Derwent
Top 100
Global
Innovator
2020

Metasol Meta Solution
Soft Starter

LS ELECTRIC

Motorsol Soft starter

Motorsol Soft Starter

Motorsol
Soft Starter

LS MOTOR SOLUTION SOFT STARTER

Contents :

LS' Soft starters provide motor starting with the stable and inexpensive way.

In case of direct starting, the inrush current reaches 5 to 8 times of the rated current, which may damage peripheral devices as well as the motor.

Soft starter, during starting and stopping, can control the voltage applied to the motor appropriately via the thyristor of the main circuit.

This limits the incoming power and thus improves the stability of peripheral equipments near and relieves excessive mechanical shock.

- **Developed model to meet the needs of the field**
  - LV : 2.2 ~ 600kW
  - MV : 350 ~ 3800kW
- **Model configuration for customer convenience**
  - LV : One-way / By-pass
  - VCB, VCS, measurement devices can be selected
- **Easy to set the method for motor starting through display unit**
  - Soft start, Kick start, Slow start, Current limit start
  - Soft stop, Slow stop
- **Various motor protection functions**
  - Over voltage, Low current, Instantaneous, Phase unbalance, Ground fault, Phase loss, etc
- **Motor monitoring function**
  - Indicating 3 phase voltage and current
  - Monitoring motor operating status and indicating errors

LS Motor Solution Soft Starter

Motorsol One-way	
600	
375	450
240	300
150	195
75	112
37	56
22	30
11	15
5.5	7.5
2.2	3.7

Motorsol By-Pass	
240	300
150	195
75	112
37	56
22	30
11	15
5.5	7.5
2.2	3.7

HV-Motorsol
3800
2500
1800
1500
1200
750
350

Applications

Power plants	Loading and unloading facilities, Compressor, Pump, Fan, Cooling system
Steel	Furnaces and steel blower, Water pump, Fan
Water treatment	Pump
Cement, glass and mining	Conveyors, Pumps, Fans
Petrochemical, oil and gas	Compressor,Extruder, Pump
Shipping	Propulsion system
Sea Port	Hoist and crane
Pulp and paper	Pumps, Fans

Ordering

LSFS Low Voltage

LSFS — LS Soft Starters

2 — Rated voltage (Vac)

2	220
3	380
4	440

002 — Motor power (kW)

002	2.2	098	98
003	3.7	112	112
005	5.5	150	150
007	7.5	187	187
011	11	195	195
015	15	225	225
022	22	240	240
030	30	300	300
037	37	375	375
056	56	450	450
075	75	600	600

* 2.2, 98, 187 and 225kW are available for rated voltage 220V

S — Version

S	One-way
BPS	By-Pass

LSFS 2002 S — **C** — Communication

C	Comm.
0	No comm.

1 — Control power (Vac)

1	110
2	220

0 — Display unit

0	Combination
1	Separate

0 — Cable length (m)

0	0
1	1
2	2
3	3

60Hz — Frequency

50Hz
60Hz

Note :
The option of cable length is for display separated.
In case of combination type the cable length is 0m.

LHVS Medium Voltage

LHVS — LS High Voltage Soft starter

3 — Rated voltage (V)

3	3300
6	6600

* For over 7200V, please consult us.

0350 — Motor power (kW)

0350	350*
0750	750*
1200	1200
1500	1500*
1800	1800
2500	2500
3800	3800

* Rated voltage 3300V is available for 350, 750, 1500kW

60Hz — Frequency

50Hz
60Hz

LHVS 3 0350 —

1 — VCB (kA)

1	12.5
2	25
4	40

4 — VCS (kA)

4	4

D — Measurement device

D	Device
N	No use

VCB

VCS

GIMAC-V

Note :
1. By-pass type Soft Starter with Vacuum contactor built-in
2. When ordering option specifications , please consult us.
(whether or not to use incoming VCB, the 2nd by-pass circuit breaker model, addition of protective relays, etc.)

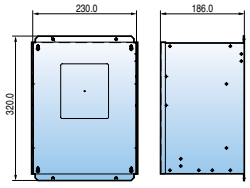
Specifications

LSFS One-way

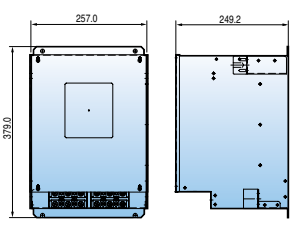
Motor power				2.2 kW	3.7 kW	5.5 kW	7.5 kW	11 kW	15 kW	22 kW	30 kW	37 kW
Rated voltage	220V			LSFS 2002 S	LSFS 2003 S	LSFS 2005 S	LSFS 2007 S	LSFS 2011 S	LSFS 2015 S	LSFS 2022 S	LSFS 2030 S	LSFS 2037 S
	380V			-	LSFS 3003 S	LSFS 3005 S	LSFS 3007 S	LSFS 3011 S	LSFS 3015 S	LSFS 3022 S	LSFS 3030 S	LSFS 3037 S
	440V			-	LSFS 4003 S	LSFS 4005 S	LSFS 4007 S	LSFS 4011 S	LSFS 4015 S	LSFS 4022 S	LSFS 4030 S	LSFS 4037 S
Max.rated operationa current	220V	AC	[A]	9	15	22	30	45	60	88	120	150
	380/440V	AC	[A]	-	7.5	11	15	22	30	45	60	7
Starting current	220/380V	AC	[A]	36	60/30	88/44	120/60	180/88	240/120	352/180	480/240	600/300
Rated frequency	50		[Hz]	●	●	●	●	●	●	●	●	●
	60			●	●	●	●	●	●	●	●	●
Size	220V	W	[mm]	230					257		257	
		H	[mm]	320 (Fig.1)					379 (Fig.2)		417 (Fig.3)	
		D	[mm]	186					249		249	
	380/440V	W	[mm]	-	230						257	
		H	[mm]		320 (Fig.1)						379 (Fig.2)	
		D	[mm]		186						249	
Usage place				Indoor (Place without corrosive gas, dust, etc)								
Temperature				-10 ~ +50 ℃								
Humidity				Under 90% RH (no dew)								
Power noise				Square wave input by noise simulator Rphase, T phase ±2000V 1μs(between power terminals)								
Cooling type				Natural cooling by heat sink and compulsory cooling using heat sink and fan								
Over heat sensor				Thermostatic sensor operation, operation temperature 85℃ ± 5℃								
Insulation resistance				Over 1000V, 5MΩ								
Standard				EN 61131-2, EN 50178								

* For product quality improvement, external dimension might be changed without prior notice. Please inquire it when you make and order.
2.2, 98, 187, 225kW are provided only for 220V

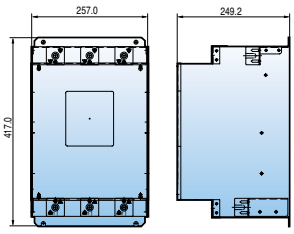
Dimension



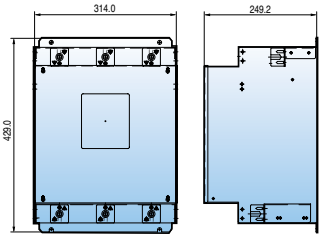
(Fig.1)



(Fig.2)

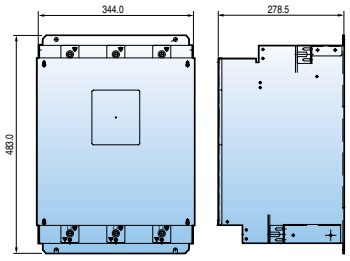


(Fig.3)

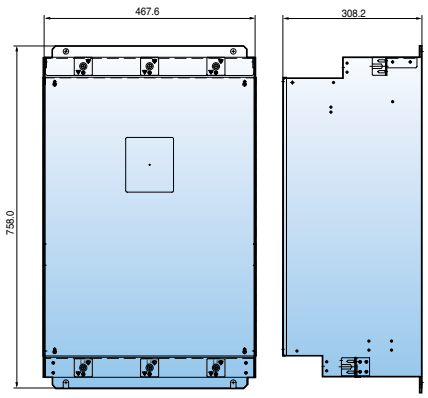


(Fig.4)

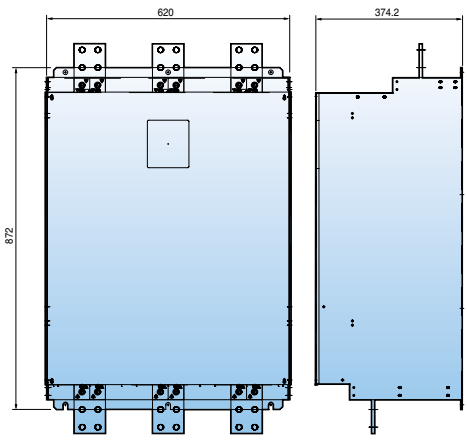
56 kW	75 kW	98 kW	112 kW	150 kW	187 kW	195 kW	225 kW	240 kW	300 kW	375 kW	450 kW	600 kW
LSFS 2056 S	LSFS 2075 S	LSFS 2098 S	LSFS 2112 S	LSFS 2150 S	LSFS 2187 S	-	LSFS 2225 S	-	-	-	-	-
LSFS 3056 S	LSFS 3075 S	-	LSFS 3112 S	LSFS 3150 S	-	LSFS 3195 S	-	LSFS 3240 S	LSFS 3300 S	LSFS 3375 S	LSFS 3450 S	LSFS 3600 S
LSFS 4056 S	LSFS 4075 S	-	LSFS 4112 S	LSFS 4150 S	-	LSFS 4195 S	-	LSFS 4240 S	LSFS 4300 S	LSFS 4375 S	LSFS 4450 S	LSFS 4600 S
225	300	390	450	600	740	-	900	-	-	-	-	-
112	150	-	225	300	-	390	-	480	600	750	900	1200
900/445	1200/600	1560	1800/900	2400/1200	2960	1560	3600	1920	2400	3000	3600	4800
●	●	●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●	●	●
314		344		468			468					
429 (Fig. 4)		483 (Fig.5)		758 (Fig.6)		-	758 (Fig.6)	-	-	-	-	-
250		279		308			308					
257			314			344		344	468			620
417 (Fig.3)		-	429 (Fig.4)		-	483 (Fig.5)	-	483 (Fig.5)	758 (Fig.6)			872 (Fig.7)
249			250			279		279	308			374
Indoor (Place without corrosive gas, dust, etc)												
-10 ~ +50 ℃												
Under 90% RH (no dew)												
Square wave input by noise simulator Rphase, T phase ±2000V 1μs(between power terminals)												
Natural cooling by heat sink and compulsory cooling using heat sink and fan												
Thermostatic sensor operation, operation temperature 85℃ ± 5℃												
Over 1000V, 5MΩ												
EN 61131-2, EN 50178												



(Fig.5)



(Fig.6)



(Fig.7)

Motorsol Soft Starter

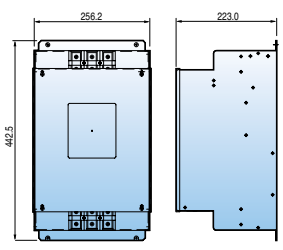
Specifications

LSFS By-pass

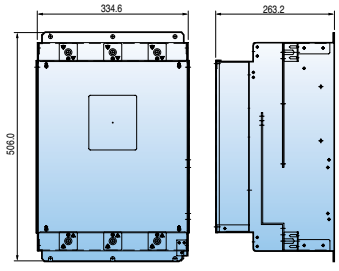
Motor power				2.2 kW	3.7 kW	5.5 kW	7.5 kW	11 kW	15 kW	22 kW
Rated voltage	220V			LSFS 2002 BPS	LSFS 2003 BPS	LSFS 2005 BPS	LSFS 2007 BPS	LSFS 2011 BPS	LSFS 2015 BPS	LSFS 2022 BPS
	380V			-	LSFS 3003 BPS	LSFS 3005 BPS	LSFS 3007 BPS	LSFS 3011 BPS	LSFS 3015 BPS	LSFS 3022 BPS
	440V			-	LSFS 4003 BPS	LSFS 4005 BPS	LSFS 4007 BPS	LSFS 4011 BPS	LSFS 4015 BPS	LSFS 4022 BPS
Max.rated operationa current	220V	AC	[A]	9	15	22	30	45	60	88
	380/440V			-	7.5	11	15	22	30	45
Starting current	220/380V	AC	[A]	36	60/30	88/44	120/60	180/88	240/120	352/180
Rated frequency	50		[Hz]	●	●	●	●	●	●	●
	60			●	●	●	●	●	●	●
Size	220V	W	[mm]	256						
		H	[mm]	442 (Fig.1)						
		D	[mm]	224						
	380/440V	W	[mm]	-	256					
		H	[mm]		442 (Fig.1)					
		D	[mm]		224					
Usage place				Indoor (Place without corrosive gas, dust, etc)						
Temperature				-10 ~ +50 ℃						
Humidity				Under 90% RH (no dew)						
Power noise				Square wave input by noise simulator Rphase, T phase ±2000V 1μs(between power terminals)						
Cooling type				Natural cooling by heat sink and compulsory cooling using heat sink and fan						
Over heat sensor				Thermostatic sensor operation, operation temperature 85℃ ± 5℃						
Insulation resistance				Over 1000V, 5MΩ						
Standard				EN 61131-2, EN 50178						

* For product quality improvement, external dimension might be changed without prior notice. Please inquire it when you make and order.
* 2.2, 98kW are provided only for 220V

Dimension



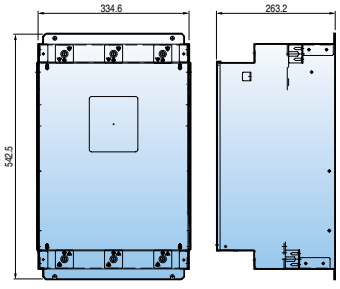
(Fig.1)



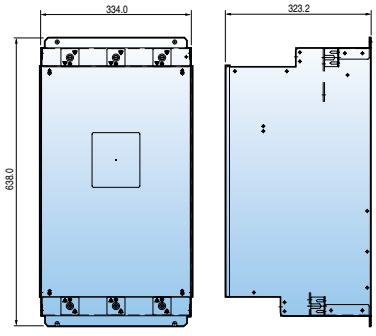
(Fig.2)

Motorsol Soft Starter

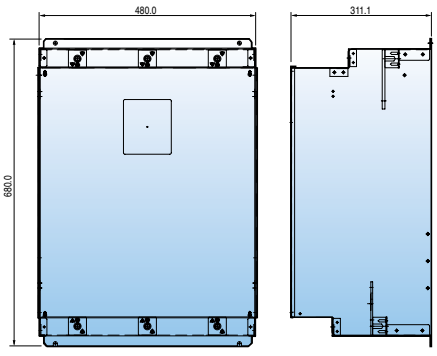
56 kW	75 kW	98 kW	112 kW	150 kW	187 kW	195 kW	225 kW	240 kW	300 kW
LSFS 2030 BPS	LSFS 2037 BPS	LSFS 2056 BPS	LSFS 2075 BPS	LSFS 2098 BPS	LSFS 2112 BPS	-	-	-	-
LSFS 3030 BPS	LSFS 3037 BPS	LSFS 3056 BPS	LSFS 3075 BPS	-	LSFS 3112 BPS	LSFS 3150 BPS	LSFS 3195 BPS	LSFS 3240 BPS	LSFS 3300 BPS
LSFS 4030 BPS	LSFS 4037 BPS	LSFS 4056 BPS	LSFS 4075 BPS	-	LSFS 4112 BPS	LSFS 4150 BPS	LSFS 4195 BPS	LSFS 4240 BPS	LSFS 4300 BPS
20	150	225	300	390	450	600	-	-	-
60	75	112	150	-	225	300	390	480	600
480/240	600/300	900/445	1200/600	1560	1800/900	1200	1560	1920	2400
●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●
344		344		344		-	-	-	-
506 (Fig.2)		542 (Fig.3)		638 (Fig.4)					
264		264		324					
256		334		-	334		334		480
442 (Fig.1)		506 (Fig.3)			542 (Fig.3)		638 (Fig.4)		680(Fig.5)
224		264			264		324		311
Indoor (Place without corrosive gas, dust, etc)									
-10 ~ +50 ℃									
Under 90% RH (no dew)									
Square wave input by noise simulator Rphase, T phase ±2000V 1μs(between power terminals)									
Natural cooling by heat sink and compulsory cooling using heat sink and fan									
Thermostatic sensor operation, operation temperature 85℃ ± 5℃									
Over 1000V, 5MΩ									
EN 61131-2, EN 50178									



(Fig.3)



(Fig.4)



(Fig.5)

Motorsol Soft Starter

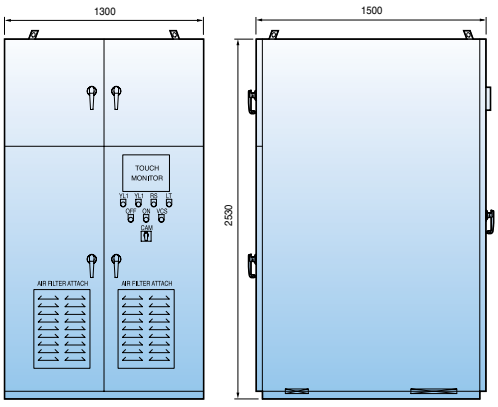
Specifications

LHVS

Motor power			350 kW		750 kW		1200 kW
Rated voltage		[V]	3300	6600	3300	6600	6600
	50	[Hz]	LHVS 3 0350 50Hz	LHVS 6 0350 50Hz	LHVS 3 0750 50Hz	LHVS 6 0750 50Hz	LHVS 6 1200 50Hz
	60	[Hz]	LHVS 3 0350 60Hz	LHVS 6 0350 60Hz	LHVS 3 0750 60Hz	LHVS 6 0750 60Hz	LHVS 6 1200 60Hz
Max.rated operational current	AC	[A]	80	40	160	80	130
Starting current	AC	[A]	320	160	640	320	520
Size	W	[mm]	1300		1300		1300
	H	[mm]	2350 (Fig.1)		2350 (Fig.1)		2350 (Fig.1)
	D	[mm]	1500		1500		1500
Usage place			Indoor (Place without corrosive gas, dust, etc)				
Temperature			-10 ~ +50 °C				
Humidity			Under 90% RH (no dew)				
Power noise			Square wave input by noise simulator Rphase, T phase ±2000V 1μs(between power terminals)				
Cooling type			Natural cooling by heat sink and compulsory cooling using heat sink and fan				
Insulation resistance			Over 1000V, 5MΩ				

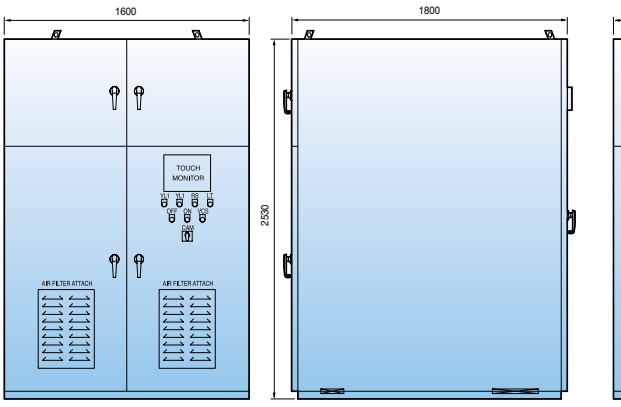
* External dimension might be changed by option selecting

Dimension

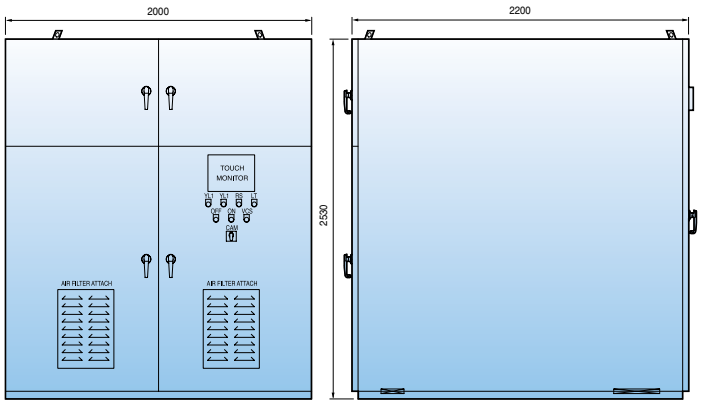


(Fig.1)

1500 kW		1800 kW	2500 kW	3800 kW
3300	6600	6600	6600	6600
LHVS 3 1500 50Hz	LHVS 6 1500 50Hz	LHVS 6 1800 50Hz	LHVS 6 2500 50Hz	LHVS 6 3800 50Hz
LHVS 3 1500 60Hz	LHVS 6 1500 60Hz	LHVS 6 1800 60Hz	LHVS 6 2500 60Hz	LHVS 6 3800 60Hz
330	160	200	270	410
1320	640	800	1080	1640
1600	1300	1600	2000	2000
2350 (Fig.2)	2350 (Fig.1)	2350 (Fig.2)	2350 (Fig.3)	2350 (Fig.3)
1800	1500	1800	2200	2200
Indoor (Place without corrosive gas, dust, etc)				
-10 ~ +50 ℃				
Under 90% RH (no dew)				
Square wave input by noise simulator Rphase, T phase ±2000V 1μs(between power terminals)				
Natural cooling by heat sink and compulsory cooling using heat sink and fan				
Over 1000V, 5MΩ				



(Fig.2)



(Fig.3)

Display unit

LSFS

Simple operation

- Simple operation that uses 8 buttons on Display panel

Installation of max size LCD

- It presents for 4×20 letters

Simple interface

- Connection of main PCB board and display using a USB cable

External Display unit

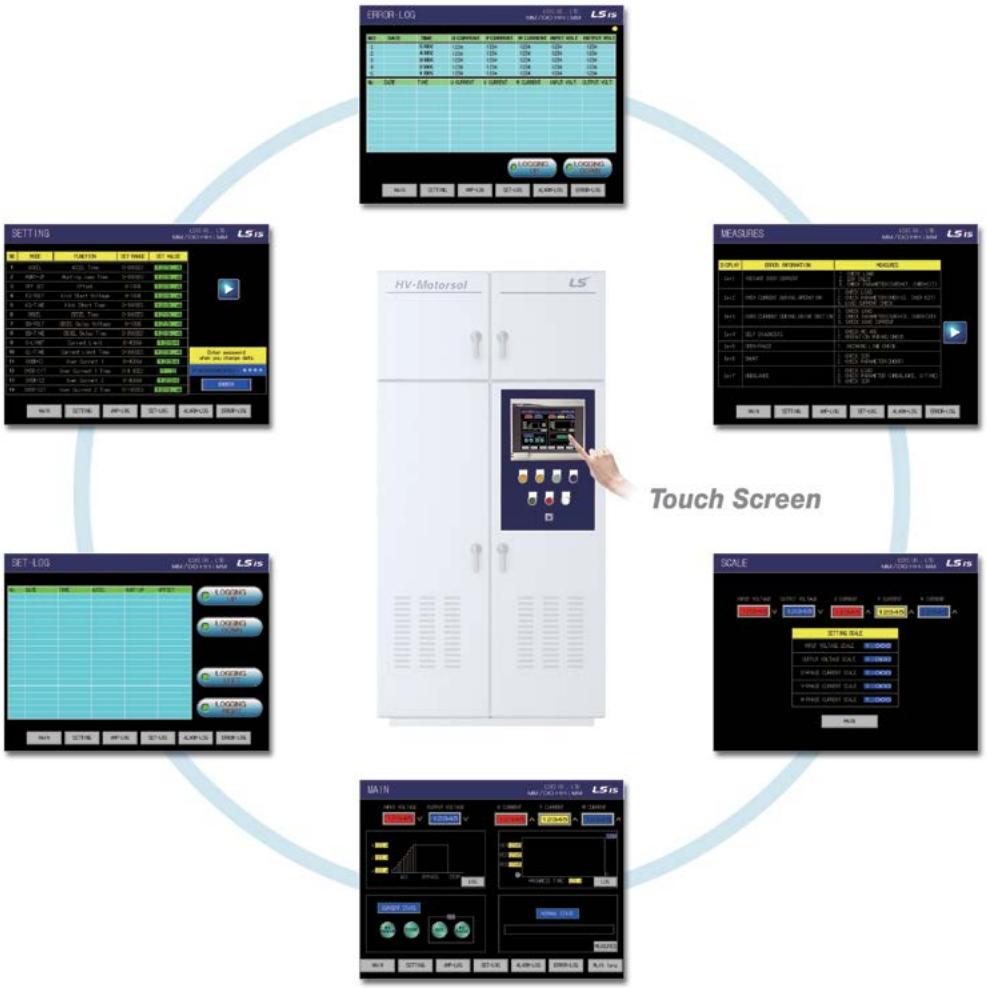
- Can be installed externally on panel

LCD Display

4×20 LCD Display
current status, error, frequency indication

Section	Description	
Section 1	R V S V T : V Hz R : A S : A T : A	Input voltage, output current during motor operation are indicated
Section 2	R V S V T : V Hz R : A ERROR 8 S : A OVER HEAT T : A	current status, error, frequency are indicated
Section 3	R V S V T : V Hz R : A S : A LOCAL-MTS T : A	Mode, error details are indicated

LHVS

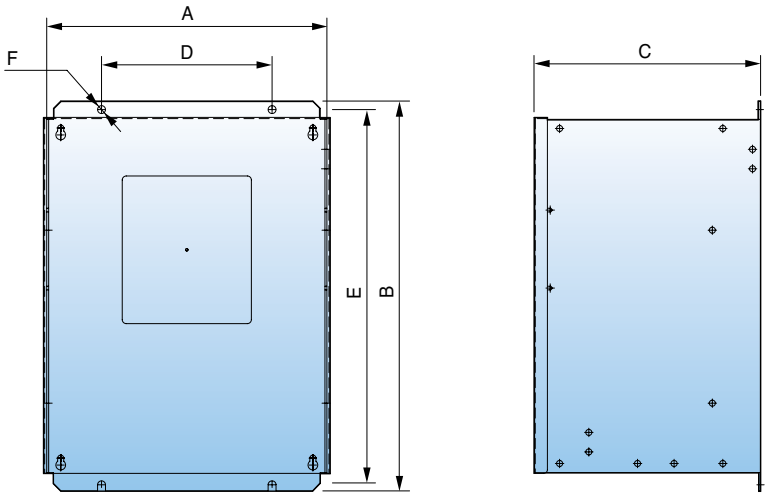


- *Input voltage for each phase provided*
- *Password input function provided*
- *Starting status indication*
- *Error indicated and stored*
- *Multi-language supported (English, Japanese, Korean)*
- *Cause of error provided*
- *Trouble shooting*
- *Data Back-up*
- *Indication of overcurrent*

Symbol	Description	Note
	TOUCH MONITOR	Soft Starter Setting and operation status can be checked
YL1	EMPR FAULT	Become ON state when EMPR Fault happens
YL2	Soft Starter FAULT	Become ON state when Soft Starter PCB FAULT happens. Check Touch Monitor
RS	FAULT RESET	Push button to reset Soft Starter FAULT
LT	LAMP TEST	Push button to test Lamp
OFF	OFF	Button to stop Soft Starter during running(LED is ON when the starter stops)
ON	ON	Button to start Soft Starter (LED is ON when the starter is running)
W2	BY-PASS VCS ON	Become ON state when the bypass contactor is closed after starting
CAM	BY-PASS/REMOTE/LOCAL	Operation mode selection S/W

Dimensions

LSFS One-way

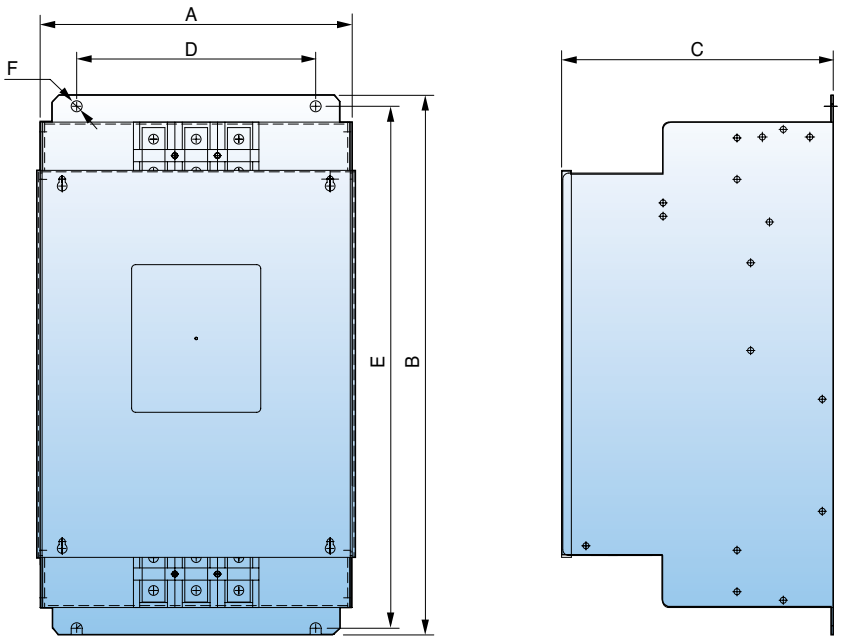


(mm)

Model						Width	Height	Depth	wide attachment	long attachment	Mounting Hole(Φ)
220V	kW	380V	kW	440V	kW	A	B	C	D	E	F
LSFS 2002 S	2.2					230	320	185	140	308	6.5
LSFS 2003 S	3.7	LSFS 3003 S	3.7	LSFS 4003 S	3.7						
LSFS 2005 S	5.5	LSFS 3005 S	5.5	LSFS 4005 S	5.5						
LSFS 2007 S	7.5	LSFS 3007 S	7.5	LSFS 4007 S	7.5						
LSFS 2011 S	11	LSFS 3011 S	11	LSFS 4011 S	11						
		LSFS 3015 S	15	LSFS 4015 S	15						
		LSFS 3022 S	22	LSFS 4022 S	22						
LSFS 2015 S	15	LSFS 3030 S	30	LSFS 4030 S	30	257	379	249	205	364	9
LSFS 2022 S	22	LSFS 3037 S	37	LSFS 4037 S	37						
LSFS 2030 S	30	LSFS 3056 S	56	LSFS 4056 S	56	257	417	249	205	402	9
LSFS 2037 S	37	LSFS 3075 S	75	LSFS 4075 S	75						
LSFS 2056 S	56	LSFS 3112 S	112	LSFS 4112 S	112	314	429	250	240	415	9
LSFS 2075 S	75	LSFS 3150 S	150	LSFS 4150 S	150						
LSFS 2098 S	98	LSFS 3195 S	195	LSFS 4195 S	195	344	483	279	264	466	9
LSFS 2112 S	112	LSFS 3240 S	240	LSFS 4240 S	240						
LSFS 2150 S	150	LSFS 3300 S	300	LSFS 4300 S	300	468	758	308	371	734	12
LSFS 2187 S	187	LSFS 3375 S	375	LSFS 4375 S	375						
LSFS 2225 S	225	LSFS 3450 S	450	LSFS 4450 S	450						
		LSFS 3600 S	600	LSFS 4600 S	600	620	872	374	524	848	12

* For product quality improvement, external dimension might be changed without prior notice. Please inquire it when you make and order.
* 600kW soft starter must be composed with by-pass circuit.

LSFS By-Pass



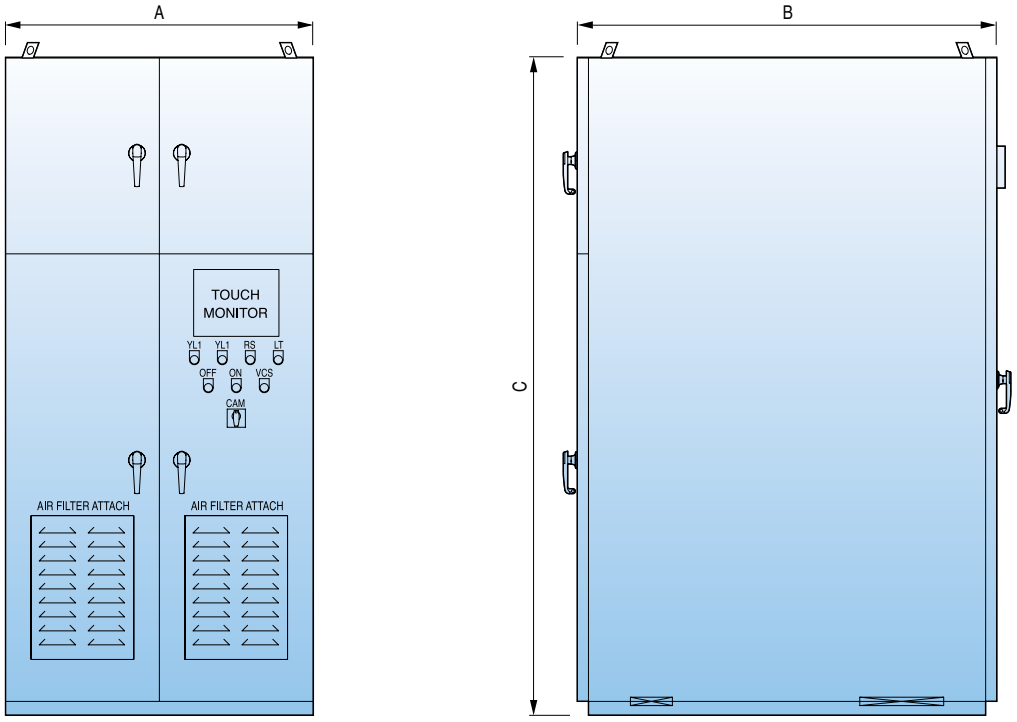
(mm)

Model						Width	Height	Depth	wide attachment	long attachment	Mounting Hole(ϕ)
220V	kW	380V	kW	440V	kW	A	B	C	D	E	F
LSFS 2002 BPS	2.2	-	-	-	-	256	442	224	196	428	9
LSFS 2003 BPS	3.7	LSFS 3003 BPS	3.7	LSFS 4003 BPS	3.7						
LSFS 2005 BPS	5.5	LSFS 3005 BPS	5.5	LSFS 4005 BPS	5.5						
LSFS 2007 BPS	7.5	LSFS 3007 BPS	7.5	LSFS 4007 BPS	7.5						
LSFS 2011 BPS	11	LSFS 3011 BPS	11	LSFS 4011 BPS	11						
LSFS 2015 BPS	15	LSFS 3015 BPS	15	LSFS 4015 BPS	15						
LSFS 2022 BPS	22	LSFS 3022 BPS	22	LSFS 4022 BPS	22						
-	-	LSFS 3030 BPS	30	LSFS 4030 BPS	30						
-	-	LSFS 3037 BPS	37	LSFS 4037 BPS	37						
LSFS 2030 BPS	30	LSFS 3056 BPS	56	LSFS 4056 BPS	56	334	506	264	276	492	9
LSFS 2037 BPS	37	LSFS 3075 BPS	75	LSFS 4075 BPS	75						
LSFS 2056 BPS	56	LSFS 3112 BPS	112	LSFS 4112 BPS	112	334	542	264	260	528	9
LSFS 2075 BPS	75	LSFS 3150 BPS	150	LSFS 4150 BPS	150						
LSFS 2098 BPS	98	LSFS 3195 BPS	195	LSFS 4195 BPS	195	334	638	324	260	624	9
LSFS 2112 BPS	112	LSFS 3240 BPS	240	LSFS 4240 BPS	240						
		LSFS 3300 BPS	300	LSFS 4300 BPS	300	480	680	311	408	666	9

* For product quality improvement, external dimension might be changed without prior notice. Please inquire it when you make and order.

Dimensions

LHVS



(mm)

Model	width (A)	Height (B)	Depth (C)
LHVS 3 0350	1300	1500	2350
LHVS 3 0750	1300	1500	2350
LHVS 3 1500	1600	1500	2350
LHVS 6 0350	1300	1500	2350
LHVS 6 0750	1300	1500	2350
LHVS 6 1200	1300	1500	2350
LHVS 6 1500	1300	1500	2350
LHVS 6 1800	1600	1800	2350
LHVS 6 2500	2000	2200	2350
LHVS 6 2500	2000	2200	2350

Note :
1. The product size with incomming VCB and by-pass contactor
2. Dimensions are subject to change without notice in order to improve the quality of the product, so when ordering, please contact us.
3. Please consult us in case of changing specifications such as whether or not to use incoming VCB, the 2nd bypass circuit breaker addition of Measurement Device, etc.)

Parameter

LSFS Low Voltage

Mark		Parameter	Input range	Function
1	MODE	DRIVE MODE	R-MTS	Controls START, STOP by the external control
			R-BPS	Controls M/C ON, OFF for BY-PASS by the external control
			L-MTS	Controls START, STOP by using the input display which is attached to MTS
			L-BPS	Controls BY-PASS ON, OFF by using the input display which is attached to MTS
			S-COM	Communication MODE
2	ACCEL	ACCEL TIME	0~300sec	The time which is taken to be applied till the full voltage of the motor, and if you make the acceleration time too short, be careful as the starting current Increases.
3	SD-TIME	START DELAY TIME	0~9.9sec	When starting, begin to start after the setting time. Generally sets-up as 2sec.
4	HUNT-JP	HUNTING JUMP TIME	0~300sec	Jump value is set after checking based on time shown in the Display when there is shunting at motor driving. In case of setting, full voltage is applied without shunting. Generally, it is set in the same way with the acceleration time
5	OFFSET	INITIAL VOLTAGE	0~100%	It sets initlal voltage in case of motor driving
6	K-VOLT	KICK START VOLT	0~100%	In case ot kick start use, it sets pre voltage value
7	K-TIME	KICK START TIME	0~300sec	In case of kick start use, it sets pre voltage application time.
8	DECEL	DECEL TIME	0~300sec	It refers to the time to stop at the full voltage of a motor. In case deceleration stop is not necessary, It Is set as 'o' .
9	DD-VOLT	DECEL DELAY VOLT	0~100%	To delay deceleration, it sets voltage tor deceleration delay
10	DD-TIME	DECEL DELAY TIME	0~300sec	It sets time to keep deceleration delay
11	C-LIMIT	CURRENT LIMIT	0~5000A	It drives by limiting load current not to flow over the set value. In case too small current is set, it burdens motor. Set between 3 to 4 times or nominal value.
12	CL-TIME	CURRENT LIMIT TIME	0~300sec	If current is limited even after setting time, fault is generated.
13	OVER-C1	OVER CURRENT 1	0~5000A	It senses instant over current with instantaneous over current detection function. Generally, it sets 600%(6 times) of motor nominal current.
14	OVER-C1T	OVER CURRENT 1 TIME	0~9.9sec	It sets the time of Instantaneous over current OVER-C1. If current over OVER-C1 setting value flows and OVER-C1T is kept, it is sensed as an error. Generally, it is set as 0.5 seconds.
15	OVER-C2	OVER CURRENT 2	0~5000A	Over current detection function during the driving senses driving current and continuous overload. Generally, it is set as 400% of nominal motor current
16	OVER-C2T	OVER CURRENT 2 TIME	0~100sec	If current over OVER-C2 setting value flows and OVER-C2T is kept, it is sensed as an error.Generally, it is set as 2/3 accel time.
17	OVER-C3	OVER CURRENT 3	0~5000A	After accel time, senses over current at RUN range. If load current is over the setting value by sensing motor's continuous overload, it is sensed as an error. Generally, it is set as 120% of a nominal motor
18	OVER-C3T	OVER CURRENT 3 TIME	0~100sec	If current over OVER-C3 setting value flows and OVER-C3T is kept, It is sensed as an error.Generally, it is set as 5 seconds.
19	SHUNT	SHUNT CURRENT	0~5000A	If load current is over the sening value et STP status and SCR short-circuit protection, it is sensed as an error.
20	UNBALANCE	3 PHASE UNBALACE	0~1000A	It sets inter-phase unbalance current difference.
21	U-TIME	3 PHASE UNBALAMCE TIME	0~100sec	It sets inter-phase current detection time. Fault is generated aftar setting time.
22	E-TIME	EARTH TIME	0~9.9sec	It sets earth detection time. Fault is generated after detection time
23	LL-CUR	LOW LOAD CURRENT	0~1000A	It sets low load current
24	LLC-TIME	LOW LOAD CURRENT TIME	0~100sec	It sets low load detection time. Fault is generated after setting time
25	LO-VOLT	LOW VOLTAGE	0~1000V	If input voltage is under the setting value, it is sensed as an error
26	HI-VOLT	HIGH VOLTAGE	0~1000V	If input voltage is over the setting value, it is sensed as an error
27	EXT-ERR	EXTERNAL FAULT ERROR	Yes / No	It sets the use of external fault. Set 'No' for not using and 'Yes' for using
28	BPS-ERR	BY-PASS Fault ERROR	Yes / No	As a function of setting when using the MC by BPS type, sets up as 'YES' when using the BPS
29	AH-JUMP	AUTO HUNTING JUMP	Yes / No	Displays whether being able to use the AUTO JUMP, Sets up as 'YES' for the basic setting
30	LOSS-PHA	LOSS Phase	Yes / No	Mark whether detecting open-phase. Set up basic setting as 'NO' (detected in case of YES)
31	NODE	NODE	0~99	Setting up the communication NODE number
32	USE-TIME	TOTAL USE TIME	-	Total use time after installing the product
33	VERSION	CPU Version	-	Displays the CPU Version which is being used currently

Parameter

LHVS Medium Voltage

Mark	Parameter	Input range		Function
1	ACCEL	Accel Time	0~300sec	Ramp time to the full voltage during starting. Normally set from 40 to 90sec.
2	HUNT-J	Hunting Jump Time	0~300sec	Used in the event of Hunting during starting. Full voltage is applied according to the set time of HUNT-J. In general, 'ACCEL' and 'HUNT-J' is set identically
3	OFFSET	Initial Voltage	0~100%	Initial motor starting voltage. Percent voltage from 0 to max. output. Normally set from 15 to 30%
4	KS-VOLT	Kick Start Voltage	0~100%	Setting the Pre Voltage when Kick Start is selected.
5	KS-TIME	Kick Start Time	0~300sec	Setting the time for Pre Voltage when Kick Start is selected.
6	DECEL	Decel Time	0~300sec	Stopping time at full voltage. Set as 0 if decelerating is not required.
7	DD-VOLT	Decel Delay Voltage	0~100%	Voltage setting for the delay of decelerating
8	DD-TIME	Decel Delay Time	0~300sec	Time setting for the delay of decelerating
9	C-LIMIT	Current Limit	0~4000A	Used to limit the maximum starting current. If the current exceeds the set value, acceleration stops till it drops below the limit. Normally set as 0.
10	CL-TIME	Current Limit Time	0~300sec	Fault happens if the current remains above the limit after the set time.
11	OVER-C1	Over Current 1	0~4000A	Monitoring the peak current during starting to provide a fault signal(instant). Normally set from 600 to 800% of the rated current.
12	OVER-C1T	Over Current 1 Time	0~9.9sec	Delay time for OVER-C1. If the current set at OVER-C1 remains after the set time,fault signal is provided. Normally set as 0.5s.
13	OVER-C2	Over Current 2	0~4000A	Monitoring overload during starting to provide a fault signal(short-time). Normally set as 400% of the rated current.
14	OVER-C2T	Over Current 2 Time	0~100sec	Delay time for OVER-C2. If the current set at OVER-C2 remains after the set time,fault signal is provided. Normally set from 15 to 30s.
15	OVER-C3	Over Current 3	0~4000A	Monitoring overload during starting to provide a fault signal(long-time). Normally set as 120% of the rated current.
16	OVER-C3T	Over Current 3 Time	0~100sec	Delay time for OVER-C3. If the current set at OVER-C3 remains after the set time,a fault signal is provided. Normally set as 5s.
17	LO-VOLT	Low Voltage	0~9000V	Recognize as low voltage if input voltage is below the set value
18	LV-TIME	Low Voltage Time	0~9.9sec	Delay time for low voltage before providing a fault signal.
19	HI-VOLT	High Voltage	0~9000V	Recognize as high voltage if input voltage is above the set value
20	HV-TIME	High Voltage Time	0~9.9sec	Delay time for high voltage before providing a fault signal.
21	LL-CUR	Low Load Current	0~1000A	Define low load current
22	LLC-TIME	Low Load Current Time	0~100sec	Delay time for low load current before providing a fault signal.
23	AH-JUMP	Auto Hunting Jump	Yes(1) / No(0)	Selection of Yes or No for automatic hunting Jump. If 1 is selected automatic hunting Jump is activated.
24	SHUNT	Shunt Current	0~4000A	Pick-up current for the protection from SCR short-circuit.
25	P-LOSS	Phase Loss	Yes(1) / No(0)	Set as 1 to activate this phase loss protection function.
26	UNBALANCE	3-phase Unbalance Current	0~1000A	Setting current unbalance level
27	U-TIME	3-phase Unbalance Current Time	0~100sec	Delay time for current unbalance before providing a fault signal.
28	STO	SCR TURN ON	Yes(1) / No(0)	SCR ON/OFF setting in case of HV-Motorsol off Set as 1 for SCR turn-on, 0 for turn-off
29	NODE	Communication Node	1~99	Node no. for RS485 communication
30	E TIME	Earth Fault Trip Time	0~30sec	Providing fault signal after Earth Fault Trip Time
31	E DELAY TIME	Earth Fault Delay Time	0~100sec	Delay time for earth fault during starting
32	ES-ACCEL	Emergency Starting Time	0~100sec	Ramp time to the full voltage during emergency starting.
33	ES-OFFSET	Emergency Starting Voltage	0~100%	Initial voltage during emergency starting.

Protect function

LSFS Low Voltage

Type	Display	Description	Check points
ERROR 1	OVER CURR 1	OVER CURR1 (Instant over current)	1. Check of load 2. Check of SCR 3. Check of Parameter (OVER-C1, OVER-C1T)
ERROR 2	OVER CURR 2	OVER CURR2 (Over current during the movement)	1. Check of load 2. Check of Parameter (OVER-C2, OVER-C2T) 3. Check of load current
ERROR 3	OVER CURR 3	OVER CURR3 (Over current during the operation)	1. Check of load 2. Check of Parameter (OVER-C3, OVER-C3T) 3. Check of load current
ERROR 4	IN COMM ERROR	INSIDE COMM ERROR	1. ON/OFF relay check (arc and earth) 2. Main conductor check (arc and earth)
ERROR 5	LOSS PHASE	LOSS PHASE	1. Check of input voltage 2. Check of internal entering line
ERROR 6	SHUNT	SHUNT	1. Check of SCR 2. Check of parameter (Shunt)
ERROR 7	UNBALANCE	3Φ PHASE UNBALANCE	1. Check of load 2. Check of Parameter (Unbalance U-TIme) 3. Check of SCR
ERROR 8	OVER HEAT	Soft Starter OVER HEAT	1. Check of Internal temperature of control board 2. Check of cooling fan
ERROR 9	EXT FAULT	EXTERNAL FAULT ERROR	1. Check of motor temperature 2. Check of EMPR 3. Check of external fault
ERROR 10	LOW LOAD	LOW LOAD	1. Check of load 2. Check of SMC display current 3. Check of parameter (LL-CUR, LLC-TIME)
ERROR 11	EARTH	EARTH	1. Check of earth 2. Check of ZCT
ERROR 12	LOW VOLT	LOW VOLTAGE	1. Check of input voltage 2. Check of SMC display voltage 3. Check of parameter (LO-VOLT)
ERROR 13	HIGH VOLT	HIGH VOLTAGE	1. Check of input voltage 2. Check of SMC display voltage 3. Check of parameter (HI-VOLT)
ERROR 14	CURR LIMIT	CURRENT LIMIT	1. Check of load at driving 2. Check of parameter (CC-LIMIT, CL-TIME)
ERROR 15	BPS FAULT	BY-PASS MC failure	1. Check By-pass MC

Protect function

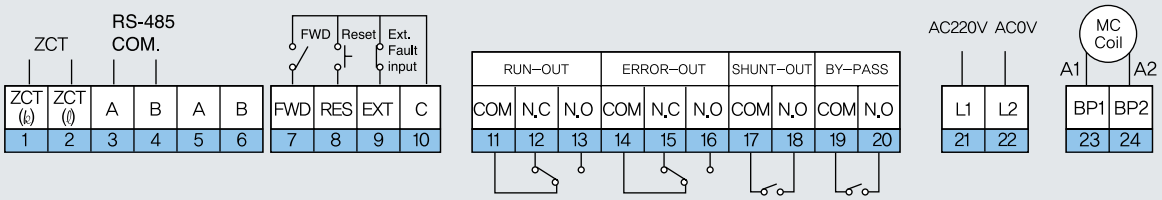
LHVS Medium Voltage

Type	Description	Check points
ERR1	Instantaneous overcurrent	1. Check loads 2. Check SCR 3. Check parameters (OVER-C1, OVER-C1 t)
ERR2	Overcurrent during starting	1. Check loads 2. Check parameters (OVER-C2, OVER-C2 t) 3. Check load current
ERR3	Overcurrent during running	1. Check loads 2. Check parameters (OVER-C3, OVER-C3 t) 3. Check load current
ERR4	Self-diagnosis	1. Check contactor arc 2. Check wiring
ERR5	Phase loss	1. Check incoming cables
ERR6	SHUNT	1. Check SCR 2. Check parameter (Shunt)
ERR7	UNBALANCE	1. Check loads 2. Check parameters (Unbalance. U-time) 3. Check SCR
ERR8	Inside overheating	1. Check temperature sensor 2. Check internal temperature of the stack
ERR9	Outside overheating	1. Check motor temperature 2. Check motor protection relay
ERR10	Low load	1. Check loads 2. Check the load current displayed 3. Check parameters (LO-CUR, LC-TIME)
ERR11	Earth fault	1. Check the load isolation 2. Check ZCT 3. Check parameters (E TIME. E DELAY TIME)
ERR12	Low voltage	1. Check input voltage 2. Check the input voltage displayed 3. Check parameters (LO-VOL, LV-TIME)
ERR13	High voltage	1. Check input voltage 2. Check the input voltage displayed 3. Check parameters (HI-VOL, HV-TIME)
ERR14	Current limit	1. Check loads 2. Check parameters (C-LIMIT, CL-TIME)

Terminal function

LSFS Low Voltage

Terminal configuration



Terminal Functions

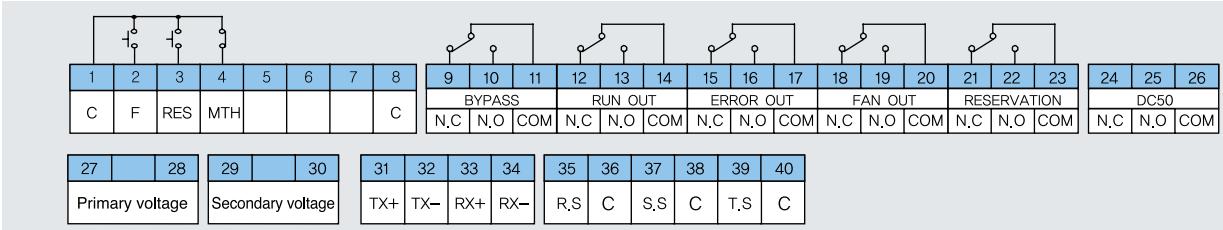
NO	Abbreviation	Name	Function	Nominal value
1	ZCT(k)	Seoond ZCT(k)	Earth detection input	200mA - 100mV
2	ZCT(l)	Seoond ZCT(l)		
3	A	DATA+	RS-485 Communication	
4	B	DATA-		
5	A	DATA+		
6	B	DATA-		
7	FWD	Forward	Forward rotation	
8	RES	Reset	In case of error, it resets.	
9	EXT	External fault	Input of external fault •In case of its use, please use 'B' contact point.	
10	C	Common	Common input	
11	COM	Relay Common	Run out : In case of running, N.O output is displayed At normal times, N.C output is displayed	AC250V 3A
12	N.C	Relay Common		
13	N.O	Relay Common		
14	COM	Relay Common	Error out : In case of running, N.O output is displayed At normal times, N.C output is displayed	
15	N.C	Normal Close		
16	N.O	Normal Open		
17	COM	Relay Common	Shunt out : It operates at shunt error	
18	N.O	Normal Open		
19	COM	Relay Common	By-pass out : It is a terminal to connectwhen external by-pass function is used	
20	N.O	Normal Open		
21	L1	AC 220V	Input of operational power (AC220V)	
22	L2	0V		
23	BP1	A1	In case of By-pass use, it connects MC coil (The coil voltage of MC should be the same with the control voltage.)	
24	BP2	A2		

※ In case operational power input 110V is used, please inquire separately.

Terminal function

LHVS Medium Voltage

Terminal configuration



Terminal Functions

NO	Abbreviation	Name	Function
1	C	Common	Common input
2	F	Forward	Forward operation
3	RES	Reset	Fault reset
4	MTH	Motor overheating	Motor overheating S/W, NC contact conneted
5			No function
6			No function
7			No function
8	C	Common	Common input(GND)
9	N.C	Normal Close	NC contact. Bypass relay output
10	N.O	Normal Open	NO contact. Bypass relay output
11	COM	Relay Common	Bypass relay common
12	N.C	Normal Close	NC contact. Bypass relay output
13	N.O	Normal Open	NO contact. Bypass relay output
14	COM	Relay Common	Bypass relay common
15	N.C	Normal Close	NC contact. Bypass relay output
16	N.O	Normal Open	NO contact. Bypass relay output
17	COM	Relay Common	Bypass relay common
18	N.C	Normal Close	NC contact. Bypass relay output
19	N.O	Normal Open	NO contact. Bypass relay output
20	COM	Relay Common	Bypass relay common
21	N.C	Normal Close	NC contact. Bypass relay output
22	N.O	Normal Open	NO contact. Bypass relay output
23	COM	Relay Common	Bypass relay common
24	N.C	Normal Close	NC contact. Bypass relay output
25	N.O	Normal Open	NO contact. Bypass relay output
26	COM	Relay Common	Bypass relay common
27	Primary voltage	Primary voltage	Secondary input terminal(110V) of Primary PT
28			
29	Secondary voltage	Secondary voltage	Secondary input terminal(110V) of Secondary PT
30			
31	TX+	Transmission+	RS-485 communication (Touch Screen connector)
32	TX-	Transmission-	
33	RX+	Reception+	
34	RX-	Reception-	
35	R.S	R-Phase Current	Signal input terminal of Load side CT of R-Phase
36	C	GND	
37	S.S	S-Phase Current	Signal input terminal of Load side CT of S-Phase
38	C	GND	
39	T.S	T-Phase Current	Signal input terminal of Load side CT of T-Phase
40	C	GND	

Run Out Relay : provides convenience when using in combination with mechanical brake

* Relay contacts max rating : AC250V 2A (do not exceed this rating)

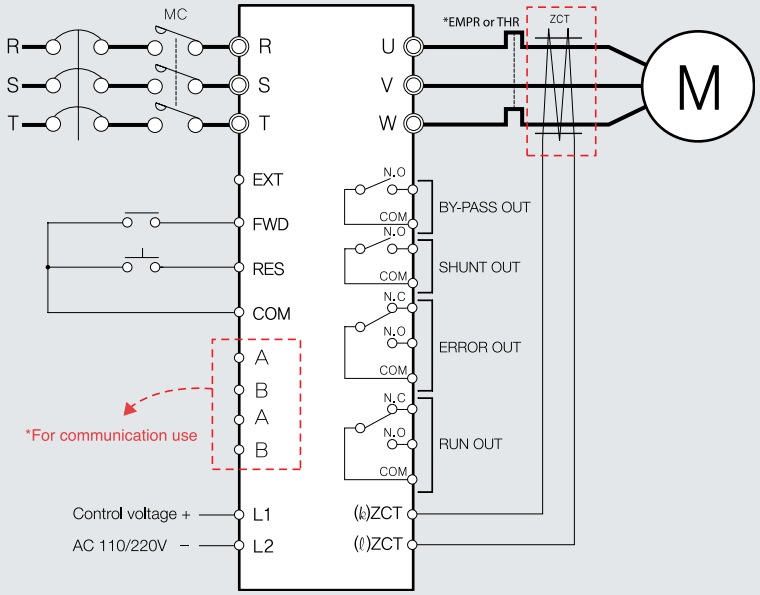
* Error Out Relay : NC is off when Error happens.

- Bells, buzers or flashing lights may be used for ERROR display device

Wiring method

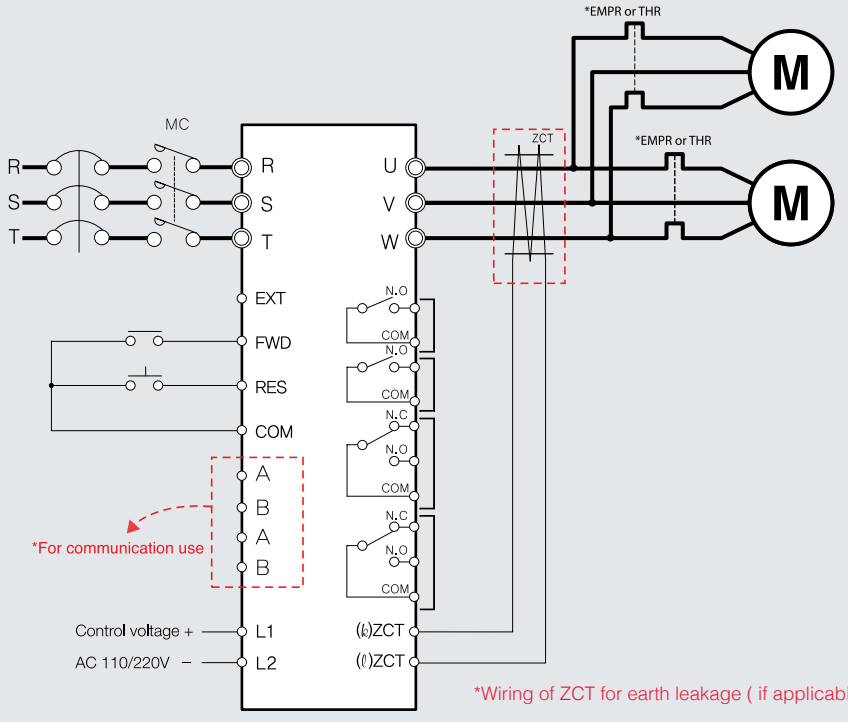
LSFS Low Voltage

Standard wiring dirgram



*Wiring of ZCT for earth leakage (if applicable)

Wiring dirgram for two or more motors

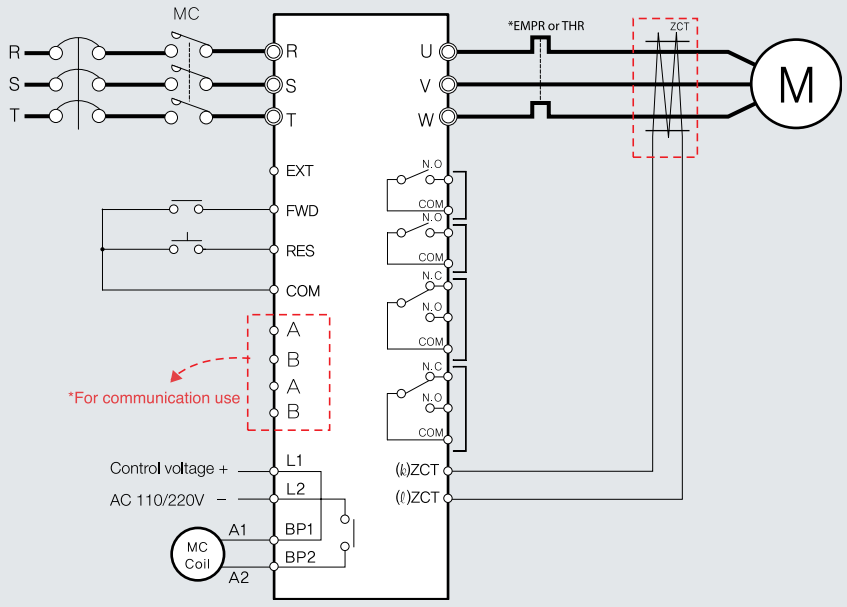


*Wiring of ZCT for earth leakage (if applicable)

Wiring method

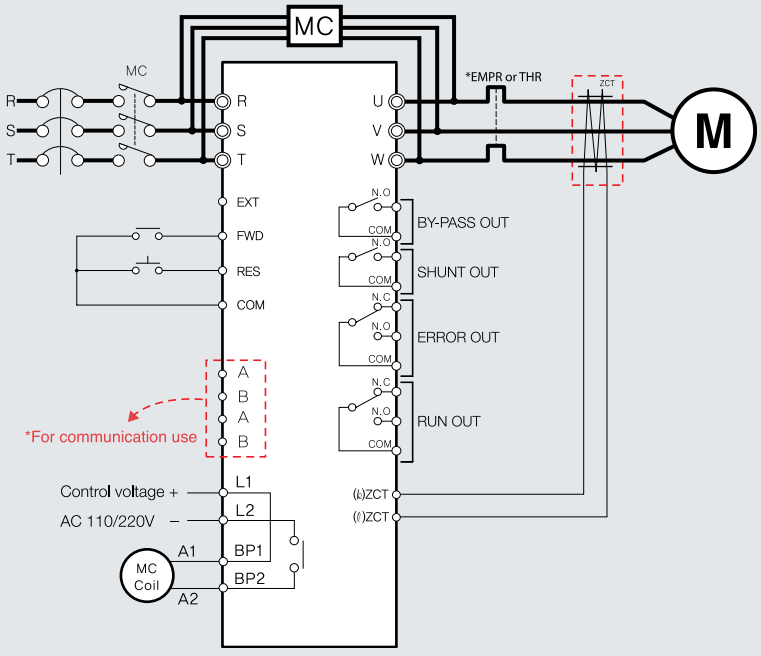
LSFS Low Voltage

Wiring dirgram for internal by-pass



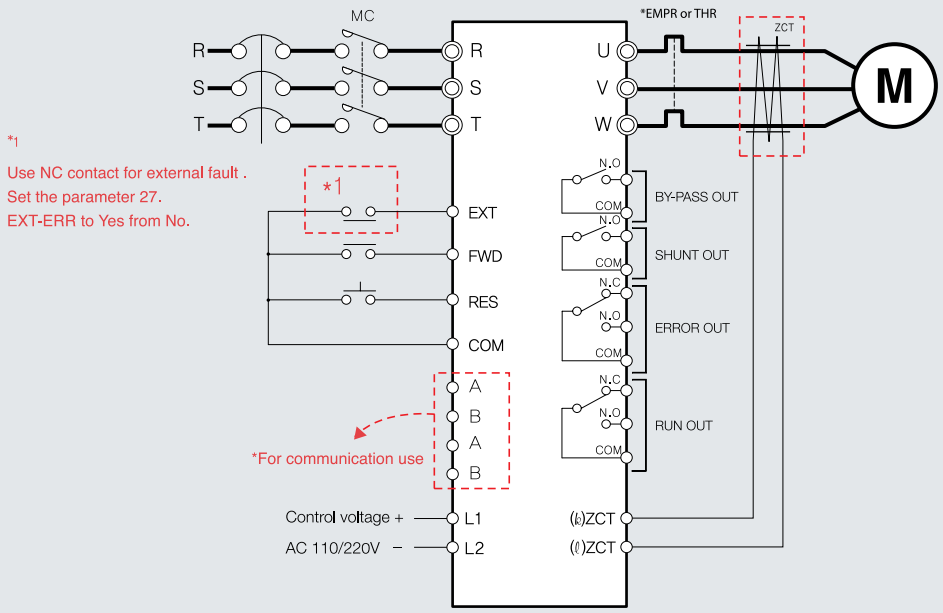
*Wiring of ZCT for earth leakage (if applicable)

Wiring dirgram for external by-pass contactor



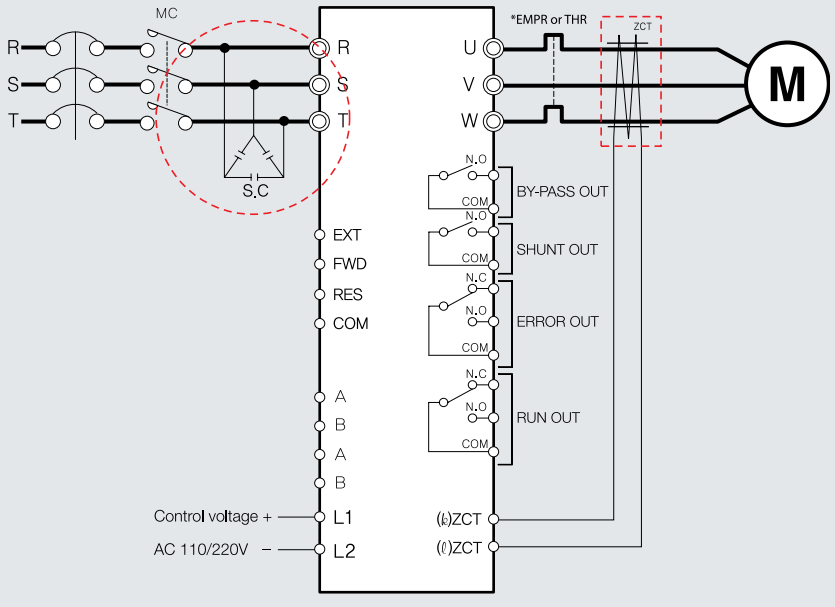
*Wiring of ZCT for earth leakage (if applicable)

Wiring dirgram for external fault(EXT)



*Wiring of ZCT for earth leakage (if applicable)

Wiring dirgram for use with a power factor correction capacitor

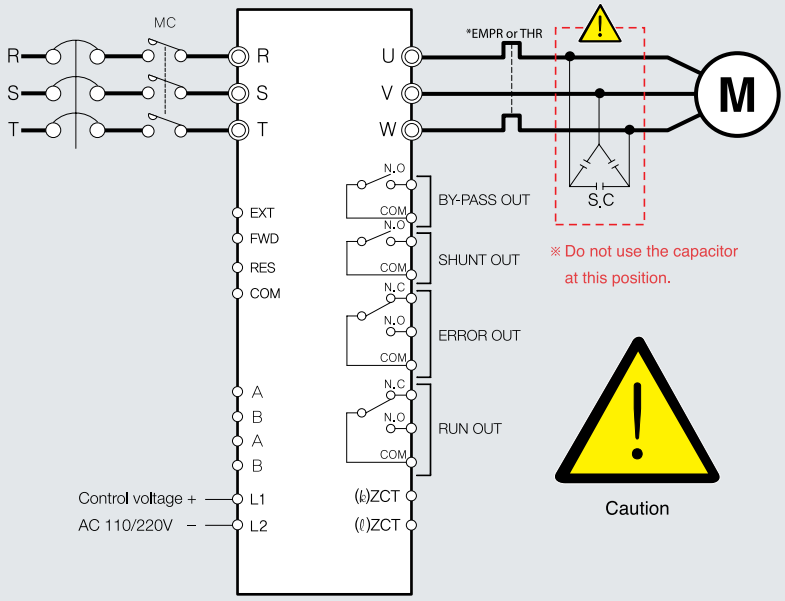


*Wiring of ZCT for earth leakage (if applicable)

Wiring method

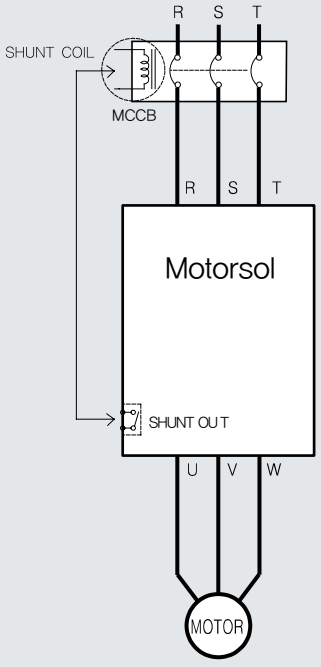
LSFS Low Voltage

Misuse of power factor correction capacitors



*Wiring of ZCT for earth leakage (if applicable)

Wiring dirgram for external by-pass contactor



SHUNT OUT Relay is a function protecting motors in case of Thyristor(SCR) short circuit, main power can be cut during SCR short circuit by using this.

It is activating when over current is being flowed over 2sec caused by SCR short circuit in case of motor stop. When SHUNT OUT is detected, main breaker is tripped and protect the motor.

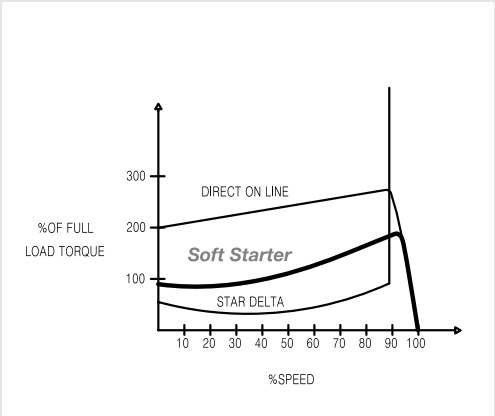
When MC is not used in the side of Soft Starter input, by using SHUNT OUT Relay motor protection can be done.

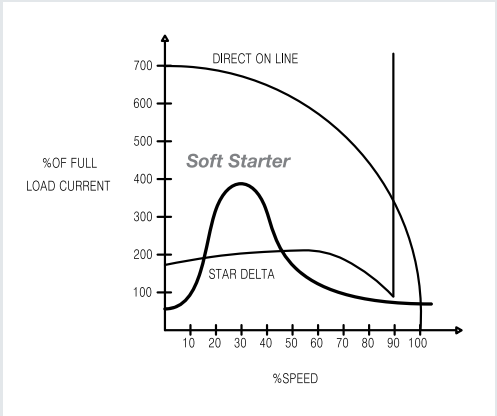
*Wiring of ZCT for earth leakage (if applicable)

Induction motor starting comparison

	Full voltage start	Reactor start	Y-△ Start	Soft Starter start	Inverter start
Description	Starting with full voltage	Starting voltage can be reduced by using a serial reactor.	Star(Y) is only used for starting	Starting with low current from low to full voltage using SCR. VVCF type	Starting with control of voltage and frequency using IGBT. VVVF type
Advantages	1. Short starting time 2. Low cost	1. Small starting torque	1. Small starting torque 2. Small accel. torque 3. Voltage drop reduced by max. starting torque	1. Low-noise 2. No arcing 3. Long motor life 4. small starting torque 5. small starting current 6. No mechanical shock 7. Easy maintenance 8. Protection/monitoring	1. Low-noise 2. No arcing 3. Long motor life 4. small starting torque 5. small starting current 6. No mechanical shock 7. Speed control 8. Protection/monitoring
Disadvantages	1. Large starting torque 2.Large starting current 3.Short motor life	1.Large accel. torque	1.Large electric & mechanical torque switching from Y to △ after starting	1.Speed control disable (except wound motors)	1. Harmonics and micro surge are generated. 2. High cost
Application	Mostly used as long as power capacity is available	Fans, blowers, pumps, small motors	Motors upto 75kW starting with no load or low load	All loads	All loads

* VVCF : Variable Voltage Constant Frequency
VVVF : Variable Voltage Variable Frequency



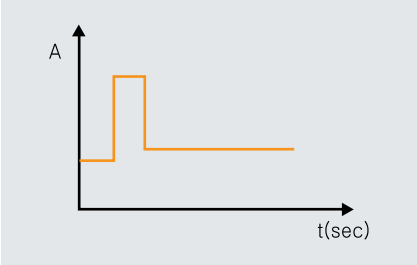


Torque and current are greatly reduced during starting using Soft Starter compared to full voltage start and Y-Δ start.

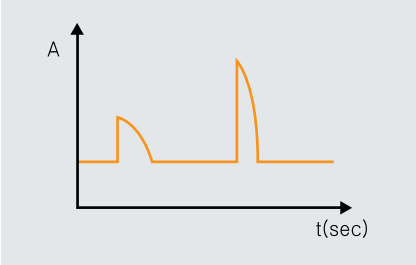
Motorsol Soft Starter

Induction motor starting comparison

Direct on line start



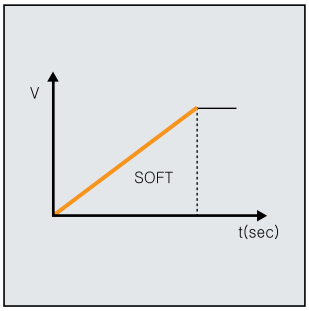
Y-Δ start



Starting systems that burden the motor as large instantaneous voltage which is 5 to 8 times than rated voltage

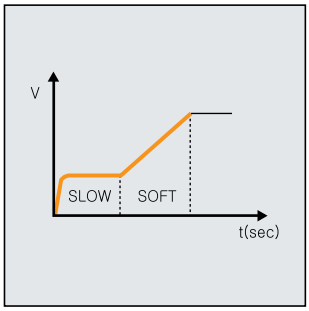
Soft Starter

Starting system that unburdens the motor with various different starting method



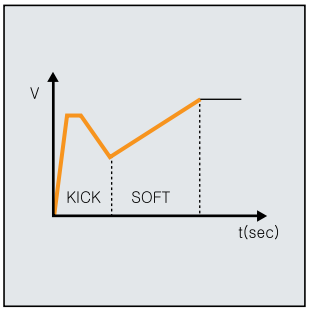
SOFT START (STANDARD)

From low voltage suitable for movement torque of a motor to high voltage generating maximum torque, it gradually provides and softly moves.



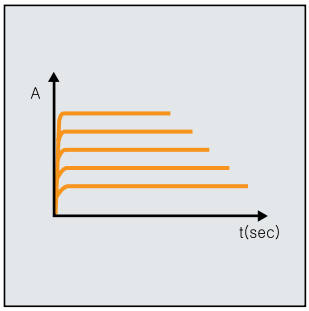
SLOW START

It is applied to move load with big cylinder type that requires long time to generate the maximum RPM as like a dewaterator or blower



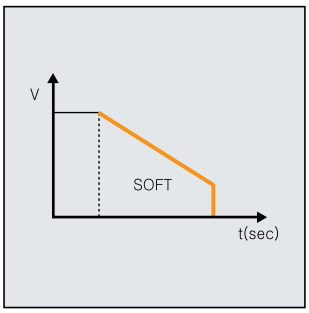
KICK START

It is applied to move load requiring bigger movement torque over stop torque as like high viscous mixer or crusher.



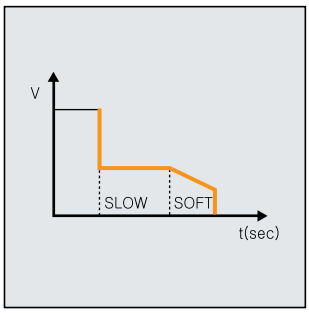
CURRENT LIMIT

The function to apply when operating by limiting movement current



SOFT STOP

It prevents from falling of shaking matters in a conveyor and pipe or an impeller being damaged by counter current in a pump

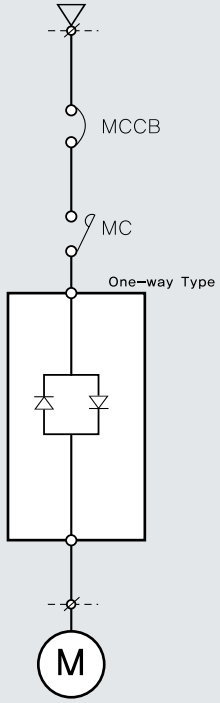


SLOW STOP

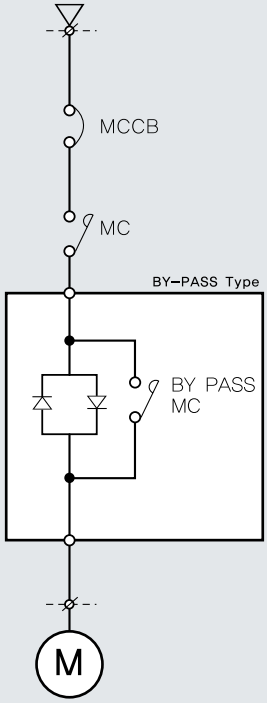
It makes softly stop by applying to a motor that is to be stopped after keeping constant speed in terms of motor characteristics

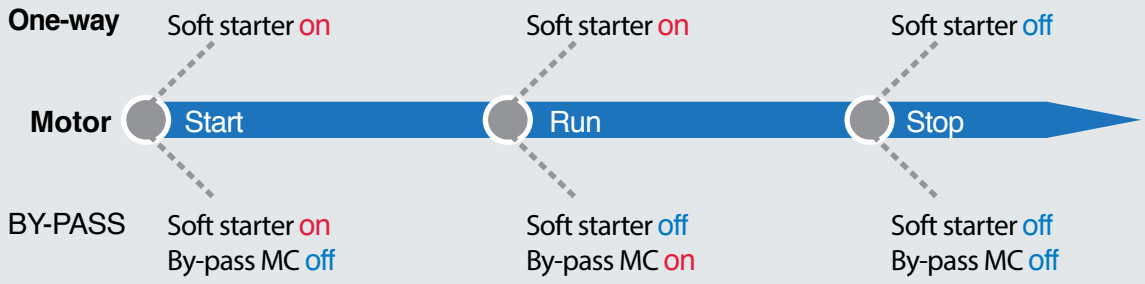
One-way VS. By-pass

One-way Type



By-pass Type





A bypass contactor can be used to carry the motor running current. In this running mode, the SCRs are only used for starting and stopping . As Softstarter does not generate heat during running a cooling fan that may cause dirt and dust to enter into the enclosure is not required. Therefore structure with moisture and dust-proof is possible.

FUTURING SMART ENERGY

We open up a brighter future through
efficient and convenient energy solutions.

Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

- According to The WEEE Directive, please do not discard the device with your household waste.

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