
- **Direct replacement (DR):** It is the most advanced retrofit solution type. In this case only the mobile part of withdrawable circuit breakers need to be removed. A special version of Emax2 moving part is supplied by ABB to be racked in/out on the installed fixed part.

When shutdown time is an issue, the DR solutions are preferable. Installation time is reduced to minimum, as the existing fixed part are not removed; with few adaptations on-site the new Emax2 moving part can be inserted. All retrofit solutions have been tested for mechanical and electrical operations, short circuit breaking capacity, short circuit withstand current and dielectric properties according to IEC standards.

The Direct Replacement is a solution suitable when the existing part is full working.

Before ordering it is important to verify integrity of the fixed part according to the directions on the document [1SDH001279R0002](#).

When fixed part is not fully working the best retrofitting solution is the Hard Bus Retrofit.

Retrofitting kit solutions for a Emax/New Emax with Emax 2

Emax/New Emax	Performance Level	Versions		
		FIXED	WITHDRAWABLE	
		HR Terminals	HR Terminals	VR Terminals
X1*	B	RF	RF	RF
	N	RF	RF	RF
E1	B	RF	DR - RF	DR
	N	RF	DR - RF	DR
E2	B	RF	DR - RF	DR - RF
	N	RF	DR - RF	DR - RF
	S	RF	DR - RF	DR - RF
E3	N	RF	DR - RF	DR - RF
	S	RF	DR - RF	DR - RF
	H	RF	DR - RF	DR - RF
	V*	RF	DR - RF	DR - RF
E4	S	RF ⁽¹⁾	DR - RF	DR - RF ⁽¹⁾
	H	RF ⁽¹⁾	DR - RF	DR - RF ⁽¹⁾
	V*	RF ⁽¹⁾	DR - RF	DR - RF ⁽¹⁾
E6	H	-	DR - RF	DR - RF ⁽²⁾
	V	-	DR - RF	DR - RF ⁽²⁾

* Devices available only for New Emax series; (1) Available only for 3p versions; (2) Available also for 4p/f versions

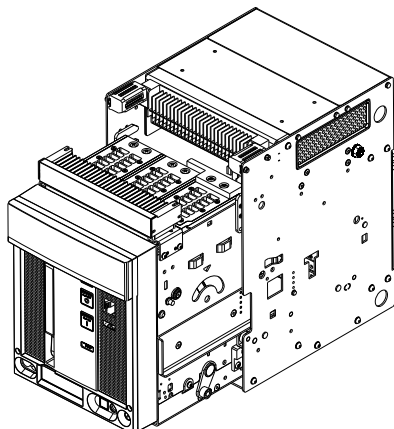
The DR kit consists of:

- Special Emax 2 moving part assembled and tested in ABB factory and ready to be racked-in into Emax/New Emax Fixed Part.

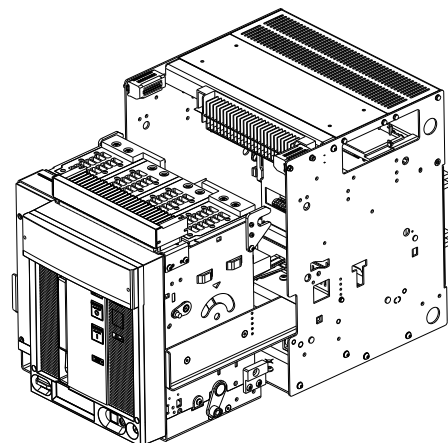
It includes:

- Sliding contacts
- Mechanical signaling
- Anti-insertion lock
- Racking in/out lever
- Kit for the door's adaption.

Direct Replacement for a 3p version



Direct Replacement for a 4p version



Correspondence table for Direct Replacement Emax/New Emax to Emax 2

Automatic circuit breakers – Emax/New Emax to Emax 2 - IEC

Emax/ New Emax	Iu [A]	Poles	Emax 2	Emax 2 Performance Level	Iu [A]	Iu (Rating Plug) [A]	Icu/Ics 415V [kA]	Icu/Ics 440V [kA]	Icu/Ics 690V [kA]	Icw (1s) [kA]
E1B	800	3p/4p	E2.2	B	1600	800	42	42	42	42
	1000*	3p/4p	E2.2	B	1600	1000	42	42	42	42
	1250	3p/4p	E2.2	B	1600	1250	42	42	42	42
	1600*	3p/4p	E2.2	B	1600	-	42	42	42	42
E1N	800	3p/4p	E2.2	N	800	-	50	50	50	50
	1000*	3p/4p	E2.2	N	1000	-	50	50	50	50
	1250	3p/4p	E2.2	N	1250	-	50	50	50	50
	1600*	3p/4p	E2.2	N	1600	-	50	50	50	50
E2B	1600	3p/4p	E2.2	B	1600	-	42	42	42	42
	2000	3p/4p	E2.2	B	2000	-	42	42	42	42
E2N	1000*	3p/4p	E2.2	N	1000	-	65	65	55	55
	1250	3p/4p	E2.2	N	1250	-	65	65	55	55
	1600	3p/4p	E2.2	N	1600	-	65	65	55	55
	2000	3p/4p	E2.2	N	2000	-	65	65	55	55
E2S	800*	3p/4p	E2.2	S	800	-	85	85	65	65
	1000*	3p/4p	E2.2	S	1000	-	85	85	65	65
	1250*	3p/4p	E2.2	S	1250	-	85	85	65	65
	1600*	3p/4p	E2.2	S	1600	-	85	85	65	65
	2000*	3p/4p	E2.2	S	2000	-	85	85	65	65
E3N	2500	3p/4p	E4.2	N	3200	2500	65	65	65	65
	3200	3p/4p	E4.2	N	3200	-	65	65	65	65
E3S	1000*	3p/4p	E4.2	H	3200	1000	75	75	75	75
	1250	3p/4p	E4.2	H	3200	1250	75	75	75	75
	1600	3p/4p	E4.2	H	3200	1600	75	75	75	75
	2000	3p/4p	E4.2	H	3200	2000	75	75	75	75
	2500	3p/4p	E4.2	H	3200	2500	75	75	75	75
	3200	3p/4p	E4.2	H	3200	-	75	75	75	75
E3H	800*	3p/4p	E4.2	V	2000	800	100 ⁽¹⁾	100 ⁽¹⁾	85	75
	1000*	3p/4p	E4.2	V	2000	1000	100 ⁽¹⁾	100 ⁽¹⁾	85	75
	1250	3p/4p	E4.2	V	2000	1250	100 ⁽¹⁾	100 ⁽¹⁾	85	75
	1600	3p/4p	E4.2	V	2000	1600	100 ⁽¹⁾	100 ⁽¹⁾	85	75
	2000	3p/4p	E4.2	V	2000	-	100 ⁽¹⁾	100 ⁽¹⁾	85	75
	2500	3p/4p	E4.2	V	2500	-	100 ⁽¹⁾	100 ⁽¹⁾	85	75
	3200	3p/4p	E4.2	V	3200	-	100 ⁽¹⁾	100 ⁽¹⁾	85	75
E3V	800*	3p/4p	E4.2	V	2000	800	130 ⁽²⁾	130 ⁽²⁾	100 ⁽³⁾	85
	1250*	3p/4p	E4.2	V	2000	1250	130 ⁽²⁾	130 ⁽²⁾	100 ⁽³⁾	85
	1600*	3p/4p	E4.2	V	2000	1600	130 ⁽²⁾	130 ⁽²⁾	100 ⁽³⁾	85
	2000*	3p/4p	E4.2	V	2000	-	130 ⁽²⁾	130 ⁽²⁾	100 ⁽³⁾	85
	2500*	3p/4p	E4.2	V	2500	-	130 ⁽²⁾	130 ⁽²⁾	100 ⁽³⁾	85
	3200*	3p/4p	E4.2	V	3200	-	130 ⁽²⁾	130 ⁽²⁾	100 ⁽³⁾	85
E4S	4000	3p/4p	E4.2	H	4000 ⁽⁴⁾	-	75	75	75	75
E4H	3200	3p/4p	E4.2	V	3200	-	100	100	85	100
	4000	3p/4p	E4.2	V	4000 ⁽⁴⁾	-	100	100	85	100
E6H	4000*	3p/4p	E6.2	H	4000	-	100	100	100	100
	5000	3p/4p	E6.2	H	5000	-	100	100	100	100
	6300	3p/4p	E6.2	H	6300	-	100	100	100	100
E6V	3200**	3p/4p	E6.2	V	4000	3200	125	125	100	100
	4000	3p/4p	E6.2	V	4000	-	125	125	100	100
	5000	3p/4p	E6.2	V	5000	-	125	125	100	100
	6300	3p/4p	E6.2	V	6300	-	125	125	100	100

* Version available only for New Emax;

** Version available only for Emax (old);

(1) Ics =85kA; (2) Ics =100kA; (3) Ics =85kA; (4) Derating to 3800A

Correspondence table for Direct Replacement Emax/New Emax to Emax 2

Switch disconnectors – Emax/New Emax to Emax 2 - IEC

Emax/ New Emax	Iu	Poles	Emax 2	Emax 2 Performance Level	Iu	Icw (1s)
	[A]				[A]	[kA]
E1B/MS	800...1600	3p/4p	E2.2/MS	B	1600	42
E1N/MS	800	3p/4p	E2.2/MS	N	800	50
	1000*	3p/4p	E2.2/MS	N	1000	50
	1250	3p/4p	E2.2/MS	N	1250	50
	1600*	3p/4p	E2.2/MS	N	1600	50
E2B/MS	1600	3p/4p	E2.2/MS	B	1600	42
	2000	3p/4p	E2.2/MS	B	2000	42
E2N/MS	1000*	3p/4p	E2.2/MS	N	1000	55
	1250	3p/4p	E2.2/MS	N	1250	55
	1600	3p/4p	E2.2/MS	N	1600	55
	2000	3p/4p	E2.2/MS	N	2000	55
E2S/MS	800*	3p/4p	E2.2/MS	N	800	65
	1000*	3p/4p	E2.2/MS	N	1000	65
	1250*	3p/4p	E2.2/MS	N	1250	65
	1600*	3p/4p	E2.2/MS	N	1600	65
	2000*	3p/4p	E2.2/MS	N	2000	65
E3S/MS	2500...3200	3p/4p	E4.2/MS	N	3200	65
E3H/MS	1000...3200	3p/4p	E4.2/MS	H	3200	75
E3V/MS	800...2000*	3p/4p	E4.2/MS	V	2000	85
	2500*	3p/4p	E4.2/MS	V	2500	85
	3200*	3p/4p	E4.2/MS	V	3200	85
E4S/MS	4000	3p/4p	E4.2/MS	H	4000 ⁽¹⁾	75
E4H/MS	3200	3p/4p	E4.2/MS	V	3200	100
	4000	3p/4p	E4.2/MS	V	4000 ⁽¹⁾	100
E6H/MS	4000*	3p/4p	E6.2/MS	H	4000	100
	5000	3p/4p	E6.2/MS	H	5000	100
	6300	3p/4p	E6.2/MS	H	6300	100

* Version available only for New Emax

(1) Derating to 3800A







Available Trip Unit and comparison

	PR111/P	PR112/P	PR113/P	PR121/P	PR122/P	PR123/P	Ekip DIP	Ekip Touch	Ekip Hi-Touch
Protection functions	LI LSI LSIG	LSI LSIG	LSI LSIG	LI LSI LSIG	LSI LSIG	LSI LSIG	LI LSI LSIG	LI LSI LSIG	LI LSI LSIG
Overload - L									
Inverse long-time delayed trip	■	■	■	■	■	■	■	■	■
Thermal memory	-	■	■	-	■	■	■	■	■
Time-delayed overcurrent - S									
Constant tripping time (t=k)	■	■	■	■	■	■	■	■	■
Constant specific let-through energy (t=k/I ²)	■	■	■	■	■	■	■	■	■
Thermal memory	-	■	■	-	■	■	■	■	■
Start-up function	-	-	■	-	■	■	-	■	■
Zone selectivity	-	■	■	-	■	■	-	■	■
Instantaneous overcurrents - I									
Constant tripping time (t=k)	■	■	■	■	■	■	■	■	■
Start-up function	-	-	■	-	■	■	-	■	■
Ground fault - G									
Constant tripping time (t=k)	-	■	■	■	■	■	■	■	■
Constant specific let-through energy (t=k/I ²)	■	■	■	■	■	■	■	■	■
Start up function	-	-	■	-	■	■	-	■	■
Zone selectivity	-	■	■	-	■	■	-	■	■
Grand fault on toroid (Gext)	-	■	■	-	■	■	-	■	■
Directional protection - D	-	-	□	-	-	■	-	-	■
Current imbalance	-	■	■	-	■	■	-	■	■
Power Control	-	-	-	-	-	-	-	□	□
Network analyzer	-	-	-	-	-	-	-	-	■
Real-time monitoring and protection									
Current	-	■	■	-	■	■	□	■	■
Voltage - Power - Energy - Frequency	-	-	□	-	□	■	-	□	■
Maintenance indicators and records	-	□	■	-	■	■	■	■	■
Communication capability	-	□	□	-	□	□	-	□	□

- Standard features
- Features available as optional or installing additional devices

Notes:

- **PR112/P:** maintenance indicators and record using the release PR112/PDL or PR112/PDM. Communication capability using the release PR112/PDL (LonTalk Protocol) or PR112/PDM (Modbus Protocol).
- **PR113/P:** directional protection D with the installation of a set of three external voltage transformers. Real time monitoring and protection of Voltage, Power, Energy, Frequency with using of a set of three external voltage transformers. Communication capability using the release PR113/PDM (Modbus Protocol).
- **PR122/P:** real time monitoring and protection of Voltage, Power, Energy, Frequency with PR120/V. Communication capability with PR120/D-M (Modbus) EP010-FBP (Profibus/DeviceNet)
- **PR123/P:** communication capability with PR120/D-M (Modbus) EP010-FBP (Profibus/DeviceNet)
- **Ekip Dip:** real time monitoring and protection of current with Ekip Multimeter
- **Ekip Touch:** real time monitoring and protection of Voltage, Power, Energy, Frequency with software packages. Power Control with Ekip Power Controller.
- **Ekip Hi-Touch:** Power Control with Ekip Power Controller

Emax	New EMAX	Emax 2
PR111/P	PR121/P	Ekip Dip *
	→ 	→ 
PR112/P	PR122/P	Ekip Touch **
	→ 	→ 
PR113/P	PR123/P	Ekip Hi-Touch
	→ 	→ 

* Ekip Touch and Ekip Hi-Touch can also replace PR121/P and PR111/P Trip Units

** Ekip Hi-Touch can also replace PR122/P and PR112 Trip Units

Accessories compatibility

SACE Emax/New Emax	DR Emax/New Emax vs Emax 2
YO (shunt opening release)	→ Emax 2 standard YO
YO2 (second shunt opening release)	→ Emax 2 standard YO2 (alternative YU)
YC (shunt closing release)	→ Emax 2 standard YC
YU (undervoltage release)	→ Emax 2 standard YU
Time-delay device D	→ Emax 2 UVD - cubicle's rewiring is required
M (motor for charging springs)	→ Emax 2 standard M (spring charge motor)
SOR Test Unit	→ Emax 2 YO/YU Test Unit - rewiring is required
Electrical signalling of electronic releases tripped S51	→ Emax 2 contact signalling tripping of Ekip protection TU S51/1
Current sensor for neutral conductor outside circuit-breaker	→ Emax 2 Current sensor for neutral conductor outside CB - cubicle's rewiring is required
Homopolar toroid for the main power supply earthing conductor	→ Emax 2 Homopolar toroid for the main power supply earthing conductor - cubicle's rewiring is required
Toroid for residual current protection *	→ Emax 2 Toroid for residual current protection - cubicle's rewiring is required
Mechanical operation counter	→ Emax 2 standard MOC
Key lock in open position	→ Emax 2 standard KLC
Padlocks in open position	→ Emax 2 standard PLC
Lock in racked-in/test isolated/racked-out position	→ Emax 2 standard KLP
IP54 door protection	→ Emax 2 standard IP54
AUX Q1...Q10 (O/C auxiliary contacts)	→ AUX Q4 (O/C - standard supply) + AUX Q6 (O/C)
AUX Q11...Q25 (O/C auxiliary contacts for installation outside the CB)	→ Re-use the ones of Emax/New Emax fixed part (adaptation kit for 15 AUX is required)
AUX spring charged (S33M/2)	→ Emax 2 standard S33M/2
AUX S75I-S75T-S75E CB racked-in/test isolated/racked-out	→ Re-use the ones of Emax/New Emax fixed part
AUX YU (YU energized)	→ Emax 2 RTC - check compatibility before ordering
PR120/K Electrical signalling contacts for TU *	→ Emax 2 Ekip Signalling 2K - 4K - 10K (10K to install outside the circuit breaker)
PR020/K Electrical signalling contacts for TU **	→ Emax 2 Ekip Signalling 2K - 4K - 10K (10K to install outside the circuit breaker)
PR120/V Measurement module for PR122/P *	→ Emax 2 Feature available with Emax 2 Ekip Hi-Touch or Ekip Touch + measuring package
PR120/D Communication modules *	→ Emax 2 Ekip Com modules - cubicle's rewiring is required to install Ekip Cartridge

* Accessory available only for New Emax

** Accessory available only for Emax

The following Emax 2 accessories are not compatible with the Direct Replacement:

- Mechanical locks for compartment door
- Mechanical interlock system with other CBs
- All accessories of Emax 2 fixed part



While the following Emax 2 accessories can be installed with an external re-wiring with local adaptation:

- Ekip Multimeter
- Ekip Control Panel
- Remote Reset YR
- Ekip View



Ekip Cartridge

This external device connected directly to the Ekip Touch/Ekip Hi-Touch Trip Unit allows to use most of the connectivity modules: the Ekip Supply, Ekip Com, Ekip Link, Ekip Signalling, Ekip Synchro check, Ekip AUP. The Ekip Cartridge has 4 slots (1 Ekip Supply + 3 modules).

If needed, when circuit-breakers in the withdrawable version are used, it is possible to connect the position AUP contacts to the related pins of the cartridge to avoid failure messages on the communication channel.

The cartridge can be installed on a DIN-rail everywhere in the panel. The cable that connects the trip unit with the Ekip Cartridge is 1m long.



Welcome in the era of Industry 4.0!

Upgrade an old device with Emax 2 means to introduce cutting-edge technologies inside your switch-gears.

Emax 2 All-in-one innovation integrates protection, control, connectivity and power management to ensure continuity of service, reliability and productivity of microgrid installations.

In ABB Ability™ EDCS, cloud-computing platform that allow to monitor, control, optimize energy consumptions is present also the PREDICT feature that supports predictive maintenance to prevent product failure optimizing maintenance strategy and reducing total costs of ownership.



ABB S.p.A.
ABB SACE Division
Service Low Voltage Products
Via Pescaria, 5
24123 Bergamo - Italy
Phone: +39 035 395.111

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