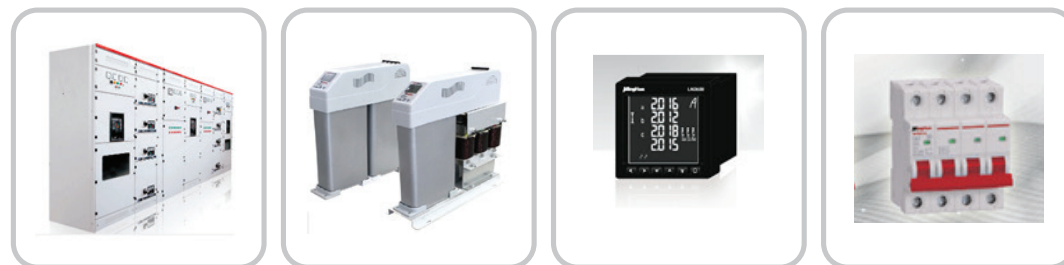


MingHan Electric is pioneer in manufacturing reliable, digitized, customized and type tested Medium and Low Voltage Power Distribution Equipment & Management systems.

#### Mv Switchgears & Distribution Automation Equipment

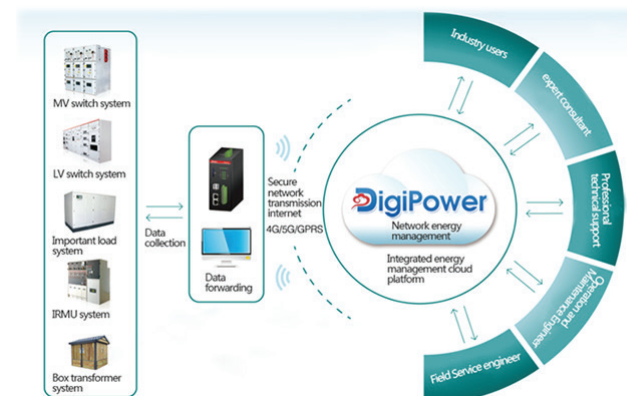


#### LV Switchgears, Circuit Breakers & Capacitors



#### DigiPower: A SCADA based Power Distribution solution

One stop  
Solution for  
Digital Power  
Distribution  
and  
Management



**Headoffice** No.9, Hongxi road, MingHan Industrial Park, Xiamen, Fujian, China.  
**Pak Office:** 4th floor, 5-Main Boulevard, DHA Phase-VI, Lahore, Pakistan.

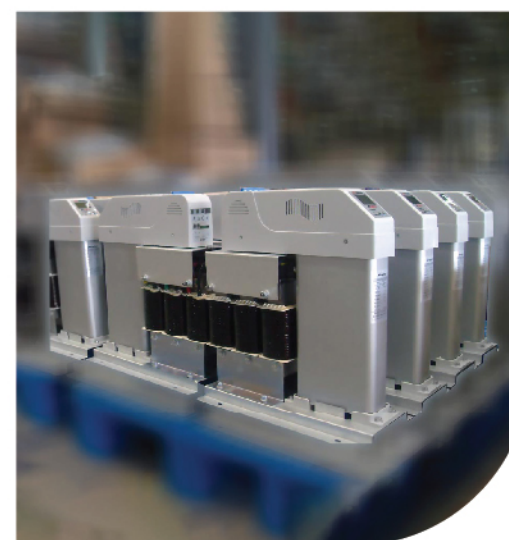
A new generation of  
Low Voltage capacitor



## KRD Smart Capacitors

A smart method of power factor correction

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Xiamen MingHan Electric Co., Ltd. is National High-Tech enterprise, famous national brand and dignified Research & Development center for 'smart grid' products. Located in Xiamen Island of Fujian Province China, MingHan Electric is an enterprise with registered capital of 12.77 million USD. It enjoys close technical cooperation with several multinational brands.

Since founded in 2004, MingHan Electric has focused on Medium & Low Voltage Switchgears, Ring Main Units and their components including LBS, VCB, ACB, MCCB, MCB, Energy analyzers and intelligent capacitors. These products are multi-times type tested from different world standard third party type testing labs. In addition, MingHan electric offers its own SCADA based complete automation system named, '**SmartSwitch**' for smart power distribution and has patent & copyrights for its software and hardware.

Thanks to our strong R&D department, we're completely capable of manufacturing standard as well as customized products up to 40.5kV. MingHan electric owns two state of the art production plants with an area of more than 55,000m<sup>2</sup> equipped with advanced machinery, latest technology, professional layout, skilled labor and latest testing facilities.

Committed to its slogan 'Serve innovation with Reliability', MingHan electric is continuously providing complete range of modern, reliable, customized and digitized switchgears and its components. Till now, MingHan has chain of well-satisfied customers in more than 30 countries across the world including America, Canada, Argentina, Singapore, Australia, Saudi Arabia, Pakistan, Iran and others.







# KRD Smart Capacitors

## Overview

KRD Smart Power Capacitor is a unique product for power factor correction. It is new generation of reactive power compensators, which can make low-voltage distribution network energy-efficient with minimum line losses and ultimately improves its quality and power factor. Each of this capacitor is a small PFI plant by itself without any assistance from additional component. It has all necessary components for power correction built-in, including circuit breaker for capacitor protection, Programmed MCU, switching module, relay for controlling, LED display for important parameters and settings display, and harmonic reactor for harmonics filtration. KRD capacitor makes sure switching at zero-point which nullifies inrush current. It can also communicate through RS-485 with central distribution control. This makes KRD an advance capacitor which is compact, intelligent, innovative and modular.

## Customer Benefits

- ◇ Saves energy, time and money resources.
- ◇ Can operate without separate relay.
- ◇ Very easy installation
- ◇ Modular structure, Easy to replace and transport.
- ◇ Compact dimensions
- ◇ Zero-Point switching
- ◇ Easy to extend and upgrade
- ◇ Designed and tested according to IEC standards.

## Applications



### Industry

Pulp & Paper	Automotive	Oil pipelines	Textiles
Cement	Petrochemical	Gas pipelines	Food
Chemicals	Quarrying	Rolling mills	Mines



### Utilities & Power Plants

Power generation stations  
Transformer stations & metering  
Main & auxiliary switchgear



### Transport

Airports	Railways
Ports	Underground transport



### Infrastructure

Hotels	Shopping centers
Hospitals	Large infrastructure & civil works



### Renewables

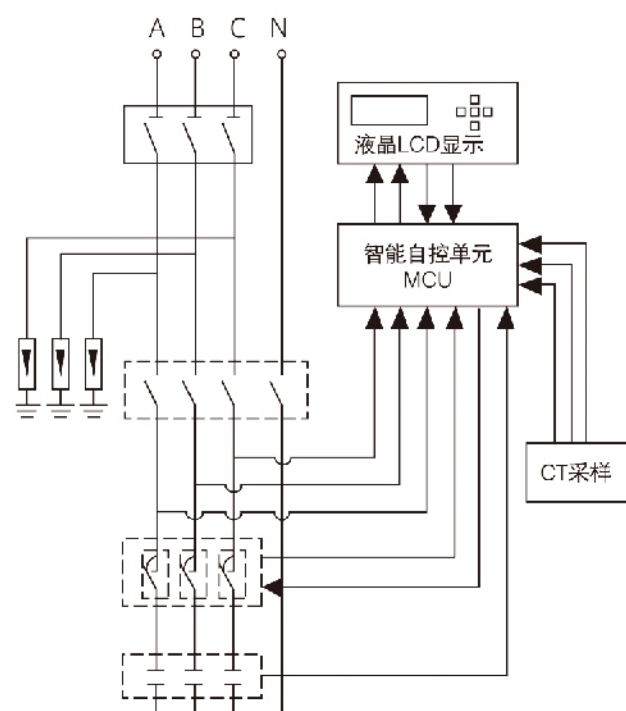
Wind	Solar/PV
------	----------



KRD Smart Power capacitors are composed of power capacitor, harmonic reactor, intelligent control unit, synchronous switching module, and an LED display and measurement and protection unit. Power parameters measured by current transformers and temperature measured by temperature sensor are sent to intelligent control unit through a dedicated terminal.

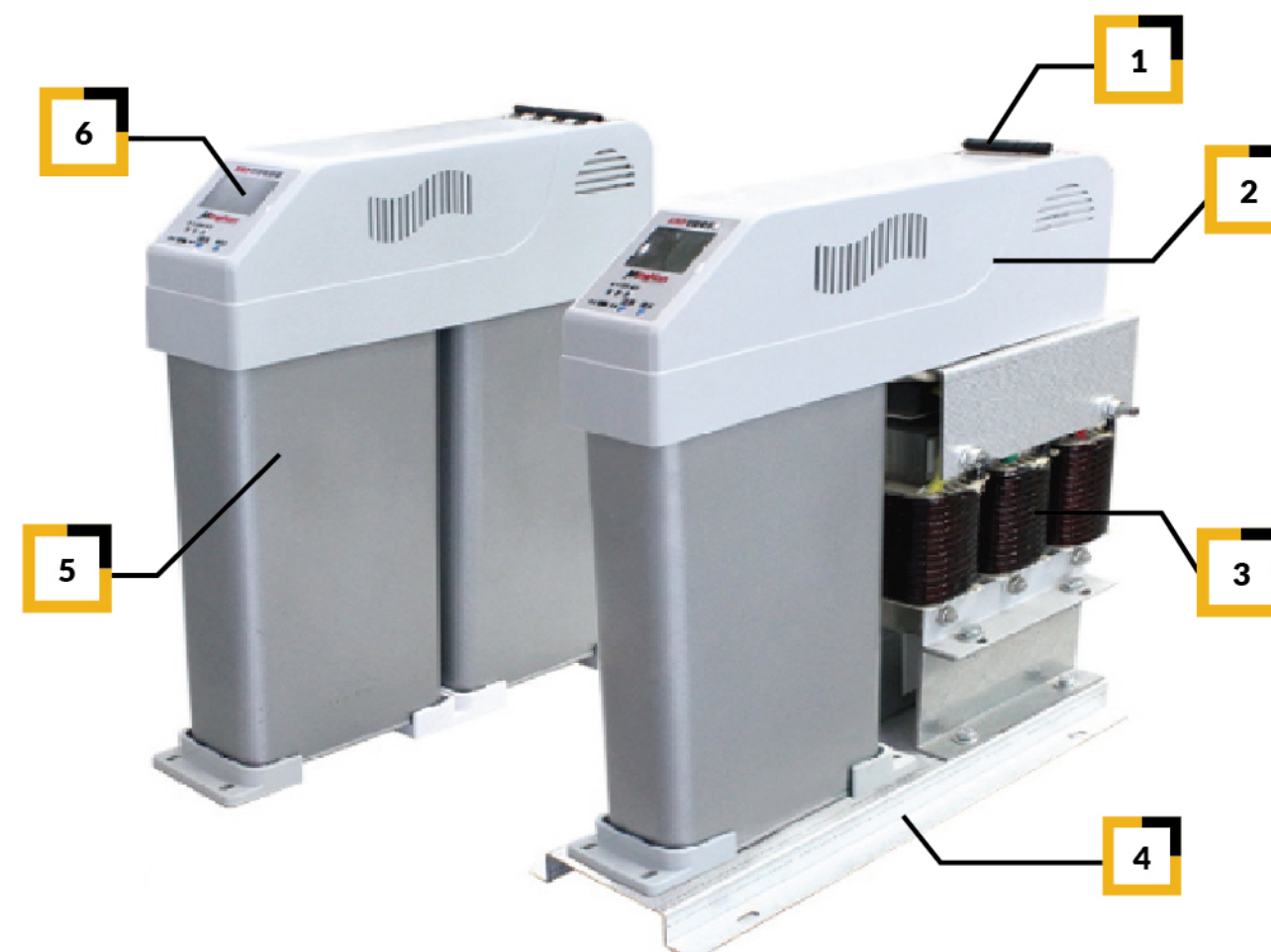
Intelligent control unit of KRD smart capacitors acts as an intelligent relay and controls capacitors. It collects signals coming from different sensors, processes it, calculates the accurate capacity and starts to detect zero crossing of grid voltage. When zero crossing arrives, it closes magnetic latch relay (part of Intelligent control unit) and capacitor starts operation. This zero point switching guarantees zero inrush current, long service life and elimination of multiple components in traditional PFI panel.

When multiple capacitors are connected in series, it is recommended to use controller (KRD600) for controlling the whole system. One capacitor is connected with this controller and other capacitor communicate with each other through that connected capacitor. In case of failure of controller, each capacitor will be switched to manual mode one by one. All settings will be carried out through LCD. Thus, all capacitors will be operating without any controller.



### Configuration

KRD smart Power capacitors are available **with and without harmonic reactor**. Depending upon application, both of these types can be connected either for split phase compensation (Y connection) or combined three-phase compensation (Delta connection). In split phase compensation, each phase is separately compensated.



- 1 □ MCB
- 2 □ MCU & Switching module
- 3 □ Reactors
- 4 □ Seat for connection with panel
- 5 □ Smart KRD capacitors
- 6 □ LCD display

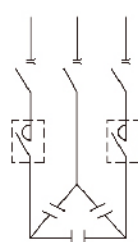


## Compensation Mode

KRD capacitors can compensate reactive power, and filters harmonics, or both simultaneously, depending on practical requirement. Each of compensation can be setup in any of the following mode.

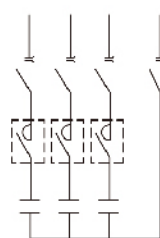
### 3-Phase Reactive Power Co-Compensation.

This mode is for common reactive power compensation of all three phases together. Capacitor connection is delta type only. There are two delta type capacitors which can be controlled together.



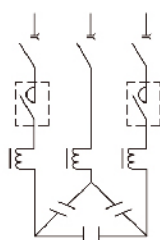
### 3-Phase Reactive Power Split Compensation.

This mode involves three switch control, three phase load mode which is perfect for separate reactive power compensation of all three phases. There are two Y-type capacitors connected and can be controlled together.



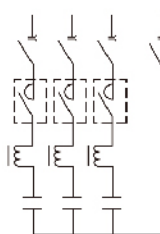
### 3-Phase Harmonic Current Co-Compensation.

This mode is for common reactive power compensation of all three phases well as filters harmonics. Capacitor connection is delta type only and a harmonic reactor (7% or 14%) is connected in series with it. Both are controlled together.



### 3-Phase Harmonic Current Split Compensation.

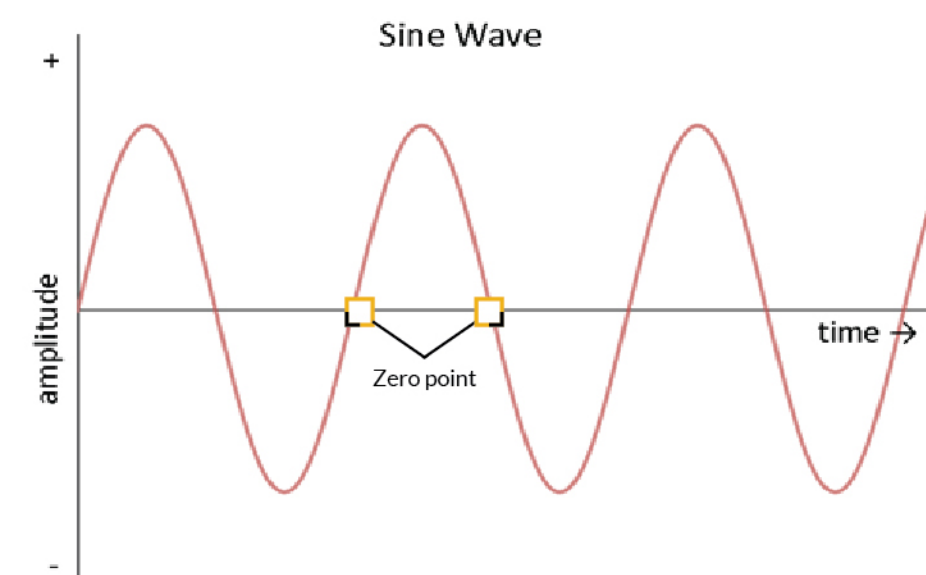
This mode is for split reactive power compensation of all three phases as well as harmonic currents. Capacitor connection is Y-type and a harmonic reactor is connected in series with it. Both can be controlled together.



## Features

### Zero-Point Switching

KRD smart capacitor has a built-in intelligent control unit. The intelligent control unit is composed of a thyristor, a magnetic latching relay, a zero-crossing trigger conduction circuit and protection circuit. It is programmed to realize the "zero switching" of the capacitor, ensuring that there is no inrush current impact and no operating overvoltage during the switching process. The switch module has fast response speed and can be operated frequently. Due to this patented technology, KRD smart power capacitor can achieve million times switching.



### Intelligent Self-Control

When many capacitors are setup together (PFI Panel), the whole system operates through KRD600 (Controller). In case of failure, all capacitors should be switched to manual mode one by one through toggle switch. Power factors and other parameters are set through built-in LCD screen. Each capacitor will maintain the given PF value and will act as a smart & self-control PFI plant.



## Features

### Built-in Temperature Sensor

Temperature sensor is built in the capacitor to reflect the internal heat degree of the capacitor under condition of overvoltage, over harmonics, excessive leakage current and excessive ambient temperature, so as to realize over-temperature protection.

### High Quality Power Capacitor

The low voltage power capacitor in the product is self-healing, resin-filled, parallel compensation dry type capacitor. It has key characteristics of fire retardant, overall explosion proof, no-leakage, low temperature rise and long service life due to quality material used.

### Series Reactor

It is dry type, iron core reactor with reactance rate of 7% and 14%. It has the characteristics of low loss, low noise, high inrush current suppression and highly anti-harmonics. The insulation level is H.

### Modular structure

The smart capacitor has a modular structure, small size, simple field wiring, and convenient maintenance. Its compact size occupies very less space. Only need to increase the number of modules to realize the expansion of the reactive power compensation system.

### Perfect protection design

KRD Smart capacitors have protections for power failure, short-circuit, under-voltage, over-voltage and capacitor over-temperature protection which effectively guarantee the safety of capacitors and extend the life of equipment.

## Features

### Automatic compensation of reactive power

KRD Smart capacitors automatically switch on and off according to the reactive power of the load, dynamically compensate reactive power and improve power quality. Smart capacitors can be used individually or in multiple units online.

### Friendly man-machine interface

Each KRD capacitor has an LCD display for displaying current, voltage, reactive power and other equipment operating parameters. In addition, it displays switching status, composite switch module fault status, and communication status. And it is convenient to realize debugging/working state switching, manual/automatic operation functions.

### Online Communication

It supports online communication through RS-485.

### Simple Wiring

PFI panel consisting KRD smart capacitors required very simple wiring because of modular nature of capacitors. It occupies small volume, less space and reduces time of wiring installation, thus, increasing installation efficiency.

### High Reliability

It can achieve 1 million time switching.

### Certifications

KRD Smart capacitors has been type tested at standard third party lab and has passed type tests against IEC60384 & GB15576 standard.



## Comparison of Switch Devices

### Capacitance Contactor

- ◇ Heavy Heat, easily sintered & oxidized contact.
- ◇ Over-current, over voltage power supply pollution.
- ◇ Short electrical life, cannot move frequently.

### Synchronous Switch (Zero-Point Switch)

- ◇ Small Voltage drop, slight heat.
- ◇ No over-current, over voltage power supply pollution.
- ◇ Long electrical life, can move frequently.

## Technical Performance & Effect of Compensation Device.

### Capacitance Contactor

- ◇ High energy consumption in operation.
- ◇ Low switching speed, complex control, easy occurred accident.
- ◇ Good over voltage resistance and over current resistance.
- ◇ Random phase angle large in restaurant randomly no harmonics.
- ◇ Poor safety performance. Easily caused safety accidents.
- ◇ Low level of intelligence. No fault, self-diagnosis.
- ◇ No capacitor protection.
- ◇ Extremely complicated wiring.
- ◇ Heavy workload for enterprise to operate.
- ◇ Poor reliability, low cost performance.

### Synchronous Switch (Zero-Point Switch)

- ◇ Minimal energy consumption in operation.
- ◇ Optimized switching one step high-speed low failure rate.
- ◇ Strong over voltage resistant and over current resistance.
- ◇ Phase angle is close to zero degree, no inrush current, and no harmonics.
- ◇ Perfect safety performance, hardly caused safety accidents.
- ◇ High level of intelligence fault, self-diagnosis.
- ◇ Capacitor protection. Various protective functions, perfect safety performance,
- ◇ Extremely simple wiring
- ◇ Workload for enterprise to operate is reduced.
- ◇ High reliability. High cost performance.

## Technical Parameters

### Environmental Conditions

- Temperature: -25<sup>0</sup>C to + 500<sup>0</sup>C  
 Relative humidity: @40<sup>0</sup>C , 20~90%  
 Altitude ≤2000m
- ◇ Wires shall be related to the capacity of capacitor for 1.3 times.
  - ◇ For high harmonic content environment. Please use the CX3 or CX4 series products. (Please check out product selection table for CX3 and CX4)

### Power Supply Conditions.

- Rated voltage: ~220V/~380V/~480V/~525V,  
 50/60 Hz  
 Related deviation: ±10%  
 Voltage distortion: Voltage THD ≤10%  
 Frequency: ±3%  
 Power consumption: ≤1.5W

### Measurement Errors

- Reactive Power: ≤1%  
 Power Factor: ±0.01

### Reliability Parameters

- Control accuracy: 100%  
 Switching times: 1,000,000 times  
 Capacitor self-discharge: Built-in discharge resistor three minutes after capacitor voltages below 75V.  
 Switching rate of decay: ≤0.1% per million times.  
 Capacitor capacity running time decay rate: ≤1%  
 Capacitor Dielectric loss: ≤0.2w/kVAR  
 Annual failure rate: ≤0.1%

### Reactive Power Compensation Parameters

- Reactive compensation error: ≤minimum capacitor capacity 50%  
 Capacitor switching time interval: >4s  
 Cascade KRD capacitor number: 32



## Product Selection

### 1 CXX for KRD capacitor series:

CX1: 3 Phase reactive power co-compensation  
 CX2: 3 Phase reactive power separated compensation  
 CX3: 3 Phase harmonic current co-compensation  
 CX4: 3 Phase harmonic current separated compensation

### 2 CX1 and CX2 series has two capacitor with the same parameters and capacity, CX3 and CX4 series has one capacitor and one reactor.

### 3 CX1 and CX3 series capacitor is A type connection, CX2 and CX4 series capacitor is Y type connection; CX1 and CX3 series capacitor rated voltage is line voltage, CX2 and CX4 series capacitor rated voltage is phase voltage;

KRD-CXX-□□□-□□-□□

Series reactance rate

Capacitor installed capacity

Capacitor rated voltage

Compensation type 1/2/3/4

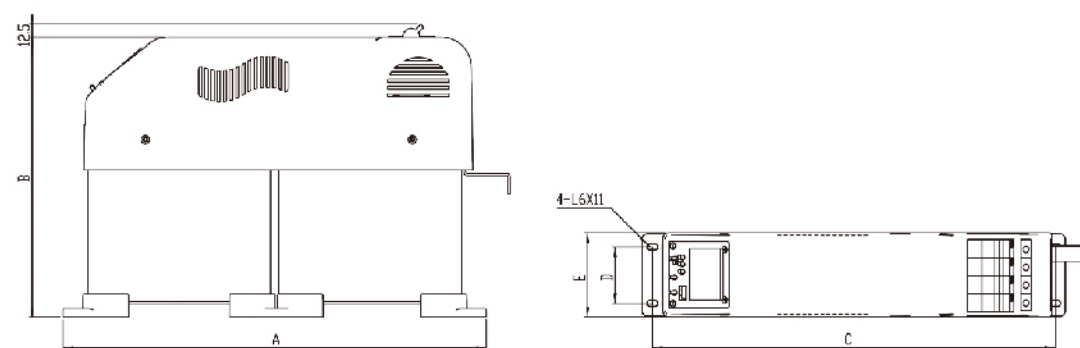
Function type

Intelligent controlled series capacitor

Compensation Mode	Specifications Models	Rated Capacity ( kvar)	Rated Voltage(V)	Remark
CX1 co- compensation CX1	KRD-CX1-450-10	10kvar	450	5+5
	KRD-CX1-450-15	15kvar	450	10+5
	KRD-CX1-450-20	20kvar	450	10+10
	KRD-CX1-450-30	30kvar	450	15+15
	KRD-CX1-450-40	40kvar	450	20+20
CX2 3 Phase reactive power separated compensation CX2	KRD-CX2-260-10	10kvar	260	5+5
	KRD-CX2-260-15	15kvar	260	10+5
	KRD-CX2-260-20	20kvar	260	10+10
	KRD-CX2-260-30	30kvar	260	15+15
CX3 3 Phase harmonic current co- compensation C3	KRD-CX3-480-10-7	10kvar +7%reactor	480	10+7%
	KRD-CX3-480-15-7	15kvar +7%reactor	480	15+7%
	KRD-CX3-480-20-7	20kvar +7%reactor	480	20+7%
	KRD-CX3-480-30-7	30kvar +7%reactor	480	30+7%
	KRD-CX3-480-40-7	40kvar +7%reactor	480	40+7%
	KRD-CX3-525-10-14	10kvar +14%reactor	525	10+14%
	KRD-CX3-525-15-14	15kvar +14%reactor	525	15+14%
	KRD-CX3-525-20-14	20kvar +14%reactor	525	20+14%
	KRD-CX3-525-30-14	30kvar +14%reactor	525	30+14%
	KRD-CX3-525-40-14	40kvar +14%reactor	525	40+14%
CX4 3 Phase harmonic current separated compensation C4	KRD-CX4-280-10-7	10kvar +7%reactor	280	10+7%
	KRD-CX4-280-15-7	15kvar +7%reactor	280	15+7%
	KRD-CX4-280-20-7	20kvar +7%reactor	280	20+7%
	KRD-CX4-280-30-7	30kvar +7%reactor	280	30+7%
	KRD-CX4-300-10-14	10kvar +14%reactor	300	10+14%
	KRD-CX4-300-15-14	15kvar +14%reactor	300	15+14%
	KRD-CX4-300-20-14	20kvar +14%reactor	300	20+14%
KRD KRD Accessory	KRD600 Controller	Multifunctional measure and control system	Installation Hole : 91x91mm	
	Secondary Current Transformer (Optional)	CCT, 5A/5mA, A/B/C three phase	Not configured by default	
	Data Wire	40cm(70cm 150cm) data wire		

Note: parameter specifications in this table is standard product parameter, if customer need different types of product, please contact with sales engineer.





补偿类型 Compensation Mod	规格型号 Specifications Models	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
CX3	KRD-CX3-480-10-7	410	390	310	150	180
	KRD-CX3-480-15-7	410	390	310	150	180
	KRD-CX3-480-20-7	410	480	310	150	180
	KRD-CX3-480-30-7	410	480	310	150	180
	KRD-CX3-480-40-7	440	480	310	170	200
	KRD-CX3-525-5-14	410	390	310	150	180
	KRD-CX3-525-10-14	410	480	310	150	180
	KRD-CX3-525-15-14	410	480	310	150	180
	KRD-CX3-525-20-14	410	480	310	150	180
	KRD-CX3-525-30-14	440	480	310	170	200
	KRD-CX3-525-40-14	440	480	310	170	200
CX4	KRD-CX4-280-10-7	410	390	310	150	180
	KRD-CX4-280-15-7	410	390	310	150	180
	KRD-CX4-280-20-7	410	480	310	150	180
	KRD-CX4-280-30-7	410	480	310	150	180
	KRD-CX4-300-5-14	410	390	310	150	180
	KRD-CX4-300-10-14	410	480	310	150	180
	KRD-CX4-300-15-14	410	480	310	150	180
	KRD-CX4-300-20-14	410	480	310	150	180
CX1	KRD-CX1-450-10	412	363	402	55	82
	KRD-CX1-450-15	412	363	402	55	82
	KRD-CX1-450-20	412	363	402	55	82
	KRD-CX1-450-30	412	363	402	55	82
	KRD-CX1-450-40	412	363	402	55	82
CX2	KRD-CX2-260-10	412	363	402	55	82
	KRD-CX2-260-15	412	363	402	55	82
	KRD-CX2-260-20	412	363	402	55	82
	KRD-CX2-260-30	412	363	402	55	82



Smart  
PFI Cabinet





## Smart PFI Cabinet

### Overview

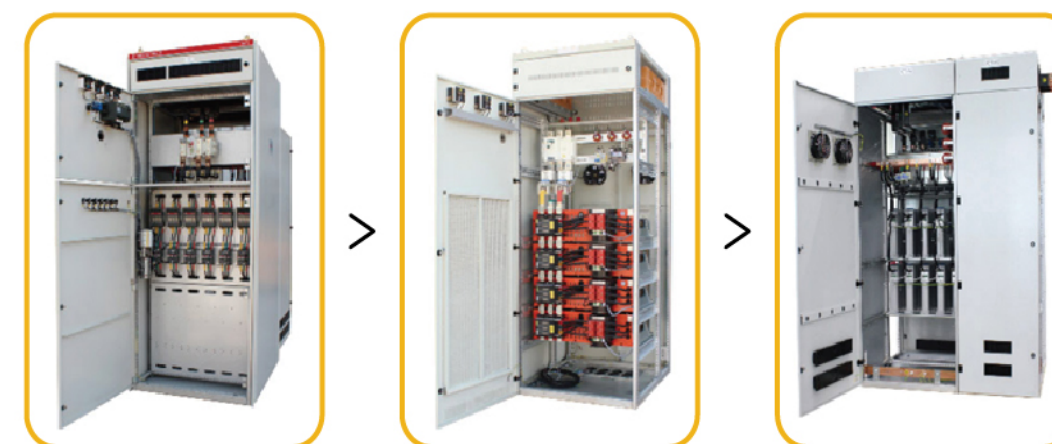
Smart PFI cabinet is third generation of low voltage power compensation devices quickly replacing traditional PFI panels. It has very simple wiring network, compact in size, cost effective, relatively low weight and has more kVAR capacity to the same size of traditional panels.

## Working Principle

Smart PFI panel is composed of KRD smart capacitors, fuse knife switch, CTs, KRD600 controller and energy analyzer. It can also use KRD smart capacitors with harmonic reactors to filter up to 3rd level harmonics. In automatic operational mode, KRD600 controller leads the whole compensation process. When the power factor is too low (lower than the threshold set by the user), the KRD600 controller in the capacitor compensation cabinet starts to issue input instructions to the internal intelligent capacitor. After receiving input instruction, capacitor starts to detect zero crossing of grid voltage. When zero crossing arrives, magnetic latch relay closes and capacitor starts operating.

When power factor approaches set value, controller stops issuing input instruction. When power factor reaches the upper limit, it starts to send cut-off instruction to disconnect capacitor from power grid.

In case of failure of KRD600, all capacitors are switched to manual mode one by one through toggle switch installed at capacitor front and the whole system will operate without controller as mentioned in features of capacitor.



1st  
generation of  
PFI Panels

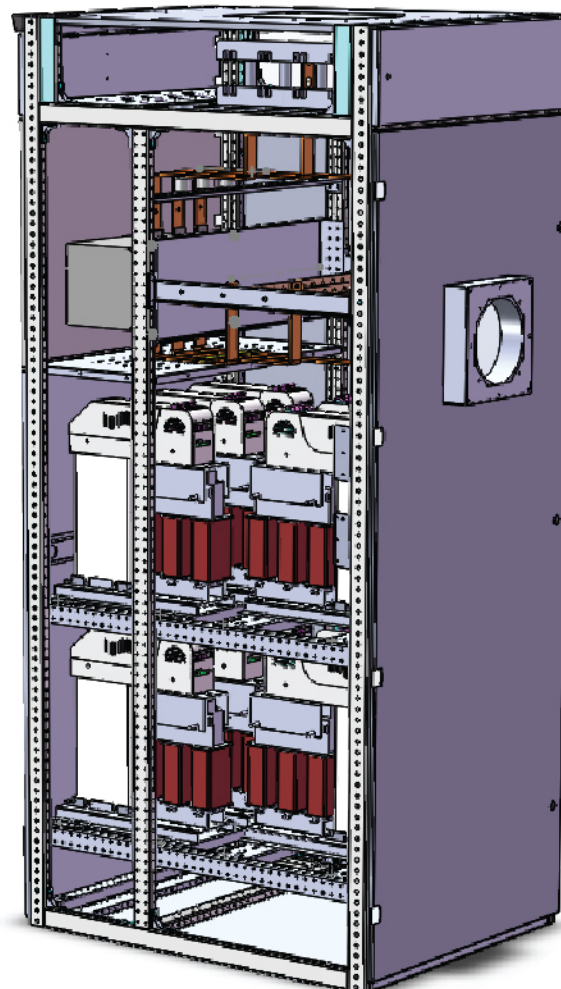


2nd  
generation of  
PFI Panels

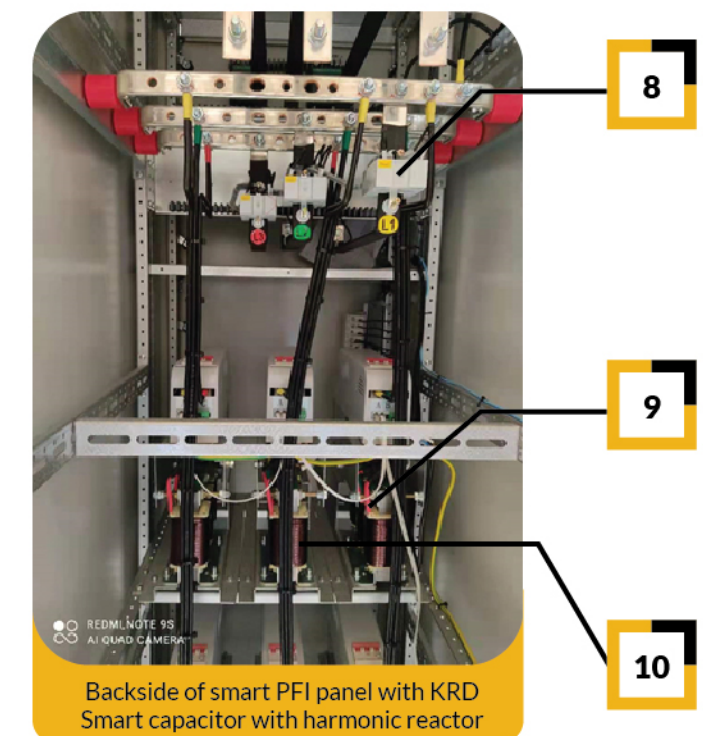
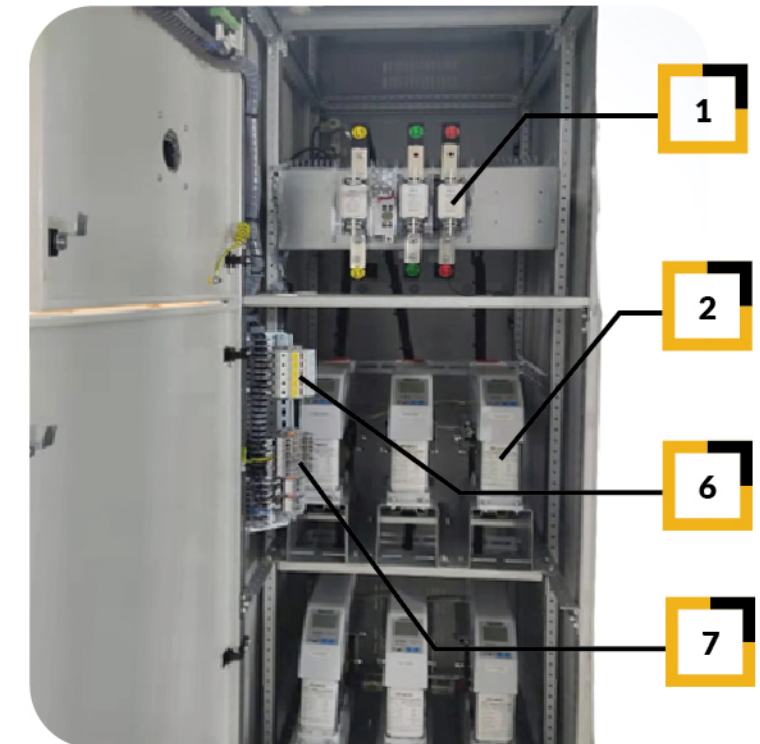
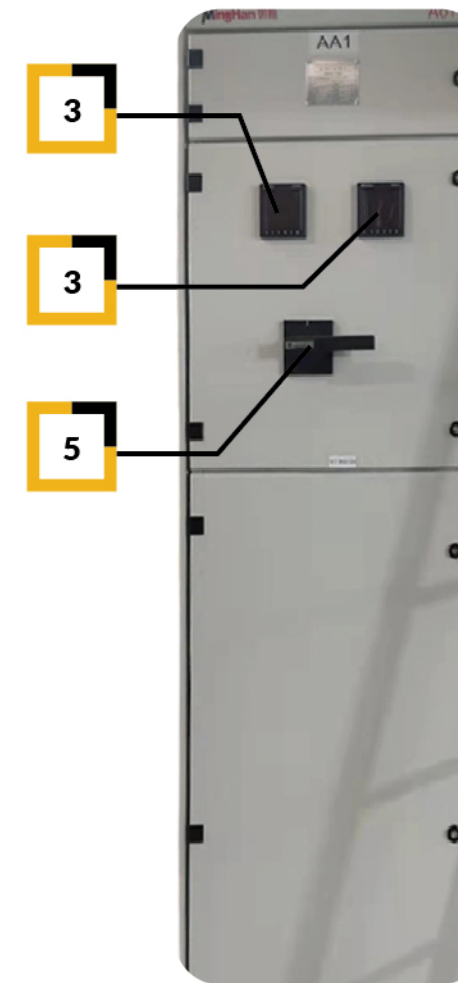


3rd  
generation of  
PFI Panels





3D  
Model of smart PFI  
panel with two  
opposite facing  
capacitors together



- 1 ☐ Knife Fuse Switch
- 2 ☐ Capacitors
- 3 ☐ Multifunctional meter
- 4 ☐ KRD Controller
- 5 ☐ Handle for knife fuse switch
- 6 ☐ Fuses
- 7 ☐ Terminals
- 8 ☐ CTs
- 9 ☐ Communication between capacitors
- 10 ☐ Harmonic reactors (Built-in with capacitors)

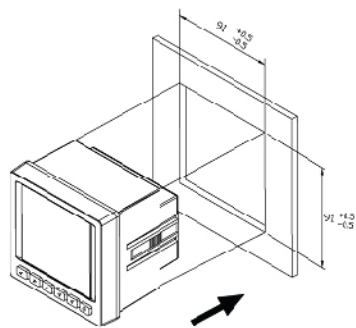
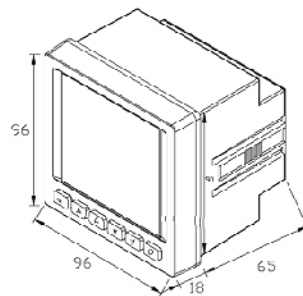


## KRD Smart PFI Panel Accessories

### Intelligent Capacitor Multifunctional Measure And Control System

MingHan has its special reactive power compensation controller KRD600 for PFI panels. It has following functions:

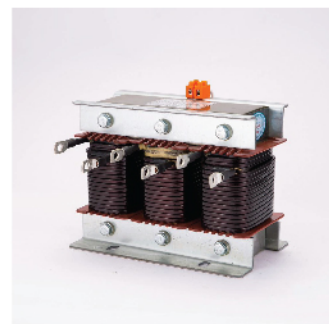
- ◇ Data collection and monitoring control
- ◇ Measurement & calculation.
- ◇ Accumulated power measurement.
- ◇ Fault recording.
- ◇ Harmonic monitoring, DI monitoring.
- ◇ Relay output.
- ◇ Monitoring various state parameters of KRD-C.
- ◇ Provides communication interface connected to the system.



L/+	NC	N/-	NC	NC	NC	NC	NC	I32	I31	I22	I21	I12	I11
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sn:													
<input type="checkbox"/> KRD600 智能电容器多功能测控系统													
CT		<input type="checkbox"/> 5A <input type="checkbox"/> 1A		PT		<input type="checkbox"/> 220V <input type="checkbox"/> 57.7V							
Input		Dry contact		RS485		<input type="checkbox"/>							
Power		85~265VAC/DC, 50/60Hz											
485+	485-	24V	30V	S1	S2	NC	NC	NC	NC	Un	Uc	Ub	Ua
15	16	17	18	19	20	21	22	23	24	25	26	27	28

### Secondary Current Transformer

KRD-CCT can be installed in smart PFI panels for current sampling. It can convert the secondary current signal (0~5A) of the compensation bus line to small signals (0~5mA) for measurement and control. For three phase compensation (Co-compensation), one CT is recommended. While for split phase compensation, three CTs are recommended (One CT for each phase).



### Communication Cable

Communication cable in smart PFI panels is important. Cable current collection and network communication lines with special treatment is 6 cores, and is configured to measure control and communicate. There are three types of communication lines. Users can be configured according to the situation.

Model	Description	Remarks
KRD-DBL1	6-core crystal head parallel lines, 40cm.	Near Products
KRD-DBL2	6-core crystal head parallel lines, 70cm.	Connection between the upper and lower layers of the product or the connection between the front and rear layers
KRD-DBL3	6-core crystal head parallel lines, 150cm.	Between KRD-CC and host product

### Connection Terminal

Capacitor power and control communication terminals are in the back of the KRD smart capacitor. Power terminals, A B C N, data and control terminal are used for sampling current signals, manual 485 communication interface, external indicator light (customers specified requirements). All terminals are easy to use, plug play type. Detailed schematic terminals are shown in the electrical schematic and wiring diagram.







### Construction

#### Traditional PFI Panel

- ◇ Composed of a controller, several low voltage power capacitors, AC contractors, reactors and protection devices assembled in the box and screen.

#### Smart KRD PFI Panel

- ◇ Composed of modular structure. KRD smart capacitors, controller and energy analyzers are all modular type.

### Configuration & Adjustability

#### Traditional PFI Panel

- ◇ Different products are integrated, equipment is configured for long-term needs and one time investment. Once the product is completed, it is very difficult to adjust its configuration and reactive power compensation.

#### Smart KRD PFI Panel

- ◇ Combination of modular products. Configured according to the current requirement and economic capacity, and can be expanded in future to realize phased investment.

### Production & Transportation

#### Traditional PFI Panel

- ◇ Complex structure, large volume, not easy to produce and transport.

#### Smart KRD PFI Panel

- ◇ Simple structure, small volume, easy to produce and transport.
- ◇ Generally, can save more than 80% of linked wires, reduces more than 80% of nodes and saves more than 60% of production hours. It can be transported separately, and quickly assembled at the site.

### Volume & Weight

#### Traditional PFI Panel

- ◇ Large volume and weight.

#### Smart KRD PFI Panel

- ◇ Small volume and weight.
- ◇ In the same equipment box and cabinet, reactive power compensation capacity can generally be more than doubled.

### Reliability

#### Traditional PFI Panel

- ◇ The controller is the bottleneck of the reliability. Once the fault occurs, the whole machine will fail and paralyze. There are various kinds of parts combined together reducing the overall reliability of the whole product.

#### Smart KRD PFI Panel

- ◇ KRD smart capacitor is mini-PFI panel by itself. It can work alone in the system to realize low voltage reactive power automatic compensation.
- ◇ Smart PFI plant has two controllers (KRD600), external controller and KRD capacitor itself. In case of failure of external relay/controller, whole system will be switched to manual state and each capacitor will continue operating. In addition, KRD smart Power Capacitor has a mechanical life and electrical life of more than two million switching times and has high reliability.

### Maintainability

#### Traditional PFI Panel

- ◇ Greatly difficult overall technology, difficult onsite fault diagnosis and settlement, time consuming.

#### Smart KRD PFI Panel

- ◇ Strong fault self-diagnosis, simple structure, convenient installation, easy onsite fault diagnosis and settlement.

## Economy

### Traditional PFI Panel

- ◇ The price of the device is not proportional to the number of capacitors, the price is relatively high, when the number is small.

### Smart KRD PFI Panel

- ◇ The price of the device is directly proportional to the number of intelligent low voltage power capacitors the total price of a large number of capacitors is much lower than that of traditional products, if the number of capacitors is small, the total cost will be much lower.
- ◇ Total price of a large number of capacitors is much lower than that of traditional products. If the number of capacitors is small, the total cost will be much lower comparatively.

## Compensation & Application

### Traditional PFI Panel

- ◇ It is generally used in centralized reactive power automatic compensation situations which is not convenient for decentralized reactive power automatic compensation and has a narrow application range.

### Smart KRD PFI Panel

- ◇ It can be used in all kinds of vocations, both centralized compensation and decentralized compensation, and has a wide range of applications.

## Certifications

KRD capacitors has passed third party type test certification of million times switching as well as it has passed safety test from CCC lab. It is awarded as reliable, safe and innovative product. Company has 20 different software and patent copyrights for KRD capacitors.

Patent & Copyright Patents	Patent No.
Detection device for action time and reset time of magnetic holding relay	201410144195.7
Hybrid device of reactive power compensation controller and intelligent capacitor	201420172174.1
Detection device for Zero crossing switching of reactive power compensation capacitor	ZL201420173067.0
Universal intelligent capacitor with separated compensation and co-compensation	ZL201420172144.0
Control system software of separated compensation intelligent capacitor v1.0	2014SR084035
Monitoring system V1.0 for touch screen of Intelligent capacitor bank	2014SR084040
Control system V1.0 for multi-machine switching of Intelligent capacitor bank	2014SR084779
Control system V1.0 for co-compensation intelligent capacitor	2014SR085014
Inspection system V 1.0 for Intelligent capacitor bank on full load operation	2014SR085019
Intelligent capacitor online adaptive zero switching automatic correction module Software v1.0	2014SR085543
Inspection System V 1.0 for Multi machine on line monitoring system of intelligent capacitor bank	2014SR085479
Detection system v1.0 for action time and reset time of magnetic holding relay	2014SR085022
On-site Zero crossing switching correction system V1.0 for Intelligent capacitor	2014SR084759
Integrated intelligent capacitor (separated and co-compensation type) control software v1.0	2014SR084027
Human Computer Interaction Application Software v1.0 for reactive power compensation controller	2014SR108756
Synchronous switch control Software v1.0 for magnetic holding relay	2014SR108878
Capacitor bank Reactive Power Compensation Control System Software v1.0	2014SR108871
Zero crossing switching detection system V1.0 for reactive power compensation capacitor	2014SR108864
Intelligent capacitor bank host switching control Software v1.0	2014SR108859



## Frequently Asked Questions

### Does this KRD capacitor operates through separate relay?

Each KRD capacitor has its own intelligent controlling unit which acts as relay. When many KRD capacitors are connected together in smart PFI cabinets, the whole system is recommended to be controlled through special reactive power compensation controller.

### How do we compare KRD capacitor with traditional in terms of price?

Much better comparison is between smart PFI cabinet with traditional PFI cabinet as both are complete PFI system. When we compare KRD smart capacitor with traditional capacitor, KRD capacitor is expensive as it is complete PFI unit and has built-in controller, relays, LCD display, breaker, etc. While traditional capacitor is just a capacitor and needs multiple components to turn into complete PFI unit.

### How about residual current during unwanted power interruption?

KRD Smart Capacitor has built-in discharge resistor which discharges residual current in case of any non-zero point switching.

### How do we setup manual / automatic operation in smart PFI cabinet?

You can select auto/manual mode through KRD600 controller as well as through capacitor LCD.

### How KRD Smart Capacitor deals with inrush current?

KRD smart capacitor ensures zero inrush current through zero-point switching. Switching module of KRD capacitors is programmed in such a way that.

### How many capacitors can be connected with one KRD-600 controller?

KRD-600 controller can control 32 capacitors at a time.

### Do we need separate controller for harmonic reactor and capacitor?

No, single controller (any of KRD-600 or built-in) is enough to operate both simultaneously.

### What harmonics are suppressed by 7% and 14% harmonic reactor?

7% harmonic reactor controls 5th harmonics while 14% suppresses 3rd harmonics. If both are found in any system, then it should use active harmonic filters directly.