

GSK983M Milling CNC System

Connection Manual



广州数控设备有限公司
GSK CNC EQUIPMENT CO., LTD.



The operating manual describes all matters concerning the operation of the system in detail as much as possible. However, it is impractical to give particular descriptions of all unnecessary and/or unavailable works on the system due to the length limit of the manual, specific operations of the product and other causes. Therefore, the matters not specified herein may be considered impractical or unavailable.



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Company Profile

GSK CNC EQUIPMENT CO., LTD(GSK) , CNC Industry Base of South China, is responsible for the National High Technology Research and Development Program of China (863 Program): Moderate CNC Industrialization Key Technology. For ten years, we are exclusively engaged in research, Development, manufacture, sale, training and popularization of Machine Tool CNC system, Servo Motor and driver, and other mechanical products. Today, GSK has already expressed into a large-scale new high-tech enterprise that deals with research, teaching, working and trading. Our products support more than 60 domestic manufacturers of machine tools with after-sales service network through the country. With a yield in the lead in China from 2000 to 2005 in succession, GSK series products are in great demand in the domestic demand and have a ready sale in Southeast Asia at high performance-to-price ratio.

Field technical support services

Field support services are available when you encounter a problem insolvable through telephone. GSK CNC Equipment Company Limited will designate a technical support engineer to the field to solve technical problems for you.

Chinese version of all technical documents in Chinese and English languages is regarded as final.

Foreword

Dear user,

We are really grateful for your patronage and purchase of GSK983M milling CNC system, which is made by GSK CNC Equipment Co., Ltd.

This manual consists of two volumes. Volume I mainly describes the specifications and programming of the system while Volume II operations, all codes, parameters, I/O interfaces and other appendices.



This system can only be operated by authorized and qualified personnel as improper operations may cause accidents. Please carefully read this operating manual before usage.

All specifications and designs herein are subject to change without further notice.

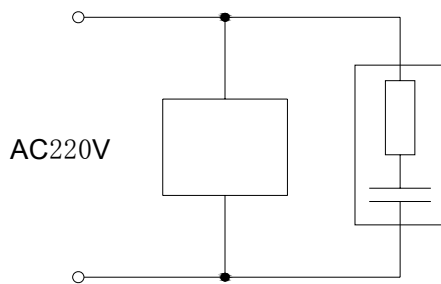
We are full of heartfelt gratitude to you for supporting us in the use of GSK's products.

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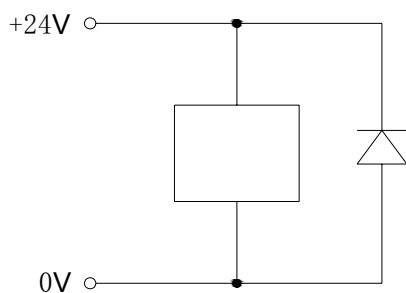
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Precautions for Connection

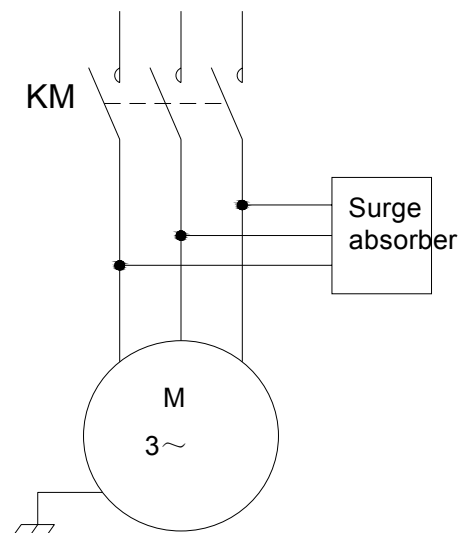
1. Power should be supplied by isolating transformer.
2. Shells of the system parts and the machine must be securely grounded.
3. The system should be installed far away from place where the interference may occur (such as converter, AC contactor, static generator, high voltage generator and subsection devices of power line); and the space dimension around the system should also be complied with the installation dimension described in the manual.
4. The environment around the system should conform to the requirements described in the manual.
5. The signal cables and control cables of weak current should be distributed far away from the place where there are strong current and strong electromagnetic interference; they should be distributed straightly against interfering signal, otherwise, it easily receives the interfering signal.
6. Interference suppression: Connect parallel RC loop to the two connector lugs of AC coil(Fig.1) and the RC loop should be fixed as near as possible to the inductive load; connect reversely parallel freewheeling diode at the two connector lugs of DC coil(Fig.2); connect parallel surge absorber at the connector lugs of AC motor winding(Fig.3).



(Fig. 1)

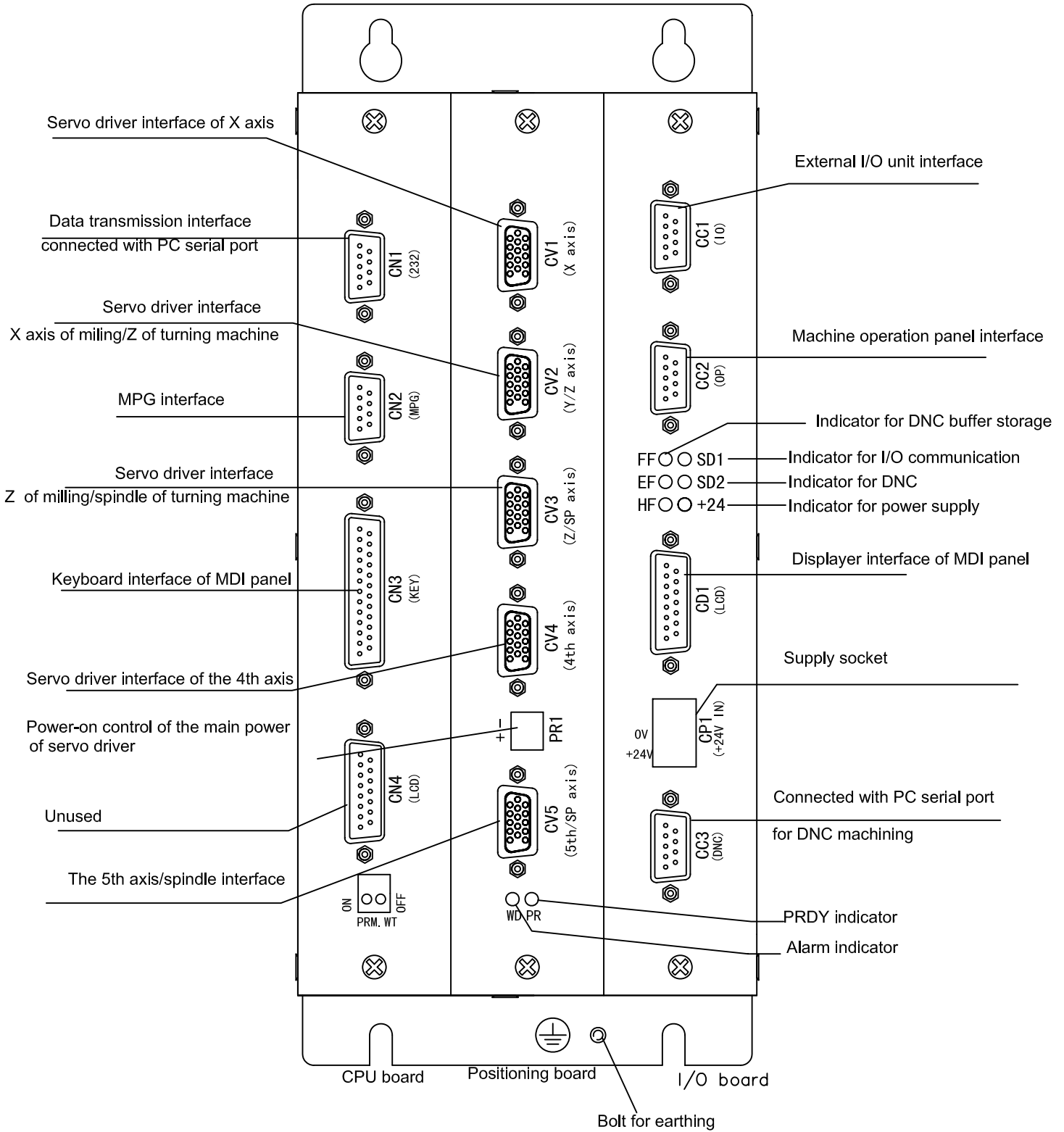


(Fig. 2)

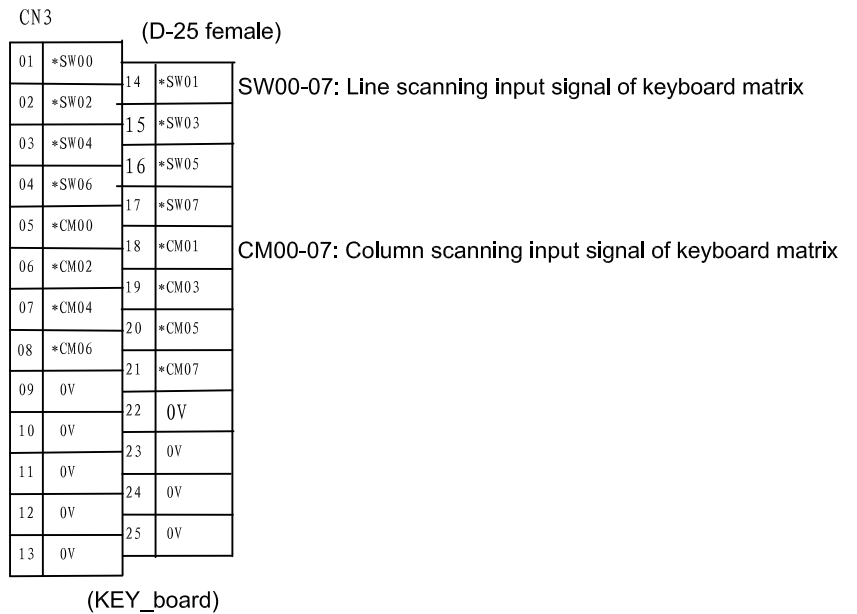
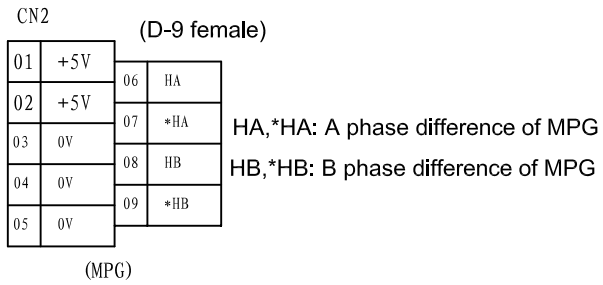
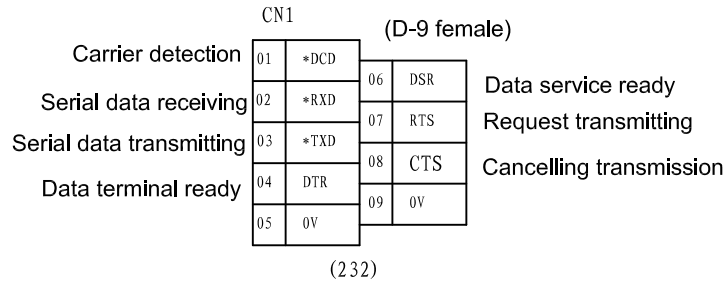
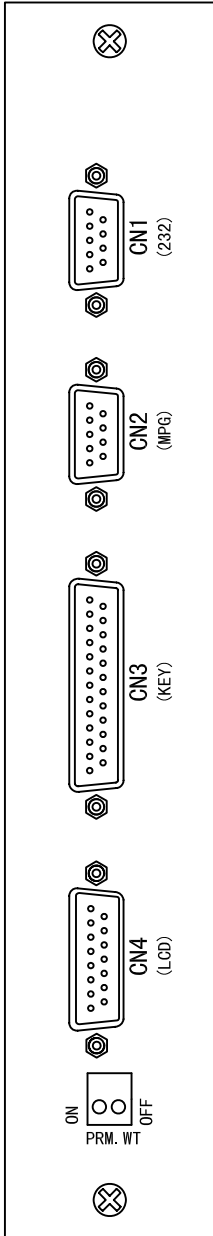


(Fig. 3)

1.Interface Layout of the System



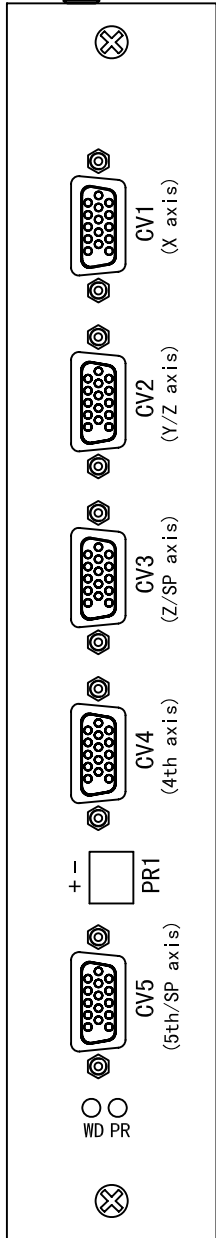
2.Interface Layout of CPU Board



CN4 (Unused)

Note: PRM.WT is the switch for parameters writing.

3.Interface Layout of Position Control Board



CV1 (D-15 female)

01	+5V	06	PCZX	11	*PCZX
02	0v	07	PCAX	12	*PCAX
03	+24v	08	PCBX	13	*PCBX
04	SRDYX	09	SONX+	14	SONX-
05	VCX	10	0V	15	0V

(X Axis SV I/F)

CV4 (D-15 female)

01	+5V	06	PCZ4	11	*PCZ4
02	0v	07	PCA4	12	*PCA4
03	+24v	08	PCB4	13	*PCB4
04	SRDY4	09	SON4+	14	SON4-
05	VC4	10	0V	15	0V

(4th Axis SV I/F)

CV2 (D-15 female)

01	+5V	06	PCZY	11	*PCZY
02	0v	07	PCAY	12	*PCAY
03	+24v	08	PCBY	13	*PCBY
04	SRDYY	09	SONY+	14	SONY-
05	VCY	10	0V	15	0V

(Y/Z Axis SV I/F)

PR1

02	PRDY-
01	PRDY+

CV3 (D-15 female)

01	+5V	06	PCZZ	11	*PCZZ
02	0v	07	PCAZ	12	*PCAZ
03	+24v	08	PCBZ	13	*PCBZ
04	SRDYZ	09	SONZ+	14	SONZ-
05	VCZ	10	0V	15	0V

(Z Axis SV I/F)

CV5 (D-15 female)

01	+5V	06	PCZ5	11	*PCZ5
02	0v	07	PCA5	12	*PCA5
03	+24v	08	PCB5	13	*PCB5
04	SRDY5	09	SON5+	14	SON5-
05	VC5	10	0V	15	0V

(5th Axis SV I/F)

Note:

PCAX~PCA5: A phase feedback signal of encoder (pulse signal of difference input ,drive → NC)

PCBX~PCB5: B phase feedback signal of encoder (pulse signal of difference input ,drive → NC)

PCZX~PCZ5: Z phase feedback signal of encoder (pulse signal of difference input ,drive → NC)

SONX+~SON5+,SONX-~SON5-: enable signal (on-off signal, NC → drive)

SRDYX~SRDY5: Servo ready (on-off signal, drive → NC)

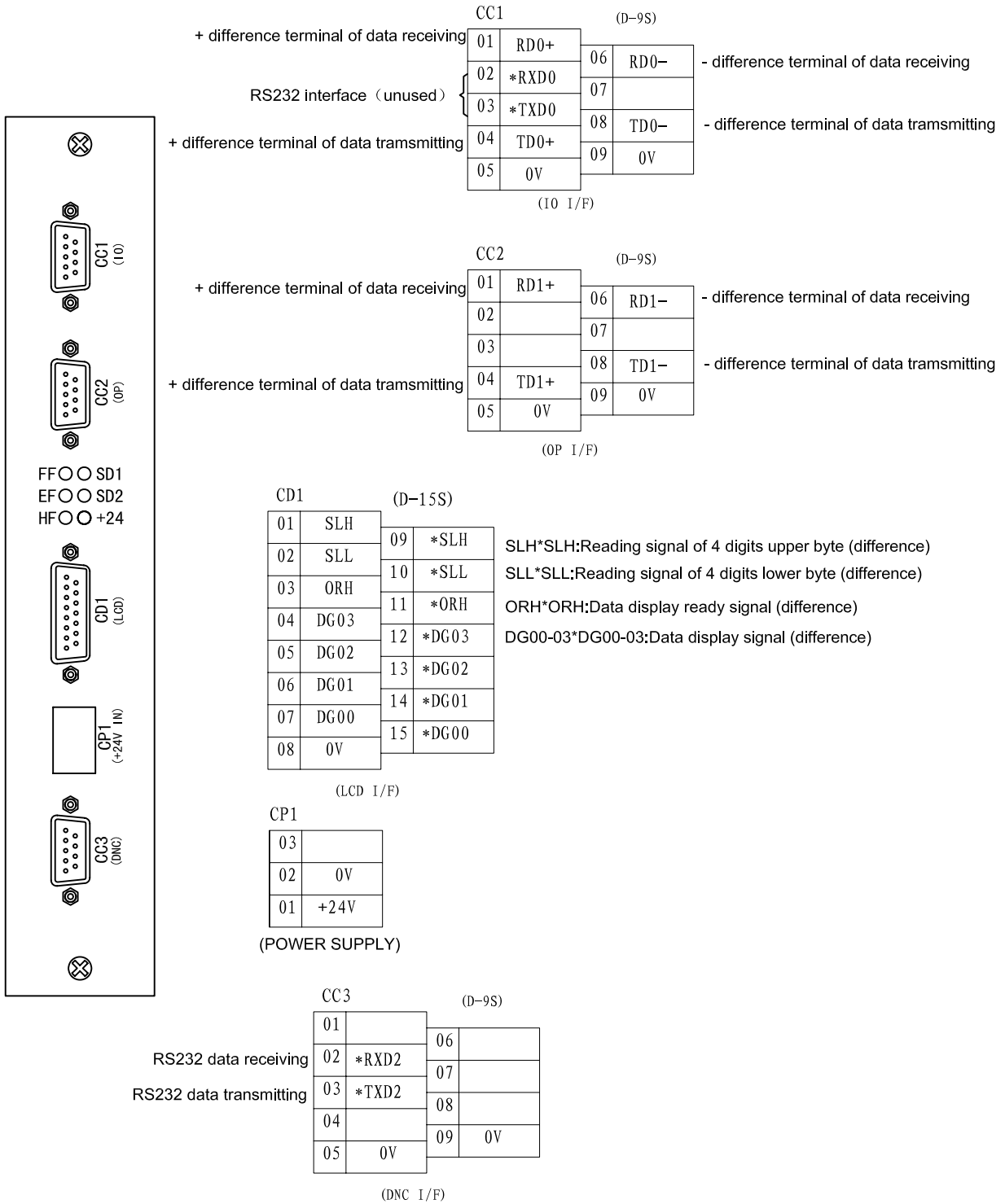
VCX~VC5: Speed control voltage (DC voltage, NC → drive)

PRDY+ signal is used for the power-on control of the main power of servo driver;

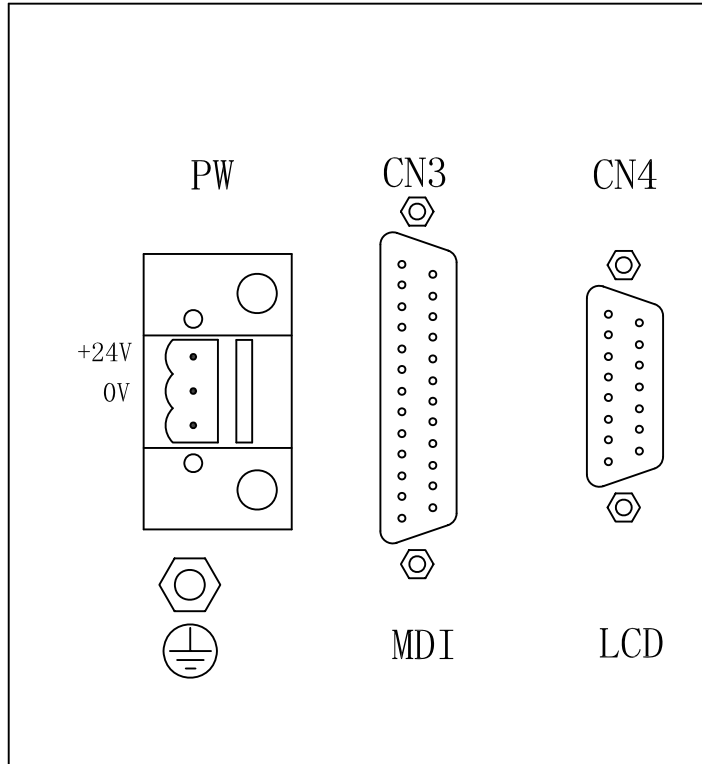
PRDY- is directly connected to 0V.

CV5 is used for spindle control or the 5th axis control.

4.Interface Layout of I/O Board



5. Interface Layout of MDI/LCD Panel

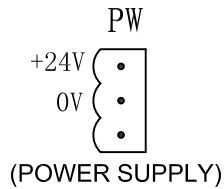


CN3 (D-25 female)

01	*SW00	14	*SW01
02	*SW02	15	*SW03
03	*SW04	16	*SW05
04	*SW06	17	*SW07
05	*CM00	18	*CM01
06	*CM02	19	*CM03
07	*CM04	20	*CM05
08	*CM06	21	*CM07
09	0V	22	0V
10	0V	23	0V
11	0V	24	0V
12	0V	25	0V
13	0V		

SW00-07: Line scanning inputsignal of keyboard matrix

CM00-07: Colum scanning outputsignal of keyboard matrix



(KEY_board)

CN4

(D-15 female)

01	SLH	09	*SLH
02	SLL	10	*SLL
03	ORH	11	*ORH
04	DG03	12	*DG03
05	DG02	13	*DG02
06	DG01	14	*DG01
07	DG00	15	*DG00
08	0V		

SLH *SLH: reading signal of 4 digits upper byte(difference)

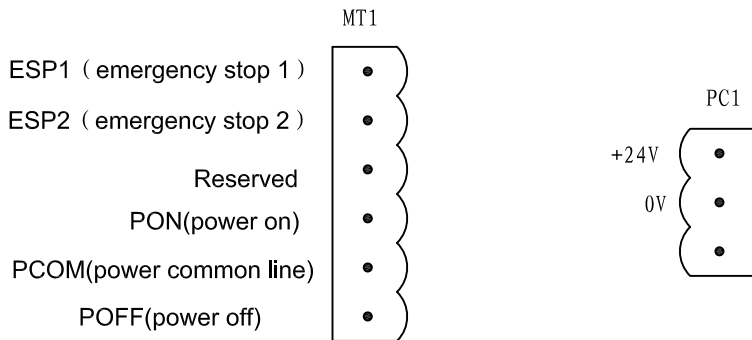
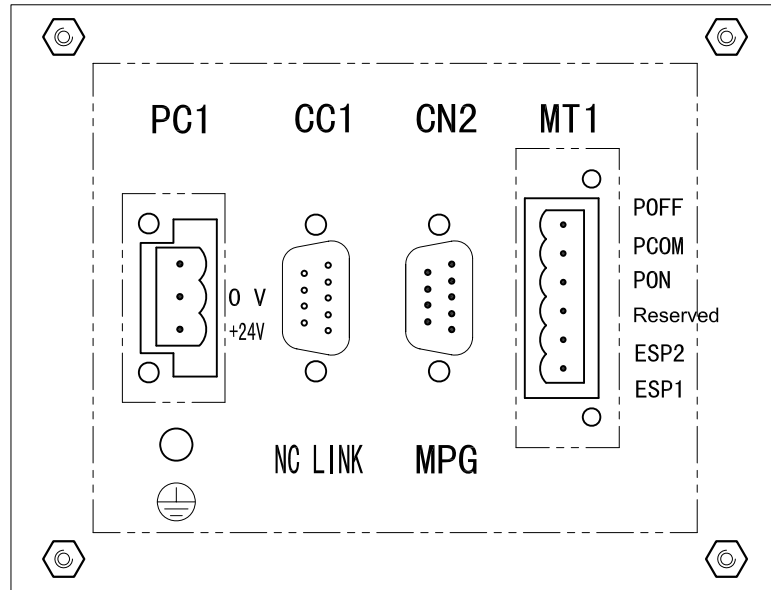
SLL *SLL: reading signal of 4 digits lower byte(difference)

ORH *ORH: data display ready signal(difference)

DG00-03 *DG00-03: display data signal (difference)

(LCD)

6. Interface Layout of Machine Operator Panel



CN2 (D-9 male)

01	+5V	06	HA
02	+5V	07	*HA
03	0V	08	HB
04	0V	09	*HB
05	0V		

HA, *HA: A phase difference of MPG
 HB, *HB: B phase difference of MPG

(MPG)

CC1 (D-9 female)

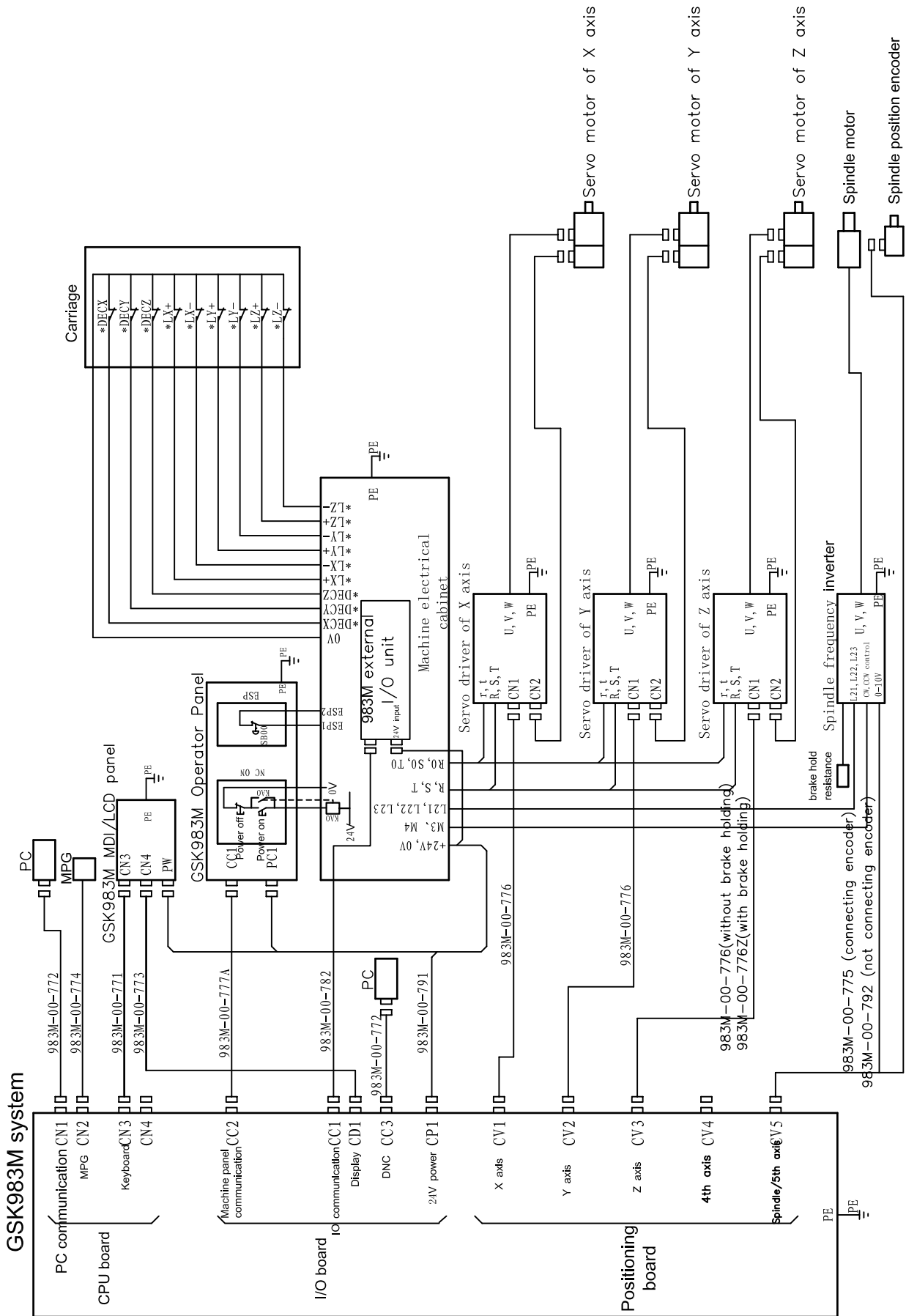
01	RD+	06	RD-
02	*RXD	07	
03	*TXD	08	TD-
04	TD+	09	0V
05	0V		

RD+ RD-: RS422 difference receiving terminal
 TD+ TD-: RS422 difference transmitting terminal
 *RXD: RS232 receiving terminal
 *TXD: RS232 sending terminal

(NC LINK)

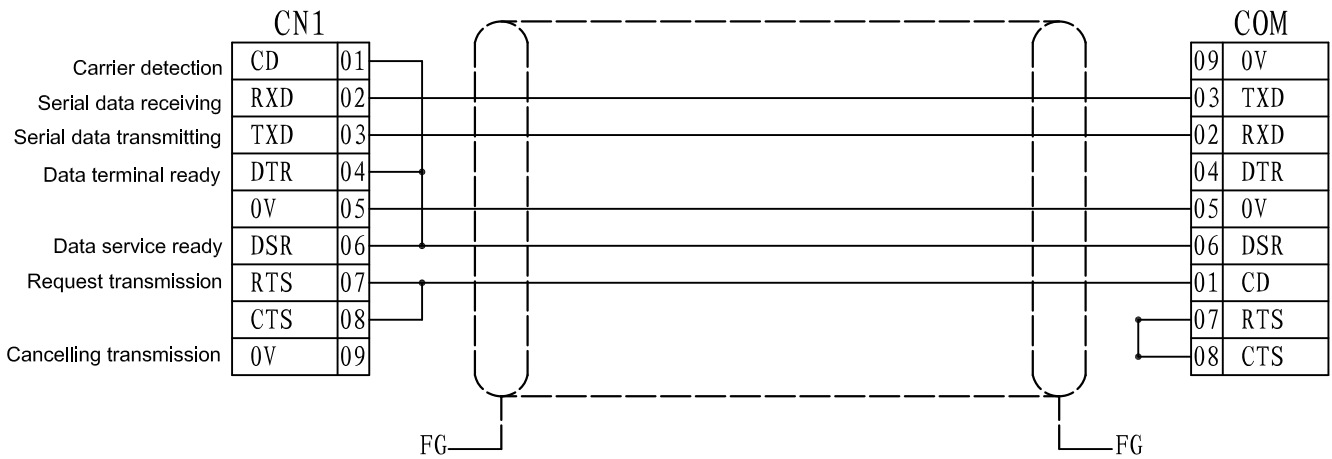
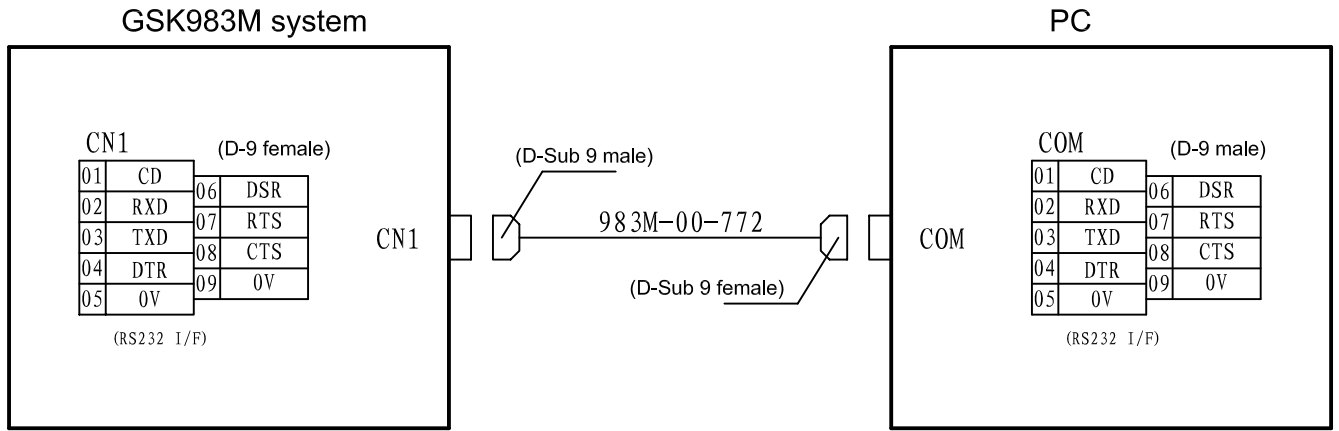
Note: The Pin number of CN2 are used for internal MPG.

7. Connection Layout



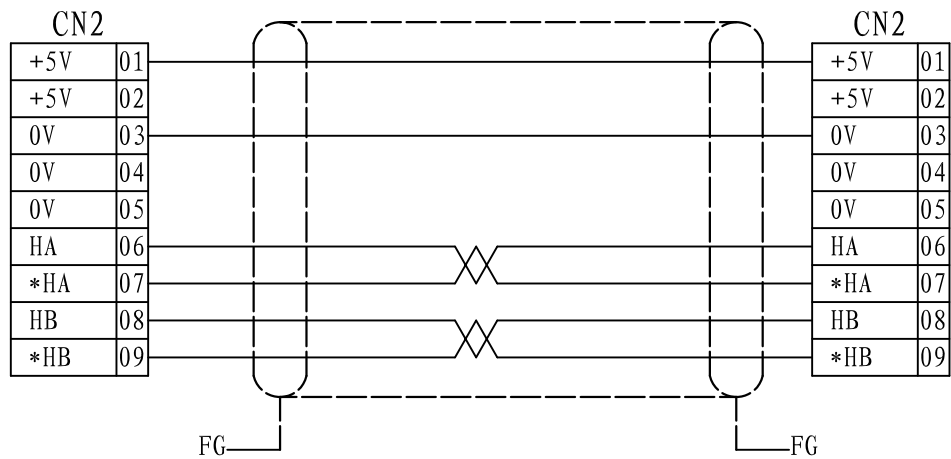
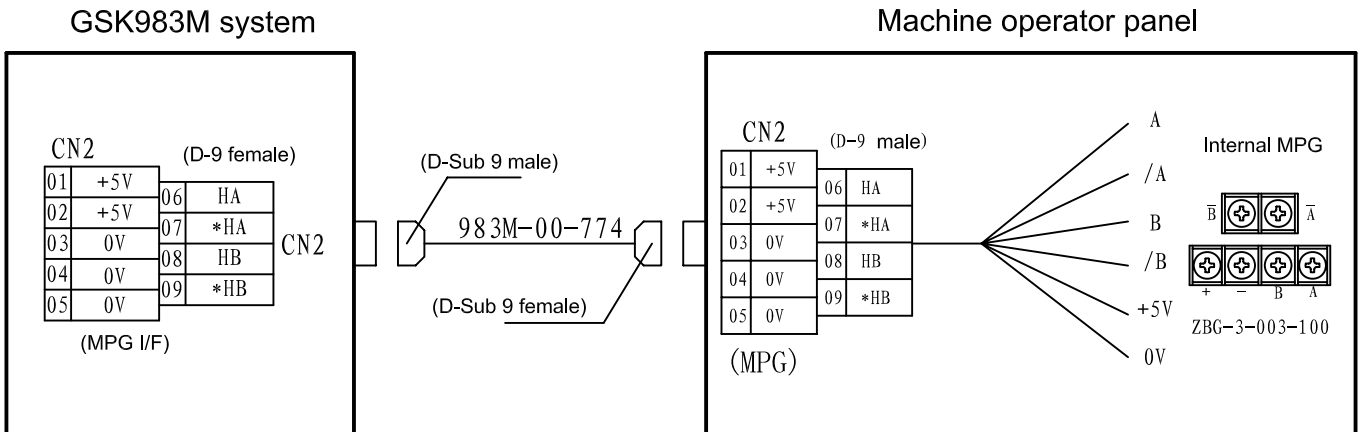
Note:
The system, MDI/LCD panel, I/O unit and servo driver should be safely grounded.

8.Connection Cable for Communication with PC (RS232)



Note: The shell of NC and of PC should be safely grounded.

9.Connection Cable for MPG(Handwheel)

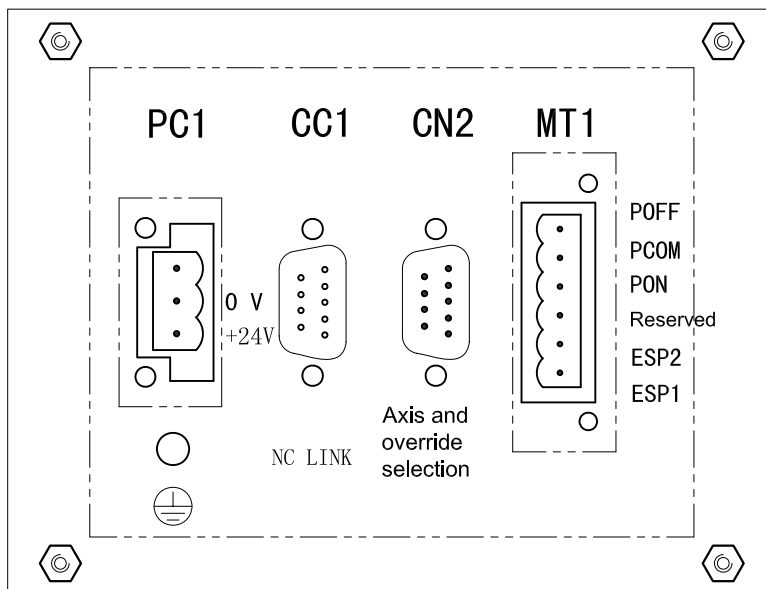


HA *HA: A phase difference signal of MPG

HB *HB: B phase difference signal of MPG

10. External MPG(Handwheel) Connection 1: Internal Connection of Operator Panel

Back board layout of operator panel



CM2 interface definition of internal control board

CM2 Pin No.	Signal name	Signal function	I/O
01	HX1	Hand box override X1	I
02	HX2	Hand box override X10	I
03	HX3	Hand box override X100	I
04	HHX	(Axis selection of hand box) X axis	I
05	HHY	(Axis selection of hand box) Y axis	I
06	HHZ	(Axis selection of hand box) Z axis	I
07	HH4	(Axis selection of hand box) 4th axis	I
08			
09	0V		
10	0V		

Operator panel Interface definition of axis and override:

Pin No.	Signal name
01	HX1
06	HX2
02	HX3
07	HHX
03	HHY
08	HHZ
04	HH4
09	
05	0V

Internal control board
CM2 (10p female)

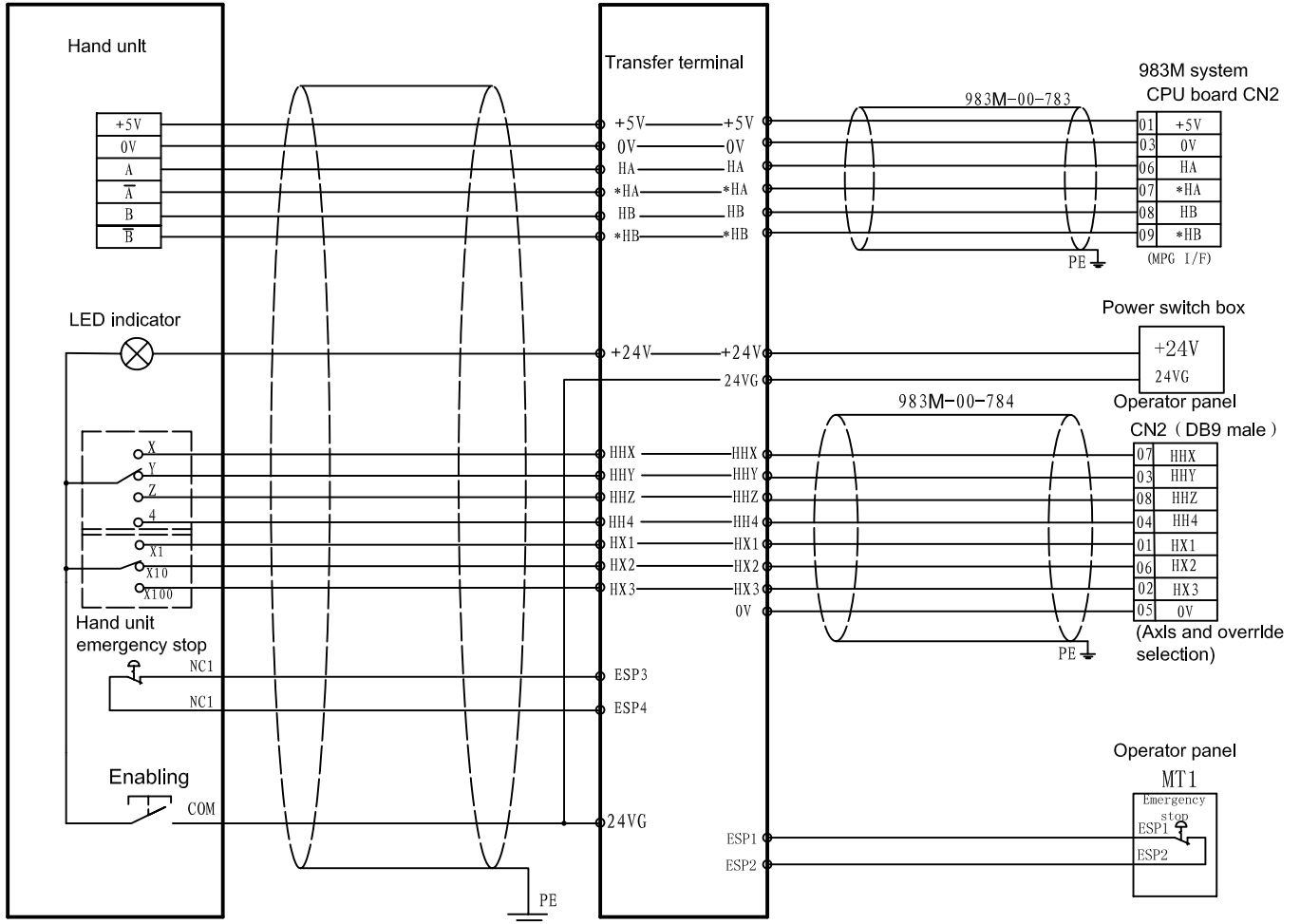
01	HX1
02	HX2
03	HX3
04	HHX
05	HHY
06	HHZ
07	HH4
08	Standby
09	0V
10	0V

983M-00-706
(Color coded flat cable, L=200mm)

Operator panel
(axis and override selection)
CN2 (DB9 male)

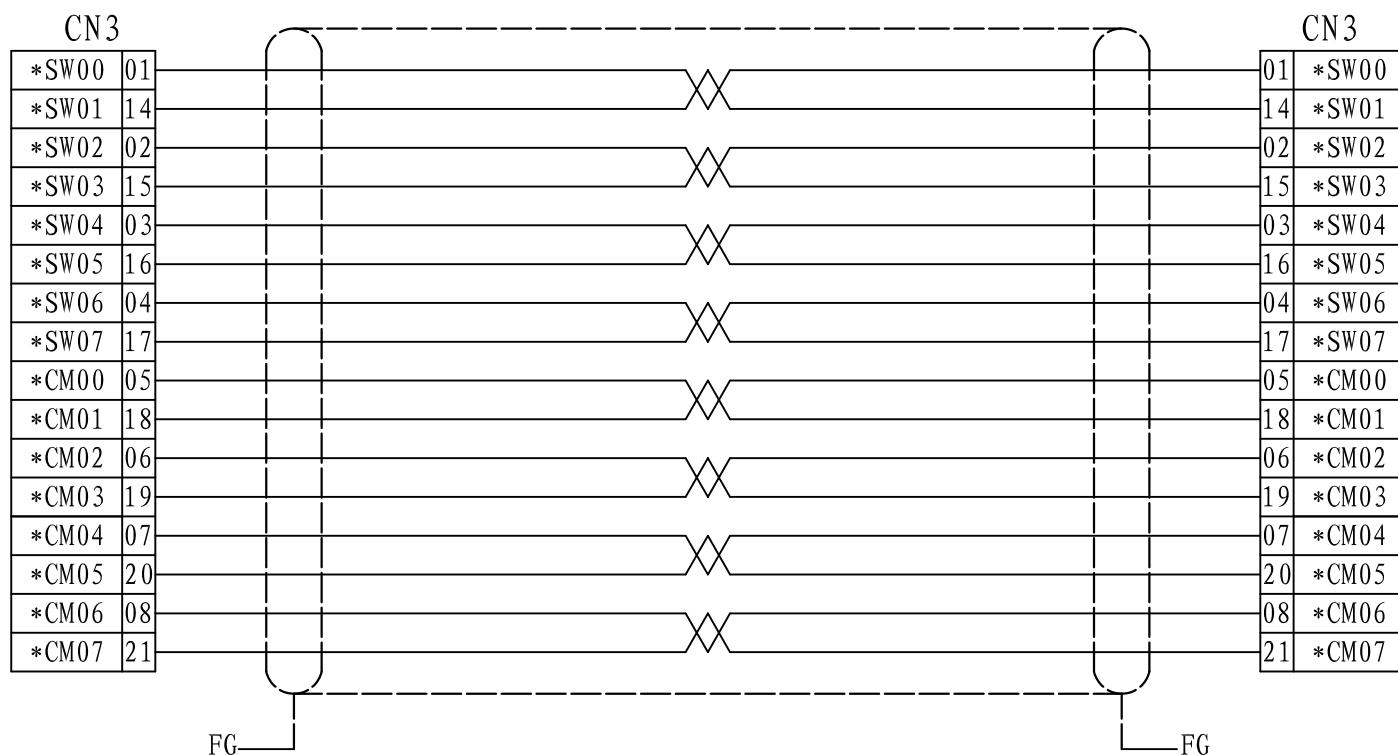
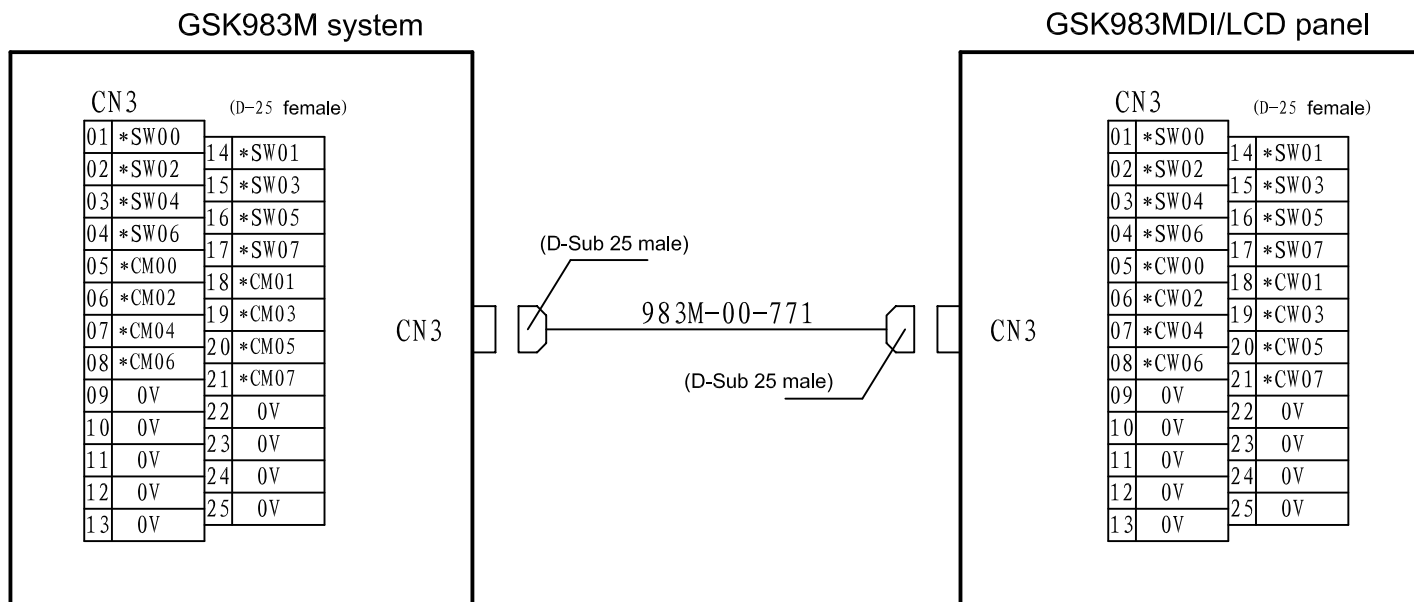
01	HX1
06	HX2
02	HX3
07	HHX
03	HHY
08	HHZ
04	HH4
09	Standby
05	0V

11. External MPG(Handwheel) Connection 2: external MPG connection



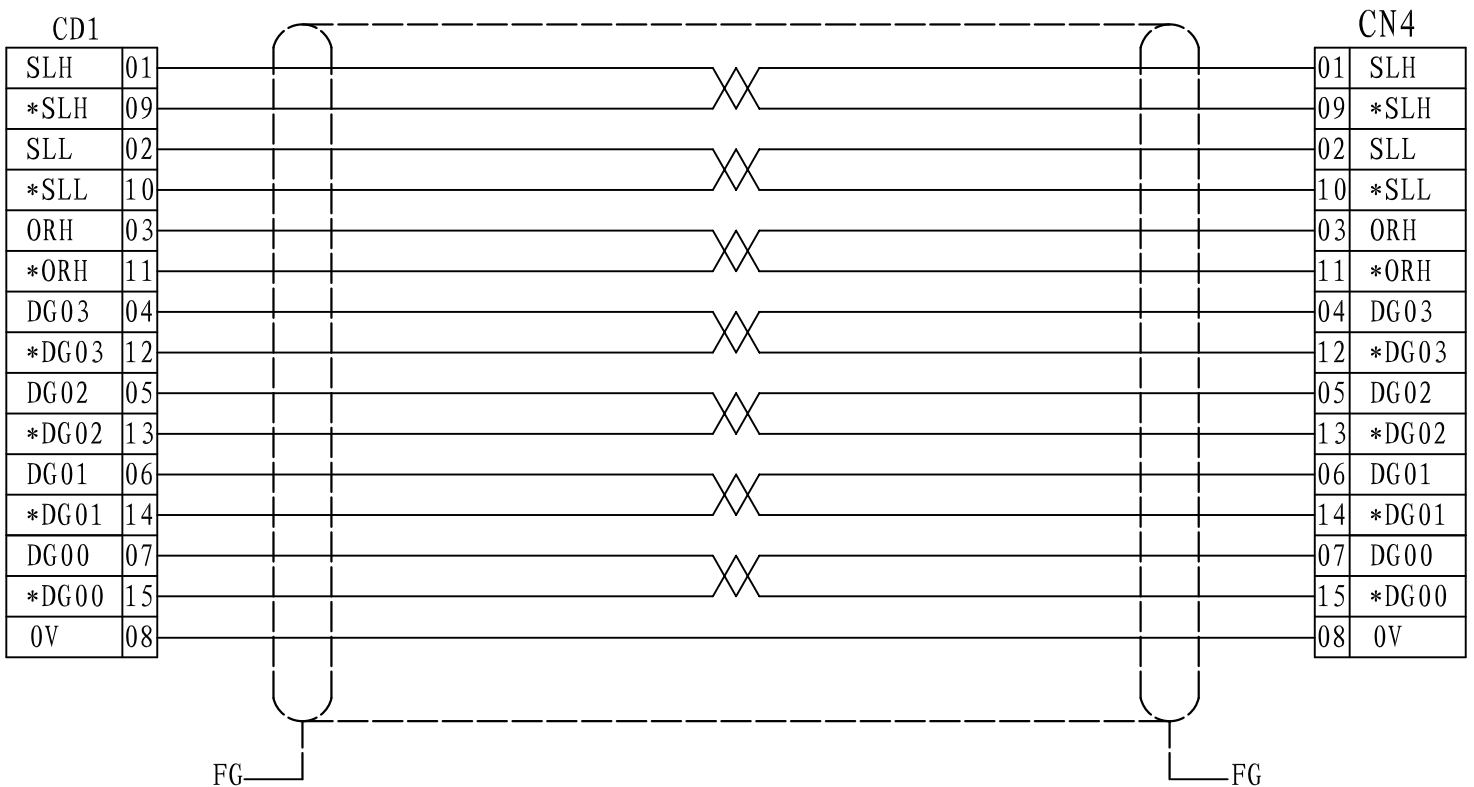
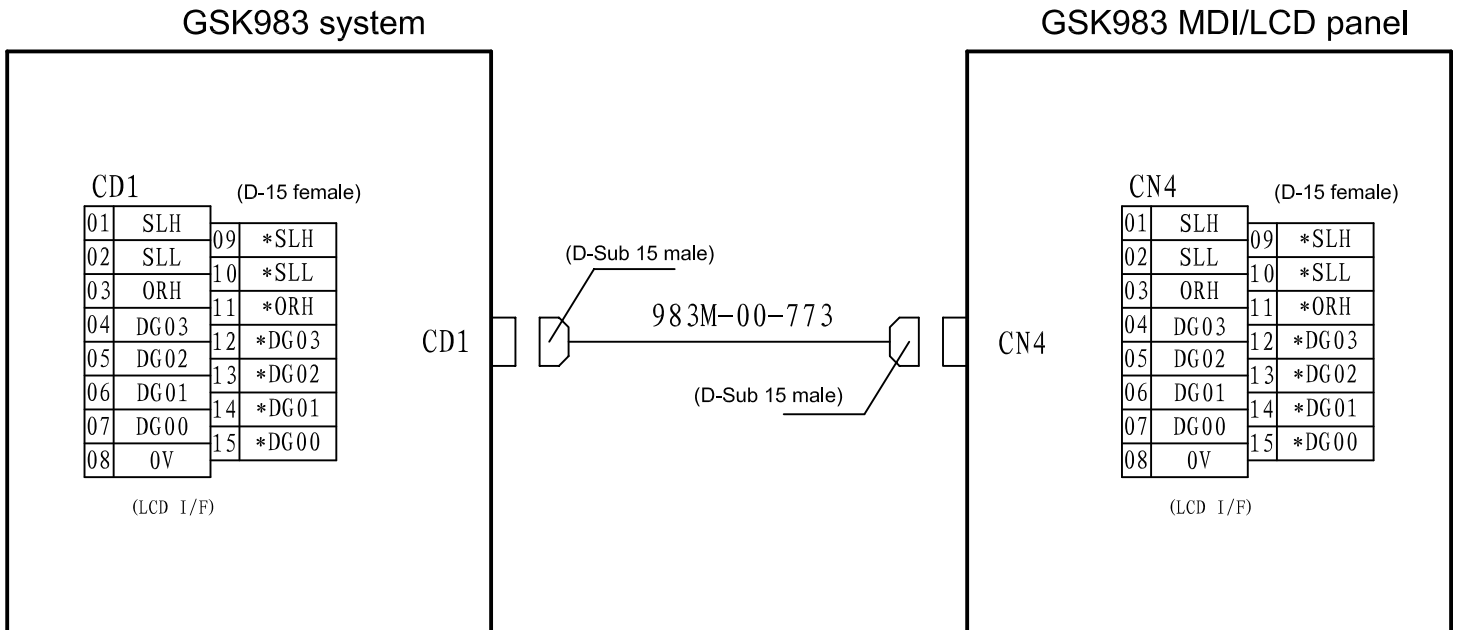
Note: The emergency stop of external MPG(handwheel) should be serially connected to the emergency link circuit, see it in "The connection diagram of emergency stop and brake hold of Z axis".

12.Connection Cable for Keyboard



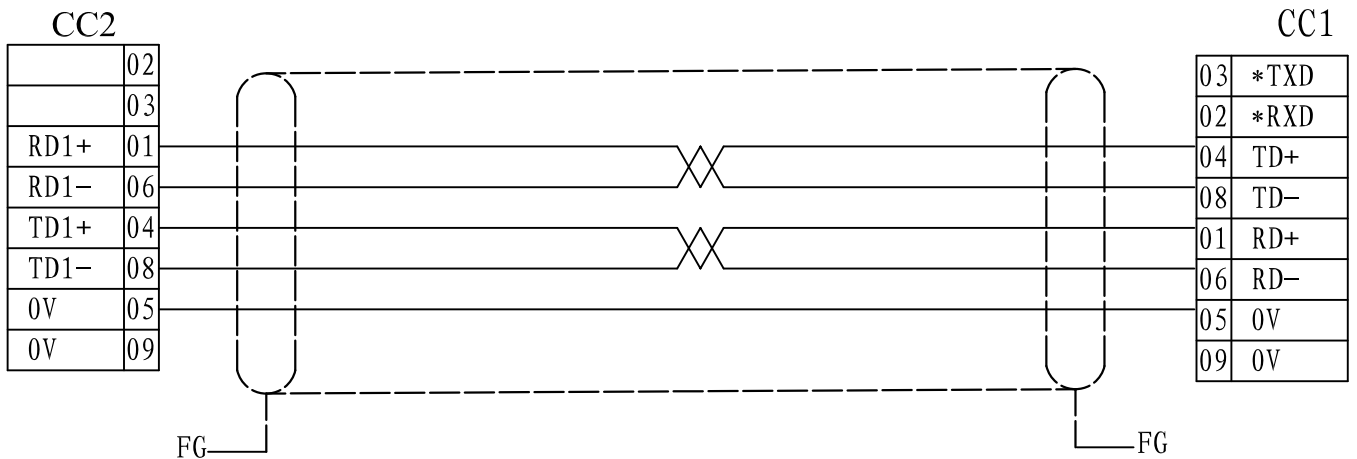
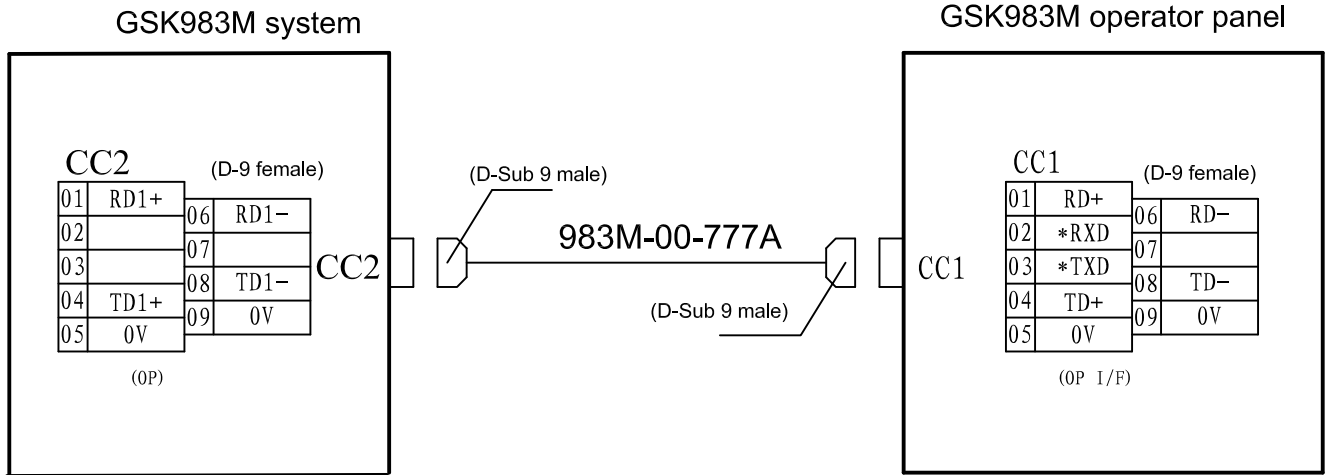
SW00-07: Line scanning input signal of keyboard matrix
 CM00-07: Column scanning output signal of keyboard matrix

13.Connection Cable for Display



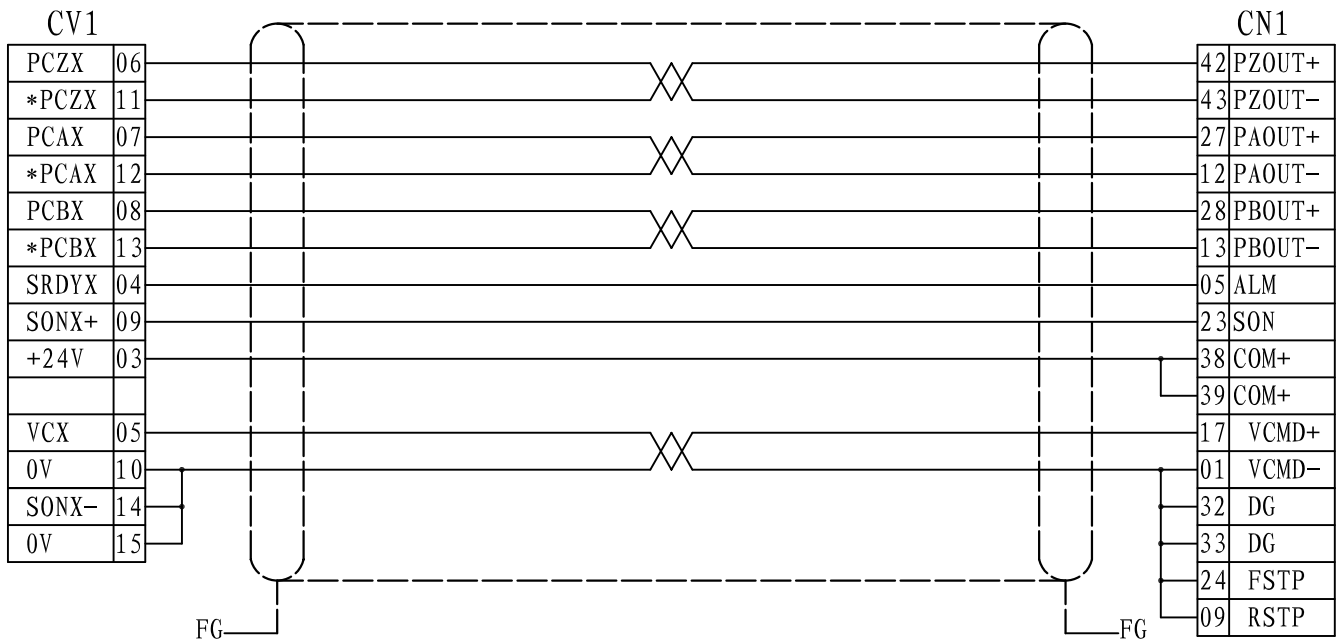
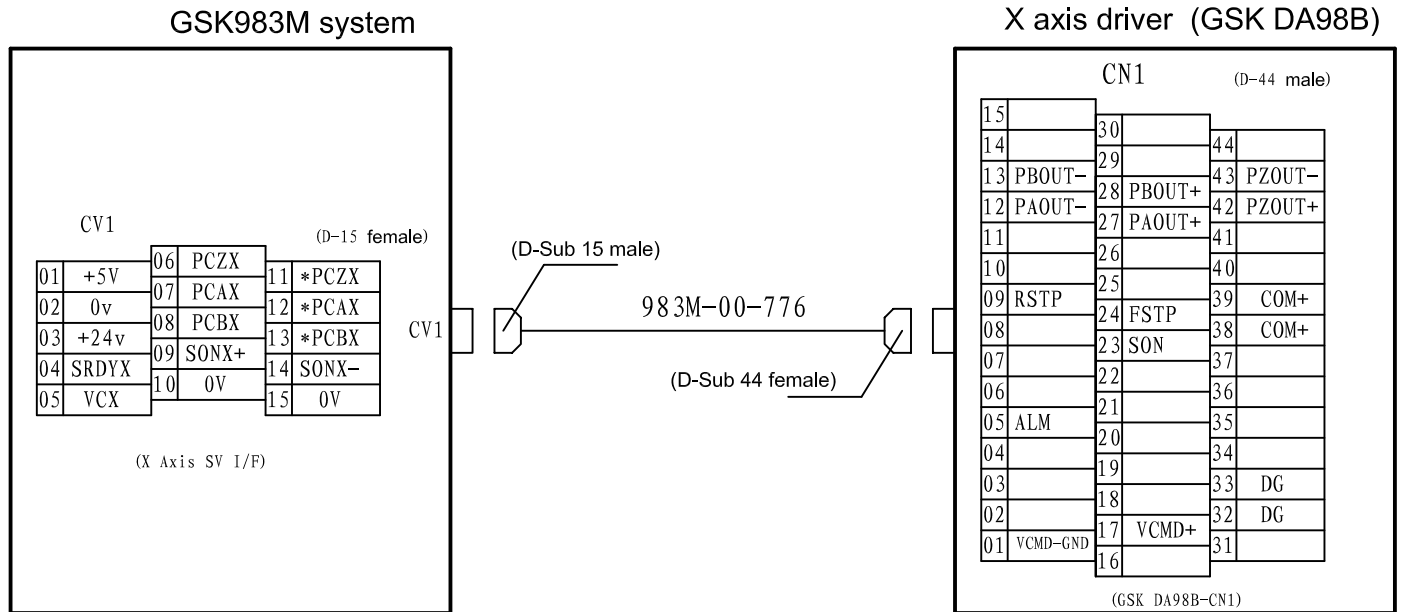
SLH *SLH: Reading signal of 4 digits to the left of the decimal point
 SLL *SLL: Reading signal of 4 digits to the right of the decimal point
 ORH *ORH: Data display ready signal
 DG00-03 *DG00-03: Data display signal

14. Communication Cable between Operator panel and System



RD+ RD-: RS422 difference receiving terminal
 TD+ TD-: RS422 difference transmitting terminal
 *RXD: RS232 receiving terminal
 *TXD: RS232 transmitting terminal

15. Cable for Connecting DA98B Drive



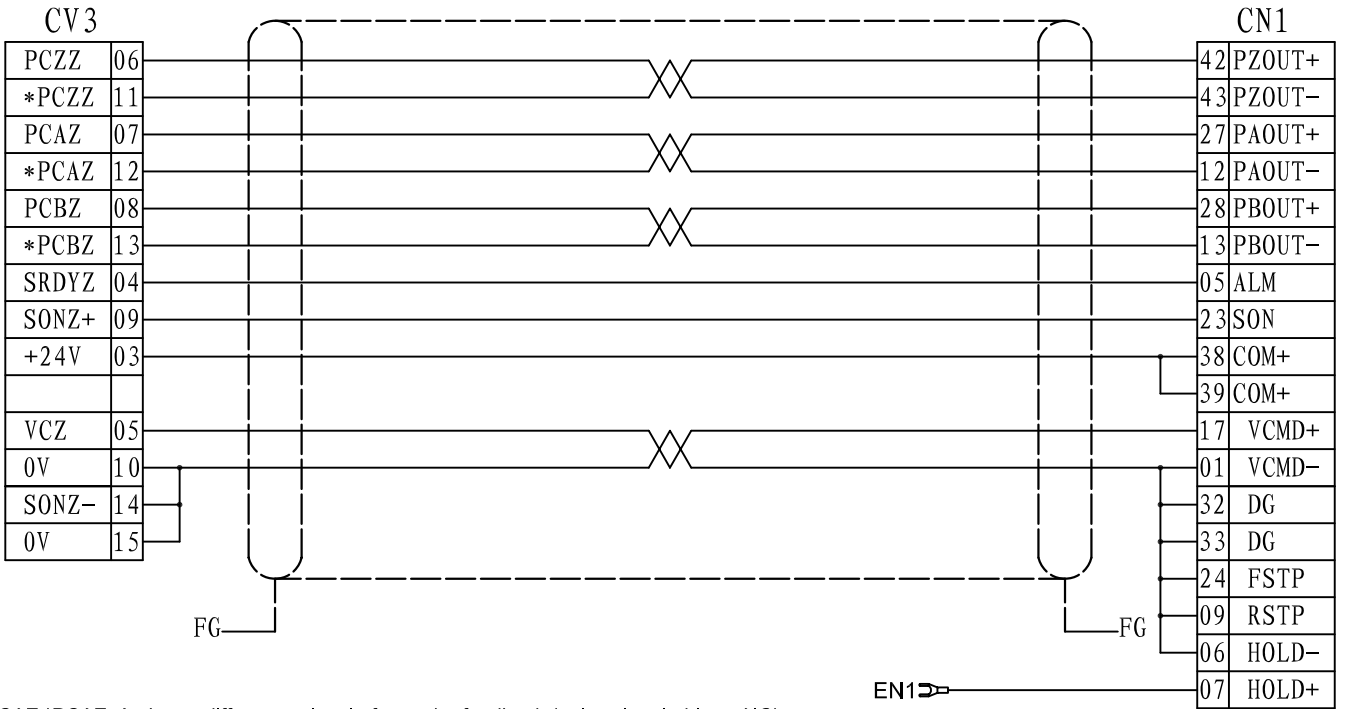
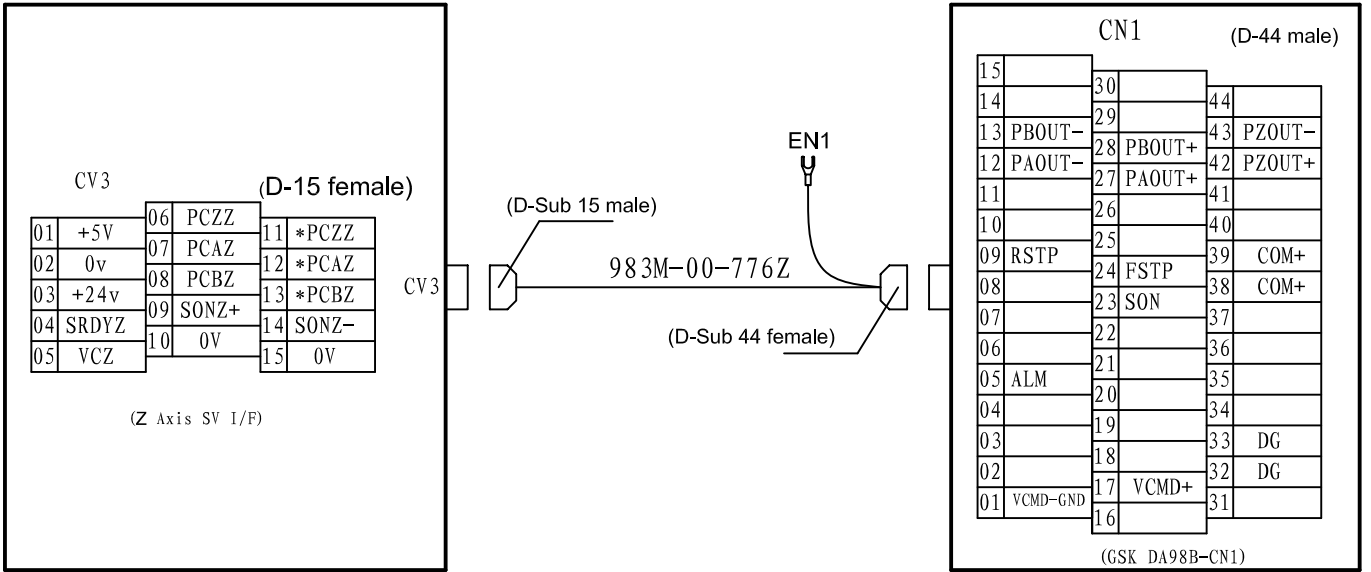
PCA *PCA: A phase difference signal of encoder feedback (pulse signal, drive → NC)
 PCB *PCB: B phase difference signal of encoder feedback (pulse signal, drive → NC)
 PCZ *PCZ: Z phase difference signal of encoder feedback (pulse signal, drive → NC)
 SON+/-: Enabling signal (ON-OFF signal, NC → drive)
 ALM: Alarm signal (ON-OFF signal, drive → NC)
 VC: Speed control voltage(DC, NC → drive)

- Note 1: The "X" in PCAX, PCBX ... stands for X axis, and Y for Y axis in PCAY, PCBY ...
- Note 2: The connecting cable of Y axis driver is the same that of X axis. And the connecting cable of Z axis without brake hold is also the same that of X axis. See the connection of Z axis with brake hold in the next page.
- Note 3: As for this connection, set the parameter No.19 (version before V2.05) of DA98B to 1, the feed direction is positive while watching the counterclockwise rotation from the motor shaft. If the motion direction is reverse to Descartes coordinate system, set the parameter No.19 of driver to a reverse value, and exchange the two wires of PAOUT+/PAOUT- by that of PBOUT+/PBOUT- respectively. (The parameter No.19 of DA98B is matched with the A, B phase feedback signals of encoder. And its delivery setting is 1. The rotation direction of motor can be modified by parameters as for versions after V2.05.
- Note 4: When matching with DA98D-1, the wiring of it is the same that of DA98B, by this means the rotation direction of the motor complies to the Descartes coordinate system(the feeding is positive direction while watching counterclockwise rotation from the motor shaft). If counterclockwise rotation is required, set the parameter PA46 of DA98D-1 to 3 (the default is "0").

16. Z Axis Connecting Holding Cable of DA98B Drive

GSK983M system

Driver of X Axis (GSK DA98B)



PCAZ *PCAZ: A phase difference signal of encoder feedback (pulse signal ,drive → NC)
 PCBZ *PCBZ: B phase difference signal of encoder feedback (pulse signal ,drive → NC)
 PCZZ *PCZZ: Z phase difference signal of encoder feedback (pulse signal ,drive → NC)
 SONZ+/-: Enabling signal (ON-OFF signal, NC → drive)
 ALM: Alarm signal (ON-OFF signal, drive → NC)
 VCZ: Speed control voltage(DC, NC → drive)

Note 1: As for this connection, set the parameter No.19 (version before V2.05) of DA98B to 1, the feeding direction is the positive while watching the counterclockwise rotation from the motor shaft. If the motion direction is reverse to Descartes coordinate system, set the parameter No.19 of driver for a reverse value, and exchange the two wires of PAOUT+/PAOUT- by that of PBOUT+/PBOUT- respectively. (The parameter No.19 of DA98B is matched with the A, B phase feedback signals of encoder. And its delivery setting is 1.

The rotation direction of motor can be modified by parameters as for versions after V2.05.

Note 2 When matching with DA98D-1, the wiring of it is the same that of DA98B, by this means the rotation direction of the motor complies to the Descartes coordinate system(the feeding is positive while watching the counterclockwise rotation from the motor shaft). If counterclockwise rotation is required, set the parameter PA46 of DA98D-1 to 3 (the default value is "0").

17. Cable for Spindle Frequency Changer

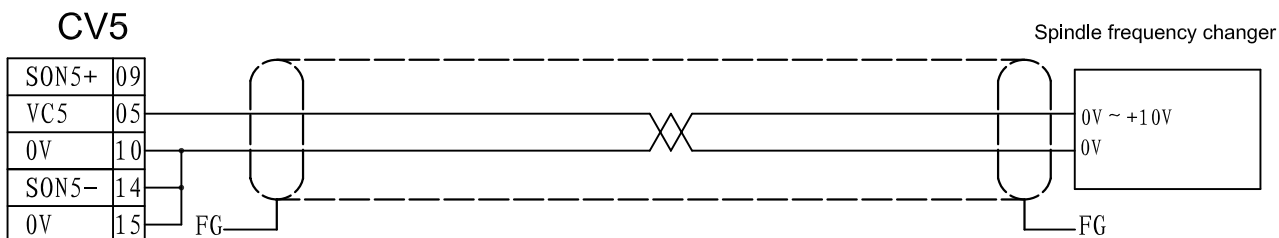
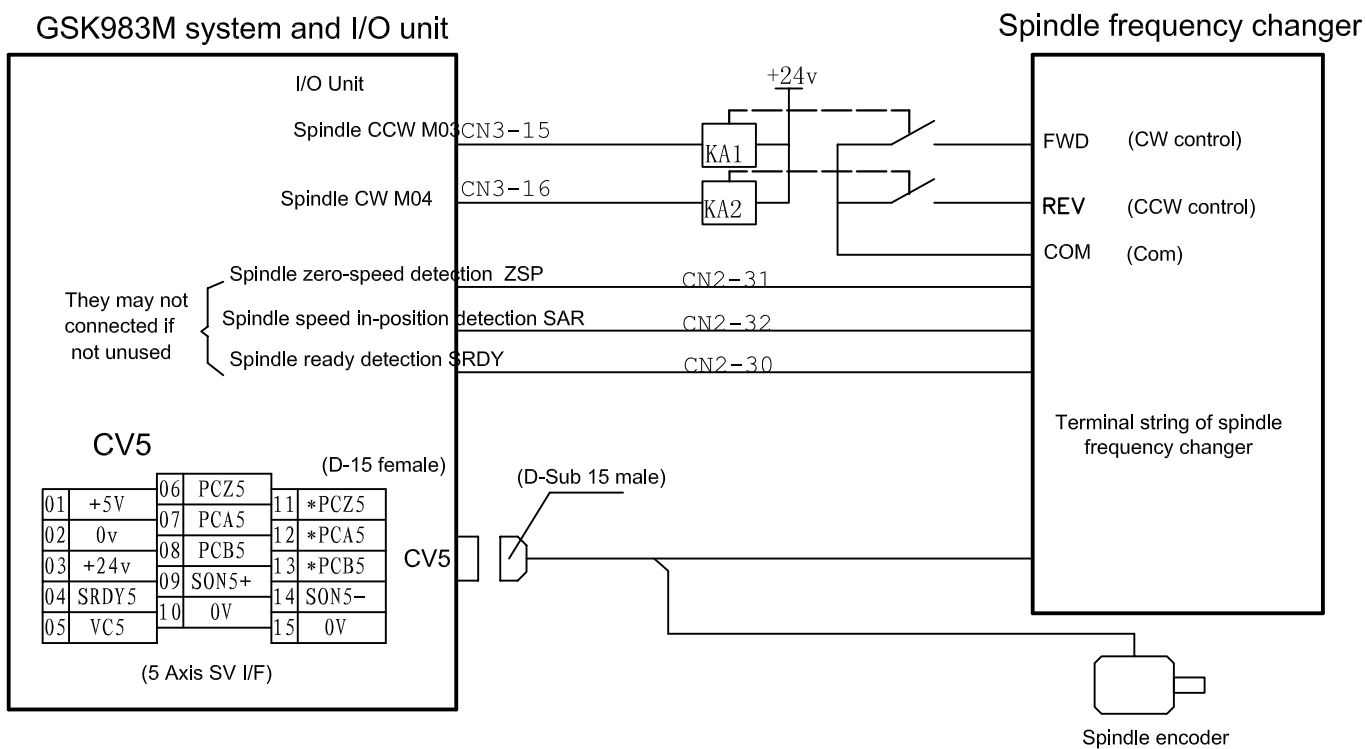


Fig.1:Wiring without spindle encoder (983M-00-792)

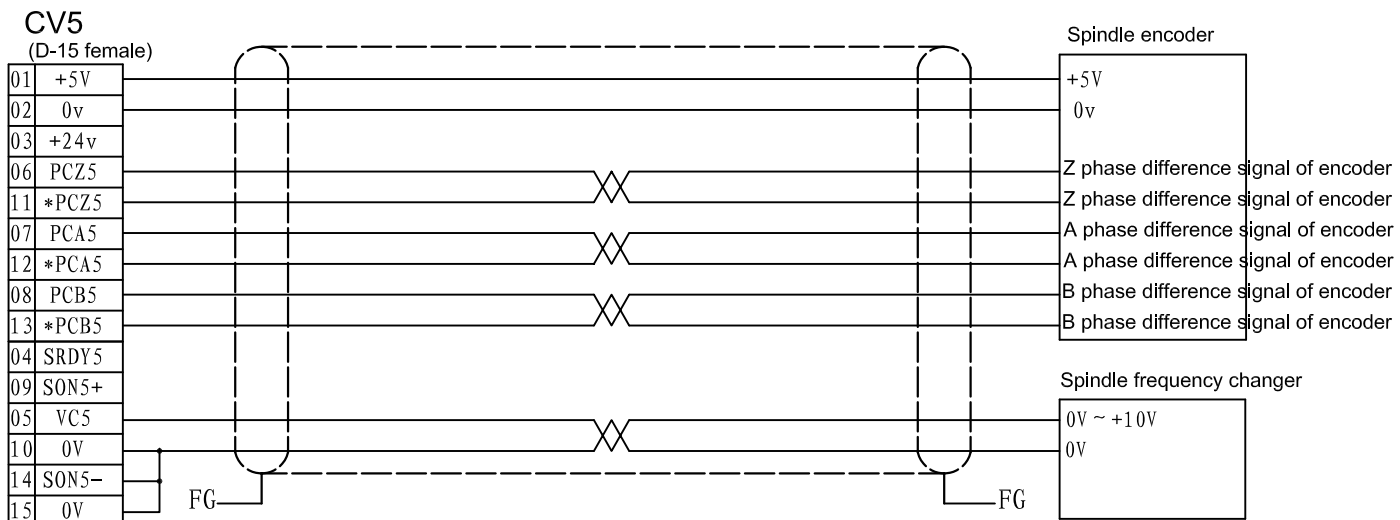
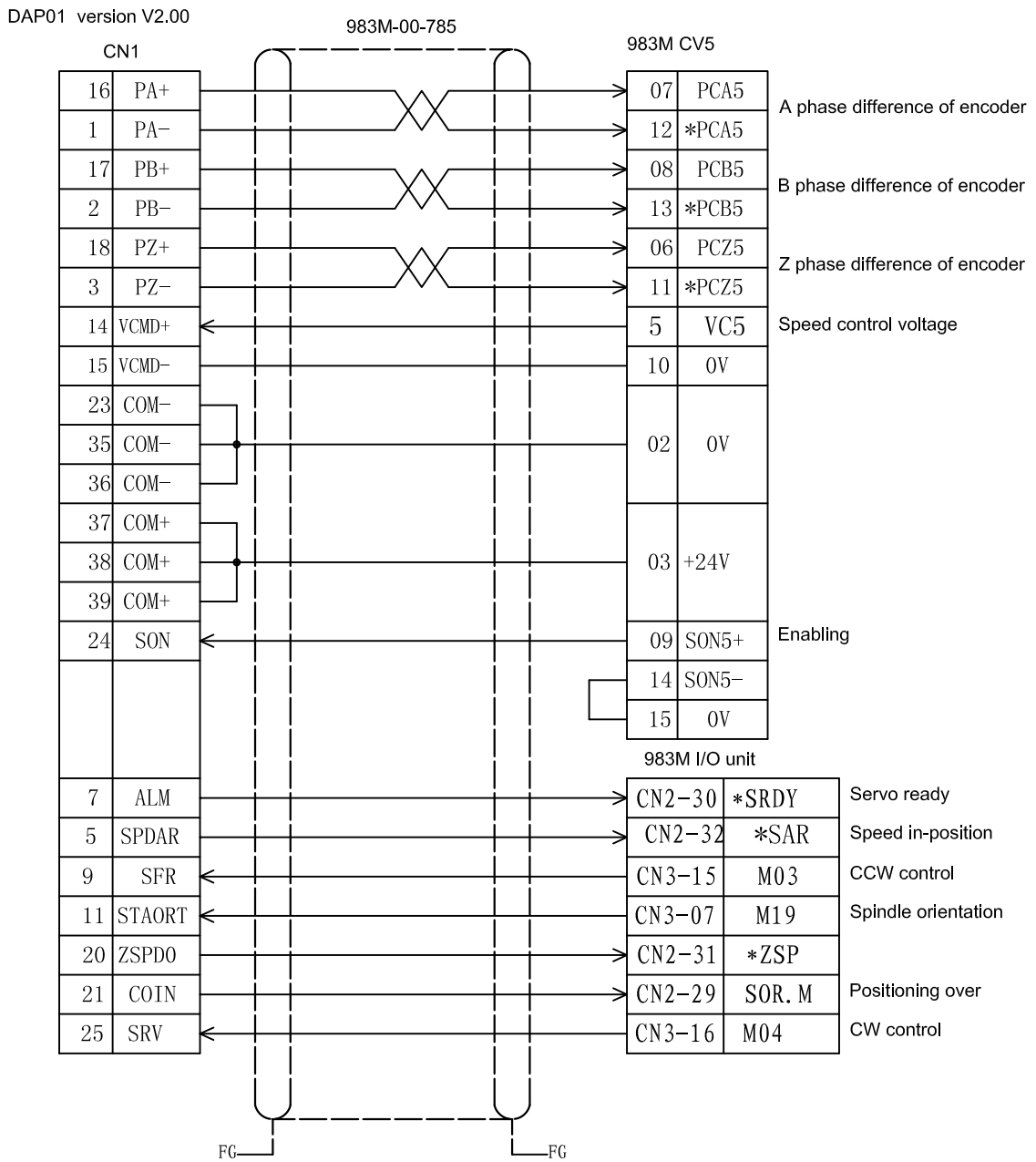


Fig.2:Wiring with spindle encoder (983M-00-775)

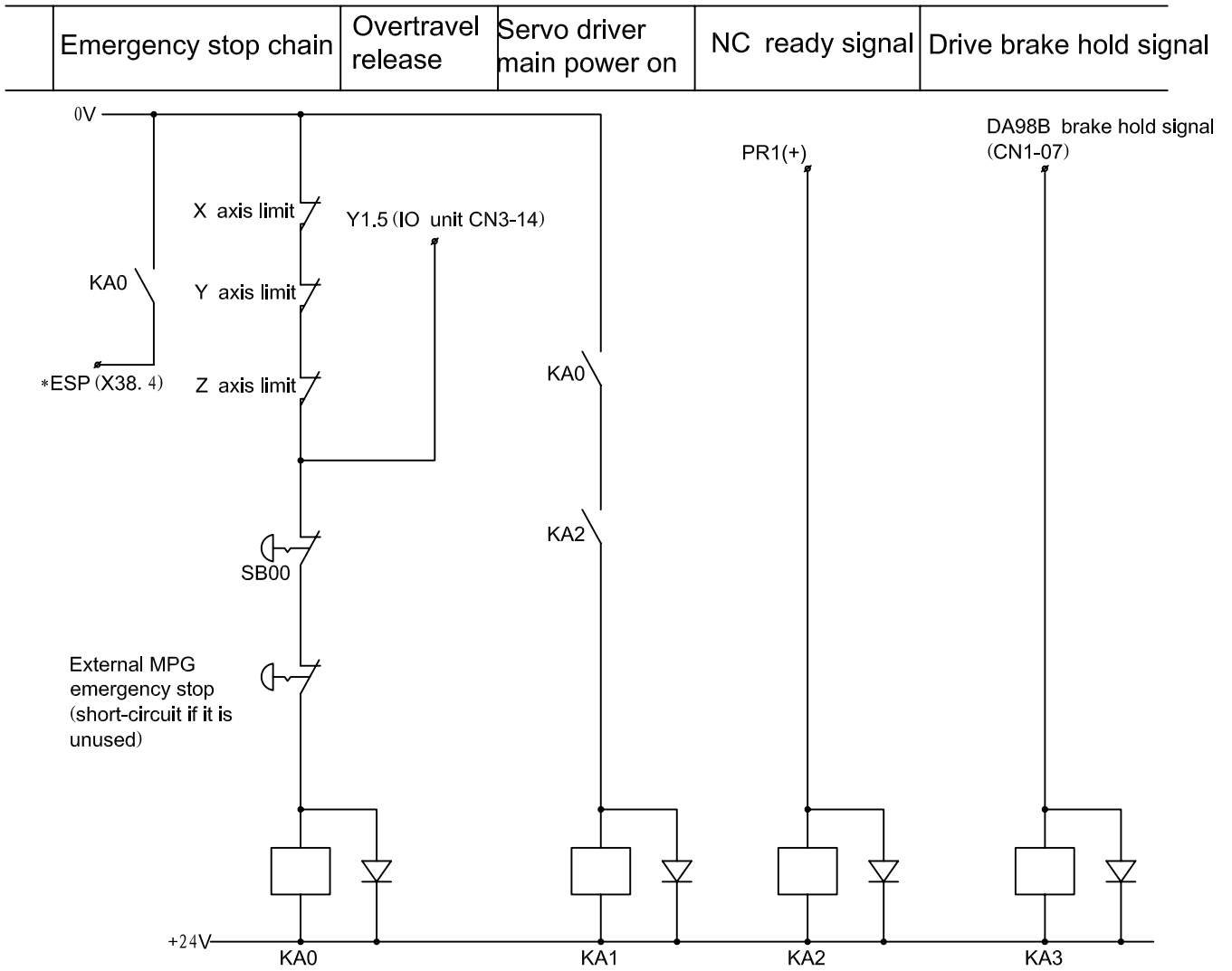
Note: The resolution of spindle is 1024.
 Note: IO unit input/output point is defined by MV2.02A-16 PLC.

18. Cable for Connecting DAP01 Servo Spindle

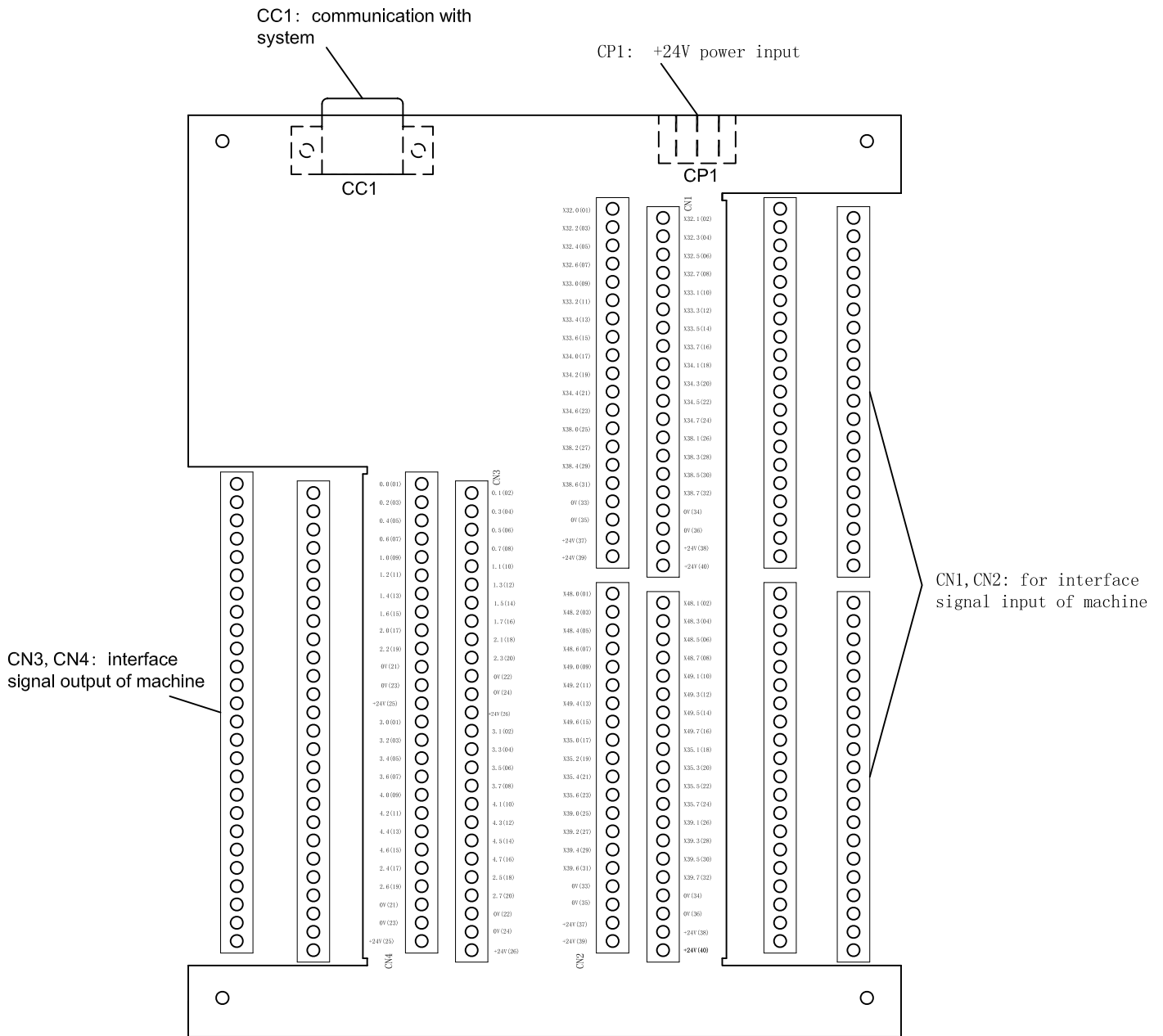


Note: I/O unit input/output point is defined by MV2.02A-16 PLC.

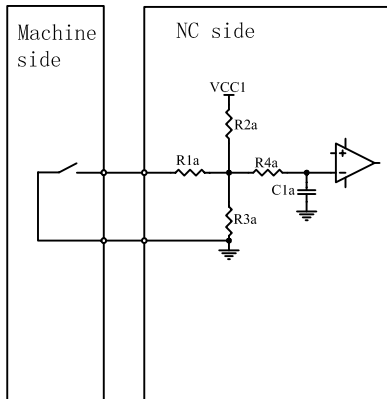
19. Connection Diagram of Machine Emergency Stop and Holding Brake



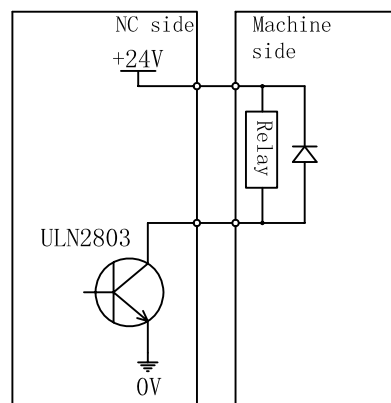
20.External I/O Unit



Wiring principle of input interface



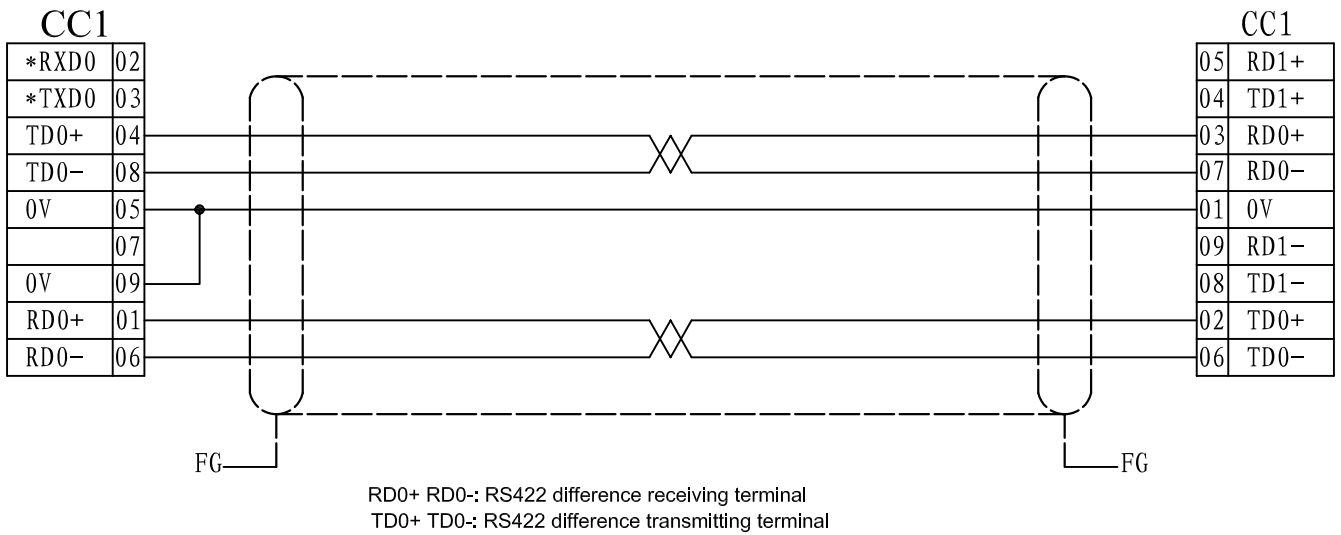
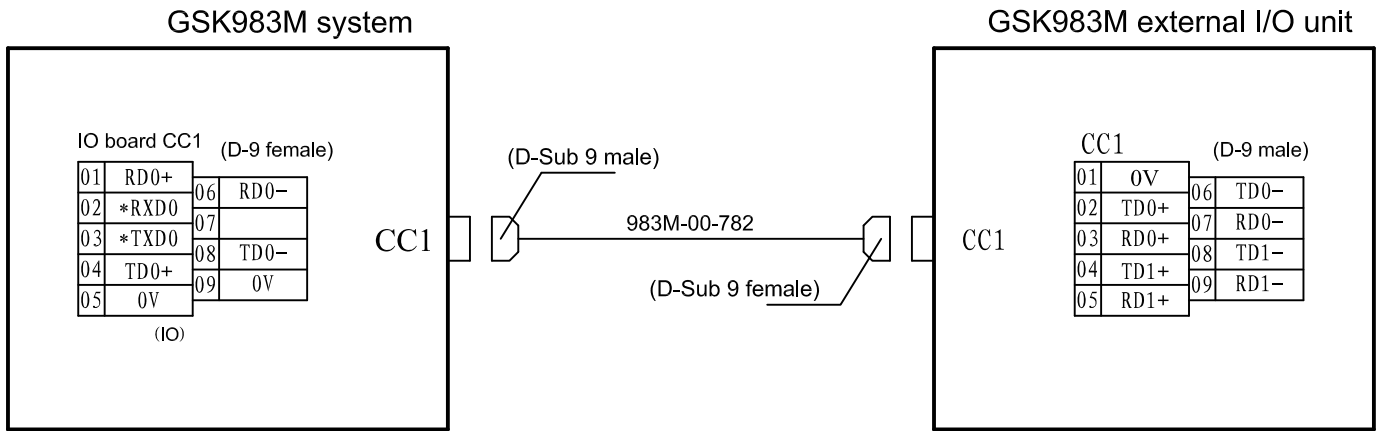
Wiring principle of output interface



Note:

The low level of delivery setting of input interface is valid; and that of output interface is Darlington array ULN2803.

21.Communication Connection Cable for External I/O Unit and System



22. Definition for I/O input/output point

CN1 pin No. input	PLC address	Signal name	I/O	CN2 pin No. input	PLC address	Signal name	I/O
1	32.0	*X+ limit	I	1	48.0		I
2	32.1	*X- limit	I	2	48.1		I
3	32.2		I	3	48.2		I
4	32.3		I	4	48.3		I
5	32.4		I	5	48.4		I
6	32.5	*X machine zero return deceleration	I	6	48.5		I
7	32.6		I	7	48.6		I
8	32.7		I	8	48.7		I
9	33.0	*Y+ limit	I	9	49.0		I
10	33.1	*Y- limit	I	10	49.1		I
11	33.2		I	11	49.2		I
12	33.3		I	12	49.3		I
13	33.4		I	13	49.4		I
14	33.5	*Y machine zero return deceleration	I	14	49.5		I
15	33.6		I	15	49.6		I
16	33.7		I	16	49.7		I
17	34.0	*Z+ limit	I	17	35.0	*+L4limit	I
18	34.1	*Z- limit	I	18	35.1	*-L4 limit	I
19	34.2		I	19	35.2		I
20	34.3		I	20	35.3		I
21	34.4		I	21	35.4		I
22	34.5	*Z machine zero return deceleration	I	22	35.5	*DEC4 machine zero return deceleration	I
23	34.6		I	23	35.6		I
24	34.7		I	24	35.7		I
25	38.0		I	25	39.0		I
26	38.1		I	26	39.1		I
27	38.2		I	27	39.2		I
28	38.3		I	28	39.3		I
29	38.4	*Emergency stop input	I	29	39.4		I
30	38.5		I	30	39.5		I
31	38.6		I	31	39.6		I
32	38.7		I	32	39.7		I
33		0V		33		0V	
34		0V		34		0V	
35		0V		35		0V	
36		0V		36		0V	
37		24V		37		24V	
38		24V		38		24V	
39		24V		39		24V	
40		24V		40		24V	

CN3 pin No. output	PLC address	Signal definition	I/O	CN4 pin No. output	PLC address	Signal definition	I/O
1	0.0			1	3.0		
2	0.1			2	3.1		
3	0.2			3	3.2		
4	0.3			4	3.3		
5	0.4			5	3.4		
6	0.5			6	3.5		
7	0.6			7	3.6		
8	0.7			8	3.7		
9	1.0			9	4.0		
10	1.1			10	4.1		
11	1.2			11	4.2		
12	1.3			12	4.3		
13	1.4			13	4.4		
14	1.5			14	4.5		
15	1.6			15	4.6		
16	1.7			16	4.7		
17	2.0			17	2.4		
18	2.1			18	2.5		
19	2.2			19	2.6		
20	2.3			20	2.7		
21		0V		21		0V	
22		0V		22		0V	
23		0V		23		0V	
24		0V		24		0V	
25		24V		25		24V	
26		24V		26		24V	

Note: The unmarked signals for CN1~CN4 is defined by PLC and also programming. The marked signals can't be changed.

Appendix 1: MV2.02A-16 PLC use

● GSK983M MV2.02A-16 PLC main function

- 1) Tool magazine control function.
- 2) High/low level selection function of tool magazine output signal (matched with different output signal).
- 3) High/low level selection function of tool magazine rotating to the stop point(matched with different level for different stop tool point).
- 4) Special parameters for debugging tool machine.
- 5) Manual/automatic clamping/releasing tool function.
- 6) Manual/automatic spindle orientation function.
- 7) Spindle function for protecting from spindle clamping signal flashing error.
- 8) Manual/automatic cooling pump control function.
- 9) Guide lubrication oil parameter setting time to automatic control.
- 10) Spindle blowing function to get the cleaner tool shank.
- 11) Manual blowing workpiece function to conveniently clean the worktable.
- 12) Washing chip.
- 13) Chip removal function.
- 14) All-axis self-hold function for reference point return.
- 15) Panel MPG and hand MPG parameter selection control function.
- 16) Rapid override function.
- 17) Cut feedrate override function.

● MV2.02A-16 I / O point

CN1 pin	PLC address	Signal name	Signal function	I/O
1	X32.0	*+LX (fixed)	X axis positive limit(connected to 0V when it is unused)	I
2	X32.1	*-LX (fixed)	X axis negative limit(connected to 0V when it is unused)	I
3	X32.2	*YW.ALM	Lubrication low or lubrication pressure low alarm	I
4	X32.3	*WD.AML		
5	X32.4	*MEN.ALM		
6	X32.5	*DECX (fixed)	X axis zero return deceleration switch	I
7	X32.6	ZDY.ALM	Userdefined alarm	I
8	X32.7	T-QIYA		
9	X33.0	*+LY (fixed)	Y axis positive limit(connected to 0V when it is unused)	I
10	X33.1	*-LY (fixed)	Y axis negative limit(connected to 0V when it is unused)	I
11	X33.2			
12	X33.3			

13	X33.4			
14	X33.5	*DECY (fixed)	Y axis zero return deceleration switch	I
15	X33.6			
16	X33.7			
17	X34.0	*+LZ (fixed)	Z axis positive limit(connected to 0Vwhen is it unused)	I
18	X34.1	*-LZ (fixed)	Z axis negative limit(connected to 0Vwhen is it unused)	I
19	X34.2			
20	X34.3			
21	X34.4			
22	X34.5	*DECZ	Z axis zero return deceleration switch	I
23	X34.6			
24	X34.7			
25	X38.0	GR1.M		
26	X38.1	GR2.M		
27	X38.2	GR3.M		
28	X38.3	GR4.M		
29	X38.4	*ESP (fixed)	Emergency stop	I
30	X38.5	TRLCK.I	Releasing tool(in-position check)	I
31	X38.6	TCLCK.I	Clamping tool(in-position check)	I
32	X38.7	CKST	Releasing/clamping tool button	I
33	0V			
34	0V			
35	0V			
36	0V			
37	+24V			
38	+24V			
39	+24V			
40	+24V			

CN2 pin	PLC address	Signal name	Signal function	I/O
1	X48.0			
2	X48.1			
3	X48.2			
4	X48.3			
5	X48.4			
6	X48.5			
7	X48.6			
8	X48.7			
9	X49.0			
10	X49.1			
11	X49.2			

12	X49.3			
13	X49.4	T0.I		
14	X49.5	TCN.I	Tool count signal (214.2=1 count switch ON)	I
15	X49.6	TFN.I	Tool magazine forward in-position(228.7=1 in-position)	I
16	X49.7	TBK.I	Tool magazine backward in-position(229.4=1 in-position)	I
17	X35.0	*+L4 (fixed)	4 th axis positive limit	I
18	X35.1	*-L4 (fixed)	4 th axis negative limit	I
19	X35.2			
20	X35.3			
21	X35.4			
22	X35.5	*DEC4 (fixed)	4 th zero return deceleration	I
23	X35.6		Index table clamping in-position	
24	X35.7		Index table releasing in-position	
25	X39.0			
26	X39.1			
27	X39.2			
28	X39.3	UNSOR.M		
29	X39.4	SOR.M	Spindle orientation in-position check	I
30	X39.5	*SRDY	Spindle alarm input signal	I
31	X39.6	*ZSP	Spindle zero speed check	I
32	X39.7	*SAR	Spindle speed arrival check	I
33	0V			
34	0V			
35	0V			
36	0V			
37	+24V			
38	+24V			
39	+24V			
40	+24V			

CN3 pin	PLC address	Signal name	Signal function	I/O
1	Y0.0	GR1.O		
2	Y0.1	GR2.O		
3	Y0.2	GR3.O		
4	Y0.3	GR4.O		
5	Y0.4	TFR.O	Tool magazine forward	O
6	Y0.5	TBK.O	Tool magazine backward	O
7	Y0.6	M19.O	Spindle orientation	O
8	Y0.7	TRL.M	Releasing tool	O
9	Y1.0	TC.O	Tool magazine CCW	O
10	Y1.1	TCC.O	Tool magazine CW	O

11	Y1.2	SPZD	Spindle brake	
12	Y1.3	CLN.O	Cooling (coolant) pump output	O
13	Y1.4	LUB.O	Lubrication pump output	O
14	Y1.5	OR.T	Overtravel release	O
15	Y1.6	M03	Spindle CCW	O
16	Y1.7	M04	Spindle CW	O
17	Y2.0	RED.ALL	Light house red light output	O
18	Y2.1	YEL.ALL	Light house yellow light output	O
19	Y2.2	GRE.ALL	Light house green light output	O
20	Y2.3			
21	0V			
22	0V			
23	0V			
24	0V			
25	+24V			
26	+24V			

CN4 pin	PLC address	Signal name	Signal function	
1	Y3.0	GZD.L	Machine working light	O
2	Y3.1	CLN2.O	Wash chip valve output	O
3	Y3.2	CFN.O	Spindle blow output	O
4	Y3.3	CHIP.CW	Chip removal CCW output	O
5	Y3.4	CLN-2O	Workpiece blow output	O
6	Y3.5	CHIP.CCW	Chip removal CW output	O
7	Y3.6			
8	Y3.7			
9	Y4.0			
10	Y4.1			
11	Y4.2			
12	Y4.3			
13	Y4.4			
14	Y4.5			
15	Y4.6			
16	Y4.7			
17	Y2.4	MTRST	System reset output	O
18	Y2.5	4UCLPO	Index table release output	
19	Y2.6	4-CLPO	Index table clamp output	
20	Y2.7			
21	0V			
22	0V			
23	0V			

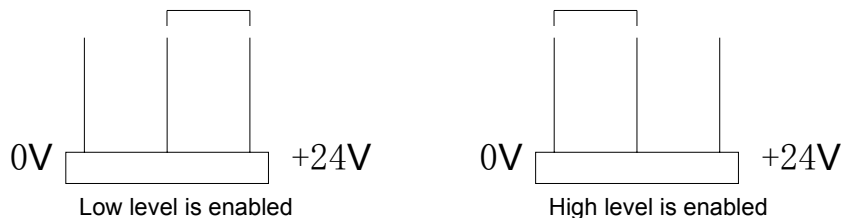
24	0V		
25	+24V		
26	+24V		

Note: I stands for the input signal and O for the output signal in the above list.

I/O interface input signal:

1) logic selection of input point

Whether the high level or low level is enabled is set by the jumper lead (S1.....S8) on the I/O board, S1-S8: the high level is enabled when it is connected to 0V; the low level is enabled when it is connected to +24V. The low level of jumper lead on I/O is enabled.



S1-S8 setting

- 32.0-32.7 is defined by S1;
- 33.0-33.7 is defined by S2;
- 34.0-34.7 is defined by S3;
- 35.0-35.7 is defined by S4;
- 38.0-38.7 is defined by S5;
- 39.0-39.7 is defined by S6;
- 48.0-48.7 is defined by S7;
- 49.0-49.7 is defined by S8.

Note: High/low level setting of S1-S8 is related to PLC program logic, considering whether PLC program logic is correct or not when the setting is changed. For MV2.02A-16 PLC version, the low level for S1-S7 is fixed to be enabled and cannot be changed into that the high level is enabled, otherwise PLC control does not normally run. Only S8, the setting of high/low level is enabled according to the output of tool magazine proximity switch.

2) Signal with *

The signal with * should be the normally-closed contact(connected to 0V) when it is turned on.

● **MV2.02A—16 PC parameters**

600	7	6	5	4	3	2	1	0
3001	X+-ZRN	ATC.ZN	TBFTCNDP	SP.ALM	TRLTCL.	ZSP.C	SAR.C	ABS-1

Bit7 X+-ZRN: X axis zero return self-protecting direction selection.

0: zero return self-protecting in positive direction.

1: zero return self-protecting in negative direction.

Bit6 ATC.ZN: whether the CNC system is matched with the tool magazine system.

0: no tool magazine function.

1: have tool magazine function.

Bit5 TBFTCNDP: it is the output signal level selection when tool magazine forward/backward signal, and the tool magazine counter switch is conducted. (the setting should be consistent with the actual electricity element).

0: When the signal for tool magazine forward/backward in-position and the switch of tool magazine counter are connected, the output signal is 0V.

1: When the signal for tool magazine forward/backward in-position, and the switch of tool magazine counter are connected, the output signal is 24V.

Note: When the signal for tool magazine forward/backward in-position, and the switch of tool magazine counter are connected, and the output signal is 24V, S8 jumper lead is connected to 0V besides the parameter should be set.

Bit4 SP.ALM: Whether CNC executes checking the spindle alarm input signal *SRDY.

0: Do not check the spindle alarm input signal.

1: Check the spindle alarm input signal.

Bit3 TRLTCL.: Whether the clamping tool in-position input signal TCLCK.I and releasing tool in-position input signal TRLCK.I is checked when the spindle rotates.

0: Do no check.

1: Check.

Bit2 ZSP.C : Whether the spindle zero speed input signal is checked when the tool is clamped/ released.

0: The spindle zero speed signal *ZSP is not check when the tool is clamped/released.

1: The spindle zero speed signal is checked. The tool releasing signal can output when the spindle zero speed signal arrives in Auto mode.

Bit1 SAR.C :Whether S instruction check the spindle speed arrival input signal.

0 : Do not check the spindle speed arrival signal *SAR. S function output is completed.

1 : Check the spindle speed arrival input signal. The S instruction does not complete until the *SAR signal arrives.

Bit0 ABS-1: Whether LCD menu switch manual absolute ON/OFF is shielded.

0: Manual absolute menu switch is shielded, menu ABS ON/OFF is disabled.

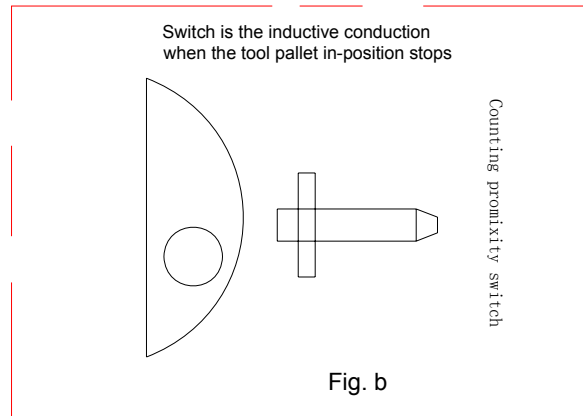
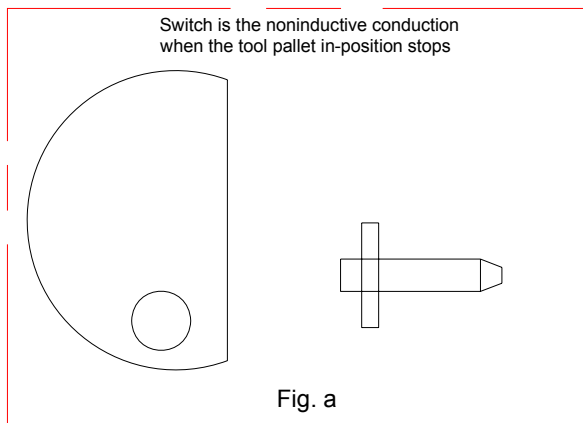
1: Manual absolute value function is enabled, menu ABS ON/OFF is enabled.

601	7	6	5	4	3	2	1	0
3002	T-STPL G		H>MP G					

Bit7 T-STPLG: Tool magazine pallet rotation/stop position selection.(set correctly when it is matched with tool magazines with different types)

0: When the pallet rotates the in-position, the counter proximity switch output is not conducted.(Fig. a).

1: When the pallet rotates the in-position, the counter proximity switch output is conducted.(Fig. b).



Bit5 H>MPG :Control MPG selection.

0: panel MPG control.

1: handle MPG control.

602	7	6	5	4	3	2	1	0
3003			CHIP.CC	CHIP.C	ZIDY.C			YW.C

Bit5 CHIP.CC : whether the CW function of the chip removal is enabled.

0 : disabled.

1 : enabled.

Bit4 CHIP.C: whether the CCW function of the chip removal is enabled.

0 : disabled.

1 : enabled.

Bit3 ZIDY.C: The run program and instruction whether check the userdefined alarm input signal

ZDY.ALM.

0 : Do not check ZDY.ALM signal. CNC can automatically run when the input signal

ZDY.ALM=0.

1 : Check ZDY.ALM signal. CNC does not automatically run and alarms when the input signal ZDY.ALM=0.

Bit0 YW.C : The run program and instruction whether check the lubrication oil high/low or pressure high/low input signal.

0: Do not check lubrication low/pressure low alarm input signal. CNC can automatically run when there is no input signal YW. ALM= 1.

1: Check lubrication low/pressure low alarm input signal. CNC can not automatically run when there is no input signal YW. ALM= 1.

603	7	6	5	4	3	2	1	0
3004		T-TZ1						

Bit6 T-TZ1: Whether the CNC enters the tool magazine mechanical debugging state.(tool magazine mechanical debugging parameter).

0: The CNC does not enter the tool magazine mechanical debugging state.(it is set to 0 when the tool magazine normally runs.)

1: The CNC enters the tool magazine mechanical debugging state.

(Note: when the mechanical position is debugged, Bit 6=1, NC alarm indicator flashes, and CNC cannot enter Auto mode but enter MDI mode. After regulating the mechanical position of tool magazine and clamping tool position of spindle, PC parameter #3004.6 is set to 0, otherwise, the run program faults.)

PC parameter number	Parameter function
1001	Time setting of first supply oil after it is turned on firstly. Unit: 0.5 millisecond.
1002	Time setting of stopping supply oil. Unit: 0.5 millisecond.
1003	Time setting of every supply oil after first supply oil. Unit: 0.5 millisecond.
1010	Time setting of checking tool clamping signal interrupt when the spindle is rotating. Unit: 0.5 millisecond.
1011	Flashing time interval of NC alarm indicator when debugging tool magazine(PC603 Bit6 is set to 1).
2001	Setting of total tool amount controlled by tool magazine program.
2101	Setting of current tool number of tool magazine.

● **MV2.02A—16 PLC M codes**

M3 spindle CCW
M4 spindle CW
M5 spindle stop
M6 T×× tool change
M8 cooling pump ON
M9 cooling pump OFF
M19 spindle orientation
M54: releasing tool
M55: clamping tool
M65: tool magazine forward
M66: tool magazine backward
M84: index table release
M85 index table clamp

● Tool magazine function

- 1) Total tool amount
For 983M MV2.02A -16 PLC software, there are total 16 tools. If a new tool is added, the internal setting value of PLC is modified. Using MV2.02A-×× PLC software, user can change the setting value of PC parameter from its external but the software cannot be used normally.
- 2) Command tool change
 1. For MV2.02A-16 PLC software, the tool change is executed by using M6 Txx in Auto and MDI mode.
 2. NC prompts No. 200 alarms when the commanded tool number is more than the total tool amount.
 3. NC prompts No. 200 alarms when the commanded tool number is 0.
 4. The tool change instruction is neglected when the commanded tool number is equal to the current tool number.
- 3) Tool change operation
 1. In Auto and MDI mode, after M6 Txx instruction is executed, the program judge whether the input tool number instruction meets the tool change conditions, if it meets, the spindle stop turning to execute the spindle orientation.
 2. Z axis returns to the first reference point.
 3. Z axis returns to the second reference point.
 4. The tool magazine forwards to clip the tool on the current spindle.
 5. Gas valve releasing tool.
 6. Z axis rises to the first reference point to make the tool escape from the spindle.

7. Rotating pallet to the commanded tool number.
8. Z axis falling down to the second reference point.
9. Clamping tool.
10. Retract from the tool magazine and the tool change completion.

The whole tool change process is completed by CNC, i.e user input the instruction M6

4) Tool change items

1. Do not lock machine lock when the tool change is executed.
2. The tool pot of tool magazine corresponding to the current spindle cannot install the tool.

5) Tool magazine notes:

1. Check and set the second reference point again after changing the CNC master board or regulating the position of Z axis deceleration limit switch.
2. must set NC parameter #320=6, otherwise the tool magazine does not run normally.
3. The second reference point of Z axis is set by NC parameter 161, and the setting value cannot be changed after debugging the machine, otherwise the tool magazine is damaged.
4. The system macro variable #509 is exclusive to tool magazine, and cannot be used and changed by user.
5. Macro program for tool change must be No. O9001 memory program.
6. The tool magazine can forward after Z axis return to the first or second reference point.

6) Troubleshoots for emergent stop, power-off, reset and alarm.

1. When the tool change is executed in MDI or Auto mode and the tool magazine is in the forward limited position, the spindle descends to the 2nd reference point position, the tool is clamped, when the tool magazine is not retracted(the system variable #509=0), and the emergency stop, power-on, alarm, reset appears, the machine tool should be in the state of debugging (PC parameter #3004.6=1), the tool magazine is retracted by M66 in MDI mode, and the machine tool escapes from the debugging state.(note: at this time, the spindle cannot be released and the tool magazine retracts in Z direction).
2. The tool change is commanded in MDI mode or is executed in Auto mode, the tool magazine is in the forward limited position, the spindle has released the tool, (system macro variable #509=1)when Z axis does not raise or the tool pallet does not rotate after it raises and the emergence stop, power-off, alarm or reset appears, the machine tool should enter the state of debugging(PC parameter #3004.6=1), M54 is commanded to release the spindle, and Z axis reaches the safety position in Manual mode and then M66 is commanded to retract from the tool magazine, and it normally use when the machine tool retracts from the state of debugging.
3. The tool change is commanded in MDI mode or is executed automatically, the tool

magazine is in the forward limited position, Z axis reaches the first reference point. When the tool magazine is rotating, the emergency stop, power-off, alarm, or reset appears, the tool number of current double digit display is not consistent with the actual tool number, if the tool is executed continuously, the machine should be in the debugging state(PC parameter #3004.6=1), M66 is commanded to retract the tool magazine, T** is commanded to rotate the tool pallet one time to ensure there is no tool in the position corresponding the current spindle, and then set PC parameter #2101 to be the current tool pot number, it can be normally used when the machine escapes from the state of debugging.

7) Alarm for tool change

In Auto and MDI mode, after the tool change is executed by M6 Txx, No. 200 alarms, which indicates the commanded tool number exceeds the setting of total tool amount or the pallet has not arrived to the correction position or the machine auxiliary function is locked.

8) Tool number display

The current tool number is displayed on the double digit display of operator panel in decimal.

9) Spindle releasing/clamping tool function:

1. The releasing/clamping tool function must be executed when the spindle stops.
2. In Manual mode, the releasing/clamping tool button is pressed, the releasing tool signal outputs; the tool is clamped after the button is released.
3. In Auto and MDI mode, pressing the releasing/clamping tool button is disabled. Use M code to release/clamp tool. M55: clamping tool; M54: releasing tool.
4. PC parameter relative to releasing/clamping tool: set PC parameter #3001.3bit=1, the releasing/clamping tool check is enabled. M55 clamping tool instruction is not completed until TRLCK.I=1, M54 releasing tool instruction is not completed until TRLCK.I=1.

● **Debugging tool magazine**

1) Setting of tool magazine debugging state

To conveniently debug the concentric between the tool pot position and spindle, and Z axis clipping tool position, set the tool magazine debugging PC parameter. Setting PC parameter #3004.6=1 to enter tool magazine debugging mode, the interlock condition of tool magazine forwarding, backing and rotating are ignored, and the tool magazine is debugged.

2) Parameter setting before debugging tool magazine

1. set PC parameter #2001 to the total tool amount.
2. set PC parameter #2101 to the current tool number.

3. set NC parameter #300.5 bit to 0.
- 3) Use in the state of tool magazine debugging
 1. When the tool magazine is in the state of debugging, the CNC system cannot run the Auto mode but other operation modes.
 2. When the tool magazine is in the state of debugging, the tool magazine forwards by M64 in MDI mode.
 3. The tool magazine backs by M66 in MDI mode.
 4. The pallet rotates to the commanded tool number by commanding T** in MDI mode.
 5. When the tool magazine is in the state of debugging, releasing spindle can move the machine in the limit position of tool forwarding.
- 4) Tool magazine debugging notes
 1. When the tool magazine is in the state of debugging, the safety position of tool magazine is controlled by debugger to avoid the bump between the tool magazine and the machine.
 2. The CNC prompts the tool magazine is in the state of debugging when **NC ALARM** indicator flashes. After the tool magazine is debugged, PC parameter #3004.6 bit is set to 0 to escape from the debugging state, and the tool magazine control is executed in Auto mode.

● Zero return of machine feed axis

- 1) Axis zero return self-protection

For 983M MV2.02A—16 PLC, press **+X**, **+Y**, **+Z**, **+4** to realize each axis to return to the reference point without setting PC parameter in Zero Return mode, and the direction button will automatically hold in the course of zero return. After the reference point return is completed, the zero point indicators on each axis will light. Press **-X**, **-Y**, **-Z**, **-4**, emergency stop button or **RESET** to cancel the zero return operation
- 2) Setting of zero return in X negative direction

983M MV2.02A—16 PLC is used for the machining center with the tool magazine control function, zero return of X axis is executed in negative direction, the position of zero return deceleration switch is reverse to the common milling machine(self-protection direction of zero return can be selected by PC parameter #3001.7, the zero return in negative direction can be executed when NC parameter #12.0 is set to 1).
- 3) Zero return and DNC mode

Tool magazine retracts is enabled in Zero Return and DNC mode, and tool magazine forwards is disabled in Zero Return and DNC mode.

● Spindle function

983M MV2.02A-16 PLC supports S4 bit digit A (analog voltage), and does not execute multi-speed spindle motor control and output mechanical gear shifting signal and execute the gear shifting in-position check.

Spindle speed is directly specified by S ××××(4 bit digit) and its max. analog voltage is ±10V.

● Spindle orientation function

When the machine is matched with servo spindle driver, press **ORIENTATION** in Manual mode or command M19 in Auto/MDI mode, the system outputs the orientation start signal to the servo driver, and it transmits the completion signal after the driver completes the spindle orientation, and then the CNC receives the orientation completion signal and M19 instruction completes.

● Spindle alarm

The check spindle alarm input signal can be set when PC parameter #3001.4 is set to 1, the **MACHINE ALARM** indicator on the machine operator panel lights and the system is in the state of emergency stop and stops all output when the alarm appears.

● Emergency stop alarm

The **MACHINE ALARM** indicator on the machine operator panel lights and all output stop when the system alarms for emergency stop.

● MPG

- 1) 983M MV2.02A—16 PLC MPG is for the one on the machine operator panel. The default step is X1=0.001mm when the system is delivered. User can select X10=0.01mm, X100=0.1mm according to the requirements.
- 2) When the machine is controlled by MPG of the external handle box, the axis selection and the override signal of the handle box are connected to CN2 of machine operator panel, A/B pulse signal of MPG is connected to CN2 of CPU board of the system, and the emergency stop switch is connected in series to the emergency stop chain. See **External MPG Connection** in *GSK983M Connection Manual*.

Note: (PC parameter #3002.5 must be set to 1 to enable external MPG control is enabled.)

● Rapid override

In Manual mode, press **RAPID** and the indicator on the machine panel lights and the rapid override is selected by X 1 , X 10, X 100; in Auto mode, the rapid override can be switched by **X 1 /F0**, **X 10/150%**, **X 100/100%**.

Corresponding relationship: X1→F0 X10→50% X100→100%, **RAPID** press key is enabled in Manual and Zero Return mode, and disabled when it overtravels and the tool magazine is in the forward limit switch position.

- **Cooling function**

In any operation modes, press **COOLING** on the machine panel to control the cooling pump ON/OFF. Press it and it becomes ON, press it again and it becomes OFF, it is ON in Manual mode, and OFF by commanding M09 in Auto MDI mode. It is ON by commanding M8 in Auto MDI mode, is OFF by pressing **COOLING** and commanding M09

- **Washing chip function**

In any operation modes, press **WASHING CHIP** on the machine operator panel to control the washing chip ON/OFF. Press it and it becomes ON, press it again and it becomes OFF.

- **Spindle blowing**

In Manual mode, when the tool is released, the spindle blowing is ON, when the tool is clamped, the spindle blowing is OFF. In Auto or MDI mode, M54 is commanded and the tool is released, the spindle blowing is ON, M55 is commanded and the tool is clamped, the spindle blowing is OFF.

- **Workpiece blowing**

In any operation modes, press **BLOWING WORKPIECE** to control the blowing workpiece ON/OFF. Press it and it becomes ON, press it again and it becomes OFF.

- **Machine light/chip removal**

Machine light/chip removal key can be selected by parameter's setting, when PC parameter: #3003.5=1 #3003.4=0: it is the machine light function in any operation mode. Press **MACHINE LIGHT/CHIP REMOVAL** and it becomes ON, press it again and it becomes OFF. The light is ON when the system resets and appears the emergency stop.

#3003.5=0 #3003.4=1: it is the chip removal CCW function. Press **MACHINE LIGHT/CHIP REMOVAL** and the chip removal CCW outputs.

#3003.5=0 #3003.4=0: it is the chip removal CW function. Press **MACHINE LIGHT/CHIP REMOVAL** and the chip removal CW outputs. The chip removal stops output when the system resets and emergently stops.

#3003.5=1 #3003.4=1: there is no output.

● **Overtravel release/tool release indicator**

Press **OVERTRAVEL**, I/O PLC address 1.5 outputs 0V, and the output stops after the key is released. User can externally connect with relay used for closing the emergency stop chain which is broken by overtravel.

● **Index table clamping/releasing control**

Whether the index table clamping/releasing control function is used is set by PC parameter 3002 Bit4. when it is used, and there is no clamping/releasing in-position signal, the 4th axis cannot run. Command M84 to output the index table releasing signal; command M85 to output the index table clamping signal. The clamping/releasing signal is output through IO unit.

● **MV2.02A-16 PLC alarm list**

MV2.02A-16PLC alarm list		
Alarm	Cause	Troubleshooting
1.The red light house is ON 2. MACHINE ALARM on the panel is ON 3.The press key is out of order and does not shift the operation modes	1.The spindle servo driver alarms 2.The level setting of driver alarm is mistake 3.*SRDY alarm connection line is turned off	1. Resolve the spindle servo alarm 2.Check the level setting of driver alarm signal 3.Check *SRDY alarm connection line
1. The red light house is ON 2. NC ALARM on the panel is ON 3. The press key is out of order and does not shift the operation modes	1. The emergency stop connection line is turned off 2. The emergency stop button is pressed 3. The CNC system is fault	1.Check whether the emergency stop button is pressed 2.Check whether the emergency stop connection line is turned off 3.Change the CNC system
1. The red light house is ON 2. FEED HOLD on the panel is ON 3.The system does not execute	1.Lubrication oil low alarms 2. *YW.ALM connection is turned	1. Add the lubrication to eliminate the alarm 2. Check *YW.ALM connection line 3. Check whether *YW.ALM alarm

Auto and MDI mode	off. 3. *YW.ALM connection is connected with +24V	level is mistake 4. Check whether the setting of No.3003.3 parameter is mistake.
No.200 alarms in tool change	1. Specified T number exceeds the total amount 2. The tool pallet is not in-position. 3. The auxiliary function is locked. 4. T code is not specified after M6 is executed.	1. Check whether the setting of total tool amount is mistake 2. Execute the next tool change in the tool magazine debugging mode. 3. Check whether the setting of T-STPLG bit is mistake.
1. The red light house is ON. 2. FEED HOLD on the panel is ON 3. The system does not execute Auto and MDI mode	1. User. *ZDY. ALM connection line is cut off 2. *ZDY.ALM connection line is connected to +24V	1. Eliminate the userdefined alarm source 2. Check *ZDY. ALM connection line 3. Whether *ZDY.ALM alarm level is mistake. 4. Whether the setting of No.3003.3 parameter is mistake

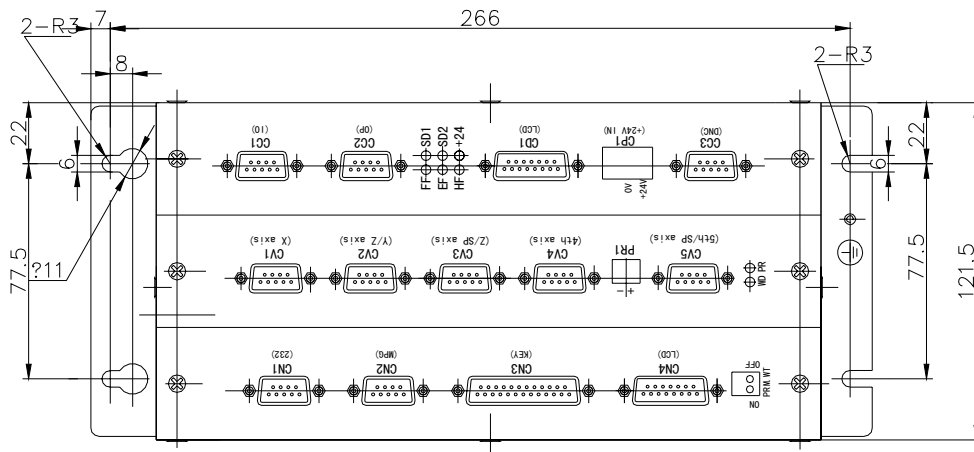
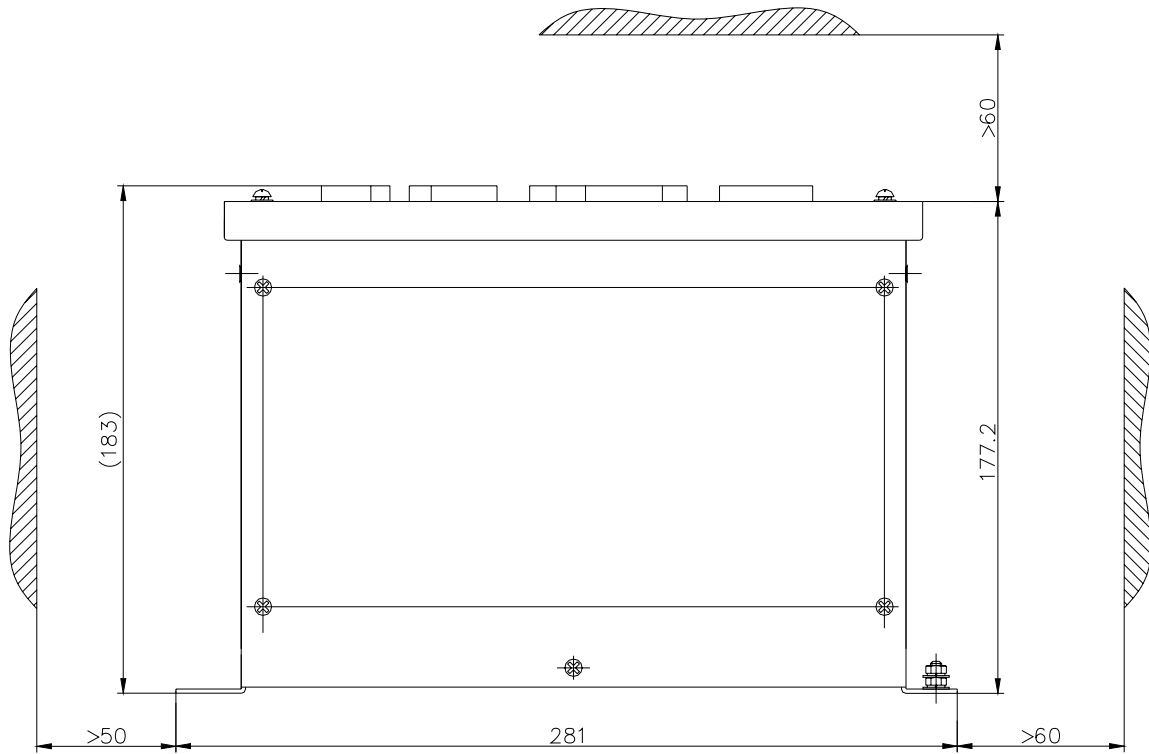
● **MV2.02A-16 PLC tool change macro program(reference)**

```

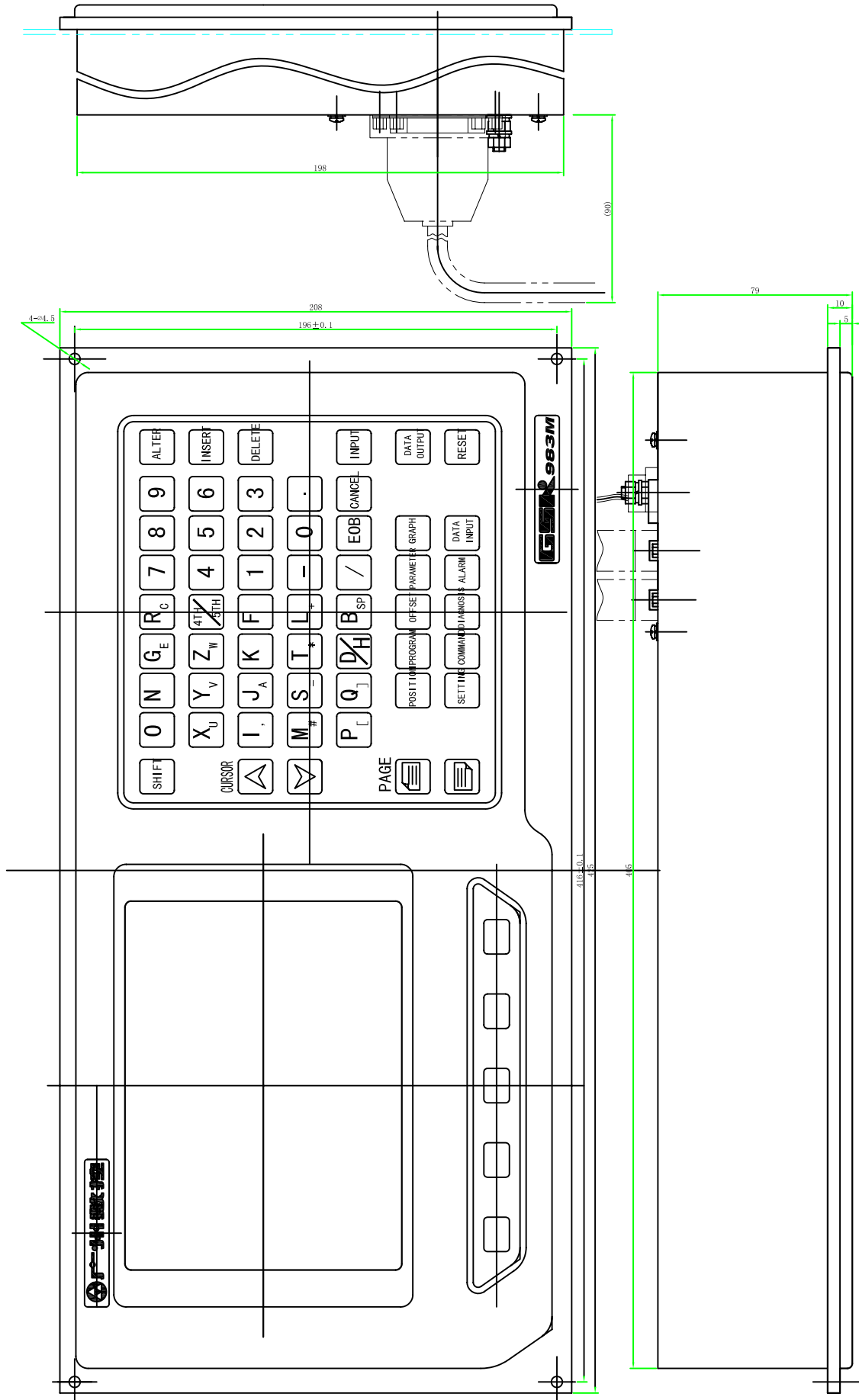
%
:9001
N0010 G04 X5
N0020 #19=#1032
N0025 IF[#19 EQ 0] GO TO 320
N0030 M5
N0040 G04 X5
N0045 IF[#1032 EQ 0] GO TO 320
N0050 IF[#4120 GE #19] GO TO 320
N0070 IF[#4120 EQ 0] GO TO 320
N0090 IF[#4120 EQ #1032] GO TO 460
N0100 M19
N0110 G04 X5
N0120 #19=#0
N0130 IF[#509 EQ 1] GO TO 330
N0140 G21 G49 G30 G91 Z0
N0160 M65
N0170 G04 X1.0
N0190 M54
N0200 #509=1
N0210 G21 G49 G28 G91 Z0
    
```

N0220 M60
N0230 G04 X1.0
N0240 G21 G49 G30 G91 Z0
N0250 M55
N0255 #509=0
N0260 G04 X1
N0270 M66
N0310 GO TO 460
N0320 #3000=200
N0330 G21 G49 G28 G91 Z0
N0335 M54
N0340 #509=1
N0350 M65
N0360 G04 X1.0
N0370 M60
N0380 G04 X1.0
N0390 G21 G49 G30 G91 Z0
N0400 M55
N0410 #509=0
N0420 M66
N0460 M99
%

Appendix 2: Installation Dimension Diagram

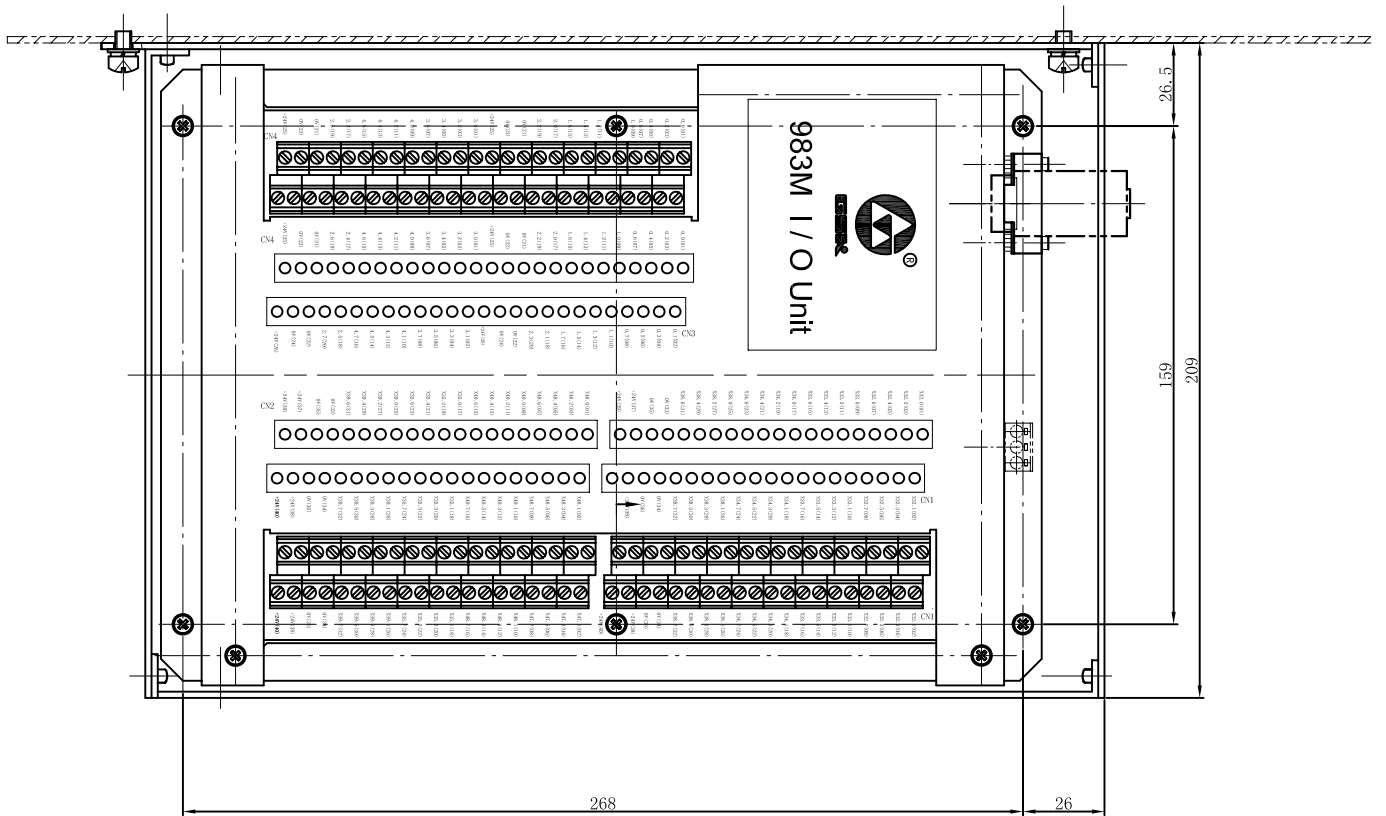
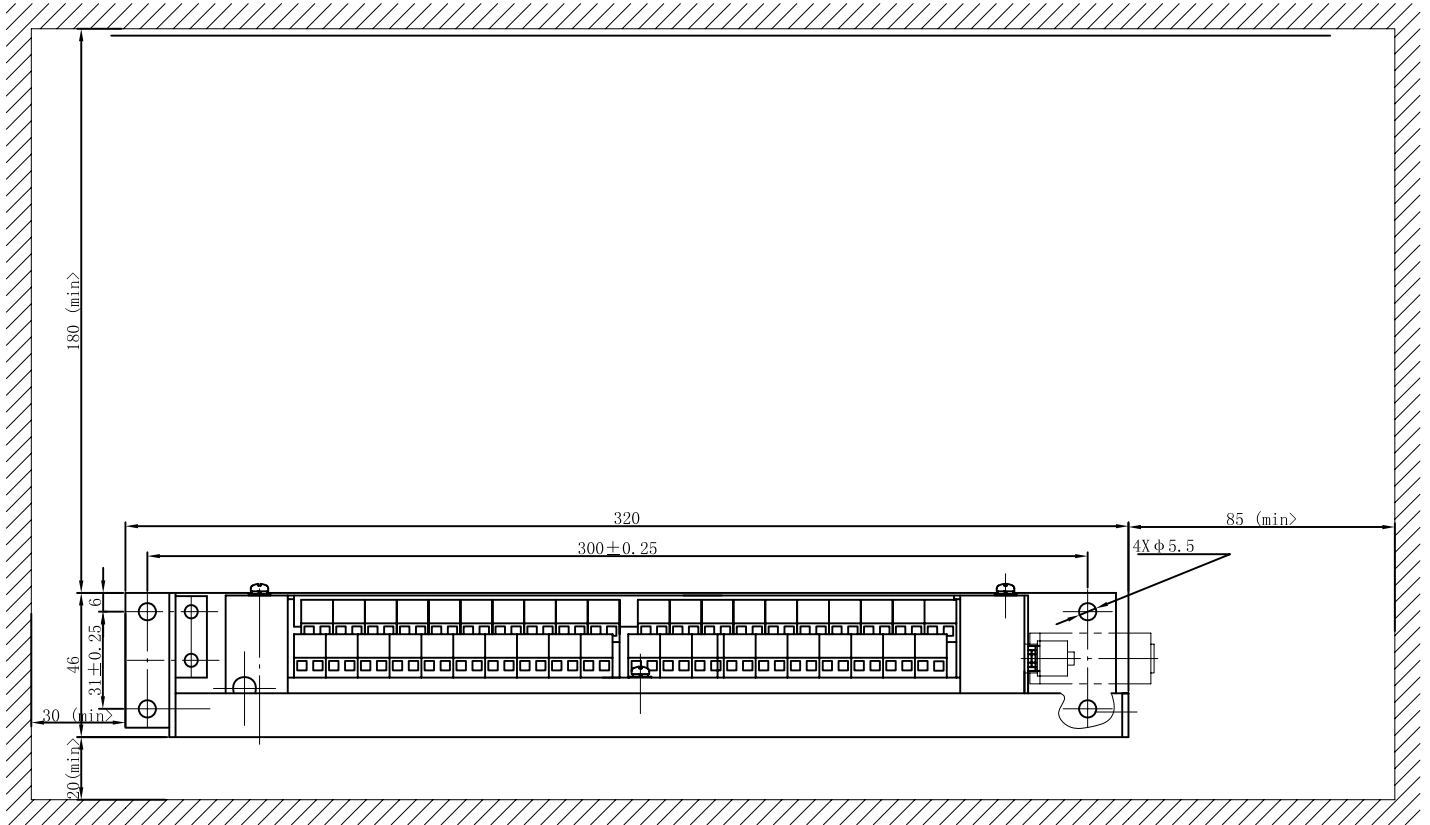


Installation dimension of the main cabinet



MDI/LCD panel installation dimension

External I/O unit installation dimension



GSK983M Connection Manual version upgrade list

No.	Date	Version No. upgrade	Upgrade content
1	2007-4-17	Version 4 from 3	PLC MV2.02A-16 is upgraded from MV2.0A-16 and the Connection Manual is changed as follows: 1. All MV2.0A-16 renamed to MV2.02A-16. 2. Add the Index Table Clamping/Releasing In-Position Input Appendix 1IO point X35.6, X35.7. 3. Add the Index Table Clamping/Releasing Output in 1IO point Y2.5, Y2.6. 4. Add the following items in Appendix 1 Tool magazine: 5) Tool change note: when the unexpected causes (emergency stop, power-down and so on) cause that the tool pot of tool magazine which corresponds to the current spindle is installed with the tool, the macro variable #509 can be set to1 to change the second reference point path of the next tool change and avoid bumping tool. 5. Add the Index Table Clamping/Releasing Control in Appendix I. 6. Have modified Tool Change Reference Macro Program in Appendix 1.

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All specification and designs are subject to change without notice May 2007/Edition 4

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