Create value for customers　　Look to the world　　Perform internationalized marketing

雷诺尔
Shanghai RENLE
Science&Technology Co., Ltd.

Shanghai RENLE Science & Technology Co., Ltd.
No.3988 Chengbei Road, Jiading District, Shanghai,
201807, P. R. China
Tel: +86 21 39538058
Fax:+86 21 39538129
E-mail: export@renle.com
http://www.renle.com
National toll free service hotline: +86 800-8200-785

Edition A, 2013

RENLE

► RNMV Series MV Solid State Soft Starter Cabinet

PRODUCT MANUAL

RENLE

雷诺尔

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Company Profile

Shanghai RENLE Science & Technology Co., Ltd. is located in the High & New Technology Industrial Park of national level in Jiading District, Shanghai, China. The company covers a total area of 100,000 square meters, including 85,000 square meters of workshops. Renle's products include LV/MV/HV motor soft starter, LV/MV/HV frequency inverter (VFD or AC drive), intelligent electric equipment, new energy electric equipment and complete sets of LV/HV power transmission and distribution equipment etc. The products are widely used in different kinds of industries and fields, such as electric power industry, metallurgical industry,petroleum and complete sets of LV/HV power transmission and distribution equipment etc. The products are widely used in different kinds of industries and fields, such as electric power industry, metallurgical industry, petroleum and petrochemical industries, mines, chemical industry, construction industry, construction material industry,municipal engineering, military industry, light industry, textile, printing and dyeing, papermaking and pharmaceutical industries etc. Renle's products are well exported to many countries and areas in the world.

Renle's products have been used as parts of complete national key projects, such as Expo 2010 Shanghai China, 2008 Beijing Olympic Games, Yangshan Deepwater Port Project of Shanghai International Shipping Center, Shanghai Pudong Airport, Shanghai Hongqiao Airport, the Three Gorges Project, Gansu Satellite Launching Center, South-to-North Water Diversion Project, West-to-East Natural Gas Transmission Project, China National Petroleum Corp. and SINOPEC etc. The products receive unanimous appraise from the customers for excellent quality and perfect after-sales service.

Renle always lays emphasis on quality control so as to attain perfection. The company has passed the certification of ISO9001 Quality Management System, ISO 14001 Environment System, OHSAS 18001 Occupational Health and Safety Management System, CE, TUV, GOST and national CCC etc. RENLE has been continuously introducing internationally advanced production and test equipment to establish laboratories and provide R&D experiment base to domestic universities and colleges. The company, paying much attention to independent innovation, has established powerful new product R&D technical center. The technical level of the center proves to be internationally advanced and domestically leading according to the retrieval results at Shanghai Science & Technology Novelty Search Center of Chinese Academy of Science.

Renle will continually develop energy saving, high efficient, precise and humanized products, as well as help customers realize economic transformation and industrial upgrading with unique industrial control technology, advanced and applicable innovation products and profoundly integrated solution. In addition, Renle will speed up its pace of internationalization, satisfy the customers with quality and try to become a world renowned professional supplier of intelligent electric equipment!

Description of Type

RN - MV - □□□ □□□ □

- Added characteristics code
- Current level (See Remark ①)
- Voltage level (See Remark ②)
- Medium Voltage Solid Soft Starter
- Shanghai RENLE Science & Technology Co., Ltd

Remarks

1.Current level：80、120、200、250、330、420、550、630、800、900、1000、1100、1200、1300

2.Voltage level:

Standard	3kV	3.3kV	6kV	6.6kV	10kV
Application range	3KV-15%~+10%	3.3KV-15%~+10%	6KV-15%~+10%	6.6KV-15%~+10%	10KV-15%~+10%

3.Mark added characteristics code: G With high voltage switch gear　E Without high voltage switch gear

General information

A complete RNMV includes：control transformer, control module，silicon controlled module，motor protecting module and bypass vacuum contactor．The soft starting parts include：control module，control transformer, silicon controlled module，and high—voltage vacuum bypass contactor．

Application Scope

The RNMV high—voltage solid soft starter cabinet is widely used for squirrel cage AC motors in the industries such as the power system，machinery manufacturing，cement production，metallurgy，mining industry，oil extraction，chemicals，and water treatment．It is designed for soft start，protection，control and soft stop of three-phase 3KV～10KV medium—high voltage motors．

Working conditions

1．Ambient air temperature not more than+50°C，and average temperature within 24hours not more than+45°C．And not lower than -20°C

2．The relative humidity at highest temperature +50°C not more than 50％．At lower temperature，it allows higher humidity such as 90％at+20°C

3．Altitude not more than 2000m．

4．The working site shall has no fire，explosion，polluted dust，chemical corrosion and violent vibration．

5．The soft starter panel should be properly stored and transported under the following conditions:-25°C～+55°C．Within short time(not more than 24h)not more than+70°C，(if the operating conditions is different from above，please consult manufacturer．

Performance index

Applicable standards：

GB311.1-1997<insulation coordination of High voltage transmission and distribution equipment>

GB 3906—91 ＜3—35KV AC metal enclosed switchgear>

GB／T13422—1992＜Electric test methods of semi conductive power convertor>

GB／T3859．1—1993＜General requirements of semi conductive convertor>

GB／T3859．2—1993＜Regulations of application for semi conductive convertor>

IEC60529 <Protection class of enclosure<IP code>>

IEC298 <AC Metal—Enclosed Switchgear and Control Equipment>

IEC60470<High—voltage AC Contactor>

IEC61000<Electromagnetic Compatibilitv>

JB／Z102<Technical Specifications for High Voltage Electrical Appliance Used at High Altitudes>

GB／T11022—99<General technical requirements for high voltage switchgear and control equipment>

RNMV special functions

Ctructure characteristics:

Adopt three - apartments isolation design. They are power unit apartment, main control relay apartment, and main loop connection apartment.

Electric characteristic:

1. The main control panel has passed the strict EMC electromagnetic compatibility test and has better electromagnetic interference—resistant performance.

2. It has exclusive intellectual property in control technology of soft starter, and it could provide free updating service of the software control system for the product to keep a leading position in technology.

3. Negative feedback function: by adopting the dynamic fussy control idea, it could, according to the load, regulate the starting time and starting moment of the motor automatically, through which the bypass contactor may automatically be pulled in when the motor accelerates smoothly and its rotate speed reaches the rated working speed. The problem that the artificially set starting curves cannot match the load moment curves could be solved. This is the unique point superior to other domestic manufacturers.

4. Better adaptive capacity. RNMV has 3 starting control modes:

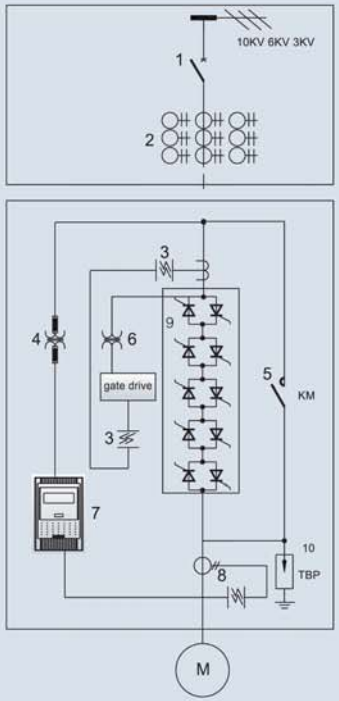
- 1) Voltage ramp start: the default setting has a voltage ramp with current limiting function that may satisfy most application circumstances. The initial moment setting is the value by which the motor may just bear the load, and then the voltage will rise smoothly. Within the limited ramp time and the motor starting current range, the motor may smoothly accelerate to full speed.
- 2) Current limited start: when starting, the current could rise to the limited value quickly till the motor runs at full speed.
- 3) Direct Start Mode.

5. Free stop or soft stop is optional: it could suit various stop circumstances, such as eliminating water hammer effect of the water pump to meet special requirements.

6. English display function: the LCD screen could display various work conditions in various languages, and in programming and fault states; the descriptions are displayed in words for easy operation.

7. System communication function: Rs-485 may realize multi - point communication with remote terminal units (in optional communication protocol such as Modbus and Profitbus); and through this function, it could directly communicate cate with upper PC to realize remote control and remote signaling functions, etc.

The Principle diagram of the soft starter



1. High voltage vacuum circuit breaker is able to breakup short-circuit current under special circumstances.
2. High voltage current transformer operates in coordination with vacuum circuit breaker to provide protections to all motors.
3. After going through the optical fiber the high voltage components are able to proceed with communications to low voltage components.
4. Built-in 120V transformer is able to provide all required power supply to soft starters.
5. Bypass Vacuum Contact
6. SCR and Isolation Transformers
7. Control Unit
8. Zero sequence current protection(optional)
9. SCR Components
10. Over-Voltage Protection Circuit

This figure is applied to G-model cabinet. G model is composed of two cabinets: one line-in protection cabinet and one soft starter cabinet. E model represents only soft starter cabinet.

Design features

The RNMV medium voltage (3300-10000V) soft starter should be equipped with an incoming cabinet with vacuum circuit breaker. The starter has Model G(with high—voltage motor protection system)and Model E (without the protection system), between which the customer could make a choice based on his concrete situations. Generally speaking, if the incoming cabinet has been equipped with a motor relay protection system, Model E would be a more economic choice. Otherwise, Model G should be adopted.

Vacuum Circuit Breaker

Input vacuum circuit breaker (VCB) owns strong over current and separating capability. The designed maximum application: 6KV VCB is used for 3000V-3300V soft starter cabinet; 7.2KV VCB is used for 6000V-6600V soft starter cabinet; 15KV VCB is used for 10KV soft starter cabinet..

Soft starter

The soft starting part is made up by bypass vacuum contactor, silicon controlled high-voltage component, RC absorber circuit, trigger circuit, and control part.

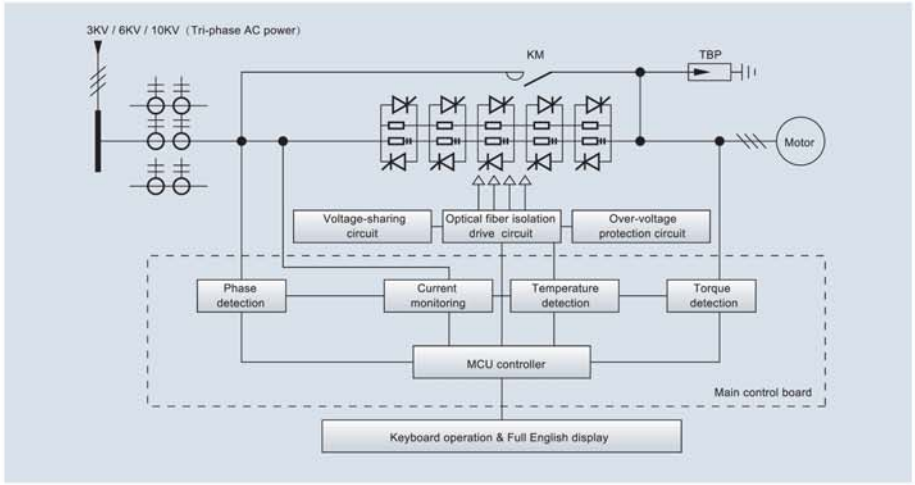
Bypass vacuum contactor: After the soft starter makes the motor finish its startup, the contactor closes the circuit to allow the motor current to pass through the bypass contactor. As regarding the voltage ratio, the 6kV is used for 3300V, 7.2kV for 6000V and 6600V, and 10kV for 10kV soft starters.

RC absorber circuit: It provides instantaneous voltage protection circuit to reduce dv／dt impulse voltage and prevents damage to the silicon control component.

Trigger circuit: It provides over 2A strong trigger pulses to ensure dynamic voltage sharing of the silicon controlled in series and in parallel. The trigger circuit and the silicon both have high voltage and are separated through optical fiber, transformer and the control panel.

The silicon high-voltage component is composed of multiple silicons that are arranged in parallel and in series. Quantity of silicon elements depends upon the motor's voltage.

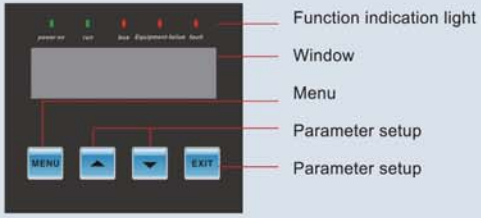
The Principle diagram of the soft starter



RNMV has a micro CPU as its control unit that can start up and protect the motor.

SCR controlled by CPU performs the phase angle triggering control to reduce voltage applied on motor. By regulating voltage and current applied on the motor, it evenly increases the motor torque till the motor runs at full speed after acceleration. The starting mode abates impulse currents at motor's startup, thereby decreases impact on the grid and the motor itself. Meanwhile, it also relieves mechanical impact on mechanical load devices, prolongs the equipment's service life and reduces malfunction and shutdown.

Display Panel



Function indication light

Window

Menu

Parameter setup

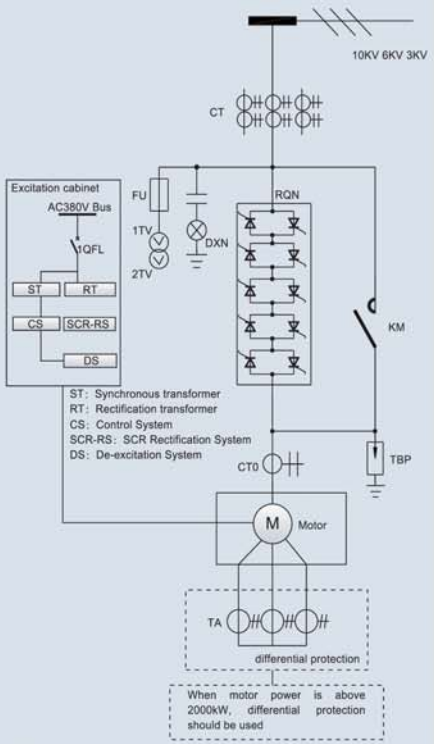
Parameter setup

Bilingual Operating Language.

To better cater to the operational behaviors of users both at home and abroad, Renle especially provides Chinese—English bilingual user interfaces. The convenient and user—friendly interfaces greatly facilitate user's operation.

Control instruction diagrams for synchronous motor and asynchronous motor

Primary diagram for Model E Synchronous motor



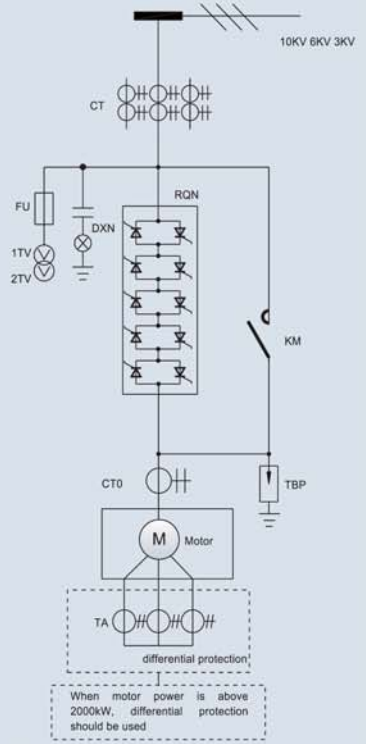
ST: Synchronous transformer
RT: Rectification transformer
CS: Control System
SCR-RS: SCR Rectification System
DS: De-excitation System

Description:

FU	FU Fuse
1TV~2TV	1TV~2TV Sampling Voltage Transformer
DXN	DXN pixel display
KM2	KM2 vacuum contactor
CT	CT Current transformer
CT0	CT0 Zero sequence transformer

The figure applies to synchronous motor

Primary diagram for Model E Squirrel cage asynchronous motor



Description:

FU	FU Fuse
1TV~2TV	1TV~2TV Sampling Voltage Transformer
DXN	DXN pixel display
KM2	KM2 vacuum contactor
CT	CT Current transformer
CT0	CT0 Zero sequence transformer

The figure applies to squirrel cage asynchronous motor

Specifications

Main specifications of RNMV unique function	
Load type	Three—phase medium—voltage asynchronous squirrel—cage motor，synchronous motor
AC voltage	3000,3300，6000,6600，10000VAC-15%—+10%
Insulation voltage	Line voltage: 3000V 6000V 10000V Insulation voltage: 18000V 25000V 42000V
Overloading capacity	Continuous: 125%controller nominal value 0verload: 500%／60s
Frequency	50Hz／60Hz ±2Hz Automatic selection
Main loop makeup	Depending upon different models，it may be made up by 12SCRS，18SCRS or 30SCRS
SCR inverse peak voltage	6900V-32500V(dependent upon specific models)
Phase sequence	RNMV capable of working under any phase sequence
Instantaneous overpressure protectio	dv／dt absorption network
Cooling	Naturally cooling
Bypass contactor	Contactor with direct starting capacity；if the rated current is more than 450A, the bypass adopts the fixed vacuum circuit breaker.
Environmental conditions	Cabinet temperature：0~50°C； chassis temperature：0-50°C (optional heater for-20°C-50°C)； Altitude：≤2, 000m； Relative humidity：5-95%
Control method	The customer makes available 2-wire or 3-wire 220VAC or 220VDC500VA
Auxiliary relay	Model C dry-type relay,5ampAC250V at maximum programmable interlocking relay；1bypass relay；1fault output relay

The motor protection(only for G type)	
Current	Two-stage timing，inverse-time overcurrent protection(timed quick current break, just be limited for G type ， overcurrent). Two-stage negative sequence timing，inverse time overcurrent protection (negative sequence quick current break, just be limited for G type and overcurrent). Zero overcurrent protection(trip / alarm is optional).
Voltage	overcurrent & over-voltage protection；zero sequence over-voltage protection (trip / alarm is optional).
Overload	Locked rotor protection；overload alarm
Temperature	Protection by temperature relay(for over-high temperature and temperature rise)

Protection for soft start	
Temperature	Protection for SCR component；trips when the temperature exceeds 85°C
Protection for over-long starting time	Trips when the starting time exceeds 120s
Input phase failure	Lack of any of the three phases will lead to start failure and trigger alarm
Starting times every hour	Starting times should be less than 6 every hour and time interval between starts is 0-120 seconds
Operation Interface	
LCD screen	English UI on LCD
Keyboard	4 touch buttons，used to make program and set up parameters
Status indication	5 LED display power supplies，start—up，buses，equipment failures，motor failures
Serial interface	
Communication protocol	Modbus RTU or Profibus
Communication interface	RS—485
Function	To observe running status and control motor's startup and stop

starting mode

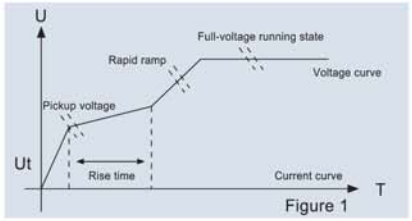


Figure 1

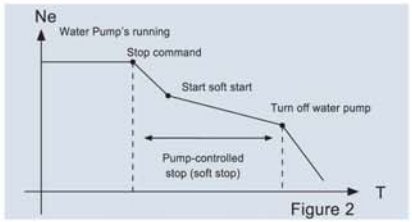


Figure 2

Voltage ramp starting mode

The voltage ramp with current—limiting function is the ex—factory configuration and the most reliable starting mode that meets requirements in most cases. The initial torque has been set to a value that just allows the motor to run with load. Then, the voltage rises smoothly to drive motor into full speed within a specified ramp time and motor starting current range. (See Figure 1)

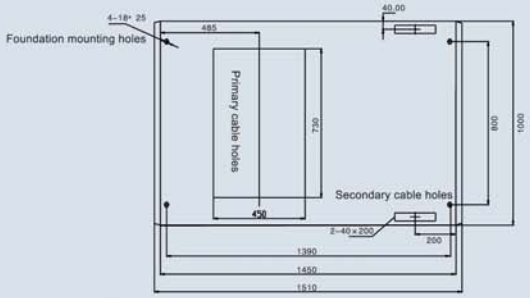
Current limiting starting mode

In starting, the current is increased to the specified value rapidly until the motor runs at full speed.

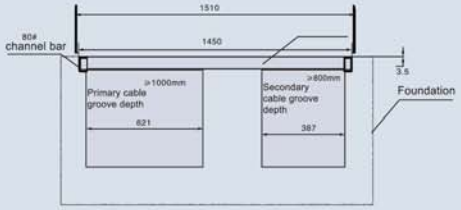
Soft Stop Mode

When loading with fluid pumps, sudden motor stops are often undesired. Therefore soft stop mode is recommended. After stop signal has been transmitted, the motor voltage decreases gradually to achieve soft stop. (See Figure 2)

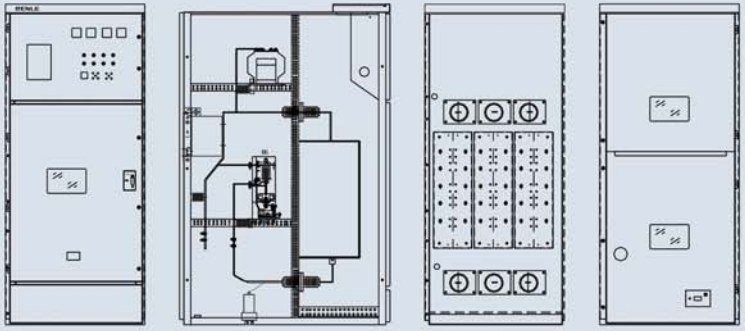
Installation size



Bottom view of high-voltage solid soft starter cabinet

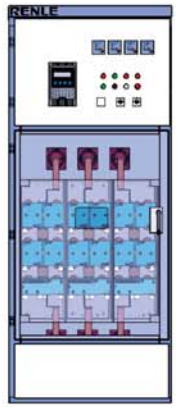


Installation foundation of high-voltage solid soft starter

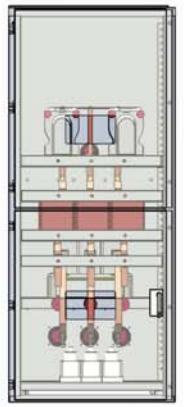


Front view Left View Back View

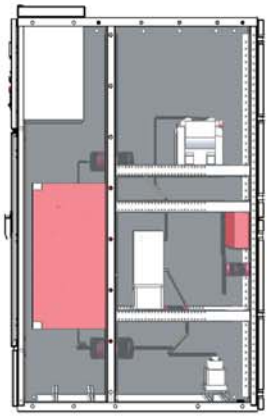
The view of the internal structure



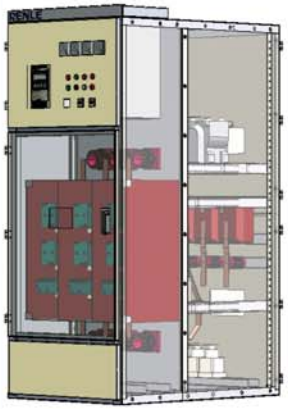
Front view



Back View



Side view



Perspective

Medium-voltage Solid soft starter type selection table

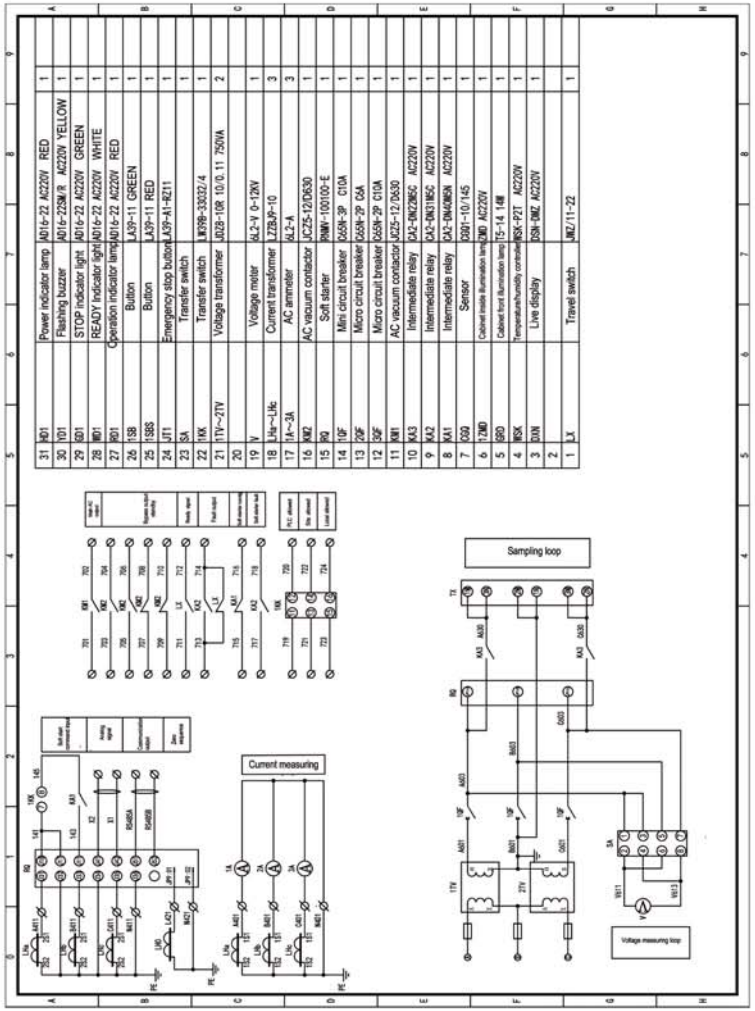
Current +8%(A)	Voltage (kV)	Max. Power (kW)	Spec.& Model	Cabinet E size Height Width Depth	Cabinet G size
80	3	350	RNMV-3080	2300*1000*1510	Add one input switch gear on the base of E type soft starter
	3.3	380	RNMV-3380	2300*1000*1510	
	6	700	RNMV-6080	2300*1000*1510	
	6.6	800	RNMV-6680	2300*1000*1510	
	10	1200	RNMV-10080	2300*1000*1510	
120	3	550	RNMV-30120	2300*1000*1510	
	3.3	600	RNMV-33120	2300*1000*1510	
	6	1150	RNMV-60120	2300*1000*1510	
	6.6	1200	RNMV-66120	2300*1000*1510	
	10	1850	RNMV-100120	2300*1000*1510	
200	3	900	RNMV-30200	2300*1000*1510	
	3.3	1000	RNMV-33200	2300*1000*1510	
	6	1800	RNMV-60200	2300*1000*1510	
	6.6	2000	RNMV-66200	2300*1000*1510	
	10	3000	RNMV-100200	2300*1000*1510	
250	3	1150	RNMV-30250	2300*1000*1510	
	3.3	1250	RNMV-33250	2300*1000*1510	
	6	2300	RNMV-60250	2300*1000*1510	
	6.6	2500	RNMV-66250	2300*1000*1510	
	10	3800	RNMV-100250	2300*1000*1510	
330	3	1600	RNMV-30330	2300*1000*1510	
	3.3	1700	RNMV-33330	2300*1000*1510	
	6	3200	RNMV-60330	2300*1000*1510	
	6.6	3400	RNMV-66330	2300*1000*1510	
	10	5200	RNMV-100330	2300*1000*1510	
420	3	2000	RNMV-30420	2300*1200*1510	
	3.3	2200	RNMV-33420	2300*1200*1510	
	6	4000	RNMV-60420	2300*1200*1510	
	6.6	4400	RNMV-66420	2300*1200*1510	
	10	6300	RNMV-100420	2300*1200*1510	
550	3	2500	RNMV-30550	2300*1200*1510	
	3.3	2700	RNMV-33550	2300*1200*1510	
	6	4800	RNMV-60550	2300*1200*1510	
	6.6	5300	RNMV-66550	2300*1200*1510	
	10	8000	RNMV-100550	2300*1200*1510	
630	3	2850	RNMV-30630	2300*1200*1510	
	3.3	3200	RNMV-33630	2300*1200*1510	
	6	5800	RNMV-60630	2300*1200*1510	
	6.6	6300	RNMV-66630	2300*1200*1510	
	10	9500	RNMV-100630	2300*1200*1510	

Current +8%(A)	Voltage (kV)	Max. Power (kW)	Spec.& Model	Cabinet E size Height Width Depth	Cabinet G size
800	3	3500	RNMV-30800	2300*1400*1660	Add one input switch gear on the base of E type soft starter
	3.3	3800	RNMV-33800	2300*1400*1660	
	6	7000	RNMV-60800	2300*1400*1660	
	6.6	7800	RNMV-66800	2300*1400*1660	
	10	12000	RNMV-100800	2300*1400*1660	
900	3	3800	RNMV-30900	2300*1400*1660	
	3.3	4200	RNMV-33900	2300*1400*1660	
	6	7800	RNMV-60900	2300*1400*1660	
	6.6	8500	RNMV-66900	2300*1400*1660	
	10	13000	RNMV-100900	2300*1400*1660	
1000	3	4300	RNMV-301000	2300*1400*1660	
	3.3	4500	RNMV-331000	2300*1400*1660	
	6	8800	RNMV-601000	2300*1400*1660	
	6.6	9500	RNMV-661000	2300*1400*1660	
	10	14000	RNMV-1001000	2300*1400*1660	
1100	3	4800	RNMV-301100	2300*1400*1660	
	3.3	5300	RNMV-331100	2300*1400*1660	
	6	9000	RNMV-601100	2300*1400*1660	
	6.6	9500	RNMV-661100	2300*1400*1660	
	10	16000	RNMV-1001100	2300*1400*1660	
1200	3	5300	RNMV-301200	2300*1400*1660	
	3.3	5800	RNMV-331200	2300*1400*1660	
	6	10000	RNMV-601200	2300*1400*1660	
	6.6	11000	RNMV-661200	2300*1400*1660	
	10	18000	RNMV-1001200	2300*1400*1660	
1300	3	5800	RNMV-301300	2300*1400*1660	
	3.3	6300	RNMV-331300	2300*1400*1660	
	6	11000	RNMV-601300	2300*1400*1660	
	6.6	12000	RNMV-661300	2300*1400*1660	
	10	20000	RNMV-1001300	2300*1400*1660	

Remarks:

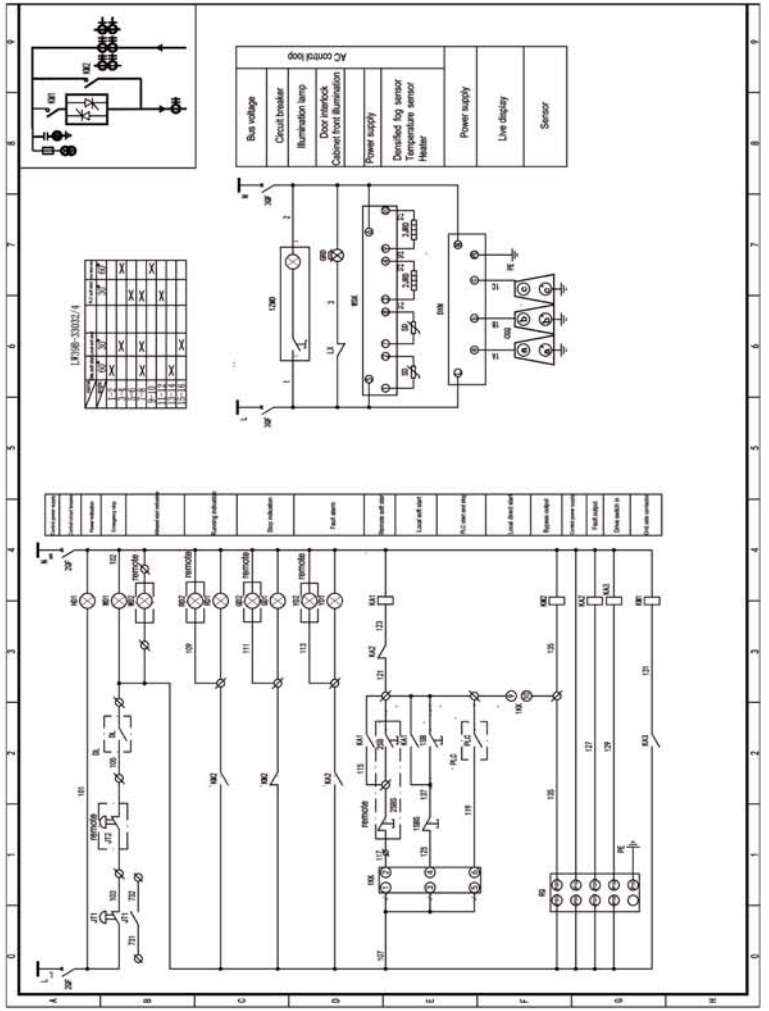
1、When motor rated current is +8% over limited current value, choose higher grade model.
2、When motor power is over max application power, choose higher grade model.
3、When motor power is above 2000kw, pls add cost of one differential protecting case.
4、When current is over 450A, by-pass contactor is replaced by fixed vacuum circuit breaker.
5、Rated current value for soft starter cabinet is based on motor rated current.
6、If the application is above 20000kw, pls contact us for details.

The secondary principle diagram of Medium solid soft starter cabinet

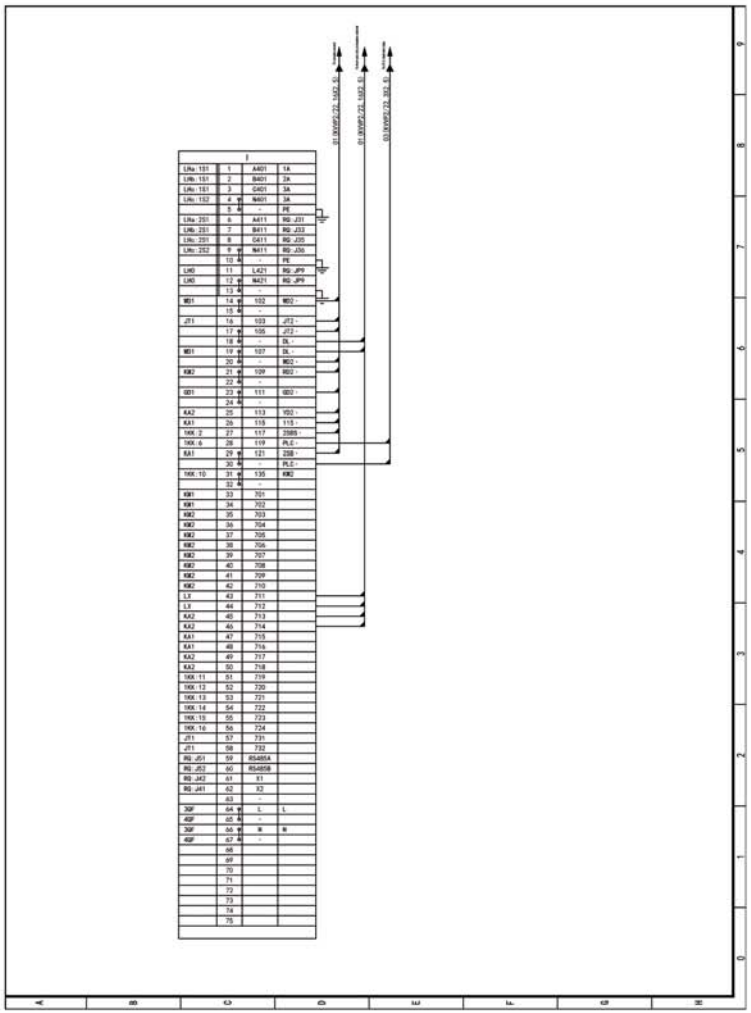


31	HD1	Power indicator lamp	AD16-22 AC220V	RED
30	YD1	Flashing buzzer	AD16-22SM/R	AC220V YELLOW
29	GD1	STOP indicator light	AD16-22 AC220V	GREEN
28	WD1	READY indicator light	AD16-22 AC220V	WHITE
27	RD1	Operation indicator lamp	AD16-22 AC220V	RED
26	1SB	Button	LA39-11	GREEN
25	1SBS	Button	LA39-11	RED
24	JT1	Emergency stop button	LA37-A1-BZ11	
23	SA	Transfer switch		
22	1KK	Transfer switch	LW39B-33032/4	
21	1TV~2TV	Voltage transformer	JDZB-10R 10/0.11	750VA
20				
19	V	Voltage meter	6L2-V 0-12KV	
18	LHa~LHc	Current transformer	LZZBJ9-10	
17	1A~3A	AC ammeter	6L2-A	
16	KM2	AC vacuum contactor	JCZ5-12/D630	
15	PQ	Soft starter	RNMY-100100-E	
14	1DF	Mini circuit breaker	DZ5N-3P	C10A
13	2DF	Micro circuit breaker	DZ5N-2P	C6A
12	3DF	Micro circuit breaker	DZ5N-2P	C10A
11	KM1	AC vacuum contactor	JCZ5-12/D630	
10	KA3	Intermediate relay	JQA2-ONG2M5C	AC220V
9	KA2	Intermediate relay	JQA2-ONG1M5C	AC220V
8	KA1	Intermediate relay	JQA2-ONM2M5N	AC220V
7	CQQ	Sensor	CQQ01-10/145	
6	1ZMD	Cabinet inside illumination lamp	ZMD	AC220V
5	GBD	Cabinet front illumination lamp	T5-14 1.4W	
4	WSK	Temperature/humidity controller	WSK-PZT	AC220V
3	DXN	Live display	DSN-ONC	AC220V
2				
1	LX	Travel switch	WMZ/11-22	

The secondary principle diagram of Medium solid soft starter cabinet



The secondary principle diagram of Medium solid soft starter cabinet



Industrial application instruction

1、Chemical industry

The main load is compressor，crusher，dust fan

2、Material transfer industry

The main load is coal transfer belt machine. Coal transfer belt machine will use the soft starter for soft start and stop so as to realize smooth acceleration and deceleration process.

3、Metallurgy industry

The main load is Oxygen feeding compressor and mill. The soft starter will use the voltage ramp start to reduce the abrasive wear of mill gear and maintenance so as to prolong the using life.

4、 Irrigation and municipal administration

The main load is the pump for agricultural irrigation and municipal drainage. The soft starter will control the pump to reduce the" water hammer effect".

5、Mechanical manufacturing

The load is bridge crane and port machine. Bridge crane and port machine will use the soft starter for soft start and stop so as to realize smooth acceleration and deceleration process in order to avoid the impact on the material and device.

6、Cement industry

The main load is fan. The medium voltage soft starter will substitute the traditional soft starter to reduce the belt wear and mechanical impact.

7、Mine

The main load is crusher, The soft starter will use the stall protection and fast protection to avoid the motor overheat because of the mechanical fault and obstruction.

8、Oil extraction

The main load is water injection pump. The soft starter will control the pump to reduce the" waterhammer effect".

——And so on