

Brochure Low Voltage Service | May 2012

# Preventive Maintenance PMP and Predictive Maintenance LEAP for New Emax Air Circuit-Breakers

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# ABB Low Voltage Breaker (LVB) Service

## Every solution at your disposal

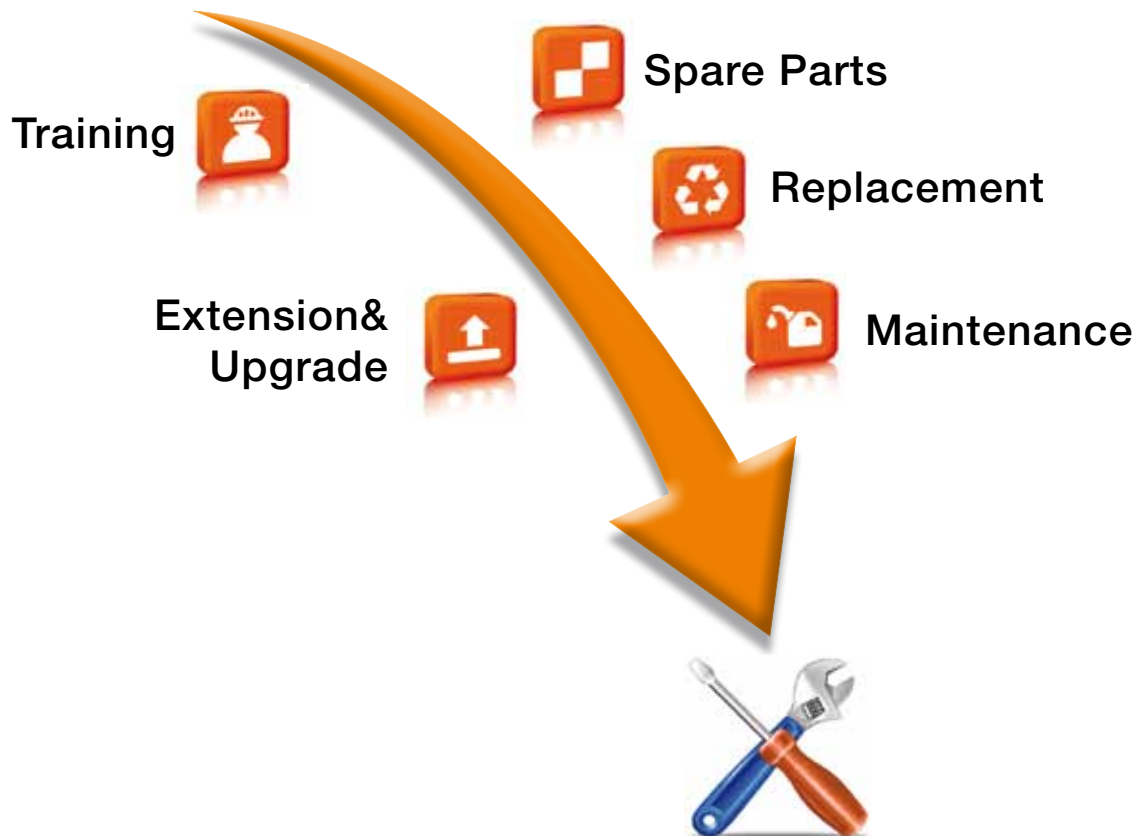
ABB Low Voltage Breaker Service offers a complete range of services to support customers in all stages of the product's life: repair, substitutions, spare parts, retrofitting solutions and any type of maintenance activities.

By integrating information with our customers, we can collect all requests for assistance and maintenance. In this way, our services are always immediate and of the highest level.

ABB Low Voltage Breaker Service offers every kind of maintenance solution for customers in order to maximize circuit-breaker efficiency, safety, performance and life extension:

- On-site repairs performed by our field engineers who are highly specialized and equipped with the proper tools.
- Preventive and Predictive maintenance in order to maximize circuit-breaker performance; increasing the reliability, safety and the lifetime of switchgear, switchboards and electrical power systems and reducing the total costs.

### Technical support



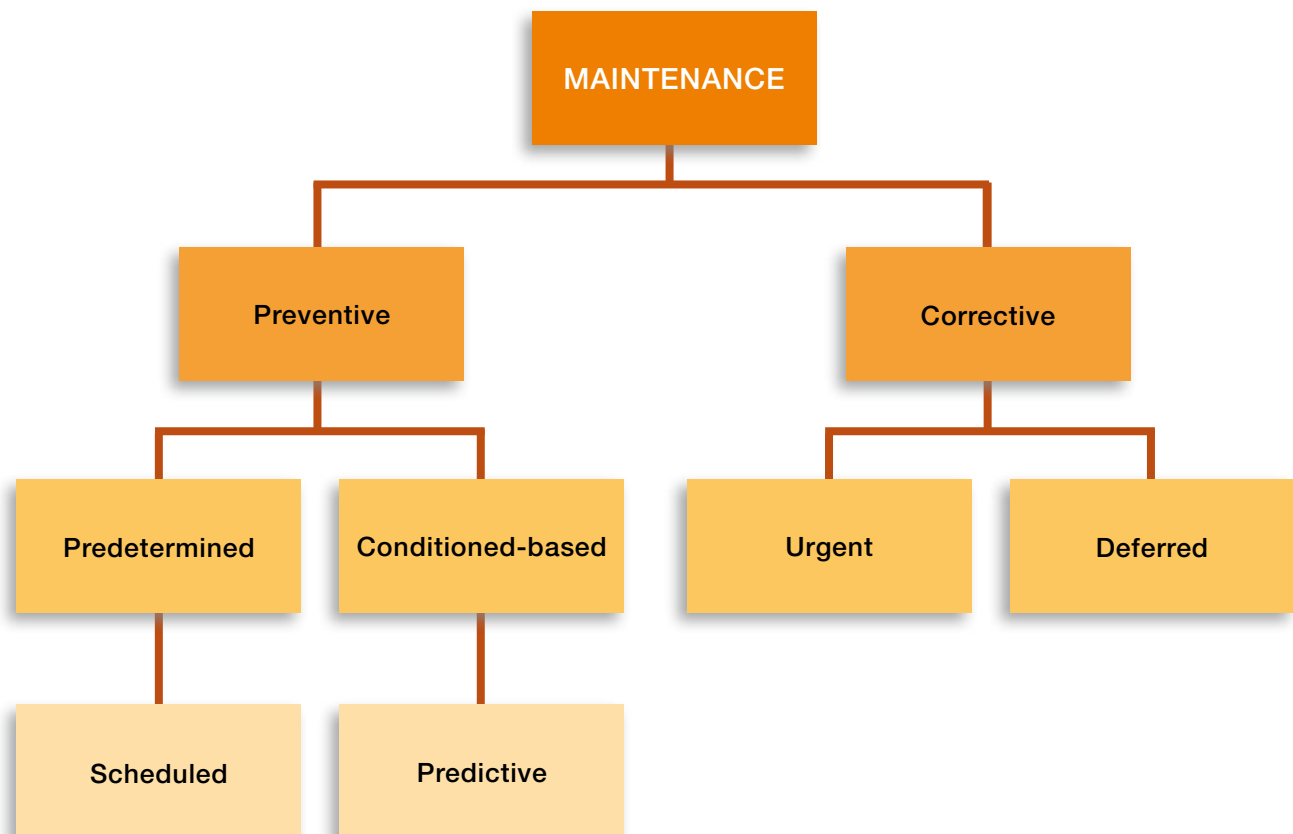
# Maintenance with ABB Low Voltage Breaker

Circuit-breakers are protection devices and require regular maintenance for a high level of performance and to avoid costly repairs.

Maintenance is mandatory for work safety standard EEC/CEEA/CE no. 654 (in effect since Nov 30th 1989) and NFPA 70E, Standard for Electrical Safety in the Workplace.

## Maintenance definitions according to EN 13306

- Preventive maintenance (EN 13306)
- Predictive maintenance (EN 13306)
- Scheduled maintenance (EN 13306)
- Condition based maintenance (EN 13306)
- Corrective maintenance (EN 13306)
- Predetermined maintenance (EN 13306).



# Why maintenance?

Necessary circuit-breaker maintenance implies inspection and checking of the integrity of the mechanical and electrical components. Replacing the parts that have ended their life cycle will keep performance level high.

## Which components to maintain?

The life expectancy of any circuit-breaker involves the wear and tear of the most sensitive components:

- Frame and plastic components
- Main contacts
- Jaw Type contacts
- Auxiliary contacts
- Operating mechanism
- Electrical and mechanical accessories
- Trip unit
- Lubricating products.

## Environmental and utilization conditions

The ordinary aging process begins with the commissioning of the circuit-breaker. However, the service age of the circuit-breaker is not the only parameter to define the aging of the device. Environment and use are other important factors which can speed up the aging of the device.

Maintenance is particularly recommended where the environmental and utilization conditions cause both mechanical and electrical overstressing of the circuit-breaker. Below is a list of the basic signs which could indicate a concern about increasing wear:

|                               | Consequences  |   |
|-------------------------------|---|---|
| <b>Utilization conditions</b> | High number of operations                             | – early wear of the operating mechanism and its mechanical components                       |
|                               | Breaking current (if short circuit)                   | – early wear on the plates of the main contacts and arcing chambers<br>– insulation leakage |
|                               | High load percentage                                  | – early aging of plastic components, lubricant, and electrical components                   |
|                               | Unused circuit-breaker (always open or always closed) | – lubricant hardness which implies the mechanical compromising of the operating mechanism   |

|                                 | Consequences                    |  |
|---------------------------------|---------------------------------|--|
| <b>Environmental Conditions</b> | High level of moisture          | – corrosion and oxidation of the metal components: <ul style="list-style-type: none"> <li>• arc chambers</li> <li>• main contacts</li> <li>• contacts</li> <li>• auxiliary contacts/shunt releases</li> </ul> – reduction of the dielectric proprieties of the plastics<br>– reduction of performance level of the electric components |
|                                 | High temperatures               | – loss of insulation<br>– aging of the lubricant inside the operating mechanism<br>– Changing of the mechanical and dielectrical proprieties of the plastics<br>– Early aging of the electronic components   |
|                                 | High vibrations                 | – loss of continuity in the contacts<br>– early aging of the operating mechanism due to mechanical wear<br>– reduction of the tightening strength of the screws<br>– breaking of the plastic parts and electrical components   |
|                                 | Dusty or polluted environmental | – reduction of the operating mechanism's lifetime<br>– reduction of insulation<br>– increasing of the resistance in the contacts points  |
|                                 | Salinity                        | – premature corrosion on the metal components<br>– faults inside the electric components (i.e SOR, AUX, ...)<br>– reduction of insulation  |



# ABB Low Voltage Breaker Service Maintenance Offers

## Extend the circuit-breaker life up to 100% in demanding environments

Investing in prevention of failure, rather than living with its consequences, such as loss of production and possible violation of health and safety legislation, is a primary concern for many businesses. Successful prevention of failure can make the difference as to whether or not a company manages to retain its long-term competitiveness.

Technical assistance in the form of ABB Low Voltage Breaker Service is effective and has a widespread network of numerous production facilities and certified service centers throughout the world.

ABB Field Service Engineers have extensive experience and product knowledge due to:

### Continuous updating

- On new products during regular training classes
- On any single component upgrade by direct contact with R&D and the production line.

### Tool and analysis

- Factory Authorized spare parts only
- Dedicated and state-of-the-art tooling
- Elaboration of the measurements found during the maintenance activity by ABB field Service Engineers: Monitoring and diagnosing the circuit-breaker can help in identifying the correct information about circuit-breaker conditions in order to reduce the costs with specific maintenance interventions.

### Professionalism and Safety

- ABB guarantees the highest level of safety at work
- All ABB field service engineers are authorized and certified by means of a regular verification process to maintain a high level of competence.

Thanks to our technical knowledge of the circuit-breakers, ABB Low Voltage Breaker Service has maintenance plans tailored for any customer that will reduce the risk of failure and the aging of the circuit-breaker.

In addition to the maintenance of a unit, which includes any type of emergency intervention, there are also complete preventive (PMP) and predictive (LEAP) maintenance service packages available. These tools ensure that those who manage the plant can gain considerable knowledge in terms of reliability, safety and reduction of costs.

An on-site audit carried out by our Field Service specialized Engineers is very important and will result in a proposal of short or long term maintenance actions.





# Preventive Maintenance Program – PMP

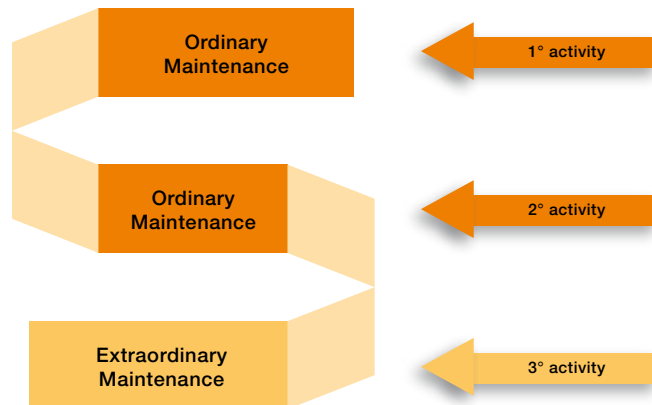
ABB Low Voltage Breaker Service offers a Preventive Maintenance Program – PMP – for all the Old and New generation family of Air Circuit-breakers (New Emax, Emax, Megamax and Novomax) to reduce the risk of failure and deterioration.

The program consists of a cycle of 3 maintenance activities:

**1st - 2nd activities: Ordinary Maintenance on the circuit-breaker to make all needed checks and ensure correct function.**

3rd activity: Extraordinary Maintenance on the circuit-breaker, carried out only by highly qualified ABB personnel, to extend the life of the circuit-breaker and increase its reliability and original efficiency.

For Circuit-breakers older than 3 years, the first intervention is Extraordinary Maintenance.



For further details see the following documents:

1SDC200014L0202 → Megamax

1SDC200015L0202 → Novomax

1SDC200016L0202 → Emax/ New Emax

## Service note Manutenzione Preventiva per interruttori automatici aperti di bassa tensione Emax e Nuovo Emax

Per garantire elevati livelli di efficienza e affidabilità al vostro impianto elettrico, ABB raccomanda una regolare Manutenzione Preventiva agli interruttori di protezione. La Manutenzione Preventiva prevede l'esecuzione di prove, ispezioni e attività di revisione, riparazione e eventuale sostituzione dei componenti dell'interruttore, sulla base di piani fissati opportunamente preventivi, volte a ridurre la probabilità di guasto e il rischio del fallimento stesso.

ABB SACE Division, leader nella progettazione e produzione di interruttori di protezione di bassa tensione, è da sempre particolarmente attenta alla soddisfazione del cliente supportandolo in tutte le fasi di vita del prodotto, dalla selezione all'assistenza post-vendita grazie alla sua struttura internamente qualificata.

**Benefici**

La Manutenzione Preventiva crea valore nel lungo periodo:

- Gestione ottimale dei costi di manutenzione, ed in particolare:
  - minori costi diretti di intervento, perché cadono gli oneri legati al carattere di urgenza;
  - minori costi indiretti di fermo impianto, perché si sfruttano nel modo migliore le normali istruzioni del lavoro;
  - Maggiore efficienza e affidabilità dell'impianto;
  - Prolungamento della vita degli interruttori;
  - Mantenimento nel tempo del grado di sicurezza dell'impianto.

**Programma di Manutenzioni Preventive**

Sulla base della conoscenza tecnica del prodotto e dell'esperienza maturata sul campo, ABB ha elaborato un piano di manutenzione per famiglie di apparecchi.

Il Programma di Manutenzione Preventiva ha i seguenti obiettivi principali:

- verificare lo stato di conservazione e l'efficienza dell'apparecchiatura;
- anticipare tendenze al deterioramento delle apparecchiature segnalando la necessità di sostituzioni, ove disponibili, dei componenti che risultano essere sconsigliatamente usurati o proponendo soluzioni alternative di accantonamento;
- aumentare il ciclo di vita dell'impianto, proponendo la sostituzione dei componenti usurati con appositi kit di sostituzione degli interruttori con altri di nuova generazione.

**Servizi forniti**

Dato l'importanza dell'attività di manutenzione e la conoscenza tecnica richiesta, ABB mette a disposizione la sua professionalità e le sue squadre di tecnici qualificati.

Al termine delle attività di ispezione e misure svolte, i tecnici ABB forniscono tutte le indicazioni riguardo alle necessità future di manutenzione e alle azioni correttive eventuali da prevedere, rilasciando apposite schede compilate durante l'intervento di manutenzione per la relazione del dossier di impianto previsto dalla norma vigente.



Costi diretti di manutenzione

Costi indiretti di Fermo Impianto

Costi Totale

Programma di manutenzione



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**Piano di manutenzione**

L'offerta di ABB prevede un programma di manutenzione preventiva sistematica e funzionale, oltre alla manutenzione ordinaria, prevista sul manuale. ABB offre ogni tre anni un intervento di manutenzione volto a prolungare la vita del prodotto (Manutenzione Straordinaria).

Se non si può effettuare il lavoro in condizioni di esercizio e ambientali non siano standard, il periodo tra un intervento di manutenzione e l'altro è da valutare opportunamente.

L'offerta può prevedere il seguente piano di manutenzione:

| Attività  | Anno dalla produzione |   |   |   |   |   |   |   |   |    |    |    |
|---|-----------------------|---|---|---|---|---|---|---|---|----|----|----|
|   | 1                     | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| <b>Controlli meccanici</b>                                  |                       |   |   |   |   |   |   |   |   |    |    |    |
| Controlli visuali   |                       |   |   |   |   |   |   |   |   |    |    |    |
| Controlli elettrici   |                       |   |   |   |   |   |   |   |   |    |    |    |
| Controlli meccanici   |                       |   |   |   |   |   |   |   |   |    |    |    |
| Controlli di iniezione dell'olio (per interruttori ad olio) |                       |   |   |   |   |   |   |   |   |    |    |    |
| Controlli di temperatura e prove con interruttori aperti    |                       |   |   |   |   |   |   |   |   |    |    |    |
| <b>Controlli di potenza</b>                                 |                       |   |   |   |   |   |   |   |   |    |    |    |
| Controlli   |                       |   |   |   |   |   |   |   |   |    |    |    |
| Controlli ausiliari   |                       |   |   |   |   |   |   |   |   |    |    |    |
| Controlli funzionali  |                       |   |   |   |   |   |   |   |   |    |    |    |
| <b>Accessori ausiliari e accessori</b>                      |                       |   |   |   |   |   |   |   |   |    |    |    |
| Sostituzione  |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |
| Organizzazione di lavoro                                    |                       |   |   |   |   |   |   |   |   |    |    |    |

**Legenda**

[ ] Esperto: Esperto e attività, attività correlate o, se necessario, sostituzione del componente

[ ] (Rilievo) Rilevazione di prove, misure ed attività di "test", "analisi", "revisione", "sostituzione", "verifica" e/o "controllo" del prodotto.

[ ] (Sostituzione attore conduttore) Sostituzione periodica del conduttore soggetto del nostro servizio ABB e seguito dal servizio di assistenza.

[ ] (Verifica stato conduttore) Verifica di Manutenzione Ordinaria e Manutenzione Preventiva.

[ ] (Misure di controllo) Misure da eseguire sul componente e/o sull'unità di manutenzione preventiva nel periodo per questo intervento.

[ ] (Sostituzione) Sostituzione obbligata del componente nell'attività di manutenzione preventiva nel periodo per questo intervento.

Si rimanda ai manuali di "Istruzioni di installazione, di esercizio e di manutenzione" dell'apparecchio per l'esecuzione della Manutenzione Ordinaria. Per la Manutenzione Straordinaria rivolgersi ad ABB S.p.A. - ABB SACE Division.

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# Predictive Maintenance Program LEAP

LEAP, Life Expectancy Analysis Program, integrated in the PMP, is the new program of predictive diagnostic analysis that optimizes the efficiency of the new generation Air Circuit-breakers New Emax.

The aim of LEAP is to give the customer a complete report, which shows the device's health before and after the Field Service Engineer's intervention, with very important suggestions about future maintenance activities.

The complete analysis is generated by ABB's sophisticated and patented software.

Three phases are followed:

## Inspection

On site monitoring and acquisition of the parameters of the circuit-breaker in standard condition:

Manual data <sup>(1)</sup>:

- Environmental data (temperature, moisture, salinity, etc...),
- Application data (application, Load, etc...).

Automatic data:

- Stored inside the electronic trip unit (trip history, contact wear, alarms, etc...).

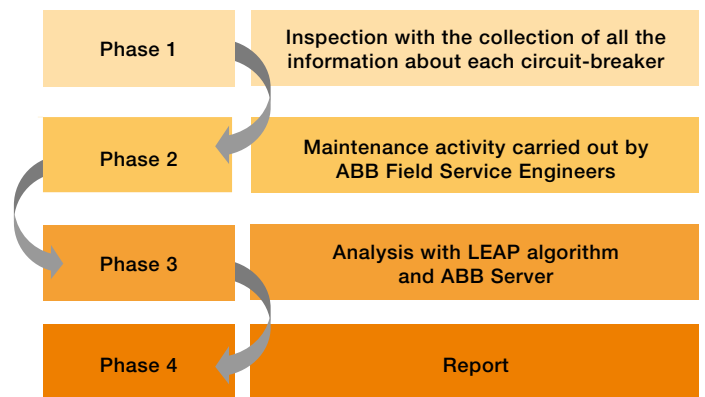
<sup>(1)</sup> Information about the environmental conditions could be given by the customer

## Maintenance

The manual data are completed with the list of the maintenance activities performed by the ABB Field Service Engineer.

## Analysis

All the data are transmitted to the ABB Server via the Web and analyzed to understand the circuit-breaker use and age.



# Predictive Maintenance Program LEAP

## Report

The report is generated with all the information acquired in the field:

- Characteristics of the circuit-breaker and of the switchboard in which it is contained, application, environmental conditions and working conditions
- Description of the main circuit-breaker components subjected to maintenance
- List of maintenance actions performed on each sensitive component, including replaced parts
- Suggested maintenance actions for the future
- Recommendations about the frequency of maintenance interventions
- 2 curves representing respectively the load and mechanical life at the moment of the maintenance activity
- The last graphic shows the risk of fault of the circuit-breaker as it relates to real working conditions.

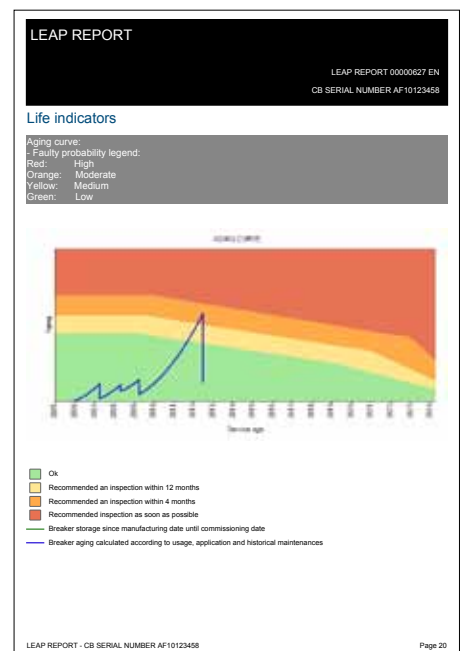
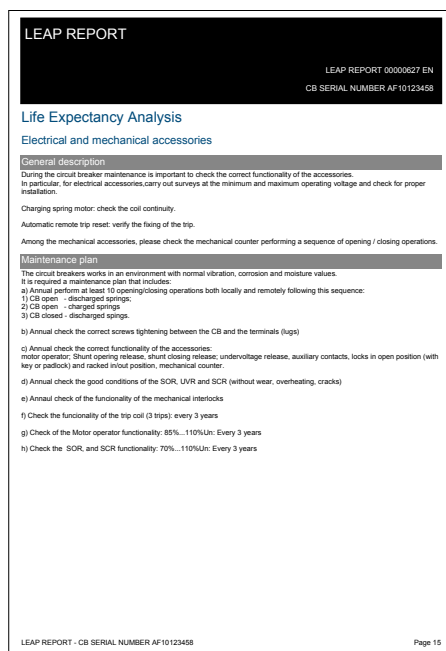
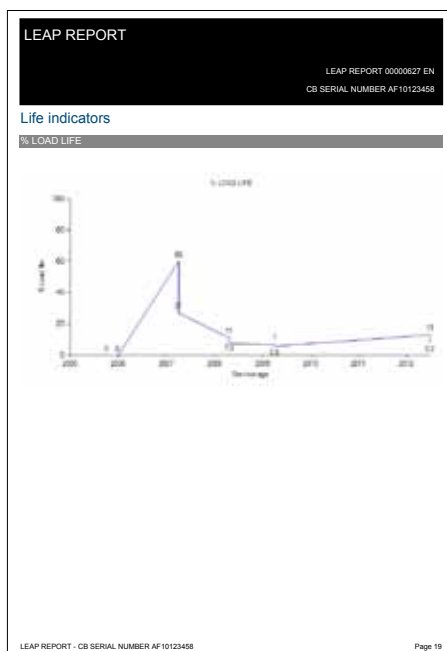
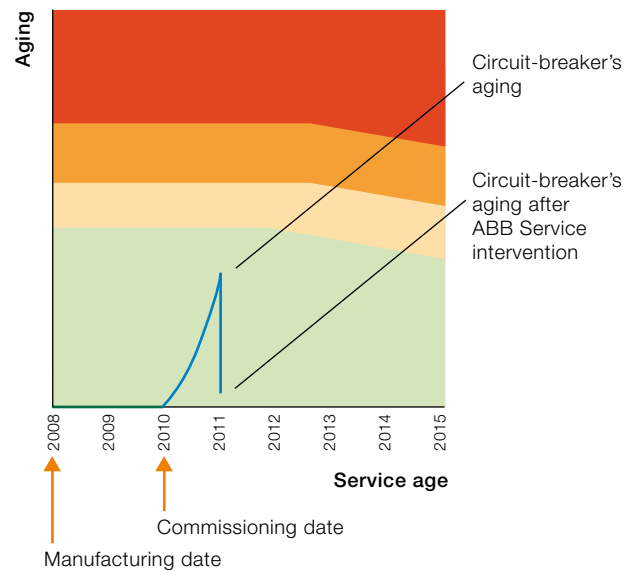
The four colored areas have different sizes according to the applications, the environment and the conditions of use.

Each color represents the risk probability for circuit-breaker failure:

- Red:** High
- Orange:** Moderate
- Yellow:** Medium
- Green:** Low

There are 2 curves:

- **Green** → circuit-breaker aging curve from the production date to the commissioning date
- **blue** → circuit-breaker aging curve from the commissioning date.





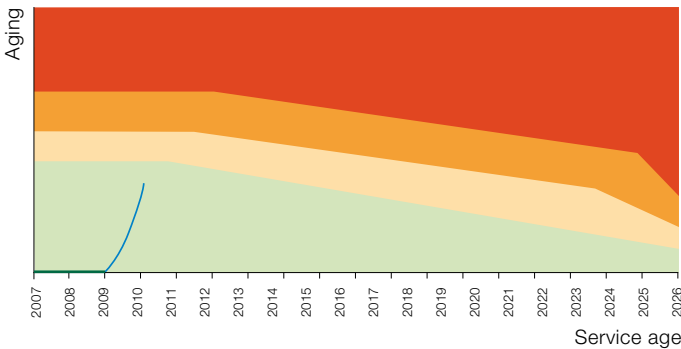
# LEAP Offers

## LEAP EASY AUDIT

The customer, after an online registration (LEAP EASY AUDIT), receives a user ID and a password to access a special online section of LEAP tool.

The customer inserts a few pieces of information about the circuit-breaker (i.e. number of operations, its application and the environmental conditions, etc...).

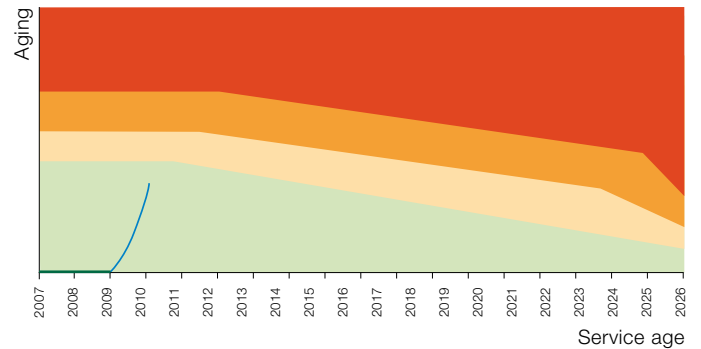
The result is an emailed health analysis of the circuit-breaker. The Report is developed on a purely theoretical and statistical basis in order to have an estimation of the circuit-breaker's health and to highlight the LEAP tool's potential.



## LEAP AUDIT

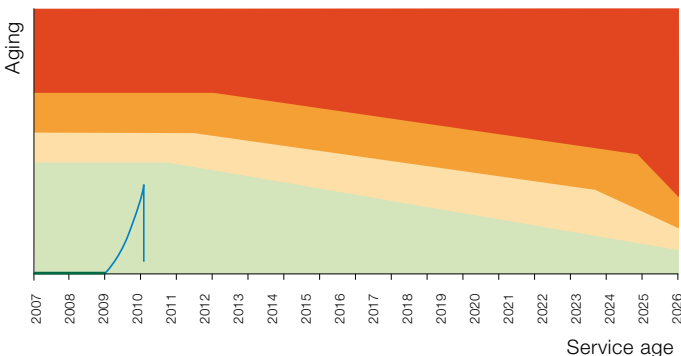
After an easy online registration (LEAP AUDIT), an ABB Service Sales representative will visit the customer's site to perform surveys and obtain a more accurate LEAP analysis. By using the data from the trip unit (with Ekip Connect SW) and a few pieces of manually acquired data about the application and the circuit-breaker operating and environmental conditions, it is possible to provide a detailed Report with the LEAP Software.

The customer receives the Report via email with the real time circuit-breaker's health and the list of the recommended next maintenance activities to be performed.



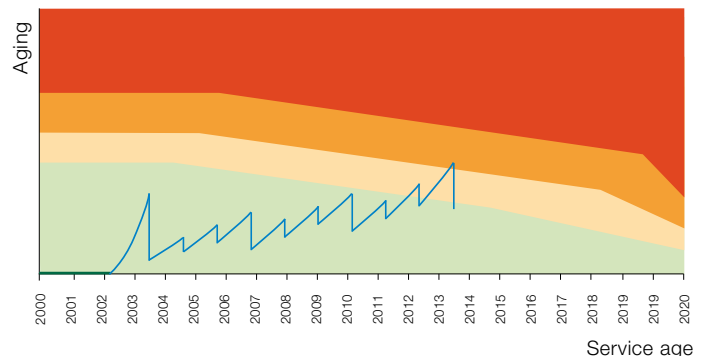
## LEAP STAND ALONE

ABB Field Service Engineer performs a maintenance activity at the customer's site. The customer receives a complete Report with all the information about the installation conditions and the list of maintenance activities performed. The aging curve, which is included in all LEAP reports, shows the status of the circuit-breaker pre and post intervention. The report also contains a list of recommended future maintenance actions.



## LEAP + PMP

LEAP, integrated into the preventive maintenance program (PMP), is the best solution for the customer: Targeted and scheduled maintenance provides the customer with immediate evidence of the added value of ABB based service. The graphic representation shows how each maintenance activity has improved the life of the circuit-breaker throughout the course of time. Customers can minimize costs by extending the device's life cycle and thereby reducing the risk of unscheduled outages and unwanted shutdowns.



# Benefits

## Customer benefits with PMP

- Ensure a high level of safety
- Guarantee the original performance level
- Increase production reliability
- Reduce overall costs:
  - direct costs of emergency maintenance
  - indirect costs due to loss of production (increasing the MTBF value)
- Support during all the phases of the product lifecycle
- ABB professional competence guaranteed.

## Extra benefits with the addition of LEAP

- LEAP is unique and certified software created by ABB that is able to give a detailed and objective diagnostic in terms of:
  - status of the circuit-breaker health
  - recommended time between maintenance activities according to the device's real needs
- The Report is detailed, transparent and exhaustive
- Extend the product's life in demanding applications.



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