TECHNICAL CATALOG

Ekip UP+

The low voltage digital unit for next generation of plants

Ekip UP+
Consultation guide

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Main characteristics

Designed for the latest market trends

New electrical grid architectures and system device connectivity are changing the energy flows.

Power distribution is continuously evolving from the traditional grid architecture to the new system design. The centralized grid with top-down energy flow has been changing towards the distributed multi-source configuration.
Power grids combines more and more the presence of big size powerhouses, spread-out high voltage transmission lines and bulk load centres together with a constellation of distributed areas of local production and consumption at the distribution layer. Sections of the electrical network have bidirectional energy flows thanks to low voltage generation resources installed in buildings, factories and communities.

In particular, the growing of renewables is promoted by technology cost and environmental pollution emissions reductions in comparison with fuel fossil sources.
The **Microgrid** concept is the answer to this market trend. Distributed energy resources and loads mainly in low voltage network defined by specific boundaries that can work together in a controlled and coordinated way, either connected to weak/strong main grid or in “islanded” mode depending on the scenario. Speeding up the innovation, microgrids simplify the higher power distribution complexity ensuring lower cost, optimizing the resources and the services.

In order to get as much as possible the energy efficiency and self-consumption, in parallel of the new electrical layouts, communication networks and **Internet of Things** (IoT) technology unlocks the power of data to make people understand energy consumption and allocate resources. Indeed, connectivity has become in the last ten years a must to have in energy distribution.

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Around 29 billion connected devices are forecast by 2022, that means 4 devices for every person on the planet. This trend regards not only the consumer but also the business world.

The digital transformation is coming to power. What cannot be missed are, of course, the switching devices, like the circuit breakers or the switch disconnectors located at the different Microgrid electrical points, so that they naturally become the leaders for the grid speed evolution.

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In the last ten years, more than 50M of Air Circuit Breakers and 300M of Molded Case Circuit Breakers have been installed worldwid from all the different brands, without advanced features for monitoring or resources optimization.

As almost more than 95% are conventional devices, there is a big potential for technology upgrade on existing facilities, avoiding big impact on investment as in the case of device replacement. In addition, around 15% of switching devices are not equipped with any electronics on board.


SUN01
SUN02
UTA 1
UTA 2

Why is Ekip UP+ a valid option for your plant?

Ekip UP+ is a low-voltage digital unit that enables to monitor, control and protect the next generation of plants.
Thanks to its upgradable software-based functionality, **Ekip UP+** is the single unit that digitalizes plant performances. Sharing all the electronics solutions via an “all-in-one” platform, **Ekip UP+** completes the ecosystem to fit all market opportunities.
The result is a unit suitable for all applications, including all required functionalities, without the need for additional external devices.
Ekip UP+ is the solution to understand current flows, to enable peak shaving and to implement load-shifting strategies.

For new installations

- A multi-functional digital unit allowing protection, metering, and asset management in one device.
- Save 20% of operational costs on electrical distribution through power management functionalities.
- One single architecture and user experience throughout all ABB low-voltage air and molded-case circuit breakers.
- Perfect integration into all automation and energy management systems through a variety of available communication protocols.
- A cost-effective solution for entry-level logics, e.g., load shedding, thanks to its multiple IOs and programmable status.
- Advanced metering accuracy throughout the whole chain (main unit and its sensors).

For upgrading exsiting installations

- Extend the lifetime of your existing low-voltage circuit breakers with a cost-effective solution in which your investments are made scalable and flexible.
- Enjoy the latest state-of-the-art metering, protection and control functionalities.
- Benefit from a plug-and-play solution, offering easy and fast installation and commissioning to upgrade your plant’s installed base to the next-generation technology.
- Connect your existing circuit breakers to the cloud and explore our ABB Ability EAM platform.

Where is Ekip UP⁺ a valid option for your plant?

For new installations

Commercial buildings - Ekip UP⁺ monitors the energy consumption of existing hotels, shopping malls, campuses or office facilities, immediately connecting them to the cloud.

In new infrastructures with e-mobility chargers, Ekip UP⁺ is the solution to understand current flows, to enable peak shaving and to implement load-shifting strategies.

Industrial – Ekip UP⁺ protects plant power systems and automation processes with a direct interface to every switching device. The unit satisfies a complete list of distribution and generation protections, aswell as embedding programmable logic. For example, within the oil and gas industry, this capability includes sending tripping commands to switch disconnectors and enabling temperature monitoring.

Microgrids – Ekip UP⁺ controls urban and remote communities. It coordinates the various resources from loads to generators, maximizing the service continuity of critical-power microgrids, like those associated with datacenters, hospitals and solar factories.

Discover more within our website:

Ekip UP⁺ - Circuit Breakers Low Voltage

For upgrading exsiting installations

- In case of your low voltage circuit breakers needs to be substituted:
  Replace existing equipment with the possibility to have Ekip UP⁺ as external digital unit.

- In case of your low voltage circuit breakers breaking part is working properly, maintained as per OEM recommendation and you want to upgrade its functionalities:

  Metering functionalities:
  Maintain existing equipment and upgrading it with monitoring functionalities with Ekip UP⁺ Monitor

  Protection and control functionalities:
  Maintain existing equipment and upgrading it with protection and control functionalities with Ekip UP⁺ Protect.


ABB
ABB

What are Ekip UP⁺ benefits for users?

Ekip UP⁺ is a low-voltage digital unit that enables to monitor, control and protect the next generation of plants.
Thanks to its upgradable software-based functionality, **Ekip UP⁺** is the single unit that digitalizes plant performances. Sharing all the electronics solutions via an “all-in-one” platform, **Ekip UP⁺** completes the ecosystem to fit all market opportunities.
The result is a unit suitable for all applications, including all required functionalities, without the need for additional external devices.

User

Asset manager - maintenance manager

Installator

HSE manager

With Ekip UP⁺ benefits

- **Extend** the lifetime of the existing breakers with a cost-effective solution.
- Enjoy the latest state-of-the art **metering** and **protection** functionalities.
- **Upgrade** the existing installed base in less than 30 minutes.
- **Optimize** maintenance strategy.

Performing the **installation** and **commisioning** has never been easier:

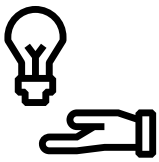
- No need to disassemble the switchgear to install the current sensors as clamp on rogowski coil are utilized.
- **Easiness** of configuration due to one Eco system with the ABB air and moulded case circuit breakers.
- Initial **configuration** at your **fingertips**.

After the successfull installation of the Ekip UP⁺ the operation team stands **outside the danger zone** (in front of the switchgear) in order to configure, monitor and protect the plant.

UP-date basic switchgear

Ekip UP⁺ updates switchboards with new monitoring, protection and power control solutions.

- Compatible with all switching devices, ABB or not.
- 100% applicable for every low-voltage scenario.



UP-grade your facilities

Ekip UP⁺ is the unit that upgrades the electronics of old facilities to make them digital.

- 40% operational cost saving via the energy management system and predictive maintenance.
- Cost-effective solution compared with traditional retrofitting.

UP-load your electrical system

Ekip UP⁺ uploads your system data to the cloud-connected ABB Ability platform.

- Enabling full microgrid control.
- In less than 10 minutes without any external gateway.

Maximize UP-time

Ekip UP⁺ maximizes uptime for system integration as a **plug and play** unit with easy installation.

- 50% time saving when retrofitting, with reduced impact on switchboard design.
- Almost zero downtime during commissioning.
- No need for disassembly, just a clamp on a Rogowski coil.
- Easy configuration as a result of one ecosystem with ABB air and molded-case circuit breakers.
- Initial configuration at your fingertips.

Leveraging our digital innovation

Ekip UP⁺ is the low-voltage digital unit able to monitor, protect and control the next generation of plants.

Thanks to the built-in software-based function, part of ABB Ability™ portfolio of connected and software enabled solutions, Ekip UP⁺ digitizes the plant performance. Sharing the electronics capabilities of “all-in-one” ABB platform, Ekip UP⁺ enables the integration of advanced functionalities into the switchgear.

The traditional approaches of industrialists towards the installed base is quite conservative. The cultural inertia for the innovation and the barrier of retrofitting cost make them not change the power distribution philosophy, loosing all the chances offered by new solutions. In case of switchgear with traditional breakers, still suitable for the mechanical performances but old for the electronics capabilities, trusting the end user to replace the whole device is more than complex. On the other side, there are many projects that need customization and engineering efforts, which are not usually addressed to the solutions embedded in switching devices but, generally, are related to external devices. Ekip UP⁺ edge units are fitted for all the market opportunities.

As multifunctional unit, Ekip UP⁺ monitors, protects and controls the power distribution and automation applications. Thanks to its plug&play design, it guarantees ease of use, modularity and flexibility.

- **Metering**
  - Measurement capability of main energy parameters.
  - Network analyzer to evaluate the power quality.
  - Datalogger based on event triggers for fast fault diagnosis.
  - Connectivity for system integration up to 8 field-bus protocols, plus a property bus for power automation applications that require advanced cyber-security.
  - Embedded gateway that ensures power understanding by cloud-based energy management system.
- **Protection**
  - Distribution protection (mains and feeders) based on current and voltage measurement.
  - Generator protection, motor protection and interface protection systems.
  - Adaptive threshold according to grid topology.
  - Digital selectivity for resource coordination.
  - Load shedding algorithms to prevent blackouts.
  - Programmable logics to manage transfer-switching operations and maximize service continuity.
  - Synchrocheck function of different power sources inside.
- **Control**
  - Power management systems to optimize plant resources and enable Demand Response applications.

The evolution of ABB external units sets a new standard for the multi-functional relays' market, leveraging the value of digital innovations.

One unit, more markets

Ekip UP⁺ is ready to meet any requirement and cover spread market opportunities worldwide.

Commercial buildings
Ekip UP⁺ monitors the energy consumption of existing hotels, shopping malls, campuses or office facilities that become imediately connected to the cloud.
Thanks to the remote energy management system and smart power management algorithm embedded in the digital unit, facility managers and end users can increase the energy efficiency of the electrical plant. Even in new infrastructures with e-mobility chargers, Ekip UP⁺ is the solution to understand current flows, enabling peak shaving and load shifting strategies.

Industrial and utility plants
Ekip UP⁺ protects plant power systems and automation processes with the direct interface to every switching devices. The unit satisfies a complete list of distribution and generation ANSI protections as well as it embeds programmable logic.
For example, sending tripping commands to switch disconnectors is a typical case for oil & gas industries. Besides, Ekip UP⁺ can also add granted backup protections to breakers so to increase reliability with complete redundancy, as in utility power stations.
Having both DIN-rail and door-mounted options in the same unit, it fits the installation requirements of OEMs and panel builders with small space requirements.

Marine

Ekip UP⁺ easily revamps the electronics of old breakers installed onboard ships, offering a cost-effective solution in respect to traditional approaches.

The unit maximizes the time for maintenance & operation technicians during the installation compared with other retrofitting solution.

The mechanical vibration performances of the unit match the marine application specifications.

Besides, through adaptive protections and digital buses, the unit enables complete coordination of motors, generators and distribution bus-bars.

Microgrids

Ekip UP⁺ controls urban or remote communities, coordinating the different resources from loads to generators.

Thanks to the all-in-one software functions, Ekip UP⁺ maximizes the service continuity of critical power microgrids, like datacenters, hospitals or solar factories.

Leveraging on advanced connectivity capability, system integrators can easily introduce the digital unit is in plant networks.

Package selling upload-model guarantees modularity and flexibility in every microgrid project for design institutes.

Product overview

Ekip UP⁺ is CE-marked and cULus listed. It conforms to the Standard IEC 60255 - “Measuring relays and protection equipment” and UL 508, CSA C22.2 No. 14-13 - "Standard for Industrial Control Equipment".

IEC 60255 certification makes Ekip UP⁺ suitable globally being recognized by other local regulatory organizations, while cULus compliance enables the access to North America market (UL508, UL1053). Ekip UP⁺ Protect version with IPS configuration package is in compliance with grid-connection standard, in particular last edition of CEI 0-16 - “Reference technical rules for the connection of active and passive consumers to the HV and MV electrical networks of distribution company”. All the Ekip UP⁺ range is approved by marine registers (RINA and DNV-GL) and other local standards (CMIM, KC).

Ekip UP⁺ operates in low voltage grids according to the following ranges and characteristics:

Operating voltage, Ue [V]	Up to 1150
Operating current, In [A]	From 100 to 6300
Operating frequency [Hz]	50 - 60
Operating temperature [°C]	From -25 to +70*
Protection degree	IP40**

* +60 according to UL
** For IP54 protection, use external cover like Rittal FT 2784.000 or equivalent

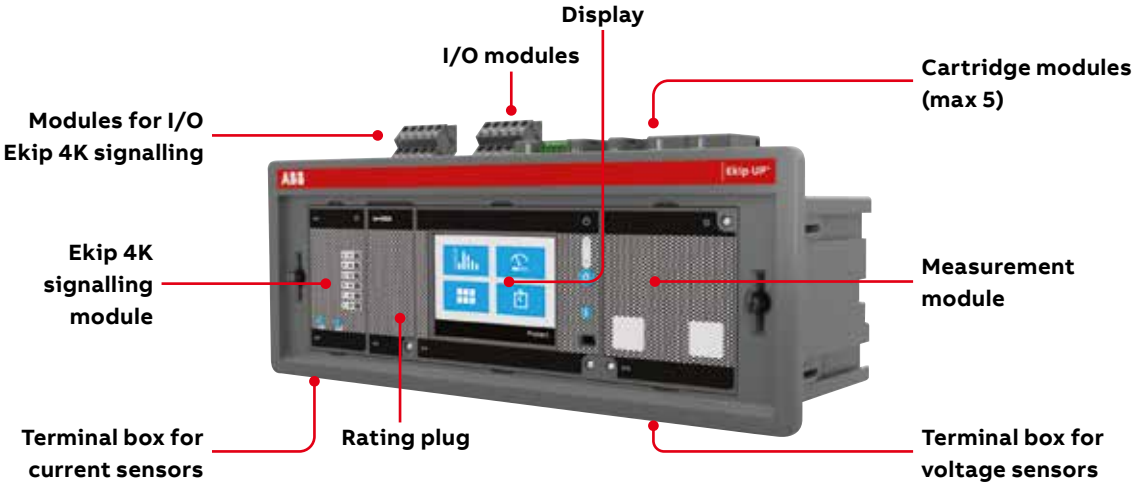
More technical and standard features are available in the dedicated manual, doc. 1SDH002129A1002.

Ekip UP⁺ unit is standard provided in the optimized bag-packaging with:
- ABB current sensors, offered in four types, if ordered (it is possible to order Ekip Up⁺ without sensors that is type E as ordering code)
- insertion bridge for voltage sockets
- power supply cartridge module
- measurement module
- ekip signaling 4K-A or 4K-B
- four I/O modules for programmable contacts
- rating plug
- display
- documentation.

Ekip UP⁺ is also able to be equipped with optional:
- communication cartridge modules
- synchrocheck cartridge module
- signalling modules
- additional protections and/or functions with software packages
- external differential or homopolar toroids.

If required, commercial voltage sensors can be applied into the specific sockets, clearly identified to ensure correct installation.

All the details of the accessories are described in Chapter 5 and ordering instructions are listed in Chapter 8.

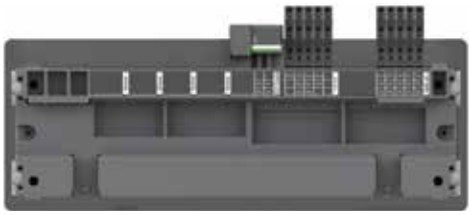


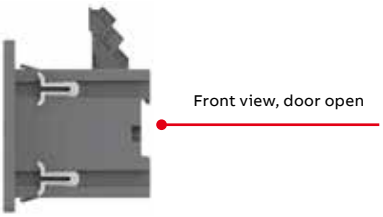
Product overview

The same Ekip UP⁺ unit may be DIN-rail or door-mounted according to the specific requirement. Many clips fix the unit guaranteeing stability in every installation.
Rotating capability of digital contacts and two dedicated labels ensure easy of use in both the mounting options.

Serial Number information is available in the label applied on the unit side as well as in the touch-screen display. Indeed, all the configurations are possible from the display or using the commissioning software Ekip Connect.
Additional labels help to identify the cartridge module plugged into the unit.

1. Door mounted, door open





2. DIN mounted

The ranges

Ekip UP⁺ units

The innovative Ekip UP⁺ digital units are the new benchmark for the measurement, protection and control for low voltage electrical systems.

The result is a single unit suitable for any demanding application without the need for other external devices.
The ABB plug&play solution improves the plant efficiency, increases awareness of resources and process behaviors, and delivers an easier, more intuitive user experience.
An optimized portfolio with two versions guarantees flexibility and modularity to meet the needs of all measurement, protection and control applications.

- **Ekip UP⁺ Monitor**
- **Ekip UP⁺ Protect**

All units can also be equipped with optional connectivity and signally modules, in addition to the standard accessories. Thanks to the software packages the Ekip UP⁺ units can be customized and configured according to customer needs.

	Ekip UP⁺ Monitor	Ekip UP⁺ Protect
Measurements & Network analyzer	●	●
Basic Protections	○	●
Power Controller	◍	◍
Generator protections	○	◍
Motor Protections	○	◍
Adaptive Protections	○	◍
Interface Protection System - CEI 0-16	○	◍
Adaptive Load shedding	○	◍

● = As standard
◍ = Optional traditional ordering channels or after via Marketplace
○ = Optional via Marketplace only
Note: the monitor version can be upgraded after via Marketplace and it becomes a Protect version.

METERING

Ekip UP⁺ is more than a measurement unit:

- Power quality Network Analyzer according to IEC61000-4-30 ed. 2 (up to 50th harmonics)
- Fault analysis Datalogger based on events with-two independent memory buffers
- Maximum, minimum and average value registers.

Ekip UP⁺ Accuracy class		
Measure	**Ekip UP unit**	→ with Sensors
Current	0.2	1
Voltage	0.5	0.5
Power	0.5	2
Energy	0.2	2

Advanced communication capabilities are compatible with 8 fieldbus and Ethernet protocol + 1 property bus for easy system integration. Ekip UP⁺ has four slots for plug and play modules to quickly and easily share up to 3000 data with supervision systems, guaranteeing modularity for each application.
Using an optional gateway module, it can be connected to the cloud-platform ABB Ability™ Energy and Asset Manager thanks to a simple architecture able to connect most of the ABB low and medium voltage devices to the energy management web-app.
This follows the technology focus for big data in the commercial and industrial market segments. Ekip UP⁺ is the hub of the plant providing full connectivity and easy integration into any supervision system making every swtichgear smart.

For more information for power quality metering, please refer to the product note for Network Analyzer - 1SDC210106D0201.

Commercial buildings (shopping malls, offices, hospital, stadium)

Multi-site facilities (police stations, campuses & universities, oil stations)

Industry (food & beverage, water & waste treatment, textile, manufatcuring)

Energy efficiency

Save 10% operational costs on electrical distribution through actions based on **energy management** and power quality analysis

Ekip UP⁺ units

PROTECTION
Ekip UP⁺ adds the protection functions above and beyond monitoring and connectivity ones.

Ekip UP⁺ Protect enables protection based on current, voltage, frequency and power as a protective relay for power feeders. Ekip UP⁺ can be accessorized and upgraded with the dedicated software packages.
In this way additional protections and control features can be installed making the Digital Unit suitable to satisfy most of the variegate and challenging applications.

Protection packages:
- Adaptive protections
- Generator protections
- Motor protections
- Interface Protection System - CEI 0-16

Control packages:
- Load Shedding
- Power Controller.

Renewables (solar plant, wind farms, cogenerators)

Marine (ferry boats, vessels, cruise ships)

Industry (oil & gas, gensets...) and utility (water, electrical)

Continuous operations and Safety

Save 10% operational costs on electrical distribution through actions based on **asset management** while increasing plant reliability and **safety protections** in 1 hour

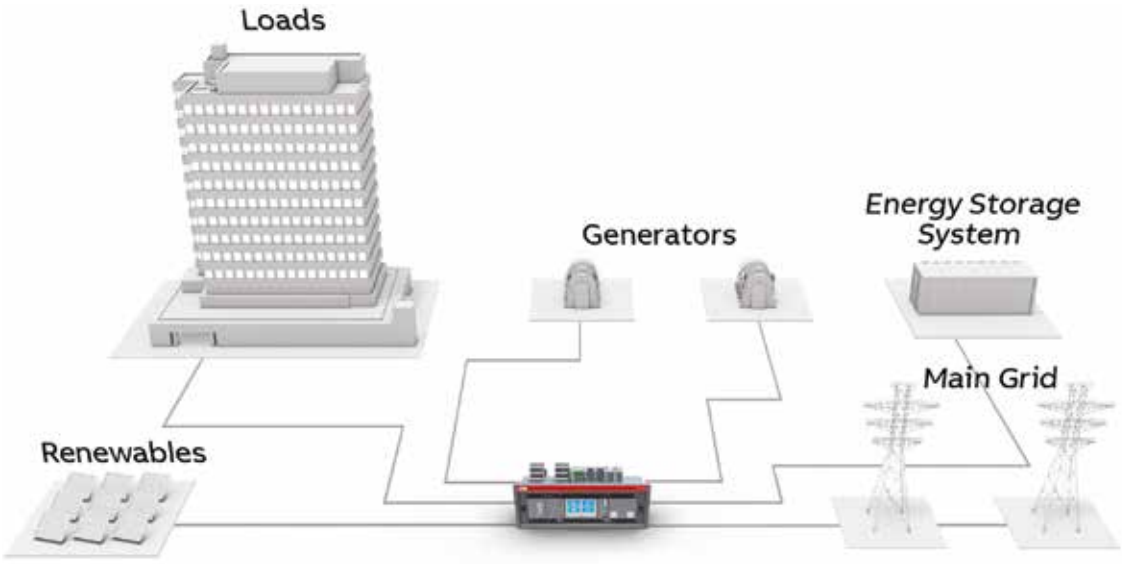
Microgrids (urban and remote communites)

Commercial buildings (Shopping malls, campus, officies)

E-mobility (commercial scale, utility scale)

System solution

Save 20% operational costs on electrical distribution through **power management**



Technical characteristics for measurement functions

Instantaneous measurements		**Parameters**	**Precision class with sensors (1)**
Currents (RMS)	[A]	L1, L2, L3, Ne	1
Earth fault current (RMS)	[A]	Ig	2
Phase-phase voltage (RMS)	[V]	U12, U23, U31	0.5
Phase-neutral voltage (RMS)	[V]	U1, U2, U3	0.5
Phase sequence			
Frequency	[Hz]	f	0.1
Active power	[kW]	P1, P2, P3, Ptot	2
Reactive power	[kVAR]	Q1, Q2, Q3, Qtot	2
Apparent power	[KVA]	S1, S2, S3, Stot	2
Power factor		Total	2
Peak factor		L1, L2, L3, Ne	

Counters recorded from installation or from the last reset		**Parameters**	**Precision Class**
Active energy	[kWh]	Ep total, Ep positive, Ep negative	2
Reactive energy	[kVARh]	Eq total, Ep positive, Ep negative	2
Apparent energy	[KVAh]	Es total	2

Network Analyzer		**Parameters**	**Intervals**
Hourly average voltage value	[V] [no]	Umin= 0.75…0.95 x Un Umax= 1.05…1.25 x Un Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)	t = 5…120min
Short voltage interruptions	[no]	Umin= 0.10…0.95 x Un Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)	t <40ms
Short voltage spikes	[no]	Umax= 1.05…1.25 x Un Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)	t <40ms
Slow voltage sags and swells	[no]	Umin1= 0,10…0,95 x Un Umin2= 0,10…0,95 x Un Umin3= 0,10…0,95 x Un Umax1= 1.05…1.25 x Un Umax2= 1.05…1.25 x Un Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)	t = 0.04s…60s
Voltage unbalance	[V] [no]	U neg. seq.= 0.02…0.10 x Un Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)	t = 5…120min
Harmonic analysis		Current and Voltage up to 50° Alarm THD: 5…20% Single harmonic alarm: 3…10% plus a count of minutes the harmonic has been exceeded	

(1) With Type C current sensors based on installation conditions mentioned in the dedicated manual, doc 1SDH002003A1001 and in case of VT used cl. 0.2 or below.

Record of values: of the parameter for each interval with time-stamping		Parameters	Window	Intervals
Current: minimum and maximum	[A]	Min, I Max	Fixed synchronizable by remote	Duration: 5...120min Number of intervals: 24
Phase-phase voltage: minimum and maximum	[V]	U Min, U max		
Reactive power: average and maximum	[kVAR]	Q Mean, Q Max		
Apparent power: average and maximum	[KVA]	S Mean, S Max		

Data logger: record of high sampling rate parameters		Parameters
Currents	[A]	L1, L2, L3, Ne, Ig
Voltages	[V]	U12, U23, U31
Active power: average and maximum	[kW]	P Mean, P Max
Sampling rate	[Hz]	1200-2400-4800-9600
Maximum recording duration	[s]	16
Recording stop delay	[s]	0-10s
Number of registers	[no]	2 independent

Information on trip and opening data:		Parameters
Type of protection tripped [1]		eg. L, S, I, G, UV, OV
Fault values per phase [1]	[A/V/Hz w/VAR]	eg. I1, I2, I3, neutral for S protection V12, V23, V32 for UV protection
Time-stamping		Date, time and progressive number

Maintenance indicators		Parameters
Information on last 30 trips [1]		Type of protection, fault values and time-stamping
Information on last 200 events		Type of event, time-stamping
Number of mechanical operations	[no]	Can be associated to alarm
Total number of trips [1]	[no]	
Total operating time	[h]	
Date of maintenance operations performed		Last
Indication of maintenance operation needed		
Unit I.D.		Type of unit, assigned device name, serial number

Self-diagnosis	Parameters	
Check of continuity of internal connnections	Alarm due to disconnection: rating plug, sensors, trip coil	Note: Opening of switching device can be set in the event of alarm
Failure of circuit-breaker to open (ANSI 50BF) [1]	Alarm following non-tripping of protection functions	
Temperature (OT)	Prealarm and alarm for abnormal temperature	

(1) for Protect only

Technical characteristics for protection functions

ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time
L	49	Overload Protection	I1 = 0.4…1 x In	0.001 x In	with I = 3 I1, t1 = 3...144 s
		Thermal Memory			
		Tolerance	Trip between 1.05 and 1.2 x I1		± 10% I ≤ 6 x In ± 20% I > 6 x In
	49	Overload Protection	I1 = 0.4…1 x In	0.001 x In	with I = 3 I1, t1 = 3...144 s Standard inverse SI: k=0.14 •α=0.02 Very Inverse VI: k=13.5 α=1 Extremely Inverse EI: k=80 α=2 t=k/I4: k=80 α=4
		Tolerance	Trip between 1.05 e 1.2 x I1		± 10% I ≤ 6 x In ± 20% I > 6 x In
S	50TD	Time-delayed overcurrent protection	I2 = 0.6...10 x In	0.1 x In	with I > I2, t2 = 0.05...0.8s
	68	Zone selectivity			t2sel = 0.04…0.2s
		Start up	Activation: 0.6…10 x In	0.1 x In	Range: 0.1…30s
		Tolerance	± 7% I ≤ 6 x In ± 10% I > 6 x In		The better of the two data: ± 10% o ± 40 ms
	51	Time-delayed overcurrent protection	I2 = 0.6...10 x In	0.1 x In	with I = 10 In, t2 = 0.05...0.8s
		Thermal Memory			
		Tolerance	± 7% I ≤ 6 x In ± 10% I > 6 x In		± 15% I ≤ 6 x In ± 20% I > 6 x In
I	50	Istantaneous overcurrent protection	I3= 1.5...15 x In	0.1 x In	with I> I3 Instantaneous
		Start up	Activation: 1.5…15 x In	0.1 x In	Range: 0.1…30s
		Tolerance	± 10%		≤ 30 ms
G	50N TD	Earth fault protection	I4 = 0.1...1 x In	0.001 x In	with I > I4 t4 = Istantaneous (with vaux) + 0.1…1s
	68	Zone selectivity			t4sel = 0.04…0.2s
		Start up	Activation: 0.2…1 x In	0.02 x In	range: 0.1…30s
		Tolerance	± 7%		The better of the two data: ± 10% o ± 40 ms or 50 ms with t4=Istantaneous
	51N	Earth fault protection	I4 = 0.1...1 x In	0.001 x In	with I = 4 In, t4 = 0.1…1s
		Tolerance	± 7%		± 15%
IU	46	Current unbalance protection	I6= 2…90% In unbalance	1%In	with unbalance > I6 t6 = 0.5…60s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
2I	50	Programmable Istantaneous overcurrent protection	I31= 1.5…….15 xIn	0,1 x In	with I> I31, Instantaneous
		Tolerance	± 10%		≤ 30 ms
MCR		Closing on short-circuit protection	I3= 1.5...15 x In	0,1 x In	with I> I3 Instantaneous Monitor time Range: 40…500ms
		Tolerance	± 10%		≤ 30 ms

Time Step	Excludibility	Excludibility trip	Blocks	Pre-allarm	Trip curve	Monitor	Protect
1s	yes	no	no	50...90% I1 step 1%	$t = k / I^2$		●
	yes						●
1s	yes	no	no	50...90% I1 step 1%	$t = \frac{kxt1}{\left(\frac{If}{I1}\right)^{\alpha}-1}$		●
0.01s	yes	yes	yes	no	t = k		●
0.01s	yes						●
0.01s	yes						●
0.01s	yes	yes	yes	no	$t = k / I^2$		●
	yes						●
-	yes	no	yes	no	t = k		●
0.01s	yes						●
0.05s	yes	yes	yes	50.....90% I4 step 1%	t = k		●
0.01s	yes						●
0.01s	yes						●
0.05s	yes	yes		50.....90% I4 step 1%	$t = k / I^2$		●
0.5s	yes	yes	no	no	t = k		●
	yes	no	no		t = k		●
0.01s	yes	no	yes	no	t = k		●

Technical characteristics for protection functions

ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time
Gext	50G TD	Earth fault protection	I41[1] = 0.1...1 x In Toroid	0.001 x In Toroid	with I > I41, t41 = 0.1…1s
	68	Zone selectivity			t41sel = 0.04…0.2s
		Start up	Activation: 0.1…1 x In	0.02 x In	range: 0.1…30s
		Tolerance	± 7%		The better of the two data: ± 10% o ± 40 ms
	51G	Earth fault protection	I41[1] = 0.1...1 x In	0.001 x In	with I = 4 In, t41 = 0.1…1s
		Tolerance	± 7%		± 15%
Rc	64 50N TD 87N	Residual current protection Differential ground fault protection	IΔn= 3 - 5 - 7 - 10 - 20 - 30A		with I > IΔn tΔn = 0.06 - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.8s
		Tolerance	- 20% ÷ 0%		140ms@0.06s (maximum trip time) 950ms@0.80s (maximum trip time)
LC1/2 Iw1/2		Current threshold LC	LC1=50%...100% I1 LC2=50%...100% I1	1% 1%	
		Current threshold Iw	Iw1= 0.1…10 In Activation Iw1: Up/Down Iw2= 0.1…10 In Activation Iw2: Up/Down	0.01 x In 0.01 x In	
		Tolerance	± 10%		
UV	27	Undervoltage Protection	U8= 0.5….0.98 x Un	0.001 x Un	with U < U8, t8 = 0.05…120s
		Tolerance	± 2%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
OV	59	Overvoltage protection	U9= 1.02….1.5 x Un	0.001 x Un	with U > U9 t9 = 0.05…120s
		Tolerance	± 2%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
VU	47	Voltage unbalance protection	U14= 2…90% Un unbalance	1%Un	with unbalance > U14, t14 = 0.5…60s
		Tolerance	± 5%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
UF	81L	Underfrequency protection	f12= 0.9….0.999 x fn	0.001 x fn	with f < f12 t12 = 0.15…300s
		Tolerance	± 1% (with fn ± 2%)		The better of the two data: ± 10 % (min = 30ms) o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
OF	81H	Overfrequency protection	f13= 1.001….1.1 x fn	0.001 x fn	with f > f13, t18 = 0.15…300s
		Tolerance	± 1% (with fn ± 2%)		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
RP	32R	Reverse active power protection	P11= -1…-0.05 Sn	0.001 Sn	P > P11, t11 = 0.5…100s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
Cyclical direction	47	Cyclical direction of the phases	1-2-3 o 3-2-1		
Power factor	78	3phase Power factor	PF3= 0.5…0.95	0.01	
S2	50TD	Time-delayed overcurrent protection	I5 = 0.6...10 x In	0.1 x In	with I > I5, t5 = 0.05...0.8s
	68	Zone selectivity			t5sel = 0.04…0.2s
		Start up	Activation: 0.6…10 x In	0.1 x In	Range: 0.1…30s
		Tolerance	± 7% I ≤ 6 x In ± 10% I > 6 x In		The better of the two data: ± 10% o ± 40 ms

Time Step	Excludibility	Excludibility trip	Blocks	Pre-allarm	Trip curve	Monitor	Protect
0.05s	yes	yes	yes	50.....90% I41 step 1%	t = k		●
0.01s							
0.01s	yes						●
0.05s	yes	yes	yes	50.....90% I41 step 1%	t = k / I^2		●
	Attivabile with rating plug Rc	no		no	t = k		●
	yes	only signalling	no	no	-		●
	yes	only signalling	no	no	-		●
0.01s	yes	yes	yes	no	t = k		●
0.01s	yes	yes	yes	no	t = k		●
0.5s	yes	yes	yes	no	t = k		●
0.01s	yes	yes	yes	no	t = k		●
0.01s	yes	yes	yes	no	t = k		●
0.1s	yes	yes	yes	no	t = k		●
	yes	only signalling	no	no	-		●
	yes	only signalling	no	no	-		●
0.01s	yes	yes	yes	no	t = k		●
0.01s	yes						●
0.01s	yes						●

Technical characteristics for protection functions

ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time
D	67	Directional overcurrent protection (Forward & backward)	I7 = 0.6...10 x In	0.1 x In	with I > I7, t7 = 0.1...0.8s
	68	Zone selectivity			t7sel = 0.1…0.8s
		Start up (Forward & backward)	Activation: 0.6…10 x In	0.1 x In	range: 0.1…30s
		Trip direction	Forward or/& backward		
		Minimun angle direction	3.6, 7.2, 10.8, 14.5, 18.2, 22, 25.9, 30, 34.2, 38.7, 43.4, 48.6, 54.3, 61, 69.6 (°)		
		Tolerance	± 7% I ≤ 6 x In ± 10% I > 6 x In		The better of the two data: ± 10% o ± 40 ms
UV2	27	Undervoltage Protection	U15 = 0.5….0.98 x Un	0.001 x Un	with U < U15, t15 = 0.05…120s
		Tolerance	± 2%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
OV2	59	Overvoltage protection	U16 = 1.02….1.5 x Un	0.001 x Un	with U > U16, t16 = 0.05…120s
		Tolerance	± 2%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
UF2	81L	Underfrequency protection	f17 = 0.9….0.999 x fn	0.001 x fn	with f < f17, t17 = 0.15…300s
		Tolerance	± 1% (with fn ± 2%)		The better of the two data: ± 10 % (min=30ms) o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
OF2	81H	Overfrequency protection	f18 = 1.001….1.1 x fn	0.001 x fn	with f > f18, t18 = 0.15…300s
		Tolerance	± 1% (with fn ± 2%)		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
S(V)	51V	Voltage controlled overcurrent protection	I20 = 0.6...10 x In	0.1 x In	with I > I20, t20 = 0.05…30s
		Step Mode	Ul= 0.2…1 x Un	0.01 x Un	
			Ks= 0.1…1	0.01	
		Linear Mode	Ul= 0.2…1 x Un	0.01 x Un	
			Uh= 0.2…1 x Un	0.01 x Un	
			Ks= 0.1…1	0.01	
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
RV	59N	Residual overvoltage protection	U22 = 0.05….0.5 x Un	0.001 x Un	with U > U22, t22 = 0.05…120s
		Tolerance	± 5%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
OP	32OF	Active overpower protection	P26 = 0.4…2 Sn	0.001 Sn	P > P26, t26 = 0.5…100s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
OQ	32OF	Reactive overpower protection	Q27 = 0.4…2 Sn	0.001 Sn	Q > Q27, t27 = 0.5…100s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)
UP	32LF	Active underpower protection	P23 = 0.1...1 x Sn	0.001 x Sn	with P < P23 t23 = 0.5…100s
		Start up			range: 0.1…30s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)

(1) available with SW package: generator protections

Time Step	Excludibility	Excludibility trip	Blocks	Pre-allarm	Trip curve	Monitor	Protect
0.01s	yes	yes	yes	no	t = k		●
0.01s	yes		yes				●
0.01s	yes						●
							●
							●
0.01s	yes	yes	yes	no	t = k		●
0.01s	yes	yes	yes	no	t = k		●
0.01s	yes	yes	yes	no	t = k		●
0.01s	yes	yes	yes	no	t = k		●
0.01s	yes	yes	yes	no	t = k		●[1)]
							●[1)]
							●[1)]
0.01s	yes	yes	yes	no	t = k		●
0.5s	yes	yes	yes	no	t = k		●[1)]
0.5s	yes	yes	yes	no	t = k		●[1)]
0.5s	yes	yes	yes	no	t = k		●[1)]
0.01s	yes						

Technical characteristics for protection functions

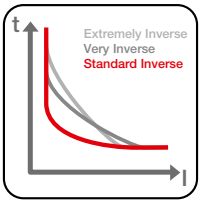
ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time	
RQ	40/32R	Loss of field or reverse reactive power protection	Q24 = -1…-0.1 Sn	0.001 Sn	Q > Q24, t24 = 0.5…100s	
			Kq = -2…2	0.01		
		Loss of field or reverse reactive power protection	Q25 = -1…-0.1 Sn	0.001 Sn	Q > Q25	
			Kq2 = -2…2	0.01		
		Voltage minimum threshold	Vmin = 0.5….1.2	0.01		
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
		Secondary voltage	100……..120	100. 110. 115. 120		
		Tolerance	± 10%			
S2(V)	51V	Voltage controlled overcurrent protection	I21 = 0.6…10 x In	0.1 x In	with I > I21 t21 = 0.05…30s	
		Step Mode	UI2 = 0.2…1 x Un	0.01 x Un		
			Ks2 = 0.1…1	0.01		
		Linear Mode	UI2 = 0.2…1 x Un	0.01 x Un		
			Uh2 = 0.2…1 x Un	0.01 x Un		
			Ks2 = 0.1…1	0.01		
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
ROCOF	81R	Rate of change of frequency protection	f28 = 0.4….10 Hz/s	0.2 Hz/s	with f > f28, t28 = 0.5…10s	
		Trip direction	Up or down up&down			
		Tolerance	± 5%		The better of the two data: ± 20% o ± 200 ms	
L (Motor Protection)	49	Motor protection overload	I1 = 0.4…1 x In	0.001 x In	5E - 10E - 20E	
		According 60947-4-1			5E - 10E - 20E - 30E	
R	51R	Rotor blockage - Jam	Ij = 2…10 x I1	0.1	tj = 1…10 s	0.5 s
	51R	Rotor blockage - Stall	Is = 1…10 x I1	0.1	ts = 2…10 s	0.5 s
U		Phase lackand/or unbalance	On/Off	-	tu = 1…10 s	0.5 s
Uc	37	Undercurrent	50…90% x I1	10%	tuc = 1…20 s	0.5 s
Synchro-check SC	25	Synchrocheck (Live busbars)	Ulive = 0.5…1.1 Un ΔU = 0.02…0.12 Un Δf = 0.1…1Hz Δφ = 5…50° elt	0.001 Un 0.001 Un 0.1Hz 5° elt	Stability voltage time for live state = 100…30000s minimum matching Time= 100…3000s	
		Tolerance	± 10%			
		Synchrocheck (Live,Dead busbars)	Ulive = 0.5…1.1 Un Udead=0.02…0.2 Un	0.001 Un 0.001 Un	tref= 0.1…30s	
		Frequency check off				
		Fase check off				
		Dead bar configuration	Reversed/standard			
		Primary voltage	100……..1150	100. 115. 120. 190. 208. 220. 230. 240. 277. 347. 380. 400. 415.440. 480. 500. 550. 600. 660. 690. 910. 950. 1000. 1150		
		Secondary voltage	100……..120	100. 110. 115. 120		
		Tolerance	± 10%			
Lock out relay	86	With external dedicated auxiliary relay, like Arteche type BJ-8-125VDC or equivalent				

(1) available with SW package: generator protections
(2) available with SW package: motor protections
(3) available with synchrocheck module

Time Step	Excludibility	Excludibility trip	Blocks	Pre-allarm	Trip curve	Monitor	Protect
0.1s	yes	yes	yes	no	t = k		● 1)
0.5s	yes	yes		no	t = k		● 1)
	yes						
0.01s	yes	yes	yes	no	t = k		● 1)
							● 1)
							● 1)
0.01s	yes	yes	yes	no	t = k		● 1)
					$t = k/I^2$		● 2)
0.5 s					t = k		● 2)
0.5 s					t = k		● 2)
0.5 s					t = k		● 2)
0.5 s					t = k		● 2)
1s	yes	only signalling	no	no	-		● 3)
10							
0.1s	yes	only signalling		no	-		
	yes						
	yes						
	yes						

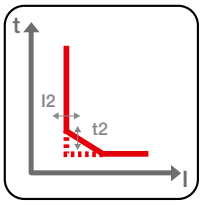
Description of protection functions

Ekip UP⁺ offers current, voltage and power based protection functions. These functions can be set with a few simple steps directly from the wide touchscreen display or using Ekip Connect commissioning software. All the protections can be excluded if necessary. Information on trip and opening data as well as maintenance indicators are available through the Ekip UP⁺ memory.

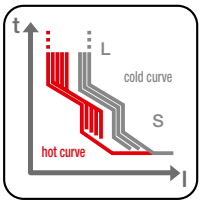


Overload (L - ANSI 49): available with three different types of trip curve:
1. $t = k/I^2$ with inverse long time;
2. IDMT in accordance with the Standard IEC 60255-151 for coordination with medium voltage protection, which are available according to the Standard Inverse (SI), Very Inverse (VI) and Extremely Inverse (EI) curves;
3. with $t = k/I^4$ curve for better coordination with upstream switching devices or with fuses.

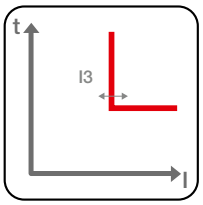
The thresholds can be fine tuned. There are adjustable pre-alarm indicators to provide notification prior a protection reaching the threshold and tripping the unit. All timing settings can also be adjusted, directly from the display.



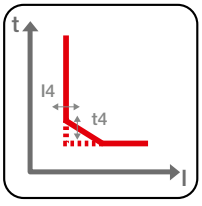
Time-delayed overcurrent (S - ANSI 51 & 50TD): with constant tripping time (t = k), or with constant specific let-through energy ($t = k/I_2$), this provides 15 current thresholds and 8 curves, for fine adjustment.



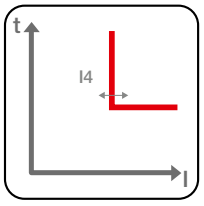
Thermal memory: for protections L and S it is used to protect the components, such as transformers, against overheating following overloads. The protection adjusts the trip time of the protection according to how much time has elapsed after the first overload, taking account of the overheating caused.



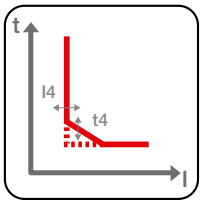
Instantaneous overcurrent (I - ANSI 50): with trip curve without intentional delay, it offers 15 tripping thresholds.
Closing on short-circuit (MCR): the protection uses the same algorithm as the protection I, limiting operation to a settable time window from the closing of the switching device. The protection can be disabled, also alternatively to protection I.
The function is active with an auxiliary supply.



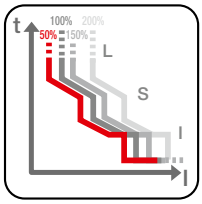
Earth fault (G - ANSI 51N & 50NTD): with trip time independent of the current (t = k) or with constant specific let-through energy ($t = k/I^2$). A pre-alarm indication is also available when 90% of the threshold is reached to activate corrective measures before the protection is tripped. The function also enables the trip to be excluded so that only the alarm is indicated, for use in installations where continuity of service is an essential requirement.



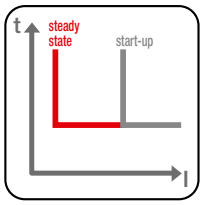
Instantaneous Earth Fault (G-ANSI 50N): with trip curve without instantaneous delay.



Earth fault on toroid (G ext - ANSI 51G & 50GTD): with trip time independent of the current (t = k) or with constant specific let-through energy (t = k/I²). Pre-alarm that 90% threshold has been reached permits the fault to be reported to supervision systems without interruption of continuity. The protection uses the external toroid installed, for example, on the star center of the transformer, and is an alternative to the G and Rc functions. The function is active with an auxiliary supply.

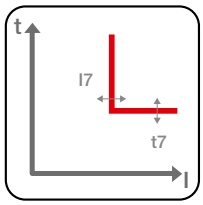


Neutral protection: available at 50%, 100%, 150% or 200% of the phase currents, or disabled, it is applied to the overcurrent protections L, S and I.

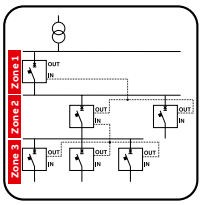


Start-up function: enables protections S, I and G to operate with higher trip thresholds during the starting phase, avoiding untimely trips due to high inrush currents of certain loads (motors, transformers, lamps). The starting phase lasts 100 ms to 30 s and is recognized automatically by the trip unit:

- at the closing of the switching device with a self-supplied trip unit;
- when the peak value of the maximum current exceeds the set threshold (0.1…10 x In) with an externally supplied trip unit; a new start-up is possible after the current falls below the threshold.



Current unbalance (IU – ANSI 46): with constant trip time (t = k), protects from an unbalance between the currents of the single phases protected by the switching device.



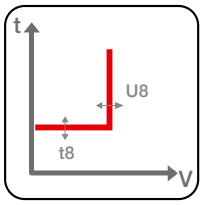
Zone selectivity for S and G protection (ANSI 68): can be used to minimize circuit- breaker trip times closer to the fault. The protection is provided by connecting all the zone selectivity outputs of the trip units belonging to the same zone and taking this signal to the trip unit input that is immediately upstream.
Each switching device that detects a fault reports it to the switching device upstream; the circuit-breaker thus detects the fault but does not receive any communication from those downstream and opens without waiting for the set delay to elapse. It is possible to enable zone selectivity if the fixed-time curve has been selected and the auxiliary supply is present.

Current thresholds: this function enables four independent thresholds to be indicated in order to enable corrective action implementation before the overload L protection trips the switching device. For example, by disconnecting loads located downstream of the switching device that are controlled by Ekip Signalling.

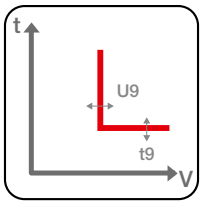
Description of protection functions

Protection functions with Ekip Measuring
Ekip UP⁺ protection functions can be further increased thanks to the embedded Ekip Measuring module. With this module, all the protection functions linked to voltage, frequency and power can be enabled, thus making Ekip UP⁺ a complete protection unit that can measure, control and protect even the most complex installation.
A different operating mode can be chosen for each protection function:
1. Active: protection enabled by opening of the circuit- breaker when the threshold is reached;
2. Only alarm: protection active, with only alarm indication when the threshold is reached;
3. Deactivated: protection disabled.

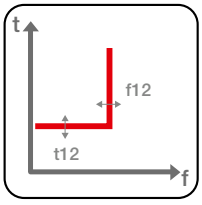
Furthermore, when the voltage and frequency protections are activated, they indicate an alarm status even when the switching device is open so that a fault can be identified before the switching device closes.



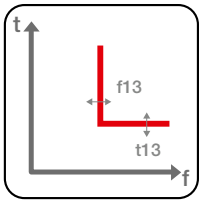
Undervoltage (UV - ANSI 27): with constant trip time (t = k), function is tripped when phase voltage falls below set threshold.



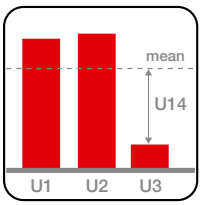
Overvoltage (OV - ANSI 59): with constant trip time (t = k), function is tripped when phase voltage exceeds the set threshold.



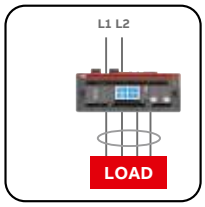
Underfrequency (UF - ANSI 81L): with constant trip time (t = k), function is tripped when network frequency falls below set threshold.



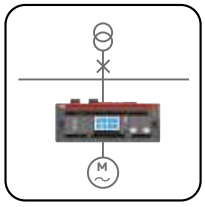
Overfrequency (OF - ANSI 81H): with constant trip time (t = k), function is tripped when network frequency exceeds the set threshold.



Voltage unbalance (VU – ANSI 47): with constant trip time (t = k), protects against an unbalance between the voltages of the individual phases that are protected by the circuit- breaker.

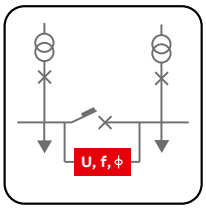


Residual current (Rc – ANSI 64 & 50NDT): with constant temperature (t=k) protects against indirect contacts and is integrated into Ekip UP⁺ Protect by a dedicated residual current rating plug and external toroid. The protection is an alternative to the functions G and Gext and it is activated by dedicated rating plugs.



Reverse active power (RP - ANSI 32R): with constant trip time (t = k), function is tripped when total active power – in the opposite direction of the current - exceeds the set threshold.

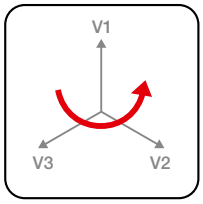
In addition to the protection functions, the following indication and control functions are available to warn the user that a given condition has been reached. The active indications are always shown on the display and are also available by communication on the system bus (with Ekip Com modules) or electrical indication (with Ekip Signalling modules).



Synchrocheck (SC - ANSI 25): the synchronism control function compares the voltages in the modules as well as the frequencies and phases of two switching devices to which the switching device is connected. Ekip UP⁺ indicates that conditions have been reached also with display synchronism indicators that enable the two lines to be made parallel.
The function is available with two work modes:

- In systems with both busbars supplied, where synchronism is determined by:
  1. voltage of the two half-busbars above the Ulive threshold for the set time
  2. difference of the module of the two voltages below the threshold ΔU
  3. difference in the frequency of the two voltages below the threshold Δf
  4. difference in the phase of the two voltages below the threshold Δ
  5. desirable time for synchronism condition tsyn
  6. switching device open
- In systems with an out-of-service line (dead busbar), where the synchronism condition is determined by the concurrence of the following conditions for the tref set time:
  1. voltage of the active half-busbar above threshold Ulive
  2. voltage of the dead half-busbar below threshold Udead
  3. switching device open

In both cases, synchronism consent is withdrawn when one of the above conditions is missing and it has not been less than 200ms from the change of the circuit- breaker condition (when the relationship has been set).
The indication of reached synchronism is available directly as an electrical indication via a contact that is always supplied with the module. The function can be activated simply by connecting the Ekip Synchrocheck module to Ekip UP⁺ Protect.

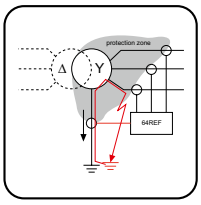


Cyclical direction of the phases (ANSI 47): indicates an alarm through inversion of the phases sequence.

Power factor (ANSI 78): available with a three-phase threshold, warns when the system operates with a power factor that is less than the set power factor.

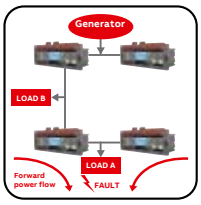
Description of protection functions

Second time-delayed overcurrent protection (S2 – ANSI 50TD): in addition to the standard protection S, a second (excludable) time-constant protection is available that enables two independent thresholds to be set in order to ensure precise selectivity, especially in highly critical conditions.



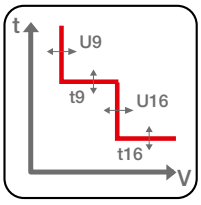
Second protection against earth fault (ANSI 50GTD/51G & 64REF): with Ekip UP⁺ Protect the user can choose the implementation of the protection G by own current sensors (calculating the vector sum of the currents). Also Ekip Up⁺ Protect offers the simultaneous management of both configurations by two independent earth fault protection curves. Owing to this characteristic, the trip unit is able to distinguish a non-restricted earth fault and then activate the opening of low voltage switching device, from a restricted earth fault, and to thus command the opening of the medium voltage switching device. Another possible configuration is with the residual current protection replacing the Gext protection, whilst the G protection remains active. The residual current protection is activated in the presence of the residual current rating-plug and of the toroid.

Directional overcurrent (D – ANSI 67): the protection is able to recognize the direction of the current during the fault period and thus detect if the fault is upstream or downstream of the circuit-breaker. The protection, with fixed time trip curve (t=k), intervenes with two different time delays (t7bw and t7fw), according to the current direction. In ring distribution systems, this enables the distribution portion to be identified in which the fault occurred and to disconnect it while maintaining the operation of the rest of the installation.

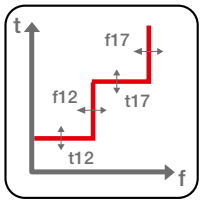


Zone selectivity for protection D (ANSI 68): enables the possibility to interconnect switching devices so that, in the event of a fault, the fault area can be rapidly isolated. Disconnection only occurs at the level close to the fault and operation to the rest of the operation continues uninterrupted. The function is particularly useful in ring and grid installations where, in addition to the zone, it is also essential to define the flow direction of the power that supplies the fault. It is possible to enable directional zone selectivity alternatively to the zone selectivity of the protections S and G, and in the presence of an auxiliary supply.

Start-up function for protection D: enables higher trip thresholds to be set at the outgoing point, as available for protections S, I and G.



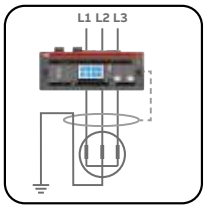
Second protection against undervoltage and overvoltage (UV2 and OV2 – ANSI 27 and 59): enables two minimum and maximum voltage thresholds to be set with different delays in order to be able to discriminate, for example, between voltage dip transients due to the start-up of a motor and an actual fault.



Second protection against underfrequency and overfrequency (UF2 and OF2 – ANSI 81L and 87H): enables two minimum and maximum frequency thresholds to be set simultaneously. For example, only an alarm can be set to be tripped when the first threshold is reached, and the switching device can be set to be opened when the second threshold is reached.

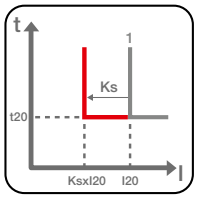
Dual setting of protections: Ekip UP⁺ Protect can store a set of alternative parameters for all protections. This second series (set B) can replace, if necessary, the default series (set A) by an external command. The command can be given when the network configuration is edited, for example when an emergency source is activated in the system, changing the load capacity and the short-circuit levels. Another typical application is protecting the operator opposite the switchgear against the electric arc. In this case, protection delays are minimized to safeguard the operator (Set A), whereas in the absence of an operator the protections are set to ensure selectivity with the switching devices downstream (Set B). It is possible to activate series B by:

- Digital input available with an Ekip Signalling module;
- Communication network, by means of one of the Ekip Com communication modules;
- Directly from the Ekip UP⁺ display;
- By a settable internal time, after the circuit-breaker has closed.

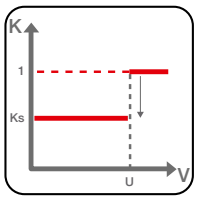


Differential ground fault (Rc - ANSI 87N): protects against internal earth fault on generator winding. It is required that the toroid hugs the active conductors and the ground conductor. Rc protection is integrated by a dedicated residual current rating plug and the external toroid.

The specific functions for generator protections are described below. For each of these it is possible to choose the operating mode: active, only alarm or deactivated. All the voltage and frequency protections also operate when the circuit- breaker is open, enabling the fault to be identified before the closing of the switching device.

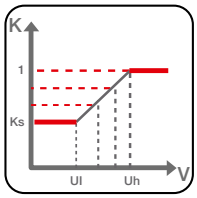


Voltage controlled overcurrent protection (S(V) - ANSI 51V): protection from maximum current with a constant trip time (t = k) that is sensitive to the voltage value. The set current threshold, following a voltage drop, decreases by steps or linearly.

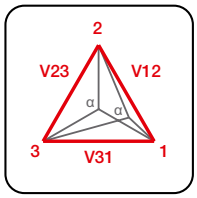


In step mode (controlled mode) the protection is tripped at the set threshold (I20) if the voltage is above U, whereas it is tripped at the lower threshold of the factor Ks (I20 * Ks) if the voltage is below U.

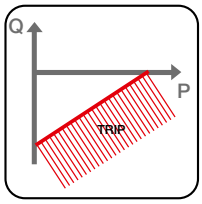
Description of protection functions



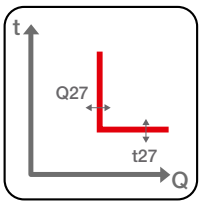
On the other hand, in linear mode (restrained mode) two voltage limits are selected within which the protection is tripped at the set threshold (I20) reduced by the factor K corresponding to the measured voltage. The variation of the factor K is proportional to the voltage, and for voltages greater than the upper threshold (Uh) the threshold I20 works, whereas for voltages below the lower threshold (Ul) the minimum threshold (I20 * Ks) applies.



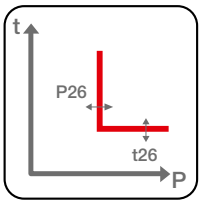
Residual overvoltage (RV – ANSI 59N): with constant trip time (t = k), protects against insulation loss in systems with insulated neutral or with neutral earthed with impedance.



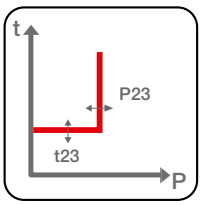
Loss of field or reverse reactive power (RQ – ANSI 40 or 32RQ): with constant trip time (t = k), the switching device tripped when the total reactive power absorbed by the generator exceeds the set threshold. It is possible to select the constant threshold (k=0) or a function of the delivered active power of the generator (k≠0).



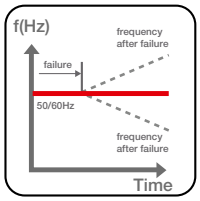
Reactive overpower (OQ – ANSI 32OF): with constant trip time (t = k), the function is tripped when reactive power exceeds the set threshold in the generator to network direction.



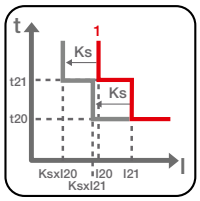
Active overpower (OP – ANSI 32OF): with constant trip time (t = k), the function is tripped when the active power exceeds the threshold set in the delivering direction of the generator.



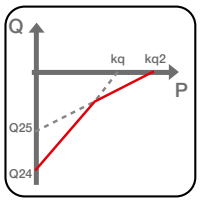
Active underpower (UP – ANSI 32LF): with constant trip time (t = k), the function is tripped when the active power delivered by the generator is lower than the set threshold. It is possible to disable the protection temporarily, to manage the start-up phase, by setting a time window from the closing of the switching device, by using an electrical signal or via incoming communication to a relay.



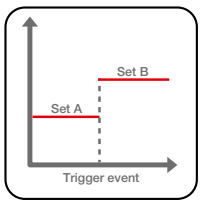
Rate of change of frequency (ROCOF – ANSI 81R): enables both positive and negative frequency variations to be rapidly detected . The protection is constant and is tripped when the frequency variation in Hz/s is greater than the set threshold.



Second protection against voltage controlled overcurrent protection (S2(V) - ANSI 51V): available in addition to the protection S(V), enables total selectivity to be achieved in all installations.



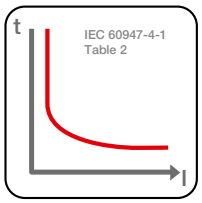
Second protection against loss of field or reverse reactive power (RQ – ANSI 40 or 32R): enables the generator's de-energization curve to be followed very accurately, thereby avoiding any unnecessary disconnection.



Adaptive protection: dual setting of protections (Set A-B)
Ekip UP⁺ can store a set of alternative parameters (set B) for all protections. This second set can replace the default series (set A) with an external control. A typical application for dual settings may be when an emergency source is activated in the system, causing a change of load capacity and short-circuit levels, and in cases of switchgear maintenance to protect the operator against electric arcs (the minimum trip delays of set B guarantee safety for the operator).
It is possible to activate series B by:

- Digital input, available with an Ekip Signalling module;
- Communication network, by means of one of the Ekip Com communication modules;
- Directly from the display;
- Using a settable internal time, after the circuit-breaker has closed.

Description of protection functions

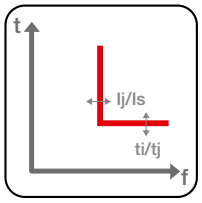


L Motor protection overload in compliance with Standard IEC 60947-4-1 Table 2

The L function protects the motor against overloads in accordance with the indications and classes defined by Standard IEC 60947-4-1 and the Table 2. The trip time is established by choosing the appropriate trip class, which depends on the motor that must be protected. In addition to this protection, the thermal memory function (implemented in accordance with Standard IEC60255-8 and the above-mentioned Standard) is permanently activated. After tripping the thermal memory is active for a time that depends on the trip class selected (see table).

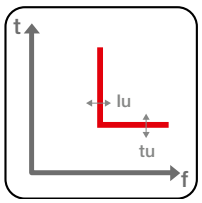
The protection unit will trip faster than the time established for a cold fault condition if a new overload occurs before the thermal memory automatically resets (hot trip condition). The protection has a “start-up” stage from the moment the current exceeds 0.25xIn to the moment the minimum time of the selected trip class is reached.

TRIP CLASS	CLASS MIN	CLASS MAX	TMEM RESETTING TIME
5E	3s	5s	5 min
10E	5s	10s	10 min
20E	10s	20s	20 min
30E	20s	30s	33 min



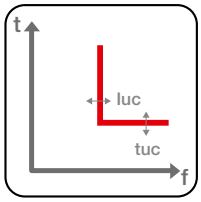
R Protection against rotor blockage

This protects the motor in two different ways, depending on whether the fault occurs on startup or during normal operation. The behavior in the two operating conditions is defined by the Standard IEC 947-4-1 in Annex 2. In the first case (Jam), the operation of the R function protects the motor against rotor jamming during normal operation. The R (Jam) protection function works in conjunction with the L protection to ensure that the motor start-up phase is completed. The R (Jam) protection is inhibited during the start-up phase for the same time as the minimum time in the selected overload protection trip class. Once this time has elapsed, the R protection is activated and causes the circuit-breaker to trip if the current remains above the current threshold setting (I5) for longer than the time (t5) setting of the protection. In the second case (Stall), the protection is designed to operate to protect the motor against rotor jamming upon start-up. If activated, the R (Stall) protection is not inhibited during start-up and causes the circuit-breaker to open if the current remains above the current threshold setting (I8) for longer than the time setting (t8) of that protection. The protection has a “start-up” stage from the moment the current exceeds 0.25xIn to the moment the minimum time of the selected trip class is reached.

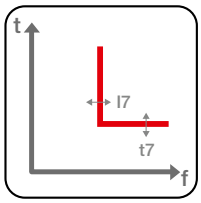


U Protection against phase loss and/or unbalance

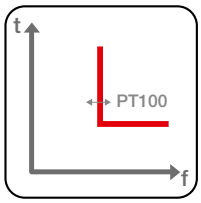
This can be implemented when the motor must be promptly protected owing to the absence of a phase. The protection trips if the r.m.s. value of at least one of the phase currents drops below the level equal to 0.1 times the rated current of the trip unit and a second phase exceeds 0.25 times the rated current. The circuit-breaker is opened if the current value fails to rise above this level within 2 sec. During start-up, the tripping time of the protection is the lowest value between 2 sec or half the minimum time of the start-up class. The protection has a “start-up” stage starting from the moment the current exceeds 0.25xIn to the moment the minimum time of the selected trip class is reached.



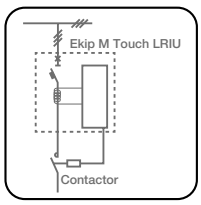
Uc Undercurrent protection
This function protects the motor from operating in conditions where the load is reduced or null.
The circuit-breaker is opened if all the phases remain below the threshold setting I9 for delay-time t9.
The protection has a “start-up” stage from the moment the current exceeds 0.25xIn to the moment the minimum time of the selected trip class is reached.



IU Protection against phase unbalance
This unit is used when a motor needs to be protected against differences in the currents circulating in the phases. Threshold setting I7 defines the maximum level of difference between each phase and the mean value of the three phases. If a phase differs more than its set level from the mean value, the protection opens the circuit-breaker once its time-delay setting (t7) has elapsed. The protection is activated only if all three phase currents exceed 0.25xI1. During the start-up phase, the tripping time is the lowest value between t7 or half the minimum time of the start-up class. The protection has a “start-up” stage from the moment the current exceeds 0.25xIn to when the minimum time of the selected trip class is reached.



PTC Temperature protection
In its initial configuration, this trip unit is set up to receive an incoming signal from a PTC sensor installed on the motor. The operating thresholds of the protection are defined in accordance with the Standard IEC 60947-8. If the threshold is exceeded, the trip unit opens the circuit-breaker after a 1 sec time-delay.



Ekip CI Contactor Interface for motor protection
The breaking capacity of a contactor is definitely lower than a circuit-breaker, but with a number of possible operations consistently higher than those of the breaker (approx. 1,000,000): motor protection and operation are thus optimized when these two devices are used in conjunction with each other.
In its initial configuration, the trip unit is set for operation in Normal mode, activating the contactor by means of the Ekip CI module if one of the protections trip (with the exception of protections I and G).
If the configuration is changed from Normal to Heavy, the trip unit opens the circuit-breaker directly without transmitting the command to the contactor. An auto-reset function allows the actuation status of the Ekip CI to reset automatically after the contactor has tripped owing to the L function, once an adjustable time from 1 to 1000s has elapsed. Auto-reset can occur only in Normal mode. A BACK UP function is also available and deals with situations where an opening command transmitted to the contactor via module Ekip CI has not been successful. In this case, the unit sends an opening command to the circuit-breaker after waiting for the set time Tx. The actuation time of the contactor given by the manufacturer must be considered when the time-delay setting Tx is entered.
The function is active with an auxiliary supply.

For more information on generator protections, please refer to the product note for Ekip G - 1SDC210108D0201.

Software functions

Introduction

The Ekip UP⁺ guarantees maximum flexibility by offering a wide range of software solutions in order to always upgrade the unit. These functions can be selected when ordering the unit or can be downloaded directly from the ABB Ability Marketplace™, even from a smart phone or tablet, thus reducing installation time to zero.

Ekip UP⁺ trip units can be now customized with the functions required.

Ekip UP⁺ always allows the user to enter in a new product experience thanks to the possibility to build up his own tailor-made trip unit by selecting the set of protections, measurements and logics.

Digital Unit customization has never been so easy.
The most advanced functionalities can be enabled following two different purchasing processes:

- **ABB Ability Marketplace™**
  Users can download digital upgrades via web and enable them directly on the trip unit, without removing the circuit-breaker from the installation point, with zero shipping time and no installation costs. This process allows additional functions to be selected after the trip unit has been already received on site and installed. Moreover, stock can be optimized by keeping in the warehouse few types of trip units and customizing them according to the customer's specific needs. Once purchased, each function can be easily activated by using a smartphone or tablet via EPiC app mobile and embedded Bluetooth connectivity, or a laptop through Ekip Connect 3.
- **Traditional ordering**
  This option represents the standard way to order ABB devices. The traditional process allows the users to select and directly install the desired functions when ordering the circuit-breaker. Once received and installed,Ekip UP⁺ always offers the possibility to add new functionalities via ABB Ability Marketplace™.

The new Ekip digital offering includes:

- **Packages**
  The software packages offer the possibility to customize the Digital Unit by selecting additional protection functions and advanced logic. The device can be customized to create tailor-made solutions according to the specific application. Maximum flexibility is guaranteed by offering specific technical features that can be combined in the Ekip UP⁺ during the product life cycle.

Ekip UP⁺ guarantees maximum flexibility for any application, delivering value throughout the entire customer journey.

1. Design
Build the Digital Unit according to specific project requirements.

Key drivers
- Ease of doing business
- Technical specifications
- Application and function

Benefits
- Flexibility of choice
- Customization by application

2. Commissioning
Customize the device thanks to the digital offering. Manage last minute changes through digital upgrades.

Key drivers
- Ease of doing business
- Management of components
- Time to market

Benefits
- Stock optimization
- Zero lead time and installation effort

3. Service
Unlock the full potential of your circuit-breaker at any time, minimizing downtime and installation changes.

Key drivers
- Manage installed base
- Simplify diagnostics
- Simplify the hardware re-design

Benefits
- Zero lead time and installation effort
- Avoid downtime

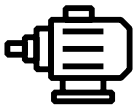
SW Packages

Each package includes a set of protection functions or measurements that can be enabled in the trip unit.

Monitor to Protect
This SW package, available on Marketplace only, allows the user to make an already supplied Ekip UP⁺ Monitor to evolve into an Ekip UP⁺ Protect. In this way the protection function are unlocked permitting also the additional protection packages to be installed.
How to order: via ABB Ability Marketplace™.

Generator Protections
Set of protections included:
- RQ - Loss of field or reverse reactive
- OQ - Reactive overpower
- UP - Active underpower
- OP - Active overpower
- ROCOF - Rate of change of frequency

How to order: via ABB Ability Marketplace™ or traditional ordering channels.



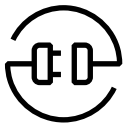
Motor Protections
Set of protections included:
- R JAM - Rotor blockage
- R STALL - Rotor blockage
- UC - Undercurrent
- U - Phase lackand/or unbalance
- PTC - Temperature

How to order: via ABB Ability Marketplace™ or traditional ordering channels.

Adaptive Protections
Set of protections included:
- Dual Setting - Set A-B.

How to order: via ABB Ability Marketplace™ or traditional ordering channels.

Three solutions are available to fully exploit the potential of the Ekip architecture: Interface Protection System, Adaptive Load Shedding and Power Controller.



Adaptive Load Shedding
Thanks to this solution, the Digital Unit enables islanding transition to avoid blackouts.
It actively controls the power consumption based on the priorities set by the user.
How to order: via ABB Ability Marketplace™ or traditional ordering channels.
The hardware accessories must be ordered via traditional ordering channels.

Power Controller
This function is the ideal solution for load management and represents an optimum compromise between reliability, simplicity and cost-effectiveness. Based on a patented calculation algorithm, Ekip Power Controller allows a list of loads to be controlled from remote according to the priorities defined by the user.
How to order: via ABB Ability Marketplace™ or traditional ordering channels.The hardware accessories must be ordered via traditional ordering channels.

Interface Protection System - CEI 0-16
This solution provides the protections necessary to connect Prosumers (end user with local generation available) to the Utility.
The generating units installed in the facility plant will be disconnected from the grid whenever voltage and frequency values of the grid itself are out of the Standards' range.
Today Ekip UP is suitable for Standard CEI 0-16, the most important Standard for the connection of Active Users. CEI 0-16 is a reference for a lot of other local standards, in particular in Italy and harmonized for Euopean countries.
How to order: via ABB Ability Marketplace™ or traditional ordering channels.
The hardware accessories must be ordered via traditional ordering channels.

When a solution is purchased via ABB Ability Marketplace™, it must be activated through Ekip Connect 3 installed on a PC using Ekip T&P to scan the trip unit.

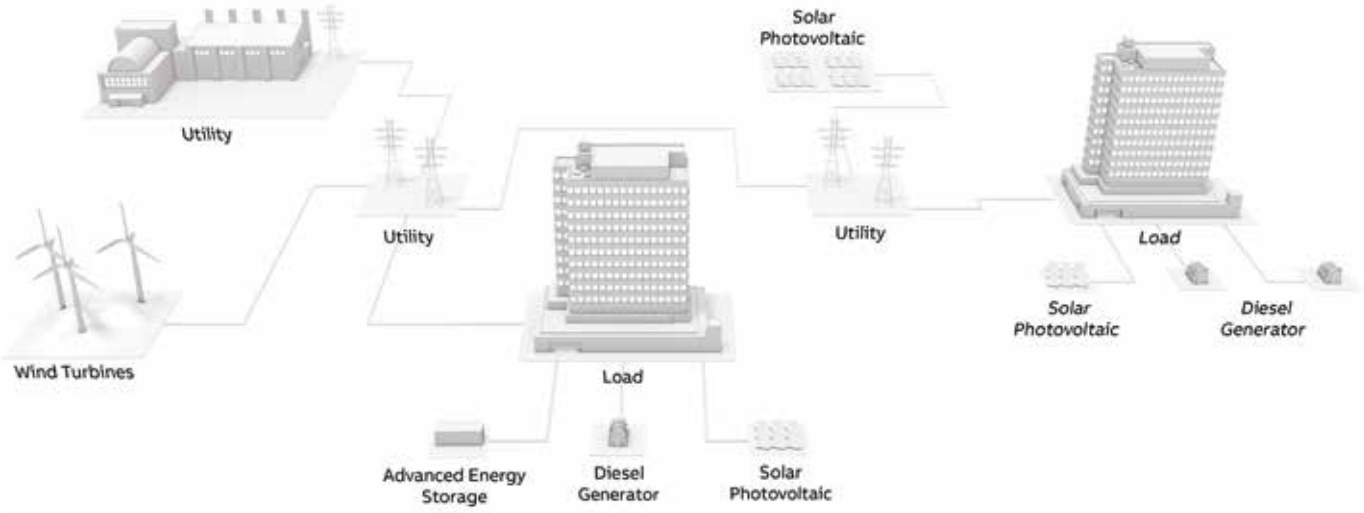
These solutions require the installation of hardware components that have to be ordered through the traditional ordering channels. For further information, please refer to the specific documentation available on ABB Library.

Smart Grid application

Renewables have been growing during the last ten years reducing pollution for a greener environment. Due to environmental changes, people have started thinking about ecology and sustainability, increasing their awareness of energy self-consumption and efficiency.

Ekip UP⁺ is the first unit to upgrade low-voltage plants with advanced protection, programmable logic, full connectivity, easy integration and comprehensive energy management in a single revolutionary device.
Installed downstream of the MV/LV transformer, Ekip UP⁺ works like a certified **Interface Protection System** in order to check the Main Grid conditions and disconnect the facility whenever grid voltage and frequency are out of the ranges prescribed by the local Standards.

Ekip UP⁺ and its **Adaptive Protections** recognize the network change and automatically set new thresholds to guarantee protection and coordination in on-grid and off-grid conditions.



In order to maximize the service continuity, local generation starts to supply the islanded plant.
Ekip UP⁺ integrates programmable status based on measurements, events and protections, so it is possible to create transfer switching logics.
It can be also easily integrated with ATS controller in revamping projects.
The **Load Shedding** embedded algorithm is able to manage the power system for comprehensive microgrid energy management.
Before the transfer from the main grid to local line, selected loads are shed to support power balance. Ekip UP⁺, using slope of frequency, can disconnect loads in case of emergency unbalance condition.

When the main grid is stable again, Synchrocheck logics manages voltage and frequency to allow plant reconnection to the Utility.
In grid-connected operation, Ekip UP⁺ manages the **Power Controller** algorithm to shave peaks and shift loads in order to optimize system performance and productivity.
Ekip UP⁺ advanced features are easily customized thanks to commissioning software tools which do not require high level engineering competencies.
Ready to use templates enable the download of all the logics directly into the unit. The solutions become plug & play, increasing modularization and standardization for design and installation.

Software function compatibility table

	Interface Protection	Load Shedding	Synchrocheck	Power Controller
Interface Protection		●		●
Load Shedding	●		●	●
Synchrocheck		●		●
Power Controller	●	●	●	

Interface Protection System

Ekip UP⁺ with IPS configuration package embeds interface protections for active plant or renewable sources connected to medium voltage grid.

Purpose
The Interface Protection System provides the protections necessary to connect Prosumers (end user with local generation available) to the Utility. The generating units installed in the facility plant will be disconnected from the grid whenever voltage and frequency values of the grid itself are out of the Standards' range. Such a disconnection is usually carried out by means of an Interface Device (air circuit breaker, molded case circuit breaker, switch disconnector or contactor) that trips after receiving an opening command provided by an external Interface Protection System. ABB Ekip UP⁺ Protect with IPS configuration package is able to perform the functions of Interface Protection System as a unique flexible solution. This advanced feature is possible thanks to the implementation of the several interface protections into the trip unit installed on board Ekip UP⁺. Today Ekip UP⁺ is suitable for Standard CEI 0-16, the most important Standard for the connection of Active Users. CEI 0-16 is a reference for a lot of other local standards, in particular in Italy and harmonized for European countries. In many other Countries the IPS function can very useful as well.

Application examples
ABB has been able to integrate in a single device the following functions to be used in the scenarios described below. Thanks to these embedded functions, the number of devices for feeder or generator protection, energy and asset management to be installed is reduced, with consequent component saving inside the switchboard. Ekip UP⁺ with embedded Interface Protection System has been tested and certified in compliance with the Standard CEI 0-16 and are suitable for the following scenarios.

Ekip UP⁺ as Microgrid Main protection unit
In this scenario, Ekip UP⁺ with embedded Interface Protection System can fulfill the function of Interface Protection System (IPS). In case of IPS tripping, microgrid, downstream Ekip UP⁺ main unit, remains active thanks to both the local generation and the load shedding feature also embedded in the main unit.

Ekip UP⁺ as local generation protection unit
In this scenario, there are non-operating loads in islanding condition, so, when there is an Utility outage, Ekip UP⁺ detects that voltage and frequency values are out of the range prescribed. According to the standard the local generation must be disconnected from the Utility, so Ekip UP⁺ opens, acting as interface device, thanks to the IPS embedded. In this condition loads are not operating as there is no voltage on the secondary of the MV/LV transformer and no local generation connected.

Benefits
Thanks to Ekip UP⁺ with embedded Interface Protection System, the following benefits are guaranteed:

- Ekip UP⁺ performs interface protections with every possible switching device, ensuring also reclosing operation when grid is restored. The reclosing logics are granted with air circuit breaker, molded case circuit breakers, switch disconnector or contactor.
- If the Ekip UP⁺ is installed on the generator feeder, the unit will be able to perform the double function of Interface Protection System and Generator Protection thanks to the range of protections upgraded with software package "Generator Protections".
- Ease of use, thanks to Ekip Connect software which allows an immediate and intuitive commissioning phase.
- Power generation remote monitoring with the main energy and power quality parameters available through cloud-based platform.

For more info check out the product note for Interface Protection Systems, 1SDC210103D0201.

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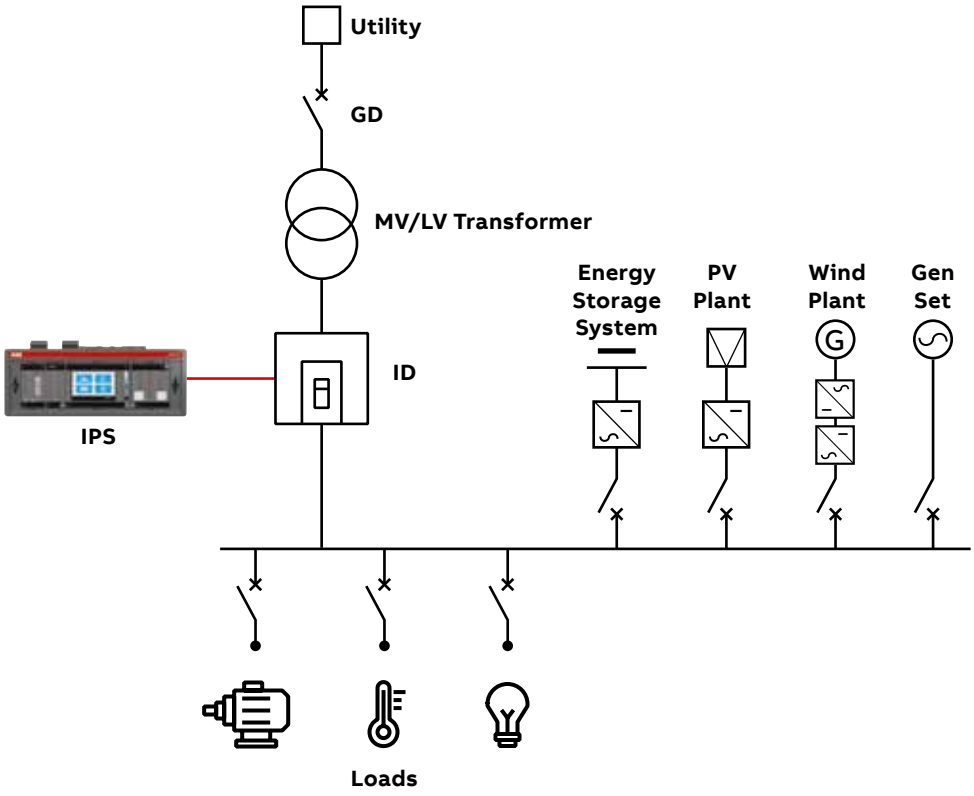
Ekip UP* as Microgrid
Main protection unit



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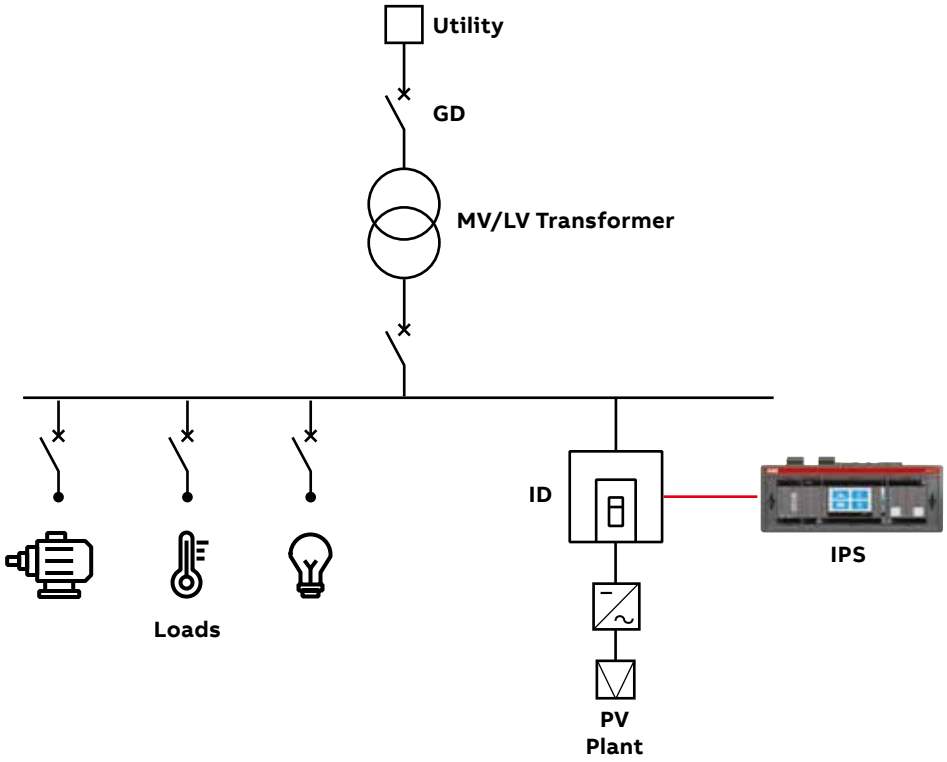
Ekip UP* as local generation protection unit



Adaptive Protections

Ekip UP⁺ with "Adaptive protections" software package offers dual protection level settings to ensure continuous operation during power transfer.

Purpose

User's plants can work as a LV Microgrid thanks to the energy produced by renewable and local power sources, in particular as a consequence of lacking of the Utility power supply, e.g. due to a fault on the MV voltage side. In order to still guarantee a high level of selectivity and continuity of service, it is important to take into account the variation of the short circuit power when moving from. Indeed, during grid connected condition the fault current on a Microgrid feeder is supplied by the Utility, so it is higher than the one supplied only by the local generation during islanded condition.

As a result, it is desirable that the different protection thresholds of the units can be automatically changed during the transition to the islanding condition. This is possible with Ekip UP⁺ Protect version and "Adaptive Protections" software package.

Application example

A typical case is facility connected to the MV Utility by means of a MV/LV transformer. If the Utility shuts down, the plant will become a Microgrid supplied by the local generator G, which will feed the priority loads by using the load shedding feature of Ekip UP⁺.

In grid-connected condition, the generator G is disconnected. With reference to fig.1:

- Circuit breaker A is closed
- Circuit breaker B is open
- Circuit breakers C are closed. The protections of the one that supplies loads D are upgraded using "Set A" of Ekip UP⁺ unit.
- Circuit breakers D are closed
- Circuit breaker E is closed
- Circuit breaker QS1 is closed
- All loads supplied.

The circuit breakers C are selectively coordinated with the upstream main circuit breaker A, supplied by the Utility, and the downstream load circuit breakers D (fig. 2).

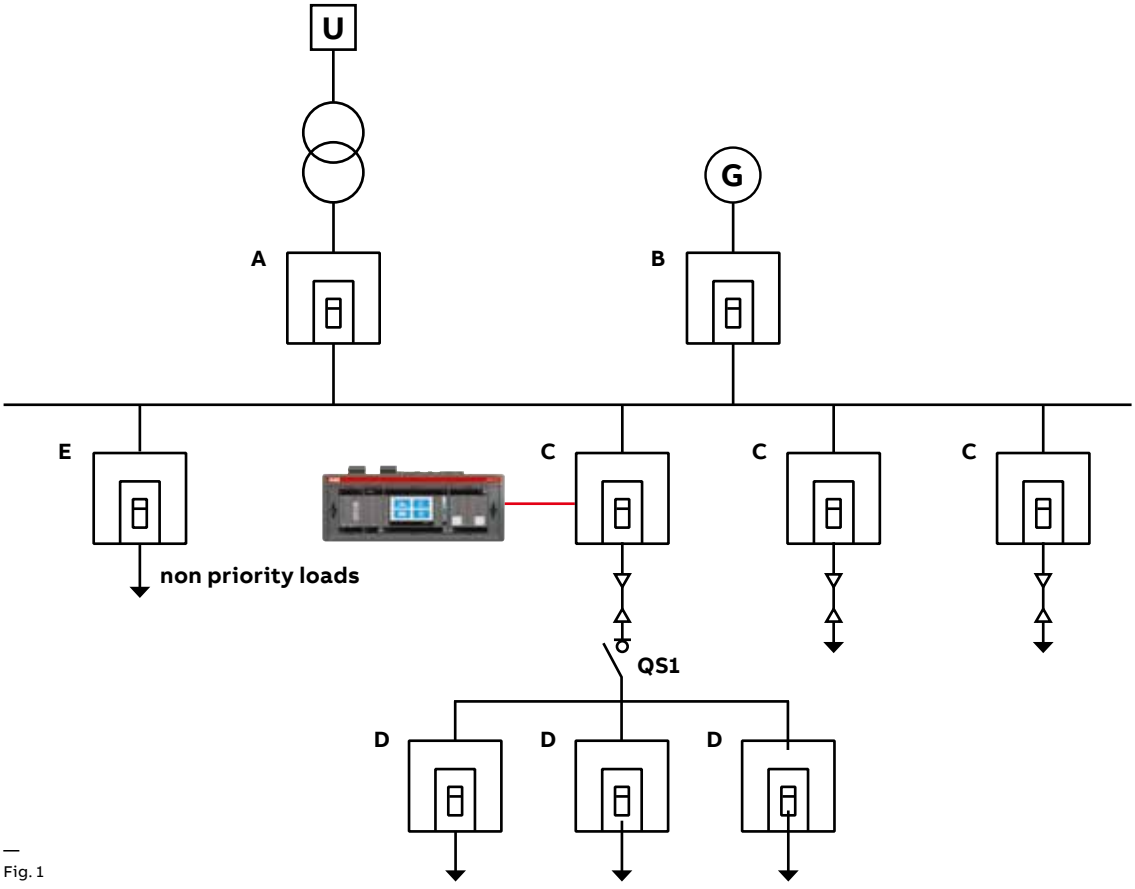


Fig. 1

When there is a Utility outage, circuit breaker A opens and B to switch to the local backup power source (islanded condition). In order to ensure coordination, Ekip UP⁺ adaptive protections - added on circuit breaker C - offer a second set of protection level settings to ensure selectivity is maintained in the system. The second set of protection levels are optimized for the characteristics of the local generator ensuring the incoming supply and load side switching devices will remain selectively coordinated.
With reference to Figure 1:

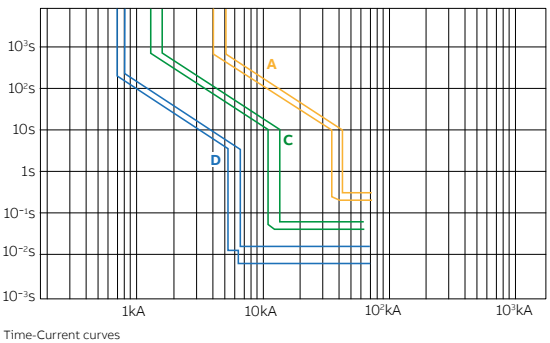
- Circuit breaker A is open
- Circuit breaker B is closed
- Circuit breakers C are closed and the protection thresholds move automatically to “Set B”
- Circuit breakers D are closed
- Circuit breaker E is open
- Circuit breaker QS1 is closed
- No priority loads can be disconnected using another functionality of Ekip UP⁺ units (see next paragraph).

The following Figure shows how it is possible to switch to a set of parameters which guarantees selective coordination between switching devices C and B by means of the “Adaptive protections“ function embedded in the trip unit of the circuit-breaker C with "Adaptive Protections" software package.

Benefits
Ekip UP⁺ Protect with "Adaptive Protections" software package offers two sets of settings in a single device providing:

- Overcurrent protection and selectivity when connected to either the main utility power or a local backup power source
- Service continuity in just a single unit of the switchboard
- Ease of use, thanks to the Ekip Connect software which allows quick and easy commissioning.

As Ekip UP⁺ shares the same electronics of Emax 2 circuit breaker, for more info check out the white paper " Emax 2, all in one innovation: Adaptive protections" - 1SDC007116G0201.



Time-Current curves

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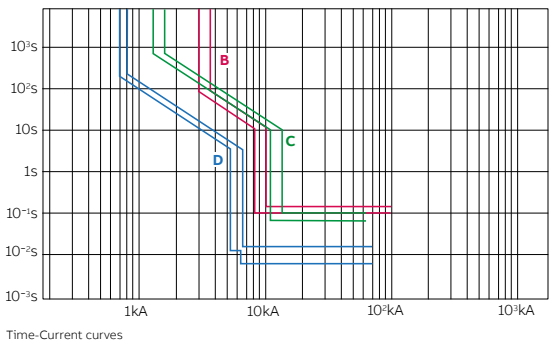
Fig. 2



Time-Current curves

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Fig. 3

Load Shedding

Ekip UP⁺ has built-in basic load shedding algorithms to avoid blackouts due to power unbalance in the low voltage plant and reduce stress on the system's components. Ekip Up⁺ can be upgraded with "Adaptive Load Shedding" software package in order to add an advanced algorithm.

Purpose
ABB Ekip UP⁺ embeds patented functions based on load shedding which reduces Microgrid stress. Typically it is the main protection relay of the low voltage Microgrid located at the interface point with the medium voltage grid, able to control the facility in every circumstances.

Microgrid in islanding operation
When a circuit breaker or switching device opens due to Ekip UP⁺ interface protection systems or an external command, the transition from on-grid to off-grid should be smooth and bumpless.
When it is standalone, the power absorption from the main grid ceases, so that the Microgrid loads remains supplied by the local generation, like a diesel GenSet or energy storage systems. This Microgrid generation can always be active or started up by an automatic transfer switching (ATS) logic after the disconnection from the main grid, depending on the plant configuration.
During the islanding transition, it is very important to avoid the frequency drop, otherwise the generation protections could trip jeopardizing the Microgrid stability with consequently a long downtime. Ekip UP⁺, employing current and voltage measurement, integrates two different fast load shedding logics to reduce this blackout risk, protecting the Microgrid during the intentional or unintentional islanding operation:

- Basic Load Shedding is a simple logic able to recognize the Microgrid disconnection event and shed a predefined group of non-priority loads thus ensuring power balance in a fast reaction time. It is present by default in Ekip Up⁺
- Adaptive Load Shedding is the advanced algorithm available with "Adaptive Load Shedding" software package as an enhancement of the basic version which is standard supplied. The intelligent software embedded in the unit sheds very quickly the non-priority loads according to the Microgrid power consumption and frequency levels. Moreover, this software has a dedicated configuration for ATS configuration with backup generation and it is even able to estimate the energy produced by a solar plant based on plant geography settings.

Application examples

- Facilities with GenSets running along with renewable sources. For example remote PV-diesesl communities connect to weak distribution grids with frequent faults, or plants located in geographical areas with frequent environmental events, such as hurricanes or earthquakes.
- Grid-connected plants with back-up GenSets that require high reliability. For example, hospitals, banks or data centers.

Benefits
Thanks to Ekip UP⁺ with Load Shedding innovation, the following benefits are guaranteed:
Service continuity

- When a plant remain disconnected from the main grid, even if local production is present, there is a significant stress that turns off all the generators with consequent blackout. Load Shedding logics reduce the frequency drop that usually makes the local generation protection trip, so maintaining the plant live.

Space saving

- Ekip UP⁺ has embedded intelligence for Load Shedding: taking advantage of the current and voltage sockets there is no need for other PLCs.
- In addition, static converters for low voltage photovoltaic production have typically anti-islanding protections: this implies another power deficit to be added to the main grid contribution lost during the Microgrid islanding. Ekip UP⁺ is the first digital unit that estimates solar production without additional sensors.
- Load Shedding is suitable with ATS architectures like Main-BusTie-Gen used to distinguish priority/non-priority loads.
  Where feasible, BusTie switching device is not required anymore and this means:
  - Significant space and material saving up to 50% in the power distribution switchgear for panel builders.
  - More flexibility for consultants during plant design. Indeed, Load Shedding dynamically chooses the loads to be shed based on real time power unbalance.
  - ATS unit manages only two sources, without interlock, logic programming and wiring connections for the third circuit breaker with less time required for installation.

Ease of use

- Load Shedding logic usually requires high level engineering and customization utilizing PLCs.
- Ekip UP⁺ guarantees easy installation through templates and a user friendly graphic interface.

For more info check out the product note for Load Shedding - 1SDC210105D0201.

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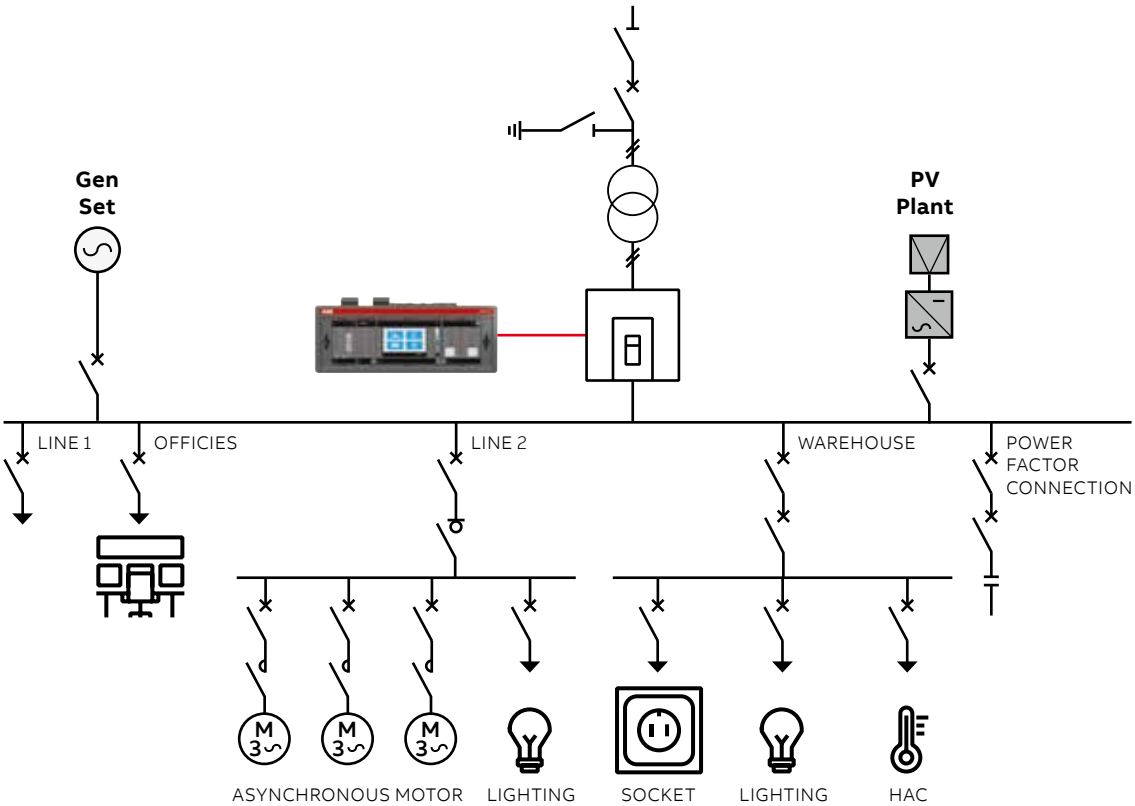
Typical load shedding application



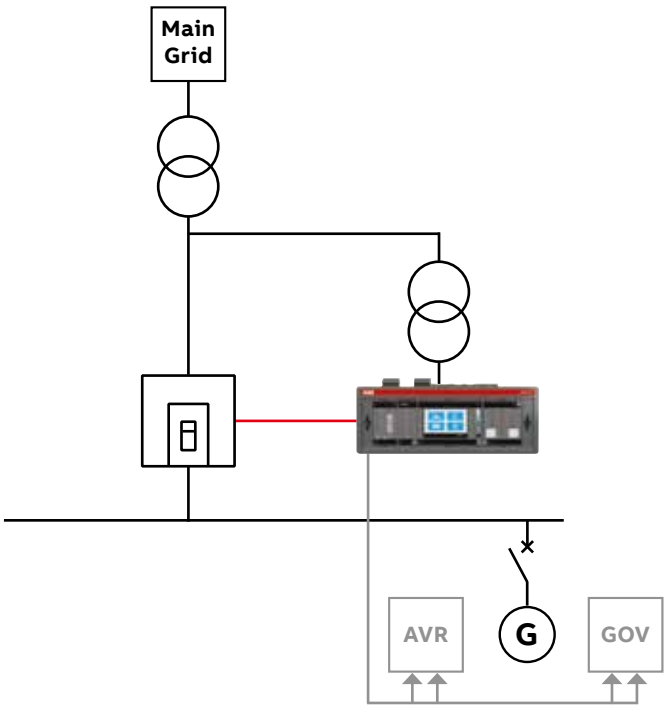
Synchrocheck logics

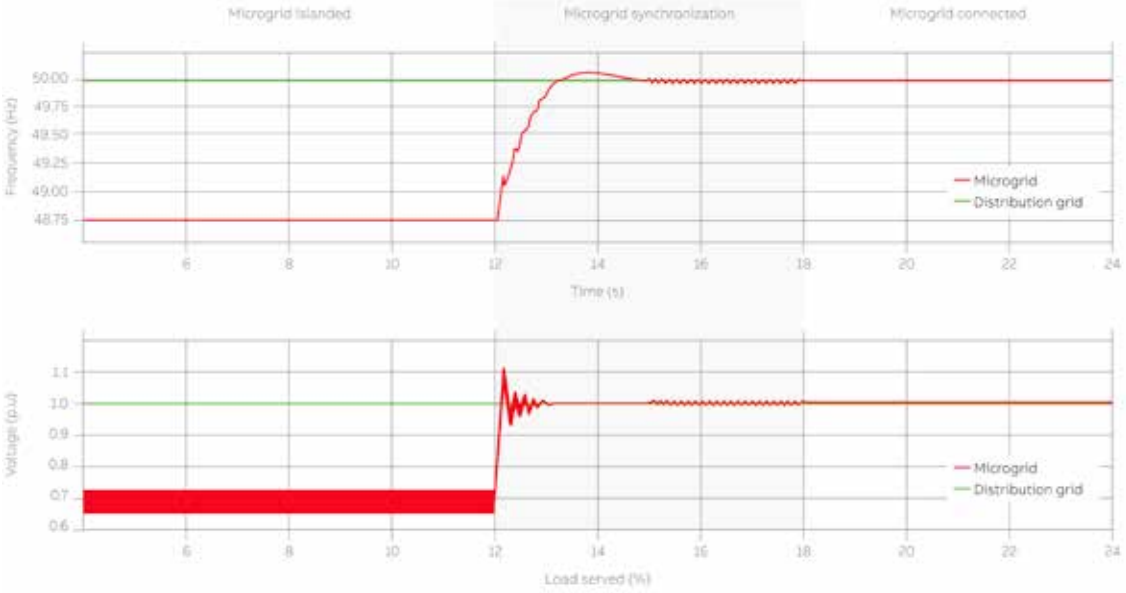
Ekip UP⁺ is able to analyze voltage waveforms from different power sources.

Purpose
Thanks to its advanced electronics, Ekip UP⁺ is the first smart unit able to island a Microgrid when faults or power quality events occur and re-connect to the distribution network when the conditions are right.
Synchrocheck logics operates the ANSI 25A, with possible automatic re-closing capabilities based on the synchronism status detection.

Using the Ekip Synchrocheck cartridge module, Ekip UP⁺ monitors the voltage amplitude, the frequencies and the phase displacement. Thanks to this information, it is possible to realize simple logics to adapt the Microgrid voltage and frequency to the main grid ones. This basic regulation based on up and down signals sent to the local generator controllers can be realized by Ekip Signalling contacts in order to reach synchronization. The switching device may be automatically reclosed when Ekip UP⁺ identifies that the synchronism is achieved using Ekip Synchrocheck and the closing actuator.
As an alternative, Ekip Synchrocheck can send an indication signal of synchronism achieved.

Application examples
Synchrocheck protection and logics are perfect for the following applications:
- During Microgrid reconnection to the main grid, speeding up paralleling between two systems with different steady states.
- When there is the closed transition of an automatic transfer switch, the main grid should be connected to the same busbar with the backup Microgrid generation in order to guarantee continuos load operation, with or without a bus-tie switching device.
- For single Gen Set paralleling operations.





Benefits

Ekip UP⁺ with embedded Synchrocheck provides:

- A single unit, more ANSI functions
  - Components reduction with no external synchrocheck relay and less voltage transformers required if compared with traditional approaches of multiple devices.
  - Increased reliability and time saving during the installation with less cabling and related installation complexity.

Ease of use

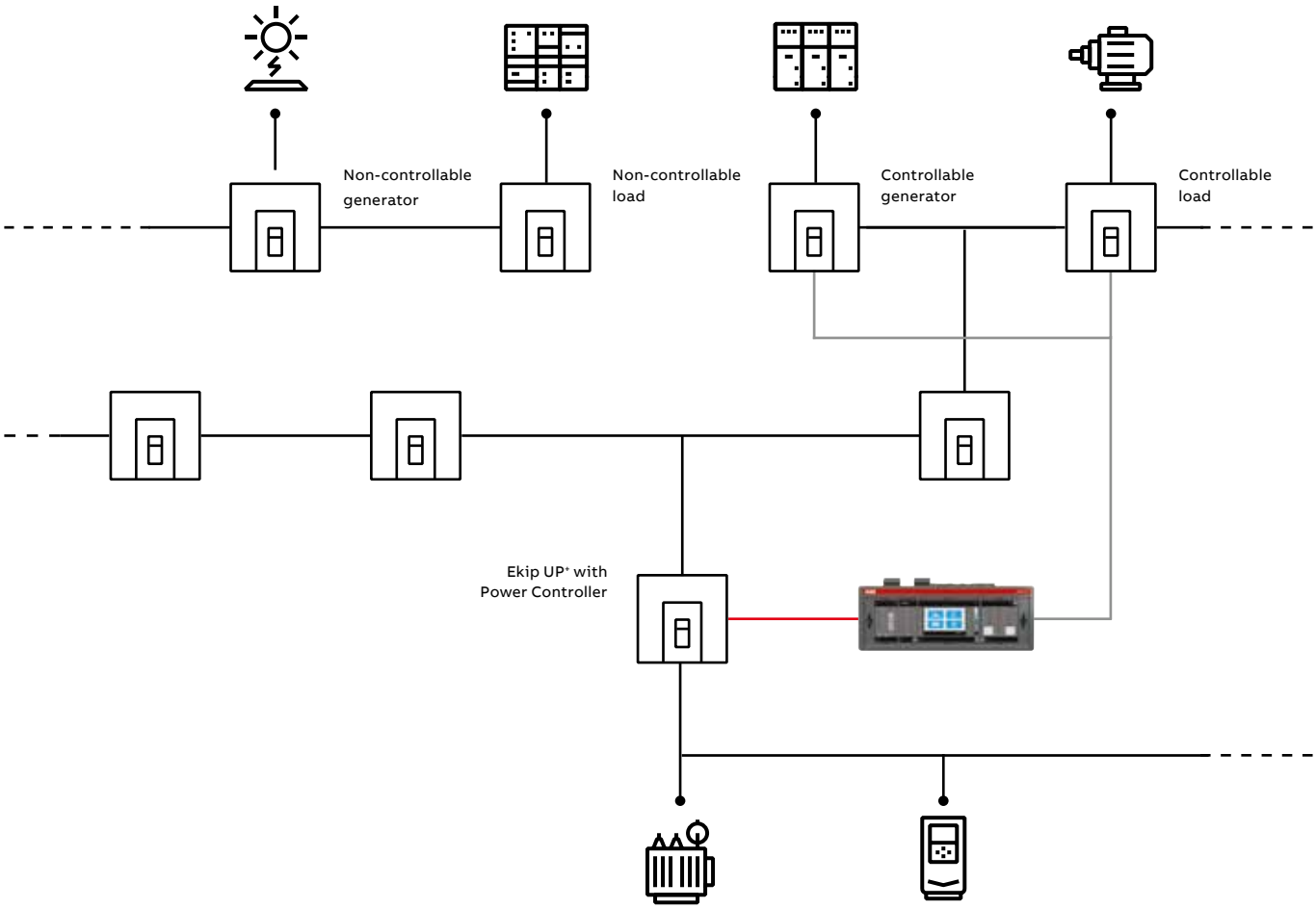
Embedded protections and logics simplified configuration, eliminate the need for programming and engineering skills.

Power Controller

Ekip UP⁺ with "Power Controller" software package is able to control loads and generator to ensure bill savings and enable demand response applications according to power management strategies.

Purpose
Thanks to Power Controller software, Ekip UP⁺ manages the power to shave the peaks and shift the loads. In this way, it possible to cut electricity bills, increase energy efficiency up to 20% and be ready for demand response programs.
Power Controller function is based on a patented calculation algorithm that allows a load list to be controlled through a remote command of relevant switching device (like circuit breaker, switch disconnector, contactor, drive) or control circuit according to a priority defined locally by the user ore remotely by a load aggregator or utility, based on his own requirements and types of load.

The algorithm is based on a forecast average power absorption over a determined time interval, and is set by the user. Whenever this value exceeds the fixed power, the Power Controller function intervenes to bring it back within the limits.
This system can be realized with "Power Controller" software package and installed as the low voltage plant controller.
Furthermore, the unit, has the ability to not only control passive loads, it can also manage a reserve generator.



In installations that are already equipped with energy management systems, the load limit can be controlled remotely. OpenADR communication standards (see Chapter 4) provides another way to receive power set-points from load aggregators or utilities.

Loads can be controlled through two ways:

- through the wired solution, by commanding the shunt opening/closing releases or acting on the motor operators of the loads to be managed;
- through a dedicated communication system Ekip Link (see cap. 4).

The ability to control the loads according to a list of priorities already defined provides significant economical and technical advantages:

- economical: controlling energy consumption eliminates penalties due to excess of power absorption in respect of the contractual power set with the Utility. Indeed, in some case the Utility increases automatically the contractual power as a consequence of repeated limit excesses. Besides, Power Controller enables demand response applications, thus give the possibility to receive rebates and profits for the services offered.
- technical: controlling power reduces the risk of malfunctioning, ageing of system components, or worse, black outs due to plant overload. Combining Power Controller with Load Shedding ensures also the possibility to avoid protection trips, even managing the average power for economical reasons.

The exclusive Power Controller function available on the new Ekip UP⁺ units monitors the power, keeping it below the limit set by the user. As a result of this more effective use, the peak of power consumed can be limited, thus reducing electricity bills.

The Power Controller, patented by ABB, disconnects non-priority utilities, such as electric car charging stations, lighting or refrigeration units, during the times when consumption limits need to be respected, and connects them again as soon as it is appropriate. When required, it automatically activates auxiliary power supplies such as generator sets. No other supervision and control system is required: it is sufficient to set the required load limit on Ekip UP⁺, which can control any switching device located downstream, even if it is not equipped with a measurement function.

Application examples
Electricity bill savings, demand response, avoiding power overload are the typical scenarios where Power Controller is adopted.
As it operates on non-critical loads, it is common in office building, shopping malls, hotels, campuses, waste and water industries or every plant that works like a low voltage Microgrid.

Power Controller

Benefits
Thanks to Ekip UP⁺ with embedded Power Controller, the following benefits are guaranteed:

- Reduction of energy costs with minimum impact.
- The loads are disconnected from the power supply as few times as possible, enabling power consumption peaks to be limited. This allows renegotiation of electrical contracts for power allocated to reduce total energy costs.
- Power limited only when necessary.
  Power Controller function manages up to four different time bands, it is therefore possible to respect a particular power limit according to whether it is during the day (peak) or night (off peak). In this way, consumption during the day when rates are at their highest can be limited.
- Power Controller function allows the installation to be managed efficiently with a simple architecture. Thanks to a patented design, it can measure the total power of the installation without needing to measure the power consumed by each load. Installation costs and times are thereby reduced to a minimum.
- Power Controller function does not require the writing, implementing and testing of complicated programs like in PLC cases: the logic is built in the protection unit and ready to use. Parameters can be set simply from a smart phone or directly from the Ekip UP⁺ display.
- From the electrical system point of view, significantly helps to flatten the load curve, limiting the use of peaking power plants in favour of base load power plants with greater efficiency.
- Thanks to integrated communication modules, Power Controller can receive the maximum absorbable power directly from the Utility control system, determining consumption for the next 15 minutes. Power Controller, according to the information received, manages the switching off of non-priority loads and the switching on of reserve generators. The software gives maximum priority to preferred energy sources, such as wind and solar, and they are therefore considered uninterruptable. In the event the production of internal power to the controlled network is reduced, due, for example, to decreased production of solar power, Power Controller will disconnect the necessary loads to respect the limit set.
- This benefit is used, for example, in installations with a system of cogeneration. Power Controller controls the total consumption drawn from the electrical network, interrupting non-critical loads when production is reduced and reconnecting them when generator power is sufficient. This offers multiple advantages: reduction in energy costs, maximum use of local production and greater overall energy efficiency.

For further information, please refer to the product note for Power Controller - 1SDC210110D0201.

Commissioning and connectivity

Introduction

Ekip UP⁺ digital units are flexible and easy to configure to meet the supervision and control levels of each applications.

Ekip UP⁺ simplifies the business thanks to plant upgrade without new design or replacements.
In addition, its commissioning is really easy leveraging free commissioning tools.
Ekip Connect simplifies the user experience.
Everyone can visualize energy and power quality measured by Ekip UP⁺, set protections thresholds, configure communication and signalling modules.
Even the setup of advanced software functions, like interface protection functions or load shedding logics, becomes intuitive like using an app on a laptop.

The supervision of the power grid is enabled by advanced connectivity built-in Ekip UP⁺, with more than 3000 data points available.
The low voltage plant, like Microgrid, can be monitored from the field by the integration with Scada systems leveraging on embedded up to 8 fieldbus or from the cloud, based on Internet technology.
Ekip UP⁺ is able to connect low voltage switchgear to the energy management system based on Microsoft Azure cloud called ABB Ability™ Energy and Asset Manager.
Thanks to this, Ekip UP⁺ is the single unit that digitalizes every gear, even existing ones.

Commissioning Software
Ekip Connect

Ekip Connect is a free tool which optimizes Ekip UP⁺'s ability to manage power, acquire and analyze electrical values, and test protection, maintenance and diagnostic functions.

Overview of the software
An overview of the software available and their main characteristics are given below:

Software	Functions	Distinctive characteristics
Ekip Connect	- commissioning - analysis of faults - testing of communication bus	- simple and intuitive use - integrated with DOC electrical design software - useable via EtherNet™ - automatic updating from Internet - off-line mode - multi-media (tablet or PC)

Most of the configurations are available from Ekip UP⁺ intuitive touchscreen display. Either way the ABB programming and commissioning Ekip Connect software tool allows the user to unlock the full potential of Ekip UP⁺, having a user-friendly graphic interface and saving all project settings. From commissioning to implementation, through monitoring, testing and analysis, Ekip Connect is the perfect tool for guiding the user in the management of ABB devices throughout the whole product life cycle.

Using Ekip Connect, the user can manage power, acquire and analyze electrical values, and test protection, maintenance and diagnostic functions. Ekip UP⁺ units can be connected to the laptop, PC or tablet simply using the mini-USB interface port with Ekip Programming or Ekip T&P accessories. Other possibility is to scan the unit from the communication network where integrated. By this tool protection configuration and testing are available.

Commissioning Software
Ekip Connect

—
Panel builders
- 50% commissionig time

Ease of use
Imagine you are a panel builder. You have to commission a switching device and you need to save time. You can! Using Ekip Connect it is possible to cut commissioning time by up to 50% instead of doing it manually. Providing a stress-free relationship with the device complexity, Ekip Connect is an easy-to-use software that has all the answers.
Ekip Connect's simple and intuitive interface means that, from the very start, it is possible to easily navigate through the tool and access every switching device operation. At a glance, the user can see all the information he needs, giving him the possibility to quickly and effectively assess any situation.

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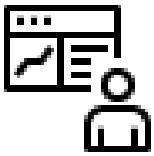
Facility manager
100% full exploitation of your device



Full exploitation
Imagine you are a facility manager. You need to perform fast and precise diagnosis in order to have everything under control and avoid failures. You can! Using Ekip Connect you can exploit the full capabilities of your device and thanks to the customizable dashboard you can organize your window into the deepest functions of the device just the way you want it. It is possible to manage all the CB settings and specifications directly with Ekip Connect, making it the perfect instrument for exploring and using the breaker.
Diagnostics are easy too: It is possible to consult and download the log of events, alarms and unit trips, thereby facilitating the identification and understanding of any anomalies.
One single software able to manage all ABB low voltage devices, giving a full integration.

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Consultant/system integrator
Complex logic at your fingertips

Product enhancement
Imagine you are a consultant or a system integrator and you want to implement advanced features while avoiding the risk of any error. You can! Using Ekip Connect it's possible to implement complex logic with a few clicks of your mouse.
To add, set and manage advanced functions has never been so easy. Automatic transfer switch logic, load shedding, advanced protection and demand management can be managed and
easily set through the Ekip Connect software.
Expand software features by purchasing and downloading software packages for advanced functions directly using Ekip Connect.

Accessing the full potential of the switching device is finally possible. Thanks to Ekip Connect software, you can achieve complete utilization of the unit and more with a few clicks of your mouse.

Configuration
- Set protections
- Configure system and communication parameters
- Unit start-up

Monitoring & analysis
- View CB status and measure
- Read events list

Product implementation
- Set advanced protections
- Logic activation
- Enable advanced functions

Testing & reporting
- Check correct functionality
- Perform tests
- Export report

For more information please refer to the product note for Ekip Connect - 1SDC210102D0201.

Ekip Connect is available for free download at http://www.abb.com/abblibrary/Download-Center/

Connectivity
Supervision on the field

The integration of low voltage devices in fieldbus communication networks is perfect for automated industrial processes, industrial and petrochemical sites, modern data centers and intelligent electricity networks, better known as Microgrids or Smart Grids.

Ekip Com Modules

Thanks to the wide range of communication protocols, Ekip UP⁺ can be integrated into communication networks without the need of external interface devices.

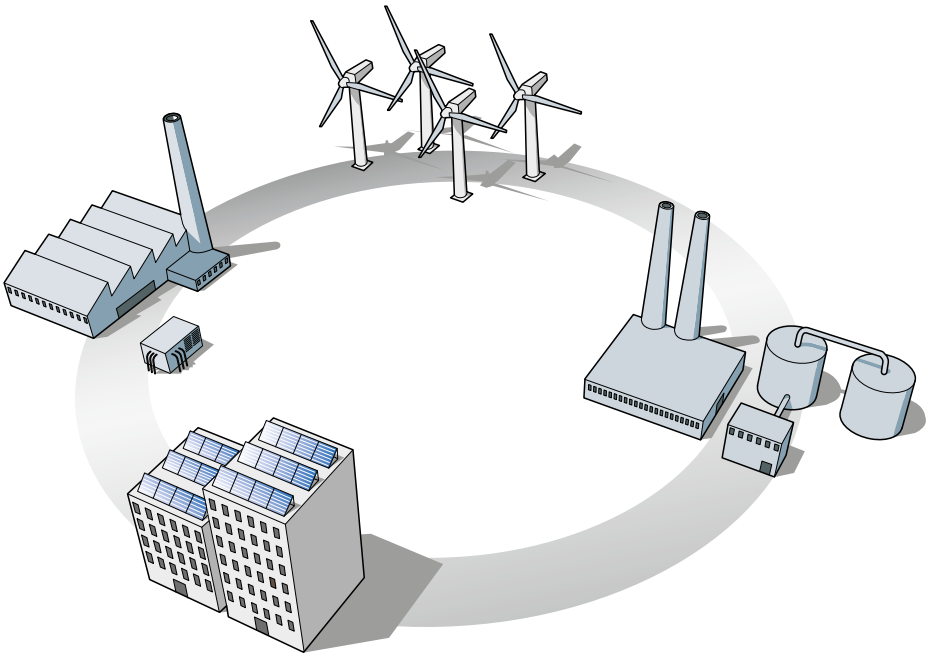
The distinctive characteristics of the Ekip UP⁺ offering for industrial communication are:

- **A wide range of supported protocols:** the Ekip Com communication modules enable integration with the most common communication protocols based on RS485 serial lines and the most modern communication systems based on EtherNet™ infrastructures, which guarantee an exchange of data in the order of 100 Mbit/s.
- **Installation times reduced to a minimum** due to the plug & play technology of the communication modules.
- **Redundancy of communication for greater reliability of the system**; the unit can be equipped with two communication modules of the same protocol at the same time, thus allowing information to be exchanged simultaneously on two buses.
- More protocols available at the same time, like Modbus TCP/IP for BMS, Profinet for PLC and IEC 61850 for Scada.

Having advanced protocol connectivity, Ekip UP⁺ is ready for:

- interaction with medium voltage grid: the Ekip Com IEC61850 module is the solution for integrating Ekip UP⁺ into automated electrical substations based on the IEC 61850 standard without external devices. Ekip UP⁺ offers both input and output goose capabilities making communication with MV relays easy for selectivity and interlocking logics.
- Power automation logics: Ekip Link is based on proprietary ABB bus that ensures robustness granted by third party and unlock control capability in low voltage plants.
- Manage I/O based on protocols to execute opening and closing commands to switching devices from external supervision system.

In addition the new embedded Bluetooth Low Energy technology makes the digital unit easier to be accessed, thus reducing time for commissioning and parameter settings.



Fiedlbus supervision of the electrical installation		
Ekip UP+ range	**Monitor**	**Protect**
Protocols supported:		
Modbus RTU	Ekip Com Modbus RTU	
Profibus-DP	Ekip Com Profibus	
DeviceNet™	Ekip Com DeviceNet™	
Modbus TCP/IP	Ekip Com Modbus TCP	
Profinet	Ekip Com Profinet	
EtherNet/IP™	Ekip Com EtherNet™	
IEC61850	Ekip Com IEC61850	
ABB bus	Ekip Link	
Control functions		
Switching devices opening and closing	●	●
Measurement functions		
Currents	●	●
Voltages	●	●
Powers	●	●
Energies	●	●
Harmonics	●	●
Network analyzer	●	●
Data logger	●	●
Adjustment functions		
Setting of thresholds		●
Resetting of alarms		●
Diagnostic		
Protection function alarms		●
Device alarms	●	●
Protection unit tripping details		●
Events log	●	●
Protection unit tripping log		●
Other data		
Local/remote mode	●	●

For more information, please referer to the product note for the Communication - 1SDC210101D0201.

Connectivity
Supervision to the cloud

ABB Ability™ Energy and Asset Manager is the innovative cloud-computing platform designed to monitor, optimize and control the electrical system.

Part of the ABB Ability™ offering, ABB Ability™ Energy and Asset Manager is built on a state-of-the-art cloud architecture for data collection, processing and storage. This cloud architecture has been developed together with Microsoft in order to enhance performance and guarantee the highest reliability and security Through a compelling web app interface, ABB Ability™ Energy and Asset Manager assists anytime and anywhere via smartphone, tablet or personal computer so the user can:

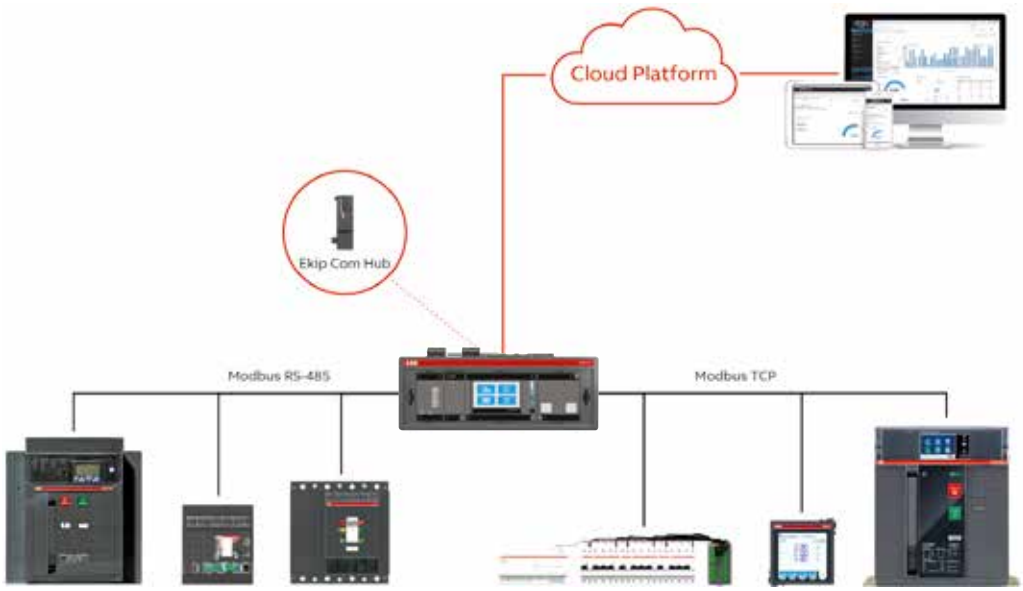
- **Monitor**
  Discover plant performance, supervise the electrical system and allocate costs to improve productivity and efficiency.
- **Optimize**
  Schedule and analyze automatic reports, improve the use of assets and take the right business decision.
- **Predict**
  Suggest the best maintenance date and reliability curve of installed assets based onreal conditions to ensure opex savings.
- **Control**
  Set up alerts and notify key personnel, and remotely implement an effective power management strategy to achieve energy savings in a simple way.

The user can choose Ekip Com Hub module plugged into Ekip UP⁺ units to connect the switchgear into the cloud. ABB Ability™ Energy and Asset Manager immediately connects to the low-voltage power distribution panel with plug and play devices:

- Air circuit breakers
- Molded-case circuit breakers
- Miniature circuit breakers
- Metering devices
- Switches and fusegears
- Arc-guard devices
- Soft starters
- Low voltage or medium voltage relay

Ekip UP⁺ solution with Ekip Com Hub
Ekip UP⁺ equipped with Ekip Com Hub cartridge module (coming soon) establishes the cloud connection for the whole switchboard. This dedicated cartridge type communication module just needs to be inserted into the terminal box and connected to the internet using an external router.
For more information, plase visit https://new.abb.com/about/our-businesses/electrification/abb-ability/energy-and-asset-manager.

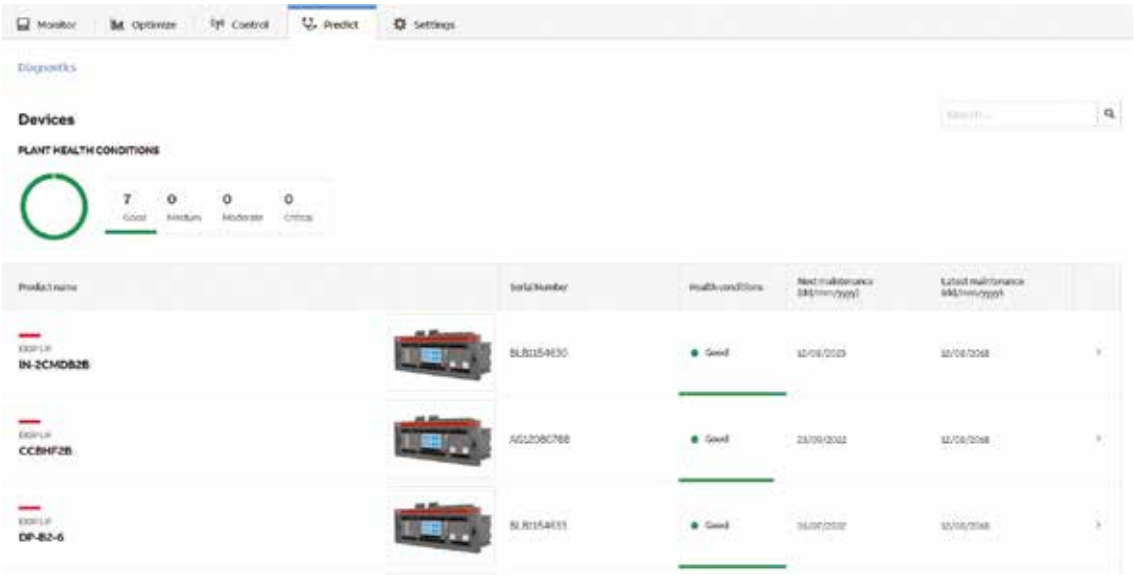
More information



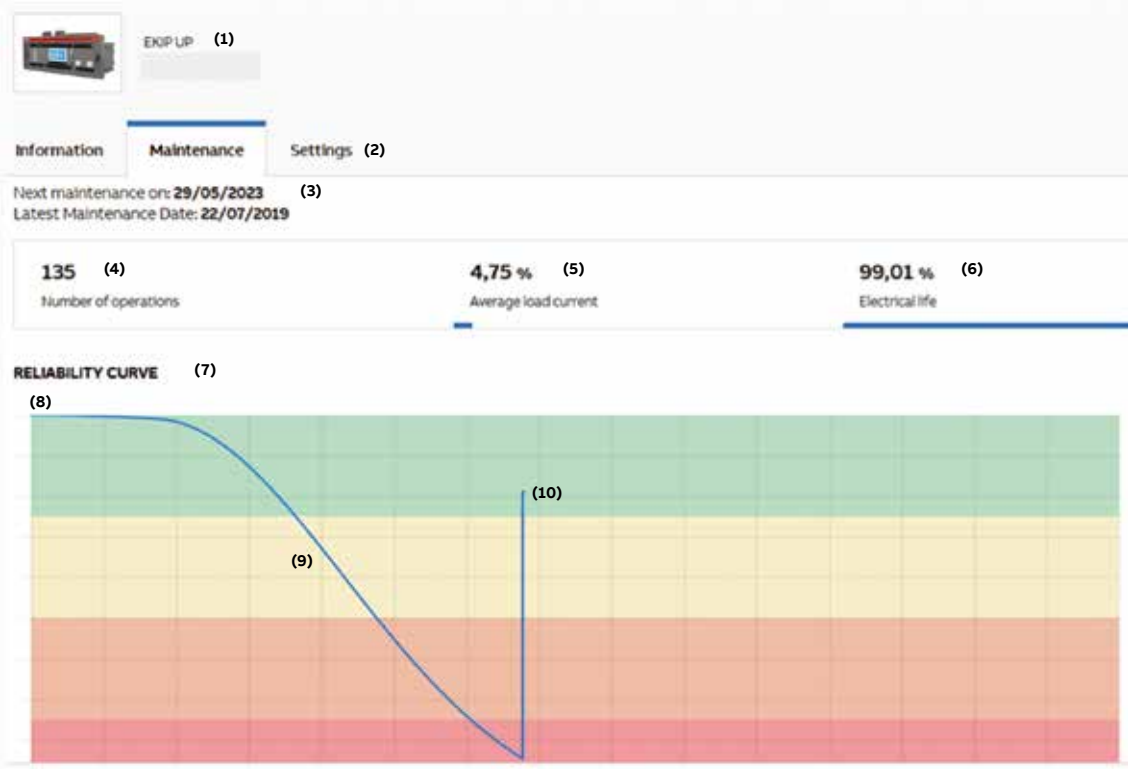
Predictive Maintenance
Energy & Assets Management improves efficiency and reliability

In addition to safety protections and energy management, Ekip UP⁺ predicts the future of installed ABB assets. The digital unit enables the predictive maintenance function on existing circuit breakers or switch disconnectors available in the cloud-based platform ABB Ability™ Energy and Asset Manager.

Measuring directly the operation number, contact wear, current flowing in steady state and protection trip (overload., short circuit, earth faults), the environmental factors (temperature, humidity, corrosion, dust level and vibrations) and thanks to the know how of ABB switching devices, the algorithm in ABB Ability™ Energy and Asset Manager provides the device reliability curve and suggests the next maintenance date.



The tool shows also the date of latest maintenance available in the device. Clicking on every single device, the reliability curve shows the historical trend of the product up to now.
Maintenance performed at the right time by ABB Authorized field service engineers has a positive influence on product health trends. With the right ABB training (ABB MAN or ABBL L2 or L3), the proper tools and genuine spare parts extending the working life of installations is simple. When latest maintenance is performed by not ABB authorized personnel, there is not effect on the reliability curve. When an important event occurs to influence the next maintenance date, an automatic notification is sent.
ABB Ability™ Energy and Asset Manager's Predict feature for Ekip UP⁺ digital units enables users to optimize their power availability with targeted maintenance for both standard and critical applications.
This function is available in Ekip UP⁺ Protect when applied with ABB New Emax and Emax 2 while coming soon with legacy GE Entelliguard G and M-pact devices.



(1) Ekip UP* tag name
(2) Here there are the setting related to circuit breakers or switch disconnector associated with Ekip UP* and environmental installation condition. For details, look at Predict technical documentation.
(3) Predict maintenance scheduling (last and next). Next one is forecasted when reliability curve will change from Green to Yellow Zone during normal life. In case of fault, it will be speeded up and SMS/mail will notice maintenance manager.
(4) Opening/closing time counted.
(5) Current utilization of the asset.
(6) Real time residual life of switching asset.
(7) Residual life expected during asset life.
(8) Asset production and installation period.
(9) Asset ageing curve without fault event.
(10) Life expectancy restoration after asset maintenance by authorized personnel and Ekip UP* installation.

Improve service profitability by optimizing maintenance costs

Extend product life by optimizing performance

Manage and connect from anywhere thanks to the ABB Ability EAM Cloud based platform

Increase safety for devices and personnel by reducing the risk of unexpected shutdowns

Accessories

Ekip UP⁺ standard supply

ABB Ekip UP⁺ comes standard with input/output contacts and a measuring module for voltage metering. A rating plug needs to be selected during ordering and factory installed (see Chapter 8).

Ekip UP⁺ is made in Italy and comes packaged with:

- Mounting clips (DIN-rail, door-mounted), terminals and insertion bridge for voltage sockets. This is useful in the applications in which voltage measurements are not strictly required.
- Mandatory accessory
  - Cable kit
  - Power supply module
- Optional accessory
  - Cartridge module for connectivity, signaling, synchrocheck
- Getting Started and module Kit Sheet

The content of the package is visible from the ordering label.
Other accessories are packaged separately.
Each Ekip UP⁺ is provided with a production report to mantain compete traceability of the product, with primary current injection tests executed from factory.

Ekip UP⁺ packaging is transit tested by ISTA. QR code printed there enables the access to product global web-site.

The new packaging of the Ekip UP⁺ has been implemented in order to improve the environmental sustainability. The result is having a new packaging which allows us to reduce CO_2 emissions compared to the previous one.
The colour of the cardboard will be completely avana to reduce the enviromental impact and it will be certified by FSC standard in order to guarantee the material comes from forests managed in responsible way.
Concerning the plastic used for the clamshell box, our choice is to guarantee 100% of post consumer recycled content.

Accessories for Ekip UP+ units

All Ekip UP+ accessories are plug& play, they come pre-configured for easy installation.

Installation	Modules	Highlights
Terminal box	Cartridge modules: - Ekip Com - Ekip Link - Ekip 2K - Ekip Supply - Ekip Synchrocheck - Ekip 3T - Ekip CI	- The Ekip Supply module enables the trip units to be supplied with a range of DC control voltages
		- The Ekip Supply module is a mandatory accessory.
		- The Ekip Supply module has a dedicated position in the installation area in the terminal box; the other modules can be installed as desired in the positions available
		- Up to 4 additional modules, among Ekip 2k, Ekip 3T, Ekip Com and Ekip Synchrocheck, can be installed together with Ekip Supply. Up to 3 Ekip 2k can be used.
Accessorizing area	Ekip Measuring Ekip Signalling 4K Rating Plug Battery for Ekip	- These are installed in specific housings
		- Ekip Measuring module is all time provided with Ekip UP+ units and enables voltage measurements, directly or using voltage sensors.
		- Ekip UP+ Monitor is standard equipped with the Ekip Signallling 4K-A, allowing the digital unit to be used also for signalling based on event, increasing the remote signalling possibilities, or activating internal logics. - Ekip UP+ Protect is standard equipped with the Ekip Signalling 4K-B, a brand new version of the module with two physical pushbuttons. This new I/O contacts module enables opening and closing commands of switching devices as well as status feedbacks that are shown on the touchscreen HMI.
		- Ekip UP+ from the factory installed own rating plug according to plant rated current. It is possible to change it, even after the installation according to new requirements (for example, plant extension).
		- Internal battery enables the cause of the fault to be indicated after a trip, without a time limit. In addition, the battery enables date and time to be updated, thus ensuring the chronology of the events.
Ekip trip unit test port	Ekip T&P Ekip TT	- These accessories can be connected to the front test port of the trip units even with the device in operation to perform commissioning activity on Ekip Connect.
		- Compatible also with the SACE Tmax XT and SACE Emax 2 ranges.
External	Ekip 10K	- Several Ekip Signalling 10K can be connected at the same time to the same Ekip UP+ units using local bus or ABB Ekip Link bus based on ethernet.
	Ekip Signalling Modbus TCP	- This DIN-rail distributed I/O allow open/closed contacts to be received by Ekip UP+ in the cloud architecture.
	Homopolar toroid Differential toroid	- These are connected to the trip unit by the terminal box of the Ekip UP+ to perform Rc (differential earth fault) and Gext (source ground fault, also for restriced/unrestricted earth fault diagnosis) protections.

Fig. 1

Power supply

Ekip Supply module (Fig.1)

The Ekip Supply module supplies all Ekip UP+ units and modules present on the terminal box of the digital unit with DC auxiliary power available in the switchgear.
The module is mounted in the terminal box and permits the installation of the other advanced modules. It is installed at the first installation of the device.
The available module is:

- Ekip Supply 24-48V DC

Electrical diagram reference: figures 31, 32

Accessories for Ekip UP⁺ units

Fig. 2

Connectivity (Fig.2)

The Ekip Com modules enable all Ekip UP⁺ units to be integrated in an industrial communication network for remote supervision and control of the circuit-breaker. They are suitable for all Ekip UP⁺ versions. Several Ekip Com modules can be installed at the same time, thereby enabling connection to communication systems that use different protocols.
The Ekip Com modules for Modbus RTU, Profibus-DP and DeviceNet™ contain a terminating resistor and dip switch for optional activation to terminate the serial network or bus.
The Profibus-DP module also contains a polarization resistor and dip switch for its activation.
For industrial applications where superior reliability of the communication network is required, the Ekip Com R communication modules, installed together with the corresponding Ekip Com modules, guarantee redundant connection to the network.
The Ekip Com modules enable Ekip trip units to be connected to networks that use the following protocols:

Protocol	Ekip Com Module	Ekip Com Redundant Module
Modbus RTU	Ekip Com Modbus RS-485	Ekip Com R Modbus RS-485
Modbus TCP	Ekip Com Modbus TCP	Ekip com R Modbus TCP
Profibus-DP	Ekip Com Profibus	Ekip Com R Profibus
Profinet	Ekip Com Profinet	Ekip Com R Profinet
EtherNet/IP™	Ekip Com EtherNet/IP™	Ekip Com R EtherNet/IP™
DeviceNet™	Ekip Com DeviceNet™	Ekip Com R DeviceNet™
IEC61850	Ekip Com IEC61850	Ekip Com R IEC61850
Cloud connectivity	Ekip Com Hub (coming soon)	–

Electrical diagram reference: figures from 51 to 59. Redundant version from 61 to 67.

Fig. 3

Ekip Link Module (Fig.3)

The Ekip Link module enables the Ekip UP⁺ units to be connected to ABB communication system for power automation logics, like Power Controller, ATS or load shedding logics.
It is suitable for all Ekip units and can be factory or field installed in the device terminal box, even when Ekip Com communication modules are present. In this way, it is possible to have a complete supervision of the system by means of the Ekip Com modules connected to the communication network.

Electrical diagram reference: figure 58

Fig. 4

Ekip Com Hub (Fig.4)

Ekip Com Hub is the new communication module for Ekip UP⁺ cloud-connectivity.
Ekip UP⁺ equipped with Ekip Com Hub can establish the direct connection to ABB Ability™ Energy and Asset Manager for the whole low-voltage power distribution panel. This dedicated cartridge-type communication module just needs to be inserted into the terminal box and connected to the internet.
For further information related to ABB Ability™ Energy and Asset Manager, please see Chapter 4.

In order to ensure cybersecurity of the device, the Ekip Com Hub has loaded a Certificate from a Trusted Authority. Ekip Com Hub has to be connected to the external network in order to refresh the Cybersercurity Certificate and have it always up to date. In case of long-term disconnections from the network, more than 6 months (e.g. module in stock or physically disconnected), the correct functioning of Ekip Com Hub can be inhibited from the cybersecurity measures in place. It is recommended to keep the module connected or periodically connect it (e.g. in stock or physically disconnected) to the external network.

Electrical diagram reference: figures 59

Fig. 5

Signalling

Ekip 2K Signalling modules (Fig.5)

The Ekip 2K Signalling modules supply two input and two output contacts for control and remote signalling of alarms and switching device status/trips. They can be programmed from the unit's display or through Ekip Connect software. Furthermore, when using Ekip Connect, combinations of events can be freely configured. They are suitable for all Ekip UP⁺ versions. Three versions of the Ekip 2K Signalling modules are available: Ekip 2K-1, Ekip 2K-2, Ekip 2K-3.

Electrical diagram reference: figures 41, 42, 43

Fig. 5A

Ekip 3T Signalling (Fig.5A)

The Ekip 3T Signalling modules supply three analog inputs for thermo-resistances PT1000 and one analog input 4-20mA for external sensors (for example, gas/humidity meters). These input data are available in the digital unit. Through the Ekip Connect software is possible to set different thresholds and link them to digital signals. Up to two cartridge module can be installed in the same unit. PT1000 sensors are available as options. The Ekip 3T Signalling modules are suitable for all Ekip UP⁺ versions.

For more information, please refer to the product note for Ekip Signalling 3T - 1SDC210109D0201.

Ekip 4K signalling module

Fig. 6

There are two versions of Ekip Signalling 4K: Ekip Signalling 4K-A (Fig.6) supplied with Monitor version and Ekip Signaling 4K-B (Fig.6A) supplied with Protect version.
They can be programmed from the touchscreen display or through the Ekip Connect software.
The Ekip 4K-A signaling module is equipped with four digital input contacts and four digital output contacts for control and remote signaling, each with its own green led light.
The Ekip 4K-B signaling module is equipped with four digital input contacts (each with own state led), two digital output contacts (with own state led) and two physical push-buttons (for direct control of contact making and breaking). When using Ekip Connect, combinations of events can be freely configured.
In Ekip UP+ Protect version, there is this configuration to be ready for protection:

Fig.6A

Ekip Signalling 4k	Ekip UP⁺ Protect
4k.Out1	open command
4k.Out2	close command*
4kIn.1	open status**
4k.In2	closed status**

* possible change to normal use with Ekip Connect
** possible change to normal use or with 4K. In2 for close status with Ekip Connect

The signalling contact switching time is 7ms max.
It is possible to connect directly the open and closing contacts to actuators on switching devices. These can be opening or, where possible to program external trip function, trip coil to open the switching device and closing coils or motor operators to close it. The time to open the switching device is the sum of protection trigger (depending on timing settings), contact switching time and switching device opening time through opening or trip coil. If needed, a dedicated contact can be programmed to open the switching device through under-voltage coil. If the actuators inrush power requested exceeds the value listed below, it is necessary to use auxiliary relays.

→

Accessories for Ekip UP⁺ units

Rated Voltage [V]	Inrush Power [W/VA]
30 Vdc	60
50Vdc	40
150Vdc	30
250Vac	1000

For more details, please refer to dedicated manual, doc. 1SDH002129A1002.

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Electrical diagram reference: figure 20A, 20B

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Fig. 7

Ekip 10K signalling unit (Fig.7)

Ekip 10K Signalling is an external signalling unit designed for DIN rail installations for Ekip UP⁺ distributed I/O. The unit provides ten contacts for electrical signalling of timing and tripping of protection devices. If connected via Ekip Connect software, the contacts can be freely configured in association with any event and alarm or combination of both.

The Ekip 10K Signalling module can be powered either by direct or alternating current and can be connected to all the units via internal bus or Ekip Link modules.

Several Ekip 10K Signalling can be installed at the same time on the same Ekip unit; max 3 by local bus, according to Ethernet band rate if using Ekip Link architecture.

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Electrical diagram reference: figure 103

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Fig. 8

Ekip Signalling Modbus TCP (Fig.8)

It is an external signalling unit designed for DIN rail installations. Function of the signalling module is to share - via an Ethernet network with Modbus TCP communication protocol - information about the state of other switching devices that might not have the ability to provide such information via Ethernet, and also to allow these products to be operated via remote control.

Characteristics of output contacts			**Number of contacts**		
Type		**Monostable**	**Ekip 2K**	**Ekip 4K**	**Ekip 10K**
Maximum switching voltage		150V DC / 250V AC	2 output + 2 input	4 output + 4 input	10 output + 11 input
Maximum switching current					
	30V DC	2A			
	50V DC	0.8A			
	150V DC	0.2A			
	250V AC	4A			
Contact/coil insulation		1000 Vrms (1min @50Hz)			

Ekip 10K signalling unit power supply	
Auxiliary supply	24-48V DC, 110-240V AC/DC
Voltage range	21.5-53V DC, 105-265V AC/DC
Rated power	10VA/W
Inrush current	1A for 10ms

Measurement and protection

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Fig. 9

Ekip Measuring module (Fig.9)

The Ekip Measuring module enables the unit to measure the phase and neutral voltages, power and energy. The Ekip Measuring module is always installed on the front, right housing of the units, without having to remove the touchscreen display itself. The voltage busbars can be connected to the Ekip Measuring four input sockets according to scheme in Chapter 7:

- directly with insulation requirements according to IEC 61010 and UL508 Standards
- using single-phase voltage transformers to comply with IEC 60255-27 Standard for protective relays with these specifications
  - secundary voltage rating 100:√3
  - precision class 0.2
  - power absorprtion 4VA

The module must be disconnected during the dielectric withstand tests on the main busbars.

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Electrical diagram reference: figures 11, 12, 13, 14

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Fig. 10

Ekip Synchrocheck (Fig.10)

This module enables the control of the synchronism condition when placing two lines in parallel enabling ANSI 25. The module can be used with Ekip UP⁺ Protect.
Ekip Synchrochek measures the voltage values on two phases of one line through an external transformer and compares them to the measured voltages at Ekip UP⁺. An output contact is available, which is activated upon reaching synchronism, and enables the switching device interfaced to be closed by means of wiring with the closing coil.

Characteristics of output contacts			**Number of contacts**
Type		**Monostable**	**Ekip Synchrocheck**
Maximum switching voltage		150V DC / 250V AC	1 output
Maximum switching current			
	30V DC	2A	
	50V DC	0.8A	
	150V DC	0.2A	
	250V AC	4A	
Contact/coil insulation		1000 Vrms (1min @50Hz)	

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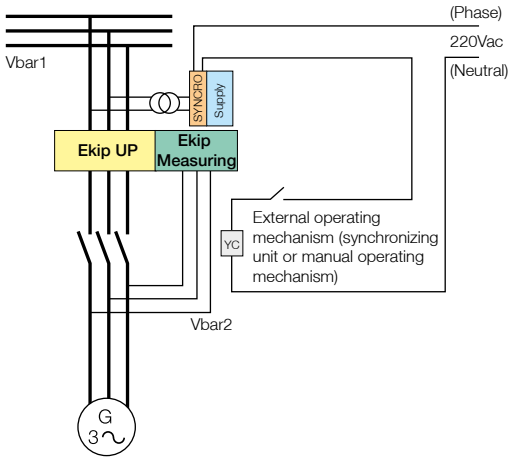
Electrical diagram reference: figure 44



Accessories for Ekip UP⁺ units

Fig. 11

Ekip CI (Fig.11)
This module is needed when the Unit and the contactor must work in conjunction with each other. In this way the higher number of operations of the contactor are used instead of the switching device (circuit-breaker/switch disconnector). When the unit is set in Normal mode (default mode) by means of the Ekip CI module the contactor is activated in one of the protection trips (excluding I and G protections); if the Heavy mode is set the trip unit directly opens the circuit-breaker. The autoreset function allows the actuation status of the Ekip CI to reset automatically after the contactor has tripped owing to the L function, once an adjustable time from 1 to 1000s has elapsed. Auto-reset can occur only in Normal mode. The BACK UP function is available and deals with situations whereby an opening command transmitted to the contactor via module Ekip CI has not been successful. In thiscase, the Ekip UP sends an opening command to the circuit-breaker/switch disconnector after waiting a settime Tx. The actuation time of the contactor given by the manufacturer must be considered when the Txtime delay setting is entered. The function is active with an auxiliary supply.

Fig. 12

Rating Plug (Fig.12)
The rating plugs are field-interchangeable from the front on all units and enable the protection thresholds to be adjusted according to the actual rated current of the system. Rating Plug is a mandatory accessory for Ekip UP⁺ units, but can be purchased also as loose accessory.
This function is particularly advantageous in installations that may require future expansion or in cases where the power supplied needs to be limited temporarily (e.g. mobile Gen Set).

Digital unit	Rating plugs available
Ekip UP⁺ all versions	100-200-250-400-600-630-800-1000-1200-1250-1600-2000-2500-3000-3200-3600 -4000 5000-6000-6300

Special rating plugs are also available for differential protection against earthing faults in combination with a suitable toroid to be installed externally.

Digital unit	Rating plug available for Rc protection
Ekip UP⁺ all versions	100-200-250-400-600-630-800-1000-1200-1250-1600-2000-2500-3000-3200-3600 -4000

Current sensors

Current sensors for three/four lines

Ekip UP+ units have four types of current sensors' technology suitable that are included in the package as mandatory configured accessories. The current sensor can be ordered as loose accessories only for replacement or changing from 3 poles to 4 poles reasons. Except insertion bridges, being based on on Rogowski technology, without core-saturation effect, they guarantee high flexibility, huge range linearity, from few Amps to hundred kAmps without frequency limit, and easy detection of quickly current variations as well as harmonic contents. Ekip UP+ has a compact solution for every situation, available both for 3 or 4 poles. 3 meters of cable enable the connection in every switchgear, maintaining EMC performances. A specific getting started explains the installation procedure.

Fig. 13

- **Type A (Fig.13)** This type is a closed sensor with copper terminals for busbars. Type A current sensors are recommended for new plants to optimize current capacity in the reduced space inside the switchgear. Type A current sensors have a dedicated label for phase and polarity, so as to get an easy installation. They are calibrated directly from the factory with also primary injection tests done.

Fig. 14

- **Type B (Fig.14)** This type is a closed sensor without copper terminals inside. Type B current sensors are recommended as a cost-effective solution for new and existing electrical systems, especially with cable connections. As Type A, also type B current sensors has a dedicated label for phase and polarity as well as the same calibration procedure.

Fig. 15

- **Type C (Fig.15)** This type is a plug-in sensor, very light and flexible so to be installed even in small spaces and suspended on measured conductor, with no external power supplier required. Type C current sensors are typically used in old switchgear, as they can be added even without shutdown if the technician can work under voltage condition according to local standards. The installation time is less than 80% compared to traditional current transfomers and there is no need to disconnect cables or busbars thanks to the split-core. They have a dedicated printed label for polarity indication. The busbars or cables can be positioned using dedicated devices.

The following table summarize main performances as examples of connections for cables or busbars.

Electrical diagram reference: figure 17, 18

Current Sensors				
Description	**d X D [mm]***	**In max [A]**	**Example of connections**	
Type A closed sensors with junction copper	50,3 x 77	2000	Busbar [mm]	2x80x10
	60 x 89	4000	Busbar [mm]	4x100x10
Type B closed sensors	29,6 x 56	400	Cable [mm]	1 x 1 x 10,5
	60 x 89	1600	Cable [mm]	2 x 2 x 11
	57x89	2500	Busbar [mm]	2 x 60 x 10
Type C open sensors	100 x 124	4000	Cable [mm]	2 x 60 x 10
	120 x 144	4000	Busbar [mm]	2 x 100 x 10
	200 x 224	4000	Busbar [mm]	4 x 100 x 10
	290 x 314	6300	Busbar [mm]	6 x 100 x 10

*d: internal diameter - D: main external dimension

Fig. 16

- **Type D (Fig.16)** This type refers to insertion bridges for current sockets that can be used in the applications in which current sensors are not strictly required, for example for Interface Protection System (IPS) or special gateway applications. Four insertion bridges are provided for each phase current that can be excluded. Configured with insertion bridges, Ekip UP+ is ready to be used with Type C 100 or Type C 120 current sensor kits, 3 or 4 poles.
- **Type E** Specifying this sensor, the Digital Unit will be shipped without current sensors. This allows a maximum level of flexibility premitting to the user to select after sales the right sensors to be associated to the digital unit. A fine tuning using ABB EPiC mobile commissioning tool is required. Only Type C sensor can be equipped after sales.

Accessories for Ekip UP⁺ units

Fig. 17

Positioning device (Fig. 17)
Thanks to this device, positioning of busbars and cables with type C current sensors becomes easier, as no other ties or equipments are needed. It is compatible with busbar connection up to 2x80x10 [mm].

Fig. 18

Homopolar toroid for the earthing conductor of main power supply (Fig.18)
Ekip UP⁺ Protect can be used with an external toroid positioned, for example, on the conductor that connects the star center of the MV/LV transformer to earth (homopolar transformer): in this case, the earth protection is called Source Ground Return. There are four sizes of the toroid: 100A, 250A, 400A, 800A. The homopolar toroid is an alternative to the toroid for differential protection.

Electrical diagram reference: figure 25

Fig. 19

Toroid for differential protection (Fig.19)
Connected to the Ekip UP⁺ Protect equipped with a rating plug for differential protection, this toroid enables earth fault currents of 3...30A to be monitored.
To be installed on the busbar system, it is an alternative to the homopolar toroid.

Electrical diagram reference: figure 24, 24A

Testing and programming

Fig. 20

Ekip TT testing and power supply unit (Fig.20)

Ekip TT is a device that allows you to verify that the Ekip UP^{+} opening and closing contacts based on protection trip mechanism is functioning correctly (protection test).

The device can be connected to the front test connector of any touschreen display of Ekip UP^{+}; trip test can be also performed with auxiliary supply using the dedicated section in the touschreen display without this accessory.

Fig. 21

Ekip T&P testing kit (Fig.21)

Ekip T&P is a kit that includes different components for programming and testing the electronic protection trip units. The kit includes:

- Ekip T&P unit;
- Ekip TT unit;
- USB cable to connect the T&P unit to the Ekip units;
- installation CD for Ekip Connect and Ekip T&P interface software.

The Ekip T&P unit is easily connected from your PC (via USB) to the unit (via mini USB) with the cable provided. The Ekip T&P unit can perform simple manual or automatic tests on the unit functions. The Ekip T&P will also provide the ability to conduct more advanced function configuration that allows the addition of harmonics and the shifting of phases to more accurately represent the real conditions of an application. Thus, setting of more suitable protection functions usually required for critical applications becomes easier. Ekip T&P can also generate a test report as well as help you to monitor maintenance schedules.

Fig. 22

Ekip Programming Module (Fig.22)

The Ekip Programming module is used for programming Ekip units from your PC via USB using the Ekip Connect software that can be downloaded on-line. This can be useful for uploading/ downloading entire sets of parameters for multiple switching devices both for set-up as well as for maintenance (for a periodical back-up of the protection parameters in case of a catastrophic situation).

For more details about Ekip Connect, please see Chapter 4.

Service

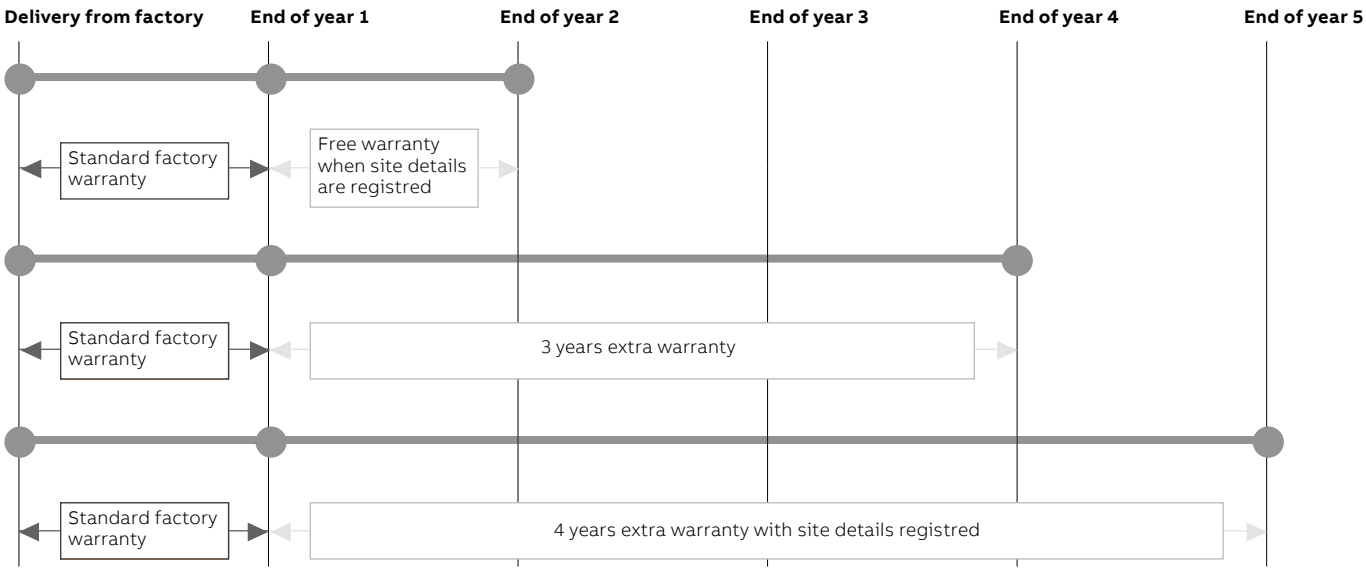
Extended warranty

For ABB Low Voltage digital unit, extending the 1-year standard factory warranty to up to 5 years has never been so simple.
Extended warranty activation can be requested after the online registration in the Extended Warranty tool. This web-tool verifies that the application of the digital unit is within the recommended guidelines, and grant the registration of the Ekip UP⁺.
When end users details are registered, one year of extra warranty is offered free-of-charge.
Extended Warranty can be ordered by following the steps:

1) Registration in the online tool (Extended Warranty Tool) to verify the application.
2) Extended Warranty part number(s) and registration code received by email
3) Place the order of the digital unit together with:
   - Extended warranty part number(s)
   - Unique registration code

Warranty coverage:

- Any possible issues related to circuit breaker quality for the complete extra warranty time
- Accessories mounted by the factory only.



Dimensions

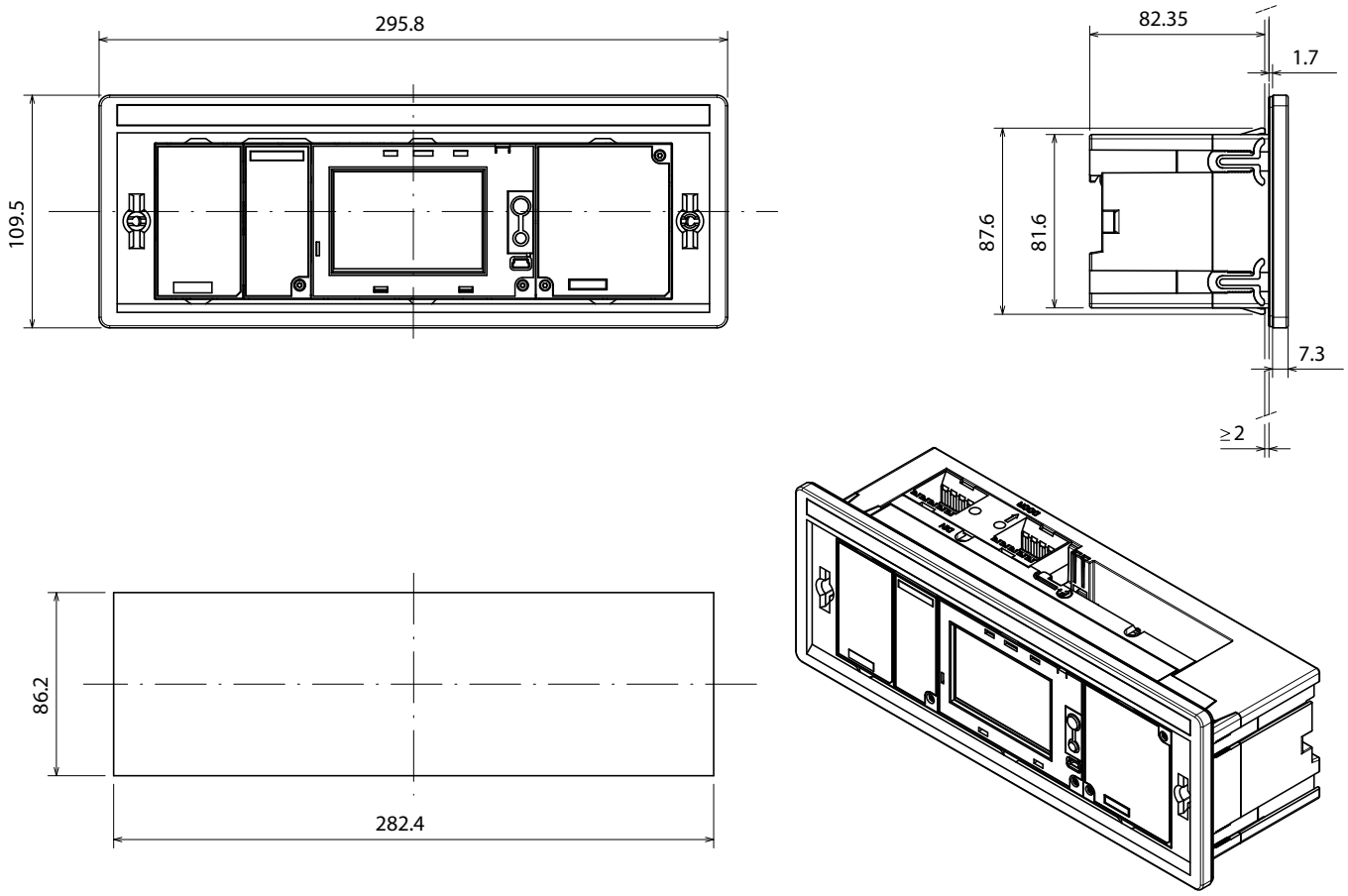
Ekip UP⁺ unit dimensions

Ekip UP⁺ is a plug & play unit that ensures easy installation, even adding current and voltage sensors wherever wanted in the plant layout.

Ekip UP⁺ can be door-on rail mounted, fitting all the requirements either in power distribution or either in process automation. DIN-rail mounting option is also very useful when it is better not to occupy space on the front doors of the switchgears. Ekip UP⁺ depth is one of the smallest among external units, so it is suitable for many switchgear sizes. Besides, the terminals (of the signaling contacts) can rotate according to the mold-printed mounting options.

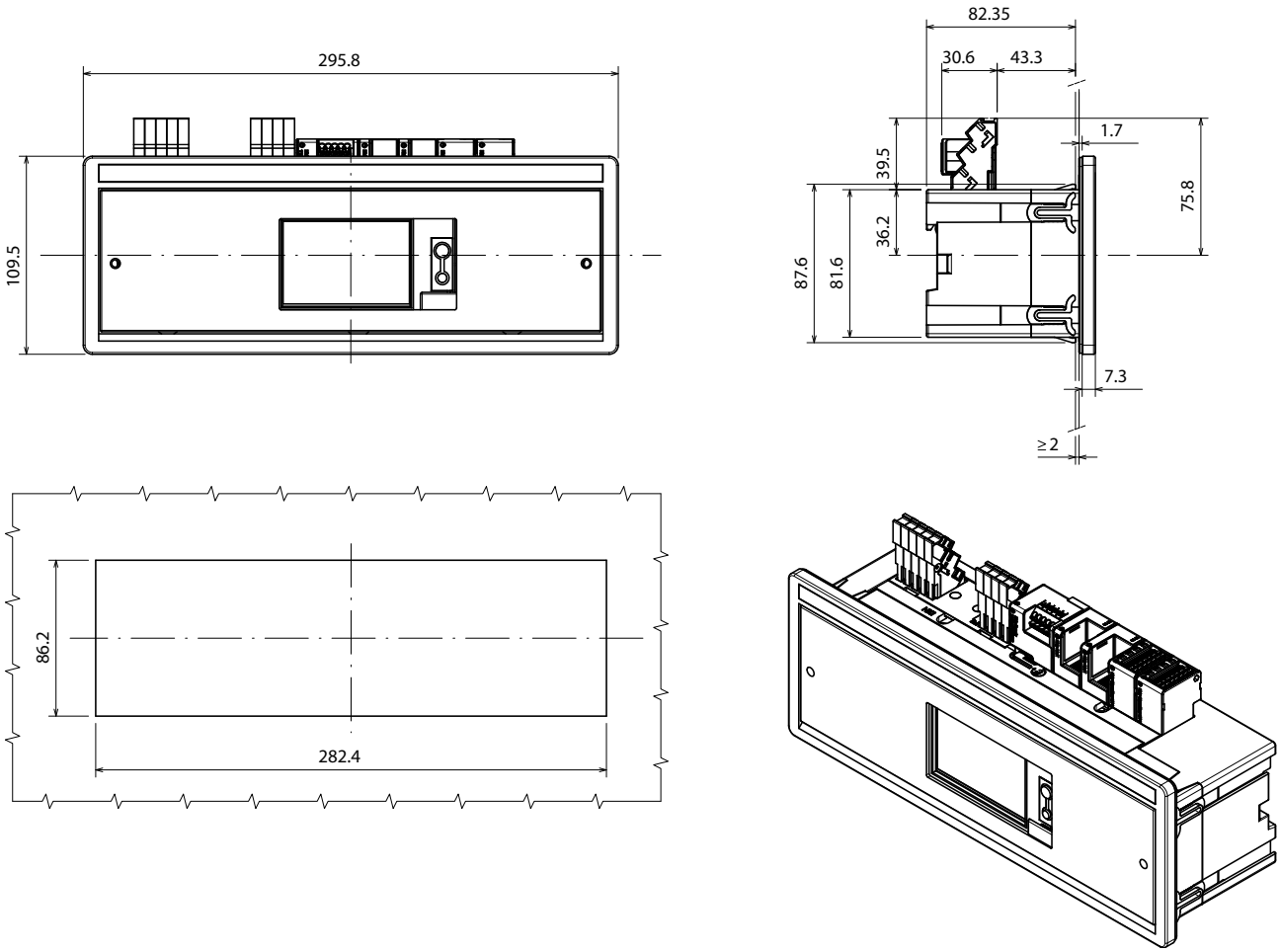
Current and voltage sensors should be applied to the dedicated numbered sockets. Current sockets are directly provided by ABB in different versions, as 3/4 poles or opening/closing Rogowski coils. They fit the current range and the space available among bus-bars/cables in the switchgear. Commercial voltage sensors can be applied following ABB specifications as described in Chapter 5.

Ekip UP⁺ unit door-mounted without modules/terminals

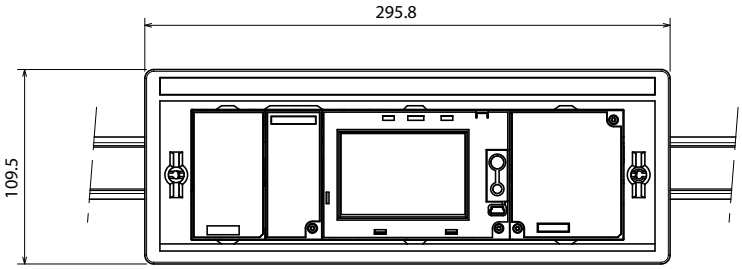


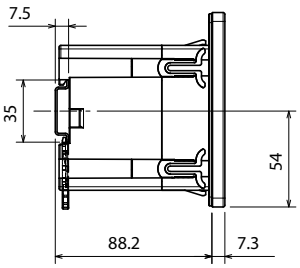
Ekip UP⁺ unit dimensions

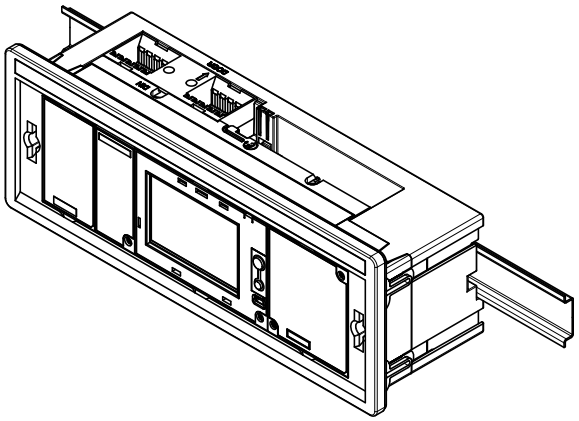
Ekip UP⁺ unit door-mounted with modules/terminals



Ekip UP⁺ unit DIN-rail mounted without modules/terminals

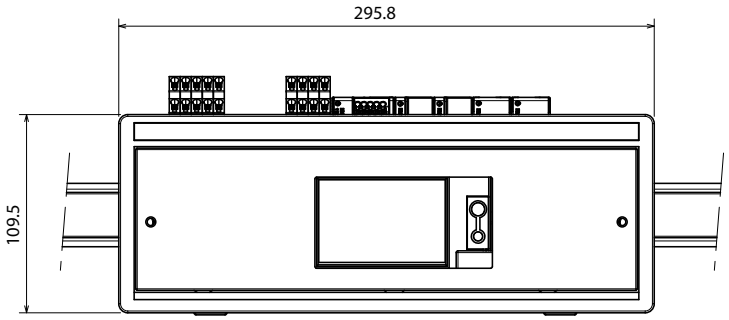


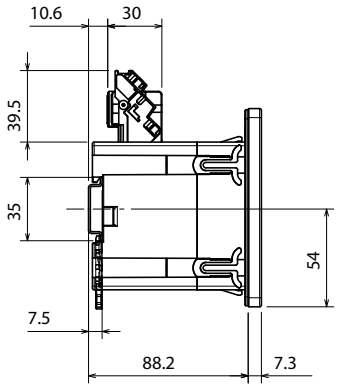


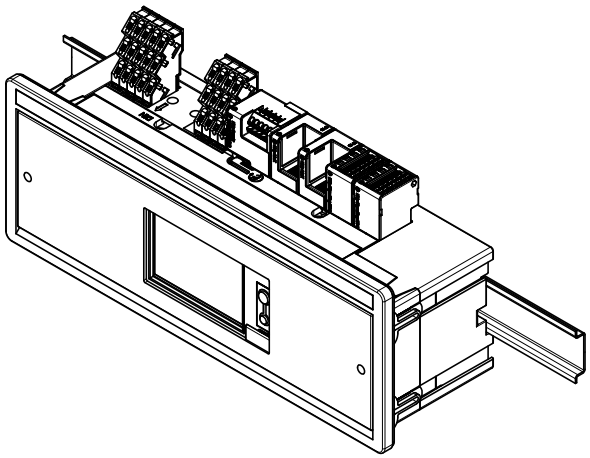


Ekip UP⁺ unit dimensions

Ekip UP⁺ unit DIN-rail mounted with modules/terminals

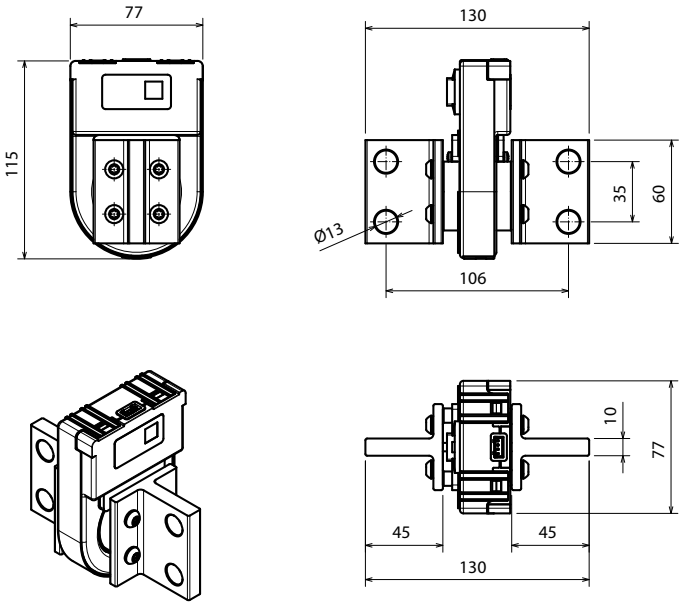




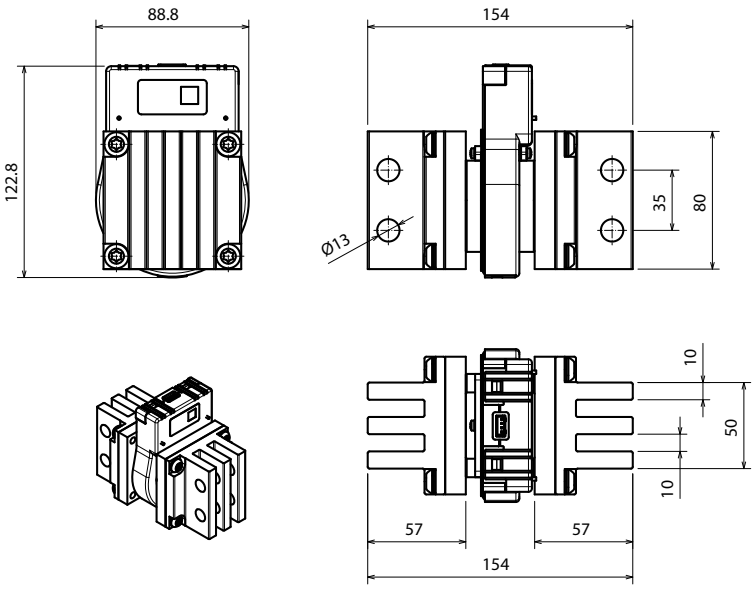


Current sensor dimensions

Current sensor type A 100A-2000A

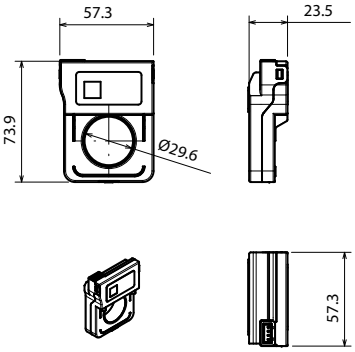


Current sensor type A 2000A-4000A

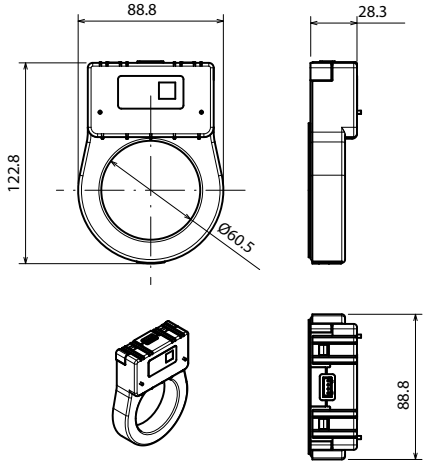


Current sensor dimensions

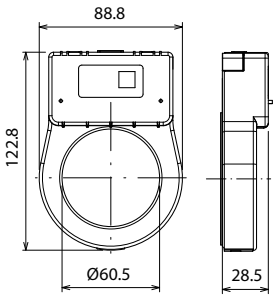
Current sensor type B 100A-400A



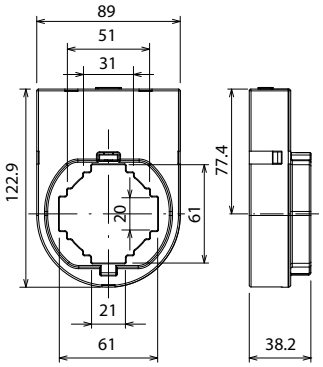
Current sensor type B 400A-1600A



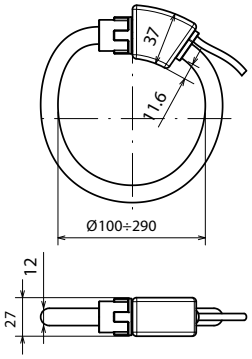
Current sensor type B up to 1600A



Current sensor type B up to 2500A



Current sensor type C
Ø 100-120-200 mm up to 4000A
Ø 290 mm from 2000A to 6300A



Wiring diagrams

Reading information

Description of figures

11) Ekip UP⁺ with external voltage transformer and 3P configuration
12) Ekip UP⁺ with external voltage transformer and 4P configuration
13) Ekip UP⁺ without external voltage transformer and 3P configuration
14) Ekip UP⁺ without external voltage transformer and 4P configuration
15) Ekip UP⁺ for residual voltage protection (only for Protect) with external transformer
16) Ekip UP⁺ for residual voltage protection (only for Protect) without external transformer
17) Ekip UP⁺ current sensor connection and 4P configuration
18) Ekip UP⁺ current sensor connection and 4P configuration
19A) Bridges for Ekip UP⁺ without current connections
19B) Bridges for Ekip UP⁺ without voltage connections
20A) Ekip UP⁺ 4k
20C) Ekip 4k on Ekip UP⁺ protect with YO and YC command and 2 status input
24) RC residual current protection sensor input (ANSI 64&50NTD)
24A) RC differential ground fault protection sensor input (ANSI 87N)
25) Transformer star center sensor input
26) Zone selectivity
32) Auxiliary supply through module 24-48V DC and local bus
41) Ekip Signalling 2K-1
42) Ekip Signalling 2K-2
43) Ekip Signalling 2K-3
44) Ekip Sinchrocheck
51) Ekip Com Modbus RTU
52) Ekip Com Modbus TCP
53) Ekip Com Profibus DP
54) Ekip Com Profinet
55) Ekip Com Devicenet ™
56) Ekip Com Ethernet/IP ™
57) Ekip Com IEC 61850
58) Ekip Link
59) Ekip Hub
61) Ekip Com Redundant Modbus RTU
62) Ekip Com Redundant Modbus TCP
63) Ekip Com Redundant Profibus DP
64) Ekip Com redundant Profinet
65) Ekip Com redundant Devicenet ™
66) Ekip Com redundant Ethernet/IP ™
67) Ekip Com redundant IEC 61850
103) Ekip Signalling 10k

Key

*	=	See the note indicated by the letter
A3	=	Applications located on terminal board and connector of Ekip Up
A4	=	Indicative devices and connections for control and signalling, outside Ekip Up
BUS1	=	Serial interface with external bus
BUS2	=	Redundant serial interface with external bus
LINK BUS	=	Interface with the external Link bus
GZi(DBi)	=	Zone selectivity input for G protection or backward input for D protection
GZo(DBo)	=	Zone selectivity output for G protection or backward output for D protection
I O1…32	=	Programmable digital inputs
K51	=	Electronic device Ekip Up for control and measuring
K51/COM	=	Communication module
K51/MEAS	=	Measurement module
K51/SIGN	=	Signalling module
K51/SUPPLY	=	Auxiliary supply module (110-240VAC/DC and 24-48VDC)
K51/SYNC	=	Synchronization module
K51/YC	=	Closing control from the EKIP protection trip unit
K51/YO	=	Opening control from the EKIP protection trip unit
M	=	Motor for loading closing springs
O 01…32	=	Programmable signalling contacts
O SC	=	Contact for synchronism control
RC	=	RC (residual current) protection sensor
SZi(DFi)	=	Zone selectivity input for S protection or forward input for D protection
SZo(DFo)	=	Zone selectivity output for S protection or forward output for D protection
TU1…TU2	=	Insulation voltage transformer (outside circuit-breaker)
Uaux	=	Auxiliary supply voltage
UI/L1-L2-L3	=	Current sensor phase L1-L2-L3
UI/N	=	Current sensor on neutral
UI/O	=	Homopolar current sensor
W2	=	Serial interface with internal bus (local bus)
W9…W14	=	RJ45 connector for communication modules
W9R.W12R	=	RJ45 connector for redundant communication modules

Notes

A For the zone selectivity and local bus function the presence of auxiliary power supply (refer to diagram 1SDM000020A1001 figure 32)

B The connections between the RC residual current protection sensor and the poles of X connector of Ekip Up must be made with 4-pole shielded cable with conductors twisted in pairs (type BELDEN 9696 or equivalent) 10 m maximum length.

C The connection between terminals 1 and 2 of the current transformer and Ge+ and Ge- unit I/O terminals of the upper X terminal box must be made with shielded and stranded 2-pole cable (type BELDEN 9841 or equivalent) 15 m maximum length.

D Obligatory in case of presence of Ekip modules Ekip module.

E The Ekip Com module selected can be redundant if required, by choosing between Fig. 61...67.

F Use cables type BELDEN 3105A or equivalent.

G Terminal box available in DIN mounting configuration.

H Use cables type BELDEN 3105A or equivalent, 15 m maximum length.

I RJ45 recommended cable: CAT6 STP.

J For the serial line connection EIA RS 485, refer to "Technical Application Paper QT9: Bus Communication with ABB Circuit-Breakers".

K Bridge-connect the terminals "120 Ohm on" if you want to insert a termination resistance on the Local Bus.

L Use cables type Belden 3079A or equivalent. For further details see White Paper 1SDC007412G0201 "Communication with SACE Emax2 Circuit-Breakers"

M Use cables type Belden 3084A or equivalent. For further details see White Paper 1SDC007412G0201 "Communication with SACE Emax2 Circuit-Breakers"

O For connection of W3 and W4 see Fig 32.

P Use a twisted pair shielded and stranded cable type BELDEN 8762/8772 or equivalent. The shield must be earthed on the selectivity input side (for zone selectivity) or on both sides (for others applications).

Q The maximum secondary rated voltage admit ted is 120V.

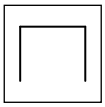
R The connection without transformer does not comply with the insulation required by the standard IEC 60255-1.

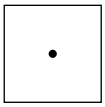
S Input and output are shown as factory default setting with 1 status input: O 01 output connected to the opening coil of the circuit-breaker/disconnector; O 02 output connected to the closing coil (or motor) of the circuit-breaker/disconnector; I 01 input connected to status input (contact closed equals to CB status = Open). For the operating limits, the configuration solutions of O 02 and I 01 and for the setting of all other input/output see the Ekip UP⁺ user manual, s(section Ekip 4k).

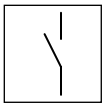
For more Ekip UP⁺ wiring diagrams, please refer to 1SDM000020A1001.

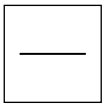
Reading information

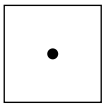
Graphical symbols for electrical diagrams (Standards IEC 617)

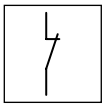

Screen, shield (it may be drawn in any convenient shape)

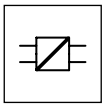

Connection of conductors

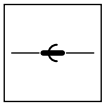

Make contact

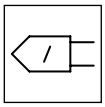

Mechanical connection (link)

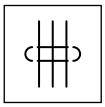

Terminal

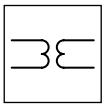

Break contact

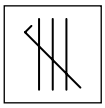

Converter with galvanic separator

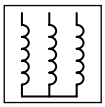

Plug and socket (male and female)


Current sensing element

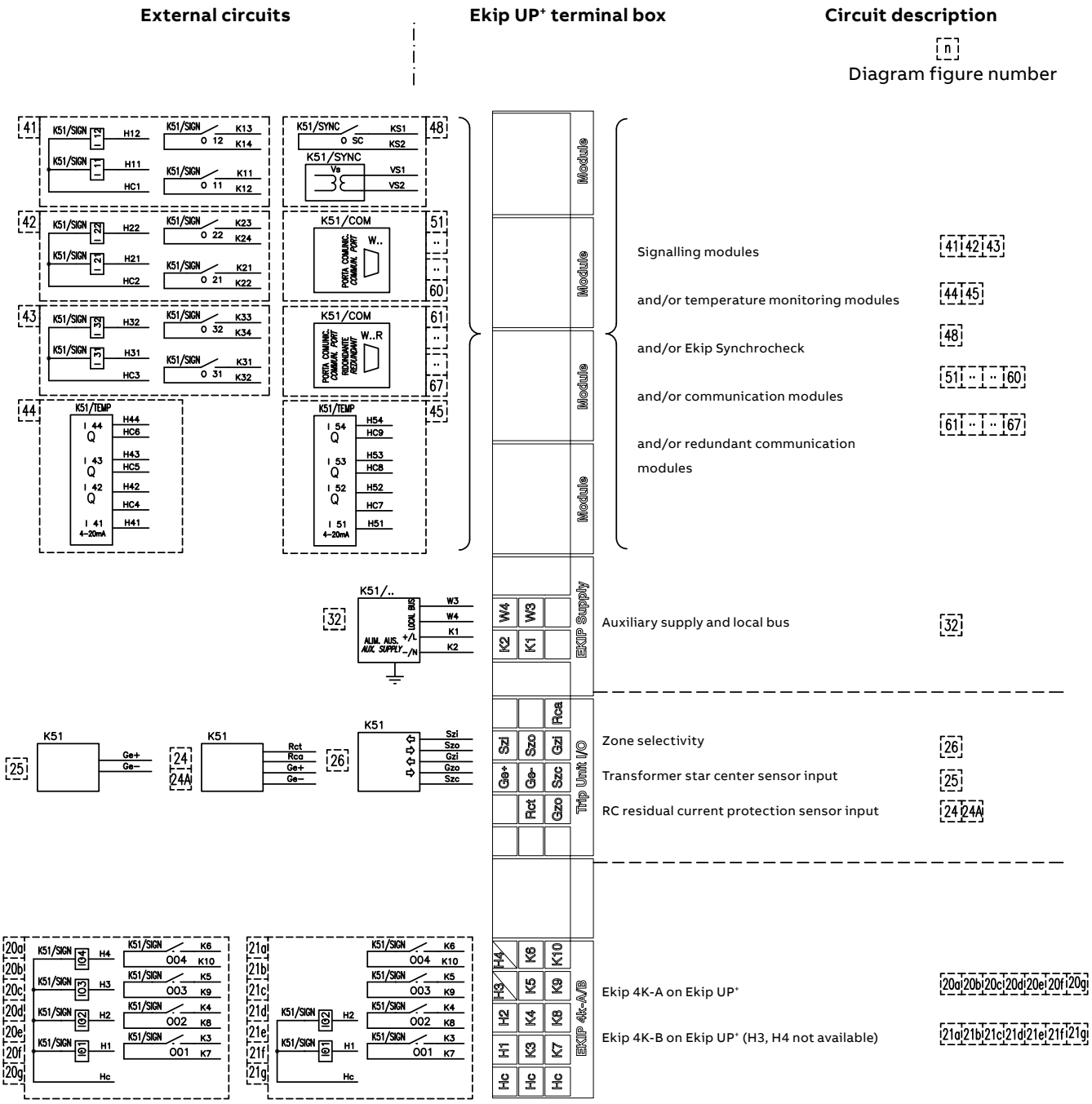

Conductors in a screened cable, three conductors shown


Voltage transformer


Twisted conductors, three conductors shown

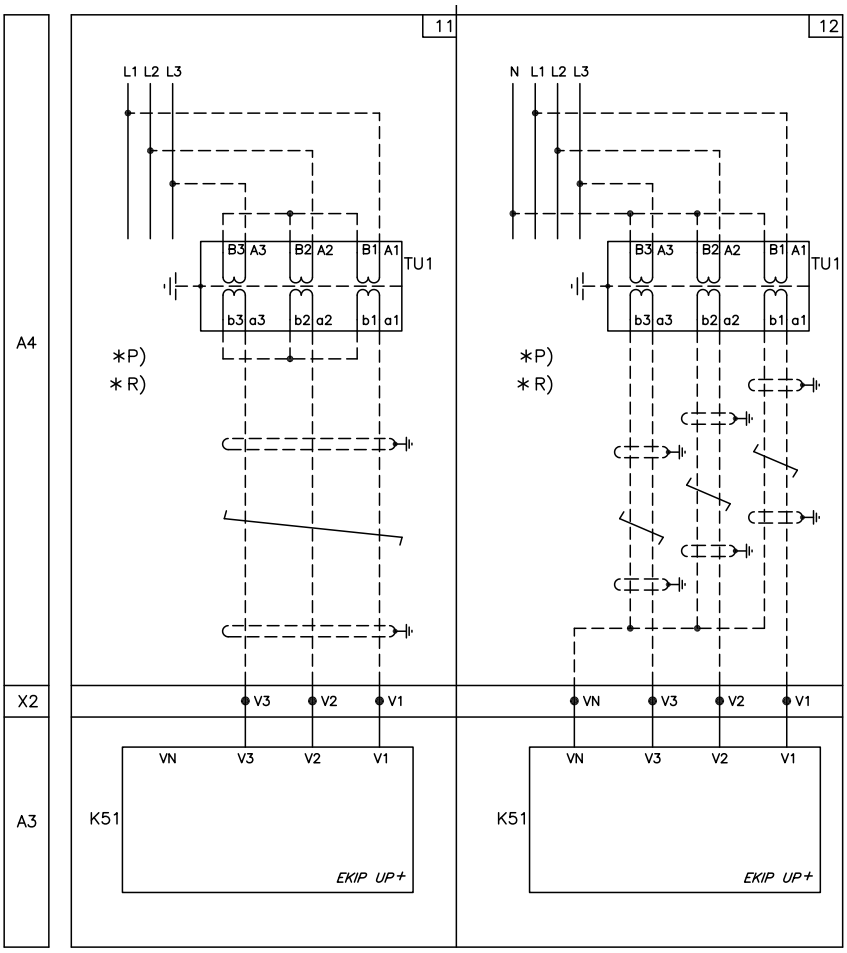

Winding of three-phase transformer, connection star

Terminal blocks

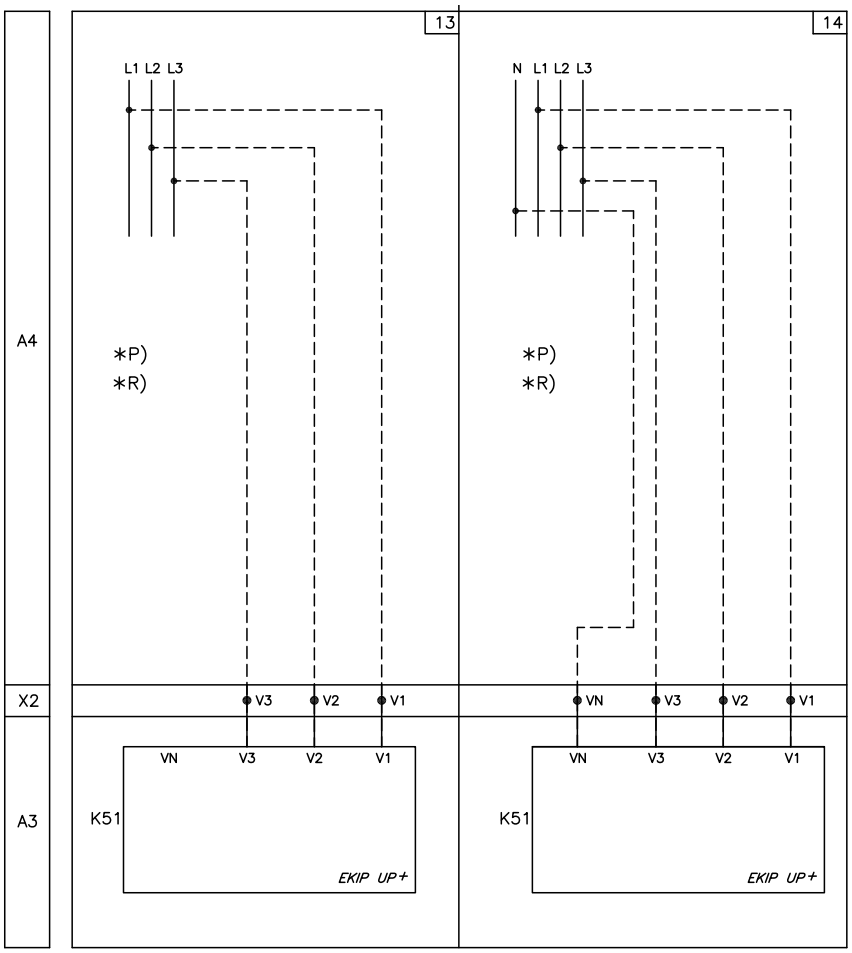


Ekip UP⁺ unit

11) Ekip UP⁺ with external voltage transformer and 3P configuration
12) Ekip UP⁺ with external voltage transformer and 4P configuration

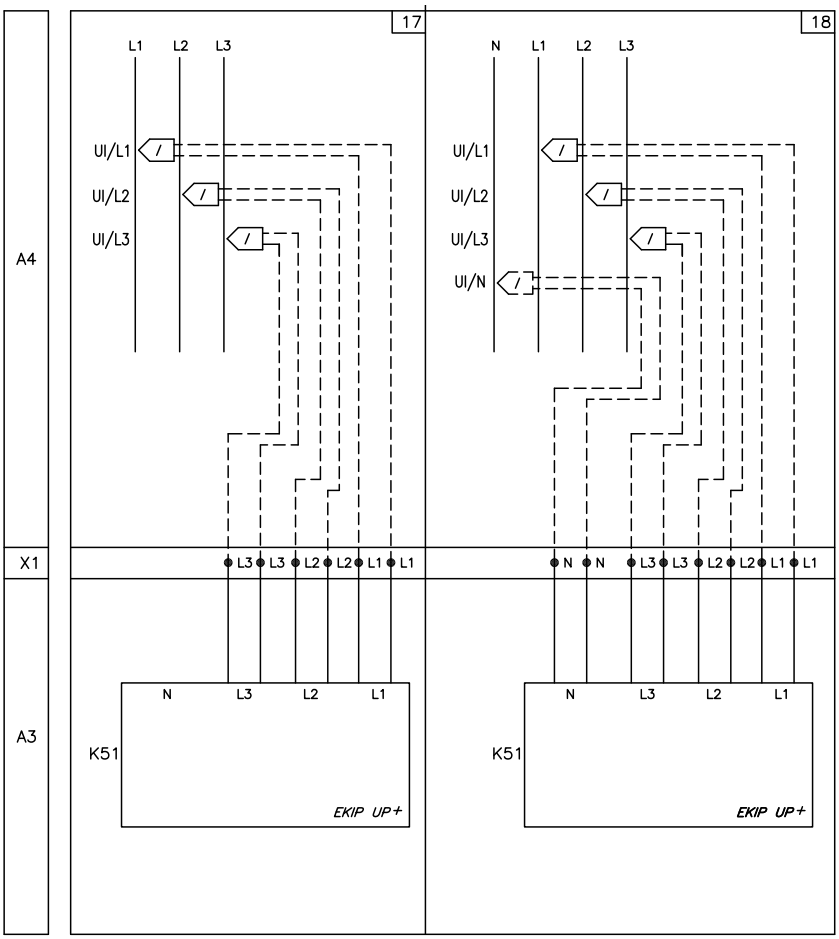


13) Ekip UP+ without external voltage transformer and 3P configuration
14) Ekip UP+ without external voltage transformer and 4P configuration

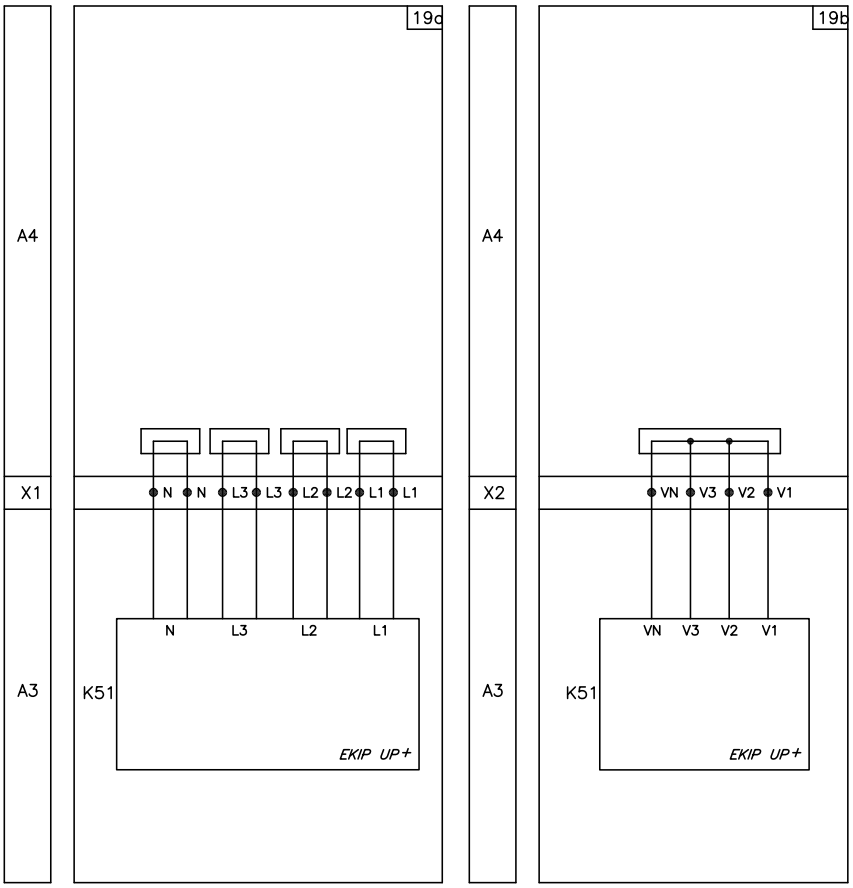


Ekip UP+ unit

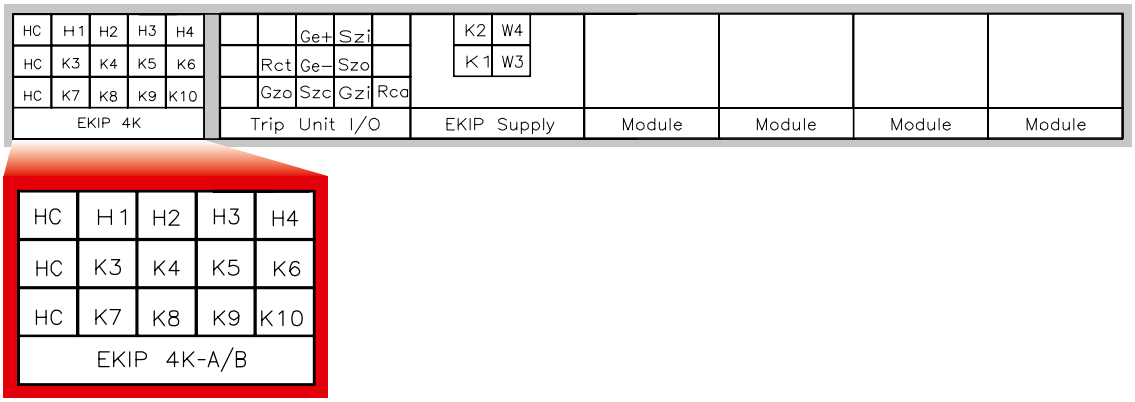
17) Ekip UP+ current sensor connection and 3P configuration
18) Ekip UP+ current sensor connection and 4P configuration



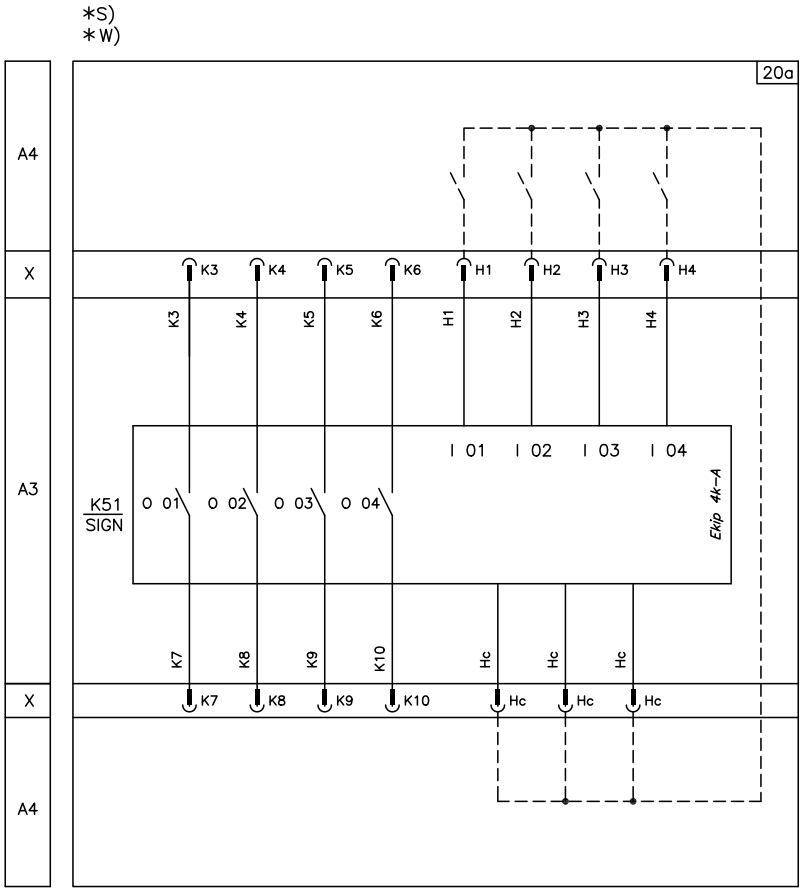
19A) Bridges for Ekip UP+ without current connections
19B) Bridges for Ekip UP+ without voltage connections

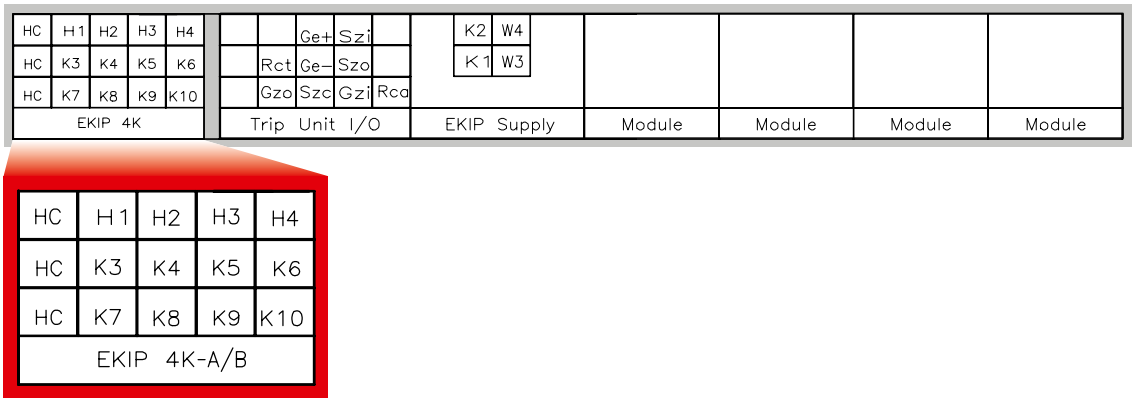


Ekip UP⁺ unit

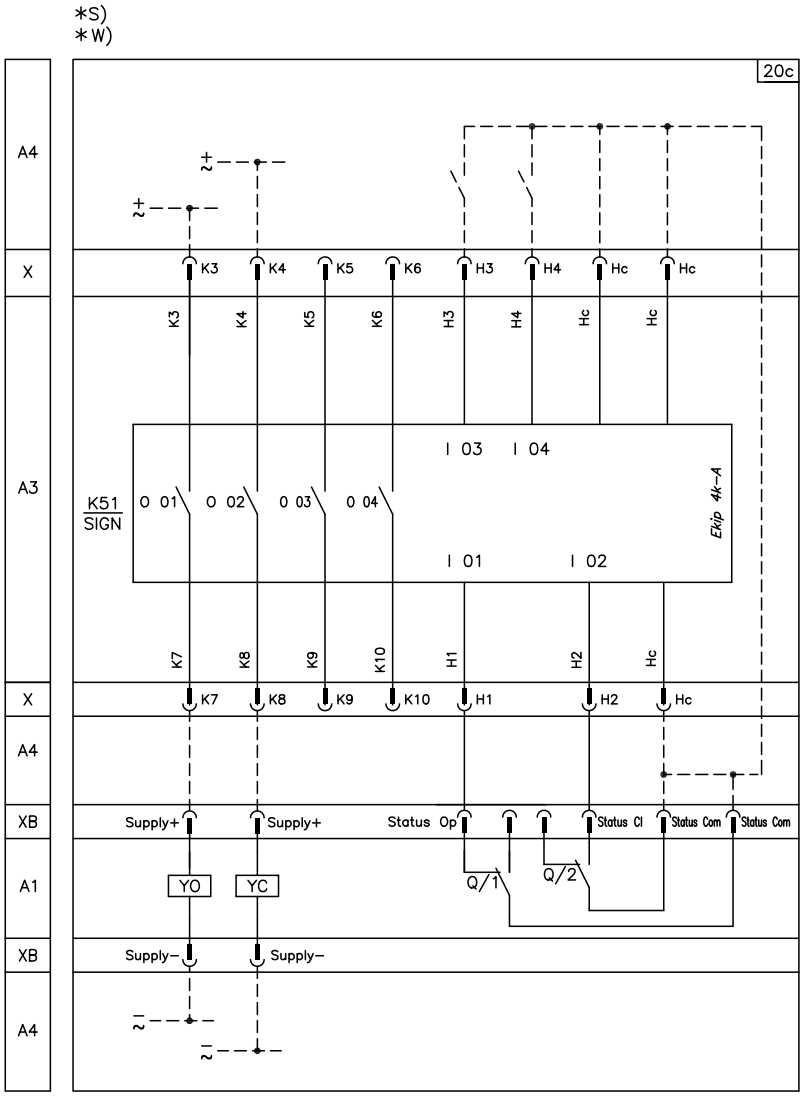


20A) Ekip 4k-A on Ekip UP⁺



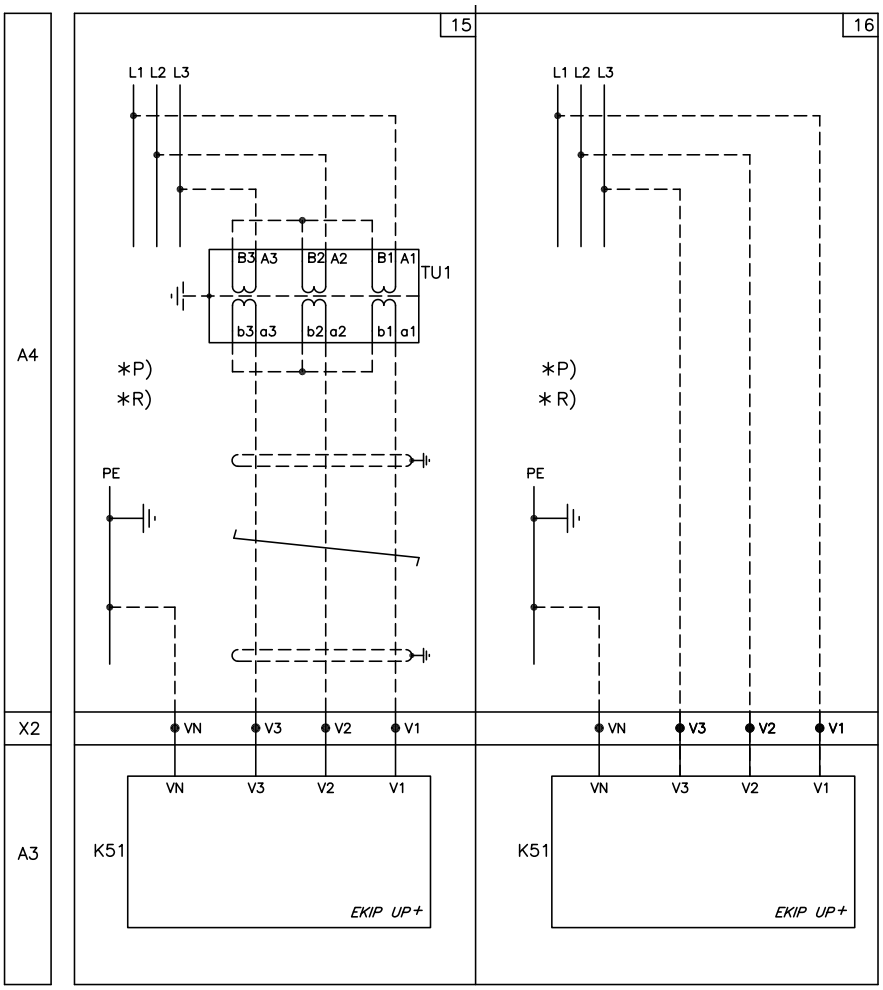


20C) Ekip 4k-A on Ekip UP⁺ with YO and YC command and 2 status input

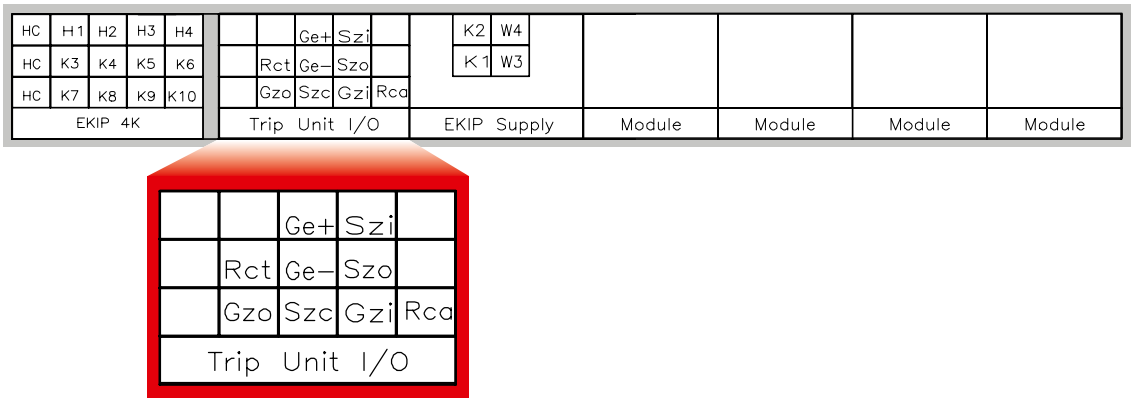


Ekip UP+ unit

15) Ekip UP+ for residual voltage protection (for protect) with external transformer
16) Ekip UP+ for residual voltage protection (for protect) without external transformer

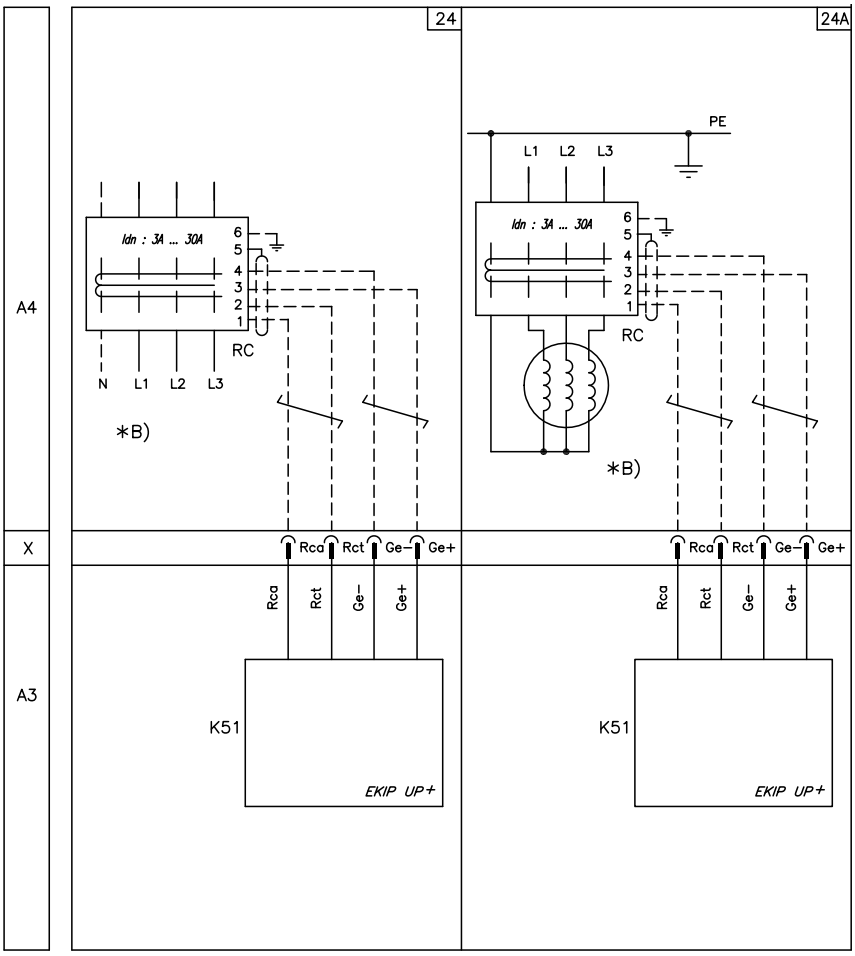


Electrical accessories

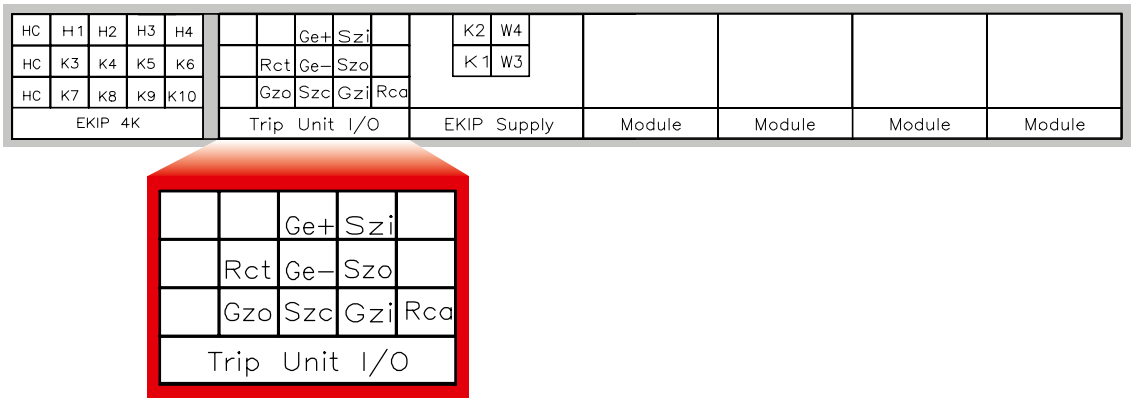


24) RC residual current protection sensor input (ANSI 64&50NTD)
24A) RC differential ground fault protection sensor input (ANSI 87N)

—
As an alternative to each other or to figure 25

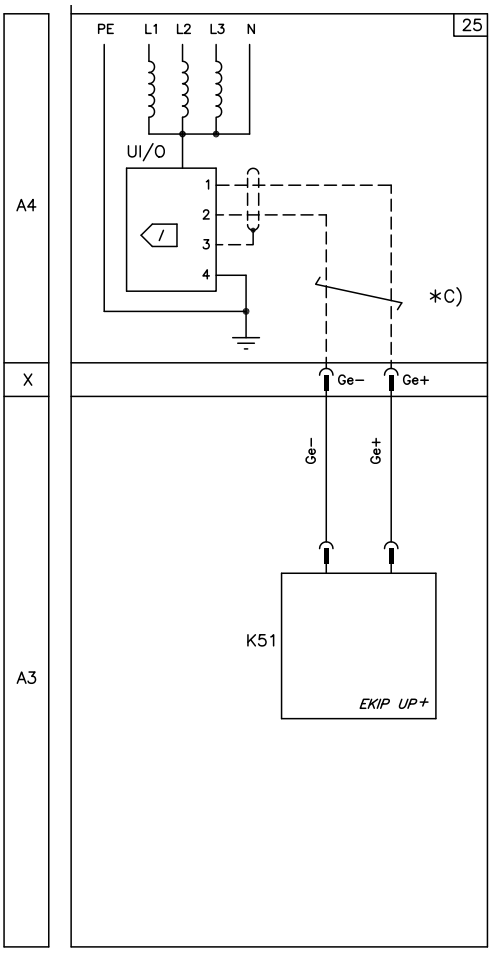


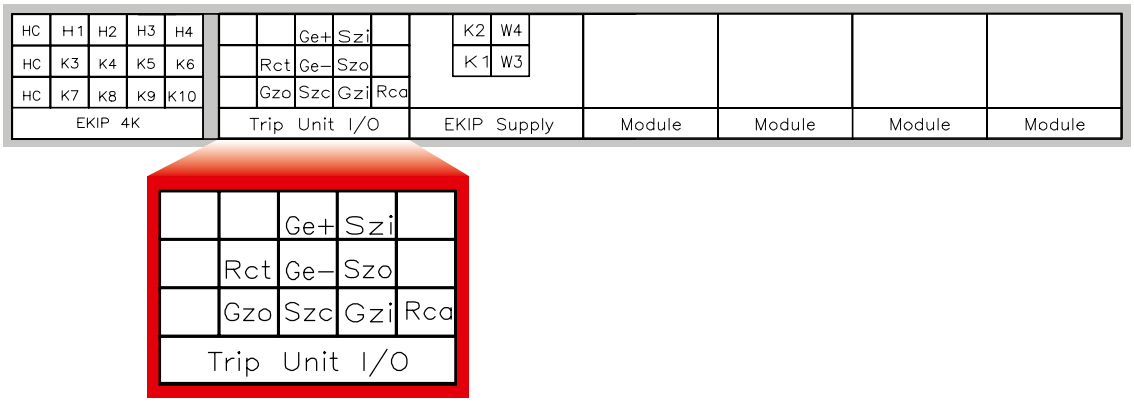
Electrical accessories



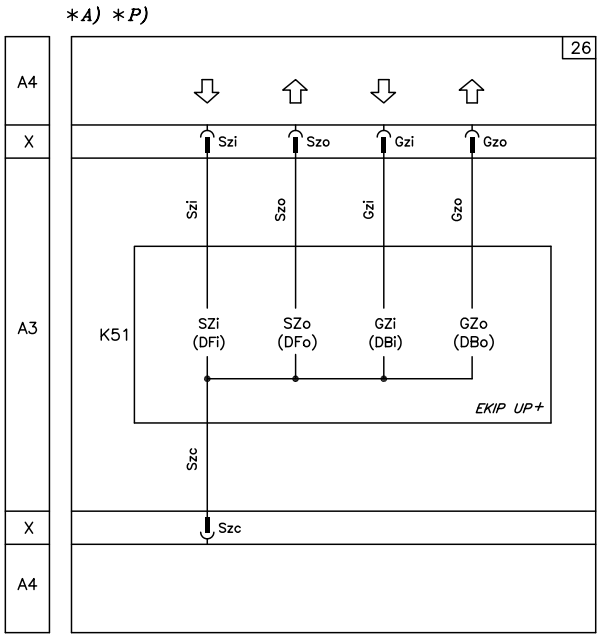
25) Transformer star centre sensor input

—
As an alternative to figures 24-24A

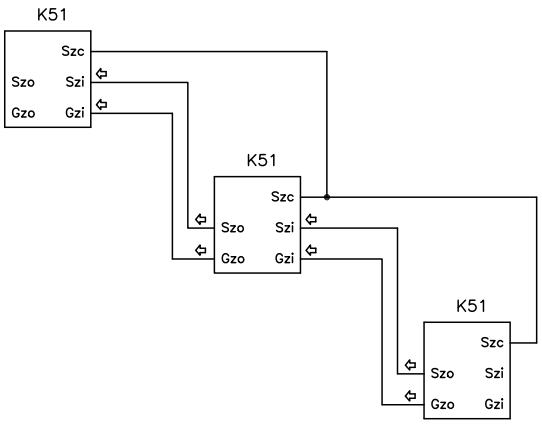




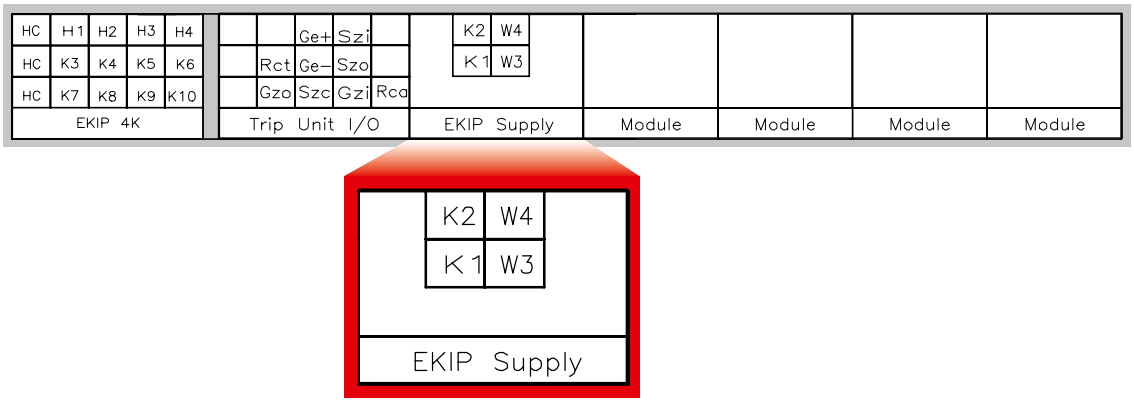
26) Zone selectivity



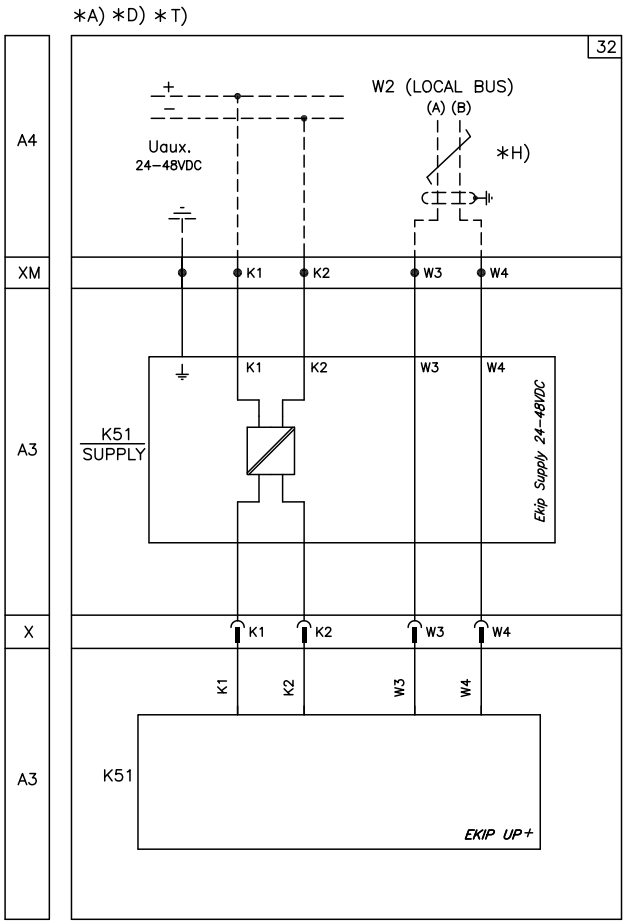
Example for application diagram (among 3 devices)

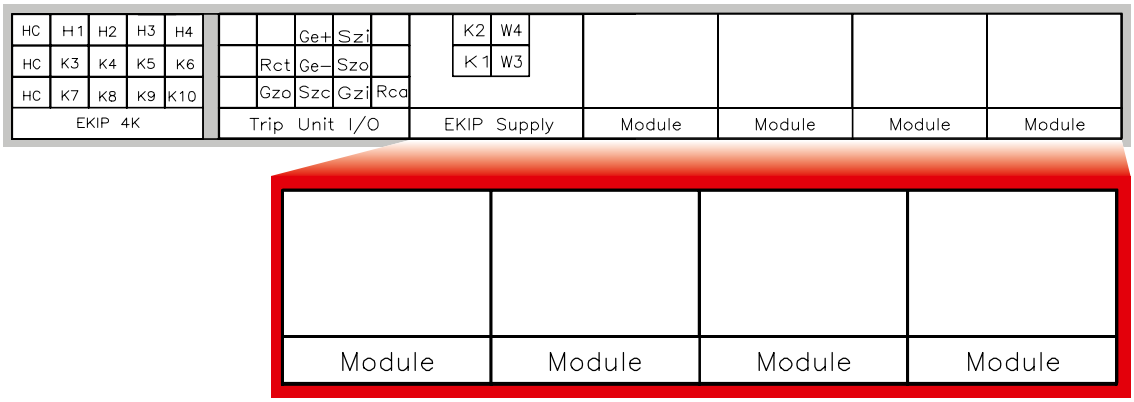


Electrical accessories

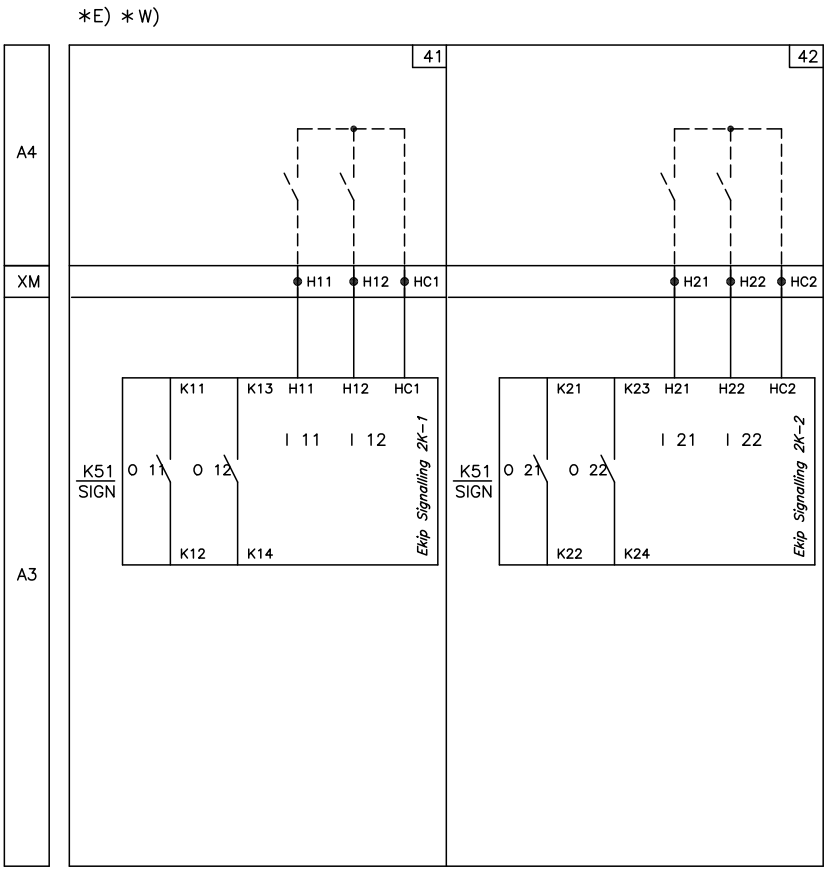


32) Auxiliary supply through module 24-48V DC and local bus

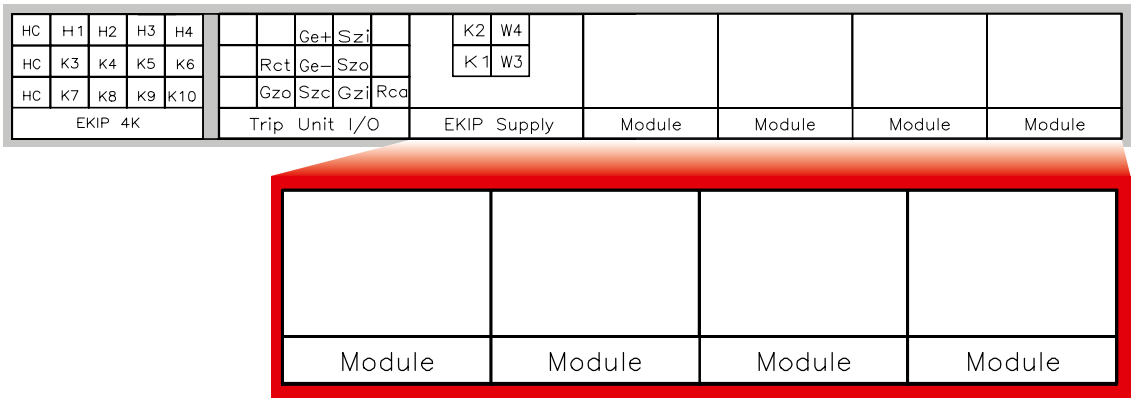




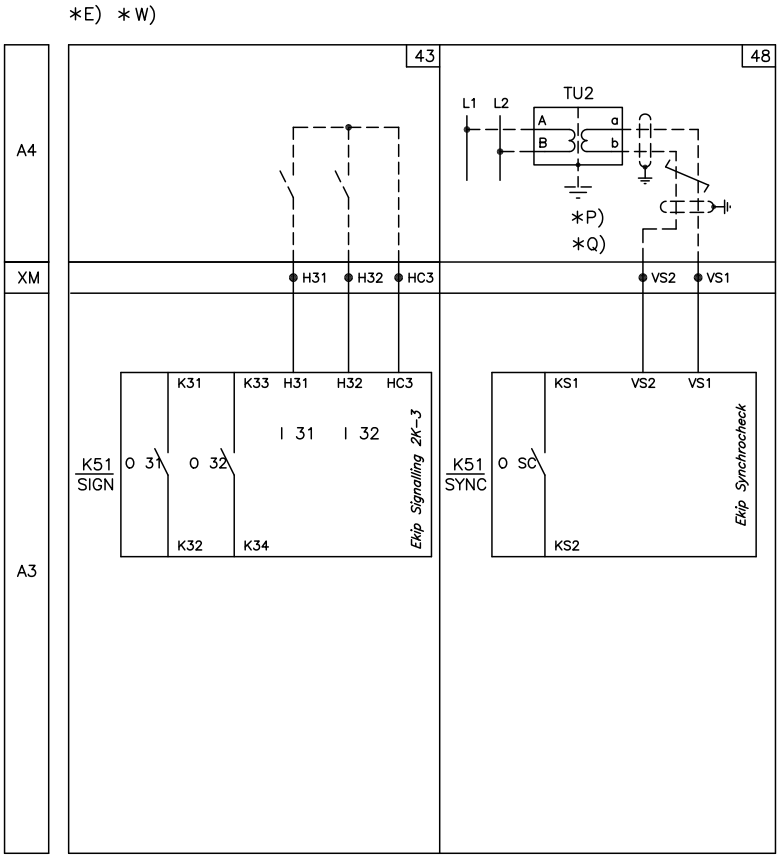
41) Ekip Signalling 2K-1
42) Ekip Signalling 2K-2

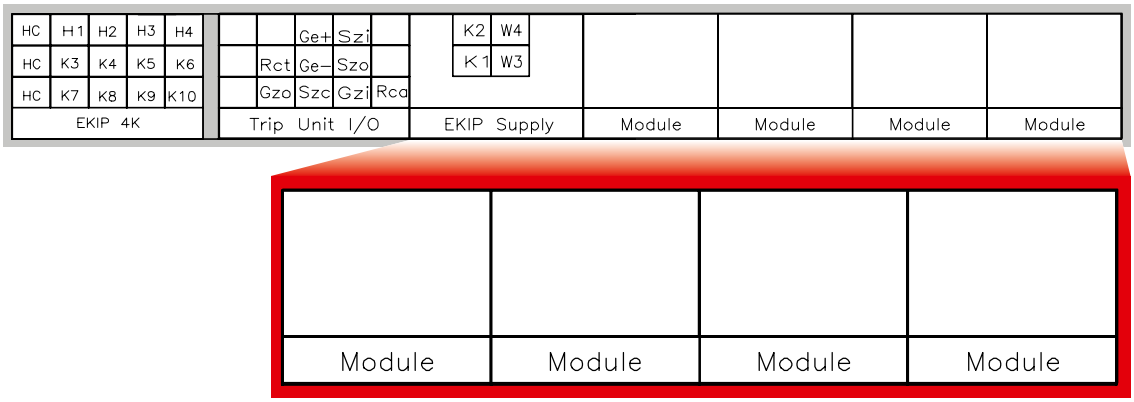


Electrical accessories

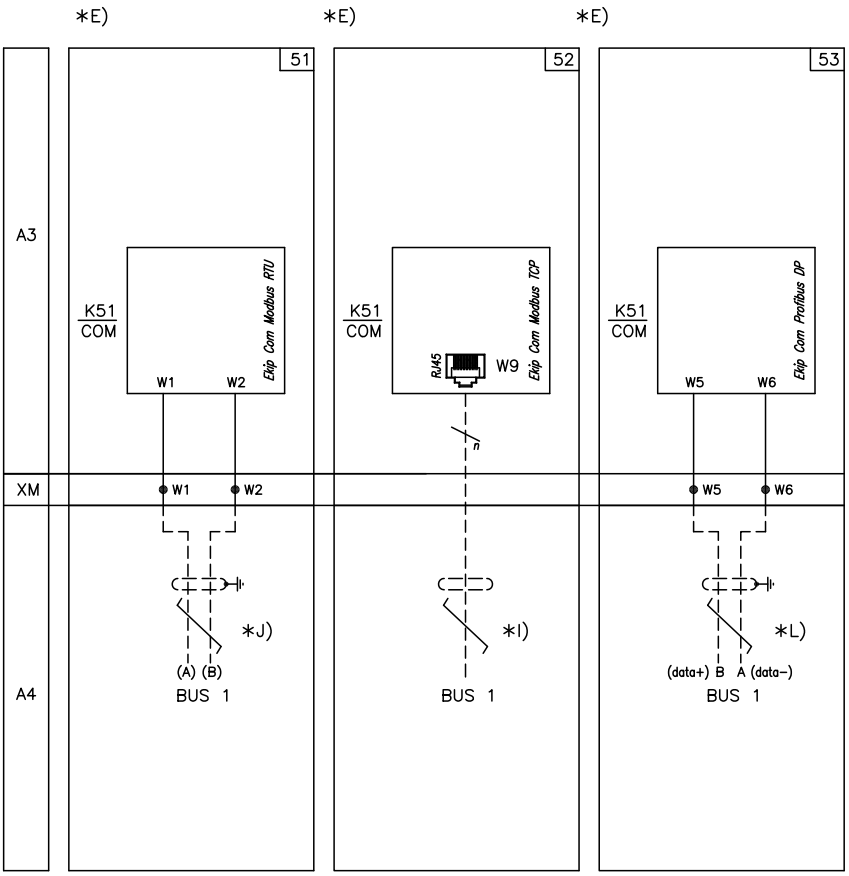


43) Ekip Signalling 2K-3
44) Ekip Sinchrocheck

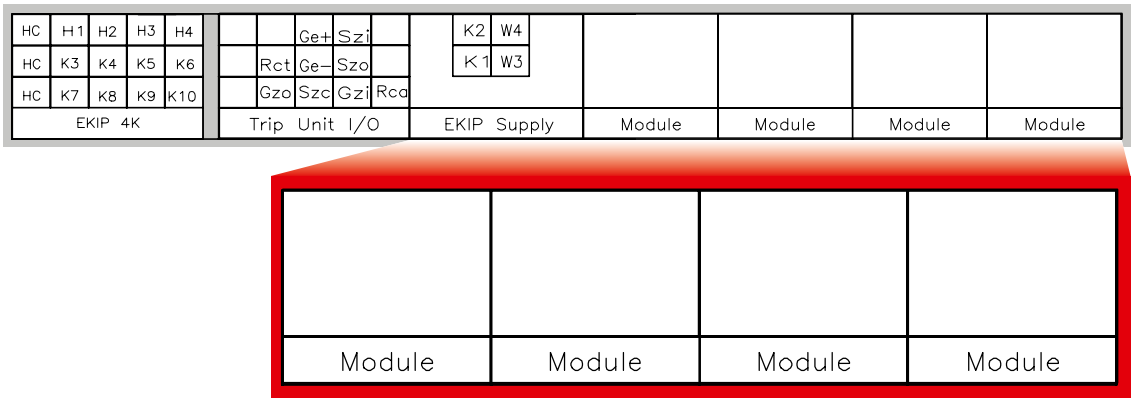




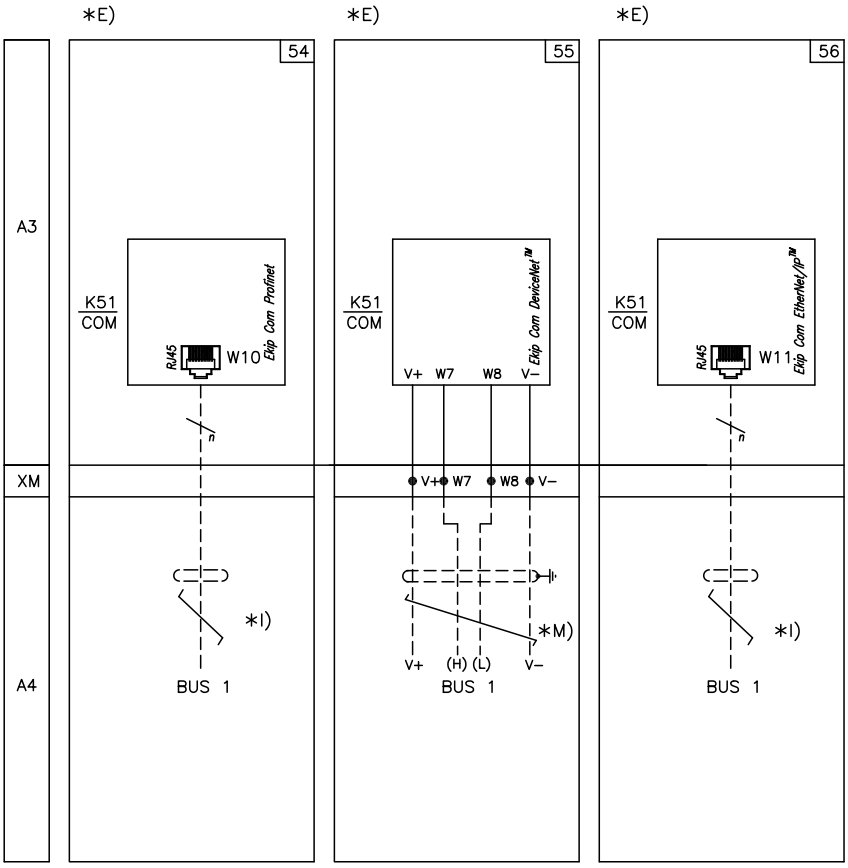
51) Ekip Com Modbus RTU
52) Ekip Com Modbus TCP
53) Ekip Com Profibus DP

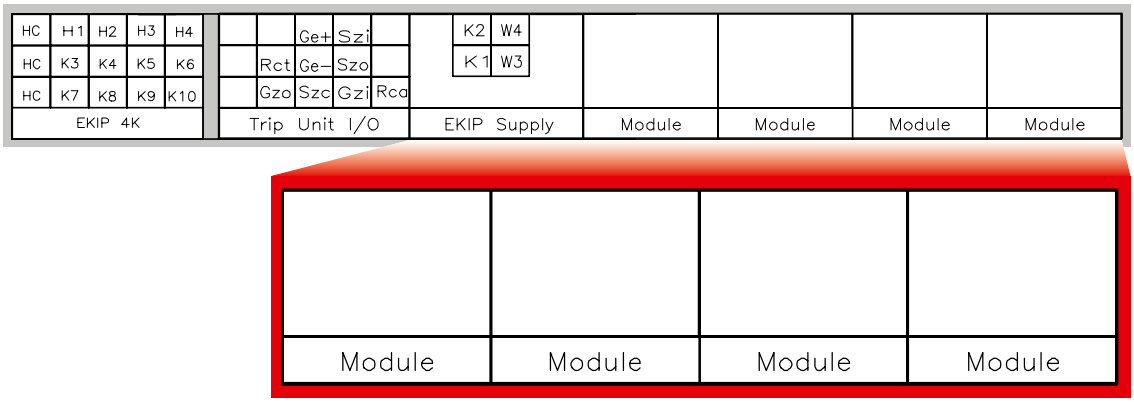


Electrical accessories

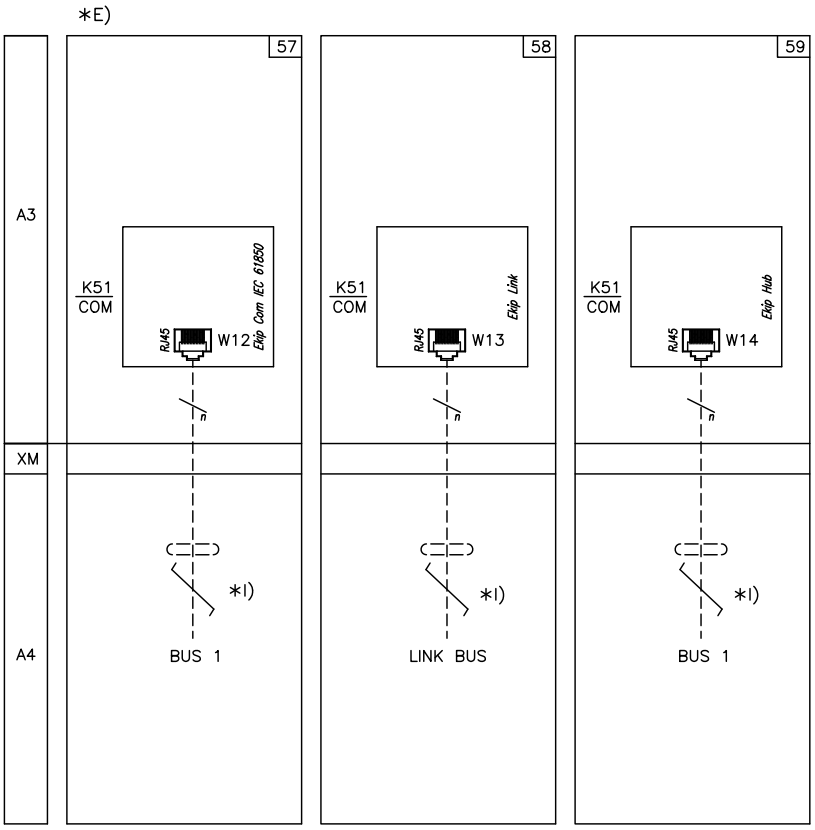


54) Ekip Com Profinet
55) Ekip Com Devicenet ™
56) Ekip Com Ethernet/IP ™

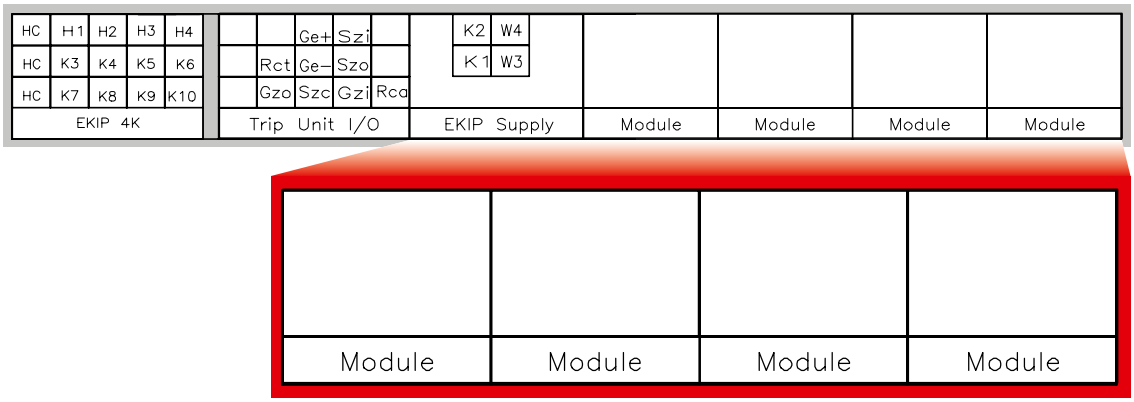




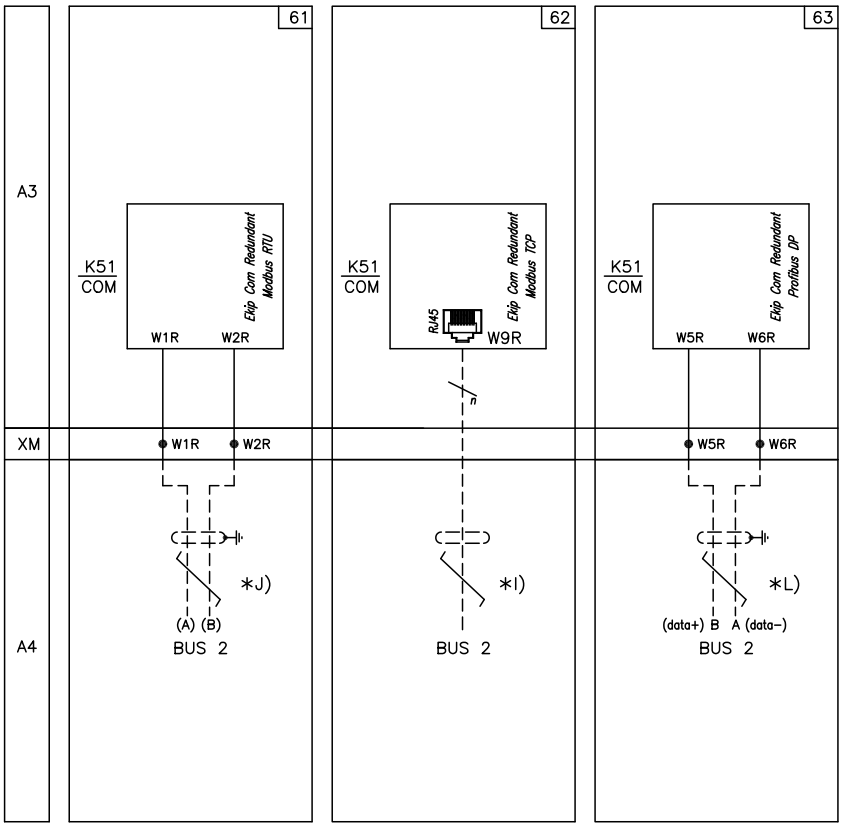
57) Ekip Com IEC 61850
58) Ekip Link
59) Ekip Hub

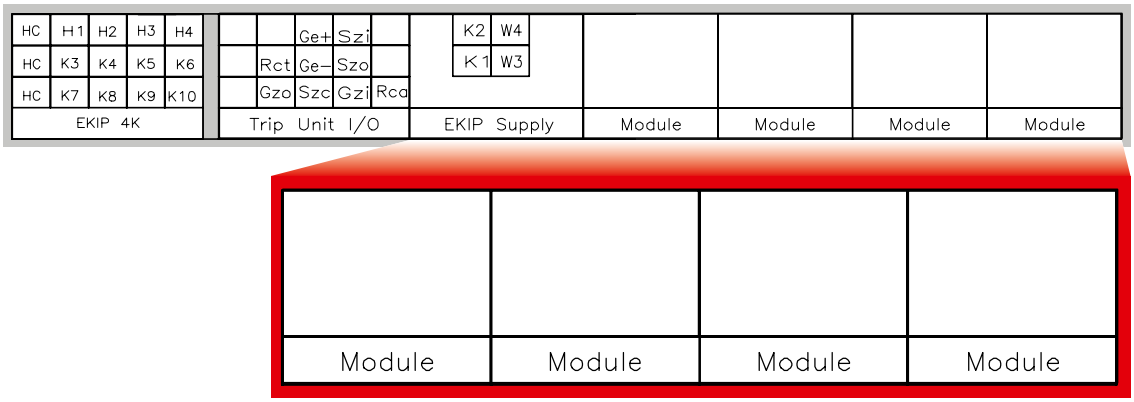


Electrical accessories

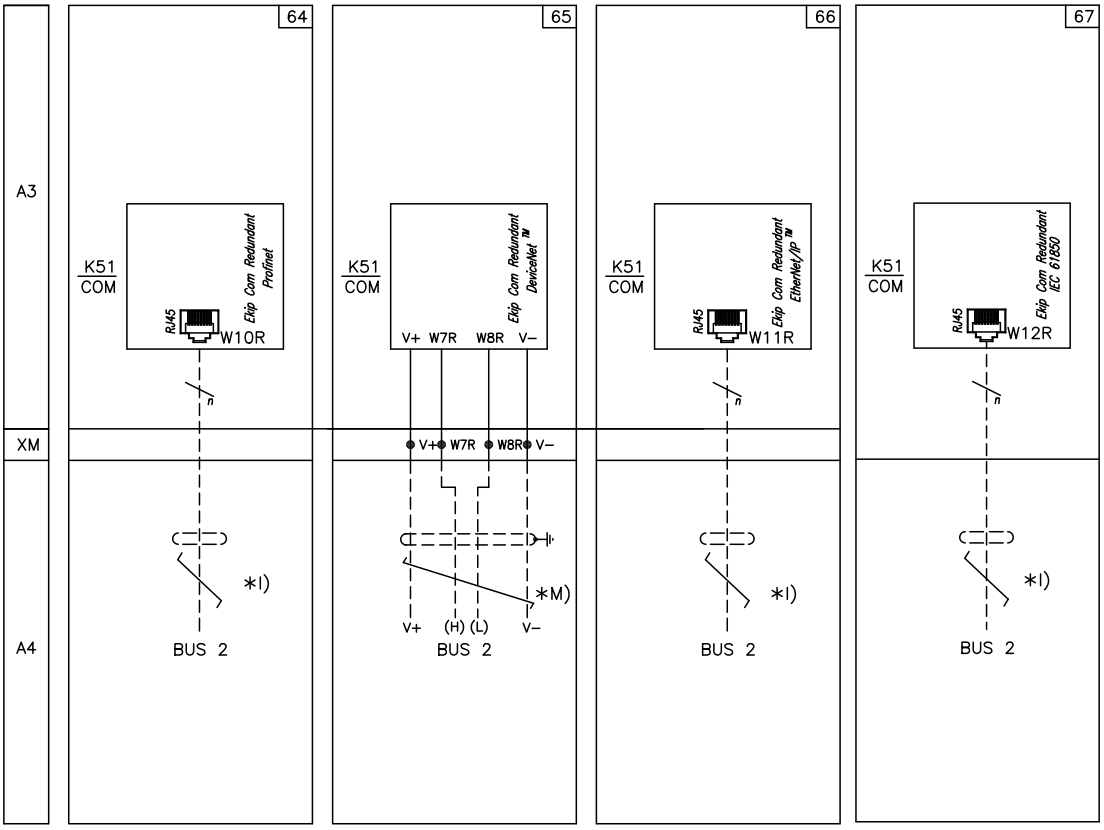


61) Ekip Com Redundant Modbus RTU
62) Ekip Com Redundant Modbus TCP
63) Ekip Com Redundant Profibus DP



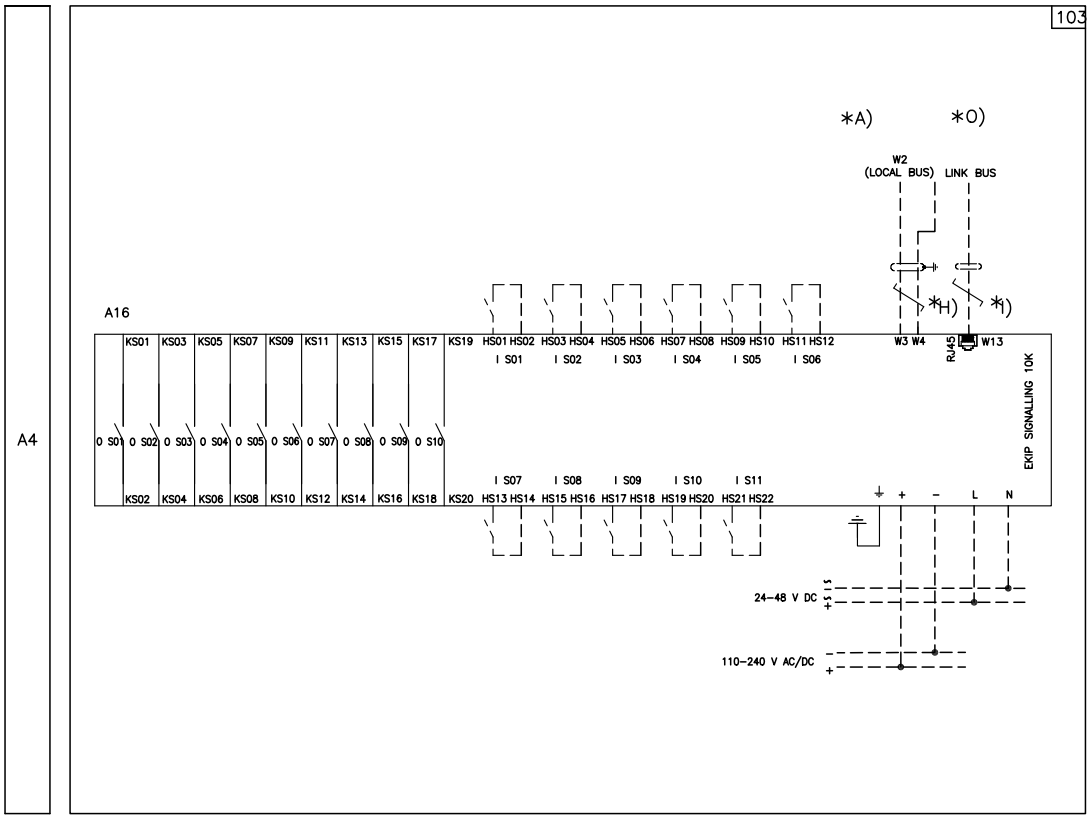


64) Ekip Com redundant Profinet
65) Ekip Com redundant Devicenet ™
66) Ekip Com redundant Ethernet/IP ™
67) Ekip Com redundant IEC 61850



Electrical accessories

103) Ekip Signalling 10k



Ordering codes

Instructions for ordering
Ordering examples

Standard version Ekip UP⁺ to be accessorized are identified by commercial codes.

To order Ekip UP⁺ unit:
1. Choose Ekip UP⁺ version with main code.
2. Select the mandatory accessories:
   a. One type of current sensors or type E (without current sensors)
   b. Installed rating plugs related to current sen sor type chosen
   c. Power supply module
3. Select optional accessories, as they can ordered mounted on the unit or loose:
   a. Cartridge connectivity modules
   b. Cartridge synchrocheck module
   c. Cartridge signalling modules
      Remind that maximum 4 slots can be occupied by cartridge connectivity, signaling and synchrocheck modules in the Ekip UP⁺ accessoring area.
   d. DIN-rail signalling modules
      Remind that maximum 3 pieces of Ekip Signalling 10k can be connected by local bus. This limit is not present with Ekip Link connectivity.
   e. External toroids
   f. Software packages
      Remind the software compatibility described in Chapter 3.
   g. Commissioning modules
   h. Spare parts
   i. Loose rating plugs as spare part to change the rated current related to the installed current sensors.

Ekip UP⁺ package contains:
- Ekip UP⁺ unit
- Current sensors (if ordered)
- Power supply modules
- Optional cartridge connectivity, synchrocheck, signaling modules

DIN-rail signalling modules (Ekip Signalling 10k, Ekip Signalling Modbus TCP), external toroids, commissioning modules, spare parts, loose rating plugs are provided only external from Ekip UP⁺ package.
Standard warranty is 1 year but it can be extended up to 5 years (see chapter 5).

Here you can find the online configurator

Example

Shopping list for the unit with advanced protection to be installed in an existing four-phase plant, rating plug 2500A, Modbus TCP/IP connectivity and connection to cloud platform, cartridge signalling module, synchrocheck module and 3 pieces of DIN-rail signaling modules for load shedding function:

Ekip UP⁺ version

Type	Code
Ekip UP⁺ Protect	1SDA117057R1

Mandatory accessories

Type	Code
Open CS 4P type C 120	1SDA083373R1
Rating Plug 2500A	1SDA074268R1
Ekip Supply 24-48Vdc	1SDA074173R1

Optional accessories

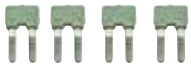
Type	Code
Ekip Com Modbus TCP	1SDA074151R1
Ekip Com Hub	1SDA082894R1
Ekip Synchrocheck	1SDA074183R1
Ekip Signalling 2K-1	1SDA074167R1
Load Shedding adaptive for Ekip UP⁺	1SDA117063R1
Motor Protections for Ekip UP⁺	1SDA117055R1
Ekip Signalling 10K*	1SDA074171R1
Ekip Signalling 10K*	1SDA074171R1
Ekip Signalling 10K*	1SDA074171R1

*provided externally from package.

Ekip UP+
Ekip UP+ versions

Type	Code
Ekip UP+ Monitor	1SDA117056R1
Ekip UP+ Protect	1SDA117057R1

Ekip UP+
Mandatory accessories



Current sensors

Type	Code
CS 100-2000A 3P type A	1SDA117333R1
CS 100-2000A 4P type A	1SDA117334R1
CS 2000-4000A 3P type A	1SDA117335R1
CS 2000-4000A 4P type A	1SDA117336R1
CS 4000-6300A 3P type A	1SDA117049R1 coming soon
CS 4000-6300A 4P type A	1SDA117050R1 coming soon
CS 100-400A 3P type B	1SDA117337R1
CS 100-400A 4P type B	1SDA117338R1
CS 400-1600A 3P type B	1SDA117339R1
CS 400-1600A 4P type B	1SDA117340R1
CS 400-2500A 3P type B	1SDA085561R1 coming soon
CS 400-2500A 3P type B	1SDA085562R1 coming soon
Open CS 3P type C 100	1SDA085566R1
Open CS 4P type C 100	1SDA085564R1
Open CS 3P type C 120	1SDA083372R1
Open CS 4P type C 120	1SDA083373R1
Open CS 3P type C 200	1SDA085565R1
Open CS 4P type C 200	1SDA085563R1
Open CS 3P type C 290	1SDA107696R1
Open CS 4P type C 290	1SDA107695R1
Insertion bridges CS type D	1SDA104662R1
No sensor - type E	1SDA117919R1

Ekip UP+
Mandatory accessories

Installed Rating Plugs

Rating plugs mounted on Ekip UP+

Type	Code
Rating Plug 100A	1SDA074258R1
Rating Plug 200A	1SDA074259R1
Rating Plug 250A	1SDA074260R1
Rating Plug 400A	1SDA074261R1
Rating Plug 600A	1SDA079826R1
Rating Plug 630A	1SDA074262R1
Rating Plug 800A	1SDA074263R1
Rating Plug 1000A	1SDA074264R1
Rating Plug 1200A	1SDA079828R1
Rating Plug 1250A	1SDA074265R1
Rating Plug 1600A	1SDA074266R1
Rating Plug 2000A	1SDA074267R1
Rating Plug 2500A	1SDA074268R1
Rating Plug 3200A	1SDA074269R1
Rating Plug 3600A	1SDA079829R1
Rating Plug 4000A	1SDA074270R1
Rating Plug 5000A	1SDA074271R1
Rating Plug 6000A	1SDA112838R1
Rating Plug 6300A	1SDA112839R1
Rating Plug RC 100A	1SDA074288R1
Rating Plug RC 200A	1SDA074289R1
Rating Plug RC 250A	1SDA074290R1
Rating Plug RC 400A	1SDA074291R1
Rating Plug RC 630A	1SDA074292R1
Rating Plug RC 800A	1SDA074293R1
Rating Plug RC 1250A	1SDA074294R1
Rating Plug RC 2000A	1SDA074295R1
Rating Plug RC 3200A	1SDA074296R1
Rating Plug RC 4000A	1SDA074297R1

Power supply modules

Type	Code
Ekip Supply 24-48V DC	1SDA074173R1

Ekip UP+
Optional accessories

Cartridge connectivity modules

Type	Code
Ekip Com Modbus RS-485	1SDA074150R1
Ekip Com Modbus TCP	1SDA074151R1
Ekip Com Profibus	1SDA074152R1
Ekip Com Profinet	1SDA074153R1
Ekip Com DeviceNet™	1SDA074154R1
Ekip Com EtherNet/IP™	1SDA074155R1
Ekip Com IEC61850	1SDA074156R1
Ekip Com Hub	1SDA082894R1 coming soon
Ekip Com R Modbus RS-485	1SDA074157R1
Ekip Com R Modbus TCP	1SDA074158R1
Ekip Com R Profibus	1SDA074159R1
Ekip Com R Profinet	1SDA074160R1
Ekip Com R DeviceNet™	1SDA074161R1
Ekip Com R EtherNet/IP™	1SDA074162R1
Ekip Com R IEC61850	1SDA076170R1
Ekip Link	1SDA074163R1
Ekip Com OpenADR	1SDA085814R1

Cartridge synchrocheck modules

Type	Code
Ekip Synchrocheck	1SDA074183R1

Cartridge signalling modules

Type	Code
Ekip Signalling 2K-1	1SDA074167R1
Ekip Signalling 2K-2	1SDA074168R1
Ekip Signalling 2K-3	1SDA074169R1
Ekip Signalling 3T-1 AI - Temp PT1000	1SDA085693R1
Ekip Signalling 3T-2 AI - Temp PT1000	1SDA085694R1
Ekip CI	1SDA105205R1

Temperature sensors

Type	Code
External probe PT1000 3 m range -25°C...+150°C	1SDA085695R1

Ekip UP+
Optional accessories

DIN-rail signalling modules

Type	Code
Ekip Signalling 10k*	1SDA074171R1
Ekip Signalling Modbus TCP*	1SDA082485R1

*Only as spare part

External toroids

Homopolar toroid for the grounding conductor of the transformer

Type	Code
Homopolar toroid 100A*	1SDA073743R1
Homopolar toroid 250A*	1SDA076248R1
Homopolar toroid 400A*	1SDA076249R1
Homopolar toroid 800A*	1SDA076250R1

*Only as spare part

Toroid for differential protection

Type	Code
Toroid RC small size*	1SDA073741R1
Toroid RC big size*	1SDA073742R1

*Only as spare part

SW function accessories

Type	Code
Adaptive Protections	1SDA117059R1
Generator Protections	1SDA117054R1
Motor Protections	1SDA117055R1
Load shedding - adaptive	1SDA117063R1
Power Controller	1SDA117341R1
IPS - Interface Protection	1SDA082919R1
Extracode - No Bluetooth Connectivity	1SDA114808R1
Supercode - CEI 0-16*	1SDA107690R1

* it contains all the accessories needed for Interface Protection System like current insertion bridges, Ekip Synchrocheck, Ekip 2k-1 and the IPS software function
Note: Load Shedding - basic is always supplied in Ekip UP+ Protect versions.

Commissioning modules

Type	Code
Ekip T&P - Programming and Test unit	1SDA066989R1
Ekip TT - Trip Test unit	1SDA066988R1
Ekip Programming	1SDA076154R1

Loose Rating Plugs

Rating plug for Ekip UP⁺ units as spare parts

Type	Code
Rating Plug 100A	1SDA112840R1
Rating Plug 200A	1SDA112841R1
Rating Plug 250A	1SDA112842R1
Rating Plug 400A	1SDA112843R1
Rating Plug 600A	1SDA112844R1
Rating Plug 630A	1SDA112845R1
Rating Plug 800A	1SDA112846R1
Rating Plug 1000A	1SDA112847R1
Rating Plug 1200A	1SDA112848R1
Rating Plug 1250A	1SDA112849R1
Rating Plug 1600A	1SDA112850R1
Rating Plug 2000A	1SDA112851R1
Rating Plug 2500A	1SDA112852R1
Rating Plug 3200A	1SDA112854R1
Rating Plug 3600A	1SDA112855R1
Rating Plug 4000A	1SDA112856R1
Rating Plug 5000A	1SDA112857R1
Rating Plug 6000A	1SDA112858R1
Rating Plug 6300A	1SDA112859R1
Rating Plug RC 100A	1SDA112879R1
Rating Plug RC 200A	1SDA112880R1
Rating Plug RC 250A	1SDA112881R1
Rating Plug RC 400A	1SDA112882R1
Rating Plug RC 630A	1SDA112884R1
Rating Plug RC 800A	1SDA112885R1
Rating Plug RC 1250A	1SDA112887R1
Rating Plug RC 2000A	1SDA112888R1
Rating Plug RC 3200A	1SDA112889R1
Rating Plug RC 4000A	1SDA112891R1

Spare Parts

Type	Code
DIN/DOOR installation kit	1SDA085567R1
Cable kit	1SDA085568R1
Cover Ekip UP⁺ Monitor (with 4K-A)	1SDA085569R1
Cover Ekip UP⁺ Protect (with 4K-B)	1SDA117955R1
Positioning device type C	1SDA085570R1

Extended warranty

Type	Code
Warranty 2 years	1SDA104660R1
Warranty 4 years	1SDA085815R1
Warranty 5 years	1SDA104661R1

Extended Warranty

—
Note:
Warranty periods are measured from the date the Ekip UP⁺ leaves the factory.

—
ABB S.p.A.
5, Via Pescaria
I-24123, Bergamo
Phone: +39 035 395.111

abb.com/low-voltage

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