

H81 Series Joysticks

Mate Industrial Joystick, Hall effect, 2-axis, Panel Mounted

MKF-JS27 Rear Panel Mount Versions



MKF-JS27A



MKF-JS27B



MKF-JS27C



MKF-JS27D



MKF-JS27E



MKF-JS27F

MKF-JS28 Top Panel Mount Versions



MKF-JS28A



MKF-JS28B



MKF-JS28C



MKF-JS28D



MKF-JS28E



MKF-JS28F

FEATURES

- Principle: Hall sensor from Germany Hall sensor, linear correction in the whole temperature range, linear correction of the magnetic curve, to ensure the linearity of the output
- 2 axis (XY), 14-bit resolution
- Working voltage: 3.2V-5.5V, can work stably at 3.3V or 5.0V
- Signal output: USB, CAN, RS232, RS422, analog voltage
- Analog voltage: 5.0V power supply 0.3~2.5~4.7V or 6%Vdd~50Vdd~94%Vdd, other parameters can be customized.
- Repetitive positioning accuracy: less than 1.5%
- Materials: aluminum alloy and ABS + stainless steel, precision structure craftsmanship
- Protection level: IP67 above the panel
- Built-in operation wake-up switch (specify when ordering):
- The mechanical switch is also effective when the power is not supplied; when the joystick is in motion, the switch is closed, and it is disconnected when it returns to the neutral position; it is mainly used for battery power to wake up the CPU to reduce power consumption

APPLICATION

- Robots
- Medical equipment
- Optical instruments

SPECIFICATION

Sensor	Hall sensor, full-scale multi-point linear correction
Signal output	linear analog voltage 4%Vdd-96%Vdd, center 50%Vdd (communication mode can be selected)
Rotation angle	±20°, diagonal angle: ±28°
Operation strength	a variety of options (or customized)
Center return accuracy	less than 1%
Supply voltage	DC3.3V or 5V
Working current	<15MA
Wake-up switch	Mechanical type, the center is disconnected, the switch is closed by turning 5-10°, and the function is optional
Operating temperature	-40°C ~ +70°C
Storage temperature	-50°C ~ +80°C
Protection level	part of the panel is IP67
Dimensions	Outline size for MKF-JS27 76.2(H)X38(L)X38(W), installation size: 31.0 x 31.0 Outline size for MKF-JS28 76.04(H)X47(L)X47(W), installation size: 35.0 x 35.0

PRODUCT CONFIGURATION

1	2	3	-	4	-	5
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H81
Product series

Operation Limiter
2C = Round
1X = Single X axis
2P = Cross
2Q = Square

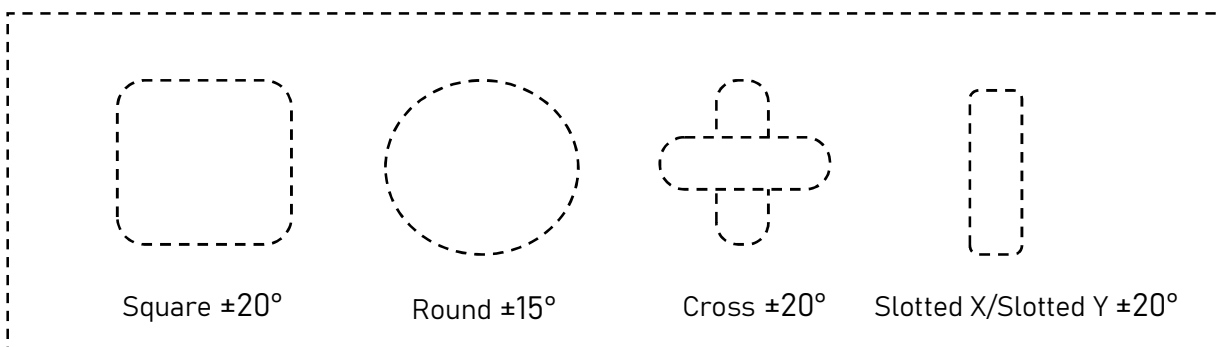
Output Option
H02 = 0V to 5V
H47 = 0.3V to 4.7V
H01 = 0.5V to 4.5V
H04 = 1V to 4V
RS232 = RS232
RS422 = RS422
RS485 = RS485
CAN = CAN

Power Supply Option
S = DC5V

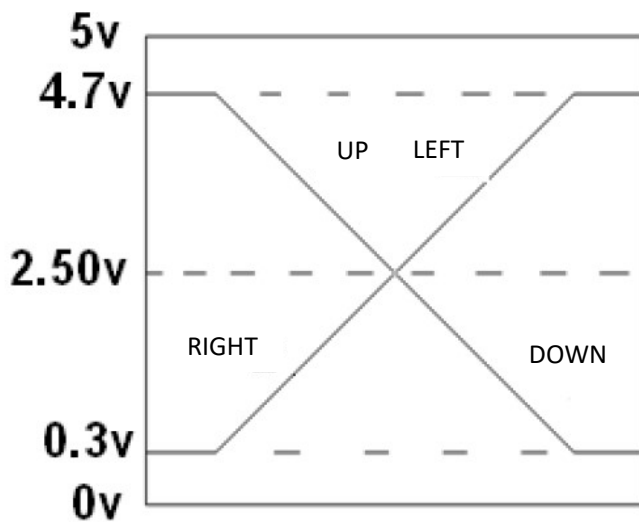
Handle Option
MKF-JS27A-F
MKF-JS28A-F



OPERATING DIRECTION



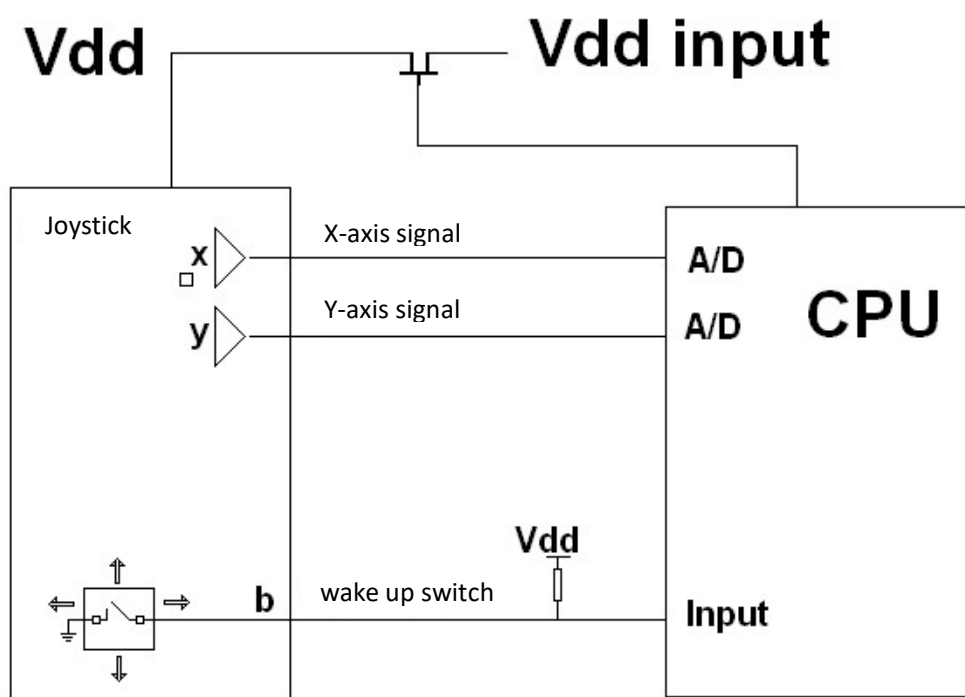
OUTPUT GRAPH



X-axis signal output 4%Vdd-96%Vdd

Y-axis signal output 4%Vdd-96%Vdd

JOYSTICK WIRING DIAGRAM



Note: Wake up the switch: when the joystick leaves the center position about 5-10° , the switch is closed, and when the joystick returns to the center, the switch is disconnected, and this function is also valid without power. For products with low power consumption, when the CPU does not move for a long time, the CPU will power off the joystick. When operating, it will wake up the CPU and power on the joystick, which can greatly reduce the standby power consumption of the whole machine. **Only products that have a wake-up function for custom joysticks have this function.**

PIN DEFINATION FOR ANALOG OUTPUT V_{dd} = 5V

Pin 1 +5V RED	PIN 2 GND BLACK	PIN 3 BUTTON YELLOW	PIN 4 NC GREEN	PIN 5 Y-AXIS BLUE	PIN 6 X-AXIS BROWN
+5V	GND	Wake-up switch signal output, the other end of the switch is grounded	Spare	Y axis Up Max = 4.7V Center = 2.5V Down MIN=0.3V	X axis Left MAX=4.7V Center = 2.5V Right MIN = 0.3V

PIN DEFINATION FOR CAN + RS485 INTERFACE

Pin 1 +5V RED	PIN 2 GND BLACK	PIN 3 CAN-H YELLOW	PIN 4 CAN-L GREEN	PIN 5 485A+ BLUE	PIN 6 485B- BROWN
+5V	GND	CAN-H	CAN-L	A+	B-

PIN DEFINATION FOR CAN + RS232 INTERFACE

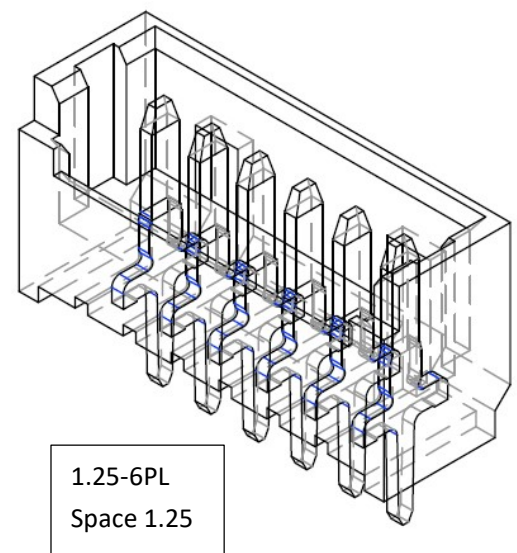
Pin 1 +5V RED	PIN 2 GND BLACK	PIN 3 CAN-H YELLOW	PIN 4 CAN-L GREEN	PIN 5 RS232TXD BLUE	PIN 6 RS232RXD BROWN
+5V	GND	CAN-H	CAN-L	TXD RS232 transmit	RXD RS232 receive

NOTE: The GND of RS232 communication is shared with the GND of the power supply and can be connected in parallel from the power supply interface.

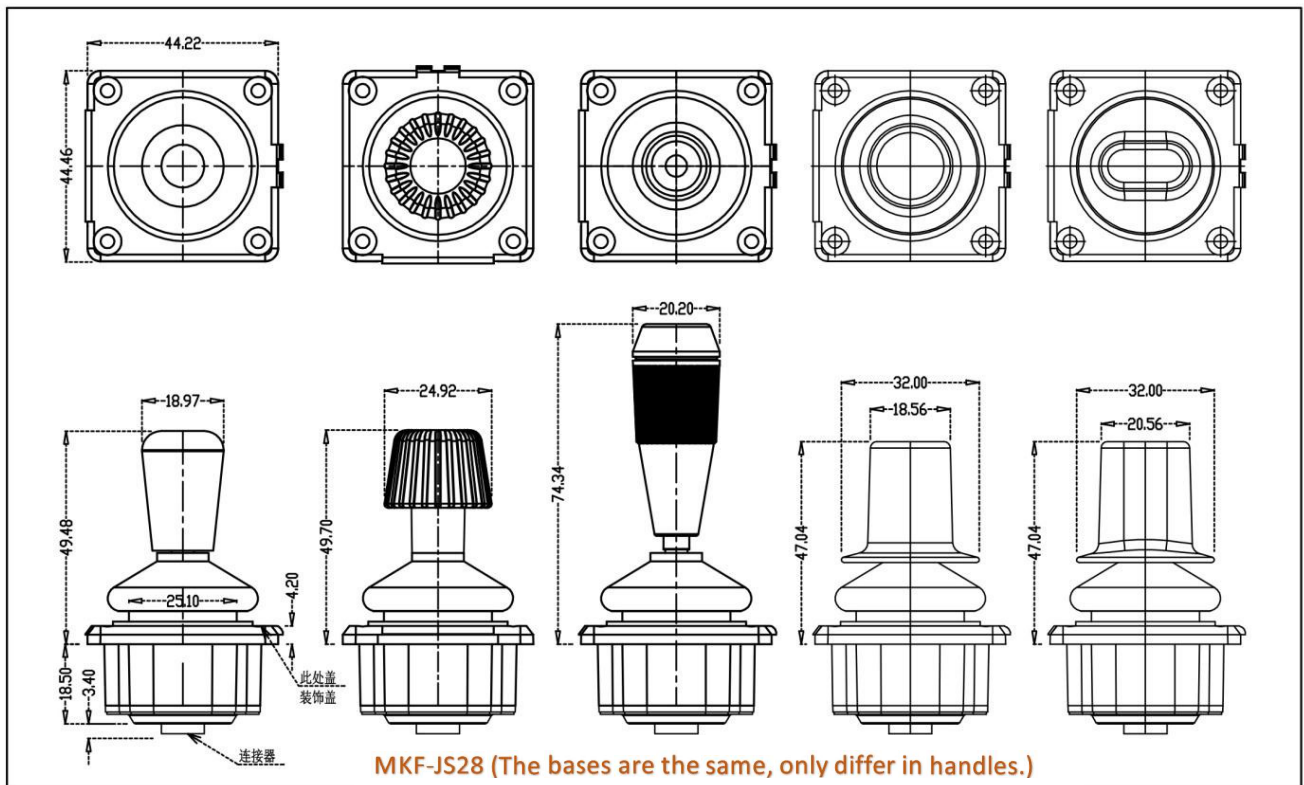
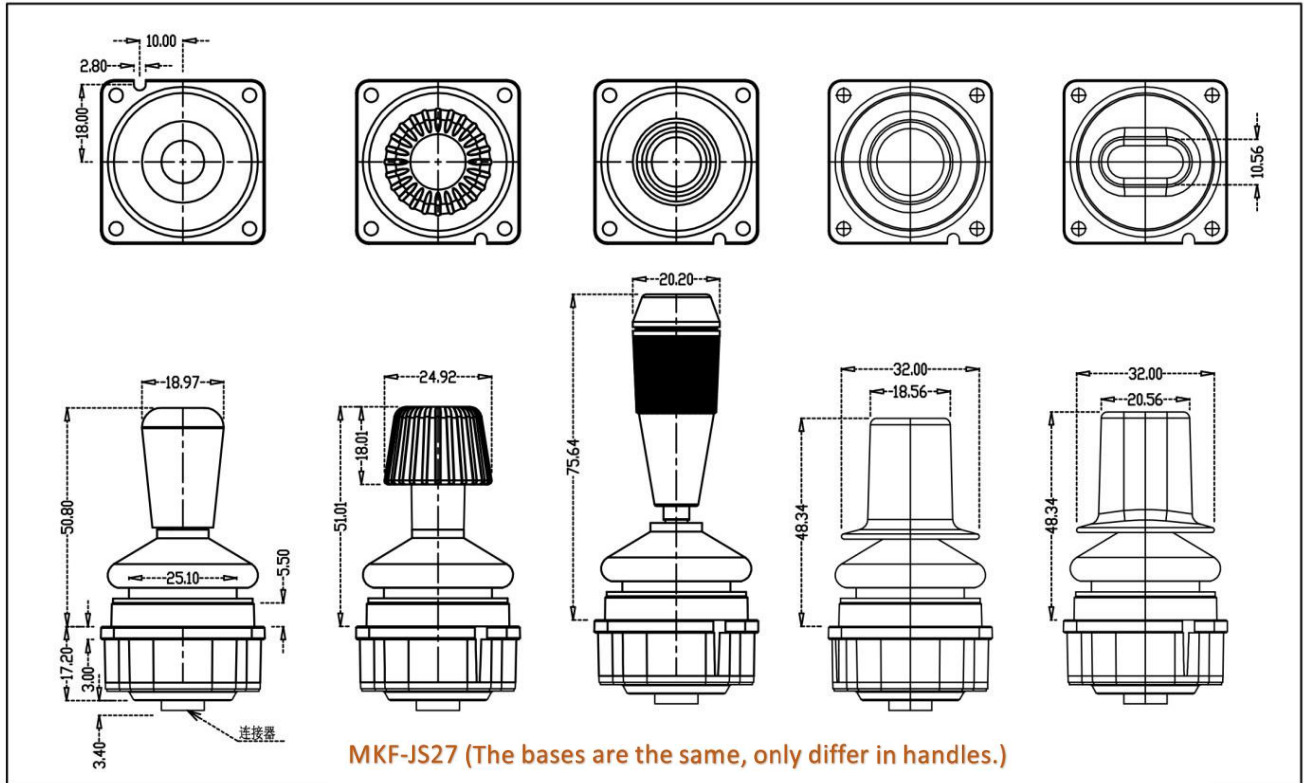
Lead wire

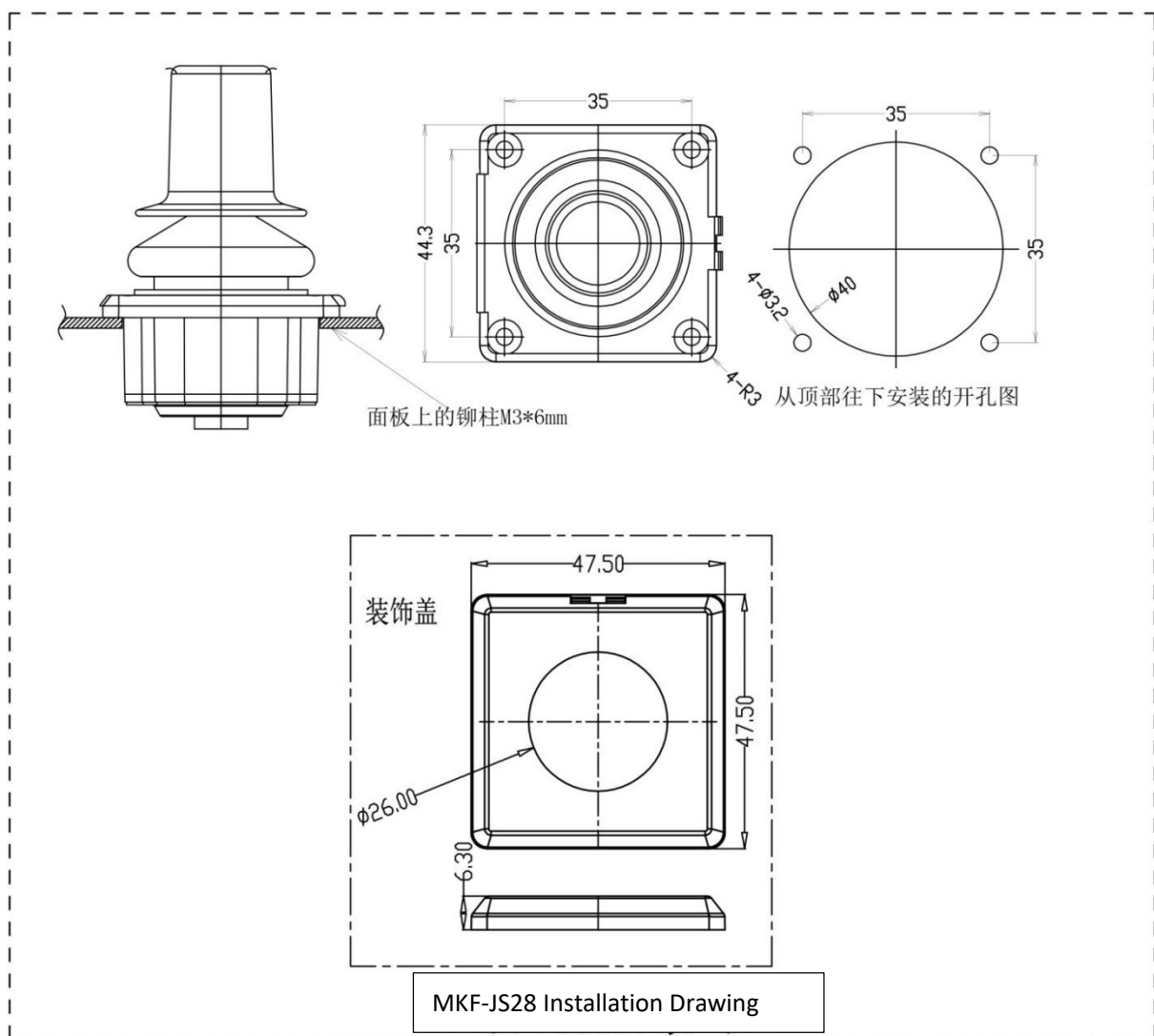
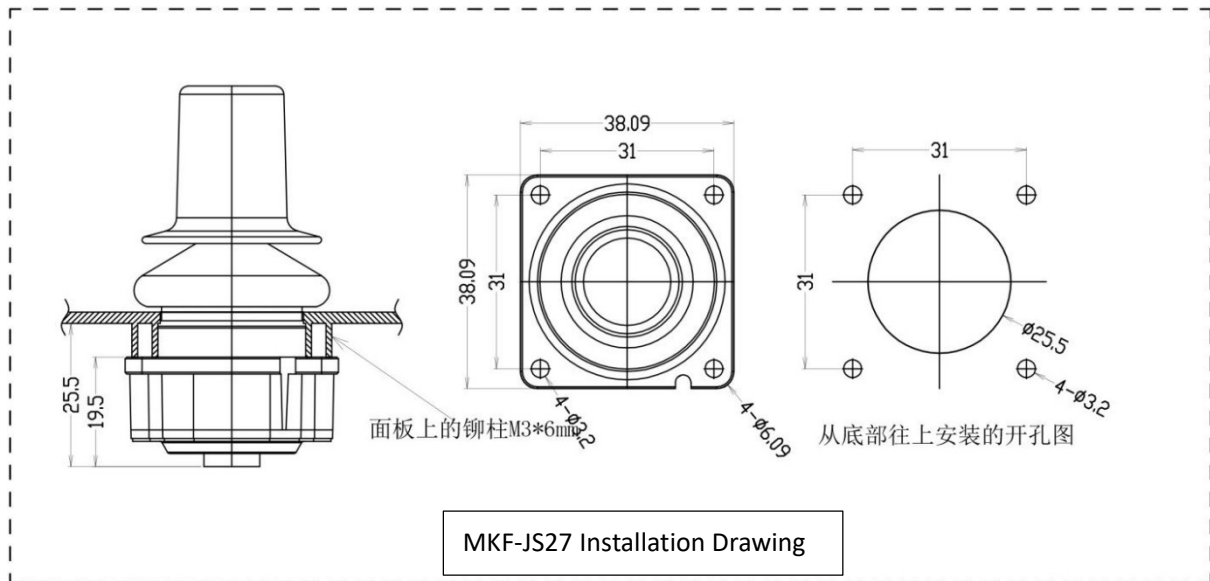
Lead wire length: 180mm (including terminal)

Terminal model: 1.25-6P



TECHNICAL DRAWINGS





CAN Bus Communication Mode

- CAN2.0B
- CAN ID: standard frame or extended frame factory preset, default ID=0X0101 (can be modified through RS232)
- Baud rate: 125K/250K/500K/1000K by default 250K
- Interval 5-100ms continuously sending, 23ms by default

Data message format (HEX):

BYTE0	XXL X axis low	X axis data 0X0020~0X0200~0X03E0
BYTE1	XXH X axis high	
BYTE2	YYL Y axis low	Y axis data 0X0020~0X0200~0X03E0
BYTE3	YYH Y axis high	
BYTE4	0X00	
BYTE5	0X00	
BYTE6	Button	Button
BYTE7	0XA5	Tail



YYYY Y axis angle
 XXXX X axis angle
 Button Button

X axis data

MAX	Left	MIN	Stop	MIN	Right	MAX
0X0020-	-- --	0X01ff	0200	0X0201-	-- --	0X03E0

Y axis data

MAX	Lower	MIN	Stop	MIN	Upper	MAX
0X0020-	-- --	0X01ff	0200	0X0201-	-- --	0X03E0

Button data

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
IN1 External button 1	Button 7	Button 6 IN2 External button 2	Button 5	Button 4	Button 3	Button 2	Button 1

1 = button is pressed; 0 = no button is pressed. E.g. 00 02 00 02 00 00 00 00 A5

RS232/RS485 communication protocol

Default baud rate 9600.8.1.N

Factory default no address bit

Function: Send the position parameters of each axis of the joystick

1. No address bit, the joystick sends data (7 bytes) (Joystick-PC):
joystick send data format: (hexadecimal HEX data)

FF	XXH	XXL	YYH	YYL	BUTTON	CH
HEAD	X High	X Low	Y High	Y High	BUTTON	SUM

XXXX X-axis angle

YYYY Y-axis angle

Button joystick button Button on joystick

CH =XXH+XXL+YYH+YYL+Button Low byte of sum (00-FF)

X axis parameters

MAX	LEFT	MIN	STOP	MIN	RIGHT	MAX
0X0020-	-- --	0X01ff	0200	0X0201-	-- --	0X03E0

Y axis parameters

MAX	Down	MIN	STOP	MIN	UP	MAX
0X0020-	-- --	0X01ff	0200	0X0201-	-- --	0X03E0

Button parameters

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IN1 External Button 1	Button 7	Button 6 IN2 External button 2	Button 5	Button 4	Button 3	Button 2	Button 1

button =1 with button pressed, 0 without button pressed

For example: FF 02 00 02 00 00 04

2. With address, joystick sends data (10 bytes) (joystick-PC)

FF	Add	XXH	XXL	YYH	YYL	BUTTON	CH
HEAD	Address	X High	X Low	Y High	Y Low	BUTTON	SUM

Add address 0X01-0X40 is the same as the address of the inspection tour

Others are the same as general protocol

CH =Add+XXH+XXL+YYH+YYL+Button (00-FF) Eg. FF 01 02 00 02 00 00 05

Joystick communication parameter setting

Users may set and modify the communication parameters of the joystick (including CAN, RS232, RS422).

All the above "parameter modification" can only be done through the RS422 interface of the joystick or RS232 interface, including CAN parameters.

PC→Joystick (RS422, RS485 or RS232) upper computer (serial port assistant) software sends commands to the joystick. (If there is no serial port assistant software, you can ask MATE technical staff for it)

If the host PC does not have RS232 (DB9 9-pin connector), there is a USB to RS232 converter (standard converter, not TTL level conversion) device).

RS422, RS485 or RS232 communication interface on the joystick, the factory default baud rate is 9600.8.1.N.

Basic Commands

1. ACK confirmation (joystick-PC)

AA 55 AF

indicates that the joystick has successfully received the address setting command and completed the execution.

2. Set the joystick ID address; ID refers to the ID in the RS232/RS422 communication protocol, or the ID in the CAN open protocol (PC→joystick)

0xaf	0x0d	00	00	00	Add	0xf5
Header	command	data 1	data 2	data 3	data 4	Tail

Add=0x01 ~ 0x7F Address 1-127

Add=0x00 Invalid (when address=0, there is no address bit in RS232 or RS422)

For example:

Set No. 1 address af 0d 00 00 00 01 f5 (HEX)

Set No. 2 address af 0d 00 00 00 02 f5 (HEX)

The joystick receives this command, after execution, it will reply ACK

3. Reset joystick (PC→joystick)

0xaf	0x15	00	00	00	Add	0xf5
Head	command	data 1	Data 2	Data 3	Data 4	Tail

Add=0x01 ~ 0x7f The address must be the same as the joystick address to reset

Add=0x00 Reset all Address joystick, any address is reset

Add range is not 0-0x7f is invalid.

For example:

Reset all address joysticks: af 15 00 00 00 00 f5 (HEX)

Reset address 1 joystick: af 15 00 00 00 01 f5 (HEX)

Reset address lever 2: af 15 00 00 00 02 f5 (HEX)

3. Set the center point of the joystick (for correcting the center point position) (PC->Joystick)

It has been set before leaving the factory, you can ignore this command.

The PC is connected to the RS422 port of the joystick, the baud rate is 9600

0xaf	0x09	00	00	00	00	0xf5
Head	command	data 1	data 2	data 3	data 4	tail

Sends these data to the joystick, Reset the stop position of the joystick (center point)

Example: af 09 00 00 00 00 f5 (HEX)

4. Communication port selection: (PC->joystick)

Choose one of the joystick communication ports RS232, RS422, CAN; (MATE has been set for the customer)

0xaf	0x05	XX	00	00	00	0xf5
Header	command	data 1	data 2	data 3	Data 4	tail

XX=00 CAN communication

XX=01 RS232 communication

XX=02 RS422 communication

XX=03 RS485 communication (standard RS232/422/485 protocol)

XX=04 RS485 Modbus RTU communication

For example:

af 05 00 00 00 00 f5 (HEX) CAN communication

af 05 01 00 00 00 f5 (HEX) RS232 communication

af 05 02 00 00 00 f5 (HEX) RS422 communication

af 05 03 00 00 00 f5 (HEX) RS485 communication (standard 485 protocol)

af 05 04 00 00 00 f5 (HEX) RS485 Modbus RTU communication

5. Refresh rate setting (PC->joystick)

Refresh rate = frame interval for sending data, such as setting 20ms (sending one frame of data to the host every 20MS)

0xaf	0x11	00	00	00	Ref	0xf5
Header	command	data 1	data 2	data 3	Data 4	tail

Ref =0x0A ~ 0x64 (10-100)ms, the unit is "millisecond" (default: 20ms)

After setting this parameter, reset or restart takes effect.

Send one frame of data, 50 times per second)

Set 20MS af 11 00 00 00 14 f5 (HEX)
 Set 25MS af 11 00 00 00 19 f5 (HEX)
 Set 33MS af 11 00 00 00 21 f5 (HEX)
 Set 50MS af 11 00 00 00 32 f5 (HEX)

The joystick receives this command→Reply ACK→Reset the joystick

Note: The baud rate is lower, the corresponding frame interval will be longer

Factory default: refresh rate 20ms (CAN baud rate 250K, RS232 and RS422 baud rate 9600)

6. Communication mode (master-slave query, timed automatic transmission, including CAN and RS232/422 communication) (PC->joystick)

Master-slave query: the joystick is a slave device, only after receiving the query command from the host, will the data be sent back to the host.

Timed automatic sending: the joystick will send data to the host when it is turned on, and the sending rate refers to the "refresh rate setting".

This parameter is stored in the joystick forever (it has been set for the customer at the factory)

Format:

0xaf	0x08	00	00	00	Mode	0xf5
Header	command	data 1	Data 2	Data 3	Data 4	Tail

Mode=00 Timing sending

Mode=01 Master-slave query

Example: (PC->joystick)

Timing sending mode af 08 00 00 00 00 f5 (HEX)

Master-slave query mode af 08 00 00 00 01 After f5 (HEX)

When successfully set, the joystick returns to ACK (AA 55 AF) (joystick->PC)

7. The number of joystick signal axes: (PC->joystick) Only for factory application.

It has been set for the customer at the factory, and the user does not need to set it:

2 axes: af 0c 00 00 00 00 f5 (HEX)

3 axes: af 0c 01 00 00 00 f5 (HEX)

4 axes: af 0c 02 00 00 00 f5 (HEX)

Communication parameter setting of RS232, RS422 and RS485

Set the baud rate of RS232, RS422 and RS485 (PC->joystick)

The baud rate of RS232 and RS422 is the same, and the settings are valid at the same time.

0xaf 0x0b 00 00 00 Baud 0xf5

Header command data 1 Data 2 Data 3 Data 4 Tail

Baud=0X00 Baud rate=9600

Baud=0X01 Baud rate=19200

Baud=0X02 Baud rate=57600

Baud=0X03 Baud rate=115200

For example:

set 9600 af 0b 00 00 00 00 f5 (HEX)

set 19200 af 0b 00 00 00 01 f5 (HEX)

set 57600 af 0b 00 00 00 02 f5 (HEX)

set 115200 af 0b 00 00 00 03 f5 (HEX)

The joystick receives this command, after execution, it will reply ACK

10. Check the position of the joystick (PC->joystick)

This command is valid only when the "master-slave query" can be trusted mode.

If there is no query command, the joystick will not output any data, check the joystick once and return it once.

0xaf	0x07	00	00	00	Add	0xf5
Head	Command	Data 1	Data 2	Data 3	Data 4	Tail

- Address = 0x01-0x7f When the address is correct, loop back

- When the joystick receives this data, it will send back the current position, check the joystick once and return it once, no data will be sent if it is not checked

For example, during RS232 communication, query:

(PC->Joystick) af 07 00 00 00 01 f5 (HEX)

(Joystick->PC) FF 01 08 00 70 00 00 00 00 79

When the joystick receives this data, it will send back the current position.

Parameter setting of CAN communication

The parameter setting of CAN also needs to pass through the RS232 or RS422 port.

11. CAN port baud rate: (PC->joystick)

0xaf	0x06	XX	00	00	00	0xf5
header	command	data 1	data 2	data 3	data 4	tail

XX=00 125K

XX=01 250K (default)

XX=02 500K

XX= 03 1000K

XX=04 100K

For example:

af 06 00 00 00 00 f5 (HEX) CAN baud rate=125K
 af 06 01 00 00 00 f5 (HEX) CAN baud rate=250K (default)
 af 06 02 00 00 00 f5 (HEX) CAN baud rate=500K
 af 06 03 00 00 00 f5 (HEX) CAN baud rate=1000K
 af 06 04 00 00 00 f5 (HEX) CAN baud rate=100K

12. CAN protocol settings: (PC->Joystick)

0xaf	0x0a	00	00	TP	SS	0xf5
Header	command	data 1	Data 2	Data 3	Data 4	Tail

SS=00 Common protocol ID=sending node ID, see (11) Joystick sending node ID setting) **Default**

SS=01 CAN open protocol ID=180+ID (refer to (2) Setting joystick ID address)

The factory has already set the TP for the customer.

It is TPDO in the CAN OPEN protocol.

TP=00: TPDO1 sends ID 0X0180+ID (See 1, 2, Set joystick ID address) **Default**

TP=01: TPDO2 sends ID 0X0280+ID (see 1, 2, Set joystick ID address)

TP=02: TPDO3 sends ID 0X0380+ID (see 1, 2, set the joystick ID address)

TP=03: TPDO4 sends ID 0X0480+ID (see 1, 2, set the joystick ID address)

For example:

af 0a 00 00 00 00 f5 (HEX) common protocol

af 0a 00 00 00 01 f5 (HEX) CAN open protocol TPDO1

13. Joystick "send node ID" setting: (PC->joystick)

Only applicable to "normal protocol", CAN open protocol does not use this command

0xaf	0x01	D1	D2	D3	D4	0xf5
Header	command	data 1	Data 2	Data 3	Data 4	Tail

D1.7=0 Extended frame 29 bits

D1.7=1 Standard frame 11 bits

- 29-bit extended frame: data range 0X0-0X0FFFFFFF, data D1-D4 corresponds to "node identification code"

For example: Set the sending node identification code - extended frame "0X00F0F101"

af 01 00 f0 f1 01 f5 (HEX)

- 11-bit standard frame: data range 0X000-0X3FF, data D3-D4 corresponds to "node identification code"

For example: Set the sending node identification code - standard frame "0X181"

af 01 80 00 01 81 f5 (HEX)

14. Joystick "receiving node ID" setting: (PC->joystick)

Only applicable to "normal protocol", CANopen protocol does not use this command.

0xaf	0x02	D1	D2	D3	D4	0xf5
Header	command	data 1	data 2	data 3	data 4	Tail

D1.7=0 Extended frame 29 bits

D1.7=1 Standard frame 11 bits

- 29-bit extended frame: data range 0X0-0X0FFFFFFF, data D1-D4 corresponds to "node identification code"

For example: Set receiving node identification code - extended frame "0X00F0F101"

af 02 00 f0 f1 01 f5 (HEX)

- 11-bit standard frame: data range 0X000-0X3FF, data D3-D4 corresponds to "node identification code"

For example: Set receiving node ID code - standard frame "0X1E1"

af 02 80 00 01 E1 f5 (HEX)

15. Joystick "shield node ID" setting: (PC->joystick)

0xaf	0x03	D1	D2	D3	D4	0xf5
Header	Command	data 1	Data 2	Data 3	Data 4	Tail

D1.7=0 Extended frame 29 bits

D1.7=1 Standard frame 11 bits

- 29-bit extended frame: data range 0X0-0X0FFFFFFF, data D1-D4 corresponds to "node identification code"

For example: set mask node identification code - extended frame "0X00002201"

af 03 00 00 22 01 f5 (HEX)

- 11-bit standard frame: data range 0X000-0X3FF, data D3-D4 corresponds to "node identification code"

For example: set mask node identification code - standard frame "0X122"

af 03 80 00 01 22 f5 (HEX)