1 Preface

AS360 series integrated elevator drive controller is a device designed by Shanghai Step Electric Corporation for new generation elevators. It is reliable, safe, functional and easy to operate along with excellent speed control performance. This manual is a brief instruction of the product and can be used as a reference for technicians in model selection, design, commissioning and Ispection. You can visit the company website: www.stepelectric.com to download more detailed user guide or contact related department to request the text version user guide or CD.

2 Models/Technical, Indicators/Specifications of Integrated Drive Controller

See table 2.1 for all models of AS360 series integraed drive controller.

Table 2.1 Models of AS360 Series Integrated Drive Controller

Model AS360-	Rated capacity （kVA）	Rated output current（A）	Matching Motor （kW）
4T02P2	4.7	6.2	2.2
4T03P7	6.9	9	3.7
4T05P5	8.5	13	5.5
4T07P5	14	18	7.5
4T0011	18	27	11
4T0015	24	34	15
4T18P5	29	41	18.5
4T0022	34	48	22
4T0030	50	65	30

See table 2.2 for technical indicators and specifications of AS360 series integraed drive controller.

Table 2.2 Technical Indicators/Specifications of AS360 Series Integrated Drive Controller

		4T02P2	4T03P7	4T05P5	4T07P5	4T0011	4T0015	4T0018	4T0022	4T0030
Max matching motor capacity（kW）		2.2	3.7	5.5	7.5	11	15	18.5	22	30
Rated output	Rated capacity（kVA）	4.7	6.9	8.5	14	18	24	29	34	50
	Rated current（A）	9	9	13	18	27	34	41	48	65
	Max output voltage （V）	400V：three-phase 380/400/415/440/460V（matching input voltage）								
Input power	Number of phases, voltage, frequency	400V：three-phase 380/400/415/440/460V、50/60Hz								
	Voltage range allowed	-15%～+10%								
	Frequency range allowed	-5%～+5%								
	Endurance capacity of instantaneous voltage drop	400V：keep running at AC300V or above；Activate under-voltage protection after 15ms from the moment when it drops from rated input condition to somewhere lower than AC300V.								
Basic characteristics	Max accessible floor	9 floor								
	Elevator running speed	≤1.75m/s								
Drive characteristics	Control mode	PG card vector control								
	Startup torque	150% 0Hz（PG card vector control）								
	Speed control scope	1:1000（PG card vector control）								
	Speed control precision	±0.02%（PG card vector control 25±10℃）								
	Torque limit	yes（set with parameter）								
	Torque precision	±5%								
	Frequency control scope	0～120Hz								
	Frequency precision (temperature fluctuation）	±0.1%								
	Frequency setting resolution	±0.06Hz/120Hz								
	Output frequency resolution （calculation of	0.01Hz								

		4T02P2	4T03P7	4T05P5	4T07P5	4T0011	4T0015	4T0018	4T0022	4T0030
	resolution）									
	No-load startup compensation	When the elevator load is unknown, suitable torque will, as per the ready-to-travel direction of elevator, be applied on motor so as to ensure smooth start of elevator, minimize the slipping and improve comfort at starting moment								
	Overload capacity	Zero speed 150% , < 3Hz is 160%, > 3Hz is 200%								
	Brake torque	150% (external braking resistor),integrated braking unit								
	Acceleration Deceleration time	0.01～600s								
	Carrier frequency	2～11kHz								
	Battery operation	In case of blackout, the battery instantaneously supplies power to elevator for leveling at low speed.								
PG Card interface port	PG card output	5V、12V，300mA								
	PG card type	Open collector output, push-pull output, SIN/COS、Endat absolute value type								
	PG card signal frequency dividing output	OA，OB orthogonal，frequency dividing coefficient 1～128								
Control input/output signal	Opt-coupler input Control power supply	Isolated 24V DC								
	Relay output control power supply	Isolated 24V DC								
	Low-voltage opt-coupler isolated input	24 channel。Switching capacity.Opt-coupler control signal is isolated 24V DC input signal.								
	High-voltage opt-coupler isolated input	3 channel, Switching capacity。								
	Relay output 1	18 channel, Normal open contact, single-pole and single-throw， contact capacity：resistive load，3A 250VAC or 3A 30VDC								
	Relay output 2	3 channel. Normal open contact, single-pole and single-throw, contact capacity：resistive load，6A 250VAC								
	Button Input/output terminals	20 channels, could be extended to channels								
Protection option	Motor overload protection	Able to use parameter setting for the protection curve of motor								
	Overload of frequency converter	< 3Hz is 160%,5 seconds， > 3Hz is 185%，10 seconds								
	Short-circuit	Provide protection to elevator integrated drive controller when overcurrent occurs								

		4T02P2	4T03P7	4T05P5	4T07P5	4T0011	4T0015	4T0018	4T0022	4T0030
	protection	to any tow phases at output side.								
	Input open phase protection	In case that open phase inputted during operation, cut off output to protect the drive controller								
	Output open phase protection	In case that open phase outputted during operation, cut off output to protect the drive controller.								
	Overvoltage threshold	Bus-bar voltage, 810V(400V series)								
	Under-voltage threshold	Bus-bar voltage 380V(400V series)								
	Instantaneous blackout compensation	15ms above protection								
	Heat sink overheat	Protection through the thermistor								
	Antistall	Antisall protection launched when running speed deviation more than 30% of the rated speed								
	Impulse encoder failure	PG disconnection								
	Brake protection	Protection launched when automatically detecting the abnormal condition of brake								
	Module protection	Protection against over-current , short-circuit, overheating								
	Current sensor protection	Self-inspection when power connection								
	Speed reversal protection	Inspection through encoder								
	I^2t protection	Inspection through three-phase current								
	Protection against input overvoltage	400V level＞ 725V，200V level ＞360V,stop and inspect								
	Output grounding protection	Any phase grounding short-circuited during operation, cut off output and protect the frequency converter.								
	Protection against output imbalance	Cut off output and protect frequency converter, after three phase current output imbalance being detected during running.								
	Short-circuit protection for brake resistor	Inspection when braking								
	Encoder interference	Evaluate the degree of interference of encoder and alarm								
	Over-speed protection	Protection launched when exceeding rated speed by 100％								
	Low-speed protection	Protection launched when the elevator running speed is far lower than the rated speed due to some reasons including failures.								
	Running time governor protection	Protection launched when floor passing time exceed the required time								

		4T02P2	4T03P7	4T05P5	4T07P5	4T0011	4T0015	4T0018	4T0022	4T0030
	Leveling switch fault protection	Protection launched when leveling switch is at fault								
	EEPROM fault	Self-inspection when power connection								
Display	LCD in Chinese and English	Menus at each level								
Environment	Surrounding temperature	-10～+45℃								
	Humidity	Below 95%RH（no condensation）								
	Storage temperature	-20～+60℃（temperature allowable during short-term transport）								
	Application place	indoor（no corrosive gas 、dust and the like）								
	Altitude	Below 1000m								
Structure	Protection grade	IP20								
	Cooling mode	Force air-cooling								
Installation mode		In-cabinet installation								

3 Installation Dimensions/Mass of Integrated Drive Controller

See Figure 3.1 and Table 3.1 for installation dimensions and mass of integrated drive controllers.

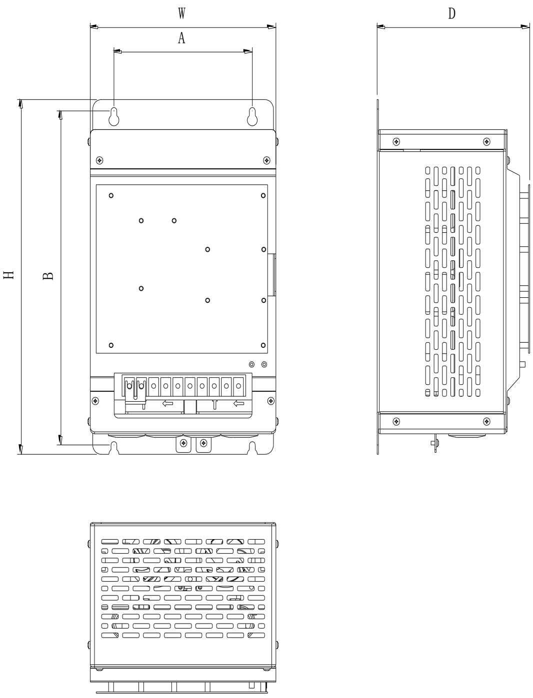


Diagram 3.1 Installation Dimensions of Integrated Drive Controller

Table 3.1 Mass Specifications of Integrated Drive Controller

<table>
<tr><th rowspan="2">Model
AS360-</th><th rowspan="2">A
(mm)</th><th rowspan="2">B
(mm)</th><th rowspan="2">H
(mm)</th><th rowspan="2">W
(mm)</th><th rowspan="2">D
(mm)</th><th rowspan="2">Installation hole diameter Φ(mm)</th><th colspan="3">Installation</th><th rowspan="2">Tightening torque (Nm)</th><th rowspan="2">Mass
(kg)</th></tr>
<tr><th>Bolt</th><th>Nut</th><th>Mass (kg)</th></tr>
<tr><td>4T02P2</td><td rowspan="8">165.5</td><td rowspan="5">357</td><td rowspan="5">379</td><td rowspan="5">222</td><td rowspan="5">205.5</td><td rowspan="8">7.0</td><td rowspan="8" colspan="2">4M6</td><td rowspan="8">4Φ6</td><td rowspan="8">3</td><td rowspan="5">8.2</td></tr>
<tr><td>4T03P7</td></tr>
<tr><td>4T05P5</td></tr>
<tr><td>4T07P5</td></tr>
<tr><td>4T0011</td></tr>
<tr><td>4T0015</td><td rowspan="3">392</td><td rowspan="3">414</td><td rowspan="3">232</td><td rowspan="3">205.5</td><td rowspan="3">10.3</td></tr>
<tr><td>4T18P5</td></tr>
<tr><td>4T0022</td></tr>
<tr><td>4T0030</td><td>200</td><td>512</td><td>530</td><td>330</td><td>291.5</td><td>9.0</td><td colspan="2">4M8</td><td>4Φ8</td><td>6</td><td>30</td></tr>
</table>

4 Connecting Terminals of Integrated Drive Controller

4.1 Description of major loop terminals

See Diagram 4.1 for the major loop connecting terminals of AS360 series integrated drive controller.

Diagram 4.1 Main loop connecting terminals

See table 4.1 for main loop terminals function description of AS360 series integrated drive controller.

Table 4.1. Function Description of Main Loop Terminals

Terminal Label	Function Description
⊕1	Connect DC reactor externally, short connected in factory
⊕2	
⊕2	External braking resistor connection
B	
⊖	DC bus negative output terminal
R/L1	Major loop AC power input; connect three-phase input power.
S/L2	
T/L3	
U/T1	integrated drive controller output; connect three-phase synchronous/asynchronous motor.
V/T2	
W/T3	

4.2 Description of Control Loop Terminals

See Diagram 4.2 for control loop terminal of AS360 series integrated drive controller.

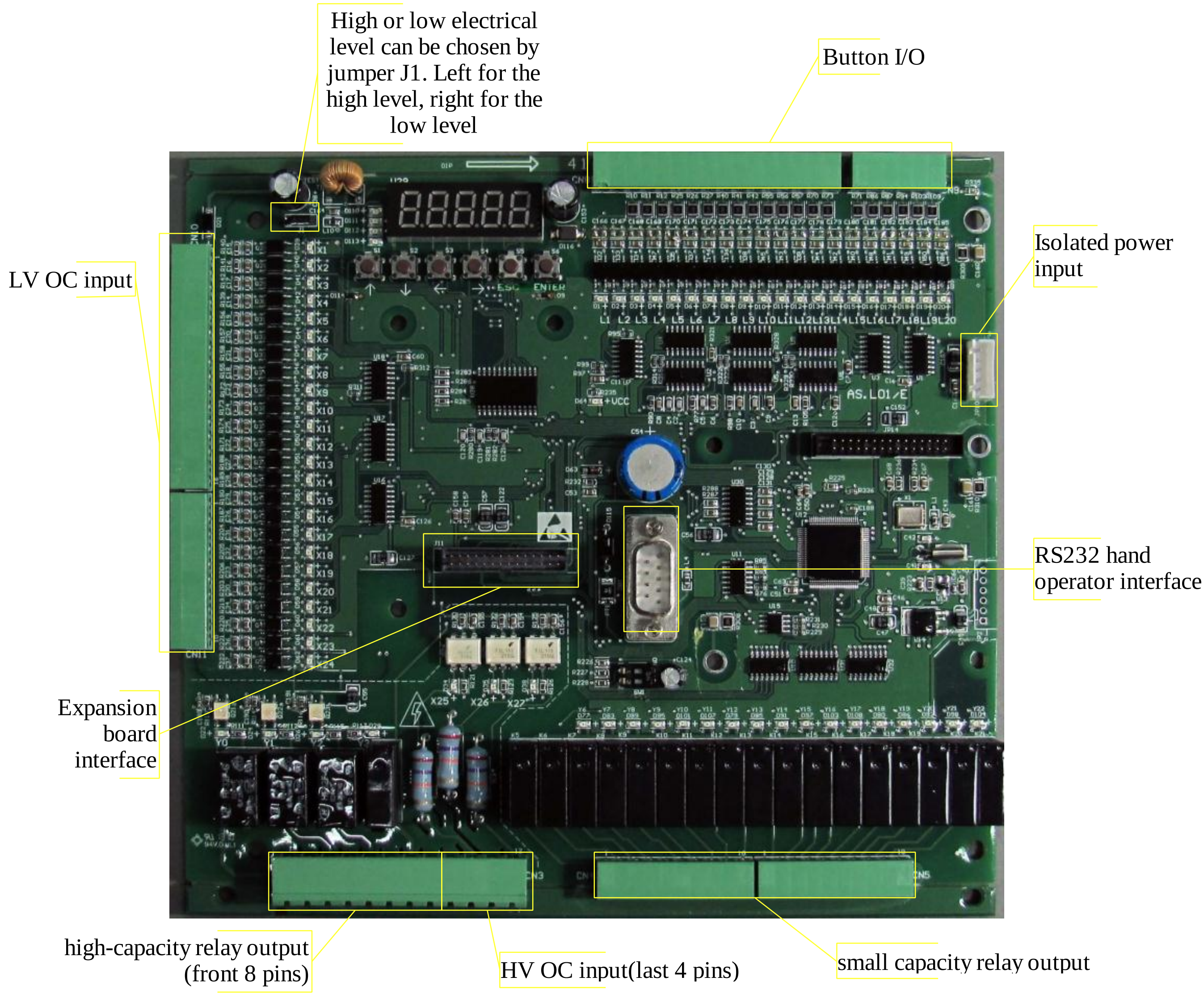


Diagram 4.2 Control Loop Terminals

See Table 4.2 for control loop terminals function description of AS360 series integrated drive controller.

Table 4.2 Function Description of Control Loop Terminals

No.	Position	Name	Definition	Default Definition	Type	Remark
CN3	CN3.1	Y0	Can be redefined	Brake excitation	Output	0：No definition 1：Run contactor 2：Brake contactor 3：Brake excitation 4：Fan lighting
	CN3.2	M0	Common port Y0		Common port	
	CN3.3	Y1	Run contactor		Output	
	CN3.4	M1	Common port Y1		Common port	
	CN3.5	Y2	Brake contactor		Output	
	CN3.6	M2	Common port Y2		Common port	
	CN3.7	Y3	Can be redefined	Fan lighting	Output	0：No definition 1：Run contactor 2：Brake contactor 3：Brake excitation 4：Fan lighting
	CN3.8	M3	Common port Y3		Common port	
	CN3.9	XCM	High pressure Common port		Common port	
	CN3.10	X25	Safety circuit		Input	
	CN3.11	X26	Hall door lock		Input	
	CN3.12	X27	car door lock		Input	
CN4	CN4.1	Y6	Can be redefined	Openning front door output	Output	0：Not used 6：Opening front door 7：Closing frongt door 8：Openning back door 9：Closing back door 10：Low display code 1 11：Low display code 2 12：Low display code 3 13：Low display code 4 14：Low display code 5 15：Low display code 6 16：Low display code 7 17：Up direction 18：Down direction 19：Negative floor
	CN4.2	Y7		Closing frongt door output	Output	
	CN4.3	Y8		Openning back door output	Output	
	CN4.4	Y9		Closing back door output	Output	
	CN4.5	YM1		Common port Y6-Y9	Common port	
	CN4.6	Y10		Low display code 1	Output	
	CN4.7	Y11		Low display code 2	Output	
	CN4.8	Y12		Low display code 3	Output	

No.	Position	Name	Definition	Default Definition	Type	Remark
	CN4.9	Y13		Low display code 4	Output	20：Fire fighting back 21：buzzer 22：overload 23：arriving station bell 24：Full load 25：maintenance 26：Fan lighting 2 27：Open door ahead of time 28：High floor 29：integrated drive Controller running normally 30：Emergency leveling 25：maintenance 26：Fan lighting 2 27：Open door ahead of time 28：High floor 29：integrated drive Controller running normally 30：Emergency leveling
	CN4.10	Y14		Low display code 5	Output	
CN5	CN5.1	Y15		Low display code 6	Output	
	CN5.2	Y16		maintenance	Output	
	CN5.3	YM2		Common port Y10-Y16	Common port	
	CN5.4	Y17		Up direction	Output	
	CN5.5	Y18		Down direction	Output	
	CN5.6	Y19		Negative floor	Output	
	CN5.7	Y20		Fire fighting back	Output	
	CN5.8	Y21		buzzer	Output	
	CN5.9	Y22		overload	Output	
	CN5.10	YM3		Common port Y17-Y22	Common port	
CN8	CN8.1	24V	24V			
	CN8.2	COM	COM		Common port	
	CN8.3	L1	Can be redefined	front door open button	Button	201：front door open button 202：front door close button 203：front door keep opening 204：Door 2 options 211~220：1~10 floor front door instruction 221~229：1~9 floor front door up call 232~240：2~10 floor front door down call 301：Back door open button 302：Back door close button 303：Back door keep opening 311~320：1~10 floor back door instruction 321~329：1~9 floor back door up call 332~340：2~10 floor back
	CN8.4	L2		front door close button	Button	
	CN8.5	L3		front door keep opening	Button	
	CN8.6	L4		back door open button	Button	
	CN8.7	L5		front door 1st floor instruction	Button	
	CN8.8	L6		front door 2nd floor instruction	Button	
	CN8.9	L7		front door 3rd floor instruction	Button	
	CN8.10	L8		front door	Button	

No.	Position	Name	Definition	Default Definition	Type	Remark
				4th floor instruction		door down call
	CN8.11	L9		front door 5th floor instruction	Button	
	CN8.12	L10		back door close button	Button	
	CN8.13	L11		Back door 1st floor instruction	Button	
	CN8.14	L12		Back door 1st floor up call	Button	
	CN8.15	L13		Front door 1st floor up call	Button	
	CN8.16	L14		Front door 2nd floor up call	Button	
CN9	CN9.1	L15		Front door 3rd floor up call	Button	
	CN9.2	L16		Front door 4th floor up call	Button	
	CN9.3	L17		Front door 2nd floor down call	Button	
	CN9.4	L18		Front door 3rd floor down call	Button	
	CN9.5	L19		Front door 4th floor down call	Button	
	CN9.6	L20		Front door 5th floor down call	Button	
CN10	CN10.1	24V	24V			
	CN10.2	COM	COM		Common port	

No.	Position	Name	Definition	Default Definition	Type	Remark
	CN10.3	X1	Can be redefined	Door area	Input	Door area switch must be defined as X1,X23 or X24 when there're 1 leveling switch(F76=1); Up and down leveling switch must be defined as X1,X23 or X24 when there're 2 leveing switches(F76=0)
	CN10.4	X2	KMY detection（Normal close）		Input	1~99：Normal open 101~199：Normal close 4：KMY detection 5：KMB detection 6：brake switch 1 7：sealing star feedback 8：Open door ahead of time detection 9：maintenance（only normal close） 10：upgoing（Only normal open） 11：downgoing:（Only normal open） 12：Fire fighting back 13：reserved 14：Lock elevator 15：upper limit 16：lower limit 17：Up decelerate 18：Down decelerate 19：overload 20：full load 21：reserved 22：open front door in place 23：open back door in place 24：close front door in place 25：close back door in place 26：front door screen 27：back door screen 28：driver 29：drive straightly 30：driver reversing 31：independent
	CN10.5	X3	KMB detection（Normal close）		Input	
	CN10.6	X4	detection（Normal close）		Input	
	CN10.7	X5	upgoing		Input	
	CN10.8	X6	downgoing		Input	
	CN10.9	X7	Can be redefined	Fire fighting back	Input	
	CN10.10	X8		Lock elevator	Input	
	CN10.11	X9	Can be redefined	upper limit（Normal close）	Input	
	CN10.12	X10		lower limit（Normal close）	Input	
	CN10.13	X11	Up decelerate（Normal close）		Input	
	CN10.14	X12	Down decelerate（Normal close）		Input	
	CN10.15	X13	Can be redefined	overload	Input	
	CN10.16	X14		open front door in place（Normal close）	Input	
CN11	CN11.1	X15		front door screen（Normal close）	Input	
	CN11.2	X16		driver	Input	
	CN11.3	X17		driver reversing	Input	
	CN11.4	X18		close front door in	Input	

<table>
<tr><th>No.</th><th>Position</th><th>Name</th><th>Definition</th><th>Default Definition</th><th>Type</th><th>Remark</th></tr>
<tr><td rowspan="7"></td><td></td><td></td><td rowspan="7"></td><td>place （ Normal close）</td><td></td><td rowspan="5">32：door 2 Selection
33：Emergency leavling
34：open door button
35：close door button
36：Safety circuit
37：Door lock circuit 1
38：Door lock circuit 2
39：half load
40：brake switch 2
41：front door safety contact board
42：back door safety contact board
43：back-up source
44：earthquake
45：firemen
46：terminal switch</td></tr>
<tr><td>CN11.5</td><td>X19</td><td>Full load</td><td>Input</td></tr>
<tr><td>CN11.6</td><td>X20</td><td>open back door in place （ Normal close）</td><td>Input</td></tr>
<tr><td>CN11.7</td><td>X21</td><td>close back door in place （ Normal close）</td><td>Input</td></tr>
<tr><td>CN11.8</td><td>X22</td><td>back door screen （Normal close）</td><td>Input</td></tr>
<tr><td>CN11.9</td><td>X23</td><td>up leveling</td><td>Input</td><td rowspan="2">Door area switch must be defined as X1,X23 or X24 when there're 1 leveling switch(F76=1); Up and down leveling switch must be defined as X1,X23 or X24 when there're 2 leveing switches(F76=0)</td></tr>
<tr><td>CN11.10</td><td>X24</td><td>down leveling</td><td>Input</td></tr>
<tr><td>J11</td><td colspan="6">expansion interface</td></tr>
<tr><td>J12</td><td colspan="6">Other encoder interface</td></tr>
</table>

Note：The Port definitions of CN4.6、CN4.7、CN4.8、CN4.9、CN4.10、CN5.1（That is outputs:Y10、Y11、Y12、Y13、Y14、Y15、Y16）can be refered of the detailed instructions of F78 in "chapter 6.2 Detailed instructions of mainboard F parameters"

Table4.3 Dial switch SW1 Setup instructions

SW1	ON	Burning program state	Factory setup is OFF (Maintain OFF during operation)

4.3 main extension board SM.09IO/D introduction

4.3.1 main extension board SM.09IO/D outside view

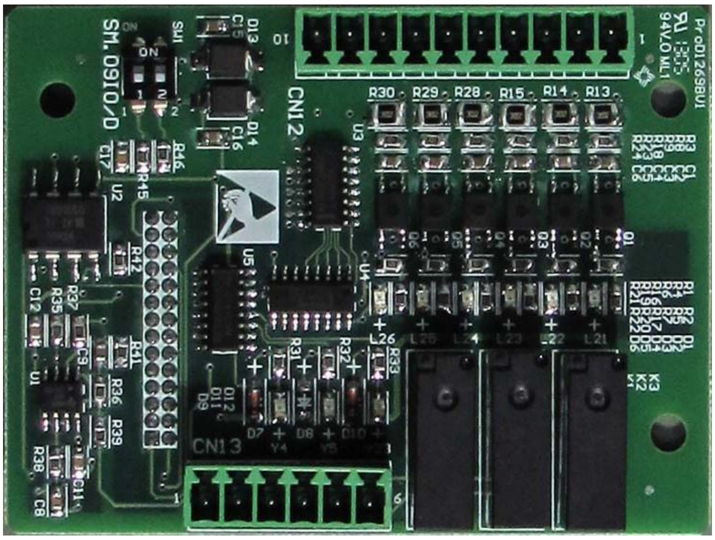


Diagram 4.3 The outside view of extension board

4.3.2 The Port definitions of the extension board SM.09IO/D

Table 4.4 Port definitions of extension board

No.	Position	Name	Definition	Default Definition	Type	Remark
CN13	CN13.1	Y4	Can be redefined	Unused	Output	0：Unused 6：front door open 7：front door close 8：back door open 9：back door close 10：low Seven-segment code a 11：low Seven-segment code b 12：low Seven-segment code c 13：low Seven-segment code d 14：low Seven-segment code e 15：low Seven-segment code f 16：low Seven-segment code g 17：Up direction 18：Down direction 19：Negative floor 20：Fire fighting back 21：buzzer 22：overload 23：arriving station bell 24：full load
	CN13.2	M4		Unused	Common port	
	CN13.3	Y5		Unused	Output	
	CN13.4	M5		Unused	Common port	
	CN13.5	Y23		Unused	Output	
	CN13.6	YM23		Unused	Common port	

No.	Position	Name	Definition	Default Definition	Type	Remark
						25：maintenance 26：Fan lighting 2 27：Open door ahead of time 28：High floor 29：integrated drive Controller running normally 30：Emergency leveling
CN12	CN12.1	L21	Can be redefined	Unused	Button	201：front door open button 202：front door close button 203：front door keep opening 204：Door 2 options 211~220：1~10 floor front door instruction 221~229：1~9 floor front door up call 232~240：2~10 floor front door down call 301：Front door open button 302：Front door close button 303：Front door keep opening 311~320：1~10 floor front door instruction 321~329：1~9 floor front door up call 332~340：2~10 floor back door down call
	CN12.2	L22		Unused	Button	
	CN12.3	L23		Unused	Button	
	CN12.4	L24		Unused	Button	
	CN12.5	L25		Unused	Button	
	CN12.6	L26		Unused	Button	
	CN12.7	CAN+	CAN communication interface			
	CN12.8	CAN-				
	CN12.9	Ai	Analog input interfaces（0-10V）		Input	
	CN12.10	M			Input	
J3	Extension interface					

4.3.3 Dial switch SW2 Setup instructions of extension board SM.09IO/D

The Setup instructions of Dial switch SW2, shown as table 4.5 below.

Table 4.5 Dial switch SW2 Setup instructions of extension board SM.09IO/D

SW2	ON	Monitor CAN terminal resistance valid state	Factory setup is OFF for SW2
	OFF	Monitor CAN terminal resistance Invalid state	

4.4 PG Card

The following part introduce the PG card suitable for the SIN/COS encoder.

4.4.1 SIN/COS PG card terminal arrangements

See diagram 4.4 for SIN/COS PG card (Model AS.T024) terminal arrangements.

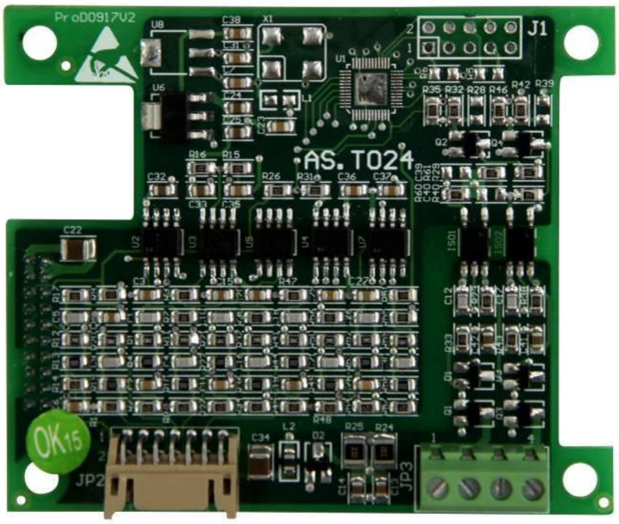


Diagram 4.4 SIN / COS PG card (Model AS.T024) terminal arrangements

4.4.2 SIN/COS PG Card Terminal Label

JP2 is input terminal (14-pin socket) with labels as follows:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
NC	NC	R-	R+	B-	B+	A-	A+	D-	D+	C-	C+	0V	V+

JP3 is (fractional frequency) output terminal with labels as follows:

FA	V0	FB	V0

4.4.3 SIN/COS PG card terminal function description

See Table 4.4 for SIN/COS PG card (AS.T024) terminal functions.

Table 4.6 SIN/COS PG card terminal function description

Name	Terminal Label	Function Description	Specifications
Collector open output	FA	fractional frequency signal output Phase A	Triode close/open output (Max. output frequency 100kHz)；
	0V	24V GND	
	FB	Fractional frequency signal output Phase B	
	0V	24V GND	
Encoder input	A+,A-	Encoder Phase A signal	Differential signal; Max. input frequency: 100kHz
	B+,B-	Encoder B phase signal	
	R+,R-	Encoder Z signal	
	C+,C-	Encoder SIN signal	
	D+,D-	Encoder COS signal	
	V+	+5V	
	0V	+5V GND	

5 Parameter Table of Integrated Drive Controller

Table 5.1 F Parameter List

No.	Name	Factory Setup	Scope	Unit	Remarks
F00	Accelerating slope	0.3	0.200～1.500	m/s^2	
F01	Decelerating slope	0.3	0.200～1.500	m/s^2	
F02	S curve T0 (initial S angle time T0)	1.3	0.300～3.000	s	
F03	S curve T1 (S angle T1 at end of acceleration)	1.1	0.300～3.000	s	
F04	S curve T2 (S angle time T2 at the beginning of deceleration)	1.1	0.300～3.000	s	
F05	S curve T3 (S angle time T3 at the end of deceleration)	1.3	0.300～3.000	s	
F06	Nominal speed	0.5	0.100～10.000	m/s	
F09	Parking floor	1	1～10	×	
F10	Offset floor	0	0～10	×	
F11	Floor number	5	2～10	×	
F12	Inspection speed	0.25	0～0.630	m/s	
F13	Re-leveling speed	0.06	0.010～0.150	m/s	
F14	Closing delay 1 (repsonse to hall call)	20	0～300.0	s	
F15	Closing delay 2 (repsonse to car call)	20	0～300.0	s	
F16	brake delay	0.2	0～2.0	s	
F17	Automatic enable signal release time	0.6	0.2～3.0	s	
F18	Fire floor	1	1～10	×	
F20	Base station return delay time	0	0～65535	s	0 represents not open; other numbers represents open and delayed time.
F21	Leveling switch motion delay distance (full-speed)	6	0～40	mm	
F22	Single and Duplex return to base station	1	1～10	×	
F23	Group control mode	0	0～3	×	
F25	Input type 1 (normal open or close setup for X0～X15 input point)	28430	0～65535	×	

No.	Name	Factory Setup	Scope	Unit	Remarks
F26	Input type 2 (normal open or close setup for X16～X25 input point)	58	0～65535	×	
F29	Service floor 1 (Set up if 1～16 floors can be docked)	65535	0～65535	×	
F33	Auomatic operation interval for test run	5	0～60	s	
F34	Automatic operation times for test run.	0	0～65535		
F35	Firefighting switch input definition and firefighting mode selection	0	0～65535	×	Bit0: 0: ordinary firefighting, 1: Schindler fire mode Bit1: 0: fireman switch without lift car board; 1: fireman switch with lift car board Bit2: 0: ordinary firefighting signal display; 1: Shandong firefighting signal display Bit3: 0: Motherboard X15 input for firefighting return; 1: Motherboard X15 input for fireman switch
F36	Band-type Brake switch detection mode	0	0～2	×	
F40	Weight data bias	48	0～100	%	
F41	Weighter study and parameter setup command.	0	0 / 1 / 2 / 10 / 20 / 30 / 40 / 50 / 60	×	
F43	Buzzing/flashing function selection for attendant status call	3	0～65535	×	
F44	Serial communication address (255 for non-monitor)	255	0～255	×	
F49	Emergency leveling orientation mode	0	0～2		
F50	Front door opening permission 1 (opening setup value for 1～16 floors)	65535	0～65535	×	
F53	Rear door opening permission 1 (opening setup value for 1～16 floors)	0	0～65535	×	
F56	Up leveling adjustment (50 to refernece value)	50	0～240	mm	
F57	Down leveling adjustment (50 to refernece value)	50	0～240	mm	
F59	Zero speed brake delay	0	0～10.00	0.01s	

No.	Name	Factory Setup	Scope	Unit	Remarks
F61	Arrival distance by arrival gong	1200	0～4000	mm	
F62	Anti-slipping limit time	32	20～45	s	
F65	Base electrode lock mode	0	0～1	×	0: No base lock, 1: output contactor off, immediate lock
F66	With or whithout upper and lower limt	0	0～1		0:no 1:yes
F67	With or whithout entension board	0	0～1		0:no 1:yes
F68	open the function of learning normal open, normal close	0	0~1		0：open 1：close
F70	Light load uplink gain	100	0-300	%	
F71	Light load lowlink gain	100	0-300	%	
F72	Heavy load uplink gain	100	0-300	%	
F73	Heavy load lowlink gain	100	0-300	%	
F74	Light load height gain	512	0-1024		
F75	Heavy load height gain	512	0-1024		
F76	The number of leveling switch	0	0～1		0：Two leveling switch 1：One leveling switch
F77	High floor output value	1	0~6		
F78	Display code output type option	0	0~3		
F79	With or without end station switch	0	0~3		Bit0：with up end station Bit1：with down end station
F81	Serial communication function selection	0	0~1		
F82	The time delay of finding door area after single leveling switch upward	10	1~100	0.1s	
F83	The time delay of finding door area after single leveling switch downward	10	1~100	0.1s	
F115	The limit time of opening door time delay	15	3～30	s	
F116	The limit time of closing door time delay	15	3～30	s	
F117	The delay time of door foced to close or the time of keeping the door open	120	0～1800	s	
F118	Opening time for the disabled	10	0～1800	s	

No.	Name	Factory Setup	Scope	Unit	Remarks
F120	Car call number when anti-nuisance function activates.	0	0～30	×	
F121	Activate forced closing function (0 represents not activate)	0	0～1	×	
F122	Signal delay release time in Inspection.	0.3	0～10.0	s	
F128	Control of front and rear doors	1	0～15	×	
F129	Activate the functions of re-leveling and/or pre-opening	0	0～3	×	
F130	Maintain the opening/closing torque	0	0～7	×	Bit0: 1: door maintaining open Bit1: 1: door maintaining closed Bit2: 1: door maintaining closed during operation
F137	Service floor 1 (Floor 1~ 16) when NS-SW function is set.	65535	0～65535	×	
F141	Time of delay release of the main contactor (after enabled)	0.5	0.50～10.00	s	
F145	Bus voltage gain	100	80～120	％	
F146	Position error distance	180	180～1000	mm	
F147	Protection of contact detection	0	0～1		
F152	Lighting delay (fans turned off automatically, delay lighting)	180	0～65535	S	0: do not turn off the lights
F153	high-voltage input detection with or without hall door lock	1	0 / 1	×	0: No 1: Yes
F156	With or without lock relay contact detection	1	0 / 1	×	0: No 1: Yes
F161	The function of floor blocking for a time slot	0	0～65535	×	Bit0: 1: block instruction Bit1: 1: block upward call Bit2: 1: block downward call
F163	Choose whether the back-up power continues running after returning to the base in case of single elevator or parallel connection	0	0 / 1	×	0: stop running 1: may continue running
F164	Type of weighing device	99	0～99	×	See the manual for more detailed explanation

No.	Name	Factory Setup	Scope	Unit	Remarks
F165	Special control of door operation	0	0～65535	×	Bit0: 1: door closed during Ispection Bit1: 1: door closed during debug running Bit2: 1: door opened at the base station for the elevator Bit3: 1: whether to open the door by LED operator
F175	Creeping speed at startup	0.006	0～0.100	m/s	
F180	Speed gain	100	0～110.0	%	
F181	Elevator No. at mutual parallel connection mode	0	0～1	×	
F182	Slow down switch series	0	0～10	×	0: determine automatically by speed
F183	Learn trip speed	0	0～Rated speed of elevator	m/s	0：self-learning speed is at the rate of 50% of the rated speed
F186	Creeping time at startup	0.5	0～10.00	s	
F187	Monitor items	0	0～255	×	
F196	Second base station at Duplex	0	0～10	×	
F200	inverter software version	Factory setup		×	Read-only
F201	Inverter drive mode	3	0 / 1 / 2 /3	×	Set inverter basic mode: 0：V/F control mode 1：Vector control without speed sensor 2：Torque control with speed sensor 3：Vector control with speed sensor
F202	Motor type	0	0 / 1	×	0: Asynchronous 1: Synchronous
F203	Motor rated power	By Inverter parameter	0．40～160．00	KW	
F204	Motor nominal current	By Inverter parameter	0．0～300．0	A	
F205	Motor nominal frequency	50	0.00～120.00	Hz	
F206	Motor nominal rotation speed	1460	0～3000	rpm	
F207	Motor nominal voltage	By Inverter parameter	0.～460	V	
F208	Number of poles of motor	4	2～128	×	
F209	Motor nominal slip frequency	1.4	0～10.00	Hz	

No.	Name	Factory Setup	Scope	Unit	Remarks
F210	Encoder type	0	2000/1/2	×	0：incremental Encoder 1：SIN/COS Encoder 2：Endat Encoder
F211	Encoder pulse number	1024	500～16000	PPr	
F212	Zero speed PID adjustor incremental P0	130	0.00～655.35	×	
F213	Zero speed PID adjustor integral I0	80	0.00～655.35	×	
F214	Zero speed PID adjustor differential D0	0.5	0.00～655.35	×	
F215	Low speed PID adjustor incremental P1	70	0.00～655.35	×	
F216	Low speed PID adjustor integral I1	30	0.00～655.35	×	
F217	Low speed PID adjustor differential D1	0.5	0.00～655.35	×	
F218	Medium speed PID adjustor incremental P2	120	0.00～655.35	×	
F219	Medium speed PID adjustor integral I2	25	0.00～655.35	×	
F220	Medium speed PID adjustor differential D2	0.2	0.00～655.35	×	
F221	High speed PID adjustor incremental P3	140	0.00～655.35	×	
F222	High speed PID adjustor integral I3	5	0.00～655.35	×	
F223	High speed PID adjustor differential D3	0.1	0.00～655.35	×	
F224	Low speed point switch frequency F0	1	0.0～100.0	％	
F225	High speed point switch frequency F0	50	0.0～100.0	％	
F226	Zero servo time	0.5	0.0～30.0	s	
F227	Band-type Brake release time	0.25	0.00～30.00	s	
F228	Current slowdown time	0	0.00～10.00	s	
F229	Torque compensation direction	0	0/1	×	0：positive direction 1：negative direction
F230	Torque compensation gain	100	0.0～200.0	％	
F231	Torque compensation bias	0	0.0～100.0	％	

No.	Name	Factory Setup	Scope	Unit	Remarks
F232	Filtering time for feedback signal of encoder	0	1～30	ms	
F233	Feedback direction of encoder	1	0 / 1	×	1：positive sequence 0：negative sequence
F234	Motor phase sequence	1	0 / 1	×	1：positive direction 0：negative direction
F235	Motor no-load current coefficient	32	0.00～60.00	％	Unnecessary to set up nomally
F236	PWM carrier frequency	6	1.100～11.000	kHz	Do not adjust this parameter under normal circumstances
F237	PWM carrier width	0	0.000～1.000	kHz	Do not adjust this parameter under normal circumstances
F238	Regulator mode	1	0/1/2/3	×	Do not adjust this parameter under normal circumstances
F239	Output torque limit	175	0～200	％	Do not adjust this parameter under normal circumstances
F240	Input voltage of inverter	380	0～460	V	
F241	Nominal power of inverter			KW	This is a read-only query data
F242	Phase angle of encoder	0	0.0～360.0	Degree	
F243	Zero position correction of encoder	0	0/2	×	Set 2 for zero point correction

6 Fault Analysis

6.1 Control System Self-Learning Fault Code

Table 6.1 Control System Self-Learning Fault Code Table

Code	Description	Sub Code	Fault Cause Analysis
10	Dislocation of upward deceleration switch 1	01	Lost upward deceleration switch 1; Upward deceleration switch 1 have not been learn.
		02	Upward deceleration switch 1 is too short from the terminal station; When the level of deceleration switch is higher than 1; The action position of upward deceleration switch 1 is higher than 3/5 top floor position height; Or, The action position of upward deceleration switch 1 is higher than the shortest deceleration distance.
		09	Up terminal station switch haven't been learn.
11	Dislocation of downward deceleration switch 1	01	Lost downward deceleration switch 1; Downward deceleration switch 1 have not been learn when Downward deceleration switch 1 and higher lever switches act.
		02	Downward deceleration switch 1 is too short from the terminal station; When the level of deceleration switch is higher than 1; The action position of downward deceleration switch 1 is lower than 3/5 bottom floor position height; Or, The action position of downward deceleration switch 1 is lower than the shortest deceleration distance.
		09	Down terminal station switch haven't been learn.
27	Up leveling switches haven't been detected.	01	Row on the elevator, the flat during the switch OFF on flat layer switch did not change. When the elevator go upstairs, and down leveling switch is OFF, up leveling switch did not change.
28	Down leveling switches haven't been detected.	01	Row on the elevator, the flat during the switch OFF on flat layer switch did not change. When the elevator go upstairs, and down leveling switch is OFF, up leveling switch did not change.
68	The combination of the length of the self study leveling spile and the distance between the leveling switches does not meet the requirements	01	When the elevator go upwars, and the two leveling switches both have not being detected, Class 1 downward deceleration switch turns from ON to OFF, and the 2 leveling switches both have not change.
		02	Leveling switch connected reversely, the state of uperword/downward leveling switch turn from ON/ON to OFF/ON. When that happens,it is judged to be leveling swith have being connected reversely.
		03	The leveling spile is too long. Algthm: (length of the leveling spile + leveling switch space)/2 greater than 900mm.
		04	The leveling spile is too short. Algorithm: (length of the leveling spile

Code	Description	Sub Code	Fault Cause Analysis
			+ leveling switch space)/2 less than 100mm.
		05	The leveling area is too long. Algorithm: (length of the leveling spile - leveling switch space)/2 greater than 100mm.
		06	The leveling area is too short. Algorithm: (length of the leveling spile - leveling switch space)/2 less than 100mm.
69	The inconsistency of the number of self study spiles and the total storey number of the elevator and the number of the floor bias	01	It is inconsistency of the self learning floor and the floor set by parameter
		02	The height of storey is too long, and greater than 8m.

6.2 Other Control System Fault Code

Table 6.2 Other Control System Fault Code Table

Code	Description	Sub Code	Fault Cause Analysis
02	Door lock disengagement during operation (emergency stop)	01	Safety loop during operation without door lock high pressure point
		02	Safety loop during operation without door lock low pressure point
03	Elevator overtravels when going upwards	01	In automatic operation, the upper and lower limit switches are in action at the same time and the elevator is not at the highest level
		03	In upward operation, the elevator crosses the top level
04	Elevator overtravels when going downwards	01	In automatic operation, the upper and lower limit switches are in action at the same time and the elevator is not at the lowest level
		03	In downward operation, the elevator crosses the bottom level
05	Door lock will not open	01	Door fails to open in position after the door-open signal outputs for consecutive 15 seconds, reports failure for 3 times
06	Door lock will not close	01	Door fails to close in position after the door-close signal outputs for consecutive 15 seconds and reports failure for 8 times. The close button flashing after fault protection
		02	Inconsistence for 4 seconds between door-close limit and door lock determines time-out for door close. Failure reported after 8 inconsistencies. The close button flashing after fault protection. The door lock anti-shake parameter is added into door keeping close parameter(F130),whitch keeping output after the door closed for 0.5s.

Code	Description	Sub Code	Fault Cause Analysis
10	Dislocation of upward deceleration switch 1	03	Check during operation: the acting position of the upward deceleration switch on the single floor is 100mm lower than the position of the upward deceleration switch on the single floor when shaft learning.
		04	Check during operation: the acting position of the upward deceleration switch on the single floor is 150mm higher than the position of the upward deceleration switch on the single floor when shaft learning.
		05	Check during stop: the acting position of the upward deceleration switch on the single floor is 100mm lower than the position of the upward deceleration switch on the single floor when shaft learning.
		06	Check during stop: the acting position of the upward deceleration switch on the single floor is 150mm higher than the position of the upward deceleration switch on the single floor when shaft learning.
		07	In automatic operation, the upper and lower limit switches are in action at the same time and the elevator is not at the top floor
		08	The elevator is at the top floor, but upward deceleration Switch 1 is acting.
11	Dislocation of downward deceleration switch 1	03	Check during operation: the acting position of the downward deceleration switch on the single floor is 100mm higher than the position of the downward deceleration switch on the single floor when shaft learning.
		04	Check during operation: the acting position of the downward deceleration switch on the single floor is 150mm lower than the position of the downward deceleration switch on the single floor when shaft learning.
		05	Check during stop: the acting position of the downward deceleration switch on the single floor is 100mm higer than the position of the downward deceleration switch on the single floor when shaft learning.
		06	Check during stop: the acting position of the downward deceleration switch on the single floor is 150mm lower than the position of the downward deceleration switch on the single floor when shaft learning.
		07	In automatic operation, the upper and lower limit switches are in action at the same time and the elevator is not at the bottom floor
		08	The elevator is at the bottom floor, but bottom deceleration Switch 1 is not acting.
19	Door open/close fault	01	At automatic mode, during the elevator stopped, the door open limit switch and the door close limit switch act at the same time with time-out for 1.5s
20	Slip protection	01	The leveling switch dose not act for over the time set in F62 (anti-slip time) during operation(except for maintenance).

Code	Description	Sub Code	Fault Cause Analysis
		02	There are 3 kinds of speed during elevator run at low speed: The maintenance Speed V1 set by parameters; The calculated speed V2 by length of the leveling spile and leveling switch length; The calculated speed V3 by the maximum storey distance and anti-slip time. When ALP re-leveling, execute protection by the calculated result as the maximum storey distance divided by the minimum value of V1, V2, and V3, then plus 2s.
21	Motor overheating	01	Input signal at motor overheating point
22	Motor run reversely	01	Skid for consecutive 0.5 seconds (upward speed feedback<-150mm, downward speed feedback>150mm)
23	Elevator overspeed fault	01	when speed feedback value is less than allowable speed for 0.1 seconds, protect as 0.2s; when speed feedback value is greater than allowable speed for 0.1 seconds, protect as 0.1s. When the given speed is less than 1m / s, allowable speed= given speed +0.25 m / s When the given speed is greater than 1m / s, allowable speed= given speed *1.25. The maximum permissible speed < rated sppe*108%. When terminal level runs at a decelerating speed of $0.8m/s^2$, Failure 23 reported when speed feedback value is greater than allowable speed for 0.1 seconds
24	Elevator over-low speed fault	01	Failure 24 reported when speed feedback value is less than allowable speed for 0.5 seconds. When the given speed is less than 0.5m / s, allowable speed= given speed -0.25 m / s When the given speed is greater than 0.5m / s, allowable speed= given speed *0.5
27	Sensor failure for upper leveling floor	02	After high-speed operation stops, the sensor for upper leveling floor dose not act.
		03	The upper leveling sensor acting distance is greater than the maximum effective protection distance. When the length of the leveling spile is less than 300mm: the maximum protection distance for effective action = 300mm*4 When the length of the leveling spile is greater than 300mm: the maximum protection distance for effective action = the length of the leveling spile*4.
		04	The distance of the uperward leveling sensor not acting is greater than the maximum protection distance for invalid action. When the top floor is less than 3: the maximum protection distance for invalid action = maximum storey height*1.5 When the top floor is greater than 3: the maximum protection distance

Code	Description	Sub Code	Fault Cause Analysis
			for invalid action = maximum storey height*2.5
		05	After the elevator go uperward crosses over the top level, when re-leveling , and downward leveling switch turns from OFF to ON, the upward leveling switch dose not act.
28	Sensor failure for lower leveling floor	02	The sensor for lower leveling floor dose not act, after the elevator whitch run at a high speed stopped.
		03	The downward leveling sensor acting distance is greater than the maximum effective protection distance. When the length of the leveling spile is less than 300mm, the maximum protection distance for effective action = 300mm*4 When the length of the leveling spile is greater than 300mm: the maximum protection distance for effective action = the length of the leveling spile*4.
		04	The distance of downward leveling sensor not acting is greater than the maximum protection distance for invalid action. When the top floor is less than 3: the maximum protection distance for invalid action = maximum storey height*1.5 When the top floor is greater than 3: the maximum protection distance for invalid action = maximum storey height*2.5
		05	After the elevator go downward crosses over the bottom level, when re-leveling , and upward leveling switch turns from OFF to ON, the downward leveling switch dose not act.
30	Leveling position error is too large	01	Detect the leveling position error when elevator stops. This failure report when the error detected is greater than the value set by F146.
32	Safety loop disconnected in operation	01	Safety loop high pressure point disconnected in operation.
		02	Safety loop low pressure point disconnected in operation.
35	Brake contactor contact fault	01	The brake contactor adheres
		02	The brake contactor does not suck
		03	The detection Connection of the brake contactor is broken
		04	The detection Connection of the brake contactor is short met
36	Output contactor contact fault	01	Motherboard has no drive signal on circuit contactor, but input signal is detected at input testing point (adhesion failure)
		02	Motherboard has drive signal on circuit contactor, but input signal is not detected at input testing point (non-adhesion failure)
37	Door-lock contactor contact fault	01	Door lock contactor adhesion failure, without door lock high voltage detection point, and with low voltage detection point.
		02	Door-lock close signal input exists when the door-open limit signal is in action
		03	Hall door lock contactor adhesion failure, without door lock high voltage detection point, and with low voltage detection point.

Code	Description	Sub Code	Fault Cause Analysis
38	Brake switch malfunction	01	The brake switch adhered or its connection was short met
		02	The brake contactor does not suck or its connection is broken.
40	Run signal failure	01	The control part of the AIO sends out run signal, but the run signal feedback from the drive part has not being received.
		02	The running signal of the inventer lose, while the elevator running.
42	Deceleration switching error	01	Overtravel in upward movement and the lower level forces slow open/close, or overtravel in downward movement and the upper level forces slow open/close
45	Pre-opening relay detection fault	01	It's inconsistent between the output of the pre-opening relay and the input of the pre-opening detection for over 0.5s, and the relay adhere without output but with input
		02	The relay dose not suck with output but without input
49	Communication failure	01	Communications fault in drive part and control part
50	Parameter read error	01	Parameter read error
		02	The limit position parameter was wrongly set: 1)There is only one leveling switch ,but which has being set without position limit(F66=0); 2)F66=1, but the upward and downward limit position switch portshave not been defined.
		03	Leveling switch set error: 1) F76=0, and there are 2 leveling switches but the port of upward and downward limit position switches have not been defined. 2) F76=1, there is only 1 leveling switch, but the port of door area switch has not been defined, or the the port of door area switch have not been defined into high speed input port (X1, X23, X24).
		04	Terminal station switch set error.
54	Inconsistent fault of the door locks	01	The general door lock has input, but the hall door lock hasn't input.
		02	The general door lock hasn't input, but the hall door lock has input.
60	Base closure failure	01	In operation, the output contactor contact is detected disconnected, turn off the output of the AIO and report Failure 60
61	Start signal failure	01	After the brake is opened, no zero servo terminal signal is received returning from the drive part.
62	No speed output	01	After start, the elevator maintains the speed at 0, and the elevator does not move.

7 User Guidance of Seven-Segment Code Display Manipulator

See the appearance and meaning of the Seven-Segment Code Display Manipulator as shown in diagram 7.1, and detailed descriptions for the functions of the operation keys in Table 7.2.

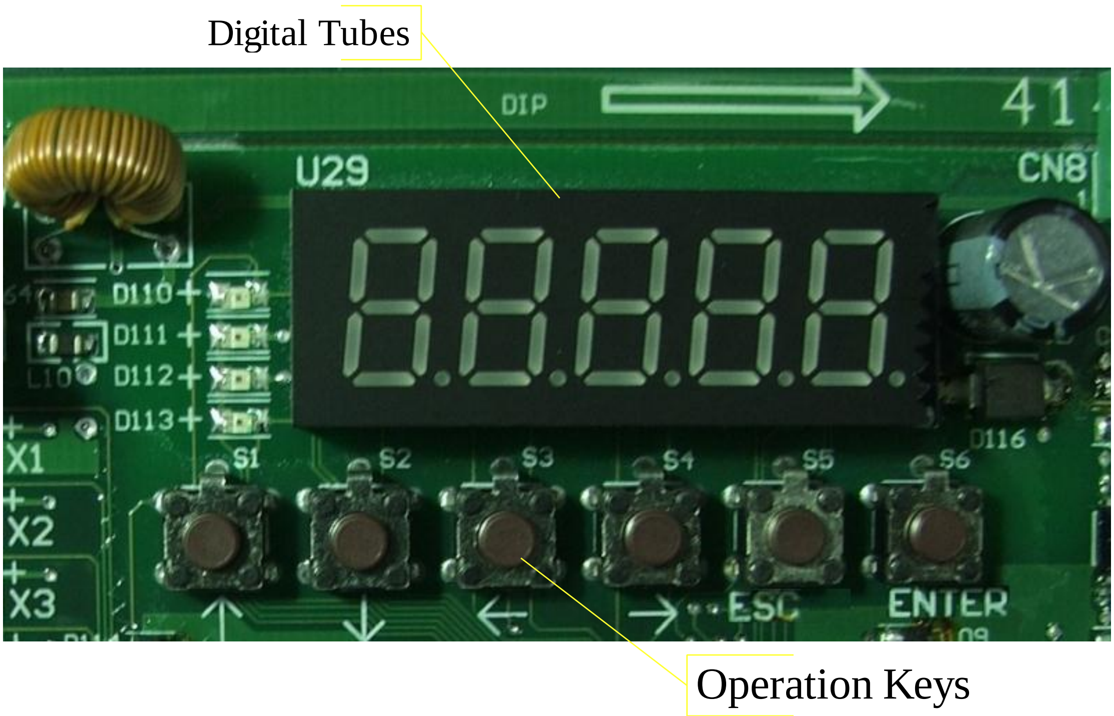


Diagram7.1 Meaning of Seven-Segment Code Display Manipulator

7.1 LED Indicator Light

Seven-Segment Code Display Manipulator has 4 LED Indicator Lights on its left. See Table7.1 for the meanings of the 4 lights.

Table8.1 Meanings of D110～D113

Code	Meaning
D110	When the safety loop conducts, this light turn bright; When the safety loop is broken, this light turn dark.
D111	State flashing light,when in normal state, flashes rapidly; when in self-study state, flashes at medium speed; when in fault state, falshes slowly.
D112	Tuns bright when the general door lock high presure loop conducts; Turns dark when the general door lock high presure loop disconnected.
D113	Tuns bright when the hall door lock high presure loop conducts; Turns dark when the hall door lock high presure loop disconnected.

7.2 Function Keys

There are 9 keys at the bottom of Manipulator. See Table 7.2 for their functions.

Table7.2 Key Function Description

Button	Name of Button	Function
∧	Upward button	1. One item upward when browsing the menu; 2. Input one digit more.
∨	Downward button	1. One item downward when browsing the menu; 2. Input one digit less.
<	Leftward button	1. One item leftward when selecting functions; 2. Cursor moves leftward when inputting data.
>	Rightward button	1. One item rightward when selecting functions; 2. Cursor moves rightward when inputting data.
ESC	Esc button	Cancel input
ENTER	MENU button	1. Modify parameters when browsing them 2. Save while entering data

7.3 Operation of Manipulator

7.3.1 Menu Structure

See Diagram 7.2 for the main menu structure. Due to the limitation of the seven-segment code and button structure, the operational interface usually uses the first level menu structure. Press the "left"and" right"key to switch between various menus.

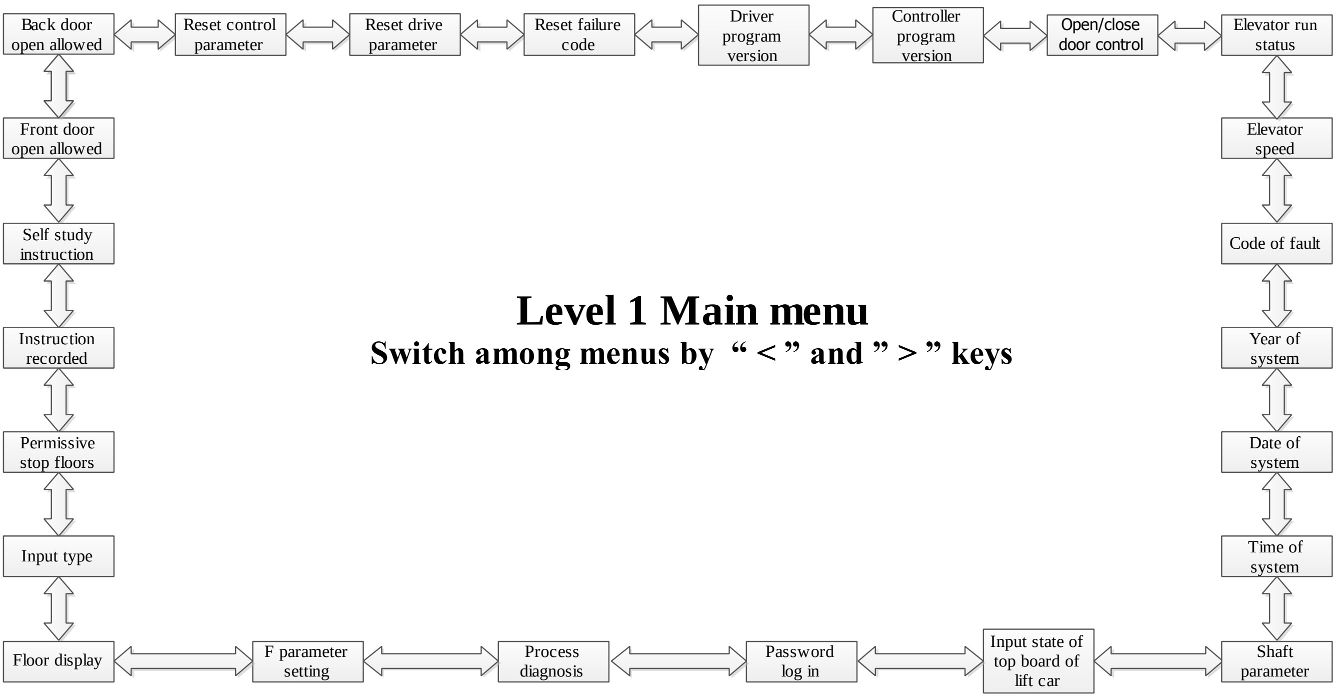
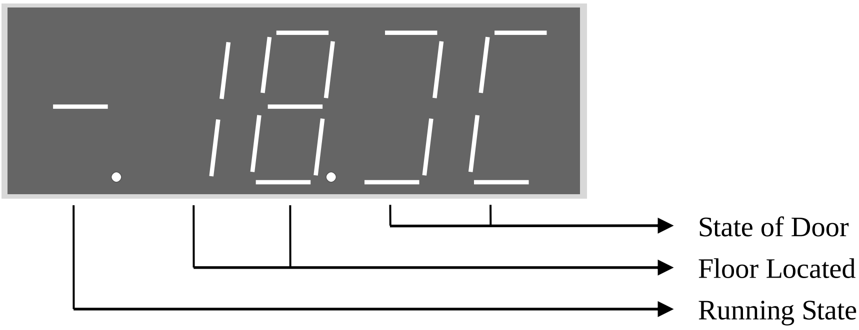


Diagram 7.2 Menu Structure

7.3.2 Switch between various menus by the left and right keys

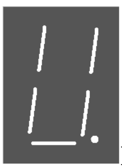
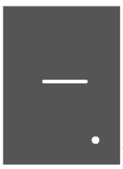
On the first level main menu interface, press the left or right key to switch between various menus. The elevator running state interface is displayed when power on each time. Detailed descriptions of each menu are as follows:

1. Elevator running state (the menu displayed when power on)



This menu displays the basic status of the elevator, including: the running state, the floor located, the state of door.

In Running State:

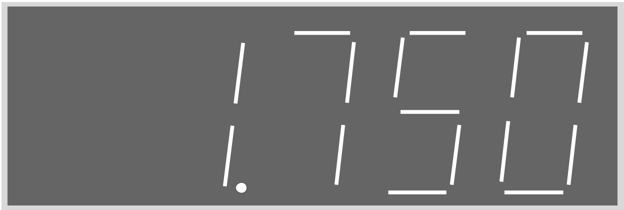
Elevator going upward, Elevator going downward, Elevator at stop

In the state of door:

Door opening, Door opened in position,

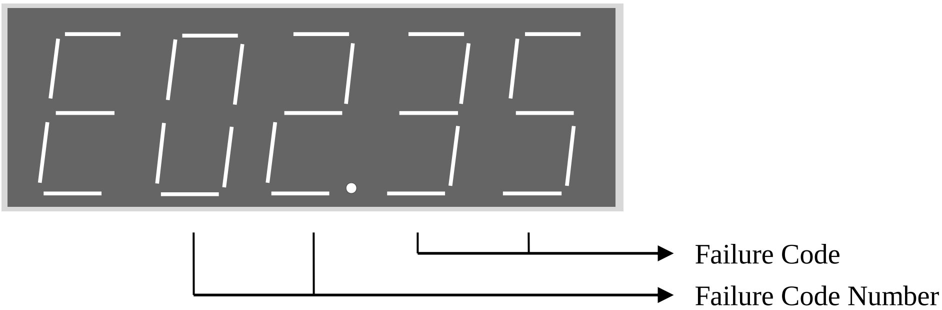
Door closing, Door closed in position.

2. Speed of Elevator



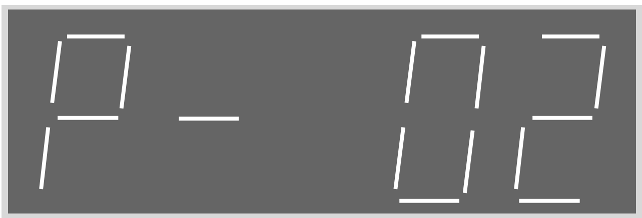
This menu displays the current running speed of the elevator, unit: m/s. As shown in the figure above, the current speed is 1.75m/s。

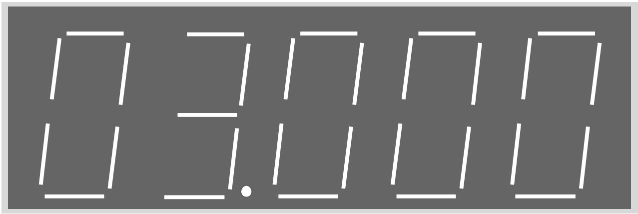
3. Failure Code



The AIO may staore 20 failure codes. The latest failure code is under No.00. Use up and down keys to view these failure codes. Press “Enter” to view the date of failure, press “left” and “right” to view the time and floor of the failure, and press “ESC” to exit.

4. Well Parameters





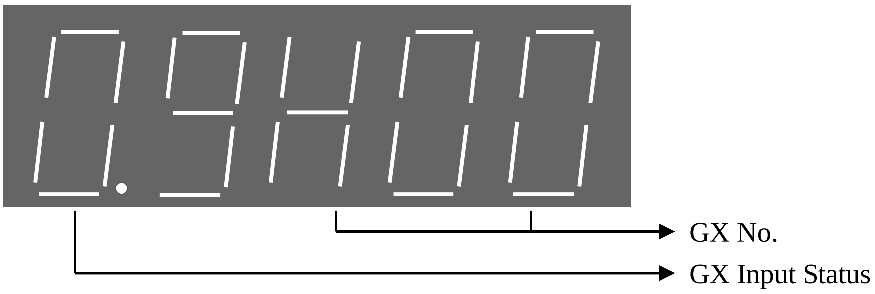
This parameter shows the data of the shaft and the length of the leveling spiles, distance of the leveling switch and the position of the deceleration switch.

Specific operation is as follows: use the "up" and "down" keys to view the parameters. Such as P02, "P-02"appears on the screen as shown above, wait a second, the screen shows the P02 parameter is 03.000, as shown above, you will see "03.000". Afterwards, "P-02" and "03.000" display alternately, each for about one second, which inditates 3 meters between Floor 1 and Floor 2. The meaning of each parameter is as follows.

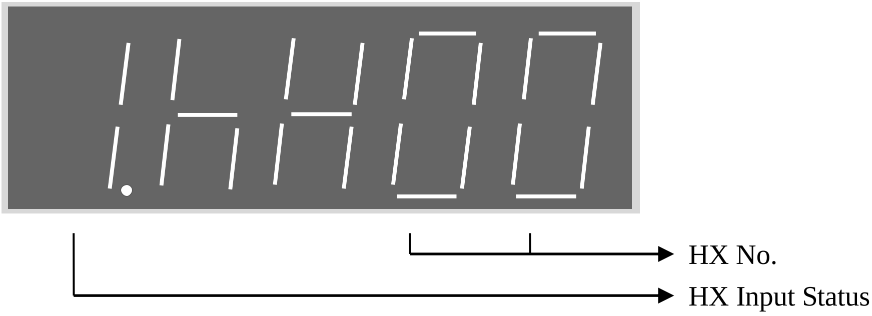
Table 7.3 Meaning of Shaft Parameters

No.	Meaning
P01-P64	Shaft data from 1st -64th floor
P65	Leveling plug-in board length
P66	Leveling switch center distance
P67	Upper deceleration switch distance on 1st floor
P68	Upper deceleration switch distance on 2nd floor
P69	Upper deceleration switch distance on 3rd floor
P70	Upper deceleration switch distance on 4th floor
P71	Lower deceleration switch distance on 1st floor
P72	Lower deceleration switch distance on 2nd floor
P73	Lower deceleration switch distance on 3rd floor
P74	Lower deceleration switch distance on 4th floor

5. Input Status of Lift Car Top Board

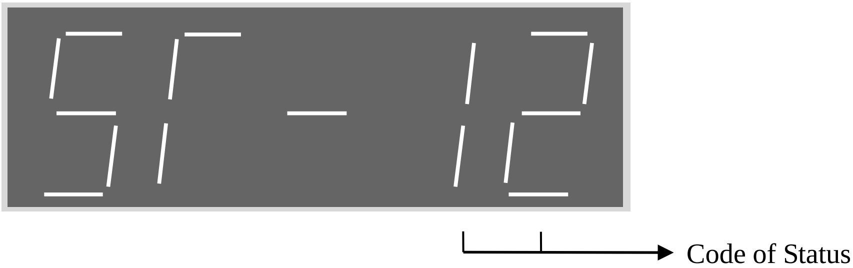


The figure above means: GX0 has no input. Press "up" and "down" keys to select GX serial number from 0 to 15. After the GX matching numbers is selected, the highest level shows that the input has no valid input (0 for invalid input, 1 for valid input).



The figure above means: HX0 has no input. Press "up" and "down" keys to select HX serial number from 0 to 15. After the HX matching numbers is selected, the highest level shows that the input end has no valid input (0 for invalid input, 1 for valid input).

6. Process Diagnosis



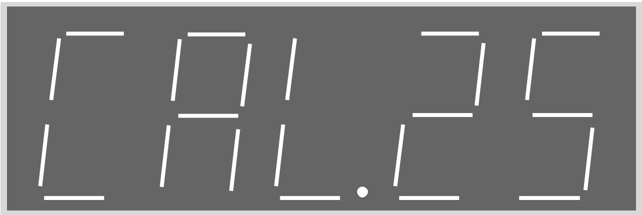
This menu displays the current status of the elevator by a two-digit number. The meaning of the status code is as follows

Table 7.4 Meaning of Status Code

No.	Description
0	Safety loop disconnected
1	Elevator breakdown
2	Motor overheating
3	Overload
4	Safety edge motion
5	Door opening button motion (door opening button or external call button motion on the same floor in the same direction)
6	Door lock short circuit/door opening limit motion
7	Elevator door opening
8	Elevator door closing
9	Door closing limit
10	Upward limit
11	Downward limit
12	Door locked, matching running conditions
13	KMY contact being in detection
14	BY contact being in detection

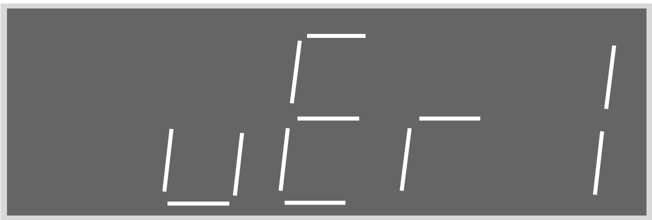
15	In zero speed servo
16	Elevator in straight running
17	Elevator in operation
18	Elevator door lock disconnected
19	Shaft learning not completed
20	Detec inverter enabled

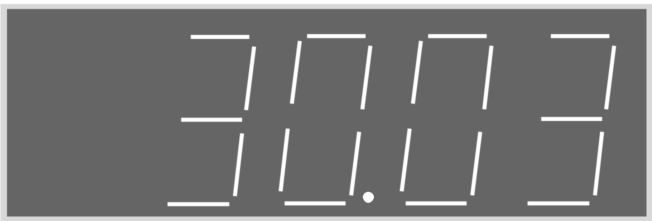
7. Command Registration



Press “up” and “down” to select the floor to be commanded; press “Enter” to confirm and the command is registered.

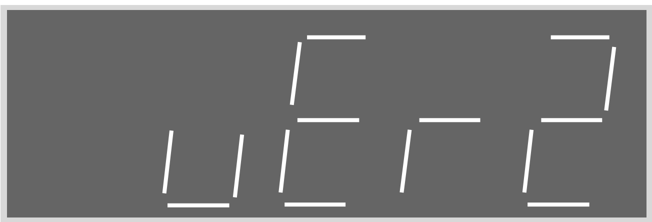
8. Version of Driver Program

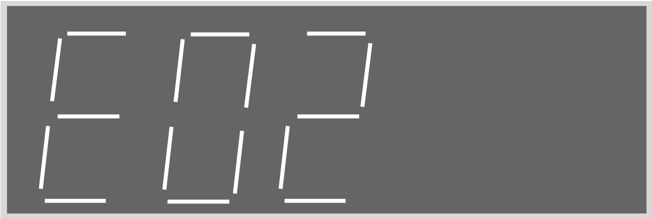




This menu displays the program version number of AIO driver. After waiting for a second, the screen shows 30.03 in the figure above. Afterwards, “VER1” and “30.03” display alternately, each for 1 second.

9. Version of Control Program





This menu displays the program version number of AIO control. After waiting for a second, the screen shows E02 in the figure above. Afterwards, “VER2” and “E02” display alternately, each for 1 second.

7.3.3 LED Displayed Numbers and Letters

Because of the structure limit of LED, numbers and letters displayed are confusing sometimes, therefore, the graph and meaning are given in the following table:

Table 7.5 Meaning of Status Code

Display	Meaning	Display	Meaning	Display	Meaning	Display	Meaning
	1		2		3		4
	5		6		7		8
	9		0		A		B
	C		D		E		F
	G		H		I		J
	K		L		M		N
	O		P		Q		R
	S		T		U		V
	W		X		Y		Z

8 Elevator Commissioning Guide

8.1 Simple Commissioning Diagram

A new elevator equipped with AS360 AIO manufactured by Shanghai STEP Electric Corporation. Its debugging process in electrical control and drive aspects is as follows.

Start

Check control cabinet before power on:

Check the grounding of power line, communication line and encoder line

Commissioning of slow car:

Confirm that the safety loop and door lock loop are connected

Confirm the upper/lower limit positions, upward/downward forced slow, priority ispection for car top and circuit connection

Set AIO parameters

Motor self study

Check upward or downward operation, and confirm that the elevator runs in the correct direction

Check upward or downward operation, and confirm that the manipulator displays the speed signal by “+” for upward and “-” for downward

Adjustment of door open/close:

Confirm that the door open/close in position signals correctly

Confirm that the safety contact edge and overload signal correctly

Press door open/close button, and confirm it can open/close normally

Shaft study:

Check upward operation. When the elevator passes through leveling floor, confirm that the switch of the down leveling switch acts before that of the up one.

Run the elevator to move upward to the up terminal landing and downward to the down terminal landing. Confirm that both upper forced slow limit position and lower forced slow limit position act correctly

Ispection operation moves to the leveling landing of the bottom and triggers the shaft study menu

In automatic state, the elevator will move automatically to the top landing at shaft study speed.

Commissioning of express car:

Configure the AIO parameters correctly.

In automatic state, record instructions, and confirm that the elevator can open/close door and brake normally

Record outside call signal, and confirm that the elevator can normally and correctly stop the car, decelerate, cancel registration and open the door.

Adjust the elevator comfort

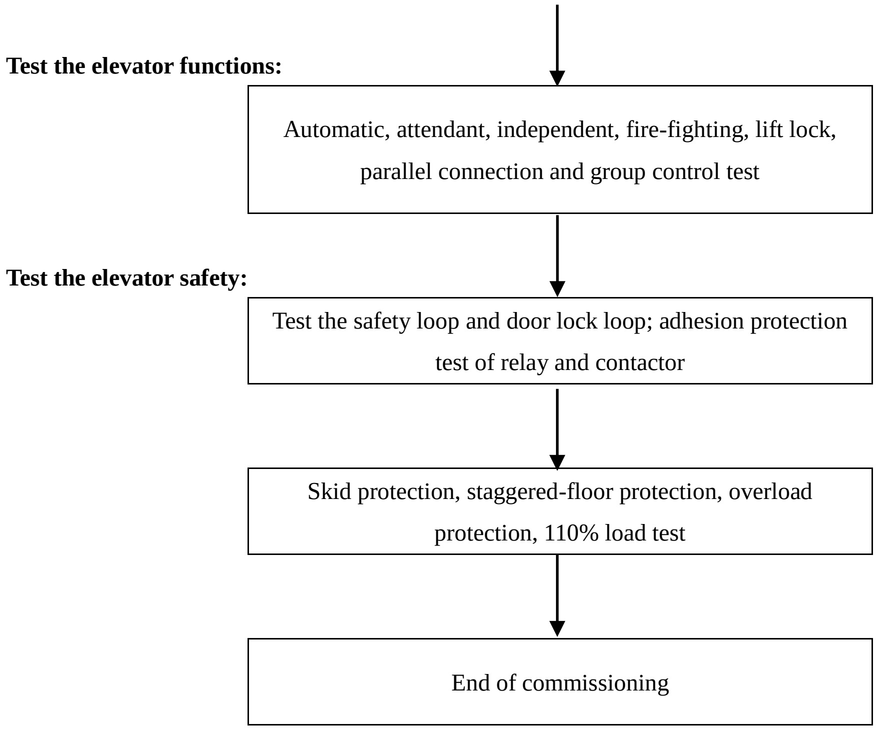


Diagram 8.1 Simple Commissioning Diagram to the the controller and the frequency converters of the AS360 AIO

8.2 Check before Power on

After installation of electrical control systems, electrical parts must be checked:

1. Check the connection of all parts, according to the user manual and electrical schematic diagram.
2. Check whether the strong current part and the weak current part are connected. Check the resistance between various voltage circuits and the earthing resistance with ohm grade of a multimeter, and they should both be ∞.
3. Please carefully check whether the power incoming line of the control cabinet and motor connections are correct, to avoid burning the elevator integrated drive controller after power on.
4. Check whether the control cabinet case, motor case, lift car earthing wire, hall door earthing wire are reliably and securely grounding, to ensure personal safety.

▲ Note: The cabinet case and the motor case should be one point grounding.

8.3 Power on and Check

8.3.1 Confirm before Power on

1. Check the control cabinet for earthing short circuit before power on:
   1) Input power line three-phase ground;
   2) Motor line three-phase ground;
   3) Terminal 220V ground;
   4) Communication line ground;
   5) Encoder line ground.

   Please exclude all items above if short circuited.

2. Grounding check: (Make sure the following items are reliably grounded)

1) Control cabinet ground;

2) Motor ground;

3) Lift car ground;

4) Door motor ground;

5) Trough ground;

6) Encoder shield control cabinet ground;

7) Encoder shield motor ground.

▲Note: single terminal grounded for asynchronous motor encoder shield, both terminals grounded for synchronous motor Encoder shield.

3. Check encoder cable and power line wiring:

Encoder lines and power lines go separate trough.

8.3.2 Checks after Power on

1. Close the main power switch. If the green light on the phase sequence relay KAP is on, the phase position is correct. If the green light is not on, shut off the main power supply, swap any two-phase positions and then power on again.

2. Check all terminal voltage of the isolation transformer TCO in the control cabinet, and see whether they are within the nominal range.

3. In the premise of carrying out the above steps correctly, proceed with the following steps:

1) Close the fuse **FUn** (n = 1, 2, 3 ...);

2) Close the door open/close power control switch; switching power supply TPB is powered on, and the motherboard is electrified to run.

Each terminal voltage of switching power supply is as follows:

Table 8.1 Terminal voltage of switching power supply

Terminal	L～N	24V～COM
voltage	220±7%VAC	24.0±0.3VDC

3) Reset the emergency stop switch of the control cabinet, connect safety loop, and the LED lights corresponding to the motherboard turned on.

4) Check the following circuit:

a) Check whether the door lock loop is normal;

b) Check whether the leveling switch signal is normal;

c) The elevator status on the handheld programmer should show "Ispection";

If abnormal, please check and correct accordingly.

8.4 Configuration of System Basic Parameters and Self Study of Motor Parameters

8.4.1 Configuration of System Basic Parameters

First set the system basic parameters in Table 5.1 correctly through a dedicated handheld LCD Manipulator (see Chapter 5 for the use of hand-held Manipulator), and then make commissioning as described in the following sections. For each new system, before setting parameters, it’s recommended to make a parameter reset through a dedicated LCD Manipulator.

Parameter reset as follows:

1) The elevator is in stop state;

2) Find "parameter reset" command interface in handheld Manipulator;

3) Align the cursor with "parameter reset" command and press Enter key, the system will complete parameter reset immediately.

After parameter reset, all the parameters are changed into factory default values. Configure the basic parameters on the basis of parameter reset, and the other parameters are set to be the factory default values, to ensure normal and reliable operation of the system.

Table 8.2 System Basic Parameters

No.	Name	Default Value	Scope	Unit	Remarks
F06	Elevator rated speed	0.500	0.100～10.000	m/s	
F09	Parking floor	1	1～64	×	
F10	Offset floor	0	0～64	×	
F11	Floor number	5	2～64	×	
F12	Ispection speed	0.250	0～0.630	m/s	
F23	Group control mode	0	0～3	×	
F25	Input Type 1 (normal open or normal closed configuration for X0 ~ X15 input point)	28430	0～65535	×	
F26	Input Type 2 (normal open or normal closed configuration for X16 ~ X25 input point)	58	0～65535	×	
F202	Motor type	0	0 / 1	×	0: asychronous 1: synchronous
F203	Motor rated power	According to inverter parameter	0．40～160．00	KW	
F204	Motor rated current	According to inverter parameter	0.0～300.0	A	
F205	Motor rated frequency	50.00	0.00～120.00	Hz	
F206	Motor rated rotary speed	1460	0～3000	rpm	
F207	Motor rated voltage	According to inverter parameter	0.～460	V	
F208	Motor pole number	4	2～128	×	
F209	Motor rated slip frequency	1.40	0～10.00	Hz	

No.	Name	Default Value	Scope	Unit	Remarks
F210	Encoder type	0	0 / 1 / 2	×	0:incremental Encoder 1:SIN/COS Encoder 2: Endat Encoder
F211	Encoder pulse number	1024	500～16000	PPr	

Note:Before debugging, the basic parameters above must be correctly set; the basic parameters of the motor can be input based on nameplate; according to the actual situation of the site, please refer to Chapter 5 for the parameter setting method and detailed definition.

8.4.2 Self learning of motor parameter

No motor parameters self study for the synchronous motor. And because AS360 series elevator integrated drive controller adopts the most advanced and unique driver technology which can automatically obtain Encoder phase angle data, therefore, there is no need for motor auto-tuning of Encoder phase angle.

Note: The drive controller of AS360 series elevator AIO is used to control synchronous motors, and every time after powered on, it will automatically capture Encoder information at its first running, which takes 2 seconds or so. Therefore, the given running signal at this time is slightly later than usual. Please do consider this detail in the design for this control system, to avoid unnecessary failure.

For the asychronous motor, if the on-site motor parameters are confirmed to be very accurate, in particular if the F209 (motor rated slip frequency) parameters are ensured to be accurate, the following self study of motor internal characteristic parameters will not be necessary. However, if the on-site motor parameters are not accurate enough, or with the purpose of ensuring excellent operating characteristics of the system, self study can be carried out on site regarding the motor internal operating parameters. Specific methods are as follows:

1) The connections between AS360 series elevator AIO and motor, between AIO and encoder have been correctly completed;

2) Correctly power on for AIO;

3) Confirm that the safety loop and door lock loop are in a normal connected state;

4) The Auto/Ispection (or emergency power operation) switch is in position of Ispection (or emergency power operation);

5) Select "asychronous motor self learning" command by Seven-Segment Code Display Manipulator or LCD handheld Manipulator, and then press the Enter key;

6) AIO starts static self learning: the main contactor between AIO and the motor will automatically suck, AIO obtains internal characteristics parameters of the motor by applying test current on the motor. But the brake contactor will not suck, neither will the motor rotate;

7) The motor parameters complete their self learning after about 30 seconds, and the main contactor releases automatically.

If the self learning does not work, mainly check the following items:

a) Whether the safety loop and the door lock loop are connected. If not, the main contactor will not suck, so it is impossible to complete the self learning;

b) Whether the Encoder wiring is correct, whether A, B phase is reversed;

c) Whether the motor parameters are set correctly.

8.5 Test Run of Slow Car

8.5.1 Ispection Operation of Engine Room and Preparations for Express Car

1. Points to be conformed by the engine room before slow car run

1) Ispection (or emergency power operation) switch of the control cabinet to "Ispection"(or emergency power operation) position, and car top Ispection switch to "normal " position;

2) Safety loop and door lock loop work properly. Remember not to have lock shorted;

3) Encoder properly installed and wired correctly;

4) After powered on, the elevator integrated drive controller displays normally and checks whether its parameters are set correctly, and handheld operator shows that the elevator is in a status of "Ispection";

5) Connect correctly the tractor brake line onto the terminal in the control cabinet;

6) The upper and lower deceleration switches are correctly wired;

7) Ispection priority circuit on the car top is correctly wired;

2. Slow run of engine room

After the engine room slow car meets the operating conditions, press the upward (downward) button on the control cabinet, and the elevator should go upward (downward) at a preset ispection speed.

1) Observe whether the elevator follows the right direction, when it goes up or down. If in the wrong direction, first check whether the up and down buttons are correctly wired. If correctly wired, change the F234 motor phase sequence parameters (from 0 to 1or from 1 to 0).

2) When the slow car goes upward or downward, if the motor displayed by AIO feedbacks an unstable speed or gives a value with significant higher, check the wiring between Encoder and the motherboard: a) whether the cable is properly used. If the Encoder is a differential signal, use shielded twisted-pair cable; if not differential signal, use general shielded cable; b) whether the wiring is reasonable. The Encoder cable and power lines should not go trunking together, and must be strictly separated; c) Check whether the shielding lines and net are reliably grounded.

3) If 2 leveling switches are installed, check whether the upper and lower leveling switches are correctly wired: when the elevator goes up slowly and before passing through the leveling floor,it should be confirmed that the down leveling switch act befor the up leveling switch. Otherwise, the shaft cannot complete self study successfully. In case of that, must swap the connection wiring of the two switches to the motherboard.

Note: Under many circumstances, slow running is not a ispection operation, but an emergency power operation. At this point, in the safety loop, the safety gear switch, speed limiter switch, upward speed protection switch, upper and lower terminal limit switch and buffer reset switch are all shorted in the slow run time, to which particular attention should be paid. It is recommended that the time and the distance of engine room emergency running should not last too long, and do not run the lift to the teminal position.

8.5.2 Car Top Ispection Operation

After engine room slow run normally, you can run the car top Ispection operations. The ispection speed may be adjusted appropriately lower in the first commissioning. After the operator entering onto the car top:

1) First set immediately the car top Auto / Ispection switch to Ispection position, and confirm that the upward and downward buttons in the control cabinet of the engine room do not work at

this moment.

2) Jog the upward and downward buttons by car top, and confirm the button direction is the same with the lift car running direction.

3) The operator should operate the elevator to the car top for a test run of back and forth, carefully observe the surrounding of the lift car and confirm that there is no obstruction for the lift car in the entire shaft.

4) By ispection operation to the car top, confirm that the shaft terminal deceleration switch act correctly and its movement position correct.

5) By ispection operation to the car top, confirm that the shaft leveling switch and leveling spiles are installed correctly, and at all leveling positions, each leveling switch act at the right point.

8.5.3 Door Open/Close Adjustment

1) Set the elevator to ispection status and leave the lift car at the leveling position;

2) Electrify gantry crane power;

3) Move the car door manually, monitor on the handheld Manipulator and confirm whether the door closing in place signal and the door opening in place signal work correctly;

4) Confirm the safety edge signal and the overload signal are not in action;

5) Confirm F165 parameter set to 0 (door operation allowed during the elevator ispection);

6) Have the car door in complete open state;

7) Press close button to confirm that the elevator door may close correctly until close in place;

8) Then, press the button to open the door, make sure the elevator door may open correctly until open in position.

8.6 Shaft Self Learning

Running well self study means the elevator runs at self study speed and records the position of each floor and the position of each switch in the shaft. As the floor location is the basis for the normal brake and operation of the elevator and for the floor display, before the express car running, it is mandatory to run shaft self learning first.

8.6.1 Shaft Self Learning Method

1. Confirm the elevator complies with safe operating conditions.
2. Confirm that all switches and its wiring within the well are correctly installed, and the connection of accompanying cables and outside cables are correct;
3. Make the elevator into ispection (or emergency electric operating) state;
4. Enter into self study menu by hand-held manipulator, follow the menu instructions, and find well self study interface. Then move the cursor to well self study command and press Enter key;
5. Set the elevator into the automatic state, and the elevator runs down to the bottom landing at the self learning speed (set by F183) and then automatically goes up at self study speed, and start well self study. Well study is complete until the elevator arrives at the top leveling position and stops automatically. The hand-held manipulator shows "self study completed" after the success of the self study;
6. During the self study process, if the control system is abnormal, self study will stop and give the corresponding fault code, and the hand-held Manipulator shows "self study unsuccessful".

Main reasons for unsuccessful well self study include:

1) The total storey number set (F11) is inconsistent with the number of leveling spiles installed in the well;

2) The number of slow down switches installed is inconsistent with the data set by parameter F182;

3) The upper and lower leveling switch wiring reversed;

4) The installed positions of the leveling switch and leveling spiles are not accurate enough that make leveling switch cann't act effectively and correctly when the leveling spile of each floor inserts;

5) The input point setting to leveling switch of normally open/normally closed is inconsistent with the actual situation;

6) The terminal deceleration switch act wrongly or is installed to a wrong position (when the lift car is at the ground floor leveling position, the down single landing terminal deceleration switch must act; before the lift car goes upward to the leveling position of the next floor bottom, the down single landing terminal deceleration switch must have been reset; when the lift car is at the top floor leveling position, the up single landing terminal deceleration switch must act, before the lift car goes downward to the leveling position of the next floor top, the up single landing terminal deceleration switch must have been reset).

7) The input point setting to the terminal deceleration swith of normally open / normally closed is inconsistent with the actual situation;

8) Encoder signal is interfered or Encoder has wiring error;

9) Leveling switch signal interfered;

10) Leveling switch failure or Encoder failure.

Special Note: during 2 landings / 2 stops self learnling,

1. As to the situation in which 2 leveling switches are installed, after the elevator in inspection state, must run the elevator to the down limit position manually,and make sure that the normally self learning operation can be done only after the up leveling switch taking off.

2. As to the situation in which only 1 leveling switch is installed, the down limit and the down limit position must short circuited, and make sure that the normally self learning operation can be done only after the down leveling switch taking off.

Note: Express car operation is only possible after well self study.

8.7 Express Car Operation

1．Test Run of Express Car

After slow car running correctly, first of all, make sure the elevator meets safe operating conditions. After well self learning, the elevator can proceed with express car test run. Specific steps are as follows:

1) Set the elevator in normal state.

2) Monitor the selected floor interface by hand-held manipulator to select the floor to where the elevator heading. Test run is possible for single floor, double floor, multi floors and full trip.

3) Check whether the elevator can correctly close the door, start, accelerate, run, cut, decelerate, stop, cancel and open.

4) In case of abnormal operation, follow the fault code (see Chapter 6) and operate

accordingly.

2．Safety Test

1) Safety loop

Testing requirements: when the elevator stops,and any of the safety switches acts, and after safety loop is disconnected, the elevator can not start; when the elevator is under Ispection operation, any of the safety switches motions, and after safety loop is disconnected, the elevator takes an emergency stop.

2) Door lock loop

Testing requirements: when the elevator stops, after any of the hall door locks is disconnected, the elevator can not start; when the elevator is under ispection operation, after any of the hall door locks is disconnected, the elevator takes an emergency stop.

3) Safety loop relay adhesion protection (This function may relieve to be tested if no safety loop relay)

Testing requirements: Press the emergency stop of control cabinet to disconnect the safety loop, and then force the safety loop relay not to release by any means. The system should be protected and not reset automatically;

4) Door lock loop relay adhesion protection (This function may relieve to be tested if no door lock loop relay)

Testing requirements: Under door-open circumstances, force the door lock loop relay not to release by any means. The system should be protected and not reset automatically;

5) Brake contactor adhesion protection

Testing requirements: Under stop circumstances, force the brake contactor not to release by any means. The system should be protected and not reset automatically;

6) Output contactor normal adhesion protection

Testing requirements: Under stop circumstances, force the brake contactor not to release by any means. The system should be protected and not reset automatically;

7) Skid protection function

Testing requirements: Move the elevator ispection to the middle floor, remove the leveling sensor lines from the control cabinet wiring terminal (assuming leveling floor signal is norm. open), switch to normal, the elevator goes leveling at low speed, the system protected within 45 seconds and will not reset automatically;

8) Split-level protection

Testing requirements: a) Move the elevator ispection to the middle floor, and switch to ispection or emergency power operation. If the terminal deceleration switch is normal closed contact, disconnect the wiring of input point at the upper single deceleration switch on the motherboard; but if it is norm. open contact, short the input and COM terminal. And thus create an intentional split-level fault, and then the system will display the top floor data. Then, change the wiring of input at the upper single deceleration switch back to normal, and operate the elevator to normal state, register the bottom instructions, elevator express car goes down, make sure the elevator can decelerate and level normally to the bottom floor and does not sink to the bottom; b) move the elevator ispection to the middle floor, and switch to ispection or emergency power operation. If the terminal deceleration switch is normal closed contact, disconnect input point wiring at the lower single deceleration switch on the motherboard; but if it is a normal open contact, short input and COM terminal. And thus create an intentional split-level fault, and then the system will display the bottom floor data. Then, change input point wiring at the lower single deceleration switch back to normal, and operate the elevator to normal state, register the top instructions, elevator express car goes up, make sure the elevator can decelerate and level normally to the top floor and does not rush to the top.

9) Overload function

Testing requirements; elevator overload switch motions, check the elevator should not be closed, the buzzer sounds inside the car, and the overload indicator light on.

8.8 Adjust Elevator Comfort

8.8.1 Factors Relating to Elevator Comfort in Operation

1. Electrical factors:

1) Operating curve parameters setting: acceleration, deceleration, S curve bend time, start brake delay, stop brake delay, etc.;

2) Vector control PID parameters: proportional gain, integral and differential constants, etc.

2. Mechanical factors:

Rail verticality, surface roughness, connection, guide shoe tightness, uniformity and tension of steel wire rope, etc.

The coordination in the mechanical system is the most fundamental factor to determine the comfort of the elevator operation; electrical parameters can only cooperate with the mechanical system, and further improve the comfort. The electrical factor is adjusted by the serial motherboard parameter and inverter parameter.

If there are problems in mechanical systems affecting the comfort, the serial motherboard parameter and inverter parameter can only improve comfort, but cannot change the mechanical defects fundamentally. The commissioning and related technicist should pay sufficient attention to this.

8.8.2 Adjust Elevator Comfort

1. Adjust Mechanical Factors

1) Slide way:

- ✧ Slideway surface roughness
- ✧ Slideway installation verticality
- ✧ Connections between slideways

The slideway verticality and the parallelism between two slideways should be controlled within the limits prescribed by the national standard (GB). If the error is too large, it will affect the elevator comfort in high-speed operation, the elevator will jitter and vibrate, or the lift car shakes from left to right in some positions.

The improper connections of slideway will generate step feelings to the elevator operation in some specific positions.

2) Tension of Guide Shoe

In case that the guide shoe is too tight, there will be step feeling, and it will generate brake feeling at stop; when guide shoe is too loose, the lift car will give shaking feeling.

If the guide shoe is the sliding sort, then a small space should be maintained between the guide shoe and the slideway. Without the space, or even guide shoe rubs the slideway surface, there will be oscillation or step feeling when the elevator starts and stops.

When commissioning, shake the lift car with your feet from left to right on the car top. It will be enough if the lift car has a obvious small displacement from left to right.

3) Uniformity of Steel Wire Rope Tension

If the steel wire rope tension is uneven, some ropes will be tight but some loose to cause jitter or oscillation in the elevator operation, and thus will affect the start, high-speed operation and stop.

In commissioning, the elevator can be stopped on the middle floor. Pull every steel wire rope manually with the same force on the car top. If the pull distance is roughly the same, the steel wire ropes are under the uniform tension; if not, must call the installer for adjusting the tension of steel wire ropes.

In addition, steel wire ropes are tied in circle around before installation, whitch with inner response torsional stress. If installed directly, the elevator operation will prone to vibrate. Therefore, before installation, it is necessary to fully release such torsional stress.

4) Lift Car Installation Fastening and Sealing

When the elevator is running at high speed, the entire lift car will be under a great force. If the lift car bracket or the lift car wall is not well fastened during high speed operation, it will generate dislocation and have the lift car vibrate. The buzzer acoustic resonance of the lift car is generally related to the fastening degree of the installation, the sealing of the lift car and the well.

5) Anti-Mechanical Resonance Device

- ✧ Pad rubber gasket under tractor shelf girder;
- ✧ Use wood chuck or other similar devices at the pigtail of the lift car steel wire rope to eliminate vibration.
- ✧ At present, for decorative effects, some lift cars use new lightweight materials, which reduces the weight of the lift car and is easy to produce "mechanical resonance ", especially in high speed elevator. When such phenomenon occurs, add appropriate load on the lift car to change its natural frequency and eliminate mechanical resonance.

6) Tractor

Sometimes improper assembly of tractor leads to poor mesh between turbine worm and gear; or due to the use time is too long, the wear of the turbine worm and gear is greater, and causes axial movement when elevator acceleration or deceleration, which generate step feeling during elevator acceleration or deceleration.

7) Lift car balance

Sometimes, the design or installation or other reasons lead to imbalance weight of the lift car to slide to one side. In the elevator operation, the guide shoe tightly rubs the slideway surface, which generates jitter or vibration. At this point, add a block on the lighter side of the lift car and test.

8) Other

Such as the parallelism of traction wheel and guide wheel, the adjustment of run-time brake clearance, etc.

2. Adjust Electrical Factors

Electrical aspects that affect comfort mainly include: the performance of the speed curve, electromagnetic interference of analog signal speed reference signal (if using analog signal speed reference method), Encoder feedback signal quality and inverter drive performance. Our later discussion is established on that all other factors above-mentioned that may affect comfort have been adjusted. How can we adjust the parameters relating to this integrated drive controller, to improve the drive performance of the system and to improve the elevator comfort.

1) Adjust starting comfort

Integrated drive controller uses original non-load sensor start-compensation technology, so even if there is no pre-load device for start compensation, it can also be adjusted by parameters to achieve good starting comfort.

a) Conventional method for adjusting starting comfort

Under normal circumstances, adjust the inverter's zero servo PID parameters and the excitation time and other parameters, to improve the starting comfort effectively. Refer to the Table below for relevant adjustment parameters.

Table 8.3 The parameter of conventional method for adjusting starting comfort

Function Code	Name	Content	Scope	Unit	Factory Setup	Remarks
F212	Zero servo gain P0	Gain value of PID regulator that takes effect on zero servo	0.00～655.35	×	130.00	
F213	Zero servo integral I0	Integral value of PID regulator that takes effect on zero servo			80.00	
F214	Zero servo differential D0	Differential value of PID regulator that takes effect on zero servo			0.50	
F226	Zero servo time	Start accelerated movement after the inverter gives operating signal and this time maintains torque.	0.0～30.0	s	0.5	

Note 1: The speed at the starting point to be adjusted around PID regulator
F226 is a zero servo time parameter, used to adjust and control the delay time given by the system speed curve; this time is also the action time of PID regulator P0, I0, and D0 at zero servo (or zero speed). See the following for the detailed timing sequence diagram.

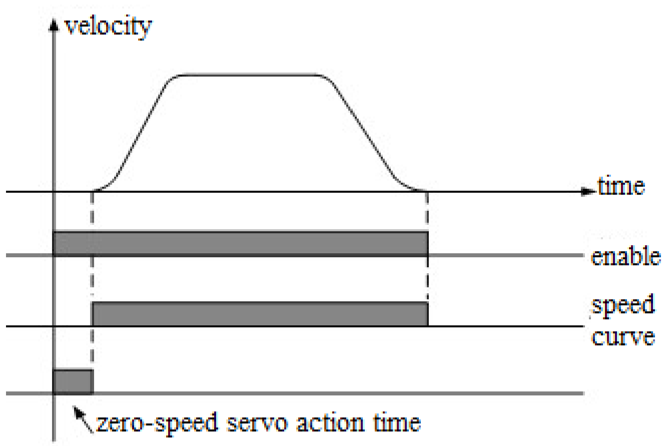


Diagram 8.2 Zero Servo Timing Sequence Diagram

When zero servo ends, AIO inverter gives the controller a signal with speed instruction, and the elevator begins to accelerate.

F212, F213 and F214 are proportional gain (P0), integral constant (I0) and the differential constant (D0) of the zero servo regulator. In adjustment, fist set P0 to a very small value, and let the elevator go downward non-loaded; at this moment, the elevator would pull-back at start. Increase the P0 value gradually, until the elevator stops pulling-back at start. However, if P0 is too large, the elevator may oscillate up and down at start. So in case of obvious oscillation at start, decrease the P0 value. I0 is the integral constant of zero-speed PID regulator at start. The greater I0 leads to the shorter the response time. If the I0 value is too small, P0 will not have enough time to motion; if I0 is too large, high frequency oscillation may be easily produced. D0 helps the system with the response speed. The larger D0 is, the faster response is; but too large D0 can cause oscillation.

b) Adjust timing sequence to improve starting comfort

The starting timing sequence is the coordination between the main contactor pull, the release of inverter upward or downward command (or enable signal), brake open and the speed signal preset, when the elevator starts. In general, at the elevator starter, the main contactor pulls first, then inverter enable signal releases, and then the brake open and the speed given command givn out. The order between the speed preset and the brake open has a great impact on the starting comfort of the elevator. The ideal coordination point is: at the mechanical movement (really open) of the brake, the speed preset is given at the same time. However, due to the brake contactor delay and the mechanical brake delay, it is not easy to give accurate data for the two motions to achieve the desired effect. The following principles may be observed for adjusting timing sequence: in no-load operation, if the downward start shows an obvious pull back, postpone the opening time of the brake (or set the preset speed earlier); if the downward start shows a weak pull back, but an obvious push for the upward start, set the brake open ahead of time(or postpone the preset speed given time). Timing Sequence diagram at start and stop as follows.

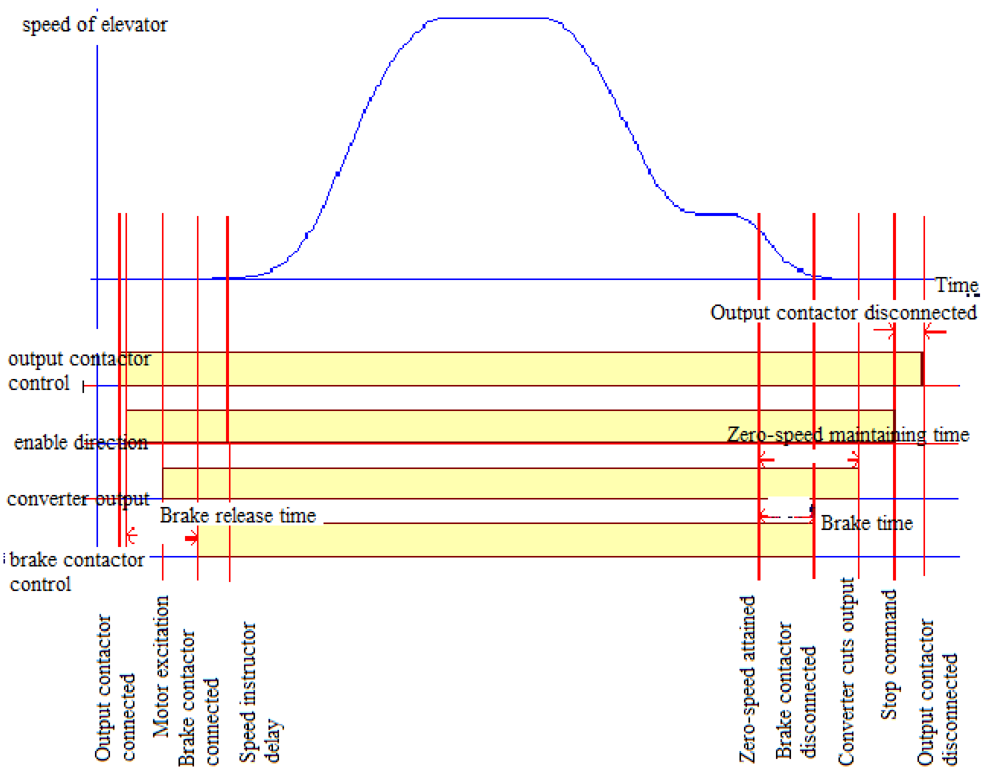


Diagram 8.3 Adjustable Timing Sequence Diagram

2) Comfort adjustment during operation

By adjusting the PID regulator parameters at each speed segment in the elevator running process, the comfort can be improved. The adjusting parameters are as follows.

Table 8.4 The comfort adjustment parameters during operation

Function Code	Name	Content	Scope	Unit	Factory Setup	Remarks
F215	Gain P1 at low speed	The effective PID regulator gain value when the given speed is lower than the switching frequency F0			70.00	See the following description
F216	Integral I1 at low speed	The effective PID regulator integral value when the given speed is lower than the switching frequency F0			30.00	See the following description
F217	Differential D1 at low speed	The effective PID regulator differential value when the given speed is lower than the switching frequency F0			0.50	See the following description
F218	Proportional P2 at medium speed	The effective PID regulator gain value when the given speed is between switching frequencies F0 and F1			120.00	
F219	Integral I2 at medium speed	The effective PID regulator integral value when the given speed is between switching frequencies F0 and F1			25.00	
F220	Differential D2 at medium speed	The effective PID regulator differential value when the given speed is between switching frequencies F0 and F1			0.20	
F221	Gain P3 at high speed	The effective PID regulator gain value when the given speed is higher than the switching frequency F1			140.00	
F222	Integral I3 at high speed	The effective PID regulator integral value when the given speed is higher than the switching frequency F1			5.00	
F223	Differential D3 at high speed	The effective PID regulator differential value when the given speed is higher than the switching frequency F1			0.10	

F224	Switching frequency F0 at low speed point	Set the switching frequency parameter of PID regulator at low speed point, which is based on a percentage of nominal frequency. If the rated frequency is 50Hz, the required switching frequency F0 is 10Hz. Because 10HZ accounts for 20% of 50Hz, the data should be set to 20	0.～100.0	％	1.0	See the following description. in the medium-speed segment between F0 and F1, PID regulation data is automatically generated by the system based on the low and high-speed PID
F225	Switching frequency F1 at high speed point	Set the switching frequency parameter of PIDregulator at high speed point, which is based on a percentage of nominal frequency. If the rated frequency is 50Hz, the required switching frequency F1 is 40Hz. Because 40HZ accounts for 80% of 50Hz, the data should be set to 80	0.0～100.0	％	50.0	See the following description. in the medium-speed segment between F0 and F1, PID regulation data is automatically generated by the system based on the low and high-speed PID

Parameters F215 ~ F217 are P, I and D values (P1, I1, D1) of the PID regulator at the low-speed section, F218 ~ F220 are P, I and D values (P2, I2, D2)of the PID regulator at the medium-speed section, F221 ~ F223 are P, I and D values (P3, I3, D3) of the PID regulator at the high-speed section. They play roles in different sections on the running curve during the entire elevator operation (see Figure 8.6). Parameters F224 and F225 are switching frequency between intervals (see Figure 8.6). Adjust Parameters F215 ~ F217, F218 ~ F220 and F221 ~ F223 and F224 and F225 to improve respectively the comfort of the elevator when running through different sections.

Increase of the proportional constant P can enhance the system's dynamic response. But if P is too large, it may generate overshoot and oscillation of the system. The impact of P on the feedback tracking is as shown below.

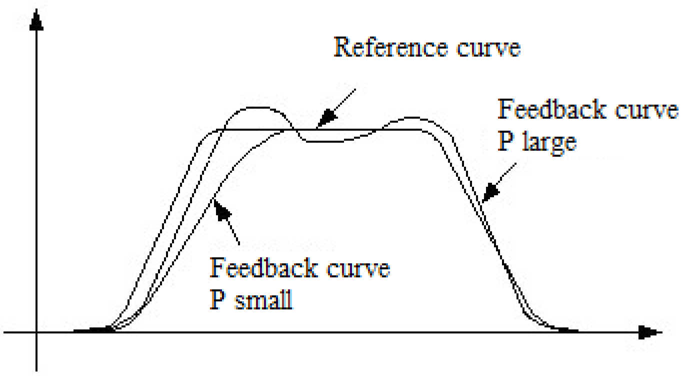


Diagram 8.4 Impact of P (Propotional Constant) on the Feedback Tracking

Increase of the integral constant I can accelerate the system's dynamic response. Increase I if the overshoot is too large or the dynamic response is too slow. But if I is too large, it may generate overshoot and oscillation of the system. The impact of P on the feedback tracking is as shown below.

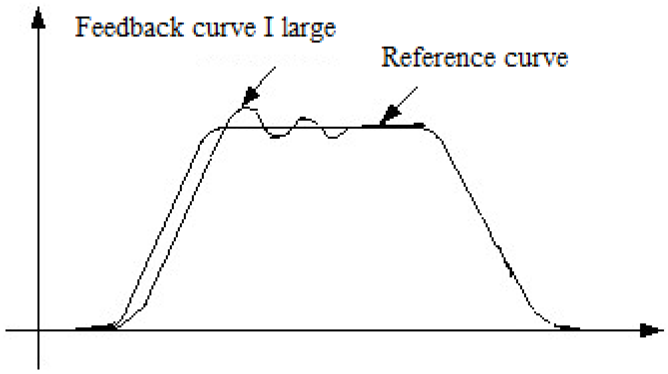


Diagram 8.5 Impact of I (Integral Constant) on the Feedback Tracking

Similarly, increasing the differential constant D can increase the sensitivity of the system. However, if D is too large, the system will be too sensitive and cause oscillation.

In the adjustment of PID regulator parameters, it is usually to adjust the proportional constant P first. Under the premise of system not oscillated, increase the P value as far as possible, and then adjust the integral constant I, so that the system has both fast response and little overshoot. Only when the adjustment results of P and I are not satisfactory, adjust the D value.

The segment of the PID regulator in Elevator operation curve is as shown in Diagram 8.6 below.

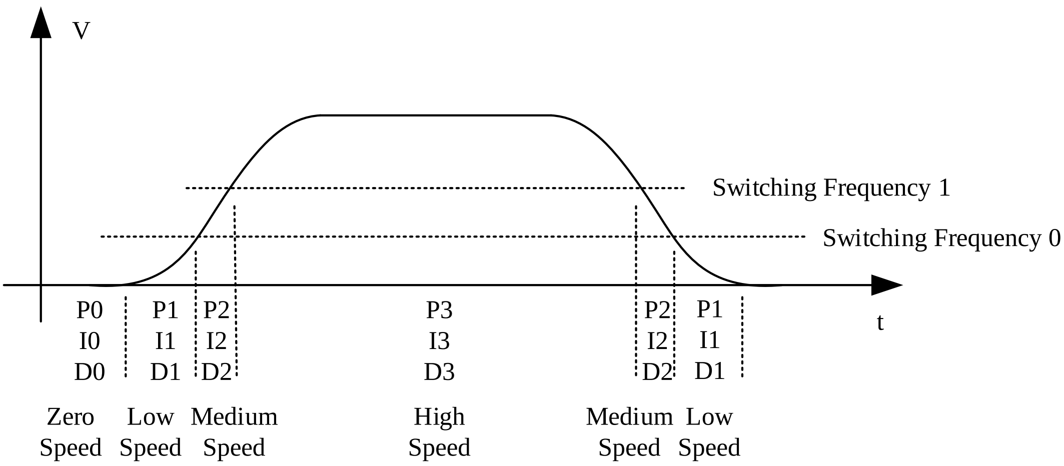


Diagram 8.6 Elevator operation curve segment PI control chart

Seen from the figure above, the PID regulator of this inverter is adjusted in three different speed sections, which facilitate the commissioning work. In case of poor comfort effect in high-speed section, it could be enough to only adjust PID parameters in high speed section, which has little impact on the other two sections. Similarly, in case of poor comfort effect in medium and low-speed sections, it could be enough to only adjust the corresponding PID parameters. Because different sections require different PID parameters to achieve the best comfort, adjusting PID values by sections can make each speed section gain their best effect.

3) Adjust Elevator Operation Curve

The shape of elevator operation curve will also directly affect the comfort of elevator. In order to satisfy passengers' requirements for comfort and operational efficiency, the elevator should run according to the S-curve as shown in Diagram 8.7. The system can adjust the acceleration / deceleration slopes of the S curve and time constant at the four turning corners to ensure the comfort and operational efficiency of the elevator. The main parameters that may affect the curve are as follows.

Table 8.5 The comfort adjustment parameters of the elevator operation curve

No.	Name	Recommended values and reference range	Parameter range
F0	Acceleration slope a1	0.500 (0.400～0.650)	The smaller this value is, the more stable the acceleration is. But too small will be inefficient. The greater this value is, the more sudden the acceleration is: ① if too sudden, users do feel uncomfortable; ② too sudden can lead to over-current fault. General 0.400 for 1m / s, 0.500 for 1.5 ~ 1.8m / s and 0.600 for 2.0m / s are appropriate. Especially it should not be too great for elevators in hotels or the residential elevators with many children and old people.
F1	Deceleration slope a2	0.500 (0.400～0.650)	The smaller this value is, the more stable the deceration is. But too small will be inefficient. The greater this value is, the more sudden the deceration is: ① if too sudden, users do feel uncomfortable; ② too sudden can lead to overvoltage fault. General 0.400 for 1m / s, 0.500 for 1.5 ~ 1.8m / s and 0.600 for 2.0m / s are appropriate. Especially it should not be too great for elevators in hotels or the residential elevators with many children and old people.
F2	S Curve T0	1.300 (1.300～1.600)	T0: transition time curve from start-up to acceleration beginning, the greater the value is, the more stable the start-up is. In this time, the elevator runs at very low speed. But if for a too long time may lead to failure of motor to drag the elevator and cause encoder fault, or over-current fault, especially when lift car is fully or heavily loaded.
F3	S Curve T1	1.100 (1.00～1.200)	T1 is the transition time curve between acceleration end to the highest speed, T2 is the transition time curve between the highest speed deceleration beginning. T1 and T2 have no significant effect on comfort, generally not adjusted. If T2 adjusted too much, may lead to level rush.
F4	S Curve T2	1.100 (1.000～1.200)	
F5	S Curve T3	1.300 (1.300～1.600)	T3 is the transition time curve between deceleration end to stop, the greater the value is, the more stable the stop is. In this time, the elevator runs at very low speed. But if for a too long time may lead to failure of motor to drag the elevator and cause encoder fault, or over-current fault, especially when lift car is fully or heavily loaded.

Note: Properly reducing F0 and F1 will increase the comfort of the elevator, but also decrease the operational efficiency. Properly increasing the time of the four turning corners F2 ~ F5 can improve the comfort, but also decrease the operational efficiency.

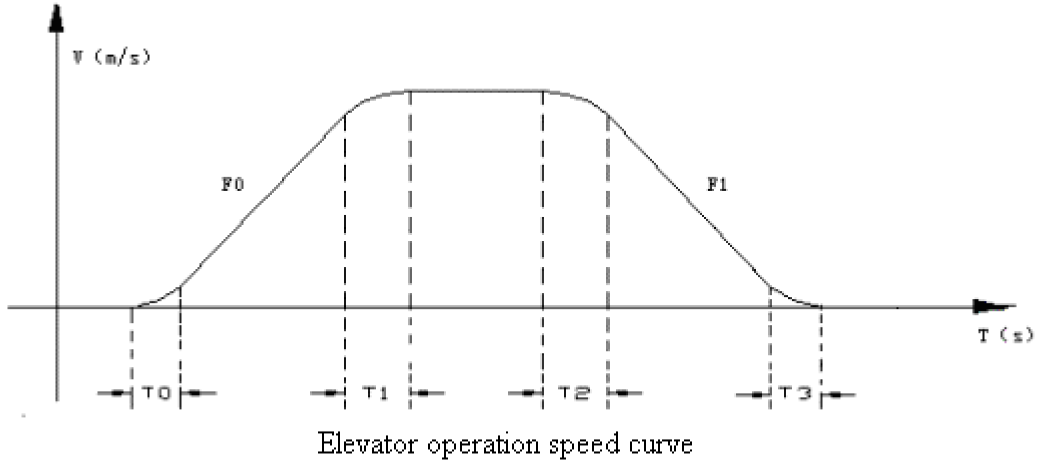


Diagram 8.7 Elevator Operation Speed Curve

4) Adjust Comfort at Stop

The following two points affect the elevator comfort most at stop: 1. the PID value in low-speed section. According to the content of the above, adjusting the PID value in low-speed section may help the elevator gain the best comfort at stop. 2. Time sequence for stop. It is mainly the coordination between the preset speed at stop and the brake action. The ideal state is: when the reference speed is zero, elevator has just held the brake. The adjustment principle is: if the elevator jerks at stop, it means the brake is held too early; the other hand, if the elevator skids at stop, it means the brake is held too late.

8.9 Leveling Adjustment

After comfort adjustment, leveling accuracy can be regulated.

8.9.1 Basic conditions to ensure the elevator leveling

1. Ensure the door area sensor and the deck board are installed very accurately, which means:

The deck length at door area of each floor must be accurate and consistent;

The bracket must be solid;

The deck boards should be installed at accurate. When the lift car is at leveling position, the deck center should coincide with the center between sensors of two door areas. Otherwise, there will be leveling deviation of this floor, which means it is higher or lower than the upper and lower leveling points.

2. If a magnetic sensor switch is used, the deck board should be inserted deeply enough when installed. Otherwise, it will affect the action time of the sensor switch, and lead to higher on top and lower on bottom when leveling on this floor.

3. To ensure leveling, the system also requires elevator to creep for a short distance before stop.

4. In the actual adjustment, level one of the middle floors first until leveled up. Then, take this floor as parameter to adjust other floors.

By adjusting the curve selection, proportional, integral gain mentioned above, ensure that the stop position (that is, the stop position should have an error of $\leq \pm 2 \sim 3$mm) should be repeatable for the elevator to go both upward and downward to stop at a middle floor.

8.9.2 Adjust leveling accuracy

1. Confirm the repeatability of stop position

By adjusting the curve selection, proportional, integral gain mentioned above, ensure that the stop position (that is, the stop position should have an error of ≤ ± 2 ~ 3mm) should be repeatable for the elevator to go both upward and downward to stop in the middle.

2. Adjust deck board at door area

1) Make the elevator stop floor by floor, measure and record the deviation △S between the lift car sill and the hall door sill (positive when the lift car sill is higher than the hall door sill, otherwise negative.)

2) Adjust the position of deck board at door area floor by floor, if △S> 0, then move the deck board downward by △S; if △S <0, then move the deck board upward by △S.

3) After the adjustment of deck board at door area, carry out well self study again.

4) Check the leveling again. If the leveling accuracy does not meet the requirements, repeat steps 1) ～ 3).

3. Adjust parameter menu

If the stop positions of the elevator are repeatable, but not at the same position on each floor, for upward or downward leveling, such as up higher down lower, or up lower down higher,this fault can be solved by adjusting the leveling parameters of F56, F57 in the parameter menu. Its default value is **50mm**. Decrease the F56 value when the elevator goes upward and rushed over the level (over leveling). Increase the F56 value when the elevator goes upward and is short of the level (less leveling). Decrease the F57 value when the elevator goes downward and rushed over the level (over leveling). Increase the F57 value when the elevator goes downward and is short of the level (less leveling).

4. Lift car leveling adjustment

1) Call the elevator to the top floor;

2) The "Leveling Mode" function menu has been added into the "Debug Operation" menu of the mainboard manipulator. Afer entering the "Leveling Mode", the outside call is invalid, and the inside instruction can be valid only when the door of the elevator is close;

3) After the elevator arriving the station, keep the door open. According the last running direction at the high speed, it can be chosen that whether running upward leveling micro-adjustment or running downward leveling micro-adjustment; according the inner call buttons of the top floor and the bottom floor, the leveling could be adjusted. The top floor inner call button ecch pressed, the leveling position of lift car increased 5mm in height. Tht bottom floor inner call button each pressed, the leveling position of lift car decrease 5mm in height. After the top and bottom inner call buttons both being pressed for 1s, the changed position would be automaticly saved by the CPU, and the door would close automaticly.

4) During leveling, the inner display tube shows the leveling adjustment value, whose initial value is 0. The number showed on display tube shift 1 by 1, after each leveling adjustment. When the leveling direction is upwarrd, the adjustment value is positive with the upward arrow light on.When the leveling direction is downward, the adjustment value is negative with the downward arrow light on. When the door automatically closed, the leveling adjustment value would be zero cleared.

5) After the door being closed, press the inner call button which needs leveleing adjustment, and then the elevator head for the floor.

6) After finishing the leveling, enter into the engine room, switch the emergency power to ON, and switch back to OFF to return to normal mode.

8.9.3 Reasons why leveling cannot be adjusted:

There may be the following questions, please check in order:

1. The following parameters will lead to improper leveling adjustment if not reasonably configured.

Check F21 (leveling sensor delay adjustment), the factory value: 6 mm. It can be set to 6mm when the elevator with the speed below 1.75m/s uses optical leveling sensor.

It can be set to 10 mm when the high-speed elevator (with the speed of 3.0m/s or above) uses optical leveling sensor.

It can be set to 16 mm when the high-speed elevator (with the speed of 5.0m/s or above) uses optical leveling sensor.

F56 upward leveling adjustment value. Factory value: 50mm.

F57 downward leveling adjustment value. Factory value: 50mm.

Leveling fine-tuning: set the leveling fine-tuning of each floor to factory default: 20 mm.

2. Encoder interference

1) Encoder shielded wire is not grounded, or the encoder is interfered by power lines for the reason of that the signal lines and power lines are not separated. This problem is even more serious on the synchronous motor site. The signal of the sincos encoder or resolver is a small analog signal signal, more vulnerable to be interfered, which is shown as random irregular unleveling;

2) Check methods: record the well data (from the bottom to the top) after self study, re-start well self study, compare the two self study data, with a corresponding position error of less than 3mm (usually identical or difference of ±1mm), error of more than 3 mm can be regarded as Encoder interfere or traction wheel skid;

3) Solutions:

a) Confirm that the motor ground wire has been connected from the motor to the control cabinet;

b) Confirm that the shielding line from Encoder to the inverter PG card has been grounded at the inverter end. Check whether this grounding line has intermediate connection terminal. If any, make sure both ends of the shielding lines are grounded;

Note: the connection of the synchronous motor Sincos Encoder!!!

c) Confirm hat the shielding line from the inverter PG Card to the motherboard Encoder has been grounded;

d) Confirm the Encoder lines separated from power lines and braking resistor lines (cover the Encoder lines with flexible conduit if in the same groove);

e) Confirm that the 0V of PG card is connected with the 0V of the motherboard (in particular, in multi-speed A +, A-, B +, B-output);

f) Check whether connecting shaft of Encoder skids.

3. Steel wire rope of traction wheel slips

1) Phenomenon: the leveling is not accurate in case of operation with no-load or full load, or the upward leveling is inconsistent with downward leveling, while the half-load operation leveling is accurate;

2) Check method: at any floor (assumed to be Floor 3), mark an aligning chalk line between

the steel wire rope and the traction wheel, run a single floor uperward and downward rount trip (Floor 3 -> Floor 4, Floor 4 to Floor 3), then return back to Floor 3, check the error distance with the chalk mark (should be less than 5mm). This error distance is the slip error for a single floor. The slip error should be done twice respectively with no load and full load. All slip error greater than 5 mm must be resolved;

3) Solution:

a) There may be a 200Kg weight difference for the lift car before and after decoration. Has the lift car decoration finished? Is the current balance coefficient correct? If not sure, set the lift car to half loaded, is there still leveling error?

b) If it is impossible to resolve the slipping problem for high-speed elevator, there are two solutions as follows:

① Install Encoder on one side of the speed governor to feedback the position to the motherboard;

② Use creeping to absorb slip error, set F24 = 2 (analog signal with creeping) or F24 = 0 (multi-speed operation).

4. When using magnetic reed sensor, ensure adequate insertion depth. Check whether the leveling spile of each floor has been inserted into within the red line of the sensor and check whether any spile is installed slantly.

5. The leveling spiles have inconsistent lengths. The spile on the second floor is the baseline length, the spiles of the other floors should be of the same length with that on the second floor, otherwise it may cause leveling problems.

6. The well self study is not carried out again after the leveling spiles being adjusted.

8.10 Method for Adjusting Pre-Load Weighing Compensation at Elevator Start

This integrated drive controller adopts advanced non-load sensor start compensation technology, so even without pre-load weighing device, the elevator can still gain comfort at start. See its start features as shown in Diagram 8.8.

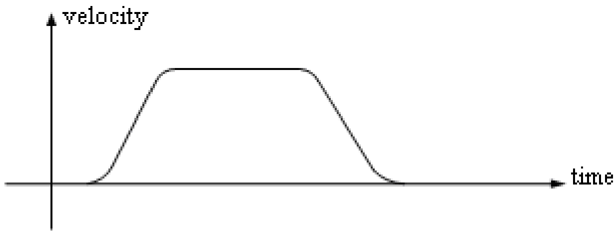


Diagram 8.8 Compensation characteristic diagram for no load sensor startup

Although, under normal circumstances, AS360 series integrated drive controller does not need pre-load weighing device, however, on some occasions, in order to obtain overload and full load signal, analog signal weighing device is installed; or some elevator users have particularly high comfort requirements when elevator starts and ask for pre-load weighing device for starting compensation; there exists also another case: in case of using non-gear tractor, no Encoder complies with non-pre-load starting compensation requirements, the elevator would need install the pre-load devices additionally, and inverter adopts torque compensation technology at start.

When pre-load weighing is used to compensate starting, it is necessary to set and adjust the following parameters.

Table 8.6 The parameters of the pre-load weithing compensation function set and adjusted when the elevator starts

Function Code	Name	Content	Scope	Unit	Factory Setup	Remarks
F164	Weithing device type		0～99	×	99	See the following descriptions for details
F40	Weighing data offset	48	0～100	%		
F70	Light-load upward gain	100	0-300	%		
F71	Light-load downward gain	100	0-300	%		
F72	Heavy-load upward gain	100	0-300	%		
F73	Heavy-load downward gain	100	0-300	%		
F74	Light-load hight gain	512	0-1024			
F75	Light-load hight gain	512	0-1024			
F229	Torque compensation direction	Set start torque compensation direction	0/1	×	0	0: forward direction 1: reverse direction
F230	Torque compensation gain	Set start torque compensation gain	0.0～200.0	％	100.0	
F231	Torque compensation bias	Set start torque compensation bias	0.0～100.0	％	0.0	

Parameter F164 has the meanings as follows:

Table 8.7 F164 The meanings of the parameter F164

F164 set value	Model of weighing device	Acquisition method of light, heavy, full and over load signal	Acquisition method of compensation signal
0	DTZZ-III-DC-SC	Input open/close signal to the car top board	Input weighing device signal by CAN, and then calculate the final compensation value by weighing device signal, F70~F75 parameters
1	DTZZ-II	Input weighing device signal by CAN, and then calculate the result by weighing device signal	Input weighing device signal by CAN
2	DTZZ-II	Input open/close signal to the car top board	Input weighing device signal by CAN

3	DTZZ-III-DC-SC	Input weighing device signal by CAN, and then calculate the result by weighing device signal	Input weighing device signal by CAN, and then calculate the final compensation value by weighing device signal, F70~F75 parameters
4	None	Input open/close signal to the car top board	Calculate the weighing compensation values at light load and heavy load by light/heavy switch signal, F70-F75 parameters. And F40 is set to be 50％ at this moment.
5		Input open/close signal to the car top board	Input weighing device signal by analog signal
6		Input weighing device signal by analog signal, and then calculate the result by weighing device signal	Input weighing device signal by analog signal
99		Input open/close signal to the car top board	None

There are three different adjustment methods corresponding to the different types of weighing devices: the first method is to use of DTZZ-III-DC-SC weighing device (set F164 as 0 or 3); the second method is to use of non-DTZZ-III-DC-SC weighing device (set F164 as 1, 2, 5 or 6); the third mothod is without weighing device, a simple compensation method by using light-load and heavy-load switch. The following three sections make a detailed introduction on how to adjust the parameters F70~F75 or F229~F231 of the three start compensating methods. In the absence of start compensation, the parameters F164, F70 ~ F75 do not need to be set, and their default value 0 will be ok; the three parameters F229~F231 can also use their default values.

8.10.1 The start compensation adjusting method using DTZZ-III-DC-SC weighing device (set F164 as 0 or 3)

While using DTZZ-III-DC-SC model weighing device, the weighing data is sent to the control system in AS360 series AIO via CAN communications. Based on the values of the adjustment parameters F70~ F75, the control system calculates the final exact compensation data which would be sent to the inverter in AIO, and the inverter makes the start torque compensation directly based on this data. Therefore, in this case, it is enough to adjust only the parameters F70 ~ F75.

1. Weighing device self study

In adjustment, set DTZZ-III-DC-SC model weighing device via Parameter F41 and carry out self study. The meaning of parameter F41 is as follows:

Table 8.8 The meaning of the parameter F41

F41 Value	Meaning
1	No load self study command, the return data after the successful no load self study
2	Full load self study command, the return data after the successful full load self study
10	When the activity of weighing device sensor ranges within 0 ~ 10mm , the return data of parameter set command and successful self study

20	When the activity of weighing device sensor ranges within 0～20mm , the return data of parameter set command and successful self study
30	When the activity of weighing device sensor ranges within 0～30mm , the return data of parameter set command and successful self study
40	When the activity of weighing device sensor ranges within 10mm～0mm , the return data of parameter set command and successful self study
50	When the activity of weighing device sensor ranges within 20mm～0mm , the return data of parameter set command and successful self study
60	When the activity of weighing device sensor ranges within 30mm～0mm , the return data of parameter set command and successful self study

Step 1, based on the actual activity scope of the device, set a correct data between 10～60 via F41; Step 2, empty the lift car load, set F41 as 1, let the weighing device carries do self study without load. After the self study succeeding, F41 displays as 1; Step 3, full load the lift car, set F41 as 2, let the weighing device do self study with full load. After the self study succeeding, F41 displays 1. After these three steps, the self study of the weighing device finish.

2. Confirm the compensation direction

Then, confirm whether the compensation direction is correct: let the elevator go upward full load from the bottom from at the inspect state. If the increase of F72 may reduce the downward impact, or reduse the downward impact oscillation when the lift car starts, or enhance the downward impact oscillation when the lift car starts, it means that the compensation direction is correct; otherwise, it means the compensation direction is wrong. If wrong, change the value of Parameter F229 (from 0 to 1, or from 1 to 0).

After confirming the compensation direction, you can adjust the parameters F70～F75.

3. Set the value of F40 according to the elevator balance coefficient.

4. Adjust the comfort without load after no-load self study

1) Stop the elevator at the bottom floor, switch on inspect mode, let the elevtor go upward. If down wash, reduce F70; if upward pull, increase the F70;

2) Stop the elevator among the bottom and the 2nd floor, switch on inspect mode, let the elevator go downward. If down wash, reduce F71; if upward pull, increase the F71;

3) Stop the elevator at the top floor, switch on the inspect mode, let the elevator go downward. If down wash, reduce F74; if upward pull, incease the F74.

5. Adjust the comfort with full load after full load self study

1) Stop the elevator at the bottom floor, switch on inspect mode, let the elevtor go upward. If down wash, reduce F72; if upward pull, increase the F72;

2) Stop the elevator among the bottom and the 2nd floor, switch on inspect mode, let the elevator go downward. If down wash, reduce F73; if upward pull, increase the F73;

3) Stop the elevator at the top floor, switch on the inspect mode, let the elevator go downward. If down wash, reduce F75; if upward pull, incease the F75.

6. Generally, F74 and F75 need not to be adjusted(unless the floors are extremely high or the weighing device's weighing values are inconsistent between at the bottom floor and at the top floor).

8.10.2 The start compensation adjusting method using non-DTZZ-III-DC-SC weighing device (set F164 as 1, 2, 5 or 6)

When non-DTZZ-III-DC-SC model weighing device is chosen, its weighing data is sent to the control system in AS360 series AIO via CAN communications or analog signal signal input port. The control system sends this data directly to the inverter in AIO. Based on the adjustment of the three adjustment parameters F229 ~ F231, the inverter calculates the final actual torque compensation value and makes starting compensation. Therefore, in this case, it is necessay to adjust the three parameters F229 ~ F231.

First, adjust the compensation offset parameter F231. Load the lift car to the balance load, run the lift car to the middle position, and then confirm that the lift car is in complete balance with its counterweight (after powered off, with the brake released, the lift car can remain completely motionless). Set the ispection speed F12 as 0, adjust the parameter F231 so that the elevator can remain completely motionless in ispection operation.

Then, confirm whether the compensation direction is correct: Leave the no-loaded lift car stop at the leveling position of any floor in the middle, if the decrease of F230 (compensated gain) may reduce the upward impact oscillation of the lift car at start (slipping back upward when start downward or rushing hard when start upward), it means the compensation direction is correct; otherwise, it means the compensation direction is wrong. If wrong, change the value of Parameter F229 (from 0 to 1 or from 1 to 0)

After confirming the compensation direction, at last, you can adjust compensation gain parameter F230. Run the no-load lift car to the leveling position of the top floor, set the ispection speed (F12) to 0, adjust the compensation gain parameter F230 (if the lift car moves upward at start, decrease this parameter; if downward, increase this parameter), until the lift car would not motion completely when starts as the inspection mode.

8.10.3 Simple start compensation adjusting method using light-load and heavy-load switch (F164 set to 4)

AS360 integrated elevator dedicated drive controller adopts pre-load starting compensation with weighing device and another simple starting compensation: by using light-load and heavy-load switch. With this starting compensation, Encoder can adopt 8192 pulse A, B, Z phase incremental Encoder, and does not need accurate weighing devices but simply installs two micro-switches on the car bottom. For synchronous gearless tractor elevator, high resolution SIN / COS Encoder is mandatory for a no weighing starting compensation mode. Compared with A, B, Z phase incremental Encoder, SIN / COS Encoder is more expensive with more wiring and weaker anti-interference ability. So, compared with no weighing starting compensation mode, the light-load and heavy-load switch starting compensation is less expensive, with less wiring and stronger anti-interference ability. Compared with pre-load starting compensation with analog signal input, it is less expensive, easier to be installed and simpler for commissioning due to the absence of an accurate weighing device. Therefore, we recommend the light-load and heavy-load switch starting compensation mode to the customers who use the AS360 series AIO.

When the light-load and heavy-load switch starting compensation mode is adopted, it is necessary to install a light-load and a heavy-load switch on the lift car bottom. We recommend that the light-load switch motions when the lift car load is less than 25% of the rated load, while the heavy-load switch motions when the lift car load is greater than 75% of the rated load. The light-load switch can be connected to JP6-02 (HX4) of (SM-02H) on the car top board, while the heavy-load switch can be connected to JP6-03 (HX5) terminal of (SM-02H) on the lift car top board.

1. Set the value of F40 according to the elevator balance coefficient.

2. Adjust the comfort without load after no-load self study

1) Stop the elevator at the bottom floor, switch on inspect mode, let the elevtor go upward. If down wash, reduce F70; if upward pull, increase the F70;

2) Stop the elevator among the bottom and the 2nd floor, switch on inspect mode, let the elevator go downward. If down wash, reduce F71; if upward pull, increase the F71;

3) Stop the elevator at the top floor, switch on the inspect mode, let the elevator go downward. If down wash, reduce F74; if upward pull, incease the F74.

3. Adjust the comfort with full load after full load self study

1) Stop the elevator at the bottom floor, switch on inspect mode, let the elevtor go upward. If down wash, reduce F72; if upward pull, increase the F72;

2) Stop the elevator among the bottom and the 2nd floor, switch on inspect mode, let the elevator go downward. If down wash, reduce F73; if upward pull, increase the F73;

3) Stop the elevator at the top floor, switch on the inspect mode, let the elevator go downward. If down wash, reduce F75; if upward pull, incease the F75.

4. Generally, F74 and F75 need not to be adjusted(unless the floors are extremely high or the weighing device's weighing values are inconsistent between at the bottom floor and at the top floor).