Definition:
Alarm relays are activated at pickup.
Tripping relays are only activated after elapse of the tripping delay.

The relays are assigned as follows:
- LEDs P>, P< and Pr are two-colored and light up green when the output relays are assigned as alarm relays and red as tripping relays.
- After the assignment mode has been activated, first LED P> lights up green. Now one or several of the four output relays can be assigned to   power element P> as alarm relays.
- Indication "1_ _ _" means that output relay 1 is assigned to this power element. When the display shows "_ _ _ _", no alarm relay is assigned to this power element.
- The assignment of output relays 1 - 4 to the power elements can be changed by pressing <+> and <-> push buttons.
- The selected assignment can be stored by pressing push button <ENTER> and subsequent input of the password.
- By pressing push button <SELECT/RESET>, LED I> lights up red. The output relays can now be assigned to this power element as tripping re-lays. Relays 1 - 4 are selected in the same way as described before.
- By repeatedly pressing of the <SELECT/RESET> push button and assignment of the relays all elements can be assigned separately to the relays.

The blocking and assignment mode can be terminated at any time by pressing the <SELECT/RESET> push button for some time (abt. 3 s).

Note:
- The function of jumper J2 described in general description "MR Digital Multifunctional Relays" has no function. For relays without assignment mode this jumper is used for parameter setting of alarm relays (activation at pickup or trip-ping).
- A form is attached to this description where the setting requested by the customer can be filled-in. This form is prepared for telefax transmission and can be used for your own reference as well as for telephone queries.

Relay function		Output relays				Display-indication	Lighted LED
		1	**2**	**3**	**4**		
P>	alarm		X			_ 2 _ _	P>: green
	tripping	X				1 _ _ _	P>: red
P<	alarm		X			_ 2 _ _	P<: green
	tripping	X				1 _ _ _	P<: red
Pr	alarm			X		_ _ 3 _	Pr: green
	tripping	X				1 _ _ _	Pr: red
$U_{<Pr}$	alarm			X		_ _ 3 _	$U_{<Pr}$: green
	tripping	X				1 _ _ _	$U_{<Pr}$: red
t_{CBFP}	tripping				X	_ _ _ 4	

Table 5.4: Example of assignment matrix of the output relay (default settings).

5.3   Indication of measuring values and fault data

5.3.1 Indication of measuring values

During normal service, the following measuring values of the MRP2-3 can be indicated:
- Total three-phase active power (LEDs L1, L2, L3 green)
- Active power in phase L1 (LED L1 green)
- Active power in phase L2 (LED L2 green)
- Active power in phase L3 (LED L3 green)

In star-connection only:
- Phase-to-neutral voltage in phase L1 (LED U and L1 green)
- Phase-to-neutral voltage in phase L2 (LED U and L2 green)
- Phase-to-neutral voltage in phase L3 (LED U and L3 green)

In delta-connection only:
- Phase-to-phase voltage U12 (LED U, L1, L2 green)
- Phase-to-phase voltage U23 (LED U, L2, L3 green)
- Phase-to-phase voltage U31 (LED U, L1,L3 green)

Phase currents:
- Current in phase 1 (LED I and L1 green)
- Current in phase 2 (LED I and L2 green)
- Current in phase 3 (LED I and L3 green)

The following measuring values of the MRP2-1 can be indicated during normal service:
- Total three-phase active power (LED P green)

In star connection:
- phase-to-neutral voltage (LED U green)

In delta connection:
- phase-to-phase voltage (LED U green)
- phase current (LED I green)

5.3.2 Indication of fault data

All faults detected by the relay are indicated on the front plate optically. For this purpose, the four LEDs (L1, L2, L3, →←) and the four function LEDs (P>, P<, Pr, U<$_{Pr}$) are equipped at MRP2 and MRP2-R1. If, for example a reverse power occurs, first the LEDs L1, L2, L3 will light up. LED Pr lights up at the same time. After tripping the LEDs are lit permanently.
At unit MRP2-1 and MRP2-R1 the two LEDs (P, →←) and the four functional LEDs (P>, P<, Pr, U<$_{Pr}$) are equipped to display the detected fault data.

5.3.3 Fault Recorder

When the relay is energized or is energized or trips, all fault data and times are stored in a non-volatile memory manner. The MRP2 is provided with a fault value recorder for max. eight fault events. In the event of additional trippings always the oldest data set is written over.

For fault indication not only the trip values are re-corded but also the status of LEDs. Fault values are indicated when push buttons <-> or <+> are pressed during normal measuring value indication.

- Normal measuring values are selected by pressing the <SELECT/RESET> button.
- When then the <-> button is pressed, the latest fault data set is shown. By repeated pressing the <-> button the last but one fault data set is shown etc. For indication of fault data sets abbreviations FLT1, FLT2, FLT3, ... are displayed (FLT1 means the latest fault data set recorded).
- By pressing <SELECT/RESET> the fault measuring values can be scrolled.
- By pressing <+> it can be scrolled back to a more recent fault data set. At first FLT8, FLT7, ... are always displayed.
  When fault recording is indicated (FLT1 etc), the LEDs flash in compliance with the stored trip information, i.e. those LEDs which showed a continuous light when the fault occurred are now blinking to indicate that it is not a current fault. LEDs which were blinking during trip conditions, (element had picked up) just briefly flash.
- If the relay is still in trip condition and not yet reset (TRIP is still displayed), no measuring values can be shown.
- To delete the trip store, the push button combination <SELECT/RESET> and <-> has to be pressed for about 3 s. The display shows 'wait'.

Recorded fault values at MRP2-3:

Indicated quantity	corresponding LED	Unit
Total power	L1, L2, L3	$[x\ P_N]$
Power in phase L1, L2, L3 *	L1, L2, L3	$[x\ P_N]$
Phase-to-phase voltage in delta connection	L1/L2, U L2/L3, U L3/L1, U	$[V]$
Phase-to-neutral voltage in Y connection	L1, L2, L3, U	$[V]$
Phase currents L1, L2, L3	L1, L2, L3, I	$[x\ I_N]$
C.B. tripping time [1]		$[s]$

* only in Y connection

Recorded fault values at MRP2-1:

Indicated quantity	corresponding LED	Unit
Total power	P	$[x\ P_N]$
Phase-to-phase voltage in delta connection	U	$[V]$
Phase-to-neutral voltage in Y connection	U	$[V]$
Phase current	I	$[x\ I_N]$
C.B. tripping time [1]		$[s]$

[1]   C.B. tripping time:
         Time between pickup and release of the low set
         element. This value is only displayed for <1% x I_N

5.4   Reset

Unit MRP2 has the following three possibilities to reset the display of the unit as well as the output relays at jumper position J3=ON.

Manual Reset
- Pressing the push button <SELECT/RESET> for some time (about 3 s).

Electrical Reset
- Through applying auxiliary voltage to C8/D8.

Software Reset
- The software reset has the same effect as the <SELECT/RESET> push button (see also communication protocol of RS485 interface).
  The display can only be reset when the pickup is not present anymore (otherwise "TRIP" remains in display).
  During resetting of the display the parameters are not affected.

5.5   Hints for the setting procedure

5.5.1   Setting of the power measuring circuits switching point

The fact that the relay has to pickup for example at an alternator reverse power of 5% does not necessarily mean that the setting value of the MRP2 is also 5%. Due to the transformer ratio, the switch-points' setting value must first be calculated.

Calculation of the setting value

Necessary data:

P_{GEN}[kW]   Active power of the generator in kW it is calculated from the apparent power of the generator S_{GEN} according to: $P_{GEN} = S_{GEN} \cdot COS\ \varphi$

P_{MRP2} [kW]   Reference power of the MRP2 in kW
It is calculated from
I_N Nominal current of the relay
U_N Nominal voltage of the relay
nI   Ratio of the current transformer
n_U Ratio of the voltage transformer
for 4 wire system according to

$P_{MRP2} = \sqrt{3}$ x I_N x U_N x nI x n_U
with U_N = phase to phase voltage

If P_{REV} [%] is the desired reverse-power value in % referring to the active power of the generator, then the value to be adjusted on the relay is calculated as per following formula:

adjustment value in % $= \frac{P_{GEN}[kW]}{P_{MRP}[kW]} \cdot P_{REV}[\%]$

Calculation-example 1

active power of the generator
PGEN = 625 kVA x 0.8   =   500 kW
rated current of MRP2 I_N =   5 A
rated voltage of MRP2 U_N =   400 V
(phase-to-phase voltage)
ratio of the current transformer nI   =   1000 A / 5 A=   200

⇒ reference power of the unit

$P_{MRP2} = \sqrt{3}$ x 5A x 400 V x 200 = 690 kW

If the relay should respond at a reverse power of 5% the adjustment value can be calculated in the following way:

adjustment value (% of scale) = x5% = 3.62%
In the previous example the relay MRP2 has to be adjusted to 4%, so that it responds to a generator reverse-active power of 5%. The more sensitive relay version MRP2-R can be adjusted to 3.7%

Calculation example 2

active power of the generator
P_{GEN} = 1875 kVA x 0.8   =   1500 kW
nominal current of MRP2 I_N =   5 A
nominal voltage of MRP2
(phase-to-phase voltage) U_N =   100 V
Ratio of
current transformer   nI   =   150 A / 5 A
                                        =   30
voltage transformer n_U =   10 kV / 100 V
                                        =   100

⇒ reference voltage of the unit

$P_{MRP2} = \sqrt{3}$ x 5 A x 100 V x 30 x 100 = 2598 kW

If the relay should pickup at reverse power greater than 3% (referred to the active power of the generator) the adjustment value can be calculated in the following way:

adjustment value % = $\frac{1500\ kW}{2598\ kW} \cdot 3\% = 1.73$

In the foregoing example the relay MRP2 has to be adjusted to 2%.
The more sensitive relay version MRP2-R can be adjusted to 1.8%.

6. Relay Testing and commissioning

The following test instructions should help to verify the protection relay performance before or during commissioning of the protection system. To avoid a relay damage and to ensure a correct relay operation, be sure that:

- the auxiliary power supply rating corresponds to the auxiliary voltage on site.
- the rated current and rated voltage of the relay correspond to the plant data on site.
- the current transformer circuits and voltage trans-former circuits are connected to the relay correctly.
- all signal circuits and output relay circuits are connected correctly.

6.1   Power-On

NOTE!
Prior to switch on the auxiliary power supply, be sure that the auxiliary supply voltage corresponds with the rated data on the type plate. Switch on the auxiliary power supply to the relay and check that the message "SEG" appears on the display and the self supervision alarm relay (watchdog) is energized (Contact terminals D7 and E7 closed).

6.2   Testing the output relays

NOTE!
Prior to commencing this test, always block the output circuits or interrupt in another way the output circuits which can cause the tripping of the circuit breaker if the breaker operation during this test is not desired. By pressing the push button <TRIP> once the display shows you the first part of the software version of the relay (e.g. „D08-"). By pressing the push button <TRIP> twice the display shows the second part of the software version of the relay (e.g. „4.01"). The software version should be quoted in all correspondence. After you have got a message "PSW?" on the display by pressing the push button <TRIP> once more please enter the correct password to proceed with the test. After that the message "TRI?" will follow. Confirm this testing by means of pressing push button <TRIP> again. All output relays should then be activated and the self supervision alarm relay (watchdog) be deactivated one after another with a time interval of 1 second. Thereafter, reset all output relays by pressing the push button <SELECT/RESET>.

6.3   Checking the set values

As input energizing quantities for three phase power relay MRP2-3, three phase voltages and currents will be applied to relay input circuits. By repeatedly actuating the push button <SELECT> all relay set values may be checked For detailed information, please refer to chapter 5.
Depending on the system conditions and the volt-age transformer used, three phase voltages can be connected to the relay input circuits with either star or delta connection. In case of a star connection the phase-to-neutral voltage will be applied to the voltage input circuits, while the phase-to-phase voltages will be connected to the voltage input circuits in case of a delta connection. The voltage input connection can be set as a parameter, and should agree with the actual voltage input connection:

Y: Star connection. Phase-to-neutral voltages will be measured and evaluated.
Delt: Delta connection. Phase-to-phase voltages will be measured and evaluated.

Phase-to-phase voltages or phase-to-neutral volt-age will be connected to the relay MRP2-1 when changeover star/delta correction.
NOTE!
For single phase power relay MRP2-1, if delta connection is chosen, current in phase 1 (I_{L1}) should be connected to input terminals B3/B4 and phase-to-phase voltage between phase 1 and phase 2 (U_{12}) should be connected to input terminals A3/A4. If star connection is chosen, the current in phase 1 (I_{L1}) should be connected to input terminals B3/B4 and phase-to-neutral voltage between phase 1 and neutral (U_{1E}) should be connected to input terminals A3/A4.

6.4   Secondary injection test

6.4.1   Test equipment

- Voltmeter, ammeter and wattmeter with class 1 or better
- Auxiliary power supply with the voltage corresponding to the rated data on the type plate
- Single-phase or three-phase current supply unit (adjustable from 0 to 2 x In)
- Single-phase or three phase voltage supply unit (adjustable from 0 to 1.2 x Un)
- Timer to measure the operating time (Accuracy class 10 ms)
- Switching device
- Test leads and tools

6.4.2 Example of test circuit for MRP2 relay

For testing power relays, you need both current and voltage input signals with adjustable phase shifting. Figure 1 shows an example of a single phase test circuit with adjustable voltage and current energizing the MRP2 relay under test.

For testing the power relay, the input voltage shall be applied to the relay with a constant value within its effective range (U = Un or U = Un/$\sqrt{3}$). The input current and phase angle shall be appropriately varied.

In figure 6.1 the relay voltage connection is sup-posed to be set to star connection and a single phase test circuit will be used to test a three phase power relay MRP2-3 or a single phase power relay MRP2-1.

1. Einstellbare Spannungsquelle
   Variable voltage source
2. Einstellbare Spannungsquelle mit Phasenschieber
   Variable voltage source with phase shifting
3. Schaltgerät
   Switching device
4. Serienwiderstand
   Series resistor
5. Voltmeter
6. Amperemeter
   Ammeter
7. Wattmeter
8. Zeitgeber
   Timer
9. zu testendes Relais
   Relay under Test

Figure 6.1: Test circuit

Great care must be taken as to connect the test current and test voltage to the relay in correct polarity. In figure 6.1 the relay and test source polarity are indicated by a * mark near the terminals. The markings indicate that the relay will measure a forward active power when the voltage drops from polarity to non-polarity in the voltage input circuit and the current flows from polarity to non-polarity in the current input circuit in case of a unity power factor.

The power at MRP2-1 (-Δsetting) will be calculated as follows:
P_{Tot} = I1 x U12 + I3 x U32 , this means: phase 2 is used as reference current.
Meanwhile the displayed power will not be changed if current I2 changes.

6.4.3 Checking the input circuits and measured values

The active power measured by MRP2 is related to the rated power of the relay P_N:

$$P_N = 3 \cdot \frac{Un}{\sqrt{3}} \cdot I_N$$

Inject a current of rated value (1A for I_N = 1A) in phase 1 (terminals B3-B4) and apply a voltage of $Un/\sqrt{3}$ to terminals A3/A4. The input voltage and current should be in phase (unity power factor). Check the measured power, voltage and current on the display by pressing the push button <SELECT>. The power to be measured in this case should be 0.33 x P_N for three phase power relays MRP2-3 and 1.00 x P_N for single phase power relays MRP2-1 respectively. The voltage to be measured is $Un/\sqrt{3}$ and current to be measured 1 x I_N.
Exchange the current input terminals B3/B4. The power to be measured in this case should be - 0.33 x P_N for three phase power relays MRP2-3 and - 1.00 x P_N for single phase power relays MRP2-1. The voltage to be measured is $U_N/\sqrt{3}$ and current to be measured 1 x I_N.
Compare the values of current, voltage and power shown in display with the measured values of am-meter, voltmeter and active power meter. The deviations of current and voltage measurement must not exceed 5%. The deviation of active power measurement must not exceed 3%.
If possible, perform the test for different phase angles and check the active power to be measured.

6.4.4 Checking the operating and resetting values of the relay

Apply rated voltage on input terminals A3/A4. Gradually increase (decrease) the current in phase 1 until the relay starts, i.e. at the moment when the LED P> (or P<) lights up or the alarm output relay P> (or P<) is activated. Read-off the operating active power from wattmeter. The deviation must not exceed 5% of the set operating value under the condition of reactive part < 50%.
Furthermore, gradually decrease (increase) the current until the relay resets, i.e. the alarm output relay P> (or P<) is de-energized.
For ascertaining the resetting value, increase (decrease) gradually the test current until the output relay P> (P<) de-energizes. For overload the resetting value must be >97%. For P< the value must be <103%.

Checking the operating and resetting values at reverse power

This test can be done similarly, only CT terminals B3/B4 have to be changed. Lighting up of LED Pr and energizing of alarm output relay Pr (terminals D6/E6) have to be observed. Values displayed to be negative in sign.

Checking the operating and resetting values at voltage-dependent reverse power

When the reverse power element is excited (see above), the measuring voltage is decreased. If the voltage-dependent reverse power element picks up, lighting-up of the LED, tripping of the jumpered alarm and tripping relays as well as the voltage value at tripping must be checked.

6.4.5 Checking the relay operating time

To check the relay operate time, a timer to is be connected to the trip relay contact. The timer should be started simultaneously with the current injection in the current input circuit and stopped by the trip relay contact. Apply rated voltage to the relay and set the current to a value corresponding to twice the operate value and inject the current instantaneously. The operate time measured by timer should have a deviation <3% of the set value or 20 ms.

Repeat the test on all phases and for all relay functions (Over-power P>, Under-power P< and Reverse power Pr) in the same manner.

6.4.6 Test of the CB failure protection

For testing the tripping time the rated voltage has to be applied and a test current of about 2 times the rated current to be injected. The timer is started upon tripping of the relay of a protection function (P<, P>, P) and stopped as soon as the relay for the CB failure protection has picked up. Message "CBFP" is displayed. The tripping time ascertained by the timer should not deviate more than 1% or, at short trip delay, less than 10 ms from the set tripping time.

Alternatively, the timer can be started when the aux. voltage and the test current are injected simultaneously. The timer stops when the corresponding output relay for circuit breaker failure protection trips.

In this case the previously measured tripping delay (see section 6.4.5) has to be subtracted from the total tripping time measured.

6.4.7 Checking the external blocking and reset functions

At MRP2 relays, all relay functions will be inhibited by external blocking input. To test the blocking function: Apply auxiliary supply voltage to the external blocking input of the relay (terminals E8/D8). Apply a test voltage and inject a test current which could cause a tripping. Observe that there is no trip and alarm.

Remove the auxiliary supply voltage from the blocking input. Apply a test voltage and inject a test current to make the relay tripped (Message „TRIP" on the display). Interrupt the test current and apply auxiliary supply voltage to extern reset input of the relay (terminals C8/D8). The display and LED indications should be reset immediately.

6.5   Primary injection test

Generally, a primary injection test could be carried out in the similar manner as the secondary injection test above described. With the difference that the protected power system should be, in this case, connected to the installed relays under test „on line", and the test currents and voltages should be injected to the relay through the current and voltage transformers with the primary side energized. Since the cost and potential hazards are very high for such a test, especially if staged fault tests are intended, primary injection tests are usually limited to very important protective relays in the power system.

Because of its powerful combined indicating and measuring functions, you have still the possibilities to test the MRP2 relay in the manner of a primary injection without extra expenditures and time consumption.

In actual service, for example, the measured cur-rent and voltage values as well as the measured active power value may be compared phase by phase with the measuring devices on the switchboard panel to verify that the relay works and measures correctly and to verify that the relay is connected to the power system with the correct polarity.

6.6   Maintenance

Maintenance testing is generally done on site at regular intervals. These intervals vary among users depending on many factors: e.g. the type of protective relays employed; the importance of the primary equipment being protected; the user's past experience with the relay, etc.

For electromechanical or static relays, maintenance testing will be performed at least once a year according to the experiences. For digital relays like MRP2, this interval can be substantially longer. This is because that:

- the MRP2 relays are equipped with very wide self-supervision functions, so that many faults in the relay can be detected and signalized during the service. Important: The self-supervision out-put relay must be connected to a central alarm panel!
- the combined measuring functions in MRP2 relay enable supervision the relay functions during service.
- the combined TRIP test function of the MRP2 re-lay allows to test the relay output circuits by power system interrupt.

A testing interval of two years for maintenance will, therefore, be recommended.

During a maintenance testing, the relay functions including the operating values and relay tripping characteristics as well as the operating time should be tested.

7. Technical data

For further information please refer to description "MR-Digital Multifunctional Relays".

7.1   Measuring input circuits

Rated data:	Rated current I_N: Rated voltage U_N: Rated frequency f_N:	1A or 5 A 100 V, 230 V, 400 V 40 - 70 Hz

Max. measuring range :   2 x I_N (MRP2)   0.5 x I_N (MRP2-R)
                                 1.5 x U_N at U_N = 100 V, 230 V
                                 1.25 x U_N at U_N = 400 V

Power consumption
in current circuit: at I_N = 1 A   0.2 VA
                                 at I_N = 5 A   0.1 VA

Power consumption in
voltage circuit: < 1 VA per phase at U_N

Thermal withstand capability
in current circuit: dynamic current withstand
                                 (half-wave)   250 x I_N
                                 for 1 s   100 x I_N
                                 for 10 s   30 x I_N
                                 continuously   4 x I_N

Thermal withstand capability
in voltage circuit: continuously   1.5 x U_N1,5 x U_N at U_N = 100 V, 230 V
                                                 1.25 x U_N = 400 V

Accuracy of measuring: P_N: 3% of measuring value or 0.5% of rated value
                                 U_N: 5% of measuring value or 1% of rated value
                                 I_N: 5% of measuring value or 1% of rated value

Additional inaccuracy of
angle measuring at rated
voltage:±2° corresponds to $\cos\varphi$=0,8 α=37° ±2,6% of rated value
                                 $\cos\varphi$=0,707 α=45° ±3,5% of rated value
                                 $\cos\varphi$=0,5 α=60° ±6,1% of rated value

7.2   Common data

Dropout to pickup ratio: >97% for P> and Pr
                                 and < 103% for P<
Returning time: 30 ms
Time lag error class index E: ± 10 ms
Minimum operating time: 30 ms

Influences of power measuring
Auxiliary voltage: in the range of 0.8 < U_H/ U_{HN} < 1.2
                                 no additional influences can be measured
Frequency: no influence
Influences on delay times: no additional influences can be measured

7.3   Setting ranges and steps

7.3.1   Setting ranges and steps MRP2-1 and MRP2-3

Function	Parameter	Setting range	Steps	Tolerance
P>	P>	$0.005...2.0 \times P_N$; EXIT	0.005; 0.01; $0.02 \times P_N$	refer to 7.1
	$t_{P>}$	$0.04...120$ s; EXIT	$0,02$; 0.01; $0,1$; $0,2$; $0,5$; $1,0$; $2,0$ s	$\pm 1\%$ or ± 10 ms
P<	P<	EXIT; $-0.1...2.0 \times P_N$	0.005; 0.01; $0.02 \times P_N$	refer to 7.1
	$t_{P<}$	$0.04...120$ s; EXIT	0.02; 0.05; 0.1; 0.2; 0.5; 1.0; 2.0 s	$\pm 1\%$ or ± 10 ms
Pr	Pr	$0.005...2.0 \times P_N$; EXIT	0.005; 0.01; $0.02 \times P_N$	refer to 7.1
	t_{Pr}	$0.04... 120$ s; EXIT	0.02; 0.05 0.1; 0.2; 0.5; 1.0; 2.0 s	$\pm 1\%$ or ± 10 ms
$U_{<Pr}$	$U_{<Pr}$	$U_N = 100$ V $2...150$ V (EXIT) $U_N = 230$ V $4...346$ V (EXIT) $U_N = 400$ V $10...600$ V	1 V 2 V 5 V	$\pm 1\%$ from setting value or $< 1\%$ Un
	$t_{U<Pr}$	$0.04... 120$ s; EXIT	0.01; 0.02; 0.05; 0.1; 0.2; 0.5; 1.0; 2.0 s	$\pm 1\%$ or ± 10 ms
t_{CBFP}	t_{CBFP}	$0,1...1,6$ s; EXIT	$0,01$; $0,02$; $0,05$; $0,1$ s	$\pm 1\%$ bzw. ± 10 ms

Table 7.1: Setting ranges and steps MRP2-1 and MRP2-3

7.3.2   Setting ranges and steps MRP2-R1 and MRP2-R3

Function	Parameter	Setting range	Step	Tolerance
$P_>$	$P_>$	$0.001...0.5 \times P_N$; EXIT	0.001; 0.002; $0.005 \times P_N$	refer to 7.1
	$t_{P>}$	$0.04...120$ s; EXIT	$0,02$; 0.01; 0.1; 0.2; 0.5; 1.0; 2.0 s	$\pm 1\%$ or ± 10 ms
$P_<$	$P_<$	EXIT; $-0.1...0.5 \times P_N$	0.001; 0.002; $0.005 \times P_N$	refer to 7.1
	$t_{P<}$	$0.04...120$ s; EXIT	0.02; 0.05; 0.1; 0.2; 0.5; 1.0; 2.0 s	$\pm 1\%$ or ± 10 ms
P_r	P_r	$0.001...0.5 \times P_N$; EXIT	0.001; 0.002; $0.005 \times P_N$	refer to 7.1
	t_{Pr}	$0.04...120$ s; EXIT	0.02; 0.05; 0.1; 0.2; 0.5; 1.0; 2.0 s	$\pm 1\%$ or ± 10 ms
$U_{<Pr}$	$U_{<Pr}$	$U_N = 100$ V $2...150$ V (EXIT) $U_N = 230$ V $4...346$ V (EXIT) $U_N = 400$ V $10...600$ V	1 V 2 V 5 V	$\pm 1\%$ from setting value or $<1\%$ Un
	$t_{U<Pr}$	$0.04... 120$ s; EXIT	0.01; 0.02; 0.05; 0.1; 0.2; 0.5; 1.0; 2.0 s	$\pm 1\%$ or ± 10 ms
t_{CBFP}	t_{CBFP}	$0,1...1,6$ s; EXIT	$0,01$; $0,02$; $0,05$; $0,1$ s	$\pm 1\%$ bzw. ± 10 ms

Table 7.2: Setting ranges and steps MRP2-R1 and MRP2-R3

7.3.3 Interface parameters

Function	Parameter	Modbus-Protocol	RS485 Open Data Protocol
RS	Slave-Address	1 - 32	1 - 32
RS	Baud-Rate	1200, 2400, 4800, 9600	9600 (fixed)
RS	Parity	even, odd, no	„even Parity" (fixed)

Table 7.3: Interface parameter

7.4   Output contact ratings

Number of relays: 5
Contacts: 2 relays with 2 change-over contacts
                                         3 relays with 1 change-over contacts

Technical data subject to change without notice!

8. Order form

Directional power relay *MRP2-*				I		U			
Measuring of reverse power only (2-steps; sensitive)		**R**							
Power measuring	1-phase		**1**						
	3-phase		**3**						
Rated current	1 A				**1**				
	5 A				**5**				
Rated voltage:	100 V/110 V						**1**		
	230 V						**2**		
	400 V						**4**		
Housing (12TE)	19"-rack							**A**	
	Flush mounting							**D**	
Optionally with Modbus protocol									**-M**

Setting list MRP2

Project: _____ SEG job.-no.: _____

Function group: = _____ Location: + _____ Relay code: - _____

Relay functions: _____ Password: _____

Date: _____

Setting of the parameters

Function		Unit	Default settings	Actual settings
Δ/Y	Input Transformer Connection		DELTA	
P>	pickup value for overload	x P_N	0.005/0.001[1]	
$t_{P>}$	Tripping delay for overload	s	0.04	
P<	Pickup value for under load	x P_N	-0,01/-0.001[1]	
$t_{P<}$	Tripping delay for under load	s	0.04	
Pr	Pickup value for reverse power	x P_N	0.005/0,001[1]	
t_{Pr}	Tripping delay for reverse power	s	0.04	
$U_{<Pr}$	Pickup value for under voltage	V	90/205/360[2]	
$t_{U<Pr}$	Tripping delay for voltage dependent reverse power	s	0.04	
	Tripping delay for C. B. failure protection	s	0,1	
U	Selection of rated voltage	V	100 [3]	
	Blocking/release of LED indication after pickup		NOFL	
RS	Slave address of the serial interface		1	
RS [4]	Transmission rate		9600	
RS [4]	Parity		even	

[1] MRP2 or MRP2-R
[2] dependent from the adjusted rated voltage
[3] Only at 100 V version possible
[4] Only Modbus protocol

Setting of code jumpers

Code jumper	J1		J2		J3	
	Default setting	Actual setting	Default setting	Actual setting	Default setting	Actual setting
Plugged			No function			
Not plugged	X				X	

Assignment of the output relays:

Function	Relay 1		Relay 2		Relay 3		Relay 4	
	Default setting	Actual setting	Default setting	Actual setting	Default setting	Actual setting	Default setting	Actual setting
P> alarm			X					
P> tripping	X							
P< alarm			X					
P< tripping	X							
Pr alarm					X			
Pr tripping	X							
$U_{<Pr}$ alarm					X			
$U_{<Pr}$ tripping	X							
t_{CBFP}							X	

Blocking parameter

Function		Default setting	Actual setting
BLOC	Blockade active/not active	BL=1 (active)	

Assignment of the blocking function:

	Default setting		Actual setting	
Function	Blocking	No blocking	Blocking	No blocking
P>	X			
P<	X			
Pr	X			
$U_{<Pr}$	X			
CBFP		X		

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