SUCH

ML7300-CAN Single Axis MEMS Gyroscope Sensor Navigation Attitude Control Instructions

Communication Protocols

If you wish to have direct access to the gyratory goniometer, it can be accessed via the gyratory goniometer's communication protocol, integrated into your system.

Communication protocol:

1. SDO Message: SDO request and reply messages always include 8 bytes, in which the data bytes are not enough to be followed by zero.

The format and content of the Write Object request message and answer message are shown in Table 1-1 and 1-2: sending the first byte 0x40 indicates the write command, and returning the first byte 0x40 indicates the write success; Node_ID is the CAN communication node number, Index_LSB is the low byte of dictionary index, Index_MSB is the high byte of dictionary index, and Sub_ index is the sub-index. Index_LSB is the low byte of dictionary index, Index_MSB is the high byte of dictionary index, Sub_index is the sub index.

1):Modify the node number (Node_ID=0x01 to 0x7F), the default node number (Node_ID) is 0x05

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x10	0x10	0x00	Node_ID	0x00	0x00	0x00

Table 1-1 SDO Request Message Format

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x10	0x10	0x00	Node_ID	0x00	0x00	0x00

Table 1-2 SDO Answer Message Format

Note: If the controller sends CAN-ID=0x600+0x05 (default), the sent data: 40 10 10 00 10 00 00 00 00 00 If the sensor returns CAN-ID=0x580+0x05 (default), the returned data: 40 10 10 00 10 00 00 00 00 00 After re-powering up, the received frame ID is 0x590 (0x580+0x10), which indicates that the frame ID modification is successful.

2) Setting the CAN Baud Rate

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x20	0x10	0x00	Baud	0x00	0x00	0x00

Table 1-3 SDO Request Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x20	0x10	0x00	Baud	0x00	0x00	0x00

Table 1-4 SDO Answer Message Format

Note: The fifth byte (Baud) is 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, where 0x01 represents setting the baud rate 500K bps, 0x02 represents setting the baud rate 250K bps, 0x03 represents setting the baud rate 125K bps, 0x04 represents setting the baud rate 100K bps, and 0x05 represents setting the baud rate 800K bps, 0x06 represents setting the baud rate 1M bps, and the default baud rate is 125K bps. 0x05 for setting baud rate 800K bps, 0x06 for setting baud rate 1M bps, the default baud rate is 125K bps, after sending this command and receiving the returned data, the sensor needs to be re-powered up for the baud rate modification to be successful.

3) Z-axis Angle Drift Elimination Calibration

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x0B	0x10	0x00	0x00	0x00	0x00	0x00

Table 1-5 SDO Request Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x0B	0x10	0x00	0x00	0x00	0x00	0x00

Table 1-6 SDO Answer Message Format

Note: * If the output angle value is drifting, use this command to eliminate it, and the initial state of Z-axis will be zeroed, and the instrument must be set in the stationary state when sending this command. It is prohibited to use this function when the instrument is rotating.

4) Setting the Z-axis Static Threshold

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x5A	0x10	0x00	DataH	DataL	0x00	0x00

Table 1-7 SDO Request Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x5A	0x10	0x00	DataH	DataL	0x00	0x00

Table 1-8 SDO Answer Message Format

Note: For example, to send: 40 5A 10 00 00 01 00 00, 5-6 bytes of Z-axis static threshold data in hexadecimal (PLC or configuration software reads the data directly from the 16-bit registers in decimal), with the high byte at the front and the low byte at the back;

After converted into decimal, the static threshold value is expressed as follows:

Static threshold = (data field)/1000.

If the register data is 0x0001, the conversion to decimal is 1

Static Threshold = (1)/1000 = 0.001°

Static Threshold unit (°), 0x0001 = 1, 1/1000 = 0.001 means set the static threshold to 0.001°, default Z-axis static threshold 0.05°. This parameter filters out the slight data jitter that occurs when the gyro goniometer is placed at rest. The Z-axis angular velocity is zero if the angular velocity is less than the "Static Threshold" setting and is considered to be stationary for the duration of the "Stabilization Time" setting. This parameter can be turned up when using scene jitter to cause Z-axis accretion, or down for scenes with very slow, uniform rotation.

5) Queries the Z-axis static threshold

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x4A	0x10	0x00	0x00	0x00	0x00	0x00

Table 1-9 SDO Request Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x4A	0x10	0x00	DataH	DataL	0x00	0x00

Table 1-10 SDO Request Message Format

6) Setting the Z-axis Stabilization Time

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x5F	0x10	0x00	DataH	DataL	0x00	0x00

Table 1-11 SDO Request Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x5F	0x10	0x00	DataH	DataL	0x00	0x00

Table 1-12 SDO Request Message Format

Note: For example, if you send: 40 5F 10 00 00 0A 00 00, the Z-axis stabilization time is 5-6 bytes of data in hexadecimal (the PLC or configuration software reads the data directly from the 16-bit register in decimal), with the high byte at the front and the low byte at the back. After converting to decimal, the stabilization time is expressed as follows:

Stabilization time = (data field)/1000.

If the register data is 0x000A, converted to decimal is 10

Stabilization time = (10)/ 1000 = 0.01s

Stabilization time unit (s), 0x000A = 10, 10/1000 = 0.01 means that the stabilization time is set to 0.01s, **the default Z-axis stabilization time is 0.1s**, and the gyro goniometer is stationary to determine the time threshold. When the angular velocity is less than the setting value of "Stationary Threshold", and continues in the time set in "Stabilization Time", this parameter can be adjusted down appropriately if the requirement of stabilization time is higher. Reducing this parameter can speed up the stabilization time but at the same time may increase the error.

7) Query Z-axis Stabilization Time

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x4F	0x10	0x00	0x00	0x00	0x00	0x00

Table 1-13 SDO Request Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x4F	0x10	0x00	DataH	DataL	0x00	0x00

Table 1-14 SDO Answer Message Format

8) Setting up Gyro Auto-Calibration

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x65	0x10	0x00	0x01	0x00	0x00	0x00

Table 1-15 SDO Answer Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x65	0x10	0x00	0x01	0x00	0x00	0x00

Table 1-16 SDO Answer Message Format

Note: When the Z-axis horizontal gyro goniometer is placed at rest and the angle is increasing, the angular velocity at rest can be eliminated by auto calibration. Method: Place the gyro goniometer on the static plane, send this command to set, and wait for more than 25s to finish.

9) Setting up Gyro Initialization

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x67	0x10	0x00	0x00	0x00	0x00	0x00

Table 1-17 SDO Answer Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x67	0x10	0x00	0x00	0x00	0x00	0x00

Table 1-18 SDO Answer Message Format

Note: When the horizontal angle of the gyro-turning goniometer is not accurately recognized under uniform or slow motion, the module can be set to initialize.

10) Setting the Angle and Angular Velocity Output Mode

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x0C	0x10	0x00	Mode	0x00	0x00	0x00

Table 1-19 SDO Answer Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x40	0x0C	0x10	0x00	Mode	0x00	0x00	0x00

Table 1-20 SDO Answer Message Format

Note: The fifth byte (Mode) is 0x00: question and answer type

0x01: 5Hz Data Rate

0x02: 15Hz Data Rate

0x03: 25Hz Data Rate

0x04: 35Hz Data Rate

0x05: 50Hz Data Rate。

The default output mode is 00. If the device is in non-answer mode, the sensor will have an angle output when it is powered up, 5Hz Data Rate means that the data will be output automatically 5 times per second, and so on.

2. single-axis gyro goniometer angle, angular velocity of the process data object PDO (Process Data Object): read Z angular velocity, angle, the message format is as follows:

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x40	0x04	0x10	0x00	0x00	0x00	0x00	0x00

Table 1-20 SDO Answer Message Format

CAN-ID	First Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+ Node_ID	0x00	0x00	0x00	ZgyroL	ZgyroH	0x00	Zangle L	Zangle H

Table 1-20 SDO Answer Message Format

There are eight byte parameters after CAN-ID, the first 4-5 bytes are Z-axis angular velocity parameters, and 7-8 bytes are Z-axis angle parameters, with the low byte at the front and the high byte at the back.

The low byte comes first and the high byte comes last. Example of angle and angular velocity conversion:

The Z-axis angular velocity and angle data size is represented by a 16-bit binary number, with the high 8 bits being XH and the low 8 bits being XL.

For example, ZangleL=0x4C, ZangleH=0x37, the angle is -58.44°.

When converted to decimal, the angle representation is as follows:

Z-axis angle true = (data field - 20000)/100.

If the register data is 374C, converted to decimal is 14156.

Z-axis angle real data = (14156-20000) / 100 = -58.44°