Power Factor Control Relays

// 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 phi 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 phi	RM 2106 / RM 2112 / RM 9606 / EMR 1100 S
Quadrant: consumption – inductive	EMR 1100
Consumer- and electricity producer networks with regulation in all 4 quadrants	RM 9606 / EMR 1100 S / EMR 1100
Measurement value logging of voltage and current (medium voltage)	EMR 1100 S / EMR 1100
Detuned Power Factor Correction Systems with detuning factors < 7 % or networks with sporadically higher harmonic voltages according to EN 61000 class 2	EMR 1100 S / EMR 1100
Dynamic Power Factor Correction Systems	RM 2012 12D
Part dynamic Power Factor Correction Systems	RM 2012 6+6D

Features / Technical Data

Category	Basic		Standard		Premium	Dynamic	
Type	**RM 2106**	**RM 2112**	**RM 9606**	**EMR 1100 S**	**EMR 1100**	**RM 2012 6+6D**	**RM 2012 12D**
Article-No. (German)	38-00320	38-00340	38-00100	38-00300	20-50006	39-29050	39-29051
Article-No. (English)	38-00320	38-00340	38-00103	38-00301	20-50008	39-29050	39-29051
Voltage measurement	L-N	L-N	L-N / L-L	L-N / L-L	L-N / L-L	L-L	L-L
EMR 1100 S Upgrade	-	-	-	20-50013	-	-	-
EMR-SW Configuration Software for EMR 1100	-	-	-	-	20-10312	-	-
Operating/ Measurement voltage [V]	220 - 240	220 - 240	220 - 400	-	-	400	400
Operating voltage [V]	-	-	-	220 - 240 380 - 420	220 - 240 380 - 420	-	-
Measurement voltage [V]	-	-	-	100 - 690	100 - 690	-	-
Frequency [Hz]	50 / 60	50 / 60	50 / 60	50 / 60	50 / 60	50 / 60	50 / 60
Current measurement	Single phase	Single phase	Single phase	Single phase	Single phase	Single phase	Single phase
Operating current min. [mA] man. programming	20	20	20	20	20	10	10
Operating current min. [mA] automatic detection	20	20	20	20	20	50	50
Current transformer X/…A	1 -5	1 -5	1 -5	1 -5	1 -5	1 -5	1 -5
Connection type	Man/Auto	Man/Auto	Man/Auto	Man/Auto	Man/Auto	Man/Auto	Man/Auto
Target cos phi	0.85 ind. - 1	0.85 ind. - 1	0.80 ind. - 0.90 cap.	0.80 ind. - 0.90 cap.	0.80 ind. - 0.90 cap.	0.80 ind. - 0.80 cap.	0.80 ind. - 0.80 cap.
Characteristics settings	Fixed	Fixed	Variable	Variable	Variable	Fixed	Fixed
Number of characteristics	1	1	1	1	2	2	2
Switching sequence	Man/Auto	Man/Auto	Man/Auto	Man/Auto	Man/Auto	Man/Auto	Man/Auto
Number of active switching outputs	Man/Auto	Man/Auto	Man/Auto	Man/Auto	Man/Auto	Man/Auto	Man/Auto
Programmable fixed stages	0	0	3	3	3	3	3
Relay contacts	6	12	6	12	12	6	0
Loading capacity of the relay contacts	230 V / 950 VA	230 V / 950 VA	250 V / 1800 VA	250 V / 1800 VA	250 V / 1800 VA	250 V / 1000 VA	-

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Switching time delay of the relay contacts	Fixed 60 sec.	Fixed 60 sec.	Adjustable 5 - 500 sec.	Adjustable 5 - 500 sec.	Adjustable 5 - 500 sec.	Adjustable 0 - 1200 sec.	-
Real switching time delay of the relay contacts	Optimised, depending on the load changes	Optimised, depending on the load changes	Optimised, depending on the load changes	Optimised, depending on the load changes	Optimised, depending on the load changes	Fixed, corresponding to the settings	-
Switching time (discharge time) of the relay contacts	Fixed 60 sec.	Fixed 60 sec.	Adjustable 5 - 900 sec.	Adjustable 5 - 900 sec.	Adjustable 5 - 900 sec.	Adjustable 0 - 1200 sec.	-
Transistor-switching contacts	0	0	0	0	0	6	12
Loading capacity of the transistor-switching contacts	-	-	-	-	-	5 - 30 VDC / 50 mA	5 - 30 VDC / 50 mA
Switching frequency [Hz] of the transistor-switching contacts	-	-	-	-	-	0.1/0.2/0.5/ 1/10/50	0.1/0.2/0.5/ 1/10/50
Fault signal contacts	1 relay switch contact selectable	1 relay switch contact selectable	1 Normally closed contact potential-free	1 Normally closed contact potential-free	1 Normally closed contact potential-free	1 Normally closed contact potential-free	1 Normally closed contact potential-free
Loading capacity of the fault signal contacts	230 V / 950 VA	230 V / 950 VA	250 V / 3 A	250 V / 3 A	250 V / 3 A	250 V / 1000 VA	250 V / 1000 VA
Inputs	0	0	0	0	1 for switching the control characteristics	1 for switching the set cos phi	1 for switching the set cos phi
Interfaces	-	-	-	-	FRAKO Starkstrombus® RS-232	Optional Profibus Modbus	Optional Profibus Modbus
Dimensions W x H x D [mm]	144 x 144 x 40	144 x 144 x 40	144 x 144 x 40	144 x 144 x 105	144 x 144 x 105	144 x 144 x 53	144 x 144 x 53
Panel cut out [mm]	138 x 138	138 x 138	138 x 138	138 x 138	138 x 138	136 x 136	136 x 136
Ingress protection front	IP50 (IP54*)	IP50 (IP54*)	IP50 (IP54*)	IP50 (IP54*)	IP50 (IP54*)	IP65	IP65
Ingress protection backside	IP20	IP20	IP20	IP20	IP20	IP20	IP20
Weight (net) [kg]	0.8	0.8	0.9	1.2	1.2	1.0	1.0

* when using a sealing ring (optional)

Operating mode displays

Category	Basic		Standard		Premium	Dynamic	
Type	**RM 2106**	**RM 2112**	**RM 9606**	**EMR 1100 S**	**EMR 1100**	**RM 2012 6+6D**	**RM 2012 12D**
Actual cos phi	Instantaneous value	Instantaneous value	Instantaneous value	Instantaneous value	Instantaneous value	Instantaneous and average value	Instantaneous and average value
Target cos phi	•	•	•	•	•	•	•
Active current [A]	•	•	•	•	•	•	•
Reactive current [A]	•	•	•	•	•	•	•
Apparent current [A]	Instantaneous value	Instantaneous value	Instantaneous value	Instantaneous value	Instantaneous value	Instantaneous and peak value	Instantaneous and peak value
Capacitor current	-	-	Overcurrent	Overcurrent	Overcurrent	•	•
Active power [kW]	-	-	-	-	-	Instantaneous and peak value	Instantaneous and peak value
Reactive power [kvar]	-	-	-	-	-	Instantaneous and peak value	Instantaneous and peak value
Apparent power [kVA]	-	-	-	-	-	•	•
Lack of capacitor rating (kvar)	-	-	•	•	•	•	•
Capacitor power per step	Value	Value	-	-	-	•	•
Connected capacitor steps	•	•	•	•	•	•	•
Mains frequency [Hz]	-	-	-	-	-	Instantaneous, peak and minimum value	Momentan-, peak and minimum value
Mains voltage [V]	-	-	-	-	-	L2-L3 Instantaneous, peak value	L2-L3 Instantaneous, peak value
Harmonic voltage [%]	THDv	THDv	5., 7., 11., 13.	5., 7., 11., 13.	5., 7., 11., 13.	3., 5., 7., 9., 11., 13., 15., 17., 19.	3., 5., 7., 9., 11., 13., 15., 17., 19.
Harmonic current [%]	-	-	-	-	-	•	•
Temperature [°C]	-	-	-	-	-	•	•
Operating hours per step [h]	-	-	-	-	-	•	•
Switching operations per step [pcs.]	-	-	•	•	•	-	-
Lack of capacity	Alarm can be deactivated	Alarm can be deactivated	Alarm can be deactivated	Alarm can be deactivated	Alarm can be deactivated	Alarm can be deactivated	Alarm can be deactivated
Defective capacitor steps	Alarm	Alarm	-	-	-	-	-
Switching operations threshold value	Alarm	Alarm	Alarm	Alarm	Alarm	-	-
Undervoltage	Alarm Switch-off	Alarm Switch-off	Alarm Switch-off	Alarm Switch-off	Alarm Switch-off	Alarm Switch-off - can be deactivated	Alarm Switch-off - can be deactivated

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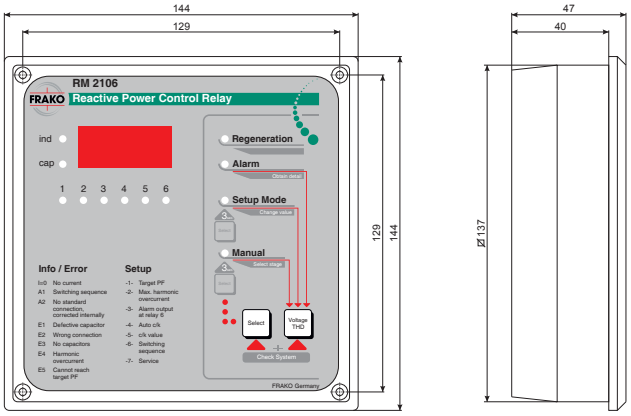
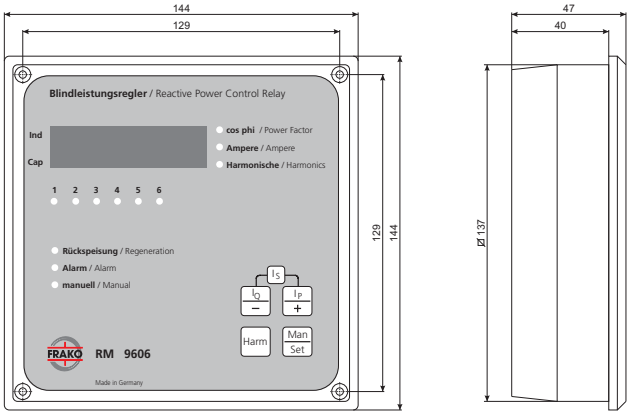
Type	**RM 2106**	**RM 2112**	**RM 9606**	**EMR 1100 S**	**EMR 1100**	**RM 2012 6+6D**	**RM 2012 12D**
Overvoltage	-	-	-	-	-	Alarm switch-off - can be deactivated	Alarm switch-off - can be deactivated
Overcurrent	Alarm switch-off	Alarm switch-off	Alarm switch-off	Alarm switch-off - can be deactivated	Alarm switch-off - can be deactivated	Alarm - can be deactivated	Alarm - can be deactivated
Minimum current	Message switch-off	Message switch-off	Message switch-off	Message switch-off	Message switch-off	Alarm switch-off - can be deactivated	Alarm switch-off - can be deactivated
Harmonic voltage limit	Alarm	Alarm	Alarm	Alarm switch-off	Alarm switch-off	Alarm - can be deactivated	Alarm - can be deactivated
Over-temperature	-	-	-	-	-	Alarm - can be deactivated	Alarm - can be deactivated

Dimensions

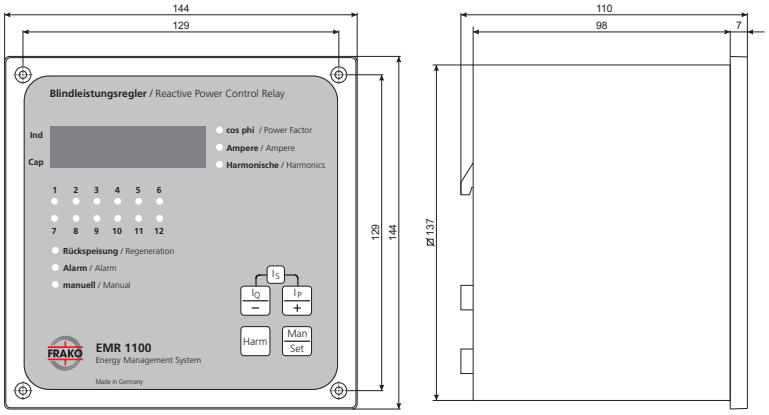
Dimensional drawing
RM 2106 (RM 2112)



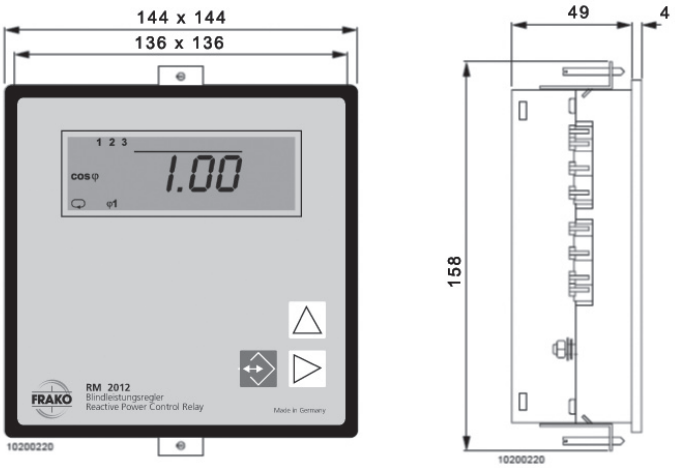
Dimensional drawing
RM 9606



Dimensional drawing
EMR 1100 /
EMR 1100 S



Dimensional drawing
RM 2012 6+6D/12D



All dimensions in mm