Design

The machine terminals REM 543 and REM 545 differ from each other in the number of digital inputs and outputs available. Please refer to the section “Ordering” for more details.

The REM 54_ machine terminals incorporate a wide range of functions:

- Protection functions
- Measurement 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 functions

Protection is one of the most important functions of the REM 54_ machine terminal. The protection function blocks are independent of each other and have their own setting groups, data recording, etc.

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

For further information about functionality levels and the protection functions included in them, refer to the table “Functionality levels, protection functions” in section “Ordering”.

Measurement functions

The measurement functions include three-phase currents, neutral current, three-phase voltages, residual voltage, frequency, active and reactive power and power factor.

An optional RTD/analogue module can be used for measuring stator winding, bearing, and ambient temperatures.

Disturbance recorder

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

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 CAP501 and CAP505 relay tools.

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 object status indicators included in the MIMIC configuration picture displayed on the HMI. The object status indicators are used to indicate the status of switching devices via the MIMIC picture and to control them locally.

Condition monitoring functions

Condition monitoring function blocks such as supervision of the energizing current and voltage input circuit, operation time counter, circuit-breaker electric wear, scheduled maintenance, trip circuit supervision and breaker travel time are available for the REM 54_ machine terminals.

General functions

Additional functions are available for different general purposes to be used in logics such as activation of HMI backlight, switchgroups, and resetting of operation indications, latched output signals, registers and disturbance recorder.

Communication functions

The machine terminal REM 54_ provides three serial communication protocols: SPA, LON and MODBUS.

Standard functions

Standard functions are used for logics such as interlocking, alarming and control sequencing. The use of logic functions is not limited

Design (cont´d)

and the functions can be interconnected with protection, control, measurement, condition monitoring and other standard functions. In addition, digital inputs and outputs and LON inputs and outputs can be connected to standard functions by using the Relay Configuration Tool.

Other functions

Low auxiliary voltage indication
The REM 54_ terminal 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 is about 10% below the lowest rated DC input voltage of the power supply module.

The indication of a low auxiliary voltage is available in the machine terminal configuration and can be connected to any signal output of the REM 54_.

Overtemperature indication
The REM 54_ machine terminal includes an internal temperature supervision function. The power supply module issues an internal alarm signal when overtemperature has been detected inside the terminal enclosure. The alarm signal will be activated once the temperature inside the terminal enclosure increases to +78°C (+75°C…+83°C). Overtemperature indication is available in the machine terminal configuration and can be connected to any signal output of the terminal.

Analogue channels
The machine terminal measures the analogue signals needed for protection, measuring, etc. via sensors developed by ABB or galvanically separated matching transformers.

Depending on whether sensors are included or not, REM 54_ machine terminals have 9 (without sensors) or 10 (with sensors) physical analogue channels. The number of channels used depends on the machine terminal configuration and the kind of matching transformers or sensor inputs used. Furthermore, the machine terminal includes virtual analogue channels for calculating the neutral current and residual voltage from phase currents and voltages.

A current sensor (Rogowski coil) or a voltage divider can be connected to each sensor input. Analogue channels of the machine terminal are configured with the CAP 505 Relay Product Engineering Tool.

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

- Machine terminals with the hardware number REM54x_xxxAAAA/CAAA/AAAB are configured for matching transformers
- Machine terminals with the hardware number REM54x_xxx AABA/CABA/AABB are configured for matching transformers and sensor inputs

Calculated analogue channels
The REM 54_ machine terminal includes virtual channels to obtain the neutral current and residual voltage when sensors are used. Current sensors and voltage dividers are connected to the machine terminal via coaxial cables and therefore a residual connection of the phase currents or an open-delta connection of the phase voltages cannot be made. Both the amplitude and the 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 machine terminal are voltage-controlled and optically isolated. The function of a digital input can be inverted. The programmable filter time removes debounces and short disturbances on a digital input. The filter time is set for each digital input of the machine terminal.

Some specific digital inputs can be programmed either as digital inputs or as pulse counters. When a digital input operates as a pulse counter, the frequency range of the input is 0…100 Hz.