MATE TECHNOLOGY SHENZHEN LIMITED
ADD.: 411, Bld. 1A, Zhida Industrial Park, Longping W Rd,Longgang District, Shenzhen, P.R China
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TEL: 0086-755-89398907
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MKF-JS40 Series Control Stick

UAV ground station dedicated control stick





Multi-axis Hall effect joystick , instrument panel mounting , handle made of aluminum-magnesium alloy, base made of stainless steel and aluminum alloy , spring-loaded automatic return mechanism, high-precision Hall effect sensor, full-range linear correction, IP65 protection rating, and offers a smooth operating feel , ergonomic mechanical design , and IP65 protection .



I. Product Features:

Materials: Handle made of aluminum-magnesium alloy, base made of aluminum alloy
Positioning: Spring automatically returns to center position
Sensor: Hall sensor
Operating angle: ± 30 degrees / ± 20 degrees, choose one
Operating range: Square limit switch, single-line limit switch, cross limit switch, T-shaped, H-shaped, or customized.
Number of axes: 2 axes + 2 axes thumb joystick (cross);
Push button switch: Waterproof button,
2-way switch: 2-way military-grade self-resetting switch;
Trigger switch: 2-stage travel, with safety lock
Signal outputs: Analog voltage 0.5-4.5V, RS422, RS232, CAN, USB
Power supply: DC5V , DC9-36V;
Power consumption: less than 32-50mA@5V
Operating life: greater than 5 million cycles;
Temperature: -40 degrees Celsius to +70 degrees Celsius
Salt spray protection: Handle section for more than 500 hours
Protection rating: IP65

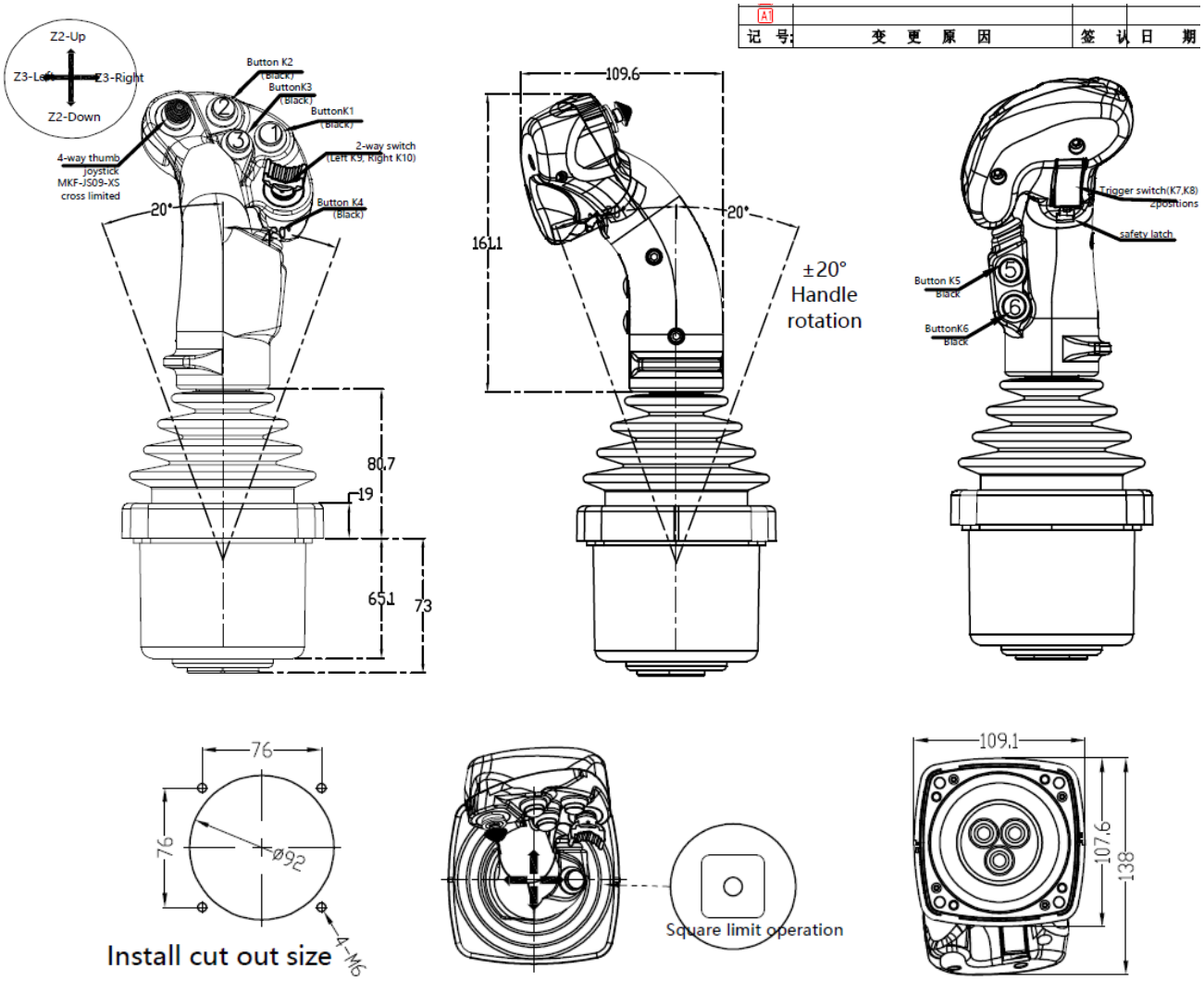
Electrical parameters:

Minimum operating voltage: 4.2V (when powered by 5V), 9V (when powered by 9-36V)
Maximum input voltage: 36V (when powered by 9-36V), 5.5V (when powered by 5V)
Operating current : less than 50mA (when powered by 5V)
Pushbutton switch capacity: 1A/24V
Limit switch capacity: 1A/24V
Analog voltage signal output load: greater than 1KΩ

Analog voltage signal output center voltage: 2.50V or 50%Vdd
Analog voltage output signal: 0.3V ～ 4.7V / 0.5V ～ 4.5V / 1V ～ 4V

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Flight handle size diagram



Right handle
(X, Y) dual-axis
Square operation range
Handle material: aluminum-magnesium alloy
Communication interface: USB-HID
See the attached page for the USB communication protocol
Power supply: DC5V
Power consumption: less than 1W
Operating temperature: -40 to +85°C
Salt spray: greater than 96 hours

Definition of USB cable sequence
1. Power supply + red wire
2.D- White line
3.D+ Blue line
4. GND: Black wire

Wire harness: 1 wire with a length of 1.5 meters
Decorative cover: 1 set
Seal gasket: 1 piece
Specification: 1 set

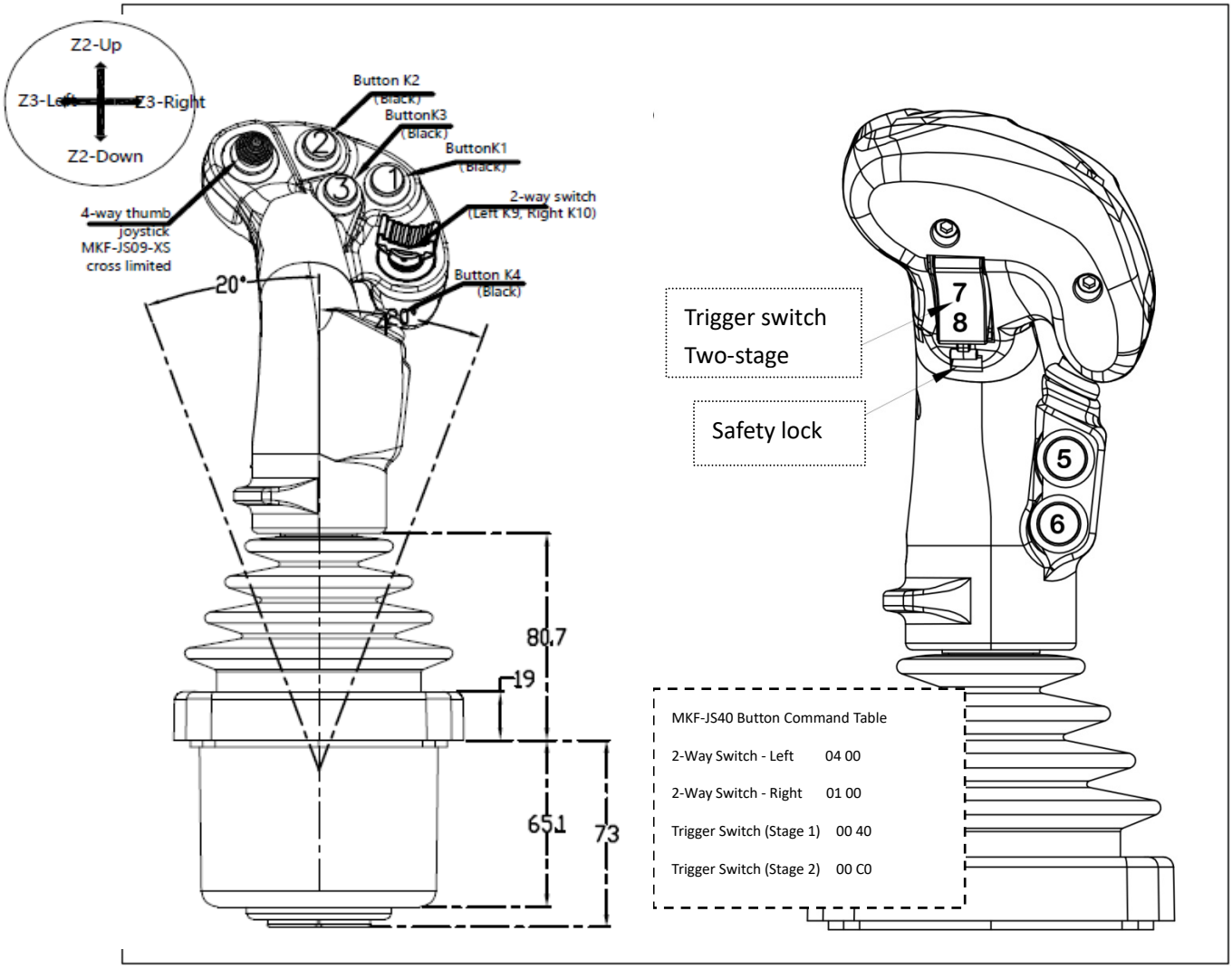
Model No.:MKF-JS40				
Mate Technology Shenzhen Limited www.matend.com				
Draw:	6	2	Scale: 1:1	View:
Design:	5	2	Stage	Unit: mm
Audit:	1	2		

Connector leads:

pin	symbol	illustrate		pin	symbol	illustrate
1	V+	Power supply +5V or 9-32V (red)		12	RX-	RS422 RX-(Data Receiver-) Purple
2	V-	Power supply - 0V Black		11	RX+	RS422 RX+ (Data Receiver+) Pink
3				10	TX-	RS422 TX-(Data Transmission-) Gray
4	CAN-H	CAN-H Blue		9	TX+	RS422 TX+ (Data Transmission+) Brown
5	CAN-L	CAN-L White		8	RXD	RS232 data reception (yellow)
6	GND	RS232 signal GND black and white bar		7	TXD	RS232 data transmission green

Connector lead-out view

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MKF-JS40 Series Joystick CAN Communication Protocol (2-4 Axes)

G represents the thumb joystick ID: standard frame or extended frame (default 0x101) , baud rate 250K (can be modified).

byte	Biyt7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	illustrate
Byte0	Z2+ G right	Z2- G Left	Z1- G under	Z1+ G on	Right	Left	backward	forward	
Byte1	A7	A6	A5	A4	A3	A2	A1	A0	Axis 1 (value) Y
Byte2	A7	A6	A5	A4	A3	A2	A1	A0	Axis 2 (value) X
Byte3	A7	A6	A5	A4	A3	A2	A1	A0	Axis 3 (value) Z1-GY
Byte4	A7	A6	A5	A4	A3	A2	A1	A0	Axis 4 (value) Z2-GX
Byte5				2-way switch (11)	2-way switch Right(10)	2-way switch Left(9)		2-way switch (12)	Digital inputs (palm grip)
Byte6	trigger Level 2	trigger Level 1	Button 6	Button 5	Button 4	Button 3	Button 2	Button 1	Digital inputs (palm grip)
Byte7	CNT7	CNT6	CNT5	CNT4	CNT3	CNT2	CNT1	CNT0	Message counter (8 bits) 0-255

Note:

1.The values of AXIS3 and AXIS4 for the two axes are 0x00 ; the data range for Axis1 (Y) and Axis2 (X) is 0x00-0xFF (0-255).

2. The value of 3-axis AXIS4 is 0x00 ; the data range of Axis3 (Z1-Y) and Axis 4 (Z1-X) is 0x00-0xF0 (0-240).

3. Direction: Valid = 1, Invalid = 0; Up (forward) +, Down (backward) -, Right +, Left -

MKF-JS40 series joysticks use RS232/RS422/485 communication protocols (2-4 axes)

Default baud rate 9600.8.1.N

No address bits are specified by factory default.

Function: Sends position parameters of each axis of the joystick.

byte	Biyt7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	illustrate
Byte0	0xFF								
Byte1	Z2 _R G right	Z2 _L G Left	Z1 _D G under	Z1 _U G on	Right right	Left Left	backward	before forward	
Byte2	A7	A6	A5	A4	A3	A2	A1	A0	Axis 1 (value) Y
Byte3	A7	A6	A5	A4	A3	A2	A1	A0	Axis 2 (value) X
Byte4	A7	A6	A5	A4	A3	A2	A1	A0	Axis 3 (value) Z1
Byte5	A7	A6	A5	A4	A3	A2	A1	A0	Axis 4 (value) Z2
Byte6				2-way switch	2-way switch	2-way switch		2-way switch	Digital inputs (palm grip)

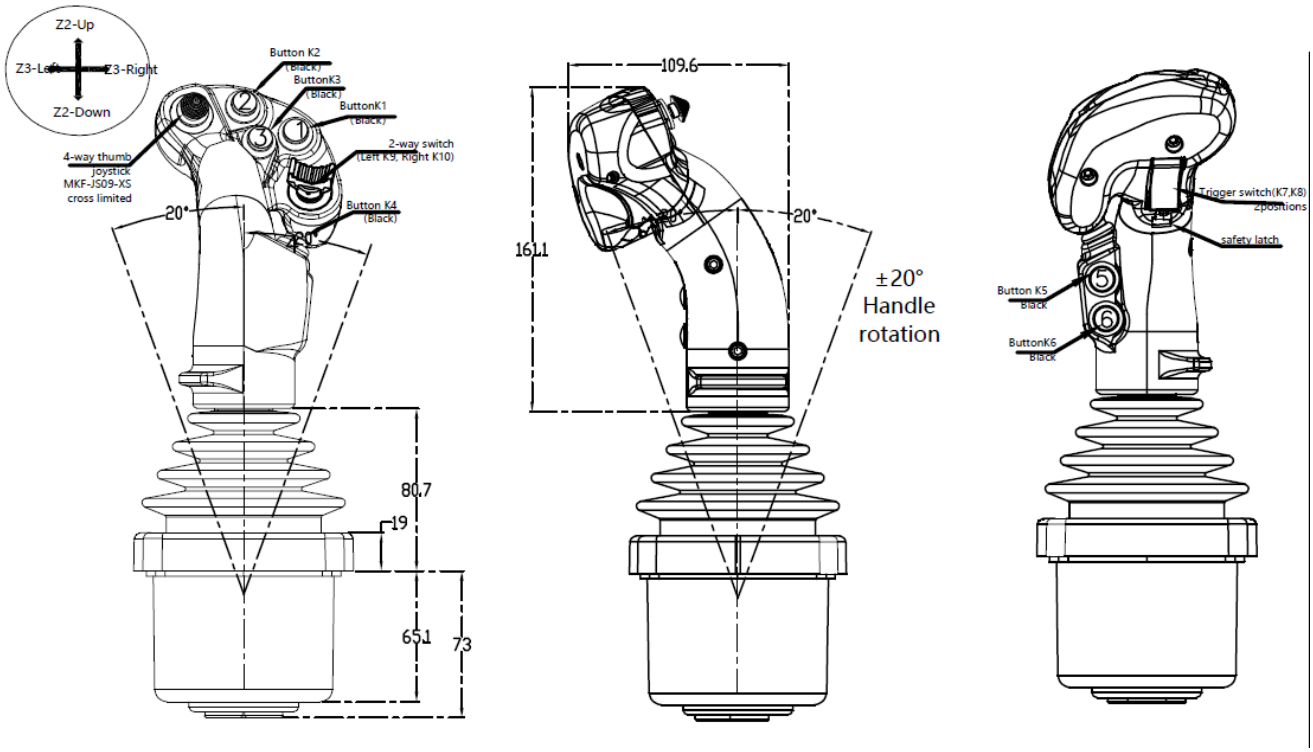
				(11)	Right(10)	Left(9)		(12)	
Byte7	trigger Level 2	trigger Level 1	Button 6	Button 5	Button 4	Button 3	Button 2	Button 1	Digital inputs (palm grip)
Byte8	CNT7	CNT6	CNT5	CNT4	CNT3	CNT2	CNT1	CNT0	Message counter (8 bits) 0-255
Byte9	CH=Byte1+ Byte2+ Byte3+ Byte4+ Byte5+ Byte6+ Byte7+ Byte8 The low-order byte of the result								Checksum CH

Note:

1. The values of AXIS3 and AXIS4 for the two axes are 0x00 ; the data range for Axis1 (Y) and Axis2 (X) is 0x00-0xFF (0-255).
2. The value of 3-axis AXIS4 is 0x00 ; the data range for Axis3 (Z1-GY) and Axis 4 (Z2-GX) is 0x00-0xF0 (0-240).
3. Direction: Valid = 1, Invalid = 0; Up (Forward) +, Down (Backward) -, Right +, Left - (G thumb joystick)

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MKF-JS40 series joysticks with RS232/RS422/485 communication protocol (3- axis)



Default baud rate 9600.8.1.N
No address bits are specified by factory default.
Function: Sends position parameters of each axis of the joystick.

byte	Biyt7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	illustrate
Byte0	0xFF								
Byte1			Z1 _D counter clockwise	Z1 _U clockwise	Right right	Left Left	backward	before forward	
Byte2	A7	A6	A5	A4	A3	A2	A1	A0	Axis 1 (0-255) Y
Byte3	A7	A6	A5	A4	A3	A2	A1	A0	Axis 2 (0-255) X
Byte4	A7	A6	A5	A4	A3	A2	A1	A0	Axis 3 (0-240) Z (S1)
Byte5									00
Byte6			**4-way switch Right(K14)**		**4-way switch Left(K 10)**	**4-way switch (K9)**	**4-way switch (K13)**	**2-way switch - right (K12)**	Digital inputs (palm grip)
Byte7	**2-way**	trigger	Button	Button	Button	Button	Button	Button	Digital inputs (palm

	switch Left(K8)	Level 12	6	5	4	3	2	1	grip)
Byte8	CNT7	CNT6	CNT5	CNT4	CNT3	CNT2	CNT1	CNT0	Message counter (8-bit)0-255
Byte9	CH=Byte1+ Byte2+ Byte3+ Byte4+ Byte5+ Byte6+ Byte7+ Byte8 The low-order byte of the result								Checksum CH

Note:

1. The values of AXIS3 and AXIS4 for the two axes are 0x00 ; the data range for Axis1 (Y) and Axis2 (X) is 0x00-0xFF (0-255).
2. The value of 3-axis AXIS4 is 0x00, with a data range of 0x00-0xF0 (0-240).
3. Direction: Valid = 1, Invalid = 0; Up (Forward) +, Down (Backward) -, Right +, Left - (G thumb joystick)

MKF-JS40 series joysticks with RS232/RS422/485 communication protocol (6- axis)

Default baud rate 9600.8.1.N
No address bits are specified by default at the factory.
Function: Sends position parameters of each axis of the joystick.

6- axis joystick RS232/RS422/485 communication protocols

byte	Biyt7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	illustrate
Byte0	0xFF								
Byte1	0	0	0	0	Right right	Left Left	backward	before forward	Axis1,2 directions
Byte2	A7	A6	A5	A4	A3	A2	A1	A0	Axis 1 (value) Y (0-255)
Byte3	-	A6	A5	A4	A3	A2	A1	A0	Axis 2 (value) X (0-255)
Byte4	S4 B	S4 B down	S3 B right	S3 B Left	S2 A	S2 A down	S 1 A 右	S 1 A 左	Axis3,4,5,6
Byte5	A7	A6	A5	A4	A3	A2	A1	A0	Axis 3 (value) Z1 –(AX) (0-240)
Byte6	A7	A6	A5	A4	A3	A2	A1	A0	Axis 4 (value) Z2–(AY) (0-240)
Byte7	A7	A6	A5	A4	A3	A2	A1	A0	Axis 5 (value) Z3-(BX) (0-240)
Byte8	A7	A6	A5	A4	A3	A2	A1	A0	Axis 6 (value) Z4- BY

									(0-240)
Byte 9	--	Enable Level/ Button 7	Button 6	Button 5	Button 4	Button 3	Button 2	Button 1	Digital inputs (palm grip)
Byte 10	CH=Byte1+ Byte2+ Byte3+ Byte4+ Byte5+ Byte6+ Byte7+ Byte8+ Byte 9 Addition and low-order byte								Checksum CH

Note: ① Direction: Valid = 1, Invalid = 0; DIR direction correspondence: Up (front) +, Down (back) -, Right +, Left -

Note:

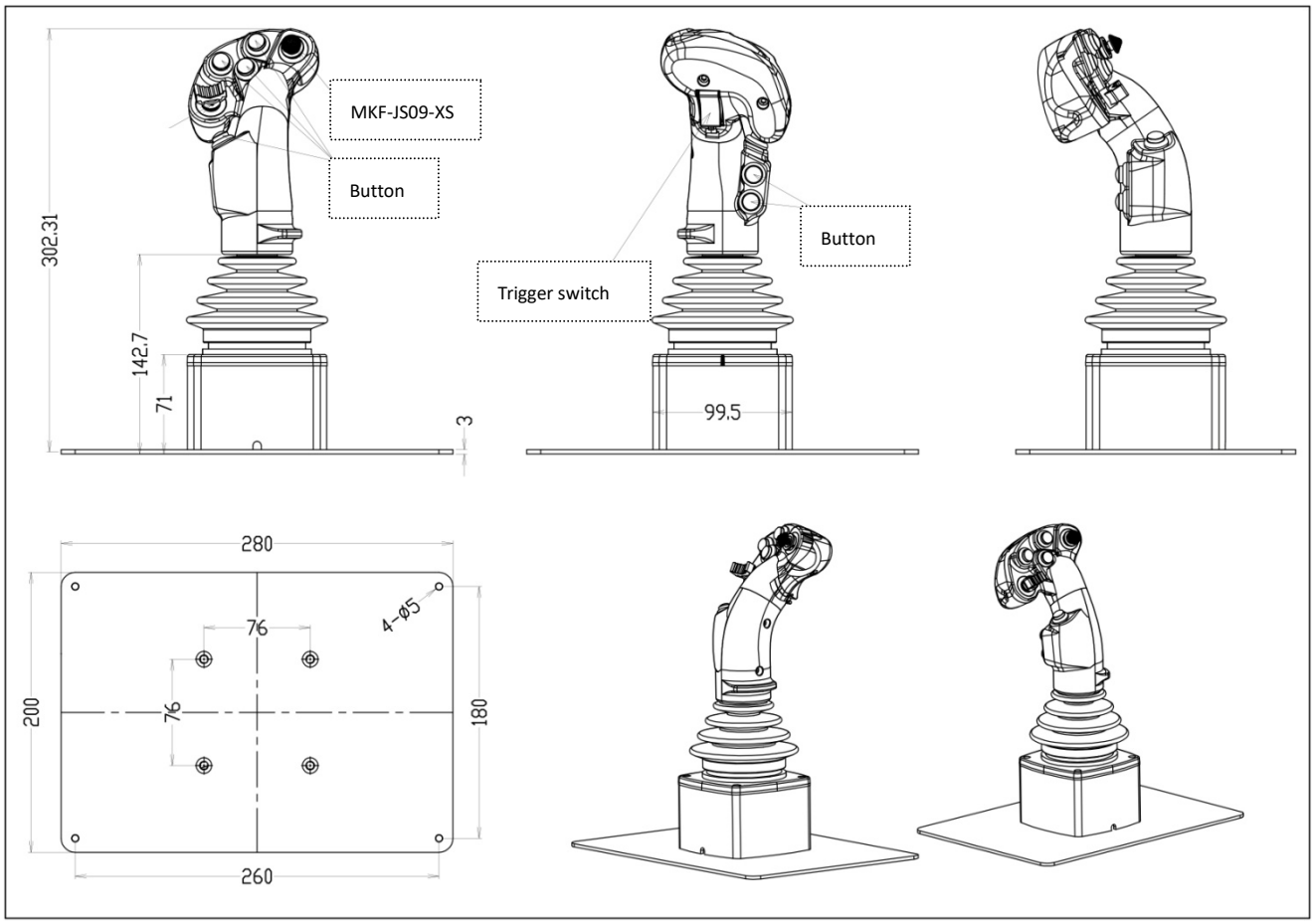
1. The data range of Axis1 (Y) and Axis2 (X) is 0X00-0XFF (0-255).
2. Axis3 (Z1-G1Y), Axis 4 (Z2-G1X) data range 0X00-0XF0 (0-240)
3. Axis 5 (Z3-G2Y), Axis 6 (Z4-G2X) data range 0X00-0XF0 (0-240)
4. Direction: Valid = 1, Invalid = 0; Up (Forward) +, Down (Backward) -, Right +, Left - (G thumb joystick)

The controller has two four-way analog sticks; the top one is for navigation (A), and the bottom one is for navigation (B).

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USB interface desktop schematics

USB 2.0 interface
Supports Windows, Android, Linux, macOS, Kylin and other operating systems, driverless.
The computer recognizes it as a game joystick.



Communication protocols for other customized products:

CAN bus communication method:

- CAN2.0B
- Frame ID: Standard frame ID and extended frame ID, default ID = 0 x 0 101 (This ID can be modified via RS232)
- Baud rate: 125K, 250K, 500K, 1000K (default 250K)
- Sending method: Continuous sending at intervals of 5-100ms (default 30ms)

5- axis CAN communication protocol

byte	Biyt7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	illustrate
Byte0	0	0	0	0	Right right	Left Left	backw ard	before forwar d	Axis1,2 directions
Byte1	A7	A6	A5	A4	A3	A2	A1	A0	Axis 1 (value) Y
Byte2	-	A6	A5	A4	A3	A2	A1	A0	Axis 2 (value) X
Byte3	S 10	S0 9	Z 3 -	Z 3 +	Z2+	Z2-	Z1-	Z1+	Axis 3, 4, 5 directions Buttons 9 and 10
Byte4	A7	A6	A5	A4	A3	A2	A1	A0	Axis 3 (value) Z1
Byte5	A7	A6	A5	A4	A3	A2	A1	A0	Axis 4 (value) Z2
Byte6	A7	A6	A5	A4	A3	A2	A1	A0	Axis 5 (value) Z3
Byte7	Switch 8	Switch 7	Button 6	Button 5	Button 4	Button 3	Button 2	Button 1	Digital inputs (palm grip)

Note:

1. The values of AXIS3 and AXIS4 for the two axes are 0x00 ; the data range for Axis1 (Y) and Axis2 (X) is 0x00-0xFF (0-255).
2. The value of 3-axis AXIS4 is 0x00; the data range of Axis3 (Z1-Y) and Axis 4 (Z1-X) is 0x00-0xF0 (0-240).
3. Direction: Valid = 1, Invalid = 0; Up (forward) +, Down (backward) -, Right +, Left -

5- axis joystick RS232/RS422/485 communication protocol

byte	Biyt7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	illustrate
Byte0	0xFF								
Byte1	0	0	0	0	Right right	Left Left	backw ard	before forwar d	Axis1,2 directions
Byte2	A7	A6	A5	A4	A3	A2	A1	A0	Axis 1 (value) Y (0-255)
Byte3	-	A6	A5	A4	A3	A2	A1	A0	Axis 2 (value) X (0-255)

Byte4	S 10	S0 9	Z 3 -	Z 3 +	Z2 _R G 右	Z2 _L G 左	Z1 _D G 下	Z1 _U G on	Axis 3, 4, 5 directions Buttons 9 and 10
Byte5	A7	A6	A5	A4	A3	A2	A1	A0	Axis 3 (value) Z1 (0-240)
Byte6	A7	A6	A5	A4	A3	A2	A1	A0	Axis 4 (value) Z2 (0-240)
Byte7	A7	A6	A5	A4	A3	A2	A1	A0	Axis 5 (value) Z3 (0-240)
Byte8	Switch 8	Switch 7	Button 6	Button 5	Button 4	Button 3	Button 2	Button 1	Digital inputs (palm grip)
Byte9	CH=Byte1+ Byte2+ Byte3+ Byte4+ Byte5+ Byte6+ Byte7+ Byte8 Addition and low-order byte								Checksum CH

Note:

Direction: Valid = 1, Invalid = 0; Up (front) +, Down (back) -, Right +, Left - .

For bytes with an address bit, an address bit is added after FF, so the byte becomes 11 bytes.

The format is as follows: FF Addr Dir1 Axis1 Axis2 Dir2 Axis3 Axis4 Axis5 CH

Modbus communication protocol

Modbus RTU Master Mode:

1. Baud rate: 9600 (can be modified)
2. Data bits: 1 start bit, 8 data bits, 1 stop bit, and a parity bit.
3. Communication interfaces: RS485 and RS232; only one can be selected, and both cannot be used simultaneously.
4. Data format: Modbus
5. Working mode: Master station (the master station sends data to slave station 1)
6. Operating mode: Joystick -> Slave
   - ◆ Data is sent periodically, with a frame interval of 17ms, approximately 20Hz/frame (refresh rate can be set) ;
   - ◆ The station does not respond;

Function	data	Parameter range
Device address	0x01	Modbus station number
Function code	0x10	
First register address - high byte	0x40	Register address
First register address - low byte	0x01	
Number of registers - high byte	0x00	Number of registers
Number of registers -	0x04	

low byte		
Data length	0x08	byte length
IO high-order bits (bits 15-8)	0x00	Bit 7 is button 10, bit 6 is button 9; Bits 5-0 are for joystick direction.
IO low-order bits (Bit7-Bit0)	0X00	Buttons 1-8 (Bit0 = Button 1) 1 = ON, 0 = OFF
joystick Y-axis high position	00	constant 0x00
Y-axis low position of the joystick	0x00-0xff	Y-axis angle values 0-255°
Joystick X-axis high position	0x00	constant 0x00
Joystick X-axis low position	0x00-0xff	X-axis angle values 0-255°
joystick Z-axis high position	00	constant 0x00
joystick Z-axis low position	0x00-0xff	Z-axis angle values 0-255°
CRC high bits		
CRC low bits		

Note: ① Direction: Valid = 1, Invalid = 0; Up (front) +, Down (back) -, Right +, Left - .

The most significant bit of the number (1 = valid, 0 = invalid).

Biyt7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Button10	Button9	Z-	Z+	RIGHT	LEFT	DOWN	UP
Button 10	Button 9			Right right	Left Left	backward	before forward

Send one frame every 25ms (refresh rate adjustable)

01 10 40 01 00 04 08 00 00 08 00 08 00 08 00 B1 91

Modbus RTU slave mode:

1. Baud rate: 9600/115200
2. Data bits: 1 start bit, 8 data bits, 1 stop bit, and a parity bit.
3. Communication interfaces: RS485 and RS232 can only be used, not both.
4. Data format: Modbus
5. Working mode: Slave station
6. Operating mode: Master-slave mode (receives a read command and retrieves 1 frame of data).

Modbus master data reading and slave response format (function code **03)**

(PC → joystick)

Byte 1	2 bytes	3 bytes	4 bytes	5 bytes	6 bytes	7 bytes	8 bytes
address	Read command	Starting address		Number of registers		CRC	
0x01	0x03	high	Low	high	Low	high	Low

Example: 01 03 40 01 00 04 00 09

When the joystick receives this command, it switches from master mode to slave mode. (It stops actively sending data; the joystick will only respond with the following data after receiving this read data.)

Joystick response (joystick → PC)

Function	data	Parameter range
Device address	0x01	Device address
Function code	0x03	
Data length	0x08	
IO high-order bits (Bits 15-8)	0x00	Bit 7 is button 10, bit 6 is button 9; Bits 5-0 are for joystick direction.
IO low-order bits Bit7-Bit0	0X00	Buttons 1-8 (Bit0 = Button 1, 1 = ON, 0 = OFF)
joystick Y-axis high position	00	constant 0x00
Y-axis low position of the joystick	0x00-0xff	Y-axis angle values 0-255°
Joystick X-axis high position	0x00	constant 0x00
Joystick X-axis low position	0x00-0xff	X-axis angle values 0-255°
joystick Z-axis high position	00	constant 0x00

joystick Z-axis low position	0x00-0xff	Z-axis angle values 0-255°
CRC high bits		
CRC low bits		

The most significant bit of the number (1 = valid, 0 = invalid).

Biyt7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Button10	Button9	Z-	Z+	RIGHT	LEFT	DOWN	UP
Button 10	Button 9			Direction -right	Direction -Left	Direction - Back	Direction -front

Note: ① Direction: Valid = 1, Invalid = 0; Up (front) +, Down (back) -, Right +, Left - .

For example:

Main unit → Joystick : **01 03 40 01 00 04 00 09**

Joystick → Main Unit (Response) : **01 03 08 00 00 08 00 08 00 08 00 91 3F**

Joystick communication parameter settings

Version: Ver: Modified to 20.05.17

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

All of the above-mentioned "parameter modifications" can only be made through the RS422 or RS232 interface of the joystick, including CAN parameters.

PC → Joystick (RS422 , RS485 or RS232) host computer (serial port assistant) software sends commands to the joystick.

(If the serial port assistant software is not available, please request it from our technical staff.)

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

The joystick features an RS422, RS485, or RS232 communication interface with a factory default baud rate of 9600.8.1.N.

I. Basic Instructions:

1. ACK Confirmation (Joystick - PC)

AA 55 AF

This indicates that the joystick 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 CANopen protocol.

(PC -> Joystick)

0x af 0x 0 d 00 00 00 Add 0x f5

Header Command Data 1 Data 2 Data 3 Data 4 Tail

A dd=0x01～0x7F Address 1-127

A dd=0x00 Invalid (When address=0, there are no address bits in RS232 or RS422).

For example:

Set address 1 (af) 0 d 00 00 00 01 f5 (HEX)

Set address 2 (af) 0 d 00 00 00 02 f5 (HEX)

Upon receiving this command, the joystick executes it and replies with an ACK.

3. Reset the joystick (PC -> Joystick)

0x af 0x15 00 00 00 Add 0x f5

Header Command Data 1 Data 2 Data 3 Data 4 Tail

A dd=0x01～0x7f) must match the address of the joystick for it to reset.

` dd=0x00` resets the joystick to all addresses; any address will be reset.

Add is invalid if the range is not 0-0x7f.

For example:

Reset all address levers: af 15 00 00 00 00 f5 (HEX)
Reset joystick at address 1: af 15 00 00 00 01 f5 (HEX)
Reset address 2 joystick: af 15 00 00 00 02 f5 (HEX)

3. Set the center point of the joystick (used to correct the center point position) (PC->Joystick)

This setting is pre-configured at the factory and can be ignored.

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

0x af 0x 0 9 00 00 00 00 0x f5

Header Command Data 1 Data 2 Data 3 Data 4 Tail

Send some data to the joystick to reset its stop position (center point).

For example: af 0 9 00 00 00 00 f5 (HEX)

4. Communication Port Selection: (PC -> Joystick)

The joystick communication port can be selected from RS232, RS422, or CAN; (it has been pre-configured by the customer at the factory).

0x af 0x 0 5 XX 00 00 00 0x f5

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 0 4 00 00 00 f5 (HEX) RS485 Modbus RTU communication

5. Refresh Rate Settings (PC -> Joystick)

Refresh rate = frame interval for sending data, for example, setting it to 20ms (sending one frame of data to the host every 20ms).

0x af 0x11 00 00 00 Ref 0x f5

Header Command Data 1 Data 2 Data 3 Data 4 Tail

Ref = 0x0A～0x64 (10-100)ms, unit is "milliseconds" ; (factory default: 20ms)

Setting this parameter will take effect after a reset or restart.

For example: Set the joystick's data refresh rate to 20ms (send one frame of data every 20ms, 50 times per second).

Set 20MS a f 11 00 00 00 14 f5 (HEX)

Set 25MS a f 11 00 00 00 19 f5 (HEX)

Set 33MS a f 11 00 00 00 21 f5 (HEX)

Set 50MS a f 11 00 00 00 32 f5 (HEX)

The joystick receives this command → replies with ACK → resets the joystick.

Note: Lower baud rates require longer frame intervals.

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

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

Master-slave query: The joystick is a slave device; it only sends data back to the master device when it receives a query command from the master device.

Scheduled automatic data transmission: The joystick sends data to the host computer upon power-on. The transmission rate is referenced in the "Refresh Rate Settings".

This parameter is permanently stored on the joystick (it's already set at the factory).

Format:

0x af 0x 0 8 00 00 00 Mode 0x f5
Header Command Data 1 Data 2 Data 3 Data 4 Tail
Mode=00 Timed Send
Mode=01 Master-Slave Query

For example: (PC -> Joystick)

Timed sending mode af 0 8 00 00 00 00 f5 (HEX)
Master-slave query mode af 0 8 00 00 00 01 f5 (HEX)
After successful setup, the joystick returns ACK (AA 55 AF) (joystick -> PC).

7. Number of joystick signal axes: (PC -> Joystick) Manufacturer application only.

The product has been pre-configured at the factory; users do not need to configure it themselves.

2 axis: af 0 c 00 00 00 00 f5 (HEX)
3 axis: af 0 c 01 00 00 00 f5 (HEX)
4 axis: af 0 c 02 00 00 00 f5 (HEX)
5 axis: af 0c 0 3 00 00 00 f5 (HEX)
6 axis: af 0c 0 4 00 00 00 f5 (HEX)

8. Query device information: (PC -> Joystick)

af 20 00 00 00 00 f5 (HEX)

Joystick response format: Joystick -> PC

FF 60 18 18 01 20 53 4D 43 36 30 41 3B
Header model, version, date, SMC 6 0 A checksum

Checksum = the sum of all bytes preceding the header (FF), taking the least significant byte of the result.

II. Communication Parameter Settings for RS232, RS422 and RS485

9. Set the RS232, RS422, and RS485 baud rates (PC -> joystick)

The RS232 and RS422 baud rates are the same, and the settings are effective simultaneously.

0x af 0x 0 b 00 00 00 Baud 0x f5

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 0 b 00 00 00 00 f5 (HEX)
Set 19200 af 0 b 00 00 00 01 f5 (HEX)
Set 57600 af 0 b 00 00 00 02 f5 (HEX)
Set 115200 af 0 b 00 00 00 03 f5 (HEX)

Upon receiving this command, the joystick executes it and replies with an ACK.

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

only effective when the "master-slave query " is in a reliable mode.

When there is no query command, the joystick outputs no data; the joystick returns once for each query.

0x af 0x 0 7 00 00 00 Addr 0x f5

Header Command Data 1 Data 2 Data 3 Data 4 Tail

- Address Addr = 0x01-0x7f. If the address is correct, a loopback will be sent.
- Once the joystick receives this data, it sends back the current position. The joystick sends a response every time the data is checked; it doesn't send data unless checked.

For example, querying during RS232 communication:

(PC->Joystick) af 0 7 00 00 00 01 f5 (HEX)
(Joystick -> PC) FF 01 08 00 70 0 0 00 00 00 00 79
The joystick sends back the current position after receiving this data.

III. CAN Communication Parameter Settings:

CAN parameters must also be set via RS232 or RS422 port;

11. CAN Port Baud Rate: (PC -> Joystick)

0x af 0x 0 6 XX 00 00 00 0x f5

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)

0x af 0x 0 a 00 Pro TP SS 0x f5

Header Command Data 1 Data 2 Data 3 Data 4 Tail

Pro: Protocol Format
Pro=00 Xiaolong Electric Appliance Protocol Xldq
Pro=01 GessmannV24CanOpen Protocol Format
Pro=02 Rexroth Protocol Format

SS: Canopen protocol
The main difference between the Canopen protocol and ordinary protocols is the CAN ID; the data format remains the same.

SS=01 CANopen protocol ID=180+ID (See (2) Setting the joystick ID address) The product has already been set up by the customer at the factory.
SS=00 indicates a non-CanOpen state. ID=Sender Node ID, see (11 Joystick Sender Node ID Settings).
Default: Not CanOpen

TP: TPDO is the transmit channel in the CAN OPEN protocol.
TP=00: TPDO1 sends ID 0X0180+ID (see section 1.2 , Setting the joystick ID address) Default
TP=01: TPDO2 sends ID 0X0280+ID (see section 1.2 , Setting the joystick ID address)
TP=02: TPDO3 sends ID 0X0380+ID (see section 1.2 , Setting the joystick ID address)
TP=03: TPDO4 sends ID 0X0480+ID (see section 1.2 , Setting the joystick ID

address)

For example: af 0a 00 00 00 00 f5 (HEX) is a standard protocol , with the protocol format XLDDQ.

af 0a 00 00 00 01 f5 (HEX) CANopen protocol, TPDO1, protocol format XLDDQ

13. Joystick "Send Node ID" setting: (PC -> Joystick)

This instruction only applies to "normal protocols"; the CAN Open protocol does not use this instruction.

0x af 0x 01 D1 D2 D3 D4 0x f5

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 correspond to "node identifier code"

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

af 01 00 f0 f1 01 f5 (HEX)

- 11-bit standard frame: Data range 0x000-0x3FF, data D3-D4 correspond to "node identifier code"

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

af 01 80 00 01 81 f5 (HEX)

14. Joystick "Receive Node ID" setting: (PC->Joystick)

This instruction only applies to "normal protocols"; the CANopen protocol does not use this instruction.

0x af 0x 0 2 D1 D2 D3 D4 0x f5

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 correspond to "node identifier code"

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

af 02 00 f0 f1 01 f5 (HEX)

- 11-bit standard frame: Data range 0x000-0x3FF, data D3-D4 correspond to "node identifier code"

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

af 02 80 00 01 E1 f5 (HEX)

15. Joystick "Mask Node ID" setting: (PC->Joystick)

0x af 0x 0 3 D1 D2 D3 D4 0x f5

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 correspond to "node identifier code"

For example: Set the mask node identifier code - extended frame "0X00002201 "

af 03 00 00 22 01 f5 (HEX)

- 11-bit standard frame: Data range 0x000-0x3FF, data D3-D4 correspond to "node identifier code"

For example: Set the mask node identifier code - standard frame "0X122 "
af 03 80 00 01 22 f5 (HEX)

IV. Parameter settings for Modbus RTU (RS485) communication:

(Modified on: 2018-01-19)

16. Set "Device Address": Factory default is 1
See Section 1.2, "Setting the Joystick ID Address".

17. Joystick Operating Mode (PC -> Joystick):
See Section 1, Chapter 6, Communication Modes.

When the joystick receives the correct " host read data" command (01 03 40 01 00 04 00 09) ,
The working mode is automatically switched to slave mode, but it is not permanently stored. It reverts to master mode upon startup.

18. Set the register address (PC -> joystick):
Data format:
0x af 0x18 D1 D2 D3 D4 0x f5
Header Command Data 1 Data 2 Data 3 Data 4 Tail
D1: High-order bits of register address
D2: Low byte of register address
(D3 and D4 = 0x00)
Factory default register address = 0x 4001
Once set, it will be permanently stored on the joystick.

For example: set the register address to 0x4001 (hexadecimal). If it is octal, you need to convert it to hexadecimal.
ID=0X4001 af 18 40 01 00 00 f5