

# Components

Power Factor Control Relays



## Components Power Factor Control Relays

The Reactive Power control Relay for maximum operational reliability.  
Simple to install, easy to operate and automatic 'plug and play' start-up.

### Characteristics that count

FRAKO's intelligent reactive power control relays automatically adjust themselves to suit the power factor correction system and the network that they serve. This automatically eliminates the risk of faulty programming.

Incorrect connections or inappropriate locations for the instrument transformers are identified and indicated, therefore making time-consuming and expensive troubleshooting unnecessary. The patented characteristic curve controls the set target  $\cos \varphi$  as a minimum value under normal load while simultaneously preventing overcorrection under low load conditions. This reliably prevents costs for reactive power arising and reduces the risk of network disruptions.

The control relay's intelligent mode of operation ensures that the target parameters are controlled and maintained with the lowest possible number of switching cycles. This minimizes wear of the power factor correction system and reduces disturbances to the network.

Some control relay versions have a trip function to protect the power factor correction system from excessive levels of harmonics.

Last not least, our customers appreciate the user-friendly operation of our reactive power control relays.

### Application Recommendations

|                                                                                                                                                                |                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Consumer network with regulation on inductive target $\cos \varphi$<br>Quadrant: consumption – inductive                                                       | RM 2106 / RM 2112<br>see from page 36<br>PQC see from page 39 |
| Consumer- and electricity producer networks with regulation in all 4 quadrants                                                                                 | PQC see from page 39                                          |
| Measurement value logging of voltage and current (medium voltage)                                                                                              | PQC see from page 39                                          |
| Detuned Power Factor Correction Systems with detuning factors $< 7\%$ or networks with sporadically higher harmonic voltages according to EN 61000-2-4 class 2 | PQC see from page 39                                          |
| Part dynamic Power and dynamic Factor Correction Systems                                                                                                       | PFC-12TR-1, PFC-12TR-1-RS485 see from page 36                 |

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## Power Factor Control Relays

### Features / Technical Data

| Category                                              | Basic                                    |          |
|-------------------------------------------------------|------------------------------------------|----------|
|                                                       | RM 2106                                  | RM 2112  |
| Type                                                  |                                          |          |
| Article-No. (German, English)                         | 38-00320                                 | 38-00340 |
| Voltage measurement                                   | L-N                                      |          |
| Operating/Measurement voltage [V]                     | 220 - 240                                |          |
| Frequency [Hz]                                        | 50 / 60                                  |          |
| Current measurement                                   | Single phase                             |          |
| Operating current min. [mA] man. programming          | 20                                       |          |
| Operating current min. [mA] automatic detection       | 20                                       |          |
| Current transformer X/...A                            | 1 - 5                                    |          |
| Connection type                                       | Man/Auto                                 |          |
| Target cos $\varphi$                                  | 0.85 ind. - 1                            |          |
| Characteristics settings                              | Fixed                                    |          |
| Number of characteristics                             | 1                                        |          |
| Switching sequence                                    | Man/Auto                                 |          |
| Number of active switching outputs                    | Man/Auto                                 |          |
| Relay contacts                                        | 6                                        | 12       |
| Loading capacity of the relay contacts                | 230 V / 950 VA                           |          |
| Switching time delay of the relay contacts            | Fixed, 60 sec.                           |          |
| Real switching time delay of the relay contacts       | Optimised, depending on the load changes |          |
| Switching time (discharge time) of the relay contacts | Fixed 60 sec.                            |          |
| Fault signal contacts                                 | 1 relay switch contact selectable        |          |
| Loading capacity of the fault signal contacts         | 230 V / 950 VA                           |          |
| Dimensions W x H x D [mm]                             | 144 x 144 x 40                           |          |
| Panel cut out [mm]                                    | 138 x 138                                |          |
| Ingress protection front                              | IP50 (IP54*)                             |          |
| Ingress protection backside                           | IP20                                     |          |
| Weight (net) [kg]                                     | 0.8                                      |          |

\* when using a sealing ring (optional)

# Components

## Power Factor Control Relays

| Category                                 | Dynamic                                                                                                               |                                                                          |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
|                                          | PFC-12TR-1                                                                                                            | PFC-12TR-1-RS485                                                         |
| Type                                     |                                                                                                                       |                                                                          |
| Article-No.                              | 39-29060                                                                                                              | 39-29061                                                                 |
| Supply voltage (L-N / L-L)               | 110-440 V AC, ± 15%                                                                                                   |                                                                          |
| Consumption                              | max. 5 VA                                                                                                             |                                                                          |
| Display                                  | 128 x 64 Pixel                                                                                                        |                                                                          |
| Voltage measurement                      | L-N / L-L                                                                                                             |                                                                          |
| Voltage ranges                           | 30-440 V AC L-N / 50-760 V AC L-L                                                                                     |                                                                          |
| Tolerance                                | -15 / +10 %                                                                                                           |                                                                          |
| Frequency                                | 42 - 80 Hz                                                                                                            |                                                                          |
| Sampling rate                            | 10 kHz (bei 50 Hz)                                                                                                    |                                                                          |
| Current measurement                      | Single phase                                                                                                          |                                                                          |
| Current ranges                           | x / 5 A (x / 1 A)                                                                                                     |                                                                          |
| Response current                         | 50 mA (10 mA)                                                                                                         |                                                                          |
| Maximum current                          | 6 A                                                                                                                   |                                                                          |
| Consumption of current measurement       | ca. 0.2 VA                                                                                                            |                                                                          |
| Switching outputs (relay)                | 12                                                                                                                    |                                                                          |
| Switching capacity                       | max. 250 V / 1.000 W                                                                                                  |                                                                          |
| Fusing                                   | 10 AT                                                                                                                 |                                                                          |
| Mechanical lifetime                      | > 10 <sup>7</sup> switching cycles                                                                                    |                                                                          |
| Electrical lifetime                      | > 10 <sup>5</sup> switching cycles                                                                                    |                                                                          |
| Switching outputs (transistor)           | 12                                                                                                                    |                                                                          |
| Switching voltage                        | 5 - 30 V DC                                                                                                           |                                                                          |
| Switching current                        | max. 50 mA                                                                                                            |                                                                          |
| Alarm relay (switching capacity)         | 1 (max. 250 V / 1.000 W)                                                                                              |                                                                          |
| Digital input (tariff switching)         | -                                                                                                                     | •                                                                        |
| Interface (communication)                | -                                                                                                                     | RS485                                                                    |
| Supported communication protocols        | -                                                                                                                     | Modbus RTU, Modbus KTR, ASCII Out, Master Mode, Slave Mode, Slave Hybrid |
| Controller Networking                    | -                                                                                                                     | •                                                                        |
| Dimensions (W x H x D)                   | 144 x 144 x 53 mm                                                                                                     |                                                                          |
| Weight                                   | 1 000 g                                                                                                               |                                                                          |
| Protection degree according to IEC 60529 | front IP54, back IP20                                                                                                 |                                                                          |
| Mounting                                 | front plate                                                                                                           |                                                                          |
| Connection cross-sections                | 0.08-2.5 mm <sup>2</sup> (solid, stranded and fine-stranded),<br>1.5 mm <sup>2</sup> (pin cable lug, wire end sleeve) |                                                                          |
| Operating temperature range              | -10 ... +55 °C                                                                                                        |                                                                          |
| Relative humidity                        | max. 95% without condensation                                                                                         |                                                                          |
| Altitude                                 | max. 2 000 m                                                                                                          |                                                                          |
| Degree of pollution                      | 2                                                                                                                     |                                                                          |
| Mounting position                        | any                                                                                                                   |                                                                          |
| EMI                                      | Guidelines 2004/108/EG & 2006/95/EG                                                                                   |                                                                          |
| Device security                          | IEC/EN 61010-1 & IEC/EN 61010-1-08                                                                                    |                                                                          |
| Protection class                         | I (with protective conductor)                                                                                         |                                                                          |
| Interference immunity                    | DIN EN (IEC) 61326-1, industrial environment                                                                          |                                                                          |
| Emitted interference                     | DIN EN (IEC) 61326-1, class B: living environment,<br>DIN EN (IEC) 61326-1, class A: industrial environment           |                                                                          |

# Components

## Power Factor Control Relays

### Operating mode displays

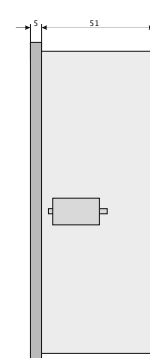
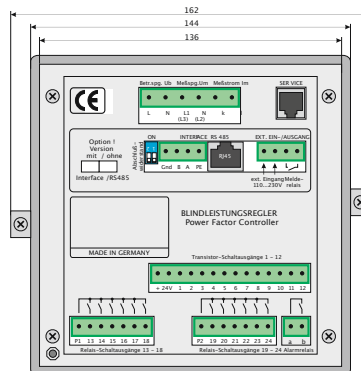
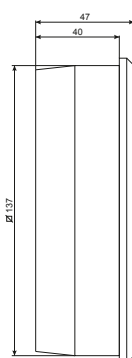
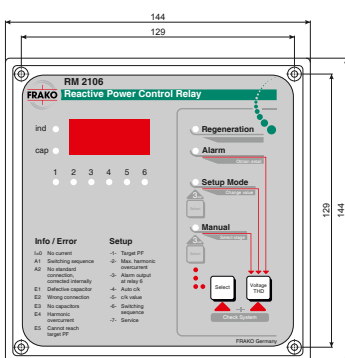
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| Category                             | Basic                    |                          |
|--------------------------------------|--------------------------|--------------------------|
|                                      | RM 2106                  | RM 2112                  |
| Type                                 |                          |                          |
| Actual cos $\varphi$                 | Instantaneous value      | Instantaneous value      |
| Target cos $\varphi$                 | •                        | •                        |
| Active current [A]                   | •                        | •                        |
| Reactive current [A]                 | •                        | •                        |
| Apparent current [A]                 | Instantaneous value      | Instantaneous value      |
| Capacitor power per step             | Value                    | Value                    |
| Connected capacitor steps            | •                        | •                        |
| Harmonic voltage [%]                 | THDv                     | THDv                     |
| Lack of capacity                     | Alarm can be deactivated | Alarm can be deactivated |
| Defective capacitor steps            | Alarm                    | Alarm                    |
| Switching operations threshold value | Alarm                    | Alarm                    |
| Undervoltage                         | Alarm Switch-off         | Alarm Switch-off         |
| Overcurrent                          | Alarm switch-off         | Alarm switch-off         |
| Minimum current                      | Message switch-off       | Message switch-off       |
| Harmonic voltage limit               | Alarm                    | Alarm                    |

| Category                             | Dynamic                                 |                                         |
|--------------------------------------|-----------------------------------------|-----------------------------------------|
|                                      | PFC-12TR-1                              | PFC-12TR-1-RS485                        |
| Type                                 |                                         |                                         |
| Actual cos $\varphi$                 | Instantaneous and average value         | Instantaneous and average value         |
| Target cos $\varphi$                 | •                                       | •                                       |
| Active current [A]                   | •                                       | •                                       |
| Reactive current [A]                 | •                                       | •                                       |
| Apparent current [A]                 | Instantaneous and peak value            | Instantaneous and peak value            |
| Capacitor power per step             | •                                       | •                                       |
| Connected capacitor steps            | •                                       | •                                       |
| Harmonic voltage [%]                 | 3., 5., 7., 9., 11., 13., 15., 17., 19. | 3., 5., 7., 9., 11., 13., 15., 17., 19. |
| Lack of capacity                     | Alarm can be deactivated                | Alarm can be deactivated                |
| Defective capacitor steps            | -                                       | -                                       |
| Switching operations threshold value | -                                       | -                                       |
| Undervoltage                         | Alarm Switch-off - can be deactivated   | Alarm Switch-off - can be deactivated   |
| Overcurrent                          | Alarm - can be deactivated              | Alarm - can be deactivated              |
| Minimum current                      | Alarm switch-off - can be deactivated   | Alarm switch-off - can be deactivated   |
| Harmonic voltage limit               | Alarm - can be deactivated              | Alarm - can be deactivated              |

Dimensions Dimensional drawing RM 2106 (RM 2112)

Dimensions Dimensional drawing PFC-12TR-1/PFC-12TR-1-RS485



All dimensions in mm