

KOMBISAVE

The new benchmark for protection and control with IEC 61850, distance, transformer differential, motor, overcurrent, frequency, voltage and earth fault protection



Solid, SAVE, swiss made.

APPLICATION

- Utility and industrial power distribution
- Radial, looped and meshed networks
- Isolated, resistance or impedance earthed neutral network
- Single or double busbar configurations
- One or two breakers, numerous switching devices
- Manually or motor operated disconnectors and earthing switches

PURE AND SIMPLE IED

- Easy to use: protection, control and measurement IED
- IEC 61850 Architecture including GOOSE and MMS
- App-based concept for software options: Add protection modules at any time.
- Complete portfolio of protection functions: from definite-time protection to QV through check synchronism and distance protection and auto-reclosing
- Small, compact, powerful
- Profitability through high functional density
- Long lifespan due to extremely low energy consumption
- Support also IEC 60870-5-103 communication
- Two communication protocols in parallel
- Galvanic or optical communication is available
- Service interface based on USB 2.0 for configuring KOMBISAVE products and use USB Flash Drives.
- No back-up batteries inside

As a competent partner, we offer more than just products. We take responsibility for planning through commissioning and support the ongoing maintenance.

This is our tradition since 1998.

Welcome to NSE.

Grid . Protection . Development



THE KOMBISAVE-FAMILY – SWISS MADE

KOMBISAVE

Ideal for transmission and distribution in medium voltage



KOMBISAVE+

Made for double busbar system in substations



KOMBISAVE VERSIONS

RN

+RN

Overcurrent and motor protection with feeder control system

BASIC
50/51, 50/51N, 49I&II, 68, 79

MOTOR
14, 37, 46PD, 46, 51M

IN ADDITION
66/86, 85, 85N, 50KSE, 50BF, 74TC

CONTROL
CB, DCC, CBT, CBAY, XCBR, LOC, CILO

MEASUREMENT : 4 CTs
3I, IO, 3I/15min, Ith

STATUS COLLECTION
Customized protection and control information can be displayed on virtual parameterizable LEDs and dynamic texts

LOGIC
Integrated PLC

COMMUNICATION
USB 2.0, IEC 60870-5-103, IEC 61850 with Fast- and Slow-GOOSE and MMS, Ethernet

FORMATS
XML, COMTRADE, XRIO, MMS, GOOSE

RF

+RF

Feeder protection with earth fault detection system, distance protection and control system

BASIC
50/51, 50/51N, 49I&II, 68, 79
67, 67N, 32N, 67NIEF, 59G

DISTANCE PROTECTION
21, 21N, 21FL

SMART GRID
QU, UFLS, 81O/U, 27/59

IN ADDITION (+ RN functionality)
47O, 25, 60, MCS31, 47

CONTROL
CB, DCC, CBT CBAY, XCBR, LOC, CILO

MEASUREMENT:: 4 CTs, 4 or 5 VTs
3I, IO, 3I/15min, Ith, 3ULE, 3ULL, UO, PQS, f, cos, Udiff, fdiff, R/X, km/miles

STATUS COLLECTION
Customized protection and control information can be displayed on virtual parameterizable LEDs and dynamic texts

LOGIC
Integrated SPS

COMMUNICATION
USB 2.0, IEC 60870-5-103, IEC 61850 with Fast- and Slow-GOOSE and MMS, Ethernet

FORMATS
XML, COMTRADE, XRIO, MMS, GOOSE

+RQ

Stabilized two winding transformer differential with integrated control system

BASIC
50/51, 50/51N, 49I&II, 68

TRANSFORMER DIFFERENTIAL PROTECTION
Amplitude and switching group adjustment, innovative stabilization characteristics
50P, 87T, 24

IN ADDITION
66/86, 85, 85N, 50KSE, 50BF, 74TC

CONTROL
CB, DCC, CBT CBAY, XCBR, LOC, CILO

MEASUREMENT: 8 CTs
3I, IO, 3I/15min, Ith, Idiff, Istab

STATUS COLLECTION
Customized protection and control information can be displayed on virtual parameterizable LEDs and dynamic texts

LOGIC
Integrated SPS

COMMUNICATION
USB 2.0, IEC 60870-5-103, IEC 61850 with Fast- and Slow-GOOSE and MMS, Ethernet

FORMATS
XML, COMTRADE, XRIO, MMS, GOOSE



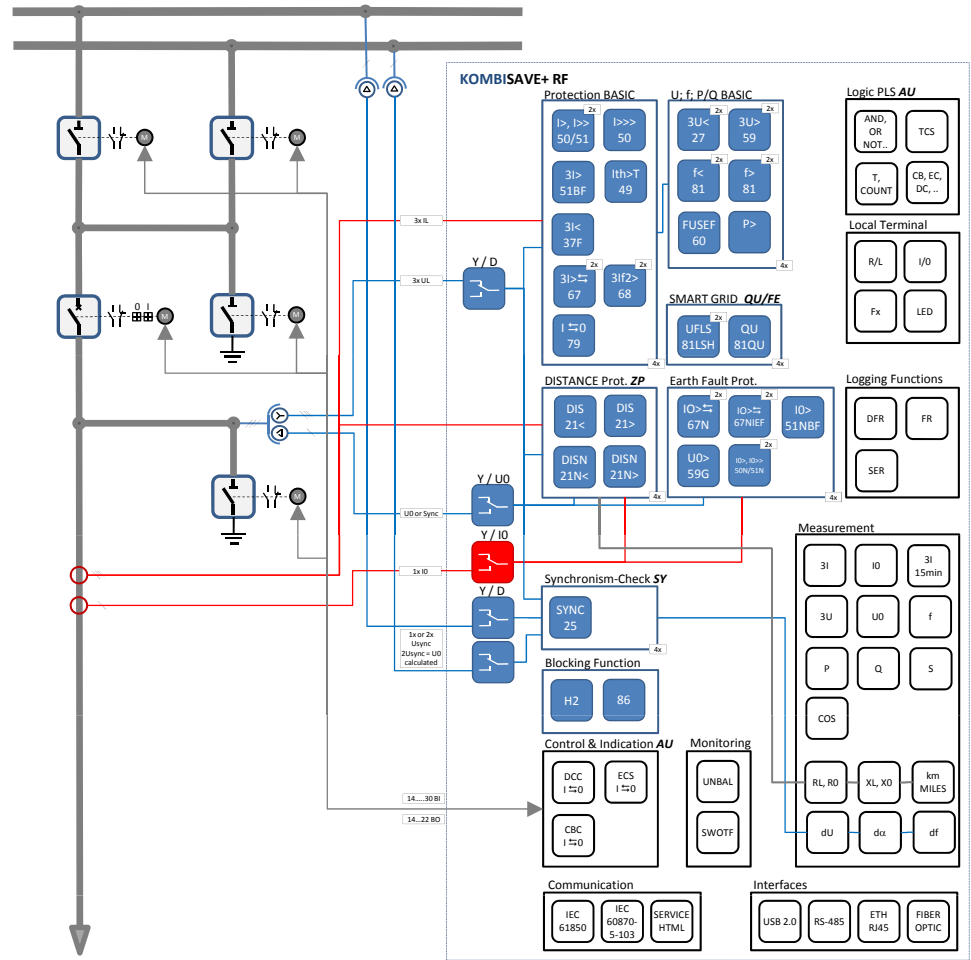
FEEDER PROTECTION AND CONTROL IED



Meshed and Isolated Neutral
Network Double Busbar System
IEDs with Communication to
SCADA System

BLOCK DIAGRAM OF A HIGH VOLTAGE DOUBLE BUSBAR SYSTEM AND A IED KOMBISAVE+ RF

- Radial, Looped and Meshed Networks
- Isolated, Resistance or Impedance Earthed Neutral Network
- Distance Protection
- Earth Fault Protection
- Fault Locator
- Synchronism Check
- Under Frequency Load Shedding
- Double Busbar Bay Control
- Integrated PLC
- IEC 61850
- IEC 60870-5-103





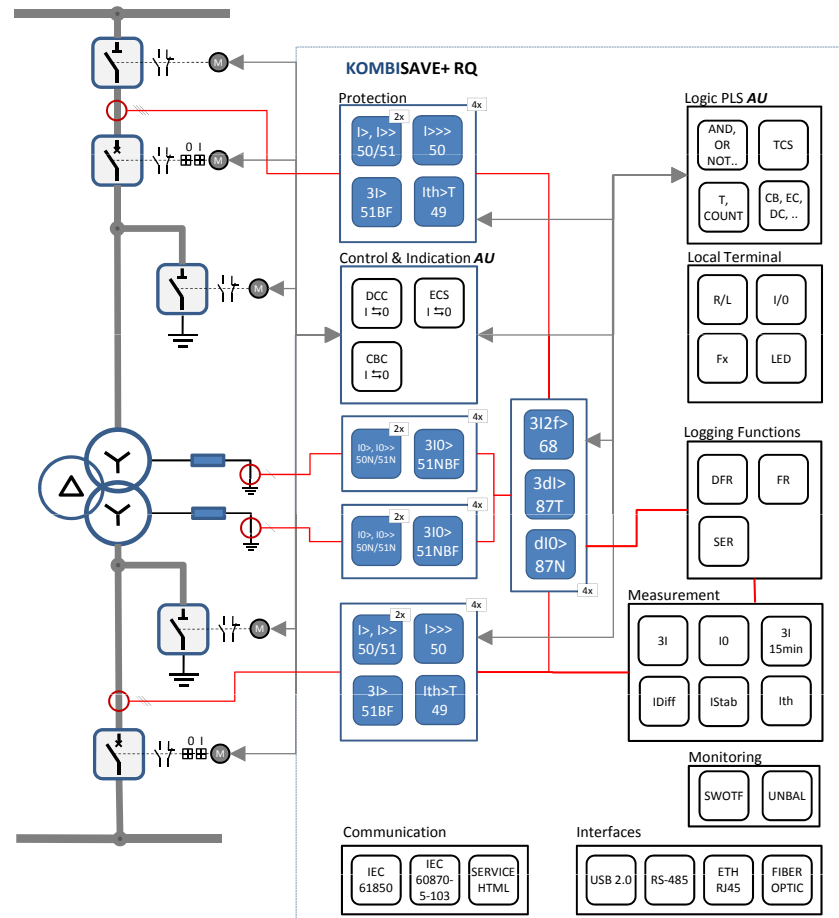
TRANSFORMER DIFFERENTIAL PROTECTION AND CONTROL

110/20kV Transformer with
Direct Earthed Star Point on
High Voltage Side, YDy0



BLOCK DIAGRAM OF A HIGH VOLTAGE TRANSFORMER SYSTEM AND A IED KOMBISAVE+ RQ

- Two-Winding Transformer
- Isolated, Resistance or Impedance Earthed Neutral Network
- Stabilized Differential Protection
- Earth Fault Protection
- Overflux Protection
- Thermal Overload
- Bay Control
- Integrated PLC
- IEC 61850
- IEC 60870-5-103



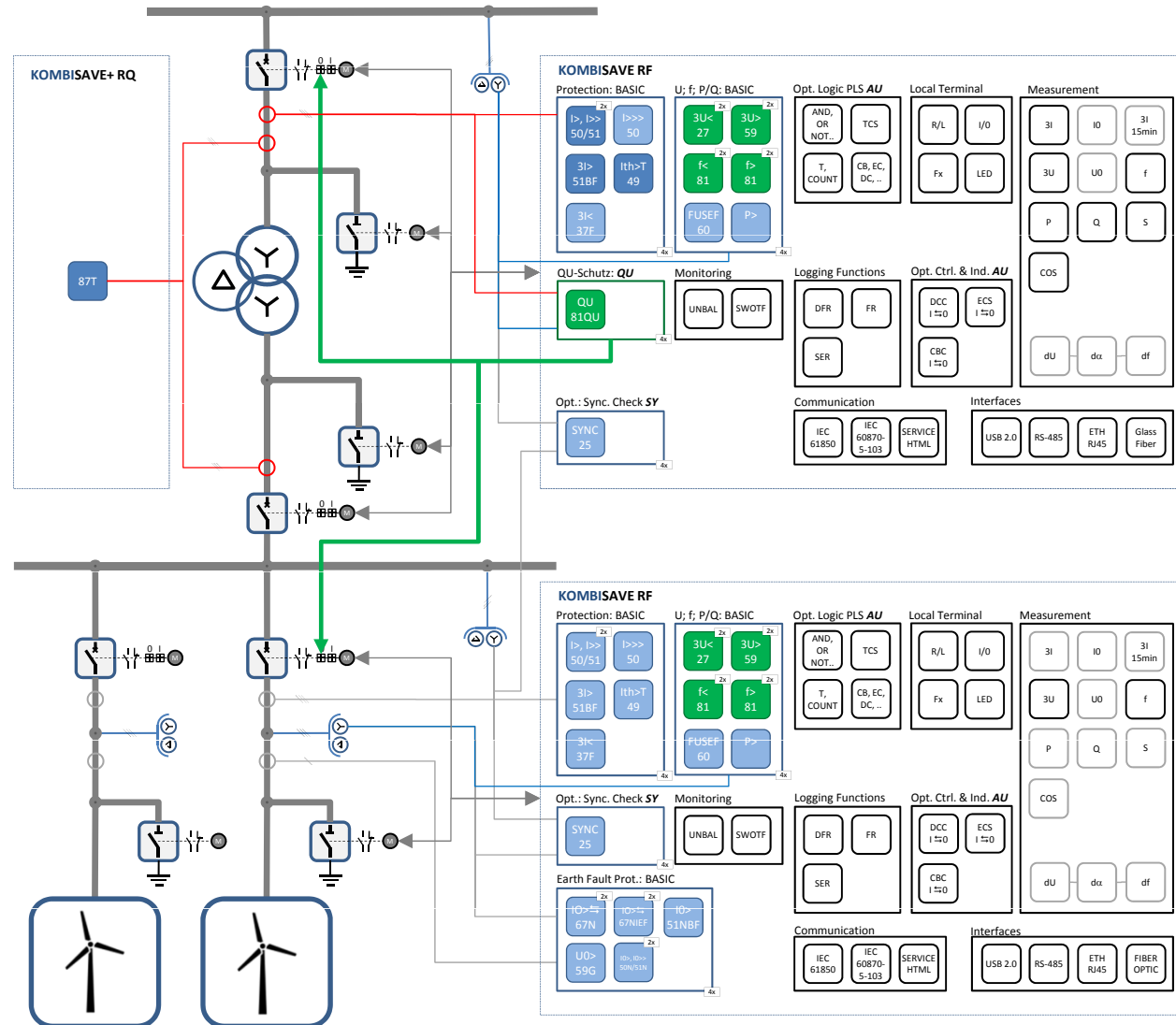


SMART GRID PROTECTION AND CONTROL

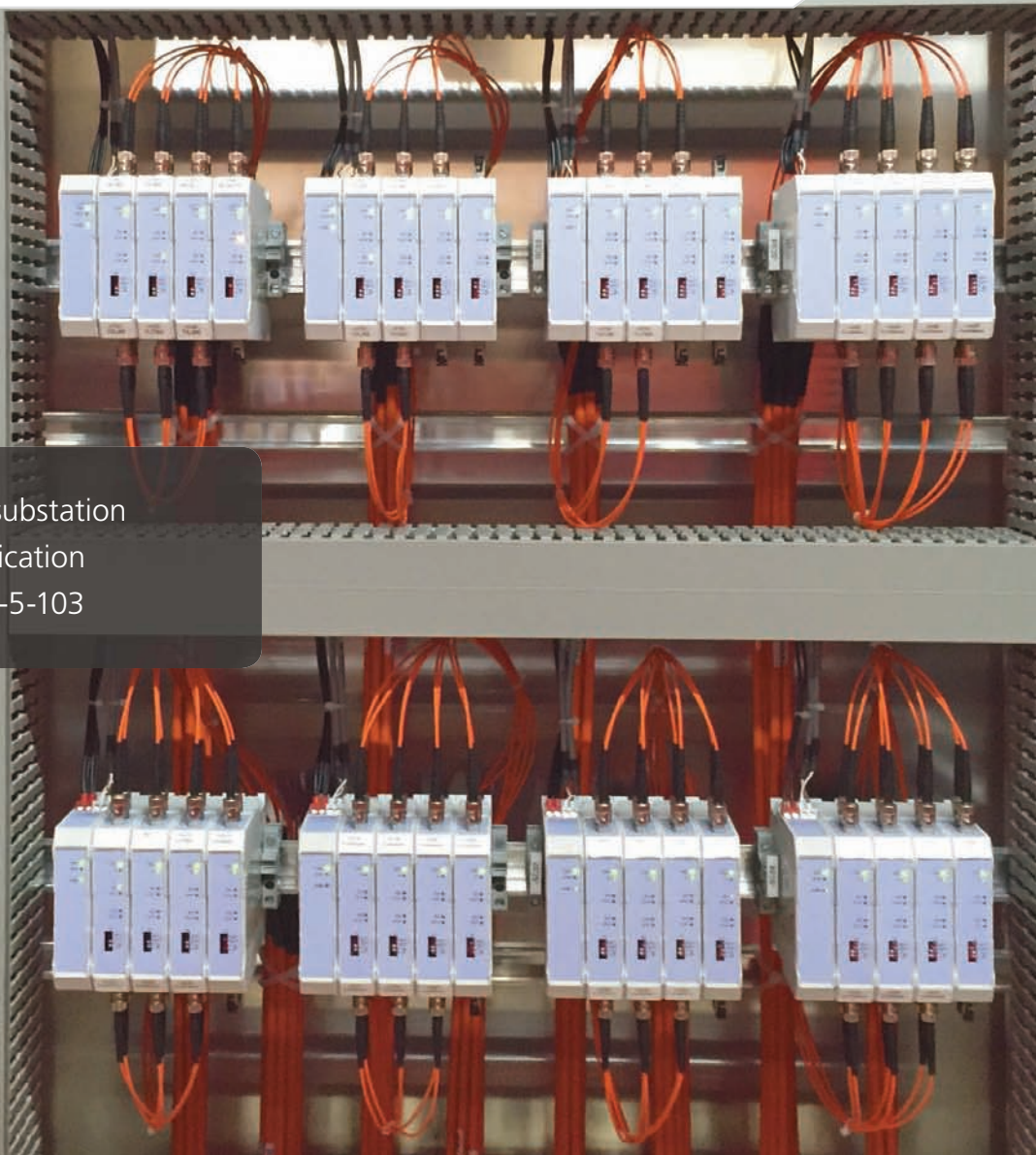
Wind Turbines Park
with Infeed to 110kV

SMART GRID CONFIGURATION WITH IED

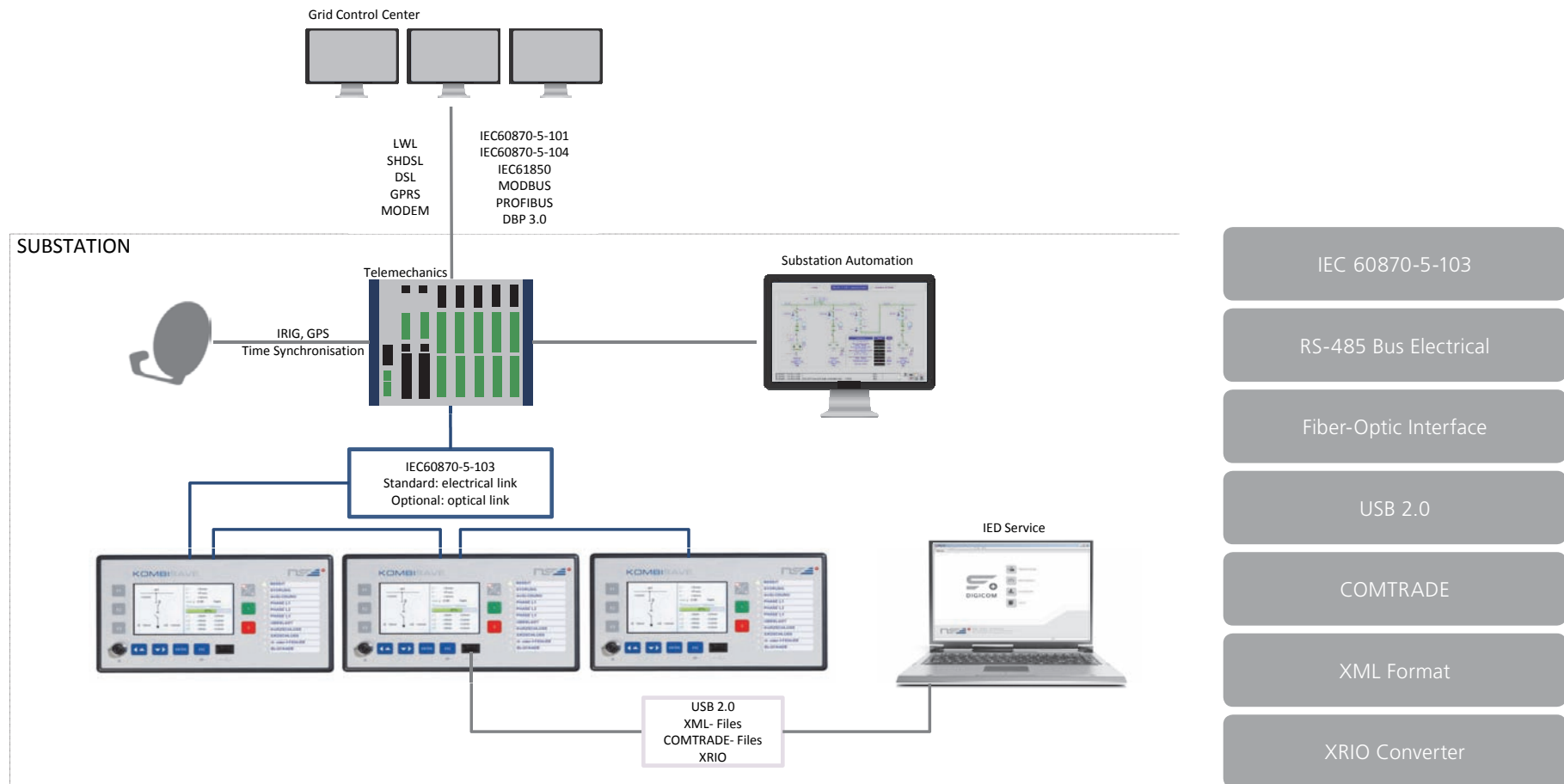
- Energy Producer
- Short Circuit and Earth Fault Protection, Network Stabilization
- Over-/Under-Voltage Protection
- Over-/Under-Frequency Protection
- Reactive Power versus Under Voltage Protection (QV)
- Synchronism and Energizing-Check
- Bay Control
- Integrated PLC
- IEC 61850
- IEC 60870-5-103



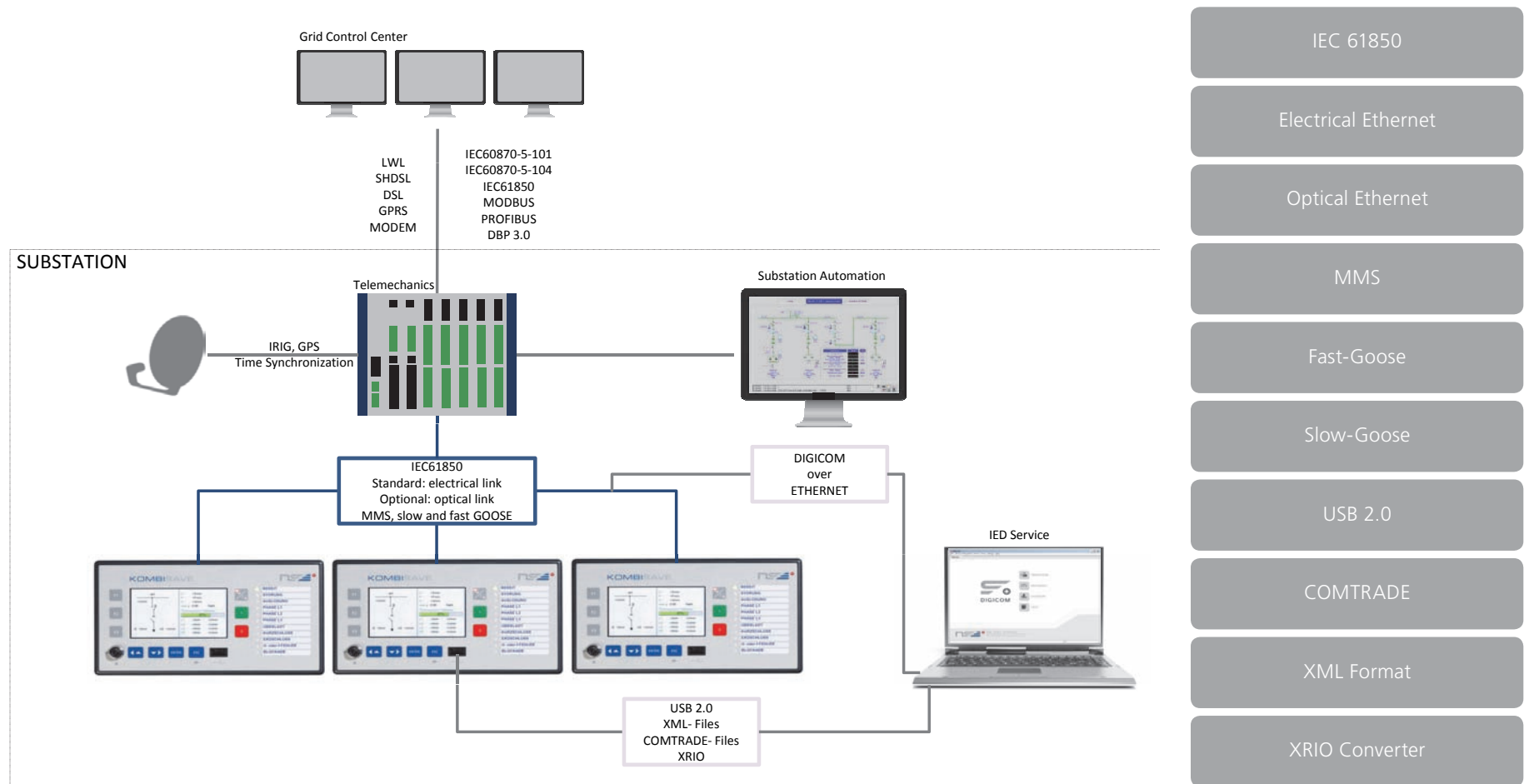
Star coupler in the substation
Optical communication
using IEC 60870-5-103



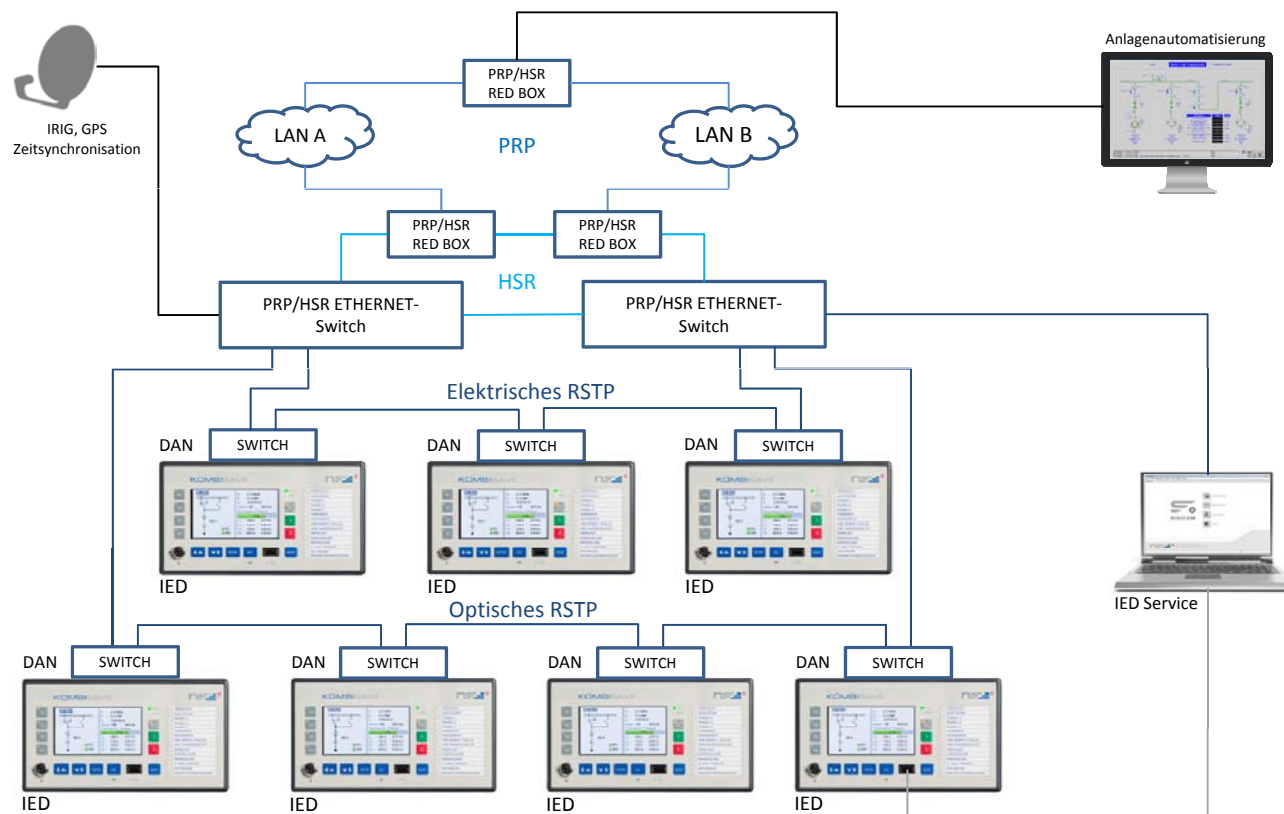
COMMUNICATION ESTABLISHED WITH IEC 60870-5-103



COMMUNICATION ESTABLISHED WITH IEC 61850



COMMUNICATION ESTABLISHED WITH IEC 61850



IED: Intelligent Electronic Device
KOMBISAVE

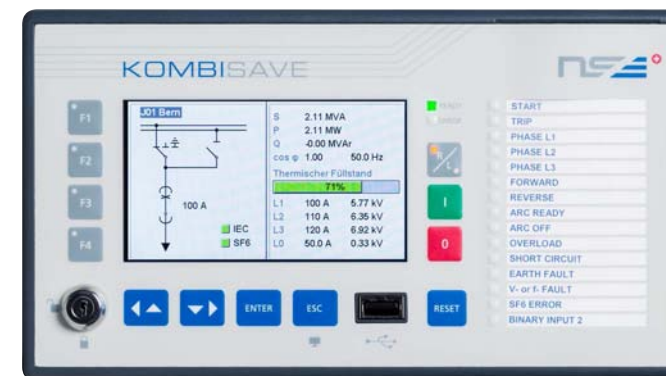
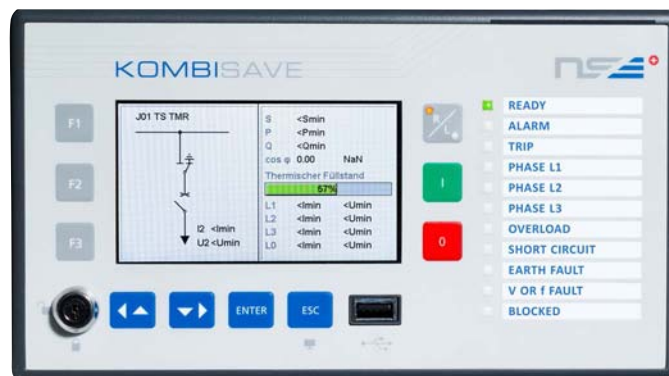
DAN: Double Attached Node
As of 2017 an integrated optical switch is available for KOMBISAVE+ devices.

HSR: High availability Seamless Redundancy
Parallel data transmission into both parts of the Ethernet ring. There is no delay when one component of the ring fails.

PRP: Parallel Redundancy Protocol
Parallel data transmission using two redundant networks. Continuous operation in case of error. No data is lost or delayed.

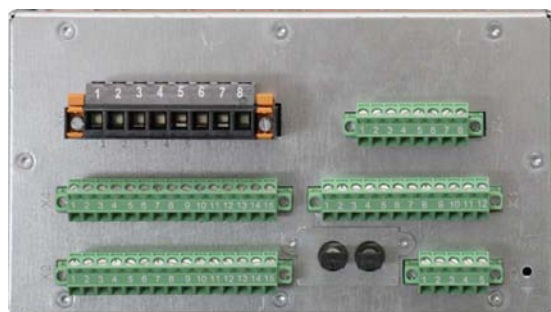
RSTP: Rapid Spanning Tree Protocol
Data transmission in a ring which is virtually «open» at one point. Short delay when one component of the ring fails. Transition to new topology happens automatically.

OPERATION



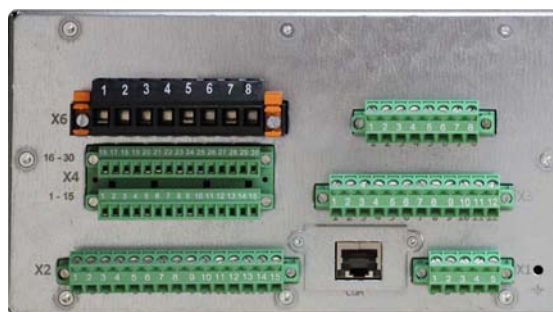
	KOMBISAVE	KOMBISAVE+ RN/RF/RQ
Navigation keys	4	4
Function keys, configurable	3	4 with LEDs
RESET key	-	•
Tri-color LEDs, configurable	11	15
System status LEDs	-	2
R/L key illuminated	•	•
Key switch	•	•
I/O keys	•	•
User configurable display	•	•
Station visualization and control, configurable	•	•
Measurement displays	•	•
Multi-color virtual LEDs for status collection	•	•
Multi-color dynamic texts for status collection	•	•
Multiple display pages, configurable	•	•

CONNECTORS



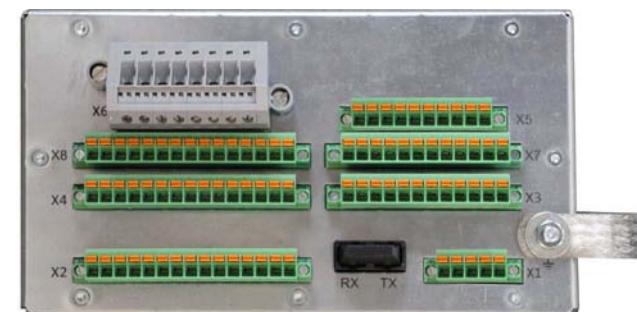
KOMBISAVE X1-I4U4X-BI14BO14-RS-RO

Option IEC 60870-5-103
with fiber optic interface



KOMBISAVE X1-I4U4X-BI26BS14-RS-EE

Option IEC 61850
with electric Ethernet interface
Version with 26 binary inputs



KOMBISAVE+ RF X1-I4U5X-B2C2-RS-EO

Option IEC 61850
with fiber optic Ethernet interface
Bx connectors on X3/X4
Cx connectors on X7/X8

KOMBISAVE+

- Short circuit connector for current inputs
 - High quality plug-in connectors
 - Grounding via flexible copper strap

SOFTWARE



DIGICOM BASIC: (free of charge)

Reading out
Parameterize
Compare parameters
Documentation
PLC automation (KiCAD)
XRIO-Converter

(for Windows XP, Windows 7 32/64Bit, Windows 10)

DIGICOM ADVANCED:

Measurement
Testing
Analyze COMTRADE (DIGIVIEW)
Visualize of distance and differential protection characteristics
Protocol testing tool for IEC 60870-5-103
Engineering and testing tool for IEC 61850

(for Windows XP, Windows 7 32/64Bit, Windows 10)

DIGICOM

DIGICOM is a powerful, easy to use and free software tool used to setup and manage KOMBISAVE products and allows users to easily manage NSE devices settings files from a single application. The protection relays are parameterized via the front interface (USB) or via the rear Ethernet-Port. A comprehensive measuring center allows monitoring circuit faults. The circuit faults are saved in the COMTRADE V91 or V99 format. Convenient COMTRADE viewer DIGIVIEW is an integral part of the DIGICOM advanced software package. The IED measuring center shows the actual state of the protection relay and includes feature to upgrade the IED-firmware.

Benefits of DIGICOM

- Toolset for the complete support and management of all SAVE protection relays
- Supports commissioning of protection relays
- Create, edit and version control of setting files offline or connected
- Provides a simple and intuitive method for configuring
- No installation required (launch from USB Flash Drive, local drive or network drive)
- Multilingual (German, English, French, Italian) with ability to switch languages without restarting
- Runs up to Windows 7

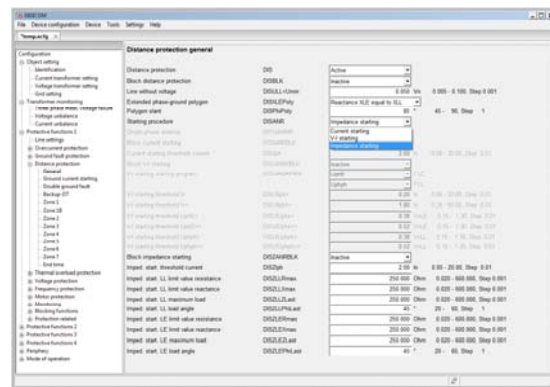
Operation

- Complete support and management of SAVE products
- Archiving setting files
- Comparing setting files
- Create/manage logic
- Create/manage graphic field control
- Communicating with SAVE protection relays
- Import parameters in OMICRON XRIO

Manuals

- Device manuals in PDF format

PARAMETRIZATION WITH DIGICOM



Object setting

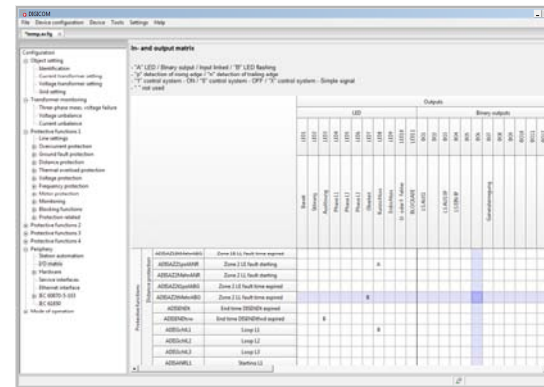
- Device identification: Description of the IED with address, installation site and creator
- Current and voltage transformer settings: Grounding direction, 1/5A, 100,110,400VAC
- Primary values, wiring of CT/VT
- Grid setting, star point treatment (isolated, compensated, impedance or resistance earthed network), rotary field direction

Transformer monitoring

- Current and voltage unbalance
- Monitoring of three phase voltage failure

Protective functions 1-4

- Line data (fault location in km or miles, grounding factor)
- Protection functions (inactive functions or parameters are grayed out)
- Clearly arranged parameterization by grouping and tree structure



Periphery

- Station automation with PLC
- I/O matrix (links in- and outputs)
- LEDs (set color, latch on start)
- Binary in- and outputs (minimum activation time of outputs, switch-on threshold of inputs)
- Service interfaces
- Ethernet (settings)
- IEC 60870-5-103 (settings, signal mapping)
- IEC 61850 (settings)

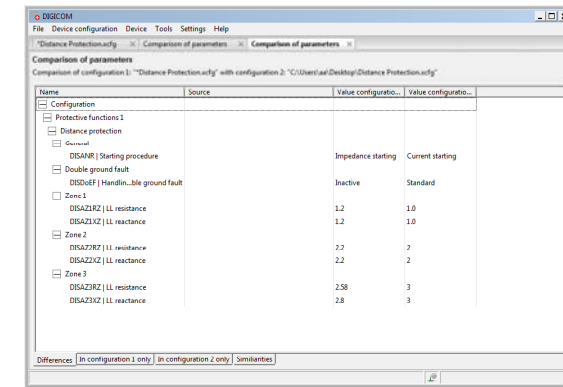
Mode of operation

- Measured values
- Switch parameter set
- Fault recorder memory

I/O- Matrix

Sources

- Binary inputs
- Protective functions
- General signals



- Control interface commands
- Logic (PLC)

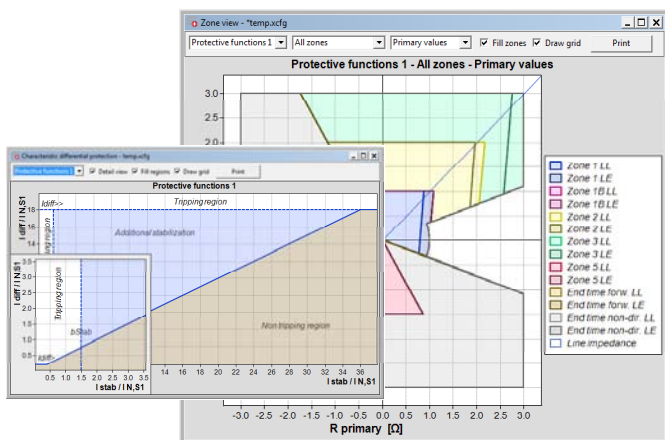
Sinks

- Binary outputs
- LEDs
- Blockages and triggers for protection functions
- Control interface status
- Logic (PLC)

Device configuration

- Receive, send and compare data
- IED Identification
- Password manager
- Send activation code for protection functions.

STATION ENGINEERING

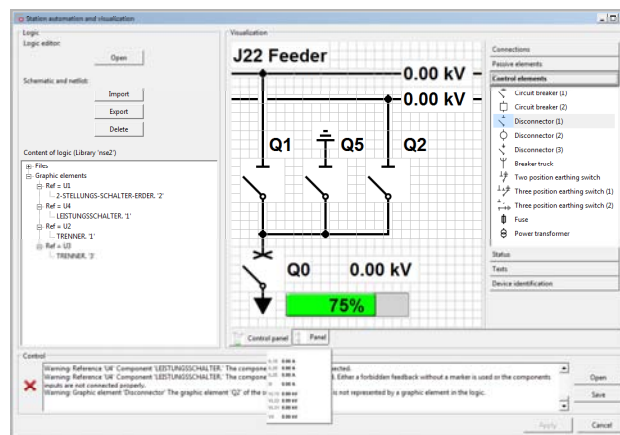


Device

- Status and values ONLINE from system
- Receive: Event and fault records
- Test center for protective functions

Tools

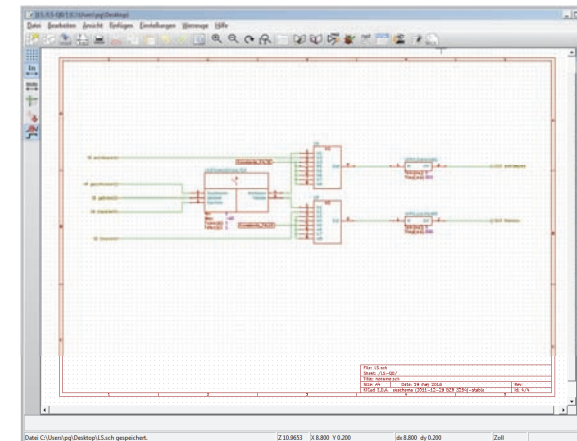
- Graphic visualization of the distance protection settings
 - R/X diagram for LL and LE
 - Maximum load and load angle for under impedance starting
- Visualization of tripping characteristic for differential protection



Create the Station Automation

Visualization

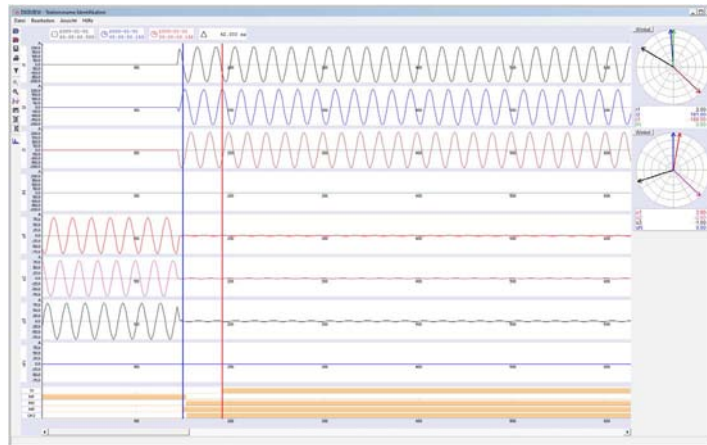
- Single-line diagram with lines, points, earth symbols and feeders
- Visualize the status of the primary and secondary process
- User configurable status panels with measured values
- Virtual LEDs and dynamic texts
- Circuit breaker, earthing switch, disconnector
 - Different graphics available
- Plausibility and status tests on import of KiCAD logic into DIGICOM
- Interface to programmable logic (PLC)



Programmable Logic System Software

- Layering allows creation of hierarchical schematics
- Integrated library browser
 - Logic in- and output
 - AND, OR, NOT, XOR
 - RS-Flip-Flop
 - Up- and down-counter
 - Different types of timers
 - Several types of breakers (CB, DC, ED)
- Import of images possible
- Drawing switchgear plans possible

FAULT ANALYSIS / DIGIVIEW: FAULT DATA ANALYSIS



Fault data records can be displayed and evaluated with DIGIVIEW. COMTRADE files are supported according to IEEE C37.111-1991 and IEEE C37.111-1999.

Extended analysis functions such as calculating the RMS value, displaying the vectors, and analyzing the harmonic distortion are possible. The percentage parts of the individual harmonics are calculated using Fourier transform. Complex issues such as transient states at transformers can also be reproduced.

DIGIVIEW requires a DIGICOM Advanced license.

- Open all standard COMTRADE files
- Analyzing primary and secondary readings
- Instantaneous values or RMS
- Dynamic current and voltage vectors
- Analog and digital recording tracks



KOMBISAVE

F1
F2
F3



S	<Smin	
P	<Pmin	
Q	<Qmin	
cos φ	0.00	NaN
Thermischer Füllstand		
		28%
L1	<Imin	<Umin
L2	<Imin	<Umin
L3	<Imin	<Umin
L0	<Imin	<Umin

STOP
ABBLÖSE
PHASE 1
PHASE 2
PHASE 3
BEREIT
KONVULSION
DREHSTILL
D- oder V-FAHRT
BLOCKADE

ENTER ESC

TECHNICAL DATA

PROTECTION FUNCTIONS

Protection Function	IEC 61850	IE 60617	ANSI	RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
Tree-phase non directional overcurrent protection	PTOC	3I>>>	50P		+	
Tree-phase non directional overcurrent protection (two-stage, IEC DT, IEC NI, IEC VI, IEC EI)	PTOC	3I> , 3I>>	50P/51P	+	+	+
Circuit breaker failure protection	RBRF	3I>BF, I0>BF	51BF, 51NBF	+	+	+
Three-phase thermal protection: one- or two-body model of thermal overload (e.g. for motors, cables, dry and oil transformers)	PTTR	3ITH>F, 3ITH>>F	49 I & II	+	+	+
Three-phase bi-directional overcurrent protection	PTOC	3I>↔, 3I>>↔	67			+
Non-directional earth fault protection (two-stage, IEC DT, IEC VI, IEC EI, IEC LTI)	PTOC	I0> , I0>>	50N/51N	+	+	+
Bi-directional earth fault protection	PTOC	I0>↔, I0>>↔	67N			+
Wattmetric and zero-sequence based bi-directional earth fault protection	PSDE	P0>↔, P0>>↔ Q0>↔, Q0>>↔, P/Q	32N			+
Transient / intermittent bi-directional earth-fault protection	PTEF	I0>↔, I0>>↔	67NIEF			+
Zero-sequence energy based bi-directional earth fault protection	PTEF	E0>↔, E0>>↔	67NIEF			+
Displacement overvoltage protection (zero-sequence voltage)	PTOV	U0>, U0>>	59G			+
Three-phase under- and overvoltage protection	PTOV PTUV	3U>, 3U>> 3U<, 3U<<	59 27			+
Frequency protection	PTOV, PTUV	f>, f>>, f<, f<<	81O/81U			+
Undercurrent protection	PTUC	3I<	37	+		+
Three-phase inrush detector	PHAR	3I2f>	68	+	+	+
Load shedding and restoration	PFRQ	UFLS/R	81LSH			FE
Phase-Phase and Phase-Neutral polygonal distance protection	PDIS	Z<, Z0<, (U, I)	21, 21N, 21P			ZP
Distance Protection starting condition: current-/ under impedance combined with load encroachment and V/C-starting. Integrated end-time (forward and non directional), double earth-fault detection. Combination possible with ARC and switch onto fault detection	PTOC, PSCH	Z<	21, 21N			ZP
Phase unbalance	PTOC	I2>	46PD	+		+
Busbar protection according to H2, protection interlocking system	PSCH	CLN	85N	+	+	+
QV protection	–	Q>, U<	QU			QU
Voltage imbalance	PTOV	U2>	47O			+
Two-winding transformer differential protection	PDIFF	3DI>T	87T		TF	
Over excitation protection by harmonic classification H5/H1	PVPH	H5/H1	24		TF	

CONTROL, MEASUREMENT AND LOGIC FUNCTIONS

Protection related functions	IEC 61850	IEC 60617	ANSI	RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
Transfer trips	PSCH	LAL	LAL	+	+	+
Signal comparison	PSCH	CLN	85	+	+	+
Auto reclosing 1- and 3-pole, 1/3-pole	RREC	I→O	79	+		+
Synchronism and energizing check	RSYN	SYNC	25			SY
Fault locator	RFLO	FLOC	21FL			FO
Three-phase switch onto fault protection	PIOC	3I>	KSE	+	+	+
Locked rotor protection	PZSU	I> +n<	14	+		+
Motor starting time supervision	PMSS	I ² start	46	+		+
Load-jam protection	PTOC	3I>	51M	+		+
Reclosing lockout	PSCH	–	66/86	+	+	+
Monitoring	IEC 61850	IEC 60617	ANSI	RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
Trip circuit supervision	SCBR	TCS	74TC	AU	AU	AU
Fuse failure supervision	RFUF	60	FUSEF			+
Three-phase current supervision	MMXU	MCS 31	MCS 31			
Auxiliary voltage monitor	NZBAT	–	–	+	+	+
Rotary field check	MMXU	–	47			+
Control	IEC 61850	IEC 60617	ANSI	RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
Circuit breaker control and visualization	XCBR, CSWI	I↔O CB	I↔O CB	+	+	+
Disconnecter and earthing switch control and visualization	XSWI, CSWI	I↔O DCC	I↔O DCC	AU	AU	AU
Breaker truck	XSWI, CSWI	I↔O CBT	I↔O CBT	AU	AU	AU
Control with interlocking scheme	CILO	I↔O	I↔O	AU	AU	AU
Field control	CBAY	CBAY	CBAY	AU	AU	AU
Local/remote switchover	LOC	R/L	R/L	+	+	+
Key switch	CILO	KEY	KEY	+	+	+
Status collection	IEC 61850	IEC 60617	ANSI	RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
Standard measurement displays and freely programmable LEDs	–	–	–	+	+	+
Virtual LEDs and dynamic texts	–	–	–	AU	AU	AU
User-defined panels with status information and measurement values	–	–	–	AU	AU	AU

CONTROL, MEASUREMENT AND LOGIC FUNCTIONS

Event and fault data	IEC 61850	IEC 60617	ANSI	RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
Fault recorder (COMTRADE standard)	RDRE	DR	DFR	+	+	+
Event recorder (Export to Excel is possible)	RSER	SER	SER	+	+	+
Measurement	IEC 61850	IEC 60617	ANSI	RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
Three-phase current display (IL1, IL2, IL3)	MMXU	3I	3I	+	+	+
Three-phase voltage display LE (VL1E, VL2E, VL3E)	MMXU	3ULE	3ULE			+
Three-phase voltage display LL (VL1VL2, VL2VL3, VL3VL1)	MMXU	3ULL	3ULL			+
Ground current	MMXU	I0	I0	+	+	+
Zero-sequence voltage	MMXU	Uo	Vn			+
P/Q/S power	MMXU	PQf	PQf			+
Power factor PF cos	MMXU	cos	cos			+
Frequency	MMXU	f	f			+
Impedances RLL, RLE, XLL, XLE	MMXU	R/X	R/X			ZP
Difference values between two systems (e.g. busbar and feeder): ΔU , Δf , Δa	MMXU	Udiff, fdiff	Udiff, fdiff			SY
Fault location	MMXU	km/miles	km/miles			FO
15mins mean current values with date per phase	MMXU	3I /15 mins	3I /15 mins	+	+	+
Differential and stabilization currents	MMXU	Idiff, Istab	Idiff, Istab		+	
Load profile	MSAT	F	F	+	+	+
Programmable logic system and generic I/O- process	IEC61850	IEC 60617	ANSI	RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
AND, OR, NOT, XOR, CONSTANT	–	–	–	AU	AU	AU
Up/down counter	FCNT	UDCNT	UDCNT	AU	AU	AU
On/off time delay	GAPC	TOF/TON	TOF/TON	AU	AU	AU
RS Flip-Flop	GAPC	RS	RS	AU	AU	AU
Single point information	GGIO	–	–	+	+	+
Double point information	GGIO	–	–	+	+	+
IEC 61850 / GOOSE communication	IEC61850			RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
Specification IEC 61850-6, 7-1, 7-2, 7-3, 7-4, 8-1	–			50	50	50
Protocol IEC 61850-8-1 block 1, 2, 2+, 4, 4+, 5, 6, 9ab, 12abcd, 13, 14	–			50	50	50
Receiver for 32 fast binary signals / interlocking / single point information	LGOS	–	–	50	50	50
Transmitter for 32 fast binary signals / interlocking / single point information	LGOS	–	–	50	50	50
Transmitter for 100 measurements / status signals	LGOS	–	–	50	50	50

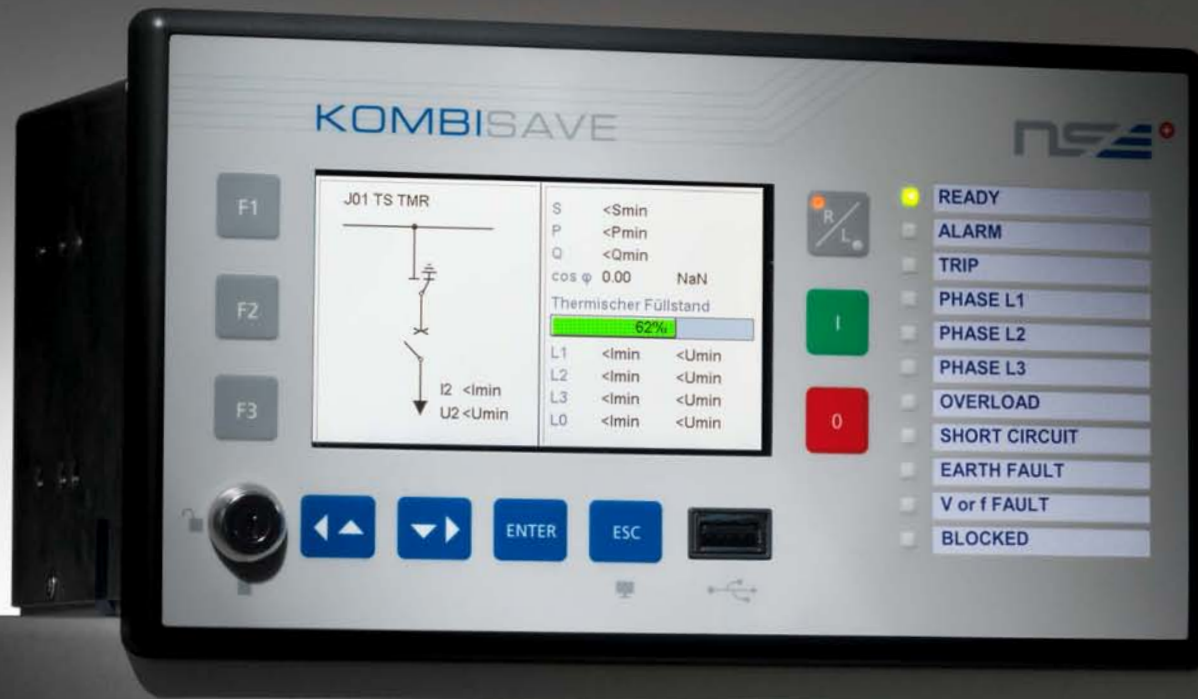
TECHNICAL OVERVIEW

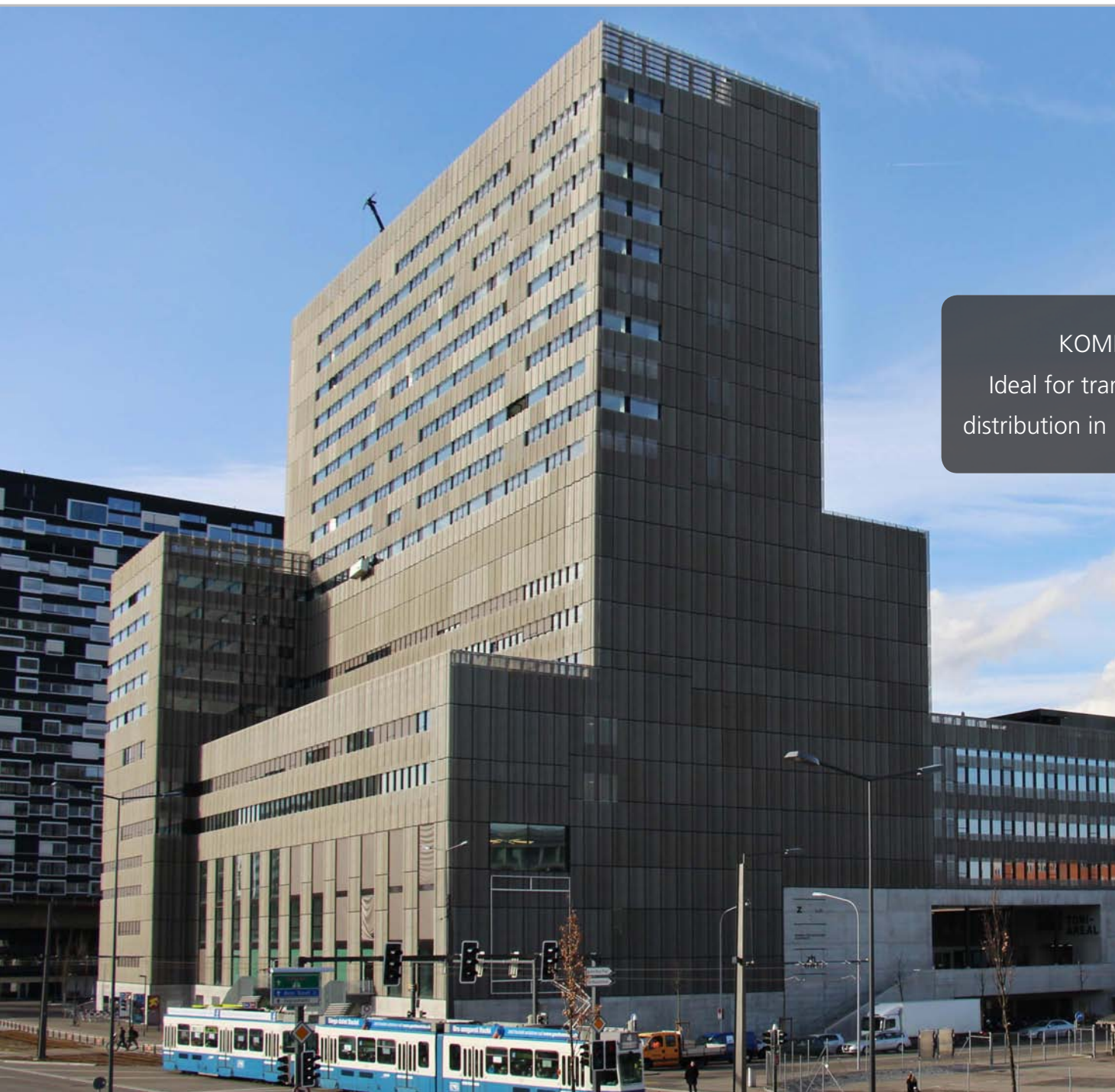
Protection functions general tolerances		
Overcurrent- / Distance- / Differential-Protection		sinus-auto-correlation @ 50Hz
Overload protection		RMS 30...1'000Hz / 0.01 ... 120 x In
Earth-fault protection		RMS 30...1'000Hz / 0.01 ... 120 x In
Measurement		RMS 30...1'000Hz
General tolerances		
Start up time		15...25ms (sub cycle I>>>: 10ms)
Tolerance @ start up		<2.5%
Timer tolerance		<1%
Directional function		Start up: ~25ms; trip time ~32ms
Fault locater		<1% @ line length, @ U/Usc >5% and 30<j<90°
Distance protection		Start up ~27ms, trip time ~37ms
Differential protection		Start up ~15ms; trip time ~20ms
Frequency module		Start up: 80...120ms
Vibration and shock		
Regulations	IEC 60255-21	
Sinusoidal oscillation	IEC 60255-21-1 IEC 60068-2-6	5...8Hz; +/-7.5mm amplitude 8... 150Hz ; 20m/s ² acceleration, frequency sweep 1 octave/min, 20Cycle in 3 axes perpendicular on each other
Vibration shock	IEC 60255-21-2 IEC 60068-2-27	Half sine, acceleration 150m/s ² , 11ms duration, each shock in both directions on all axes
Sinusoidal vibration during earthquakes	IEC 60255-21-3 IEC 60068-3-3	Horizontal: 1 ... 8 Hz, +/- 3.5mm amplitude Vertical: 1 ... 8 Hz, +/- 1.5mm amplitude horizontally @ 1g : 8 ... 35Hz Vertical @ 5m/s ² : 8 ... 35Hz Frequency sweep 1 octave / min, 1cycle all axes
Half sine vibration during earthquakes	IEC 60255-21-3 IEC 60068-3-3	Acceleration 100m/s ² , 16ms duration, each 1000 shocks in all directions
Vibration and shock during transportation	IEC 60255-21-1 IEC 60068-2-6	Half sine, acceleration 15g, 11ms duration, each shock in both directions on all axes
Climatic compatibility		
Regulations	IEC 60255-1	Continuous operation : -10 ... + 55 ° C Storage temperature: -25 ... + 55 ° C Transport temperature: -25 ... + 70 ° C
	IEC 60068-2-17	Test condition for 16h: -25 ° ... + 85 ° C Temporarily admissible eventual displays impaired Operating from 55° for 96h: -20 ... + 70 ° C
Humidity		Throughout the year < 75 %, condensation and ice formation is not permitted Throughout the month < 95% at max . 40°C, condensation and ice formation is not permitted
Installation height		<3000 m.a.s.l

REGULATIONS AND TESTS

Electrical tests	Norm		
Regulations	IEC 60255-1 IEEE Std C37.9.0/.1/.2 UL 508 VDE 0435	Measuring Relays and Protection Equipment	
Insulation test	Type examination Serial testing	5kV, 1.2/50µs, 0.5J 2.5kV; 50Hz, 1min	
Electromagnetic compatibility	IEC60255-26 EN 61000-6-2 VDE 0345	Replacement for 60255-22 Part 301 and 110	-1, -2, -3, -4
Electrostatic discharge immunity test	IEC 61000-4-2	Contact discharge Air discharge	6k 15kV
Irradiation in the radiofrequency field	IEC 61000-4-3	10V/m, 80% AM, 1kHz Frequency sweep Fixed frequency	80 ... 1000MHz, 1400 ... 2700MHz 80, 160, 380, 450, 900, 1850, 2150MHz
Fast transient/disturbance/burst	IEC 61000-4-4	Communications Other connections	2kV, 5/50ns, 5kHz, both polarity 4kV, 5/50ns, 5kHz, both polarity
High-energy surge immunity test	IEC 61000-4-5	Impulse Auxiliary supply Communications Other Inputs	1.2/50µs CM: 4kV, 10 Ohm, 9µF DM: 2kV, 0 Ohm, 18µF CM: 4kV, 0 Ohm, 0µF CM: 4kV, 40 Ohm, 0,5µF DM: 2kV, 40 Ohm, 0.5µF
Immunity to conducted disturbances, induced by radio frequency fields	IEC 61000-4-6	Communications Other connections	10V; 150kHz...80MHz; 80% AM, 1kHz 20V; 150kHz...80MHz; 80% AM, 1kHz
Power frequency magnetic field immunity test	IEC 61000-4-8	constantly for 1..3 s; 50 Hz	30A 300A/m/m
Test for immunity to conducted, common mode disturbances in the frequency range	IEC 61000-4-16	Binary Input	Zone A DM: 150 V, 100 Ohm, 0.1 µF; CM: 300 V, 200 Ohm, 0.47 µF
Damped oscillatory wave immunity test	IEC 61000-4-18	Communications Other connections	CM: 1kV @ 1 MHz, 200 Ohm DM: 1kV; CM: 2.5kV @ 1kHz and 1 MHz, 200 Ohm
Voltage dips, short interruptions and voltage variations on DC Input power port immunity tests	IEC 61800-4-11 IEC 61000-4-29	In the whole indicated auxiliary voltage range	
Radio-frequency disturbance characteristics	IEC CISPR 11	30MHz ... 1000MHz	
Conducted interference of the auxiliary voltage	IEC CISPR 22	150kHz ... 30MHz	

KOMBISAVE





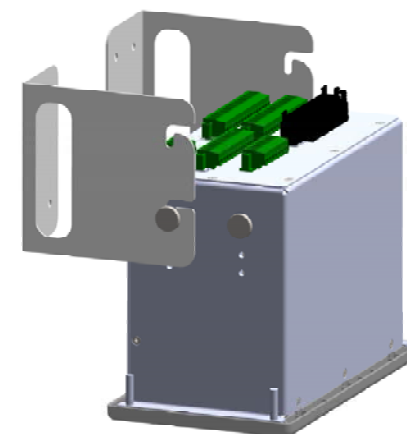
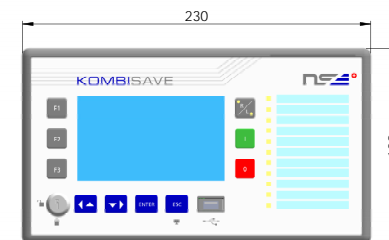
KOMBISAVE
Ideal for transmission and
distribution in medium voltage



KOMBISAVE / TECHNICAL SPECIFICATIONS

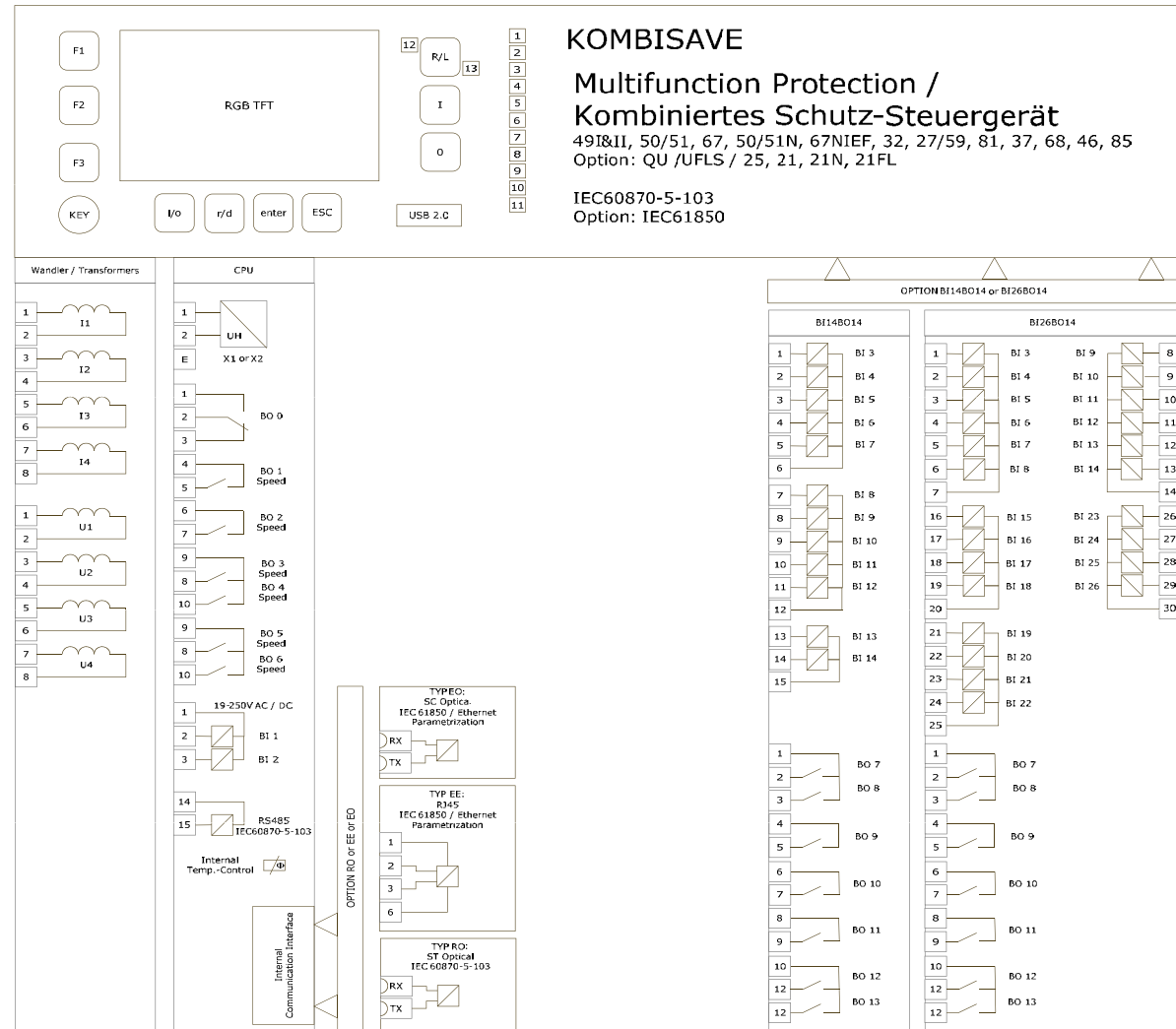
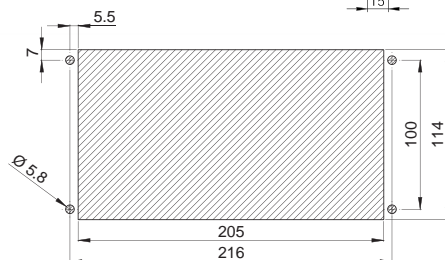
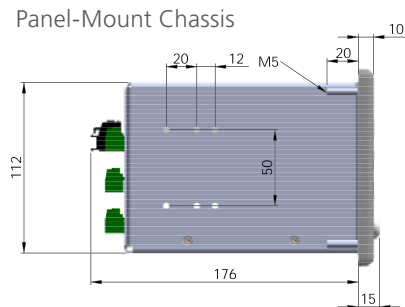
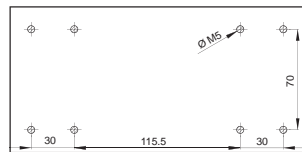
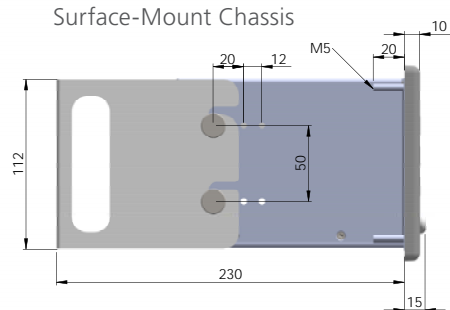
Hardware	I4U0 (RN)	I4U4X (RF)
Dimensions 19"/2; 3HE	+	+
ARM microprocessor system: 1x or 2x for IEC 61850	+	+
Energy storage for event and fault recorder: POWERCAP <7d	+	+
Binary input 20...60 / 80...250V AC/DC with integrated „contact cleaning system“; max. 220nF line capacity	14	14
Binary input 20...60 / 80...160V DC with integrated „contact cleaning system“; max 220nF line capacity	26	26
Binary output 10A@250 VAC (2000VA); standard 6ms, high-speed 3ms	BO0...6 : high-speed BO7 ... : standard	BO0...6 : high-speed BO7 ... : standard
Analog inputs	I4U0 (RN)	I4U4X (RF)
Current transformers: Nominal current 1/5A; 50Hz; Range: 0.01...64xIn; <0.2VA	4	4
Voltage transformers: Nominal voltage 100/110/400(230)V; 50Hz; Range 0.05...440 VAC; <0.2VA	-	4
Auxiliary power supply	I4U0 (RN)	I4U4X (RF)
X1: 22...28 V DC; P<10VA; bridging time (voltage dips) >50ms	X1	X1
X2: 50...275 V AC; 44...250 V DC; P<10VA; bridging time (voltage dips) >50ms	X2	X2
HMI and display	I4U0 (RN)	I4U4X (RF)
Super sharp RGB TFT display with automatic switching to power-saving mode and alarm display on grid fault	+	+
three function keys	+	+
Key switch for unlocked control operations	+	+
Local/remote key	+	+
Direct control keys	+	+
11 tri-color LEDs	+	+
USB 2.0 service interface for communication with PC or direct USB flash drive access	+	+
Communication	I4U0 (RN)	I4U4X (RF)
Standard: Electric RS-485 interface for IEC 60870-5-103	+	+
Optional: Fiber optic interface for IEC 60870-5-103	RO	RO
Standard: XML parameterization over USB	+	+
Optional: Electric Ethernet interface including parameterization over Ethernet	EE	EE
Optional: Fiber optic Ethernet interface including parameterization over Ethernet	EO	EO
Optional: IEC 61850 MMS and GOOSE (Ethernet interface necessary)	50	50

MECHANICAL CONSTRUCTION



When mounted in brackets KOMBISAVE can be tilted down for easy access to the connectors.

KOMBISAVE / ELECTRICAL WIRING DIAGRAM



KOMBISAVE RN / OVERCURRENT AND MOTOR PROTECTION RELAY WITH FIELD CONTROL

RN

Hardware: Overcurrent and motor protection relay with field control	KOMBISAVE	-	-	I4U0	-	-	RS	-
Auxiliary power supply 22...28V DC <10W 44...250V DC / 50...275V AC 50/60Hz < 10W		X1 X2						
Analog inputs 4x CT: 1A/5A (configurable)				I4U0				
Binary in- and output Binary inputs: 14x20...60V AC/DC; 80...250 V AC/DC (configurable) Binary outputs: 14x2000VA / 6ms						BI14BO14		
Additional inputs Binary inputs: 26x20...60V DC; 80...160V DC (configurable) Binary outputs: 7x2000VA / 6ms und 7x2000VA / 3ms						BI26BS14		
Standard 1. Communication Control system interface RS-485 electric for IEC 60870-5-103							RS	
Optional 2. Communication No further communication interface Control system interface serial fiber optic for IEC 60870-5-103 (ST-Plug, 820nm) Control system interface Ethernet electric (RJ45-Plug) DIGICOM over Ethernet Control system interface Ethernet fiber optic (SC-Plug, 1300nm) DIGICOM over Ethernet								00 RO EE EO
Software: Overcurrent and motor protection relay with field control			-			-00-00-00-00-00-00-		
Communication requires KOMBISAVE ...-EE/EO No further communication protocol Communication protocol IEC 61850				00 50				
Station automation and visualization / Field control No station automation and visualization / Field control Station automation and visualization / Field control								00 AU

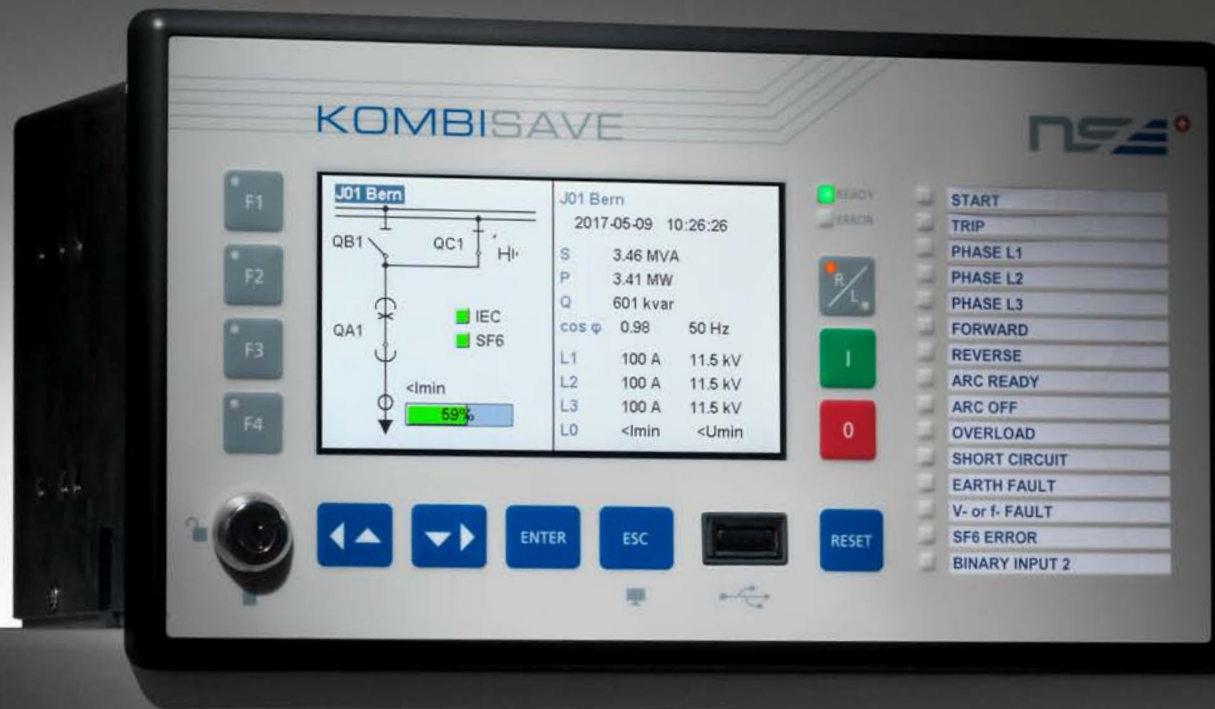
KOMBISAVE RF / FEEDER PROTECTION RELAY WITH FIELD CONTROL

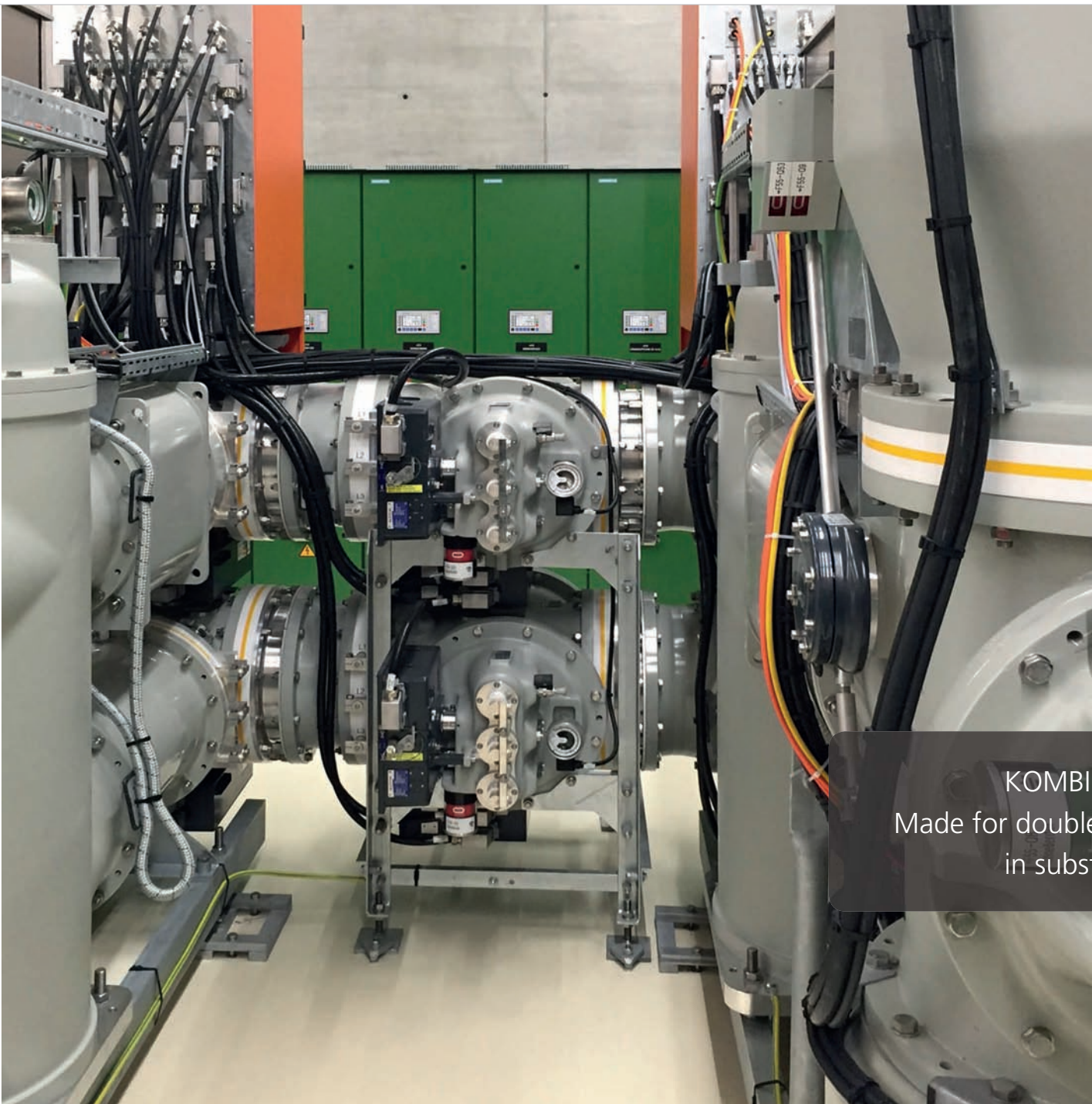
RF

Hardware: Feeder protection relay with field control	KOMBISAVE	-	-	-	I4U4X	-	-	RS	-
Auxiliary power supply 22...28V DC <10W 44...250V DC / 50...275V AC 50/60Hz < 10W			X1 X2						
Analog Inputs 4x CT: 1A/5A (configurable) 4xVT: 100V, 110V, 400V AC (configurable)					I4U4X				
Binary In- and Output Binary Inputs: 14x20...60V AC/DC; 80...250 V AC/DC (configurable) Binary Outputs: 14x2000VA / 6ms							BI14BO14		
Additional Inputs Binary Inputs: 26x20...60V DC; 80...160V DC (configurable) Binary Outputs: 7x2000VA / 6ms und 7x2000VA / 3ms							BI26BS14		
Standard 1. Communication Control system interface RS-485 electric for IEC 60870-5-103								RS	
Optional 2. Communication No further communication interface Control system interface serial fiber optic for IEC 60870-5-103 (ST-Plug, 820nm) Control system interface Ethernet electric (RJ45-Plug) DIGICOM over Ethernet Control system interface Ethernet fiber optic (SC-Plug, 1300nm) DIGICOM over Ethernet									00 RO EE EO

Software: Feeder protection relay with field control	-	-	-	-	-	-	-	-00-00-00-	
Communication requires KOMBISAVE ...-EE/EO No further communication protocol Communication protocol IEC 61850		00 50							
Synchronism check No synchronism check Synchronism check (25)			00 SY						
Smart grid protection No Smart grid protection Q-V protection (QV) Under frequency load shed (UFLS) Q-V protection and under frequency load shed (QV & UFLS)					00 QU UL QF				
Fault Locator No fault locator Fault locator (21FL)						00 FO			
Distance protection No distance protection Distance protection with I, VI and Z< start module (21P, 21N, 21G)							00 ZP		
Station automation and visualization / Field control No station automation and visualization / Field control Station automation and visualization / Field control									00 AU

KOMBISAVE+



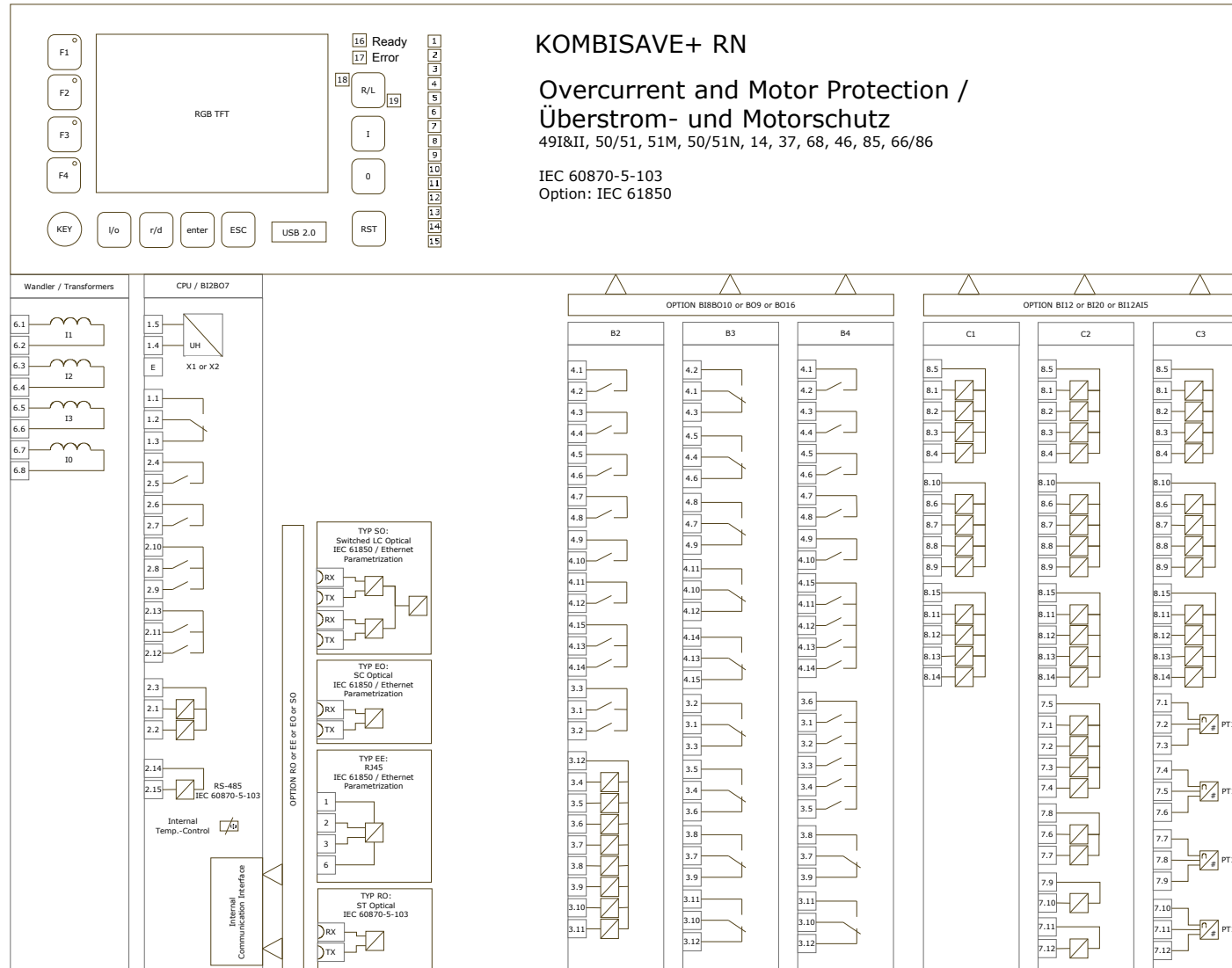


KOMBISAVE+
Made for double busbar system
in substations

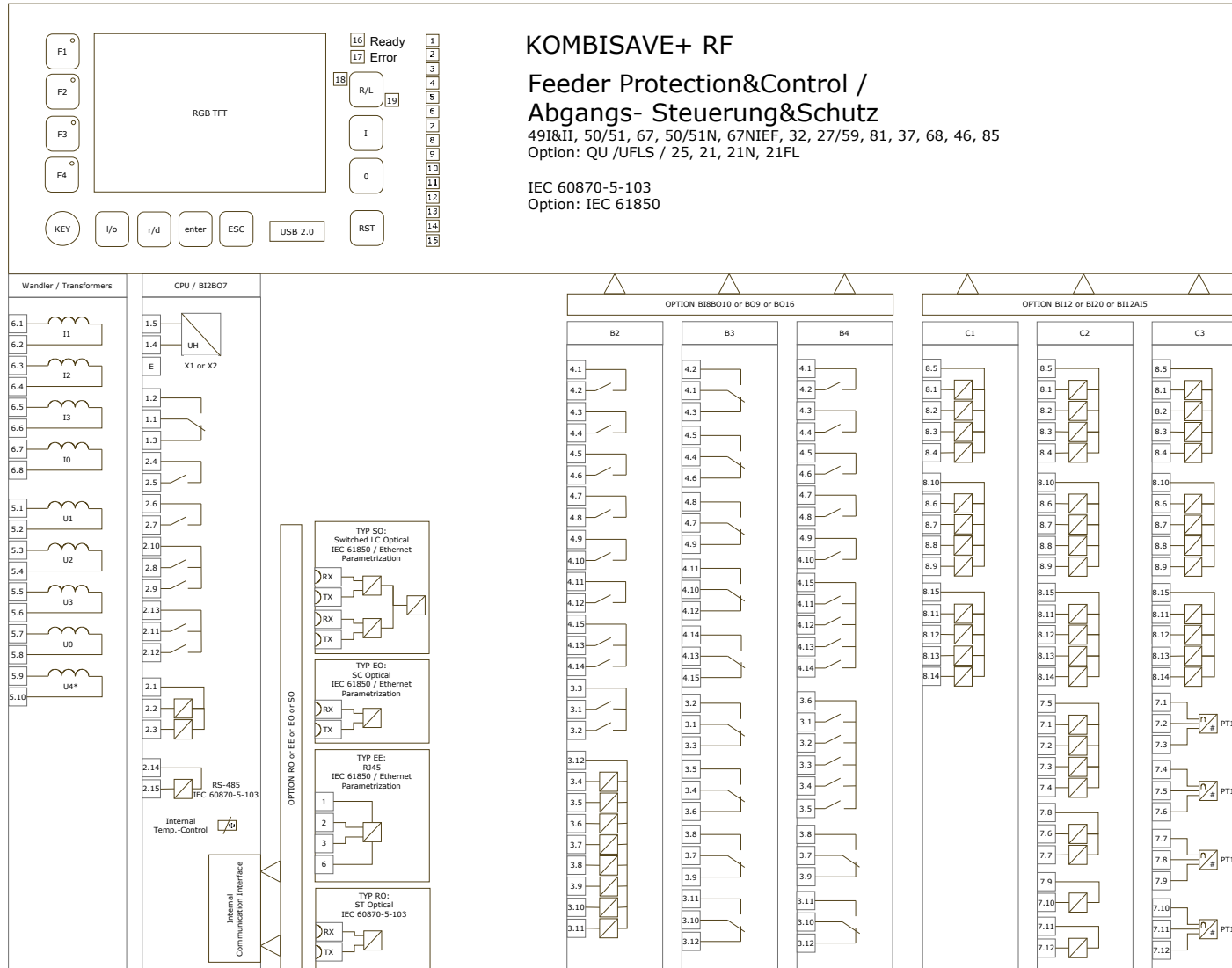
KOMBISAVE+ / TECHNICAL SPECIFICATIONS

Hardware	RN (I4U0)	RQ (I8U0)	RF (I4U4X/5X)
Dimensions 19"/2; 3HE	+	+	+
ARM microprocessor system: 1x or 2x for IEC 61850	+	+	+
Energy storage for event and fault recorder: POWERCAP <7d	+	+	+
Binary input CPU-Board: 20...60 / 80...250V AC/DC with integrated „contact cleaning system“; max. 220nF line capacity	CPU / 2x	CPU / 2x	CPU / 2x
Binary input B/C-Board: 20...60 / 80...160V DC with integrated „contact cleaning system“; max 220nF line capacity	B/C	B/C	B/C
Binary output 10A@250 VAC (2500VA); standard 6ms, high-speed 3ms	BO0...6 : high-speed BO7 ... : standard	BO0...6 : high-speed BO7 ... : standard	BO0...6 : high-speed BO7 ... : standard
Analog inputs	RN (I4U0)	RQ (I8U0)	RF (I4U4/5X)
Current transformers: Nominal current 1/5A; 50Hz; Range: 0.01...64xIn; <0.2VA; short-circuit connector	4	8	4
Voltage transformers: Nominal voltage 100/110/400(230)V; 50Hz; Range 0.05...440 VAC; <0.2VA	-	-	4 or 5
Auxiliary power supply	RN (I4U0)	RQ (I8U0)	RF (I4U4/5X)
X1: 22...28 V DC; P<10VA; bridging time (voltage dips) >50ms	X1	X1	X1
X2: 50...275 V AC; 44...250 V DC; P<10VA; bridging time (voltage dips) >50ms	X2	X2	X2
HMI and display	RN (I4U0)	RQ (I8U0)	RF (I4U4/5X)
Super sharp RGB TFT display with automatic switching to power-saving mode and alarm display on grid fault	+	+	+
Four function keys with white LEDs	+	+	+
Key switch for unlocked control operations	+	+	+
Local/remote key	+	+	+
Direct control keys	+	+	+
15 tri-color LEDs	+	+	+
Dedicated green “READY” and red “ERROR” LED	+	+	+
USB 2.0 service interface for communication with PC or direct USB flash drive access	+	+	+
Communication	RN (I4U0)	RW (I8U0)	RF (I4U4X/5X)
Standard: Electric RS-485 interface for IEC 60870-5-103	+	+	+
Optional: Fiber optic interface for IEC 60870-5-103	RO	RO	RO
Standard: XML parameterization over USB	+	+	+
Optional: Electric Ethernet interface including parameterization over Ethernet	EE	EE	EE
Optional: Fiber optic Ethernet interface including parameterization over Ethernet	EO	EO	EO
Optional: Switched fiber optic Ethernet interface including parameterization over Ethernet	SO	SO	SO
Optional: IEC 61850 MMS and GOOSE (Ethernet interface necessary)	50	50	50

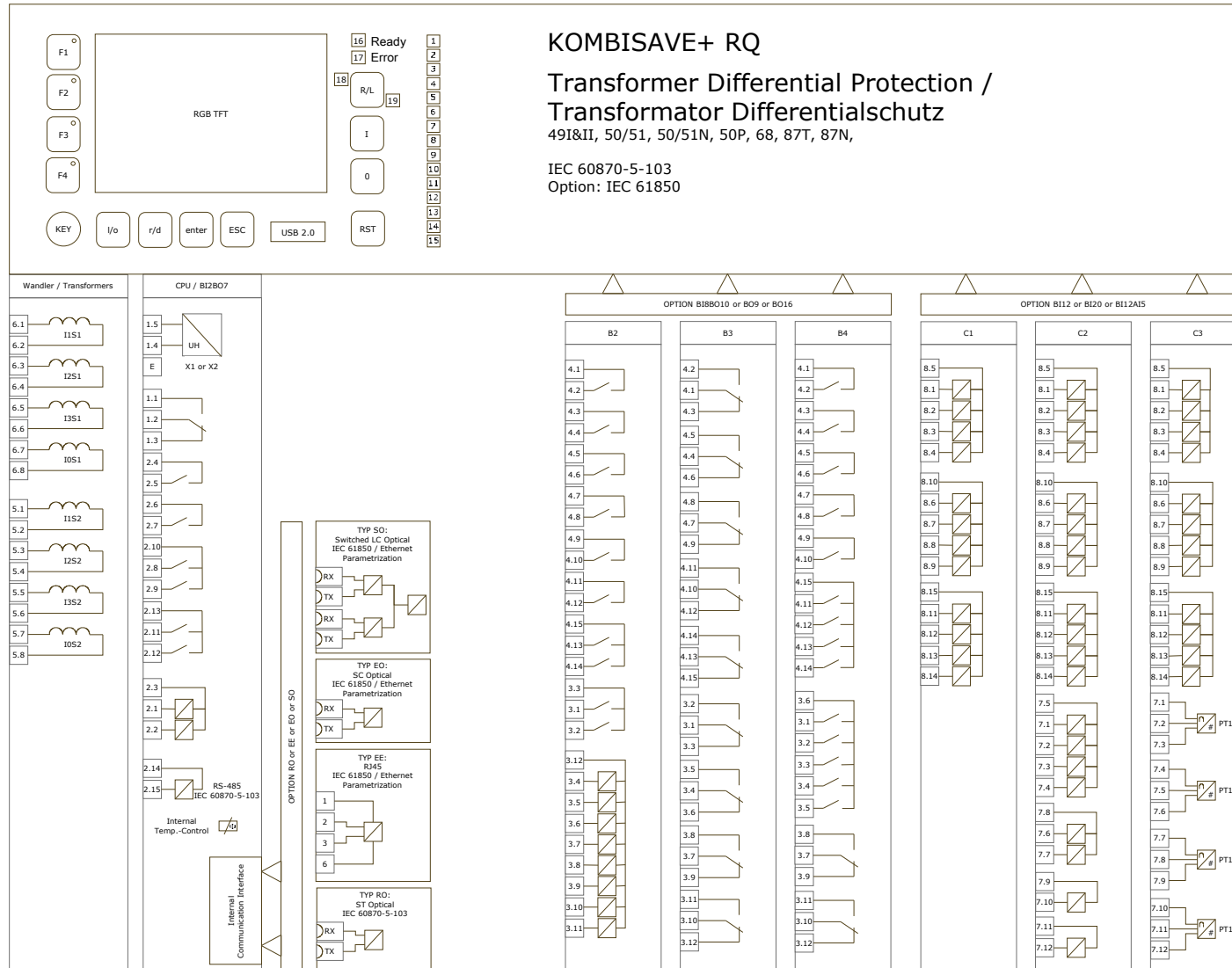
KOMBISAVE+ RN / ELECTRICAL WIRING DIAGRAM



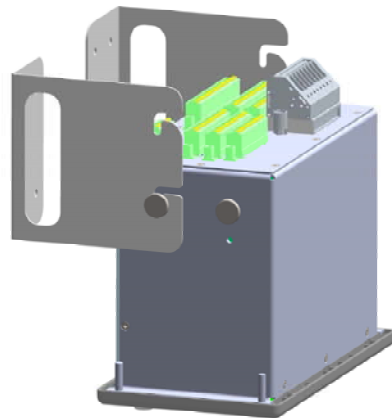
KOMBI SAVE+ RF / ELECTRICAL WIRING DIAGRAM



KOMBI SAVE+ RQ / ELECTRICAL WIRING DIAGRAM

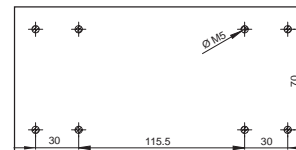
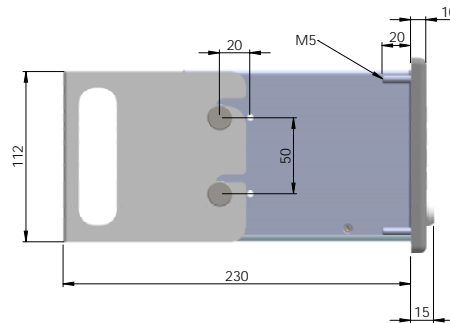
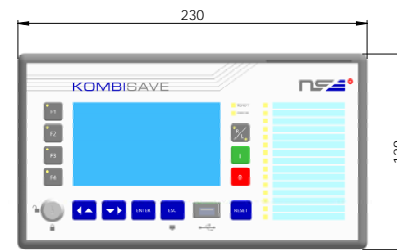


KOMBISAVE+ / MECHANICAL CONSTRUCTION

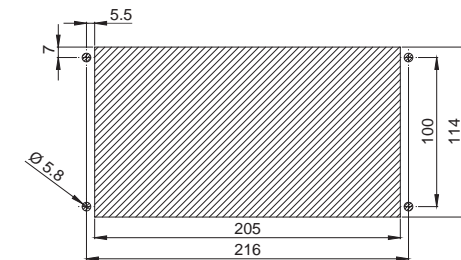
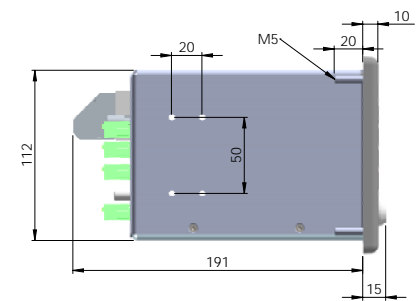
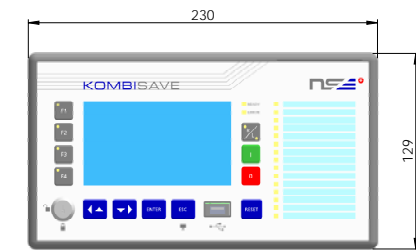


When mounted in brackets KOMBISAVE can be tilted down for easy access to the connectors.

Surface-Mount Chassis



Panel-Mount Chassis



KOMBISAVE+ RN / OVERCURRENT AND MOTOR PROTECTION RELAY WITH FIELD CONTROL



Hardware: Overcurrent and motor protection relay with field control	KOMBISAVE+ RN	-	-	I4U0	-	-	RS	-
Auxiliary power supply 22...28V DC <10W 44...250V DC / 50...275V AC 50/60Hz < 10W		X1 X2						
Analog inputs 4x CT: 1A/5A (configurable), short-circuit connector				I4U0				
Basic equipment (CPU board) Binary Inputs: 2x 20...60V AC/DC / 80...250V AC/DC (configurable) Binary Outputs: 6x 2500VA / 3ms Watchdog: 1x 2500VA / 3ms								
Additional in- and outputs B (combinable with C) Binary Inputs : 8x 20...60V DC / 80...250V DC (configurable) +Binary Outputs: 10x 2500VA / 6ms Binary Outputs: 9x 2500VA / 6ms; 9x changeover Binary Outputs: 16x 2500VA / 6ms; 2x changeover					B2 Cx B3 Cx B4 Cx			
Additional inputs C (combinable with B) Binary Inputs: 12x 20...60V DC / 80...250V DC (configurable) Binary Inputs: 20x 20...60V DC / 80...250V DC (configurable) Binary Inputs: 12x 20...60V DC / 80...250V DC (configurable) +Analog Inputs: 4x PT100					Bx C1 Bx C2 Bx C3			
Standard 1. Communication Control system interface RS-485 electric for IEC 60870-5-103							RS	
Optional 2. Communication No further communication interface Control system interface serial fiber optic for IEC 60870-5-103 (ST-Plug, 820nm) Control system interface Ethernet electric (RJ45-Plug) DIGICOM over Ethernet Control system interface Ethernet fiber optic (SC-Plug, 1300nm) DIGICOM over Ethernet Control system interface switched Ethernet fiber optic (2xLC-Plugs, 1300nm) DIGICOM over Ethernet								00 RO EE EO SO
Software: Overcurrent and motor protection relay with field control								
Communication requires KOMBISAVE+ RN ...-EE/EO/SO No further communication protocol Communication protocol IEC 61850				00 50				
Station automation and visualization / Field control No station automation and visualization / Field control Station automation and visualization / Field control								00 AU

KOMBISAVE+ RF / FEEDER PROTECTION RELAY WITH FIELD CONTROL



Hardware: Feeder protection relay with field control	KOMBISAVE+ RF	-	-	-	-	-	RS	-
Auxiliary power supply 22...28V DC <10W 44...250V DC / 50...275V AC 50/60Hz < 10W		X1 X2						
Analog Inputs 4x CT: 1A/5A (configurable), short-circuit connector 4x VT: 100V AC, 110V AC, 400V AC (configurable)				I4U4X				
4x CT: 1A/5A (configurable), short-circuit connector 5x VT: 100V AC, 110V AC, 400V AC (configurable)				I4U5X				
Basic equipment (CPU board) Binary Inputs: 2x 20...60V AC/DC / 80...250V AC/DC (configurable) Binary Outputs: 6x 2500VA / 3ms Watchdog: 1x 2500VA / 3ms								
Additional in- and outputs B (combinable with C) Binary Inputs : 8x 20...60V DC / 80...250V DC (configurable) +Binary Outputs: 10x 2500VA / 6ms Binary Outputs: 9x 2500VA / 6ms; 9x changeover Binary Outputs: 16x 2500VA / 6ms; 2x changeover					B2 Cx B3 Cx B4 Cx			
Additional inputs C (combinable with B) Binary Inputs: 12x 20...60V DC / 80...250V DC (configurable) Binary Inputs: 20x 20...60V DC / 80...250V DC (configurable) Binary Inputs: 12x 20...60V DC / 80...250V DC (configurable) +Analog Inputs: 4x PT100					Bx C1 Bx C2 Bx C3			
Standard 1. Communication Control system interface RS-485 electric for IEC 60870-5-103							RS	
Optional 2. Communication No further communication interface Control system interface serial fiber optic for IEC 60870-5-103 (ST-Plug, 820nm) Control system interface Ethernet electric (RJ45-Plug) DIGICOM over Ethernet Control system interface Ethernet fiber optic (SC-Plug, 1300nm) DIGICOM over Ethernet Control system interface switched Ethernet fiber optic (2xLC-Plugs, 1300nm) DIGICOM over Ethernet								00 RO EE EO SO

KOMBISAVE+ RF / FEEDER PROTECTION RELAY WITH FIELD CONTROL

Software: Feeder protection relay with field control	-	-	-	-	-	-	-	-	-00-00-00-
Communication requires KOMBISAVE+ RF-EE/EO/SO									
No further communication protocol	00								
Communication protocol IEC 61850	50								
Synchronism check									
No synchronism check			00						
Synchronism check (25)			SY						
Smart grid protection									
No Smart grid protection					00				
Q-V protection (QV)					QU				
Under frequency load shed (UFLS)					UL				
Q-V protection and under frequency load shed (QV & UFLS)					QF				
Fault Locator									
No fault locator						00			
Fault locator (21FL)						FO			
Distance protection									
No distance protection							00		
Distance protection with I, VI and Z< start module (21P, 21N, 21G)							ZP		
Station automation and visualization / Field control									
No station automation and visualization / Field control									00
Station automation and visualization / Field control									AU



KOMBISAVE+ RQ / TRANSFORMER DIFFERENTIAL PROTECTION RELAY WITH FIELD CONTROL



Hardware: Transformer differential protection relay with field control	KOMBISAVE+ RQ	-	-	18U0	-	-	RS	-	...
Auxiliary power supply 22...28V DC <10W 44...250V DC / 50...275V AC 50/60Hz < 10W		X1 X2							
Analog inputs 8x CT: 1A/5A (configurable), short-circuit connector				18U0					
Basic equipment (CPU board) Binary Inputs: 2x 20...60V AC/DC / 80...250V AC/DC (configurable) Binary Outputs: 6x 2500VA / 3ms Watchdog: 1x 2500VA / 3ms									
Additional in- and outputs B (combinable with C) Binary Inputs : 8x 20...60V DC / 80...250V DC (configurable) +Binary Outputs: 10x 2500VA / 6ms Binary Outputs: 9x 2500VA / 6ms; 9x changeover Binary Outputs: 16x 2500VA / 6ms; 2x changeover						B2 B3 B4	Cx Cx Cx		
Additional inputs C (combinable with B) Binary Inputs: 12x 20...60V DC / 80...250V DC (configurable) Binary Inputs: 20x 20...60V DC / 80...250V DC (configurable) Binary Inputs: 12x 20...60V DC / 80...250V DC (configurable) +Analog Inputs: 4x PT100						Bx Bx Bx	C1 C2 C3		
Standard 1. Communication Control system interface RS-485 electric for IEC 60870-5-103							RS		
Optional 2. Communication No further communication interface Control system interface serial fiber optic for IEC 60870-5-103 (ST-Plug, 820nm) Control system interface Ethernet electric (RJ45-Plug) DIGICOM over Ethernet Control system interface Ethernet fiber optic (SC-Plug, 1300nm) DIGICOM over Ethernet Control system interface switched Ethernet fiber optic (2xLC-Plugs, 1300nm) DIGICOM over Ethernet									00 RO EE EO SO
Software: Transformer differential protection relay with field control									
Communication requires KOMBISAVE+ RQ ...-EE/EO/SO No further communication protocol Communication protocol IEC 61850				00 50					
Differential protection Two-winding transformer differential protection							TF		
Station automation and visualization / Field control No station automation and visualization / Field control Station automation and visualization / Field control									00 AU

SOFTWARE

Software for configuration and operation SAVE protection relays	DIGICOM	-
<p>Relay parameterization</p> <ul style="list-style-type: none"> - USB or Ethernet (if interface is present on device) - Parameterization with access to protection manuals <ul style="list-style-type: none"> - Adaptation to protected object - Adaptation to grid - Transformer adaption (CT, VT) - Protection functions, grouped and structured - I/O matrix for hardware in- and outputs, communication, LEDs, logic in- and outputs of PLC - Hardware configuration (display timeout, minimum activation time of relays, etc.) - Communication settings - IEC 60870-5-103 data points - IEC 61850 <ul style="list-style-type: none"> - Server configuration - Data set definitions - Report control block definitions - GOOSE control block definitions - Network input configuration - Intelligent control object configuration - Export of ICD files - Import of ICD files - Station automation and visualization (PLC engineering tool, logic editor): Function has to be enabled in device as "AU" option! <ul style="list-style-type: none"> - Create station visualization - Configure intelligent control objects - Create status collection with virtual LEDs and dynamic texts - Creation of customer-specific measured value displays - Creation of automation logic - Device passwords, licenses, date and time - Print function - Compare files - Manage data - Manuals for SAVE protection devices, protection functions, automation, XRIO filter - Multilingual (English, German, French, Italian) 		BASIC
<p>Single user license with USB dongle</p> <ul style="list-style-type: none"> - Online device status (also over Ethernet if interface available) - Event list: read out, export to EXCEL - Analyze disturbance data (Measured data, RMS, harmonic analysis, vector display) with DIGIVIEW - Service and test functions - IEC 60870-5-103 test tool - Firmware update - Visualize distance protection characteristic in R/X monitor - Visualize differential protection characteristic - Analyzer for automation logic 		ADVANCED
<p>Multiuser license</p> <ul style="list-style-type: none"> - All functions of the Advanced license in the form of a unlimited company license (key is provided as a file and can be distributed / copied within the company / contract partners unlimited) 		MULTIUSER ADVANCED



System requirement

- Windows XP, Windows 7 (32 or 64bit version), Windows 10
- Memory requirements approx. 200 MB
- No installation required

INNOVATION AT A GLANCE



HARDWARE

Wide range power supply

Wide range binary inputs

„Contact Fritting“

Current monitoring of binary inputs

Fast electromechanical output relays

Advanced EMC tests

Wide range current transformer inputs

Wide range voltage transformer inputs

Plug connectors (short-circuit current connectors)

High-resolution color display

SuperCaps – no batteries necessary



FUNCTIONS

RMS and 50Hz vectors for protection and measurement

No aging: use of software-based filters

Stabilized distance protection

Stabilized differential protection

Completely IEC 61850 Ed.1 and Ed.2 compatible

Self explanatory menu guidance, operation and parameterization

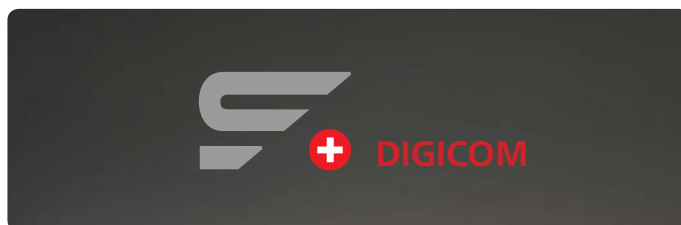
Built-in protection logic

Built-in logic (PLC)

Compensation of current transformer saturation

Ground fault protection for intermittent earth faults

Transient Earth Fault Protection: EU-Patent PCT/CH 2015/000152
 Stabilized Distance Protection: EU-Patent PCT/CH 2015/000017



SOFTWARE

- Protection and automation in one
- Flat menu structures for self-explanatory operation
- No installation required
- Small memory requirements, compact parameter files
- Runs under Windows XP, Windows 7, and Windows 10
- Useful test tools
- Interface to OMICRON test software (XRIO)
- Data readable and available in XML
- Import and export of ICD files
- Simple creation of station visualization
- Graphical visualization of complex protection functions

NOTE

IEC is a registered trademark of the “International Electrotechnical Commission”

IEEE is a registered trademark of the “Institute of Electrical and Electronics Engineers”

KOMBISAVE, DIGICOM and DIGIVIEW are trademarks of NSE AG

NSE reserves the right at any time to modify the product specifications described herein without notice and obligation to notify

© 2018, NSE AG.

NSE AG

Bremgarterstrasse 54
CH-5610 Wohlen
Tel.: +41 56 618 77 99
Fax.: +41 56 618 77 90
Mail: info@nse.ch
Internet: www.nse.ch

PHOENIX CONTACT Energy Automation GmbH

Am Rosenhügel 1–7
42553 Velbert, Deutschland
Tel.: +49 2053 4239-0
Fax: +49 2053 4239-199
E-Mail: energy.automation@phoenixcontact.com
phoenixcontact.com