



Life Cycle Extension

Services for Safe, Smart, & Sustainable Electrification

Electrification Business Area

Leading technology portfolio generates strong global position

Distribution Solutions



Medium and low voltage control & protection products, systems & switchgear, grid hardware, power and asset management

in Medium Voltage

Smart Power



Low voltage breakers & switches, enclosures, motor starter application, power protection, energy management

in Low Voltage

Smart Buildings



Miniature breakers, distribution enclosures, load centers, residential circuit breakers, wiring accessories, building automation

in Electrification

Installation Products



Wire & cable management and protection, termination, medium voltage for utilities, conduits, fittings & other accessories

in electrical products that connect and protect

Services



Installation and commissioning, spares and consumables, maintenance, engineering and consulting, extensions, upgrades and retrofit

in electrical equipment installed base

E-mobility



DC fast and high-power chargers, DC & AC Wallbox, bi-directional charging, heavy vehicle and bus charging, site and load management solutions, remote diagnostics and service

in charging infrastructure for cars, buses & heavy vehicles



Capabilities

Our solutions – enabling sustainability, availability, reliability and predictability

Across an installed base of >17 million and over for decades to come

LV and MV components
equipment and systems

Care services

- Installation & commissioning
- Training
- Spare parts; Repairs & maintenance
- Service agreements

Advisory services

- Engineering & consulting

Modernization services

- Extensions, upgrades & retrofits
- End-of-life services
- Replacements

Year 1

Year 5

Year 10

Year 20++

Service at a Glance

Vision

- Provide a **superior customer experience** both internal & external

11. Support of agreements
(Power of Care)

10. Advanced services
(Smart Asset Management)

Reliability

Life Cycle Services

- 9. Replacement
- 8. End of life services
- 7.3. Retrofits
- 7.2. Upgrades
- 7.1. Extensions
- 6. Engineering and consulting

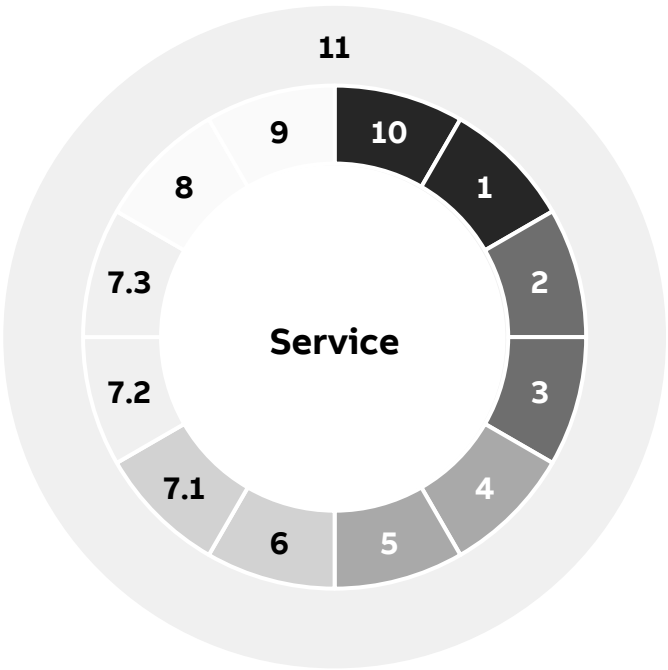


ABB Ability™

Safety

- 1. Installation and commissioning (I&C)
- 2. Training
- 3. Spares and consumables
- 4. Maintenance
- 5. Repairs

Availability

Start-up and maintenance services



Our Mission

- Reduce total cost of ownership
- Maximize revenue for our customers
- Provide safe, smart, and reliable solutions for the entire asset life cycle

US Electrification Service

Core Focus Areas

Complete One-Line Solution for Low and Medium Voltage



Electrical Power Distribution Field Services

- Preventative Maintenance
- Installation and Commissioning
- Customer Training
- Disaster Recovery
- Testing Services



Power Consulting Services

- Arc Flash Mitigation Solutions
- Arc Flash Studies
- Short Circuit Current Limiting Devices
- Safety Personnel Training



Life Cycle Extension

- Breaker Retrofits / Retrofills
- Upgrades
- Protection and Control Upgrades
- Switchgear Add-ons and Upgrades
- Repairs



Performance Enhancement

- ABB Ability™ energy and asset manager
- Condition Based Assessment Studies
- Real Time Equipment Monitoring (temperature, humidity, partial discharge)
- Remote Service Offerings
- Service Agreements

Electrification Service Capabilities

Availability (Field Service)

Support Areas:

- Start-up & Commissioning
- Maintenance & Repairs
- Training
- Engineering & Consulting
- Service Agreements



Reliability (Retrofits & Spares)

Support Areas:

- Retrofits, Retrofills
- Upgrades, Extensions, Replacements
- Spare Parts
- End of Life Services (refurbishment)



Additional Support

Additional Areas:

- Nuclear Services
- Critical Power
- Motor Services
- Service Centers
- Training



Supported Brands:

- ABB
- GE
- ITE
- Brown Boveri
- Sace
- Eaton
- Cutler Hammer
- Siemens
- Allis Chalmers
- Schneider
- Rockwell Automation
- Powell
- Gould
- Westinghouse

Built on foundation of safety/underlining safety

Life Cycle Extension

Breaker Retrofits / Retrofills | Upgrades | Protection & Control Upgrades
Switchgear Add-on or Upgrades | Repairs

Life Cycle Extension Solutions

ABB's worldwide leadership and manufacturing excellence, in medium and low voltage products, allows ABB to provide **a variety of aftermarket solutions and services** for both conventional and nuclear safety related applications



Low Voltage Solutions

- MCC bucket replacements
- MCC VFD & Starter upgrades
- ACB Breaker upgrades
 - Direct Replacement
 - Cradle-in-Cradle
 - Hard Bus
- Trip Unit upgrades & conversion kits
- Power Break & HPC upgrades
- Circuit Breaker Evaluation & Repair
 - Legacy ABB & GE Shops

Medium Voltage Solutions

- MCC
 - Air to Vacuum conversion kits
 - Relay upgrades
- LIS – Arc Flash remediation upgrade
- Roll-in Replacements
- Hard-bus Retrofit
- Arc Furnace breaker upgrades
- Relay panel upgrades
- UFES Arc Protection
- Fault Current Limiters

ABB Retrofit Solution

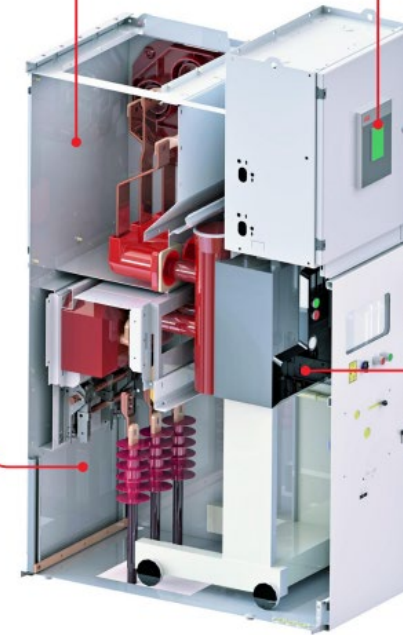
Retrofitting is an optimal measure for subsequently upgrading older equipment in power transmission and distribution systems by integrating state of-the-art components to achieve a clearly defined goal: **maintaining a high level of availability and assuring the necessary safety standards at a minimum of cost.**

Busbar compartment

- Retrofitting the arc fault protection from UFES (Ultra Fast Earthing Switch)
- Retrofitting the busbar compartment – replacing parts of the insulating material
- Replacing asbestos sheets that pose health hazards by installing non-hazardous partition components

Cable connection compartment

- Retrofitting current transformers
- Replacing asbestos sheets that pose health hazards by installing non-hazardous partition components
- Retrofitting earthing switches



Low voltage compartment

- Retrofitting the protection relay
- Preventive maintenance (preventative testing and maintenance of the protection relay)
- Retrofitting the control facilities

Circuit breaker compartment

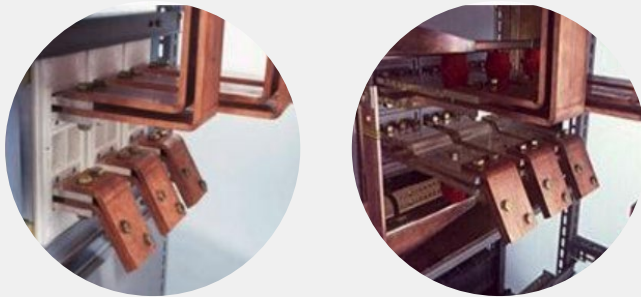
- Retrofitting the switchgear truck / circuit breaker

Technical Solutions for Low Voltage Breaker Retrofits

Replacing old circuit breaker components with newer versions can be done using the ABB special conversion kits which enable quick installation without structural modifications to the original compartment. In addition, complete “turnkey” solutions are available

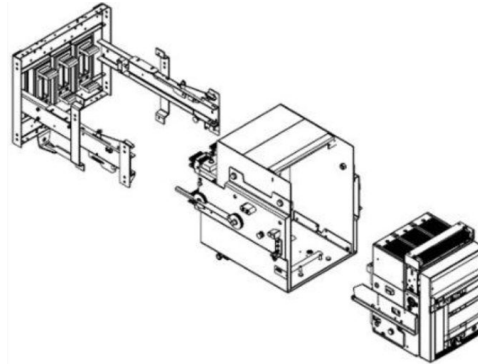
Hard Bus Retrofill (RF)

Existing fixed part is removed from the switchboard and the new one is installed using a pre-designed bus bar connection and protection shields



Cradle in Cradle (CiC)

The existing fixed part remains in place and a new one is installed inside. The thermal behavior can be critical and new breakers must be significantly smaller than the existing one



Direct Replacement (DR)

The new moving part is modified to fit the existing fixed part, which remains unchanged. Installation involves racking out the old breaker, and racking in the new breaker. This is the most advanced solution, with the most convenient and quickest installation procedure



Low Voltage Switchgear Upgrade Strategy

Suitable for when existing switchgear is intact but has aging breakers

Retrofill existing metal frame circuit breaker with a new, modern technology, Power Circuit Breaker



Upgrade switchgear with external Ekip UP



- 1 I/O terminal box
- 2 Rating plug
- 3 Display
- 4 Modules [max 5]
 - Supply
 - Communication
 - Syncrocheck
 - Signaling
- 5 Signalling contacts
- 6 Current sensors
- 7 Measurement Module
- 8 Voltage sensors



Upgrade the “Brain” of existing breaker with EntelliGuard TU or Conversion Kits

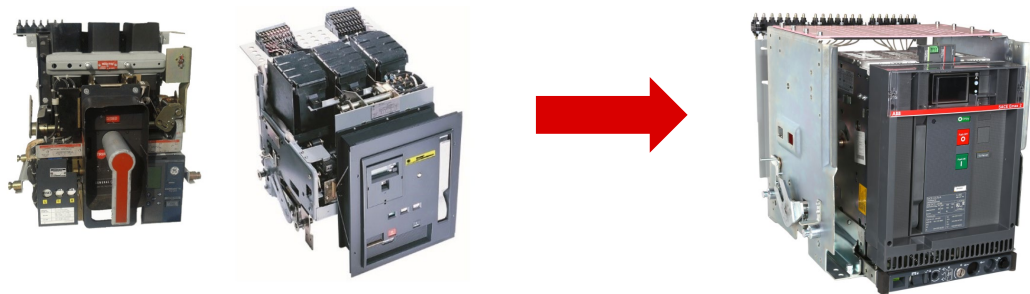


Digital Offering

- ABB Ability EDCS
- Predictive Maintenance
- Additional Service Offerings:
- Extended Warranty
- Maintenance activity
- Remote Monitoring
- Compatible with New Emax/Emax2 circuit breakers and switch disconnectors

GE (AK/AKR/WP) Legacy Circuit Breakers

Retrofill Solutions with Emax 2



Available Now:

- Emax 2 CiC for AKD-5/OEM ≤ 2000A (fuseless)
- Emax 2 DR for AKD-8,10/OEM (fuseless)
- Available for quote via SFDC – Services-Burlington Aftermarket

Coming Soon:

- Emax 2 CiC for AKD-5/OEM 3000A+ (fuseless) – August 2022
- Emax 2 DR for AKD-6/OEM (fuseless) – June/August 2022
- Emax 2 DR for AKD-5-10/OEM fusible – Q3 2022

More info:

[US Electrification Page](#)
[Inside+ Page](#)

Breaker details						Interrupting rating with inst. (kA)			Interrupting rating without inst. (kA)		
Manufacturer	Switchgear type	Thermal rating max. (A)	Breaker type	Frame size (A)	Retrofill solution	240 V	480 V	600 V	240 V	480 V	600 V
GE	AKD5/OEM	600	AK-25	600	CiC Emax E1.2	42 ¹	42 ¹	30 ¹	22	22	22
		1600	AK-50, AKJ-50, AKS-50	1600	CiC Emax E2.2	65	65	50	65	65	50
		2000	AKT-50, AKJT-50, AKST-50, AKJT-50H	2000	DR Emax E2.2	65	65	50	65	65	50
	AKD8/OEM	800	AKR-30S	800	DR Emax E2.2	42 ¹	42 ¹	42 ¹	42 ¹	42 ¹	42 ¹
			AKR-30, AKR-30H			50	42	42	42	42	42
			AKR-30L			65	65	50	65	65	50
		1600	AKR-50, AKR-50H	1600	DR Emax E2.2	65	65	50	65	65	50
		2000	AKRT-50, AKRT-50H	2000	DR Emax E2.2	65	65	65	65	65	65
		3200	AKR-75	3200	DR Emax E4.2	85	65	65	65	65	65
			AKR-75H			130	85	85	85	85	85
		3600	AKR-100	3600	DR Emax E4.2	130	85	85	85	85	85
		4000	AKR-100	4000*	DR Emax E4.2	130	85	85	85	85	85
		5000	AKR-125	5000	DR Emax E6.2	130	85	85	85	85	85
	AKD10/OEM	800	WPS-08	800	DR Emax E2.2	42	30	30	30	30	30
			WPH-08			50	42	42	42	42	42
			WPX-08			65	65	50	65	65	50
		1600	WPS-16	1600	DR Emax E2.2	65	50	42	50	50	42
			WPH-16			65	65	65	65	65	65
		2000	WPS-20	2000	DR Emax E2.2	65	65	65	65	65	65
		3200	WPS-32	3200	DR Emax E4.2	85	65	65	65	65	65
			WPH-32			130	85	85	85	85	85
			WPX-32			130	100	85	100	100	85
		3600	WPS-40	3600	DR Emax E4.2	130	85	85	85	85	85
			WPX-40			130	100	85	100	100	85
		4000	WPS-40	4000*	DR Emax E4.2	130	85	85	85	85	85
			WPX-40			130	100	85	100	100	85
		5000	WPS-50	5000	DR Emax E6.2	130	85	85	85	85	85
			WPX-50			130	100	85	100	100	85

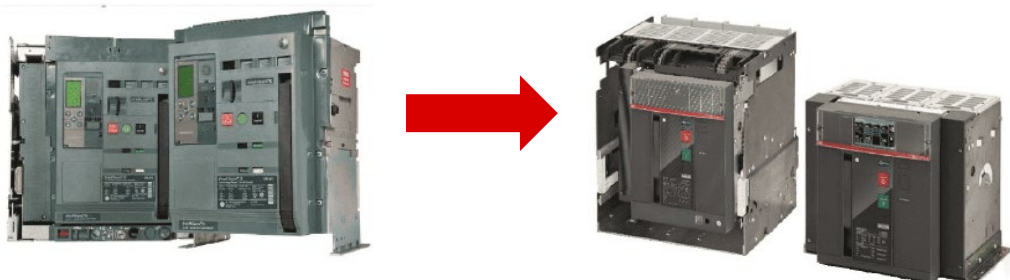
For other manufacturers and/or breaker types, contact your ABB representative.

¹Retrofill offers increased ratings on AK25 and AKR30S with no cubicle modifications required. AK25 was 22 kA/C and AKR30S was 30 kA/C.

* fan cooled for 4000A, 3600A without fans

GE EntelliGuard G Legacy Circuit Breakers

Retrofill Solutions with Emax 2



Available Now:

- EntelliGuard G as replacement in AKD-20/OEM gear (Limited)
- Emax 2 HBR for EntelliGuard G in OEM gear
 - Replacements for UL1066 and UL489
 - Fixed and Drawout
- Available for quote via SFDC – Services-Burlington Aftermarket

Coming Soon:

- Emax 2 DR for AKD-20/OEM for Env.1 & 2 – Q4 2022
- Emax 2 HBR for AKD-20 Env. 3 – Q1 2023

More info:

[Inside+ Page](#)

HBRF - EntelliGuard G ANSI/UL1066 to Emax 2 ANSI C37/1066/CSA

Fixed versions

EntelliGuard G			Emax 2						
Version	Type	In [A]	Version	Type	In [A]	Icu/Ics [kA] 254 V	Icu/Ics [kA] 508 V	Icu/Ics [kA] 635 V	Icw(1s)
Envelope 1	N	up to 1600	E2.2	S-A	1600 ⁽¹⁾	65	65	65	65
Envelope 1	H	up to 1600	E2.2	H-S	1600 ⁽¹⁾	85	85	65	65
Envelope 1	P	up to 1600	E2.2	V-A	1600 ⁽¹⁾	100	100	65	65
Envelope 1	N	2000	E2.2	S-A	2000	65	65	65	65
Envelope 1	H	2000	E2.2	H-A	2000	85	85	65	65
Envelope 1	P	2000	E2.2	V-A	2000	100	100	65	65
Envelope 3	M	4000	E6.2	V-A	4000	100	100	100	85
Envelope 3	B	3200 - 4000	E6.2	V-A	4000 ⁽²⁾	100	100	100	100
Envelope 3	M	5000	E6.2	V-A	5000	100	100	100	85
Envelope 3	B	5000	E6.2	V-A	5000	100	100	100	100

(1) Rating Plug In=800...1200A as mandatory accessory to retrofit Envelope1 with In = 800...1200A

(2) Rating Plug In=3200A as mandatory accessory to retrofit Envelope3 with In = 3200A

HBRF - EntelliGuard G ANSI/UL1066 to Emax 2 ANSI C37/1066/CSA

Withdrawable version

EntelliGuard G			Emax 2						
Version	Type	In [A]	Version	Type	In [A]	Icu/Ics [kA] 240 V	Icu/Ics [kA] 580 V	Icu/Ics [kA] 600 V	Icw(1s)
Envelope 1	N	up to 1600	E2.2	S-A	1600 ⁽¹⁾	65	65	65	42
Envelope 1	H	up to 1600	E2.2	H-S	1600 ⁽¹⁾	85	85	85	50
Envelope 1	P	up to 1600	E2.2	V-A	1600 ⁽¹⁾	100	100	100	50
Envelope 1	N	2000	E2.2	S-A	2000	65	65	65	42
Envelope 1	H	2000	E2.2	H-A	2000	85	85	65	50
Envelope 1	P	2000	E2.2	V-A	2000	100	100	65	50
Envelope 2	N	2500	E4.2	V-A	2500	65	65	65	42
Envelope 2	H	2500	E4.2	V-A	2500	85	85	65	50
Envelope 2	M	2500	E4.2	V-A	2500	100	100	100	65
Envelope 2	H	3000	E4.2	V-A	3200 ⁽²⁾	85	85	65	50
Envelope 2	M	3000	E4.2	V-A	3200 ⁽²⁾	100	100	100	65
Envelope 3	M	4000	E6.2	V-A	4000	100	100	100	65
Envelope 3	M	5000	E6.2	V-A	5000	100	100	100	65

(1) Rating Plug In=800...1200A as mandatory accessory to retrofit Envelope1 with In = 800...1200A

(2) Adjust the protections L,S,I,G according to the system capability. The retrofitting kit guarantees performances up to 3000A

ABB Emax and New Emax Circuit Breakers

Retrofill Solutions with Emax 2



Emax



New Emax



Emax 2

Available Now:

- Hard Bus Retrofit solutions with Emax 2 to replace Emax and New Emax
- Available for quote via SFDC – Services-Senatobia Aftermarket

Coming Soon:

Direct Replacement with Emax 2

- E2, E3 UL – September 2022
- E1, E6 UL - October 2022
- E3, E4 3200A UL – Q1 2023

Manufacturer	Legacy Breaker	Retrofitting Kit Type	New Breaker	Availability
ABB	E1 HR 3P/4P F	HBR	E2.2	Y
	E1 HR 3P/4P W	HBR	E2.2	Y
	E1 VR 3P/4P F	HBR	E2.2	Y
	E1 VR 3P/4P W	HBR	E2.2	Y
	E2 HR 3P/4P F	HBR	E2.2	Y
	E2 HR 3P/4P W	HBR	E2.2	Y
	E2 VR 3P/4P F	HBR	E2.2	Y
	E2 VR 3P/4P W	HBR	E2.2	Y
	E3 HR 3P F	HBR	E2.2	N/A
	E3 HR 4P F	HBR	E2.2	N/A
	E3 HR 3P W	HBR	E2.2	Y
	E3 HR 4P W	HBR	E2.2	N/A
	E3 VR 3P/4P F	HBR	E2.2	N/A
	E3 VR 3P/4P W	HBR	E2.2	Y
	E3 HR 3P/4P F	HBR	E4.2	Y
	E3 HR 3P/4P W	HBR	E4.2	Y
	E3 VR 3P/4P W	HBR	E4.2	N/A
	E3 VR 3P/4P F 2000A	HBR	E4.2	Y
	E3X VR 3P/4P F 2000A	HBR	E4.2	Y
	E3 VR 3P/4P F 2500A	HBR	E4.2	Y
	E3 VR 3P/4P F 3200A	HBR	E4.2	Y
	E4 HR 3P/4P F	HBR	E4.2	N
	E4 HR 3P W	HBR	E4.2	N
	E4 HR 4P W	HBR	E4.2	N/A
	E4 VR 3P F	HBR	E4.2	N
	E4 VR 4P F	HBR	E4.2	N/A
	E4 VR 3P W	HBR	E4.2	N
	E6 HR 3P/4P F	HBR	E6.2	N
	E6 HR 3P/4P W	HBR	E6.2	Y
	E6 VR 3P/4P F	HBR	E6.2	N
	E6 VR 3P/4P W	HBR	E6.2	Y

Low Voltage Breaker Upgrades

Power Break I to Power Break II - Highly compact, heavy-duty circuit breakers

Key features

- Compact, lightweight design
- Optional mechanical counter
- Padlock device standard
- Easy to reach ON/OFF buttons
- Choice of trip units
- Padlockable trip unit cover provides added security
- Drop-in shunt trip, undervoltage release, and bell alarm (with and without manual lockout) modules
- Flush mounted pump handle



Power Break II circuit breakers are UL and CSA Listed, and IEC Certified

Low Voltage Breaker Upgrades

High Pressure Contact (HPC) Fusible Switch

Old HPC



New HPC



Key features

- 800A – 4000A current rating
- Top/Bottom feed
- PBI accessories: electric operator, remote closing, bell alarm, UVR etc.
- New HPC only switch in the industry that meets NEC 240.67 today !
- Fully remote operation for close and open with internal operating motor
- Two types of supplemental Instantaneous protection:
 - Adjustable Selective Instantaneous protection
 - Reduced Energy Let-Through (RELT) Instantaneous

Tmax® XT Retrofit Kit for Spectra™ Panelboards and Switchboards

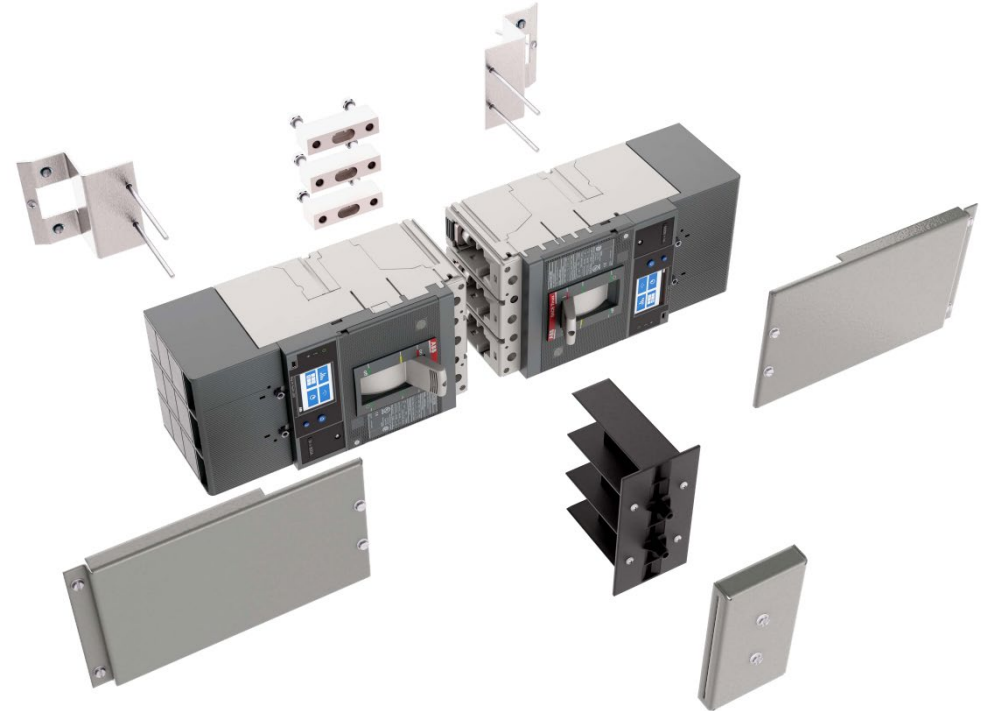
Spectra plug-in

Available Now:

- Hard Bus Retrofit Kits to modify existing Spectra Plug-In modules AMC* to allow replacement of SE, SF, SG and SK legacy Spectra frame sizes with Tmax XT1, XT4, XT5 and XT7;
- Single & Dual breaker hardware
- New filler plates are included
- Kirk Lock options are available
- UL tested/recognized
- Standard Tmax XT accessories (shunt trips, UVRs, AUX, ect.) can be selected with the breakers (ordered separately); signaling/communication accessories might not be available.
- Launched: July 2022

More Info:

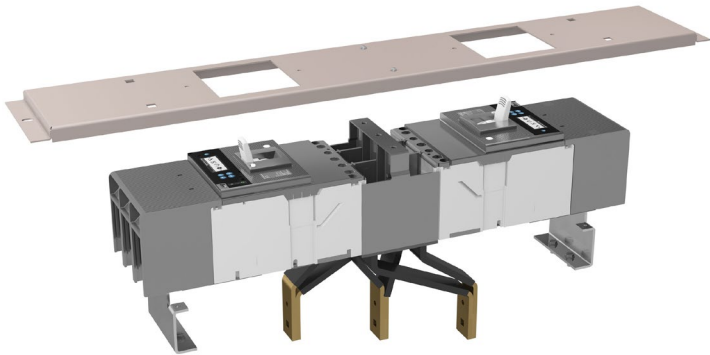
[US Electrification Page](#)



Tmax® XT Retrofit Kit for Spectra™ Panelboards and Switchboards

Spectra bolt-on

- Hard Bus Retrofit Kits to existing Spectra bolt for replacement of SE, SF, SG and SK legacy Spectra frame sizes with Tmax XT1, XT4, XT5 and XT7;
- Single & Dual breaker hardware
- New filler plates are included



More Info:

[Bolt-on solution](#)

Bolt-on Strap Kits - Type SRFB

Example:	SRFB	6 Poles	XT1 C/B Frame	B Mounting	FPX Accessory Code
		3	XT1 = Tmax® XT XT1	Blank = Main or Branch	FPX = With Filler
		6	XT4 = Tmax® XT XT4	B = Branch Only	Plate Kit
			XT5 = Tmax® XT XT5	M = Main Only	(full width
			XT7 = Tmax® XT XT7		plates with
					cutouts for
					handles, etc.)
					FPK = With Filler Plate
					Kit and Kirk
					Lock Provision

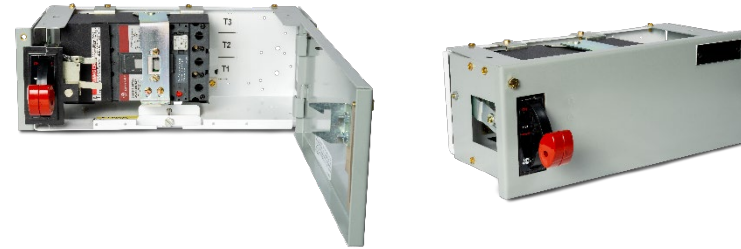
Neutral CT Kits - Type SRFN

Example:	SRFN	400 Ampere Rating	GF Modification Code
		400 = 400A Tmax® XT XT5	GF = Tmax® XT Spectra™ Panel Neutral CT kit
		600 = 600A Tmax® XT XT5	
		800 = 800A Tmax® XT XT7	
		100 = 1000A Tmax® XT XT7	
		120 = 1200A Tmax® XT XT7	

Low Voltage Motor Control Center Upgrade Strategy

LV MCC Replacement Buckets

- Spectra Breaker Replaced by Tmax XT
- **Rotary operating handle replaced vertical handle**
- New door and other sheet metal parts
- Upgraded wiring harness
- Feeders, FVNR, FVR, 2S1W and 2S2W.
- Extended Length: Fastrac available from 6" to 48"
- Available with UMC100.3 or SEL849 smart motor relays with ground fault protection
- **Still Compatible with 2700, 7700, Spectra and 8000**
- **Still UL845 Listed**



Old Design: Spectra E&F Frame Breaker

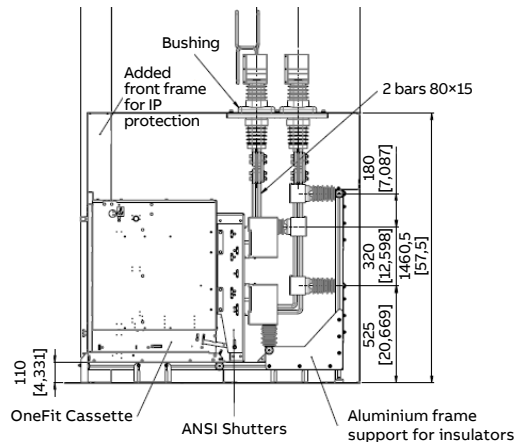


New Design: Tmax XT2 & XT4 Breaker

Technical Solutions for Medium Voltage Breaker Retrofits

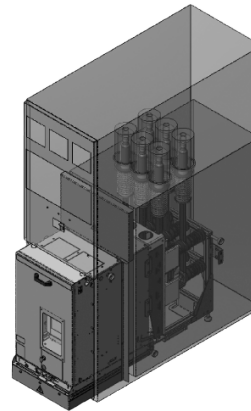
One-Fit/Hard Bus Retrofill

Only new components used. The new frame hosts a standard circuit breaker, and an additional power circuit makes the connection. Existing bushings generally remain in place



OneFit

OneFit is the latest ABB hard bus retrofit design concept, embedding an integrally safe plug-in technology to easily connect the new breaker to a wide range of existing panels



Roll in Replacements

The new moving part is modified to fit the existing fixed part, which remains unchanged. Installation involves racking out the old breaker, and racking in the new breaker. This is the most advanced solution, with the most convenient and quickest installation procedure

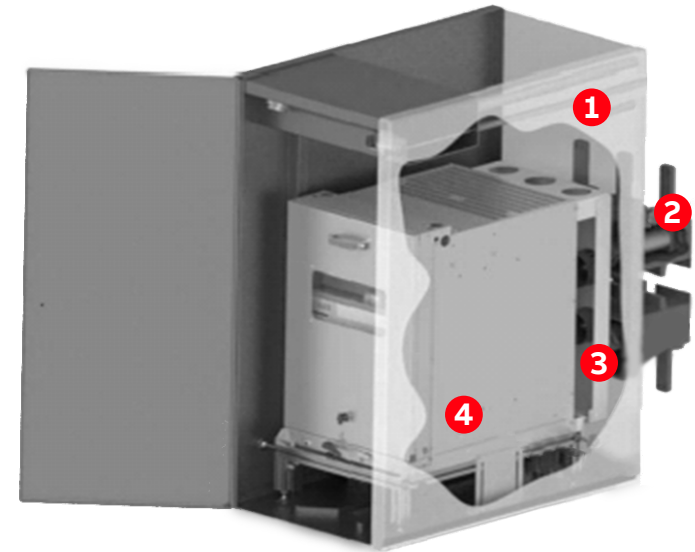


Medium Voltage Breaker Hard-bus Retrofill Design

OneFit available for ABB and Other OEMs

OneFit is the latest ABB retrofit concept embedding an integrally safe plug-in technology to easily connect the new breaker to a wide range of existing non-ABB panels

- Retrofill includes replacement of the circuit breaker and main functional components of the original switchgear
- OneFit is applicable to withdrawable floor rolling apparatus where the existing switchgear frame is in serviceable condition
- OneFit retrofill solution is composed by an adaptation kit and a standard withdrawable apparatus
- Both vertical and horizontal solutions are available



1 Original Panel

2 Original insulating system

3 New Insulating system

4 OneFit Frame

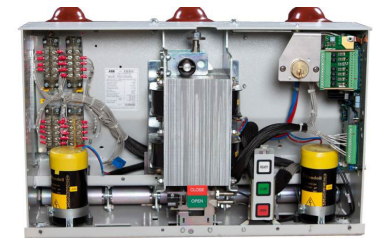
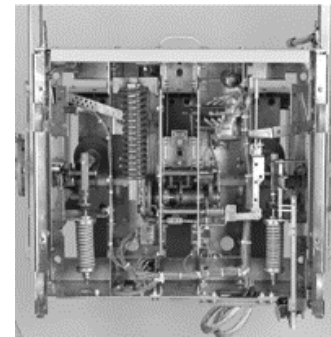
Medium Voltage Breaker Roll-in Replacements

RMVAC – Direct Roll-in Replacement Magnetically Actuated Vacuum Circuit Breakers

- RMVAC replacement circuit breakers from ABB utilize the ABB **magnetically actuated** medium voltage circuit breaker as the primary operating element
- RMVAC Roll-in-Replacement provides a streamlined solution to update legacy circuit breakers with a new breaker
- This includes smart design features such as embedded poles, reliable magnetically actuated mechanism and reduced weight, to bring shorter maintenance times and simple installation to customers
- The breaker element, interlocks, primary finger clusters, draw-out
- Assembly, secondary disconnects, and fully rated ground contact assembly and wiring are new

Key features

- High-End VCB Embedded Pole Technology
- Improved Performance
- Fewer moving parts
- Reduced Maintenance Cost



Magnetic actuator

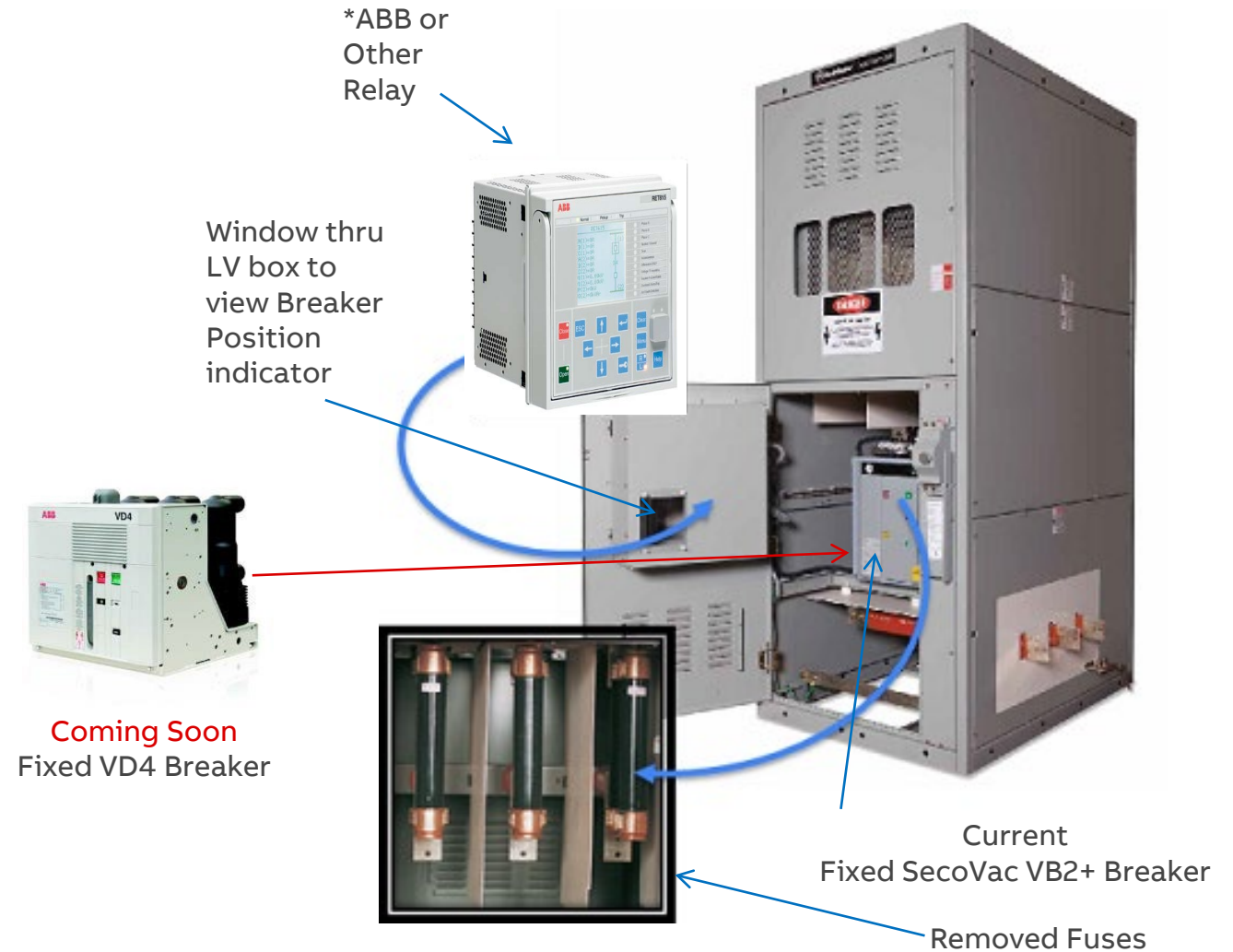


Medium Voltage Switch Upgrades

Breakmaster V – **Still an active product!**

Arc energy and equipment protection

- Reduced Arc Flash levels from the transformer down to the LV system
- Transformer protection via the latest relay technology (bus and transformer differential protection)
- Relay options that provide upstream and/or downstream communications
- Minimal downtime for installation and commissioning (approx. 12-14 hours)
- A separate low voltage door to permit access for breaker operation without the need to open the high voltage compartment
- Available as New or as Retrofit (pre-order measurements required)
- Currently using a SecoVac breaker; **Will transition to VD4 breaker 2H 2023**
- Services Florence, SC can still supply spare Seco parts

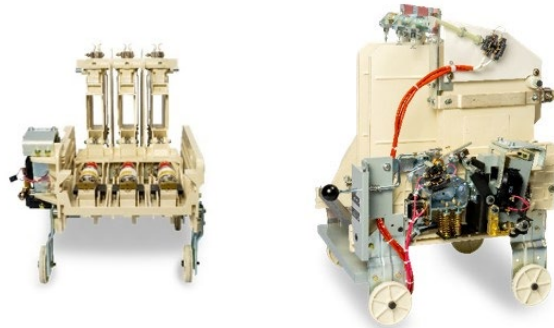


Medium Voltage Motor Control

Limitamp



- Air to Vacuum Conversion Kits CR7160 to Vacuum Contactors CR194
- Ability to modify from AC to DC Coil



- A high-interrupting capacity, MV control for squirrel-cage, wound-rotor and synchronous motors.
- For applications of >1000V.

Contactor Features:

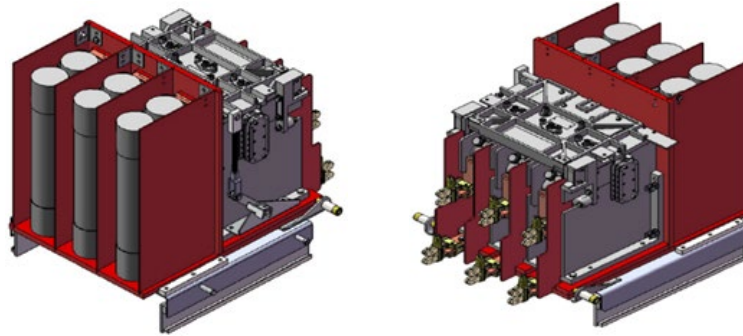
- Extremely quick interruption - reduces the arc energy and results in low contact wear
- DC closing coil – quiet operation, lower maintenance and replacement costs
- No need for exhaust chute
- No replaceable arc vanes and arcing horns to maintain
- Uses same clip and bolted fuses as air-break contactors
- Long life with minimal maintenance
- Fast and simple inspection of vacuum interrupter tip wear
- Interrupters use low chopping current materials

ITE 7850 Roll-in Replacement

Limitamp



- Air to Vacuum Conversion Kits 7850 to Vacuum Contactors CR194



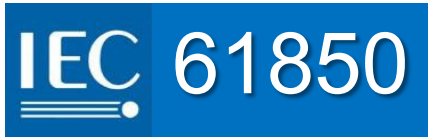
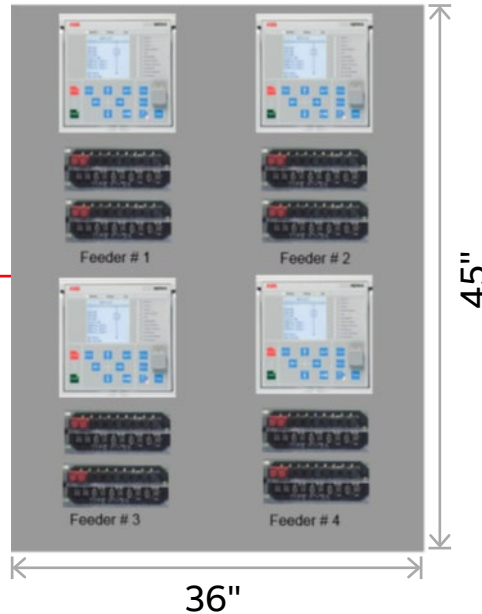
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Protection and Control Upgrades

New protection for existing panels



Including fast horizontal
GOOSE communication

New Protection Functionality

- Advanced ground fault protections
- Directional protection, frequency
- Fault locator
- Auto diagnostic
- Bus differential
- Can be programmed to do controls and communications

Reduce Response Time

- Moving from analog to digital selectivity
- Better personnel and equipment protection
- In kind replacements for aged digital relays

Ready for switchgear diagnostic and asset condition

Relion Relay Family

New protection for existing panel (Direct replacements for GE Multilin Family)

Reduce intervention time:

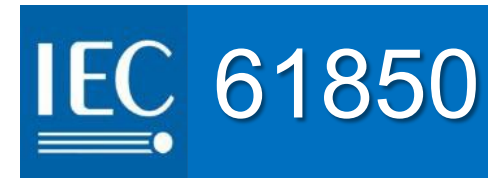
- moving from chronometric to logic selectivity
- faster protection and circuit breaker operations

New protection functionality:

- Advanced ground fault protections, ...
- Directional protection, frequency,
- Fault locator
- Auto diagnostic

Ready for switchgear diagnostic and asset condition

12-year “no questions asked” warranty policy



Including Fast horizontal
GOOSE communication

Medium Voltage Switchgear Enhancements

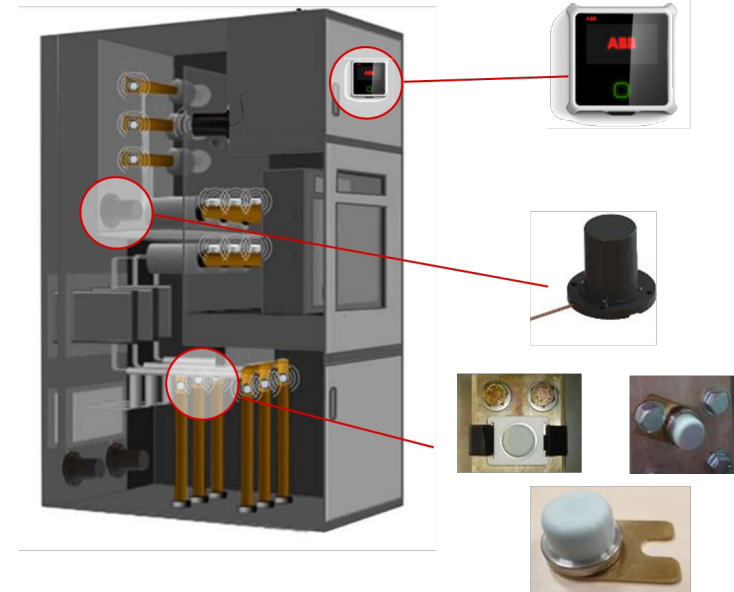
SWICOM™ - Switchgear temperature, humidity and partial discharge monitoring

A monitoring and diagnostics solution for LV and MV Switchgear and MCC (Motor Control Center) with the following sensor packages:

- Wireless solution for temperature and PD monitoring
 - SAW sensors
 - UHF measurements
- Wired solution for temperature monitoring
 - IR sensors
 - Thermistor sensors for LV MCC buckets
- Wired solution for humidity monitoring (in combination with both above)

Spot problems as soon as they develop; reduce unplanned outages

- Available in NEW switchgear as well as a RETROFIT
- Provides local and remote monitoring
- Suggest monitoring aging or difficult for personnel to get to equipment

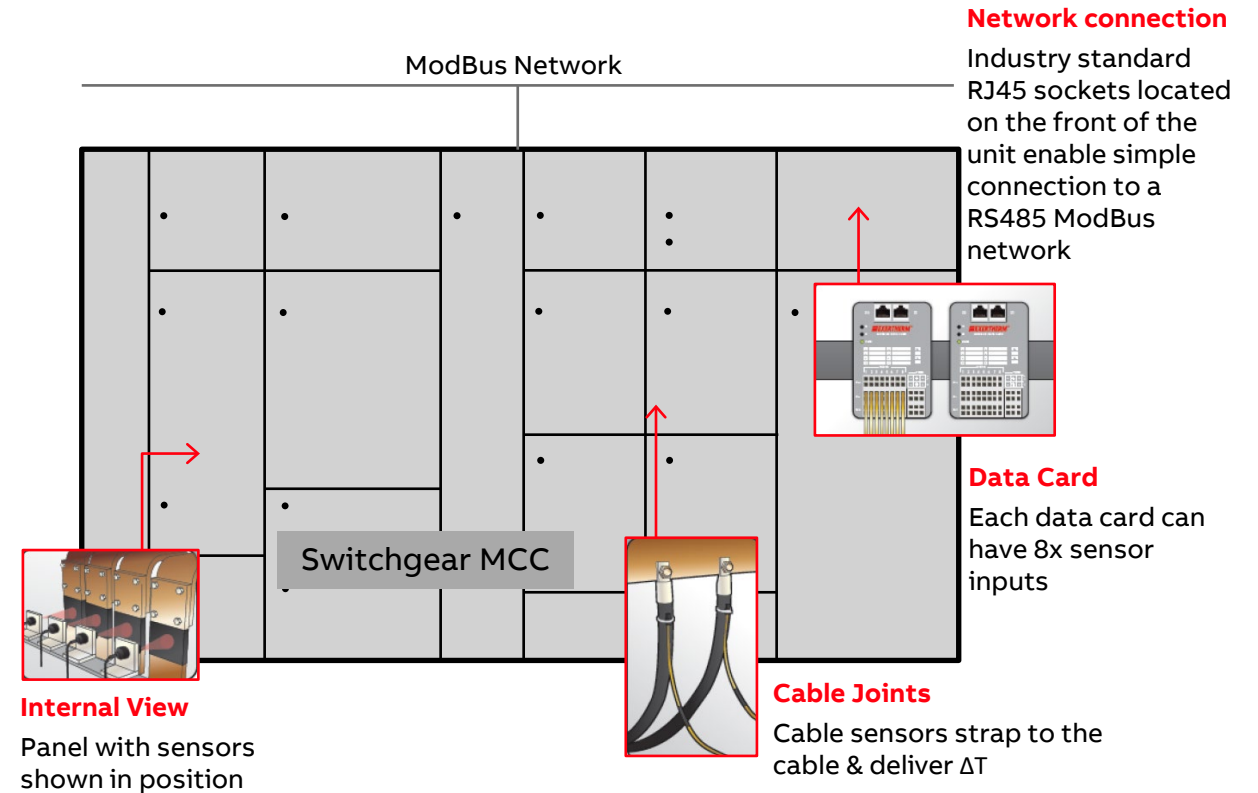
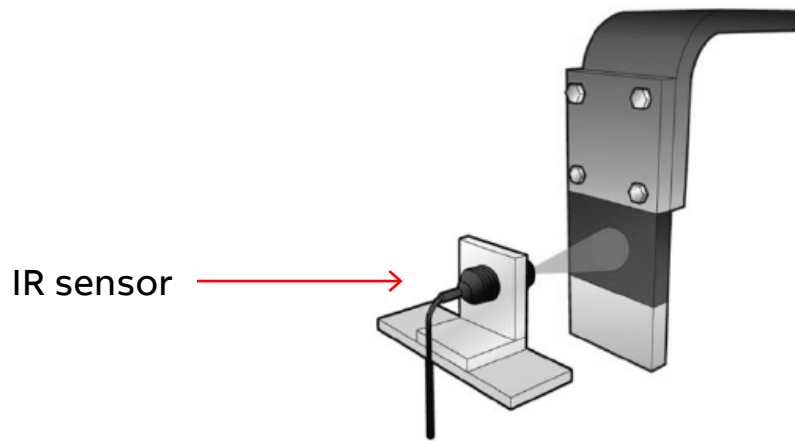


- Available in ABB switchgear up to 27kV
- Consult the service team further for 38kV applications

Medium Voltage Switchgear Enhancements

IR Sensor Temperature Sensing System

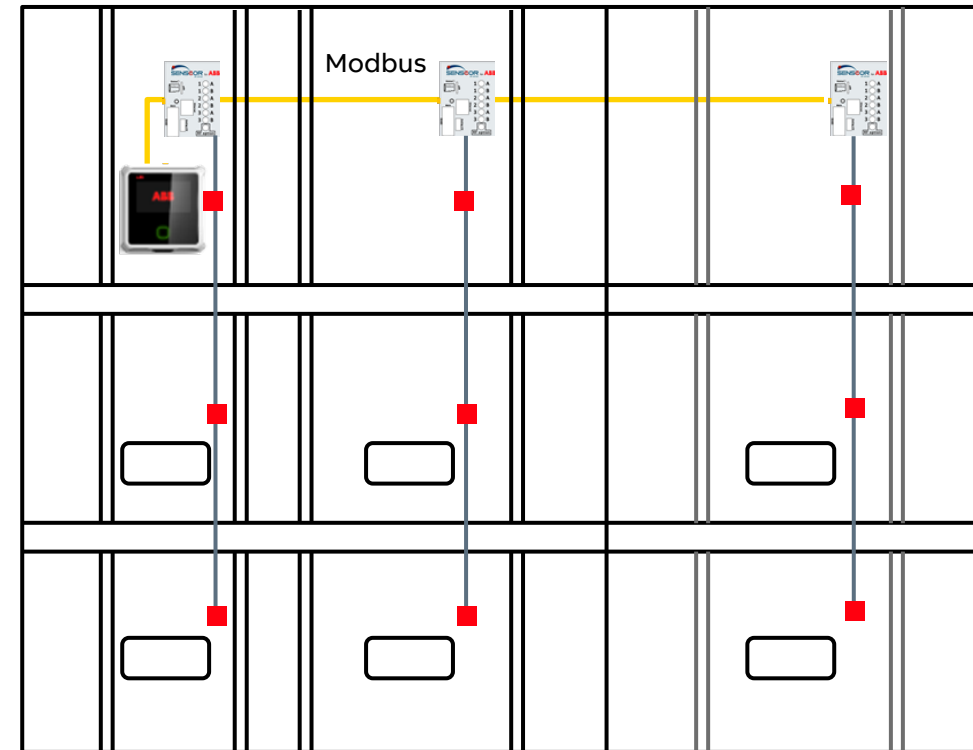
- IR sensor has non-conductive plastic body
- Sensors do not require external power
- Sensors provide rise over ambient (DT) reading
- Sensors have lifetime calibration
- Sensors are UL recognized & CE certified



Medium Voltage Switchgear Enhancements

Partial Discharge Monitoring

- Measurement is based on UHF technology
- The antennas used for temperature with a humidity sensor is used to detect partial discharge
- Suitable for ANSI/IEC



12 Sensors per panel configuration (full)

Switchgear Add-ons or Upgrades

- ABB reproduces many of the heritage brand switchgear that is no longer in active production as both full line-ups or add-on frames for existing installations
- ABB has the reference drawings and manufacturing capabilities to easily produce exact match expansion frames for ABB lineage designs
- Electrification Products Distribution Solutions Services controls both design and manufacturing of all interfaces and extensions, including bus work and protection and control panels
- Field service technicians work with customers to install, connect, test, and commission the switchgear line-up or match-in-line/extension

As the OEM, ABB can still manufacture switchgear types to match existing installed switchgear line-up including:

- HK
- HKII
- K-line

Benefits of match-in-line include:

- Maintain equipment, operating procedures, and safety standards
- Ensure consistent technical standards
- Optimization of spares and maintenance
- Breaker interchangeability

Repair Types

Inspection & repairs for existing breakers, trip units, & motors

Planned on-site repair

- ABB technicians visit site during a planned outage time
- The technician will be trained and certified on the respective product and will arrive well-prepared to repair in minimum time



Repair Shops

- Offered in our state-of-the-art service workshops
- Allows technicians to reach a higher range of repair that cannot always be achieved on site
- Fundamental failures can be more easily detected and removed
- In addition to the repair work, the equipment will be fully tested in our testing facility and sent back to the customer with the accompanying documentation



Emergency Repair

- Technicians available 24/7 to support emergencies
- Technicians have the support of the ABB factories to provide necessary parts, drawings, and engineering guidance
- Dramatically reduces unexpected outage times





Life Cycle Phases

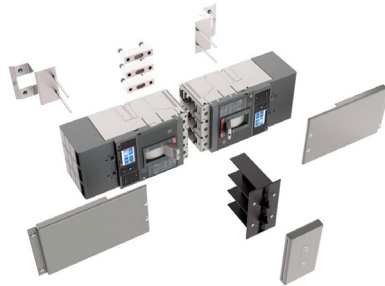
Aftermarket Product Solutions for Channels

Suitable when existing low voltage switchboards, switchgear, and MCC are intact but has aging breakers and failing parts

**Upgrade the “Brain”
of existing breaker
with EntelliGuard TU
or Conversion Kits**



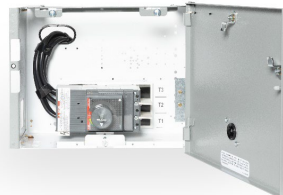
**Spectra plug-in
Switchboard &
Power Panel Tmax
XT retrofit Kits**



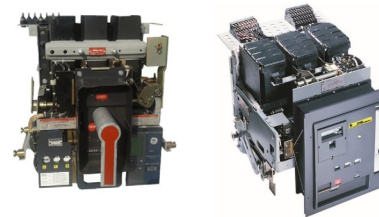
**Replacement
MCC Buckets
and MCC Parts**



**Aftermarket Parts
LV Swbd, MCC &
ATS**



**Retrofill existing metal
frame circuit breaker
with a new, modern
technology, Power
Circuit Breaker**



**Support Field Services
work**

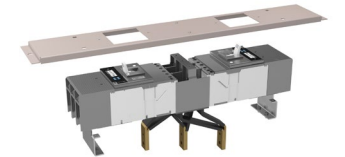
Retrofills PB1 to PBII



HPCII



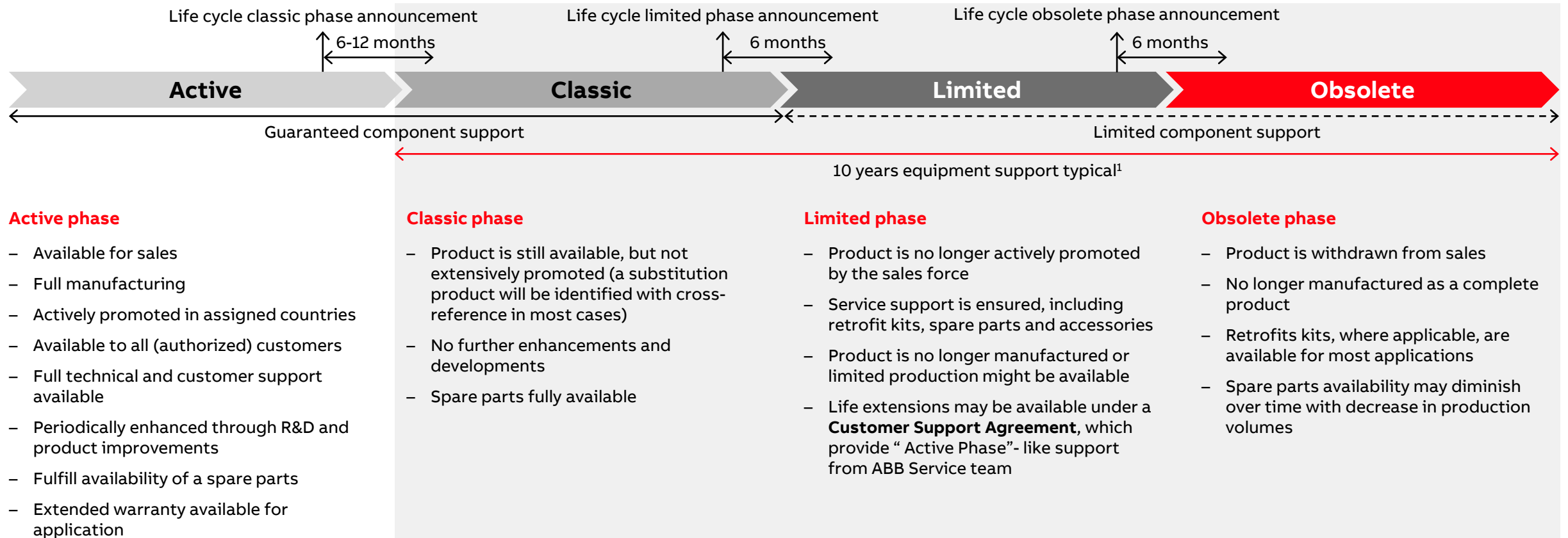
Spectra bolt-in



Distribution Channel Serving – EC, ISP, Smaller OEM & end users

Specialized Dist. Channel – EC, ISP, Smaller OEM & end users

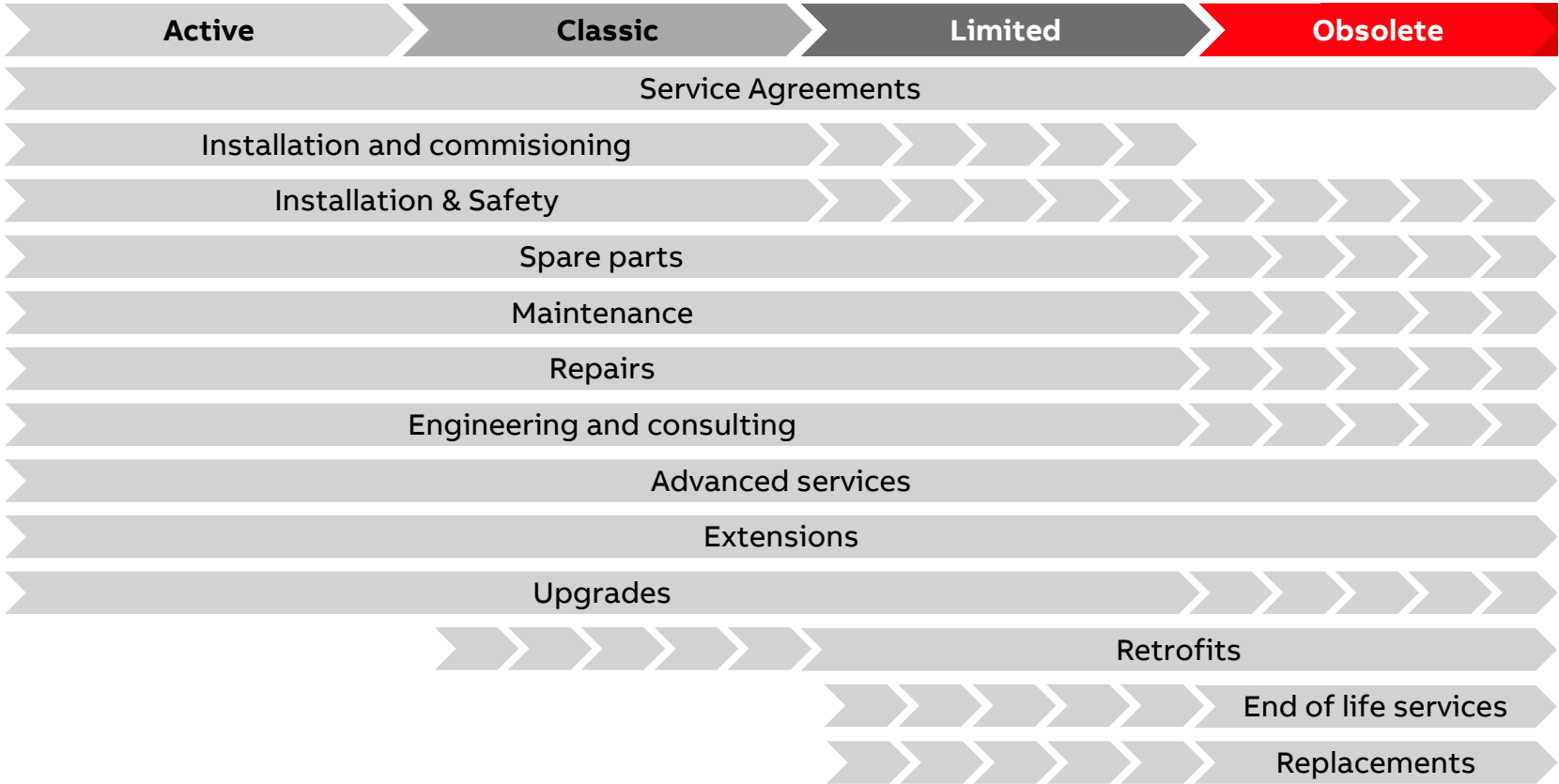
Lifecycle Phase Breakdown



Service Agreements

Maintaining Equipment

- Equipment reliability will decrease as the equipment ages. If not properly maintained the risk for an unexpected failure dramatically increases
- After a long useful life, all electrical equipment will start to show its' age, in that case an upgrade or retrofit can be utilized to further extend its useful life as well as increase performance with the latest technology available
- Regularly maintaining and upgrading equipment will increase overall safety with reduced risk for arc faults, as well as meeting new safety requirements



Supported Products

	Active	Classic	Limited	Obsolete	Switchgear		Switchboards	Circuit Breakers		
Status	Product is actively marketed and sold	Product will be replaced but is still available for sales, mainly for spares and expansion projects	Limited manufacturing/stock availability	Product is no longer available nor sellable	Low Voltage	Med Voltage	Low Voltage	Low Voltage		Med Voltage Vacuum/Air
			Not guaranteed		ReliaGear SG	SafeGear	ReliaGear SB	Molded Case Tmax XT Spectra Insulated Case PowerBreak II PowerBreak	Power EMAX2 Entelliguard New EMAX K-Line KDON K-Line Plus EMAX WavePro AKR AK MB LK	AMVAC
					MNS SG AR	Advance	PowerBreak II			ADVAC
					Entellisys 5.6	SecoGear	AV3			VMAX
					Entellisys Max SG	PowerVac	PowerBreak I			SecoVac
					K-Line	HKII				PowerVac
Product available for sales	●	●	Not guaranteed	●	AKD-20	MagneBlast				VHK
					AKD 10, 8, 6, 5				VHK-X	
					K-Line Plus				HK	
					MB				MagneBlast	
					LK				SecoVac R	
Spares availability	●	●	●	Not guaranteed						
Product on stock	●	●	Not guaranteed	●	Motor Control Centers (MCCs)		Outdoor Breakers	Load Interrupter Switches (LIS)		
Available in online tools	●	●	●	●	Low Voltage	Med Voltage	Med Voltage	Med Voltage		
					ReliaGear MCC	LimitAmp	RMAG	BreakMaster LIS		
					MNS MCC AR	SafeGear	V Breaker	BreakMaster V		
					E9000	MCC	R Breaker			
					8000 Series	Advance				
Maintenance and repair	●	●	●	Not guaranteed	7700 Series	ITE 7850				



Equipment Lifecycle Extension Considerations

Evaluate

- **Baseline** equipment – data collection, **asset health** evaluation, **lifecycle** review
- Review **shared database** of condition findings
- Sharing of **continuous improvement** opportunities
- Consider solutions approach based **on site constraints and safety**

Maintain

- Initiate/optimize **proactive maintenance** programs
- Routine
- Condition-based
- Predictive
- **Remote Assistance**

Monitor

- Look at **condition monitoring** solutions
- Support transition from basic monitoring to **predictive**

Extend

- Intentional **spare strategy**
- Structured lifecycle extension plan that integrates improved safety and standards compliance

ABB Services & Call Center

+1 888 434 7378 or +1 540 387 8617

General Services

- Local Service & Sales Team Initiated
- Installation, startup and commissioning
- Feasibility/engineering studies
- Assessment/inspection/testing
- Preventative Maintenance
- Outage support
- Repair and product replacement
- Training

Call Center

- Toll Free & Direct Dial Numbers
- 24 x 7 x 365 emergency services and parts
- Calls for equipment under warranty
- Field Engineer or Tech Dispatch
- Time & Material Quotes @ Published rates

Contract Customers

- Toll Free & Direct Dial Numbers
- Assigned a customer profile
- List of equipment covered
- Notes on customer drawings & configuration
- Customer notification email list
- Primary and Secondary Field Engineers contacted to support
- Escalation procedure to local Service and Account Managers as needed
- Contract rates for dispatch

External, services, & sales support portal

US EL Service webpage

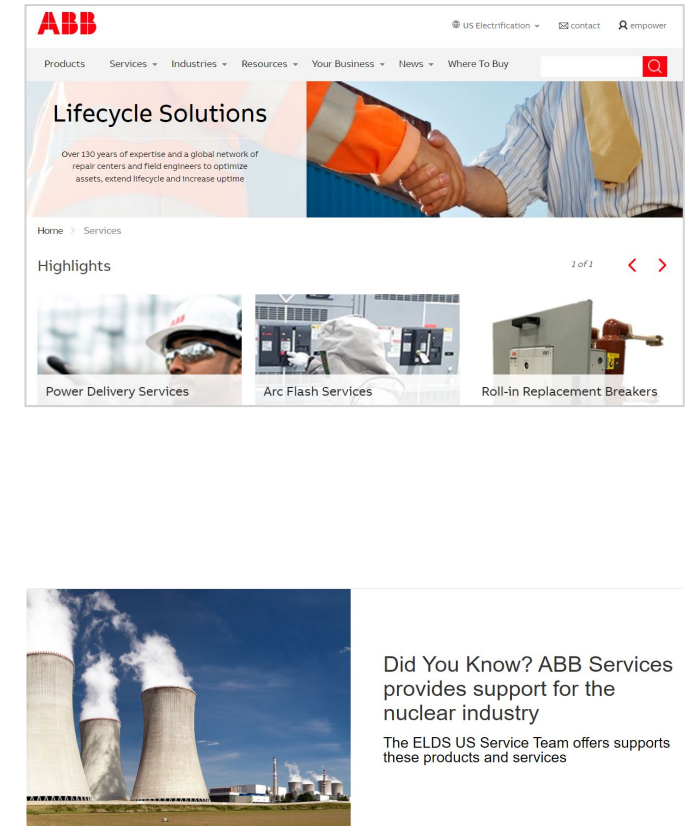
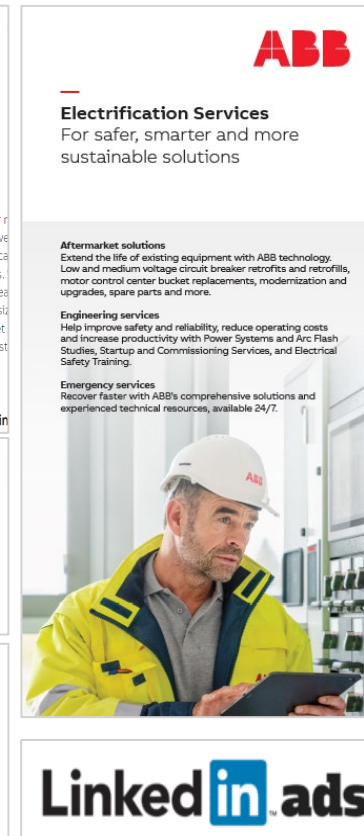
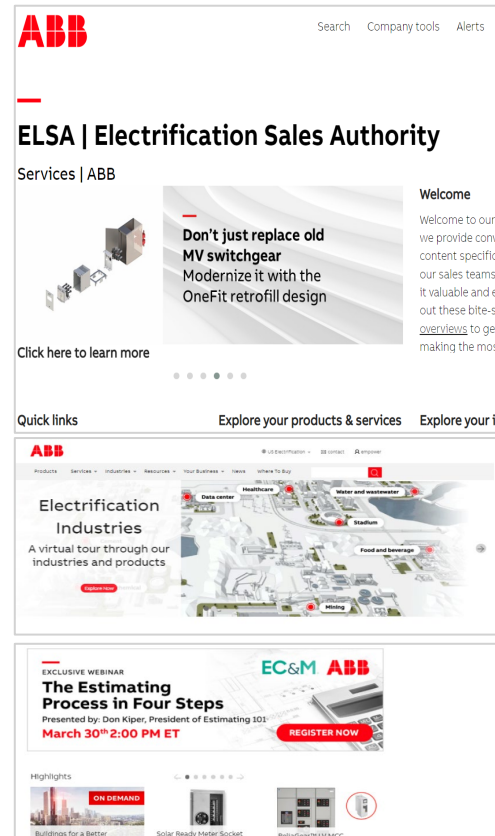
Services Product Line Card

Power Delivery Services

Aftermarket Services

Roadshow

Training



ABB