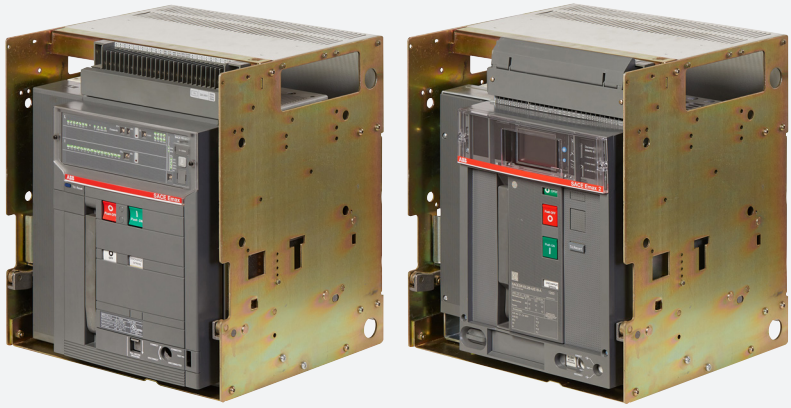
SERVICE NOTE

Advanced retrofitting kit solution

Direct Replacement Emax UL, New Emax UL to Emax 2 UL



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

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 enough 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Service offers a unique way to upgrade installed hardware and software to the next generation, by changing the worn or outdated parts while maintaining the original plant and equipment configuration.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.

Value Propositions

Safety & Protection
Highest quality level confirmed by certified products. ABB brand is associated with buying quality products.

Easy to install
Fast and easy installation without dismantle the existing fixed part.
Reduction of the downtime due to the installation in less than 1 hour.

Control & Connectivity
Ekip Power Controller to improve energy efficiency and saving. Integration into systems with integrated communication modules of different protocols:
Modbus RS-485, Modbus TCP, Profibus, DeviceNet, EtherNet/IP, IEC61850, Bluethooth.

Easy to maintain
Diagnosis and installation with Ekip Connect Software. Automatic notifications to remind maintenance activities.
ABB Ability Energy and Asset Manager is also available with Emax 2 for Predictive Maintenance.

Sustainability
Retrofit kits enable a circular economy by extending the lifespan of your electrical system and minimizing CO_2 emissions and raw materials usage.

Certification
All the Direct Replacements Emax UL/ New Emax UL to Emax 2 UL are UL classified products.
This allows to maintain the validity of switchgear's certificate.

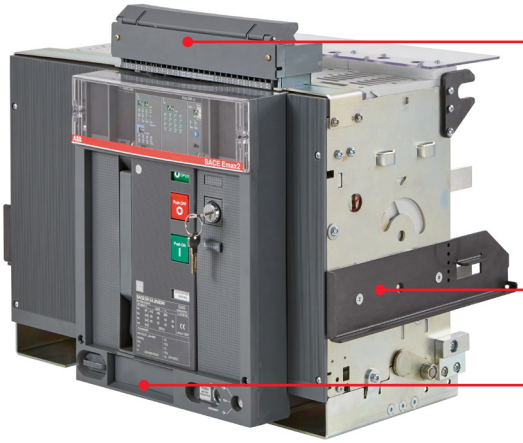
How to retrofit an Emax UL/New Emax UL?
ABB offers a complete range of solutions to upgrade Emax UL/New Emax UL circuit breakers with Emax 2 UL:

- **Hard Bus Retrofill (HBRF):** it is the traditional retrofit kit for which the complete Emax UL/New Emax UL circuit breaker needs to be dismantled. The kit consists in a new Emax 2 UL 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. In this case only the moving part of withdrawable circuit breakers need to be removed. A special version of Emax 2 UL moving part is supplied by ABB to be racked in/out in the existing Emax UL/New Emax UL fixed part.

When shutdown time is an issue, the DR solutions are preferable. Installation time is reduced to minimum, as the existing fixed part is not removed; with few adaptations on-site the Emax 2 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 fixed part is fully 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 retrofit solution is the Hard Bus Retrofill.

Product details

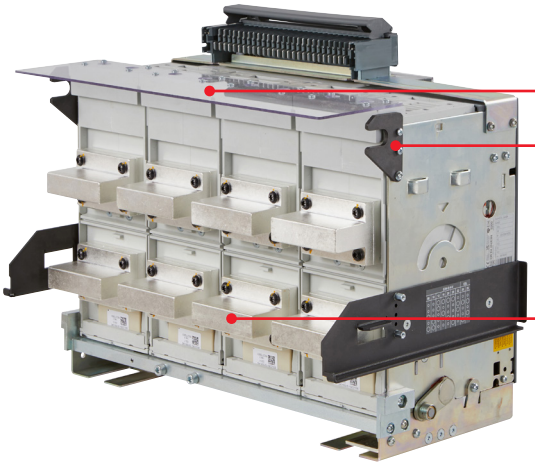
The Direct Replacement retrofit kit consists in a special Emax 2 moving part developed and tested in ABB Service factory and designed to fit inside the Emax UL/New Emax UL cassette.
The Direct Replacement kit includes:



Pre-wired Emax UL/New Emax UL sliding contacts

Special lateral guides to fit Emax UL/New Emax UL cassette

Special draw-out mechanism dedicated to Emax UL/New Emax UL cassettes complete with anti-racking-out device when the springs are charged (FAIL SAFE).



Lexan insulation cover

Anti rotation bracket

Special Direct Replacement terminals

The kit includes also:

- Door adaptation kit
- Wiring diagrams
- Instruction manual

Correspondence table

The tables below show the correspondences between Emax UL/New Emax UL and Emax 2 both for automatic circuit breakers and switch disconnectors.

Automatic Circuit Breakers: Emax UL/New Emax UL to Emax 2 UL

Emax UL, New Emax UL size	Emax UL, New Emax UL performance level	Iu [A]	Version	Poles	Emax 2 UL	Iu [A]	Rated short circuit current 254V [kA]	Rated short circuit current 508V [kA]	Rated short circuit current 635V [kA]	Rated short time current [kA]
E1	B-A	800	Emax UL, New Emax UL	3p/4p	E2.2-A	800	42	42	42	42
		1200	Emax UL, New Emax UL	3p/4p	E2.2-A	1200	42	42	42	42
	N-A	800	New Emax UL	3p/4p	E2.2-A	800	50	50	50	50
		1200	New Emax UL	3p/4p	E2.2-A	1200	50	50	50	50
E2	B-A	1600	Emax UL, New Emax UL	3p/4p	E2.2-A	1600	42	42	42	42
	N-A	800	New Emax UL	3p/4p	E2.2-A	800	65	50	50	50
		1200	Emax UL, New Emax UL	3p/4p	E2.2-A	1200	65	50	50	50
		1600	Emax UL, New Emax UL	3p/4p	E2.2-A	1600	65	50	50	50
	S-A	800	New Emax UL	3p/4p	E2.2-A	800	65	65	65	65
		1200	New Emax UL	3p/4p	E2.2-A	1200	65	65	65	65
		1600	New Emax UL	3p/4p	E2.2-A	1600	65	65	65	65
	H-A	800	New Emax UL	3p/4p	E2.2-A	800	85	85	65	65
		1200	New Emax UL	3p/4p	E2.2-A	1200	85	85	65	65
		1600	New Emax UL	3p/4p	E2.2-A	1600	85	85	65	65
E3	N-A	2000	Emax UL, New Emax UL	3p/4p	E4.2-A	2000	65	50	50	50
		2500	Emax UL, New Emax UL	3p/4p	E4.2-A	2500	65	50	50	50
	S-A	800	New Emax UL	3p/4p	E4.2-A	800	85	65	65	65
		1200	Emax UL, New Emax UL	3p/4p	E4.2-A	1200	85	65	65	65
		1600	Emax UL, New Emax UL	3p/4p	E4.2-A	1600	85	65	65	65
		2000	Emax UL, New Emax UL	3p/4p	E4.2-A	2000	85	65	65	65
		2500	Emax UL, New Emax UL	3p/4p	E4.2-A	2500	85	65	65	65
	H-A	800	New Emax UL	3p/4p	E4.2-A	800	85	85	85	65
		1200	Emax UL, New Emax UL	3p/4p	E4.2-A	1200	85	85	85	65
		1600	Emax UL, New Emax UL	3p/4p	E4.2-A	1600	85	85	85	65
		2000	Emax UL, New Emax UL	3p/4p	E4.2-A	2000	85	85	85	65
		2500	Emax UL, New Emax UL	3p/4p	E4.2-A	2500	85	85	85	65
	V-A	800	New Emax UL	3p/4p	E4.2-A	800	100 (1)	100 (1)	100	85
		1200	Emax UL, New Emax UL	3p/4p	E4.2-A	1200	100 (1)	100 (1)	100	85
		1600	Emax UL, New Emax UL	3p/4p	E4.2-A	1600	100 (1)	100 (1)	100	85
		2000	Emax UL, New Emax UL	3p/4p	E4.2-A	2000	100 (1)	100 (1)	100	85
		2500	Emax UL, New Emax UL	3p/4p	E4.2-A	2500	100 (1)	100 (1)	100	85
E6	H-A	4000	Emax UL, New Emax UL	3p/4p	E6.2-A	4000	100 (2)	85	85	100
	V-A	4000	Emax UL, New Emax UL	3p/4p	E6.2-A	4000	100 (2)	100 (2)	100	100
	L-A	4000	New Emax UL	3p/4p	E6.2-A	4000	100 (3)	100 (3)	100	100
	X-A	4000	New Emax UL	3p/4p	E6.2-A	4000	100 (4)	100 (4)	100	100

Note:
(1) derating on rated short circuit current of New Emax UL (125 kA)
(2) derating on rated short circuit current of Emax, New Emax (125 kA)
(3) derating on rated short circuit current of New Emax (150 kA)
(4) derating on rated short circuit current of New Emax (200 kA)

Switch disconnectors: Emax UL/New Emax UL to Emax 2 UL

Emax UL, New Emax UL size	Emax UL, New Emax UL performance level	Iu [A]	Version	Poles	Emax 2 UL	Iu [A]	Rated short time current [kA]
E1	B-A/MS	800	Emax UL, New Emax UL	3p/4p	E2.2-A/MS	800	42
		1200	Emax UL, New Emax UL	3p/4p	E2.2-A/MS	1200	42
	N-A/MS	800	New Emax UL	3p/4p	E2.2-A/MS	800	50
		1200	New Emax UL	3p/4p	E2.2-A/MS	1200	50
E2	B-A/MS	1600	Emax UL, New Emax UL	3p/4p	E2.2-A/MS	1600	42
	N-A/MS	800	New Emax UL	3p/4p	E2.2-A/MS	800	50
		1200	Emax UL, New Emax UL	3p/4p	E2.2-A/MS	1200	50
		1600	Emax UL, New Emax UL	3p/4p	E2.2-A/MS	1600	50
	S-A/MS	800	New Emax UL	3p/4p	E2.2-A/MS	800	65
		1200	New Emax UL	3p/4p	E2.2-A/MS	1200	65
		1600	New Emax UL	3p/4p	E2.2-A/MS	1600	65
E3	N-A/MS	2000	Emax UL, New Emax UL	3p/4p	E4.2-A/MS	2000	50
		2500	Emax UL, New Emax UL	3p/4p	E4.2-A/MS	2500	50
	S-A/MS	800	New Emax UL	3p/4p	E4.2-A/MS	800	65
		1200	Emax UL, New Emax UL	3p/4p	E4.2-A/MS	1200	65
		1600	Emax UL, New Emax UL	3p/4p	E4.2-A/MS	1600	65
		2000	Emax UL, New Emax UL	3p/4p	E4.2-A/MS	2000	65
		2500	Emax UL, New Emax UL	3p/4p	E4.2-A/MS	2500	65
	V-A/MS	800	New Emax UL	3p/4p	E4.2-A/MS	800	85
		1200	New Emax UL	3p/4p	E4.2-A/MS	1200	85
		1600	New Emax UL	3p/4p	E4.2-A/MS	1600	85
		2000	New Emax UL	3p/4p	E4.2-A/MS	2000	85
		2500	New Emax UL	3p/4p	E4.2-A/MS	2500	85
E6	H-A/MS	4000	Emax UL, New Emax UL	3p/4p	E6.2-A/MS	4000	100

Trip Unit comparison

With Emax 2 retrofit kits it is possible to choose amid three different Trip Units in order to replace the Emax UL/New Emax UL ones: Ekip Dip, Ekip Touch and Ekip Hi-Touch.

The table below shows the functions available for the various Emax UL/New Emax UL trip units compared to the Emax 2 trip units:



	Emax UL Trip Units			New Emax UL Trip Units			Emax 2 Trip Units Ekip		
	PR111	**PR112**	**PR113**	**PR121**	**PR122**	**PR123**	**Dip**	**Touch**	**Hi-Touch**
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	-	-	O	-	-	●	-	-	●
Current unbalance	-	●	●	-	●	●	-	●	●
Power Control	-	-	-	-	-	-	-	O	O
Network analyzer	-	-	-	-	-	-	-	-	●
Real-time monitoring and protection									
Current	-	●	●	-	●	●	O	●	●
Voltage - Power - Energy - Frequency	-	-	O	-	O	●	-	O	●
Maintenance indicators and records	-	O	●	-	●	●	●	●	●
Communication capability	-	O	O	-	O	O	-	O	O

● = supplied as standard
O = optional

Accessories compatibility

The majority of Emax UL/New Emax UL mechanical and electrical accessories can be replaced with Emax 2's ones:

Emax UL/New Emax UL	DR Emax UL/New Emax UL to Emax 2 UL
Shunt trip - YO	Emax 2 standard YO
Second shunt trip - YO2 (in alternative to YU)	Emax 2 standard YO2 (in alternative to YU)
Closing coil - YC	Emax 2 standard YC
Undervoltage release - YU (in alternative to YO2)	Emax 2 standard YU (in alternative to YO2 or to Fail Safe)
Time-delay device for undervoltage release - D	Emax 2 standard UVD
Gearmotor for the automatic charging of closing springs - M	Emax 2 standard M
Contact signalling closing springs charged - S33 M/2	Emax 2 standard S33 M/2 contact
Bell alarm - S51	Emax 2 standard S51 contact (standard supply with automatic circuit-breakers)
Bell alarm with remote reset command - S51 and YR	Emax 2 standard S51 contact + YR
4 open/closed auxiliary contacts - Q1…Q4	Emax 2 standard AUX 4Q (standard supply with automatic circuit-breakers)
6 open/closed auxiliary contacts - Q5…Q10	Emax 2 dedicated DR accessory AUX 6Q (in alternative to Ekip Signalling 4K module, not available for DR Emax UL with PR112 or PR113)
15 supplementary open/closed auxiliary contacts for installation outside the circuit breaker - Q11…Q25	Re-use the ones of Emax UL/New Emax UL fixed part (adaptation kit for Q11…Q25 is required)
Electrical signalling of circuit breaker racked-in/ test isolated/racked-out - S75	Re-use the ones of Emax UL/New Emax UL fixed part
Contact signalling undervoltage release de-energized - C. Aux YU	Emax 2 standard RTC (check functionality compatibility before ordering)
Electrical signals K51/p1, K51/p2, K51/YO1 and K51/μP (only for Emax UL)	Emax 2 dedicated DR accessory Ekip Signalling 4K (in alternative to AUX 6Q, configuration to be performed by the customer)
PR120/K Internal Module (only for New Emax UL)	Emax 2 dedicated DR accessory Ekip Signalling 4K (in alternative to AUX 6Q, configuration to be performed by the customer)
PR120/V Measuring Module (only for New Emax UL)	Emax 2 standard features available with Ekip Hi-Touch or Ekip Touch + Measuring Package
PR120/D-M Communication Module	Emax 2 standard Ekip Com modules (Ekip Cartridge required, SCADA/PLC reconfiguration to be performed by the customer)
PR020/K signalling unit (only for Emax UL)	Emax 2 standard Ekip 10K Signalling modules (local adaptation is needed, configuration to be performed by the customer)
PR021/K signalling unit (only for New Emax UL)	Emax 2 standard Ekip 10K Signalling modules (local adaptation is needed, configuration to be performed by the customer)
Mechanical operation counter	Emax 2 standard mechanical operation counter MOC
Key lock in open position	Emax 2 standard key lock in open position KLC
Padlocks in open position	Emax 2 standard padlocks in open position PLC
Protective cover for opening and closing pushbuttons	Emax 2 standard protection device for opening and closing pushbuttons PBC
Key lock in racked-in/test isolated/racked-out position	Emax 2 standard key lock in racked-in/test/racked-out position KLP
Accessories for lock in test isolated/racked-out position	Accessory not replicable with Direct Replacement
Padlock in racked-in/test isolated/racked-out position	Emax 2 standard padlock in racked-in/test/racked-out position PLP
Anti-racking-out device when the springs are charged - FAIL SAFE	Emax 2 dedicated DR accessory FAIL SAFE (in alternative to YU or YO2)
Mechanical lock for compartment door	Accessory not replicable with Direct Replacement
Mechanical interlock	Accessory not replicable with Direct Replacement
IP54 door protection	Emax 2 standard IP54 flange
External current sensors for neutral conductor outside circuit breaker	Emax 2 standard current sensor for external neutral (only for 3 poles circuit breakers, local adaptation is needed)
Homopolar toroid for the main power supply grounding conductor (star center of the transformer)	Emax 2 standard homopolar toroid for the earthing conductor of the main power supply (local adaptation is needed)

The following Emax 2 accessories are **not compatible** with these retrofit kit solutions:

- Auxiliary position contacts - AUP (Re-use Emax UL/New Emax UL electrical signaling of circuit breaker racked-in/test isolated/racked-out)
- Open/closed external supplementary auxiliary contacts - AUX 15Q (Re-use Emax UL/New Emax UL 15 supplementary open/closed auxiliary contacts for installation outside the circuit breaker - Q11…Q25)
- Second closing release - YC2
- Second contact signalling tripping of Ekip protection trip unit - S51/2
- Door mechanical locks
- Mechanical interlock
- Remote Racking Device - RRD

Ekip Cartridge for DR Emax UL/New Emax UL to Emax 2 UL

This external device connected directly to the Ekip Touch/Ekip Hi-Touch Trip Unit allows to use most of the connectivity modules including: Ekip Supply, Ekip Com, Ekip Link, Ekip Signalling, Ekip Synchrocheck, Ekip AUP.

The Ekip Cartridge has 4 slots (1 Ekip Supply + 3 modules).

If needed it is possible to connect the position AUP contacts to the related pins of the cartridge to avoid failure messages on the communication channel.

Ekip Cartridge can be installed on a DIN-rail everywhere in the panel (supplied with a 1 m long cable).

Note: this accessory is dedicated for the Direct Replacement Emax UL/New Emax UL to Emax 2 UL and it is different compared to Tmax XT and other versions of Direct Replacement cartridges.

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