Remote Monitoring and Control Unit

REC 523

Product Guide

Issued: April 1999
Status: Updated
Version: E/12.01.2009
Data subject to change without notice

Features

- Remote control and monitoring unit for the control of medium voltage disconnectors, switches, ring-main units and other substation secondary equipment
- Current and voltage measurement by means of conventional transformers or current and voltage sensors
- Extended functionality for protection and fault indication, control, measurement, condition monitoring, power quality and communication
- Protection functions including e.g. non-directional and directional overcurrent and earth-fault protection, undervoltage protection and auto-reclosing
- Control functions including local and remote control of switching objects, status indication of the switching objects and interlockings on bay and station level
- Measurement of phase currents, phase-to-phase and phase-to-neutral voltages, residual current and voltage, frequency, power factor, active and reactive power and energy, etc.
- Condition monitoring including circuit-breaker condition monitoring and internal self-supervision of the unit
- Additional functions including capacitor bank control and measurement of current and voltage harmonics
- Communication over three communication interfaces: one for local communication with a PC and two for remote communication with a network control centre or with a substation monitoring system
- Extensive, bidirectional information exchange between the power system process and the network control centre via several remote communication protocols
- Remote communication is possible via radio telephone, radio link, fixed lines, leased lines, public telephone lines, mobile phones (NMT/GSM), DLC and radio modems
- Operation, communication and reporting secured during power outages by means of external maintenance-free batteries
- Power supply unit including integrated temperature compensated battery charger
- Automatic heating control in low temperature and humid environments
- Outlet for communication device, e.g. conventional radio
- Management via network control system, e.g. MicroSCADA
- Continuous self-supervision of hardware and software
- Part of the ABB Distribution Automation system

Application

The remote monitoring and control unit REC 523 is designed to be used for remote and local control, protection and fault indication, condition monitoring, supervision and automation of secondary substations in medium voltage networks. It can be used with various ring main units (RMUs), air-insulated and SF_6-insulated disconnectors, switches and other remote-controlled substation secondary equipment.

The protection and fault indication functions support different type of networks such as isolated neutral network, resonant-earthed networks and partially earthed networks.

In addition to protection, measurement, control, condition monitoring and general functions, the unit is provided with a variety of PLC functions allowing several automation and sequence logic functions needed for feeder automation to be integrated into one unit, for example current based or voltage-time automatic sectionalizing.

The data communication capabilities include IEC 60870-5-101 communication, SPA bus communication, DNP 3.0 communication, Modbus communication or LON bus communication with higher-level equipment. Further, the LON communication together with the PLC functions minimizes the need for hardwiring between the units.

The freely programmable LED display facilitates status indication of local I/Os and thus also of the RMU, disconnectors or switches.

Design

The REC 523 remote monitoring and control unit incorporates a wide range of functions:

- Protection functions
- Measurement functions
- Power quality monitoring functions
- Control functions
- Condition monitoring functions
- General functions
- Communication functions
- Standard functions

The function blocks are documented on the CD-ROM “Technical Descriptions of Functions” (1MRS 750889-MCD).

Protection and fault indication functions

REC 523 provides a set of protection functions which also can be used for fault indication. The protection function blocks supported by REC 523 are independent of each other and have their own setting groups, data recording, etc.

The typical current-based protection functions (e.g. overcurrent) can use either Rogowski coil or conventional current transformer measurement. Correspondingly, voltage-based functions (e.g. undervoltage) use either voltage dividers or voltage transformers.

By means of the fault indication functions the network control system can obtain information about measured and set values. The information can be used, for instance, to locate faults in a medium voltage distribution network. The wide energizing input ranges of transformers and sensors facilitate monitoring and fault indication in different types of substation.

Measurement functions

Measurement functions include three phase currents, neutral current, three-phase voltages, residual voltage, frequency, active and reactive power and power factor. In addition, other measurement functions are available.

As a standard feature the REC 523 remote monitoring and control unit includes three pulse-counter inputs.

Disturbance recorder

The transient disturbance recorder is capable of recording 16 current or voltage waveforms and 16 logic digital signals. The sampling frequency of the analogue inputs is 2 kHz at 50 Hz rated frequency of and 2.4 kHz at 60 Hz rated frequency .

The user can set the length of a recording within a range determined by the number of analogue inputs used. The number of recordings depends on the sampling frequency, length of recordings and number of analogue inputs.

The recordings can be uploaded with a DR-Collector Tool which converts the data to a COMTRADE format. The DR-Collector Tool is supported in CAP 501 and CAP 505 relay tools.

Power quality functions

The power quality functions enable measurement of total harmonic distortion (THD) of voltage and current, and the total demand distortion (TDD) of current. Individual harmonics are measured up to the 13th.order.

The power quality functions produce statistical data about harmonic distortion for long term evaluation. Short time average and maximum values for the THD and the individual harmonics are also supported.

LIB 510 supports graphical presentation of harmonics in the PQ Monitoring Tool.

Control functions

The control functions are used to indicate the status of switching devices, i.e. circuit breakers and disconnectors, and to execute open and close commands for controllable switching devices of the switchgear. Furthermore, control functions provide on/off switching objects for control logic purposes and miscellaneous objects for data monitoring, etc.

The control functions configured with the Relay Configuration Tool must be linked to the object status LED indicator panel.

Power factor controller (option)

The function is designed to be used for controlling the switching of capacitor banks based on the reactive power requirements of the load in the network. The power factor controller of REC 523 controls a maximum of four capacitor banks.

Condition monitoring functions

The condition of the batteries is secured by periodic condition monitoring tests. The unit measures the battery voltage continuously, also during the condition monitoring test. The minimum voltage value will be recorded in the memory. The condition and lifetime of the batteries can be estimated on the basis of the minimum values recorded.

Regular reinitialization is used for monitoring the condition of an external modem. The monitoring and control unit reinitializes the modem when there has not been any successful communication within a certain period of time.

Condition monitoring function blocks such as supervision of the energizing current and voltage input circuit, operation time counter, scheduled maintenance and breaker travel time are available for the REC 523 units.

General functions

Additional functions are available for different general tasks to be used in logics, switchgroups, and resetting of operation indications, latched output signals, registers and disturbance recorder.

Standard functions

Standard functions are used for logics such as interlocking, alarms and control sequencing. The use of logic functions is not limited and the functions can be interconnected to protection, control, measurement, condition monitoring and other standard functions. In addition, digital inputs, outputs, LON inputs and outputs can be connected to standard functions by using the Relay Configuration Tool (CAP 505).

Battery backup

The battery backup of the station can be arranged by using two 12 V sealed lead acid batteries connected in series to the monitoring and control unit. The integrated temperature-compensated switched-mode battery charger charges the batteries under normal conditions and supplies the power needed by the unit during power outages. Thus the operation of the unit and the communication between the substation and the network control centre are always secured.

Data communication

For remote communication purposes the unit is provided with an RS-232 serial port.

The RS-232 serial port with SPA protocol and LON protocol are used for local communication with a PC, used e.g. for parameterization by means of the CAP 505 tool.

Supported field bus protocols are the LON bus and the SPA bus. Network management protocols supported are IEC 60870-5-101, MODBUS or DNP3.0.

Other functions

Low auxiliary voltage indication

The REC 523 unit is provided with a low auxiliary voltage indication feature. The power supply module issues an internal alarm signal when a drop in the power supply voltage is detected (ACFail, active low). The alarm signal is activated if the power supply voltage falls about 10% below the lowest rated AC/DC input voltage of the power supply module.

The indication of low auxiliary voltage is available in the unit configuration and can be connected to any signal output of the REC 523 unit.

Overtemperature indication

The REC 523 unit includes an internal temperature supervision function. The power supply module issues an internal alarm signal when overtemperature has been detected inside the unit enclosure. The alarm signal will be activated once the temperature inside the unit enclosure increases to +78°C (+75°...+83°C). The overtemperature indication is available in the unit configuration and can be connected to any signal output of the REC 523 units.

Analogue channels

The number of channels used depends on the selected unit type and the kind of matching transformers or sensor inputs used. A REC 523 remote monitoring and control unit can have a maximum of ten external analogue measurements. Furthermore, the unit includes virtual analogue channels for calculating the

phase-to-phase voltages, neutral current and residual voltage from phase currents and voltages.

The unit measures the analogue signals needed for protection, measuring, etc. via sensors or galvanically matching transformers.

A current sensor (Rogowski coil) or a voltage sensor can be connected to each sensor input. The REC 523 unit allows the user to configure each sensor input for the type of sensor to be used.

Each analogue channel of the unit is separately configurable using the CAP 505 Relay Product Engineering Tools.

A separate scaling factor can be set for each analogue channel. The factors enable differences between the ratings of the protected object and those of the measuring device (CTs, VTs etc.). The setting value 1.00 means that the rated value of the protected object is exactly the same as that of the measuring device.

Calculated analogue channels

The REC 523 unit includes virtual channels to obtain phase-to-phase voltages, neutral current and residual voltage when sensors are used. Current and voltage sensors are connected directly to the unit via coaxial cables and therefore residual connection of the phase currents or open-delta connection of the phase voltages cannot be made. Both amplitude and phase angle are calculated for the virtual channels.

Though primarily meant to be used with sensors, the calculated analogue channels can also be used with conventional current and voltage transformers.

Note! When sensitive earth-fault protection is needed, core balance transformers are not recommended to be replaced with the numerically derived sum of phase currents. Normally, an earth-fault setting below 10% of the rated value requires the use of a core balance transformer.

Digital inputs

The digital inputs of the unit are voltage controlled and optically isolated. The function of a digital input can be inverted. A programmable filter time removes debounces and short disturbances on a digital input. The filter time is set for each digital input separately.

Some specific digital inputs can be programmed to operate as pulse counters. When a digital input is programmed to operate as a pulse counter, the pulse counting frequency can be up to 100 Hz.

Oscillation suppression

The REC 523 units have two global parameters for the suppression of digital input oscillations. The settings of these parameters determine the oscillation level and hysteresis for all digital inputs. An event is generated in case oscillation is detected.

Attributes of a digital input for relay configuration

For each digital input the status of the input (value), the time tag for the status change (time) and the validity of the digital input (invalidity) can be issued by the attributes. These attributes are available in the configuration and can be used for various purposes.

Digital outputs

The outputs of the REC 523 unit are categorized as follows:

- HSPO: High-speed power output, double-pole contact, preferred for tripping purposes and for circuit breaker and disconnector control.
- SO: Signal output, either NO (Normally Open) or NO/NC (Normally Open/Normally Closed) contact. The output contact is a normal-duty contact and cannot be used for controlling a heavy load such as a circuit breaker.

LED display

The LED panel consists of power-on, IRF, STO and 21 freely programmable LEDs using the CAP 505 tool. Each LED has four states: ON, OFF, fast blinking, and slow blinking.

The state “ON” of the STO LED indicates when the unit is storing information into non-volatile memory.

External serial communications

The REC 523 has one RS-485 and two RS-232 serial communication ports. The 9-pole RS-485 connection X5.3 connects the REC 523 units to the distribution automation system via a SPA bus or a LON bus. The RS-232 port (X5.2) is used for the parameterization purposes. The second RS-232 port (X5.1) is used for the remote communication protocol.

The fibre-optic interface module type RER 103 is used for connecting the REC unit to the fibre-optic communication bus. This module supports both SPA bus and LON bus communication.

Self supervision

The REC 523 unit is provided with an extensive self-supervision system. The self-supervision system handles run-time fault situations and informs the user about existing faults via the remote communication and LON/SPA communication.

When a fault has been detected the red IRF LED indicator lights up. At the same time the unit delivers a fault signal to the self-supervision output relay and blocks the protection trip outputs.

The unit will try to recover from a fault either by restarting the module (I/O module) that reported the fault, or by restarting the whole unit. During restarting the IRF state will remain active until the internal selfsupervision program has determined that the unit is operating normally. If the fault is still persistent after restarting three times, the unit will be in permanent IRF state.

The fault code is stored in the memory and can be read from the unit.

Relay configuration

The Relay Configuration Tool, which is included in the CAP 505 Relay Product Engineering Tools, is used for configuring the REC 523 unit, protection and logic function blocks, control and measurement functions, timers and other functional elements included in the logic functions category.

The Relay Configuration Tool is based on the IEC 61131-3 standard. The programmable system of REC 523 unit allows the output contacts to be operated in accordance with the state of the logic inputs and the outputs of protection and fault indication, control, measurement and condition monitoring functions. The PLC logics (e.g. interlocking and alarm logic) are programmed with Boolean functions, timers, counters, comparators and flip-flops. The program is written in the function block diagram language by using the configuration software.

Lon network configuration with LNT 505

The Lon network configuration tool is used for binding network variables between the units. Typically, LON is used for transferring status data between units.

Relay parameterization

The parameters of the units can be set via the serial communication using the Relay Setting Tool CAP 501/CAP 505.

External parameterization

The Relay Setting tool CAP 501 is used for parameterizing the units. The parameters can be set off-line in a PC and downloaded to the unit over a communication port. The setting parameters can be chosen from the hierarchical menu structure.

Terminal connections

All external circuits are connected to the terminal blocks on the rear panel. The terminal block for the measuring transformers consists of fixed screw terminals.

ABB’s sensors (Rogowski coils or voltage sensors) are connected to the unit with special-type shielded twin BNC connectors. This type of connectors is used to improve reliability and protection against disturbances. Unused sensor inputs must be short-circuited with a special connector 1MRS 1200515.

The digital input and output contacts of the units are connected to the multi-pole connectors.

The protective earth is connected to the screw, marked with the earth symbol.

Connector descriptions:

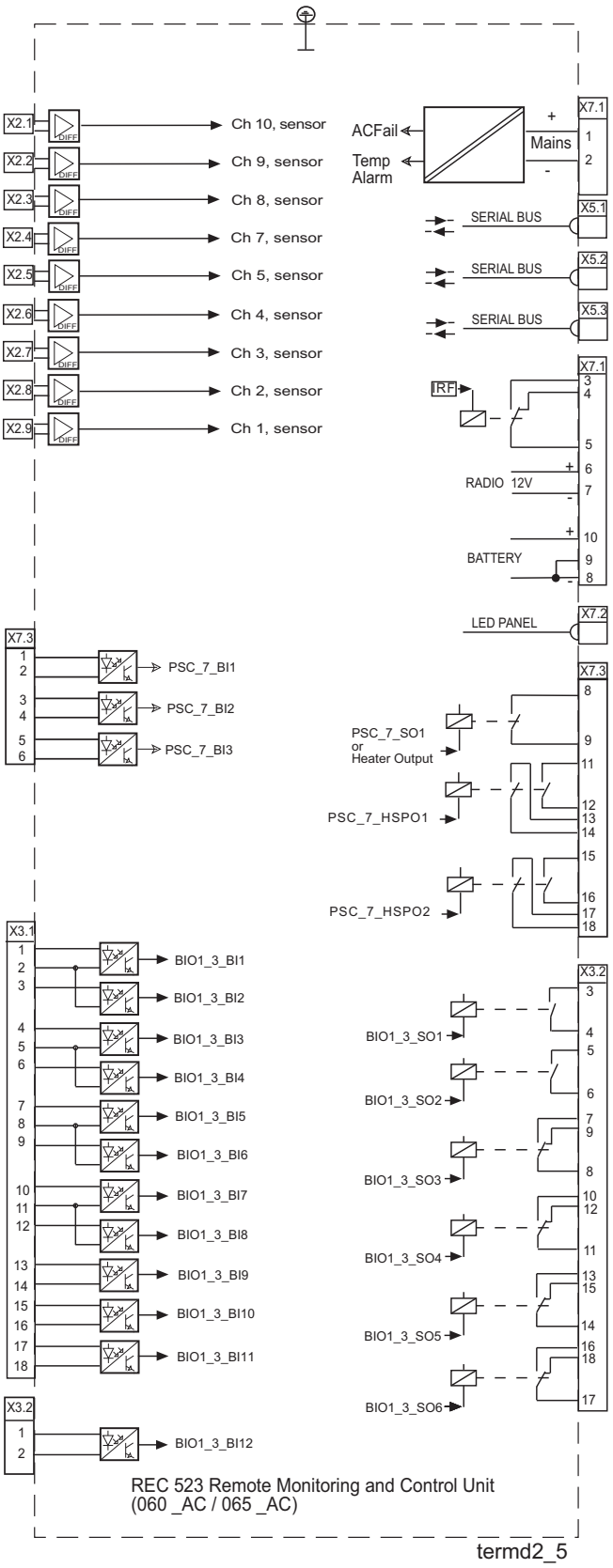

Fig. 1 Terminal diagram of REC 523 with sensors (REC 523F 060_AC/REC523F 065_AC)

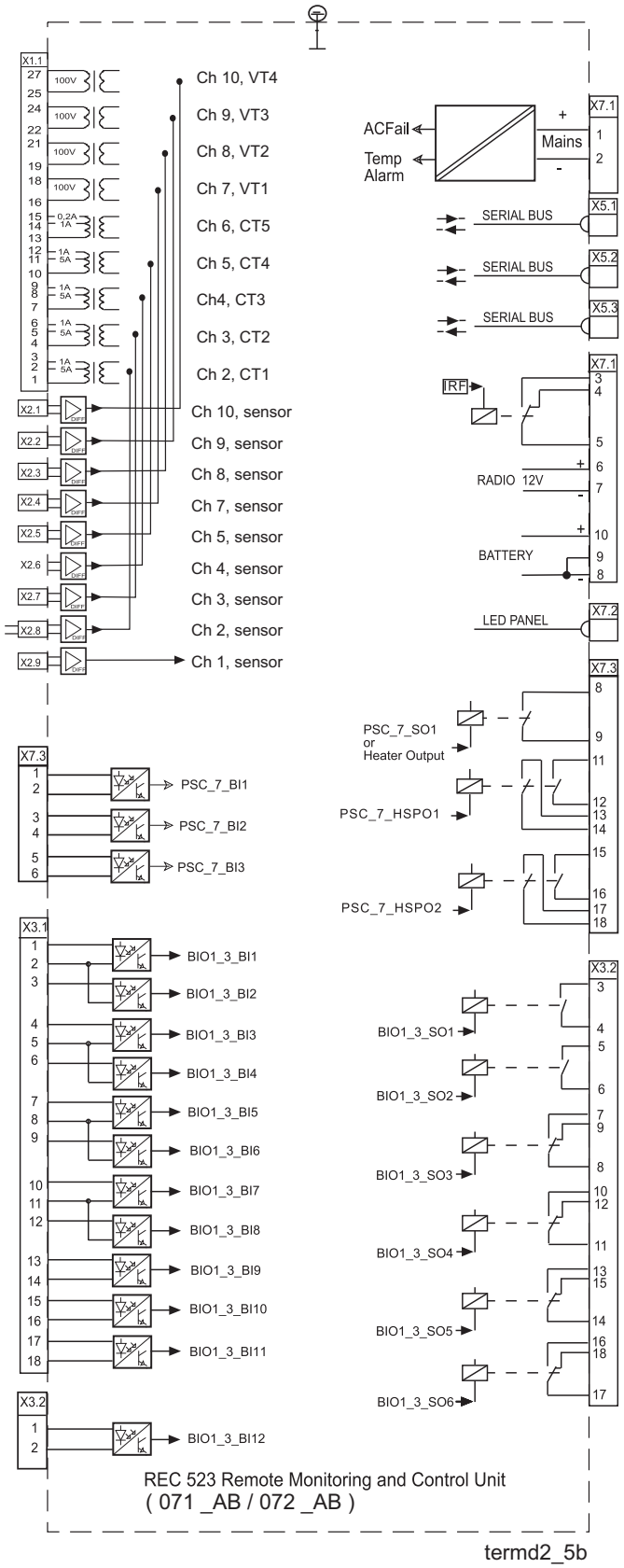

Fig. 2 Terminal diagram of REC 523 with five current transformers, four voltage transformers and nine sensor channels (REC 523F 071_AB/REC523F 072_AB

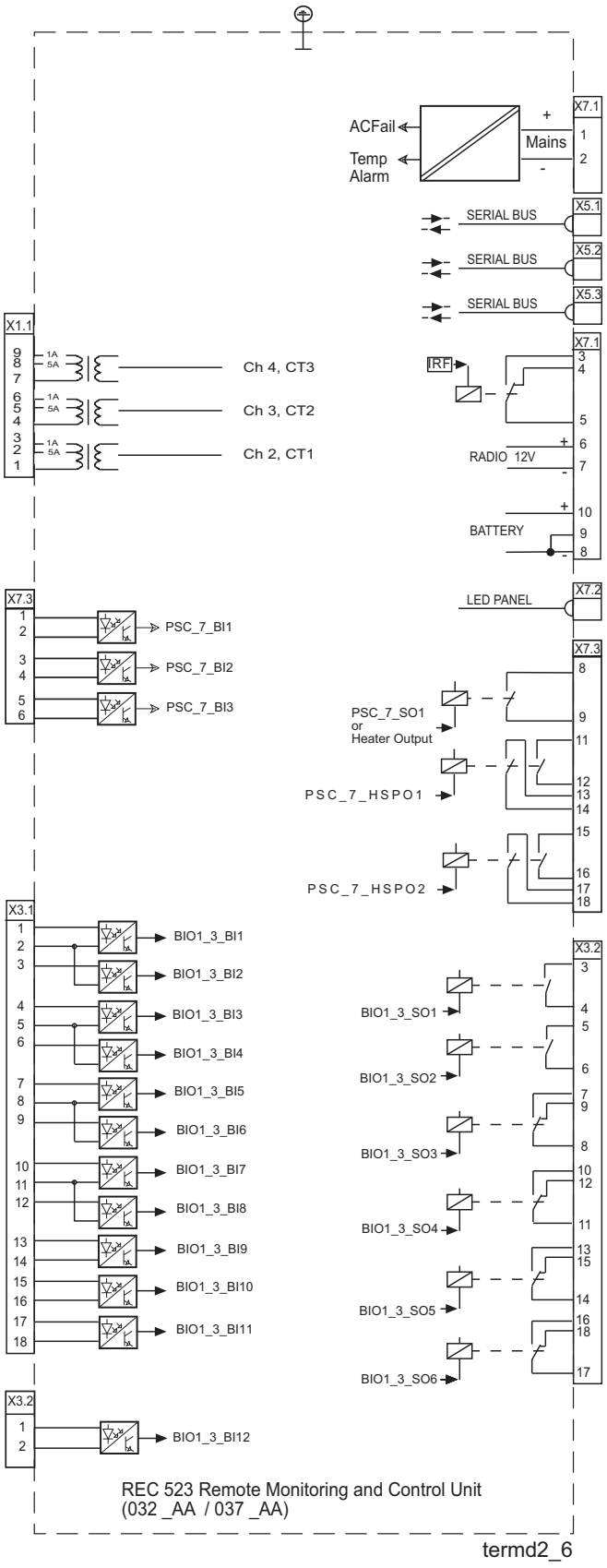

Fig. 3 Terminal diagram of REC 523 with three current transformers (REC 523F 032_AA/REC523F 037_AA)

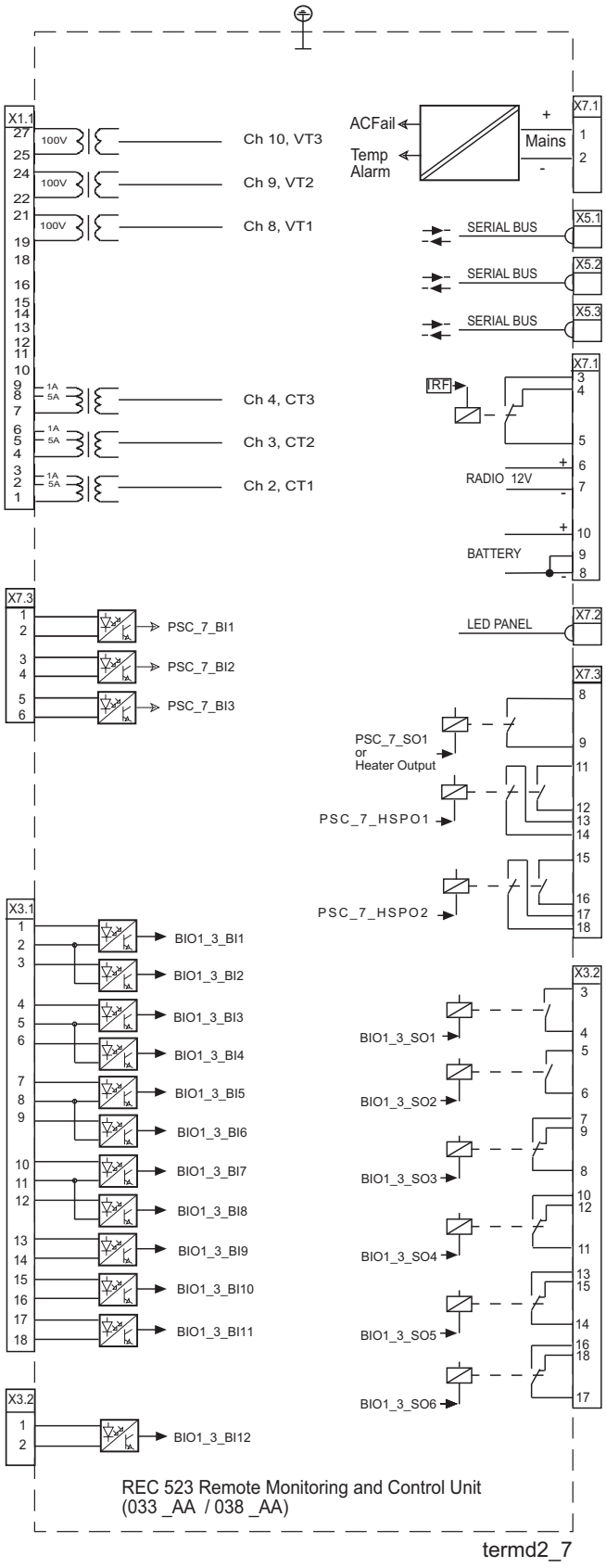

Fig. 4 Terminal diagram of REC 523 with three current and three voltage transformers (REC 523F 033_AA/REC523F 038_AA)

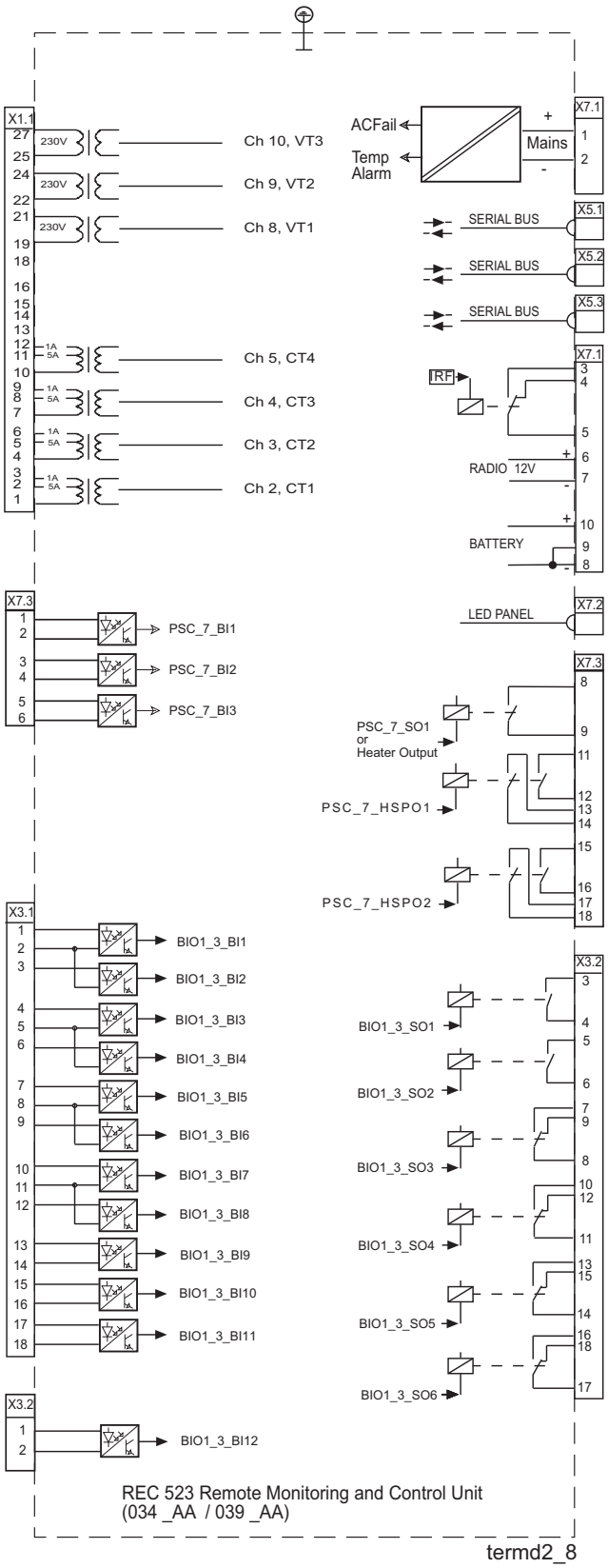

Fig. 5 Terminal diagram of REC 523 with four current transformers and three voltage transformers (REC 523F 034_AA/REC523F 039_AA)

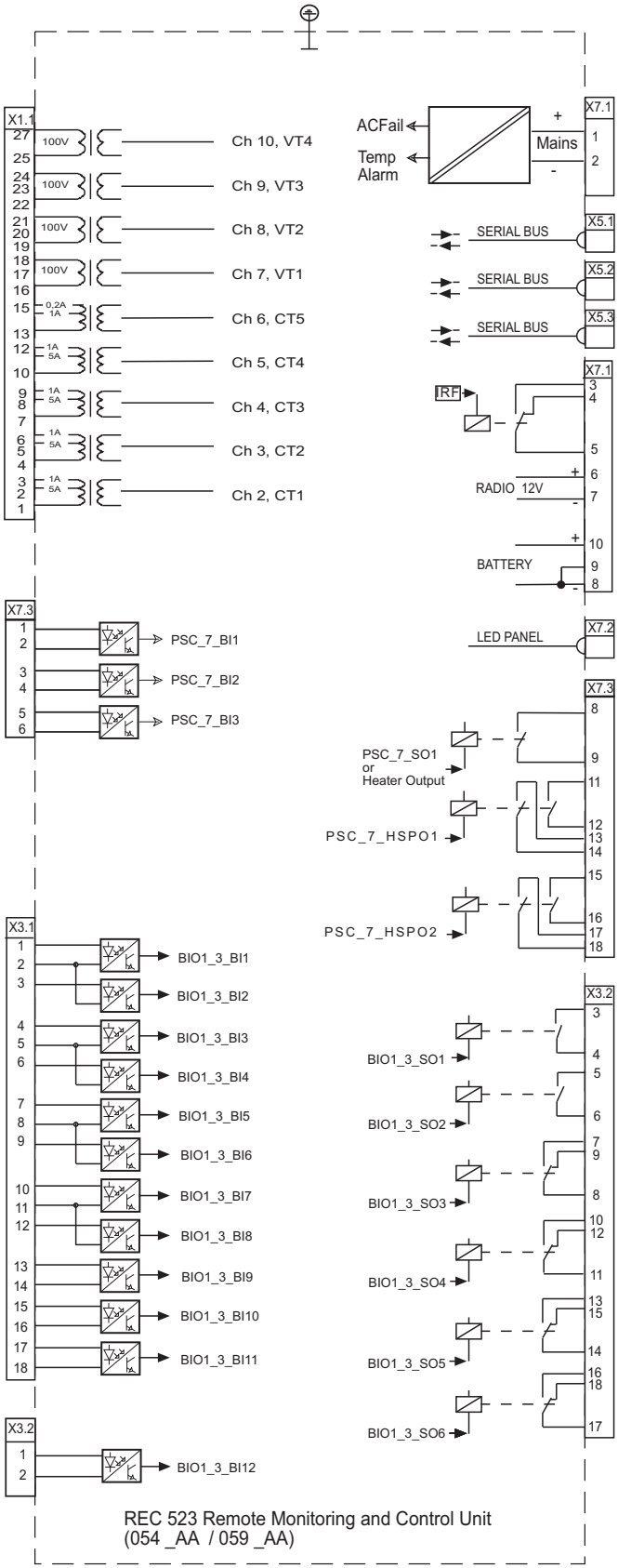

Fig. 6 Terminal diagram of REC 523 with five current and four voltage transformers (REC 523F 054_AA/REC523F 059_AA)

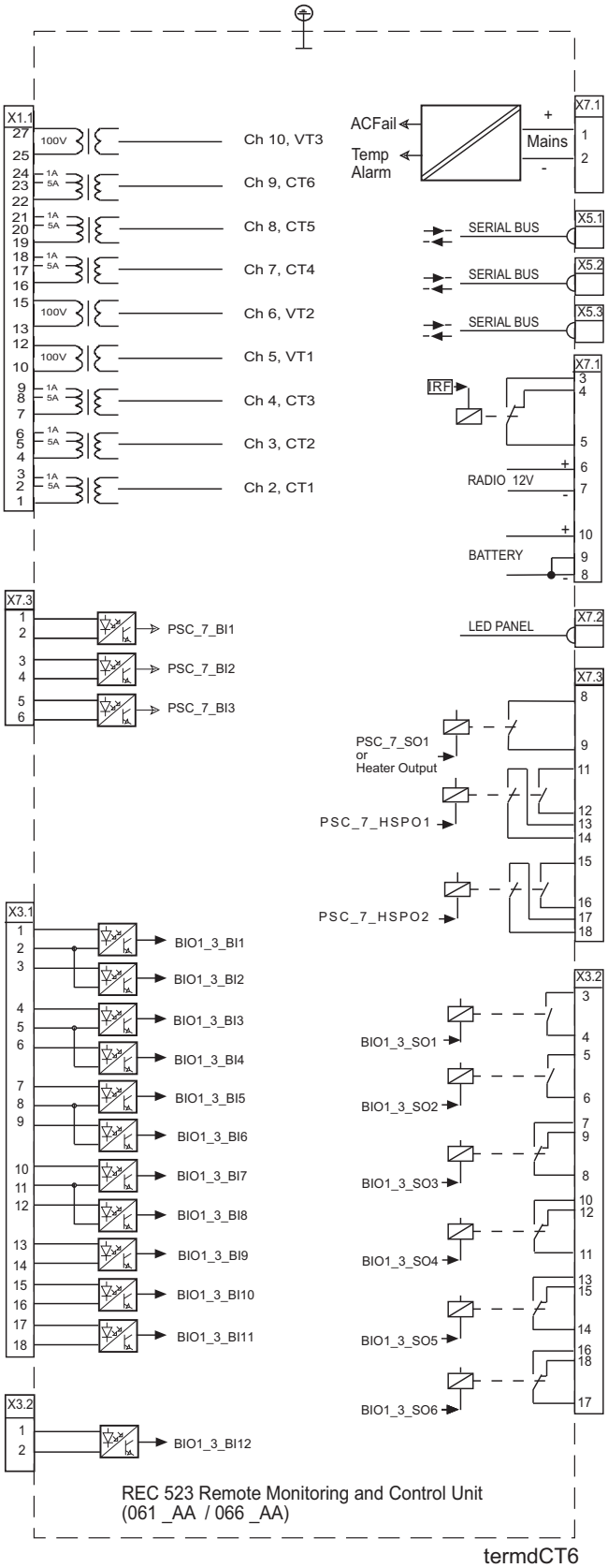

Fig. 7 Terminal diagram of REC 523 with six current and three voltage transformers (REC 523F 061_AA/REC523F 066_AA)

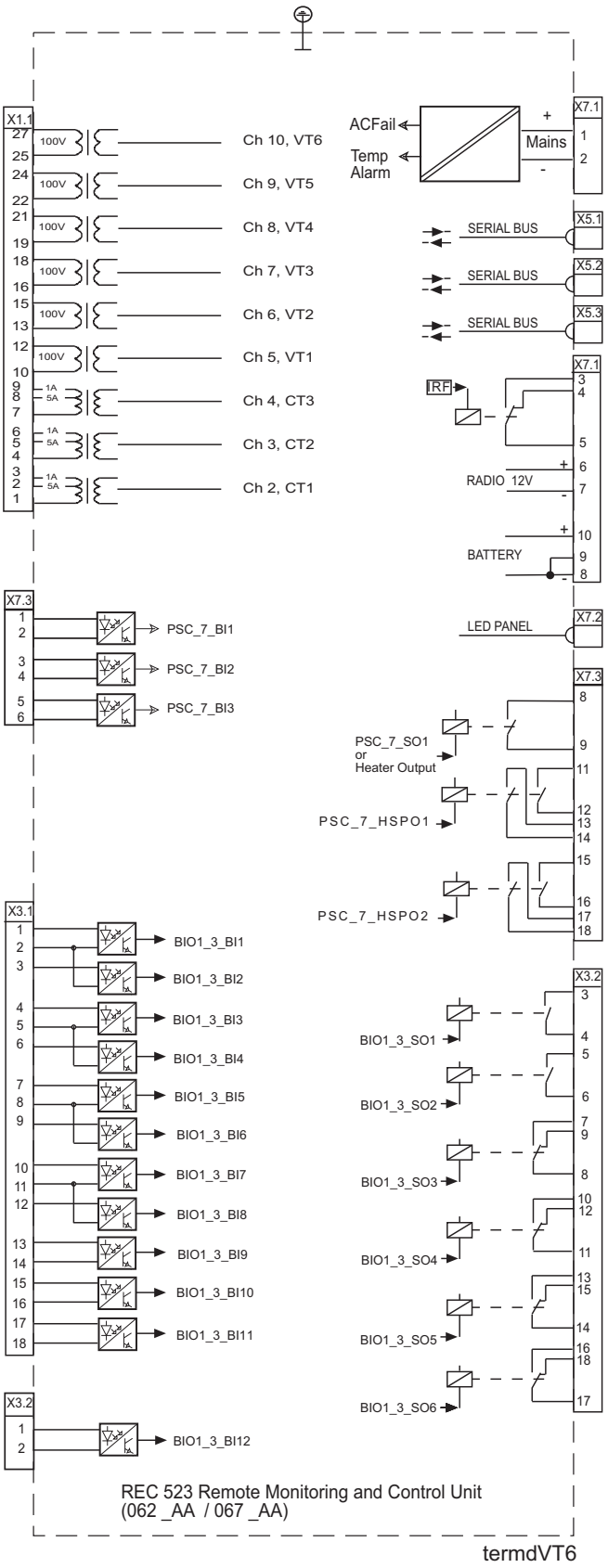

Fig. 8 Terminal diagram of REC 523 with three current and six voltage transformers (REC 523F 062_AA/REC523F 067_AA)

Auxiliary voltage

For its operation the REC 523 unit requires a auxiliary voltage supply. The unit's internal power supply module forms the secured voltages required by the relay electronics. The power supply module is a galvanically isolated (fly-back type) dc/dc converter. A LED indicator "ON" on the front panel is lit when the power supply module is in operation.

Power supply

There are two basic versions of power supply modules available for the REC 523: type PSC1 and type PSC2. The PSC1 module is used for the auxiliary voltage range 80…265 V ac/dc and PSC2 module for the range 18…80 V dc. The power supply version is specified by a letter combination in the hardware number of the REC 523 unit.

Functions

Table 1: General function blocks

Functions	Description
INDRESET	Resetting of operation indicators, latched output signals, registers and waveforms of i.e. in the disturbance recorder
SWGRP1…SWGRP20	Switchgroup SWGRP1…SWGRP20

Table 2: Standard function blocks

Functions	Description
ABS	Absolute value
ACOS	Principal arc cosine
ADD	Extensible adder
AND	Extensible AND connection
ASIN	Arc sine
ATAN	Arc tangent
BITGET	Get one bit
BITSET	Set one bit
BOOL_TO_*	Type conversion from BOOL to WORD/ USINT/ UINT/ UDINT/ SINT/ REAL/ DWORD/ DINT/ BYTE
BOOL2INT	Type conversion from BOOL inputs to INT output
BYTE_TO_*	Type conversion from BYTE to WORD/ DWORD
COMH	Hysteresis comparator
COS	Cosine in radians
CTD	Down-counter
CTU	Up-counter
CTUD	Up-down counter
DATE_TO_UDINT	Type conversion from DATE to UDINT
DINT_TO_*	Type conversion from DINT to SINT/ REAL/ INT
DIV	Divider
DWORD_TO_*	Type conversion from DWORD to WORD/ BYTE
EQ	Extensible comparison to equal
EXP	Natural exponential
EXPT	Exponentiation
F_TRIG	Falling edge detector
GE	Extensible comparison to greater or equal
GT	Extensible comparison to greater
INT_TO_*	Type conversion from INT to REAL/ DINT
INT2BOOL	Type conversion from INT input to BOOL outputs
LE	Extensible comparison to less or equal
LIMIT	Limitation
LN	Natural logarithm
LOG	Logarithm base 10
LT	Extensible comparison to less
MAX	Extensible maximum
MIN	Extensible minimum
MOD	Modulo
MOVE	Move
MUL	Extensible multiplier
MUX	Extensible multiplexer
NE	Comparison to greater or less
NOT	Complement
OR	Extensible OR connection
R_TRIG	Rising edge detector
REAL_TO_*	Type conversion from REAL to USINT/ UINT/ UDINT/ SINT/ INT/ DINT
ROL	Rotate to left
ROR	Rotate to right
RS	Reset dominant bistable function block
RS_D	Reset dominant bistable function block with data input
SEL	Digital selection
SHL	Bit-shift to left
SHR	Bit-shift to right
SIN	Sine in radians
SINT_TO_*	Type conversion from SINT to REAL/ INT/ DINT
SUB	Subtractor
SQRT	Square root
SR	Set dominant bistable function block
XOR	Extensible exclusive OR connection
TAN	Tangent in radians
TIME_TO_*	Type conversion from TIME to UDINT/ TOD/ REAL
TOD_TO_*	Type conversion from TOD to UDINT/ TIME/ REAL

Table 2: Standard function blocks

Functions	Description
TOF	Off-delay timer
TON	On-delay timer
TP	Pulse
TRUNC_*	Truncation toward zero
UDINT_TO_*	Type conversion from UDINT to USINT/ UINT/ REAL
UINT_TO_*	Type conversion from UINT to USINT/ UDINT/ REAL/ BOOL
USINT_TO_*	Type conversion from USINT to UINT/ UDINT/ REAL
WORD_TO_*	Type conversion from WORD to DWORD/ BYTE

Table 3: Condition monitoring function blocks

Functions	Description
CMBWEAR1	Circuit-breaker electric wear 1
CMBWEAR2	Circuit-breaker electric wear 2
CMCU3	Supervision function of the energizing current input circuit
CMGAS1	Gas pressure monitoring
CMGAS3	Three-pole gas pressure monitoring
CMSCHED	Scheduled maintenance
CMSPRC1	Spring charging control 1
CMTIME1	Operate time counter 1 for the operate time used (motors)
CMTIME2	Operate time counter 2 for the operate time used (motors)
CMTRAV1	Breaker travel time 1
CMVO3	Supervision function of the energizing voltage input circuit

Table 4: Control function blocks

Functions	Description
COCB1	Circuit breaker 1 control with indication
COCB2	Circuit breaker 2 control with indication
CO3DC1	Three-state disconnector 1 with indication
CO3DC2	Three-state disconnector 2 with indication
CODC1…COCD5	Disconnector 1…5 control with indication
COIND1...COIND8	Switching device 1...8 indication
COLOCAT	Logic-controlled control position selector

Power factor controller, COPFC	
The number of capacitor banks to be controlled	1...4
The relational step sizes and the type of the switching sequence	1:1:1:1 linear; 1:1:1:1 circul.; 1:1:2:2 circul.; 1:2:2:2 linear; 1:2:2:2 circul.; 1:2:4:4 linear; 1:2:4:4 circul.; 1:2:4:8
Size of the first capacitor bank (should be the smallest)	10.0...50000.0 kvar
Target value for daytime cos φ	0.70...1.00
Day unit	Inductive; Capacitive
Target value for night-time cos φ	0.70...1.00
Night unit	Inductive; Capacitive
Setting the reconnection inhibit time (discharge time)	0.5...6000.0 s
Sensitivity in the inductive side	60.0...200.0%
Sensitivity in the capacitive side	0.0...100.0%
Alarm limit for the maximum reactive power	0.1...100.0 Mvar
Alarm limit for the minimum reactive power	-100.0...0.0 Mvar
Overvoltage limit when the switching in is inhibited	0.80...1.60 x Un
Operation mode	Not in use; Automatic mode; Manual mode; Testing mode
Starting the automatic testing sequence	Not activated; Start
Calculation method	Normal; Integral
Control principle	Progressive; Direct
Duration demand	0.5...6000.0 s
Day&night switch	Not in use; Digital input; Internal clock; By setting
Manual command	Not activated; Remove one step; Add one step; Disconnect all
Recorded data	
Number of switching operations per day	0...65535
Number of switching operations per week	0...65535
Operation accuracies	±2.0% of set value or ±0.02 x rated value
Accuracy class of operation	2.0

Table 5: Measurement function blocks

General measurement/ analogue input on RTD/analogue module, MEAI1...8	
The general measurement function blocks can be used to measure general purpose dc or ac voltage signals with a sensor input. They also include a REAL type input which can be used to monitor any internal REAL type IEC 61131-3 based signal, e.g. input data from the RTD/analogue module.	
GE1…3 (V dc/ac)	-10000.00000...10000.00000
General REAL type input	-10000.00000...10000.00000

Neutral current measurement, MECU1A and MECU1B	
Io (A)	0.0…20000.0 A
Io (%)	0.0…80.0% In

Three-phase current measurement, MECU3A and MECU3B	
IL1	0.0…20000.0 A
IL2	0.0…20000.0 A
IL3	0.0…20000.0 A
IL1	0.0…1000.0% In
IL2	0.0…1000.0% In
IL3	0.0…1000.0% In
IL1 demand	0.0…20000.0 A
IL2 demand	0.0…20000.0 A
IL3 demand	0.0…20000.0 A
IL1 demand	0.0…1000.0% In
IL2 demand	0.0…1000.0% In
IL3 demand	0.0…1000.0% In

Transient disturbance recorder for 16 analogue channels, MEDREC16	
The transient disturbance recorder MEDREC16 is used for recording the current and voltage waveforms, as well as the status data of internal IEC 61131-3 based logic signals and digital inputs connected to the feeder terminals. The maximum number of analogue inputs and logic signals is 16. One fundamental cycle contains 40 samples.	
Operation mode	Saturation Overwrite Extension
Pre-trg time	0…100%
Over limit ILx	0.00…40.00 x In
Over limit Io	0.00…40.00 x In
Over limit Iob	0.00…40.00 x In
Over limit Uo	0.00…2.00 x Un
Over limit Ux	0.00…2.00 x Un
Over limit Uxy	0.00…2.00 x Un
Over limit U12b	0.00…2.00 x Un
Over limit ILxb	0.00…40.00 x In
Under limit Ux	0.00…2.00 x Un
Under limit Uxy	0.00…2.00 x Un
AI filter time	0.000…60.000 s

The recording can be triggered by any (or several) of the alternatives listed below:

- triggering on the rising or falling edge of any (or several) of the digital inputs
- triggering on overcurrent, overvoltage or undervoltage
- manual triggering via the menu or with the push-button F on the front panel (if configured)
- triggering via serial communication
- periodic triggering

The recording length depends on the number of recordings and inputs used. For example, the following combination of recording length, number of recordings and number of inputs is available at 50 Hz:

# recordings \ # inputs	1	3	10
1	1163 cyc. 23.2 s	412 cyc. 8.2 s	126 cyc. 2.5 s
5	232 cyc. 4.6 s	82 cyc. 1.6 s	25 cyc. 0.5 s
10	115 cyc. 2.3 s	41 cyc. 0.8 s	12 cyc. 0.24 s

System frequency measurement, MEFR1	
Frequency	10.00…75.00 Hz
Average Freq.	10.00…75.00 Hz
Voltage U	0.0…2.0 x Un

Three-phase power and energy measurement, MEPE7	
P3 (kW)	-999999…999999 kW
Q3 (kvar)	-999999…999999 kvar
Power factor DPF	-1.00…1.00
Power factor PF	-1.00…1.00
P3 demand (kW)	-999999…999999 kW
Q3 demand (kvar)	-999999…999999 kvar
Energy kWh	0…999999999 kWh
Reverse kWh	0…999999999 kWh
Energy kvarh	0…999999999 kvarh
Reverse kvarh	0…999999999 kvarh

Residual voltage measurement, MEVO1A and MEVO1B	
Uo	0…150000 V
Uo	0.0…120.0% Un

Three-phase voltage measurement, MEVO3A and MEVO3B	
UL1_U12	0.00…999.99 kV
UL2_U23	0.00…999.99 kV
UL3_U31	0.00…999.99 kV
UL1_U12	0.00…2.00 x Un
UL2_U23	0.00…2.00 x Un
UL3_U31	0.00…2.00 x Un
UL1_U12 average	0.00…999.99 kV
UL2_U23 average	0.00…999.99 kV
UL3_U31 average	0.00…999.99 kV
UL1_U12 average	0.00…2.00 x Un
UL2_U23 average	0.00…2.00 x Un
UL3_U31 average	0.00…2.00 x Un

Table 6: Protection function blocks

Three-phase non-directional overcurrent protection, low-set stage, NOC3Low, 3I>	
Start current	0.10…5.00 x In
Operate time at DT mode	0.05…300.00 s
Time multiplier at IDMT mode	0.05…1.00
Operation mode	Not in use Definite time Extremely inverse Very inverse Normal inverse Long time inverse RI-type inverse RD-type inverse IEEE Extremely inverse IEEE Very inverse IEEE Short time inverse IEEE Short time extremely inverse IEEE Long time extremely inverse IEEE Long time very inverse IEEE Long time inverse
Measuring mode	Peak-to-peak Fundamental frequency
Drop-off time of the operate time counter	0...1000 ms
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	±2.5% of set value or ±0.01 x In
Start time	Injected currents > 2.0 x start current: internal time < 32 ms total time < 40 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio, typically	0.95
Retardation time	< 45 ms
Operate time accuracy at DT mode	±2% of set value or ±20 ms
Accuracy class index E at IDMT mode	Class index E = 5.0 or ±20 ms

Three-phase non-directional overcurrent protection, high-set stage, NOC3High, 3I>>	
Start current	0.10…40.00 x In
Operate time	0.05…300.00 s
Operation mode	Not in use Definite time Instantaneous
Measuring mode	Peak-to-peak Fundamental frequency
Drop-off time of the operate time counter	0...1000 ms
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	0.1...10 x In: ±2.5% of set value or ±0.01 x In 10...40 x In: ±5.0% of set value
Start time	Injcted currents > 2.0 x start current: internal time < 32 ms total time < 40 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio, typically	0.95
Retardation time	< 45 ms
Operate time accuracy at DT mode	±2% of set value or ±20 ms

Three-phase directional O/C function, low-set stage, DOC6Low, I>→	
Operation mode	Not in use; Definite time Extremely inv.; Very inverse Normal inverse Long-time inv.; RI-type inverse RD-type inverse
Start current	0.05…40.00 x In
Operate time	0.05…300.00 s
Time multiplier	0.05…1.00
Basic angle φ_b	0…90°
Operation direction	Forward Reverse
Earth-fault protection	Disabled Enabled
Measuring mode	Phase-to-phase voltages, peak-to-peak measurement Phase-to-phase voltages, fundamental freq. measurement Phase-to-earth voltages, peak-to-peak measurement Phase-to-earth voltages, fundamental freq. measurement
Drop-off time of the operate time counter	0...1000 ms
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	0.1...10 x In: ±2.5% of set value or ±0.01 x In 10...40 x In: ±5.0% of set value ±2.5% of measured voltage or ±0.01 x Un ±2°
Start time	Injected currents > 2.0 x start current: internal time < 42 ms total time < 50 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio, typically	0.95
Retardation time	< 45 ms
Operate time accuracy at DT mode	±2% of set value or ±20 ms
Accuracy class index E at IDMT mode	Class index E = 5.0 or ±20 ms

Three-phase directional O/C function, high-set stage, DOC6High, I>>→	
Operation mode	Not in use Definite time Instantaneous
Start current	0.05…40.00 x In
Operate time	0.05…300.00 s
Basic angle φ_b	0…90°
Operation direction	Forward Reverse
Earth-fault protection	Disabled Enabled
Non-directional operation (when the direction cannot be determined)	Disabled Enabled
Measuring mode	Phase-to-phase voltages, peak-to-peak measurement Phase-to-phase voltages, fundamental freq. measurement Phase-to-earth voltages, peak-to-peak measurement Phase-to-earth voltages, fundamental freq. measurement
Drop-off time of the operate time counter	0...1000 ms
Operation accuracy	Note! The values below apply when f/fn = 0.95...1.05 0.1...10 x In: ±2.5% of set value or ±0.01 x In 10...40 x In: ±5.0% of set value ±2.5% of measured voltage or ±0.01 x Un ±2°
Start time	Injected currents > 2.0 x start current: internal time < 42 ms total time < 50 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio, typically	0.95
Retardation time	< 45 ms
Operate time accuracy at DT mode	±2% of set value or ±20 ms

Non-directional earth-fault protection, low-set stage, NEF1Low, Io>	
Start current	1.0…500.0% of In
Operate time at DT mode	0.05…300.00 s
Time multiplier at IDMT mode	0.05…1.00
Operation mode	Not in use Definite time Extremely inverse Very inverse Normal inverse Long time inverse RI-type inverse RD-type inverse IEEE Extremely inverse IEEE Very inverse IEEE Short time inverse IEEE Short time extremely inverse IEEE Long time extremely inverse IEEE Long time very inverse IEEE Long time inverse
Measuring mode	Peak-to-peak Fundamental frequency
Drop-off time of the operate time counter	0...1000 ms
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	±2.5% of set value + 0.0005 x In
Start time	Injected currents > 2.0 x start current: internal time < 32 ms total time < 40 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio, typically	0.95
Retardation time	< 45 ms
Operate time accuracy at DT mode	±2% of set value or ±20 ms
Accuracy class index E at IDMT mode	Class index E = 5.0 or ±20 ms

Non-directional earth-fault protection, high-set stage, NEF1High, Io>>	
Start current	0.10…12.00 x In
Operate time	0.05…300.00 s
Operation mode	Not in use Definite time Instantaneous
Measuring mode	Peak-to-peak Fundamental frequency
Drop-off time of the operate time counter	0...1000 ms
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	±2.5% of set value or + 0.01 x In
Start time	Injected currents > 2.0 x start current: internal time < 32 ms total time < 40 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio, typically	0.95
Retardation time	< 45 ms
Operate time accuracy at DT mode	±2% of set value or ±20 ms

Directional earth-fault protection, low-set stage, DEF2Low, Io>→	
Start current	1.0…500.0% of In
Start voltage	2.0…100.0% of Un
Operate time at DT mode	0.1…300.0 s
Time multiplier at IDMT mode	0.05…1.00
Operation mode	Not in use Definite time Extremely inverse Very inverse Normal inverse Long time inverse
Operation criteria	Basic angle & Uo Basic angle IoSin/Cos & Uo IoSin/Cos Non-directional Io Non-directional Uo
Operation direction	Forward Reverse
Basic angle φ_b	-90°... 0°
Operation characteristic	IoSin(φ) IoCos(φ)
Intermittent E/F	Not active Active
Measuring mode	Peak-to-peak Fundamental frequency
Drop-off time of the operate time counter	0...1000 ms
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	±2.5% of set value + 0.0005 x In ±2.5% of set value or + 0.01 x Un Phase angle ±2°
Start time	Injected neutral current > 2.0 x start current and residual voltage > 2.0 x start voltage: internal time < 72 ms total time < 80 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio, typically	0.95
Retardation time	< 50 ms
Operate time accuracy at DT mode	±2% of set value or ±20 ms
Accuracy class index E at IDMT mode	Class index E = 5.0 or ±20 ms

Directional earth-fault protection, high-set stage, DEF2High, Io>>→	
Start current	1.0…500.0% of In
Start voltage	2.0…100.0% of Un
Operate time	0.1…300.0 s
Operation mode	Not in use Definite time Instantaneous
Operation criteria	Basic angle & Uo Basic angle IoSin/Cos & Uo IoSin/Cos Non-directional Io Non-directional Uo
Operation direction	Forward Reverse
Basic angle φ_b	-90°... 0°
Operation characteristic	IoSin(φ) IoCos(φ)
Intermittent E/F	Not active Active
Measuring mode	Peak-to-peak Fundamental frequency
Drop-off time of the operate time counter	0...1000 ms
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	±2.5% of set value + 0.0005 x In ±2.5% of set value or + 0.01 x Un Phase angle ±2°
Start time	Injected neutral current > 2.0 x start current and residual voltage > 2.0 x start voltage: internal time < 72 ms total time < 80 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio, typically	0.95
Retardation time	< 50 ms
Operate time accuracy at DT mode	±2% of set value or ±20 ms

Three-phase undervoltage protection, low-set stage, UV3Low, 3U<	
Start voltage	0.10…1.20 x Un
Operate time	0.1…300.0 s
Time multiplier	0.1…1.0
Operation mode	Not in use Definite time C curve
Measuring mode	Phase-to-phase voltages; peak-to-peak measurement Phase-to-phase voltages; fundamental freq. measurement Phase-to-earth voltages; fundamental freq. measurement
Operation hysteresis	1.0...5.0%
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	±35 ms
Start time	Injected voltages < 0.5 x start voltage: internal time < 32 ms total time < 40 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio	1.04 (range 1.005...1.05)
Retardation time	< 60 ms
Operate time accuracy at DT mode	±2.5% of set value
Accuracy class index E at IDMT mode, typically	±35 ms

Three-phase undervoltage protection, high-set stage, UV3High, 3U<<	
Start voltage	0.10…1.20 x Un
Operate time	0.1…300.0 s
Operation mode	Not in use Definite time
Measuring mode	Phase-to-phase voltages; peak-to-peak measurement Phase-to-phase voltages; fundamental freq. measurement Phase-to-earth voltages; fundamental freq. measurement
Operation hysteresis	1.0...5.0%
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	±2.5% of set value
Start time	Injected voltages < 0.5 x start voltage: internal time < 32 ms total time < 40 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio	1.04 (range 1.005...1.05)
Retardation time	< 60 ms
Operate time accuracy at DT mode	±2.5% of set value

Auto-reclosure function, AR5Func, O → I	
Number of reclosures	0…5
Initiation mode	Trip Start
AR1, AR2, AR3, AR4 starting line operation mode	No operation AR shot initiated Initiation of AR shot blocked
AR1 AR2, AR3, AR4 start delay	0…10.00 s
Dead time	0.20…300.00 s
Synchro-check	Not in use; ARSYNC in use
Discriminating time td	0…30.00 s
Operation accuracy	±1% of setting value or ±30 ms

Phase discontinuity protection, CUB3Low, 3ΔI>	
Start unbalance	10.0…95.0%
Operate time	1.0…300.0 s
Operation mode	Not in use Definite time
	Note! The values below apply when f/fn = 0.95...1.05
Operation accuracy	±2.5% of set value or ±1% unit
Start time	internal time < 95 ms total time < 100 ms
Reset time	40...1000 ms (depends on the minimum pulse width set for the trip output)
Reset ratio, typically	0.95
Retardation time	Total time for blocking: < 25 ms Total time when current drops below start value: < 50 ms
Operate time accuracy at DT mode	±2% of set value or ±50 ms

Table 7: Power quality functions

Current waveform distortion measurement, PQCU3H	
The current waveform distortion measurement PQCU3H is used for measurement and statistical analysis of current waveform distortion. The standards concerning voltage distortion measurement are applied to current distortion measurement in PQCU3H. Data collection and analysis is done according to EN 50160. Measuring principles for individual harmonics and THD are adapted from the International standard IEC 61000-4-7. The American standard IEEE Std 1159 is also partly supported. Analysis can be done for one selected phase current or most distorted phase current can be tracked.	
Measuring modes	Not in use; L1; L2; L3; Worst phase
Measurement activation	Triggering by: setting parameter, digital input, date & time setting
Triggering mode	Single; Continuous; Periodic
Distortion factor	THD; TDD
Monitored values	
THD (3 sec and 10 min mean values)	0.0 ... 1000.0%
Harmonic components from 1st to 13th (3 sec mean values)	0.0 ... 1000.0% In
Harmonic components from 2nd to 13th (10 min mean values)	0.0 ... 1000.0% In
Statistics	
Observation times for statistics	1 hour; 12 hours; 1 day; 2 days; 3 days; 4 days; 5 days; 6 days; 1 week
Percentile setting	90.0 ... 99.5%
Percentiles for each harmonic and THD	0.0 ... 1000.0% In
Five fixed percentiles (1,5,50,95,99) for one selectable harmonic or THD	0.0 ... 1000.0% In
Maximum values for each harmonic and THD	0.0 ... 1000.0% In
Recorded data	One data set for updating; One data set from the previous observation period
Harmonic limit supervision	
Limit for THD	0.0 ... 60.0%
Limits for each harmonic	0.0 ... 40.0% In
Recorded data	If any limit should be exceeded, the whole harmonic set will be recorded during the maximum THD (3 sec values)
Operation criteria	
Fundamental frequency	0.9 ... 1.1 Fn
Frequency deviation	≤ 0.5 Hz (difference between max and min values within one second)
Amplitude of the fundamental wave	≥ 1% In
Measurement accuracy	
Measured harmonic Im = 1st, ... , 10th	In accordance with IEC 61000-4-7
Measured harmonic Im = 11th, ... , 13th	± 1.0% In, if Im < 10% In; ± 10% Im, if Im ≥ 10% In

Voltage waveform distortion measurement, PQVO3H	
The voltage waveform distortion measurement PQVO3H is used for measurement and statistical analysis of voltage waveform distortion. Data collection and analysis is done according to EN 50160. Measuring principles for individual harmonics and THD are adapted from the International standard IEC 61000-4-7. The American standard IEEE Std 1159 is also partly supported. Analysis can be done for one selected phase or phase-to-phase voltage or most distorted phase or phase-to-phase voltage can be tracked.	
Measuring modes	Not in use; L1; L2; L3; Worst phase; L1-L2; L2-L3; L3-L1; Worst main
Measurement activation	Triggering by: setting parameter, digital input, date & time setting
Triggering mode	Single; Continuous; Periodic
Monitored values	
THD (3 sec and 10 min mean values)	0.0 ... 120.0%
Harmonic components from 1st to 13th (3 sec mean values)	0.0 ... 120.0% Un
Harmonic components from 2nd to 13th (10 min mean values)	0.0 ... 120.0% Un
Statistics	
Observation times for statistics	1 hour; 12 hours; 1 day; 2 days; 3 days; 4 days; 5 days; 6 days; 1 week
Percentile setting	90.0 ... 99.5%
Percentiles for each harmonic and THD	0.0 ... 120.0% Un
Five fixed percentiles (1,5,50,95,99) for one selectable harmonic or THD	0.0 ... 120.0% Un
Maximum values for each harmonic and THD	0.0 ... 120.0% Un
Recorded data	One data set for updating; One data set from the previous observation period
Harmonic limit supervision	
Limit for THD	0.0 ... 30.0%
Limits for each harmonic	0.0 ... 20.0% Un
Recorded data	If any limit should be exceeded, the whole harmonic set will be recorded during the maximum THD (3 sec values)
Operation criteria	
Fundamental frequency	0.9 ... 1.1 Fn
Frequency deviation	≤ 0.5 Hz (difference between max and min values within one second)
Amplitude of the fundamental wave	≥ 0.7 Un
Measurement accuracy	
Measured harmonic Um = 1st, ... , 10th	In accordance with IEC 61000-4-7
Measured harmonic Um = 11th, ... , 13th	± 0.3% Un, if Um < 3% Un; ± 10% Um, if Um ≥ 3% Un

Technical data

Table 8: Energizing inputs

Number of inputs			max. 9
Rated frequency			50.0/60.0 Hz
Current inputs	rated current		0.2 A/1 A/5 A
	Thermal withstand capability	continuously	1.5 A/4 A/20 A
		for 1 s	20 A/100 A/500 A
	dynamic current withstand, half-wave value		50 A/250 A/1250 A
	input impedance		<750mΩ/<100mΩ/ <20 mΩ
Voltage inputs	rated voltage		100 V/110 V/115 V/120V/230 V (parametrization)
	voltage withstand, continuous		2 x U_n (240 V)
	burden at rated voltage		<0.5 VA
Sensor inputs, max. 9	AC voltage range		9.4 V RMS
	DC voltage range		±13.3 V peak
	input impedance		>4.7 MΩ
	input capacitance		< 1 nF

Table 9: Auxiliary power supplies

Type	**PSC1**	**PSC2**
Input voltage, AC	110/120/220/240 V	-
Input voltage, DC	110/125/220 V	24/48/60 V
Operating range	AC 85...110% of rated value DC 80...120% of rated value	DC 80...120% of rated value
Fuse	2 A slow	8 A slow
Normal power consumption	20...30 W	
Ripple in DC auxiliary voltage	max. 12% of the DC value	
Interruption time in auxiliary DC voltage without resetting	<50 ms, 110 V and <100 ms, 200 V	
Internal overtemperature indication	+78°C (+75…+83°C)	

Table 10: Battery (recommended)

Type	**YUA NP 17-12**	**YUA NPL 24-12**
Rated voltage	12 V	12 V
Capacity	17 Ah	24 Ah, long life
Weight	5.6 kg	9.0 kg
Size	181x76x167 cm (L x W x H)	197x165x170 cm (L x W x H)

Table 11: Supply for radios

With batteries	12 V DC, 7 A peak, 1A continuosly
Without batteries	12 V DC, 1 A peak

Table 12: Temperature compensated charger for batteries

Rated charging voltage	27.6 V DC, at 20°C
Output power	15 W
Fuse (F2)	6 A
Temperature compensation	- 0.04 V / °C

Table 13: Digital inputs

Number of inputs	15
Operating range	18…265 V DC (24/48/60/110/220 V DC)
Current drain	~2…25 mA
Power consumption/input	<0.8 W
Pulse counting (specific digital inputs), frequency range	0…100 Hz

Table 14: Power outputs

Number of outputs	2
Max. system voltage	250 V AC/DC
Continuous carry	5 A
Make and carry for 0.5 s	30 A
Make and carry for 3 s	15 A
Breaking capacity when control circuit time constant L/R <40 ms, at 48/110/220 V DC	5 A / 3 A / 1 A
Contact material	$AgCdO_2$

Table 15: Signal outputs

Number of outputs	7
Max. system voltage	250 V AC/DC
Continuous carry	5 A
Make and carry for 0.5 s	10 A
Make and carry for 3 s	8 A
Breaking capacity when control circuit time-constant L/R <40 ms, at 48/110/220 V DC	1 A/0.25 A/0.15 A
Contact material	$AgCdO_2$

Table 16: Environmental conditions

Specified service temperature range		-10…+55°C
	with heated enclosure	-40...+55°C
Temperature range limit (short-term)		-40...+70°C
Transport and storage temperature range		-40…+70°C
Enclosure class (IEC 60529)	wall-, flush- and rackmounted	IP 20
	with UEMC-xx enclosure	IP 55
Dry heat test		according to IEC 60068-2-2
Dry cold test		according to IEC 60068-2-1
Damp heat test, cyclic		according to IEC 60068-2-30 r.h. = 95%, T = 25°…55°C
Storage temperature tests		according to IEC 60068-2-48

Table 17: Standard tests

Insulation tests	Dielectric test IEC 60255-5	Test voltage	2 kV, 50 Hz, 1 min.
	Impulse voltage test IEC 60255-5	Test voltage	5 kV, unipolar impulses, waveform 1,2/50 μs, source energy 0.5 J
	Insulation resistance measurements IEC 60255-5	Insulation resistance	> 100 MΩ, 500 V DC
Mechanical tests	Vibration tests (sinusoidal)		IEC 60255-21-1, class I
	Shock and bump test		IEC 60255-21-2, class I

Table 18: Electromagnetical compatibility tests

The EMC immunity test level fulfills the requirements specified below		
1 MHz burst disturbance test, class III, IEC 60255-22-1	common mode	2.5 kV
	differential mode	1.0 kV
Electrostatic discharge test, class III, IEC 61000-4-2 and IEC60255-22-2	for contact discharge	6 kV
	for air discharge	8 kV
Radio frequency interference test	conducted, common mode IEC 61000-4-6 and IEC 60255-22-6	10 V (rms), f = 150 kHz…80 MHz
	radiated, amplitude-modulated IEC 61000-4-3 and IEC 60255-22-3	10 V/m (rms), f = 80…1000 MHz
	radiated, pulse-modulated ENV 50204	10 V/m, f = 900 MHz
Fast transient disturbance test IEC 60255-22-4 and IEC 61000-4-4	power supply	4 kV
	I/O ports	2 kV
Surge immunity test IEC 61000-4-5 and IEC 60255-22-5	power supply	4 kV, line to earth 2 kV, line to line
	I/O ports	2 kV, line to earth 1 kV, line to line
Power frequency (50 Hz) magnetic field IEC 61000-4-8	100 A/m	
Voltage dips and short interruptions IEC 61000-4-11	30%, 10 ms 60%, 100ms 60%, 1000ms >95%, 5000ms	
Electromagnetic emission tests EN 55011 IEC 60255-25	conducted RF emission (mains terminal)	EN 55011, class A IEC 60255-25
	radiated RF emission	EN 55011, class A IEC 60255-25
CE approval EN 50263	Complies with the EMC directive 89/336/EEC and the LV directive 73/23/EEC	

Table 19: Data communication

Front interface, connector X5.3	RS485 connection	
	LON bus or SPA bus, selectable	
	the fibre-optic interface module RER 103 is needed for galvanic isolation	
	data transfer rates	SPA bus: 4.8/9.6 kbps LON bus: 78.0 kbps/1.25 Mbps
Communication interface, connector X5.1	remote communication protocol	
Communication interface, connector X5.2	parametrization, SPA	
Communication protocols	SPA bus protocol LON bus acc. to ABB LON Application Guideline V1.2 IEC 60870-5-101 acc. to Protocol Description 1MRS750956 MODBUS acc. to Protocol Description 1MRS750957 DNP 3.0 acc. to Protocol Description 1MRS750958 Refer to software configuration and software numbers	

Table 20: General

Toolboxes	CAP 501 CAP 505
Event recording	500 latest events are recorded
	the events are recorded in higher level syntax: reason, time, date

Table 20: General

Data recording	records operate values	
Control functions	see “Technical Descriptions of Functions”, CD-ROM (1MRS750889-MCD)	
Condition monitoring functions		
Measurements	see “Technical Descriptions of Functions”, CD-ROM (1MRS750889-MCD)	
	temperature of enclosure	-40°...+60°C, ±3°C
	battery voltage	15...35 V DC, ±3%
Self-supervision	all analogue reference voltages	
	automatic test sequences for I/Os, batteries and flash memory	
Mechanical dimensions	Width: 261 mm Height: 265 mm Depth: 250 mm	
Weight of the unit	5...7.2 kg	

Ordering

Order number

The following data should be specified in the order:

- Order number (see fig. 8 below)
- Software number of protocol options)
- Software number of function options
- Quantity of REC 523 units

Each REC 523 unit has a specific order number that identifies the unit type as well as the hardware and the software revision as described in Fig. 8.

.

Item	Identifies	Options
1	Control unit type	-
2	Software revision	-
3	Hardware number	-
4	Auxiliary voltage range of a power supply module	A: U_r = 110/120/220/240 V AC; 110/125/220 V DC (PSC1) C: U_r =24/48/60 V DC (PSC2)
5	Digital input voltage range	A: U_r =24/48/60/110/220 V DC
6	Analogue interface type	A: Only matching transformers included (MIM) B: Both matching transformers and sensor inputs included C: Only sensor inputs included (SIM)

Fig. 9 Ordering number

The REC 523 units differ from each other as to the number and type of measuring inputs.

All the REC 523 hardware versions include the same number of digital inputs and outputs, whereas the number of matching transformers and sensor inputs as well as the auxiliary voltage range vary between the different hardware versions.

Software configuration and software number

Each REC 523 allows different software configurations based on separate functions that can be activated from comprehensive libraries within the scope of the processing capacity as well as the I/O connections and analogue channels available, and considering the total CPU load of the selected functions.

There are two separate software numbers to be specified in the order, one for the protocol options as described in Table 21 and the other for the function options as described in Table 22.

Table 21: Protocol options

Software No	Protocol options included
1MRS110006-001	SPA, LON and IEC 60870-5-101
1MRS110011-001	SPA, LON and DNP 3.0*)
1MRS110012-001	SPA, LON and Modbus (both the RTU and ASCII modes)*)

*) DNP 3.0 and Modbus protocols are only available in software revision E

Table 22: Function options

Software No	Function options for REC 523
1MRS100512	Current waveform distortion measurement
1MRS100513	Voltage waveform distortion measurement
1MRS100143	Power factor controller

Optional peripherals

Table 23: Peripheral devices

Parametrization cable	1MRS 120520
Cable between REC 523 and a commercial modem	1MRS 120528
Cable between MicroSCADA and REC 523	1MRS 120523
Bus connection module RER 103	1MRS 090701-XX*)
Semi-flush mounting kit	1MRS 050239
Rack mounting kit	1MRS 050242

*)XX receiver / transmitter; B = plastic fibre cable; M = Glass fibre cable

The REC 523 versions have the following analogue channels:

Table 24: REC 523 versions and analogue channels

REC 523 version	Analogue channel
REC523F 032AAA (wall-mounted) **REC523F 037AAA (flush-mounted)**	3 current transformers 1/5 A U_{aux} = 80-265 V AC/DC
REC523F 032CAA (wall-mounted) **REC523F 037CAA (flush-mounted)**	3 current transformers 1/5 A U_{aux} = 18-80 V DC
REC523F 033AAA (wall-mounted) **REC523F 038AAA (flush-mounted)**	3 current transformers 1/5 A 3 voltage transformers 100 V U_{aux} = 80-265 V AC/DC
REC523F 033CAA (wall-mounted) **REC523F 038CAA (flush-mounted)**	3 current transformers 1/5 A 3 voltage transformers 100 V U_{aux} = 18-80 V DC
REC523F 034AAA (wall-mounted) **REC523F 039AAA (flush-mounted)**	4 current transformers 1/5 A 3 voltage transformers 230 V U_{aux} = 80-265 V AC/DC
REC523F 034CAA (wall-mounted) **REC523F 039CAA (flush-mounted)**	4 current transformers 1/5 A 3 voltage transformers 230 V U_{aux} = 18-80 V DC
REC523F 054AAA (wall-mounted) **REC523F 059AAA (flush-mounted)**	1 current transformer 0.2/1 A 4 current transformers 1/5 A 4 voltage transformers 100 V U_{aux} = 80-265 V AC/DC
REC523F 054CAA (wall-mounted) **REC523F 059CAA (flush-mounted**	1 current transformer 0.2/1 A 4 current transformers 1/5 A 4 voltage transformers 100 V Uaux = 18-80 V DC
REC523F 060AAC (wall-mounted) **REC523F 065AAC (flush-mounted)**	9 sensor channels (current sensor or voltage divider) U_{aux} = 80-265 V AC/DC

Table 24: REC 523 versions and analogue channels

REC 523 version	Analogue channel
REC523F 060CAC (wall-mounted) **REC523F 065CAC (flush-mounted)**	9 sensor channels (current sensor or voltage divider) U_{aux} = 18-80 V DC
REC523F 061AAA (wall-mounted) **REC523F 066AAA (flush-mounted)**	6 current transformers 1/5 A 3 voltage transformers 100 V U_{aux} = 80-265 V AC/DC
REC523F 061CAA (wall-mounted) **REC523F 066CAA (flush-mounted)**	6 current transformers 1/5 A 3 voltage transformers 100 V Uaux = 18-80 V DC
REC523F 062AAA (wall-mounted) **REC523F 067AAA (flush-mounted)**	3 current transformers 1/5 A 6 voltage transformers 100 V Uaux = 80-265 V AC/DC
REC523F 062CAA (wall-mounted) **REC523F 067CAA (flush-mounted)**	3 current transformers 1/5 A 6 voltage transformers 100 V Uaux = 18-80 V DC
REC523F 071AAB (wall-mounted) **REC523F 072AAB (flush-mounted)**	1 current transformer 0.2/1 A 4 current transformers 1/5 A 4 voltage transformers 100 V 9 sensor channels (current sensor or voltage divider) U_{aux} = 80-265 V AC/DC
REC523F 071CAB (wall-mounted) **REC523F 072CAB (flush-mounted)**	1 current transformer 0.2/1 A 4 current transformers 1/5 A 4 voltage transformers 100 V 9 sensor channels (current sensor or voltage divider) U_{aux} = 18-80 V DC

The REC 523 remote monitoring and control unit always includes:

- A CPU module
- A power supply and charger module:
  - frequency 50/60 Hz
  - 2 power outputs, double-pole
  - 1 signal output or heater output
  - +12 V output for communication devices
  - 3 digital inputs
  - 1 IRF output
- An I/O module BIO1:
  - 12 digital inputs
  - 2 signal outputs (NO)
  - 4 signal outputs (NO/NC)

The last number of the hardware version number specifies whether the measuring and control unit is flush-mounted or wall-mounted.

Each analogue channel is separately configured by using the Relay Configuration Tool.

The hardware number and a combined software nymber is labelled on the marking strip on the front panel of the device delivered. The software number is for factory use only.

Application examples

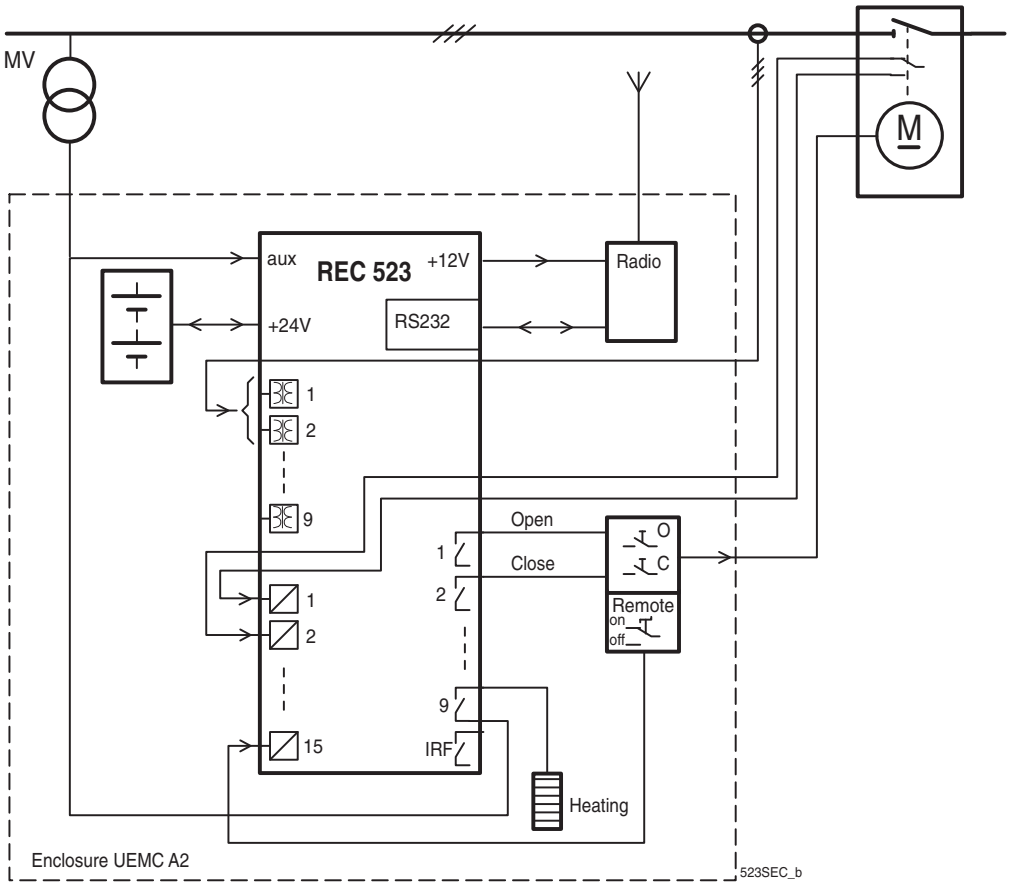

Fig. 10 Basic functions of the REC 523 provided with an NPS-type air-insulated disconnector and KOHU/KOKU current sensor

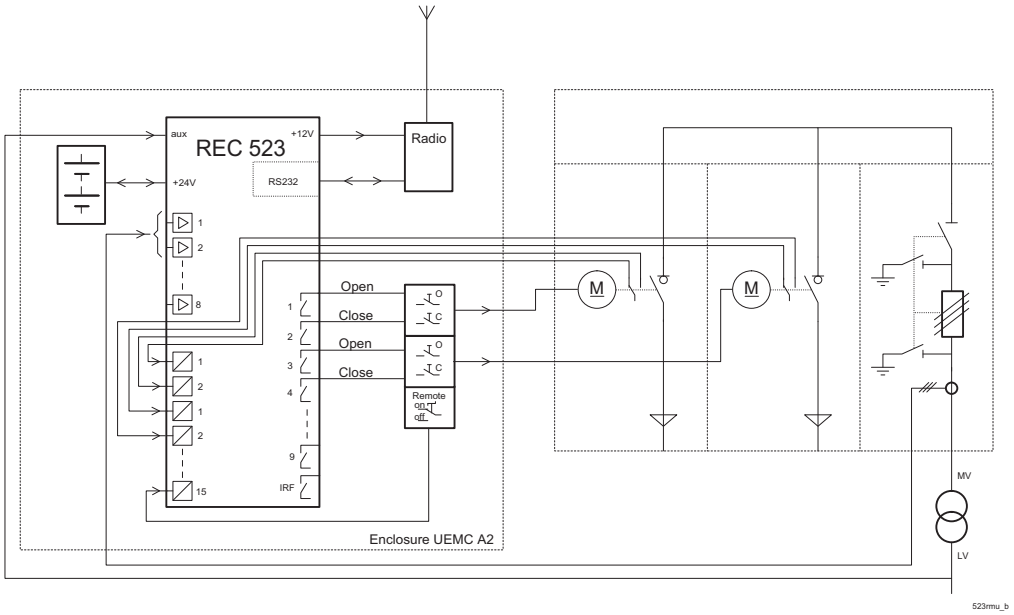

Fig. 11 Basic functions of the REC 523 provided with a CCF-type ring main unit (RMU)

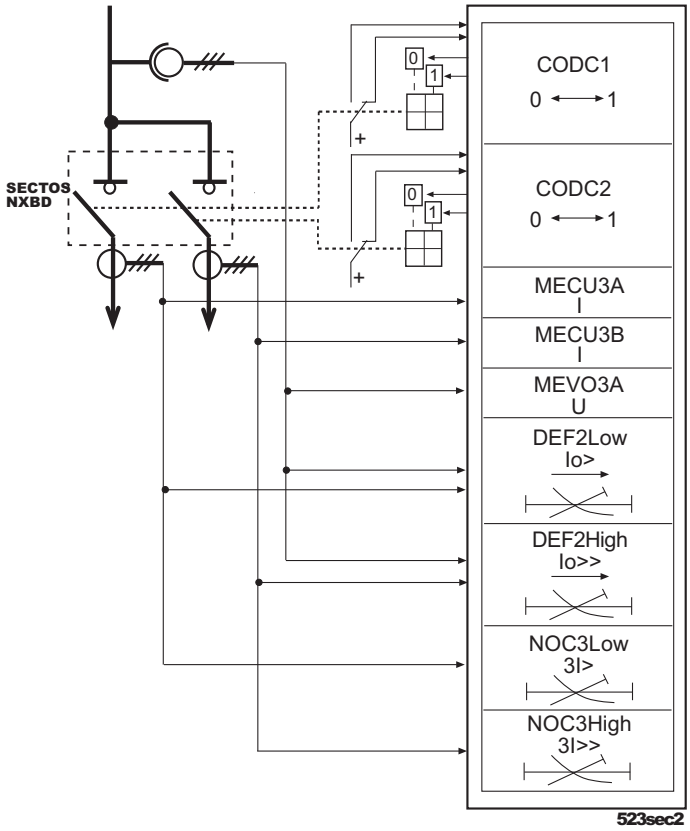

Fig. 12 Basic functions of a REC 523 unit provided with NXBD type SF6 gas-insulated double disconnectors.

References

Name of the manual	Document ID
REC 523 manuals	
RE_ 5_ _, Protection, Monitoring and Control, Installation Manual	1MRS750526-MUM
REF 54_, REM 54_, RET 54_, REC 523, Configuration Guideline*)	1MRS750745-MUM
REC 523, Technical Reference Manual	1MRS750881-MUM
Technical Descriptions of Functions on the Distribution Automation Product Documentation DVD	1MRS756250
Protocol descriptions	
DNP 3.0 Remote Communication Protocol for REC 523, Technical Description	1MRS750958-MUM
IEC 60870-5-101 Remote Communication Protocol for REC 523, Technical Description	1MRS750956-MUM
LonWorks Network in Protection and Control Systems, User's Manual and Technical Description	1MRS750035-MTD
MODBUS Remote Communication Protocol for REC 523, Technical Description	1MRS752015-MUM
SPA-Bus Communication Protocol V2.5, Technical Description	1MRS750076-MTD
Other manuals	
CAP 505 Protocol Editing Tool, User's Guide	1MRS751982-MUM
CAP 505 Protocol Mapping Tool, Operation Manual	1MRS755277
LIB, CAP and SMS, Tools for Relays and Terminals, User's Guide	1MRS752008-MUM
LNT 505, Operator's Manual	1MRS751706-MUM
Relay Configuration Tool, Quick Start Reference	1MRS751905-MEN
Relay Configuration Tool, Tutorial	1MRS751903-MEN
Echelon documents	
LonMark Application Layer Interoperability Guidelines	-
LonMark SNVT Master List	-

*) Included in the CD-ROM Technical Descriptions of Functions on the Distribution Automation Product Documentation DVD

ABB Oy
Distribution Automation
P.O. Box 699
FI-65101 Vaasa, FINLAND
Tel +358 10 22 11
Fax +358 10 224 1094
www.abb.com/substationautomation