REFU

MACTROL-MOTIONCONTROL PVT. LTD.

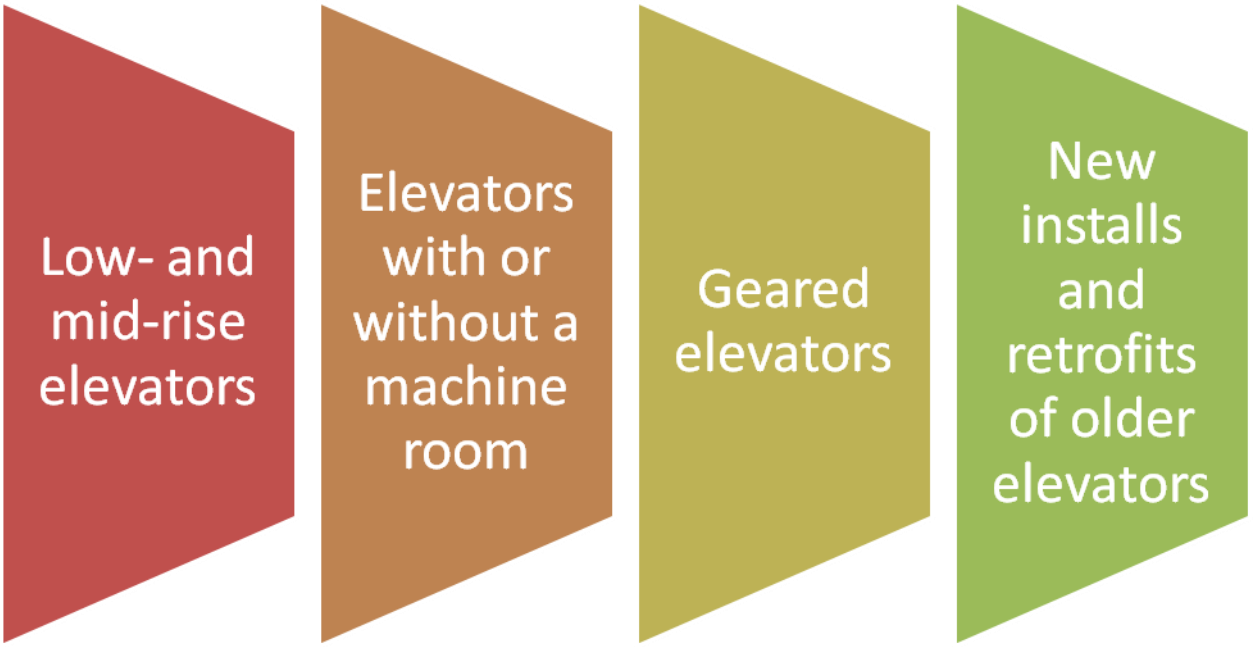
www.mactrol.org

Mactrol-Refu Elevator Drive

Variable speed drives are used in a vast number of motor control applications, but they are predominantly industrial operations where the key objective is usually to save energy and money. Elevators are different in that as the main priority is to provide precise, consistent motor control, guaranteed to ensure a smooth passenger journey from start to finish, especially in this case where such heavy loads are being carried.

Our new **Mactrol-Refu Elevator drives** are a reliable choice for many types of new elevator installations and modernization of older elevators. They seamlessly work with all motor types. Includes excellent tuning possibilities for the quietest, safest, most efficient and most comfortable passenger experience without vibration and jerks.
Low power consumption helps fulfill the latest energy efficiency classifications. Regenerative drive option lets you reduce the elevator's carbon footprint and operatingcosts even further.

Elevators Type Addressed



Key Features:

Reliability-Adopted the best components, the prime optimized software algorithm, the most reliable structural design, strict inspection and test standards, long-time operation under severe field conditions.

Comfort ability-By optimizing the Acc/Dec S-curves according to our performance testing feedbacks, MR-HPHDL-01 offers you the best stable & comfortable passenger experience.

Usability Unique groups of elevator parameters, perfect default values can meet most of the application requirements, which makes commissioning easy and straightforward, saves your time significantly

MR-HPHDL-01 Elevator Drive

MR-HPHDL-01 series elevator drive is the new generation closed-loop vector control drive of **Mactrol-Refu**. It's designed special for elevator industry. It concludes below improvement & innovation based on the ordinary V/F or Close-Loop control inverter. With the high-end design and high quality and reliability, **MR-HPHDL-01** series drives will bring the users all new experience.

Features:

- Closed-Loop vector control
- Supports multiple voltage grade
- Unique groups of elevator parameters
- Smooth ride performance
- Integrated brake control
- Default factory setting user friendly factory, get you started quickly.
- Independent S-Ramps
- Programmable DC–injection braking
- Regenerative feedback available
- Complete Solution with DBR & Chokes

Model Definition:

Frequency Converter Model	Motor adapter		Rated input A	Rated output A
	kW	HP		
1PH single phase input：AC 220V，50/60Hz				
MR-HPHDL-01-00D75G1	**0.75**	1	8.3	**4**
MR-HPHDL-01-001D5G1	**1.5**	2	14.1	**7**
MR-HPHDL-01-002D2G1	**2.2**	3	24.2	**10**
MR-HPHDL-01-00400G1	**4.0**	5.5	34.0	**16**
MR-HPHDL-01-005D5G1	**5.5**	7.5		**25**
MR-HPHDL-01-007D5G1	**7.5**	10		**32**
3PH 3-phase input：AC 220V，50/60Hz				
MR-HPHDL-01-00D75G2	**0.75**	1	5.3	**4**
MR-HPHDL-01-001D5G2	**1.5**	2	8.0	**7**
MR-HPHDL-01-002D2G2	**2.2**	3	11.8	**10**
MR-HPHDL-01-00400G2	**4.0**	5.5	18.1	**16**

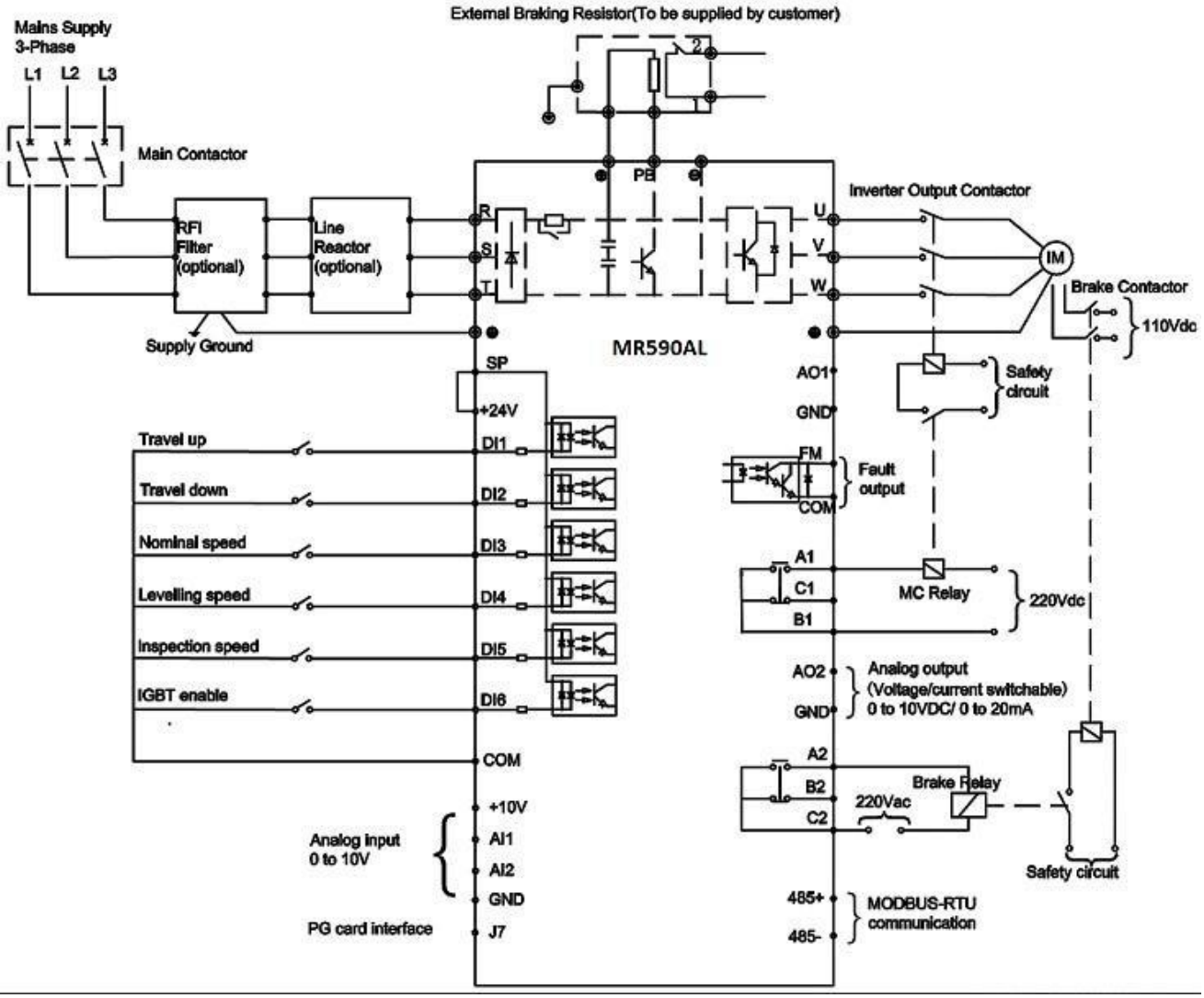
MR-HPHDL-01-005D5G2	**5.5**	7.5	28.0	**25**
MR-HPHDL-01-007D5G2	**7.5**	10	37.1	**32**
3PH 3-phase input：AC 380V，50/60Hz				
MR-HPHDL-01-00D75G3	**0.75**	1	3.5	**2.1**
MR-HPHDL-01-001D5G3	**1.5**	2	5.0	**3.8**
MR-HPHDL-01-002D2G3	**2.2**	3	5.8	**5.1**
MR-HPHDL-01-00400G3	**4.0**	5	10.5	**9.0**
MR-HPHDL-01-005D5G3	**5.5**	7.5	14.6	**13**
MR-HPHDL-01-007D5G3	**7.5**	10	20.5	**17**
MR-HPHDL-01-00110G3	**11.0**	15	26.0	**25**
MR-HPHDL-01-01500G3	**15.0**	20	35.0	**32**
MR-HPHDL-01-018D5G3	**18.5**	25	38.0	**37**
MR-HPHDL-01-02200G3	**22**	30	46.0	**45**
MR-HPHDL-01-03000G3	**30**	40	62.0	**60**
MR-HPHDL-01-03700G3	**37**	50	76.0	**75**
3PH 3-phase input：AC 460V，50/60Hz				
MR-HPHDL-01-00D75G4	**0.75**	1	3.5	**2.1**
MR-HPHDL-01-001D5G4	**1.5**	2	5.0	**3.8**
MR-HPHDL-01-002D2G4	**2.2**	3	5.8	**5.1**
MR-HPHDL-01-00400G4	**4.0**	5	10.5	**9.0**
MR-HPHDL-01-005D5G4	**5.5**	7.5	14.6	**13**
MR-HPHDL-01-007D5G4	**7.5**	10	20.5	**17**
MR-HPHDL-01-00110G4	**11.0**	15	26.0	**25**
MR-HPHDL-01-01500G4	**15.0**	20	35.0	**32**
MR-HPHDL-01-018D5G4	**18.5**	25	38.0	**37**
MR-HPHDL-01-02200G4	**22**	30	46.0	**45**
MR-HPHDL-01-03000G4	**30**	40	62.0	**60**
MR-HPHDL-01-03700G4	**37**	50	76.0	**75**

Product model and braking resistor

Model	Braking unit	Braking resistor		Braking moment %
		Specifications	Quantity	
Three-phase input：AC 220V，50/60Hz				
MR-HPHDL-01-00400G2	Standard built-in	750W >=45Ω	1	135
MR-HPHDL-01-005D5G2		1200W >=22Ω	1	135
MR-HPHDL-01-007D5G2		1500W >=16Ω	1	130
Three-phase input： AC 380V，50/60Hz				
MR-HPHDL-01-00400G3	Standard built-in	750W >=130Ω	1	135
MR-HPHDL-01-005D5G3		1200W >=90Ω	1	135
MR-HPHDL-01-007D5G3		1500W >=65Ω	1	130
MR-HPHDL-01-00110G3		2500W >=43Ω	1	135
MR-HPHDL-01-01500G3		3000W >=32Ω	1	125
MR-HPHDL-01-018D5G3		4000W >=28Ω	1	125
MR-HPHDL-01-02200G3		4800W >=25Ω	1	125
MR-HPHDL-01-03000G3		4800W >=25Ω	1	125
MR-HPHDL-01-03700G3		4800W >=25Ω	1	125
Three-phase input： AC 460V，50/60Hz				
MR-HPHDL-01-00400G3		750W >=150Ω	1	135
MR-HPHDL-01-005D5G3		1200W >=110Ω	1	135

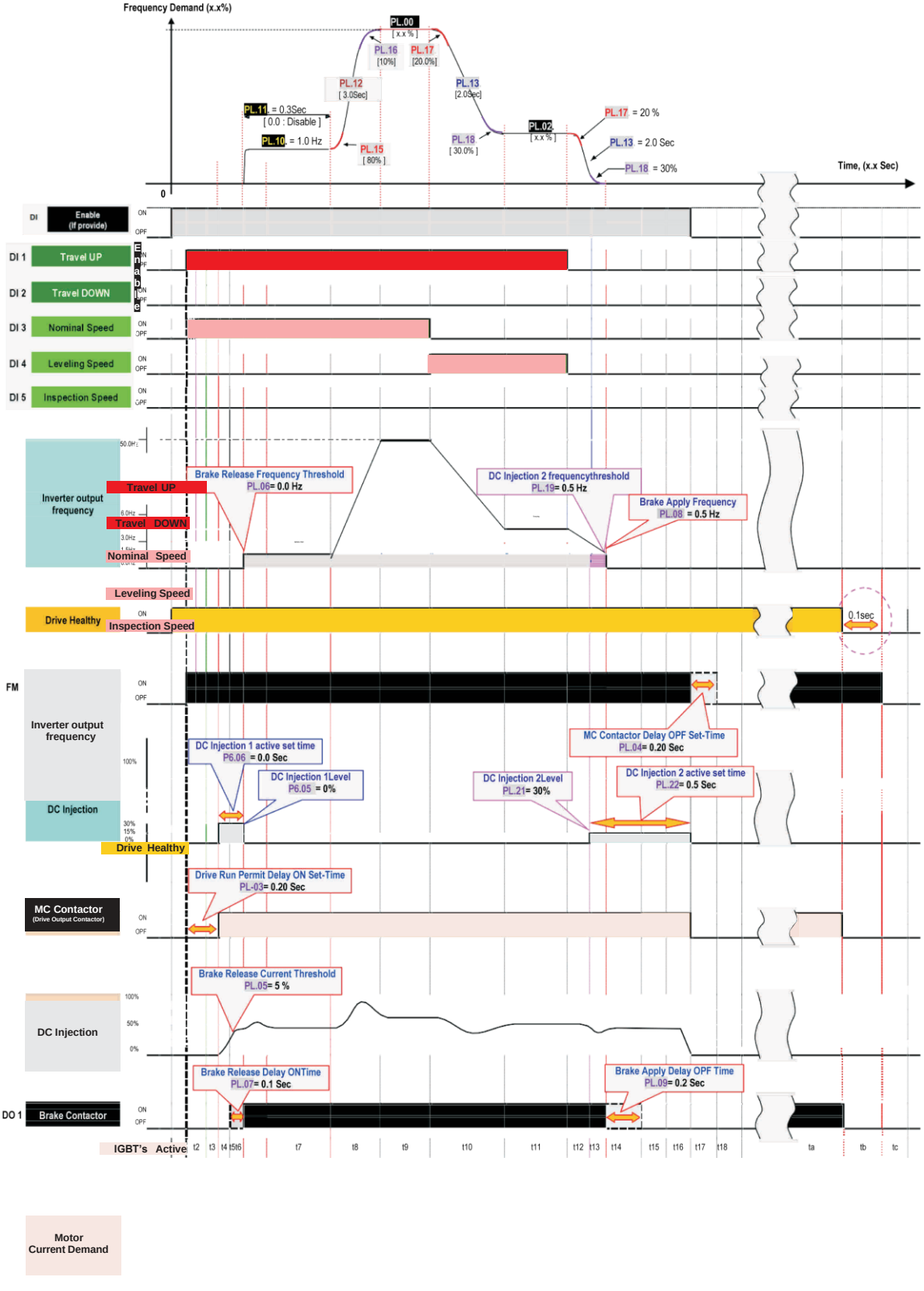
MR-HPHDL-01-007D5G3	Standard built-in	1500W >=78Ω	1	130
MR-HPHDL-01-00110G3		2500W >=52Ω	1	135
MR-HPHDL-01-01500G3		3000W >=38Ω	1	125
MR-HPHDL-01-018D5G3		4000W >=34Ω	1	125
MR-HPHDL-01-02200G3		4800W >=30Ω	1	125
MR-HPHDL-01-03000G3		4000W >=34Ω	1	125
MR-HPHDL-01-03700G3		4000W >=34Ω	1	125

Typical wiring diagram



Quick setup

Complete timing diagram for normal travel (Use multi- reference as frequency reference)



Event	Descriptions	Function	Drive Status
Ta	– Drive healthy – MC and brake Contactor are energized	----	RUN
Tb	– Drive Trip – IGBTs disable – Brake contactor de-energized	----	Trip
Tc	– MC contactor got de-energized provided drive IGBTs are disabled after 0.1sec	----	Trip
t1	– Drive waits to enable by lift controller	----	Inhibit
t2	– Drive MC contactor output energized when direction demand command enable by the lift controller. – Desired preset speed reference command enable by lift controller	PL.03	Ready
t3	– Drive IGBTs immediately go into active mode after the desire drive run permit delayON set time has elapse	PL.03	STOP
t4	– DC injection active – Motor brake contactor energized when motor current demand excess thebrake release current level and brake release frequency	PL.05 PL.06 PL.05 PL.06	RUN
t5	– Motor brake contactor is energized – Optimize profile generator active – Motor start to run	PL.07 PL.10 PL.11	RUN
t6	– DC injection 1 disable after the desired set time has elapsed	PL.06	RUN
t7	– Start optimizer profile generator disable after the desired set time has elapse	PL.11	RUN
t8	– Motor ramp up to the desire preset speed reference	PL.15 PL.16 PL.12 PL.0x	RUN
t9	– Drive output at speed status	PL.01	RUN
t10	– Change of preset speed reference demand – Motor ramp down to the desire preset speed reference	PL.15 PL.16 PL.12 PL.0x	RUN
t11	– Drive output at speed status	PL.0x	RUN
t12	– Direction demand command disabled – Motor ramp down to zero speed	PL.17 PL.18 PL.13	RUN
t13	– DC injection active when drive output falls below the -DC injection 2 frequency threshold	PL.19 PL.21	RUN
t14	– Brake contactor got de-energize when the drive output frequency fall below the brake apply frequency	PL.06 PL.09	RUN
t15	– DC injection still active when brake contactor got de-energize	PL.21	RUN
t16	– DC injection disable after the desire set time has elapse	PL.22	STOP
t17	– Drive IGBTs got disable – MC contactor delay OFF time active	----	Ready
t18	– MC contactor de-energize after the desire se	PL.04	Inhibit

Parameter Group L-Elevator Parameters

Para	Parameter Name	Default Value	Commissioning
Set multi-reference value			
PL.00	Normal speed	100	100
PL.01	Leveling speed	11	11
PL.02	Maintenance speed	40	40
Set magnetic contactor			
PL.03	Drive run delay On set time	0.2	0.2
PL.04	Main contactor (MC) delay Off set time	0.2	0.2
Set brake contactor		5	5
PL.05	Brake release current threshold	0	0
PL.06	Brake release frequency threshold	0	0
PL.07	Brake release delay On set time	0.5	0.5
PL.08	Brake apply frequency threshold	0.2	0.2
PL.09	Brake apply delay OFF set time	28.0	25
Set Startup frequency			
PL.10	Startup frequency	1	1
PL.11	Startup frequency active set time	0.3	0.3
Set acceleration and deceleration			
PL.12	Acceleration time 1	3	3
PL.13	Deceleration time1	2	2
Set S-curve			
PL.14	Acceleration/deceleration mode	3	3
PL.15	Time proportion of S-Ramp at acc Start	80	80
PL.16	Time proportion of S-Ramp at acc end	10	10
PL.17	Time proportion of S-Ramp at dec Start	20	20
PL.18	Time proportion of S-Ramp at dec end	30	30
Set DC injection for stopping			
PL.19	DC injection 2 frequency threshold	0.5	0.5
PL.20	DC injection 2 delay on set time	0	0
PL.21	DC injection 2 level	30	30
PL.22	DC injection 2 active set time	0.5	0.5
Set Emergency action			
PL.23	Emergency action enable	0	0
PL.24	Emergency action voltage threshold	350	350

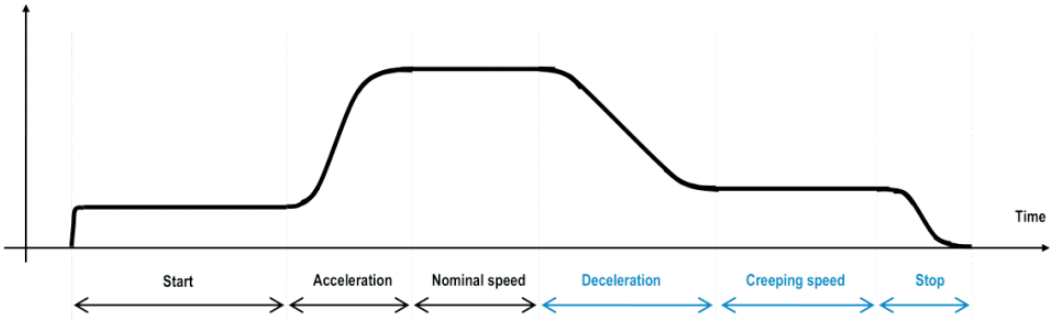
Standard specifications

Items		Description	
Basic function	Input voltage classes	3-phase input：AC 220V，50/60Hz；AC 380V，50/60Hz；AC 460V，50/60Hz	
	Control system	High performance of current vector control technology to realizeasynchronous motor and synchronous motor control	
	Maximum frequency	Vector control：0~300HzV/Fcontrol：0~3200Hz	
	Carrier frequency	0.5k~16kHz; The carrier frequency will be automatically adjusted according to theload characteristics	
	Input frequency resolution	Digital setting： 0.01Hz Analog setting： maximum frequency ×0.025%	
	Control mode	Open loop vector control(SVC) Closed loop vector control(FVC)V/F control	
	Startup torque	Type G：0.5Hz/150%(SVC)；0Hz/180%(FVC)	
	Speed range	1：100(SVC)	Speed range
	Speed stabilizing precision	±0.5%(SVC)	Speed stabilizing precision
	Torque control precision	±5%(FVC)	
	Over load capability	G type：rated current 150% -1 minute, rated current 180% -3 seconds;	
	Torque boost	Auto torque boost function； Manual torque boost 0.1%~30.0%	
	V/F curve	Linear V/F,Multi-point V/F and Square V/F curve(power of 1.2, 1.4, 1.6, 1.8, 2)	
	Acc /dec curve	Straight line or S curve acceleration and deceleration mode. Four kinds of acceleration and deceleration time. Acceleration anddeceleration time range between 0.0s to 6500.0s	
	DC brake	DC brake frequency：0.00Hz to maximum frequency, brake time：0.0s to 36.0s, and brake current value： 0.0% to100.0%.	
	Jog control	Jog frequency range：0.00Hz~50.00Hz. Jog acceleration/deceleration time 0.0s~6500.0s.	
	MS speed running	It can realize at maximum of 16 segments speed running via thebuilt-in PLC or control terminal.	
	Auto voltage regulation (AVR)	It can keep constant output voltage automatically in case ofchange of network voltage.	
	Over-voltage/current stall control	It can limit the running voltage/current automatically and preventfrequent over-voltage/current tripping duringthe running process	
	Quick current limit	Minimize the over-current fault,protect normal operation of theinverter	
	Torque limit & control	″ Excavators" characteristics,automatically limit torque during operation,prevent frequent over-current trip; Closed loop vector mode can realize the torque control	
Personalized	Instantaneous stopnon-stop	When instantaneous power off,voltage reduction is compensated through load feedback energy,which could make inverter keep runningin a short period of time.	
	Rapid current limit	To avoid inverter frequent over-current fault.	
	Encoder support	Support difference,open collector, UVW, rotary transformer, sinecosine encoder etc.	

Running	Running command channel	Three types of channels： operation panel reference,control terminal reference and serial communication port reference.These channels can be switched in various modes.
	Frequency source	There are totally eleven types of frequency sources, such as digital reference, analog voltage reference, analog current reference, pulsereference, MS speed, PLC, PID and serial port reference.
	Input terminal	11 kinds of auxiliary frequency source which can flexible achieveauxiliary frequency tuning, frequency synthesis
	Output terminal	Standard： 1 digital output terminals, Y1 is high-speed pulse output terminal (can be chosen as open circuit collector type), support 0~10kHz square wave signal; 2 relay output terminal; 2 analog output terminals, support 0~20mA output current or0~10V output voltage; Extended card HV590IO2： 1 channel collector output：DO22channel relay：TA3,TB3,TC3 1 analog output terminal, support 0~20mA output current or0~10V output voltage.
	Protection function	It can implement power-on motor short-circuit detection,input/output phase loss protection, over current protection,over voltage protection,under voltage protection,overheating protection and overload protection.
	Optional parts	1, Brake component 2, Multi-function I/O cardHV590IO1, HV590IO2 3, Differential& Open-collectorinput PG cardHV590PG1: Optional5V/12V/24V.without dividing frequency output
Environment	Using place	Indoor,and be free from direct sunlight,dust,corrosive gas,combustible gas,oilsmoke, vapor,driporsalt.
	Altitude	Below 1000m
	Ambient temperature	-10 ℃ to +40 ℃ (Derating use when under ambient temperatureof 40 ℃ to 50 ℃)
	Humidity	Less than 95%RH, without condensing
	Vibration	Less than 5.9 m/s (0.6g)
	Storage temperature	－20℃~＋60℃

Trouble shooting

Timing Table



Stage	Symptom	Diagnostics	Remedies
Start	Rollback	Brake device releases too early	Increase PL.07,ranging 0 to 0.5s
			Applicable only if Drive Controls M/C Brake
		Start frequency is too low	Increase PL.10,ranging 0 to 1.5Hz
		Torque output is insufficient	Ensure P3.00=25Hz, P3.01=3% (Increase as per need up to 30%)
	Jerk	Brake device releases too late	Decrease PL.07,ranging 0 to 0.5s
			Applicable only if Drive Controls M/C Brake
		Start frequency is too high	Decrease PL.10,ranging 0 to 1.5Hz
	Slow Speed Tripping	Cabin imbalanced	Check- Cabin Balance, Counter Weight should be equal to cabin + passengers weight.
		Torque Insufficient	Ensure P3.00=25Hz, P3.01=3% (Increase as per need up to 30%)
		Voltage Supply Problem	Ensure Input Supply is OK.
			Three Phase supply should be used.
			If you are using Single Phase to 220V to 415v Converter and applying 415v to 2 phases then Ensure P9.12=00
Acceleration	Jerk when acceleration starts	Accel rate too fast	Increase PL.15,ranging 0 to 80%
			Or increase PL.12,ranging 0 to 20s
	Jerk when acceleration ends	Accel rate too fast	Increase PL.16,ranging 0 to (95-(PL.15))%
			Or increase PL.12,ranging 0 to 20s
	Overshoot when acceleration ends	Speed loop PI over gain	Decrease P2.03,ranging 0 to 100
			Or increase P2.04,ranging 0 to 10
	Vibration	Too small margin between P2.02 and P2.05	Make sure P2.05-P2.02>3Hz,usually increase P2.05,ranging fromP2.02 to 7Hz
		Overcurrent stall prevention occurs	Ensure P3.18=170%
Nominal	Vibration	Speed loop PI over gain	Decrease P2.00 or P2.03,ranging 0 to 100,or increase P2.04 orP2.04,ranging 0.01 to 10.00
		Current loop PI over gain	Double check the motor parameters and then perform motor auto- tuning once more
Deceleration	Jerk when acceleration starts	Deceleration rate too fast	Increase PL.18,ranging 0 to 80%,Or increase PL.13,ranging 0 to 20s
	Vibration	Overcurrent stall prevention occurs	Make sure P3.18=170%
	Jerk when acceleration ends	Deceleration rate too fast	Increase PL.18,ranging 0 to 80%,Or increase PL.13,ranging 0 to 20s

Stage	Symptom	Diagnostics	Remedies
Creeping	Vibration	Insufficient torque output	Ensure P3.00=25Hz, P3.01=3%
	Elevator at half	Insufficient torque output	Ensure P3.00=25Hz, P3.01=3%
	Move much slower than expected	Insufficient torque output	Ensure P3.00=25Hz, P3.01=3%
		Adjust creeping speed	Increase P4.16,ranging 0 to 100% or decrease relevant multi-reference
Stopping	Jerk	Deceleration rate too fast	Increase PL.18,ranging 0 to 80%
			Increase PL.13,ranging 0 to 20s
			Use second deceleration time P8.04: First,set P8.04 bigger than PL.13,ranging PL.13 to 20s;then set P8.26=creeping speed
		Braking device applies too early	Make sure PL.08=0.5Hz,then increase PL.09,ranging 0 to 0.5s
		DC injection overgain	Decrease PL.21,ranging 0 to 100%
	Slip	DC injection gain time too short	Increase PL.22,ranging 0 to 1s
		DC injection gain step point too low	Increase PL.21,ranging 0 to 100%
		Brake apply delay too long	Ensure PL.08=0.5Hz,then decrease PL.09,ranging 0 to 0.5s
	Inaccurate leveling position	Too slow deceleration	If P8.04 is not applied, then decreasePL.13,ranging 0 to 20s
			If P8.04 is applied, then firstly decrease/increase P8.04; secondly set P8.26=creeping speed
			If P0.01=2, increase P3.09=Slip compensation gain(0~ 200%)
			If P0.01=0, increase/decrease P2.06=Vector slip gain (50~200%)

FAULT DIAGNOSIS

Fault name	Acceleration over current
Panel display	Fault No.2= Err02
Fault investigation	1、Acceleration time too short 2、Improper manual torque boost or V/F curve 3、Low voltage 4、Inverter output loop grouded or short circuit 5、Vector control mode without parameter identification 6、Start the rotating motor 7、Sudden load add in acceleration process 8、Small type selection of inverter.
Fault countermeasures	1、Increase acceleration time 2、Adjust manual torque boost or V/F curve 3、Adjust voltage to normal range 4、Eliminate external faults 5、Parameter identification 6、Select speed tracking start or restart after motor stop 7、Cancel sudden added load 8、Choose inverter of greater power level

Fault name	Deceleration over current
Panel display	Fault No.3= Err03
Fault investigation	1、Inverter output loop grouded or short circuit 2、Vector control mode without parameter identification 3、Deceleration time too short 4、Low voltage 5、Sudden load add in deceleration process 6、No braking unit and brake resistence installed
Fault countermeasures	1、Eliminate external faults 2、Parameter identification 3、Increase deceleration time 4、Adjust voltage to normal range 5、Cancel sudden added load 6、Install braking unit and brake resistence

Fault name	Constant speed over current
Panel display	Fault No.4= Err04
Fault investigation	1、Inverter output loop grouded or short circuit 2、Vector control mode without parameter identification 3、Low voltage 4、Sudden load add in deceleration process 5、Small type selection of inverter
Fault countermeasures	1、Eliminate external faults 2、Parameter identification 3、Adjust voltage to normal range 4、Cancel sudden added load 5、Choose inverter of greater power level

Fault name	Acceleration over voltage
Panel display	Fault No.5= Err05
Fault investigation	1、No braking unit and brake resistence installed 2、High input voltage 3、External force drive motor operation during acceleration process 4、Acceleration time too short
Fault countermeasures	1、Install braking unit and brake resistence 2、Adjust voltage to normal range 3、Cancel external force or install brake resistence 4、Increase acceleration time

Fault name	Deceleration over voltage
Panel display	Fault No.6= Err06
Fault investigation	1、High input voltage 2、External force drive motor operation during deceleration process 3、Deceleration time too short 4、No braking unit and brake resistence installed
Fault countermeasures	1、Adjust voltage to normal range 2、Cancel external force or install brake resistence 3、Increase deceleration time 4、Install braking unit and brake resistence

Fault name	Constant speed over voltage
Panel display	Fault No.7= Err07
Fault investigation	1、External force drive motor operation 2、High input voltage
Fault countermeasures	1、Cancel external force or install brake resistence 2、Adjust voltage to normal range

Fault name	Control power supply fault
Panel display	Fault No.8= Err08
Fault investigation	1、Input voltage is not within the specified range
Fault countermeasures	1、Adjust voltage to normal range

Fault name	Under voltage fault
Panel display	Fault No.9= Err09
Fault investigation	1、Instantaneous power-off 2、Input voltage is not within the specified range 3、Bus voltage anomalies 4、Rectifier and buffer resistance anomalies 5、Drive board anomalies 6、Control board anomalies
Fault countermeasures	1、Reset fault 2、Adjust voltage to normal range 3、For technical support

Fault name	Inverter overload
Panel display	Fault No.10= Err10
Fault investigation	1、Small type selection of inverter. 2、Overload or motor stall
Fault countermeasures	1、Choose inverter of greater power level 2、Reduce the load and check the motor and mechanical condition

Fault name	Motor overload
Panel display	Fault No.11= Err11
Fault investigation	1、Small type selection of inverter 2、Improper setup of P9.01 3、Overload or motor stall
Fault countermeasures	1、Choose inverter of greater power level 2、Set P9.01 correctly 3、Reduce the load and check the motor and mechanical condition

Fault name	Input phase lack
Panel display	Fault No.12= Err12
Fault investigation	1、Drive board anomalies 2、Lightning protection board (BESP) anomalies 3、Control board anomalies 4、3-phase input power-supply anomalies
Fault countermeasures	1、Replace driver, power- supply board or contactor 2、For technical support 3、Eliminate external loop faults

Fault name	Output phase lack
Panel display	Fault No.13= Err13
Fault investigation	1、Wiring between motor and inverter anomalies 2、Inverter unbalanced 3-phase output 3、Drive board anomalies 4、Module anomalies
Fault countermeasures	1、Eliminate external loop faults 2、Check 3-phase winding and eliminate faults 3、For technical support

Fault name	Motor tuning fault
Panel display	Fault No.19= Err19
Fault investigation	1、Parameter identification process overtime 2、Wrongly set motor parameters
Fault countermeasures	1、Check wire between inverter and motor 2、Set motor parameters correctly according to the nameplate

Fault name	Short circuit to ground fault
Panel display	Fault No.23= Err23
Fault investigation	1、Motor short circuit to ground
Fault countermeasures	1、Replace cable or motor

Fault name	Each wave current limiting fault
Panel display	Fault No.40= Err40
Fault investigation	1、Excessive load or motor stall 2、Small type selection of inverter.
Fault countermeasures	1、Reduce the load and check the motor and mechanical condition 2、Choose inverter of greater power level

For Enquiries Please Contact:

Standards: