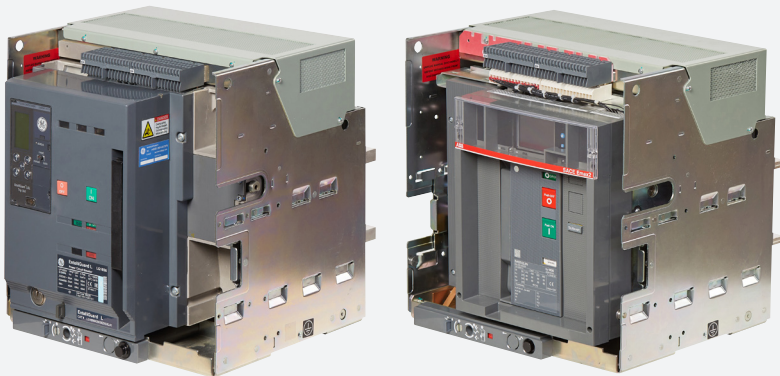


SERVICE NOTE

# Advanced retrofitting kit solution

## Direct Replacement GE EntelliGuard L to Emax 2 IEC



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Service offers a unique way to upgrade installed hardware and software to the next generation, by changing the worn or outdated parts while maintaining the original plant and equipment configuration.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



### 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<sub>2</sub> emissions and raw materials usage.

## How to retrofit an EntelliGuard L IEC?

ABB offers a complete range of solutions to upgrade GE EntelliGuard L circuit breakers with Emax 2:

- **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 moving part is supplied by ABB to be racked in/out in the existing EntelliGuard L fixed part.

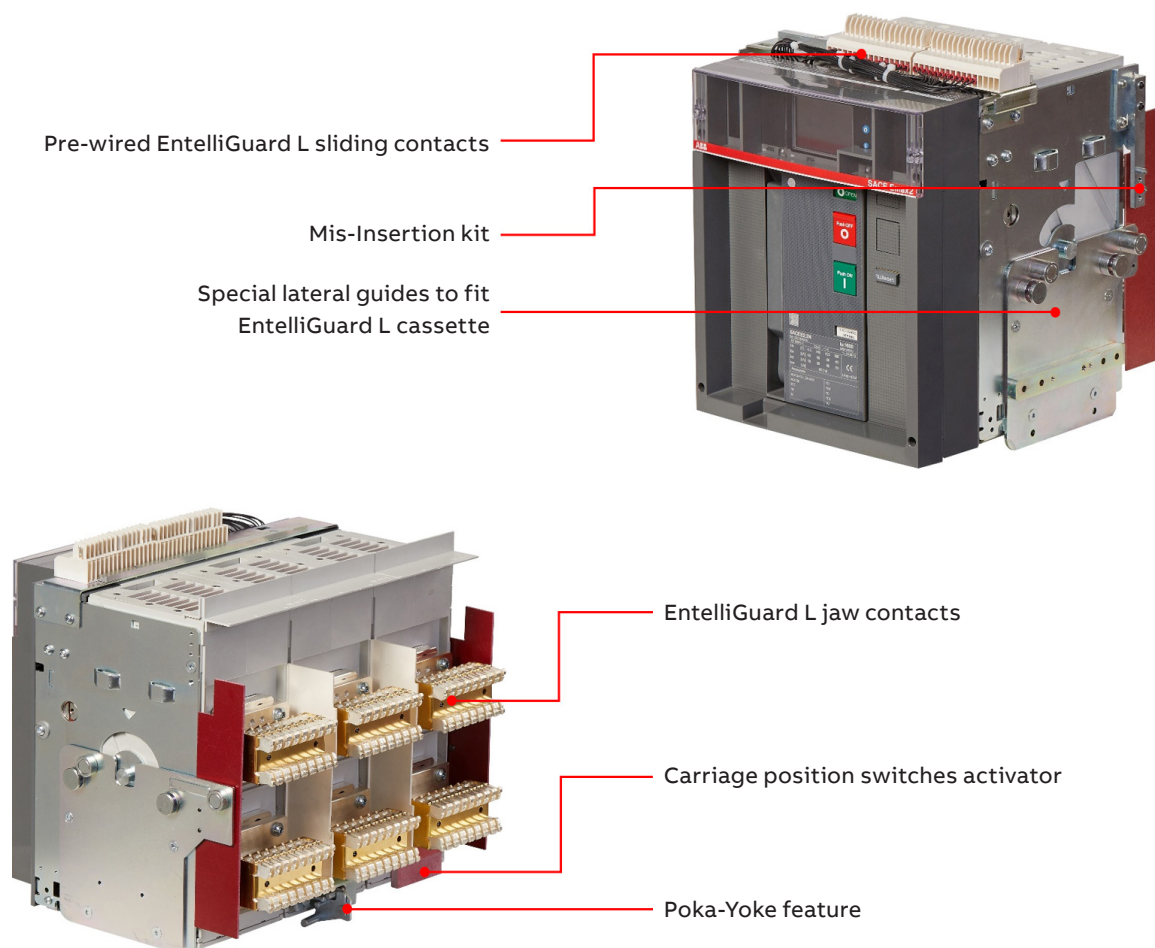
When shutdown time is an issue, the DR solutions are preferable. Installation time is reduced to minimum, as the existing fixed part is not removed; with few adaptations on-site the Emax2 moving part can be inserted. All retrofit solutions have been tested for mechanical and electrical operations, short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

The Direct Replacement is a solution suitable when the existing 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.

### 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 EntelliGuard L cassette.

The Direct Replacement kit includes:



The kit includes also:

- Door adaptation kit
- Wiring diagrams
- Instruction manual

### Correspondence table

The tables below show the correspondences between EntelliGuard L and Emax 2 both for automatic circuit breakers and switch disconnectors.

#### Automatic Circuit Breakers: GE EntelliGuard L to Emax 2

EntelliGuard L Frame	EntelliGuard L Type	Iu [A]	Poles	Emax 2	Iu [A]	Icu/Ics 440V [kA]	Icu/Ics 500V [kA]	Icu/Ics 690V [kA]	Icw (500V, 1s) [kA]
Frame 1	Type S	400	3p/4p	E2.2	400	50	50	40	50
		630	3p/4p	E2.2	630	50	50	40	50
		800	3p/4p	E2.2	800	50	50	40	50
		1000	3p/4p	E2.2	1000	50	50	40	50
		1250	3p/4p	E2.2	1250	50	50	40	50
		1600	3p/4p	E2.2	1600	50	50	40	50
		2000	3p/4p	E2.2	2000	50	50	40	50
		2500	3p/4p	E2.2	2500 <sup>(1)</sup>	50	50	40	50
	Type N	400	3p/4p	E2.2	400	65	65	40	65
		630	3p/4p	E2.2	630	65	65	40	65
		800	3p/4p	E2.2	800	65	65	40	65
		1000	3p/4p	E2.2	1000	65	65	40	65
		1250	3p/4p	E2.2	1250	65	65	40	65
		1600	3p/4p	E2.2	1600	65	65	40	65
		2000	3p/4p	E2.2	2000	65	65	40	65
		2500	3p/4p	E2.2	2500 <sup>(1)</sup>	65	65	40	65
Frame 2	Type C	2000	3p/4p	E4.2	2000	50	50	50 <sup>(4)</sup>	50
		2500	3p/4p	E4.2	2500	50	50	50 <sup>(4)</sup>	50
		3200	3p/4p	E4.2	3200 <sup>(2)</sup>	50	50	50 <sup>(4)</sup>	50
		4000	3p/4p	E4.2	4000 <sup>(3)</sup>	50	50	50 <sup>(4)</sup>	50
	Type D	2000	3p/4p	E4.2	2000	65	65	50 <sup>(4)</sup>	65
		2500	3p/4p	E4.2	2500	65	65	50 <sup>(4)</sup>	65
		3200	3p/4p	E4.2	3200 <sup>(2)</sup>	65	65	50 <sup>(4)</sup>	65
		4000	3p/4p	E4.2	4000 <sup>(3)</sup>	65	65	50 <sup>(4)</sup>	65

**Note:**

(1) derating to 2400A in case of cassettes with vertical (VR) terminals. Derating to 2300A in case of cassettes with horizontal (HR) or front (F) terminals.

(2) derating to 3000A in case of cassettes with horizontal (HR) or front (F) terminals. No derating in case of cassettes with vertical (VR) terminals.

(3) derating to 3600A in case of cassettes with vertical (VR) terminals. Derating to 3450A in case of cassettes with horizontal (HR) or front (F) terminals.

(4) Ics=40 kA

For 4 poles circuit breakers it's mandatory to specify the position of the neutral phase by choosing between standard sequence (N, L1, L2, L3) or neutral on right side sequence (L1, L2, L3, N).

## Switch disconnectors: GE EntelliGuard L to Emax 2

EntelliGuard L Frame	EntelliGuard L Type	Iu [A]	Poles	Emax 2	Iu [A]	Icw (500V, 1s) [kA]
Frame 1	Type R	400	3p/4p	E2.2/MS	400	42
		630	3p/4p	E2.2/MS	630	42
		800	3p/4p	E2.2/MS	800	42
		1000	3p/4p	E2.2/MS	1000	42
		1250	3p/4p	E2.2/MS	1250	42
		1600	3p/4p	E2.2/MS	1600	42
		2000	3p/4p	E2.2/MS	2000	42
		2500	3p/4p	E2.2/MS	2500 <sup>(1)</sup>	42
	Type S	800	3p/4p	E2.2/MS	800	50
		1000	3p/4p	E2.2/MS	1000	50
		1250	3p/4p	E2.2/MS	1250	50
		1600	3p/4p	E2.2/MS	1600	50
		2000	3p/4p	E2.2/MS	2000	50
		2500	3p/4p	E2.2/MS	2500 <sup>(1)</sup>	50
		Frame 2	Type C	2000	3p/4p	E4.2/MS
2500	3p/4p			E4.2/MS	2500	50
3200	3p/4p			E4.2/MS	3200 <sup>(2)</sup>	50
4000	3p/4p			E4.2/MS	4000 <sup>(3)</sup>	50
Type D	3200		3p/4p	E4.2/MS	3200 <sup>(2)</sup>	65
	4000		3p/4p	E4.2/MS	4000 <sup>(3)</sup>	65

**Note:**

(1) derating to 2400A in case of cassettes with vertical (VR) terminals. Derating to 2300A in case of cassettes with horizontal (HR) or front (F) terminals.

(2) derating to 3000A in case of cassettes with horizontal (HR) or front (F) terminals. No derating in case of cassettes with vertical (VR) terminals.

(3) derating to 3600A in case of cassettes with vertical (VR) terminals. Derating to 3450A in case of cassettes with horizontal (HR) or front (F) terminals.

For 4 poles circuit breakers it's mandatory to specify the position of the neutral phase by choosing between standard sequence (N, L1, L2, L3) or neutral on right side sequence (L1, L2, L3, N).

### Trip Unit comparison

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

The table below shows the functions available for the various GE EntelliGuard L trip units compared to the Emax 2 trip units:



	EntelliGuard L Trip Unit GT	Emax 2 Trip Units Ekip		
	GT-L	Dip	Touch	Hi-Touch
<b>Protection functions</b>				
L - Overload protection	●	●	●	●
S - Selective short-circuit	●	●	●	●
I - Instantaneous short-circuit	●	●	●	●
G - Earth fault	●	●	●	●
Neutral protection	●	● (4p); ▲(3p)	● (4p); ▲(3p)	● (4p); ▲(3p)
Thermal memory for L&S protections	●	●	●	●
<b>Other functions</b>				
Current measurement (L1, L2, L3, N)	-	▲	●	●
Trip target (trip reason indication)	●	●	●	●
Trip info (magnitude/phase)	●	∞	●	●
Trip counter	●	∞	●	●
Trip alarm contact	○	●	●	●
Event logger (trip events)	●	∞	●	●
General inputs (4 available)	-	-	▲	▲
General relay outputs (4 available)	-	-	▲	▲
Load shedding	-	-	○	○
Watchdog	-	●	●	●
Modbus	-	-	▲	▲
24V DC auxiliary power supply	○	●	●	●
Test kit with power support function	○	●	●	●

● = supplied as standard

○ = optional

▲ = module or device needed

∞ = control panel or connection software needed

## Accessories compatibility

The majority of GE EntelliGuard L mechanical and electrical accessories can be replaced with Emax 2's ones:

GE EntelliGuard L	DR EntelliGuard L to Emax 2
Shunt trip - ST	Emax 2 standard YO
Closing coil - CC	Emax 2 standard YC
Undervoltage release - UVR	Emax 2 standard YU
Undervoltage release time delayed - UVTD	Emax 2 standard UVD (external wiring required)
Motor operator - MOP	Emax 2 standard M
Spring charged contact (1 N/O)	Emax 2 standard S33 M/2 contact
Ready to close contact (1 N/O)	Emax 2 standard ready to close signalling contact RTC
Auxiliary contacts (4 N/C + 4 N/O)	Emax 2 standard AUX 4Q + AUX 6Q
GT-L trip alarm (1 N/O)	Emax 2 standard S51 contact
Carriage position switches	Re-use the ones of EntelliGuard L fixed part
Facia push-button padlocking facilities	Emax 2 standard protection device for opening and closing pushbuttons PBC
Breaker key lock facilities	Emax 2 standard key lock in open position KLC
Cassette key lock facilities	Accessory not replicable with Direct Replacement
Interlocks Frames 1 and 2	Re-use EntelliGuard L mechanical interlock (Mechanical interlock adaptation kit required, mixed solutions with an EntelliGuard L interlocked with a DR Emax 2 are not allowed)
Mis-Insertion kit	Emax 2 dedicated kit for Mis-Insertion
Mechanical operations counter - MOC	Emax 2 standard mechanical operation counter MOC
Current sensor for neutral conductor outside circuit-breaker (Rogowski coil)	Emax 2 current sensor for neutral conductor outside CB (only for 3 poles CB, local adaptation is needed)

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

- Auxiliary position contacts – AUP (Re-use EntelliGuard L carriage position switches)
- Open/closed external supplementary auxiliary contacts – AUX 15Q
- Second opening release - YO2
- Second closing release - YC2
- Second contact signalling tripping of Ekip protection trip unit - S51/2
- Remote Reset – YR
- Key lock in racked-in/test/racked-out position – KLP
- Padlock in racked-in/test/racked-out position - PLP
- Door mechanical locks
- Ekip 4K Signalling module
- IP54 protection
- All the accessories of Emax 2 fixed part
- Remote Racking Device - RRD.

### **Ekip Cartridge for DR EntelliGuard L to Emax 2**

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 Synchro-check, 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 GE EntelliGuard L to Emax 2 and it is different compared to Tmax XT and other versions of Direct Replacement cartridges.

