



## Medium Voltage Soft Starter

### Shanghai Nancal Electric Co., Ltd.

Address: C708, 699 Zhongke Rd., Pudong New District, Shanghai, China  
Postcode: 201210  
Tel: 021-5041 0009  
Fax: 021-2042 2388  
E-mail: sales.sh@nancal.com  
Website: www.nancal.com  
Customer service: +86 18217165478



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Medium Voltage AC Drives	Low Voltage Industrial AC Drives	Medium Voltage Soft Starter	APF	SVG	SVGC	SPC	High Voltage SVG	Shore Power
								
2.3kV-18kV	400V/480V/690V	1.14kV-13.8kV	400V/480V/690V	400V/480V/690V	400V/480V/690V	400V	3kV-35kV	High voltage: 6kV-10kV Low voltage: 380V-690V
200kW-15MW (Air cooling) 7MW-65MW (Water cooling)	37kW-8MW	220kW-26MW	30A-750A	30kvar-600kvar	100kvar-600kvar	35kvar-100kvar	1000kvar-100Mvar	High voltage: 300kVA-20MVA Low voltage: 100kVA-8MVA
Draught fan, water pump, compressor energy saving; process speed regulation	High performance single/ multiple variable frequency drive system	Motor soft starting	Harmonic elimination	Reactive compensation	Reactive compensation	Three-phase balancing	High voltage reactive compensation	Marine power supply

## Shanghai Nancal Electric Co., Ltd.

Shanghai Nancal Electric Co., Ltd. is the holding subsidiary of Nancal (stock code: 603859). The company specializes in R&D, production and sale of power electronic products, such as APF (Active Power Filter), SVG (Static Var Generator), Medium Voltage AC Drives, Low Voltage Industrial AC Drives, Medium Voltage Soft Starter, High Voltage SVG, Shore Power and so on.

### Glories

- High technology enterprise, software enterprise
- Type test reports, CE certification, CCS certification, SIL2 certification
- 54 patents for utility models
- 61 software copyrights
- Science and technology special award of Chinese Machinery Industry



# Introduction



NC3S Soft Starter is a new high-tech electrical equipment which design based on third generation DSP and modern power electronic control technology. The equipment is specialized for medium voltage large electrical machine, offer optimal soft starter method for voltage reduction and current-limiting. In order to apply in different loads and better effects, NC3S Soft Starter has multiple control functions can achieve stable accelerate start with minimum required motor current, decrease start power grid voltage drop, also decline current impacting and mechanical vibration. NC3S Soft Starter also provide soft stop function, generate gently decreasing control voltage to motor, thus drive system achieves soft stop.

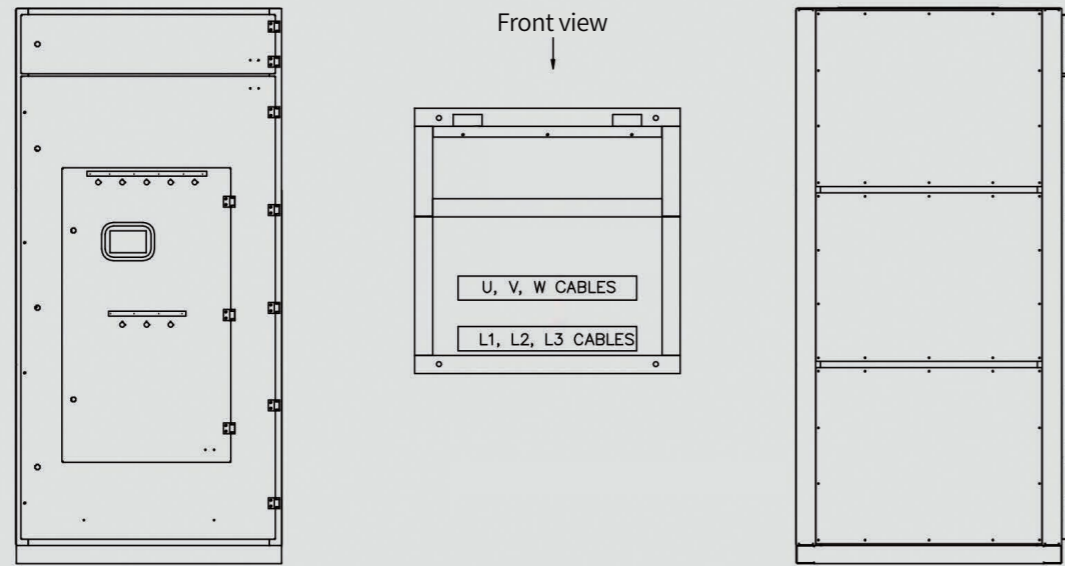
## Certification



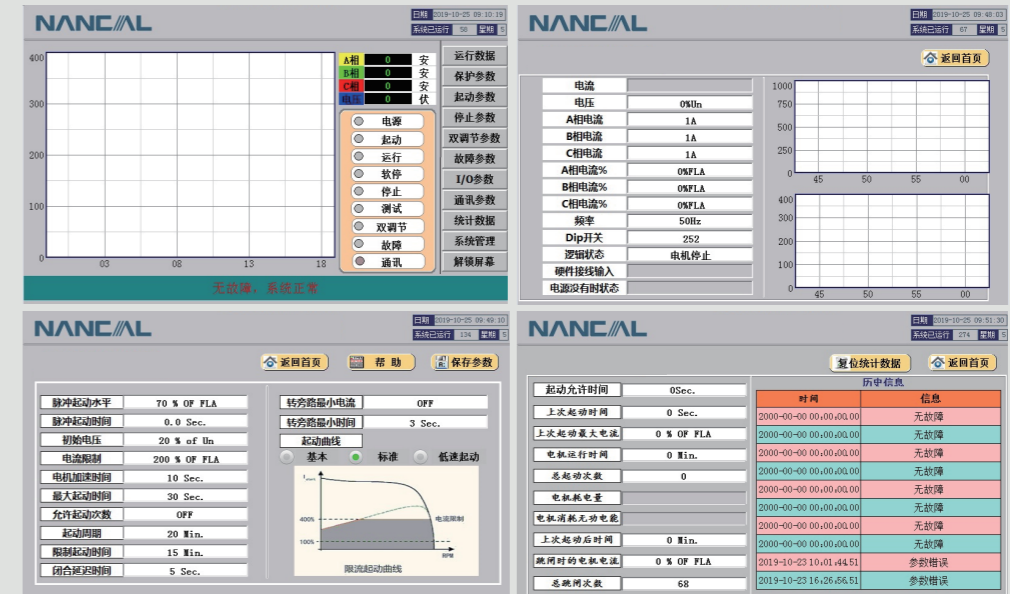
## Product features

- Use DSP manage data and communication, system has strong capacity of resisting disturbance since use signal grading and isolation technique. In addition, equipment has high efficiency, stability and reliability.
- Advanced optical fiber communication control technical, can trigger and test high voltage thyristor, high safety isolation between high voltage and low voltage control circuits.
- High frequency power isolation and transmitting technology, supply safety and reliable power to high voltage electrical device.
- RC static network, dynamic voltage balancing and absorption technology, guarantee high voltage series operation.
- Multiple start curves to adapt different loads characteristics. Motor maximum torque is adjustable, result in steady accelerate curve and mechanical impact declined, and can be applied in overloading start. In addition, unique transformer soft starter function, eliminate magnetizing inrush current, solve the impact of the transformer start on the power grid.
- One soft stop wave, prevent water hammer effect by pump loads shut down.
- Pulse snap function, improve original start torque, adapt to high static resistance torque system.
- Protection function: overvoltage, under voltage, overload protection waves, and undercurrent, loss of phase, current unbalancing, fault phase sequence, zero sequence ground protection and another fault protection.
- NC3S Soft Starter will proceed low voltage motor (380V) simulation test before high voltage motor operation, ensure safety guarantee and technical data.

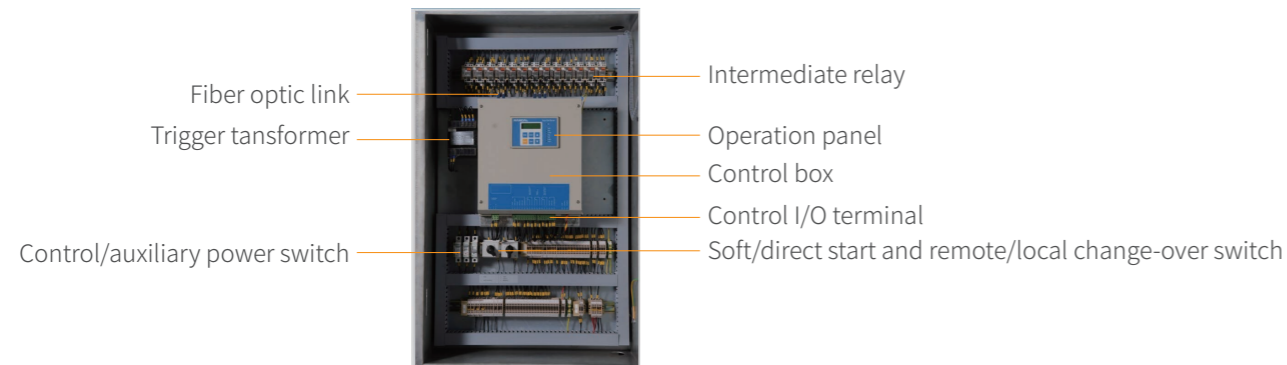
# Product Composition



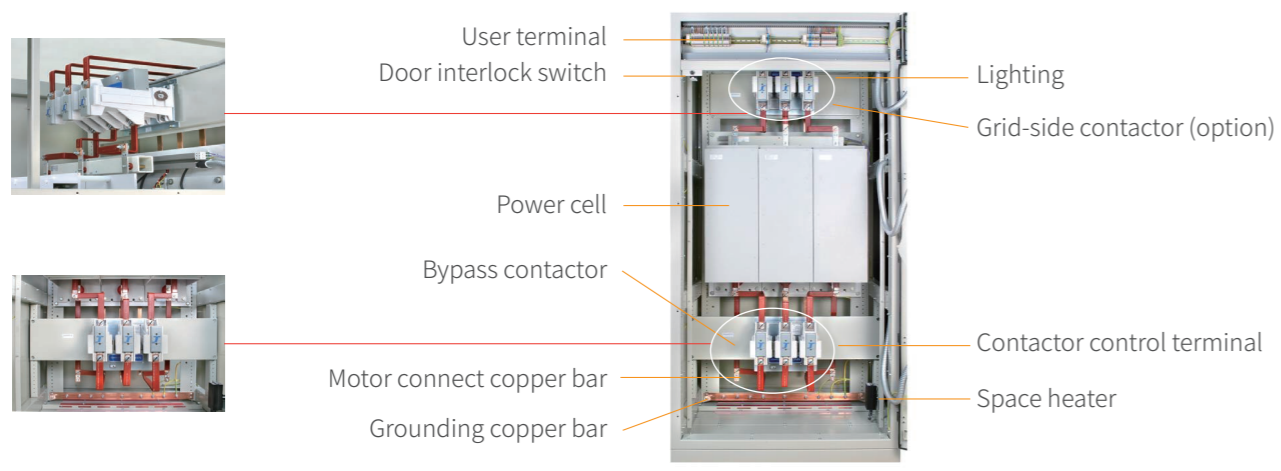
# HMI (option)



## Low voltage compartment (standard configuration)



## Medium voltage compartment

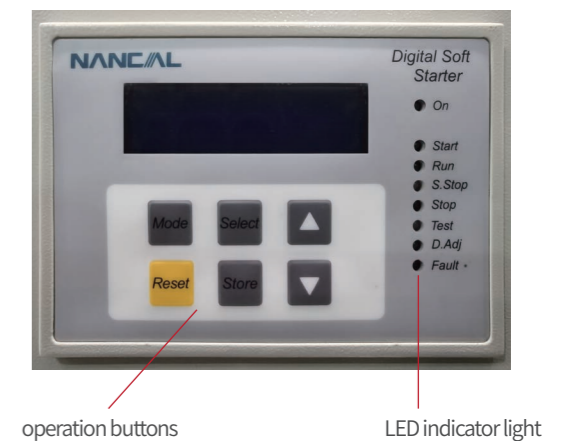


## Smart HMI

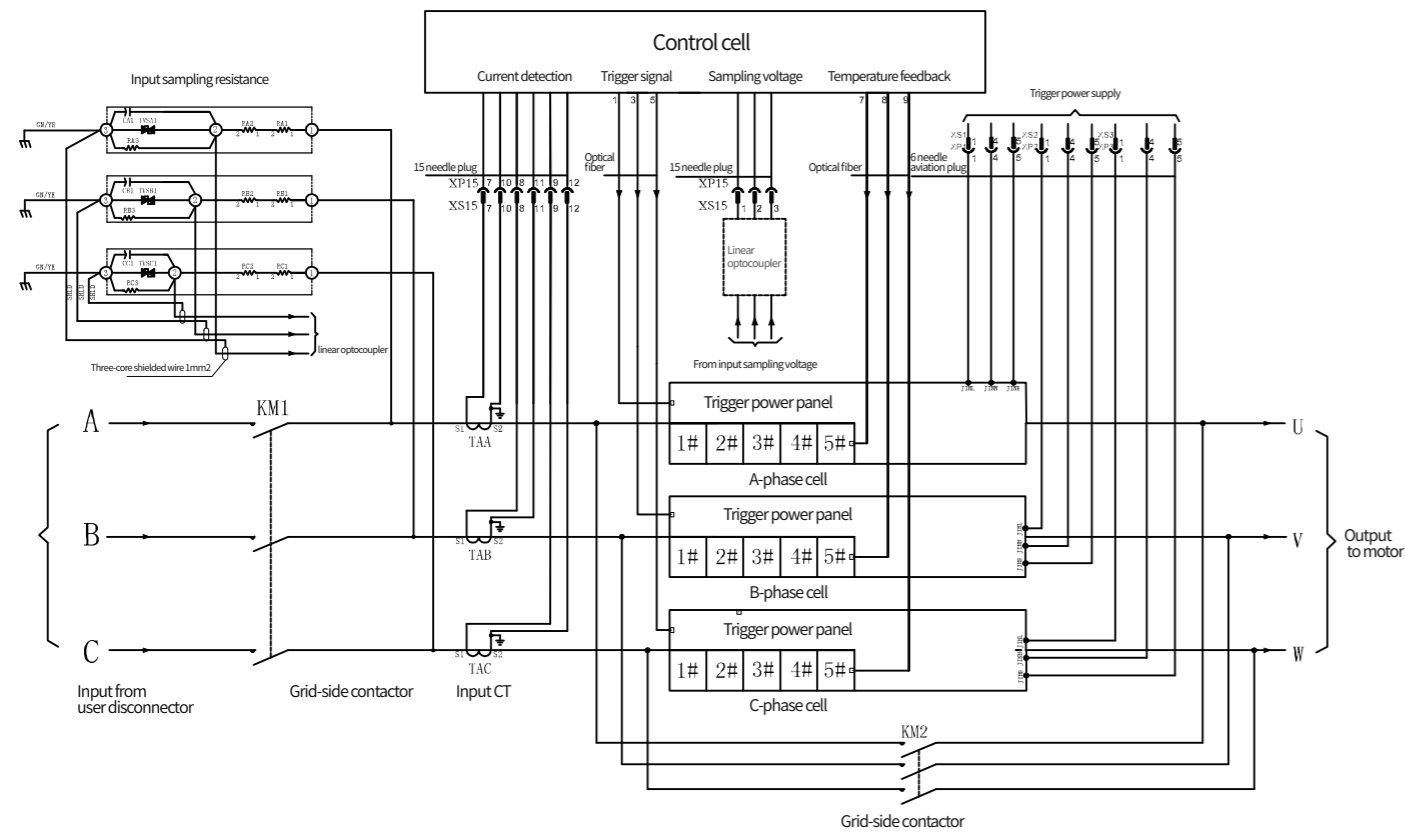
- Nancal NC3S Soft Starter has RS485 and TCP/IP communication interface, transfer data to user upper level monitoring system.
- The cabinet install digital value, analog value communication module, which can connect user switch value or analog signal, and display user demand device status in the screen.
- In addition, HMI can display user disconnecter switch on/off, operating current, operating voltage. Also, storage many alarm records, failure warning records.

## Standard HMI

- Display soft starting, running, soft stop, stop, double regulation, failure and other status.
- Display soft starter voltage and current in time.
- Strong data record function, can record soft starter starting, running, stop and failure time, total running time, total starting time, last starting time, last maximum starting current, total trip time, last trip current, final trip item.

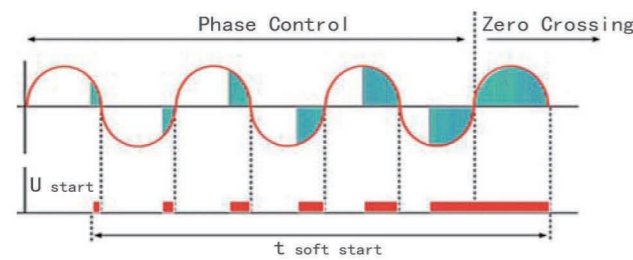


# Primary System Diagram

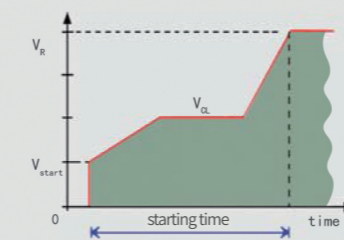


# Product Principle

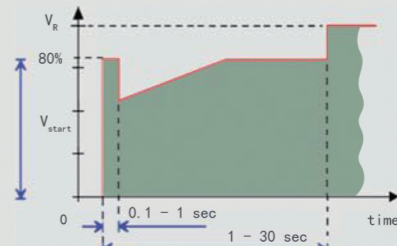
According to thyristor controllable breakover characteristics, and combine microelectronic technique. Since control thyristor conduction angle  $\alpha$  to change actual voltage effective value which add in motor stator, thereby decrease motor start current. Motor terminal voltage increase from setting start value to system supply voltage through phase control. Therefore, start current and start torque can achieve optimal adjustment based on drive conditions.



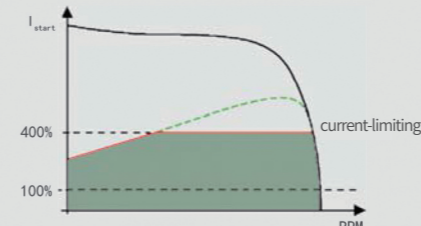
# Performance Waveforms



Dual-slope starter curves



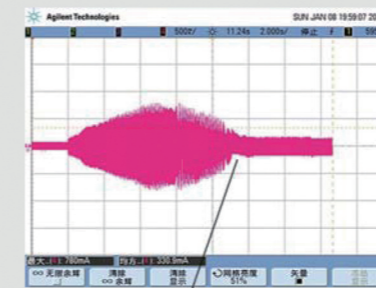
Pulse starter curves



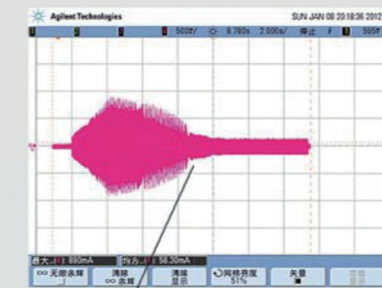
Current-limiting starter curves



Standard starter and double regulation starter curves



asymmetric current, motor vibration



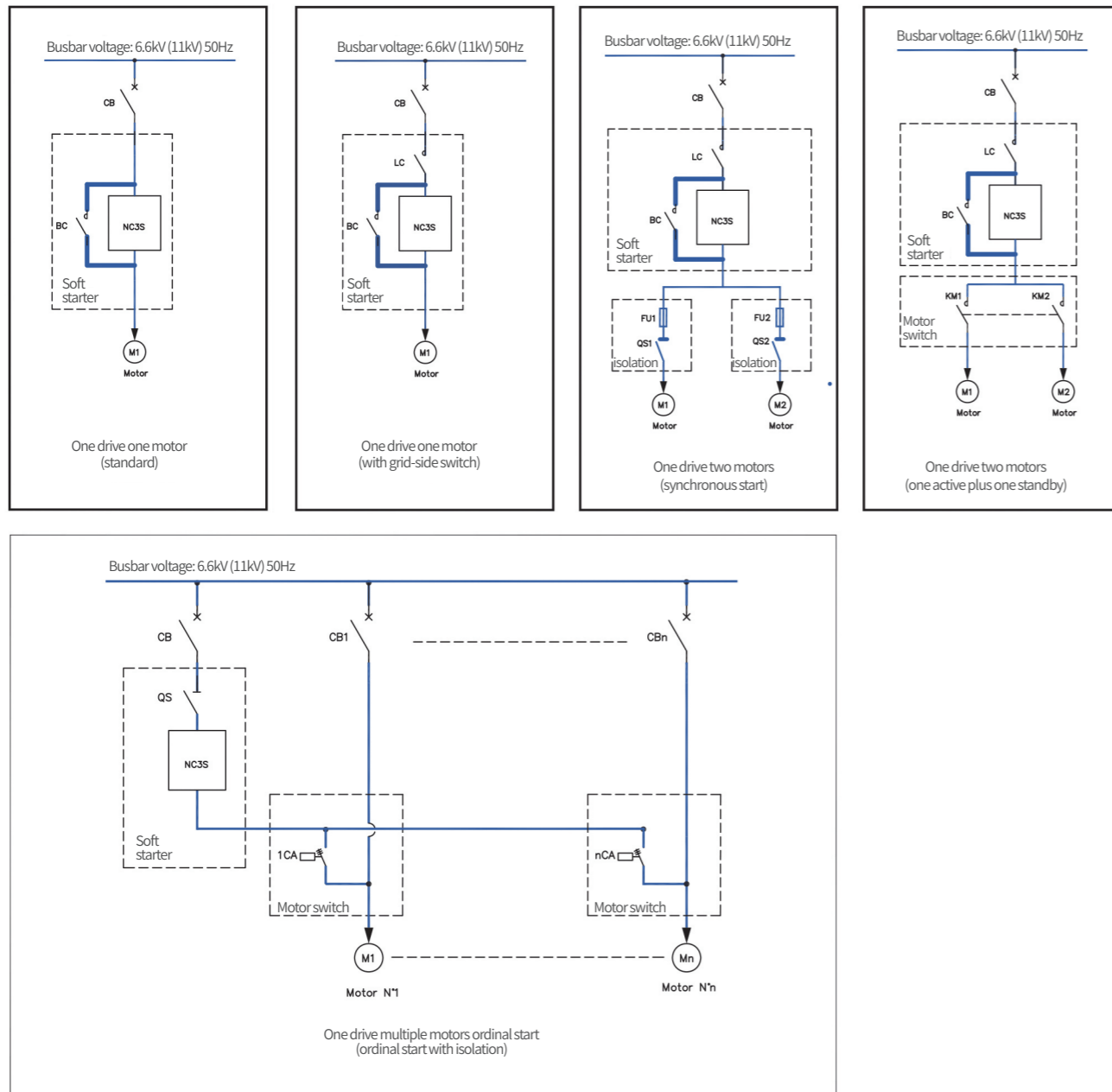
quickly start, symmetric current, running smoothly.

Other brands soft starter at 3 times start current

Nancal NC3S soft starter at 3 times start current

NC3S technical features	NC3S performance features	Control circuits
Patented electronic voltage measurement	Soft starter/soft stop	Multifunction programmable input/output (I/O)
Patented power unit structure design	Current-limiting, optimized torque and current control	Optoelectronic isolation controllable input
Innovative low voltage motor measurement	Pump control, pulse snap back starting	Three relay output 8A/250VAC - starting immediately - stop accelerate - fault can be programmed to "trip" or "safety trip"
Independent trigger test	Double adjustments: start/stop two different electrical performance motor or double speed motor	
Optical fiber trigger control system design	Compressor starting	0/4-20mA, 0-10VDC analog output
Isolation between high voltage and low voltage control circuits		
Perfect motor protection, high cost performance		
Easy installation and maintenance		

# Primary System Diagram



## Instructions:

1. CB, CB1...CBn are mains side high voltage vacuum circuit disconnecter (user supplied)
2. Supply scope in the dotted box
3. LC is grid-side contactor within cabinet
4. BC is bypass contactor within cabinet
5. FU1, FU2 is high voltage fuse; QS1, QS2 is high voltage disconnection switch
6. QS is inlet wire disconnection switch
7. KM1, KM2 are motor switch contactor
8. N is number of motors

# Product Models



NC3S - 06 - 250 - A - 2S

### Product series:

- 2S-NC3S-2000STD (with keypad controller)
- 2I-NC3S-2000ITG (with colored touch screen)

### Size:

A-standard; B-customized

### Rated current:

70A, 140A, 250A, 300A, 400A, 500, 600A

### Rated voltage:

03-3kV, 3.3kV; 06-6kV, 6.3kV; 10-10kV; 11-11kV; 14-13.8kV

### Product name: Solid Soft Starter

NC: Nancal

# Technical Features

Basic Information	
Load type	three-phase medium voltage squirrel-cage asynchronous motor, synchronous motor
AC voltage	3kV, 3.3kV, 6kV, 6.6kV, 10kV, 11kV, 13.8kV AC (-10% ~ +10%)
Frequency	50/60±2Hz
Main circuit	12SCRS, 18SCRS, 30SCRS, 36SCRS (depends on model)
SCR reverse peak voltage	13000V~39000V (depends on model)
Phase sequence	allow operation in all phase
Instant overvoltage protection	du/dt absorb network
Cooling	air cooling
Bypass	Used for equipment direct starting. Below 400A, choose vacuum contactor, above 400A, choose fixed disconnecter
Working condition	-10 °C ~ +50 °C
	Altitude <1000m (5%~95% relative humidity); altitude >1000m (derating)
Control power supply	<ul style="list-style-type: none"> <li>110-240V + 10%/-15%, 50/60 Hz (standard)</li> <li>110-220VDC (optional)</li> </ul>
Assistant relay	3 line dry contact 8A, 250V, 2000VA relay, function respectively are: <ul style="list-style-type: none"> <li>Immediately relay (when soft starter send signal, contactor location changed)</li> <li>Fault relay (open when fault occurrence)</li> <li>Starting over relay (when starting over, after 0-120s delayed, contactor location changed)</li> </ul>

Motor Protection	
Overload	Inverse time limit, current range: 75%-150%
	Trip delayed: 1-10s
Current unbalance	Unbalance trip standard: 10-100% any two phases
	Trip delayed: 1-60s
Overcurrent	Range: 100%-850%FLA, trip delayed: 0-5s
Undercurrent	Range: 20%-90%FLA, trip delayed: 1-40s
Overvoltage	Range: 110%-125%Un (line voltage)
	Delayed: 1-10s
Under/no voltage	Under voltage range: 50%-90% Un (line voltage)
	Under voltage delayed: 1-10s, no voltage delayed: 0-120s
Phase lose	Trip delayed: 0-120s
Ground fault	Fault current range: 10%-100%FLA
	Ground trip delayed: 1-60s
Overlong starting time	Trip when starting time over setting value
	range: 1-250s
Over temperature	trip when power cell over temperature
Power on but unstart	Trip when main circuit power on 30s but no starting signal
Deceleration time	Trip when starting interval is less than setting time
	Setting time: 0-90s
Number of starts/hr	Range: ≤6 times

Serial Interface	
Communication protocol	MODBUS <sup>1)</sup>
Communication interface	RS485
Functions	Parameter setting, running data and condition monitoring.

<sup>1)</sup> : for other communication protocol, please contact us.

## Product Selection Guides

3kV Soft Starter						
Model	Rated current	Motor power		Cabinet size (without grid-side disconnecter)	Dimension	
	(A)	(kW)	(hp)	(width x depth x height)	without grid-side disconnecter	with grid-side disconnecter
NC3S-03-70-A	70	300	405	1000*1450*2300	A	D
NC3S-03-140-A	140	605	815			
NC3S-03-250-A	250	1085	1450			
NC3S-03-300-A	300	1305	1745	1200*1450*2300	B	E
NC3S-03-400-A	400	1740	2330			
NC3S-03-500-A	500	2250	3060			
NC3S-03-600-A	600	2650	3550	2200*1450*2200	C	F
NC3S-03-800-A	800	3600	4900			
NC3S-03-1000-A	1000	4500	6125			
NC3S-03-1200-A	1200	5400	7345	2400*1450*2200	G	H
NC3S-03-1400-A	1400	6200	8300			
NC3S-03-1600-A	1600	7050	9450			

3.3kV Soft Starter						
Model	Rated current	Motor power		Cabinet size (without grid-side disconnecter)	Dimension	
	(A)	(kW)	(hp)	(width x depth x height)	without grid-side disconnecter	with grid-side disconnecter
NC3S-033-70-A	70	340	455	1000*1450*2300	A	D
NC3S-033-140-A	140	680	900			
NC3S-033-250-A	250	1250	1650			
NC3S-033-300-A	300	1450	1950	1200*1450*2300	B	E
NC3S-033-400-A	400	1950	2650			
NC3S-033-500-A	500	2450	3250			
NC3S-033-600-A	600	2900	3900	2200*1450*2200	C	F
NC3S-033-800-A	800	3900	5250			
NC3S-033-1000-A	1000	4850	6500			
NC3S-033-1200-A	1200	5830	7800	2400*1450*2200	G	H
NC3S-033-1400-A	1400	6800	9100			
NC3S-033-1600-A	1600	7775	10425			

6kV Soft Starter

Model	Rated current	Motor power		Cabinet size (without grid-side disconnecter)	Dimension	
	(A)	(kW)	(hp)	(width x depth x height)	without grid-side disconnecter	with grid-side disconnecter
NC3S-06-70-A	70	600	810	1000*1450*2300	A	D
NC3S-06-140-A	140	1210	1630			
NC3S-06-250-A	250	2170	2900			
NC3S-06-300-A	300	2610	3490			
NC3S-06-400-A	400	3480	4660	1200*1450*2300	B	E
NC3S-06-500-A	500	4500	6120			
NC3S-06-600-A	600	5300	7100	2200*1450*2200	C	F
NC3S-06-800-A	800	7200	9800			
NC3S-06-1000-A	1000	9000	12250			
NC3S-06-1200-A	1200	10800	14690			
NC3S-06-1400-A	1400	12400	16600	2400*1450*2200	G	H
NC3S-06-1600-A	1600	14100	18900			

6.6kV Soft Starter

Model	Rated current	Motor power		Cabinet size (without grid-side disconnecter)	Dimension	
	(A)	(kW)	(hp)	(width x depth x height)	without grid-side disconnecter	with grid-side disconnecter
NC3S-066-70-A	70	680	910	1000*1450*2300	A	D
NC3S-066-140-A	140	1360	1800			
NC3S-066-250-A	250	2500	3300			
NC3S-066-300-A	300	2900	3900			
NC3S-066-400-A	400	3900	5300	1200*1450*2300	B	E
NC3S-066-500-A	500	4900	6500			
NC3S-066-600-A	600	5800	7800	2200*1450*2200	C	F
NC3S-066-800-A	800	7800	10500			
NC3S-066-1000-A	1000	9700	13000			
NC3S-066-1200-A	1200	11660	15600			
NC3S-066-1400-A	1400	13600	18200	2400*1450*2200	G	H
NC3S-066-1600-A	1600	15550	20850			

6.3kV Soft Starter

Model	Rated current	Motor power		Cabinet size (without grid-side disconnecter)	Dimension	
	(A)	(kW)	(hp)	(width x depth x height)	without grid-side disconnecter	with grid-side disconnecter
NC3S-063-70-A	70	650	870	1000*1450*2300	A	D
NC3S-063-140-A	140	1300	1750			
NC3S-063-250-A	250	2300	3100			
NC3S-063-300-A	300	2800	3750			
NC3S-063-400-A	400	3700	5000	1200*1450*2300	B	E
NC3S-063-500-A	500	4700	6300			
NC3S-063-600-A	600	5600	7500	2200*1450*2200	C	F
NC3S-063-800-A	800	7400	9900			
NC3S-063-1000-A	1000	9300	12500			
NC3S-063-1200-A	1200	11200	15000			
NC3S-063-1400-A	1400	13000	17500	2400*1450*2200	G	H
NC3S-063-1600-A	1600	14840	19900			

10kV Soft Starter

Model	Rated current	Motor power		Cabinet size (without grid-side disconnecter)	Dimension	
	(A)	(kW)	(hp)	(width x depth x height)	without grid-side disconnecter	with grid-side disconnecter
NC3S-10-70-A	70	1000	1350	1000*1450*2300	A	D
NC3S-10-140-A	140	2100	2800			
NC3S-10-250-A	250	3700	5000			
NC3S-10-300-A	300	4500	6000			
NC3S-10-400-A	400	5900	7900	1200*1450*2300	B	E
NC3S-10-500-A	500	7400	9900			
NC3S-10-600-A	600	8800	11900	2200*1450*2200	C	F
NC3S-10-800-A	800	11800	15800			
NC3S-10-1000-A	1000	14800	19800			
NC3S-10-1200-A	1200	18000	24000			
NC3S-10-1400-A	1400	20600	27500	2400*1450*2200	G	H
NC3S-10-1600-A	1600	24000	31600			



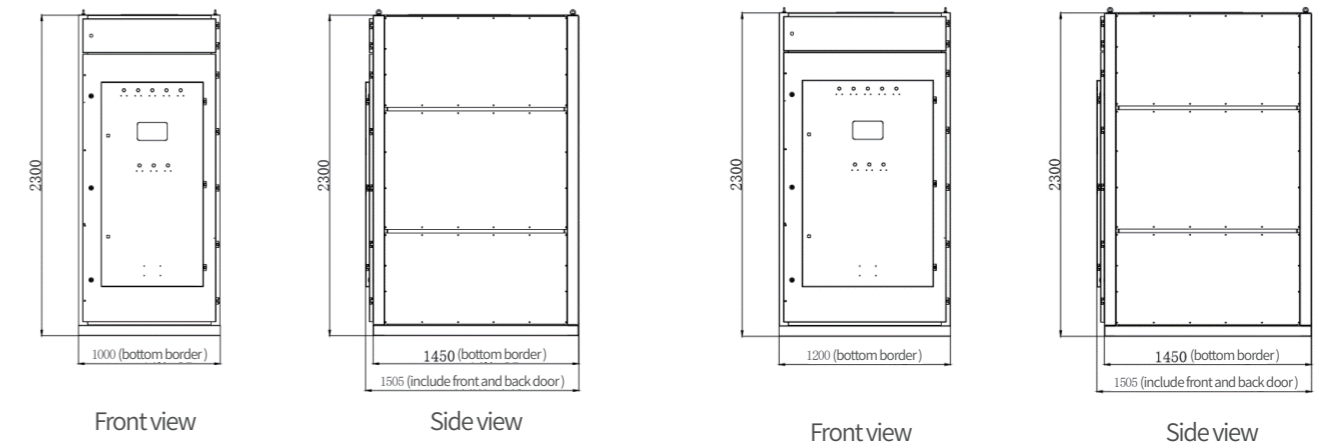
# Dimension

11kV Soft Starter						
Model	Rated current	Motor power		Cabinet size (without grid-side disconnecter)	Dimension	
	(A)	(kW)	(hp)	(width x depth x height)	without grid-side disconnecter	with grid-side disconnecter
NC3S-11-70-A	70	1140	1520	1000*1450*2300	A	D
NC3S-11-140-A	140	2300	3050			
NC3S-11-250-A	250	4050	5500			
NC3S-11-300-A	300	4900	6500			
NC3S-11-400-A	400	6500	8700	1200*1450*2300	B	E
NC3S-11-500-A	500	8100	10900			
NC3S-11-600-A	600	9700	13000	2200*1450*2200	C	F
NC3S-11-800-A	800	13000	17500			
NC3S-11-1000-A	1000	16200	22000			
NC3S-11-1200-A	1200	19500	26100			
NC3S-11-1400-A	1400	22700	30500	2400*1450*2200	G	H
NC3S-11-1600-A	1600	26000	35000			

13.8kV Soft Starter						
Model	Rated current	Motor power		Cabinet size (without grid-side disconnecter)	Dimension	
	(A)	(kW)	(hp)	(width x depth x height)	without grid-side disconnecter	with grid-side disconnecter
NC3S-14-70-A	70	1380	1863	1000*1450*2300	A	D
NC3S-14-140-A	140	2898	3864			
NC3S-14-250-A	250	5106	6900			
NC3S-14-300-A	300	6210	8280			
NC3S-14-400-A	400	8142	10902	1200*1450*2300	B	E
NC3S-14-500-A	500	10212	13662			
NC3S-14-600-A	600	12144	16422	2200*1450*2200	C	F
NC3S-14-800-A	800	16284	21804			
NC3S-14-1000-A	1000	20424	27324			
NC3S-14-1200-A	1200	24840	33120			
NC3S-14-1400-A	1400	28428	37950	2400*1450*2200	G	H
NC3S-14-1600-A	1600	33120	43608			

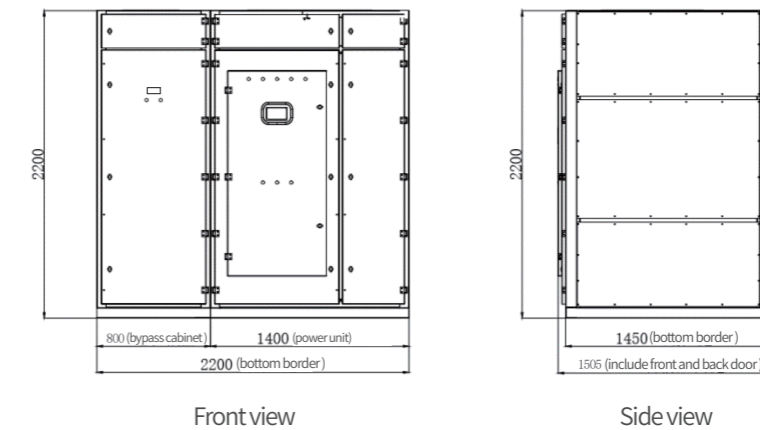
## Instructions:

- Parameters for reference only, take practically as standard.
- Special requirement cabinet can be designed on request.
- Other voltage class, current class and cabinet size, please contact us.
- Cabinet size may be changed since different electrical elements, please contact us.

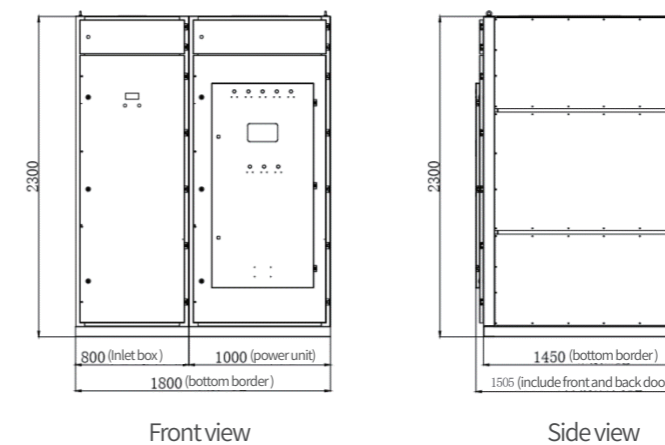


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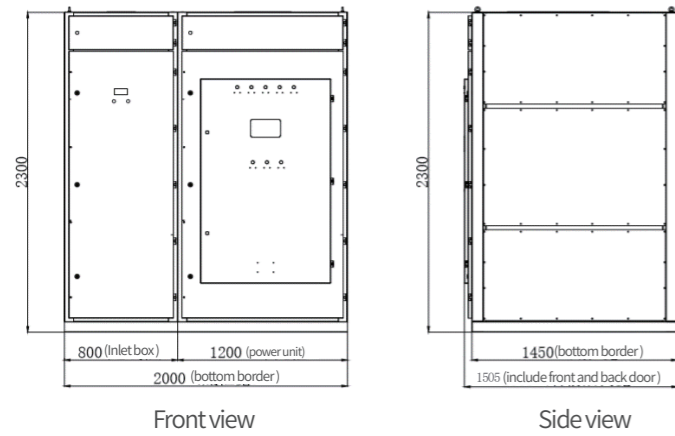
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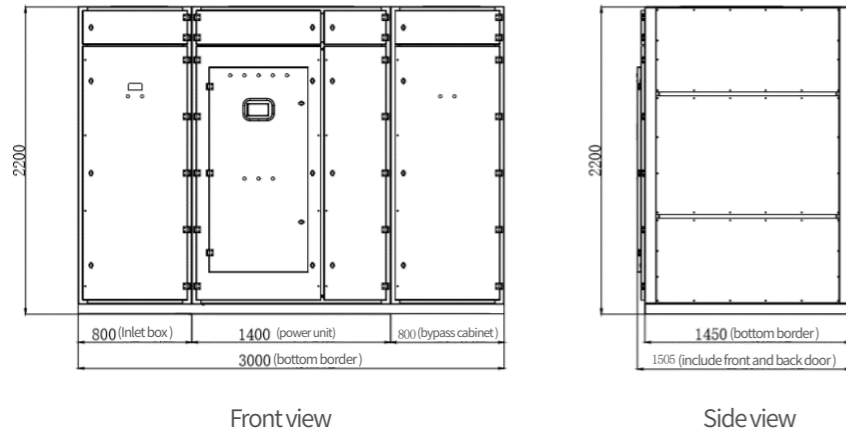
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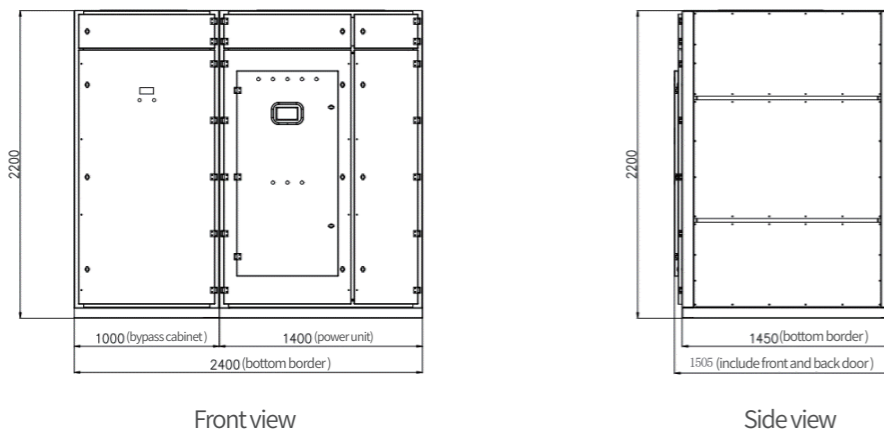
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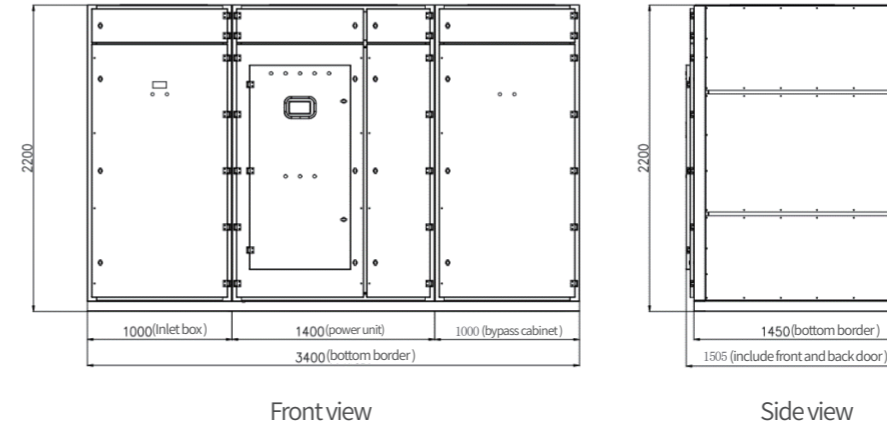
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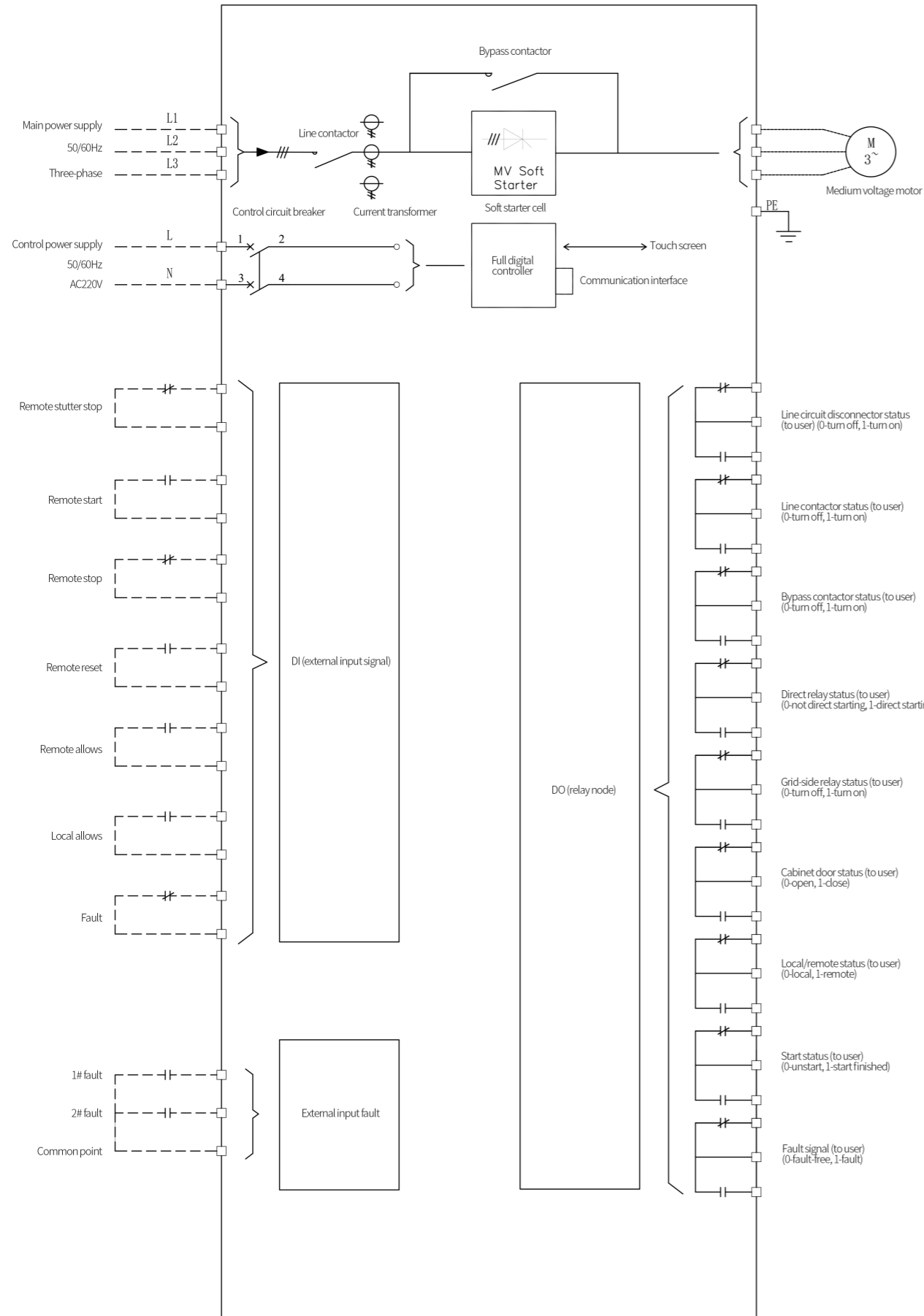


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### Instructions:

1. Cabinet design and production are strictly following ISO9001 standard.
2. Indoor metal closed fixed cabinet, main part material is 2.5mm thick cold-roll steel sheets, can suffer damage from transportation, installation and short circuit.
3. Metal shell, protective screen and cabinet door are grounded as request, with special grounding busbar can connect multiple terminals.
4. In the medium voltage compartment, auxiliary contacts of gate-controlled switch are designed in soft starter control circuit, avoid harm on human body.
5. Cabinet top has pressure relief device (emergency pressure relief device).
6. IP31, special requirement can be designed.
7. Standard color is RAL7032, or custom design.

# Standard Wiring Diagram



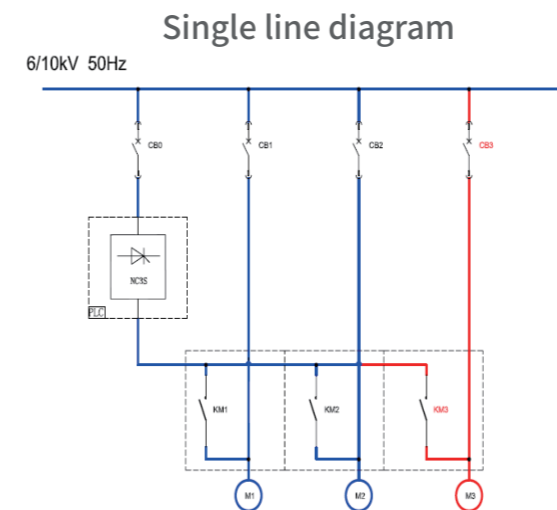
# Applications

- Crusher
- Conveyor belt
- Heat pump
- Air pump
- Grinding miller
- Press machine
- Escalator
- No-load motor
- Diesel generator
- Centrifugal pump
- Piston compressor
- Centrifugal compressor
- Screw compressor
- Induced draft fan
- Air blower
- Elevating machine
- Agitator
- Transformer

# Application Cases

## 1. Metallurgy

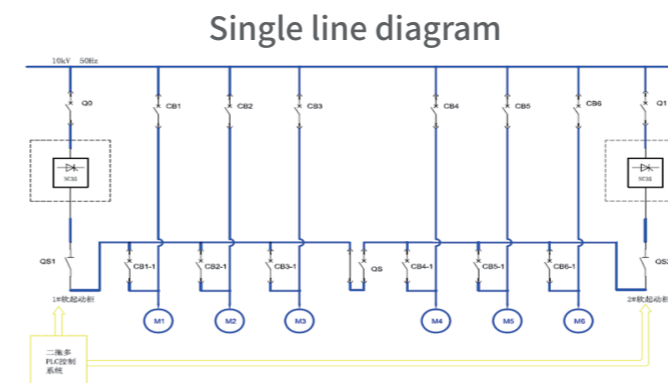
Wuhan Iron and Steel, Egang oxygen compressor



Motor: 10kV 6000/3000/2400kW  
Load: oxygen compressor, nitrogen compressor  
Drive method: one drive three motors

## 2. Aviation & Military

Gas Turbine (624 institute) air compressor and water pump testing bed



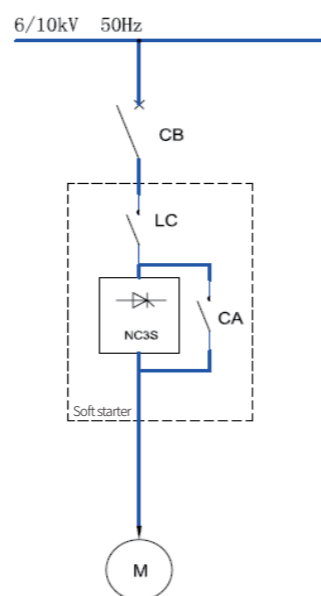
Motor: 10kV 1600/1250kW  
Loads: draught fan, water pump  
Drive method: two drive six motors  
Soft starter type: NC3S-10-140-A-2S  
Quantity: 2 sets

### 3. Tunnel

Zhongnanshan Tunnel-18.02km, the longest highway tunnel in Asia



Single line diagram



Load: draught fan  
 Drive method: one drive one  
 Soft starter type: NC3S-06-140-A-2S  
 Quantity: 36 sets

### Glories

- CE certification
- CCS (China Classification Society) certification
- TÜV certification
- Arc test
- 6kV/10kV soft starter type-test report
- High power soft starter type-test report
- Ministry of Communications test report
- Invention patents

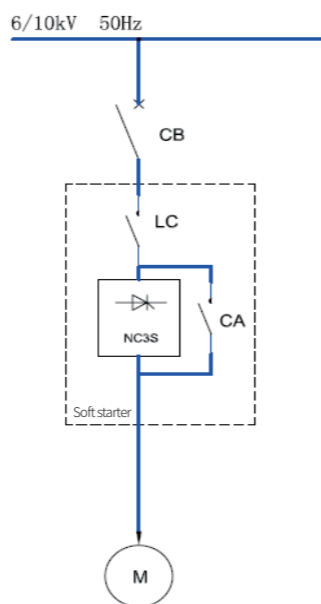


### 4. Petrochemical

Sinopec North branch Taba temple-Yulin natural gas pipeline supercharge and capacity expansion



Single line diagram



Load: compressor  
 Drive method: one drive one  
 Soft starter type: NC3S-06-140-A-2S  
 Quantity: 30 sets

