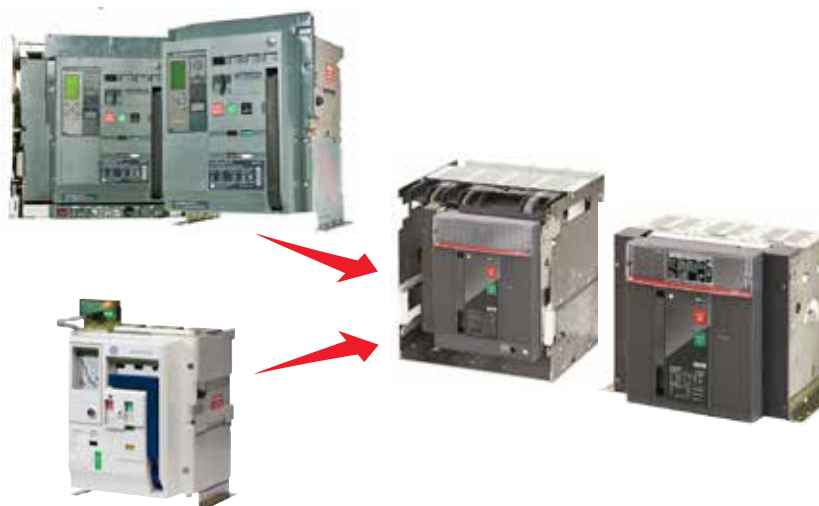# Retrofit kits
Hard Bus Retrofill EntelliGuard G/Mpact/Mpact plus to Emax 2 IEC

With only few modification actions and sustainable costs, retrofitting kits are the perfect solution to improve a low voltage switchgear. ABB has developed new hard bus retrofitting kits to replace and upgrade the GE EntelliGuard G/Mpact/Mpact plus circuit breaker with the ABB latest family of SACE Emax 2.

Value propositions

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

Easy to install
Easy installation requires limitated shutdown. Instructional sheet is provided with the product.

Continuous operation
PREDICT feature in ABB Ability™ EDCS for Predictive Maintenance Ekip power controller to improve energy efficiency

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

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Service offers a unique way to upgrade installed hardware and software to the next generation, by changing the worn or outdated parts while maintaining the original plant and equipment configuration.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 ELSP Lab, accredited by ACCREDIA and acknowledged by important international certification bodies such as ACAE / LOVAG, ANCE, ASTA, ETL SEMKO, UL, CSA and Naval Registers.

We are introducing, as a new retrofitting kit solutions:
• Hard Bus Retrofill to Emax 2 for fixed EntelliGuard G Envelope 1-2-3, Mpact/Mpact plus frame 1-2-3 with horizontal terminals 3 and 4 poles versions - IEC standard;
• Hard Bus Retrofill to Emax 2 for withdrawable EntelliGuard G Envelope 1 - 2 - 3 with horizontal and vertical terminals, 3 and 4 poles versions - IEC standard.

Hard Bus Retrofill is a traditional retrofit kit for which the complete old circuit breakers/switch disconnectors need to be replaced. The kit consists in a Emax 2 device equipped with special terminals to fit the existing busbars.
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.

HBRF EntelliGuard G to Emax 2 for fixed versions - IEC
Correspondance table - Solutions available also for Non Automatic EntelliGuard G

EntelliGuard - Automatic					Emax 2						
Version	Terminals	Pole	Type	In [A]	Version	Type	In [A]	Icu/Ics 440 V	Icu/Ics 500 V	Icu/Ics 690 V	Icw (1s)
Envelope 1 - Automatic	HR	3p/4p	S	up to 1600	E2.2	N	1600 [1]	50	50	40	42
Envelope 1 - Automatic	HR	3p/4p	N	up to 1600	E2.2	N	1600 [1]	65	65	50	65
Envelope 1 - Automatic	HR	3p/4p	H	up to 1600	E2.2	S	1600 [1]	85	65	65	65
Envelope 1 - Automatic	HR	3p/4p	S	2000	E2.2	N	2000	50	50	40	42
Envelope 1 - Automatic	HR	3p/4p	N	2000	E2.2	N	2000	65	65	50	65
Envelope 1 - Automatic	HR	3p/4p	H	2000	E2.2	S	2000	85	65	65	65
Envelope 2 - Automatic	HR	3p/4p	N	2500-3200	E4.2	N	3200 [1]	65	65	50	65
Envelope 2 - Automatic	HR	3p/4p	H	2500-3200	E4.2	H	3200 [1]	85	65	65	65
Envelope 2 - Automatic	HR	3p/4p	E	up to 2000	E4.2	H	3200 [1]	85	85	85	85
Envelope 2 - Automatic	HR	3p/4p	M	up to 3200	E4.2	V	3200 [1]	100	100	85	85
Envelope 3 - Automatic	HR	3p	M	up to 5000	E6.2	H	5000 [1]	100	100	85	85
Envelope 3 - Automatic	HR	3p	G	up to 5000	E6.2	H	5000 [1]	100	100	100	100
Envelope 3 - Automatic	HR	3p	L	up to 5000	E6.2	V	5000 [1]	150	130	100	100

(1) Rating Plug to use in case of retrofit for EntelliGuard G with nominal current lower than the one indicated for the Emax 2
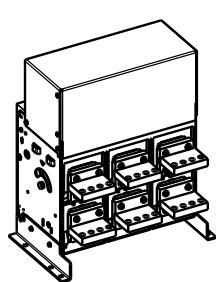
HBRF Mpact/Mpact plus to Emax 2 for fixed versions - IEC
Correspondance table - Solutions available also for Non Automatic Mpact/Mpact Plus
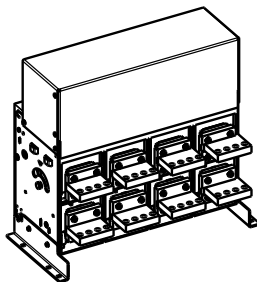
Mpact/Mpact plus - Automatic					Emax 2						
Version	Terminals	Pole	Type	In [A]	Version	Type	In [A]	Icu/Ics 415 V	Icu/Ics 500 V	Icu/Ics 690 V	Icw (1s)
Frame 1 - Automatic	HR	3p/4p	S	up to 1600	E2.2	N	1600 [1]	50	50	40	50
Frame 1 - Automatic	HR	3p/4p	N	up to 2000	E2.2	N	2000 [1]	65	65	40	65
Frame 1 - Automatic	HR	3p/4p	S	2000	E2.2	N	2000	50	50	40	50
Frame 1 - Automatic	HR	3p/4p	S	2500	E2.2	N	2500	50	50	40	50
Frame 1 - Automatic	HR	3p/4p	N	2500	E2.2	N	2500	65	65	40	65
Frame 2 - Automatic	HR	3p/4p	S	up to 2000	E4.2	N	3200 [1]	50	50	40	50
Frame 2 - Automatic	HR	3p/4p	N	up to 2000	E4.2	N	3200 [1]	65	65	40	65
Frame 2 - Automatic	HR	3p/4p	H	2500-3200	E4.2	H	3200 [1]	80	80	60	80

(1) Rating Plug to use in case of retrofit for EntelliGuard G with nominal current lower than the one indicated for the Emax 2

For EntelliGuard G/Mpact/Mpact plus with rear vertical (RV) and front terminals (F), fixed versions, it is possible to obtain HBRF solutions ordering HBRF for HR terminals and, during the installation, connecting the existing EntelliGuard G/Mpact/Mpact plus terminals RV and F terminals.

HBRF for 3 poles F version   HBRF for 4 poles F version

The HBRF for EntelliGuard G/Mpact/Mpact plus for fixed versions consists of:
• Fixing plates to mount the new breaker
• Adapting terminals
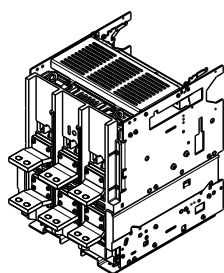• Insulating cover
• Kit for door's adaptation

HBRF EntelliGuard G to Emax 2 for withdrawable versions - IEC
Correspondance table - Solutions available also for Non Automatic EntelliGuard G
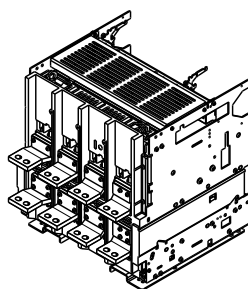
EntelliGuard - Automatic					Emax 2						
Version	Terminals	Pole	Type	In [A]	Version	Type	In [A]	Icu/Ics 440 V	Icu/Ics 500 V	Icu/Ics 690 V	Icw (1s)
Envelope 1	S	up to 1600	3p/4p	HR/VR	E2.2	N	1600	50	50	40	42
Envelope 1	S	2000	3p/4p	HR	E2.2	N	2500 (1)	50	50	40	42
Envelope 1	N	up to 2500	3p/4p	HR/VR	E2.2	N	2500 (2)	65	65	50	65
Envelope 1	H	up to 2000	3p/4p	HR/VR	E2.2	S	2500 (2)	85	65	65	65
Envelope 1	S	2000-2500	3p/4p	VR	E2.2	N	2500	50	50	40	42
Envelope 1	F	2500	3p/4p	VR	E2.2	S	2500	85	65	65	65
Envelope 2	E	up to 2000	3p/4p	HR/VR	E4.2	H	4000 (2)	85	85	85	85
Envelope 2	N	up to 3200	3p/4p	HR/VR	E4.2	N	4000 (2)	65	65	50	65
Envelope 2	H	up to 3200	3p/4p	HR/VR	E4.2	H	4000 (2)	85	65	65	65
Envelope 2	M	up to 3200	3p/4p	HR/VR	E4.2	V	3200	100	100	85	85
Envelope 2	N	4000	3p/4p	VR	E4.2	N	4000	65	65	50	65
Envelope 2	H	4000	3p/4p	VR	E4.2	H	4000	85	65	65	65
Envelope 2	M	4000	3p/4p	VR	E4.2	V	4000	100	100	85	85
Envelope 3	M	up to 5000	3p/4p	HR	E6.2	H	5000 (1)	100	100	85	85
Envelope 3	G	up to 5000	3p/4p	HR	E6.2	H	5000 (1)	100	100	100	100
Envelope 3	L	up to 5000	3p/4p	HR	E6.2	V	5000 (1)	150	130	100	100
Envelope 3	M	up to 6400	3p/4p	VR	E6.2	H	6300 (1)	100	100	85	85
Envelope 3	G	up to 6400	3p/4p	VR	E6.2	H	6300 (1)	100	100	100	100
Envelope 3	L	up to 6400	3p/4p	VR	E6.2	V	6300 (1)	150	130	100	100

(1) Rating Plug to use in case of retrofit for EntelliGuard G with nominal current lower than the one indicated for the Emax 2
(2) Rating Plug mandatory

HBRF for 3 poles W version   HBRF for 4 poles W version

The HBRF for EntelliGuard G for withdrawable versions consists of:
- Base supports to mount Emax2 at a similar high of the EntelIIGuard G
- Adapting terminals kit
- Kit for door's adaptation

Accessories and Trip Unit

Emax 2 internal mechanical and electrical accessories are compatible with the ones of EntelliGuard G/Mpact/Mpact plus. On the table, information about the solutions for external accessories.

EntelliGuard G/Mpact/Mpact plus External Accessories	Solution with Emax 2
Cable Interlocks	Replace all interlocked breakers in the system.
Time delay module (TMD)	Replace with Emax 2 Electronic time-delay device for undervoltage release - UVD.
Auxiliary switches: - 8NO + 8NC for EntelliGuard G - 3NO + 3NC as standard supply + 2NO as extra for Mpact/Mpact plus	Chose Emax 2 AUX 15Q in case AUX4Q + AUX6Q does not provide enough contacts.
Voltage conditioner plate	Emax 2 has internal voltage sensing in these situations: - Ekip Touch/G-Touch + Measuring Package - Ekip Hi-Touch/G Hi Touch. By default, voltage input is wired to the bottom terminals; if top is desired make sure to specify on the order. Order the external voltage socket arrangement in case the use of external potential transformers is desired.
Door interlocks	Replace with the Emax 2 DLC, DLP or DLR solution.
Neutral Rogowski CTs	Replace with Emax 2 External current sensors (in a 3P - 4W system).
External CT for ground-fault detection	Replace zero sequence CT for the earthing conductor of the main power supply by Emax 2's homopolar toroid.
Modbus/Profibus COMM	Emax 2 needs to be ordered with Ekip Com Modbus RS485 or Ekip Com Profibus plus the Ekip Supply Module (Ekip Touch/Hi-Touch) *.
Auxiliary power supply 24V dc	Ekip Supply Module is needed.
Key Interlock mounted on the cassette	Evaluate the use of: - key lock and padlock in open position KLC/PLC - key lock and padlock in racked-in/racked-out position KLC/PLP.
Zone Selectivity interlocking (no present in Mpact/Mpact plus)	Contact ABB for information.

* adaptation of SCADA system is needed using Emax2 Modbus system interfaceContact ABB for information.

With the retrofit kits with Emax 2 it is possible to choose amid three different Trip Units to replace the ones of EntelliGuard G, Mpact and Mpact plus: Ekip Dip, Ekip Touch, Ekip Hi-Touch. Emax 2 Trip Units are available in the versions LI, LSI, and LSIG.

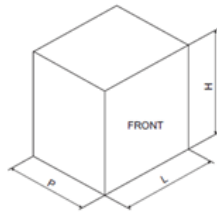|	Mpact TU	Mpact plus TU	GE Entelliguard TU	Ekip DIP	Ekip Touch	Ekip Hi-Touch
Protection functions	MPRO- 27 LI LSI LSIG	MPRPO-50 LI LSI LSIG	LI, LSI, LSIG	LI, LSI, LSIG	LI, LSI, LSIG	LI, LSI, LSIG
Basic protection functions						
L - Overload protection	S	S	S	S	S	S
S - Selective short-circuit	S	S	S	S	S	S
I - Instantaneous short-circuit	S	S	O	S	S	S
G - Earth fault	O	O	O	S	S	S
Neutral protection	S	S	O	S (4p); M (3p)	S (4p); M (3p)	S (4p); M (3p)
Thermal memory for L&S protections	S	S	S (L only)	S	S	S
Advanced protection functions						
Start-up function for L, S, & G protections	S	S	S	-	S	S
G_ext - Earth fault on toroid	O	O	O	-	S	S
Zone selectivity short circuit	-	-	O	-	S	S
Measurement functions						
Phase & Neutral current (RMS)	S	S	S	M+C	S	S
Voltage: phase-phase, phase-neutral	S	S	O	-	M	S
Power: active, reactive, apparent	O	O	O	-	M	S
Energy: active, reactive, apparent	O	O	O	-	M	S
Frequency	S	S	O	-	M	S
Power factor	S	S	O	-	M	S
Peak factor	S	S	O	-	M	S
Maximum current value for phase	S	S	S	C	S	S
Average & max. power, max. & min. voltage	S	S	O	-	M	S
Trip history	S	S	S	C	S	S
Event log	S	S	S	C	S	S
Mechanical operator counter	O	O	M	M	M	M
Electric operator counter	S	S	S	C	S	S
Total operating time	S	S	S	C	S	S
Contact wear	-	S	S	C	S	S
Maintenance indicators	-	S	S	C	S	S
Data logger	-	-	O	-	S	S
Network analyzer	-	-	-	-	-	S
Power controller	-	-	-	-	O	O

S= supplied as standard
O= optional
M= module or device needed
C= control panel or connection software needed

Checks before ordering

Before ordering, it is important to check the minimum cubicle dimensions according to the indications on the tables:

HBRF EntelliGuard G/Mpact/Mpact plus to Emax 2 - fixed versions

Type	L (3p) [mm]	L (4p) [mm]	H [mm]	P [mm]
E2.2-EGG/MPACT Frame 1	400	490	515	221
E4.2-EGG/MPACT Frame 2	500	600	545	221
E6.2-EGG Frame 3	900	1000	545	221