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 φ 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 φ Quadrant: consumption – inductive	RM 2106 / RM 2112 see from page 36 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

Features / Technical Data

Category	Basic	
Type	**RM 2106**	**RM 2112**
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 φ	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)

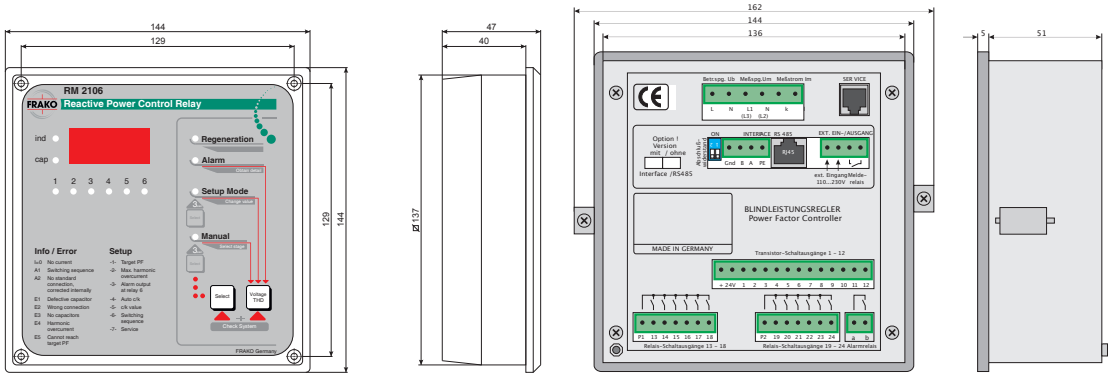
Category	Dynamic	
Type	**PFC-12TR-1**	**PFC-12TR-1-RS485**
Article-No.	39-29060	39-29061
Supply voltage (L-N / L-L)	110-440 V AC, ± 10%	
Consumption	max. 3 VA	
Display	128 x 64 Pixel	
Voltage measurement	L-N / L-L	
Voltage ranges	30-440 V AC L-N / 50-760 V AC L-L	
Frequency	42 - 80 Hz	
Sampling rate	10 kHz (bei 50 Hz)	
Current measurement	Single phase	
Current ranges	x / 5 A (x / 1 A)	
Response current	20 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	> 10^7 switching cycles	
Electrical lifetime	> 10^5 switching cycles	
Switchting outputs (transistor)	12	
Switching voltage	24 V	
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 protocolls	–	Modbus RTU, Modbus KTR, ASCII Out, Master Mode, Slave Mode, Slave Hybrid
Controller Networking	–	•
Dimensions (W x H x D)	144 x 144 x 55 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 mm² (solid, stranded and fine-stranded), 1.5 mm² (pin cable lug, wire end sleeve)	
Operating ambient temperature	-20 … +60 °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	IEC 61000-6-2; EN 61326, industrial environment	
Emitted interference	DIN EN (IEC) 61326-1, class B: living environment, DIN EN (IEC) 61326-1, class A: industrial environment	

Operating mode displays

Category	Basic	
Type	**RM 2106**	**RM 2112**
Actual cos φ	Instantaneous value	Instantaneous value
Target cos φ	•	•
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	
Type	**PFC-12TR-1**	**PFC-12TR-1-RS485**
Actual cos φ	Instantaneous and average value	Instantaneous and average value
Target cos φ	•	•
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) Dimensional drawing PFC-12TR-1/PFC-12TR-1-RS485



All dimensions in mm