

# FRANKE<sup>®</sup>

GMKP ENERGY

for a better power

## Power Factor Correction

Low Voltage System



Save energy and reduce Carbon dioxide emission!

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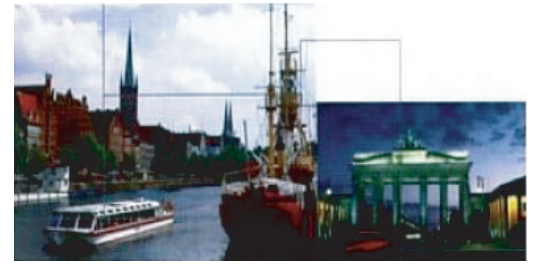
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Many years of continuous technology development leads FRANKE GMKP now to one of world leading manufacturers of Power Factor Correction in Low & Medium Voltage systems; as well as filter reactors tuned/detuned; capacitor contactors; automatic controllers; automatic capacitor (filter) banks and capacitor racks.

FRANKE Company's origin began in 1947 in Germany, when it was founded by the German Engineer Mr. Franke.

At the beginning FRANKE was already supplier of SIEMENS Germany for medium voltage capacitors. FRANKE is one of the original manufacturers of product development for the new production of low-dielectric capacitor film capacitors. The development from oil-filled capacitors to the media filled capacitors with special gases was following. Today most of manufacturers use this technical and universal standard for capacitor production.



This long period allows FRANKE to accumulate comprehensive knowledge and experience in the area of Power Factor Correction and Power Saving Technology.

Following our high German technology standard FRANKE GMKP became a international operating company with distributors, manufacturers and administrative centers in Germany, England, China, India, Turkey, Italy, Syria and many more.

All our products are not only designed to highest international standards and certificates, moreover FRANKE also focus on highest customer satisfaction, reliability and system integrity.

FRANKE's system of quality assurance has been approved by the highest international standards. Our customer service has a top priority in order to provide comprehensive and versatile support and establish a mutually beneficial, long term corporation and partnership. Our customers may always rely on our short periods of delivery with our best price. In addition FRANKE GMKP ENERGY has the ability to provide individual solutions according costumers request.



# What means Power Factor Correction?

## Introduction

A transfer of high power with minimum losses is a problem in electrical engineering.

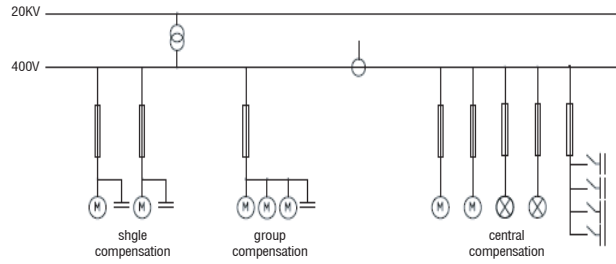
To go from low to medium or high voltage only partly solves the problem, as one of the most important factors,  $\cos \phi$ , must not be neglected.

Due to the widespread use of induction motors in trade and industries, the power factor in power facilities has increasingly deteriorated and impairs an optimum utilization of installed facilities.

With the power factor getting worse (i.e. with the reactive current increasing) the voltage drop increases, which makes voltage control more difficult and negatively affects power values with the users, due to under-voltage.

To achieve the most suitable power factor, there has to be compensation by a capacitor. Static phase shifters (i.e. power-factor correction capacitors) are a preferred solution.

Using power-factor correction capacitors to improve the power factor has several advantages. It needs to be underlined that capacitors, except for the small losses inside of them, are static electrical machines, such as transformers, so that there is almost no wear.



Type of compensation in power system

There are two types of compensation.

One of them is static compensation.

The capacitor's power is adjusted to the user and the capacitors automatically. They switch on or shut down these capacitors respectively.

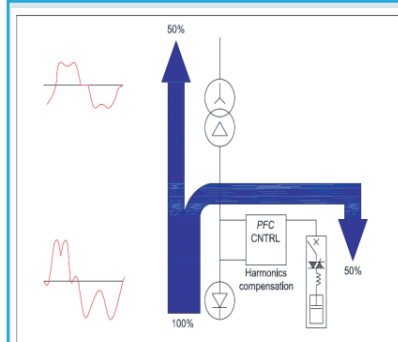
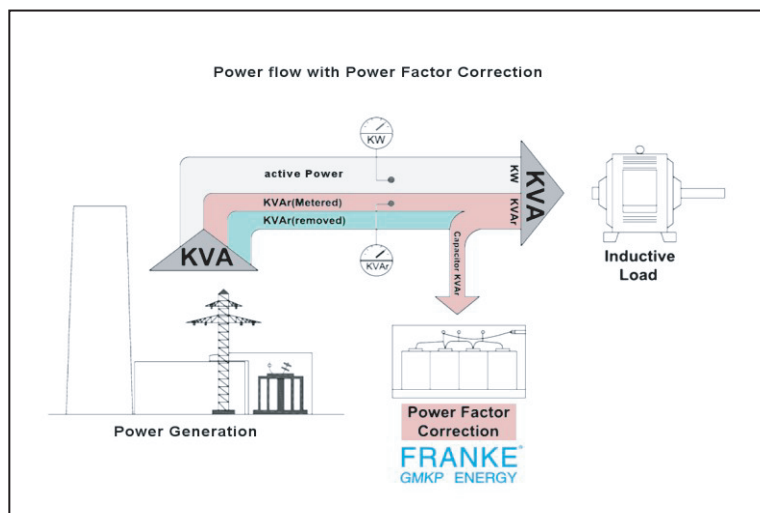
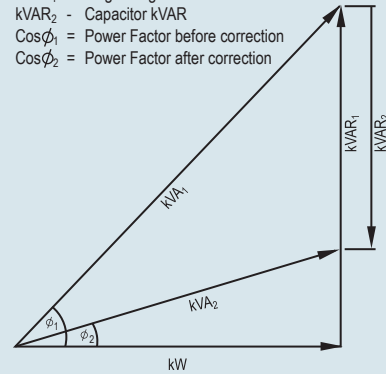
Any power increase may be achieved as you wish by subsequently adding further capacitor units.

Our highly-developed industrial community increasingly uses plants and equipment whose operations lead to interference in power facilities.

Harmonic waves are one cause of disturbance. Certain limits, concerning these disturbances, absolutely have to be met to ensure a reliable operation of plants and equipment.

In connection with power-factor correction filter reactors with various choke factors are applied to achieve this.

- KW - Power consumed by system
- KVA<sub>1</sub> - Apparent Power
- KVA<sub>2</sub> - Apparent Power after correction
- KVAR<sub>1</sub> - Magnetting kVAR
- KVAR<sub>2</sub> - Capacitor kVAR
- Cos $\phi$ <sub>1</sub> = Power Factor before correction
- Cos $\phi$ <sub>2</sub> = Power Factor after correction



Active harmonics filter

## General Information

The power capacitors produced by FRANKE GMKP were specially designed for reactive power compensation. Using state of the art technology and high-quality materials have enabled us to develop a range of capacitors to meet the demands of the future. Furthermore FRANKE's products and system of manufacturing and service is part of the new environmental protection industry and will strongly work further to improve our world's conditions.

## GMKP type name

FRANKE's registered type name worldwide based on FRANK's own special German technology.

## FRANKE GMKP prime advantages are:

- completely dry capacitor construction, so there are no possibility of out flow
- special one form capacitor cane, also minimize possibilities for leaks
- no PCB using
- filled with protective gas
- fireproofing
- overpressure and over-current tear off fuse
- self healing polypropylene foil
- stable fixed connection
- long life working

## Construction features

For capacitors long life properly working the construction and manufacturing process has high priority and is constantly observed by FRANKE's specialists.

All GMKP power capacitors have cylindrical extruded aluminium housing with a special three cascade sealing method for the capacitor cane to provide leaks. Another FRANKE special is the double safety system, which not only protect in case of overpressure, but also switch the capacitor off in case of over-current. The purpose is to protect the capacitor against excessive pressure increase inside. The inner connections are separated for this purpose from the main supply.

The internal construction includes lengthwise separate windings of high quality, resistant, metalized polypropylene films. For example, a three phase capacitor has therefore three windings. The quality of the polypropylene film is significantly responsible for the self-healing ability of the capacitors and so our special metallization procedure ensures a high degree of capacitor self-healing.

Our capacitors are delivered with the appropriate discharge resistors. FRANKE's special design is the internal resistors. In case of high power consumption we so avoid arcs outside the capacitor to protect the equipment from burning and over-heating. Another advance of this design is to reduce the time for discharging in addition with very low resistor losses and at least safe space for installing the capacitor.



## Application

- Automatic power factor correction (PFC) and capacitor banks
- Individual solution for fixed power factor correction (e.g. Motor, transformers, lighting etc.)
- Group fixed power factor correction (several equipment connected in a group)
- Capacitor banks of tuned and detuned
- Harmonic trap applications (e.g. UPS, frequency drives and converters etc.)
- Special application such as outdoor mounting, filter model, bushing terminal style etc.

- Internal discharge resistor
- Terminal for high capacity cables (up to 16 to 32mm<sup>2</sup>), both side of the terminal can be used

### Mounting

- Reduced mounting costs
- Any position mounting
- Maintenance-free

### Environment

- Non-pollution, Non PCB
- Environmentally friendly manufactured
- Recyclable
- Easy to dispose
- Save energy and reduce Carbon dioxide emission!

### Safety

- Dry type design
- Self-healing type
- Overpressure and over-current disconnecter
- Non-flammable
- Touch-proof terminals
- Three cascade cylinder sealing
- One form capacitor cane, no possibility for leaks

## Benefit:

### Electrical

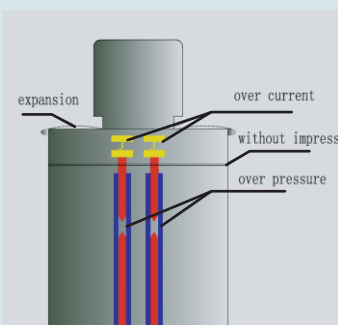
- Long life cycle (100,000 hours)
- Highest pulse current withstand capability (200xIn)
- Corona-free
- low losses

## General Technical Data

Over voltages	U	$U_N+10%$ (up to 8h daily)/ $U_N+15%$ (up to 30 min daily)/ $U_N+30%$ (up to 1 min daily)
Over current	$I_{max}$	Min.1.5* $I_N$ (in certain cases higher)
Inrush current	$I_s$	200 times rated current(other request is available)
Losses (dielectric)		$\leq 0.20$ W/KVar
Capacitance tolerance		-5%/+5%
Test voltage terminal to terminal	$U_{TT}$	$2.15 \cdot U_N$ , AC, 10S
Test voltage terminal to case	$U_{TC}$	Up to $U_N \leq 660V$ :3000V <sub>AC</sub> , 10s;above $U_N = 660V$ :6000 V <sub>AC</sub> , 10s
Life expectancy	$T_{LD(CO)}$	100,000 operating hours.(other request is available)
Ambient temperature category	LCT/UCT	-25/D, max, 55°C, with forced cooling conditions higher ambient temperature possible.
Cooling		Naturally air-cooled (of forced air cooling)
Permissible max humidity	$H_{rel}$	95%
Maximum permissible altitude		Normal 1000 M above sea level (Max.3000M)
Mounting position		Any position , normal stand mounting
Mounting and grounding		Threaded M12 or M16 stud on bottom of case
Safety features		Dry technology, overpressure/current disconnecter , self-healing,
Discharge resistors		Internal discharge module design included in delivery, (<75V within 3 min)
Case		Extruded aluminium can without any impress
Degree of protection		IP20, indoor mounting (optionally with cover for IP55)
Impregnation		Non-PCB, special protection gas or resin.
Terminals		Dual, with electric shock protection, max, cross-section 16 mm <sup>2</sup> cable
Installation		Indoor and outdoor (with the cover)
Standards		IEC60831-1+2, EN60831-1+2, VDE0560-46+47, CE.(UL marking on request)



### Double safety system



## GMKP Capacitors - 400V, 3 Phase

Freq	230	250	280	400	415	440	480	525	600	660	690	Rated	Rated	Dimensions	Weight	Minimum	FRANKE Item
												Current					
Hz	V	V	V	V	V	V	V	V	V	V	V	@ Max		mm	kg	Qty	
												Voltage				pcs	
50	1.7	2.0	2.5	5.0	-	-	-	-	-	-	-	7.2	3 x 33.2	76 x 180	1.1	32	GMKP400-3-5.0
60	2.0	2.3	2.9	6.0	-	-	-	-	-	-	-	8.7					
50	2.5	2.9	3.7	7.5	-	-	-	-	-	-	-	10.9	3 x 50	76 x 240	1.25	32	GMKP400-3-7.5
60	3.0	3.5	4.4	9.0	-	-	-	-	-	-	-	13.0					
50	3.3	3.9	4.9	10.0	-	-	-	-	-	-	-	14.4	3 x 66.3	88 x 240	1.65	10	GMKP400-3-10.0
60	4.0	4.7	5.9	12.0	-	-	-	-	-	-	-	17.3					
50	4.1	4.9	6.1	12.5	-	-	-	-	-	-	-	18.0	3 x 82.9	88 x 240	1.8	10	GMKP400-3-12.5
60	5.0	5.9	7.4	15.0	-	-	-	-	-	-	-	21.7					
50	5.0	5.9	7.4	15.0	-	-	-	-	-	-	-	21.7	3 x 100.0	96 x 260	2.1	8	GMKP400-3-15.0
60	6.0	7.0	8.8	18.0	-	-	-	-	-	-	-	26.0					
50	6.6	7.8	9.8	20.0	-	-	-	-	-	-	-	28.9	3 x 133.0	106 x 260	3.05	8	GMKP400-3-20.0
60	7.9	9.4	11.8	24.0	-	-	-	-	-	-	-	34.6					
50	8.3	9.8	12.3	25.0	-	-	-	-	-	-	-	36.1	3 x 166.0	116 x 280	3.05	8	GMKP400-3-25.0
60	9.9	11.7	14.7	30.0	-	-	-	-	-	-	-	43.3					

## GMKP Capacitors - 440V, 3 Phase

Freq	230	250	280	400	415	440	480	525	600	660	690	Rated	Rated	Dimensions	Weight	Minimum	FRANKE Item
												Current					
Hz	V	V	V	V	V	V	V	V	V	V	V	@ Max		mm	kg	Qty	
												Voltage				pcs	
50	2.0	2.4	3.0	6.2	6.7	7.5	-	-	-	-	-	10.0	3 x 42.0	76 x 180	0.95	32	GMKP440-3-7.5
60	2.5	2.9	3.6	7.4	8.0	9.0	-	-	-	-	-	11.8					
50	2.5	2.9	3.7	7.5	8.1	9.1	-	-	-	-	-	11.9	3 x 49.9	76 x 240	1.3	32	GMKP440-3-9.1
60	3.0	3.5	4.4	9.0	9.7	10.9	-	-	-	-	-	14.3					
50	2.7	3.2	4.0	8.3	8.9	10.0	-	-	-	-	-	13.1	3 x 54.8	76 x 240	1.3	32	GMKP440-3-10.0
60	3.3	3.9	4.9	9.9	10.7	12.0	-	-	-	-	-	15.7					
50	3.1	3.6	4.5	9.3	10.0	11.2	-	-	-	-	-	14.7	3 x 61.4	76 x 240	1.7	32	GMKP440-3-11.2
60	3.7	4.3	5.4	11.1	12.0	13.4	-	-	-	-	-	17.6					
50	3.3	3.9	4.9	10.0	10.8	12.1	-	-	-	-	-	15.9	3 x 66.3	88 x 240	1.7	10	GMKP440-3-12.1
60	4.0	4.7	5.9	12.0	12.9	14.5	-	-	-	-	-	19.1					
50	3.9	4.6	5.7	11.7	12.5	14.1	-	-	-	-	-	18.5	3 x 77.3	88 x 240	1.6	10	GMKP440-3-14.1
60	4.6	5.5	6.9	14.0	15.1	16.9	-	-	-	-	-	22.2					
50	4.1	4.9	6.1	12.5	13.4	15.1	-	-	-	-	-	19.9	3 x 82.8	88 x 240	1.6	10	GMKP440-3-15.1
60	5.0	5.8	7.3	15.0	16.1	18.1	-	-	-	-	-	23.8					
50	5.0	5.9	7.4	15.0	16.2	18.2	-	-	-	-	-	23.9	3 x 99.7	96 x 260	1.8	8	GMKP440-3-18.2
60	6.0	7.1	8.8	18.0	19.4	21.8	-	-	-	-	-	28.7					

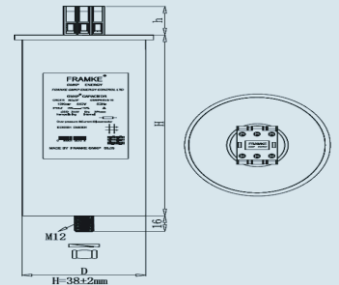


Remark : Capacitor 3Phase 230V and single Phase 230V can be made by your requestment

## GMKP Capacitors - 440V, 3 Phase (Continued)

Freq	230	250	280	400	415	440	480	525	600	660	690	Rated Current @ Max Voltage	Rated Capacitance	Dimensions (dxh)	Weight	Minimum Packing Qty	FRANKE Item Number
Hz	V	V	V	V	V	V	V	V	V	V	V	A		mm	kg	pcs	
50	6.6	7.8	9.8	20.0	21.5	24.2	-	-	-	-	-	31.8	3 x 132.6	106 x 260	3.05	8	GMKP440-3-24.2
60	7.9	9.4	11.8	24.0	25.8	29.0	-	-	-	-	-	38.1					
50	7.7	9.1	11.4	23.2	25.0	28.1	-	-	-	-	-	37.0	3 x 154.0	116 x 280	3.1	8	GMKP440-3-28.1
60	9.2	10.9	13.7	27.9	30.0	33.7	-	-	-	-	-	44.2					
50	8.3	9.8	12.3	25.0	27.0	30.3	-	-	-	-	-	39.76	3 x 166.2	116 x 310	3.1	8	GMKP440-3-30.3
60	9.9	11.7	14.7	30.0	32.3	36.3	-	-	-	-	-	47.7					

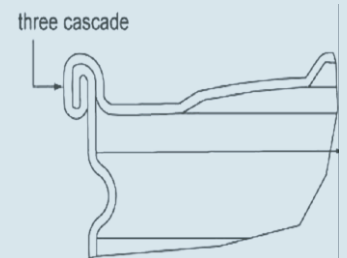
Mounting draw



## GMKP Capacitors - 480V, 3 Phase

Freq	230	250	280	400	415	440	480	525	600	660	690	Rated Current @ Max Voltage	Rated Capacitance	Dimensions (dxh)	Weight	Minimum Packing Qty	FRANKE Item Number
Hz	V	V	V	V	V	V	V	V	V	V	V	A		mm	kg	pcs	
50	2.1	2.4	3.1	6.3	6.7	7.6	9.0	-	-	-	-	10.8	3 x 41.4	88 x 240	1.2	10	GMKP480-3-9.0
60	2.5	2.9	3.7	7.5	8.1	9.1	10.8	-	-	-	-	13.0					
50	2.5	2.9	3.7	7.5	8.1	9.1	10.8	-	-	-	-	13.0	3 x 49.7	88 x 240	1.2	10	GMKP480-3-10.0
60	3.0	3.5	4.4	9.0	9.7	10.9	13.0	-	-	-	-	15.6					
50	2.9	3.4	4.3	8.7	9.3	10.5	12.5	-	-	-	-	15.1	3 x 58.0	88 x 240	1.2	10	GMKP480-3-12.5
60	3.4	4.1	5.1	10.4	11.2	12.6	15.0	-	-	-	-	18.0					
50	3.3	3.9	4.9	10.0	10.8	12.1	14.4	-	-	-	-	17.3	3 x 66.3	96 x 260	1.65	8	GMKP480-3-14.4
60	4.0	4.7	5.9	12.0	12.9	14.5	17.3	-	-	-	-	20.8					
50	3.8	4.5	5.7	11.6	12.5	14.0	16.7	-	-	-	-	20.1	3 x 76.9	96 x 260	1.65	8	GMKP480-3-16.7
60	4.6	5.4	6.8	13.9	15.0	16.8	20.0	-	-	-	-	24.1					
50	4.1	4.9	6.1	12.4	13.4	15.0	17.9	-	-	-	-	21.5	3 x 82.4	106 x 260	2.3	8	GMKP480-3-17.9
60	4.9	5.8	7.3	14.9	16.1	18.0	21.5	-	-	-	-	25.8					
50	4.6	5.5	6.8	14.0	15.0	16.9	20.1	-	-	-	-	24.1	3 x 92.6	106 x 260	2.3	8	GMKP480-3-20.1
60	5.5	6.5	8.2	16.8	18.0	20.3	24.1	-	-	-	-	29.0					
50	5.5	6.5	8.1	16.5	17.8	20.0	23.8	-	-	-	-	28.6	3 x 109.6	116 x 260	2.8	8	GMKP480-3-23.8
60	6.6	7.7	9.7	19.8	21.3	24.0	28.6	-	-	-	-	34.4					
50	5.7	6.8	8.5	17.4	18.7	21.0	25.0	-	-	-	-	30.1	3 x 115	116 x 260	2.8	8	GMKP480-3-25.0
60	6.9	8.1	10.2	20.8	22.4	25.2	30.0	-	-	-	-	36.1					
50	6.8	8.1	10.1	20.7	22.3	25.0	29.8	-	-	-	-	35.8	3 x 137.2	116 x 310	3.4	8	GMKP480-3-29.8
60	8.2	9.7	12.2	24.8	26.7	30.0	35.8	-	-	-	-	43.0					
50	7.7	9.1	11.4	23.2	25.0	28.1	33.4	-	-	-	-	40.2	3 x 153.8	116 x 310	3.4	8	GMKP480-3-33.4
60	9.2	10.9	13.6	27.8	30.0	33.7	40.1	-	-	-	-	48.2					

Three cascade sealing process



Robust / dual terminals



## GMKP Capacitors - 525V, 3 Phase

Freq	230	250	280	400	415	440	480	525	600	660	690	Rated Current @ Max Voltage	Rated Capacitance	Dimensions (dxh)	Weight	Minimum Packing Qty	FRANKE Item Number
Hz	V	V	V	V	V	V	V	V	V	V	V	A		mm	kg	pcs	
50	-	-	-	2.5	2.7	3.0	3.6	4.3	-	-	-	4.7	3 x 16.6	76 x 180	1.1	32	GMKP525-3-3.0
60	-	-	-	3.0	3.2	3.6	4.3	5.2	-	-	-	5.7					
50	-	-	-	2.9	3.1	3.5	4.0	5.0	-	-	-	5.5	3 x 19.2	76 x 180	1.1	32	GMKP525-3-5.0
60	-	-	-	3.5	3.7	4.2	5.0	6.0	-	-	-	6.6					
50	-	-	-	4.4	4.7	5.3	6.3	7.5	-	-	-	8.3	3 x 28.9	76 x 240	1.2	32	GMKP525-3-7.5
60	-	-	-	5.2	5.6	6.3	7.5	9.0	-	-	-	9.9					
50	-	-	-	5.0	5.4	6.0	7.2	8.6	-	-	-	9.5	3 x 33.1	88 x 240	1.2	10	GMKP525-3-8.6
60	-	-	-	6.0	6.4	7.2	8.6	10.3	-	-	-	11.3					
50	-	-	-	5.8	6.2	7.0	8.4	10.0	-	-	-	11.0	3 x 38.5	88 x 240	1.2	10	GMKP525-3-10.0
60	-	-	-	7.0	7.5	8.4	10.0	12.0	-	-	-	13.2					
50	-	-	-	7.3	7.8	8.8	10.4	12.5	-	-	-	13.7	3 x 48.1	88 x 240	1.7	10	GMKP525-3-12.5
60	-	-	-	8.7	9.4	10.5	12.5	15.0	-	-	-	16.5					
50	-	-	-	8.7	9.4	10.5	12.5	15.0	-	-	-	16.5	3 x 58.0	106 x 260	3.05	8	GMKP525-3-15.0
60	-	-	-	10.4	11.2	12.6	15.0	18.0	-	-	-	19.8					
50	-	-	-	11.6	12.5	14.0	16.7	20.0	-	-	-	22.0	3 x 77.0	106 x 310	3.05	8	GMKP525-3-20.0
60	-	-	-	13.9	15.0	16.9	20.1	24.0	-	-	-	26.4					
50	-	-	-	14.5	15.6	17.6	20.9	25.0	-	-	-	27.5	3 x 96.2	106 x 310	3.05	8	GMKP525-3-25.0
60	-	-	-	17.4	18.7	21.1	25.1	30.0	-	-	-	33.0					

## GMKP Capacitors - 690V, 3 Phase

Freq	230	250	280	400	415	440	480	525	600	660	690	Rated Current @ Max Voltage	Rated Capacitance	Dimensions (dxh)	Weight	Minimum Packing Qty	FRANKE Item Number
Hz	V	V	V	V	V	V	V	V	V	V	V	A		mm	kg	pcs	
50	-	-	-	-	-	-	-	-	3.8	4.6	5.0	4.2	3 x 11.1	76 x 180	1.1	32	GMKP690-3-5.0
60	-	-	-	-	-	-	-	-	4.5	5.5	6.0	5.0					
50	-	-	-	-	-	-	-	-	5.7	6.9	7.5	6.3	3 x 16.7	76 x 240	1.25	32	GMKP690-3-7.5
60	-	-	-	-	-	-	-	-	6.8	8.2	9.0	7.5					
50	-	-	-	-	-	-	-	-	6.3	7.6	8.3	6.9	3 x 18.5	76 x 240	1.25	32	GMKP690-3-8.3
60	-	-	-	-	-	-	-	-	7.5	9.1	10.0	8.3					
50	-	-	-	-	-	-	-	-	7.6	9.1	10.0	8.4	3 x 22.3	88 x 240	1.65	10	GMKP690-3-10.0
60	-	-	-	-	-	-	-	-	9.1	11.0	12.0	10.0					
50	-	-	-	-	-	-	-	-	9.5	11.4	12.5	10.5	3 x 27.9	96 x 260	1.8	8	GMKP690-3-12.5
60	-	-	-	-	-	-	-	-	11.3	13.7	15.0	12.6					
50	-	-	-	-	-	-	-	-	11.3	13.7	15.0	12.6	3 x 33.4	106 x 260	2.1	8	GMKP690-3-15.0
60	-	-	-	-	-	-	-	-	13.6	16.5	18.0	15.1					
50	-	-	-	-	-	-	-	-	12.6	15.3	16.7	14.0	3 x 37.2	106 x 260	2.1	8	GMKP690-3-16.7
60	-	-	-	-	-	-	-	-	15.2	18.3	20.0	16.8					
50	-	-	-	-	-	-	-	-	15.1	18.3	20.0	17.0	3 x 44.6	106 x 260	3.05	8	GMKP690-3-20.0
60	-	-	-	-	-	-	-	-	18.1	22.0	24.0	20.1					
50	-	-	-	-	-	-	-	-	18.9	22.9	25.0	21.0	3 x 55.7	106 x 280	3.05	8	GMKP690-3-25.0
60	-	-	-	-	-	-	-	-	22.7	27.4	30.0	25.1					

High vacuum processing system





The increasing uses of modern power electronic apparatus are producing non-linear current influences and load the network with harmonics pollution. The capacitor forms a resonant with the feeding transformer (250-500Hz), it lead to overloading of capacitor and transformer, interference, voltage distortion; etc. These can be avoided by filter reactors.

The function of the reactors is to protect capacitors in low voltage power factor correction systems.

The connection of these reactors in series with capacitors causes a shift of the resonance frequency of the circuit composed by feeding transformer-reactors capacitors, so that the resulting self-resonance frequency is well below the line harmonics foreseen by the ENV 61000-2-2 standard.

Resonance would create undesired effects as overloading of capacitors, transformer and transmission equipment, amplification of harmonics and voltage distortion.

The reactors are connected in series with the capacitors to be protected and the inductive reactance determines the self resonance frequency of the L-C circuit .The locking factor P% is expressed by the ratio between inductive reactance and capacitive reactance and it corresponds to the increase of voltage applied to capacitors, with respect to line voltage .due to circulation of capacitive current in the reactor.

## Basic Calculations

1.) Harmonic Load (continuous)

$$U_3 = 0.5\%UR$$

$$U_5 = 5.0\%UR$$

$$U_7 = 5.0\%UR$$

2.) Fundamental Harmonic Load

$$I_1 = 1.06.IR$$

(IR=current of the fundamental harmonic)

3.) Thermal Rating

$$I_{th} = 1.05I_{rms}$$

4.) Magnetic Rating

$$I_{in} = 1.75 \times \text{rated. Current with } L \geq 0.95L_n$$

## Features

long useful life

high linearity

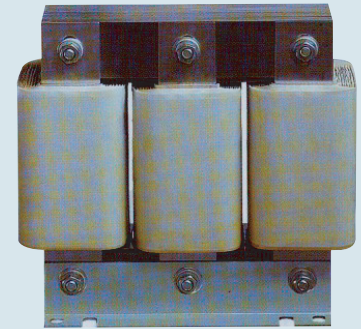
low losses & low noise

High resistance to harmonics

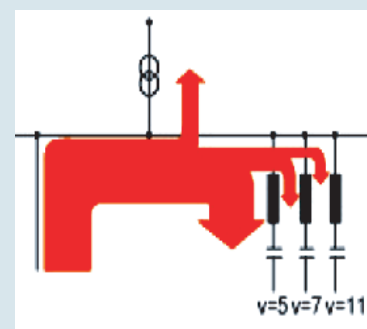
easy mounting

## Specification

Voltage & frequency.	100V-690V power system, 50Hz (or 60Hz)
output of Kvar	5 to 100Kvar
detuning	6%, 7%, 14% etc.
temperature	T40/B, natural cooling ,with temperature protection terminal
impregnation	polyester resin, class H
adjustment accuracy & insulation	L=±3%, U=3KV (winding to core)
standards	IEC76,VDE0550/0532



Harmonic filtering



## Rates:

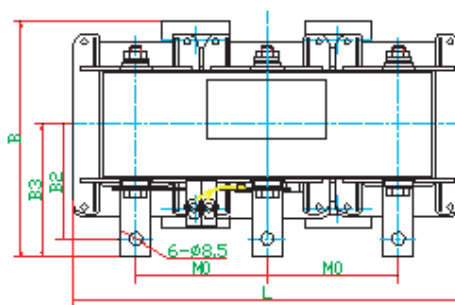
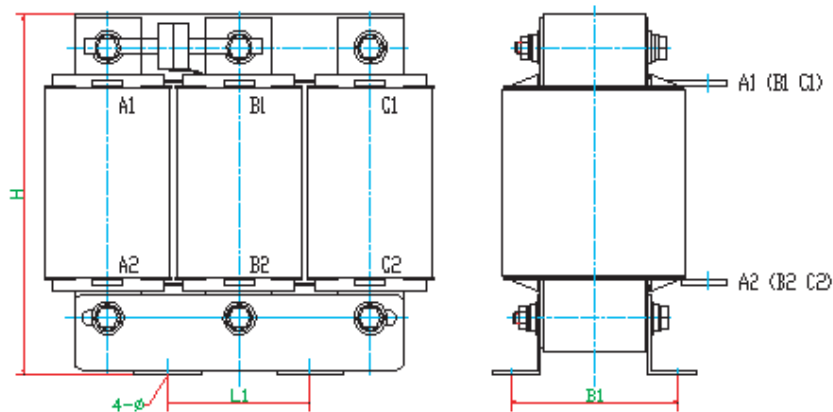
System voltage: 400V, 50Hz

German Winding Machine

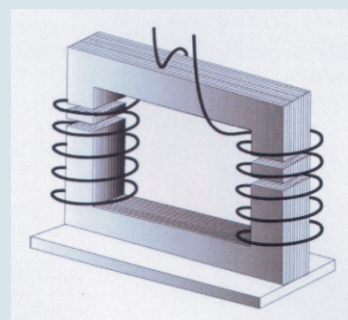


Power in kvar	P%	mH	I <sub>N</sub>	H	L	B		L1	B1	B2	B3	Weight (kg)
25	6.0	1.186	36	210	230	130	11	150	91	62	74	16.5
25	7.0	1.535		210	235	135			91	66	78	17.8
25	14	3.238		235	255	150			98	71	83	24.9
50	6.0	0.593	72	235	255	150			98	70	82	24
50	7.0	0.767		235	260	150			98	73	85	25.9
50	14	1.638		260	290	175			118	87	99	36.3
100	6.0	0.297	144	265	290	175			98	70	82	39.2
100	7.0	0.384		265	295	180			108	79	92	41.9
100	14	0.819		295	325	195			138	92	102	56.6

## Mounting Draw:



German design



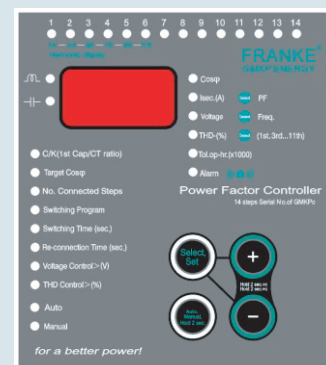
Reactive power compensation plants are used to decrease the load of cables and power distributions caused by inductive currents and to save reactive power costs. The power factor controller is a main part of such a plant and connects or disconnects capacitor stages automatically. The power factor controller GMKPc800II is suitable for the use in conventional or special dynamic reactive power compensation systems, and a mixed operation is possible as well.

## Features

- Micro-processor based.
- Digital power factor display.
- Programmable switching sequence (Optimized) (Auto, Custom or Preset).
- LED indication for individual step.
- Auto / Manual operation.
- Automatic detection of C.T. polarity.
- Automatic detection of C/K value.
- Secondary current / Power Factor info display.
- Voltage / Frequency info display.
- THD / Individual Harmonic info display. (3th to 11th harmonics display)
- Alarm output. (THD, Frequency, Under/Over Compensate, Over Voltage).
- Integrated Timer-controlled Exhaust Fan output.
- Programmable over-voltage cut-off.
- Programmable THD cut-off.
- Keypad lock (Software programmable).
- Flush mount
- More than 14 steps

## Specification

Power Supply	240 VAC ±10% or other on request
Rated Current (In)	..5A (same phase with power supply)
Working Current	0.02 - 10A
Operating Frequency	45 ~ 65Hz
Output Relay / Alarm / Fan	5A / 250VAC
Weight	~ 770g
Operating Temperature	0° to +55°C



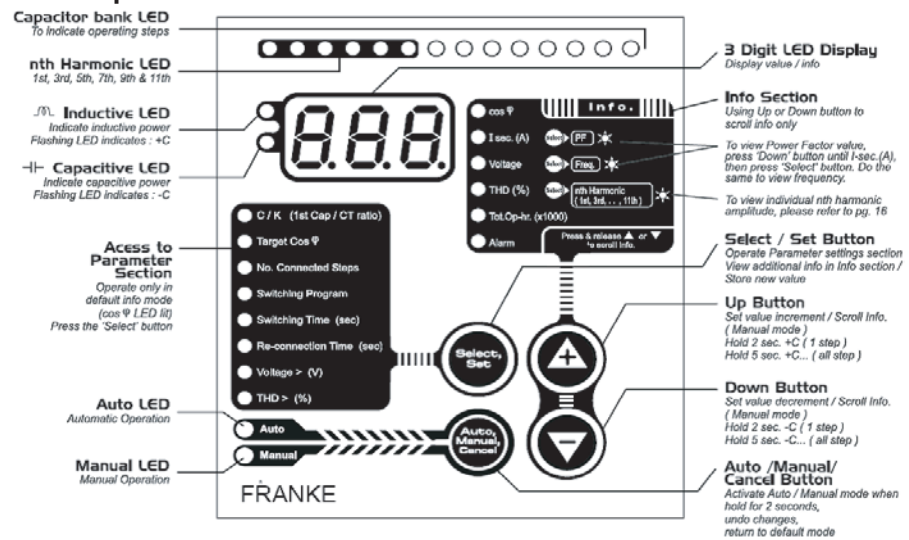
## Program table

STEP PROGRAM SEQUENCE	
P-0	LINEAR
P-1	1:1:1:1:1
P-2	1:2:2:2:2
P-3	1:1:2:2:2
P-4	1:1:1:2:2
P-5	1:2:4:4:4
P-6	1:1:2:2:4

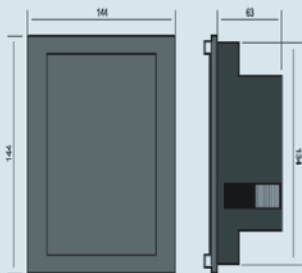
## PROGRAM SEQUENCE

c/k	0.02-1.00
Power factor	0.85-0.95
Switching	6 program
Re-connection time	1-250sec.
voltage	Off/240-270V
THD	Off/20-100%

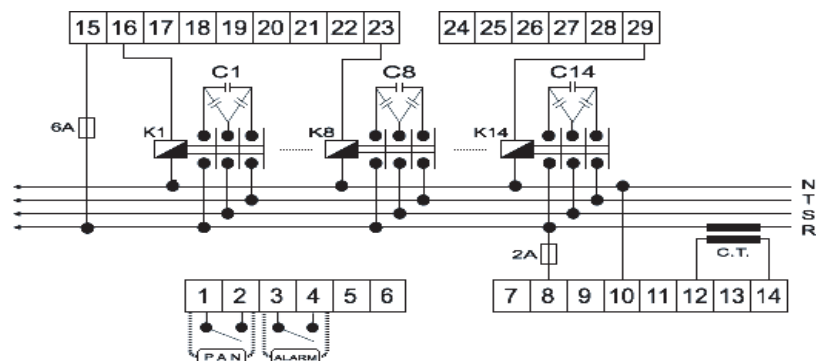
## Control panel



Dimension: 144x144mm; panel cut-out 136 x 136mm



## Electric connection



# GMKP<sup>®</sup>c Controller

## INSTRUCTION of FRANKE'S REACTIVE POWER CONTROLLER of GMKPcJKL 58 & 5F

### 1. Technical parameters

- 1.1 Operating voltage: 380 V±20% 50 Hz
- 1.2 Input current: ≤ 5 A
- 1.3 Output contact capability: 250V/5A AC 380V/3A AC
- 1.4 Operating way: automatic cycle and continuous operation
- 1.5 Throwin threshold :more than 1.1 Ic and less than COS<sub>φ</sub> setting value
- 1.6 Throwout threshold: lead
- 1.7 COS<sub>φ</sub> Setting:adjustable between 0.90 and 0.99
- 1.8 Delay time setting: adjustable between 10 and 99 S
- 1.9 Overvoltage setting: adjustable between 410 and 470 V , voltage return difference: 8-10 V
- 1.10 Number of return circuits setting: adjustable between 1 and 10
- 1.11 Throwin/out locking time of same set capacitance: more than 60 S
- 1.12 Grouping of capacitor:Applicable for both same and unequal capacity.

### 2. Operating conditions

- 2.1 Height above sea level: not higher than 2000 m
- 2.2 Ambient temperature: lower than +50 °C and higher than -10 °C
- 2.3 Air relative humidity: 85% at 25 °C
- 2.4 Applicable for the occasions without any flammable and explosive media, and free of conductive dust or corrosive air.

### 3. Input and wiring

- 3.1 Input current shall adopt the signal from current transformer of main distribution panel supplied.
- 3.2 Input voltage phases B and C shall be adopted if using input current signal A. That means that another two phases shall be adopted whenever using any phase of current signal.
- 3.3 The contact P is connected with the contact B when the coil voltage of contactor is 380 V ( see the diagram at the back ). The contact P is connected with the contact N when coil voltage is 220 V.

### 4. Parameter setting

- 4.1 Press **⊙** key, the manual light will turn on. Then press **⬆** key for gradually throwing in and **⬇** key for gradually throwing out.
- 4.2 Press **⊙** key and hold for 3 seconds and then the setting light will turn on and functional code F-0 will display. Press **⊙** key, COS<sub>φ</sub> setting value will display. Press **⬆** or **⬇** key for reset.
- 4.3 Press **⊙** key, functional code F-1 will display. Press **⊙** key again, setting value will display. Press **⬆** or **⬇** key for reset.
- 4.4 Press **⊙** key, functional code F-2 will display. Press **⊙** key again, overvoltage setting value will display. Press **⬆** or **⬇** key for reset.
- 4.5 Press **⊙** key, functional code F-3 will display. Press **⊙** key again, value of number of return circuits setting will display. Press **⬆** or **⬇** key for reset.
- 4.6 Press **⊙** key, functional code F-4 will display. Press **⊙** key again, self-test setting value will display. Press **⬆** or **⬇** key for reset.
- 4.7 Press **⊙** key, functional code F-5 will display. Press **⊙** key again, value of accumulated throwin/out cycles will display. Press **⬆** or **⬇** key for reset.
- 4.8 After completion of above-mentioned setting parameters, press **⊙** key and hold for 3 seconds, the automatic light will turn on. In this case, confirm the amended setting value.
- 4.9 Shortcut: Press **⊙** key, the manual light will turn on. Double click **⊙** key, the setting light will turn on and functional code F-□ will display. Press **⬆** or **⬇** key to select the functional code. Then press **⊙** key again, the relative setting parameter will display correspondingly. Press **⬆** or **⬇** key to reset.  
Double click **⊙** key after reset and the automatic light will turn on.
- 4.10 In the setting state, automatically return to automatic state if not pressing any key within 20 seconds.

### 5. Functional code table

Functional code	Name	Setting range	Unit	Min. value	Factory setting value
F-0	COS <sub>φ</sub>	0.90-0.99		0.01	0.98
F-1	Delay	10-99	S	1	30
F-2	Overvoltage	410-470	V	5	430
F-3	Number of return circuits	1-10/12 (1-57)		1	10/12 (5/7)
F-4	Self-test	0. YES 1. NO		—	1
F-5	Throwin/out cycle	Unable for setting	100 cycles	1	0XX

### 6. Notes

- 6.1 After connecting with power supply, 0.CC denotes that load current is less than 5% of designed rating, or no load or input current is open.
- 6.2 After connecting with power supply, it is unable to throw in the capacitor but leading or power factor is more than 0.90 and less than 0.30 in the display, denoting wrong selection of phase of input current and voltage. If so, reconnect the wire.
- 6.3 If self-test is required, the self-test F-4 shall be set at 0. Disconnect with power supply and then restart the power supply. In this case, self-test cycle will begin. After completion of self-test, F-4 will be automatically set at 1 under the control of the controller.

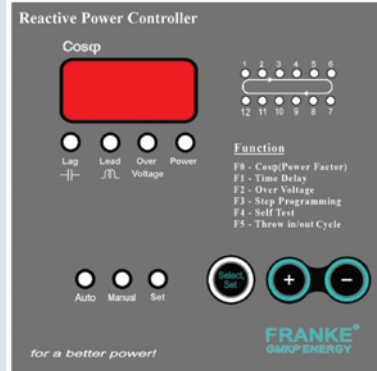
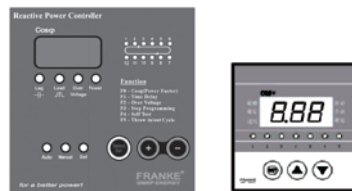
## GMKPcJKL58-5steps/7steps GMKPcJKL5F-10steps/12steps REACTIVE POWER CONTROLLER

### General Information

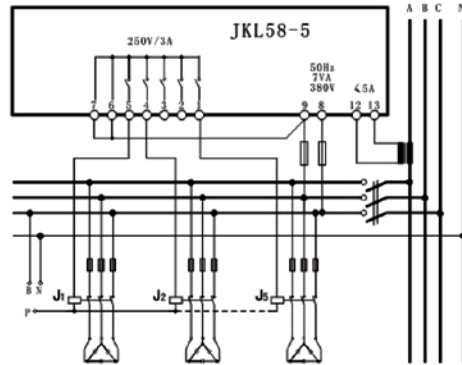
JKL5F/58 Series Intelligent Reactive Power Controller is a controller designed for low-voltage distribution system for compensation of reactive power. Applying the latest reactive power control CMOS chip from U.S.A., the Controller features high anti-jamming capability, wide compatibility with the distribution systems with different parameters, stable function, complete compensation and simple operation.

### Function Features

- **Control signal**  
Comprehensive controlled by using two physical quantities, i.e. Power factor and reactive current.
- **Simple operation**  
Automatic running, manual throwin/out, parameter setting by using three keys.
- **Current distinguish**  
Automatic distinguish of switching in/out free of taking account of polarity of input current.
- **General purpose of number of circuits**  
Number of throwing in/out return circuits subjects to the user.
- **Data memory**  
The setting parameters won't lose if power down and the data will be saved permanently.
- **Wide applicability**  
The Controller can automatically meet the distribution systems of different parameters while the transformation ratio of current transformer and capacitance of compensation capacitor are not required.
- **Overvoltage protection**  
Automatically and quickly throw out the thrown in capacitor unit step by step when the voltage of power network exceeds the setting value.
- **Low reactive locking**  
The capacitor unit will be restricted to throw in to avoid throwin/out vibration when the reactive value of power network is less than 1.1 times of compensation value of one set of capacitor, even COS<sub>φ</sub> is less than the setting value.
- **Low load locking**  
The capacitor will be restricted to throw in and the thrownin capacitor unit will be thrown out step by step according to the designed delay time when the current signal is less than 5% of designed rating.
- **Throwing in/out interval self-lock**  
In order to avoid throwin/out overvoltage caused by insufficient discharge of capacitor, throwin will be restricted until the interval is more than 1 minute when the throwin/out action interval is less than the discharging time of same set of capacitor unit.

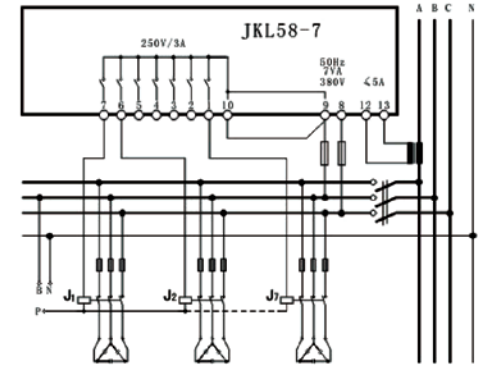


GMKPcJKL58-5

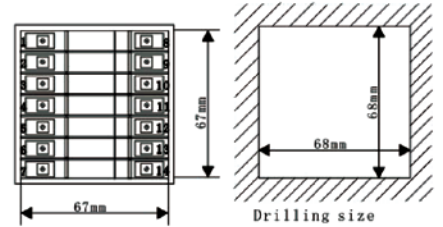
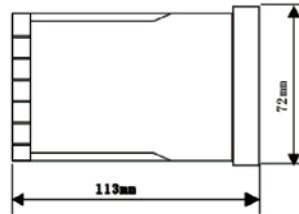
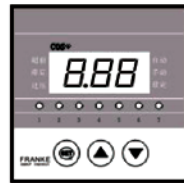


Contactor 220V contact p connects with contact N  
Contactor 380V contact p connects with contact B

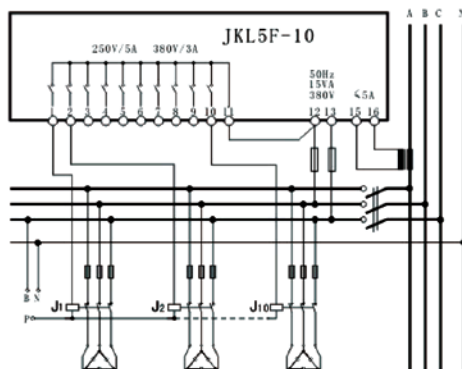
GMKPcJKL58-7



Contactor 220V contact p connects with contact N  
Contactor 380V contact p connects with contact B

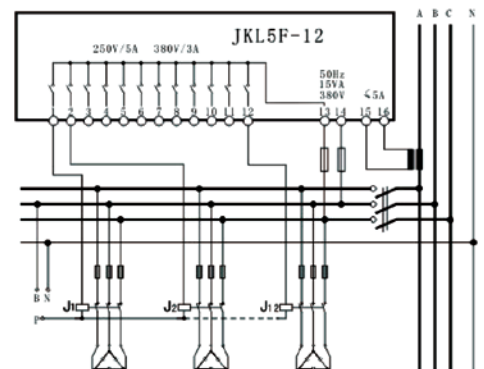


GMKPcJKL5F-10

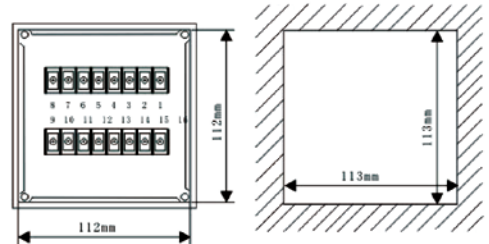
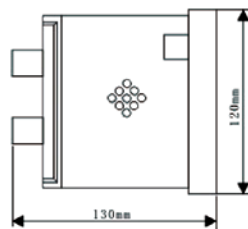
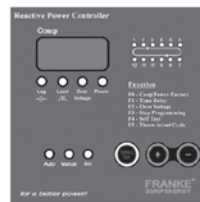


Contactor 220V contact p connects with contact N  
Contactor 380V contact p connects with contact B

GMKPcJKL5F-12



Contactor 220V contact p connects with contact N  
Contactor 380V contact p connects with contact B





## IEC CONFORMITY CERTIFICATE

With this certificate we approve that **GMKP** type **LOW VOLTAGE POWER FACTOR CORRECTION CAPACITORS** provided by **FRANKE GMKP ENERGY** are in compliance with reference standards **IEC 60831-1 (2002-11) & IEC 60831-2 (1995-12)** (including latest amendments).

This conformity certificate has been issued after running the following tests at the special technical department FRANKE in Germany and China.

### 1. ROUTINE TESTS

- 1.1 Measurement of capacitance & output calculation
- 1.2 Measurement of the tangent of loss angle ( $\tan \delta$ ) of the capacitor
- 1.3 Voltage test between terminals
- 1.4 Voltage test between terminals and container
- 1.5 Test for internal discharge device

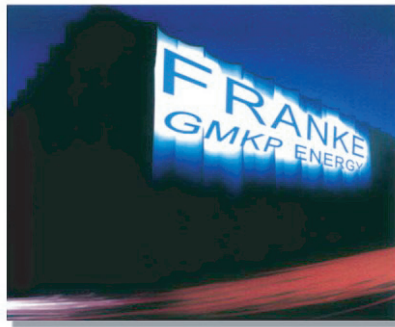
### 2. TYPE TESTS

- 2.1 Thermal stability test
- 2.2 Measurement of the tangent of loss angle ( $\tan \delta$ ) of the capacitor at elevated temperature
- 2.3 Voltage test between terminals
- 2.4 Voltage test between terminals and container
- 2.5 Discharge test
- 2.6 Self-healing test

Tests were carried out in accordance with **IEC 60831-1 (2002-11) & IEC 60831-2 (1995-12)**

A handwritten signature in black ink, appearing to be "Martin.S", written over a horizontal line.

Martin.S  
Chief Engineer  
FRANKE ENERGY



FRANKE GMKP has founded successful corporation with famous brands and manufacturer all over the world. Because of FRANKE GMKP does strongly work to keep and improve a German Quality level, we were selected by international renowned companies (like ABB, Siemens, and LS) for using our products.



Beside the world famous brands, FRANKE GMKP is partner of major projects like (Olympic projects, diversion, DC input Electricity, etc.). Moreover FRANKE is supplier of many famous foreign brand-capacitor manufacturers for their (OEM) production of capacitors. In addition to our capacitor manufacturing FRANKE GMKP ENERGY CONTROL provides a wide range of products for power factor correction (PFC), such like:

MV Capacitors    MV Dry & Air Coil reactors    Capacitor Banks of: automatic, Pole mounted and open Racks

