



Protection relay for reliable grid protection

Protecting, monitoring and controlling electrical networks

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Our products for reliable grid protection

The extensive protection and control device portfolio enables reliable grid operation in voltage ranges from 10 kV to 110 kV. The focus of these IEDs (intelligent electronic devices) includes single and double busbars as well as radial, ring-operated and meshed networks. They can be used in isolated, compensated, solidly grounded and low-resistance grounded grids.

The devices are therefore ideal for use in substations and grid feed-in points for public power supply as well as in industrial power distribution.



Your advantages

- Wide range of functions with protection, control and measuring functions in a compact design
- Intuitive operation thanks to clear front of the unit and simple parameterization options
- Long service life thanks to battery-free design and extremely low energy consumption
- Meets the requirements for IT security according to the BDEW whitepaper

KOMBISAVE+

Intelligent grid protection with the KOMBISAVE+

The protection relays in the KOMBISAVE+ product family are ideal for use in the distribution network. Motors, transformers, cables and lines can be protected in substations with single or double busbars. The devices offer a comprehensive range of functions, including overcurrent protection, QU-protection, distance and line differential protection, synchrocheck and automatic reclosure.

An integrated PLC also makes it possible to cover customer-specific requirements. Thanks to state-of-the-art network technology in accordance with IEC 61850, the devices can be easily integrated into complex systems.

Standard features of the KOMBISAVE+	
Control	Standard: Circuit-breaker control with graphic position display, local/remote switching, key switch Extended (only with AU software options): Complete bay control, control of disconnectors and earthing switches, withdrawable trucks, use of interlocking scheme
Message and Status display/front of the unit	Standard: Predefined measurement charts, freely configurable LEDs Extended (only with AU software options): User-specific measured value, status measured value and status panels, freely configurable virtual LEDs, freely customizable text and background colors
Programmable logic (only with AU software options)	Integrated logic editor
Communication interfaces	Standard: USB; serial electrical interface Extended: Ethernet electrical or optical; serial optical interface Advanced: optical or electrical 100 MB switch
Communication protocols/ Cybersecurity according to BDEW	Standard: IEC 60870-5-103, MODBUS RTU Expandable: IEC 61850 (Ed. 1/ Ed. 2) RADIUS, Syslog

Further information can be found from page 55 onwards.

Device versions

KOMBISAVE+ RN

Simple overcurrent and motor protection with bay control



Efficient protection for industrial and power supply systems

Characteristics of the design variants		
Protective functions	Common	38, 49I&II, 50P/51P, 50N/51N, 50HS, 68
	Motor protection	14, 37, 46, 48, 50M
Protection-related functions		50BF, 50SOTF, 74TC / 95, 79, 85, 86
Measure-ment	Number of current transformers	4
	Number of voltage transformers	–
	Measured values	3I, IO, 3I/15 min, Ith, trip delay, No. of trips, tripping, I²t

KOMBISAVE+ RQ

Stabilized differential protection for two-winding transformers with bay control



Reliable transformer protection in medium voltage

Characteristics of the design variants		
Protective functions	Common	38, 49I&II, 50N/51N, 50H, 50P/51P, 68
	Transformer differential protection (software option TF)	24, 87T
Protection-related functions		50BF, 50SOTF, 74TC / 95, 85, 86
Measure-ment	Number of current transformers	8
	Number of voltage transformers	–
	Measured values	3I, IO, 3I/15 min, Ith, Idiff, Istab, trip delay, No. of trips, tripping, I²t

KOMBISAVE+ RF

Outgoing circuit protection with distance protection and ground fault detection with bay control



Compact bay controller for complex applications in substations

Characteristics of the design variants		
Protective functions	Common	27P/59P, 32P, 32N, 32R, 38, 47, 49ISII, 50P/51P, 50N/51N, 50HS, 59N, 67, 67N, 67NIEF, 67NF3/5/7, 67NPPD, 68, 81O/U, 81R
	Motor protection	14, 37, 46, 48, 50M
	Distance protection (only with software options ZP)	21FL, 21N, 21P
	Smart Grid (only with QU, FE or QF software options)	27QV (QU), 81LSH (UFLA)
Protection-related functions		25, 47, 50BF, 50SOTF, 60P, 74TC / 95, 79, 85, 86, MCS31, VTFF
Measure-ment	Number of current transformers	4
	Number of voltage transformers	4 or 5
	Measured values	3I, IO, 3I/15 min, Ith, 3ULE, 3ULL, UO, P, Q, S, f, cosφ, Udiff, fdiff, R/X, km/miles, trip delay, no. trips, tripping, I²t

KOMBISAVE+ RL

Stabilized line differential protection with distance protection and ground fault detection with bay control



Main protection for lines up to 110 kV

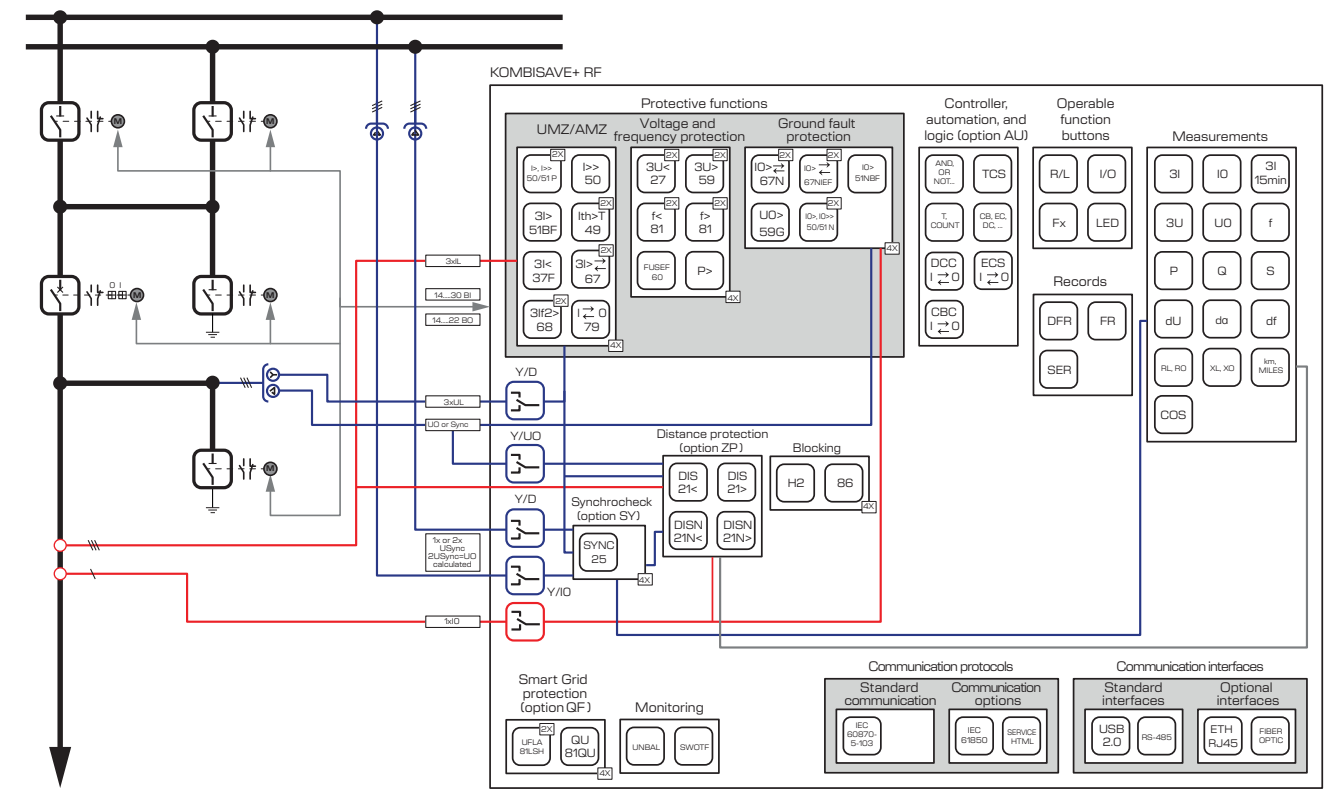
Characteristics of the design variants		
Protective functions	Common	27P/59P, 32P, 32N, 32R, 38, 47, 49ISII, 50P/51P, 50N/51N, 50HS, 59N, 67, 67N, 67NIEF, 67NF3/5/7, 67NPPD, 68, 81O/U, 81R
	Motor protection	14, 37, 46, 48, 50M
	Distance protection (only with software options ZP)	21FL, 21N, 21P
	Smart Grid (only with QU, FE or QF software options)	27QV (QU), 81LSH (UFLA)
	line differential protection (only with software options LT or LD), (with consideration of transformer on protective distance)	24, 50P, 87L, 87LT
Protection-related functions		25, 47, 50BF, 50SOTF, 60P, 74TC / 95, 79, 85, 86, MCS31, VTFF
Measure-ment	Number of current transformers	4
	Number of voltage transformers	0 or 5
	Measured values	3I, IO, 3I/15 min, Idiff, Istab, Ith, 3ULE, 3ULL, UO, cosφ, Udiff, fdiff, R/X, km/miles, Trip delay, no. trips, tripping, I²t, -dB

Application examples

Protection of a high-voltage double busbar with a KOMBISAVE+ RF

The RF version is a multifunctional outgoing circuit protection with ground fault detection and bay control. The device can be used in simple star or ring networks as well as in complex meshed networks with isolated, compensated, solidly grounded or low-resistance grounded star points. In addition to the standard current protection functions, the protection unit is used with the optional distance protection (full scheme) for complete protection of outgoing feeders. It covers all earth fault protective functions of the above-mentioned network types. As in all versions, other monitoring and measuring functions are implemented in addition to the pure protective functions.

In addition to the communication option implemented as standard via IEC 60870-5-103, the appropriate IEC 61850 software function can also be used. The optional fault location, synchrocheck function and under-frequency load shedding complete the protection package. The device can also apply complete bay control. The optional integrated programmable logic allows the functions to be adapted to special requirements, such as additional interlocking or automatic switching.

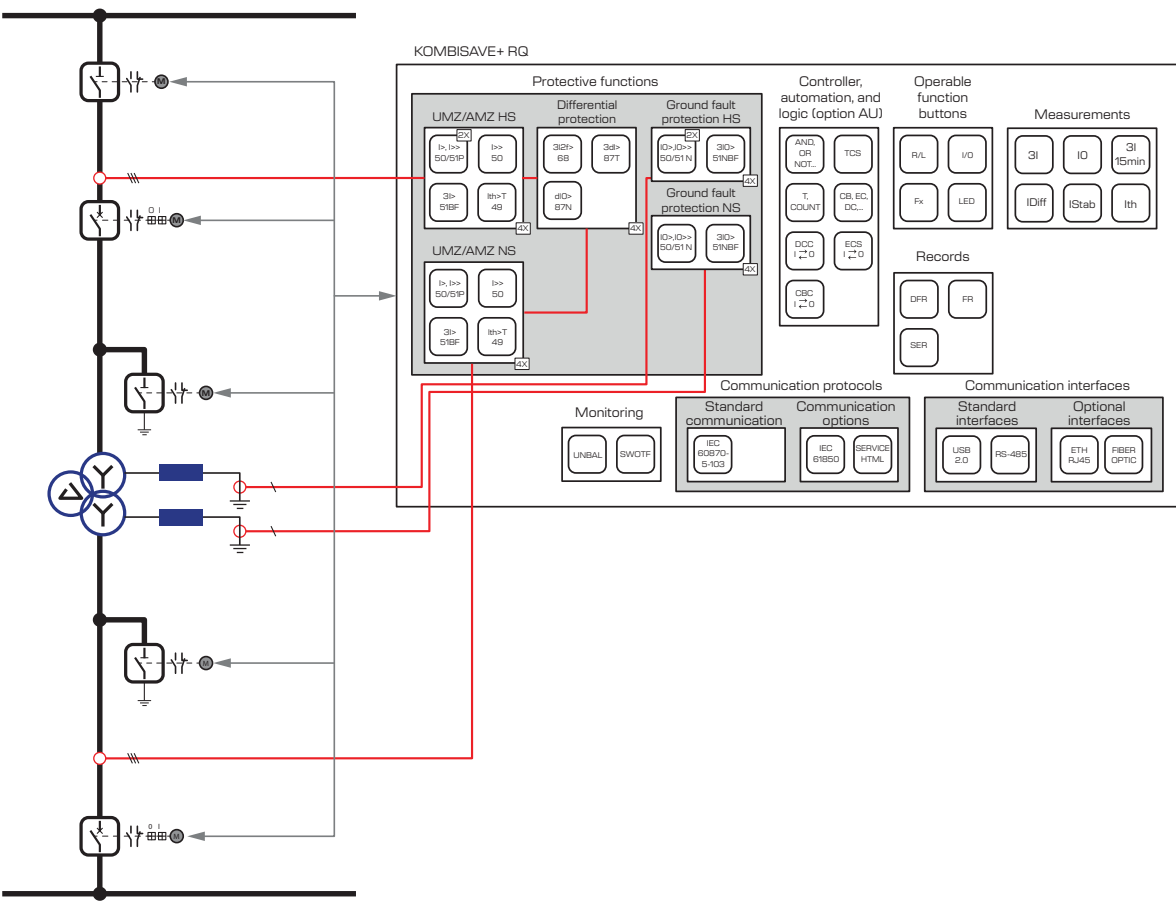


Protection of a two-winding transformer with a KOMBISAVE+ RQ

The RQ device version enables the protection of two-winding transformers at any voltage level. The integrated functions offer optimum ground fault protection when used in isolated, compensated, solidly grounded or low-resistance grounded grids. The focus is on stabilized transformer differential protection. Protection against false tripping when transformers are turned on (inrush) or overexcited is guaranteed by measuring and evaluating the second and fifth harmonics. A standard thermal overload protection with a two-body model and temperature measurements via Pt-100 inputs complete the functions of the RQ version.

As with all variants in the device family, it is also possible for the device to apply bay control. The optional integrated programmable logic allows the functions to be adapted to special requirements, such as additional special interlocking or automatic switching. IEC 60870-5-103 is available as the protocol for standard communication, and IEC 61850 Ed. 1 / Ed. 2 can be used as an option by selecting the appropriate software function.

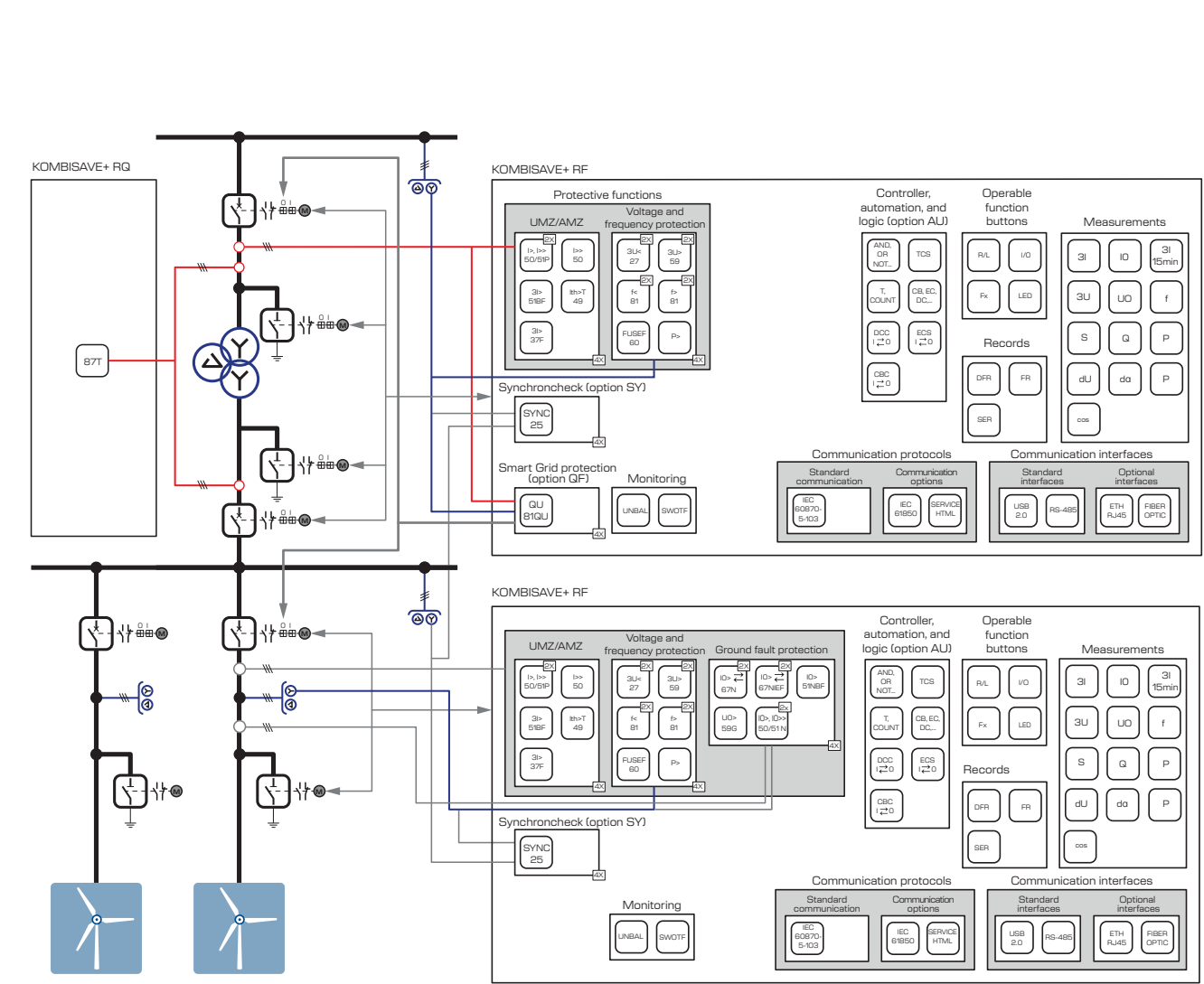
The use of two KOMBISAVE+ RL in combination with the installed INTERSAVE interfaces is recommended for connecting OS or US-side voltages and for using additional functions.



Smart Grid configuration with the KOMBISAVE+ device family

The application example shows the use of the device design variants as part of the feed-in management of decentralized power generation systems. The main protection of the transformer is realized with the design variant RQ and the backup protection RF. Protection at the grid connection point is covered by the KOMBISAVE+ RF. Our range of devices is certified for typical applications in the field of renewable energy generation, such as wind energy or photovoltaic systems, in accordance with VDE-AR-N 4110 and VDE-AR-N 4120. The focus of the protective functions here is on voltage and frequency functions as well as QU-protection.

The synchrocheck function can be used as an option. The device can also be used as a bay control. The optional integrated programmable logic enables the protective functions to be adapted. Direct communications to a control system or a higher-level control system can be realized via IEC 60870-5-103 or optionally by selecting the appropriate software function IEC 61850 Ed. 1 / Ed. 2.

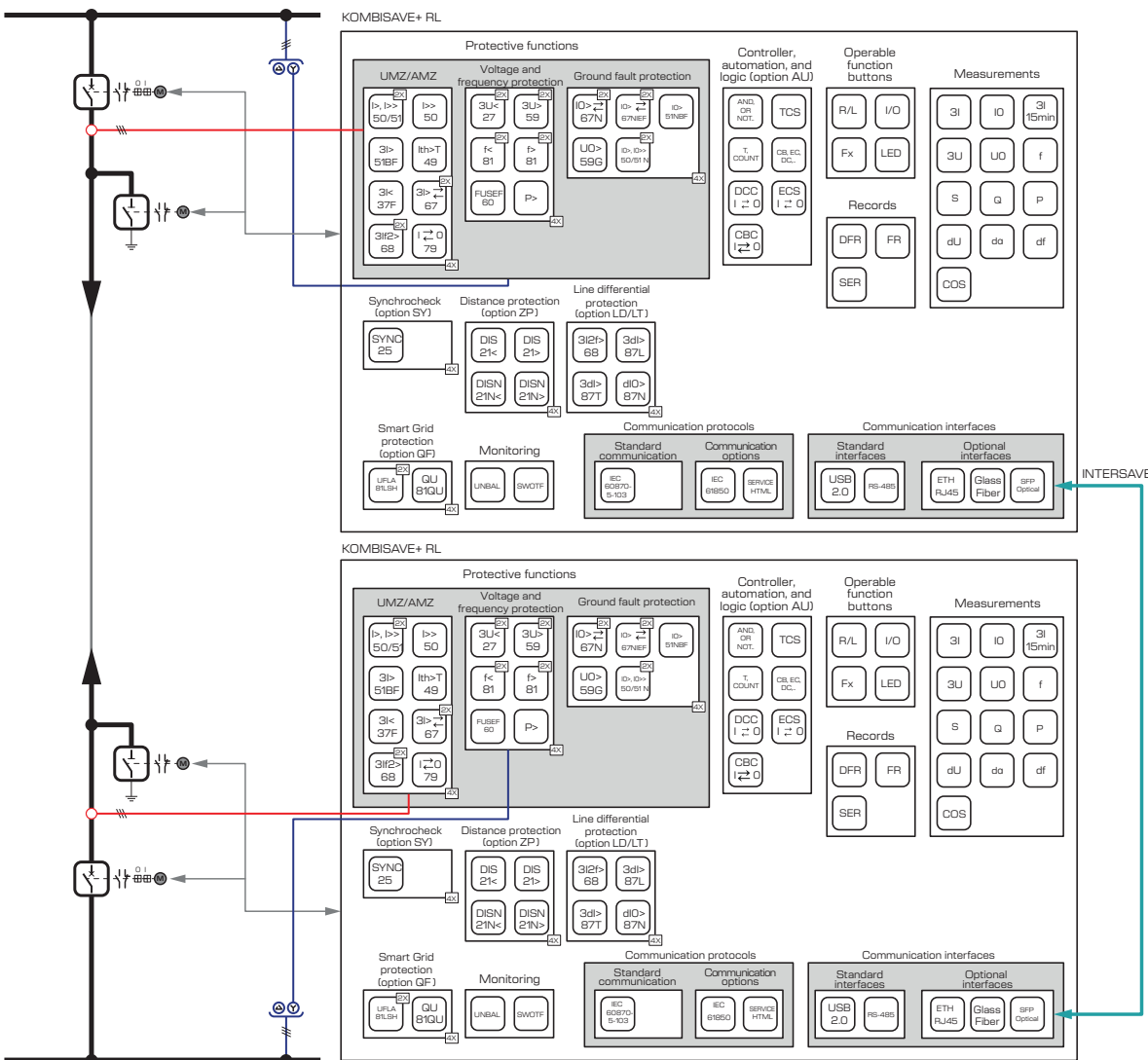


Protection of a high-voltage overhead line with two KOMBISAVE+ RL

Distance protection and line differential protection are generally used as the main protection functions to protect high-voltage overhead lines. The RL device version covers both main protection functions in one compact protection unit. The stabilized line differential protection uses an optical INTERSAVE protection interface. Time synchronization of the devices used for line differential protection is not necessary. Depending on the distance, different SFP modules are available as options. The protection units are also suitable for applications with an internal transformer. Protective functions such as ground fault protection, voltage, power and frequency functions complete the protection package. Fault locations and synchrocheck are also available as options.

The device can also be used as a bay control. The integrated PLC can be used to implement blocking functions, for example. Direct communications to a higher-level control system can be realized via IEC 60870-5-103 or optionally by selecting the appropriate software function IEC 61850 Ed. 1 / Ed. 2.

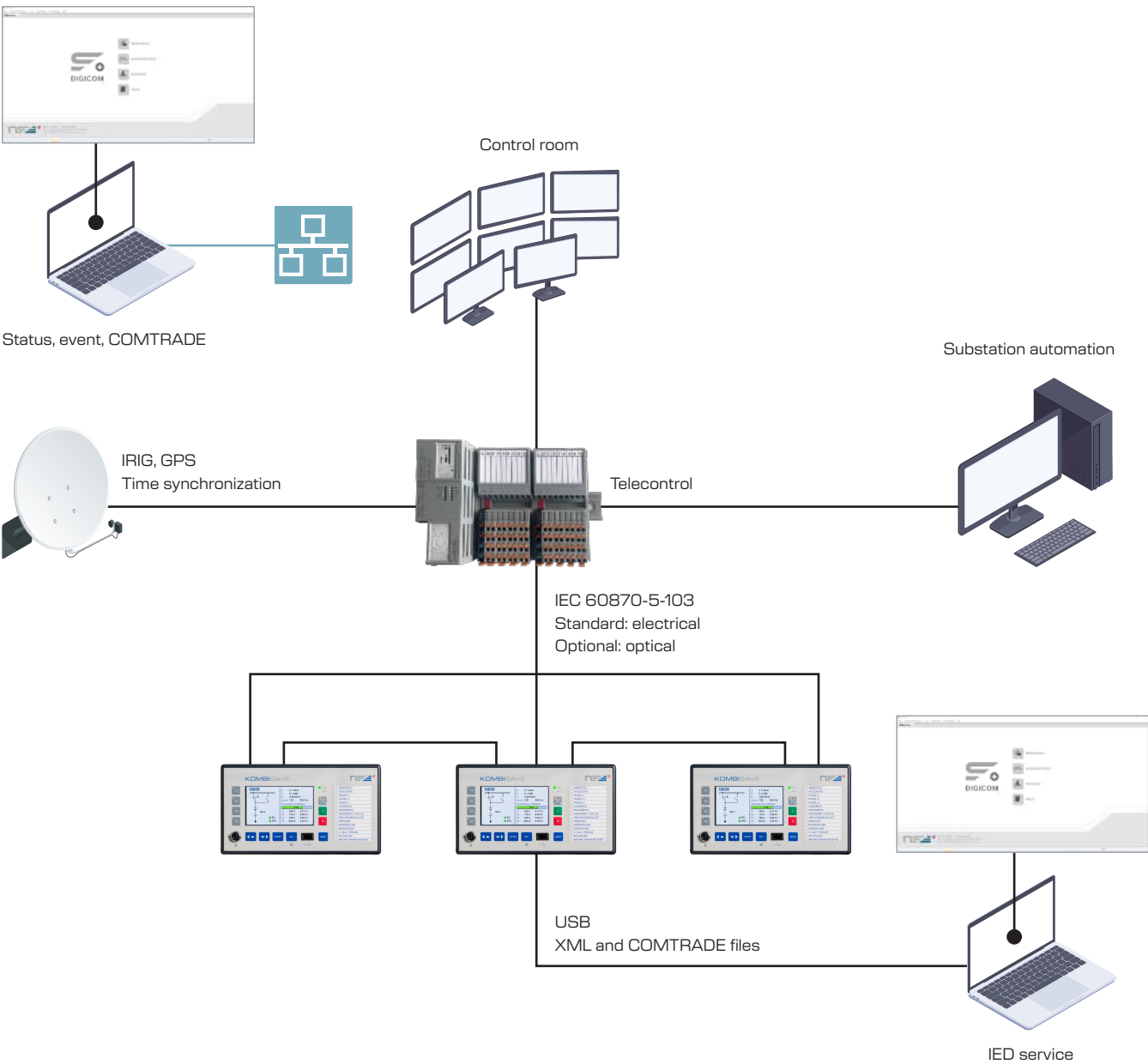
Redundant ring topologies in communications can be realized by an additionally integrated electrical or optical switch module (HSR, PRP, RSTP).



Communication options

Standard communication with IEC 60870-5-103

All versions of the KOMBISAVE+ device family have a serial electrical interface for communications via IEC 60870-5-103 as standard. In addition to the RS-485 connection, there is also the option of communicating via an optical interface. The optical interface is suitable for ST connectors and optical fibers with 820 nm. Programming is carried out using xcfg files via the USB front interface.



IT safety

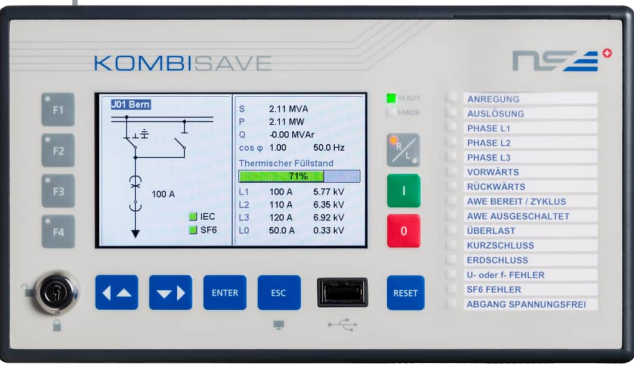
Our protective device families are developed with regard to cyber security, taking into account the BDEW white paper. The aim is to increase IT safety in substations in the energy sector against unwanted internal and external intrusion. Central elements in this context are, for , role-based access control and protection mechanisms at the communication interfaces. This includes the management of user roles and rights (RBAC) as well as the recordings of security-relevant events. In addition, the installation of non-proprietary software is prevented.

To verify data, the files are signed using SHA-256 and 3072-bit RSA keys, e.. for update and patch management. For particularly high data security, user files are saved encrypted with AES-256 independently of the configuration file and encrypted with TLS during data transfer via the Ethernet interface.



Further information can be found at <https://www.nse.ch/en/save-tech/product-certificates/>

Safety access



Protection and bay controller



Data verification with SHA-256 and 3072-bit RSA



Data encryption with AES-256

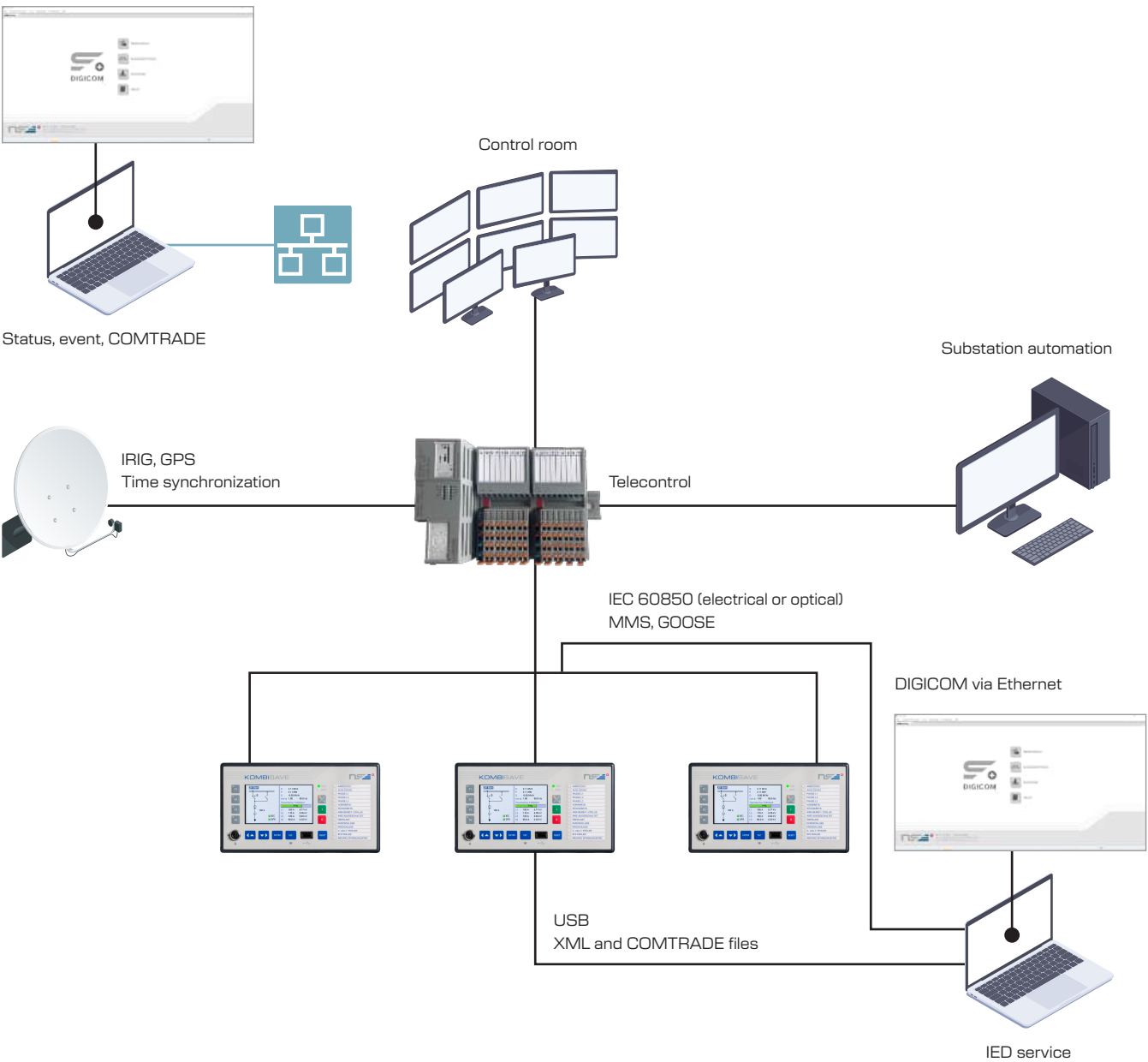


Role-based access rights (Role Based Access Control, RBAC)

IEC 61850 communication option

In addition to communications via IEC 60870-5-103, it is also possible to communicate via IEC 61850. All versions of the KOMBISAVE+ device family are available with IEC 61850 Ed. 1 / Ed. 2. The associated physical connections can be selected as an Ethernet interface electrically via RJ45 or Ethernet optically with a 1300 nm SC connector. The Ethernet port can also be used as a dedicated service interface with DIGICOM. In order to implement the necessary redundancy concepts, options with electrical or optical switches can also be selected.

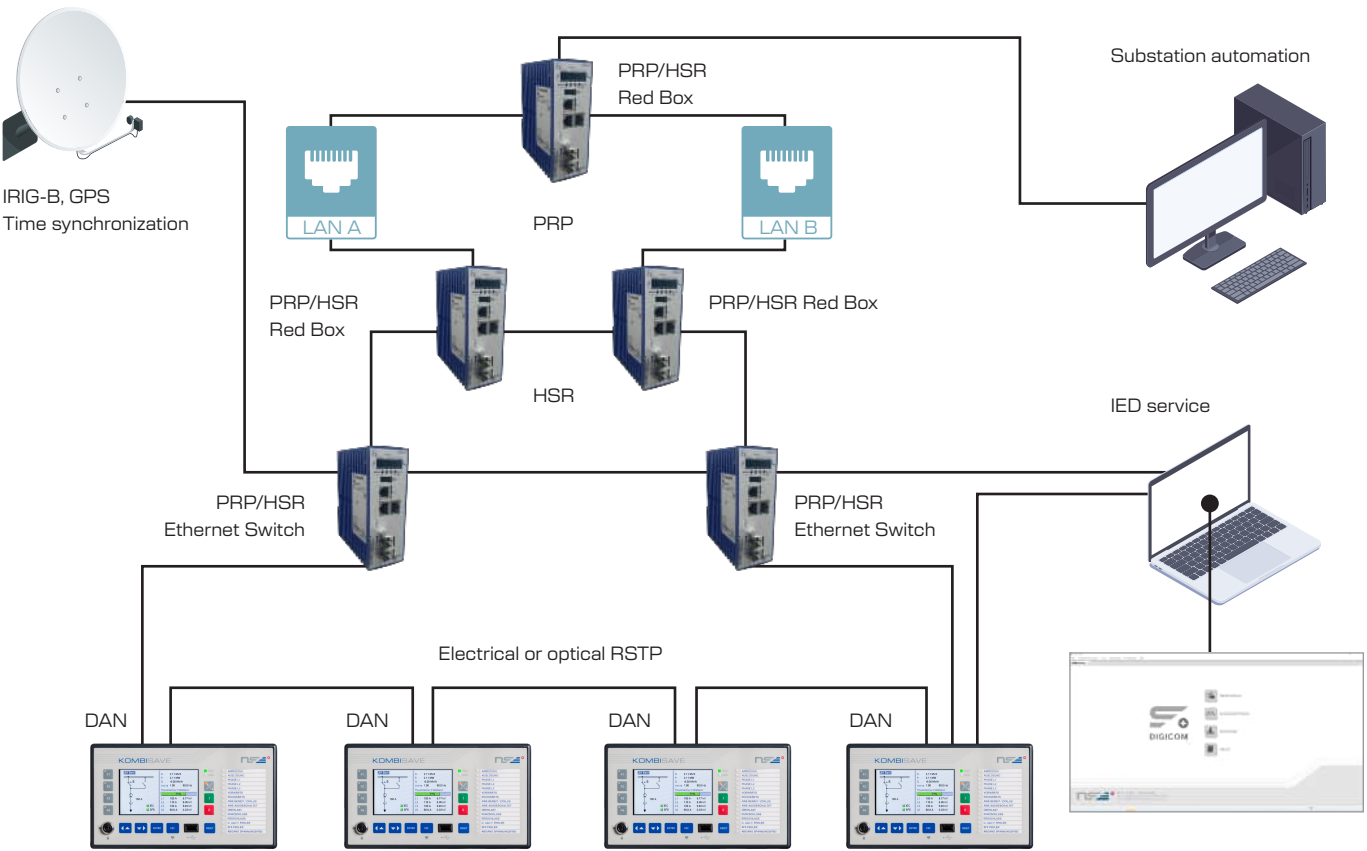
All devices with the IEC 61850 option support MMS and GOOSE functionalities (FAST GOOSE and SLOW GOOSE). Each of the existing Ethernet interfaces can be used as a service interface with the DIGICOM operator software. Programming is carried out using xofg files via the USB front or Ethernet service interface. In addition, the transmission of COMTRADE files for error analysis is also possible.



Redundancy concepts with IEC 61850

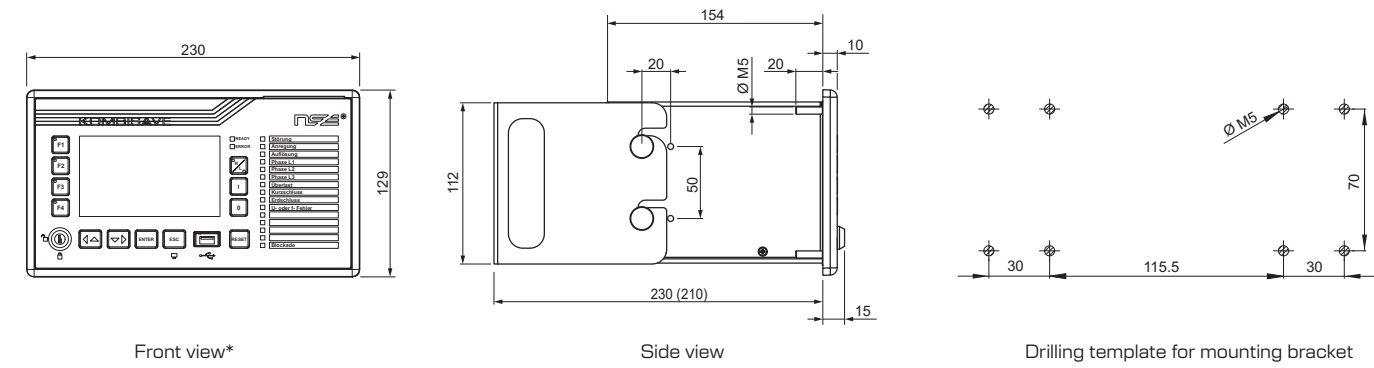
For applications with IEC 61850, the KOMBISAVE+ device family offers various redundancy concepts: Parallel Redundancy Protocol (PRP), High-availability Seamless Redundancy (HSR) and Rapid Spanning Tree Protocol (RSTP). PRP is used for parallel transmission to two redundant networks so that continuous operation is possible in the event of a fault. Data is neither lost nor delayed in this process. The DAN functionality (Double Attached Node) is realized by an integrated switch. By using SFP modules, the functionality can be implemented both electrically and optically with various fiber optic options.

HSR allows data to be transmitted to both parts of the ring in parallel. This means that there is no downtime in the event of faults in components within the ring. Non-redundant subscribers are connected via a redundancy box (Red Box). With RSTP, transmission takes place in the ring, which is virtually "open" at one point. This results in short downtimes in the event of faults in a component of the ring. The switchover to a new topology takes place automatically.



Body descriptions

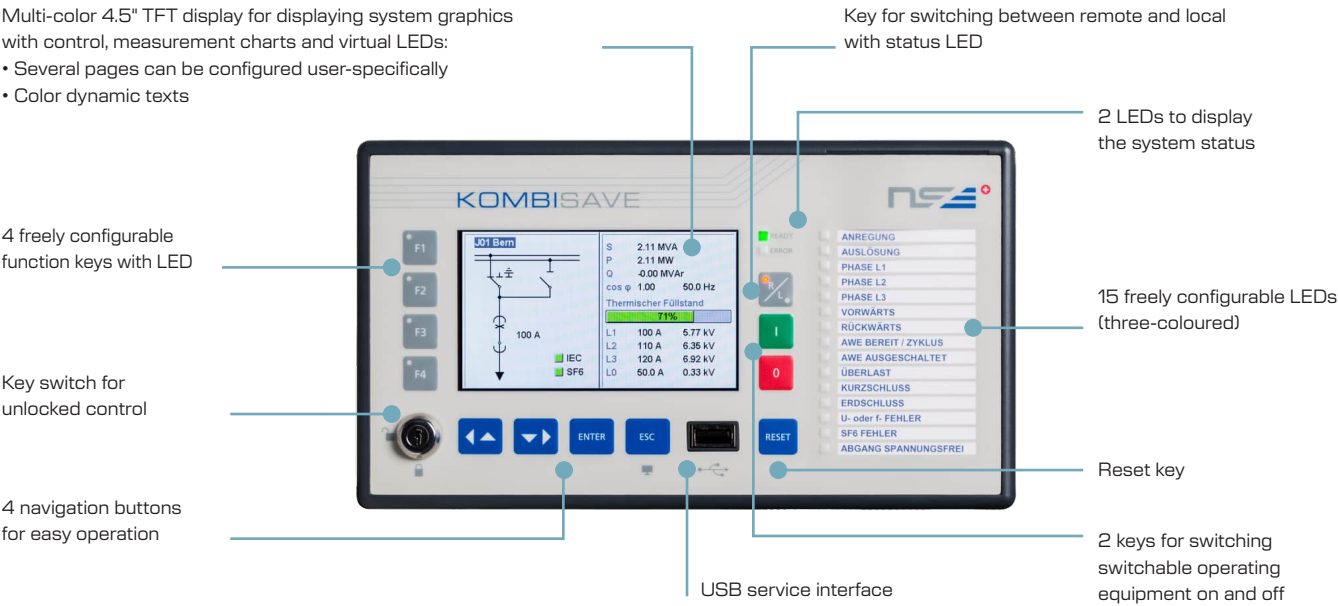
Dimensional drawing body version in mm



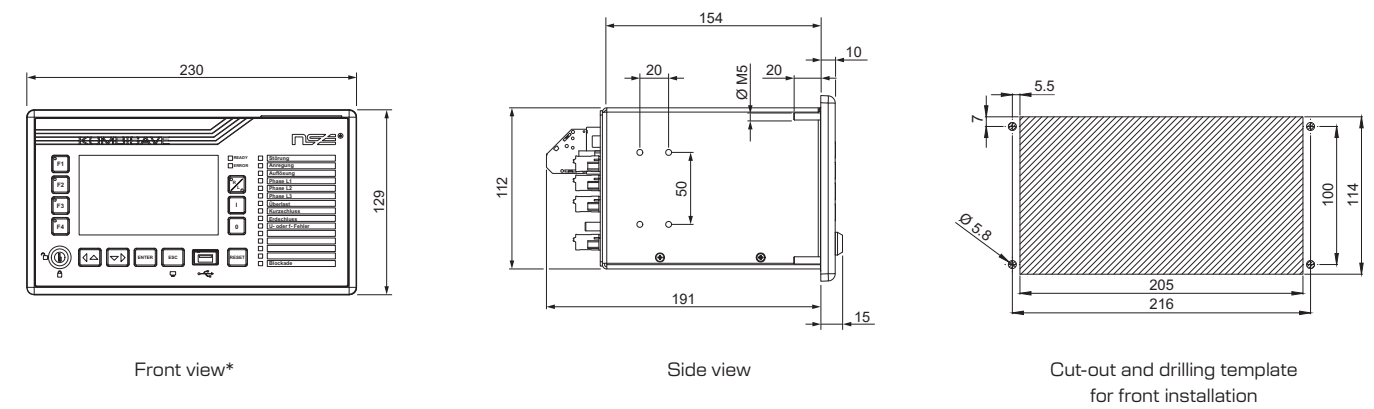
Front of the KOMBISAVE+ device family

Multi-color 4.5" TFT display for displaying system graphics with control, measurement charts and virtual LEDs:

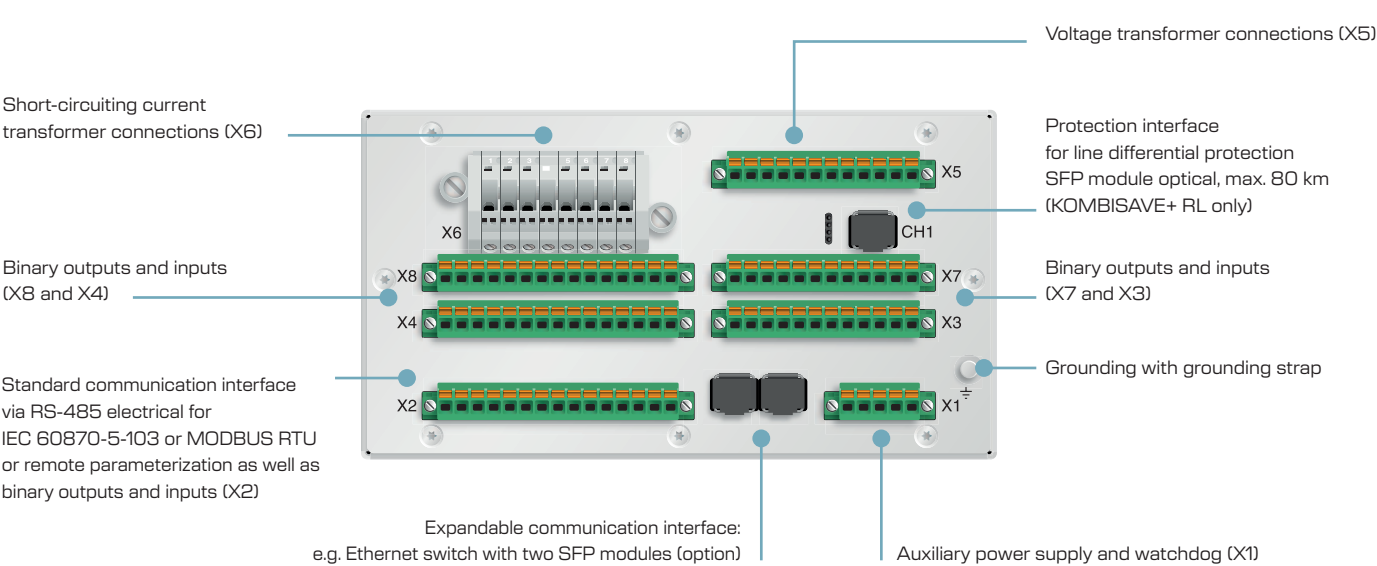
- Several pages can be configured user-specifically
- Color dynamic texts



Dimensional drawing installation version in mm



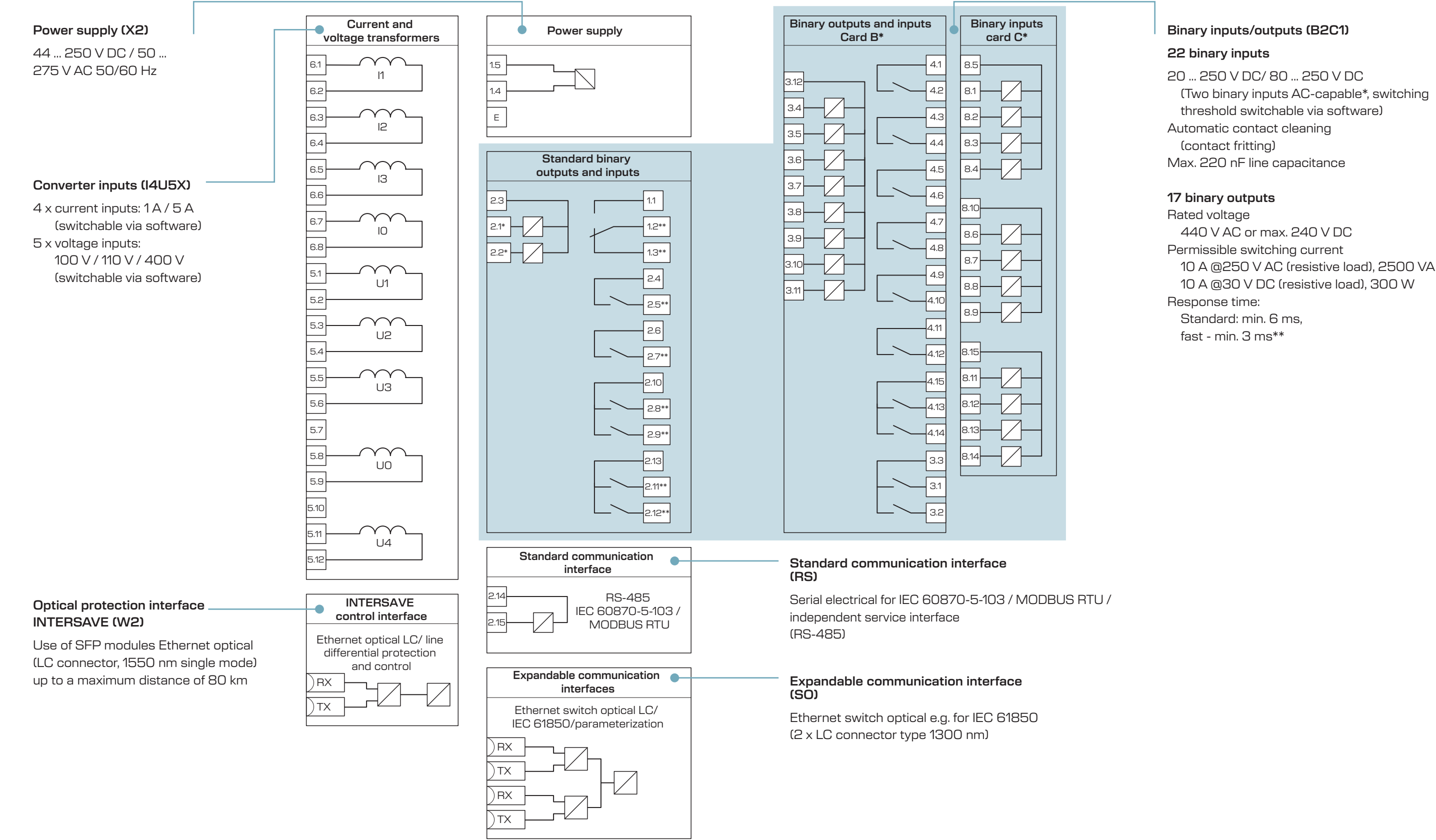
Example of the rear side of a KOMBISAVE+ RL device version



* For the device connection, the KOMBISAVE+ can be folded down in the mounting brackets

Exemplary technical connection diagram
KOMBISAVE+ RL-X2-I4U5X-W2-B2C1-RS-SO

Our sales department will be happy to provide you with device-specific connection diagrams.



Order code

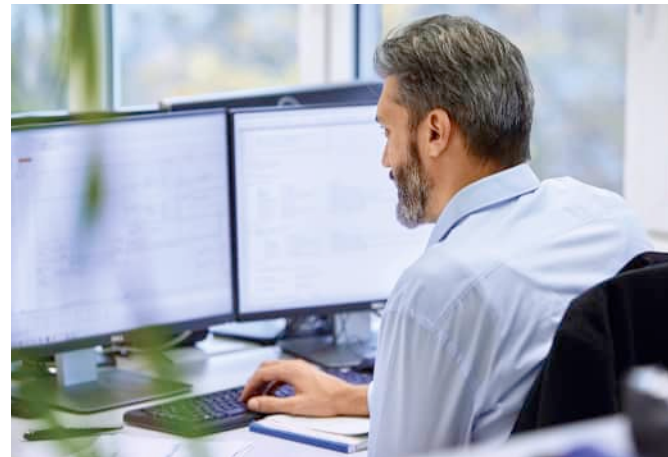
Configure your protection relay directly in the online configurator

Configure and order your protection relay online at any time. Simply enter the web code in the search field on our website.

Alternatively, you can put together your individual order code on the following pages.

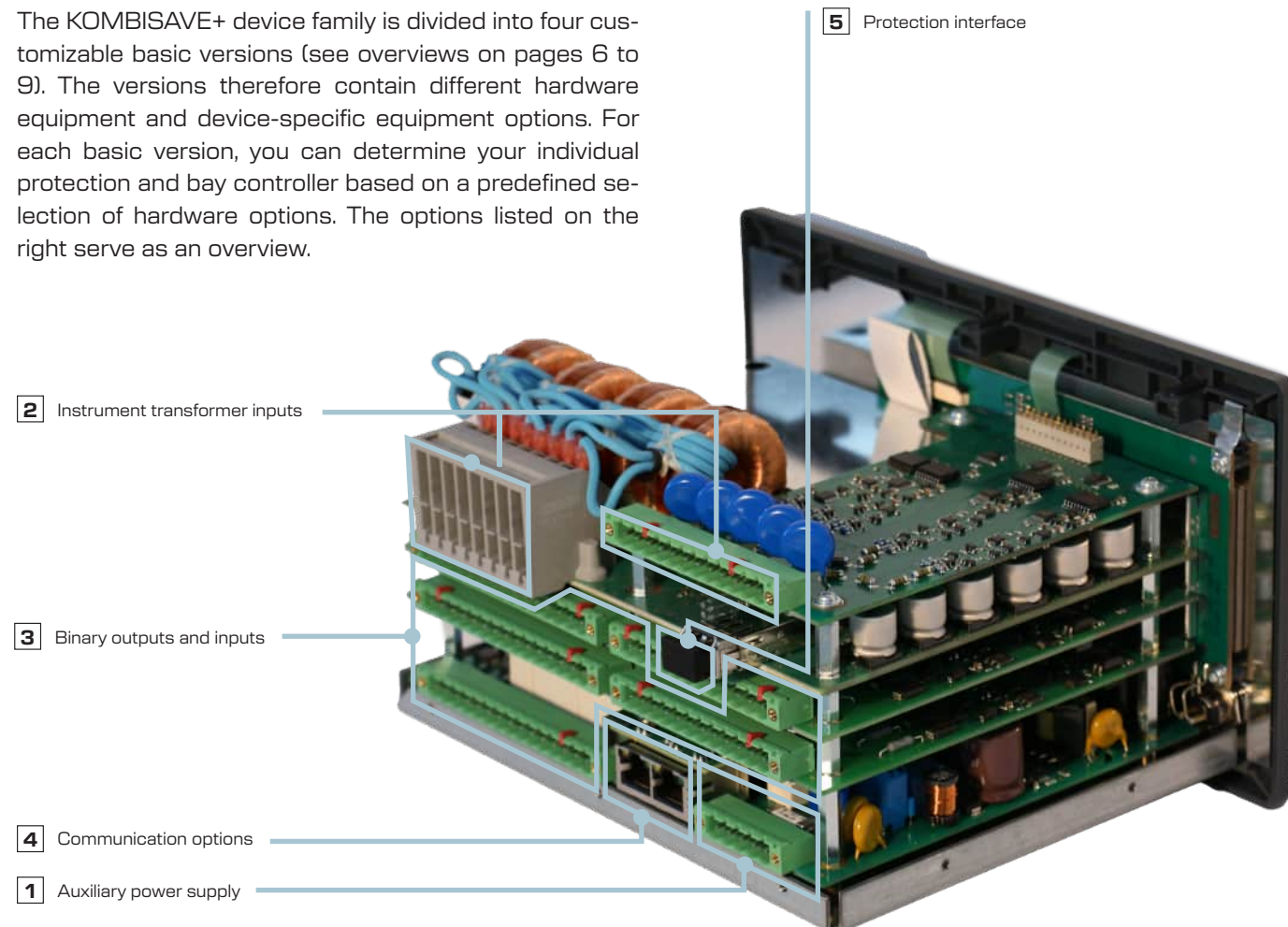


<https://nse.ch/en/konfigurator/>



1. Define hardware

The KOMBISAVE+ device family is divided into four customizable basic versions (see overviews on pages 6 to 9). The versions therefore contain different hardware equipment and device-specific equipment options. For each basic version, you can determine your individual protection and bay controller based on a predefined selection of hardware options. The options listed on the right serve as an overview.



2. Define device-specific software (see pages 25, 27, 29, 31)

The devices are supplied with a predefined range of functions as standard. Depending on the hardware specification, additional software functions can be selected. The device-specific software functions A-J can be selected on pages 25, 27, 29 and 31.

- A** Additional communication protocol
- B** Synchrocheck
- C** Smart grid protection
- D** Fault location
- E** Distance protection
- F** Extended protective functions
- G** Cybersecurity
- H** Differential protection
- J** Substation automation/ bay control

In addition, the devices are supplied with the DIGICOM BASIC operator software. The software is used for parameterization and configuration of the devices. It is also possible to extend the software with functionalities such as error analysis. The software can also be used by several users by purchasing a multi-user license. Further information on the appropriate operator and fault analysis software can be found from page 68 onwards.

Simply put together your order code

To compile your order code, please refer to the tables on the following pages. You will find the order code in the second line of each table. You can use predefined options to customize your product.

An order code is made up of the hardware and software options.

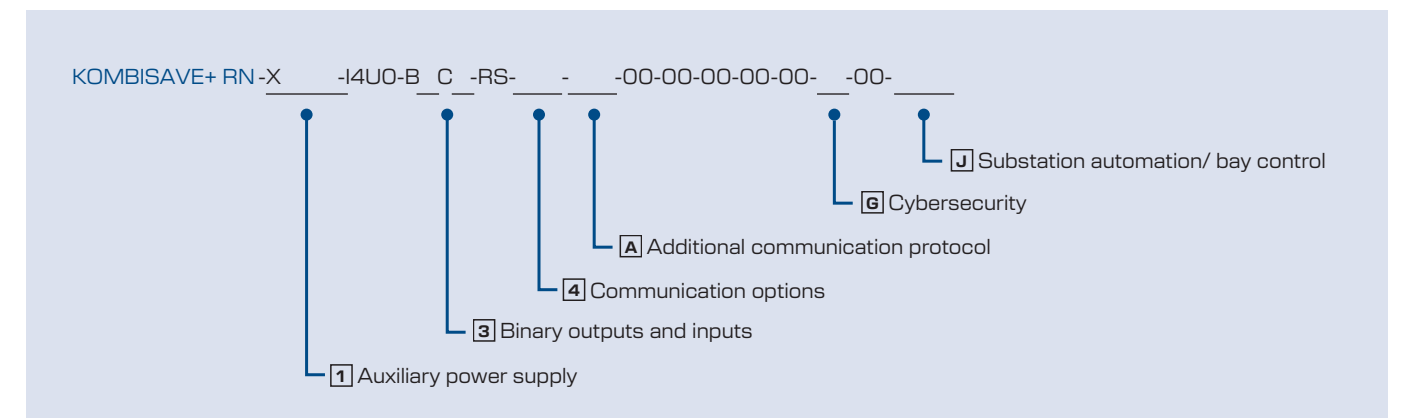
A complete order code for the KOMBISAVE+ RN looks as follows, for example:

Hardware:

KOMBISAVE+ RN-X2-I4U0-B2C1-RS-EE

Software:

50-00-00-00-00-00-00-AU



Determine order code KOMBISAVE+ RN

Define hardware						Define device-specific software				
CPU board	1 Auxiliary power supply	Instrument transformer inputs	3 Binary outputs and inputs**	Standard communication	4 Communication options	A Additional communication protocol	Device-specific Software options	G Cybersecurity	Device-specific Software options	J Substation automation/ bay control
KOMBISAVE RN	— please select	I4U0 —	— please select —	RS —	— please select —	— please select —	00-00-00-00-00	— please select —	00 —	— please select
2 x binary inputs AC/DC* 6 x binary outputs (2500 VA / 3 ms) 1 x watchdog (2500 VA / 3 ms)	X1 24 V DC	4 x current inputs (1 A / 5 A***)	B2C1 20 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms)	1x serial electrical for IEC 60870-5-103 / MODBUS RTU (RS-485)	00 without additional Communication option	00 without		00 without		00 without
	X2 44 ... 250 V DC 50 ... 275 V AC		B2C2 28 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms)		RO 1x serial optical for IEC 60870-5-103 (ST connector, 820 nm)	50 IEC 61850		ZA Centralized Authentication (RADIUS)		AU Option included
			B2C3 20 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms) 4 x analog inputs (Pt 100)		EE 1x Ethernet electrical e.g. for IEC 61850 (RJ45 connector)	04 IEC 60870-5-104				
			B3C1 12 x binary inputs DC* 9 x binary outputs (2500 VA / 6 ms)		EO 1x Ethernet optical e.g. for IEC 61850 (SC connector, 1300 nm)	54 IEC 61850 IEC 60870-5-104				
			B3C2 20 x binary inputs DC* 9 x binary outputs (2500 VA / 6 ms)		SE 1x Ethernet switch electrical e.g. for IEC 61850 (2x RJ45 connector)					
			B3C3 12 x binary inputs DC* 9 x binary outputs (2500 VA / 6ms) 4x analog inputs (Pt 100)		SO 1x Ethernet switch optical e.g. for IEC 61850 (2 x SFP-MM2X module)					
			B4C1 12 x binary inputs DC* 16 x binary outputs (2500 VA / 6 ms)							
			B4C2 20 x binary inputs DC* 16 x binary outputs (2500 VA / 6 ms)							
			B4C3 12 x binary inputs DC* 16 x binary outputs (2500 VA / 6 ms) 4 x analog inputs (Pt 100)							

NOTE

The DIGICOM BASIC operator software is supplied as standard with your product. You have the option of purchasing an extended version (see page 68).

KOMBISAVE+ RN-X -I4U0-B C -RS- - -00-00-00-00-00- -00- -

1 Auxiliary power supply

3 Binary outputs and inputs

4 Communication options

A Additional communication protocol

G Cybersecurity

J Substation automation/ bay control

* Switching threshold switchable
** Further inputs and outputs on the CPU board
*** Range switchable by software

Determine order code KOMBISAVE+ RF

Define hardware						Define device-specific software								
CPU board	1 Auxiliary power supply	2 Instrument transformer inputs	3 Binary outputs and inputs**	Standard communication	4 Communication options	A Additional communication protocol	B Synchronous check	C Smart grid protection	D Fault location	E Distance protec- tion	F Extended protective functions	G Cybersecurity	Device-spe- cific Software options	J Substation automation/ bay control
KOMBISAVE RF	please select	please select	please select	RS	please select	please select	please select	please select	please select	please select	please select	please select	00	please select
2 x binary inputs AC/DC* 6 x binary outputs (2500 VA / 3 ms) 1 x watchdog (2500 VA / 3 ms)	X1 24 V DC	I4U4X 4 x current inputs (1 A/5 A***) 4 x voltage inputs: (100 V/110 V/400 V*)	B2C1 20 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms)	1x serial electrical for IEC 60870-5-103/ MODBUS RTU (RS-485)	00 without additional Communication option	00 without	00 without	00 without	00 without	00 without	00 without	00 without		00 without
	X2 44 ... 250 V DC 50 ... 275 V AC	I4U5X 4 x current inputs (1 A/5 A***) 5 x voltage inputs: (100 V/110 V/400 V*)	B2C2 28 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms)		RO 1x serial optical for IEC 60870-5-103 (ST connector, 820 nm)	50 IEC 61850	SY Option included	QU QU-protection	FO Option included	ZP Option included	OV Ground fault detection using the har- monic method	ZA Central authentication (RADIUS)		AU Option included
			B2C3 20 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms) 4 x analog inputs (Pt 100)		EE 1x Ethernet electrical e.g. for IEC 61850 (RJ45 connector)	04 IEC 60870-5-104		FE automatic Frequency relief AFE//UFLA						
			B3C1 12 x binary inputs DC* 9 x binary outputs (2500 VA / 6 ms)		EO 1x Ethernet optical e.g. for IEC 61850 (SC connector, 1300 nm)	54 IEC 61850 IEC 60870-5-104		QF QU-protection and automatic Frequency relief AFE//UFLA						
			B3C2 20 x binary inputs DC* 9 x binary outputs (2500 VA / 6 ms)		SE 1x Ethernet switch electrical e.g. for IEC 61850 (2x RJ45 connector)									
			B3C3 12 x binary inputs DC* 9 x binary outputs (2500 VA / 6ms) 4x analog inputs (Pt 100)		SO 1x Ethernet switch optical e.g. for IEC 61850 (2 x SFP-MM2X module)									
			B4C1 12 x binary inputs DC* 16 x binary outputs (2500 VA / 6 ms)											
			B4C2 20 x binary inputs DC* 16 x binary outputs (2500 VA / 6 ms)											
			B4C3 12 x binary inputs DC* 16 x binary outputs (2500 VA / 6 ms) 4 x analog inputs (Pt 100)											

NOTE

The DIGICOM BASIC operator software is supplied as standard with your product.
You have the option of purchasing an extended version (see page 68).

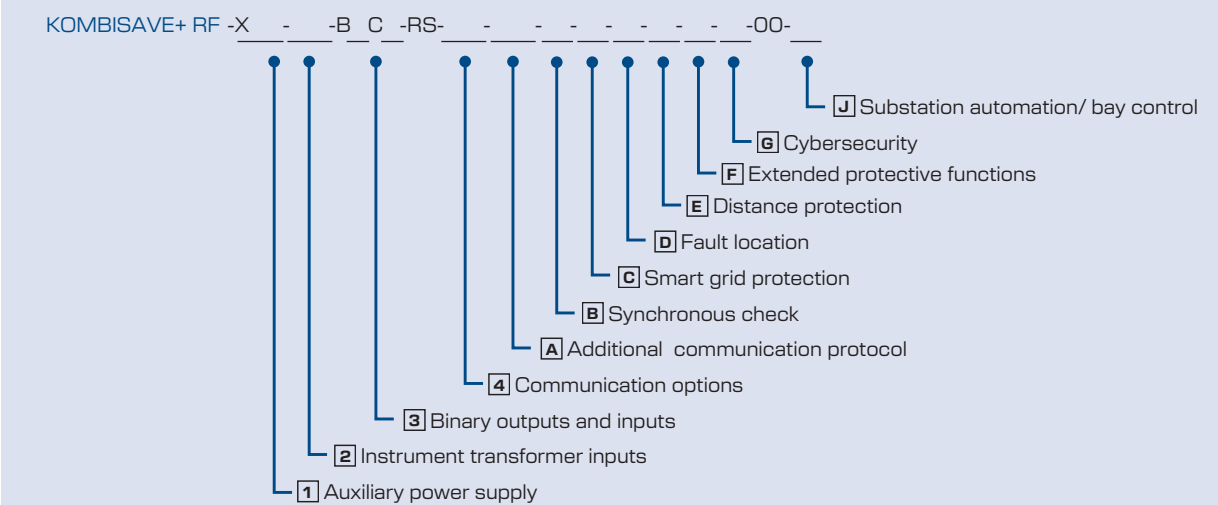
KOMBISAVE+ RF -X - -B C -RS- - - - - - - - -OO-

- 1 Auxiliary power supply
- 2 Instrument transformer inputs
- 3 Binary outputs and inputs
- 4 Communication options
- A Additional communication protocol
- B Synchronous check
- C Smart grid protection
- D Fault location
- E Distance protection
- F Extended protective functions
- G Cybersecurity
- J Substation automation/ bay control

* Switching threshold switchable

** Further inputs and outputs on the CPU board

** Range switchable by software



Determine order code KOMBISAVE+ RQ

Define hardware						Define device-specific software				
CPU board	1 Auxiliary power supply	Instrument transformer inputs	3 Binary outputs and inputs**	Standard communication	4 Communication options	Additional communication protocol	A Device-specific Software options	G Cybersecurity	H Differential protection	J Substation automation/ bay control
KOMBISAVE RQ	— please select —	— I8U0 —	— please select —	— RS —	— please select —	— please select —	00-00-00-00-00	— please select—	TF	— please select
2 x binary inputs AC/DC* 6 x binary outputs (2500 VA / 3 ms) 1 x watchdog (2500 VA / 3 ms)	X1 24 V DC	8 x current inputs (1 A / 5 A***)	B2C1 20 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms)	1x serial electrical for IEC 60870-5-103 / MODBUS RTU (RS-485)	00 without additional Communication option	00 without		00 without	Transformer differential protection for two-winding transformer	00 without
	X2 44 ... 250 V DC 50 ... 275 V AC		B2C2 28 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms)		RO 1x serial optical for IEC 60870-5-103 (ST connector, 820 nm)	50 IEC 61850		ZA Centralized Authentication (RADIUS)		AU Option included
			B2C3 20 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms) 4 x analog inputs (Pt 100)		EE 1x Ethernet electrical e.g. for IEC 61850 (RJ45 connector)	04 IEC 60870-5-104				
			B3C1 12 x binary inputs DC* 9 x binary outputs (2500 VA / 6 ms)		EO 1x Ethernet optical e.g. for IEC 61850 (SC connector, 1300 nm)	54 IEC 61850 IEC 60870-5-104				
			B3C2 20 x binary inputs DC* 9 x binary outputs (2500 VA / 6 ms)		SE 1x Ethernet switch electrical e.g. for IEC 61850 (2x RJ45 connector)					
			B3C3 12 x binary inputs DC* 9 x binary outputs (2500 VA / 6ms) 4x analog inputs (Pt 100)		SO 1x Ethernet switch optical e.g. for IEC 61850 (2 x SFP-MM2X module)					
			B4C1 12 x binary inputs DC* 16 x binary outputs (2500 VA / 6 ms)							
			B4C2 20 x binary inputs DC* 16 x binary outputs (2500 VA / 6 ms)							
			B4C3 12 x binary inputs DC* 16 x binary outputs (2500 VA / 6 ms) 4 x analog inputs (Pt 100)							

NOTE

The DIGICOM BASIC operator software is supplied as standard with your product. You have the option of purchasing an extended version (see page 68).

KOMBISAVE+ RQ -X -I8U0-B C -RS- - -00-00-00-00-00- -TF-

1 Auxiliary power supply

3 Binary outputs and inputs

4 Communication options

A Additional communication protocol

G Cybersecurity

H Differential protection

J Substation automation/ bay control

* Switching threshold switchable

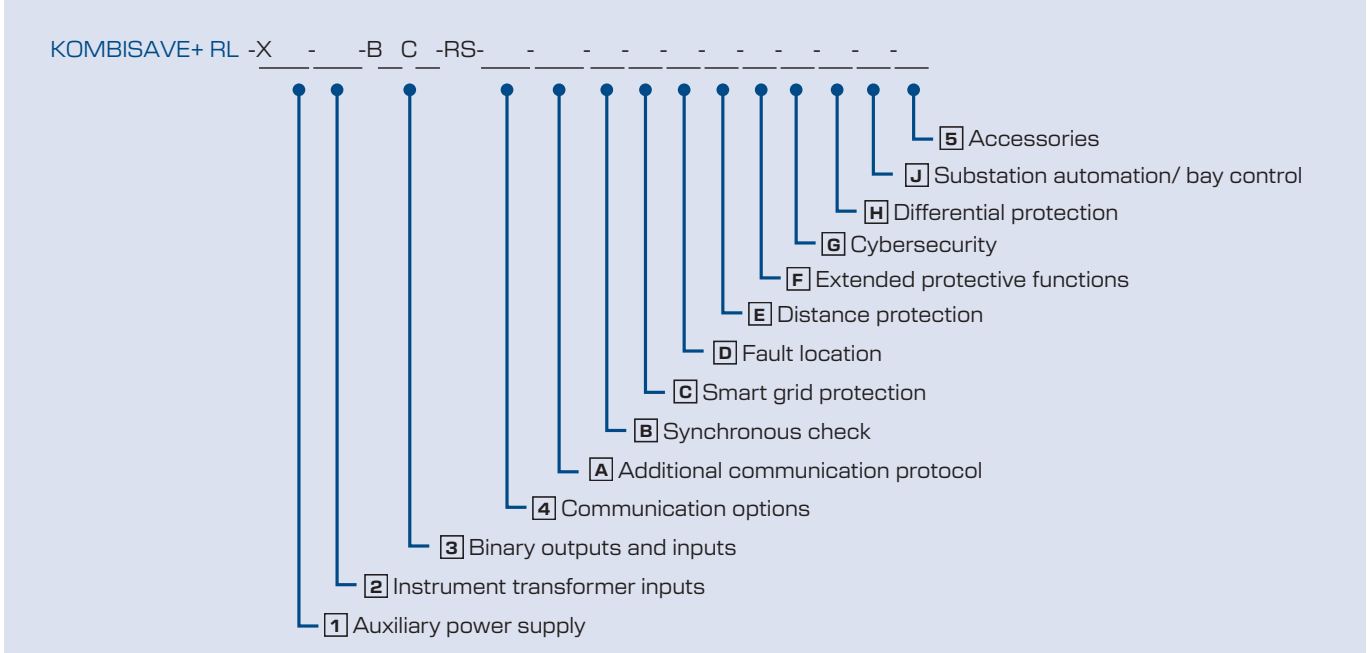
** Further inputs and outputs on the CPU board

*** Range switchable by software

Define hardware							Define device-specific software										Define accessories
	1	2		3		4	A	B	C	D	E	F	G	H	J	5	
CPU board	Auxiliary power supply	Instrument transformer inputs	Standard Kommunikation	Binary outputs and inputs**	Standard communication	Communication options	Additional communication protocol	Synchronous check	Smart grid protection	Fault location	Distance protection	Extended protective functions	Cyber-security	Differential protection	Substation automation/ bay control	Optical communication module in plug-in technology	
KOMBISAVE RL –	please select –	please select –	WS –	please select –	RS –	please select –	please select –	please select –	please select –	please select –	please select –	please select –	please select –	please select –	please select –	please select –	
2 x binary inputs AC/DC* 6 x binary outputs (2500 VA / 3 ms) 1 x watchdog (2500 VA / 3 ms)	X1 24 V DC	I4U0 4 x current inputs (1 A/5 A***)	1 x Protection interface INTERSAVE	B2C1 20 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms)	1 x serial optical for IEC 60870-5-103 (RS-485)	00 without additional Communication option	00 without	00 without	00 without	00 without	00 without	00 without	00 without	00 without	00 without	00 without communication modules	
	X2 44 ... 250 V DC 50 ... 275 V AC	I4U5X 4 x current inputs (1 A/5 A***) 5 x voltage inputs: (100 V/110 V/ 400 V*)		B2C2 28 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms)		RO 1x serial optical for IEC 60870-5-103 (ST connector, 820 nm)	50 IEC 61850	SY Option included	QU QU-protection	FO Option included	ZP Option included	OV Ground fault detection using the harmonic method	ZA Central authentication (RADIUS)	LD line differential protection	AU Option included	SFP-MM2X 1 x multimode 1310 nm LC-Dup 2 km (with double selection 2 x Multimode 1310 nm LC-Dup 2 km)	
				B2C3 20 x binary inputs DC* 10 x binary outputs (2500 VA / 6 ms) 4 x analog inputs (Pt 100)		EE 1x Ethernet electrical e.g. for IEC 61850 (RJ45 connector)	04 IEC 60870-5-104		FE automatic Frequency relief AFE//UFLA					LT Line differential protection with transformer in the protection zone		SFP-SM15 1 x singlemode 1310 nm LC-Dup 15 km (with double selection 2 x singlemode 1310 nm LC-Dup 15 km)	
				B3C1 12 x binary inputs DC* 9 x binary outputs (2500 VA / 6 ms)		E0 1x Ethernet optical e.g. for IEC 61850 (SC connector, 1300 nm)	54 IEC 61850 IEC 60870-5-104		QF QU-protection and automatic Frequency relief AFE//UFLA							SFP-SM40 1 x singlemode 1310 nm LC-Dup 40 km (with double selection 2 x singlemode 1310 nm LC-Dup 40 km)	
				B3C2 20 x binary inputs DC* 9 x binary outputs (2500 VA / 6 ms)		SE 1x Ethernet switch electrical e.g. for IEC 61850 (2x RJ45 connector)										SFP-SM80 1 x singlemode 1550 nm LC-Dup 80 km (with double selection 2 x singlemode 1550 nm LC-Dup 80 km)	

The DIGICOM BASIC operator software is supplied as standard with your product. You have the option of purchasing an extended version (see page 68).

*** Range switchable by software





Your advantages

- Autonomous operation thanks to integrated power management
- Compact surface-mounted design is particularly suitable for retrofitting existing systems
- Cost benefits through optional connection to low-power voltage sensors
- Intuitive operation thanks to clear front of the unit and simple parameterization options
- Meets the requirements for IT security according to the BDEW white paper nach BDEW-Whitepaper

POWERSAVE

Transformer-fed mains protection with the POWERSAVE

POWERSAVE is a compact and powerful protection and bay controller with a full range of protection, control and measurement functions. Thanks to the optional integrated power management, for direct trip, tripping from the circuit breaker, the device solution is independent of a stable external power supply. The combination of power management and distance protection functions makes the device indispensable as blackout protection.

Standard properties of the POWERSAVE	
Integrated power management – Energy block – CT power supply	24 V DC with 3 J and 300 V DC with 50 J with an availability of three autonomous circuit breaker trips during 48 hours without recharging via auxiliary power or CT power supply CT power supply from 0.2 xIn, system start <100 m
Control	Standard: CB, XCBR, LOC, CILO (key switch) Extended (only with AU software options): DCC, CBT, CBAY, CILO (interlocking scheme), direct control via HMI
Message and Status display/ front of the unit	Standard: Predefined measurement charts, freely configurable LEDs
Programmable logic (only with AU software options)	Standard: USB; serial electrical interface Extended: Ethernet electrical or optical; serial optical interface Advanced: optical or electrical 100 MB - Switch
Communication options	Standard: USB, IEC 60870-5-103, MODBUS RTU Expandable: IEC 61850
Formats	XML, COMTRADE, XRIO, MMS, (Fast) GOOSE

Further information can be found from page 55 onwards.

Device versions

POWERSAVE+ RN

Simple overcurrent and motor protection with bay control and optional power management



Efficient protection for industrial and power supply systems

Characteristics of the design variants		
Protective functions	Common	38, 49I&II, 50P/51P, 50N/51N, 50HS, 68
	Motor protection	14, 37, 46, 50M
Protection-related functions		50SOTF, 50BF, 74TC / 95, 79, 85, 86
Measure-ment	Number of current transformers	4
	Number of voltage transformers	–
	Measured values	3I, IO, 3I/15 min, Ith, Trip delay, No. of trips, tripping, I²t

POWERSAVE+ RF

Outgoing circuit protection with distance protection, ground fault detection with bay control and optional power management



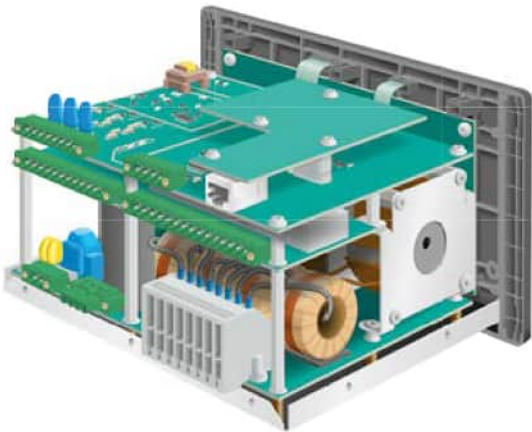
Compact bay controller for complex applications in substations

Characteristics of the design variants		
Protective functions	Common	27P/59P, 32P, 32N, 32R, 38, 47, 49I&II, 50P/51P, 50N/51N, 50HS, 59N, 67, 67N, 67NIEF, 67NF3/5/7, 67NPPD, 68, 81O/U, 81R
	Motor protection	14, 37, 46, 48, 50M
	Distance protection (only with software options ZP)	21FL, 21N, 21P
	Smart Grid (only with QU, FE or QF software options)	27QV (QU), 81LSH (UFLA)
Protection-related functions		50BF, 50SOTF, 60P, 74TC / 95, 85, 86
Measure-ment	Number of current transformers	4
	Number of voltage transformers	3 or 4
	Measured values	3I, IO, 3I/15 min, Ith, 3ULE, 3ULL, UO, PQS, f, cosφ, R/X, km/miles, trip delay, nos. trips, tripping, I²t

Special features of the **POWERSAVE** device family

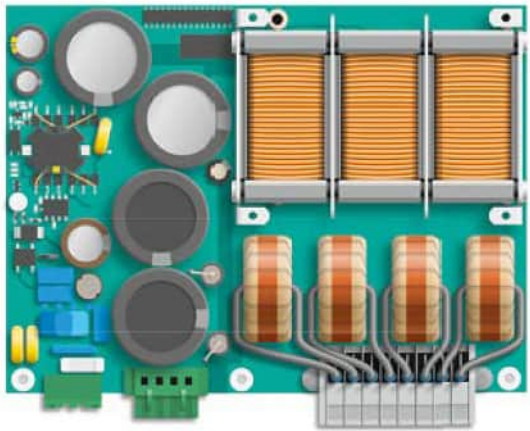
Maximum system availability thanks to blackout protection

Optional power management with energy block and CT power supply enables system operation independent of external power supply.



Optional CT power supply

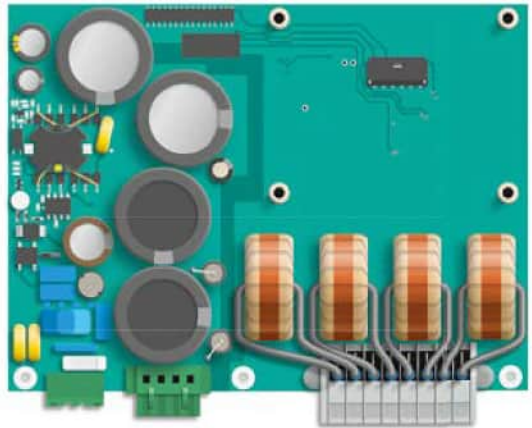
The optional CT power supply enables continued system operation even in the event of failure of the primary power supply. In this case, the optional energy blocks are charged by the CT power supply.



Optional energy block

With an energy block, connected circuit breakers can be switched for more than two days after failure of the power supply (at least two trips, tripping). Another energy block provides the power supply for the auxiliary signals. An integrated capacitor enables the system to be maintained for at least 30 seconds. Combination with a CT power supply is possible.

The output voltage can be adjusted between 20 and 320 V DC so that it can be precisely adapted to the coil types in the circuit breaker.



Application examples

Typical application with a POWERSAVE RF

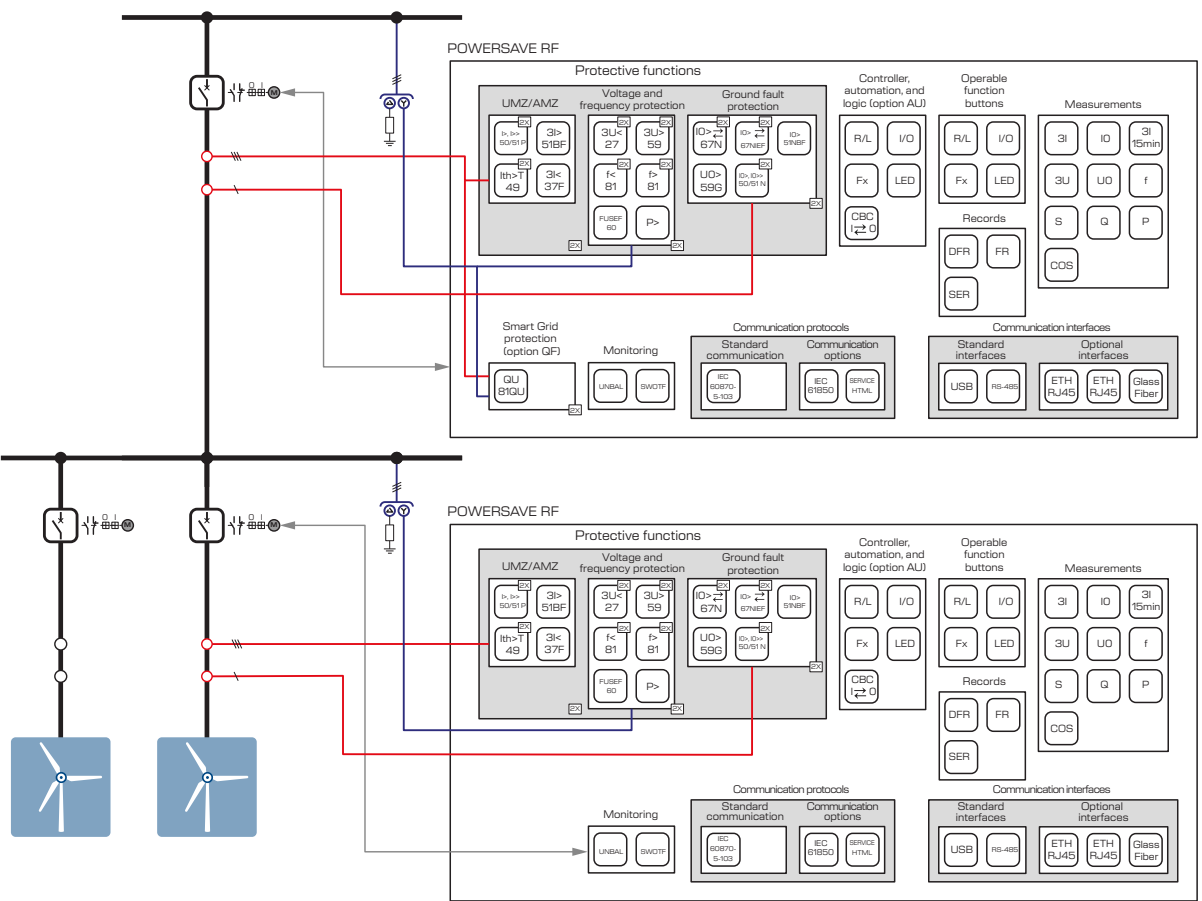
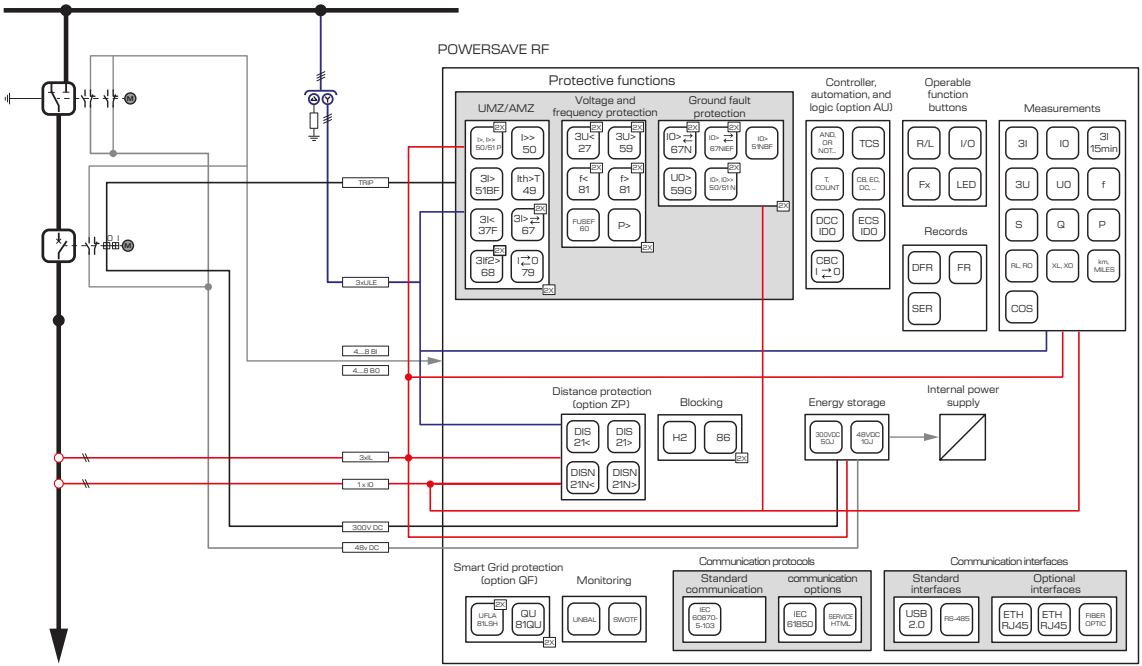
The RF version is a multifunctional outgoing circuit protector with ground fault detection and bay control as well as optional power management functionality. The device can be used in simple star or ring networks and in complex meshed networks with isolated, compensated, solidly grounded or low-resistance grounded star points. In addition to the standard current protection functions, the protection unit is used with the voltage and frequency functions as well as the optional distance protection (full scheme) for complete protection of outgoing feeders. The device covers all earth fault protective functions of the above-mentioned network types.

As in all versions, other monitoring and measuring functions are implemented in addition to the pure protective functions. In addition to the communication option implemented as standard via IEC 60870-5-103, IEC 61850 can also be used by selecting the appropriate software function. The optional fault location and under-frequency load shedding complete the protection package. The device can also apply complete bay control. The optional integrated programmable logic allows the functions to be adapted to special requirements, e.g. additional special interlocking, automatic changeover, etc..

Smart grid configuration with POWERSAVE RF

The application example shows the use of the device version as part of the feed-in management of decentralized energy generation systems. Protection in the outgoing feeders and at the grid connection point is covered by the POWERSAVE RF. Our devices are certified in accordance with VDE-AR-N 4110 and VDE-AR-N 4120 for typical applications in the field of renewable energy generation in the medium and high voltage range. The focus of the protective functions here is on voltage and frequency functions as well as QU-protection. As with all variants of the device family, it is also possible for the device to apply bay control.

The optional integrated programmable logic enables functional adaptation to the respective application. Direct communications to a control system or a higher-level control system can be realized via IEC 61870-5-103 or optionally by selecting the appropriate software function IEC 61850 Ed. 1 / Ed. 2.

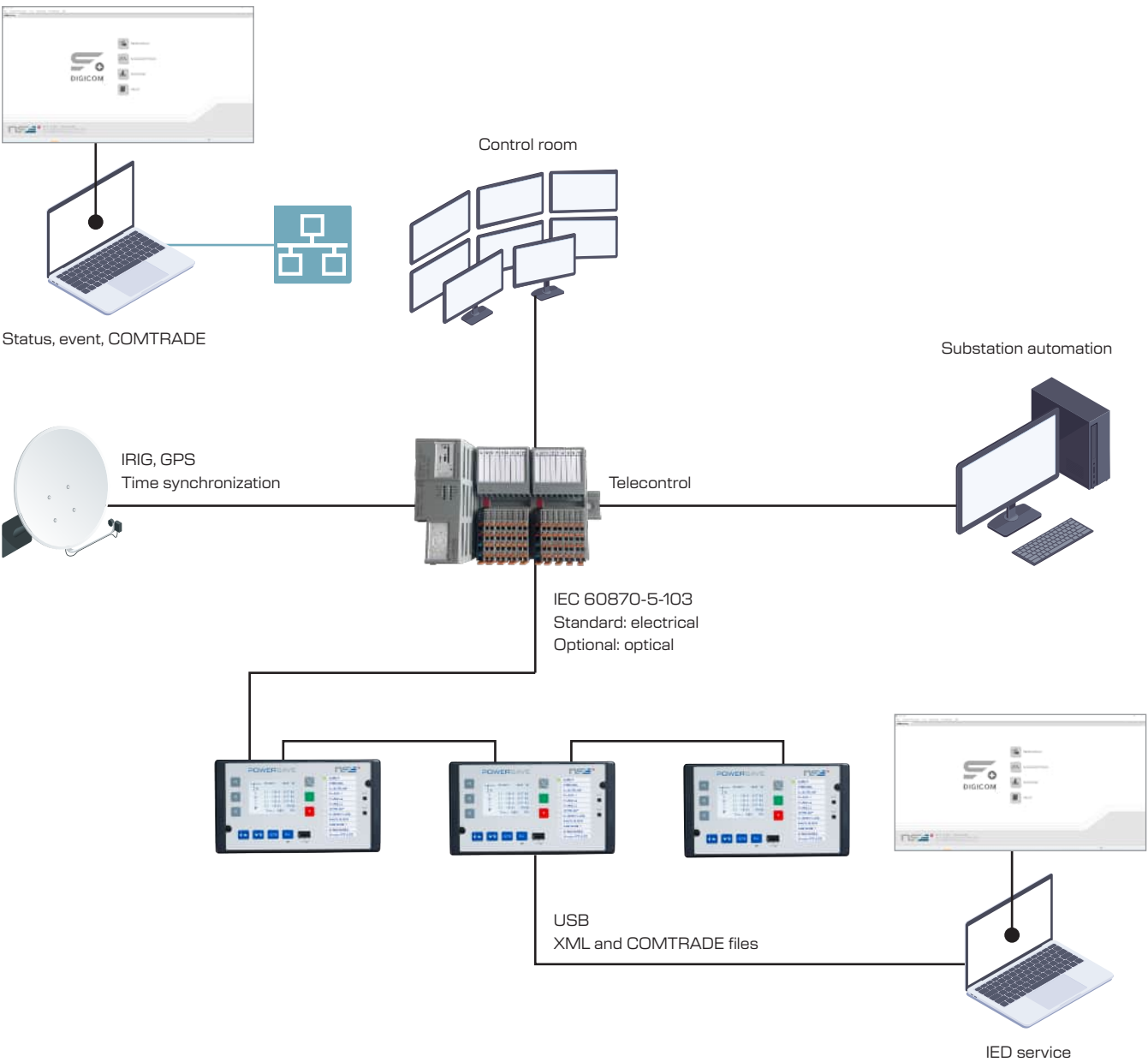


Communication options

Standard communication with IEC 60870-5-103

The POWERSAVE RF has a serial electrical interface as standard for communications via IEC 60870-5-103. The POWERSAVE RN can be optionally extended with a serial electrical interface. In addition to the RS-485 connection, it is also possible to communicate via an optical interface.

The optical interface is suitable for ST connectors and optical fibers with 820 nm. Programming is carried out using xcfg files via the USB front interface.



IT safety

Our protective device families are developed with regard to cyber security, taking into account the BDEW white paper. The aim is to increase IT safety in substations in the energy sector against unwanted intrusions from inside and outside. Central elements in this context are, for role-based access control and protection mechanisms at the communication interfaces. This includes the management of user roles and rights (RBAC) as well as the recordings of security-relevant events. In addition, the installation of non-proprietary software is prevented.

To verify data, files are signed using SHA-256 and 3072-bit RSA keys, e.g. for update and patch management. For particularly high data security, user files are saved encrypted with AES-256 independently of the configuration file and encrypted with TLS during data transfer via the Ethernet interface.



Further information can be found at
<https://www.nse.ch/en/save-tech/product-certificates/>

Safety access



Protection and bay controller



Data verification with SHA-256 and 3072-bit RSA



Data encryption with AES-256

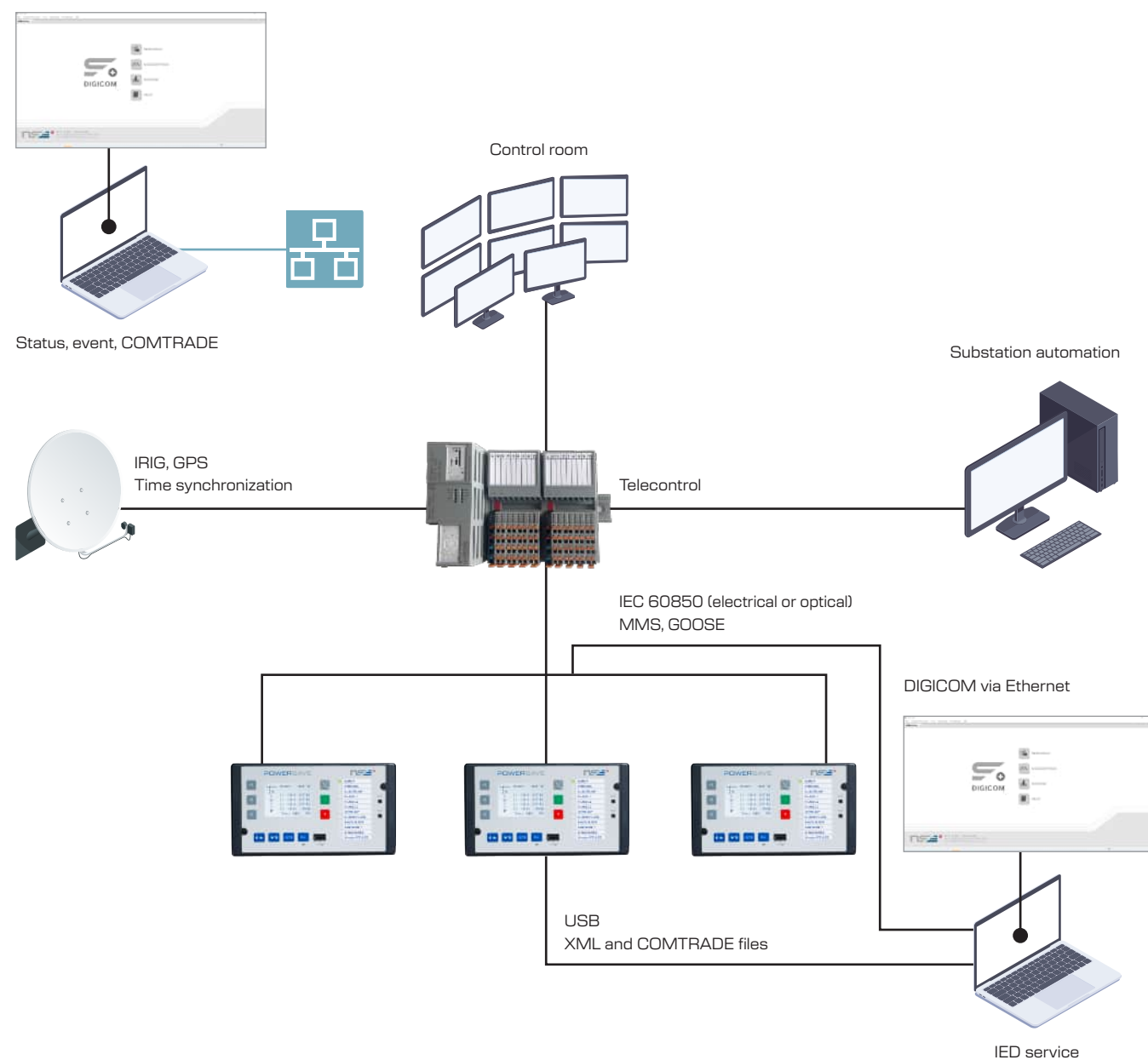


Role-based access rights (Role Based Access Control, RBAC)

IEC 61850 communication option

In addition to communications via IEC 60870-5-103, it is also possible to communicate via IEC 61850. All versions of the POWERSAVE device family are optionally available with IEC 61850 Ed. 1 / Ed. 2. The associated physical connections can be selected as an Ethernet interface electrically via RJ45 or Ethernet optically with a 1300 nm SC connector. The Ethernet port can also be used as a dedicated service interface with DIGICOM. In order to implement the necessary redundancy concepts, options with electrical or optical switches can also be selected. By using SFP modules, the desired variants can be specified when ordering.

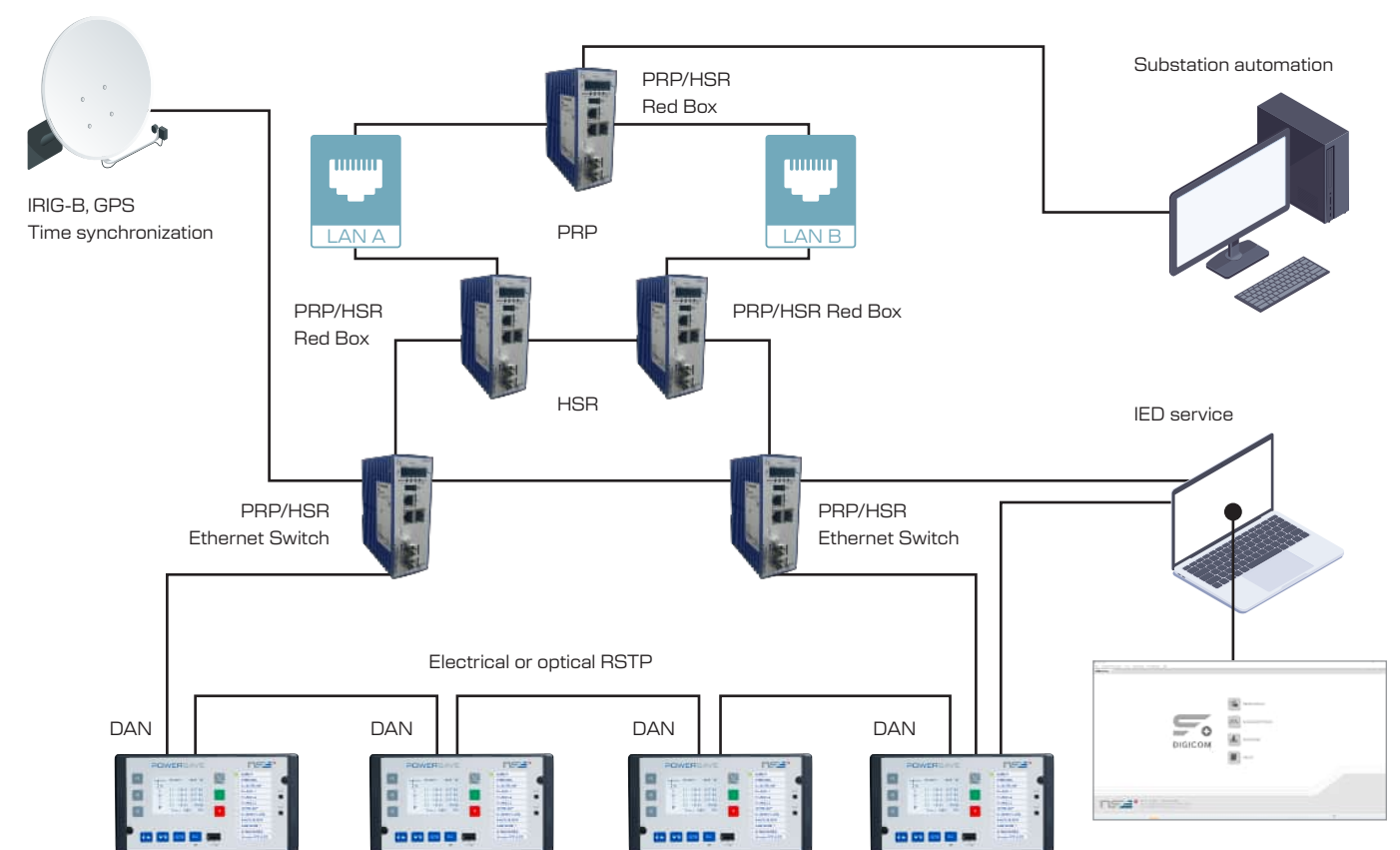
All devices with the IEC 61850 option support MMS and GOOSE functionalities (FAST GOOSE and SLOW GOOSE). Each of the existing Ethernet interfaces can be used as a service interface with the DIGICOM operator software. Programming is carried out using xcfg files via the USB front or Ethernet service interface. In addition, the transfer of COMTRADE files for error analysis is also possible.



Redundancy concepts with IEC 61850

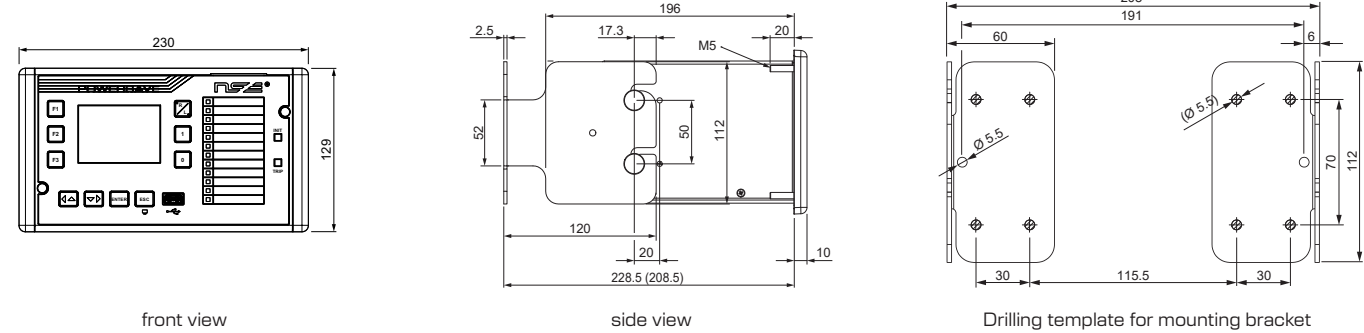
For applications with IEC 61850, the POWERSAVE device family offers various redundancy concepts: Parallel Redundancy Protocol (PRP), High-availability Seamless Redundancy (HSR) and Rapid Spanning Tree Protocol (RSTP). PRP enables parallel transmission to two redundant networks so that continuous operation is possible in the event of a fault. Data is neither lost nor delayed in this process. The DAN functionality (Double Attached Node) is realized by an integrated switch. By using SFP modules, the functionality can be implemented both electrically and optically with various fiber optic options.

HSR allows the parallel transmission of data in both ring sections. This means that there is no downtime in the event of faults in components within the ring. Non-redundant subscribers are connected via a redundancy box (Red Box). With RSTP, transmission takes place in the ring, which is virtually "open" at one point. This results in short downtimes in the event of faults in a component of the ring. The switchover to a new topology takes place automatically.

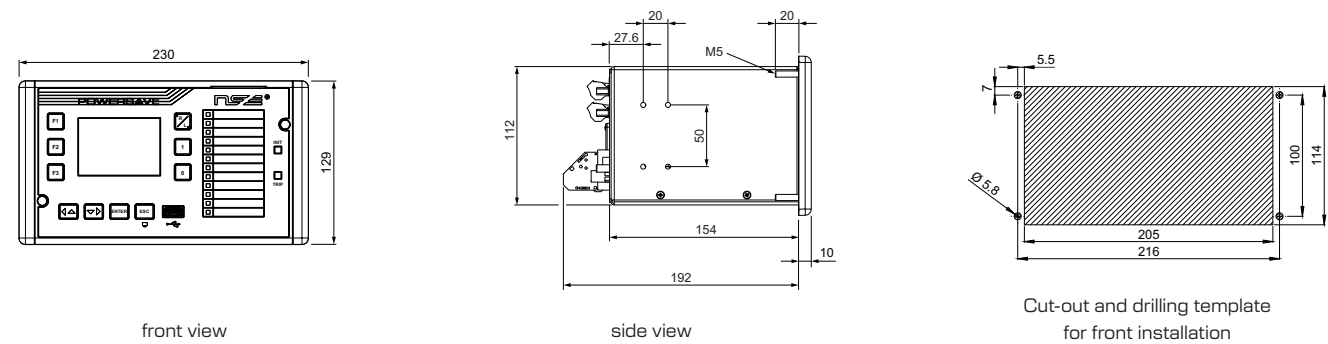


Body descriptions

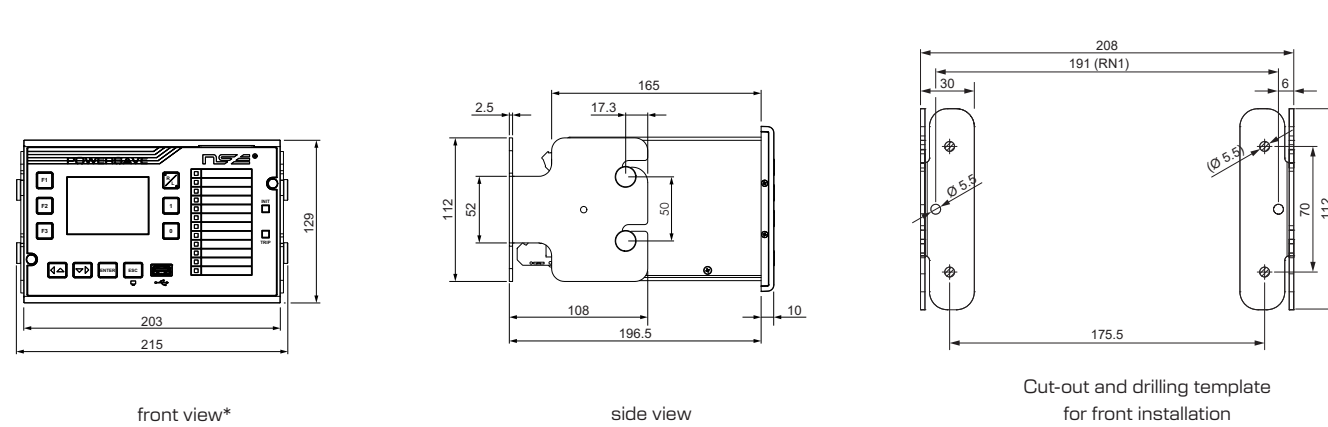
Dimensional drawing body version (type S) in mm



Dimensional drawing installation version (type S) in mm

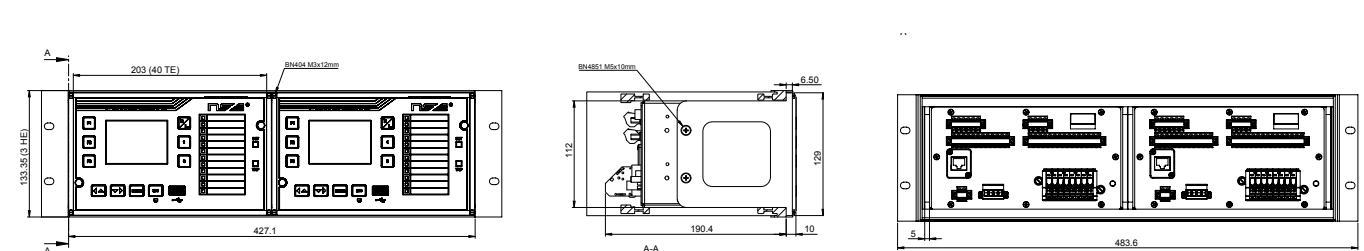


Dimensional drawing of surface-mounted version for RN1 or DIGISAVE retrofit projects (type R) in mm



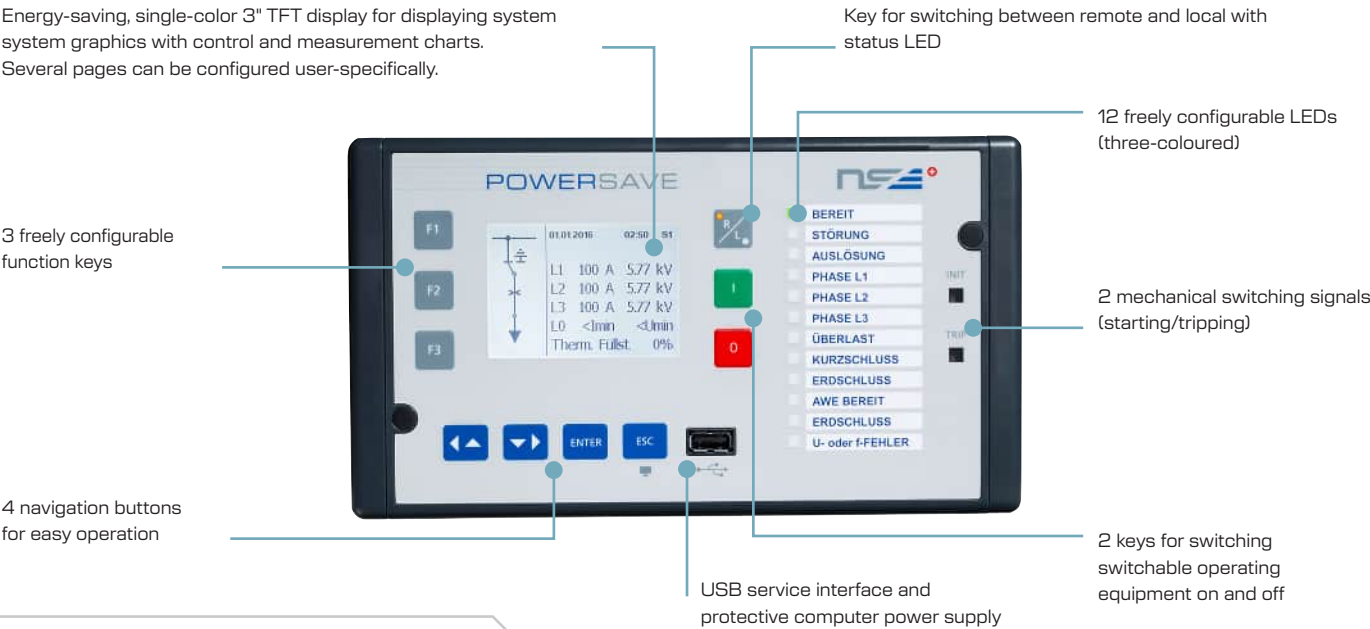
Dimensional drawing installation version for 19" rack 3U (type R) in mm

Mounting brackets, which can be ordered separately, are required. Details can be found in the device manual.

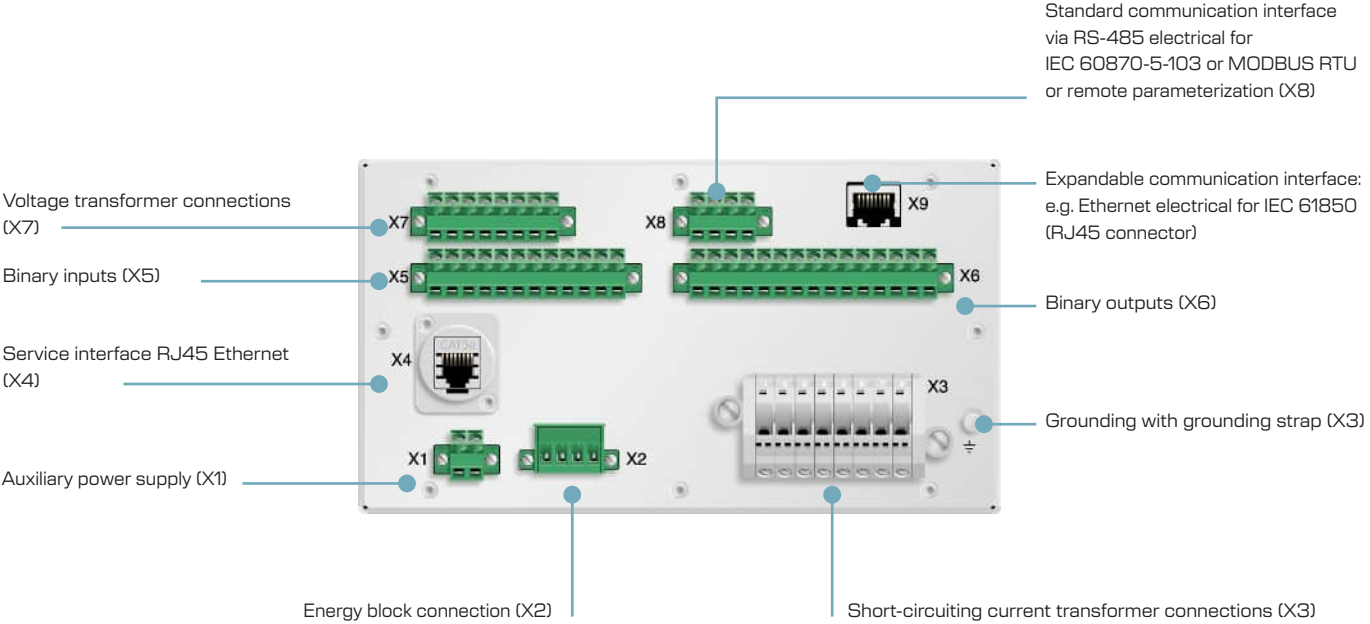


Front of the POWERSAVE device family

Energy-saving, single-color 3" TFT display for displaying system graphics with control and measurement charts. Several pages can be configured user-specifically.



Example of the rear side of a POWERSAVE+ RF device version



Exemplary technical connection diagram

POWERSAVE RF-X2-I4U4-P1-BI8BO8-RS-EE-S
POWERSAVE RF-X2-I4S3-P1-BI8BO8-RS-EE-S

Our sales department will be happy to provide you with device-specific connection diagrams.

Energy block

Energy block for signaling signals**

Charging voltage: 24 V DC
Energy content: 3 J at 24 V DC
Capacity: 10 mF
Charging time of
the backup capacitor: 4 minutes

Energy block for tripping circuit*

Charging voltage: 20 ... 320 V DC
(configurable via software)
Energy content: 50 J at 300 V DC
Charging time at 300 V DC: 120 s
(with auxiliary power supply)

Power supply (X2)

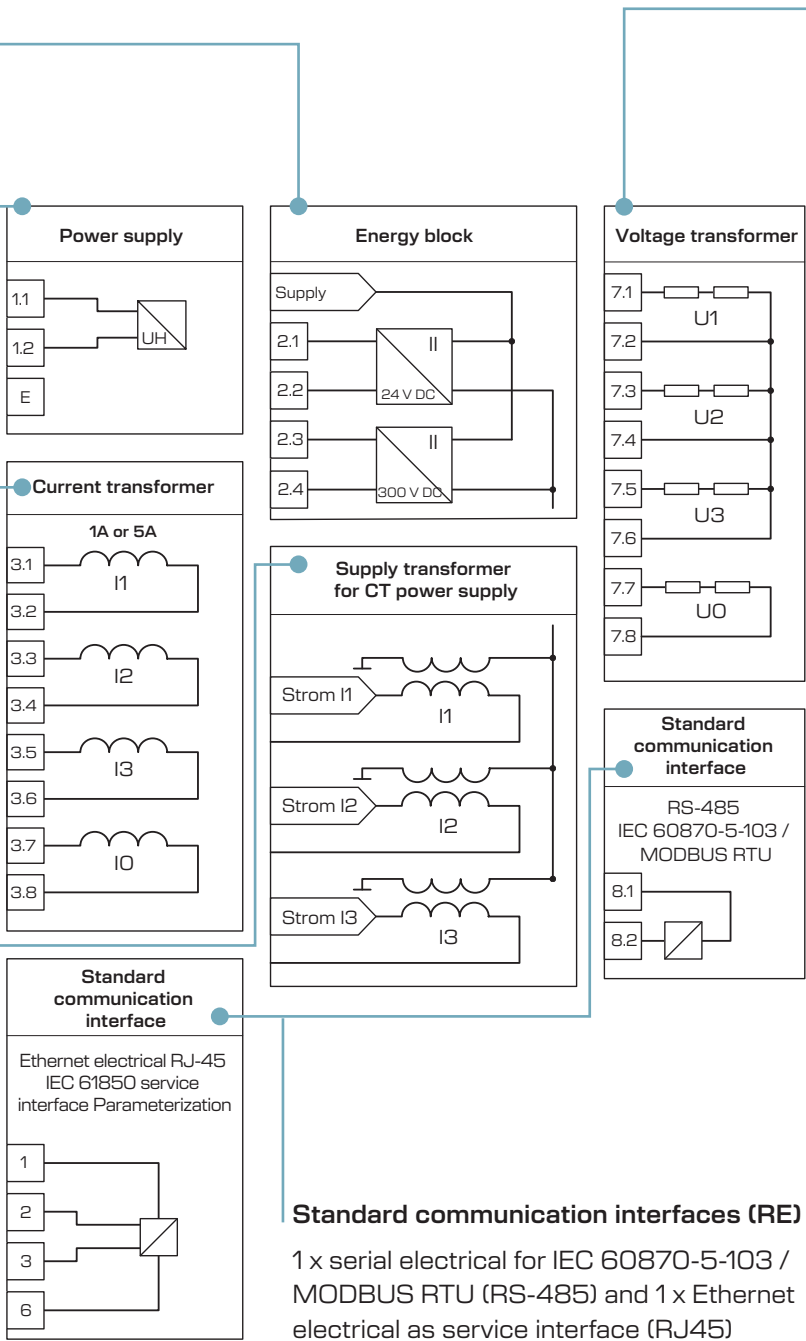
44 V DC ... 250 V DC
50 V AC ... 275 V AC, 50/60 Hz

Current transformer

Current transformer inputs (I4xx)
4 x current inputs: 1 A / 5 A
– With energy storage option 00 / KO:
switchable via software
– For energy storage option Wx / Px:
1 or 5 A = order option

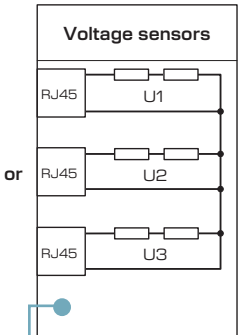
CT power supply***

Minimum supply current:
all phases 0.2 I_n, one phase 0.5 I_n
Short-circuit detection according to ZUKS:
< 70 ms (system time)
Primary transformer load at I_n: < 2.0 VA



Voltage transformer

Voltage converter inputs (xxU4)
4 x voltage inputs: 100/110/400 V AC
(switchable via software)

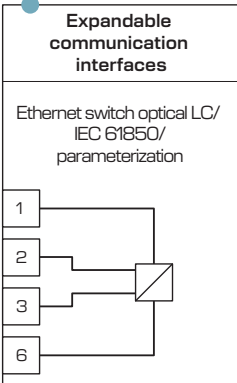


Voltage sensors

Voltage converter inputs (xxS3)
3 x sensor inputs: max. 3.25 V according to
IEC 61869 (configurable via software)

Expandable communication interface (EE)

Ethernet electrical e.g. for IEC 61850 (RJ45)



Binary inputs/outputs (BI8BO8)

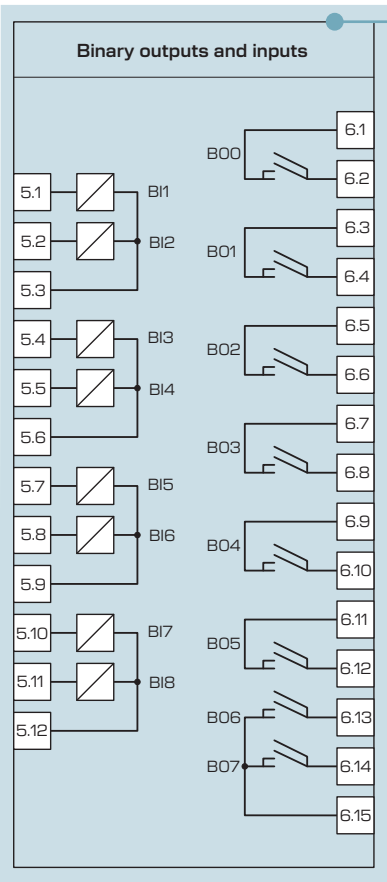
8 binary inputs
20 ... 250 V AC / DC
Integrated contact cleaning system/contact fritting
Stability against capacitive interference signals
in accordance with VDE directives

8 binary outputs
Rated voltage:
250 V AC / 230 V DC

switching:
2 x 8 A @ 250 VAC (2 x 2000 VA)
2 x 8 A @ 30 V DC (2 x 240 W)

making:
1000 W (L/R ≤ 40 ms)
internal two contacts in parallel;

Operating time:
5 ... 8 ms



* To control low-energy coils, a ballast can be used according to the requirements (pulse shaper).

** Do not use the 24 V DC auxiliary power supply output for tripping circuit breakers.

*** In pure transformer current operation, the control system interfaces are switched off.

Order code

Configure your protection relay directly in the online configurator

Configure and order your protection relay online at any time. Simply enter the web code in the search field on our website. Alternatively, you can put together your individual order code on the following pages.

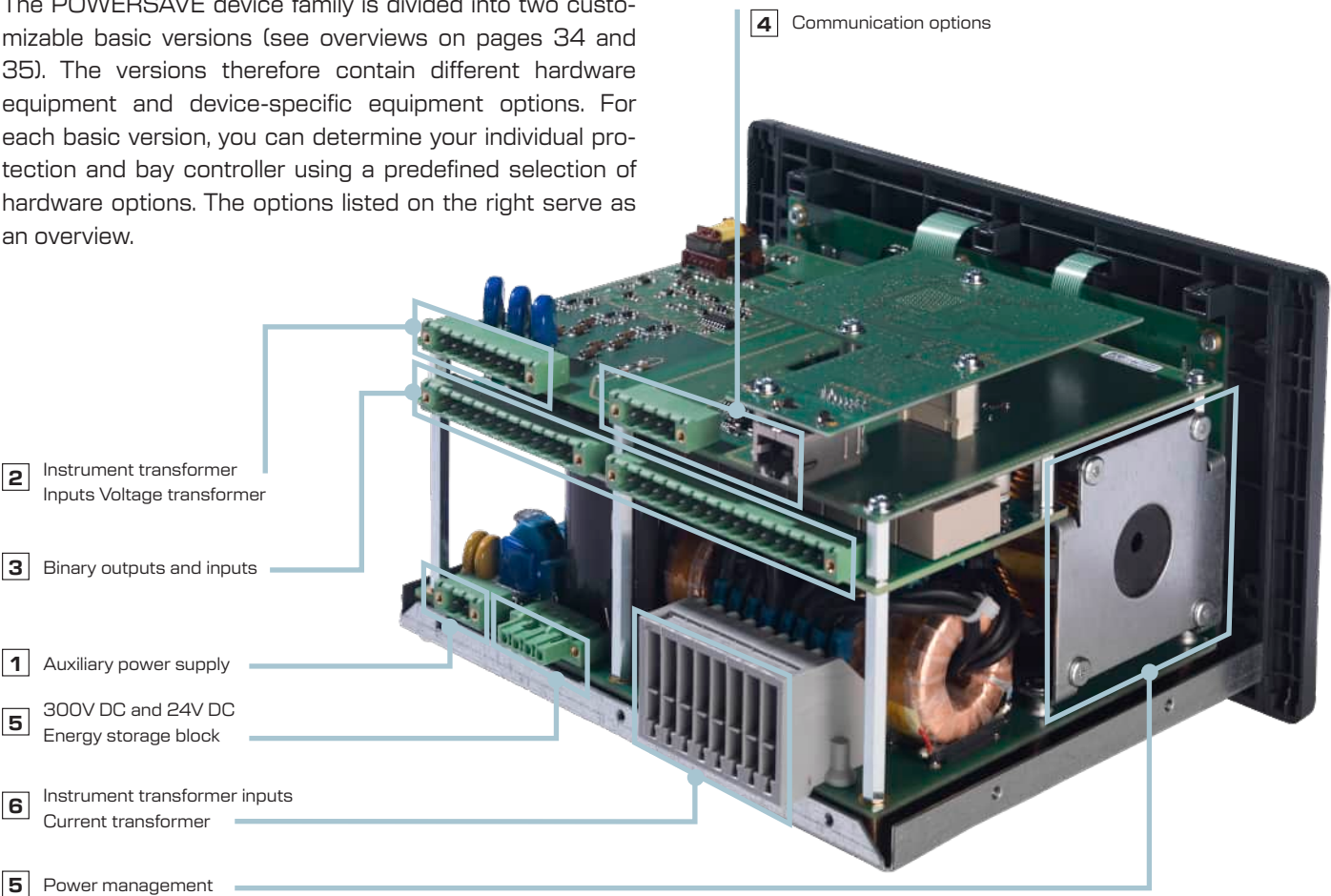


<https://nse.ch/en/konfigurator/>



1. Define hardware

The POWERSAVE device family is divided into two customizable basic versions (see overviews on pages 34 and 35). The versions therefore contain different hardware equipment and device-specific equipment options. For each basic version, you can determine your individual protection and bay controller using a predefined selection of hardware options. The options listed on the right serve as an overview.



2. Define device-specific software (see pages 51, 53)

The devices are supplied with a predefined range of functions as standard. Depending on the hardware specification, additional software functions can be selected. The device-specific software functions A-G can be selected on pages 51 and 53.

- A Additional communication protocol
- B Smart grid protection
- C Fault location
- D Distance protection
- E Extended protective functions
- F Cybersecurity
- G Substation automation/ bay control

In addition, the devices are supplied with the DIGICOM BASIC operator software. The software is used for parameterization and configuration of the devices. It is possible to expand the software to include functionalities such as error analysis. The software can also be used by several users by purchasing a multi-user license. Further information on the appropriate operator and fault analysis software can be found from page 68 onwards.

Simply put together your order code

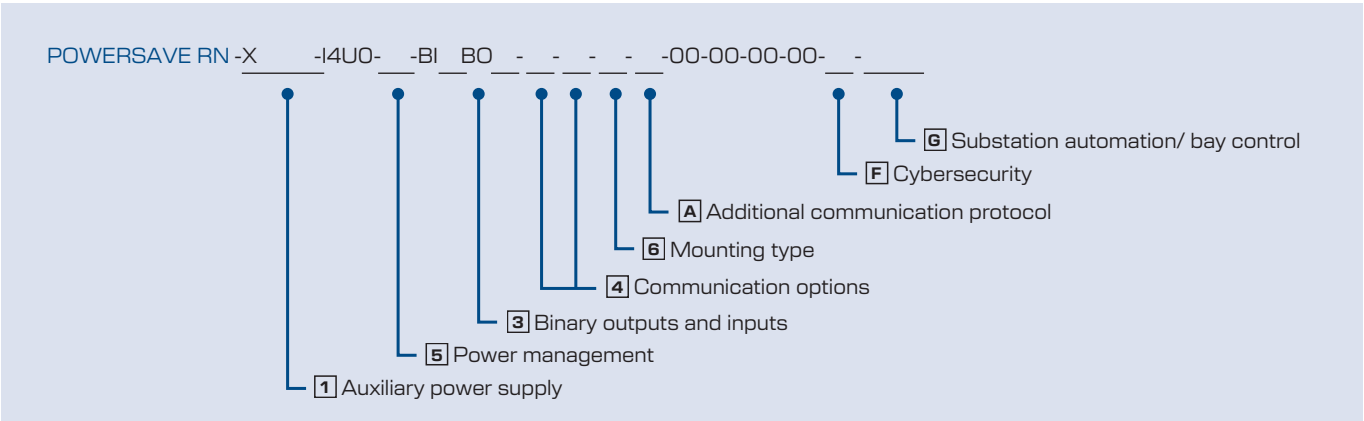
To compile your order code, please refer to the tables on the following pages.

You will find the order code in the second line of each table. You can use predefined options to customize your product. An order code is made up of the hardware and software options.

A complete order code for the POWERSAVE RN looks like this, for example:

Hardware:
POWERSAVE RN-X1-I4U0-KO-BI4BO4-RS-SE-S

Software:
50-00-00-00-00-00-AU



Determine order code POWERSAVE RN

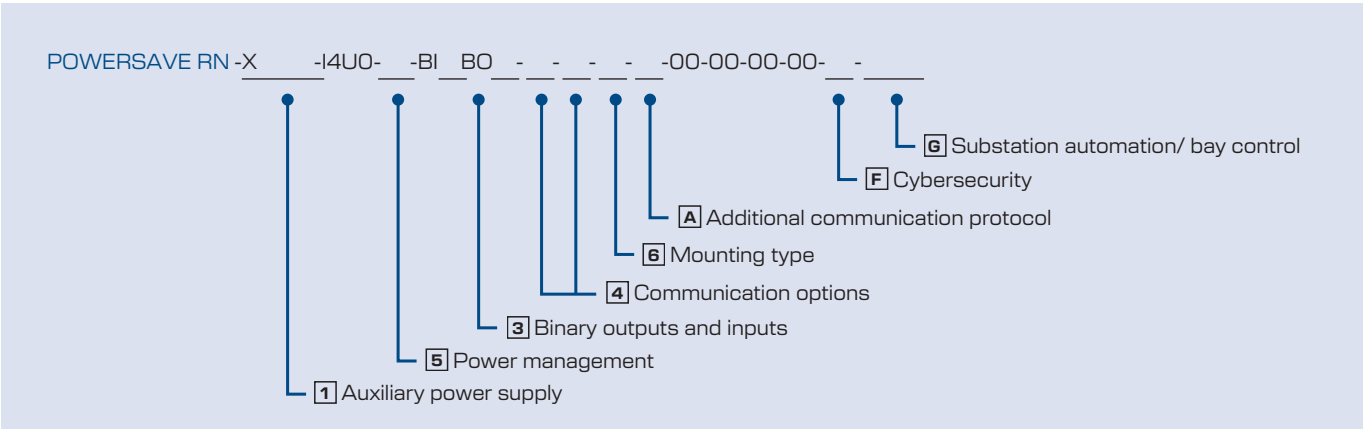
Define hardware								Define device-specific software				
POWERSAVE	1 Auxiliary power supply	2 Instrument transformer inputs	5 Power management	3 Binary outputs and inputs**	4 Communication options		6 Mounting type	A Additional communication protocol	Device-specific Software options	F Cyber-security	G Substation automation/ bay control	
RN	— please select —	— I4U0 —	— please select —	— please select —	— please select —	— please select —	— please select —	— please select —	00-00-00-00 —	— please select —	— please select —	
	X1 24 V DC	4 x current inputs (1 A / 5 A*)	00 without	BI4BO4 4 x binary inputs DC 4 x binary outputs	00 without	00 without additional Communication option	S Size 19"/2; 3U for surface-mounted and mounting (type S)	00 without		00 without	00 without	
	X2 44 ... 250 V DC 50 ... 275 V AC		KO 1 x energy block (300 V DC/50 J and 24 V DC/3 J)	BI8BO8 8 x binary inputs DC 8 x binary outputs	RS 1x serial electrical for IEC 60870-5-103 (RS-485)	RO 1x serial optical for IEC 60870-5-103 (ST connector, 820 nm)	R Size 19"/2; Rack installation and RN1-surface-mounted replacement (type R)	50 IEC 61850		ZA Centralized Authen- tication (RADIUS)	AU Option included	
			W1 1 x CT power supply three-phase (In = 1 A)		EX 1 x Ethernet electrical as service interface via DIGICOM (RJ45 connector)	EE 1x Ethernet electrical e.g. for IEC 61850 (RJ45 connector)		04 IEC 60870-5-104				
			W5 1 x CT power supply three-phase (In = 5 A)		RE 1 x serial electrical for IEC 60870-5-103 (RS-485) 1 x Ethernet electrical as service interface via DIGICOM (RJ45 connector)	EO 1x Ethernet optical e.g. for IEC 61850 (SC connector, 1300 nm)		54 IEC 61850 IEC 60870-5-104				
			P1 1 x energy block (300 V DC/50 J and 24 V DC/3 J) 1 x CT power supply three-phase (In = 1 A)			SE 1x Ethernet switch electrical e.g. for IEC 61850 (2x RJ45 connector)						
			P5 1 x energy block (300 V DC/50 J and 24 V DC/3 J) 1 x CT power supply three-phase (In = 5 A)			SO 1x Ethernet switch optical e.g. for IEC 61850 (2 x SFP-MM2X module)						

NOTE

The DIGICOM BASIC operator software is supplied as standard with your product. You have the option of purchasing an extended version (see page 68).

* 4 x current inputs: 1 A / 5 A
– For energy storage option 00 / KO: switchable via software
– For energy storage option Wx / Px: 1 or 5 A = order option

** Further inputs and outputs on the CPU board



Determine order code POWERSAVE RF

Define hardware								Define device-specific software							
	1 Auxiliary power supply	2 Instrument transformer inputs	5 Power management	3 Binary outputs and inputs**	4 Communication options		6 Mounting type	A Additional communication protocol	B Smart grid protection	C Fault ocation	D Distance protec- tion	E Extended Protective functions	F Cyber- security	G Substation automation/ bay control	
POWERSAVE	please select	please select	please select	please select	please select		please select	please select	please select	please select	please select	please select	please select	please select	
	X1 24 V DC	I4U3 4 x current inputs* 3 x voltage inputs (100 V/110 V/400 V)	00 without	BI4BO4 4 x binary inputs DC 4 x binary outputs	RS 1x serial electrical for IEC 60870-5-103 (RS-485)		00 without additional Communication option	S Size 19"/2; 3U for surface-moun- ted and mounting (type S)	00 without	00 without	00 without	00 without	00 without	00 without	
	X2 44 ... 250 V DC 50 ... 275 V AC	I4S3 4 x current inputs* 3 x voltage inputs	K0 1 x energy block (300 V DC/50 J and 24 V DC/3 J)	BI8BO8 8 x binary inputs DC 8 x binary outputs	RE 1 x serial electrical for IEC 60870-5-103 (RS-485) 1 x Ethernet electrical as ser- vice interface via DIGICOM (RJ45 connector)		R0 1x serial optical for IEC 60870-5-103 (ST connector, 820 nm)	R Size 19"/2; rack in- stallation and RN1- surface-mounted replacement (type R)	50 IEC 61850	QU QU-protection	FO Option included	ZP Option included	OV Ground fault detection using the har- monic method	ZA Central authen- tication (RADIUS)	AU Option included
		I4U4 4 x current inputs* 4 x voltage inputs (100 V/110 V/400 V)	W1 1 x CT power supply three- phase (In = 1 A)	BI4BO12 4 x binary inputs DC 12 x binary outputs			EE 1x Ethernet electrical e.g. for IEC 61850 (RJ45 connector)		04 IEC 60870-5-104	FE automatic Frequency relief AFE//UFLA					
			W5 1 x CT power supply three- phase (In = 5 A)				E0 1x Ethernet optical e.g. for IEC 61850 (SC connector, 1300 nm)		54 IEC 61850 IEC 60870-5-104	QF QU-protection and automatic Frequency relief AFE//UFLA					
			P1 1 x energy block (300 V DC/50 J and 24 V DC/3 J) 1 x CT power supply three- phase (In = 1 A)				SE 1x Ethernet switch electrical e.g. for IEC 61850 (2x RJ45 connector)								
			P5 1 x energy block (300 V DC/50 J and 24 V DC/3 J) 1 x CT power supply three- phase (In = 5 A)				S0 1x Ethernet switch opti- cal .g. for IEC 61850 (2 x SFP-MM2X module)								

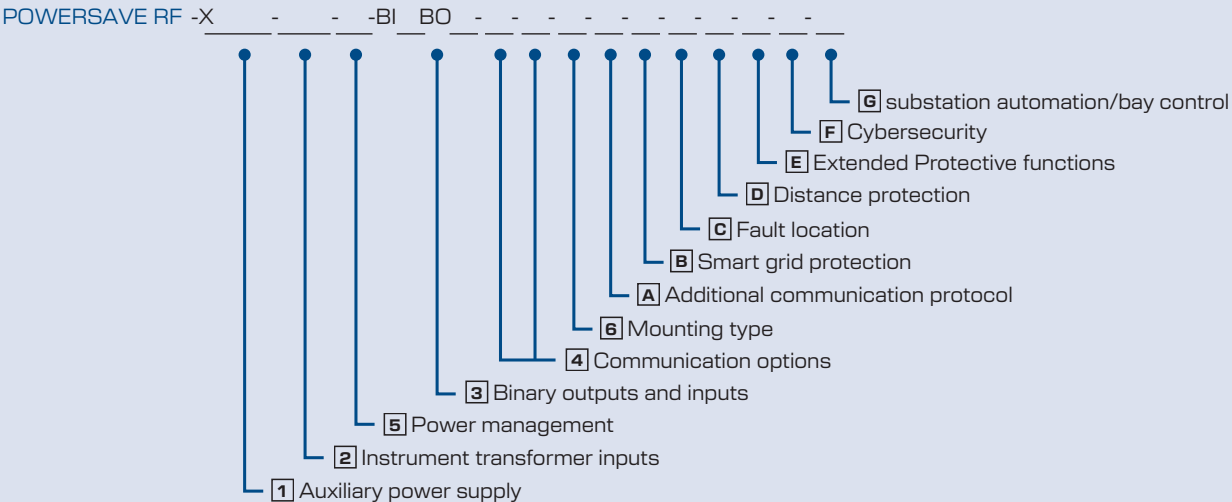
NOTE

The DIGICOM BASIC operator software is supplied as standard with your product. You have the option of purchasing an extended version (see page 68).

* 4 x current inputs: 1 A / 5 A

- For energy storage option 00 / KO: switchable via software
- For energy storage option Wx / Px: 1 or 5 A = order option

* Further inputs and outputs on the CPU board



Technical data



Characteristics	ANSI	Description	IEC 61850	Device design variants					
				KOMBISAVE+				POWERSAVE	
				RN	RF	RL	RQ	RN	RF
Tolerances									
	–	Typical starting times (15 ms ... 25 ms (sub cycle I>>> : 10 ms))	–	●	●	●	●	●	●
	–	Switching to short circuit from transformer current and three-phase I> = 1.0In, starting U _{MZ} I>, t>=0.01 s (70 ... 90 ms)	–	–	–	–	–	W1/ W5/ P1/P5	W1/ W5/ P1/P5
	–	Excitation tolerance (<2.5 %)	–	●	●	●	●	●	●
	–	Relative time tolerance (<1 %)	–	●	●	●	●	●	●
	–	Time tolerance of directed functions (starting: ~25 ms, tripping: ~32 ms)	–	–	●	●	–	–	●
	–	Tolerance fault location (<1 % @ line length, @ U/U _{sc} >5 % and 30°<j<90°)	–	–	●	●	–	–	●
	–	Time tolerance for distance protection (starting ~27 ms, trip, tripping ~37 ms)	–	–	●	●	–	–	●
	–	Time tolerance differential protection (starting ~15 ms, trip, tripping ~20 ms)	–	–	–	●	●	–	–
	–	Time tolerance Frequency protection (starting: ~80 ms ... 120 ms)	–	–	●	●	–	–	●
Protection-related functions									
	16	Monitoring device faults	CALH	●	●	●	●	●	●
	16	Protection interface for the transmission of 16 binary information and 3 current values	ITPC	–	–	●	–	–	–
	25	Synchrocheck	RSYN	–	SY	SY	–	–	–
	21FL	Fault location	RFLO	–	FO	FO	–	–	FO
	47	Rotating field direction monitoring	–	–	●	●	–	–	●
	50BF	CB failure protection	RBRF	●	●	●	●	●	●
	50SOTF	Three-phase switch-onto-fault protection (SOTF)	PIOC	●	●	●	●	●	●
	86	Reclosing lockout	PSCH	●	●	●	●	●	●
	74TC/95	Trip circuit monitoring	SCBR	AU	AU	AU	AU	AU	AU
	79	Automatic reclosure (AWE) 1/3-pole	RREC	●	●	●	–	●	●
	79	Reclosure	RREC	–	●	●	–	–	●
	85	Signal comparison	PSCH	●	●	●	–	●	●
	85	Busbar protection with H2 logic	PSCH	●	●	●	–	●	●
	85	Transfer tripping / intertripping	PSCH	●	●	●	●	●	●
	MCS31	Circuit monitoring (CT supervision)	–	●	●	●	–	●	●
	–	Voltage circuit monitoring (CT supervision)	–	–	●	●	–	–	●
	VTFF	Monitoring the supply voltage	–	–	●	●	–	–	●
	–	Monitoring the supply voltage	–	●	●	●	●	●	●

Characteristics	ANSI	Description	IEC 61850	Device design variants					
				KOMBISAVE+				POWERSAVE	
				RN	RF	RL	RQ	RN	RF
Protective functions									
Common	27P	Three-phase undervoltage protection (two-stage)	PTUV	–	●	●	–	–	●
	32P	Overperformance protection (two-stage)	PDOP	–	●	●	–	–	●
	37P	Underperformance protection (two-stage)	PDUP	–	●	●	–	–	●
	47	Unbalance protection Voltage	PTOV	–	●	●	–	–	●
	49	Three-phase therm. Overload protection with therm. image (two-stage, e.g. for motors, cables, dry and oil transformers)	PTTR	●	●	●	●	●	●
	49RTD	Temperature monitoring RTD	STMP	●	●	●	●	–	●
	50HS	Three-phase nondirectional high current protection	PTOC	●	●	●	●	●	●
	50N/51N	Nondirectional earth short-circuit protection (three-stage, IEC DT, IEC VI, IEC EI, IEC LTI)	PTOC	●	●	●	●	●	●
	50P/51P	Three-phase nondirectional overcurrent protection (two-stage, IEC DT, IEC NI, IEC VI, IEC EI)	PTOC	●	●	●	●	●	●
	51NIEF	Intermittent earth short-circuit protection	PIEF	●	●	●	–	●	●
	59N	Displacement voltage protection (two-stage)	PTOV	–	●	●	–	–	●
	59P	Three-phase overvoltage protection (two-stage)	PTOV	–	●	●	–	–	●
	60P	Unbalance protection electricity	PTOC	●	●	●	–	●	●
	67P	Three-phase directed overcurrent protection (two-stage, IEC DT, IEC NI, IEC VI, IEC EI)	PTOC	–	●	●	–	–	●
	67N/32N	Directed earth short-circuit protection (three-stage, IEC DT, IEC VI, IEC EI, IEC LTI) Wattmetrically directed ground fault protection based on zero system quantities	PTOC	–	●	●	–	–	●
	67SG	Directed ground fault protection for transient and intermittent ground faults based on zero sequence energy (two-stage)	PSDE	–	●	●	–	–	●
	67NTEF	Directed wiper relay	PTEF	–	●	●	–	–	●
	67NPPD	Earth fault - pulse detection	PSDE	●	●	●	–	●	●
	67NF3/5/7	Earth fault - harmonic method							
	68	Three-phase inrush stabilization	PHAR	●	●	●	●	●	●
	81O	Overfrequency protection (two-stage) (zweistufig)	PTOF	–	●	●	–	–	●
	81U	Underfrequency protection (two-stage)	PTUF	–	●	●	–	–	●
	81R	Frequency change protection (two-stage)	PFRC	–	●	●	–	–	●
Motor protection	14	Rotor blocking protection for motors	PZSU	●	●	●	–	●	●
	37	Undercurrent protection	PTUC	●	●	●	–	●	●
	46	Phase balance protection	PTOC	●	●	●	–	●	●
	48	Startup time protection for motors	PMSS	●	●	●	–	●	●
	50M	Load jump protection	PTOC	●	●	●	–	●	●
Distance protection	21N, 21P	Current starting, under-impedance starting with load discrimination, U/I starting	PTOC, PSCH	–	ZP	ZP	–	–	ZP
		Polygonal Six-System Distance Protection for Phase-Phase and Phase-Ground	PDIS	–	ZP	ZP	–	–	ZP
Smart Grid	81LSH	Multi-stage load shedding at underfrequency with active power direction (under-frequency load shedding) UFLA	PTUF, GAPC	–	FE/QF	FE/QF	–	–	FE/QF
	27QV	QU-protection (reactive power undervoltage protection)	PTUV	–	QU/QF	QU/QF	–	–	QU/QF
Line differential protection	24	Overexcitation protection	PHAR	–	–	LT	–	–	–
	87L	Differential protection for lines without a transformer in the protection zone	PDIFF	–	–	LD	–	–	–
	87LT	Differential protection for lines with transformer in the protection zone	PDIFF	–	–	LT	–	–	–
	87LTN	Differential protection with integrated zero current correction	PDIFF	–	–	LD/LT	–	–	–
Transformer differential protection	24	Overexcitation protection	PHAR	–	–	–	●	–	–
	87T	Differential protection for two-winding transformers	PDIFF	–	–	–	●	–	–
	87N	Differential protection with integrated zero current correction	PDIFF	–	–	–	●	–	–

Characteristics	ANSI	Description	IEC 61850	Device design variants					
				KOMBI SAVE +				POWER SAVE	
				RN	RF	RL	RQ	RN	RF
Measurement									
Analog Inputs	–	Current transformer: rated current 1/5 A, 50 Hz, Measuring ranges: 0.01...64xIn, <0.2 VA Automatic short-circuiting plug contacts	–	4	4	4	8	4	4
	–	Current transformer: rated current 1/5 A, 50 Hz, Measuring ranges: 0.01...64xIn, <2.5 VA Automatic Short-circuiting plug contacts For devices with W1/W5/P1/P5 option	–	–	–	–	–	4	4
	–	Voltage transformer: rated voltage 100/110/400(230) V, 50 Hz, Measuring ranges: 0.05 V AC ... 440 V AC, <0.2 VA	–	–	4/5	0/5	–	–	3/4
	–	Sensor inputs for resistive voltage transformers max. 3.25 V, Un = 1 V	–	–	–	–	–	–	3
Electricity	3I	Three-phase current display (IL1, IL2, IL3)	MMXU	●	●	●	●	●	●
	10	Earth current	MMXU	●	●	●	●	●	●
	Idiff, Istab	Differential and stabilizing currents	MMXU	–		●	●	–	–
	Ith	Thermal level	–	●	●	●	●	●	●
Voltage	3ULE	Three-phase voltage indicator LE (UL1E, UL2E, UL3E)	MMXU	–	●	●	–	–	●
	3ULL	Three-phase voltage indicator LL (UL1UL2, UL2UL3, UL3UL1)	MMXU	–	●	●	–	–	●
	U0	Displacement voltage	MMXU	–	●	●	–	–	●
	Udiff, fdiff	Difference values between two systems for Synchrocheck: ΔU Δf Δα	MMXU	–	SY	SY	–	–	–
Frequency	f	Frequency	MMXU	–	●	●	–	–	●
Performance	cosφ	Power factor	MMXU	–	●	●	–	–	●
	P, Q, S	Active, reactive and apparent power	MMXU	–	●	●	–	–	●
Other	3I/15 min	Drag pointer, three-phase, 15 min	MMXU	●	●	●	●	●	●
	F	Load profile	MMXU	●	●	●	●	●	●
	km/miles	Fault location	MMXU	–	FO	FO	–	–	FO
	R/X	Impedances RLL, RLE, XLL, XLE	MMXU	–	ZP	ZP	–	–	ZP
Steering									
	↔ O CB	Circuit-breaker control and graphic position indicator	XCBR, CSWI	●	●	●	●	●	●
	↔ O DCC	Control disconnectors and ground switches with graphic position indicator	XSWI, CSWI	AU	AU	AU	AU	AU	AU
	↔ O CBT	Control withdrawable truck with graphic position indicator	XSWI, CSWI	AU	AU	AU	AU	AU	AU
	↔ O	Control with interlocking scheme	CILO	AU	AU	AU	AU	AU	AU
	CBAY	Bay control	CBAY	AU	AU	AU	AU	AU	AU
	R/L	Local and remote switching	LOC	●	●	●	●	●	●
	KEY	Key switch	CILO	●	●	●	●	–	–

Characteristics	ANSI	Description	IEC 61850	Device design variants					
				KOMBI SAVE+				POWER SAVE	
				RN	RF	RL	RQ	RN	RF
Message and status display on the front of the unit									
	—	Standard measurement charts and freely configurable LEDs	—	●	●	●	●	●	●
	—	Comprehensive measured value and status charts	—	●	●	●	●	●	●
	—	Virtual LEDs and dynamically displayed texts	—	AU	AU	AU	AU	—	—
	—	User-specific measured value and status boards	—	AU	AU	AU	AU	—	—
	—	High-resolution RGB TFT display with automatic energy-saving function and alarm panel in the event of a power-system fault	—	●	●	●	●	—	—
	—	Energy-saving high-resolution monochrome 3" graphic display	—	—	—	—	—	●	●
	—	Three user-specific assignable function keys	—	—	—	—	—	●	●
	—	Four user-assignable function keys with white LED	—	●	●	●	●	—	—
	—	Key switch for unlocked control	—	●	●	●	●	—	—
	—	Key for local/remote switching	—	●	●	●	●	●	●
	—	Direct control buttons	—	●	●	●	●	●	●
	—	Tri-color LEDs	—	15	15	15	15	12	12
	—	Two flag indicators (mechanical position indicators)	—	—	—	—	—	●	●
	—	One green "RUN" LED and one red "ERROR" LED permanently assigned	—	●	●	●	●	—	—
	—	USB service interface for communications from PC	—	●	●	●	●	●	●
	—	Direct USB stick access	—	●	●	●	●	—	—
Programmable logic									
	RS	RS flip-flops	GAPC	AU	AU	AU	AU	AU	AU
	TOF/TON	On and off delay	GAPC	AU	AU	AU	AU	AU	AU
	UDCNT	Up and down counters	FCNT	AU	AU	AU	AU	AU	AU
	—	Individual message	GGIO	●	●	●	●	●	●
	—	Double message	GGIO	●	●	●	●	●	●
	—	AND, OR, NOT, XOR, CONSTANT	—	AU	AU	AU	AU	AU	AU

Characteristics	ANSI	Description	IEC 61850	Device design variants					
				KOMBI SAVE +				POWER SAVE	
				RN	RF	RL	RQ	RN	RF
Communication options									
Physical interfaces	–	1 x USB	–	●	●	●	●	●	●
	–	1 x serial electrical	–	●	●	●	●	RS/RE	RS/RE
	–	1 x Ethernet electrical for service interface via Ethernet (RJ45 connector)	–	–	–	–	–	EX/RE	RE
	–	1 x serial optical for IEC 60870-5-103 (ST connector, 820 nm) (only with hardware option RS, RE)	–	RO	RO	RO	RO	RO	RO
	–	1 x Ethernet electrical e.g. for IEC 61850 (RJ45 connector) (only with hardware option RS, RE)	–	EE	EE	EE	EE	EE	EE
	–	1 x Ethernet optical e.g. for IEC 61850 (SC connector, 1300 nm) (only with hardware option RS, RE)	–	EO	EO	EO	EO	EO	EO
	–	1 x Ethernet switch electrical e.g. for IEC 61850 (2 x RJ45 connectors) (only with hardware option RS, RE)	–	SE	SE	SE	SE	SE	SE
	–	1 x Ethernet switch optical e.g. for IEC 61850 (2 x LC connector, 1300 nm) (only with hardware option RS, RE)	–	SO	SO	SO	SO	SO	SO
	–	1x protection interface (1 x LC connector)	–	–	–	●	–	–	–
Service interface	–	Service interface via USB	–	●	●	●	●	●	●
	–	Power-Over-USB: Service functions even without auxiliary power supply	–	–	–	–	–	●	●
	–	Service interface via RS-485	–	●	●	●	●	–	–
	–	Service interface via Ethernet (only with hardware option EE, EO, SE or SO)	–	●	●	●	●	–	–
	–	Service interface via Ethernet (only with hardware option EX, RE)	–	–	–	–	–	●	●
Control system protocols	–	IEC 60870-5-103 (only with hardware option RS, RE)	–	●	●	●	●	●	●
	–	MODBUS RTU (only with hardware option RS, RE)	–	●	●	●	●	●	●
	–	IEC 61850 (only with hardware option EE, EO, SE or SO): – Specification IEC 61850-6, 7-1, 7-2, 7-3, 7-4, 8-1 – Protocol IEC 61850-8-1 block 1, 2, 2+, 4, 4+, 5, 6, 9ab, 12abcd, 13, 14 – Receiver for 32 fast binary signals/interlocking/individual messages – Sends 32 fast binary signals/interlocking/individual messages – Sends 100 measured values/status signals – IEC 61850 MMS and GOOSE	–	50	50	50	50	50	50
	–	IEC 60870-5-104 (only with hardware option EE, EO, SE or SO)	–	04/54	04/54	04/54	04/54	04/54	04/54
	–	Receiver for 16 fast binary signals/interlocking/individual messages	–	–	●	–	–	–	–
Effective interface	–	Sends 16 fast binary signals/interlocking/individual messages	–	–	●	●	●	●	●
	–	Transmitter and receiver for time-compensated analog current measurement signals in LDIFF function	–	–	●	●	●	●	●
	–	Ongoing quality monitoring of the protection interface in [-dB]	–	–	●	●	●	●	●
	–	HSR: High-Availability Seamless Redundancy - Protocol	–	SE/SO	SE/SO	SE/SO	SE/SO	SE/SO	SE/SO
Network protocols	–	PRP: Parallel Redundancy Protocol	–	SE/SO	SE/SO	SE/SO	SE/SO	SE/SO	SE/SO
	–	RSTP: Rapid Spanning Tree Protocol	–	SE/SO	SE/SO	SE/SO	SE/SO	SE/SO	SE/SO
	–	NTP: Network Time Protocol	–	●	●	●	●	●	●

Characteristics	ANSI	Description	IEC 61850	Device design variants					
				KOMBISAVE+				POWERSAVE	
				RN	RF	RL	RQ	RN	RF
Formats									
Event and fault data	DFR	Fault data recording (COMTRADE standard)	RDRE	●	●	●	●	●	●
	SER	Event list		●	●	●	●	●	●
Other hardware									
Mounting type	–	Size 19"/2, 3 U for surface-mounted and mounting	–	●	●	●	●	S	S
	–	Size 19"/2, 3 U rack installation and RN1 surface-mounted replacement	–	–	–	–	–	R	R
	–	Microprocessor ARM 1 x or 2 x (for IEC 61850)	–	●	●	●	●	●	●
	–	Energy block for fault data and events: POWERCAP <7 T	–	●	●	●	●	●	●
	–	Binary inputs 20...250 V AC/DC with integrated contact cleaning system "contact cleaning system", max. 220 nF line capacitance	–	–	–	–	–	4/8	4/8
	–	Binary outputs 250 V AC / 230 V DC Rated contact current 2 x 8 A continuous; 20 A à 0.5 s; 30A à 0.2 s (AC / DC) Switch-on capacity: 1000 W (L/R ≤ 40 ms) Breaking capacity: 2 x 2000 VA (250 V AC, 8 A) or 30 W DC inductive (L/R ≤ 40 ms) internally two contacts in parallel Contact times: 5... 8 ms	–	–	–	–	–	4/8/12	4/8/12
	–	Binary inputs 20...60 / 80...250 V DC with integrated "contact cleaning system", max 220 nF line capacitance	–	14/22/ 30	14/22/ 30	14/22/ 30	14/22/ 30	–	–
	–	Binary outputs 250 V AC / 250 V DC Rated contact current 10 A continuous; 20 A à 0.5 s; 30 A à 0.2 s (AC / DC) Switch-on capacity: 1000 W (L/R ≤ 40 ms) Breaking capacity: 2500 VA (250 V AC, 10 A) or 30 W DC inductive (L/R ≤ 40 ms) Contact times: Standard 6 ... 8 ms High-Speed 3 ... 4 ms	–	16/17/ 23	16/17/ 23	16/17/ 23	16/17/ 23	–	–
	–	Analog inputs (Pt 100)	–	0/4	0/4	0/4	0/4	–	–
Auxiliary power supply	–	22 ... 28 V DC, P < 5 W, bridging time >50 ms	–	X1	X1	X1	X1	X1	X1
	–	44 ... 250 V DC, 50 ... 275 V AC, P < 5 W, Bridging time >50 ms	–	X2	X2	X2	X2	X2	X2
Power management	–	CT power supply for protection, current transformer <2.0 VA (1 A), <2.6 VA (5 A), system start 3 x In <70 ms	–	–	–	–	–	W1/ W5/ P1/P5	W1/ W5/ P1/P5
	–	Energy block for tripping circuit 320 V DC / 50 J, adjustable 20..320 V DC, charge retention min. 48 h, Automatic cyclical monitoring, charging from auxiliary power supply in t~120 s, Charge from current transformer supply at 3 x 0.2 In	–	–	–	–	–	KO/P1/ P5	KO/P1/ P5
	–	Energy block for signaling circuit 24 V DC / 3 J, charging from auxiliary power supply t~240 s, charging from current transformer supply at 3 x 0.2 In	–	–	–	–	–	KO/P1/ P5	KO/P1/ P5
	–	System retention in the event of failure of auxiliary supply and three-phase measuring current <0.18 In, ~30 s (from charged state)	–	–	–	–	–	KO/P1/ P5	KO/P1/ P5
	–	System retention in the event of failure of auxiliary supply from 3 x 0.2 In: continuous	–	–	–	–	–	W1/ W5/ P1/P5	W1/ W5/ P1/P5
	–	Energy maintenance in the event of failure of auxiliary supply from 3 x 0.2 In: continuous	–	–	–	–	–	P1/P5	P1/P5

Characteristics	Standards	Tests
Electrical tests		
Standards	IEC 60255 VDE 0435	
Measuring relays and protective devices	IEC 60255-1 (VDE 0435-300)	Common requirements
Insulation test	Type testing	5 kV, 1,2/50 ms, 0,5 J
	Series testing	3.5 kV DC, 1 min
Electromagnetic compatibility	IEC 60255-26	Replacement for IEC 60255-22-1, -2, -3, -4
	EN 61000-6-2	
	VDE 0345 Part 301 and 110	
Interference emission Housing	IEC CISPR 11	30 MHz ... 1000 MHz
Interference emission Auxiliary power supply	IEC CISPR 22	150 kHz ... 30 MHz
Irradiation with HF bay Frequency sweep	IEC 61000-4-3	10 V/m, 80 ... 1000 MHz and 1400 ... 2700 MHz, Pass through 80 % AM, 1 kHz
Irradiation with HF bay single frequencies	IEC 61000-4-3	10 V/m, 80, 160, 380, 450, 900, 1850, 2150 MHz, 80 % AM, 1 kHz, duration 10 s
Electrostatic discharge	IEC 61000-4-2	6 kV contact, 15 kV air
Fast transient disturbance variables/burst	IEC 61000-4-4	Communications: 2 kV 5/50 ns, 5 kHz, both polarities Other connections: 4 kV, 5/50 ns, 5 kHz, both polarities
High-energy impulse voltages	IEC 61000-4-5	Pulse: 1,2/50 ms Auxiliary power supply phase-to-ground: 4 kV, 10 Ω, 9 μF Conductor to conductor: 2 kV, 0 Ω, 18 μF Communications: phase-to-ground: 4 kV, 0 Ω, 0 μF Other connections: Phase-to-ground: 4 kV, 40 Ω, 0,5 μF Conductor to conductor: 2 kV, 40 Ω, 0,5 μF
Conducted HF, AM	IEC 61000-4-6	Communications: 10 V, 150 kHz ... 80 MHz, 80 % AM, 1 kHz Other connections: 20 V, 150 kHz ... 80 MHz, 80 % AM, 1 kHz
Operating frequency magnetic field	IEC 61000-4-8	30 A/m continuous, 300 A/m for 1 s ... 3 s
Slow, damped oscillating waves	IEC 61000-4-18	Communications: CM: 1 kV bei 1 MHz, 200 Ω Other connections: DM: 1 kV, CM: 2,5 kV bei 1 kHz und 1 MHz, 200 Ω
Operating frequency	IEC 61000-4-16	Binary inputs: Zone A, DM: 150 V, 100 Ω, 0,1 μF, CM: 300 V, 220 Ω, 0,47 μF
Voltage fluctuations and flicker	IEC 61000-4-11 IEC 61000-4-29	In the entire specified auxiliary voltage range
Interference immunity functional ground connection	IEC 61000-4-6	150 kHz ... 80 MHz 10 V, 150 Ω, 80 % AM
	IEC 61000-4-4	Burst: 4 kV, Zone A



Characteristics	Standards	Tests
Vibrations and shocks		
Earthquake safety	IEC 60255-21-3	Nominal frequency range 1...35 Hz Average frequency 8...9 Hz Horizontal 3.5 mm; 10 m/s Vertical 1.5 mm; 5 m/s
Vibration stress	IEC 60255-21-1 IEC 60068-2-6	Fc: 10 ... 150 Hz; 0.075 mm; 1 g
Vibration shock	IEC 60255-21-2 IEC 60068-2-27 IEC 60068-2-29	• Ea: 11 ms; 15 g • Eb: 16 ms; 10 g
Climatic environmental conditions		
Standards	IEC 60255-1	Operating temperature: -10 °C ... +55 °C Storage temperature: -25 °C ... +55 °C Transport temperature: -25 °C ... +70 °C (for a few hours)
	IEC 60068-2-17	Test conditions during 16 hours: -25 °C ... +85 °C Temporarily permissible for 96 hours with possibly impaired display during operation from +55 °C: -20 °C ... +70 °C
	Moisture	Annual average < 75 %, condensation/ice formation invalid Monthly average < 95 % at max. +40 °C, Condensation/ice formation invalid
	Installation location	up to 3000 m above sea level



Your advantages

- One standardized operator software for all protection units
- Intuitive parameterization and operation of the devices
- Efficient operation thanks to integrated help function
- Portable software for installation-free use

DIGICOM

Easily parameterize protection relays and analyse data

Basically, the DIGICOM operator software is used to parameterize the protection relays and document the setting data. Depending on the version of the operator software, additional functions are available to the user, such as the graphical evaluation of fault data. The operator software can be used to carry out firmware updates via USB or service interface.



Software overview

DIGICOM – one operator software for all protection units

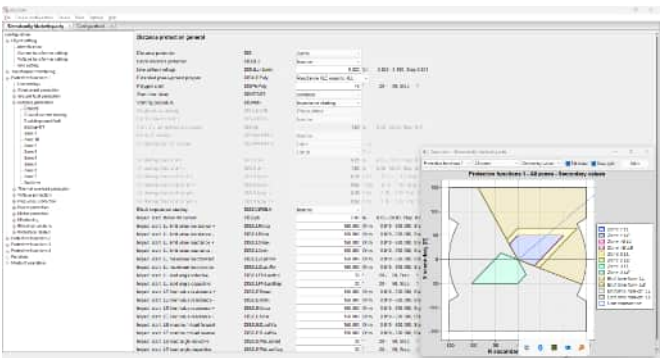
DIGICOM is the operator software for standard configuration and parameterization of the KOMBISAVE+ and POWERSAVE protective relay families. Alternatively, the protection relays can be set directly on-site on the device.

A local help function allows direct access to the current function and device manuals. In addition to the basic device settings, extensive automation functions such as interlocking, blockades etc. can also be programmed. The substation automation for controlling an outgoing feeder and its visualization on the display can be configured using a logic and graphics editor.

The current device status can be viewed online via the operator software. For example, measured values and the states of the binary outputs and inputs are visualized. In addition, DIGICOM enables extensive test functions and the installation of firmware updates.

Parameterization of protection and control functions with DIGICOM BASIC

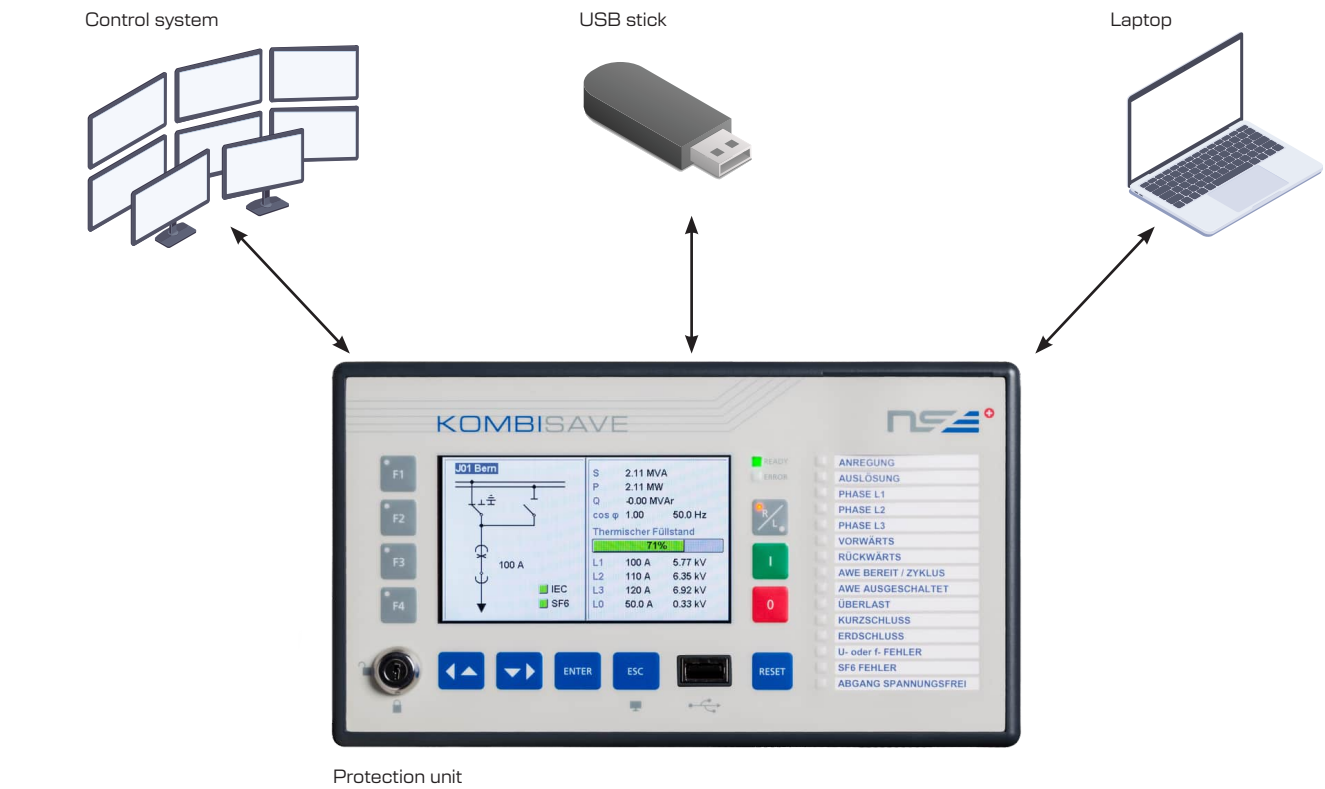
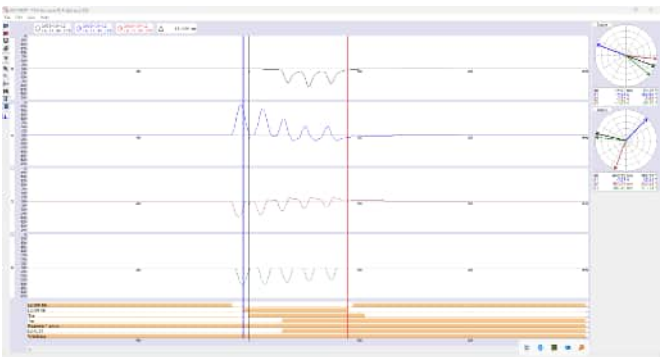
The basic variant DIGICOM BASIC enables full parameterization of the protection and control functions of the protection relays. The configuration files can be read from the protection units, compared, adapted and reloaded. The existing help function makes all current device and function manuals available locally to ensure smooth operation.



Extended device status, test and service functions with DIGICOM ADVANCED

The DIGICOM ADVANCED extension contains numerous additional functions. The additions extend the range of functions, particularly with regard to device status and test functions. All current measured values and the status information of all binary outputs and inputs are available in the operator software.

In addition, the event lists and fault data can be viewed and saved locally. The test and service functions are used, for example, to test parallel and serial interfaces. The integrated analysis tool DIGIVIEW enables fault data to be analyzed. The extension is available as a single-user license via USB dongle and as a multi-user license via company license files.



Safety access to your protection units
(further information on IT security can be found on pages 15 and 41)



**Download DIGICOM BASIC
operator software free of charge**

DIGICOM is the operator software for initial device setup and for adjustments during subsequent operation. For optimal decision-making, you can get a first impression of the software in advance. The basic version DIGICOM BASIC is available as a free download on our website. You do not need an existing test device to get a first impression.

Download software easily and free of charge

Optimum network protection not only requires reliable and particularly robust hardware, but also intuitive operation of the components and support during commissioning and subsequent operation. You can download the operator software DIGICOM BASIC free of charge and get your first impressions of its use. All functions of the basic version can be used without installation. A detailed description can be found in the user manual and within the software.

Functions	DIGICOM		
	BASIC	ADVANCED	ADVANCED MULTIUSER
Complete creation of the setting files incl. programmable logic and substation automation	✓	✓	✓
Downloading the device data	✓	✓	✓
Comparison of configuration files	✓	✓	✓
Uploading the setting files to the protection unit	✓	✓	✓
Password management	✓	✓	✓
Language switching (DE, EN, FR, IT)	✓	✓	✓
Integrated help function, function and device manuals	✓	✓	✓
Download event lists		✓	✓
Display of measured values and status displays in the measuring center (online data)		✓	✓
Graphical visualization of the DIST/DIFF characteristic curves (only for devices with the ZP software option)		✓	✓
Test functions (Activation of binary outputs, LEDs, IEC 60870-5-103, Theral image)		✓	✓
Download and graphical analysis of COMTRADE fault data in DIGIVIEW		✓	✓
Firmware update		✓	✓
Multiuser license			✓





**Extensive functions
with intuitive operation**

The DIGICOM operator software enables simple and self-explanatory use with a clear display. The software provides support with device parameterization and guides you through the extensive protection settings, substation automation and evaluation of the available data. DIGICOM uses an integrated graphics and logic editor and the optional DIGIVIEW analysis program for this purpose.

Device parameterization

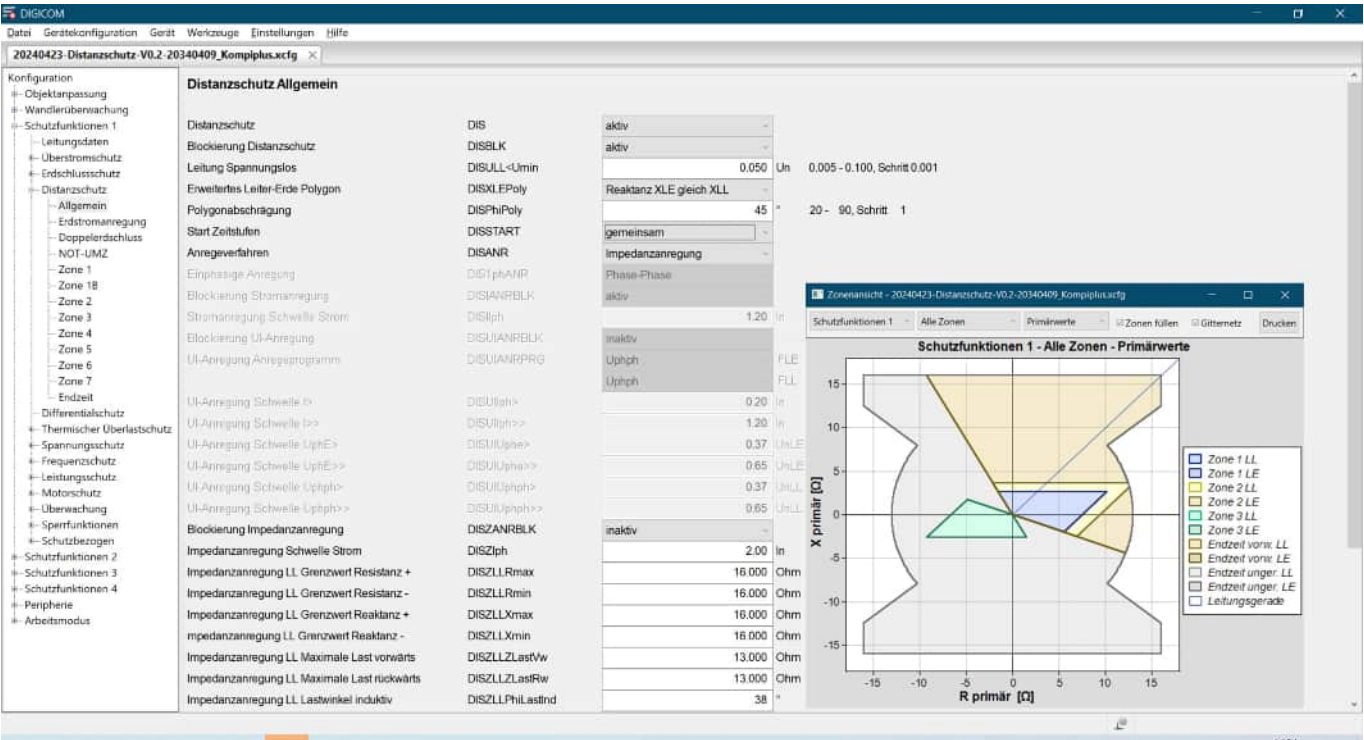
Clear user interface for configuration

The DIGICOM operator software enables quick and easy device parameterization. The configuration file is either created new or read from a ready parameterized unit. The menu navigation of the configuration files is surface-mounted in a user-friendly tree structure. This enables clear and step-by-step device parameterization. The selection of the individual sub-items automatically displays the parameters that can be set. The software automatically grays out the parameters that cannot be changed due to previous settings. The tried-and-tested procedure makes it easier for the user to program the device.

**Parameterization of the interfaces
to the primary technology**

The connections of conventional current and voltage transformers are set in the "Object setting" section. For the POWERSAVE protective relay family, the settings for connected sensors are made depending on the hardware variant. In the case of transformer parameterization, this includes, for , the connection direction, primary values, wiring, rated currents and voltages as well as star point treatment.

The "CT supervision" section defines how the connected transformers are monitored. Monitoring functions such as measuring-circuit voltage failure, current and voltage unbalance as well as current and voltage sum can be configured here. Activating monitoring or protective functions automatically makes the associated data points available in the communication protocol, logic and I/O matrix.



Flexible programming of protective functions and peripheries

In the area of protective functions, DIGICOM offers the option of setting up to four different parameter sets. These parameter sets each contain the same selection options for protective functions and can be set independently of each other. In addition to the protective functions, operational support functions for monitoring, signal transmission or AWE can also be found in each parameter set. The parameter sets can be switched using the function keys on the front of the unit.

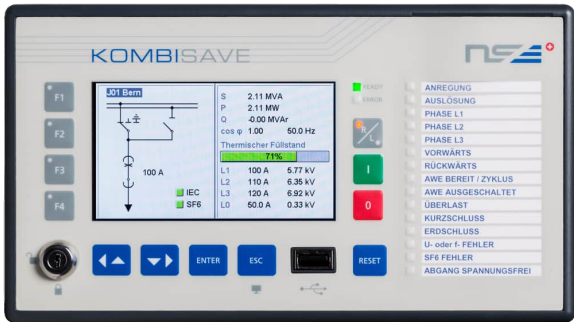
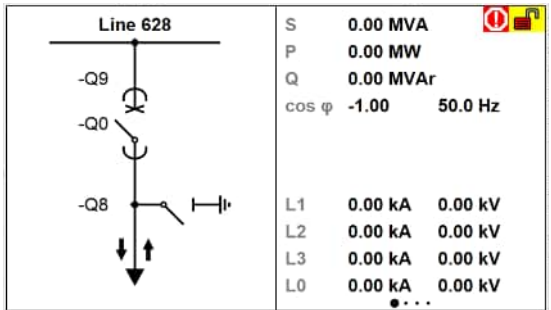
The settings in the periphery section cover various topics. In this area, parameters are defined that are used to control the primary technology, the station automation and the connection to the telecontrol system or that affect the display. The integrated graphics and logic editor and the I/O matrix are tools for engineering substation automation. Parameters for defining communications via IEC 61850, IEC 60870-5-103 or MODBUS RTU are also defined in this section.

Substation automation and engineering

Visualization and system logic

The visualization of the control panel on the device display and the programmable system logic are edited with the graphics and logic editor. The editor is a divider of the DIGICOM BASIC operator software. The logic editor is used to define the substation automation. The visualization for the device display is created graphically in the editor and linked to the programmable logic. The logic files can be exported, imported and edited directly from the editor. This allows templates to be reused on other devices. The combination of logic file and visualization results in the control of the switchgear panel.

The editor is used to define the display on the device-to-device display freely or with predefined panels. The left half of the display shows the system topology with all switching elements. On the right half, all measured or calculated values can be displayed, for example. Static and dynamic text blocks, information from the device identification or virtual LEDs can also be displayed.

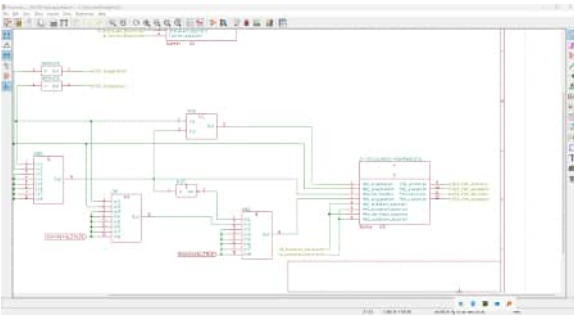


Intuitive control of substations via the front of the unit

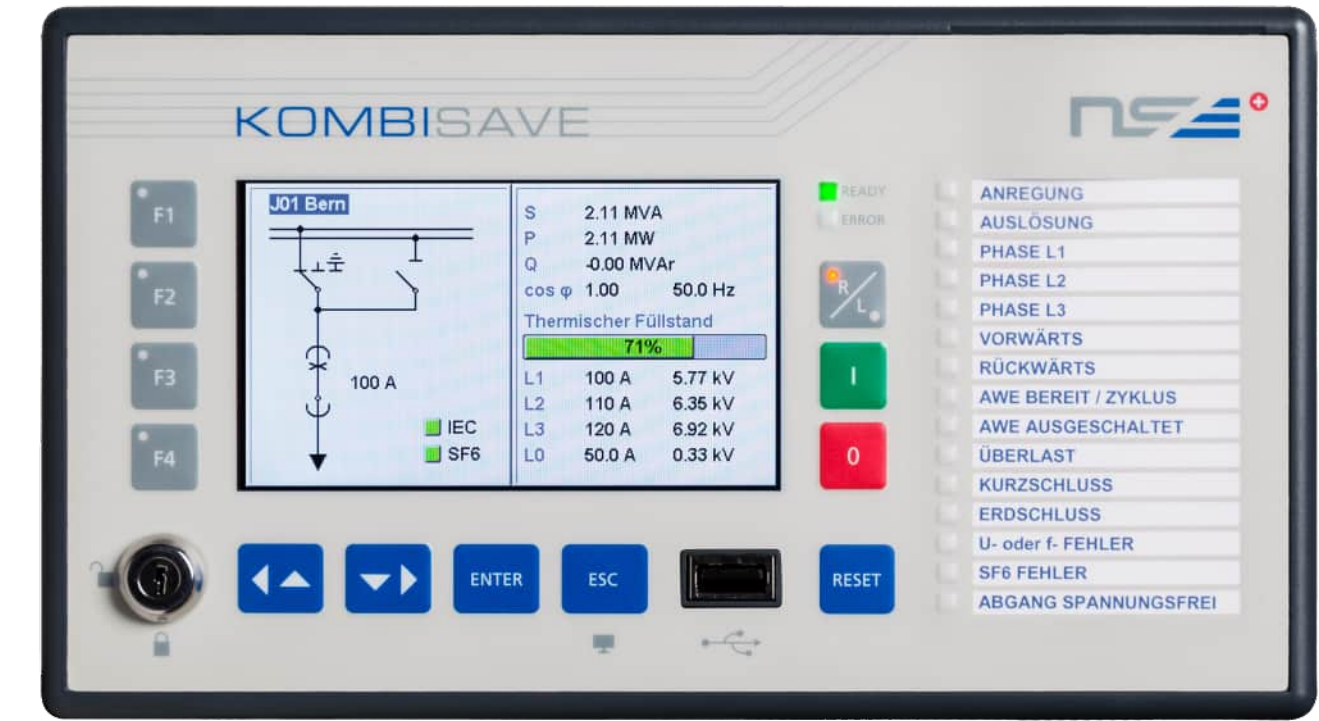
Working with the logic editor

The logic editor offers extensive possibilities for substation automation. The logics enable, example, the expansion of protective functions, the version of switching sequences or automatic network switching. The supplied software library provides RS flip-flops, counters, timers and Boolean logic operations. The switching elements specified by the primary technology are also available. These logical switching elements are used, for example, to ensure that the switching position is shown correctly on the display and transmitted to the control system.

The logic editor and I/O matrix are linked via logic inputs and logic outputs. The identifiers of the inputs and outputs are automatically applied during import into the I/O matrix and linked to the desired signals. The circuit diagrams can be structured hierarchically with the editor, which enables a clear presentation of the system information and the reuse of standardized templates.



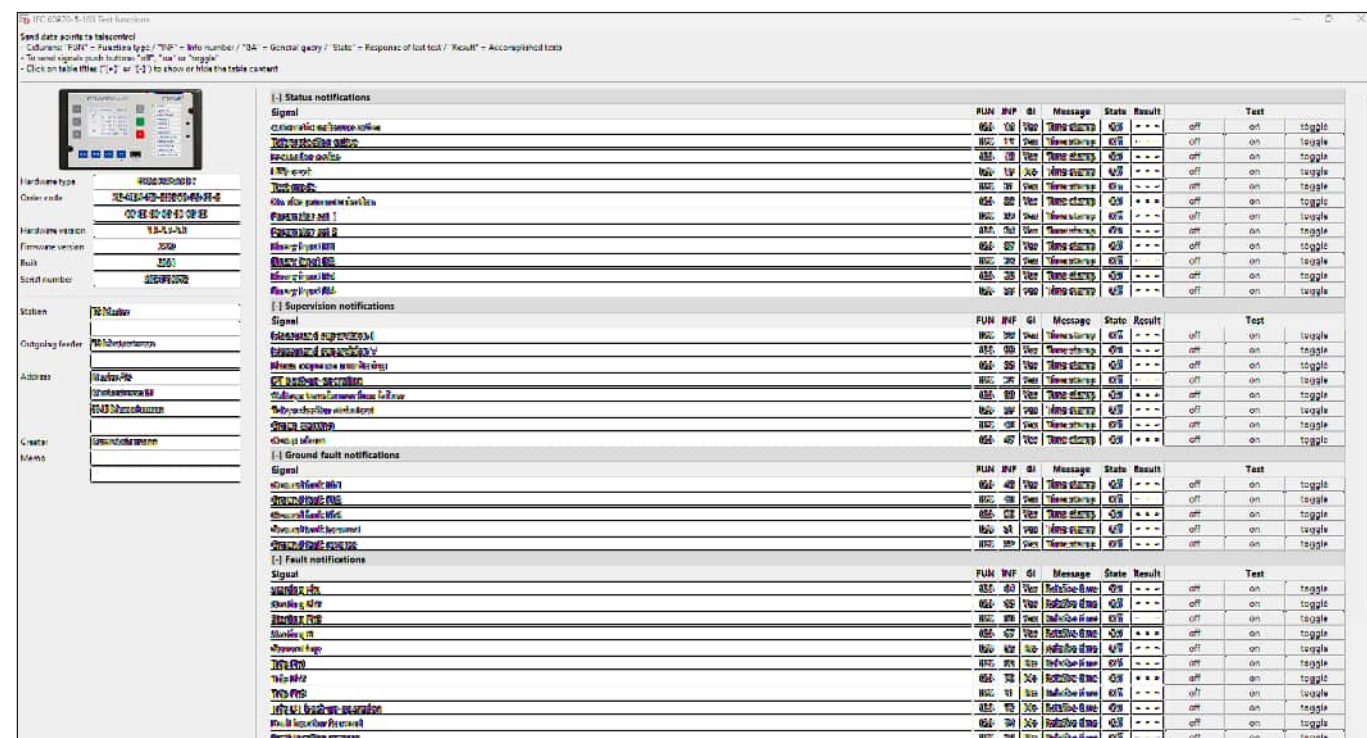
Create clear investment logics



Support for commissioning through integrated test functions

In addition to the parameterization and configuration of the protection relay, the software also allows the version of test functions. This is necessary, for example, during commissioning tests and maintenance work as well as when rectifying faults. In addition to activating the binary inputs and outputs, the test of the excitation signal can also be set. It is also possible to check the functionality of the LEDs and the display. A thermal level can be specified for the thermal image, which simulates the preheating of the protected operating equipment, e.g. a motor.

The test of the communication function via IEC 60870-5-103 can be carried out using DIGICOM. As not all data points can be tested directly, signals such as device faults and warnings can be started as individual data points. This can be easily carried out with the support of the DIGICOM test function.



Display of test functions IEC 60870-5-103

Analyzing fault data with DIGIVIEW

For optimum analysis of fault data, the DIGIVIEW analysis program supplied can be used to display COMTRADE files. DIGIVIEW is a universal tool that clearly displays and evaluates fault data recordings. The program supports COMTRADE files in accordance with IEC 60255-24:2013. The measured analog values are displayed as $u(t)$ and $i(t)$. Further values such as RMS values are calculated and displayed from these. In addition to the analog values and binary traces, the current and voltage values can also be displayed in vector diagrams.

Fault recordings can be synchronized to a common point in time for comparison purposes or due to invalid time stamps. DIGIVIEW supports the display of primary and secondary values and allows subsequent changes to the primary and secondary ratios of the transformers. The displayed areas are scalable so that the appropriate magnification enables detailed data analysis. A modified fault record can be saved with a new file name and also printed. DIGIVIEW is part of the DIGICOM Advanced operator software package, for which a license is required according to the software.

Fourier transforms are used to determine the proportions of the harmonics, calculate their percentages and display them in the program. This makes it easier to assess transient processes in transformers. The analog or binary values to be displayed are selected in the configuration. The settings for the vector diagrams, the fault data time, the trigger time and the device name can also be customized here.

