



ABB Ability™ Circuit Breaker Upgrade for MV

VD4 Digitup - Enabling digital switchgear

ABB offers a solution to completely modernize existing medium voltage (MV) switchgear regardless of their age, design and brand, making them ABB digital compliant. VD4 Digitup provides customers with unmatched control and efficiency. The digital switchgear reduces maintenance requirements and the need for miles of conventional cabling. ABB takes these advances several steps further by combining the latest medium voltage circuit-breaker with sensors and IEC 61850 based Relion® relays. VD4 Digitup is a core enabler to increase flexibility, efficiency, safety, productivity and reliability for plant operators and to lower cost of operation.

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1. Switchgear modernization

ABB Introduces VD4 Digitup for making any switchgear digital

This concept brings many benefits for power distribution systems enabling that existing medium voltage switchgear can be completely modernized regardless of their age, design and brand. The switchgear assets become ABB digital compliant enabling a safer work environment and optimizing maintenance.

Normally retrofit breakers are used to replace phased out devices with latest production versions. They are mechanically and electrically engineered to adapt to the existing solution on site. ABB Service experts conduct site audits on the existing installations to assess the condition of the equipment, recommend the proper solution and support the right investment decision.



Roll-in replacement

The roll-in replacement circuit breaker is a completely new device built around a modern fixed assembly and it does not incorporate original parts. A properly designed replacement circuit breaker is fully interchangeable with the existing one and does not require significant modifications to the switchgear.

Retrofill

Another option is a modernization process including the replacement of the circuit breaker and some of the functional components of the power compartments. It is applicable where the existing switchgear frame is in serviceable condition. Two design concepts can be applied depending on the requirements:

- Hard-bus retrofill with OneFit
- Cradle in cradle with ABB cassettes

All the solutions have the protection relay in the auxiliary compartment. The roll-in replacement can also be provided with the relay onboard when the existing circuit breakers with integrated direct protection relays need to be replaced.

Upgrade of the protection and control functions requiring voltage signals that are not available in the panels, becomes possible.

Current and voltage sensors are preassembled and provide error free connections. Their response is absolutely linear, unaffected by saturation and ferroresonance, thus immune from grid disturbances. They are freely configurable during the network life without any need for hardware modification.



Roll-in replacement with relay onboard the breaker or the panel.

2. Benefits of a digital switchgear

Bridging the gap between analogue and digital, enabling a safer work environment and optimized maintenance.

Efficient information distribution

- All signals digital on the station and process level
- All information available in the communication network: analog measurements, switchgear status, monitoring data
- Control and protection commands available on fiber optics
- Information acquired once and distributed on the process bus

Start-up efficiency

- Time reduced by 40 to 50% during the commissioning phase
- Full system test from the process IOs to protection, control and SCADA system off-site
- Easy to do last minute modifications
- Speed and flexibility increase system availability

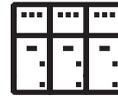
Operations optimization

- Supervision of the exchanged data reduces the need for periodic testing
- Permanent supervision enables fast and precise actions in case of failures
- IEC 61850 testing and simulation features enable fast and safe isolation and testing of protection functions
- Spare parts stock optimization grants lower operational costs

Increased safety

- Reduced risk of electrical shock by substituting copper wires with fiber cables
- VD4 Digitup eliminates risks with CT and VT circuits (short-circuiting or open-circuiting)
- Sensors placed onboard the withdrawable breaker guarantee their inspection and maintenance while keeping the switchgear live
- Intrinsically safe electrical connection between primary and secondary power distribution

Ready for the future



Switchgear modernization

VD4 Digitup perfectly moves customers communication from the past into the future.



Future proof

IEC 61850 Standard compliance enables efficient future system upgrade.



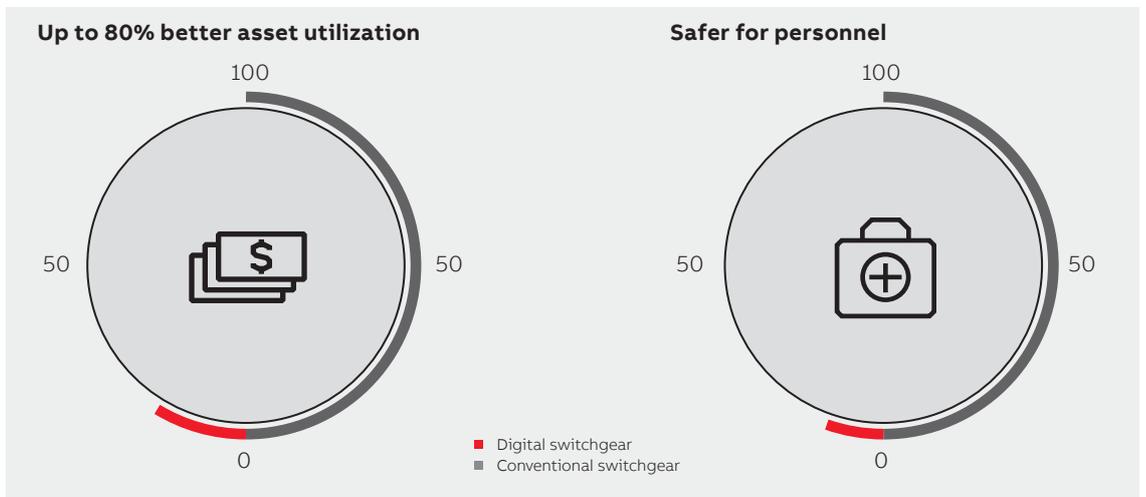
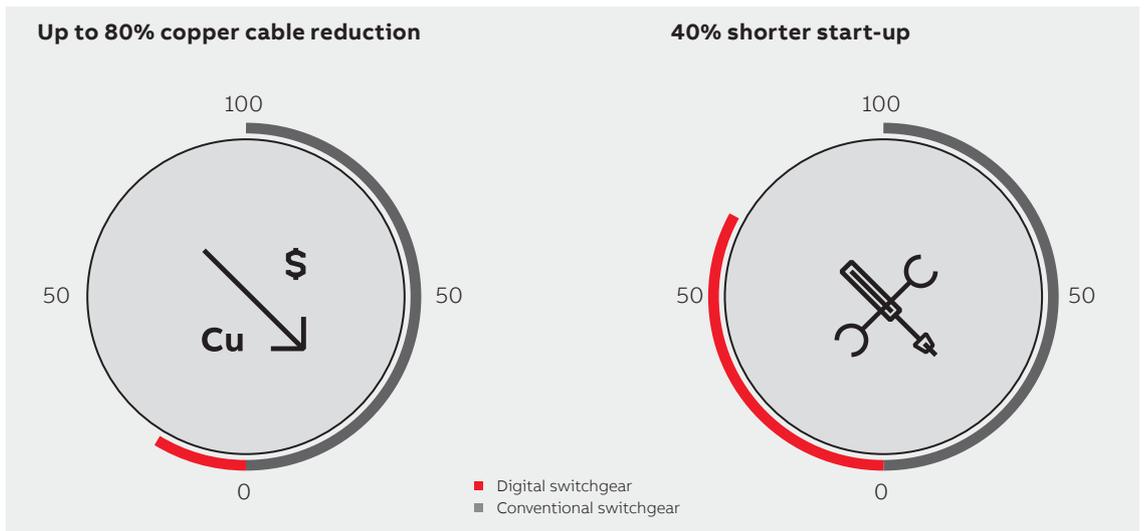
Cyber security

Protecting systems from cyber abuse or vandalism from the outside world.



Improved asset management

Gain control of the switchgear with second-by-second analysis and control.



Based on modernization of a MV air insulated switchgear made of ten panels, when breakers, relays and all the wirings are replaced with a VD4 Digitup solution.

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Environmental impact reduction

Technologies:

- Sensors instead of CTs and VTs
- New relays instead of old range of auxiliaries
- Breakers with lower resistance and dissipation
- Breakers with low energy auxiliaries onboard

Energy saving:

- Lowering consumption of the cooling system
- Lowering consumption of the auxiliary supply
- Reducing dimensions of the UPS and batteries
- Lowering power circuit self-consumption of the switchgear

3. VD4 Digitup integrates ABB's latest innovations in primary and secondary technologies

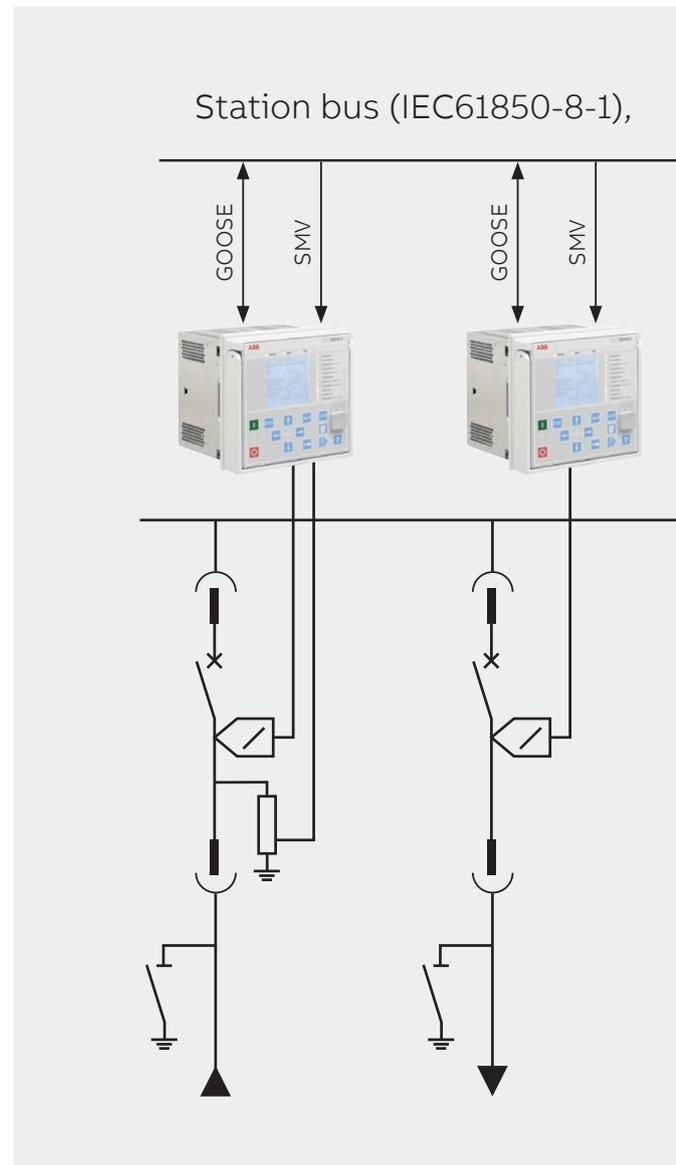
Based on the seamless integration of state-of-the-art IEC 61850-based protection control and relays, and the relevant primary components and sensors of a modern circuit breaker.

The defining feature of a digital switchgear is the implementation of a IEC 61850 station and process bus. Point-to-point copper connections between different components (e.g. instrument transformers, old fashion relays, etc.) and switchgear are substituted by safe, standardized communication bus. The process bus enables, real-time measurement signals and status information to be broadcasted throughout a substation without any complex wiring schemes.

Small and integrated sensors substitute heavy and bulky current and voltage transformers. For medium voltage applications, ABB was the first in the world to introduce the IEC 61850-9-2 process bus between protection and control equipment allowing the sharing of all the sampled measured values (SMV). Protection relays can act as merging units and measure currents and voltages in the switchgear, thus other relays can receive the SMV over Ethernet and use these values for carrying out their phase voltage based functions. Digital switchgear exploits the benefits of digital protection, control and communication technologies, mirroring the digitalization trend in many other industries.

Within medium voltage switchgear, the horizontal exchange of IEC 61850-8-1 GOOSE and sampled analogue values reduces wiring and accelerates the testing and commissioning. Digitalized technology continuously monitors mission-critical functions, while performing real time simulation and diagnostics, making proactive management of the assets lifecycle possible.

The used time synchronization method is IEEE 1588 v2 Precision Time Protocol (PTP) with Power Profile.



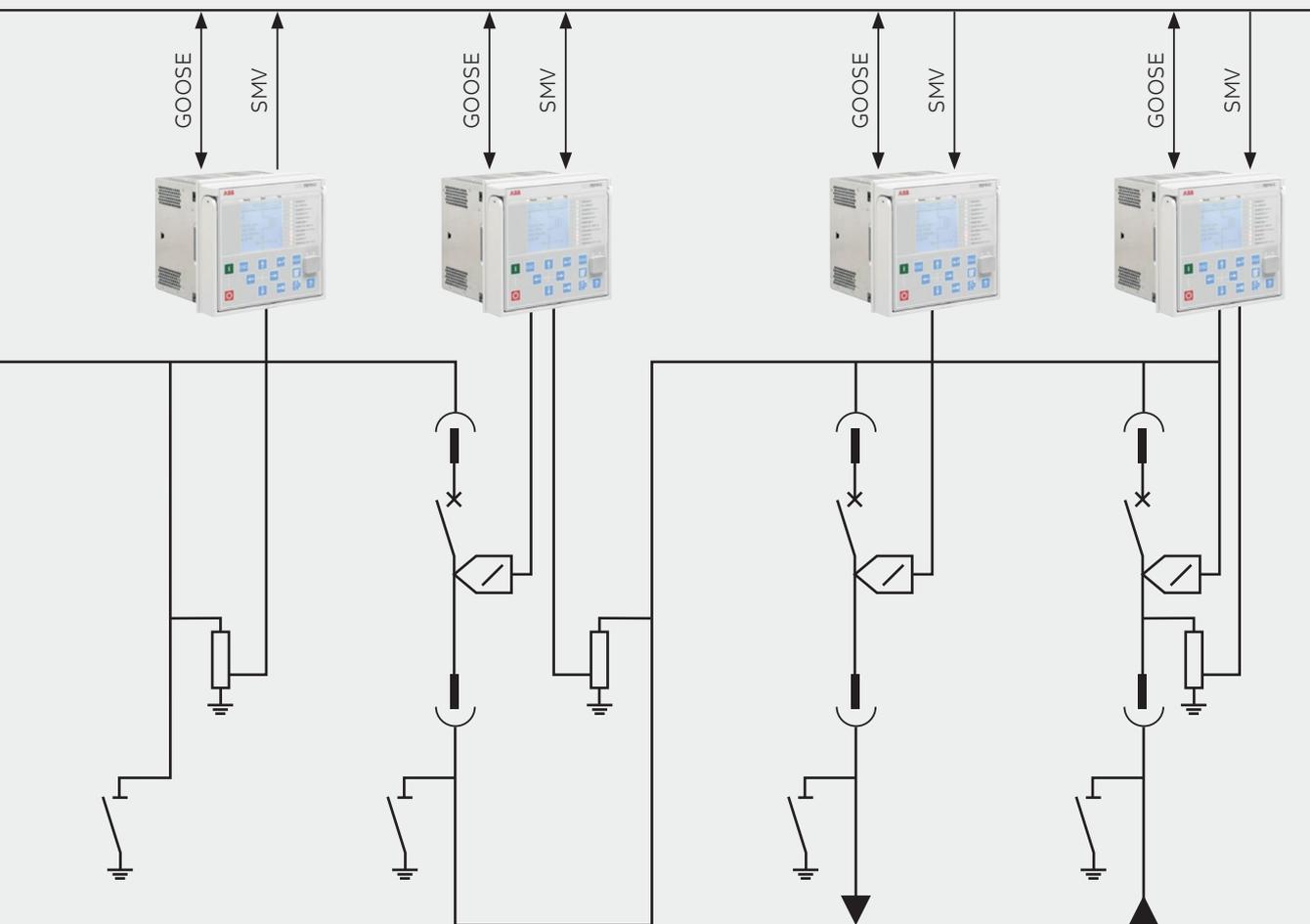
Digital switchgear brings unseen opportunities for the power distribution.

New protection functionalities:

- Advanced earth fault protection such as the multifrequency admittance-based protection
- Current and voltage based protection functions such as directional protection
- Fault locator
- Auto diagnostic

Common Ethernet

process bus (IEC 61850-9-2-LE) and IEEE 1588 v2 time synchronization



Reduced intervention time:

- Moving from chronometric to logic selectivity
- Faster protection and circuit breaker operations

Advanced relay functionalities:

- Fault recorder
- Arc flash protection
- Circuit breaker monitoring
- Web HMI

Advanced functionalities without new wiring:

- Automatic Transfer Scheme (ATS) and Synchro check
- Load-shedding
- Selectivity
- Breaker failure protection

4. Leading switchgear development

Dependable switchgear performance is a key factor for medium voltage network reliability



VD4 Digitup allows implementing of a truly digital switchgear easily and quickly also when the panel designs are not set for the application. Distribution network evolution brings new requirements to the medium voltage switchgear, challenging both the equipment manufacturers and the end users. VD4 Digitup is a perfect solution for this process and it meets all the new needs both of the distribution network and the customer:

- Energy demands requiring higher reliability and safety levels to fulfil new standards for operator and equipment
- Deeper power generation integration
- Protection selectivity higher requirements
- Renewable or distributed energy sources introducing bidirectional energy flow.

VD4 Digitup supports energy efficiency in reducing consumption and dissipation. It saves energy, thus also CO2 emissions, making medium voltage equipment more environmentally friendly than any conventional approach.



Relion® is since 2009 ABB's latest protection and control relay family featuring native IEC 61850 digital communication.



ABB launched instrument sensors for MV applications as the first manufacturer in 1993.

VD4 vacuum circuit breaker has ABB's advanced current and voltage sensors technology onboard.



Since 1987, over one million of VD4 circuit breakers have been worldwide successfully installed in a wide range of applications.



Notes

A large grid of small dots for taking notes, consisting of 20 columns and 30 rows.



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For more information please contact:



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More information:
abb.com/mediumvoltage
Your contact center:
abb.com/contactcenters
More service information:
abb.com/service

VD4 Digitup webpage:

