

Advanced retrofitting kit solution

Direct Replacement GE M-PACT/GE M-PACT Plus/ GEC Alsthom M-PACT 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 M-PACT/GE M-PACT Plus/GEC Alsthom M-PACT 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Service offers a unique way to upgrade installed hardware and software to the next generation, by changing the worn or outdated parts while maintaining the original plant and equipment configuration.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 CO₂ emissions and raw materials usage.

How to retrofit an M-PACT IEC?

ABB offers a complete range of solutions to upgrade GE M-PACT/GE M-PACT Plus/GEC Alsthom M-PACT IEC circuit breakers with Emax 2:

- **Hard Bus Retrofill (HBRF):** it is the traditional retrofit kit for which the complete M-PACT circuit breaker 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. 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 M-PACT 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. When fixed part is not fully working the best retrofit solution is the Hard Bus Retrofill.

Retrofitting kit solutions for M-PACT IEC

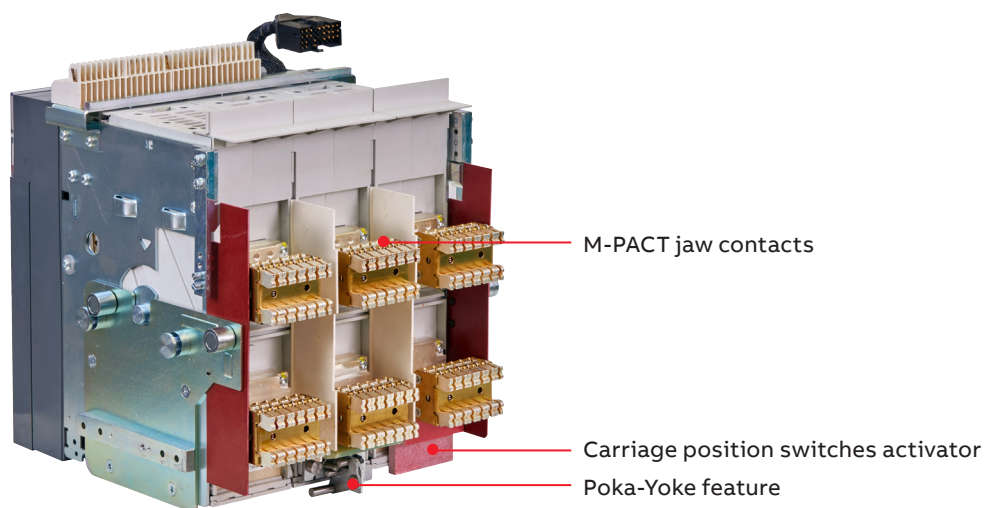
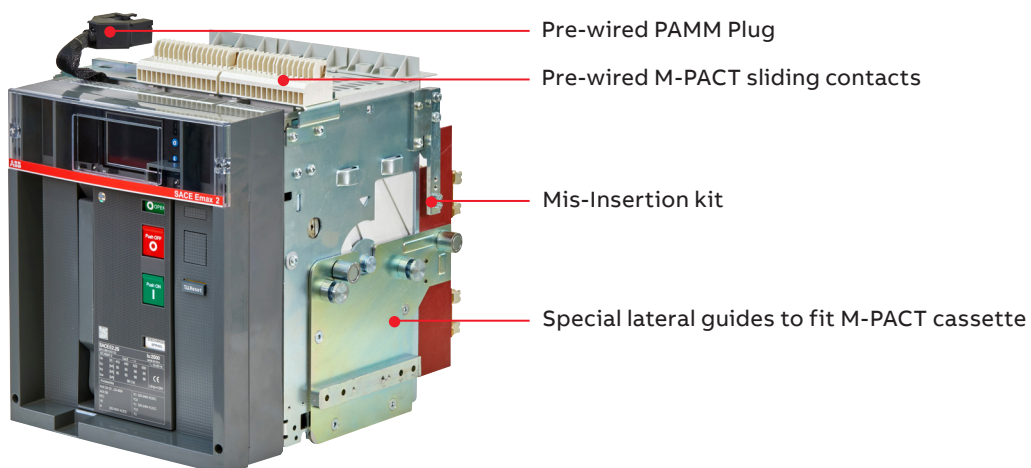
M-PACT	Type	A, S, D, N, H1, H2, H		
	Frame	1	2	2
	Rating	from 400A to 2500A	from 800A to 3200A	4000A
FIXED	HR terminals			
	VR terminals (*)	HBRF	HBRF	-
	F terminals (*)			
WITHDRAWABLE	HR terminals			
	VR terminals	HBRF/DR	HBRF/DR	HBRF/DR
	F terminals			

(*) For M-PACT fixed versions with rear vertical (VR) or front (F) terminals, it's possible to obtain HBRF solutions ordering the kit for HR terminals and, during the installation, connecting the existing M-PACT VR or F terminals.

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 M-PACT cassette.

The Direct Replacement kit includes:



The kit includes also:

- Racking panel
- Door adaptation kit
- Wiring diagrams
- Instruction manual.

Correspondence table

The tables below show the correspondences between M-PACT and Emax 2 both for automatic circuit breakers and switch disconnectors.

Automatic Circuit Breakers: GE M-PACT/GE M-PACT Plus/GEC Alsthom M-PACT to Emax 2

M-PACT Frame	M-PACT Type	Iu [A]	Poles	Emax 2	Iu [A]	Iu (Rating Plug) [A]	Icu/Ics 415V [kA]	Icu/Ics 500V [kA]	Icu/Ics 600V [kA]	Icu/Ics 690V [kA]	Icw (500V, 1s) [kA]
Frame 1	Type A or S	400	3p/4p	E2.2N	800	400	50	50	50	40	50
		630	3p/4p	E2.2N	800	630	50	50	50	40	50
		800	3p/4p	E2.2N	800	-	50	50	50	40	50
		1000	3p/4p	E2.2N	1000	-	50	50	50	40	50
		1250	3p/4p	E2.2N	1250	-	50	50	50	40	50
		1600	3p/4p	E2.2N	1600	-	50	50	50	40	50
		2000	3p/4p	E2.2N	2000	-	50	50	50	40	50
	2500	3p/4p	E2.2N	2500 ⁽¹⁾	-	50	50	50	40	50	
	Type D or N	400	3p/4p	E2.2N	800	400	65	65	50	40	65
		630	3p/4p	E2.2N	800	630	65	65	50	40	65
		800	3p/4p	E2.2N	800	-	65	65	50	40	65
		1000	3p/4p	E2.2N	1000	-	65	65	50	40	65
		1250	3p/4p	E2.2N	1250	-	65	65	50	40	65
		1600	3p/4p	E2.2N	1600	-	65	65	50	40	65
2000		3p/4p	E2.2N	2000	-	65	65	50	40	65	
Frame 2	Type A or S	2000	3p/4p	E4.2N	3200	2000	50	50	50	40	50
		2500	3p/4p	E4.2N	3200	2500	50	50	50	40	50
		3200	3p/4p	E4.2N	3200 ⁽²⁾	-	50	50	50	40	50
		4000	3p/4p	E4.2N	4000 ⁽³⁾	-	50	50	50	40	50
	Type D or N	2000	3p/4p	E4.2N	3200	2000	65	65	50	40	65
		2500	3p/4p	E4.2N	3200	2500	65	65	50	40	65
		3200	3p/4p	E4.2N	3200 ⁽²⁾	-	65	65	50	40	65
		4000	3p/4p	E4.2N	4000 ⁽³⁾	-	65	65	50	40	65
	Type H1	800	3p/4p	E4.2H	3200	800	80	65	50	40	65
		1000	3p/4p	E4.2H	3200	1000	80	65	50	40	65
		1250	3p/4p	E4.2H	3200	1250	80	65	50	40	65
		1600	3p/4p	E4.2H	3200	1600	80	65	50	40	65
		2000	3p/4p	E4.2H	3200	2000	80	65	50	40	65
		2500	3p/4p	E4.2H	3200	2500	80	65	50	40	65
3200		3p/4p	E4.2H	3200 ⁽²⁾	-	80	65	50	40	65	
4000		3p/4p	E4.2H	4000 ⁽³⁾	-	80	65	50	40	65	
Type H2 or H	800	3p/4p	E4.2H	3200	800	80	80	65	60	80	
	1000	3p/4p	E4.2H	3200	1000	80	80	65	60	80	
	1250	3p/4p	E4.2H	3200	1250	80	80	65	60	80	
	1600	3p/4p	E4.2H	3200	1600	80	80	65	60	80	
	2000	3p/4p	E4.2H	3200	2000	80	80	65	60	80	
	2500	3p/4p	E4.2H	3200	2500	80	80	65	60	80	
	3200	3p/4p	E4.2H	3200 ⁽²⁾	-	80	80	65	60	80	
	4000	3p/4p	E4.2H	4000 ⁽³⁾	-	80	80	65	60	80	

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).

Switch disconnectors: GE M-PACT/GE M-PACT Plus/GEC Alstom M-PACT to Emax 2

M-PACT Frame	M-PACT Type	Iu [A]	Poles	Emax 2	Iu [A]	Icw (500V, 1s) [kA]
Frame 1	Type A or S	400	3p/4p	E2.2N/MS	800	50
		630	3p/4p	E2.2N/MS	800	50
		800	3p/4p	E2.2N/MS	800	50
		1000	3p/4p	E2.2N/MS	1000	50
		1250	3p/4p	E2.2N/MS	1250	50
		1600	3p/4p	E2.2N/MS	1600	50
		2000	3p/4p	E2.2N/MS	2000	50
	2500	3p/4p	E2.2N/MS	2500 ⁽¹⁾	50	
	Type D or N	400	3p/4p	E2.2N/MS	800	65
		630	3p/4p	E2.2N/MS	800	65
		800	3p/4p	E2.2N/MS	800	65
		1000	3p/4p	E2.2N/MS	1000	65
		1250	3p/4p	E2.2N/MS	1250	65
		1600	3p/4p	E2.2N/MS	1600	65
2000		3p/4p	E2.2N/MS	2000	65	
2500	3p/4p	E2.2N/MS	2500 ⁽¹⁾	65		
Frame 2	Type A or S	2000	3p/4p	E4.2N/MS	3200	50
		2500	3p/4p	E4.2N/MS	3200	50
		3200	3p/4p	E4.2N/MS	3200 ⁽²⁾	50
		4000	3p/4p	E4.2N/MS	4000 ⁽³⁾	50
	Type D or N	2000	3p/4p	E4.2N/MS	3200	65
		2500	3p/4p	E4.2N/MS	3200	65
		3200	3p/4p	E4.2N/MS	3200 ⁽²⁾	65
		4000	3p/4p	E4.2N/MS	4000 ⁽³⁾	65
	Type H1	800	3p/4p	E4.2H/MS	3200	65
		1000	3p/4p	E4.2H/MS	3200	65
		1250	3p/4p	E4.2H/MS	3200	65
		1600	3p/4p	E4.2H/MS	3200	65
		2000	3p/4p	E4.2H/MS	3200	65
		2500	3p/4p	E4.2H/MS	3200	65
3200		3p/4p	E4.2H/MS	3200 ⁽²⁾	65	
4000		3p/4p	E4.2H/MS	4000 ⁽³⁾	65	
Type H2 or H	800	3p/4p	E4.2H/MS	3200	80	
	1000	3p/4p	E4.2H/MS	3200	80	
	1250	3p/4p	E4.2H/MS	3200	80	
	1600	3p/4p	E4.2H/MS	3200	80	
	2000	3p/4p	E4.2H/MS	3200	80	
	2500	3p/4p	E4.2H/MS	3200	80	
	3200	3p/4p	E4.2H/MS	3200 ⁽²⁾	80	
	4000	3p/4p	E4.2H/MS	4000 ⁽³⁾	80	

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 switch disconnectors 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 M-PACT/GE M-PACT Plus/GEC Alsthom M-PACT ones: Ekip Dip, Ekip Touch and Ekip Hi-Touch.

The table below shows the functions available for the various M-PACT trip units compared to the Emax 2 trip units:



	M-PACT Trip Units M-PRO								Emax 2 Trip Units		
	17	17 Plus	18 Plus	20	30	40	27	50	Ekip Dip	Ekip Touch	Ekip Hi-Touch
Protection functions											
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	●	●	●	●	●	●	●	●	●	●	●
Other functions											
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 M-PACT/GE M-PACT Plus/GEC Alsthom M-PACT mechanical and electrical accessories can be replaced with Emax 2's ones:

M-PACT/M-PACT Plus/GEC Alsthom M-PACT	DR M-PACT to Emax 2
Shunt trip - ST	Emax 2 standard YO (AUX 4Q always installed on the kit and wired in series with YO, also if YO is not present)
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
Auxiliary contacts (5 N/C + 3 N/O)	Emax 2 standard AUX 6Q (max 6 auxiliary contacts available, AUX 4Q always installed on the kit and wired in series with YO)
M-PRO trip alarm (1 N/O)	Emax 2 standard S51 contact
Carriage position switches	Re-use the ones of M-PACT fixed part
Facia push-button padlocking facilities	Emax 2 standard protection device for opening and closing pushbuttons PBC
Key interlock facilities	Emax 2 standard key lock in open position KLC
Cassette key lock facilities	Re-use M-PACT cassette key lock facilities
Interlocks Frames 1 and 2	Re-use M-PACT mechanical interlock (mechanical interlock adaptation kit required, mixed solutions with an M-PACT 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)
Interposing CT for Ground Fault source return	Replace zero sequence CT for the earthing conductor of the main power supply by Emax 2's homopolar toroid
General inputs (4 available) General relay outputs (4 available)	Emax 2 standard Ekip Signalling 2K-1, 2K-2 (Ekip Cartridge required)

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

- Auxiliary position contacts - AUP (Re-use M-PACT 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
- Ready to close signalling contact - RTC
- 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 M-PACT 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 M-PACT/GE M-PACT Plus/GEC Alstom M-PACT to Emax 2 and it is different compared to Tmax XT and other versions of Direct Replacement cartridges.

